

WSUD Showcase - Bellamack

Darwin Harbour WSUD Strategy

Background Research

- Interviews and Desktop Research
- Implementation and Technical Issues

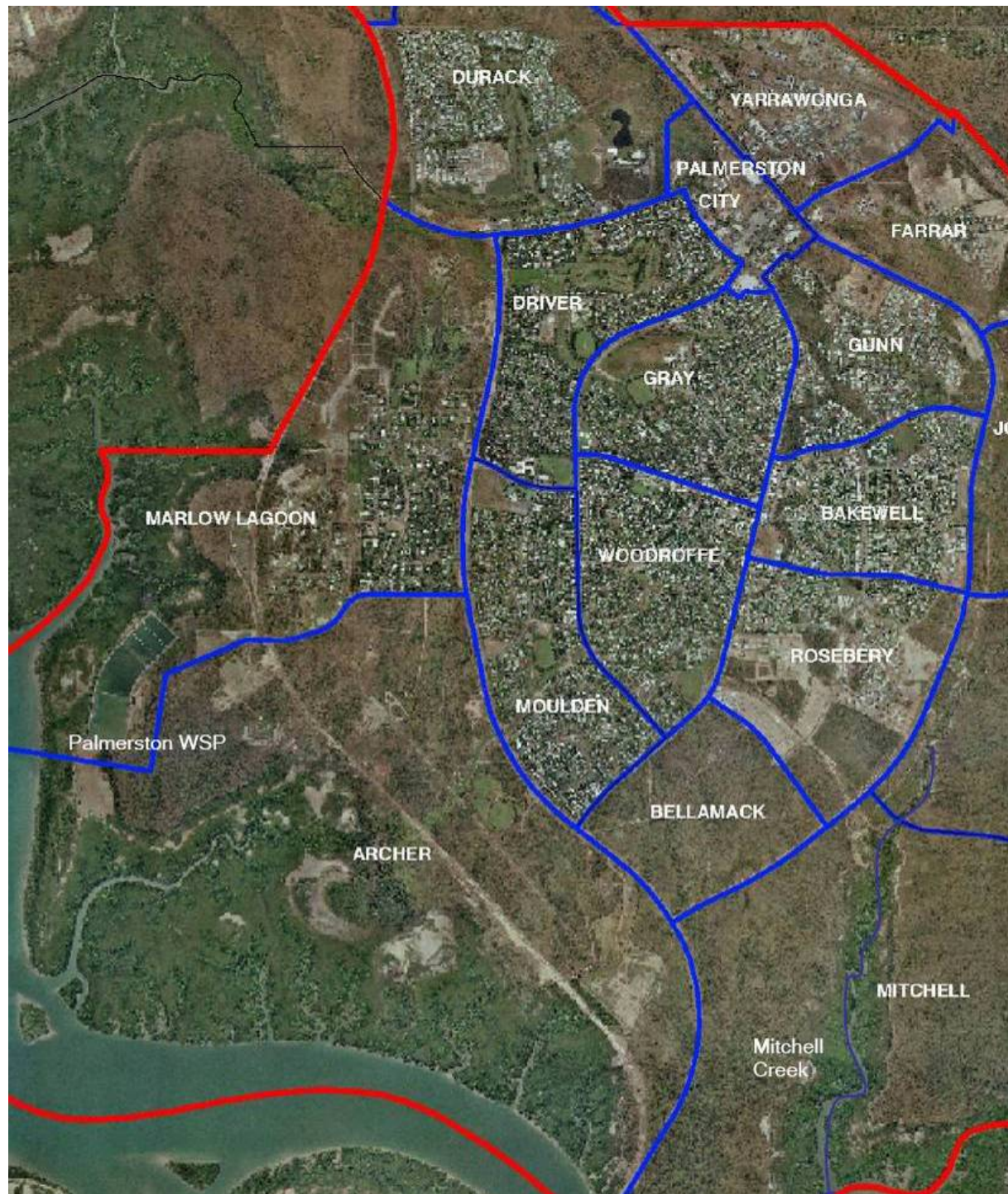
WSUD Policy and Targets

WSUD Technical Guidelines and Tools

Practical Implementation - Bellamack



Bellamack WSUD Strategy overview



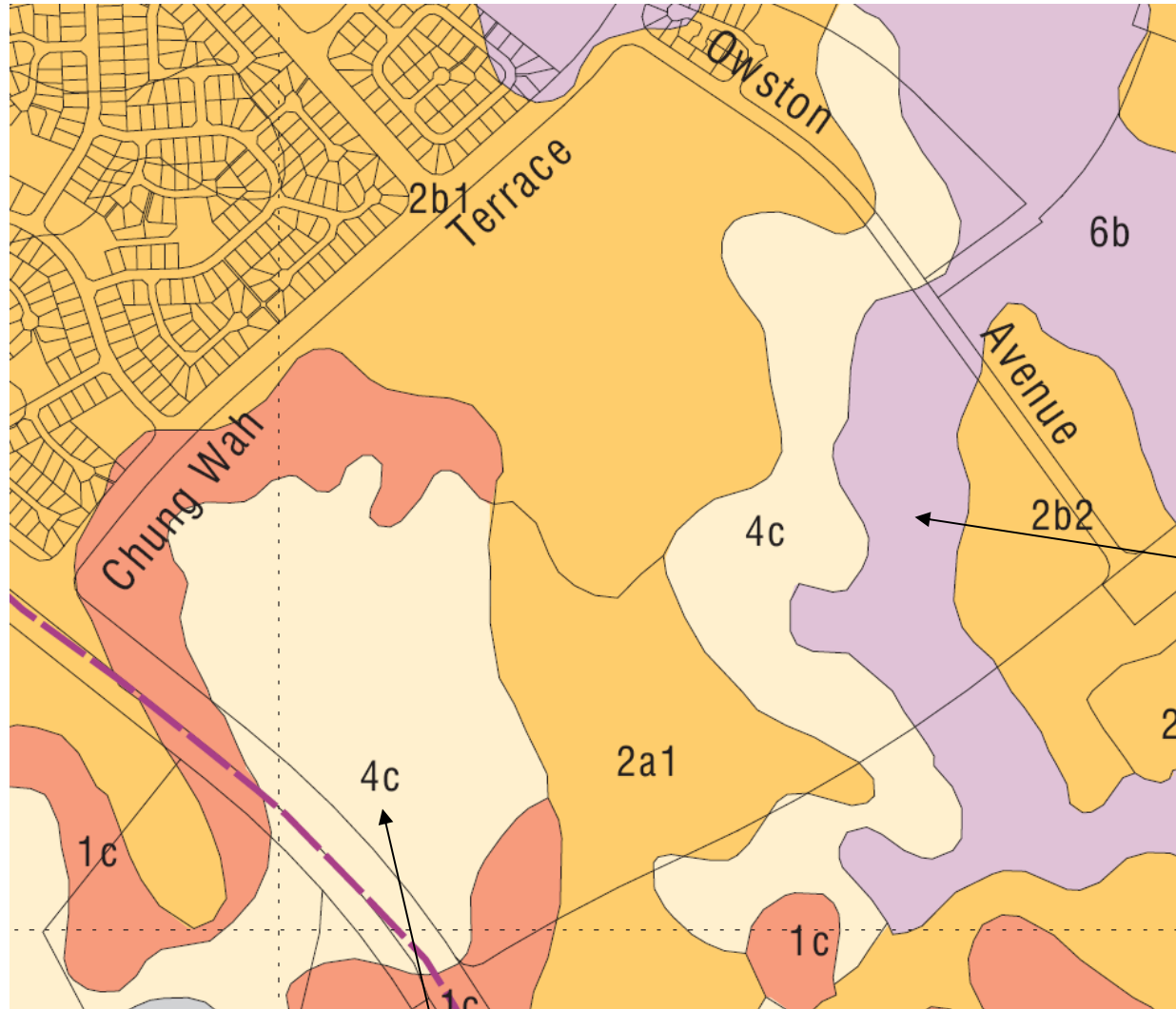
Bellamack

- Total land area = 118.6 ha
- Development area = 75 ha
- Development intent
 - 650 detached dwellings
 - 200 townhouses
 - 16 'shop top' units
 - 20 rural style lots
- Design Principles
 - Water Sensitive Urban Design
 - Circulation
 - Open Space
 - Neighbourhood Centre
 - Housing diversity
 - Climate control and energy efficiency

