

Barrage Fishways

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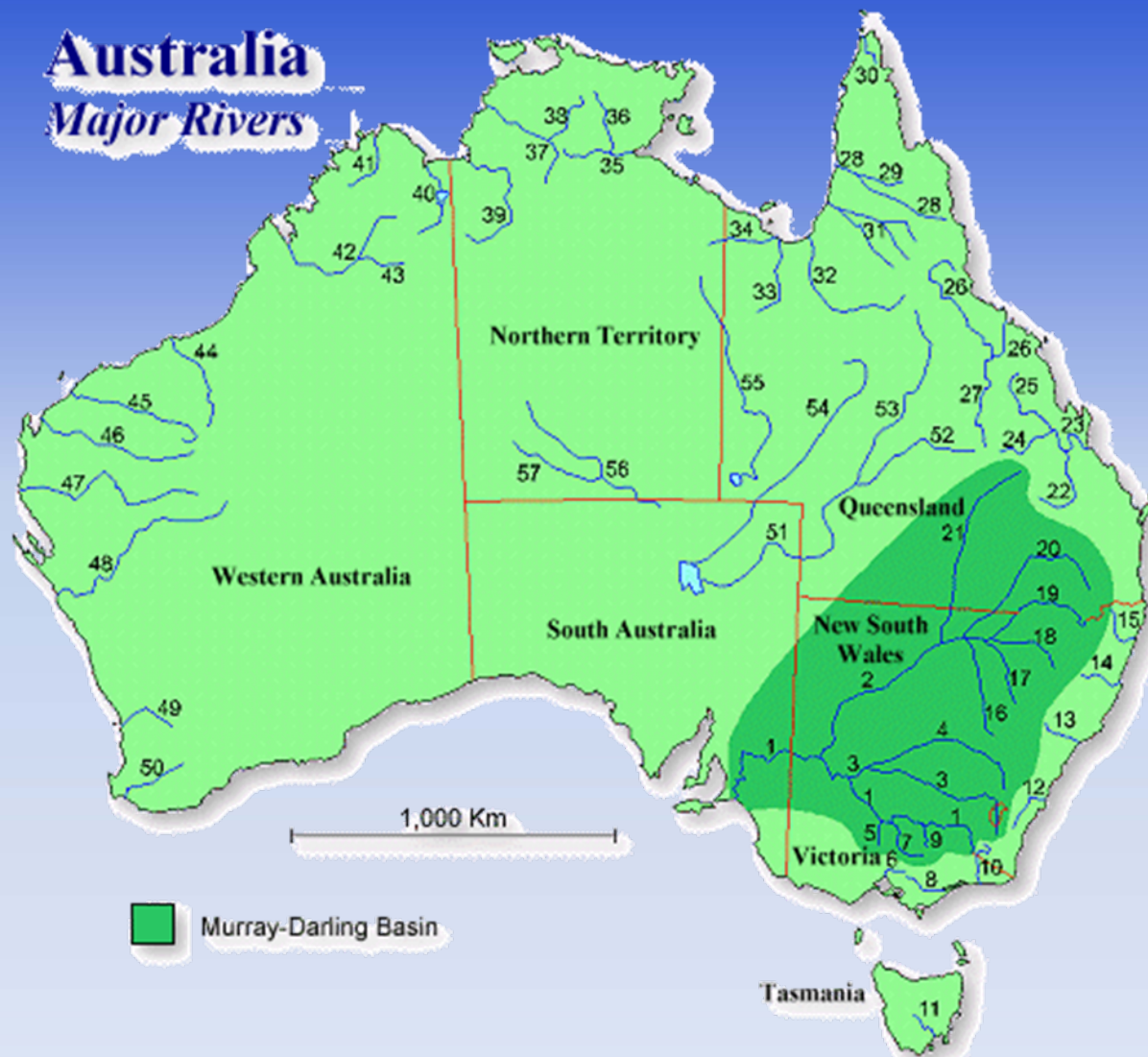
17 January 2012

1. Context
2. Process of fishway design
3. Overview of different fishway designs
4. Ecological Objectives for the Barrages
 - ➔ Present fishways
 - ➔ New fishways
5. Lessons
6. Next steps

Context

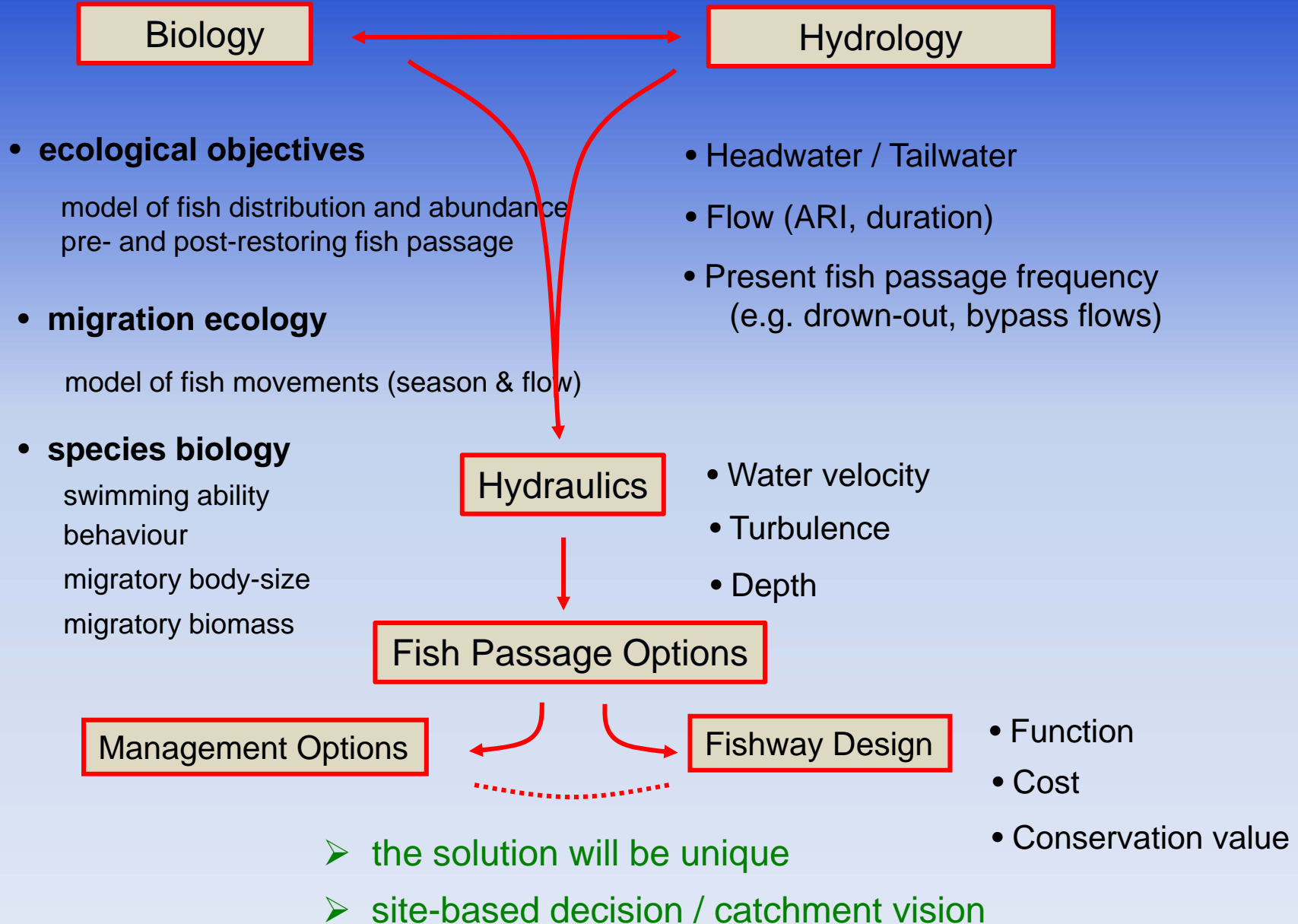


Context



Process of fishway design

Function → Design



Developing a concept design

1. Team from the start: engineers, scientists, owners / operators
2. Hydrology & Biology
3. Site visit; engage stakeholders
4. Options Analysis
 - Workshop
 - Early sketches of concepts
5. Transparency of Risk and Expectations

