SENRM Board

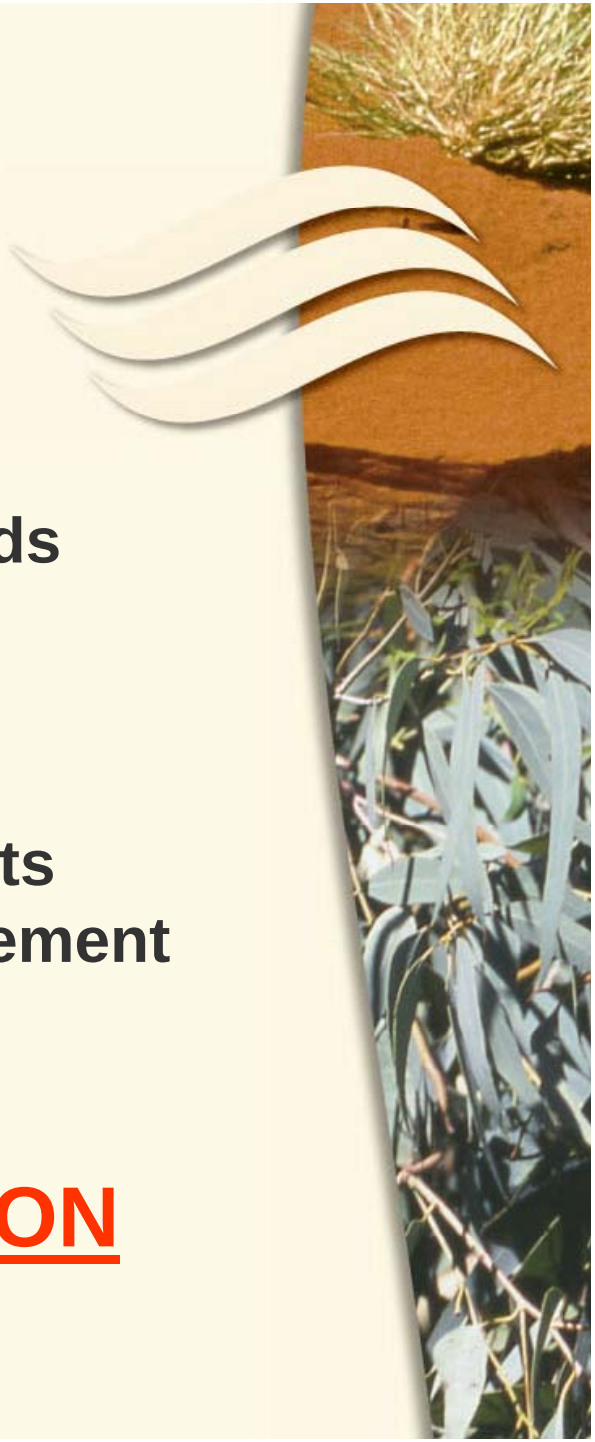
(Adaptive)
Flows Management Program

October 2007

Government of South Australia
Department of Water, Land and Biodiversity Conservation

Objectives of the USE Program:

- Drain Saline Groundwater out of the Landscape
- Manage Flooding of Agricultural Lands
- Provide Environmental Flows to Key Wetlands
- Protect & Enhance Biodiversity Assets Across the Region Under Management Agreement



BALANCE : INTEGRATION

Groundwater Drainage

Surface Water Drainage

Flood Mitigation / Floodways

Environmental Flows

Overlaying Objectives Require Overlaid Solutions

ADAPTIVE MANAGEMENT

What's that look like?

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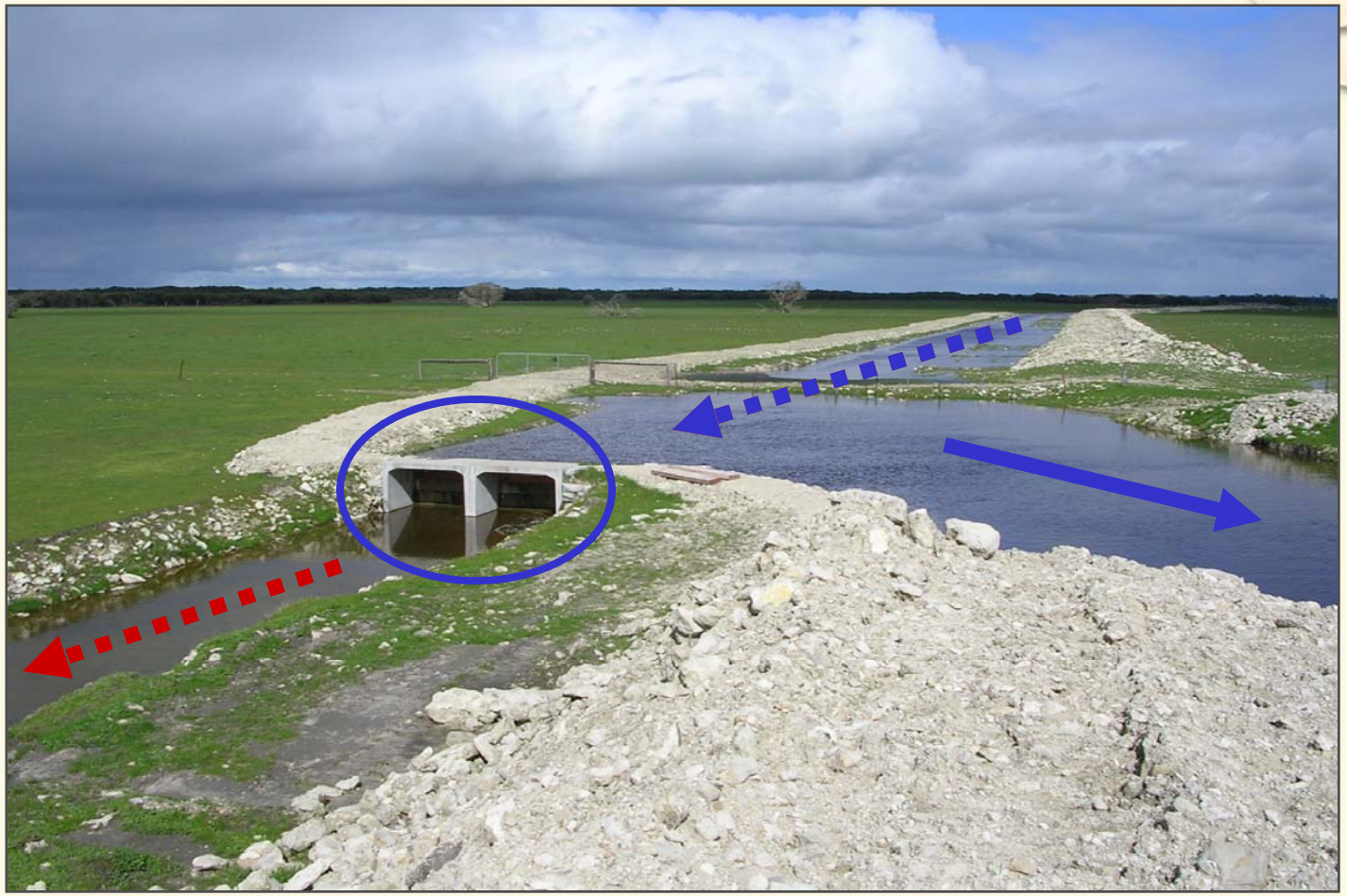
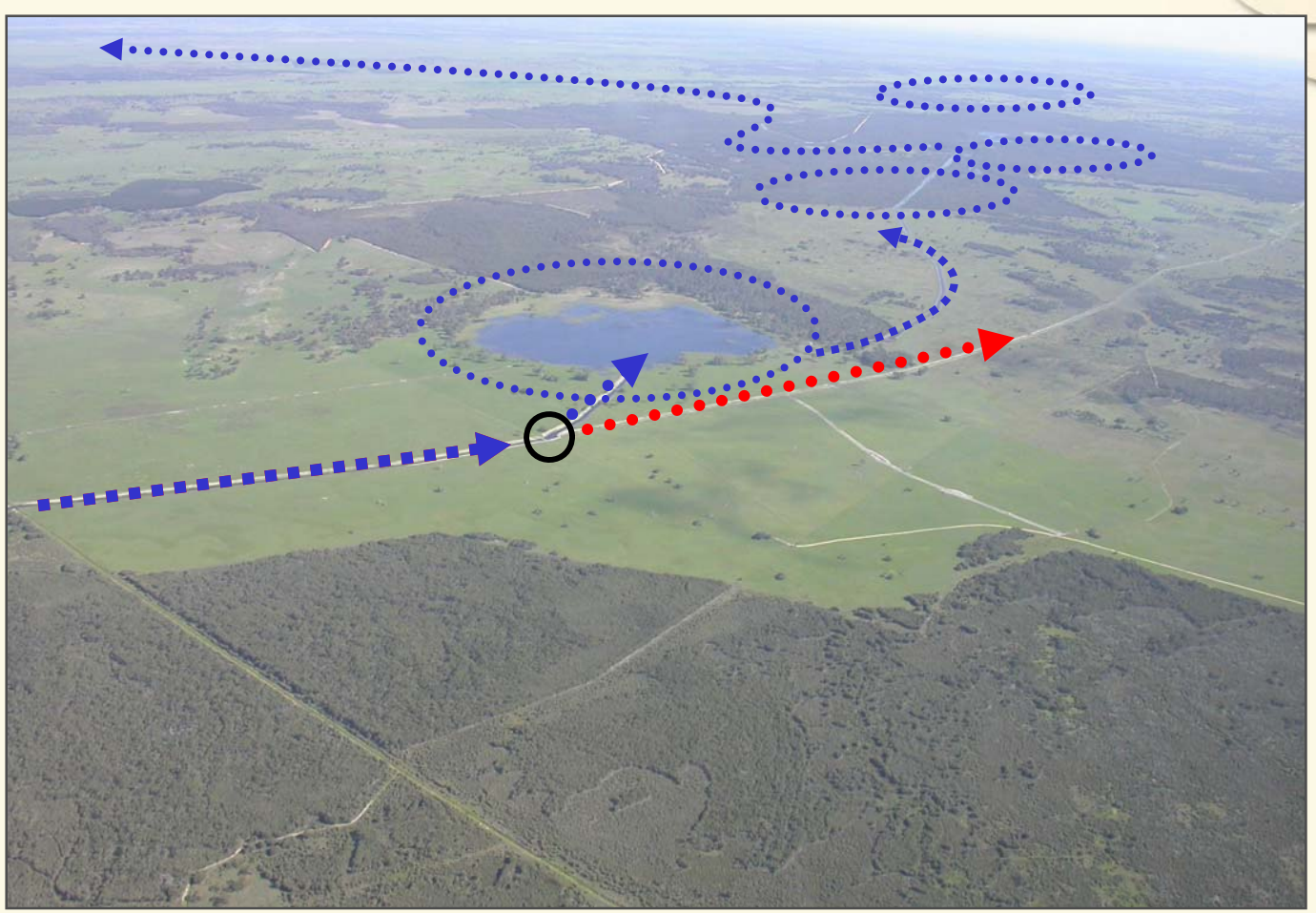
Adaptive Management In Action

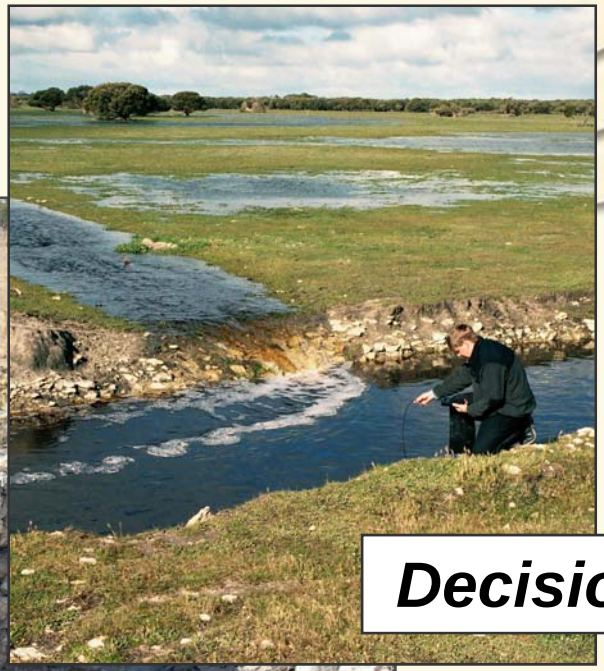


Adaptive Management In Action



Purpose & Functional Requirements

Critical Control Point



Decision Point

ADAPTIVE MANAGEMENT…

…THAT'S A GREAT IDEA!

