



Sepia Depression Ocean
Outlet Landline (SDOOL)
& Perth Long Term Ocean
Outlet Monitoring
Program (PLOOM)
2017–2018 Annual Report



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BMT has prepared this report in accordance with our Health Safety Environment Quality Management System, in compliance with OHSAS 18001, AS/NZS 4801, ISO 14004 and ISO 9001: 2008.

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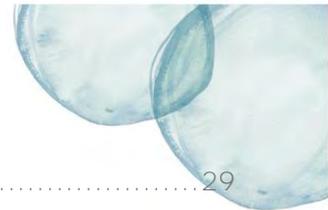
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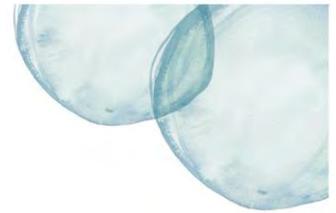
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Executive Summary

This report documents the findings of the 2017–2018 Sepia Depression ocean monitoring program. Results are reported in the context of the Environmental Quality Management Framework (EQMF) described in EPA (2015). The results are summarised in Report Card format and contain colour-coded results, with the individual colours representing the extent to which the Environmental Quality Criteria (EQC) were met (Table ES. 1).

Table ES. 1 Summary report card legend

Management response ¹	Colour
Monitor: EQG met (continue monitoring)	
Investigate: EQG not met (investigate against the EQS), EQS met (continue monitoring)	
Action: EQS not met (management response required)	

Note:

1. The required response following an exceedance of either the Environmental Quality Guideline (EQG) or Environmental Quality Standard (EQS) is shown in parentheses.

For the Environmental Quality Objective (EQO) Maintenance of Ecosystem Integrity, all Environmental Quality Guidelines (EQGs) were met (Table ES. 2), with the exception of the phytoplankton biomass EQG1. On the 27 March 2018 the median chlorophyll-a concentration exceeded three times the median of reference sites exceeding the EQG for phytoplankton biomass and triggering assessment against the EQS.

Median chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on more than one occasion in the 2017–2018 or 2016–2017 non-river flow periods so EQS1 was met. Chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on 25% or more occasions in 2017–2018 or 2016–2017 non-river flow periods so EQS2 was met.



Table ES. 2 Summary report card for the Environmental Quality Objective 'Maintenance of Ecosystem Integrity'

Environmental quality indicator		EQC	Comments	Compliance
Toxicants in treated wastewater (TWW)	Bioaccumulating toxicants	EQG	Concentrations of cadmium and mercury in the undiluted TWW stream were below the ANZECC/ARMCANZ (2000) 80% species protection guidelines.	■
	Non-bioaccumulating toxicants		Contaminant concentrations were lower than the ANZECC/ARMCANZ (2000) triggers for 99% species protection guidelines after dilution equivalent to that expected at the LEPA boundary	■
	Total toxicity of the mixture (TTM)		The TTM for the additive effect of ammonia, copper and zinc after dilution was lower than the ANZECC & ARMCANZ (2000) guideline value of 1.0.	■
	Whole of effluent toxicity testing		The lowest NOEC during the reporting period was 6.3% TWW. Only 15.9 dilutions are required to achieve this NOEC, which is lower than the dilutions typically achieved at the LEPA boundary	■
Nutrient enrichment	Chlorophyll-a	EQG	Median chlorophyll-a concentration within the high ecological protection area (HEPA) was lower than the 80 th percentile of historical reference site data.	■
	Light attenuation coefficient		Median LAC within the HEPA was lower than the 80 th percentile of historical reference site data.	■
Phytoplankton blooms	Phytoplankton biomass (measured as chlorophyll-a)	1. EQG	There was one instance where median chlorophyll-a concentrations in the HEPA exceeded 3-times median of reference sites.	■
	Phytoplankton biomass (measured as chlorophyll-a at each site)	2. EQG	Chlorophyll-a samples at any site (and at any time) exceeded 3 times the median chlorophyll-a concentration of reference sites on 12.5% of occasions.	■
	Phytoplankton biomass (measured as chlorophyll-a)	1. EQS	Median chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on more than one occasion in 2017–2018 or 2016–2017 non-river flow periods.	■
	Phytoplankton biomass (measured as chlorophyll-a at each site)	2. EQS	Chlorophyll-a did not exceed 3 times median chlorophyll-a concentration of reference sites on 25% or more occasions in 2017–2018 or 2016–2017 non-river flow periods.	■
Physical-chemistry	Organic enrichment	EQG	Dissolved oxygen saturation remained above 90% saturation at all times.	■
	Salinity	EQG	Within the HEPA, median salinity was between the 20 th and 80 th percentile of reference site data.	■

Note:

- Green symbols (■) indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.



For the EQO Maintenance of Seafood Safe for Human Consumption, all EQGs were met (Table ES. 3).

Table ES. 3 Summary report card for the Environmental Quality Objective 'Maintenance of Seafood for Human Consumption'

Environmental quality indicator		EQC	Comments	Compliance ¹
Microbiological contaminants	Thermotolerant coliforms (TTC)	EQG	The median value for TTC derived from 120 samples collected over the 2015–2016, 2016–2017 and 2017–2018 sampling seasons at the limit of detection (<10 CFU/100 mL)	
			There were 8.3% of TTC samples that exceeded 21 CFU/100 mL over the 3–season pooled dataset.	
Algal biotoxins	Potentially toxic phytoplankton species	EQG	Toxic phytoplankton species were not recorded in excess of Western Australian Shellfish Quality Assurance Program guidelines values during 2017–2018 monitoring	 HIK306706488

Note:

- Green symbols (■) indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.

The EQG and EQS for primary contact recreation require the 95th percentile concentrations of *Enterococci* spp. to not exceed 200 MPN/100 mL and 500 MPN/100mL, respectively, at the post upgrade boundary. The 95th percentile *Enterococci* spp. concentration, assessed over three sampling seasons (to achieve a sufficient sample size of n = 120) was 1100 MPN/100 mL and exceeded both the EQG and EQS (Table ES. 4). Exceedance of the EQG and EQS for primary contact recreation has been reported to the Department of Health for consideration as required by the SDOOL Monitoring and Management Plan. The exceedance is due to a change from the ANZECC/ARMCANZ (2000) limit that applied when the post-upgrade boundary was defined, to the more conservative 95th percentile guidelines for *Enterococci* spp.

The EQG for secondary contact recreation (2000 MPN/100 mL) was met (Table ES. 4).

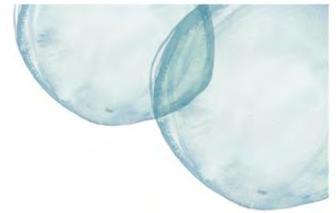


Table ES. 4 Summary report card for the Environmental Quality Objective 'Maintenance of Primary and Secondary Contact Recreation'

Environmental quality indicator		Comments	EQC	Compliance
Faecal streptococci	<i>Enterococci</i> spp.	The 95 th percentile of <i>Enterococci</i> spp. concentrations was 1100 MPN/100 mL	EQG (primary contact; 200 MPN/100 mL)	
			EQS (primary contact; 500 MPN/100 mL)	
			EQG (secondary contact; 2000 MPN/100 mL)	
Algal biotoxins	Phytoplankton (cell concentration)	The median total phytoplankton cell concentration was 107 cells/mL	EQG (15 000cells/mL)	

Note:

- Green symbols (■) indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.

The Maintenance of Aesthetic Values EQGs were met for nuisance organisms, faunal deaths, surface films and fish tainting substances (Table ES. 5). There were EQG exceedances for water clarity, colour, surface debris and odour leading to assessment against the EQS (Table ES. 5).



Table ES. 5 Summary report card for the Environmental Quality Objective 'Maintenance of Aesthetic Values'

Environmental Quality Indicator	EQC	Comments	Compliance ¹
Nuisance organisms	EQG	Nuisance organisms were not present in excessive amounts.	
Faunal deaths	EQG	There were no instances of dead marine organisms observed.	
Water clarity	EQG	Measurements of light attenuation confirmed that the natural visual clarity of the water was reduced by more than 20%.	
Colour	EQG	There was a noticeable colour on three out of eight sampling occasions.	
Surface films	EQG	There were no occasions where oil or petrochemicals were observed as a visible film on the surface of the water.	
Surface debris	EQG	Floating debris was visible on the surface on 13 December 2017.	
Odour	EQG	A noticeable odour was recorded 50% of sampling occasions.	
Water clarity, colour, surface debris and odour	EQS	There was no overall decrease in the aesthetic water quality values of Cockburn Sound using direct measures of the community's perception of aesthetic value	
Fish tainting substances	EQG	Concentrations of contaminants did not exceed the aesthetics guidelines for fish tainting substances at the Shellfish Harvesting Safety Zone boundary.	

Note:

- Green symbols () indicate the Environmental Quality Criteria (EQC) were met; amber () and red () symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.



1. Introduction

1.1 Document purpose

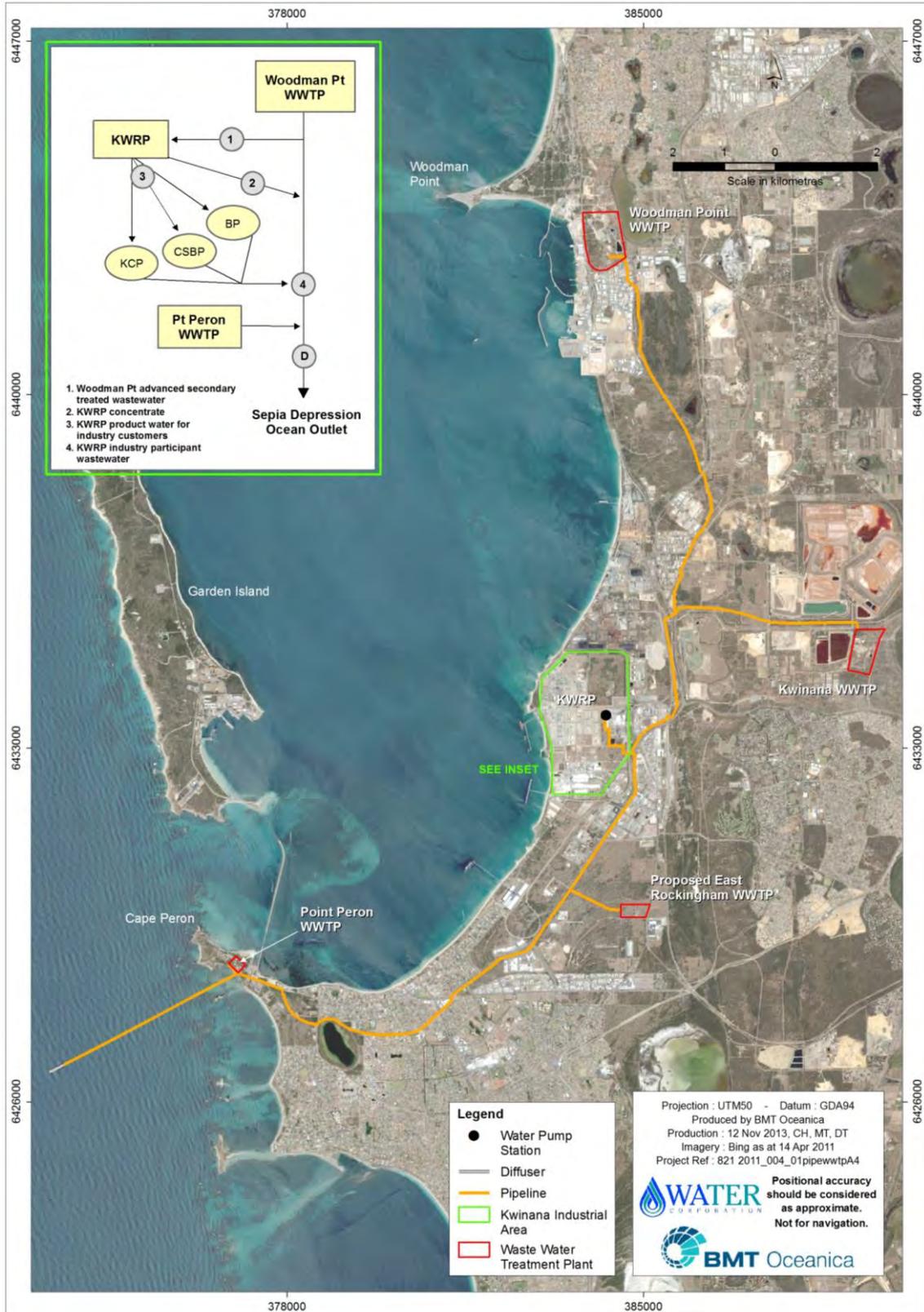
This annual report documents the findings of the 2017–2018 ocean monitoring around the Sepia Depression ocean outlet. Monitoring was completed according to the SDOOL Monitoring and Management Plan (SDOOL MMP; BMT Oceanica 2014).

1.2 Wastewater treatment plant infrastructure and discharge

Treated wastewater (TWW) discharged to the Sepia Depression ocean outlet comes from a number of domestic and industrial sources including the Woodman Point Wastewater Treatment Plant (WWTP), Point Peron WWTP, the Kwinana Water Reclamation Plant (KWRP), and the approved Kwinana industries. The Woodman Point WWTP services the southern Perth metropolitan area and receives predominantly domestic wastewater (from kitchen, bathroom, toilet and laundry uses), with ~8% received from light industrial wastewater. Most TWW discharged to the Sepia Depression is from the Woodman Point WWTP. However, a small fraction of primary TWW is from the Point Peron WWTP, located downstream of the Woodman Point WWTP (Figure 1.1).

The KWRP processes secondary TWW from the Woodman Point WWTP to a quality suitable for use as high-grade industrial processing water by industries in the Kwinana industrial area. This high-grade industrial water is supplied to industry participants to reduce consumption of potable scheme water. The KWRP process concentrate is disposed of via the SDOOL (refer to Figure 1.1). Up to 208 ML/d of wastewater can be discharged to Sepia Depression via the SDOOL (Figure 1.1), comprising:

- treated wastewater from Woodman Point WWTP and Point Peron WWTP
- contaminated groundwater from the Jervoise Bay Groundwater Recovery Scheme
- A reject stream from the KWRP
- Industrial wastewater from participating industries (including BP Refinery, CSBP limited and the Kwinana Cogeneration Plant).



Notes:

1. WWTP = wastewater treatment plant; KWRP = Kwinana Water Reclamation Plant; BP = BP Refinery; KCP = Kwinana Cogeneration Plant; CSBP = CSBP Limited
2. Point D is the composite treated wastewater sample point prior to discharge

Figure 1.1 Location of the Sepia Depression ocean outlet relative to the SDOOL contributors



1.3 Potential stressors in treated wastewater

1.3.1 Toxicants

Metals and persistent organic compounds may be toxic to marine species or accumulate in biota at concentrations sufficient to pose a risk to human health when consumed. TWW is screened for bioaccumulating and non-bioaccumulating toxicants prior to discharge. To account for synergistic effect of multiple toxicants and toxicants without guidelines, the overall toxicity of the discharge is determined using whole of effluent toxicity (WET) testing (also known as direct toxicity assessment).

1.3.2 Physico-chemical stressors

TWW contains organic matter, decomposition of which by microorganisms uses oxygen. If more dissolved oxygen (DO) is consumed than is produced, DO levels decline. DO saturation in receiving waters near the outfalls provides an indication of the risk posed by deoxygenation.

Reduced salinity near the outfalls, resulting from freshwater in the TWW plume, may cause osmotic stress in marine biota. Salinity in receiving waters near the outfalls is compared to the salinity at appropriate reference sites. The comparison allows evaluation of whether any reduction in salinity near the outfalls is within the range of natural variability at the reference sites.

1.3.3 Nutrients

TWW contains elevated concentrations of biologically available nutrients, including ammonia, nitrite, nitrate and orthophosphate. At times, the addition of nutrients may stimulate phytoplankton growth beyond natural levels, which under some circumstances may lead to shading of photosynthetic organisms such as seagrasses and macroalgae. The potential for shading is measured using in-water measures of chlorophyll-a (a measure of phytoplankton biomass) and light attenuation (a measure of water clarity).

Although most algal blooms are harmless, some contain species that produce toxins that may be harmful to swimmers (via ingestion or skin contact) or contaminate seafood. For this reason, phytoplankton species composition and cell concentrations are monitored to ensure concentrations are within acceptable limits.

1.3.4 Microbial contaminants

Disease-causing organisms in the TWW pose a risk to humans if exposed during primary and/or secondary contact activities (i.e. swimming and boating). The same organisms if ingested by marine fauna may reduce their suitability for human consumption. To assess the risk, numbers of indicator organisms are routinely compared to the Environmental Protection Authority's (EPA) criteria for primary and secondary contact, and the criteria for seafood safe for human consumption.

1.4 Environmental management approach

The Sepia Depression Long Term Ocean Outlet (SDOOL) and Perth Long Term Ocean Outlet Monitoring (PLOOM) monitoring programs are underpinned by the State Government's EQMF (EPA 2017).



1.4.1 Environmental Quality Management Framework (EQMF)

The EQMF is based on:

- identifying Environmental Values (EVs) (Table 1.1)
- establishing and spatially defining Environmental Quality Objectives (EQOs) that need to be maintained to ensure the associated EVs are protected (Table 1.1)
- monitoring and managing to ensure the EQOs are achieved and/or maintained in the long-term in the areas they have been designated
- establishing Environmental Quality Criteria (EQC), which are quantitative benchmarks or 'trigger values' against which monitoring results can be compared.

There are two levels of EQC:

1. Environmental Quality Guidelines (EQGs) are quantitative, investigative triggers, which, if met, indicate there is a high degree of certainty that the associated EQO has been achieved. If the guideline is not met a more detailed assessment against the EQS is triggered.
2. Environmental Quality Standards (EQSs) are management triggers which, if exceeded, signify that the EQO is at risk of not being met and that a management response may be required.

Table 1.1 Environmental Values and Environmental Quality Objectives for the marine waters of Western Australia

Environmental Values	Environmental Quality Objectives
Ecosystem Health (ecological value)	<ul style="list-style-type: none"> • EQO 1: Maintain ecosystem integrity at a maximum level of ecological protection. • EQO 1: Maintain ecosystem integrity at a high level of ecological protection. • EQO 1: Maintain ecosystem integrity at a moderate level of ecological protection. • EQO 1: Maintain ecosystem integrity at a low level of ecological protection. <p>This means maintaining the structure (e.g. the variety and quantity of life forms) and functions (e.g. the food chains and nutrient cycles) of marine ecosystems to an appropriate level.</p>
Fishing and Aquaculture (social use value)	<ul style="list-style-type: none"> • EQO 2: Seafood (caught or grown) is of a quality safe for eating. • EQO 3: Water quality is suitable for aquaculture purposes.
Recreation and Aesthetics (social use value)	<ul style="list-style-type: none"> • EQO 4: Water quality is safe for primary contact recreation (e.g. swimming and diving). • EQO 5: Water quality is safe for secondary contact recreation (e.g. fishing and boating). • EQO 6: Aesthetic values of the marine environment are protected.
Industrial Water Supply (social use value)	<ul style="list-style-type: none"> • EQO 7: Water quality is suitable for industrial use.
Cultural and Spiritual (social use value)	<ul style="list-style-type: none"> • EQO 8: Cultural and spiritual values of the marine environment are protected.

Source: EPA (2016)

1.4.2 'Maintenance of Ecosystem Integrity' EQO

The intent of this EQO is to maintain a healthy and diverse ecosystem. There are four levels of ecological protection, with each applied depending on the designated level required: low, moderate, high or maximum (Table 1.2). A low ecological protection area (LEPA) has been established at the Sepia Depression outfall and occupies the area within a 100 m radius of the diffuser



(BMT Oceanica 2014). Waters outside the LEPA are maintained to a high level of ecological protection (HEPA; Figure 1.2).

Table 1.2 Levels of ecological protection

Level of Ecological Protection	Definition
Low	Allows large changes in abundance and biomass of marine life, biodiversity and rates of ecosystem processes, but only within a confined area.
Moderate	Applied to relatively small areas within inner ports and adjacent to heavy industrial premises where pollution from current and/or historical activities may have compromised a high level of ecological protection.
High	Allows for small measurable changes in the quality of water, sediment and biota, but not to a level that changes ecosystem processes, biodiversity or abundance and biomass of marine life beyond the limits of natural variation.
Maximum	Activities to be managed so that there were no changes beyond natural variation in ecosystem processes, biodiversity, abundance and biomass of marine life or in the quality of water, sediment and biota.

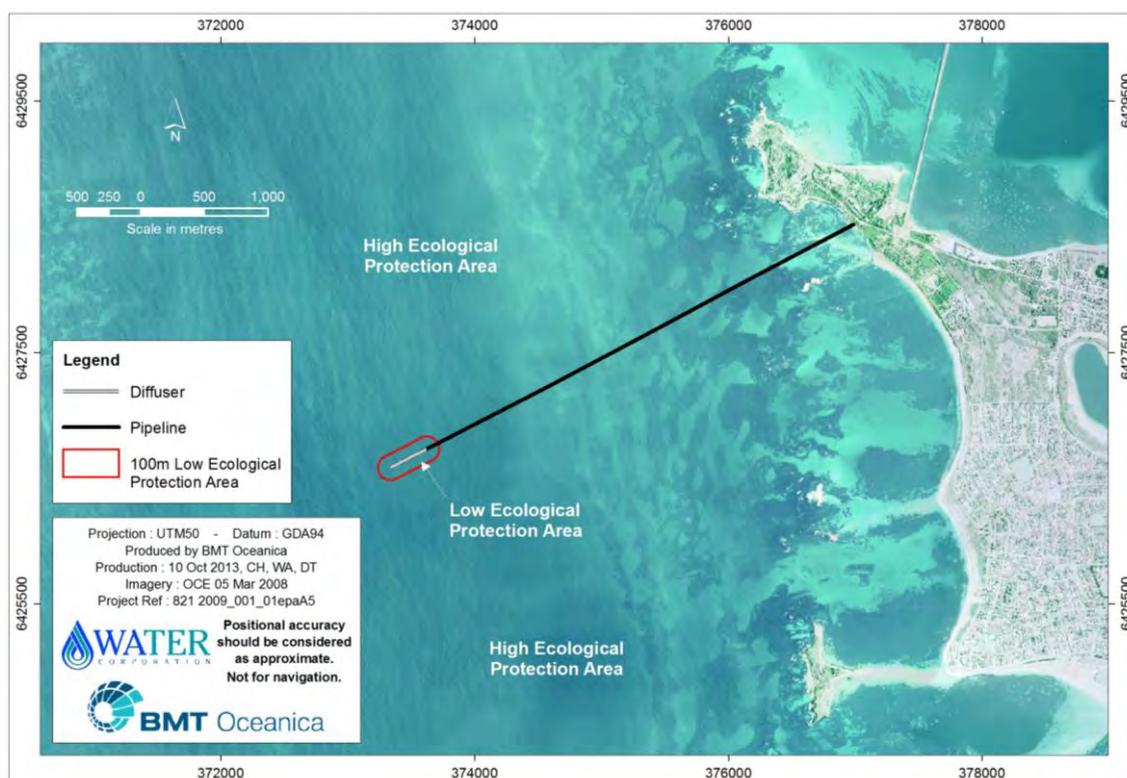


Figure 1.2 Sepia Depression ocean outlet ecological protection boundaries

1.4.3 'Maintenance of Seafood Safe for Human Consumption' EQO

The intent of this EQO is to maintain seafood safe for human consumption (a social value), with the exception of a small area surrounding the ocean outlet where EQO 2 may not apply as seafood may be unsafe to eat. Formal management zones have been established for the Sepia Depression outlet. Microbiological contaminants and algal biotoxins are monitored at the boundary of the Shellfish Harvesting Exclusion Zone (SHEZ) to ensure the EQO is being met.

1.4.4 'Maintenance of Primary and Secondary Contact Recreation' EQO

The intent of the primary and secondary contact EQOs are to support swimming and boating activities, respectively. The EQOs apply throughout



Perth's coastal waters with the exception of areas around ocean outlets, where water quality may not be suitable for swimming. A formal area where primary contact recreation is not recommended has been established for the Sepia Depression outlet. This is known as the recreational exclusion zone.

As the maintenance of primary contact recreation EQO requires a higher water quality standard to be maintained than secondary contact recreation EQO, by default it is assumed that if primary contact recreation EQSs are met, secondary contact recreation EQSs will be achieved.

1.4.5 'Maintenance of Aesthetic Value' EQO

The objective of this EQO is to ensure that the aesthetic value of Perth's coastal waters is protected. To ensure this EQO is being met, monitoring routinely assesses the quality of the surface water appearance.



2. Maintenance of Ecosystem Integrity

2.1 Environmental Quality Objective

The EQO for the EV 'Ecosystem Health' is aimed at maintaining ecosystem integrity and biodiversity and ensuring the continued health and productivity of Perth's coastal waters (EPA 2016). The EQC for the EQO 'Maintenance of Ecosystem Integrity' are outlined in Table 2.1.



Table 2.1 Environmental Quality Criteria for the EQO of Maintenance of Ecosystem Integrity (EQO)

Environmental quality indicator	Environmental Quality Criteria (EQC) ¹	
	Environmental Quality Guideline	Environmental Quality Standard
Toxicants in treated wastewater <ul style="list-style-type: none"> • ammonia • metals • pesticides • herbicides • other chemicals 	Treated wastewater characterisation – bioaccumulating toxicants Concentrations of contaminants will not exceed the ANZECC & ARM CANZ (2000) 80% species protection guideline trigger levels for bioaccumulating toxicants at the diffuser.	Sentinel mussel monitoring The median concentrations of metals that may bioaccumulate (cadmium and mercury) within mussel tissue from sites at the boundary of the low/high ecological protection areas will not exceed the 80 th percentile of reference site data.
	Treated wastewater characterisation – non-bioaccumulating toxicants Wastewater contaminant concentration corrected for minimum dilution at the LEPA boundary will ensure: <ol style="list-style-type: none"> 1. The ANZECC & ARM CANZ (2000) 99% species protection guideline trigger levels for toxicants (with the exception of cobalt, where the 95% guideline trigger level will apply), are being achieved at the boundary of the Low Ecological Protection Area (LEPA) (i.e. a high level of protection is met beyond a 100 m radius of the diffuser) 2. The total toxicity of the mixture (TTM) for the additive effect of ammonia, copper and zinc, calculated as per ANZECC & ARM CANZ (2000), will not exceed the trigger value of 1.0. Note that for metals, the assessment is to be based on bioavailable concentrations of metals in the wastewater (i.e. concentrations after filtering through a 0.45 µm filter). If any EQGs are exceeded, assessment against the EQS will commence.	Whole of effluent toxicity (WET) testing Undertake the full suite of WET testing of the waste stream in accordance with ANZECC & ARM CANZ (2000) guidelines. The EQS will be exceeded where: $\frac{DALEPA}{DR99\%BurriIOZ} \leq 1$ where <i>DALEPA</i> = dilutions achieved at the boundary of the LEPA; <i>DR99%BurriIOZ</i> = number dilutions required to achieve the 99% species protection guideline specific to treated wastewater that is calculated with BurriIOZ software using the results of the full suite of WET tests, as per ANZECC & ARM CANZ (2000).
	Whole of effluent toxicity (WET) testing The EQG will be exceeded if following the 1-hour sea urchin test: $\frac{TDA}{DRNOEC} \leq 1.0$ where TDA = Typical Dilutions Achieved (constant based on 200-fold dilution) DRNOEC = number of dilutions required to achieve the no observed effects concentration (NOEC). Breaching the above triggers investigations against the EQS, which would comprise the full suite of WET tests (minimum of five species from four trophic groups).	Whole of effluent toxicity (WET) testing As per EQS above.
Receiving water physical-chemical measures <ul style="list-style-type: none"> • nutrient enrichment • organic enrichment • salinity 	Nutrient enrichment <ol style="list-style-type: none"> 1. Median chlorophyll-a of defined area² during non-river flow period³ not to exceed chlorophyll-a: 80th percentile of reference sites data. 2. Median light attenuation of defined area² during non-river flow period³ not to exceed light attenuation: 80th percentile of reference sites data. 	Not applicable. No suitable EQS available.
	Organic enrichment Median dissolved oxygen in bottom waters (0–0.5 m above the sediment surface) greater than 90% saturation at any site for a defined period of not more than 6 weeks.	Organic enrichment Median dissolved oxygen in bottom waters (0–0.5 m above the sediment surface) greater than 60% saturation at any site for a defined period of not more than 6 weeks. No deaths of marine organisms resulting from de-oxygenation.
	Salinity Median salinity (0.5 m below the water surface) at an individual site over any period not to deviate beyond the 20 th and 80 th percentile of natural salinity range over the same period.	Salinity No deaths of marine organisms resulting from anthropogenically-sourced salinity stress.
Receiving water direct biological measures (algal growth potential) <ul style="list-style-type: none"> • phytoplankton biomass (chlorophyll-a) 	Phytoplankton blooms <ol style="list-style-type: none"> 1. Median phytoplankton biomass measured as chlorophyll-a not to exceed 3 times median chlorophyll-a concentration of reference sites, on any occasion during non-river flow period³. 2. Phytoplankton biomass measured as chlorophyll-a at any site does not exceed 3 times median chlorophyll-a concentration of reference sites, on 25% or more occasions during the non-river flow period³. If either of these EQGs are exceeded, assessment will proceed against the EQS.	Phytoplankton blooms <ol style="list-style-type: none"> 1. Median phytoplankton biomass measured as chlorophyll-a not to exceed 3 times median chlorophyll-a concentration of reference sites, on more than one occasion during non-river flow period³ and in two consecutive years. 2. Phytoplankton biomass measured as chlorophyll-a at any site does not exceed 3 times median chlorophyll-a concentration of reference sites, on 25% or more occasions during the non-river flow period³ and in two consecutive years.

Source: (BMT Oceanica 2014)

Notes:

1. Where there is more than one EQC for an indicator, each one is to be considered individually. If any one of these is exceeded then the guideline or standard for that indicator has not been met.
2. Defined area = area to be characterised for environmental quality against pre-determined Environmental Quality Objectives and levels of ecological protection.
3. Non-river flow period = summer period December–March inclusive, when river flows are weak.



2.2 Toxicants in treated wastewater

2.2.1 Comprehensive treated wastewater characterisation (CTWWC)

TWW (final effluent) from the Point Peron WWTP is analysed for a suite of parameters comprising the major contaminants of concern for the Sepia Depression ocean outlet:

- Nutrients (total nitrogen, ammonia, nitrate+nitrite (NO_x), total phosphorus, orthophosphate)
- Microbiological contaminants
- Bioavailable metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc)
- Pesticides and herbicides (organophosphate pesticides, organochlorine pesticides, triazine herbicides)
- Polyaromatic hydrocarbons
- Phenols
- Phthalates
- Polychlorinated biphenyls
- Benzene, toluene, ethylbenzene and xylenes
- Petroleum hydrocarbons
- Surfactants
- Dissolved organic carbon

A 24-hour flow-weighted composite sample was obtained from the Point Peron WWTP on 20 February 2018. The bulk sample was homogenised (agitated), split into individual containers and sent to a National Association of Testing Authorities (NATA)-accredited laboratory for analysis. Samples for bioavailable metals were filtered through a 0.45 µm filter prior to analysis (EPA 2005b). Analyses were completed using NATA-accredited methods (Appendix B).

Bioaccumulating toxicants

The concentration of cadmium in the TWW sample was below the analytical detection limit (<0.1 µg/L; Appendix C), and consequently below the 80% species protection guideline (36 µg/L; ANZECC/ARMCANZ 2000). The concentration of mercury in the TWW sample was 0.56 µg/L and was below the 80% species protection guideline (1.4 µg/L; ANZECC/ARMCANZ 2000). Therefore, the EQG for bioaccumulating toxicants was met.

Non-bioaccumulating toxicants

Contaminant concentrations were below their waste stream triggers based on the ANZECC/ARMCANZ (2000) 99% species protection guidelines scaled for dilution equivalent to that expected at the LEPA boundary (1:310). Therefore, the EQG was met (Table 2.2). Concentrations of analytes without triggers are provided for contextual purposes in Appendix C and Appendix E.



Table 2.2 Toxicants in the Sepia Depression TWW stream compared with relevant trigger levels

Toxicant ¹	Waste stream Trigger ²	Sepia Depression TWW ³
Nutrients (µg/L)		
Ammonia-N	154 537	36 000
Dissolved Metals (0.45 µm filtered) (µg/L)		
Chromium	43	2
Copper	68	3
Lead	679	<1
Nickel	2016	3.1
Silver	248	<1
Zinc	2124	12
Organophosphate Pesticides (µg/L)		
Chloropyrifos	0.16	<0.1
Organochlorine Pesticides (µg/L)		
Endrin	1.24	<0.001
Endosulfan sulfate ⁵	1.55	<0.001
Phenol (µg/L)		
Phenol	83 685	<1
Pentachlorophenol	3379	<2
Chlorinated hydrocarbons (µg/L)		
1,2,4-Trichlorobenzene	6046	<20
BTEX (µg/L)		
Benzene	110 890	<1.0
Polyaromatic hydrocarbons (µg/L)		
Naphthalene	15 485	<0.01
Benzo(g,h,i)perylene	15 485	<0.01

Notes:

1. Assessment undertaken only for toxicants with ANZECC & ARMCANZ (2000) guideline values.
2. ANZECC & ARMCANZ (2000) scale based on 5th percentile dilution at the LEPA boundary (1:310).
3. TWW = treated wastewater.
4. Trigger values for Endosulfan, not Endosulfan sulfate (Table 3.4.1; ANZECC/ARMCANZ 2000).

Total toxicity of the mixture (TTM)

The potential for cumulative toxic effects on marine organisms assessed after initial dilution as per ANZECC/ARMCANZ (2000), based on the effects of ammonia, copper and zinc (the contaminants of concern based on those most likely to exceed their respective guidelines).

$$\text{Total Toxicity of Mixture} = \frac{[\text{ammonia}]}{[\text{Trigger Value}]} + \frac{[\text{copper}]}{[\text{Trigger Value}]} + \frac{[\text{zinc}]}{[\text{Trigger Value}]}$$

The TTM after dilution (0.56; Table 2.3) was less than the ANZECC/ARMCANZ (2000) guideline value of 1.0, and thus met the EQG.



Table 2.3 Total toxicity of treated wastewater (TWW) at the edge of the initial mixing zone associated with the Sepia Depression ocean outlet

Toxicant	TWW concentration (µg/L)	Background concentration ¹ (µg/L)	Dilution	Total toxicity of the mixture (TTM) ²
Ammonia	36 000	1.5	1:310	0.56
Copper	3	0.08		
Zinc	12	0.15		

Notes:

1. Background concentrations for copper and zinc from McAlpine et al. (2005); Perth marine waters (pp. 19; Table 12). Surface background concentration for ammonia calculated as median of reference site data from 2003–2017 (BMT Oceanica, unpublished data).
2. $TTM = [ammonia]/guideline + [copper]/guideline + [zinc]/guideline$.

2.2.2 Quarterly treated wastewater characterisation

Water Corporation conducts quarterly sampling of the SDOOL waste stream from sample point D (Figure 1.1). TWW from the SDOOL waste stream is analysed for a smaller set of the key contaminants of concern that are most likely to be present in the waste stream. Quarterly sampling occurred on 4 July 2017, 3 September 2017, 9 January 2018 and 3 April 2018.

On each occasion, a composite sample (time weighted) was obtained from sample point D (Figure 1.1). This sample represents an average of the TWW discharged to the Sepia Depression ocean outlet for the 24 hours prior to and during the sample collection. The bulk sample was homogenised and split into separate sample containers for the various analyte groups. Samples were handled and analysed according to the NATA-accredited laboratory requirements.

The bioaccumulating toxicants cadmium and mercury met the 80% species protection guidelines in the TWW stream prior to dilution on each sampling occasion.

Contaminants measured quarterly in the Sepia Depression TWW at sample point D were all below their respective waste stream triggers based on the ANZECC/ARMCANZ (2000) 99% species protection scaled for dilution equivalent to that occurring at the LEPA boundary (Table 2.4).



Table 2.4 Toxicants measured quarterly in the Sepia Depression TWW stream compared with relevant guideline trigger levels after initial dilution

Toxicant ¹	Waste Stream Trigger (µg/L) ²	Sepia Depression TWW sample point D (µg/L) ³			
		July 2017	October 2017	January 2018	April 2018
Ammonia	154 537	13000	NA	NA	NA
Cadmium ⁴	36	<0.05	<0.05	0.1	0.1
Chromium	43	1	NA	NA	NA
Cobalt	307	<0.5	NA	NA	NA
Copper	68	9	18	<0.5	29
Lead	379	<0.5	<0.5	<0.5	1
Mercury ⁴	1.4	<0.05	<0.05	<0.05	<0.05
Nickel	2016	3	3	3	2
Silver	248	<0.5	<0.5	<0.5	<0.5
Vanadium	14 913	<5	<5	<5	<5
Zinc	2124	62	55	47	45
Phenol	83 685	<25	<25	<25	<25

Notes:

1. Assessment undertaken only for toxicants with ANZECC & ARMCANZ (2000) guideline values.
2. ANZECC & ARMCANZ (2000) scaled based on 5th percentile dilution at the LEPA boundary (1:310).
3. NA = no available data.
4. TWW = treated wastewater.
5. Bioaccumulating toxicants cadmium and mercury must meet the ANZECC & ARMCANZ (2000) 80% species protection guidelines at the diffuser (i.e. prior to dilution).

For the quarterly sampling, TTM was calculated for the additive effects of ammonia, copper and zinc using the dilution of 1:310, based on that expected at the LEPA boundary. The TTM ranged between 0.40 and 0.57 on the four sampling occasions (Table 2.5), all were below the ANZECC & ARMCANZ (2000) guideline of 1.0.

Table 2.5 Total toxicity of the quarterly treated wastewater characterisation for the SDOOL combined waste stream

Quarterly sampling date	Natural background concentrations in Perth's coastal waters (µg/L) ¹			Dilution	Total toxicity of the mixture (TTM) ²
	Ammonia	Copper	Zinc		
July 2017	1.5	0.08	0.15	1:310	0.50
October 2017 ³					0.57
January 2018 ³					0.40
April 2018 ³					0.41

Notes:

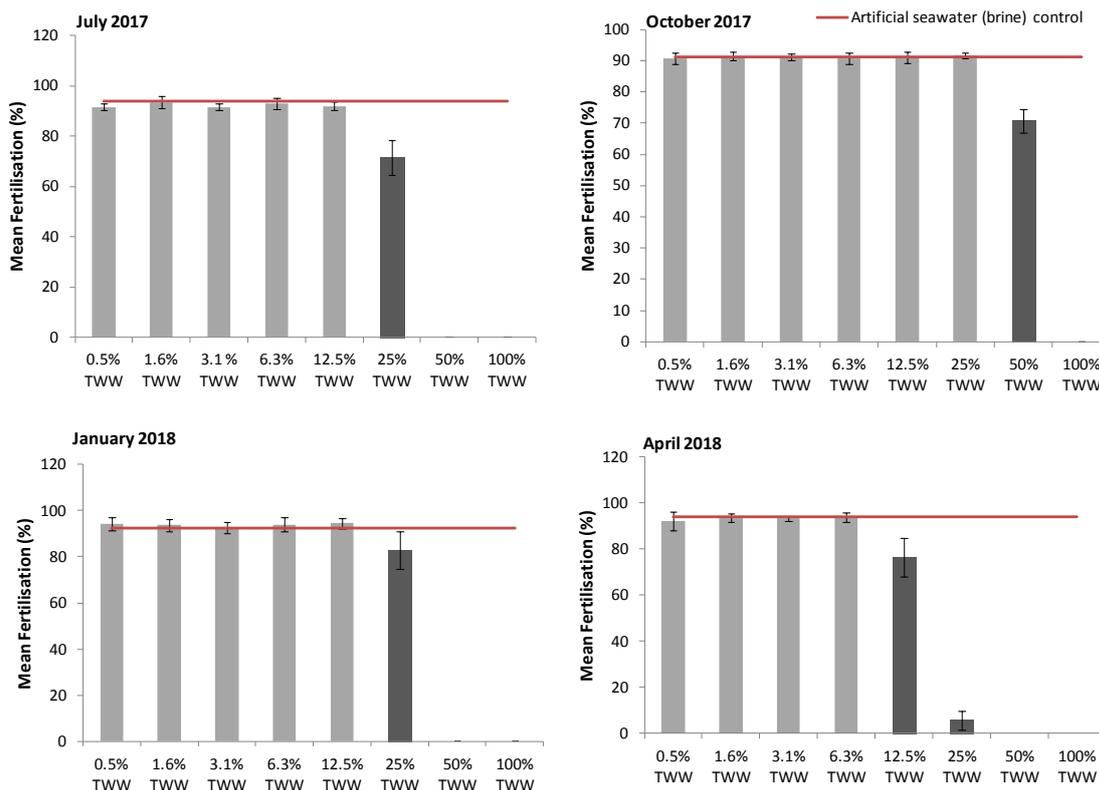
1. Background concentrations for copper and zinc from McAlpine et al. (2005); Perth marine waters (p. 19; Table 12). Surface concentration for ammonia calculated as a median of reference site data from 2003–2018 (BMT Oceanica, unpublished data).
2. Total toxicity of mixture = [ammonia]/guideline + [copper]/guideline + [zinc]/guideline.
3. No quarterly ammonia concentration given; therefore in TTM calculation the July quarterly ammonia concentration used.

2.2.3 Whole of effluent toxicity (WET) testing

WET testing is useful for assessing toxicity of potential contaminants without guidelines, or where the effects may be cumulative. Fertilisation success in sea urchins (*Heliocidaris tuberculata*) exposed to salt-adjusted dilutions (0.5, 1.6, 3.1, 6.3, 12.5, 25, 50 and 100%) of TWW was used to calculate a No Observed Effect Concentration (NOEC; the highest concentration where no significant effect is observed). Detailed methods are provided in Appendix F.



In July 2017, sea urchin fertilisation was significantly lower than the artificial seawater control when exposed to the 25%, 50% and 100% TWW concentrations (with all other concentrations not significantly different to the control; Figure 2.1). In October 2017, significantly lower sea urchin fertilisation was reported for the 50% and 100% concentrations (with all other concentrations not significantly different to the control; Figure 2.1). In January 2018, sea urchin fertilisation was significantly lower than the artificial seawater control when exposed to TWW concentrations 25%, 50% and 100% (with all other concentrations not significantly different to the control; Figure 2.1). For all four sampling dates, the NOEC was greater than 1% TWW (Table 2.6), and the EQG for WET testing was met.



Notes:

1. Error bars represent ± 1 standard deviation.
2. TWW = treated wastewater.
3. Light grey bars represent concentrations of treated wastewater (TWW) at which there is no observed significant effect on fertilisation. Dark grey bars represent concentrations of TWW that acted to significantly reduce the success of sea urchin fertilisation.

Figure 2.1 Comparison of whole effluent toxicity TWW dilution results to artificial seawater control

Table 2.6 Calculated parameters from whole of effluent toxicity tests

Indicator	July 2017	October 2017	January 2018	April 2018
NOEC ¹	12.5%	25%	12.5%	6.3%
Dilutions required to meet the NOEC	8	4	8	15.9
Dilutions required/dilutions achieved ²	0.01	0.00	0.01	0.01
≤ 1	Yes	Yes	Yes	Yes

Notes:

1. NOEC = no observed effect concentration
2. Calculation based on 1120 dilutions achieved, which is expected at the LEPA boundary.



