Tallawarra Stage B Gas Turbine Power Station

SUBMISSIONS REPORT

March 2010

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1. Introduction

This report provides a response by TRUenergy to submissions made on the Tallawarra Stage B Power Station project. TRUenergy, the proponent for the project, is a provider of both electricity and natural gas to residents and businesses in Victoria, South Australia, New South Wales and the Australian Capital Territory, as well as providing electricity in Queensland and to businesses in Tasmania. It also owns power stations in Victoria and South Australia and the recently completed Tallawarra Stage A power station in New South Wales.

The location of the Tallawarra B project site is shown in Figure 1. The proposed development would be located on land owned by TRUenergy and would be adjacent to the existing Tallawarra Stage A power station.

In accordance with the *State Environmental Planning Policy (SEPP) (Major Projects) 2005* (Major Projects SEPP), the Minister for Planning formed the opinion that the Tallawarra Stage B Power Station project, being a development for the purposes of electricity generation as defined in clause 24(a) of Schedule 1 to the Major Projects SEPP, is appropriately classified as a "major project" to which Part 3A of the *Environmental Planning &Assessment Act 1979* (EP&A Act) applies. The Minister confirmed this in a letter dated 15 September 2007.

As of 26 February 2008, all new power stations in NSW with a generation capacity greater than 250MW have been declared as 'critical infrastructure' under section 75C of the EP&A Act, provided the project application is lodged prior to 1 January 2013. Since the proposed Tallawarra B power station would have a generation capacity greater than 250MW, the Minister for Planning will consider the proposal as "critical infrastructure".

Under the requirements of Part 3A, a Project Application was submitted to the Department of Planning (DoP) which outlined the proposal and a preliminary environmental assessment of the project. The DoP consulted with relevant government agencies regarding the Project Application and prepared integrated requirements for the Environmental Assessment (EA). These requirements were provided to the proponent by the Director-General of Planning under section 75F of the EP&A Act on 31 October 2007.

The proponent prepared the EA report in support of an application to the Minister for Planning under section 75J (1) for project approval. The EA was prepared in accordance with the Director-General's requirements and the report was placed on public exhibition by the DoP between 5 August and 3 September 2009.

Legend

- Proposed Tallawara B
- Tallawara A
- Tallawarra Land Border
- Power Station Site Boundary

Source: Aerial supplied by NSW Dept of Lands, Topographic data by Streetworks

0 210 420

Metres

1:17,000 At A4

SINCLAIR KNIGHT MERZ
SKM

Figure 1 - Site Layout

Projection: GDA94 MGA Zone 56

EN02239 - Tallawarra Stage B Power Station

July 22, 2008
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The Department of Planning placed advertisements in the newspapers, advising members of the public of the exhibition locations and the processes by which a submission could be made. The EA and advice on the submission timing and processes were also placed on the DoP website.

In addition, TRUenergy held a Community Information and Feedback Session at the Dapto Ribbonwood Centre between 6pm and 8pm on Tuesday 25 August 2009. This voluntary community engagement activity was structured as an informal drop-in session to provide members of the community with an opportunity to find out more about the plans for the site and to provide feedback on the Stage B project. Members of the project team from TRUenergy and Sinclair Knight Merz were in attendance at the session to provide information and respond to questions from the community. Participants provided verbal feedback to members of the project team at the Session and were invited to make submissions through the formal exhibition process run by the NSW Department of Planning. Around 20 members of the local community participated in the session.

The local community was notified of the session through:

- A Community Update (newsletter) distributed to a local catchment of 4,000 homes;
- A full page Community Update published in the Illawarra Mercury and Lake Times newspapers;
- A daily radio notice from 19 to 24 August on PowerFM, 2ST, VOXFM and ABC Radio Illawarra; and
- An invitation to all Community Liaison Group members.

Seven submissions on the EA were received by the Department of Planning and these were forwarded to the proponent for a response to be provided in accordance with section 75H (6) (a) of the Act. No submissions were received from the general community.

The proponent's responses to these submissions and any proposed changes to the draft Statement of Commitments form the basis of this report. Chapter 3 outlines a detailed response to the main issues as identified by the Department of Planning. Of particular note was the response to issues associated with the discharge of biocides into receiving waters, and these were addressed in detail in Appendix A. Chapter 4 addresses all of the issues raised by the submissions and Chapter 5 addresses recommended changes to the Statement of Commitments. Where recommendations were made for conditions of approval these are commented on in Appendix B.

2. Project Description

The Tallawarra Stage B power station was described in Chapter 5 of the Environmental Assessment. It would comprise, in summary, the construction and operation of:

- power station plant, consisting of:
  - 2 or 3 open cycle gas turbine (OCGT) generators with a nominal capacity of 300-450MW, or
  - one combined cycle gas turbine (CCGT) generator with a nominal capacity of 400MW;
- turbine condensate cooling comprising wet cooling towers with lake water make-up (CCGT only);
- distillate tank and unloading station (OCGT only);
- high voltage switchyard (extension) comprising high voltage connection to the unit transformers and associated switchgear;
- transmission line connection to the existing 132kV network;
- connecting gas pipelines, gas metering and pressure reduction station;
- potable/fire water tank;
- demineralised water tank;
- electrical module; and
- emergency diesel generator.

The project would also utilise, where possible, existing infrastructure associated with the Tallawarra Stage A power station, including the existing gas supply lateral pipeline, water treatment plants, control room, administration, amenities and workshop buildings.

The submissions received from Department of Planning were reviewed and are addressed in this report. Following consideration of these submissions TRUenergy has resolved that there are no changes proposed to the project description as identified in Chapter 5 of the EA.

3. Responses to Main Issues

The Department of Planning (DoP) provided comments on specific issues, generally in summary of the issues raised in submissions by relevant agencies. These comments and responses to these comments are provided below.

3.1. Noise

The draft Wollongong Local Environmental Plan 2009 proposes to rezone the Tallawarra Lands site for a variety of purposes including residential uses. As there is now certainty as to the proposed zoning, and the footprint for residential development on the Tallawarra Lands has been determined, the impact of the project on the acoustic amenity of future residents as part of the Submissions Report must be addressed, including low frequency noise impacts.

The potential impact of the proposal on the acoustic amenity of future residents was addressed in Section 7.4.2, Section 8.4.2 and Appendix E – Noise Assessment of the EA. Specifically the noise assessment provided indicative noise criteria for proposed residential zones of the Tallawarra Lands site and compared predicted noise impacts from the power station (including a 5dB(A) penalty for low frequency noise) with the indicative criteria.

Further detail on the exact location of residential areas will not be known until development approval is obtained for the Tallawarra Lands development.

Further discussion on this is provided in the response to the submission from DECCW in Chapter 4.

3.2. Water

3.2.1. Use of unapproved biocide

The Department noted that the project proposes the use of an unapproved biocide (DegacleanR150) in the operation of the plant. The Environmental Assessment refers to an exemption being applicable to the registration of industrial biocides for the control of organisms in water used in cooling systems. The referenced exemption does not apply to the use of DegacleanR150, only to its possession and supply.

The Department cannot consider a project which proposed to use a product which is not approved for use in Australia. It is understood that the manufacturer is seeking approval (a permit) for the use of the biocide in Australia, although there is no guarantee as to when and if an approval would be granted.

The APVMA is an Australian government authority responsible for the assessment and registration of pesticides and veterinary medicines and for their regulation up to and including the point of retail sale.

Chemicals for the treatment of industrial cooling water systems fall under the remit of APVMA. A sub-set of such chemicals is biocides – chemicals applied to prevent the growth of nuisance organisms in cooling systems. The APVMA has previously issued a specific exemption from registration for industrial biocides for the control of organisms in water used in cooling systems.

Despite this the current position of the APVMA is that any cooling water biological control agent not registered must at least be permitted for use. A product for which a registration application is lodged with and gazetted by APVMA can be issued a permit for use as an interim measure while the registration process is completed.

The status of various products is discussed in the report in Appendix A. The identified biocide for project approval is Hydrex 2470 which has a permit under the APVMA. A registration application has been lodged with the APVMA under application number 36525. While this registration process is on-going, APVMA has issued a permit (PER8188) which allows the use of the product as a biological control agent for organisms in water used in cooling systems. This is in force until September 2011.

The methodology for biofilm control using this product is presented in Appendix A.

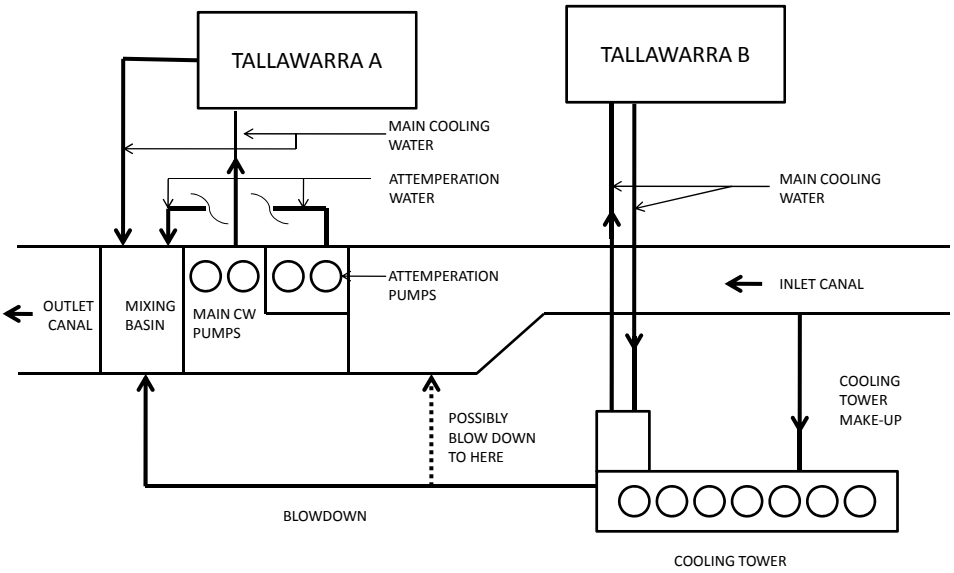
3.2.2. Use of approved biocide

The Submissions Report should present a method which uses an approved product or an alternative treatment methodology for biofilm control and assess the worst case impacts associated with its use.

Figure 2 shows a sketch of the proposed cooling water arrangements for Tallawarra Stage B. The concept design is for the blowdown from the Tallawarra B cooling tower to be released to the mixing basin at the outlet from the Tallawarra A cooling system. Alternatively, the blowdown could be released into the inlet canal before Tallawarra A.

Explanation of ecotoxicity and target concentration in discharge

Substances which could have harmful impacts are tested for their eco-toxicity. Trials are conducted to determine the effect of the substances on organisms which could be impacted upon by the discharge of the substance. The results of these trials provide guidelines to permit regulators to determine safe discharge limits for the substances.



- *Figure 2 - Schematic of proposed operation*

The No Observed Effect Concentration (NOEC) is the highest test concentration that does not cause a significant effect, whilst the EC_{50} is the median effect concentration which is generally used when it is difficult to determine mortality accurately and some surrogate end-point such as immobility is measured which, if the test were extended, would lead to mortality (ANZECC 2000).

When toxicity data sets are relatively limited, as in the available data on Hydrex 2470 (also referred to as Mexel 432/336) it is appropriate, in accordance with the ANZECC (2000) water quality guidelines, to assign an assessment factor to account for other organisms which have not been assessed for toxicity response and may be more or less sensitive than those tested. The magnitude of these assessment factors depends upon the degree of confidence in the data reflecting the field situation. Most factors are in multiples of 10 and larger factors are applied where there is less certainty in the data (ANZECC 2000). In discussions with DECCW it was agreed that, in the absence of specific toxicity data for the organisms likely to be present in the receiving waters, a safety factor of x100 would be appropriate for EC_{50}.

The lowest EC_{50} in the available dataset for Hydrex 2470 is observed for the algal biomass of *Phaeodactylum tricornutum* (EC_{50} 0.1mg/L). When the assessment factors are applied, the target concentration in the final discharge in terms of EC_{50} is 0.001mg/L.

Results when Tallawarra A and B are operating

When both Tallawarra A and Tallawarra B are operating, under worst-case operating conditions, the Hydrex 2740 concentration at the mixing point for both plants reaches a maximum of 0.00084mg/L which is under the relevant target concentrations.

Results when Tallawarra A is not operating

When Tallawarra A is not operating and assuming the main cooling water flow is not available, the Tallawarra A attemperation pumps (7,000 kg/s of water from the inlet) would be used to dilute the water flow in the mixing area. It is expected that this would occur for less than 10% of the time that Tallawarra B would be in service.

During the periods when the blowdown is shut off for dosing, the make-up rate to the tower would be reduced to replace just the water evaporated. The concentration of salts in the tower would temporarily increase.

During the one hour period when the blowdown is closed, the cold water temperature would rise by approximately 1°C, causing a drop in output of approximately 700kW. The cold water temperature – and so the output - would revert to normal over the next several hours as the blowdown and make-up rates return to the design values.

Under worst case operating conditions (hot day), the Hydrex 2470 concentration at the mixing point would reach approximately 0.0014mg/l, exceeding the EC_{50} target concentration of 0.001mg/L. This concentration occurs immediately after the blowdown from the cooling tower has been re-opened after the Hydrex 2470 has been dosed to the system. Over a period of time, as the blowdown rate is increased following the dosing event, the concentration of Hydrex 2470 would vary between the target value and approximately 0.0014 mg/L until, approximately 7 hours after the blowdown has been re-established, the residual concentration would be below the target value at all times. Refer to Figure 5 in the PCS report (Appendix A) for graphical representations of the predicted Hydrex 2470 concentration.

Results if attemperation pumps are not working

If Tallawarra A is not operating and the attemperation pumps are not available, we would expect the plant to be able to operate for several days – perhaps up to a week - without dosing, with no

long term detrimental impact on the efficacy of the cooling water system. This would allow time to re-establish the pumps.

General conclusion

Whilst the available data for Hydrex 2470 is limited, it has already been approved for use in the salt water auxiliary cooling system at Munmorah Power Station into Tuggerah Lakes. The licence requirements at Munmorah Power Station appear to permit a discharge at 0.5mg/L at the equivalent point in the process where the discharge from Tallawarra B would be less than 0.1mg/L.

On this basis and the results of the modelling described above and in detail in Appendix A we conclude that the minor exceedance of the EC_{50} values during Tallawarra A outages does not represent a threat to the marine environment of Lake Illawarra.

The data in the PCS report is realistic though probably a little conservative. Operationally, it should be possible to dose the system at times when the evaporation rate is lower (eg during cooler periods rather than in the heat of the afternoon) and so the blowdown rate will be lower.

On that basis it would be possible to achieve a rational dosing regime using Hydrex without any environmental hazard.

3.2.3. Use of alternatives to an approved biocide

The Submissions Report could note that approval is being sought to use DegacleanR150 and in the event that approval is obtained prior to commissioning of the plant, this would be used as an alternative to the method proposed.

The APVMA status of other biological control agents - DegacleanR150 and Proxitane - are also discussed in Appendix A, along with their permit or approval status.

DegacleanR150 is manufactured by Evonik Degussa Peroxide Pty Ltd. They had previously been in contact with APVMA and were of the opinion that their product was exempt from registration. They are now aware that there is a requirement to have their product registered and we understand they are seeking to submit an application as soon as possible. Once the application is lodged and has been gazetted by APVMA, Evonik will request a permit for the interim use of the product in Australia while the registration process is completed.

Although the assessment provided in this report deals with Hydrex 2470 as the preferred product due to its current permit for use, an assessment is also provided for DegacleanR150 as it is anticipated that the product will be available and approved for use before the proposed power plant is constructed.

3.2.4. Need for recalculation of data

It is noted that there are still errors in the calculations used to determine the concentration of contaminants in potential discharges to Lake Illawarra. Hence, the results of the impact assessment on aquatic ecosystems are questionable. In the event that you pursue the use of Degaclean R150 as an alternative, the Submissions Report should include a recalculation of the discharge concentrations and use the highest dose concentration (i.e. worst case scenario rather than the lowest likely possible dose) to assess the impact of the discharge on the aquatic ecology of Lake Illawarra.

