



# Pluto LNG Project Mermaid Sound Dredging 2007-10

A Synopsis



# The Pluto Dredging Program

## Where:

- Mermaid Sound, Dampier, Pilbara Region of WA

## When:

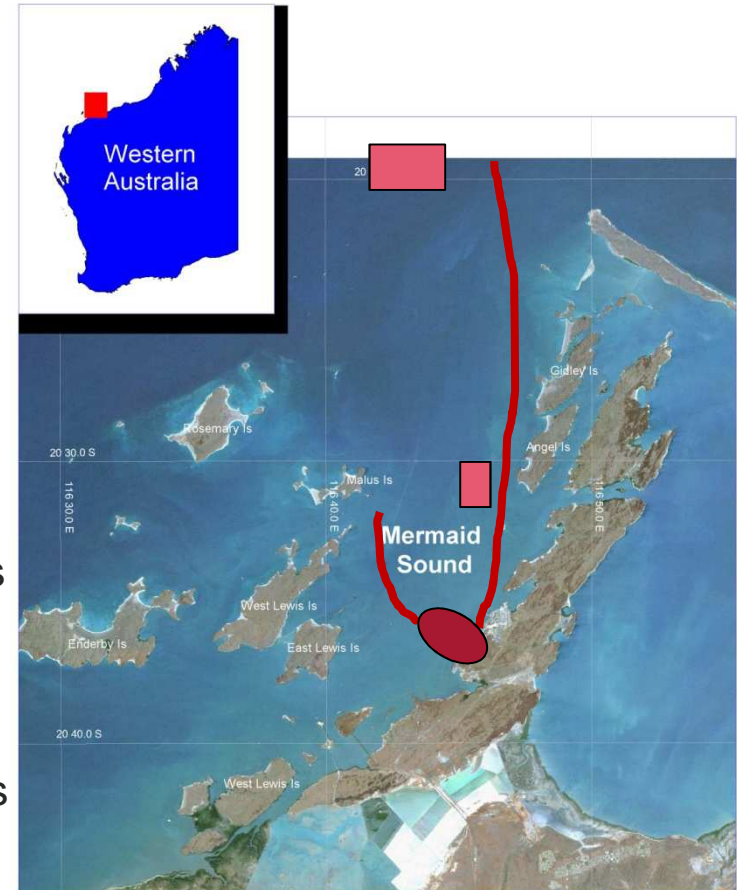
- Started Nov 2007: completed May 2010

## How Big:

- 10Mcu m:berths, basins, channel into two grounds

## What Gear:

- THSDs – big and bigger; CSDs, Backhoe, Sweeps



Location of Mermaid Sound, northwestern Australia

2 0 2 4 6 8 km  
Scale: GDA94(Z50)  
Projection: Scale 1: 250,000  
Printed: 29/06/2009  
File name: gen\_dpr

