



NewGen Power

NEWGEN POWER STATION KWINANA

MARINE ENVIRONMENT TEMPERATURE ELEVATION MANAGEMENT PLAN (METEMP)

Amended September 2014

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1. Element/Issue

In November 2005, the NewGen Kwinana Gas-Fired Power Station received environmental approval with the issuing of Ministerial Statement 698 which contained approval to construct and operate a natural gas-fired power station on a site adjacent to Cockburn Sound on the western edge of the Kwinana Industrial Area.

This Marine Environment Temperature Elevation Management Plan (METEMP) addresses the issue of elevated marine temperature around the cooling water outflow diffuser from the power station in accordance with the following requirements contained in Ministerial Statement 698.

6-7 The proponent shall measure temperature in accordance with the *Manual of Standard Operating Procedures 2005* which supports the *State Environmental (Cockburn Sound) Policy 2005*, and its updates, unless otherwise agreed in writing by the Environmental Protection Authority.

6-8 Prior to disturbance of the marine environment, the proponent shall prepare a Marine Environment Temperature Elevation Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note 3: In preparation of advice to the Minister for the Environment, the Environmental Protection Authority expects that advice of the following agencies will be obtained:

- the Water Corporation;
- Cockburn Sound Management Council; and
- Western Power

6.9 The proponent shall not allow thermal discharges from the diffuser other than in accordance with the Marine Environment Temperature Elevation Management Plan required by condition 6-8.

The objectives of this Plan are:

- to specify and ensure that upper limits of instantaneous and daily average cooling water effluent temperature are not exceeded;
- to ensure that the near-field mixing performance of the cooling water outflow diffuser is as predicted (pursuant to condition 6-1); and
- that the thermal discharge from the diffuser meets the objective of the *State Environment (Cockburn Sound) Policy 2005* and its updates.

This Plan shall address

1. specific measures to monitor:
 - a. cooling water effluent temperature;



- b. mixing performance of the diffuser to the edge of the near-field mixing zone; and
- c. The temperature elevation filed in Cockburn Sound.

Note 4: The monitoring plan shall be in accordance with the *Manual of Standard Operating Procedures 2005* which supports the *State Environmental (Cockburn Sound) Policy 2005*, and its updates.

- 2. Contingency plans to address exceedences of the Environmental Quality Guidelines specified in the *Environmental Quality Criteria Reference Document for Cockburn Sound (2003-2004)* and its updates.

Note 5: The contingency plans shall outline specific management actions to be taken in the event of an exceedence of the Environmental Quality Guidelines, including an investigation against the temperature Environmental Quality Standards included in the *Environmental Quality Criteria Reference Document for Cockburn Sound (2003-2004)* and its updates.

Note 6: The contingency plans shall outline management actions to be taken in the event of an exceedence of the Environmental Quality Standard.

2. Current Status

2.1 Project description

The power station will supply base load power into the South West Interconnected Network with a nominal generation capacity of 320 MW.

Approximately 430 ML/day of seawater, sourced from Cockburn Sound, is used for non-contact cooling of steam condensate in the condenser. This is a once-through system with the seawater returned to Cockburn Sound via an ocean outfall pipeline and diffuser array.

2.2 Existing marine temperatures

Average water temperature in Cockburn Sound varies from about 16°C in winter to 24°C in summer (Oceanica 2005). Surface temperatures generally have more variation than bottom temperatures.

A recent report (Oceanica 2006) found surface temperatures of the shallows of the eastern shelf near the diffuser location were around 1°C warmer in summer than central basin sites. Water temperatures rose between 1°C and 3 °C from 13 December 2005 through to 15 February 2006 with a maximum temperature of 24°C. Bottom temperatures rose from around 20°C to 23°C during that time.



3. Potential Impacts

Cooling water re-enters Cockburn Sound at a temperature higher than at intake. This temperature elevation could adversely affect the environment and industrial users if not managed adequately.

4. Environmental Objectives

The cooling water intake and outfall will be within the marine area covered by the State Environmental (Cockburn Sound) Policy 2005 (SEP) (Government of Western Australia 2005).

The Minister for the Environment released the SEP to declare, protect and maintain the environmental values of Cockburn Sound. These are summarised in Table 1.

Table 1 Environmental values and objectives for Cockburn Sound

Environmental values	Environmental quality objectives
Ecosystem health	Maintenance of ecosystem integrity in terms of structure (e.g. biodiversity, biomass and abundance of biota) and function (e.g. food chains and nutrient cycles).
Seafood safe for eating	Maintenance of aquatic life for human consumption, such that seafood is safe for human consumption when collected or grown.
Aquaculture	Maintenance of aquaculture, such that water is of a suitable quality for aquaculture purposes.
Recreation and aesthetics	Maintenance of primary contact recreation values, such that primary contact recreation (e.g. swimming) is safe. Maintenance of secondary contact recreation values, such that secondary contact recreation (e.g. boating) is safe. Maintenance of aesthetic values, such that the aesthetic values are protected.
Industrial water supply	Maintenance of industrial water supply values, such that water is of suitable quality for industrial water supply purposes.

Environmental quality criteria (EQC) have been developed and provide guidance for measuring success in achieving the environmental quality objectives set in the SEP (EPA 2005).

EQC consist of environmental quality standards (EQS; exceedence of which requires management action to identify the cause (or source) of the exceedence and then appropriate source control measures to reduce the risk of an environmental problem) and environmental quality guidelines (EQG; exceedence of which triggers further investigation). The standards and guidelines for the Environmental Quality Objective (Maintenance of Ecosystem Integrity) are different for areas designated as high, moderate or low level of environmental protection.

The NewGen outfall diffuser is within an area designated by the SEP as a Low Ecological Protection Area (LEPA). The area surrounding the LEPA is an area of moderate ecological protection. The EQC for moderate protection is therefore required to be met at the boundary of the LEPA (see Figure 1). The EQS and EQG for temperature for areas of moderate and high ecological protection are listed in the EQC reference document (EPA 2005) and shown in Table 2.



Table 2 Environmental Quality Standard and Guideline for Temperature for Moderate Protection

Environmental Quality Guideline	Environmental Quality Standard
Moderate Protection	
Median temperature at an individual site over any season, measured according to SOP, not to exceed: - the 95%ile of the natural temperature range over the same period or - the median temperature at a suitable reference site over the same period by more than the temperature values specified in Table 3.	<ul style="list-style-type: none"> i. No persistent (i.e., ≥ 4 weeks) and significant change beyond natural variation in any ecological or biological indicators that are affected by water temperature unless that change can be demonstrably linked to a factor other than water temperature. ii. No deaths of marine organisms resulting from anthropogenically-sourced thermal stress.
High Protection	
Median temperature at an individual site over any season, measured according to SOP, not to exceed: - the 80%ile of the natural temperature range over the same period or - the median temperature at a suitable reference site over the same period by more than the temperature values specified in Table 3.	<ul style="list-style-type: none"> i. No significant change beyond natural variation in any ecological or biological indicators that are affected by water temperature unless that change can be demonstrably linked to a factor other than water temperature. ii. No deaths of marine organisms resulting from anthropogenically-sourced thermal stress.
Notes	
SOP – Standard Operating Procedure as provided in EPA 2005b Or – means either one of the two alternative can be used. The choice will generally depend on the availability of quality reference site data.	Anthropogenically – of human origin (i.e. industry)

The EQC reference document also contains numerical environmental quality criteria and guidance notes. These are shown in Table 3.

