

Baseline Water Quality Monitoring - Methodology Plan

Mixed Use Development at West Culburra, NSW



Final Report

P1203365JR11V03

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Director	Daniel Martens
Manager	Andrew Norris
Principal Author	Daniel Martens

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Suite 201, 20 George St, Hornsby, NSW 2077, Australia
ACN 070 240 890 ABN 85 070 240 890
P +61-2-9476-9999 | mail@martens.com.au | www.martens.com.au

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Executive Summary

Development consent for State Significant Development (**SSD**) (application SSD 3846) (the **Consent**) located on Lot 2 in DP 1279350, Culburra Road Culburra Beach NSW (the **Site**), was granted on 1 December 2021. The Consent approves a mixed use residential and commercial development located on the northern side of Culburra Road between the Crookhaven River Estuary and Lake Wollumboola.

This report documents the methodology for undertaking baseline water quality monitoring required by the Consent. Monitoring sites adopted for this report include:

1. Surface water quality within the Site (3 sites).
2. Groundwater levels and water quality within the Site (7 sites).
3. Crookhaven River water quality, including oyster lease areas and control sites (17 sites).
4. Crookhaven River nearshore environment condition visual monitoring (7 sites).
5. Surface water quality monitoring within the northern Lake Wollumboola catchment (8 sites).

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Definitions

Al	Aluminium
As	Arsenic
BOD ₅	Biochemical Oxygen Demand (5-day)
Cr	Chromium
Cu	Copper
DO	Dissolved Oxygen
EC	Electrical conductivity
<i>E.coli</i>	<i>Escherichia coli</i> (bacteria)
FC	Faecal coliforms
Fe	Iron
Hg	Mercury
MA	Martens & Associates Pty Ltd
MPN	Most probable number
OCP	Organochlorine Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
pH	Acidity or alkalinity of a solution
Se	Selenium
Temp	Temperature
TN	Total nitrogen
TP	Total phosphorus
TRH	Total recoverable hydrocarbons
TSS	Total suspended solids
WWE	Wet weather event (sampling)
Zn	Zinc

1 Introduction

1.1 Overview

Development consent for State Significant Development (**SSD**) (application SSD 3846) (the **Consent**) located on Lot 2 in DP 1279350, Culburra Road Culburra Beach NSW (the **Site**), was granted on 1 December 2021. The Consent approves a mixed use residential and commercial development located on the northern side of Culburra Road between the Crookhaven River Estuary and Lake Wollumboola (Figure 1).

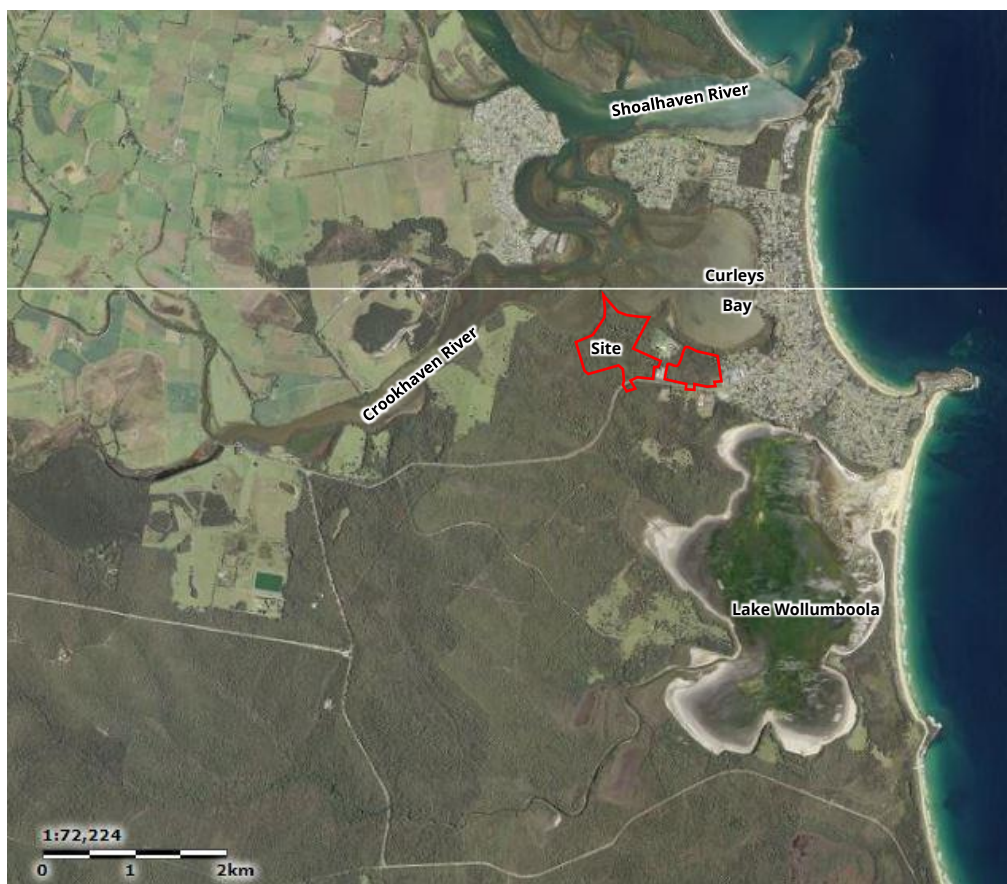


Figure 1: Study area location and nearby waterbodies.¹

This report documents the methodology for undertaking baseline water quality monitoring required by the Consent. The required monitoring includes (Figure 2):

1. Surface water within the Site.
2. Groundwater within the Site.

¹ Approximate extent of site shown) (source: www.six.maps.nsw.gov.au, accessed 13/7/2022).