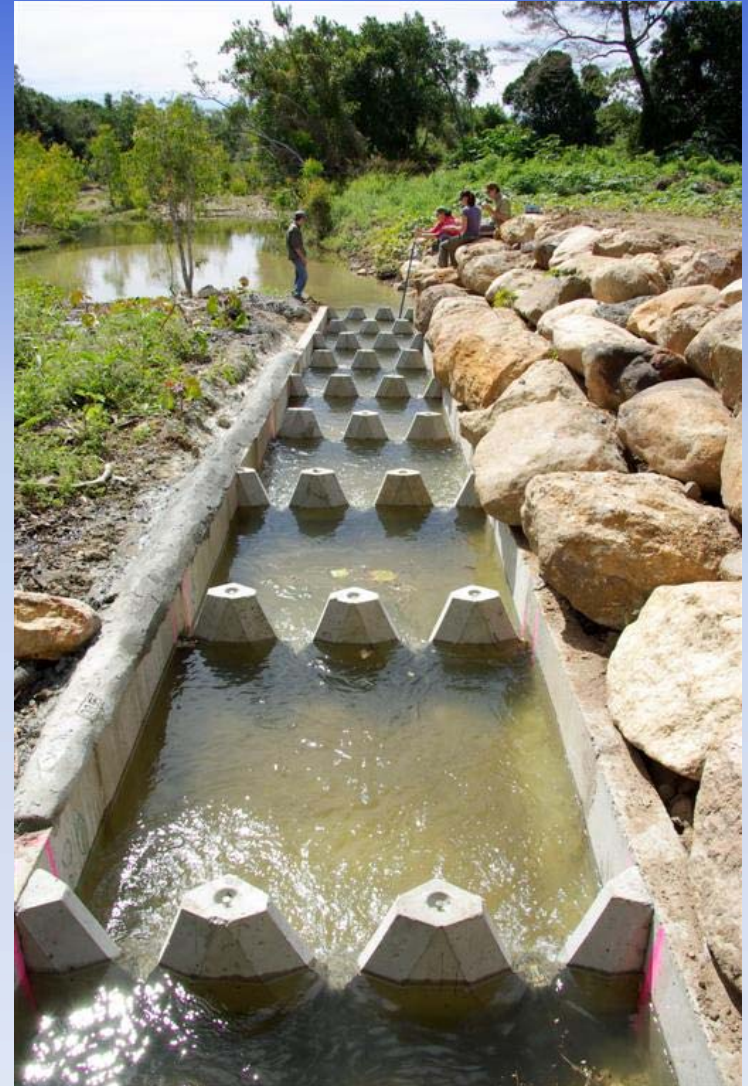
Fishway Designs

Pool-type fishways

Vertical-slot

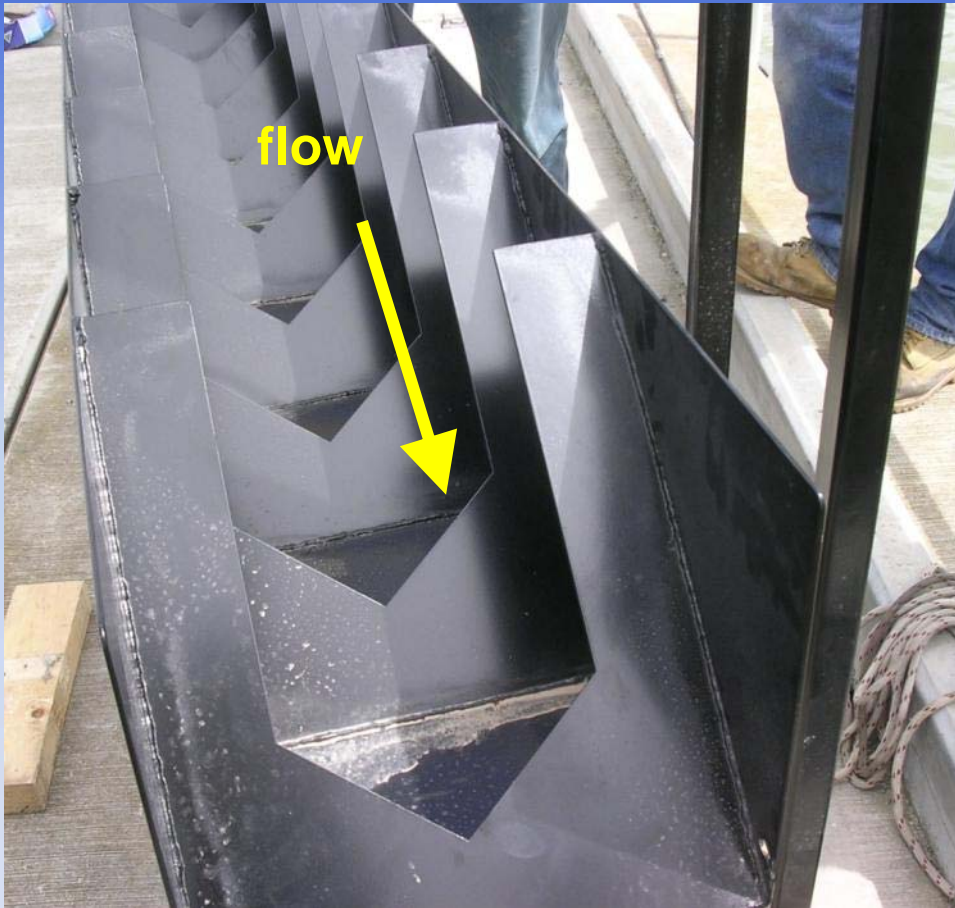


Cone fishways



Fishway Designs

Denil fishways



Fishway Designs

Rock-ramp fishways

Full-width



Partial-width



Fishway Designs

Hybrid Designs

