

The background of the cover is a photograph of a park. On the left, a large, leafy tree stands in the foreground. To its right is a wide, open grassy field. In the distance, a line of trees and some buildings are visible under a sky with scattered clouds. A large, solid green triangle is positioned on the left side of the image, partially overlapping the tree and the field. The title text is overlaid on the lower right portion of the image.

Chameleon Reserve Master Plan Report Prepared on behalf of Penrith City Council

21-25443
November 2017

Architecture
Interior Design
Planning
Urban Design
Landscape Architecture

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01 INTRODUCTION

1.1 Summary

1.1.1 Report overview

Chameleon Reserve is located in Erskine Park, approximately two kilometres from the Erskine Park Rd exit on the M4. The Park is more than 10 hectares in extent and holds significant potential to be developed into a district level park with a wide range of recreation opportunities and facilities.

Through the analysis of the immediate and wider site context, existing opportunities and constraints, and existing documentation GHDWoodhead have developed a vision and set of objectives for the site which are outlined as follows:

Vision

Deliver an open space that engages and inspires the local and regional community that promotes healthy outdoor recreation and active lifestyles, while enhancing and preserving its natural environmental and ecological assets.

Objectives

- Facilitate improved connectivity to enhance pedestrian and cyclist use and experience
- Provide all ages play and exercise equipment
- Implement biodiversity, a riparian corridor / dry creek bed and native vegetation
- Incorporate environmentally sensitive design
- Provide a dog exercise area / leash-free park
- Establish a strong 'Sense of Place' through place making, signage and wayfinding and public art
- Implement crime prevention through design (CPTD)
- Facilitate current and future commercial opportunities

From the vision and objectives, GHDWoodhead has provided high level urban design and landscaping to create a master plan which reflects and builds upon Council's goals and initial community feedback.

1.1.2 Context

The estimated resident population for Erskine Park in 2016 was 6,741, and is forecast to be fairly stable for the next 20 years, growing to 6,935 by 2036. Although the population profile of the suburb is generally one of an ageing community Chameleon Reserve is centrally located to five schools being Blackwell Public School, James Erskine Public School, Erskine Park High School, Clairgate Public School and St Clair High School, all of which are within 1.5km walking distance.

Major adjoining roads are significant barriers between Erskine Park and its surrounds, with the M4 isolating the suburb from Colyton to the north. Erskine Park Road is the major connection between the M4 and the Westpark Industrial Estate causing high volumes of traffic which had separated Erskine Park from neighbouring St Clair to the east. However, plans for the Erskine Park Road and Bennett Road intersection, located along the western perimeter of Chameleon Reserve, to upgrade to a signalised intersection presents the opportunity for increased connectivity and access to the Park.

1.1.3 The Community

Erskine Park was used as a pilot project to gather feedback on the community's recreation priorities, and identify the availability and suitability of Council parks in the suburb. This helped to gauge community support for the funding of quality improvements to open spaces in their suburb. Funding would be generated by divesting some of the Council owned land that is not required for the community's current recreation needs.

Combining the community feedback received through focus groups, drop-in sessions and over 200 resident survey responses with an independent recreation study, a draft Open Space Master Plan (OSMP) has been developed for Erskine Park. The draft Plan identified which parks should be upgraded and which open space land should be considered for sale to fund improvements.

Chameleon Reserve is highly valued by the Erskine Park community and has been identified as a park where funding should be allocated towards improvements. The community consultation process revealed the community are supportive of improvements to Chameleon Reserve and provided six key initiatives. These initiatives have been incorporated into the objectives developed by GHDWoodhead. The initiatives and the community consultation process are discussed further in section 6.2.



Figure 1: Location Map

1.2 Vision and strategic direction

1.2.1 Vision

Deliver an open space that engages and inspires the local and regional community that promotes healthy outdoor recreation and active lifestyles, while enhancing and preserving its natural environmental and ecological assets.

1.2.2 Strategic Direction

Foster participation in healthy outdoor recreation activities

Chameleon Reserve offers an important venue for a range of passive and structured healthy activities including walking, cycling, jogging and individual and team games. Outdoor recreation should be enjoyed by residents of all ages. Performing physical exercise while outdoors provides a way to get outside and enjoy your natural surroundings. This helps reduce stress from work and daily living and encourages quality personal and family time. Central to the development of the master plan are logical and convenient networks of cycle and pedestrian footpaths, and an understanding of the spatial requirement for a range of activities.

Demonstrate sustainability principles

Clearance of native habitat for urbanisation has negatively impacted the comfort for city dwellers. Chameleon Reserve provides the opportunity to redress one of the more significant impacts on human comfort and enjoyment of the outdoors - the urban heat effect. The introduction and augmentation of existing habitat and green spaces can have many environmental benefits including improve air quality, increasing biodiversity and reducing ambient temperature.

Mitigation investment i.e. increase in tree canopy cover and water sensitive urban design (WSUD)

Through the implementation of permeable surfaces and increasing canopy cover, the quantity of storm water to be conveyed by traditional storm water network can be reduced. Additionally, opportunities for bioremediation, and increasing the water holding capacity of soils and growing medium, can improve water quality before recharging the existing creek. An important feature of the Chameleon Reserve is its roles in the areas storm water strategy. The impact of the master plan proposals will need to be carefully balanced against the detention function and capacity of the park.

Reflect the needs and aspirations of the community

Chameleon Reserve is highly valued by the Erskine Park community and has been identified as a park where funding should be allocated towards improvements. The initial community consultation process revealed the community are supportive of improvements to Chameleon Reserve and provided six key initiatives that are to be integrated into the objectives.



