LAY OF THE LAND
knowing country

BROOME NORTH LANDSCAPE MASTERPLAN REPORT

Opportunities, directions and strategies for the open space associated with Broome North

Prepared by UDLA

PREPARED September 2009

AMENDMENT 1a October 2009

UDLA (urban design and landscape architecture)

Suite 1 / 64 High Street
Fremantle WA 6160
(08) 9336 7577
www.udla.com.au

On behalf of LandCorp

CONTENTS

1 INTRODUCTION

The Broome North development sets up an exciting opportunity to provide Broome with both innovative, affordable housing and locally focused open space amenity. Through understanding the local condition Broome North has the potential to provide benchmark outcomes with regard to sustainable and site specific design.

The Broome Peninsula is a unique location, yet an ignorance of local knowledge and 'place' during development planning phases often results in unsustainable development in relation to the landscape, community and cultural condition. This Landscape Masterplan Report will be specifically investigating the experience, practicality and strategies for the provision of new locally sensitive open spaces / places within Broome. These investigations and strategies are informed by local conditions in regard to climate, ecology and culture, materials and labour availability. It also reflects upon historical development outcomes within the Broome town site as a whole.

In addition, the report takes into account a responsibility to plan and provide open space that is sensitive to the local site, conditions and culture. As part of site specific design, the project team will use the existing and broader site ecosystem as an informant and guide to the design. Being informed by the project sites biodiversity and landform often provides design cues for sustainable outcomes within the parameters of site development and in turn lessons environmental disturbance for the broader landscape.

Thorough and appropriate planning from the initial stages ensures the development is site specific and achieves the best outcomes in regard to creating meaningful, practical and pleasant spaces with personal scale and amenity. Consultation with local community groups, in particular the indigenous community shall provide important clues to the existing condition. Engaging with community, local businesses and educational institutions in the design phase will also assist in fostering community pride, spaces designed for local uses / opportunities and in turn foster local ownership.

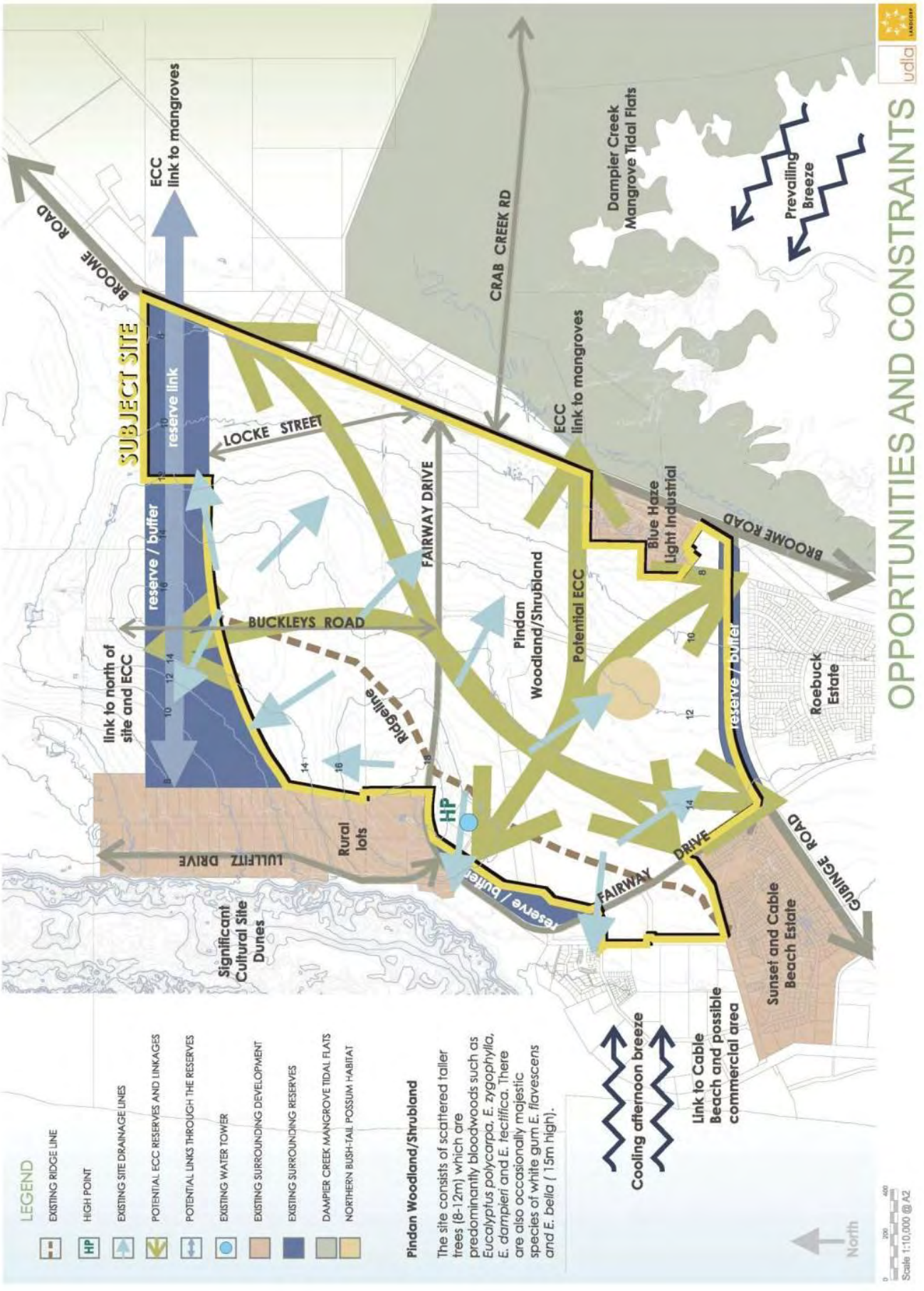
Furthermore, applying local knowledge and materials reduces ongoing maintenance costs and most importantly, nurtures an important layer of local culture offering an opportunity for indigenous communities to continue using these spaces for traditional uses; a resource for themselves and an educational tool for interested tourists and residents. Inclusion and retention of local materials also showcases the Northwest landscape, helping to create a sense of place and promote the region. Visitors especially remember these unique elements and places.

Key recommendation for the Broome North development that the follow in this report include building capacity for the community through:

- Supporting local industry;
- Creating spaces that promote growth and learning;
- Maintaining connections and linkages through the landscape (flora, fauna and people);
- Providing cultural and community connections to 'country' through the inclusion of an Environmental Cultural Corridor;
- Protecting and repairing natural systems so traditional practices can take place alongside development;
- Minimising landform reshaping;
- Maximising vegetation retention on site;
- Inclusion of interpretation and public art within open space as part of an overall art strategy;
- Combining recreation, preservation, education/ interpretation and link urban/ natural drainage systems through Multi use corridors, and;
- Incorporating site specific solutions (such as the provision of shade amenity through consistent street tree planting along road and pedestrian connections).

Through consideration of the existing landscape, the local spatial order and cultural understanding, Broome North will aim to set a new benchmark for development in the North West Region.

BROOME PENINSULA AERIAL
Broome North project area



LANDSCAPE OPPORTUNITIES AND DIRECTIONS (Broad mapping)
Broome North project area

2 Cultural Considerations

In recent years Broome has experienced a growing tourism industry, ongoing commercial enterprise, significant local residential growth and an extractive industry's boom, and as a consequence, expansion of the Townsite has been inevitable. This can bring many positive outcomes for the community as a whole, however, an increase in population places increased pressure on the existing environment and the need to maintain a sustainable 'lifestyle' for trees, animals and its people becomes paramount.

Developers must remain aware of the impact of an increasing population on the environment, specifically indigenous lifestyle and traditions (opportunity to maintain access, stories, culture, and a lifestyle for their children's future).

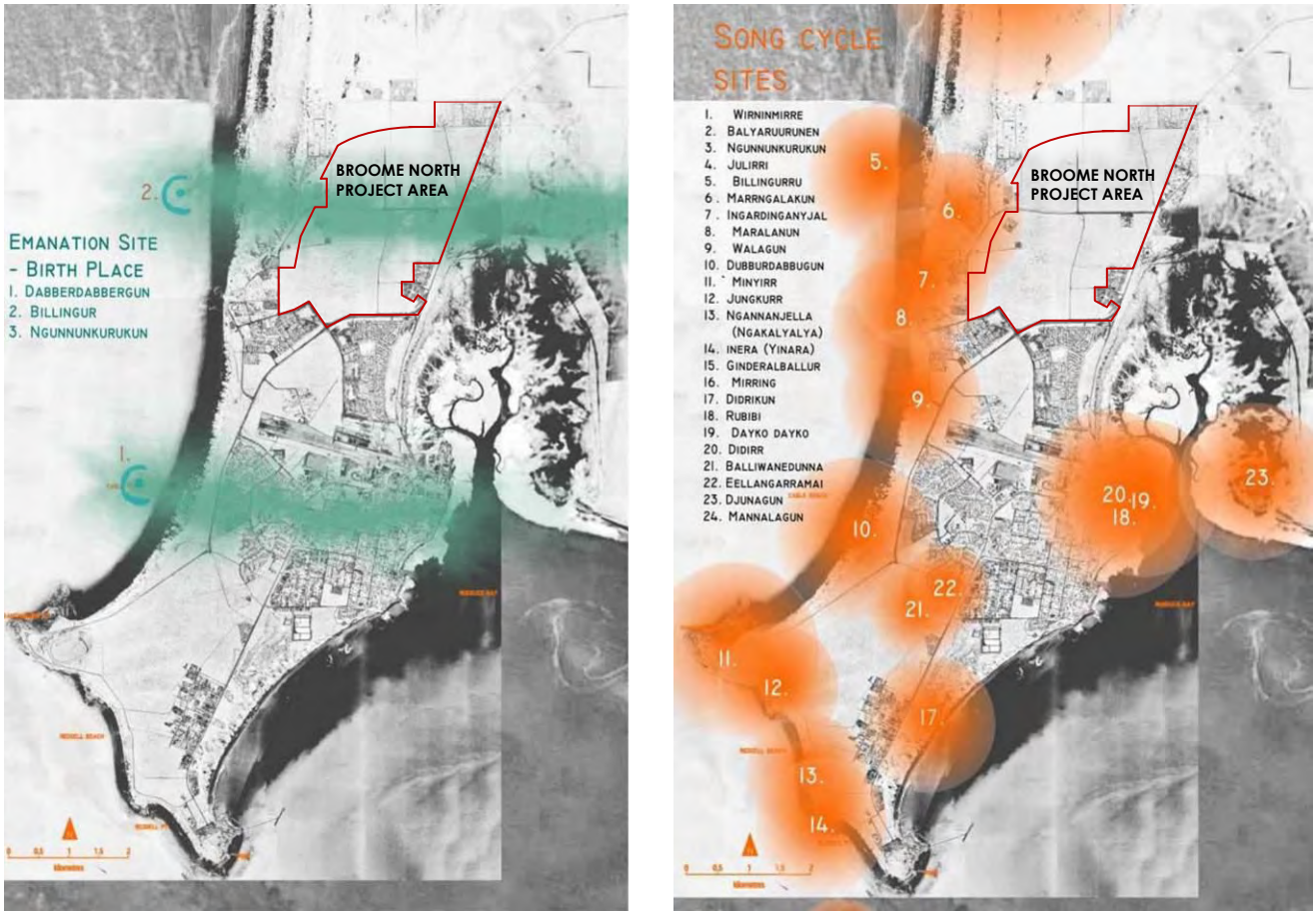
Indigenous people of the Broome Region have described with concern their fundamental loss of land and vegetation as a result of development together with other issues such as a reduction in fish stocks. Pollution from boats is also affecting the quality of the fish that are caught. Often these sorts of issues appear unavoidable with development, however taking the time to learn from the traditional custodians of the land and allowing their knowledge to inform design decisions will assist in limiting the negative impacts of development.

2.1 SIGNIFICANT SITES AND SONGLINES

Broome is a significant location in regard to the Dreamtime (Bugarregarre) and Minyirr Park just south of the Broome North site is the epicentre for this beginning.

It is important that we recognise and retain this relationship and respect the significance of this knowledge and place in a way that allows Aboriginal people to be able to continue using the land: to pass on skills; heritage and stories to generations that follow.

In discussions with the Yawuru (the local Indigenous community) it is evident that particular sites are significant for 'animal cycles' and 'song lines'. It must be noted that 'song lines' are very important but private and restricted to the Yawuru culture.



Drawing supplied with permission of UWA, courtesy of V. Margetts, 2008

2.2 SIX SEASONS

Local indigenous groups follow the annual cycle of six seasons and understand the complexities of the seasons for survival. Each season supplies Mungary (food) and local indigenous groups understand what can be hunted and gathered to maintain species numbers within each season. They look to the insects, weather, plant, trees, animals, ocean, land and stars who inform them what is ready to eat. The Six Seasons as defined by the Goolaraboolo people (The Lurujarri Heritage Trail) are as follows:

Mankala - December to March

An exciting Season Electric great storms humid hot rain wind cool when rain continues. Camping along the coast shelters out of Paperbark.

Marul - Begins around April

The storms are gone some clouds a little rain everything growing quiet changing time , people travel extensive through country ***INGU*** *(seasonal water places) filled up grass high waiting for knock em down rain.*

Wirralblu - Begins around May

Cool east winds blowing in from the desert nights cooling down Dew covering country, the days are becoming clear, ocean getting fresh, Salmon wriggling their tails, the constellation of the seven sisters early morning in the east.

Barrgana - June to August

Clear Cool weather, Brilliant Starry nights Cold through at the early morning easygoing, people camp inland protected from the east wind. Seven sisters clear in the morning sky. Cold east wind, Willing flowering. Whales travelling north

Wirlburu - Begins around September

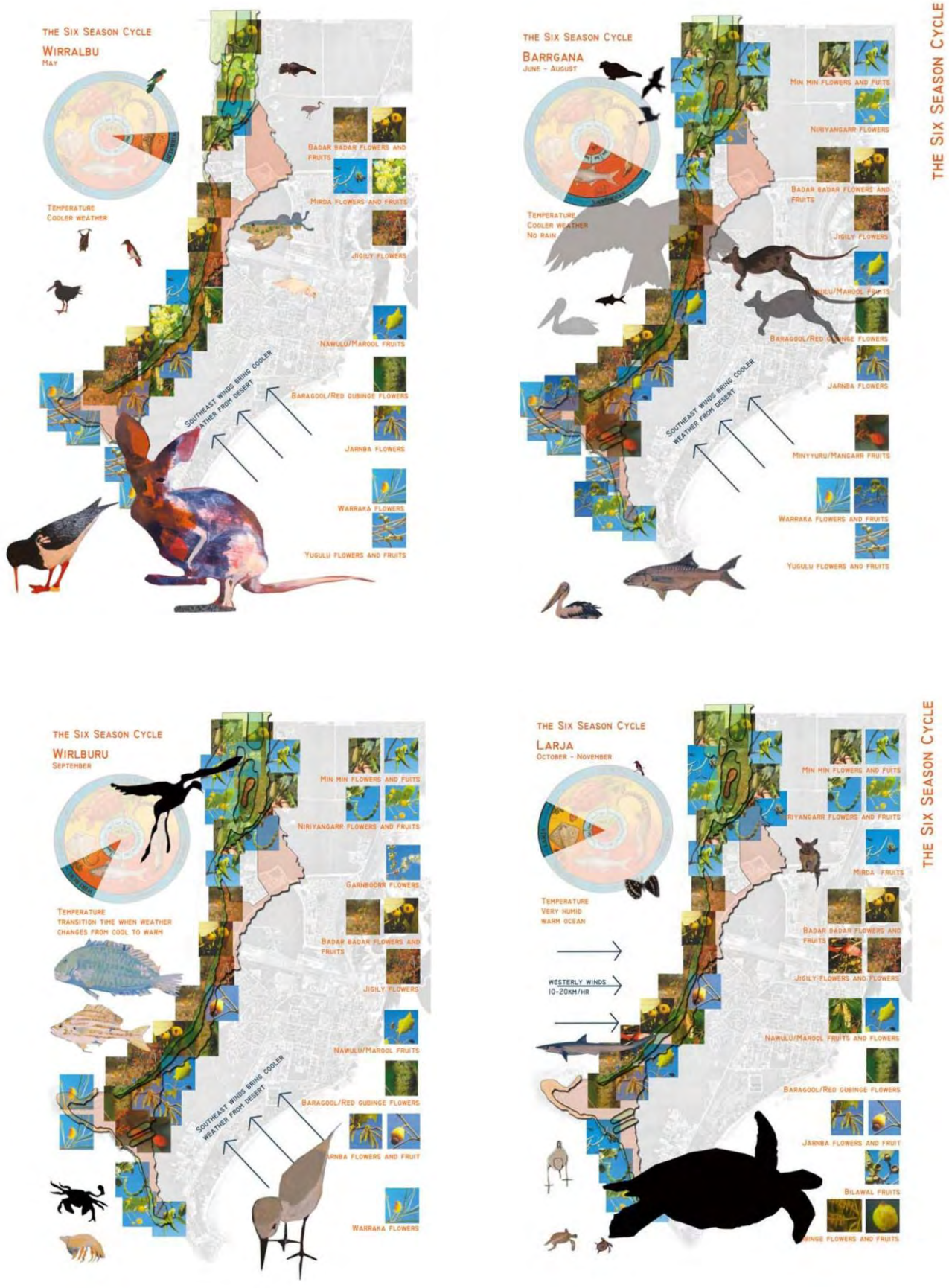
West winds blowing, Ocean changing, Days getting warmer, Mist coming in from the Ocean, Seaweed on the beach Turtle marry season. Dry wind from the desert. People moving towards the coast. Camping near ***Jila*** *(living Water constant water source,).*

Larja - During October and November

Hot east wind blowing in from the desert. Ocean heating up clouds getting bigger in the East. Country getting hot, still, brooding. Then rain, growth, renewal relief for all, enough water now for animals and ***JINUP*** *{Stingray fat)* ***Gubinge*** *and bush berries ready. More rain, pindan flows into the ocean, roads are closed. Quiet time and Barni (Goanna are on the run from us hunters}.*[1]

Interpretative drawings supplied with permission of UWA, courtesy of V. Margetts, 2008

[1] The Lurujarri Heritage Trail



Interpretative drawing supplied with permission of UWA, courtesy of V. Margetts, 2008

2.3 CONSULTATION

The developers of Broome North recognise the importance of the Yawuru (indigenous people of Broome) connection and their relationship to 'country', and have sought opportunities to retain the existing landscape integrity having consideration for vegetation, animals and people.

Development within Broome should also ideally be informed by the current community, to ensure that the project can maximise the potential whilst retaining the integrity and connection to 'country'.

Taking this into consideration, the Broome North project team is conducting a series of workshops with the local Yawuru to be guided and educated by generations of knowledge from the traditional custodians of the land. Consultation with the non-indigenous community has also occurred and will be ongoing throughout the project.

Community workshops at Minyirr Park and at the Yawuru offices, explored 'Lay of the Land – Knowing Country' exploring what is important to retain the lifestyle of Broome both culturally and physically. This initiated discussion into the outcomes for Broome North and by initiating engagement with key members of the community in the early design phases it is hoped this will foster local pride and ownership, with the public spaces less likely to fall victim to vandalism and neglect.

"All of it is our Backyard" (Debbie Pigram)

Photo supplied courtesy of CODA, 2009

2.4 CULTURE AND CONNECTION TO COUNTRY

Vanessa Margett's, '*Growing Rubibi*' research document, 2008, provides an understanding of the concept of 'country' and its relationship to the Yawuru (Native Title Holders in the Broome Region). It was explained that during the Bukarrigarra (the dreaming) the spirit came out of the ocean near Broome and onto land where it became a human body;

> *"The place where Aboriginal people came from is here, in Minyirr," he says (Micklo Corpus). "The old people tell me we came out of a spirit form off the reef. When we came onto the land the spiritual form got harder, and that's how we got bodies. And then we dried up and got human form"*[2]

THE NOTION OF COUNTRY

'Country', is an Australian indigenous concept of knowing land, religion, ecology and culture in reciprocal, interrelated ways – one creates the other, and without this relationship neither exists nor manifests them into being.

