

## **Great Western Highway - Forty Bends**

### **Purple Copper Butterfly**

*Paralucia spinifera*



## **2019 FINAL Post-Construction Monitoring Report**



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**MJADWESCH**  
**ENVIRONMENTAL**  
**SERVICE SUPPORT**

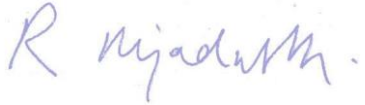
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Signed:

Date: 13 November 2019



Raymond Mjadwesch (BAppSc – Env Tech)

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Cover: *The Purple Copper Butterfly (Paralucia spinifera)*



## Introduction

Occupied Purple Copper Butterfly habitat along the Forty Bends Realignment of the Great Western Highway and the ecology and behaviour of the Purple Copper Butterfly was described in Mjadwesch (2012); Mjadwesch (2013) detailed the same for the Fern Hill section of the realignment. Management / operational procedures to minimise impacts on the threatened butterfly within and adjacent to the construction area were provided by GHD (2013) and NGH (2014). Locations of the occupied habitat areas are indicated in Figure 1; grid coordinates for each site are included as Table 1.

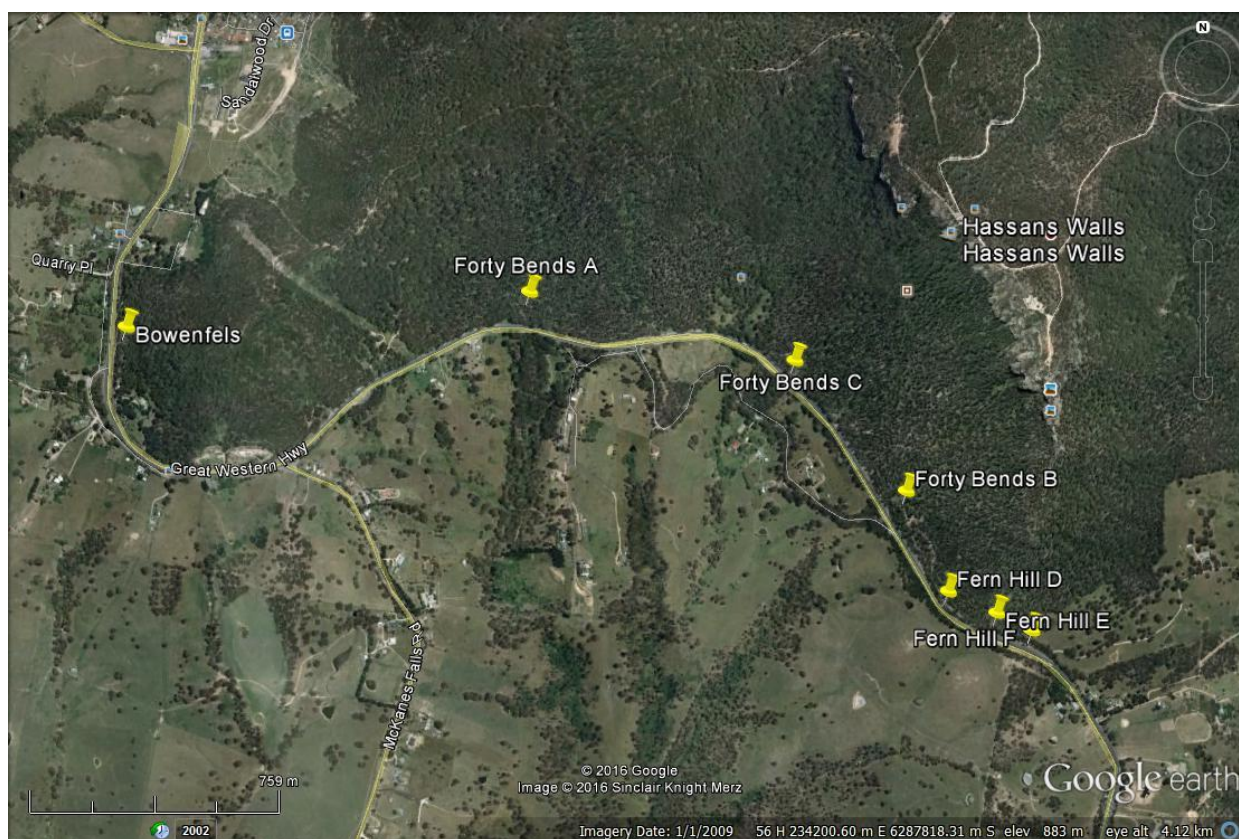


Figure 1. Location of Purple Copper Butterfly sites at Forty Bends

Table 1. Forty Bends / Fern Hill Purple Copper Butterfly Sites

Designation	Site Name	EASTING	NORTHING
L19(A)	Forty Bends A	233882	6288167
L19(B)	Forty Bends B	235016	6287612
L19(C)	Forty Bends C	234703	6287969
L19(D)	Fern Hill D	235150	6287318
L19(E)	Fern Hill E	235292	6287260
L19(F)	Fern Hill F	235397	6287211

