SCENIC RIM TRAIL BASELINE DATA COLLECTION PLAN

THORNTON TRAILHEAD TO SPICERS CANOPY NATURE RESERVE, QLD

EPBC 2016/7847
SPICERS RETREATS HOTELS AND LODGES PTY LTD
ACN 008 971 499

SCENIC RIM TRAIL
BY SPICERS

Produced by CTM Consulting (Qld), Biodiversity Assessment and Management Pty Ltd, and Moreton Environmental

EPBC Number

2016/7847

Project Name

Scenic Rim Trail – Thornton Trailhead to Spicers Canopy Nature Reserve, Qld

Proponent

Spicers Pty Ltd

ABN 22 137 592 593

Action

Spicers Retreats Hotels and Lodges Pty Ltd (Spicers) is developing a 53 km multi-day walk from the privately-owned Thornton View Nature Refuge to the privately-owned Spicers Peak Nature Reserve, via the Main Range National Park and A Gondwana Rainforests of Australia World Heritage Area. The walk is to be known as the Scenic Rim Trail and will follow a series of existing tracks in the Park connected by a new series of tracks to be established by Spicers. Two EcoCamps will be constructed in the Park (outside of the World Heritage Area).

Location

Thornton Trailhead to Spicers Canopy Nature Reserve via Main Range National Park and Gondwana Rainforests of Australia World Heritage Area, Queensland

Date of Preparation

15 July 2019

Declaration of accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

Benjamin O'Hara

Spicers Retreats Hotels and Lodges Pty Ltd

15 July 2019

Document Version Control

Version Number	Date Approved	Approved By	Description
1.0	21 February 2019	Ben O'Hara, GM Land & Environment	Document submitted to DoEE
1.1	25 March 2019	Ben O'Hara, GM Land & Environment	Updated to address DoEE feedback
2.0	27 May 2019	Ben O'Hara, GM Land & Environment	Peer reviewed document submitted to DoEE
2.1	19 June 2019	Ben O'Hara, GM Land & Environment	Removal of CoA 8.d, 8.e., 8.f., 8.g. by variation
3.0	5 July 2019	Ben O'Hara, GM Land & Environment	Submission to DoEE

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Annexure 2 Qualifications of independent reviewer of BDCP [to be added via hyper link on website]

1. Project Description (2016/7847)

Spicers Retreats Hotels and Lodges Pty Ltd (Spicers) are developing a multi-day bushwalking experience called the Scenic Rim Trail (SRT; EPBC Number 2016/7847) that traverses the Main Range National Park (MRNP). The MRNP contains one of 42 reserves making up the Gondwana Rainforests of Australia World Heritage Area (GRAWHA). The SRT will start and finish on private property (Thornton View Nature Refuge and Spicers Peak Nature Reserve). The SRT was approved **18th January 2019**. Variations to the conditions of approval were received **2 July 2019**.

1.1. Conditions of Approval – Baseline Data Collection Plan

Condition 8 requires that the BDCP outline the methods (including survey methodology, effort, timing, frequency, responsibility) for the collection of:

a. baseline population data for Hastings River Mouse within 100 metres of Woodcutters Ecocamp;
b. baseline population data for Fleay's Frog and Mountain Frog within 100 metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek;
c. baseline water quality data within 100 metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek;
d. baseline riparian habitat quality data within 100metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek.

1.2. Purpose of the Baseline Data Collection Plan

This Baseline Data Collection Plan (BDCP) contributes to the 10-year monitoring program (Condition 14.c.i-iv.) capable of:

- predicting and detecting a decrease in the:
    - population of Hastings River Mouse within 100 metres of Woodcutters Ecocamp;
    - population of Fleay's Frog and Mountain Frog within 100 metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek;
    - water quality within 100 metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek; and
    - riparian habitat quality within 100 metres upstream and downstream of each crossing of the new trails at Blackfellow Creek and Dalrymple Creek
- informing species population, water and habitat quality criteria that will trigger corrective actions by Spicers if any decrease in the above is detected.

2. Condition 8.a. - Hasting River Mouse

2.1. Ecology and Habitat

The Hastings River Mouse is listed as endangered under the EPBC Act because of its reduced, limited, and disjunct distribution, small local population sizes, and low reproductive rate. Its modern distribution is thought to be limited by genetic, climatic and vegetation factors, occupying only a small part of the potential habitat. Current populations occur in isolated areas >500m above sea level, and are distributed from the Mount Royal National Park, NSW, through to the Gondwana Rainforests of Australia, Qld. It is thought that most localised populations are <10 - <50 individuals. (NSW DEC 2005).

Its habitat is open wet or dry sclerophyll forests and woodlands with native grass, sedge, rush, fern, or heath understorey. The availability of dense vegetative ground cover in the height range of 10–75 cm, and the presence of structures such as tree root hollows, boulders, or fallen logs, providing cover from predators, are thought to be key habitat conditions (NSW DECC 2005).

Potential habitat has been mapped based on REs associated with records of Hastings River Mouse (Figure 1). The total area of potential habitat within the MRNP that include previous Hastings River Mouse observations and the Trail network is 14,300 ha. There are 31,676 ha of potential habitat between the southern Main Range and the New South Wales border, but not all of this is suitable habitat, as habitat quality for Hastings River Mouse is determined by ground cover type and time since last disturbance.

The area adjacent the proposed Woodcutters EcoCamp provides potential habitat for Hastings River Mouse, with REs 12.8.1 and 12.8.14 over a groundcover of dense mat-rush (*Lomandra longifolia*) and the grasses *Poa labillardierei* and *Imperata cylindrica*, particularly to the north and west of the EcoCamp. The grassy groundcover to the north east is sparser and less dominated by mat-rush. Shelter sites, including hollow logs and rocky outcrops are abundant throughout.

The designated lease area for Woodcutters EcoCamp is assessed as not suitable habitat for Hastings River Mouse, being dominated by ferns, native raspberry (*Rubus parvifolius*), and rainforest saplings. The rainforest ecotone fringing the north, east, and southern boundaries of the EcoCamp is dominated by Lantana (*Lantana camara*), ferns, and rainforest trees, and lacks mat-rush and grassy groundcover. Consequently, construction of the Woodcutters EcoCamp will not reduce or fragment the habitat of Hastings River Mouse.

2.2. Baseline Survey Method

The survey method outlined below is in accordance with the Recovery Plan for the Hastings River Mouse (*Pseudomys oralis*) (NSW DECC 2005) and the Survey guidelines for Australia's threatened mammals – Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999 (Commonwealth of Australia 2011).

2.2.1. Survey Method

A targeted trapping survey will be undertaken using size-A Elliott traps baited with peanut butter and rolled oats. Traps will be set in the late afternoon and checked again within two hours of sunrise to identify and release all animals live-trapped overnight. Trapping will not occur during cold or wet conditions. The total number of individuals of all species trapped each night on each transect shall be recorded and the capture rate will be standardised as captures per 100 trap nights (C/100TN).

2.2.2. Location

Transects will be placed in suitable local-scale habitat to maximise the likelihood of capture e.g. near fallen trees, adjacent to rock outcrops, trees with basal cavities, dense grass, and burrows of suitable size adjacent to Woodcutters EcoCamp (Figure 1). Sampling will also be undertaken near the Mt Mistake and Goomburra sections of the Main Range National Park (in predicted habitat) and Amphitheatre View EcoCamp (predicted non-habitat) to determine presence or absence in these areas.