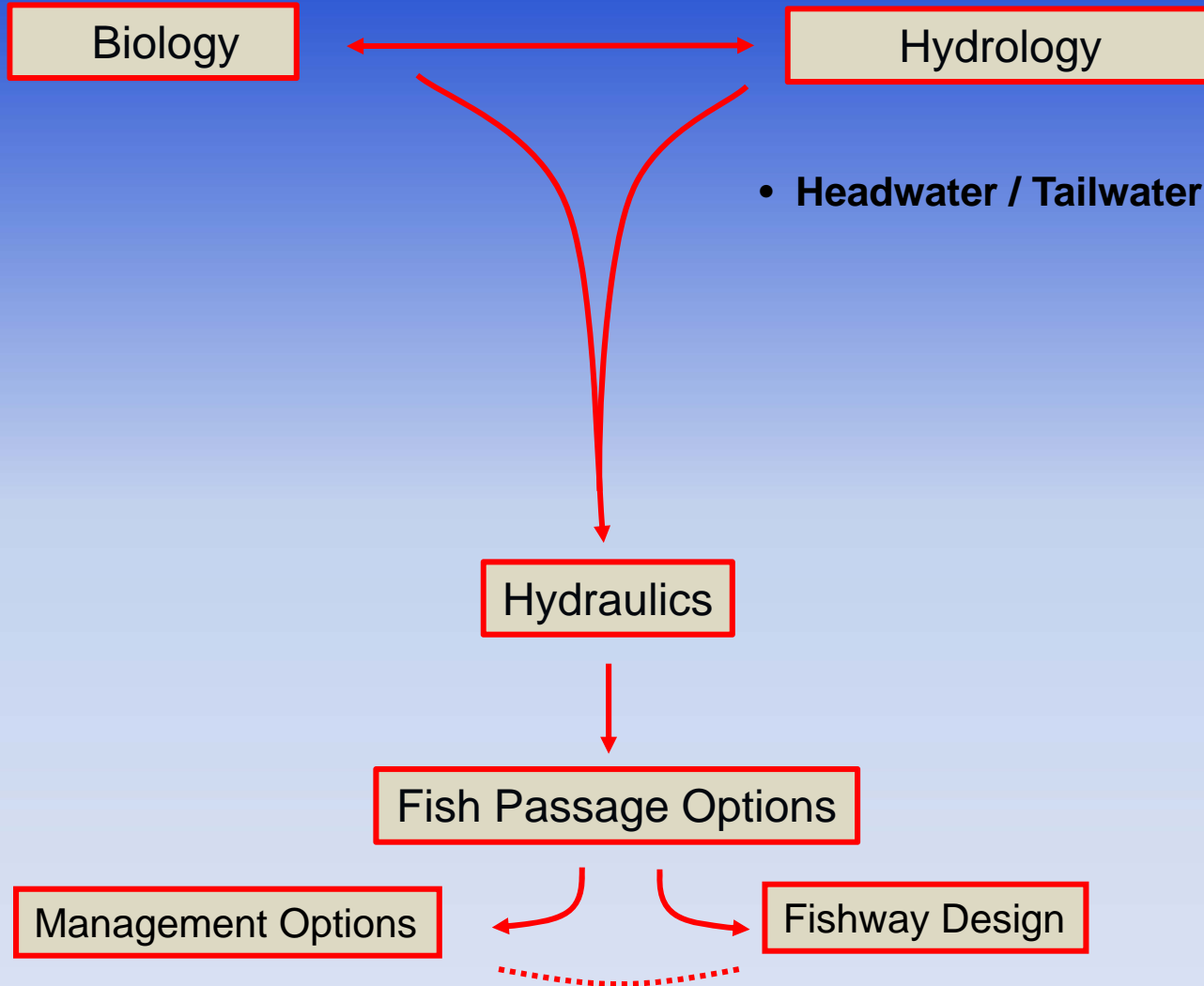


Fishway Designs

Culverts

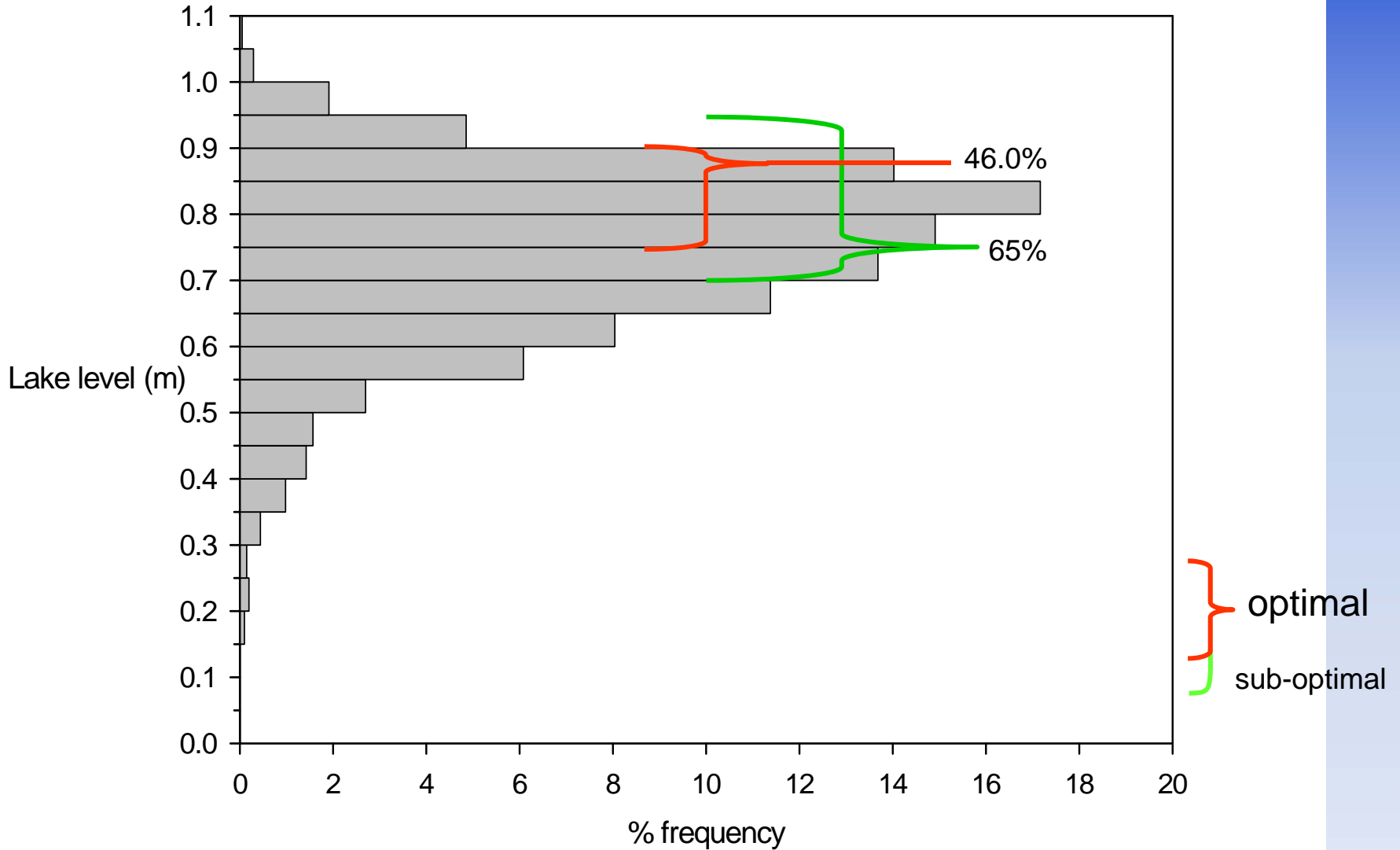


Process of fishway design



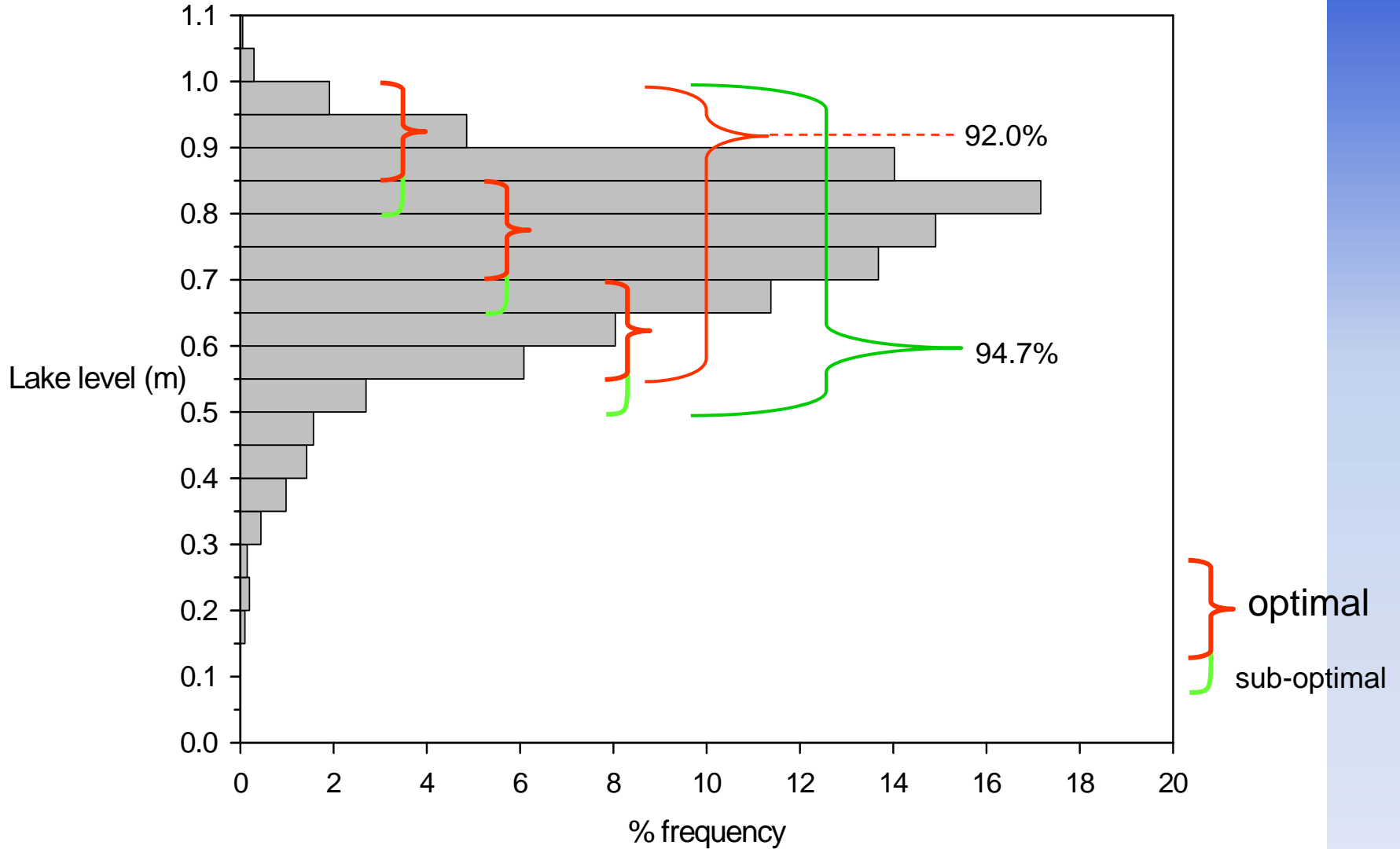
Hydrology analysis - single rock-ramp fishway option

Tauwitchere Lake levels (Sept-Feb, 1995 - 2006)

