ecology & heritage partners

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Hume City Council Fauna Surveying Project 2012

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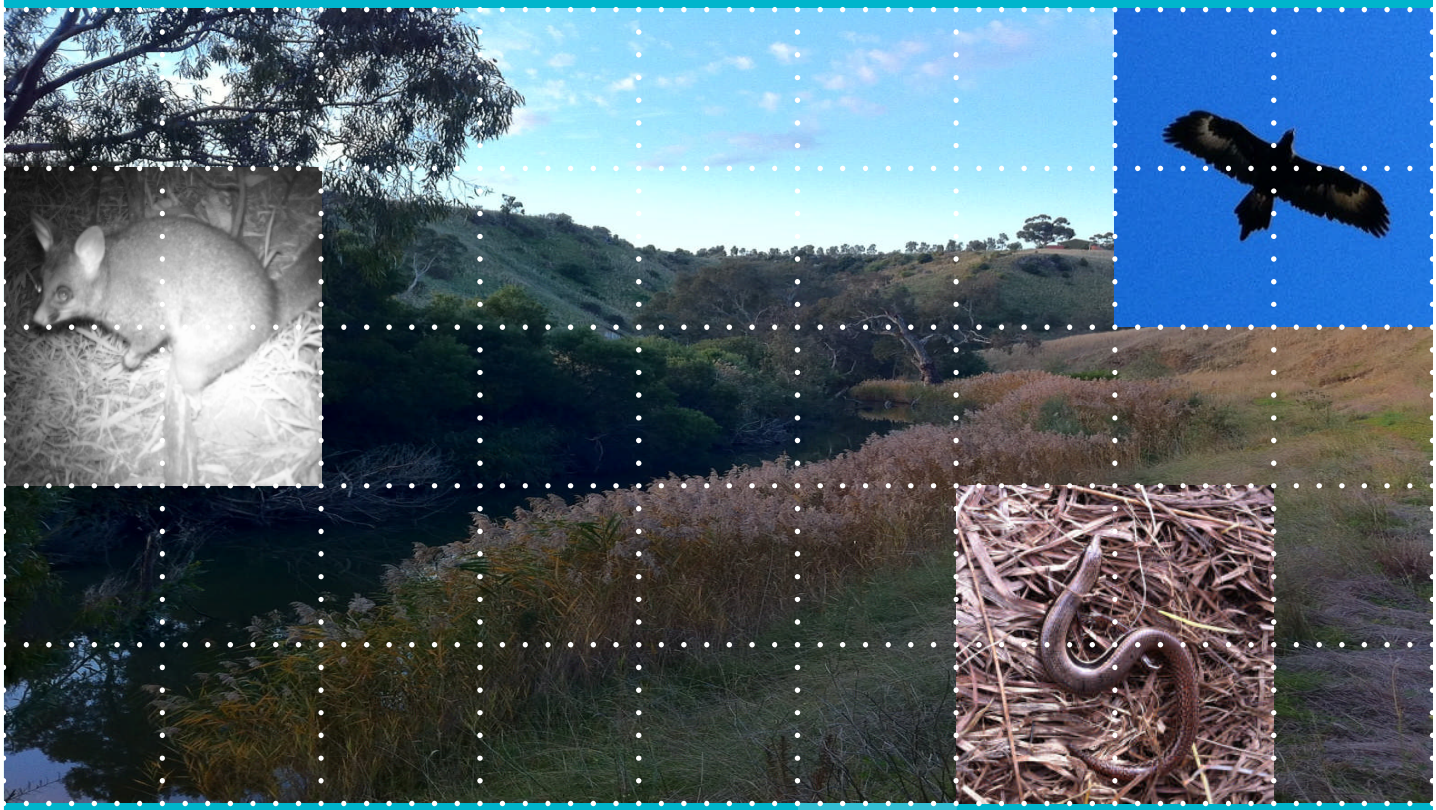

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- Barbara Triggs (Dead Finish) for hair analysis.

***Cover Photos*:** Jacksons Creek at Sunbury Pop Festival Site, infra-red photo of Common Brushtail Possum *Trichosurus vulpecula*, Wedge-tailed Eagle *Aquila audax*, Bougainville's Skink *Lerista bougainvillii* (Kim Downs, Ecology and Heritage Partners Pty Ltd)

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SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was engaged by Hume City Council to undertake detailed fauna assessments of five council-managed reserves near Sunbury and Diggers Rest, Victoria. The purpose of the fauna surveys was to improve Council's knowledge of the distribution of local fauna populations. Undertaking fauna surveys in Council-managed reserves is a key action identified in Hume City Council's *Natural Heritage Strategy 2011-2015* (NHS). The five council-managed reserves surveyed were Mount Holden Reserve, Emu Valley Reserve, Emu Bottom Wetlands Reserve, Albert Road Nature Reserve and the Sunbury Pop Festival Site.

This report presents the results of the detailed fauna surveys, describes habitat types present within each reserve, identifies significant species which are likely to utilise each reserve and provides recommendations for the future conservation of fauna within the Hume City Council reserve system.

Methods

All relevant biological databases, protected matters searches, relevant environmental legislation and policies, previous ecological reports and relevant scientific literature pertaining to the five council-managed reserves and surrounding area were reviewed.

Between mid-March and late May 2012 a series of detailed fauna surveys and habitat assessments were undertaken within the five council-managed reserves. Surveys targeted diurnal and nocturnal birds, arboreal mammals, frogs, ground-dwelling mammals, microchiropteran bats (microbats), reptiles and fish.

Results

A total of 109 fauna species, comprising 74 birds (69 native, five introduced), 21 mammals (16 native, five introduced), one native reptile, six native frogs, six fish (three native, three introduced) and one native crustacean were recorded during the current assessment. No species of national significance were recorded, however one species of state significance, Black Falcon *Falco subniger* and one of regional significance, Brown Quail *Coturnix ypsilophora australis* were detected during the assessment.

The reserves contain diverse habitat types including woodland, shrubland, creekline, grassland, waterbodies, planted trees and shrubs and artificial (human-made) habitats. These areas provide potential habitat for a large number of significant species with moderate to high likelihood of occurrence including four nationally significant species, seven state significant species and six regionally significant species.

Conservation issues and recommendations

The five council-managed reserves assessed currently provide high quality habitat for a wide range of species. Ensuring the long-term conservation of fauna within these reserves will involve careful planning and consideration by Hume City Council. In particular, increasing urban development in the surrounding area is likely to result in reduced habitat connectivity within the landscape which will affect the viability of fauna populations. Other management issues for the reserves include ongoing vegetation management, pest control, road effects and lighting. It is recommended that future surveys be undertaken during warmer seasons and that targeted surveys are undertaken for threatened species where possible.

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was engaged by Hume City Council to undertake detailed fauna assessments within five council-managed reserves in Sunbury and Diggers Rest, Victoria. The purpose of the surveys was to address lack of knowledge about the distribution of fauna populations across the Hume Local Government Area (LGA). Undertaking fauna surveys of Council-managed conservation reserves was identified within the *Hume City Council Natural Heritage Strategy 2001-2015* (Hume City Council 2012a) as a key action to "improve Council's knowledge of the distribution of local fauna populations". The Strategy recommends a target of "ten Council-managed conservation sites to be thoroughly surveyed by 2015". The *Hume City Council Natural Heritage Strategy Action Plan 2011-2015* (Hume City Council 2012b) identifies Mt Holden Reserve, Emu Bottom Wetlands Reserve, Emu Valley Reserve, Albert Road Nature Reserve and the Sunbury Pop Festival Site as five of the conservation sites to be surveyed. These reserves were chosen for surveying based on their size and proximity to intact native vegetation and waterways (Hume City Council, consultants brief).

The specific aims of the detailed terrestrial and aquatic fauna surveys were to:

- Conduct a desktop assessment that reviewed relevant literature, ecological reports and biological databases pertaining to the project;
- Liaise with key stakeholders and environmental authorities, for example, representatives from Hume City Council, the Department of Sustainability and Environment (DSE), the Australian Platypus Conservancy, Jacksons Creek Eco-Network and landholders when required;
- Conduct detailed surveys to determine the presence and distribution of the following fauna groups within the study areas:
    - Nocturnal and diurnal birds;
    - Arboreal mammals;
    - Ground dwelling mammals;
    - Microchiropteran bats;
    - Amphibians;
    - Reptiles; and
    - Freshwater fish.
- Provide figures detailing previous records of significant fauna in the study area and the immediate surrounds; and
- Provide information to inform the management of fauna habitat on Council-managed land and strategic planning and permits regarding areas of fauna habitat.

1.1 Study Areas

Fauna assessments were conducted within five Council-managed reserves; Mount Holden Reserve, Emu Valley Reserve, Emu Bottom Wetlands Reserve and Albert Road Nature Reserve in Sunbury and the Sunbury Pop Festival Site in Diggers Rest, Victoria. According to the DSE Biodiversity Interactive Map (DSE 2012) the reserves are located within the Victoria Volcanic Plain (VVP) bioregion. All reserves are within the Hume local government area (LGA).

1.1.1 Mount Holden Reserve

Mount Holden Reserve is a large reserve of around 174 hectares, composed of two separate properties located on the north-western fringe of Sunbury township. The larger property to the north is 515 Riddell Rd and the southern property is 250A Reservoir Rd, Sunbury.

Much of the northern property, 515 Riddell Rd, is currently utilised for the Sunbury Landfill and Recycling Centre. The upper reaches and tributaries of Blind Creek run through this property. Severe gully erosion occurs around the creek-lines and tunnel erosion is common throughout the site. The landfill area includes work sheds and a weighbridge, tracks, an active tipping face, a large burial area, three leachate ponds (two large and one small) and a leachate spraying area. The south-eastern half of the property supports a large area of Acacia and Cassinia shrubland with a diverse native understorey but few trees. Current Ecological Vegetation Class (EVC) mapping classifies this vegetation as Grassy Woodland (EVC 175) and Plains Grassy Woodland (EVC 55) (DSE 2012). Areas north and south of the active landfill are designated as a BioSite of state significance (Sunbury Landfill BioSite, site I.D. 5184) (DSE 2012). The property is zoned Public Use Zone – Local Government (PUZ6) with a small parcel at the entrance zoned Public Use Zone – Service and Utility (PUZ1) and is outside the Urban Growth Boundary (DPCD 2012). The area containing the shrubland is covered by a Vegetation Protection Overlay- Schedule 2 under the Hume Planning Scheme. The scheme recognises that the vegetation called 'Burke Hill Shrubland' is of at least local significance due to its "substantially intact ground flora" (DPCD 2012). The remaining parts of the property are dominated by introduced pasture grasses, with revegetated patches, including community tree plantings. The neighbouring properties are used predominantly for agriculture, including grazing.

The southern property, 250A Reservoir Rd, includes the Mount Holden volcanic cone. The area has been cleared of most native vegetation and is dominated by introduced pasture grasses. Some revegetated patches, which have been planted with native trees and shrubs, occur within the area, along with degraded patches of indigenous vegetation which include scattered shrubs and some native grasses and herbs. Current EVC mapping classifies these degraded patches as Plains Grassy Woodland. Basalt outcrops occur throughout the site, with a large amount of surface rock present. The property is zoned Low Density Residential Zone (LDRZ) and is within the Urban Growth Boundary (DPCD 2012). The land is subject to Development Plan Overlay- Schedule 6 under the Hume Planning Scheme, which is the 'Mt Holden Development Plan'. Whilst the development plan from 2006 shows part of this property as being built on for residential use, (DPCD 2012) the Mt Holden Reserves

Masterplan from 2008 indicates that the entire property will be kept as a reserve (Thompson Berrill Landscape Design Pty Ltd 2008). Residential properties occur to the south and communication towers occur in a separate parcel in the north-east corner.

1.1.2 Emu Valley Reserve

Emu Valley Reserve is a linear creekline reserve around 20.9 hectares in area, along Jacksons Creek, in the north of Sunbury. The reserve is composed of two separate properties; 35 Valley View Crescent to the north and 506 Racecourse Road to the south.

The majority of the site is composed of steep wooded slopes with smaller areas of shallower floodplain and riparian vegetation along the creekline. The wooded slopes comprise relatively intact woodland with Melbourne Yellow Gum *Eucalyptus leucoxylon* ssp. *connata*, Yellow Box *Eucalyptus meliodora* and Manna Gum *Eucalyptus viminalis* the dominant overstorey species with scattered indigenous shrubs in the understorey. Riparian shrubland occurs immediately adjacent to the creek, with shrubs including *Acacia* spp, *Callistemon* sp. and *Leptospermum* sp. growing along the banks of Jacksons Creek. Current EVC mapping classifies the riparian vegetation immediately adjacent to the creek as Stream Bank Shrubland (EVC 851) whilst the vegetation on the hill slope is classified as Grassy Woodland (EVC 175) (DSE 2012).

The section of Jacksons Creek running through the reserve is part of a designated BioSite of state significance (Jacksons Creek, Sunbury BioSite, site I.D. 4630) (DSE 2012). Another small BioSite of regional significance (Jacksons Creek, Sunbury North BioSite, site I.D. 5196) occurs within private property on the hill slope just west of the northern part of the reserve. This area has been made a BioSite as it contains habitat for the nationally significant Swift Parrot *Lathamus discolour* and regionally significant Common Dunnart *Sminthopsis murina murina* (DSE 2012).

The reserve is zoned Green Wedge A Zone (GWAZ) and is covered by a Land Subject to Inundation Overlay (LSIO) (DPCD 2012). Part of the northern property is subject to Environmental Significance Overlay - Schedule 1 'Rural Waterways and Environs' under the Hume Planning Scheme, which recognises the "environmental, drainage and recreation functions" of this and other rural waterways (DPCD 2012). The reserve is outside the Urban Growth Zone; however the 2010 Urban Growth Boundary occurs on the eastern side of Jacksons Creek (DSE 2011). Low density residential properties on large blocks (one hectare minimum) occur to the west and farmland used for grazing occurs to the east.

1.1.3 Emu Bottom Wetlands Reserve

Emu Bottoms Wetlands Reserve is a relatively large reserve, around 40.3 hectares in area, along Jacksons Creek in Sunbury's north, south of Emu Valley Reserve. The area has a high level of use by the public, particularly by people walking or exercising their dogs. The reserve is composed of three adjoining properties, the largest of which is 300 Racecourse Road, Sunbury (DPCD 2012). Large areas of the reserve are formal open space maintained by slashing and/or mowing. An avulsion channel (billabong) occurs in the southern portion of

the reserve. Extensive planting has been undertaken at the site as part of community revegetation works over the past 15- 20 years with revegetated areas, which include a range of tree and shrub species, created around the billabong, along the creek edge and as linear patches throughout the reserve. Some remnant riparian shrubland remains along the edge of the creek. Current EVC mapping classifies the riparian vegetation immediately adjacent to the creek as Stream Bank Shrubland (EVC 851) with small patches of Valley Grassy Forest (EVC 47) adjacent to the creek and the billabong (DSE 2012).

The section of Jacksons Creek running through the reserve is part of the same BioSite of state significance present within Emu Valley Reserve (Jacksons Creek, Sunbury BioSite, site I.D. 4630) (DSE 2012). The reserve is zoned Green Wedge Zone (GWZ) and Green Wedge A Zone (GWAZ), is covered by a Land Subject to Inundation Overlay (LSIO) and is outside the Urban Growth Boundary (DPCD 2012). The 2010 Urban Growth Boundary occurs on the eastern side of Jacksons Creek, neighbouring the reserve (DSE 2011). Low density residential properties on large blocks occur to the west of the reserve and agricultural land, used for grazing, occurs to the east.

1.1.4 Albert Road Nature Reserve

Albert Road Nature Reserve is a reserve of around 15 hectares in area, north of Albert Road in Sunbury's north. The reserve comprises one property; 110-140 Albert Road, Sunbury. A tributary of Jackson's Creek, with banks affected by severe gully erosion, flows along the southern boundary of the property. Relatively intact woodland with an overstorey of Bundy *Eucalyptus goniocalyx* and Melbourne Yellow Gum and a relatively diverse understorey of native shrubs occurs as a large patch on the rise in the east of the reserve. Less intact vegetation composed of scattered Melbourne Yellow Gums and native shrubs occurs along the western boundary. The remainder of the reserve is dominated by grassland. A previous flora assessment of the site has classified the majority of the woodland vegetation within the site as Valley Grassy Forest (EVC 47) with smaller patches of Box Ironbark Forest (EVC 61) on the eastern hilltop and western boundary (Botanicus Australia Pty Ltd 2011).

Albert Road Nature Reserve is part of a BioSite of state significance [Spavin Drive Reserve (Albert Road Nature Reserve), site I.D. 4631] due to the high ecological integrity of the area and presence of Victorian Rare or Threatened (VROT) flora and fauna (DSE 2012). The reserve is zoned Green Wedge A Zone (GWAZ) and is outside the Urban Growth Boundary (DPCD 2012). The property is subject to Vegetation Protection Overlay – Schedule 1 (VPO1) 'Grassy woodlands in vicinity of Spavin Drive' under the Hume Planning Scheme which recognises that remnant vegetation in this area is of regional significance due to its floristic diversity and habitat value. The reserve is outside the Urban Growth Zone and the 2010 Urban Growth Boundary occurs along its southern border (DSE 2011c). Low density residential houses on large blocks occur along the eastern, southern and northern boundaries and large remnant patches of woodland occur to the west and south-west.

1.1.5 Sunbury Pop Festival Site

Sunbury Pop Festival Site is a council-managed reserve of around 11.3 hectares, south of Jacksons Creek in Diggers Rest. This site was the location for four Sunbury Pop/Rock Festivals which were held on the Australia Day long weekends of 1972-75 (Hume City Council, date unknown). The reserve comprises two properties; 225 Glencoe Drive and 200 Watsons Road, Diggers Rest (DPCD 2012). A small eastern portion of the reserve is designated part of a BioSite of national significance (Holden Flora Reserve BioSite, site I.D. 3287) due to records of nationally significant species, including Growling Grass Frog *Litoria raniformis*, Grassland Earless Dragon *Tympanocryptis pinguicolla* and the state significant Brown Toadlet *Pseudophryne bibronii*.