2.3 Water quality monitoring – receiving environment

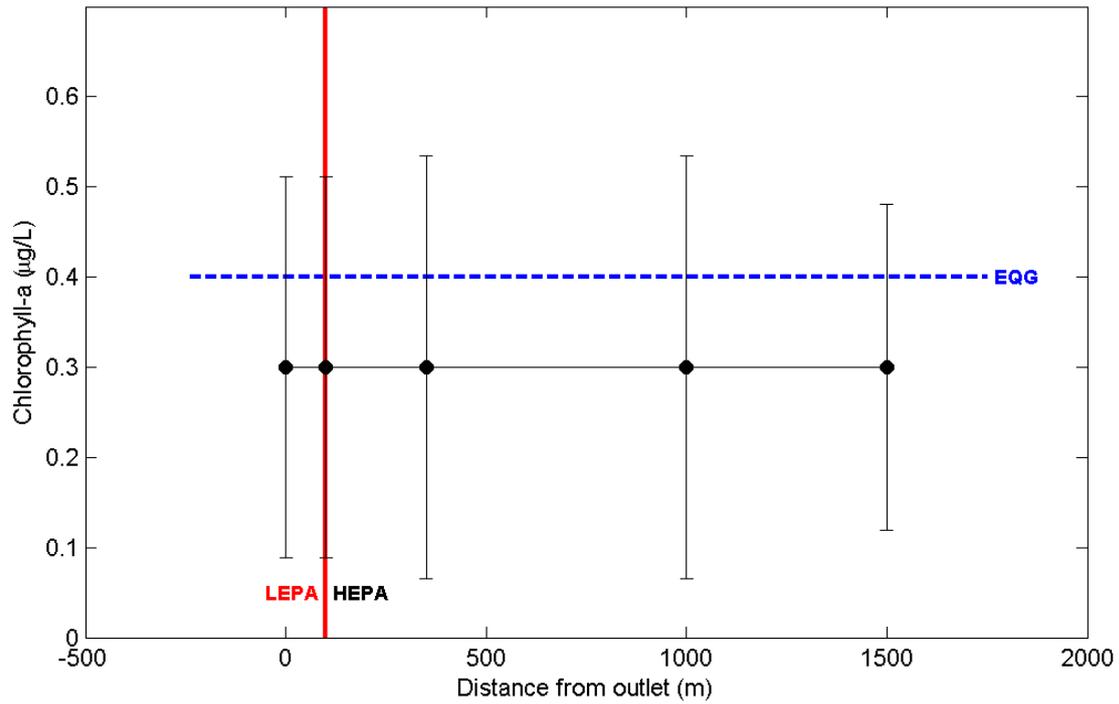
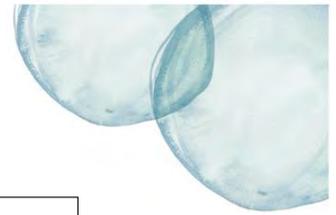
Nutrients, phytoplankton biomass and physical and chemical stressors were monitored along a down-current gradient approximately fortnightly from the beginning of December 2017 to the end of March 2018 (Table 2.7), coinciding with the summer non-river flow period. Refer to Appendix F for detailed methods.

Table 2.7 Water quality monitoring dates near the Sepia Depression ocean outlet between December 2017 and March 2018

Sample day	Date
1	4/12/2017
2	13/12/2017
3	4/01/2018
4	31/01/2018
5	15/02/2018
6	28/02/2018
7	13/03/2018
8	27/03/2018

2.3.1 Nutrient enrichment

The overall median chlorophyll-a concentration in the Sepia Depression HEPA (100 m plus) (0.30 µg/L) was below the 80th percentile of historical reference site data (0.4 µg/L; Figure 2.2) meeting the EQG.

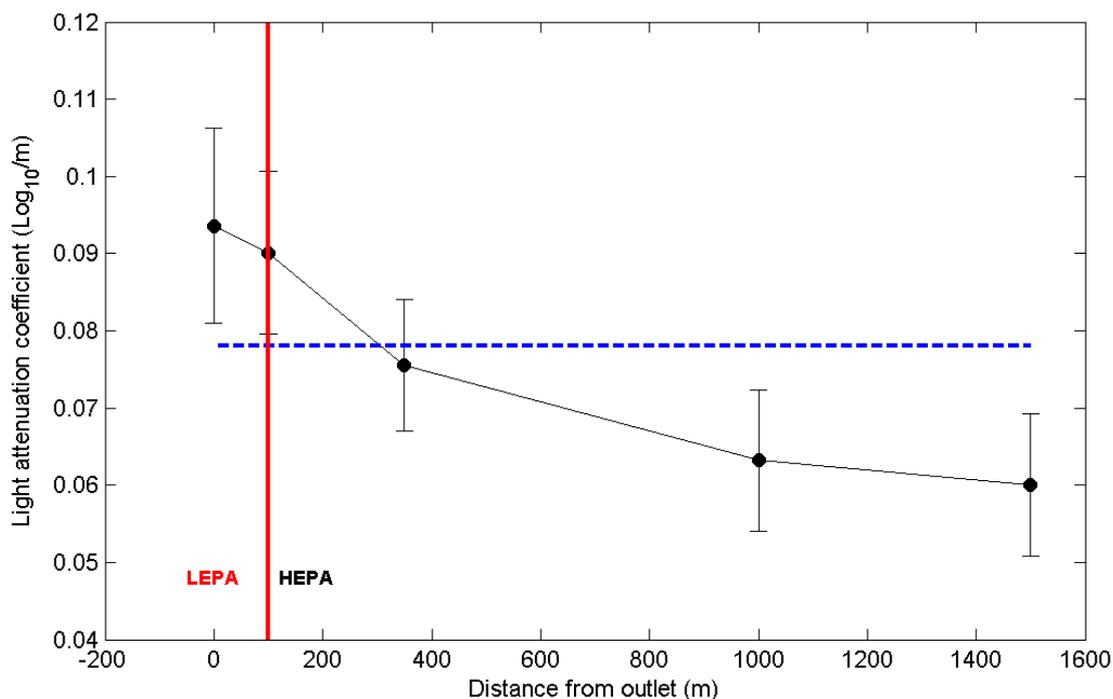


Notes:

1. Error bars represent $\pm 95\%$ confidence intervals
2. Dark blue dashed line = Environmental Quality Guideline (EQG) is the 80th percentile of historical reference site data ($0.4 \mu\text{g/L}$ chlorophyll-a).
3. LEPA = notional low ecological protection area; HEPA = high ecological protection area.
4. Data were polled across eight sampling days ($n=8$) over December 2017–March 2018.

Figure 2.2 Median chlorophyll-a concentration obtained at fixed monitoring sites above and down-current of the Sepia Depression outlet during the summer monitoring period

The overall median light attenuation in the Sepia Depression HEPA (100 m plus) was $0.0697 \text{ Log}_{10}/\text{m}$ and lower than the 80th percentile of historical reference site data ($0.078 \text{ Log}_{10}/\text{m}$; Figure 2.3), meeting the EQG.



Notes:

1. Error bars represent $\pm 95\%$ confidence intervals.
2. Dark blue dashed line = Environmental Quality Guideline (EQG) is the 80th percentile of historical reference site data (0.078 Log₁₀/m).
3. LEPA = notional low ecological protection area; HEPA = high ecological protection area.
4. Data for each distance were pooled across eight sampling occasions (n=8) over December 2017–March 2018

Figure 2.3 Median light attenuation coefficient obtained at fixed distanced down-current of the Sepia Depression outlet during the summer monitoring period

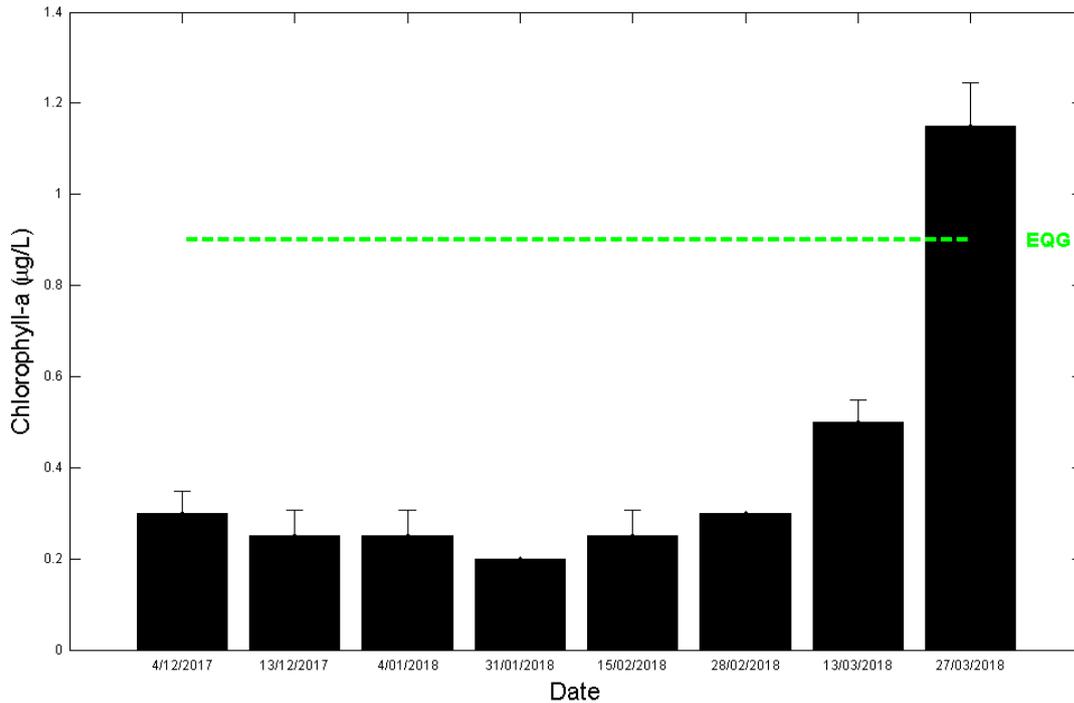
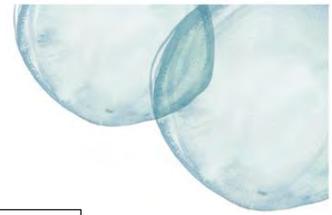
2.3.2 Phytoplankton blooms

On 27 March 2018 the median chlorophyll-a concentration exceeded three times the median of reference sites (0.9 $\mu\text{g/L}$; Figure 2.4) exceeding EQG1 and triggering assessment against the EQS.

Chlorophyll-a concentration exceeded 3 times the median chlorophyll-a concentration of reference sites on 12.5% of occasions, (<25% of occasions) and EQG2 was met.

Median chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on more than one occasion in the 2017–2018 non-river flow period (Table 2.4), or in the 2016–2017 non-river flow period (BMT Oceanica 2017) and EQS1 was met.

Chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on 25% or more occasions in 2017–2018 or 2016–2017 (BMT Oceanica 2017) non-river flow periods. Therefore, EQS2 was met.



Notes:

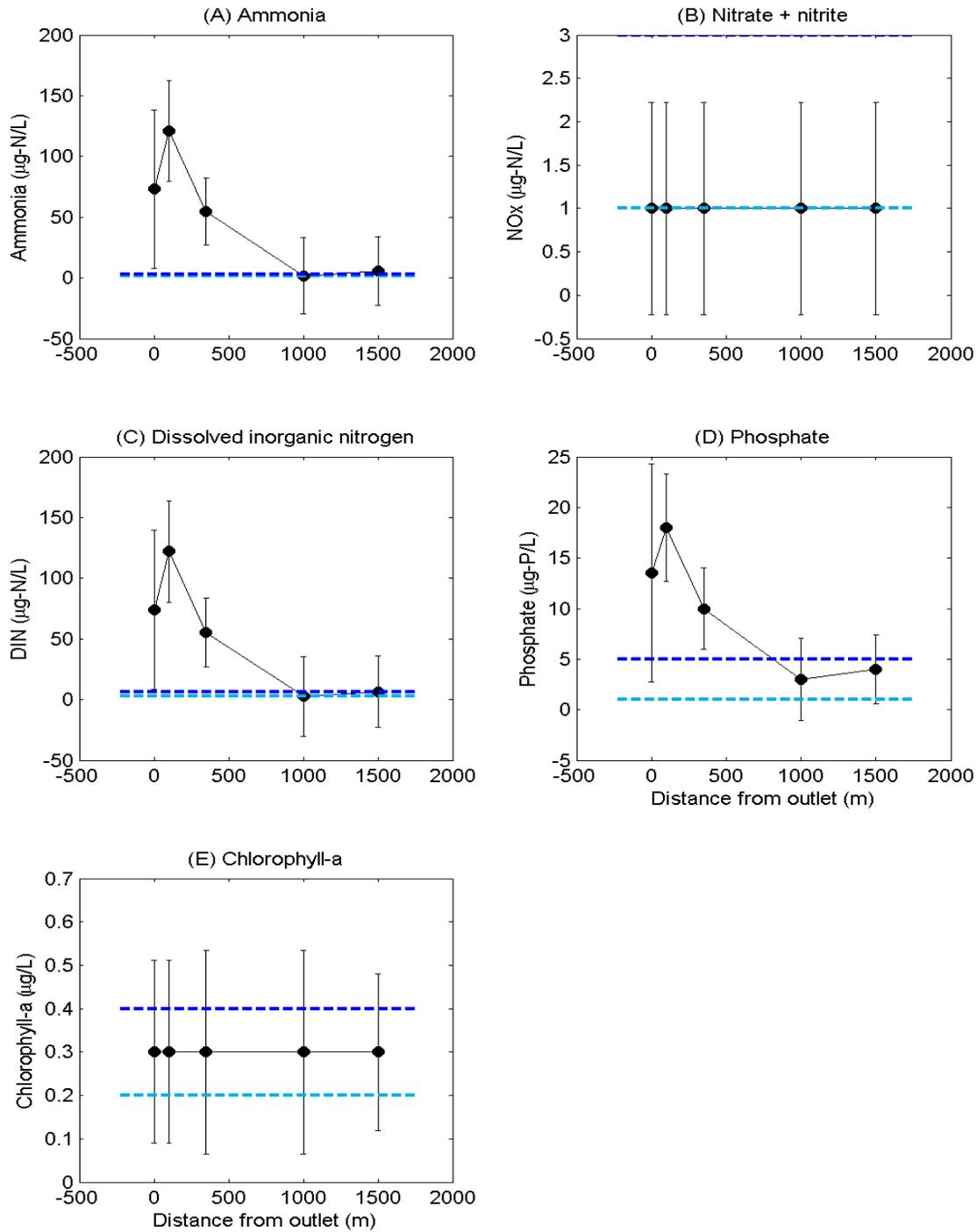
1. Error bars represent $\pm 95\%$ confidence intervals.
2. Green dashed line = Environmental Quality Guidelines (EQG) is 3-times the median chlorophyll-a concentration of reference site data.
3. Values measured at 0 m are not included in the figure or EQG assessment, as the 0 m site is situated directly above the outlets within the notional low ecological protection area (LEPA).
4. Data were pooled across four sites within the high ecological protection area (HEPA) (n=4).

Figure 2.4 Median phytoplankton biomass during the summer monitoring period, pooling data from fixed sites ≥ 100 m down-current of the Sepia Depression outlet

Additional data – nutrient gradients

The characterisation of nutrient gradients is useful for detecting the plume footprint by determining the distance down-current where nutrient concentrations reach background concentrations. Background levels are considered to be 20th and 80th percentile of historical reference site data (dark blue and light blue broken lines, respectively, in Figure 2.5).

Median concentrations of ammonia, dissolved inorganic nitrogen and phosphate were elevated above background concentrations at the outlet, increased at 100 m from the outlet and remained higher than background until ~1000 m down-current of the outlet (Figure 2.5A, C and D). Median concentrations of nitrate and nitrite (NO_x) at each site down current of the diffuser and the 20th and 80th percentiles of reference site data were all equal to half the limit of reporting (Figure 2.5B). Median chlorophyll-a concentrations were 0.3 µg/L at all monitoring sites and within the 20th and 80th percentile of historical reference site data (Figure 2.5E).



Notes:

1. Error bars represent $\pm 95\%$ confidence intervals.
2. Dark blue line = 80th percentile of historical reference sites, light blue line = 20th percentile of historical reference sites.
3. NOx = nitrate+nitrite; DIN = dissolved inorganic nitrogen.
4. Data were pooled across eight sampling days (n=8) over December 2017–March 2018.

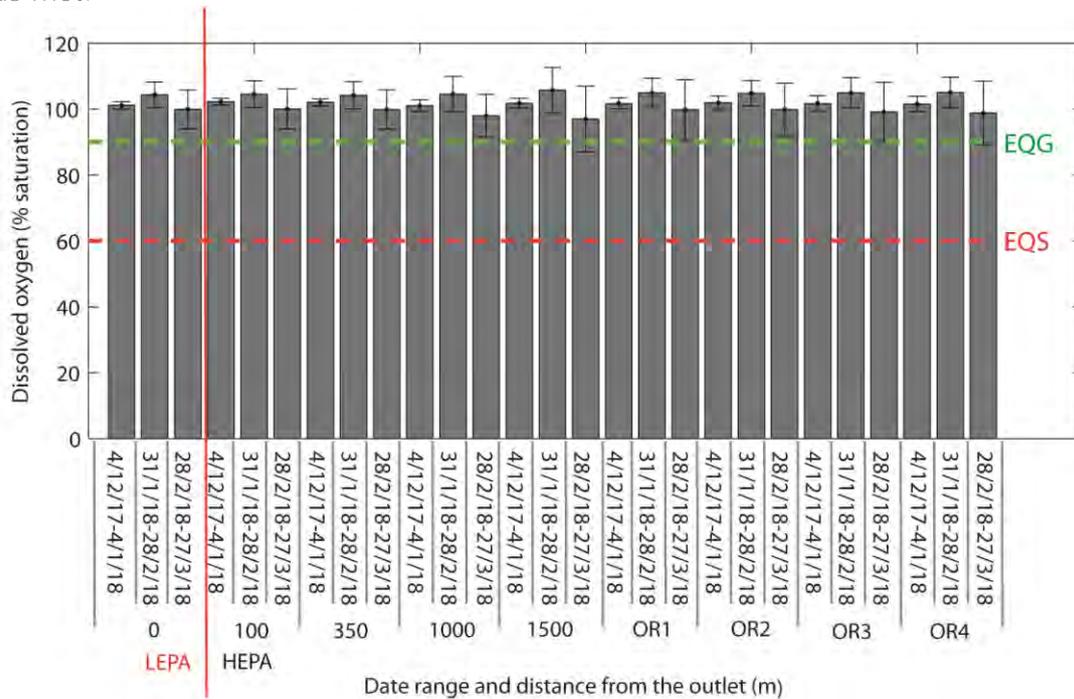
Figure 2.5 Median nutrient and chlorophyll-a concentrations obtained at fixed monitoring sites above and down-current of the Sepia Depression ocean outlet during the summer monitoring period



2.3.3 Physical-chemical stressors

Dissolved oxygen (DO)

Bottom (0–0.5 m) DO saturation levels near the outlet measured on eight occasions between December 2017 and March 2018 at Sepia Depression were >90% saturation at all times (Figure 2.6). As the ambient value for DO in bottom waters was >90% saturation over defined periods of ≤6 weeks during the 2017–2018 summer monitoring period, the EQG for organic enrichment was met.



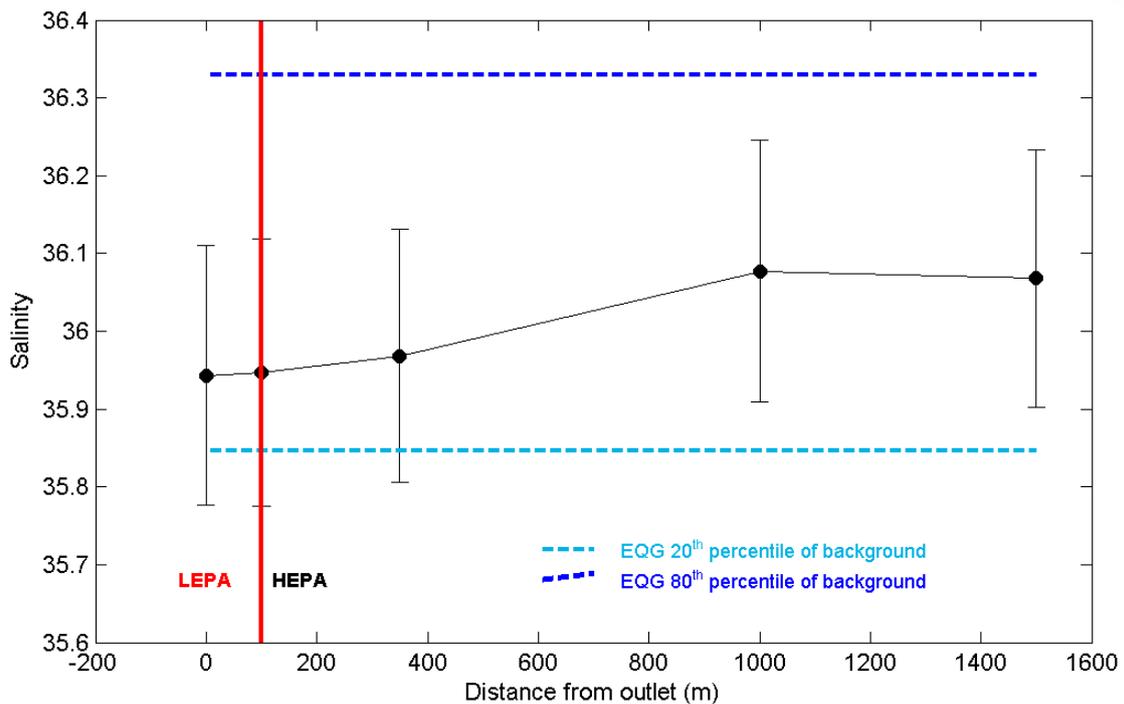
Notes:

1. Error bars represent $\pm 95\%$ confidence intervals.
2. Dissolved oxygen (DO) measured 0–0.5 m above the seabed.
3. Green dashed line = Environmental Quality Guideline (EQG) = 90% DO saturation.
4. Red dashed line = Environmental Quality Standard (EQS) = 60% DO saturation.
5. LEPA = low ecological protection area; HEPA = high ecological protection area.
6. Reference site data (SD1–SD4) are compared against EQG for contextual purposes only.

Figure 2.6 **Median dissolved oxygen for defined periods of ≤6 weeks during the summer monitoring period**

Salinity

Median salinity was between the 20th and 80th percentile of the natural salinity range at all sites within the notional HEPA (at 100, 350, 1000 and 1500 m from the outlet; Figure 2.7). The EQG requires the median salinity not to deviate beyond the 20th and 80th percentile of the natural salinity range at any individual site within the notional HEPA over the summer monitoring period so the EQG was met.



Notes:

1. Error bars represent $\pm 95\%$ confidence intervals.
2. Salinity measured 0–0.5 m below the sea surface.
3. Dark blue line = 80th percentile of historical reference sites; light blue dashed line = 20th percentile of historical reference sites.
4. LEPA = notional low ecological protection area; HEPA = high ecological protection area.
5. Data for each distance were pooled across eight sampling occasions (n=8) over December 2017–March 2018.

Figure 2.7 Median salinity compared to the 20th and 80th percentile of reference site data during the summer monitoring period

2.4 Compliance summary

For the Environmental Quality Objective (EQO) Maintenance of Ecosystem Integrity, all Environmental Quality Guidelines (EQGs) were met, with the exception of the phytoplankton biomass EQG1 (Table 2.8). On the 27 March 2018 the median chlorophyll-a concentration exceeded three times the median of reference sites, exceeding the EQG and triggering assessment against the EQS.

Median chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on more than one occasion in the 2017–2018 or 2016–2017 non-river flow periods so EQS1 was met. Chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on 25% or more occasions in 2017–2018 or 2016–2017 non-river flow periods so EQS2 was met.

These results are summarised in Table 2.8.



Table 2.8 Compliance against EQC relevant to the EQO 'Maintenance of Ecosystem Integrity' (EQO1)

Environmental quality indicator		EQC	Comments	Compliance
Toxicants in treated wastewater (TWW)	Bioaccumulating toxicants	EQG	Concentrations of cadmium and mercury in the undiluted TWW stream were below the ANZECC/ARMCANZ (2000) 80% species protection guidelines.	
	Non-bioaccumulating toxicants		Contaminant concentrations were lower than the ANZECC/ARMCANZ (2000) triggers for 99% species protection guidelines after dilution equivalent to that expected at the LEPA boundary	
	Total toxicity of the mixture (TTM)		The TTM for the additive effect of ammonia, copper and zinc after dilution was lower than the ANZECC & ARMCANZ (2000) guideline value of 1.0.	
	Whole of effluent toxicity testing		The lowest NOEC during the reporting period was 6.3% TWW. Only 15.9 dilutions are required to achieve this NOEC, which is lower than the dilutions typically achieved at the LEPA boundary	
Nutrient enrichment	Chlorophyll-a	EQG	Median chlorophyll-a concentration within the high ecological protection area (HEPA) was lower than the 80 th percentile of historical reference site data.	
	Light attenuation coefficient		Median LAC within the HEPA was lower than the 80 th percentile of historical reference site data.	
Phytoplankton blooms	Phytoplankton biomass (measured as chlorophyll-a)	1. EQG	There was one instance where median chlorophyll-a concentrations in the HEPA exceeded 3-times median of reference sites.	
	Phytoplankton biomass (measured as chlorophyll-a at each site)	2. EQG	Chlorophyll-a samples at any site (and at any time) exceeded 3 times the median chlorophyll-a concentration of reference sites on 12.5% of occasions.	
	Phytoplankton biomass (measured as chlorophyll-a)	1. EQS	Median chlorophyll-a concentration did not exceed 3 times the median chlorophyll-a concentration of reference sites on more than one occasion in 2017–2018 or 2016–2017 non-river flow periods.	
	Phytoplankton biomass (measured as chlorophyll-a at each site)	2. EQS	Chlorophyll-a concentration did not exceed 3 times median chlorophyll-a concentration of reference sites on 25% or more occasions in 2017–2018 or 2016–2017 non-river flow periods.	
Physical-chemistry	Organic enrichment	EQG	Dissolved oxygen saturation remained above 90% saturation at all times.	
	Salinity	EQG	Within the HEPA, median salinity was between the 20 th and 80 th percentile of reference site data.	

Note:

- Green symbols () indicate the Environmental Quality Criteria (EQC) were met; amber () and red () symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.



3. Maintenance of Seafood for Human consumption

3.1 Environmental Quality Objective

The EQO for the EV 'Fishing and Aquaculture' is aimed at ensuring seafood is safe for human consumption. The EQC for the EQO 'Maintenance of Seafood for Human Consumption' are outlined in Table 3.1.

Table 3.1 Environmental Quality Criteria for the EQO 'Maintenance of Seafood for Human Consumption' (EQO2)

Environmental quality indicator	Environmental Quality Criteria	
	Environmental Quality Guideline	Environmental Quality Standard
Thermotolerant coliforms (TTC)	Median TTC concentrations at sites at the boundary of the Shellfish Harvesting Exclusion Zone (SHEZ) are not to exceed 14 CFU/100 mL, with no more than 10% of the samples exceeding 21 CFU/100 mL as measured using the membrane filtration method.	Median TTC concentrations at sites at the boundary of the SHEZ not to exceed 70 CFU/100 mL, with no more than 10% of the samples exceeding 85 CFU/100 mL as measured using the membrane filtration method.
Algal biotoxins	<p>Concentrations of potentially toxic algae at sites at the boundary of the SHEZ not to exceed the WASQAP¹ trigger concentrations for any of the following:</p> <ul style="list-style-type: none"> • <i>Alexandrium</i> spp. (100 cells/L) • <i>Gymnodinium</i> spp. (1000 cells/L) • <i>Karenia</i> spp. (1000 cells/L) • <i>Dinophysis</i> spp. (500 cells/L) • <i>Dinophysis acuminata</i> (3000 cells/L) • <i>Prorocentrum lima</i> (500 cells/L) • <i>Pseudo-nitzschia</i> spp. (250 000 cells/L) • <i>Gonyaulax</i> cf. <i>spinifera</i> (100 cells/L) • <i>Protoceratium reticulatum</i> (<i>Gonyaulax grindleyi</i>) (500 cells/L) <p>If this EQG is exceeded, assessment will proceed against the EQS for sentinel mussel tissues.</p>	<p>Toxin concentrations in seafood not to exceed EQS in any sample at the boundary of the SHEZ¹:</p> <ul style="list-style-type: none"> • paralytic shellfish poison (0.8 mg Saxitoxin eq./kg) • diarrhoeic shellfish poison (0.2 mg/kg) • neurotoxic shellfish poison (200 mouse units/kg) • amnesic shellfish poison (domoic acid; 20 mg/kg).

Note:

1. Western Australian Shellfish Quality Assurance (WASQAP) Operations Manual (DoF 2007)

3.2 Microbiological contaminants and algal biotoxins

3.2.1 Thermotolerant coliforms

TTC were sampled eight times during the 2017–2018 summer monitoring period (yielding a total of 40 samples). NHMRC (2008) guidelines and EPA (2005b) suggest that a minimum of 100 samples over the monitoring period are needed for accurate assessment of the EQC. Data from multiple years can be pooled where there are <100 samples provided local pollution conditions have not changed (NHMRC 2008). Assuming conditions have not



changed, data collection over three summers (since summer 2015–2016) were pooled to yield an adequate sample size (n=120).

The median concentration of TTC derived from the three years of pooled samples was equal to the limit of detection (<10 CFU/100 mL; Table 3.2), thus meeting the EQG criterion for median concentrations (not to exceed 14CFU/100 mL). Over the three sampling periods, there were ten instances where TTC exceeded 21 CFU/100mL, representing 8.3% of samples and meeting the EQG criterion ($\leq 10\%$) for percentage of samples above (Table 3.3).

Table 3.2 Median thermotolerant coliform concentration at the fixed monitoring sites for the Sepia Depression outlet for 2015–2018

Date	Median (CFU/100 mL)	Compliance (EQG)
Dec 2015–Mar 2016 Dec 2016–Mar 2017 Dec 2017–Mar 2018 (n=120)	<10	

Notes:

- Green symbols () indicate the Environmental Quality Criteria (EQC) were met; amber () and red () symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.
- Thermotolerant coliform results below the analytical detection limit (< 10 CFU/100 mL) were halved (= 5 CFU/100 mL) to calculate the median.
- Environmental Quality Criteria are based on EPA (2005a).

Table 3.3 Thermotolerant coliform abundance for sites at the edge of the Sepia Depression SHEZ that exceeded concentrations of 21 CFU/100 mL

Sampling season	Date	Site	CFU/100 mL	Compliance	
2015-2016	15/12/2015	SD23	27		
	7/01/2016	SD31	36		
	27/01/2016	SD24	170		
	11/03/2016	SD23	370		
2016-2017	2/02/2017	SD29	200		
	16/02/2017	SD23	150		
2017–2018	4/12/2017	SD30	320		
	4/12/2017	SD31	670		
	4/01/2018	SD23	30		
	13/03/2018	SD29	40		
% total samples (n=120) >21 CFU/100 mL (EQG)			8.3		

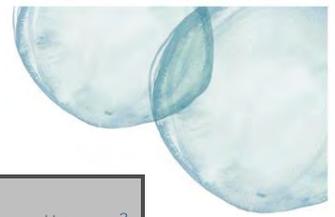
Note:

- Green () symbols indicate the Environmental Quality Criteria (EQC) were met; amber () and red () symbols represent an exceedance of the Environmental Quality Guideline (EQG) or Environmental Quality Standard (EQS), respectively.

3.2.2 Toxic phytoplankton species

Cell densities of toxic phytoplankton species were below relevant Western Australian Shellfish Quality Assurance Program (WASQAP; DoH 2007) guidelines (Table 3.4; Appendix K).

Table 3.4 Estimated cell densities of phytoplankton species known to produce toxins



Date	Site ¹	Species	Estimated density (cells/L)	WASQAP guideline ²	Compliance ³
4/12/2017	SD29	<i>Pseudo-nitzschia delicatissima</i> group	2232	250 000	■
	SDR3	<i>Pseudo-nitzschia delicatissima</i> group	4650	250 000	■
13/12/2017	SD26	<i>Pseudo-nitzschia delicatissima</i> group	7998	250 000	■
	SDR3	<i>Pseudo-nitzschia delicatissima</i> group	1302	250 000	■
4/01/2018	SD22	<i>Pseudo-nitzschia delicatissima</i> group	13 576	250 000	■
	SDR4	<i>Pseudo-nitzschia delicatissima</i> group	6138	250 000	■
24/01/2018	SD26	<i>Pseudo-nitzschia delicatissima</i> group	5022	250 000	■
	SDR4	<i>Pseudo-nitzschia delicatissima</i> group	2790	250 000	■
1/02/2018	SD26	<i>Pseudo-nitzschia delicatissima</i> group	7626	250 000	■
	SDR1	<i>Pseudo-nitzschia delicatissima</i> group	6882	250 000	■
28/02/2018	SD26	<i>Pseudo-nitzschia delicatissima</i> group	5022	250 000	■
	SDR4	<i>Pseudo-nitzschia delicatissima</i> group	6324	250 000	■
13/03/2018	SD30	<i>Pseudo-nitzschia delicatissima</i> group	10974	250 000	■
	SDR1	<i>Pseudo-nitzschia delicatissima</i> group	9114	250 000	■
27/03/2018	SD22	<i>Pseudo-nitzschia delicatissima</i> group	8370	250 000	■
	SDR4	<i>Pseudo-nitzschia delicatissima</i> group	11 904	250 000	■

Notes:

1. Samples were analysed for one monitoring site and one reference site per sampling occasion.
2. Western Australian Shellfish Quality Assurance Program (WASQAP) (DoH 2007).
3. Green (■) symbols indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) or Environmental Quality Standard (EQS), respectively.
4. - = no toxic species detected, NA = not applicable.

3.3 Compliance summary

Results of the 2017–2018 monitoring programs revealed no exceedances of EQGs for the EQO 'Maintenance of Seafood for Human Consumption' (Table 3.5).



Table 3.5 Compliance against EQC relevant to the EQO
'Maintenance of Seafood for Human Consumption'

Environmental quality indicator		EQC	Comments	Compliance ¹
Microbiological contaminants	Thermotolerant coliforms (TTC)	EOG	The median concentration of TTC derived from 120 samples collected over the 2015–2016, 2016–2017 and 2017–2018 sampling seasons was at the limit of detection (≤ 10 CFU/100 mL)	
			There were 8.3% of TTC samples that exceeded 21 CFU/100 mL over the 3–season pooled dataset.	
Algal biotoxins	Potentially toxic phytoplankton species	EOG	Toxic phytoplankton species were not recorded in excess of WASQAP (DoH 2007) guidelines values during 2017–2018 monitoring	 _HIK306706488

Notes:

- Green symbols (■) indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.
- Western Australian Shellfish Quality Assurance Program (WASQAP) (DoH 2007).



4. Maintenance of Primary and Secondary Contact Recreation

4.1 Environmental Quality Objective

The EQOs for the EV 'Recreation and Aesthetics' are aimed at ensuring Perth's coastal waters are safe for primary and secondary contact recreation activities, such as swimming and boating. The EQC for the EQO 'Maintenance of Primary and Secondary Contact Recreation' are outlined in Table 4.1.

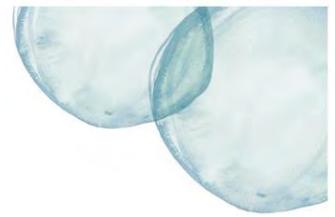
Table 4.1 Environmental Quality Criteria for the EQOs of 'Maintenance of Primary and Secondary Contact Recreation' (EQO4 and EQO5)

Environmental quality indicators	Environmental Quality Criteria	
	Environmental Quality Guideline	Environmental Quality Standard
Faecal pathogens	<p><u>Primary contact:</u> The 95th percentile of <i>Enterococci</i> concentrations over the bathing season not to exceed 200 MPN/100 mL outside the post-upgrade boundary.</p> <p><u>Secondary contact:</u> The 95th percentile of <i>Enterococci</i> concentrations over the bathing season not to exceed 2000 MPN/100 mL outside the post-upgrade boundary.</p>	<p><u>Primary contact:</u> The 95th percentile of <i>Enterococci</i> concentrations over the bathing season not to exceed 500 MPN/100 mL outside the post-upgrade boundary.</p> <p><u>Secondary contact:</u> The 95th percentile of <i>Enterococci</i> concentrations over the bathing season not to exceed 5000 MPN/100 mL outside the post-upgrade boundary.</p>
Algal biotoxins	<p>Median total phytoplankton cell concentration for the area of concern (either from one sampling run or from a single site over agreed period of time) should not exceed 15 000 cells/mL.</p> <p>or</p> <p>There should be no reports of skin or eye irritation or potential algal poisoning in swimmers considered by a medical practitioner as potentially resulting from toxic algae when less than 15 000 cells/mL are present in the water column.</p>	<p>There should be no confirmed incidences (by the Department of Health) of skin or eye irritation caused by toxic algae, or of algal poisoning in recreational users.</p>

4.2 Microbiological contaminants and algal biotoxins

4.2.1 Faecal streptococci (*Enterococci* spp.)

Samples were collected eight times over the 2017–2018 summer monitoring period (yielding a total of 40 samples). NHMRC (2008) guidelines and EPA (2005b) suggest that a minimum of 100 samples over the monitoring period are needed for accurate assessment of the EQC. Data from multiple years can be pooled where there are less than 100 samples over the monitoring period are needed for accurate assessment of the EQC. Data from multiple years can be pooled where there are less than 100 samples provided local pollution conditions have not changed (NHMRC 2008). Assuming conditions have not changed, data from the past three summers were pooled to yield an adequate sample size (n = 120).



The 95th percentile of *Enterococci* spp. concentrations based on 120 samples was 1100 MPN/100 mL (Table 4.2), thus exceeding the EQG for primary contact recreation (200 MPN/100 mL) and triggering assessment against the EQS. The EQS for primary contact recreation requires the 95th percentile of *Enterococci* spp. not to exceed 500 MPN/100 mL. As the 95th percentile of *Enterococci* spp. was 1100 MPN/100 mL, the EQS for primary contact recreation was exceeded (Table 4.2). Exceedances of the EQG and EQS for primary contact recreation have triggered a management response by Water Corporation in consultation with the Department of Health (DoH), which is ongoing.

The 95th percentile of *Enterococci* spp. Concentrations (1100 MPN/100 mL; Table 4.2) **met the EQG for secondary recreation (≤ 2000 MPN/100mL).**

Table 4.2 The 95th percentile of *Enterococci* spp. concentrations at the boundary of the primary and secondary contact recreation zone for the Sepia Depression ocean outlet

Date	95 th percentile (MPN/100 mL) ¹	Compliance ²		
		EQG (primary contact)	EQS (primary contact)	EQG (secondary contact)
Dec 2015–Mar 2016	1100	■	■	■
Dec 2016–Mar 2017		■	■	■
Dec 2017–Mar 2018 (n=120)		■	■	■

4.2.2 Phytoplankton cell concentrations

Table 4.3 Estimated phytoplankton total cell densities collected at fixed monitoring sites for contact recreation down-current of the Sepia Depression outlet

Date	Site	Total density (cells/mL)	Compliance
4/12/2017	SD13	50	■
13/12/2017	SD9	151	
4/01/2018	SD7	161	
24/01/2018	SD9	102	
1/02/2018	SD9	56	
28/02/2018	SD9	23	
13/03/2018	SD14	111	
27/03/2018	SD7	112	
Median (all data)		107	

4.3 Compliance summary

The EQG and EQS for primary contact recreation require the 95th percentile concentrations of *Enterococci* spp. not to exceed 200 MPN/100 mL and 500 MPN/100 mL, respectively at the post upgrade boundary. The 95th percentile *Enterococci* spp. concentration was assessed based on three sampling seasons of pooled data (to achieve a sufficient sample size of



n = 120) was 1100 MPN/100 mL, exceeding both the EQG and EOS (Table 4.3). Exceedance of the EQG and EOS for primary contact recreation was reported to the Department of Health for consideration as required by the SDOOL MMP.

The EQG for secondary contact recreation (2000 MPN/100 mL) and for phytoplankton cell concentrations were met (Table 4.4).

Table 4.4 Compliance against EQC relevant to the EQO 'Maintenance of Primary and Secondary Contact Recreation'

Environmental quality indicator		Comments	EQC	Compliance
Faecal streptococci	<i>Enterococci</i> spp.	The 95 th percentile of <i>Enterococci</i> spp. concentrations was 1100 MPN/100 mL	EQG (primary contact; 200 MPN/100 mL)	
			EQS (primary contact; 500 MPN/100 mL)	
			EQG (secondary contact; 2000 MPN/100 mL)	
Algal biotoxins	Phytoplankton (cell concentration)	The median total phytoplankton cell concentration was 107 cells/mL	EQG (15 000cells/mL)	

Note:

- Green symbols (■) indicate the Environmental Quality Criteria (EQC) were met; amber (■) and red (■) symbols represent an exceedance of the Environmental Quality Guideline (EQG) and Environmental Quality Standard (EQS), respectively.



5. Maintenance of Aesthetic Values

5.1 Environmental Quality Objective

The EQO for the EV 'Recreation and Aesthetics' is to ensure that Perth's coastal waters are aesthetically pleasing and that the aesthetic value is protected. To ensure this EQO is being met, monitoring routinely assesses the quality of surface water appearance (Table 5.1).

Table 5.1 Environmental Quality Criteria for the EQO 'Maintenance of Recreation and Aesthetics' (EQO5)

Environmental Quality Indicators	Environmental Quality Criteria	
	Environmental Quality Guideline	Environmental Quality Standard
Nuisance organisms	Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae and sewage fungus should not be present in excessive amounts.	There should be no overall decrease in the aesthetic water quality values of Cockburn Sound using direct measures of the community's perception of aesthetic value.
Faunal deaths	There should be no reported incidents of large-scale deaths of marine organisms relating from unnatural causes.	
Water clarity	The natural visual clarity of the water should not be reduced by more than 20%.	
Colour	The natural hue of the water should not be changed by more than ten points on the Munsell scale.	
Surface films	Oil and petrochemicals should not be noticeable as a visible film on the water or detectable by odour.	
Surface debris	Water surfaces should be free of floating debris, dust and other objectionable matter, including substances that cause foaming.	
Odour	There should be no objectionable odours.	
Fish tainting substances	Concentrations of contaminants will not exceed the aesthetics guidelines for fish tainting substances at the Shellfish Harvesting Safety Zone boundary.	There should be no detectable tainting of edible fish harvested outside the Shellfish Harvesting Safety Zone boundary.