Receiving environment

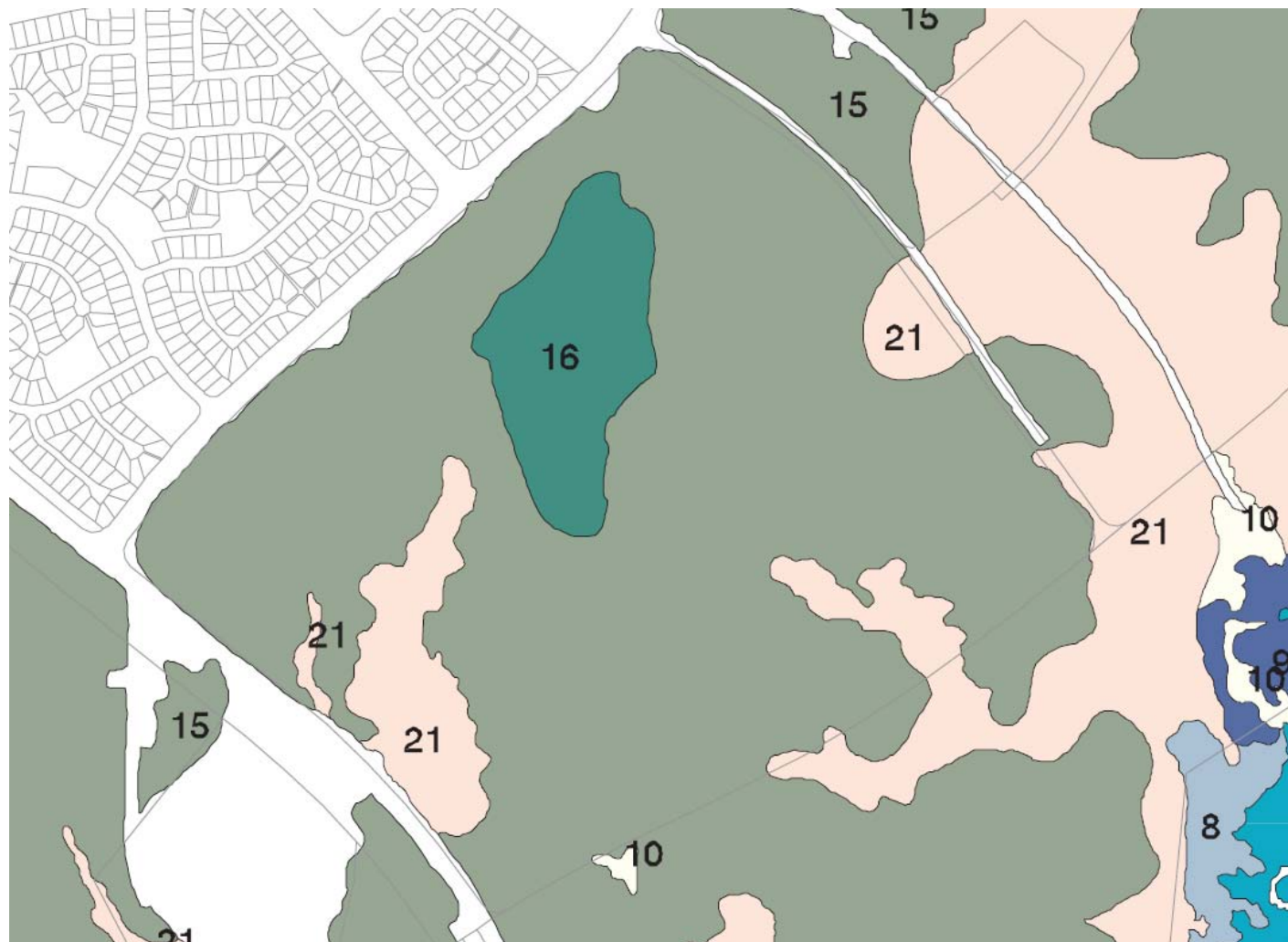






Severe
water-
logging

Wet season water table



15, 16 = Eucalyptus woodland
21 = Pandanus woodland



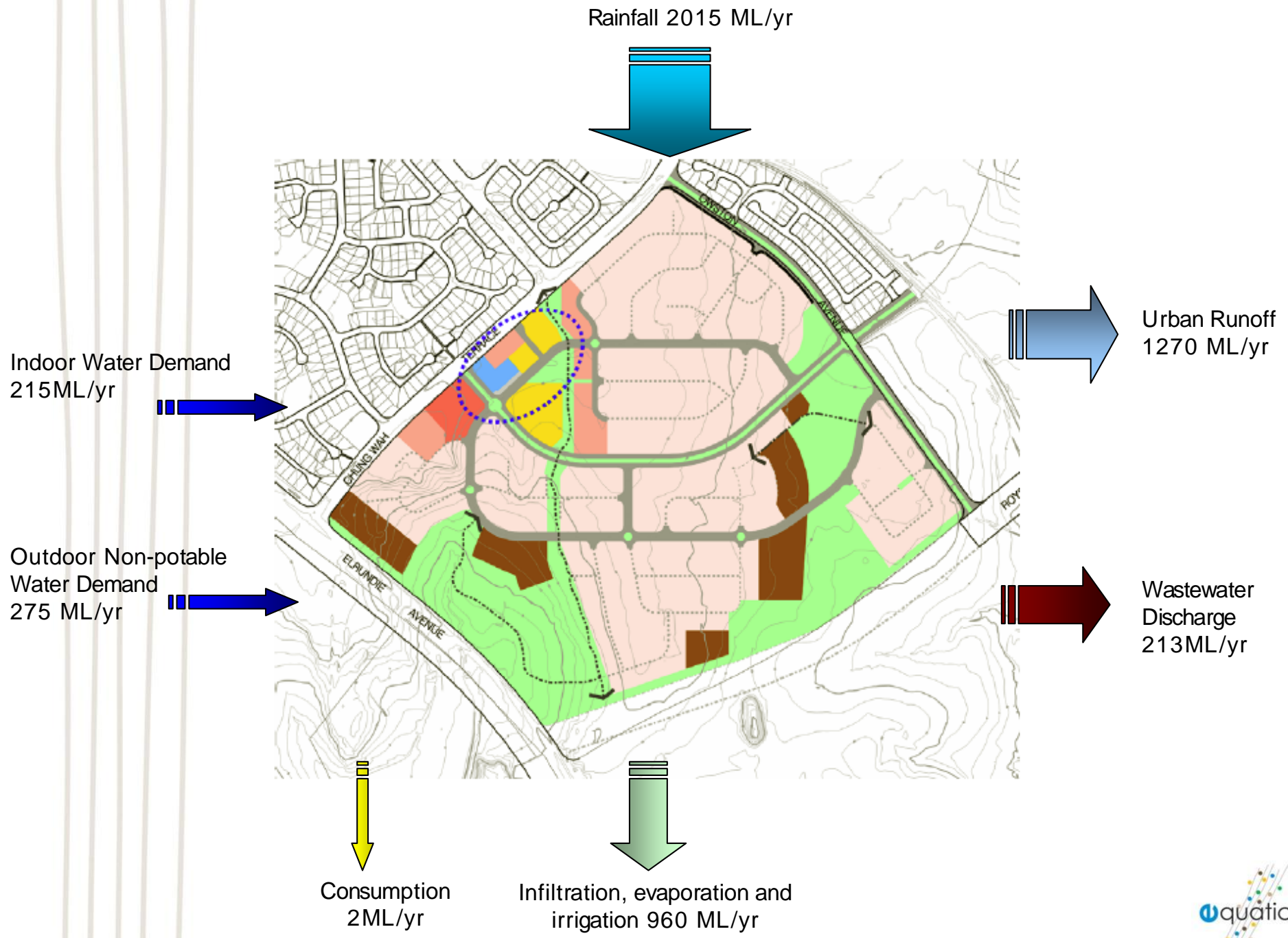
WSUD Strategy for Bellamack - Principles

- Protect existing natural features and ecological processes
- Protect water quality of surface and ground waters
- Maintain natural hydrologic behaviour of catchments
- Minimise demand for potable water
- Minimise wastewater generation and discharge to the natural environment
- Integrate water into the landscape to enhance urban design, visual, social, cultural and ecological values
- Add value while minimising development costs