3. Crookhaven River sampling including control sites and oyster lease areas within Curleys Bay and Billys Bay.
4. Crookhaven River nearshore environment condition photo monitoring.
5. Surface water within the northern Lake Wollumboola catchment.



Figure 2: Study area locality.²

1.2 Scope

The scope of this report includes the following:

1. A review of Consent baseline monitoring obligations.
2. A plan of baseline monitoring locations.
3. Details of baseline monitoring frequencies and analytes to be assessed.

The works detailed in this plan excludes construction and post construction phase works which are to be undertaken following development of applicable monitoring plans.

1.3 Documents and Guidelines

This water quality monitoring plan is based on the following documents:

² Approximate extent of site shown) (source: www.six.maps.nsw.gov.au, accessed 13/7/2022).

1. *Integrated Water Cycle Management Strategy, Mixed Use Urban Development at West Culburra NSW*, prepared by Martens & Associates Pty Ltd, dated 9 November 2020 (**IWCMS**).
2. *Addendum to Integrated Water Cycle Management Strategy, Mixed Use Urban Development at West Culburra NSW*, prepared by Martens & Associates Pty Ltd, dated 20 July 2021 (**Addendum IWCMS**).
3. *Determination of Development Application by Grant of Consent to DA SSD 3846, Annexure A to Sealark Pty Limited v Independent Planning Commission of New South Wales [2021] NSWLEC 1500* (**Consent Conditions**).
4. *Mixed Use Concept Plan Revision 08*, prepared by Allen Price & Scarratts Pty Ltd dated 28 September 2020 (**Concept Plan**).

In addition to these, the following documents were considered in the preparation of this water quality monitoring plan:

1. State Environmental Planning Policy 62 (2018) Sustainable Aquaculture [now repealed] (**SEPP 62**).
2. NSW Oyster Industry Sustainable Aquaculture Strategy, prepared by the NSW Government, dated 2006 (**OISAS**).
3. Healthy Estuaries for Healthy Oysters Guidelines, NSW Department of Primary Industries, September 2017 (**Healthy Estuaries Guideline**).
4. Shoalhaven City Council Development Control Plan 2014, chapter G2: Sustainable Stormwater Management and Erosion / Sediment Control as commenced on 12 February 2020 (**SDCP**).
5. Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (**ANZECC Guideline**).

1.4 Concept Plan Overview

The Consent approves a **Concept Plan** consisting of a staged, mixed-use development situated near the southern side of the Crookhaven River to the west of the existing township of Culburra Beach on the NSW South Coast (Figure 3). In addition to ancillary roads and infrastructure, key development precincts are summarised as follows:

1. **Town Centre Precinct** – including mixed use residential and commercial development located near to the existing Culburra Beach township, sports fields, parks and open space.
2. **Industrial Precinct** – including development adjacent and near to existing industrial areas.

3. **New Residential Precinct** – including residential lots parks and open space.

In terms of development occurring within water catchments, the Concept Plan can be alternatively summarised as follows:

1. **Draining to Crookhaven River** – Approximately 46 ha of urban development comprising of some 40 ha residential / commercial development, 6 ha industrial land and some open space and parkland.
2. **Draining to Lake Wollumboola** – Approximately 0.5 ha of urban development comprising of a link road to the western residential land area of the proposed development from Culburra Road, and a new roundabout at the intersection between the proposed link road and Culburra Road

To manage water quality, the Concept Plan include the following stormwater management infrastructure (refer also to Figure 3):