How do we do that again?

SYSTEMATISE

INVENTORISE

CHARACTERISE

PRIORITISE

OPTIMISE

How do we apply this approach to something as large and complex as the USE region?

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SYSTEMATISE

INVENTORISE

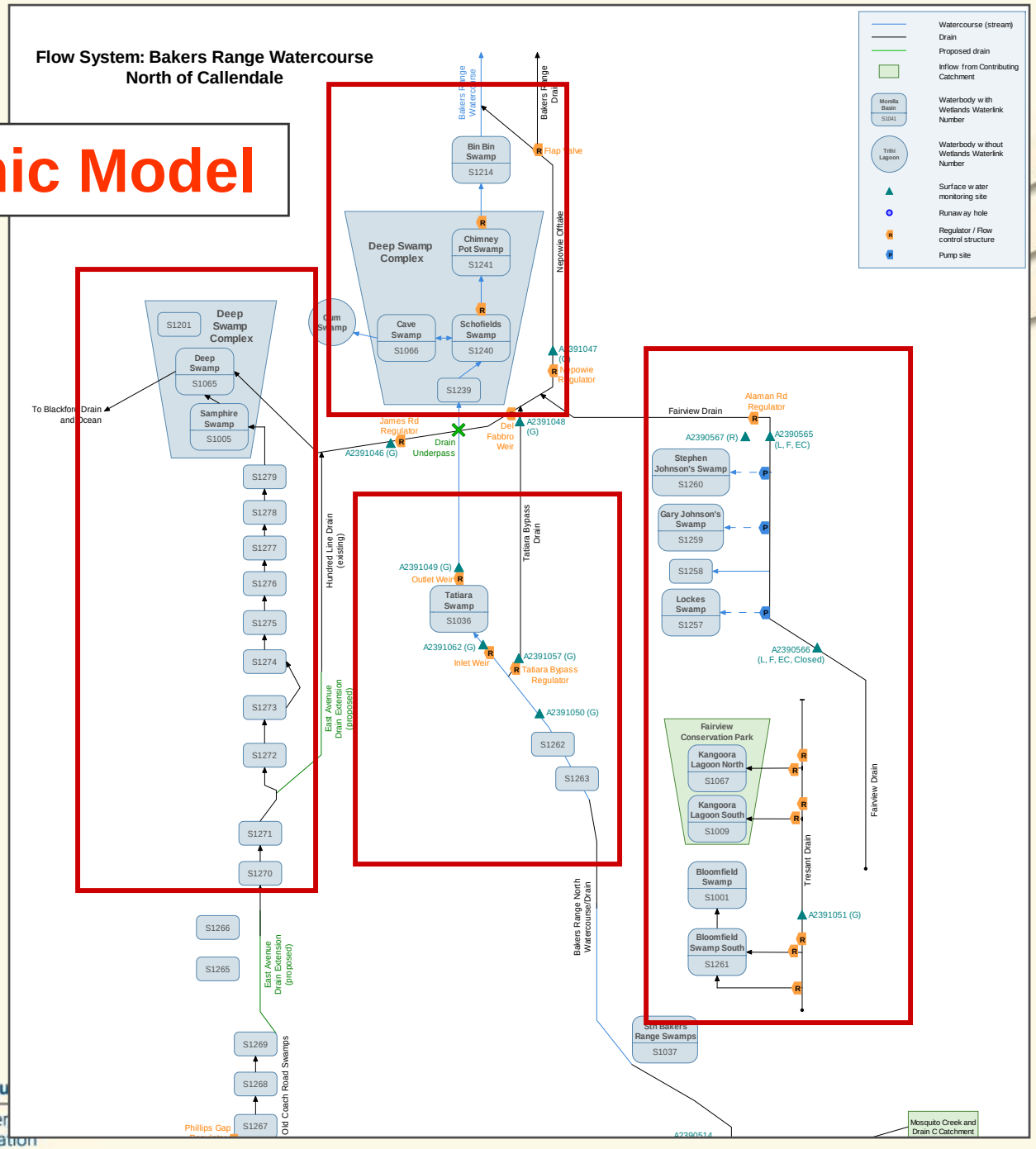
CHARACTERISE

PRIORITISE

OPTIMISE

- **Define the whole operating system and its arrangement of component parts**
- **Identify the process linkages in the system including inputs and outputs**

Systemic Model



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Biodiversity Conservation

SYSTEMATISE

INVENTORISE

CHARACTERISE

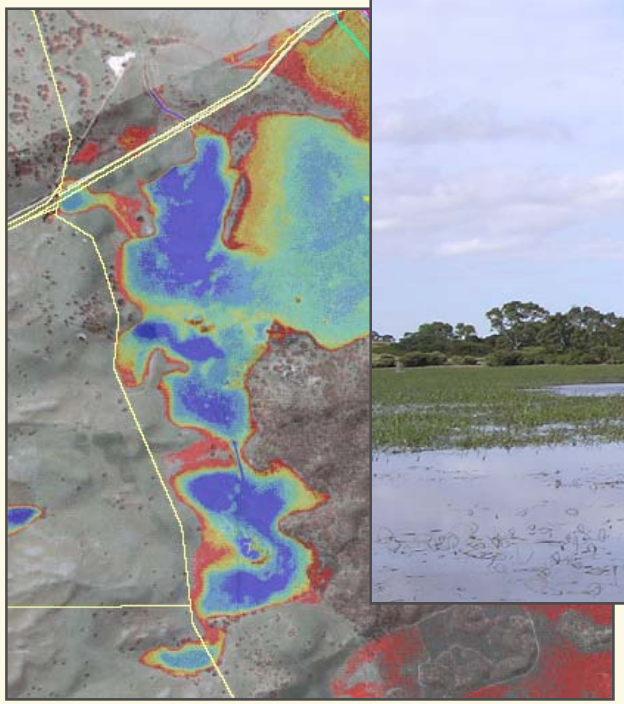
- **Identify all functioning components of the system as a data set**
- **Specify the functional attributes of all system components as data to enable multi-criterion query/analysis**