> *For Aboriginal peoples, country is much more than a place. Rock, tree, hill, river, animal, human – all were formed of the same substance by the Ancestors who continue to live in land, water, sky...Country is family, culture, identity. Country is self. (Kwaymullina)*[3]

Margetts (2008) research document investigates and focuses on the notion of country and how Minyirr Park in Broome is a key location in understanding the Australian spiritual context. The conclusions of this research document outlines the notion of country exists when the following occurs:

> *1. Performing and passing on traditional practises such as collecting and eating bush plants and animals for nourishment on a day to day basis and for special occasions or ceremonies. Finding and use of local medicines, collecting wood and making tools etc. Story-telling and teaching traditional knowledge such as laws, language, song and dance.*
>
> *2. There is an openness to move through the land and be able to access and have connection with and between significant areas such as song cycle sites, birth places and significant sites.*
>
> *3. There are physical connections with the natural environment including swimming in the ocean and walking and camping on the land.*
>
> *To keep country alive and connected and, therefore, the spirit awakened, the above need to be allowed to continue to happen. If any part of the natural ecology of a place is lost, country also begins to breakdown. That is why it is so important that the natural systems are restored and allowed to function in a healthy manner.*[4]

---

2 V. Margetts, 2008, Growing Rubibi, pg 6

3 V. Margetts, pg 6-7

4 V. Margetts, pg 7

3 FUTURE RESIDENTS

The non-indigenous community will make up a large proportion of people who will purchase a home within the Broome North development. The development therefore must also endeavour to encapsulate the views and needs of these future residents.

As part of the community consultation for Broome North, Allan Tranter from 'Creating Communities' has conducted Community Reference Group meetings. The Planning and Design Forum (PDF) associated with the development of Broome North was also open to the general community and stakeholders and provided opportunity for further community feedback.

3.1 CHARACTERISTICS OF BROOME LIFESTYLE

Tranter (Aug 2009) points out that Broome is often associated with a '*...mystique and romance...*' and people often visit Broome with great expectations associated with this romantic view. This can result in residents and visitors being '*...disappointed with their experience of today, [and] nostalgically refer[ring] to the Broome of yesteryear where everything verged on perfection."*

Some of the aspects that future residents have defined in consultation groups related to the present character of Broome include:

- Climate
- Outdoor lifestyle
- Multiculturalism
- Tourism

'Old Broome' has many positive connotations due to its sense of open space and more intimate community structure, however new development has not received the same reception. Newer developments such as Januburu and Roebuck Bay are perceived to have a 'suburban feel' and a tension between 'old' and 'new' Broome is apparent within the community.

Sporting activities help bind the community and fortunately facilities are currently well catered for, however, these facilities are often underutilised (largely due to fencing and lack of access etc.), and with an increase in population there is a requirement to provide accessible multipurpose spaces and local active and passive open spaces. Furthermore, a lack of appropriate pedestrian connections around Broome is disconnecting the community. Shaded, dual use walkways are considered essential to encourage community interaction and a healthy lifestyle.

3.2 OPPORTUNITIES FOR BROOME NORTH

The characteristics people would like to see in Broome North largely reflect the characteristics seen in 'Old Broome' with an emphasis on multiculturalism. The community reference group placed great importance on development that embodied variety and sustainability, more specifically catering for the Broome climate and capitalising on the outdoor lifestyle through a variety of multi-purpose outdoor meeting places and housing options.

Furthering this idea, the community would like 'open plan' designs that allow for breezeways and activated streets catering for both vehicles and pedestrians. Natural systems that enhance the

visual experience of Broome and promote the local environment is understood to be the best avenue to provide a connection back to country and deal with the environmental issues (e.g. drainage, stormwater issues associated with pindan runoff etc)

Finally, existing residents believe that if future residents were educated and aware of Broome's natural context there would be a greater respect for the lifestyle of plants, animals and people.

4 INTERPRETATION

4.1 EXISTING SITE

The Broome North site needs to retain its integrity to allow residents to reflect upon the history of their land and its natural beauty. Moreover, indigenous people need to be able to continue using the land for traditional practices and as an educational tool for people where appropriate.

Retaining local bushland and landform also presents opportunities to display cultural stories and sustainable solutions in the natural environment and plays an important role in promoting the region.

BROOME NATURAL BEAUTY
Photos sourced from left to right Julie Innis (Flickr.com), Kristy (Flickr), Gary Haynes (Flickr), Greg Grabasch (UDLA)

4.2 STREETSCAPES AND OPEN SPACES

Another approach to reflect 'country' and culture within the development can be achieved through the selection of materials and landscape themes within the design of streetscapes and the landscape of open spaces.

Streetscapes, (including the road design) are a primary public space within a subdivision landscape.

The roundabout intersections at Januburu Six Seasons (Broome) development were identified as an opportunity for subtle cultural references. Concrete pavers were chosen in six colours, referencing and interweaving each of the six seasons recognised by the local indigenous community, to produce a simple, robust interpretive accents within the Estate. Also within Januburu, gravels were used to display the story of the six seasons and other stories were represented through interventions such as the Iwarra wall. The interpretative free form concrete wall finished with pindan coloured render, references the story of two Naji spirit sisters and is symbolic of the Yuuru (snake) that intended

to keep them apart. A subtle feature, complimented by gravel banding in the foreground, it adds a meaningful, unique and low maintenance streetscape solution that is well suited to its location.

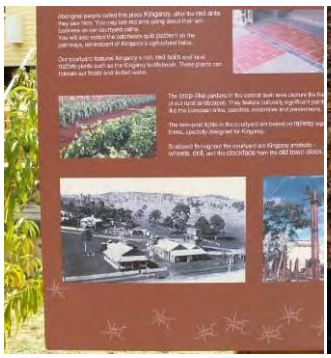
OVERALL STREETSCAPE – JANUBURU SIX SEASONS
Sense of openness, local materials, and cultural stories told within the streetscape design
Photo by UDLA

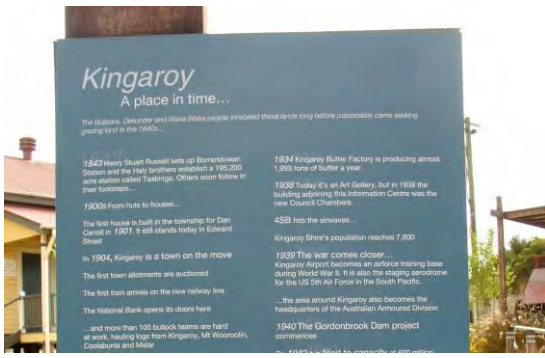
4.3 PLACE NAMING

The naming of new places within any development provides an important opportunity to recognise significant local people, places or events. Using locally recognised names also helps to nurture local history.

PLACE NAMING – JANUBURU SIX SEASONS
Many parts of Januburu were named using local names
Photo by UDLA

Interpretative signage offers an extra level of detail for interested residents and visitors to an area. Signage can illustrate photographs, images and diagrams and explain a place or offer further interpretation of a particular space or artwork.

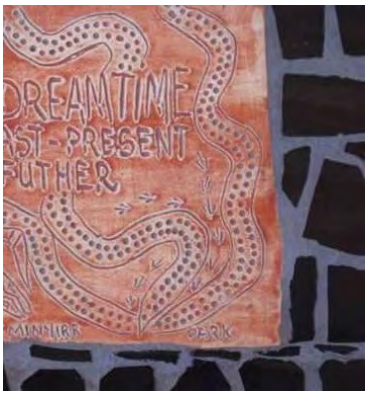



INTERPRETATIVE SIGNAGE EXAMPLES (WA) - MERREDIN, KINGAROY, JANUBURU SIX SEASONS
Many parts of Januburu were named using local or indigenous names
Photos by UDLA

4.5 COMMUNITY ARTWORK

Januburu Six Seasons also used the idea of mosaics as a community art form. The most community oriented outcome within the hard landscape is seen at the Eastern Entry of Januburu development. A coloured concrete pad and recess provided the basis for a mosaic artwork depicting the six seasons. This artwork is an aesthetic feature as well as a successful tool in allowing members of the community to gain ownership of the project by becoming involved in its design and construction of the artwork. Local sandstone boulders set into concrete pads act as informal seating. They are robust and allow people to linger, for relaxation, storytelling and educational opportunities for residents and Yawuru youth. The mosaic encouraged community involvement and offers an opportunity for indigenous communities to use this as a resource for themselves and an educational tool for interested tourists, local residents and businesses.

Opportunities such as tree planting could also be used as a tool to educate people in respect of local plants and for site rehabilitation. Plaques can be utilised to commemorate individuals and groups involved in the planning, design and research of various aspects of the development and help to encourage ownership.


COMMUITY ARTWORK EXAMPLES-KINGAROY, NANANGO, HALLS CREEK
Photo courtesy of UDLA

OVER PAGE
MOSAIC CONSTRUCTION AT JANUBURU EASTERN ENTRY, BROOME
Photo courtesy of UDLA

4.6 COMMISSIONED ARTWORK

In particular areas it may be appropriate to explore ways in which indigenous and local culture can be displayed more formally to promote and educate the community and visitors about the various cultural layers of Broome. This can be achieved in a number of ways including signage, mosaics, walls, paving, sculpture and gravels, and provides an opportunity for local stories to be told and remembered.

Use of local materials including stone and aggregates within a streetscape setting helps aid a 'sense of place' and promotion of the region. Visitors especially remember these visual clues; an important consideration in a region that relies heavily on the tourism industry for its survival.

COMMISSIONED ARTWORK- KINGAROY AND EAST NEWMAN
Photo courtesy of UDLA

Finally, it is also important that artwork is integrated into an overall strategy addressing the locality and Greater Broome Region to ensure the scheme is integrated and there is not an adhoc placement of unrelated elements throughout the Broome Peninsula.

5 LANDFORM RETENTION

Unnecessary clearing and levelling of land has been common practice for development within Western Australia in the past, especially within the Swan Coastal Plain. If these unsustainable practices are replicated in the Northwest, rehabilitation is difficult and costly in the highly sensitive landscapes of the region.

In addition, existing landscape features such as rock outcrops, drainage lines and local vegetation in the Northwest, all play an important role in heightening experience of the 'place', its amenity and the ongoing protection of a 'natural' site.

The significant cost of construction in areas such as Broome combined with the issues listed above strongly suggest that implementing built forms and landscape solutions that respond to existing conditions is the most appropriate response to the design of new development and follows best practise methodologies.

It is important to maintain existing ecosystems in order to 'maintain lifestyle'. This again involves vegetation retention (flora /fauna corridors), slope retention (maintain landform integrity) and in regard to drainage, maintaining existing drainage paths and systems.

As Broome is subject to extreme weather events (including cyclones), drainage is of primary concern within any development, and the provision of sufficient systems to deal with the large weather events can often be the cause of loss of landform and subsequently vegetation. Furthermore, development and unnecessary clearing can lead to a series of events that degrade not only the immediate site but the land surrounding it and even ecosystems well beyond the site. Previously, Broome has installed large engineered systems to deal with major stormwater events and Broome's pindan soils which have low infiltration properties. Standing water in Broome is also not an ideal situation and can lead to health problems if mosquito breeding is allowed to occur.



EXISTING DRAINAGE WITHIN BROOME
Photo by UDLA

5.1 PRECENDENT PROJECT: JANUBURU SIX SEASONS (BROOME)

Site Drainage

The latest subdivision in Broome, Januburu Six Seasons, attempted to change the way development has dealt with drainage. Januburu drew heavily on the concept of using the existing site and local knowledge to inform and guide the design, ensuring minimal site disturbance and allowing the development to relate to its context. The drainage system at Januburu exemplifies this concept by re-establishing and connecting existing drainage networks,

Januburu incorporates the following interventions to deal with site drainage:

- Maintaining overland flow rate volumes as recorded prior to development
- Redirect and evenly distribute clean water flows from the development area
- Evenly distribute overland flows to the back of dunes along Cable Beach where large areas of vegetation occur within the Broome Peninsula.
- Drainage run-off directed from lots onto roads, then into free form swale retention basins
- Basins designed to slow overland water flows and deliver the volumes at a lesser pace to large compensating basins. These basins allow settlement of free pindan soil particles and more importantly exotic weed seed before distribution to Minyirr Park.
- Low infiltration properties of the deep red Broome pindan soils requires drainage management to includes low flow devices, such as V-weirs, gabion drainage walls and dam structures with small outlet pipes (low flow pipes) whose purpose is not to hold the water, but to impede or slow the run-off rate back to a natural flow rate, i.e. a rate that existed before development occurred.

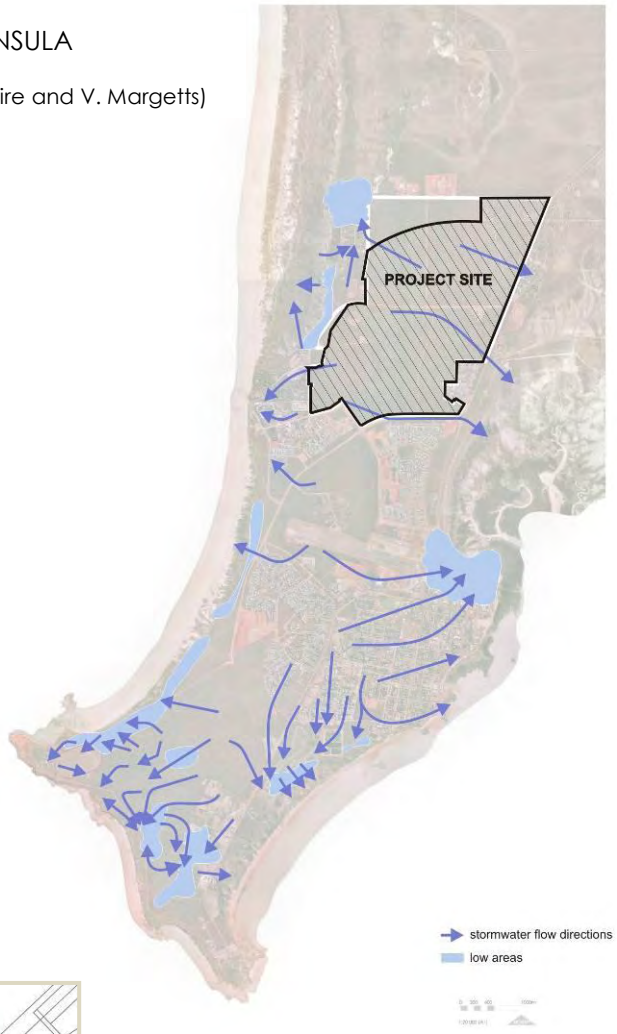
The benefits of the Januburu drainage management system include:

- Low silt/pindan soil distribution
- Less scouring or flood damage to drainage or development infrastructure
- Less spread of exotic seed to natural areas such as Minyirr Park
- Direction of water from development to back of Cable Beach dunes for natural health of local vegetation
- Drainage water is not directed as one large volume to historical flood prone or weed infested areas
- Drainage swales are free form with a natural aesthetic
- Drainage swales negotiate existing significant vegetation

INITIAL DRAINAGE CONCEPTS
Drawing by UDLA

DISCUSSING NEW DRAINAGE SOLUTIONS / FREE FORM DRAINAGE SWALES / CONCRETE WEIRS
JANUBURU SIX SEASONS, BROOME
Photo by UDLA

EXISTING DRAINAGE – BROOME PENINSULA
Drawn by UDLA, 2009
(using information supplied by the Broome Shire and V. Margetts)

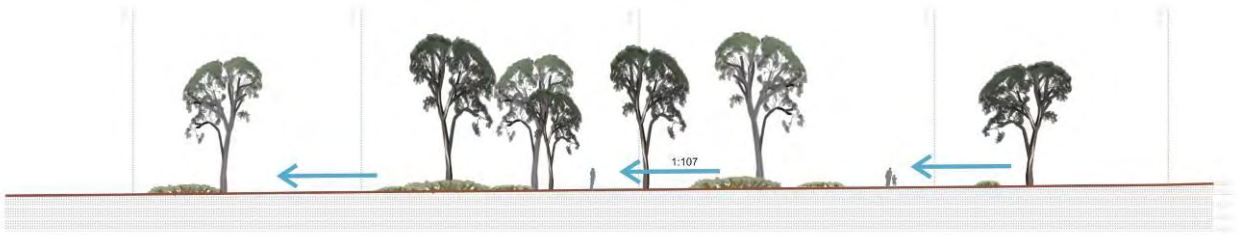


EXISTING DRAINAGE – BROOME NORTH SITE
Drawn by UDLA, 2009
(using information supplied by the Broome Shire, Roberts Day and SKM)

5.2 PREVIOUS LOT DESIGN WITHIN THE BROOME LANDSCAPE

Grading of individual lots requiring drainage to runoff towards lot frontage has a major impact on the overall drainage system in regard to pindan runoff, water flow rates and dealing with weed control and infiltration etc.

Januburu Six Seasons (Broome), explored new options in regard to dealing with lot drainage, and has a similar site gradient and flow to the Broome North site. On both sites, the majority of the land highlighted for development has a relatively gentle gradient.

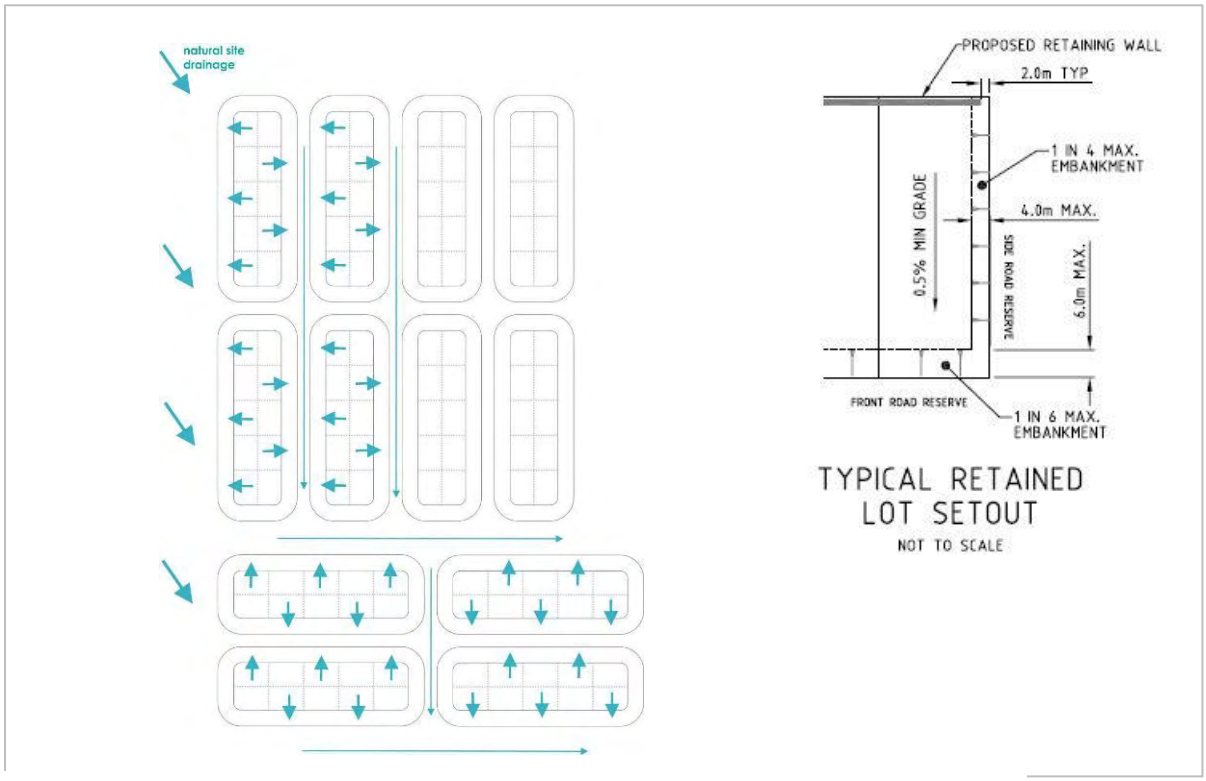


STANDARD SITE DRAINAGE
Drawing by UDLA

The existing site for Januburu saw each block graded to a gentle 1 in 107 slope with several significant trees and soil binding vegetation on site. Despite this, and attempts to retain natural slope and vegetation, extensive clearing was undertaken in earlier stages. In an attempt to improve this situation different techniques were applied to achieve more successful outcomes in subsequent stages of development. Slope retention primarily helps aide vegetation retention (refer to section 3.3 for benefits of this outcome) but also allows the site to maintain existing flow rates, drainage networks and through minimal soil disturbance, weed invasion is less prevalent, as is erosion and pindan runoff, and an finally, a local 'sense of place' is retained. This may encourage new homeowners to interact with their new surroundings with an understanding of the landscape of 'the place' and be more sympathetic in the responses to the design of their own gardens.