The explanation for the errors is outlined in Table 4-1 in the response to DECCW submission. Essentially the dosing should have been 9 mg/L/s over 15 minutes rather than 9 mg/L.

This has been corrected and the proposed dosing for DegacleanR150 is explained in detail in and an assessment provided in Appendix A.

3.3. Air Safety

An application to the Civil Aviation Safety Authority for an aircraft operational assessment must be made, and the outcomes of the assessment must be forwarded to the Department.

A letter from Shellharbour Council was forwarded for comment. The letter requested the department to consider the impacts of the proposed power station development on the current and potential operations at the existing Illawarra Regional Airport.

A meeting with the Civil Aviation Safety Authority (CASA) and Airservices Australia (AsA) in regard to plume penetration issues has been formally requested and pursued by TRUenergy and its aviation consultants (Ambidji) since early December 2009. This meeting has yet to be achieved, but is still being discussed with the Office of Airspace Regulation (OAR) within CASA.

Ambidji has previously expressed its concerns in writing to AsA and OAR in regard to the outcomes of the AsA aeronautical assessment which was provided to NSW planning late last year. The nature of these concerns were articulated to NSW planning in a letter to the Director-General dated 11 December 2009. The significant issue was that the AsA aeronautical assessment overstates the height of the penetrations of aviation protective surfaces due to not using the CASA accepted plume height exceedance figure of 0.1%.

Since the AsA assessment was sent to NSW Department of Planning, Sinclair Knight Merz (SKM) has prepared a revised plume rise report which has, as its key outcome, reduced plume rise heights for the OCGT option. Ambidji is reviewing its aeronautical assessment and will produce a revised report based on the revised SKM plume rise report of February 2010.

Additionally, this revised SKM plume rise report has been forwarded to OAR with a request for it to be incorporated into our request for AsA to review their aeronautical assessment.

It is understood that CASA (OAR) has requested AsA to review their original aeronautical assessment on the basis of:

1. Ambidji's concerns, in particular that the 0.1% exceedance figure was not used, and
2. the new SKM plume rise report

TRUenergy, through Ambidji, is pressing OAR for the results of the AsA review. OAR has stated that once the aeronautical review is received and considered, it will discuss the outcomes of this review and the merits of a meeting with TRUenergy and Ambidji.

Either on the basis of outcomes of the anticipated meeting or in the absence of such a meeting TRUenergy intends to proceed to make a formal application to CASA for the aviation safety approval of both of the gas fired power stations (OCGT and CCGT) options for Tallawarra B.

A supplementary submissions report will be prepared to address the issue once outcomes are agreed with AsA and CASA.

4. Responses to Environmental Assessment

4.1. Submissions Received

Submissions in response to the Environmental Assessment were received during the exhibition from the following:

- Department of Environment, Climate Change and Water (DECCW);
- NSW Office of Water (NOW);
- Shellharbour City Council;
- Wollongong City Council;
- Commonwealth Department of Defence;
- Roads and Traffic Authority (RTA);
- Lake Illawarra Authority (LIA).

These submissions were forwarded by DoP to the proponent.

There were no responses received from the general community.

A number of agencies also provided recommendations for changes to Statements of Commitments and these are addressed in Chapter 5.

4.2. Responses to Submissions

The comments received and the responses are provided in the following tables. In general, submissions were related to issues associated with noise, air quality, water quality, flora and fauna, visual impacts. The submissions are addressed according to agency.

Table 4-1 Department of Environment, Climate Change and Water

Comments	Response
Biocides and Antiscalents	
The Appendix G calculations (page 9) to estimate the peracetic acid discharged concentration into Lake Illawarra appear incorrect and significantly underestimate the likely discharge concentration. The dose rate is reported to be 9mg/L of active ingredient (peracetic acid) for 15 minute dosing intervals which occurs three to six times each day. The calculations assume a one off dose of nine milligrams (mg) instead of a dose of 9mg/L. The flow rate is 217 Litres (L) per second so the dose of peracetic acid per second is 1953mg (9x217mg) instead of the 0.01mg calculated in Appendix G. This means the concentration in the discharge is underestimated by more than five orders of magnitude. Based on our calculations the final concentrations should have been 0.16mg/L for the design case, 0.2mg/L for the hot day case, and 0.13mg/L for the cold day case.	It is acknowledged that the dosing assumption used was incorrect. It should have been 9 mg/L as PAA for 15 minutes per day which is the preferred dosing regime. See response below for an explanation
EA Table 8-28 includes ecotoxicity data from a New Zealand (NZ) study which included four marine organisms. The table compares the lowest NOEC (no observed effect concentration) with the calculated discharge concentration. Four organisms means the data set is limited. It is accepted practice, as outlined in the ANZECC water quality guidelines, to include an *assessment factor* to account for other organisms which have not been assessed for toxicity response and may be more or less sensitive than those tested. Here, given the limited data set, the factor is 100. Thus the "acceptable" concentration is the lowest EC50 value divided by 100. The study found an EC50 of 0.69mg/L for a blue mussel embryo and 0.89mg/L for a marine alga. The two fish species were much less sensitive and EC50s were both about 4mg/L. This means an estimated acceptable concentration after accounting for the assessment factor would be 0.007mg/L. The EA uses the 0.89 value instead of the 0.69 value and derive a acceptable value of 0.009mg/L. Either way the final peracetic acid discharge concentration (0.13–0.2mg/L) is markedly higher than the acceptable level (0.007 mg/L). DECCW believes a proper assessment must be completed promptly and prior to determination rather than at some later stage such as during the design and commissioning of the constructed Power Station.	It is acknowledged that the dosing assumption used was incorrect. The dosing regime intended and the resultant concentrations are described in Appendix A of this report. In the reassessment of the PAA based assessment outlined in Appendix A uses the EC50 of 0.7 mg/L for blue mussel embryo and applies the ANZECC guideline safety factor of x 100 dilution such that the acceptable concentration of the PAA based compound at discharge would be 0.007 mg/L. The recalculations provided in Appendix A indicate that, for the reaction scenarios detailed and the dilution flows available, the final PAA concentrations in the receiving waters would be less than the criterion of 0.007 mg/L. As noted in Chapter 3 the assessment has been redone for an approved biocide (Hydrex 2470). Hydrex is shown to be acceptable for use. The corrections to the PAA based biocide were provided on the basis that approval is being sought for the use of Degaclean and this may eventually be the biocide used in the operation of the plant.

<table>
<tr>
<td>A possible mitigating factor that warrants investigation may be the periodic dosing regime (that is, 15 minute dosing events 3–6 times per day) rather than longer term continuous dosing events.
Additionally, TRUenergy could assess the discrepancy between likely discharge concentration and the acceptable concentration by undertaking their own ecotoxicological testing. The tests should look at the more sensitive organisms from the NZ study (or an Australian equivalent) and could account for the proposed periodic dosing regime. DECCW would seek to be involved in the design and review of such an investigation.</td>
<td>The appropriate dosing regime for PAA based biocide is described in Appendix A.

There is no need for ecotoxicological testing.</td>
</tr>
<tr>
<td>Noise</td>
<td></td>
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<tr>
<td>1. Project Specific Noise Levels
The Industrial Noise Policy (INP) provides that the PSNLs are the more stringent of the intrusive and amenity criteria. The intrusive criteria is set at the Rating Background Level (RBL) plus 5dB(A) for day, evening and night. The amenity criteria is based on acceptable noise levels for a given receiver category (for example, residential urban, residential suburban etc) modified on the basis of existing industrial noise levels, again for day, evening and night periods. A further explanation of the INP criteria derivation process can be obtained with reference to Chapter 2 of the INP.
Section 3 in the NIA deals with criteria, or more appropriately ‘project specific noise levels’. However, PSNLs are only derived for Locations T2 (Carlyle Street) and T4 (Wyndarra Way). Criteria for locations identified as ML#9, 10 & 11 appear to have been derived from the intrusive criteria and are presented in the NIA in Tables 4.3 and 4.5.
It is acknowledged in the NIA, that on the basis of potential 24 hour operation, that the night time criteria is more stringent, and therefore assessment has been undertaken against the night time criteria. This approach is conservative and therefore acceptable.
Table 1 below presents the PSNL for the proposal for the night time operating period, as presented in the NIA (column 2), and also any adjustment to the PSNL recommended by DECCW (column 4).
Table 1: Project specific noise levels, LAeq,15min dB(A)1
<table>
<tr><th>Receiver Location</th><th>Night time PSNL recommended in NIA</th><th>Night time PSNL recommended by DECCW</th><th>Reason for DECCW recommendation</th></tr>
<tr><td>T2</td><td>43</td><td>37</td><td>Night time RBL of 32dB(A) recorded at Coronet Place by SKM in 2008 (See NIA Table 4-1).</td></tr>
<tr><td>T4</td><td>36</td><td>36</td><td>No change recommended</td></tr>
<tr><td>ML#9[2]</td><td>38</td><td>38</td><td>No change recommended</td></tr>
<tr><td>ML#10[2]</td><td>37</td><td>37</td><td>No change recommended</td></tr>
<tr><td>ML#11[2]</td><td>44</td><td>41</td><td>The day and evening RBLs were lower than the night time RBL. In accordance with INP Application Notes the lower evening RBL was adopted.</td></tr>
</table>
[1]. All PSNL in NIA assume a descriptor of LAeq,15min which is conservative when the PSNL is informed by the amenity criteria and therefore acceptable to DECCW.</td>
<td><u>1.</u> The noise level in Table 4-1 identified as Location 2 (Coronet Place) is not the same as Location T2 (Carlyle Street) in Table 2-3 of the report, which was used for the assessment of noise impacts. These locations have different noise influences such as traffic noise from the southern freeway at T2 and have different topographic shielding from the Power Station. The PSNL identified in the report is correct for the location T2 and therefore it would be non-compliant with the INP to set a PSNL of 37 dB(A) at this location as suggested by DECCW.

At Location ML11 the background noise level is presented in Table 4-1 of the report. This noise level is consistent with the setting of a PSNL of 44 dB(A) at this location. The DECCW recommended PSNL of 41 dB(A) is based on noise data collected at Location T1 in the centre of the Tallawarra Lands, which is not representative of the noise sources at the assessment location of ML11. Therefore it would be non-compliant with the INP to set a PSNL of 41 dB(A) at this location as suggested by the DECCW.</td>
</tr>
</table>

[2]. PSNL based on intrusive criteria only, as existing industrial noise not reported in NIA. This is not considered to be of major consequence, because the predicted noise levels are below LAeq,15minute 35dB(A). Therefore limits will be informed by the predicted level and will represent the lowest INP criteria for residential receivers. Note that the Statement of Commitments only commits to satisfying the PSNL in the NIA not the predicted noise levels.

2. Predicted Noise Levels and Impacts

2a. Noise emissions outside the Tallawarra Land Area

The modelling scenarios include calm and adverse meteorological conditions, which consist of "F" class inversion conditions with a 1.6m/s drainage wind flow from the west. The modelling has been undertaken for combined operation of Stage A and Stage B plants considering both OCGT and CCGT options. The predicted noise levels include a positive 5dB(A) adjustment to account for the high potential for a low frequency noise adjustment as required by the INP.

Table 2 presents a summary of the noise predictions in the NIA for combined Stage A and B operations with both turbine options.

Table 2: Summary of Predicted Operational Noise Levels in the NIA (combined Stage A & B) LAeq,15minutes dB(A).

Receiver Location	Location description	Predicted Noise level OCGT Neutral / Calm	Predicted noise level CCGT Neutral / Calm	Night time PSNL recommended by DECCW
T2	Carlyle Street Koonawarra	27/28	28/30	37
T4	Wyndarra Way Koonawarra	26/27	29/31	36
ML#9	Central Park Mongurah Point	30/33	31/35	38
ML#10	Boonarah Point	30/33	32/35	37
ML#11	Haywards Bay Estate Yallah	25/28	26/31	41

The predicted noise levels indicate that the combined operation of the Stage A and Stage B development, considering both the OCGT and CCGT options, under neutral and adverse meteorological conditions will satisfy the most stringent criteria under the INP of LAeq,15minutes 35dB(A).

In accordance with the INP application notes, the predicted noise levels have been considered in recommending licence limits for the proposal. Given that the proponent has indicated that noise emissions not exceeding LAeq,15minutes 35 dB(A) are achievable from the development, this level will be recommended as a licence limit for all residential areas outside the Lands area.

2a. It is not considered reasonable to impose a noise limit of 35 dB(A) (the most stringent of noise level requirements) as a blanket condition on the development which would reduce the acceptable development noise levels to between 1 and 9 dB(A) below those required to be met under the INP assessment methodology.

The predicted noise impacts are based on a CONCAWE noise model with inherent uncertainty. To illustrate the potential impact reducing the INP set criteria may have on the project by applying a single criteria of 35 dB(A),at locations T4, ML9 and ML10 the reduction of criteria would deduct up to 3 dB(A) over the INP determined criteria and more than 3 dB(A) at other locations . The range of +/- 3dB(A) is considered to be at the limit of predictive accuracy of the noise model and therefore it is not considered reasonable to reduce noise levels to the actual lowest predicted level of the model. This is considered to be of critical importance given that noise modelling is likely to be required to determine compliance for the project at distant locations once the project becomes operational.

Limiting the proposal to the minimum noise criteria at off-site locations will also limit commercial discretion when selecting equipment for the project. It is recommended that the PSNLs identified in the noise report are maintained as the project noise goals at this stage of the approval process, although it is acknowledged that DECCW policy is to set noise limits at modelled levels (allowing for uncertainty, low frequency noise contribution and a minimum of 35 dB(A)) where predicted noise levels are lower than PSNLs.

2b. Noise emissions inside the Tallawarra Lands area

The NIA assessment shows the location of proposed residential areas within the Lands, overlaid with noise contour predictions. The proponent asserts that establishing assessment criteria for the residential areas within the Lands is;

"premature at this stage of the project as this development will be the subject of a separate approval process and as such there are no firm development plans for the site, which is a key consideration when developing noise criteria" (NIA, page 30).

DECCW believes the ambient noise monitoring presented in the NIA could be used to establish conservative assessment criteria. This criteria could be used to assess potential impacts on the residential components of the Lands. If potential impacts are established, now is the ideal opportunity to determine whether additional *"feasible and reasonable"* source noise controls can be incorporated into the Power Station development. The rational for such an approach is to increase the compatibility of proposed land uses within the Tallawarra Lands. If assessment of the Lands is deferred until after determination on this proposal, the potential for additional noise controls on the Power Station development may be limited.

On this basis DECCW has determined the following "*impact assessment goals*" for the Lands. Figure 7-15 in the EA identifies three proposed residential areas. For ease of identification, DECCW will refer to these as proposed residential north (PRN), proposed residential central (PRC) and proposed residential south (PRS).

Table 3 presents the proposed night time assessment criteria, together with the basis and assumptions for the "impact assessment goal" developed.

Table 3: Proposed night time "Impact Assessment Goals" for Tallawarra Lands Residential Areas.

Location	Night time	Comments
PRN	LAeq,15minutes 36dB(A) LAeq,night 36dB(A)	The intrusive criteria was established on the basis of night time RBL measured at location T3. The amenity criteria was developed on the basis of a rural receiver category and existing industrial noise of LAeq, 38dB(A) stated in the NIA. , If noise from Stage A is considered in the criteria derivation process, and it increases existing industrial noise, the amenity criteria would reduce.
PRC	LAeq,15minutes 37dB(A)	Adopt PSNLs for Carlyle Street
PRS	LAeq,15minutes 41dB(A)	Adopt PSNLs for ML#11 – Haywards Bay Estate, Yallah.

The following preliminary impact assessment comments have been generated from interpolation of the noise contour plots in Figures 4-6, 4-7, 4-8 and 4-9.

