Response from Dr Matt Landos to Senate Committee Great Barrier Reef Inquiry, in response to Dr Andersen's response (22 July 2014) to my initial written and oral submission.

25 August 2014

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To: Environment and Communications References Committee Inquiry

Inquiry into the Great Barrier Reef

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Dr Andersen made several claims in her senate response 22 July 2014, that warrant rebuttal with evidence. Particular claims of Dr Andersen which I will demonstrate to be false are:

1) That the baseline water quality was not substantially affected by the inclusion of dredging and construction impacted data from October 2010 through to May 2011.
2) That the use of data from during the QCLNG construction dock project (23 October 2010 to 4 February 2011) "was unlikely to have enriched the calculation of a trigger value for this entire period."
3) That baseline data can include data collected during impacted conditions including dredging and construction.
4) That my submission was a "rant"

I also wish to clarify the claims made in my first report and oral submission about Dr Andersen's business Vision Environment and the reports which it produced, as the company responsible for monitoring water quality, in relation to the expansion of the Port of Gladstone, commencing in October 2010.

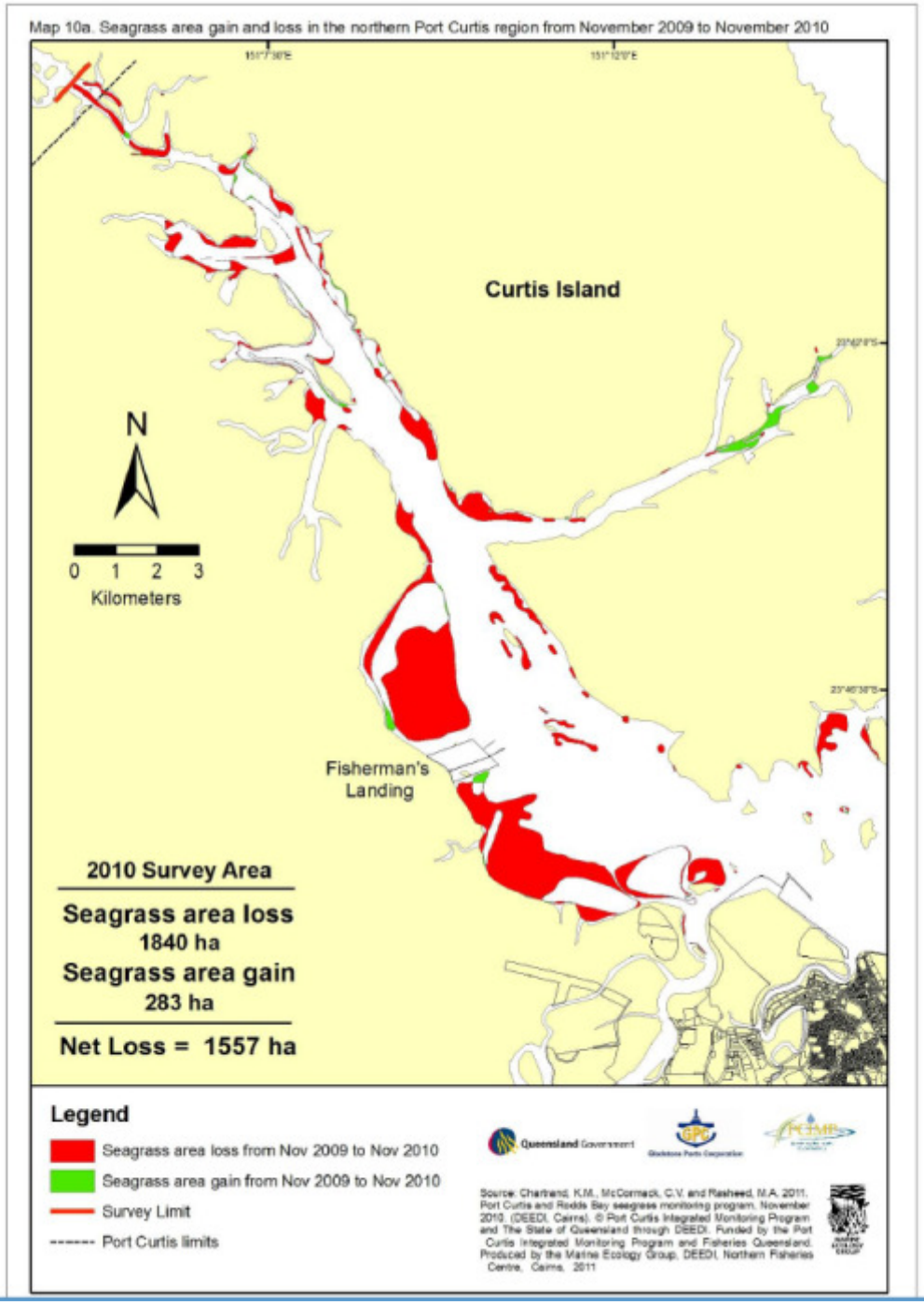
The following paper trail demonstrates the likely substantial role that the port expansion projects (drilling, core sampling, bund construction, construction docks, dredging, disposal etc) and elevation of trigger values, had on triggering the loss and hindering the recovery of seagrass meadows from 2010. This is contrary to the widely expressed view of GPC and the Queensland Government that late December 2010-January 2011 floods were the cause of declines.

Relevant evidence associated with seagrass meadow declines will be presented in this context.

The senate should appreciate that seagrass reserves are critical to the survival of protected marine animals such as turtles and dugongs. They are also essential for fishery production as nursery areas. Many species integral to the UOV of the Great Barrier Reef require healthy seagrass meadows for

their viability. Hence the process outlined below, which demonstrates turbidity trigger values were increased, at a cost to the seagrass meadow health is of critical importance to the Great Barrier Reef, and is not a trivial issue.

The image below demonstrates that the seagrass meadows of the western basin were largely lost prior to the December 2010-January 2011 flood.



Cut from Port Curtis and Rodds Bay Seagrass Monitoring Program November 2010.

Vision were also prepared for turbidity impacts from the construction of the bund wall as illustrated in the below excerpt from the "Fisherman's Landing Bund Construction: Water Quality Monitoring" from mid-December 2010. However the turbidity impacts of the bund construction were never

mentioned in the seagrass monitoring reports as a cause of turbidity, which could be attributed with exacerbating seagrass decline.

Fisherman's Landing Bund Construction: Water Quality Monitoring

From mid-December 2010, Vision Environment QLD has been undertaking water quality monitoring for Gladstone Ports Corporation (GPC) at the potential plume impact area associated with the bund wall construction of the Fisherman's Landing extension. The extension of Fisherman's Landing is being undertaken for disposal of capital dredged material associated with the Western Basin Dredging and Disposal project. This monitoring is taking place in order monitor and mitigate impacts of elevated turbidity and sedimentation during construction. The monitoring program is an extension of existing monitoring provided for GPC under the BPPHA and Condock Dredge monitoring, and is designed to meet the requirements of the Bund Construction Water Quality Monitoring program (Aurecon Australia, 2010).

The water quality monitoring program includes the use of continuous data loggers at four sites:

- C3, alongside the north Fisherman's Landing seagrass meadows;
- ST1, south of the Fisherman's Landing seagrass meadows;
- QE4, located north of the potential impact area at the base of the Narrows; and
- P2, located adjacent to Wiggins Island, south of the potential impact area.