Habitat assessment shall be undertaken at each of four habitat assessment sites, recording the following vegetation characteristics: (1) the canopy height range, median height and percentage canopy cover for each of the canopy, subcanopy, shrub and groundcover layers using a line-intercept method along a 50 m transect, and the dominant species in each layer; (2) the floristic species richness of groundcover vegetation within each of five 1 m x 1 m quadrats spaced at 10 m intervals along the 50 m transect; and (3) the general abundance of potential shelter sites for Hastings River Mouse. The habitat assessment and targeted trapping surveys will be collocated, and annual surveys repeated at the same locations/transects.

2.2.3. Effort

The minimum survey effort shall be 400 trap-nights (100 traps over four consecutive nights, set out as trapping transects of 25 traps along each of four transects) at each site. Trap sites will be photographed and geolocated with GPS to allow replacement at the same sites in following years.

2.2.4. Timing

The survey data will be collected during November to minimise the risk of hypothermia, following three days of dry conditions and the forecast does not predict rain heavy rain. Traps will be covered with suitable material (such as a plastic freezer bag) if there is a chance of rainfall.

2.2.5. Frequency

The baseline survey will be conducted twice over a period of four nights as per NSW DECC (2005) and will hereafter be repeated once annually as part of the 10-year monitoring program.

2.2.6. Responsibility

The baseline survey will be undertaken by a suitably qualified expert and responsibility for the conduct and reporting of the baseline survey is held by the Spicers General Manager (Land & Environment).

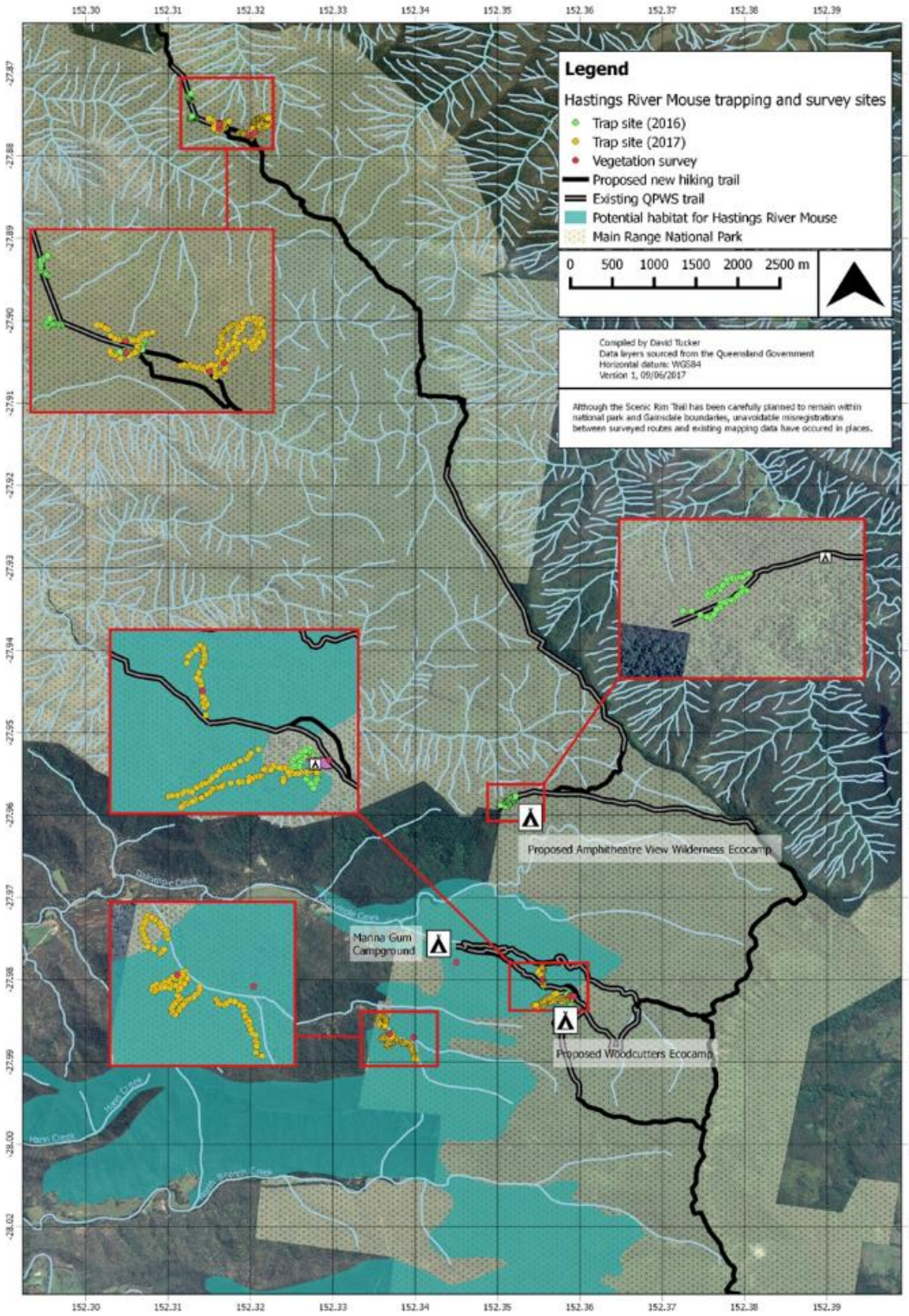

Figure 1 Baseline Hastings River Mouse and habitat surveys will be conducted at four locations including Woodcutters EcoCamp and Amphitheatre View EcoCamp

3. Condition 8.b. - Fleay's Barred Frog

3.1. Ecology and Habitat

Fleay's Barred Frog is listed as endangered under the EPBC Act. It is one of five species of upland stream-dwelling frog which has declined in south-east Queensland in recent decades, and this species has disappeared completely from the Bunya Mountains and Mount Tamborine in Queensland.

This species has a narrow and disjunct distribution in rainforest, Antarctic Beech forest, and the wetter eucalypt forests, from the Great Dividing Range in south-east Queensland to Yabbra Scrub in north-east New South Wales. Fleay's Barred Frog are found from near sea level to approximately 1,000 m altitude but are most commonly recorded at mid-elevation sites between 400 and 800 m.

Adult Fleay's Barred Frog are typically found in the leaf litter along the banks of permanent fast-flowing streams in forested areas, with the males rarely moving more than 10m from the stream (Doak 2005). Males call at night during the breeding season from rocks in the streams, from the margins of these streams, or from the forest floor. During the breeding season, the female lays eggs on bedrock in the shallow riffle zone of the stream or in small depressions amongst submerged leaf litter or gravel. After hatching, tadpoles are found in pools of water, and may occur all year round in some locations.

While females can be found foraging at night in suitable rainforest habitat along ridge-tops hundreds of metres from the nearest stream, radio-tracking has shown that most adult females typically remain within 20m of permanent streams (Doak 2005). They appear to favour foraging along cleared fire-trails and walking tracks when these are present.

3.2. Baseline Survey Method

The survey method outlined below is in accordance with the Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (NSW DECC 2009) and Survey guidelines for Australia's threatened frogs – Guidelines for detecting frogs listed as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999 (the Guidelines; Commonwealth of Australia 2010).

Breeding male Fleay's Barred Frog call actively at night along the banks of permanent rainforest streams during September to March (the activity period), but not generally during heavy rainfall or strong stream flow conditions since such conditions are unsuitable for egg-laying. Therefore, any survey based on detecting breeding frogs should be conducted within this time period, but not during or within one week of heavy rainfall or strong stream flow.

The Guidelines recommend that survey methods include nocturnal call playback and spotlighting while walking transects along the stream (minimum transect length of 200 m) under conditions when the substrate and leaf litter is wet. The minimum survey effort for calling surveys for adult male Fleay's Barred Frogs is a minimum of two nights under ideal conditions repeated on at least four separate survey occasions in the activity period. There are no minimum survey effort guidelines for surveying larval frogs. A stable and successfully reproducing frog population is comprised of both adult and larval (i.e. tadpole) life stages. Monitoring baseline population status and to detect change over time therefore requires survey of both adult and larval life stages, where feasible.