Figure 2: Existing pathway and site access



Figure 3: Example of existing vegetation



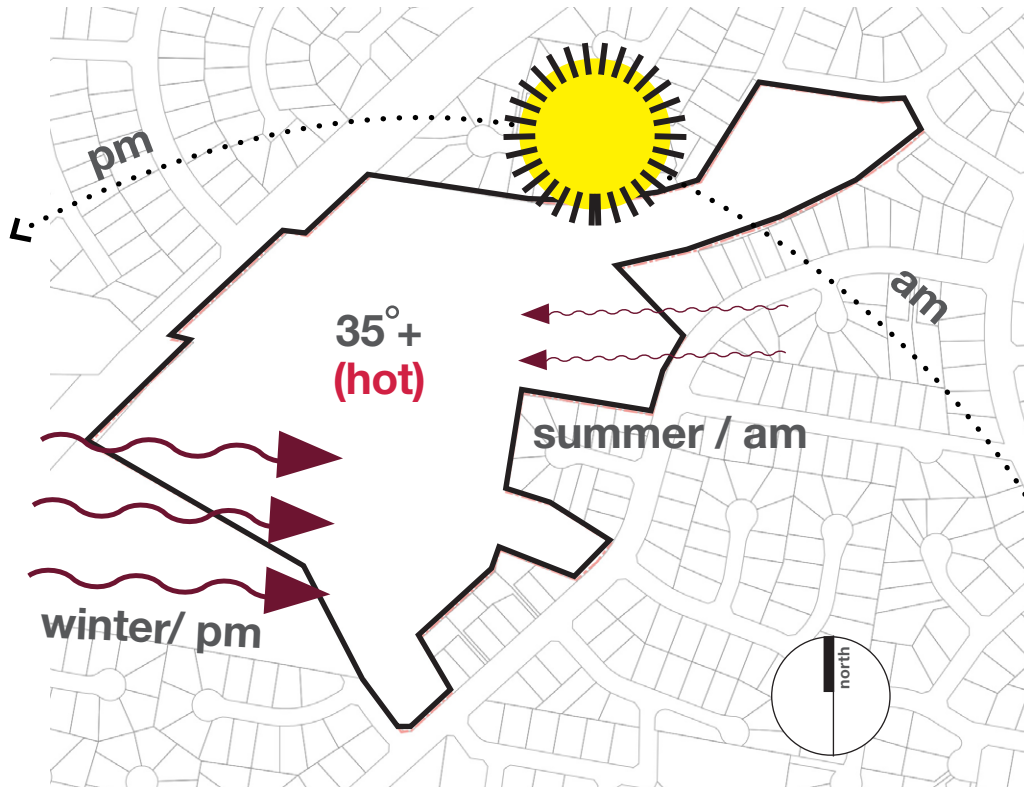
Figure 4: Existing grass swale

1.2.3 Objectives and actions

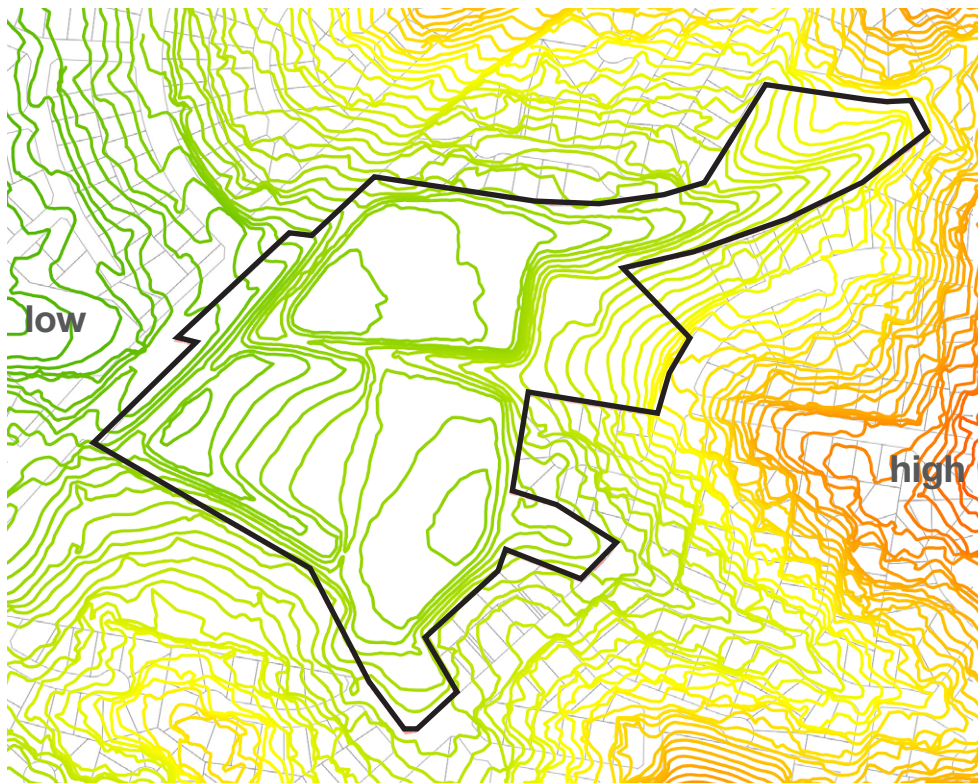
Item	Objectives	Actions
1	Facilitate improved connectivity to enhance pedestrian and cyclist use and experience	- Implement design elements throughout the site according to the Active Transport Strategy set out in the <i>Penrith Urban Strategy Managing Growth to 2031</i> and the <i>Penrith Recreational and Cultural Strategy</i>. - Provide DDA compliant access to site. - Create a safe space that is well connected and separated from vehicular traffic. - Provide end of journey facilities including water refill point, fixing post, bike parking.
2	Provide all ages play and exercise equipment	- Implement an all ages playground. - Provide multi age exercise stations throughout the park, along the pathways, to promote active lifestyles. - Include shade (structural and natural), seating, tables, BBQ facilities, Wi-Fi, amenity lighting.
3	Implement biodiversity, a riparian corridor / dry creek bed and native vegetation	- Retain the established green assets for the site including the mature tree planting. - Retain the existing detention basin ensuring no volume is taken. - Provide additional planting to improve biodiversity, shade, air quality, ambient air temperature and visual amenity. Aim to have connecting canopies within and throughout the site to encourage arboreal fauna migration. - Restore the natural waterway corridor by implementing a dry creek bed with provision for small weirs to create small permanent waterbodies/wetland below the existing water level. - Avoid ponds (algae, weeds) - Look at low flow channels, stepped systems. Where water is only flowing in a storm event.
4	Incorporate environmentally sensitive design to ensure efficient stormwater management, resilience and sustainability	- Implement good design to improve the quality of the environment including site remediation, low carbon material choices, low energy use, improve air quality. - Integration of WSUDs initiatives to improve water quality and storm event management. - Celebrate natural systems (water cycle, solar energy and ecology) and facilitate a greater connection with the natural environment.
5	Provide a dog exercise area/ leash-free park	- Provide a compliant leash-free area which includes play and exercise equipment, shade, seating and water. - Consideration in design for fence type if in low lying area and implications for litter trap and water flow impediment
6	Establish a strong 'Sense of Place' through place making, signage and wayfinding and public art	- Implement public art that reflects the community heritage, identity and values. - Utilise signage and wayfinding elements to establish a strong sense of place and orientate users.
7	Implement crime prevention through design (CPTD) to create a safe and welcoming environment for users	- Create quality visual connections and open lines of sight which enables casual surveillance throughout the site. - Incorporate permeable barriers separating ped/cycle from vehicular traffic. - Implementing public art to deter unwanted vandalism.
8	Provide for current and future commercial opportunities to activate the site	- Consider food and beverage facility, coffee cart, bicycle workshops, bike hire. - Provide space and utilities for commercial opportunities now and in the future.

02 ANALYSIS

2.1 Existing conditions



Microclimate

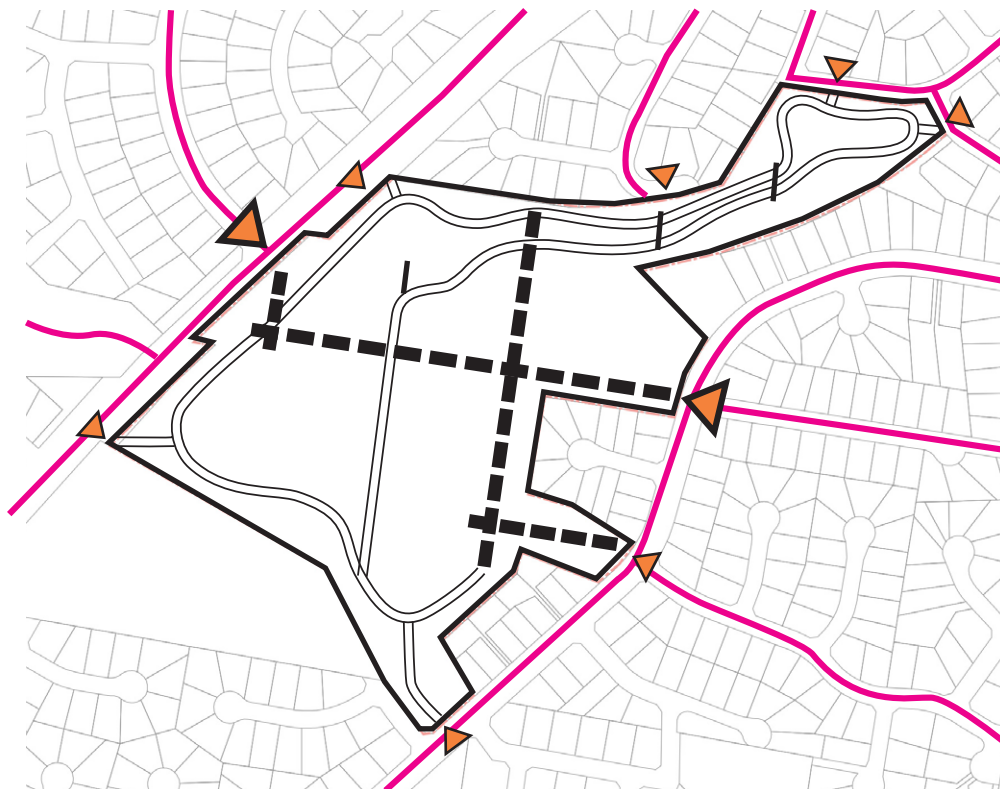


Topography

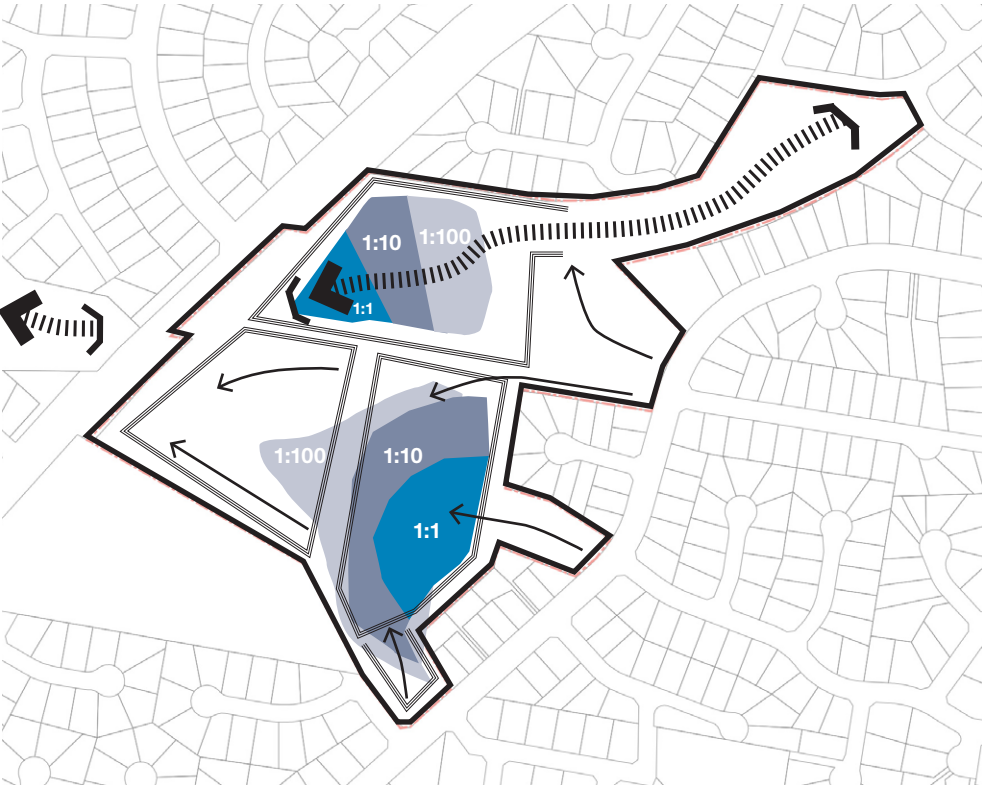
2.2 Organising elements

A range of opportunities and constraints have been identified via site visit, background study information and desktop research. The intention is to enhance landscape amenity and improve pedestrian access, safety and experience, ensure the existing stormwater detention function is not compromised and fauna and flora habitats are enhanced, rehabilitated and protected.