Table 3 Environmental Quality Guideline (EQG) values for temperature

Season	E2 – High Protection Valve (°C)	E3 Moderate Protection Valve (°C)
Summer	0.8	1.6
Autumn	1.9	3.1
Winter	0.5	1.5
Guidance Notes		
This indicator has been developed for use at the local scale (e.g. around an outfall) rather than broader scales.		



Temperature measured either at 50 centimetres below the water surface or 50 centimetres above the sediment surface depending on plume density and seasonal median compared with EQG in Table 3.

Measurements are taken at both the potential impact site and a suitable reference site.

The preferred approach for measuring temperature is to use semi-permanently located data loggers according to SOP.

The EQG have been derived from reference sites in Cockburn Sound according to the recommended approach in ANZECC & ARMCANZ (2000) (i.e. 20th and/or 80th percentiles of reference distribution for high ecological protection and 5th and/or 95th percentiles for moderate ecological protection)

5. Performance Indicators/Criteria

5.1 Outflow temperature

Ministerial Condition 6-9 requires that upper limits of instantaneous and daily average cooling water temperature elevation above ambient are specified. The upper limit for instantaneous cooling water temperature elevation is specified at 27.1°C whilst the maximum daily average cooling water temperature elevation is specified at 14.1 °C. These temperature values represent the highest discharge values given abnormal operating conditions, such as the unusual event that one cooling water pump goes out of operation and the remaining pump has its inlet screen blocked. However, during normal operation the upper limit for instantaneous cooling water temperature elevation is specified at 13.1 degrees C, whilst the maximum daily average cooling water temperature elevation is specified at 9.5 degrees C.

5.2 Diffuser performance

The diffuser has been designed to achieve sufficient dilution for a temperature elevation of 1.5°C over background at the edge of its mixing zone in the worst case (highest heat load, lowest current) conditions. The mixing zone is targeted to extend 50m either side of the diffusers. Monitoring results have been compared to this performance level (Refer also to Section 7.2).

5.3 Temperature elevations

The environmental quality criteria (EQC) for temperature are specified in the SEP and are listed in Section 4. The cooling water outflow pipeline and diffuser array has been designed and modelled to meet:

- The EQGs for a moderate level of protection for seasonal temperature elevation (Table 3) at the edge of the LEPA;
- The EQC for a high level of protection for seasonal temperature elevation (Table 3) at the outer edge of the MEPA.

The determination of compliance with the EQG required, this was completed from 2008 to 2014 and NewGen was found to be compliant at all times (refer Section 7.3 for more details):

- For each season (three month period), water temperature data (at 30 minute intervals or less) to be recorded at specified test sites and control sites;
- Water temperature data to be collected in accordance with the Manual of Standard Operating Procedures;



- Use of this data to demonstrate that, for each test site, the appropriate Environmental Quality Guidelines for water temperature (Table 2) were met.

The EQS's for temperature for both Moderate and High Ecological Protection Areas require that, if the EQG are exceeded, then monitoring is implemented that:

1. For a High Ecological Protection Area, assesses whether there is any significant change (for a Moderate Ecological Protection Area this is any persistent (i.e. ≥ 4 weeks) and significant change) beyond natural variation in any ecological or biological indicators (i.e. other than temperature) that are affected by water temperature unless that change can be demonstrably linked to a factor other than water temperature.
2. Assesses whether there are any deaths of marine organisms due to anthropogenically-sourced thermal stress, where a contribution to that stress is imposed by the power station.

Monitoring of the mixing zone from 2008-2014 confirmed that the EQG's are being met at all times. It is important to note that the EQC define the limits of acceptable change to environmental quality. They do not represent pollution levels that trigger enforcement action if exceeded. Nor do they infer it is acceptable to load up the ecosystem to these levels – waste avoidance/minimisation strategies should always be adopted and reinforced.

6. Implementation

6.1 Design/construct

The NewGen Power cooling water outflow pipeline and diffuser array has been designed to meet the requirements of the environmental quality guidelines for temperature elevation in the SEP. The SEP designates a low ecological protection area (LEPA) in the waters of Cockburn Sound adjacent to the NewGen Power site. There are other outflows into the LEPA that have been considered in the design of the pipeline and diffuser.

Details of the location and design of the pipeline and diffuser and the hydrodynamic modelling of the diffuser thermal outflows are the subject of a separate environmental management plan (Final Diffuser Location and Design Management Plan, NewGen Power 2006) which should be consulted for more detailed information.

Ocean intake is from the expanded pumping basin facility at Verve Energy's Kwinana power station.

The following outflow characteristics for flow rates and temperature elevations were used as inputs into the hydrodynamic modelling of outflows either in operation or previously approved by the EPA (WorleyParsons 2006a):

- Verve Energy Kwinana Power Station Unit A/B and Unit C and Cockburn 1 – combined daily and seasonally variable flow rate of between $5 \text{ m}^3/\text{s}$ and $29.36 \text{ m}^3/\text{s}$ with a daily and seasonally variable elevation of between 7.2°C and 11.25°C .
- Water Corporation Perth Seawater Desalination Plant - constant flow rate $2.483 \text{ m}^3/\text{s}$ with constant elevation of 1°C .
- Verve Energy Cockburn 2 gas fired power station – constant flow rate of $5.1 \text{ m}^3/\text{s}$ with constant elevation of 9°C .
- BP refinery – constant total flow rate of $5.4 \text{ m}^3/\text{s}$ with constant elevation of 13.83°C .



- NewGen Power gas fired power station – constant flow rate 5 m³/s with seasonally and daily variable overhead of between 5°C and 13.1°C.

The NewGen Power diffuser has been designed to avoid overlap between the near-field mixing zone and other existing or approved near-field mixing zones or intakes. This includes the diffuser and intake for Water Corporation's Perth Seawater Desalination Plant, Verve Energy's Cockburn 2 diffuser (approved but not constructed) and the existing intakes and outflow canals for Verve Energy's Kwinana and Cockburn Power Stations.

The NewGen Power diffuser design consists of 21 ports at 5m spacing along the 100m end section of the pipeline.

These diffusers and intakes are illustrated in Figure 1.

