Illawarra Escarpment Mountain Bike Concept Plan

Report commissioned by National Parks and Wildlife Service NSW
Final Report - November 20th 2020

Report Prepared by Synergy Trails

Australia's sustainable trail builders

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Acknowledgements

We acknowledge the traditional owners and custodians of the land throughout the Illawarra. We recognise all the Aboriginal nations who have a continuing connection to this country, sea, land, and community. We pay respect to Elders, past, present, and emerging.

We acknowledge that the Illawarra Escarpment is traditional country of the Wadi Wadi People of the Dharawal language group.

Synergy would like to thank the NPWS, Wollongong City council, the Illawarra Escarpment MTB Advisory Group and others who contributed to the development of this MTB Concept Plan.

Contents

Executive summary

This report has been commissioned by NPWS (proponent) to provide a feasible concept for the provision of a mountain bike trail network that is to be built in the area between O'briens Drift and Kembla Village. The report is to take into account the competing interests and provide a practical solution for mountain biking within the Illawarra Escarpment. The report is to provide a practical trail network that has been flagged and provides detailed data on which NPWS is able to build an accurate document for the tendering for construction of trails. The report provides a realistic trail network that takes into account the physical, environmental and cultural constraints as provided by NPWS and stake holder groups. The trail network is aimed at providing a like for like replacement of unsanctioned trails on Mount Keira and to focus mountain bike activity away from this specific location.

NPWS Project Rationale

- MTB is a growing sport & recreational pursuit
- Popularity and lack of formal trails in the Illawarra has led to a proliferation of illegal trails
- Illegal trails are causing environmental harm and safety hazards
- NSW govt acknowledges the need for formal trails and for safety and the environmental to be better managed
- NPWS engaged Synergy Trails to develop a concept for formal trails on the escarpment in consultation with council and stakeholders

Objectives / Matters Considered

Primary Objective:

To produce a concept plan for a formal network of mountain bike trails (MTB), for all abilities, between O'Brien's Drift and Mount Kembla

Synergy Trails has considered the below matters for the trail network Concept:

- Trail network to occur in specific land tenures
- Trail network to avoid where possible environmentally constrained land
- Trail network to focus mountain bikers away from Mount Keira and Mount Kembla
- Trail network to provide like for like replacement of existing unsanctioned trail on Mount Keira
- Trail network to meet mountain bike community needs and expectations
- Trail network aims to reduce the incidence of unsanctioned trail building by providing a range of trail types
- Trail network to be considerate of intersections with urban areas and other trail users
- Trail network to have adequate supporting infrastructure
- Trail network to consider rider safety
- Trail network to provide trail infrastructure that is fit for purpose for beginner to advanced riders
- Trail network to allow for expansion within defined boundaries

These matters were considered to a degree that is appropriate for planning a MTB network to a concept level. Detailed planning and assessment is necessary to implement the MTB network. The final network may change as an outcome of detailed planning and assessment.

NPWS Scope of Works, Key Considerations:

- Key considerations were safety, ride experiences, integration (within the network and with supporting infrastructure and services), environmental and community impacts, construction methods, materials and cost, and maintenance.
- Existing trails and trails proposed in the Draft Illawarra Escarpment MTB Strategy (NPWS and Wollongong City Council 2018) were considered first.
- Network integration: Avoiding development in areas identified as "highly constrained" (Environmental Constraints Map, NPWS & Council 2015).
- Adherence to IMBA and relevant NPWS standards.
- High quality experiences for riders of all ages, styles and abilities.
- Compliance with relevant planning and assessment standards, policies and other requirements.
- Avoiding adverse impacts on sensitive environmental and cultural heritage values, other park users and the community.
- A minimum trail volume of 35 kilometres with potential to expand.
- Identify and integrate with supporting infrastructure and services (uplift, parking, access hubs/nodes, amenities, food and other services)

Mountain bike trends and needs (future facing)

Mountain biking is both a sport and a form of recreation, there is and has been significant growth in the take up of mountain biking amongst the general population. With a growing mountain bike community has come increased pressure on trail, both sanctioned and unsanctioned. The growth has led to increased demand for all trail types from green beginner to black advanced trails. The progress of technological innovation has reduced the fitness barrier of mountain biking and has subsequently increased the volume of riders who are able to access more remote trails.

The Illawarra Escarpment Mountain Bike Concept is to consider new and existing riders, the direction that mountain biking will take due to technology and the desire for mountain bikers to have a trail network that provides:

- Quality associated infrastructure
- Ease and equality of accessibility to the trail network
- Diversity of trail type, length and the ability for progression of skills
- An immersive nature based experience

Equally the mountain bike community will have to better integrate itself with government organisations and seek to aid in the management of unsanctioned trail building and the maintenance of the provided infrastructure. Mountain bikers should be included in the process of bush regeneration and the construction of trails to help generate ownership, responsibility and connection with both the land and the trails themselves. Critical for the ongoing maintenance of mountain bike trails is a vibrant and engaged mountain bike community who are willing and comfortable working with government organisations through formal channels and who in return receive support and recognition from government bodies.

Vision

The Illawarra Escarpment mountain bike concept aims to provide a trail network that is fit for purpose to the mountain bike community whilst respecting natural heritage, cultural heritage, other trail users, suburban intersections and recognises that the trail network occurs on sensitive environmental lands.

The trail network by design caters to the local community needs of mountain bikers. The trails have been designed to be accessible with multiple access points and the ability to construct multiple loops of increasing length and difficulty, allowing local riders the ability to progress their skills and ride trails in the manner that they wish.

The scope of works provided to Synergy Trails emphasises the need for creating a trail network whose primary focus is servicing the local mountain bike community whilst minimising the impact of mountain bikers on other users of national parks.

One of the primary drivers for the network is to act as a like for like replacement of the current unsanctioned trail network on Mount Keira. To effectively achieve a mountain bike network that draws riders to it, is the quality, quantity, diversity and progression offered by the trail network. Quality trails and accessibility of those trails are the key to any successful mountain bike location, above and beyond any supporting infrastructure.

Included within the network is the provision of trail types that covers the majority of needs from the mountain bike community.

Beyond the trails themselves, success of the network relies upon the provision of infrastructure to create a focal point for the mountain bike community. Synergy Trails with input from NPWS, Wollongong City Council and Private Land Holder South 32 have outlined trail head locations to fill this role. Trail heads are critical to a functioning network and provide the necessary infrastructure to support the trail network.

Land Tenures

The mountain bike trail network crosses multiple land tenures via the mapped trail corridors. NPWS provided the land tenures that are potentially suitable for mountain bike trails as part of the scope of works. Please map on page 13 for tenures.

Land Tenure

Private Lands -

- South 32

Public Lands -

- Sydney Water
- Water NSW
- Powerline easements on NPWS land
- Crown Roads
- National Parks and Wild life
- Wollongong City Council

Methodology

Synergy Trails methodology for the trail network has been primarily focused on fieldwork, consultation with local stakeholders, utilisation of environmental constraints mapping and tenure mapping as provided by National Parks & Wildlife Service and Wollongong City Council.

Due to the difficult nature of the landscape and to provide accurate costings and viable trail corridors, Synergy Trails spent approximately 330 hours in the field some of this in conjunction with National Parks & Wildlife, Illawarra Aboriginal Land Council and representatives from Wollongong City council. Over 90% of the trails have been flagged for the Review of Environmental Factors (REF). Those unflagged trails have been provided for by outlining a specific area for assessment.

It was quickly realised that steep cliffs, ridge lines, gullies and springs created an environment that could not be anticipated by providing desktop alignments. Viable trail corridors could be as narrow as 6m in width and easily missed.

Critical to providing a concept was input from all local stakeholders including Illawarra Local Aboriginal Land Council, Wollongong City Council, Private business and Stake holder groups. All these groups have had input toward the provided mountain bike trail network.

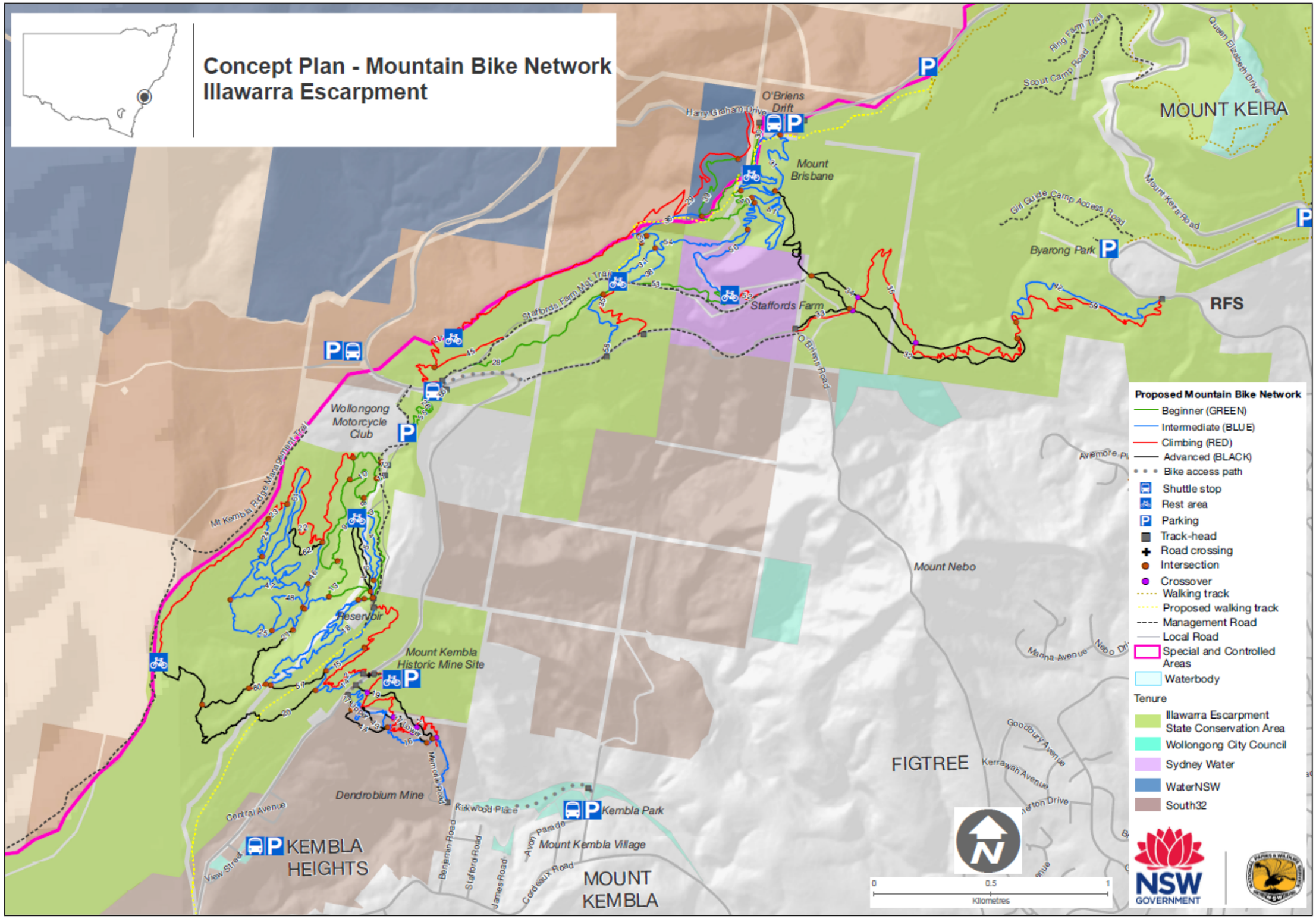
There was a conscious decision made to where possible utilise existing trail corridors, realign existing trail corridors and to also discuss remediation of certain areas to ensure that the network was sensitive to natural heritage and would minimise any further disturbance of environmental land.