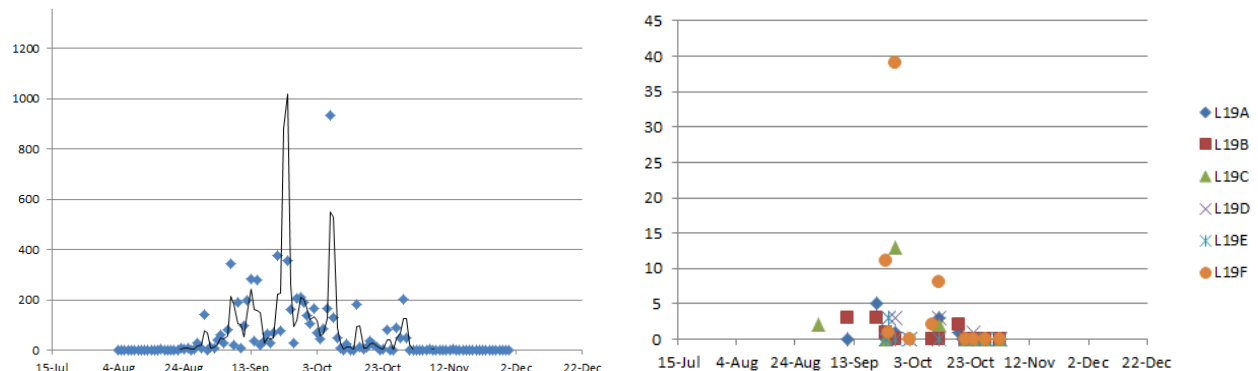
In addition a conservation offset property was identified near to the construction envelope, being referred to as L20. Donaldsons (E235529 N6287273). Annual monitoring of the offset site is also required as part of the post-construction monitoring program.

## Post-Construction Monitoring

Seymour Whyte Constructions were contracted to deliver the Great Western Highway MV2L safety upgrade, with works completed in 2017; Mjadwesch (2016) describes the known butterfly sites and impacts of the works program. Subsequently monitoring of (amongst other things) the Purple Copper Butterfly sites fell to the RMS; the RMS commissioned a monitoring program to quantify outcomes for the threatened butterfly; a monitoring report covering the years 2017 – 2018 was produced in February 2019; this is the final monitoring report covering the 2019 flying / active period.

## Methodology

Butterfly survey targeted each site under optimal conditions (sunny days) during the flying season (September – October), with site inspections conducted between 1000 – 1500 hrs.



Observations for the species define a flying period from late August – early November

Daytime inspections of known active sites included area searches of the entire known occupied area, and periods of observation. All butterflies observed were counted, and their locations were GPS'ed.

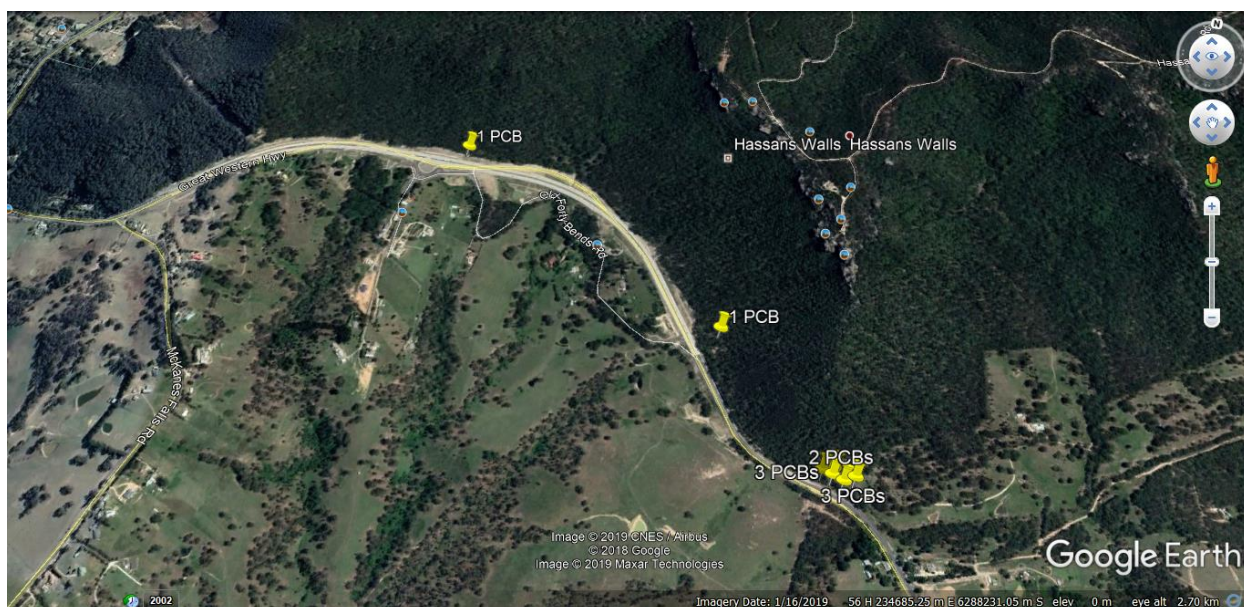
Data sheets from monitoring sessions in 2019 are attached as Appendix 1.