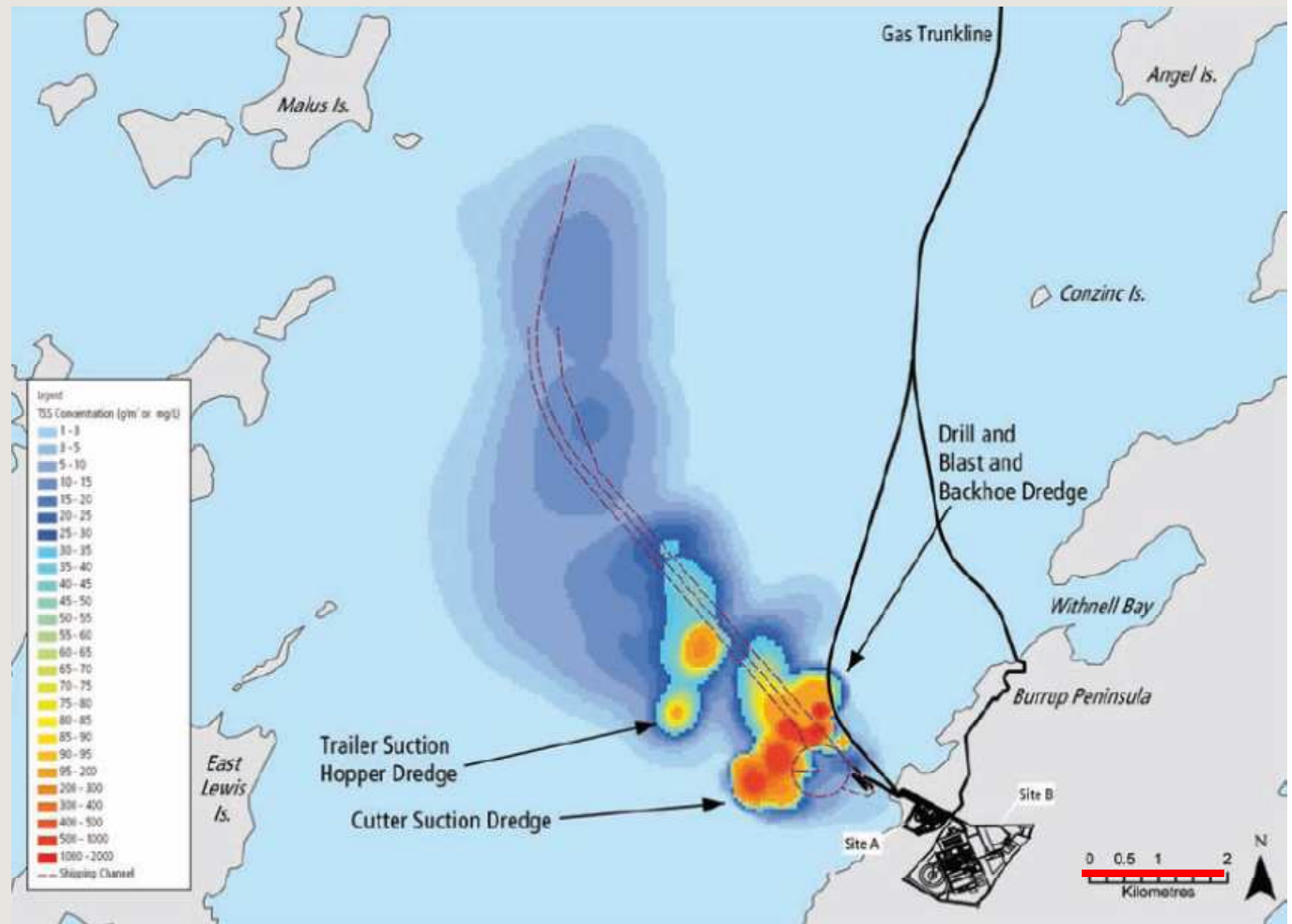
# Where

## Mermaid Sound

- Surrounded by the Dampier Archipelago, which is highly biodiverse, including over 200 species of coral, and proposed for marine park status
- A site of frequent dredging by multiple users of the Port of Dampier since 2000 – with thousands of vessel visits a year – many by very large bulk carriers
- Remnant coral communities fringe the Sound
- Coral communities with a history of exposure to a wide range of turbidity from both background and anthropogenic sources

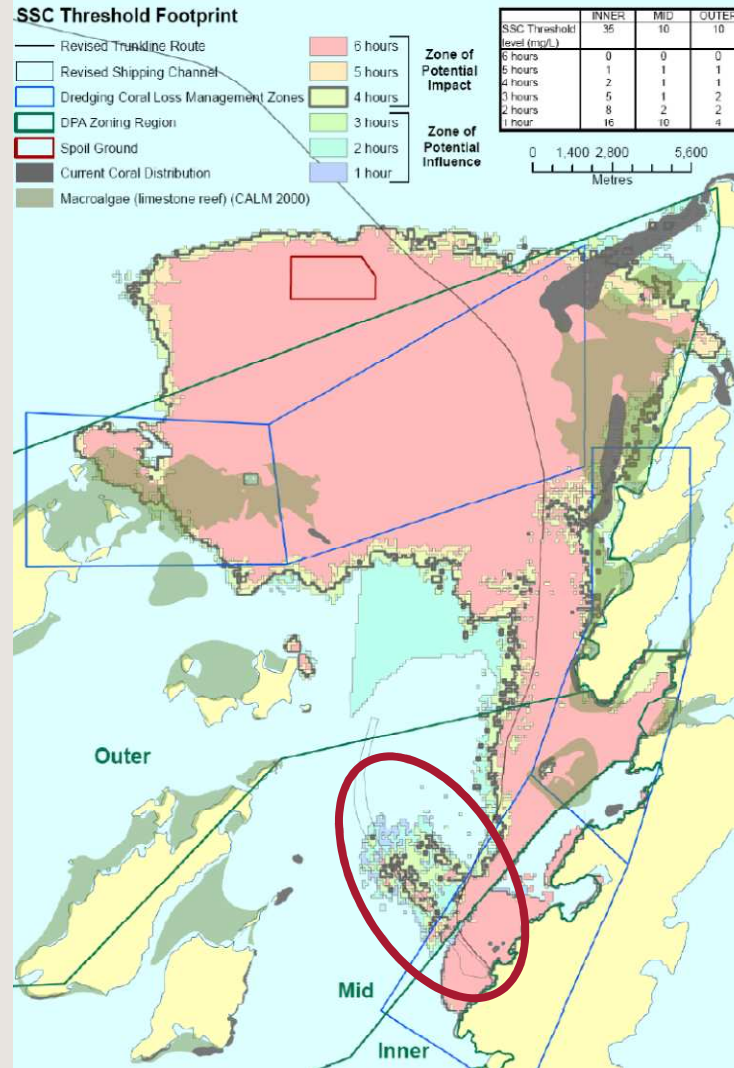
# Early prediction of the impact zone

- No resuspension:
- Impacts based on 'expert guess'