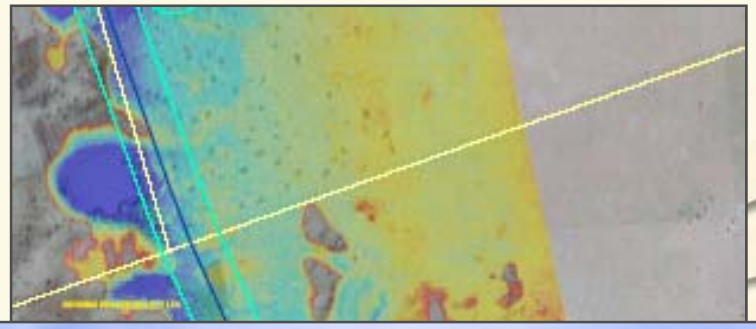
PRIORITISE

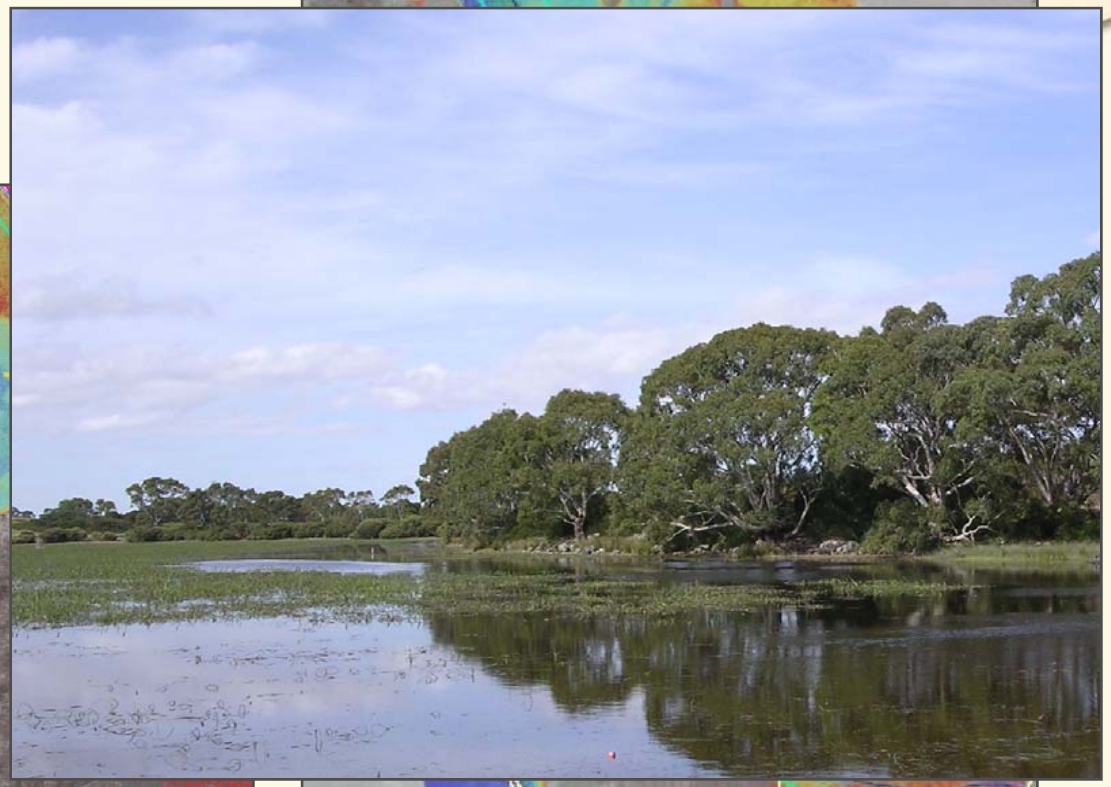
OPTIMISE

Natural Asset Inventory

Functional Attributes of System Components







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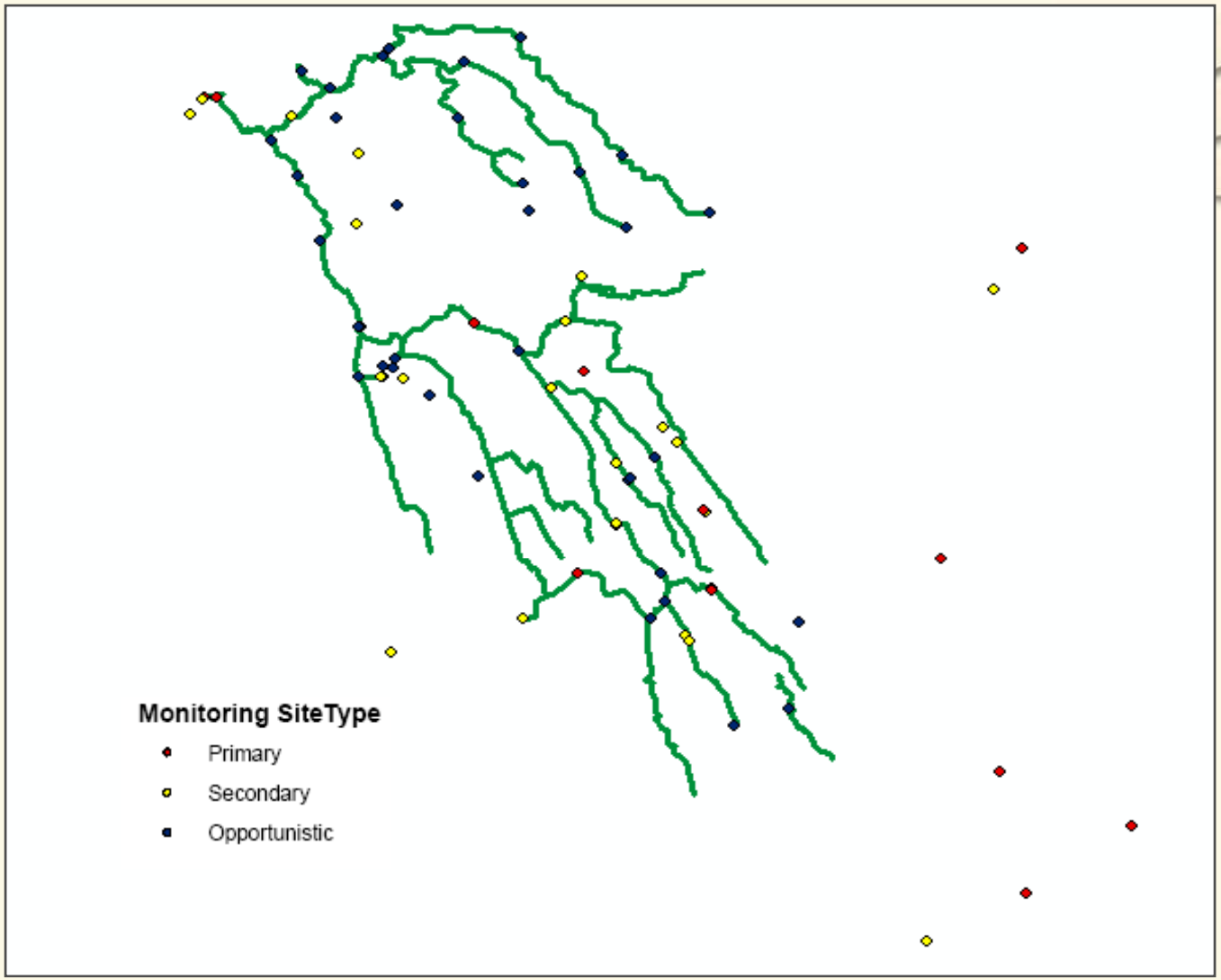
Infrastructure Inventory

Hydrological Monitoring Program



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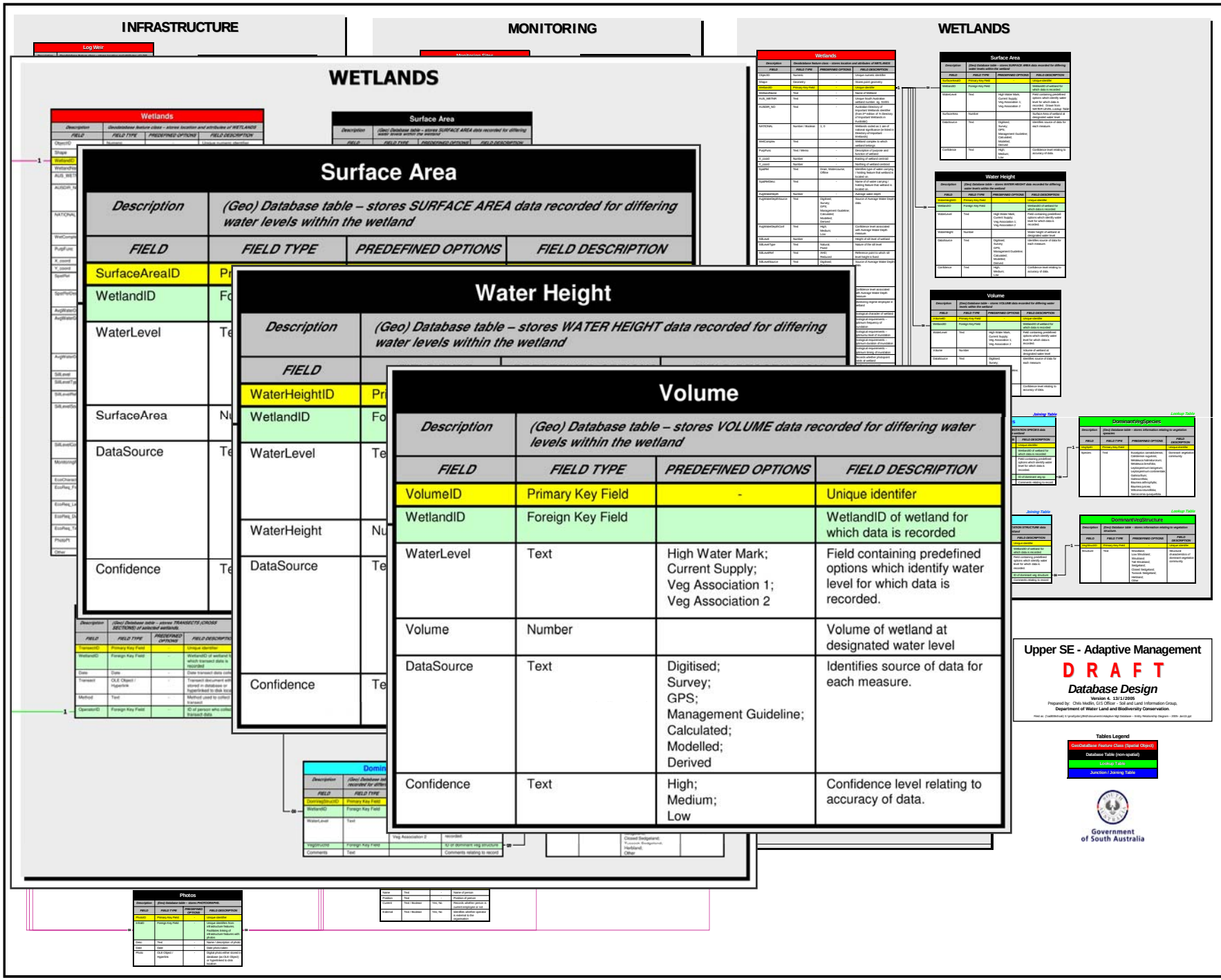
INFRASTRUCTURE
MONITORING
WETLANDS
WETLANDS
Surface Area
Description
(Geo) Database table – stores SURFACE AREA data recorded for differing water levels within the wetland
FIELD
FIELD TYPE
PREDEFINED OPTIONS
FIELD DESCRIPTION
SurfaceAreaID
WetlandID
WaterLevel
SurfaceArea
DataSource
Confidence
Water Height
Description
(Geo) Database table – stores WATER HEIGHT data recorded for differing water levels within the wetland
WaterHeightID
WetlandID
WaterLevel
WaterHeight
DataSource
Confidence
Volume
Description
(Geo) Database table – stores VOLUME data recorded for differing water levels within the wetland
VolumeID
Primary Key Field
Unique identifer
WetlandID
Foreign Key Field
WetlandID of wetland for which data is recorded
WaterLevel
Text
High Water Mark;
Current Supply;
Veg Association 1;
Veg Association 2
Field containing predefined options which identify water level for which data is recorded.
Volume
Number
Volume of wetland at designated water level
DataSource
Text
Digitised;
Survey;
GPS;
Management Guideline;
Calculated;
Modelled;
Derived
Identifies source of data for each measure.
Confidence
Text
High;
Medium;
Low
Confidence level relating to accuracy of data.
Upper SE - Adaptive Management
D R A F T
Database Design
Version 4. 13/1/2005
Prepared by: Chris Medlin, GIS Officer - Soil and Land Information Group,
Department of Water Land and Biodiversity Conservation.
Tables Legend
GeoDatabase Feature Class (Spatial Object)
Database Table (non-spatial)
Lookup Table
Junction / Joining Table
Government of South Australia

