SESSION 3

'Dealing With Challenges'

gold coast
visionchallengeleadership

All-Day Regional Development Industry Conference

Gold Coast

Tuesday 10 August, 2010

sustainabledevelopment
gold coast inc.

NEIL SUTHERLAND

(Presenting for Neil Collins & Owen Droop)

‘Flood Mitigation & Coastal Management’

FLOOD MITIGATION AND COASTAL MANAGEMENT

By Neil Collins & Owen Droop
Principal Hydraulic & Water Resource Engineers
For Regional Development Industry Conference, Gold Coast
10th August 2010

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POTENTIAL FACTORS ASSOCIATED WITH CLIMATE CHANGE WITH IMPLICATIONS FOR CURRENT AND FUTURE DEVELOPMENT

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- Sea level rise
- Change in rainfall
- More intense storms
- Barometric pressure reduction/ increased storm tide
- Increased wind speed and changed seasonality

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Change in wave climate

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Change in shoreline erosion/ recession

- Estuary dynamics/ aquifer response
- Drainage response

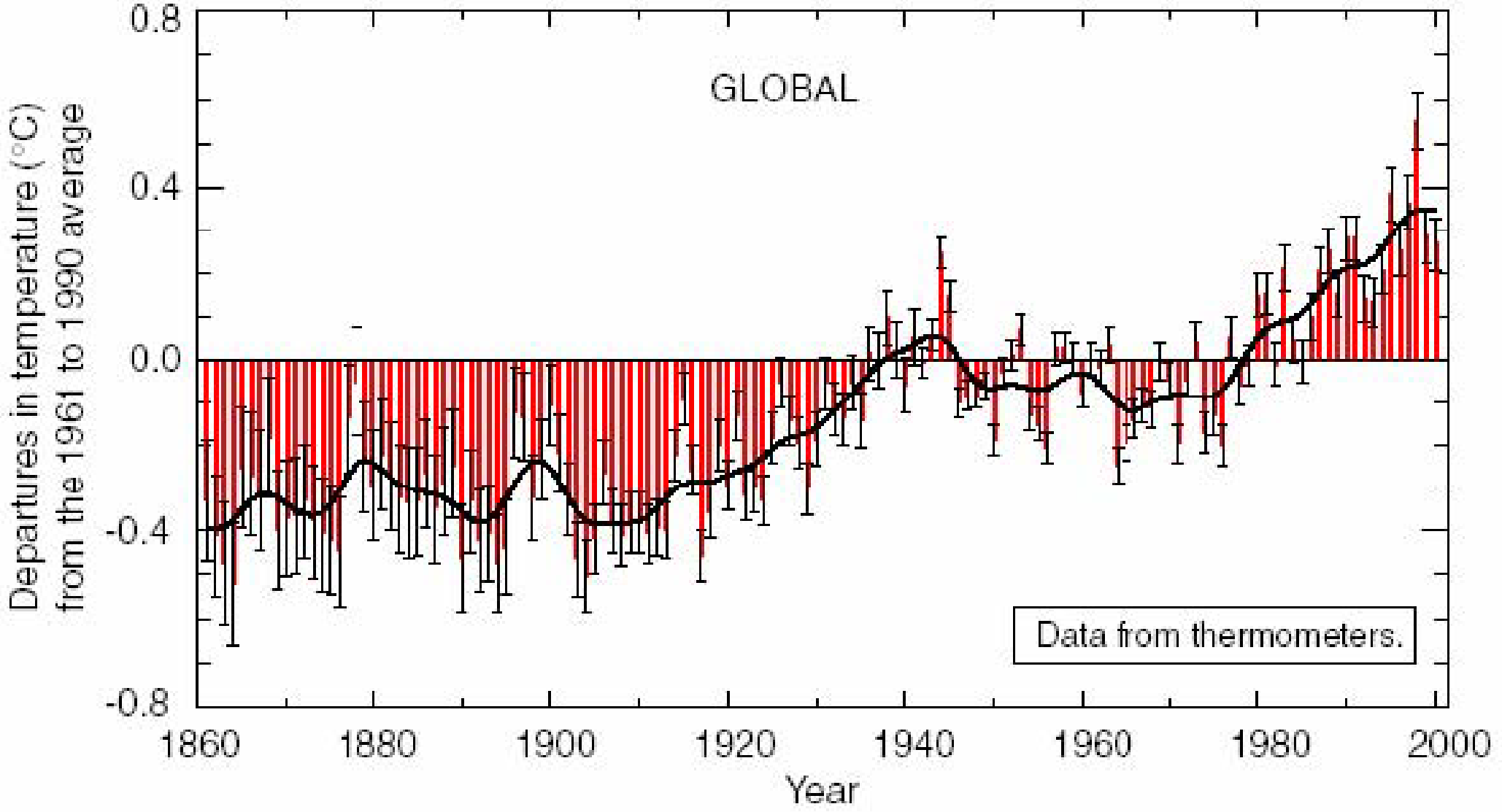
GLOBAL
Departures in temperature (°C)
from the 1961 to 1990 average
0.8
0.4
0.0
-0.4
-0.8
1860
1880
1900
1920
1940
1960
1980
2000
Year
Data from thermometers.