# Final prediction of the potential impact zone

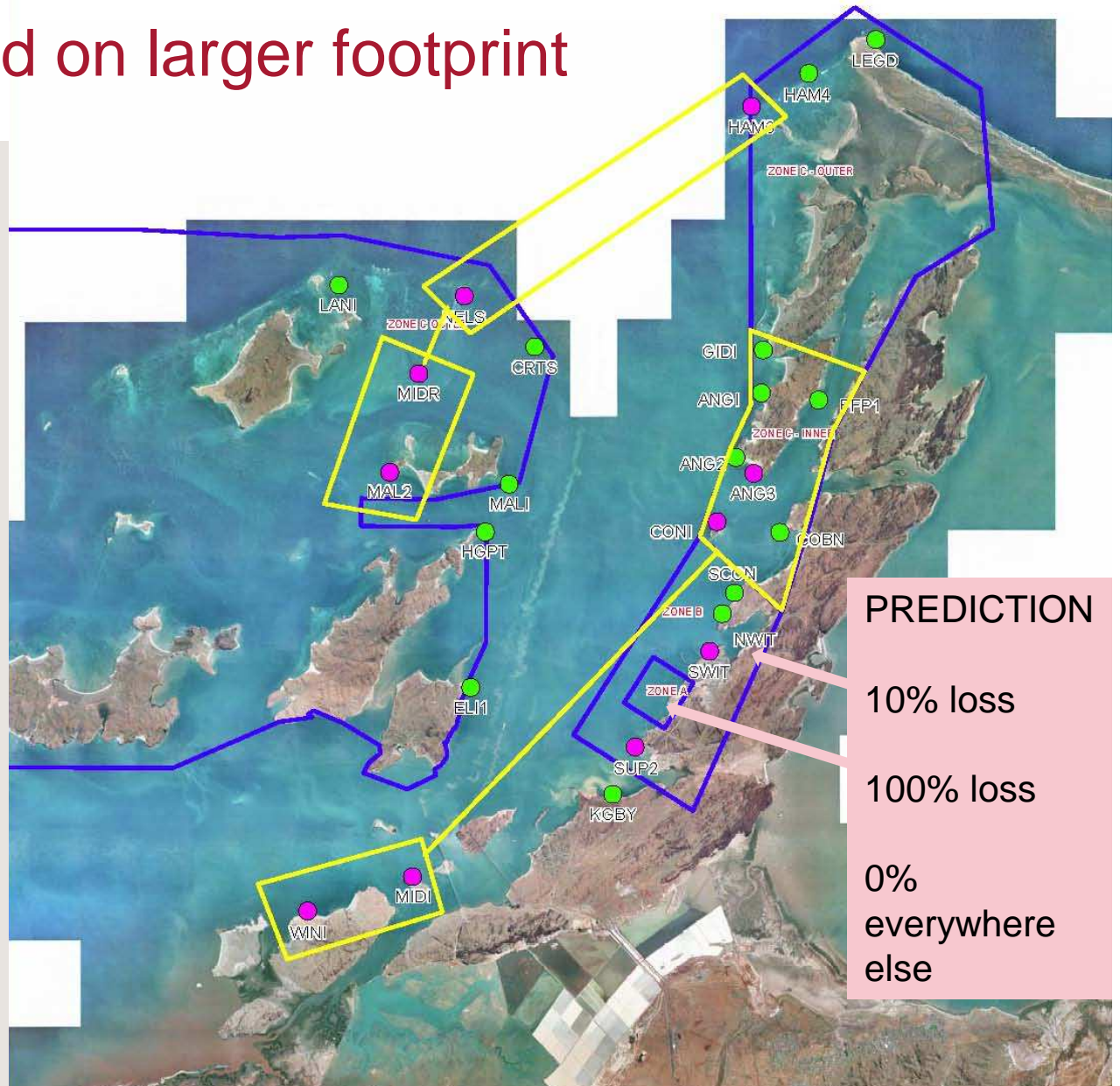
- Includes resuspension:
- Calculates impact thresholds using FID McArthur et al



# Monitoring based on larger footprint

## Components:

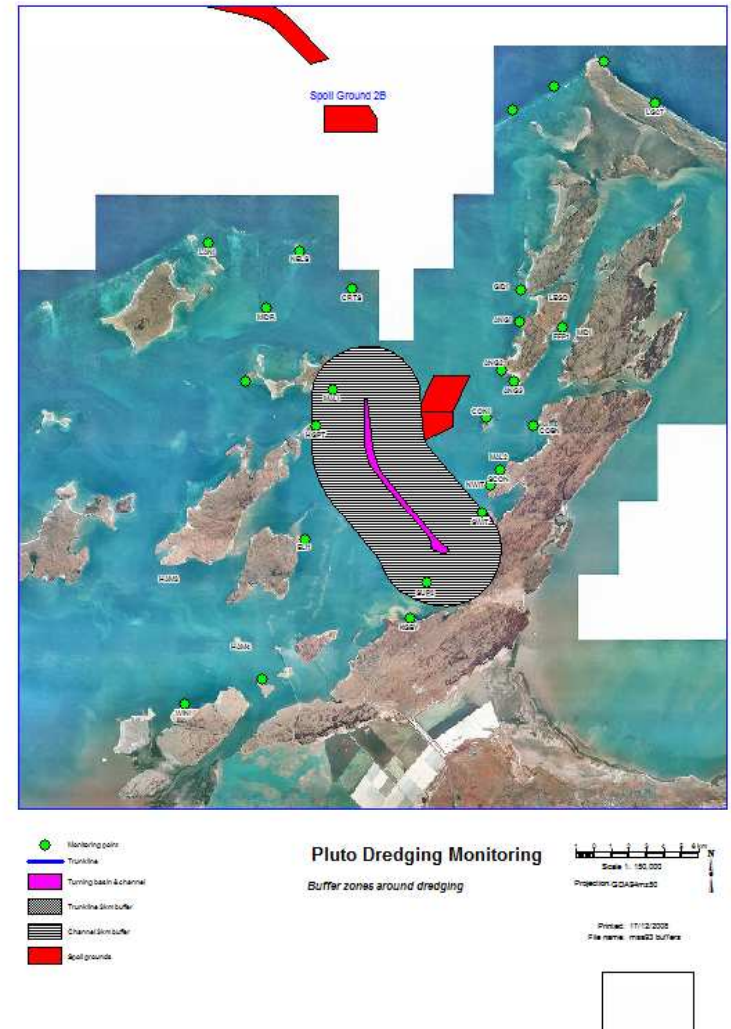
- 3 management zones – A, B, C
- 25 operating sites – visited every 2 weeks
- Turbidity, temperature, coral mortality
- Water - 10 telemetered and 15 logged
- Comparisons between pooled Reference and individual Impact sites