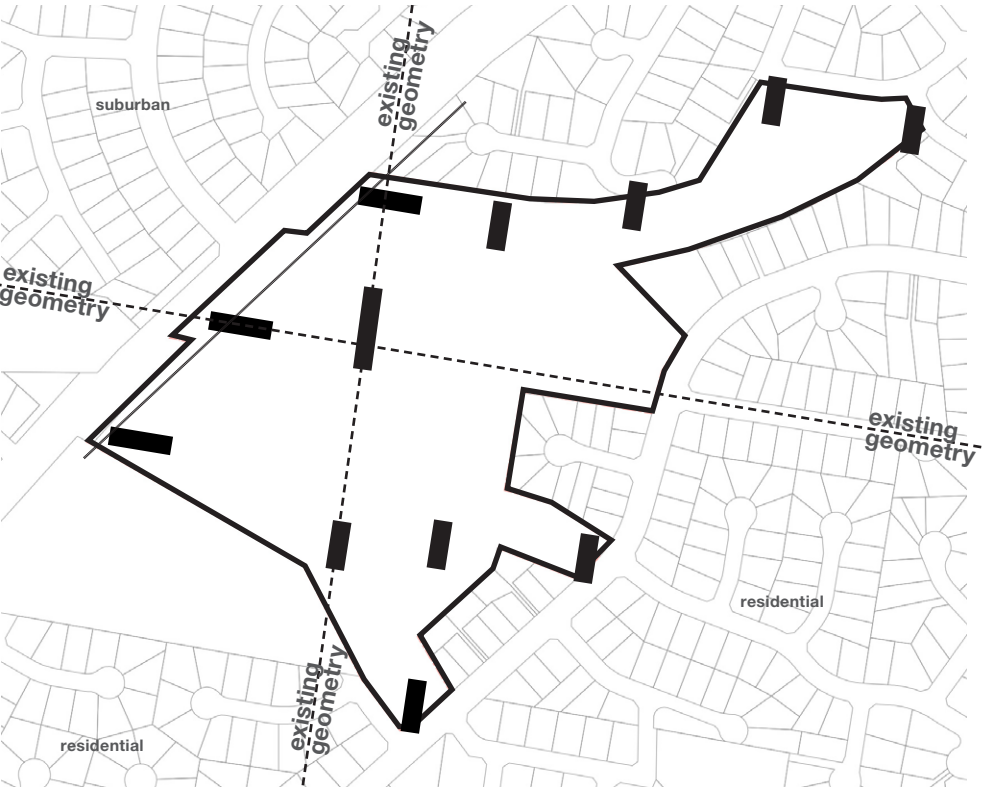
The key organising elements are visually represented in the following diagrams.



**Pedestrian and
cycle circulation**



Stormwater



Landscape



Habitat



Activities

03 DESIGN INTENT

3.1 Key features



3.1.1 Play areas



Figure 5: Example of nature / water play

The restoration of the natural creek at Chameleon Reserve presents the opportunity for 'nature play' areas to be integrated into the parkland, including natural water play areas which are highly attractive to children and an effective mitigation to the high summer temperatures.

Playing outdoors was a huge part of past generation's childhoods, whether it was riding a bike, climbing trees, kicking a football or playing games in the backyard. Unfortunately for many children today, this is not their everyday experience. Children are spending less time outdoors with the average Australian child spending less than two hours a day outside. Fortunately, in recent years there has been a movement towards promoting unstructured play outdoors and in nature. It is founded on the understanding that unstructured play outdoors, or 'nature play', is fundamental to a full and healthy childhood.

Nature play promotes health benefits, including cognitive, social and emotional development, and builds resilience and creativity. Experiences in nature as a child also leads to environmental awareness and stewardship later in life.

For these reasons the design intent for Chameleon Reserve is to provide formal playgrounds with natural play elements which are integrated into the parkland and cater to a range of age groups and abilities including 0-3; 3-7, 7+ and teenagers, while offering an array of activities. These spaces should also provide supporting facilities for children, parents and carers such as shade, seating and drinking fountains

Natural materials that can be used in creating a 'natural' playing environment include:

- climbing frames
- log steppers
- boulders and rocks
- fallen tree branches
- water

Integration within proposed and existing tree canopies provides natural shade and should be considered for all the play area locations.



Figure 6: Royal Park nature playground, Melbourne



3.1.2 Multigenerational fitness

Many parks are replacing outdoor trails and exercise areas with equipment that is more accessible to everyone. Playgrounds built for senior or multigenerational use serve as social hubs. Face-to-face and multi-user equipment makes them great places to meet people locally while encouraging quality interaction across all age groups. They also enable the whole community to maintain an active lifestyle and in turn reduce related health issues.

For these reasons the design intent for Chameleon Reserve is to provide multigenerational stations with equipment that is easy to use, low impact, designed to prevent falls, works most muscle groups, and caters to people with limited agility, balance or flexibility.

Key elements that these multigenerational fitness stations should include are:

- A swing that is strong and has wide seats for both adults and children.
- A slide that's adult-sized and has a gentle slope.
- An outdoor recumbent bike that's easy to get onto and off of.
- A two-person cross-country ski machine that's easy to use and fun for people of any age.
- An elliptical machine to improve range of motion.
- A "Tai Chi Spinner"—two wheels, one for the right hand and one for the left, that you can rotate this way and that way together or separately to improve flexibility in your arms, shoulders and wrists.
- A two-person "rotator" that stretches the backs and hips while strengthening the abdominal muscles.
- Stand-alone "activity panels." To allow for activities such as push-ups, arm raises, mini squats and upper body cycling.



Figure 7: Example of multigenerational use of public fitness equipment



3.1.3 Leash-free dog area



Figure 8: Example of a leash-free dog park

Pet ownership brings considerable benefits to individuals, the economy and the community. Dog parks provide a space for exercising and socialising dogs in a safe and controlled environment for the benefit of both owners and their dogs.

For these reasons the design intent for Chameleon Reserve is to provide a designated leash-free dog park area for dog owners to legally exercise, play and socialise with their dogs off-leash in a secure environment. The park should be fully enclosed or fenced and have amenities that make it clear that dogs are invited, not just permitted.

Core amenities to be included:

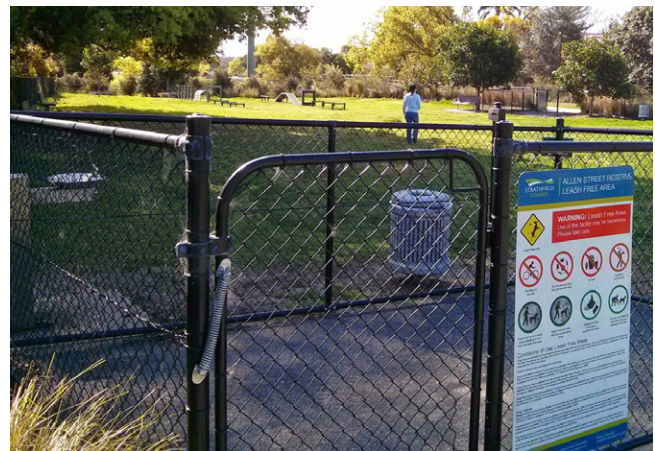


Figure 9: Example of standard gate system at leash-free dog parks

- Perimeter fencing
- Entry gates/ doggy airlock (2 gates per entry)
- Service (maintenance) gates
- Pathways (internal and external)
- Ground surfaces (e.g. grass, mulch, gravel, sand, concrete)
- Landscaping (planting, screening)
- Drinking water fountains
- Bins and bag dispensers
- Shelter and seating
- Signs (e.g. directional and park rules)
- Site lighting
- Dog play/agility equipment

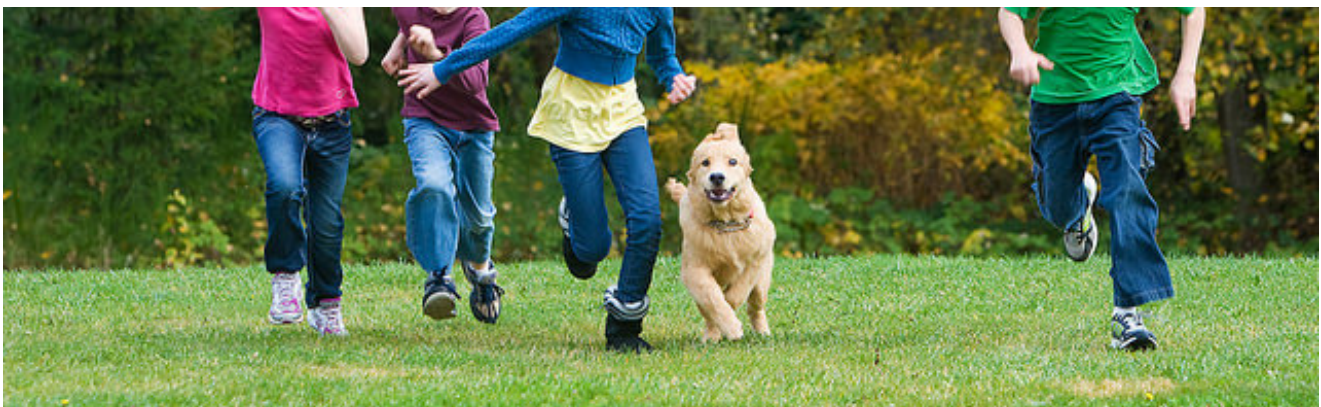


Figure 10: Children playing with their dog in a leash-free dog park



3.1.4 Pedestrian and cycle network



Figure 11: Example of primary shared pathway

Various consultations with the local community have identified footpaths and cycleways as one of the most important infrastructure needs, with the existing network seen as being fragmented, indirect and unpleasant to use. The ageing population of Penrith, as well as the proximity to a number of local schools indicated the need to provide universal design facilities and services for the cycle and pedestrian network in order to cater for all users.

For these reasons the design intent for the Chameleon Reserve pedestrian and cycle network is to provide upgraded pathways to support increased traffic and ensure emerging community needs, including disability access, are met.

The pedestrian and cycle network for Chameleon Reserve should include the following key characteristics:

- Strong linkages to the existing pedestrian and cycle network and surrounding nodes.
- Strategically located facilities and amenities for enhanced user experience and comfort - seating, signage and wayfinding, shade, water fountains, bike fixing station, drinking fountain, bike racks.
- Primary paths – 5 m, linear paths in a grid layout, enabling ease of access and movement as well as clear sight lines. Segregated cycle and pedestrian paths will be considered for safety and mobility.
- Secondary paths - 3.5-4 m, shared pathway to create a recreational cycle circuit around the parkland.
- Tertiary paths - 1.8 m, primarily pedestrian, meandering throughout the parklands and providing a circuit for passive recreation.