- Southerly portions of the PRN: predicted noise levels up to LAeq,15minutes 40dB(A). This level exceeds the impact assessment goal in the order of 4dB(A)
- Easterly portions of the PRC: predicted noise levels up to LAeq,15minutes 40dB(A). This level exceeds the impact assessment goal in order of 3dB(A)
- Noise impacts above the impact assessment goals are not predicted for PRS.

On the basis of the above information, DECCW believes additional feasible and reasonable noise mitigation measures should be considered for the Power Station to satisfy the impact assessment goals developed for the residential areas proposed for the Lands. If this issue is not addressed during this EA process, additional land use compatibility options

2b. The identification of the area nominated as **PRN** as a rural receiver or using current location T3 background noise measurements to set criteria for residential development at or near this location in the future is not considered technically valid for the site. The use of the rural receiver category would be valid for the protection of an existing receiver in a rural setting in this location if there were any but there are currently no existing receivers in this area. The noise criteria are needed to protect the amenity of future receivers within a suburban development, hence the approach to apply an amenity criteria for suburban areas. For evening and night time periods it is acknowledged that the INP defined acceptable noise levels for a rural and suburban area are the same, and equate to a PSNL of LAeq,night of 36dB(A). Further assessment as part of the Tallawarra Lands Part 3A Application will confirm this criterion. It is not possible to determine an appropriate intrusive criterion as background noise levels for a future land-use are unable to be determined, but undoubtedly they would be higher than existing background noise level, given the noise that will be generated by suburban activity.

As for locations **PRC** and **PRS**, these PSNL have been correctly determined in the noise report as 43 and 44 dB(A) respectively. See 1 above.

The DECCW comments regarding the need to consider additional noise controls now rather than later are not considered necessary on the basis that the interim criteria determined for the Tallawarra Lands described above have been appropriately determined as opposed to the alternate and lower criteria offered by DECCW.

Additionally and as previously discussed with DECCW, any further consideration of noise controls is best undertaken in negotiation with an equipment supplier as part of the Contract negotiations for the

are unlikely to involve source noise controls at the Power Station. Start up and shut down noise assessment Section 4.9 in the NIA identifies short term noises associated with start up and shut down procedures. The NIA indicates, that due to the short term nature of the events, that they will not influence the LAeq,15 minute noise emissions from the Power Station. The assessment indicates that the DECCW screening level assessment criteria is not predicted to be exceeded at residential locations outside the Lands. LAmax noise limits will be recommended for locations outside the Lands. Noise levels from short term events have not been assessed to the proposed residential areas inside the Lands. It is recommended that the proponent commit to satisfying the DECCW sleep disturbance screening level assessment criteria at all residential locations within the Lands. OCGT versus CCGT Electricity generation from gas turbine generators is a relatively new industry to NSW. However, an emerging trend is that OCGT have higher exhaust stack noise levels than CCGT generators. This phenomenon is reflected in the stack mouth sound power levels used in the current assessment. This may be a consequence of the turbine exhaust first passing through the HRSG in the case of CCGT prior to exiting the stack mouth. A large component of the overall noise level from the proposed CCGT is the cooling tower, which is not a noise source associated with significant low frequency emissions. The overall "Power Station" noise emissions from CCGT are therefore lower than for OCGT. Intuitively, noise emissions from OCGT will have a higher component of low frequency energy than CCGT, and will therefore have a greater potential for annoyance. DECCW has not received complaints regarding the operation of Tallawarra Stage A CCGT. However DECCW has received complaints from the recent commencement of operations of a OCGT development with residences at similar offset distances to the Tallawarra development, with the principal basis for complaint being low frequency noise. It is recommended that the proponent be required to determine the low frequency noise content of the Tallawarra Stage A CCGT Power Station, with reference to the guidelines in the INP. The low frequency noise level from Stage A should be adopted as a design parameter for the Stage B plant, and committed to as a statement of commitments.	project. Prior to this TRUenergy have limited opportunities to negotiate on items like acoustic controls. The process of minimising noise will be worked through during the design development. The need to undertake a complete assessment in accordance with the DECCW Sleep Disturbance criteria within the Tallawarra Lands should not be required for the Stage B project. This requirement will be necessary when a Development Application for the Tallawarra Lands is submitted. Any assessment of this aspect would be premature prior to the construction of the Stage B plant and, regardless, would need to be duplicated for a future Tallawarra Lands DA. The assessment of noise impacts applies a 5 dB(A) penalty to all predicted noise levels for both OCGT and CCGT noise designs. There is considered to be no need to extend this assessment any further, for example measuring the low frequency noise contribution from Tallawarra A. In the event this was done and it was determined that the Tallawarra A low frequency noise contribution exceeded INP thresholds for low frequency noise , then it would be necessary to apply a 5 dB(A) penalty to predicted noise levels. As stated this has already been done, in anticipation that the OCGT and CCGT will have a low frequency component. Further the low frequency parameter is only one component of the overall project design requirement and cannot alone be the limiting consideration in the selection of equipment and ancillaries for the proposed Stage B development. TRU energy would commit to the consideration of acoustic requirements in conjunction with other project design parameters.

Table 4-2 Roads and Traffic Authority

Comments	Response
The developer shall prepare a Traffic Management Plan (TMP) for the construction phase. The TMP shall be prepared by a person who is certified to prepare Traffic Control Plans. Should the TMP require a reduction of the speed limit, a Direction to Restrict will also be required from the Traffic Operations Unit (TOU).	Traffic management plans will be prepared as part of the Construction EMP. This was noted in the Statement of Commitments.
The developer shall apply for a Road Occupancy Licence (ROL) from the RTA Traffic Operations Unit (TOU) prior to commencing work within the classified road reserve or within 100m of traffic signals. The developer shall submit the ROL application 10 business days prior to commencing work. It should be noted that receiving an approval for the ROL within this 10 business day period is dependent upon the RTA receiving an accurate and compliant TMP.	A ROL will be applied for and received prior to construction work commencing.

Table 4-3 Department of Defence

Comments	Response
Defence has assessed the proposal and concurs with the EA that an application will need to be made to the Civil Aviation Safety Authority for assessment and determination and this will meet Defence requirements for the proposal.	An Air Safety Study is currently in preparation and will be submitted to CASA for an Aircraft Operational Assessment.

Table 4-4 NSW Office of Water

Comments	Response
The NOW recommends that the proposal is consistent with the stream categorisation as defined by the Wollongong City Council's Riparian Corridor Management Study (2004) (RCMS).	DWE attended the Planning Focus Meeting and had input to the development of the Director-General's requirements for the preparation of the EA. There were no requests for consideration of Yallah Creek in the context of the RCMS, nor any requirement for restoration work
The EA shows the proposed Tallawarra Stage B power station is located in close proximity to Yallah Creek. Yallah Creek has been identified as a Category 1 watercourse by DIPNR in 2004. This stream categorisation was reiterated by DNR in 2006 in relation to a draft LEP amendment for the Tallawarra site. As a Category 1 watercourse, Yallah Creek warrants riparian vegetation and protection for a minimum width of 50m either side of the waterway (measured from top of bank). A number of management objectives are encouraged to be achieved, primarily the width of riparian land required to enable the identified function to connect Lake Illawarra with the native vegetation on Mount Brown with the added integration opportunities of Aboriginal Cultural Heritage along the	Notwithstanding Yallah Creek's status as a Category 1 watercourse there are no changes proposed for the creek from the construction of the Stage B power station. TRUenergy has had an extensive look at an option for diverting the drain into a series of open drains, but this would not be possible without extensive earthworks and creating a system of dams and swales.

Comments	Response
creek. Section 6.1.4 of the EA indicates that Yallah Creek is piped under the north-west section of the Stage B power station site before it discharges into Lake Illawarra. Some degree of compromise may be required for the riparian corridor at the foreshore end but an important aim is to not compromise the Category 1 objective any further. The NOW encourages DOP to deliver an award winning planning and development outcome by providing an integrated environmental corridor linking the upper catchment with the receiving water body (having identified Regional Significance in the Illawarra Regional Strategy) and thereby connect an isolated EEC with the lake foreshore ecosystems as well as integrate Aboriginal Cultural Heritage attributes.	The power station will be constructed on the existing hard stand area and Yallah Creek will continue to be piped under the north west section of the existing hard stand area before discharge to Lake Illawarra. There is no proposal for the proponent to divert the Yallah Creek alignment or to undertake any further restoration work.
The NOW recommends that the piped section of Yallah Creek be removed and rehabilitated to mimic a natural system, so the proposal improves this watercourse rather than just maintaining its current state.	TRUenergy will be bridging over the conduit as was done with the former development by NSW Electricity Commission. A review of the surrounding land area indicates that it not feasible to re-route the creek on the surface
Figure 5-7 shows it is proposed to locate the Stage B transmission line easement over Yallah Creek. The poles/pylons and any other direct impacts associated with the proposal should be located outside 50 m from the top of the bank of the creek and the proposed method for stringing of conductors should avoid the need for machinery to be operated at or near the banks of the creek.	All efforts will be made to avoid the possibility of impacts on the creek and its riparian areas. This will include minimising the use of machinery at or near the banks of the creek.
The NOW notes that there are other watercourses located within the Tallawarra land site. While the Stage B proposal is only located on a small part of this site, the minimum riparian setback requirements for these watercourses should be followed for any future development within Tallawarra land.	This project deals with the application for a power station at the site of the former coal fired power station. Riparian setbacks for Tallawarra lands were and will be dealt with in the approval processes for development of Tallawarra lands.
Duck Creek is mapped as a Category 1 watercourse and warrants riparian revegetation and protection. Because the Duck Creek riparian corridor is the only connection point between the Tallawarra lands and environmental lands of the Yallah – Marshall Mount Precinct, a corridor width in excess of 100 m each side of the waterway is recommended for long term sustainability of the regional corridor's functionality. The value of the connection is beyond just that of riparian values (ie riparian biodiversity, water quality and channel stability) as this link will provide the only connection between the lowland woodlands either side of the freeway.	There are no impacts on Duck Creek predicted from the development of the power station and no need to address this issue.
The NOW notes the foreshore area adjacent to the former coal-fired power station has been dedicated to the Lake Illawarra Authority (LIA) (page 6-3). The NOW recommends that as a minimum, a 50m wide vegetated riparian corridor be established from top of shore around Lake Illawarra. The NOW recommends that DOP consults with the LIA to confirm the adequacy of this riparian setback width, particularly as the LIA is pursuing up to 100m width in other locations north from the power station area.	Tallawarra Power station has a licence to generate electricity over all of this land and adjacent sections of Lake Illawarra and would not support a change in corridor width or its ability to generate electricity.
The proposal should incorporate the following riparian outcomes: (a) the minimum width of the CRZ is to be measured from top of bank in accordance with the RCOS categories (b) the CRZ and VB is to remain, or become vegetated, with fully structured native vegetation (trees, shrubs and	Noted. There are no changes proposed to the design of the power station as it relates to Yallah Creek and no

Comments	Response
groundcover species). (c) Any Asset Protection Zone (APZ) requirement, or any part of the APZ, must not be located within the CRZ or VB. (d) All uses (with the exception of environmental protection works, drainage and crossings (e.g. roads, service utilities, paths)) must be located outside the CRZ and VB. (e) Any disturbance of watercourses associated with the proposal must be rehabilitated to emulate a naturalised system for aquatic and terrestrial environments. (f) Any waterway crossings should be designed and constructed in accordance with the *DWE Guidelines for Controlled Activities Watercourse Crossings (February 2008)*.	further restoration work proposed for Yallah Creek.

Table 4-5 Shellharbour City Council

Comments	Response
The possible visual impact of the proposal when viewed from the Shellharbour City Council area, in particular the foreshores of Lake Illawarra and Shellharbour City Centre. In this regard, the use of non-reflective materials and extensive landscaping to screen the development would be preferred.	Visual mitigation measures were addressed in Sections 7.9.7 and 8.9.7 of the EA and in the Statement of Commitments. These are consistent.
The possible impact on the health of Lake Illawarra. The Lake is a natural asset shared by both Wollongong and Shellharbour City Councils. Its health and long term management area of great concern to both Councils and special consideration should be given to ensure that the proposed development does not have a detrimental impact on either of these.	The possible environmental impacts on Lake Illawarra were addressed in the EA.
Possible increase in air pollution. Council would be concerned if there were any increase in air pollution in the Local Government Area as a result of this or both power stations cumulatively.	Air pollution issues were addressed in the EA in Sections 7.1 and 8.1.

Table 4-6 Lake Illawarra Authority

Comments	Response
Regardless of whether or not an open cycle gas turbine (OCGT) power station or combined cycle gas turbine (CCGT) power station is approved for the site, the Authority is concerned about potential impacts on the environment of the lake. The Authority notes that potential impacts to Lake Illawarra have been assessed in the EA and measures identified to mitigate impacts. The Authority supports the Statement of Commitments which outlines environmental mitigation, management and monitoring provisions for the project during proposed construction and operation phases.	Noted.

Table 4-7 Wollongong City Council

Comments	Responses
Noise Assessment Long term background noise levels and TRUenergy operational noise levels have been obtained using noise prediction modelling and compliance with noise criteria has been subsequently determined by the proponent. In using the noise prediction model as a decision making tool it should be noted that the model utilises a snapshot of the physical environment. Physical conditions are variable and consequently the modelling results may not predict the true noise levels. It is considered that any noise assessment for the proposal should be rigorous and draw on a number of scenarios. Intermittent noise from the proposal should also be considered, as should the location of future residential development within TRU energy land and nearby suburbs. The Tallawarra site is bounded by low density residential development and Council would like to see the amenity of surrounding residents and the local community maintained. As such, Council supports the implementation of all operational noise attenuation methods detailed in the report.	The noise assessment has met the requirements of the relevant agency guidelines as requested in the Director-General's requirements and correspondence with DECCW.
Atmospheric Emissions The proposed Stage B gas turbines will utilise diesel fuel as a back-up fuel for use during interruption to or periods of limited natural gas supply. Measures would be imposed to ensure that the combined nitrogen oxide emissions from both Stage A and B emission do not surpass the limit of 900 tpa. Furthermore, emissions from diesel fired turbines will increase the concentration of sulphur dioxide, PM10 and unburned hydrocarbon in the local atmosphere, specifically in the immediate residential area surrounding the power station. A higher level of emissions and smog generation is expected to be discharged into the air-locked Warrawong-Albion Park air shed. This should be addressed and all measures to reduce the level of emissions should be investigated.	Noted. This was addressed in the EA – sections 7.1 and 8.1.
Water Quality The subject site is not sewered and an on-site waste management system is required unless all treated wastewater from the treatment plant is re-used for operational purposes. An on-site waste water management licence is required where treated wastewater is proposed to be discharged into waterways, above ground pr below ground. Any increased usage of an existing septic effluent system generated by the proposed activity will also require approval from Council. The proponent should meet the NSW DECCW targeted goals for the removal of gross pollutants, total suspended solids, total phosphorus and total nitrogen. Council would also like the proponent to give consideration to water sensitive urban design (WSUD), noting that while WSUD may not be applicable for power stations and their operations, it may be applied to other parts of the land within TRUenergy site.	The existing on-site wastewater management system will be used for the proposed Tallawarra B project. There will be no changes to the operation of the system and existing approvals will remain in place.
Water Usage The use of natural water for cooling purposes in the proposal will increase pressure on an already constrained freshwater supply. Additionally the use of Lake Illawarra water for cooling purposes and the subsequent discharge of the warmer water into the lake during the warmer seasons of the year may result in thermal pollution with a direct impact on the seagrass bed. Council recommends further consultation with the Lake Illawarra Authority in this regard.	Access to potable water has been discussed with Sydney Water and would be subject to its approval. The use of lake water and discharge to the lake is addressed in the EA in Chapter 8.5 and in this Submissions Report.