## Results

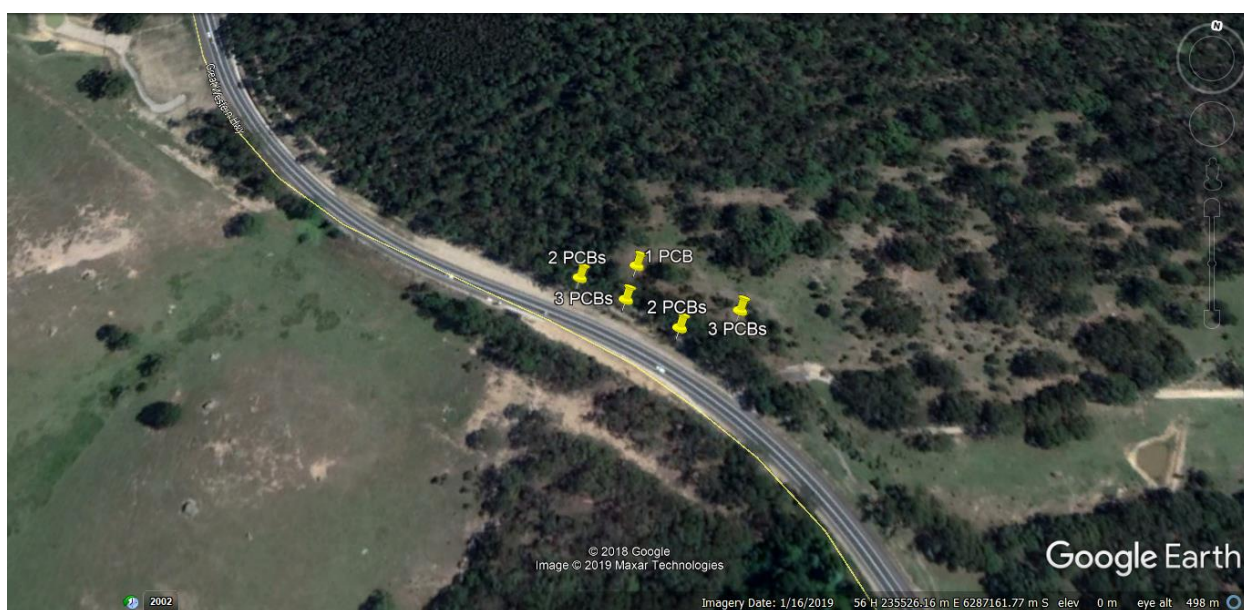
### 2019 Monitoring Period

25 September 2019	Forty Bends A (1110-1145)	Nil observed
	Forty Bends B (1235-1245)	P. spinifera (1)
	Forty Bends C (1430-1445)	Nil observed
	Fern Hill D (1225-1230)	Nil observed
	Fern Hill E (1220-1225)	Nil observed
	Fern Hill F (1200-1220)	P. spinifera (11)
	L20 (Donaldsons) (1310-1400)	P. spinifera (18)





Forty Bends – Fern Hill 25.9.2018 Purple Copper Butterfly observations



Fern Hill F: 25.9.2018 Purple Copper Butterfly observations (detail)

10 October 2018	Forty Bends A (1230-1245)	Nil observed
	Fern Hill F (1130-1215)	P. spinifera (2)

The 10<sup>th</sup> became increasingly overcast and survey was discontinued at 1245.