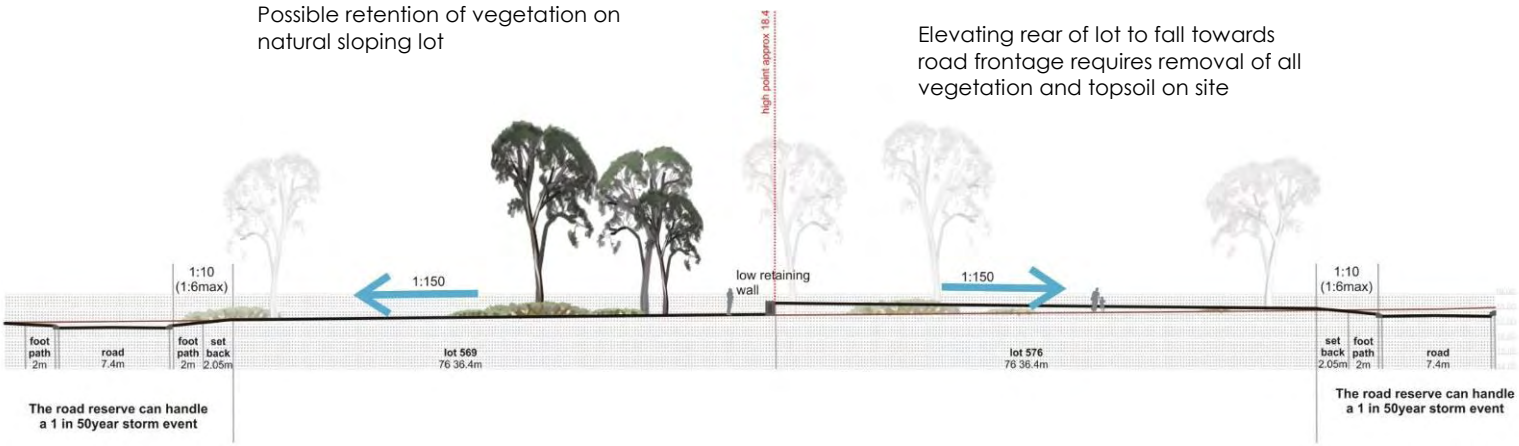
5.2.1 STANDARD LOT DESIGN (DRAINAGE)

Unlike Perth drainage solutions (that requires water from lots to be dealt with onsite only) it is a requirement within the Broome region for residential development to drain water off the front of the lot, and essentially the roads becomes large drainage networks directing water to retention or infiltration basins and swales. (This is due to the large storm events experienced in Broome)



CONVENTIONAL LOT DRAINAGE BROOME – CARDINAL LOT LAYOUT
Drawn by UDLA, 2009

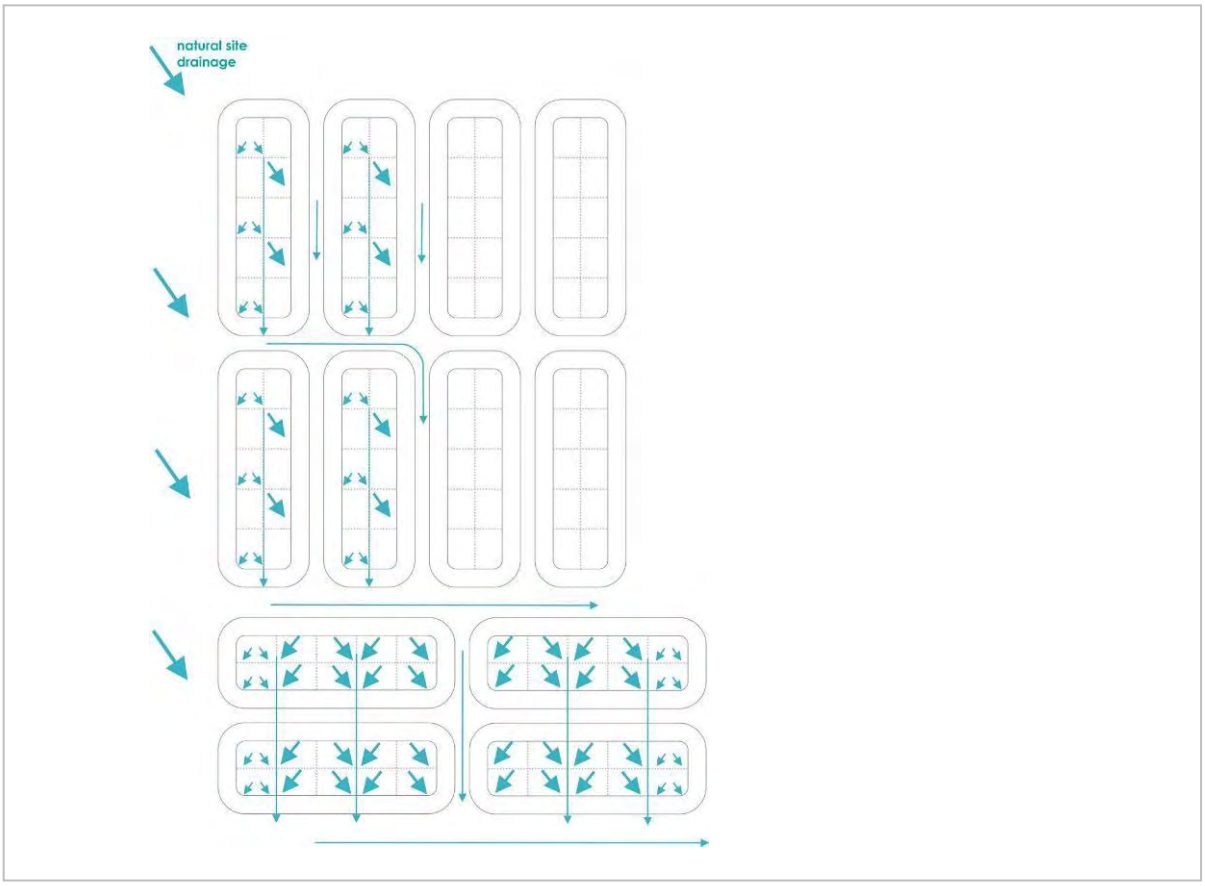
This outcome appeared unavoidable and has resulted in the loss of vegetation and the conventional benching of the site in Januburu Stage One by the inclusion of retaining walls. Despite efforts to retain as many significant trees as possible, due to the drainage outcome most of the site was cleared.



CONVENTIONAL DRAINAGE RESPONSE
Drawing by UDLA

5.2.2 ALTERNATIVE LOT DESIGN

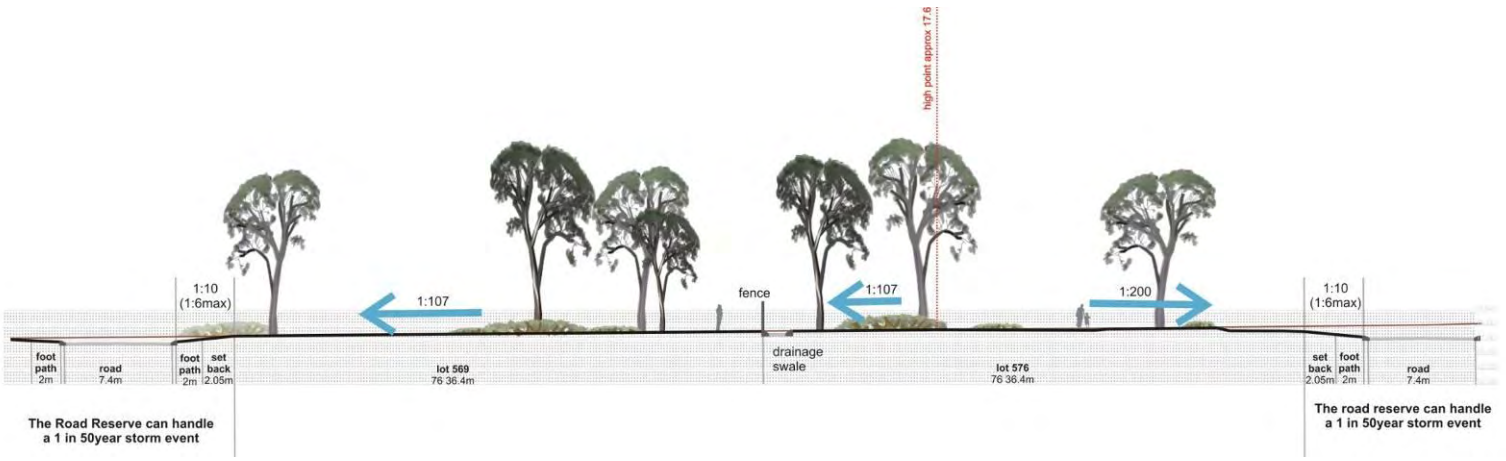
Working with the local Broome Authority and project engineers, Stage Four, Januburu recognises benefits that are gained by retaining the natural slope and vegetation of lots wherever possible. A new response was also tested on the lots that required regrading.



DRAINAGE TO CENTRE OF LOTS
Cardinal lot layout
Drawing by UDLA, 2009

The lots that required regrading tested a new method of drainage in order to retain slope and biodiversity. These lots were graded in two directions allowing approximately half the lots to drain to the road and half to drain towards the rear boundary. The introduction of a lined drain allowed this water to flow towards the flanking roads.

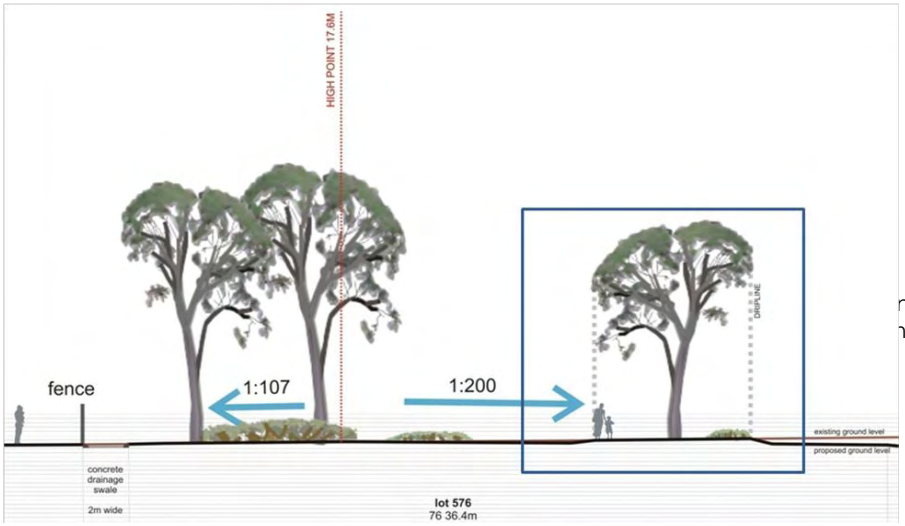
By maintaining the slopes close to natural gradients (1:107) and shaping the land to allow water to flow positively in two directions across the lots, many benefits were seen in regard to retention of top soil, vegetation and landform.



ALTERNATIVE DRAINAGE RESPONSE
Drawing by UDLA

Occasionally significant trees were situated were minor grading was required. If maximum soil removal was not plus or minus 300mm and no soil was disturbed within the trees drip line this vegetation could be retained through localised grading.

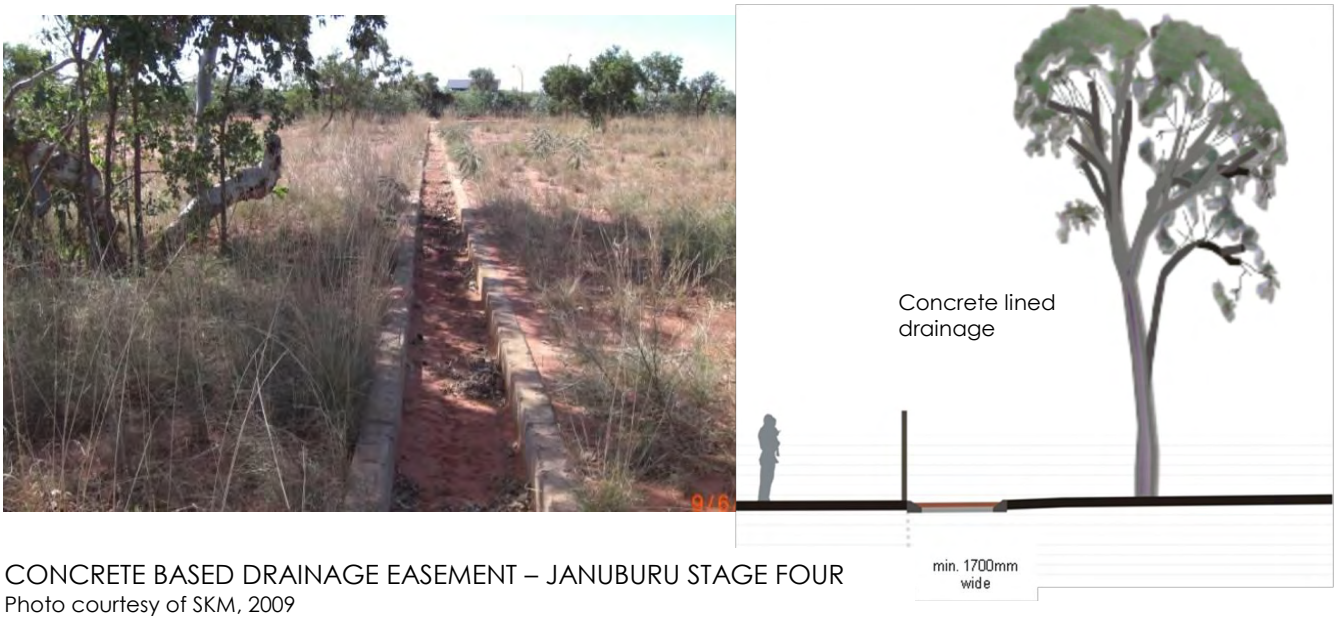
Care taken to retain the existing ground level within the tree's drip line meant many more significant trees were retained on site.



ng to elevated
ne (+ / - 300mm

DETAIL – RETENTION OF GROUNDLEVEL AROUND SIGNIFICANT TREES
Drawing by UDLA

Due to maintenance concerns by the Local Authority, it was required that the rear of lot drainage easements be concrete lined and a minimum of 1700mm wide. Any curves in drains were required to be designed in relatively wide arc so a small excavator could turn in the drains when maintenance and cleaning is required. .



CONCRETE BASED DRAINAGE EASEMENT – JANUBURU STAGE FOUR
Photo courtesy of SKM, 2009
Drawing by UDLA, 2008

5.3 OPPORTUNITY FOR LANDFORM RETENTION

5.3.1 VEGETATED REAR LOT DRAINS

Aligning with LandCorp's Retention of Landform and Ecology Policy, Januburu Six Seasons saw the progress of drainage solutions within development in Broome. Although the progression enjoyed a level of success, Broome North proposes to create a new benchmark for drainage outcomes in Broome.

The most significant advance in this area is the proposal that concrete lined drains be replaced by a vegetated or gravel mulched swale to prevent erosion and allow natural infiltration.

Although this method has been utilised worldwide and received predominantly positive feedback from community members during the recently held Planning and Design Forum, there are still various concerns associated with this method from both community and Shire Perspective. Some of these issues are explored below:

ONGOING MAINTENANCE

This is in regard to level of maintenance required and who will be the responsible for its ongoing care. Currently, the concrete lined basins serving rear lot drains are the responsibility of the Local Authority. UDLA believe that once significant vegetation has established within the swale, maintenance will be low and propose responsibility for this area should fall onto individual lot owners. This may be formally incorporated as a caveat forming part of the sale agreement and/or more informally as a Shire guideline.

LANDSCAPING OPTIONS

Owners have different ideas for their garden designs and may not aspire to the 'bush aesthetic' and perceive this proposed drainage solution requires them to apportion part of their rear lot to native bushland which may be viewed as an unreasonable expectation.

Fortunately, the proposed drainage swales will be shallow and lot owners will have many options in regard to its treatment. The swale can be planted with exotic plant species or similarly the swale could have lawn (would act as a very effective treatment to prevent scouring, filter runoff and in slowing water velocity).

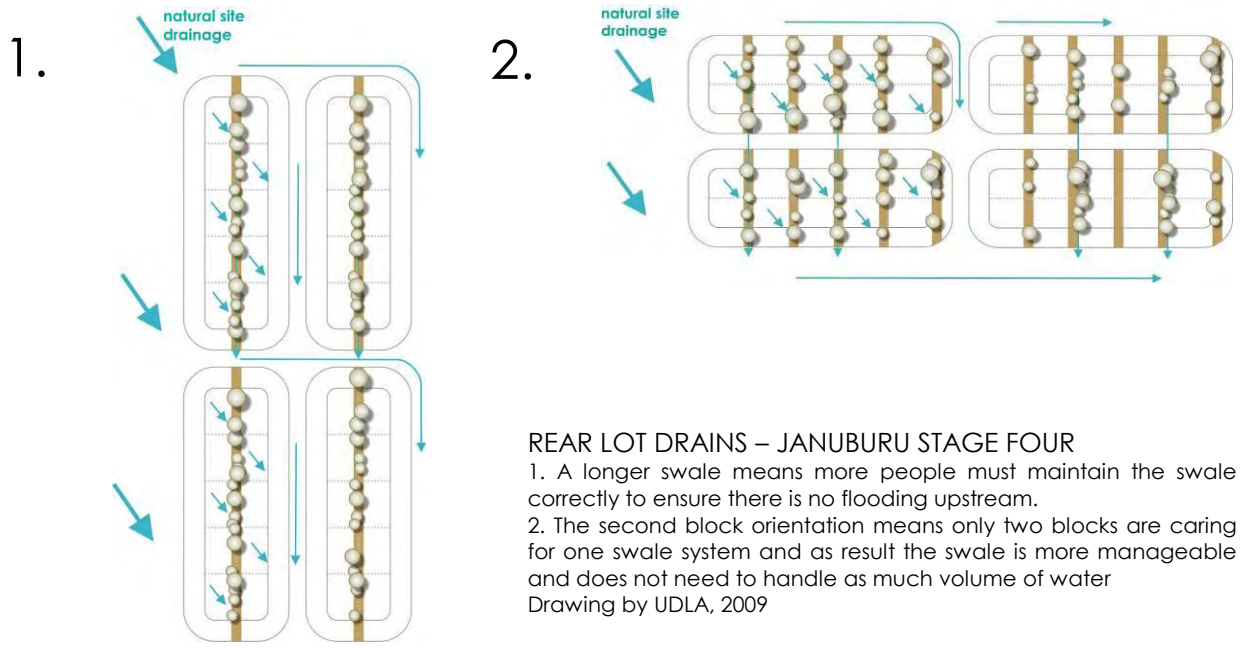
SCOURING

Swales cannot be left untreated as this would cause scouring, increased water velocity and pindan runoff. Binding the pindan with vegetation and grasses is the most effective way to prevent scouring. A bio degradable geo-fabric may be beneficial to stabilise the soil before plants have established prior to the wet season.

SWALE BLOCKAGES

There are always risks associated with drainage easements that require residents to maintain them such as the potential for one of the lots downstream to block his/her swale thus causing flooding further up the swale. The best way to minimise this risk is to provide suitable education to the lot owners and potential fines for people not adhering to the swale standards put into place.

Another effective way to minimise the risk is to limit the number of lots that water must pass through before linking into the road drainage system. The drawings on the following page demonstrate two block layouts: in the first example the swales effectiveness relies on many lot owners undertaking correct design and maintenance, whereas the second example layout relies on only two lots within each swale system. This would make it easier to pinpoint problems if they arise due to less residents being involved in the chain. In other locations where these systems have been prototyped any issues which arise can usually be sorted at a neighbour discussion level. If the issue needs to be raised with the local authority then they would need the authority to request this to be rectified.



REAR LOT DRAINS – JANUBURU STAGE FOUR
1. A longer swale means more people must maintain the swale correctly to ensure there is no flooding upstream.
2. The second block orientation means only two blocks are caring for one swale system and as result the swale is more manageable and does not need to handle as much volume of water
Drawing by UDLA, 2009

There is potential for these drainage easements in Broome to become a natural feature with planting, local gravels and boulders. Keeping the area unsealed will aide infiltration and as vegetation establishes itself the roots will bind the pindan soil which discourages erosion, pindan runoff and slows flow rates and trapping invasive weed seeds before they reach significant dune systems or cultural places. The vegetation lines will also help to conceal fence lines between lots and provide shade amenity to the subdivision.