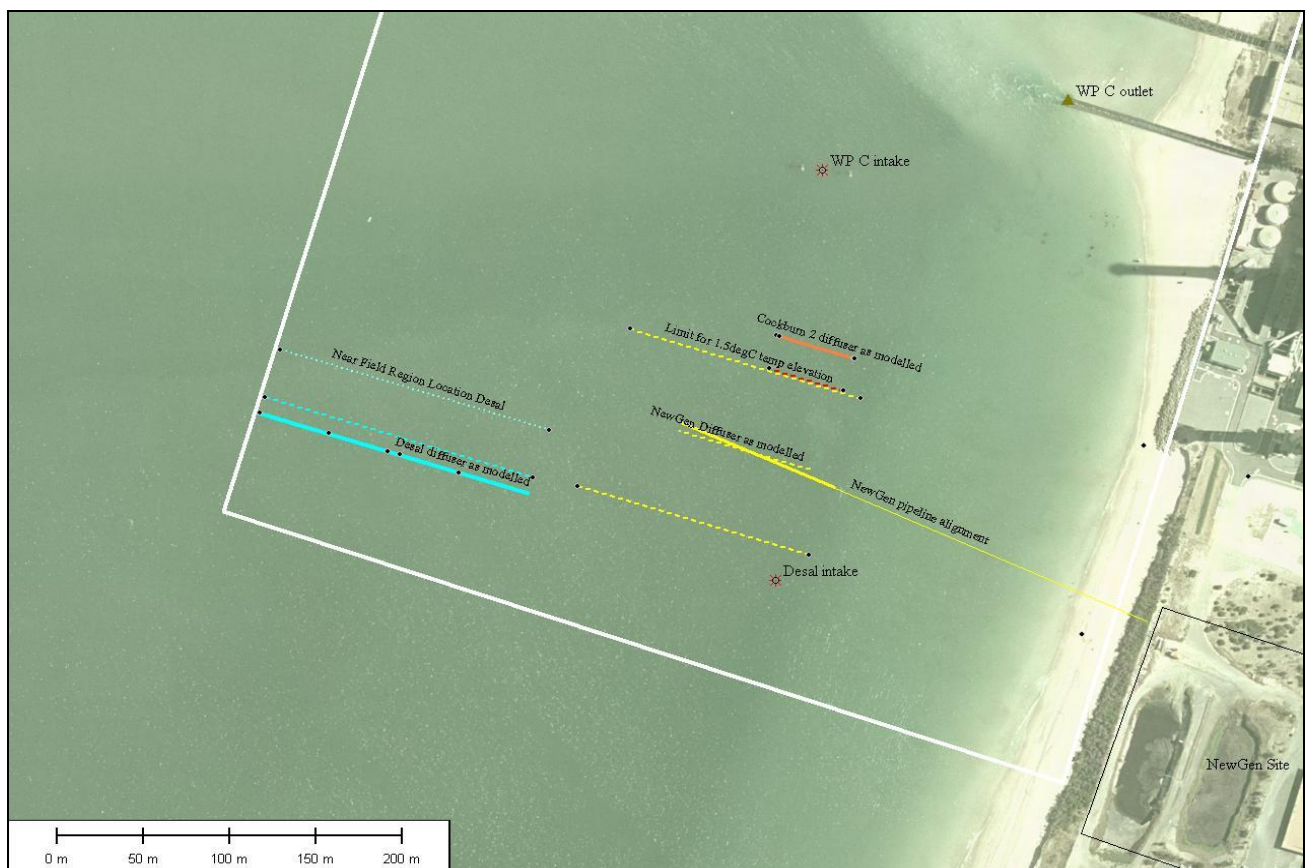


Figure 1 Location of other diffusers (solid lines) and intakes (black circles) adjacent to NewGen Power diffuser (yellow). White line is the boundary of the LEPA, mixing zones indicated by dashed lines.

6.2 Operation

The maximum instantaneous temperature increase for NewGen Power's cooling water output of 5m³/s is expected to be 13.1°C during normal operations. This temperature increase occurs when the plant is running at full generation capacity which requires maximum supplementary duct firing

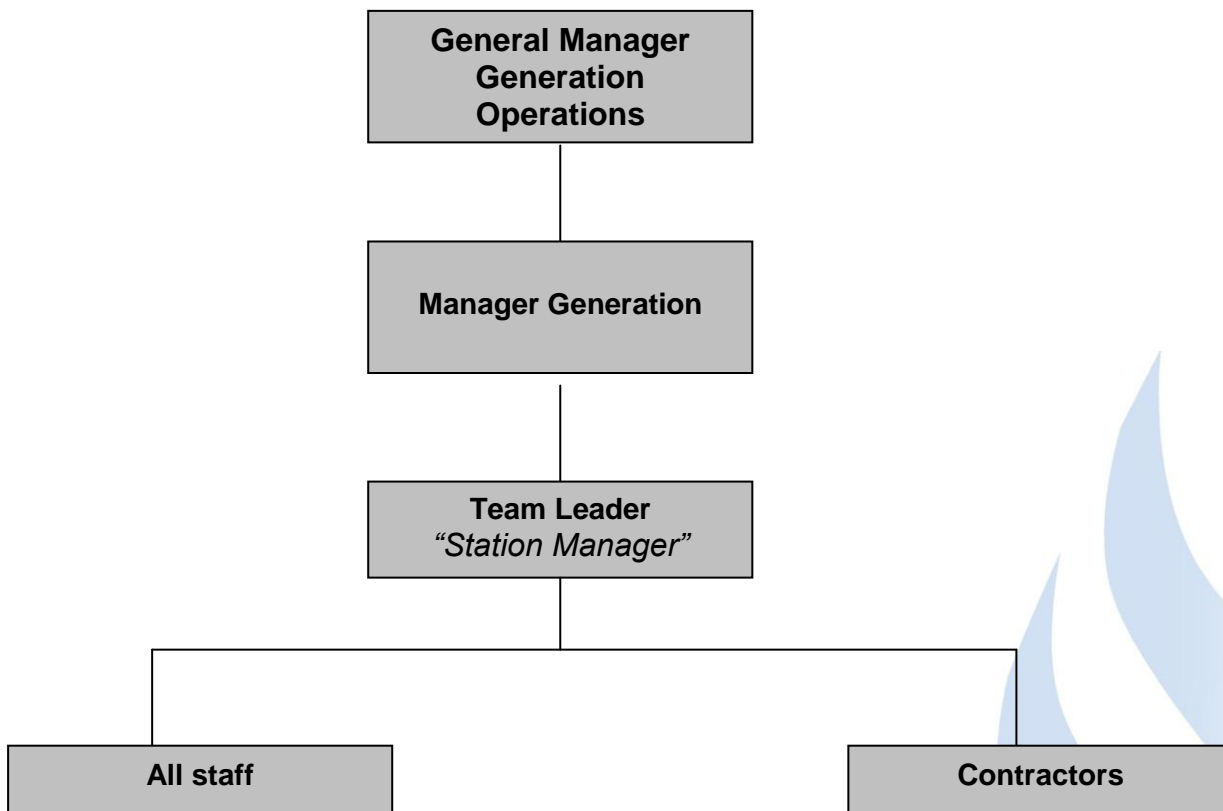


in the Heat Recovery Steam Generator (HRSG) as well as maximum output from the combined cycle gas turbine (CCGT).

Whilst the plant is base load and therefore scheduled to operate consistently, excluding planned maintenance, it will not run at full generation capacity continuously but will have a varying load that reflects the demand and operational requirements of the SWIS. The temperature elevation of the cooling water will vary according to the generation output and is expected to vary regularly between 5 and 13°C.

Routine preventative maintenance of the outflow pipeline and diffuser array will be undertaken in accordance with the design engineering and manufacturer's operation and maintenance recommendations and to minimize any potential loss of performance. Maintenance of the pipeline and diffusers will not involve excessive temperatures or the use of marine contaminants.

6.3 Roles and responsibilities



General Manager (Generation Operations)

- Ensure review of compliance with this METEMP conducted as required.
- Ensure all licences and permits are obtained and maintained.
- Ensure all obligations and commitments are communicated and actioned.
- Maintain effective relationships with stakeholders including regulatory authorities and Cockburn Sound Management Council.



Manager Generation

- Ensure contract documentation specifies the responsibilities of contractors in regard for the requirements of this METEMP.
- Assist with review of compliance with this METEMP.
- Assist with meeting environmental monitoring and reporting requirements.
- Responsible for compliance with legislative requirements.
- Ensure effective communication with Team Leaders.
- Liaison with stakeholders, regulatory authorities and Cockburn Sound Management Council as required.

Station Manager

- Ensure staff and contractors are familiar with requirements of this METEMP.
- Responsible for compliance with the administering authority.
- Responsible for the development of appropriate work procedures and ensuring that staff are trained in their use.
- Ensure staff are trained to competently conduct tasks required by this METEMP, appropriate licences and other legal requirements.
- Ensure instances of breach or potential breach of any legislation or licence conditions are identified, reported and actioned as required by regulation or the Site Access Agreement with Verve Energy.
- Ensure potential environmental hazards are identified and reported.
- Ensure ongoing effective communication with staff and contractors.