Figure 12: Example of secondary pathway



Figure 13: Example of possible line markings for shared pathway



3.1.5 Waterway/WSUDs



Figure 14: Example natural waterway in a detention basin

Rivers and creeks are vital living ecosystems that carry water from catchments into estuaries and oceans. They support species of fish, frogs, aquatic plants and insects, while yielding water for drinking, agriculture, industry and recreation.

In the context of urban water management Water Sensitive Urban Design (WSUD) is the integrated design of the urban water cycle, incorporating water supply, wastewater, stormwater and groundwater management, urban design and environmental protection. It represents a fundamental shift in the way water and related environmental resources and water infrastructure are considered in the planning and design of cities and towns, at all scales and densities.



Figure 15: Example dry waterway with small weirs

For these reasons the design intent for Chameleon Reserve is to enhance the integration of WSUD's for their quantitative and qualitative impacts on land, water and biodiversity, and the community's aesthetic and recreational enjoyment of waterways.

Key actions to achieve this design intent include:

- uncover the existing stormwater pipe in the northern half of the reserve and restore the previously removed creek and associated habitat.
- implement permeable surfaces and increase native vegetation canopy cover.



Figure 16: Example restored natural waterway



3.1.6 Improved native vegetation

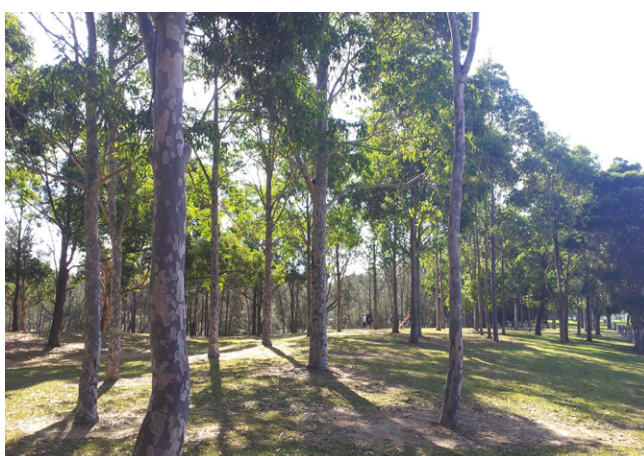


Figure 17: Example of high canopies

Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils. The remaining stands of this ecological community are threatened by the spread of the Sydney suburban areas. Threats include clearance for agriculture, grazing, hobby and poultry farming, housing, invasion by exotic plants and increased nutrient loads due to fertiliser run-off from gardens and farmland, and other developments. Before European settlement Cumberland Plains were extensive across western Sydney. Today, only nine percent of the original extent remains intact.

Both New South Wales and the Commonwealth Government have listed the Cumberland Plains Woodland as an endangered ecological community under their respective Legislation. A Recovery Plan for this Woodland is being prepared by the NSW Government. Environment Australia, under the Natural Heritage Trust, is supporting a number of projects restoring and rehabilitating these woodlands through Landcare and Bushcare programs and through community groups (Department of Environment and Energy, 2017). Good examples can be seen at Scheyville National Park and Mulgoa Nature Reserve.

Part of the restoration efforts is the Biodiversity Investment Opportunities (BIO) Map, funded by the NSW Environmental Trust. The BIO Map aims to achieve better biodiversity outcomes by directing biodiversity investment funding to the strategic locations of greatest benefit, of which Penrith local government area is included.



Figure 18: Example of clear sightlines through vegetation

Although Chameleon Reserve is not specifically identified as an area for restoration, its proximity to the identified corridors presents the opportunity to contribute to the rehabilitation efforts. For these reasons the design intent for Chameleon Reserve is to incorporate native Cumberland Plains species back into the parkland.

The most common species which characterise the Cumberland include:

Dominant canopy trees

- Grey Box (*Eucalyptus moluccana*)
- Forest Red Gum (*E. tereticornis*)
- Narrow-leaved Ironbark (*E. crebra*)
- Spotted Gum (*Corymbia maculata*)

Dominant shrubs and grasses

- Blackthorn (*Bursaria spinosa*)
- Kangaroo Grass (*Themeda australis*)
- Weeping Meadow Grass (*Microlaena stipoides* var. *stipoides*).

The Cumberland Plains woodlands contain many more species and further research should be undertaken to identify those species most suitable to Chameleon Reserve.

In the context of Chameleon Reserve species should be selected with the intention of creating high canopies and maintaining clear lines of sight for enhancing CPTED.



3.1.7 BBQ and outdoor eating

The outdoor BBQ is iconic to Australia and deeply engrained in the Australian way of life. It is common place to find free public BBQ amenities scattered throughout parklands and open spaces as this enables diversity and prolonged use of the spaces.

For this reason the design intent for Chameleon Reserve is to provide BBQ areas throughout the parkland, with in close proximity to complementary facilities such as playgrounds and restrooms. This will provide opportunities for visitors to enjoy the park throughout the day, and activate the spaces.



Figure 19: Example public BBQ facilities



Figure 20: Existing grass swale



3.1.8 Seating and shaded nodes



Figure 21: Example seating

Nodes are strategic focal points into which the people can enter and gather, typically in the form of junctions of paths, or concentrations of elements (i.e. seating), squares and plazas. When supported by a strong physical form, nodes become clearly identifiable and memorable.

For this reason the design intent for Chameleon Reserve is to provide nodes at key path intersections enabling ease of movement and creating spaces for rest and gathering. In addition to nodes, seating will be placed along the pedestrian and cycle network at strategic locations to address the identified community concern for the lack of available seating in the park.



Figure 22: Example shaded structure



3.1.9 Unstructured activity area

Open space areas enable unstructured play, (activities that children create on their own) and physical activity such as: ball games, tag, frisbee and make-believe. Similar to 'nature play', unstructured play encourages children to take initiative and create activities and stories in the world around them. Research indicates unstructured play promotes intellectual and cognitive growth, emotional intelligence, and benefits social interactions.

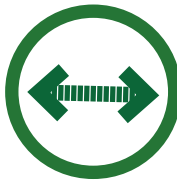
For these reasons the design intent for Chameleon Reserve is to enhance social sustainability through the provision of open, turf space which allows for unstructured activities and pop-up events which community groups could utilise for activities such as markets, outdoor cinemas, ball games, school fetes and community meetings.



Figure 23: Example of pop-up event



Figure 24: Example of unstructured play



3.1.10 Aerial/subterranean fauna connections (subject to further investigation)

The value of isolated habitats can be significantly increased by providing safe connectivity across existing infrastructure. The restoration of habitat within the green spaces in and around Chameleon Reserve will offer a fantastic opportunity for the re colonisation of the regions declining animal species. Safe connectivity can be provided both above and below ground and has the following benefits:

- Increases diversity among the plant and animal community
- Reduces death of animal crossing roads
- Guides animals to the wider network, decreases the time required for recolonisation
- Is a visible reflection of the councils and communities commitment to the environment.

For these reasons it is recommended that the opportunity within the proposed civil works to Erskine Park Road be investigated with the intention to integrate improved wildlife connectivity. Further ecological input would be required on the appropriate connection type. Consideration should be given to the existing culvert design between Chameleon Reserve and surrounding parks and green corridors.

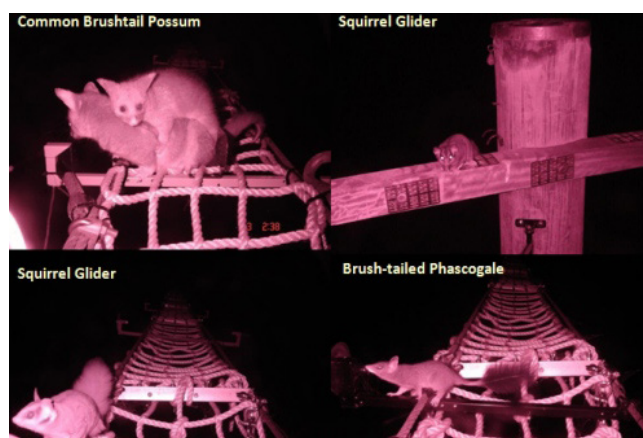


Figure 25: Example of native fauna utilising aerial connectors

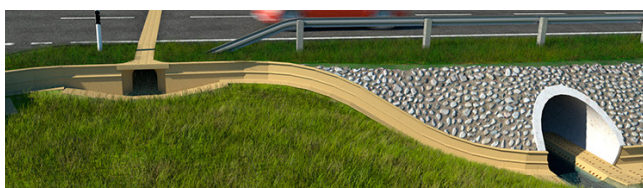


Figure 26: Example of subterranean connector design

04 MASTER PLAN

4.1 Master plan





LEGEND

	Amenity turf		Existing mounds
	Proposed structure tree planting		Lighting along primary circulation (20m centres / solar)
	Existing trees to be retained		Entry point
	Improved native vegetation		Vehicle/ maintenance entry
	Riparian planting		Existing Outfalls
	Creek/WSUD's		Existing Inlet
	Creek reserve		Gross pollutant trap
	Primary circulation (5.0m shared surface)		Head walls
	Secondary circulation (3.5-4m shared surface)		Boundary
	Tertiary circulation (1.8m pedestrian path)		Extent of 1:100 year flood
	Nodes and seating areas		Extent of 1:10 year flood
			Extent of 1:1 year flood

FEATURES

	Pedestrian footpath		Signage and wayfinding
	Pedestrian crossing (by others)		Community information board
	Shared path		Wifi zone
	Bus stop		Potential temporary event space
	Young child and carers		Existing/ over flow car parking
	3-7 age play area		Habitat creation
	7+ age play area		Additional tree planting
	Teenage play (parkour/half pipe/ball wall)		Waterway/WSUD
	Informal nature play		Safe wildlife crossing (TBC)
	Unstructured activity		Waste and recycling bins
	Multi-generational fitness node		
	Leash-free dog play area		
	BBQ		
	Drinking fountain		
	Amenities block to be upgraded		
	Shade structure		

05 BENCHMARKING

5.1 Garnet Lehman Park, Toowoomba

5.1.1 Location

Garnet Lehmann park is a popular park in Toowoomba, QLD which forms part of the East Corridor. It links the Water Bird Habitat to the south with Lake Annand and Joseph Leadbetter Park to the north.

