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DOCUMENT CONTROL
The Living Knowledge Stream Design Guidance has been prepared for Curtin University by Syrinx Environmental PL in collaboration with sync7 and Dr Noel Nannup (Elder custodian).
PART 1.0
INTRODUCTION
1.1 THE LIVING KNOWLEDGE STREAM

The ‘Living Knowledge Stream’ (the Stream) represents the major green infrastructure and Indigenous cultural trail network within Greater Curtin. It is a composite of different functional and structural ecological elements, rooted in the character of the Curtin site and its people and their connection to water. The Stream provides a high amenity landscape, reinstating cultural connections with water, and providing a platform for education, art and technology installations. The Stream provides enormous opportunities for integration with many schools of learning at Curtin and has logical ties to key research centres. In its various expressions, the Stream is seen as a premier outdoor research and learning laboratory.

The Songlines provide connection to earth and country. Aboriginal perception of country is not just at a surface level, but a deeper understanding of the Dreaming or Nyitting period before living memory. Nyitting means ‘cold’, ‘ice age’, ‘cold time’ or ‘ancestral times’.

Dr. Noel Nannup

FIGURE 1: SKETCH COURTESY OF DR NOEL NANNUP, 2012
1.2 THE PURPOSE OF THE DOCUMENT

This is a Design Guidance document to assist Curtin in ensuring that the Living Knowledge Stream and its connecting elements are ultimately designed and constructed to deliver a fully integrated ecological, cultural, educational and interactive landscape while maintaining its water management functions. A key objective of this document is to ensure the Indigenous importance of the 'Kujal Kela' (Twin Dolphin) and 'Djiridji' (Zamia) Whadjuk Nyoongar Songlines embedded in the Stream and its infrastructural network, are interpreted in a visionary yet pragmatic way.

All new developments that abut the Stream are required to engage with this key structuring landscape element imaginatively. As such, design guidance contained in this document is focused on creating tangible experiences through the practical understanding of place and the relationship between water, soils, flora, fauna, seasonality and people within the specific context of the site.

PART 1: INTRODUCTION (THIS SECTION)

1. Provide physical, interpretive and program guidance to both Curtin University and individual developers for the detailed design of the Stream network
2. Provide Curtin with an appropriate toolkit that can guide the ongoing long-term recovery and restoration of key ecological and cultural nodes across the site independent of development staging and timelines
3. Establish a precedent for the integration of outdoor learning, interpretation, art and technology installations to complement Curtin’s teaching curriculum
4. Assist Curtin’s staff and resources (including various specialised centres and research institutes) to drive the development, assessment and delivery of initiatives and themes outlined within this document
5. Encourage an ongoing commitment to future water management, including its capture, conveyance and reuse to enhance ecological and cultural connections and interpretation throughout the public realm

PART 2: VISION

Outlines the vision for The Living Knowledge Stream.

PART 3: DEFINING THE STREAM NETWORK

Provides an overview of the key themes, character and development influences which inform the structuring elements and define the Living Knowledge Stream network.

PART 4: DEFINING THE PALETTES

Outlines the character, stories, planting and materiality influences to assist designers and developers in achieving the vision set out in Part 1 and Part 2.

PART 5: DEVELOPER GUIDANCE

Part 5: The Developer Guidance

Provides specific design guidance and requirements for each of the Stream Typologies

PART 6: DELIVERY

Outlines the key requirements and conditions for the formulation, review and approval of design and interpretation features within the Stream network.

PART 7: APPLICATION OF GUIDELINES

Outlines the key cultural and ecological stories across the Stream network

• Defines the key cultural and ecological stories across the Stream network
• Defines the hard and soft material palettes
1.4 THE PROCESS

WRITTEN STUDIES

A number of studies have preceded the work that forms the basis of this document.

Those highlighted here should be used as additional reference documents in the design process as they outline specific guidance and regulatory compliance requirements which are not repeated in this document.

As such, this current Living Knowledge Stream Design Guidance should be seen as part of the suite of documents Curtin has to guide the delivery of the Greater Curtin Master Plan.

Key reference documents are the Local Water Management Strategy (LWMS) and the LWMS Implementation Plan for the Local Water Management Strategy, which contains specific requirements related to flood management, hydraulics and water quality improvement, and contains the complete hydraulic infrastructure drawing set.

There will be additional documents prepared that may also be relevant as reference materials and users of this document should ensure they seek an understanding of these ahead of commencing a design process.

KEY REFERENCE DOCUMENTS

- **Bentley-Curtin Specialised Activity Centre**
  Department of Planning, Lands and Heritage 2018. Bentley-Curtin Specialised Activity Centre - Specialised Activity Centre Plan. Western Australian Planning Commission, W.A.

- **Curtin Academic Heart Framework**
  Curtin University 2013. Creating the City of Innovation Part D - Greater Curtin Academic Heart. Curtin University, W.A.

- **Curtin University Biodiversity Study**
  Syrinx 2012. Curtin University Biodiversity Study. Curtin University, W.A.

- **Greater Curtin - Integrated Urban Water Management Strategy (IUWMS)**

- **Greater Curtin Local Water Management Strategy**

- **Greater Curtin Master Plan**
  Curtin City Project Group 2013. Creating the City of Innovation Part B - Greater Curtin Master Plan. Curtin University, W.A.

- **Greater Curtin Stage One Development Guidelines**
  Curtin University 2016. Creating the City of Innovation Stage One Part A - Greater Curtin Stage One Development Guidelines. Curtin University, W.A.

- **Tree Replacement Plan For Black Cockatoo Habitat Improvement**
  Syrinx 2014. Tree Replacement Plan For Black Cockatoo Habitat Improvement. Curtin University, W.A.
ORAL STUDIES AND KNOWLEDGE SHARING

This document is the result of an iterative consultation and review process, which included numerous workshops and site walkovers with Syrinx, sync7, Dr Noel Nannup (Elder/Custodian and Traditional Ecological Knowledge (TEK) consultant), and The Centre for Aboriginal Studies (CAS) and Curtin staff.

It builds on work originally undertaken with sync7 and Dr Noel Nannup in 2012 during the master planning process, which identified two key Indigenous Songlines that intersect on university grounds. These Songlines were ground truthed as part of this current study, with key nodes and linkages along the walking trails identified.

This document communicates guidelines for appropriate interpretation that explores the interconnected relationship between the Songlines, water and ecology. An oral recording of this process is held by Curtin and can be accessed with permission from the Curtin Reference Group at CAS.

The inclusion of Aboriginal knowledge and wisdom and active engagement by Aboriginal people is a developing area to ensure long term equitable roles in biodiversity management. Traditional Ecological Knowledge (TEK) is now a core component of conservation legislation (e.g. Convention of Biological Diversity 2004 and Australia’s key piece of environmental legislation, the Environment Protection and Biodiversity Conservation (EPBC) Act 1999). The EPBC Act includes TEK as ‘a partnership approach to environmental protection and biodiversity conservation’ that recognises and promotes ‘indigenous peoples’ role in, and knowledge of, the conservation and ecologically sustainable use of biodiversity’. Hence, TEK is seen as fundamental to contemporary natural resource management and, through this, to more resilient social-ecological systems1.

TEK has been embraced extensively throughout the process of this project by the project team.

PART 2.0
VISION
2.1 INTRODUCTION

The Living Knowledge Stream (the Stream) concept was embedded into the Greater Curtin Master Plan in 2012 and implementation of the Stream forms a substantial component of achieving the overall Greater Curtin Master Plan and Vision.

This document provides a framework that considers the Stream as an infrastructural and interpretive landscape network across Curtin University and supports the six guiding principles embedded in the Master Plan.
2.2 THE VISION

The vision for the Stream is to ensure that Greater Curtin connects people with place, regardless of their cultural backgrounds, through an immersive local experience focused on revealing the richness of the ecological and cultural landscape.

Essentially, the Stream is intended as a surface expression (water, vegetation, materials and program) of a richer and more complex story. It is a story of ecological and cultural recovery, connection and knowledge sharing, encompassing the social, cultural, physical, and spiritual elements that make up the layers of life and determine community and environmental wellbeing.

The Stream and the activities it supports celebrate a new, modern Curtin University culture, which, via connection and knowledge sharing, is inclusive, accepting and invitational.
PART 3.0
DEFINING THE LIVING KNOWLEDGE STREAM
3.1 DEFINING THE LIVING KNOWLEDGE STREAM

The Stream in its entirety forms an integrated network of interpretive, landscape and water management features that flow across the site and provide an ecological and cultural landscape based on an interconnected system of people, ecology and water. There are two key north-south and multiple (predominantly) east-west structuring elements.

The location of the Stream is critical to the objective of celebrating and recovering the story of water and our relationships with it. The location aligns spatially with wider connections to the Swan and Canning River systems, following the alignment of a former river channel (paleochannel), the chain of predevelopment wetlands, existing groundwater springs and ‘Kujal Kela’ (Twin Dolphin) and ‘Djiridji’ (Zamia) Songlines which are ultimately linked to the watercourses and wetlands.

The Stream also incorporates management of stormwater within it, hence part of the Stream network is a multi-functional constructed waterway and swale network, which are water sensitive urban design (WSUD) components. These reflect the functions of a natural stream as far as practicable within the context of its urban setting and enable collection, conveyance, storage, treatment, and reuse/infiltration of stormwater within Greater Curtin.
3.2 DEFINING THE STORY

RELATIONSHIPS

Experientially, the Stream is conceived as an ecological and cultural landscape built on an understanding of the relationships between water flow, the energy this emanates, and the life it supports.

The story of these relationships is embedded in the design of the Stream, its location, its form, and its elements and, as such, the Stream is the key interpretive feature and storyteller. The story is also to be told in artworks, teaching and learning curricula, programming, and incidental conversations—a universal oral tradition which becomes part of the cultural fabric of Greater Curtin and beyond.

The Stream design is informed by both Traditional Ecological Knowledge (TEK) and western-scientific knowledge, and seeks to communicate this unity by creating an immersive experience in a restorative landscape.

TEK is based on large-scale interconnectivity between systems (geology, water, vegetation, fauna) and the processes (physical and spiritual) sustaining them. This aligns with the contemporary western-scientific definition of systems ecology, and as such TEK and mainstream science are well aligned. TEK, however, contributes a highly integrated sense of ecological cycles, plant-animal interactions and natural climate change developed over thousands of years of observational science and interaction with the landscape. TEK also uses pattern thinking and holistic approaches to map and understand complexity.

Embedding TEK into the Stream acknowledges the many layers and deeper connections that exist, and helps encourage a multi-dimensional perspective in appreciating the values of the land and water within Curtin.

The stories collected are about respecting old memories and creating new ones to deepen and evolve connections to place. Artistic, creative responses through different plant, landscape or architectural forms, for example, are intended to provide both strong physical connections to the Curtin landscape and offer comfort and security of place, whilst other elements offer change to refresh and reignite connections to place.

TEK and the cultural stories used to inform the Stream come from Whadjuk Nyoongar people of this area, as told to Dr Noel Nannup who is the Elder with authority over this area.

..We can then bring this type of information to people that are studying there, to realise that there is way, way, more to what Aboriginal people are about and it’s not necessarily just the story, song, dance, and art. It’s a deeper, deeper thing, it’s spiritual... When opportunities like this come along, where we can articulate it as Aboriginal people and what it means to us and where it is, despite all this new world, we are still hanging on to that old way, we still know it, we still understand it, and like that old way, it is all about sharing.

- Dr Noel Nannup.
CONNECTIONS

The land underlying Greater Curtin is part of a much larger landscape linked by water catchments, subterranean and surface water features, plant and animal habitats, and people and animal movements.

The Swan and Canning Rivers are significant sites for Nyoongar people and as such are listed on the Register of Aboriginal Sites under the Aboriginal Heritage Act 1972. Although the Stream is less than 2 km long, its linkage to these rivers adds to its significance, and its ecological and cultural connections make it part of a much larger, interconnected system that spans well beyond the Perth region.

Ecologically, the Curtin site captures a fragment of the wider climate and geological history of the Swan Coastal Plain. This is a story of sea level rise and fall, of sediments deposited by rivers and floodplains filling in wetlands and creeks, a story of wind-blown dunes forming hills and swales, a thin veneer of land overlying buried creeks and an expansive groundwater reservoir.

The Curtin site sits on the Swan Coastal Plain within the large, deep (15 km) Perth Basin, which was formed ~200 million years ago and which has been infilled over progressive sea level changes with layers of sediment and water. The depth of water in this giant ‘bucket’ is about 4.5 km and is held in four different aquifers. The shallow (Swan) aquifer is 70 m deep, and this is the aquifer that forms most of the wetlands and springs, including those within Curtin. This groundwater is the lifeblood of our ecosystems and the most vulnerable due to over-extraction and pollution.
CONNECTIONS

Within this wider framework, the Curtin site has its own pattern, largely linked to groundwater, which defines its sense of place. The vegetation and fauna that define Curtin respond to the interactions between water, topography, and soils at macro- and micro-scales.

The topography is variable with a high ridge running along the eastern boundary grading down to interdunal depressions to the west, which support a chain of wetlands oriented north-south. The topographic changes are mirrored by shifts in the dominant vegetation associations.

The dune ridge is comprised of Bassendean sands—bleached, quartz materials overlying laterite—and is characterised by Banksia-Jarrah Woodland (Banksia attenuata, Eucalyptus marginata). Many plant species, including the banksias, tap into the shallow groundwater table to supplement their water requirements in summer when soil moisture levels are low.

The vegetation transitions into Banksia Woodland on the sandy slopes (Banksia attenuata, Banksia menziesii), to Marri-Sheoak Woodland along the flats. Melaleuca Woodland (Melaleuca rhaphiophylla, Melaleuca preissiana) characterises the wetlands.
3.3 The Water Story

The water cycle describes the continuous movement of water on, above and below the surface of the Earth. At a local level and at the scale relevant to the water story interpreted in the Stream, this cycle is viewed as the flow and energy of water as it falls, runs, collects, infiltrates and migrates across and beneath the land to the river, sustaining life on its way. At every point, every water droplet, has a function as part of this story.