1. Stormwater retention ponds (x 3)
2. Bioretention basins (x 9).
3. Stormwater re-use areas (x 4).

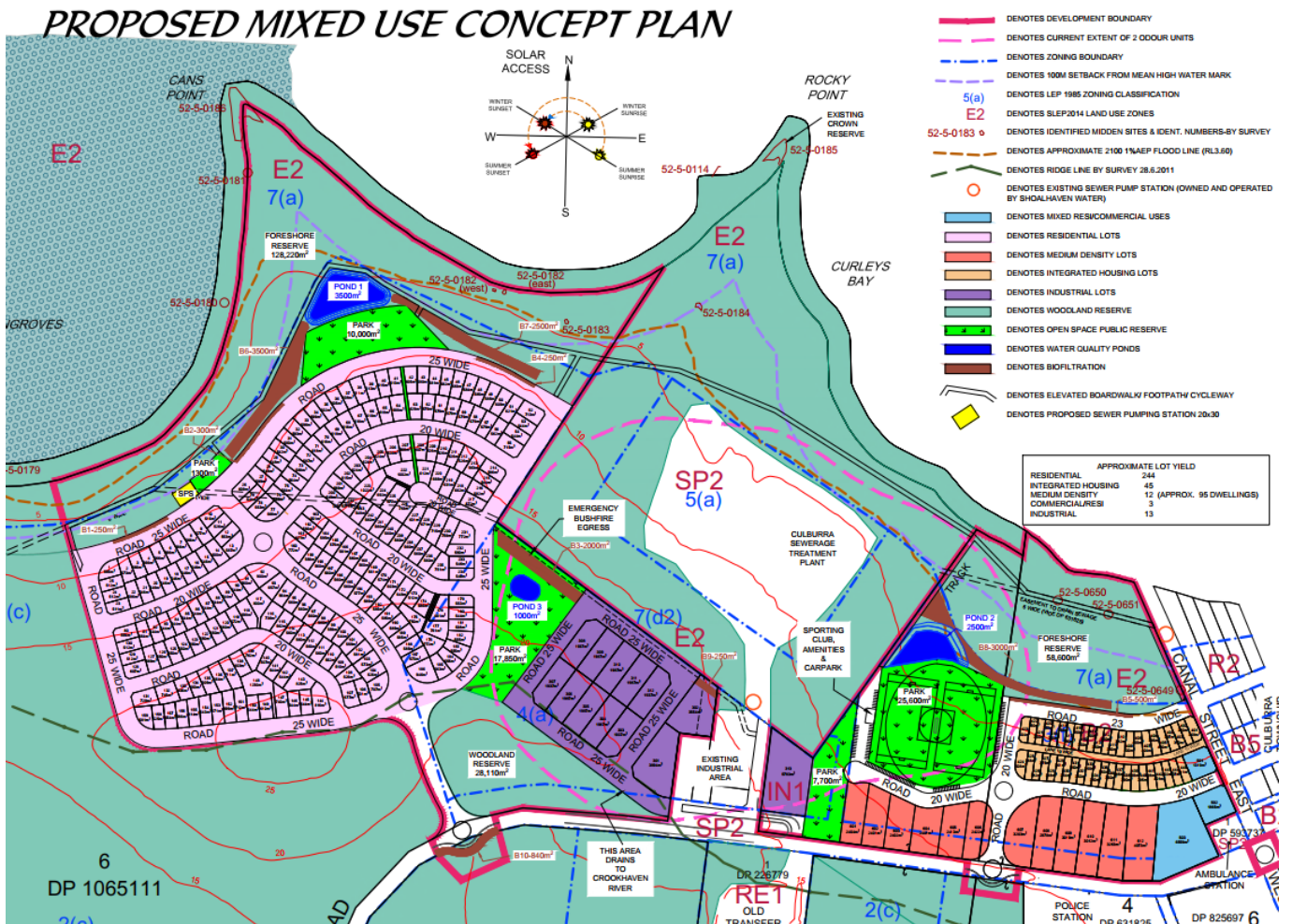


Figure 3: Approved mixed use Concept Plan.

1.5 Author of Report

This report is authored by Dr Daniel Martens. Dr Martens maintains over 30 years of experience in both civil engineering and environmental science, which has included authoring, undertaking and supervising numerous surface water and groundwater quality monitoring programs. Dr Martens has been endorsed as the independent expert by Shoalhaven City Council with respect to Conditions C16(a), C17(a) and C18(a) of the Consent Conditions (Appendix D).

2 Monitoring Plan

2.1 Requirements

Water quality monitoring requirements arising out of the Consent are summarised in Table 1. The following is noted:

1. Conditions C1 and C2 require monthly monitoring with 2 wet-weather events (**WWEs**) during the baseline monitoring period of 18 months. No sampling replicates are required for these monitoring events.
2. Conditions C16 and C18 require bimonthly monitoring with 3 WWEs during the baseline monitoring period of 18 months. 2 replicate samples are required for each monitoring event at each testing site.

2.2 Analytes

Water quality monitoring analytes arising out of the Consent are summarised in Table 2. The following is noted:

1. All surface water sampling is to include testing regimes T1 and T2.
2. All groundwater sampling is to include testing regimes T3 – T5.
3. All visual survey is to include testing regime T6.

2.3 Rainfall Monitoring

Site specific rainfall monitoring is not considered to be required as part of the baseline monitoring. The Bureau of Meteorology maintains rainfall monitoring stations (Culburra Treatment Works BOM State 068083 and Greenwell Point Bowling Club BOM Station 068080) which are considered to be representative of site rainfall.

2.4 Monitoring Sites

On the basis of the outcomes summarised in Table 1, the following sampling locations have been determined:

1. Crookhaven Estuary sampling sites as shown in Map 1.
2. Lake Wollumboola sampling sites as shown in Map 2.
3. Site sampling sites as shown in Map 3.

Monitoring sites, sampling requirements and frequency, are summarised in Table 4. The following is noted:

1. In respect of sampling sites within the Crookhaven Estuary, these have been determined on the basis of the Consent and advice provided by the project ecologist. Where possible, sites have been selected to serve more than one monitoring purpose.
2. In respect of sampling sites within the catchment of Lake Wollumboola:
 - a. Three creeks have been selected with at least two locations in each creek. Sampling includes two locations where these creeks discharge into the lake.
 - b. Where monitoring sites are dry, data shall be recorded as for other monitoring locations and it shall be noted that no water was available. If surface water is found nearby, sampling of that location for the event may be undertaken and the location of the water sampling recorded by GPS position.
3. In respect of sampling sites within the Site, these have been selected based on Map 41 of the IWCMS.
4. Monitoring site locations were selected by the approved independent expert and author of this report.

2.5 Monitoring Frequency

Frequency of monitoring at selected monitoring sites shall be undertaken as summarised in Table 1 and following sections:

2.5.1 Monthly Monitoring

Monthly monitoring, for a minimum 18 months, is to be undertaken at:

1. Surface water sampling sites SW101 – SW103.
2. Groundwater sampling sites GW101 – GW107.
3. Crookhaven estuary surface water sampling sites SW205, SW207 and SW210.
4. Crookhaven estuary shellfish / oyster sampling site SW211.
5. Visual survey sampling sites PW101 – PW107.

Monitoring shall include a minimum of 2 wet weather events over the 18 month baseline period of 18 months for each monitoring site.