The environmental, physical, cultural, tenure, safety and trail user constraints have had a significant impact on the proposed trail network design. This trail network design is by necessity reactive to these constraints.

Stake Holder Groups:

- Illawarra Local Aboriginal Land Council (Aboriginal community stakeholder, traditional custodians)
- National Parks Association (Illawarra) (conservation & recreational stakeholder group)
- Illawarra Escarpment Alliance (conservation & recreation stakeholder group)
- Illawarra Mountain Bike Alliance (recreation stakeholder group)
- Destination Wollongong (tourism promoter)
- Destination Sydney Surrounds South (tourism promoter)
- National Parks & Wildlife Service (project partner, land holder & approving authority)
- Wollongong City Council (project partner, land holder & approving authority)
- Water NSW (catchment)
- Sydney Water Corporation (land holder)
- South 32 (land holder)
- Office of Sport (government stakeholder)
- Trail Care (recreation stakeholder group)

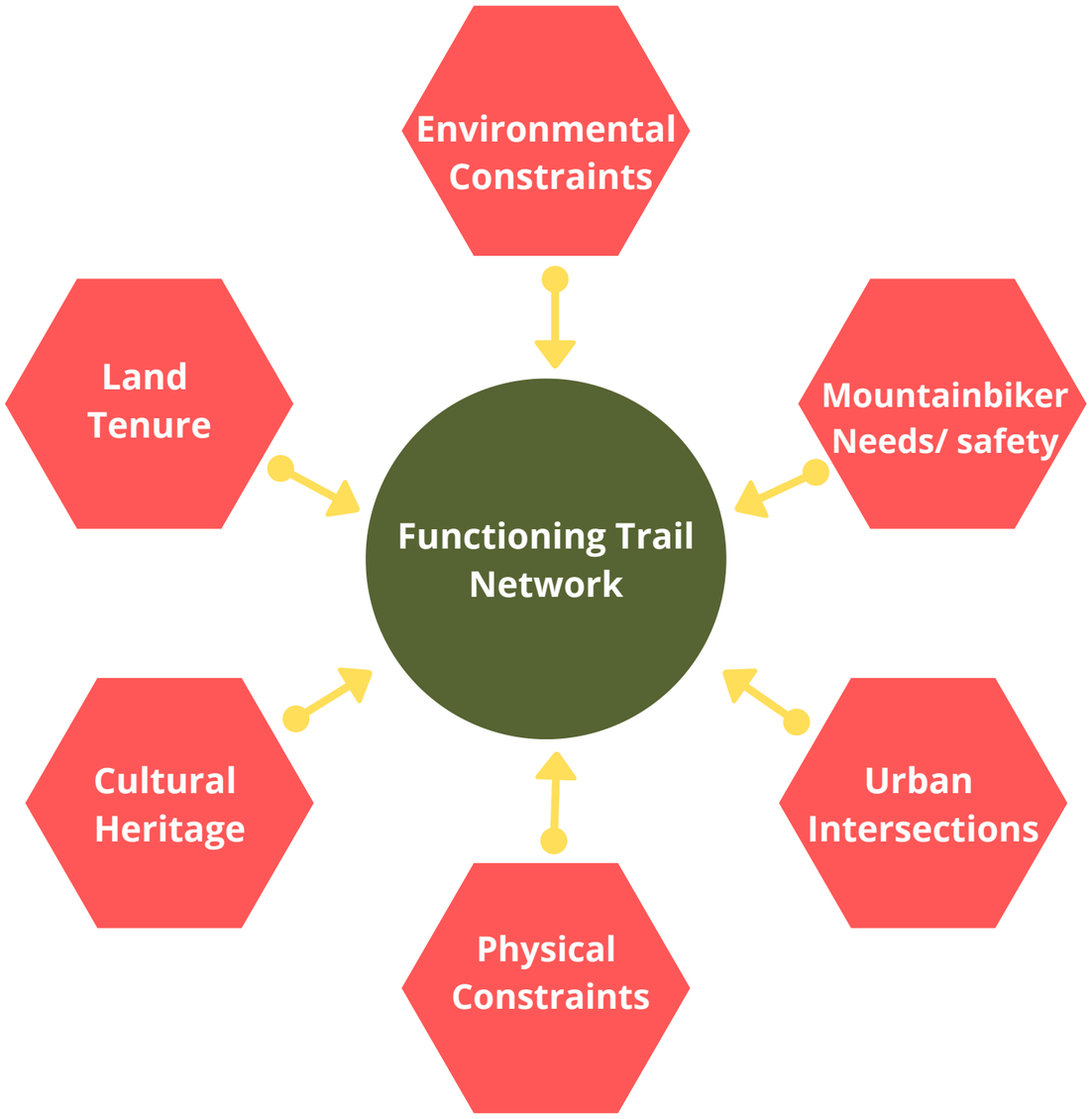
The concept reflects feedback from these parties. Synergy Trails understands that further engagement with stakeholders will be carried out by NPWS and council during detailed project planning and assessment.



Draft Trail Map

Please note: for the purposes of this report the climb trails are indicated in red. The trail summary provides the IMBA rating of climb trails (Appendix 1)

Opportunities & Challenges



Competing Interests

The trail network outcome is an exercise in compromise

The challenge of providing a like for like mountain bike trail network is the combination of competing interests and constraints.

Whilst these constraints need to be respected there also needs to be room for compromise on all fronts to create a viable outcome.

Opportunities & Challenges - cont

Consideration

Functioning Trail Network

Environmental Constraints

- Utilisation of existing trail corridors - (moto trails and unsanctioned MTB Trails)
- Environmental constraints heat mapping
- Integration of bush regeneration as part of the trail network development
- Remediation of damages caused by old motocross trails as part of construction costings
- Flexible trail corridors to work with REF
- Field work with NPWS officers

Cultural Heritage

- No trails in network on Mount Keira or Mount Kembla
- Direct riders in towards Kembla Heights/ Obriens Drift trail network
- Mt Keira access into proposed trail network
- Focus location of MTB services to Obriens' Drift, Kembla Heights/ Village
- Consultation with Illawara Aboriginal Land Council

Physical Constraints

- Field work mapping viable trail corridors (330 hours)
- Fieldwork with NPWS officers
- Desktop assessment of physical constraints and landscape
- Use of hardened trail for sustainability where required
- Assessment of direction of travel (mountain bikers)

Opportunities & Challenges - cont

Consideration

Functioning Trail Network

Land Tenure

- Ensure where possible that trails stay within provided boundaries
- NPWS discusses potential with land managers
- Consultation with private land holders

Mountainbiker Needs/ safety

- Focus on removing mountain bikers from the road
- Recommendation for consultation and preplanning with emergency services
- Consultation with Wollongong City council for road safety
- Inclusion of rider calming areas and obstacles
- Assessment of network as a whole
- Provision of mountain bike infrastructure
- Focus on mountain bike trail standards
- Accessibility of trail network
- Mountain bike trail network to meet community needs/ expectations

Urban Intersections

- Separation of riders from pedestrians where possible
- Consultation with Wollongong City Council
- Shutting or rerouting of trails that cross pedestrian path ways
- Recommendation of dispersed parking and faciities

Opportunities Challenges - cont

Planning a safe, sustainable, functional, diverse, meaningful, multi-tenure mountain bike network in an area as environmentally constrained as the Illawarra escarpment has unique challenges. A unified trail network must remain considerate of all constraints whilst meeting the needs of the mountain bike community.

A priority of the trail network design has been to avoid highly constrained environmental lands where possible. Referencing the provided environmental constraints map and fieldwork with National Parks Officers aided the placement of trail corridors. The majority of trail corridors within the network do not cross Endangered Ecological Communities. To further reduce any impact, new trail corridors are considered flexible and it is proposed that trail alignments could be realigned within the trail corridors that have been subjected to detailed environmental assessment. The flexibility is designed to allow trails to comply with the outcome of relevant environmental impact assessments. It should be noted that the trail network as outlined has a significant reduction of mountain bike trails crossing environmentally constrained land in comparison to unsanctioned trails on Mount Keira.

The proposed trail network has been designed to where possible utilise existing trail corridors to minimise environmental impact. Existing trails will require improvements to provide a high quality riding experience and can be upgraded as a component of formalisation. Existing trail corridors that are highly degraded, notably some originally used as illegal motocross tracks will be reconstructed to form part of the MTB network. The trail network requires drainage and bush regeneration works to repair unsustainable trails and to enhance riding experiences. Those bush regeneration works haven't been costed within the report as it falls outside of the report scope and expertise of Synergy Trails.

Additionally trails that cross water courses or could potentially encroach on rainforest areas have been flagged for elevated trail, reducing any direct impact within the trail corridor. All trails should be constructed based on sustainable trail principals as outlined by the NSW government and IMBA trail building guidelines. There are several areas within the proposed network that would benefit from bush regeneration to aid biodiversity and to reinstate natural areas that are currently encroached upon by invasive species.

To satisfy the proponents primary objective and provided matters to be considered; Synergy Trails places a high reliance on the Concept Plan being substantially implemented, however there is some scope to amend or refine in response to detailed planning and assessment.

Trail Network Concept

The primary focus of the concept planning involved how to deliver an interconnected network of trails that functions as a whole, as opposed to individual trails. A connected trail network allows mountain bikers to explore and link the trails in different ways that suits the individual riders preference and skill level.

Key to planning was an acknowledgment that beginner and intermediate level riders were poorly catered for and that the existing infrastructure did not link together with mountain bike trail, instead relying on roads for riders to return to the top of the network. The existing trails are not compliant with IMBA grading and need additional work to bring them to the correct standard.

A critical aspect of the network is the insertion of climbing trails. Riders will be able to ride climbing trail from Kembla Village to Obrien's drift on a combination of cycle path and singletrack. This combination of climbs and links only requires two separate road crossings, minimising exposure of riders to vehicle traffic and providing a more natural bush based experience. For riders who prefer to take a shuttle service to the top of the network three proposed shuttle points have been inserted into the network , the locations can be seen in the trail head infrastructure information and concept map.

The trail network has to provide for all levels and disciplines of riders, providing a multitude of trail types to ensure that there is trail suitable for each discipline. The trail types included in the trail network are:

- **Cross Country trails**
- **Flow Trail**
- **Jump lines**
- **Technical natural downhill**
- **Climbing singletrack**
- **Management roads**

Trail Network Concept Cont.

The trail network comprises all levels of International Mountain Bike Association (IMBA) trail gradings ensuring there is a trail for every mountain biker. IMBA trail grades included in network:

- **Green Circle**
- **Blue Square**
- **Black Diamond**
- **Double Black Diamond**

To meet IMBA standards the existing trails that have been incorporated into the proposed network will require modification to meet the IMBA standards. These modifications are noted in the Trail Database. Generally the trails will need modifications such as:

- Widening of trail corridor
- Adjustment of gradient
- Adjustment of technical features
- Trail corridor height clearance to minimum 2400mm
- Rectification works to existing motocross trails

Emergency Response

An emergency response plan needs to be developed with emergency response agencies. A number of suitable medevac extraction points where recognised during field inspection, however emergency response planning is a highly specialised task and was not a part of the Project Brief and also falls outside the expertise of Synergy Trails.