Functionally, the Stream facilitates water flow across the site and forms a stormwater management infrastructure network that enables collection, conveyance, storage, treatment, and reuse/infiltration of stormwater within a natural channel network which largely replaces conventional pit and pipe drainage infrastructure.

These approaches to stormwater management provide the opportunity to incorporate water flow visibly, and express the story of the water cycle within the Stream landscape more tangibly.

The locations and various expressions of the restored water flows are informed by the naturally occurring historical landscape. In most cases, the Stream aligns with a historic buried channel (paleochannel) which once connected to the Canning River. Hence, the Stream seeks to uncover, reveal and recover this water flow path.

FIGURE 5: THE WATER SETTING

- Existing Water Bodies
- Historic Damplands
- Historic Water Bodies
- Canning River
- Indigenous Dreaming Trails
- Indigenous Sites of Significance Along Canning River

The groundwater supports a rich biodiversity. The trees on the University grounds—banksias, marris, jarrahs, sheoaks—and the deeper rooted shrubs tap into the groundwater for their water supply. These support the Carnaby Cockatoos and a myriad of other fauna dependent on their nectar, bark, hollows, leaves and shade. The wetlands depend on this water to sustain the paperbarks, rushes, sedges, aquatic invertebrates and other fauna, including frogs and long-necked turtles. Restoring groundwater levels is key to restoring Jack Finney Lake, which is the last remaining wetland within Curtin. The groundwater also forms the springs, which, in turn, once supported their own permanent water flow dependent biodiversity.
3.4 THE CULTURAL STORY

The ‘Kujal Kela’ (Twin Dolphin) and ‘Djiridji’ (Zamia) Songlines respond to, and follow, energy flow or energy lines. These energy flows are ultimately tied to, and follow, the historic underground and surface water flows which support life. Energy flows generate a feeling of vitality where the water is healthy.

Water flow and water health are intrinsically linked to the cultural and spiritual identity and wellbeing of Aboriginal people. The land and water form an integral part of who Aboriginal people are—and they, in turn, form a part of the land and waters.

Universally, we are all intrinsically connected and drawn to water and we all depend on these flows, whether or not we have the same awareness as Aboriginal people.

This is why the sustainable management of water and the protection, restoration and sustainable use of ecosystems, formed two of the United Nations’ Sustainable Development Goals in 2015.

The water flows underneath the ground as well, not just above it. So when you have a place where there’s the run-off going one way and then the other, you have running through a landscape, down underneath, it’s oh so easy to find when you’re trained and you know what you’re looking for because in the old way it was as simple as reading a landscape and looking at it and going large diameter tree, large diameter tree, large diameter tree.

The reason they are there, is because they’re tapped straight into copious amounts of beautiful sweet water.

- Dr. Noel Nannup.
3.5 COMMUNICATING THE STORY

A critical component of the Stream’s richness lies in the effective communication of the relationship between the water flows and energy flows in the landscape and the dependency of all life forms on these flows.

As such, the Stream—through its materiality and expression—aims to tangibly demonstrate the notions of respect, recovery and connection to the environment, connection to the community, and connection to the University as a place of learning, research and information exchange.

This is intended to be realized through both visible expressions of water in the landscape and more abstract, nonrepresentational expressions of the water cycle.

This includes the use of visible markers—artwork, installations, physical soils and other materials, and ‘Living Indicators’. Living indicators include the particular plants and animals that respond to the different water ‘types’ (groundwater, surface water, springs etc).

In order to achieve this, the following objectives are intended to guide the Stream design process:

- Recover and reinterpret aspects of the predevelopment landscape character in a modern university town setting.
- Restore connections and linkages (physically, ecologically and culturally) across Curtin University grounds to the Canning River.
- Communicate the interconnectedness between the water cycle and the dreaming trails.
- Facilitate recovery of the flora and fauna associated with Indigenous cultural stories (Songlines) of the Whadjuk Nyoongar people.
- Provide outdoor knowledge sharing spaces to continue the oral history and traditions of the Whadjuk Nyoongar people.
- Provide spaces for outdoor labs, art, technology installations and programming to occur which promote inclusiveness, experimentation and innovation through different mediums such as song, dance, storytelling and art.
- Establish a high amenity landscape through inclusion of water and water-related stories that provide recreational opportunities for the wider community.
3.6 STRUCTURING THE STREAM

GREATER MASTER PLAN PUBLIC REALM STRUCTURING ELEMENTS

The Greater Curtin Master Plan established a set of structuring elements to drive future development in a cohesive and integrated way. These elements form the key building blocks at a site-wide scale and set in place the fundamental structures and systems within which the finer grain details of design and development are to be shaped. The key relevant public realm structuring elements are:

**Living Stream** – This key element of the Master Plan draws on the legacy and characteristics of the historic natural landscape to define a major north–south orientated corridor connecting neighbourhoods across Curtin and focussing on aquatic and ecological initiatives.

**The East-West Links** – These form strong and formal vegetated armatures that connect pedestrians and cyclists from the existing hill-top of the Academic Heart of campus into each development band. They also form a critical part of the water management strategy.

**Points of Ignition (Nodes)** – The points of ignition are created at the intersection between the Living Stream and the Links. They are places of intensity and focus across community, educational, commercial and ecological themes.
DEFINING THE SPATIAL EXTENT OF THE STREAM

All future development is guided by the Greater Curtin Master Plan which proposes both the retention and refurbishment of existing buildings and POS as well as new development (individual buildings and super-lots); the reconfiguration of green space for active sport and civic purposes; and new and modified vehicular and pedestrian connections across the site to improve connectivity.

The land use, built form and programming that are associated with this human influence, defines the spatial extent of the Stream. This results in a defined public realm easement (the Living Stream Corridor) dedicated to achieving both the water management and broader recreational and cultural landscape objectives.

In turn, the influence of the Stream’s character, materiality and programming extends beyond this defined Living Stream Corridor to influence adjacent built form responses.

All built form in adjacent private development lots and existing and new University buildings abutting the Stream are required to engage and respond with the Stream.

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FIGURE 6: SPATIAL EXTENT OF STREAM NETWORK

- Public Realm Easement
- Development Interface
- Proposed Development Lots
- Existing Buildings to be Retained
- Existing Buildings to be Refurbished
- Public Realm
- Green Space | Sports Fields
THE STREAM STRUCTURING ELEMENTS

Defining the Stream network builds and expands on these pre-defined Greater Curtin Master Plan public realm structuring elements and responds to the development context described above. Collectively, the structuring elements described below form the Stream network.

The Stream’s structuring elements are organised around water flow, cultural connections with country, historic and future centres of significance or activity, and the physical movement network across the site. These elements are:

**Connectors**
These form part of broader scale regional connectors running north-south across Curtin University grounds, connecting the Canning River to the Swan River and beyond, and strengthening regional biodiversity connections. They map the Songlines (dreaming trails) and relate to both underlying and surface water flows and energy lines.

**Links**
These form key ‘green’ linkages running east-west, facilitating pedestrian and water movement, and connecting the wider campus to the main north-south stream alignment. They provide linkages between the Songlines, relate to surface water conveyance and flow, and link ‘fragmented’ areas of remnant vegetation.

**Nodes**
These are key intersection points between the connectors and links, bringing people together and responding to significant cultural and ecological expressions in the landscape. They provide key meeting, gathering and rest points, and relate to points where water slows, is expressed at the surface, or changes direction.
3.7 THE STREAM NETWORK

Each of these broad-scale structuring elements, are broken down into the two Songlines—the ‘Kujal Kela’ (Twin Dolphin) and ‘Djiridji’ (Zamia) Songlines—and five Character Zones (distinct zones that have unique features that create a sensation of being in that particular place).

These zones are broad expressions of water flow, with the term Character Zone used to describe a common understanding of that place. They include the following:

- Paleochannel
- Groundwater Aquifer
- Seasonal Wetlands
- Springs
- Swales

Together, the Songlines and the Character Zones tell the stories of the ecological system and the connections between the Whadjuk Nyoongar people of this area and inform the design palette for the Stream across Curtin University.

**FIGURE 7: THE STREAM NETWORK**

CONNECTORS:
- Songlines, Paleochannel, Groundwater Aquifer

LINKS:
- Swales

NODES:
- Seasonal Wetlands, Springs
SONGLINES

The Songlines form regional connectors running north-south across the site and follow the two Whadjuk Nyoongar Songlines—‘The Kujal Kela’ (Twin Dolphin) and ‘Djiridji’ (Zamia) walking trails.

The Songlines reflect the flow of underground and overland water across the site, aligning with existing and historic paleochannels, wetlands, springs, surface water and groundwater flows.

These Songlines represent distinct walking trails which are associated with dreaming stories and navigation across a broader landscape to regional destinations. Each distinct path generates unique opportunities for design responses in character, expression of water, vegetation, soils, and cultural and educational activity.

Even though the sections of the trails across the Curtin site cover less than 2 km, they form a key part of the regional story and it is important that this is recognised and the link to the Canning River is maintained and reinforced.

The Songlines are described within the video recording made by Dr Noel Nannup for this project, and users of this document are encouraged to access this material to enhance their understanding of each of the dreaming trails.

Lynne Kelly 2016 described the traditional Aboriginal landscape as a ‘memory space on a grand scale’ where ‘Songlines, or Dreaming Tracks, are pathways through the landscape connecting a large number of significant locations in a fixed order—rocky outcrops, springs, mountains, valleys, caves, waterholes.

When performed, a songline is sung as a long sequence of short verses, which together form a sung chart of the ancestral being’s creative journey or origin story. The ritual cycle ensured that sites were visited regularly, the knowledge performed and associated sacred paintings retouched, a further aid to memory.

(Kelly, Lynne. 2016. The memory code : the traditional Aboriginal memory technique that unlocks the secrets of Stonehenge, Easter Island and ancient monuments the world over. Sydney: Allen & Unwin.)

The ‘Kujal Kela’ (Twin Dolphin) Songline

‘Djiridji’ (Zamia) Songline
THE ‘KUJAL KELA’ TWIN DOLPHIN DREAMING

The ‘Kujal Kela’ (Twin Dolphin) trail through Curtin University grounds is a complex story of maintaining connections and the continuum of human history across natural climate cycles and change.

The ancestral Swan-Canning Rivers cut a channel into the sediments of the Swan Coastal Plain during the last glacial period when the sea level was about 130 m lower than its current level, and when the coastline was some 12 km west of Rottnest Island around 15-20,000 years ago. The specific story of the Dolphin Trail is connected to the inundation of land during formation of the modern Swan-Canning Estuary during the last interglacial period ~5-10,000 years ago.

During this time, the Whadjuk Nyoongar’s land contracted significantly, and generations of connection to that now buried land was in jeopardy. The Dolphin dreaming story is about an agreement made between the Whadjuk Nyoongar people and the bottlenose dolphins who continue to move between the ocean and the rivers, and who agreed to carry the messages of the ancestors through time in order to maintain Whadjuk Nyoongar connections to their ancestral lands and the ‘drowned’ river. This agreement was made at Salter Point on the Canning River, which is the origin of the Dolphin Trail.

The ‘Kujal Kela’ trail runs in an arc across the suburb of South Perth between Salter Point (Triple Dolphin Dreaming) and east of Clontarf (Twin Dolphin Dreaming). Within the Curtin site, the Twin Dolphin trail extends north along the base of the hillslope and is symbolised by two springs and near-surface groundwater within the shallow aquifer; these maintain the water connection to the Canning River.

In the north-west corner of university grounds, the trail traverses the paleochannel, soaks and surface water. It then follows the western base of the lower ridge hill slope, connecting two break-in-slope springs. It exits the site in the south-east corner traversing historic damplands (seasonally moist wetlands) before connecting with the ‘Kujal Kela’ site.

The directional flow of underlying water has spiritual significance for the Whadjuk people because it mirrors the energy lines tied to water flows and connections to river; hence it is important that the alignment of the storyline is respected. The trail reads as a relationship between the ‘hidden’ water, and the plants and animals that interact with and depend on it.

The second trail, which incorporates the main Living Stream conveyance channel, is the 'Djiridji' (Zamia) trail. This trail is associated with surface flow, wetlands and the buried paleochannel. It tells the story of seasonal journeys from river to hills and the abundance of food and water.

The 'Djiridji' (Zamia) trail follows the alignment of a former tributary of the Canning River (now a paleochannel) and connects to a chain of existing and infilled wetlands that once extended between the Canning and Swan Rivers.

This trail was part of the seasonal movement of people from campsite to campsite from the Canning River to the scarp. Along this journey, the Curtin site was the summertime place in the Birak and Bunuru Indigenous seasons.

The trail would have been resource rich with the chain of wetlands acting as points of abundance providing water, fauna and flora (food), and medicine. The trail connects to the Swan River around the Burswood area and then carries on to the Darling Scarp—a winter time place (Makuru Season).

Across Greater Curtin, the 'Djiridji' (Zamia) Trail runs in a general north-east to south-west direction. In the north-east corner of Curtin, the trail traverses the northern edge of the hill slope then follows historic wetlands, connecting to what is now known as Jack Finney Lake. It then follows the paleochannel down to the south-west corner of the site and connects with the wetlands within Waterford to the Canning River.
THE INTERSECTION

The two trails intersect on site in the present day entry to the Curtin Stadium near the Dome. The point of intersection signifies a change in the directional flow of water, therefore, is a significant water and energy nexus.

This point provides a significant wayfinding point and point of passing and crossing, and an opportunity to interpret the meeting, gathering and exchanges between people arriving and departing within Greater Curtin. As such, this point is essentially social in nature.

*Welcoming, knowledge sharing, trade* are all key themes that should be explored in this area.
CHARACTER ZONES -
THE FIVE EXPRESSIONS OF WATER

Whilst each Songline is rich and expansive in cultural meaning, the significance of these trails are ultimately linked to the connections between the surface and underground water flows, and their specific micro- and macro-scale plant and animal communities.

Recovering the layers of water types and reinterpreting different characteristics of the water cycle through varied soils, plants, water depth, seasonality and flow, provides a means to express this complex story.