5.1.2 History

The park was named in honour of Garnet Lehmann recognising his contribution to Toowoomba as Director of Parks and Recreation from 1st April 1986 to 17th May 1991, his achievement towards the conservation and improvements of degraded farming land, and his service to the community and Toowoomba region as a whole.

Toowoomba City Council's Director of Parks and Recreation, Garnet Lehmann had a vision for flood mitigation works for the Toowoomba catchment area, and was responsible for implementing the planting of trees along the waterways and park areas as a soil and water conservation measure.

5.1.3 The site

The Park is primarily a detention basin which was one of several measures under the \$25 million Gowrie Creek Catchment Flood Mitigation Project, including channel works, stream and water flow improvements, a second detention basin at Ballin Drive Park and an early flood warning system. The park is designed to mitigate the impacts of flooding in the region, following the devastating 2011 floods that caused extensive damage to property and infrastructure.

The Queensland Minister for Transport and Minister for Infrastructure, Local Government and Planning Jackie Trad

recognised the Garnet Lehmann basin as an opportunity to deliver a range of additional benefits to the Toowoomba community with the focus on creating an attractive open space as well as the inclusion of a playground and leash-free dog park upstream from the basin.

Garnet Lehmann Park features a number of plantings which are designed for flood mitigation and to attract a wide variety of wildlife. Included in the plantings were hundreds of new large trees, thousands of new shrubs and ground cover plants, aimed to increase the biodiversity of the park.

The central lake or basin features varied depths of water which encourage different fish, tadpoles and frogs to the area. Other habitats, including new plantings of threatened plants - have been created for frogs, lizards and birds.



Figure 28: Signage indicating wildlife species present in the park



Figure 27: Pedestrian footbridge over waterway



Figure 29: Retention of existing mature trees



Figure 30: View of detention basin from the top of the earth mound

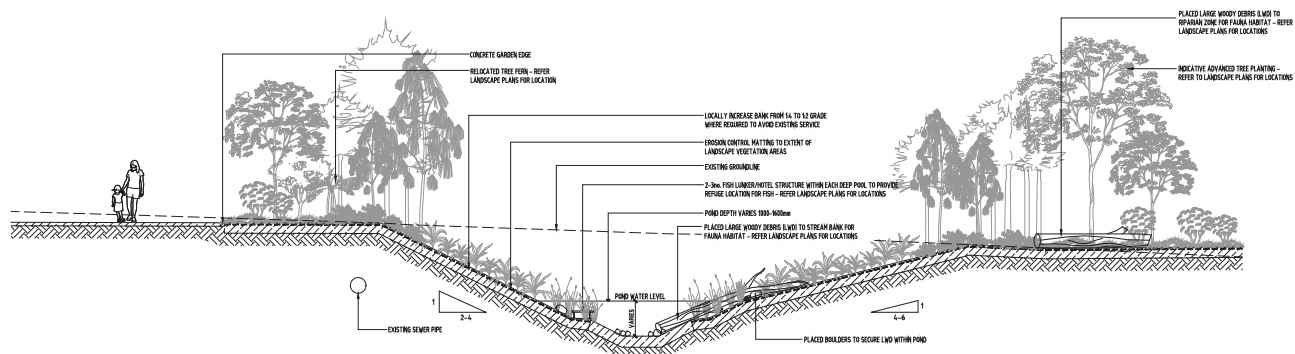


Figure 31: Example section drawing



Figure 32: Primary drainage pipes



Figure 33: Secondary drainage pipes



Figure 34: Small weirs



Figure 35: Natural riparian corridor restoration

06 TECHNICAL CONSIDERATIONS

6.1 Stormwater

Chameleon Reserve integral to existing regional flood management

The stormwater and water sensitive urban design (WSUD) assessment involved both a review of the existing stormwater function of the reserve as well as development of WSUD elements of the master plan.

Initially a site inspection was undertaken by a GHD water resources engineer as well as review of the reserve design drawings provided by Council. This confirmed that the intention of the reserve includes a significant stormwater detention function. This could be observed by the topography of the reserve providing significant water storage volume, and the size of the outlet culverts indicating an intended reduction in peak flows leaving the reserve. However, the actual extent and volume of detention storage anticipated during different design rainfall events was not immediately apparent and this information was not available from Council. Regional flooding information was available but was expected not to represent the detention outflow structures in sufficient detail for this assessment.

Therefore, an XP-RAFTS hydrologic model was simulated for a range of design rainfall events. This model simulated runoff in the upstream catchment and the predicted outflows from the detention storage to estimate the predicted detention storage maximum volume for different design rainfall events. This volume was compared to the site topography to estimate the resulting depth and extent of inundation associated with the maximum storage volumes. This allowed for an understanding of the overall detention function of the reserve.

It was noted that the primary detention storage areas are within the northern and south-eastern depression areas of the reserve, with the south western area not providing a significant detention function. This is due to the configuration of the pipe drainage network throughout Chameleon Reserve, which collects runoff from upstream urban areas, conveying smaller flows underground through the reserve, but surcharging higher flows above the surface for detention storage.

Guidance on development within detention areas

Based on the understanding developed of the overall detention function of the reserve key constraints were developed to inform the development of the master plan:

- There must be no increase in net fill underneath the 100-year inundation extents otherwise detention storage will be compromised
- Permanent standing water (e.g. wetlands) must not be introduced into the current detention storage volume as the detention storage must be available at the start of a storm event
- The configuration of outflow culverts from detention storage areas must not be modified such that the outflow rates from the detention would be affected
- If the risk of blockage of outlet structures is increased (e.g. through provision of more vegetation) appropriate mitigation measures must be put in place

Introduction of creek and WSUD's

Based on the above constraints key opportunities were identified which do not conflict with the above constraints. In particular these included provision of low-flow WSUD features below the invert level of the current detention storage areas. It was identified that pipes running underneath detention storage could be removed and replaced with WSUD sensitive features such as naturalised channels, without altering the actual outlet structure from the basin. As these features would be at or above the invert of the existing culverts they could drain by gravity to the basin outlet. Furthermore, permanent pools of water, such as wetlands could be introduced below this level to provide both amenity and water quality treatment.

It was noted that the above opportunities were generally more applicable in the northern regions of the site. In the southern regions existing underground pipes either drain in the opposite direction to the ground surface, or contaminated soil is present, both of which would pose a significant challenge to the implementation of WSUD facilities.

On this basis a WSUD strategy is presented in the master plan where a section of the underground stormwater sewer is revealed to reintroduce a creek and additional attenuation. The creek will improve water quality and increase ground water recharge.

6.2 Stakeholder

Previous community consultation

Council undertook consultation with Erskine Park residents to understand how they would like Chameleon Reserve to be improved. The consultation activities included focus groups, drop-in sessions and over 200 resident survey responses.

The survey asked what type of improvements residents would like to see at a number of parks throughout the suburb. 127 comments were made in relation to different preferred improvements. Those with the most comments related to: seating (13 comments); exercise and/or playground equipment (12 comments); and barbeque facilities (11 comments).

Six key initiatives

Based on the outcomes of the survey and other consultation tools, the following six key initiatives were identified for Chameleon Reserve:

- Better pedestrian connections, cycle paths and through connections
- Active open space
- Playground and all ages exercise equipment
- Informal park / dog exercise area
- Riparian corridor restoration
- Wetlands

A community needs assessment was also prepared for Erskine Park in 2010 by the St Clair Youth and Neighbourhood Team, a local community centre. The needs assessment was informed by a community survey with over 200 responses from local residents. When asked what improvements Erskine Park residents would like to see, the second highest response to the open ended option was parks and playgrounds.

The Chameleon Reserve master plan has been designed considering these survey results with the aim of satisfying the Erskine Park resident's requests for quality parks and playgrounds.

Previous community consultation

GHD was engaged by Penrith City Council to undertake community consultation activities to gather feedback on the Chameleon Reserve Master Plan Draft. As part of their community consultation plan GHDWoodhead representatives in conjunction with Council representatives held a community information booth to present the Draft Master Plan to the wider community of Erskine Park to gauge interests and any potential concerns. This information has been incorporated into the Final Master Plan and Master Plan Report.

See Appendix for the Community Consultation Summary Memo.

6.3 Ecology / habitat

Appropriate habitat types

Depending on the final landscape features to be established at Chameleon Reserve, habitat types to be reinstated at the site may include wetlands, riparian and terrestrial woodland. In general, native habitat restoration will aim to rehabilitate local native vegetation assemblages in order to establish terrestrial and aquatic habitat for local biota. Ecological rehabilitation goals and design will also be tailored to engineering (e.g. WSUD), functional (e.g. biofiltration ponds) and edaphic (e.g. contaminated soils) constraints and requirements at the site.

Benefits of this approach to the project include:

- Use of plant species that are adapted to prevailing local site conditions.
- Increased local cover of habitat and food resources favourable to native fauna species, particularly mobile species such as birds and insects.
- Contribution to an expanded genetic spread for those plant species installed as part of project works.
- An enhanced 'sense of place' at the project site and immediate surrounds.
- Passive promotion of native vegetation management and restoration initiatives to the local and visiting community.

Revegetation works to be considered at the project site would be derived from native seed collection and propagation specific to the locality and proposed works. In addition to plant species diversity, revegetation works will aim to establish a diverse habitat mosaic.

