LANDSCAPE DESIGN GUIDELINES

Adopted 13 June 2017

REVISION HISTORY:

REVISION	DATE	REVIEWED BY:	COMMENTS
Master	July 2013		Document created
1	March 2015	City Design and Asset Management	General formatting and document re-structure. New sections added: • *6.0 Landscape Design for SQUIDs* • *2.6 Landscape Compliance Report* • *2.7 Landscape Rectification Report* • *2.8 Landscape Asset Handover Report* • *Appendix E Suitable Species for SQIDS*
2	June 2017	Integrated Planning	Deleted Casuarina sp. From recommended species lists.
3	August 2019	City Design, DAC and Environmental Systems-Natural Assets	Updated Appendix C preferred street trees – species list revised; updated links to information on weed species.

EXECUTIVE SUMMARY

This guideline provides advice and guidance on how to ensure the adequate level of landscaping detail is prepared and presented for all forms of development in accordance with Council's current Development Control Plan (DCP). The Guideline provides information on:

- Landscape Documentation and Plans:
  - Landscape Site Analysis
  - Landscape Concept Plans
  - Landscape Master Plans
  - Landscape Design Reports
  - Landscape Construction Plan and Specifications
  - Landscape Compliance, Rectification and Maintenance Reports
- Landscape Design considerations for:
  - Public Reserves
  - Road Reserves
  - Car Parks
  - Stormwater Quality Improvement Devices
  - Lake Foreshore
  - Planting Design
  - Bushland Protection
- Landscape Units of Lake Macquarie
- Preferred species selections for street trees
- Native species lists for foreshore areas
- Species to protect against fire
- Native species lists for use in SQIDs

For landscape elements proposed on public land owned or managed by Council, undertake design and detailing in accordance with the LMCC Landscape Standard Details.

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1 INTRODUCTION – THE LAKE MACQUARIE VISION

Lake Macquarie is one of Australia's largest coastal lakes and is the predominant feature in the landscape of the Lake Macquarie area. The ecological, visual and recreational characteristics of the lake are extremely important to the Lake Macquarie community.

Lake Macquarie City Council (LMCC) is committed to preserving and improving the lifestyle opportunities offered in the Lake Macquarie area. Council is aiming to enhance urban development by preserving the quality of the natural environment, emphasising Lake Macquarie's bushland qualities and maintaining a quality lifestyle for the Lake Macquarie community.

With increasing population and expansion of the built environment, the very qualities that attract people to the lake could disappear as the quality of the environment is eroded. This decline can be avoided if the environment is treated as a highly valuable resource and given due consideration through quality landscape planning, design and construction. Landscape design is an important part of the planning process and should be addressed at the initial stages and demonstrate an integrated approach to all planning issues for the development.

These guidelines are a tool to achieve these aims and has been developed to assist applicants with the preparation of landscape plans for submission with development applications (DA) . It outlines landscape standards required as part of the development process and clarifies the responsibilities of developers and landscape consultants in providing landscape documentation.

For the purpose of these guidelines, **landscape** refers to all areas outside the building. It encompasses all disturbed and undisturbed areas on the site. Landscape analysis and planning is an important part of the site planning process.

These landscape standards apply to all land in the Lake Macquarie City Council area on which development is permitted. These standards advise developers and consultants of the minimum requirements for granting consent in the Development Application (DA) process and work in conjunction with Council's DCP.

1.1 LANDSCAPE OBJECTIVES

Design in the landscape is about achieving a physically and visually acceptable alliance between human habitation and the environment. The consideration of these aspects is extremely important to the overall success of a proposal, its long term establishment and maturation in the landscape.

2 LANDSCAPE DOCUMENTATION

The category of the development will determine what level of Landscape Plans are required to be included in a development application. Landscape categories are determined in accordance with the nature and scale of the development proposal. Each category of development requires a level of landscape documentation by a landscape consultant with qualifications and experience appropriate to the scale and significance of the proposed development. The requirements for the differing categories are outlined in the controls within Council's DCP.

Landscape consultants will need to work closely with other sub-consultants such as surveyors, engineers, and architects and need to be fully briefed on relevant documentation such as survey, civil and services drawings.

For more complex or significant developments including proposals for which Council will have management of in the future (parks, streetscape) it is highly recommended that pre-DA consultation is undertaken with Council officers. Site analysis and concept plans should be produced for this purpose.

2.1 LANDSCAPE SITE ANALYSIS

Preparation of a Landscape Site Analysis is critical in providing a foundation for the thorough investigation of landscape opportunities and constraints for both the site and its context. The Landscape Site Analysis should be based on the initial Site Analysis prepared at the beginning of the development process with additional information as required.

For further details see Council's *Site Analysis Guidelines*

For Category 2 or 3 development the following items must be included in the Landscape Site Analysis:

Checklist for Landscape Site Analysis Plan	Y	N	N/A
• Drawings at a scale that is appropriate for all detail to be clear and legible. • Details of surrounding land use • Existing open space adjoining or opposite the site, • Existing and proposed underground and above ground utilities including on-site wastewater system areas • Existing street services and proposed utilities including hydrant and substation locations. • Any natural drainage lines located within the site • The movement pattern of the sun in Summer and Winter and the prevailing seasonal wind conditions, • Vehicle access and roads adjacent to and near the site, • Pedestrian or cycling pathways adjacent to and near to the site, • All trees and vegetation on the site and on adjoining lots, and within the street, including actual canopy width, and heights of trees, and species particularly for local indigenous vegetation. • Any trees listed on the Significant Tree Register. • A preliminary arborist assessment of tree value (size, health, species) and recommendation for removal or retention • Tree protection zones for trees to be retained. • Existing cleared areas, • Mine Subsidence areas, • Proposed areas for construction purposes eg, temporary site access and			

Checklist for Landscape Site Analysis Plan	Y	N	N/A
driveways, stockpile areas, site compounds, tree protection zones or any areas for control during construction and rehabilitation. • Identify areas with poor natural surveillance or potential entrapment issues to be addressed through the Crime Prevention Through Environmental Design assessment. • Existing and proposed road layouts,			

2.2 LANDSCAPE CONCEPT PLAN

For more complex or significant developments including proposals for which Council may manage in the future (e.g. parks, streetscape) it is recommended that concept plans are used for pre-DA consultation with Council Officers.

Landscape Concept Plans should be provided in the form of a drawing or series of drawings. These drawings document the preliminary site planning alternatives and landscape design concept for the site. The Concept Plans should reflect opportunities and constraints identified in the Site Analysis. The Concept Plan should clearly express the design intent and ideas. These drawings form the basis for the preparation of a comprehensive Landscape Master Plan. The checklist below indicates the issues to be addressed in a Landscape Concept Plan.

Checklist for Landscape Concept Plan	Y	N	N/A
• All items contained in Checklist for Landscape Site Analysis Plan should be included. • The scale should be appropriate to the size of the site and complexity of the proposed design, • Proposed road layouts, bus stops, slip lanes, taxi areas and street parking that may impact on landscape proposals, • Car parking areas, parking space numbers and parking for people with disabilities, • Surrounding land uses as well as existing and proposed utilities, • Proposed and existing lot boundaries, • Vegetation to be removed and retained including notable trees on adjoining properties as well as areas of ecological value and/or ecological corridors, • Tree protection zones • Broad planting theme, • Broad distribution of paving and soft landscaping treatments, • Indication of site grading, site retaining and opportunities with preliminary cross sections where relevant to demonstrate proposals balance cut and fill, • Indicative location of proposed recreation facilities and/or infrastructure, • Drainage and open space corridors and links to open spaces, • Existing and proposed structures and important openings (windows, doors) • Bushfire hazard zones and fire trails if relevant, • Pedestrian and cyclist linkages,			

Checklist for Landscape Concept Plan	Y	N	N/A
• Signage theme and location, • Lighting, • Awnings and overhead structures affecting proposals. • Locations of key services such as waste collection areas, hydrants and substations. • Landscape consultant's declaration.			

2.3 LANDSCAPE MASTER PLAN

The Landscape Master Plan describes the ultimate proposal for the site including all stages of development.

The landscape proposal should demonstrate appropriate responses to issues identified in the Site Analysis and Landscape Design Report.

Checklist for Landscape Master Plan	Y	N	N/A
• All items contained in Checklist for Landscape Site Analysis Plan and Checklist for Landscape Concept Plan should be included. • The scale should be appropriate to the size of the site and complexity of the proposed design • Existing site information (boundaries, contours, underground/overhead services, easements, drainage lines) as outlined in the Site Analysis Plan Checklist, • Existing and proposed structures including those that overshadow the site, • Trees covered by Tree Preservation and Management, Significant Trees, trees to be retained and trees proposed to be removed due to the development including those identified in the Arborist report., • The outline of any major tree or building on adjoining property which the proposed development may affect in any way, • Proposed location of buildings/structures including finished floor levels, • Roadways, car parks, footpaths, driveways with description of materials and finishes, • Proposed tree planting and soft landscaping and their proposed treatment (planting arrangement, planting schedule (including botanical names), quantities, pot size, staking and planting details), • Sub-surface and surface drainage, • Fences and screens (materials and heights), • Location of site furniture, fixtures and lighting, • Indicative cross-sections of important features or areas of the site (entrances, watercourses, retaining walls), • Site protection works, • Fire mitigation works where necessary, • Entrance/s to subdivision or development, • Proposed water quality control devices, • The proposed location of all infrastructure servicing the site, • The proposed location of all free-standing signage structures,			

Checklist for Landscape Master Plan	Y	N	N/A
• Landscape consultant's declaration.			

2.4 LANDSCAPE DESIGN REPORT

The Landscape Design Report supports the Master Plan and outlines the overall landscape design objectives proposed for the site. It should briefly address how the proposal responds to issues identified in the site and functional analysis for the proposed development, how it relates to the surrounding urban and landscape setting and how the proposed development meets the objectives and controls of Council's DCP.

Checklist for Landscape Design Report	Y	N
• Project name and location, applicant's name and address, consultants name & contact details, • Proposed site use and key functional issues for the landscape design proposal, • Social and cultural issues, • Key issues identified in the site analysis, • Summary of the surrounding setting, • Summary of relevant issues identified in other reports and documentation, such as the aborist's report, scenic analysis, stormwater • How the landscape proposal responds to key issues, • How the landscape proposal meets the objectives and controls in Council's DCP, • Other options considered advantages & disadvantages. • Landscape consultant's declaration.		

2.5 LANDSCAPE CONSTRUCTION PLAN AND SPECIFICATIONS

These documents need to be read in conjunction with the Landscape Master Plan and should include final detailed and documented landscape plans and specifications to enable construction. This documentation should cover the matters detailed in the following checklist.

Note: for landscape planting works associated with Stormwater Quality improvement Devices, refer also to the **Engineering Guidelines to the DCP – Part 3 – SQID Guidelines** for detailed checklists covering the design, installation, maintenance and asset handover of SQIDs.

Checklist for Landscape Construction Plan and Specifications	Y	N	N/A
• Proposed design levels and original ground levels/contours, • Design details and materials of all surfaces, retaining walls, edging, embankments, furniture, planting, lighting and other structures, • Typical cross sections through the site, • Details of tree/bushland protection and erosion control measures, • Construction details for planting, paving and concrete jointing, edging and retaining walls, • Hose-cocks and irrigation systems, • Specification notes either on the drawings or in an associated report that adequately outline the quality of construction materials and contractual arrangements. • Specification notes for maintenance works required during the planting			

Checklist for Landscape Construction Plan and Specifications	Y	N	N/A
establishment period. • Specification notes outlining requirements for submissions, approvals and hold points for quality control, e.g. tree stock, soil testing and amelioration methods, maintenance log. • For trees to be installed in the public domain, ensure specifications reflect Councils standard specification LSD-SPEC-01 Typical Tree Planting, including Dispatch Tree Stock Inspection Checklists in accordance with AS2303-2015 Appendix C- Example A. • Consultant's declaration.			

2.6 LANDSCAPE COMPLIANCE REPORT

At practical completion and prior to issue of the occupation certificate, the landscape consultant may be required to inspect the site and submit a report to council providing written certification that the landscape works comply with the Landscape documentation approved by Council.

The certification is to outline any minor defects which must be rectified and any specific landscape maintenance requirements during the maintenance period.

Note: for landscape planting works associated with Stormwater Quality improvement Devices, refer also to the **Engineering Guidelines to the DCP – Part 3 – SQID Guidelines** for detailed checklists covering the design, installation, maintenance and asset handover of SQIDs.

Checklist for Landscape Compliance Report	Y	N	Action Required
• Provide dates of inspections • Have the works been installed in accordance with the design documentation? • Have all the required submissions, written approvals, certificates of compliance and warranties been provided as specified? • For trees installed in the public domain- have Dispatch Tree Inspection checklists in accordance with AS2303-2015 Appendix C- Example A been provided? • Have copies of the above been included with this report? • Has a maintenance plan and/or have maintenance logs been provided? • Are there any signs of damage? • Is any replanting required? • Is any weed removal required? • Is any mowing required? • Are the drainage systems functioning? • Have the landscaped areas been left tidy and free from litter/waste? • What, if any, rectification works are required? • Consultant's declaration.			

2.7 LANDSCAPE RECTIFICATION REPORT

The landscape consultant may also be required to carry out an inspection 8 weeks after practical completion to ensure that any necessary rectification works are carried out in accordance with the Landscape Compliance Report, and that an appropriate level of landscape maintenance is being carried out.

Submit a report to council providing written certification of compliance.

Note: for landscape planting works associated with Stormwater Quality improvement Devices, refer also to the **Engineering Guidelines to the DCP – Part 3 – SQID Guidelines** for detailed checklists covering the design, installation, maintenance and asset handover of SQIDs.