The dual data loggers (two sondes per site) measure the ambient turbidity (NTU), temperature (°C), conductivity (mS/cm), pH and dissolved oxygen (% saturation) levels, at 15 minute intervals at approximately 1.0 m water depth. Each logger is attached to a solar powered telemetry unit, and data is transmitted every 30 minutes via GPRS modem to a secure FTP site operated by Vision Environment.

In addition, weekly monitoring of light attenuation and the physicochemical parameters listed above are undertaken at each of the four logger sites and an additional site (C1, adjacent to the Fisherman's Landing wharves). At each of the 5 sites, water samples for the analysis of total suspended solids (TSS) are collected on each sample occasion. Every three months, samples for analysis of chlorophyll *a*, nutrients and total metal concentrations are also collected. The GPS locations (Table 7) and a map (Figure 5) of monitoring sites can be found at the end of this document.

Monitoring commenced on the 16th December 2010 with construction commencing initially on 21st December 2010. Due to the holiday period construction was intermittent until it resumed fully on the 4th January 2011.

Dr Andersen knew the difference between baseline monitoring and dredge impacted monitoring.

The Vision report “Port Curtis Baseline Water Quality and Seagrass Health-Monitoring November 2009-September 2010” highlights the true baseline conditions of the harbour which should have remained the basis for setting of trigger values for protection of Ecosystem Health. These did not include dredging impacted data.

Dr Andersen claimed in her response to my report that her methods for removal of erroneous data were acceptable. An example from her Vision report “QCLNG Construction Dock Dredging: Water Quality Monitoring1st October 2010 to 4th February 2011” demonstrates that the high values of so called erroneous probes were kept in the data set. Yet the low values at another site were removed from the dataset.

This is the dataset which Environmetrics subsequently relied upon to be baseline vis-a-vis “unimpacted”. By removing the low values of the data set, the baseline will be artificially increased. Despite it being described by Vision as “anomalously elevated”, it was still used by Environmetrics to increase trigger values at water quality monitoring sites QE4 and ST1. And it is claimed by Vision to have not substantially enriched the trigger values.

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3 Results

3.1 Continuous Data Loggers

The continuous data loggers recorded turbidity, temperature, conductivity, pH and dissolved oxygen at 15 minute intervals. Results for the formal dredge reporting period of October 1st 2010 to February 4th 2011 are reported here. Detail regarding the removal of erroneous data from malfunctioning sondes throughout the monitoring is contained in the weekly reports and a summary of key events provided in the Appendix (Table A2). Rainfall and wind speeds recorded during the monitoring period are displayed separately in Figure 5.

3.1.1 Turbidity

Data from the continuous loggers was divided into the two formal reporting time periods: Baseline and Dredge (Table 2), in order to determine whether parameters differed between the two time periods. Note that the three week formally reported baseline period would be considered only a snapshot of typical winter baseline conditions and a longer reporting period would be more appropriate for comparative purposes. Comparisons of dredge results to results gained over a longer baseline monitoring period can be found in the discussion.

For impact sites P14 and BG10, and reference site P2, mean turbidity was similar (within 3 NTU) during Baseline and Dredging. At impact site QE4, turbidity during Baseline was lower (10 NTU) than during Dredging (17 NTU), while the reverse was evident at reference site P5, with turbidity during Baseline (21 NTU) higher than during Dredging (8.6 NTU). At P5, the sonde malfunctioned during the majority of the Baseline monitoring period, producing erroneously higher turbidity values and thus these results should be treated with caution.

Overall, reference site P2 and impact site BG10 exhibited the highest mean turbidity during both Baseline (23 to 24 NTU) and Dredging (21 NTU). Mean turbidity at these sites, in addition to site P5 during Baseline, exceeded the Australian Water Quality Guideline (AWQG) of 20 NTU (ANZECC/ARMCANZ 2000). All mean turbidity values at all sites during both Baseline and Dredging exceeded the more stringent Queensland Water Quality Guideline (QWQG) of 8 NTU (DERM 2009).

During the Baseline and Dredging monitoring, the 95th percentile value at all sites was greater than 20 NTU, indicating that more than 5% of turbidity values exceeded AWQG. In the case of BG10, the 50th percentile value during Baseline also exceeded 20 NTU, indicating more than half the turbidity values at BG10 exceeded AWQG prior to Dredging. However, data for Baseline monitoring at BG10 and P2 during the neap tide periods, which are typically an ameliorating period of low turbidity, were erroneous and were therefore removed. Thus this has resulted in anomalously elevated Baseline statistics for these sites.

The 10 day rolling average (RA) was the parameter used for the Management Response Levels (Table 3). During Baseline monitoring, the 10 day RA exceeded Level 1 Thresholds (30 NTU) at site P2 for 5 days (10th to 14th October) and at BG10 for 2 days (17th to 18th October). Once again exceedences during this period may be an artefact of erroneous data during neap tides having been removed. During Dredging, the 10 day RA exceeded Level 1 Thresholds for 12 days at P2 (27th December 2010 to 7th January, 2011), for six days at P14 (24th to 29th January) and for seven days at BG10 (24th to 30th January, 2010). The 10 day rolling averages did not exceed the Level 2 Threshold (50 NTU) at any site or time during the monitoring.

In a report signed off by Dr Andersen, **BPPHA Water Quality and Sedimentation Data Summary Queensland Gas Corporation (QGC)** October 2010 report (which is now not available on GPC's website but I can supply a copy) it states the:

BPPHA Water Quality and Sedimentation Data Summary

The QGC Midstream Port Curtis Benthic Primary Producers Habitat Assessment (BPPHA) project for the month of September included water quality and sedimentation monitoring. Previously monitoring efforts were conducted at 15 sites throughout Port Curtis with three reference sites at Rodds Bay. The month of October 2010 saw the addition of six new sites; three within the Narrows (BG5, QE3 and QE5) and a further three along Graham's Creek (C7-1, C7-2 and C7-3) under the Narrows water Quality Program (QGC Upstream). These sites are currently also monitored under the Port Curtis Integrated Monitoring Program (PCIMP). Furthermore, dredging of the QCLNG Condock area on Curtis Island commenced on the 23rd of October and hence monitoring has moved from baseline to dredge conditions. Water quality and sedimentation monitoring was conducted weekly during October. Individual GPS locations are listed in Table 10, while maps of monitoring locations can be viewed in Figures 3 and 4, located at the end of this document.

Sampling was carried out on the following dates and tides:

Tides	Port Curtis sites	Rodds Bay sites
New spring October 8th	October 4th	October 1st

So in October 2010, Dr Andersen accepted that dredging and construction activity associated with the QGC Construction Dock was generating impacted data, not baseline data.

In the Vision December 2010 report it stated:

The Port Curtis monitoring locations included the Narrows, Grahams Creek and the mid and outer regions of the Gladstone harbour. These sites are also monitored under the Port Curtis Integrated Monitoring Program (PCIMP). Dredging of the QCLNG Condock area at Curtis Island commenced on the 23rd of October 2010, and hence results for sites surrounding this area reflect dredge conditions. Bund Wall (Fisherman's Landing) and Aggregate Dock construction (RGTCT) also commenced in the third week of December 2010. The GPS locations of the sites are listed in Table 11, while maps of monitoring locations can be viewed in Figures 3 and 4, located at the end of this document.