Trail Network Structure

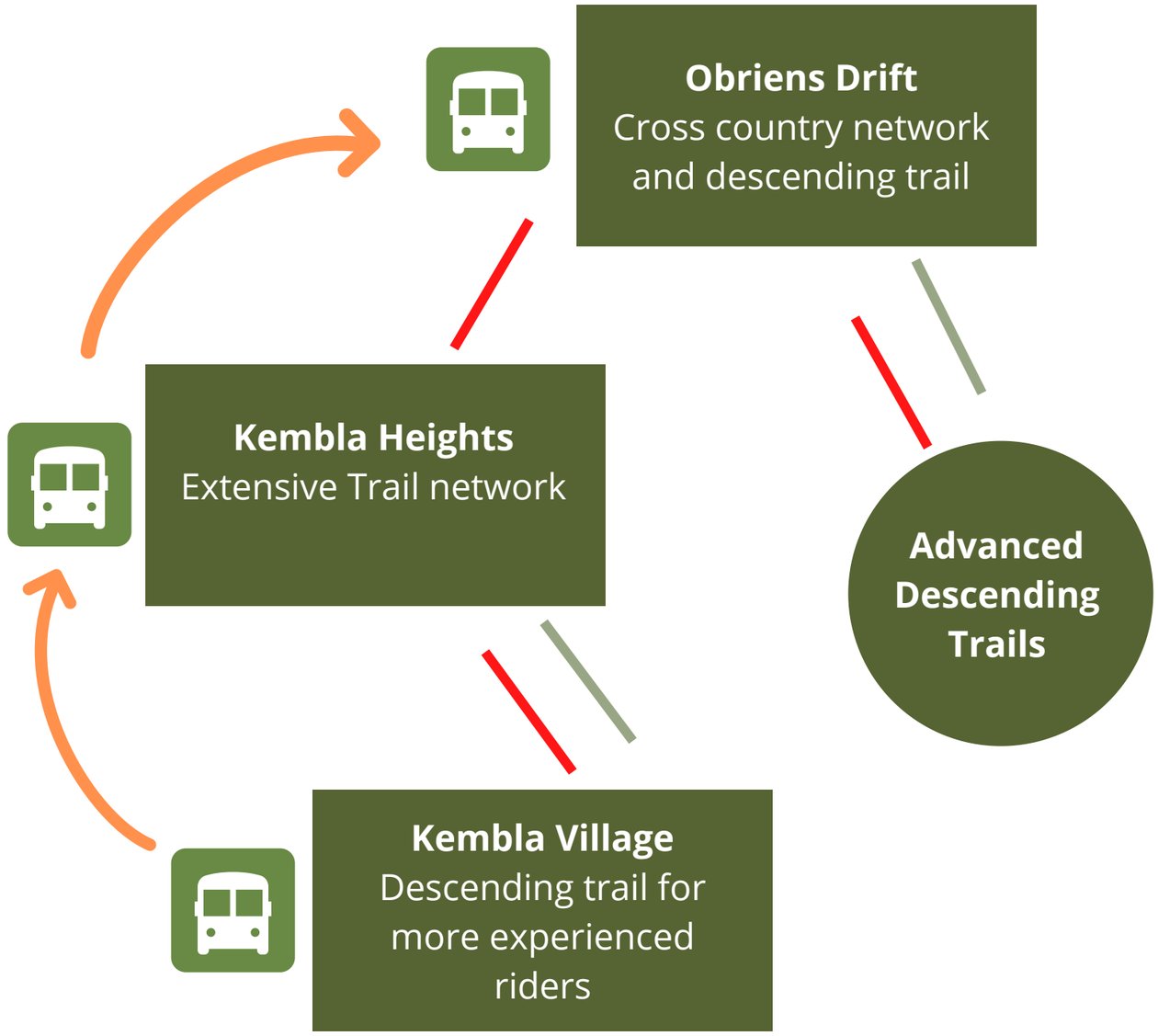
Trails over three distinct interconnected levels

The trail structure can be viewed as three separate levels:

Top Level:
O'briens Drift trail head with a short flowy cross-country network and descending trail to the mid level. It is also the start location for the advanced full length descents. The entire trail network can be accessed from the Mt Keira foothills in close proximity to the Mt Keira RFS station. The entire network is therefore linked internally by climbing trail and management trails minimising the need for mountain bikers to access trails via the road.

Mid Level:
This level occurs behind the Motocross track in the National Park land above Kembla Heights and comprises the bulk of the trail network with a range of trail available for different riding genres and skill levels. This area has the greatest variety of trail types and is specifically designed to provide diversity of trail types and difficulty levels.

Lower Level:
Descending trail network into Kembla Village for more experienced riders, including a return climb to Harry Graham Drive.



The three levels can be either ridden as a whole or utilised individually, it is possible to start at O'briens Drift and link trails to Kembla Village and then return to the top via climbing trails or take a shuttle bus. The network is designed to enable a multitude of riding options and the possibility of creating unique loops that suit an individual riders ability and or preference. The dispersed parking enables riders to easily access the riding start point of their choice and the climbing trails enable riders to cycle into the network from surrounding suburbs. Multiple network entry points provide ease of accessibility for riders.

Trail Network Data

Total Network Length: 61 Trails comprising 44 kilometres *(Does not include fire trail, access road or bike path).*

Trail Grade	Number of trails	Length (km)
Green Circle	14	5.7
Blue Square	22	16.8
Black Diamond	13	5.0
Double Black Diamond	2	3.0
Climbing Trails	12	13.5
TOTAL	**61**	**44.0**

Complete Trail list see Appendix 1. Full Trail breakdowns and detailed notes please see Appendix 4.

Note: Initial impressions indicate that there exists space for approximately an additional 8-10km of trail for future expansion within the area designated by the scope of works (will require additional fieldwork to locate viable trail corridors).

Approximate composition New and Existing Trails

- Trails comprised of existing trail corridors: *43% of network total (18.6 km)*
- Trails comprised of new trail Corridors: *57% of total network (25.3 km)*
- Trails requiring repair and rectification: *62% of existing trail corridors (11.6 km)*

Approximate Trail Network Footprint *(does not include rest areas, trail heads, parking or management trails etc).*
Footprint based on one metre wide construction corridor: 4.4 hectares.
Footprint based on IMBA minimum trail widths: 2.7 hectares.

Above calculation is based on the construction width of the trail corridor, this has the potential to be reduced back to IMBA minimum trail widths through bush regeneration. The existing motocross trails have a foot print greater than 1m and these trails have the potential for significant width reduction through bush regeneration.

(It is anticipated that construction of these trails will not effect the green canopy, scoping of trails included the desire to ensure no mature trees required removal).

Ancillary Infrastructure

A key component of the trail network function is the provision of parking, amenities and predetermined shuttle pick up locations. These items have been identified in the concept trail head design and are briefly outlined below. Much of the Ancillary infrastructure will occur on tenures outside of National Parks, this information is included in the detailed trail head concepts.

Parking:
The parking model is for dispersed parking removing the need for large scale infrastructure and avoiding the drawback of a singular location. Parking is recommended to be available in alignment with the three trail levels O'briens Drift, adjacent the Wollongong Motocross facility and alongside the northern edge of Avon Parade as outlined in the Trail head descriptions. The parking location adjacent Wollongong Motocross Club is physically constrained and does not have adequate capacity, an additional overflow site should be located to cater for this area. Any additional parking should be linked by dedicated cycle path to the entry point of the trail network.

Amenities:
Amenities blocks should preferably be available at the three trail head locations (Obriens Drift, Kembla Heights and Kembla Village)as outlined in the trail head design information. Currently the existing amenities block at Kembla Village Oval would be suitable for use. A new amenities block in close proximity to the jumplines situated to the south of the motocross track would be advantageous due to the anticipated usage this area will receive. Amenities facilities are critical to minimise any likelihood of human waste entering the nearby catchment areas and should be located at all three trail head locations.

Shuttle turn around area:
Mountain bike shuttle pick up/ drop off points are located at each of the trail head locations. These points need to be assessed for suitability and safety. The shuttle points should also be separated from parking areas to ensure safety. The points need adequate space for a bus and trailer combination to safely turn around, enter and exit traffic.

Cycle Path:
This report recommends the inclusion of dedicated cycle path at three locations:

1. Kembla Village alongside the memorial pathway
2. Joining O'briens and Staffords Firetrail
3. Alongside Harry Graham Drive on the low side of the road linking the top of the descending trails

The construction method and material of the cycle path is at the recommendation of Wollongong City Council, however this should be at minimum hardened trail 1800mm wide

Signage

International Mountain Bike Association

Signage is a critical component of a functioning mountain bike trail network. Synergy Trails recommends use of the IMBA standardised signage as a general rule. We also advise the use of trail names on any signpost.

NPWS Signs Manual

All associated signage must comply with the NPWS signage manual.

Regional Consistency

To create consistency in signage through out the Illawarra it is recommended the signage convention used in the Cringilla Hills Trail network be investigated and replicated where appropriate. This will promote consistency in signage and way finding throughout the region, meaning riders do not have to adapt navigation to different networks.

Emergency Response

Consultation with local emergency services to create a recognised system of location points to aid recovery of injured riders should be conducted. These identifiers should be part of the trail signage information.