Checklist for Landscape Rectification Report	**Y**	**N**
• Provide dates of inspections • Have all matters raised in the Compliance report been actioned? • Does it appear that maintenance is being carried out in accordance with the Maintenance Plan? • Have inspection and maintenance logs been provided and attached with this report? • Consultant's declaration.		

2.8 LANDSCAPE ASSET HANDOVER REPORT

For works installed in the public domain, the landscape consultant may be required to inspect the site with a representative of Council and submit a Handover Report to prior to Council accepting responsibility of the assets.

Note: for landscape planting works associated with Stormwater Quality improvement Devices, refer also to the **Engineering Guidelines to the DCP – Part 3 – SQID Guidelines** for detailed checklists covering the design, installation, maintenance and asset handover of SQIDs.

Checklist for Landscape Asset Handover Report	**Y**	**N**	**Asset Owner Sign-off***
• Do the works appear to be functioning in accordance with the design – ie, vegetation is established; drains are operational. • No obvious signs of under-performance? • Is the plant establishment period complete? • Have the inspection and maintenance logs been provided and attached with this report? • Have the assets been inspected for defects and inspection dates and logs been provided? • Have WAEX plans been provided and attached with this report? • Has a street tree register (excel spread sheet) been returned to Council, identifying numbers and locations of Street Trees, which remain following the maintenance period? • For trees installed in the public domain- have Dispatch Tree Inspection checklists in accordance with AS2303-2015 Appendix C- Example A been provided? • Has all proprietary information and warranties been provided and attached with this report? • Have copies of the Landscape Compliance Report and the Landscape Rectification Report been provided and attached? • Consultant's declaration.			

*Asset owner before acceptance by LMCC

2.9 CONSULTANT'S DECLARATION

I (name in full) .....

have prepared this documentation and hold qualifications to meet the requirements of Lake Macquarie City Council for this category of development as outlined in Council's DCP. I have familiarised myself with all sections of Council's DCP and this guideline relevant to the landscape proposal for this development.

Category of proposal: .....

Qualification: .....

Institute obtained from: .....

Year of graduation: .....

Years of relevant post graduate work experience:

Signature: .....

3 LANDSCAPE DESIGN FOR PUBLIC RESERVES

Design Considerations:

1. Identify landscape assets and include or link these into public reserve e.g. open space network, bushland, drainage corridors.
2. Any street frontages in the design of public reserves are to have a minimum of 50 metres street frontage to allow the reserve to be easily accessed and allow unobscured public observation and supervision of the reserve
3. Where Stormwater Quality Improvement Devices are proposed on public reserves they are to be designed to:
    - Comply with LMCC SQID Guidelines
    - Comply with LMCC Water Cycle Management Guidelines
    - Contribute to the aesthetics and amenity of the area.
    - Restrict access to open water using dense vegetative barriers or fencing. Where fencing is required, the layout and design of fencing needs to respond to the contextual setting of the area, and comply with relevant Australian standards and Building Code of Australia requirements.
    - Provide a variety of habitats for wildlife specific to the area.
    - Utilise species suitable to their placement and function within the SQID design- refer to Appendices.
4. Ensure that car parks, roads, buildings and other structures do not encroach upon public reserves or contribute to the fragmentation of open space. Provide for vehicle control.
5. Provide for the movement of pedestrians and cyclists through public reserves to link with open space network and neighbourhood facilities e.g. Schools, community halls, playing fields. Pedestrian pathways to be a minimum 1500mm wide and where necessary cyclist/pedestrian pathways. Consider the safety of users through avoidance of hidden spaces.
6. Provide a 4000mm (minimum) access point to all parts of public reserves for maintenance/emergency purposes.
7. Identify measures to avoid erosion and compaction, protect and retain existing vegetation communities and topsoil, and include these in the overall design of the reserve.
8. In accordance with recommendations of the Australian Pesticides and Veterinary Medicines Authority (APVMA), avoid the use of Copper Chrome Arsenate (CCA) treated timber for play equipment, picnic tables, decking, handrails and the like.
9. Turf design for parks and sporting venues are required to be suitable for the intended use. Design to include sub soil profile and soil characteristics, drainage and irrigation. Irrigation systems must be designed by an Irrigation Australia certified designer. Designs to be reviewed to ensure they are able to be maintained to a reasonable standard.
10. Refer to the Landscape Standard Details for further guidance on the design and installation of landscape elements in Public Reserves.

Playground Specific Considerations:

1. All playgrounds (equipment and soft-fall) and accompanying seating must comply with Australian Standards and be discussed with Council at an early stage to determine Council requirements for each site.

2. Avoid the use of known branch dropping species in areas of high use such as playgrounds and park furniture, where falling branches may present an increased risk to people and property (refer to Section 8 of this document).
3. Shade must be provided for the playground and seating by locating facilities where they will benefit from existing shade or by planting shade trees suitable to the site.
4. For larger playgrounds with more equipment and where children and carers may stay for longer periods, a shade structure may be required over play equipment and furniture.
5. In locating and sizing shade planting and structures the pattern of solar movement and sun-shade patterns should be considered. Avoid locating structures under known branch dropping species (refer to Section 8 of this document).
6. Seating to be provided at each playground site. Style of seating must conform to Council's range or be approved by Council landscape architects.
7. Water (tap or bubbler) must be provided at each playground site unless stated otherwise.
8. All playgrounds built by developers must be certified following installation by an independent playground auditor for compliance with Australian Standards. The developer is responsible for obtaining the audit and certification.

4 LANDSCAPE DESIGN FOR ROAD RESERVES

Design Considerations:

1. Conserve significant landscape features and include in site design.
2. Consider street and site factors when selecting tree species for streets. Provide compatible landscape types in streetscapes with heritage considerations.
3. Integrate with open space networks and natural drainage lines and ensure drainage meets Councils stormwater treatment requirements.
4. Where Stormwater Quality Improvement Devices are proposed with the road reserve, ensure compliance with LMCC SQID Guidelines and LMCC Water Cycle Management Guidelines, using species suitable to their placement and function within the SQID design- refer to Appendices.
5. Position street trees to maximise shade opportunities for pedestrians and car parking and minimise disturbance to service lines.
6. Ensure that public landscapes are easily and economically maintained and create no liabilities for Council.
7. Use or reinstate native grasses or ground covers where possible to minimise maintenance and reduce sediment runoff. Where roads are being used as a hard barrier to bushland, use of weed free mulch and local indigenous species is required on the bushland side of the road.(Refer to Section 9 of this document for Bushland Protection Measures)
8. Where roads dissect wildlife corridors, plant species should be of a type to narrow gaps between roadside vegetation and facilitate arboreal wildlife movements.
9. Refer to the Landscape Standard Details for further guidance on the design and installation of landscape elements in Road Reserves.

5 LANDSCAPE DESIGN FOR CAR PARKS

Design Considerations:

1. Include any existing significant landscape elements in the landscape design e.g mature trees, and where possible incorporate these into the design.
2. Plant hardy domed tree species which will provide shade. Evergreen tree species are to form the basis of planting, with shrub planting to screen where necessary.
3. Ensure clear sightlines at entry/exit points to roads.
4. Use line marking, kerbs and wheel restraints to define parking areas rather than upright timber vehicle barriers.
5. Consider the use of contrasting pavement materials to define pedestrian and vehicular movement.
6. Ensure car park design meets Councils stormwater treatment requirements.
7. Where Stormwater Quality Improvement Devices are proposed within car parks, ensure compliance with LMCC SQID Guidelines and LMCC Water Cycle Management Guidelines, using species suitable to their placement and function within the SQID design- refer to Appendices.
8. Comply with the requirements for *Landscaping and Tree Planting in Car parks* for relevant Parts of the LMDCP.
9. Refer to Landscape Standard Details for detailed planting and pavement guidelines for car park areas.

6 LANDSCAPE DESIGN FOR STORMWATER QUALITY IMPROVEMENT DEVICES (SQIDS)

The key objectives of landscape design for SQIDs are:

- To ensure the selection of appropriate plant species for stormwater treatment whilst enhancing the overall natural landscape.
- To integrate the design of SQIDs within urban and open space environments.
- To create landscape amenity opportunities that enhance community and environmental needs.

Vegetation is a critical factor in the success of most Stormwater Quality Improvement Devices. Well-considered planting design contributes to the aesthetic, physical, chemical, biological and ecological functioning of the SQID.

As a general principle, Council requires SQID landscaping to be designed in accordance with the current Water by Design WSUD Technical Guidelines and Bioretention Technical Design Guidelines. These guidelines can be downloaded from http://waterbydesign.com.au/

Design Considerations:

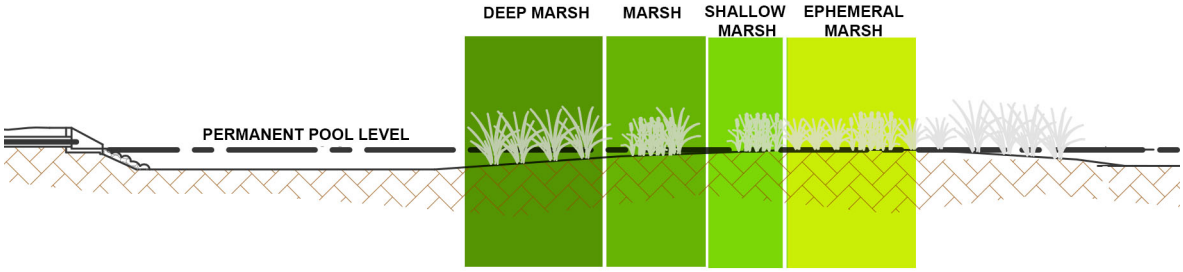
1. **CPTED:**

Landscape design of SQIDs need to accommodate the principles of informal surveillance, reducing concealement by providing open visible areas as required. Clear sight lines between roads, footpaths, activity areas and properties need to be maintained, where groundcovers and shrubs should not exceed 1m in height, and trees with a clear trunk height of 1.6m. Refer to the LMDCP Crime Prevention Through Environmental Design (CPTED) Guidelines for guidance on CPTED issues that need to be addressed..

2. APPROPRIATE PLANT SELECTION:

Planting for Stormwater Quality Improvement Devices may consist of the following vegetation types:

- **Macrophyte**s- consisting of:
    - Deep Marsh – from 0.5-0.35 below the permanent pool water level.
    - Marsh – from 0.35-0.2m below the permanent pool water level,
    - Shallow Marsh – from 0.2m to 0m below the permanent pool water level, this is typically where seasonal water level changes occur, planting should aid in stormwater quality improvement and provide aquatic habitat.
    - Ephemeral Marsh - from 0 to 0.2m above the permanent pool water level, this is typically where seasonal water level changes occur, planting should aid in stormwater quality improvement and provide aquatic habitat.



- **Turf** – for stormwater treatment and erosion protection, and where trafficable areas are required.
- **Groundcovers** - for stormwater treatment and erosing protection. Can form part of a littoral (embankment) zone on basins. Requires a dense and unviorm distribution to prevent preferred flow paths, prevent scour and create a uniform root zone.
- **Shrubbery** - for screening, glare reduction and character and habitat values. Can form part of a littoral (embankment) zone on basins
- **Trees** - for shading, character and habitat values.
- **Existing vegetation**- retention of existing trees may require diversion of flow paths to avoid the critical root zone of trees to be retained.

NOTE: Where the planting design contains canopy layers, shade tolerant species should be selected for the groundcover layer. Trees and shrubs should also be managed so that the groundcover layer is not out-competed. If this does occur, replacement planting and possible thinning of the upper vegetation layers may be required to ensure the pollutant removal capacity of the groundcover is maintained.

3. SPECIES:

While the Tables in Appendix E provide guidance on plant species selection suitable for the Lake Macquarie area, it is not intended as an exhaustive list and designers should ensure that the proposed planting schedule is suitable for each specific site and soil conditions, SQID functioning and broader landscape objectives.

4. SOURCING VEGETATION AND LEAD TIMES:

To ensure a planting specification can be accommodated, the minimum recommended lead time for ordering is 3-6months. The following sizes are recommended:

- Macrophytes- Viro- Tube or Strips- similar to a Flora edge or border strip system. Note: systems where several plants are grown together will maximise protection from water bird damage as

the birds find it difficult to lift the interlocking plants out of the substrate unlike single plants grown in tubes.

- Groundcovers – Viro-Tube, Forestry Tube or 140mm(2.5L) pots.
- Shrubs - Viro-Tube, Forestry Tube or 140mm(2.5L) pots.
- Trees – to suit design – Note: Lake Macquarie Council requires street trees to be installed at a min. 75L size; trees in Parks and Reserves are required to be installed at a min. 45L size. Mass planting of trees in revegetation projects or adjacent existing bushland may be installed at smaller sizes.

NOTE: Pot size selection may affect planting density requirements for SQIDS. Refer to Appendix E – Suitable Species for SQIDS for further details.

5. **TIMING FOR PLANTING:**

October and November are considered the most ideal time to plant vegetation in treatment elements. This allows for adequate establishment/root growth before the heavy summer rainfall period but also allows the plants to go through a growth period soon after planting resulting in quicker establishment. Planting late in the year also avoids the dry winter months, reducing maintenance costs associated with watering.

Construction planning and phasing should endeavour to correspond with suitable planting months wherever possible. In some circumstances it may be appropriate to leave temporary planting in place (if this is used to protect the swale during the building phase, e.g. turf over geofabric) and then remove this at a suitable time to allow the final swale planting to occur at the preferred time of year.

6. **SOILS:**

SQID soils are required to support plant growth and provide a filtration function.