The baseline survey method targets the riparian areas where the creek crossings will occur and is the point of potential impact on the population. It focuses on measuring: (a) the relative abundance of adult Fleay's Barred Frogs, particularly calling males, within 20 m of permanent streams, where most

adult frog activity is concentrated; and (b) the relative abundance of Fleay's Barred Frog tadpoles in pools of permanent streams.

The baseline surveys will be supplemented with survey of adult frogs along the existing Cascade Track and survey of tadpoles at two additional control sites along permanent streams adjacent to the focal streams.

3.2.1. Survey Method

A transect will be established upstream (100m) and downstream (100m) of the crossings of Blackfellow Creek (Figure 2, Figure 3) and Dalrymple Creek (Figure 4, Figure 5) providing a Before-After Control-Impact (BACI) design. Each nocturnal survey shall start at least 45 minutes after sunset and will involve walking slowly and quietly along the transect listening for calling frogs and searching for foraging frogs based on reflective eye-shine from the light of a head-torch within 20 m of each side of the stream, and pausing at intervals to use call-playback to stimulate calling (in accordance with the 'Audio strip transect survey' method). The position of all frogs seen or heard along the transects between the start and end points will be recorded using a hand-held GPS. Adult frogs are not proposed to be captured and sexed using measurements of body size since: (a) it is time-consuming and there is no peer-reviewed published and tested method to reliably sex all frogs encountered; and (b) sexing of frogs has no bearing on the monitoring of relative abundance for detection of potential project impacts.

A supplementary survey will occur with the positions of all frogs seen or heard along the Cascades Circuit (Figure 4) from Manna Gum Campground to the Dalrymple Creek crossing point (a 2,700 m long transect survey through prime foraging habitat) will be recorded using a hand-held GPS on each survey night, while walking to or from the Dalrymple Creek crossing site.

The presence and relative abundance of Fleay's Barred Frog larvae (tadpoles) will be determined by dip-netting in five pools per 100 m transect (upstream and downstream of each crossing point) during the day. These locations will be georeferenced with GPS to allow for repeat sampling in following years. Tadpoles will be captured, identified, and released at the same location. The total number of Fleay's Barred Frog tadpoles captured in each of two 5-second sweeps of the net at each pool will be recorded. An additional two control sites will be selected on adjacent streams, and tadpoles will also be sampled in these.

Observations will be summarised as counts/hour providing an index of relative abundance that can be compared across sites and years.

3.2.2. Location

The location of the crossing of Blackfellow Creek is shown in Figure 2. Figure 3 shows the start point and end point of the 100m frog monitoring and riparian habitat monitoring transects upstream and downstream of Blackfellow Creek. The location of the Dalrymple Creek crossing (relative to the Cascade Trail crossings is shown in Figure 4. Figure 5 shows the start point and end point of the 100m frog monitoring and riparian habitat monitoring transects upstream and downstream of Dalrymple Creek.

3.2.3. Timing

The recommended timing for surveys to characterise population size of Fleay's Barred Frog is late summer (Quick *et al*. 2015) since Fleay's Barred Frogs are more active along creeks during the late breeding season (Stratford et al. 2010, Quick et al. 2015). At least two separate surveys for adult

frogs will be conducted, one in the early-mid breeding season[1] (September-December), one in the mid-late breeding season (January-March), during ideal conditions, at each of the crossing points.

Ideal conditions for adult surveys are defined as when the substrate and leaf litter are wet after a rainfall event of at least 20mm, but not during strong stream flow conditions within the first week after heavy rainfall. Ideal conditions for larval surveys are defined as base stream flow conditions, i.e. not during strong stream flow conditions within the first week after heavy rainfall.

3.2.4. Effort

Sampling of adults will be repeated for at least two nights at each site when the substrate and leaf litter are wet after a rainfall event of at least 20mm, but not during strong stream flow conditions within the first week after heavy rainfall.

Sampling of tadpoles with 2 x 5-second sweeps of a net per pool will occur once during each sampling period, repeated on four sampling occasions.

Sampling will be undertaken by the same suitably qualified expert.

3.2.5. Frequency

Sampling of adult frogs will occur over two sample periods (early and late season) of a minimum of two night's duration under ideal conditions. Tadpoles will therefore be sampled on four sampling occasions.

3.2.6. Responsibility

The baseline survey will be undertaken by a suitably qualified expert and responsibility for the conduct and reporting of the baseline survey is held by the Spicers General Manager (Land & Environment).

[1] Males will only reliably respond to recorded calls during the breeding season. This method will not work efficiently during the non-breeding season.

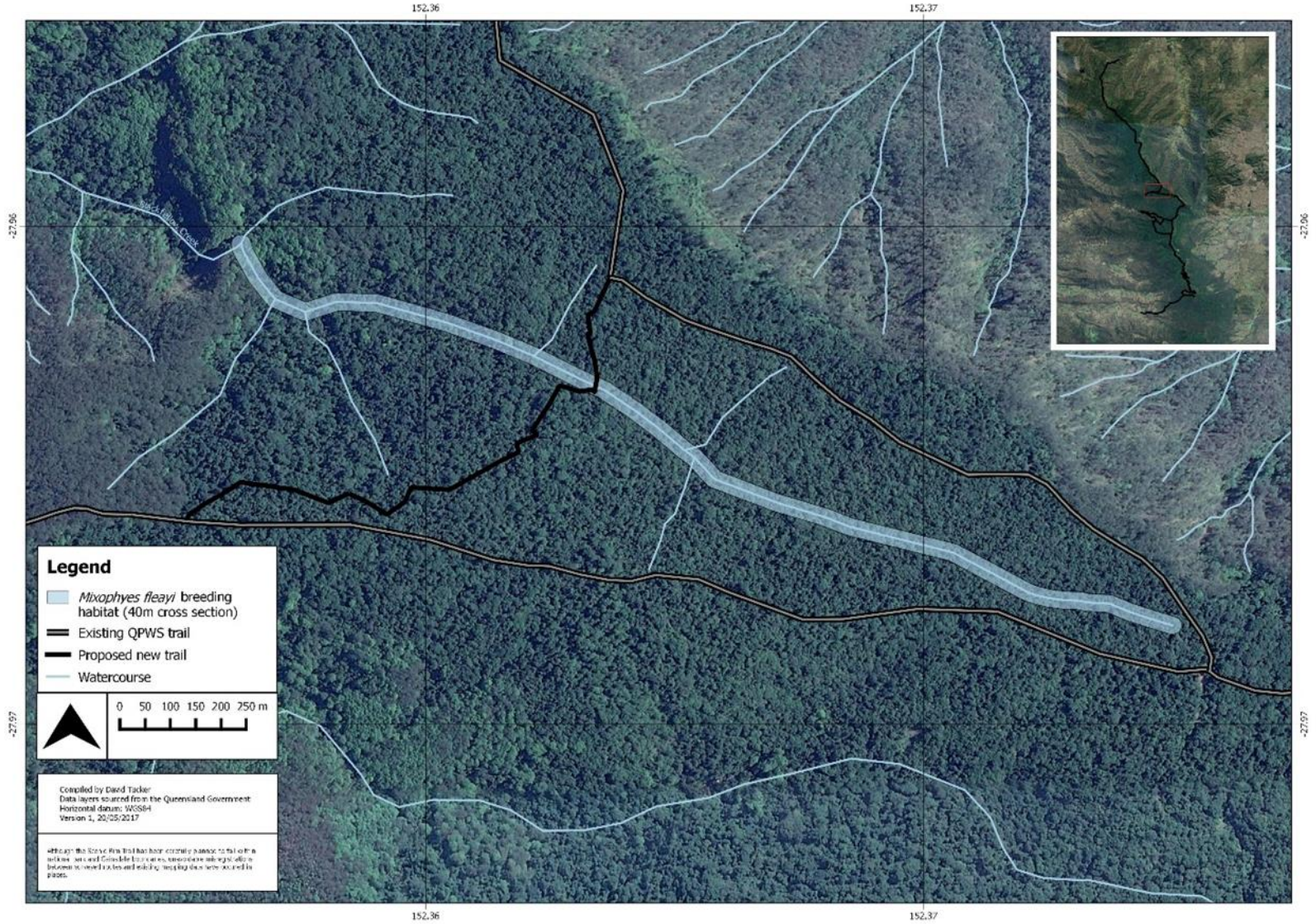

Figure 2 Location of the new Blackfellow Creek crossing, and Fleay's Barred Frog breeding habitat