2.5.2 Bimonthly Monitoring

Bimonthly (every second month) monitoring for 18 months, is to be undertaken at:

1. Crookhaven estuary surface water monitoring control sites SW201, SW202, SW 216 and SW217.
2. Crookhaven estuary surface water monitoring sites SW204, SW209, SW213 and SW214.
3. Crookhaven estuary shellfish / oyster sampling site SW203, SW206, SW208, SW212 and SW 215.
4. All Lake Wollumboola surface water monitoring sites SW301 – SW 308.

Monitoring shall include a minimum of three wet weather events over the 18 month baseline period for each monitoring site.

2.5.3 Wet Weather Monitoring Events

Wet weather events (included in the schedules described in Sections 2.5.1 and 2.5.2) are defined as sampling immediately (within 48 hours) after a rainfall event of 30 mm (or greater) in a 48 hour period, based on the Curleys Bay Oyster Harvest Area Management Plan (NSW DPI, December 2021). For the purposes of this definition, rainfall at Culburra Treatment Works (or if that data is not available, at Greenwell Point Bowling Club), is to be considered.

2.6 Sampling Protocol

2.6.1 Sample Collection and Monitoring

Collection protocols for different sample / data types are summarised in Table 3. Sample volume and numbers of samples collected are to be sufficient to allow for required physical and chemical analyses (Table 2) to be undertaken in accordance with laboratory analysis procedures.

2.6.2 Field Measurements

Measurements of physical and chemical parameters shall be completed in the field for surface and groundwater monitoring sites as detailed in Table 2.

Field measurements shall be taken using fully calibrated water quality meters. Calibration shall be against known standards and at frequencies in accordance with manufacturer's recommendations.

2.6.3 Recording of Results

Results of field sampling are to be recorded on field data sampling forms (Appendix C) for all surface water, groundwater and photo sites. Records are to include unique sampling identification including monitoring site location, time and date and sampler details.

2.6.4 Sampling Equipment Decontamination

All sampling equipment (bailers, probes, *etc.*) shall be either single use or be decontaminated between sampling locations. Where a sampling site either shows evidence of contamination or has previously been contaminated (e.g. visual confirmation of surface water conditions such as algal bloom or contaminant spill, sample colour, odour, *etc.*), all sampling equipment shall need to be cleaned thoroughly prior to continuation of sampling. The following methodology is to be used to clean equipment:

1. Rinsed in potable water.
2. Cleaned using solution of De-Con 90 or other commercially available phosphate free detergent and manual cleaning with disposable single use cloths to remove any visible contaminants.
3. Rinsed with potable water.
4. Equipment to be rinsed three times with deionised water.
5. Equipment to be allowed to dry prior to reuse.

2.6.5 Quality Assurance and Control

All samples (including grab samples and field measurements) shall be subject to quality assurance protocols.

During each sampling event duplicates are to be collected at a minimum rate of 1 duplicate rate per 10 primary samples. Duplicates are to be laboratory analysed for: heavy metals for surface water samples; and pH and EC for groundwater samples. Results of primary and duplicate samples are to be compared to assess the data quality.

Quality assurance and control protocols during sampling and recording of field measurements will be undertaken for all monitoring and sampling in accordance with ANZECC/ARMCANZ (2000b) guidelines to ensure data integrity.

All grab samples for analysis are to be collected, stored and transported to a NATA accredited laboratory with appropriate sample containers and preservation as relevant to the analyte under chain of custody conditions.

Field measurements shall be checked for accuracy, reproducibility and discrepancies, with resampling as required, prior to leaving each sampling / monitoring site.

Initial field review of data from groundwater loggers shall be undertaken prior to resetting loggers and replacing in piezometers. Dip level shall be taken and compared to logger data to confirm data validity.

2.6.6 Occupational Health and Safety

Sampling shall be undertaken in accordance with relevant occupational health and safety guidelines and any approved risk management plan. Sampling shall only be undertaken

at monitoring sites where the site is able to be accessed safely, following an onsite review of weather and water conditions, relevant transportation means and method (e.g. relevant safety and operational checks of vessel, *etc.* to be used to confirm if it is safe to access monitoring sites), safety equipment (e.g. life preserver vests) and other relevant protocols prior to sampling being undertaken.

2.7 Compliance Assessment

2.7.1 Roles, Responsibilities and Training

Roles, responsibilities and training related to baseline water quality monitoring are summarised in Table 5. All persons involved in the baseline water quality monitoring program will require a general site induction and specific risk management training relating to the baseline monitoring program (e.g. review of site conditions, requirements for safety equipment and clothing, sample management, contamination and spill control, *etc.*).

2.7.2 Data Management

Baseline water quality data management shall include the following:

1. All surface water and groundwater quality testing, sampling and visual survey monitoring sites to be established and identified by GPS coordinates. GPS shall be used during subsequent testing and sampling events to ensure correct monitoring locations are assessed.
2. Each sample shall be identified by the unique sampling location name and dated.
3. All samples collected for laboratory analyses are to be collected, stored and transported in accordance with the laboratory requirements for sample storage and preservation for the analytes specified.
4. Data obtained in field including all field results sheets, downloaded data from groundwater loggers and visual survey photos to be transferred into data storage system for baseline monitoring (data entry to results spreadsheet, scanned copies of field results sheets, uploading into data management system of georeferenced photos *etc.*) as soon as is feasible following each site monitoring event. This shall include appropriate comments and description where necessary to allow for subsequent interpretation and reporting.