The installation of soils should follow environmental best practices and include:

- Stripping and stockpiling of existing site topsoils prior to commencement of civil works.
- Soil testing of stockpiles.
- Deep ripping of subsoils using a non-inversion plough.
- Reapplication of stockpiled topsoils and, based on site testing results, remedial works or additives.
- Addition where necessary of imported topsoils (certified to AS4419-2003)

Filter media for Biortention devices must also meet the following requirements:

- Characteristics for plant growth should be confirmed with soil analysis in consultation with a horticulturalist.
- Saturated hydraulic conductivity should be between 100mm/hr and 300mm/hr to maximise plant establishment and survival.
- Filter media must not be made from dispersive or erodible materials
- Must be tested in accordance with the *Guidelines for Soil Filter Media in Biofiltration Systems* (FAWB Guidelines) at the frequencies specified in the Water By Design *Bioretention Technical Design Guidelines.*
- The surface of the filter media must be lightly compacted prior to planting using a single pass of a drum lawn roller.

The following minimum topsoil depths are required:

- Min 400mm deep for Bioretention filter media
- 150mm for turf
- 300mm for ground covers and small shrubs

- 450mm for large shrubs
- 600mm for trees

7. **MULCHING:**

Conventional mulching is not recommended as most loose mulch floats and run-off causes this material to be washed away, causing blockages to outlet structures and potentially increasing nutrient concentrations and the risk of algal blooms.

Maximise weed control by adopting high planting density rates. To batters, light-weight or medium-weight biodegradable erosion control matting is preferred to facilitate plant growth, however heavy-weight matting may be required in some instances to ensure sufficient erosion control. Consult with the SQID design team to ensure any matting specified is suitable for both erosion control and plant growth functions.

For Bioretention systems, use an organic friable mulch such as fine sugar cane or tea tree mulch, pinned down with a loose-weave jute mesh at 500mm centres.

The following should not be used as mulch for SQIDs:

- Long lasting organic mulches such as hardwood or pine chips
- Organic mulch that is likely to contain weed seeds
- Heavy duty matting such as 800gsm jute mat- unless required to address specific erosion control issues.
- Inorganic matting such as filter cloth

8. **VEGETATION ESTABLISHMENT AND MAINTENANCE**

Council's Engineering Guidelines to the DCP – Part 3 – SQID Guideline provides advice on the duration and maintenance requirements prior to asset handover. The Water By Design Guidelines provide assistance as to how these requirements can be achieved. The current Water by Design Guidelines can be downloaded from http://waterbydesign.com.au/

Refer to the Engineering Guidelines to the DCP – Part 3 – SQID Guidelines for detailed checklists covering the design, installation, maintenance and asset handover of SQIDs.

7 LANDSCAPE DESIGN FOR THE LAKE FORESHORE

1. Ensure planting is scheduled at higher densities with a broad range of species to enhance plant survival, increase the root mass and depth and allow a more diverse ecosystem to develop. Increased planting densities will improve the chance of establishment and to allow the new plants to out-compete weeds and provide each other with some support and shelter. For example, ground covers/grasses should be planted in the order of 10 plants per square metre.
2. Ensure that proper site preparation and use of appropriate fertilisers, soil modifiers, water absorbing materials, mulch (not deeper than 200mm) and in some cases shelter are considered to maximise the chances of plant establishment.
3. Maximise use of endemic species, many of which are identified in the Appendix B below, in foreshore planting.
4. Wholesale removal of existing vegetation, which is often introduced grasses, to plant native species may not be warranted in every situation. Introduced grasses can provide a stable transition from a beach to the land. Where an erosion scarp of up to 200mm has formed, grasses assist in holding the bank in place and may be adequate in limiting further erosion.
5. Where scarps are higher, such as greater than 250mm the shallower root depth and/or root mass of the grass does not hold the bank, undermining by wave action may continue and the bank collapses taking the grass cover with it. In this instance, native species with a longer root base may be more suitable.

6. Planting should occur as soon as possible after the construction of the foreshore stabilisation treatment. Delaying the planting leaves the foreshore vulnerable to erosion.
7. Planting in areas used for private land/water based recreation will require greater consideration to ensure damage through trampling does not result. Grouping or limiting planting areas and improving the growth of the grass component in active area will provide a better overall result.
8. Ongoing care of the plants, including replanting, watering, weed control, shelter control, restricting pedestrian access, is an essential factor in plant establishment.

8 PLANTING DESIGN

1. Give preference to local indigenous species (Refer to Appendices A and B for local landscape units and native species lists) and preference plant material of local provenance;
2. Exclude species that have the potential to invade local bushland, reduce bushland biodiversity and successfully compete to the detriment of local vegetation communities (e.g. by freely seeding, runner, shading, or be carried by watercourse into bushland);
3. Use, suitable native species selected from the species listed in a flora and fauna assessment that has been prepared to accompany a development proposal;
4. Maximise potential for healthy and vigorous plant growth by responding to specific site conditions (e.g. wind, soil types, solar-exposure, drainage, microclimate),
5. Respond to cultural requirements (e.g. non-local species may appropriate for some heritage applications) however, known environmental weeds should be avoided (refer to http://www.lakemac.com.au for a list of known environmental weeds);
6. Respond to aesthetic and amenity issues (e.g. visual impact when fully mature, scenic assessment issues, shading, appropriateness to landscape setting, screening, over-shadowing, dust control, solar access, drainage issues);
7. Respond to potential hazards (e.g. select and site trees to minimise property damage and personal injury – (refer Table 1 - Known Branch Dropping Species below), provide adequate shade, plant barriers to water bodies);
8. Respond to being in a bushfire prone area by meeting the requirements of Planning for Bushfire Protection and selecting species appropriate for the site that assist to guard against bushfire.(refer to Section 6 of this document for Bushfire protection measures);
9. Reduce future maintenance (e.g. plant dense understoreys, weed barrier species and multi-storeys to shade and compete out weeds, provide adequate mulch and natural drainage to optimise plant health);
10. Select plants with relevance to water-sensitive urban design principles;
11. Reduce turfed areas and replace with mulched garden beds, native ground covers and/or native grasses, to lower maintenance requirements, reduce use of fossil fuels for mowing, increase on-site harvesting of water, nutrients and sediments, and reduce reliance on soil additives such as fertilisers and herbicides;
12. Provide foraging sources and habitat for native fauna where appropriate (e.g. multi storeys, nectar, nut and fruit sources, trees overhanging water bodies);
13. Avoid species which produce fruit and attract Queensland fruit fly (owners or custodians of the land on which the plant is growing have a legal obligation to treat this pest or remove the tree).

Landscape Design should reflect the landscape character of the local area. This can be achieved by selecting local indigenous species preferably of local provenance, which have the following advantages:

14. General climatic suitability and tolerance of existing soil conditions;
15. Reinforcing and enhancing the unique landscape character of the Lake Macquarie area;

16. Maintaining scenic values of the Lake Macquarie region, particularly for highly visible locations and elements such as ridgelines, foreshore, headlands and major roadways, and highly visible buildings;
17. Reducing the likelihood of introducing bushland weeds to the area;
18. Maintaining natural nutrient balances (e.g. seasonal leaf drop by deciduous plants may impact on local watercourses, non-local species may increase the soil nutrient load by reliance on fertilisers and other additives);
19. Providing habitat and food source to maintain native fauna populations;
20. Maintaining genetic biodiversity;
21. Providing an incentive to nurseries to supply a wide range of local species suitable for cultivation;
22. Maximising the potential for healthy and vigorous landscapes by selecting local plant material responsive to local site conditions

KNOWN BRANCH DROPPING SPECIES

The following species should not be planted in areas of high use where falling branches may present an increased risk to people and property. The list includes but is not excluded to the following:

Table 1: Known Branch Dropping Species.

Acacia melonoxylon	*Angophora costata*
A. floribunda	*A. subvelutina*
Araucaria bidwillii - cones	*Eucalyptus alba*
E. botryoides	*E. camaldulensis*
E. citriodora	*E. cornuta*
E. grandis	*E haemastoma*
E. maculata	*E. mannifera*
E. mannifera ssp. maculosa	*E. megacornuta*
E. obliqua	*E. pilularis*
E. regnans	*E. rossii*
E. rubida	*E. viminalis*

(From: Australian Plant Study Group, 1990 *Grow What Where*, Viking O'Neal, Victoria, Australia)

9 LANDSCAPE DESIGN FOR BUSHLAND PROTECTION

Council views bushland as a valuable resource to be protected, retained and rehabilitated where possible. Bushland in good health minimises maintenance costs and maximises conservation of biodiversity. When proposing developments which impact on (large or small) areas of bushland the following is to be applied.

- depending on the size or type of development Council may require a flora study of the area documenting native communities and weeds
- do not use kikuyu or Rhodes grass in roadside rehabilitation or soil stabilisation works adjoining bushland. Native plants are preferred and are now available in turf and seed form.

- no site materials, green waste, plant or equipment is to be stockpiled, dumped or stored in bushland
- any material which has washed, blown or accidentally been placed into bushland is to be removed
- fire trails or roads are to be built on the perimeter within the boundary of the development and not encroach on remnant bushland areas
- the edge or interface of where the development meets bushland is to be addressed and measures preventing weed spread outlined
- do not remove scrub layer from bushland unless carrying out authorised fire mitigation works. Underscrubbing changes bushland ecology allowing weed invasion and eventually leads to tree layer decline and death
- erosion filter fencing is to be used during construction rather than hay bales which break down readily, spread weed seed and increase nutrient levels
- a buffer zone may be required which is in keeping with the Office of Environment and Heritage guidelines.

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APPENDIX A - LANDSCAPE UNITS OF LAKE MACQUARIE AREA

Map 1. shows the broad vegetation communities of the Lake Macquarie area. This information is based on soil and topographic information and is taken from two reports produced by the NSW Department of Land and Water Conservation on soil landscapes of the Gosford-Lake Macquarie and Newcastle areas. The species listed provide a typical example of common species found in that particular area with variations depending on microclimatic effects.

Vegetation Types are:

1. WATAGAN MOUNTAINS

Tall open forest and closed forest in gullies.

Common species on slopes with southerly aspect: *Eucalyptus maculata, E. umbra* and *E. siderophloia*. On drier northern and western slopes *Angophora floribunda, Eucalyptus punctata, E. tereticornis, E. oblonga* and *Allocasuarina torulosa* with grassy understorey.

Closed forests in sheltered gullies: *Ceratopetalum apetalum* and *Doryphora sassafras*.

2. DORA CREEK

Melaleuca linariifolia, M. styphelioides, Eucalyptus longifolia, E. robusta, E. saligna.

3. LAKE MACQUARIE LOWLANDS

Common tree species include *Angophora costata, Eucalyptus gummifera, E. haemastoma, E. capitellata, E. punctata* and *Allocasuarina torulosa.* Understorey species include *Lambertia formosa, Banksia spinulosa* var. *collina, B. oblongifolia, Leptospermum attenuatum, Isopogon anemonifolus, Melaleuca* spp. in poorly drained areas.

4. AWABA HILLS

Coastal heaths and woodlands with low open woodland along sheltered drainage lines.

Woodland species include: *Angophora costata, Eucalyptus haemastoma, E. maculata, E. capitellata, E. punctata* and *Allocasuarina littoralis.* Along sheltered drainage lines *Eucalyptus gummifera, and E. capitellata*.

Common heathland species: *Melaleuca nodosa, Allocasuarina distyla, Banksia integrifolia, B. spinulosa* var. *spinulosa, B. oblongifolia, Lambertia formosa, Hakea teretifolia* and mallee *E. capitellata* and *E. umbra*. Catherine Hill Bay has extensive *Themeda triandra* grasslands. In poorly drained areas *Melaleuca quinquenervia* and *M. nodosa.*

5. WARNERS BAY

Tall open forest with *Eucalyptus maculata*, *E. punctata, E. gummifera, E. umbra, E. paniculata, E. glaucina* and *E. piperita.* On poorly drained sites *Melaleuca* spp. and *E. robusta*.

6. KILLINGWORTH

Open forest with some woodland. Common species include *Eucalyptus maculata, E. eugenioides, E. umbra, E. fibrosa, E. paniculata* with understorey of *Themeda triandra, Leptospermum* spp. and *Xanthorrhoea* spp. *Eucalyptus punctata, E. propinqua, E. globoidea* common on upper slopes. *Melaleuca styphelioides* occurs on poorly drained sites. *E. capitellata* and *E. haemastoma* occur in southern extent of landscape unit. *Syncarpia glomulifera* and *E. piperita* on sheltered upper slopes.

7. SUGAR LOAF RANGE

Tall open forest of *Eucalyptus piperita, E. umbra, E. paniculata, E. punctata* and *Allocasuarina torulosa*. Understorey of *Doranthes excelsa, Xanthorrhoea* spp. *Macrozamia communis, Imperata communis* and *Themeda triandra*. *Angophora costata* and *E. gummifera* on exposed sites.

8. COCKLE CREEK

Lower Cockle Creek woodlands of *Angophora costata, A. floribunda*, *E. gummifera* and *E. piperita*. Upper Cockle Creek common species are *Eucalyptus robusta, E. umbra, E. amplifolia, E. deanei* with understorey of *Glochidion ferdinandi, Acacia parramattensis* and *Rapanea variabilis*. *Melaleuca* spp. occurs on poorly drained sites.

9. CHARLESTOWN

Angophora costata, E. haemastoma, E. gummifera, E. capitellata and *Allocasuarina torulosa.* Understorey species include *Lambertia formosa, Banksia spinulosa* var. *collina, B. oblongifolia, Leptospermum attenuatum, Isopogon anemonifolus, Melaleuca* spp. in poorly drained areas.

10. WHITEBRIDGE ESCARPMENT

On exposed slopes *Eucalyptus maculata* and *E. umbra*. Tall open forest of *Eucalyptus saligna, E. maculata* and *E. umbra with Syncarpia glomulifera*. In sheltered gullies species include *Synoum glanulosum, Ceratopetalum apetalum, Doryphora sassafras*, *Backhousia myrtifolia, Choricarpia leptopetala* and *Acmena smithii*.