Water flow across the Stream network is described through five distinct Character Zones, each representing a different expression of water in the landscape, most drawn from the palette of natural types of water expression within the Curtin site.

The Character Zones each form a key connector, link or node in the Stream network:

**CONNECTORS:**
- Paleochannel – an ancient, subsurface flow buried water channel
- Groundwater Aquifer – the slow moving water stored underground

**NODES:**
- Seasonal Wetlands – expressions of the groundwater through the seasonal rise and fall of the watertable
- Springs – active discharge of groundwater at the base of the hillslope

**LINKS:**
- Swales – surface water flows from rainfall run-off

Each of the Character Zones are read by markers in the landscape. The flora and fauna markers are referred to as ‘Living Indicators’ by the Whadjuk Nyoongar people.

**FIGURE 12: CHARACTER ZONES**
PALEOCHANNEL

The paleochannel is an ancient buried water channel, which was once a tributary to the Canning River, connecting a chain of seasonal wetlands across Curtin.

Historically, the paleochannel would have defined a regional path for Whadjuk Nyoongar people travelling between the Canning and Swan Rivers, along the Zamia trail, with ‘Djiridji’ or Zamias (Macrozamia niedlei) and Balgas (Xanthorrhoea preissii) occurring in abundance along the upper channel.

The channel is likely underlain by the same river and floodplain sediments that underlie the Canning River and was buried by the deposition of unconsolidated sands during interglacial periods when river flows slowed, allowing these sediments to fill the former channel valley.

The base of the youngest sediments are characterised by laterite gravels and limonite-cemented sand, colloquially called ‘coffee rock’. Whilst the channel is now buried, it still acts as a preferential flow path for subsurface flows, and hence still functions as an underground stream.

The interpretation approach for this Character Zone is to reveal and reinterpret this channel at ground level, through the main Living Stream conveyance channel, as well as through plants, material palettes, artwork and programming. The paleochannel is a major water flow path and energy line.

The distinctive vegetation of the paleochannel reflects the permanence and abundance of water and defines the linear shape of the channel.

Particular rushes (Leptocarpus (ex Meeboldina) scariosus, Chaetanthus aristatus in the upper channel), a sedge (Baumea vaginalis in the channel bed) and a shrub (Darwinia citriodora for top of channel) are markers of the revealed channel (the new Living Stream WSUD channel) and indicate the laterite and iron-cemented sediments and clay bed. The indicator tree within the channel floodway is the Flooded Gum (Eucalyptus rudis).

FIGURE 13: PALEOCHANNEL CHARACTER ZONE
GROUNDWATER AQUIFER

Groundwater aquifers are the hidden layers of water beneath our feet, held in soil pore spaces, rock fractures and permeable rock formations. The superficial (or shallow) aquifer underlying the Swan Coastal Plain is recharged from rainfall, and flows slowly from the Darling Scarp and Gingin Scarp, to the ocean.

Locally within Curtin, this aquifer forms a discreet system that discharges south-west to the Canning River, and this is the aquifer interpreted within the Stream.

Traversing the Academic Heart of the campus, the ‘Kujal Kela’ (Twin Dolphin) Songline follows this underground movement of water and Living Indicators mark the expression of the near-surface (1-15 m maximum below ground level) abundant water reservoir, in this setting most notably via larger diameter trees.

Because the aquifer is shallow, the groundwater is within the rooting depth of many plant species and hence the aquifer here is pivotal to the survival and health of Curtin’s biodiversity. The indicators of the shallow aquifer include the trees—Sheoaks (Allocasuarina fraseriana) and Marris (Corymbia calophylla)—the shrubs—Pink Featherflower (Verticordia densiflora) and Native Violet (Hybanthus calycinus)—and the herb Black-anther Flax-lily (Dianella revoluta).

Aside from human interference, the groundwater aquifer maintains a dynamic equilibrium of uptake, evaporation, discharge and rainfall replenishment. It has permanency, longevity and age, and is often referred to as old or fossil water, which has a long journey to the river – an individual water drop may take thousands of years to find its way to the river.

Responding to the water underneath our feet provides opportunities to express the water story along the ‘Kujal Kela’ trail through mediums such as art, sound, lighting and planting rather than through a direct physical presence of water.
SEASONAL WETLANDS

The third water expression within the Curtin site are the seasonal wetlands, which are low lying basins (sumplands) that intersect the groundwater table in winter. The wetlands are therefore seasonally inundated, drying down in summer as groundwater levels falls. They are often referred to as windows to the water table.

Historically, there was a chain of seasonal wetlands that ran north-south along the western side of the Curtin University grounds, most of which have been infilled. Jack Finney Lake and two basins—one to the north and one to the south—are the only wetlands remaining within Greater Curtin. Jack Finney Lake is a significant local asset to Curtin, and is a registered Aboriginal Heritage site.

The ‘Djiridji’ (Zamia) Songline follows and connects with these surface water expressions, which would have provided resource-rich resting and gathering nodes on the seasonal journey. The chain of wetlands would have created a diverse mosaic of habitats supporting a range of flora and fauna and created a trail for Whadjuk Nyoongar people following food sources between the Canning and Swan River systems.

The Living Indicators of the wetlands include the paperbark trees (*Melaleuca rhaphiophylla* and *Melaleuca preissiana*), the common astartea shrub (*Astartea scoparia*) and the sedges (*Baumea rubiginosa*, *Baumea articulata*).

Points of recovery and restoration of the seasonal wetlands form key cultural and ecological nodes of varying intensity and function. Each wetland node is a unique attraction and point of particular activity that is informed and characterised by a particular story. Each node also performs a particular water treatment and storage function as part of the wider stream network.

These nodes are intended to reflect the character of wetlands as places of abundance and places of gathering, whilst also being points of rest and moments of pause along a journey.

They are places of intensity and focus where features of the natural landscape intersect with important community, educational, and ecological experiences—where memories and systems interact.

**FIGURE 15: WETLAND CHARACTER ZONE**
SPRINGS

Springs are an active surface expression of groundwater resulting from upward pressure or occurring along a break-of-slope. Two key springs are located on the site. Both springs exist as break-in-slope groundwater expressions and are located at the base of the ridge surrounding the Academic Heart.

The springs and their surrounds are key nodes along the ‘Kujal Kela’ (Twin Dolphin) Songline. The springs are traditionally a place of teaching (teaching the young ones about the ‘Kujal Kela’ trail) and knowledge sharing. The springs are traditionally a place of ‘sweet water’. Only the Elders can drink directly from the spring and campsites are not permitted in proximity to the spring.

One spring is located at the north-western end of The Forum near the Chancellery building. Traditionally a place of teaching and ceremony, in present day it still forms a significant open space on university grounds with views across to Jack Finney Lake and is often used for formal, civic functions and gatherings.

The second spring is located at the base of slope in the Sir Charles Court promenade above the Creative Quarter. It is an important location connected to Rob Riley Walk and offers opportunities to become a key outdoor knowledge sharing node adjacent to the Centre for Aboriginal Studies (CAS) to reveal and share the cultural stories associated with the springs.

The springs are marked by Bull Banksia (Banksia grandis – dry areas), Centella (Centella asiatica – damp areas) and Jointed Twig Sedge (Baumea articulata – wet areas).

These nodes are intended to reflect the character of springs as places to celebrate abundance and as places of knowledge sharing, teaching and learning. Like the wetlands, the springs provide pause points along a journey.

FIGURE 16: SPRING CHARACTER ZONE
SWALES

The swales follow the seasonal overland flow of water after rainfall, which runs to the Stream and wetlands, and seeps back into the soil to replenish the groundwater. They capture and convey water flow as it moves across the surface of the land.

The swales run predominately east-west, linking the existing hilltop in the Academic Heart to the recreational spaces and mixed developments on the western side of the site.

The swales are part of the wider biophilic, green infrastructure links that connect the movement of water, biota and people across the Stream network. The north-south swales are predominantly biodiversity corridors linking vegetation and creating habitat beyond the boundary of the Curtin site.

The swales provide a wayfinding network, providing sensory cues in the landscape, responding to seasonal water flow and infiltration, and telling stories of restoration and strengthening of biodiversity corridors.

The swales are marked by two key species, depending on whether they are infiltration swales, which carry ephemeral flows only, or conveyance swales or biofilters, which have semi-pervious bases and may also have submerged zones.

Infiltration swales are marked by *Eremaea pauciflora*, which can access groundwater in summer to reduce irrigation requirements, and conveyance swales and biofilters are marked by Twig Sedge (*Baumea juncea*).

Surface water flows ephemerally in response to rainfall run-off, infiltrating along its way and discharging to the wetlands and eventually the river. This water supports shallow-rooted rushes and sedges that can respond quickly to the wet conditions, and can tolerate temporary inundation and rapid water flows. A distinctive band of trees and shrubs follows the line of the watercourses within the floodway, supplementing their water needs. The creeks and swales are important habitat for birds, frogs and other fauna, and provide important biodiversity linkages.
PART 4.0
DEFINING THE PALETTES
4.1 INFORMING THE PALETTES

Part 4 provides the palettes from which to draw the materials, planting and stories, and identifies where to apply these palettes to reinforce the uniqueness and richness of each Character Zone and Songlines.

The environmental and cultural layers from which the palettes are derived are discussed in Part 3. These layers include the following:

**Environmental Layers**
- This is the historic, pre-existing landscape character of the vegetation, soils and geology that define the hard and soft material palette. It is the surface layer that the new stream landscape seeks to restore, recover and reveal. From an interpretive and landscape response, this historic environmental layer ‘morphs and twists’ in response to the modern urban form.

**Cultural Layers**
- This is the story of Curtin, the stories of the Songlines and the Character Zones which come together to tell the story of a modern Curtin that has reconnected with its past, its people and the trajectory of knowledge. From an interpretive and landscape response perspective these stories provide the cues and inspiration for planting, artworks, installations and materiality.

The palettes informed by these layers are intended to create distinct and tangible changes in the landscape fabric across the Stream network. These palettes include the following:

**Planting Palettes**
- Vegetation Association Palettes
- Songline Wayfinding Palette
- Seasonal Indicator Palette
- Character Zone Indicator Palettes

**Material Palettes**
- Character Zone Palettes

**Cultural Palettes**
- Overarching Themes
- Story Topics
4.2 PLANTING PALETTES

The planting palettes respond to:

- Historic vegetation associations.
- Plants with Indigenous cultural significance.
- Present and proposed hydrological conditions across the Stream network.

The species included in the palettes are a selection from the full species composition of the vegetation assemblages. The use of these particular plants is an abstraction of what would naturally occur, and is intended to strengthen the readability of each Character Zone and the cultural stories across the Stream network.

The identified species have all been selected for distinctive habit, foliage, and colour to celebrate the diversity of the individual Character Zones and to address varying hydrological conditions. It is anticipated that designers use modern horticultural knowledge to creatively interpret and apply these palettes in a contemporary landscape setting.

All plants need to be pre-ordered at least 12 months prior to planting, as some species may require longer lead times to collect seed/cuttings and propagate to a suitable size. Requirements for mature plants will require longer pre-order periods. It is important that this forward planning is undertaken so as to avoid any dilution of the intent of the Stream through delays or substitutions to this list.
VEGETATION ASSOCIATION PALETTES

All proposed species throughout the Stream network are drawn from the four endemic vegetation associations historically present across Curtin. These associations have been mapped and indicate the intended wider plant response for each section of the Stream.

These palettes form the base list that all Character Zone and Seasonal Indicator Palettes are drawn from but are not, themselves, Character Zone specific.

The species included in the following palettes are a selection from the full species composition of the vegetation assemblages and are intended to cover varying hydrological conditions and strengthen the readability of the Character Zones and cultural stories across the Stream network.

The four palettes are to be used to supplement the specific Character Zone Indicator Palettes. Supplementary species should not visually dominate each Character Zone.

In order to achieve this, the following criteria should be applied to the use of these palettes:

- Maximum 50% of any planting mix is to be comprised of supplementary species.
- Supplementary species added to any planting mix are to comprise of at least 3 species.
- No individual supplementary species is to form more than 20% of the total planting mix in any area.
### BANKSIA-JARRAH WOODLAND PALETTE

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Nyoongar / Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trees</strong></td>
<td></td>
</tr>
<tr>
<td>Banksia attenuata</td>
<td>Biara / Candle Banksia</td>
</tr>
<tr>
<td>Eucalyptus marginata</td>
<td>Jarrah</td>
</tr>
<tr>
<td><strong>Shrubs</strong></td>
<td></td>
</tr>
<tr>
<td>Acacia lasiocarpa</td>
<td>Panjang</td>
</tr>
<tr>
<td>Babingtonia camphorosmae</td>
<td>Kurren / Camphor Myrtle</td>
</tr>
<tr>
<td>Banksia dallamneyi</td>
<td>Bullgalla / Couch Honeypot</td>
</tr>
<tr>
<td>Hemiandra pungens</td>
<td>Snakebush</td>
</tr>
<tr>
<td>Hibbertia hypericoides</td>
<td>Yellow Buttercups</td>
</tr>
<tr>
<td>Hovea trisperma</td>
<td>Puyenak / Common Hovea</td>
</tr>
<tr>
<td>Melaleuca seriata</td>
<td>Pixie Mops</td>
</tr>
<tr>
<td>Petrophile linearis</td>
<td>Pepper and Salt</td>
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<tr>
<td>Philotheca spicata</td>
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<tr>
<td><strong>Herbs</strong></td>
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<tr>
<td>Hybanthus calycinus</td>
<td>Wild Violet</td>
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<tr>
<td>Conostylis aculeata</td>
<td>Prickly Conostylis</td>
</tr>
<tr>
<td>Burchardia congesta</td>
<td>Kara / Milkmaids</td>
</tr>
<tr>
<td>Sowerbaea laxiflora</td>
<td>Purple Tassels</td>
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</table>