Large mature River Red-gums *Eucalyptus camaldulensis* grow within the riparian area adjacent to the creek with scattered native shrubs in the understorey. Revegetation works with plantings of native trees and shrubs have been undertaken alongside the creek and on the hill slope. Current EVC mapping identifies the remnant vegetation adjacent to the creekline as Stream Bank Shrubland (EVC851) and Riparian Woodland (EVC 641) with Plains Grassland (EVC 132) on the hill slopes (DSE 2012).

The reserve is zoned Green Wedge Zone (GWZ) and is outside the Urban Growth Boundary (DPCD 2012). The 2010 Urban Growth Boundary occurs directly to the west of the reserve and on the northern side of Jacksons Creek (DSE 2011c). The reserve is subject to Environmental Significance Overlay – Schedule 1 (ESO1) 'Rural Waterways and Environs' under the Hume Planning Scheme, which recognises the "environmental, drainage and recreation functions" of this and other rural waterways (DPCD 2012). A Heritage Overlay Schedule (HO237) 'Sunbury Rock Festivals Site' occurs within the reserve. The reserve occurs within a rural setting and is surrounding by agricultural land used predominantly for grazing.

2 METHODS

2.1 Nomenclature

Common and scientific names of fauna follow the Victorian Biodiversity Atlas (VBA) (DSE 2011a).

2.2 Desktop Assessment

The following resources were reviewed as part of the desktop assessment:

- DSE's VBA (DSE 2011a for documented records of significant species in the region;
- Viridan's Victorian Fauna Database (VFD) (Viridans 2011) for additional documented records of significant species not detected in the VBA search;
- Biodiversity Interactive Maps (DSE 2012) for the extent of historic and current EVCs, and the location of sites of biological significance within the region;
- Department of Sustainability, Environment, Water, Population and Community's (SEWPaC) Protected Matters Search Tool (PMST) to identify the likely occurrence of EPBC Act-listed significant species and/or suitable habitat for these species in the region (SEWPaC 2012);
- The Planning Schemes Online maps (DPCD 2012) for current zoning and overlays applicable to the study area;
- The Atlas of Australian Birds, maintained by BirdLife Australia (BirdLife Australia 2012);
- Relevant environmental legislation and policies pertaining to significant species including: EPBC Act Policy Statements; FFG Act Action Statements, National Recovery Plans and Advisory Lists;
- Previous ecological reports relevant to the study area including results from the Australian Platypus Conservancy's assessment of Platypus in the Greater Melbourne region (Australian Platypus Conservancy 2008); and
- Relevant biological and ecological literature pertaining to the target species.

2.3 Fauna Surveys

Preliminary site assessments to determine the appropriate fauna survey methodology to adopt at each reserve were undertaken on 15th March 2012. During these assessments, two zoologists traversed each reserve on foot and by vehicle. They assessed the broad habitat types present, along with their likelihood of supporting various fauna groups. They also noted site access issues and level of public activity. These preliminary evaluations were used to plan the survey strategies for each site, to maximise the detection rate for fauna.

2.3.1 Arboreal mammal surveys

Spotlighting transects were undertaken in areas which were identified as having habitat suitable for arboreal mammals. Consequently, transects were located in patches of vegetation with sufficiently mature trees and shrubs to provide sheltering and foraging habitat for arboreal mammals. Spotlighting was undertaken at all reserves except for Mt Holden Reserve, which was not accessed at night due to occupational health and safety concerns (steep muddy tracks, rubbish within and surrounding the landfill and tunnel erosion). Spotlighting was be undertaken on two occasions per transect (Table 1).

Experienced personnel undertook spotlighting transects on foot, using 30 watt 12 volt spotlights, to survey for arboreal mammals in suitable habitat. Spotlighting surveys were conducted after call play-back (see below) had been performed. Animals were initially detected by their reflected eyeshine or by sounds they made whilst moving through the canopy. Binoculars were used to aid identification when the individual was located high in the tree. All weather and environmental conditions including temperature, wind speed, cloud cover and moon phase were recorded. Unfavourable weather conditions, such as heavy rain or high winds, were avoided.

Systematic searches for incidental evidence of arboreal mammals including characteristic sap-feeding notches on trees made by Sugar Gliders *Petaurus breviceps*, fur, droppings, trunk scratches and other signs were undertaken throughout each study area during daylight. Infra-red cameras, used as part of the small ground-dwelling mammal survey (described below) also detected arboreal species which came to the ground.

2.3.2 Ground-dwelling mammal surveys

Hair tubes were installed along transects in suitable vegetation within each reserve. Hair tubes were baited with a mixture of peanut butter, rolled oats, treacle and truffle oil and double-sided tape was stuck to the inside upper surface of the tube entrances. Hair samples collected on double-sided tapes were analysed by Barbara Triggs (Dead Finish) to determine the species of mammals which had visited the hair tubes. In most cases hairs were identified to species level. The tubes were placed on the ground in suitable microhabitats, spaced around 20 metres apart and left in place for a minimum of two weeks. For reserves with high levels of public visitation, hair tubes were located in areas where they could be largely hidden from public view, to avoid interference.

Infra-red motion detector cameras were deployed concurrently to the hair tubes, at key locations within suitable habitat (Plate 1). Cameras were positioned such that their focal point was on areas of suitable micro-habitat (e.g. mammal run-ways, logs, etc.). A baited hair tube was placed at the focal point of each camera to attract fauna to the field of view. Cameras were left in the field for a minimum of two weeks (Table 1).

Trapping with live-capture traps (i.e. Elliott traps and cage traps) was not deemed suitable for this survey. The reasons for this were that most sites had at least some degree of public access and theft of traps (with or without animals inside) posed a risk to animal welfare. Additionally, since the surveys were principally to determine the presence of species (which hair-tubes and cameras provided) the additional risk to animal welfare of trapping through injury, stress or trap-death was not warranted.

During day-time assessments searches for ground-dwelling mammals or evidence of their presence were also undertaken. This included making observations of diggings, burrows, scats and animal remains (fur or bones). Ground debris including large rocks, logs and rubbish were lifted to search for small ground-nesting mammals or evidence of them.

Plate 1: *Infra-red camera mounted on tree for mammal survey, Emu Bottom Wetlands Reserve.*

2.3.3 Microchiropteran bat surveys

Most microbat species can be identified from analysis of their ultrasonic echolocatory sequence. AnaBat SD1 and SD2 units (Titley Scientific) which record and log ultrasonic bat calls were deployed at suitable locations within each reserve (Plate 2). Two detectors were set up for two nights per reserve (Table 1). Sites were chosen within potential bat flight corridors such as along drainage lines and vegetation edges, and next to likely drinking sources including dams and pools within Jacksons Creek. The calls were analysed to species and call-complex level by Rob Gration from Ecological Consulting Services Pty Ltd who has access to good reference calls for the species present in the Melbourne region.

Harp traps were not utilised during the current surveys. The success of harp-traps is predominantly related to their placement within the landscape and the presence of microhabitats where the vegetation will 'funnel' bats into traps. Since much of the vegetation within the reserves exists as relatively small remnant patches, suitable locations for harp-trap

placement were not found. Additionally, the traps are conspicuous and deployment in sites with public access was inadvisable.

Plate 2: Anabat detector in Albert Park Nature Reserve

2.3.4 Diurnal bird surveys

Experienced zoologists undertook diurnal bird surveys during appropriate climatic conditions, within all suitable habitat types. Areas were assessed by walking transects through suitable habitat. Binoculars were used to scan areas for birds and observers listened intently for vocalisations. Whilst watching and listening for birds, observers also searched for other signs of bird activity including nests, hollows, remains of dead animals, feathers, droppings and footprints.

Each transect was surveyed on at least two occasions during the times of peak bird activity (early morning and late afternoon) (Table 1). Due to the mobility of bird species, brief visual assessments of suitable adjoining habitat outside the study areas were also undertaken. From the combined assessments within and surrounding the study areas, zoologists were able to determine the likely usage of the study sites by these species, in terms of residency, vagrancy, or as part of a wider home-range.

2.3.5 Nocturnal Bird Surveys

Owl call play-back was undertaken to detect owls residing or foraging within the study area. This technique relies on the fact that most owl species are territorial and use calls as a method of defending their territory. As well as attracting a response from their own species, these calls often elicit a response from other owl species and prey species including possums and gliders (author, personal observation). Owl call play-back for multiple species, including Powerful Owl *Ninox strenua*, Barking Owl *Ninox connivens*, Pacific Barn Owl *Tyto javanica* and Southern Boobook *Ninox novaeseelandiae*, was undertaken at all sites in accordance with the survey guidelines outlined by DSE for Powerful Owl (which also included other species)

(DSE 2011b). The calls of each species were played through a hand-held megaphone. This was followed by periods of listening and spotlighting in the immediate area to locate any fauna attracted to the site. The order of play-back for different species followed the recommendations outlined in the DSE survey standards (DSE 2011b). Call play-back was undertaken within each reserve on two separate nights, in conjunction with spotlighting activities (Table 1).

2.3.6 Frog surveys

Nocturnal frog surveys were undertaken at waterbodies (dams, ponds and swamps) and waterways (creeks and drainage lines) which were identified during the initial site assessments as providing suitable habitat for frogs. These were undertaken in all reserves except for Mt Holden Reserve, which was not accessed at night due to occupational health and safety concerns (steep muddy tracks, rubbish within and surrounding the landfill, as well as tunnel erosion). At Mt Holden Reserve, opportunistic diurnal assessments of frog activity were undertaken in areas with suitable habitat. Each nocturnal survey area was visited on two occasions during weather conditions considered suitable for frog activity (Table 1). Weather conditions including temperature, wind speed, cloud cover and humidity were recorded.

Two qualified zoologists, experienced in frog identification, systematically walked along or around each watercourse or waterbody. Auditory survey points were located at waterbodies and at selected points along waterways. Quiet listening was undertaken for five minutes at each monitoring point, during which the number of all frog species heard was recorded. Visual encounter surveys were conducted by spotlighting within suitable habitat types, and any frogs found were identified and recorded. The zoologists searched for additional signs of frog activity, including the presence of spawn or tadpoles.

Habitat assessments to determine the quality of habitat present were undertaken for all areas surveyed. Variables noted included water quality and depth, fringing and emergent vegetation, submerged and floating vegetation, and the presence of adjacent shelter sites (e.g. rock piles). Water quality measurements were taken from sites along Jacksons Creek. The parameters measured included temperature, pH, electrical conductivity, dissolved oxygen and turbidity. The presence, or otherwise, of predatory Mosquito Fish *Gambusia holbrooki* was also noted.

2.3.7 Reptile surveys

Active reptile searches, involving searching amongst leaf and other ground litter, rolling over large rocks and logs and actively scanning likely places such as the edge of waterbodies, was undertaken for each reserve. Active searches were undertaken for at least one hour per reserve (Table 1). Additional opportunistic searches were also undertaken concurrent to other fauna survey methodologies. Reptile searches were undertaken during the morning as at this time of day reptiles are less active and easier to catch. Many skink species require very close examination by hand in order to identify them correctly to species.

2.3.8 Fish surveys

Fish surveys included the use of collapsible bait traps and fyke nets. Survey method and effort varied depending on the size and habitat availability at each site, but each site generally had ten bait traps and two fyke nets set for one night (Table 1). All traps were collected and processed the following morning.

Bait traps with glow sticks were set on dusk, left overnight and retrieved the following morning. Traps were set within microhabitats present at each site including within fringing, emergent, floating vegetation; under overhanging banks; amongst snags and; in open pools. Single winged fyke nets were set on dusk, left overnight and retrieved the following morning (Plate 3). Floats were placed in the cod ends to ensure that air was available for any other vertebrate species trapped overnight (i.e. turtles, platypus or water rats). Nets were aligned to guide fish into the net during their movements up and down stream. All fish and crustaceans were identified and released back into the same habitat where they were caught.

Plate 3: Fyke net set in Jacksons Creek, Sunbury

Table 1: Survey effort summary for all reserves

Site	Survey methodology	Dates	Intensity
Mount Holden Reserve	Bird survey	30/04/12,15/05/12, 01/06/12	>1 hour per survey
	Hairtube and camera deployment	30/04/12-15/05/2012	20 hairtubes, 2 cameras
	Owl call playback	27/03/12, 17/05/12	25 min per survey
	Active reptile searches	30/04/12, 15/05/12, 01/06/12	30-45 min per survey
	AnaBat detectors	27-28/03/12	2 detectors
Emu Valley Reserve	Bird survey	16/05/12, 31/05/12	>1 hour per survey
	Hairtube and camera deployment	16/05/12-31/05/12	10 hairtubes, 2 cameras
	Owl call playback	27/03/12, 16/05/12	25 min per survey
	Spotlighting	27/03/12, 16/05/12	45 min per survey
	Frog survey	27/03/12, 16/05/12	30 min per survey
	Active reptile searches	16/05/12, 31/05/12	30-45 min per survey
	AnaBat detectors	27-28/03/12	2 detectors
	Fish survey	22/05/12	6 Fyke nets, 30 bait traps
Emu Bottom Wetlands	Bird survey	16/05/12, 31/05/12	>1 hour per survey
	Hairtube and camera deployment	16/05/12-31/05/12	10 hairtubes, 2 cameras
	Owl call playback	29/03/12, 19/05/12	25 min per survey
	Spotlighting	29/03/12, 19/05/12	30 min per survey
	Frog survey	29/03/12, 19/05/12	30 min per survey
	Active reptile searches	16/05/12, 31/05/12	30-45 min per survey
	AnaBat detectors	27-28/03/12	2 detectors
	Fish survey	22/05/12	15 bait traps
Albert Road Nature Reserve	Bird survey	27/03/12, 16/05/12	>1 hour per survey
	Hairtube and camera deployment	30/04/12-15/05/2012	10 hairtubes, 2 cameras
	Owl call playback	27/03/12, 17/05/12	25 min per survey
	Spotlighting	27/03/12, 17/05/12	45 min per survey
	Frog survey	27/03/12, 17/05/12	15 min per survey
	Active reptile searches	27/03/12, 16/05/12	30-45 min per survey
	AnaBat detectors	27-28/03/12	3 detectors
Sunbury Pop Festival Site	Bird survey	17/05/12, 01/06/12	>1 hour per survey
	Hairtube and camera deployment	16/05/12-01/06/12	18 hairtubes, 2 cameras
	Owl call playback	29/03/12, 21/05/12	25 min per survey
	Spotlighting	29/03/12, 21/05/12	45 min per survey
	Frog survey	29/03/12, 21/05/12	25 min per survey
	Active reptile searches	17/05/12, 01/06/12	30-45 min per survey
	Fish survey	21/05/12	3 Fyke nets, 25 bait traps

2.3.9 Other general fauna survey techniques

Active searches for general signs of fauna (bones, feathers, fur, scats, tracks, scratching and diggings) were undertaken within each habitat type in each reserve. The presence of many species is often determined not by directly observing the species, but by finding distinct signs of their presence including bones, scats and tracks. Many species can be identified by the size and shape of their faecal material. For example, faecal counts are a recommended survey strategy for determining habitat use by Koalas *Phascolarctos cinereus*. Signs of foraging activities can also indicate species presence such as incisions in the bark of Acacias left by Sugar Gliders feeding on sap and conical diggings left by foraging bandicoots.

2.3.10 Habitat assessments

For each reserve detailed habitat assessments were undertaken to identify habitat zones important for various fauna groups. For each habitat zone a range of variables were assessed. For example, terrestrial habitats included an assessment of tree maturity, shrub cover, ground layer cover (including vegetation, logs and rocks) and overall structural complexity. Aquatic habitats included an assessment of the presence and structure of within-stream and stream-side vegetation.

2.3.11 Fauna survey limitations

The 'snap shot' nature of standard fauna assessments reduces the likelihood of detecting mobile, migratory, seasonal, cryptic, nocturnal or uncommon fauna species. Therefore, an absence of such species from the results does not necessarily mean that these species are not present or do not use the study area. As with any assessment, a greater amount of time and survey effort on the site would increase the likelihood of recording additional flora and fauna species. Generally, targeted or repeated surveys, at specific times of the year, are required to detect such species.

The timing of surveys (late March to early June) meant that some threatened species, including the nationally listed Growling Grass Frog *Litoria raniformis*, Striped Legless Lizard *Delma impar* and Golden Sun Moth *Synemon plana*, were likely to be missed as recommended survey timing for these species is outside of this period. Whilst this means that records for these species are unlikely to be collected, detailed habitat assessments were conducted to assess the availability of suitable habitat for threatened species within each reserve to determine the likely presence of threatened species.

Many frog species do not call in autumn and are likely to have been missed by the frog surveys. The timing of surveys was also outside the breeding season for the majority of bird species. The benefit of conducting bird surveys during spring and summer is that it enables an assessment of the importance of habitats for breeding activities. Also, many birds are more conspicuous immediately before and at the start of the breeding season due to increased vocalisation and breeding displays. Ideally microbat surveys should be conducted in summer in order to survey during the time of peak activity. Microbats are most active during warm nights, when insect activity is high and save energy by becoming torpid on cold nights.

The seasonal timing of surveys is likely to have been a severe limitation preventing a representative assessment of reptile presence. The *Survey Guidelines for Australia's Threatened Reptiles*, produced by SEWPaC (2011) recommends that reptiles should be surveyed in late spring and early summer in temperate areas of Australia, as this is when activity levels for these species peak. During colder seasons, many reptiles become inactive and retire to winter refugia, making them difficult to detect (SEWPaC 2011). The low success of reptile surveys is likely to be an artefact of cool conditions during the surveys, which may have meant that reptiles were inactive and therefore more difficult to find.