Rehabilitated wetland habitats would principally comprise a mix of dense emergent and submergent native macrophyte species located along the outer edges of the wetland. Open wetland waters may also include areas of emergent macrophyte vegetation. Scattered trees and shrubs would be included around pond edges to create shade areas and perches for birds. Native macrophytes may also form a primary biofiltration role if settlement ponds are included in the design. Rehabilitated riparian habitats would transition from a dense cover of sedges and rushes at the toe of creek banks, to flowering shrubs and small trees along mid-banks and woodland areas along upper banks. Woodlands would be representative of the Cumberland Plain Woodland vegetation community forming an open grassy woodland structure.

Habitat restoration and maintenance

The degree to which native habitats are restored will depend largely upon the project goals/vision and available project budget, both upfront and ongoing. In particular, the degree of ongoing maintenance that rehabilitated native assemblages will require must be considered at the early stages of concept design in order to ensure that project goals and expectations are realistic and can be met.

Project goals and vision may need to be tempered by funding available for maintenance. It should be noted that higher level native rehabilitation projects should be maintained by suitably qualified bush regenerators, rather than Council maintenance crews. Regardless of the approach, all native vegetation rehabilitation works will require some degree of ongoing maintenance.

In general, native rehabilitation works that aim to establish representative assemblages of local vegetation will require higher upfront and ongoing maintenance funding. The maintenance requirement will be relatively reduced in the long-term where sufficient site preparation has occurred and where dense and diverse native vegetation assemblages have been successfully established. Conversely, lesser prepared sites, with lower densities of revegetation will require lesser upfront and ongoing costs, but are also more likely to suffer from higher ongoing weed growth. Given lowered expectations, and in an effort to reduce maintenance costs, such sites are frequently oversprayed with herbicide as a maintenance approach, resulting in rehabilitations with far lesser native habitat and amenity value.

Appendix

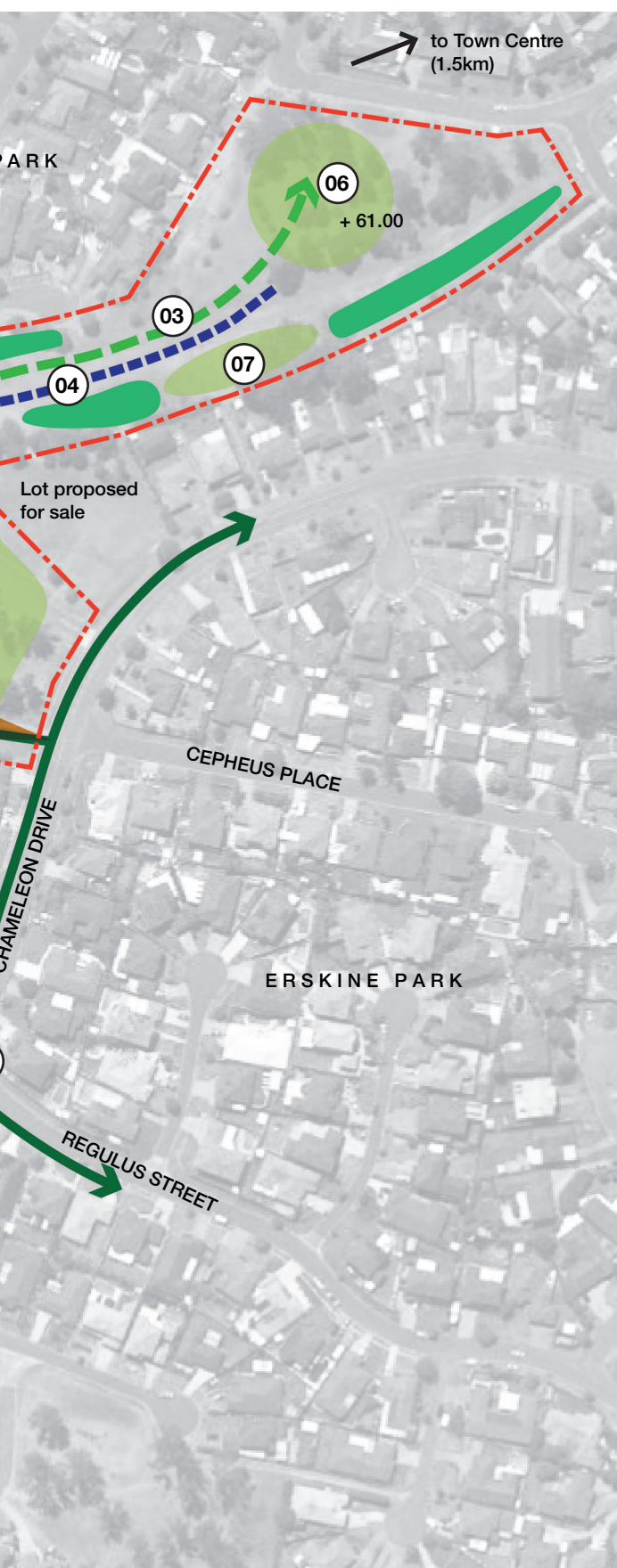




Appendix A: Opportunities & constraints

Landscape





The following opportunities and constraints have been identified via site visit, background study information and desktop research, with a view to enhancing landscape amenity and improving pedestrian access, safety and experience.

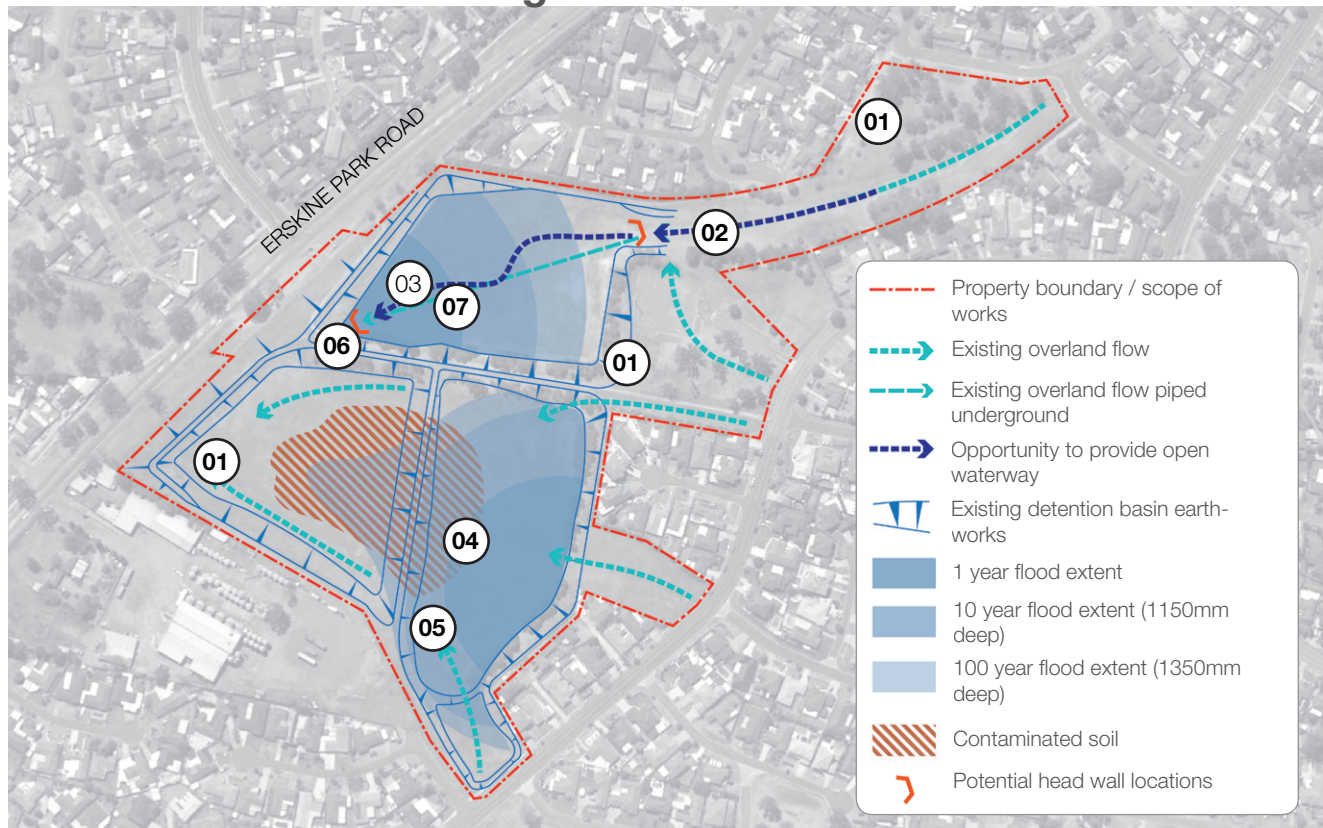
Opportunities

- 01** Opportunity for signalised intersection on Erskine Park Road
- 02** Pedestrian island crossing to Regulus Street
- 03** Greater pedestrian connections and opportunities for circuit walks
- 04** Opportunity to replace grass overland swale with dry creek bed
- 05** Opportunity for open wetland/water bodies to the base of existing basin
- 06** Opportunity for active/play areas
- 07** Opportunity for passive areas
- 08** Opportunity for dog facilities
- 09** Views of existing wheat silos provide character and point of interest

Constraints

- 10** Contaminated soil may pose issues with what can be built/provided on top
- 11** Detention basin grades may impact accessibility for formal footpaths
- 12** Flood areas dictate activity nodes and level of landscape amenity

Stormwater/ water management



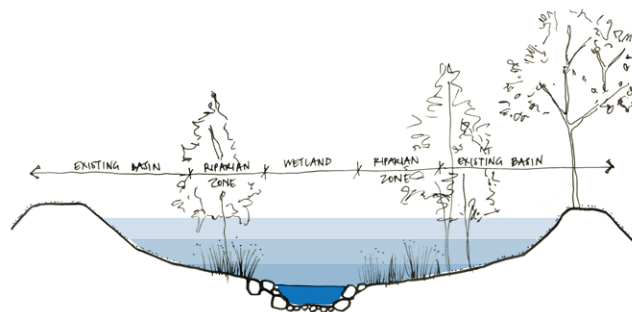
The following opportunities and constraints have been identified via site visit, background study information and desktop research, with a view to ensuring existing storm water detention function is not compromised.