**TREES**

**SHRUBS**

**HERBS**
### Species Name

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<thead>
<tr>
<th>Trees</th>
<th>Nyoongar / Common Name</th>
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<tbody>
<tr>
<td>Allocasuarina fraseriana</td>
<td>Kondil / Sheoak</td>
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<tr>
<td>Banksia attenuata</td>
<td>Biara / Candle Banksia</td>
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<tr>
<td>Banksia grandis</td>
<td>Mungitch / Bull Banksia</td>
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<tr>
<td>Banksia menziesii</td>
<td>Bulgalla / Firewood Banksia</td>
</tr>
<tr>
<td>Eucalyptus todtiana</td>
<td>Dwutta / Coastal Blackbutt</td>
</tr>
<tr>
<td>Nuytsia floribunda</td>
<td>Mooja / Christmas Tree</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrubs</td>
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</tr>
<tr>
<td>Adenanthos cygnorum</td>
<td>Common Woollybush</td>
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<td>Allocasuarina humilis</td>
<td>Dwarf Sheoak</td>
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<tr>
<td>Bossiaea eriocarpa</td>
<td>Common Brown Pea</td>
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<td>Daviesia triflora</td>
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<tr>
<td>Eremea pauciflora</td>
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<td>Gympholobium tomentosum</td>
<td>Hairy Yellow Pea</td>
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<td>Scholtzia involucrata</td>
<td>Spiked Scholtzia</td>
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<td>Verticordia densiflora</td>
<td>Compacted Featherflower</td>
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<td></td>
<td></td>
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<tr>
<td>Herbs / Grasses</td>
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</tr>
<tr>
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<td>Catspaw</td>
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<td>Anigozanthos manglesii</td>
<td>Kurulbrang / Mangles Kangaroo Paw</td>
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<td>Conostylis setigera</td>
<td>Bristly Cottonhead</td>
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<td>Dampiera linearis</td>
<td>Common Dampiera</td>
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<td>Haemodorum spictum</td>
<td>Mardja / Bloodroot</td>
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<tr>
<td>Lomandra hermaphroditana</td>
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</tr>
<tr>
<td>Lomandra preissii</td>
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</tr>
<tr>
<td>Patersonia occidentalis</td>
<td>Komma / Purple Flag</td>
</tr>
<tr>
<td>Rytidosperma occidentale</td>
<td>Wallaby Grass</td>
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### MARRI-SHEOAK FOREST PALETTE

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<td><strong>Trees</strong></td>
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</tr>
<tr>
<td>Allocasuarina fraseriana</td>
<td>Kondil / Sheoak</td>
</tr>
<tr>
<td>Banksia menziesii</td>
<td>Bulgalla / Firewood Banksia</td>
</tr>
<tr>
<td>Bankisia ilicifolia</td>
<td>Holly-leaved Banksia</td>
</tr>
<tr>
<td>Corymbia calophylla</td>
<td>Marri</td>
</tr>
<tr>
<td><strong>Shrubs</strong></td>
<td></td>
</tr>
<tr>
<td>Acacia wildeonowiana</td>
<td>Grass Wattle</td>
</tr>
<tr>
<td>Adenanthis obovatus</td>
<td>Basket Flower</td>
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<tr>
<td>Daviesia decurrens</td>
<td>Prickly Bitter-pea</td>
</tr>
<tr>
<td>Darwinia citriodora</td>
<td>Lemon-scented Darwinia</td>
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<td>Gastrolobium capitatum</td>
<td>Eggs and Bacon</td>
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<tr>
<td>Hardenbergia complioniana</td>
<td>Native Wisteria</td>
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<tr>
<td>Hibbertia racemosa</td>
<td>Stalked Guinea Flower</td>
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<td>Lechenaultia floribunda</td>
<td>Free-flowering Leschenaultia</td>
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<td>Melaleuca thymoides</td>
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<tr>
<td><strong>Herbs / Grasses</strong></td>
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<tr>
<td>Conostylis juncea</td>
<td>Pineapple Bush</td>
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<tr>
<td>Dasygogon brolleilifolius</td>
<td>Mangard / Blueberry Lily</td>
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<tr>
<td>Dianella revoluta</td>
<td>Wollung / Scarlet Runner</td>
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<tr>
<td>Kennedia prostrata</td>
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<tr>
<td>Phlebocarya ciliata</td>
<td>Kangaroo Grass</td>
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<td>Themeda triandra</td>
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**TREES**

**SHRUBS**

**HERBS | GRASSES**
# MELALEUCA WOODLAND PALETTE

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Nyoongar / Common Name</th>
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</thead>
<tbody>
<tr>
<td><strong>Trees</strong></td>
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</tr>
<tr>
<td>Melaleuca rhaphiophylla</td>
<td>Bibool / Swamp Paperbark</td>
</tr>
<tr>
<td>Melaleuca preissiana</td>
<td>Moonah</td>
</tr>
<tr>
<td>Eucalyptus rudis</td>
<td>Moich, Gooloorda / Flooded Gum</td>
</tr>
<tr>
<td>Banksia littoralis</td>
<td>Pungura / Swamp Banksia</td>
</tr>
<tr>
<td><strong>Shrubs</strong></td>
<td></td>
</tr>
<tr>
<td>Astartea scoparia</td>
<td>Common Astartea</td>
</tr>
<tr>
<td>Calytrix flavescens</td>
<td>Summer Starflower</td>
</tr>
<tr>
<td>Calytrix fraseri</td>
<td>Pink Summer Calytrix</td>
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<td>Euchilopsis linearis</td>
<td>Swamp Pea</td>
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<tr>
<td>Eutaxia virgata</td>
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<tr>
<td>Hibbertia subvaginata</td>
<td></td>
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<tr>
<td>Hypocalymma angustifolium</td>
<td>Koodgeed / White Myrtle</td>
</tr>
<tr>
<td>Hypocalymma robustum</td>
<td>Koodgeed / Swan River Myrtle</td>
</tr>
<tr>
<td>Melaleuca lateritia</td>
<td>Robin Redbreast Bush</td>
</tr>
<tr>
<td>Melaleuca teretifolia</td>
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<tr>
<td>Pericalymma ellipticum</td>
<td>Swamp Teatree</td>
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<tr>
<td><strong>Rushes / Sedges</strong></td>
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<tr>
<td>Baumea articulata</td>
<td>Wuargle (Ngarnak, Kuiarch) / Jointed</td>
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<tr>
<td></td>
<td>Twig Sedge</td>
</tr>
<tr>
<td>Baumea rubiginosa</td>
<td></td>
</tr>
<tr>
<td>Baumea juncea</td>
<td></td>
</tr>
<tr>
<td>Baumea vaginalis</td>
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</tr>
<tr>
<td>Chaetanthus aristatus</td>
<td>Bare Twig Sedge</td>
</tr>
<tr>
<td>Lepidosperma effusum</td>
<td>Pale Twig Sedge</td>
</tr>
<tr>
<td>Lepidosperma longitudinale</td>
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<tr>
<td>Leptocarpus scariosus (prev. Meeboldina scariosa)</td>
<td>Spreading Sword Sedge</td>
</tr>
<tr>
<td>Schoenus subfascicularis</td>
<td>Pithy Sword Sedge</td>
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<td><strong>Herbs</strong></td>
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<tr>
<td>Centella asiatica</td>
<td>Centella</td>
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<tr>
<td>Lobelia anceps</td>
<td>Angled Lobelia</td>
</tr>
<tr>
<td>Patersonia occidentalis</td>
<td>Purple Flag</td>
</tr>
<tr>
<td>Thysanotus multiflorus</td>
<td>Tjunguri / Many-flowered Fringe Lily</td>
</tr>
</tbody>
</table>
SONGLINE (WAYFINDING) PALETTE

Each Songline is defined by a signifying species; these are as follows:

The 'Kujal Kela' (Twin Dolphin) Songline
- Balga (*Xanthorrhoea preissii*)

The 'Djiridji' (Zamia) Songline
- Zamia Palm (*Macrozamia riedlei*)

These species are intended to act as clear wayfinders in the landscape, leading people visually and physically along the trail.

It is important that the continuity of the Songline trils are maintained and, hence, any obstructing buildings, roads or other infrastructure must maintain connectivity via vertical facades and roof gardens, or via artwork, patterns or other artistic responses. Where there are significant gaps in the plant connection, there may need to be a larger cluster planting response at each end of the break in trail.

Songline wayfinding species are to be group planted following a linear arrangement along the length of the Songline, crossing all Character Zones. Planting density is to increase approaching nodes.

FIGURE 20: SONGLINE WAYFINDING SPECIES

- Balga/Grass Tree (*Xanthorrhoea preissii*)
- Zamia Palm (*Macrozamia riedlei*)
SEASONAL INDICATOR PALETTE

Seasonal indicator species have been selected to respond to and represent seasonal change within the landscape.

Specific species are chosen for their flowering colour to provide intense bursts of that colour at particular locations and times of the year. These reference the Nyoongar six seasons and specifically how they influence interactions with landscape.

These seasonal indicators follow the Zamia Songline, with locations and species responding to Curtin as a summertime place as part of a seasonal transition along this Songline.

The seasons provide opportunity for programme responses, such as food festivals linked with abundant food reserves (honey nectar), designers and maker events associated with summertime camping and resting etc.

---

**FIGURE 21: SEASONAL INDICATOR PALETTE**

- First Summer (Birak)
- Time of transition
- Indicator of change
- Time of transition
- Second Summer (Bunuru)
- Time of transition
- Moving into Autumn (Djeran)
- Transition to Winter (Makuru)
CHARACTER ZONE INDICATOR PALETTES

Each Character Zone is represented by a small, distinct group of plants covering each strata (tree, shrub, herb), which are appropriate to the varying hydrological conditions (wet / dry / damp).

These indicator species are representative of what would naturally be the dominant plants associated with each of the Character Zones. Within each Character Zone, indicator species are to be used as the dominant plants to define and strengthen the unique character.

These species should visually dominate each Character Zone. In order to achieve this, the following criteria are to be applied to this palette:

- Minimum 50% -70% of Character Zone planting mix is to be comprised of its Indicator Species.

FIGURE 22: CHARACTER ZONE INDICATOR PALETTES

PALEOCHANNEL INDICATOR SPECIES

- **Baumea vaginalis**
- **Eucalyptus rudis**
- **Leptocarpus scariosus**
- **Chasmanthium aristatus**
- **Darwinia citriodora**

GROUNDWATER AQUIFER INDICATOR SPECIES

- **Dianella revoluta**
- ** Allocasuarina fraseriana**
- **Corymbia calophylla**
- **Hybanthus calycinus**
- **Verticordia densiflora**

SEASONAL WETLANDS INDICATOR SPECIES

- **Baumea articulata**
- **Baumea rubiginosa**
- **Melaleuca raphiophylla**
- **Hypocalymma robustum**
- **Melaleuca preissiana**
- **Ascaria scoparia**

SPRINGS INDICATOR SPECIES

- **Baumea articulata**
- **Centella asiatica**
- **Lomandra hermaphrodita/preissii**
- **Banksia grandis**

SWALES INDICATOR SPECIES

- **Baumea juncea**
- **Banksia littoralis**
- **Eremaea pauciflora**

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4.3 MATERIAL PALETTES

These palettes refer to the materiality, colour and texture to be applied to each distinct Character Zone within the Stream network.

The material palettes reference both the underlying soils and geology, as well as the colours and textures of the timbers and barks of the Character Zone Indicator species.

The following descriptions are to be used to guide all hard material responses for surfacing, furniture, artworks and building interfaces. The visual and sensory intent to be achieved is most important, rather than the use of specific materials (which are not prescribed).

Material responses are to explore the interrelationships between soils, water and plants at the macro- through to the micro-scale, and the interesting patterns and textures in the world below the surface as well as above.
PALEOCHANNEL

The paleochannel is a former tributary of the Canning River and is comprised of clay floodplain deposits (alluvial sediments), and gravel and other sediments washed down from the Darling Scarp (fluvial sediments).

The intent is to interpret the material types of the buried channel, rather than the sands that have covered it over time.

Soils are predominantly orange to dark red-brown laterites and yellow cemented sands (pavements). The colour of these materials comes from iron. The base of the channel would be dark grey clays.

Responses should recognise the layered colours and textures of the revealed channel stratigraphy.

FIGURE 23: PALEOCHANNEL CHARACTER ZONE

MATERIALS | COLOURS | TEXTURES

Eucalyptus rudis bark
Centella aristatus
Laterite patterns
Leptocarpus scariosus
GROUNDWATER AQUIFER

The shallow aquifer at Curtin occurs within the Bassendean sands, which are coastal sands deposited by wind.

These are predominantly bleached grey quartz sands. The hill at Curtin is a dune formed from these sands.

Vertically down the profile, these sands have distinctive patterns at different scales due to the transformation of sediments and water chemistry from interactions between roots and biota accessing the groundwater table.

These interactions create distinctive patterns driven by the architecture of root systems—the remnants of fossilised roots that create mini-pipelines to the water table for other species. These small-scale patterns reinforce the message of connections, relationships and interdependencies.

Responses should explore patterns, perforations or arrangements of materials that reference these processes at different scales.
SEASONAL WETLANDS

The wetlands are formed within the interdunal swales of the Bassendean sands, and are characterized by dark-grey sands, fine organic silts and black peats, which form from decomposing wetland vegetation.

Responses should be rich and explore the ephemeral nature of the wetlands, the covering and revealing of the darker, richer black peats of the wetter and deeper soils then transitioning to finer, dry grey sands at the surface layers. The changing colours, the process of drying out and inundation, the changing barks of the trees, and the very distinctive texture of the paperbarks, offer a diverse palette. The use of timber is an appropriate material response.

At a small scale, exploring the air cells within wetland plant roots and other adaptive responses to tolerating abundant water, may contrast with the story of acquiring water that is common to the groundwater aquifer Character Zone.

FIGURE 25: SEASONAL WETLANDS CHARACTER ZONE
SPRINGS

The springs are characterised by pure white sands which have become bleached by the constant flow of water. They too, are made of quartz. The spring produces an upward discharge expression forming soaks and horizontal water flow.

Materials should explore the shape of the spring, and the subtle textural and colour responses — grey to white and coarse to medium-grained sands.