11. REDHEAD BEACH

Species include *Angophora costata, Banksia serrata, B. integrifolia, Leptospermum laevigatum, Acacia longifolia* var. *sophorae, Eucalyptus botryoides, Allocasuarina torulosa* with understorey species of *Dillwynia glaberrima, Macrozamia communis, Ricinocarpus pinifolius* and *Pimelia linifolia.* Sheltered closed forest species include *Livistonia australis* and *Acmena smithii.* On poorly drained sites *Melaleuca quinquenervia.*

12. SWANSEA

As a beach landscape unit, common vegetation includes *Eucalyptus gummifera, E. pilularis, E. robusta, Banksia integrifolia, B. serrata, B. aemula, Angophora costata, Leptospermum laevigatum, Acacia longifolia* var. *sophorae* and *Melaleuca quinquenervia*. Understorey species include *Imperata cylindrica* and *Macrozamia communis*.

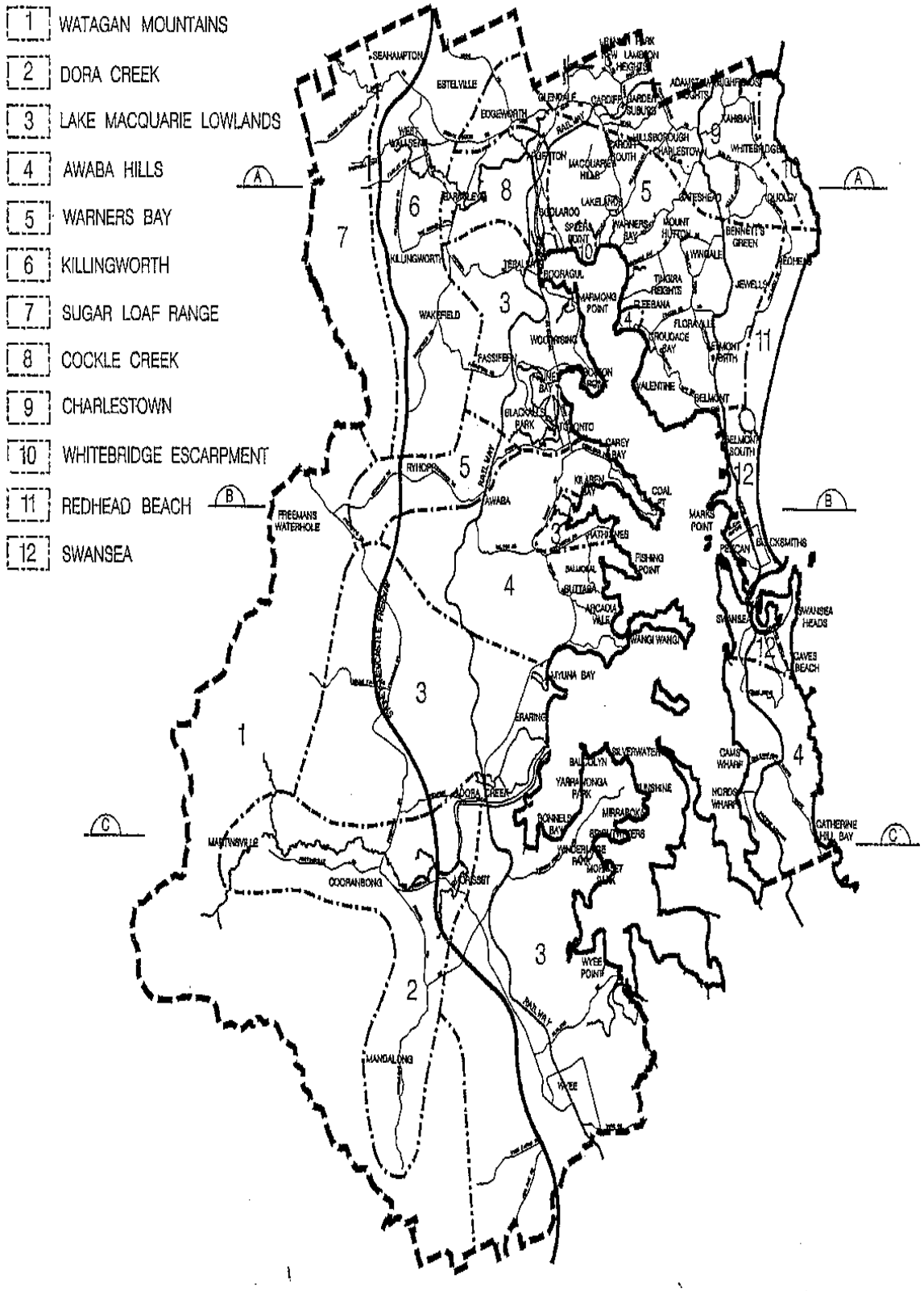

Figure 1 - Map - Landscape Units of Lake Macquarie

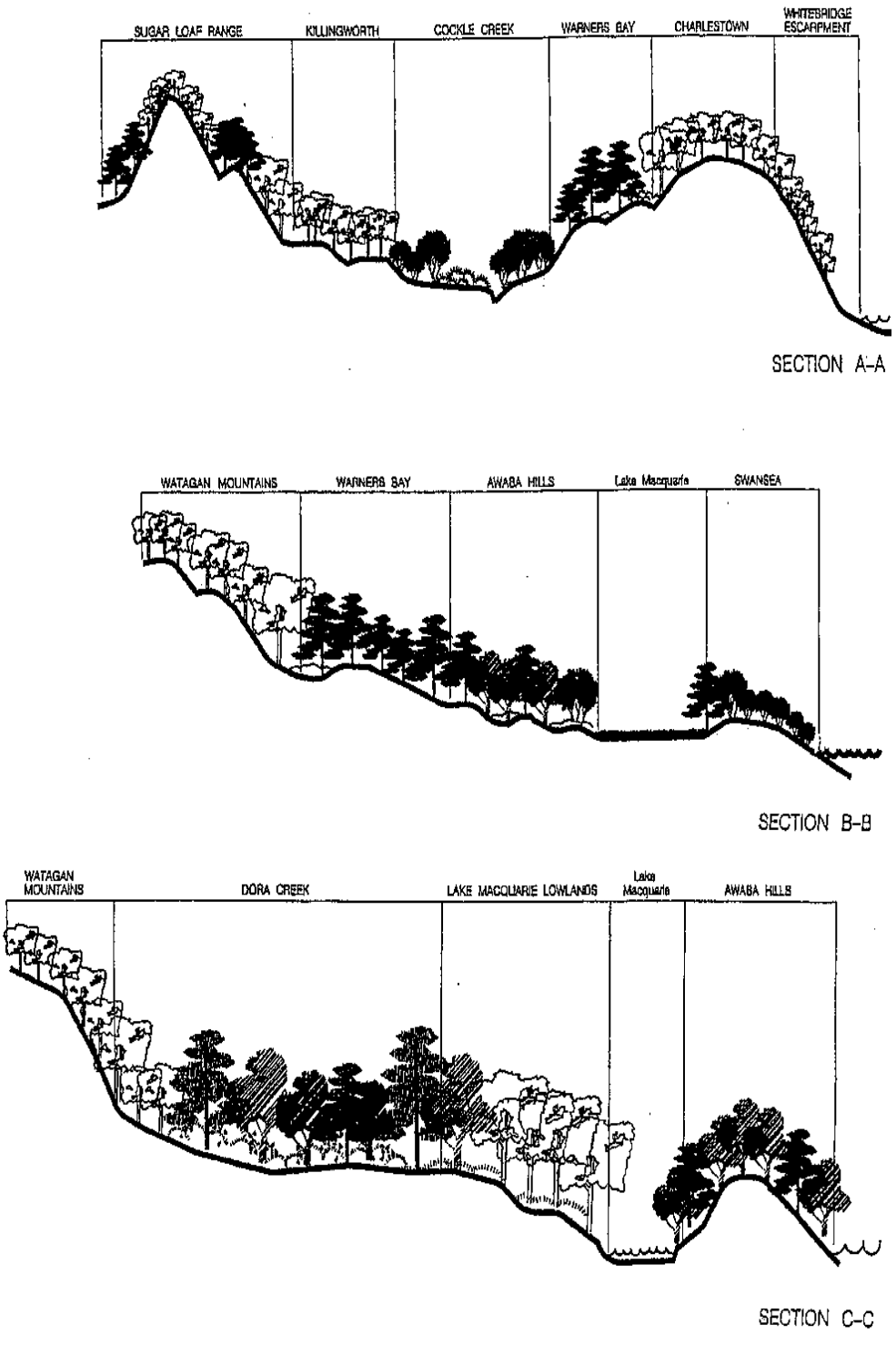

Figure 2 - Landscape Units of Lake Macquarie – typical profiles

APPENDIX B- NATIVE SPECIES FOR FORESHORE AREAS

Table 1 - Local Native Species Suitable for Streambank Planting

	Common Name	Botanical Name	Growth Form	Conditions	Position	Notes
AQUATIC	Water Plantain	Alisma plantago-aquatica	Erect, emergent herb to 1 m tall	Wet-damp	In water - waters edge	Tubers are edible
		Ludwigia peploides	Herb with creeping or floating vegetative stems, and erect flowering stems to 50 cm tall	Wet, ponds and creeks	In water	Yellow flower
	Swamp Lily	Ottelia ovalifolia	Submerged plant with floating leaves	Wet, ponds and slow-moving water	In water	Attractive white flowers
	Water Ribbons	Triglochin procerum	Submerged, tufted herb	Wet, permanent creeks	In water	Widespread and common; small, green fruits are edible
	Tall Spike-rush	Eleocharis sphacelata	Large rush to 2 m tall	Wet, standing water	In water	Forms extensive colonies
	Leafy Twig-rush	Cladium procerum	Erect, leafy sedge 1-1.5 m high	Edge of freshwater swamps on the coast	In water	
	Jointed Twig-rush	Baumea articulata	Sedge 1-2 m tall	Swamps	In water	Attractive plant with large, drooping inflorescence
GROUND COVERS	Native Violet	Viola hederacea	Creeping herb forming carpets	Moist and shady	Bank slope to floodplain	
	River Buttercup	Ranunculus inundatus	Small herb	Marshy, periodically inundated	Waters edge	

	Common Name	Botanical Name	Growth Form	Conditions	Position	Notes
	Swamp Pennywort	Centella asiatica	Creeping herb	Marshy, clay or sandy soils	Top of bank to floodplain	
		Hydrocotyle peduncularis	Creeping herb	Sheltered, marshy	Top of bank to floodplain	
	Scurvyweed	Commelina cyanea	Creeping herb	Moist, shady	Top of bank to floodplain	
	Swamp Goodenia	Goodenia paniculata	Small, tufted herb to 30 cm	Marshy conditions	Top of bank to floodplain	

	Common Name	Botanical Name	Growth Form	Conditions	Position	Notes
TREES	Rasp Fern	Doodia aspera	Small, erect fern with harsh fronds 20-40 cm high	Moist, shady	Bank to floodplain	Forms extensive colonies
	Prickly-leaved Paperbark	Melaleuca styphelioides	Tree 6-15 m	Swampy places, fresh and brackish	Top of bank to floodplain	Lower catchment
	Narrow-leaf Paperbark	Melaleuca linariifolia	Small tree to 8 m	Marshy ground	Top of bank to floodplain	Lower catchment
	Node-fruited Paperbark	Melaleuca nodosa	Shrub or small tree to 6 m	Marshy ground	Top of bank to floodplain	Lower catchment
	Broad-leaved Paperbark	Melaleuca quinquenervia	Tree 8-12 m	Marshes	Top of bank to floodplain	Lower catchment
	Willow Bottlebrush	Callistemon salignus	Shrub 3-4 m	Moist and swampy ground	Top of bank to floodplain	Lower catchment
	Cabbage Tree Palm	Livistona australis	Tall palm	Rainforest gullies	Top of bank to floodplain	
	Water Gum	Tristaniopsis laurina	Small, spreading tree 4-10 m	Moist	Top of bank to floodplain	Upper catchment
	Grey Myrtle	Backhousia myrtifolia	Spreading shrub 3-4 m	Sheltered gullies	Top of bank to floodplain	Upper catchment

	Common Name	Botanical Name	Growth Form	Conditions	Position	Notes
	Lilly Pilly	Acmena smithii	Shrub or tree	Moist	Top of bank to floodplain	Upper catchment
	Sandpaper Fig	Ficus coronata	Small tree 3-4 m	Moist	Top of bank to floodplain	Upper catchment
	Black Wattle	Callicoma serratifolia	Large shrub usually 4-5 m	Moist	Top of bank to floodplain	Upper catchment
	Cheese Tree	Glochidion ferdinandi	Shrub or tree usually 4-8 m	Moist	Top of bank to floodplain	Upper catchment
	Rough-barked Apple	Angophora floribunda	Small to medium tree	Moist valleys with deep, alluvial soils	Top of bank to floodplain	Upper western parts of catchment in valleys of Watagan mountains
	Sydney Blue Gum	Eucalyptus saligna	Tall tree 30-50 m	Moist	Top of bank	Upper catchment
	Swamp Mahogany	Eucalyptus robusta	Tree 20-30 m	Swampy ground, fresh and brackish	Floodplain (and steep foreshore land)	Lower catchment
LOW UNDERSTOREY	Swamp Water Fern	Blechnum indicum	Erect fern 50-150 cm	Swampy ground near the coast	Floodplain	
	Common Maidenhair Fern	Adiantum aethiopicum	Delicate fern 15-40 cm high	Damp, shady places	Bank to floodplain	Occurs in dense colonies
	False Bracken Fern	Calochlaena dubia	Soft fern to 1.5 m	Moist, shady conditions on sandy soils	Top of bank to floodplain	Forms dense colonies
	Spiny Mat-rush	Lomandra longifolia	Grass-like herb to 1 m	Wide range of habitats	Bank slope to floodplain (above high tide on foreshores)	Flowers / bases of new leaves are edible
	Tussock Rush	Juncus usitatus	Forms dense clumps to 1 m	Range of soils from moist to swampy sites	Bank slope and waters edge	
	Tussock Sedge	Carex appressa	Tussock to 1 m	Moist to waterlogged soils	Bank slope to floodplain	

