



# Port Curtis Ecosystem Health Report Card 2007

## Our Healthy Harbour

Taking a very close look at the health of our harbour and its waterways has been a major task with significant responsibility. With the support of 15 members from industry, government and research institutions, the Port Curtis Integrated Monitoring Program (PCIMP) recently completed an independent 'whole of harbour assessment'.

It is important to understand what is happening in our harbour so we can effectively manage it and enjoy all its resources.

Port Curtis is one of Australia's most vital commercial harbours containing several large industries as well as having cultural significance and valuable environmental resources. It is located within a Great Barrier Reef World Heritage Area and contains several marine parks.

## What does PCIMP Monitor?

PCIMP has monitored four main areas of ecological importance, namely Water Quality (including Biomonitoring), Intertidal Monitoring, Seagrass Health, and Oil Spill Assessment (relating to the Global Peace oil spill). Within each of these monitoring themes, researchers have looked specifically at indicators such as water chemistry and metals, mangrove health, sediment contaminants, and seagrass.

The harbour was divided into nine zones which included a full cross section of inner harbour regions of high activity, as well as reference (background) zones of lesser impact in the outer harbour and oceanic areas. Measurements were taken at up to 175 sites in the water quality program and 62 sites in the Intertidal program, with results being collated to give an overall rating.

## Report Card snapshot:

Overall, the ecosystem of Port Curtis is quite healthy. To summarise the research findings to date:

**Water quality:** Was of a moderate to high standard with a tendency for lower pH (acidity) and higher turbidity (muddy waters) in the more estuarine sites. One nutrient was elevated in all zones including reference zones and has been highlighted for further investigation.

**Metals in Water\*:** Although there were generally higher levels of metals in the inner harbour compared to outer reference zones, all levels were below Australian Water Quality Guidelines in all zones indicating that metal concentrations were at or below acceptable limits (\*DGT-labile metals).

**Metals in transplanted Oysters:** Generally, oysters deployed for 8 weeks in the inner harbour zones tended to absorb greater levels of metals in comparison with oysters placed at sites in the outer reference zones, but these higher levels were not excessive and unlikely to be of environmental concern.

**Metals in Sediments:** Concentrations varied within Port Curtis but all sediment metal levels were acceptable being below Australian Sediment Quality Guidelines.

**Polyaromatic hydrocarbons (PAH) in Sediments:** PAHs (oil and petroleum) were only detected between Zone 2 and Zone 6, with concentrations in these zones well below Australian Sediment Quality Guidelines and not of environmental concern.

Check out our Grades Report card grades inside



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# What is an Ecosystem Health Report Card?

Ecosystem health (EH) is the ability of an environment/ecosystem to cope with stress from both human and non-human impacts. Data for each indicator is measured against appropriate Australian Water (or sediment) Quality Guidelines or background reference zone data, and a standardised score from 0 to 1 produced. The closer the result is to a score of 1, the healthier the ecosystem. The indicators are grouped into performance categories (such as water chemistry, DGT metals, sediment metals etc.) and these are averaged to develop a final health rating grade from A+ to F for that zone. A rating below a D+ would be highlighted for action, while attaining a rating close to reference zone ratings (A+) indicates a relatively unimpacted ecosystem.

STANDARDISED SCORE	ZONE RATING	CONDITION
>0.95-1.00	A+	Equals reference
>0.90-0.95	A	Mild departure from reference
>0.85-0.90	A-	
>0.80-0.85	B+	
>0.75-0.80	B	Moderately Impacted
>0.70-0.75	B-	
>0.65-0.70	C+	
>0.60-0.65	C	Severely impacted
>0.55-0.60	C-	
>0.50-0.55	D+	
>0.45-0.50	D	
>0.40-0.45	D-	
>0.35-0.40	E+	
>0.30-0.35	E	
>0.25-0.30	E-	
>0.20-0.25	F+	
>0.15-0.20	F	
0.10-0.15	F-	
<0.0 - <0.11	FAIL	Degraded

## ZONE 1 Narrows OVERALL GRADE A

*A narrow estuarine passage between Curtis Island and the mainland in near pristine state*

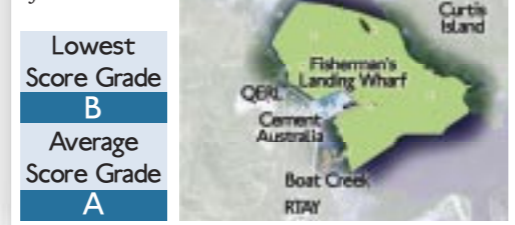
Performance Categories	Average	Rating	Lowest
Water Chemistry	0.96	0.89	0.89
DGT-Labile Metals	0.99	0.93	0.93
Oyster-Labile Metals	0.97	0.89	0.89
Sediment Metals	0.96	0.86	0.86
Sediment PAHs	1.00	1.00	1.00
Average Total Score	0.98	0.91	0.91