Water sampling was carried out on the following dates and tides:

Tides	Port Curtis sites	Rodds Bay sites
Neap November 29th	November 30th & December 1st	
New spring December 6th	December 7th & 8th	December 9th
Neap December 13th	December 13th & 15th	

"BPPHA Water Quality and Sedimentation Data Summary

Gladstone Ports Corporation (GPCL) Queensland Gas Corporation (QGC)

January 2011

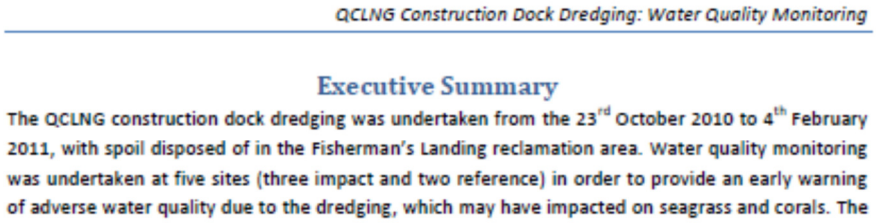
Dredging of the QCLNG Condock area at Curtis Island was carried out from the 23rd of October 2010 to 4th February 2011, and hence results for sites surrounding this area during January may reflect dredge conditions.

Aggregate Dock construction (RGTCT) commenced in the third week of December 2010 and was completed on the 17th January 2011.

Bund Wall (Fisherman's Landing) construction commenced on the 28th of January 2011 and is continuing."

Note how by January 2011, the date of the bund wall construction had falsely reported to have shifted to 28th of January 2011. This shifted the start of bund construction until after elevated metals had been first detected. The flood was again blamed for this elevation to the exclusion of all other causes including the bund construction over large areas of known ASS.

This once again highlighted that Dr Andersen knew the difference between baseline and dredge impacted data. In Dr Andersen's response to my submission she agreed with my definition that the term baseline, meant "prior to impacts commencing."

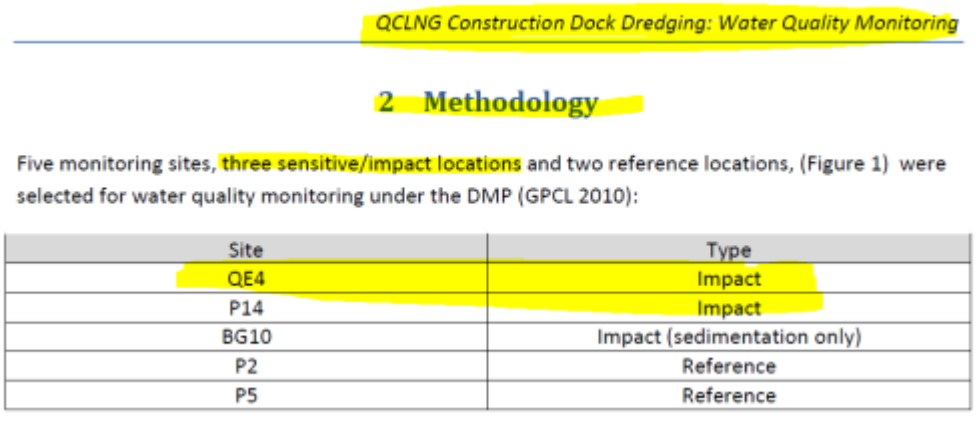


QCLNG Construction Dock Dredging: Water Quality Monitoring

Executive Summary

The QCLNG construction dock dredging was undertaken from the 23rd October 2010 to 4th February 2011, with spoil disposed of in the Fisherman's Landing reclamation area. Water quality monitoring was undertaken at five sites (three impact and two reference) in order to provide an early warning of adverse water quality due to the dredging, which may have impacted on seagrass and corals. The

This excerpt demonstrates that the monitoring at QE4 was for the purposes of detecting impact.



QCLNG Construction Dock Dredging: Water Quality Monitoring

2 Methodology

Five monitoring sites, three sensitive/impact locations and two reference locations, (Figure 1) were selected for water quality monitoring under the DMP (GPCL 2010):

Site	Type
QE4	Impact
P14	Impact
BG10	Impact (sedimentation only)
P2	Reference
P5	Reference

The role of monitoring site QE4 is illustrated above from the Vision Environment report QCLNG Construction Dock Dredging: Water Quality Monitoring 1st October 2010 to 4th February 2011.

Vision repeatedly identified the period after 23 October 2010 as "dredge conditions" again in Vision Environment, QCLNG Construction Dock Dredging: Water Quality Monitoring 24th to 31st December 2010. (Extract below)

Table 2. Turbidity results (NTU) gained from the continuous data loggers deployed at sites QE4, P14, P2, BG10 and P5 during Baseline and Dredge conditions.

Activity	Statistic	Data Logger Site				
		QE4	P14	P2	BG10	P5
Baseline 1-23rd Oct	Mean ± se	8.6 ± 0.2	17 ± 0	18 ± 1	22 ± 0	23 ± 1
	Range (n)	0 – 76 (2187)	1.5 – 190 (2187)	0 – 71 (1125)	0 – 193 (1716)	0 – 322 (2186)
	95th percentile	27	48	51	47	101
	50th percentile	5.5	12	15	20	14
	5th percentile	0	3.0	0	0	0
Dredging 23rd Oct to 31st Dec	Mean ± se	16 ± 0	17 ± 0	20 ± 0	19 ± 0	8.1 ± 0.1
	Range (n)	0 – 160 (9803)	0 – 175 (10263)	0 – 324 (9757)	0 -322 (9320)	0 – 224 (10192)
	95th percentile	40	44	46	47	19
	50th percentile	13	13	14	15	6.8
	5th percentile	3.3	2.8	2.5	2.1	0.9

Sonde data continues to be divided into two time periods: Baseline and Dredge (Table 2). During Dredging (since 6.30pm on October 23rd), mean turbidity values at all sites remained equal to or less than 20 NTU, the AWQG. Mean turbidity at all sites continued to be either lower than or similar to what was recorded during Baseline monitoring, with the exception of site QE4. However, the higher mean turbidity at QE4 is likely to be due to the sediment plug within the holding chamber reported previously, and cannot necessarily be directly attributed to dredging activity.

For all sites except QE4 and P14, mean turbidity was similar (within 4 NTU) during Baseline and Dredging. At both QE4 and P14, turbidity during Baseline was lower (5.2 and 7.4 NTU, respectively) than during Dredging (17 and 14 NTU, respectively). For TSS, only concentrations at QE4 were markedly higher (~23 mg/L higher) during Dredging than Baseline, with all other sites exhibiting similar TSS concentrations across both periods (within 5 mg/L). In regard to light attenuation, QE4 and P14 Kd values were also the only sites to be markedly higher (>0.7 higher) during Dredging, with all other sites exhibiting Kd values similar across both time periods (difference of ≤ 0.5). These sites are likely to be highly influenced by freshwater flows from the Fitzroy River which traverse down the Narrows during large rain events.