Sustainability

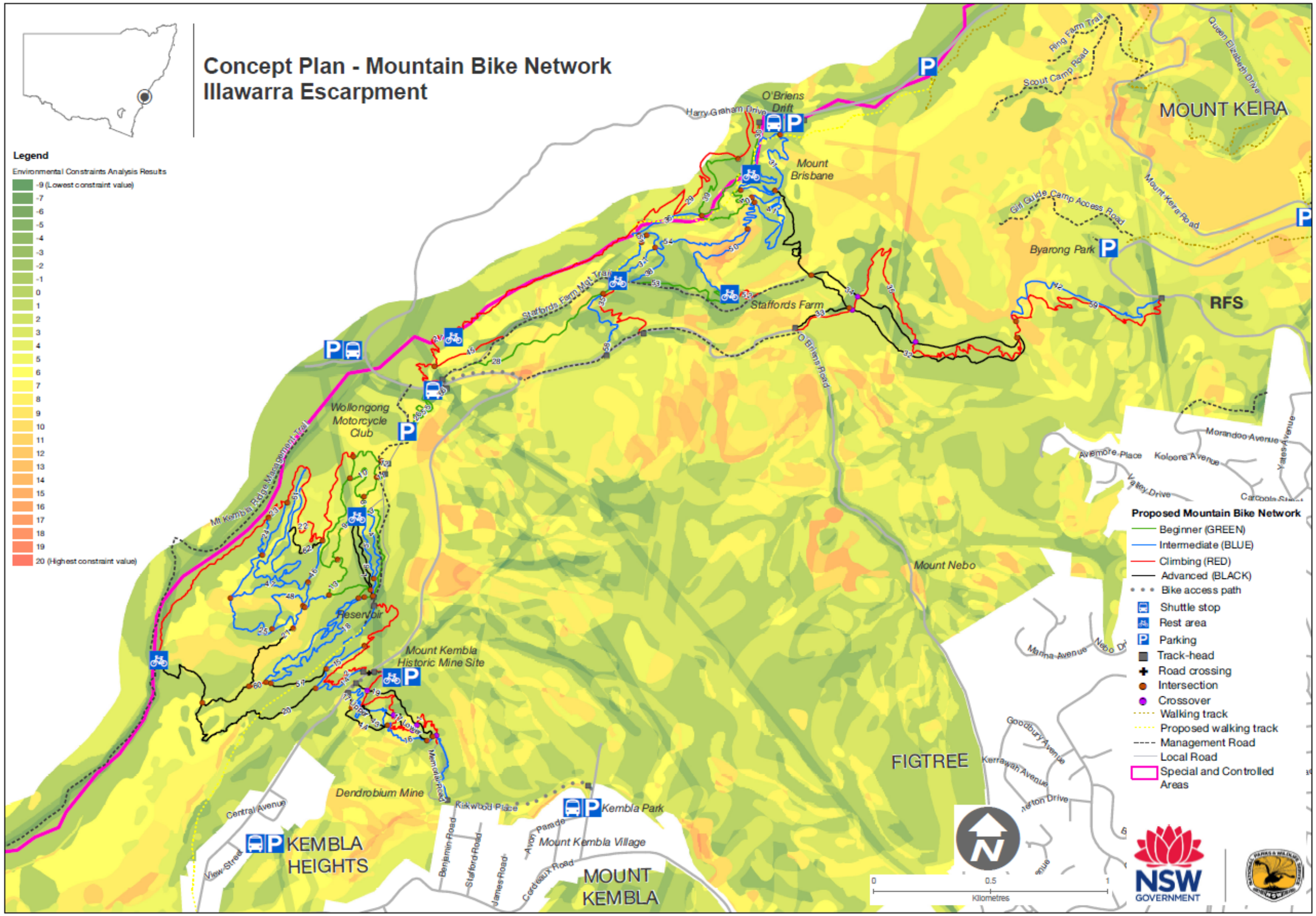
The proposed trail network has been designed to where possible utilise existing trail corridors to minimise environmental impact. There are a high quantity of existing trail corridors that are highly degraded.These have been noted for use in the trail network particularly those occurring in the Kembla Heights network that are originally motocross tracks. As part of the process of trail construction, these areas will require modification to ensure drainage and natural water courses are returned to original alignment. Some remediation works will be required by bush regeneration specialists. This has not been costed within the report as it falls outside of the report scope and expertise of Synergy Trails.

A priority of the trail network design has been to avoid highly constrained environmental lands where possible. Referencing the provided environmental constraints map and fieldwork with National Parks Officers aided the placement of trail corridors. The majority of trail corridors within the network do not cross Endangered Ecological Communities. To further reduce any impact, new trail corridors are considered flexible and it is proposed that trail alignments could be realigned within the trail corridors that have been subjected to detailed environmental assessment. The alteration is designed to allow trails to comply with the outcome of relevant environmental impact assessments. It should be noted that the trail network as outlined has a significant reduction of mountain bike trails crossing environmentally constrained land in comparison to unsanctioned trails on Mount Keira.

Additionally trails that cross water courses or could potentially encroach on rainforest areas have been flagged for elevated trail, reducing any direct impact within the trail corridor.

All trails should be constructed based on sustainable trail principals as outlined by the NSW government and IMBA trail building guidelines.

There are several areas within the proposed network that would benefit from bush regeneration, such as unused motorbike trails and the area containing the jump trails (Trails, 3,4,5,6,7). This would reduce impact by enhancing natural areas that are currently affected by invasive species or otherwise degraded.



Environmental Constraints Mapping

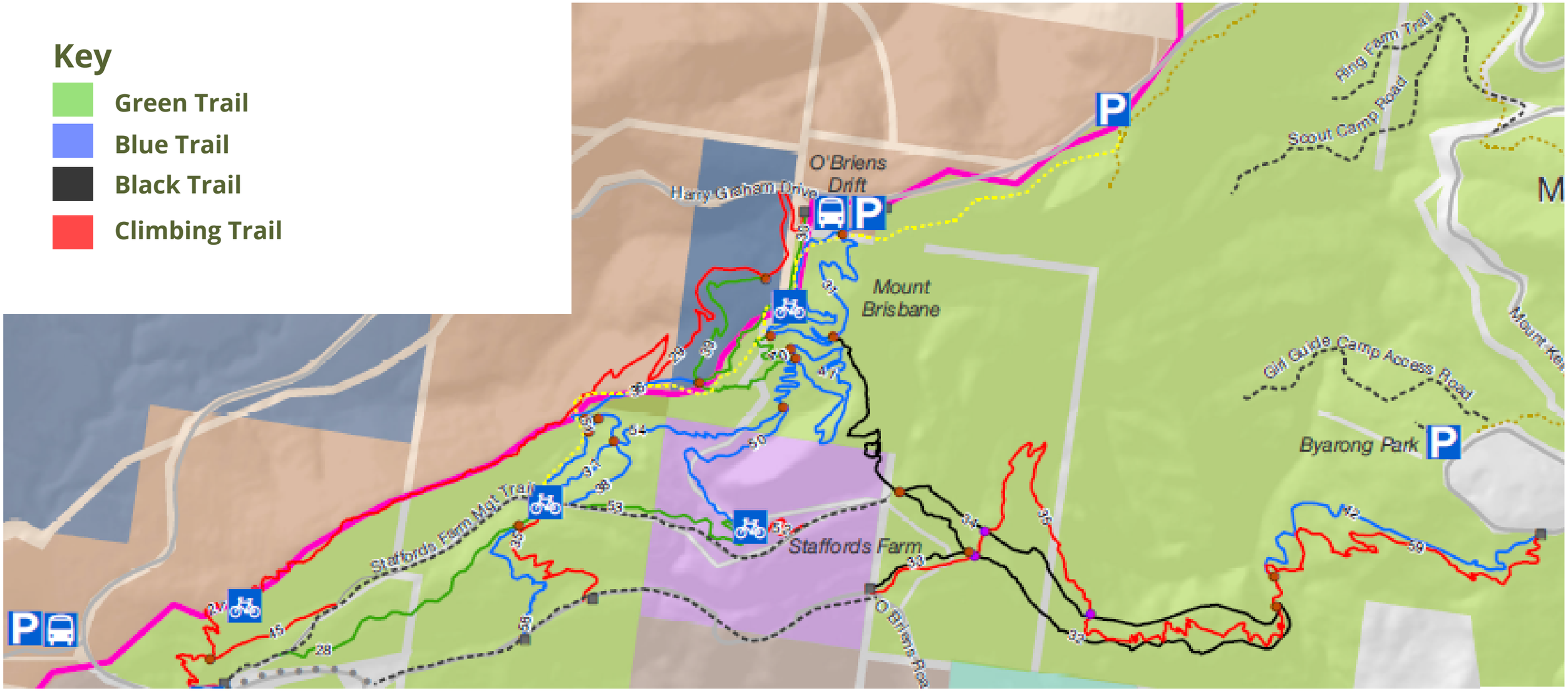
Illawarra Escarpment Mountain Bike Concept Plan

SYNERGY TRAILS

Obriens Drift Trail Map

Key

- Green Trail
- Blue Trail
- Black Trail
- Climbing Trail



Obriens Drift Trail Map Cont.

O'briens Drift is the anchor point of the network. Pride of place is the mountain biker hub comprised of existing hardstand and the industrial buildings onsite. The Trail head is the high point of the network and will provide the majority of the parking and mountain bike related amenities. Potential shuttle services will terminate here. The network is comprised of two short cross country loops and trails that descend further into the network.

Drift XC trail
The Drift XC descending trail has been repurposed into a climb (29). this climb allows riders to climb from the Kembla Heights network to the O'briens drift network. It also effectively shuts the lower drift XC trail (not mapped) that has been flagged by NPWS as inappropriate.

Stafford Farm & O'briens Firetrail
Stafford Management Trail and O'briens Management Trail comprise linkages between O'briens Drift Trail network and Kembla Heights trail network. The fire roads allow descending trails to access return climbs or further descents. Staffords Fire Trail is also utilised as part of an extended Green loop. Between trails 52 & 53 on the map is a grassy picnic area with excellent outlook that could be considered for picnic tables or similar infrastructure to create a natural stop point for family rides.

Staffords Firetrail will require some upgrades to ensure durability in regard to wet weather with low points prone to becoming boggy. These sections will require rock armouring. Descending trails that intersect firetrails will require features that reduce rider speed and warn riders of impending intersection. Surface changes, signage and rider calming features are ideal.

Fight Club and Even Flow (trails 32 & 34)
These trails have some sustainability issues however they can be overcome via minor realignment, rock armouring, outslope and drains. These trails offer considerable challenge and exposure for riders. The trails are also difficult to extract injured riders from and consultation with emergency services should be undertaken. Whilst these trails deliver risks they are also a key requirement for riders wishing to experience extended technical descents.

Fight Club Climb (trail 42)
The end point for this climb has been extended to a more appropriate location that enable riders to more safely enter traffic for the return climb. The climb itself will require an engineered bridge to cross the Byarong Creek and substantial reworking.

Obriens Drift Trail Map Cont.

Fight Club and Even Flow (trails 32 & 34) Fight Club Climb (trail 42)

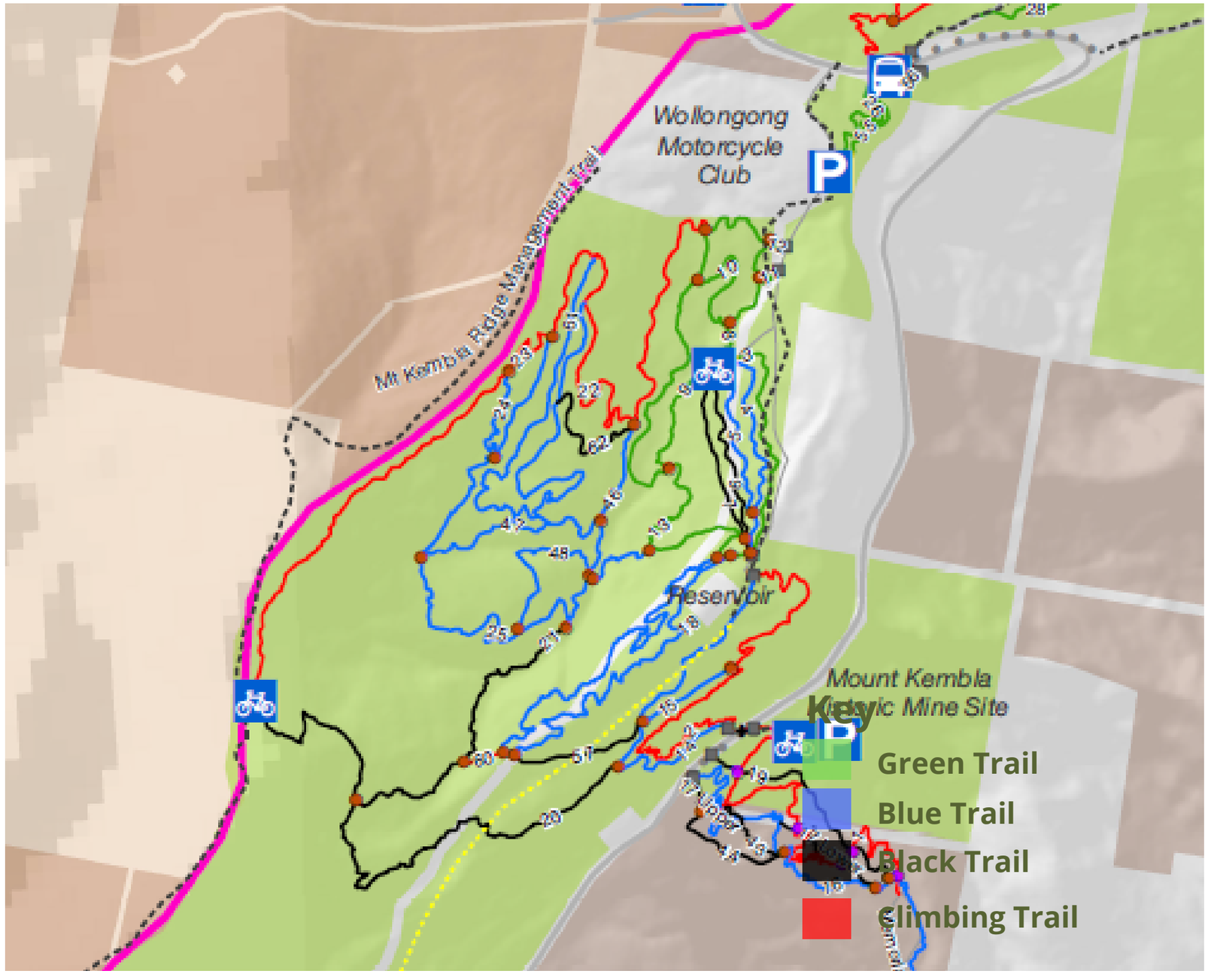
Climb trails to and from Mount Keira Road (59/35)