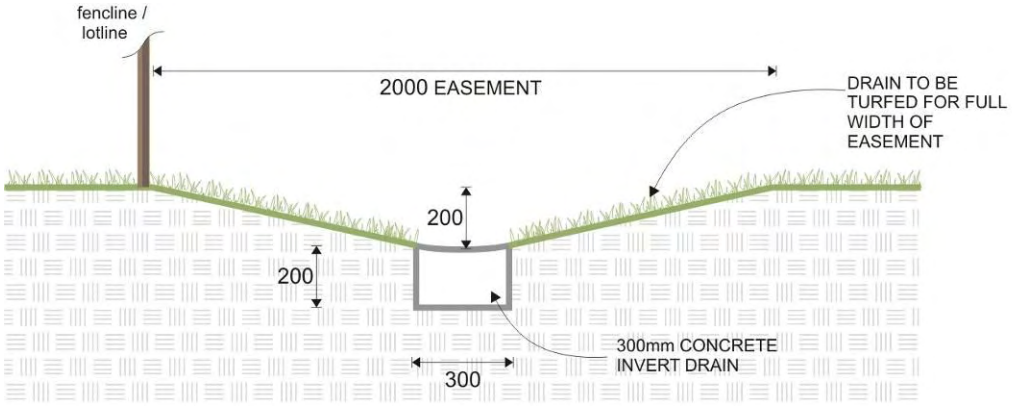
However these vegetated drainage lines do not have to be tree planted and individual homeowners may opt to have lawn to the back fence. Their only requirement is to retain the swale and keep the area vegetated in some way to bind the pindan and filter the water runoff.

VEGETATED DRAINAGE FEATURES
Images courtesy of UDLA, 2009 and landcare research.com

5.3.2 IMPLEMENTATION IN STAGE ONE

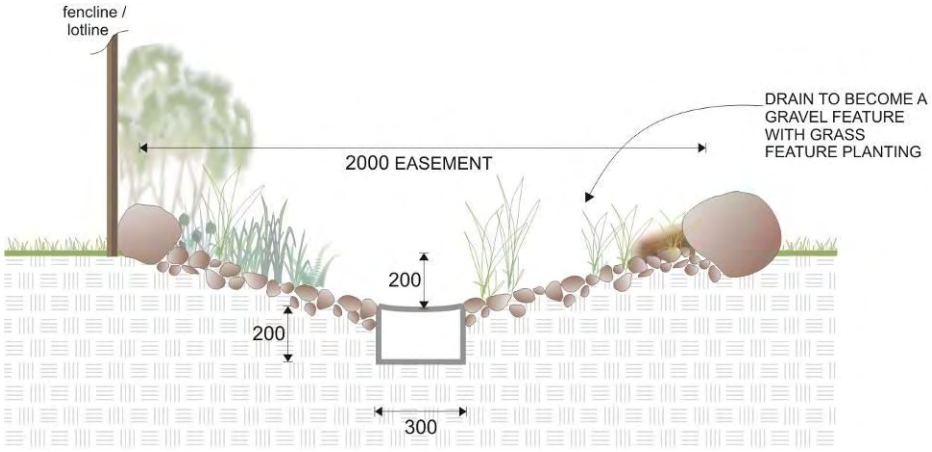
The vegetated drainage lines implemented as part of Stage One works proposes to incorporate a drainage swale model used by the Mackay City Council. From information gathered by the engineer consultants for Broome North (SKM) it appears that allotment drainage swales are used regularly in the City of Mackay with the following general principles:

- Side and Back drains are used
- Turf drains with a 300mm wide concrete base are part of their standard allotment drawings (The concrete base defines the invert level and helps to ensure it is well maintained at that level overtime.

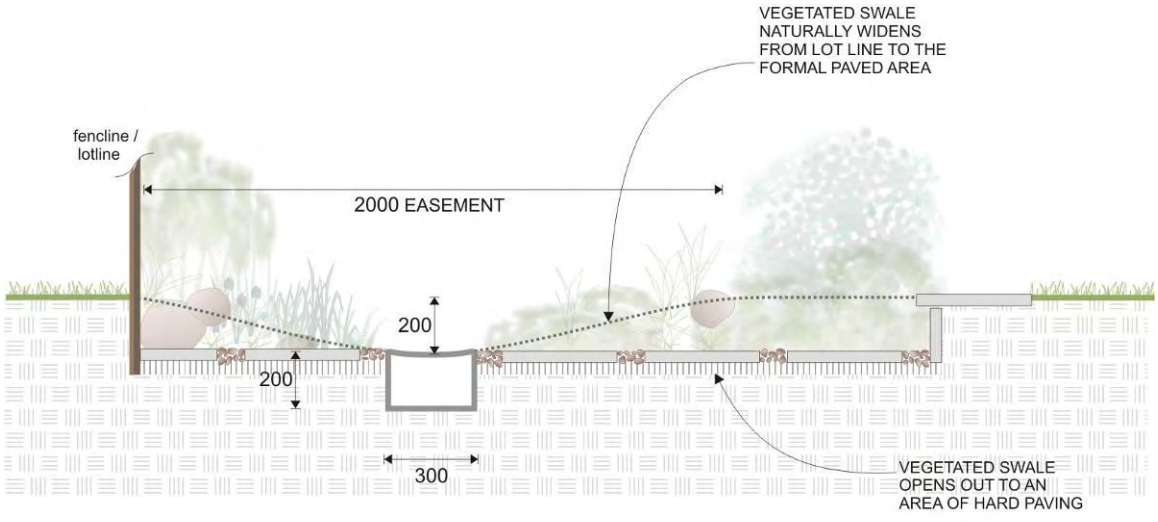


MACKAY CITY COUNCIL
Allotment drain detail – standard treatment

It is proposed that within Stage One of Broome North, the Mackay model of drainage easements will be investigated; however there is opportunity for alternative landscaping options to be explored within individual lots.



ALTERNATIVE LANDSCAPING
A gravel and/or planted out swale offers an ephemeral feature in people's yards.



ALTERNATIVE LANDSCAPING
A more considered design could see tapering of the swale to a hard paved step down area within the backyard.

6 VEGETATION RETENTION

The existing site is predominantly open pindan woodland that can be described as "...scattered taller trees (8-12m) which are predominantly Bloodwoods such as *Eucalyptus polycarpa, Eucalyptus zygophylla, Eucalyptus dampieri* and *Eucalyptus tectifica*. There are also occasionally majestic species of White Gum *Eucalyptus flavescens* and *Eucalyptus bella* (15m)"[5]

Ensuring the retention of local vegetation has many benefits such as:

- Reduction of soil runoff (benefits to adjacent sites and waterways, in particular the nearby mangroves and ocean marine life)
- Reduced erosion
- Weed control
- Flora and fauna biodiversity
- Local fauna habitat
- Immediate site maturity
- Local sense of place
- Visual amenity
- Cost saving on clearing
- Recognises indigenous belief of 'lifestyle' for trees and animals and humans
- Shade amenity
- Existing presence of landscape allows for the fast creation of multi use public areas for recreation/ drainage/ walkways etc.

(far left) EXISTING VEGETATION
An example from the Broome North site
Photo courtesy of UDLA, 2009

(left) PINDAN RUNOFF
An example from Januburu due to loss of vegetation on lots
Photo courtesy of UDLA, 2009

[5] Broome and Beyond, 1996

PRELIMINARY INVESTIGATIONS INTO PINDAN EROSION

Broome North has a significant landform ridgeline that informs vegetation, drainage and ultimately development opportunities for this area. It has recently been noted through scientific analysis by Dr. Dave Deeley of Acacia Springs Environmental, proposes that Pindan silts entering the ocean at Cable Beach and Roebuck Bay have the potential to retain phosphates and negatively impact the bay and shorelines food chain. This is of particular concern with regards to the Broome North development's potential drainage strategy. Following is preliminary conclusions to initial investigations within Roebuck Bay.

- Eroded Pindan detrimental but localised impact on nutrient availability (N,P) in intertidal surficial sediments;
- Adverse impacts for plants (benthic micro and macro algae, mangroves) and molluscs and other organisms grazing on them.
- Additional sampling and mapping of erosion gullies and mangrove distribution is warranted.
- These data suggest managing erosion should proceed as a priority.

PINDAN RUNOFF EFFECTS ALONG THE COAST IN BROOME
Photo courtesy of Acaia Springs Environmental, 2009

Retaining vegetation is an important aspect of any development and can be approached in a variety of ways as outlined below.

6.1 PREVIOUS TREE RETENTION SOLUTIONS IN BROOME

6.1.1 SIGNIFICANT GROUPINGS OF TREES

Significant trees often grow in groupings (stands) within an area, highlighting these areas and retaining them is a highly desirable development response to preserve these major assets. This method usually sees the clearing of the remaining land for development and these tracts become natural features, parks or drainage areas. This method can be coupled with other vegetation retention efforts.

The disadvantage of this method is that it does not take advantage of linear opportunities for natural drainage and ignores the fact that fauna and Australian trees often 'move' through the landscape and need space for this to occur. Furthermore, as the areas of vegetation no longer

have a buffer of planting around them and become fragmented they are exposed to degradation through increased traffic, compaction, weed invasion and littering.

6.1.2 SIGNIFICANT INDIVIDUAL TREES

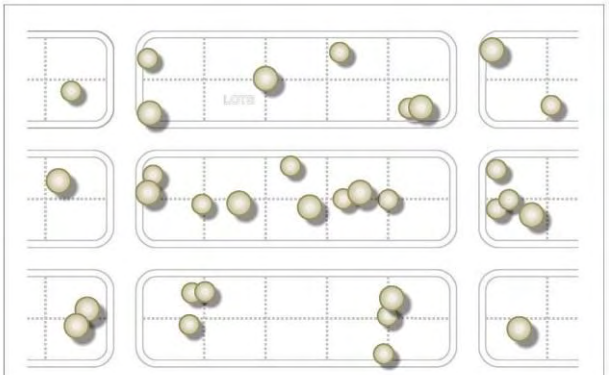
When significant trees are identified individually across the site, another solution is to walk the site and tag significant trees. This allows the clearing to occur around the trees and allows landowners the option of retaining these mature trees on site when developing their lot.

A disadvantage with this is option is that the tree is more susceptible to compaction and disease, Also these trees are often removed, because homeowners do not see the significance of a stand-alone tree, find tree maintenance 'bothersome' or conflicts with their garden design. This is particularly prevalent in Broome due to the typically small size of most native trees.

The image of the cleared lots within Januburu Six Seasons on the following page demonstrates the outcome and disadvantage of singular tree tagging. With limited significant and sizeable trees the result can often be a cleared landscape. Following discussions at the Planning and Design Forum with the community, it was agreed this outcome is highly unfavourable.

CONCEPTUAL PLAN

RETAINING SIGNIFICANT STANDS OF TREES



CONCEPTUAL PLAN
RETAINING SIGNIFICANT TREES
Drawn by UDLA, 2009

TAGGING SIGNIFICANT TREES
For Januburu Six Seasons
Image courtesy of UDLA

PROBLEMS WITH RETAINING ONLY THE SIGNIFICANT TREES
Total removal of all groundcover as seen at Januburu Six Seasons
Photo courtesy of UDLA

6.2 VEGETATION RETENTION OPPORTUNITY

6.2.1 WHOLE SITE RETENTION

Januburu Six Seasons applied both of the above mentioned methods. There has been a level of success, particularly in Stage Four where due to slope retention, more trees and site vegetation was able to be retained. However disadvantages of these methods are:

- Isolated trees are exposed to degradation
- Loss of linear opportunities for natural drainage
- Trees cannot 'move' through corridors in the landscape
- The tree is more susceptible to compaction and disease
- Home owners often see no significance of a stand-alone tree

Broome North should aim to be a benchmark project in terms of vegetation responding to the local condition however following site visits and research reports/ investigations, the area highlighted for the development has few significant tree stands. The site appears to be open vegetation dotted with few significant Bloodwood species. This means that no particular area can be highlighted as a significant group for retention and if individual trees are to be tagged then the result would be similar to the image on the previous page.

A concept UDLA believe should be explored is whole lot site retention. This would involve the construction of roads and installation of services; however the rest of the site kept as vegetated. This has numerous benefits, as noted previously, economically, environmentally and culturally. It also provides the lot owners with options in regard to using the existing vegetation for landscaping by formalising the edges and retaining vegetation of interest.

In addition it would avoid (as a Yawuru local pointed out)

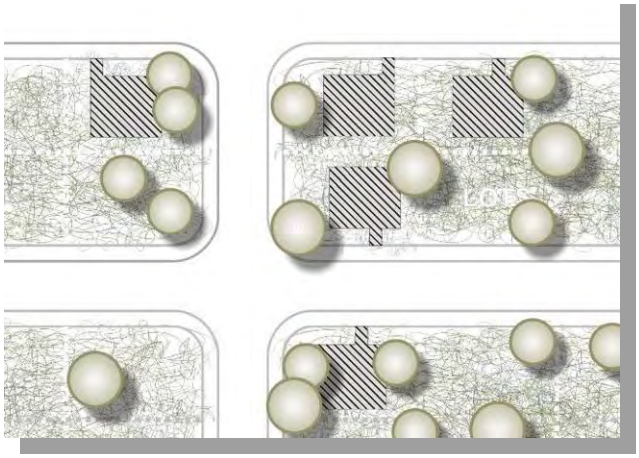
"...clearing 50 blocks and people only building on two at a time."

This concept received strong support from the community during the Planning and Design Forum and due to the relatively consistent and level slope of the Broome North Development site this option is a viable possibility.

EXISTING VEGETATION – BROOME NORTH
Photo courtesy of UDLA, 2009

CONCEPTUAL PLAN
WHOLE SITE VEGETATION RETENTION
Drawn by UDLA, 2009

UDLA suggests a rebate package could be offered to new lot owners whereby the building envelope to a specified value is paid for and allows contractors who are supervised and educated to undertake minimal clearing of the house area only on the lots.



DETAIL
CLEARED BUILDING ENVELOPE
Potential to be offered as part as a land purchase scheme
Drawn by UDLA, 2009

6.2.2 IMPLEMENTATION OF VEGETATION RETENTION IN STAGE ONE

As part of Stage one works at Broome North, there is opportunity to take vegetation retention to the next practical level by:

- Partial lot vegetation retention

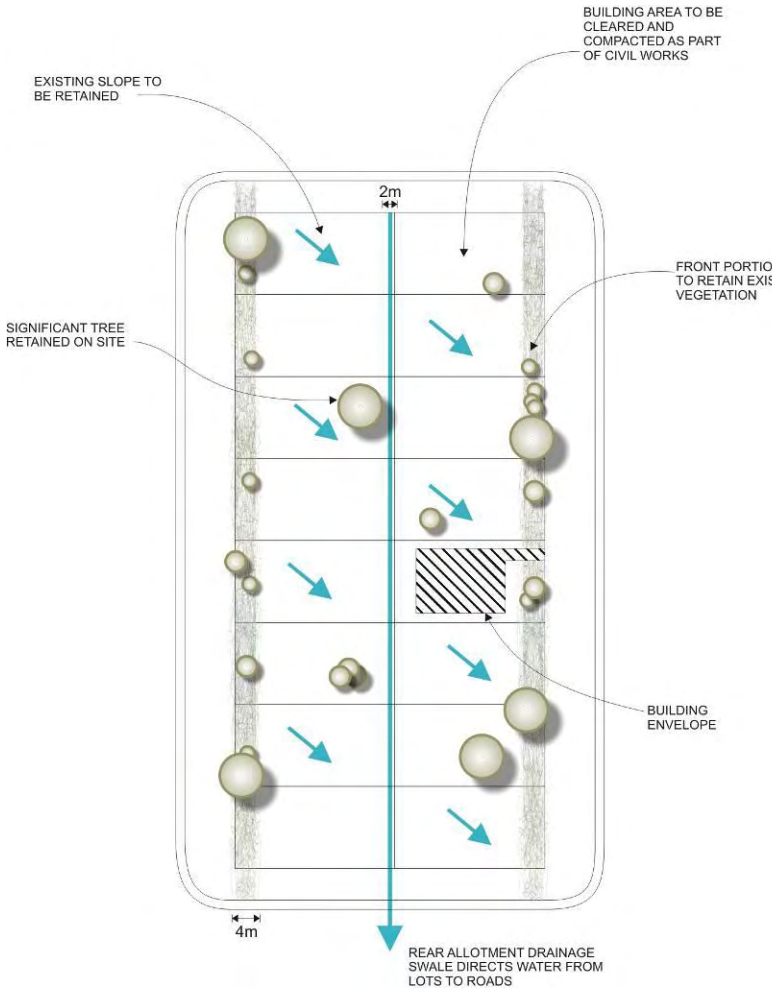
  Retaining a linear portion of retention at the front of each lot allows the portion of the lot where the house would be built to be cleared and compacted ready for the lot owner to build their home. The strip of retained vegetation will primarily serve the function of filtering runoff from the cleared portion of the lot. There is an opportunity to progress this strategy in later stages. E.g. implementing whole site vegetation retention.

- Significant tree retention

  This involves identification (through tagging) of significant individual and groupings of trees within this stage of works. This may further refine the draft conceptual plan as to where linear parklands and open spaces may be best located.

- Vegetated allotment drainage

  The allotment drains will provide opportunity to stabilise the lot further through the establishment of grass or vegetation at the development phase.



CONCEPTUAL PLAN
VEGETATION RETENTION WITHIN STAGE ONE
Potential to retain the vegetation at the front of the lot (approx 4m)
Drawn by UDLA, 2009

7 RESIDENTIAL DESIGN

Residential lot design should reflect the strategies outlined for the wider landscape such as incorporating:

- Drainage solutions;

  (E.g. minimise areas of hardstand through the introduction of gravels, mulches, and planting to aid water infiltration, ultimately reducing pressure on the larger drainage network)

- Local materials
- Local planting palette
- Shade amenity

  (E.g considered tree planting within front landscapes will enhance shade amenity for the streetscape. However views from the house to the street should be maintained in areas to passive surveillance and security)

These outcomes can be encouraged through:

- Leading by example

  Residents are often inspired and informed by the landscapes around them, so by developing prototype examples of working 'dry creek beds' and water wise solutions within public open space areas this may influence residents in their residential garden designs.

- Education

  Education of future residents is vital in the success of sustainable private landscapes. Potentially, garden design guidelines/plans that incorporate surfaces for infiltration and water wise and local material solutions could offer further clues to residents when they design their front yard and work with the rear allotment drainage system.

- Rebate packages

  Offering landscape 'packages' to new residents that allows them to have their front gardens designed and planted, up to a specified value, if they are willing to use a majority of native plant species, local materials and water wise objectives. This initative has proven popular at Januburu Six Seasons and similar packages could be used within Broome North. Another successful rebate package developed as part of Januburu Six Seasons, is allowing the lot owner to select a 'free' street tree when landscaping their front garden. This encourages ownership and establishment of street trees.



EXAMPLE OF A RESIDENTIAL REBATE PACKAGE AT JANABURU – FRONT LANDSCAPING
This type of initiative not only helps aide a local sense of place and local industry, it also helps deal with water at its source by encouraging infiltration.
Photo courtesy of UDLA, 2009

8 WEED CONTROL

A preliminary impact assessment and biological survey of the development site (GHD, January 2009) identifies ... introduced species within the study area – (Lot 3150 & Lot 304). Most of these weed species are naturalised and/or widespread throughout the Kimberley Region. Weeds found in the study area include:

Kapok (*Aerva javanica*)

Buffel Grass (*Cenchrus ciliaris*)

Rubber tree/ Calotropis (*Calotropis procera*)

Noogoora Burr (*Xanthium strumarium*)

Curry Bush (*Senna occidentalis*)

Bellyache Bush (*Jatropha gossypifolia*)

Rosella (*Hibiscus sabdariffa*)

Verano Stylo (*Stylosanthes hamata*)

Wild Passionfruit (*Passiflora foetida var. Hispida*)

Zomia (*Ziziphus mauritiana*)

Pie Melon (*Citrullus lanatus*)

Basil Bush (*Ocimum basilicum*)

Mint Bush (*Hyptis suaveolens*)

Triumfetta petandra

Sida acuta

Coffee Bush (Leucaena leucocephala)

Hairy Merremia (Merremia aegyptia)

Siratro Macroptilium atropurpureum

Butterfly Pea (Clitoria ternatea)

White Creeper (Merremia dissecta)

Neem (Azadirachta indica)

Taylor Fruit (Ziziphus mauritiana) Declared plant P1, P5

Gallons Curse (Cenchrus biflorus)

Mossman River Grass (Cenchrus echinatus)

Other high threat weeds that have been located close to the site should be on the control list, should they later be located within the development zone:

Tiger paw (Ipomoea pes-tigridis)

Rubber vine (Cryptostegia madagascariensis) Declared plant P1, P2

Coffee Senna, (Senna occidentalis) Declared plant P1, P2

Candle Bush (Senna alata)

Khaki weed (Alternanthera pungens)

Praxelis (Praxelis clematidea) Declared plant P1/ National Alert list species

The presence of a number of these weed species reflects the extent of disturbance across the study area as a result of human activities such as clearing, vehicle access along roads and tracks and, rubbish dumping. Weed species are most dominant along property perimeters tracks and roads, within and adjacent to private properties and amongst rubbish dumped within the study area. Weeds are often established when seed escapes from surrounding gardens. E.g. Neem trees and Lantana. These trees are also a problem within residential areas.