All Staff

- Every NewGen staff member has a general environmental duty that will be discharged through appropriate training, work practices and event reporting.
- It is the responsibility of every NewGen Power Kwinana staff member to report instances of breach or potential breach of any legislation or licence conditions.
- Comply with directions and procedures required by this METEMP.
- Ensure that contractors and other persons working at NewGen sites undertake works in accordance with this METEMP.

Contractors

- Shall comply with this METEMP as if they were NewGen staff members.

7. Monitoring

7.1 Temperature limits

Cooling water outflow temperatures will be monitored in-line on a continuous basis at the outflow from the condenser as part of the Distributed Control System (DCS). Flow rate of cooling water discharge will be measured on a continuous basis and recorded. Monitoring and recording of the cooling water outflow temperatures will be compared to the specified upper limits for instantaneous and daily average cooling water outflow temperatures used in the pipeline and diffuser design studies and given in Section 5.1. The number and duration of any exceedence events and an explanation of the causes and remedial strategies implemented shall be included in the annual reporting to the OEPA.



7.2 Diffuser performance

The dilution performance of the cooling water outflow diffuser was assessed after construction of the pipeline. For the first 5 years of operation dilution performance of the cooling water outflow diffuser was measured annually. The results were compared against the predicted near-field mixing performance of the diffuser. All models showed the diffuser performance to be better than design as such diffuser modelling is now to be completed every 5 years. The performance has been predicted by fine scale hydrodynamic modelling and is reported in a separate management plan (NewGen Power 2006). The sampling dates and times have been and will continue to be selected to be conducted under relatively constant cooling water heat loads and during a period of northerly flowing current that furthermore occurs after several days of consistent northerly flowing currents in the region. This is to avoid any potential confounding effects of temperature signatures caused by outflow from Synergy's existing cooling water discharge.

Surface drogues have been deployed during sampling occasions to determine the direction and speed of the prevailing current. The information on current speed and direction, together with cooling water discharge characteristics and the ambient salinity and temperature conditions measured at the reference sites (see below), will be used as the input information for the initial dilution model (CORMIX). CORMIX will be used to predict the degree of dilution at distances of 25 m and 50 m from the edge of the diffuser, and the dilutions will, in turn, have been used to predict the expected temperature elevations at these locations.

CTD (conductivity, temperature and depth) profiling has been undertaken in the field to compare the recorded temperatures with those predicted by the CORMIX model. The temperature depth profiles of the water column have been measured using a CTD probe in accordance with the Manual of Standard Operating Procedures for Cockburn Sound (EPA 2005). Monitoring has been undertaken at fixed sites based on a 25 m grid that is centred on each end (0 m and 100 m) and the midpoint of the diffuser (50 m). CTD profiles have been taken at the 3 sites along the diffuser, then at distances of 25 m and 50 m (Figure 2). CTD profiles have been recorded at two locations 200 m south of the diffuser. The results from the CTD monitoring and the water temperatures predicted from modelling will be used to assess and compare the actual versus the modelled performance of the diffuser. The results are reported to the Office of the Environmental Protection Authority (OEPA).

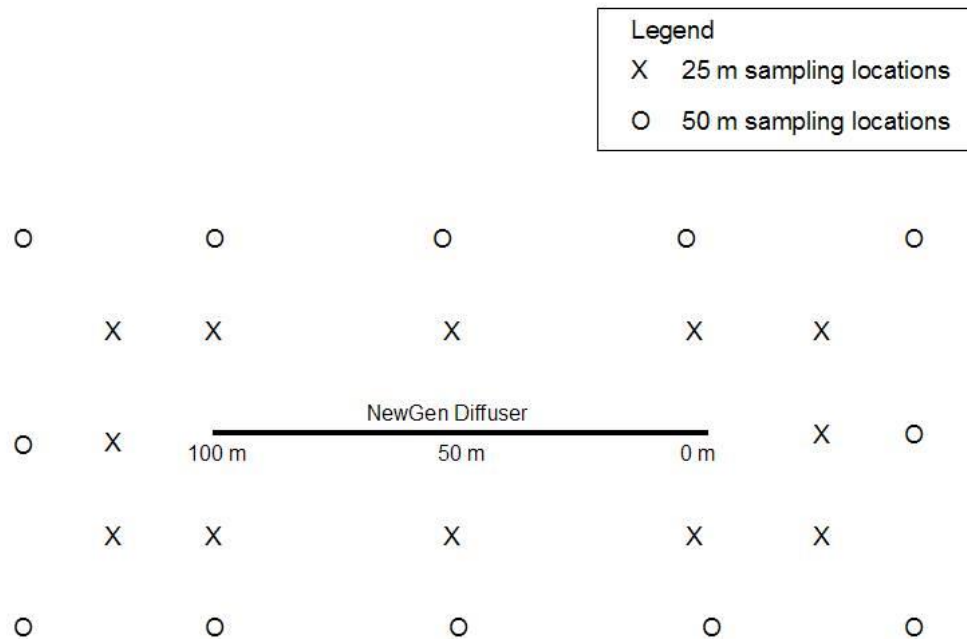


Figure 2 NewGen Diffuser Performance Monitoring Schematic

7.3 Temperature elevations

In addition to the monitoring of diffuser performance during the commissioning of the station, seasonal water quality monitoring (i.e. water temperature) was undertaken for the first 5 years of operation of the plant and compared to criteria of the State Environmental (Cockburn Sound) Policy 2005 (Government of Western Australia 2005). At all times NewGen was found to be compliant as such this is no longer required, provided the temperature elevation limits of the main cooling water outfall remain in place as per item 5.1 of the METEMP.

Temperature profiles were measured at three sites near the boundary of the low and moderate ecological protection area (sites A, B and C), two sites near the boundary of the moderate and high ecological protection areas (sites D and E) and at two reference sites: Cockburn Sound summer water quality monitoring site CS7 and Jervoise Bay Northern Harbour monitoring site NH5 in the northern end of Cockburn Sound (refer Figure 4). The reference sites were unaffected by thermal discharges and yet in similar waters as the NewGen diffuser. Over ten years of water quality monitoring data for the this region has shown no sign of any measurable thermal pollution from the Western Power cooling water outfalls at these sites (e.g. Figure 3, and Oceanica 2006a). These waters are open and are some of the least sheltered in Cockburn Sound. As such, the waters over



the shallower (approximately 8 to 10 m deep) eastern margin are generally well mixed and are on the same sill and have similar depths to the NewGen diffuser area.