	Common Name	Botanical Name	Growth Form	Conditions	Position	Notes
	Saw-sedge	Gahnia clarkei	Forms dense thickets to 2.5 m	Damp and marshy sites	Bank slope to floodplain	
	Club-rush	Bolboshoenus caldwellii	Erect sedge 50-100 cm tall	Brackish water	Waters edge	
	Marsh Club-rush	B. fluviatilis	See above	Freshwater	Waters edge	
	River Club-rush	Schoenoplectus validus	Forms dense stands to 1.5 m or more	Freshwater	Waters edge	

Table 2 - Local Native Species Suitable for Foreshore Planting

	Common Name	Botanical Name	Growth form	Conditions	Position	Notes
GROUNDCOVERS	Sand Couch	Sporobolus virginicus	Creeping, perennial grass	Saline	From upper tidal range to above high tide	
	Coast Couch	Zoysia macrantha	Creeping, perennial grass	Saline-brackish	Above high tide	
	Samphire	Sarcocornia quinqueflora	Small herb to 30 cm	Saline, frequent inundation	Upper tidal range	Edible
	Austral Seablite	Suaeda australis	Spreading herb to 40 cm	Saline, frequent inundation	Upper tidal range	Edible
	Pigface	Carpobrotus glaucescens	Creeping herb	Saline	Above high tide	Succulent leaves and pink, daisy-like flowers
	Sesuvium	Sesuvium portulacastrum	Sprawling herb	Saline	Above high tide	Thick, glossy leaves and pink, star-shaped flowers
	Scurvyweed	Commelina cyanea	Creeping herb	Moist, shady, saline - fresh	Above high tide	
	New Zealand Spinach	Tetragonia tetragonioides	Robust, leafy, sprawling herb	Moist, saline	Above high tide	Leaves edible, preferably cooked
	Sea Celery	Apium prostratum	Scrambling herb	Saline, infrequent inundation	Above high tide	Superior substitute for parsley
	Creeping Brookweed	Samolus repens	Herb to 30 cm	Saline, infrequent inundation	Above high tide	
		Lobelia alata	Small herb with white to blue flowers	Marshy, brackish	Above high tide	Sharply angular stems, flowers white to sky blue
	Bacopa	Bacopa monnieri	Small, creeping herb	Marshy, brackish	Within tidal range	
		Selliera radicans	Creeping herb, forming dense carpets under Swamp Oak	Marshy, brackish	Above high tide	

	Common Name	Botanical Name	Growth form	Conditions	Position	Notes
LOW UNDERSTOREY	Swamp Lily	Crinum pedunculatum	Large perennial herb with thick leaves to 2 m long and large white flowers	Marshy, brackish	Above high tide	Crushed leaves rubbed on skin are antidote to marine stings
	Sea Rush	Juncus krausii	Forms dense clumps 1-2 m high	Saline water	Above high tide	
		Isolepis nodosa	Erect sedge, forming clumps to 70 cm	Moist, saline - brackish	Above high tide	Spikelets form dense globular clusters near top of stem
		Baumea juncea	Slender, erect sedge to 1 m	Slightly saline	Above high tide	
		Cyperus laevigatus	Erect sedge 40-60 cm tall	Saline	Within tidal range	
		Bolboschoenus caldwelli	Erect sedge 50-100 cm tall	Brackish	Within tidal range	
	Streaked Arrow-grass	Triglochin striata	Small, erect, grass-like herb	Brackish, with strong flow	Within tidal range	
	Kangaroo Grass	Themeda australis	Tufted grass to 1 m high	Steep foreshore land	Above high tide	
	Boobialla	Myoporum insulare	Scrambling shrub 50-150 cm high	Saline	Above high tide	
	Sydney Golden Wattle	Acacia longifolia	Shrub 3-4 m high	Steep foreshore land	Above high tide	Golden yellow flowers
TREES	Grey Mangrove	Avicennia marina	Small tree 2-5 m	Saline water	Within tidal range	Fruit fall in December and are dispersed by the tide
	Coastal Banksia	Banksia integrifolia	Shrub or tree 6-16 m high	Saline	Above high tide	Underside of leaves is white
	Tuckeroo	Cupaniopsis anacardioides	Small to medium tree 3-10 m tall	Saline, from coastal headlands to littoral rainforest	Above high tide	
	Spotted Gum	Corymbia maculata	Tree to 30 m high	Steep foreshore land	Above high tide	Smooth, spotted bark

APPENDIX C – PREFERRED STREET TREES

Introduction

This list is for preferred street trees and is intended to guide the selection of preferred tree species for use in road reserves throughout the Lake Macquarie local government area. The list is to be referenced for the purposes of determining a suitable tree species where no existing appropriate plantings exist. The species list is not exhaustive and is updated on a regular basis.

This list is not intended to guide the selection of park and bush land trees, nor does it include shrubs and other non-tree vegetation.

A tree is defined as 'a perennial woody plant with secondary branches supported by a primary stem and usually having a distinct crown'.

Plant Names

Scientific nomenclature is used to identify genus and species and either cultivar or hybrid of a species. Proper naming of species is required to prevent misunderstandings and the use of inappropriate species. Street tree planting proposals must provide a current, complete, botanical name and if applicable cultivar, hybrid, or subspecies. A recognised common name or well-known synonyms can also be included.

Using the abbreviation spp. to indicate a group of species is not an acceptable naming protocol. The species, hybrid or cultivar is required.

Preferred Street Tree Species

The preferred street tree list includes forty species from 17 families. Thirty-five of the forty species are native. The following ranges of attributes have been considered in selecting these species;

- Visually appropriate to the Lake Macquarie landscape setting;
- Attractive appearance size, flower, colour, and texture;
- Reliable form and shape and stability suited to polluted urban environments;
- Arboricultural Association endorsed expected safe useful life;
- No excessive shedding of fruits, foliage, stems or leaves;
- Moderate mature size appropriate to available root and canopy volumes;
- Deep growing root formation not predisposed to surface rooting;
- Not or unlikely to become, an environmental weed; and
- Commercial availability.

All trees planted in public areas of Lake Macquarie local government area must be sourced from a nursery that complies with the Australian Standard AS2303 - Tree Stock for Landscape Use.

Undesirable Street Tree Species

Not all tree species are suitable for use as street trees. This list nominates some species or groups of species that have been determined to be unacceptable for use as street trees in Lake Macquarie. The reasons for undesirability include;

- Self-pruning of larger limbs;
- massive mature size of canopy or roots;
- invasive or high rooting root systems;
- susceptibility to insect and pathogen infestation;

- aggressive self-seeding or known environmental weeds;
- suckering or adventitious growth patterns;
- hazardous spines, thorns or appendages;
- toxic, allergenic or irritant properties;
- producing large fleshy fruits, or numerous small hard fruits;
- producing large amounts of shed bark, leaves, fruit or flowers;
- being a declared noxious weed; and
- high management costs.

The website https://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weedspeciesindex.pl?id=701 has a search facility that contains all of the species of plants declared noxious throughout Australia. NSW Weedwise provides a searchable list of NSW weeds at https://weeds.dpi.nsw.gov.au/ . Both these lists should be checked before proposing to use a plant species in the Lake Macquarie Council area and any plant listed as noxious in any jurisdiction in Australia will not be accepted.

Using Tree Species not on the Preferred List

The preferred species list is not exclusive and provides indicative information only. Selecting species from outside of the preferred list for street tree use is permitted but requires justification, considering all of the factors relevant to street tree selection for a particular site. Species on the undesirable tree list will not be supported for use. Applicants intending to plant species other than those on the preferred list must provide documented justification in support of the proposal or discuss with the LMCC Development and Certification Landscape Architect prior to lodgement. Council reserves the right to accept or reject any such proposals.

For every site, the landscape character and setting of the locality underpins tree selection. Environmental conditions also require consideration including soil type, drainage, aspect, local climatic conditions, available root and canopy space, existing species in the area and proximity to water bodies including Lake Macquarie. Deciduous tree species that annually shed large volumes of leaves into street drainage infrastructure impacting stormwater detention, tributaries or water bodies adjoining Lake Macquarie will not be supported.

Preferred Street Tree Species. NOTE: final street tree species selection is on the advice of Council officers or as per the conditions of consent.

BOTANICAL NAME	Family	COMMON NAME	COMMENTS	For use in narrow footpath areas <3.5m	For use in median strips (minimum 3m width)	For use under power lines	For use in salt air conditions	Expected height in cultivation	deciduous (Y/N/semi)
Acmena smithii	Myrtaceae	lilly pilly	Medium size tree, hardy versatile use, habitat value	n	y	n	n	20	n
Agonis flexuosa 'Burgundy' 'After Dark'	Myrtaceae	burgundy willow myrtle	Small tree with weeping habit, well drained soils	y	y	y	y	5-7	n
Angophora hispida	Myrtaceae	dwarf apple	Small to medium size local native tree, requires formative pruning of lateral branches	y	y	y	y	4	n
Angophora bakeri	Myrtaceae	rough barked apple	Short trunked with low branches, habitat value	y	y	n	n	10-15	n
Archontophoenix cunninghamiana	Arecaceae	bangalow palm	Single stem local native palm, self-cleaning, grows to a predictable size and shape, leaf drop potential problem above high use areas	y	y	n	n	20	n
Backhousia citriodora	Myrtaceae	lemon scented myrtle	Australian tree with narrow canopy, lemon scented leaves, sheltered location with good soil moisture	n	y	n	n	20	n
Backhousia myrtifolia	Myrtaceae	grey myrtle	Local native, medium/small tree, hardy	y	y	y	n	15	n
Banksia integrifolia	Proteaceae	coast Banksia	Medium sized local native, hardy, prefers sandy or well drained soils	y	y	n	y	12	n
Banksia serrata	Proteaceae	old man Banksia	Tolerant of a variety of soils, habitat value	n	n	y	y	7	n
Brachychiton discolour	Malvaceae	lacebark trees	Tolerant of range of climates and slow growing drought resistant, irritant hairs	n	n	n	n	15	y
Brachychiton 'Bella Pink' + selections	Malvaceae	Brachychiton	Reliable shade tree in well drained location, hardy once established	y	y	y	n	8-10	n

Buckinghamia celsissima	Proteaceae	ivory curl tree	Medium sized tree, showy fragrant flowers with habitat value, hardy, suits sheltered position with ample soil moisture	n	y	y	n	7	n
Caesalpinia ferrea	Fabaceae	leopard tree	Slow growing, hardy, fine leaved, frost free in warm microclimate	y	y	n	n	20	s
Callistemon citrinus	Myrtaceae	crimson bottlebrush	Medium sized floriferous tree, some formative pruning of low branches	y	y	y	y	8	n
Callistemon salignus	Myrtaceae	willow bottlebrush	Medium sized narrow canopied tree, some formative pruning of low branches	y	y	y	y	10	n
Callistemon cultivars 'Dawson River Weeper' 'Harkness' 'Kings Park Special'	Myrtaceae	bottlebrush	Small/ medium sized floriferous trees, some formative pruning of low branches, well suited to hardy sites	y	y	y	y	5-7	n
Calodendrum capense	Rutaceae	cape chestnut	Large tree native of south-eastern Africa, spectacular summer flowering and dense dark green foliage, suited to moist soil profile	n	n	y	n	12	n
Corymbia eximia	Myrtaceae	yellow bloodwood	Woodland tree with good canopy, floriferous with high amenity and habitat values	n	n	n	n	12	n
Corymbia eximia 'Nana'	Myrtaceae	dwarf yellow bloodwood	Suits dry conditions once established, tolerant of variety of soils, not frost tolerant	y	y	y	n	6-8	n
Corymbia ficifolia grafted cultivars incl. 'Wildfire' 'Summer Red' 'Summer Pink'	Myrtaceae	grafted flowering gums	Grafted varieties only, small floriferous trees, large woody fruits but not excessively produced, relatively short life span	y	n	y	n	6	n
Corymbia gummifera	Myrtaceae	red bloodwood	Tolerates variety of soils provided adequate moisture at establishment phase, good habitat value	n	n	n	n	15-20	n
Elaeocarpus reticulatus	Elaeocarpaceae	blueberry ash	Medium tree with narrow canopy, showy flowers and habitat value, colourful foliage, will tolerate shading	n	y	y	n	12	n

Eucalyptus sideroxylon 'Rosea'	Myrtaceae	red flowering ironbark	Adaptable tree suited for hardy low rainfall sites, great habitat values, single leader specimens important	n	n	n	n	10-15	n
Eucalyptus leucoxylon 'Euky Dwarf'	Myrtaceae	dwarf yellow gum	Small tree with open light canopy and smooth bark, hardy once established	y	y	y	n	5-7	n
Eucalyptus cultivar selections	Myrtaceae	Variety of cultivars producing hardy small trees suited to urban environments	Research required by landscape architect to determine suitability to site and root and canopy volumes, commercial availability	-	-	-	-	-	n
Flindersia australis	Rutaceae	Australian teak	large Australian tree, dense foliage, woody fruits not for near footpaths	n	y	n	n	40	n
Geijera parviflora	Rutaceae	wilga	Small local native tree, very hardy, small leaved, slow growing but of excellent habit and appearance, well-drained	y	y	y	y	8	n
Glochidion ferdinandi	Euphorbiaceae	cheese tree	Local native, dense foliage, suits coastal areas with some shelter, good soil moisture	n	y	y	y	10	n
Hibiscus tiliaceus 'Rubra'	Malvaceae	cottonwood	Coastal conditions, medium Australian tree, with spreading crown providing good shade amenity, deciduous in drought, suitable replacement for coral trees	n	n	y	y	15	n
Lagerstroemia indica cultivars		crepe myrtle	Variable range of small floriferous trees, require further research to determine suitability of site to cultivar	-	-	-	y	3-10	y
Magnolia grandiflora cultivars 'Little Gem' 'Exmouth'	Magnoliaceae	dwarf Magnolia	Large white flowers, slow growing but long lived, dislikes root damage and very dry conditions, prefers moist soil profile	y	y	y	n	5	n
Melaleuca bracteata	Myrtaceae	black tea tree	Adaptable species suitable for narrow footpath	y	y	n	y	5-8	n
Stenocarpus sinuatus	Proteaceae	firewheel tree	Medium size Australian tree, evergreen, showy red flowers, frost hardy once established, prefers moist soil profile	y	y	y	n	12	n
Syzygium selections	Myrtaceae	lilly pilly	Variety of cultivars that require research as to suitability to site, fruit drop a consideration	-	-	-	n	5-10	n
Tibouchina	Melastomataceae	Lasiandras	Small tree suited to warmer microclimates	y	y	y	n	6	n