19 October 2018	Forty Bends A (1200-1230)	Nil observed
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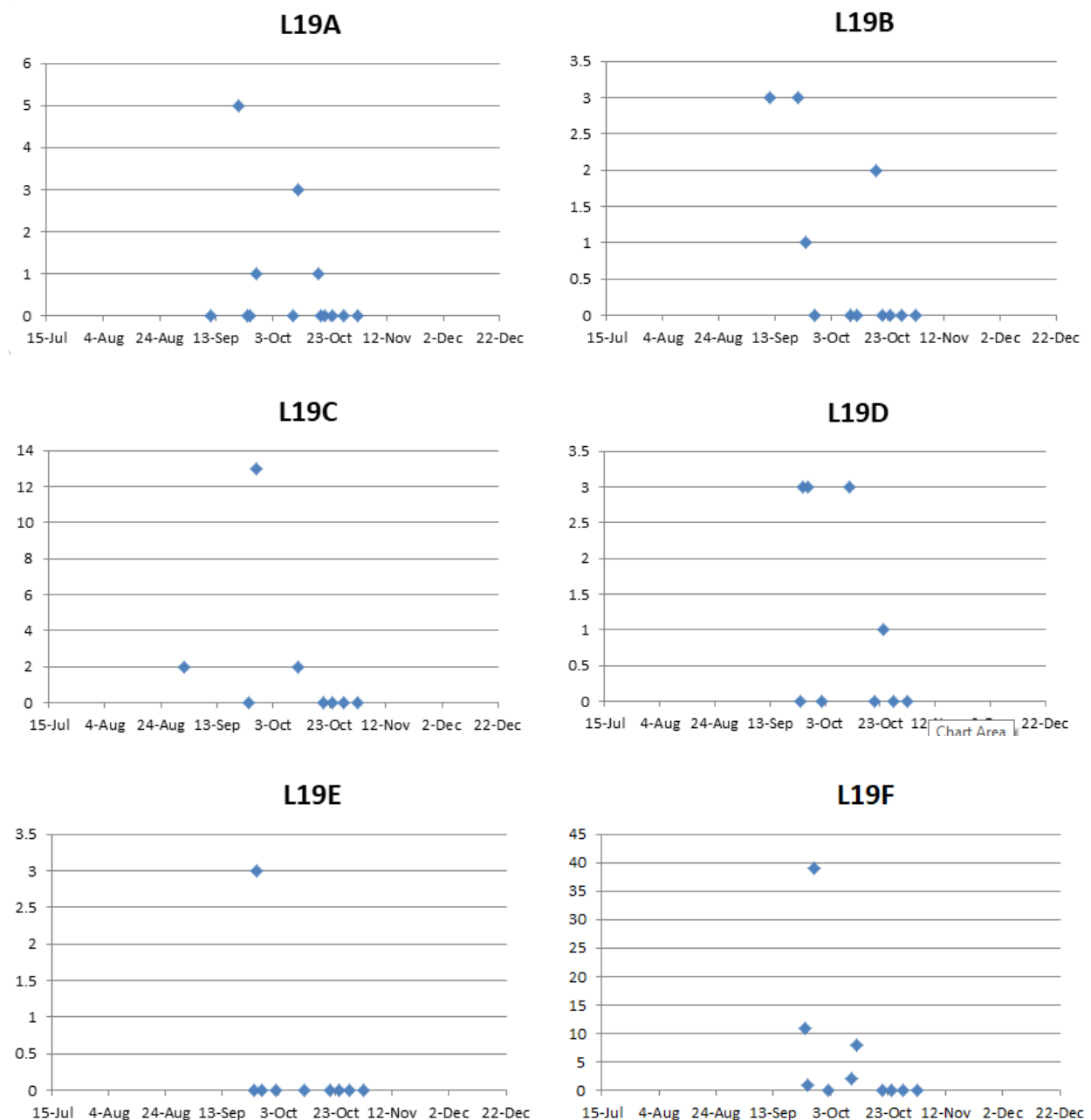
The 19<sup>th</sup> became increasingly overcast and survey was discontinued at 1230.

21 October 2018	Forty Bends A (1115-1145)	Nil observed
	Forty Bends B (1235-1245)	Nil observed
	Forty Bends C (1430-1445)	Nil observed
	Fern Hill D (1255-1300)	Nil observed
	Fern Hill E (1250-1255)	Nil observed
	Fern Hill F (1245-1250)	Nil observed
	L20 (Donaldsons) (1150-1245)	Nil observed

## Discussion – Forty Bends & Fern Hill

Sub-optimal survey conditions during early September 2019, with periods of rain and being often overcast, continued until the 22<sup>nd</sup> of September. The 25<sup>th</sup> of September was the first day that allowed for a couple of days of emergence (23-24 September) followed by a sunny day for survey, however conditions continued to be cool, and more heavily shaded sites were not observed to be active even under these conditions. Subsequently early October also proved to be frequently cloudy with occasional rain (see Appendix 2), with surveys being truncated due to increasingly overcast conditions on the 10<sup>th</sup> and 19<sup>th</sup> of October, and with the first full sunny day (the 21<sup>st</sup> of October) confirming the end of the flying season at Forty Bends for 2019.

Sites at Forty Bends / Fern Hill have been inspected enough times now to produce graphs of observations across the flying season, which seem to define an early finishing date in the Forty Bends / Fern Hill area; inspections in the earlier part of the season (late August and early to mid September) have been infrequent – optimal sunny warm days during this part of the flying period have been infrequent in recent years.





Not illustrated in the graphs above are the observations from the inspection when the distribution of the species at each site were surveyed, at which time Forty Bends A was operating at its peak, with butterflies observed across a wide area extending ~100m into the adjacent roadside reserve (>20 observed). Nil observations on 25 September 2019 was countered by observation of a butterfly in the nearby roadside reserve under overcast conditions during the site stabilisation inspection on 30 September.