Table 1 -Projected sea level increases to 2100

Scenario	*IS92a*		*SRES*	Engineering
Range (m)	IPCC (1996a)	IPCC (2001b)	IPCC (2001b)	**Estimate**
Min	0.20	0.11	0.09	**0.1**
Central	0.49	0.44	0.48	**0.5**
Max	0.86	0.77	0.88	**0.9**

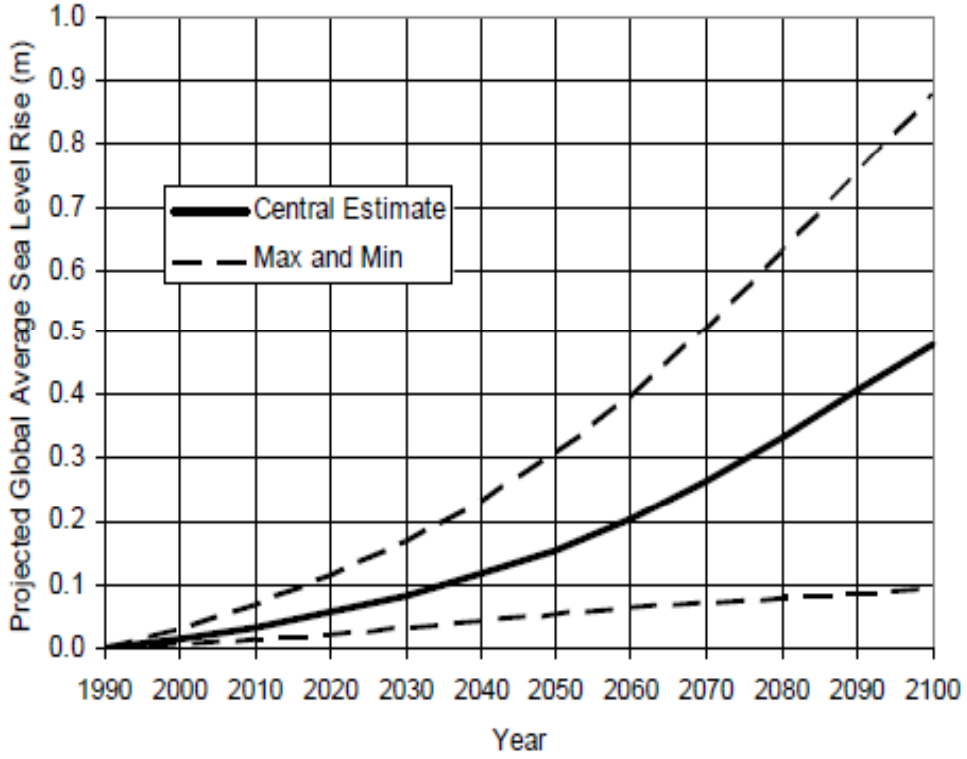

Figure 5 - 1990 to 2100 SRES sea level rise projections (after IPCC 2001b)