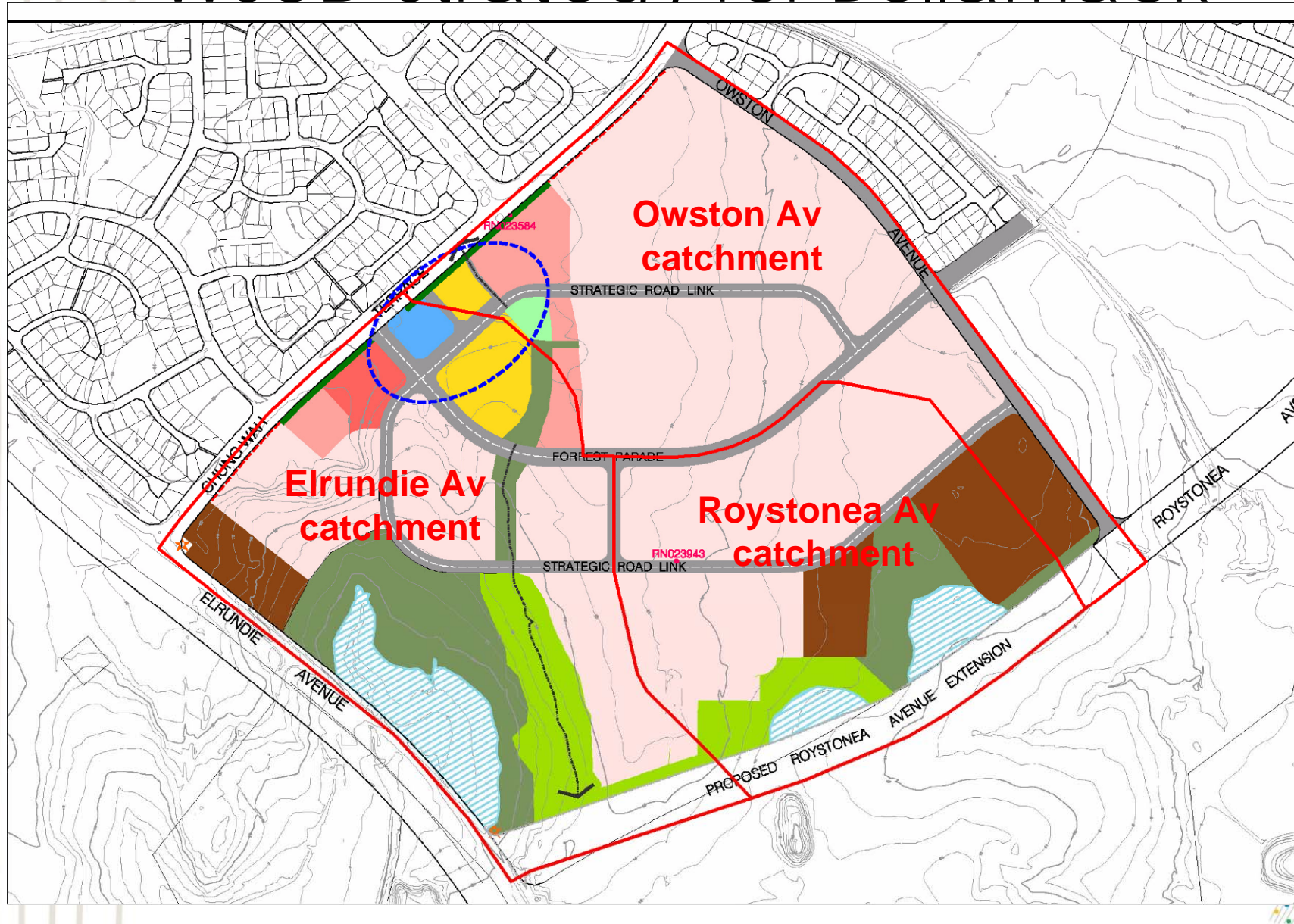


WSUD Strategy for Bellamack - Objectives

- **Water quality**
 - 80% reduction in the mean annual load of total suspended solids
 - 60% reduction in the mean annual load of total phosphorus
 - 45% reduction in the mean annual load of total nitrogen
 - 90% reduction in the mean annual load of total gross pollutants
- **Water conservation**
 - Low water use public landscapes & private gardens
 - Water efficient fittings & appliances, including mandatory dual flush toilets
 - Utilise treated wastewater and groundwater for non-potable uses, particularly irrigation
- **Wastewater minimisation**
 - Demand management
 - Minimise wet weather infiltration
 - Maximise reuse
- **Landscape integration**



WSUD Strategy for Bellamack -



WSUD Strategy for Bellamack - Preferred WSUD solutions

Strategy	Preferred solutions	Alternatives/additional options
Potable water conservation and wastewater minimisation	<ul style="list-style-type: none">• Demand management• Non-potable water supply system (third pipe)• Wastewater reuse (regional)• Groundwater bore	<ul style="list-style-type: none">• Wastewater reuse within buildings• Low infiltration sewers
Stormwater treatment	<ul style="list-style-type: none">• Constructed wetlands	<ul style="list-style-type: none">• Bioretention basins• Bioretention swales



Potable water conservation – demand management

Area	Demand management measures
Public buildings	<ul style="list-style-type: none">• Low water use fixtures and appliances, such as taps, showers, toilets, urinals, washing machines and dishwashers
Private buildings	<ul style="list-style-type: none">• Provision of information packs, water efficient display homes and incentives for water efficient fixtures• Encourage developers to adopt minimum water efficiency ratings for fixtures
Public landscapes	<ul style="list-style-type: none">• Endemic and low water use plant species• Third pipe water supply system
Private landscapes	<ul style="list-style-type: none">• Provision of information packs, water efficient gardens at display homes and incentives for low water use plants and materials• Third pipe water supply system

Wastewater Reuse

- Palmerston WSP
 - Effluent from City of Palmerston
 - Bulk waste from Septic Areas of rural and unsewered areas
- Wastewater has a significant impact on Darwin Harbour
- Potential to meet dry season irrigation demands
- “Third pipe” system proposed



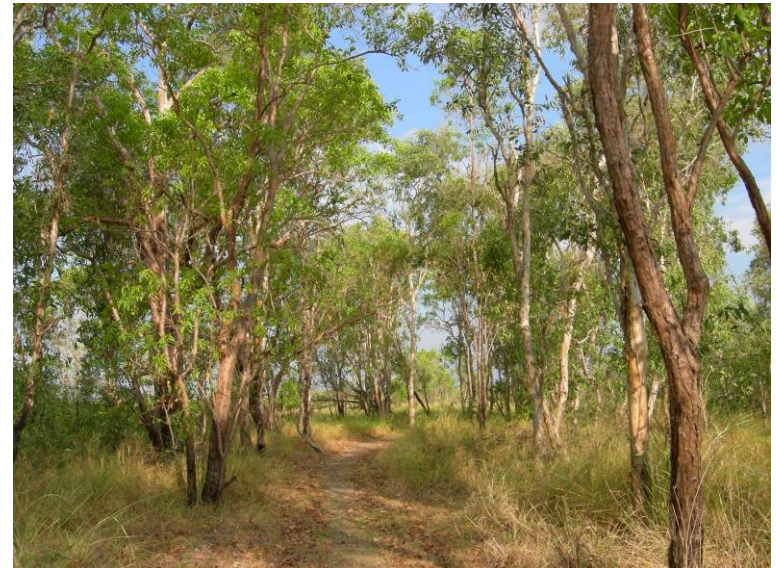
Wastewater Reuse - Issues

- Further Treatment Required
 - Analysis of treatment processes required
 - Secondary and tertiary wetlands
 - DAF and Filtration (eg Northlakes)
- Recycled Water Pipeline
 - Easement required?
 - Timing?
 - Coupled to other infrastructure?
- Risk Assessment Required
- Cost



Bellamack Aquifer Reuse

- Aquifer Recharge
 - Potential to recharge aquifer from treated flows from wetlands
 - Recharge beneficial only if aquifer is not recharged by infiltration of rainfall by the end of the wet season
 - Current monitoring
 - Management strategy: design wetland to be able to be retrofitted if required
- Existing data
 - Salinity
 - Water levels
 - Water Quality
 - Extraction