Notwithstanding the above, terrestrial and aquatic fauna information collected during the field assessment and obtained from relevant sources (i.e. biological databases) satisfies the survey effort outlined in the project brief and provides an accurate assessment of the ecological values within the study area.

3 RESULTS

3.1 All reserves combined

A total of 109 species fauna species, comprising 74 birds (69 native, five introduced), 21 mammals (16 native, five introduced), one native reptile, six native frogs, six fish (three native, three introduced) and one crustacean were recorded during the current assessment (Appendix 1.1). No species of national significance were recorded, however one species of state significance, Black Falcon *Falco subniger* and one of regional significance, Brown Quail *Coturnix ypsilophora australis* were detected during the assessment. A list of fauna species previously recorded within 10 kilometres of the study area is provided at the end of this document (Appendix 1.1). There have been 343 fauna species previously documented, the majority of which are birds, with lower numbers of mammals, reptiles, frogs and fish (DSE 2011a). An additional two bird species, not recorded on the VBA, were recorded on the Birdata database managed by BirdLife Australia (BirdLife Australia 2012). This suggests the local area contains a broad range of fauna species, many of which (primarily common birds) are expected to use the five reserves on either a regular or irregular basis.

3.1.1 Birds

At all sites, common gregarious bird species with a high tolerance for habitat modification and fragmentation were present. These species, including Australian Magpie *Gymnorhina tibicen*, Australian Raven *Corvus coronoides*, Little Raven *Corvus mellori* and Magpie Lark *Grallina cyanoleuca*, have life history traits which mean they adapt well to the increase in open areas resulting from agricultural and suburban land use. For example, Australian Magpies are generalist and opportunistic feeders capable of feeding on a wide variety of foods including invertebrates, fruit and carrion. This species aggressively defends territory from other conspecific and interspecific competitors and exhibits cooperative behaviour within family groups (Kaplan 2004). The resilience of these bird species to human-induced habitat change means that they are widely dispersed and abundant in rural and suburban landscapes.

A large number of woodland-adapted bird species were recorded during the current survey. This included a suite of small insectivorous birds, such as Grey Fantail *Rhipidura albiscarpa*, Buff-rumped Thornbill *Acanthiza reguloides*, Red-browed Finch *Neochmia temporalis* and Spotted Pardalote *Pardalotus punctatus*. These species typically utilise areas where shrubs and connected canopy cover are present to provide foraging habitat, shelter and refuge. Other species which extensively utilised woodland areas within the reserves included Black-faced Cuckoo-shrike *Coracina novaehollandiae*, Fan-tailed Cuckoo *Cacomantis flabelliformis*, and White-plumed Honeyeater *Lichenostomus penicillatus*.

Parrot diversity within the reserves was relatively high, with nine species recorded. This is likely to result from a high cover of grassland, which provides foraging habitat for species which feed on the ground such as Long-billed Corella *Cacatua tenuirostris*. Also present was an abundance of woodland habitat for species such as Eastern Rosella *Platycercus*

eximius which feed in trees. Hollow-bearing trees were also present in abundance, with medium and large sized hollows for nesting sites by a range of hollow-dependent species.

Common waterbird species were present within all reserves with permanent water sources. Ducks including Australian Wood Duck *Chenonetta jubata*, Pacific Black Duck *Anas superciliosa* and Australian Shelduck *Tadorna tadornoides* were present along Jackson's Creek, as well as in waterbodies such as the Emu Bottom Wetland Reserve Billabong and the leachate ponds at Mount Holden Reserve. Other waterbirds including Little Pied Cormorant *Microcarbo melanoleucos*, Purple Swamphen *Porphyrio porphyrio* and Dusky Moorhen *Gallinula tenebrosa* were observed along the Jackson's Creek. It is likely that many more species of waterbird utilise the creek and waterbodies within the reserves on occasion though they are likely to be migratory or nomadic. Repeated surveys over a number of seasons and years would be necessary to fully evaluate the use of the reserves by all waterbirds.

A high abundance and diversity of birds of prey (including owls) were recorded throughout the study areas during the current surveys. In total seven raptor species and two owl species were detected. One of these, Black Falcon, is a species of state significance, being listed under the FFG Act. The high abundance and diversity of birds of prey is likely to reflect high habitat suitability for these species within the landscape around Sunbury and Diggers Rest. The escarpments and deep gullies formed by creeks in the area are likely to provide strong thermals for species such as Wedge-tailed Eagle *Aquila audax* to soar on. Mature remnant trees in the area provide vantage points from which birds of prey can watch for prey species. Large open areas, including paddocks and escarpments provide foraging areas where prey movement can be easily detected. The high abundance of this group suggests that prey items are in high abundance. Direct observation, cameras and hair-tube results showed that rabbits, rats and mice are abundant in this landscape.

3.1.2 Mammals

Eight species of microchiropteran bats were detected using AnaBat echolocation call analysis. Most of these are common and widely distributed species, which have a higher tolerance to habitat modification and fragmentation. However, one species, Eastern Falsistrellus *Falsistrellus tasmaniensis* is a rarer species. This species is typically absent from small patches of remnant forest (Churchill 2008), preferring to forage over the tree canopy in large forested areas, however, they also occur around creeklines with a high cover of River Red-gums (Rob Gration, Ecological Consulting Services, pers comm.). The species was detected at two reserves during the current survey. The first location was over the billabong in Emu Bottom Wetlands Reserve. This waterbody is likely to provide a drinking area for microbats. The nearby Jacksons Creek is fringed with vegetation, including mature River Red-gums and is likely to provide both roosting and foraging habitat. The second site where the species was detected was next to a large, relatively intact, treed remnant in Albert Road Reserve. This remnant has numerous mature Eucalypts and is relatively well connected to other remnants in the surrounding landscape, providing suitable foraging habitat as well as abundant hollows for roosting. All species of microbat recorded are dependent on tree hollows for roosting, though they can fly considerable distances between their roosting and foraging habitat.

Arboreal mammals, including Common Brushtail Possum *Trichosurus vulpecula* and Common Ringtail Possum *Pseudocheirus peregrinus* were found in all four of the reserves spotlighted at night. Whilst not recorded during the current assessment, Sugar Gliders are also likely to occur within most of the reserves and Koalas are likely to move through the reserves or use them as part of a larger home range. All the reserves surveyed have a relatively high level of connectivity with surrounding vegetation, which is important for the long-term conservation of arboreal mammal populations.

Two macropods; Eastern Grey Kangaroo *Macropus giganteus* and Black Wallaby *Wallabia bicolor* (Plate 4) were recorded in all five reserves. Black Wallaby are primarily browsers (Strahan 1995) and hence are dependent on shrub cover within an area for foraging and also shelter. Unlike most wallabies, Black Wallabies have been observed to persist well on the fringes of urban areas (Zusi 2010). Eastern Grey Kangaroos are grazers, feeding on grasses and forbs and consequently have benefited from pasture creation through land clearing. Individuals typically rest in the shelter of trees and shrubs during daylight hours, moving to more open areas to graze from late afternoon to early morning (Strahan 1995). Both species have high roadkill rates (Jackson and Vernes 2010), and mortality and injury from vehicles is likely to be exacerbated with increasing urbanisation in the Sunbury area.

An additional three native ground-dwelling mammals were recorded during the current surveys: Swamp Rat *Rattus lutreolus*, an unidentified dasyurid (probably *Antechinus* sp.), and Echidna *Tachyglossus aculeatus*. The first two species were detected at the Sunbury Pop Festival Site and the latter at Emu Bottom Wetlands Reserve. Introduced rodents; Black Rat *Rattus rattus* and House Mouse *Mus musculus* were present at all sites. Most of the reserves have relatively modified ground-level cover, and along with predation pressure from introduced carnivores, this is likely to be reason for the depauperate ground-mammal fauna. It is likely that Echidna utilise all the reserves at some stage, as this species is relatively resilient to habitat modification and introduced predators. It is possible that Agile Antechinus *Antechinus agilis* and the state-listed Common Dunnart *Sminthopsis murina murina* occur within the woodland areas within Emu Valley Reserve, Albert Road Nature Reserve and the Sunbury Pop Festival Site. The latter has been previously recorded within Albert Road Nature Reserve (Figure 2). Rocky outcrops which represent suitable habitat for the regionally significant Fat-tailed Dunnart *Sminthopsis crassicaudata* occur within all reserves except for Emu Bottom Wetlands Reserve. However, it is likely that these species occur at extremely low densities and detection would be dependent on targeted surveys, probably involving pit-fall traps or tiling for the Dunnarts and high-intensity Elliott trapping for Antechinus.

One semi-aquatic mammal was detected during the current surveys; Water Rat *Hydromys chrysogaster* at the Sunbury Pop Festival Site. Whilst this species was detected at only one site, it is likely that it is present along the Jacksons Creek throughout the Sunbury and Diggers Rest area. Although not observed during the current survey, targeted surveys by the Australian Platypus Conservancy recorded Platypus *Ornithorhynchus anatinus* within Jacksons Creek at Emu Bottom Wetlands Reserve (Australian Platypus Conservancy 2008).

The species was has been sighted in the Diggers Rest area and as far south as Organ Pipes National Park (Australian Platypus Conservancy 2008) so it is likely that it occurs within Emu Valley Reserve as well as the Sunbury Pop Festival Site since suitable habitat occurs within both reserves. An unofficial record of Platypus from the Hume Fauna Sightings Database occurs within the Sunbury Pop Festival Site (Hume City Council 2012).

In addition to the two introduced rodents, European Rabbit *Oryctolagus cuniculus*, Cat *Felis catus* and Red Fox *Vulpes vulpes* were also recorded frequently during the current surveys. Rabbits were recorded from all reserves; however, the number visually observed was relatively low. This is likely to be the result of on-going rabbit management actions which with baiting being undertaken concurrent to the surveys. Rabbit baiting was undertaken at most of the reserves at the beginning of the survey period. Red Fox presence was observed in all reserves, and cats were recorded from all reserves except for Albert Park Nature Reserve. However, given the close proximity of this reserve to neighbouring residences, it is likely that cats also occur here.

Plate 4: Infra-red photo of Black Wallaby, Emu Valley Reserve

3.1.3 Frogs

Six common frog species were detected during the current assessments. Frogs were recorded from all five reserves and were generally recorded when calling from creeklines and waterbodies. It is probable that if surveys were repeated during spring and summer additional species which call during the warmer months would be detected. Whilst no significant frog species were detected, Growling Grass Frog has been previously recorded from both Emu Bottom Reserve and Albert Road Nature Reserve. Suitable breeding, dispersal and refuge habitat for this species occurs within Emu Valley Reserve, Emu Bottom Wetlands Reserve and the Sunbury Pop Festival Site.

3.1.4 Reptiles

Surprisingly, despite extensive active searches in every reserve, only a single reptile was recorded during the current surveys. This record was a Bougainville's Skink *Lerista bougainvillii* which was found during searches within Albert Road Nature Reserve. The VBA provides records for 27 reptile species within a ten kilometre radius of the study sites (Appendix 1.1). The lack of success in finding reptiles during the current survey is likely to be an artefact of the season in which the surveys were conducted. The *Survey Guidelines for Australia's Threatened Reptiles*, produced by SEWPaC (2011a) recommends that in temperate areas of Australia most reptile species should be surveyed in late spring and early summer, as this is when activity levels for these species peak. During colder seasons, many reptiles become inactive and retire to winter refugia, making them difficult to detect (SEWPaC 2011a).

3.1.5 Fish

Three native fish; Australian Smelt *Retropinna semoni*, Flat-headed Gudgeon *Philypnodon grandiceps*, Short-finned Eel *Anguilla australis* (Plate 5) and three exotic fish (Eastern Gambusia *Gambusia holbrooki*, Redfin *Perca fluviatili* and Tench *Tinca tinca*) were recorded in low numbers in Jacksons Creek with a total of 77 individuals (Appendix 2, Table A2.3.) One native decapod crustacean (Freshwater Shrimp *Paratya australiensis*) was recorded in high abundances throughout Jacksons Creek with a total of 456 individuals (Appendix 2, Table 2.3.). Other common fish species that may occur within Jacksons Creek and which may have gone undetected during the single survey night include the native Common Jollytail *Galaxias maculates*, Mountain Galaxias *Galaxias olidus*, Trout Galaxias *Galaxias truttaceus*, Tupong *Pseudaphritis urvillii*, Shorthead Lamprey *Mordacia mordax* and Southern Pygmy Perch *Nannoperca australis* as well as the exotic Common Carp *Cyprinus carpio*, Goldfish *Carassius auratus,* Roach *Rutilus rutilus* and Brown Trout *Salmo trutta*.

Plate 5: Short-finned Eel, Emu Valley Reserve.

3.1.6 Significant species

3.1.6.1 *Nationally significant species*

No nationally significant fauna species were recorded within the study areas during the assessment. Twelve nationally listed fauna species have previously been recorded within the local area (i.e. a 10 kilometre radius of the study area) (VBA 2011a) (Appendix 1.2 and Figure 2) and an additional nine species have habitat that either occurs or is predicted to occur within this radius (SEWPaC 2012) (Appendix 1.2).

The likelihood of occurrence of nationally significant fauna species within the study areas is outlined below (Appendix 1.2, Table A.1.2). Based on the number and location of recent records, landscape context and habitat present within the study area, the following five species are considered to have a moderate to high likelihood of occurrence within the study area. The remaining 16 nationally listed species are considered unlikely or of low likelihood to reside in, rely upon or regularly use the study area.

Striped Legless Lizard ***Delma impar***

There is a moderate likelihood that the Striped Legless Lizard occurs within the study areas. Striped Legless Lizard is listed as vulnerable under the EPBC Act, vulnerable under the National Action Plan, Threatened under the FFG Act and endangered in the DSE *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Two records of the species exist within 10 kilometres of the study areas, the most recent being from 2001 (Appendix 1.2). The nearest record for the species occurs around 5.7 kilometres south of the Sunbury Pop Festival Site. It is likely that the paucity of records surrounding the study areas may reflect the cryptic nature of the species and low survey effort rather than low abundance in the local area. Suitable habitat for the species occurs within grassland areas in Emu Valley Reserve, Albert Road Nature Reserve (low likelihood of occurrence) and Mount Holden Reserve and the Sunbury Pop Festival Site (moderate likelihood of occurrence).

Growling Grass Frog ***Litoria raniformis***

There is a high likelihood that Growling Grass Frog *Litoria raniformis* is present within the study areas. The Growling Grass Frog is listed as vulnerable under the EPBC Act, vulnerable under the National Action Plan, threatened under the FFG Act and endangered in the DSE *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Thirty-one records for the species occur within ten kilometres of the study area, the most recent being from 2006 (Appendix 1.2). However, the species was also recorded from the Holden Flora and Fauna Reserve in 2010, which is adjacent to the Sunbury Pop Festival Site (Ecology Partners Pty Ltd 2010). The species has been previously recorded from the Emu Bottom Wetlands Reserve in 1988 and from the Albert Road Nature Reserve in 2000 (Figure 2). The Hume Fauna Sightings Database also contains an unofficial record of the species occurring within the landfill section of the Mount Holden Reserve (Hume City Council

2012c). Suitable habitat for the species occurs within creeklines and waterbodies in Mount Holden Reserve, Emu Valley Reserve, Emu Bottom Wetlands Reserve and the Sunbury Pop Festival Site.

Golden Sun Moth ***Synemon plana***

There is a moderate likelihood that Golden Sun Moth may be found within the study areas. Golden Sun Moth is listed as critically endangered under the EPBC Act, threatened under the FFG Act and critically endangered under the *Advisory List of Threatened Invertebrate Fauna in Victoria* (DSE 2009a).

Thirty-two records exist for this species within ten kilometres of the study area, the most recent being from 2008 (Appendix 1.2). The nearest records occur around Toolern Vale to the west and Craigieburn to the east (Figure 2). Suitable habitat for the species occurs within areas of grassland with a high cover of native grasses, particularly wallaby grasses *Austrodanthonia* spp. within Emu Valley Reserve, Albert Park Nature Reserve and the Sunbury Pop Festival Site.

Swift Parrot ***Lathamus discolor***

There is a high likelihood that Swift Parrot may be found within the study areas. Swift Parrot is listed as endangered under the EPBC Act, threatened under the FFG Act and endangered under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Fifteen records exist for this species within ten kilometres of the study areas, the most recent being from 2007 (Appendix 1.2). An unofficial record of the species occurring close to Emu Bottom Wetlands Reserve in 2010 was provided by Christina Cheers from the Jacksons Creek Eco-Network. Suitable habitat for the species in areas of woodland within Emu Valley Reserve, Emu Bottom Wetlands, Albert Road Nature Reserve and the Sunbury Pop Festival Site.

3.1.6.2 *State significant species*

One species of state significance was recorded during the current survey; Black Falcon *Falco subniger*. An additional 30 state significant species have been previously recorded within ten kilometres of the study areas (Appendix 1.2).

The likelihood of occurrence of nationally significant fauna species within the study areas is outlined below (Appendix 1.2). Based on the number and location of recent records, landscape context and habitat present within the study area, the following seven species are considered to have a moderate to high likelihood of occurrence within the study area. The remaining 21 state listed species are considered unlikely or of low likelihood to reside in, rely upon or regularly use the study area.

Common Dunnart ***Sminthopsis murina murina***

There is a moderate likelihood that Common Dunnart may be found within the study areas. Common Dunnart is listed as vulnerable under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

One record for this species occurs within ten kilometres of the study areas (Appendix 1.2). This record is from 1990 and is for an individual within the Albert Road Nature Reserve (Figure 2). Suitable habitat for this species occurs within Albert Road Nature Reserve and at the Sunbury Pop Festival Site.