If greenhouse gas concentrations were stabilised (even at present levels), sea level would nonetheless continue to rise for hundreds of years. IPCC (2001a)

Geomorphological Threats of Climate Change on the Gippsland Coast

Allan Charteris[1], Eric Sjerp[2], Andrew McCowan[3], Elise Lawry[3] and Duncan Malcolm[4]

1 Aurecon, Maroochydore, Australia
2 Ethos NRM, Bairnsdale, Australia
3 Water Technology, Melbourne, Australia
4 Gippsland Coastal Board, Bairnsdale, Australia

Climate change is likely to impact average as well as extreme wind conditions, and in doing so alter the wave regime on our coasts. And even small changes in wind climate may result in significant alterations to the geomorphology of our sandy beaches.

Table 1 Percentage change in mean wind speed due to climate change in the Bass Strait Region

Projected to 2030			
Season	**Low**	**Medium**	**High**
Annual	-1	1	3
Summer	-1	1	2
Autumn	-3	-1	1
Winter	-1	2	5
Spring	-2	1	3

Projected to 2070			
Season	**Low**	**Medium**	**High**
Annual	-5	3	10
Summer	-3	2	7
Autumn	-9	-3	3
Winter	-4	5	14
Spring	-6	2	9

APPROACHES TO CHANGE

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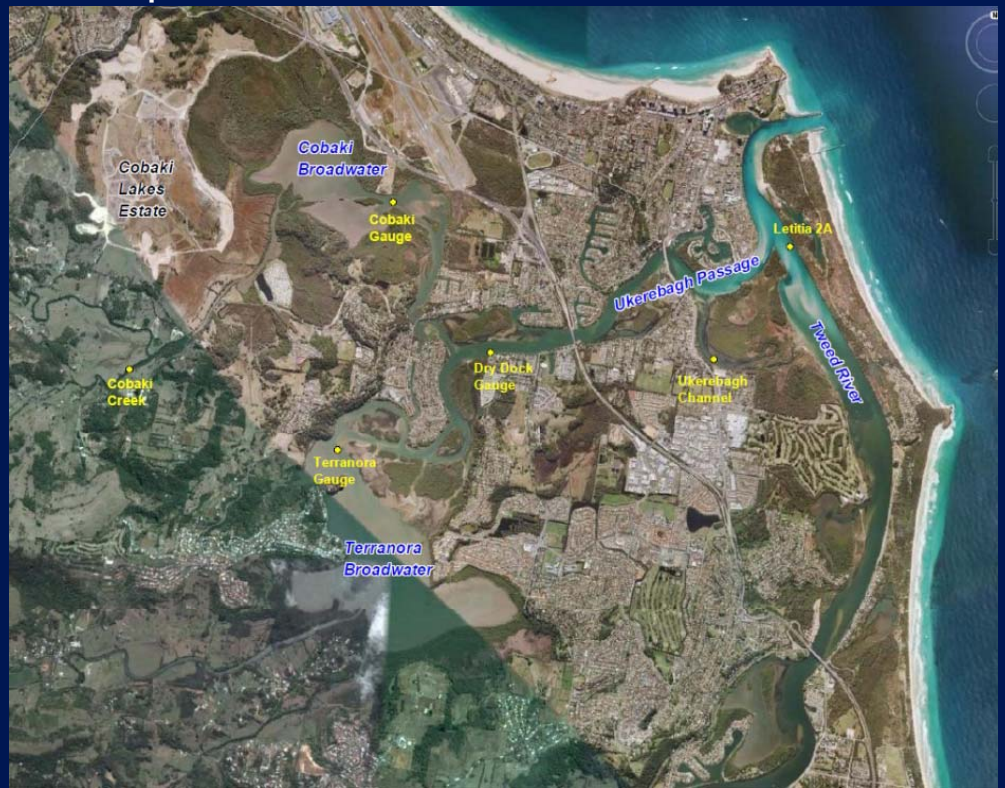
Natural Disaster Management