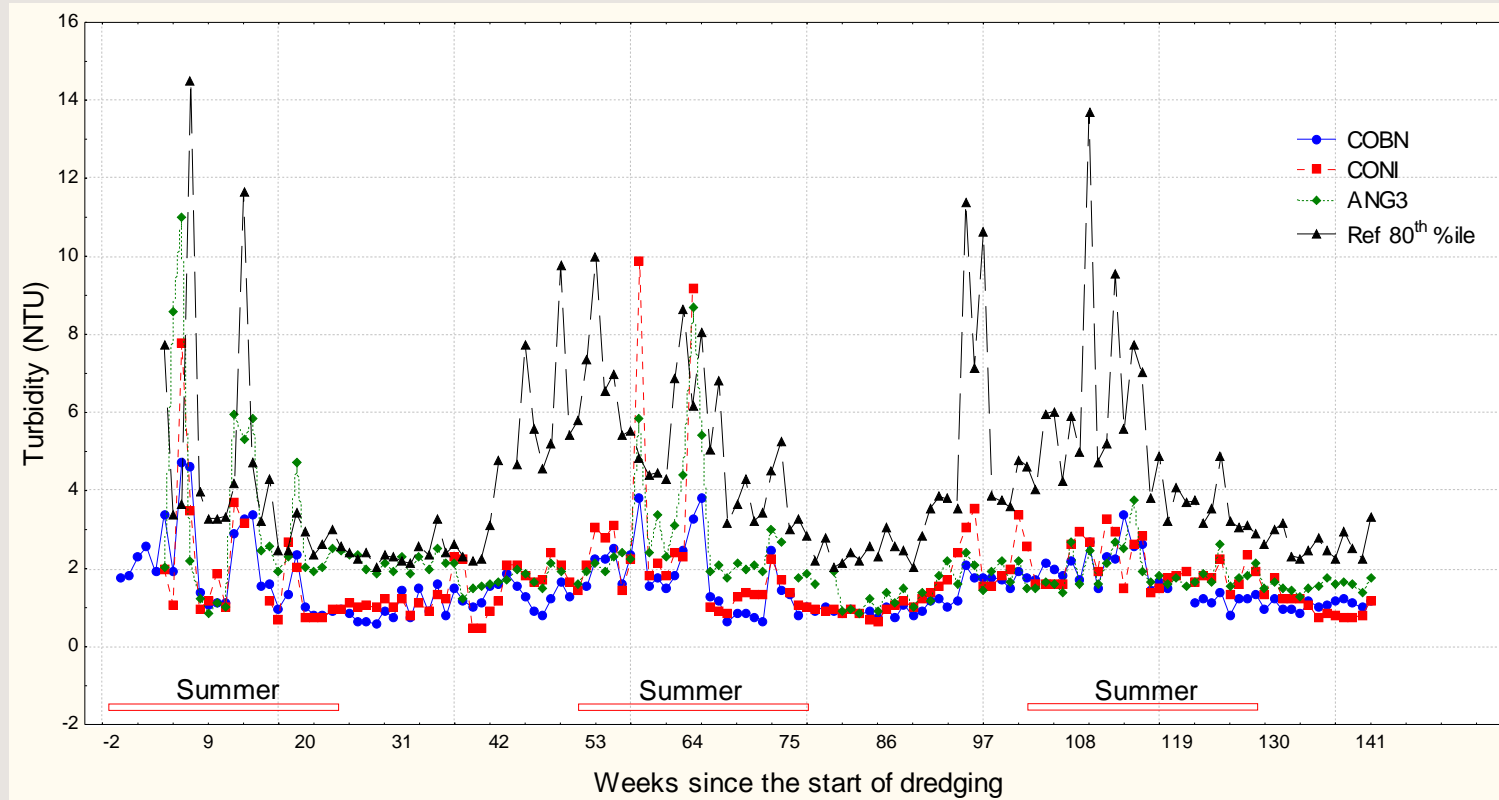
# Near Field Monitoring- water quality

Short term field studies during dredging indicated:

- extent of direct plume influence = 3-5 km from the operating dredge
- dredge plume diminishes rapidly when dredging stopped – returns to background <48 hours



# Long Term Trends



- No convergence of Impact median and reference 80<sup>th</sup> percentile – no cumulative long term elevation of turbidity
- Comparison of periods of dredging and no dredging indicated a possible small increase of <0.5 NTU (~1.5mg/L) at Impact sites



# Coral Health Monitoring Program

## Tests required by Ministerial Conditions:(Net Mortality)

- Do coral communities in **Zone B** the Zone of Moderate Impact suffer mortality levels 5%, 8% or 10% above those of reference sites
- No coral community in **Zone C** (proposed marine park) shows mortality above that of the reference sites
- No more than 10% of corals at any **Zone C** site show a sublethal effect