After failing to locate any Purple Coppers at Forty Bends B in 2017-2018 a single individual was again observed here in 2019, which is illustrative of the hit-and-miss nature of observations at sites which are small and/or intermittently active across the flying season. Conversely the highest ever recorded number at Forty Bends C in 2018 (13) was followed with nil observations in 2019, however the site was shady at the time of inspection in 2019 – surveys during this monitoring program have established the fact that this site needs to be inspected after 2:00PM for best results.

Fern Hill D was subject to intensive intervention during the construction phase, with caterpillars (190) being relocated out of the projected construction footprint ahead of re-shaping and stabilisation of the cutting here. Low numbers of imagos observed here in the period 2014-2018, and nil observations in 2019, are not indicative of a small population, given the numbers of caterpillars found during nocturnal work at the site. Confirmation of species persistence at this location by nocturnal survey in 2019 is recommended.

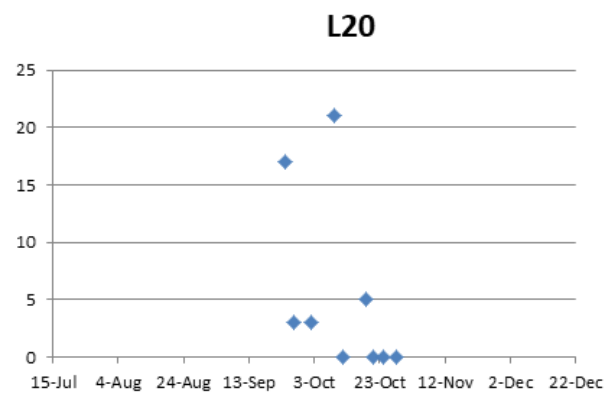
There have not been any observations of the species at Fern Hill E subsequent to the initial observation of three butterflies there in 2014; similarly for the location where a single butterfly was observed by Stokes (RMS Environment Officer) on the track between the Forty Bends B site and Fern Hill D. Like the Type locality at Yetholme, Fern Hill E may be ephemeral and/or active intermittently, being dependant on seasonal conditions, or perhaps being reliant on dispersing individuals moving across the wider habitat area, which is extensive between the Forty Bends B site and the Fern Hill F site, beyond which point Blackthorn distribution in the roadside reserve (east-bound) becomes discontinuous.

The Fern Hill F site is reliably active, with butterflies having open sunny habitats available on both sides of the belt of trees at different times of day, with the population being in fact contiguous and intermixing with the adjacent Donaldson's Off-set Site – butterflies have been observed crossing the fenceline.

An opportunistic check of the Neubecks Hill site following on from the survey at Forty Bends / Fern Hill / Donaldsons on the 21<sup>st</sup> of October confirmed that this site remained active (13 butterflies were observed); activity at this site has been recorded through until December, illustrating something of the temporal nature (short flying season) of some sites (for example the Forty Bends / Fern Hill complex), compared to other more reliably active sites.

## Discussion – L20. Donaldson’s (the Off-set Site)

L20. Donaldson’s (the Off-set site) continues to return observations; with scattered records over time, the majority of the site appears to provide habitat which supports a low-density population across a wide area. In 2019 the second highest number of individuals observed (17) indicates the site remains viable and active; nil observations at the eastern end of the known active area (above the dam) and at the “core” area in 2018/2019 whilst appearing elsewhere suggests the population is dynamic.



L20. Donaldsons: 25.9.2018 Purple Copper Butterfly observations



The “core” habitat area and habitat above the dam in the east of the Donaldson’s Off-set Site (pictured above) are sunny in the morning, but become shady by about lunch time. The 25 September survey visited these sites later in the day, when they were shady (no butterflies were observed); by 21 October butterflies seemed to have stopped flying throughout the site returning (nil obs at these locations in 2019).



## Recommendations

Lack of observations in 2019 at Forty Bends A and C and Fern Hill D and E is likely to be a consequence of the lack of opportunity to conduct survey during the early part of the flying season (the first two weeks in September) rather than an indication of absence, as sites here finish “early” with a very short active period, and where the populations consist of relatively few individuals. Persistence at these locations could be demonstrated by commissioning larvae (nocturnal) survey in November / December 2019 – positive observations of caterpillars would bring the post-construction monitoring to its conclusion.

Recommendations for management of the sites (road reserves and the Off-set Site) into the future should include on-going reduction of forest cover. The butterfly requires open sunny aspects and regenerating vegetation (principally eucalypts including Blaxlands Stringybark (*Eucalyptus blaxlandii*) and Monkey Gum (*E. cypellocarpa*) and Black Wattle (*Acacia melanoxylon*)) detracts from habitat values (image below), particularly at Fern Hill D and F, and in the Off-set Site.



*Sapling regeneration should be periodically thinned at Fern Hill D & F (pictured) and in the Off-set Site*

Patch burning could improve sections of habitat so that more high-density populations could be established locally – preliminary results from a trial burning program by the LLS in 2018 indicated a positive response to prescribed fire (Mjadwesch (2019)).