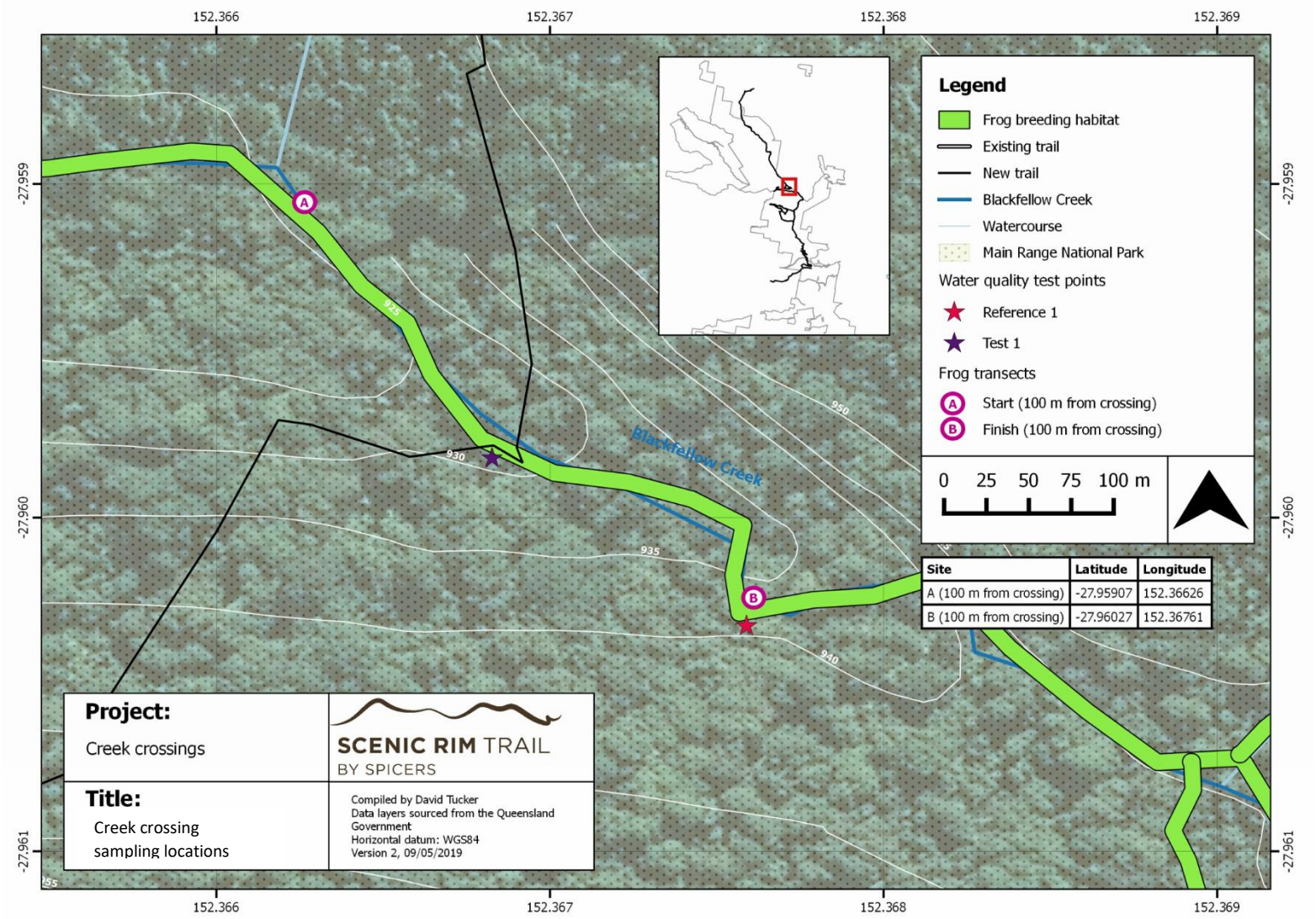

Figure 3 Location of the downstream start point (A) and upstream end point (B) of the frog monitoring transects, riparian habitat, and water quality sampling points for the Blackfellow Creek crossing. Note that sampling point Test 1 is below the actual crossing.