FIGURE 26: SPRINGS CHARACTER ZONE

MATERIALS | COLOURS | TEXTURES

Banksia grandis
Baumea articulata
Xanthorrhoea preissii
SWALES

The swales reference the geology and soils of the surrounding regional landscape, extending from the Darling Scarp to the Swan and Canning Rivers through a compressed sequence. They link Curtin to the stories, connections and wider journey beyond.

The swales' materiality, patterns and textures respond to the flow of water eroding the soils and revealing the parent and weathered rocks.

The surface material picks up on the granite parent rock of the scarp, transitioning to the laterite gravels of the slopes, through to the sands of the plains.

The swales connect the movement of water, biota and people across Curtin and the materiality is to respond to this idea of linkage and connection, and pick up on common colours and textures as they intersect with other Character Zones.

The swale indicator species—Bare Twig Sedge (Baumea juncea), found naturally occurring across this topographic gradient and its range of soils—acts as a wayfinder and a symbol of continuity, a unifying element as the swales move across Curtin.

FIGURE 27: SWALES CHARACTER ZONE

MATERIALS | COLOURS | TEXTURES

Baumea juncea

Banksia littoralis

Eremaea pauciflora
4.4 CULTURAL PALETTES
OVERARCHING THEMATICS

The cultural palettes distil and reimagine the Songlines and the Character Zones in the context of a wider regional story that comes together to tell the narrative of a new Curtin that has reconnected with its past, its people, and the trajectory of knowledge.

These palettes are intended to provide the user with inspiration and thematic guidance through the detailed design process, and are about communicating the stories.

Overarching themes are outlined across the Curtin site (indicated below); these are then broken down into example story topics (sub-themes that sit under each overarching theme). These are to be further drawn on at specific locations and should be viewed as prompts.

Individual design responses to example story topics at specific locations are to be considered as part of the Curtin-wide story (recovery, connection, knowledge), and therefore must reference and consider the overarching themes to ensure this message is reinforced and consistently communicated.

These stories are to be told through the Songline, planting and hard material palettes described above, as well as in richer layers of visual, artistic and programming responses that explore specific topics.

Development of these stories, responses and content are intended to be further developed in collaboration with the reference group to ensure cultural appropriateness.

FIGURE 28: OVERARCHING THEMES

- Groundwater Flow
- Surface Water Flow
- Diversity
- Journey
- Knowledge
- Recharge
- Celebration
- Reconnect
SUB-THEMES | EXAMPLE STORY

JOURNEY
1. Seasonal Migration
   Seasonal Abundance
2. The Zamia Palm
   Cyclical Resources
3. The Banksia
   Nourishment
4. The Wetland Chain
   Connection to Canning, Past and Present

RECHARGE
5. Windows to the Water Table
   Rise and Fall of the Aquifer
6. Summertime Place
   Kooyar Dreaming

DIVERSITY
7. Duality and Difference
   Respect and Learn

KNOWLEDGE
8. Interconnectedness
   Water Under Our Feet
9. Energy Flow
   Water Health and Caring for Country
10. Reading the Landscape
    Living Indicators
11. Nuturing
    Connection Through Change

CELEBRATION
12. Bounty and Wealth
    Protection of Resources
13. Family
    Sharing

RECONNECT
14. Growth
    Generate and Innovate

FIGURE 29: SUB-THEMES
(DJIRIDJI SONGLINE)

FIGURE 30: SUB-THEMES
(KUJAL KELA SONGLINE AND SWALES)
PART 5.0
DESIGN GUIDANCE
5.1 DESIGN GUIDANCE

OVERVIEW

This Part provides design guidance for the Stream typologies. The typologies are subsets of the Character Zones (as described in Part 3), further defined and characterised at a more specific, local scale.

The typologies are informed by, and respond to, the layers of human influence including functional water management and the expression of water (e.g. visible/below ground etc), adjacent built form, land use, programming, spatial influences and constraints.

• Firstly, this section describes the water management influences that need to be integrated into the design of the Stream.

• Secondly, this section defines each typology; its general location, character, potential activities and programme, materiality, and functional role in water management.

• Thirdly, each typology is graphically represented with guidance outlining the application of the material, planting and cultural palettes (described in Part 4).

Note:
Design guidance is limited to spatial and material guidance on the intended landscape character for the Stream. The Local Water Management Strategy (LWMS) and LWMS Implementation Plan are to be referenced during design and construction to ensure all functional design criteria are addressed within the Stream.

Similarly, this document does not provide specific land use or built form criteria and thus should be read in conjunction with the Greater Curtin Master Plan and specific Development Guidelines for the campus.
5.2 WATER MANAGEMENT

The Stream network is the major stormwater infrastructure system for flood management, conveyance, water quality improvements, storage, and groundwater recharge.

The open green channel network consisting of a primary north-south vegetated channel and interconnecting secondary vegetated swales, will capture run-off from the hard surfaces of the buildings, paving, car parks and road side swales.

Rooftop gardens are proposed for buildings located adjacent to the Stream. Along with achieving other benefits, rooftop gardens assist to dampen peak velocity and run-off volumes during storm events and will contribute to the biodiversity connectivity and function of the Stream network.

Developments are, as a minimum, required to cater for first flush rainfall events and will be required to connect directly to the main conveyance channel and swale network. This network is designed to convey the critical 10 year average recurrence interval (ARI) rainfall event.

Larger events (up to the critical 100 year ARI) will be detained and infiltrated within ephemeral vegetated basins dispersed throughout the network.

As it is a 'living' biological system, the Stream enables progressive treatment of conveyed stormwater using physical and biological processes.

Within the Stream network planting palettes described in Part 4 are to be supplemented by locally native rush and sedge species (only—not shrubs, trees or herbs) drawn from the Vegetation guidelines for stormwater biofilters in the south-west of Western Australia, appropriately matched to the position within the channel so as to facilitate flows and water quality improvement.

Note: The LWMS and LWMS Implementation Plan are to be referenced during design and construction to ensure all functional design criteria are addressed within the Stream.

FIGURE 31: WATER MANAGEMENT

- Main North-South Vegetated Conveyance Channel
- Vegetated Conveyance Swales - Treatment and storage of stormwater run-off (<1:10 ARI) with flows directed towards ephemeral basins
- Vegetated Infiltration Swales - Treatment and infiltration of stormwater run-off (<1:10 ARI)
- Ephemeral Basins - stormwater detention (<1:100 ARI) and recharge of groundwater via infiltration
- Connecting road side treatment swales (<1:10 ARI)
- Piped Connections

This section provides a brief description of each Character Zone Typology within the Stream network, followed by a graphic representation demonstrating indicative spatial configurations and application of planting and material palettes (defined in Part 4).

The typologies (for all of the Character Zones) have been categorised into the following three main types.

**Urban**
Urban links, connectors and nodes are formal in character, with larger areas and ratio of hardscape and hard edge treatments to the Stream. These spaces allow greater human interaction and access to the stream/water bodies and are generally located in tighter urban spaces adjacent to and defined by built form and/or roads.

**Green/Restorative**
Green links, connectors, restoration nodes and restorative links are more naturalistic typologies that are purposefully designed and maintained in a state that emulates a softer, more native habitat whilst still being adapted to the functional human requirements and programming across Curtin. These landscapes offer a natural, softer alternative to the more formalized harder urban landscapes.

**Built Form Interface**
These typologies require a response integrated within the building facade, forecourts or pavement areas fronting the stream. This may be through integrated public art commissions, surface treatment, facade treatments or green walls.

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**Figure 32: The Stream Typologies**

- **Paleochannel**
  - Urban Connector
  - Green Connector
  - Built Form Interface

- **Groundwater Aquifer**
  - Urban Core Connector
  - Green Core Connector
  - Built Form Interface

- **Seasonal Wetlands**
  - Urban Nature Node
  - Restoration Node
  - Built Form Interface

- **Springs**
  - Water Feature Node

- **Swales**
  - Urban Link
  - Green link
  - Restorative Nature Link
  - Built Form Interface

- **The Intersection**
PALEOCHANNEL TYPOLOGIES

**Urban Connector**

Urban Connectors provide spaces for outdoor labs, seating, socialising and studying along the Stream.

Their urban character is defined by built form edge to both or one side of the Stream. They are defined by a formal, predominately hardscape edge to the main conveyance channel that allows interaction and engagement with the Stream. Hard terracing is to reference the stratigraphy of the paleochannel. Pedestrian corridors to either side are to allow generous walking zones that seamlessly transition in materiality to the conveyance channel.

Planting is formal in arrangement, creating a defined high canopy of shade and a linear arrangement to emphasise the Songline and journey across Curtin.

**Green Connector**

Green Connectors provide open space for informal gathering, picnicking, passive recreation and study. They are defined by a predominately softscape treatment and varying formal to informal edges to the main conveyance channel. The channel is defined by a gentler grade and wider spaces that allow gradual transition between typologies. They are typified by bordering the wide open sports fields, wetlands or lawn areas across Curtin.

Planting is more naturalistic in arrangement, however maintains a strong linear pattern.

**Built Form Interface**

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.
DESIGN CRITERIA

1. Vegetated treatment zone with discrete areas of hardstand treatment (e.g., pavement rock) to facilitate for informal crossing:
   - Semi-pervious base to promote conveyance.
   - Minimum base width of 1.2 m.

2. Hard terraced edge channel treatment:
   - Colour and texture to reflect relevant stratigraphy.
   - Terrace height no more than 0.5 m.
   - Min. overall grade of 1:6 across.
   - Consider relevant safety regulations with respect to water depth.

3. Intermittent vegetated terraces:
   - Densely planted (lower strata) terraces to have a min. width of 1.5 m with un-compacted soils to promote infiltration.

4. Promenade - Surface colour and texture to provide linear contuinity. Interpretation to be incorporated into surface treatments.

5. Shaded rest areas adjacent promenade.


7. Linear vegetated areas to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand.

8. Character Zone upper storey tree. Trees to be planted in linear planting pattern.*** Character Zone lower storey planting in linear pattern.***

9. Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.

10. Seasonal Indicator species** to be planted on mass in groupings.

11. Shade trees within Dry Zone to be selected from Vegetation Association Palette.***

12. Flow > first 15 mm rainfall event within adjacent development to be directed into conveyance channel.

13. Integrated built form including potential green roof.

MATERIALS | COLOURS | TEXTURE

WET ← DRY

Shade trees within Dry Zone to be selected from Vegetation Association Palette.***

Flow > first 15 mm rainfall event within adjacent development to be directed into conveyance channel.

Integrated built form including potential green roof.

NOTES:

*Species varies, refer Songline Wayfinding Species Palette
**Species varies, refer Seasonal Indicator and Stories Palette
***Supplementary species from relevant Vegetation Association Palette
Incorporate existing copses of pines and native trees where feasible.

Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

Flow >1:10 yr ARI to overflow to adjacent seasonal wetland via cascade.

Flow > first 15 mm rainfall event within adjacent development to be directed into conveyance channel.

**Notes:**
*Species varies, refer Songoine Wayfinding Species Palette
** Species varies, refer Seasonal Indicator and Stories Palette
***Supplementary species from relevant Vegetation Association Palette

**DESIGN CRITERIA**

1. Naturalistic ephemeral creek.
   - Semi-pervious to pervious base to promote conveyance.
   - Minimum base width of 1.2 m.
   - Channel vegetation to provide passive water treatment via biological processes.

2. Vegetated edge treatment:
   - Densely planted (lower strata) embankments.

3. Intermittent formalised terraces providing areas for rest and passive recreation adjacent pathways
   - Terrace height no more than 0.5 m.

4. Consider relevant safety regulations with respect to water depth.

5. Linear pathway - Surface colour and texture to provide linear continuity. Interpretation to be incorporated into surface treatments.


7. Linear vegetated areas to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand and turf.

8. Character zone upper storey tree. Trees to be planted in linear planting pattern.

9. Character zone lower storey planting in linear pattern.

10. Songoine Wayfinder* in linear planting pattern to reinforce wayfinding along the Songoine.

11. Seasonal Indicator species** to be planted on mass in groupings.

12. Shade trees within Dry Zone to be selected from Vegetation Association Palette.

13. Incorporate existing copses of pines and native trees where feasible.

14. Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

15. Flow >1:10 yr ARI to overflow to adjacent seasonal wetland via cascade.

16. Flow > first 15 mm rainfall event within adjacent development to be directed into conveyance channel.

**MATERIALS | COLOURS | TEXTURE**

WET → DAMP ← DRY

**PROGRAM**

*Species varies, refer Songoine Wayfinding Species Palette
** Species varies, refer Seasonal Indicator and Stories Palette
***Supplementary species from relevant Vegetation Association Palette
**GROUNDWATER AQUIFER TYPOLOGIES**

**Urban Core Connector**

Urban Core Connectors are located predominately through the established Academic Core. They are defined as an intervention into a pre-existing landscape, generally surrounded by existing built form on all sides. Size, location and adjacent land use and services will largely influence the ratio of hard to soft landscaping.

Responses may include planting, retrofitting of pavement, integrating public artworks, facade modifications/integration of artworks or addition of surface features.

Planting is to include the Marri and Sheoak trees in a linear arrangement where feasible and focus on the strong linear planting of the Balga and mass plantings of the lower strata vegetation.

**Green Core Connector**

Green Core Connectors provide strong, linear, soft landscaped edges to the site. They provide strong visual and physical continuity between the campus and adjacent areas through use of pavement, in-ground and standalone artworks and large diameter trees.

Planting is to include Marri trees, Balga and mass plantings of the lower strata vegetation through the roadside plantings in a strong linear arrangement to reinforce Songline connection.

**Built Form Interface**

This typology refers to both new developments and retrofitting of existing buildings in the Academic Core. Buildings should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.
DESIGN CRITERIA

1. Character Zone upper storey tree. Trees to be planted in linear planting pattern.**

2. Character Zone lower storey planting in linear pattern.**

3. Surface colour and texture of pathways to provide linear continuity. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.

4. Shaded spaces for rest, social interaction and outdoor teaching.

5. Public art and urban furniture to interpret Character Zone themes.

6. Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.