SYSTEMATISE

INVENTORISE

CHARACTERISE

PRIORITISE

OPTIMISE

- **Define the nature & requirements of key system components / processes**

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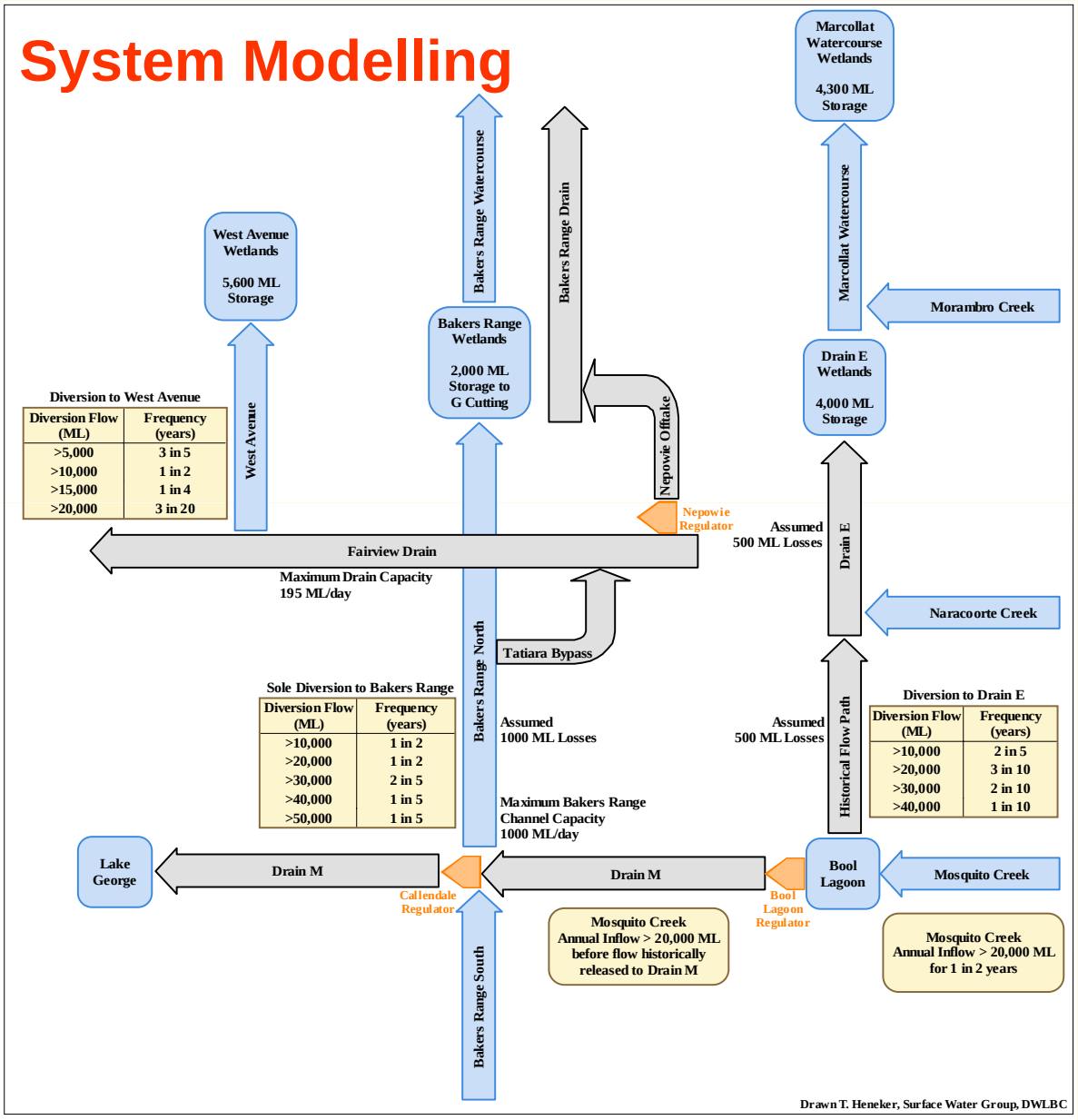
Department of Water, Land and Biodiversity Conservation

Assets

System Modelling



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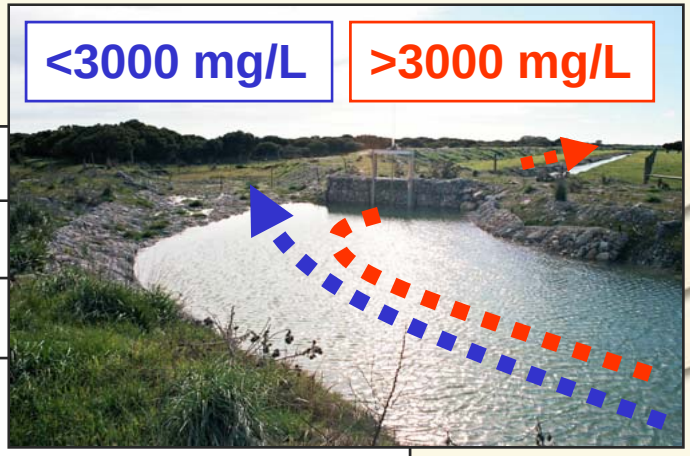
Operations

Past Flow Regime

Current Flow Regime

Purpose of Regulator

Water Management Guidelines



A. Default position is that surface water flows northward across the overpass structure into the Mandina-Cortina Complex and the regulator on the drain remains open to confine saline groundwater to the drain for disposal via the Kercoonda S-bend.

B. Trigger: level in Bonneys Camp North reaches 14.1m AHD or Litigation Lane Swamps require freshwater surge to remove silt. Quantity: approximately 500ML is required. Quality: <3,000mg/L. Frequency: 1 in 10 if flow from West Avenue doesn't perform function. Timing: Likely to be September-October but need to remain flexible according to rainfall conditions.

C. Quality: currently <6,000mg/L, (would prefer <4,000mg/L) Frequency: <6,000mg/L on an irregular 'as-needs' basis to supplement inundation late in season if required (eg to support established Ibis breeding cycle), such that total salinity of wetland water would be between 3,000mg/L and 5,000mg/L. If source water <4,000mg/L then on a regular basis (1 in 2). Timing: September-October. Duration: 4 weeks of flow.

D. Trigger: Messent is inundated and likely to exceed 10.5m AHD, and/or flow volumes likely to exceed storage capacity of BRW wetlands. Frequency: 1 in 20 is predicted. Timing: August-October. Quality: <3,000mg/L but likely to be <1,500mg/L.

SYSTEMATISE

INVENTORISE

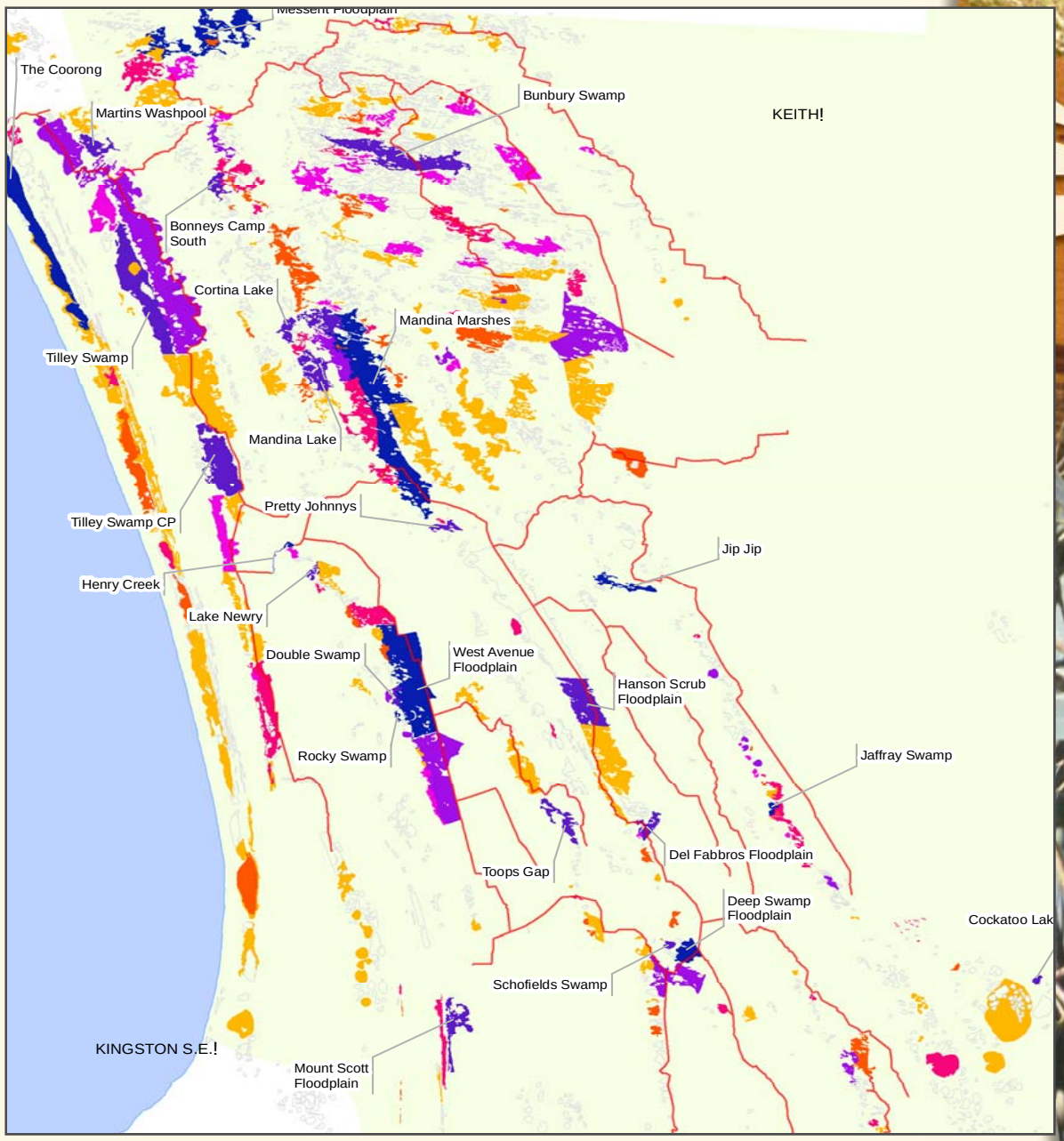
CHARACTERISE

- **Asset Values & Requirements**
- **Risk Exposures**
- **Management Objectives**

PRIORITISE

OPTIMISE

Asset Value Prioritisation



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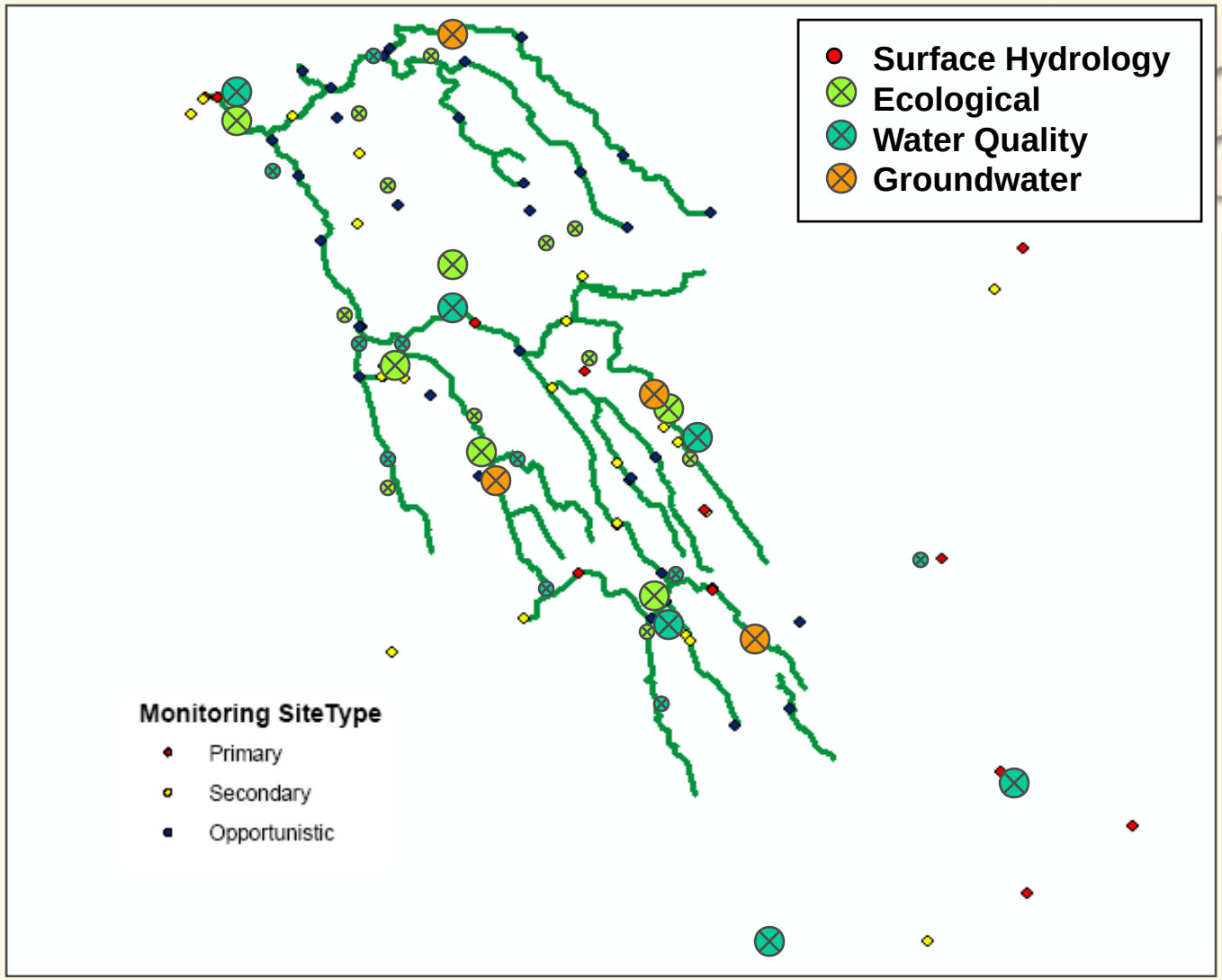
Integrated Monitoring Program