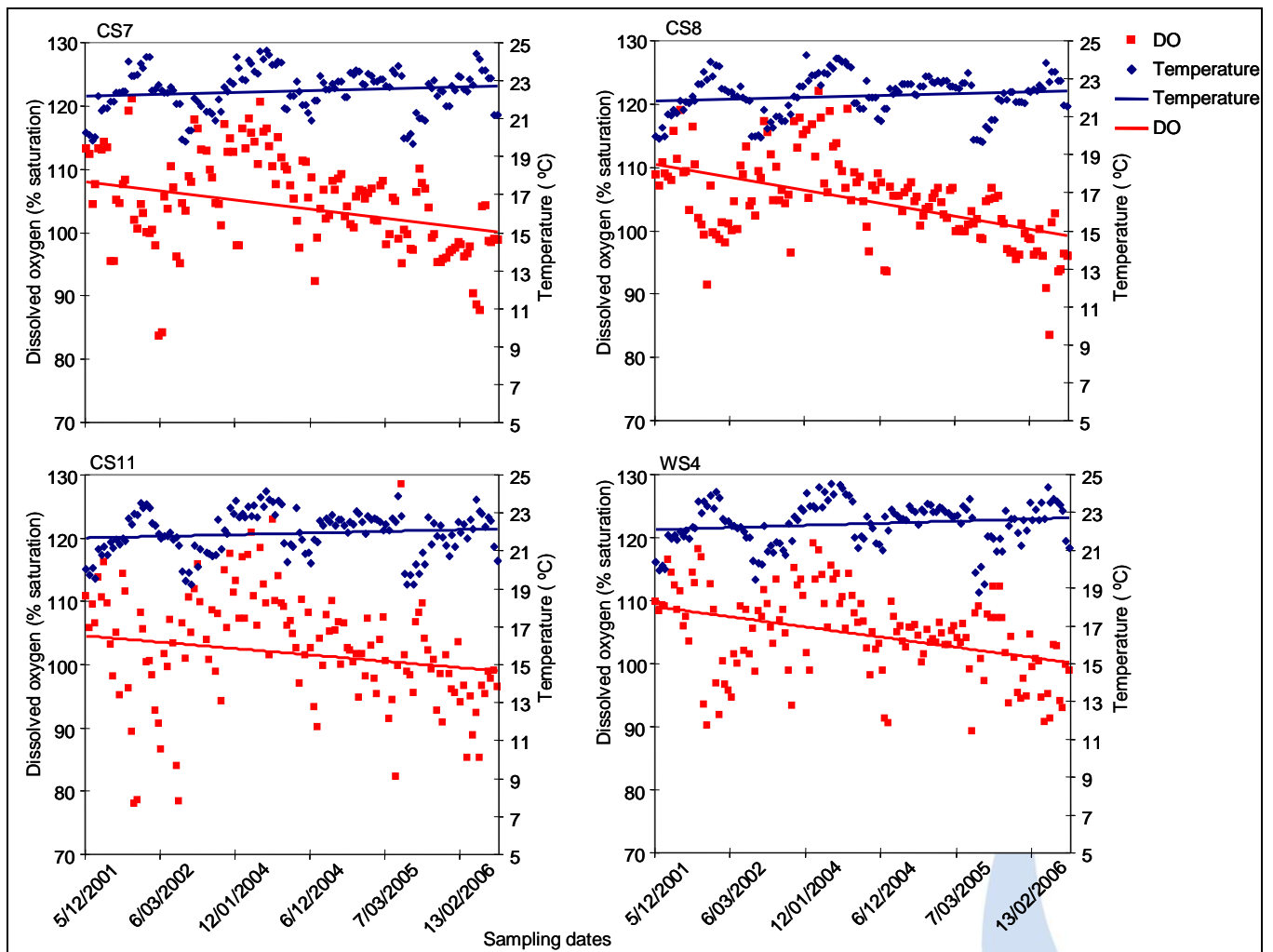


Figure 3 CS7 compared with other summer monitoring sites, it can be seen that there is no evidence of elevated temperatures at CS7 (data supplied by MAFRL; refer Wilson & Paling 2006).

Monitoring on the boundary of the low ecological protection area consisted of temperature profiles at the points on the northern, western and southern boundaries closest to the midpoint of the NewGen diffuser.

Temperature monitoring near the boundary of the moderate ecological protection zone was at two locations on the eastern shelf of Cockburn Sound, located west and north of the modelled outlet. The reference sites were Cockburn Sound summer water quality monitoring site CS7 and Jervis Bay Northern Harbour monitoring site NH5 at a similar depth and distance from shore as the NewGen diffuser.



Temperature profiles were measured in accordance with the Manual of Standard Operating Procedures for Cockburn Sound (EPA 2005) and Guidance Note E from Table 1 (a) of the EQC Reference document (EPA, 2005a). That is:

- The preferred approach for measuring temperature was to use semi-permanently located data loggers according to the SOP (EPA, 2005b);
- Seasonal (3 month duration) median temperature required deployment of temperature loggers, logging continuously at intervals of 30 minutes or less at the test sites (A, B, C, D and E) and the control sites (CS7 and NH5);
- To demonstrate compliance with the EQG, temperature sensors were required at 0.5 m below sea level (as close as practicable) and 0.5 m above seabed;
- The temperature sensors were calibrated and quality controlled to a resolution and accuracy of 0.1 deg C, or better;
- At each test site (A-E), compliance with the water temperature EQG for a particular season within a year was established on the basis of not less than 4 weeks duration of simultaneous 30 minute temperature data at the test site and one of the nominated reference sites.
- With this data set it was possible to test against both of the two alternative formulations of the water temperature given in Table 2. If either one is satisfied, then the EQC was deemed to be met at that site.

The CSMC was informed of the METEMP monitoring program, supplied with monitoring data, and informed of any exceedences of the water temperature EQG or EQS.

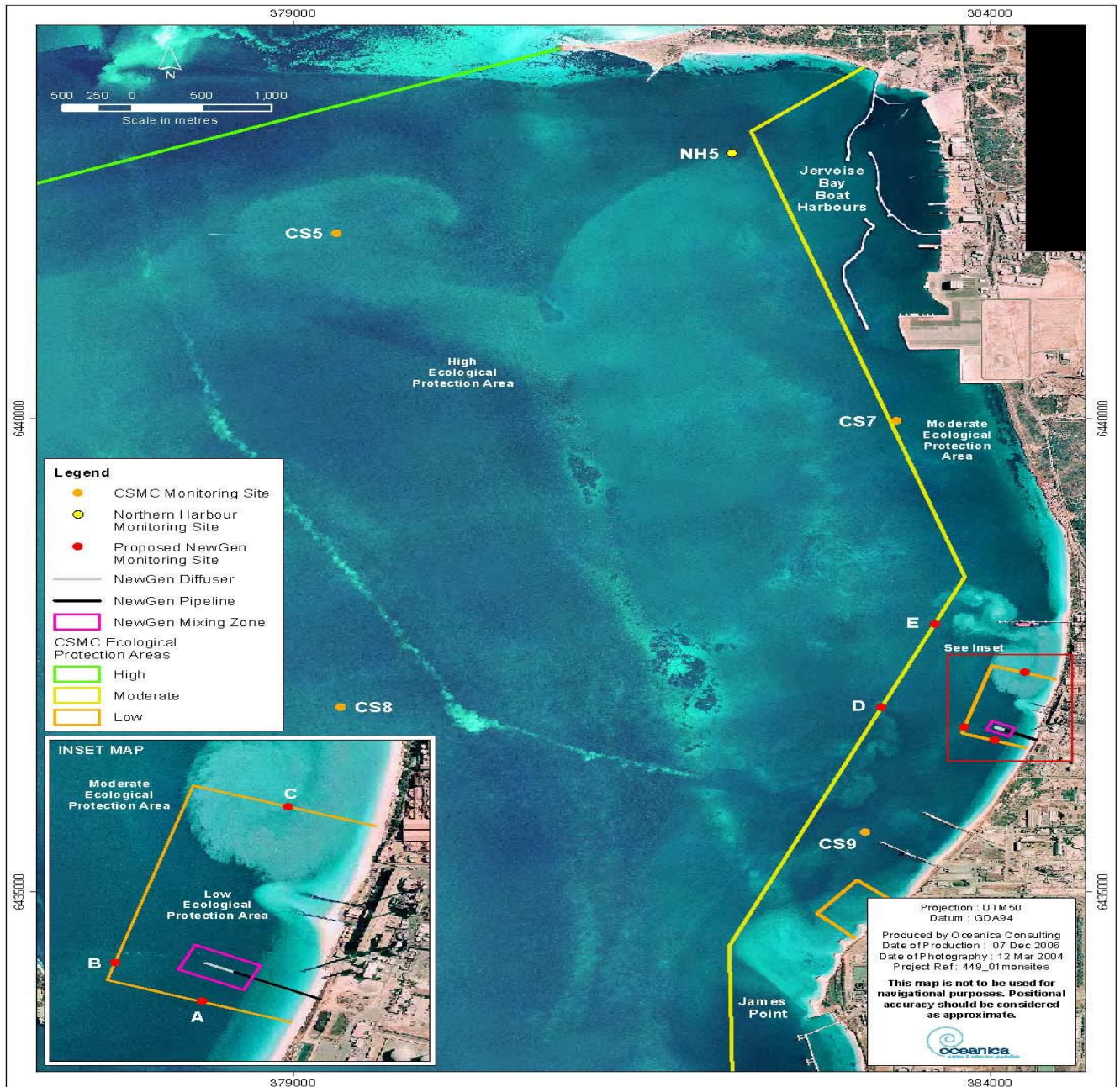


Figure 3 Temperature elevation monitoring sites

7.4 Complaints

A complaints procedure has been established to receive complaints from the community associated with cooling water outflows from the power station. The following information about each complaint shall be recorded:

- Name of complainant (anonymous if preferred).
- Address/general location of complainant when incident occurred.
- Nature of incident (e.g. foam near outlet, odour).



- Detailed description of incident (e.g. if odour, what did the odour smell like?).
- Date/time.
 - (a) When complaint logged.
 - (b) When incident occurred.

The power station operator shall investigate all complaints and, where the power station is likely to be the cause of the incident, the operator shall take actions to identify the cause and implement measures to mitigate the risk of the incident recurring.

The operator shall record the following information in response to a complaint:

- Details of the activities undertaken at the time of the incident (e.g. normal operations at X% capacity, duct firing on/off, fuel burn data).
- Details of the nature of any abnormal activities or operational conditions.
- Results of on-site observations and investigations made to investigate the incident.
- Results of on-site observations of cooling water temperature, flow rate and weather conditions.
- Details of actions taken on-site, if any required, to alter activities to alleviate or mitigate the effects of the incident.
- Operator's conclusion as to the cause of the incident:
 - (a) Is the incident likely to be due to on-site activities?
 - (b) If the incident is likely to be due to on-site activities, detail the specific activities responsible and mitigation measures that will be implemented to reduce the risk of the incident recurring.
- Steps taken to notify complainant of the outcomes of the operator's investigations.

8. Contingencies

The following mechanisms will be established to identify actual and apparent non-conformance (exceedance) with the METEMP:

- (a) If in-line temperature sensors show that the cooling water temperature increase above ambient exceeds 27.1°C or the increase above ambient averaged over a calendar day exceeds 14.1°C, the OEPA will be informed within one business day of the event and of the operating conditions and any exceptional circumstances and any actions taken. Such events shall trigger investigations of cause and implementation of remedial strategies as appropriate. The number and duration of these events and an explanation of the causes and remedial strategies implemented shall be included in the annual reporting to the OEPA.
- (b) If in-line temperature sensors malfunction, the OEPA shall be informed within 24 hours of the discovery of the malfunction and provided with an estimated time for repair as well as the projected temperature elevations for the period of repair and the risk of exceedance and any action to be taken.



9. Stakeholder consultation

NewGen Power has sought comments on this METEMP from Verve Energy, Water Corporation and the Cockburn Sound Management Council. These comments are contained in Appendix A with NewGen's responses. Comments received from stakeholders have been incorporated into this METEMP.

The METEMP has been made publically available and is posted on the NewGen Power Website:

<http://newgenpowerkwinana.com.au/>

NewGen Power will respond directly to all comments received from stakeholders on the METEMP.

10. Auditing

Internal audits will be conducted to assess compliance with this METEMP.

11. Review and revision

This METEMP was reviewed after five years of operation. Results were analysed and compared against the objectives of the Plan. This led to the amendments to the METEMP requested in 2014.

12. Reporting

12.1 Annual report

An annual report will be prepared within twelve months of completion of the first year of operation and annually thereafter, that:

- Summarises compliance with the METEMP commitments.
- Provides details of any incidents of non-compliance.
- Summarises marine temperature monitoring data collected as part of this METEMP.
- Summarises complaints.
- Summarises outcomes of auditing.

The report will be prepared in accordance with the Department of Environment Regulation guidelines for performance and compliance reporting.

12.2 Record keeping

The following records are to be kept on site and made available to an EPA representative on request.

- Cooling water monitoring reports and data;
- All environmental complaints – maintain complaints register;
- External reporting to EPA, including annual reports; and Daily checklists.



13. Key Management Actions Table

Table 4: Key Management Actions

Ref #	Timing/Phase	Key Management Action	EPA Reporting/Evidence	Status
METEMP1	During commissioning	Monitor diffuser performance against model prediction	Result submitted to EPA in post-commissioning compliance report	
METEMP2	Post commissioning	Monitor seasonal temperatures as described in S7.3	Results submitted to EPA for the first 5 years or operation, no longer required	
METEMP3	All phases	Implement a complaints handling process	Results summarised in Annual Report	
METEMP4	Post commissioning	Monitor maximum instantaneous and daily average temperature elevations	Report exceedances or faults within 24 hours	
METEMP5	Post commissioning	Investigate potential exceedances of EQG for temperature	No longer required.	

14. References

ANZECC/ARMCANZ. 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand, National Water Quality Management Strategy No. 4.

Environmental Protection Authority of Western Australia 2005a; *Environmental Quality Criteria Reference Document for Cockburn Sound (2003-2004)*. A supporting document to the *State Environmental (Cockburn Sound) Policy 2005*.

Environmental Protection Authority of Western Australia 2005b; *Manual of Standard Operating Procedures for Cockburn Sound*.

Government of Western Australia 2005; *State Environmental (Cockburn Sound) Policy*

NewGen Power 2006; *Final Diffuser Location and Design Management Plan*.

Oceanica 2005; Marine Environment, Part B Chapter 5 in *Proposed Development of NewGen Power Station in the Kwinana Industrial Area, Western Australia: Seawater Cooled Condenser*, Environmental Protection Statement, NewGen Power Pty Ltd (2005).

Oceanica 2006a; Jervoise Bay Northern and Southern Harbour Monitoring Program Summer 2005/2006 Data Report. Report to Parsons Brinckerhoff, June 2006. Report No. 274/9



Oceanica 2006b; *Perth Seawater Desalination Plant 1, Water Quality Monitoring Programme – Baseline Component Data Report* (Dec 2005 – Feb 2006).

Wilson C. and Paling E.I. 2006; *Water Quality of Cockburn and Warnbro Sounds* (December 2005 to March 2006), Report to Cockburn Sound Management Council, Kwinana Industries Council and The Royal Australian Navy, prepared by Marine and Freshwater Research Laboratory Environmental Science, Report No. MAFRA 06/2.

WorleyParsons 2006; *NewGen Kwinana Power Station Fine Scale Hydrodynamic Modelling in Final Diffuser Location and Design Management Plan*.

15. Acronyms

EPA	Environmental Protection Authority of Western Australia
FDLADMP	Final Diffuser Location and Design Management Plan
LEPA	Low Environmental Protection Area as defined in the State Environmental (Cockburn Sound) Policy 2005
METEMP	Marine Environment Temperature Elevation Management Plan
MIKE3	Marine modeling package from the Danish Hydraulic Institute
SEP	State Environmental (Cockburn Sound) Policy 2005

16. Acknowledgements

This document has been prepared for NewGen Power with the assistance of Oceanica and ELP.