## ZONE 2 Inner Harbour Fisherman's OVERALL GRADE B+

*Inner harbour area encompassing Fisherman's Landing wharf and the shallow estuary of Boat Creek*

Performance Categories	Average	Rating	Lowest
Water Chemistry	0.96	0.76	0.76
DGT-Labile Metals	0.90	0.61	0.61
Oyster-Labile Metals	0.87	0.67	0.67
Sediment Metals	0.95	0.79	0.79
Sediment PAHs	1.00	1.00	1.00
Average Total Score	0.94	0.77	0.77



## ZONE 3 Inner Harbour Calliope OVERALL GRADE A

*Encompasses the Calliope River, Anabran, Wiggins Island seagrass beds, and includes the RGT coal wharf*

Performance Categories	Average	Rating	Lowest
Water Chemistry	0.96	0.88	0.88
DGT-Labile Metals	0.96	0.83	0.83
Oyster-Labile Metals	0.86	0.74	0.74
Sediment Metals	0.96	0.88	0.88
Sediment PAHs	1.00	1.00	1.00
Average Total Score	0.95	0.87	0.87



## ZONE 5 Mid Harbour OVERALL GRADE A-

*Includes the southern end of Curtis Island (South End) and the western side of Facing Island south to Gatcombe Head and Seal Rocks*

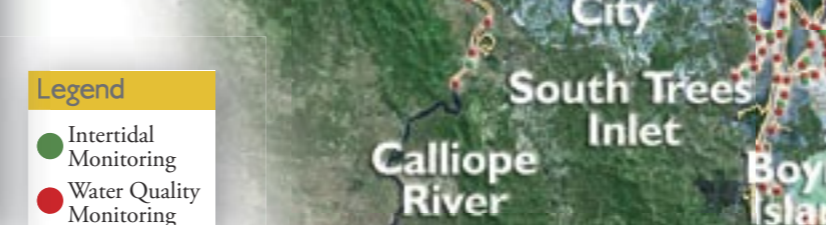
Performance Categories	Average	Rating	Lowest
Water Chemistry	0.96	0.75	0.75
DGT-Labile Metals	0.99	0.87	0.87
Oyster-Labile Metals	0.94	0.75	0.75
Sediment Metals	0.94	0.59	0.59
Sediment PAHs	1.00	1.00	1.00
Average Score	0.97	0.79	0.79



## ZONE 4 Auckland Creek OVERALL GRADE A

*Includes Auckland Creek and its tributaries, the Gladstone Marina and several wharf facilities*

Performance Categories	Average	Rating	Lowest
Water Chemistry	0.97	0.78	0.78
DGT-Labile Metals	1.00	1.00	1.00
Oyster-Labile Metals	0.79	0.70	0.70
Sediment Metals	0.97	0.94	0.94
Sediment PAHs	1.00	1.00	1.00
Average Total Score	0.95	0.88	0.88



## ZONE 6 Inner Harbour South Trees OVERALL GRADE B+

*Incorporates South Trees Inlet and adjacent tributaries*

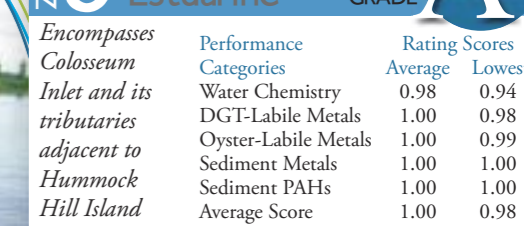
Performance Categories	Average	Rating	Lowest
Water Chemistry	0.95	0.54	0.54
DGT-Labile Metals	0.95	0.72	0.72
Oyster-Labile Metals	0.93	0.63	0.63
Sediment Metals	0.97	0.83	0.83
Sediment PAHs	1.00	1.00	1.00
Average Score	0.96	0.75	0.75



## ZONE 7 Boyne Tannum OVERALL GRADE A+

*Includes Boyne River separating the coastal communities of Boyne Island from Tannum Sands and includes Wild Cattle Creek*

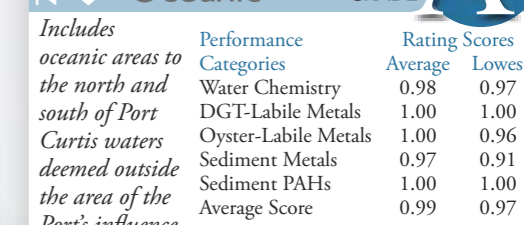
Performance Categories	Average	Rating	Lowest
Water Chemistry	0.95	0.85	0.85
DGT-Labile Metals	0.98	0.96	0.96
Oyster-Labile Metals	0.99	0.94	0.94
Sediment Metals	0.98	0.92	0.92
Sediment PAHs	1.00	1.00	1.00
Average Score	0.98	0.93	0.93