Flora and Fauna Issues The recommendations contained within the EA to carry out further assessment of the following species is supported: Black Bittern, Green and Golden Bell Frog, Grey-headed Flying Fox, Greater Broad-nosed Bat, Yellow-bellied Sheathtail-bat, Southern Myotis, Common Bentwing-bat, Glossy Black-cockatoo. The EA states that the nearest recorded population of Green and Golden Bell-frog is located in Commonderry Swamp. It is noted that the core Illawarra population of this species occurs within the Port Kembla area (as detailed in the recovery plan), and it is closer to the subject site than the Commonderry Swamp. The EA describes the occurrence of a number of EECs on the site. Although the EA states that no native vegetation would be cleared, it is acknowledged that some strands of EEC may suffer edge effects and therefore "harm" as a result of the proposed development. As such Council recommends that a s5A assessment of significance for impacts on EECs on the site be prepared.	There is no commitment to further assessment of these species within the EA and none is proposed. Noted. The information used in the EA was from the studies done on Tallawarra Lands and probably predates this further information. The conclusions, however, would be unchanged. The EECs identified in Figure 6-7 of the EA are not directly or indirectly affected by the proposal and for this reason and the requirements under Part 3A there is no need to undertake an assessment of EECs under S 5A of the EP&A Act.
Geotechnical The Environmental Assessment submitted indicates that the land over the subject site consists of deep fill. It is recommended that geotechnical advice be obtained in order to design the foundations for the various components of the development.	Appropriate geotechnical studies will be undertaken during detailed design.
Stormwater and Flooding Suggested conditions of consent in relation to stormwater and flooding have been provided in the Attachment.	These will be addressed in Appendix B.
Storage of Materials The storage of large volumes of diesel fuel on site provides potential for greater fire risk and long-term soil and groundwater contamination. Further detail relating to the amount and types of materials to be stored on site and the measures proposed to contain these materials would be beneficial.	A PHA was undertaken for the project. Further hazard studies will be undertaken at later stages of the project development. These are discussed in Section 7.5.5 of the EA.

5. Statement of Commitments

5.1. Recommended changes by DECC

Noise

Comment: *Noise levels from short term events have not been assessed to the proposed residential areas inside the Lands. It is recommended that the proponent commit to satisfying the Department of Environment, Climate Change and Water (DECCW) sleep disturbance screening level assessment criteria at all residential locations within the Lands.*

Response: The need to undertake a complete assessment in accordance with the DECCW Sleep Disturbance criteria should not be required for the Stage B project. This requirement will be necessary when a development approval for the Tallawarra Lands is submitted. Any assessment of this aspect would be premature prior to the construction of the Stage B plant and, regardless, would need to be duplicated for a future Tallawarra Lands approval.

Comment: *It is recommended that the proponent commit to adopting, as a design parameter, selecting a turbine type that does not have a greater low frequency noise content than exhibited by the Stage A plant, as determined by the guidelines in the Industrial Noise Policy.*

Response: The low frequency parameter is only one component of the overall project design requirement and cannot alone be the limiting consideration in the selection of equipment and ancillaries for the proposed Stage B development. TRU energy would consider acoustic requirements in conjunction with other project design parameters.

Comment: *It is recommended the proponent modify the commitment to satisfying PSNL to satisfying the noise levels predicted in the Noise Impact Assessment.*

Response: This condition is considered very onerous and, places significant weight on the accuracy of the noise model. The intention of the model should be to demonstrate whether or not the plant can comply with INP determined PSNLs. In the case of Tallawarra B the noise modeling (with the inclusion of a low frequency noise penalty) for the most part shows that PSNLs will be readily achieved at surrounding sensitive receiver locations and this should give TRUenergy some commercial discretion as to the required acoustic design of the plant. By setting noise limits at modelled levels with some allowance for model inaccuracies (and not less than 35 dB(A)), there is very little scope for actual plant noise levels to deviate from those modelled and still comply with the specified noise limits which are lower than the PSNLs

Conclusion: Although the difficulty in setting noise limits at modelled levels is stated in the above response, it is acknowledged that this is DECCW policy, and the Statement of Commitments has therefore been modified to reflect a commitment to meet noise limits as prescribed by DECCW.

Changes made to the Statement of Commitments are shown (as underline) below.

Objective	Action	
	OCGT Plant	**CCGT Plant**
Minimise operational noise impact on surrounding residences	- The project noise goals listed in Table 7-17, developed in accordance with the Industrial Noise Policy (INP), will be adhered to during the operation of the Stage B OCGT plant. - Additionally the OCGT plant will be designed such that noise limits specified in the project approval documents are able to be achieved during plant operations.	- The project noise goals listed in Table 8-16, developed in accordance with the Industrial Noise Policy (INP), will be adhered to during the operation of the Stage B CCGT plant. - Additionally the CCGT plant will be designed such that noise limits specified in the project approval documents are able to be achieved during plant operations.
	- Any future development within the Tallawarra Lands area will need to consider the operational noise emissions of the plant and implement design measures (either at the plant, in the transmission pathway and/or at the receiver) to minimise the impact of such emissions. Operational noise emissions monitoring will be undertaken during the operational phase. - The start up and shut down activities will be managed through the Operational Environmental Noise Management Plan developed for Tallawarra A, Ref 7142-037-02-01 Rev 2.	

Water

Comment: *All necessary permits, registrations, or approvals required by the Australian Pesticides and Veterinary Medicines Association (APVMA) for the proposed biocides and antifouling chemicals will be acquired prior to the commencement of commissioning.*

Response: Agree.

Comment: *Only biocides and antifouling chemicals permitted, registered, or approved for use by the APVMA will be used in the Power Stations.*

Note: Advice received by the DECCW from APVMA on 1 September 2009 is that peracetic acid will need to be registered or have a permit. Based on this advice the exemption from this requirement for this product is not in effect.

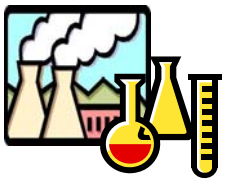
Response: Agree.

Conclusion: The following commitment will be added to the Operational – Water listing:

If required by the Australian Pesticides and Veterinary Medicines Association (APVMA), all relevant permits, registrations or approvals for biocides and antifouling chemicals will be obtained prior to the commencement of commissioning of the power station.

Appendix A Evaluation of Biological Control Treatment Program

PCS Ltd



Making process chemistry work for you

Tallawarra B CCGT:
Evaluation of Preferred Biological Control Treatment Program for Cooling Tower System

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1 INTRODUCTION

TRUenergy is considering construction of a 400 MW (nominal) F-Class combined cycle power station adjacent to the western side of Lake Illawarra, near Wollongong, NSW, Australia. This facility ('Tallawarra B') would occupy a site adjacent to the existing Tallawarra A plant.

The Tallawarra B project will incorporate a cooling tower system, which will abstract water from the local Lake Illawarra. This lake is a shallow, coastal lagoon, with relatively low tidal exchange.

This document discusses the preferred biological control program for cooling water treatment at Tallawarra B that will meet the technical and environmental demands of the cooling tower system. An optional biological control program is also presented.

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2 COOLING SYSTEM DESIGN AND OPERATIONAL CONDITIONS

2.1 Design Conditions

Design conditions for the cooling tower system are shown below (Table 1).

Parameter	Units	Value
Ambient temperature	Deg C	25
Relative humidity	%	70
Ambient wet bulb temperature	Deg C	21.4
Recirculation allowance	Deg C	0.5
Temperature at CT	Deg C	25.5
Thermal load	MW	260
Cold water temperature	Deg C	29.4
Hot water temperature from condenser	Deg C	39.4
Recirculating water mass flow rate	kg/s	6200
Evaporation rate – nominal	kg/s	90

Table 1: Design conditions for the Tallawarra B cooling water system

2.2 Operational Conditions

While the cooling tower system design case for evaporation is approximately 90 kg per second, the operating evaporation rate is dependent upon ambient conditions. The following (Table 2) shows the estimated design, upper and lower bounds for system evaporation:

	Ambient Temperature [^{o}C]	Ambient Relative Humidity [%]	Evaporation [kg/s]
Cold day	1	70	67
Design	25	70	90
Hot day	40	20	108

Table 2: Evaporation rate operating range for cooling tower system

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The tower system is expected to operate at 1.25 cycles of concentration. Dependent upon evaporation rate, the blowdown rate for this cycles of concentration value will vary as shown in Table 3:

Evaporation Rate (kg/s)	Blowdown Rate at 1.25 Cycles (kg/s)
67 (cold Day)	268
90 (design)	360
108 (hot day)	432

Table 3: Variation in cooling tower system blowdown rate for variations in evaporation rate at 1.25 cycles

2.3 Chemistry Conditions

The tower system will operate at a nominal 1.25 cycles of concentration, which equates to a blowdown water rate of 360 kg/second at the design condition.

A biological control agent will be added to the tower system to minimise growth of nuisance macro-organism like mussels, barnacles, clams, etc., and to minimise biofilm growth and proliferation of Legionella bacteria.

A scale control agent will be dosed to prevent the formation of hardness and silica scales on the heat exchange surfaces of the condenser and the cooling tower.

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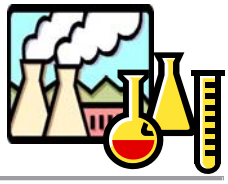

3 APVMA STATUS OF AVAILABLE BIOLOGICAL CONTROL AGENTS FOR COOLING WATER TREATMENT

3.1 Introduction

Halogen-based biocides dominate the cooling water treatment market in Australia and internationally, both for freshwater and brackish/seawater cooling systems. Non-oxidising biocides are at times used in freshwater high-cycles cooling tower systems, but for cost reasons they are usually not used in seawater low-cycles tower systems or in freshwater or seawater once-through cooling systems.

Where neither halogens nor non-oxidisers are used, biological control and treatment options are limited.

For the purpose of the Tallawarra-B project, the preferred biological control agent is:

- HYDREX 2470: A fatty-amine-derivative filming agent.

The technical and environmental compatibility of this product to the requirements of the project is discussed in Section 4 below.

An alternative treatment program based around the use of a stabilised peracetic acid biocide is presented in Section 5. Two such products are:

- PROXITANE: A 5% peracetic acid-based strong oxidising biocide; and,
- DEGACLEAN 150: A 15% peracetic acid-based strong oxidising biocide.

3.2 Legal Use of Biological Control Agents in Australia

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is an Australian government authority responsible for the assessment and registration of pesticides and veterinary medicines and for their regulation up to and including the point of retail sale.

Chemicals for the treatment of industrial cooling water systems fall under the remit of the APVMA. A sub-set of such chemicals is biocides—chemicals applied to prevent the growth of nuisance organisms in cooling systems, such as bacteria, fungi, bivalves, molluscs, etc.

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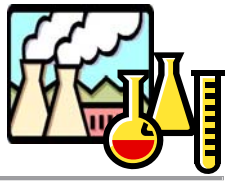

The APVMA has previously issued a specific exemption from registration for industrial biocides for the control of organisms in water used in cooling systems. This exemption was gazetted in 1996 and to date has not been rescinded.

In addition to this exemption several ***disinfectants*** were reserved from registration in 2007 under 56ZU of the Agricultural and Veterinary Chemicals Code Act 1994. These are disinfectant products containing low levels of benzalkonium chloride, glutaraldehyde, hydrogen peroxide, O-benzyl-p-chlorophenol, ortho-phenylphenol, peroxyacetic acid, phosphoric acid, sodium hydroxide, sodium hypochlorite, sulfamic acid and sulphuric acid. Disinfectant products covered by the reservation remain under the control of APVMA but may be supplied in accordance with the conditions of reservation without specific individual approval.

Despite exemptions and exclusions for cooling water biocides apparently being in place, the current position of the APVMA is that any cooling water biological control agent not registered must at least be permitted for use. If such a permit were not issued, custody, supply or use of the product would constitute an offence. A product, for which a registration application is lodged with and gazetted by APVMA, can be issued a permit for use as an interim measure while the registration process is ongoing. This allows product vendors to operate their businesses legally without incurring unnecessary delay.

3.3 APVMA Status of Preferred Biological Control Agent for Tallawarra B

3.3.1 HYDREX 2470

The HYDREX 2470 product is manufactured and marketed by Veolia Water Solutions and Technologies Pty Ltd, under licence from Mexel Industries. A registration application for HYDREX 2470 has been lodged with APVMA under Application Number 36525. While this registration process is ongoing, APVMA has issued Veolia a permit to use the product. Permit Number PER8188 applies and is in force from 8th July 2009 to 30th September 2011. Permit jurisdiction applies to all Australian states.

3.4 APVMA Status of Optional Biological Control Agents for Tallawarra B

3.4.1 PROXITANE

The PROXITANE product is manufactured and marketed by Solvay Interox Pty Ltd. This product is registered with APVMA as a disinfectant under APVMA product number 47491. The product registration applies to all Australian states.

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3.4.2 DEGACLEAN 150

The DEGACLEAN 150 product is manufactured and marketed by Evonik Degussa Peroxide Pty Ltd. Evonik had previously been in correspondence with the APVMA and was of the opinion that their product was exempt from registration. It has only been in recent months that Evonik has become aware of the requirement to have their product registered. As of the date of issue of this report, Evonik has yet to submit a full application for registration of their product to APVMA. Evonik will complete the application process at the earliest opportunity and has contracted a consultant with specific expertise in this area to manage the process. Once the application is lodged, and has been gazetted by APVMA, Evonik will request a permit for the interim use of the product in Australia while the registration process is completed. As an indication, once gazetting is complete, a permit can be issued in a 6-month timeframe. Permitting is subject to the ongoing timely submittal to APVMA of all requested documentation. The registration process itself takes between 15 and 36 months.

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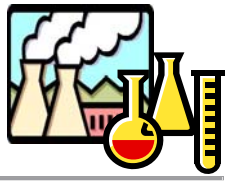

4 EVALUATION OF HYDREX 2470 AS THE PREFERRED BIOLOGICAL CONTROL AGENT FOR COOLING WATER TREATMENT

4.1 Overview

The proposed Tallawarra B cooling tower system will consist of the following operational elements:

- Recirculating water flow rate: 6,200 kg/second
- Cycles of concentration: 1.25 nominal
- Blowdown rate: 360 kg/second nominal

Normally, the blowdown water will be diluted before discharge with a dilution water flow of 11,500 kg/second, which is available from the Tallawarra A once-through cooling water system.

When Tallawarra A is not in service, dilution flow will be provided via an attemperation pump system, which can provide a total flow of 7,000 kg/second.

The preferred biological control agent for the Tallawarra B cooling tower system is HYDREX 2470. This product will be evaluated in terms of its consumption within the cooling tower system, the maximum residual concentration of product likely to be present in the blowdown at any given time, and the fate of that residual with respect to dilution within other receiving waters and further reaction with those receiving waters, if any.

4.2 HYDREX 2470

4.2.1 Product Overview

HYDREX 2470 is manufactured by Veolia Water Solutions and Technologies Pty Ltd, under licence from Mexel Industries. HYDREX 2470 is not a biocide per se, but is rather a filming agent composed of a mixture of fatty amines, in particular N-oleyl-1,3-diaminopropane and N-coco-alkyltrimethylenediamines. The product (sold by Mexel) has found use in European once-through cooling systems and in cooling tower systems, and there are case studies to support the technical claims made. The product is essentially non-hazardous and its transportation and storage should present no engineering or health and safety challenges.

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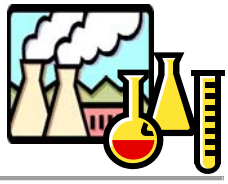

Action Against Macro-Fouling Species:

The product has a strongly hydrophobic functional group on one end of its active polymer, which causes the polymer to readily adhere to system surfaces in contact with the process cooling water. The other end of the polymer consists of a strongly hydrophilic functional group which makes it soluble and causes it to pull water into surface interfaces. In relation to macro-organisms, the product controls growth by coating these organisms in a sub-micron thickness of filming agent, thereby inhibiting dissolved oxygen transfer to the gills, which is sufficient to encourage dislodgement of the organisms from their host surfaces, which in this case would be the water-touched surfaces of the cooling system. The product is generally applied at a concentration between 6 and 10 mg/L, with the vast majority being consumed in surface-filming. Dosing is typically daily; at least until sufficient performance data is collected to support an optimisation program. Dose duration is 10 – 30 minutes. For the purposes of evaluating the environmental compatibility of the product, it is assumed that a daily dose of 8 mg/L as product is applied.