5.2 Aesthetics

Aesthetic quality was assessed fortnightly via a questionnaire completed by field personnel on eight occasions during the non-river flow period. On each occasion, the questionnaire was completed at one location on the post upgrade boundary down-current of the diffuser. Water clarity around the outlet (mean LAC at 350m from the diffuser, pooled from all days) was compared against water clarity at a greater distance from the outlet (mean LAC at 1500 m from the diffuser from all days pooled) to assess whether aesthetic differences exist. Water Corporation also maintains a complaint's register for the SDOOL program.



The field surveys found algae/plant material visible on the surface on 50% of occasions (Table 5.2). No dead marine organisms or oils or other films were found on the surface on any occasion (Table 5.2). A noticeable colour variation and plume was visible on the 4 January, 15 February and 27 March 2018 (Table 5.2). Floating debris was visible on 13 December 2017. A noticeable odour was associated with the water on 50% of occasions (Table 5.2).

Mean LAC around the ocean outlet (0.078 Log₁₀/m) was slightly higher than at distance from the outlet (0.063 Log₁₀/m), meaning that light was more quickly attenuated at 350 m than 1500 m (Table 5.3). Overall water clarity was reduced by ~25%, and therefore the EQG that the natural visual clarity of the water should not be reduced by more than 20% was exceeded, triggering assessment against the EQS. As per Table 4.10 of BMT Oceanica (2014) the exceedance of the EQG is being reported in this annual report.

The EQS is that there should be no overall decrease in the aesthetic water **quality values of Cockburn Sound using direct measures of the community's** perception of aesthetic value. Water Corporation has received some feedback from the community during a period of upgrade to the plant but none pertaining to Cockburn Sound and the EQS was therefore met.

Fish tainting substances in the comprehensive TWW characterisation sample collected on 20 February 2018 did not exceed the EPA 2005a aesthetic guidelines for fish tainting substances (Table 5.4).

Table 5.2 Aesthetic observations and measurements near the Sepia Depression ocean outlet from December 2017 to March 2018

Date	Site	Algae/plant material visible on surface?	Dead marine organisms visible?	Secchi depth (m)	Noticeable colour variation?	Oil or other films on the surface?	Floating debris visible on the surface?	Noticeable odour associated with the water?
04/12/2017	SD13	Yes, macroalgae	No	15	No	No	No	No
13/12/2017	SD11	Yes, macroalgae	No	10.6	No	No	Yes	No
04/01/2018	SD5	No	No	7.6	Yes, plume visible	No	No	Yes
31/01/2018	SD11	Yes, macroalgae, seagrass	No	17.5	No	No	No	No
15/02/2018	SD9	No	No	8	Yes plume visible	No	No	No
28/02/2018	SD7	No	No	10.5	No	No	No	Yes
13/03/2018	SD14	No	No	10	No	No	No	Yes
27/03/2018	SD7	Yes, phytoplankton scum	No	4.7	Yes, plume visible	No	No	Yes



Table 5.3 Light attenuation coefficient at sites 350 m and 1500 m from the Sepia Depression ocean outlet from December 2017 to March 2018

Date	Light attenuation coefficient (Log ₁₀ /m)	
	350 m (site SDT-350m)	1500 m (site SDT-1500m)
04/12/2017	0.069	0.069
13/12/2017	0.076	0.053
04/01/2018	0.070	0.058
31/01/2018	0.092	0.049
15/02/2018	0.075	0.060
28/02/2018	0.083	0.064
13/03/2018	0.062	0.061
27/03/2018	0.098	0.092
Mean	0.078	0.063

Table 5.4 EPA (2005a) guidelines for fish tainting substances and parameters measured on 20 February 2018 in the SDOOL wastewater stream

Parameter	Aesthetics guidelines	2017/18 treated wastewater sampling
Metals and Metalloids (µg/L)		
Copper (Cu)	1000	3
Zinc (Zn)	5000	12
Phenols (µg/L)		
Phenol	300	<1
2,4-Dichlorophenol	0.3	<1
2,4,6-Trichlorophenol	2	<2
Pentachlorophenol (PCP)	30	<2
Chlorinated hydrocarbons (µg/L)		
Hexachlorocyclopentadiene	1	<20
Ethers (µg/L)		
Nitrobenzene	30	<20
BTEX (µg/L)		
Toluene	250	<1.0
Ethylbenzene	250	<1.0
PAHs (µg/L)		
Naphthalene	1000	<10
Acenaphthene	20	<10

Note:

1. BTEX = Benzene, toluene, ethylbenzene and xylene; PAHs = Polycyclic aromatic hydrocarbons.

5.3 Dam flushing event

The SDOOL MMP (BMT Oceanica 2014) requires monitoring of the magnitude and distribution of suspended sediment plumes from dam flushing events once per annum. The 4 January 2018 sampling was timed to coincide with a dam flushing event. On this occasion, total suspended solids (TSS), turbidity (assessed via LAC) and ammonia were measured in a down-current direction from the diffuser, for comparison to relevant guidelines or the 80th percentile of reference data.

During the dam flushing event, ammonia at the LEPA boundary (48 µg/L) was below the ANZECC/ARMCANZ (2000) trigger for 99% species protection (500 µg/L). The LAC at 100m from the outlet (0.085 Log₁₀/m) was above the



80th percentile of historical reference data but was below the 80th percentile of historical reference site data at the remaining three sites within the HEPA (350 m, 1000m and 1500 m; Table 5.5). TSS within the HEPA ranged from 0.8 –1.3 mg/L and was below the 80th percentile of reference site data (1.5 mg/L) (Table 5.5). Reference site data has only been collected for four sampling periods to date (2014/2015–2017/2018; n=16), and the TSS trigger will be further improved as a larger sample size is obtained.

Table 5.5 Measurements during dam flushing on 4 January 2018 compared to trigger levels

Parameter	2017/18 sampling	Trigger ¹
Ammonia-N (µg/L) ²	48	500
Total suspended solids (mg/L) ³	0.8–1.3	1.5
Light attenuation coefficient (Log ₁₀ /m) ³	100 m: 0.085 350 m: 0.070 1000 m: 0.066 1500 m: 0.058	0.078

Notes

1. The trigger value for ammonia-N in marine waters is from Table 3.4.1 in ANZECC & ARMCANZ (2000). The trigger value for total suspended solids is the 80th percentile of reference data collected over 2014/2015– 2017/2018 (n = 16). The trigger value for light attenuation coefficient is the 80th percentile of historical reference site data collected over 2003–2018(BMT Oceanica, unpublished data).
2. Orange bold text denotes exceedance of trigger.
3. Assessed at LEPA boundary (100 m downstream of outlet).
4. Assessed at all sites within the HEPA (100 m, 350 m, 1000 m and 1500 m downstream of the outlet).

5.4 Compliance summary

The EQGs for nuisance organisms, faunal deaths, surface films and fish tainting substances were met (Table 5.6). There were exceedances of the EQG for water clarity, colour, surface debris and odour leading to assessment against the EQS (Table 5.6). There was no overall decrease in the aesthetic water quality values of Cockburn Sound using direct measures of the **community’s perception of aesthetic value** and the EQS was therefore met.



Table 5.6 Compliance against EQC relevant to the EQO
'Maintenance of Recreation and Aesthetics' (EQO5)

Environmental Quality Indicator	EQC	Comments	Compliance ¹
Nuisance organisms	EQG	Nuisance organisms were not present in excessive amounts.	
Faunal deaths	EQG	There were no instances of dead marine organisms observed.	
Water clarity	EQG	Measurements of light attenuation confirmed that the natural visual clarity of the water was reduced by more than 20%.	
Colour	EQG	There was a noticeable colour on three out of eight sampling occasions.	
Surface films	EQG	There were no occasions where oil or petrochemicals were observed as a visible film on the surface of the water.	
Surface debris	EQG	Floating debris was visible on the surface on 13 December 2017.	
Odour	EQG	A noticeable odour was recorded 50% of sampling occasions.	
Water clarity, colour, surface debris and odour	EQS	There was no overall decrease in the aesthetic water quality values of Cockburn Sound using direct measures of the community's perception of aesthetic value	
Fish tainting substances	EQG	Concentrations of contaminants did not exceed the aesthetics guidelines for fish tainting substances at the Shellfish Harvesting Safety Zone boundary.	

Note:

- Green () symbols indicate the Environmental Quality Criteria (EQC) were met; amber () and red () symbols represent an exceedance of the Environmental Quality Guideline (EQG) or Environmental Quality Standard (EQS), respectively.



References

- ANZECC/ARMCANZ (2000) National Water Quality Management Strategy Paper No 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1 – The Guidelines (Chapters 1–7). Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory, October 2000
- BMT (2018) Sepia Depression Ocean Outlet – Incident Report. Prepared for Water Corporation by BMT, Report No. 1138_03_001/1_RevB, Perth, Western Australia, June 2018
- BMT Oceanica (2017) Sepia Depression Ocean Outlet Annual Report 2016-2017. Prepared for Water Corporation by BMT Oceanica Pty Ltd, Report No. 1138_01_006/1_Rev0, Perth, Western Australia September 2017
- BMT Oceanica (2014) Sepia Depression Ocean Outlet – Monitoring and Management Plan. Prepared for Water Corporation by BMT Oceanica Pty Ltd, Report No.821_001/1_Rev5, Perth, Western Australia, April 2014
- DoF (2007) Western Australian Shellfish Quality Assurance Program (WASQAP) Operations Manual. Department of Fisheries, Perth, Western Australia
- EPA (2016) Technical Guidance Protecting the Quality of Western Australia's Marine Environment. Environmental Protection Authority, December 2016, Perth, Western Australia
- EPA (2005) Manual of Standard Operating Procedures – For Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria (2003 – 2004) – A supporting document to the State Environmental (Cockburn Sound) Policy 2005. Environment Protection Authority, Report No. 21, Perth, Western Australia
- McAlpine KW, Wenziker KJ, Apte SC, Masini RJ (2005) Background quality for coastal marine waters of Perth, Western Australia. Department of Environment, Report No. 117, Perth, Western Australia
- NHMRC (2008) Guidelines for Managing Risks in Recreational Water. National Health and Medical Research Council, Canberra, Australian Capital Territory



Appendix A – Woodman Point wastewater treatment plant Licence conditions and Ministerial Statement



MINISTER FOR THE ENVIRONMENT

Statement No.

000065

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

**USE OF THE CAPE PERON OUTLET PIPELINE TO DISPOSE OF INDUSTRIAL
WASTEWATER TO THE SEPIA DEPRESSION, KWINANA**

Proposal: To dispose of up to 30 megalitres per day of industrial effluent in addition to treated wastewater from the Water Corporation's wastewater treatment plants and water from the Jervoise Bay Groundwater Recovery Scheme, up to a combined maximum of 208 megalitres per day through the Sepia Depression Ocean Outlet Landline, into the Sepia Depression, 4.1 kilometres offshore west-south-west of Point Peron, as documented in schedule 1 of this statement.

Proponent: Water Corporation

Proponent Address: 629 Newcastle Street, LEEDERVILLE WA 6007

Assessment Number: 1471

Report of the Environmental Protection Authority: Bulletin 1135

The proposal referred to above may be implemented by the proponent subject to the following conditions and procedures:

1 Implementation

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments documented in schedule 2 of this statement to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Published on

28 OCT 2004

3 Proponent Nomination and Contact Details

- 3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.
- 3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.
- 3-3 The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

- 4-1 The proponent shall substantially commence the proposal within five years of the date of this statement or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

- 4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;
2. new, significant, environmental issues have not arisen; and
3. all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

5 Compliance Audit and Performance Review

- 5-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environment which address:

1. the status of implementation of the proposal as defined in schedule 1 of this statement;
2. evidence of compliance with the conditions and commitments; and
3. the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environment is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5-2 The proponent shall submit a performance review report every five years after the start of operations, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

1. the major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;
2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;
3. significant improvements gained in environmental management, including the use of external peer reviews;
4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
5. the proposed environmental targets over the next five years, including improvements in technology and management processes.

5-3 The proponent may submit a report prepared by an auditor approved by the Department of Environment under the "Compliance Auditor Accreditation Scheme" to the Chief Executive Officer of the Department of Environment on each condition/commitment of this statement which requires the preparation of a management plan, programme, strategy or system, stating that the requirements of each condition/commitment have been fulfilled within the timeframe stated within each condition/commitment.

6 Monitoring and Management of the Outlet

6-1 Prior to the acceptance of industrial effluent into the Sepia Depression Ocean Outlet Landline, the proponent shall prepare a Preliminary Sepia Depression Ocean Outlet Monitoring and Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

The objective of this Plan is to ensure that both ecological and social environmental values for marine waters in the vicinity of the Sepia Depression are maintained.

This Plan shall include:

- 1 the monitoring and evaluation of the environmental effects of discharging treated wastewater into the Sepia Depression;
 - 2 long-term environmental quality objectives and their spatial application consistent with the Environmental Protection Authority's objectives as described in the publication "Perth's Coastal Waters, Environmental Values and Objectives", Environmental Protection Authority, February 2000;
 - 3 a programme to achieve long-term environmental quality objectives through short to medium term targets;
 - 4 agreed "trigger" levels for further investigations (environmental quality guidelines);
 - 5 agreed "trigger" levels for remedial and/or preventative actions to protect the water quality and the environment of the Sepia Depression (environmental quality standards); and
 - 6 management actions to be taken in the event that environmental quality guidelines or environmental quality standards are not met.
- 6-2 Within twelve months following the acceptance of industrial effluent into the Sepia Depression Ocean Outlet Landline, the proponent shall prepare a Sepia Depression Ocean Outlet Monitoring and Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.
- This Plan shall address items 1 to 6 of condition 6-1 and any matters arising during the twelve months of operation, and shall be subject to amendment from time to time.
- 6-3 The proponent shall implement the Sepia Depression Ocean Outlet Monitoring and Management Plans, required by conditions 6-1 and 6-2, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 6-4 The proponent shall make the Sepia Depression Ocean Outlet Monitoring and Management Plan, required by condition 6-2 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

7 Ecological Protection Zones and Toxicant Criteria

- 7-1 During operation, the proponent shall determine and report to the Department of Environment whether the concentrations of bio-accumulating toxicants in the effluent at the diffuser exceed the ANZECC & ARMCANZ¹ 80% species protection guideline "trigger" levels (as published from time to time) for bio-accumulating toxicants in accordance with the Sepia Depression Ocean Outlet Monitoring and Management Plans required by conditions 6-1 and 6-2, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

- 7-2 In the event that a guideline “trigger” level for a bio-accumulating toxicant, referred to in condition 7-1, is exceeded, the proponent shall report the matter to the Department of Environment within one working day of determining that this has occurred, and shall initiate an investigation against the environmental quality standards and into the cause of the exceedance in accordance with the framework developed in Revised Environmental Quality Criteria Reference Document (Cockburn Sound)², to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 7-3 If an environmental quality standard for a bio-accumulating toxicant, referred to in condition 7-2, is exceeded, the proponent shall initiate a management response to determine the cause and remedy the exceedance in accordance with the implementation framework for the National Water Quality Management Strategy³, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 7-4 During operation, the proponent shall determine and report to the Department of Environment whether the ANZECC & ARMCANZ 99% species protection guideline “trigger” levels (as published from time to time) for toxicants (with the exception of cobalt, where the 95% guideline shall apply), identified in accordance with the Sepia Depression Ocean Outlet Monitoring and Management Plans required by conditions 6-1 and 6-2, are being exceeded within the Zone of High Ecological Protection (i.e. beyond a 100 metre radius of the diffuser), to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 7-5 In the event that a guideline “trigger” level for a toxicant, referred to in condition 7-4 is exceeded, the proponent shall report the matter to the Department of Environment within one working day of determining that this has occurred, and shall initiate an investigation against the environmental quality standards and into the cause of the exceedance in accordance with the framework developed in Revised Environmental Quality Criteria Reference Document (Cockburn Sound)², to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 7-6 If an environmental quality standard for a toxicant, referred to in condition 7-5, is exceeded, the proponent shall initiate a management response to determine the source and remedy the exceedance in accordance with the implementation framework for the National Water Quality Management Strategy³, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note:

- 1 ANZECC & ARMCANZ guidelines are published in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- 2 *Revised Environmental Quality Criteria Reference Document (Cockburn Sound), A supporting document to the draft Environmental Protection (Cockburn Sound) Policy 2002*, Environmental Protection Authority Report 20, November 2002.
- 3 *Implementation framework for Western Australia for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Guidelines Nos 4 & 7:*

8 New Discharges and Changes to Industrial Wastewater Discharge

- 8-1 The proponent shall not accept industrial effluent from industries not specified in schedule 1 unless a proposal has been referred to the Environmental Protection Authority.

9 Toxicant Loads

- 9-1 The proponent shall only accept and convey effluent from the industry participants to the Sepia Depression where industrial toxicant loads to be discharged do not exceed those authorised for discharge into Cockburn Sound by the relevant individual industry *Environmental Protection Act Part V* licences.
- 9-2 The proponent shall not accept discharges which are not licensed under Part V of the *Environmental Protection Act 1986* into the Sepia Depression Ocean Outlet Landline for disposal to the Sepia Depression.

10 Nitrogen Loads

- 10-1 The proponent shall operate the Sepia Depression Ocean Outlet Landline so that the annual nitrogen load to the Sepia Depression does not exceed the nitrogen load discharged from the outlet in 1994.
- 10-2 In the event that subsequent monitoring shows an adverse environmental impact at the 1994 nitrogen load, the proponent shall reduce the annual nitrogen load to 75% of the load discharged from the outlet in 1994.

11 Sediment Quality

- 11-1 During operation, the proponent shall monitor sediment quality within and at the boundary of the Zone of Low Ecological Protection, and report to the Department of Environment on whether sediments exceed the ANZECC & ARMCANZ¹ Interim Sediment Quality Guidelines-low “trigger” levels, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 11-2 In the event that a guideline “trigger” level for sediment quality, referred to in condition 11-1, is exceeded, the proponent shall report the matter to the Department of Environment within one working day of determining that this has occurred, and shall initiate an investigation against the environmental quality standards and into the cause of the exceedance in accordance with the framework developed in Revised Environmental Quality Criteria Reference Document (Cockburn Sound)², to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

11-3 If an environmental quality standard for sediment quality referred to in condition 11-2 is not met, the proponent shall initiate a management response to determine the cause and act to prevent further sediment quality degradation, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Note:

- 1 ANZECC & ARMCANZ guidelines are published in *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- 2 *Revised Environmental Quality Criteria Reference Document (Cockburn Sound), A supporting document to the draft Environmental Protection (Cockburn Sound) Policy 2002*, Environmental Protection Authority Report 20, November 2002.

12 Decommissioning Plans

12-1 Within six months following the issuing of the notice to the decision-making authorities under section 45(7) of the *Environmental Protection Act 1986*, the proponent shall prepare a Preliminary Decommissioning Plan which provides the framework to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The Preliminary Decommissioning Plan shall address:

- 1 conceptual plans for the removal or, if appropriate, retention of infrastructure; and
- 2 long-term management of systems affected by the discharge of waste.

12-2 At least 12 months prior to the anticipated date of decommissioning, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Decommissioning Plan designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The Final Decommissioning Plan shall address:

- 1 conceptual plans for the removal or, if appropriate, retention of infrastructure; and
- 2 long-term management of systems affected by the discharge of waste.

12-3 The proponent shall implement the Final Decommissioning Plan required by condition 12-2 until such time as the Minister for the Environment determines, on advice of the Environmental Protection Authority, that the proponent's decommissioning responsibilities have been fulfilled.

Procedures

- 1 Where a condition states “to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority”, the Environmental Protection Authority will provide that advice to the Department of Environment for the preparation of written notice to the proponent.
- 2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment.
- 3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment.
- 4 To ensure that discharge loads are not increased, the Chief Executive Officer of the Department of Environment will review from time to time the *Environmental Protection Act* Part V licences issued to industries which discharge into the Sepia Depression Ocean Outlet Landline to set appropriate load limits on toxicants and on any other contaminants which may have an adverse impact on the marine environment.

Notes

- 1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment over the fulfilment of the requirements of the conditions.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT

28 OCT 2004

Schedule 1

The Proposal (Assessment No. 1471)

The proposal is to discharge up to 30 megalitres per day (ML/day) of industrial wastewater, in addition to treated wastewater from Woodman Point and Cape Peron wastewater treatment plants and water from the Jervoise Bay Groundwater Recovery Scheme, to the Sepia Depression via the Cape Peron outlet line from the following specified sources and further unspecified sources:

- the Kwinana Wastewater Reclamation Plant (KWRP);
- BP Refinery (Kwinana);
- CSBP Limited; and
- Edison Mission Energy.

The proposal takes into account the cumulative environmental impacts of replacing the Cape Peron Wastewater Treatment Plant with a new East Rockingham Wastewater Treatment Plant.

The Sepia Depression Ocean Outlet is situated 4.1 kilometres offshore west-south-west of Point Peron (Figure 1). The proposal does not involve any construction or marine ecological disturbance. The existing pipeline and diffuser will be used. The proposal includes the instruments and controls, telemetry and shutdown systems between industries and the Kwinana Wastewater Reclamation Plant and Sepia Depression Ocean Outlet Landline as described in Section 2 of the Public Environmental Review, which are relevant to monitoring and controlling wastewater input to the Sepia Depression.

Industrial wastewater will only be accepted if the quality of the combined wastewater stream meets the ANZECC & ARMCANZ 80% species protection guidelines for toxicants at discharge and the ANZECC & ARMCANZ 99% species protection guidelines for toxicants (excepting cobalt where the 95% species protection guideline will apply) at 100 metres from the diffuser (Figure 2).

The proposal does not allow any of the specified industries to increase their discharge of current contaminant loads to the marine environment without prior referral to the Environmental Protection Authority.

The key characteristics of the proposal are set out in Table 1.

Table 1 – Key Proposal Characteristics (Assessment no. 1471)

Parameter	Description		
Location	Sepia Depression Ocean Outlet; approximately 4.1 kilometres offshore west-south-west of Point Peron		
	Current (2003)	Current plus initial KWRP (2004)	Possible expansion (2019)
Industry Reclaimed Water Reuse	0	17 ML/day	up to 27 ML/day
Industry Wastewater Discharge to SDOOL			
Typical	0	6 ML/day	up to 30 ML/day
Maximum	0	13 ML/day	
Combined Treated Wastewater Quantity and Quality			
Average Volume			
Typical*	124 ML/day	113 ML/day	up to 200 ML/day
Maximum**	124 ML/day	122 ML/day	up to 208 ML/day
Suspended Solids	34 mg/L	39 - 42 mg/L	35** mg/L
Biochemical Oxygen Demand (BOD ₅)	22 mg/L	24 - 32 mg/L	16** mg/L
Total Nitrogen (TN)	18 mg/L	22 - 32 mg/L	22* -27** mg/L
Total Phosphorus (TP)	10 mg/L	11 - 12 mg/L	11* - 12** mg/L
Dilutions	~	Average dilution of the SDOOL wastewater stream will be at least 1:300 with the dilution being above 1:200 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.	
Annual Toxicant Loads from Industrial Participants		Toxicant loads from industries nominated in this proposal, will not increase beyond that currently permitted to be discharged to Cockburn Sound, unless the proposal for a change to loads is referred to the EPA.	New proposals or proposals to increase toxicant loads for discharges to the Sepia Depression Ocean Outlet Landline will be referred to the EPA.
Toxicant Concentrations	as per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 80% species protection guideline values for bio-accumulating toxicants at the diffuser.	
	as per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 99% species protection guideline values (with the exception of cobalt, where the 95% guideline will apply) beyond 100 metres from the Sepia Depression Ocean Outlet diffuser.	

Nutrient Loads	Nutrient loads from the SDOO to the Sepia Depression will be no greater than 1994 loads, and should subsequent monitoring show an adverse environmental impact at that level, it will be reduced to 75% of 1994 loads.
Sediment	ANZECC & ARMCANZ Interim Sediment Quality Guideline-low levels to be used as trigger for management action and investigation for bio-accumulating substances within the Zone of Low Ecological Protection, and generally outside the Zone of Low Ecological Protection.
Protection of Social Values	
Contact recreation	The area not meeting the guidelines for contact recreation due to domestic wastewater discharge will not increase because of the addition of industrial effluent.
Aesthetic value	Visual amenity will not deteriorate because of the addition of industrial effluent.
Seafood for Human Consumption	The industrial wastewater discharge will not increase area not meeting the guidelines for seafood harvesting due to domestic wastewater discharge.

* Typical means the expected average daily operating parameter.

** Maximum means the expected infrequent highest (peak) operating condition reflecting “normal” operational variability.

Abbreviations:

KWRP Kwinana Water Reclamation Plant

ML/day Megalitres per day

mg/L milligrams per litre

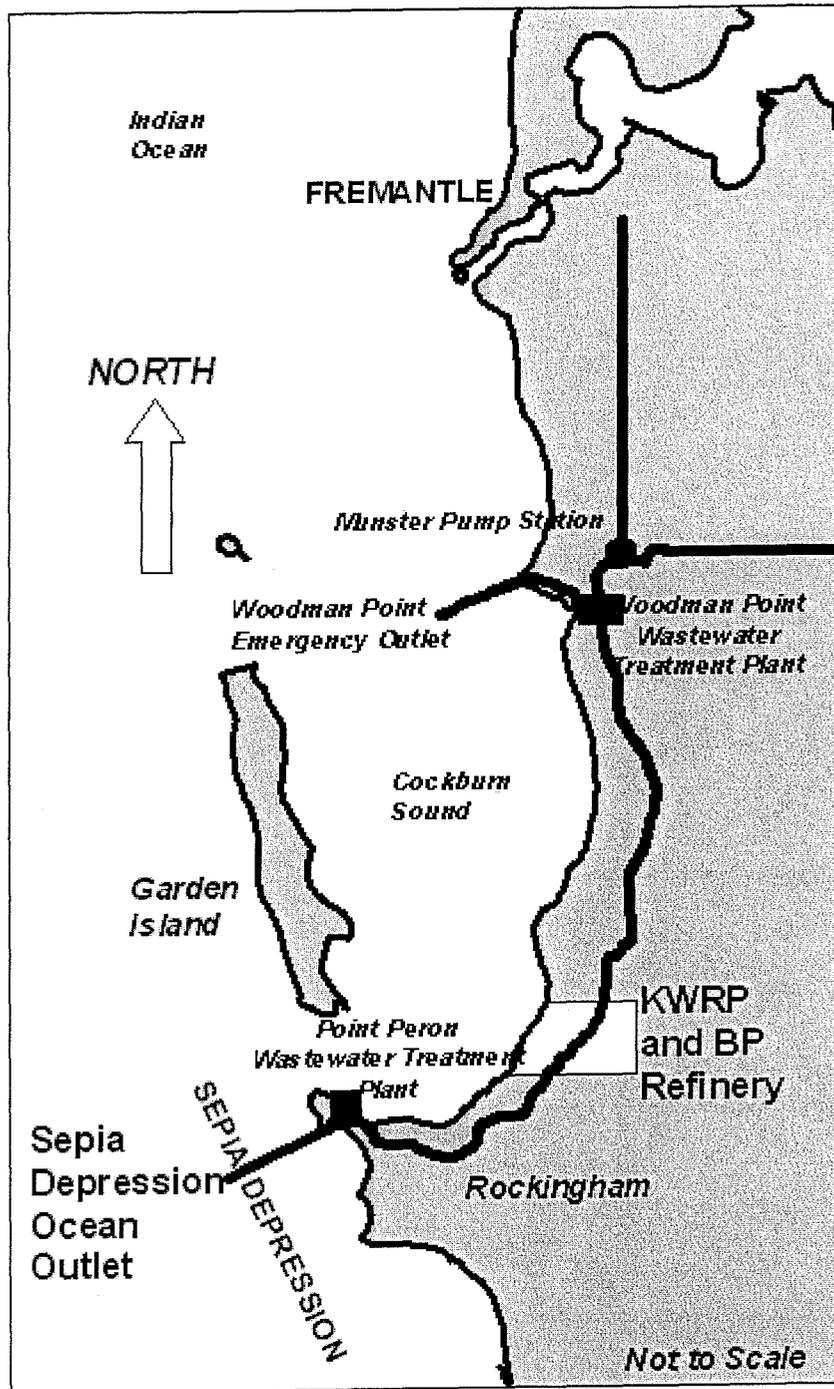
SDOOL Sepia Depression Ocean Outlet Landline

PLOOM Perth Long-term Ocean Outlet Monitoring

ANZECC & ARMCANZ *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

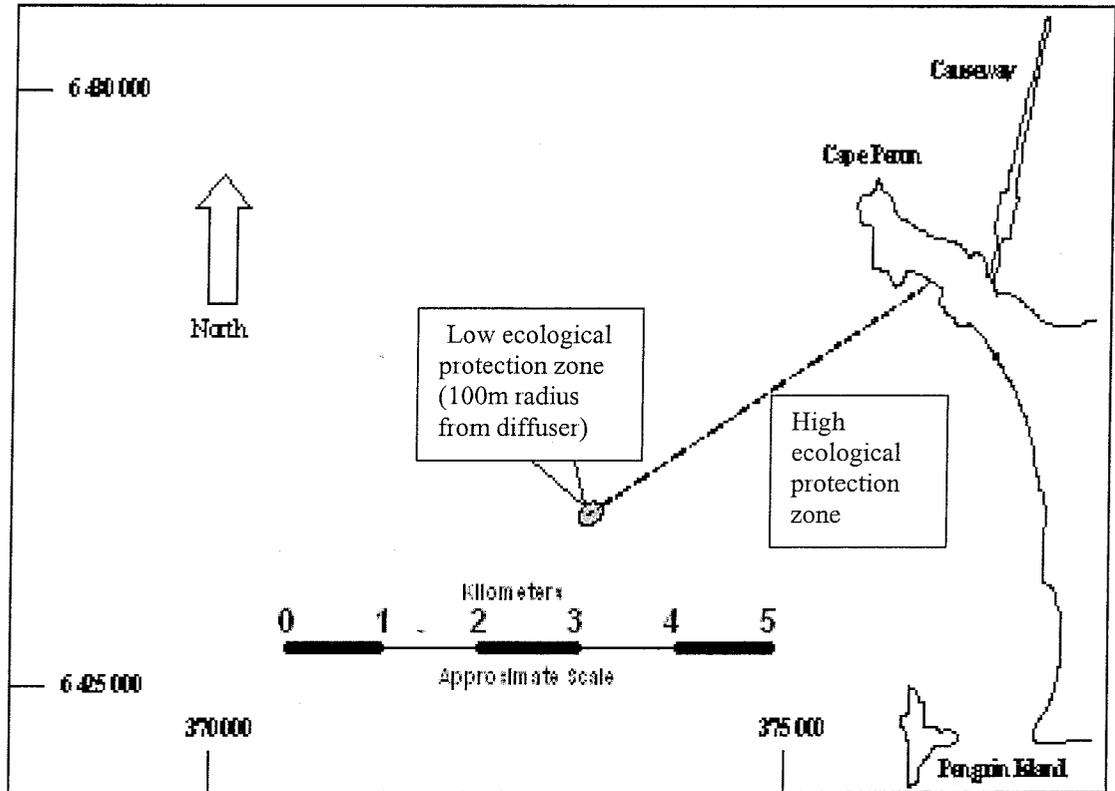
Figures (attached)

Figure 1 – Location of the Sepia Depression Ocean Outlet, and
 Figure 2 – Sepia Depression Ocean Outlet Toxicant Boundary.



(Source: Water Corporation)

Figure 1. Location of the Sepia Depression Ocean Outlet



(Source: Water Corporation)

Figure 2 Sepia Depression Ocean Outlet Toxicant Boundary

Proponent's Environmental Management Commitments

September 2004

**USE OF THE CAPE PERON OUTLET
PIPELINE TO DISPOSE OF INDUSTRIAL
WASTEWATER TO THE SEPIA DEPRESSION,
KWINANA**

(Assessment No. 1471)

Water Corporation

Proponent's Environmental Management Commitments - September 2004

**USE OF THE CAPE PERON OUTLET PIPELINE TO DISPOSE OF INDUSTRIAL WASTEWATER TO THE SEPIA DEPRESSION, KWINANA
(Assessment No. 1471)**

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the 'action' to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environment.

No.	Topic	Objective	Action	Timing	Advice
1.	Marine Environmental Values	To minimise impact on the marine environment.	<p>Attain an average dilution of the Sepia Depression Ocean Outlet Landline (SDOOL) wastewater stream of at least 1:300 with the dilution being above 1:200 at least 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.</p> <p>Dilution will be demonstrated by modelling and monitoring.</p>	During Operation	
2.	Marine Environmental Values	-	<p>Accept only wastewater from industrial participants whose discharge is authorised by the relevant licence and/or Ministerial conditions issued to them, or as otherwise authorised in writing by the DoE from time to time.</p> <p>Keep a Register of relevant industries' licences or Ministerial Statement numbers.</p>	During Operation	

No.	Topic	Objective	Action	Timing	Advice
3.	Marine Environmental Values	To minimise impact on the marine environment.	<p>Manage the discharge of treated wastewater to the Sepia Depression, including that accepted from industrial participants and future expansion of the wastewater treatment system to ensure that the concentration of toxicants meets agreed EQC 100 metres from the diffuser.</p> <p>Compliance will be demonstrated by modelling and monitoring.</p>	During Operation	
4.	Protection of Marine Flora and Fauna	To monitor for, and respond to potentially significant impacts to marine flora and fauna from discharges from SDOOL.	<p>Conduct specific investigations and annually report the effects of wastewater discharge to the Sepia Depression through the Perth Long-term Ocean Outlet Monitoring programme or other agreements.</p> <p>Reporting will be through the Compliance Report.</p>	During Operation	
5.	Protection of Marine Flora and Fauna	To monitor for, and respond to potentially significant impacts to marine flora and fauna from discharges from SDOOL.	<p>Conduct specific investigations in the event that toxicants in the treated wastewater exceed concentrations which will result in the EPA's relevant high protection EQG being exceeded following 1:200 initial dilution, with the relevant industrial participant/s and in consultation with the DoE to identify the source and cause of the identified condition.</p> <p>Report any exceedances in the Compliance Report.</p>	During Operation	Industry Participants
6.	Protection of Marine Flora and Fauna	To respond to potentially significant impacts to marine flora and fauna from discharges from SDOOL.	<p>Undertake assessment of the risk presented to the ecological processes in the Sepia Depression by the exceedance in commitment 5, and undertake measures necessary to mitigate those risks.</p> <p>Report mitigation measures taken in the Compliance Report.</p>	During operation	

No.	Topic	Objective	Action	Timing	Advice
7.	Protection of Marine Flora and Fauna	To demonstrate that the diluted effluent quality meets EQC's	<p>Undertake Whole Effluent Toxicity (WET) testing using a method agreed with the DoE following the principles contained in the USEPA, APHA and ASTM protocols at a NATA accredited laboratory in accordance with the protocols set out in ANZECC/ARMCANZ 2000 and in accordance with the Monitoring Program specified in <i>Plan for Monitoring and Management of SDOO</i>.</p> <p>Report results in the Compliance Report.</p>	During operation	
8.	Public Health Values	To establish the relevant Social EQC's for discharge of treated wastewater to the Sepia Depression.	<p>Participate in close consultation with the Department of Health, the Department of Conservation and Land Management and DoE to further refine the notional social environmental quality objectives for the maintenance of seafood for human consumption and recreation and aesthetic EQC values and boundaries for treated wastewater discharge to the marine environment.</p> <p>Deploy sentinel mussels to monitor tissue coliform levels in accordance with the Monitoring Program specified in <i>Plan for Monitoring and Management of SDOO</i>.</p> <p>Report results in the Compliance Report.</p>	During operation	<p>Department of Health</p> <p>Department of Conservation and Land Management</p>
9.	Public Health Values	To delineate the area where primary contact recreation and the taking of seafood is not recommended	<p>Notify the Department for Planning and Infrastructure of the spatial extent of the area in proximity to the Sepia Depression Ocean Outlet where primary contact recreation and taking of seafood is not recommended, with a request for inclusion on relevant Maritime Charts.</p> <p>Provide evidence of the notification.</p>	Prior to industrial wastewater discharge and following any change to spatial extent of area	

No.	Topic	Objective	Action	Timing	Advice
10.	Environmental Management	To minimise environmental impacts from the implementation of the proposal, and to ensure that environmental approval requirements are met.	<p>Prepare a Wastewater Monitoring and Management Plan to address the receipt and discharge of wastewater from the SDOOL, including:</p> <ol style="list-style-type: none"> 1. The monitoring and evaluation of combined treated wastewater and industrial effluent into the Sepia Depression. <p>The monitoring will include as far as practicable:</p> <ul style="list-style-type: none"> • Real-time monitoring of all streams of wastewater returned to the SDOOL and combined streams prior to discharge. Routine monitoring is to include flow-rate, pH, conductivity, turbidity and temperature; and • Routine monitoring of prescribed contaminant levels in all streams of wastewater returned to the SDOOL and combined streams prior to discharge. Prescribed contaminants are those agreed from time to time under this Plan. <ol style="list-style-type: none"> 2. Procedures required to be implemented by the proponent and KWRP participants if the wastewater contamination has the potential to cause the toxicant concentrations and loads specified in Table 1 of schedule 1 to be exceeded; and 3. Mode of operation of the SDOOL to attain an average dilution of the combined wastewater stream of at least 1:300 with the dilution being above 1:200 at least 99% of the time within 100 metres of the diffuser. <p>Submit framework and plan to Audit Branch, Department of Environment.</p>	Framework of the management plan agreed prior to industrial wastewater acceptance	Water Corporation Industry Participants

No.	Topic	Objective	Action	Timing	Advice
11.	Environmental Management	To minimise environmental impacts from the implementation of the proposal, and to ensure that environmental approval requirements are met.	Finalise the Plan referred to in commitment 10. Submit plan to Audit Branch.	Plan finalised within 6 months of commencement of acceptance of Wastewater to SDOOL	Water Corporation Industry Participants
12.	Environmental Management	To minimise environmental impacts from the implementation of the proposal, and to ensure that environmental approval requirements are met.	Implement the Plan referred to in commitments 10 and 11. Report in the Compliance Report.	During operation	
13.	Stakeholder Consultation Strategy	To formalise and document the purpose, role and functions of the SLG group. To ensure that the public has open access to information regarding the environmental performance of SDOOL and KWRP, and an avenue to address any significant issues arising.	Develop a Stakeholder Consultation Strategy. The Strategy will: <ul style="list-style-type: none"> • Identify relevant stakeholders including community groups, environmental groups, local governments (including the City of Rockingham) and government agencies; • Describe stakeholder consultation measures, having regard for the Government's consultation strategy; • Require stakeholder input into the Plans and Strategies required to be prepared by these commitments; • Describe opportunities to publicly review annual reports and data on the Sepia Depression Ocean Outlet environmental performance and monitoring programs; 	At least six months prior to industrial wastewater discharge.	

No.	Topic	Objective	Action	Timing	Advice
			<ul style="list-style-type: none"> • Make reports on Kwinana Water Reclamation Plant environmental performance readily available to the public and advertise their availability; • Make the results of the Perth Long-term Ocean Outlet Monitoring programme readily available to the public and advertise their availability; • Maintain a complaints/response record of actions taken to address matters arising from the project; and • Present up to date information and data, consult on and receive input on current and possible future industry participation prior to any referral under section 38 of the <i>Environmental Protection Act 1986</i>. <p>Implement the Stakeholder Consultation Strategy.</p> <p>Report monitoring results, complaints and responses in the Compliance Report.</p>	<p>During Operation.</p> <p>During Operation.</p>	

Abbreviations

ANZECC/ARMCANZ 2000 : *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000.*

APHA : American Public Health Association

ASTM : The American Society for Testing and Materials

DoE : Department of Environment

EPA : Environmental Protection Authority

CAPE PERON OUTLET PIPELINE (Assessment No. 1471) – continued

EQC : Environmental Quality Criteria

EQG : Environmental Quality Guidelines

EQO : Environmental Quality Objectives

KWRP : Kwinana Water Reclamation Plant

NATA : National Association of Testing Authorities

SDOO : Sepia Depression Ocean Outlet

SDOOL : Sepia Depression Ocean Outlet Landline

USEPA : United States Environmental Protection Agency

Attachment 1 to Ministerial Statement 665

Change to proposal under s45C of the *Environmental Protection Act 1986*

Attachment 1 replaces Schedule 1 in Ministerial Statement 665

Proposal: Use of the Cape Peron Outlet Pipeline to Dispose of Industrial Wastewater to the Sepia Depression, Kwinana

Proponent: Water Corporation

The Proposal (Assessment No.1471) (Revised Description)

The proposal is to dispose of up to 30 megalitres per day of industrial wastewater, in addition to treated wastewater from Woodman Point and Cape Peron wastewater treatment plants and water from the Jervoise bay Groundwater Recovery Scheme, up to a combined maximum of 208 megalitres per day, through the Sepia Depression Ocean Outlet Landline, into the Sepia Depression from the following specified sources and further unspecified sources:

- the Kwinana Wastewater Reclamation Plant (KWRP);
- BP Refinery (Kwinana);
- CSBP Limited; and
- Edison Mission Energy.

The proposal takes into account the cumulative environmental impacts of replacing the Cape Peron Wastewater Treatment Plant with the East Rockingham Wastewater Treatment Plant.

The Sepia Depression Ocean Outlet is situated 4.1 kilometres offshore west-south-west of Point Peron (Figure 1). The proposal does not involve any construction or marine ecological disturbance. The existing pipeline and diffuser will be used. The proposal includes the instruments and controls, telemetry and shutdown systems between industries and the Kwinana Wastewater Reclamation Plant and Sepia Depression Ocean Outlet Landline as described in Section 2 of the Public Environmental Review (2004), which are relevant to monitoring and controlling wastewater input to the Sepia Depression.

Industrial wastewater will only be accepted if the quality of the combined wastewater stream meets the ANZECC & ARMCANZ 80% species protection guidelines for toxicants at discharge and the ANZECC and ARMCANZ 99% species protection guidelines for toxicants (excepting cobalt where the 95% species protection guideline will apply) at 100 metres from the diffuser (Figure 2).

The key characteristics of the proposal are set out in Table 1.

Changes:

- Amend the “*Proposal description*” by deleting:
 - “*the proposal does not allow any of the specific industries to increase their discharge of current contaminant loads to the marine environment without prior referral to the Environmental Protection Authority*”;
- Amend the “*Annual toxicants loads from industrial participants*”;
- Delete the “*combined treated wastewater quality and quantity for 2003*” column;
- Amend the date for “*Possible expansion*” from 2019 to 2030;
- Increase the “*Typical*” and “*Maximum*” average volume of “*combined treated wastewater quantity*” (for 2004 scenario);
- Increase the “*maximum*” toxicant loadings of “*combined treated wastewater quality*” (for 2004 scenario) for the following parameters:
 - Suspended solids;
 - Biochemical Oxygen Demand (BOD₅);
 - Total Phosphorus (TP);
- Replace the “*2004 scenario*” with “*2013*”;
- Amend definitions for “*typical*” and “*maximum*” for discharge criteria in the key characteristics table;
- Replace “*Total Nitrogen*” concentration with “*Annual Nitrogen Load*”; and
- Update all Figures in Schedule 1.