To reduce the increase and spread of these species as well as the potential introduction of new weed varieties, suggested management and control actions are as follows:

- Clearing should be kept to a minimum as necessary (during construction period);
- Minimise clearing of land adjacent to development site;
- Follow existing tracks and roads where possible and not allowing uncontrolled access;
- If a new track is required, present and future routes should be investigated and utilised, in order to minimise the number of new tracks required;
- Ensure cleared bushland and topsoil is removed from site (if contaminated with weed seed) in Shire approved dumpsites or used in rehabilitation of any adjacent disturbed areas (i.e. not retained in mounds or windows);
- To reduce the risk of spreading weed species or introducing new species during proposed works all vehicles and machinery should be cleaned of plant material and soil before and after entering the site (in particular when working along the perimeter of the site or in areas noted to have invasive weed presence);
- If imported soils and materials are to be used, they should be certified weed free, and;
- All litter and waste materials should be contained and removed off-site regularly.

General vegetation mitigation for the area would include the following actions:

- Manual/ physical selective removal of weeds;
- Weed spraying using the industries best practise and appropriate regimes (e.g. use non-residual glysophate based herbicide sprays, limit herbicide overspray, apply herbicide by qualified technician, use a appropriate herbicide in proximity of waterways, e.g. 'Roundup CT' etc) ;

- Control the spread of invasive grasses/low shrubs through regular verge slashing before seeding occurs, and;

- Three introduced species recorded within the study area, the Belly Ache bush, Rubber tree/Calotropis and the Noogoora Burr, are listed as Declared Plants under the *Agriculture and Related Resources Protection Act, 1976*. Occurrences of these plants should be controlled using recommended methods outlined by the Western Australian Department of Agriculture and Food.

9 MATERIALITY

Currently, the vast majority of construction materials are imported into the region, significantly increasing costs due to transportation distances. Moreover, this response fails to take advantage of significant local industry opportunities.

With a growing responsibility to pursue sustainable environmental practices, more and more development will rely upon utilising local industries, materials and products closer to their source. This nurtures an important layer of site specific design and provides robust solutions that require lower on-going levels of maintenance. In addition, this support encourages promotion and development of the Northwest landscape industry.

9.1 PATHWAYS

Many paths and tracks may require only small areas of mechanical clearing to create pindan tracks or paths. Other potential local materials for paths include mulches and gravels.

Making use of red pindan soils is a key element in the northwest. Januburu Six Seasons tested an innovative technique of rammed earth consisting stabilised with 5% cement, fine binding gravel and compacted pindan to create aesthetic and durable solutions for paths and rest areas. This technique provides a site specific alternative that compliments the surrounding landscape.

Other treatments such as concrete footpaths using local aggregates are to be used in appropriate areas.



FOOTPATH TREATMENTS USING LOCAL AGGREGATES
Photo courtesy of UDLA, Flickr.com

LOCAL MATERIALS – CEMENT STABILISED AND COMPACTED PINDAN PATH
OVER PAGE CLEARED INFORMAL PINDAN TRACK Photos courtesy of UDLA

9.2 STREET AND PARK FURNITURE

Due to the harsh environment and high incidence of vandalism in remote areas, innovative ways of providing street furniture need to be explored. Local sandstone boulders are proven to withstand the harsh conditions and use in Broome. Boulders selected for their smooth shape and set into the ground at the appropriate heights (450-60mm high) provide robust seating and table solutions within the open space areas.

LOCAL SANDSTONE SEATING BOULDERS
Photo courtesy of UDLA

9.3 GARDEN BEDS

9.3.1 LOCAL GRAVEL FEATURE MULCH

Januburu explored widespread use of local aggregates featured in contrasting bands with backdrops of endemic plants, adding to site specific design. They require little ongoing maintenance, withstand the unforgiving conditions[6] and are useful tools in enlivening a dry landscape and displaying local stories. Furthermore, the Broome Township is often viewed from the sky[7] these aggregate features read as large local patterns on the landscape.

9.3.2 SITE MULCH

Vegetation that must be removed from the site can be mulched down and used as mulch for future garden beds (provided it does not contain weed seed). The existing native seed bank within the mulch has proven to provide a good source for propagating and establishing local plants within swales and garden beds.

[6]Unforgiving conditions pertains to the extreme climatic conditions of Broome such as high temperatures and cyclonic events that can cause rapid weathering of landscape materials and difficult cultivation conditions

[7] Due to the central location of the airport in Broome, aeroplanes fly in low over the township, offering unique aerial views of the Broome

10 PLANTING PALETTE

Historically, landscaping in the Northwest has relied heavily on exotic nursery planting stocks that often give the impression of a tropical or sub-tropical paradise. This treatment offers no clues to the greater surrounding unique and natural landscape and practically speaking, requires high maintenance, high water requirements that are costly, supporting a largely unsustainable practice.

The case for supporting local plant palettes within the Broome North development is as follows:

Environmental

'Native' plant stocks are often sourced from other parts of the continent and are not endemic to the region.[8] These stocks are mostly unsuited to northwest environmental conditions; i.e. have mismatched water, soil and nutrient requirements, become invasive and promote a foreign landscape.

In general, endemic species compliment their unique conditions, requiring minimal ongoing maintenance, provide habitat and food for local fauna and continue to support local ecosystems.

Visual and Social

From a visual aesthetic, endemic plants showcase the unique landscape of the Northwest Region and act as a unique attraction. Use of local vegetation within a streetscape setting provides an opportunity to display unique flora and fauna, aiding in creating a 'sense of place' and fostering community pride.

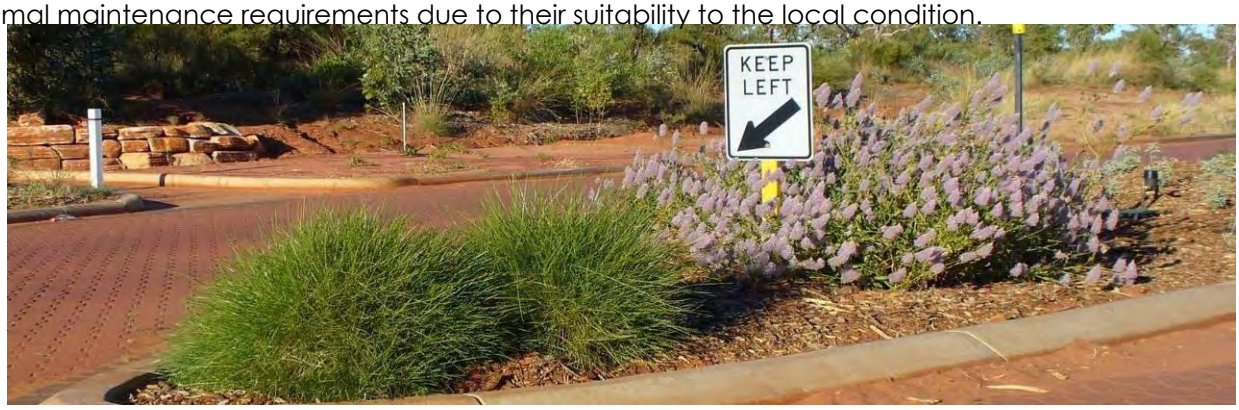
Nursery stocks suitable for landscape purposes should be cultivated from 'solid' performing local plants that provide the required landscape outcomes i.e. low compact shrub forms, respond well to trimming, strong performers, and most importantly, shade trees that are suitable in terms of their form and structure for street or residential garden use

Cultural

By including local species, an important layer of culture is nurtured offering an opportunity for indigenous communities to continue using the plants for traditional uses; a resource for themselves and an educational tool for interested parties. It also offers the trees, animals and humans a continuing 'lifestyle'. This ongoing lifestyle for all life is a very important concept to the local Yawuru people.

Maintenance

Many organisations and community groups e.g. local authority – 'SKIPS', Nurseries etc. are now recognising that endemic plant stocks suited to the area offer a sustainable option that requires minimal maintenance requirements due to their suitability to the local condition.



[8] Endemic plants are those that are unique to a particular geographic location such as a specific habitat type.

10.1 STREET TREE PLANTING

One of the most important streetscape features will be bringing shade into the area to improve pedestrian amenity. The following are different methods of supplementing vegetation within the streetscape. Street trees are important for a variety of reasons, in particular;

- Shade amenity
- Visual amenity
- Informs place, provides street hierarchy / character
- Variety of street tree opportunities
- Recognised a number of local species are appropriate to provide streetscape form

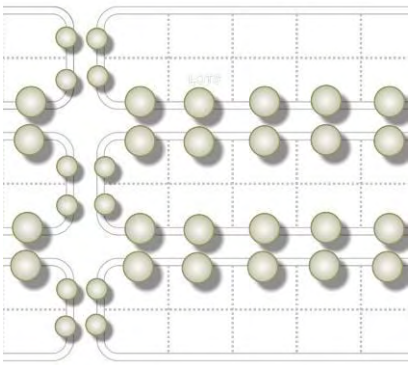
10.1.1 STREET TREE IMPLEMENTATION WITHIN STAGE ONE

There is a number of ways trees could be introduced into the streetscape and that may be appropriate to the Broome north development are outlined below.

AVENUE PLANTING

Avenue planting is one of the most popular methods of introducing trees into the urban environment. It is achieved by selecting a specimen tree in linear alignments along a road or footpath. This will often result in adding a formal effect to the streetscape character of the street or open space. One species is typically designated to one avenue. By varying species and/or densities of tree plantings (including creating double or triple avenues) this can provide hierarchy to streets within a subdivision.

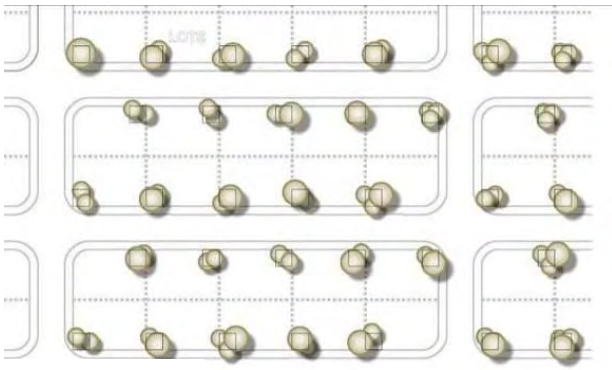


AVENUE STREET TREE PLANTING
Sketch plan by UDLA, photos courtesy of UDLA and sourced from flickr.com

RETENTION OF NATIVE VEGETATION AREAS WITHIN EACH LOT

Retention of native vegetation is possible in areas within limited road reserves. A portion of each lot may retain groupings of local trees and companion planting.

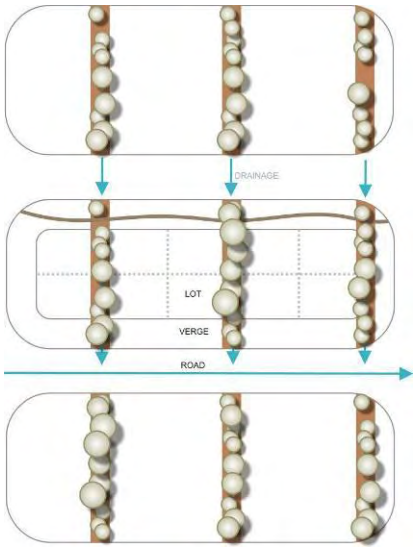


GROUPED PLANTING
Drawing by UDLA, 2009, photos courtesy of UDLA and sourced from realadventures.com

Following discussions at the Planning and Design Forum, these types of vegetation treatments could be used within 'tighter' streetscapes where areas are set aside for local planting. There is an idea that these set 'preserved' areas could become optional planting areas. For example, a homeowner may wish to apply to council to plant it out and there is a possibility for the council providing suitable local plant lists to support the local landscape.

PLANTING WITHIN DRAINAGE LINES

Referencing the concept from section 3.2.3 Exploring new solutions, the streetscape could follow the concept of tree planting and Spinifex planting within these locations. The vegetated drainage lines will help to filter water runoff from the lots, stabilise the pindan and act as attractive features and ecological corridors for the site. Where the vegetated drainage line connects back to the street, the trees will provide shade amenity for the pedestrian.



VEGETATED DRAINAGE FEATURES
Drawing by UDLA, 2009
Images courtesy of UDLA, 2009

10.1.2 STREET TREE ESTABLISHMENT ISSUES

Although street tree planting has many advantages, it is rare to find a street within Broome with a solid example of street trees. If trees are planted in copses or linear systems it is likely they will have a greater chance of surviving, however singular tree planting is often very difficult to establish in this kind of location. The harsh climatic condition of Broome means that selecting appropriate species is imperative.

However, in recent times the main issue facing street tree establishment is a culture of little value being placed on these trees by contractors and individuals, leading to vandalism predominantly by large vehicles. Januburu *Six Seasons* attempted to establish local trees within the streetscape, the developer had the majority of street trees planted early in the civil stages of works, to ensure some maturity of plant stock at the time residents moved to their new homes. This included a 2 year low cost sacrificial irrigation system for establishment. Unfortunately, many of the trees were destroyed by contractors during the construction of homes. People could not see the worth of these street trees during construction and many trees were run over by large vehicles.

Attempts to use more mature stock is very difficult to source in the current Northwest landscape industry, however early ordering of stock; at least 18 months in advance (advice given by a local supplier) will ensure suitable mature stock is available. Unfortunately, there are disadvantages using mature tree stock. Mature plant stock is considerably more expensive for a developer and regardless of their size; street trees warrant little respect and are subject to vandalism from large vehicles, particularly construction vehicles. Furthermore, larger, mature trees are more difficult it is to establish as healthy, stable trees. The majority of trees local to Broome do not establish if retained in pots as the root system will wrap itself around the pot, forming a deformed growth habit. Some tree varieties are more suited to being grown in a pot and the project team were advised at the Planning and Design Forum that the Gubinge tree is one local tree that can successfully be raised in a pot to a mature size (approx 2m within 18 months).

Other solutions to overcome issues related to establishing street trees could include:

- Similar to Januburu Six Seasons Stage Four, a front garden landscape rebate that includes streetscape planting to lesson damage by contractors (being installed when major building works are completed) This also encourages homeowners to develop a level of ownership for the street tree as part of their overall front garden and therefore care for it; and/or;

- Implement the use of robust stakes/bollards/guards that place importance on each street tree. These stakes/bollards/guards have the potential to be viewed as part of a larger art strategy that could reflect local themes or introduce contemporary themes.





10.1.3 TREE SPECIES

During the planning and design forum, community members provided the project team with some local trees that they believe should be featured within the landscape. These include;

- *Eucalyptus miniata* – Woolly butt (should be planted in groups with a low understorey of plants mimicking there natural condition) The *E. miniata* grows to 6-20m, with a rough, fibrous-flaky bark. It may be self pruning, so planted in groups within garden beds would be the best outcome.
- *Ficus opposita var. indecora* (fast growing*Melaleuca sp*. (street tree or drainage lines)
- *Terminalia petiolaris x Terminalia ferdinandiana* - Red Gubinge - Suitable as a street tree and potential within drainage lines as they like to keep their feet wet)
- *Adansonia gregorii*- Boab (although not known to originate from the area, some local trees are estimated to be approx. 300 years old and therefore the seeds was believed to have been traded by local indigenous people... meaning the tree has a long cultural connection with the place. The Boab grows 5-15m with a distinctive bottle shaped trunk.
- Eucalyptus camaldulensis (Northwest var.) (Stately tree, not to be pruned so may be useful in larger open space areas where major top pruning will not be carried out. These are a large tree for the area)






E. miniata *Ficus opposita* *Melaleuca* sp. Red Gubinge *E. camaldulensis* *Adansonia gregorii*

Photo courtesy of UDLA (trees located within Broome town site)

Further trees that could be investigated as part of the streetscape are outlined on the following pages.

Corymbia flavescens

Wrinkle-leaf Ghost Gum

Form	tree
Height	3-15m
Bark	Smooth, white, shedding in thin scales
Flowers	white, cream. Apr-Jun/Nov
Soil	Red earth soil
Located	Often along drainage lines
Notes	May be self pruning


Melaleuca dealbata

Freshwater Paperbark

Form	tree
Height	6-15m
Bark	Papery and layered
Flowers	Cream. Aug - Nov
Foliage	Blue grey
Soil	Sand or sandy soils
Located	coastal dunes, seasonally wet depressions, and small watercourses.
Notes	Relatively slow growing



Corymbia ptychocarpa

Swamp Bloodwood

Form	tree
Height	4.5 - 18(-20) m
Bark	rough, tessellated
Flowers	Pink. Feb-May
Soil	Sand, alluvium
Located	Along watercourses, near springs


Corymbia bella C. papuana

Ghost Gum

Form	tree
Height	6-20m
Bark	smooth, white, shedding in thin scales
Flowers	cream, white. Jul-Dec
Soil	Usually on alluvial soils
Located	Along watercourses, floodplains
Notes	May tend to be self pruning. Shapely crown with a weeping habit


Eucalyptus alba

White gum

Form	tree
Height	5-15m
Bark	smooth
Flowers	cream, white. Jul-Sept.
Soil	Sand, clay, alluvium
Located	Along watercourses, seasonally wet depressions
Notes	May tend to be self pruning

Corymbia polycarpa

Long-fruited Bloodwood

Form	tree
Height	(3-)5-15(-25)m
Bark	rough, tessellated
Flowers	white, cream. Apr-Aug
Foliage	shiny and green
Soil	Sand over sandstone, laterite or quartzite, alluvium
Located	Usually low lying areas

Eucalyptus bigalerita

Northern Salmon Gum

Form	tree, generally single trunked
Height	6-18m
Bark	smooth, pale grey to copper
Flowers	white, yellow. Aug-Sep
Foliage	light green leaves, broad and large
Soil	Alluvium, sandy
Located	Along watercourses, low lying flats
Notes	Culturally not appropriate as a street tree for Broome

Eucalyptus jensenii

Ironbark

Form	tree
Height	3-10(-15m)
Bark	rough, deeply furrowed
Flowers	white, cream. Jan-May
Soil	Red sand, sandy loam, sometimes with gravel
Located	Sandstone plateaus, lateritic rises and plains

Eucalyptus microtheca

Coolibah

Form	tree
Height	5-10m
Bark	rough, box type
Flowers	white. Dec-Feb
Soil	Clay
Located	Seasonally waterlogged flats, along watercourses, swamps

Planchonia careya

Cocky apple

Form	tree or shrub
Height	1-15m
Flowers	showy white, cream, pink. Jan-Dec
Soil	Sand to clay, sandstone
Located	Edges of creeks and swamps, screes

Terminalia petiolaris

Marool, Blackberry tree

Form	semi- deciduous tree
Height	4-14m
Bark	fissured, dark brown to black
Flowers	cream, white. Feb-May/Dec
Foliage	Green, often red to purplish before falling.
Soil	Sandy soils, sandstone
Located	Coastal areas, often vine thickets

Mimusops elengi

Mamajen

Form	tree or shrub
Height	2-16m
Flowers	white. Jan- Sep
Soil	Sandy soils, sandstone, basalt
Located	coastal or near coastal areas

Melaleuca argentea

Silver cadjeput

Form	tree or shrub (rarely)
Height	3-18(-25) m
Flowers	Cream, white. Jul-Nov
Soil	Alluvium, sand or clay, sometimes saline
Located	Along watercourses, swamps

Lophostemon grandiflorus

Freshwater mangrove

Form	tree
Height	4-8m
Flowers	Cream, white. Jan- Dec. highly scented
Foliage	small glossy leaves
Located	Damp habitats (swamps, seepages)

Nauclea orientalis

Leichardt pine

Form	tree with horizontal branching
Flowers	attractive yellow golf ball flowers during summer
Notes	A distinctive tree, can be used a pioneer establish an area. Hardy and fast growing

Lysiphyllum cunninghamii

Kimberley bauhinia, Jigal

Form	tree. usually stout trunk with weeping branch habit.
Height	up to 6m
Bark	dark coarsely flaking bark
Flowers	bright red. Apr- Aug
Foliage	two lobes joined like butterfly wings. New flushes of growth are a colourful display of red and pink.
Notes	Ideal shade tree, attraction for local fauna. Allow other shrubs to grow beneath canopy. Connection to local indigenous stories and use.