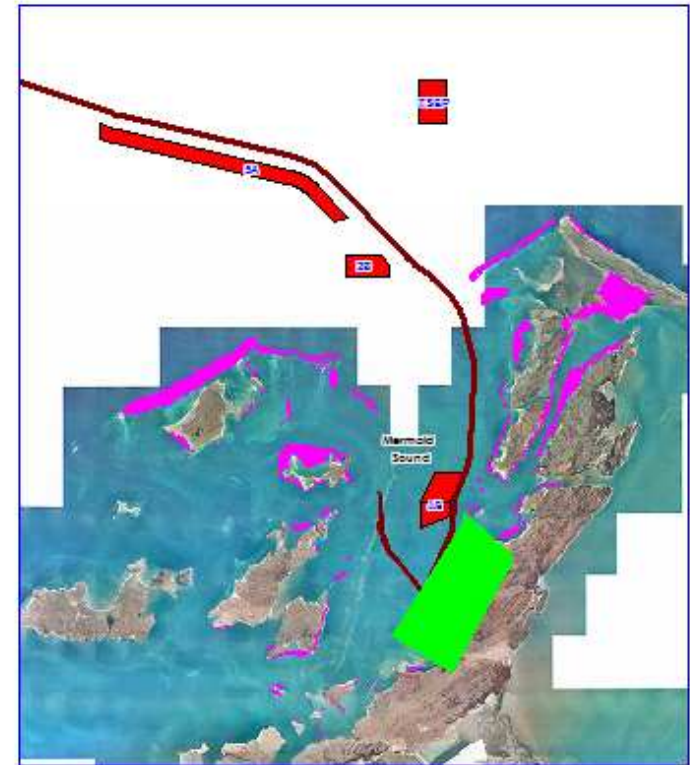
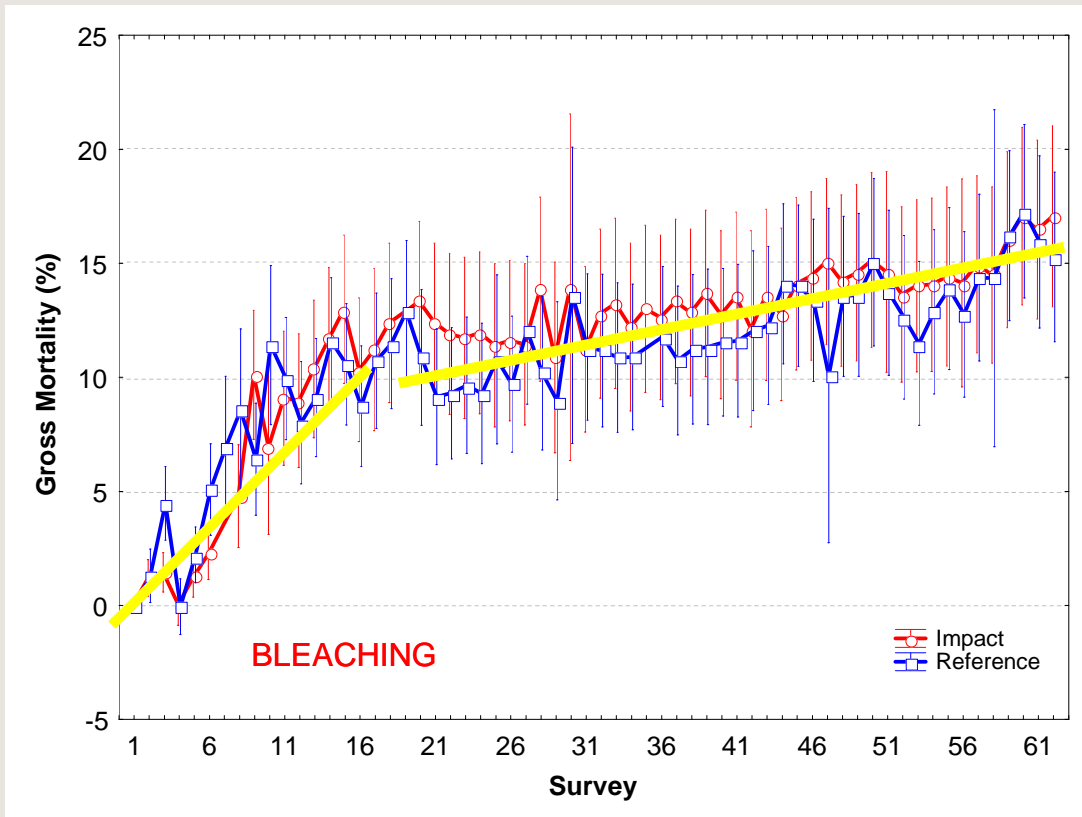
## Comprised:

- Fortnightly assessment of bleaching and mortality levels at 24 coral sites using 60 marked individuals
- Pre and post dredging assessment of coral cover at these 24 sites
- Pre and post dredging assessment of density of small corals at these 24 sites



# Zone B Results

- Predicted impact - up to 10% loss (Net = Impact - Ref):