The engineering report from BMT WBM (link below) suggest the bund wall leaks led to elevated turbidity when stating:

"

> It was found that the addition of a 50kg/s source within the reclamation area (with a porous bund) from 7th September onwards was sufficient to result in modelled TSS levels that approximated the measurements in most locations, at least during the spring tide periods. The modelled TSS levels during neap tidal periods tended to exceed the measured levels for this case, indicating that the dynamics of this hypothetical source of suspended sediment into the system are not yet fully replicated by the model.
>
> These results indicate that the porosity of the bund may be the key cause of widespread elevated total suspended sediment levels, since material discharged into the reclamation area by the CSD can migrate into the harbour. Note that elevated levels observed on the mudflats north of the reclamation area are consistent with the model results from the 50kg/s discharge case (refer Figure 10).

http://www.westernbasinportdevelopment.com.au/media/pdf/Memo%20resuspension%20and%20plume%20modelling%20from%20BMT%202011.pdf

The monitoring sites which had repeated exceedances of the first WBDDP triggers were QE4 and ST1, which were located to the north and south of the reclamation area. BMT WBM also stated:

> - The spring tide ranges of the 12/09/11 were smaller than the preceding spring tides, however the turbidity readings at sites such as station C3 and QE4 were significantly higher during this period. Refer Figure 2.
> - High turbidity readings during the 12/09/11 spring tide were first experienced at station C3 shortly followed by QE4. This probably indicates a source in the vicinity of the reclamation generating plumes which subsequently reach these sites on the flooding tide. Refer Figure 3.
> - Other sites tended to experience higher than normal turbidity readings but with an obvious lag and lower readings relative to C3 and QE4. This would indicate that the major source was probably on the western side of the Western Basin (i.e. around the reclamation). This appears to be supported by aerial photographs from this time. Refer Figure 3.
> - Looking at Figure 7 it is evident that spring tidal ranges are on the decline over the coming period until early March 2012. Even then as the spring tide ranges build the combination of high tide range and low low-water levels (as experienced in September/October) won't be revisited to the same extent over this period.

http://www.westernbasinportdevelopment.com.au/media/pdf/Memo%20of%20exceedance%20november%202011.pdf

The Dredge Technical Reference Panel acknowledged clearly the impact of the bund leaks in the Transitional Environment Program Bund Sealing document stating:

> Therefore, the dredging contractor has recommended the sealing of the northern section and has commenced works near the bund closure point. The bund closure near the northern corner was undertaken based on an approved engineering design using vertical and horizontal closure technique. To maintain its structural integrity larger boulders were used to stabilise the closure section of the bund wall. This section for the bund wall has the greatest propensity to be porous. This resulted in turbid water seeping through and under the wall despite the installation of the required geofabric. This has triggered turbidity exceedances at QE4 and ST1 even where the dredging operations with the Cutter Suction Dredge have ceased for in excess of 7 days as recently observed. Visual illustrations of the north eastern section of the bund wall are provided in Figure 1.

http://www.westernbasinportdevelopment.com.au/media/pdf/Transitional%20Environmental%20Plan.pdf

However, despite it being acknowledged above that it was bund leaks causing the elevations at QE4 and ST1, it was only at these two monitoring sites which GPC requested the increased trigger values for, through supplying the impacted October 2010-May 2011 data to Environmetrics.

GPC told the Commonwealth bund wall review that trigger values for turbidity were increased based on the Environmetrics report. This report relied on the impacted data from the wet season of 2010-2011, not the truly baseline data collected prior to the onset of dredging and construction.

See Figure 1 page 4 from the Environmetrics report which identified that from 19 May 2011 dredges may be impacting turbidity data. An excerpt below:

"Page | 2

Executive Summary

A comprehensive analysis of monitored turbidity data collected at site QE4 has been undertaken in order to update current interim turbidity trigger values. In view of the fact that dredging activities commenced in Port Curtis on May 20, 2011, data collected post-May 20 2011 has been excluded from this analysis since the results can no longer be regarded as being indicative of 'background' conditions alone."

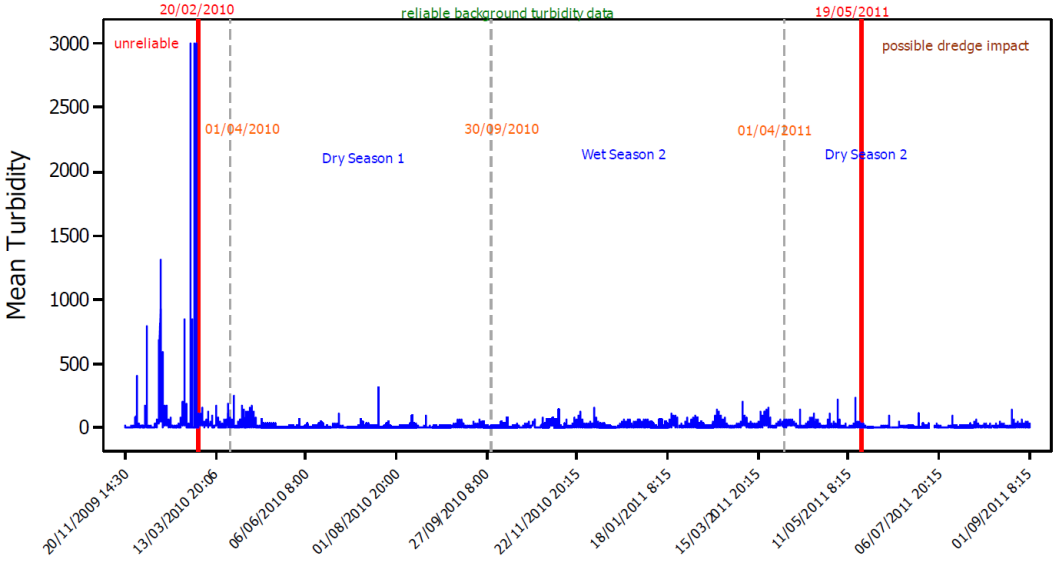


Figure 1. Time series plot of raw (average of two sonde readings) at QE4 since commencement of monitoring (20/11/2009).

http://www.westernbasinportdevelopment.com.au/media/pdf/Revised%20QE4%20interim%20EWMA%20NTU%20trigger%20values.pdf

The image above from the Environmetrics report indicates that the data after May 20, 2011 is denoted as "possible dredge impacted." The dredge "Big Boss" was operating during that period. The same dredge, "Big Boss" was working between October 2010 and February 2011. In addition the "Wombat" and "Brisbane" dredges were working in the October 2010 to February 2011. However this earlier data was used as a baseline to calculate new (higher) trigger turbidity values for QE4 and ST1.

Both Dr Andersen (Vision) and GPC acknowledged in late 2011 that the leaking bund was likely to be impacting the inner harbour seagrass meadows, which should have been protected under project conditions. This knowledge did not stop them continuing to pump into the failed bund, breaching conditions of project consent. It did not stop them supporting an increase in turbidity trigger values in May 2012.

Dr Andersen was a member of the Dredge Reference Technical Panel. They were involved in requesting the increase in trigger values at QE4 and ST1. Dr Andersen's (Vision's) impacted data from October 2010-February 2011, was then provided to Prof Fox (Environmetrics) and taken to be "baseline" to calculate new (higher) triggers. Subsequently DEHP approved substantial increases in turbidity trigger values at QE4 and ST1 at a time when seagrass was demonstrably substantially impacted.