Key Characteristics Table:

Parameter	Description of approved proposal			Description of approved change to proposal		
	Current (2003)	Current plus initial KWRP (2004)	Possible expansion (2019)	Current (2003)	Current plus initial KWRP (2013)	Possible expansion (2030)
Industry reclaimed Water Reuse	0	17 ML/day	up to 27 ML/day		17 ML/day	up to 27 ML/day
Industry Wastewater Discharge to SDOOL				Figures representing the wastewater quantity and quality for 2003 are no longer relevant.		
Typical	0	6 ML/day	up to 30 ML/day		6 ML/day	up to 30 ML/day
Maximum	0	13 ML/day			13 ML/day	
Combined Treated Wastewater Quantity and Quality				These figures are removed from the table.		
Average Volume						
Typical*	124 ML/day	113 ML/day	up to 200 ML/day		145 ML/day	up to 200 ML/day
Maximum**	124 ML/day	122 ML/day	up to 208 ML/day		160 ML/day	up to 208 ML/day
Suspended Solids	34 mg/L	39-42 mg/L	35** mg/L		39-90 mg/L	35** mg/L

* Typical means the expected average daily operational target.

** Maximum means the expected infrequent (<10% of the time) operational targets based on the monthly average contributions from each industry participant.

Parameter	Description of approved proposal			Description of approved change to proposal		
	Current (2003)	Current plus initial KWRP (2004)	Possible expansion (2019)		Current plus initial KWRP (2013)	Possible expansion (2030)
Biochemical Oxygen Demand (BOD ₅)	22 mg/L	24-32 mg/L	16** mg/L		24-40 mg/L	16** mg/L
Total Phosphorus (TP)	10 mg/L	11-12 mg/L	11* -12** mg/L		11-22 mg/L	11* -12** mg/L
Total Nitrogen (TN)	18 mg/L	22-32 mg/L	22* - 27** mg/L		1,100 tonnes per annum	1,778 tonnes per annum
Dilution	Average dilution of the SDOOL wastewater stream will be at least 1:300 with the dilution being above 1:200 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.			Average dilution of the SDOOL wastewater stream will be at least 1:300 with the dilution being above 1:200 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.		
Annual Toxicant Loads from Industrial	Toxicant loads from industries nominated in this proposal, will not increase beyond that currently permitted to be discharged to Cockburn Sound, unless the proposal for a change to loads is referred to the EPA.	New Proposals or proposals to increase toxicant loads for discharges to the Sepia Depression Ocean Outlet Landline will be referred to the EPA.		In order to manage the capped toxicant load, at a maximum permissible level of 208ML/day, the Water Corporation is responsible to carefully consider any proposed increase in toxicant loads to ensure ecological and social values of the marine environment are protected.	New Proposals for discharges to the Sepia Depression Ocean Outlet Landline will be referred to the EPA.	
Toxicant Concentrations	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 80% species protection guideline values for bio-accumulating toxicants at the diffuser.		As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 80% species protection guideline values for bio-accumulating toxicants at the diffuser.	
	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 99% species protection guideline values (with the exception of cobalt, where the 95% guideline will apply) beyond 100 metres from the Sepia Depression Ocean Outlet diffuser.		As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 99% species protection guideline values (with the exception of cobalt, where the 95% guideline will apply) beyond 100 metres from the Sepia Depression Ocean Outlet diffuser.	
Nutrient Loads	Nutrient loads from the SDOO to the Sepia Depression will be no greater than 1994 loads, and should subsequent monitoring show an adverse environmental impact at that level, it will be reduced to 75% of 1994 loads.			Nutrient loads from the SDOO to the Sepia Depression will be no greater than 1994 loads, and should subsequent monitoring show an adverse environmental impact at that level, it will be reduced to 75% of 1994 loads.		
Sediment	ANZECC & ARMCANZ Interim Sediment Quality Guideline-low levels to be used as			ANZECC & ARMCANZ Interim Sediment Quality Guideline-low levels to be used as trigger for		

Parameter	Description of approved proposal	Description of approved change to proposal
	trigger for management action and investigation for bio-accumulating substances within the Zone of Low Ecological Protection, and generally outside the Zone of Low Ecological Protection.	management action and investigation for bio-accumulating substances within the Zone of Low Ecological Protection, and generally outside the Zone of Low Ecological Protection.
Protection of Social Values		
Contact recreation	The area not meeting the guidelines for contact recreation due to domestic wastewater discharge will not increase because of the addition of industrial effluent.	The area not meeting the guidelines for contact recreation due to domestic wastewater discharge will not increase because of the addition of industrial effluent.
Aesthetic value	Visual amenity will not deteriorate because of the addition of industrial effluent.	Visual amenity will not deteriorate because of the addition of industrial effluent.
Seafood for human consumption	The industrial wastewater discharge will not increase area not meeting the guidelines for seafood harvesting due to domestic wastewater discharge.	The industrial wastewater discharge will not increase area not meeting the guidelines for seafood harvesting due to domestic wastewater discharge.

Note: Text in **bold** in the Key Characteristics Table, indicates changes to the proposal.

Abbreviations

KWRP	Kwinana Water Reclamation Plan
ML/day	Megalitres per day
mg/L	milligram per litre
SDOOL	Sepia Depression Ocean Outlet Landline
PLOOM	Perth Long-term Ocean Outlet Monitoring
ANZECC & ARMCANZ	<i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i>

List of Figures: Figures 1 and 2 replace all Figures in Schedule 1

Figure 1: Location of Sepia Depression Ocean Outlet

Figure 2: Sepia Depression Ocean Outlet Toxicant Boundary

[Signed 15 July 2014]

Dr Paul Vogel
CHAIRMAN
Environmental Protection Authority
under delegated authority

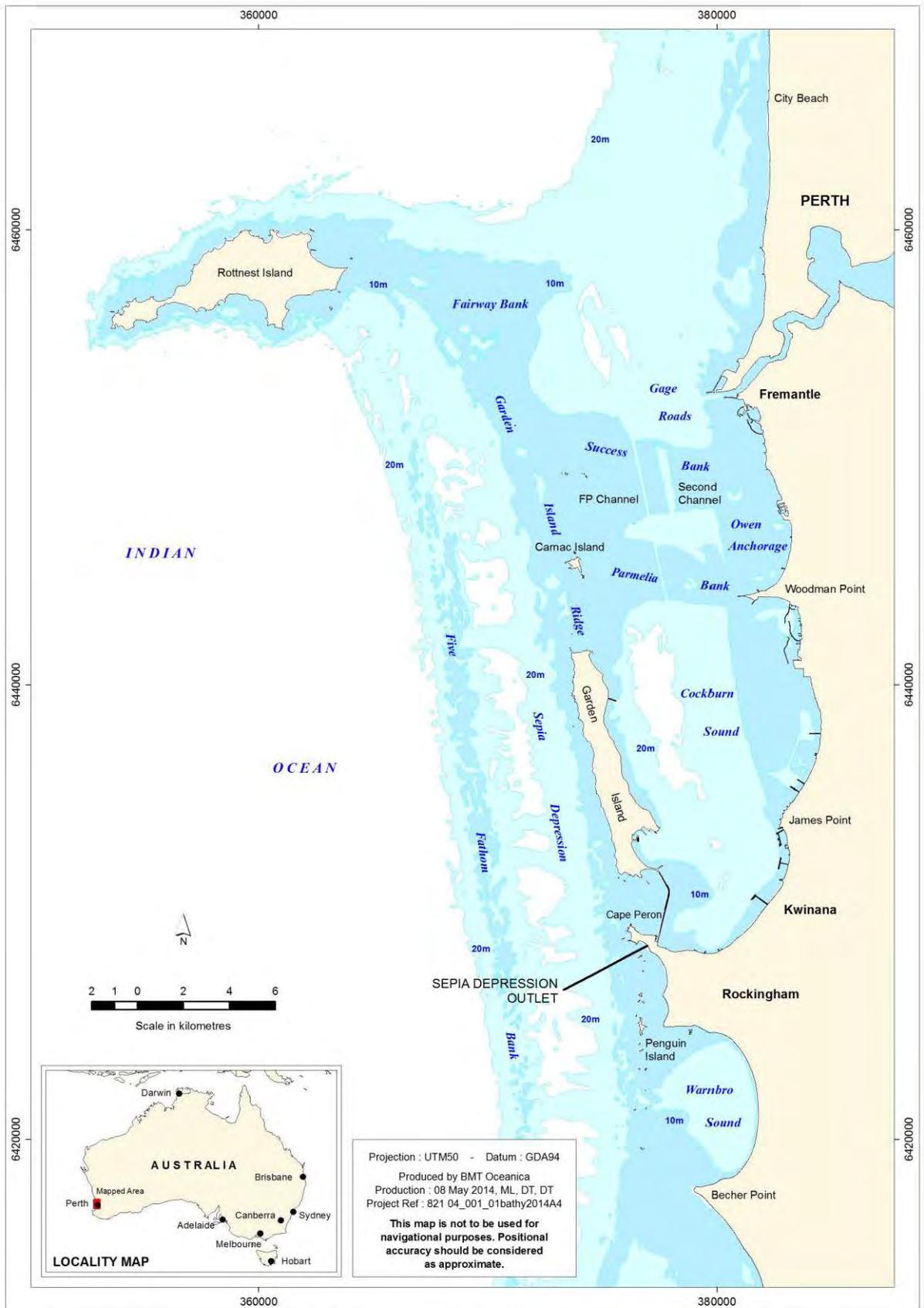


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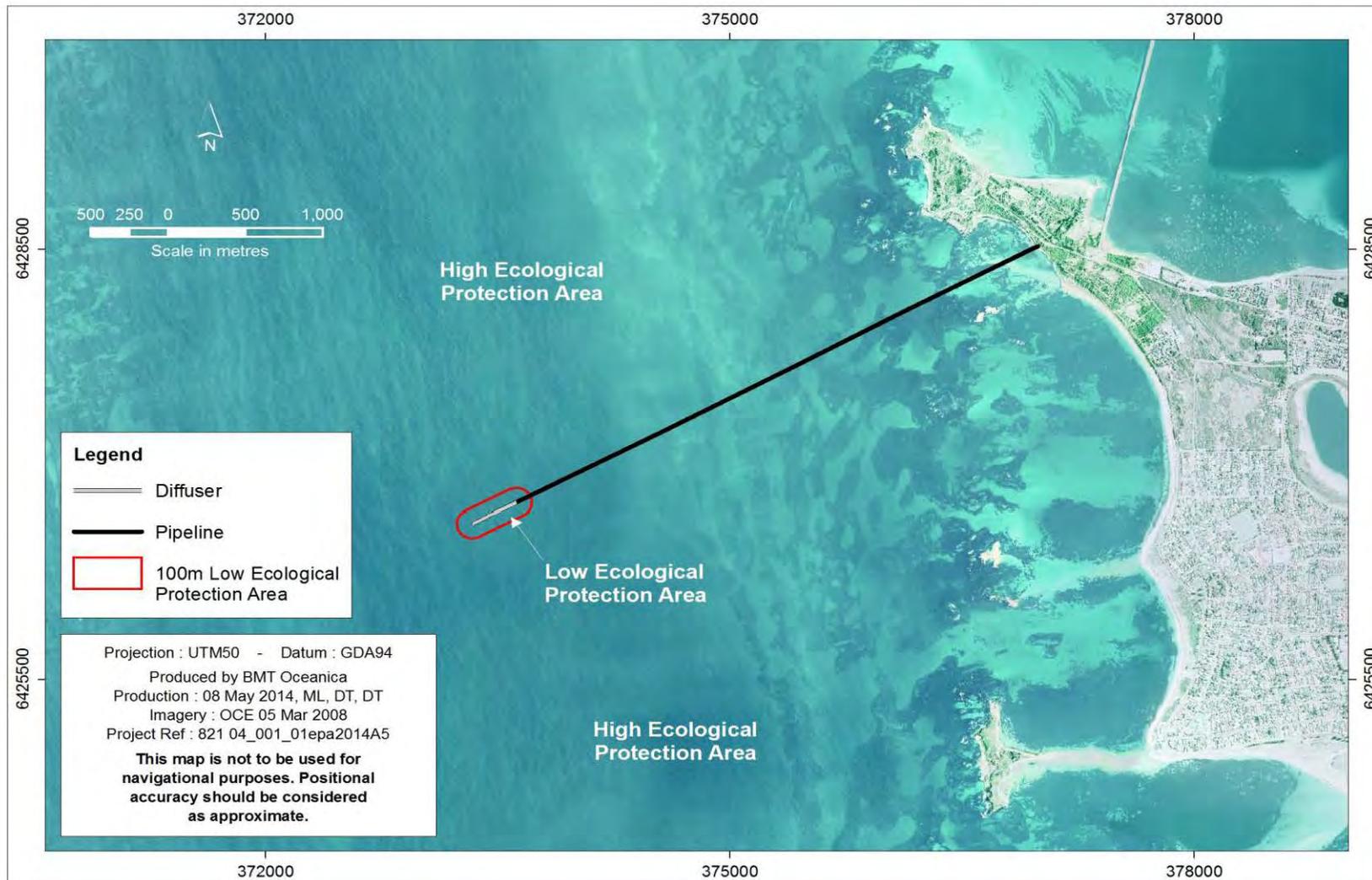


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Attachment 2 to Ministerial Statement 665

Change to proposal under s45C of the *Environmental Protection Act 1986*

Attachment 2 replaces Attachment 1 in Ministerial Statement 665

Proposal: Use of the Cape Peron Outlet Pipeline to Dispose of Industrial Wastewater to the Sepia Depression, Kwinana

Proponent: Water Corporation

The Proposal (Assessment No.1471) (Revised Description)

The proposal is to dispose of up to 30 megalitres per day of industrial wastewater, in addition to treated wastewater from Woodman Point and Cape Peron wastewater treatment plants and water from the Jervoise bay Groundwater Recovery Scheme, up to a combined maximum of 208 megalitres per day, through the Sepia Depression Ocean Outlet Landline, into the Sepia Depression from the following specified sources and further unspecified sources:

- the Kwinana Wastewater Reclamation Plant (KWRP);
- BP Refinery (Kwinana);
- CSBP Limited; and
- Edison Mission Energy.

The proposal takes into account the cumulative environmental impacts of replacing the Cape Peron Wastewater Treatment Plant with the East Rockingham Wastewater Treatment Plant.

The Sepia Depression Ocean Outlet is situated 4.1 kilometres offshore west-south-west of Point Peron (Figure 1). The proposal does not involve any construction or marine ecological disturbance. The existing pipeline and diffuser will be used. The proposal includes the instruments and controls, telemetry and shutdown systems between industries and the Kwinana Wastewater Reclamation Plant and Sepia Depression Ocean Outlet Landline as described in Section 2 of the Public Environmental Review (2004), which are relevant to monitoring and controlling wastewater input to the Sepia Depression.

Industrial wastewater will only be accepted if the quality of the combined wastewater stream meets the ANZECC & ARMCANZ 80% species protection guidelines for toxicants at discharge and the ANZECC and ARMCANZ 99% species protection guidelines for toxicants (excepting cobalt where the 95% species protection guideline will apply) at 100 metres from the diffuser (Figure 2).

The proposal does not allow any of the specified industries to increase their discharge of current contaminant loads to the marine environment without prior consideration by the Environmental Protection Authority.

Change:

- Replace “Annual Nitrogen Load” of 1,100 with 1,778 tonnes per annum.

Key Characteristics Table:

Parameter	Description of approved proposal		Description of approved change to proposal	
	Current plus initial KWRP (2013)	Possible expansion (2030)	Current plus initial KWRP (2013)	Possible expansion (2030)
Industry reclaimed Water Reuse	17 ML/day	up to 27 ML/day	17 ML/day	up to 27 ML/day
Industry Wastewater Discharge to SDOOL Typical Maximum	6 ML/day 13 ML/day	up to 30 ML/day	6 ML/day 13 ML/day	up to 30 ML/day
Combined Treated Wastewater Quantity and Quality Average Volume Typical* Maximum**	145 ML/day 160 ML/day	up to 200 ML/day up to 208 ML/day	145 ML/day 160 ML/day	up to 200 ML/day up to 208 ML/day
Suspended Solids	39-90 mg/L	35** mg/L	39-90 mg/L	35** mg/L
Biochemical Oxygen Demand (BOD ₅)	24-40 mg/L	16** mg/L	24-40 mg/L	16** mg/L
Total Phosphorous (TP)	11-22 mg/L	11* -12** mg/L	11-22 mg/L	11* -12** mg/L
Total Nitrogen (TN)	1,100 tonnes per annum	1,778 tonnes per annum	1,778¹ tonnes per annum	1,778 tonnes per annum
Dilution	Average dilution of the SDOOL wastewater stream will be at least 1:300 with the dilution being above 1:200 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.		Average dilution of the SDOOL wastewater stream will be at least 1:300 with the dilution being above 1:200 99% of the time within 100 metres of the Sepia Depression Ocean Outlet (SDOO) diffuser.	
Annual Toxicant Loads from Industrial	In order to manage the capped toxicant load, at a maximum permissible level of 208ML/day, the Water Corporation is responsible to carefully consider any proposed increase in toxicant loads to ensure ecological and social values of the marine environment are protected.	New Proposals for discharges to the Sepia Depression Ocean Outlet Landline will be referred to the EPA.	In order to manage the capped toxicant load, at a maximum permissible level of 208ML/day, the Water Corporation is responsible to carefully consider any proposed increase in toxicant loads to ensure ecological and social values of the marine environment are protected	New Proposals for discharges to the Sepia Depression Ocean Outlet Landline will be referred to the EPA.

* Typical means the expected average daily operational target.

** Maximum means the expected infrequent (<10% of the time) operational targets based on the monthly average contributions from each industry participant.

¹ The limit determined by Condition 10-1 of this Ministerial Statement.

Parameter	Description of approved proposal		Description of approved change to proposal	
	Current plus initial KWRP (2013)	Possible expansion (2030)	Current plus initial KWRP (2013)	Possible expansion (2030)
Toxicant Concentrations	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 80% species protection guideline values for bio-accumulating toxicants at the diffuser.	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 80% species protection guideline values for bio-accumulating toxicants at the diffuser.
	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 99% species protection guideline values (with the exception of cobalt, where the 95% guideline will apply) beyond 100 metres from the Sepia Depression Ocean Outlet diffuser.	As per PLOOM reporting, 1992 to 2002	Projected loads and flows will result in toxicant concentrations meeting the ANZECC & ARMCANZ 99% species protection guideline values (with the exception of cobalt, where the 95% guideline will apply) beyond 100 metres from the Sepia Depression Ocean Outlet diffuser.
Nutrient Loads	Nutrient loads from the SDOO to the Sepia Depression will be no greater than 1994 loads, and should subsequent monitoring show an adverse environmental impact at that level, it will be reduced to 75% of 1994 loads.		Nutrient loads from the SDOO to the Sepia Depression will be no greater than 1994 loads, and should subsequent monitoring show an adverse environmental impact at that level, it will be reduced to 75% of 1994 loads.	
Sediment	ANZECC & ARMCANZ Interim Sediment Quality Guideline-low levels to be used as trigger for management action and investigation for bio-accumulating substances within the Zone of Low Ecological Protection, and generally outside the Zone of Low Ecological Protection.		ANZECC & ARMCANZ Interim Sediment Quality Guideline-low levels to be used as trigger for management action and investigation for bio-accumulating substances within the Zone of Low Ecological Protection, and generally outside the Zone of Low Ecological Protection.	
Protection of Social Values				
Contact Recreation	The area not meeting the guidelines for contact recreation due to domestic wastewater discharge will not increase because of the addition of industrial effluent.		The area not meeting the guidelines for contact recreation due to domestic wastewater discharge will not increase because of the addition of industrial effluent.	
Aesthetic Value	Visual amenity will not deteriorate because of the addition of industrial effluent.		Visual amenity will not deteriorate because of the addition of industrial effluent.	
Seafood for human consumption	The industrial wastewater discharge will not increase area not meeting the guidelines for seafood harvesting due to domestic wastewater discharge.		The industrial wastewater discharge will not increase the area not meeting the guidelines for seafood harvesting due to domestic wastewater discharge.	

Note: Text in **bold** in the Key Characteristics Table, indicates changes to the proposal.

Abbreviations

KWRP	Kwinana Water Reclamation Plan
ML/day	Megalitres per day
mg/L	milligram per litre
SDOOL	Sepia Depression Ocean Outlet Landline
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List of Figures: Figures 1 and 2 replace all figures in Attachment 1

Figure 1: Location of Sepia Depression Ocean Outlet

Figure 2: Sepia Depression Ocean Outlet Toxicant Boundary

[Signed 20 February 2015]

Dr Paul Vogel
CHAIRMAN
Environmental Protection Authority
under delegated authority

Approval date: _____

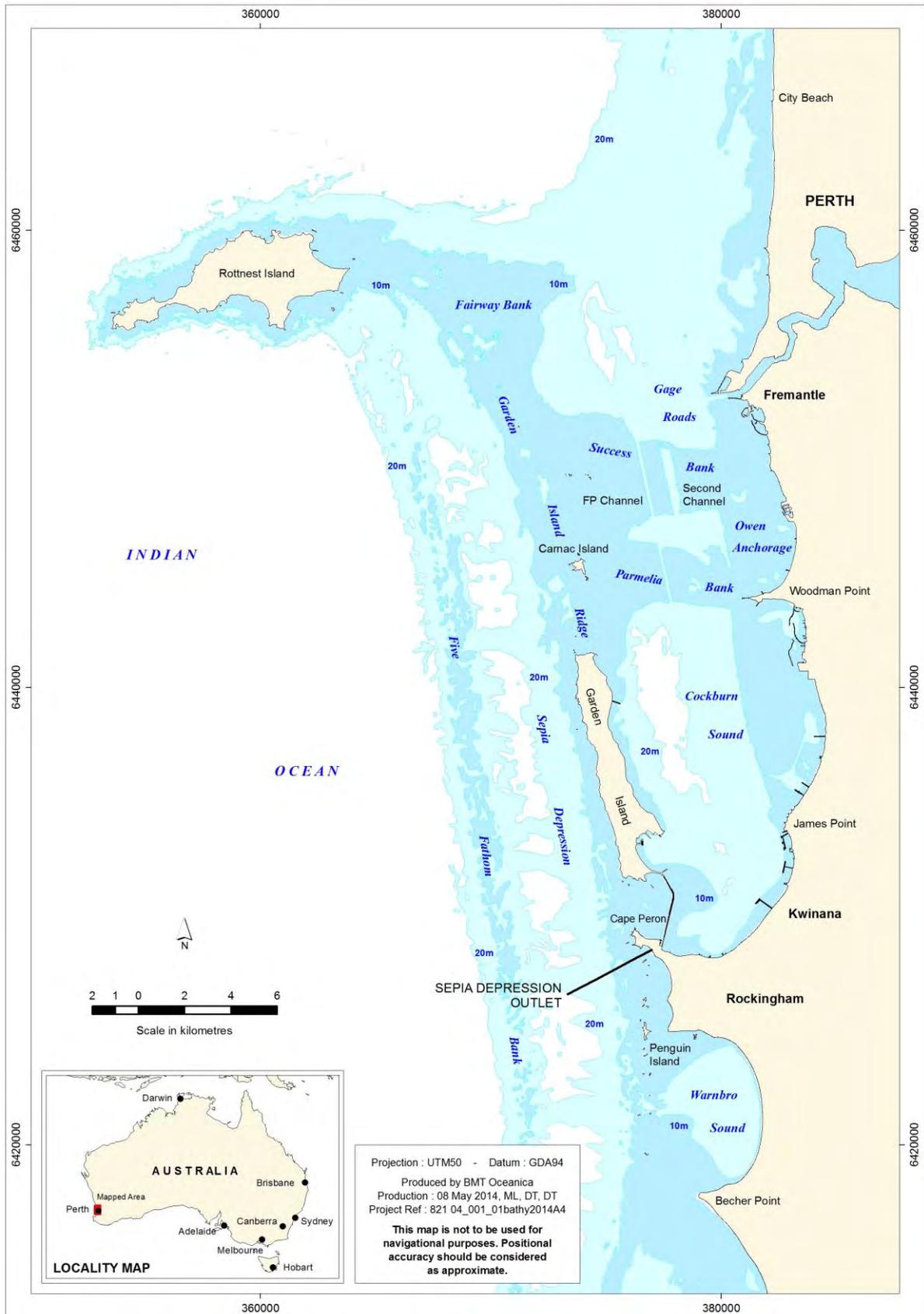


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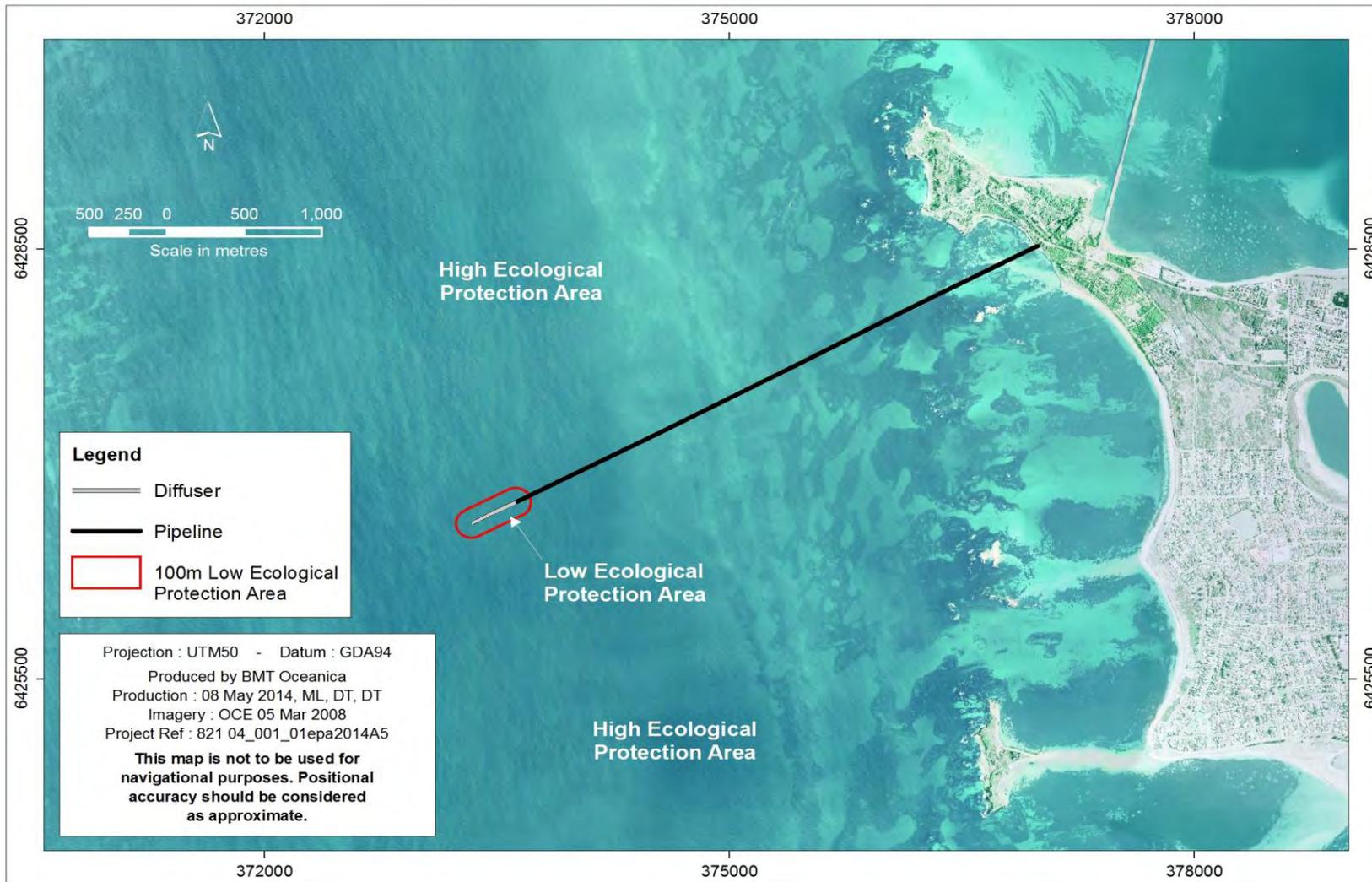


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The Sepia Depression Ocean Outlet is situated 4.1 kilometres offshore west-south-west of Point Peron (Figure 1). The proposal does not involve any construction or marine ecological disturbance. The existing pipeline and diffuser will be used. The proposal includes the instruments and controls, telemetry and shutdown systems between industries and the Kwinana Wastewater Reclamation Plant and Sepia Depression Ocean Outlet Landline as described in Section 2 of the Public Environmental Review (2004), which are relevant to monitoring and controlling wastewater input to the Sepia Depression.

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Change:

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[Signed 20 February 2015]

Dr Paul Vogel
CHAIRMAN
Environmental Protection Authority
under delegated authority

Approval date: _____

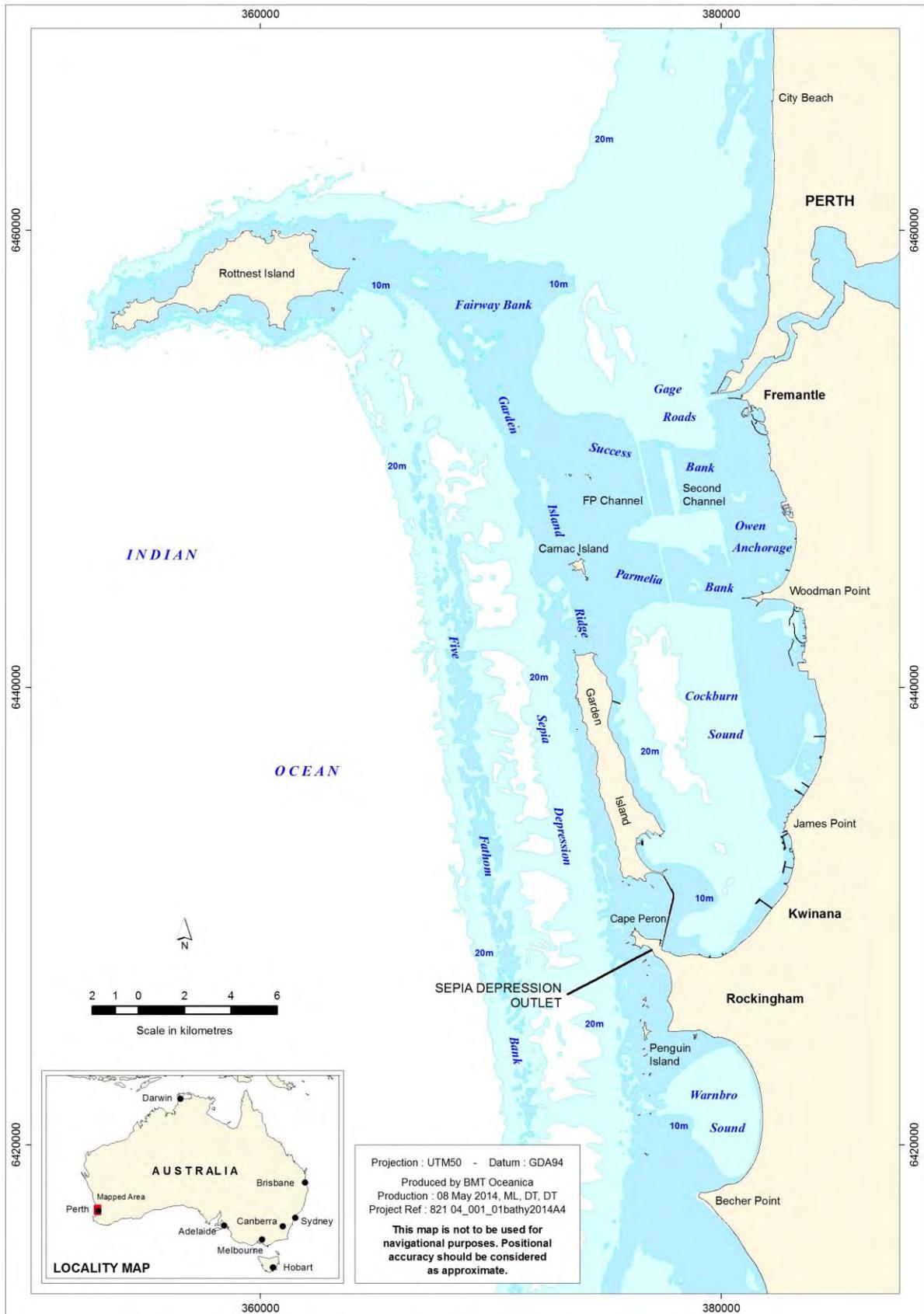


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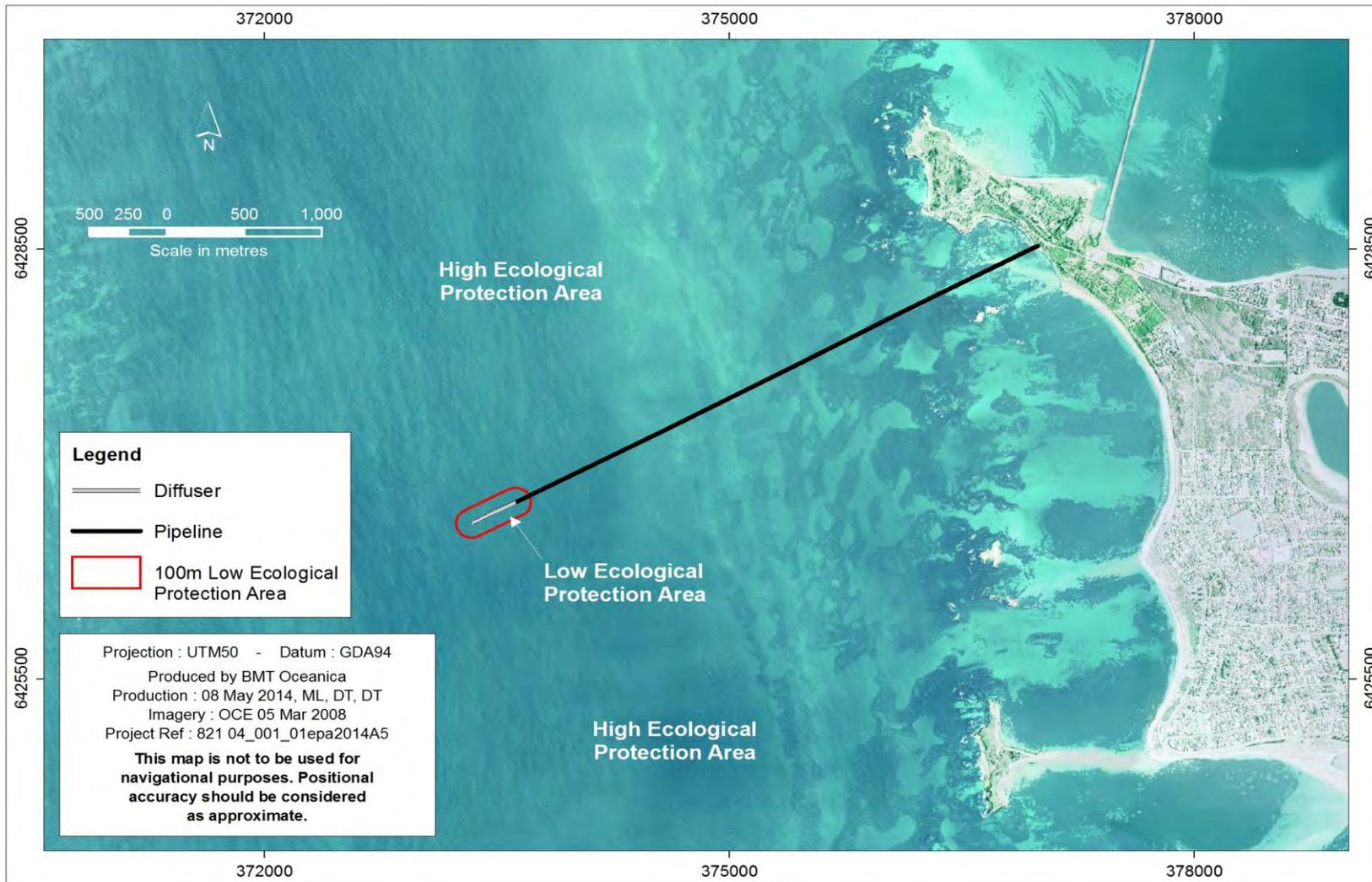


Figure 2: Sepia Depression Ocean Outlet Toxicant Boundary



Licence

Environmental Protection Act 1986, Part V

Licensee: Water Corporation

Licence: L4201/1991/11

Registered office: 629 Newcastle Street
 LEEDERVILLE WA 6007

Premises address: Woodman Point Wastewater Treatment Plant
 Cockburn Road
 MUNSTER WA 6166
 Being Lot 9 on Diagram 31097 as depicted in Schedule 1.

Issue date: Thursday, 28 October 2010

Commencement date: Monday, 1 November 2010

Expiry date: Friday, 31 October 2031

Prescribed premises category

Schedule 1 of the *Environmental Protection Regulations 1987*

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
54	Sewage facility: premises – (a) On which sewage is treated (excluding septic tanks); or (b) From which treated sewage is discharged onto land or into waters.	100 cubic metres per more per day	180,000 cubic metres per day
61	Liquid waste facility: premises on which liquid waste produced on other premises (other than sewerage waste) is stored, reprocessed, treated or irrigated.	100 tonnes or more per year	50,000 tonnes per annual period

Conditions

This Licence is subject to the conditions set out in the attached pages.

Date signed: 12 July 2016

.....
 Caron Goodbourn
 A/ Manager Licensing (Waste Industries)
 Officer delegated under section 20
 of the *Environmental Protection Act 1986*



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Licence	1
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Introduction	2
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Introduction

This Introduction is not part of the Licence conditions.

DER's industry licensing role

The Department of Environment Regulation (DER) is a government department for the state of Western Australia in the portfolio of the Minister for Environment. DER's purpose is to advise on and implement strategies for a healthy environment for the benefit of all current and future Western Australians.

DER has responsibilities under Part V of the *Environmental Protection Act 1986* (the Act) for the licensing of prescribed premises. Through this process DER regulates to prevent, control and abate pollution and environmental harm to conserve and protect the environment. DER also monitors and audits compliance with works approvals and licence conditions, takes enforcement action as appropriate and develops and implements licensing and industry regulation policy.

Licence requirements

This Licence is issued under Part V of the Act. Conditions contained within the Licence relate to the prevention, reduction or control of emissions and discharges to the environment and to the monitoring and reporting of them.

Where other statutory instruments impose obligations on the Premises/Licensee the intention is not to replicate them in the licence conditions. You should therefore ensure that you are aware of all your statutory obligations under the Act and any other statutory instrument. Legislation can be accessed through the State Law Publisher website using the following link:
<http://www.slp.wa.gov.au/legislation/statutes.nsf/default.html>

For your Premises relevant statutory instruments include but are not limited to obligations under the:

- *Environmental Protection (Unauthorised Discharges) Regulations 2004* – these Regulations make it an offence to discharge certain materials such as contaminated stormwater into the environment other than in the circumstances set out in the Regulations.
- *Environmental Protection (Controlled Waste) Regulations 2004* - these Regulations place obligations on you if you produce, accept, transport or dispose of controlled waste.
- *Environmental Protection (Noise) Regulations 1997* – these Regulations require noise emissions from the Premises to comply with the assigned noise levels set out in the Regulations.



You must comply with your licence. Non-compliance with your licence is an offence and strict penalties exist for those who do not comply.

Licence holders are also reminded of the requirements of section 53 of the Act which places restrictions on making certain changes to prescribed premises unless the changes are in accordance with a works approval, licence, closure notice or environmental protection notice.

Other Guidelines which you should be aware of include:

- *Western Australian Guidelines for Biosolids Management*, Department of Environment and Conservation, December 2012 (as amended from time to time).

Licence fees

If you have a licence that is issued for more than one year, you are required to pay an annual licence fee prior to the anniversary date of issue of your licence. Non payment of annual licence fees will result in your licence ceasing to have effect meaning that it will no longer be valid and you will need to apply for a new licence for your Premises.

Ministerial conditions

If your Premises has been assessed under Part IV of the Act you may have had conditions imposed by the Minister for Environment. You are required to comply with any conditions imposed by the Minister.

Premises description and Licence summary

The Woodman Point Wastewater Treatment Plant (WWTP) is owned and operated by Water Corporation and is located approximately 25km south west of Perth. The premises is surrounded by 'Special Use' town planning scheme zoned areas to the east, south and west, and is adjacent to the 'Jervoise Bay Cove' to the west. The premises services the southern suburbs of Perth which has a nominal contributing population of approximately 700,000.

The WWTP consists of pre-treatment, primary treatment and secondary treatment, which includes a four quadrant sequencing batch reactor (SBR) and an anaerobic biosolids digestion process.

Treated wastewater is discharged to the Sepia Depression via a 23km Sepia Depression Ocean Outfall Landline (SDOOL) and ocean outfall via the Jervoise Bay Cove.

An Odour Control Facility (OCF) treats odours from the pre-treatment and primary treatment facility, the SBR bio-selectors and the biosolids handling area. The plant also has a Tanker Receiver Facility (TRF), which accepts third party waste. The TRF has a separate dedicated chemical odour scrubber to control odour. Dewatered biosolids is removed from the premises and disposed of to landfill, with the liquid fraction from the WWTP and TRF being discharged to the flow balancing dam.

The plant is designed to treat up to 160 ML influent per day, with the average daily inflow currently at 141ML/d, for the 2014/ 2015 reporting period. As the premises is nearing capacity, the Licensee has proposed an upgrade to the premises which will increase the design capacity to 180 ML/d, on completion of the works upgrade. This will require the current operation to be taken off line and operated through a temporary (150 ML/d) system until the works are completed. The proposed works will be constructed over a 2.5 year period consisting of three stages that will include construction of the following:

Stage one –

- Two new 9.75 m vortex grit tanks;
- Four new primary sedimentation tanks;
- Eight secondary sedimentation tanks (temporarily designed as aeration tanks, four with lift out diffused aeration grids and four operated as clarifiers);
- New recycled water pump station and filtration system.



Stage two –

- Conversion of the SBR to a Modified Ludzack-Ettinger (MLE) configuration (Treated wastewater from the primary sedimentation tanks will bypass the SBR to the temporary secondary sedimentation tanks for a period of nine months).

Stage three –

- Secondary sedimentation tanks retrofitted from temporary aeration tanks to fully functioning secondary sedimentation tanks;
- Mixed liquor transferred to MLE quadrants over 2-3 days and blended with imported seed biosolids.

A desk top assessment of groundwater bore (Site Id. 20022946) on the western boundary of the premises identifies depth to groundwater at approximately 10.4 mBGL, with TDS approximately 5,000 mg/L (saline). The groundwater forms part of the Murray River Basin and Bartram Road Catchment.

The closest sensitive residential receptor has been identified by the Licensee as approximately 0.5 km south of the premises. The premises operation includes an odour buffer of 750 m to the nearest land use.

The premises is subject to conditions within Ministerial Statement 665.

The main potential emissions during construction are expected to be odour issues from the change in operational process and dust emissions from site construction.

This Licence is a DER initiated amendment to undertake administrative changes from the previous amendment process carried out for the works upgrade at the premises. Comments from the draft review process were omitted and are now included through this amendment.