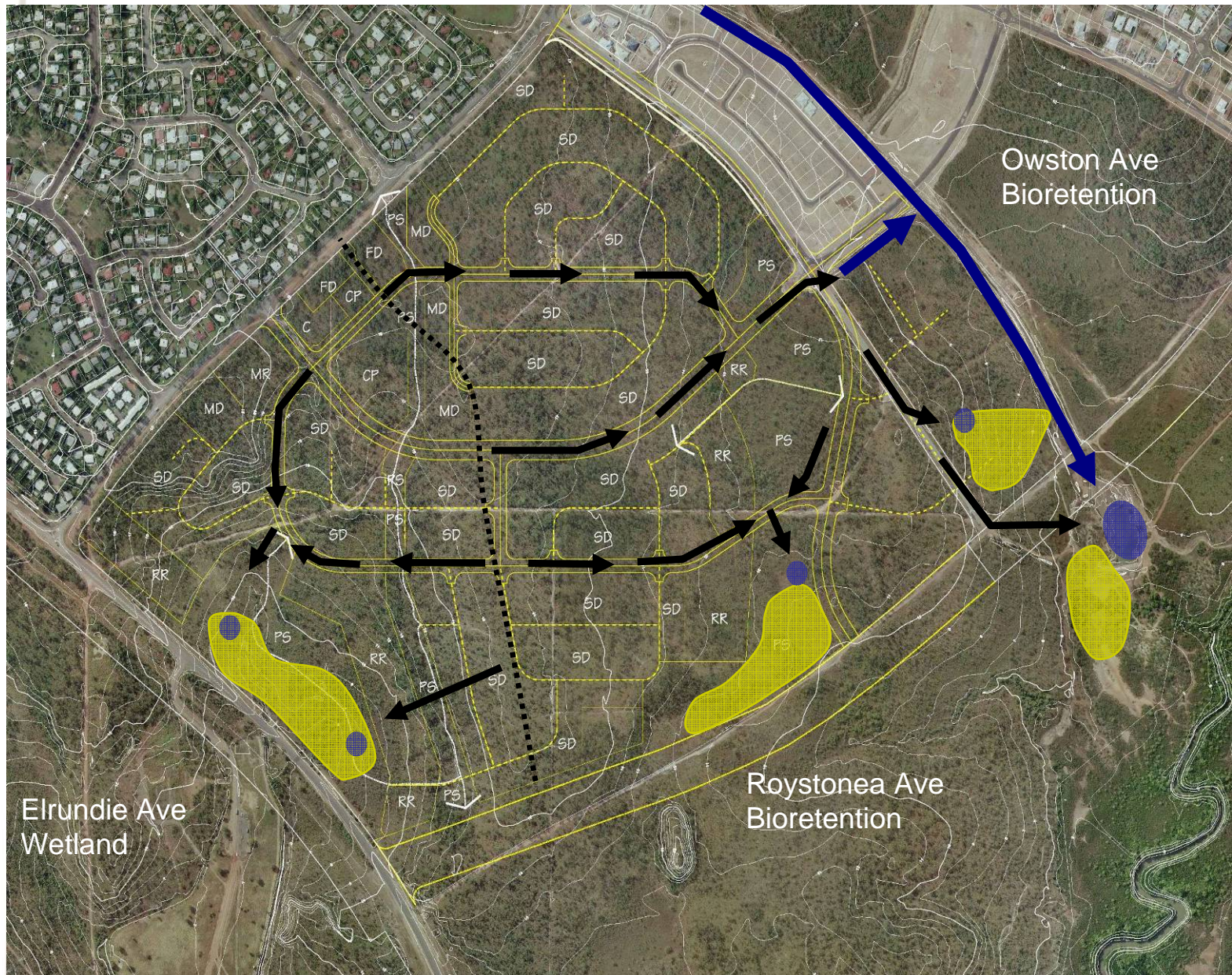


Bellamack Aquifer Reuse

- Aquifer Reuse Operation and Management
 - Adaptive management
 - Metering and monitoring
 - Ownership
 - Operation and Maintenance
 - Pricing
 - Licensing of extraction from aquifer
- Technical Issues
 - Storage requirements for peak flows
 - Further modelling requirements
 - Open space irrigation demands



Stormwater treatment strategy



WSUD strategy implementation

- Concept designs:
 - Workshopped with DPI, NRETAS, Health, Council
 - Sign off from PCG
- Detailed designs:
 - Being completed for the developer at Bellamack
- Construction
 - Subdivision developer
- Asset handover, ongoing maintenance
 - Council
- Monitoring strategy
 - NRETAS



Wetland design

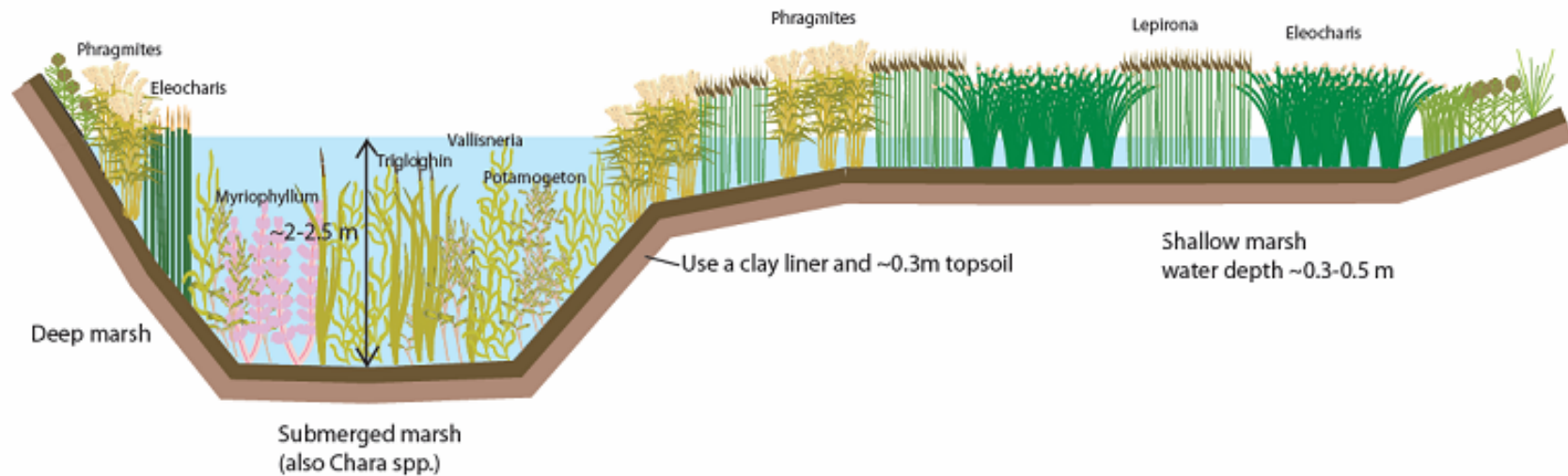
Bellamack wetlands: design development

- Key design issues
 - Water level fluctuations
 - Vegetation selection
 - Mosquito management
 - Integration into landscape/aesthetics
 - Cost
 - Maintenance

