

Project Background and Plan Objectives

Stringybark Consulting was engaged by Sunshine Coast Council to produce this plan for the Southern Wetland at the Maleny Community Precinct site, to assist in the identification of landscape management and treatment requirements and to assist in discussion with project stakeholders and community groups. The project objective is to provide concept detail for the management of the southern wetland, which balances the recreational land use and community expectations with environmental and conservation objectives.

The Maleny Community Precinct (MCP) Master Plan was approved in 2010 following many years of community and council collaboration, to provide community-use facilities on the 126 hectare (previously agricultural) site. The adjoining recreational uses including the Stage 2 "licence to use" area for the Maleny Golf Course is immediately adjacent the wetland littoral zone and has (in some areas) resulted in very limited opportunity for the wetland to be buffered for ecotonal migration or riparian connectivity purposes.

In this regard, a series of landscape treatments have been identified to provide a compromise of conservation and sustainable landscape management objectives, and at the same time acknowledge the need to retain open sedgeland vistas and significant canopy height constraints for the narrow buffer areas available.

The objectives for the Southern Wetland Landscape Plan is to;

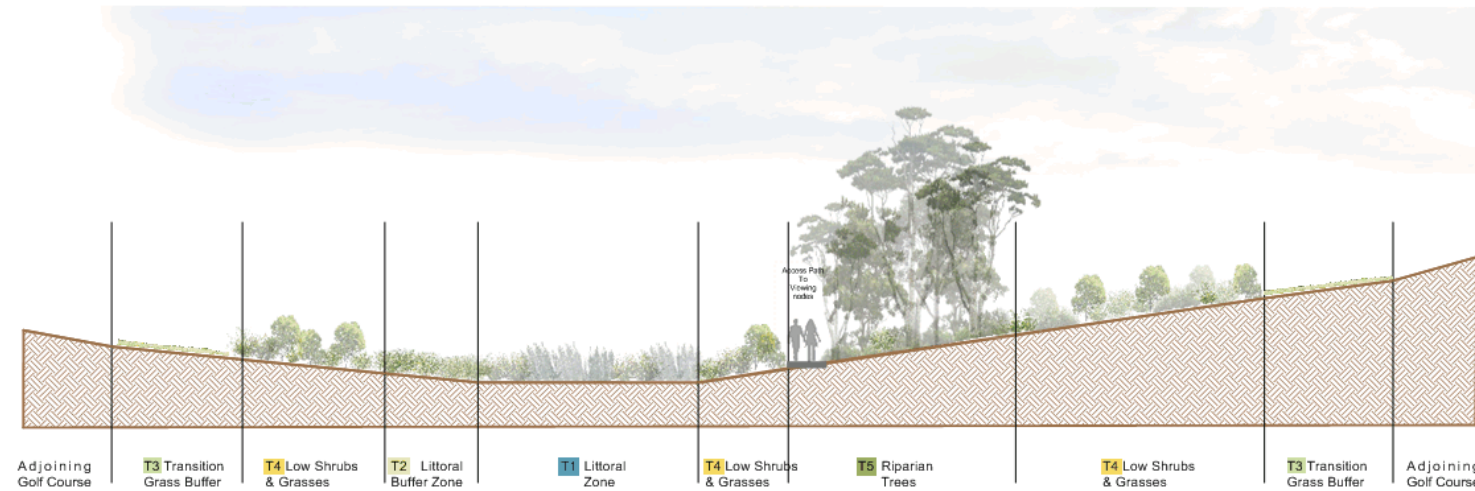
- Consider the existing lease boundaries and adjacent community uses
- Consider ecological values, and hydrological principles as identified by previous environmental reporting of the site
- Provide landscape treatments for the Southern Wetland including sectional views and projected vegetation profiles (typical sections) of the proposed revegetation areas (anticipated mature height)
- Detail a proposed remediation methodology for the inner southern wetland, including principles for weed management, replanting areas, suggested species and planting densities
- Identify the location of potential public access and environmental interpretive node in consideration of surrounding uses and associated activities