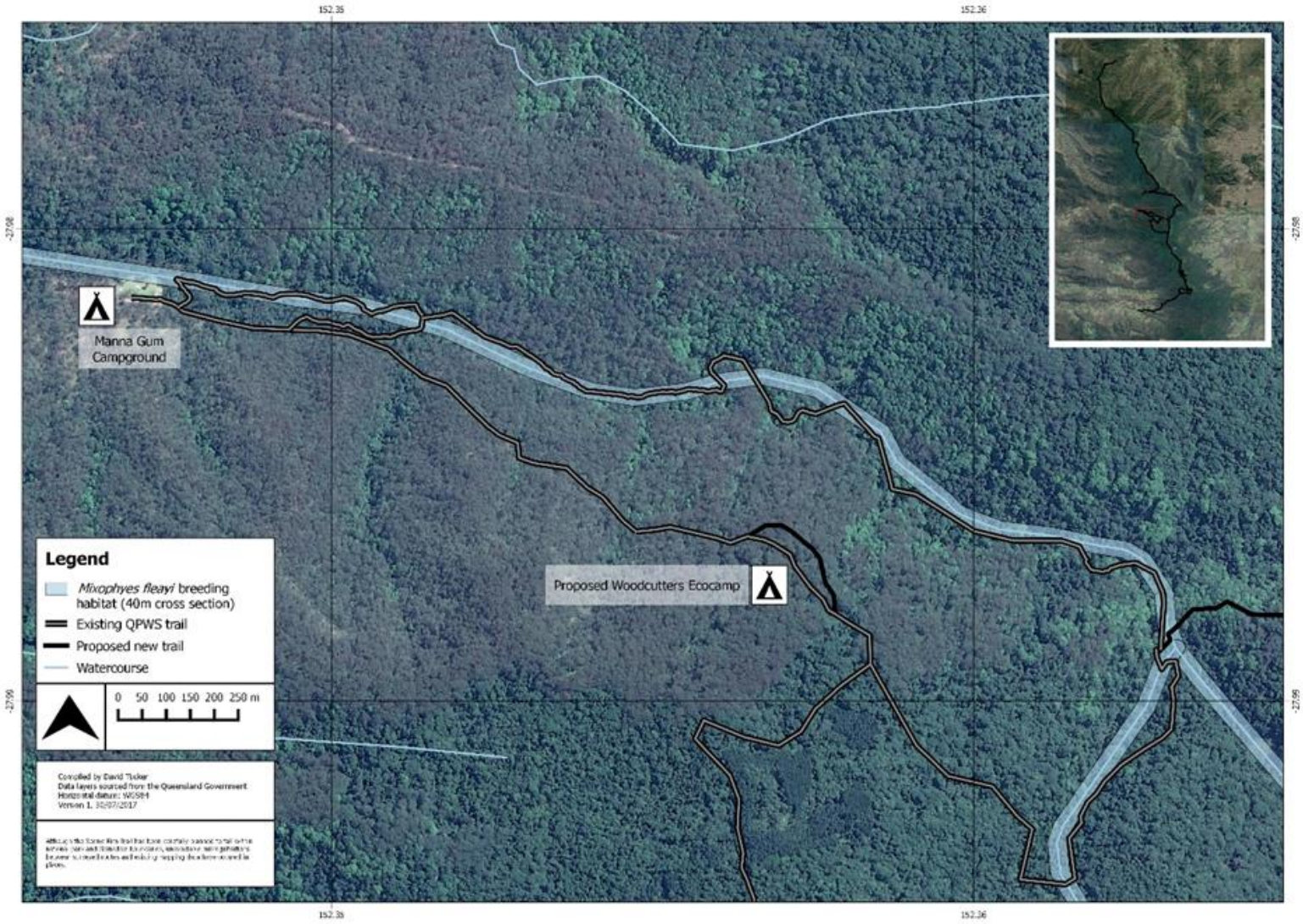

Figure 4 Location of the new Dalrymple Creek crossing (black line, lower right of figure) within breeding habitat. The Cascade Trail (foraging and breeding habitat) is shown from Manna Gum campground along Dalrymple Creek to the new creek crossing.

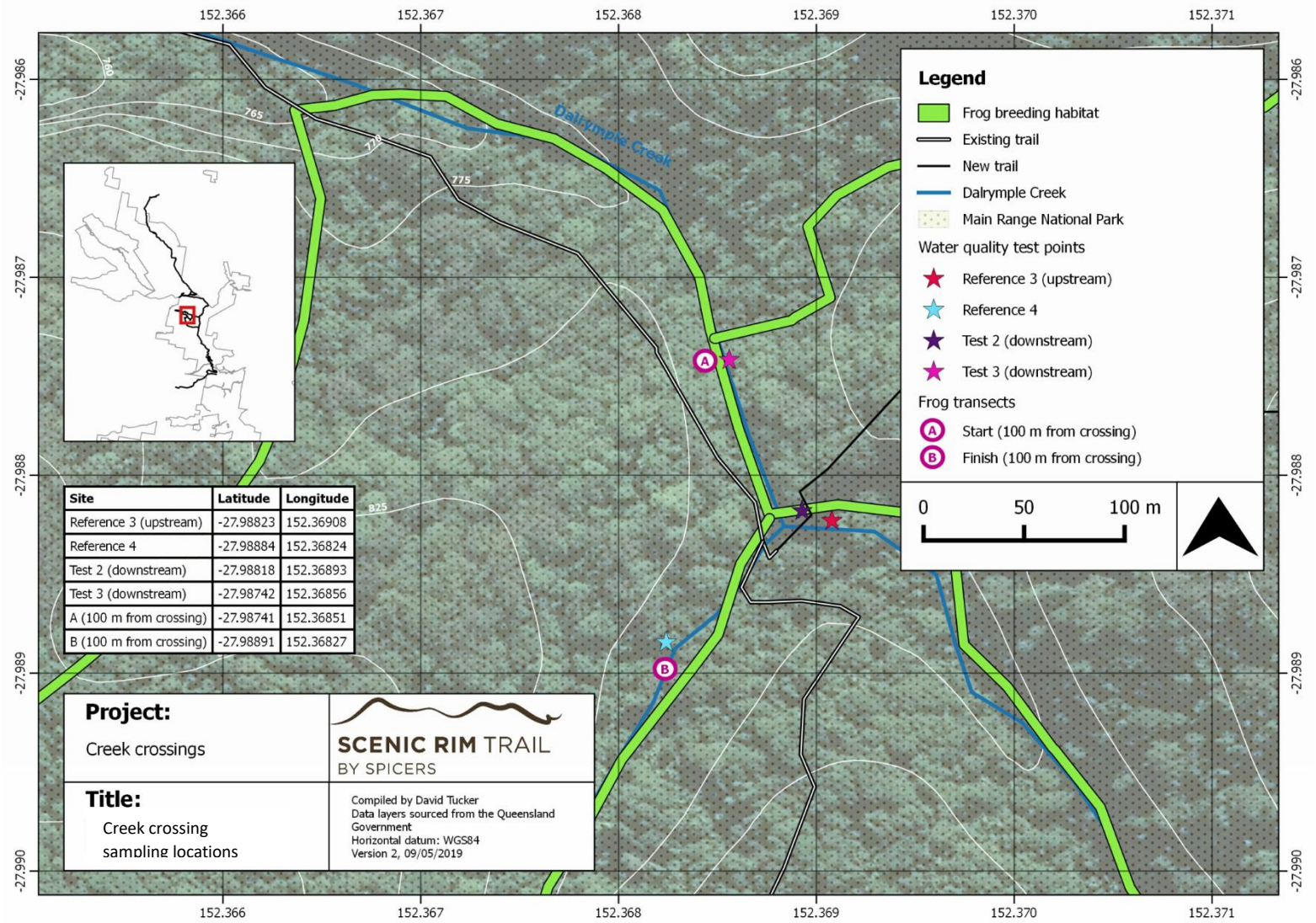

Figure 5 Location of the downstream start point (A) and upstream end point (B) of the frog monitoring transects, riparian habitat, and water quality sampling points for the Dalrymple Creek crossing.

4. Condition 8.b. - Mountain Frog

4.1. Ecology and Habitat

The Mountain Frog (*Philoria kundagungan*) is not listed by the EPBC Act but is part of the ecological values of the GRAWHA. This species requires continually high moisture levels and is most common in subtropical and temperate rainforests. It is found in shallow burrows in mud, moss, or in leaf-litter in the headwaters and along the edges of constantly flowing streams or around permanent soaks in highland forest, usually co-occurring with Rainforest Spinach (*Elatostema reticulatum*). It also occurs in wet eucalypt forests, where rock outcrops or cliff bases hold surface moisture.

4.2. Baseline Survey Method

The survey method outlined below is in accordance with the Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (the Guidelines; NSW DECC 2009).

The Guidelines recommend that surveys for Mountain Frog should be conducted during the months of September to February and involve listening for calling males in areas of suitable habitat during the day when the species calls most actively. A minimum of one 200-metre transect per water body should be surveyed, with a repeated survey occurring on a second day. However, Mountain Frog calling data collected using continuously recording song meters by Liam Bolitho, a post-graduate student at Southern Cross University, in Main Range National Park in 2016 showed that Mountain Frogs were calling most actively in September and October at one location and September to December at a second location, but with limited calling activity thereafter. These data suggest that the peak calling period for Mountain Frog in Main Range National Park is September to early November (Liam Bolitho, personal communication).

4.2.1. Survey Method

Mountain Frogs will be surveyed during the daytime. Rainforest Spinach habitat along the upstream and downstream transects of Blackfellow and Dalrymple creeks established for Fleay's Barred Frog surveys (Figure 3 and Figure 5) will be surveyed for calling adult male frogs. The audio strip transect survey method will be applied and the number and location of calling frogs will be recorded on handheld GPS.