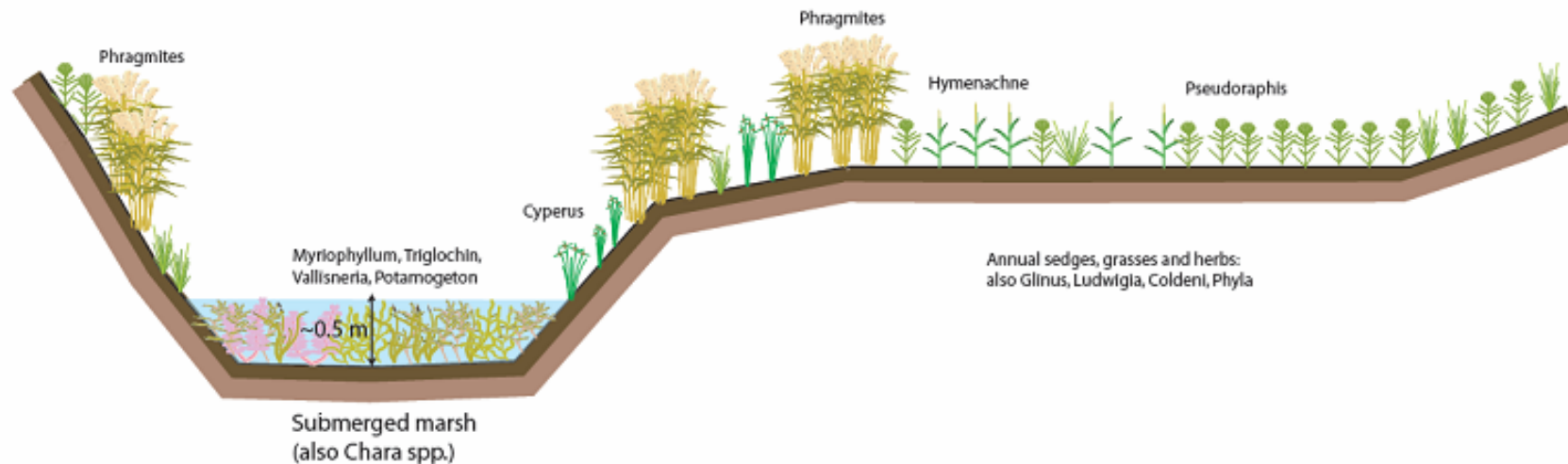




Conceptual solution

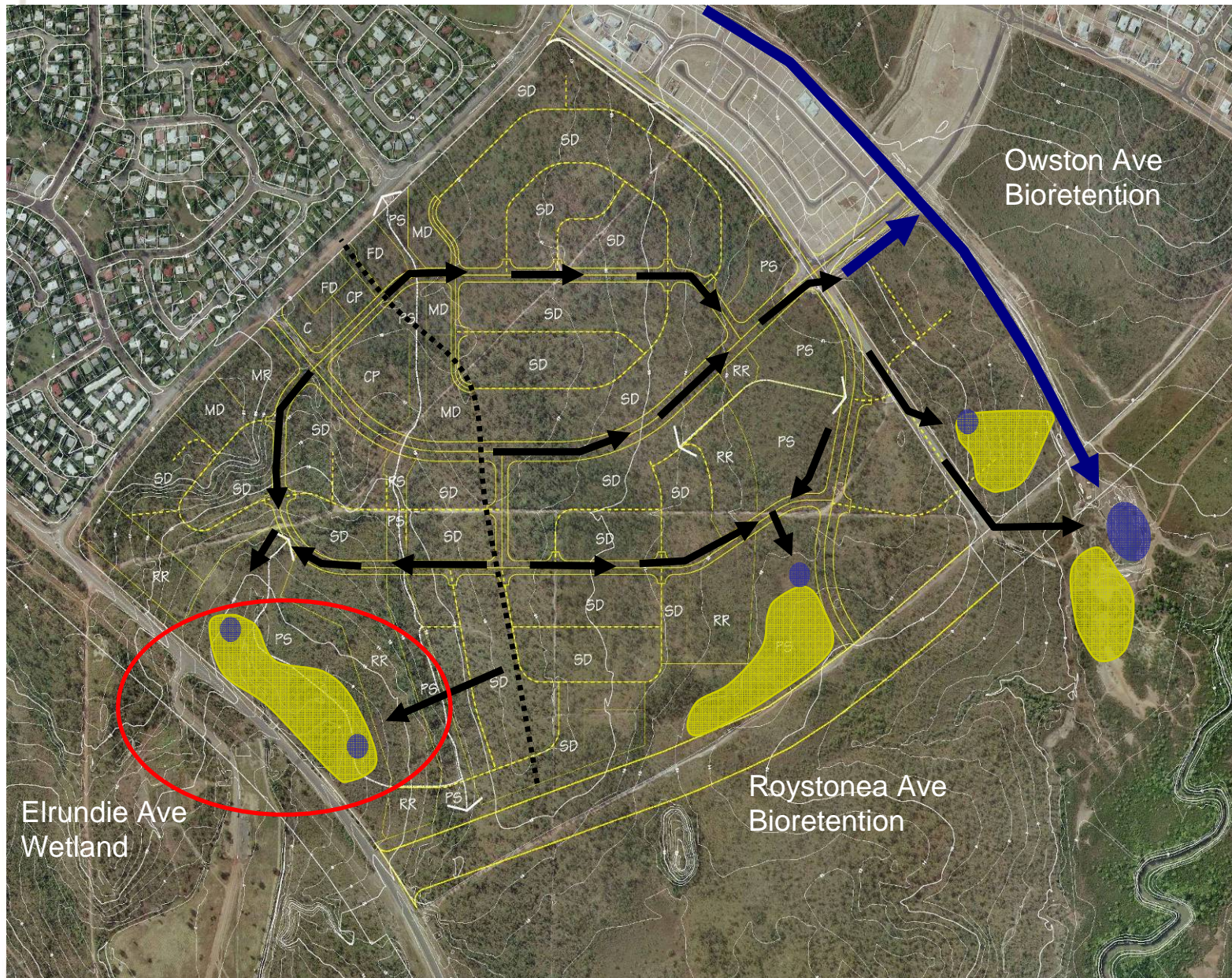