Wetland Management Objectives

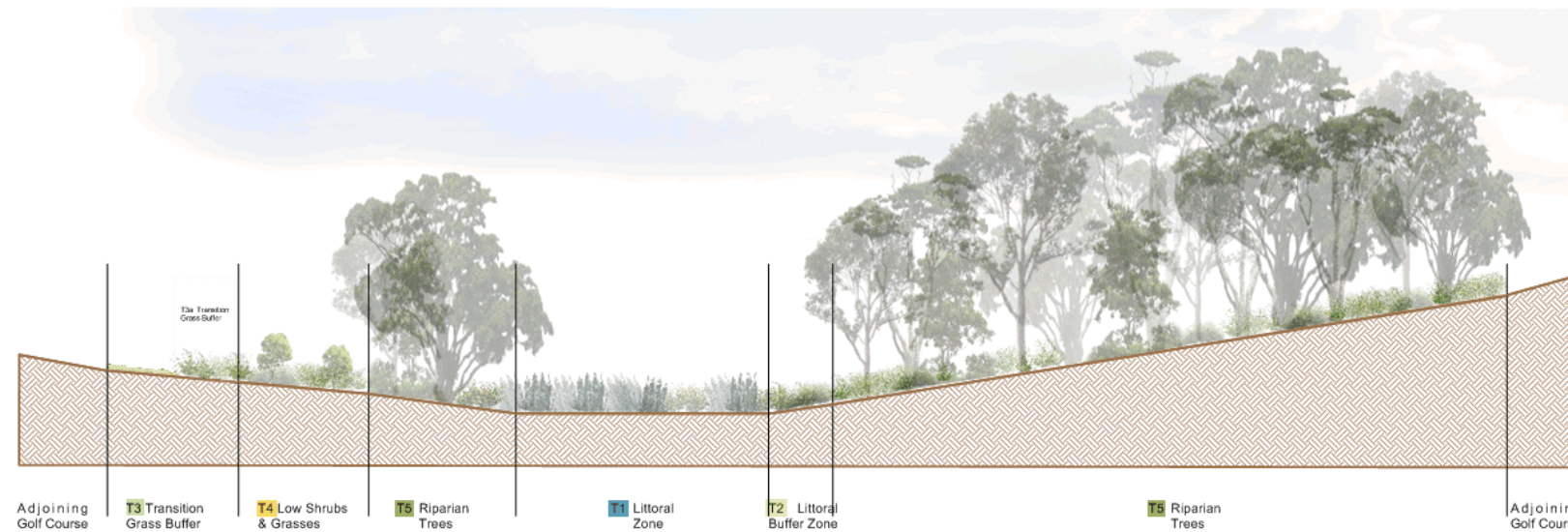
The Southern Wetland displays floristic composition and physical attributes which are derived from natural processes in response to the previous long history of grazing use and agricultural land management practices. Typically wetland systems are dynamic environments which react to changes of landscape management, hydrology and nutrient inputs, and impacts from stock or wildlife. The long history of cattle interactions with the Southern Wetland for both grazing (and probably drinking) would have been instrumental in the floristic composition, surface hydrology interactions and resultant habitat opportunities. For the Southern Wetland, the removal of grazing, changes to the drainage regime and changes to the surrounding land management practices will continue to influence the systems trajectory of change.

The objective for management of the Southern Wetland is to;

- Manage the system with a focus on the maintenance of existing habitat values and community
- Undertake weed management works without compromising native vegetation cover or impacting upon existing habitat values
- Mitigate potential changes to the hydrologic regime & water balance, and nutrient inputs as much as possible
- Encourage natural regeneration of native sedges and grasses to build system resilience and to maintain a balance between weed management, and plant coverage
- Establish buffer vegetation which is resilient, contributes to the water quality, weed management objectives and positively contributes to identified habitat values



TYPICAL SECTION AA



TYPICAL SECTION BB

*drawing based upon historical topography and aerial photography interpretation only.
 Boundaries of wetland and treatment zones to be confirmed on ground and subject to survey prior to works.
 Not based upon site topographic survey. Refer to drawing DS-01 for typical cross section locations and treatment layout

Key Ecological Considerations

Fifty-one native flora species including wetland sedges, grasses and riparian forest species were recorded during surveys conducted by Native Foresters in 2016. No flora of state or federal conservation significance were recorded.