Rainforest Spinach habitat has been mapped along the SRT and this is shown for the whole SRT on Figure 6 and is included in mapped riparian breeding habitat in Figure 2 and Figure 4. Rainforest Spinach habitat within 50m of new tracks will be surveyed for calling male frogs during the daytime using the audio point survey approach where habitat patches are small). The number and location of frogs will be recorded on handheld GPS.

The survey approach for Mountain Frog will focus on survey for adult frogs during optimal times for male calling activity only; surveys for Mountain Frog larvae are not feasible since the nests are highly cryptic and would typically be destroyed during the effort to locate them.

Observations will be summarised as counts/hour providing an index of relative abundance that can be compared across sites and years.

4.2.2. Location

The location of the crossings of Blackfellow Creek and Dalrymple Creek are shown in Figure 2 – Figure 5. The location of the rainforest spinach habitat adjacent to the SRT is shown on Figure 6.

4.2.3. Effort

Sampling will be limited to two separate, consecutive days at each site by the same suitably qualified expert. The 100m transects and the sites adjacent to the SRT will be walked at the same time once each day.

4.2.4. Timing

Surveys will be undertaken between September - November (the main calling period for this species at Main Range National Park; Liam Bolitho pers. comm.).

4.2.5. Frequency

Sampling will occur in conjunction with the Fleay's Barred Frog surveys.

4.2.6. Responsibility

The baseline survey will be undertaken by a suitably qualified expert and responsibility for the conduct and reporting of the baseline survey is held by the Spicers General Manager (Land & Environment).

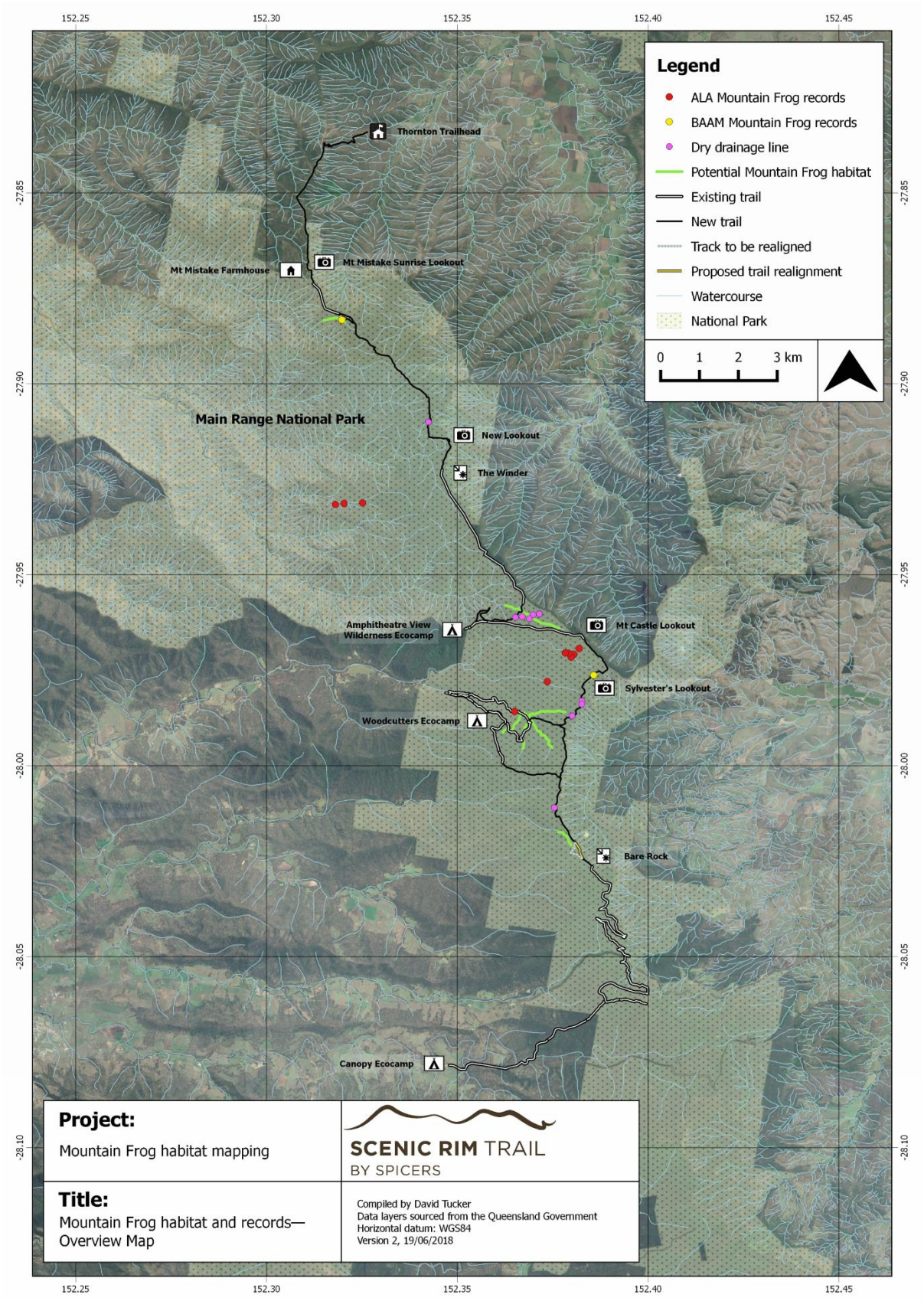

Figure 6 Location of Mountain Frog rainforest spinach habitat adjacent to new SRT trails

5. Condition 8.c. - Water Quality at Creek Crossings

5.1. Water Quality

The quality of Queensland waters is protected under the Environmental Protection (Water) Policy 2009 (EPP (Water)). The EPP (Water) achieves the object of the *Environmental Protection Act* 1994 (EP Act) to protect Queensland's waters while supporting ecologically sustainable development.

Water quality objectives (WQOs) define the physical, chemical and biological characteristics of Queensland waters (e.g. nitrogen content, dissolved oxygen, turbidity, toxicants). The objective for high ecological value (HEV) waters are to maintain or achieve effectively unmodified water quality.

Water quality at these forested sites is projected to be relatively high during base flow conditions and low during high flow and flood flow conditions because of inflows of sediments and nutrients from the surrounding catchments. The published 80th percentile values for HEV waters in south eastern catchments of the Condamine River Basin (DES 2018a) will provide an indicator of water quality of Blackfellow Creek and Dalrymple Creek (Table 1), i.e. the median quality values should be lower than the 80th percentile of concentration values of the reference values[2].

Table 1 80th percentile water quality objectives for high ecological value waters

Ammonium – N	Oxidised – N	Total N	Filterable P	Total P	Chlorophyll-a	Dissolved Oxygen	Turbidity	Suspended Solids	pH	Conductivity	Sulfate Alkalinity
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	%	NTU	mg/L	pH Units	µS/cm	mg/L ($CaCO_3$)
40	275	1510	130	560	ID	110	90	105	8.1	335	140

5.2. Baseline Survey Method

The survey method outlined below is in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy (DES 2018b) and the Australian Guidelines for water quality monitoring and reporting (ANZECC and ARMCANZ 2000).

5.2.1. Survey Method

Surface water will be collected in sterile equipment from moving water instream and tested onsite for pH, EC, dissolved oxygen (DO), turbidity, and temperature. Samples, including replicates and samples for quality control, will be bottled, stored in an esky with ice at 4°C, and sent to a NATA accredited laboratory within the designated holding timeframes for the following analysis:

- Total Suspended Solids (mg/L);
- *E. coli* (cfu/100ml);
- Ammonia (mg/L as N), Total Kjeldahl Nitrogen, Nitrate, Nitrite (mg/L as N);
- Total Phosphorus, Ortho Phosphate (mg/L);
- Major Anions - Chloride, Sulphate, Bicarbonate, Fluoride;
- Major Cations - Sodium, Potassium, Calcium, Magnesium

[2] https://www.waterquality.gov.au/anz-guidelines/monitoring/data-analysis/derivation-assessment

Industry standard Quality Assurance and Quality Control (QA/QC) procedures will be followed to avoid sample contamination.