Action Against Micro-Fouling Species:

HYDREX 2470 does not have biocidal properties at the microbial level. Microorganism growth is prevented through a surfactant effect, i.e. the penetration into surface biofilm with the subsequent disruption of that community and the sloughing off of biofilm into the bulk water, where it becomes part of the flow that can be discharged via blowdown. As for macro-fouling control, the product is applied at a target concentration of 8 mg/L (as product) based on the cooling system volume.

Corrosion Control:

Filming agents are a well known corrosion-protection strategy in the water treatment industry. HYDREX 2470 is novel in respect of the thickness of film applied, which is in the order of only 30 Angstrom. The principle of corrosion protection is akin to applying a layer of paint: by excluding the replenishment of oxygen at the metal/water boundary layer, the normal electrochemical corrosion reactions are inhibited. HYDREX 2470 can also contribute to preventing scaling from calcium carbonate through the disruption of the ‘lock-and-key’ mechanism of incipient scaling crystal formation.

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4.2.2 Ecotoxicity Data

The available ecotoxicity data on the product is produced by Mexel Industries. The HYDREX 2470 product is equivalent to Mexel 432/0. Veolia Water, the supplier of HYDREX 2470, has confirmed that ecotoxicity data showing the effect of a similar product called Mexel 432/336/0 on seawater algae are relevant to the HYDREX 2470 product also. The data set is shown below (Figure 1):

Mexel® 432/336/0 toxicity to algae

Sea water

***Phaeodactylum tricornutum*:** EC_{b50} 72 hrs 100 µg/L, EC_{t50} 72 hrs 250 µg/L, $NOEC_b$ 72 hrs 24.685 µg/L, $NOEC_t$ 72 hrs 49,37 µg/L. Method NF EN ISO 10253. Report No.:BPL 06-0025. Test in GLP - SGS Multilab, Laboratory of Rouen – 65, rue Ettore Bugatti -BP 90014 – F-76801 Saint Etienne du Rouvray Cedex (France).

Figure 1: Ecotoxicity data for effect of product on seawater algae

An EC_{b50} value of 0.10 mg/L (100 µg/L) as product is taken for the purpose of further evaluation of the product.

Ecotoxicity data sets for the effect of the product on seawater crustaceans and the seawater mollusc *Aulacomya ater* are shown below (Figures 2 and 3).

Mexel® 432/0 toxicity to crustacean

Sea Water

Americamysis bahia: IC_{50} 24 and 48 hrs are respectively > 0.8 and 0.32 mg/l (nominal concentration - Mexel® 432/0). Test performed in flow-through condition at 25 ± 2 °C and at a salinity of 20 ‰. Test performed in GLP. Report No.: 507A-101 - Wildlife International, Ltd. 8598 Commerce Drive – Easton – Maryland - 21601 – USA.

Artemia salina : LC_{50} 48 hrs is 1.31 mgL^{-1} (1.14 – 1.49 mgL^{-1} ; nominal concentration). Test performed in static at 13°C ± 1 °C in natural sea water. Method US EPA- 600/4-90-027F (1995). Test performed in GLP – Report CREA (2008) -148-08, 5 pp

Emerita analoga : LC_{50} 96 hrs is 43.67 mgL^{-1} (32.20 – 59.25 mgL^{-1} ; nominal concentration). Test performed in static at 13°C ± 1 °C in natural sea water. Method US EPA- US EPA- - 600/4-90-027F (1995). Test performed in GLP – Report CREA (2008) -175-08, 4 pp

Figure 2: Ecotoxicity data for effect of product on seawater crustaceans

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Mexel® 432/0 toxicity to mollusk

Sea Water

Aulacomya ater : LC_{50} 96 hrs is 14.36 mgL^{-1} (12.54 – 16.45 mgL^{-1} ; nominal concentration). Test performed in static at 13°C ± 1 °C in natural sea water. Method US EPA- 821-R-02-014 (2002). Test performed in GLP – Report CREA (2008) -174-08, 4 pp

Figure 3: Ecotoxicity data for effect of product on a seawater mollusk

Where data sets are relatively limited, as per the available ecotoxicity data on HYDREX 2470, it is appropriate in accordance with the ANZECC water quality guidelines to assign an assessment factor to account for other organisms which have not been assessed for toxicity response and may be more or less sensitive than those tested. In this case, the assessment factor is given as 100. Hence, when evaluating the environmental compatibility of HYDREX 2470, the target concentration of product after all dilution effects and product reactions are taken into account is 1/100th of the EC_{b50} value of 0.10 mg/L as product, i.e. 0.0010 mg/L as product.

4.3 Ensuring Environmental Compliance in the use of HYDREX 2470

4.3.1 Reaction of HYDREX 2470 Within The Cooling Tower System

The decay kinetics for this fatty-amine product is in the order of hours to days. Because the period being considered for dosing in the Tallawarra B process is short, i.e. 10 – 30 minutes, decay time cannot be factored into the evaluation of breakdown of the product residual during the time it is present in the blowdown water. Consumption of the product in the cooling tower system is therefore considered to be through demand only.

HYDREX 2470 Demand:

HYDREX 2470 is dosed on the assumption that the vast majority of it is consumed through a filming action on water-touched cooling system surfaces. It has no disinfectant or biocidal properties at the standard dosed concentration of 8 mg/L, so unlike conventional biocides there is no requirement or desire to maintain a residual of product in the water. Indeed, any appreciable residual in the water would constitute a waste of the product, since the residual is the amount of chemical not consumed in the surface-filming process. Demand is based not only on filming of system surfaces (piping, condenser, cooling tower structure), but on filming and therefore sequestration of suspended solids in the bulk water.

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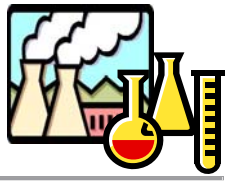

It is the latter effect that is expected to rapidly consume any remaining residual in the Tallawarra B cooling tower system. With the source cooling water being abstracted from the shallow Lake Illawarra, suspended solids loading is likely to be at least moderate, i.e. 3 – 10 NTU. This suspended solids load will therefore assist in consuming any residual of HYDREX 2470 in the tower system.

Product information indicates that for an applied concentration of 8 mg/L as product, 99% of product should be consumed in the tower system. This equates to a final product residual of 0.08 mg/L.

Circuit Time Within The Cooling Tower System:

The Tallawarra B cooling tower system will have a nominal system water volume of 3,500 m^3 and a recirculating flow rate of c. 6.2 m^3/s. The time for all water to complete one circuit of the tower system (the 'circuit time') is therefore 565 seconds or approximately 9.4 minutes. For convenience, a circuit time of 10 minutes is used.

Proposed HYDREX 2470 Consumption in a Seawater-Type Cooling System:

To facilitate the consumption of HYDREX 2470 and the minimisation of residual in the cooling tower system, the cooling tower blowdown can be closed for one hour from the commencement of dosing. Keeping the blowdown closed for up to an hour allows sufficient time relative to the system circuit time of 10 minutes to apply several small doses of product, with the aim of allowing each mini-dose to work its way around the system and be taken up via filming of surfaces and bulk-water suspended solids. This helps ensure the product is not overdosed, and thus that the final residual of product at the end of the 1-hour holding period is <0.10 mg/L.

The residual in the tower system or in the blowdown can be readily determined through use of proprietary test kits, which can measure to as low as 0.10 mg/L of product. The test kit can be taken to the point of sampling for increased accuracy, and requires no user expertise. As such, it can be verified through direct field testing that the HYDREX 2470 residual is consumed by the amount indicated above before blowdown is re-established.

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4.3.2 Stepwise Blowdown Regime

The cooling tower blowdown will recommence following the one hour holding period. To meet the target concentration of HYDREX 2470 of 0.0010 mg/L in the final discharge, the blowdown will be increased in steps, according to the following operating plan:

- Blowdown is closed for 60 minutes from the onset of product dosing;
- Blowdown is then operated for 120 minutes at a theoretical cycles of concentration equal to 1.90;
- Blowdown is then operated for 120 minutes at a theoretical cycles of concentration equal to 1.70;
- Blowdown is then operated for 120 minutes at a theoretical cycles of concentration equal to 1.50;
- Blowdown is then operated for 180 minutes at a theoretical cycles of concentration equal to 1.40;
- Blowdown is operated thereafter at a theoretical cycles of concentration equal to 1.25.

The above dictates that 10 hours after dosing commences, the cooling tower is operating at its nominal target of 1.25 cycles of concentration. The tower remains at this setting until the next scheduled product dosing.

4.3.3 Final Discharge Concentration of HYDREX 2470 for Dilution Flow of 11,500 kg/s

This is the scenario where the Tallawarra A cooling water flow is available as dilution water flow. This is expected to be the normal situation, and this flow is presumed to be available for at least the equivalent Service Factor of Tallawarra A, i.e. in the order of 90% of the time. It is possible that this flow can be maintained in service even if Tallawarra A is not actually in generation mode.

With this flow available, and a starting product concentration post-dosing of 0.08 mg/L in the blowdown, Table 4 below shows the final product concentration in the discharge for the range of evaporation rates given in Table 2. The calculations confirm that for an initial HYDREX 2470 dose of 8 mg/L, the residual concentration of this product in the final discharge will be **less than** the $1/100^{th}$ EC_{b50} value of 0.0010 mg/L at all times and for all operating scenarios.

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Dilution Flow = 11,500 kg/s; EVAPORATION = 108 kg/s							
Time from Start of HYDREX 2470 Dosing (minutes)	*Blowdown Flow (kg/s)*	*Theoretical Cycles of Concentration*	*Dilution Flow (kg/s)*	*Dilution Factor*	*HYDREX 2470 Concentration in Blowdown Flow (mg/L)*	*HYDREX 2470 Concentration in Combined Flow (mg/L)*	*HYDREX 2470 Concentration Less Than 1/100th EC_{b50} Value of 0.0010 mg/L?*
60	120	1.90	11,500	96.8	0.0800	0.00083	Yes
180	154.3	1.70	11,500	75.5	0.0625	0.00083	Yes
300	216	1.50	11,500	54.2	0.0455	0.00084	Yes
420	270	1.40	11,500	43.6	0.0291	0.00067	Yes
600	432	1.25	11,500	27.6	0.0126	0.00046	Yes
Dilution Flow = 11,500 kg/s; EVAPORATION = 90 kg/s							
Time from Start of HYDREX 2470 Dosing (minutes)	*Blowdown Flow (kg/s)*	*Theoretical Cycles of Concentration*	*Dilution Flow (kg/s)*	*Dilution Factor*	*HYDREX 2470 Concentration in Blowdown Flow (mg/L)*	*HYDREX 2470 Concentration in Combined Flow (mg/L)*	*HYDREX 2470 Concentration Less Than 1/100th EC_{b50} Value of 0.0010 mg/L?*
60	100	1.90	11,500	116.0	0.0800	0.00069	Yes
180	128.6	1.70	11,500	90.4	0.0651	0.00072	Yes
300	180	1.50	11,500	64.9	0.0500	0.00077	Yes
420	225	1.40	11,500	52.1	0.0345	0.00066	Yes
600	360	1.25	11,500	32.9	0.0172	0.00052	Yes
Dilution Flow = 11,500 kg/s; EVAPORATION = 67 kg/s							
Time from Start of HYDREX 2470 Dosing (minutes)	*Blowdown Flow (kg/s)*	*Theoretical Cycles of Concentration*	*Dilution Flow (kg/s)*	*Dilution Factor*	*HYDREX 2470 Concentration in Blowdown Flow (mg/L)*	*HYDREX 2470 Concentration in Combined Flow (mg/L)*	*HYDREX 2470 Concentration Less Than 1/100th EC_{b50} Value of 0.0010 mg/L?*
60	74.4	1.90	11,500	155.5	0.0800	0.00051	Yes
180	95.7	1.70	11,500	121.1	0.0687	0.00057	Yes
300	134	1.50	11,500	86.8	0.0564	0.00065	Yes
420	167.5	1.40	11,500	69.7	0.0428	0.00061	Yes
600	268	1.25	11,500	43.9	0.0255	0.00058	Yes

Table 4: Evaluation of HYDREX 2470 residual in the final discharge for a dilution flow of 11,500 kg/s

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Figure 4 shows the relative changes in final discharge concentration of HYDREX 2470 for the expected range of cooling tower evaporation rates and for the step-wise blowdown scheme employed.

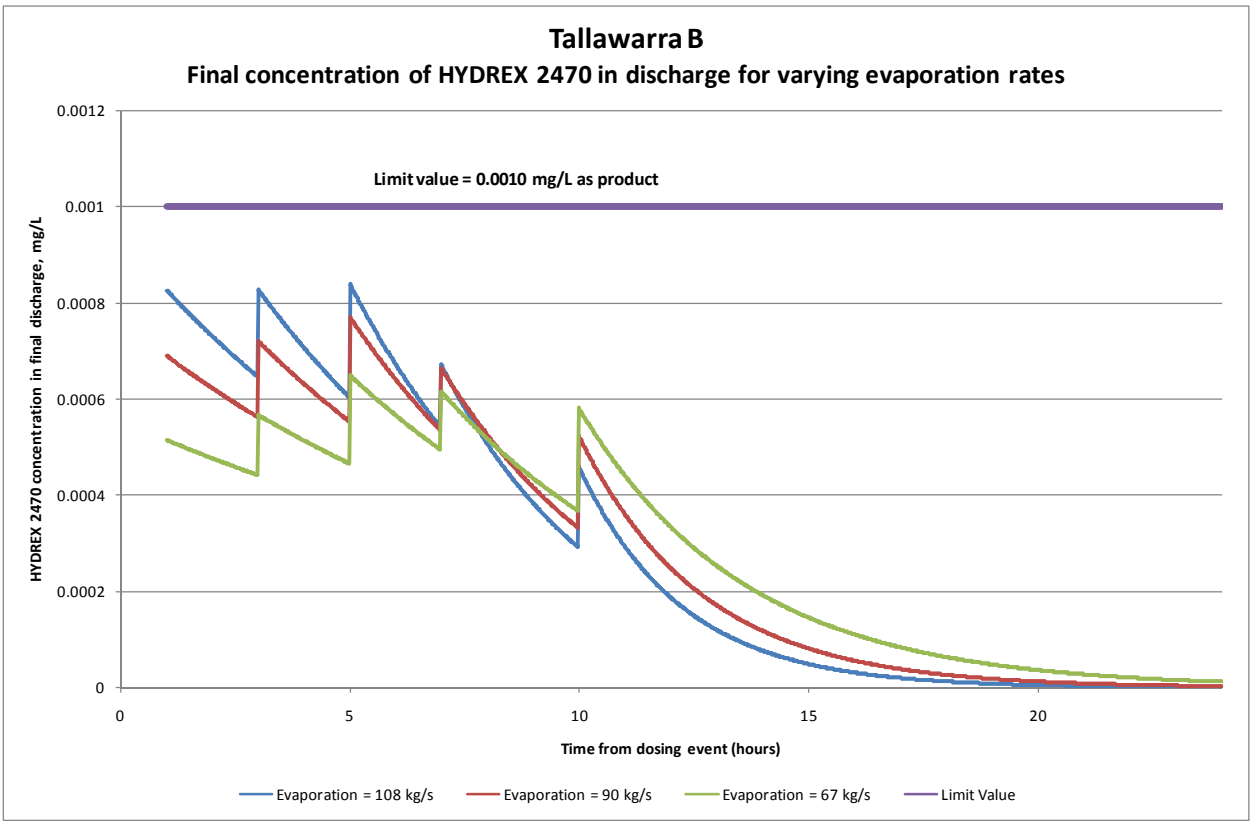

Figure 4: HYDREX 2470 in the discharge for the 24-hour period between dosing events, for dilution flow = 11,500 kg/s

4.3.4 Final Discharge Concentration of HYDREX 2470 for Dilution Flow of 7,000 kg/s

This is the scenario where attemperation water flow is used as dilution water flow. This is expected to be the situation only when the Tallawarra A cooling water flow is not available.