Fauna surveys of the wetland confirmed that the wetland is diverse, with 42 species of birds recorded including a large number of passerines, waterbirds and waders. Survey has also confirmed raptors Black shouldered kites (*Elanus axillaris*) and Grey Goshawk (*Accipiter novaehollandiae*) and historical records exist of the federally listed and migratory Latham's Snipe (*Gallinago hardwickii*). Mammals recorded at the site include Long-nosed bandicoot (*Perameles nasuta*) and Northern brown Bandicoot (*Isodon macrourus*), Swamp Wallaby (*Wallabia bicolor*) and three species of introduced mammals. Reptiles include three species of skink and four snake species including Red belly black snakes (*Pseudechis porphyriacus*), Common green tree snake (*Dendrelaphis punctulata*), Small eyed snake (*Cryptophis nigrescens*) and Keelback (*Tropidonophis mairii*) - refer to Maleny Precinct Southern Wetland - Flora and Fauna Assessment produced by Native Foresters Oct 2016.

As works are undertaken on the site, these must ensure that the stormwater and nutrient inputs are maintained (as close as possible) to the previous landuse patterns which contributed to the present wetland arrangement. Weed management and revegetation plantings should also aim to preserve species composition, surface water availability and light availability over time. Tall riparian revegetation must be sited a sufficient distance from the wetland to not interfere with these processes, and/or is configured in a manner which still permits the open sunny aspect of the wetland.

Water Balance & Floristic Arrangement Considerations

The ephemeral nature of the wetland, and arrangement of macrophyte species and pasture grasses suggests that water inflows (and outflow retardation) are presently balanced to create a system which experiences seasonal drying for much of the winter and spring. The wetland is anticipated to have evolved as a product of the existing hydrological patterns. Changes to the current hydrological patterns will result in a change in the floristic composition trending towards a system dominated by either macrophytes (should conditions increase water inflows or detention period) or towards increases in pasture grasses (should conditions be allowed to dry).

For further information, the MCP Southern Wetland Management Plan and Operational Works Rehabilitation Plan provide an excellent summary of the technical requirements for ecotonal wetland interface communities.

Recreational Use Considerations

Several bird species of local and national environmental significance including migratory birds (such as Latham's Snipe) have been identified at the wetland. Opportunity exists for users of the broader Obi walking trail to access environmental interpretive and viewing nodes adjacent to the wetland which may provide environmental educational and bird watching opportunities (refer drawing DS-01). Two options for viewing nodes are provided on DS-01. A third possible future location is also nominated for consideration.

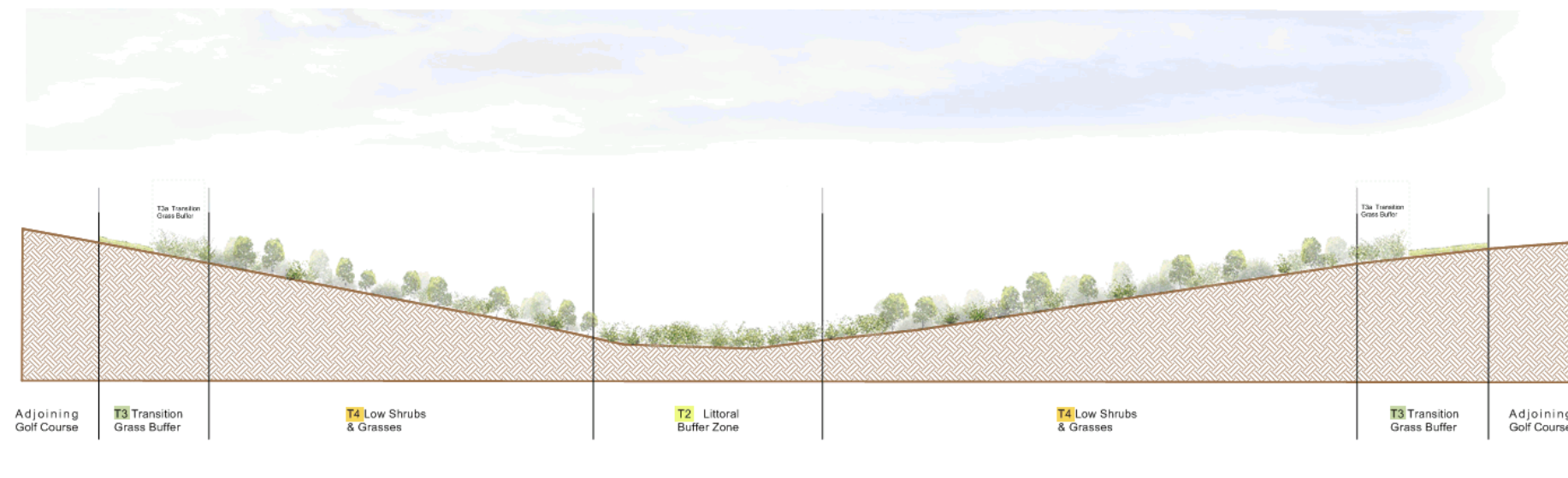
The adjacent Golf course has existing golf holes on the eastern and northern side of the wetland including the ninth hole which results in golf shots being played over the south eastern edge of the wetland area. The approved lease area for the proposed Stage 2 golf holes on the southern and western side of the course includes fairways which are within meters of the wetland littoral zone. Plantings in these areas must consider the mature growing height of plants selected for use in these areas.