The licences and works approvals issued for the Premises, since 25/10/1998, are:

Instrument log		
Instrument	Issued	Description
W1013/1991/1	25/10/1993	Works approval
W1330/1991/1	19/12/1995	Works approval
W2710/1991/1	01/04/1999	Works approval
L4201/1991/4	19/09/2000	Licence re-issue
L4201/1991/5	01/07/2001	Licence re-issue
L4201/1991/6	01/07/2002	Licence re-issue
L4201/1991/7	14/01/2003	Licence re-issue
W3793/1991/1	28/04/2003	Works approval
L4201/1991/8	30/06/2003	Licence re-issue
L4201/1991/9	02/07/2004	Licence re-issue
L4201/1991/10	31/10/2005	Licence re-issue
W4319/1991/1	01/10/2007	Works approval
L4201/1991/11	28/10/2010	Licence re-issue
L4201/1991/11	19/11/2015	Licence amendment
L4201/1991/11	14/04/2016	Licence amendment for works upgrade for design capacity increase
L4201/1991/11	12/07/2016	Licence amendment for administrative changes on previous amendment process

Severance

It is the intent of these Licence conditions that they shall operate so that, if a condition or a part of a condition is beyond the power of this Licence to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the power of this Licence to impose and are not otherwise *ultra vires* or invalid.

END OF INTRODUCTION



Licence conditions

1 General

1.1 Interpretation

1.1.1 In the Licence, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 For the purposes of this Licence, unless the contrary intention appears:

'Act' means the *Environmental Protection Act 1986*;

'annual period' means the inclusive period from 1 July until 30 June in the following year;

'AS/NZS 2031' means the Australian Standard AS/NZS 2031 *Selection of containers and preservation of water samples for microbiological analysis*;

'AS 4323.1' means the Australian Standard AS4323.1 *Stationary Source Emissions Method 1: Selection of sampling positions*;

'AS 4323.3' means the Australian Standard AS4323.3 *Stationary Source Emissions Part 3: Determination of odour concentration by dynamic olfactory*;

'AS/NZS 5667.1' means the Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of samples*;

'AS/NZS 5667.9' means the Australian Standard AS/NZS 5667.9 *Water Quality – Sampling – Guidance on sampling from marine waters*;

'AS/NZS 5667.10' means the Australian Standard AS/NZS 5667.10 *Water Quality – Sampling – Guidance on sampling of waste waters*;

'averaging period' means the time over which a limit is measured or a monitoring result is obtained;

'CEO' means Chief Executive Officer of the Department of Environment Regulation;

'CEO' for the purpose of correspondence means;
Chief Executive Officer
Department Administering the Environmental Protection Act 1986
Locked Bag 33
CLOISTERS SQUARE WA 6850
Email: info@der.wa.gov.au

'controlled waste' has the definition in *Environmental Protection (Controlled Waste) Regulations 2004*;

'Chemical Scrubber Outlet' means after the chemical scrubber but prior to entering the Odour Control Facility Discharge Stack;

'engineered containment system' means any vessel or tank containment infrastructure associated with the treatment of wastewater;

'g/s' means grams per second;

'hardstand' means a surface with a permeability of 10^{-9} metres/second or less;



'Jervoise Bay Ocean Outlet', 'Sepia Depression Ocean Outlet (SDOOL)' and 'Woodman Point Ocean Outlet' mean the marine discharge points labelled and depicted in Schedule 1: Maps of the Licence;

'leachate' means liquid released by or water that has percolated through waste and which contains some of its constituents;

'Licence' means this Licence numbered L4201/1991/11 and issued under the Act;

'Licensee' means the person or organisation named as Licensee on page 1 of the Licence;

'Ministerial Statement 665' means "*Ministerial Statement 665 - Use of the Cape Peron Outlet Pipeline to Dispose of Industrial Wastewater to the Sepia Depression, Kwinana*" as amended from time to time;

'NATA' means the National Association of Testing Authorities, Australia;

'NATA accredited' means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis;

'normal operating conditions' means any operation of a particular process (including abatement equipment) excluding start-up, shut-down and upset conditions, in relation to stack sampling or monitoring;

'Odour Control Facility' and 'Odour Control Facility Discharge Stack' means those structures labelled and depicted in Schedule 1;

'Odour Control Summary' means Woodman Point Wastewater Treatment Plant Upgrade – Odour Control Summary, identified as Appendix 1 within Woodman Point Wastewater Treatment Plant Licence Amendment – Supporting Document, November 2015. Version: 2 February 2016. Doc Id. PM#13945397-V4.)

'OU' means odour units;

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Licence;

'process equipment' means any wastewater or biosolids containment infrastructure or wastewater treatment vessel;

'quarterly' means the 4 inclusive periods from, 1 July to 30 September, 1 October to 31 December and in the following year, 1 January to 31 March and 1 April to 30 June;

'Schedule 1' means Schedule 1 of this Licence unless otherwise stated;

'Schedule 2' means Schedule 2 of this Licence unless otherwise stated;

'six monthly' means the 2 inclusive periods from 1 July to 31 December and 1 January to 30 June in the following year;

'spot sample' means a discrete sample representative at the time and place at which the sample is taken; and

'stack test' means a discrete set of samples taken over a representative period at normal operating conditions;

'STP' means standard temperature and pressure (0°Celsius and 101.325 kilopascals respectively);



‘Tanker Receival Facility’ and **‘Tanker Receival Facility Discharge Stack’** means those structures labelled and depicted in Schedule 1;

‘usual working day’ means 0800 – 1700 hours, Monday to Friday excluding public holidays in Western Australia.

‘USEPA’ means United States (of America) Environmental Protection Agency; and

‘USEPA Method 2’ means the USEPA Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube).

‘Waste Code’ means the Waste Code assigned to a type of controlled waste for purposes of waste tracking and reporting as specified in the Department of Environment Regulation “Controlled Waste Category List” (July 2014), as amended from time to time; and

‘wastewater treatment vessels’ means any vessel, pond or tank containment infrastructure associated with the storage and treatment of wastewater.

1.1.3 Any reference to an Australian or other standard in the Licence means the relevant parts of the the standard in force from time to time during the term of this Licence.

1.1.4 Any reference to a guideline or code of practice in the Licence means the version of that guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guideline or code of practice made during the term of this Licence.

1.2 General conditions

1.2.1 The Licensee shall operate and maintain all pollution control (odour control facility, covers on process equipment) and monitoring equipment (continuous monitors) to the manufacturer’s specification or any relevant and effective internal management system.

1.2.2 The Licensee shall immediately recover, or remove and dispose of spills of waste (as defined in Table 1.3.1) outside an engineered containment system.

1.2.3 Subject to the Conditions of this Licence, the Licensee must construct and operate the Works in accordance with the document listed in Table 1.2.1.

Table 1.2.1: Construction Requirements¹

Document	Parts	Date of Document
Woodman Point Wastewater Treatment Plant Licence Amendment – Supporting Document, November 2015. Version: 2 February 2016. Doc Id. PM#13945397-V4.	All, including appendices and drawings	2 February 2016

Note 1: Where the details and commitments of the documents listed in condition 1.2.1 are inconsistent with any other condition of this Licence, the Conditions of this Licence shall prevail.

1.2.4 The Licensee must ensure that the proposed Works specified in Column 1 of Table 1.2.2 meets or exceeds the specifications in Column 2 of Table 1.2.2 for the infrastructure in each row of Table 1.2.2.

1.2.5 The Licensee must not depart from the specifications in Table 1.2.2 except:
 (a) where such departure is minor in nature and does not materially change or affect the infrastructure; or
 (b) where such departure improves the functionality of the infrastructure and does not increase risks to public health, public amenity or the environment;
 and all other Conditions in this Licence are still satisfied.



Table 1.2.2: Works specifications	
Column 1	Column 2
Infrastructure	Specifications (design and construction)
Stage one	<ol style="list-style-type: none"> 1. Installation of two new 9.75 m vortex grit tanks to replace pre-treatment (cross-flow) detritors; 2. Grit tanks to have trafficable FRP covers; 3. Grit tanks to include ability to have pumped grit removal and separate grit washer; 4. Foul air extraction to be included for the grit washing and classification systems; 5. Construction of four new primary sedimentation tanks (PST); 6. Construction of eight secondary sedimentation tanks (temporarily designed as aeration tanks, four with lift out diffused aeration grids and four operated as clarifiers); 7. SST to each include a pair of direct-piped Return Activated Biosolids (RAS) pumps; 8. New recycled water pump station and filtration system integrated into system with existing recycled water facility decommissioned; 9. New recycled water pump station to include a new junction chamber on the twin outlets to the treated water disposal pump station to allow dam bypass functionality; 10. Incorporation of a new solids-liquids separation system.
Stage two	<ol style="list-style-type: none"> 1. Conversion of the SBR to a continuously aerated Modified Ludzack-Ettinger (MLE) configuration (Treated wastewater from the primary sedimentation tanks will bypass the SBR to the temporary secondary sedimentation tanks for a period of nine months); 2. Treated wastewater to be diverted to the SST from the PST during conversion of the SBR; 3. Decommissioning and removal of two mixed liquor recycle (MLR) pump stations, one WAS pump station, eight mechanical decanters and the existing fixed-to-floor system from each SBR basin; 4. Construction of baffle walls and MLR duct; 5. Height of the existing peripheral channel wall adjacent to basin 1 and 2 increased; 6. New mixed liquor discharge structure intergrated into channel; 7. Installation of three submersible mixers, five submersible MLR pumps and one submersible drain pump into each MLE basin.
Stage three	<ol style="list-style-type: none"> 1. Eight secondary sedimentation tanks retrofitted from temporary aeration tanks to six fully functioning secondary sedimentation tanks; 2. Mixed liquor transferred to MLE quadrants over 2-3 days and blended with imported seed biosolids; 3. Imported seed biosolids to be obtained from Beenyup or Kwinana WWTP's.

- 1.2.6 If Condition 1.2.5 applies, then the Licensee must provide the CEO with a list of departures which are certified as complying with Condition 1.2.5 at the same time as the certifications under Condition 1.2.8.
- 1.2.7 The Licensee must submit a construction compliance document to the CEO, within one month, following the construction of each stage (Stages 1 to 3) of the Works at Woodman Point Wastewater Treatment Plant.
- 1.2.8 The Licensee must ensure the construction compliance document:
- (a) is certified by a suitably qualified professional engineer or builder that each item of infrastructure specified in Condition 1.2.5, Table 1.2.2 has been constructed in accordance with the Conditions of the Licence with no material defects; and



- (b) be signed by a person authorised to represent the Licensee and contain the printed name and position of that person within the company.

1.2.9 The Licensee must not operate the premises above 160 ML/day until the compliance documents for all stages of the works upgrade have been submitted and in accordance with Licence conditions 1.2.6-1.2.8.

1.3 Premises operation

1.3.1 The Licensee shall only accept waste on to the Premises if:

- (a) it is of a type listed in Table 1.3.1;
(b) the quantity accepted is below any quantity limit listed in Table 1.3.1; and
(c) it meets any specification listed in Table 1.3.1.

Table 1.3.1: Waste acceptance			
Waste	Waste Code	Quantity Limit	Specification¹
Putrescible and Organic wastes			
Sewage waste	K130	180 ML/ day	<ul style="list-style-type: none"> Accepted through sewer inflows; and/ or Tankered into the premises and discharged via the WWTP pre-treatment works during emergency events or maintenance works.
Septage waste	K210	Combined total of 50,000 t/annual period	<ul style="list-style-type: none"> Tankered into the premises and discharged via the Tanker Reveal Facility.
Vegetable oils and derivatives and other wastes	K200		
Wool scouring wastes	K190		
Tannery wastes not containing chromium	K140		
Animal effluent and residues	K100		
Grease waste	K110		
Industrial Strength Wastewater			
Industrial wash water	L150		
Car and truck wash waters	L100		
Inorganic Chemicals			
Non toxic salts	D300		

Note 1: Additional requirements for the acceptance of controlled waste are set out in the *Environmental Protection (Controlled Waste) Regulations 2004*.

1.3.2 The Licensee shall ensure that where waste does not meet the waste acceptance criteria set out in conditions 1.3.1 it is removed from the Premises by the delivery vehicle or, where that is not possible, the Licensee shall contact the CEO to agree a course of action in relation to the waste.

1.3.3 The Licensee shall ensure that wastes accepted onto the Premises are only subjected to the process(es) set out in Table 1.3.2 and in accordance with any process limits described in that Table.



Table 1.3.2: Waste processing		
Waste type	Process	Process requirements
Sewage	Physical, chemical and biological treatment	<ol style="list-style-type: none"> 1. Treatment of sewage waste shall be at or below the treatment capacity of 180 ML/day. 2. Sewage biosolids to be directed to ABD; 3. Dewatered biosolids to be removed via a controlled waste carrier to a licenced landfill. 4. Discharged to ocean outfall via SDOOL.
Liquid waste	Physical, chemical and biological treatment	<ol style="list-style-type: none"> 1. Treatment of liquid waste received shall be at or below 50,000 tonnes per annual period; 2. Tested for pH and electrical conductivity prior to being processed at the premises. 3. Leachate from dewatering system to be returned back to the WWTP pre-treatment works.
Biosolids	Physical, biological treatment	<ol style="list-style-type: none"> 1. Dewatered biosolids to be removed to for offsite disposal.

1.3.4 The Licensee shall ensure that waste material is only stored and/or treated within vessels or compounds provided with the infrastructure detailed in Table 1.3.3.

Table 1.3.3: Containment infrastructure		
Vessel or compound	Material	Requirements
Inlet works (Step Screen)	Grit and Screenings	<ul style="list-style-type: none"> • Screening wash which returns leachate to the start of the treatment process. • Screenings stored within an enclosed bin which is removed to landfill weekly.
Tanker receival facility	Wastewater	<ul style="list-style-type: none"> • Covered except during routine maintenance or emergency situations; • Chemical scrubbers; • Odour emission stack.
Primary sedimentation tanks	Wastewater	<ul style="list-style-type: none"> • Tanks constructed of concrete with splitter box.
Secondary sedimentation tanks	Wastewater	<ul style="list-style-type: none"> • Tanks constructed of concrete with splitter chamber.
Sequencing batch reactor (SBR)	Treated wastewater	<ul style="list-style-type: none"> • Constructed of concrete; • Biosolids directed via Dissolved Air Flotation Tank to ABD; • Liquid fraction directed to flow balancing dam.
Flow balancing dam	Treated wastewater	<ul style="list-style-type: none"> • 2 x 1.5 mm Plastic lined (polyethylene) layers with leak detection layer; • Discharge to ocean outfall via SDOOL.
Odour control facility	-	<ul style="list-style-type: none"> • Enclosed; • Odour scrubbing equipment; • Odour emission stack.
Anerobic biosolids digester (ABD)	Sewage biosolids	<ul style="list-style-type: none"> • Enclosed; • Digested biosolids storage tank; • Dewatering centrifuge; • Biosolid hoppers.



- 1.3.5 The Licensee shall take the specified management action in the case of an event in Table 1.3.4.

Table 1.3.4: Management actions			
Emission point	Event/ action reference	Event	Management action
Odour control facility and Tanker Receiving Facility	EA1	Hydrogen sulphide emission levels above 1,500 ppb from the chemical scrubber outlets	a) Assess operation to determine any failure, malfunction or abnormal operation period; b) Implement corrective actions to reduce hydrogen sulphide emission levels; c) Restore normal operation of any failed equipment or replace the failed equipment; d) Notify DER CEO in writing, as per condition 5.3.1.

- 1.3.6 Following the cessation of emissions/operation under condition 1.3.5, the Licensee shall not restart operation of the process until:
- (a) the problem has been rectified; and
 - (b) the Licensee has complied with condition 1.3.5.
- 1.3.7 The Licensee shall manage the wastewater treatment vessels such that:
- (a) overtopping of the vessels does not occur; and
 - (b) stormwater runoff is prevented from entering the vessels; and
 - (c) the integrity of the containment infrastructure and facility operation is maintained; and
 - (d) vegetation and floating debris (emergent or otherwise) is prevented from growing or accumulating in the vessels.
- 1.3.8 The Licensee shall:
- (a) implement security measures at the site to prevent as far as is practical unauthorised access to the site; and
 - (b) undertake regular inspections of all security measures and repair damage as soon as practicable; and
 - (c) ensure the entrance gates are closed and locked when the site is closed or unmanned.
- 1.3.9 The Licensee must develop an 'Odour Monitoring Strategy' within three months of commencing construction that will:
- (a) specify an odour field criteria that can be compared against the odour field assessment results;
 - (b) undertake a risk assessment of exceedences and the proposed management measures to be employed.
- 1.3.10 The Licensee must:
- (a) undertake an odour verification of the monitoring and modelling programme (MAM) initially completed, within six months of full operation of the new works, to confirm it is compliant against the 'odour control summary'; and
 - (b) develop contingencies/ mitigation measures where any failures/ exceedences have been found to occur against the MAM verification.



2 Emissions

2.1 General

2.1.1 The Licensee shall record and investigate the exceedance of any descriptive or numerical limit specified in any part of section 2 of this Licence.

2.2 Point source emissions to air

2.2.1 The Licensee shall ensure that where waste is emitted to air from the emission points in Table 2.2.1 and identified on the map of emission points in Schedule 1, it is done so in accordance with the conditions of this Licence.

Table 2.2.1: Emission points to air			
Emission point reference and location on Map of emission points	Emission Point	Emission point height (m)	Source, including any abatement
Odour control facility	Chemical scrubber inlet	-	Hydrogen sulphide emitted. Chemical odour scrubbers in use.
	Chemical scrubber outlet (prior to entering discharge stack)	-	
	Discharge stack	50 m	
Tanker receival facility	Chemical scrubber	-	
	Discharge stack	12 m	

2.3 Point source emissions to surface water

2.3.1 The Licensee shall ensure that where waste is emitted to surface water from the emission points in Table 2.3.1, and identified on the map of emission points in Schedule 1, it is done so in accordance with the conditions of this Licence.

Table 2.3.1: Emission points to surface water		
Emission point reference and location on Map of emission points	Description	Source including abatement
Sepia Depression Ocean Outfall Landline (SDOOL)	Discharge pipeline to ocean outfall ¹	Treated effluent.
Woodman Point Ocean Outlet	Discharge pipe to ocean	Treated effluent only discharged during routine maintenance or emergency situations, in order of priority, to: <ul style="list-style-type: none"> • Woodman Point Ocean Outlet; and • Jervoise Bay Ocean Outlet.
Jervoise Bay Ocean Outlet		

Note 1: Combined discharge volumes are regulated under Ministerial Statement 665.



2.4 Odour

2.4.1 The Licensee must ensure odour emissions are managed in accordance with the documents, or parts of documents, specified in Table 2.4.1.

Management Plan Reference	Parts	Date of Document
Odour Improvement Plan, Water Corporation.	All	December 2006
Odour Management Plan and Mitigation Strategy	All	
Woodman Point Wastewater Treatment Plant Upgrade – Odour Control Summary (Identified as Appendix 1 within Woodman Point Wastewater Treatment Plant Licence Application – Supporting Document, Ref. AQUA #13945397) (Water Corporation independent document reference number AQUA#14290847).	All, including appendices	2 February 2016

3 Monitoring

3.1 General monitoring

3.1.1 The licensee shall ensure that:

- (a) all water samples are collected and preserved in accordance with AS/NZS 5667.1;
- (b) all surface water sampling is conducted in accordance with AS/NZS 5667.9
- (c) all wastewater sampling is conducted in accordance with AS/NZS 5667.10;
- (d) all groundwater sampling is conducted in accordance with AS/NZS 5667.11;
- (e) all microbiological samples are collected and preserved in accordance with AS/NZS 2031; and
- (f) all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured unless indicated otherwise in the relevant table.

3.1.2 The Licensee shall ensure that :

- (a) monthly monitoring is undertaken at least 15 days apart;
- (b) quarterly monitoring is undertaken at least 45 days apart; and
- (c) annual monitoring is undertaken at least 9 months apart.

3.1.3 The Licensee shall ensure that all monitoring equipment used on the Premises to comply with the conditions of this Licence is calibrated in accordance with the manufacturer's specifications.

3.1.4 The Licensee shall, where the requirements for calibration cannot be practicably met, or a discrepancy exists in the interpretation of the requirements, bring these issues to the attention of the CEO accompanied with a report comprising details of any modifications to the methods.



3.2 Monitoring of point source emissions to air

3.2.1 The Licensee shall undertake the monitoring in Table 3.2.1 according to the specifications in that table.

Table 3.2.1: Monitoring of point source emissions to air						
Emission point reference	Parameter	Units¹	Limit	Averaging period	Frequency²	Method
Odour control facility	Hydrogen sulphide – Chemical scrubber inlets (S1008217/ S20 & S1008219/ S21)	ppm	-	Monthly to achieve a 90% availability	Continuous	-
	Hydrogen sulphide - chemical scrubber outlet prior to entering discharge stack (S100761/ S27)	ppb	1,500			
	Volumetric flow rate (S1008217 & S1008219)	m ³ /hr	-		Continuous	USEPA Method 2
Odour control facility – discharge stack sampling (FT07011/ M48 & AT07002/ M49)	Hydrogen sulphide (concentration)	mg/ m ³	5	Spot sample	Annual	Manual
	Hydrogen sulphide (rate)	g/s	0.25			-
	Volumetric flow rate	m ³ /s	-			USEPA Method 2
	Stack exit temperature	°celsius	-			-
	Odour units	OU	-			AS 4323.1 AS 4323.3
Tanker receival facility – stack sampling (S1004857)	Hydrogen sulphide	mg/ m ³	5	Spot sample	Annual	Manual
	Volumetric flow rate	m ³ /s	-			USEPA Method 2
	Stack exit temperature	°celsius	-			-
	Odour units	OU	-			AS 4323.1 AS 4323.3

Note 1: All units are referenced to STP dry.

Note 2: Monitoring shall be undertaken to reflect normal operating conditions and any limits or conditions on inputs or production.



3.3 Monitoring of point source emissions to surface water

3.3.1 The Licensee shall undertake the monitoring in Table 3.3.1 according to the specifications in that table.

Table 3.3.1: Monitoring of point source emissions to surface water					
Emission point reference	Parameter	Units	Frequency		
Treated Water channel, at new Reclaimed Water pump station (S1002273/ S9)	pH ¹	-	Monthly		
	Total suspended solids	mg/L			
	Total dissolved solids				
	Biological oxygen demand				
	Total nitrogen				
	Total phosphorus				
	Ammonium-nitrogen				
	Nitrate+nitrite-nitrogen				
	<i>E. coli</i> ³			cfu/ 100 ml	
	Cadmium	mg/L		Quarterly	
Copper					
Chromium					
Lead					
Mercury					
Nickel					
Zinc					
	Contaminant loading ²	kg/d	Annual		

Note 1: In situ non-NATA accredited sampling permitted.

Note 2: Each parameter identified within the table assessed using flow-weighted data, excluding pH and *E. coli*.

Note 3: Actual units are to be reported except where the result is greater than the highest detectable level of 24,000 cfu/100mL. In this case the reporting of the highest detectable level is permitted.

3.4 Monitoring of inputs and outputs

3.4.1 The Licensee shall undertake the monitoring in Table 3.4.1 according to the specifications in that table.

Table 3.4.1: Monitoring of inputs and outputs					
Input/Output	Monitoring point reference	Parameter	Units	Averaging period	Frequency
Wastewater input	WWTP Inflow meter (S1001222/ S1)	Volumetric flow rate (cumulative)	m ³ /day; or ML/ day	Monthly	Continuous
	Tanker receival facility	Liquid waste			Each load received to the facility
Wastewater output	WWTP Outflow meter (S1004373/ M10)	Volumetric flow rate (cumulative)			Continuous
Biosolids output	ABD	Sewage biosolids	m ³ /day; or tonnes	Monthly	Each load leaving the premises



3.5 Process monitoring

3.5.1 The Licensee shall undertake the monitoring in Table 3.5.1 according to the specifications in that table.

Table 3.5.1: Process monitoring					
Monitoring point reference	Process description	Parameter	Units	Frequency	Method
Tanker Receiving Facility	Compliance assessment of all tankered controlled waste received against condition 1.3.1	Flow	-	Each load received to or rejected from the premises	Visual
	Tanker controlled waste received	pH electrical conductivity	-		None specified

4 Improvements

4.1.1 The Licensee shall complete the improvements in Table 4.1.1 by the date of completion in Table 4.1.1.

Table 4.1.1: Improvement program		
Improvement reference	Improvement	Date of completion
IR1	The Licensee shall install an analyser that can suitably measure and (if applicable) calculate the Hydrogen Sulphide (H ₂ S) emissions from the Tanker Receiving Facility stack. Data recorded from the analyser shall be undertaken as per the requirements stated within conditions 1.3.5, 2.2.1 and 3.2.1 of the Licence, on an annual basis.	31/01/2017

5 Information

5.1 Records

5.1.1 All information and records required by the Licence shall:

- be legible;
- if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval;
- except for records listed in 5.1.1(d) be retained for at least 6 years from the date the records were made or until the expiry of the Licence or any subsequent licence; and
- for those following records, be retained until the expiry of the Licence and any subsequent licence:
 - off-site environmental effects; or
 - matters which affect the condition of the land or waters.

5.1.2 The Licensee shall complete an Annual Audit Compliance Report indicating the extent to which the Licensee has complied with the conditions of the Licence, and any previous licence issued under Part V of the Act for the Premises for the previous annual period.



- 5.1.3 The Licensee shall:
- (a) implement a complaints management system that shall record the following information (if known or provided) about complaints received at the Premises concerning any environmental impact of the activities undertaken at the Premises:
 - (i) name and address of the complainants (if consented);
 - (ii) date and time of complaint;
 - (iii) date and time of alleged incident;
 - (iv) alleged source of the incident;
 - (v) general description of the alleged incident, including any environmental or health impacts reported by the complainant;
 - (vi) wind direction, wind speed and temperature at time of alleged incident;
 - (vii) likely source of the alleged incident; and
 - (viii) actions taken by the Licensee to address the complaint, including the outcome of any investigation(s) and action(s) to verify any impacts.
 - (b) complete an annual analysis and review of complaints recorded under 5.1.3(a) to identify any common factors and root cause of complaints and proposals to address these.

5.2 Reporting

- 5.2.1 The Licensee shall submit to the CEO an Annual Environmental Report within 63 calendar days after the end of the annual period (1 September). The report shall contain the information listed in Table 5.2.1 in the format or form specified in that table.

Table 5.2.1: Annual Environmental Report		
Condition or table (if relevant)	Parameter	Format or form¹
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Table 1.3.4	Summary of Management actions undertaken	None specified
Table 3.2.1	Summary of Monitoring of point source emissions to air	None specified
Table 3.3.1	Summary of Monitoring of point source emissions to surface water	None specified
Table 3.4.1	Summary of Monitoring of inputs/ outputs	None specified
Table 3.5.1	Summary of Process monitoring	None specified
5.1.2	Compliance	Annual Audit Compliance Report (AACR)
5.1.3	Complaints summary	None specified

Note 1: Forms are in Schedule 2

- 5.2.2 The Licensee shall ensure that the Annual Environmental Report also contains:
- (a) any relevant process, production or operational data recorded; and
 - (b) an assessment of the information contained within the report against previous monitoring results and Licence limits.



5.2.3 The Licensee shall submit the information in Table 5.2.2 to the CEO according to the specifications in that table.

Table 5.2.2: Non-annual reporting requirements				
Condition or table (if relevant)	Parameter	Reporting period	Reporting date (after end of the reporting period)	Format or form
-	Copies of original monitoring reports submitted to the Licensee by third parties	Not applicable	Within 14 days of the CEOs request	As received by the Licensee from third parties
-	Record of tankered third party waste (date/ time)	Not applicable		As recorded by Licensee

5.3 Notification

5.3.1 The Licensee shall ensure that the parameters listed in Table 5.3.1 are notified to the CEO in accordance with the notification requirements of the table.

Table 5.3.1: Notification requirements			
Condition or table (if relevant)	Parameter	Notification requirement¹	Format or form²
-	Any maintenance works on the SDOOL that will require the use of the Woodman Point or Jervoise Bay Ocean Outlets	Two weeks prior to planned maintenance operations taking place; or As soon as practicable but no later than 5pm of the next usual working day after becoming aware of any emergency maintenance operations undertaken.	None specified
1.3.5	Limit exceedance where management action taken	As soon as practicable but no later than 5pm of the next usual working day after becoming aware of any confirmed measurement that was not rectified within four hours of detection.	None specified
		Submit to the CEO a written report within five working days of receiving the confirmed measurement and shall include, but not limited to: (i) Date and time of exceedance; (ii) Results of continuous monitoring required by conditions 2.2.1 and 3.2.1 at the time of the exceedance; (iii) Cause of the exceedance; (iv) Indication of potential or known environmental impacts of the exceedance; and (v) Any corrective actions undertaken to prevent recurrence.	Email or letter
1.3.1, 1.3.4 and 3.2.1	Breach of any descriptive or numerical limit specified in the Licence	Part A: As soon as practicable but no later than 5pm of the next usual working day. Part B: As soon as practicable	N1



3.1.4	Calibration report	As soon as practicable.	None specified
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Note 1: Notification requirements in the Licence shall not negate the requirement to comply with s72 of the Act

Note 2: Forms are in Schedule 2



Schedule 1: Maps

Premises map

The Premises is shown in the maps below. The blue line depicts the Premises boundary.





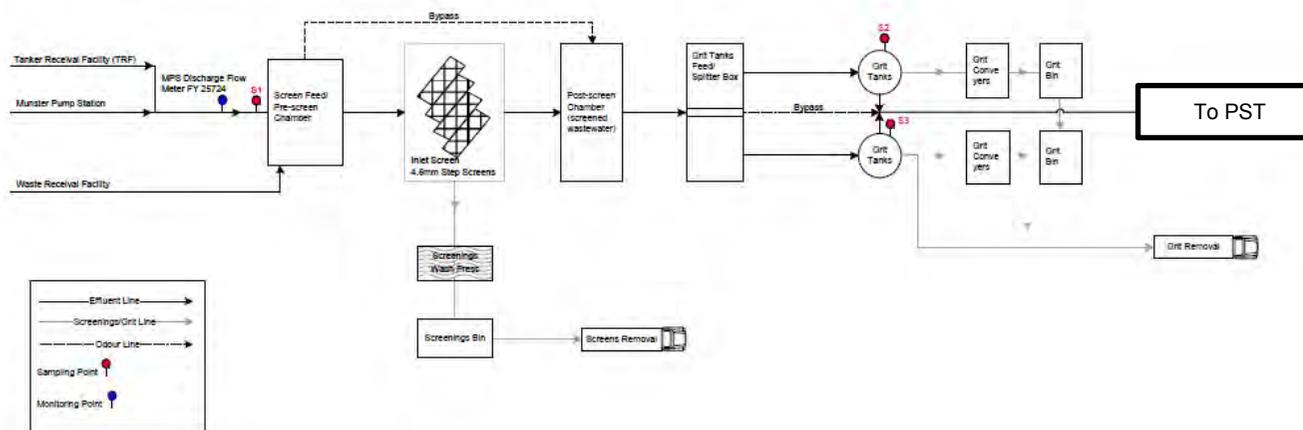
Premises map of discharge pipeline



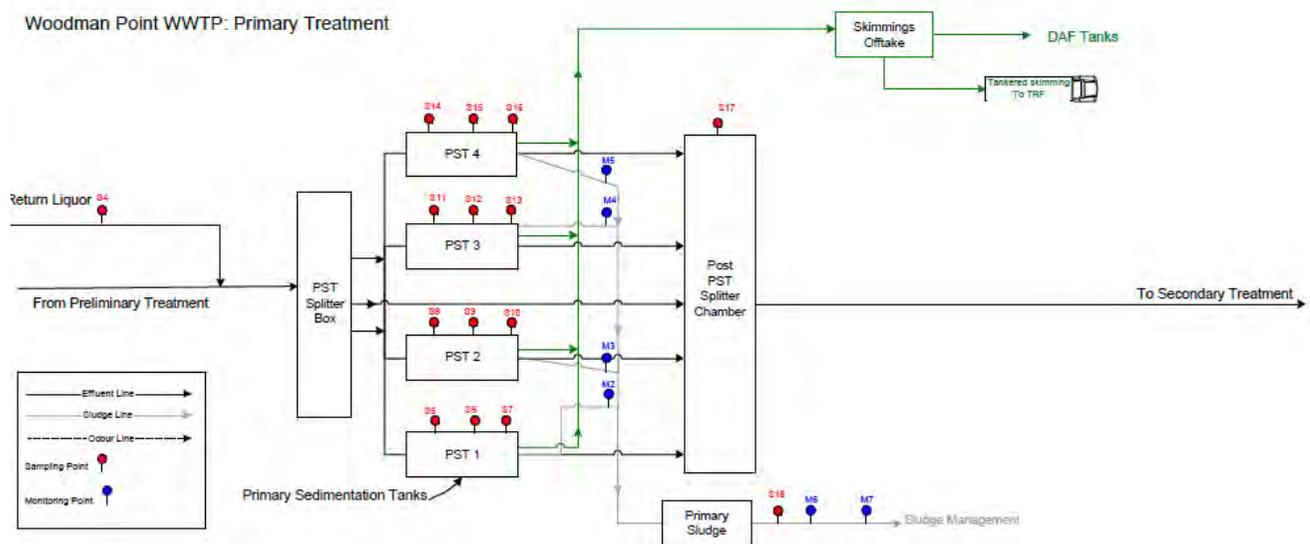


Map of WWTP emission and monitoring points

Woodman Point WWTP: Preliminary Treatment

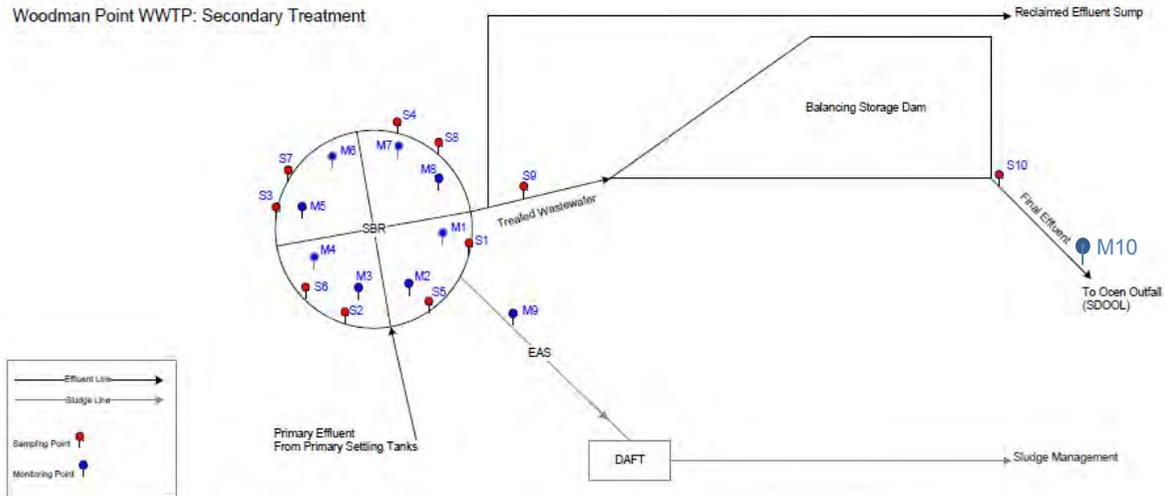


Woodman Point WWTP: Primary Treatment

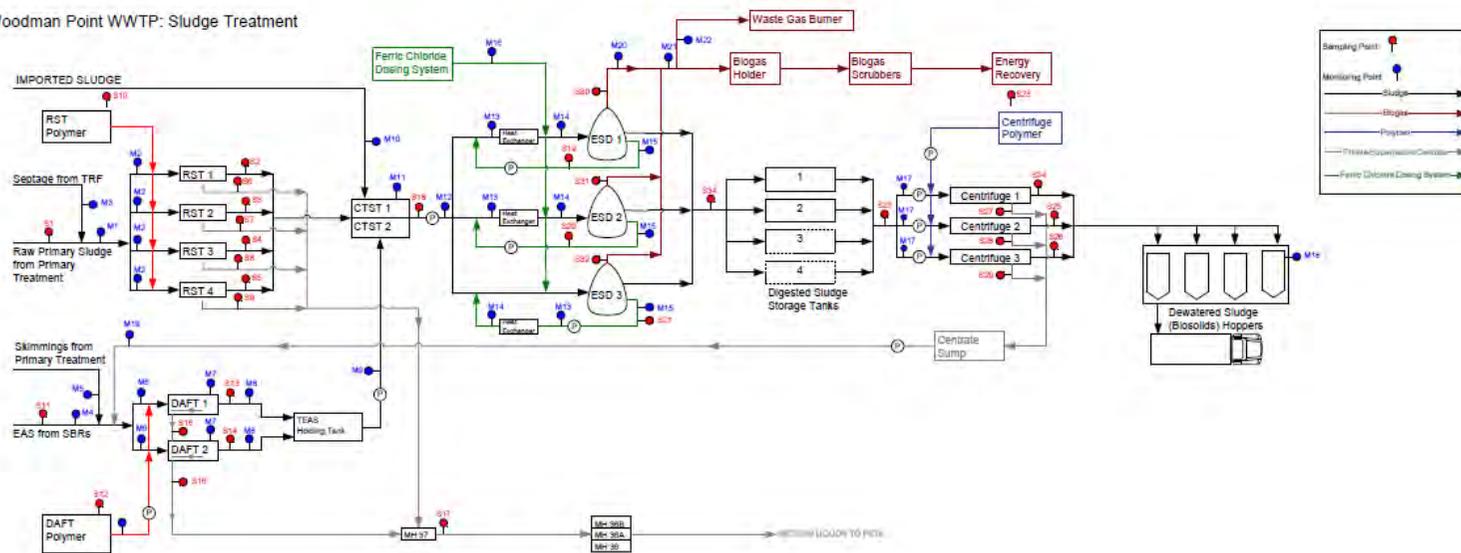




Woodman Point WWTP: Secondary Treatment



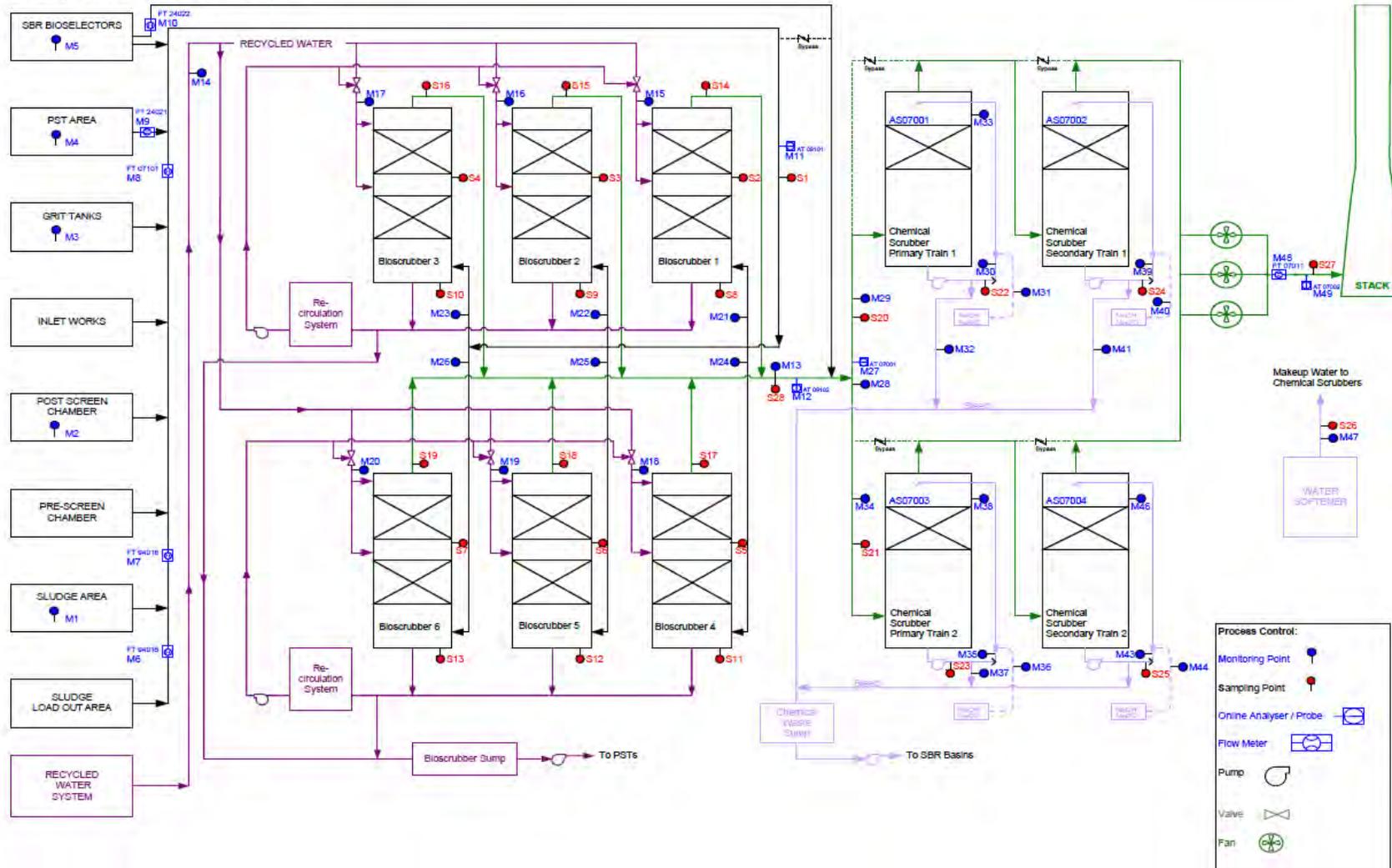
Woodman Point WWTP: Sludge Treatment





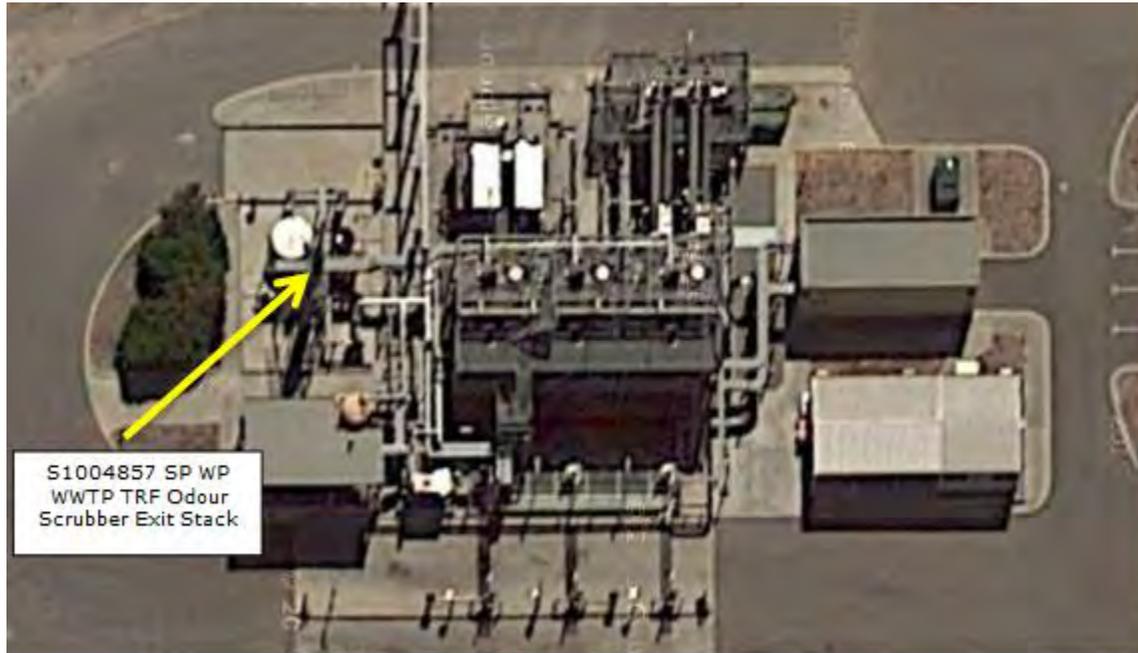
Map of Odour Control Facility emission and monitoring points

Woodman Point WWTP – Odour Control Stage 1





Map of Tanker Receiving Facility emission point





Schedule 2: Reporting & notification forms

These forms are provided for the proponent to report monitoring and other data required by the Licence. They can be requested in an electronic format.