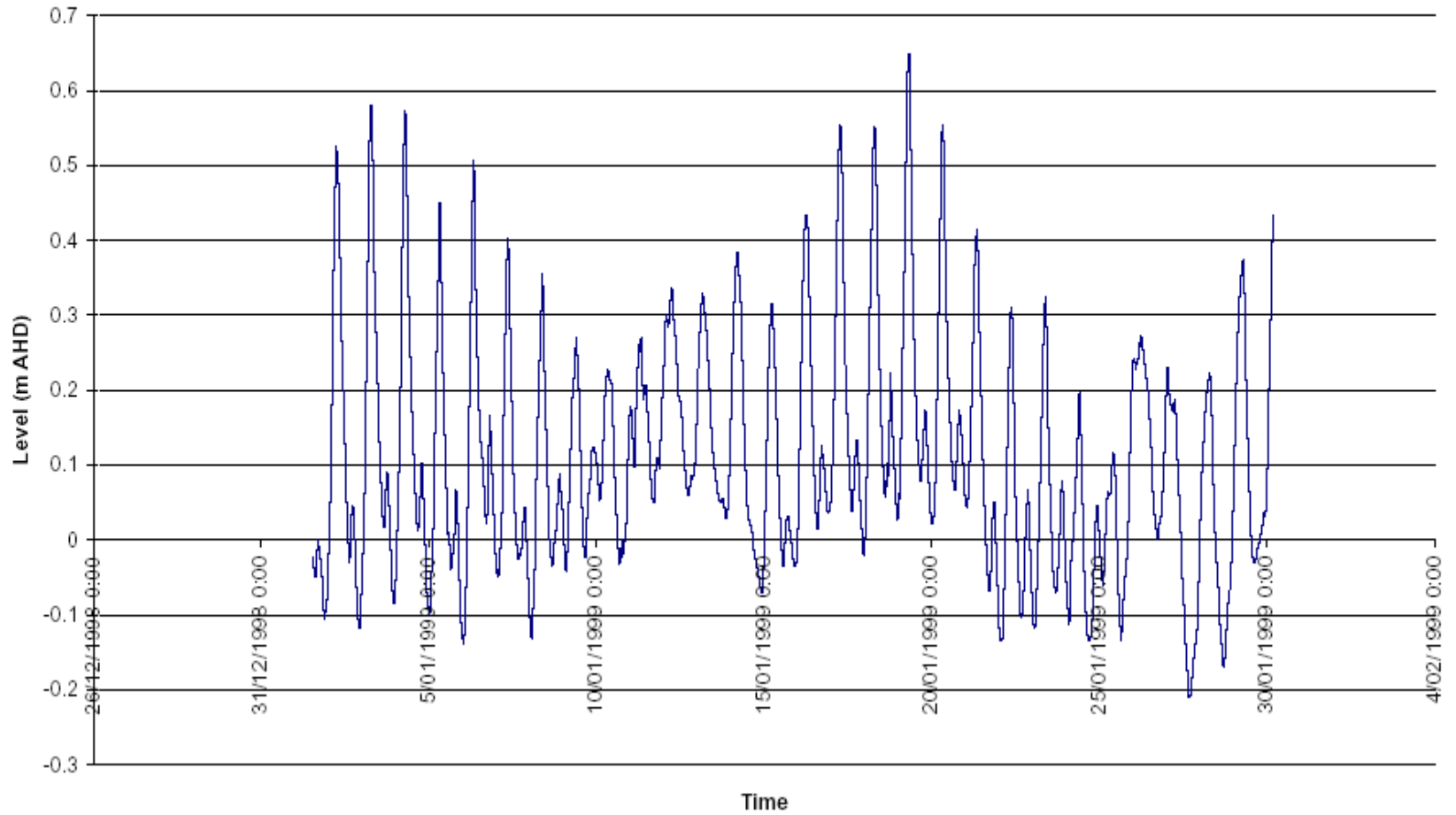


Hydrology analysis – triple rock-ramp fishway option

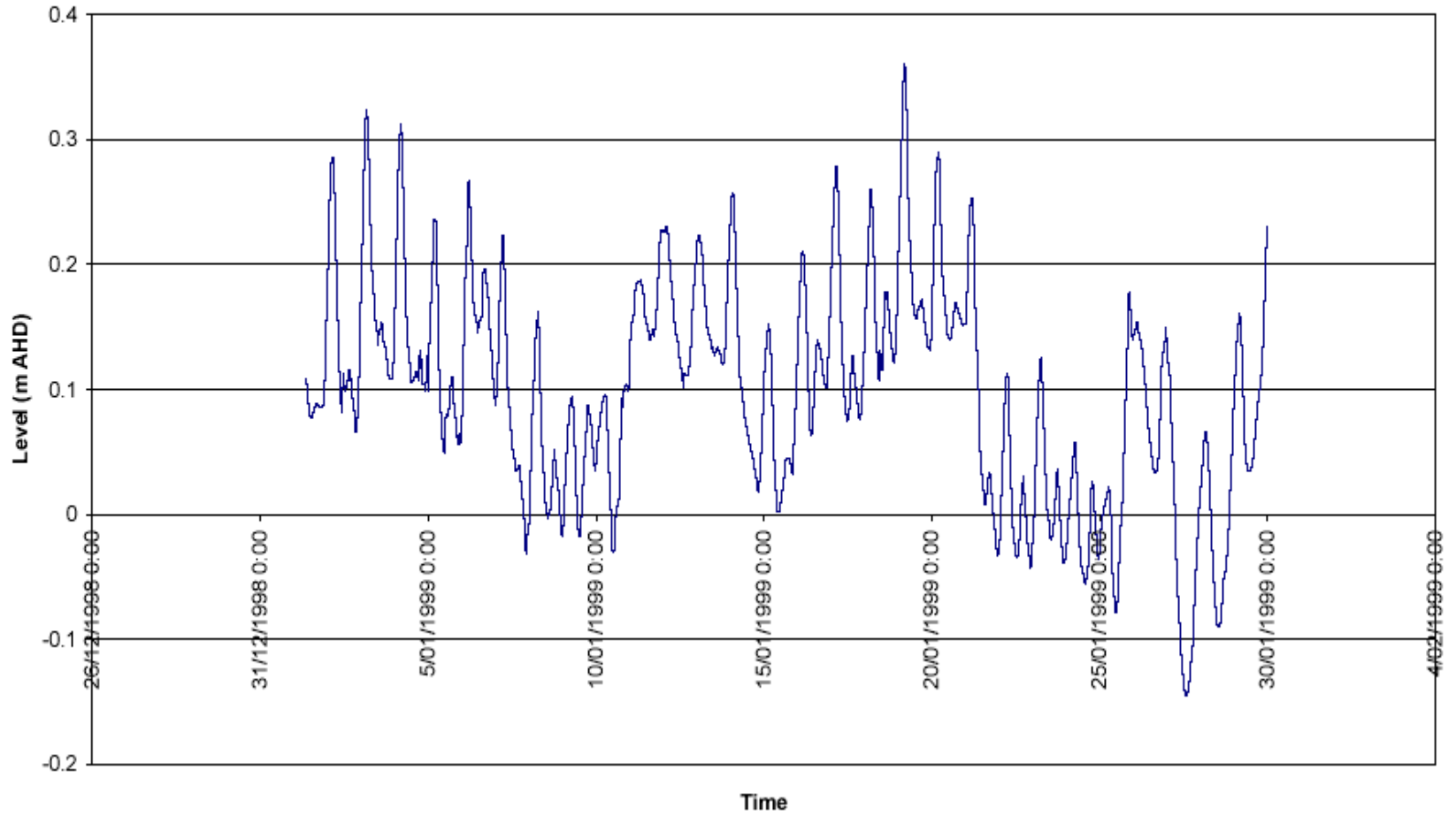
Tauwitchere Lake levels (Sept-Feb, 1995 - 2006)