Canarium australianum

Styptic tree

Form	tree, with open spreading crown
Height	3-20m
Bark	smooth creamy grey bark
Flowers	yellow, green, white. Nov-Apr
Foliage	pinnate leaves
Soil	Sand, clay shallow skeletal soils, basalt.
Located	Lateritic scree, Sandstone ridges and cliff faces

* The initial list of trees mostly originates from the top end and northwest Australia and is proving to provide reasonable growth rate and shade amenity

Wherever possible, site specific spaces and places should be created whereby local planting can be used appropriately. The Planning and Design Forum reinforced a strong community desire to use local street trees.

However, in some cases it may be necessary to incorporate some tree species that are not endemic to the Kimberley region for provision of amenity. If this situation arises, the following planting list may be referred to with regard to similar water and soil requirements.

INTRODUCED SPECIES TREE LIST

Leptospemum longifolium

White wood, Weeping tea tree

Form	weeping graceful tree
Height	3-5m
Bark	smooth cream to white deciduous bark
Flowers	small cream flowers Jul-Nov
Located	Permanent freshwater streams

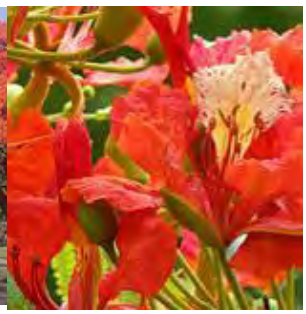
Eucalyptus herbertiana

Kalumburu Gum

Form	mallee or tree
Height	4-8 (-10) m
Bark	smooth powdery white
Flowers	white cream, Jan
Soils	skeletal
Located	Sandstone outcrops and rocks, base of ridges, hillsides
Notes	from north of Broome to Darwin

Delonix regia

Royal Poinciana



Peltophorum pterocarpum

Yellow flame tree

Tipunana tipu

Rosewood

10.1.4 SUGGESTED PLANTING LIST

The rate of plant growth within the Broome area is fast, due to the ideal growing conditions, provided planting is carried out within the correct times of the year and with the appropriate care. In one season tube stock plants can establish themselves if planted prior to, or at the beginning of the wet season.

The availability of appropriate local plants is one of the greatest factors affecting the successful outcome of establishing native gardens and landscapes in Broome North. Plants need to be sourced months in advance to ensure quantities of appropriate stock are available.

Old Broome has a mature plant palette which provides excellent shade amenity and aids cooling and shading of the streets. However, Old Broome relies heavily on tropical exotic planting such as;

TREES
African Mahogany, Mangoes, Poincianas (*Delonix regia),* Figs, Palms (e.g. Carpentaria, Foxtail, Coconuts)

SHRUBS
Ixora, Ginger, Alamanda, Mock Orange, Hibiscus, Bougainvillea, Golden Cane, Exotic Gum trees (e.g. *E. maculata*), Duranta, Tamarind

As part of a 'new Broome' style the project team proposes to use local species where possible. A local plant palette will support the local landscape industry, reflecting a local sense of place and enable water wise outcomes that are adapted to local conditions and as a consequence requires little ongoing maintenance.

Maintenance is an important issue. Native species are highly suited to the area with regard to climate, soil and water requirements; however all planting requires a certain level of maintenance and the premise that native plants do not require maintenance is unrealistic.




PLANT GROWTH OF LOCAL SPECIES
One year's growth at Januburu Six Seasons (from tube stock and seed stocks within site mulch)
Photos courtesy of UDLA

Following is a suggested species list for supplemented planting using local plants from the West Kimberley.

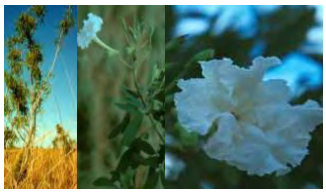
TALL SHRUBS / SMALL TREES

Caesalpina major
Goolyi

Height 4m
Spread 2m

Dolichandrone heterophylla
Jumburru
Lemonwood

Height 6m
Spread 2 - 3m



Ehretia saligna
Miganiny
Native Willow

Height 5m
Spread 3 - 5m

Exocarpos latifolius
Jarnba
Mistletoe tree

Height 5m
Spread 5m

Grewia breviflora
Goolmi
Currant or Coffee tree

Height 8m
Spread 3 - 5m

Hakea arborescens
Irrgil
Yellow Hakea

Height 4m
Spread 2 - 3m

Hakea macrocarpa
Jarridiny

Height 5m
Spread 2 - 3m

Mallotus nesophilus
Badarrbadarr
Yellow ball flower tree

Height 5m
Spread 2 - 3m

Santalum lanceolatum
Gumamu
Tropical Sandalwood

Height 8m
Spread 8m

Sesbania formosa
Irirrwal
White Dragon tree

Height 13m
Spread 8m

LOW SHRUBS / GROUNDCOVERS

Acacia adoxa
Prostrate Acacia

Height 0.3m
Spread 0.8m

Acacia bivenosa
Nirliyangarr
Dune wattle

Height 2m
Spread 2m

Acacia colei
Lirrirngin
Soapy wattle

Height 3m
Spread 3m

Acacia eripoda
Yirragulu
Broome Pindan wattle

Height 3m
Spread 3m

Acacia translucens
Balalagoord
Poverty Bush

Height 2m
Spread 2m

Caesalpina major
Goolyi

Height 2m
Spread 2m

Canavalia rosea
Windi
Beach bean

Height 0.5m
Spread 0.5m

Carissa lanceolata
Gungkarra
Conkerberry

Height 2m
Spread 2m

Crotalaria cunninghamii
Minmin
Green birdflower tree

Height 2m
Spread 0.5 - 1.5m

Crotalaria sp.
Rattle pod

Height 0.5m
Spread 0.5m

Crotalaria medicaginea Lam

--

Height 0.5m
Spread 1m

Flueggea virosa
Goowal
Snowball bush

Height 2.5m
Spread 2.5m

Grevillea dryandri
Prostrate Grevillea

Height 0.5m
Spread spreading

Grevillea refracta
Willing jamoordoo
Silverleaf grevillea

Height 4m
Spread 1- 3m

Ipomoea pes-caprae
Goordayoon
Beach morning glory

Height 0.5m
Spread 1m

Scaevola parvifolia
--

Height 0.3m
Spread 0.4m

SWALE REHABILITATION (TREE PLANTING)

Acacia platycarpa
Ghost wattle

Height 8m
Spread 4m

Corymbia dampieri
Biilal
Dampier's Bloodwood

Height 11m
Spread 8m

Corymbia flavescens
Gunurru
White Gum

Height 8m
Spread 8m

Eucalyptus tectifica
Ngarrban
Grey box

Height 8m
Spread 8m

Ficus opposita
Wgamarnajina
Sandpaper fig

Height 8m
Spread 8m

Gyrocarpus americanus
Mirda Stinkwood

Height 8m
Spread 8m

Hakea macrocarpa
Jarridiny

Height 8m
Spread 8m

Lysiphyllum cunninghami
Jigal
Kimberley bauhinia

Height 8m
Spread 8m

Melaleuca dealbata
Garnboorr
Freshwater paperbark

Height 8m
Spread 8m

Santalum lanceolatum
Gumamu
Tropical Sandalwood

Height 8m
Spread 8m

Terminalia ferdinandiana
Gabiny
Gubinge tree

Height 8m
Spread 8m

Terminalia petiolaris
Marool
Blackberry tree

Height 8m
Spread 8m

SWALE REHABILITATION (SHRUB AND GROUNDCOVER PLANTING)

Acacia adoxa
Prostrate Acacia

Height 0.3m
Spread 0.8m

Acacia colei
Lirrirngin
Soapy wattle

Height 3m
Spread 3m

Acacia eripoda
Yirragulu
Broome Pindan wattle

Height 3m
Spread 3m

Acacia monticola
Warraka
Scratchy wattle

Height 4m
Spread 3m

Acacia translucens
Balalagoord
Poverty Bush

Height 2m
Spread 2m

Caesalpina major
Goolyi

Height 2m
Spread 2m

Canavalia rosea
Windi
Beach bean

Height 0.5m
Spread 0.5m

Carissa lanceolata
Gungkarra
Conkerberry

Height 2m
Spread 2m

Crotalaria cunninghamii
Minmin
Green birdflower tree

Height 1.5m
Spread 0.5 - 1.5m

Fluegga virosa
Goowal
Snowball bush

Height 2.5m
Spread 2.5m

Ptilotus exaltatus
Bardirl Bardirl
Pink Mulla Mulla

Height 1m
Spread 0.5m

Trioda sp.
Spinifex

Height 0.3m
Spread 0.8m

11 TRANSECT APPROACH

Different areas within a subdivision will be designed with varying visual cues and spatial arrangements to create a legible and recognisable space for people within it.

> *"As observed in natural ecosystems, a community will function properly and sustain life in the face of a change if it is full and diverse. Using the ecosystem as a model for human settlements suggests that places of varying intensity and character are required in order to cater for the full cross section of the community..."* (Excerpt from Roberts Day Broome transect poster)

Roberts Day identified five transects (T1 to T5) or zones to categorize different areas within a development;

T1 - Nature

T2 - Bush Living

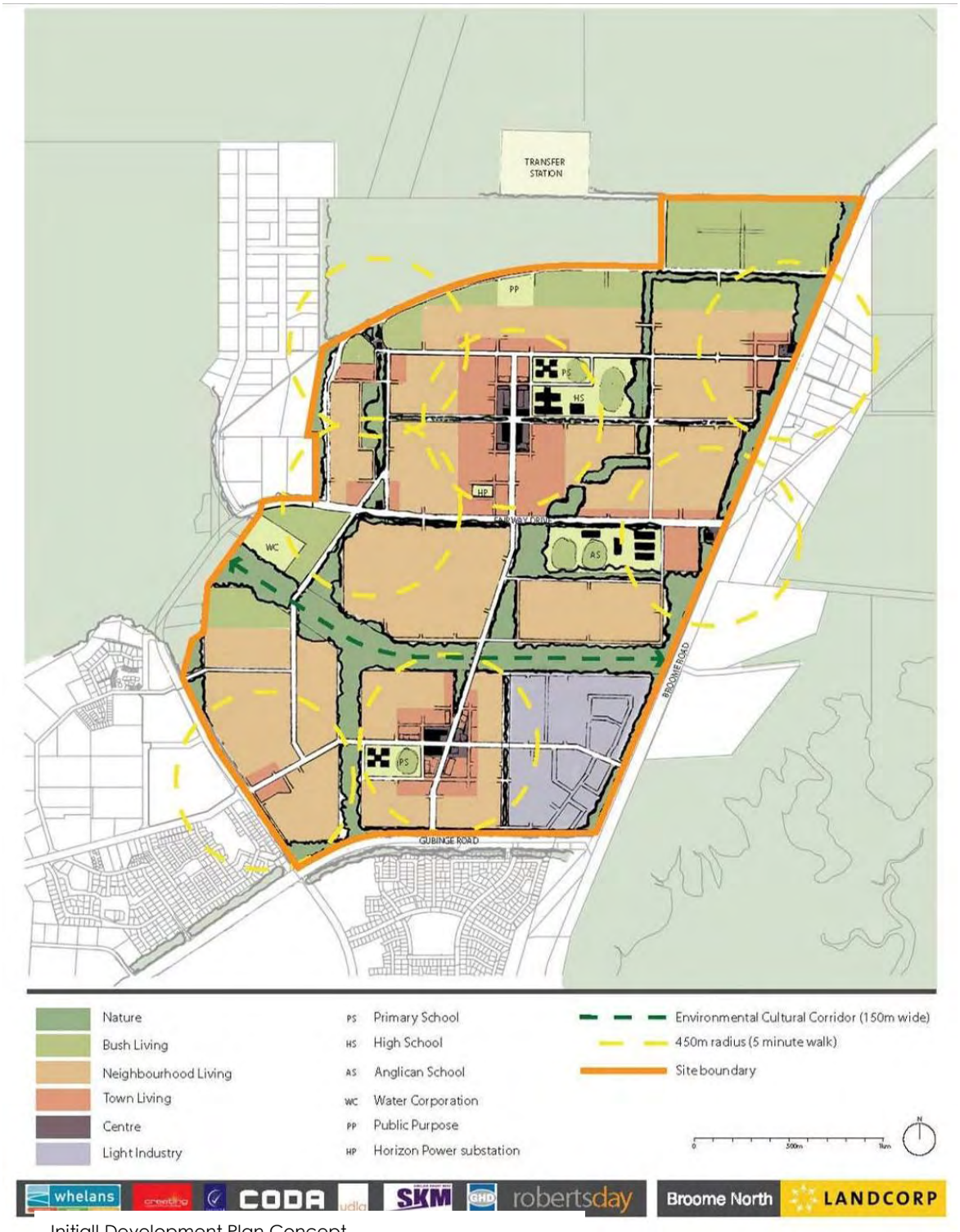
T3 – Neighbourhood Living

T4 – Town Living

T5 – Town Centre

It must be noted that these transects aim to define typical zones within a development, using visual cues and spatial scales to make these spaces legible. It is likely that the new development could test the juxtaposition of these transects to create exciting and new experiences for the resident. It is also not essential to include each of these spaces, yet a balance must be found between variety and order to provide a legible opportunity for pedestrian and vehicle experience.

The following page is the Development Plan created at the PDF and produced by Roberts Day incorporating the various transects (above) and taking into considerations topics outlined previous to this section and discussed with community members during this Planning and Design Forum.



Initiall Development Plan Concept
Drawing by Roberts Day (2009)

Following the Planning and Design Forum (PDF) and aligning with the agreed concept base plan, the different transects and their distributions have been tested to ensure the design meets community, drainage, open space and town planning outcomes. Below is the refined version of the plan (produced by Roberts Day).

Final Development Plan Concept
Drawing by Roberts Day (2009)

12 LANDSCAPE SPACES

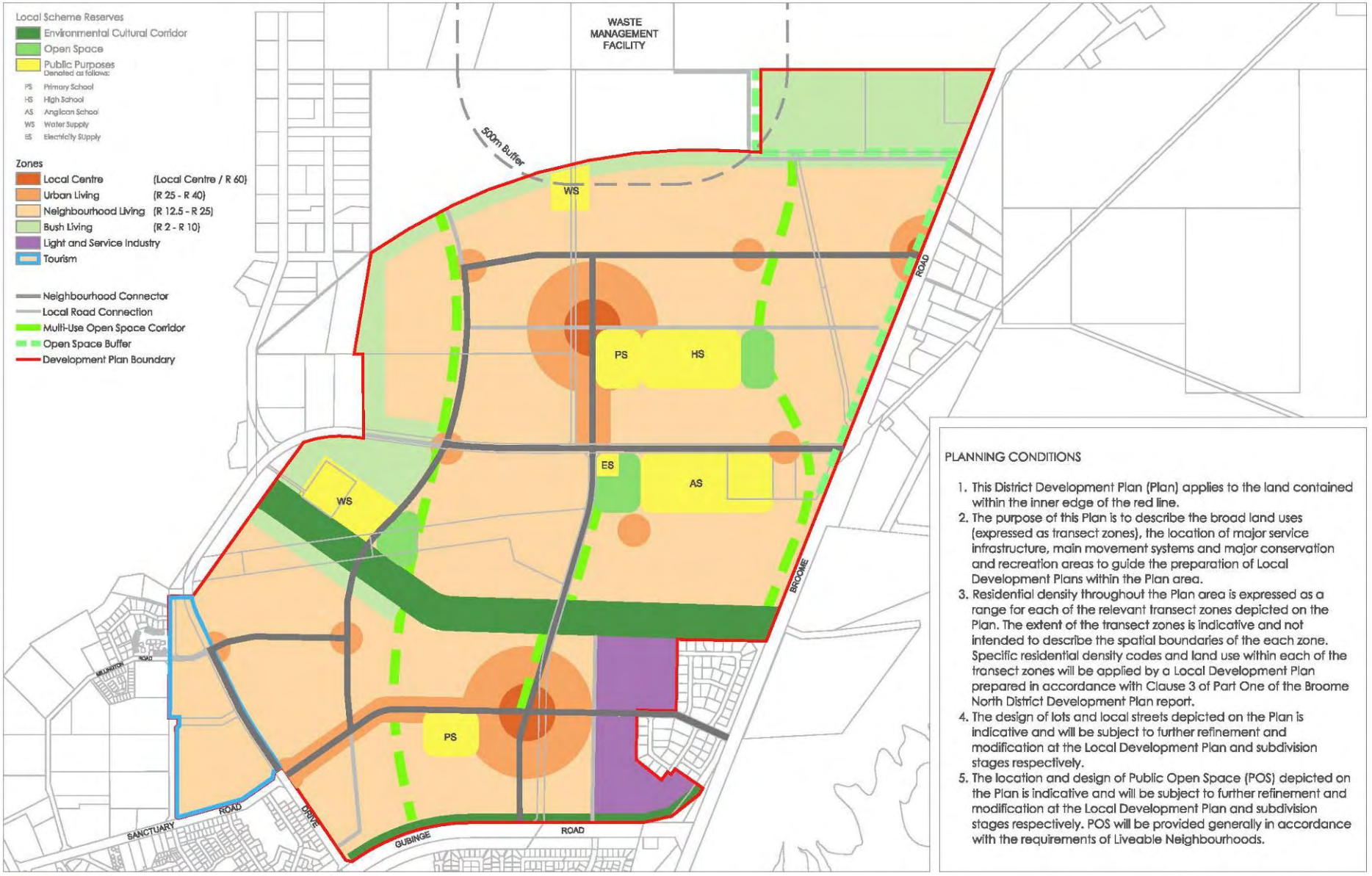
12.1 DISTRICT DEVELOPMENT LEVEL

Investigations have also been conducted into the distribution of POS within Broome North and more specifically the area highlighted for development (DAP area). Aligning with liveable neighbourhoods with reference to specific comments made by the local community, a variety of POS spaces are proposed within the development to cater for various needs. The district level plan below shows that ample open space has been provided in the form of:

- An Environmental Cultural Corridor(ECC);
- Public Open Space;
- Multi use open space corridors; and,
- Open Space Buffers.

At the district level a primary road network is also defined as:

- Neighbourhood connector street; and,
- Local road Connection Street.



PLANNING CONDITIONS

1. This District Development Plan (Plan) applies to the land contained within the inner edge of the red line.
2. The purpose of this Plan is to describe the broad land uses (expressed as transect zones), the location of major service infrastructure, main movement systems and major conservation and recreation areas to guide the preparation of Local Development Plans within the Plan area.
3. Residential density throughout the Plan area is expressed as a range for each of the relevant transect zones depicted on the Plan. The extent of the transect zones is indicative and not intended to describe the spatial boundaries of the each zone. Specific residential density codes and land use within each of the transect zones will be applied by a Local Development Plan prepared in accordance with Clause 3 of Part One of the Broome North District Development Plan report.
4. The design of lots and local streets depicted on the Plan is indicative and will be subject to further refinement and modification at the Local Development Plan and subdivision stages respectively.
5. The location and design of Public Open Space (POS) depicted on the Plan is indicative and will be subject to further refinement and modification at the Local Development Plan and subdivision stages respectively. POS will be provided generally in accordance with the requirements of Liveable Neighbourhoods.