Wet season state

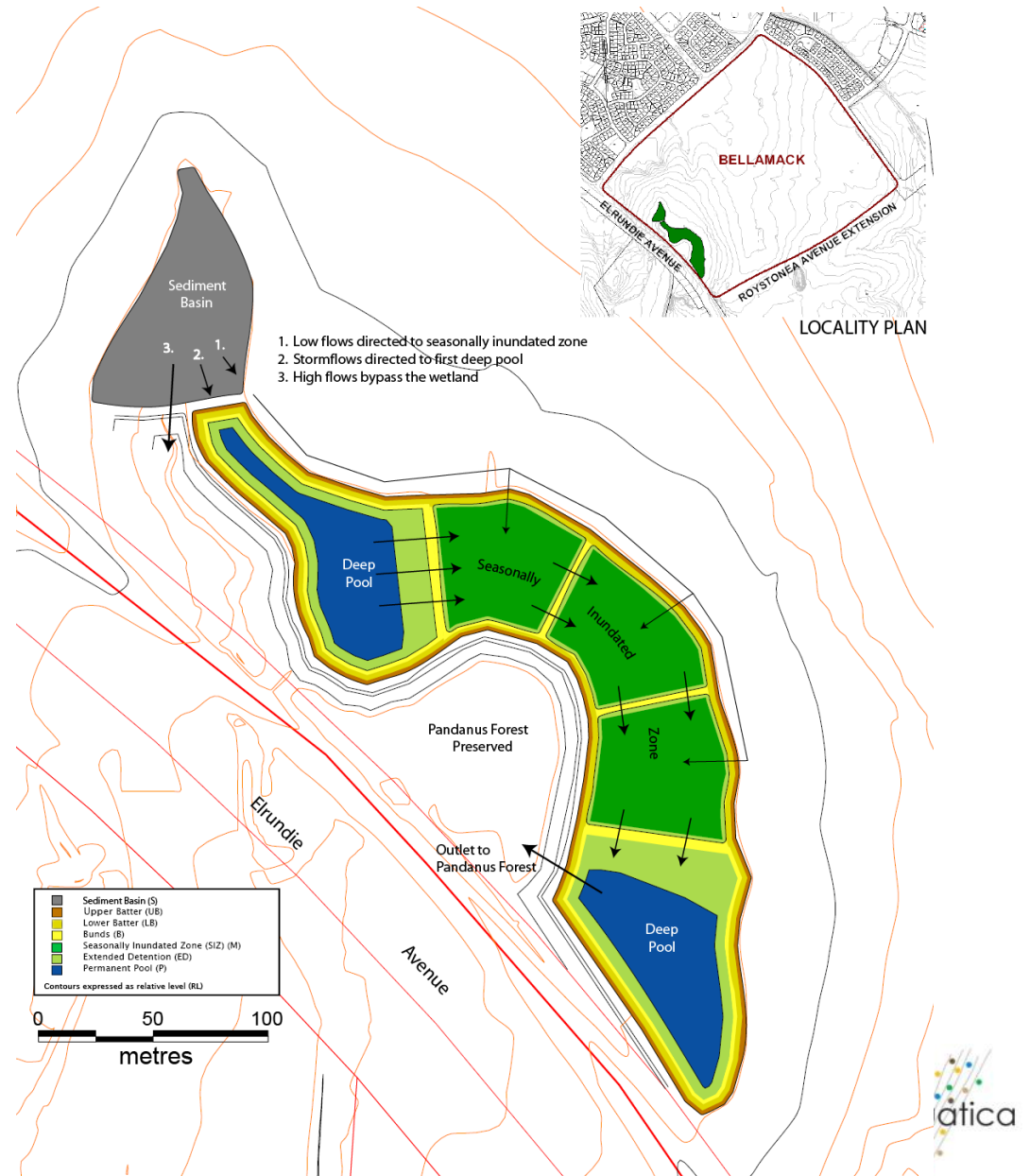
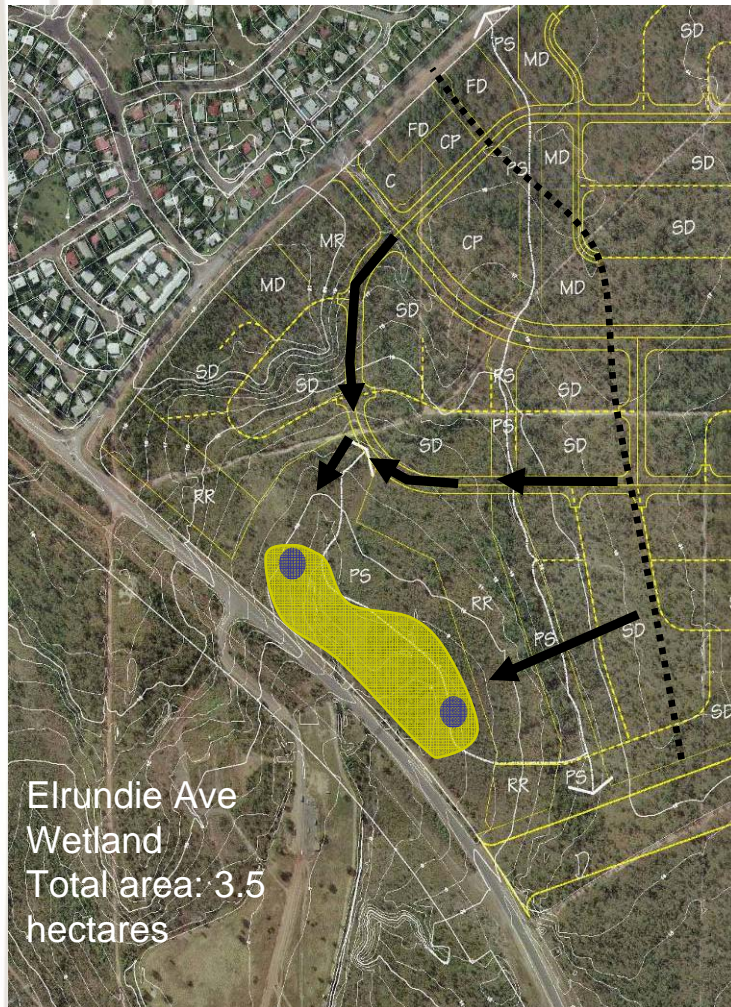