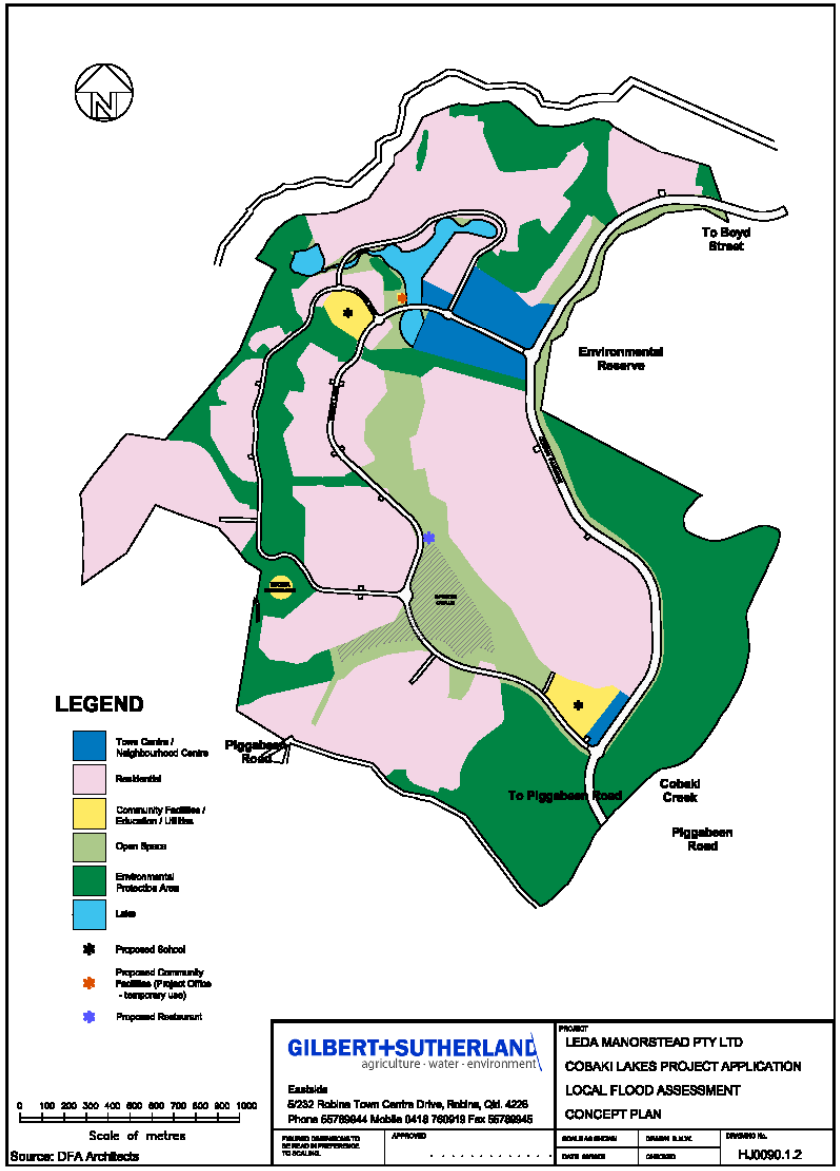
- Avoid the risk;
- Adapt to the risk (e.g. flood resistant/ tolerant buildings, evacuation strategies, appropriate design for climate change);
- Defend against the risk (e.g. sand nourishment, sea walls, levels);
- Retreat from the risk (abandonment in future planning);
- Monitor & research the risk.