7. Incorporate existing copses of pines and native trees where feasible.

INDICATOR SPECIES

- D. revoluta
- A. fraseriana
- C. calophylla
- H. calycinus
- V. densiflora
- K. calycina

MATERIALS | COLOURS | TEXTURE

WET → DAMP → DRY

- Perforations, Patterns, Bleached Grey Quartz Sands

PROGRAM

- Songline Wayfinding in linear planting pattern to reinforce wayfinding along the Songline.
- Incorporate existing copses of pines and native trees where feasible.

NOTES:

*Species varies, refer Songline Wayfinding Species Palette

**Supplementary species from relevant Vegetation Association Palette
**DESIGN CRITERIA**

1. Character Zone upper storey tree. Trees to be planted in linear planting pattern.

2. Character zone lower storey planting in linear pattern.

3. Surface colour and texture of pathways and roads to provide linear continuity. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.

4. Shaded spaces for rest, social interaction and outdoor teaching.

5. Public art and urban furniture to interpret Character Zone themes.

6. Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.

7. Incorporate existing copses of pines and native trees where feasible.

8. Continuation of Living Knowledge Stream (beyond).

**NOTES:**

*Species varies, refer Songline Wayfinding Species Palette
**Supplementary species from relevant Vegetation Association Palette

**PROGRAM**

**INDICATOR SPECIES**

- D. revoluta
- A. fraseriana
- C. calophylla
- H. calycinus
- V. densiflora

**MATERIALS | COLOURS | TEXTURE**

- Perforations, Patterns, Bleached Grey Quartz Sands
SEASONAL WETLANDS TYPOLOGIES

**Urban Nature Node**

Urban Nature Nodes are ephemeral wetlands that are defined by their contemporary, urban interpretation of a natural wetland system. They are outdoor hubs that provide spaces for outdoor labs, informal seating, socialising and studying. Their urban character is defined by the built form surrounding the wetland on one or more sides. They are defined by a mix of both hard and soft edge treatments that allow varying degrees of interaction with the water body.

Planting contains a semi-naturalistic arrangement with good shade coverage for seating while allowing areas of clear open views. Some areas of turf are to be included to allow passive recreation.

**Restoration Node**

The restorative wetland (specifically, Jack Finney Lake) involves restoration of a historic wetland. This is predominately an informal landscape, naturalistic in character, informed by the natural remnant vegetation and wetland structure, however, managed to accommodate more intense use and enjoyment by the Curtin community.

The space is defined by soft landscape edges and gentle transitions in grades and planting between the more formal soft landscaping of adjacent typologies. Planting contains a diverse native species palette planted in a naturalistic manner.

**Built Form Interface**

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.
**Ephemeral wetland:**
- Densely planted (lower strata) base and embankments.
- Minimum grade 1:6 to embankments.

**Formalised boardwalks/terracing** providing areas for rest, passive recreation and outdoor teaching. Interpretation to be incorporated into surface treatments.

**Public art and urban furniture** to interpret Character Zone themes.

**Character Zone upper storey** tree. Trees to be planted in copse.

**Character Zone lower storey** species planted in groupings.**

**Seasonal Indicator species*** to be planted on mass in groupings.

**Supplementary species** selected from Vegetation Association Palette.**

**Linear vegetated areas** to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand and turf.

**Nominal 1 m wide mulch buffer zone** to perimeter. All turf areas to be separated by 300 mm deep mowing strip.

**Flow >1:10 yr ARI** to overflow from adjacent conveyance channel via cascade.

*Species varies, refer Songline Wayfinding Species Palette

**Supplementary species from relevant Vegetation Association Palette

**Notes:**

DESIGN CRITERIA

1. Ephemeral wetland:
   - Densely planted (lower strata) base and embankments.
   - Minimum grade 1:6 to embankments.

2. Formalised boardwalks/terracing providing areas for rest, passive recreation and outdoor teaching. Interpretation to be incorporated into surface treatments.

3. Public art and urban furniture to interpret Character Zone themes.

4. Character Zone upper storey tree. Trees to be planted in copse.

5. Character Zone lower storey species planted in groupings.

6. Seasonal Indicator species to be planted on mass in groupings.

7. Supplementary species selected from Vegetation Association Palette.

8. Linear vegetated areas to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand and turf.

9. Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip.

10. Flow >1:10 yr ARI to overflow from adjacent conveyance channel via cascade.
**DESIGN CRITERIA**

1. Naturalistic ephemeral wetland:
   - Densely planted (lower strata) base and embankments.
   - Minimum grade 1:6 to embankments.

2. Formalised boardwalks/viewing decks providing areas for rest, passive recreation and outdoor teaching. Interpretation to be incorporated into surface treatments.

3. Public art and urban furniture to interpret Character Zone themes.

4. Character Zone upper storey tree. Trees to be planted in copses.

5. Character Zone lower storey species planted in groupings.

6. Seasonal Indicator species* to be planted on mass in groupings.

7. Supplementary species selected from Vegetation Association Palette.**

8. Linear vegetated areas to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand and turf.

9. Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

10. Flow >1:10 yr ARI to overflow from adjacent conveyance channel via cascade.

**NOTES:**

*Species varies, refer Songline Wayfinding Species Palette

**Supplementary species from relevant Vegetation Association Palette
SPRINGS TYPOLOGIES

**Water Feature Node**

The spring typology occurs at two locations within the pre-existing, developed Academic Core.

This typology is to be expressed as an urban water feature, around which people can meet, connect and interact.

The character of the spring is to be interpreted as contemporary abstracted expression of a spring, with water as a permanent feature. The water feature is to incorporate both planting and hard materials in its design.

The Songline indicator—*Xanthorrhoea preissii*—is to be group planted, with planting density increasing incrementally on approach to the spring typologies.
**DESIGN CRITERIA**

1. Permanent water feature with feature paving inlay.
2. Intermittent Character Zone (lower strata) planting within water feature.**
3. Character Zone upper storey tree. Trees to be planted in copses upslope from permanent water feature.**
4. Surface colour and texture of pathways to provide definition of node. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.
5. Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.

**NOTES:**
*Species varies, refer Songline Wayfinding Species Palette
**Supplementary species from relevant Vegetation Association Palette
SWALES TYPOLOGIES

**Urban Link**

Urban Links are stormwater infiltration swales following important pedestrian routes through the Academic Core connecting to the Green Links.

These are defined by a tighter urban condition and presented as formal landscapes in narrower roadside swales and bioretention pits. They are defined by a strong shade canopy and mass plantings of *Eremaea pauciflora*.

**Green Link**

Green Links are important pedestrian and stormwater conveyance corridors defined by a soft landscape character with a strong shade canopy and an abundant understorey.

These are wide vegetated corridors running adjacent to open green spaces or wide forecourts to public buildings. They are to be designed with generous walking zones, regular rest points for gathering and interaction, and fluid crossing of the swales.

Planting is more naturalistic in arrangement to the Urban Links, however maintains a strong linear pattern with mass plantings of *Baumea juncea*.

**Restorative Nature Link**

The Restorative nature links are to strengthen biodiversity across site and provide ecological corridors linking vegetation and creating habitat beyond the boundary of the Curtin site.

These nature links are located to enhance existing areas of native remnant vegetation. They are typically wider buffers and verges to the site boundary, and are defined by a diverse native species palette planted in a naturalistic manner. Although designed as a naturalistic biodiverse corridor the planting mix needs to account for safety and security requirements.

**Built Form Interface**

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.
**DESIGN CRITERIA**

1. Ephemeral vegetated treatment swale:
   - Densely planted (lower strata) base.
   - Pervious base to promote infiltration.
   - Minimum base width of 1.2 m.

2. Urban edge treatment integrating rest nodes and interpretation/public art.

3. Pedestrian prioritised east-west link. Surface colour and texture of pathways to provide linear continuity.

4. Arbours and/or green facades on adjacent buildings providing continuity of vegetation linkages and Character Zone themes. Permeable pavements to promote infiltration.

5. Intermittent informal crossings. Enhance and promote the visual and acoustic qualities of surface water movement through landscape design and public art.

6. Character Zone upper storey tree. Trees to be planted in linear planting pattern.*

7. Character Zone species planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to be appropriately matched to the position within the channel, so as to facilitate flows and water quality improvement.**

8. Lower strata within dry zone to be selected from Vegetation Association Palette.*

**MATERIALS | COLOURS | TEXTURE**

- *WET* ← Granite ← Laterite ← Sand ← *DRY*

**PROGRAM**

Notes:

*Supplementary species from relevant Vegetation Association Palette

** Supp. species from the Vegetation Guidelines for Stormwater Biofilters in the South-West of WA
**DESIGN CRITERIA**

1. Naturalistic ephemeral vegetated treatment swale:
   - Densely planted (lower strata) base and embankments.
   - Semi-pervious base to promote conveyance and maintain moist conditions, or biofilters with submerged zone.
   - Minimum base width of 0.6 m and embankment grade of 1:6.

2. Pedestrian prioritised east-west link. Surface colour and texture of pathways to provide linear continuity.

3. Intermittent informal crossings. Enhance and promote the visual and acoustic qualities of surface water movement through landscape design and public art.

4. Formalised crossings (raised walkway). Interpretation to be incorporated into surface treatments.

5. Character Zone upper storey tree. Trees to be planted in linear planting pattern.*

6. Character Zone species planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to be appropriately matched to the position within the channel, so as to facilitate flows and water quality improvement.**

7. Lower strata within dry zone to be selected from Vegetation Association Palette.*

8. Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

9. Character Zone species for infiltration swales. Flow > first 15 mm rainfall event within adjacent development to overflow to conveyance swale.

**NOTES:**
*Supplementary species from relevant Vegetation Association Palette
** Supp. species from Vegetation Guidelines for Stormwater Biofilters in the South-West of WA
Incorporate existing copses of pines and native trees where feasible.

**Notes:**
* Supplementary species from relevant Vegetation Association Palette
** Supp. species from Vegetation Guidelines for Stormwater Biofilters in the South-West of WA

**Design Criteria**

1. Linear “Open Woodland” biodiversity connector. Densely planted base (lower strata) to deter/ restrict public access and informal crossing. Habitat creation where feasible.

2. Intermittent ephemeral vegetated treatment swales providing either infiltration or conveyance:
   - Minimum base width of 0.6 m.
   - Minimum grade of 1:4.

3. Character Zone upper storey tree. Trees to be planted in linear planting pattern.*

4. Character Zone species planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to be appropriately matched to the position within the channel, so as to facilitate flows and water quality improvement.**

5. Lower strata within dry zone to be selected from Vegetation Association Palette.*

6. Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

7. Linear “Open Woodland” biodiversity connector. Densely planted base (lower strata) to deter/ restrict public access and informal crossing. Habitat creation where feasible.
THE INTERSECTION

This is where the Songlines meet and water flow changes direction.

The location forms a key junction, arrival and departure point in modern Curtin University.

Interpretive responses should celebrate Curtin’s diversity and explore knowledge sharing and connection through both oral and visual means.

This could include audio-visual media, art installations, interactive sculpture, building facades and surfacing treatments.
PART 6.0
DELIVERY
6.1 DELIVERY PROCESS

The role of this document is to provide design guidance to future designers working within the Living Stream Corridor and adjacent development lots to ensure the design intent of the Stream is implemented.

The custodian of this document is Curtin University Properties Facilities and Development and this document provides a reference for the assessment of design proposals submitted. This document is part of a suite of guidance documents which will be referenced in the review of designs and approvals for projects within the Stream Corridor and adjacent development lots.

This document does not provide guidance in relation to the construction, maintenance or monitoring of specific elements nor does it provide specific guidance to individual development lots.

The preparation of this document has been undertaken in parallel with a series of active planning studies led by Curtin which propose alternative development to that outlined within the 2013 Greater Curtin Master Plan.

Given this, minor shifts in the overall extent of the Living Stream Corridor and arrangement of Stream typologies may alter over time in response to changes in planning.

Curtin Properties Facilities and Development will be responsible for alignment of the Living Stream Corridor and typologies with any adjustments to proposed planning of the University over time and for the provision of any easement(s) to protect the integrity of the Stream into the future.

Detailed below is a high-level summary of the approval pathway developed to protect the integrity of the Stream network. This process facilitates communication of planning changes over time and designers should seek clarity from Curtin to confirm the obligations of their project with respect to implementation of the Stream within their specific project.

Further details relating to approvals will be specified by Curtin on a project by project basis.

6.2 APPLICABLE PROJECTS

This document will be referenced in the design, review and approval of the following projects:

- Curtin led new works/upgrades to the Public Realm within the Stream Corridor.
- Curtin led new construction or refurbishment of existing buildings adjacent to the Stream Corridor.
- Developer led new designs or refurbishment of buildings within development lots adjacent to the Stream Corridor.
- Curtin updates to landscape and environmental management/maintenance plans and strategies within Greater Curtin and the academic core.
- Curtin specific educational curriculum programming, tools and or any other projects which directly or indirectly influence the form, function, interpretation or purpose of the Stream.

Public realm works include roads, hard and soft landscaping, urban furniture and signage, minor structures, public art and associated servicing infrastructure.

FIGURE 33: SPATIAL EXTENT OF STREAM NETWORK
6.3 CONSULTATION AND REVIEW

Prior to progression of design proposals, the designer is to consult with the Curtin University Cultural Reference Group (CUCRG) and execute a consultation agreement prepared for the project.

This agreement would define (including, but not limited to) the terms of reference, vetting of artists, who the appropriate person(s) to provide guidance are, consultation framework/review milestones, intellectual property and royalties.

Design may be undertaken by Curtin (with the design team comprising either Curtin staff or external consultants) or by developers. Where design is led by Curtin, a Curtin representative for the project will execute the agreement with the CUCRG.

Where design is undertaken by a developer, the approval process will be in line with the relevant Curtin University Development Guidelines. The developer will be required to execute the consultation agreement prior to any formal development agreement with Curtin.

Design for public realm works within the Stream Corridor are to be approved by Curtin. The approval process may vary depending on the nature of the project. Curtin may utilise a design review panel as part of its project specific review and approval process.