Dry season state

Stormwater treatment strategy



- Elrundie wetland layout



Sediment basin



Deep pools



Seasonally inundated zone



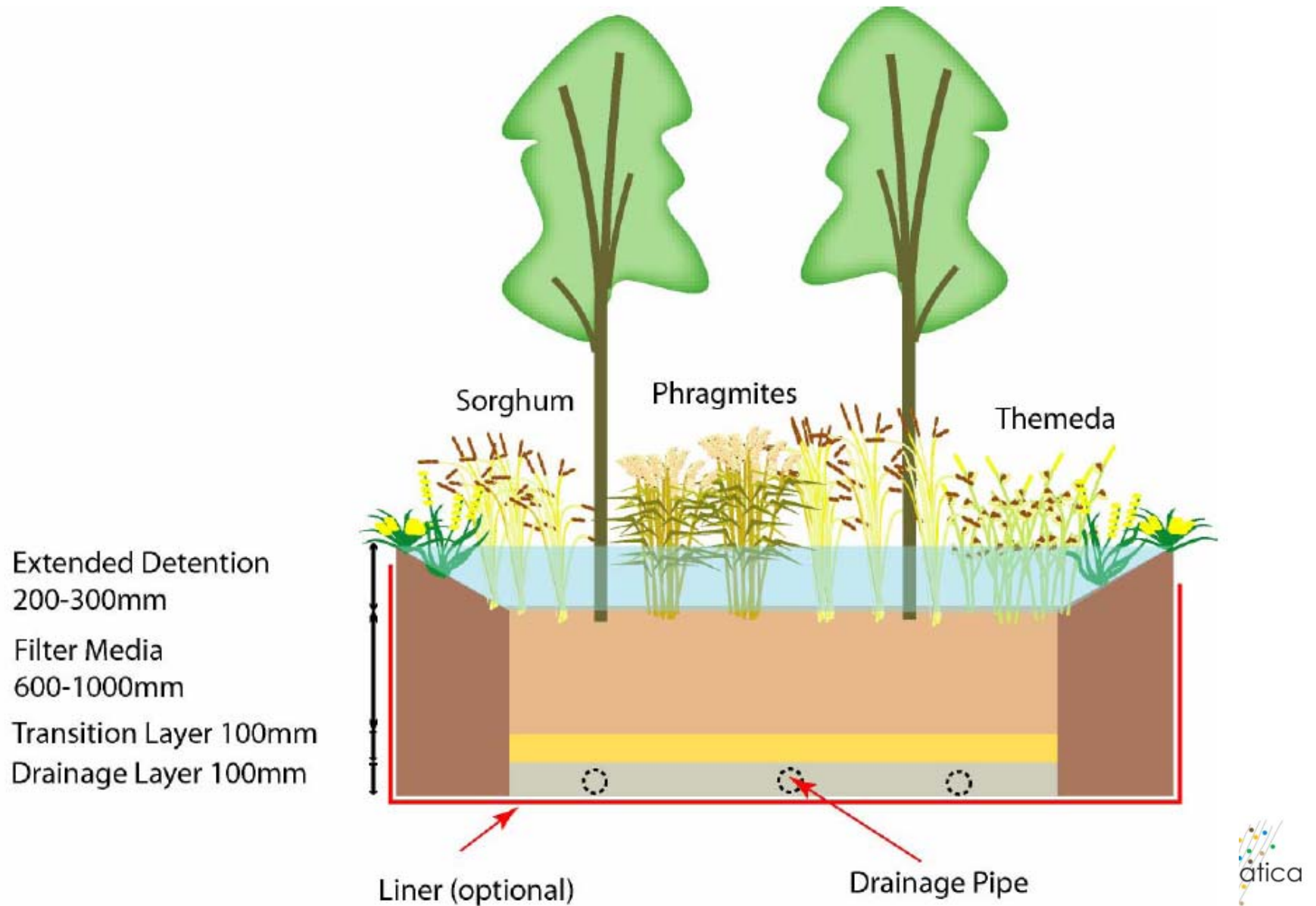
A photograph of a natural landscape. In the foreground, there is a field of tall, dry, yellowish-brown grass. Scattered throughout the field are several palm plants with large, fan-shaped fronds. In the background, there is a dense stand of trees with green foliage. The sky is a clear, bright blue. The text "Bioretention system design" is overlaid in white on the left side of the image.