2.7.3 Auditing

Audits shall be undertaken to assess compliance of the baseline water quality monitoring program with the Consent Conditions as follows:

1. Field procedures. Auditing of sampling process documentation to ensure that all necessary field procedures are being followed and water quality monitoring is being undertaken correctly.
2. Data management. Review of collated data to be undertaken after each monitoring event to assess short term trends and to identify any data outliers. Where data outliers are unexplained, additional samples may be collected between specified monitoring events to clarify unexplained data.
3. Routine checks. Auditing of baseline water quality monitoring program is to include general internal routine checks of maintenance of required water quality measuring and safety equipment, training of field and data management staff, review of samples management with respect to laboratory samples, *etc.*

2.7.4 Continuous Improvement

Ongoing review of the baseline monitoring program shall be undertaken following site monitoring events and data reviews. Where review identified opportunities for improvement in the process of data acquisition or data management adjustments to the program shall be made to respond. If implementation of this ongoing improvement of the monitoring program requires, the consent authority may be consulted prior to the implementation of the improvement measures for approval. Review shall include:

1. Identification of any issues with water quality sampling and testing (e.g. access to monitoring sites) and results of sampling and testing.
2. Improvement in sampling techniques and management as necessary (e.g. improved technology / sampling probes, *etc.*).
3. Documentation of changes required to any procedures, sample and data management.
4. Liaison with consent authorities as required.

2.8 Reporting

A summary of reporting requirements is provided in Table 6.

Appendix A – Maps



Legend

- Site Boundary
- Cadastre
- Crookhaven Estuary Water Quality Monitoring**
- ⊕ Crookhaven Estuary Surface Water Control Site
- ⊕ Oyster / Bay Site
- ⊕ Bay Site
- ⊕ Bay Site Monthly
- ⊕ Oyster / Bay Site Monthly
- Oyster Leases



1:20000 @ A4
 Viewport 1
 Notes:
 - Aerial image from Nearmap (2019).



Map Title / Figure:
Crookhaven Estuary Sampling Sites

Map 01	Map
West Culburra, NSW	Site
Proposed Mixed Use Subdivision	Project
Sealark Pty Ltd	Client
13/10/2022	Date

Project No: P1203365 Map Set: MS11-R01 EPSG: 28356



0 200 400 600 800 1,000 m

1:20000 @ A4

Viewport 2

Notes:
- Aerial image from Nearmap (2019).

Map Title / Figure:

Lake Wollumboola Sampling Sites

Map 02

West Culburra, NSW

Proposed Mixed Use Subdivision

Sealark Pty Ltd

13/10/2022

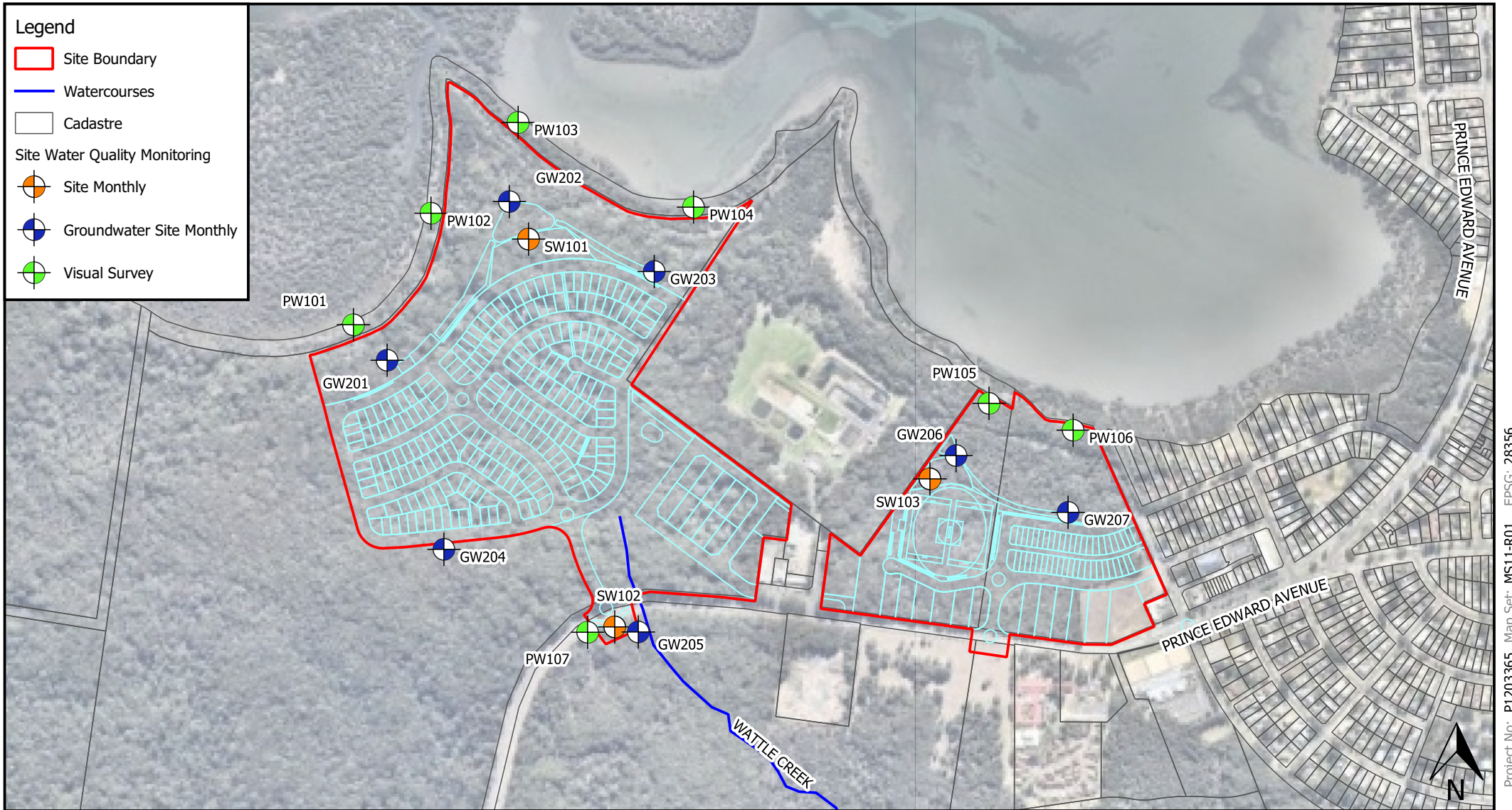
Map

Site

Project

Client

Date



1:10000 @ A4
 Viewport 3
 Notes:
 - Aerial image from Nearmap (2019).

Map Title / Figure:
Site Sampling Locations

Map 03	Map
West Culburra, NSW	Site
Proposed Mixed Use Subdivision	Project
Sealark Pty Ltd	Client
13/10/2022	Date

Project No: P1203365 Map Set: MS11-R01 EPSG: 28356

Appendix B – Monitoring Tables

Table 1: Summary of monitoring obligations arising out of Consent.

Condition	Component	Site Surface Water	Crookhaven Estuary Surface Water	Lake Wollumboola Catchment	Site Groundwater	Crookhaven Oyster Area Surface Water	Visual Survey
C1 and C2	No. of Sites	3	3	-	7	1	7
	Analytes	T1, T2	T1, T2	-	T3, T4, T5	T1, T2	T6
	Replicates	-	-	-	-	-	-
	Frequency - Routine	Monthly for 18 months	-	-	Monthly for 18 months	Monthly for 18 months	Monthly for 18 months
	Frequency - Wet Weather ³	2 WWE in 18 months	-	-	2 WWE in 18 months	2 WWE in 18 months	2 WWE in 18 months
C16 and C18	No. of Sites		12 ^{1,2}	8 ³	-	6 ⁴	-
	Analytes	-	T1, T2	T1, T2	-	T1, T2	-
	Replicates	-	2	2	-	2	-
	Frequency - Routine	-	Bimonthly for 18 months	Bimonthly for 18 months	-	Bimonthly for 18 months	-
	Frequency - Wet Weather ³	-	3 WWE in 18 months	3 WWE in 18 months	-	3 WWE in 18 months	-

Notes

1. C16(c)-(d): Includes 8 sites within Curleys Bay/Billys Bay, including 2 sites each within Billys Bay, between Crow Island and the northern boundary of the Concept Proposal site, within the south eastern portion of Curleys Bay and within the northern part of Curleys Bay (near the existing Culburra township).
2. C16(c): Includes 2 upstream and 2 downstream control sites.
3. C16(e): Includes Wattle Creek and two other creeks within Lake Wollumboola catchment between Culburra Road and the Lake, with 2 samples on each creek.
4. C18(c)-(d) and advice from project ecologist.

³ Minimum 30 mm in 48 hours based on the Curleys Bay Oyster Harvest Area Management Plan (NSW DPI, December 2021).

Table 2: Water quality analytes / parameters to be assessed.

Analyte Test Regime	Methodology	Water Quality Analytes to be Assessed
T1 General surface water	Grab sample from upper 100 mm of water column to NATA accredited laboratory	FC, E. coli, TSS, TN, orthophosphate, TP, PAH, TRH, PCB, Chlorophyll a, metals (Al, As, Cr, Cu, Fe, Hg, Pb, Se and Zn) and OCP
T2 Surface water probe	In-situ water quality probe at top (upper 100 mm) and bottom of profile.	pH, temperature, EC / salinity, DO and turbidity
T3 Groundwater quality	Grab sample of water to NATA accredited laboratory	FC, TN, orthophosphate and TP
T4 Groundwater probe	In-situ groundwater quality probe	pH, temp, and EC / salinity
T5 Groundwater level	In-situ groundwater diver	Groundwater level (m), air pressure (kPa)
T6 Visual survey	In-situ photography of visual survey site	Minimum 3 photos at each inspection at each monitoring location. Coastal wetlands, mangroves and riparian vegetation assessment: excessive sediment accumulation, significant vegetation dieback or change in species composition, major gross pollution deposition

Table 3: Sampling collection methodology by monitoring sample type.

Sample Type	Sample Collection and Handling
Surface water grab samples	Sample to be collected by hand in approved container (sample bottle provided by NATA accredited laboratory or decontaminated sampling equipment) and stored at appropriate temperature in a suitable container for transportation to laboratory under chain of custody controls.
Groundwater grab sample	Sample to be collected from groundwater piezometer by decontaminated or single use groundwater bailer and placed in approved container (sample bottle provided by NATA accredited laboratory) and stored at appropriate temperature in a suitable container for transportation to laboratory under chain of custody controls.
Surface water probe	Probe to be placed into water column at appropriate depth and measurements taken in accordance with probe instructions (re: minimum sampling time and stabilisation of readings, relevant probe angle, etc.). Probe to be decontaminated between sites.
Groundwater probe	Probe to be placed directly in groundwater within piezometer at appropriate depth or to be in water recovered by low flow pumps and measurements taken in accordance with probe instructions. Probe to be decontaminated between uses at different piezometers.
Air and groundwater pressure data	Pressure transducer / data logger unit to be recovered and data downloaded for relevant monitoring period. Unit to be replaced in piezometer once data is collected.
Visual survey	Photographs to be taken at same position and in same direction at each sampling site to ensure consistency of survey.