IMPLEMENTATION STRATEGIES

Example – Cobaki strategy

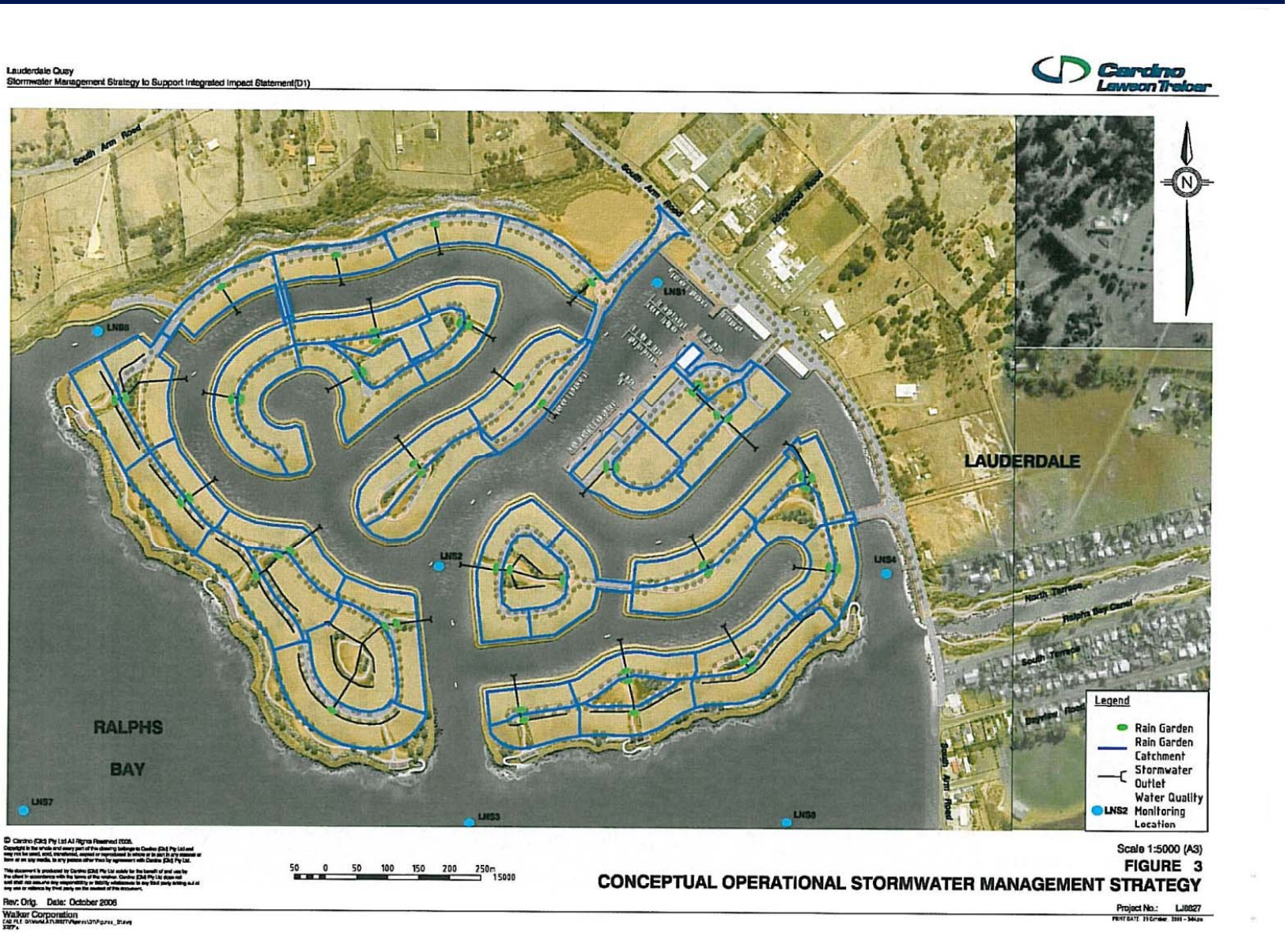
- Set habitable floor levels for year 2100 ARI 100 year event, with allowance for 10% rainfall increase.
- Emergency management planning/evacuation routes to consider up to PMF and up to 30% increase in rainfall.
- Fill levels set to achieve ARI 100 year immunity for 2100 sea level rise with ‘super-levee’ in place for future protection.





Example – Lauderdale Quay

- Set fill levels to year 2100 sea level rise
- Design drainage for up to 30% increase in rainfall intensity
- Emergency planning/ evacuation routes to manage in up to extreme events



THE MITIGATION STRATEGY

Sand nourishment to maintain beaches will be required

A range of options exists for managing the coastal impacts of climate change in developed areas of the coast. For example, a seawall option means progressive loss of public beach as against an asset retreat option which maintains a beach but results in the loss of assets.