Climbs trails are a critical component of the trail network:

- To remove riders from Mt Keira Road for safety reasons
- To draw riders away from existing unsanctioned trail by providing a descent into O'briens Drift network (trail 12)
- To draw riders away from Mount Keira.
- To create an internal link within the trail network to tie descending trail back to the top of the network via singletrack

The trails that run off Mt Keira Rd allow local community access from Kieraville into and out the trail network, the climb also allows rider to access the Kembla Heights network via both Stafford and O'briens management trails. The cross over between climbing trail 35 and descents 32 and 34 will require flyover bridges to reduce the risk of collision between climbing and descending riders.

Kembla Heights Trail Map



Kembla Heights Trail Map Cont.

Kembla Heights comprises the bulk of the new mountain bike trails within the proposed network. The area is criss-crossed by existing current and old motorbike trails, where possible these existing trails have been incorporated into the network to minimise the requirement for new trail corridors and subsequent environmental disturbance. Many of the existing motocross tracks have caused significant erosion and ruts. Part of the process of repurposing motocross trails to mountain bike trails should be rectification of drainage line and rehabilitation of bushland in certain areas. The trail network has been designed to have a variety of trail types and difficulty levels, the trails are designed to work in loops where riders can link multiple trails together to form extended loops of increasing difficulty. Additional ancillary infrastructure such as benches and picnic tables should be sited at the top and bottom of the jumplines as this is a social and scenic area. The need for overflow Parking was flagged during feedback on the Draft Strategy, Synergy Trails agrees additional parking is desirable. Synergy Trails cannot provide any feedback on the proposed new parking location.

Jump lines/ Flow trail (trails 3/4/5/6/7)
In the Kembla Heights trail network several 350 - 400m long jump lines have been included. These types of trails are in demand and the sanctioned provision of this trail type will potentially lead to a decreased use of unsanctioned jump lines.
The jump lines have been located as:

- Ensure ease of access for emergency services
- The land is currently disturbed and has a very high level of weeds.
- The area would be ideal for bush regeneration around the new trails
- There is appropriate slope and visibility
- The trails are central within the network allowing ease of access for all rider abilities

Note: jump lines are not dirt jump parks they are trails that have consistent jump and berm features through out their length.

Black Trail (20/21)
The Black descent from the the top has been flagged, however these trail corridors have significant flexibility to allow them to be realigned if the review of environmental factors flags any issues.

Trail Nodes
There are four trail nodes in the Kembla Heights Network, these node points form the junction of multiple trails, all trails entering these areas should have trail features that slow riders naturally on entry. The node points will require clear signage and small cleared area for riders to regroup or choose the next trail.

Consultation
This area is heavily trafficked by motorcycles, it is critical to consult with the motorcycle club regarding placement of trails. Without consult
likelihood of user conflict is high. There is also potential for collision between motorcyclist and mountain bikers.

Additionally consultation with the residential user of the private road should be undertaken

Kembla Village Trail Map

Key

- Green Trail
- Blue Trail
- Black Trail
- Climbing Trail

Kembla Village Trail Map Cont

The Trail network from Kembla Heights comprises descending trails for more experienced riders with a return to the top climbing trail.

The trail network crosses Harry Graham Drive onto a hardened trail dual direction bike path on the low side of the road. From this trail the descents drop off toward Kembla Village. The climb trail links onto the hardened trail at its north eastern end and allows for riders to continue climbing into the the Kembla Heights network.

Due to the nature of the topography this area is only suitable for advanced descending trail with multiple black and a single blue line. The black trails are designed to intersect to provide riders the ability to choose what combination of trails they will take.

Climb Trail (Trail 1)
The climb trail makes use of the lower portion of the existing memorial pathway, the speed of climbing riders is relatively low and should be compatible with pedestrians. Approximately 60% of the climb is a new singletrack construction. (This trail does not access the memorial area) The trail requires the inclusion of flyovers to cross the downhill trails.

Node Point
There are two trail node points in the Kembla Village network. The nodes are at the junction of the descending and climbing trails. More information on the layout of the trail end point can be found in the Kembla Village Trail head diagrams. The lower Node point will need to be located to the side of the memorial pathway and the trails entering the Node point will require rider calming features that naturally reduce rider speed. The Node Points may require hardening.

Existing Black Trail Realignment (14/17/19)
The existing black descents will require extensive realignment. Currently the trails cross the pedestrian memorial pathway multiple times. Mountain bikers on these trails will be travelling at speed and the potential for collision between pedestrian and mountain biker is high. Synergy Trails have rerouted the black lines on the trail map for safety reasons. The old lines will need to be blocked and remediated to ensure they do not continue to be utilised. To provide like for like replacement multiple lines have been provisioned allowing for riders to link multiple trails together to provide variety and progression of skill.

The existing black trails provide multiple commitment features that require rebuilding and assessment.

Kembla Village Trail Map Cont.

Bicycle Lane
From the lower node point in Kembla Village it is proposed that a cycle track is constructed alongside the Memorial pathway to separate mountain bikers from pedestrians and to act as a direct link to the proposed shuttle pickup point and lower parking area. Additional information available in the trail head description.

Mid Level Node Point
The mid level node point holds a conjunction of descending trails and the climbing trail. This will need a cleared space to allow riders to regroup. All trails entering this area should feature obstacles or trail alignment that naturally slows the speed of the rider.

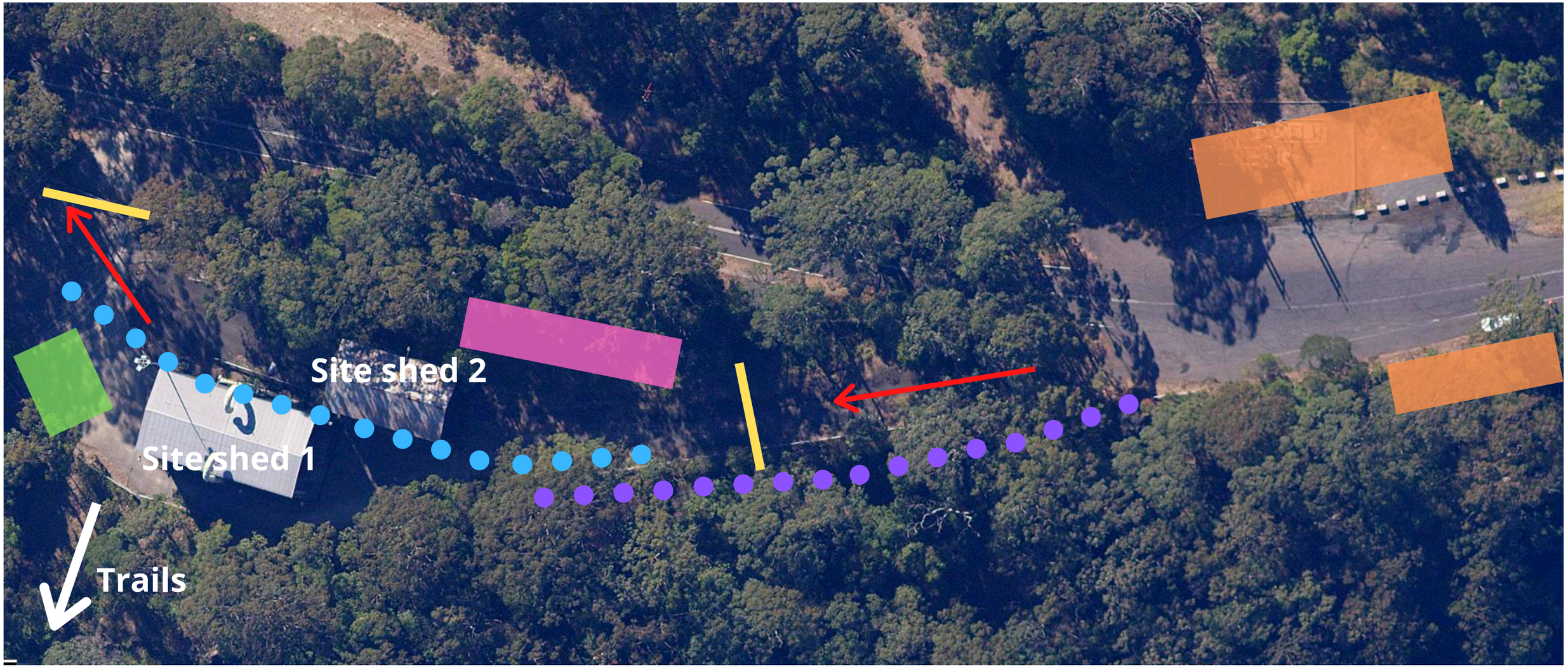
Fly Overs
Blue Trail 16 and Climbing trail 1 cross the black trail corridors numbers 17/ 18/ 19. These cross overs will require built features in the form of flyovers. The flyovers will occur over an existing disused fire trail and will be a primary feature of the Kembla Village trail network. The blue trail is to run under the black network at these locations.

Obriens Drift Trail Head Concept

A focal point for mountain bikers is key to providing a functioning trail network, successful shuttle operation, parking, amenities and as a cultural hub for the mountain bike community. Existing infrastructure at the trail head could be successfully incorporated. Utilisation of hardstand and a revamp of site sheds will provide the basis of the trail head. It is critical for Wollongong City Council to assess suitability of selected sites and provide advice on safety, traffic management and site suitability.

Key

- Public Parking
- Service Parking
- Amenities
- Boom Gates
- Permeable barrier
- Shuttle Traffic Direction
- Bicycle Lane



Obriens Drift Trail Head Concept Cont.