'Alstonville'			with adequate soil moisture						
Tristaniopsis laurina	Myrtaceae	water gum	Local native small evergreen tree fits under power lines unless planted in wet areas where it grows much larger, open branching habit and canopy, prefers moist soil profile	y	y	y	n	15	n
Tristaniopsis laurina 'Luscious'	Myrtaceae	water gum	Compact tight canopy and low branching, prefers moist soil profile					10	
Ulmus parvifolia 'Todd', 'Burnley Select' 'Murray's Form'	Ulmaceae	Chinese elm	Small tree, hardy, semi-deciduous, fine leaved, attractive mottled bark , 'Todd' is an upright form, 'Murray's Form' is broad domed medium tree	y	y	y	n	10	semi
Waterhousia floribunda cultivars 'Sweeper' 'Green Avenue' 'Whisper'	Myrtaceae	weeping lilly pilly	Tolerant of high soil moisture, well suited to sheltered locations	n	y	n	n	10-15	n
Xanthostemon chrysanthus	Myrtaceae	golden penda	An evergreen small sized Australian tree, noted for its clusters of bright yellow flowers and habitat value. Low branching and only suitable for sheltered sites with soil moisture	y	y	n	n	15	n

Undesirable Street Tree Species

BOTANICAL NAME	COMMON NAME	COMMENTS
Acacia saligna	golden wreath wattle	Invasive in bushland, poor growth form
Casuarina spp. including *Allocasuarina* spp.	various	Problems with surface root systems and suckering, hard dry fruits problem on paved and lawn areas
Cinnamomum camphora	camphor laurel	invasive in bushland, excessive growth/size, allergenic, eco-toxin properties
Erythrina spp.	coral tree	Excessive growth, prone to windfall, deciduous with large leaves, environmental weed
Ficus spp.	fig tree	Most species too large for street use, invasive root systems
Fraxinus griffithii	evergreen ash	Known to be weedy in LMCC near waterways
Grevillea robusta	silky oak	Known to be allergenic particularly for tree workers, massive trunk develops
Koelreutaria paniculata	golden rain tree	Bushland weed and know to be weedy near waterways
Lagunaria patersonii	Norfolk Island hibiscus	Hazardous/ irritant fruits, invasive in bushland
Liquidambar styraciflua	Liquidambar	Too large for normal street use, deciduous with large leaf drop, invasive root system
Melia azedarach	white cedar	Deciduous, problems with processionary caterpillars each autumn, heavy fruit drop
Phoenix canariensis	Canary Island date pam	Spiny fronds hazardous, provides rat harbourage, invasive in bushland, massive size
Phoenix senegalensis	clustered date palm	Spiny fronds hazardous, provides rat harbourage, invasive in bushland
Pistacio chinensis	Chinese pistachio	Naturalised in some parts of NSW and considered a sleeper weed
Platanus spp.	plane trees	Excessive growth, known for invasive root systems, known allergenic, develops into tree of massive proportions
Populus spp.	poplars	Suckering species, excessive leaf drop
Pyrus spp.	Ornamental pear	Suckering species, leaf drop
Robinia psuedoacacia	black locust	Thorny, root suckers, environmental weed
Salix spp.	willow	Most species are declared noxious, invasive root systems, weeping willows require frequent pruning

Schefflera actinophylla	umbrella tree	Invasive root system, invasive in bushland
Syagrus romanzoffiana	Cocos palm	Large fleshy fruit and hard seed, provides rat harbourage, invasive in bushland, difficult to maintain clean appearance
Tecoma stans syn. *Stenolobium stans*	yellow bells	Invasive in bushland
Toxicodendron spp.	rhus tree	All species - hazardous sap causes skin irritation, invasive in bushland
Triadica sebifera syn. *Sapium sebiferum*	Chinese tallow tree	Invasive surface roots and naturalised in bushland
Pinus spp.	pine trees	large growth, large falling cones, large roots damaging infrastructure, invasive in bushland

APPENDIX D - VEGETATION SELECTION TO GUARD AGAINST FIRE

There is no such thing as a non-flammable plant, all plants will burn when exposed to enough heat.

Look for these features in plants when choosng vegetation for areas that may be susceptible to fire

- High salt content in leaves
- High moisture content in leaves
- Low volatile oil content in leaves
- Tall trees with full canopies and fine leaves for wind breaks or filter traps are better to stop smoke and catch sparks.

Points to remember when maintaining a fire retardant area around your property

- Plants may retain and accumulate dead leaves and twigs that will easily ignite. Ensure that dead plant matter is cleaned away from vegetation and stored or disposed in a safe way.
- Plants are less likely to burn if they have a high moisture content in their leaves, so ensure plants are kept well watered. However, take note of water restrictions, as water may be in short supply during a bad fire season.
- Long dead grass is a major fire hazard whilst short green grass can be used as a firebreak. Ensure grass is kept short, and watered well to prevent the travel of fire to your house.
- Gain extra information from Lake Macquarie City Council and the NSW Rural Fire Brigade about fire exclusion zones and other precautions that can be taken to ensure your house and property is fire safe.

The plant species list below are plants that are more fire retardant than others and are less likely to ignite during moderate intensity bushfires.

When purchasing plants, nurseries that specialise in native plants will be more likely to stock the plants contained within this list.

The plant species in the following list occur locally in the Lake Macquarie City Council region. The inclusion of the species in the list was determined from the following resources:

REMS vegetation survey (Lower Hunter & Central Coast Regional Environmental Management Strategy, http://www.lhccrems.nsw.gov.au/projects/biodiversity/LakeMacquarieSpecies.xls, 2002)

Species List from Cam's Wharf, Nesca Park, Green Point (Carl Fulton: Landcare vegetation officer, 2002),

Appendix 7: Regionally Significant Species (City of Lake Macquarie State of the Environment 1999-2000, 2000, p191-193)

Appendix1: Green Point Estate flora list (Green Point Estate Bushland Park: Conservation and Management of Native Vegetation, June 1995, Urban Bushland Management Pty. Ltd.)

The fire tolerance of the species in the list were determined from the following resources:

Some Fire-retardant Plants for the Blue Mountains, Living Near the Bush: a voluntary code and information guide for Blue Mountains' residents and visitors, (Blue mountains Conservation Society)

Factsheet 5: Australian Plants for Fire Prone Central Coast Gardens (Australian Plants Society, Central Coast Group in conjunction with the Central Coast Waste Board, Gosford City Council and Wyong Shire Council)

Tree Selection for Fire Prone Areas (NSW Rural Fire Service, http://www.bushfire.nsw.gov.au/communityfiresafety/fireguard03.htm,11/10/02)

Using fire-retardant plants for fire protection (Queensland Natural resources and mines, http://www.nrm.qld.gov.au/factsheets/pdf/tree/T51.pdf, 9/12/02)

Australian Plants for Fire Prone Areas (SGAP guide to Australian plants, http://farrer.riv.csu.edu.au/ASGAP/fire.html, 29/10/02)

Legend for Vegetation Community:

W-Widespread, RF-Rainforest, F-Forest, OF-Open Forest,WL-Woodland, SL-Scrubland, HL-Heathland, GL-Grassland, SD-Sand dunes, B-River/Creek Banks, M-Marshes/Wetlands, E-Estuary, C-Coastal, m-moist, s-saline, r-rocky soil/rocky outcrops, f-freshwater, b-brackish, d-dry, ss-sandy soil, cs-slay soil.

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair Fern	RF,mB,	Fern, 15-40cm	y	
Adiantaceae	*Adiantum formosum*	Giant Maidenhair	RF, mF, mB	Herb, erect 1m	Y	
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair fern	RF,mF,mB,r	Fern, 50cm	y	
Agavaceae	*Doryanthes excelsa*	Gymea Lily/ Giant Lily	WL,r,ss	Herb, Stem:3-4m	y	Y
Aizoaceae	*Carpobrotus glaucescens*	Pigface	SD:C,ss	Herb, Creeping	y	Y
Anarcardiaceae	*Euroschinus falcata*	Ribbonwood	RF	Tree, 10-20m	y	
Araceae	*Gymnostachys anceps*	Settler's Flax	RF	Herb, 2m	y	
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax/ Celerywood	mF, ss	Tree, 3-8m	y	
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	RF	Palm	y	Y
Arecaceae	*Livistona australis*	Cabbage-tree Palm	RF,C	Palm, 30m	y	Y
Ascelpiadaceae	*Tylophora barbata*	Bearded Tylophora	RF, ss, mB	Herb, Creeper	y	
Asteraceae	*Brachycome multifida*	Cut-leaf Daisy	OF-GL	Herb, <40cm	y	Y
Asteraceae	*Chrysocephalum apiculatum*	Yellow Button/ Common Everlasting Daisy	F, GL, ss	Herb, 7-60cm	y	Y
Asteraceae	*Senecio lautus*	Coast Groundsel	SD:C,r	Herb, Ground Cover	y	
Atherospermataceae	*Doryphora sassafras*	Sassafras	RF	Tree, 20-40m	y	
Avicenniaceae	*Avicennia marina*	Grey Mangrove	sE,sM, C	Tree, 4-6m	y	
Bignoniaceae	*Pandorea pandorana*	Wonga-Wonga Vine	W, RF,ss	Climber, Woody	y	Y
Blechnaceae	*Doodia aspera*	Rasp fern	RF	Fern, 20-40cm	y	
Caesalpiniaceae	*Senna odorata*	Cassia/ Southern Cassia	WL, ss	Shrub, 1-2m	y	Y

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Caprifoliaceae	*Sambucus australasica*	Yellow Elderberry/Native Elderberry	RF	Shrub, 2-4m	y	
Casuarinaceae	*Allocasuarina distyla*	Scrub She-oak	SL, HL, d,r	Shrub, dense, 4m	y	Y
Casuarinaceae	*Allocasuarina littoralis*	Black Sheoak	SL, WL, ss,r	Tree, 3-6m	y	Y
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	WL, F, m	Tree, 8m	y	Y
Celastraceae	*Cassine australis*	Red -fruited Olive Plum	RF	Tree, 6-10m	y	Y
Chenopodiaceae	*Atriplex australasica*	Saltbush	sE, sM	Herb, Sprawling annual	y	
Chenopodiaceae	*Atriplex cinerea*	Grey Saltbush	SD,C	Shrub, Erect 1m	y	
Chenopodiaceae	*Einadia nutans*	Native Seaberry/ Saloop-bush	C	Herb, Small weak 1m	Y	
Chenopodiaceae	*Sarcocornia quinqueflora*	Samphire/ Glasswort	sM, C	Herb, leafless 30cm	y	
Chenopodiaceae	*Suaeda australis*	Austral Seablite	sM, bE	Herb, 40cm	y	Y
Commelinaceae	Aneilema acuminatum		RF	Herb, 40cm	y	
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	W	Herb	y	Y
Commelinaceae	*Pollia crispata*	Pollia	RF	Herb, 80cm	y	
Convolvulaceae	*Dichondra repens*	Kidney Weed	RF, ss, m	Herb, Creeping	y	
Cunoniaceae	*Aphanopetalum resinosum*	Resin vine/ Gum vine	RF	Climber, woody	y	Y
Cunoniaceae	*Callicoma serratifolia*	Callicoma/ Black Wattle	RF, m,ss	Shrub, 4-5m	y	Y
Cunoniaceae	*Ceratopetalum apetalum*	Coachwood	RF,ss,mB	Tree, 15m	y	
Cunoniaceae	*Schizomeria australis*				y	
Cyperaceae	Carex appressa	Tall Sedge	W, RF, M, ss	Sedge, 70-100cm	y	Y

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Cyperaceae	*Isolepis nodosus*	Knobby Clubrush	mC	Sedge, 70cm	y	Y
Dilleniaceae	*Hibbertia scandens*	Golden Guinea Flower	W	Climber	y	Y
Dioscoreaceae	*Dioscorea transversa*	Native Yam			y	
Ebenaceae	*Diospyros australis*	Black Plum	RF	Shrub, Small Tree	y	Y
Elaeocarpaceae	*Elaeocarpus obovatus*	Hard Quandong	RF	Tree, Medium	y	
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	WL, ss, mf,r	Tree, 4-10m	y	Y
Euphorbiaceae	*Baloghia inophylla*	Brush Bloodwood	RF	Tree, 6-10m	y	
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	RF, ss, mB	Shrub, 2-3m	y	
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree	RF,ss,mB	Tree, small	y	Y
Euphorbiaceae	*Omalanthus populifolius*	Bleeding Heart	RF	Shrub, 2-4m	y	Y
Eupomatiaceae	*Eupomatia laurina*	Bolwarra	RF	Shrub, Small Tree	y	Y
Fabaceae	*Jacksonia scoparia*	Dogwood	dF,ss,r	Shrub, 3m	y	
Fabaceae	*Kennedia prostrata*	Running Postman	HL,WL	Herb, Creeper	y	Y
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla	WL,W,r	Herb, Attractive scrambler	y	Y
Fabaceae (Faboideae)	*Kennedia rubicunda*	Red Kennedy Pea/ Dusky Coral Pea	W	Herb, Attractive scrambler	y	Y
Fabaceae (Mimosoideae)	*Acacia binervata*	Two-veined Hickory	mF, C, RF, ss	Tree, Dense 16m	y	
Fabaceae (Mimosoideae)	*Acacia brownei*		WL, ss	Shrub, spiky 1m	y	
Fabaceae	Acacia bynoeana	Bynoe's Wattle	HL, WL	Shrub, low	y	