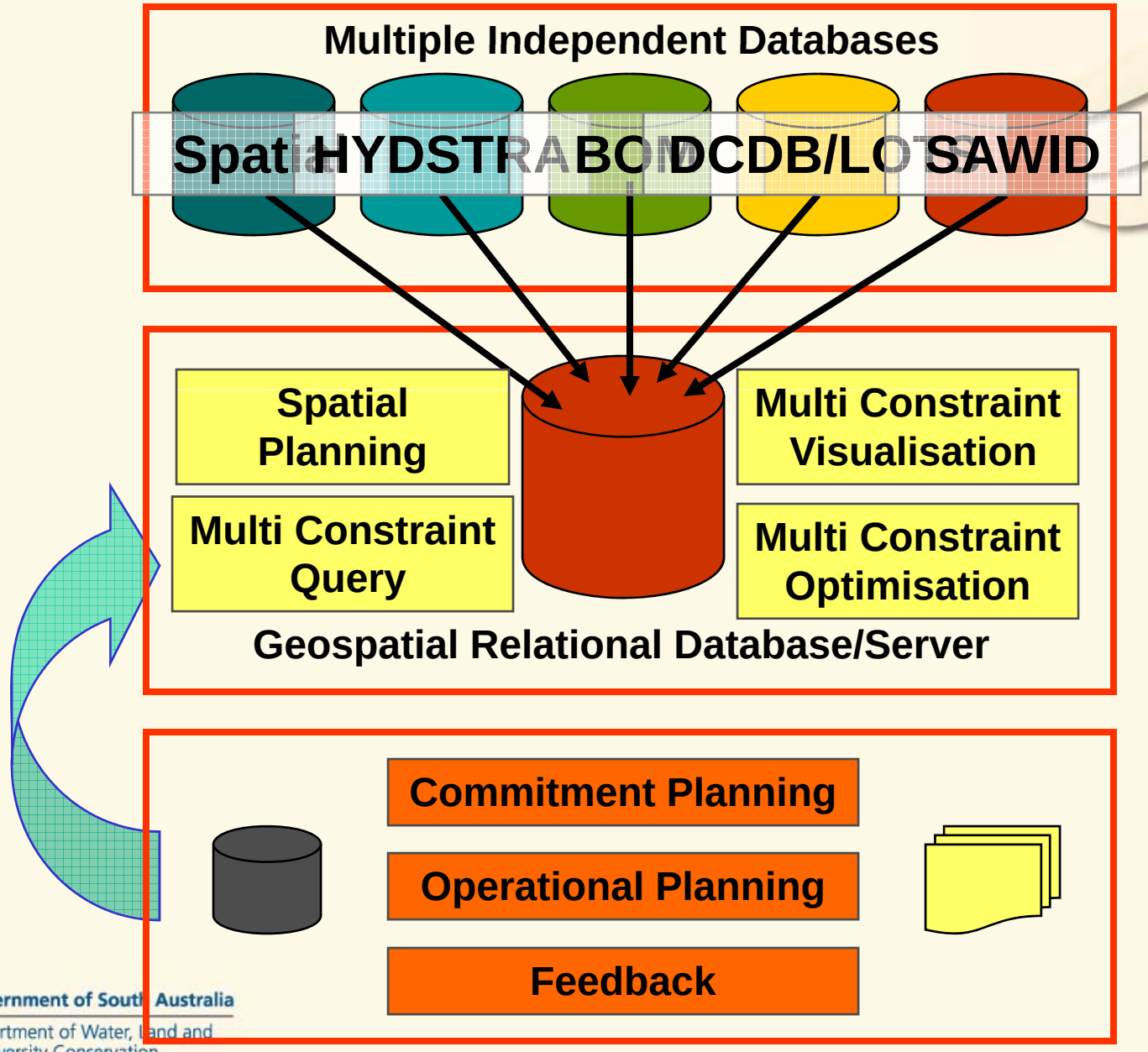


The options / benefits part of the decision making process in which system managers make informed judgements about the manipulation of flows based upon defined strategic objectives, system and resource constraints, modelled scenarios & real-time information.

SYSTEMATISE
INVENTORISE
CHARACTERISE
PRIORITISE

OPTIMISE

Resource Optimisation Framework

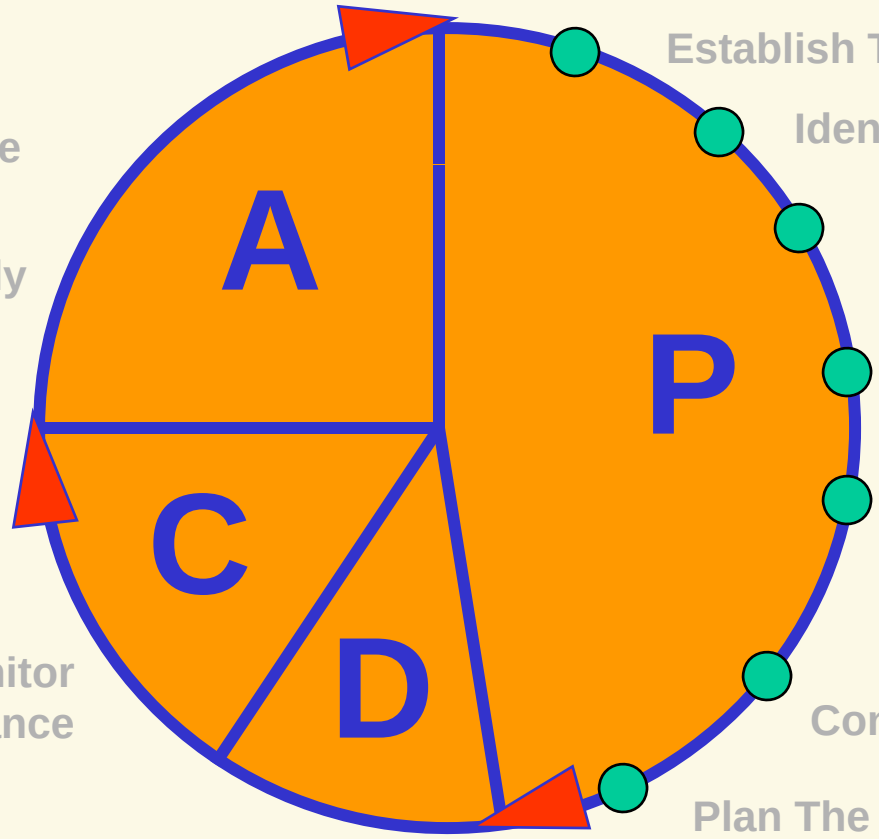


ADAPTIVE MANAGEMENT…

…Deliberate & Continuous Improvement

CONTINUOUS IMPROVEMENT CYCLE

PLAN	***Plan the Process***
DO	***Implement the Process***
CHECK	***Monitor & Review the Process and its Outcomes***
APPLY	***Review Performance & Apply Learning***