## Conclusion

Poor conditions through early September precluded effective survey during the early part of the season in 2019, however in late September good numbers were observed flying in sunnier habitat areas (Fern Hill F and the Off-set Site), and given good numbers observed in 2018 at other more shady sites (particularly Forty Bends C) there is no reason to expect that there has been any discernable impact of roadworks on butterfly populations adjacent to the highway realignment project area. Commissioning larvae survey (nocturnal) in November / December 2019 would be expected to confirm persistence at sites which returned nil observations during the flying season.

The 2019 survey sessions bring the 2 year post-construction monitoring period to a conclusion; butterflies were consistently found throughout the previously known extent of their distribution during monitoring sessions, even if this has been intermittently in some locations. There was no indication that habitat has been affected in any way that would preclude the butterflies continued occurrence at the site into the medium term.

Thinning of regenerating vegetation at Fern Hill D and F, and in the Off-set Site, would ensure habitat values are maintained in an optimal condition, to ensure the species persistence in the longer term.

## Bibliography / References

- GHD 2013 *Great Western Highway Upgrade (Forty Bends to River Lett Hill) Purple Copper Butterfly Management Plan* unpublished report to RMS
- GHD 2013 *Great Western Highway (Forty Bends Safety Upgrade) Purple Copper Butterfly EPBCA Act Offset Strategy* unpublished report to RMS
- Mjadwesch R 2012 *Purple Copper Butterfly Survey Report – Great Western Highway: Mt Victoria to Lithgow Realignment* unpublished report to SKM
- Mjadwesch R 2013 *Purple Copper Butterfly: Forty Bends - River Lett - Hartley Offset Assessment* unpublished report to RMS
- Mjadwesch R 2015 *Great Western Highway: Fern Hill Purple Copper Butterfly Management Program* unpublished report to RMS
- Mjadwesch R 2019 *Great Western Highway: Forty Bends Purple Copper Butterfly 2017-2018 Post Construction Monitoring Report* unpublished report to RMS
- Mjadwesch R 2019 *Purple Copper Butterfly 2018 Caterpillar Survey & Summary Report* Unpublished report to the LLS
- NGH 2014 *Review of Environmental Factors: Great Western Highway – Fern Hill* unpublished report to RMS
- NPWS 2001 *Environmental Impact Assessment Guidelines – Purple Copper Butterfly* OEH Hurstville



## APPENDIX 1: Data Sheets

### Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch **Contact:** Ray on 02 6331 5858

**Site:** L19. Forty Bends / Fern Hill **Date:** 25.9.2019 **Start time:** 1110 **Finish time:** 1430

**GPS co-ordinates:** **Map Zone:** 56 **Map datum:** .....

A 233882 6288167; B 235016 6287612; C 234703 6287969

D 235150 6287318; E 235292 6287260; F 235397 6287211

#### Weather conditions

Cloud cover:

- ☒ None  
☐ Up to 25%  
☐ 26 – 50%  
☐ 51 – 80%  
☐ Overcast

Wind:

- ☒ None  
☐ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☒ 11–20°C  
☐ 21–29°C  
☐ 30°C +

**Site Conditions:** Air temp.:..... Ground temp.:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- ☒ Blackberry  
☐ St John's Wort  
☐ Sweet Briar

- ☐ Phalaris  
☐ Willow  
☐ Verbena (purple top)

- ☐ Hawthorn  
☐ Thistle  
☐ Primrose

- ☐ Broom  
☐ Pine  
☐ Cotoneaster

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☐ 1-5 ☐ 5-10 ☐ 10-30 ☐ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number: A = 0; B = 1; C = 0; D = 0; E = 0; F = 11

**Butterfly behaviour:** Flying ☒ Basking ☒ Breeding ☐ Feeding ☐ Fighting ☐

☐ Other behaviour (describe).....

If feeding, identify (or describe) plants used: .....

Other insects present on *Bursaria*: Bees, Blowflies, Bee-flies, Dragonflies

Other butterflies (describe): *Paralucia aurifer* at Forty Bends B (1) and Fern Hill D (1)

Other observations at this site: Flowering plants include *Hardenbergia violacea*, *Leucopogon lanceolata*, *Stackhousia viminea*, *Glycine spp.*, *Caladenia spp.* Forty Bends A and C were shady.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.

## Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch

**Contact:** Ray on 02 6331 5858

**Site:** L20. Donaldsons **Date:** 25.9.2019 **Start time:** 1310 **Finish time:** 1400

**GPS co-ordinates:** E235529 N6287273 **Map Zone:** 56 **Map datum:**

### Weather conditions

Cloud cover:

- ☒ None  
☐ Up to 25%  
☐ 26 – 50%  
☐ 51 – 80%  
☐ Overcast

Wind:

- ☐ None  
☒ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☒ 11–20°C  
☐ 21–29°C  
☐ 30°C +

**Site Conditions:** Air temp.:..... Ground temp.:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- |  |  |                                   |                                      |
|--|--|-----------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Blackberry | <input type="checkbox"/> Phalaris              | <input type="checkbox"/> Hawthorn | <input type="checkbox"/> Broom       |
| <input type="checkbox"/> St John's Wort        | <input type="checkbox"/> Willow                | <input type="checkbox"/> Thistle  | <input type="checkbox"/> Pine        |
| <input type="checkbox"/> Sweet Briar           | <input type="checkbox"/> Verbenum (purple top) | <input type="checkbox"/> Primrose | <input type="checkbox"/> Cotoneaster |

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☐ 1-5 ☐ 5-10 ☐ 10-30 ☒ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number: 18

**Butterfly behaviour:** Flying ☒ Basking ☒ Breeding ☐ Feeding ☐ Fighting ☐

☐ Other behaviour (describe) Courting

If feeding, identify (or describe) plants used:

.....