Table 4: Monitoring Sites.

Site ID	Testing	Former ID	Condition	Purpose	Frequency
Site Surface Water					
SW101	T1, T2	SW1 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
SW102	T1, T2	SW2 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
SW103	T1, T2	SW3 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
Site Groundwater					
GW201	T3, T4, T5	GW1 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW202	T3, T4, T5	GW2 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW203	T3, T4, T5	GW3 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW204	T3, T4, T5	GW4 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW205	T3, T4, T5	GW5 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW206	T3, T4, T5	GW6 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
GW207	T3, T4, T5	GW7 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
Site Visual Survey					
PW101	T6	PW1 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW102	T6	PW2 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW103	T6	PW3 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW104	T6	PW4 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW105	T6	PW5 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW106	T6	PW6 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
PW107	T6	PW7 IWCMS Map 41	Satisfies C1, C2	Site baseline	Monthly incl. 2 WWE
Crookhaven Estuary Surface Water					
SW201	T1, T2	-	Satisfies C16 baseline	Control site	Bi-monthly incl. 3 WWE
SW202	T1, T2	-	Satisfies C16 baseline	Control site	Bi-monthly incl. 3 WWE
SW203	T1, T2	-	Satisfies C18 baseline	Oyster/bay site	Bi-monthly incl. 3 WWE
SW204	T1, T2	-	Satisfies C16 baseline	Bay site	Bi-monthly incl. 3 WWE
SW205	T1, T2	WQ1 IWCMS Map 41	Satisfies C1, C2, C16 baseline	Bay site	Monthly incl. 2 WWE
SW206	T1, T2	-	Satisfies C18 baseline	Oyster/bay site	Bi-monthly incl. 3 WWE
SW207	T1, T2	WQ2 IWCMS Map 41	Satisfies C1, C2, C16 baseline	Bay site	Monthly incl. 2 WWE
SW208	T1, T2	-	Satisfies C18 baseline	Oyster/bay site	Bi-monthly incl. 3 WWE
SW209	T1, T2	-	Satisfies C16 baseline	Bay site	Bi-monthly incl. 3 WWE
SW210	T1, T2	WQ3 IWCMS Map 41	Satisfies C1, C2, C16 baseline	Bay site	Monthly incl. 2 WWE
SW211	T1, T2	SF1 IWCMS Map 41	Satisfies C1, C2, C16, C18 baseline	Oyster/bay site	Monthly incl. 2 WWE
SW212	T1, T2	-	Satisfies C18 baseline	Oyster/bay site	Bi-monthly incl. 3 WWE
SW213	T1, T2	-	Satisfies C16 baseline	Bay site	Bi-monthly incl. 3 WWE
SW214	T1, T2	-	Satisfies C16 baseline	Bay site	Bi-monthly incl. 3 WWE
SW215	T1, T2	-	Satisfies C18 baseline	Oyster/bay site	Bi-monthly incl. 3 WWE
SW216	T1, T2	-	Satisfies C16 baseline	Control site	Bi-monthly incl. 3 WWE
SW217	T1, T2	-	Satisfies C16 baseline	Control site	Bi-monthly incl. 3 WWE
Lake Wollumboola Surface Water					
SW301	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW302	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW303	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW304	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW305	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW306	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW307	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE
SW308	T1, T2	-	Satisfies C16 baseline	Lake baseline	Bi-monthly incl. 3 WWE

Table 5: Summary of roles, responsibilities and training related to baseline water quality monitoring.

Role	Responsibilities	Required Training
Site owner / developer.	<ul style="list-style-type: none"> Organisation of site access and transportation measures where necessary. 	<ul style="list-style-type: none"> No specific training requirements.
Transportation operator.	<ul style="list-style-type: none"> Maintenance and operation of transportation required to access monitoring sites (e.g. boat, 4WD, etc.). 	<ul style="list-style-type: none"> General site induction. Risk assessment and occupational health and safety requirements. Appropriate NSW vehicle operating licences.
Water quality sampling officer / engineer.	<ul style="list-style-type: none"> Organisation of site monitoring events (including remote wet weather monitoring for determining when wet weather monitoring may be undertaken). This may include liaison with site owner / developer and relevant consent authorities to discuss monitoring requirements as necessary. Collection of water quality grab samples. Field testing of water quality parameters by probe. Collection and download of groundwater data from all divers. Replacement of divers as necessary. Visual survey photography. Decontamination and onsite management of water quality sampling and testing equipment. Organisation of laboratory analyses of grab samples including full chain of custody. Review of site monitoring and debrief following each site monitoring event. 	<ul style="list-style-type: none"> General site induction. Field sampling training including sample collection, storage and transport, field measurement using water quality probe(s) and familiarisation with field results sheets. Equipment maintenance and decontamination in field. Quality assurance training.
Water quality data storage and collation (may be same person as water quality sampling officer / engineer).	<ul style="list-style-type: none"> Management / collation of water quality data including all laboratory results and field measurements (water quality and physical measurements). Collation and review of local climate conditions (rainfall, evaporation, temperature, pressure, etc.) for establishment of relationships between water quality results and site climate conditions (where applicable). 	<ul style="list-style-type: none"> Water quality data analyses and management. Laboratory samples handling (where necessary).
Civil engineer (may be same person as water quality sampler / engineer).	<ul style="list-style-type: none"> Write up of progress and final baseline water quality reports. Review and amendment of monitoring requirements including liaison with relevant consent authorities to discuss baseline water quality monitoring results and program. 	<ul style="list-style-type: none"> Water quality data interpretation and reporting.