The existing sheds and hardstand at Obrien's Drift should be incorporated into the Escarpment mountain bike plan as the primary trail head location.

The trail head will require:

- Shuttle Drop Off points
- Defined cyclist access route
- Amenities building
- Safety barriers to separate shuttle vehicles from riders
- Automated boom gates
- Utilities connections
- Water station
- Setout to allow for food trucks
- Potential permanent shipping container style cafe
- Lighting
- Picnic tables/ seating
- Bike racks
- Parking for staff or maintenance crew
- ebike charging station

Synergy Trails recommends refurbishment of existing infrastructure where possible for sustainability and to utilise the industrial nature of the site.

Synergy Trails recommends evaluation of this infrastructure by qualified individuals to ensure that the site can be made safe.

Obriens Drift Trail Head Concept: Parking

Northern Side of Harry Graham Drive

Southern Side of Harry Graham Drive

Parking is a key requirement for the trail head location. Currently parking is minimal and unregulated. The trail network will need a significant increase in availability of parking. It is recommended that parking options are available at multiple locations through out the mountain bike trail network. The Trail head will operate as the primary location for parking.

There is opportunity for parking on the eastern side of the proposed trail head location with opportunities on both sides of Harry Graham Drive.

Northern Side of Harry Graham Drive
This location is fenced and unused, it would be ideal for a parking lot that is separated from the road with armco or similar and that provides defined parking spaces and vehicle entry/ exit points.

Crossing of Harry Graham Drive from the proposed parking area to the trail head is a key safety issue and requires further consultation to ensure public safety.

Southern side of Harry Graham Drive
There exists some opportunity for angled parking in this location.

All parking and signage should encourage cyclists to enter the trail head via the Cycle path not through the shuttle bus access.

Overflow Parking
Overflow parking may be required and there is potential of additional parking at Robertsons Knoll. This requires advice from Wollongong city council.

All concepts provided are subject to review and advice from Wollongong City Council. Public safety is paramount and this aspect is outside the scope and expertise of Synergy Trails.

Kembla Heights Trail Head

A trail head is recommended for parking and accessibility of the Kembla Heights trails. The mid level trails are the primary location of Green rated trails and as such will be highly trafficked by families and inexperienced mountain bikers.

The Kembla Heights trail parking is proposed to be located adjacent the Wollongong Motocross track. It will be key to enter into dialogue with the motocross facility to ensure that user conflict is minimised.

Alongside the access road is space for angled parking of approximately 20+ vehicles.

The area requires assessment for suitability. The proposed trail network will be accessible from the southern end of the proposed parking area.

- Consultation with private residents utilising the road should be undertaken
- The trail head area will require modification to an existing access gate to allow access by cyclists to the mountain bike trail network
- This trail head location will enable access to both the trails to the south of the motocross track and also to the Stafford Trail and return climb to O'briens Drift
- Consideration should be given to a shuttle pick up location at the mid point trail head
- Consideration should be given to providing an amenities building at the Kembla Heights Trail Head

Additional feedback from stakeholders and the proponent indicate that additional parking or potential re-siting of the Kembla Heights trail head may be desirable to increase capacity and to reduce traffic congestion outside the motocross circuit. Synergy Trails agrees that these are desirable outcomes but can not provide feedback as the new proposed location was outside of the areas provided to Synergy Trails to investigate.

Kembla Heights Trail Head Cont.

Entry to Trail Head Coordinates
Approximately 34°24'44.7"S 150°48'58.7"E

Key

- Public Parking
- Road Crossing
- Cyclist accessible gate

Kembla Heights Trail Head:
Road Crossing Harry Graham Drive to Stafford Trail

Crossing Cordinates Approximately 34°24'44.6"S 150°49'04.1"E

The crossing of Harry Graham to Stafford Trail may be problematic due to restriction of line of sight. The crossing location on the southern side of the road is flexible and the mountain bike trail can be manipulated to lead to the location with the best line of site.

Wollongong City Council to provide detailed advice and recommendations at this location to ensure public safety. WCC preliminary traffic management report can be read in Appendix 4.

Kembla Heights Trail Head:
Road Crossing Harry Graham Drive at Kembla Heights

Crossing cordinates Approx: 34°25'24.4"S 150°48'50.6"E

The Road Crossing of Harry Graham Drive at Kembla Heights has been located to provide waiting areas on both the eastern and western sides of the road. The western side of the road will require a small clearing to be made adjacent the road to act as calming area where cyclists will naturally reduce their speed.

It is recommended that the trail leading out of the calming area be made of more formal materials to indicate to cyclists that they are approaching a road.

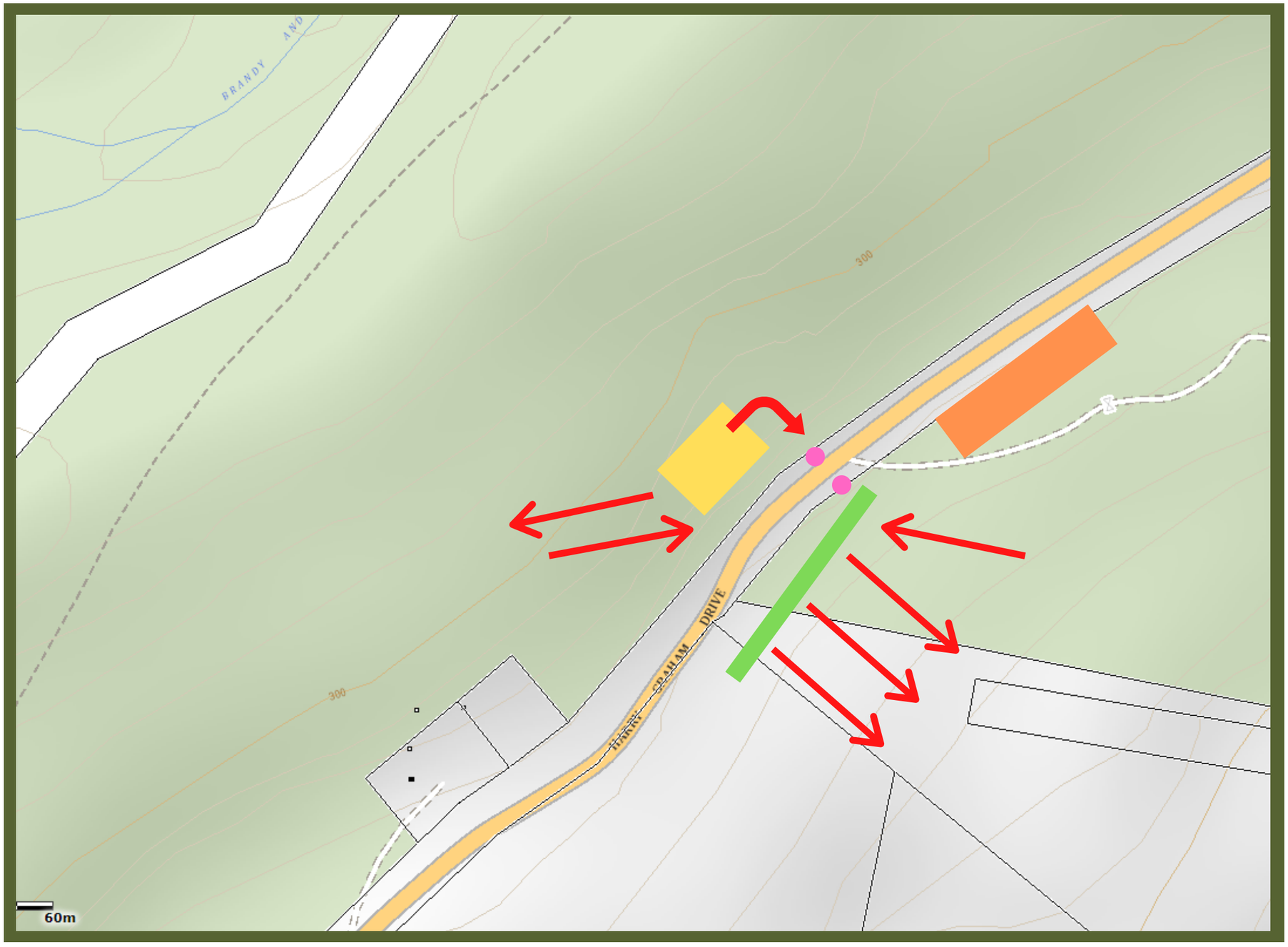
Constructed barriers such as fencing should be positioned to ensure that cyclists do not create alternative exits from the calming area and are forced to follow the predetermined route.

Entry points to descending trail to Kembla Village will be relocated and a hardened cycle path from the road crossing will be built to remove cyclists from the road.

Wollongong City Council to provide assessment of the location and advice on how to manage traffic and safety.

The crossing takes advantage of an existing grassy park to be used as a rest area for cyclists.

Kembla Heights Trail Head:
Road Crossing Harry Graham Drive at Kembla Heights



Key

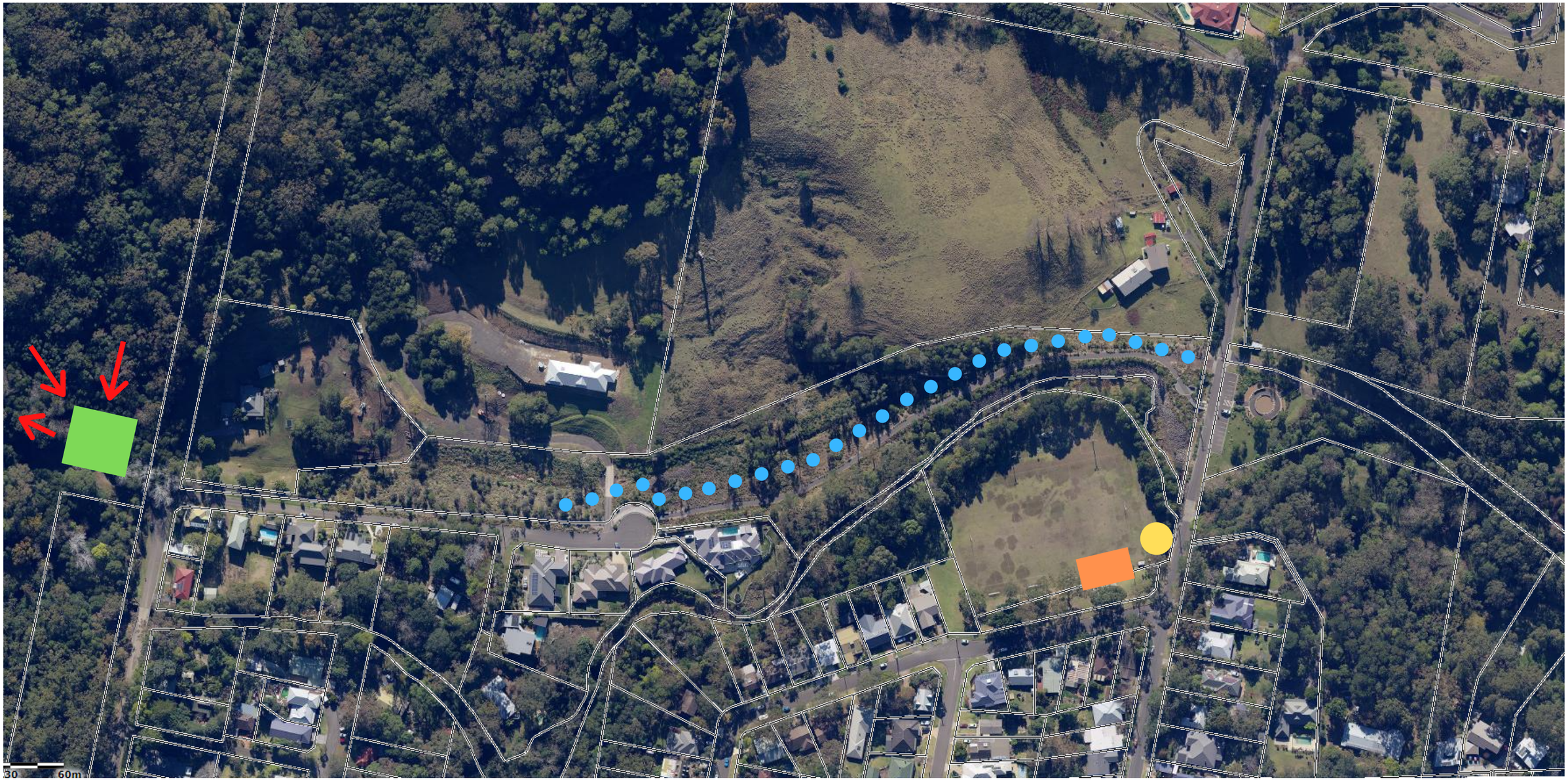
- Public Park
- Road Crossing
- Cyclist calming area
- Trail Direction
- Hardened Trail