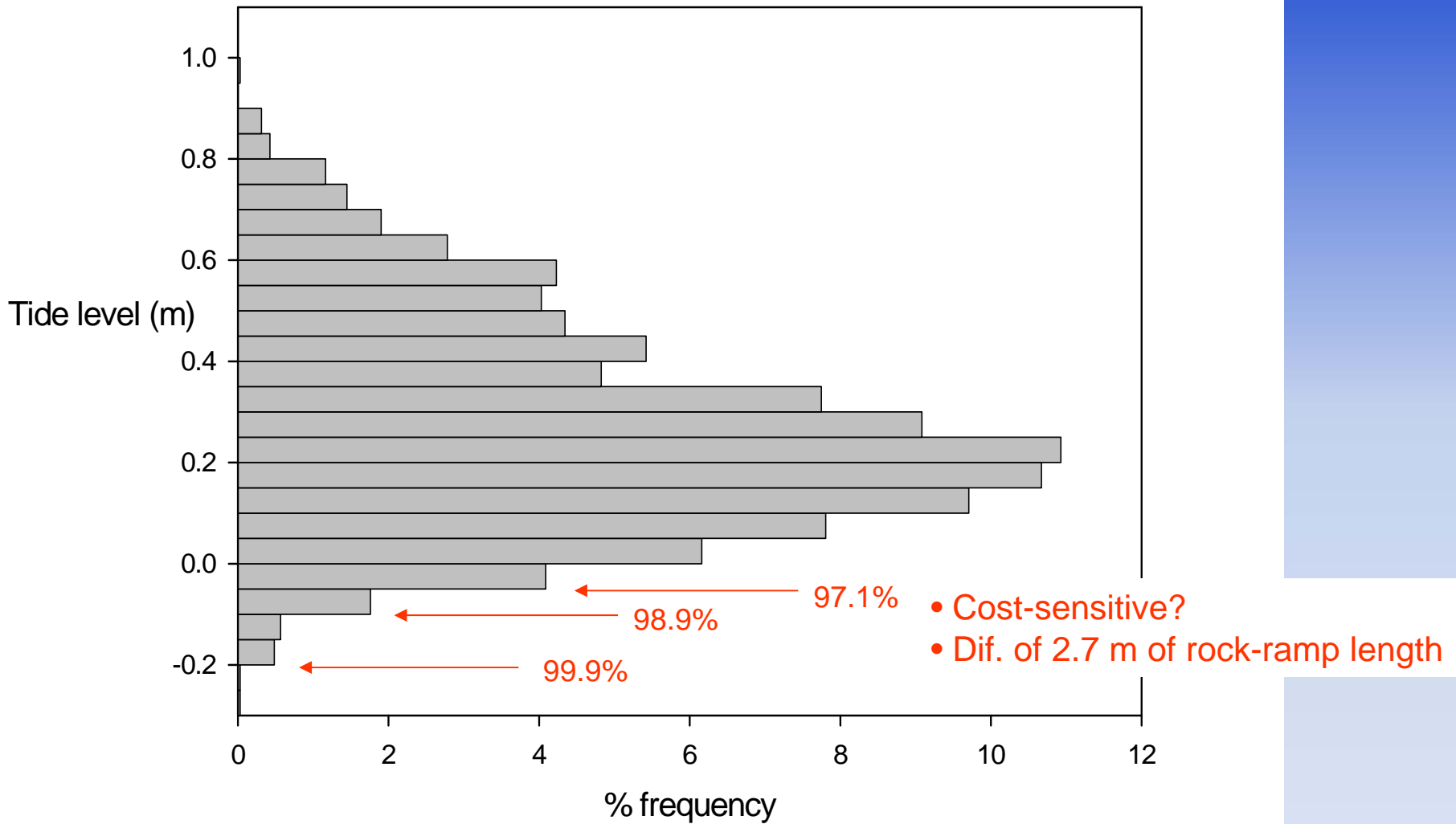
Goolwa 29 days of Typical Tidal Data



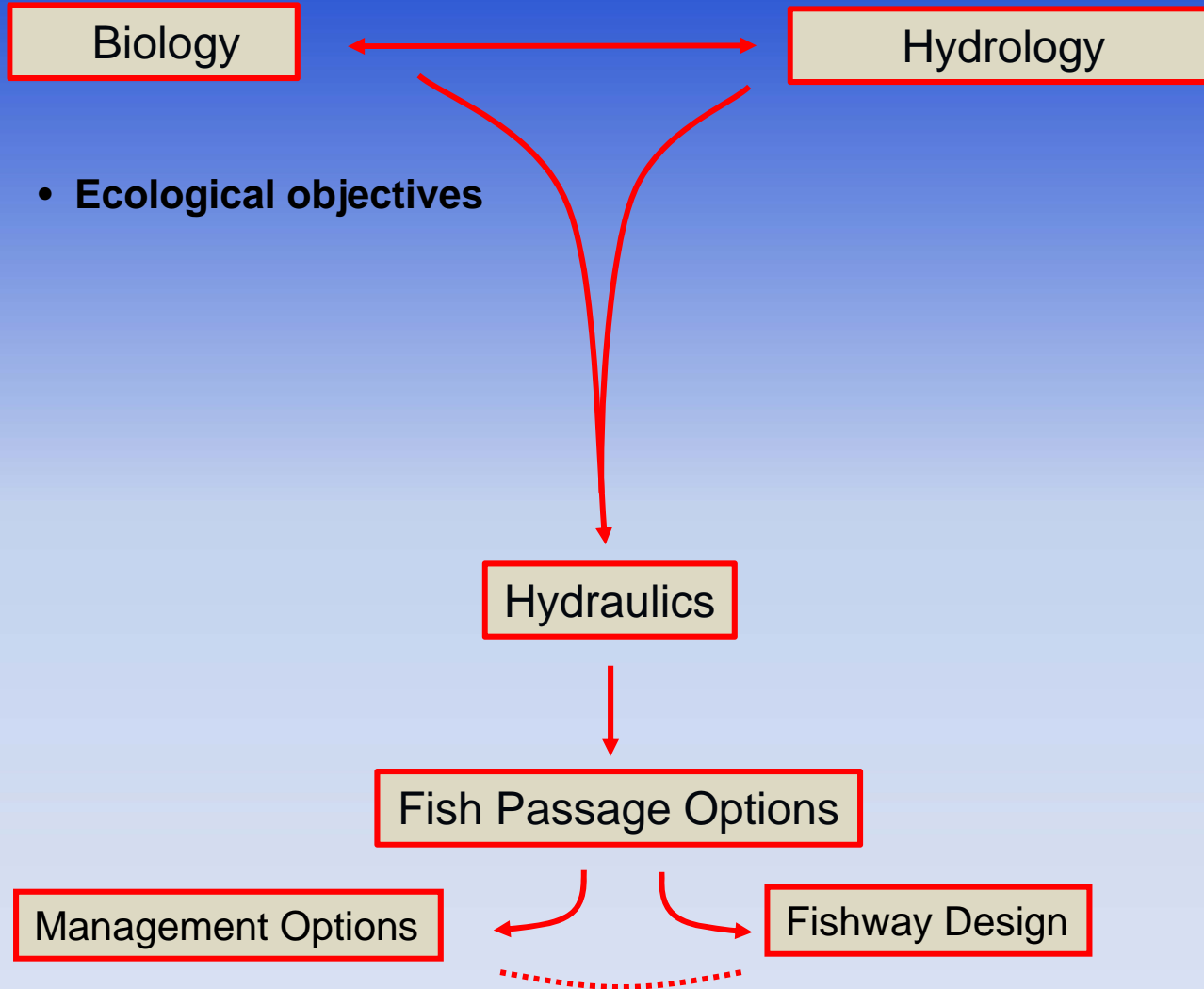
Tauwichere 29 days of Typical Tidal Data



Tauwitchere Tide levels (Sept-Feb, 1995 - 2006)



Process of fishway design



Ecological Objectives for the Barrages

Rehabilitation of:

- native fish populations (NFS 60% of pre-European)
 - all native fish species (freshwater, estuarine)
- life cycle processes (spawning, recruitment, movement)
- movement / migration patterns

 fish passage objectives

**Barrages
- achieve
passage of**

1	2	3	4	5	6
High biomass	Fish spread over a wide area	Large-bodied fish	Small-bodied fish	Fish at low flows (< 5 ML/d, low-flow fishway)	Fish at high flows (high lake level, small dif. in head)

Ecological Objectives for the Barrages, 2001

“Fishways at the barrages need to be designed to operate:

- at low flows as a priority, but should also operate at higher flows when some non-commercial species may be migrating . . .
- with sufficient space to:
 - commonly pass fish up to 60 cm in length;
 - potentially pass mulloway up to 1.3 m”
- plus other criteria

A few assumptions:

- Flow for fishways
- Lake levels - high in spring & early summer
- Downstream passage not an issue

STRATEGIC PLAN OF FISHWAYS FOR THE MURRAY RIVER BARRAGES

FISH PASSAGE OBJECTIVES

Achieve passage of:

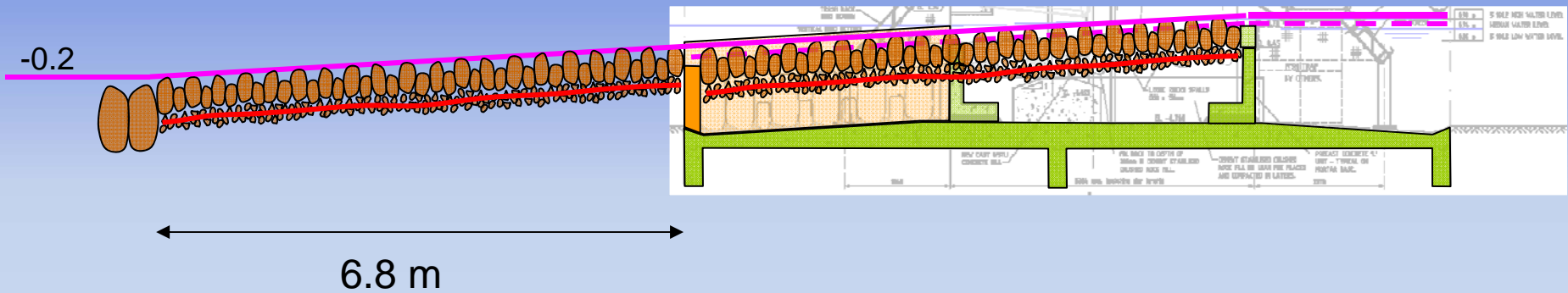
	1 High biomass	2 Fish spread over a wide area	3 Large- bodied fish	4 Small- bodied fish	5 Fish at low flows	6 Fish at high flows
Goolwa	●	●	●	●	●	●
Mundoo	?		?			?
Boundary Ck				●	●	?
Ewe Is.		?	?	?	?	●
Tauwitchere	●	●	●	●	●	●
Hunters Ck				●	●	
Spillways & other channels				●		●

STRATEGIC PLAN OF FISHWAYS FOR THE MURRAY RIVER BARRAGES

	FISHWAY OPTIONS						
	Rock-ramp	Fish lock	Culverts	Small vertical-slot	Large vertical-slot	Denil	Navigation lock
Goolwa		✓		✓	✓	✓	✓
Mundoo	?				?	?	
Boundary Ck				✓			
Ewe Is.	?			?	?	✓	
Tauwitchere	✓			✓	✓	✓	
Hunters Ck				✓			
Spillways & other channels			✓				

Tauwitschere rock-ramp fishway for upper lake levels

- extend for operation of 99.9% of tailwater levels

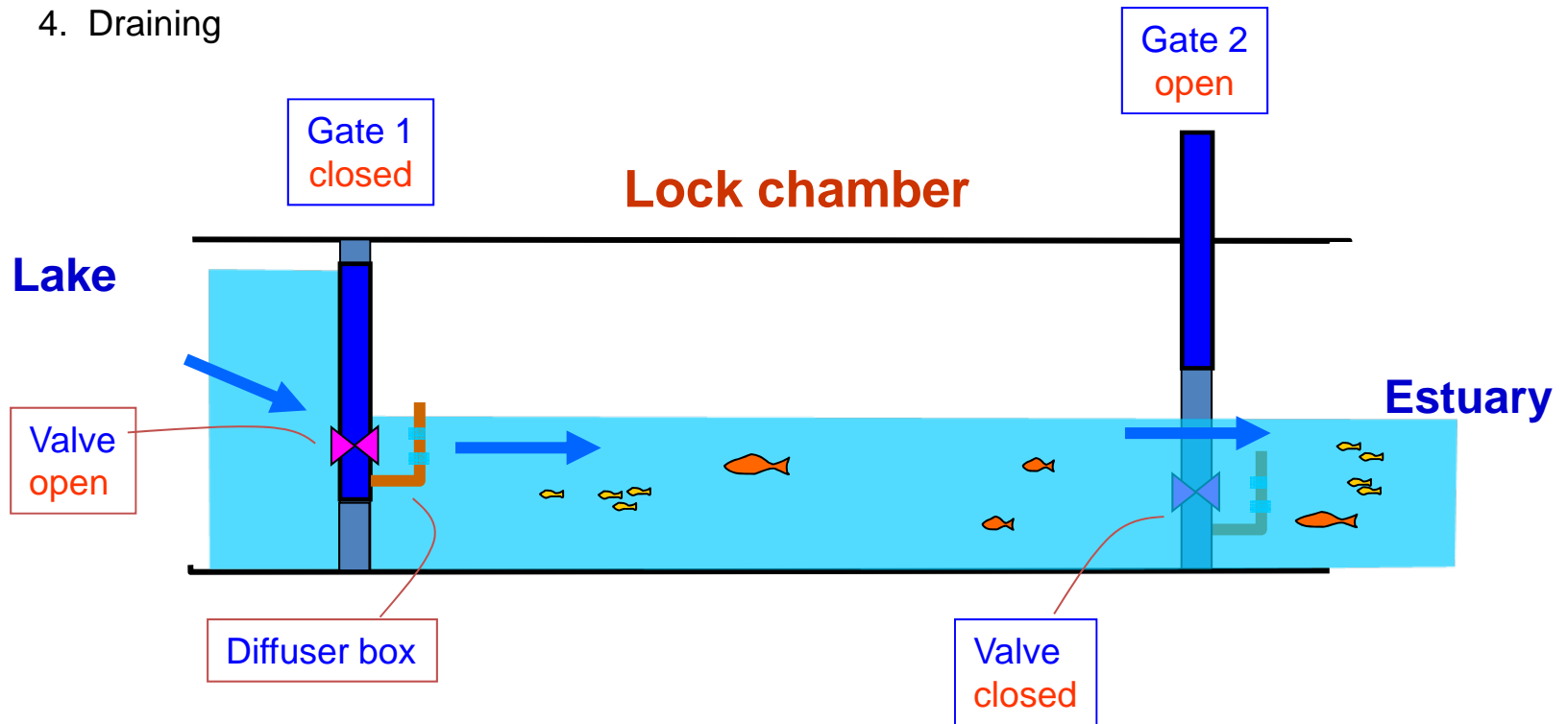


Goolwa fish lock operation

Four phases:

1. Attraction
2. Filling
3. Exit
4. Draining

1. Attraction Phase

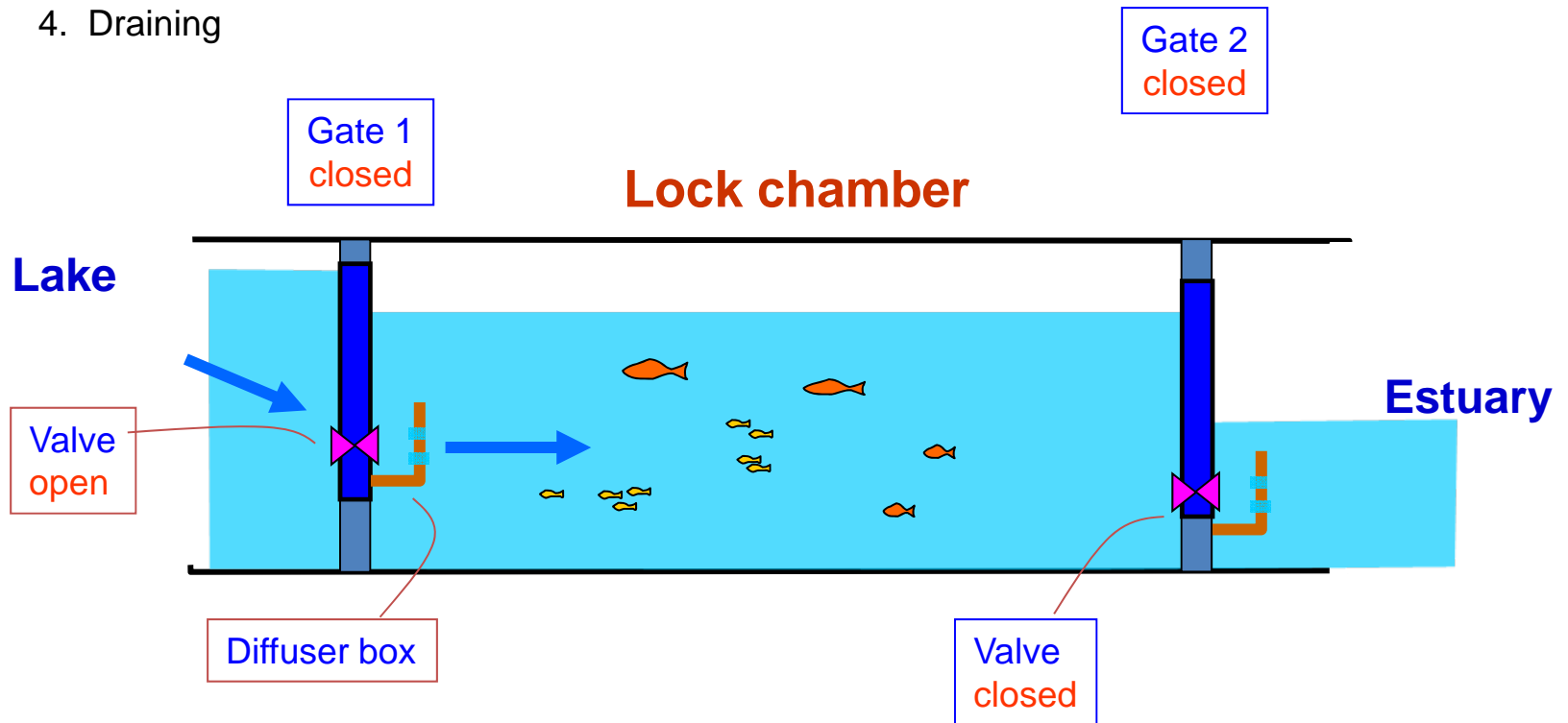


Goolwa fish lock operation

Four phases:

1. Attraction
2. Filling
3. Exit
4. Draining

2. Filling Phase

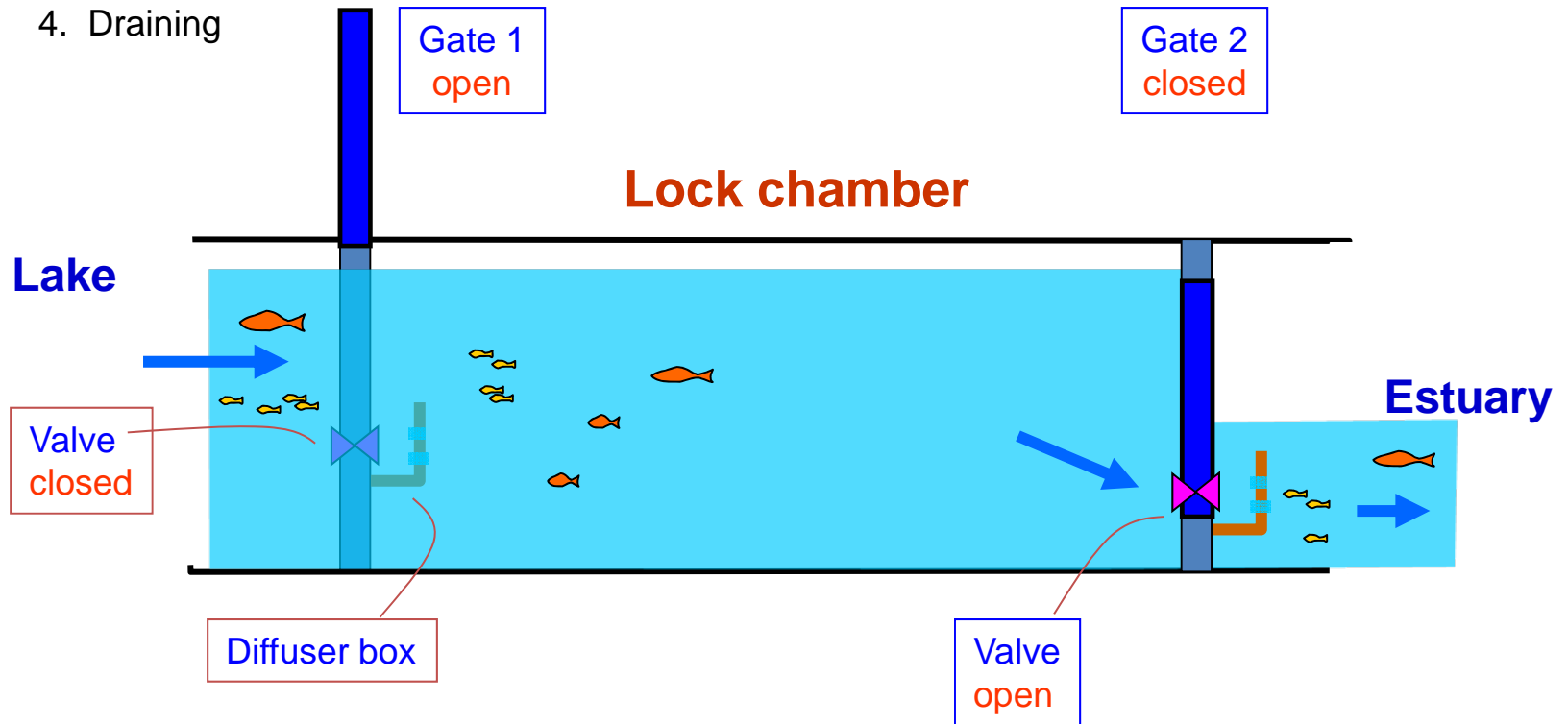


Goolwa fish lock operation

Four phases:

1. Attraction
2. Filling
3. Exit
4. Draining

3. Exit Phase

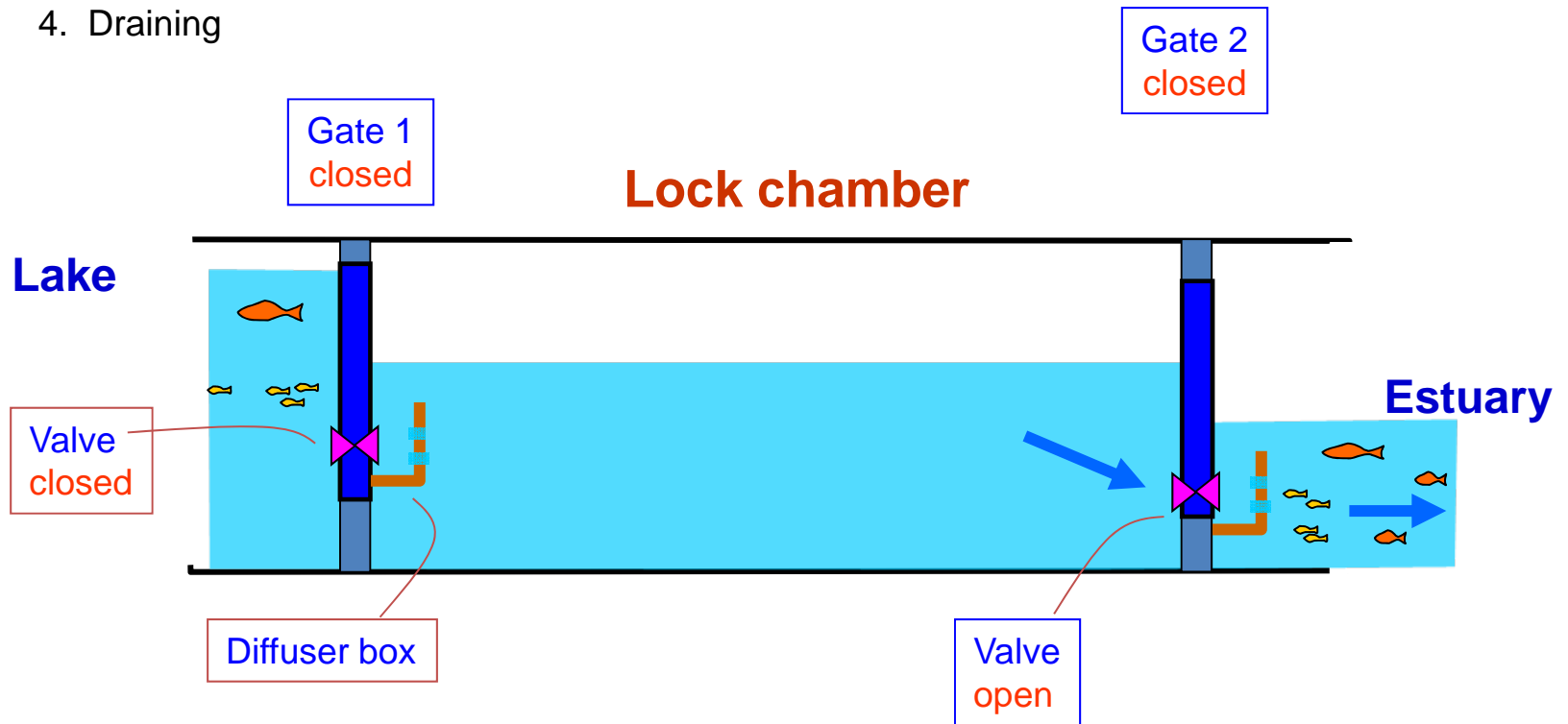


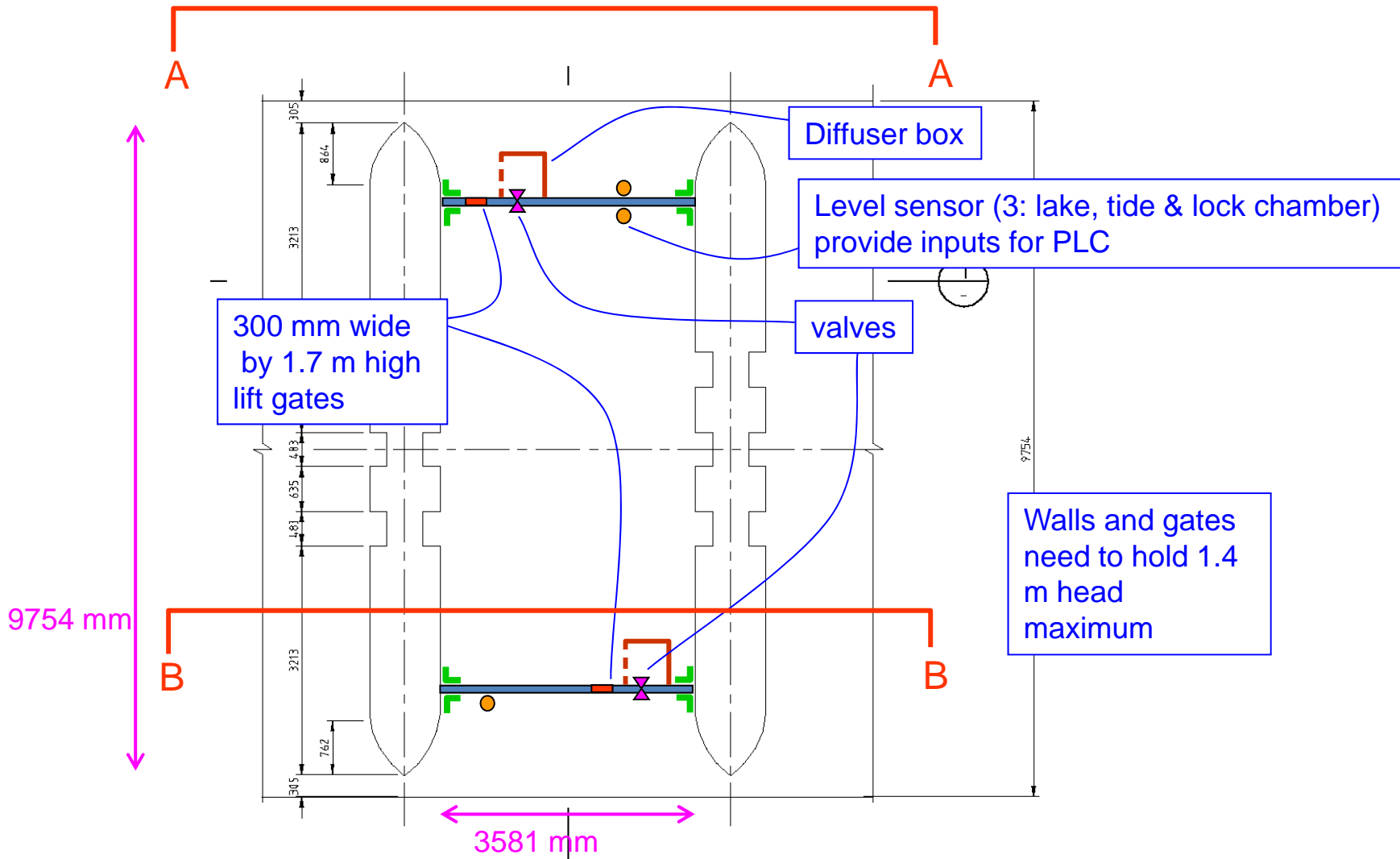
Goolwa fish lock operation

Four phases:

1. Attraction
2. Filling
3. Exit
4. Draining

4. Draining Phase

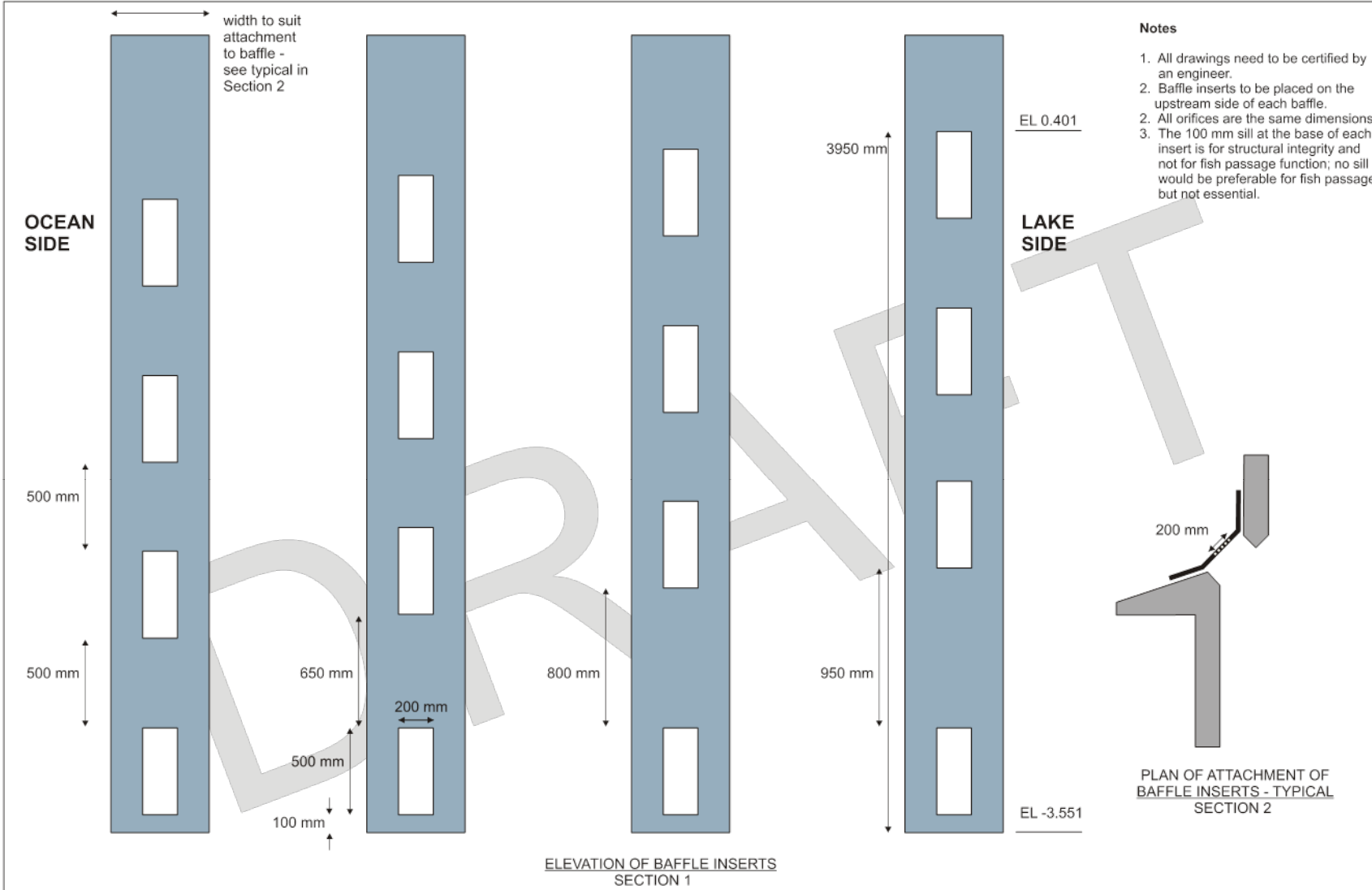




PLAN OF BASE SLAB - SOUTH OF LOCK (FLOOR -1.418)

SCALE 1:50

48 OPENINGS & 47 PIERS
FLOOR LEVEL -1.418m



Lessons

- Monitoring, including “why” (process) as well as “what” (description)
 - leads to experimental research and adaptive management
 - e.g. Lock 8 turbulence experiments & Goolwa nav. lock
- Flow for fishways; flow to create salinity gradients and estuary function
- Quality Control
 - peer review
 - continuity of designers, owners
 - 1. concept
 - 2. detailed design
 - 3. construction
 - commissioning
 - assessment
- Handover
 - incl. fishway objectives and O & M
- Downstream passage
 - can't assume it will occur
 - undershot gates poor (appl. at barrages?)