Hardhead ***Aythya australis***

There is a high likelihood that Hardhead may be found within the study areas. Hardhead is listed as vulnerable under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Five records for this species occur within ten kilometres of the study areas, the most recent being from 1991 (Appendix 1.2). An unofficial record of the species occurring within Emu Bottom Wetlands Reserve in 2006 was provided by Christina Cheers from the Jacksons Creek Eco-Network. Suitable habitat for the species occurs within creekline and waterbodies within Emu Valley Reserve, Emu Bottom Wetlands and the Sunbury Pop Festival Site.

Eastern Great Egret ***Ardea modesta***

There is a moderate likelihood that Eastern Great Egret may be found within the study areas. Eastern Great Egret is listed as threatened under the FFG Act and vulnerable under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Twenty-two records for this species occur within ten kilometres of the study areas, the most recent being from 1991 (Appendix 1.2). Suitable habitat for the species occurs within creekline and waterbodies within Emu Valley Reserve, Emu Bottom Wetlands and the Sunbury Pop Festival Site.

Intermediate Egret ***Ardea intermedia***

There is a moderate likelihood that Intermediate Egret may be found within the study areas. Intermediate Egret is listed as threatened under the FFG Act and critically endangered under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

One record from 1975 occurs within ten kilometres of the study area (Appendix 1.2). An unofficial record of the species occurring within Emu Bottom Wetlands Reserve in 2000 was provided by Christina Cheers from the Jacksons Creek Eco-Network. Suitable habitat for the species occurs within creekline and waterbodies within Emu Valley Reserve, Emu Bottom Wetlands and the Sunbury Pop Festival Site.

Speckled Warbler ***Chthonicola sagittatus***

There is a moderate likelihood that Speckled Warbler may be found within the study area. Speckled Warbler is listed as near threatened under the National Action Plan, threatened under the FFG Act and vulnerable under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Twenty-five records for this species occur within ten kilometres of the study area, the most recent being from 1990 (Appendix 1.2). This species was recorded within Albert Road Nature Reserve in 1990 (Figure 2). Suitable habitat for this species occurs within Emu Valley Reserve, Albert Road Nature Reserve and the Sunbury Pop Festival Site.

Diamond Firetail ***Stagonopleura guttata***

There is a moderate likelihood that Diamond Firetail may be found within the study area. Diamond Firetail is listed as near threatened under the National Action Plan, threatened under the FFG Act and vulnerable under *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Twenty-two records for this species occur within ten kilometres of the study area, the most recent being from 2005. This species was recorded in Albert Park Nature Reserve in 2005. Suitable habitat for this species occurs in Emu Valley Reserve, Albert Road Nature Reserve and the Sunbury Pop Festival Site.

Brown Toadlet ***Pseudophryne bibronii***

There is a moderate likelihood that Brown Toadlet may be found within the study area. Brown Toadlet is listed as data deficient under the National Action Plan, threatened under the FFG Act and endangered under the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007).

Twenty-two records for this species occur within ten kilometres of the study area, the most recent being from 1990 (Appendix 1.2). This species was recorded was also recorded from the Holden Flora and Fauna Reserve, adjacent to the Sunbury Pop Festival Site in 1990 (Figure 2). Sub-optimal habitat for this species occurs at the Sunbury Pop Festival Site.

3.1.6.3 *Regionally significant species*

One regionally significant fauna species was recorded during the surveys: Brown Quail *Coturnix ypsilophora australis*, which was observed at the Sunbury Pop Festival Site. This species has been previously recorded at Albert Road Nature Reserve (Figure 2).

An additional 13 regionally significant species have previously been recorded within 10 kilometres of the study areas (Appendix 1.2) (Figure 2). Six of these species are considered to have a moderate likelihood of occurrence within the study area; Fat-tailed Dunnart, Pied Cormorant *Phalacrocorax varius*, Nankeen Night Heron *Nycticorax caledonicus hillii*, Latham's Snipe *Gallinago hardwickii*, Azure Kingfisher *Alcedo azurea* and Black-chinned

Honeyeater *Melithripterus gularis gularis*. Azure Kingfisher has previously been recorded within Emu Valley Reserve (Figure 2) as has Pied Cormorant (Christina Cheers, Jacksons Creek Eco-Network, pers comm.). Black-chinned Honeyeater has been previously recorded at Albert Road Nature Reserve. The remaining seven regionally significant species have a low likelihood of occurrence in the study areas or are unlikely to occur there.

3.2 Mount Holden Reserve

A total of 44 fauna species were recorded at Mount Holden Reserve including eleven mammals (seven native, four introduced), 31 birds (27 native, four introduced) and two native frogs (Appendix 1.3, Table A1.3.1). Unofficial records for a reptile species (Blue-tongue Lizard *Tiliqua* sp.) and a further four frog species, including the nationally significant Growling Grass Frog occur within the Hume Fauna Sightings Database (Hume City Council 2012c). Seven broad habitat types occur within the reserve; shrubland, planted and regenerating trees and shrubs, grassland, creekline, ponds, artificial marsh and the landfill.

3.2.1 Fauna habitats

3.2.1.1 *Shrubland*

A large patch of modified shrubland occurs in the centre of the reserve. The shrubland is dominated by *Cassinia* sp. and *Acacia* sp. with a diverse native understory (Plate 6). Few remnant trees remain in this area. The soil is stony and friable, with abundant surface rock present and tunnel erosion is common throughout this habitat. This vegetation provides suitable habitat for small insectivorous birds, microbats, macropods and reptiles. The abundant shrub cover provides suitable foraging, sheltering and nesting habitat for a suite of small birds including Brown and Yellow-rumped Thornbill *Acanthiza pusilla* and *A. chrusorrhoa*, Silvereye *Zosterops lateralis* and Grey Fantail. Microbats are likely to forage over and within this vegetation for insects, with calls from five species identified within this habitat type. Eastern Grey Kangaroos were observed sheltering within this vegetation and Black Wallaby was recorded from a camera placed in the area. The abundant surface rock and tunnel erosion provide refuge and basking habitat for reptiles including skinks and snakes. Whilst no reptiles were recorded during actives searches, the landfill staff reported that snakes were commonly seen within these areas during warmer months.

Plate 6: Shrubland within Mount Holden Reserve

3.2.1.2 *Planted and regenerating trees and shrubs*

Patches of planted native trees and shrubs and scattered regenerating or planted shrubs occur throughout the reserve. A sign belonging to the 'Sunbury Conservation Society' is placed near plantings at the landfill entrance to advertise ongoing efforts by the community group to revegetate the landfill site. These plantings include native shrubs such as Acacias, young Eucalypts and Casuarinas. All plantings are relatively young (10-15 years at most) and consequently none of the trees have reached maturity or developed hollows. Scattered shrubs, either planted or naturally regenerating occur within the grassland areas. These include Black Wattle *Acacia mearnsii* and Tree Violet *Melicytus dentatus s.l.* as well as woody weeds such as African Box-thorn *Lyceum ferocissimum* and Sweet Briar *Rosa rubiginosa.* The plantings and revegetated shrubs provide suitable habitat for foraging, refuge and nesting habitat for a variety of birds with a tolerance for crossing open areas, including Dusky Woodswallow *Artamus cyanopterus*, White-plumed Honeyeater and New Holland Honeyeater *Phylidonyris novaehollandiae*. Microbats are likely to forage for flying insects within and around these trees and shrubs.

3.2.1.3 *Grassland*

Large areas of grassland occur near the landfill entrance, north and west of the landfill, and in the southern section on the slopes of Mount Holden (Plate 7). These areas are dominated by introduced pasture grasses, though small patches of native grassland occur, particularly on the northern slopes of Mount Holden. Basalt outcrops occur on Mount Holden and in the far west and northern sections of the reserve, with large amounts of surface rock present in these areas. These grasslands provide suitable habitat for a variety of species adapted to open areas. Common birds such as Australian Magpie, Willie Wagtail *Rhipidura leucophrys* and Welcome Swallow *Petrochelidon neoxena* were recorded utilising these open areas for foraging. Quails, including the regionally significant Brown Quail, may utilise this habitat.

Birds of prey are likely to hunt for prey and scavenge in these areas, with both Wedge-tailed Eagle and Nankeen Kestrel *Falco cenchroide o*bserved foraging over these sections of grassland. Eastern Grey Kangaroos are likely to graze extensively in this habitat. The abundance of surface rock in areas with basalt outcrops provides suitable habitat for a range of reptile species, including skinks and snakes. These rocky outcrops within the grassland represent suitable habitat for the nationally significant Striped Legless Lizard *Delma impar* and the regionally significant Fat-tailed Dunnart. The less modified grassland areas, particularly surrounding rocky outcrops, provide potential habitat for the nationally significant Golden Sun Moth.

Plate 7: *Grassland on the slopes of Mount Holden*

3.2.1.4 *Creekline*

The upper reaches of Blind Creek run through the reserve. These creeklines have severe gully erosion, with steep unstable banks. At the time of assessment, only very small, isolated puddles of water were present within the creeklines. The channels have sandy and rocky bases and banks, with little aquatic vegetation present. Scattered patches of Cumbungi *Typha* sp. grow in the lower reaches of the creek within the reserve. These ephemeral creeklines are likely to provide habitat for common frog species. It seems unlikely that the creeklines retain water long enough to provide breeding habitat. However, frogs are likely to disperse along the creeks to the ponds within the site, where they may breed.

3.2.1.5 *Ponds*

The large leachate ponds which are part of the landfill provide habitat for a variety of common species including waterbirds, frogs and microbats. The largest pond in the west of the reserve is lined with rubber liner with bare banks and no aquatic vegetation present. The large leachate pond in the east of the reserve contains a considerable amount of emergent Cumbungi with fringing Common Spike Rush *Elocharis acuta* and rushes *Juncus* sp. A smaller pond, which collects run-off from the leachate irrigation area, occurs close to the larger pond. This

pond is fringed by pasture grass, with scattered emergent rushes. Pacific Black Duck, Australian Shelduck and Australasian Grebe *Tachybaptus novaehollandiae* were observed paddling within the large leachate ponds. An AnaBat bat detector placed near one of the ponds detected four common species of microbat. It is likely that the ponds provide drinking water for microbats as well as a foraging area with higher insect abundance than surrounding areas. Two common frog species; Common Froglet *Crinia signifera* and Spotted Marsh Frog *Limnodynastes tasmaniensis* were heard calling from the ponds. Whilst frogs are unlikely to breed within the largest pond, due to the absence of aquatic vegetation, they are likely breed within both the second largest and smallest ponds. The Hume Fauna Sightings Database contains an unofficial record for Growling Grass Frog within the landfill section of this reserve (Hume City Council 2012c). The eastern leachate pond contains suitable breeding habitat for this species, however the creekline provides sub-optimal dispersal habitat. Overall this species has a low likelihood of occurrence in the area.

3.2.1.6 *Artificial marsh*

An artificial marsh area has been created on a hill slope adjacent to the largest leachate pond, where spray irrigation of leachate is undertaken. The continual spraying of leachate has resulted in a swampy area, dominated by rushes and pasture grasses. This area provides potential habitat for a range of marsh-adapted birds and frogs. For example, White-faced Heron *Egretta novaehollandiae*, Australian White Ibis *Threskiornis molucca* and Australian Shelduck are known to forage amongst swampy areas of pasture. Both Common Froglet and Spotted Marsh Frog were heard calling from within this habitat.

3.2.1.7 *The landfill*

The active landfill area includes tracks, the burial area and the active tip face where rubbish is dumped prior to burial. The rubbish itself provides a food source for generalist bird species which are tolerant of open areas. Large flocks of Little Raven, Australian White Ibis and introduced Common Myna *Acridotheres tristis* were observed foraging amongst the recently dumped rubbish. The rubbish is also likely to support high numbers of House Mouse and Black Rat which in turn provide a food source for birds of prey. During the current assessment Brown Falcon *Falco berigora*, Black-shouldered Kite *Elanus axillaris* and Brown Goshawk *Accipiter fasciatus* were all observed hovering over the landfill area.

3.2.2 Significant species

Based on previous records, habitat suitability and landscape context, the following significant species have a moderate to high likelihood of occurrence within Mount Holden Reserve.

- Nationally significant species:
  - Striped Legless Lizard; and
  - Golden Sun Moth.
- Regionally significant species;
  - Fat-tailed Dunnart; and
  - Brown Quail.

3.3 Emu Valley Reserve

A total of 63 fauna species were recorded at Emu Bottom Wetlands Reserve including 11 mammals (seven native, four introduced), 43 birds (41 native, two introduced), three native frogs, five fish (three native, two introduced) and one native crustacean (Appendix 1.3, Table A1.3.2). The Hume Fauna Sightings Database contains a record for an additional bird species, Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus* (Hume City Council 2012). Five broad habitat types occur within the reserve; woodland, riparian shrubland, planted trees and shrubs, grassland and creekline.

3.3.1 Fauna habitats

3.3.1.1 *Woodland*

The steep hill-slope within the reserve supports relatively intact woodland (Plate 8). This vegetation is dominated by mature Melbourne Yellow Gum, Yellow Box and Manna Gum. Scattered indigenous shrubs including Tree Violet and Sweet Bursaria *Bursaria spinosa* grow in the mid-storey with a grassy ground layer which has a high cover of introduced grasses. Basalt boulders and surface rocks are common throughout the site and tunnel erosion is present. There is a moderate cover of fallen logs present within this area. This vegetation represents good quality habitat for a range of species including woodland birds, arboreal mammals, microbats and reptiles. A variety of woodland-dependent birds including Spiny-cheeked Honeyeater *Acanthagenys rufogularis*, Crimson Rosella *Platycercus elegans* and Black-faced Cuckoo-shrike were observed foraging in the tree canopy. The nationally significant Swift Parrot is likely to visit this area occasionally and has a high likelihood of occurrence. Quails, including the regionally significant Brown Quail, may occur within the grassy understorey. A high density of Common Brushtail Possum were observed at this site during spotlighting surveys, probably due to a high abundance of tree hollows in the mature eucalypts. Whilst not recorded during the current surveys, it is possible that Sugar Gliders and Koalas also utilise this habitat. Black Wallaby was observed utilising this habitat extensively. Microbats are likely to roost in small tree hollows and beneath loose bark and forage within and around the mature trees in this area. Whilst no reptiles were found during active searches, the high cover of surface rock and soil cracks resulting from tunnel erosion provide abundant suitable refuge areas for skinks and snakes. This area represents suitable habitat for the nationally significant Striped Legless Lizard. The grassy slope may also represent sub-optimal habitat for the nationally significant Golden Sun Moth. Although no small native ground-dwelling mammals were recorded in this habitat, it is possible that the state significant Common Dunnart and regionally significant Fat-tailed Dunnart could occur in the area.

Plate 8: Woodland within Emu Valley Reserve

3.3.1.2 *Riparian shrubland*

Shrubby vegetation fringes much of the edge of Jacksons Creek which flows through the reserve. This habitat includes a high cover of native shrubs including Woolly Tea-tree *Leptospermum lanigerum*, Black Wattle, Blackwood *Acacia melanoxylon*a and River Bottlebrush *Callistemon sieberi.* Mature River Red-gum are scattered along the bank along with introduced Willows *Salix* sp. The dense shrub cover within this habitat provides suitable foraging, refuge and nesting areas for small birds. During the current surveys a diverse suite of small birds were observed using this habitat, including Spotted Pardelote, Scarlet and Flame Robin *Petroica boodang* and *P. phoenicea* and thornbills. This habitat provides foraging areas for microbats and browsing and refuge areas for Black Wallaby.

3.3.1.3 *Planted trees and shrubs*

Plantings of native trees and shrubs have been undertaken in some sections of the reserve. Trees and shrubs near the Valley View Crescent entrance of the reserve and along some of the creekline appear to have been planted, as do some scattered eucalypts on the hillside. These trees and shrubs provide suitable foraging habitat for a variety of fauna, particularly birds, and increase the overall connectivity of habitats within the site. During the current assessments a range of bird species including Red Wattlebird *Anthochaera carunculata*, White Plumed Honeyeater and New Holland Honeyeater were observed foraging within the planted trees.

3.3.1.4 *Grassland*

Patches of open grassland occur throughout the reserve. A relatively flat area of slashed grass, dominated by introduced pasture species, occurs near the Valley View Crescent entrance. On the hill slope large areas of open grassland occur which are also dominated by introduced grasses, particularly Serrated Tussock *Nassella trichotoma*. These areas are of

marginal value for most fauna, with the exception of birds which are tolerant of open areas such as Australian Magpie, Magpie Lark and Galah *Eolophus roseicapilla,* which utilise open areas for foraging.

3.3.1.5 *Creekline*

The section of Jacksons Creek which flows past the reserve contains moderate to high quality habitat for fauna. Large pools (Plate 9) are interspersed with narrower, more swiftly flowing sections. Some sections of the creek, including the large pools, contain large emergent and fringing boulders with bedrock or cobble substrate, whilst other sections have earth banks and a gravel substrate. Overhanging vegetation is generally low, with a low amount of shading, except in areas where Willows occur. Little woody debris occurred within this section of the stream but in-stream macrophyte cover was high and diverse. Macrophytes present within this reserve included floating vegetation; Water Ribbon *Triglochin* sp., Water Fern *Azolla* sp. and Water Couch *Paspalum distichum,* submerged vegetation; Watermilfoil *Myriophyllum* sp. and emergent/fringing vegetation; Common Reed *Phragmites australis,* Common Rush *Juncus* spp., Spike Rush *Eleocharis* spp., Umbrella Sedge *Cyperus* sp. and Marsh Club-sedge *Bolboschoenus medianu* (Appendix 2, Table A2.2.). Water quality was good; except for elevated turbidity levels at the furthest point downstream (Appendix 2, Table A2.1.).