Establish Team

Identify Business Needs

Analyse Current Procedures

Define Options

Undertake Feasibility Analysis

Conduct Detailed Design

Plan The Implementation

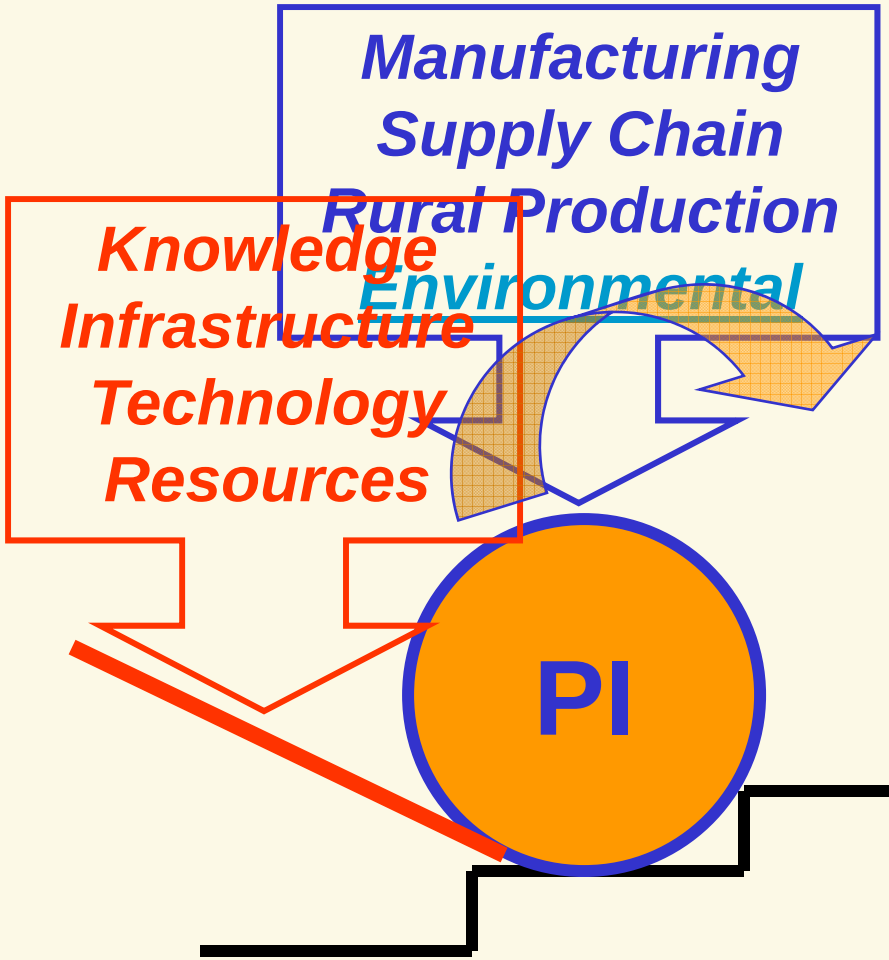
Implement The Plan

Monitor Performance

Review Performance & Continuously Improve

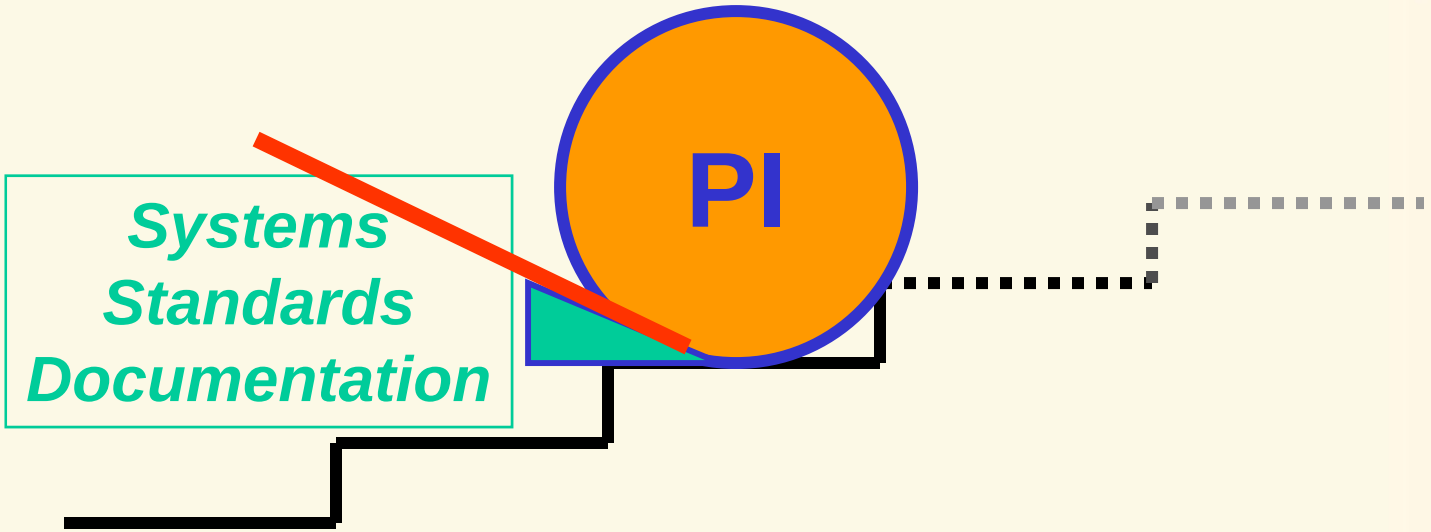
Continuous Improvement

The Wheel, The Lever & The Wedge

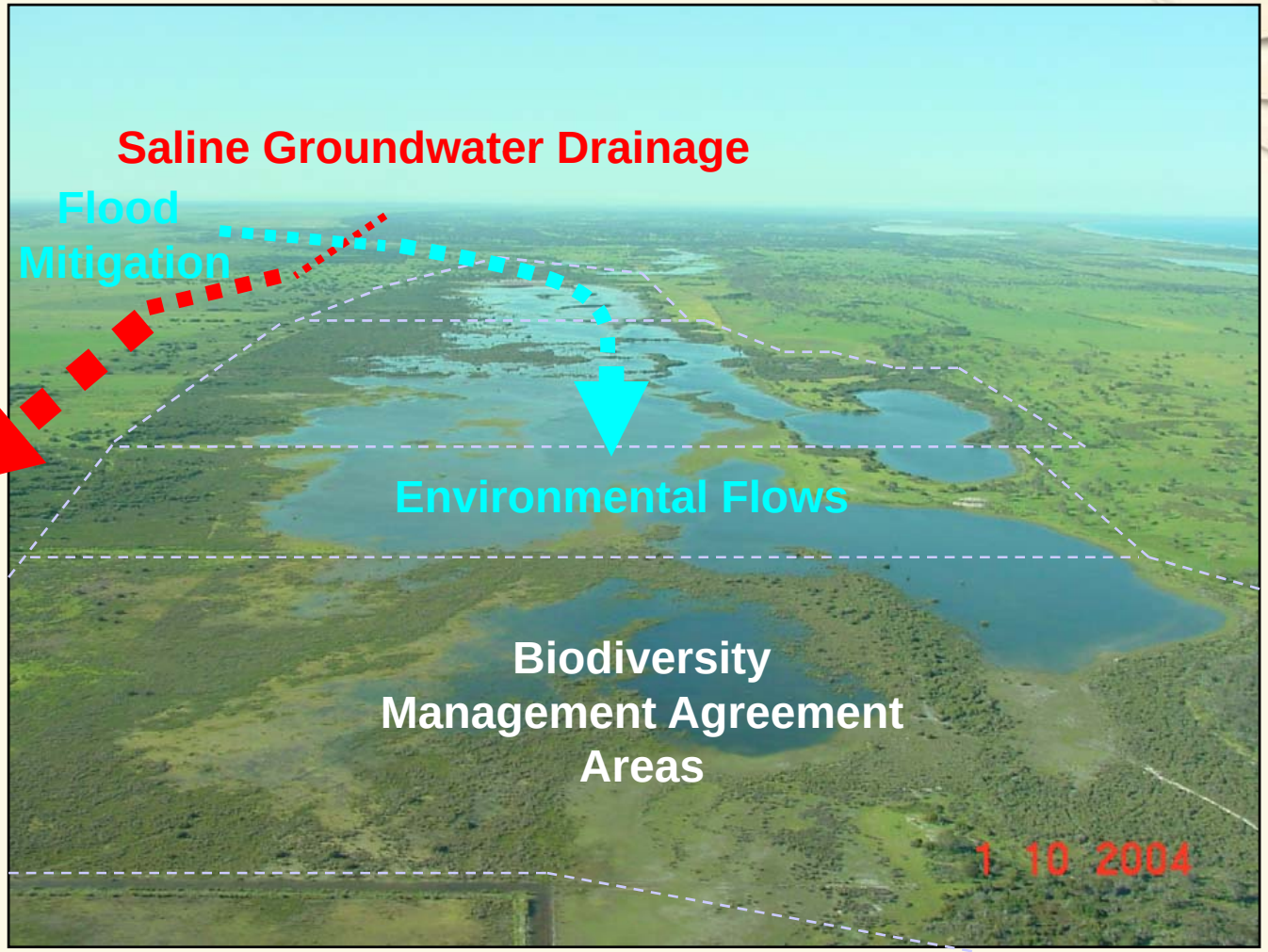


Continuous Improvement

The Wheel, The Lever & The Wedge

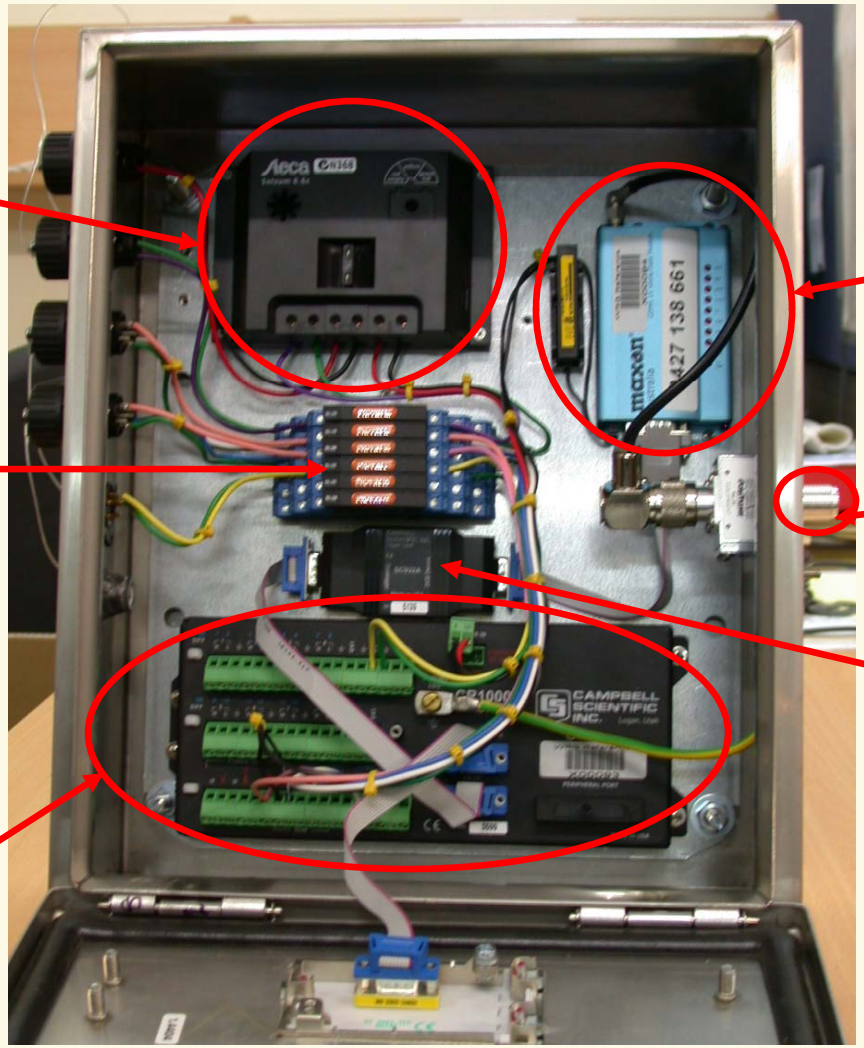