ANNUAL AUDIT COMPLIANCE REPORT PROFORMA

SECTION A LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name: Trading as:	ABN:
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of the Licence complied with within the reporting period? (please tick the appropriate box)

Yes Please proceed to Section C

No Please proceed to Section B

Each page must be initialled by the person(s) who signs Section C of this Annual Audit Compliance Report (AACR).

Initial:



SECTION C

SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report (AACR) may only be signed by a person(s) with legal authority to sign it. The ways in which the AACR must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this AACR is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		The Annual Audit Compliance Report must be signed and certified:
An individual	<input type="checkbox"/> <input type="checkbox"/>	by the individual licence holder, or by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	by affixing the common seal of the licensee in accordance with the <i>Corporations Act 2001</i> ; or by two directors of the licensee; or by a director and a company secretary of the licensee, or if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	<input type="checkbox"/> <input type="checkbox"/>	by the chief executive officer of the licensee; or by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of \$50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

SIGNATURE: _____

NAME:
(printed) _____

NAME:
(printed) _____

POSITION: _____

POSITION: _____

DATE: ____ / ____ / ____

DATE: ____ / ____ / ____

SEAL (if signing under seal)



Licence: L4201/1991/11 Licensee: Water Corporation
 Form: N1 Date of breach:

Notification of detection of the breach of a limit.

These pages outline the information that the operator must provide.
 Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

Part A

Licence Number	
Name of operator	
Location of Premises	
Time and date of the detection	

Notification requirements for the breach of a limit	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	



Part B

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident.	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission.	
The dates of any previous N1 notifications for the Premises in the preceding 24 months.	

Name	
Post	
Signature on behalf of Water Corporation	
Date	



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1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.



2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/>	
	New Licence <input type="checkbox"/>	
	Licence amendment <input checked="" type="checkbox"/>	
	Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	54 – Sewage facility	160,000 cubic metres per day
	61 – Liquid waste facility	50,000 tonnes per annual period
Application verified	Date: N/A	
Application fee paid	Date: N/A	
Works Approval has been complied with	Yes <input type="checkbox"/>	No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Compliance Certificate received	Yes <input type="checkbox"/>	No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Commercial-in-confidence claim	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Commercial-in-confidence claim outcome	N/A	
Is the proposal a Major Resource Project?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Is the proposal subject to Ministerial Conditions?	Yes <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>
		Ministerial statement No: 490 & 665 EPA Report No: Mandatory Audit Report, 2013/0000447726.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i>)?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Department of Water consulted Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 – revoked; Environmental Protection (Kwinana)(Atmospheric Wastes) Policy 1999 and Regulations 1992 (Area C) - enacted. Relates to atmospheric emissions of SO ₂ and fugitive (dust emissions).		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
Emission types from the primary activities of the premises do not fall within the EPP requirements within which the premises exists.		



3 Executive summary of proposal and assessment

The Woodman Point Wastewater treatment Plant (WWTP) is owned and operated by Water Corporation and is located approximately 25km south west of Perth. The premises is surrounded by 'Special Use' town planning scheme zoned areas to the east, south and west, and is adjacent to the 'Jervoise Bay Cove' to the west. The premises services the southern suburbs of Perth which has a nominal contributing population of approximately 700,000.

The WWTP consists of pre-treatment, primary treatment and secondary treatment, which includes a four quadrant sequencing batch reactor (SBR) and an anaerobic sludge digestion process.

Treated wastewater is discharged to the Sepia Depression via a 23km Sepia Depression Ocean Outfall Landline (SDOOL) and ocean outfall via the Jervoise Bay Cove.

An Odour Control Facility (OCF) treats odours from the pre-treatment and primary treatment facility, the SBR bio-selectors and the sludge handling area. The plant also has a Tanker Receiver Facility (TRF), which accepts third party waste. The TRF has a separate dedicated chemical odour scrubber to control odour. Dewatered sludge is removed from the premises and disposed of to landfill, with the liquid fraction from the WWTP and TRF being discharged to the flow balancing dam.

The plant is designed to treat up to 160 ML influent per day, with the average daily inflow currently at 141ML/d, for the 2014/ 2015 reporting period. As the premises is nearing capacity, the Licensee has proposed an upgrade to the premises which will increase the design capacity to 180 ML/d. This will require the current operation to be taken off line and operated through a temporary (150 ML/d) system until the works are completed. The proposed works will be constructed over a 2.5 year period consisting of three stages that will include construction of the following:

Stage one –

- Two new 9.75 m vortex grit tanks;
- Four new primary sedimentation tanks;
- Eight secondary sedimentation tanks (temporarily designed as aeration tanks, four with lift out diffused aeration grids and four operated as clarifiers);
- New recycled water pump station and filtration system.

Stage two –

- Conversion of the SBR to a Modified Ludzack-Ettinger (MLE) configuration (Treated wastewater from the primary sedimentation tanks will bypass the SBR to the temporary secondary sedimentation tanks for a period of nine months).

Stage three –

- Secondary sedimentation tanks retrofitted from temporary aeration tanks to fully functioning secondary sedimentation tanks;
- Mixed liquor transferred to MLE quadrants over 2-3 days and blended with imported seed sludge.

A desk top assessment of groundwater bore (Site Id. 20022946) on the western boundary of the premises identifies depth to groundwater at approximately 10.4 mBGL, with TDS approximately 5,000 mg/L (saline). The groundwater forms part of the Murray River Basin and Bartram Road Catchment.

The closest sensitive residential receptor has been identified by the Licensee as approximately 0.5 km south of the premises. The premises operation includes an odour buffer of 750 m to the nearest land use.

The premises is subject to conditions within Ministerial Statement 665.



The main potential emissions during construction are expected to be odour issues from the change in operational process and noise and dust emissions from site construction.

This Licence is a DER initiated amendment to undertake administrative changes from the previous amendment process carried out for the works upgrade at the premises. Comments from the draft review process were omitted within the final draft submitted for signing.



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Interpretation	L1.1.2	<p>Construction and operation Conditions 1.1.1 – 1.1.4 require that terminology used within the Licence is referenced to the appropriate definitions where applicable, and that any reference to a standard or guideline is to the most current version of that standard or guideline.</p> <p>An administrative change has been undertaken to amend minor changes to the Licence from a previous amendment process. Definitions have been updated.</p> <p>Condition 1.1.2 includes additional definitions in relation to an 'engineered containment system' and 'tanker receival facility discharge stack'.</p>	General provisions of the <i>Environmental Protection Act 1986</i> .
General conditions	L1.2.3 L1.2.7 L1.2.9	<p>Construction and operation An administrative change has been undertaken to amend minor changes to the Licence from a previous amendment process.</p> <p>Condition 1.2.3, Table 1.2.1, Note 1: Updated to reflect conditions under the Licence.</p> <p>Condition 1.2.7 amended to require the submission of the compliance document "within one month" following construction of each stage. The wording "and prior to operating the new works" has been removed as the proponent determined that this would not be feasible/ possible within the previous timeframe.</p> <p>Condition 1.2.9 has been amended with the removal of CEO approval and inclusion of</p>	Application supporting documentation. General provisions of the <i>Environmental Protection Act 1986</i> .



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		'in accordance with Licence conditions 1.2.6-1.2.8'.	
Premises operation	L1.3.3	<p>Construction and operation An administrative change has been undertaken to amend minor changes to the Licence from a previous amendment process.</p> <p>Condition 1.3.3, Table 1.3.2 'Waste processing' has been amended with the removal of pH range from the liquid waste section and with the addition of reporting requirements within condition 4.3.1.</p> <p>Condition 1.3.5, Table 1.3.4, 'Management actions', point a) amended to define "corrective actions" instead of "management actions". Point d) removed from the table, and point e) includes "in writing".</p> <p>Condition 1.3.6 (a) amended to require compliance to condition 1.3.5 and removal of "recorded the actions taken to maintain compliance with the Licence".</p>	<p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p>Application supporting documentation.</p> <p><i>Environmental Protection (Controlled Waste) Regulations 2004</i></p> <p><i>Environmental Protection (Noise) Regulations 1997</i></p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations, 2004.</i></p> <p>Australian and</p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
			New Zealand guidelines for fresh and marine water quality – 2000.
Improvements	L4.1.1	<p>Operation</p> <p><u>Emission Description</u> <i>Emission:</i> Discharge of Hydrogen Sulphide (H2S) from the Tanker Receival Facility stack at the premises <i>Impact:</i> Reduced local air quality and odour emissions which could potentially interfere with the health welfare, convenience, comfort or amenity of any person. <i>Controls:</i> The proponent monitors parameters for point source emissions at the Tanker Receival Facility (TRF) stack (S1004857) which includes H2S. The TRF includes a chemical scrubber and discharge stack (50 m). Water Corporation have an 'Odour Improvement Plan and Mitigation Strategy' in place and have undertaken an odour control summary to assess emissions from the premises operation (as defined within condition 2.4.1 of the Licence.</p> <p>The closest residential receptor is 500 m south of the premises.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Moderate <i>Likelihood:</i> Possible <i>Risk Rating:</i> Moderate</p> <p><u>Regulatory Controls</u> Condition 1.3.5 has been included to require monitoring of H2S emission levels at the Tanker Receival Facility stack and includes management actions in the event of</p>	General provisions of the <i>Environmental Protection Act, 1986.</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>exceedences of the limit specified.</p> <p>Condition 2.4.1 defines the operating documents for consideration in and management of odour emissions at the premises.</p> <p>Condition 3.2.1 requires monitoring of point source emissions to air at the premises which includes the Tanker Reival Facility (TRF).</p> <p>Condition 4.1.1, Improvement Programme has been included within the Licence as it has been identified, through the review of the draft Licence amendment documentation by Water Corporation, that the TRF does not have an operational H2S analyser to determine H2S emissions as defined within condition 1.3.5. It is considered that the ability to assess if the TRF is emitting emission levels above the required limit set that the Licensee is able to more promptly respond to the exceedence and implement appropriate management actions to mitigate and manage such issues and potential complaints. It is considered that this will assist in reducing the volume of odour emissions from the premises and improve monitoring of H2S emissions at the premises.</p> <p><u>Residual Risk</u> <i>Consequence:</i> Minor <i>Likelihood:</i> Possible <i>Risk Rating:</i> Moderate</p>	
Information	L5.2.1	<p>Operation</p> <p>Condition 5.2.1, Table 5.2.1 includes a summary for reporting of any exceedences according to guidance as defined within Ministerial Statement 665, relating to the premises. This relates specifically to Table 3.3.1 of the Licence.</p>	N/A



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Licence Duration	N/A	<p>The current Licence will expire on 31 October 2016 in line with DER 'Licence duration, May 2015', guidance statement.</p> <p>"Woodman Point WWTP (Lot 9) is reserved as 'Public Purposes - Water Authority of WA'. Lot 20 is reserved "Public Purposes - special uses'. Development Approval is not required for Woodman Point WWTP (Note: A Development Approval is not required for development on reserved land that is owned by or vested in a public authority for the purpose of the supply, treatment, drainage or conveyance of water or wastewater (Clause 16(1a) of the MRS) where the land is: reserved for Water Corporation 'Public Purpose' use; vested in, or owned by the Water Corporation, and does not involve the clearing of regionally significant bushland in a Bush Forever Area)."</p>	N/A



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
30/05/2016	Proponent sent a copy of draft instrument	<p>Comments on draft received from Water Corporation, Danielle Berry, via email to Chris Slavin (DER) on 20 April 2016, that were not addressed through the initial works upgrade amendment process:</p> <ol style="list-style-type: none"> 1) Minor change- Bold “Tanker Receival Facility Discharge Stack” at the top of page 7. 2) Remove the definition for “Freeboard” – it is not referenced in this Licence. 3) Define ‘engineered containment system’ in the definitions. 4) Note 1 (below table 1.2.1) refers to the Licence as a Works Approval. Please replace the words ‘Works Approval’ with ‘Licence’ (as this is not a WA). 5) It doesn’t make sense to refer to the Licence Amendment Supporting Document here. A lot of the information in this document is background info (including current operation of the plant), and was submitted to provide information for the DER to enable them to draft this revised Licence. The upgrade information in section 6 is repeating what is listed in table 1.2.2 of the draft Licence. The DER should have extracted the various sections of this document, and used the info to develop conditions relating to the upgrade works. 6) General comment – whilst we have put a lot of effort into defining exactly what we want in the BDC documents eg. 5No. MLR pumps, the Delivery Alliance will still be able to offer 	<p>DER initiated amendment on comments not addressed, as follows:</p> <ol style="list-style-type: none"> 1) Definition placed within condition 1.1.2; 2) Removed; 3) Definition placed within condition 1.1.2; 4) Changed; 5) Statement. No change. This does not relate to the application or premises but a formatting approach. 6) No change. Noted. The Licence is based on current operation with the amendment defining what the proposed works upgrade incorporates. Once the upgrade is completed, then an amendment is required to update the Licence to the new and final operation design. This cannot be done until all works are completed and a compliance document submitted as per condition 1.2.7 and 1.2.8 of the Licence. 7) No change. The specifics of the upgrade must be defined within the documentation in order to define the basis of the risk assessment on what is proposed (DER process). See comment above regarding conditions 1.2.4, 1.2.5 and 1.2.6.



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>alternatives if they can demonstrate a significant NPV advantage to the Corporation. Stage 1, Item 7: I think that this should be either left out or simplified. The Alliance may be able to come up with a better NPV alternative to the proposed 720kW RAS system, which may only require 4No. pumps instead of 16No. Stage 2 is quite prescriptive, and could be reduced to three Items, in the order No. 3, No. 1 and No. 2. Leave the rest out, as how we reconfigure the SBR to an MLE reactor is entirely up to us?</p> <p>7) As per Wayne's comment above the licence shouldn't specify the design details. Condition's 1.2.4 and 1.2.5 are confusing and contradict each other.</p> <p>8) What if the change in specification is not minor, but improves the functionality of the infrastructure? The last line states 'and all other conditions in this Licence are still satisfied'. If you change the specs listed in Table 1.2.2, we may not be compliant with the doc referenced in Table 1.2.1.</p> <p>9) This doesn't allow time for the compliance report to be written (following construction and prior to commissioning applies commissioning cannot commence until the compliance document has been submitted however the compliance document cannot be written until construction is complete. I.e. this condition implies works will have to stop while the report is written and submitted?</p> <p>10) We cannot provide a commitment at the end of construction that there are no material defects. Defects are sometimes not discovered until commissioning is undertaken. Remove the reference to /no material defects'.</p>	<p>8) No change – see condition 1.2.5 which clarifies this point.</p> <p>9) Amended.</p> <p>10) No change. The requirement for a suitably qualified professional engineer or builder is to give surety that to the best of their ability/ knowledge it has been adequately constructed to operate as defined. This is a standard condition within DER.</p> <p>11) No change. This will be removed on completion of the upgrade and submission of a compliance report for review, through the final amendment process to reflect the final upgrade once in place. The interim process has been designed at the lower capacity therefore full capacity for the interim operational phase is not permitted.</p> <p>12) Amended.</p> <p>13) No change. Defined within Licence – see condition 1.3.4, Table 1.3.3.</p> <p>14) Removed. Seawater pH range is considered approximately between 7.5-8.4. Emissions to Ocean of pH 4 is not considered appropriate. Assessment of the 2014/ 2015 AER identifies that the premises discharge pH parameter is currently achieving a suitable pH range.</p> <p>15) No change – comment does not correlate</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>11) Contradicting to limit the premises capacity to 160 ML/d, when Table 1.3.1, 1.3.2 and the premise category (pg. 1) states 180 ML/d. Cannot control inflow – please remove this condition.</p> <p>12) If the condition has to stay in, Define ‘reviewed’? Does this refer to DER acknowledging the submission of the reports or do we require the CEO’s approval?</p> <p>13) Expand acronym ‘ASD’</p> <p>14) Current pH acceptable range is 4-8 (Licence specifies 6.5-8). Please amend.</p> <p>15) Fifth entry should be “MLE reactor”</p> <p>16) We do not have online H2S analyser at the TRF, as such this is not relevant. Please remove the Tanker Reival Facility from this Table.</p> <p>17) What is the difference between a management action and a corrective action? I would have thought that a corrective action IS a management action. Suggest changing to: “Implement Management Actions including: Assess operation to determine any failure... Undertake corrective action... Restore normal operation... Notify CEO...”</p> <p>18) It is impractical to state that we shall not restart operations until we have recorded all actions taken to maintain compliance with the Licence. Is the intention of that condition to only mean actions taken in relation to the OCF (not the whole Licence). The top priority is to ensure that the odour control facilities are back up and operational – any report/records will be completed as soon as practicable (but not necessarily before operations are restarted). The problem will be ‘rectified’ as</p>	<p>to Table 1.3.3?</p> <p>16) Discharge points are identified at both facilities for H2S and monitoring is required at both facilities. Table 1.3.4 defines management actions/ approach required on emission levels. Please explain how assessment has been undertaken from this part of the facility, and reported in the past, as an emissions stack is present?</p> <p>17) Amended.</p> <p>18) Condition 1.3.6 amended.</p> <p>19) No change. Section 5.5 of the submitted application supporting documentation identifies the ‘Odour Control Summary’ as Appendix 1, within AQUA no. 13945397.</p> <p>20) Amended, with inclusion into Table 4.3.1.</p> <p>21) No change. Table requires continuous monitoring frequency with a monthly averaging by use of inflow/ outflow meters.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>part of management actions in accordance with Table 1.3.4. Please remove condition 1.3.6.</p> <p>19) The Odour Management Plan and Mitigation Strategy for the upgrade refers to doc PM#13945397. This doc is in word version – and DOES NOT include the referenced Appendix 1. In other words, the Licence keeps referencing a document which doesn't contain the specified odour mgt plan. This needs amending to the correct PM#- which is 14290847.</p> <p>20) Note 2: please exclude pH and E.Coli from the contaminant loading requirements. Note 4: why is MS 665 referenced here? Not sure what this note means or its relevance as MS 665 doesn't define that emission point.</p> <p>21) How can we monitor cumulative ML/day flow rates each month? Needs to be monthly cumulative flow rates in ML, AND/OR daily averaged flow rates in ML/d.</p> <p>Comments received back from Danielle Berry on 17 June 2016 as a result of 21 day consultation period of the Licence amendment process. Comments included:</p> <p>1) General comment – there is potential that the contractor tenders may propose slightly different and potentially more efficient/effective infrastructure therefore a reduce level of detail would be prudent to avoid the need for a licence amendment down the track when final design is confirmed.</p> <p>2) Stage 2, Item 7 should read" into each MLE basin". Stage 3, Item 1 – does the number of SSTs</p>	<p>DER response to comments received on 17 June 2016:</p> <p>1) Refer to condition 1.2.4, 1.2.5 and 1.2.6 of the Licence with regards to 'Departures'</p> <p>2) The Licence amendment incorporates a works upgrade as per the details supplied in the application supporting documentation. The risk assessment has been based on the design specification supplied. Any departures from the design specifications supplied are to be addressed through conditions 1.2.4, 1.2.5 and 1.2.6 of the Licence.</p> <p>3) Incorrect. No change.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>need to be specified? Stage 3, Items 2 & 3 – the Construction Alliance may decide on a different configuration. Does the level of detail specified need to be this specific?</p> <p>3) Condition's 1.2.4 and 1.2.5 contradict each other.</p> <p>4) 1.2.5: If the construction Alliance change the specs listed in Table 1.2.2, we may not be compliant with the doc referenced in Table 1.2.1. Is this level of infrastructure to be construction required?</p> <p>5) 1.2.8: Can the reference to no material defects' be removed? Compliance doc will confirm the infrastructure has been constructed as described however defects potentially won't be identified until commissioning and can be reported via the commissioning report.</p> <p>6) 1.3.3: Expand acronym 'ASD'</p> <p>7) 1.3.5: We do not have online H2S analyser at the TRF. Please remove the Tanker Receiving Facility from this Table.</p> <p>8) The condition states that we can't restart until we have complied with condition 1.3.5. This is an issue because condition 1.3.5 requires a written notification to DER. We cannot wait until we have notified DER in writing to restart the odour control facility. Please amend Table 1.3.4 to remove "in writing".</p> <p>9) The TRF stack is 50m.</p> <p>10) Can the AQUA#13945397 be changed to AQUA#14290847?</p> <p>11) There is no continuous monitoring device to record volumetric flow rate of the TRF. Can only record volumes of liquid waste as each</p>	<p>4) Any departures from the design specifications supplied are to be addressed through conditions 1.2.4, 1.2.5 and 1.2.6 of the Licence.</p> <p>5) No change. Condition is consistent with those used by DER.</p> <p>6) The initial application referenced ASB which was defined as the Anaerobic Biosolids Digester which was defined within the respective condition – addressed in previous comments sent to Water Corporation above (30/5/2016). The acronym has now been changed from ASD to ABD.</p> <p>7) The condition has been amended however an improvement condition has now been proposed within Section 4 Improvement programme for the installation of an H2S analyser.</p> <p>8) No change. Written correspondence can be notification via any written form confirming operation is now rectified e.g. email.</p> <p>9) Amended stack height.</p> <p>10) As previously stated, the Application Supporting Document does not reference this number however I have included this number as follows within Table 2.4.1: "(Water Corporation independent document reference number AQUA#14290847)".</p> <p>11) Amended to each load received.</p> <p>12) Removed and placed within Table 5.2.1.</p> <p>13) Amended from 3.1.3 to 3.1.4.</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>truck comes in. Please amend to reflect this process.</p> <p>12) This new text needs to be removed. MS 665 is not specifically on Woodman Point WWTP - it is on the SDOOL line (which includes a number of dischargers/participants). An exceedance of criteria therefore cannot be attributed necessarily to Woodman Point WWTP. MS 665 exceedances are managed through the MMP (which states that the DER is to be notified), and should not be regulated through the DER Licence.</p> <p>13) This should reference condition 3.1.4 (not condition 3.1.3), as the condition refers to the calibration reports that need to be developed if calibration requirements can't be met.</p> <p>Final comments received from Danielle Berry via email (6 July 2016) through the draft referral process included:</p> <p>1) 1.3.1: Table 1.3.2 states that dewatered biosolids to be sent to registered landfill. Biosolids sent to storage facility or to farm (licenced facilities) - not to landfill. Please amend/remove.</p> <p>2) 1.3.5: Table 1.3.4 should refer to 5.3.1, not 4.3.1</p> <p>3) 1.3.6: States that we cannot restart operations until we have complied with all the management actions in Table 1.3.4. We cannot wait until we have assessed H2S issue, rectified and notified DER before we restart operations. We need to be able to restart operations as soon as possible to avoid unnecessary odour emissions. Please amend.</p> <p>4) 2.2.1: amended the height of the wrong</p>	<p>DER response to comments received from draft referral process, as follows:</p> <p>1) Changed biosolids to read: "Dewatered biosolids to be removed for offsite disposal</p> <p>2) Typographical error: changed to 5.3.1</p> <p>3) Condition 1.3.5 and 1.3.6 must be read in the context of Table 5.3.1 – No change.</p> <p>4) Amended.</p> <p>5) Removed. The summary of exceedences does incorporate other premises and as such the independent reporting of any exceedence should be emailed through to DER CEO, outside of the Licence.</p> <p>6) Awaiting confirmation of construction details/ permeability from Licensee.</p> <p>7) Typographical error. Amended.</p> <p>8) Amended to 31/01/2017 (six months).</p> <p>9) Amended to read: "... and ocean outfall</p>



Date	Event	Comments received/Notes	How comments were taken into consideration
		<p>stack. OCF is 50m high, TRF is 12 m high. Please amend</p> <p>5) 5.2.1: the requirements in MS665 relate to overall SDOOL discharge, not individual plants. It is unreasonable to include a summary of any exceedance relating to Woodman Point operations, as a MS exceedance cannot necessarily be attributed to Woodman Point WWTP (or effluent quality as referred to in the decision doc). DER will be notified of EQO exceedances as per the Ministerial. Please amend or remove.</p> <p>6) 1.3.4: Table 1.3.3 refers Flow Balancing Dam as “constructed of concrete”. Please amend to “plastic lined”.</p> <p>7) 1.3.4: Table 1.3.3 – Please correct “Anerobic biosolids digester” to “Anaerobic biosolids digester” (typo)</p> <p>8) IR condition - September 2016 is not feasible (need 6-12 months).</p> <p>9) Premises Description: Talks about discharge of final effluent through the SDOOL and 4.2km Ocean Outlet through “Jervoise Bay Cove”. Ocean outlet is 4.2 km from Point Peron to Sepia Depression.</p> <p>10) 2.3.1, Table 2.3.1: Spelt “Priority” wrong.</p>	<p>via the Jervoise Bay Cove.”</p> <p>10) Typographical error. Amended.</p>



6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



Appendix A

Point source emissions to air including monitoring

For the Woodman Point Wastewater Treatment Plant facility, the principle emissions of concern are emissions to air (odour from Hydrogen sulphide emissions). DER has reviewed the proponent's impact assessment for emissions to air from the premises and is satisfied with the assessment provided by the proponent.

The proponent has an 'Odour Management Plan and Mitigation Strategy' and 'Odour Improvement Plan' and is required to comply with Ministerial requirements for the reduction of odour emissions by at least 50% since 2005 within three years for the premises. The long term objective has been defined by the Licensee as "*achieving [a] long term 73% reduction in odour emissions as envisaged in the SER (Strategic Environmental Review),...to the extent that there are no noticeable odour beyond the existing buffer zone*" (Appendix 1 – Odour Control Summary, application supporting documentation).

The proposed works upgrade is considered by the Licensee to have the ability to further improve odour emissions from the premises through improved technology installation (conversion of SBR to MLE and providing separate secondary clarifiers within the new MLE).

The proponent has undertaken two Odour monitoring and modelling programmes (MAM) since 2008/2009 to assess compliance against Ministerial requirements and in 2010 determined that the premises has reduced emissions by 55% since the Ministerial determination in 2005.

The upgraded premises, at full capacity of 180 ML/ day, is expected to have odour emissions of 118,500 OU/s as compared to emissions before 2009 of 297,100 OU/s.

The odour analysis/ assessment and modelling (Appendix A 'Odour modelling' within Odour Control Summary Appendix 1 of the application supporting documentation) provided was submitted to DER Air Quality Branch on 29 February 2016 for review. The review determined that the risk is considered low once operational, with low to moderate risk during the operation of the temporary facility configuration (construction phase/ concurrent operation). The secondary treatment facility is considered to be overloaded during the SBR retrofitting phase.

The drafting of the Odour Improvement Plan (OIP) in accordance with the East Rockingham Wastewater Treatment Plant is considered appropriate, which the proponent has committed to undertaking. The OIP is to comprehensively assess risk related to:

- sources and operations on site;
- their monitoring;
- corrective actions to be implemented if necessary; and
- contingencies should the corrective actions not be effective.

The WWTP is expected to continue growing to its anticipated ultimate capacity of 320ML/ day in the future, based on the capacity of the catchment and the main sewer system feeding the Munster Pumping Station. An upgrade to 220ML/ day will require a separate plant to be built onto the site which may impact the current buffer separation distance currently within the premises (750 m). This expansion is approximately 40 years into the future.

Emission Risk Assessment – Construction and Operation

Emission Description

Emission: Odorous emissions (Hydrogen sulphide) from the Tanker Receiving Facility, Odour Control Facility operations, pre-treatment works, stack emissions, SBR operation (normal operation) and as a



result of the proposed works upgrade (abnormal operations/ alteration of process by taking current process off line to operate through a temporary process).

Impact: Reduction in local air quality. Nearest sensitive residential receptor is approximately 1.2 km south of the premises.

Controls: All odour emissions from the operation of the premises are directed through to the Odour Control Facility (OCF). The enclosed OCF and enclosed Tanker Receival Facility (TRF) both have chemical scrubbers to assist in the reduction of odour emissions. Sewage sludge is processed and stored within the enclosed Anaerobic Sludge Digestors (ASD) facility prior to discharge off site to an authorised landfill.

The following has been determined from Appendix 1 – Odour Control Summary (from the application supporting documentation):

Preliminary/ Pre-treatment: Grit removal

Entire process train from each tank to collection container for the inlet screening is to be enclosed to minimise fugitive emissions. Foul air extraction incorporated for the grit washing and classification systems.

Primary treatment (PST's)

The new PST's 5-8 will be covered and sealed as per the existing PST's 1-4 but with improved sealing on the skimming (scum) line. Foul air collection ductwork will be extended from the current PST's to service the new PST's.

SBR to MLE Conversion

Conversion to MLE continuous process with separate clarifiers is considered to be a more stable operation. The proponent has determined that similar operations at the Beenyup WWTP have "confirmed that there will be a considerable reduction in odour from a continuously aerated reactor as in the MLE format." This has predominantly been determined as a result of the spike in odour emissions caused from the start-up of the aeration process within the current SBR, which will be eliminated from the MLE conversion.

Additional covers and ventilation will be provided for the first anoxic zones in each MLE basin to counteract potential emissions from turbulence caused by mixing of the Mixed Liquor Recycle (MLR) and selector outlet streams. The Odour Control Summary, section 5.2, (Appendix 1 of the application supporting documentation) further identifies odour control efficiency requirements for the odour control facility for OU and H₂S and in relation to upgrades on the odour covers (section 5.3, Appendix 1, of the application supporting documentation).

Solids treatment area (ASD)

The works upgrade will not alter or increase any aspect of the current process, therefore no change to odour emissions from this area of the premises is expected.

Risk Assessment

Consequence: Moderate

Likelihood: Possible

Risk Rating: Moderate

Regulatory Controls

Condition 1.2.10 limits the increase in design capacity until review of the compliance documents for all stages of the works upgrade has been completed.

Condition 1.3.5 requires the management of hydrogen sulphide emission levels at the premises.



Condition 1.3.9 requires the Licensee to develop an 'Odour Monitoring Strategy' for the premises.

Condition 1.3.10 requires an odour monitoring and modelling (MAM) programme verification and the development of contingencies/ mitigation measures where any failures/ risks have been identified.

Condition 2.4.1 requires the Licensee to manage odour emissions according to the specific management plans relevant to the premises operation.

Condition 3.2.1 requires the Licensee to monitor odour emissions for hydrogen sulphide from the premises operations.

Condition 4.1.3 includes a detailed complaints management system requirement for the recording of complaints.

Condition 4.2.1 requires the reporting of all complaints.

Condition 4.3.1 requires the reporting/ notification of all limit exceedences where management action was taken.

Residual Risk

Consequence: Minor

Likelihood: Possible

Risk Rating: Moderate

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT REGULATION

Environmental Protection Act 1986

LICENCE

LICENCE NUMBER: L4202/1991/10

FILE NUMBER: 2010/007811-1

NAME OF OCCUPIER:

Water Corporation
629 Newcastle Street
LEEDERVILLE WA 6007
ABN: 28 003 434 917

NAME AND LOCATION OF PREMISES:

Point Peron Wastewater Treatment Plant
2152 and 2642 Point Peron Road
PERON WA 6168
Being Lot 2152 on Plan 173916 and Lot 2642 on Plan 184654
(As depicted in Attachment 1 of this licence)

Environmental Protection Regulations 1987

CLASSIFICATION(S) OF PREMISES:

Category 54: Sewage facility
Category 61: Liquid waste facility

ISSUE DATE OF LICENCE: Thursday, 28 October 2010

COMMENCEMENT DATE OF LICENCE: Monday, 1 November 2010

EXPIRY DATE OF LICENCE: Monday, 31 October 2016

CONDITIONS OF LICENCE:

As described and attached:
DEFINITIONS (8)
GENERAL CONDITIONS (5)
WATER POLLUTION CONTROL CONDITION(S) (12)
ATTACHMENTS (2)

.....
Ruth Dowd
Senior Manager – Industry Regulation (Waste Industries)
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Date of amendment: 22 October 2015

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT REGULATION

Environmental Protection Act 1986

LICENCE NUMBER: L4202/1991/10

FILE NUMBER: 2010/007811-1

DEFINITIONS

In these conditions of licence, unless inconsistent with the text or subject matter:

“APHA-AWWA-WEF” means American Public Health; American Water Works Association; Water Environment Federation;

“Australian Standard 5667” means the most recent version and relevant parts of AS/NZS 5667;

“CEO” means Chief Executive Officer of the Department of Environment Regulation;

‘CEO’ for the purpose of correspondence means;

Chief Executive Officer
Department Administering the Environmental Protection Act 1986
Locked Bag 33
CLOISTERS SQUARE WA 6850
Email: info@der.wa.gov.au

“Emergency Situations” means situations which are not normal or routine, such as breakdowns, or major failures of equipment etc;

“mg/L” means milligrams per litre;

“MIEX” means magnetic ion exchange;

“NATA” means the Australian body of the National Association of Testing Authorities; and

Other terms take their meaning from the *Environmental Protection Act 1986*.

GENERAL CONDITIONS

ANNUAL ENVIRONMENTAL REPORT

1. The licensee shall provide to the CEO by **1 September in each year**, an Annual Environmental Report (AER). The Annual Environmental Report will cover the period from **1 July the previous year to 30 June in that year**. The report shall contain but not be limited to:
 - (i) monitoring data required by any condition of this licence, which shall be presented in a tabular and graphical format;
 - (ii) monitoring data that exceeds any limits, guidelines and policies set in this licence, including reasons why limits were exceeded (if known) and actions taken by the Licensee to prevent recurrence of such exceedances;
 - (iii) a summary of any data exceeding those limits, guidelines or policies including information on why the exceedence occurred (if known) and action taken by the licensee to prevent recurrence of such exceedances.
 - (iv) the number and type of complaints received as required by Condition 4 of this licence;
 - (v) volumes of treated wastewater and MIEX wastewater discharged to the Sepia Depression Ocean Outlet Landline;
 - (vi) MIEX wastewater colour sampling results;

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT REGULATION

Environmental Protection Act 1986

LICENCE NUMBER: L4202/1991/10

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- (vii) results for ocean sampling (for colour);
- (viii) any changes on and off the premises to site boundaries, location of monitoring/sampling points, discharge points, waste storage areas, surface drainage channels and on-site or off-site impacts or pollution; and
- (ix) a list of any monitoring methods used to collect and analyse data required by any condition of this licence to demonstrate they comply with the methods specified in this licence.

MONITORING PARAMETERS

- 2. The licensee shall use the following units for monitoring data parameters as required by any condition of this licence:

Parameter	Unit
Monthly volume of treated wastewater discharged to the environment	Cubic metres per day or ML/day (average for the month)
Standing water level	Metres (Australian Height Datum)
pH	pH units
<i>Escherichia coli</i> (E.coli)	Colony forming units per 100 millilitres
All other parameters	Milligrams per litre (mg/L)

ANNUAL AUDIT COMPLIANCE REPORT

- 3. The licensee shall provide to the CEO **by 1 September in each year**, an Annual Audit Compliance Report (AACR) in the form in Attachment 2 of this licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the licensee has complied with the conditions of this licence, and any previous licence issued under Part V of the Act for the premises, during the period **beginning 1 July the previous year and ending on 30 June in that year**.

COMPLAINTS

- 4. The licensee shall keep a written and accurate record of all complaints received at the premises concerning the environmental impact of the premises. The record must be dated and provide the following information (if known):
 - (i) date and time of complaint;
 - (ii) location about which the complaint was made;
 - (iii) general description of the nature of complaint;
 - (iv) wind direction, wind speed and temperature at the time of the complaint;
 - (v) likely source of the reported problem; and
 - (vi) action taken in response to the complaint.
- 5. The licensee shall ensure the record required by Condition 4 of this licence shall be available for viewing or copying by the CEO on request.

WATER POLLUTION CONTROL CONDITIONS

DISCHARGE POINT

- 6. The licensee shall discharge treated wastewater from the premises to the environment through the Sepia Depression Ocean Outlet Landline.
- 7. Subject to Condition 6 of this licence, the licensee may, during Emergency Situations, discharge treated wastewater from the premises to the environment via onsite soakage.

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DEPARTMENT OF ENVIRONMENT REGULATION

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FILE NUMBER: 2010/007811-1

FLOW MONITORING DEVICE

8. The licensee shall monitor and record the cumulative monthly volumes of treated wastewater discharged via the Sepia Depression Ocean Outlet Landline.

TREATED WASTEWATER SAMPLING REQUIREMENTS

9. The licensee shall collect representative samples of treated wastewater being discharged to the Sepia Depression Ocean Outlet Landline (at the treated wastewater sampling point) at the sampling frequency listed below. Levels of the following parameters shall be determined:

(i) pH;	monthly;
(ii) Total Suspended Solids (TSS);	monthly;
(iii) Biochemical Oxygen Demand (BOD);	monthly;
(iv) Total Nitrogen;	3-monthly;
(v) Ammonium-nitrogen;	3-monthly;
(vi) Oxidised nitrogen (nitrate + nitrite-nitrogen);	3-monthly;
(vii) Total Phosphorus;	3-monthly;
(viii) Cd, Cr, Cu, Hg, Ni, Pb, Zn	6-monthly; and
(ix) <i>E.coli</i>	6-monthly

CALCULATION OF CONTAMINANT LOAD

10. The licensee shall determine the monthly and annual average load of each contaminant in the treated wastewaters discharged from the premises (where applicable) using flow weighted data. The loads shall be based on the treated wastewater discharge rate and the concentration as measured in accordance with conditions 8 and 9 of this licence.

GENERAL MONITORING REQUIREMENTS

11. The licensee shall collect all water samples in accordance with Australian Standard 5667.
12. The licensee shall analyse all water samples in its own quality assured laboratory, or ensure that samples are analysed in a laboratory with NATA accreditation for the analysis specified. If the licensee uses its own laboratory, then at least one set of sample per year shall also be submitted to a laboratory holding NATA accreditation for the analysis specified in Condition 9 of this licence. The licensee shall report these duplicate results to the CEO in the following Annual Monitoring Report, specifying the laboratory in which each analysis was performed.

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT REGULATION

Environmental Protection Act 1986

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TOTAL NITROGEN DISCHARGE LIMIT

13. The licensee shall ensure that Total Nitrogen in water discharged through the Sepia Depression Ocean Outlet does not cause or contribute to a load in excess of 1778 tonnes per year (for the period 1 July to 30 June).

MIEX REGENERANT

14. The licensee shall store MIEX wastewater (where the total volume exceeds 250 litres) within low permeability (10^{-9} metres per second or less) compound(s) designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound.
15. The licensee shall monitor and record the daily volume of MIEX wastewater discharged to the Sepia Depression Ocean Outlet Landline.
16. The licensee shall, every three months, measure and record the colour of the MIEX wastewater that is discharged to the Sepia Depression Ocean Outlet Landline.
17. The licensee shall **at least once each year**, monitor and record the colour units of all ocean monitoring sites within 100 metres of Sepia Depression Ocean Outfall diffuser (depending on ocean current) samples, while the MIEX wastewater is being discharged.

ATTACHMENT 2 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4202/1991/10

FILE NUMBER: 2010/007811-1

ANNUAL AUDIT COMPLIANCE REPORT PROFORMA

SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name: Trading as:	ABN:
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of the Licence complied with within the reporting period? (please tick the appropriate box)

Yes Please proceed to Section C

No Please proceed to Section B

Each page must be initialled by the person(s) who signs Section C of this Annual Audit Compliance Report (AACR).

Initial:

ATTACHMENT 2 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4202/1991/10

FILE NUMBER: 2010/007811-1

SECTION B

DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each Licence condition that was not complied with.

a) Licence condition not complied with:	
b) Date(s) when the non compliance occurred, if applicable:	
c) Was this non compliance reported to DER?:	
<input type="checkbox"/> Yes <input type="checkbox"/> Reported to DER verbally Date _____ <input type="checkbox"/> Reported to DER in writing Date _____	<input type="checkbox"/> No
d) Has DER taken, or finalised any action in relation to the non compliance?:	
e) Summary of particulars of the non compliance, and what was the environmental impact:	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram):	
g) Cause of non compliance:	
h) Action taken, or that will be taken to mitigate any adverse effects of the non compliance:	
i) Action taken or that will be taken to prevent recurrence of the non compliance:	

Each page must be initialled by the person(s) who signs Section C of this AACR

Initial:

ATTACHMENT 2 – ANNUAL AUDIT COMPLIANCE REPORT

LICENCE NUMBER: L4202/1991/10

FILE NUMBER: 2010/007811-1

SECTION C

SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report (AACR) may only be signed by a person(s) with legal authority to sign it. The ways in which the AACR must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this AACR is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		The Annual Audit Compliance Report must be signed and certified:
An individual	<input type="checkbox"/> <input type="checkbox"/>	by the individual licence holder, or by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	by affixing the common seal of the licensee in accordance with the <i>Corporations Act 2001</i> ; or by two directors of the licensee; or by a director and a company secretary of the licensee, or if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	<input type="checkbox"/> <input type="checkbox"/>	by the principal executive officer of the licensee; or by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	<input type="checkbox"/> <input type="checkbox"/>	by the chief executive officer of the licensee; or by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of \$50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

SIGNATURE: _____

NAME:
(printed) _____

NAME:
(printed) _____

POSITION: _____

POSITION: _____

DATE: ____/____/____

DATE: ____/____/____

SEAL (if signing under seal)



Decision Document

Environmental Protection Act 1986, Part V

Proponent: **Water Corporation**

Licence: **L4202/1991/10**

Registered office: 629 Newcastle Street
LEEDERVILLE WA 6007

Premises address: Point Peron Wastewater Treatment Plant
2152 and 2642 Point Peron Road
PERON WA 6168
Being Lot 2152 on Plan 173916 & Lot 2642 on Plan 184654

Issue date: Thursday, 28 October 2010

Commencement date: Monday, 01 November 2010

Expiry date: Monday, 31 October 2016

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue an amended licence. DER considers that in reaching this decision, it has taken into account all relevant considerations.