With this flow available, and a starting product concentration post-dosing of 0.08 mg/L in the blowdown, Table 5 below shows the final product concentration in the discharge for the range of evaporation rates given in Table 2. The calculations show that for an initial HYDREX 2470 dose of 8 mg/L, there are times when the residual concentration of this product in the final discharge will be greater than the 1/100th EC_{b50} value of 0.0010 mg/L.

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Time from Start of HYDREX 2470 Dosing (minutes)	Blowdown Flow (kg/s)	Theoretical Cycles of Concentration	Dilution Flow (kg/s)	Dilution Factor	HYDREX 2470 Concentration in Blowdown Flow (mg/L)	HYDREX 2470 Concentration in Combined Flow (mg/L)	HYDREX 2470 Concentration Less Than 1/100th EC_{b50} Value of 0.0010 mg/L?	% Above Limit Value
Dilution Flow = 7,000 kg/s; EVAPORATION = 108 kg/s								
60	120	1.90	7,000	59.3	0.0800	0.00135	No	34.8%
180	154.3	1.70	7,000	46.4	0.0625	0.00135	No	34.8%
300	216	1.50	7,000	33.4	0.0455	0.00136	No	36.2%
420	270	1.40	7,000	26.9	0.0291	0.00108	No	8.1%
600	432	1.25	7,000	17.2	0.0126	0.00073	Yes	-
Dilution Flow = 7,000 kg/s; EVAPORATION = 90 kg/s								
60	100	1.90	7,000	71.0	0.0800	0.00113	No	12.7%
180	128.6	1.70	7,000	55.4	0.0651	0.00117	No	17.4%
300	180	1.50	7,000	39.9	0.0500	0.00125	No	25.3%
420	225	1.40	7,000	32.1	0.0345	0.00107	No	7.4%
600	360	1.25	7,000	20.4	0.0172	0.00084	Yes	-
Dilution Flow = 7,000 kg/s; EVAPORATION = 67 kg/s								
60	74.4	1.90	7,000	95.0	0.0800	0.00084	Yes	-
180	95.7	1.70	7,000	74.1	0.0687	0.00093	Yes	-
300	134	1.50	7,000	53.2	0.0564	0.00106	No	5.9%
420	167.5	1.40	7,000	42.8	0.0428	0.00100	Yes	
600	268	1.25	7,000	27.1	0.0255	0.00094	Yes	-

Table 5: Evaluation of HYDREX 2470 residual in the final discharge for a dilution flow of 7,000 kg/s

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Figure 5 shows the relative changes in final discharge concentration of HYDREX 2470 for varying evaporation rates and for the step-wise blowdown scheme employed.

It is clear that the concentration of HYDREX 2470 in the final discharge is less than the limit value for a significant period of time between dosing events.

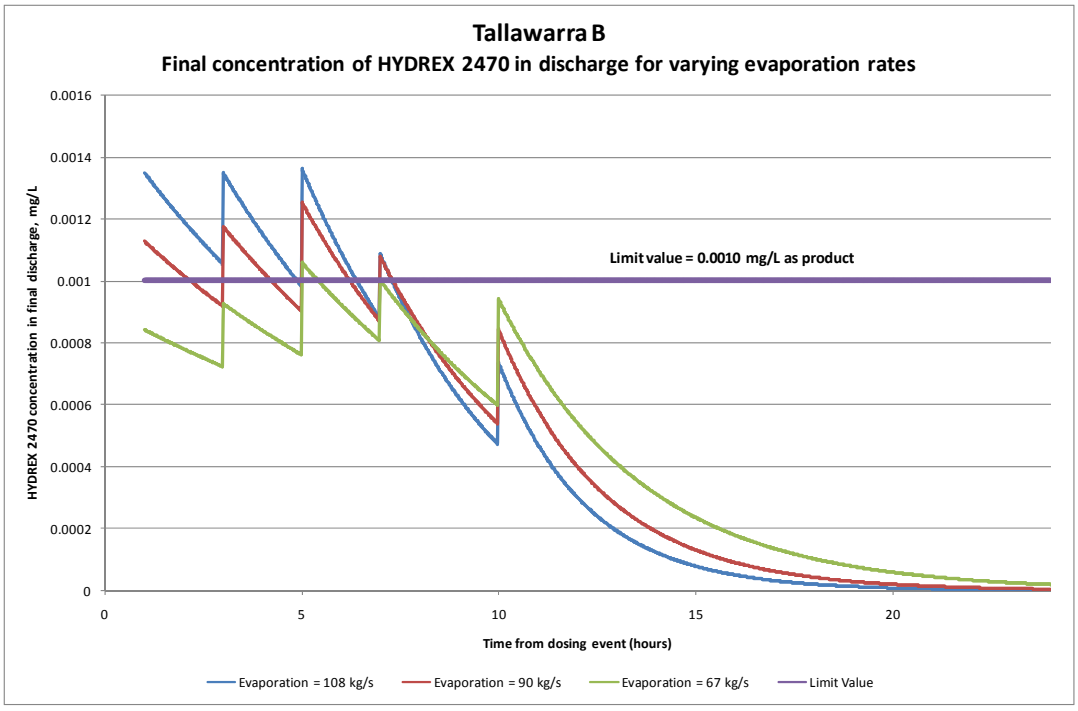

Figure 5: HYDREX 2470 in the discharge for the 24-hour period between dosing events, for dilution flow = 7,000 kg/s

4.4 Conclusion

Under normal operating conditions, the blowdown water from Tallawarra B will be diluted before discharge with a dilution water flow of 11,500 kg/second, which is available from the Tallawarra A once-through cooling water system.

With this dilution flow, and for the stepwise blowdown scheme identified in this report, the residual concentration of HYDREX 2470 in the final discharge will be **less than** the 1/100th EC_{b50} value of 0.0010 mg/L at all times and for all operating scenarios. The scheme identified above will ensure that the residual of product in the cooling tower system is effectively zero before the next scheduled dosing.

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5 EVALUATION OF PERACETIC ACID AS AN OPTIONAL BIOLOGICAL CONTROL AGENT FOR COOLING WATER TREATMENT

5.1 Introduction

Peracetic acid biocides provide the basis of an alternative treatment program for the Tallawarra B system. Currently, the status of these chemicals for use in industrial cooling water systems is being verified with the APVMA. Inevitably, peracetic acid biocides will be approved for use in cooling tower systems, and TRUenergy may wish to consider them. The nature and mode of action of peracetic acid biocides is described in the following sections.

5.2 Stabilised Peracetic Acid Biocides

5.2.1 Product Overview

Stabilised peracetic acid is an equilibrium mixture of peracetic (peroxyacetic) acid (PAA), hydrogen peroxide and acetic acid. The PAA content in products manufactured for industrial cooling water use usually ranges from 5% to 15%. PAA biocides are very strong oxidising chemicals, second only in oxidising power to ozone. The reactivity of the product is a distinct advantage in terms of cooling water treatment not only because it is very effective against biological material, but because its residual will break down rapidly and the by-products of those breakdown reactions are benign materials (carbon dioxide, oxygen, and water).

PAA biocides have found use in several European once-through cooling systems in large power generation and chemical manufacturing facilities. PAA biocides have also been successfully used internationally in industrial cooling tower systems. The overall use of PAA as a water treatment chemical is growing as the use of halogen-based biocides becomes more and more regulated.

Action Against Macro-Fouling Species:

PAA biocides are known to be very successful in preventing macro-biological growth in cooling water systems. The preferred dosing regime is 9 mg/L as PAA for 10 minutes per day, every day. At this dosage, the developing shell of any embryonic macro-organism species will be readily oxidised, thereby killing the organism. Because control-action is via oxidation, there is no opportunity for organism resistance.

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For the purposes of evaluating the environmental compatibility of the product, it is assumed that a daily 10-minute dose of 9 mg/L as PAA is applied.

Action Against Micro-Fouling Species:

PAA-based biocides kill microorganisms such as bacteria, viruses and algae. PAA targets microorganisms through the oxidation and subsequent disruption of their cell membrane structure via hydroxyl radical reaction. The mode of action and the high oxidation potential utilised in the applied dose ensures that there is no microbial resistance to the chemical.

Where a cooling system has a macro-fouling risk and a micro-fouling risk simultaneously, the 9 mg/L PAA dose applied for macro-fouling control is sufficient to provide micro-fouling control also. Where product is only applied for micro-fouling control, the target dose can be as low as 3 – 6 mg/L as PAA.

For the purposes of evaluating the environmental compatibility of the product, it is assumed that a daily 10-minute dose of 9 mg/L as PAA is applied, i.e. that the macro-fouling dosing control regime is used.

Corrosion Control:

In general, oxidising chemicals increase the corrosion rate of the common metallurgies used in engineering structures. However, in the case of stainless steel and titanium grades, corrosion is in the form of mass-gain, due to an increase in the thickness of the protective oxide layer that normally coats the parent metal. As such, the use of PAA biocides in cooling systems where only stainless steel or titanium metallurgies are present will not lead to any increase in the natural corrosion rate of the system.

5.3 Ensuring Environmental Compliance in the use of a Peracetic Acid Biocide

5.3.1 Ecotoxicity Data

Available ecotoxicity data is limited for marine species of interest in Australian waters. The most sensitive organisms, based on EC_{50} data, are the blue mussel embryo and seawater algae, both of which have an EC_{50} of c. 0.7 mg/L as PAA (Figures 7 and 8).

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Chronic toxicity

- Fishes, various species, LC50
  Remarks: no data available
- NOEC
  Remarks: no data available
- Algae, various species, EC50, 72 - 96 h, 0.7 - 16 mg/l

Further information on ecology

- Bacteria, Pseudomonas aeruginosa, EC100, 5 min, 5 mg/l
- Terrestrial plants, various species, Lowest observable effect level, 10 mg/l
  Remarks: phytotoxic effect

Figure 7: Ecotoxicity data for a 5% PAA biocide showing an algal species as having the lowest EC_{50}

Test Organism	Test Duration (h)	NOEC[1] (mg PAA/L)	LOEC[2] (mg PAA/L)	EC_{50} [3] (mg PAA/L)	TEC [4] (mg PAA/L)	Dilution from 6 mg PAA/L
MARINE						
Marine algae	48	0.59	1.19	0.89	0.84	10
Blue mussel embryo	48	0.30	0.59	0.69	0.42	20
Juvenile shellfish	96	1.17	2.35	4.37	1.66	5
Juvenile flounder	96	2.87	5.75	4.30	4.05	2

[1]NOEC: The highest concentration causing No Observed Effect relative to the controls.
[2]LOEC: The Lowest Concentration causing an Observed Effect relative to the controls.
[3]EC_{50}: The Concentration having a negative effect (e.g., growth inhibition, abnormal development, or mortality) on 50% of the test organisms by the end of the test.
[4] TEC: Threshold Effect Concentration, the geometric mean of NOEC and LOEC.

Figure 8: Ecotoxicity data for a 15% PAA biocide showing blue mussel embryo as having the lowest EC_{50}

The value of 0.7 mg/L as PAA is therefore taken for the purpose of evaluating the effect of a PAA residual from the Tallawarra B cooling tower system on the final receiving environment.

Where data sets are relatively limited, as per the available data on PAA biocides, it is appropriate in accordance with the ANZECC water quality guidelines to assign an assessment factor to account for other organisms which have not been assessed for toxicity response and may be more or less sensitive than those tested. In this case, the assessment factor is given as 100. Hence, when evaluating the environmental

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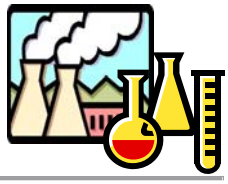

compatibility of peracetic acid, the target concentration of product after all dilution effects and product reactions are taken into account is 1/100th of the EC_{50} value of 0.7 mg/L as PAA, i.e. 0.007 mg/L as PAA.

5.3.2 Reaction of PAA Biocide Within The Cooling Tower System

As mentioned above, any PAA biocide used in the Tallawarra B cooling tower system would be dosed to a target concentration of 9 mg/L PAA in the cooling water, for a period of 10 minutes daily.

It is known that the decay kinetics of PAA in water is a strong function of the particular water matrix into which it has been introduced. Factors influencing the stability of PAA in an aqueous system include pH, salinity, temperature, and the presence of transition metal ions. The reaction of PAA in seawater is expected to be extremely rapid due to the high salinity and alkalinity of seawater, coupled with the presence of other competing substances such as dissolved organic material and dissolved iron and other trace metals.

PAA Demand:

When PAA is added to saline water, there is an initial 'demand' that is met, which is typically in the order of 50% of the applied concentration, assuming an applied concentration of 5 – 20 mg/L as PAA, an alkalinity of >100 mg/L as calcium carbonate, and a total dissolved organic carbon concentration of 2 – 5 mg/L. Following this initial demand, the ongoing reaction and decomposition of the remaining PAA residual is predicated on:

- Reaction with microbiological material, such as bacteria, algae, etc, both in the form of free-floating planktonic microorganisms, and as part of a sessile community (a biofilm);
- Reaction with macro-biological species, such as mussels, barnacles, clams, etc;
- Reaction with materials of construction within the system, e.g. a surface condenser;
- Reaction with the natural alkalinity and organic matter in the water; and,
- Decomposition reactions associated with the acid dissociation constant and the breakdown of PAA to hydrogen peroxide and acetic acid, and subsequently to carbon dioxide, oxygen, and water.

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PAA Half-Life:

A study by Enviro Tech Chemical Services[1] indicates a PAA half-life of 12 minutes in artificial seawater (water made from 35 parts per thousand sea salt dissolved in deionised water). Given that artificial seawater will contain none of the other constituents of natural seawater known to react readily with PAA, such as those given above, the half-life of PAA in real-world seawater-type waters would therefore be considerably less than 12 minutes.

Note that the proposed dosing regime for Tallawarra B is such that product is added in front of the condenser inlet until the recirculating water does one complete circuit of the cooling system. For a system volume of 3,500 m^3 and a recirculating flow rate of c. 6.2 m^3/s, the circuit time is approximately 9.5 minutes.

For the purpose of conservatism, a PAA half-life of **10 minutes** will be assumed in the evaluation of a PAA biocide, i.e. the product will lose half of its residual with each full circuit of the cooling tower system. The 10-minute half-life will apply on the assumption the water stream in question meets the following generalised chemistry conditions:

- Salinity >5 parts per thousand
- Alkalinity >80 mg/L as $CaCO_3$
- Total dissolved organic matter >1 mg/L
- Temperature >8 degrees Celsius
- Total metals concentration >0.25 mg/L

Proposed PAA Breakdown in a Seawater-Type Cooling System:

To facilitate the reduction in the residual of PAA in the cooling tower system, the cooling tower blowdown can be closed from the onset of dosing, and remain closed for one hour from the cessation of dosing. With the above conditions in mind, and with a starting concentration of 9 mg/L PAA added to the cooling tower water, the decay of PAA in the system over time is given in Table 6.

[1] Decay Kinetics of Peroxyacetic Acid (PAA) and Hydrogen Peroxide (PERASAN, EPA #63838-2) in a Variety of Water Matrices, Enviro Tech Chemical Services, Modesto CA 95358.

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For added conservatism, it is assumed the PAA residual at the end of the nominal 10-minute dosing duration is 4.5 mg/L, i.e. it is the residual after the applied 9 mg/L PAA has been consumed by the 50% demand rate assumed for a seawater-type system.