Gladstone Ports Corporation
Growth, Prosperity, Community.

Turbidity levels approved

5 May 2012

Gladstone Ports Corporation (GPC) has received confirmation from the Department of Environment and Heritage Protection (EHP) that some trigger values for turbidity will be raised.

The decision comes after an extensive review of additional data by the regulator to better reflect the background turbidity levels.

Naturally occurring turbidity prior to dredging commencing was analysed to determine the background levels in the harbour and presented to EHP.

"GPC applied to change the turbidity triggers when natural occurrences alone were causing exceedances," Chair of the Dredge Technical Reference Panel (DTRP) Dr Rick Morton said.

"Turbidity increases with larger tidal ranges so most spring and king tides pushed turbidity levels over the trigger levels."

Dr Morton said the responsible and adaptive approach to dredging meant dredging was paused during these periods of high turbidity, despite dredging not being the main cause.

"The DTRP therefore supported the application to revise the trigger levels accordingly," Dr Morton added.

original

The registered operator must not allow turbidity levels at sensitive receptors (QE4, ST1, P2, BG10) to exceed the turbidity levels contained in Table 1 – *Maximum allowable (6 Hour EMWA) Turbidity levels* fo a period of greater than 48 hours, unless it can be demonstrated to the satisfaction of the administering authority that the elevated turbidity is the result of errors or natural background variations.

Table 1 – Maximum allowable (6 Hour EMWA) Turbidity levels

Sensitive Sites (GPS Co-ordinates)	Maximum 99th Percentile Turbidity (NTU)	
QE4 (S23 44.689' E151 09.676)	34 (Wet)	28 (Dry)
ST1 (S23 47.987' E151 11.750')	38 (Wet)	24(Dry)
P2 (S23 48.514' E151 12.950')	69 (Wet)	40 (Dry)
BG10 (S23 47.859' E151 14.121')	56 (Wet)	46 (Dry)

Table 1 – Maximum allowable (6 Hour EMWA) Turbidity levels

Sensitive Sites (GPS Co-ordinates)	Maximum 99th Percentile Turbidity (NTU)	
QE4 (S23 44.689' E151 09.676)	55 (Wet)	30 (Dry)
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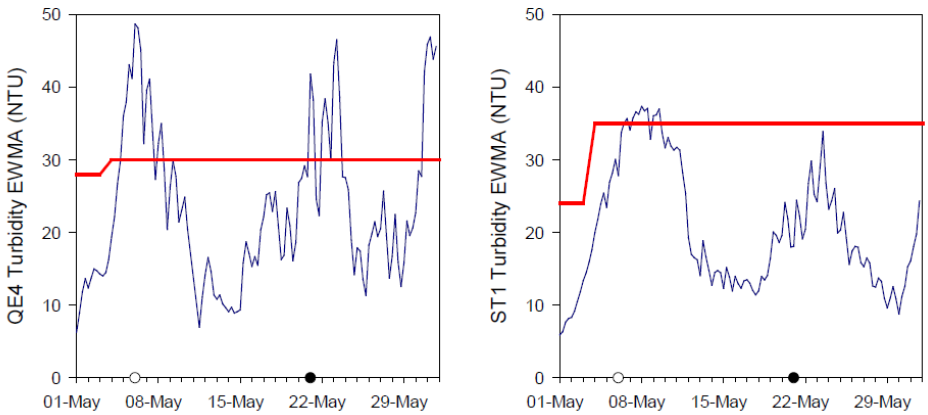
Above tables taken from ERA 16 dredge permit change. This document is not available on the GPC website. It highlights the increase in both wet and dry season trigger values.
http://www.westernbasinportdevelopment.com.au/project_approvals_permits/section/documentation

WBDDP Water Quality Monitoring



GPC falsely claimed that the dry season value had not been increased to Minister Hunt's Bund Wall review. See page 5, 7 and 8 of their submission.
http://www.environment.gov.au/submissions/gladstone-bund-wall/9-gladstone-ports-corporation.pdf

Excerpts below.

> These investigations were discussed at the (DTRP) Dredge Technical Reference Panel meetings which are attended by regulators and independent experts as evidenced by meeting minutes. Further, the approved Water Quality Management plan required meetings of the DTRP subcommittee whenever exceedences of the 95% percentile at any of these license sites occurred. Regular meetings occurred throughout the latter months of 2011 and into 2012. At these meetings constant updates on actions being planned and undertaken were provided.
>
> By October 2011 had data available up to May 2011. Post May 2011 data was excluded as dredging had commenced. Utilising this wider data set, which included a full wet season, and in line with the adaptive management approach outlined in the Water Quality Management Plan the refined values for the 95th and 99th percentiles at QE4 and ST1 were submitted to allow for the triggers to
>
> be adjusted reflecting the full data set available. The approval to change the limits proved time consuming and difficult and in fact the dry season limit was never changed despite the recommendations.
>
> As can be seen by the attached graphs of ST1 and QE4, if the licence limits had been adjusted to correspond to recommendations, the only exceedences (48hrs above 99% percentile) occurred when the bund was closed in September/October 2011, around the time of the Transitional Environmental Program (TEP – approved bund sealing works using 2 CSD's in July/August 2012) and in normal rain events. The levels of 'exceedences' recorded are also within the ranges experienced by the inner harbour from natural weather events.

These increases thus permitted dredging to carry on, even though turbidity exceeded the previously established baseline (pre-October 2010) that had been applied during the QGC construction dock project, a prelude to the larger Western Basin Dredging and Disposal Project to protect the sensitive inner harbour seagrass meadows. This did however successfully avoid the expensive dredge stoppages for GPC, and doomed the seagrass to non-recovery.

Comparison with 2009 and June 2010 Assessments

Distribution of seagrass in the Western Basin November 2010 survey was significantly lower than what was observed during the November 2009 survey. Overall, there was a net loss of seagrass between years of 1557 ha (Map 10a, b). An additional survey of the area in June 2010 (i.e. winter), demonstrated the significant seasonal decline characteristically observed following wet season flooding with a loss of 2241 ha from November 2009 (Map 9a, b). Typically, seagrass recovery during late winter/spring results in seagrass abundance and distribution returning to pre-flood levels by October/November. However, recovery of only 46% of the total distribution by November 2010 suggests seagrasses were severely impacted over the 2009/2010 cycle.

The greatest loss in area over the 12 month period was in the Fishermans Landing intertidal and subtidal meadows (Meadows 6-9; Table 11). These losses are discussed in greater detail within the annual monitoring section of the present report in addition to loss recorded in the Rodds Bay monitoring meadow (Map 10b).

The Narrows north of Laird Point had a substantial net loss of 719 ha. The area lost was of patchy meadows consisting of *Zostera capricorni* and *Halophila ovalis* on the intertidal mudbanks lining the creeks and mangroves.

The seagrass report fails to mention the substantial increase in boat traffic and early dredging in October 2010 as key potential drivers of the loss of the inner western basin seagrass meadows through elevating turbidity.

Also prior to the late December 2010 flooding, turbidity was likely to be generated by the commencement of the bund construction on 21 December. (Note that GPC later falsely reported the start of bund construction to 28 January 2011).