The wetland is bounded by the golf course with a safe access point for the access trail from the crossing to the outlet to the Obi Obi Creek. The final alignment for the access trail to a proposed environmental interpretive and viewing node, should be determined on-ground to ensure safety and minimise golf course user conflicts.

The wetland also provides significant passive recreational benefits as it is viewed from several other locations around the Maleny Community Precinct site, including view lines from Parklands Drive, Beersheba Living Museum, Pattemore House and throughout the golf course through the patches of riparian trees.



APPENDIX B - MALENY COMMUNITY PRECINCT
 Southern Wetland Landscape Plan



**drawing based upon historical topography and aerial photography interpretation only.
 Boundaries of wetland and treatment zones to be confirmed on ground and subject to survey prior to works.
 Not based upon site topographic survey. Refer to drawing DS-01 for typical cross section locations and treatment layout*



APPENDIX B - MALENY COMMUNITY PRECINCT
 Southern Wetland Landscape Plan



PF1628 DS-03
 Sheet 3 of 5
 Rev D 27/01/2017
 Not to Scale

Landscape Treatments & Methodology

In consideration of the ecological values, recreational use expectations, and the treatments described in the MCP Southern Wetland Management Plan and Operational Works Rehabilitation Plan, the following Landscape Treatments were determined (see Drawing Sheet 1 - DS-01).

Planting works should utilise local endemic native plant species, where possible selected for their suitability in the landscape position and in consideration of the proposed long term management requirements. Generally works should be prioritised in accordance with the Southern Wetland Operational Works Rehabilitation Plan with the wetland weed control and littoral buffer established first (T1 & T2) and the woody weed management and establishment of shrub and riparian zones proceeding as the next priorities (T4 & T5). For works in the wetland littoral zones T1 & T2, these works should be programmed for the dry season and progress from the wetter zones (i.e. the southern outlet end) towards the drier zones, thus maximising seasonal access opportunities.

Undertaking weed removal by hand or herbicide application should adopt a mosaic treatment approach where the contractor only treats a maximum of 50% of each area per season. This will limit disturbance of habitat and limit potential water quality impacts which may arise from disturbing large areas per event.

Treatment zone T3 -Transition Grass Buffer is identified as infrequently mowed existing pasture (mostly Kikuyu). As a transition to planted areas, treatment zone T3a has also been identified as a dense barrier planting of Lomandra and Carex. An alternative strategy may be negotiated between Sunshine Coast Council and Maleny Golf Club where the littoral zone is in close proximity of existing or proposed golf fairways (refer DS-05 for T3 and T3a planting strategy).

Natural Regeneration Processes

The decision to undertake infill planting within the T1 and T2 littoral zone and littoral buffer zone areas should be made with a clear understanding of the potential natural regenerative capacity of the wetland. Historical aerial photographs document a long history of grazing and soil disturbance by cattle within the wetland which together with changed hydrologic regime resulted in the expansion of persistent emergent sedges within the wetland. This would be anticipated to have resulted in a significant existing seed bank resource within the wetland, which may rely upon seasonal conditions and lack of soil surface competition to germinate and provide natural regeneration. For example hand removal of woody weeds or pasture grasses at the end of the dry season within the T1 zone of the wetland may not require immediate infill planting. Particularly for species such as *Schoenoplectus mucronatus* and *Persicaria* (e.g. near the outlet) these species may only be present in small numbers when competition or seasonal factors are restricting growth/germination. If damp exposed soil within the wetland is permitted to germinate, it would be anticipated that some native species would be naturally recruited as part of this process.