Table 6: Summary of reporting requirements.

Report	Due	Submission Authority
Interim baseline water quality monitoring report	After 6 months of baseline monitoring plan.	Shoalhaven City Council
Interim baseline water quality monitoring report	After 12 months of baseline monitoring plan.	Shoalhaven City Council
Annual water quality monitoring report	Within 2 months of data collection contained in Annual Report	Shoalhaven City Council
Final baseline water quality monitoring report	After minimum 18 months of baseline monitoring.	Shoalhaven City Council Results of baseline monitoring to be presented to NSW DPI, NSW DPI Fisheries, NSW EPA and NSW oyster industry. Results to be made available on website.

Appendix C – Field Results Sheets

Surface Water Sampling Results Sheet

Inspection completed by:	
Name:	
Signature:	
Role:	
Date of sampling:	
Time of sampling:	
Monthly / bimonthly / wet weather event:	

Site details and results:	
Sampling site ID (SW):	
GPS coordinates (easting / northing):	
Equipment:	
pH:	
Electrical conductivity:	
Salinity:	
Temperature:	
Dissolved oxygen:	
Turbidity:	
Additional grab samples taken (Y/N):	
Locations sampled:	
Chain of Custody reference:	
Comments:	
Additional observations:	

Groundwater Sampling Results Sheet

Inspection completed by:	
Name:	
Signature:	
Role:	
Date of sampling:	
Time of sampling:	
Monthly / bimonthly / wet weather event:	

Site details and results:	
Sampling site ID (GW):	
GPS coordinates (easting / northing):	
Equipment:	
pH:	
Electrical conductivity:	
Salinity:	
Temperature:	
Dissolved oxygen:	
Turbidity:	
Additional grab samples taken (Y/N):	
Locations sampled:	
Chain of Custody reference:	
Comments:	
Additional observations:	

Visual Survey Sampling Results Sheet

Inspection completed by:	
Name:	
Signature:	
Role:	
Date of sampling:	
Time of sampling:	
Monthly / bimonthly / wet weather event:	

Site details and results:	
Sampling site ID:	
GPS coordinates (easting / northing):	
Photos taken:	
Riparian vegetation conditions (describe vegetation condition, ecological conditions, presence of fauna, etc.), notable or obvious changes to previous conditions:	
Aquatic vegetation conditions (describe vegetation condition, ecological conditions, presence of fauna, etc.), notable or obvious changes to previous conditions:	
Pollution conditions (any excessive gross pollutants, sediments, odour, visual conditions of waterways, etc.):	
Bank conditions (stability, slope, evidence of erosion or instability and % bank impacted):	
Comments:	
Additional observations:	

Appendix D – Council Letter of Endorsement

Council Reference: 3A10/1003 (D22/186812)

Your Reference:

06/05/2022

By email only: mattphilpott@allenprice.com.au

Dear Mr Philpott,

**West Culburra Concept Proposal – State Approved Development (SSD 3846)
Part Lots 5 & 6 DP 1065111, Culburra Rd, Culburra Beach
Conditions of Development Consent – C16(a), C17(a) and C18(a)**

Reference is made to your letter requesting Council's endorsement of the independent expert in response to conditions of development consent.

Condition C16(a) states:

Receiving Water Quality

C16. Prior to construction of any stage of the Concept Proposal, the Applicant must prepare a water quality monitoring program for baseline monitoring, construction monitoring and post-construction monitoring of surface waters in the Crookhaven River estuary and in the catchment of Lake Wollumboola and sections of lake fringe at appropriate locations. The program must:

(a) be designed by a suitably qualified and experienced independent expert, whose appointment has been endorsed by the Council;.....

Condition C17(a) states:

Aquatic Ecology

C17. Prior to construction of any stage of the Concept Proposal, the Applicant must prepare an aquatic ecology monitoring program for baseline monitoring, construction monitoring and post-construction monitoring of aquatic ecology in the Crookhaven River estuary and in the catchment of Lake Wollumboola and sections of lake fringe at appropriate locations. The program must:

(a) be designed by a suitably qualified and experienced independent expert, whose appointment has been endorsed by the Council;

Condition C18(a) states:

Oyster Aquaculture

C18. Prior to construction of any stage of the Concept Proposal, the Applicant must prepare an oyster monitoring program for baseline monitoring, construction monitoring and post-construction monitoring of environmental indicators and oyster condition around selected oyster leases in the Crookhaven River estuary. The program must:

(a) be designed by a suitably qualified and experienced independent expert, whose appointment has been endorsed by the Council;

The conditions require the preparation of certain programs and monitoring prior to any stage of construction. As it stands, the Development Applications for the various stages have not been lodged. These are yet to be lodged, assessed and determined. Thereafter the Subdivision Works Certificates can be issued, assuming all is in order.

We understand that it may take some time to develop the programs required by the concept approval and the consent requires monitoring no less than 18 months (oysters) prior to the commencement of construction.

It should be noted that whilst the condition contains specific requirements for the programs and monitoring, it is possible that the subsequent consents *may* raise other issues impacting on these programs and monitoring regimes.

With respect to your nominated independent experts (having regard to the definition of expert contained in the Development Consent), being Paul Anink from Marine Pollution Research Pty Limited and Dr Daniel Martens from Martens and Associates Pty Limited, Council does not object and endorses the appointment of the experts Mr Paul Anink and Dr Daniel Martins.

Thank you for writing to us. If you have any further enquiries, please contact Cathy Bern on 4429 3111 citing, 3A10/1003.

Yours faithfully



Cathy Bern
Development Services Manager