Engineering and Ecological Solutions



Instrumentation Interfacing

Instrumentation Interfacing



Solar Regulator

Modem

Sensor/Data Logger Interface

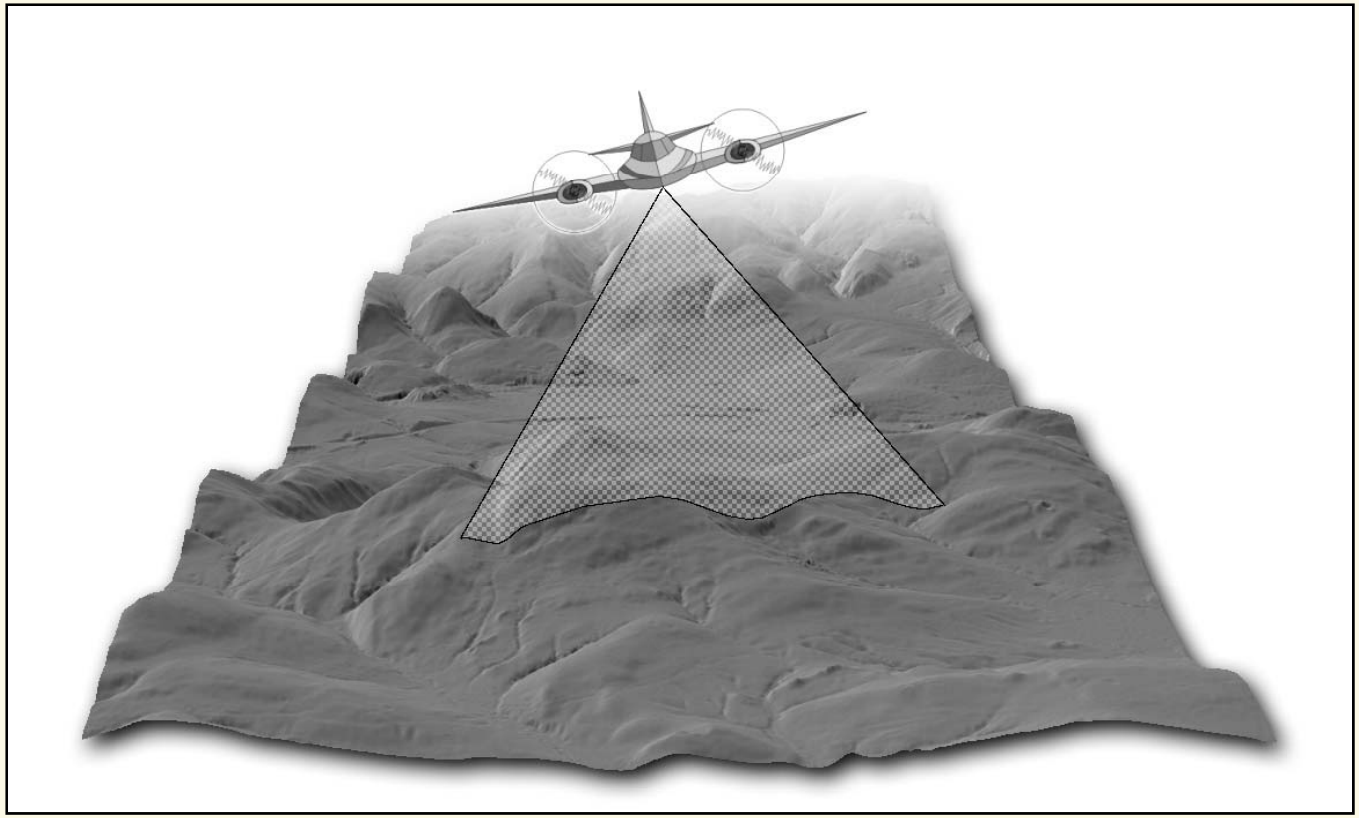
Telemetry Output

Data Logger/Modem Interface

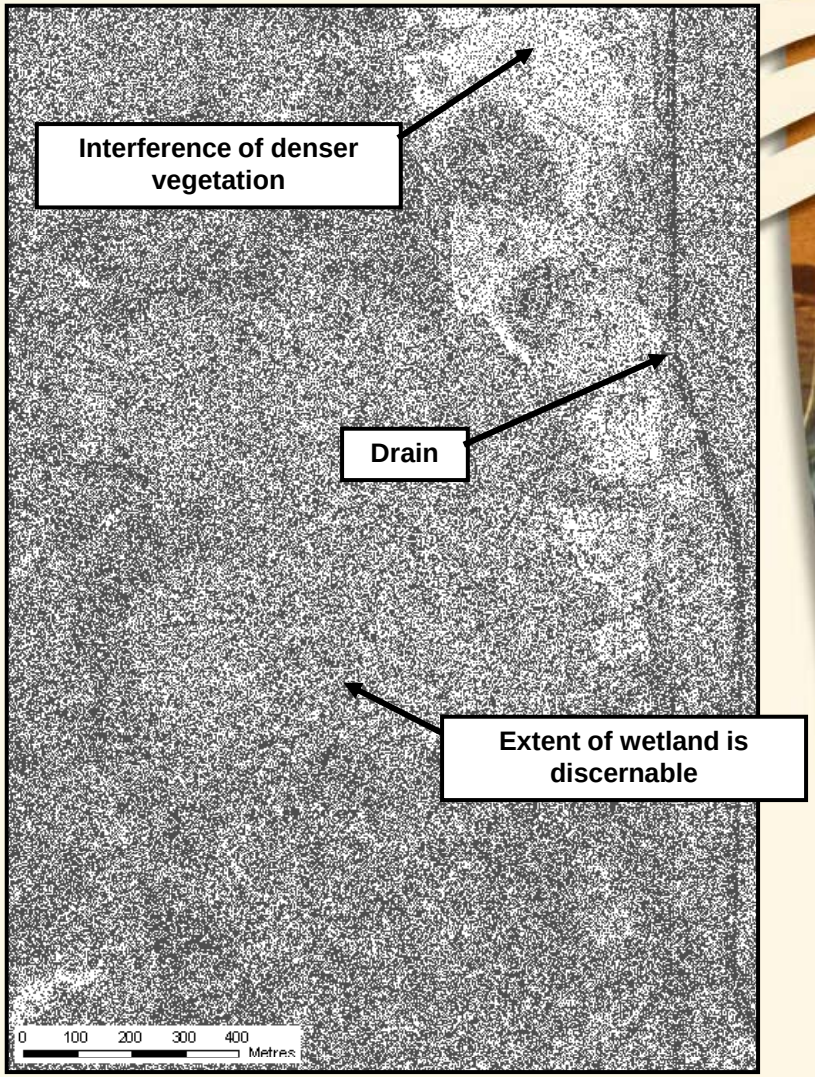
Data Logger

LiDAR - Light Detection And Ranging

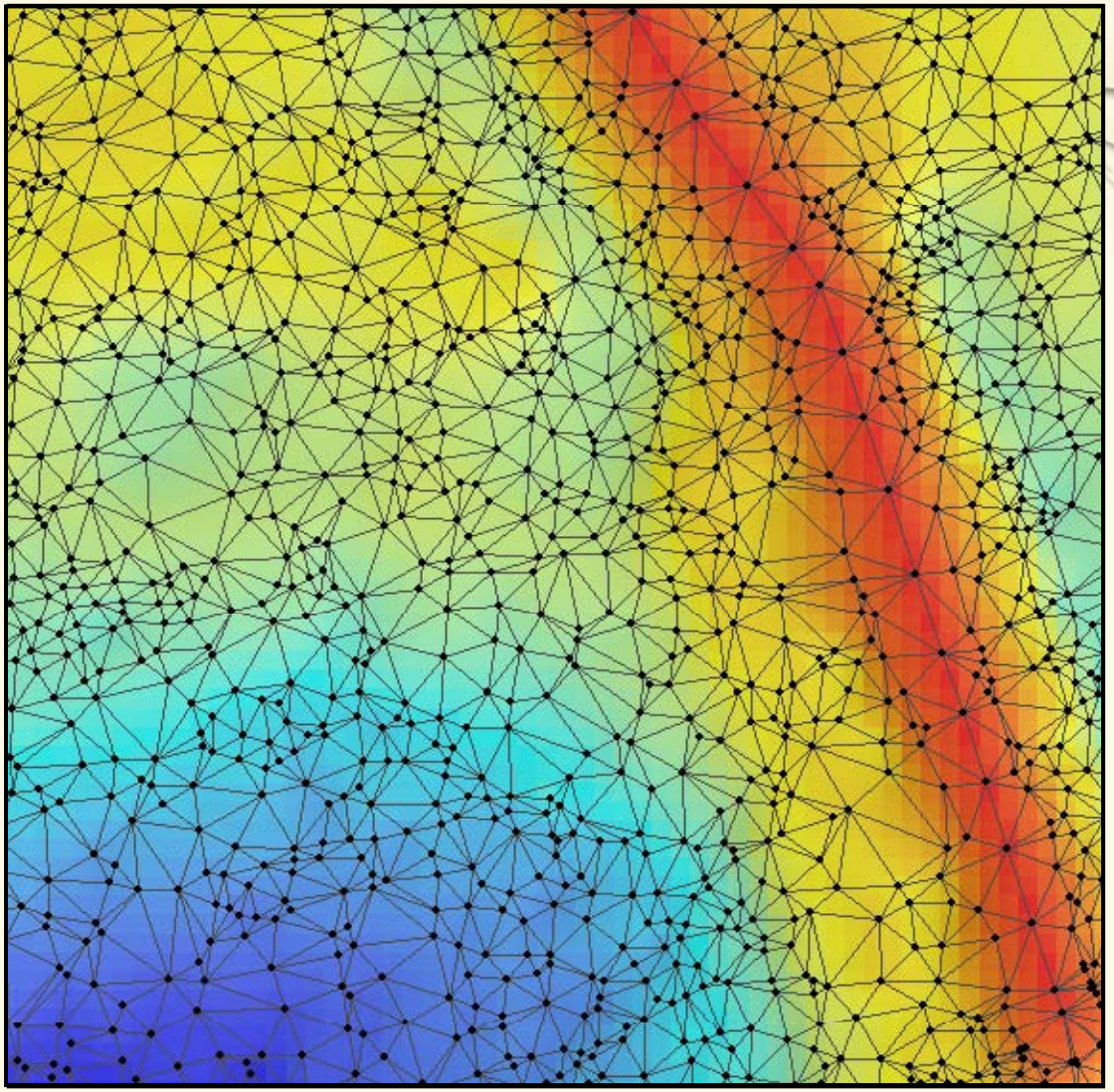
Also sometimes called Laser Imaging Detection and Ranging



LiDAR Data – Ground Strikes

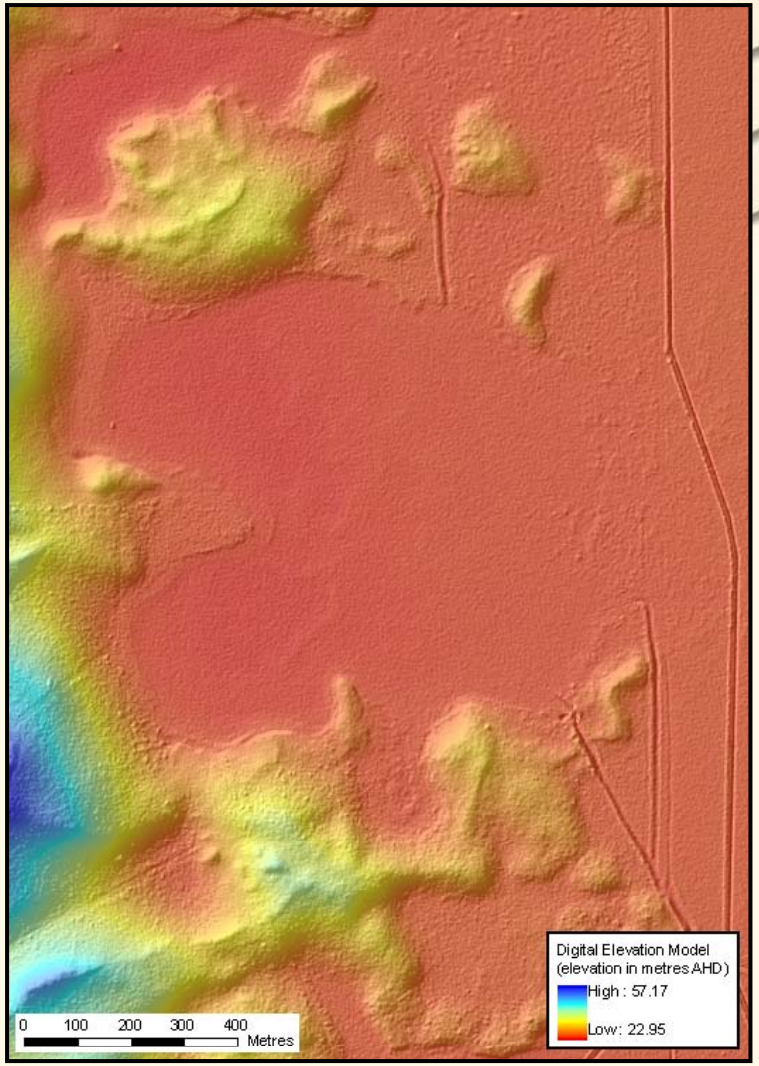


Triangulated Irregular Network (TIN)