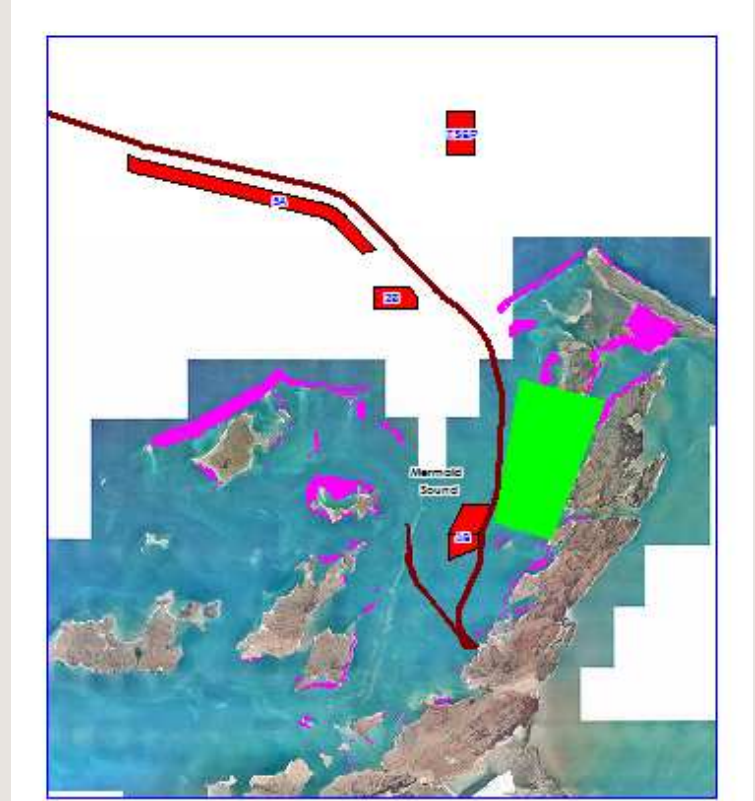
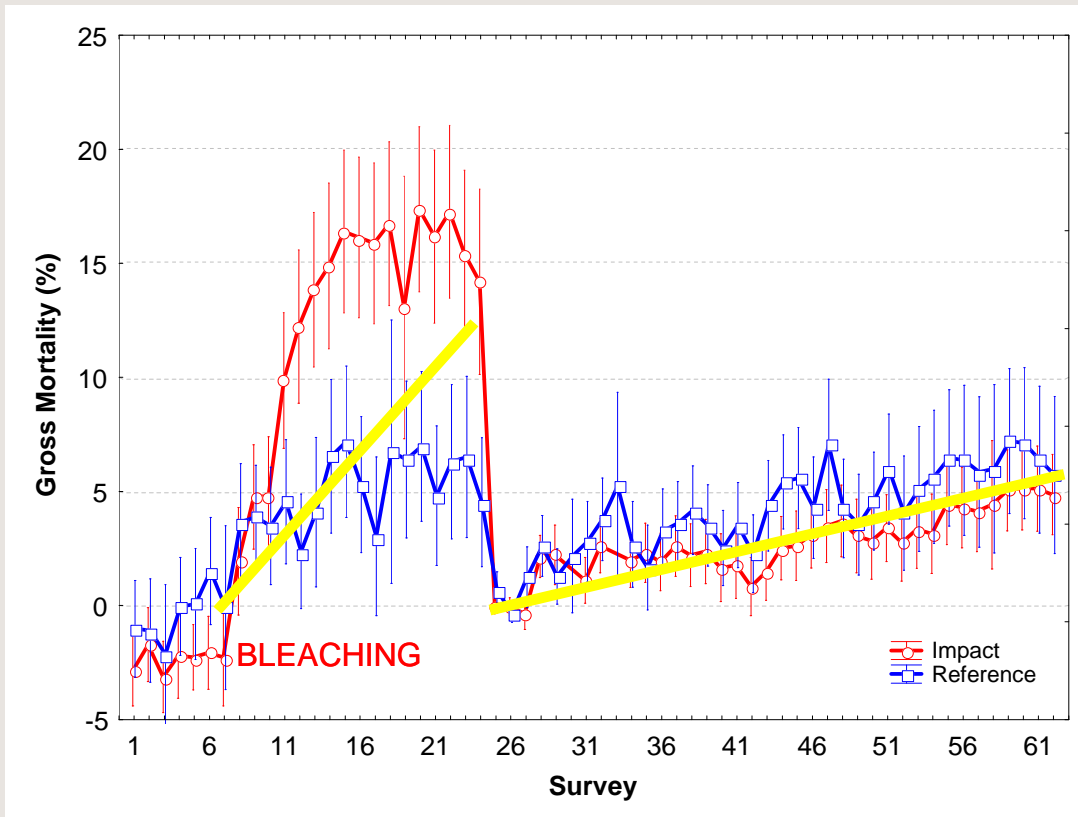


- Outcome – zero net loss



# Zone C Inner Results

- No net mortality allowed:

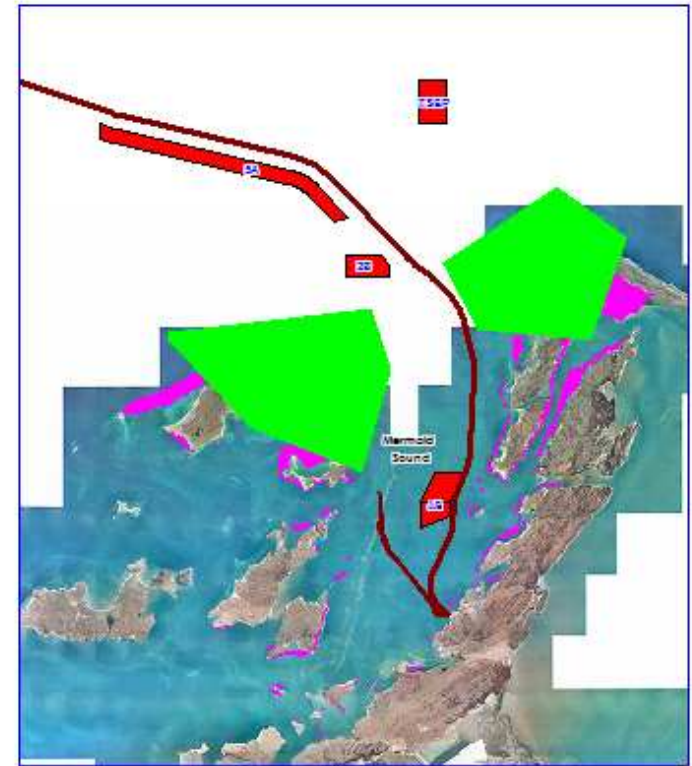
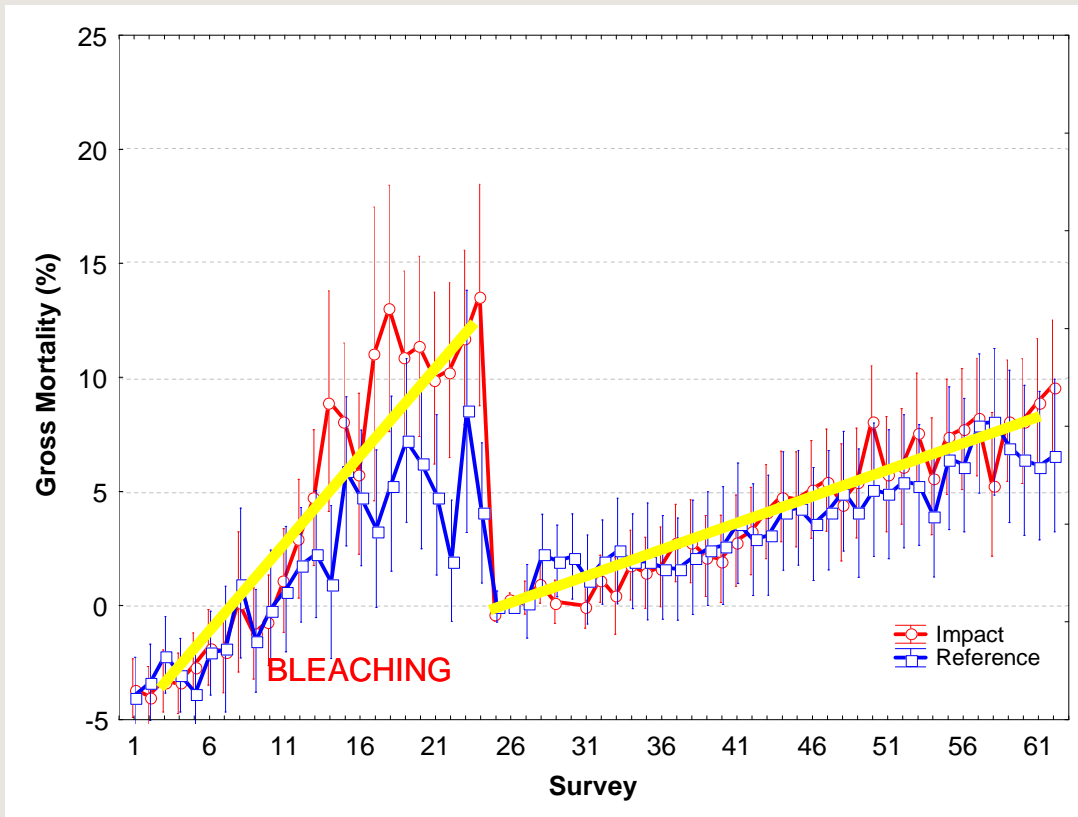


- Outcome - No net loss outside thermal bleaching period



# Zone C Outer Results

- Prediction - no net mortality:

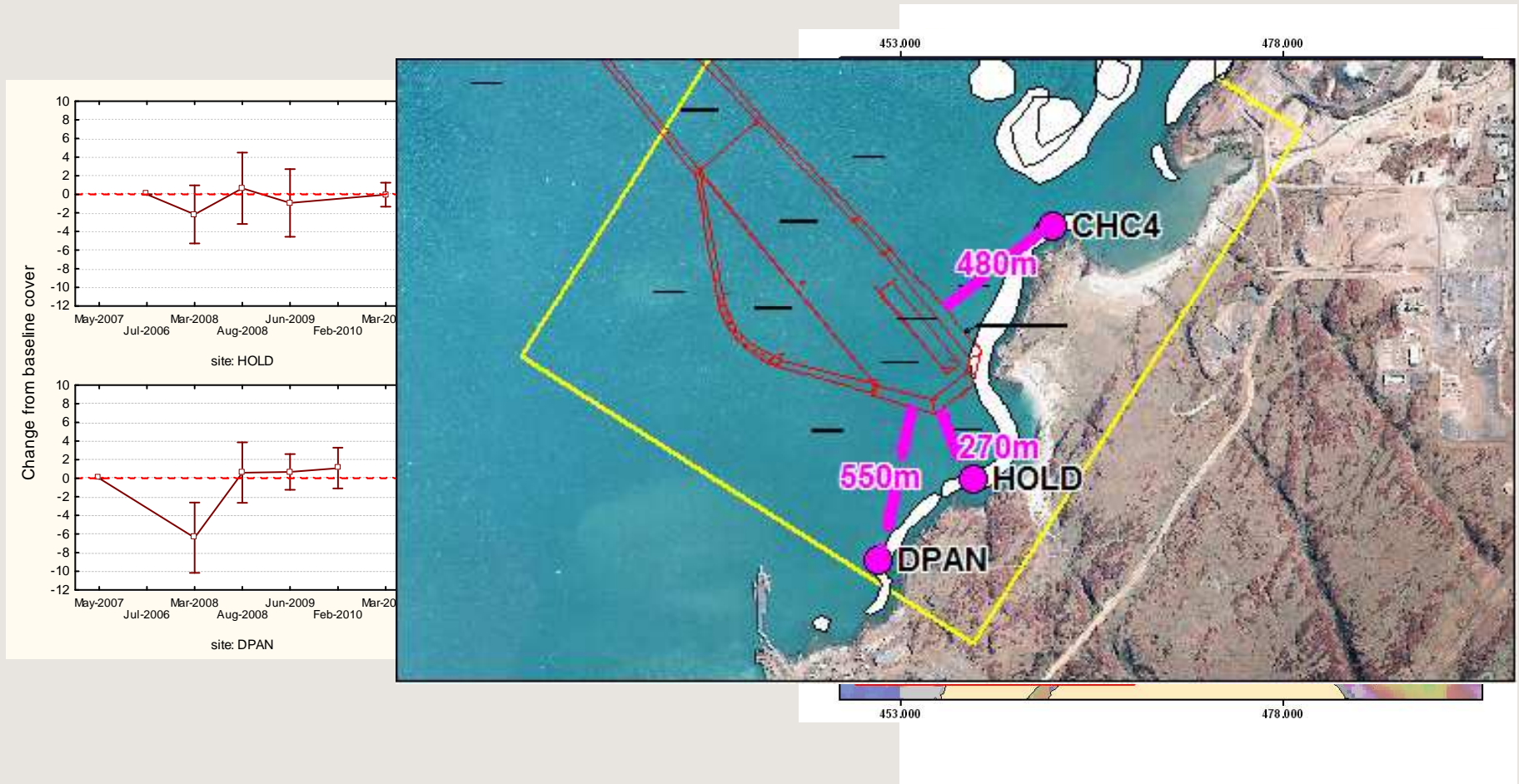


- Outcome - No net loss outside thermal bleaching period



# Zone A Results

- Prediction: significant mortality predicted, total mortality allowed:

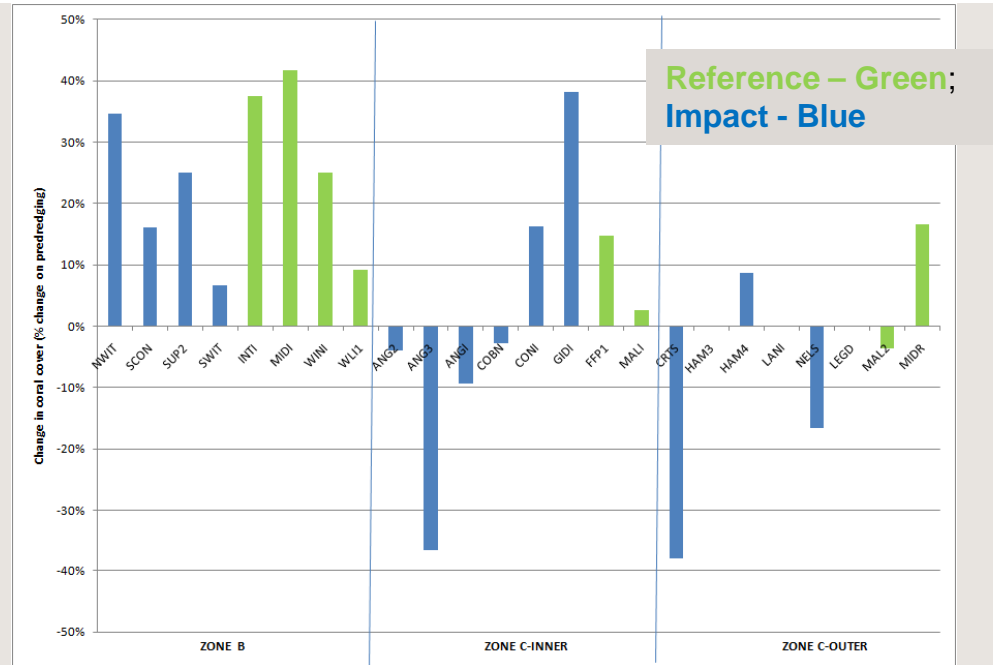




# Coral Cover & Recruitment

Coral cover is dynamic and goes up and down irrespective of site type:

Mortality of individuals is not well correlated with change in cover (other influences)



Small corals are initially more abundant at reference sites but after 30 months of dredging have increased to be equal to those at reference sites

# small corals per m<sup>2</sup>

Survey	Impact	Reference
Pre-dredging	41.8	67.4
Post-dredging	64.9	63.5



# Coral Monitoring Conclusions

## What can we say about coral mortality?

- Clear influence of thermal bleaching and predators which raise mortality rate 3-5x background rates
- Disease may play a role as well, but hard to isolate at present
- No clear link to water quality deterioration

## Receptor monitoring needs more refinement:

- Monitoring coral mortality is unlikely to allow reactive management with an effective response time
- Monitoring programs designed to test compliance are not suited to elucidating a stress-response relationship – that needs a specific research program
- Mortality is likely to result from a complex pathway of interacting stress factors and simple reference-impact comparisons are unlikely to