5.2.2. Location

Sampling will occur at 7 locations; three downstream of the creek crossings and four control (reference) sites upstream of the creek crossings and at one other independent site (Figure 7). The sampling sites upstream and downstream of the creek crossings are shown in finer detail in Figure 3 and Figure 5. The one independent site will be sampled to provide a wider water quality context for the baseline surveys but will not be repeated in following years.

The three downstream test sites are located as follows: (1) Test 1 is approximately 10 m downstream from the Blackfellow Creek crossing point (Figure 3); (2) Test 2 is approximately 10 m downstream from the Dalrymple Creek crossing point, just above a waterfall that marks the confluence with another tributary (Figure 5); and (3) Test 3 is approximately 90 m downstream of the Dalrymple Creek crossing point (Figure 5), downstream of the confluence with the tributary on which Reference site 4 is located.

The four reference sites are located as follows: (1) Reference 1 is approximately 90 m upstream of the Blackfellow Creek crossing (Figure 3); (2) Reference 2 is approximately 100 m upstream of the Lookout Road crossing (Figure 8); (3) Reference 3 is approximately 20 m upstream of the Dalrymple Creek crossing on the same tributary as the crossing, above a waterfall that separates Reference 3 from the crossing point (Figure 8); (4) Reference 4 is on a different tributary of Dalrymple Creek to the crossing point and Reference 3, approximately 100 m upstream from the confluence of the two tributaries (Figure 5).

5.2.3. Effort

Sampling will occur three times per annum at each creek crossing and the one independent site under baseflow conditions. At least two samples will be collected at each site for onsite testing. At least two samples will be collected at each site for laboratory testing. A field duplicate sample will be collected per 10 samples.

5.2.4. Timing

Three surveys will be conducted at the Blackfellow Creek and Dalrymple Creek crossings per annum. Two sample periods will occur while frog populations are being monitored (the wet season) and one sample will occur during the dry season under ambient conditions. Sampling will occur during baseflow conditions and not within a week of a high rainfall event causing flooding.

5.2.5. Frequency

During the 10-year monitoring program sampling will occur three times per annum at Blackfellow Creek and Dalrymple Creek crossing under ambient conditions and will be repeated annually.

5.2.6. Responsibility

The baseline survey will be undertaken by a suitably qualified expert and responsibility for the conduct and reporting of the baseline survey is held by the Spicers General Manager (Land & Environment).