DISCUSSION

The results of the seventh annual Port Curtis seagrass monitoring program and Western Basin survey found the majority of monitoring meadows had reduced to their smallest area and density recorded in the program and suggests that seagrasses were in a vulnerable condition. In 2009, seagrasses in Port Curtis were at their peak abundance and distribution since monitoring began in 2002. Above average rainfall and flooding from local rivers and waterways likely led to the observed reduction in available light for seagrasses and resulting seagrass declines. The complete loss of the subtidal monitoring meadows at Fishermans Landing and intertidal meadow at South Trees is of particular concern. The contraction of the Wiggins Island monitoring meadow and lack of dugong feeding trails recorded during the aerial survey are key shifts from all previous monitoring surveys.

Port Curtis seagrass meadows are of high ecological and economic value. Their role includes providing important habitat and feeding resources for IUCN red-listed vulnerable species of dugong and green turtle (Hughes et al. 2009), supporting economically important fisheries (Watson et al. 1993, Unsworth and Cullen 2010), and playing an important role in nutrient and carbon cycling in the local environment (Costanza et al. 1997, Hemminga and Duarte 2000). Fisheries surveys in 1988 found Gladstone harbour seagrass meadows to be important habitat for a range of fish, crab and prawn species (Lee Long et al. 1992).

As the only known major area of seagrass between Hervey Bay (170 km south) and Shoalwater Bay (170 km north), seagrass meadows in Port Curtis and Rodds Bay play an important role for turtles and dugong in this region (Lee Long et al. 1992). Local meadows provide both a regular food source as well as a natural corridor between adjacent seagrass habitats. This value is recognised by the Dugong Protection Area (DPA: Zone B) declared for the majority of the surveyed area (www.gbrmpa.gov.au). Dugong and turtle (and their feeding trails) have been commonly observed throughout Port Curtis and Rodds Bay by the Marine Ecology Group (DEEDI) during seagrass surveys over the last two decades (1988 to 2009). Corresponding with a reduction in seagrass area there was an absence of DFTs in many areas where they have consistently been recorded in previous surveys. However, the natural decline in seagrasses in the port area may have led to dugong utilising more appropriate feeding areas in the short term and feeding trails were observed in the Pelican Banks area where relatively dense seagrass remained. If local conditions continue to improve, signs of dugong activity would be expected to return in parallel with increased seagrass abundance during future surveys.

Light is considered to be the primary environmental variable determining seagrass distribution, abundance and productivity (Duarte et al. 1997; Vermaat et al. 1997). Seagrass minimum light requirements differ between species, yet it is well established that changes in the availability of light with increasing depth remains the primary factor affecting the distribution of seagrasses (Bjork et al. 1999; Hemminga and Duarte 2000; Erftemeijer and Lewis 2006; Ralph et al. 2007). Studies of seagrasses in tropical regions have indicated that genera such as *Zostera* and *Halodule* require significantly greater light requirements (Grice et al 1996; Bach et al 1998; Collier et al. 2009) than other genera such as *Halophila* and *Halodule* (Freeman et al 2008). In Gladstone, it is likely that high turbidity from well above average river flooding in combination with a typically turbid port environment resulted in the greatly reduced light availability, potentially contributing to the widespread decline of intertidal meadows and loss of subtidal seagrass.

Many of the changes to seagrasses that were observed in Port Curtis in 2010 were indicative of low light conditions. Seagrasses growing near their minimum light requirements employ a range of physiological and morphological mechanisms to increase survival. In particular, shoot density, biomass, growth and shoot length decrease (Abal et al. 1994, Longstaff et al. 1999, Ralph et al. 2007, Collier et al. 2009), changes that were clearly identifiable in Gladstone seagrasses in 2010. In conditions of severe low light, periods around low tide for intertidal seagrasses can provide the

GPC had this knowledge of the decline and state of stress on seagrass meadows in the western basin and of its obligation to protect those meadows described through the conditions of approval of the projects (Construction Docks, Bund Wall Construction, WBDDP, etc).

There was reported to be signs of recovery in July 2011 in the DEEDI Gladstone Permanent Transect Seagrass Monitoring July 2011 Update.

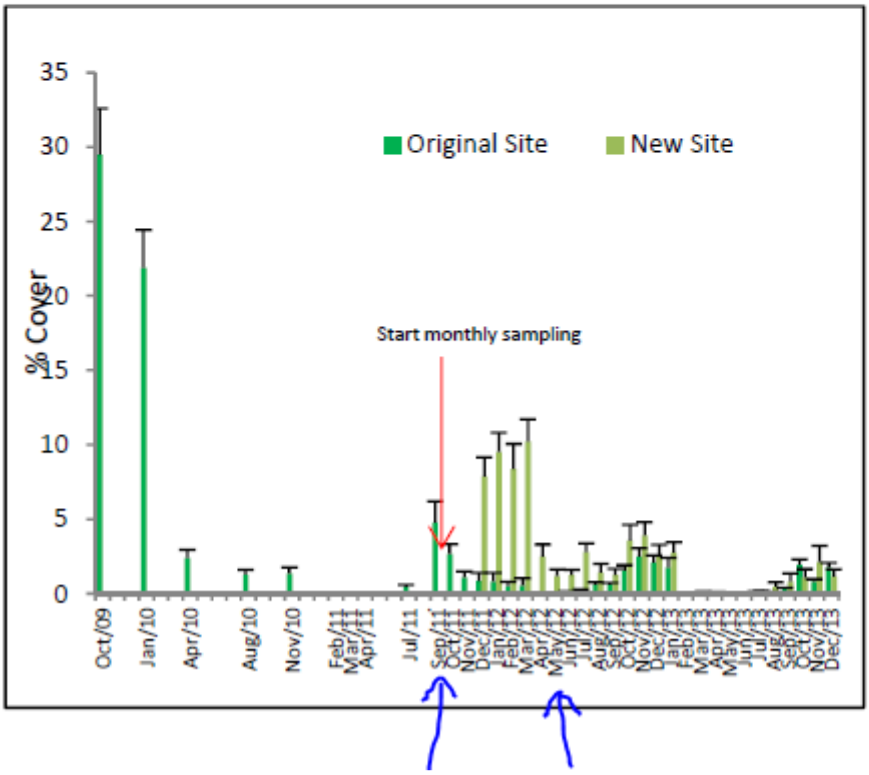
> During the March 2011 seed bank investigation, *Halophila* seeds were found at the Inner Harbour sites at Wiggins Island and Fishermans Landing. Subsequently, in July 2011, new shoots of both *Halophila ovalis* and *Zostera capricorni* were sprouting across both sites and at Rodds Bay. The appearance of new shoots and seedlings where there was previously very little above-ground biomass is evidence that recovery is assisted by the germination of seeds stored in the sediment.

However, as the bund scouring and leaks continued, and dredging ramped up again, the nearby Wiggins Island seagrass meadows declined.

Wiggins Island

Mean seagrass cover at the original site had increased since the November survey. Seagrass cover was similar to the same period in 2012 and higher than December 2011.

At the new site, mean seagrass cover had remained at a similar level to November. Seagrass cover was similar to the same period in 2012 but significantly lower than December 2011.