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
(Mimosoideae)						
Fabaceae (Mimosoideae)	Acacia cheelii				y	
Fabaceae (Mimosoideae)	*Acacia decurrens*	Sydney Green Wattle	F	Tree, 10-16m	y	
Fabaceae (Mimosoideae)	*Acacia echinula*	Prickly Wattle	OF, HL	Shrub	y	
Fabaceae (Mimosoideae)	*Acacia elongata*	Swamp Wattle	HL,WL, m	Shrub, 3m	y	
Fabaceae (Mimosoideae)	*Acacia falcata*	Sickle Wattle	WL, cs,	Shrub, open 5m	y	Y
Fabaceae (Mimosoideae)	*Acacia filicifolia*	Fern-leaved Wattle	OF, WL	Tree, small	y	
Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally/White Sallow Wattle	B	Shrub, Dense 2-4m	y	Y
Fabaceae (Mimosoideae)	*Acacia howittii*	Sticky Wattle	m	Tree	Central Coast	Y
Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory, Lightwood	me,cs	Shrub, Small tree, 4-10m	y	Y
Fabaceae (Mimosoideae)	*Acacia irrorata*	Green Wattle	mB, ss	Tree, 15m	y	Y
Fabaceae (Mimosoideae)	*Acacia linifolia*	Flax-leaved Wattle	HL,WL	Shrub, 2m	y	
Fabaceae (Mimosoideae)	*Acacia longifolia*	Sydney Golden Wattle	F,m	Shrub, 3-4m	y	Y

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Fabaceae (Mimosoideae)	*Acacia maidenii*	Maiden's Wattle	RF, C	Tree 12m	y	
Fabaceae (Mimosoideae)	*Acacia myrtifolia*	Red-stemmed Wattle	WL,ss	Shrub, erect .5-1m	y	Y
Fabaceae (Mimosoideae)	*Acacia obtusifolia*		WL	Shrub, erect 3m	y	
Fabaceae (Mimosoideae)	*Acacia parramattensis*				y	
Fabaceae (Mimosoideae)	*Acacia prominens*	Golden Rain Wattle/Gosford Wattle	WL	Shrub, erect 3-6m	Central Coast	
Fabaceae (Mimosoideae)	*Acacia quadrilateralis*				y	
Fabaceae (Mimosoideae)	*Acacia sophorae*	Coastal Wattle	SD,ss	Shrub, 3m	y	Y
Fabaceae (Mimosoideae)	*Acacia stricta*	Straight Wattle	OF	Shrub, 3m	y	
Fabaceae (Mimosoideae)	*Acacia suaveolens*	Sweet Wattle	HL, WL	Shrub, 1.5m	y	Y
Fabaceae (Mimosoideae)	*Acacia terminalis*	Cedar Wattle/ Sunshine Wattle	HL, WL,m	Shrub, 1.5m	y	Y
Fabaceae (Mimosoideae)	*Acacia ulicifolia*	Prickly Moses	WL, d	Shrub, 1.5m	y	Y
Fabaceae (Mimosoideae)	*Pararchidendron pruinosum*	Snow Wood	RF	Tree 4-8	y	
Flacourtiaceae	*Scolopia braunii*	Scolopia/ Flintwood	RF	Tree 3-8m	y	

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Goodeniaceae	*Scaevola aemula*	Fairy fan flower		20cm	y	Y
Goodeniaceae	*Scaevola albida*	Pale fan flower	OF, cs	Herb, 30-50cm	y	Y
Goodeniaceae	*Scaevola calendulacea*	Scented Fan Flower	SD,C	Herb	y	Y
Goodeniaceae	*Scaevola ramosissima*	Snake-flower	WL, ss	Herb, Scrambling .5-1m	y	Y
Juncaceae	*Juncus usitatus*	Common Rush	M,E,m	Sedge, <1m	y	Y
Lauraceae	*Cryptocarya glaucescens*	Brown Beech/ Jackwood	RF	Tree, 15-30m	y	
Lauraceae	*Cryptocarya microneura*	Murrogun	RF	Tree, 15-30m	y	
Lauraceae	*Cryptocarya rigida*	Forest Maple			y	
Lauraceae	*Endiandra discolor*	Rose Walnut	RF	Tree	y	
Lauraceae	*Endiandra sieberi*	Corkwood	RF, ss, mWL	Tree, 20-30m	y	
Lauraceae	*Neolitsea dealbata*	White Bolly Gum	RF	Tree, Tall	y	
Liliaceae	*Dianella caerula*	Paroo Lily/ Blue Flax Lily	WL, ss	Herb, Tufted 50cm	y	Y
Lobeliaceae	*Lobelia alata*		CB,CE	Herb, 10-50cm	y	Y
Luzuriagaceae	*Geitenoplesium cymosum*	Scrambling Lily	RF, F	Climber, wiry	y	
Meliaceae	*Melia azedarach*	White Cedar	W	Tree, 3-8m, Deciduous in Winter	y	Y
Meliaceae	*Synoum glandulosum*	Scentless Rosewood	RF, m	Shrub, 1.5-3m	y	
Monimiaceae	*Wilkiea huegeliana*	Wilkiea	RF	Shrub, 2-4m	y	
Moraceae	*Ficus coronata*	Sand Paper Fig/Creek Sandpaper fig	RF,B	Tree, 3-4m,Straggly	y	Y
Moraceae	*Ficus fraseri*	Fraser's Sandpaper Fig		Tree, Small, fast	y	

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
				growth		
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	RF	Tree, 30-50m	y	Y
Moraceae	*Ficus obliqua*	Small-leaved Fig	RF	Tree, <40m	y	Y
Moraceae	*Ficus rubiginosa*	Port Jackson Fig/Rusty Fig	RF, B,r	Tree, 4-10m	y	Y
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn	RF	Shrub, 2-3m	y	
Moraceae	*Streblus brunonianus*	Whalebone Tree	RF	Tree, 3-8m	y	
Myoporaceae	*Eremophila debilis*	Amulla	M,OF	Shrub, 1m	Central Coast	Y
Myoporaceae	*Myoporum acuminatum*	Mangrove boobialla	RF,E, C, F	Tree, 4-6m	y	
Myoporaceae	*Myoporum boninense*	Boobialla	rC, ss	Shrub, Scrambling .5-1.5m	y	
Myoporaceae	*Myoporum parvifolium*	Creeping boobialla			Central Coast	Y
Myrsinaceae	*Rapanea howittiana*	Turnipwood/ Brush Muttonwood	RF	Tree, 3-10m	y	Y
Myrsinaceae	*Rapanea variabilis*	Mutton Wood	F, ss	Shrub, 2-3m	y	Y
Myrtaceae	*Acmena smithii*	Lilly Pilly	RF	Tree, 20m, Fast growing	y	Y
Myrtaceae	*Angophora costata*	Sydney Red Gum/ Smooth-barked Apple	W	Tree	y	Y
Myrtaceae	*Angophora hispida*	Dwarf apple	CF	Shrub, <4m	Central Coast	Y
Myrtaceae	*Backhousia myrtifolia*	Grey Myrtle	RF, mB	Shrub, 3-4m	y	Y

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Myrtaceae	*Choricarpia leptopetala*	Brush Turpentine			y	
Myrtaceae	*Eucalyptus maculata/ Corymbium maculata*	Spotted Gum	W, OF	Tree, <30m	y	Y
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	RF	Tree, 4-8m	y	
Myrtaceae	*Syzygium oleosum*	Blue Lilly Pilly	RF	Tree, 3-8m, fast growing	y	
Myrtaceae	*Syzygium paniculatum*	Magenta Lillypilly/ Scrub cherry	RF	Tree, 3-8m	y	Y
Myrtaceae	*Tristaniopsis laurina*	Water Gum	RF,rE	Tree, 4-10m	y	Y
Oleaceae	*Notalaea longifolia*	Mock Olive	mF	Shrub, 2-4m	y	
Oleaceae	*Notalaea venosa*		RF	Tree, 2.5-8m	y	
Pittosporaceae	*Bursaria spinosa*	Blackthorn/ Sweet Bursaria	F	Shrub, 2-3m	y	Y
Pittosporaceae	*Citriobatus pauciflorus*	Orange Thorn	RF	Shrub, 1-1.5m	y	
Pittosporaceae	*Hymenosporum flavum*	Native Frangipani	RF	Tree, Small	y	Y
Pittosporaceae	*Pittosporum revolutum*	Rough-fruit Pittosporum	mF, RF	Shrub, 1-3m	y	Y
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	RF	Tree, 3-10m	y	Y
Poaceae	*Oplismenus aemulus*	Basket grass	RF, F,mWL	Herb, small weak grass	y	
Poaceae	*Oplismenus imbecillis*	Basket grass	RFT,F ,mWL	Herb, small weak grass	y	
Podocarpaceae	*Podocarpus elatus*	Brown pine	WL	Tree	y	Y
Proteaceae	*Banksia aemula*		C, ss	Shrub, 4m	y	
Proteaceae	*Banksia integrifolia*	Coastal Banksia	CSL,CF,CSD,E ,ss	Shrub,Tree 6-16m	y	Y

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Proteaceae	*Banksia marginata*	Silver Banksia	HL, WL	Shrub,Tree 6m	y	Y
Proteaceae	*Banksia oblongifolia*	Rock Banksia	HL,WL,W	Shrub, Spreading .5-2m	y	Y
Proteaceae	*Banksia spinulosa*	Hair-pin Banksia	WL,m	Shrub, 2m	y	Y
Proteaceae	*Grevillea linearifolia*	White spider flower	HL,WL	Shrub, 2m	y	Y
Proteaceae	*Grevillea montana*				y	
Proteaceae	*Grevillea sericea*	Pink spider flower	HL	Shrub, 1-2m	y	Y
Proteaceae	*Grevillea x gaudichaudii*		m	<1m	Central Coast	Y
Proteaceae	*Hakea bakeriana*		HL,WL	Shrub, 2m	y	
Proteaceae	*Hakea dactyloides*	Finger Hakea/Broad-leaved Hakea	HL,dF,W, ss	Shrub, 1.5-4m	y	Y
Proteaceae	*Hakea salicifolia*	Willow-leaved Hakea	mWL,mF	Shrub, tree >2m	Central Coast	Y
Proteaceae	*Isopogon anemonifolius*	Drumstick	HL,SL	Shrub, 1-1.5m	y	
Proteaceae	*Lambertia formosa*	Mountain Devil	HL,SL,dF	Shrub, <1.5m	y	Y
Proteaceae	*Lomatia silaifolia*	Crinkle Bush	dF	Shrub, Low tufted ground	y	Y
Proteaceae	*Persoonia lanceolata*	Geebung	HL	Shrub,Erect 2m	y	
Proteaceae	*Persoonia laurina subsp laurina*	Golden Geebung	WL	Shrub, 1m, Spreading	y	
Proteaceae	*Persoonia levis*	Broad-leaved Geebung	HL,WL	Shrub, 4m	y	

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	W	Shrub, 3m	y	
Proteaceae	*Stenocarpus sinuatus*	Firewheel tree	RF	Tree	Central Coast	Y
Proteaceae	*Xylomelum pyriforme*	Woody Pear	F, ss, W	Shrub, 2-4m	y	
Rhamnaceae	*Alphitonia excelsa*	Red Ash		Tree 6-10m	y	Y
Rutaceae	*Acronychia oblongifolia*	Acronychia/ Lemon Aspen	RF	Shrub,Tree 2-8m	y	Y
Rutaceae	*Eriostemon myoporoides ssp. Myoporoides*	Long leaf Wax Flower	mB	Shrub, 1-2m	Central Coast	Y
Rutaceae	*Melicope micrococca*	White Euodia/ Hairy-leaved Doughwood	RF	Shrub, tree 1-6m	y	
Rutaceae	*Sarcomelicope simplicifolia*	Yellow Lillypilly	RF	Tree, 8m	y	
Sapindaceae	*Alectryon subcinereus*	Native Quince/ Wild Quince	RF	Tree, 8m	y	Y
Sapindaceae	*Cupaniopsis anacardiodes*	Tuckeroo	C,m,RF	Tree, 3-10m	y	Y
Sapindaceae	*Diploglottis australis*	Native Tamarind	RF	Tree, 20m	y	Y
Sapindaceae	*Dodonaea triquetra*	Common Hop Bush	F	Shrub, 2m	y	Y
Sapindaceae	*Guioa semiglauca*	Guioa	RF	Tree, 8-15m	y	
Sapotaceae	*Planchonella australis*	Black Apple	RF	Tree, 8-20m	y	
Sinopteridaceae	*Pellaea falcata*	Sickle Fern	OF,RF	Fern, 60cm	y	
Solanaceae	*Duboisia myoporoides*	Corkwood	RF	Shrub, 3-6m	y	
Solanaceae	*Solanum lanceolatum*	Kangaroo apple			Central Coast	

Family	Scientific Name	Common Name	Vegetation Community	Habit	Found In Studies	Sold locally
Sterculiaceae	*Brachychiton populneum*	Kurrajong	W, dcs,r	Tree, 10-35m, deciduous in winter		
Sterculiaceae	*Commersonia fraseri*	Black-fellow's Hemp	mF,mB,RF	Tree, 3-6m	y	
Symplocaceae	*Symplocos stawellii*	Buff Hazelwood	RF	Tree, 4-8m	y	
Ulmaceae	*Trema aspera*	Native Peach	mF,mB,RF	Tree, 3-6m	y	Y
Verbenaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	mF	Shrub, 2-4m	y	
Violaceae	*Viola hederacea*	Native Violet	m, W	Herb, Creeping	y	Y
Vitaceae	*Cissus hypoglauca*	Water Vine	RF,mC	Climber, Woody Vine	y	
Xanthorrhoeaceae	*Lomandra longifolia*	Mat rush	W	Herb, tufted 50cm	y	Y
	Dysoxylum fraserianum	Rosewood	RF	Tree, Large	y	Y

APPENDIX E - SUITABLE SPECIES FOR SQIDS

Note: the following tables list local native species suitable for SQID planting. These are not exhaustive lists and do not preclude designers from using other species suitable to climatic, function and landscape design objectives.