Opportunities

- 01** Yearly flood events still allow sufficient areas for landscape amenity without inundation
- 02** Opportunity for the installation of dry creek bed to replace existing grass swale overland flow path
- 03** Opportunity for the installation of small weirs to create small permanent waterbodies/wetland below the existing water level (removal of underground pipes required with excavation beneath current basin levels)

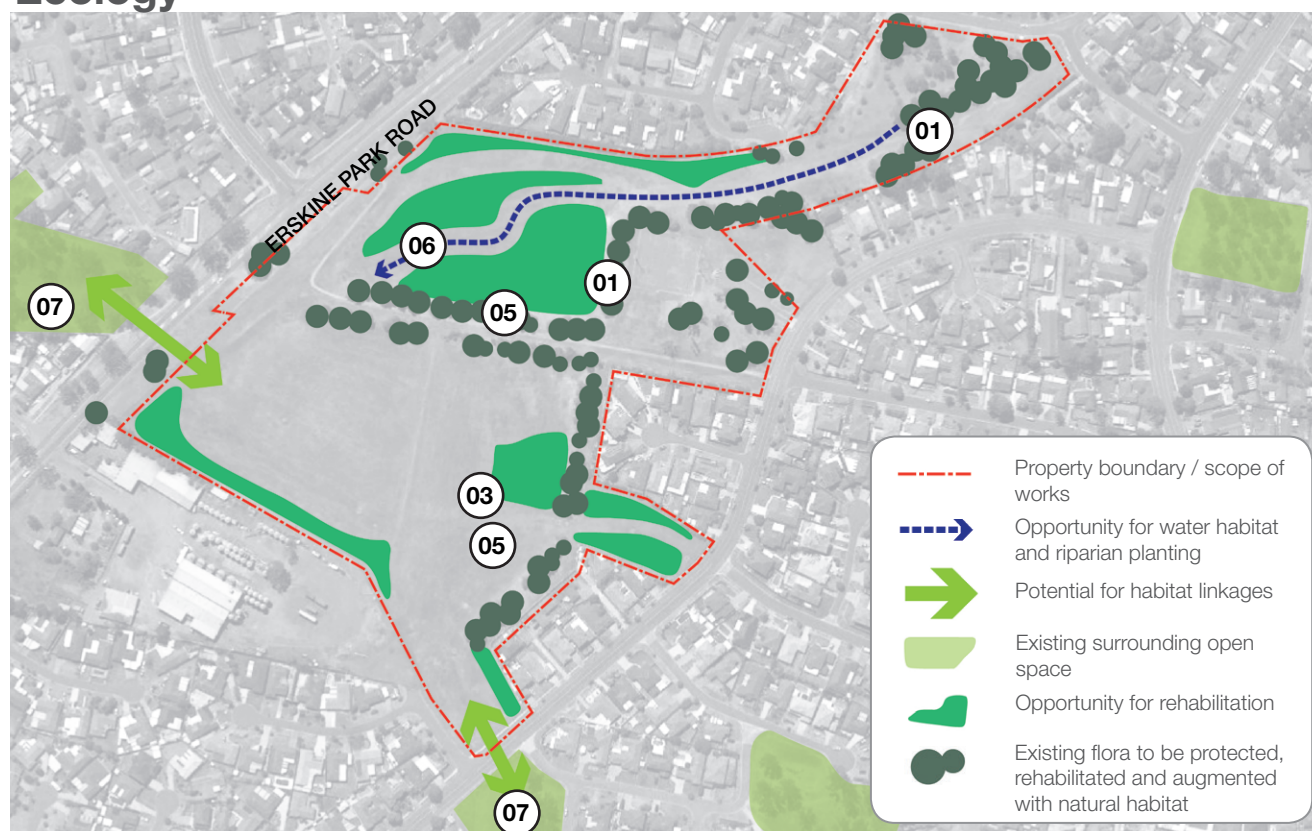
Constraints

- 04** 1 in 100 year flood events fill majority of the parkland and spill over from the Southern detention basin
- 05** Existing pipe in Southern detention basin runs against grade of surface - making retrofitting of WSUD difficult
- 06** Possibility to create open wetland in northern detention basin however it increases the chance of blockage with new head walls
- 07** Location of open wetland in flood zone may limit water quality treatment and facilities for active open space
- 08** Contaminated land may limit visibility and limits excavation



Indicative section illustration of opportunities for wetland / open waterbodies within existing detention basin

Ecology



The following opportunities and constraints have been identified via site visit, background study information and desktop research, with a view to protect, rehabilitate and enhance fauna and flora habitats.

Opportunities

- 01 Existing local native shrubs and trees to be retained, with areas to be extended/connected where possible
- 02 Restoration of endangered local vegetation communities could be incorporated into the landscape design. The basis of restoration design would be formed by:
 - Critically endangered Cumberland Plain Woodland ecological community within terrestrial areas;
 - Endangered Freshwater Wetland on Coastal Floodplains community within any constructed wetland areas;
 - Endangered River-flat Eucalypt Forest on Coastal Floodplains community within any constructed riparian areas and wetland fringes.
- 03 Restoration / habitat areas to be incorporated with open space where possible
- 04 Diversity of fauna habitats could be maximised throughout the site
- 05 Establishment of habitat mosaics could be incorporated within the site (variety of ground coverings and plant species)

- 06 Restoration works could provide habitat requirements for threatened fauna species known to occur within the local area, including:

- Green and Golden Bell Frog;
- Australian Painted Snipe;
- Black-chinned Honeyeater;
- Varied Sittella.

- 07 Potential for habitat linkages to Ropes and South Creek via coordination with projects establishing native vegetation within adjoining open space areas to the south and north-west.

Constraints

- 08 Introduction of invasive species and diseases during construction and/or maintenance and operational site phases
- 09 Increased costs of establishment with increasing levels of complexity and aspiration
- 10 Cost of ongoing weed control and habitat management
- 11 CPTED could be compromised without appropriate selection and location of plant species (ie. shrubs and grasses)

Appendix B: Supporting documents

Environmentally sensitive design

Purpose of form	To assist in the identification of environmental factors that may affect the overall design and provide guidance regarding further investigation into such matters.
Guidance	Designers should confirm the legal requirements associated with environmental factors during the design phase and confirm Environment in Design activities within scope of works. The information provided below, while a guide, may be used as a checklist by designers to evidence the process utilised to consider environmental factors during design.

Job Name:	Chameleon Park	Job No:	2125443
Design Component:	draft master plan	Date Completed	14/07/2017
Job Manager:	Lee Allen	Project Director:	Lynn Sorrell
Persons involved in identification process:	Chris Bray, Lee Allen, Jahni Glasby	Document(s) this information has been transferred to:	

Information required about what to do if “yes” is checked.		
Items checked	Yes /No	Comments
Does your project require selection of sites, routes or alignments?	Y	<i>Yes the internal circulation work. The project should use the existing internal circulation network and connection to minimise new construction requirements.</i>
Will your project potentially require disturbance to native vegetation or fauna habitat?	N	<i>Ecologist Daniel Whaite to confirm</i>
Will your project result in liquid effluent discharges (including site drainage and run-off, process wastes, cooling water, treated effluents, sewage)?	Y	<i>Storm water network passes through the site, the project will aim to restore the creek and improve water quality through sedimentation capture, reedbeds and bio remediation</i>
Will your project result in discharges to air (including process emissions, fugitive emissions, emissions from combustion of fossil fuels in stationary and mobile equipment, emissions from traffic, dust from materials handling, odours)?	N	

Will your project result in generation of other wastes (including construction or demolition wastes, surplus spoil, process wastes by-products, surplus or reject products, hazardous wastes, household or commercial wastes, site	Y	<i>Organic waste from landscape maintenance to be re processed – discuss with operations (Penrith City Council) for composting and soil opportunities</i>
Will the project give rise to noise, heat, light, vibration or ionising or electromagnetic radiation (including equipment, processes, construction works, traffic, lighting)?	Y	<i>Light pollution from amenity lighting – consider ‘dark sky’ compliance for fixture selection</i>
Does your project have potential to affect landscape character, cultural or heritage values, views or viewpoints?	N	<i>The site is within a heavily degraded, suburban context with low sensitivity</i>
Will your project involve excavation works near waterways, floodplains and previously undisturbed areas?	Y	<i>Yes, proposal included restoration of the creek.</i>
Will your project require the use of energy or generate greenhouse gas emissions	Y	<i>Consider LED’s and solar powered lighting.</i>
Will your project require use of water (including in processes, constructions works, or by the end user)?	N	<i>Possible drinking foundation – not possible at this stage to use reclaimed water other than potable supply</i>
Will you be designing drainage structures?	Y	<i>Yes, WSUD’s will be used, including creek restoration and large areas of permeable surfacing</i>
Will you be specifying construction materials?	Y	<i>Review supply chain for material for ESD of all materials. Materials supply, select low CO2 embodied materials and process i.e. concrete (consider reclaimed demolition waste for aggregate)</i>
Will you be designing industrial and manufacturing processes, products or infrastructure?	N	
Will you be designing buildings?	N	
Will your project involve landscaping, revegetation or plantings?	Y	<i>Ecologist is currently part of the team</i>
Will your project result in high community interest?	Y	<i>Yes – we have stakeholder as part of the team</i>
Does the project have potential to strengthen local community needs (reducing poverty or increasing access to training, resources, infrastructure, employment, or services)?	Y	<i>Access to recreational space support communities health/ wellbeing/ liveability requirements. Small food and beverage facility opportunities for eg coffee cart weekend/ temporary</i>