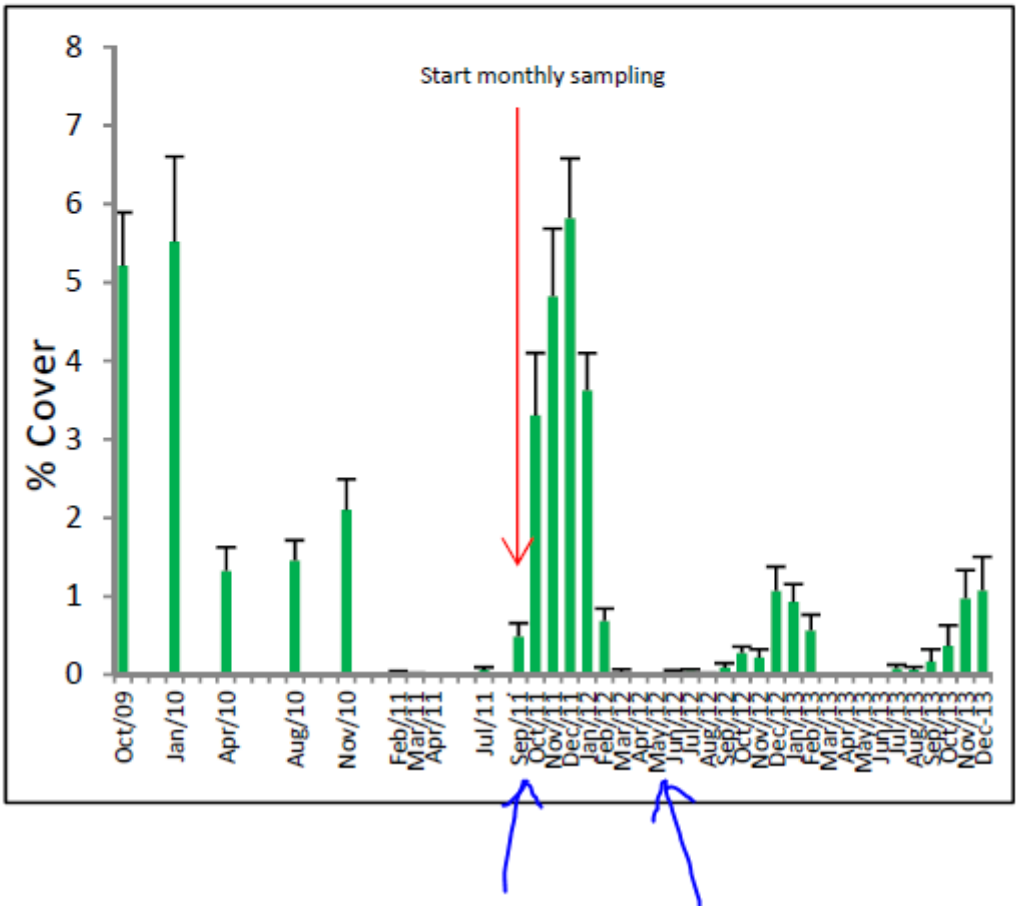


Even after the monitoring changed sites, the seagrass declined, under the management of the Gladstone Harbour projects and failed to recover after the turbidity trigger values were increased in May 2012. The timing of loss of the new site, suggests the monitoring and trigger value protections were insufficient.

Fishermen's Landing meadows also were documented to have declined and failed to recover in the growing seasons.

Fisherman's Landing

Seagrass percent cover along transects had not increased significantly since November although observers noted that seagrasses appeared more abundant at the site. Mean percent cover was similar to the same period in 2012 but lower than 2011.



Graphs above extracted from the JCU Gladstone Permanent Transect Seagrass Monitoring: Monthly report December 2013.

Even when the widely reported flooding in late December 2010 and early 2011 caused further stressful inputs of sediment, the pressure from the harbour development was not meaningfully slowed, to allow this cornerstone habitat the opportunity to recover.

The warning below was made in November 2010. As I will go on to demonstrate, further anthropogenic stressors were put on these stressed meadows in the following 6 months through dredging and construction activities associated with the Port Expansion. These stresses continued and were increased through the upwards adjustment of turbidity trigger values in May 2012.

There is potential for a full recovery of seagrasses however a second year of high rainfall following the November 2010 survey suggests seagrasses will remain well below previous years for some time. Additional stressors (natural or anthropogenic) over the next six months may have detrimental effects to seagrass meadows already in a reduced state. Natural recovery from a large loss can typically take up to five years (Preen et al. 1995), but could take longer if additional stressors (e.g. high turbidity and poor water quality) are present.

Seagrasses of Port Curtis and Rodds Bay - November 2010 47

Boat traffic substantially increased sediment re-suspension (an example is illustrated below) with sediment plumes trailing vessels which were developing construction docks and accesses to Curtis Island LNG sites. These were not reported in seagrass monitoring reports as potential contributors to elevated turbidity which appeared to be contributing to seagrass declines.

The extent of increased boat traffic is documented in Mariners Logs. (Appendix 1) Some activities in the area where monitors showed elevations in turbidity such as QE4 time coincident with losses of seagrass meadows were:

Maritime Safety Queensland
Queensland Notices to Mariners

594 (Temporary) of 2010

Queensland Government

Gladstone pilotage area

Locality: Fishermans Landing to Hamilton Point, Curtis Island

Activity: geotechnical investigation drilling

Mariners are advised that the jack-up drill rig barge "Sealift 3" will be conducting drilling operations between Fishermans Landing and Hamilton Point, Curtis Island from Thursday, 15 July 2010 until Tuesday, 9 November 2010. The following coordinates indicate the drill sites and area of operations:

- MBH1 - latitude 23° 47.370' S, longitude 151° 12.607' E
- MBH2 - latitude 23° 47.204' S, longitude 151° 12.380' E
- MBH3 - latitude 23° 57.333' S, longitude 151° 12.537' E
- MBH4 - latitude 23° 47.378' S, longitude 151° 12.570' E
- MBH5 - latitude 23° 47.423' S, longitude 151° 12.602' E
- MBH6 - latitude 23° 47.326' S, longitude 151° 12.381' E
- MBH7 - latitude 23° 47.423' S, longitude 151° 12.499' E
- MBH8 - latitude 23° 47.581' S, longitude 151° 12.598' E
- MBH9 - latitude 23° 47.713' S, longitude 151° 12.142' E
- MBH10 - latitude 23° 47.627' S, longitude 151° 11.638' E
- MBH11 - latitude 23° 48.072' S, longitude 151° 11.997' E
- MBH12 - latitude 23° 47.988' S, longitude 151° 11.496' E
- MBH13 - latitude 23° 48.288' S, longitude 151° 11.628' E
- MBH14 - latitude 23° 47.672' S, longitude 151° 11.084' E
- MBH15 - latitude 23° 48.312' S, longitude 151° 11.102' E
- MBH16 - latitude 23° 47.681' S, longitude 151° 10.635' E
- MBH17 - latitude 23° 48.891' S, longitude 151° 11.005' E
- MBH19 - latitude 23° 47.717' S, longitude 151° 13.909' E
- MBH20 - latitude 23° 47.708' S, longitude 151° 13.985' E
- MBH21 - latitude 23° 47.883' S, longitude 151° 13.202' E
- MBH22 - latitude 23° 47.953' S, longitude 151° 13.247' E

The drill barge will display appropriate day shapes and lights and will be accompanied by the tender vessel "Seapunt 3". Operations will be conducted during daylight hours only and vessels will monitor VHF channels 13 and 16

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The seagrass meadows at the supposedly “low impact” sites demonstrably failed to stage any substantial recovery after these further trigger value increases in May 2012.