Document ID.	Revision No.	Reviewed by:	Approved by:	Date
<i>NPK – METEMP</i>	<i>Rev 5.0</i>	<i>H Henderson</i>	<i>M Hammond</i>	<i>19/09/14</i>



17. APPENDIX A STAKEHOLDER COMMENTS

A draft copy of the METEMP was circulated to designated stakeholders for comment. The following comments were received. NewGen responses are in italics.

Marine Ecosystems Branch EPA Service Unit

An argument needs to be mounted to support the statement that locations in Jervis Bay are thermally unaffected and appropriate for use as reference sites. This could be demonstrated through a suitably validated model or, preferably, data should be collected as supporting evidence for appropriateness before determination of the reference site. *The necessary data has been included in the revised METEMP. There are considerable data on water column physical characteristics in Jervis Bay offshore from the harbours (from Northern Harbour Monitoring: much of the data has also previously been provided to CSMC for inclusion in the WIN database). There is no evidence to suggest that the water column in Jervis Bay is affected by thermal discharges. The sites are not in the harbour areas and do not suffer from reduced mixing or flushing.*

Clarification is required for the diffuser performance sampling exercise. The document needs to confirm that the two locations 200m south of the diffuser are to be used as reference sites. Clarification needs to be provided in regard to how the data collected will be used to validate the CORMIX predictions of the near field dilutions. *This information has been included in the revised METEMP.*

Cockburn Sound Management Council

While the METEMP is comprehensive it is not detailed enough for several components. For example, it does not provide sufficient information on the proposed monitoring program for the discharge of cooling waters. The METEMP should include further information on such things as frequency of sampling, location of sites (including a map of the sites), list of coordinates and the sampling methodology. *The individual items in this summary are discussed below.*

Consistent with both the Environmental Quality Criteria for Cockburn Sound and the Manual of Standard Operating Procedures for Cockburn Sound (EPA 2005), NewGen need to ensure that the proposed monitoring reference sites are appropriately located, and that the methods used for comparing reference site data against impact site data are appropriate and clearly defined. The METEMP does not give sufficient information on the location of the reference sites in Jervis Bay. The CSMC feels that the selection of reference site locations in Jervis Bay needs to be justified and explained. This concern is based on the nature of Jervis Bay and the potential to have reduced flushing and other water quality issues affect reference sites, making them not directly comparable to the location of the NewGen plant's outfall. *This information has been provided in the revised METEMP. There are considerable data on water column physical characteristics in Jervis Bay offshore from the harbours (from Northern Harbour Monitoring: much of the data has also previously been provided to CSMC for inclusion in the WIN database). There is no evidence to suggest that the water column in Jervis Bay is affected by thermal discharges. The sites are not in the harbour areas and do not suffer from reduced mixing or flushing. At the direction of the EPA and the Minister, the METEMP is to be concerned with*



temperature effects and does not consider other water quality issues at reference sites (Refer EPA Bulletin 1190 and Ministerial Statement 698).

The METEMP states that the dilution performance of the cooling water outflow will be assessed on two sampling occasions during commissioning of the plant. The CSMC believes clarification is required in regard to the specifics of commissioning and whether two sampling periods are adequate to validate both modelled predictions and ongoing water quality (i.e. temperature). A second concern is the duration and intensity of monitoring after commissioning given that the METEMP should also be a long term plan to monitor the plant during full operational capacity for at least the next three years.

Commissioning is not a process of known duration or outcome and so it is not possible to be specific about the exact sampling that will be conducted. Monitoring will be conducted so that the performance of the diffuser is confidently known. This would involve two sampling periods as detailed in the EMP. More sampling will be conducted as required if either the conditions in the Sound or the plant operation conditions not do not match those specified or otherwise do not allow confident interpretation of the results. The sampling and results will be provided in the annual report.

The CSMC believes there is a need to expand monitoring to include several other parameters in order to either dismiss them as an issue or to reveal unexpected new sources of contaminants (for example, nutrients and certain heavy metals, given the use of chlorine for anti-scaling/ fouling purposes). If NewGen believe these are not valid requirements then the monitoring plan needs to adequately justify the lack of monitoring for these parameters. In addition the CSMC believes there would be considerable benefits in having continuous loggers located within the expected thermal dispersion field so that more refined monitoring and reporting is possible.

The direction of the EPA and the Minister in Conditions 6-7, 6-8 and 6-9 is that the METEMP be concerned with temperature effects. The METEMP does not consider nutrient related or toxicant issues (Refer EPA Bulletin 1190 and Ministerial Statement 698).

This issue of chemical biocides is specifically addressed in Conditions 6-12, 6-13 and 6-14 of Ministerial Statement 698.

More information will be obtained during the commissioning and seasonal monitoring programmes. Temperature information in the Sound is also collected from existing adjacent sites. The use of continuous loggers is not required for NewGen to provide data capable of demonstrating compliance with the SEP.

The CSMC believes the METEMP or another appropriate management plan needs to adequately explain how potential contaminants or excessive temperatures etc. will be measured and monitored during maintenance operations such as backwashing activities. Again, if these are not relevant concerns there needs to be adequate explanation to dismiss them.

The cooling water system is not in contact with any other potential contaminant source from maintenance or routine power station operations. This was addressed during the impact assessment process. Maintenance of the pipeline and diffusers will not involve excessive temperatures or the use of marine contaminants. This has been added to the text.

The METEMP does not commit to adequate contingency options. The CSMC would like to see the METEMP commit to stronger contingency options if the temperature of the cooling water is exceeded for an extended period of time. The CSMC believes seven days is much too long to notify the Department of Environment and Conservation (DEC) of exceedances. The CSMC believes that NewGen needs to commit to a hierarchy of contingency notification and action. For example, in the first instance exceedances occurring consistently over three to four hour periods require the DEC to be notified on an informal basis. Consistent exceedances over 24-48 hours



require a management response explaining to the DEC how they will be dealt with and why they have occurred. At this stage plant shutdown must be an option to prevent significant environmental damage. This kind of contingency commitment and reporting would also be expected to be a part of any licensing conditions.

The METEMP has been modified to in light of these comments.

Advice from the Department of Fisheries has highlighted the potential risk to marine fauna (e.g. crabs, forage fish, pink snapper and their propagules) as a result of both construction activities and temperature elevations caused by NewGen's thermal discharge. The CSMC shares this concern and would encourage NewGen to discuss such issues further with the Department of Fisheries and consider including management options to address such concerns within the METEMP, if necessary.

The area directly affected by the NewGen outflow thermal elevation is within the designated Low Environmental Protection Area and is a bare sand habitat. The project will not result in changes to circulation patterns of Cockburn Sound, nor will it affect the areas in which snapper spawning occurs. The EPA has assessed the project and all key stakeholders and the public have had the opportunity to comment on the project during the assessment period. The EPA Bulletin 1190 and Ministerial Statement 698 have specific comments relating to impacts on fisheries. The temperature criteria established by the EPA are designed to conservatively protect fauna, as such the METEMP addresses the issue of fauna protection through the management criteria..

Verve Energy Comments

The METEMP appears to be a well written consultant's report that addresses all of the objectives, targets, responsibilities and monitoring one would expect of an environmental management plan written to manage a significant environmental risk. Verve Energy assumes that it will be incorporated into Newgen's overall environmental management system (EMS). Indications are that it is, for instance, we are pleased to see that it is subject to an audit and review process, presumably the same as the rest of Newgen's EMS. Being a management plan written by a consultant and not the owner/operator, it will need these checks.

NewGen will incorporate the METEMP into its EMS.

Dot point three on page 7 tends to indicate that Cockburn 2 will have an impact of a 9 C increase on the sound that is flat. This is not the case, the heat load will vary dependant on the unit load the figure quoted is a maximum.