Next Steps

- Hydrology and future lake levels?
- Clayton Regulator?
- Confirm Fish Passage Objectives (add downstream)
- Pursue flow allocation for fishways (and for estuary function)
- Review Fish Passage Function and Priorities
 - short background paper?
 - FPTF
- Develop fishway concepts
- Engage engineering firm for concept development, with ongoing review

STRATEGIC PLAN OF FISHWAYS FOR THE MURRAY RIVER BARRAGES

SITE	ECOLOGICAL OBJECTIVES To achieve passage of:						FISHWAY OPTIONS						
	1 High biomass	2 Fish spread over a wide area	3 Large- bodied fish	4 Small- bodied fish	5 Fish at low flows	6 Fish at high flows	Rock-ramp (triple)	Fish lock	Culverts	Small vertical- slot	Large vertical- slot	Denil	Navigation lock
Goolwa	●	●	●	●	●	●		✓ (1, 2, 4)		✓ (2, 4, 5)	✓ (1, 2, 3)	✓ (1, 2, 3, 6)	✓
Mundoo Boundary Ck	?		?	●	●	?	?				?	?	
Ewe Is.		?	?	?	?	●	?			?	?	✓ (1, 2, 3, 6)	
Tauwitchere	●	●	●	●	●	●	✓ (1, 2, 4)		✓ (2, 4, 5)	✓ (1, 2, 3)	✓ (1, 2, 3, 6)		
Hunters Ck				●	●					✓ (4, 5)			
Spillways & other channels				●		●					✓ (4, 6)		





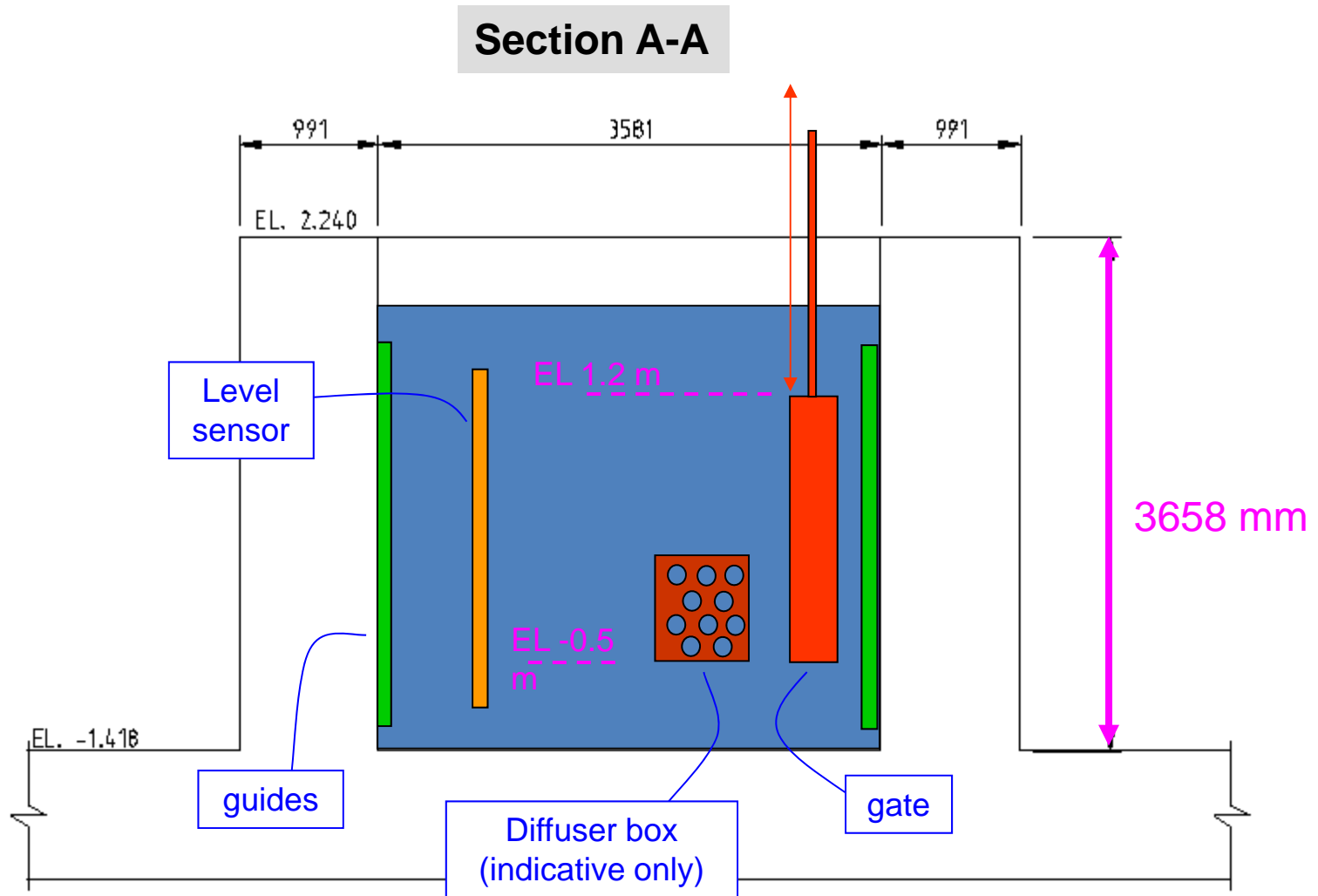
THE COORONG

MUNDOO ISLAND

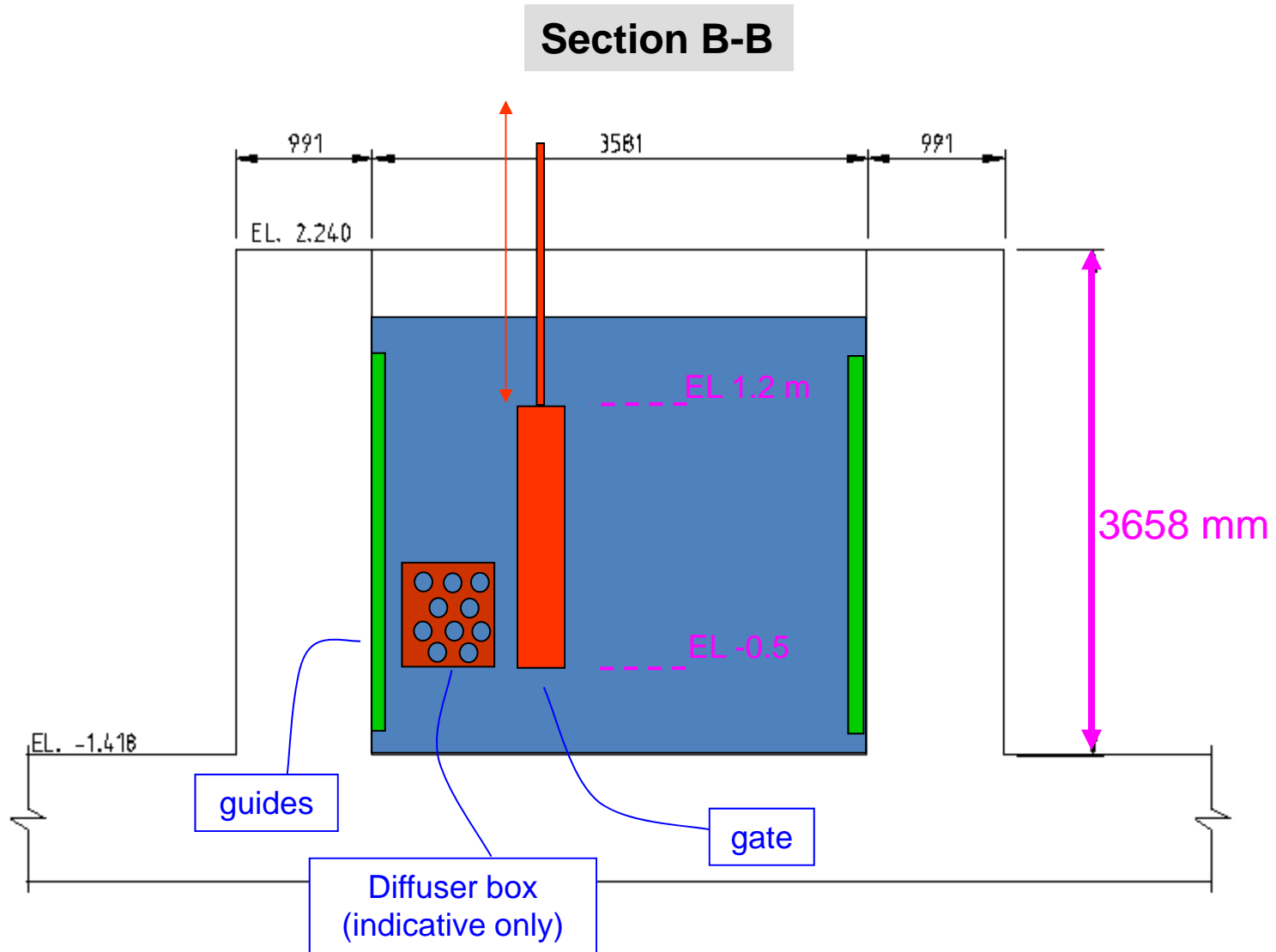
HINDMARSH ISLAND.

RIVER MURRAY

Goolwa fish lock concept



Goolwa fish lock concept



Goolwa fish lock concept

**Section B-B
gate in raised position**