Time From Commencement of Dosing (minutes)	PAA Concentration In The Cooling Tower (mg/L as PAA)
0	9.0
10	4.5
20	2.25
30	1.125
40	0.5625
50	0.2813
60	0.1406
70	0.0703

Table 6: Breakdown of PAA residual during a 70-minute period with tower blowdown suspended

At the end of a 70-minute holding period, the cooling tower blowdown valve will be opened and the maximum concentration of PAA expected in this blowdown stream is 0.0703 mg/L, as per Table 6 above.

The PAA residual in the tower system or in the blowdown can be quickly and easily determined through use of the quick-test ampoules, such as those provided by CHEMetrics. The test method for peracetic acid comes in convenient concentration ranges: 0.1 to 1.0 ppm and 1.0 to 5 ppm as peracetic acid. This technique is readily available, can be taken to the point of sampling for increased accuracy, and requires no user expertise. As such, it can be verified through direct field testing that the PAA residual is consumed by the amount indicated above before blowdown is re-established.

Further Dilution of Residual in Blowdown Water:

The blowdown water from Tallawarra B will be diluted within other process streams as detailed in Section 4.1. This evaluation will consider the case of dilution only, and show that the residual of PAA in the final discharge zone as a consequence of biocide dosing meets the $1/100^{th}$ EC_{50} requirement dictated

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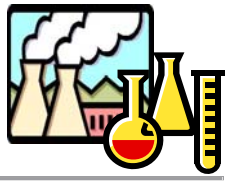

by ANZECC considerations. If the PAA residual is less than the 1/100th EC_{50} value for the case of dilution only, then it is certain that the actual residual would be less than that once other reaction and decomposition pathways are taken into account.

The flow rate of blowdown water from Tallawarra B will depend on the cooling tower evaporation rate and the tower cycles of concentration. As given elsewhere in this report, the tower system will nominally operate to a design cycles of concentration value of 1.25. The associated blowdown for each of the cold-day, design, and hot-day evaporation rate operating scenarios of 67, 90, and 108 kg/second is shown in Table 7 as follows:

Tower Cycles of Concentration	*Tower Blowdown (kg/s) for evaporation = 67 kg/s*	*Tower Blowdown (kg/s) for evaporation = 90 kg/s*	*Tower Blowdown (kg/s) for evaporation = 108 kg/s*
1.25	268	360	432

Table 7: Tower blowdown rate for various operating evaporation rates

For dosing with a PAA biocide, the dilution of blowdown water for the various blowdown rates shown should be such that the PAA concentration in the final discharge zone is less than the 1/100th EC_{50} value of 0.007 mg/L.

This is confirmed in the calculations shown in Table 8 for dilution flows of 11,500 kg/second and 7,000 kg/second, and for an initial PAA concentration in the blowdown of 0.0703 mg/L.

Blowdown Flow (kg/s)	Tallawarra A Flow (kg/s)	Dilution Factor	PAA Concentration in Blowdown (mg/L)	PAA Concentration in Combined Flow (mg/L)	PAA Concentration Less Than 1/100th EC_{50} Value of 0.007 mg/L?
268	11,500	43.9	0.0703	0.0016	Yes
360	11,500	32.9	0.0703	0.0021	Yes
432	11,500	27.6	0.0703	0.0025	Yes
268	7,000	27.1	0.0703	0.0026	Yes
360	7,000	20.4	0.0703	0.0034	Yes
432	7,000	17.2	0.0703	0.0041	Yes

Table 8: PAA concentration in the final discharge zone for various blowdown flow rates and for available dilution flows

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Reaction and Decomposition of PAA During Blowdown:

Once blowdown is re-established, the PAA residual will continue to break down according to its assumed 10-minute half life. Coupled with this is the dilution effect of the make-up water brought into the cooling tower system. Dilution and breakdown produce the following residual decay curve in the blowdown line, for a blowdown rate of 360 kg/s at 1.25 cycles of concentration and a starting PAA residual of 0.0703 mg/L (Figure 9). It is worthwhile noting that, within one hour of re-establishing blowdown, the concentration of PAA in the blowdown line is already less than the 1/100th EC_{50} value of 0.007 mg/L, even without further downstream dilution effects.

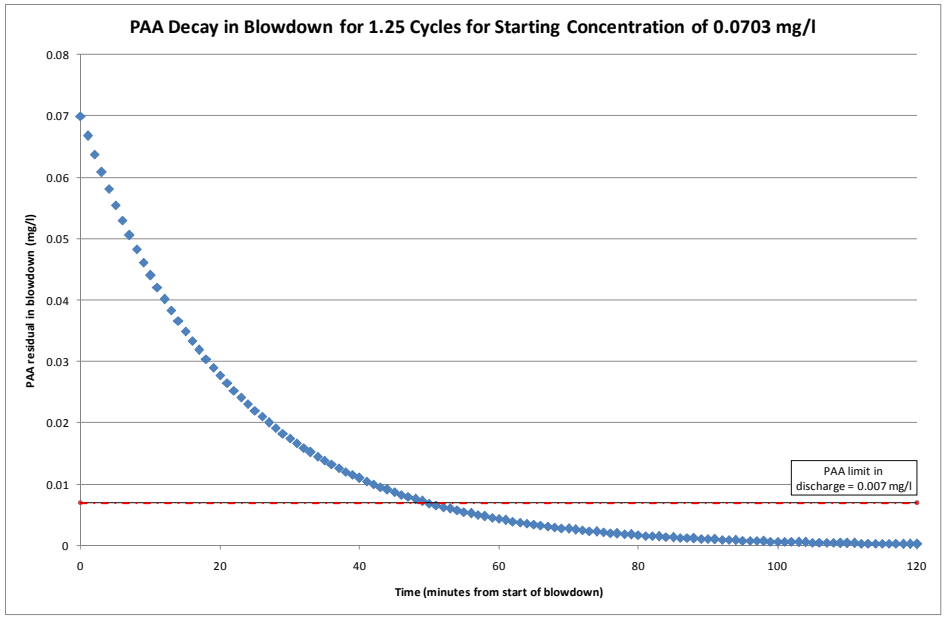

Figure 9: PAA decay in blowdown line upon recommencement of blowdown for 1.25 cycles

5.4 Conclusion

PAA-based biocides are ideally suited for use in cooling water systems such as the proposed Tallawarra B cooling tower system. For the reaction scenarios detailed and the dilution flows available, the use of a PAA biocide in the Tallawarra B cooling tower system would result in a final PAA concentration in the receiving environment that is **less than** the 1/100th EC_{50} value of 0.007 mg/L at all times and under all operating scenarios.

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End of Report

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Appendix B Response to Consent Conditions

DECCW

1. Administrative conditions

A1 Information supplied to the EPA

A1.1 Except as expressly provided by these recommended conditions of approval, works and activities must be carried out in accordance with the proposal contained in:
1. Project application for Tallawarra Stage B Gas Turbine Power Station, Project Application Number 07_0124.
2. All other relevant correspondence in relation to the development.

Comment: Relevant correspondence needs to be named specifically.

Air

Stack Sampling Positions

P1 The proponent must ensure that the design and construction of the facility includes sampling positions that comply with TM-1 as set out in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW.*

Approved Fuels (CCGT)

P2 Natural gas is the only fuel approved for firing of the Power Station burner/turbine.

Approved Fuels (OCGT)

P3 Natural gas is the primary fuel approved for firing of the Power Station burners/turbines.

P4 Diesel fuel shall only be used to manage fuel capacity or network system constraints, in the event of failure of existing major electricity generating facilities, failure of natural gas supplies, a state or regional system shutdown situation; if cessation of operation would otherwise lead to a loss or reduction in electricity necessary to maintain the required network supply security/reliability or at the direction of the National Electricity Market Operator.

Comment: This needs to be clarified in the context of an obligation by the proponent to generate electricity in the event of an inability to obtain natural gas supplies.

P5 Diesel fuel used at the Power Station shall have a maximum sulphur content of 50 parts per million.

Comment: The proponent would seek to use any commercial grade diesel fuel available.

2. Discharges to air and water and applications to land

P6 Location of monitoring/discharge points and areas

P6.1 The following points referred to in the table below are identified for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air or water from the point.

Air

EPA identification no.	Type of monitoring point	Type of discharge point	Description of location
12	Air emissions monitoring	Discharge to Air	Stack Serving CCGT
12	Air emissions monitoring	Discharge to Air	Stack Serving OCGT Turbine 1
13	Air emissions monitoring	Discharge to Air	Stack Serving OCGT Turbine 2

Note 1: A Site Map must be provided with the Environment Protection Licence (EPL) application identifying the location discharge and monitoring point/s.

Water and land

EPA identification no.	Type of monitoring point	Type of discharge point	Description of location
4	Ambient water monitoring		Inlet waters to the Power Station
5	Discharge to waters. Discharge quality monitoring	Discharge to waters. Discharge quality monitoring	Cooling water discharge into the outlet canal downstream of the attemperation mixing zone.

Note 1: A Site Map must be provided with the EPL application identifying the location of the new discharge and monitoring point.

P7 The following points referred to in the table below are identified for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air or water from the point.

EPA identification number	Type of Monitoring Point	Description of Location
11	Weather Analysis	Weather station located at the Power Station

Note 1: A Site Map must be provided with the EPL application identifying the location of the new discharge and monitoring point.

Comment: It should be made clear that this is the existing weather station as identified in the Tallawarra A EPL.

3. Limit conditions

L1 Load limits

L1.1 The Project will be incorporated into the Load Based Licensing scheme under the fee based classification, *Electricity Generation – Coal and Gas.*

Note: The EPA Load Based Licensing Load Calculation Protocol lists the following assessable pollutants under this activity: air – oxides of nitrogen; water – total suspended solids and salt.

L1.2 The actual load of an assessable pollutant discharged from the premises during the reporting period must not exceed the load limit specified for the assessable pollutant in the table below.

Note: An assessable pollutant is a pollutant which affects the licence fee payable for the licence.

L1.3 The actual load of an assessable pollutant must be calculated in accordance with the relevant load calculation protocol.

Assessable Pollutant	Load limit (kg)
Nitrogen Oxides (Air)	900000
Salt (Enclosed Waters)	note 1
Total suspended solids (Enclosed Waters)	note 1

Note 1: Load limits for salt and total suspended solids will be developed by the EPA in consultation with the Proponent following a period of discharge and collection of a representative monitoring data set.

Comment: The need for monitoring of suspended solids and salt needs to be discussed and justified.

L2 Mass Limits

L2.1 The load of a pollutant discharged from the premises must not exceed the limit specified for the pollutant in the table below.

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Pollutant	Mass limit (tonnes per annum)
Nitrogen dioxide (NO_2) or nitric oxide (NO), or both as nitrogen dioxide (NO_2)	900 (note 1, 2)

Note 1: The above mass limit applies to the combined discharges from Station A plus Station B. That is Points 9 plus 12 for the CCGT or Points 9 plus 12 and 13 for the OCGT power stations.

Note 2: The above mass limit applies to emissions during start-up and shutdown as well as natural gas and diesel fuel operation (for the OCGT).

Comment: The relationship of the mass limit with start up and shut down needs to be discussed.

L3 Concentration limits

L3.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

Air

Point 12 Stack serving turbine 1 (CCGT)

Pollutant	Units of Measure	100 Percentile Concentration Limit	Averaging Period	Reference Conditions
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per cubic metre	51	1-hour block	Dry, 273 K, 101.3 kPa, 15% oxygen (O_2)

L3.2 The concentration limits prescribed above do not apply to the emissions from an individual turbine during the following periods:
(a) a start-up period – that is, while a turbine is being brought up to normal operation following a period of inactivity; or
(b) a shutdown period – that is, while a turbine is being taken out of service from normal operation to inactivity.

Note 1: While the concentration limits specified in Condition 1 do not apply during start-up or shut down periods, the proponent is subject to the requirements of section 128 (2) of the *Protection of the Environment Operations Act* in relation to the prevention and minimisation of air pollution.

Note 2**:** Condition 2 only applies to an individual turbine during a start-up or shut down period for that turbine. The concentration limits specified in Condition 1 continue to apply to the other turbine if it is operational during these periods.

Point 12 and 13 Stacks serving turbine 1 and 2 (OCGT)

Fuel Type	Pollutant	Units of Measure	100 Percentile Concentration Limit	Averaging Period	Reference Conditions
Natural Gas	Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per cubic metre	51	1-hour block	Dry, 273 K, 101.3 kPa, 15% oxygen (O_2)
Diesel	Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per cubic metre	86	1-hour block	Dry, 273 K, 101.3 kPa, 15% oxygen (O_2)

L3.3 The concentration limits prescribed above do not apply to the emissions from an individual turbine during the following periods:
(a) a start-up period – that is, while a turbine is being brought up to normal operation following a period of inactivity; or
(b) a shutdown period – that is, while a turbine is being taken out of service from normal operation to inactivity.

Note 1: While the concentration limits specified in Condition 1 do not apply during start-up or shut down periods, the proponent is subject to the requirements of section 128 (2) of the *Protection of the Environment Operations Act* in relation to the prevention and minimisation of air pollution.

Note 2: Condition 2 only applies to an individual turbine during a start-up or shut down period for that turbine. The concentration limits specified in Condition 1 continue to apply to the other turbine if it is operational during these periods.

Note 3: In the event that the Power Station is constructed with three open cycle gas turbines, the stack servicing turbine number three (3) shall be required to comply with the same concentration limits, units of measure, averaging periods and reference conditions as defined for stacks 1 and 2 in the tables above.

Water and Land

POINT 5

Pollutant	**Units of Measure**	**50 percentile concentration limit**	**90 percentile concentration limit**	**3DGM concentration limit**	**100 percentile Concentration Limit**
Temperature	degrees Celsius				35
Biocide					Note 1

Note 1: A discharge of biocide or antifouling chemical may be approved, and a limit developed by the EPA following a satisfactory environmental assessment by the Proponent.

L6 Noise

L6.1 Noise generated at the Tallawarra Power Station premises must not exceed the noise limits presented in the table below. The localities are those described in the *"Tallawarra Stage B Gas Turbine Power Station – Environmental Assessment (Final)"* – Appendix E prepared by SKM and TRUenergy dated July 2009.

		Noise Limits dB(A)			
		Day	Evening	Night	
Locality	Location	LAeq,15min	LAeq,15min	LAeq,15min	LAmax
T2 (A)	Any residence on Carlyle Close, Wollin Place, Coronet Place and Crompton Street Koonawarra	35dB(A)	35dB(A)	35dB(A)	45dB(A)
T4	Any residence on Wyndarra Way, Malonga Place Koonawarra	35dB(A)	35dB(A)	35dB(A)	45dB(A)
ML#9 (C)	Any residence on The Boulevarde, Park Crescent, Horsley Road, Newton Crescent Oak Flats.	35dB(A)	35dB(A)	35dB(A)	45dB(A)
ML#10 (D)	Any residence on Reddall Parade, Henricks Parade Mt Warrigal.	35dB(A)	35dB(A)	35dB(A)	45dB(A)
ML#11 (E)	Any residence in Haywards Bay.	35dB(A)	35dB(A)	35dB(A)	45dB(A)

Comment: We do not agree with these limits. They should be in accordance with the INP and PSNL as assessed in the EA

L6.2 Noise generated from the premises in excess of the limits set out in condition L6.1, whether on one or more occasions, constitutes a breach of the licence regardless of Chapter 11 or the Definition of Terms in the NSW Industrial Noise Policy.

Refer to comments for L6.1 above

L6.3 For the purpose of Condition L6.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holiday's
- Evening is defined as the period 6pm to 10pm
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holiday's.

L6.4 The noise limits set out in Condition L6.1 apply under all meteorological conditions except for any one of the following:

a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
b) Stability category G temperature inversion conditions; or
c) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level.

L6.5 For the purpose of Condition L6.3:

Comment: This should read 6.4 not 6.3

a) The metrological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA Identification Point 11; and
b) Stability category temperature inversion conditions are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the Industrial Noise Policy.