The Sydney Coastline the assets at risk include not only high value private property but also beach front parks, parking areas, amenities, surf clubs and infrastructure such as water, sewerage, power and roads. The option that can maintain all aspects is beach nourishment.

Table 1. Volume of Nourishment required

Location	Beach Length km	Volume cu m × 10^6	Storm Safety cu m × 10^6
Pittwater	5	1.1	0.05
Broken Bay	4	2.16	0.16
Northern Beaches	15	14.85	3.7
Harbour Beaches	8	3.8	0.08
Eastern Suburbs	2.5	2.48	0.63
Botany Bay	12	5.5	0.12
Bate Bay	4	3.96	1.0
Port Hacking	5	1.1	0.05
Total	**55.5**	**34.95**	**5.79**

The Potential for Offshore Sand Sources to Offset Climate Change Impacts on Sydney's Beaches
Angus Gordon. Coastal Zone Management and Planning

THE MITIGATION STRATEGY

Sand nourishment to maintain beaches will be required

For a 100 year sea level rise of 0.9m the volume of material required would be of the order 53Mm^3 equating to a present day cost of between $500M and $800M. The value of private and public oceanfront assets at risk was of the order $1,200M in 1989. this figure is now closer to $5,000M.

Hence the estimated nourishment project cost is 10% of the asset value alone without considering the commercial and recreational benefits.

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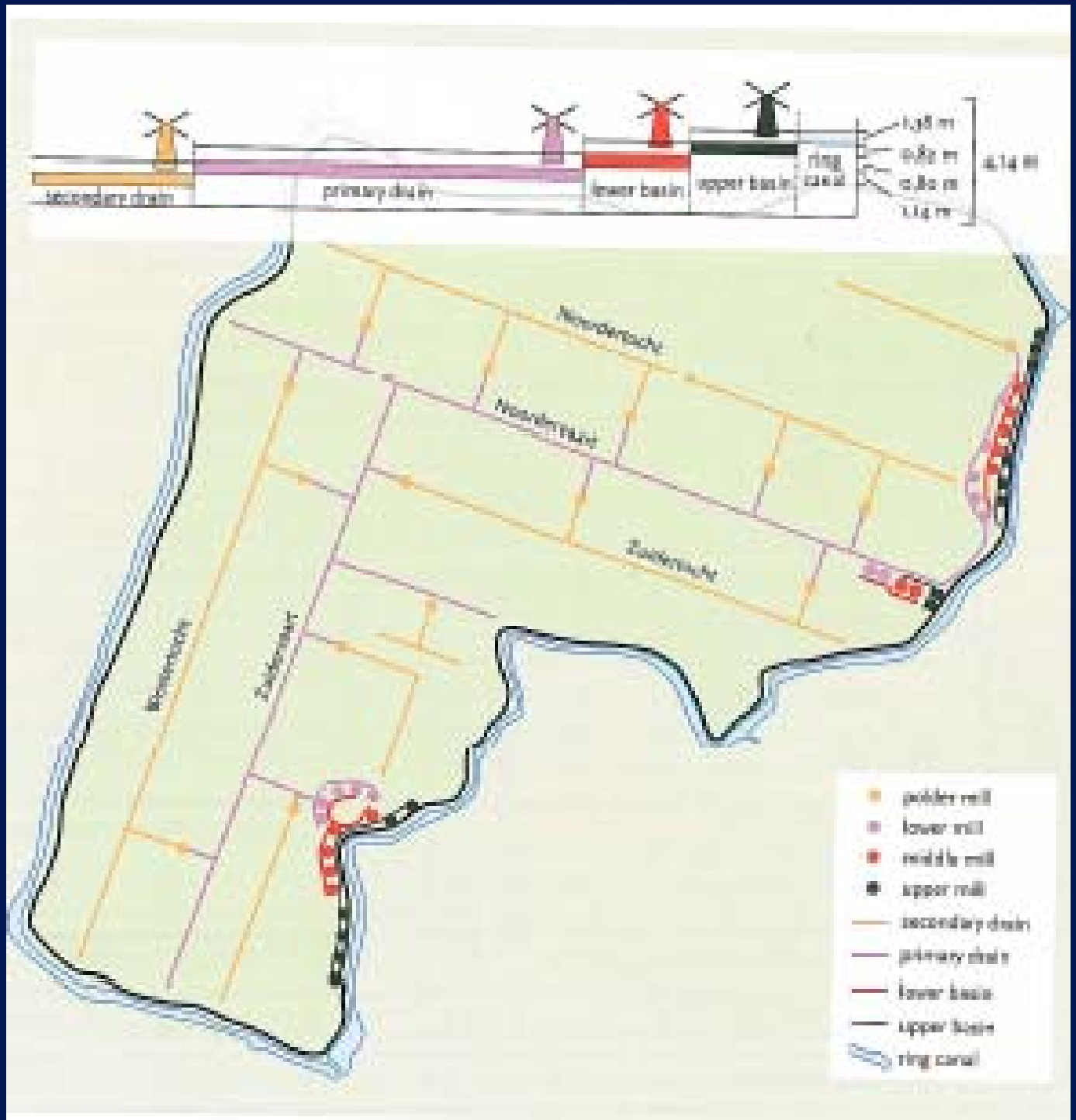
The Potential for Offshore Sand Sources to Offset Climate Change Impacts on Sydney's Beaches
Angus Gordon. Coastal Zone Management and Planning