Overall, the creekline represents good quality habitat for frogs, fish, waterbirds, semi-aquatic mammals and microbats. Three common frog species were heard calling from the creekline; Plains Froglet *Crinia parasignifera,* Common Froglet and Southern Brown Tree Frog *Litoria ewingii*. The creekline represents high quality breeding and dispersal habitat for frogs. Whilst the survey was conducted outside the active season for the nationally significant Growling Grass Frog the presence of large still pools with moderate amounts of floating, submerged and emergent vegetation provide suitable habitat for breeding by the species. Two native fish species; Flat-headed Gudgeon and Short-finned Eel were recorded during the current surveys, along with Australian Freshwater Shrimp. Common waterbirds including Pacific Black Duck, Australian Wood Duck and Little Pied Cormorant were observed during the current assessment. It is likely that other waterbird species utilise this section of the creek on occasion, including the state significant Hardhead and Eastern Great Egret and regionally significant Nankeen Night-heron and Pied Cormorant. The creek provides suitable habitat for both foraging and breeding by Platypus. Four commons species of microbat were recorded over the creek during the current assessment. The creek provides suitable habitat for foraging and drinking by microbats, and is also likely to be used as a flyway through the landscape.

Plate 9: Pools in Jacksons Creek, Emu Valley Reserve

3.3.2 Significant species

Based on previous records, habitat suitability and landscape context, the following signficiant species have a moderate to high likelihood of occurrence within Emu Valley Reserve.

- Nationally significant species:
  - Growling Grass Frog;
  - Swift Parrot; and
  - Striped Legless Lizard.
- State significant species:
  - Common Dunnart;
  - Eastern Great Egret;
  - Intermediate Egret;
  - Hardhead;
  - Speckled Warbler; and
  - Diamond Firetail.
- Regionally significant species;
  - Fat-tailed Dunnart;
  - Brown Quail;
  - Pied Cormorant;
  - Nankeen Night Heron;
  - Azure Kingfisher.

3.4 Emu Bottom Wetlands Reserve

A total of 67 fauna species were recorded during the current assessments at Emu Bottom Wetlands Reserve including 16 mammals (12 native, four introduced), 43 birds (38 native, five introduced), five native frogs, two native fish and one native crustacean (Appendix 1.3, Table A1.3.3.).

Records of observations between 2000 and 2012, supplied by Christina Cheers (Jacksons Creek Eco-Network) add an additional 27 bird species and one mammal species, whilst records of significant species from the VBA add an additional bird species and frog species (DSE 2011a) (Appendix 1.3, Table A1.3.3.). Five broad habitat types occur within the reserve; dense shrubland, scattered planted trees and shrubs, the billabong, creekline and grassland.

3.4.1 Fauna habitats

3.4.1.1 *Dense shrubland*

This habitat type occurs along the edge of Jackson's Creek, around the billabong, and in linear patches at the edges of the open grassland. Dense plantings of native trees and shrubs undertaken by the Friends of Emu Bottom Wetlands and Council have combined with remnant vegetation to provide areas of dense shrubland (Plate 10). These areas contain a diverse mix of shrubby species including Acacias, immature Eucalypts, Tea-tree and Bottlebrush. Scattered mature remnant River Red-gums grow along the edge of the creek. These areas provide suitable habitat for small birds, arboreal mammals, microbats and macropods. A variety of small birds including Red-browed Finch, Spotted Pardalote, Scarlet Robin and White-browed Scrubwren *Sericornis frontalis* were observed foraging within the dense shrubs. The nationally significant Swift Parrot has been recorded within the reserve (Christina Cheers, Jacksons Creek Eco-Network, records) and is likely to forage within this habitat occasionally. This habitat is likely to provide shelter and nesting habitat for a range of birds, for example the nest of a small raptor (probably a Collared Sparrowhawk *Accipiter cirrhocephalus* as this species was observed nearby) was found in this area. Shrubs along the creekline provide potential habitat for the regionally significant Azure Kingfisher, for which a record from 1987 occurs within the reserve (DSE 2012). Microbats are likely to forage above and around this habitat and may roost within the mature River Red-gums. Common Brushtail Possum and Common Ringtail Possum were both observed in this habitat type. The mature River Red-gums provide hollows for Common Brushtail Possum to shelter in whilst Common Ringtail Possum are likely to build spherical nests (dreys) within the dense shrubs. The shrubs and trees provide foraging habitat for both species. These areas provide browsing and sheltering habitat for Black Wallaby. An Echidna was also observed on the bank of Jacksons Creek within this habitat type.

Plate 10: Dense shrubland adjacent to Jacksons Creek, Emu Bottom Wetlands Reserve

3.4.1.2 *Scattered planted trees and shrubs*

Scattered planted trees and shrubs, of the same species planted in more dense patches, occur throughout the reserve. These provide foraging habitat for more gregarious birds such as Red Wattlebird, Crimson Rosella, White-plumed Honeyeater and New Holland Honeyeater and are also likely to be used as 'stepping stones' between denser patches by the suite of insectivorous birds described above. Microbats are likely to forage around these scattered trees and shrubs.

3.4.1.3 *Creekline*

The section of Jacksons Creek which flows past the reserve contains moderate to high quality habitat for fauna. Relatively wide pools are interspersed with narrower, flowing sections. Along the length within the reserve, much of the bank is relatively steep and unstable; however, there are some areas with gently sloping banks (Plate 8). The banks consist of earth throughout and the substrate is mostly gravel. Some emergent boulders occur within the larger pools. Overhanging vegetation and shading is varies between low to moderate, being higher where the creek is fringed by shrubs including Woolly Tea-tree. Little woody debris is present within this section of the stream and in-stream macrophyte cover varies along the length with some sections with little aquatic vegetation and others with a high amount of fringing and emergent vegetation. Macrophytes present within this reserve include floating Water Ribbon and Water Couch, and emergent and fringing Common Reed, Common Rush and Cumbungi (Appendix 2, Table A2.2.). Water quality was good, except for elevated turbidity levels (Appendix 2, Table A2.1.).

Overall, this section of Jacksons Creek represents good quality habitat for frogs, fish, waterbirds, semi-aquatic mammals and microbats. The creekline provides habitat suitable for breeding, dispersal and refuge by a range of frog species. During the current assessments five frog species were recorded within the reserve.

Whilst the most recent record of the nationally significant Growling Grass Frog within the reserve is from 1989 (DSE 2012), the creek provides potential breeding and dispersal habitat for this species. Two native fish species; Australian Smelt, Flat-headed Gudgeon and Common Freshwater Shrimp *Paratya australiensis* were recorded during the current fish surveys. Christina Cheers, from the Jacksons Creek Eco-Network, also reported that Short-finned Eel were captured during platypus trapping undertaken by the Australian Platypus Conservancy. Common waterbirds including Pacific Black Duck, Australian Wood Duck, Purple Swamphen, Eurasian Coot and White-faced Heron were observed utilising this habitat during the current assessment. Many additional waterbirds have also been observed in the reserve over the last twelve years by Christina Cheers, from the Jacksons Creek Eco-Network, including the state significant Hardhead and regionally significant Pied Cormorant. Platypus occur within this section of the creek and surveys by the Australian Platypus Conservancy (2008) found the species at three of four trapping sites within the reserve. This included females, indicating that platypus breeding burrows potential occur within this area (Australian Platypus Conservancy 2008). Whilst Water Rats were not recorded in this reserve during the current survey, it is likely that they also occur within the area. The creekline provides both drinking and foraging habitat for a variety of microbats, with five common microbat species recorded by an AnaBat detector placed next to the creek.

3.4.1.4 *The billabong*

The billabong is an avulsion channel of Jacksons Creek, in the southern portion of reserve (Plate 11). The main portion of the billabong is approximately 230 metres from the adjacent creek. During the current assessments the billabong was filled with water to an average depth of around 50 centimetres, with high turbidity. Macrophytes are abundant within the waterbody and include floating Water Ribbons and Water Couch and fringing and emergent Common Rush and Spike Rush. Patches of densely planted native trees and shrubs have been created adjacent to the waterbody. The billabong provides high quality habitat for a variety of frogs, waterbirds and microbats. During the present surveys four common frog species were heard calling from the billabong. Whilst Growling Grass Frog has not previously been recorded within this waterbody, this area represents high quality potential breeding habitat for the species. The abundant macrophytes provide refuge areas and floating vegetation for males of the species to call from, whilst the still shallow water provides suitable habitat for tadpoles and metamorphs. Waterbirds with a preference for shallow water are likely to utilise the billabong extensively. These species include Australian Wood Duck, Purple Swamphen, Dusky Moorhen and White-faced Heron. Additionally, a number of significant fauna may forage within the billabong on occasion. Christina Cheers from the Jacksons Creek Eco-Network observed the state significant Intermediate Egret within this area and the state significant Eastern Great Egret and regionally significant Nankeen Night Heron and Lathams Snipe may also utilise this area occasionally. The billabong provides habitat for a diverse microbat community. During the current assessment six microbat species were recorded over the billabong, including the relatively rare Eastern Falsistrellus (described in section 3.1.2). It is likely that a high abundance of flying insects occurs over the billabong and combined with

the close proximity to the creek, which this group would use as a flyway, it provides high quality foraging habitat for microbats.

Plate 11: The billabong, Emu Bottom Wetlands Reserve

3.4.1.5 *Grassland*

Large expanses of open grassland occur throughout the reserve, particularly in the southern section. These areas are dominated by introduced pasture grasses and are mostly mown or slashed. A patch of uncut grass has been deliberately left as refuge habitat in the south of the reserve. These areas are of low value for most fauna, with the exception of birds adapted to open areas, common reptiles and Eastern Grey Kangaroo. Common birds including Australian Magpie, Magpie Lark and Masked Lapwing were observed utilising the mown grassland as habitat. Common reptile species, such as snakes and skinks, are likely to occur within areas of long grass adjacent to the creek. Groups of Eastern Grey Kangaroo are likely to graze within the grassy areas at night time.

3.4.2 Significant species

Based on previous records, habitat suitability and landscape context, the following signficiant species have a moderate to high likelihood of occurrence within Emu Bottom Wetlands Reserve.

- Nationally significant species:
  - Swift Parrot; and
  - Growling Grass Frog.
- State significant species:
  - Eastern Great Egret;
  - Intermediate Egret; and
  - Hardhead.
- Regionally significant species;

- Pied Cormorant;
- Nankeen Night Heron;
- Latham's Snipe; and
- Azure Kingfisher.

3.5 Albert Road Nature Reserve

A total of 48 fauna species were recorded at Albert Road Nature Reserve including 13 mammals (nine native, four introduced), 30 birds (26 native, four introduced), one native reptile and four native frogs. Records for an additional six significant species (one mammal, four birds and one frog) occur within this reserve (DSE 2011a) (Appendix 1.3, Table A1.3.4.). Four broad habitat types occur within the reserve; woodland, scattered trees and shrubs, grassland and creekline.

3.5.1 Fauna habitats

3.5.1.1 *Woodland*

Relatively intact remnant woodland occurs on the hill in the eastern half of this reserve (Plate 12). Bundy and Melbourne Yellow Gum, including some mature hollow-bearing specimens, form the overstorey on the hill top. A dense shrub layer including Drooping Cassinia, Sweet Bursaria, Black Wattle, Golden Wattle and Blackwood occurs across the peak and slopes of the hill and the vegetation includes diverse ground-layer vegetation. Surface rock is abundant throughout the area.

This area provides good quality habitat for a variety of species, including woodland birds, birds of prey, arboreal mammals, microbats, reptiles and ground-dwelling mammals. A diverse suite of woodland birds were observed utilising the woodland including Mistletoe Bird *Sturnus vulgaris,* three species of Thornbill, Silvereye and White-throated Treecreeper *Cormobates leucophaeus*. Records exist for three state significant woodland birds within the reserve; Speckled Warbler and Black-chinned Honeyeater *Melithripterus gularis gularis* from 1990 and Diamond Firetail from 2005 (DSE 2012). The nationally significant Swift Parrot is also likely to utilise the woodland occasionally. The trees on the hilltop provide good vantage points for owls and raptors to scan for prey items. Southern Boobook and Pacific Barn Owl were heard calling from woodland within and surrounding the reserve and a Peregrine Falcon *Falco peregrinus* was observed perched at the top of a mature eucalypt on the hill top. The hollow-bearing eucalypts provide sheltering habitat for Common Brushtail Possums, which were observed during spotlighting surveys. Whilst not detected during the current assessment, Koala has previously been recorded within the reserve (Hume City Council 2012c) and is likely to utilise this patch as part of a larger home range. The woodland provides foraging and roosting habitat for microbats. The echolocation calls of six microbat species were detected within the reserve, including Eastern Falsistrellus, which is a relatively rare species in remnant patches. The presence of this species within the reserve is probably due to the high connectivity of the vegetation with surrounding woodland areas in neighbouring properties. The abundant surface rock and high amount of ground cover provides suitable habitat for a

range of reptile species, including skinks and snakes. This ground-cover may also provide habitat for small ground-dwelling mammals, although no native species from this group were detected during the current surveys. Echidna has been previously recorded within the reserve (Hume City Council 2012c). The state significant Common Dunnart *Sminthopsis murina murina* has was recorded within the reserve in 1990(DSE 2012) and this area represents potential habitat for the species. Black Wallaby are likely to browse vegetation in this area and both this species and Eastern Grey Kangaroo used this habitat for refuge during the current assessment.

Plate 12: Woodland within Albert Road Nature Reserve

3.5.1.2 *Scattered trees and shrubs*

Scattered trees and shrubs, of the same species present with the woodland patch, occur on the lower hill slopes, along the western boundary and either side of the creekline in the south of the reserve. These provide foraging habitat for more gregarious birds such as Red Wattlebird, Crimson Rosella and Grey Fantail and are also likely to be used as 'stepping stones' between denser patches by the suite of insectivorous birds described above. Microbats are likely to forage around these scattered trees and shrubs.

3.5.1.3 *Grassland*

Large areas of open grassland occur in the western half of the reserve. Whilst large sections are dominated by introduced grasses and weeds, large patches of relatively intact native grassland also occur. The latter areas contain a high diversity of graminoids and herbs. Surface rock is scattered throughout the grassland on the western hill slope. These areas are of moderate to high value for fauna. A variety of bird species, tolerant of open areas are likely to utilise these areas. Whilst common species including Australian Magpie, Magpie Lark and Willie Wagtail are likely to use these areas extensively, the native grasslands also provide habitat for less common grassland bird species. During the current assessment Horsfield's Bushlark *Mirafra javanica* was observed foraging within the grassy areas and the state

significant Brown Quail was observed within the reserve in 2005 (DSE 2012). A variety of common reptiles are likely to utilise this habitat with Bougainville's Skink found in this habitat during the current assessment. The areas represents potential habitat for the nationally significant Striped Legless Lizard and Golden Sun Moth. A large mob of Eastern Grey Kangaroos live in this reserve and were commonly observed grazing within the grassland areas.

3.5.1.4 *Creekline*

A creekline which forms a tributary to Jacksons Creek occurs along the southern boundary of the reserve (Plate 13). The near vertical banks of the creek have undergone severe gully erosion, and are eroded to a depth of six metres in sections. Rubbish including rusted corrugated iron, steel, wire and car parts litters the incised gully. During the current assessments the creek had little flow, being no more than a trickle of water on the sandy creek bed. Whilst introduced grasses grow down the eroded banks and in the base of the creek, no aquatic vegetation was present. Scattered eucalypts and Acacias grow within the gully and along its edges. This creekline represents poor habitat for wildlife.

Four common frog species were recorded during the current surveys, however, many of these seemed to be calling from gardens neighbouring the reserve, rather than from the creekline. The creekline is not suitable breeding habitat and has little available refuge for frogs. A record for the nationally significant Growling Grass Frog from 1990 occurs within this reserve. However, the poor habitat quality of this creekline makes it likely that the individual was either dispersing through the area whilst moving between areas of more suitable habitat, or else the location of the record is incorrect.

Plate 13: Tributary to Jacksons Creek, Albert Road Nature Reserve

3.5.2 Significant species

Based on previous records, habitat suitability and landscape context, the following signficiant species have a moderate to high likelihood of occurrence within Albert Road Nature Reserve.

- Nationally significant species:
  - Swift Parrot;
  - Striped Legless Lizard; and
  - Golden Sun Moth.
- State significant species:
  - Common Dunnart;
  - Speckled Warbler; and
  - Diamond Firetail.
- Regionally significant species;
  - Fat-tailed Dunnart;
  - Brown Quail; and
  - Black-chinned Honeyeater.

3.6 Sunbury Pop Festival Site

A total of 73 fauna species were recorded at Sunbury Pop Festival Site including 15 mammals (ten native, five introduced), 49 birds (45 native, four introduced), two native frogs, five fish (three native, two introduced) and one native crustacean (Appendix 1.3, Table A1.3.5.). Four broad habitat types occur within the reserve; riparian woodland, planted trees and shrubs, grassland and creekline.

3.6.1 Fauna habitats

3.6.1.1 *Riparian woodland*

Riparian woodland with an overstorey of mature River Red-gums occurs along the edge of Jacksons Creek on the northern boundary of the reserve. Scattered native shrubs including Tree Violet, River Bottlebrush, Sweet Bursaria and Acacias grow in the understorey. Tussock Grass *Poa* sp., native herbs, weeds and introduced grasses grow patchily throughout the area. In the eastern half of the reserve, this vegetation grows over a point bar composed of stones. Previous floods have deposited large piles of washed up logs and branches throughout this section (Plate 14). The River Red-gum canopy in this area is connected, with branches of adjacent trees touching. In the western section the trees become scattered and patchily distributed along the creek bank.