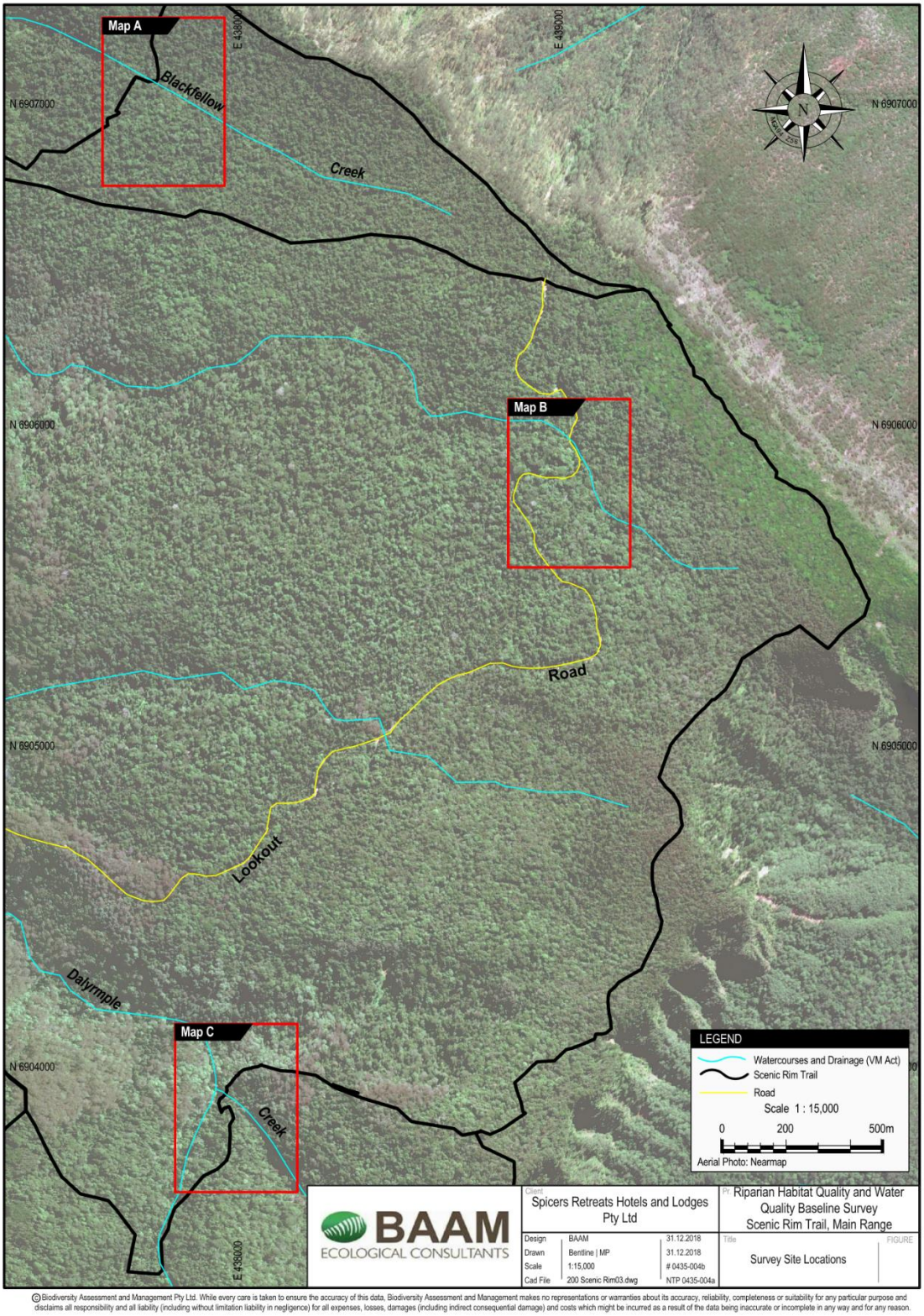

Figure 7 High level location of Creek crossing water quality sampling sites

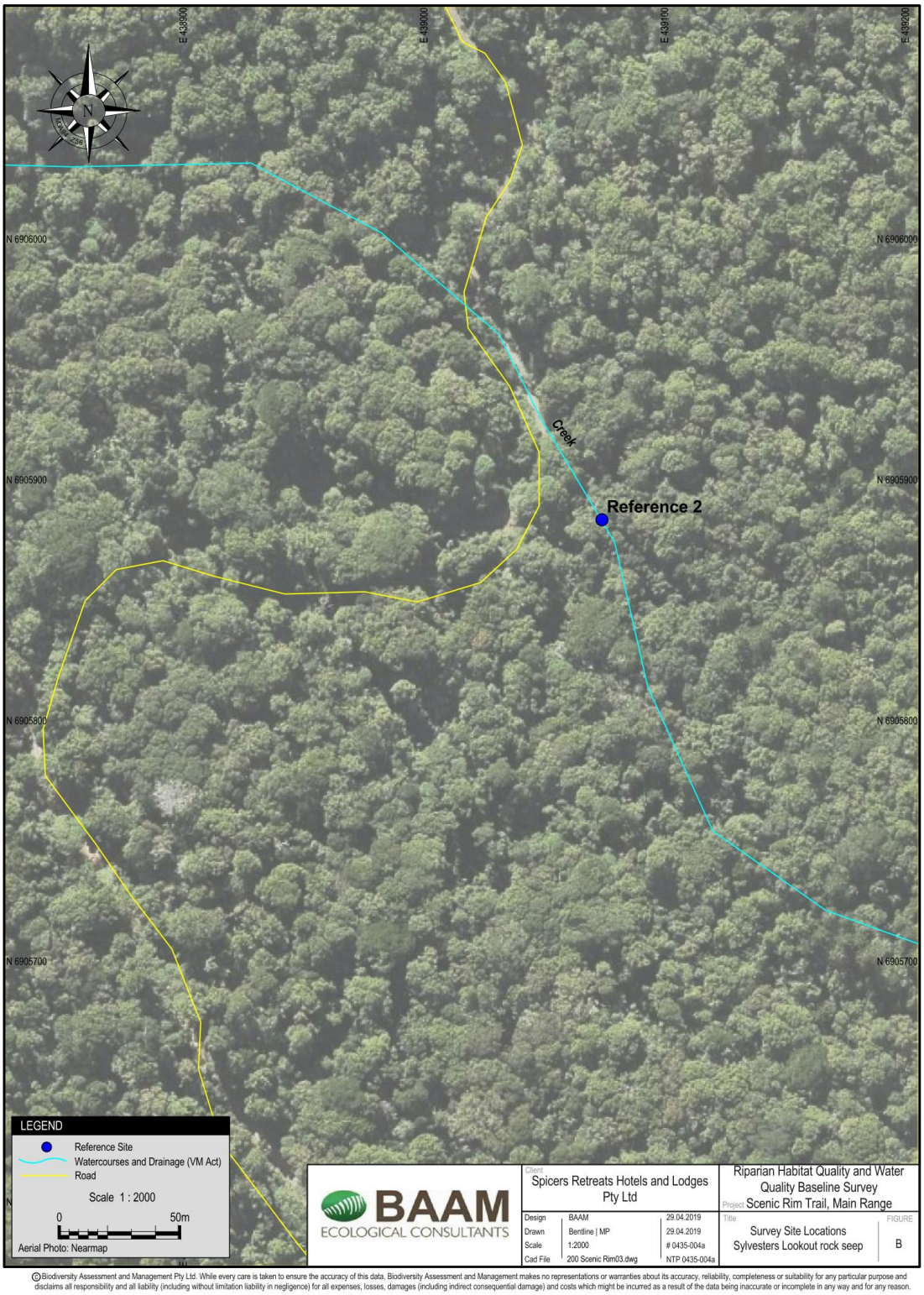

Figure 8 Map B Specific location of control water quality sampling site at unnamed creek, Lookout Road

6. Condition 8.d. Riparian Habitat at Creek Crossings

6.1. Ecology, Hydrology, and Geology

In MRNP, Fleay's Barred Frog occurs along first to third order permanent and semi-permanent freshwater streams between 100-1000 m in altitude[3]. They are not found in ponds or ephemeral pools. Adults may be found in leaf litter and along watercourses in rainforest and adjoining wet sclerophyll forests. They may also be found in areas where riparian vegetation has been disturbed and replaced by weeds, however this is considered marginal habitat.

During the breeding season males call from the riparian margins and instream from rock platforms. Females construct a nest in the shallow running water that occurs between pools in relatively wide, flat sections of the streams.

Similarly, Mountain Frog is found in shallow burrows in mud, moss, or in leaf-litter in the headwaters and along the edges of constantly flowing streams, usually co-occurring with Rainforest Spinach. Rainforest Spinach is a significant component of the riparian vegetation within 5 metres of Blackfellow Creek and Dalrymple Creek.

Blackfellow Creek within 100m upstream and downstream of the proposed new trail crossing is a high-energy headwater perennial stream located in the bed of a steep valley on an escarpment plateau. The stream has a bank full width of 3-4m and comprises a series of mostly shallow pools separated by short riffle zones, with occasional pools that reach a depth of a little over 0.5m. The streambed is stable, having a range of sediment sizes and comprised of consolidated (tightly arranged and packed) material, with a channel that is in a relatively natural state (not deepened or infilled) with bed and bar sediments roughly the same size. Many pools have a bedrock bed with loose cobbles and limited fine sediments. The baseflow is provided by groundwater.

The proposed crossing point of Blackfellow Creek occurs on a narrow, shallow, run and riffle section of the stream with gently sloping banks on either side. The creek will be crossed on a deposition bar of cobbles.

Dalrymple Creek within 100m upstream and downstream of the proposed new trail crossing is a high-energy headwater perennial stream located in the bed of a steep valley. The stream is sharply incised in the valley and has a bank full width of 5-10m above the crossing and 10-15m below the crossing below the junction with another stream. The stream above the proposed crossing comprises a series of mostly shallow pools separated by short riffle zones or flows over bedrock, with occasional pools that reach a depth of a little over 0.5m. The stream below the proposed crossing has larger, deeper pools interspersed with short riffle zones or flows over bedrock slopes or platforms. The baseflow is provided by groundwater.

The proposed crossing point of Dalrymple Creek is on a rock platform in shallow water below a small waterfall.

6.2. Baseline Survey Method

The survey method outlined below is in accordance with the Australian River Assessment System (AusRivAS) Physical Assessment Protocol, a standardised protocol for the assessment of stream physical condition, and a description of riparian groundcover vegetation community composition and structure (eWater CRC 2012). Particular attention will be focussed on indicators of key

[3] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25960

threatening processes for Fleay's Barred Frog[4] and Mountain Frog, i.e. the condition of the riparian vegetation (including Rainforest Spinach), trampling of riparian soils, and in-stream sediment.

6.2.1. Survey Method

Key threatening processes for Fleay's Barred Frog[5] and Mountain Frog associated with riparian habitat and instream condition will be assessed using the AusRivAS methods for the following indicators:

- Extent of trampling of sensitive groundcover vegetation, including Rainforest Spinach, along the riparian bank;
- Extent of erosion along the hiking trail in the vicinity of the creek crossings;
- Extent of feral pig tracks, scats, diggings or mud wallows;
- Extent of domestic cattle tracks, pugging, scats or browsing of groundcover vegetation, including Rainforest Spinach;
- Extent of sediment in the in-stream channel;
- Extent of damage to riparian bank stability; and
- Extent of weeds.

6.2.2. Location

Surveys will occur in the 100m transects upstream and downstream of the Blackfellow Creek and Dalrymple Creek crossings (Figure 3, Figure 5).

6.2.3. Effort

The 100m transect upstream and downstream of the Blackfellow Creek and Dalrymple Creek crossings (Figure 3, Figure 5) will be walked and the species and condition of the vegetation, the condition of the creek bank, and instream habitat condition, within a 5 metre strip either side of the creek will be recorded. This will be done twice during the Fleay's Barred Frog breeding season (September – March).

6.2.4. Timing

The surveys will be conducted between September – March during baseflow conditions and not within a week of a high rainfall event that causes flooding. This period is typically the summer rainy season.

6.2.5. Frequency

Two riparian habitat surveys will be conducted within the period September - March and will be repeated annually as part of the 10-year monitoring program.

6.2.6. Responsibility

The baseline survey will be undertaken by a suitably qualified person and responsibility for the conduct and reporting of the baseline survey is held by the Spicers General Manager (Land & Environment).

[4] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25960
[5] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25960

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