Groynes/ rock walls



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Pumped drainage & levee banks for existing infrastructure

Trained rivers

Storm tide controls on estuaries will potentially be required

Existing Ports and Marinas

Increased sea level & increase wind and storm tide

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larger waves

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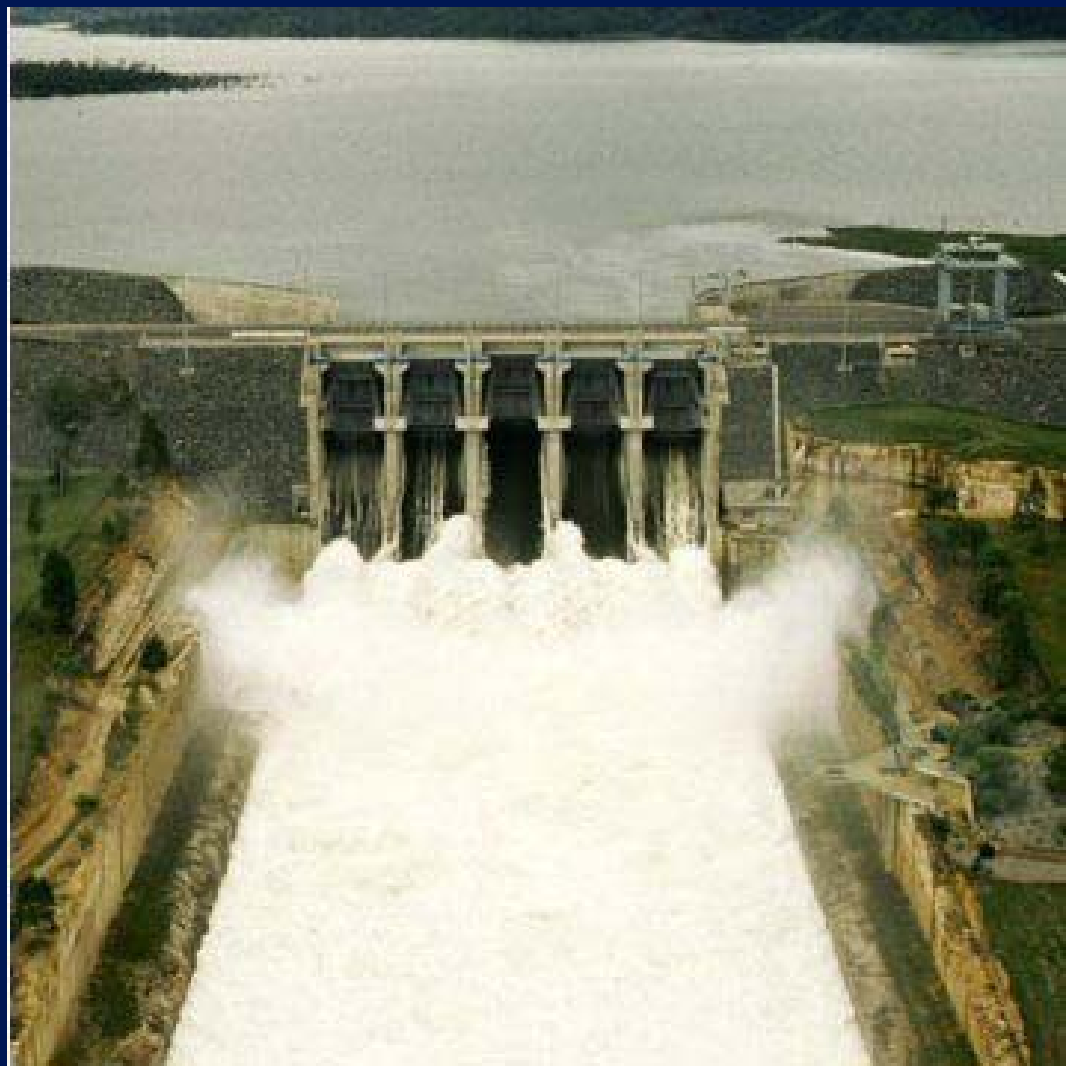
Need higher walls and larger armour & possible additional wall extensions.