Bioretention system design

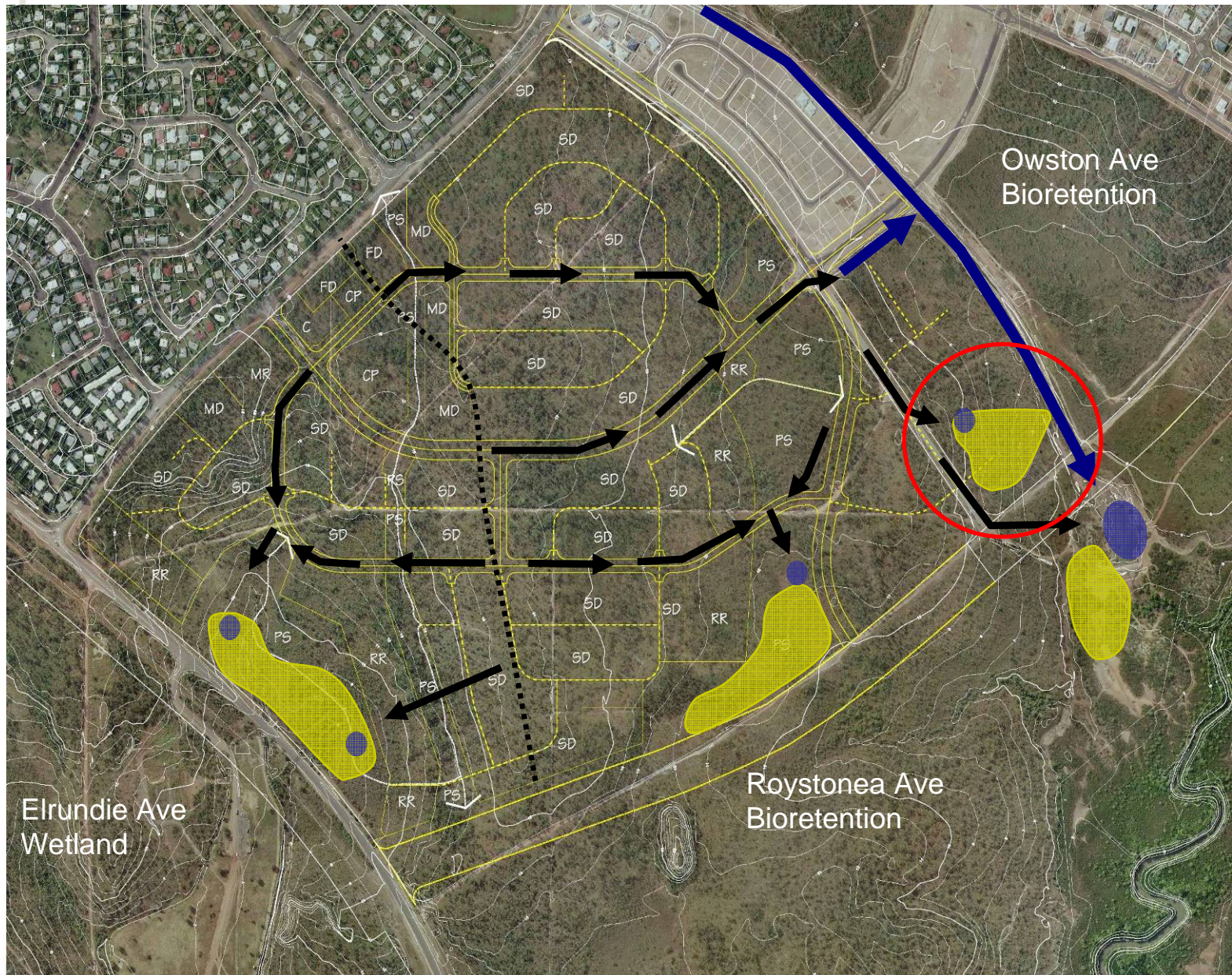
Bellamack bioretention systems: design development

- Key design issues:
 - Vegetation
 - Water table
 - Aesthetics
 - maintenance

Conceptual solution



Stormwater treatment strategy



Bellamack bioretention: Vegetation



Bellamack bioretention: Vegetation



Bellamack bioretention: Irrigation

Area	5000 m ²
Irrigation Frequency	2 weeks
Irrigation Volume	10 mm/m ²
Irrigation Period	April – September (6 months)
Total Irrigation Volume	650 kL/yr
Equivalent houses	1.5 houses