L6.6 For the purposes of determining the noise generated at the premises:

a) Class 1 or 2 noise monitoring equipment that is calibrated in accordance with the manufacturer's specifications must be used according to AS IEC61672.1-2004 and AS IEC61672.2-2004
b) The noise monitoring equipment used at a location must be placed in a position that is:
   i. that is, where applicable:
      - approximately on a location's property boundary that is closest to the premises, where any dwelling at the location is within 30 metres of the location's property boundary that is closest to the premises; or
      - within 30 metre of a dwelling façade where any dwelling at a location is situated more than 30 metres from the location's property boundary that is closest to the premises; or
   ii. that is within 1 metre of a dwelling façade at a location to determine compliance with the L_{Amax} noise limits in condition L6.1; and

L6.7 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the monitoring equipment.

L6.8 All construction work at the premises must only be conducted between Monday to Friday 7am to 6pm; Saturday 8am to 1pm; no work on Sundays or public holidays.

L6.9 The following activities may be carried out at the premises outside the hours specified in conditions L6.3:
(a) the delivery of materials as requested by Police or other authorities for safety reasons;
(b) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

Comment: There needs to be a clause which allows the opportunity to seek approval for work outside hours if a justification can be provided.

L6.10 The licensee shall prepare and implement a Construction Noise and Vibration Management Plan with reference to the guidelines contained in the Interim Construction Noise Guideline (DECCW, 2009).

4 Operating conditions

Dust Control

O1 All operations and activities occurring at the premises must be carried out in a manner that will minimise dust at the boundary of the premises.

Air - CCGT

O2 Neither Station A or Station B may be operating in a cold start cycle at the same time.

Note 1: A cold start is the first 120 minutes following of Power Station operation after a period of more than 36 hours shut down

Note 2: The EPA is willing to consider a variation of this condition through a post commissioning submission from the Proponent using operational data which demonstrates compliance with Ground Level Concentration Criteria.

5 Monitoring and recording conditions

M1 Requirement to monitor concentration of pollutants discharged

For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

POINTS 4,5

Pollutant	Units of Measure	Frequency	Sampling Method
Temperature	degrees Celsius	Continuous	Probe
Salt		24 representative pooled samples* per year, min. 15 days apart. (See notes 1 and 2)	A pooled sample is defined as at least three grab samples forming the pooled sample, with the first and last samples taken at least 7 hours apart. (See notes 1 and 2)
Total suspended solids		24 representative pooled samples* per year, min. 15 days apart (See notes 1 and 2)	A pooled sample is defined as at least three grab samples forming the pooled sample, with the first and last samples taken at least 7 hours apart. (See notes 1 and 2)
Biocide	(Note 3)	(Note 3)	(Note 3)
Flow		(See notes 1 and 2)	Continuous measurement device; or Use volume balance calculation for water. (See notes 1 and 2)

Note 1: Or as otherwise approved in writing by the EPA.
Note 2: The sampling frequency and method for flow, salt and total suspended solids is from the Load Based Licensing Protocol.
Note 3: Pending a satisfactory environmental assessment by the Proponent and approval by the EPA.

Comment: The need for monitoring of suspended solids and salt needs to be discussed and justified. Locations for sampling need to be discussed.

POINT 12 (CCGT)

Pollutant	Units of Measure	Frequency	Sampling Method
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per normalised cubic metre	Continuous	CEM-2

Note: The sampling methods set out in the above table are those specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

POINT 12 and 13 (OCGT)

Pollutant	Units of Measure	Frequency	Sampling Method
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per normalised cubic metre	Continuous	CEM-2
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per normalised cubic metre	Continuous	CEM-2

Note: The sampling methods set out in the above table are those specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

M2 Requirement to monitor weather

M2.1 For each monitoring point specified in the table below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Comment: For clarity the licensee will use the existing (Tallawarra A) monitoring point.

Point 11

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Rainfall	Mm	Continuous	1 hour	AM-4
Wind speed @ 10 metres	m/s	Continuous	15 minute	AM-2 & AM-4
Wind direction @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Temperature @ 2 metres	°C	Continuous	15 minute	AM-4
Temperature @ 10 metres	°C	Continuous	15 minute	AM-4
Sigma theta @ 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Solar radiation	W/m²	Continuous	15 minute	AM-4
Additional requirements - Siting - Measurement				 AM-1 & AM-4 AM-2 & AM-4

6 Reporting conditions

R1 Environmental Monitoring Report to be submitted Yearly with the Annual Return

R1.1 The licensee must submit a report with each Annual Return, which details the results of all monitoring undertaken in the licensing period being reported on. The report must include, but need not be limited to:

AIR

- Line graphs for each day of the reporting period showing the instantaneous concentration of nitrogen oxides recorded at Points 9 and 12 (CCGT) or Points 9, 12 and 13 (OCGT) and compared to the instantaneous concentrations of nitrogen dioxide and ozone at Pont 10 (as listed on the current EPL). These graphs must have two y-axis scales, one scale for nitrogen oxides and one scale for nitrogen dioxide and ozone. These graphs must also include horizontal lines showing the nitrogen oxides licence limit of 25 ppm and the 1 hour NEPM goals for nitrogen dioxide (12 pphm) and ozone (10 pphm).

Comment: It needs to be clarified that this graph is a composite graph showing the range of instantaneous values during normal operations (or zero if not operating for whole days) for each day of the year.

- Column graphs showing the amount of times (if any) each of the standards for nitrogen dioxide and ozone, as detailed in the National Environment Protection Measure (NEPM) for Ambient Air Quality, were exceeded over the reporting period at Point 10.
- Column graphs showing the annual loads of nitrogen oxides, total sulphur and fine particulates emitted from Point 9 for the current reporting year, plus the nine preceding years (where such data exists).

NOISE

- A copy of a report on the annual noise monitoring must be included with the Environmental Monitoring Report. This report must detail the results of the noise monitoring required under all relevant conditions of this document at each of the receiver locations detailed in the Limit Conditions of this licence. If the monitoring shows noise limits have been exceeded the report must detail actions that will be taken by the licensee, including timelines, to ensure licence limits can be met at all times.

Comment: There needs to be time set after which, subject to results, annual noise reports will no longer required.

Special conditions

E1 Notification of Commissioning Schedule

E1.1 Prior the commencement of commissioning the proponent must notify the EPA in writing of the proposed timing of commissioning the Power Station and how all plant and equipment will be brought on line to ensure compliance with all relevant environment protection requirements.

Comment: The proponent would provide a commissioning plan but it is not necessarily the case that compliance could be guaranteed during commissioning.

E2 Post Commissioning Testing at the Power Station

E2.1 **Post Commissioning Air Pollutant Emissions Verification**

The proponent must undertake monitoring during the commissioning of the Power Station to confirm that the emissions performance of each turbine is consistent with (or lower than) the emissions used in air quality modelling for the Environmental Assessment of the Power Station. The monitoring required by this condition is set out in the following table:

Comment: The proponent would provide a commissioning plan but it is not necessarily the case that compliance could be guaranteed during commissioning.

Stack Verification Monitoring – commissioning Point 12 (CCGT) or Points 12 and 13 (OCGT)

Pollutant	Units of Measure	Sampling Method
Carbon monoxide (CO)	milligrams per normalised cubic metre	TM-32
Dry gas density	kilograms per cubic metre	TM-23
Moisture content of stack gases	percent	TM-22
Molecular weight of stack gases	grams per gram mole	TM-23
Nitrogen dioxide (NO_2) or nitric oxide (NO) or both, as NO_2 equivalent	milligrams per normalised cubic metre	TM-11
Oxygen (O_2)	percent	TM-25
Solid Particles	milligrams per normalised cubic metre	TM-15
Speciated organic compounds	milligrams per normalised cubic metre	TM-34
Sulphur dioxide (SO_2)	milligrams per normalised cubic metre	TM-4
Temperature	degrees Celsius	TM-2
Velocity	metres per second	TM-2
Volumetric flow rate	cubic metres per second	TM-2

Note: The sampling methods set out in the above table are those specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW*.

E2.2 The commissioning monitoring required by Condition E2.1 must be undertaken at such time(s) as is necessary to provide an adequate characterisation of the emissions from each turbine during normal operation.

E2.3 Within six months of the plant being commissioned and brought into regular operation the licensee must submit a report to the EPA detailing the results of the testing described in E2.1 above and comparing the results to limits of this licence and the predicted levels of pollutants used in Environmental Assessment modelling, which was used to predict the impact of the Power Station on ground level concentrations of pollutants.

E2.4 Post Commissioning Noise Monitoring and Reporting

a) Within three months of commencement of normal operations, noise from the premises must be monitored. The monitoring methodology used must be able to determine the noise contribution from the premises, and include attended noise surveys at the receiver locations shown in the Conditions of this document. The meteorological conditions prevailing during all monitoring must be reported. This noise assessment must include operations that have the potential to cause offensive noise including, safety valve operation, blowdown operation, and the operation of circuit breakers.

Comment: This should be for 6 months rather than for three months

b) Within six months of the plant being commissioned and brought into regular operation the licensee must submit a report to the EPA detailing the results of the noise monitoring described in (a). If the monitoring shows noise limits have been exceeded the report must detail actions that will be taken by the licensee, including timelines, to ensure licence limits can be met at all times.

E3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Construction phase controls

Soil and water management controls must be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities. The Proponent should prepare and implement a Soil and Water Management Plan for the project to the satisfaction of the Director General. The plan should be submitted to the Director General prior to construction commencing and should:

a) Be consistent with the requirements in Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004 (Landcom);
b) Identify construction and operational activities that could cause soil erosion and generate sediment;
c) Describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;
d) Describe the location, function, and capacity of erosion and sediment control structures for both construction and operation;
e) Describe what measures would be implemented to maintain the structures over time; and
f) Describe the procedures that would be followed for planned and unplanned water discharges from the site.

NSW Office of Water

Comment: None of these conditions is appropriate for the project as defined, except for item 11 which would be incorporated elsewhere.

Yallah Creek catchment is small (0.35 km^2) and has a total stream length of approximately 600 m. A bunded artificial wetland, developed by the proponent, is located in the upper Yallah Creek catchment and the wetland is fed by first flush and small intermittent flows. The stream flows in a west-east direction from the wetland to the northern western section of the proposed Stage B development. It then enters the “northern drain” and is piped under the north-west section of the proposed Stage B power station site before discharging into Lake Illawarra. The northern drain was created when the original coal fired power station was constructed and was used to direct flow from the creek under the site.

As noted in the responses to the submission (see Table 4-4), TRUenergy has investigated the option of diverting the flow in the northern drain into a system of open drains / channels, but it was found this would only be possible with extensive earthworks and by creating a system of dams and swales to capture flow from the northern side of the creek catchment. Due to the levels involved, the drainage from the southern slopes could only drain to a point at the entrance to the northern drain. Directing this flow to the north of the site to allow any reconstruction of the Yallah Creek would be impractical.

Yallah Creek is within the power station site (from the boundary to the northern drain entrance) is about 150m long. The vegetation fringing the creek on this length is about 50m wide on either side of the creek line. No works are proposed within this riparian zone and the vegetation will be managed according to the Environmental Management Plan prepared for the Tallawarra A development. The EMP for Tallawarra B will be consistent with this plan.

1) The piped section of Yallah Creek must be rehabilitated to emulate a stable natural watercourse system that behaves as, and has the appearance of a stable natural streatm system of the area (including floodplains, terraces and other typical natural features). Part of the form of the watercourse is to create meanders, suitable pool and riffle sequences, with suitable aquatic and terrestrial habitat.
2) A riparian zone consisting of local native plant species shall be established and maintained in and adjacent to Yallah Creek within the power station site boundary.
3) The extent of the riparian zone is to be measured horizontally landward from the top of the bank of the watercourse. The width of the riparian zone is to be a minimum of 50 metres on both sides of the watercourse.
4) All works and disturbance areas associated with the proposal (with the exception of any crossing) must be located outside the riparian zones and must not compromise the riparian zones in any way.
5) A VMP for site rehabilitation is to be prepared that demonstrates protection of any remnant local native riparian vegetation at the site and the restoration of any riparian zones to a state that is reasonably representative of the natural ecotone of the protected water system, to achieve sound naturalised watercourse and long term riparian area

stabilisation and management by the enhancement/emulation of the native vegetation communities of the subject area.

6) Seed and propagule sources are to be from local botanical provenance (regarded as from as close as possible and from the same general habitat (same soil type, distance from watercourse, exposure, etc).
7) The riparian zones must be maintained for a period of at least five (5) years after final planting or where other revegetation methods are used, five years after plants are at least of tubestock size and are at the densities required by these conditions and with species richness as described in the VMP, and five (5) years minimum for those areas required for access and maintenance relating to any WP.
8) The riparian zones must be monitored over a period of 5 years commencing after final planting and will include weed control monitoring and the establishment of locally indigenous riparian vegetation (comprising both natural regeneration and/or planting).
9) A permanent physical barrier (such as bollards, logs, a fence, pathway, road etc), to prevent inadvertent damage to riparian zones is to be placed at the landward extent of the riparian zones.
10) Any crossing is to be designed and constructed in accordance with *the DWE guidelines for Controlled Activities Watercourse Crossings (February 2008)*.
11) Erosion and sediment control measures are to be implemented prior to any works commencing at the site and must be maintained for as long as necessary after the completion of works, to prevent sediment and dirty water entering the watercourse. These control measures are to follow relevant management practices as outlined in the Landcom manual *"Managing Urban Stormwater: Soils and Construction – Volume 1" (4th Ed., 2004) – the "Blue Book".*
12) Any requirements for bushfire protection zones, including fire trails, are not to compromise in any way the extent, form or function of the riparian zones. Fuel reduced areas are to be located outside of riparian zones.

Wollongong City Council

Comment: Tallawarra B would be constructed at the same level as Tallawarra A. It is proposed to address flood requirements by alternative means such as bunding. The clause could be modified to allow flood works to be designed by the proponent (in consultation with Council), to the satisfaction of the Director-General.

Minimum platform level: The platform for the power station must be constructed at a minimum of RL 3.94m AHD to comply with Wollongong City Council's DCP54 and Draft Lake Illawarra Floodplain Risk Management Study and Plan (2005). This requirement is based on the proposed development being categorised as a "critical utility" under DCP54.

Storage of equipment and materials: all electrical and mechanical equipment and materials storage which are susceptible to damage when inundated by floodwaters must be located at or above the Probable Maximum Flood (PMF) level plus 0.7m freeboard (ie RL 3.94m AHD)

Flood compatible materials: the proposed structures associated with the development must be constructed of flood compatible materials as defined in Schedule 2 of Council's DCP 54 – Managing our flood risks. Where alternative materials are proposed and not shown in Schedule 2 of DCP 54, relevant documentation from the manufacturer shall be provided to ensure the materials satisfy the definition of "flood compatible" materials as stated in DCP54.

Site emergency response flood reports: the report shall incorporate an effective emergency response plan and evacuation procedure for the subject site in the early stages of a storm event up to an including a PMF being at RL 3.24m AHD. This report should be submitted to the Department and prepared by a suitable qualified engineer.

Tank overflows: overflows from rainwater storage tanks must be directed to the existing on site stormwater system, nearest on site watercourse or stormwater swale within the constraints of existing topography. Stormwater outlets directed to the on site watercourses or swales should incorporate appropriate scour / erosion protection measures to minimise erosion and preserve water quality.

Overflow paths: overflow paths must be provided to allow for flows of water in excess of the capacity of the pipe / drainage system draining the land. Blocked pipe situations with 1 in 100 year ARI events must be incorporated in the design. Overflow paths must also be provided in low points and depressions.

Depth and location of services: The depth and location of all services (ie gas, sewer, electricity, telephone etc) must be ascertained.

No adverse runoff impacts to adjoining neighbours: The design of the development should ensure that there are no adverse effects to adjoining properties or upon the land as a result of flood or stormwater run-off. Attention must be paid to ensure adequate protection for buildings against the ingress of surface run-off. Allowance must be made for surface run-off from adjoining properties. Any direction or treatment of that run-off must not adversely affect any other property.