This vegetation provides habitat for a variety of woodland birds, arboreal mammals, small ground-dwelling mammals, microbats, reptiles and frogs. A diverse range of small to medium sized woodland birds were observed utilising this habitat, including Spotted Pardalote, White-browed Scrubwren, Grey Shrike-thrush, Fat-tailed Cuckoo, Golden Whistler *Pachycephala pectoralis* and Spiny-cheeked Honeyeater. This are provides foraging, refuge and nesting habitat for these species.

The regionally significant Diamond Firetail has been recorded in the nearby Holden Flora Reserve and may occur within this habitat on occasion. Similarly, this area provides suitable habitat for the nationally significant Swift Parrot, which may occasionally visit the reserve. Hollow-nesting birds including parrots are likely to utilise this areas extensively for breeding. Common Brushtail Possum and Common Ringtail Possum were observed in high abundances in this habitat. Both these species would utilise the abundant tree hollows available for shelter and Ringtail dreys were observed within some tall shrubs. Whilst not detected during the current surveys, Sugar Glider and Koala are also likely to utilise this habitat. Two native ground-dwelling mammals were detected in this habitat with hairtubes; an unidentified dasyurid which was probably an Antechinus and Swamp Rat *Rattus lutreolus.* One semi-aquatic mammal; Water Rat was also detected with a hairtube in this area. Abundant ground-cover created by low-level vegetation, rocks and piles of flood-deposited logs provide high quality refuge, shelter and foraging habitat for small ground-dwelling mammals. This area represents foraging and roosting habitat for microbats, with three species detected in this vegetation. Whilst no reptiles were recorded during the current surveys in this area, the abundant rock and log provides ample refuge and foraging habitat for a variety of reptiles, including Tree Dragon *Amphibolurus muricatus* and common snakes and skinks. Similarly, frogs are likely to refuge within and beneath the rocks, logs and vegetation in this area, including the nationally significant Growling Grass Frog which has previously been recorded from the nearby Holden Flora and Fauna Reserve (DSE 2012, Ecology Partners Pty Ltd 2010). This area represents sub-optimal habitat for Brown Toadlet which has also been previously recorded in Holden Flora and Fauna Reserve (DSE 2012) (Figure 2). Frog surveys were conducted during the calling season for this species (March-June) and it was not recorded, however this species calls erratically and failure to detect the species does not necessarily mean absence from a site.

Plate 14: Riparian woodland, Subury Pop Festival Site

3.6.1.2 *Planted trees and shrubs*

Plantings of native trees and shrubs have been undertaken throughout the site as part as ongoing revegetation efforts coordinated by Hume City Council. Shrubs and trees have been planted along the creekline and on the hill slope. Whilst many of the planted shrubs and trees on the hill slope are too young to have much habitat value yet, those planted closer to the creekline are more mature. These provide foraging habitat for insectivorous birds including Yellow-rumped Thornbill, Silvereye and Red-browed Finch as well as for microbats.

3.6.1.3 *Grassland*

The hill slope within the reserve is contains modified grassland. Whilst much of this area is dominated by introduced pasture grasses, some relatively intact areas of native grassland with a high cover of native species, including Wallaby Grasses *Austrodanthonia* spp. occur on this hill slope. The area has a relatively high cover of surface rock, indicating that it has never been ploughed. This area represents suitable habitat for a variety of common fauna including grassland adapted birds, raptors, reptiles and mammals. It is also suitable habitat for a number of significant species. In addition to common birds tolerant of open areas, such as Australian Magpie and Magpie Lark, birds adapted to grasslands, including quails, are likely to use this grassland. During the current survey, the regionally significant Brown Quail was observed within this area. The open structure of the grassland, along with its location in the Jacksons Creek valley and the associated thermal columns make it suitable habitat for a wide range of raptor species. During the current surveys a number of birds of prey were observed foraging over the area including; Wedge-tailed Eagle, Black-shouldered Kite, Nankeen Kestrel, Brown Falcon and the state significant Black Falcon. Although no reptiles were found in these areas during the current surveys, the low level cover provided by the grass and surface rock entails suitable habitat for a range of common reptile species, including skinks and snakes. Mobs of Eastern Grey Kangaroos were observed grazing within this area. It is possible that the regionally significant Fat Tailed Dunnart may reside in this area, since the abundant surface rock provides suitable sheltering habitat for the species.

This area represents suitable habitat for three species of national significance; Striped Legless Lizard, Grassland Earless Dragon and Golden Sun Moth. Striped Legless Lizard require sheltering habitat, such as the surface rock found within this area, and typically occur in grasslands with a mixture of native and exotic tussock-forming species (SEWPaC 2011b). Grassland Earless Dragon was recorded in the nearby Holden Flora and Fauna Reserve in 1990 (Figure 2). However, targeted surveys after 1994 failed to find the species (DSE 2008). Given the rarity of the species, it is likely that it once occurred within the reserve but is now locally extinct, however, the abundance of surface rock and areas of native grassland and close proximity to the nearby record make it a possibility and warrants further investigation. The presence of reasonably intact patches of native grassland, including *Austrodanthonia* spp.; the food source for Golden Sun Moth larvae, make this suitable habitat for this species.

3.6.1.4 *Creekline*

The structure of Jacksons Creek varies considerably along the length of the reserve. The creekline includes large deep pools, shallow riffle zones and narrow, slow flowing sections (Plate 15). Much of the stream bed, particularly around the riffle zones, is composed of cobble and small to medium sized stones with boulders occurring along the banks. Other sections have a clay-silt substrate with earth banks. Coarse woody debris is common along this reach of the creek. Mature River Red-gums grow along the bank and in some sections protrude into the creek, resulting in moderate shading of the water. The creek contains a moderate level of macrophyte cover with floating vegetation including Duckweed *Lemna* sp., Water Ribbons and Slender Knotweed and fringing and emergent vegetation such as Common Reed, Common Rush and Umbrella Sedge (Appendix 2, Table A2.2.). In some sections large stands of Common Reed occur along the creek edge and extend up the banks. Water quality is high within this section of the creek (Appendix 2, Table A2.1).

This section of Jacksons Creek provides good quality habitat for frogs, fish, waterbirds, semi-aquatic mammals and microbats. The creekline represents suitable breeding, dispersal and refuge habitat for a variety of frog species. During the current assessments two frog species; Common Froglet and Southern Brown Tree Frog were heard calling. It is likely that assessments during summer would reveal the presence of a greater variety of frog species. Growling Grass Frog has been previously recorded in the neighbouring Holden Flora and Fauna Reserve, most recently from 2010 (Ecology Partners Pty Ltd 2010). The habitat present within this section of Jacksons Creek is suitable for breeding, dispersal and refuge of this species. Three native fish species; Australian Smelt, Flat-headed Gudgeon and Short-finned Eel were recorded during the current fish surveys, along with one native decapod crustacean; Freshwater Shrimp. Other common native fish species may also occur within this area but have gone undetected during the single night trapping at the site. A variety of common waterbirds were observed in this habitat during the current assessment including Pacific Black Duck, Australian Wood Duck, Little Pied Cormorant, Darter *Anhinga novaehollandiae*, Purple Swamphen, Dusky Moorhen and White-faced Heron. Migratory and nomadic waterbirds are likely to utilise the creekline occasionally, including significant species such as the state significant Eastern Great Egret, Intermediate Egret and Hardhead. This section of creek represents good quality habitat for Platypus and the species has previously been recorded here (Hume City Council 2012). Water Rat was recorded from hair-tubes within the reserve and would utilise the creekline extensively. The creekline provides both drinking and foraging habitat for a variety of microbats and is likely to be utilised as a flyway through the landscape, with three common microbat species recorded during the current assessment.

Plate 15: Jacksons Creek riffle zone, Subury Pop Festival Site

3.6.2 Significant species

Based on previous records, habitat suitability and landscape context, the following signficiant species have a moderate to high likelihood of occurrence within the Sunbury Pop Festival Site.

- Nationally significant species:
  - Swift Parrot;
  - Striped Legless Lizard;
  - Grassland Earless Dragon;
  - Growling Grass Frog; and
  - Golden Sun Moth.
- State significant species;
  - Common Dunnart;
  - Hardhead;
  - Eastern Great Egret;
  - Intermediate Egret;
  - Black Falcon;
  - Diamond Firetail; and
  - Brown Toadlet.
- Regionally significant species;
  - Fat-tailed Dunnart;
  - Brown Quail;
  - Pied Cormorant;
  - Nankeen Night Heron; and
  - Azure Kingfisher.

4 CONSERVATION ISSUES AND RECOMMENDATIONS

The five council-managed reserves assessed currently provide high quality habitat for a wide range of species. Ensuring the long-term conservation of fauna within these reserves will involve careful planning and consideration by Hume City Council. In particular, increasing urban development in the surrounding area is likely to result in reduced habitat connectivity within the landscape which will affect the viability of fauna populations. Other management issues for the reserves include ongoing vegetation management, pest control, road effects and lighting. It is recommended that future surveys be undertaken during warmer seasons and that targeted surveys are undertaken for threatened species where possible.

4.1 Habitat Connectivity within the Landscape

In general, the reserves currently have a high degree of connectivity with habitat in the surrounding landscape. Ensuring that these reserves remain connected to other surrounding habitat in the future is essential to maintain the long-term viability of fauna populations within the reserves. All reserves are currently outside the Urban Growth Boundary and as such, are not at immediate risk of being landlocked by future high density development.

4.1.1 Reserves connected by riparian corridors

Three of the reserves; Emu Valley Reserve, Emu Bottom Wetlands Reserves and Sunbury Pop Festival site are connected to other areas of riparian habitat by the riparian corridor provided by Jacksons Creek. The sections of Jacksons Creek connected to Emu Bottom Wetlands Reserve, Emu Valley Reserve and the Sunbury Pop Festival site, within the Urban Growth Zone, have been designated Category 1 areas for Growling Grass Frog under the draft *Biodiversity Conservation Strategy for Melbourne's Growth Areas* (DSE 2011) and as such, these areas would be maintained as conservation zones. This would ensure that these reserves maintain a degree of connectivity with habitat within the surrounding landscape, via the riparian corridor. The Growth Area Authority's *Growth Corridor Plans* (GAA 2012) map Jacksons Creek as a riparian corridor and the areas on the opposite bank of the creek to the three reserves as areas with biodiversity values. A metropolitan trail network is proposed adjacent to Jacksons Creek (GAA 2012). The Natural Heritage Strategy (Hume City Council 2012a) advocates for a 50 metre buffer of riparian vegetation either side of waterways, and a 25 metre buffer either side of smaller creek tributaries.

4.1.1.1 *Recommendations*

It is recommended that Hume City Council ensure that activities within the riparian vegetation buffer around Jacksons Creek remain amenable to fauna conservation. This should involve ensuring that the 50 metre buffer of vegetation is dedicated for flora and fauna conservation and that trails, tracks and formal open areas are located outside the buffer zone.

4.1.2 Connectivity of Albert Road Nature Reserve

Albert Road Nature Reserve is not connected to the Jacksons Creek riparian corridor and as such, is at the greatest risk of becoming isolated. The land immediately south and south-west of Albert Road Nature Reserve is zoned Residential 1 Zone (R1Z). Consequently it is likely that high density residential development will occur in this area in the future and that the high quality woodland which this reserve is connected to in the south will be largely cleared. Land to the west of the reserve is zone Green Wedge A Zone (GWAZ) and under the Hume Planning Scheme schedule is mapped as area B, which means it has a minimum subdivision area of six hectares. Should this area be subdivided, even with these relatively large block sizes, some or all of the high quality woodland, directly to the west of the reserve, could be lost. This neighbouring woodland helps to provide connectivity between Albert Road Reserve and Parkway Drainage Reserve to the north.

4.1.2.1 *Recommendations*

It is recommended that Hume City Council investigate options for the protection of the woodland patch to the west of the reserve. This could be achieved by extending the existing Vegetation Protection Overlay – Schedule 1 under the Hume Planning Scheme which currently covers Albert Park Reserve and other grassy woodland in the vicinity of Spavin Drive, Albert Road, Kismet Road and Winilba Drive or by adding a new Vegetation Protection Overlay.

4.1.3 Connectivity of Mount Holden Reserve

Mount Holden Reserve is largely surrounded by grasslands, both natural and introduced. This currently provides landscape connectivity for grassland-dependent fauna within the reserve. Much of the surrounding area to the north and west of the reserves is zoned Green Wedge Zone (GWZ) and under the Hume Planning Scheme schedule is mapped as area A which means that that the smallest subdivision area is 80 hectares. Under this zoning, connectivity within the landscape for grassland fauna will remain relatively unchanged. Ongoing works to improve the health and habitat value of Blind Creek, such as those undertaken by Council and the Sunbury Conservation Society, will further improve connectivity for creek-dependent fauna including frogs and waterbirds.

4.1.3.1 *Recommendations*

It is recommended that Hume City Council, in collaboration with community groups and other stakeholders, continue to plan and implement revegetation and weed control works along Blind Creek and its tributaries.

4.1.4 Connectivity for macropods

Eastern Grey Kangaroos and Swamp Wallabies were found to use all five bushland reserves assessed. With increasing development in the surrounding areas, careful planning must be undertaken to ensure that these populations do not become landlocked. Previous examples of

Eastern Grey Kangaroos becoming landlocked in newly developed areas on Melbourne's fringes have resulted in large mobs having to be culled. For example, in 2010 a mob of Eastern Grey Kangaroos which had become landlocked by development in South Morang were culled by DSE following welfare concerns for the mob, sparking protests by some community groups and animal welfare organisations (Smith 2010). In order to prevent similar occurrences in the Sunbury area, early planning should address whether or not to maintain these populations. If they are to be conserved, connectivity within the landscape should be maintained, if not provisions should be made to humanely remove these species from the reserves prior to them becoming landlocked. It should be noted that these species contribute to ecosystem function and their removal from reserves could result in detrimental changes to ecosystem dynamics.

4.1.4.1 *Recommendations*

It is recommended that Hume City Council address the issue of whether or not to maintain macropod populations within the reserve system. If they are not to be maintained, a program of staged humane removal from the reserves (potentially by herding macropods out of the area or implementing fertility control programs) should be undertaken prior to these areas becoming landlocked. If the macropod populations are to be conserved in the reserves then Hume City Council should plan for and maintain permanent corridors to link reserves with suitable habitat in the surrounding landscape.

4.2 Vegetation Management

Existing revegetation works within the reserves, undertaken by Hume City Council and community groups, have high value for fauna as described in detail in the results sections. The value of these areas for fauna will continue to increase as the vegetation matures, particularly if long-lived and/or naturally regenerating plant species are used. In all reserves along the Jacksons Creek there was a marked improvement in weed cover between the Council-managed reserves on one side of the creek as compared to private property on the opposite bank. By continuing the ongoing program of plantings combined with staged fauna-sensitive weed control, connectivity within important corridors such as the Jacksons Creek and Blind Creek riparian zones can be improved.

4.2.1.1 *Recommendations*

It is recommended that Hume City Council continue and expand revegetation programs both within reserves and in corridors such as riparian areas. Maintenance of existing vegetation should be undertaken with careful consideration to existing fauna. For example, removal of woody weeds should be staged and gradual. Where trees require pruning for safety reasons, it is recommended that this be undertaken in a sensitive manner, in accordance with the recommendations of the Australasian Bat Society (2012a), to protect hollows and enhance future hollow formation for wildlife, including microbats. Recommendations for pruning include:

- Where appropriate, fence off dead/hollow trees or change paths to avoid them, rather than removing or pruning them;
- If a dead tree is on a path edge, only prune branches on the side facing the path;
- Avoid pruning when microbats may be using hollows as maternity roosts (November – January) because very large groups of females and their young could be killed when the branch/tree is felled;
- Leave as much of the branch as possible and only remove branches that pose a safety risk;
- Cut branches well above any hollows and on an angle to avoid existing hollows being filled with water; and
- Use coronet cuts rather than traditional flat chainsaw cuts, to mimic natural breakage and encourage hollow formation.

4.3 Pest Management

Control of introduced vertebrate pests, particularly rabbits, foxes and cats is important for the conservation of many wildlife species. Hume City Council currently employs licensed contractors for rabbit control in Council-managed reserves. Introduced carnivores, including cats and/or foxes were recorded within all reserves surveyed. These predators are likely to have a significant impact on a range of local wildlife species including small mammals, frogs, reptiles and birds. The Natural Heritage Strategy (Hume City Council 2012a) outlines the objective to "seek to minimise the threat to native fauna in Hume posed by foxes and domestic and feral cats" and the Action Plan (Hume City Council 2012b) aims to investigate the "viability of fox and feral cat control" and establish a "fox and feral cat control program" if viable by June 2014. The current survey results support the need to establish and implement these programs. It is likely that a significant increase in residential development will occur around the reserves in future, which will in turn result in higher numbers of domestic cats straying into the reserves. Whilst the potential for fox baiting within urban areas is generally more constrained than in rural areas, the success of the 'Sydney-North Regional Fox-control Program', where 1080 baiting has successfully been conducted in bushland bordering high-density housing for more than 10 years, demonstrates that with careful planning baiting in urban areas can be conducted safely (Carter *et al* 2011).

4.3.1.1 *Recommendations*

It is recommended that Hume City Council establish and implement a fox and cat control program within both Council-managed reserves and the surrounding landscape. In rural reserves such as the Sunbury Pop Festival Site, fox control should be conducted in coordination with surrounding landowners in order to ensure maximum effectiveness. It is suggested that the methodology utilised for the 'Sydney-North Regional Fox-control Program' be should investigated to determine its applicability for urban fox control in the Hume reserve system.

It is recommended that Council investigate the implementation of cat ownership controls (including bans on cat ownership) for new housing developments. This can be arranged through a Section 173 Agreement, under the provisions of the *Planning and Environment Act 1987*.