Should natural regeneration not occur on disturbed areas following weed management activities, then intervention with infill plantings would be anticipated to occur the following season. If site access and plant densities allow, translocation or selective harvest of macrophyte clumps could be considered as an onsite method of revegetation. This provides the benefit of providing larger established clumps which provide better grazing resistance - however this technique may also result in more significant disturbance.

Species Selection and Infill Plantings

Planting works (where required) are anticipated to be infill or reinforcement plantings to support the existing native vegetation, and may be done in conjunction with, and subsequent to weed control activities in the wetland. Planting to area T4 Low Shrubs and Grasses treatment area is anticipated to be more broadscale planting as much of this area of the site contains native species to be retained in the landscape. Some of the shrub species in this treatment area such as the Narrow-leaved Wattle and the Bolwarra would benefit from a single formative pruning early in establishment to provide a low growing habit.

Refer to plant species table (adjacent) and typical planting arrangements on drawing sheet DS-05. Note that planting densities shown are intended as a guide only and for infill areas should include existing native plants in any density calculation.

All plants supplied would be anticipated to be grown from local provenance seed sources where practicable and grown as sun-hardened 50mm forestry tubestock. Site preparation and planting methodology should be in accordance with Section 5.9.1.7 of the South East Queensland Ecological Restoration Framework Manual.



View across wetland to Pattermore House



View East to existing riparian vegetation stand and woody weeds



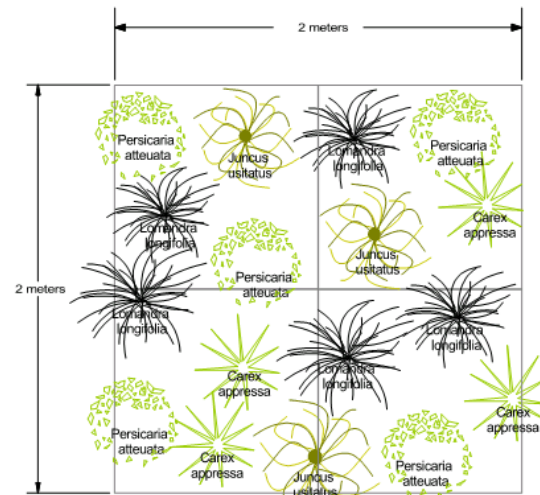
Wetland Outlet Structure



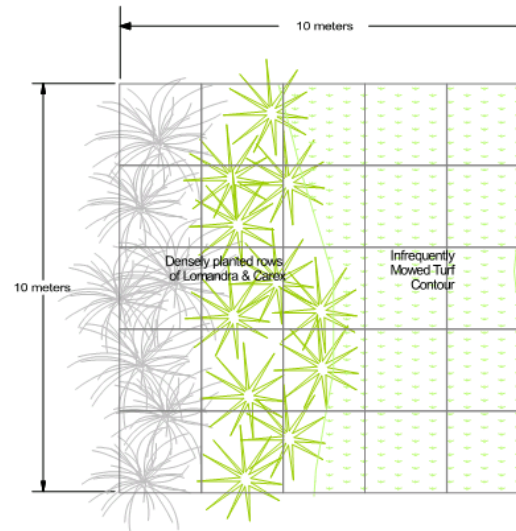
View north along 9th hole and wetland interface