Decision Document prepared by: Tessa Smith
Licensing Officer

Decision Document authorised by: Ruth Dowd
Delegated Officer



Contents

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5 Advertisement and consultation table	5
6 Risk Assessment	6

1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input checked="" type="checkbox"/> Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	54 Sewage Facility	20 000 m ³ per day
	61 Liquid Waste Facility	N/A
Application verified	Date: N/A	
Application fee paid	Date: N/A	
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Commercial-in-confidence claim outcome	NA	
Is the proposal a Major Resource Project?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Referral decision No: 1471 Managed under Part V <input checked="" type="checkbox"/> Assessed under Part IV <input checked="" type="checkbox"/>



Is the proposal subject to Ministerial Conditions?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Ministerial statement No: 665 EPA Report No: 1135
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i>)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Department of Water consulted Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If Yes include details of which EPP(s) here. Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, include details here, eg Site is subject to SO ₂ requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

The Point Peron Wastewater Treatment Plant (WWTP) is located approximately 50 km south of Perth. The ocean is located approximately 100m north and 40m south of the Premises. School camp accommodation is located approximately 70m north west of the premises, and holiday accommodation is located approximately 200m south east.

The WWTP is a primary treatment facility and liquid waste receival facility, designed to treat up to 20 mega litres of effluent per day. The plant treats wastewater to a primary standard and consists of pre-treatment, primary treatment and sludge thickening. All treated wastewater is discharged to the ocean via Sepia Depression Ocean Outfall Landline (SDOOL). The SDOOL is situated 4.1 kilometres offshore west-south-west of Point Peron. The licensee also accepts magnetic ion exchange (MIEX) wastewater from the Wanneroo groundwater treatment plant. This wastewater is classified as a liquid waste and is accepted and disposed of with the treated effluent via the SDOOL. Thickened sludge is transported to the Woodman Point WWTP for further processing.

The activity is subject to Ministerial Statement number 665.

This amendment is to extend the duration of the Licence by 12 months; changing the expiry date to the 31 October 2016. Emissions and discharges have not been reassessed as part of this amendment. It is intended that a review of the licence and conversion to the updated licensing format will occur within this 12 month extension period.



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Definitions, General Conditions, Water Pollution Control Conditions	L1, L3, L5, L12	References to Director have been updated to CEO in accordance with current licensing process.	
General conditions	L1	Condition 1 has been amended to change the title of the report from 'Annual Monitoring Report' to 'Annual Environmental Report' for consistency with the current DER reporting requirements.	
Attachment 2	N/A	The AACR has been updated to the current format used by DER.	
Licence Duration	N/A	The Licence is being amended to extend the duration by 12 months; changing the expiry date to the 31 October 2016. Emissions and discharges have not been reassessed as part of this amendment. It is intended that a review of the licence and conversion to the updated licensing format will occur within this 12 month extension period.	



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
28/09/2015	Application advertised in West Australian (or other relevant newspaper)	No comments received.	N/A
7/10/2015	Proponent sent a copy of draft instrument	No comments received.	N/A



6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



Appendix B – Analytical laboratories and methods

Analytical Laboratories

Analytes determined and analytical laboratories used for treated wastewater characterisation

Analytes	Analytical Laboratory	Analytical Method	Reporting Limit	Unit
Microbiological				
E.coli	PathWest Laboratory Medicine WA	Membrane filtration	Dilution dependent ⁽¹⁾	CFU 100 mL ⁻¹
Enterococci	PathWest Laboratory Medicine WA	Membrane filtration	Dilution dependent ⁽¹⁾	MPN 100 mL ⁻¹
Nutrients				
Ortho-phosphate	Murdoch University Marine and Freshwater Research Laboratory (MAFRL) and/or National Measurement Institute (NMI)	Lachat-Automated Flow Injection Analyser (4100)	2 ⁽²⁾	µg P L ⁻¹
Ammonia		Lachat-Automated Flow Injection Analyser (2000)	3 ⁽²⁾	µg N L ⁻¹
Nitrate + Nitrite		Lachat-Automated Flow Injection Analyser (2100)	2 ⁽²⁾	µg N L ⁻¹
Total Nitrogen		Lachat-Automated Flow Injection Analyser (2700)	50 ⁽²⁾	µg N L ⁻¹
Total Phosphorus		Lachat-Automated Flow Injection Analyser (4700)	5 ⁽²⁾	µg P L ⁻¹
Metals and Metalloids				
Arsenic filtered	National Measurement Institute (NMI)	Inductively coupled plasma mass spectrometry and inductively coupled plasma atomic emission spectrometry (NT2.47.251)	1	µg L ⁻¹
Arsenic total		NT2.47.251	1	µg L ⁻¹
Cadmium filtered		Inductively coupled plasma mass spectrometry and inductively coupled plasma atomic emission spectrometry (NT2.47)	0.1	µg L ⁻¹
Cadmium total		NT2.47	0.1	µg L ⁻¹
Chromium filtered		NT2.47	2	µg L ⁻¹
Chromium total		NT2.47	2	µg L ⁻¹
Copper filtered		NT2.47	1	µg L ⁻¹
Copper total		NT2.47	1	µg L ⁻¹
Lead filtered		NT2.47	1	µg L ⁻¹
Lead total		NT2.47	1	µg L ⁻¹
Mercury filtered		Inductively coupled plasma mass spectrometry and inductively coupled plasma atomic emission spectrometry (NT2.47.244)	0.1	µg L ⁻¹
Mercury total		NT2.47.244	0.1	µg L ⁻¹
Nickel filtered		NT2.47	2	µg L ⁻¹
Nickel total		NT2.47	2	µg L ⁻¹
Selenium filtered		NT2.47.251	1	µg L ⁻¹
Selenium total		NT2.47	1	µg L ⁻¹
Silver filtered		NT2.47	0.8	µg L ⁻¹
Silver total		NT2.47	0.8	µg L ⁻¹
Zinc filtered		NT2.47	2	µg L ⁻¹
Zinc total		NT2.47	2	µg L ⁻¹

Analytes	Analytical Laboratory	Analytical Method	Reporting Limit	Unit
Phenoxy Acid Herbicides				
Dicamba	National Measurement Institute (NMI)	Electron Impact Full Scan or Selected Ion Monitoring (NGCMS_1117)	1	µg L ⁻¹
MCPA		NGCMS_1117	1	µg L ⁻¹
Dichlorprop		NGCMS_1117	1	µg L ⁻¹
2,4-D		NGCMS_1117	1	µg L ⁻¹
2, 4, 5-T		NGCMS_1117	1	µg L ⁻¹
2 4, 5 –TP		NGCMS_1117	1	µg L ⁻¹
2, 4-DB		NGCMS_1117	1	µg L ⁻¹
MCCP		NGCMS_1117	1	µg L ⁻¹
Trichlopyr		NGCMS_1117	1	µg L ⁻¹
Triazine Herbicides				
Atrazine	National Measurement Institute (NMI)	Extraction, Cleanup and Analysis (NR_19)	0.1	µg L ⁻¹
Hexazinone		NR_19	0.1	µg L ⁻¹
Metribuzine		NR_19	0.1	µg L ⁻¹
Prometryne		NR_19	0.1	µg L ⁻¹
Simazine		NR_19	0.1	µg L ⁻¹
Organophosphate Pesticides				
Azinphos-Methyl	National Measurement Institute (NMI)	NR_19	0.1	µg L ⁻¹
Azinphos-Ethyl		NR_19	0.1	µg L ⁻¹
Chlorpyrifos		NR_19	0.1	µg L ⁻¹
Chlorpyrifos Methyl		NR_19	0.1	µg L ⁻¹
Chlorfenvinophos (E)		NR_19	0.1	µg L ⁻¹
Chlorfenvinphos (Z)		NR_19	0.1	µg L ⁻¹
Demeton-S-Methyl		NR_19	0.1	µg L ⁻¹
Dichlorvos		NR_19	0.1	µg L ⁻¹
Diazinon		NR_19	0.1	µg L ⁻¹
Dimethoate		NR_19	0.1	µg L ⁻¹
Ethion		NR_19	0.1	µg L ⁻¹
Fenthion		NR_19	0.1	µg L ⁻¹
Fenitrothion		NR_19	0.1	µg L ⁻¹
Malathion		NR_19	0.1	µg L ⁻¹
Parathion (Ethyl)		NR_19	0.1	µg L ⁻¹
Parathion Methyl		NR_19	0.1	µg L ⁻¹
Pirimiphos-Ethyl		NR_19	0.1	µg L ⁻¹
Pirimiphos-Methyl	NR_19	0.1	µg L ⁻¹	
Organochlorine Pesticides				
Aldrin	National Measurement Institute (NMI)	NR_19	0.01	µg L ⁻¹
trans-Chlordane		NR_19	0.01	µg L ⁻¹
cis-Chlordane		NR_19	0.01	µg L ⁻¹
Oxychlordane		NR_19	0.01	µg L ⁻¹
BHC (other than lindane)		NR_19	0.01	µg L ⁻¹
DDD		NR_19	0.01	µg L ⁻¹
DDE		NR_19	0.01	µg L ⁻¹
DDT		NR_19	0.01	µg L ⁻¹
Dieldrin		NR_19	0.01	µg L ⁻¹
Endrin		NR_19	0.01	µg L ⁻¹
Endrin Aldehyde		NR_19	0.01	µg L ⁻¹
Endrin Ketone		NR_19	0.01	µg L ⁻¹
alpha-Endosulfan		NR_19	0.01	µg L ⁻¹
beta-Endosulfan		NR_19	0.01	µg L ⁻¹
Endosulfan Sulfate		NR_19	0.01	µg L ⁻¹
HCB		NR_19	0.01	µg L ⁻¹

Analytes	Analytical Laboratory	Analytical Method	Reporting Limit	Unit
Heptachlor		NR_19	0.01	µg L ⁻¹
Heptachlor epoxide		NR_19	0.01	µg L ⁻¹
Lindane		NR_19	0.01	µg L ⁻¹
Methoxychlor		NR_19	0.01	µg L ⁻¹
Phthalates				
Dimethyl phthalate	National Measurement Institute (NMI)	Electron Impact or Selected Ion Monitoring (NGCMS_1111)	10	µg L ⁻¹
Diethyl phthalate		NGCMS_1111	10	µg L ⁻¹
Di-n-butyl phthalate		NGCMS_1111	10	µg L ⁻¹
Benzyl butyl phthalate		NGCMS_1111	10	µg L ⁻¹
Bis(2-ethylhexyl)phthalate		NGCMS_1111	20	µg L ⁻¹
Di-n-octyl phthalate		NGCMS_1111	10	µg L ⁻¹
PCB Aroclors				
Aroclor 1016	National Measurement Institute (NMI)	NR_19	0.1	µg L ⁻¹
Aroclor 1221		NR_19	0.1	µg L ⁻¹
Aroclor 1232		NR_19	0.1	µg L ⁻¹
Aroclor 1242		NR_19	0.1	µg L ⁻¹
Aroclor 1248		NR_19	0.1	µg L ⁻¹
Aroclor 1254		NR_19	0.1	µg L ⁻¹
Aroclor 1260		NR_19	0.1	µg L ⁻¹
Total PCBs (as above)		NR_19	0.1	µg L ⁻¹
Chlorinated Hydrocarbons				
2-Chloronaphthalene	National Measurement Institute (NMI)	Extraction, Filtration and Analysis using a modified USEPA 8270 method (NGCMS_1122)	20	µg L ⁻¹
1,4-Dichlorobenzene		NGCMS_1122	20	µg L ⁻¹
1,2-Dichlorobenzene		NGCMS_1122	20	µg L ⁻¹
1,3-Dichlorobenzene		NGCMS_1122	20	µg L ⁻¹
Hexachlorobenzene		NGCMS_1122	20	µg L ⁻¹
1,2,4-Trichlorobenzene		NGCMS_1122	20	µg L ⁻¹
Hexachloroethane		NGCMS_1122	20	µg L ⁻¹
Hexachlorocyclopentadiene		NGCMS_1122	20	µg L ⁻¹
Hexachloro-1,3-butadiene		NGCMS_1122	20	µg L ⁻¹
Ethers				
4-Bromophenyl phenyl ether	National Measurement Institute (NMI)	NGCMS_1122	20	µg L ⁻¹
4-Chlorophenyl phenyl ether		NGCMS_1122	20	µg L ⁻¹
Bis(2-chloroethyl)ether		NGCMS_1122	20	µg L ⁻¹
Bis(2-chloroethoxy)methane		NGCMS_1122	20	µg L ⁻¹
Bis(2-chloroisopropyl)ether		NGCMS_1122	20	µg L ⁻¹
Amines, Nitroaromatics & Nitrosamines				
Azobenzene	National Measurement Institute (NMI)	NGCMS_1122	20	µg L ⁻¹
2,4-Dinitrotoluene		NGCMS_1122	20	µg L ⁻¹
2,6-Dinitrotoluene		NGCMS_1122	20	µg L ⁻¹
Nitrobenzene		NGCMS_1122	20	µg L ⁻¹
NNitrosodimethylamine		NGCMS_1122	20	µg L ⁻¹
N-Nitrosodiphenylamine		NGCMS_1122	20	µg L ⁻¹
N-Nitrosodi-n-		NGCMS_1122	20	µg L ⁻¹

Analytes	Analytical Laboratory	Analytical Method	Reporting Limit	Unit
propylamine				
Aniline		NGCMS_1122	20	µg L ⁻¹
4-Chloroaniline		NGCMS_1122	20	µg L ⁻¹
2-Nitroaniline		NGCMS_1122	20	µg L ⁻¹
3-Nitroaniline		NGCMS_1122	20	µg L ⁻¹
4-Nitroaniline		NGCMS_1122	20	µg L ⁻¹
Other Organics				
Dichlorobenzidine	National Measurement Institute (NMI)	NGCMS_1122	20	µg L ⁻¹
2-Methylnaphthalene		NGCMS_1122	10	µg L ⁻¹
Isophorone		NGCMS_1122	20	µg L ⁻¹
Benzyl alcohol		NGCMS_1122	20	µg L ⁻¹
Carbazole		NGCMS_1122	20	µg L ⁻¹
Dibenzofuran		NGCMS_1122	20	µg L ⁻¹
BTEX				
Benzene	National Measurement Institute (NMI)	Purge and trap technique with GC/FID (WL244)	1	µg L ⁻¹
Toluene		WL244	1	µg L ⁻¹
Ethylbenzene		WL244	1	µg L ⁻¹
Xylene		WL244	2	µg L ⁻¹
Total BTEX		WL244	5	µg L ⁻¹
TPH				
TPH C6-C9	National Measurement Institute (NMI)	WL244	25	µg L ⁻¹
TPH C10-C14		Gas chromatography with flame ionisation detection (WL203)	25	µg L ⁻¹
TPH C15-C28		WL203	100	µg L ⁻¹
TPH C29-C36		WL203	100	µg L ⁻¹
Total Petroleum Hydrocarbons (TPH)		WL203	250	µg L ⁻¹
PAHs				
Naphthalene	National Measurement Institute (NMI)	NGCMS_1111	0.1	µg L ⁻¹
Acenaphthylene		NGCMS_1111	0.1	µg L ⁻¹
Acenaphthene		NGCMS_1111	0.1	µg L ⁻¹
Fluorene		NGCMS_1111	0.1	µg L ⁻¹
Phenanthrene		NGCMS_1111	0.1	µg L ⁻¹
Anthracene		NGCMS_1111	0.1	µg L ⁻¹
Fluoranthene		NGCMS_1111	0.1	µg L ⁻¹
Pyrene		NGCMS_1111	0.1	µg L ⁻¹
Benzo(a)anthracene		NGCMS_1111	0.1	µg L ⁻¹
Chrysene		NGCMS_1111	0.1	µg L ⁻¹
Benzo(b)&(k)fluoranthene		NGCMS_1111	0.1	µg L ⁻¹
Benzo(a)pyrene		NGCMS_1111	0.1	µg L ⁻¹
Indeno(1,2,3-cd)pyrene		NGCMS_1111	0.1	µg L ⁻¹
Dibenz(ah)anthracene		NGCMS_1111	0.1	µg L ⁻¹
Benzo(ghi)perylene		NGCMS_1111	0.1	µg L ⁻¹
Surfactants				
methylene blue active substances (MBAS) *	SGS Australia	Methylene dye added, extraction and colorimetrically measured based on test APHA 5540C	n/a	n/a
Miscellaneous Other				
Chlorine-Free	National Measurement Institute (NMI)	Colour test by comparison with coloured disc (WL146)	0.02	mg/L
Chlorine-Total		WL146	0.02	mg/L
Dissolved Organic		Split Sample and Compare	n/a	mg/L

Analytes	Analytical Laboratory	Analytical Method	Reporting Limit	Unit
Carbon (after filtering)		Total Carbon and Inorganic Carbon measured with Infrared Detector – Based on Method APHA 5310B (WL240)		
Total Organic Carbon		WL240	n/a	mg/L
Total Suspended Solids		Gravimetric Procedure – Based on APHA Methods 2540D and E (WL126)	5	mg/L
5-day Biological Oxygen Demand		5 Day Incubation of Neutralised, Chlorine Free Sample – Based on APHA Method 5210B (WL189)	5	mg/L
pH		Measured Potentiometrically Using a Combination Electrode (WL120)	0.1	pH unit

Notes:

1. The upper and lower detection limits for microbiological indicators are dependent on the dilution of the original sample.
2. Method detection limit determined from 3.2 x standard deviation of 10 standard samples.
n/a = information not available

Analytical methods and reporting limits for water quality parameters

Parameter	Analytical Method(1)	Reporting Limit	Unit
Nutrients			
Ortho-phosphate	Lachat-Automated Flow Injection Analyser (4100)	2 ⁽²⁾	µg P L ⁻¹
Ammonia	Lachat-Automated Flow Injection Analyser (4100)	3 ⁽²⁾	µg P L ⁻¹
Nitrate + Nitrite	Lachat-Automated Flow Injection Analyser (4100)	2 ⁽²⁾	µg P L ⁻¹
Primary Production			
Chlorophyll-a	Acetone extraction (3000)	0.1 ⁽²⁾	µg P L ⁻¹
Phaeophytin	Acetone extraction (3000)	0.1 ⁽²⁾	µg P L ⁻¹
Microbiological Indicators			
E.coli	Membrane filtration	Dilution dependent ⁽³⁾	CFU 100 ml ⁻¹
Enterococci	Membrane filtration	Dilution dependent ⁽³⁾	CFU 100 ml ⁻¹

Notes:

1. Numbers in brackets refer to the MAFRL analysis method number.
2. Method detection limit determined from 3.2 x standard deviation of 10 standard samples.
3. The upper and lower detection limits for microbiological indicators are dependent on the dilution of the original sample.



Appendix C – Comprehensive treated wastewater characterisation results

Parameter	SDOOL TWW	ANZECC/ARMCANZ (2000) guidelines (µg/L) ¹				
		Level of protection				Low reliability value (LRV)
	2018	99%	95%	90%	80%	
Microbiological						
Confirmed <i>Enterococci</i> (MPN/100 mL) ²	>24 000	n/a ³	n/a	n/a	n/a	n/a
Presumptive thermotolerant coliforms (TTC; CFU/100 mL) ⁴	8 000 000	n/a	n/a	n/a	n/a	n/a
Confirmed TTC (CFU/100 mL) ⁴	6 400 000	n/a	n/a	n/a	n/a	n/a
<i>Escherichia coli</i> (CFU/100 mL)	3 200 000	n/a	n/a	n/a	n/a	n/a
Nutrients (µg/L)						
Ammonia-N	36 000	500	910	1 200	1 700	-
Nitrate-N+Nitrite-N	57	ID ⁵	ID	ID	ID	13 000
Nitrogen-Total N	43 000	n/a	n/a	n/a	n/a	n/a
Phosphate-Ortho as P	5200	n/a	n/a	n/a	n/a	n/a
Phosphorous-Total P	7500	n/a	n/a	n/a	n/a	n/a
"Dissolved" metals (0.45 µm filtered) (µg/L)						
Arsenic (As)	1	ID	ID	ID	ID	2.3 (As III) 4.5 (As V)
Cadmium (Cd)	<0.1	0.7	5.5	14	36	-
Chromium (Cr)	2	7.7 (Cr III) 0.14 (Cr VI)	27.4 (Cr III) 4.4 (Cr VI)	48.6 (Cr III) 20 (Cr VI)	90.6 (Cr III) 85 (Cr VI)	-
Copper (Cu)	3	0.3	1.3	3	8	-
Lead (Pb)	<1	2.2	4.4	6.6	12	-
Mercury (Hg)	0.56	0.1	0.4	0.7	1.4	-
Nickel (Ni)	3.1	7	70	200	560	-
Selenium (Se)	<1	ID	ID	ID	ID	3
Silver (Ag)	<1	0.8	1.4	1.8	2.6	-
Zinc (Zn)	12	7	15	23	43	-
Total metals (acid extractable; unfiltered) (µg/L)						
Arsenic (As)	1.1	ID	ID	ID	ID	2.3 (As III) 4.5 (AsV)
Cadmium (Cd)	<0.1	0.7	5.5	14	36	-
Chromium (Cr)	2.7	7.7 (Cr III) 0.14 (Cr VI)	27.4 (Cr III) 4.4 (Cr VI)	48.6 (Cr III) 20 (Cr VI)	90.6 (Cr III) 85 (Cr VI)	-
Copper (Cu)	31	0.3	1.3	3	8	-
Lead (Pb)	1.3	2.2	4.4	6.6	12	-
Mercury (Hg)	<0.1	0.1	0.4	0.7	1.4	-
Nickel (Ni)	3.7	7	70	200	560	-
Selenium (Se)	<1	ID	ID	ID	ID	3
Silver (Ag)	<1	0.8	1.4	1.8	2.6	-
Zinc (Zn)	81	7	15	23	43	-
Triazine herbicides (µg/L)						
Atrazine	<0.1	ID	ID	ID	ID	13
Hexazinone	<0.1	ID	ID	ID	ID	75
Metribuzine	<0.1	n/a	n/a	n/a	n/a	n/a
Prometryne	<0.1	n/a	n/a	n/a	n/a	n/a

Parameter	SDOOL TWW	ANZECC/ARMCANZ (2000) guidelines ($\mu\text{g/L}$) ¹					Low reliability value (LRV)
		Level of protection					
	2018	99%	95%	90%	80%		
Simazine	<0.1	ID	ID	ID	ID	3.2	
Phenoxy acid herbicides ($\mu\text{g/L}$)							
Dicamba ⁶	<1	n/a	n/a	n/a	n/a	n/a	
MCPA	<1	ID	ID	ID	ID	1.4	
Dichlorprop	<1	n/a	n/a	n/a	n/a	n/a	
2,4-D	1	ID	ID	ID	ID	280	
2,4,5-T	<1	n/a	n/a	n/a	n/a	n/a	
2,4,5-TP	<1	n/a	n/a	n/a	n/a	n/a	
2,4-DB	<1	n/a	n/a	n/a	n/a	n/a	
MCPP	<1	n/a	n/a	n/a	n/a	n/a	
Triclopyr ⁷	<1	n/a	n/a	n/a	n/a	n/a	
Organophosphate pesticides ($\mu\text{g/L}$)							
Azinphos-Methyl	<0.1	ID	ID	ID	ID	0.01	
Azinphos-Ethyl	<0.1	n/a	n/a	n/a	n/a	n/a	
Chlorpyrifos	<0.1	0.0005	0.009	0.04	0.3	-	
Chlorfenvinphos (E)	<0.1	n/a	n/a	n/a	n/a	n/a	
Chlorfenvinphos (Z)	<0.1	n/a	n/a	n/a	n/a	n/a	
Demeton-S-Methyl	<0.1	ID	ID	ID	ID	4	
Dichlorvos	<0.1	n/a	n/a	n/a	n/a	n/a	
Diazinon	<0.1	ID	ID	ID	ID	0.01	
Dimethoate	<0.1	ID	ID	ID	ID	0.15	
Ethion	<0.1	n/a	n/a	n/a	n/a	n/a	
Fenthion	<0.1	n/a	n/a	n/a	n/a	n/a	
Fenitrothion	<0.1	ID	ID	ID	ID	0.001	
Malathion	<0.1	ID	ID	ID	ID	0.05	
Parathion (Ethyl)	<0.1	ID	ID	ID	ID	0.004	
Parathion Methyl	<0.1	n/a	n/a	n/a	n/a	n/a	
Pirimiphos-Ethyl ⁸	<0.1	n/a	n/a	n/a	n/a	n/a	
Pirimiphos-Methyl ⁹	<0.1	n/a	n/a	n/a	n/a	n/a	
Organochlorine pesticides ($\mu\text{g/L}$)							
Aldrin	<0.001	ID	ID	ID	ID	0.003	
Trans-Chlordane ¹⁰	<0.001	ID	ID	ID	ID	0.001	
Cis-Chlordane ¹⁰	<0.001	ID	ID	ID	ID	0.001	
Oxychlordane ¹⁰	<0.001	ID	ID	ID	ID	0.001	
Gamma-BHC (Lindane)	<0.001	ID	ID	ID	ID	0.007	
alpha-BHC	<0.001	n/a	n/a	n/a	n/a	n/a	
beta-BHC	<0.001	n/a	n/a	n/a	n/a	n/a	
delta-BHC	<0.001	n/a	n/a	n/a	n/a	n/a	
p,p-DDD	<0.001	n/a	n/a	n/a	n/a	n/a	
p,p-DDE	<0.001	ID	ID	ID	ID	0.0005	

Parameter	SDOOL TWW	ANZECC/ARMCANZ (2000) guidelines ($\mu\text{g/L}$) ¹					Low reliability value (LRV)
		Level of protection					
	2018	99%	95%	90%	80%		
p,p-DDT	<0.001	ID	ID	ID	ID	0.0004	
Dieldrin	<0.001	ID	ID	ID	ID	0.01	
Endrin	<0.001	0.004	0.008	0.01	0.02	-	
Endrin aldehyde	<0.001	n/a	n/a	n/a	n/a	n/a	
Endrin ketone	<0.001	n/a	n/a	n/a	n/a	n/a	
alpha-Endosulfan	<0.001	ID	ID	ID	ID	0.0002	
beta-Endosulfan	<0.001	ID	ID	ID	ID	0.007	
Endosulfan sulfate ¹¹	<0.001	0.005	0.01	0.02	0.05	-	
HCB (Hexachlorobenzene)	<0.001	ID	ID	ID	ID	0.05	
Heptachlor	<0.001	ID	ID	ID	ID	0.0004	
Heptachlor epoxide	<0.001	n/a	n/a	n/a	n/a	n/a	
Methoxychlor	<0.001	ID	ID	ID	ID	0.004	
Phenol ($\mu\text{g/L}$)							
Phenol	<1	270	400	520	720	-	
Nonylphenol	<1	ID	ID	ID	ID	1	
2-Chlorophenol	<1	ID	ID	ID	ID	340	
2-Methylphenol	<1	n/a	n/a	n/a	n/a	n/a	
2,4-Dichlorophenol	<1	ID	ID	ID	ID	120	
2-Nitrophenol	<1	n/a	n/a	n/a	n/a	n/a	
4-Chloro-3-methylphenol	<2	n/a	n/a	n/a	n/a	2	
2,4,6-Trichlorophenol	<2	ID	ID	ID	ID	34	
4-Nitrophenol	<1	ID	ID	ID	ID	2	
2,4,5-Trichlorophenol	<2	n/a	n/a	n/a	n/a	n/a	
2,3,4,6-Trichlorophenol	<2	ID	ID	ID	ID	10	
Pentachlorophenol (PCP)	<2	11	22	33	55	-	
Phthalates ($\mu\text{g/L}$)							
Dimethyl phthalate	<10	ID	ID	ID	ID	3700	
Diethyl phthalate	<10	ID	ID	ID	ID	900	
Di-n-butyl phthalate	<10	ID	ID	ID	ID	25	
Butyl benzyl phthalate	<10	n/a	n/a	n/a	n/a	n/a	
Bis(2-ethylhexyl) phthalate	<20	ID	ID	ID	ID	1	
PCB aroclors							
Aroclor 1016	<0.1	ID	ID	ID	ID	0.009	
Aroclor 1221	<0.1	ID	ID	ID	ID	1	
Aroclor 1232	<0.1	ID	ID	ID	ID	0.3	
Aroclor 1242	<0.1	ID	ID	ID	ID	0.3	
Aroclor 1248	<0.1	ID	ID	ID	ID	0.03	
Aroclor 1254	<0.1	ID	ID	ID	ID	0.01	
Aroclor 1260	<0.1	ID	ID	ID	ID	n/a	
Total PCBs (as above) ¹²	<0.1	ID	ID	ID	ID	n/a	

Parameter	SDOOL TWW	ANZECC/ARMCANZ (2000) guidelines ($\mu\text{g/L}$) ¹				
		Level of protection				Low reliability value (LRV)
	2018	99%	95%	90%	80%	
Chlorinated hydrocarbons ($\mu\text{g/L}$)						
2-Chloronaphthalene	<20	n/a	n/a	n/a	n/a	n/a
1,4-Dichlorobenzene	<20	ID	ID	ID	ID	60
1,2-Dichlorobenzene	<20	ID	ID	ID	ID	160
1,3-Dichlorobenzene	<20	ID	ID	ID	ID	260
Hexachlorobenzene	<20	ID	ID	ID	ID	0.05
1,2,4-Trichlorobenzene	<20	20	80	140	240	-
Hexachloroethane	<20	ID	ID	ID	ID	290
Hexachlorocyclopentadiene	<20	ID	ID	ID	ID	0.05
Hexachloro-1,3-butadiene ¹³	<20	ID	ID	ID	ID	0.03
Ethers ($\mu\text{g/L}$)						
4-Bromophenyl phenyl ether ¹⁴	<20	n/a	n/a	n/a	n/a	n/a
4-Chlorophenyl phenyl ether	<20	n/a	n/a	n/a	n/a	n/a
Bis(2-chloroethyl)ether	<20	n/a	n/a	n/a	n/a	n/a
Bis(2-chloroethoxy)methane	<20	n/a	n/a	n/a	n/a	n/a
Bis(2-chloroisopropyl)ether	<20	n/a	n/a	n/a	n/a	n/a
Amines, nitroaromatics nitrosamines ($\mu\text{g/L}$)						
Azobenzene	<20	n/a	n/a	n/a	n/a	n/a
2,4-Dinitrotoluene	<20	ID	ID	ID	ID	16
2,6-Dinitrotoluene	<20	n/a	n/a	n/a	n/a	0.3
Nitrobenzene	<20	ID	ID	ID	ID	550
N-Nitrosodimethylamine	<20	n/a	n/a	n/a	n/a	n/a
N-Nitrosodiphenylamine	<20	ID	ID	ID	ID	6
N-Nitrosodi-n-propylamine	<20	n/a	n/a	n/a	n/a	n/a
Aniline	<20	ID	ID	ID	ID	8
4-Chloroaniline	<20	n/a	n/a	n/a	n/a	n/a
2-Nitroaniline	<20	n/a	n/a	n/a	n/a	n/a
3-Nitroaniline	<20	n/a	n/a	n/a	n/a	n/a
4-Nitroaniline	<20	n/a	n/a	n/a	n/a	n/a
Other organics ($\mu\text{g/L}$)						
Dichlorobenzidine ¹⁵	<20	ID	ID	ID	ID	0.5
2-Methylnaphthalene	<10	n/a	n/a	n/a	n/a	n/a
Isophorone	<20	ID	ID	ID	ID	130
Benzyl alcohol	<20	n/a	n/a	n/a	n/a	n/a
Carbazole	<20	n/a	n/a	n/a	n/a	n/a
Dibenzofuran	<20	n/a	n/a	n/a	n/a	n/a
BTEX ($\mu\text{g/L}$)						
Benzene	<1.0	500	700	900	1300	500
Toluene	<1.0	ID	ID	ID	ID	180
Ethylbenzene	<1.0	ID	ID	ID	ID	5

Parameter	SDOOL TWW	ANZECC/ARMCANZ (2000) guidelines ($\mu\text{g/L}$) ¹					Low reliability value (LRV)
		Level of protection					
	2018	99%	95%	90%	80%		
Xylene ¹⁶	<2.0	ID	ID	ID	ID	75	
Total BTEX ¹²	<5.0	n/a	n/a	n/a	n/a	n/a	
Total petroleum hydrocarbons (TPH) ($\mu\text{g/L}$)							
TPH C6 - C9 ¹⁷	<25	ID	ID	ID	ID	n/a	
TPH C10 - C14 ¹⁷	<25	ID	ID	ID	ID	n/a	
TPH C15 - C28 ¹⁷	<100	ID	ID	ID	ID	n/a	
TPH C29 - C36 ¹⁷	<100	ID	ID	ID	ID	n/a	
Total TPH ^{17,18}	<250	ID	ID	ID	ID	n/a	
Poly aromatic hydrocarbons (PAHs) ($\mu\text{g/L}$)							
Naphthalene	<0.01	50	70	90	120	-	
Acenaphthylene	<0.01	n/a	n/a	n/a	n/a	n/a	
Acenaphthene	<0.01	n/a	n/a	n/a	n/a	n/a	
Fluorene	<0.01	n/a	n/a	n/a	n/a	n/a	
Phenanthrene	<0.01	ID	ID	ID	ID	2	
Anthracene	<0.01	ID	ID	ID	ID	0.4	
Fluoranthene	<0.01	ID	ID	ID	ID	1.4	
Pyrene	<0.01	n/a	n/a	n/a	n/a	n/a	
Benz(a)anthracene	<0.01	n/a	n/a	n/a	n/a	n/a	
Chrysene	<0.01	n/a	n/a	n/a	n/a	n/a	
Benzo(b,k)fluoranthene	<0.02	n/a	n/a	n/a	n/a	n/a	
Benzo(a)pyrene	<0.01	n/a	n/a	n/a	n/a	n/a	
Indeno(1,2,3-cd)pyrene	<0.01	n/a	n/a	n/a	n/a	n/a	
Dibenz(a,h)anthracene	<0.01	n/a	n/a	n/a	n/a	n/a	
Benzo(g,h,i)perylene	<0.01	50	70	90	120	-	
Surfactants (mg/L)							
Methylene blue active substances (MBAS) ¹⁹ (mg/L)	0.31	n/a	n/a	n/a	n/a	n/a	
Miscellaneous other (mg/L unless indicated)							
Chlorine-Free	<0.01	ID	ID	ID	ID	3	
Chlorine-Total	<0.01	ID	ID	ID	ID	3	
Dissolved Organic Carbon (DOC)	18	n/a	n/a	n/a	n/a	n/a	
Total organic carbon (TOC)	22	n/a	n/a	n/a	n/a	n/a	
Total suspended solids (TSS) ²⁰	76	n/a	n/a	n/a	n/a	n/a	
Biological oxygen demand (BOD)	46	n/a	n/a	n/a	n/a	n/a	
pH ²¹	7.4	n/a	n/a	n/a	n/a	n/a	

Notes:

- The trigger values for marine waters are from Table 3.4.1 in ANZECC/ARMCANZ (2000a). The EPA has provided advice that in WA waters where a high level of protection applies, that the 99% species protection levels should be used, with the exception of cobalt, where the 95% species protection levels is used. Grey bold text represents the relevant ANZECC/ARMCANZ (2000a) guideline values and amber bold text represents an exceedance of guideline values prior to initial dilution.
- Primary and secondary contact guideline for recreational marine waters are 35 and 230 Enterococci organisms/100 mL, respectively (ANZECC/ARMCANZ 2000a).
- n/a = ANZECC/ARMCANZ (2000a) guideline or LRV not available for this parameter.
- Primary and secondary contact guidelines for recreational marine waters 150 and 1 000 faecal coliforms/100 mL (ANZECC/ARMCANZ 2000a), respectively.

5. ID = insufficient data to derive a reliable national trigger value.
6. Recreational guideline for Dicamba = 300 µg/L (Table 5.2.4; ANZECC/ARMCANZ 2000a).
7. Recreational guideline for Triclopyr = 20 µg/L (Table 5.2.4; ANZECC/ARMCANZ 2000a).
8. Recreational guideline for Pirimiphos-ethyl = 1 µg/L (Table 5.2.4; ANZECC/ARMCANZ 2000a).
9. Recreational guideline for Pirimiphos-methyl = 60 µg/L (Table 5.2.4; ANZECC/ARMCANZ 2000a).
10. Guideline values are for total chlordane though cis-chlordane is ~7 times more toxic than transchlordane (ANZECC/ARMCANZ 2000a).
11. Guideline values are for Endosulphan, not Endosulphan sulfate (Table 3.4.1; ANZECC/ARMCANZ 2000a).
12. ANZECC/ARMCANZ (2000b) recommends using a formula to calculate total toxicity of the mixture if using total PCBs and BTEX (page 8.3-65; ANZECC/ARMCANZ 2000b).
13. Environmental Concern Level (ECL) for Hexachloro-1,3-butadiene (not LRV) (definition of ECL on page 8.3-35; page 8.3-231; ANZECC/ARMCANZ 2000b).
14. Recommended ECL for 4-**Bromophenyl phenyl ether** = 12 µg/L (page 8.3-232; ANZECC/ARMCANZ 2000b).
15. ECL for Dichlorobenzidine (not LRV) (page 8.3-187; ANZECC/ARMCANZ 2000b).
16. Guideline for o-xylene = 350 µg/L, for m-xylene = 75 µg/L and for p-xylene = 200 µg/L (ANZECC/ARMCANZ 2000a).
17. Guideline values are for generic oils and petroleum hydrocarbons (Table 3.4.1; ANZECC/ARMCANZ 2000a).
18. A generic estimate of 7 µg/L for a total petroleum hydrocarbon chronic value has been estimated using USEPA methods (page 8.3-297; ANZECC/ARMCANZ 2000b).
19. Recreational guideline for MBAS = 0.2 mg/L (ANZECC/ARMCANZ 2000a).
20. Suspended solids guidelines for the protection of saltwater aquaculture species = <10 mg/L (Table 4.4.2; ANZECC/ARMCANZ 2000a).
21. pH guideline range for slightly disturbed inshore marine ecosystems in southwest Australia = 8.0 to 8.4 (Table 3.3.6; ANZECC/ARMCANZ 2000a).

References

- ANZECC/ARMCANZ (2000a) National Water Quality Management Strategy: Paper No 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1 – The Guidelines (Chapters 1-7). Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory, October 2000
- ANZECC/ARMCANZ (2000b) National Water Quality Management Strategy: Paper No 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 2 – Aquatic Ecosystems – Rationale and Background Information (Chapter 8). Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory, October 2000



Appendix D – Initial dilution output

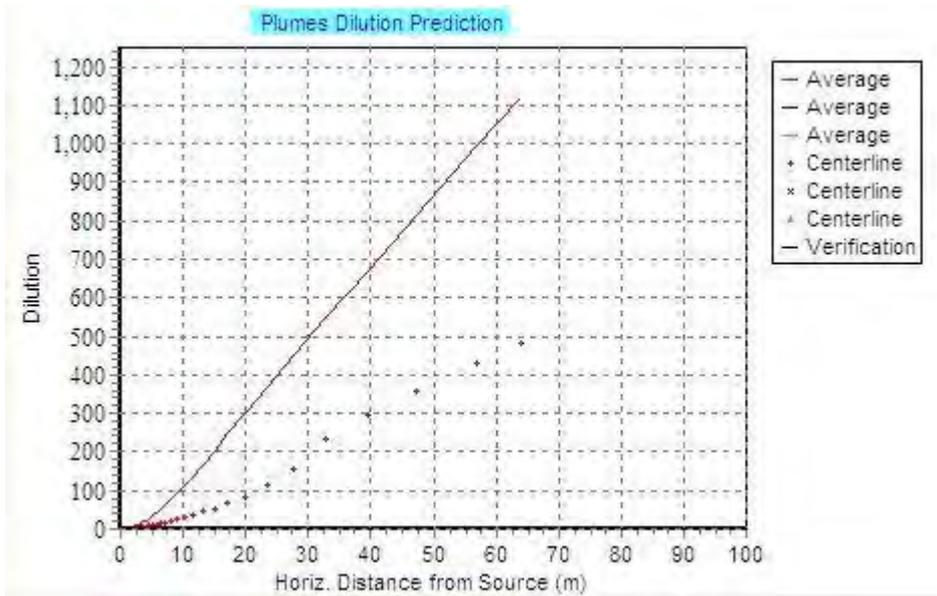
Sepia Depression

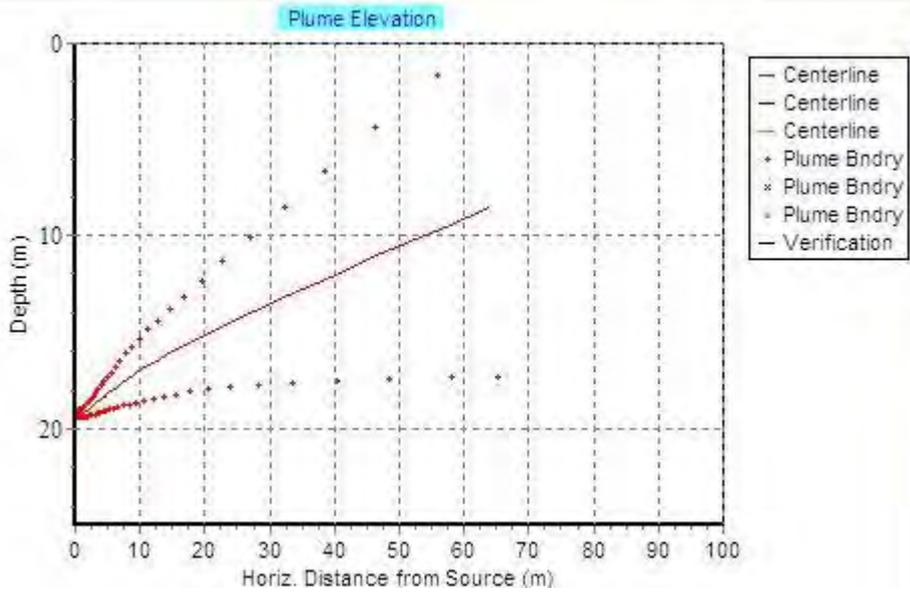
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/ UM3. 5/17/2018 11:43:17 AM
Case 1; ambient file c:\plumes\vp plume 62.001.db; diffuser table record 1: -----
Ambient Table:
Depth    Amb-cur  Amb-dir  Amb-sal  Amb-tem  Amb-pol  Decay  Far-spd  Far-dir  Disprsn  Density
  m      m/s      deg      psu      C        kg/kg    s-1    m/s      deg      m0.67/s2  sigma-T
0.0      0.382   108.2    36.19   22.9     0.0      0.0001 -        -        0.0      24.89
19.25   0.29    108.2    36.18   22.9     0.0      0.0001 -        -        0.0      24.88

Diffuser table:
P-dia    P-elev  V-angle  H-angle  Ports  Spacing  AcuteMZ  ChrnMZ  P-depth  Tt1-flo  Eff-con  Temp  Polutnt
  (m)     (m)     (deg)    (deg)    (°)     (m)      (m)      (m)     (m)      (MLD)(mmho/cm)  (C)  (kg/kg)
0.135    0.75    0.0      108.2    68.0    4.65     100.0    150.0    19.25    140.08   1.354   28.41  0.1

Simulation:
Froude number:      8.613; effluent density (sigma-T)  -3.276; effluent velocity  1.666(m/s);
Step  Depth    Amb-cur  P-dia  Polutnt  Dilutn  CL-diln  x-posn  y-posn
  0     19.25   0.29    0.135  0.1      1.0      1.0      0.0      0.0;
 100   19.04   0.291   0.659  0.0138  7.073    2.598    -0.573  1.742;
 200   17.84   0.297   2.166  0.0019  51.07    14.84    -2.002  6.089;
 275   15.84   0.306   4.692  0.000429  225.4    60.0     -4.994  15.19; merging;|
 300   14.6    0.312   6.614  0.000261  369.8    117.3    -7.281  22.15;
 304   14.34   0.313   7.054  0.000241  400.3    133.1    -7.777  23.65; stream limit reached;
 356   8.509   0.341   17.69  8.508E-5  1120.9   492.7    -19.59  59.57; surface;
:
11:43:17 AM. amb fills: 2
    
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Appendix E – National Measurement Institute laboratory results



Appendix F – Detailed methodologies

1. Maintenance of Ecosystem Integrity

1.1 Environmental Quality Objective

The EQO for the EV 'Ecosystem Health' is aimed at maintaining ecosystem integrity and biodiversity, thereby ensuring the continued health and productivity of Perth's coastal waters (EPA 2000). There are two designated areas of ecological protection surrounding the Sepia Depression ocean outlet: a high ecological protection area (HEPA) and a low ecological protection area (LEPA). The LEPA includes waters within a 100 m radius around the diffuser; waters outside this zone are managed as a HEPA (Figure 1.1).