The impact of the early construction dock work from October 2010 was not provided to the scientific advisory panel brought together by the Qld Govt. Nor was the turtle metals data, the toxic algae data, or the PCIMP metals elevation data.

It was also not apparent that adequate consideration had been applied in the report from Anthea Tinney and CSIRO for Minister Hon. Tony Burke, nor still in the Bund Wall Review of Anthea Tinney and CSIRO report for Hon. Greg Hunt.

Dr Andersen claimed that my assessment of a baseline to be "idealistic". My assessment of a baseline is based on the conditions of the project approval, as per below. They were to be "pre-dredging". Not as the DTRP, GPC and Vision later construed to include dredge impacted data. Seagrass meadows were to be protected, as were dugongs, dolphins and turtles. Yet they died on mass.

http://www.westernbasinportdevelopment.com.au/media/pdf/Coordinator%20Generals%20reports%20for%20an%20EIS.pdf

4.2 Baseline conditions

Condition 53 In conjunction with the WQMP, the FFMP is to establish sufficient pre-development baseline data of relevant marine and terrestrial flora, fauna and ecological communities within the project area to ensure the range of seasonal and inter-annual changes are characterised to enable comprehensive assessment of the effects of dredging and construction of the reclamation area.

3.4.2 *Water quality monitoring – general*

Condition 41 Prior to the commencement of dredging activities, a water quality monitoring program, to assess the impacts from the dredging on ecological health and water quality, must be developed in consultation with, and approved by, DERM and DEEDI with the following provisions:

a) monitoring will commence a minimum of 6 months prior to commencement of dredging

b) monitoring must continue over the full period of dredging, and for a period prior to and after dredging as defined by the monitoring program

c) all data obtained from the monitoring program must be made available to DERM and DEEDI within 28 days of survey or data acquisition

d) methods of water quality sampling must comply with the DERM Water Quality Sampling Manual.

Condition 42 The primary purposes of the proposed water quality monitoring program will be to:

a) establish a baseline for background water quality

b) measure background water quality

c) measure increased turbidity associated with the dredging program

[13] Turbidity limits are to be determined (correlated to SS) by proponent to ensure suspended solids limit is not exceeded when sampled. Turbidity is to be monitored, *in situ*, every 15 minutes.

[14] Limits for metals are trigger values only.

d) introduce a transition to the implementation of a light-based approach to water quality monitoring and management

e) provide some level of validation against predictions made in the EIS and for use in plume modelling of dredging conducted during the project

f) provide a trigger for action where impacts are felt in areas not predicted to be impacted.

3.4.3 *Dredge plume modelling*

Condition 43 The proponent is to undertake hydrodynamic and plume modelling during dredging, to assist the validation of water quality predictions associated with dredging operations.

3.4.3 *Seagrass assessment*

Condition 44 For the purpose of water quality monitoring, the assessment of seagrass communities at key locations must include:

a) establishment of permanent seagrass assessment sites, with at least quarterly measurements of seagrass health and resilience

b) consideration of natural seasonal seagrass variation

c) assessment of seagrass resilience to impact and capacity for recovery.

3.4.4 *Initial water quality monitoring program*

Condition 45 The water quality monitoring program initially used to assess the impacts from the dredging on ecological health and water quality, will be based on the use of turbidity as a water quality indicator with limits set for key environmentally sensitive locations that trigger operational responses.

Condition 46 The initial water quality monitoring program must include:

The quantity capital dredging for the construction docks was more than 355,000 cubic metres, more than had been dredged back to 2002-03. But this was not the only dredging going on with the Brisbane also undertaking maintenance dredging of an unknown quantity in February 2011. Also construction of the RG Tanna Wharf was underway during October 2010 as illustrated in GPC's media release: Port Talk December 2010.

Early dredging milestone achieved

Early works dredging is well underway with GPC achieving its first project milestone in November.

Dredging commenced in October as part of the early works schedule to provide construction access for LNG proponents in an area off Curtis Island, with the area now ready for the first dock on the island.

Project General Manager Mark Greenaway said the 'Wombat' cutter suction dredge has been used since October to complete the works, with the 'Big Boss' backhoe dredge arriving in November to assist.

"The Wombat pumps dredge material from the dredge via a floating pipeline to a substation. The substation then pumps the material to a designated disposal area," Mr Greenaway said.

"For early works dredging, material was pumped to the area known as cell one at the existing Fisherman's Landing reclamation area."

Dredging has now moved to the shoreline area parallel to RG Tanna Wharf to facilitate the construction of an aggregate load out facility for LNG proponents.

"Dredge material resulting from activities for the aggregate load out facility will be pumped into the designated cell located within the bund wall adjacent to RG Tanna Coal Terminal," Mr Greenaway said.

Early works dredging in this area is expected to be completed in February 2011, with capital dredging works expected to follow.

"Capital dredging will occur in stages and in locations at a rate commensurate with the needs of industries," Mr Greenaway said.

Dredging and material disposal will facilitate vessel access for the LNG proponents and fulfil the industrial development purpose of the Gladstone State Development Area (GSDA).

Mr Greenaway said dredge material will be placed within the Fisherman's Landing reclamation area and GPC's offshore disposal area.

"The use of an offshore disposal area has mitigated the visual impact of the Fisherman's Landing bund wall, facilitating the reduction of the reclamation mound in both volume and height.

"GPC will utilise the existing East Bank offshore disposal area, previously used for the disposal of maintenance dredging material from the inner and outer harbour area.

"The area has an additional capacity of up to 15 million cubic metres (Mm^3) which will accommodate the disposal of eight to 10 Mm3 of dredge spoil.

"This area will be closely monitored to control and minimise environmental impacts associated with the placement of dredge material."

The conditions of the project were breached. Neither SEWPAC nor the Qld Government have prosecuted these breaches.

A Royal Commission is required to further investigate these circumstances.

It is my opinion that the cause of the harm which was caused to the GBR WHA from this Port Development will be revealed through such a process. To date there has not been a single panel or inquiry, fully briefed with all data, with membership sufficiently skilled in aquatic animal health and engineering, with a Terms of Reference to consider the most likely cause of harm to the OUV of the GBR WHA and aquatic biota of Port Curtis.

Dr Andersen described my initial submission as "a rant".

Such language appears to be "playing the man, not the issue" of the practices undertaken by her company in monitoring the Gladstone Harbour Expansion projects.

My veterinary investigation remains the single most accurate assessment of the cause of massive harm to the aquatic biota of Gladstone Harbour to be impacts (turbidity, toxic algae, metals, noise) due to the Harbour Development. The flood played the most minor role in triggering the losses of aquatic animals.

I wish also to declare that all work I undertook in relation to the Veterinary Outbreak Investigation was not for profit. I have substantially invested my own personal funds and time to complete the work and participate in Government reviews through drafting submissions and attending senate hearings.

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