4.4 Road Effects

Roads affect wildlife directly through vehicle-caused mortalities and indirectly by fragmenting populations through contributions to edge effects and barrier effects (Forman and Alexander 1998). Many species actively avoid and are unwilling to cross roads, whilst others are at considerable risk of injury and mortality when crossing roads to disperse in and out of reserves. Vehicle-related mortality affects a range fauna groups including arboreal and ground-dwelling mammals, macropods, birds, reptiles and frogs (Queensland Department of Main Roads, 2000). Local traffic is likely to increase in the areas surrounding the reserves with future development, which will likely necessitate upgrades to existing roads. Both barrier effects and roadkill rates have been found to be affected by road width and traffic flow (Forman and Alexander 1998) and it is therefore important that Hume City Council consider fauna when planning for road upgrades to minimise roadkill rates whilst maximising connectivity of wildlife populations.

4.4.1.1 *Recommendations*

It is recommended that Hume City Council investigate options for fauna sensitive road design when upgrading the road network near Council-managed reserves. For maximum effectiveness, a landscape-scale approach, involving modelling of existing and future fauna corridors could be undertaken to identify locations for fauna road-crossing and funnelling structures. The Queensland Department of Transport and Main Roads has prepared two documents which contain detailed guidelines for incorporating wildlife protection and conservation measures into road design: *Fauna Sensitive Road Design Volume 1 – Past and Existing Practices* (QDMR 2000) and *Fauna Sensitive Road Design Manual Volume 2 – Preferred Practices* (QDTMR 2010).

4.5 Lighting

Light pollution can significantly impact on wildlife, particularly nocturnal species including microbats. Artificial lighting can alter the behaviour of fauna species, for example Gould's Long-eared Bats *Nyctophilus gouldi* have been found to avoid flood-lit areas of bushland (Australasian Bat Society 2012b). Employing sensitive lighting practices in and around bushland reserves (including within neighbouring new developments) is essential to ensure that light pollution does not negatively impact on the fauna within the reserves.

4.5.1.1 *Recommendations*

It is recommended that Hume City Council investigate options to minimise light pollution within bushland reserves when installing or upgrading lighting in these areas or the

surrounding neighbourhood. The Australasian Bat Society has provided recommendations on fauna-sensitive lighting (Australasian Bat Society 2012b) which include:

- Avoid installing lighting within and around bushland unless absolutely necessary;
- Install shields on street lights to direct illumination down to the ground and reduce spill-over into nearby bushland;
- Reduce the time that bushland is exposed to unnatural light levels by using timers and/or sensors to turn lights on and off at appropriate times;
- Use globes that emit long-wavelength light (rather than broad spectrum, white or fluorescent light) in the red or orange part of the spectrum; and
- Increase tree and shrub cover adjacent to bushland to provide a buffer to reduce light penetration into these areas.

4.6 Additional Surveys

As discussed in the methods section, the timing of surveys was a limiting factor for the detection of many fauna species; particularly reptiles, frogs which call during summer and some bird species. Further survey work, such as that planned for the other five reserves outlined in the Natural Heritage Strategy (Hume City Council 2012a) should be conducted in the summer months if possible.

Significant species with a moderate to high likelihood of occurrence have been identified for each reserve. It is possible that some surveys for significant species could be undertaken as part of a citizen science program, under the guidance of qualified ecologists. For example, targeted surveys for Growling Grass Frog, involving active listening and call playback could be undertaken within the reserves on the Jacksons Creek by community groups, in collaboration with organisers from Council or other organisations. Melbourne Water currently runs the Healthy Waterways Waterwatch Frog Census using community volunteers. Community members visit their local waterbody or waterway, use an audio recorder to record for five minutes and fill in data sheets. It does not matter whether frogs are calling at that time or not. The volunteers submit the audio files and associated data sheets to Melbourne Water, who arrange for a professional ecologist to formally identify the species calling and enter the information into a database. These records are entered into the Melbourne Water Frog Census website map and submitted to the Atlas of Victorian Wildlife database (Melbourne Water 2012). Surveys involving the handling of wildlife require an experienced animal handler with current DSE permits and ethics approval. However, it is possible that community surveys could be undertaken under the guidance of a professional ecologist who would handle the fauna if necessary.

The grassland areas of Mount Holden Reserve contain areas of suitable habitat for the nationally significant Golden Sun Moth, Striped Legless Lizard and regionally significant Fat-tailed Dunnart. The Mount Holden Reserves Masterplan outlines actions to rehabilitate the site, enhance the vegetation present and create recreation areas for the public (Thompson Birrill Landscape Design Pty Ltd 2008).

It is recommended that targeted surveys for these three significant species be undertaken in areas of suitable prior to any earthworks being undertaken (for steps, tracks and viewing areas) in order to determine their presence or not and any mitigation measures required to prevent negative impacts.

4.6.1.1 *Recommendations*

It is recommended that future general fauna surveys be undertaken during the warmer months of the year, in order to detect the maximum number of fauna species possible. The surveys planned for the further five major Council reserves should be conducted over late spring and summer.

Targeted surveys for the significant species identified as having a moderate to high likelihood of occurrence within each reserve are advisable. These would extend current knowledge of the distribution of these species within the Sunbury and Diggers Rest area and may provide knowledge useful for determining future management actions for the reserves and assessing development applications within the surrounding landscape.

Where major works, such as construction or landscaping are planned for the reserves (such as that planned for Mount Holden Reserve) it is recommended that targeted surveys be conducted by qualified zoologists for the significant species which have been identified in this report as having a moderate high likelihood of occurrence.

5 CONCLUSION

The five council-managed reserves assessed currently provide high quality habitat for a wide range of species. A total of 109 species fauna species, comprising 74 birds (69 native, five introduced), 21 mammals (16 native, five introduced), one native reptile, six native frogs, six fish (three native, three introduced) and one crustacean were recorded during the current assessment. No species of national significance were recorded, however one species of state significance, Black Falcon *Falco subniger* and one of regional significance, Brown Quail *Coturnix ypsilophora australis* were detected during the assessment.

All reserves assessed contain a variety of habitat types including woodland, shrubland, creekline, grassland, waterbodies, planted trees and shrubs and artificial (human-made) habitats. Many of these habitats are of high value for fauna and provide potential habitat for a variety of significant fauna species. Potential habitat was identified within the five reserves for four nationally significant species, seven state significant species and six regionally significant species.

Managing these reserves for the long-term conservation of native fauna will involve careful planning and consideration by Hume City Council. Increasing urban development in the surrounding area is likely to place considerable pressures on local wildlife, particularly through decreases in habitat connectivity and careful planning will be required to minimise the effects of habitat fragmentation. Other management issues include the control of introduced predators (cats and foxes), vegetation management, preventing negative road effects and minimising the impact of lighting on fauna within the reserves. It is recommended that future surveys be undertaken during warmer seasons and that targeted surveys are undertaken for threatened species where possible.

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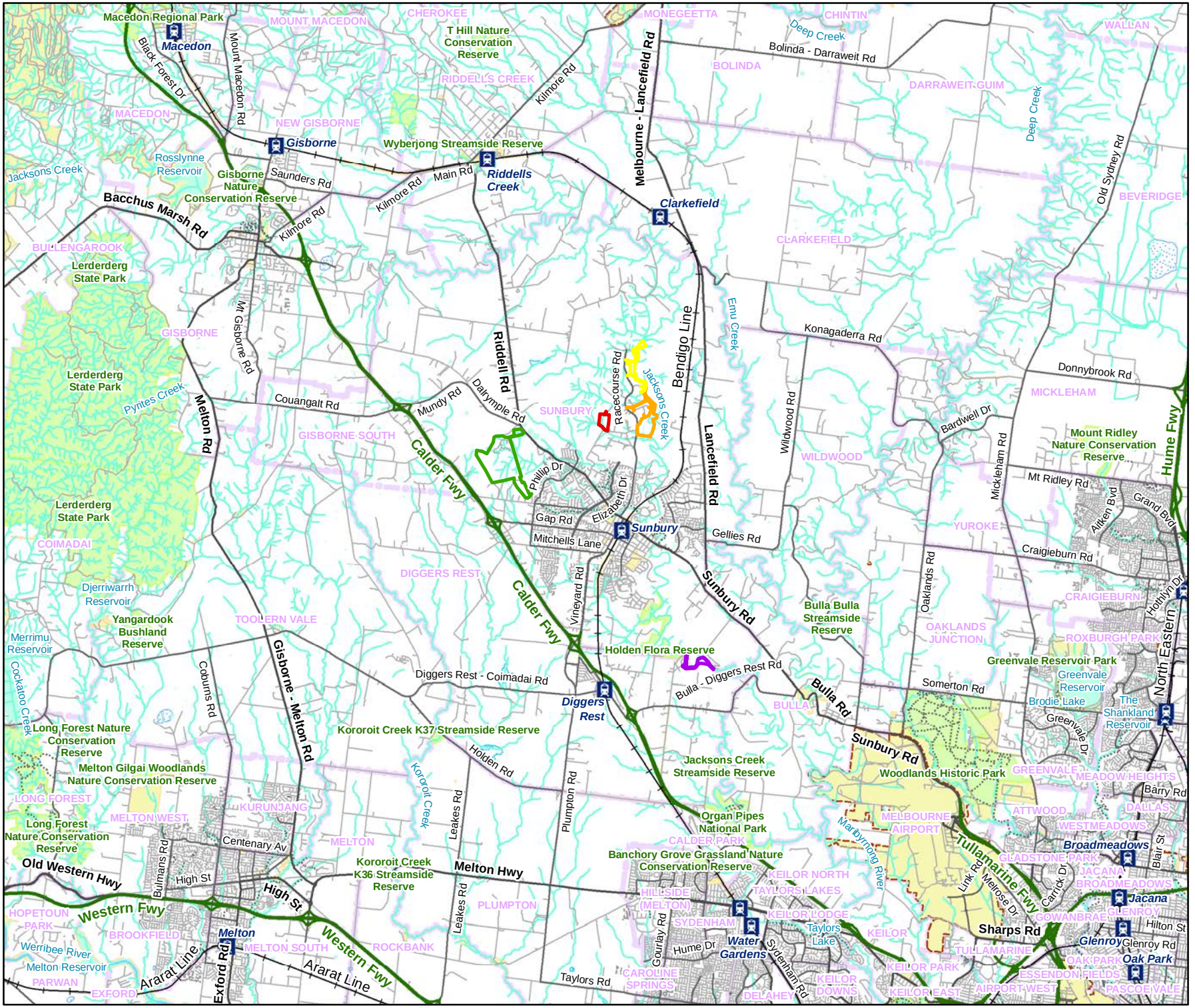
FIGURES



Legend

- Albert Road Nature Reserve
- Emu Bottom Wetlands Reserve
- Emu Valley Reserve
- Mount Holden Reserve
- Sunbury Pop Festival Site

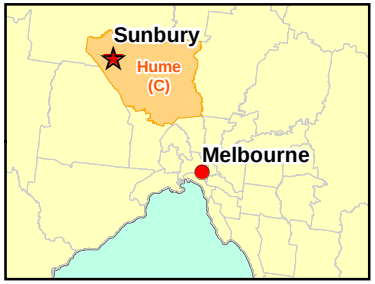


Figure 1

Location of the study area

Hume City Council

N

0 1,650 3,300

Metres

ecology & heritage partners

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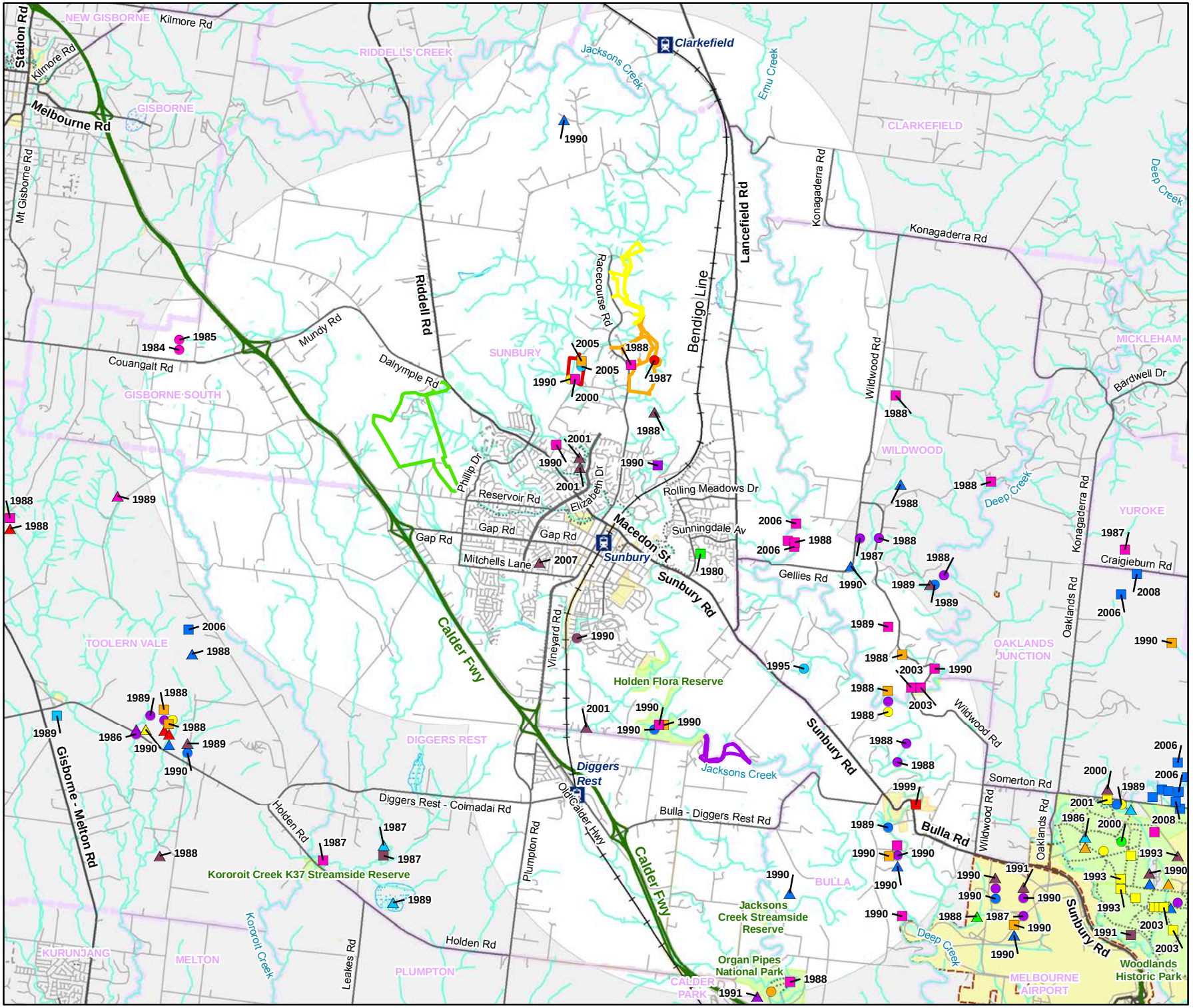


Legend

- Albert Road Nature Reserve
- Emu Bottom Wetlands Reserve
- Emu Valley Reserve
- Mount Holden Reserve
- Sunbury Pop Festival Site
- Azure Kingfisher
- Black Falcon
- Black-chinned Honeyeater
- Black-eared Cuckoo
- Brown Quail
- Brown Toadlet
- Brown Treecreeper (south-eastern ssp.)
- Brush-tailed Phascogale
- Common Dunnart
- Diamond Dove
- Diamond Firetail
- Eastern Barred Bandicoot
- Eastern Great Egret
- Fat-tailed Dunnart
- Golden Sun Moth
- Grassland Earless Dragon
- Growling Grass Frog
- Hardhead
- Hooded Robin
- Nankeen Night Heron
- Painted Honeyeater
- Pied Cormorant
- Royal Spoonbill
- Speckled Warbler
- Spotted Harrier
- Spotted Quail-thrush
- Swift Parrot

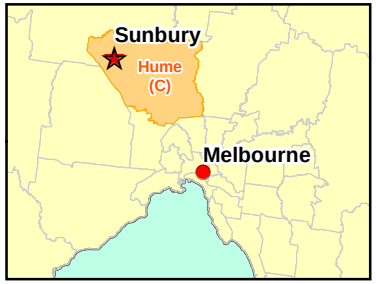


Figure 2

Previously documented significant fauna within 5km of the study area

Hume City Council

0 1,250 2,500
Metres

ecology & heritage partners

Legend

- Study Area
- Hair Tube Transect 1
- Hair Tube Transect 2
- Fish Survey
- Anabat Detection Locations

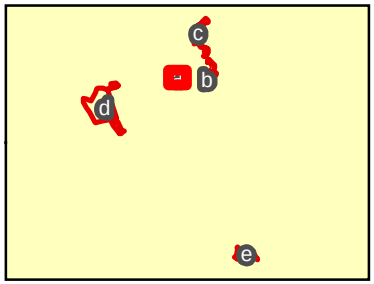


Figure 3a

Survey Effort

Hume City Council

Albert Road Nature Reserve

N

0 50 100

Metres

ecology & heritage partners

3797_Fig03_SurveyEffort.mxd 21/06/2012 ALF

Legend

- Study Area
- Hair Tube Transect 1
- Hair Tube Transect 2
- Fish Survey
- Anabat Detection Locations