Kembla Village Trail Head

Kembla Village presents difficulties in interaction between mountain bikers and the local community. The area is lacking in parking and also has a physical separation between trail exits and potential parking and shuttle pick up. The key requirement is to minimise the impact of mountain bikers on local residents.

Key

- Existing Amenities
- Potential Parking
- Trail Node
- Potential Shuttle Turning Circle
- Potential Cycle Path
- MTB Trail



Kembla Village Trail Head Cont.

Amenities & Parking

Additional parking will be required in Kembla Village for riders utilising the shuttle service. The existing shoulder of Avon Road provides potential for additional parking to be constructed.

The existing amenities building should be left open for mountain bikers to use where possible.

There is potential for user groups conflict on weekends when these spaces are more active.

Wollongong city Council to provide advice in regard to potential additional parking spots.

Shuttle Bus loading & turnaround

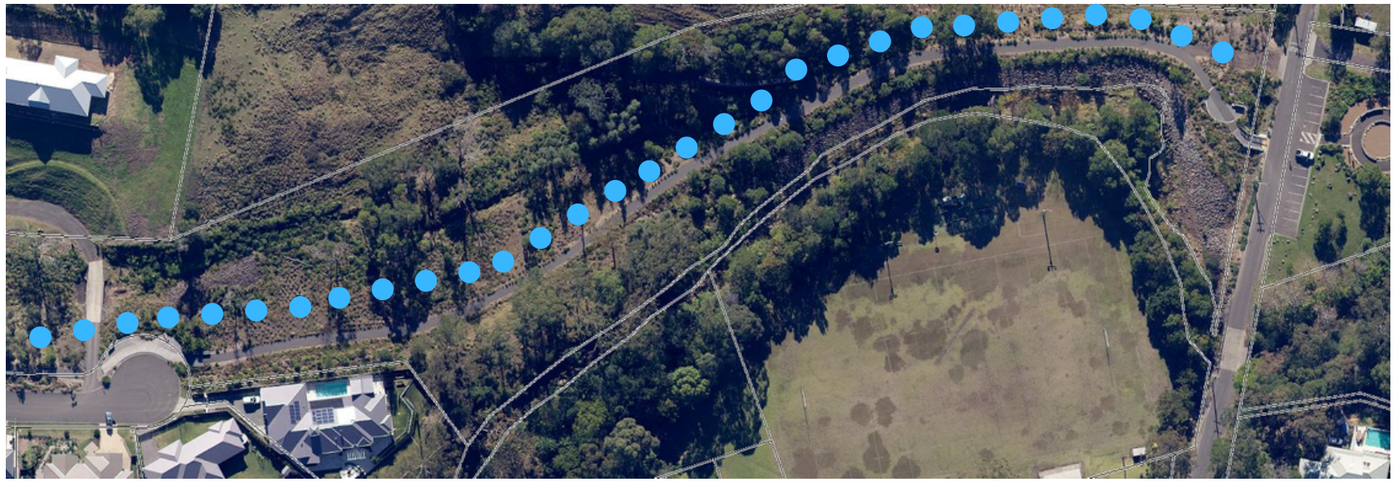
A shuttle service will require a turnaround area and safe location off the road to load passengers and mountain bikes. The western side of Stones road provides sufficient space to construct a turning circle for use by a shuttle bus.

Wollongong city Council to provide advice in regard to potential shuttle turn around, see appendix 4.

Kembla Village Trail Head Cont.

Trail Node Point

There will be a trail node point located within south 32 land, the node point will act as meeting point between the descending and climbing trails with the aim to reduce the volume of riders entering Kirkwood place and to provide a safe return to Harry Graham Drive. It is proposed to use a portion of the existing memorial walkway for the return climb. The speed differential between cyclists and walkers up hill will be minimal and should not present significant safety concerns.



Potential Supplementary Cyclepath

The existing Memorial pathway is utilised consistently by the local community. The pathway has a downslope towards the existing parking area. This slope will encourage speeds that are not compatible with walkers and may present a safety issue. It is proposed to build a cycle path alongside the memorial pathway approximately 370m long on council owned land. The remaining shared section of the memorial pathway is flatter and will require signage to indicate shared use and speed control.

Wollongong city Council to provide advice in regard to potential additional cycle path, see appendix 4.

Kembla Village Trail Head Cont.

Private landholders

It should be noted that there is enormous potential for the use and involvement of private land holders and private businesses to provide mountain bike infrastructure, trails and services.

The trail network as it is provided in the concept plan could be simply rerouted through private land and terminated at a specific purpose built facility. Whilst this is not currently viable, land ownership may change over time and Wollongong City Council and National Parks and Wildlife service should be aware of the synergies available.

Use of private land could potentially remove mountain bikers entirely from public streets and cycle paths and instead provide them with a dedicated facility, built infrastructure and dedicated shuttle pick up location in Kembla Village.

Mount Keira Road Trail Exit

Approx location: 34°24.5729'S 150°51.0915'E

The exit point of the existing Fight Club Climb Trail currently occurs at a point on Mount Keira Road that is unsuitable. The exit point does not have a shoulder and requires a bike to be lifted over existing Armco directly into vehicle traffic. Synergy Trails proposes to extend the existing climb slightly to reach an exit point onto an existing service road that provides adequate space and site lines for mountain bikers to safely re-join the road. As this climb is in proximity to existing unsanctioned trails Synergy Trails advises that there should be no formal parking for mountain bikers on Mt Keira Rd. A reduction in mountain bike services and activities will actively discourage mountain biker activity on Mount Keira and focus these trails on local community riders as opposed to visiting riders. Formal closure of existing Mt Keira trails that are in proximity to the exit point will reduce use of the unsanctioned network. This should only occur after the new network is open.

Wollongong City Council to provide detailed advice and recommendations at this location to ensure public safety

Construction Notes

- All trail corridors new and existing will need to be cleared to height of 240cm, the corridors should also be checked for over hanging branches. An arborist should be consulted about any trees of concern.
- All trails should comply with International Mountain Bike Association difficulty rating guidelines and build standards (see appendix 2).
- Existing trails may need widening to meet IMBA guidelines (please see trail Database).
- Existing motocross tracks have been costed as all require some remediation, modification of outslope, reinstatement of gully lines and alteration of slope and repair of ruts etc.
- The construction of jump trails will require clean fill of an appropriate clay material that is locally sourced and compatible with the local soil types.
- There are existing motocross bridges which may have to be removed and replaced. This will require an engineer or civil inspection and report.
- There are multiple areas of boggy ground, these have been flagged for raised trail or rock armouring.
- Certain existing trails will require heli-ops to deliver material, heli-ops have not been costed.
- Rainforest areas will have very specific construction criteria and may require raised trail.
- For existing trail, where slope exceeds IMBA standards the trail will switch back across the existing trail where possible. This will create some new trail but minimise the expansion of the trail corridor.
- At all trail junctions and intersections, rider calming features are to be utilised to naturally reduce speed and create a preferred direction of travel.

Construction Notes - Cont

Machine Construction - For additional information please see: *Trail Solutions : IMBA's Guide to Building Sweet Singletrack*
Bike Parks: IMBA's Guide to New School Trails

Corridor width:
All new machine built trails will have a minimum working corridor of 1 metre, the trails will be designed to reduce back to there IMBA specified trail widths post construction.

Cut depth:
Bench cut depth of excavated trail will vary according to side slope, given the variability of slope within a mountain bike trail network this can not be calculated across the entire network. Side slope workable maximum is forty five degrees and reduces back to zero degrees. examples of cut depth:

45 Degree Slope:
Cut depth 1 metre for a 1 metre wide corridor and batter layback of approximately 30 degrees where possible creating a 1.3 to 1.5m wide corridor.

20 Degree Slope:
Cut depth 190 mm with a batter layback of approximately 30 degrees.

Spoil
Site won spoil where possible will be utilised to moderate slope of trails, or construct water management and or technical features. Where excess spoil is created this will be deposited down slope of the bench cut.

Features
Features such as jumps and berms will be constructed from site won materials unless otherwise specified in the trail database. The main exceptions are the jump and flow trails which will require imported fill. Approximate fill requirements
are set out in the trail database should be confirmed by the contractor prior to construction.

Construction Notes - Cont

Machine Construction - For additional information please see: *Trail Solutions : IMBA's Guide to Building Sweet Singletrack.*
Bike Parks: IMBA's Guide to New School Trails.

Existing Trail

Trail widening

Some existing trails require widening of the trail corridor to meet IMBA standards. The widening process can be completed either by hand or machine dependent on accessibility. Method of trail widening is specified in the Trail Database for each trail. This is subject to final agreement by the contractor and NPWS.

Trail Remediation/ Rectification

Existing motocross trails that have been incorporated into the network design will need rectification works to ensure that they are fit for purpose when used by mountain bikers. The existing trails are also heavily eroded and rutted and will need extensive works to ensure that the repurposed trails effectively manage water flow and minimise impact on natural drainage lines. This work will be by machine and may include some significant earthworks to create a functional sustainable trail.

Trail features

Trail features on existing trail will be built using site won fill. Where appropriate rock from the surrounding area will be used for trail hardening, in conjunction with additional imported rock.

Construction Notes - Cont

Material for trail construction

Rock:

Rock is specified to harden trail surfaces, rock should be from a local source that is suitable for the local environment. Rock is used for hardening trails surfaces to reduce maintenance and potential erosion. Rock armouring of trails can also be used to protect exposed tree roots.

Fill:

Clean fill from local sources whose composition and ph value is similar to the site should be utilised. Fill will be utilised to construct features in jump and flow lines.

Capping:

Capping of jumps and features within flow lines with a locally sourced clay based soil will be required. This will harden the surface, improve the jump quality and reduce maintenance.