## ZONE 8 Reference Estuarine OVERALL GRADE A+

*Encompasses Colosseum Inlet and its tributaries adjacent to Hummock Hill Island*

Performance Categories	Average	Rating	Lowest
Water Chemistry	0.98	0.94	0.94
DGT-Labile Metals	1.00	0.98	0.98
Oyster-Labile Metals	1.00	0.99	0.99
Sediment Metals	1.00	1.00	1.00
Sediment PAHs	1.00	1.00	1.00
Average Score	1.00	0.98	0.98



## ZONE 9 Reference Oceanic OVERALL GRADE A+

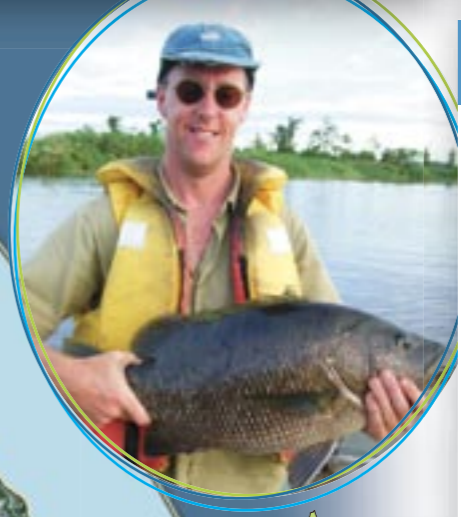
*Includes oceanic areas to the north and south of Port Curtis waters deemed outside the area of the Port's influence*

Performance Categories	Average	Rating	Lowest
Water Chemistry	0.98	0.97	0.97
DGT-Labile Metals	1.00	1.00	1.00
Oyster-Labile Metals	1.00	0.96	0.96
Sediment Metals	0.97	0.91	0.91
Sediment PAHs	1.00	1.00	1.00
Average Score	0.99	0.97	0.97



**Legend**

- Intertidal Monitoring
- Water Quality Monitoring



## Regional Overview

Not all items that were measured contributed to our overall report card rating because they don't have a guideline value to compare with, or they don't have a known response to stressors. In order to provide a better understanding of the health and vitality of the harbour as a whole, a synopsis of those current individual monitoring themes not included in the card rating system, is provided here.

**Seagrass Health:** Results of the 13 seagrass areas monitored during 2006 showed that subtidal meadows had increased substantially from 2005 and many intertidal meadows had increased to record high densities. Research also showed the Global Peace oil spill of 2006 did not have a significant effect on the seagrasses.

**Intertidal Health:** Mangrove species diversity measured in 2006 did not appear to be impacted by sediment metal or PAH (oil) contaminant levels. Mangrove characteristics such as tree and seedling density, were similar among the zones indicating diverse mangrove communities across all Port Curtis zones.

**Oil Spill Assessment – Field Assessment:** To assess the short and long-term impacts of the 2006 Global Peace oil spill on affected Port Curtis intertidal areas, surveys of mangroves were undertaken at one month (Baseline), six and twelve month intervals, post-spill. Overall, PAH (oil) concentrations decreased significantly (up to 98%) in the oil-impacted sites, and

intertidal crab populations appeared to recover from initial impacts. Longer-term impacts on mangroves became apparent with increased seedling and tree deaths and leaf loss in latter surveys. It is conservatively estimated that less than 0.02% of the Port Curtis mangrove ecosystem was affected by the oil spill.

**Oil Spill Assessment – Toxicity Testing:** Testing was undertaken to determine the toxicity of the oiled sediments to the local water column and sediment-dwelling organisms. While most water column organisms were marginally impacted by the residual oil on the intertidal sediments, sediment-dwelling organisms were impacted to a higher degree. However, the results of the field surveys at the six and twelve month intervals which demonstrated the marked reduction in PAH concentrations, suggest that the toxicity was of a short-lived nature.

### Future Directions

A number of additional indicators were measured in 2007 and/or are proposed for monitoring in 2008 and beyond. Where the known response to contaminants can be established and grades of ecosystem health assigned, these indicators will be included in future Port Curtis Eco-Cards. These are: light attenuation, macroalgae and marine invertebrates, sediment macroinvertebrates, metals in mangrove roots, seagrass amphipods and chlorophyll a.

### How will the results be used?

One of the major outcomes of the report is to identify any impacts occurring in harbour zones that would prioritise actions to minimize those impacts. The PCIMP annual monitoring program will be modified and adapted to address any identified issues. The report card based on the annual data will be produced at regular intervals (eg. every three years) so that changes in estuary health can be monitored and managed over time.



You can find a copy of our full report (including methods used) on our website:  
[www.pcimp.com.au](http://www.pcimp.com.au)