At each review and/or approval milestone, Curtin will refer proposals to the CUCRG in accordance with the consultation agreement and facilitate review commentary back to the Design Team from the CUCRG. Curtin will refer proposals to other relevant stakeholder groups where appropriate.

6.4 DESIGN REVIEW AND APPROVAL

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4.4 DESIGN REVIEW AND APPROVAL

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At each review and/or approval milestone, Curtin will refer proposals to the CUCRG in accordance with the consultation agreement and facilitate review commentary back to the Design Team from the CUCRG. Curtin will refer proposals to other relevant stakeholder groups where appropriate.
PART 7.0
APPLICATION OF GUIDELINES
7.1 URBAN NATURE NODE
EPHEMERAL WETLAND

A design for the Southern Basin area of Curtin University is presented here as a practical example of applying the Living Knowledge Stream design guidelines. This design was developed in accordance with both the values and design specifications outlined in Parts 1–6 of this document.

The Southern Basin is an ephemeral wetland in the south-west corner of Curtin, located at the point where the Stream exits the Curtin campus. It is an important seasonal wetland that lies on the cultural Journey towards the Canning River (as per Page 100). It acts as an Urban Nature Node, a point of confluence between surrounding Urban Connector (built form), Green Connector (Stream Corridor) and Restorative Nature Link (conveyance swale) zones, as defined on Page 110.

The Southern Basin design documentation includes plans of the site as well as Character Zone mapping, and corresponding material and planting palettes. The palette detail reflects the comprehensive guidance outlined in Part 4 of this document.
**CONCEPT PLAN 1:1000 @ A1**

- **SEMI-PRIVATE ZONE**
  - Wetland built form interface - green wall potential
  - Banskia spp. to provide seasonal colour
  - Melaleuca preissiana to provide shade on upper terraces
  - Wide terraces with heritage interpretive paving
  - Opportunity for interaction with waterway
  - Timber deck and integrated seating

- **PUBLIC PROMENADE**
  - Terracing to provide interaction/play opportunities with wetland edge
  - Groups of Melaleuca spp., Banskia spp., and Eucalyptus rudis provide shady grass banks

- **WETLAND TERRACING**
  - Existing Eucalyptus grandis to be retained along site boundaries
  - Groups of Melaleuca spp., Banksia spp., and Eucalyptus rudis provide shady grass banks

- **EPHEMERAL VEGETATED WETLAND**
  - Vegetated ephemeral wetland

- **PALEOCANAL TERRACING**
  - Recreational grass banks

- **MAIN PROMENADE**
  - Sheltered seating along main promenade
  - Active/permeable frontages to stream network/Potential alfresco spaces
  - Semi private areas fronting Living Knowledge Stream

**KEY PLAN NTS**

**SECTION AA 1:250 @ A1**
**DETAILED AREA PLAN 1:500 @ A1**

- **Semi-private zone:**
  - Semi-private zones fronting Living Knowledge Stream. Stream materiality and planting to be carried through into semi-private areas.
  - Integrated built form facade to stream - potential green walls.

- **Public promenade:**
  - Gently undulating grass bank.
  - Existing stand of mature Eucalyptus grandis to retain.
  - Trees to be selectively thinned to improve views and safety.
  - Existing mature Eucalyptus rudis to retain.
  - Enhanced and integrated verge treatment to Kent Street.
  - Restoration swales, and enhanced verge treatment to Manning Road.
  - Informal trails of varying sands and rock meander through swales.
  - Gently undulating mounding and swale vegetation to wrap around built form.
  - Pedestrian prioritised crossings linking Living Knowledge Stream network.
  - Shared surface, high amenity, slow traffic zone.
  - Active/porous frontages to stream network.
  - Large, open terrace allows potential alfresco spaces, with bespoke shade shelters incorporated.

- **Paleochannel terracing:**
  - Timber boardwalk with integrated seating areas.
  - Timber deck traversing wetland, width to accommodate seating and study groups at key locations.
  - Sheltered seating along main promenade.
  - Raised planters with integrated seating.
  - Vegetated ephemeral wetland. Densely planted with swaths of *Baumea* spp. and scattered *Melaleuca* spp.
  - Daylighting of existing pipes in form of overland swales.
  - Occasional *Eucalyptus* rudis planted along terraces to provide shade.
  - *Banksia* spp. to provide seasonal colour.
  - *Zamia* to mark dreaming trail.
  - Vegetated understorey of *Baumea* spp. creating dense open sedgeland.

- **Ephemeral vegetated wetland:**
  - Swales weave along Manning Road boundary.
  - Informal trails of varying sands and rock meander through swales.
  - Gently undulating mounding and swale vegetation to wrap around built form.
  - Pedestrian prioritised crossings linking Living Knowledge Stream network.
  - Shared surface, high amenity, slow traffic zone.
  - Active/permeable frontages to stream network.
  - Large, open terrace allows potential alfresco spaces, with bespoke shade shelters incorporated.

- **Grass embankment:**
  - Gently sloping grassed bank to wetland edge.
  - Max. 1:6 slope.

- **Shared surface space:**
  - Pedestrian prioritised shared streetscape.

- **Restoration swales:**
  - Swales weave along Manning Road boundary.

**SECTION BB 1:250 @ A1**

- **New south-west entrance to site.**
  - Public art location to signify 'Djiridji' Zamia Palm Dreaming Trail and connection to Canning River.
  - Pedestrian promenade following 'Djiridji' Zamia Palm Dreaming Trail. Embedded art/interpretation through paving.
  - Zamia palms planted on mass in linear arrangement along main promenade act as wayfinding markers along the 'Djiridji' Zamia Palm Dreaming Trail.

- **Vegetated ephemeral wetland.**
  - Densely planted with swaths of *Baumea* spp. and scattered *Melaleuca* spp.
  - Daylighting of existing pipes in form of overland swales.

- **Vegetated understorey of *Baumea* spp. creating dense open sedgeland.**
  - High value existing mature *Eucalyptus* rudis to be retained along grass bank.
  - Dryland swale understorey.

**ILLUSTRATIVE VIEW LOOKING NORTH-EAST ACROSS WETLAND**
MATERIAL PALETTES
ALL CHARACTER ZONES

PALEOCHANNEL CHARACTER ZONE

WETLAND CHARACTER ZONE

SWALES CHARACTER ZONE

GROUNDWATER AQUIFER CHARACTER ZONE

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The Curtin Living Knowledge Stream Design Guidance

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The paleochannel connects and reveals, forming a link, and providing an experiential journey between places of pause and reflection.

Spatially expanding and contracting, a path is defined that cascades into a tiered landscape, to reveal the stratigraphy of a buried geology and history.

Materially, the landscape references pale sands at the surface through to the rich oxides and greys of an iron cemented clay bed closer to the water table.
MATERIAL PALETTE
CHARACTER ZONE: WETLANDS

SURFACE TREATMENTS
Decking, walkways, terracing, edging, retaining walls

Element: main promenade
Indicative Material: exposed aggregate concrete or stone segmental pavers
Colour: varying shades of light washed grey

Element: timber decking
Indicative Material: hardwood

Element: intermediate terraces/steps
Indicative Material: in situ concrete, light grey to charcoal grey, textured finishes

Element: larger terraces
Indicative Material: in situ concrete, smooth, washed finished

FURNITURE ELEMENTS
Shelter, seating, informal play elements, stepping stones etc

Element: Bespoke shade/picnic shelters

Element: bench seating to deck
Indicative Material: timber

Element: seating blocks/terracing blocks to lower terraces
Indicative Material: exposed aggregate concrete/rough hewn stone

Element: pavement/decking inlays
Indicative Material: routed timber/steel inlays

Element: integrated art/water play to upper terraces
Indicative Material: rough hewn stone/charcoal grey to light grey textured concrete

Element: stepping stones/seating blocks to lower terraces

Element: integrated art/water play

INTERPRETIVE ELEMENTS
Specific signage, embedded stories, ephemeral water play, artwork etc

Element: Embedded interpretive text/art
Indicative Material: Acid etched / sandblasted concrete

Element: integrated art/water play
Indicative Material: routed timber/steel inlays

Element: integrated art/water play
Indicative Material: rough hewn stone/charcoal grey to light grey textured concrete

Element: embedded interpretive text/art

The urban wetland is a place of celebration and gathering, a place to pause and reflect.

Spatially, a series of terraces gradually expand from the paleochannel stratigraphy into looser, wider spaces that encourage people to pause, gather and enjoy. Large, shaded terraces and an undulating grassy bank accommodate community and student recreation, relaxing, picnicking and outdoor labs.

Materials reference smooth, dark grey-blues, fine silts and the peat of wetter times, transitioning to lighter, rougher, flaky textures of dryer times, cracked, exposed finishes, flaky paperbark and greying of weathered timbers.

The Curtin Living Knowledge Stream Design Guidance
MATERIAL PALETTE
CHARACTER ZONE: GROUNDWATER AQUIFER

The groundwater aquifer is about journey, larger regional connections, and responds to the flow of water under our feet and the living indicators surrounding us.

Spatially, linear arrangements following the Songline, represent movement and flow, using living indicators (Marris, Sheoaks and Balga) above us, and large scale interpretive surface treatments under our feet as storytelling, directional and wayfinding cues.

Materials reference bleached quartz sands and draw on the architectural heritage of Curtin to form a continuous in situ concrete carpet of varying textural and patterned finishes. Surface treatments move to deeper charcoal colours and timbers around the wetland, before transitioning to the granites of the swales.

SURFACE TREATMENTS
Walkways, edging, retaining walls etc

Element: main promenade
Indicative Material: large format concrete paving slabs

Element: feature paving off main promenade
Indicative Material: exposed aggregate concrete/granite strip pavers

Element: feature paving off main promenade, towards wetland
Indicative Material: in situ concrete, light grey, timber board finish

Element: Main promenade
Indicative Material: Integrated art/patterning to large scale in situ concrete areas

FURNITURE ELEMENTS
Shelter, seating, informal play elements etc

Element: shelter, seating, raised planters walling
Indicative Material: perforated steel with integrated lighting

Element: bespoke shade shelters
Indicative Material: light grey, smooth concrete

Element: seating blocks/play elements
Indicative Material: light grey, smooth concrete

Element: Integrated pavement art

INTERPRETIVE ELEMENTS
Specific signage, embedded stories, artwork etc

Element: embedded interpretive text/art
Indicative Material: acid etched/sandblasted concrete

Element: large scale embedded interpretive text/art in facades/walling
Indicative Material: acid etched/sandblasted concrete

Element: commissioned integrated public artworks through promenade area

Element: Commissioned integrated public artworks as part of building fenestration/facade
The swales respond to movement and flow, and provide restorative connections and linkage across the wider campus.

Spatially, the swale is a meandering rivulet, ephemeral in nature, weaving in and out, wrapping around and up built form, expanding and contracting and creating ‘breathing’ spaces in the landscape. The restorative swale is loose and informal in its surface finish and planting arrangement.

Materials reference a dry creek bed, revealing threads of varying loose and compacted sands, gravels and rocks representing the wider profile of the granites of the scarp, to lateritic gravels, to fine grey sands and gravels to crushed limestone.
**PLANTING PALETTE**  
**CHARACTER ZONE: PALEOCHANNEL**

---

### Species Name | Nyoongar / Common Name | Indicative Percentage (%) within each planting mix

| Trees | | Mix 1P: Buffer | Mix 2P: Songline | Mix 3P: Seasonal | Mix 4P: Banksia
---|---|---|---|---|---
*Banksia attenuata*** (Seasonal Indicator) | Biara / Candle Banksia | 5 | 3 | 4 | 1
*Banksia ilicifolia*** (Seasonal Indicator) | Holly-leaved Banksia | 1 | 4 | | 
*Banksia menziesii*** (Seasonal Indicator) | Bulgalla / Firewood Banksia | | | | 4
Eucalyptus rudis* (Indicator species) | | | | | 5 | 1
Macrozamia riedlei (Songline Wayfinding) | Djiridji / Zamia | 5 | 25 | 10 | 10
Nuytsia floribunda (Seasonal Indicator) | Mooja / Christmas Tree | | | | | 0.5

| Shrubs | | Mix 1P: Buffer | Mix 2P: Songline | Mix 3P: Seasonal | Mix 4P: Banksia
---|---|---|---|---|---
Astartea scoparia* | Common Astartea | | | | 1
Adenanthera cygnorum** | Common Woolybush | | | | 1
Allocasuarina humilis** | Dwarf Sheoak | | | | 0.5
Bassaeas eriocarpa** | Common Brown Pea | | | | 2
Calytrix flavescent* | Summer Starflower | 5 | 1 | 2 |
Calytrix fraseri* | Pink Summer Calytrix | 5 | | 2 |
Darwinia citriodora*** (Indicator species) | Lemon-scented Darwinia | 20 | 15 | 10 | 10
Daviesia triflora** | | | | | 2
Eremaea pauciflora** | | 5 | 2 | 1 | 2
Hibbertia hypericoides**** | Yellow Buttercups | 1 | 3 |
Hibbertia subvaginata* | | | | | 4
Hypocalymma angustifolium* | White Myrtle | 1 | 1 | 2 |
Hypocalymma robustum* | Swan River Myrtle | 4 | 3 | 1 |
Gompholobium tomentosum** | Hairy Yellow Pea | 2 | 1 | 1 | 3
Melaleuca latensia* | Robin Redbreast Bush | | | | 0.5
Melaleuca serata**** | | 1 | 0.5 | 0.5 | 2
Persicymma ellipticum* | Swamp Teatree | 3 | 0.5 | 1 | 5
Scholtzia involucrata*** | Spiked Scholtzia | 1 | | 0.5 | 3
Verticornia densiflora** | Compacted Featherflower | | | | 0.5 | 3

| Rushes / Sedges | | Mix 1P: Buffer | Mix 2P: Songline | Mix 3P: Seasonal | Mix 4P: Banksia
---|---|---|---|---|---
Baumea junceae* | Bare Twig Sedge | 4 | 5 | 8 |
Baumea vaginalis* (Indicator species) | Pale Twig Sedge | | | | 5 |
Chaetanthus aristatus* (Indicator species) | | - | 10 | 15 | 15 | 15
Lepidosperma effusum* | Spreading Sword Sedge | 2 |
Lepidosperma longiflorale* | Pithy Sword Sedge | 2 |
Leptostachys scariosa* (Indicator species) | | - | 10 | 20 | 25 | 15

| Herbs | | Mix 1P: Buffer | Mix 2P: Songline | Mix 3P: Seasonal | Mix 4P: Banksia
---|---|---|---|---|---
Anigozanthos humilis*** | Catspaw | | | | 2 |
Anigozanthos manglesii*** | Kurubrang / Mangales | 2 | 5 |
Conostylis setigera** | Bristly Cottonhead | 1 | 1 | 2 | 5
Dampiera linearis** | Common Dampiera | | | | 3 |
Dianella revoluta*** | Blueberry Lily | 1 |
Haemodorus spicatus*** | Mardja / Bloodroot | | | | 1 |
Patersonia occidentalis* | Konna / Purple Flag | 5 | | 2 | 4 |
Rytidosperma occidentale* | Wallaby Grass | | | | 4 |
Thysanotus multiflorus* | Many-flowered Fringe Lily | 3 | | 1 | | 100 | 100 | 100 | 100 |