Existing policy / strategy document study

Document Title	Prepared by	Year	Subject/Description
Erskine Park Heat Assessment	Urban Forest Consulting	2015	Mitigation against Urban Heat
Established Residential Areas Infrastructure Facilities and Services Strategy	Penrith City Council	2004	People's Lifestyle, Aspirations (PLANS)
Penrith Open Space Action Plan 2007	Penrith City Council	2007	Specifies the works required for the City's open spaces, sports facilities. Developed in response to the Lifestyle, Aspirations and Needs
Erskine Park Open Space Strategic Master Plan Report	Clouston Associates	2015	Strategic framework for the development of Erskine Park, the Open Space Master Plan (OSSM)
Penrith Overland Flow Overview Study Map	Cardno	2006	N/A
Penrith Overland Flow Flood 'Overview Study'	Cardno	2006	Flood analysis for Central Urban, Rural (Zone 2), Southern Rural
Recreational and Cultural Strategy	Penrith City Council	2004	Study evaluating planning and cultural and other urban services

	Key Findings/Observations relevant to Chameleon Reserve Master Plan
at Island effect	• Extremely hot thermal imaging shown in/adjacent to Chameleon Park - up to 45degrees • Chameleon Reserve nominated as site with highest potential impact for heat mitigation • Increased tree planting for more canopy cover (recommendation for north west and south west boundaries) • Passive storm water harvesting such as swales and soil infiltration to increase water availability for vegetation
s and Needs Study	• Community safety is a high priority • Footpaths and cycleways identified as one of the most important infrastructure needs • Quality and character of landscaping directly related to likelihood of residents using open space • Adequate lighting is key to safety and usage of public spaces
to enhance the quality of tsgrounds and facilities. e PLANS (People's eds Study	• Top 5 priorities for city recreation improvement identified: reserves and waterways, playgrounds, parks, walking and cycle paths, aquatic centres and pools • Encourage water-based recreation activities within the Penrith LGA • The community is asking for promotion/information of available recreation and cultural facilities and activities • Design for social inclusion is a high priority • District park > 5ha, Neighbourhood Park 3 - 5ha, Local Park 0.5-3ha, Pocket Park 0.25 - 1ha
open space network of e Strategic Master Plan	• Potential for Chameleon Reserve to provide a major link to open space corridors beyond the suburb • Key activities identified: formal sports, informal sports, play and exercise equipment, passive open space and recreation, dog exercise and training area, and events. • GHD Woodhead acknowledges identification of formal sport facilities however review of flood studies suggests storm water constraints will dictate quality and size of amenities • A mix of active and passive recreation opportunities available for this site • Opportunity for car parking, increased footpath connections, riparian corridor and wetlands
	• Significant overland flow/flooding to site area as shown in blue
oan (Zone 1), Northern al (Zone 3)	• Modelling does cover the extent of the Chameleon Reserve site • It appears that the culverts at the site were not input into the regional model, and as such it would not predict flooding with sufficient accuracy
d strategy of recreational, ices and facilities.	• Significant desire from locals for access to higher quality and useable open space with more embellishment • 'Semi rural' character applies to Penrith LGA • Provision of high quality passive and informal active recreation opportunities • Equitable and affordable access to community facilities, especially for young people • Family friendly open space areas and amenities • Provision of visual relief from urban landscape dominated by residential character • Retain and revegetate corridor lands as natural bushland areas and habitat reserves

3 November 2017

To	Penrith City Council		
Copy to	Elizabeth Roxburgh		
From	Jahni Glasby	Tel	+61 2 9239 7605
Subject	Chameleon Reserve Community Consultation Summary	Project no.	21/25443

GHD was engaged by Penrith City Council to undertake community consultation activities to gather feedback on the Chameleon Reserve Master Plan Draft. As part of their community consultation plan GHDWoodhead representatives in conjunction with Council representatives held a community information booth to present the Draft Master Plan to the wider community of Erskine Park to gauge interests and any potential concerns.

The following memo provides a summary of the engagement during the community consultation activity.

1. Approach

This information booth was held at Chameleon Reserve on Saturday 7th October 2017 from 10am to 12pm. The consultation activity was held at the subject location with the intention of providing direct project exposure and capturing feedback from community members local to the park.

The community consultation information was publicised both informally on Council's website, and formally through posted flyers to the surrounding households of Erskine Park.

The Draft Master Plan and character images were presented to the wider community on A0 display boards mounted on easels under a shaded structure organised by Council (Figure 1). Community members were engaged by GHDWoodhead and Council representatives, initiating conversations about the Draft Master Plan and encouraging feedback.



Figure 1: Chameleon Reserve Community Consultation

2. Outcomes

2.1 Overview

GHDWoodhead and Council representatives engaged in conversation with a total of 13 people from five households. Additional people were exposed to the Draft Master Plan which has been displayed on Council's website, no additional feedback has been received. The people who attended included middle-age couples, elderly and a young family with five children.

Those who attended the community consultation overall reacted positively to the Draft Master Plan and expressed their excitement for Chameleon Reserve to be upgraded. There were a few minor concerns raised, some of which have been incorporated into the Final Master Plan and Master Plan Report, and some have been flagged to be investigated and address in the next stages of detailed design.

2.2 Queries and concerns

The following table outlines the 13 key concerns raised, GHDWoodhead's options to address them and Council's responses.

Item No.	Public concern details	GHDWoodhead's recommended options	Penrith City Council's response
1	Reported anti-social behaviour (drinking, smashed glass, loitering at night)	1. Increase casual surveillance by providing direct sight lines into areas of reported concern. 2. Install solar sensor lights at BBQ and shelter areas to encourage legitimate use and increase surveillance 3. Provide rubbish bins: There are currently no bins on site, providing a place rubbish and bottles is at least providing an alternative to littering and leaving smashed glass	1. Can be considered in detail design 2. Not necessarily desirable particularly adjacent to residences Any additional lighting is more likely to encourage night use & potentially anti-social activity. Please do not include. 3. Please note on masterplan that bins will be provided. Can be detailed at next stage of design
2	Concerns proposed BBQ and shade structure at the northern point of site will attract further anti-social behaviour	1. Increase surveillance provide solar-powered sensor security camera to recording activities when activated and deterring anti-social behaviour http://www.hiddencamera.com.au/3g-hd-solar-security-camera 2. Remove/relocate proposed BBQs	1. Not a practical solution for Council, there are not the resources to manage this type of infrastructure in a remote location. 2. Please remove BBQ & shelter from northern end of site. Relocate shelter to another location closer to the amenities block. Delete the BBQ.
3	Concerns proposed BBQ at the northern point of site will increase visitors parking along Strickland Pl	1. Provide off-street parking along Strickland Place 2. Safeguard locations for parking if additional capacity is required in the future 3. Remove/relocate BBQ: Investigate possible location	As above (2)

4	Concerns there is not enough parking on-site to provide for increased patronage	1. Investigate extension of existing car park: This may require the removal of existing trees and reduce space for play/rest facilities in this area 2. Identify parking locations along Erskine Park Road:	1. Include in Masterplan additional car parking spaces (at existing car park location) 2. Parking along Erskine Park Rd not desirable
5	Reported injuries due to divots and uneven ground across the site	1. Top dress existing ground surface not effected by earthworks/planting	1. Will be included in detailed design brief to be included in works
6	Reported bindies/prickles across the site	2. Specific that regular weed removal/spraying as part of maintenance plan	No response
7	Concerns the current amenities block is not sufficient to service the whole site and increased patronage	1. Additional amenities blocks will need to be investigated/ approved by council	1. Please amend Master Plan to note 'amenities block to be upgraded'. (for detail design phase)
8	Questions if there is adequate lighting throughout the site or if additional lighting will attract further anti-social behaviour	1. <i>CPTED principles indicate lighting promotes legitimate activity by users of public spaces after dark, increases surveillance and deters anti-social behaviour</i> http://apps.actpla.act.gov.au/tplan/planning_register/register_docs/resmanual.pdf 2. The primary path through the site will be lit, in addition the shared ped/cycle circuit could have solar-powered sensor lights which preserve energy while improving safety and visibility for visitors to the park outside of daylight hours	1 and 2. Lighting to remain in the central spine only (which is desirable for safety purposes). Perhaps note that solar lighting in central spine will be investigated. (the existence of a treed pathway may mean that solar lighting may not be feasible)
9	Reports of teenagers riding dirt bikes through the site	1. Provide/identify alternative activities for teenagers (see item 10) 2. Investigate access control options: anti-motorbike barriers https://www.cyklodoprava.cz/file/infrastruktura-zklidnovani-dopravy-zklidnujici-opatreni-ncc-cycling-design-guide-2006/ 3. Investigate a legitimate/formalised space for dirt bike riders: This is outside of the scope of this project and would need to be undertaken by council in consultation with the community	2. Entry to the park to be considered in detail design, including barriers for trail bikes
10	Concerns that other parks in the area do not provide for the teenage demographic	1. Provide for teenage demographic: Investigate preferences for multi-court, play/parkour equipment, or skate bowl/equipment http://convic.com/	1. Teen play area already noted in masterplan and would be investigated & included in detail design
11	Reported suspected dead trees on site	1. In the next stages of schematic and detailed design an arborist report will be required to determine the viability and public risk of existing trees	1. agree

12	Concerns that new light intersection upgrade will create safety issues for pedestrians as trucks are known to run red lights at intersections further up the road	1. Investigate a pedestrian/cycle overbridge	1. New RMS design includes a signalised pedestrian crossing of the road.
13	Remove Cricket pitch		Please remove the cricket pitch from the Masterplan. (Apologies, however we have had internal feedback recommending not formally noting it on the Masterplan)

Regards



Jahni Glasby

Graduate Urban Planner

GHD Woodhead Pty Ltd

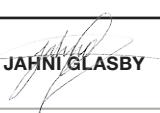
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Document Status

REV NO.	AUTHOR	REVIEWER		AUTHORISATION		
		NAME	SIGNATURE	NAME	SIGNATURE	DATE
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