The heat load will vary however environmental approval for Cockburn 2 is for 9°C at 5.1 m³/s and therefore was used for modelling purposes. This was re-confirmed as appropriate by Verve Energy prior to modelling being conducted.

S 5.1 Outflow temperature: The temperature increase stated in this document on the maximum daily increase in water temperature for the NewGen Plant is 9.3 C. The modelling completed in the Final Diffuser Location and Design Management Plan uses a temperature of 8 C. The maximum number quoted is consistent with the Cockburn plant we operate at 9 C. The 1 C difference when operating the machine at MCR will have an impact on the other users in the sound. Your modelling should be based on the 9.3 C not the 8C.

Modelling of the NewGen outflows was based on a realistic operational time series not a theoretical maximum output.

S 6 Design/construct - Figure 1: Cockburn 2 intake will be the same as Kwinana, Cockburn 1 and NewGen. The last para is tending to indicate that Cockburn 2 will have its own inlet pipe.



The paragraph has been reworded.

S 6. Design/construct - Figure 1: It is understood that the Desal Plant outlet had been located a further 500 metres off shore. Could the location of this outlet be confirmed?

The location is as shown in Figure 1.

S 6 6.2 Operation: The statement on the routine maintenance is not clear on page 9. 'Routine preventative maintenance of the outfall pipe and the diffuser' should replace 'Routine preventative maintenance of the cooling water pipeline' on the first line of the first paragraph.

The sentence has been reworded.

There are contractual obligations under the SAA with respect to compliance, notice and supply of data that have to be complied with as part of the management plan.

SAA is the Site Access Agreement between NewGen and Verve and includes an obligation on NewGen to report compliance or breaches to Verve. This has been included in S 6.3.

S 7. Monitoring: The monitoring program appears thorough and should be sufficient to both verify the modelling and demonstrate the plant's compliance with the Cockburn EPP. Verve Energy should request that Newgen forward us a copy of all monitoring. The points addressed under complaints, including operational information to be recorded, are consistent with good environmental management. One again, VE should request a copy of any complaints that do or have the potential to impact on KPS or CKB.

NewGen will forward any complaints that may relate to KPS or CKB to Verve.

S 7.2 Diffuser performance: CORMIX modelling is discussed in the document. Verve request NewGen supply of the data from the modelling.

NewGen will supply CORMIX results to Verve.

S 8. Contingencies: We note that there are no site specific operational controls in this section to reduce temperature impact. We gather that this is because of operational constraints (the plant is base load and subject to system requirements). If so, perhaps this could be stated.

The plant is base load and subject to system requirements and also to environmental requirements. The contingencies section describes the process to be followed rather than trying to identify specific operational reactions to actual or apparent non-conformances or events. Identifying specific events and possible operational responses appears more limiting than specifying the process required.

S 9. Stakeholder consultation: While VE appreciates that opportunity to comment on the METEMP, the period given for comment is too short to allow a detailed appraisal of all the information.

The assistance of Verve Energy in meeting the tight timing is appreciated. Comments from Verve Energy have been incorporated wherever possible.

Water Corporation Comments

Need to insert an acronym list.

Included

1.0 - 2nd sentence – Elevated water temperatures can affect marine environments, and adjacent industrial and recreational pursuits.

Sentence reworded.

2.1 - 430,000m³/day equivalent to 430 ML/day.



Sentence reworded

2.2 - Oceanica references not included in references. The annual range appears the same as the Occtech report, undertaken for the desalination project – check references and include. Need to look closely at historical temperature information as there are suggestions that the temperature is rising slightly with time.

References included

3.0 – higher than at the intake.

Sentence reworded

5.1 – when will this comparison occur. Need to mention the model type.

Comparisons occur when reported annually. Model type added.

5.2 – need to define mixing zone here.

Definition added.

6.1 – summarise key diffuser information.

Information added

Worley Parsons references are not included in references.

References added

Water Corporation's outflow is approximately 190 ML/day, nominally 45GL/annum and the intake is approximately 320 ML/d. This allows for downtime for maintenance and possible down time from low DO events in Cockburn Sound. The maximum elevation is 1 degree.

Figure 1.0 – need to put the mixing zones on the map – i.e 50m for PSDP1 and 25m? for NewGen and whatever the mixing zones are for the other discharges in the LEPA.

Mixing zones are indicated by dashed lines

6.2 - The plant will be operated to reflect the needs of the SWIS at varying load reflecting s, yet 2.2 states the plant is a base load plant.

This is not inconsistent. Base load is not a constant output but is constantly generating some load.

6.3 – roles and responsibilities differs from the MWCEMP – which identifies names and contact details (which is more thorough). Perhaps roles and responsibilities could be one technical appendix common to all the plans.

The Plans need to be stand alone documents so roles need to be mentioned in each one.

7.2 – need to define the FDLAD report. Two sampling occasion may not be enough to verify the diffuser performance (as advised to the Water Corporation as part of their diffuser monitoring).

The sampling occasions should occur under a variety of flow rates and over a variety of seasons.

Confounding effects – compounding (ie cumulative) impacts.

FDLAD reference changed. The NewGen diffuser and thermal plume is less complex than the desal brine plume so sampling is not required to be the same. Once the diffuser performance is known the seasonal monitoring of temperatures will provide necessary information.

7.3 – first sentence a seasonal water quality monitoring program. Reference sites as Jervoise Bay and Warnbro Sound – may need some justification? Marine Ecosystems Branch recommended two closer sites for desalination – refer Dredging and Backfill Environmental Management Plan. Reference sites can be 'up' current.

The Dredging Plan is not a public document and was not available from Water Corporation. The reference sites have been selected as thermally unaffected.

How will the median value be calculated – a median of all the readings from each profile or a median compared for each site at the same level.

Median values will be determined in accordance with the Manual of Standard Operating Procedures.

Figure 2 – should overlay this over an aerial and include the criteria show it is visually demonstrated.

The aerial overlay was considered to be too cluttered and so the diagram was preferred.

8.0 - The contingency of a literature review and WET testing should really be completed prior to an exceedence occurring – as the information should be on hand in the event. Would need to advise



Water Corporation of a temperature increase beyond that modelled and in accordance with the EQC.

The contingency process is in accordance with the national guidelines (ANZECC/ARMCANZ). The WET testing is not done as a precaution but would follow a range of other precedent actions and is not required if, for example, monitoring results are within predictions and policy limits.

12.1 – May not be a need to report annually if it is found the analysis complies. Perhaps insert a review after five years.

Review changed to every five years.

Table 1.0 – heading - title case. Row one – DEC not DoE.

Amended

References – update.

Updated

General comment – Water Corporation must supply water into the integrated water supply system (IWSS) that meets the Australian Drinking water Guidelines (i.e it must fall below 25 degrees). With the background ranging between 14 – 26 and then there being an addition by NewGen – the report needs to demonstrate how this will be met. The summer temperature increase is the time for concern – and additional 1.6 degrees (consistent with MEPA EQC for Cockburn Sound) on a background of 26 degrees – could cause IWSS temperature problems. The FDLADMP (section 6.4) states that the maximum temperature at the PSDP is 24 degrees in summer – perhaps this needs to be covered in this temperature plan.

As mentioned the specific predictions for temperatures at other users intakes (Water Corp and Verve) are in the FDLADMP rather than this document which deals with the monitoring program to assess performance against the modelling predictions and the policy levels.

General comment – the works are occurring over winter which is not ideal from a weather perspective. Perhaps need to show a little more detail on the schedule (albeit indicative).

The schedule is discussed in more detail in the Marine Works Construction Environmental Management Plan