| Southern Wetland - Embellishment Planting Species List | | | | |
|--|----------------------|----------------------------------|--|--------------|
| Zone | Description | Scientific Name | Common Name | |
| T1 | Littoral Zone | <i>Eleocharis dulcis</i> | Water Chestnut | |
| | | <i>Juncus prismatocarpus</i> | Bog Rush | |
| | Reinforcement | <i>Lepironia articulata</i> | Cigar Rush, Grey Rush | |
| | planting as | <i>Persicaria attenuata</i> | Large white Smartweed | |
| | required only | <i>Persicaria strigosa</i> | Hard Smartweed | |
| | (4 plants/m2) | <i>Philydrum lanuginosum</i> | Frogsmouth | |
| | | <i>Schoenoplectus mucronatus</i> | Triangle Sedge | |
| T2 | Littoral Zone Buffer | <i>Carex appressa</i> | Tall Sedge | |
| | | <i>Carex gaudichaudiana</i> | Tufted Sedge | |
| | Infill | <i>Juncus prismatocarpus</i> | Bog Rush | |
| | planting as | <i>Juncus usitatus</i> | Branching Bog Rush | |
| | required only | <i>Lomandra longifolia</i> | Mat Rush | |
| | (4 plants/m2) | <i>Persicaria attenuata</i> | Large white Smartweed | |
| | | <i>Philydrum lanuginosum</i> | Frogsmouth | |
| | Transition Grass | | | |
| | T3 | Buffer | <i>Pennisetum clandestinum</i> | Kikuyu Grass |
| | | | <i>(some areas - additional native grasses and sedges TBC SCC & Maleny Golf)</i> | |
| T3a | (2 plants/m2) | <i>Carex appressa</i> | Tall Sedge | |
| | | <i>Lomandra longifolia</i> | Mat Rush | |
| T4 | Low shrubs and | | | |
| | | | | |
| | Grasses | <i>Acacia longissima</i> | Narrow leaf Wattle | |
| | | (1-2.5m height) | <i>Carex appressa</i> | Tall Sedge |
| | (1-2 plants/m2) | <i>Dianella caerulea</i> | Flax | |
| | | <i>Eupomatia laurina</i> | Bolwarra | |
| | | <i>Lomandra longifolia</i> | Mat Rush | |
| | | <i>Sambucus australasica</i> | Yellow Elderberry | |
| | | <i>Cayratia clematidea</i> | Slender Grape | |
| | | <i>Callicarpa pedunculata</i> | Purple Callicarpa | |
| <i>Ptilidostigma rhytidispermum</i> | | Plum Myrtle | | |
| <i>Psychotria daphnoides</i> | | Smooth Psychotria | | |
| T5 | Riparian Trees | <i>Acacia melanoxylon</i> | Blackwood | |
| | | <i>Acmena smithii</i> | Narrow-leaf lilly pilly | |
| | Infill | <i>Alphitonia excelsa</i> | Red Ash | |
| | planting as | <i>Cinnamomum oliveri</i> | Oliver's sassafras | |
| | required only | <i>Gmelina leichhardtii</i> | White beech | |
| | (up to 25m height) | <i>Guioa semiglauca</i> | Native quince | |
| | | <i>Homalanthus nutans</i> | Bleeding heart | |
| | | <i>Myrsine variabilis</i> | Muttonwood | |
| | | <i>Pittosporum undulatum</i> | Sweet Pittosporum | |

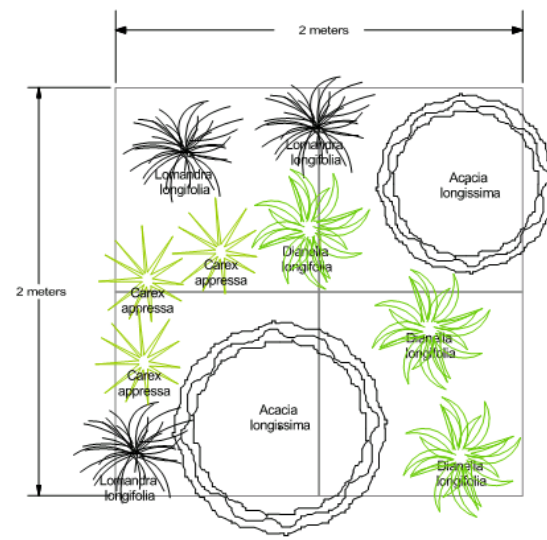




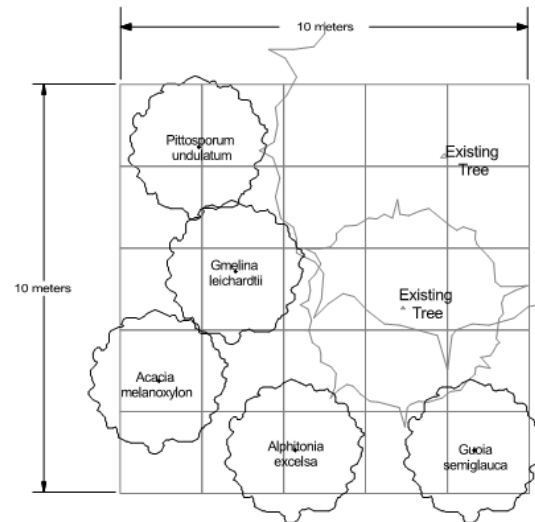
TYPICAL PLANTINGS - LITTORAL ZONE BUFFER - T2