Other insects present on *Bursaria*:

Other butterflies (describe): Skipper (*Suniana spp*), Meadow Argus (*Junonia villida*)

Other observations at this site: Main site and dam site shady in the afternoon / during this assessment; Gang-gangs calling.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.

## Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch

**Contact:** Ray on 02 6331 5858

**Site:** L19. Forty Bends / Fern Hill **Date:** 10.10.2019 **Start time:** 1130 **Finish time:** 1245

**GPS co-ordinates:** Map Zone: 56 **Map datum:** .....

A 233882 6288167; F 235397 6287211

### Weather conditions

Cloud cover:

- ☐ None  
☐ Up to 25%  
☐ 26 – 50%  
☒ 51 – 80%  
☐ Overcast

Wind:

- ☐ None  
☒ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☒ 11-20°C  
☐ 21-29°C  
☐ 30°C +

**Site Conditions:** Air temp.:..... Ground temp.:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- ☒ Blackberry  
☐ St John's Wort  
☐ Sweet Briar

- ☐ Phalaris  
☐ Willow  
☐ Verbenum (purple top)

- ☐ Hawthorn  
☐ Thistle  
☐ Primrose

- ☐ Broom  
☐ Pine  
☐ Cotoneaster

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☐ 1-5 ☒ 5-10 ☐ 10-30 ☐ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number: A = 0; F = 2 at 12:05

**Butterfly behaviour:** Flying ☒ Basking ☒ Breeding ☐ Feeding ☐ Fighting ☐

☐ Other behaviour (describe) Emerging (still cool and shady).

If feeding, identify (or describe) plants used:

Other insects present on *Bursaria*: Dragonflies, blowflies,

Other butterflies (describe): Skipper (*Suniana spp*)

Other observations at this site: *Comesperma ericinum* flowering. Became too cloudy by 12:45 so survey was discontinued.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.

## Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch

**Contact:** Ray on 02 6331 5858

**Site:** L19. Forty Bends / Fern Hill **Date:** 19.10.2019 **Start time:** 1200 **Finish time:** 1230

**GPS co-ordinates:** Map Zone: 56 Map datum: .....

A 233882 6288167

### Weather conditions

Cloud cover:

- ☐ None  
☐ Up to 25%  
☐ 26 – 50%  
☒ 51 – 80%  
☐ Overcast

Wind:

- ☐ None  
☒ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☒ 11-20°C  
☐ 21-29°C  
☐ 30°C +

**Site Conditions:** Air temp.:..... Ground temp.:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- ☒ Blackberry  
☐ St John's Wort  
☐ Sweet Briar

- ☐ Phalaris  
☐ Willow  
☐ Verbenum (purple top)

- ☐ Hawthorn  
☐ Thistle  
☐ Primrose

- ☐ Broom  
☐ Pine  
☐ Cotoneaster

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☒ 1-5 ☐ 5-10 ☐ 10-30 ☐ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number:

**Butterfly behaviour:** Flying ☐ Basking ☐ Breeding ☐ Feeding ☐ Fighting ☐

☐ Other behaviour (describe)

If feeding, identify (or describe) plants used:

Other insects present on *Bursaria*: Blowflies,

Other butterflies (describe): Bright Copper (*Paralucia aurifer*)(1), Caper White (*Belenois java teutonia*)

Other observations at this site: Flowering plants include *Comesperma ericinum*, *Hardenbergia violacea*, *Podolobium ilicifolium*, *Stackhousia viminalis*, *Caladenia* spp. Became cloudy at 12:30 so survey was discontinued.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.

## Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch

**Contact:** Ray on 02 6331 5858

**Site:** L19. Forty Bends / Fern Hill **Date:** 21.10.2019 **Start time:** 1115 **Finish time:** 1345

**GPS co-ordinates:** **Map Zone:** 56 **Map datum:** .....

A 233882 6288167; B 235016 6287612; C 234703 6287969

D 235150 6287318; E 235292 6287260; F 235397 6287211

### Weather conditions

Cloud cover:

- ☒ None  
☐ Up to 25%  
☐ 26 – 50%  
☐ 51 – 80%  
☐ Overcast

Wind:

- ☐ None  
☒ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☐ 11–20°C  
☒ 21–29°C  
☐ 30°C +

**Site Conditions:** Air temp:..... Ground temp:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- |  |   |                                   |                                      |
|--|---|-----------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Blackberry | <input type="checkbox"/> Phalaris             | <input type="checkbox"/> Hawthorn | <input type="checkbox"/> Broom       |
| <input type="checkbox"/> St John's Wort        | <input type="checkbox"/> Willow               | <input type="checkbox"/> Thistle  | <input type="checkbox"/> Pine        |
| <input type="checkbox"/> Sweet Briar           | <input type="checkbox"/> Verbena (purple top) | <input type="checkbox"/> Primrose | <input type="checkbox"/> Cotoneaster |

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☒ 1-5 ☐ 5-10 ☐ 10-30 ☐ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number:

**Butterfly behaviour:** Flying ☐ Basking ☐ Breeding ☐ Feeding ☐ Fighting ☐

Other behaviour (describe).....

If feeding, identify (or describe) plants used: .....

Other insects present on *Bursaria*:

Other butterflies (describe): Ant Blue (*Zizina labradus*) at Fern Hill D

Other observations at this site: Flowering plants at Forty Bends C include *Chrysicephalum apiculatum*, *Diuris macullata*, *Vittadinia spp*, *Caladenia spp*, and at Fern Hill D *Podolepis spp* and *Linum marginale*. Forty Bends C was still shady.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.



## Purple Copper Butterfly Survey Form

**Observer(s)'s name(s):** Raymond Mjadwesch

**Contact:** Ray on 02 6331 5858

**Site:** L20. Donaldsons **Date:** 21.10.2019 **Start time:** 1150 **Finish time:** 1245

**GPS co-ordinates:** E235529 N6287273 **Map Zone:** 56 **Map datum:**

### Weather conditions

Cloud cover:

- ☒ None  
☐ Up to 25%  
☐ 26 – 50%  
☐ 51 – 80%  
☐ Overcast

Wind:

- ☐ None  
☒ Light breeze  
☐ Light wind  
☐ Steady wind  
☐ Strong wind

Precipitation:

- ☒ None  
☐ Drizzle  
☐ Light rain  
☐ Heavy rain night before  
☐ Downpour

Temperature:

- ☐ < 0°C  
☐ 0 – 10°C  
☐ 11–20°C  
☒ 21–29°C  
☐ 30°C +

**Site Conditions:** Air temp.:..... Ground temp.:..... Relative humidity:..... Shade:.....%  
(if thermometer held)

**Weeds present** Yes ☒ No ☐

If yes, identify where possible:

- ☒ Blackberry  
☐ St John's Wort  
☐ Sweet Briar

- ☐ Phalaris  
☐ Willow  
☐ Verbenum (purple top)

- ☐ Hawthorn  
☐ Thistle  
☐ Primrose

- ☐ Broom  
☐ Pine  
☐ Cotoneaster

Other Weeds / Notes:

**% weed invasion:** up to 10% ☒ 10-25% ☐ 25-50% ☐ 50-75% ☐ >75% ☐

**Attendant ant:** Present ☐ Absent ☐

**Survey method:** Transect ☐ Area search ☒ Stationary ☐

**Number of butterflies observed:** None ☒ 1-5 ☐ 5-10 ☐ 10-30 ☐ 30-50 ☐ 50-100 ☐ >100 ☐

Other / exact number:

**Butterfly behaviour:** Flying ☐ Basking ☐ Breeding ☐ Feeding ☐ Fighting ☐

Other behaviour (describe).....

If feeding, identify (or describe) plants used: .....

Other insects present on *Bursaria*: Dragonflies, Bee-flies

Other butterflies (describe): Bright Copper (*Paralucia aurifer*)(2+1) at main site.

Other observations at this site: Flowering plants include *Hibbertia obtusifolia*, *Linum marginale*, *Stackhousia viminalis*. Site appears to be very dry, with very few flowering plants in the groundcover.

**Follow up required?** Yes ☒ No ☐ If yes, describe: Ongoing monitoring required.

## APPENDIX 2: Bureau of Meteorology – 2019 Rainfall Data

Daily Rainfall 2019 <sup>1</sup>	Sep	Oct
1st	0.2	0
2nd	0	0
3rd	0	0
4th	0	0
5th	0	0.8
6th	0	0
7th	2.8	0
8th	0.4	0
9th	0	0.6
10th	0	0
11th	0.1	0.1
12th	0	1.4
13th	0	0.3
14th	0	0
15th	0	0
16th	0	0
17th	11.2	0
18th	20.6	0
19th	5.6	0
20th	0.1	0.8
21st	0	0
22nd	10.4	0
23rd	0	0
24th	0	0
25th	0	0
26th	0	5.8
27th	0.1	0.1
28th	0	0
29th	0	0
30th	0	
31st		

<sup>1</sup> Bureau Of Meteorology – data from the Lithgow (Coerwull) weather station  
<http://www.bom.gov.au/climate/data/index.shtml?bookmark=136>