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Mix 1P: Buffer Planting

Woodland of Banksia attenuata and Eucalyptus rudis with low flowering understorey

Mix 2P: Songline

Low open woodland of Banksia spp., with linear arrangement of Macrozamia riedlei, interspersed with occasional Eucalyptus rudis

Mix 3P: Seasonal

Open woodland of Banksia spp. characterised by yellow flowers and swathes of rushes and sedges. Dryland to ephemeral on lower terraces

Mix 4P: Remnant Banksia

Banksia spp. and low understorey to buffer and complement the remnant Banksia woodland

*Melaleuca Woodland vegetation association  
**Banksia woodland vegetation association  
***Marri-Sheoak Woodland vegetation association  
****Banksia-Jarrah Woodland vegetation association
### PLANTING PALETTE

#### CHARACTER ZONE: WETLAND

**Mix 1W: Upper Embankment (Dryland)**

Melaleuca open woodland, with low flowering understorey, interspersed with occasional *Eucalyptus rudis* and groupings of *Banksia* spp.

**Mix 2W: Lower Embankment (Ephemeral)**

Melaleuca open woodland, over sedgeland of *Baumea* spp. and groupings of Melaleuca spp. Dryland on upper banks transitioning to ephemeral basin.

**Mix 3W: Wetland Basin (Ephemeral)**

Scattered Melaleuca *rhapophylla* over open sedgeland of *Baumea* spp.

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<table>
<thead>
<tr>
<th>Species Name</th>
<th>Nyoongar / Common Name</th>
<th>Indicative Percentage (%) within each planting mix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trees</strong></td>
<td></td>
<td>MIX 1W: UPPER EMBANKMENT</td>
</tr>
<tr>
<td><em>Banksia attenuata</em>** (Seasonal Indicator)*</td>
<td>Biara / Candle Banksia</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Banksia illicifolia</em>** (Seasonal Indicator)*</td>
<td>Holly-leaved Banksia</td>
<td>1.5</td>
</tr>
<tr>
<td><em>Banksia litoralis</em></td>
<td>Punghura / Swamp Banksia</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Eucalyptus rudis</em></td>
<td>Molch / Flooded Gum</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Melaleuca woodlands vegetation association</em></td>
<td><em>Bibool / Swamp Paperbark</em></td>
<td>2</td>
</tr>
<tr>
<td><em>Marri-Sheoak vegetation association</em></td>
<td><em>Moonah</em></td>
<td>2</td>
</tr>
</tbody>
</table>

| **Shrubs** |                        | MIX 1W: UPPER EMBANKMENT | MIX 2W: LOWER EMBANKMENT | MIX 3W: WETLAND BASIN |
| *Astartea scoparia* (Indicator species) | Common Astartea | 10 | 1 |  |
| *Calytrix flavescens* | Summer Starflower | 5 | 2 |  |
| *Calytrix fraseri* | Pink Summer Calytrix | 5 | 3 |  |
| *Darwinia citriodora*** | Lemon-scented Darwinia | 5 |  |  |
| *Eremaea pauciflora*** | Swamp Pea | 2 | 3 |  |
| *Eucilopsis linearis* | Swamp Pea | 2 | 3 |  |
| *Hibbertia subvaginata* | Koodgeed / White Myrtle | 5 | 10 | 2 |
| *Hypocalymma angustifolium* | Koodgeed / White Myrtle | 15 | 5 |  |
| *Melaleuca lateritia* | Robin Redbreast Bush | 0.5 | 1 |  |
| *Melaleuca teretifolia* | - | 0.5 | 2 |  |
| *Lechenaultia floribunda* | Free-flowering Leschenaultia | 5 | 3 |  |
| *Pericalymma ellipticum* | Swamp Tea Tree | 2 | 2 |  |
| *Verticordia densiflora*** | Compact Feathertop | 2 |  |  |

| **Rushes / Sedges** |                        | MIX 1W: UPPER EMBANKMENT | MIX 2W: LOWER EMBANKMENT | MIX 3W: WETLAND BASIN |
| *Baumea articulata* (Indicator species) | Wuarulg / Jointed Twig Sedge | 10 | 40 |  |
| *Baumea juncea* | Bare Twig Sedge | 10 | 4 | 5 |
| *Baumea rubiginosa* (Indicator species) | - | 20 | 30 |  |
| *Baumea vaginalis* | Pale Twig Sedge | 15 |  |  |
| *Chaetanthus aristatus* | - | 2 | 1 |  |
| *Lepidosperma effusum* | Spreading Sword Sedge | 1 |  |  |
| *Lepidosperma longitudinale* | Pithy Sword Sedge | 1 |  |  |
| *Leptocarpus scariosus* | - | 5 |  |  |
| *Schoenus subfascicularis* | - | 2 |  |  |

| **Herbs** |                        | MIX 1W: UPPER EMBANKMENT | MIX 2W: LOWER EMBANKMENT | MIX 3W: WETLAND BASIN |
| *Centella asiatica* | Centella | 2 | 2 |  |
| *Lobelia anceps* | Angled Lobelia | 6 | 2 |  |
| *Patersonia occidentalis* | Purple Flag | 7 |  |  |
| *Thysanotus multiflorus* | Tjungeri / Many-flowered Fringe Lily | 6 |  |  |

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*Melaleuca Woodland vegetation association
**Bankia woodland vegetation association
***Marri-Sheoak vegetation association
**PLANTING PALETTE**

**CHARACTER ZONE: SWALES**

Mix 1S: Transitional Melaleuca to Banksia Woodland

Woodland of Banksia littoralis transitioning to low open shrubland dominated by *Eremaea pauciflora* bordering mass planting of *Baumea juncea*

Mix 2S: Transitional Marri to Banksia Woodland

Marri open forest transitioning to low open shrubland dominated by *Eremaea pauciflora* interspersed with swathes of *Banksia littoralis* bordering mass planting of *Baumea juncea*

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### PLANTING MIXES

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Nyoongar/Common Name</th>
<th>Indicative Percentage (%) within each planting mix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIX 1S: MELALEUCA WOODLAND</strong></td>
<td></td>
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</tr>
<tr>
<td><em>Banksia ilicifolia</em>** (Seasonal Indicator)</td>
<td>Holly-leaved Banksia</td>
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<tr>
<td><em>Banksia litoralis</em> (Indicator species)</td>
<td>Pungura / Swamp Banksia</td>
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<tr>
<td><em>Banksia menziesii</em>** (Seasonal Indicator)</td>
<td>Bulgala / Firewood Banksia</td>
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<tr>
<td><em>Eucalyptus rudis</em></td>
<td>Melotch / Flooded Gum</td>
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<tr>
<td><strong>MIX 2S: MARRI-SHEOAK FOREST</strong></td>
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<tr>
<td><em>Acacia wilsoniana</em>**</td>
<td>Grass Wattle</td>
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</tr>
<tr>
<td><em>Adenanthera polystachya</em>**</td>
<td>Basket Flower</td>
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</tr>
<tr>
<td><em>Calycanthus floribundus</em>**</td>
<td>Summer Starflower</td>
<td>4</td>
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<tr>
<td><em>Calycanthus fraseri</em></td>
<td>Pink Summer Calycanthus</td>
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<tr>
<td><em>Darwinia ciliata</em>**</td>
<td>Lemon-scented Darwinia</td>
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<tr>
<td><em>Daviesia decurrens</em>**</td>
<td>Prickly Bitter-pea</td>
<td>2</td>
</tr>
<tr>
<td><em>Eremaea pauciflora</em>** (Indicator species)</td>
<td>-</td>
<td>25</td>
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<tr>
<td><em>Eucalyptus linearis</em></td>
<td>Swamp Pea</td>
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<td><em>Eucalyptus virgata</em></td>
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<tr>
<td><em>Gastrolobium capitatum</em>**</td>
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<tr>
<td><em>Hardenbergia comptoniana</em>**</td>
<td>Native Wisteria</td>
<td>0.5</td>
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<tr>
<td><em>Hibbertia racemosa</em>**</td>
<td>Stalked Ginea Flower</td>
<td>4</td>
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<tr>
<td><em>Hibbertia subdigyna</em></td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td><em>Hypocalymma angustifolium</em></td>
<td>Koodeed / White Myrtle</td>
<td>4</td>
</tr>
<tr>
<td><em>Lechenaultia floribunda</em>**</td>
<td>Free-flowering Lechenaultia</td>
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<tr>
<td><em>Melaleuca latens</em></td>
<td>Robin Red Breast Bush</td>
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<tr>
<td><em>Melaleuca teretifolia</em></td>
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</tr>
<tr>
<td><em>Melaleuca thymoides</em>**</td>
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<tr>
<td><em>Pericalymma ellipticum</em></td>
<td>Swamp Teatree</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Verticordia densiflora</em>**</td>
<td>Compacted Featherflower</td>
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<tr>
<td><strong>Rushes / Sedges</strong></td>
<td></td>
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<tr>
<td><em>Baumea juncea</em> (Indicator species)</td>
<td>Bare Twig Sedge</td>
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<tr>
<td><em>Lepidosperma effusum</em></td>
<td>Spreading Sword Sedge</td>
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<td><em>Lepidosperma longifolium</em></td>
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<td><em>Schoenus subfascicularis</em></td>
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<tr>
<td><strong>Herbs</strong></td>
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<tr>
<td><em>Conostylis juncea</em>**</td>
<td>-</td>
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<tr>
<td><em>Dasyypogon bromeliifolius</em>**</td>
<td>Pineapple Bush</td>
<td>10</td>
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<tr>
<td><em>Dianella revoluta</em>**</td>
<td>Mangari / Blueberry Lily</td>
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<tr>
<td><em>Kennedia prostrata</em>**</td>
<td>Wellung / Scarlett Runner</td>
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<tr>
<td><em>Lobelia anceps</em></td>
<td>Angled Lobelia</td>
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<td><em>Polemonium occidentalis</em></td>
<td>Purple Flag</td>
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<tr>
<td><em>Polemonium ciliatum</em>**</td>
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<tr>
<td><em>Thelymitra triandra</em>**</td>
<td>-</td>
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<tr>
<td><em>Thysanotus multiflorus</em></td>
<td>Many-flowered Fringe Lily</td>
<td>3</td>
</tr>
</tbody>
</table>

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**Species Notes:**

*Melaleuca Woodland vegetation association
**Banksia woodland vegetation association
***Marri-Sheoak vegetation association

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The Curtin Living Knowledge Stream Design Guidance
### PLANTING PALETTE

**CHARACTER ZONE: GROUNDWATER AQUIFER**

**Mix 1A: Grasstree Shrubland**
Grasstree shrubland with scattered Marri and low flowering understorey of herbs and shrubs

**Mix 2A: Marri Woodland Open Forest**
Marri open forest with low flowering understorey interspersed with regular linear strips of *Xanthorrhoea preissii* and linear groupings of *Allocasuarina fraseriana*

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<table>
<thead>
<tr>
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<th>Indicative Percentage (%) within each planting mix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MIX 1A: MELALEUCA WOODLAND</strong></td>
<td></td>
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<tr>
<td><strong>Trees</strong></td>
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<tr>
<td><em>Allocasuarina fraseriana</em>*** (Indicator species)</td>
<td>Kondil / Sheoak</td>
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<tr>
<td><em>Corymbia calophylla</em>*** (Indicator species)</td>
<td>Marri</td>
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<tr>
<td><em>Xanthorrhoea preissii</em> (Songline Indicator)</td>
<td>Balga / Grass tree</td>
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<td><strong>Shrubs</strong></td>
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<tr>
<td><em>Acacia willdenowiana</em>***</td>
<td>Grass Wattle</td>
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<td><em>Adenanthos obovatus</em>***</td>
<td>Basket Flower</td>
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<td><em>Asterace scoparia</em></td>
<td>Common Asterace</td>
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<td><em>Daviesia decurrens</em>***</td>
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<td>Free-flowering Leschenaultia</td>
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<td><em>Melaleuca thymoides</em>**</td>
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<td><em>Pterocalymma ellipticum</em></td>
<td>Swamp Tea-tree</td>
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<tr>
<td><em>Verticordia densiflora</em>** (Indicator species)</td>
<td>Compacted Featherflower</td>
<td>15</td>
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<td><strong>Rushes / Sedges</strong></td>
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<td><em>Lepidosperma longitudinal</em></td>
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<td>Mangard / Blueberry Lily</td>
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<tr>
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<td>Wild Violet</td>
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<tr>
<td><em>Kennedia prostrata</em>**</td>
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<td><strong>100</strong></td>
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<td><strong>100</strong></td>
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*Melaleuca Woodland vegetation association
**Banksia woodland vegetation association
***Marri-Sheoak vegetation association
****Banksia-Jarrah Woodland vegetation association

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