Table 1 - Filter strips, Grassed and Planted Swales

Note: Kikuyu grass is not to be specified in the vicinity of drainage infrastructure.

Scientific Name	Common Name	Form	Height (mm)	Planting Density (min/m2)*	Comments
Cynodon Dactylon	Couch	Grass	50-150	Seeded or rolled	Mowing required to achieve smaller heights
Digitaria didactyla	Blue Couch	Grass	50-150	Seeded or rolled	Mowing required to achieve smaller heights
Paspalum distichum	Water Couch	Grass	To 500	Seeded or rolled	Not suitable for sandy soils with low water holding capacity
Pasplum vaginatum cv. 'Saltene'	Salt Water Couch	Grass	To 500	Seeded or rolled	Salt tolerant
Sporobolus viginicus	Marine Couch	Grass	To 400	Seeded or rolled	Salt tolerant
Stenotaphrum secundatum	Buffalo	Grass	50-150	Seeded or rolled	Mowing required to achieve smaller heights
Bacopa monnieri	Bacopa	Prostrate	100	6-8	
Carpobrotus glaucescens	Pigface	Prostrate	100	4-6	Suitable for infrequently flooded areas only
Myoporum boobialla	Boobialla	Prostrate	150	4-6	Suitable for infrequently flooded areas only
Viola hederacea	Native Violet	Prostrate	100	4-6	Shade tolerant. Suitable for infrequently flooded areas only
Baumea juncea	Bare twig-rush	Tufted	1500	4-6	

*Planting densities shown are minimum requirements for Viro-tube planting. Decreased densities will only be accepted if pot sizes are increased accordingly.

Carex appressa	Tussock sedge	Tufted	1000	6-8	
Crinum pendunculatum	Swamp Lily	Tufted	1500	4-6	Suitable for infrequently flooded areas only
Cyperus laevigatus	-	Tufted	400-600	6-8	
Dianella caerulea cv 'Breeze'	Blue Flax Lily	Tufted	600	4-6	Suitable for infrequently flooded areas only
Dianella caerulea cv 'Little Jess'	Blue Flax Lily	Tufted	400	6-8	Shade tolerant. Suitable for infrequently flooded areas only
Dianella longifolia var. longifolia	Pale Flax Lily	Tufted	500	6-8	Shade tolerant. Suitable for infrequently flooded areas only
Dianella tasmanica	Tasman Flax Llly	Tufted	1000	4-6	Shade tolerant. Suitable for infrequently flooded areas only
Dichelachne crinita	Long Haired Plume Grass	Tufted	200	6-8	
Gahnia clarkei	Saw Sedge	Tufted	2500	4-6	Has moderate salt tolerance.
Gahnia sieberiana	Saw Sedge	Tufted	2500	4-6	Has moderate salt tolerance.
Isolepis nodosa(syn. Ficinia nodosa)	Knobby Clubrush	Tufted	700	6-8	Salt tolerant.
Juncus krausii	Sea Rush	Tufted	600-2500	6-8	Salt tolerant.
Juncus usitatus	Common Rush	Tufted	500	8-10	
Lomandra longifolia	Spiny Mat Rush	Tufted	1000	4-6	Shade tolerant. Suitable for infrequently flooded areas only
Lomandra longifolia cv 'Katrinus'	Mat Rush	Tufted	1000	4-6	Shade tolerant. Suitable for infrequently flooded areas only

*Planting densities shown are minimum requirements for Viro-tube planting. Decreased densities will only be accepted if pot sizes are increased accordingly.

Lomandra longifolia cv 'Tanika'	Mat Rush	Tufted	500-1000	4-6	Shade tolerant. Suitable for infrequently flooded areas only
Poa labillardieri cv 'Eskdale'	Eskdale	Tufted	450	6-8	Suitable for infrequently flooded areas only
Themeda australis	Kangaroo Grass	Tufted	500	6-8	Suitable for infrequently flooded areas only
Themeda australis cv 'Mingo'	Mingo	Tufted	200	8-10	Suitable for infrequently flooded areas only
Callicoma serratifolia	Black Wattle	Shrub	4.0m	N/A	
Callistemon salignus	White Bottlebrush	Tree	4.0m	N/A	
Banksia integrifolia	Coast Banksia	Tree	10.0m	N/A	
Eucalyptus robusta	Swamp Mahogany	Tree	25.0m	N/A	
Livistona australis	Cabbage Tree palm	Tree	12.0m +	N/A	
Melaleuca linariifolia	Snow-in-Summer	Tree	8.0m	N/A	
Melaleuca nodosa	Prickly-leaved Paperbark	Tree	2.0m - 7.0m	N/A	
Melaleuca styphelioides	Prickly-leaved Paperbark	Tree	6.0 – 15.0mm	N/A	
Melaleuca quniquinervia	Broad-leaved Paperbark	Tree	12.0m	N/A	

*Planting densities shown are minimum requirements for Viro-tube planting. Decreased densities will only be accepted if pot sizes are increased accordingly.

Table 2 - Biofiltration/Bioretention Systems

Note: the following list of core plant species has been derived from the *Water By Design Bioretention Technical Design Guidelines*. Using these core plant species ensures that a minimum level of bioretention performance will be achieved. At least 50% of the filter are should be planted with the core plant species, and the remainder of the filter media area should be planted with the supplemental species. Batter slopes and non-filter media areas should be planted with species suitable for the landscape objectives, anticipated wetting and drying regime, and local climatic conditions.

Scientific Name	Common Name	Form	Height (mm)	Planting Density (min/m2)*	Comments
Core functional species					
Carex appressa	Tussock sedge	Tufted	1000	6-8	Suitable for sporadically flooded areas.
Isolepis nodosa (syn. Ficinia nodosa)	Knobby Clubrush	Tufted	700	6-8	Salt tolerant.
Imperata cylindrica	Blady Grass	Tufted	500	6-8	
Lepidosperma laterale	Variable sword-sedge	Tufted	500-1000	6-8	
Lomandra longifolia	Spiny Mat Rush	Tufted	1000	4-6	Shade tolerant. Suitable for infrequently flooded areas only
Poa labillardieri cv 'Eskdale'	Eskdale	Tufted	450	6-8	Suitable for infrequently flooded areas only
Themeda australis	Kangaroo Grass	Tufted	500	6-8	Suitable for infrequently flooded areas only
Banksia robur	Swamp banksia	Shrub/Small tree	1.5m	One plant per 2-20sq.m. Min. pot size 140mm	
Melaleuca thymifolia	Thyme Honey Myrtle	Shrub	1000	One plant per 2-20sq.m. Min. pot size 140mm	
Casuarina glauca	Swamp Oak	Tree	15.0m	N/A	

*Planting densities shown are minimum requirements for Viro-tube planting unless otherwise noted. Decreased densities will only be accepted if pot sizes are increased accordingly.

Melaleuca quniquinervia	Broad-leaved Paperbark	Tree	12.0m	N/A	
Supplementary species					
Gahnia clarkei	Saw Sedge	Tufted	2500	4-6	Has moderate salt tolerance.
Gahnia sieberiana	Saw Sedge	Tufted	2500	4-6	Has moderate salt tolerance.
Juncus usitatus	Common Rush	Tufted	500	8-10	
Buckinghamia celsissima	Ivory Curl Flower	Shrub	2.0m	One plant per 2-20sq.m. Min. pot size 140mm	
Hibiscus heterophyllus	Native Rosella	Shrub	1.5m	One plant per 2-20sq.m. Min. pot size 140mm	
Cupaniopsis anacardioides	Tuckeroo	Tree	7.5m	N/A	
Tristaniopsis laurina	Water Gum	Tree	7.5m	N/A	
Waterhousia floribunda	Weeping Lily-pily	Tree	10.0m	N/A	
Paspalum distichum	Water Couch	Grass	To 500	Seeded or rolled	Not suitable for sandy soils with low water holding capacity
Pasplum vaginatum cv. 'Saltene'	Salt Water Couch	Grass	To 500	Seeded or rolled	Salt tolerant
Sporobolus viginicus	Marine Couch	Grass	To 400	Seeded or rolled	Salt tolerant
Zoysia macrantha	Zoysia	Grass	To 150mm	6-8	Suitable for infrequently flooded areas only

*Planting densities shown are minimum requirements for Viro-tube planting unless otherwise noted. Decreased densities will only be accepted if pot sizes are increased accordingly.

Table 3 - Constructed Wetlands and Sediment Basins

Scientific Name	Common Name	Depth below permanent pool water level (mm)	Zone	Form	Height (mm)	Planting Density (min/m2)*	Comments
Ludwigia peploides	Water Primrose	1.5-0.5	Open Water	Submerged macrophyte	500	1	Rapid growth; yellow flowers.
Ottelia ovalifolia	Swamp Lily	0.5-0.35	Deep Marsh	Submerged macrophyte	1000	1	Attractive white flowers.
Baumea articulata	Jointed twig-rush	0.5-0.35	Deep Marsh	Emergent macrophyte	1000-2000	6-8	Slow growing
Bolboschoenus fluviatalis	Marsh Club-rush	0.5-0.35	Deep Marsh	Emergent macrophyte	1500	4-6	Flow resistant
Eleocharis sphacelata	Tall Spike-rush	0.5-0.35	Deep Marsh	Emergent macrophyte	1250	6-8	Slow establishment; rhizomes can restrict growth of other plants; flow resistant
Schoenoplectus validus	River Club-rush	0.5-0.35	Deep Marsh	Emergent macrophyte	1500	4-6	
Triglochin procerum	Water-ribbon	0.5-0.35	Deep Marsh	Emergent macrophyte	2000	4-6	Aesthetic; spreading
Alisma plantago-aquatica	Water Plantain	0.35-0.2	Marsh	Tufted	1000	4-6	Rapid establishment
Bolboschoenus caldwellii	Club-rush	0.35-0.2	Marsh	Emergent macrophyte	1000	4-6	Rapid establishment; salt tolerant
Baumea juncea	Bare twig-rush	0.2-0.0	Shallow Marsh	Tufted	1500	4-6	*Slow establishment*

*Planting densities shown are minimum requirements for Viro-tube planting unless otherwise noted. Decreased densities will only be accepted if pot sizes are increased accordingly.

Isolepis nodosa (syn. Ficinia nodosa)	Knobby Clubrush	0.2-0.0	Shallow Marsh	Tufted	700	6-8	Salt tolerant.
Juncus usitatus	Common Rush	0.2-0.0	Shallow Marsh	Tufted	500	8-10	Rapid growth
Carex appressa	Tussock sedge	0.0-+0.2	Ephemeral Marsh	Tufted	1000	6-8	
Ranunculus inundatus	River Buttercup	0.0-+0.2	Ephemeral Marsh	Prostrate (groundcover)	300	4-6	Rapid growth, often forms large mats.
Cyperus laevigatus	-	+0.2-+0.5	Batters	Tufted	400-600	6-8	
Dianella longifolia var. longifolia	Pale Flax Lily	+0.2-+0.5	Batters	Tufted	500	6-8	Shade tolerant
Gahnia clarkei	Saw Sedge	+0.2-+0.5	Batters	Tufted	2500	4-6	Has moderate salt tolerance.
Gahnia sieberiana	Saw Sedge	+0.2-+0.5	Batters	Tufted	2500	4-6	Has moderate salt tolerance.
Lomandra longifolia	Spiny Mat Rush	+0.2-+0.5	Batters	Tufted	1000	4-6	Shade tolerant
Triglochin striatum	Streaked Arrow Grass	+0.2-+0.5	Batters	Emergent macrophyte	300	6-8	Salt tolerant
Viola hederacea	Native Violet	+0.2-+0.5	Batters	Prostrate (groundcover)	100	4-6. Min. pot size 140mm	Shade tolerant. Rapid growth. Prolific once established. Flowering.
Callistemon salignus	White Bottlebrush	+0.2-+0.5	Batters	Tree	4.0m	N/A	Moist sandy and alluvial soils- tolerates part shade.
Eucalyptus robusta	Swamp Mahogany	+0.2-+0.5	Batters	Tree	25.0m	N/A	Tolerates inundation
Lophostemon confertus	Brush Box	+0.2-+0.5	Batters	Tree	25m		Moist sandy or alluvial clay soils

*Planting densities shown are minimum requirements for Viro-tube planting unless otherwise noted. Decreased densities will only be accepted if pot sizes are increased accordingly.

Melaleuca linariifolia	Snow-in-Summer	+0.2-+0.5	Batters	Tree	8.0m	N/A	Moist sandy soils and swampy areas
Melaleuca nodosa	Prickly-leaved Paperbark	+0.2-+0.5	Batters	Tree	2.0m - 7.0m	N/A	Moist sandy soils
Melaleuca quniquinervia	Broad-leaved Paperbark	+0.2-+0.5	Batters	Tree	12.0m	N/A	Tolerates inundation

*Planting densities shown are minimum requirements for Viro-tube planting unless otherwise noted. Decreased densities will only be accepted if pot sizes are increased accordingly