Contaminants are monitored in the TWW prior to discharge, as well as within the receiving environment. The primary contaminants of concern are nutrients (principally nitrogen and phosphorus) and toxicants (i.e. metals, herbicides, pesticides and organic particulates). Monitoring against EQC involves:

- toxicants in TWW
- receiving water physical/chemical measures
- receiving water direct biological measures.

Total allowable nutrient loads are regulated by Condition 10 in Ministerial Statement 665. Physical/chemical stressors in the receiving waters (i.e. the marine environment) are managed via the CM developed under the PLOOM program.

Toxicant loads are also defined within Ministerial Statement 665 and EQC defined within the SDOOL MMP (BMT Oceanica 2014a). Within the LEPA, an average dilution of the wastewater stream of at least 300-fold, and above 200-fold 99% of the time, is to be achieved. The ANZECC/ARMCANZ (2000) 99% species protection guidelines for toxicants (with the exception of cobalt, for which the 95% species protection guideline will apply) must be met at the LEPA boundary.

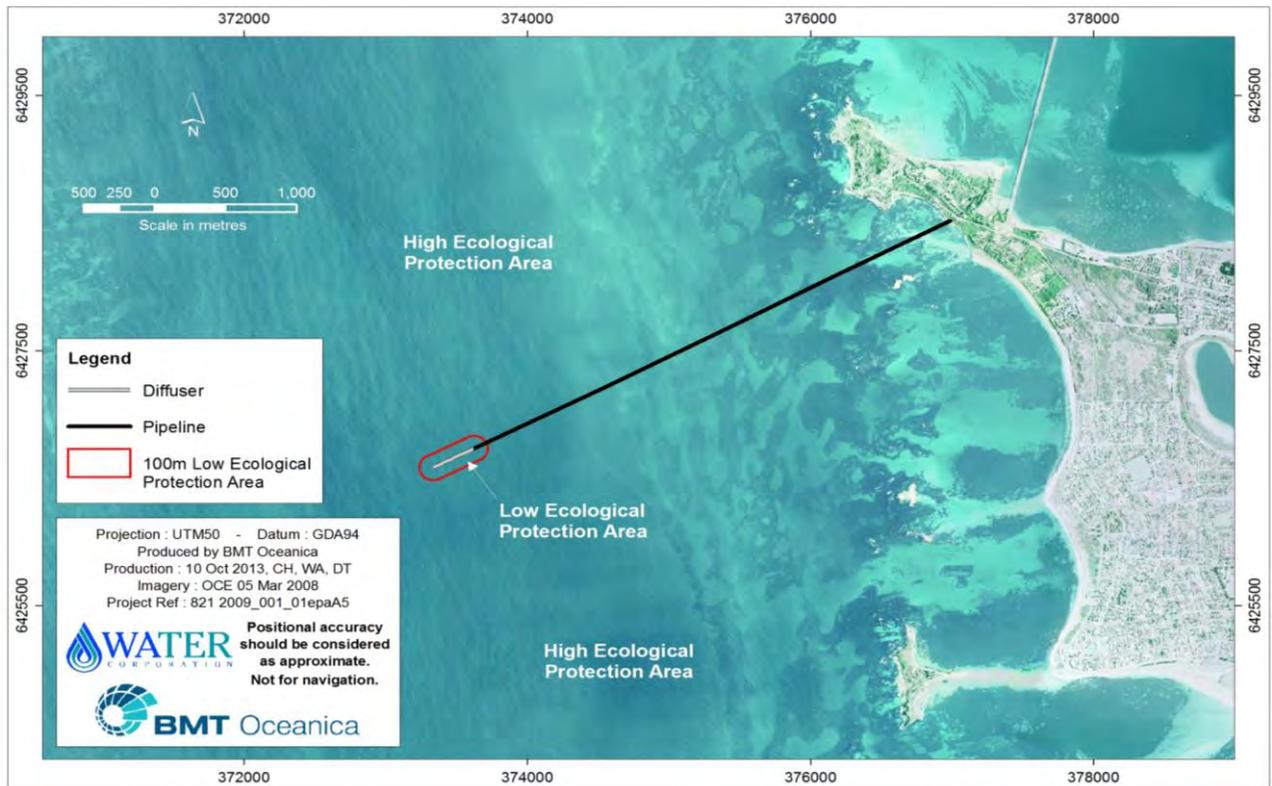


Figure 1.1 Sepia Depression ocean outlet ecological protection boundaries

1.2 Toxicants in treated wastewater

Toxicants in TWW are assessed using EQG triggers for:

- bioaccumulating toxicants in the undiluted TWW stream¹ (EQG 1)
- non-bioaccumulating toxicants at the LEPA boundary (EQG 2)
- total toxicity of the mixture (TTM) for key contaminants (ammonia, copper and zinc) at the LEPA boundary (EQG 3)
- WET testing using various dilution levels of the TWW stream (EQG 4).

Quarterly wastewater sampling is also undertaken to measure a subset of contaminants more regularly, with results evaluated against both the ANZECC/ARMCANZ (2000) 99% species protection guidelines and Schedule 1 criteria from Ministerial Statement 665. TTM calculations are also conducted for the contaminants most likely to cause toxicity effects (ammonia, copper and zinc).

¹ Sampled from the SDOOL at a point directly after the Point Peron WWTP so as to include all wastewater inputs into the SDOOL; refer to Error! Reference source not found..

1.2.1 Comprehensive treated wastewater characterisation

TWW (final effluent) from the SDOOL is analysed for a suite of parameters comprising the major contaminants of concern:

- nutrients (total nitrogen, ammonia, nitrate+nitrite (NO_x), total phosphorus, orthophosphate)
- microbiological contaminants
- bioavailable metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc)
- pesticides and herbicides (organophosphate pesticides, organochlorine pesticides, triazine herbicides)
- polyaromatic hydrocarbons
- phenol
- phthalates
- polychlorinated biphenyls
- benzene, toluene, ethylbenzene, and xylenes
- petroleum hydrocarbons
- surfactants
- dissolved organic carbon.

Sampling for the CTWWC occurred on 28 February 2017. A 24-hour flow-weighted composite sample was obtained from the SDOOL prior to discharge (at a location called sample point D). This sample represents an average of the TWW discharged to the Sepia Depression ocean outlet for the 24 hours prior to and during the sample collection.

The bulk sample is homogenised (agitated), split into separate sample containers for the various analyte groups and handled according to the National Association of Testing Authorities (NATA)-accredited laboratory requirements for those analytes. Samples for bioavailable metals are passed through a 0.45 µm filter prior to analysis, in accordance with Environmental Protection Authority (EPA) prescribed methods (EPA 2005a). Analyses are completed by laboratories with NATA-accredited methods, and the results are compared against the EQG (based on ANZECC/ARMCANZ (2000) guidelines).

Total toxicity of the mixture

The total toxicity of the mixture (TTM) calculation is an additional interpretative tool used for estimating the potential toxicity of TWW, and is used to evaluate EQG 3 for toxicants in TWW. The potential for cumulative toxic effects on marine organisms is assessed as per the ANZECC/ARMCANZ (2000) guidelines based on the effects of ammonia, copper and zinc (after initial dilution of the TWW with seawater), the three contaminants of concern most likely to exceed their respective guidelines.

$$\text{Total Toxicity of Mixture} = \frac{[\text{ammonia}]}{[\text{Trigger Value}]} + \frac{[\text{copper}]}{[\text{Trigger Value}]} + \frac{[\text{zinc}]}{[\text{Trigger Value}]}$$

The TTM must be <1 to meet the total toxicity criteria, in accordance with ANZECC/ARMCANZ (2000) guidelines. The initial mixing zone dilution calculated in the ASWQS (see Section 1.2) is applied.

1.3 Quarterly treated wastewater characterisation

Water Corporation conducts quarterly sampling of the SDOOL waste stream from sample point D. TWW from the SDOOL waste stream is analysed for key contaminants of

concern that are most likely to be present in the waste stream at concentrations that are above their analytical Limit of Reporting (LoR). The list of parameters includes:

- nutrients (total nitrogen, ammonia and total phosphorus)
- physio-chemical stressors (biological oxygen demand, suspended solids)
- total metals (arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, vanadium and zinc)
- phenol
- cyanide
- petroleum hydrocarbons
- surfactants.

Sampling for the quarterly wastewater monitoring of the combined SDOOL waste stream occurred on 5 July 2016, 4 October 2016, 10 January 2017 and 4 April 2017. On each occasion, a composite sample (time weighted) was obtained from sample point D. This sample represents an average of the TWW discharged to the Sepia Depression ocean outlet for the 24 hours prior to and during the sample collection.

The bulk sample is homogenised (agitated), and split into separate sample containers for the various analyte groups. Samples are handled and analysed according to the NATA-accredited laboratory requirements.

Contaminants measured in the quarterly wastewater characterisation analysis must not exceed the ANZECC/ARMCANZ (2000) guideline for 99% (or for cobalt, 95%) species protection at the LEPA boundary. The bioaccumulating toxicants cadmium and mercury must meet the 80% species protection guidelines in the TWW stream prior to dilution.

1.4 Whole of effluent toxicity (WET) testing

To meet the EQG for TWW toxicants (and as required by Environmental Management Commitment No. 7, Schedule 2, Ministerial Statement 665) quarterly WET testing is used to establish whether the TWW stream is toxic to marine biota. As a direct toxicity assessment, WET testing is particularly useful in the absence of reliable guidelines for toxicants that occur in low concentrations, or where the toxicity effects of contaminants are poorly understood. For example, the detection limits for pesticide analysis presently attainable by commercial laboratories in Australia are sometimes higher than the ANZECC/ARMCANZ (2000) guidelines.

WET testing involves exposing sea urchins (*Heliocidaris tuberculata*) to different concentrations of TWW for ~1 hour and then measuring fertilisation success. This test has been chosen for its fast analytical turn-around time and the sea urchins' sensitivity to contaminants in TWW. The test results are used to calculate the NOEC (highest concentration where no significant effect is observed), the LOEC (lowest concentration where a significant effect is observed) and the EC50 (the concentration of TWW causing 50% inhibition fertilisation rate). In some circumstances, sea urchin WET tests may act as a 'trigger' for a full suite of WET testing. This is an additional series of WET tests incorporating a suite of marine organisms from a variety of trophic levels. To trigger the full suite of WET tests, the NOEC must be $\leq 0.5\%$ (equivalent to more than a 200-fold dilution).

All WET tests were carried out by NATA accredited Ecotox Services Australasia Pty Ltd (Ecotox), Sydney, New South Wales. Twenty-four hour flow-weighted composite samples were collected on a quarterly basis (July 2016, October 2016, January 2017, April 2017) from the end of the Sepia Depression pipeline at Woodman Point WWTP,

using containers supplied by Ecotox. The test dilutions of TWW used were 0.5, 1.6, 3.1, 6.3, 12.5, 25, 50 and 100%. All TWW dilutions were salt-adjusted (using artificial sea salts) to marine salinities, so that only the toxicity due to the presence of contaminants is examined, not the toxic effect of freshwater on the marine organism. Testing was also undertaken on a seawater 'control', and an artificial sea salt (brine) control.

1.5 Water quality monitoring – receiving environment

Water quality was monitored approximately fortnightly between the beginning of December and the end of March, coinciding with the summer non-river flow period. The CM program collects data for comparison with the EQC for nutrients, phytoplankton biomass and physical and chemical stressors.

On each sampling occasion, a surface drogue was deployed over the centre of the ocean outlet diffuser and retrieved ~30 min later. The drift direction of the drogue was used to provide a directional vector and samples were collected at five compliance sites located at intervals of 0, 100, 350, 1000 and 1500 m along that vector down-current of the outlet (Figure 1.2). Samples were also collected at four reference sites.

A composite sample, representative of the top half of the water column, was collected from each site for analysis of chlorophyll-a and nutrients (Figure 1.2). Chlorophyll-a was measured using material retained on GF/C filters through which 1–5 L of water were passed. Water samples for inorganic nutrient analysis were passed through a 0.45 µm GF/C filter. All samples were immediately placed on ice before being transported to the laboratory for analysis.

Samples were analysed at Murdoch University's Marine and Freshwater Laboratory using standard laboratory analytical procedures undertaken according to NATA-accredited methods.

At each of the sites the following physical-chemical parameters were measured in situ using a YSI 6600/YSI 600XL water quality sensor or LiCor Model LI-1000 light meter:

- dissolved oxygen (DO) depth profile
- salinity depth profile
- irradiance
- temperature depth profile (for contextual purposes).

Irradiance measurements were obtained with one sensor positioned 1 m below the surface and a second sensor 7 m below the surface and the light attenuation coefficient (LAC) calculated as follows:

$$\text{LAC} = [\log_{10}(\text{Irradiance at Depth}) - \log_{10}(\text{Irradiance at surface}) / \text{Depth interval (in metres)}]^2$$

The extent to which the EQC was met was assessed using pooled data collected in the HEPA, i.e. at distances equal to and greater than 100 m from the ocean outlet. Any data collected inside the LEPA are presented for contextual purposes only.

² Base 10 logs have been specified as they are generally the basis for environmental quality criteria favoured by the Office of the EPA.

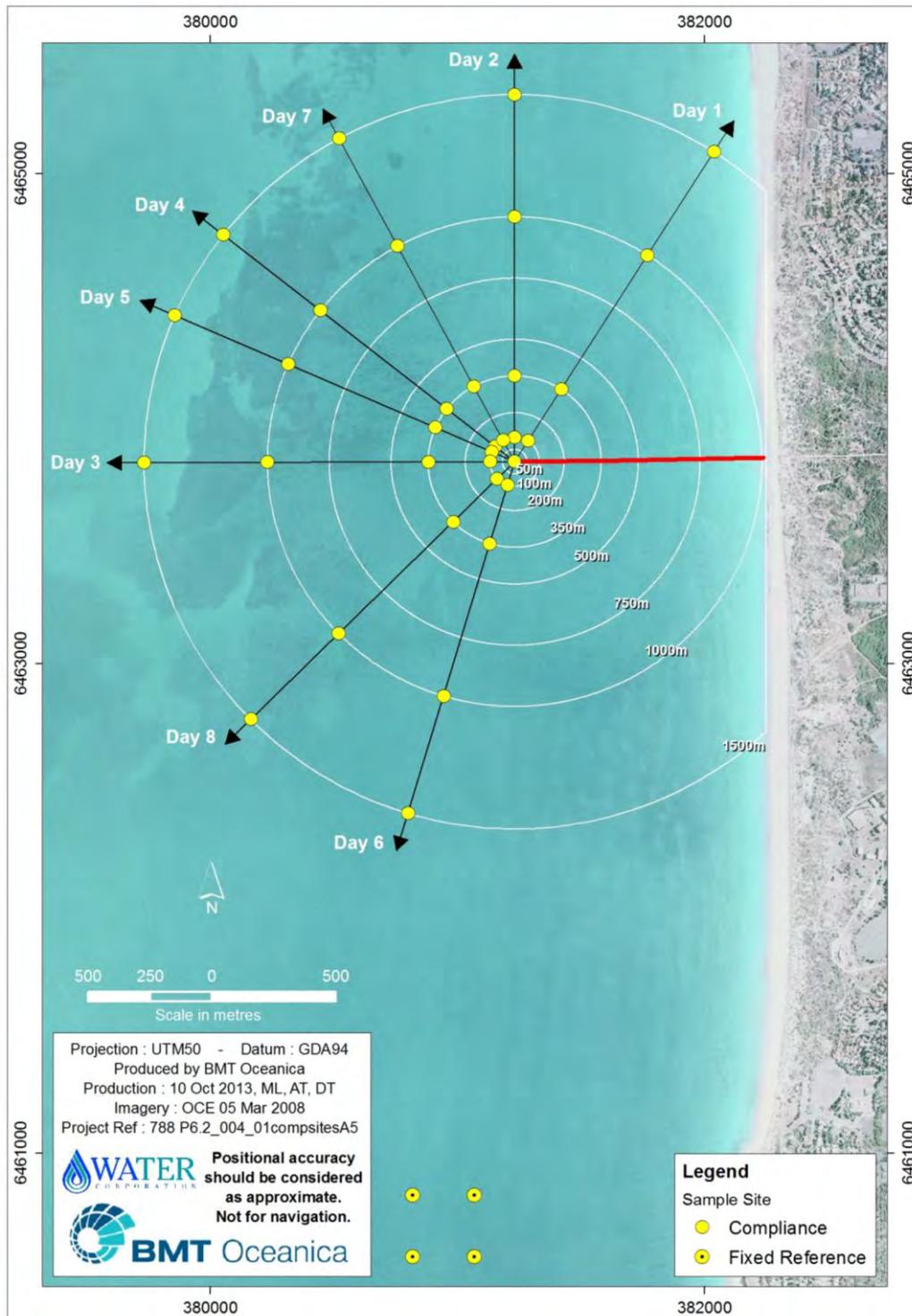


Figure 1.2 Conceptual diagram of the Compliance Monitoring program showing hypothetical compliance sites and their relative distances from the outlet diffuser

2. Maintenance of Seafood for Human Consumption

2.1 Environmental Quality Objective

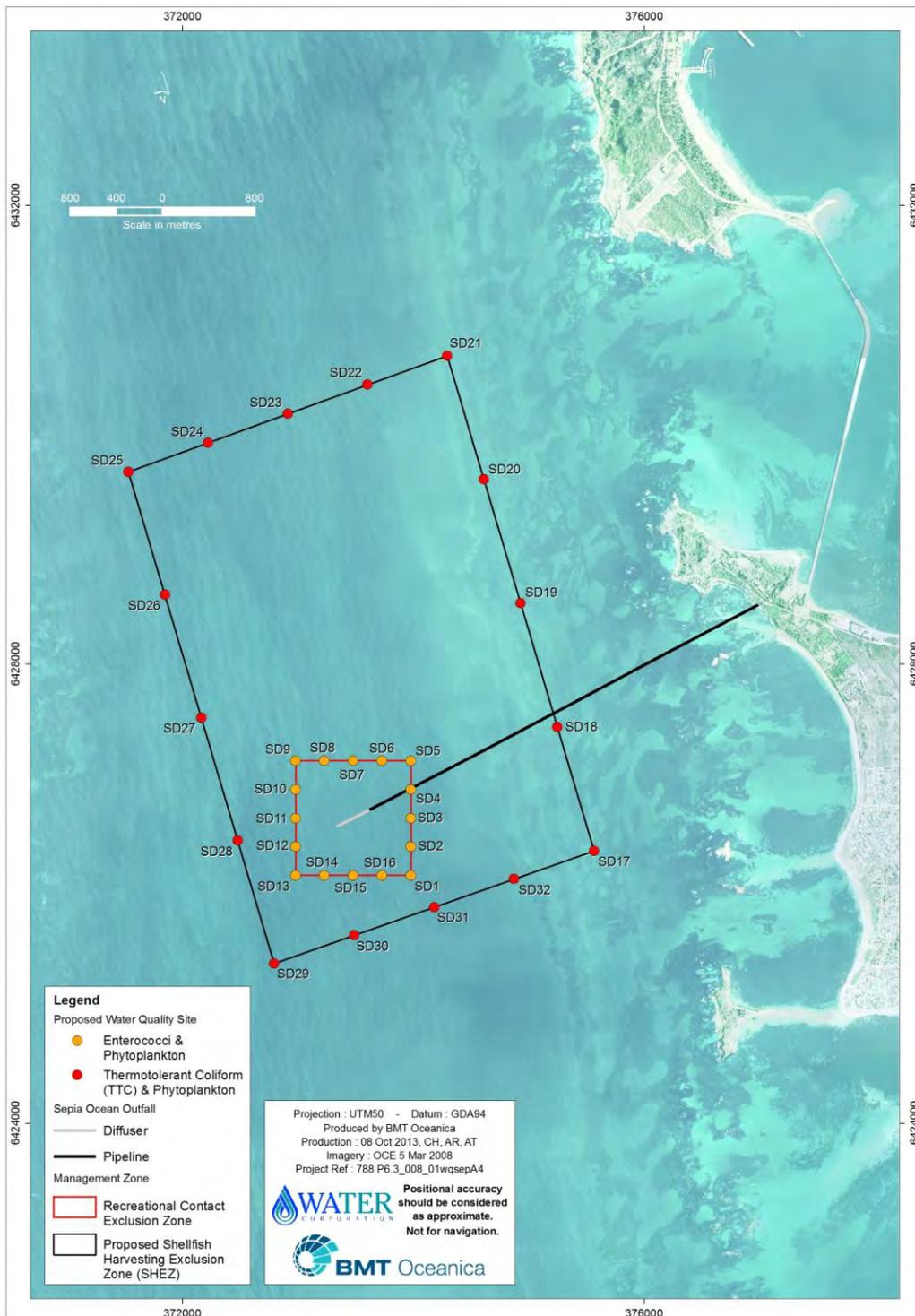
The EQO for the EV 'Fishing and Aquaculture' is aimed at ensuring seafood is safe for human consumption. To ensure the EQO is being met, microbiological contaminants and algal (phytoplankton) biotoxins are monitored at the boundary of a pre-designated management zone as part of the PLOOM CM program and the PLOOM ASWQS.

As the TWW discharged from the Sepia Depression ocean outlet moves north with the prevailing longshore currents (Bailey et al. 2003), the TWW is not considered to pose a risk to shellfish quality in Cockburn Sound (DoF 2007). However, the area immediately adjacent to the outlet (see proposed SHEZ, Figure 2.1) is considered unsuitable for seafood harvesting (DoF 2007). Consequently, a proposed mussel SHEZ has been established (DoF 2007), with boundaries illustrated in Figure 2.1³.

The EQO, Maintenance of Seafood for Human Consumption, is primarily concerned with the harvesting and consumption of raw shellfish (i.e. filter-feeding bivalve molluscs such as oysters, mussels, clams, pipis, scallops, cockles, and razor clams) and not other forms of seafood. Human health concerns relating to consumption of shellfish are not considered an issue at Sepia Depression as there is no aquaculture within 250 m of the diffuser and no known harvesting of shellfish in the waters 1–3 km offshore. The Department of Health (DoH) discourages the public from taking wild shellfish, recommending instead that shellfish are only consumed if harvested commercially and **under a strict monitoring program. The DoH has further indicated that "it is impossible to guarantee the safety of eating wild shellfish without having a comprehensive monitoring program that tests the waterway concerned for harmful microorganisms and toxins" and has formally advised the Department of Environment and Conservation⁴** that, in the absence of a full monitoring program, the application of the TTC criteria (EPA 2005a) is insufficient to protect those who wish to collect and eat wild shellfish.

³ Note that coordinates differ slightly to DoF (2007), due to inaccuracies with the reported area boundaries.

⁴ Now known as the Department of Environment Regulation.



Note:

1. On each sampling occasion, samples are collected down-current of the diffuser at a subset of five fixed monitoring sites located i) at the boundary of the recreational contact exclusion zone, and ii) at the boundary of the proposed Shellfish Harvesting Exclusion Zone (SHEZ; refer DoF 2007). The sites are selected based on the water current direction as indicated by a drogue release (see **Error! Reference source not found.**).

Figure 2.1 Fixed sites around the Sepia Depression outlet sampled for thermotolerant coliforms, *Enterococci* spp. and algal (phytoplankton) toxins in relation to the recreational contact exclusion zone and proposed SHEZ

2.2 Microbiological contaminants and algal biotoxins

The accepted method for determining whether the EQC for maintenance of seafood for human consumption have been met is to monitor microbiological contaminants (measured as concentrations of thermotolerant coliforms, or TTC) and algal biotoxins (measured as concentrations of toxic phytoplankton species) at the boundary of the SHEZ.

Many disease-causing organisms are transferred from human and animal faeces to water via sewage effluent, from where they can be ingested by marine fauna and infect them, adversely affecting their suitability for human consumption. TTC are one such bacteria that primarily originate in the intestines of warm-blooded animals. By testing for TTC, it can be determined whether the ocean water around the Sepia Depression has potentially been exposed to faecal contamination.

Nutrient enrichment as a result of TWW discharge could result in changes to the naturally occurring planktonic algae community. Although most algal blooms are considered harmless, some may contain species that produce toxins that have a potentially harmful effect on the surrounding marine environment. Species such as *Heterosigma akashiwo* and *Cryptosporidium parvum* are two such algae that cause fish mortalities.

Samples were collected on eight occasions during the non-river flow period at five fixed sites on the boundary of the SHEZ immediately down-current of the diffuser, with site selection based on the water current direction as indicated by the drogue. Composite water samples representative of the top half of the water column were collected and analysed for TTC and phytoplankton species.

For TTC, samples were collected in pre-sterilised bottles before being chilled in the dark to 4°C. Samples were subsequently transferred to PathWest laboratories and analysed according to NATA-accredited methods.

For phytoplankton, samples were preserved in Lugol's iodine solution and transported to Dalcon Environmental Laboratories for identification using the Utermöhl method. Phytoplankton were identified to the lowest taxonomic level possible. On each sampling occasion only one sample (i.e. in the direct path of the drogue) was analysed with the remaining four samples archived. Protocols require that in the event that toxic phytoplankton species are present at concentrations that exceed the recommended WASQAP guidelines (DoF 2007), the full set of samples (i.e. archived samples) are to be analysed (Table 2.1).

Table 2.1 Protocols for analysis of archived phytoplankton samples

Outcome of initial analysis	Further action
No exceedance of WASQAP ¹ guideline concentrations	No analysis of archived samples
Exceedance of WASQAP guideline concentrations at both the reference site and the CM ² site	No analysis of archived samples
Exceedance of WASQAP guideline concentrations at the reference site, but not at the CM site	No analysis of archived samples
Exceedance of WASQAP guideline concentrations at the CM site but not at the reference site	Additional samples analysed

Notes:

1. Western Australian Shellfish Quality Assurance Program (DoF 2007).
2. Compliance Monitoring.

3. Maintenance of Primary and Secondary Contact Recreation

3.1 Environmental Quality Objective

The EQOs for the EV 'Recreation and Aesthetics' are aimed at ensuring Perth's coastal waters are safe for primary and secondary contact recreation activities such as swimming and boating. To meet this objective, water quality around the Sepia Depression outlet is to be maintained so that:

- primary contact recreation (e.g. swimming) is safe in all waters except areas designated otherwise (see Figure 2.1)
- secondary contact recreation (e.g. boating) is safe in all waters except areas designated otherwise (see Figure 2.1).

The boundary where primary and secondary contact recreation is not recommended near the Sepia Depression outlet is shown in Figure 2.1 as the recreational contact exclusion zone. This boundary is based on estimated median faecal streptococci (*Enterococci* spp.) concentrations sampled between 1992 and 1997 and extrapolated in a prediction model to represent the 2003 expansion of the Sepia Depression WWTP and upgrade to secondary TWW (DAL 1997). This area of influence, calculated considering 160 ML/d of secondary TWW discharge post-upgrade, was defined as a square of dimensions 1000 m × 1000 m with the centroid located at the centre of the diffuser (Figure 2.1; DAL 1997) and is also known as the post-upgrade boundary.

As the maintenance of primary contact recreation EQO requires a higher water quality standard to be maintained than secondary contact recreation EQO, by default, it is assumed that if primary contact recreation EQOs are met, secondary contact recreation EQOs will also be achieved.

3.2 Microbiological contaminants and algal biotoxins

The accepted method for determining whether the EQC for primary and secondary contact recreation have been met is to monitor microbiological contaminants (measured as numbers of faecal streptococci) and algal biotoxins (measured as numbers of phytoplankton cells) at the boundary of a pre-designated management zone.

Disease-causing microorganisms (pathogens) associated with bathing areas include salmonellae, shigellae, enteropathogenic *Escherichia coli*, cysts of *Entamoeba histolytica*, parasite ova, enteroviruses and infectious hepatitis (Hart 1974, McNeill 1985; cited in ANZECC/ARMCANZ 2000). The most common types of diseases associated with water-borne pathogens are eye, ear, nose and throat infections, skin diseases and gastrointestinal disorders (ANZECC/ARMCANZ 2000). Detecting faecal pathogens within routine water samples is difficult and often 'indicator' micro-organisms (such as *Enterococci* spp.) are used to assess the health risks associated with pathogens in recreational waters (Elliot & Colwell 1985; cited in ANZECC/ARMCANZ 2000).

Algal blooms can be harmful to human/animal health if encountered via ingestion or skin contact. For this reason, phytoplankton cell concentrations are monitored in the CM program to ensure concentrations are within acceptable guideline limits (EPA 2005b).

Faecal streptococci (*Enterococci* spp.) and phytoplankton were sampled at a series of fixed monitoring sites on the boundary of the Recreational Contact Exclusion Zone (Figure 2.1), as per the SDOOL MMP (BMT Oceanica 2014a). Samples were collected on eight occasions during the non-river flow period at five fixed sites located immediately down-current of the diffuser, with site selection based on the water current direction as indicated by the drogue. Composite water samples representative of the top half of the water column were collected and analysed for *Enterococci* spp. and toxic phytoplankton species.

For *Enterococci* spp., samples were collected in pre-sterilised bottles before being chilled to 4°C and placed in the dark. On completion of sampling, the samples were transferred to PathWest laboratories and analysed according to NATA-accredited methods.

For phytoplankton, samples were collected, preserved and analysed in the manner described in Section 2.2.

4. Maintenance of Aesthetic Values

4.1 Environmental Quality Objective

The EQO for the EV 'Recreation and Aesthetics' is to ensure that Perth's coastal waters are aesthetically pleasing and that the aesthetic value is protected. To ensure this EQO is being met, monitoring routinely assesses the quality of surface water appearance.

The discharge to Sepia Depression is ~4 km offshore, therefore any effect on the aesthetic values of the area would be limited to aerial views and those associated with secondary recreation activities. For most of the time, any plume associated with the wastewater discharge would not be noticeable.

4.2 Aesthetic measurements

Monitoring was undertaken in conjunction with the Compliance Monitoring Program. This allows for visual assessment of the water surface and measurement of LAC at each site and is consistent with requirements set out in EPA (2005b) for assessing aesthetic values. However, since a pre-discharge baseline has not been established, water clarity around the outlet (mean LAC at 350 m from the diffuser, pooled from all days) was instead compared against water clarity at a greater distance from the outlet (mean LAC at 1500 m from the diffuser from all days pooled) to assess whether aesthetic differences exist.

Aesthetic quality was assessed fortnightly via a questionnaire completed by field personnel on eight occasions during the non-river flow period. On each occasion, the questionnaire was completed at one location on the post upgrade boundary down-current of the diffuser. The Water Corporation also maintains a complaints register for the SDOOL.



Appendix G – Ecotox Australasia laboratory results



Appendix H – Marine and Freshwater Research Laboratory results



Appendix I – Site locations and coordinates

Site Coordinates

Sepia Depression trial compliance monitoring (TCM) reference and seasonal monitoring site location details and water quality parameters measured at the different sites

Site Code	Location with Respect to Outlet	Parameters Measured	Easting	Northing
<i>Intensive Summer Water Quality ('Trial Compliance') Monitoring</i>				
SDR1	Reference Site \approx 4,000 m south	Nutrients; Phytoplankton; Water column profiles	373228	6422664
SDR2	Reference Site \approx 4,000 m south	Nutrients; Phytoplankton; Water column profiles	373479	6422659
SDR3	Reference Site \approx 4,000 m south	Nutrients; Phytoplankton; Water column profiles	373728	6422673
SDR4	Reference Site \approx 4,000 m south	Nutrients; Phytoplankton; Water column profiles	373981	6422655

Datum: UTM WGS84 Zone 50

Sepia Depression compliance monitoring (CM) sites and their relative distances from the outlet diffuser

Date	Site Code - Distance from outlet diffuser	Easting	Northing
08/12/2016	SDT-0	373478.2118	6426659.197
	SDT-100	373427.7967	6426744.987
	SDT-350	373298.956	6426961.161
	SDT-1000	372986.0851	6427529.277
	SDT-1500	372725.1893	6427956.31
15/12/2016	SDT-0	373478.8751	6426661.734
	SDT-100	373348.4203	6426484.29
	SDT-350	373198.4215	6426286.347
	SDT-1000	372808.8881	6425767.048
	SDT-1500	372500.1187	6425368.401
05/01/2017	SDT-0	373481.0197	6426658.787
	SDT-100	373445.1009	6426753.235
	SDT-350	373363.2086	6426994.625
	SDT-1000	373156.7293	6427602.778
	SDT-1500	372996.2022	6428079.731
18/01/2017	SDT-0	373478.5411	6426655.615
	SDT-100	373403.5491	6426731.459
	SDT-350	373223.4266	6426905.993
	SDT-1000	372762.67	6427365.181
	SDT-1500	372417.8979	6427727.768
02/02/2017	SDT-0	373476.9418	6426654.73
	SDT-100	373409.2424	6426733.882
	SDT-350	373240.5046	6426920.883
	SDT-1000	372816.253	6427420.968
	SDT-1500	372479.0259	6427778.159
16/02/2017	SDT-0	373481.1517	6426659.597
	SDT-100	373402.8726	6426735.689
	SDT-350	373227.3612	6426912
	SDT-1000	372781.8382	6427362.105
	SDT-1500	372449.8731	6427692.771
16/03/2017	SDT-0	373476.5466	6426653.508
	SDT-100	373436.9801	6426525.038
	SDT-350	373358.2265	6426287.2
	SDT-1000	373150.9839	6425673.425
	SDT-1500	372996.8137	6425199.234
31/03/2017	SDT-0	373478.6785	6426661.034
	SDT-100	373441.699	6426751.928
	SDT-350	373354.2257	6426989.494
	SDT-1000	373124.8087	6427597.182
	SDT-1500	372936.5156	6428056.88

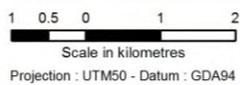
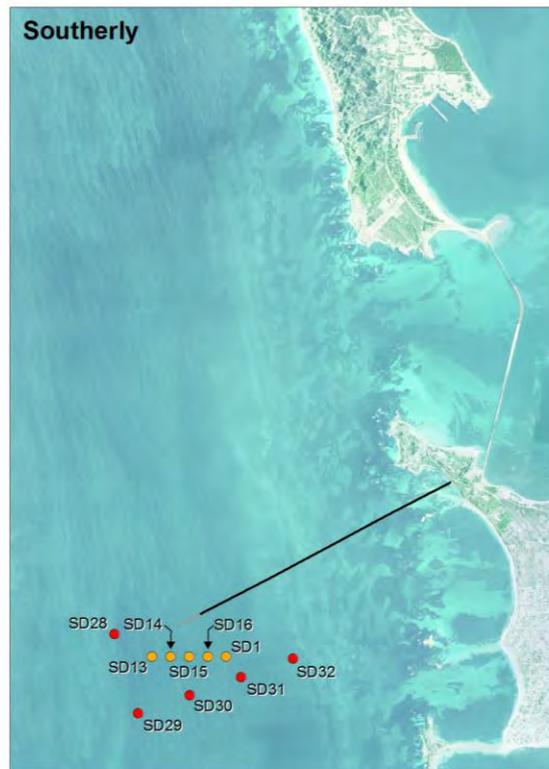
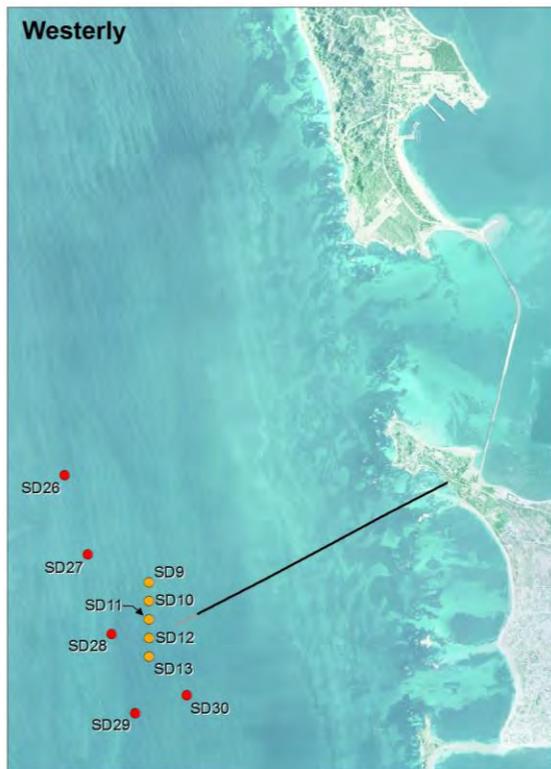
Datum: UTM WGS84 Zone 50

Notes:

1. The location of TCM potential impact sites are determined based on the direction of the surface current on the sampling day.

Sepia Depression microbial and phytoplankton monitoring sites at the boundary of the observed zone of influence for contact recreation (1-16) and human consumption (17-32)

Site	Easting	Northing
SD1	373979	6426159
SD2	373979	6426409
SD3	373979	6426659
SD4	373979	6426909
SD5	373979	6427159
SD6	373729	6427159
SD7	373479	6427159
SD8	373229	6427159
SD9	372979	6427159
SD10	372979	6426909
SD11	372979	6426659
SD12	372979	6426409
SD13	372979	6426159
SD14	373229	6426159
SD15	373479	6426159
SD16	373729	6426159
SD17	375567	6426374
SD18	375249	6427453
SD19	374931	6428532
SD20	374613	6429612
SD21	374295	6430691
SD22	373605	6430438
SD23	372914	6430185
SD24	372224	6429932
SD25	371533	6429679
SD26	371849	6428607
SD27	372164	6427536
SD28	372480	6426464
SD29	372795	6425393
SD30	373488	6425638
SD31	374181	6425883
SD32	374874	6426129



Produced by BMT Oceanica
 Production : 10 Oct 2013, ML, AT, DT
 Imagery : OCE 05 Mar 2008
 Project Ref : 788 P6_2_008_01sepsitelabel1A4
Not for navigation.

Legend

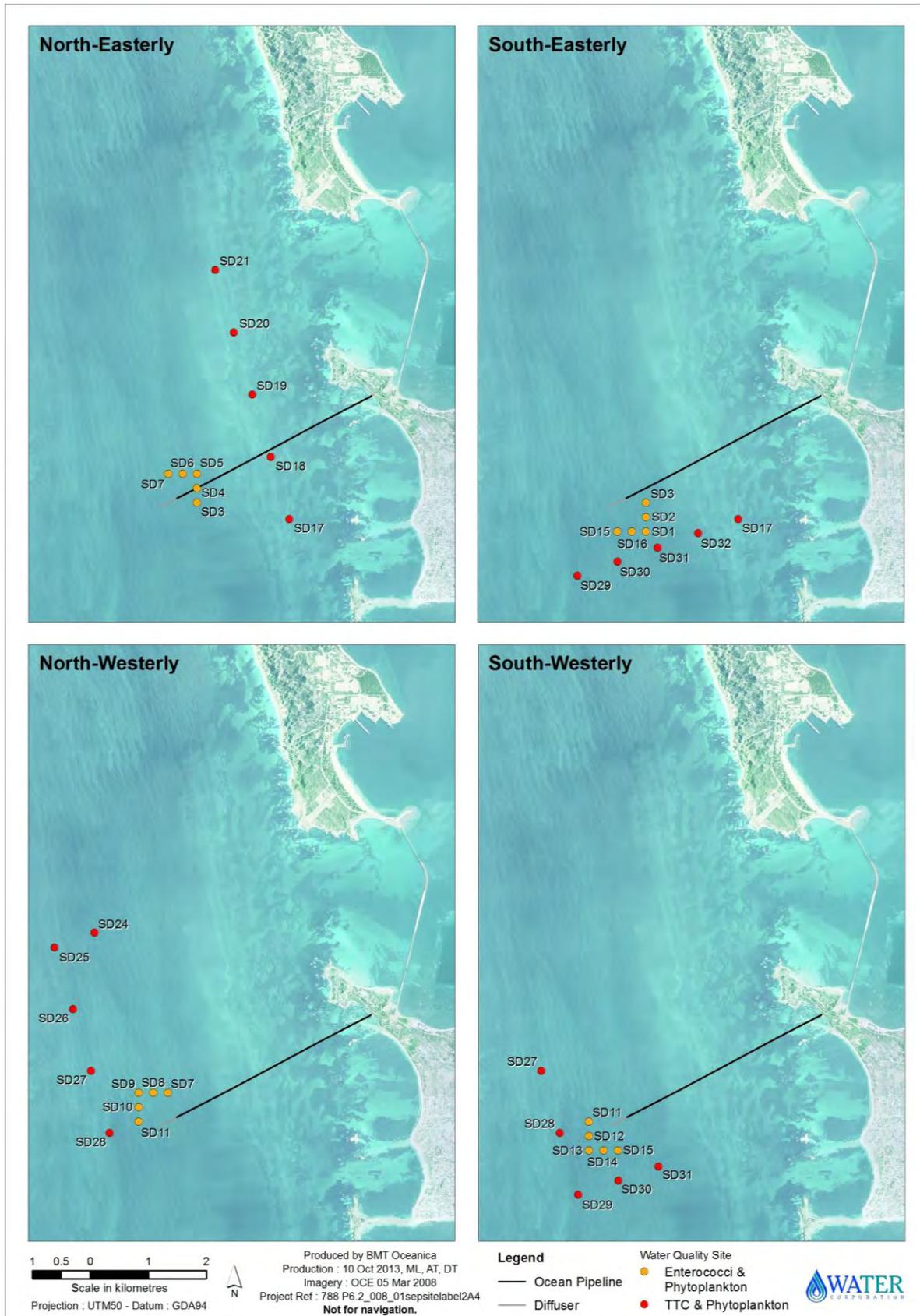
- Ocean Pipeline
- Diffuser

Water Quality Site

- Enterococci & Phytoplankton
- TTC & Phytoplankton



Fixed sites around the Sepia Depression outlet sampled for thermotolerant coliforms (TTC), *Enterococci* spp. and phytoplankton during periods with northerly, easterly, westerly and southerly currents



Fixed sites around the Sepia Depression outlet sampled for thermotolerant coliforms (TTC), *Enterococci* spp. and phytoplankton during periods with north-easterly, south-easterly, north-westerly and south-westerly currents



Appendix J – PathWest Microbiological Laboratory results



Appendix K – Dalcon Environmental Laboratory results



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