LANDCORP

District Development Plan (Plan No. 1)

Broome North

SHIRE OF BROOME

ISSUE	DESCRIPTION	YYMMDD	DRAWN	APPVD
H	Statutory Amendments	091009	SJ	DP
G	Modifications to design	091009	SG	SG
F	Statutory Layers	091008	SG	SG
E	Modifications to design	090930	SG	SG
D	Open Day Concept	090924	SG	SG

DRAWING NUMBER UD1 102 REV H
REFERENCE NUMBER LAN BRO
SCALE 1:5000 @ A0 1:10000 @ A1
0 300 600m

robertsday
perth | sydney | melbourne | dubai
Level 1 | 130 Royal Street East Perth
Western Australia 6004 AUSTRALIA
T: 61 8 9218 8200 | F: 61 8 9218 8701
www.robertsday.com.au

12.2 LOCAL DEVELOPMENT PLAN

Specific investigations of the POS distribution within the local development area allowed the further refinement and description of the public open space areas to be included within Broome North.

The reference back to a district level plan and thorough investigations into existing infrastructure and community needs and wants, addresses the Shire of Broome Open Space Review (2009) that notes...*Open Space within the Town site of Broome has not been provided in accordance with a predetermined plan or philosophy...and with open space planning there is an opportunity to maintain or heighten the existing Broome 'lifestyle'*.

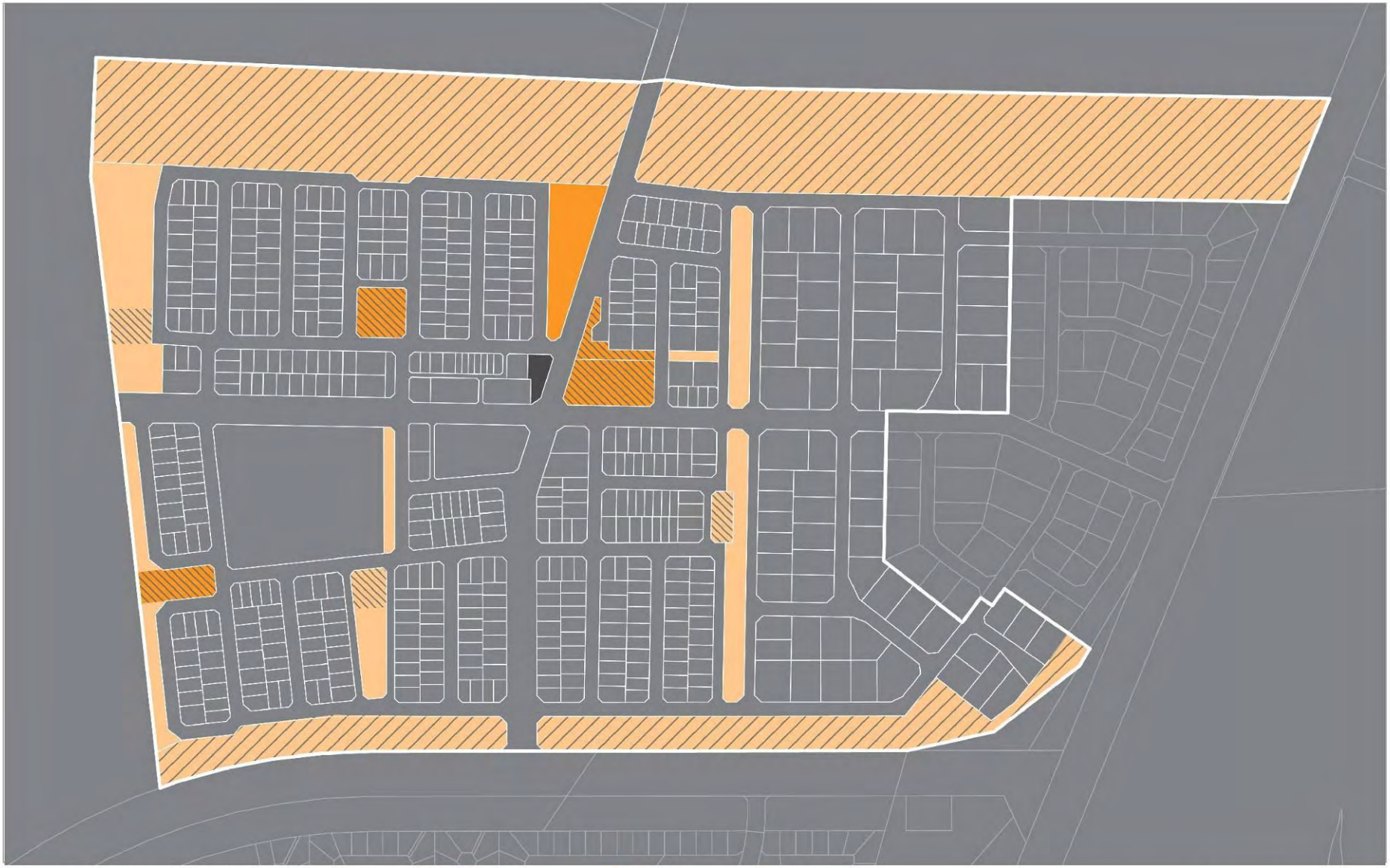
New open space needs to provide connection back to country and serve many purposes including;

- Allude to the Broome 'lifestyle' , heritage and culture theming
- Pedestrian amenity and scale
- Be sensitive to local conditions
- Create meaningful and practical connections, informal and formal recreation

The Landscape Typology plan on the following page is based on liveable neighbourhood principles (mirrored in the Shire of Broome Open Space Review, 2009) and shows the extent of open space provision within the local development area and defines the different landscape spaces including:

- Environmental Cultural Corridor (12.2.1)
- Multi Use Corridors (12.2.2)
- District park (12.2.3)
- Neighbourhood Park (12.2.4)
- Local Park (12.2.5)
- Local Park – Civic (12.2.6)

Refer to the indicated section for further detail and an example sketch on each landscape space.



LANDCORP

Landscape Typologies (Plan No. 3)

Broome North

for LandCorp

DRAWING NUMBER UD3 208 REV B
REFERENCE NUMBER LAN BRO
SCALE 1:2000 SHEET A1
0 100 200m

B Landscape Typologies 091012 BG DP
ISSUE DESCRIPTION YYMMDD DRAWN APPVD

Issued for design assist only. All areas and dimensions are subject to detail design + survey.

robertsday
perth | sydney | melbourne | dubai
Level 1 | 130 Royal Street East Perth
Western Australia 6004 AUSTRALIA
T: 61 8 9218 8700 | F: 61 8 9218 8701
www.robertsday.com.au

12.2.1 ENVIRONMENTAL CULTURAL CORRIDOR

Environmental Cultural Corridors (ECC's) are an initiative used previously within developments in Broome and serve a variety of purposes. The concept was born out of previous meetings with the Yawuru and is essentially a tract of land set aside to be retained without development. This land must provide important connections between significant sites for the indigenous people and may follow important drainage networks or significant tracks or trails (maintaining fauna, flora and peoples lifestyle).

TYPICAL VIEWS WITHIN AN ECC
Photos courtesy of UDLA

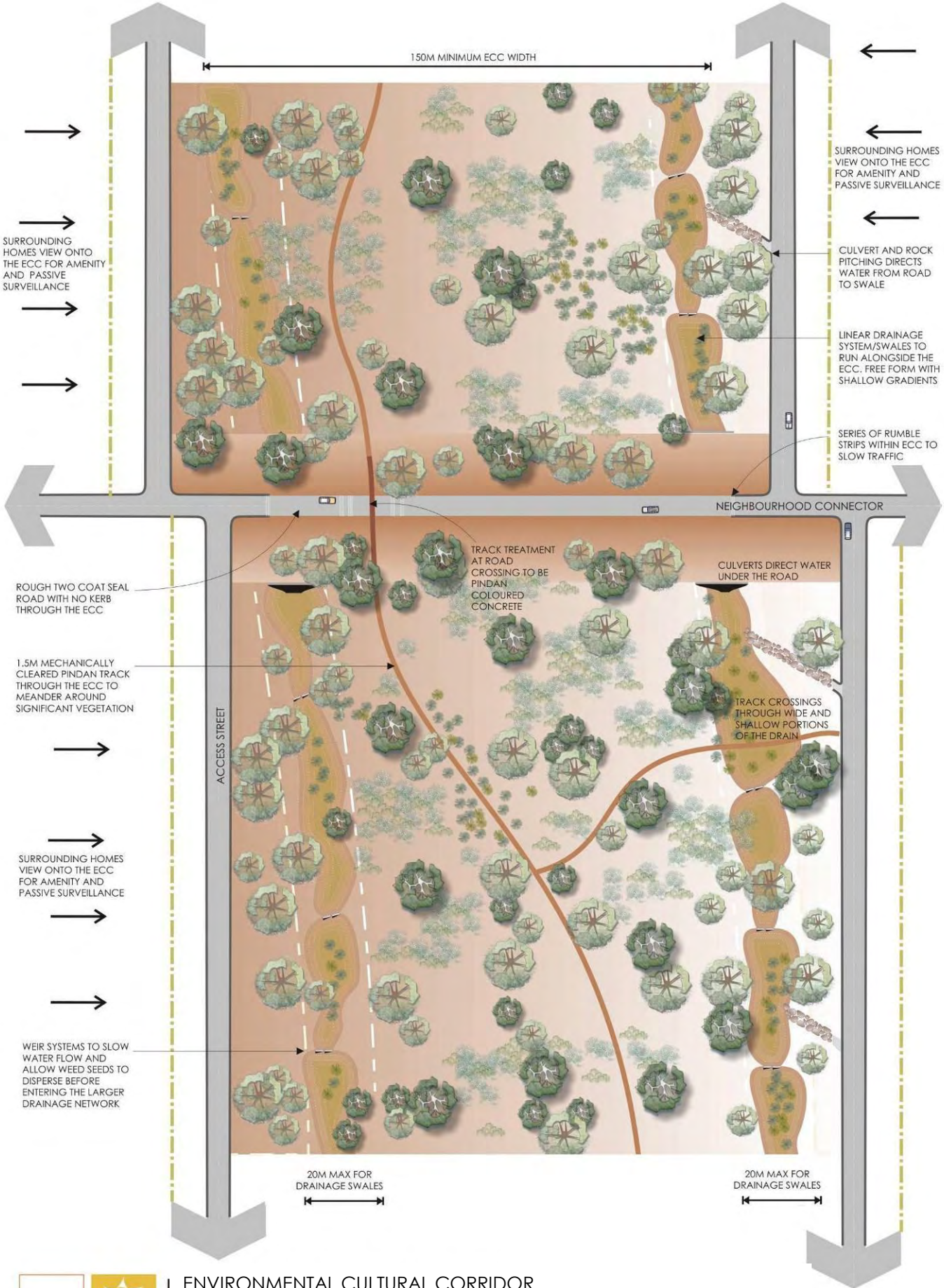
The ECC serves the purpose of:

- a buffer between the development and existing infrastructure, or significant areas;
- a buffer and linkage for indigenous people and for animals to move through the landscape between important places;
- retains a significant portion of local bushland to establish the sense of place and provide a constant connection to country for the development;
- allows education and traditional practices to continue on the land, and;
- supports biodiversity and local ecology through a natural tract of landscape.

The area is proposed not to be formally designed and low maintenance cleared pindan tracks are preferred to other more solid path materials. A rural style perimeter fence will discourage trails bikes and vehicles from entering the ECC.

TYPICAL FENCING INTO THE JANUBURU ECC
Photo courtesy of UDLA

ECC SECTION
Drawing by UDLA



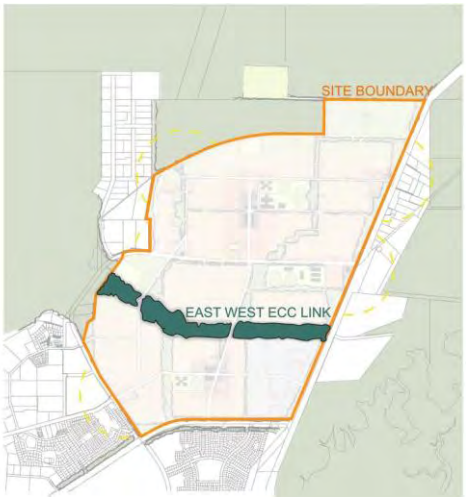
udla LANDCORP

ENVIRONMENTAL CULTURAL CORRIDOR

TYPICAL TREATMENT INCLUDING DRAINAGE TO EDGES - Drawing by UDLA

The exact location of the ECC's was a time consuming mapping exercise which could only be established through ongoing discussions with the Yawuru. The result is a strong connection through 'country'. The outcome of the ECC (following ongoing discussions and the Planning and Design Forum) was to maintain a strong east west connection, a minimum width of 150 metres.

The Yawuru have provided permission for drainage to be contained within the ECC but bound only to the edges of the ECC and to be carried out in a similar way to the drainage swale basins in Januburu Six Seasons. Refer to section 5.1 *Precedent Projects: Januburu Six Seasons*. The drainage is to take up a maximum of 20metres within either side of the ECC boundaries.



ECC LOCATION (indicative)
Base drawing courtesy of Roberts Day, 2009
Modified image by UDLA, 2009



DRAINAGE SWALES WITHIN THE ECC
Photos courtesy of UDLA, 2006-2009

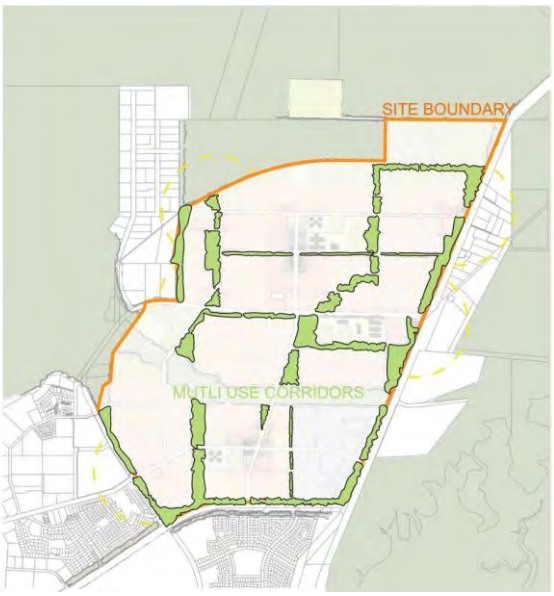
There is a strong desire by the Yawuru people to have the ECC meander through the Town Centre nodes. There were genuine attempts to make this happen within the structure plan, however other security concerns raised by other members of the community and the logistics of having a 150 metre 'natural' bushland tract through a Town Centre resulted in the ECC being offset to the north of the neighbourhood centre location. However, a significant portion of open space has been set aside that will connect to the ECC and into the heart of the Town Centre. This allows a 'green space' to interlink to the major urban centre and provide a connection to country, a 'Broome style' meeting space and an interpretative local link back into the ECC. An investigation of the design possibilities of this space was sketched at the Planning and Design Forum and is included within Section 12.2.3 District Park.

12.2.2 MULTI-USE CORRIDORS

As Broome continues to grow, components of the community have expressed the strong desire for areas of native vegetation and open space to be retained to support ongoing cultural connections across the peninsula and continuing connectivity from the' Beach to Bay'.(*Shire of Broome 'Open Space Review' 2009*)

Aside from the ECC, the district level and local development plan includes these kinds of connections that will have the opportunity to provide informal connection to 'country' through local planting, materials and informal open spaces.

Ideally linear in shape, this area would become a multi use corridor, providing the community with a myriad of opportunities including the following.



MULTI USE CORRIDORS (indicative)
Base drawing courtesy of Roberts Day, 2009
Modified image by UDLA, 2009

- Ideally linear in shape
- Provide informal connection to 'country' (local planting, materials and open space)
- Can be located adjacent to any of the other transects
- Potential for it to be connected to adjacent ECC corridors (Refer to section 6.5)
- Natural and urban drainage including flood management
- Flora and fauna linkages and habitat
- Cultural and community linkages/ opportunities
- Informal (kickabouts) and Formal (Exercise, play equipment) play areas
- Dual use paths/ tracks
- Cultural, Heritage and environmental interpretation/ education
- Public and community art opportunities
- Drainage opportunities
- Buffer Planting
- Irrigated open lawn areas provide opportunity for grey water usage

MULTI USE CORRIDORS
Open lawn areas can act as kickabouts, amphitheatres, and drainage areas etc
Images from UDLA (2009), Flickr.com

The multi use corridors are proposed to include urban and natural drainage programs. In general these areas would include low flows and large storm event capacity. This transect maximises urban drainage retention and infiltration by including full cover vegetation, thus minimising the amount of hard runoff area. Solutions such as mulch, lawn or vegetated surfaces allow water to be retained and potentially reinfiltrate.

Specific area planning that copes with the drainage requirements, including gentle grading will ensure the space is still functional for other uses (e.g. recreation). For example, during a large storm event the lower portion of the corridor would act as infiltration swales and basins. Therefore, formal and dry areas would be located on higher ground to protect equipment and facilities.

An important point highlighted during the PDF was the opportunity for hydro-zoning the landscape. For example, different factors such as contours and vegetation types will impact water availability. Through considered deign and the use of varied reticulation lines, the appropriate amount of water will be delivered to the various areas, minimising wastage.

ACTIVE AND PASSIVE RECREATION

A gentle grade within the multi use corridor can be utilised as kick about areas and coupled with retained and supplemented vegetation, rolling lawns can provide incidental moments for visitors to relax under the shade of a tree with slight elevation for passive surveillance of the surrounding parkland. Grading of these lawn areas could also provide opportunities for cultural and festival events within an informal lawn amphitheatre.

It is proposed that lawn areas are well considered so that there is no excessive maintenance or nutrient runoff issues.

From experience within present day Broome, these areas often experience high levels of vandalism. For this reason, furniture and facilities are to be extremely robust and situated in highly visible locations for passive surveillance purposes. (E.g. robust seating consists of local sandstone boulders)

LANDSCAPE BEAUTIFICATION

It is proposed that landscaping is to maintain a local sense of place by retaining and utilising local materials where possible. With this mind, it is important that edge treatments are well considered. For example: the juxtaposition of well maintained lawn against the natural bushland; the use of mulches as a contrast to lawn and natural bushland; and using paths to segregate lawn and bushland.

The multi use corridors will retain vegetation where possible. The use of local mulch or slashing during development construction will provide an immediate seed bank for revegetation. Other areas will require additional local tube stock planting.

MAINTAINING ENVIRONMENTAL SYSTEMS AND LINKAGES

It is proposed that multi use corridors fulfil an environmental role such as maintaining habitat including fauna and flora linkages. For example the retention of trees within this corridor, provides habitat and linkages for the existing possum colony identified within the development area.




The multi use corridors propose to retain the existing natural drainage flow paths and maintain natural flow rates at discharge points pre-development. For this reason and due to development

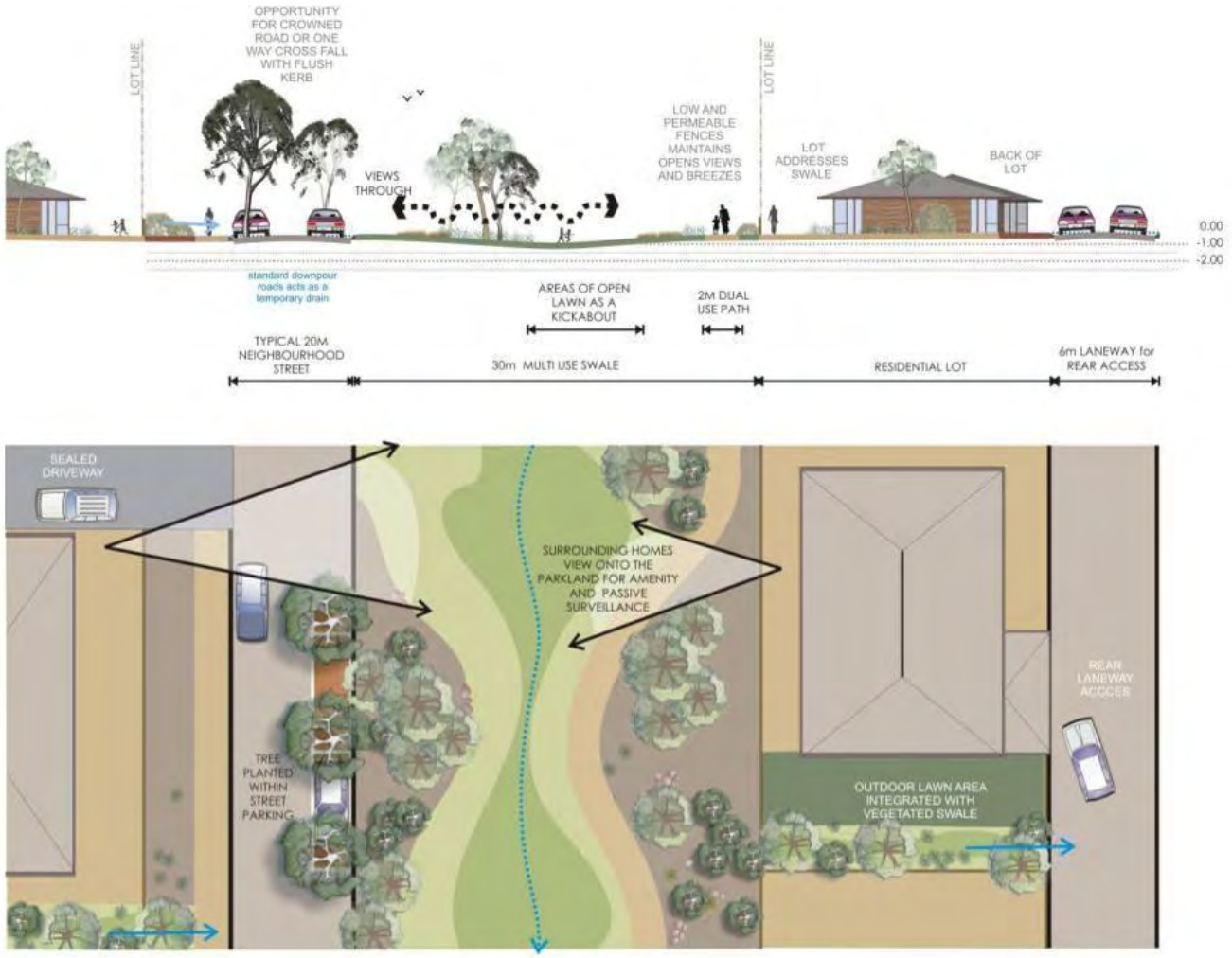
area constraints there will be increased volumes of water restricted within these corridors. Therefore, it is important that innovations such as weirs and natural holding areas (including full vegetation cover to act as a natural slow flow device) are incorporated and used to their full capacity.