DAMS

- Increased rainfall intensity may require larger spillway on some dams.

- At present the Bureau of Meteorology says no effect on PMP, so once all referable dams are upgraded (by 2025) this shouldn't worsen flooding.

- Increasingly dams being maximised for water storage, possibly at the expense of flood mitigation.



ENGINEERS
AUSTRALIA

Guidelines for Responding to the Effects of Climate Change in Coastal and Ocean Engineering

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2004 Update

The National Committee on
Coastal and Ocean Engineering

Queensland Government
Draft State Planning Policy Coastal Protection
Draft for Public Consultation – July 2009

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- For land not already subject to a development commitment, sea level rise of 0.8m by 2100 will need to be taken into account

- For land already subject to a development commitment, the following sea levels will need to be accommodated:

Year of end of planning period (asset life)	Projected sea level rise
Year 2050	0.3m
Year 2060	0.4m
Year 2070	0.5m
Year 2080	0.6m
Year 2090	0.7m
Year 2100	0.8m

NSW Government
DEPARTMENT OF
ENVIRONMENT & CLIMATE CHANGE

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Floodplain Risk Management Guideline

Practical Consideration of Climate Change

- Sea level rise on the NSW coast is projected to be in the range of 0.18m to 0.91m by between 2090 and 2100
- Increased frequencies of events due to increased rainfall intensities
- The precautionary principal suggests consideration of the full range of scenarios
- 0.91m High Level Ocean Impacts
- 30% in peak rainfall and storm volume

OTHER PLACES

Victoria:

0.18 to 0.9m by 2100; 0.8m now adopted

New Zealand:

0.5m base rise level increase by 2099, and risk based approach considering upper limit IPCC; infill only requires 0.5m generally

THE CHALLENGES

- Now almost mandatory to include 0.8m to 0.91m sea level rise by 2100 despite uncertainties – CSIRO has recently suggested 1.1m by 2100.

  - *'Combining the relevant global and local information indicates that sea level rise on the NSW coast is expected to be in the range of 0.18 to 0.91m by between 2090 and 2100.'*

- Draft QLD Coastal Plan addresses new development by restricting it.

- Management and Protection of existing coastal development not well addressed by current planning or policies in Australia. (perhaps NZ approach worth considering).

THE CHALLENGES

- Engineering Solutions exist but are expensive (nourishment, groynes, seawalls, pumped drainage).

- The need for risk based approach and sensible interpretation of policy; consideration of design life -v- encounter probability.

    - Most houses are only designed for a 50 year life span

    - Provided subsequent redevelopment can be catered for, this would imply consideration of 0.4m sea level rise by year 2060

- No need for drastic action and need for sensible planning.