TYPICAL TRANSITION GRASS BUFFER - T3a AND T3



TYPICAL PLANTINGS - LOW SHRUBS AND GRASSES AREA - T4



TYPICAL REINFORCEMENT PLANTINGS - RIPARIAN AREA - T5

Fertiliser & Mulch Treatments / Tubestock Protection

Blanket mulch and the use of "ring mulch" for tubestock in the T4 and T5 treatment areas is anticipated for planting areas. However, the final arrangements for mulch will be influenced by site mulch availability, suitability and budget constraints. Site mulch derived from vegetation management activities on the site, or weed free materials such as certified weed free sugar cane or wood chip may be considered for use on this site. No tree guards or mulch is proposed for use within the wetland littoral zone T1 or littoral zone buffer T2. No mulch is to be installed within any steep batter or invert of drains, unless derived from very coarse materials which have demonstrated batter holding capacity (such as coarse ground mulch products).

The use of fertiliser at the time of planting tubestock such as tree tablets or slow release pellets is not recommended for use on this site.

Weed Maintenance Considerations

Weed management should adopt a prioritisation framework approach which targets Restricted Invasive species and aggressive environmental weed species that pose a threat to floristic and habitat values of the wetland. This would include species such as Small leaved privet (*Ligustrum sinensis*), Broad-leaved privet (*Ligustrum lucidum*), Groundsel (*Baccharis halimifolia*) and Lantana (*Lantana camara*), and South African Pigeon Grass (*Setaria sphacelata*). Due to the limited seasonal inundation of the wetland, water weeds such as the identified Sagittaria (*Sagittaria platyphylla*) which has been identified near the outlet of the wetland would not be anticipated to dominate the wetland, however ongoing management of invasive aquatic weeds should also be a priority.

In this regard, species of pasture grasses and other low priority weed species that are noted as providing habitat for small birds and butterflies should not be routinely eliminated from the system, but only periodically controlled if observed to be overwhelming native vegetation. A mosaic management approach to weed control should be adopted where no greater than 50% of each treatment area is managed in each maintenance event. This will reduce potential for impacts upon habitat disturbance and potential water quality issues arising from availability of sediment and/or organics in the wetland during the wet season.

Large woody weeds such as the Camphor Laurel should be progressively removed and replaced with native vegetation to avoid potential erosion and minimise displacement of fauna.

Hand removal of seeding woody weeds such as Groundsel and Lantana is anticipated to be the preferred method within the watercourse. Herbicide spray should be used on species where hand removal is not as successful, or in areas where significant thickets of pasture grasses occur. The use of amphibian-friendly glyphosate formulations are required for use on the site as these formulations limit or exclude toxic surfactant additives. All herbicides must be prepared in accordance with manufacturers specifications (refer to Labels, MSDS). All weed removal methods and treatment methodology should be in accordance with bush regeneration best practice (refer South East Queensland Ecological Restoration Framework Manual), and advice as constantly updated through Biosecurity Queensland website (http://www.dpi.qld.gov.au/4790_7043.htm).

Weed management techniques are detailed further in the Operational Works Rehabilitation Plan produced for the Maleny Community Precinct.

Recommendations

To better inform management decisions for the Southern Wetland the following would be an advantage;

- Detailed bathymetric (or aerial) survey (including extent of vegetation cover) to permit more accurate definition of management zone boundaries and as a useful tool to track floristic changes over time
- Ongoing monitoring of water levels and macrophyte plant cover to inform future decisions relating to stormwater management and water inputs to the wetland
- SCC and Maleny Golf representatives to negotiate potential for inclusion of native grasses and sedges in the T3 treatment zone where proposed Stage 2 fairways are immediately adjacent to the littoral zone.