ROADS

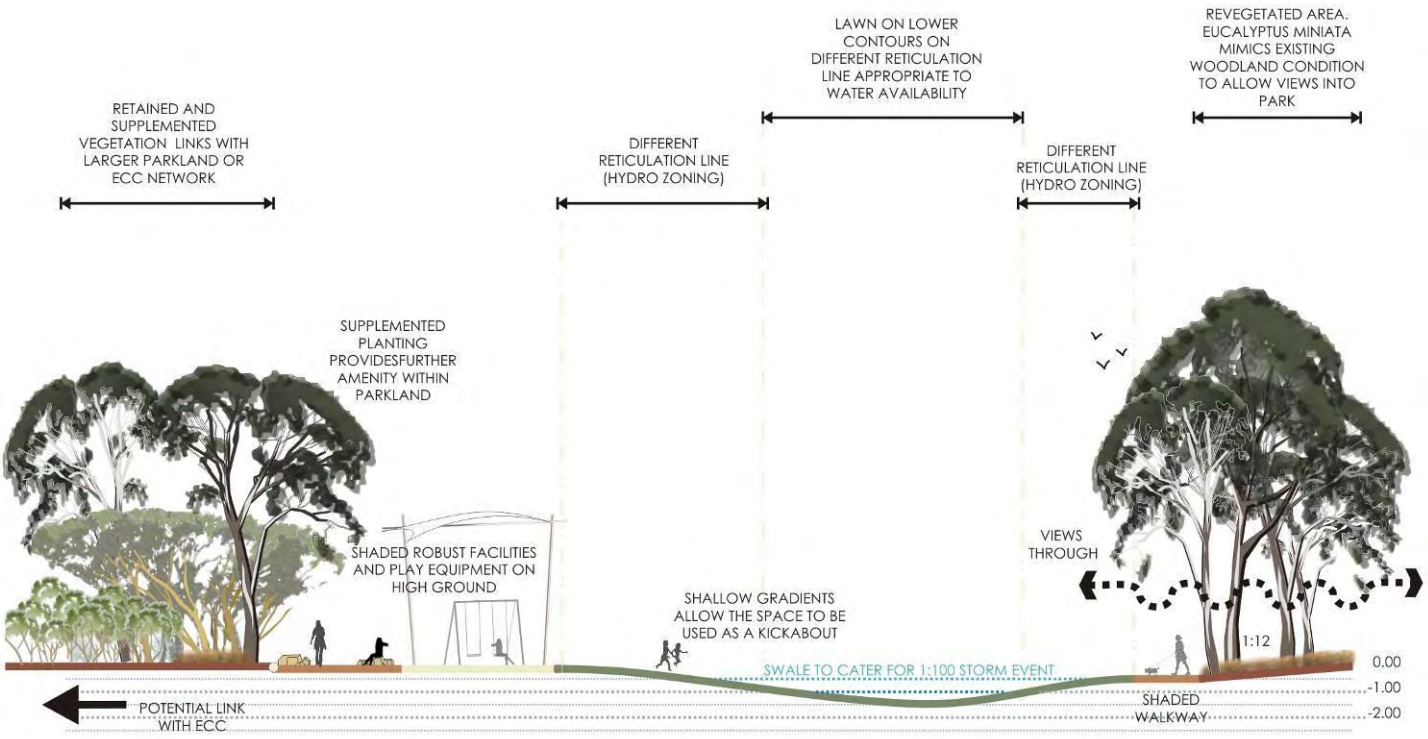
Proposed roads that dissect these multi use corridors need to be kept pedestrian friendly with dual use path crossings, the ability to allow stormwater to 'run across' areas (i.e. limited kerbing) and easy access for fauna.

OPEN SPACE INTERFACE

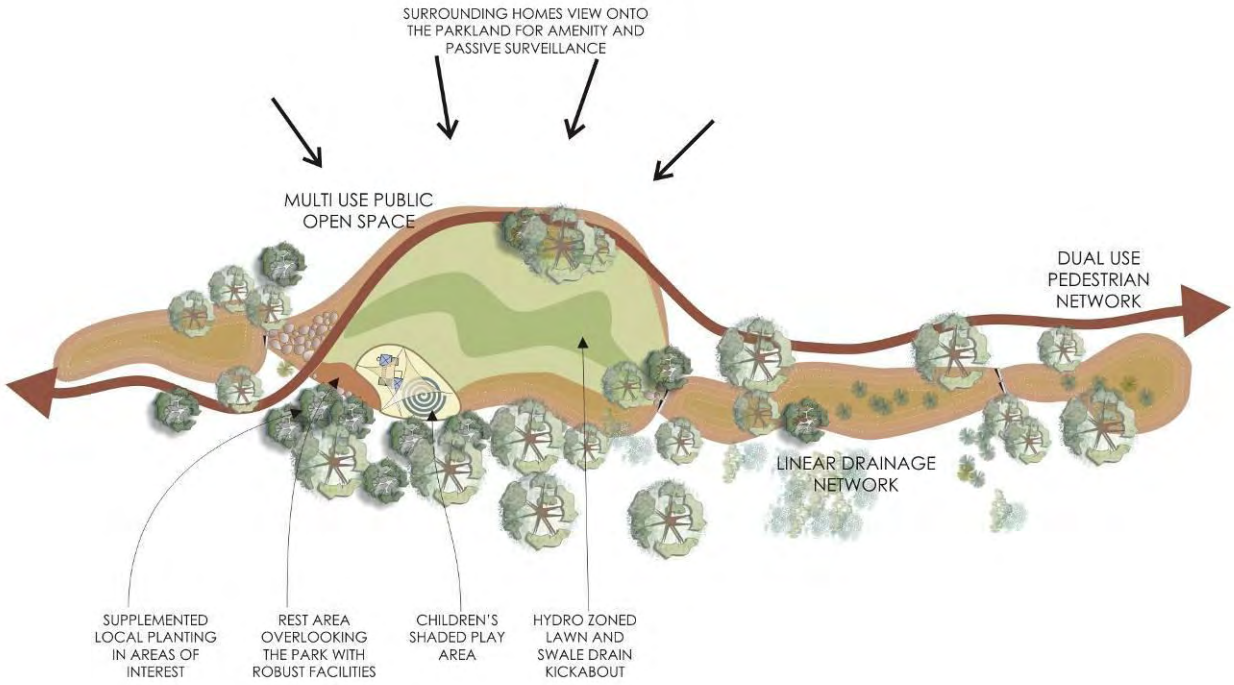
A key outcome of the multi use corridors is to maximise passive surveillance. The corridors will always be addressed by either a street or a house. It is proposed that homes that address these linear parklands will enjoy the amenity from the front of the house and will have vehicle access via a rear laneway.



MULTIUSE CORRIDOR INTERFACE WITH THE STREETSCAPE (section and plan)
Drawing by UDLA (2009)



MULTI USE PUBLIC OPEN SPACE SECTION
RESEARCH SKETCH (BROOME NORTH)
1:200 (A3)



MULTI USE PUBLIC OPEN SPACE PLAN
RESEARCH SKETCH (BROOME NORTH)
1:1000 (A3)

PRECENDENT PARK

Within Broome, this style of park has been executed successfully at Sunset Park (Old Broome) It is a multipurpose park where the open lawn area;

- Acts as a drain directing water to a larger drainage swale network;
- Allows infiltration;
- Filters runoff; and has,
- A useable kick about area - Large trees stabilise the swale slope where scouring may occur.



SUNSET PARK
Images courtesy of UDLA (2009)

The drawback of this park is its high level of maintenance. Large areas of lawn with single trees standing within the lawn area have contributed to this problem.

Another issue within this park was highlighted previously; the lack of planning according to water availability has led to overwatered lawn areas. For example, the lawn area covers varying contour levels; this has resulted in the low lying lawn areas becoming 'boggy' due to the high watering required for the higher levels. A way to avoid this is to ensure the park design is hydro zoned. This means that different contours are planted according to water availability. If lawn is required over several contours then each level should be reticulated by irrigation lines providing individual and specific water volumes.

It is important to note that these corridors will not always be open 'green' spaces. At appropriate locations, the multi use corridor may serve the function of a more formal urban space, such as a public square linked to a central public space.

12.2.3 DISTRICT PARK

Aligning with Liveable Neighbourhood information from the Shire of Broome Open Space Planning Review 2009 "...*District parks of approx. 2.5-7ha should be provided, notionally serving* three neighbourhoods, and should be between a 600m and 1km walk from most dwellings. These larger parks should preferably be located between neighbourhoods..."

It is envisaged that the district park within the Local Development area will provide a green link back to the ECC and offer opportunity for interpretation and education as the transition from urban built form, to natural existing bushland (ECC) occurs.

A district level concept for these larger parks is to provide community interpretation/education, program and community services (such as a community garden) in accessible areas. The investigation of the first District Park within the local development area has opened up an opportunity for a potential East Kimberley Botanical Garden.

Conceptual sketch of the District Park within the Local Development Plan
Concept sketch by UDLA (2009)
Drawing by Roberts Day (2009)

12.2.4 NEIGHBOURHOOD PARK

The liveable Neighbourhoods requires neighbourhood parks to remain approx. 3000-5000m2 or larger, to serve about 600-800 dwellings and be a maximum 400m walk from most dwellings. They should also be located between or towards the edge of neighbourhoods rather than at the core. It is proposed that these parks will attempt to have streets on all sides of perimeter.

Conceptual sketch of the Neighbourhood Park within the Local Development Plan
Concept sketch by UDLA (2009)
Drawing by Roberts Day (2009)

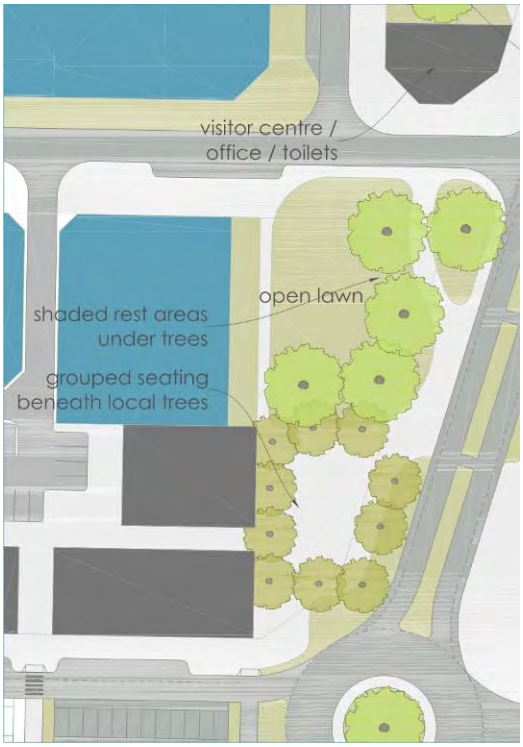
12.2.5 LOCAL PARK

Local parks should be provided for "*...within safe walking distance from all dwellings. Up to 3000m2 should be provided for local children's play and resting places, designed as small intimate spaces where appropriate and to allow pedestrian connectivity and to create a sense of place*." (extract from Shire of Broome Open Space Review (2009).

Conceptual sketch of a local Park within the Local Development Plan
Concept sketch by UDLA (2009)
Drawing by Roberts Day (2009)

12.2.6 LOCAL PARK – CIVIC

This park would provide a cool area of escape and contrast from the built centre and provide an excellent opportunity to display local plants and materials allowing a connection back to 'country' in the hub of the community.



Conceptual sketch of a local Park (Civic)within the Local Development Plan
Concept sketch by UDLA (2009)
Drawing by Roberts Day (2009)

PRECENDENT PARK

At the Planning and Design Forum it was noted that a unique part of the existing Broome town site is *Male Oval* as it provides many functions to the Broome Town Centre including;

- An Informal meeting space
- An Active space close to facilities
- Sporting facility
- Events area
- Reference point for locals and visitors



MALE OVAL, BROOME
Photo courtesy of UDLA, 2009

This green space is a feature that is largely unique to Broome and it has been recognised that such a space could be incorporated within Broome North to provide a space where people can meet and orientate themselves from the new development. There is an opportunity to provide a more urban style park, with paved areas and formal seating.

12.3 DUNE CROSSINGS

In the future there will be increased pressure for people to access Cable Beach from the Broome North development.

Ideally no access should be encouraged over the dunes and the development plan has funnelled movement in directions other than the dune area. However, it is assumed that one or two specified tracks will be required to reduce uncontrolled access and impact on this significant area as the population in the north of Broome increases. The exact location of these tracks will require ongoing discussions with the Yawuru and any tracks should be clearly identifiable to prevent any other tracks being created.

The 'tracks' would be designed to create low impact with suitable facilities such as drinking fountains and seats to encourage use of these specific paths.

13 IMPLEMENTATION PLAN

Following the Planning and Design Forum (PDF) it is important that the project team continue to investigate the outcomes and concerns raised by the community. The conceptual planning for Stage One is expected to be undertaken within the next 3 months. Ongoing engagement with the community will occur during the documentation phase and continue through implementation.

To ensure the above mentioned outcomes are achieved the following requirements are essential.

It is important to keep ongoing lines of communication open with the community to maintain their support and ownership of the project.

Several key groups that will need to follow up consultation include:

- Local schools
- Local landscape and construction contractors
- Local nurseries and material suppliers
- Local artists (development of art and cultural strategy)
- Yawuru people

Within Broome it has been indicated that there is an informal landscape and art community with great potential. Capitalising on the community engagement many opportunities exist for the Broome North project to assist in developing these layers of the Broome community and help to consolidate some overall planning and design / implementation strategies.

13.1 BROOME COMMUNITY CULTRAL ART STRATEGY

There is a strong desire to incorporate public art within the Broome North Development. Broome has the potential to attract a large art community with its extensive history and current industries (the pearling and mining industry), its local community and in particular the skills of the traditional owners of the land who have much to contribute in terms of their local knowledge. However, as mentioned earlier, it must be carried out as part of an overall art strategy.

This strategy can start to be developed through consultation with the community to consolidate a listing of potential artists that exist within the community, their particular skills, preferred mediums and their interest in contributing to such a scheme. In collating this document certain opportunities can be highlighted and adequate, realistic timing and involvement can be developed to ensure the outcomes are practical and align with key implementation dates.

13.2 INVESTIGATE AND DEVELOP NURSERY SUPPLY

Broome North will demand high levels of plant stocks for supplementation, revegetation, feature planting, garden development and street planting. Currently, the local nursery industry cannot support the quantity or quality required.

Urgent consultation with current suppliers, seed collectors and growers is required to ensure the correct stock can be produced and will be available at the programmed stage of works required.

Involving the local industry early in the development programme will optimise the chances of obtaining the required plant stocks, help to develop a sustainable local landscape industry and will encourage plant material to be sourced locally.

Plant material, especially street trees need to be ordered as soon as possible due to the tight time constraints associated with Broome North, therefore immediate communication and securing of tree stocks needs to occur.

13.3 INVESTIGATE AND DEVELOP LOCAL LANSCAPE CONTRACTOR SKILLS

An opportunity exists to encourage local landscape contractors to become involved from the outset of the project. Early discussions with contractors will enable them to understand what would be required for this project to ensure they may be in a position to successfully tender for the project. This kind of engagement will help to support a sustainable local industry and also ensure relevant local expertise will be aligned with the project.

Investigations by community groups may uncover potential skills and labour that will provide opportunities for potential partnerships for both the developer and the community (especially in regard to developing new skills to aid employment).

13.4 INVESTIGATE LOT DRAINAGE

With the strong support shown by members of the community towards the vegetated drainage swales, it is important to now follow up investigations into precedent projects (Derby) and investigate if they have been successful. This will ensure a better informed, successful and innovative outcome for Broome North.

13.5 CONCEPTUAL PLANNING

Working collaboratively with the project team and the community, the design of the spaces within Broome North Stage One can begin to develop.

The initial phase of this planning will investigate the appropriate location for practical and accessible open spaces within the multipurpose corridors. Conceptual planning will then move to a finer detail investigating conceptual plans for individual spaces within stage one.

14 CONCLUSION

The development of Broome, and more specifically the Broome North site, is challenging as it "...*must navigate the boundary of cross cultural processes*".[9]

The project team proposes to acknowledge this cultural connection by continuing the existing Broome lifestyle with special consideration for the existing indigenous culture, landform and ecosystems. Recognising these factors will aid to intrinsically connect the project to 'country'.

Broome North has the potential to;

- Provide cultural and community connections to 'country';
- Continuation of the Broome 'lifestyle';
- Maintain connections and linkages through the landscape (flora, fauna and people);
- Protect and repair natural systems so traditional practices can take place alongside development;
- Create spaces that promote growth and learning, and;
- Combine recreation, preservation, education/ interpretation and urban/ natural drainage systems.

Through consideration of the existing landscape, the local spatial order and cultural understanding, Broome North will aim to set a new benchmark for development in the North West Region.

[9] V. Margetts, 2008

15 References

- V. Margetts, 2008, Growing Rubibi, as part of an University of Western Australia's Landscape Architecture Honours by Design

- G. Noury & N.Lombard, 2005, Tree Talk: Minyirr Park trees, shrubs & Aboriginal culture

- UDLA, 2009, North West Landscape Industry Support Network, LandCorp (Unpublished)

- Kenneally, K.F, Edinger, D.C, Willing, T., 1996, Broome and Beyond: Plants and People of tithe Dampier Peninsula, Kimberley Western Australia, CALM

- GHD, January 2009, Report for Environmental Consultancy: Lot 3150 (Area A) Preliminary Environmental Impact Assessment and Biological Survey

- GHD, January 2009, Report for Environmental Consultancy: Lot 304 (Area B) Preliminary Environmental Impact Assessment and Biological Survey

- Florabase, florabase.dec.wa.gov.au, accessed July 2009

- Real adventures: incredible vacations and great getaways, realadventures.com, accessed Aug 2009

- LandCare Research: Manaaki Whenua, Vegetated Swales, landcareresearch.co.nz, accessed Aug 2009

- 1998, R.McPhee, The Larujarri Heritage Trail, http://www.environskimberley.org.au/ lurujarri/lht_seasons.htm, accessed September 2009

- Broome North Creating Communities Reference Group Notes, 5 August 2009, Broome Circle Learning Centre

Revision

Rev.	Author	Reviewer	Date
		Name	
1	A. Mangano G.Grabasch	A. King (UDLA)	07-09-2009
2		Greg Grabasch (UDLA)	17-09-2009
3		Broome North Project Team	18 -09-2009
4		Greg Grabasch (UDLA)	13-10-2009
5		Greg Grabasch (UDLA)	25-01-2010