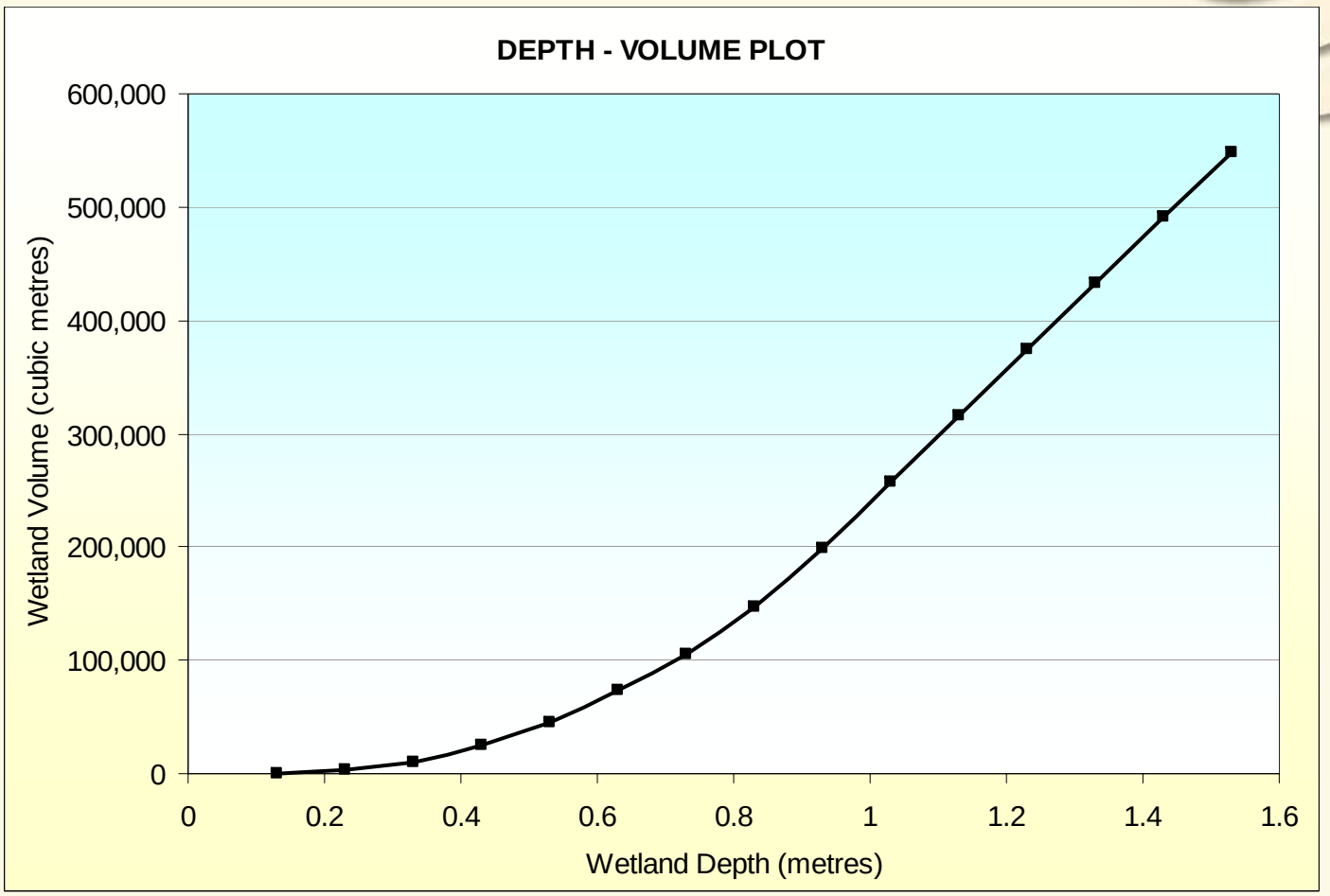


Raster DEM

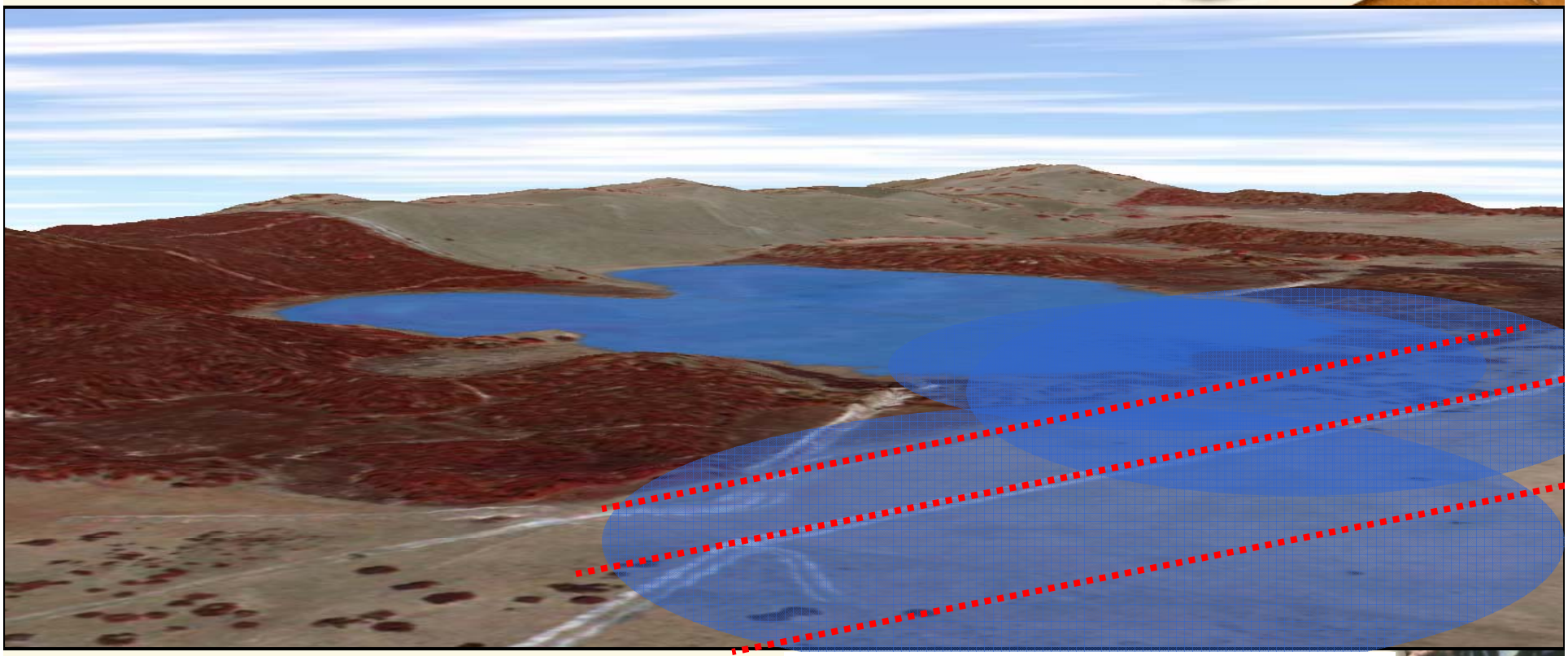

0 100 200 300 400
Metres


0 100 200 300 400
Metres
Digital Elevation Model
(elevation in metres AHD)
High : 57.17
Low : 22.95

Depth Volume Relationship



Three Dimensional Raster DEM



Wetland Landscape Components

14 dominant types have been nominated:

- River Red Gum woodland
- Melaleuca halmaturorum shrubland
- Melaleuca brevifolia shrubland
- Gahnia trifida tussock sedgeland
- Gahnia filum tussock sedgeland
- Seasonal emergent macrophytes and herbland
- Drier emergent macrophytes (sedgelands)
- Baumea arthrophylla sedgeland
- Leptospermum continentale shrubland
- Leptospermum lanigerum shrubland
- Callistemon rugulosus shrubland
- Samphire saltmarsh
- Semi-permanent/permanent open water
- Saline wetlands

Conceptual Models

Describe the key values and requirements of the components. Melaleuca halmaturorum example:

Feature Category	Habitat Feature/Management Objective
Surface Water Regime	Seasonal waterlogging for 6 months is required, inundation for 6 months to 0.5m < 6,000µs/cm EC is normal. Can tolerate short duration (<3 months) saline inundation <30,000µs/cm EC.
Groundwater Regime	Shallow groundwater and salinity up to 30,000µs/cm EC (depth more important).
Soil Conditions	Heavy soils, sometimes with calcareous influence. Can tolerate mild soil salinity.
Perennial Flora	Shrubland overstorey – *Melaleuca halmaturorum*, +/- emergent *M. brevifolia*
	Gahnia trifida / *Gahnia filum* is often present as a co-dominant.
	fresh sites *Baumea juncea*, *Baumea arthrophylla*, *Leptocarpus* spp., *Isolepis* spp., *Schoenus nitens*, moss and lichen.
	Saline/brackish sites *Sarcocornia* spp., *Selliera radicans*, *Samolus repens*, *Wilsonia* spp, *Angianthus preissianus*, *Lawrencia* spp.
Aquatic Flora	When wet (fresh sites): – *Myriophyllum* spp.; *Triglochin striatum*; *Villarsia reniformis*.
Aquatic Fauna	Colonial Nesting Waterbirds - breeding, minimum 4 months inundation required.
	Freckled Duck - provides shelter.
	Roosting habitat for ducks and other waterbirds.
	Cormorants - roosting habitat, breeding.
	Provide shelter and breeding for frogs when flooded.
	Tortoise - eats frogs, tadpoles when flooded.

Threats to Ecological Values

When restricted to hydrological threats:

Reduced surface flooding

Falling water table
Rising salinity in shallow groundwater

Inundation with saline water

Excessive flooding