Fiber Reinforced Plastic Grid (FRP)

Elevated trail will be required in areas that pass through rainforest. FRP with a mesh size of 20mm is ideal for this purpose. FRP should be used only on trails where speeds are lower as there is increased risk of injury to riders from crashing on FRP.

Gravel Clay hardened surface

For rider calming areas gravel hardened surface is an option for use. Compacted gravel minus 10/20mm bound with either natural clay or a soil binder is suitable for high use areas.

Soil Binders

Where appropriate to the natural environment soil binders should be given consideration to increase the durability of features built from soil. Soil binders can significantly reduce maintenance schedules and potentially
reduce erosion particularly on features such as jumps and berms.

Construction Notes - Cont

Construction Machinery

All contractors have preferences toward specific machinery and will differ from contractor to contractor. To ensure that the risk of any contamination from machinery is minimised:

- All machinery should be washed down before being placed on site
- All machinery should be serviced and in good working order
- All machinery should have accessible spill kits
- For sensitive areas machinery may need to move over mats

Typical machinery Used

- Narrow Track Excavator
- Power Carrier
- Plate compactor
- Power tools
- Hand Tools

Construction Notes - Cont

Methodology

The preferred methodology for trail construction may vary with the contractor and should be negotiated with the principal NPWS before construction begins. Below is simplified approximation of construction methodology:

- Site Locations, methods of access and exit points confirmed
- Trail Corridor identified
- Trail microflagged and approved by principal and hold/ witness points confirmed
- Corridor clearing/ arborist check commences
- Erosion control measures in place as agreed
- Narrow track excavator to begin excavated trail
- Materials for surface hardening bought in
- Trail surface to be finished with plate compactor and any trail hardening works to be completed
- Trail quality checked by principal

Trail Maintenance

To ensure new trail is maintained correctly for the first 12 months and to remedy the initial high use of new trail it is advised that the tendering process include the provision of a maintenance contract. The maintenance contract should be subject to negotiation, however approximately 7.5% - 10% of the construction value should be set aside for this purpose for the first 12 months.

As part of the maintenance contract it is advised that the contractor be required to provide basic trail building maintenance classes to local mountain bikers through an official channel such as the local mountain bike club. The training of local mountain bikers through a recognised organisation will reduce the burden of maintenance costs towards NPWS and build ownership for local mountain bikers.

Funding of trail maintenance and expansion should also be explored through commercial partnerships with businesses whose primary profit driver is the trail network. Shuttle businesses, bike shops and food services that are directly integrated with the trail network should be approached for this purpose.

To ensure trails and the challenge of trails is kept fresh it is recommended that part of the ongoing maintenance schedule involve the periodic change of certain technical features such as jumps, drops, rock gardens etc. In this way trails can be revitalised without requiring additional trail corridors to provide fresh challenges to local riders. Maintenance programs can therefore double as a method of providing 'new' trail experiences.

Appendix 1

Trail Database Summary (comprehensive trail database has been provided to NPWS as a separate document

Trail Summary

Please note that this document is only indicative of pricing and designed only to provide approximate cost estimates

Climbing								
Trail ID	**Grade**	**Name**	**Existing**	**Type**	**length**	**Construction**	**Method**	**Note**
1	Blue		No	Climb	1183	Machine & Hand	desktop	Requires 4 flyovers to avoid descending trails
2	Blue		No	Climb	1100	Machine & Hand	Flagged	Harry Graham Drive to Watertank
22	Blue		Partial	Climb	1335	Machine	Flagged	Climb from motorcross track
23	Blue		Majority	Climb	1247	Machine & hand	Flagged	Climb to black descents
27	Green		No	Climb	1750	Machine	Flagged	climb to drift XC/ DH
29	Green		Yes	Climb	795	Machine	Flagged	Repurpose drift XC trail into a climb with additional trail
33	Black		Yes	Climb	334	machine		Black as it leads only to black descent
35	Blue		Minor	Climb	3449	Machine & hand	Flagged	Intensive hand build on lower slopes, start area may require elevated trail
45	Green		No	Climb	327	Machine	desktop	Link trail to Obriens Drift climb
52	Green		No	Climb	200	Machine	Desktop	Links to grassy rest area node point
59	Blue	Fight Club Climb	Yes	Climb	1660	Machine & hand		Requires modification and elevated trail in rainforest areas.
60	Blue		Yes	Climb	90	machine	Flagged	Existing access road that is unused may require hardened water crossing
				Total	**13470**		AVG Cost P/M	$67.29

Green Descending/ Undulating								
Trail ID	**Grade**	**Name**	**Existing**	**Type**	**length**	**Construction**		
3	Green		No	Flow	464	Machine	Desktop	
8	Green		No	singletrack	96	Machine	Flagged	
9	Green		No	singletrack	250	Machine	Flagged	Follow creek line, will require sediment control
10	Green		Majority	singletrack	809	Machine	Flagged	Inner Green loop, primarily modified MX trail
11	Green		No	Wide track 1200mm	63	Machine	Flagged	Entry to trail network Kembla Heights
12	Green		No	Wide track 1200mm	38	Machine	Flagged	Exit from Trail network Kembla Heights
13	Green		Majority	singletrack	1120	Machine	Flagged	Extended green loop, primarily modified MX trail
26	Green		No	singletrack	458	Machine	Flagged	Link to Stafford Fire Road. Trail northern end flexible for road crossing
28	Green		No	singletrack	795	Machine	Desktop	
30	Green		yes	singletrack	225	machine		Entry from Obriens Drift (requires widening)
39	Green	Drift XC	Yes	Singletrack	769	Hand		Requires widening to meet blue standard
53	Green		No	singletrack	260	Machine	Desktop	Have walked the area and is feasible to construct
55	Green		No	singletrack	280	Machine	Desktop	Return Link from Stafford Fireroad
56	Green		No	Wide track 1800mm	80	Machine	Desktop	Flexible two way link trail links to Stafford Road crossing
				Total	**5707**		AVG cost P/M	$63.57

Appendix 1- Cont.

Trail Database Summary

Blue Descending/ Undulating							
Trail ID	**Grade**	**Name**	**Existing**	**Type**	**length**	**Construction**	
4	Blue		No	Jumpline	443	Machine	Desktop
5	Blue		No	Jumpline	315	Machine	Desktop
14	Blue		No	Flow line	780	Machine	Flagged
15	Blue		No	Singletrack	209	Machine	Desktop
16	Blue		No	Singletrack	1036	Machine	Flagged
18	Blue		No	Singletrack	1850	Machine	Flagged
24	Blue		Partial	Singletrack	318	Machine	Flagged
25	Blue		Majority	Singletrack	1440	Machine & hand	Flagged
31	Blue	Fat Attack	Yes	singletrack	1560	Hand	Flagged
37	Blue		Partial	Singletrack	360	Machine	
36	Blue	Drift DH	Yes	Singletrack	681	Hand	
38	Blue		No	Singletrack	245	machine	Desktop
40	Blue		No	Singletrack	482	Machine	TBA
41	Blue		Yes	Singletrack	907	hand	
42	Blue		No	Singletrack	1026	Machine & hand	Flagged
46	Blue		Majority	Singletrack	391	machine	Flagged
47	Blue		No	Singletrack	450	Machine & hand	Flagged
48	Blue		Partial	Singletrack	370	Machine	Flagged
50	Blue		No	Singletrack	1400	Machine & hand	Flagged
54	Blue		No	Singletrack	500	Machine	Desktop
57	Blue	Drift Lower	Yes	Singletrack	460	Machine & hand	
61	Blue		Majority	Singletrack	1540	Machine	Flagged
				Total	**16763**		Avg Cost P/M

	Links to climb back to water tank
	Utilises old road and existing trail requires additional build to avoid memo
	Undulating windy XC loop
	Blue descent extension
	requires widening by hand full length
	Requires significant rock armouring
	Requires increased width to meet IMBA standard
	Will require elevated trail towards the creek to mitigate potential impacts o
	Existing MX trail, requires rectification works
	Flowing descent
	Area walked and is viable
	Requires modification to meet IMBA guidelines
	Majority existing MX trail with some new singletrack, MX trail heavily rutte
	$51.78

Appendix 1- Cont.

Trail Database Summary

Black Descending/ Undulating

Trail ID	Grade	Name	Existing	Type	length	Construction		
6	Black		No	Jumpline	342	Machine	Desktop	Will require imported fill
7	Black		No	Jumpline	352	Machine	Desktop	Will require imported fill
17 Upper	Black		TBA	Singletrack	180	Machine		Modify existing trail
17 Lower	Black		TBA	Singletrack	270			Modify existing trail
19	Black	Long Neck	Yes	Singletrack	528	Hand		Requires mid level rebuild
20	Black		No	Singletrack	878	Machine/hand	Flagged	Trail has a flexible coriidor and can be realigned if required by REF
21	Black		No	Singletrack	1065	Machine/ hand	Flagged	Trail has a flexible coriidor and can be realigned if required by REF
33	Black		Yes	Singletrack	274	Machine/ hand		Links Obriens trail to Fight Club descent
43	Black		Yes	Singletrack	125	Machine/ hand		Rebuild main feature
44	Black		Yes	Singletrack	260	Machine/ Hand	Flagged	Rebuild top features
51	Black		Yes	Singletrack	30	Hand		Requires reworking for sustainability. Black option line
57	Black		Partial	Singletrack	280	Machine	Flagged	Utilises existing old road to link trails
62	Black		No	Singletrack	395	Machine & Hand	Flagged	Will require extenisve rock armouring on steep section
				Total	**4979**		Avg Cost P/M	$73.92

Double Black Descending

Trail ID	Grade	Name	Existing	Type	length	Construction		
32	Double Black	Fight Club	Yes	Singletrack	1882	Hand		Requires rock armouring in section, this will require heli ops
34	Double Black	Even Flow	Yes	Singletrack	1120	Hand		Requires rock armouring in section, this will require heli ops
				Total	**3002**		Avg Cost P/M	$33.12

MTB Trail Network	**43921**

Appendix 2

IMBA Trail Difficulty Rating System

	EASIEST WHITE CIRCLE	EASY GREEN CIRCLE	MORE DIFFICULT BLUE SQUARE	VERY DIFFICULT BLACK DIAMOND	EXTREMELY DIFFICULT DBL. BLACK DIAMOND
TRAIL WIDTH	72" (1,800 mm) or more	36" (900 mm) or more	24" (600 mm) or more	12" (300 mm) or more	6" (150 mm) or more
TREAD SURFACE	Hardened or surfaced	Firm and stable	Mostly stable with some variability	Widely variable	Widely variable and unpredictable
AVERAGE TRAIL GRADE	Less than 5%	5% or less	10% or less	15% or less	20% or more
MAXIMUM TRAIL GRADE	Max 10%	Max 15%	Max 15% or greater	Max 15% or greater	Max 15% or greater
NATURAL OBSTACLES AND TECHNICAL TRAIL FEATURES (TTF)	None	Unavoidable obstacles 2" (50 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 36" (900 mm) or wider	Unavoidable obstacles 8" (200 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 24" (600 mm) or wider TTF's 24" (600 mm) high or less, width of deck is greater than 1/2 the height	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or wider TTF's 48" (1,200 mm) high or less, width of deck is less than 1/2 the height Short sections may exceed criteria	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or narrower TTF's 48" (1,200 mm) high or greater, width of deck is unpredictable Many sections may exceed criteria