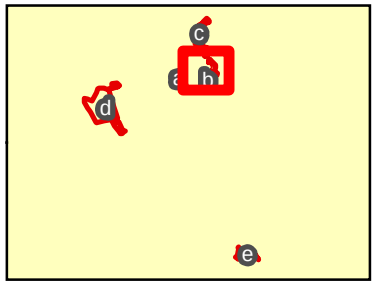


Figure 3b

Survey Effort

Hume City Council

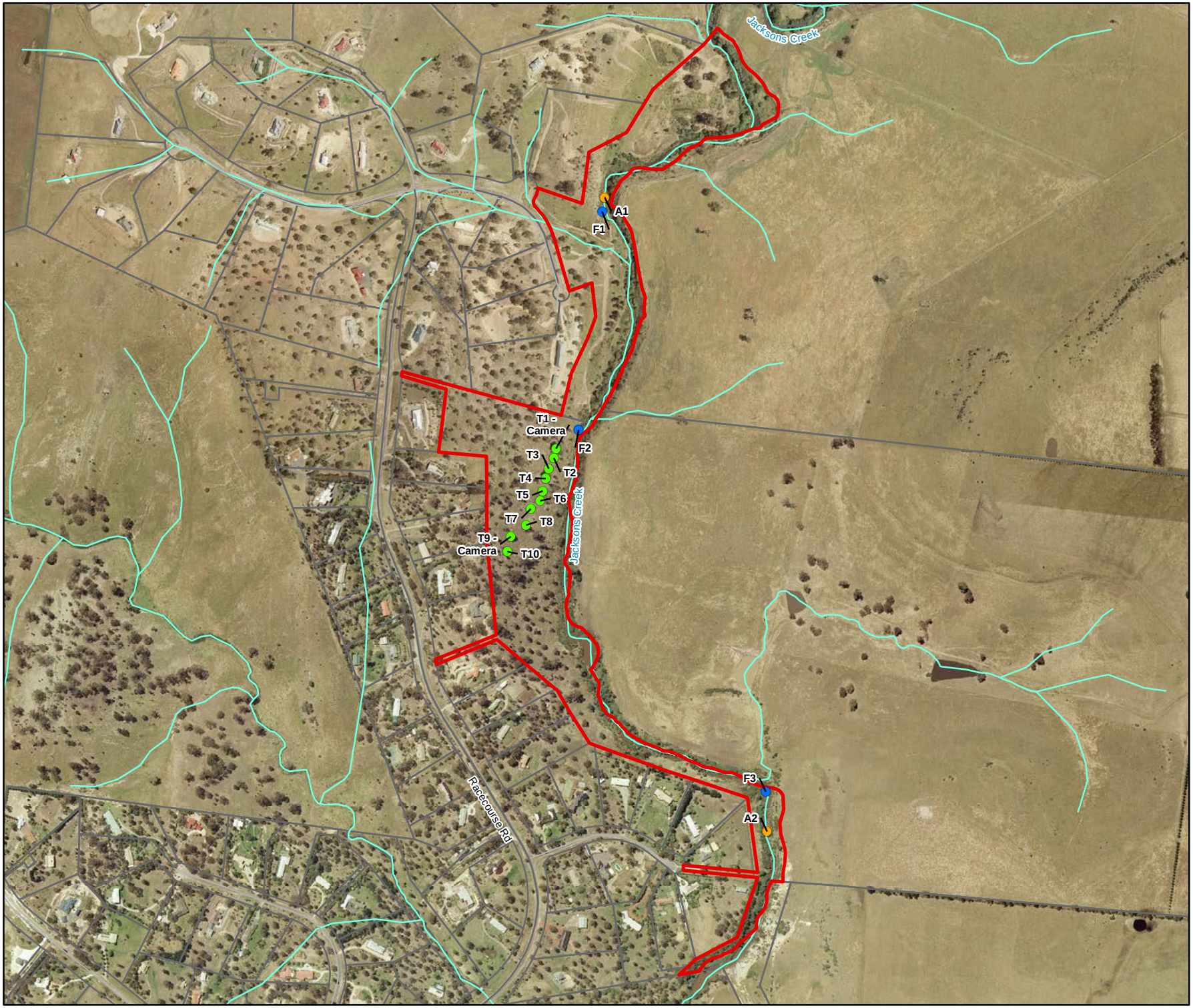
Emu Bottom Wetlands Reserve

N

0 50 100 200 300

Metres

ecology & heritage partners



Legend

- Study Area
- Hair Tube Transect 1
- Hair Tube Transect 2
- Fish Survey
- Anabat Detection Locations

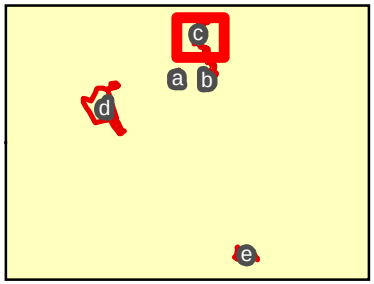


Figure 3c

Survey Effort

Hume City Council

Emu Valley Reserve

N

0 50 100 200 300

Metres

ecology & heritage partners

Legend

- Study Area
- Hair Tube Transect 1
- Hair Tube Transect 2
- Fish Survey
- Anabat Detection Locations

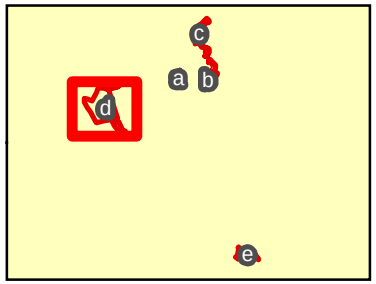


Figure 3d

Survey Effort

Hume City Council

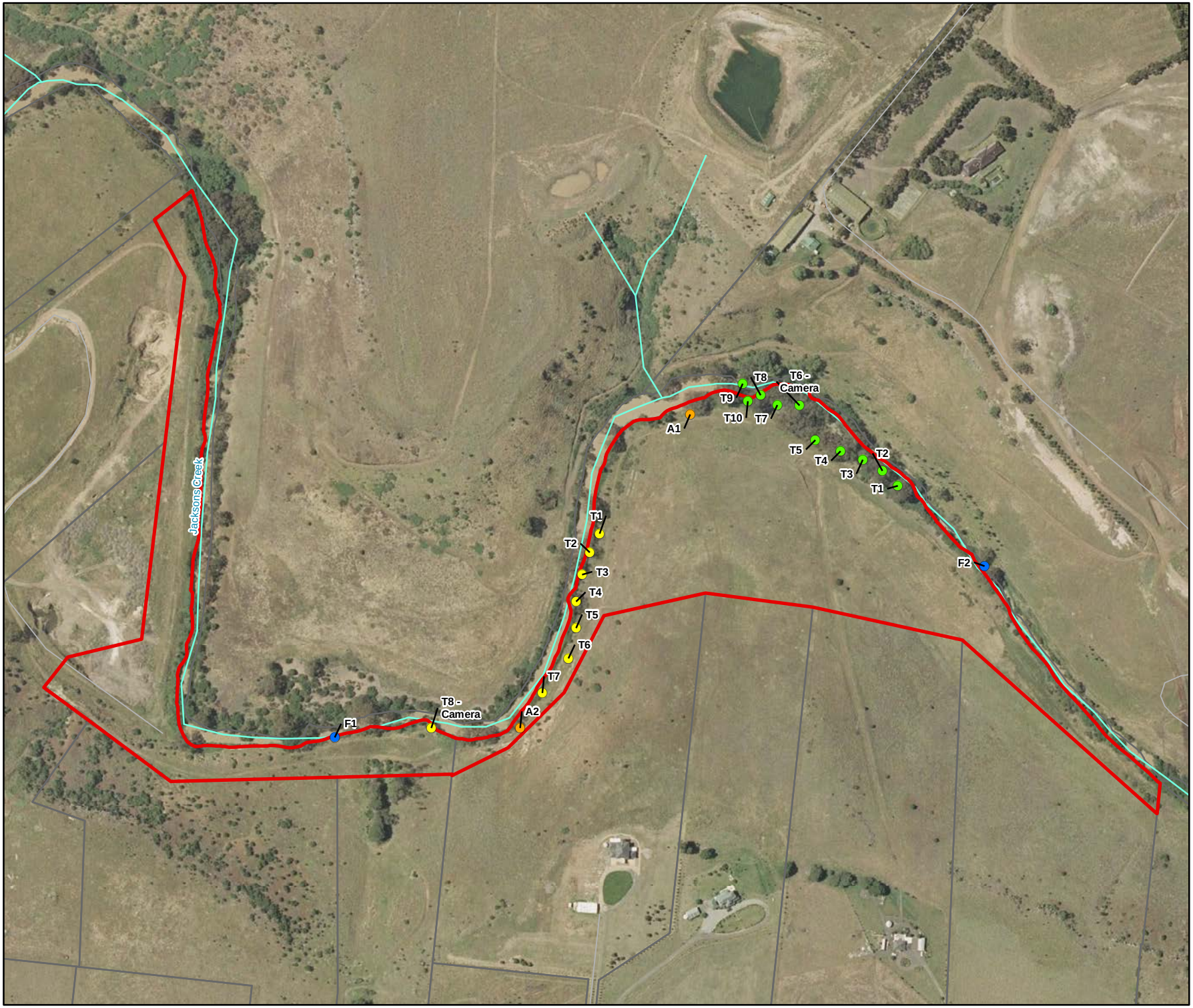
Mount Holden Reserve

N

0 50 100 200 300 400

Metres

ecology & heritage partners



Legend

- Study Area
- Hair Tube Transect 1
- Hair Tube Transect 2
- Fish Survey
- Anabat Detection Locations

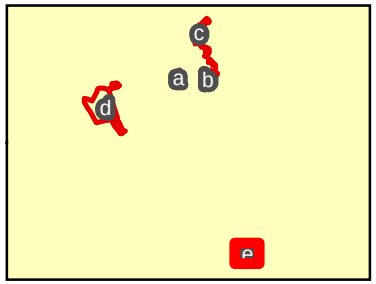


Figure 3e

Survey Effort

Hume City Council

Sunbury Pop Festival Site

N

0 50 100 200

Metres

ecology & heritage partners

APPENDICES

Appendix 1.1 – Fauna survey results

Table A1.1. Fauna recorded at all reserves during the present surveys (March-May 2012) and previously recorded within 10 kilometres of the study area.

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera

Mi Migratory
Ma Marine
* Introduced species
# Additional records from Birdata database, Birds Australia

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
	MAMMALS					
Platypus	*Ornithorhynchus anatinus*	2007	62	-	-	-
Short-beaked Echidna	*Tachyglossus aculeatus*	2004	35	-	-	S
Agile antechinus	*Antechinus agilis*	1979	16	Partial	-	-
Dusky Antechinus	*Antechinus swainsonii*	1845	1	-	-	-
Unidentified Dasyurid (probably Antechinus)	Probably *Antechinus sp.*	-	-	-	-	HT
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	1883	1	Partial	-	-
Eastern Quoll	*Dasyurus viverrinus*	1900	2	-	-	-
Brush-tailed Phascogale	*Phascogale tapoatafa tapoatafa*	1985	12	Total	-	-
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	1989	9	-	-	-
Common Dunnart	*Sminthopsis murina murina*	1990	1	-	-	-
Eastern Barred Bandicoot	*Perameles gunnii*	2003	10	-	-	-
Common Wombat	*Vombatus ursinus*	1967	2	-	-	-
Koala	*Phascolarctos cinereus*	2003	44	-	-	-
Common Brushtail Possum	*Trichosurus vulpecula*	2006	101	Total	-	S, C
Sugar Glider	*Petaurus breviceps*	1996	39	Total	-	-
Common Ringtail Possum	*Pseudocheirus peregrinus*	2006	49	Partial	-	S, I
Eastern Grey Kangaroo	*Macropus giganteus*	2008	120	-	-	S, C
Black Wallaby	*Wallabia bicolor*	2007	62	-	-	S, HT, C
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	1932	1	Total	-	-
Eastern Freetail Bat	*Mormopterus sp. 2*	1995	1	-	-	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
White-striped Freetail Bat	*Tadarida australis*	1991	10	Total	-	H, A
Southern Freetail Bat	*Mormopterus sp. 4*	1991	1	-	-	A
Gould's Wattled Bat	*Chalinolobus gouldii*	1994	21	Total	-	A
Chocolate Wattled Bat	*Chalinolobus morio*	1992	15	Total	-	A
Gould's Long-eared Bat	*Nyctophilus gouldi*	1991	1	Total	-	-
Eastern Falsistrellus	*Falsistrellus tasmaniensis*	-	-	Total	-	A
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	1991	16	Total	-	-
Unidentified Long-eared Bat	*Nyctophilus sp.*	-	-	Total	-	A
Inland Broad-nosed Bat	*Scotorepens balstoni*	1991	1	Total	-	-
Large Forest Bat	*Vespadelus darlingtoni*	1992	21	Total	-	A
Southern Forest Bat	*Vespadelus regulus*	1994	11	Total	-	-
Little Forest Bat	*Vespadelus vulturnus*	1994	18	Total	-	A
Water Rat	*Hydromys chrysogaster*	2003	15	-	-	HT
House Mouse*	*Mus musculus*	2007	32	-	-	HT, C
Bush Rat	*Rattus fuscipes*	1979	6	-	-	-
Swamp Rat	*Rattus lutreolus*	1989	1	-	-	HT
Brown Rat*	*Rattus norvegicus*	1992	1	-	-	-
Black Rat*	*Rattus rattus*	2005	19	-	-	S, HT, C
Dingo & Dog (feral)*	*Canis lupus*	1992	4	-	-	-
Red Fox*	*fam. Canidae gen. Vulpes*	2007	75	-	-	S, C, I
Ferret*	*Mustela furo*	1994	2	-	-	-
Cat*	*Felis catus*	2007	14	-	-	S, HT, C
Goat (feral)*	*Capra hircus*	1988	2	-	-	-
European Rabbit*	*Oryctolagus cuniculus*	2007	113	-	-	S, I
European Hare*	*Lepus europeaus*	2007	34	-	-	-
	BIRDS					
Emu	*Dromaius novaehollandiae*	1846	1	-	-	-
Stubble Quail	*Coturnix pectoralis*	2006	47	-	Ma	S
Brown Quail	*Coturnix ypsilophora australis*	2005	4	-	-	S
Musk Duck	*Biziura lobata*	1977	5	-	Ma	-
Black Swan	*Cygnus atratus*	2002	31	-	-	-
Australian Shelduck	*Tadorna tadornoides*	1988	15	Total	-	S

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Australian Wood Duck	*Chenonetta jubata*	2007	97	Total	-	S
Pink-eared Duck	*Malacorhynchus membranaceus*	1975	2	Partial	-	-
Australasian Shoveler	*Anas rhynchotis*	1977	4	-	-	-
Grey Teal	*Anas gracilis*	1990	15	Total	-	-
Chestnut Teal	*Anas castanea*	2007	16	Total	-	-
Northern Mallard*	*Anas platyrhynchos*	1999	2	-	-	-
Pacific Black Duck	*Anas superciliosa*	2007	108	-	-	S
Hardhead	*Aythya australis*	1991	5	-	-	-
Australasian Grebe	*Tachybaptus novaehollandiae*	2007	42	-	-	S
Hoary-headed Grebe	*Poliocephalus poliocephalus*	1991	14	-	-	-
Great Crested Grebe	*Podiceps cristatus*	1991	1	-	-	-
Rock Dove*	*Columba livia*	2006	65	-	-	-
Spotted Turtle-Dove*	*Streptopelia chinensis*	2006	70	-	-	-
Common Bronzewing	*Phaps chalcoptera*	2005	35	-	-	S
Brush Bronzewing	*Phaps elegans*	1846	1	-	-	-
Diamond Dove	*Geopelia cuneata*	1999	1	-	-	-
Peaceful Dove	*Geopelia striata*	2007	3	-	-	-
Wonga Pigeon	*Leucosarcia melanoleuca*	1979	1	-	-	-
Tawny Frogmouth	*Podargus strigoides*	2008	28	-	-	S
White-throated Nightjar	*Eurostopodus mystacalis*	1988	4	-	-	-
Australian Owlet-nightjar	*Aegotheles cristatus*	1990	10	Total	-	-
White-throated Needletail	*Hirundapus caudacutus*	1991	22	-	Mi/Ma	-
Fork-tailed Swift	*Apus pacificus*	2007	9	-	Mi/Ma	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	1977	4	-	-	-
Darter	*Anhinga novaehollandiae*	2008	4	-	-	S
Little Pied Cormorant	*Microcarbo melanoleucos*	2002	49	-	-	S
Great Cormorant	*Phalacrocorax carbo*	2002	25	-	-	-
Little Black Cormorant	*Phalacrocorax sulcirostris*	1991	21	-	-	-
Pied Cormorant	*Phalacrocorax varius*	1990	2	-	-	-
Australian Pelican	*Pelecanus conspicillatus*	2000	16	-	Ma	-
Australasian Bittern	*Botaurus poiciloptilus*	1975	5	-	-	-
White-necked Heron	*Ardea pacifica*	2000	58	-	-	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Eastern Great Egret	*Ardea modesta*	1991	22	-	Mi/Ma	-
Intermediate Egret	*Ardea intermedia*	1975	1	-	Ma	-
Cattle Egret	*Ardea ibis*	2008	7	-	Mi/Ma	-
White-faced Heron	*Egretta novaehollandiae*	2006	165	-	-	S
Nankeen Night Heron	*Nycticorax caledonicus hillii*	1986	9	-	Ma	-
Australian White Ibis	*Threskiornis molucca*	2007	63	-	Ma	S
Straw-necked Ibis	*Threskiornis spinicollis*	2005	61	-	Ma	-
Royal Spoonbill	*Platalea regia*	1989	7	-	-	-
Yellow-billed Spoonbill	*Platalea flavipes*	2000	41	-	-	-
Black-shouldered Kite	*Elanus axillaris*	2007	113	-	-	S
Letter-winged Kite	*Elanus scriptus*	1977	2	-	-	-
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	1846	1	-	Mi/Ma	-
Whistling Kite	*Haliastur sphenurus*	2006	48	-	Ma	-
Black Kite	*Milvus migrans*	2003	5	-	-	-
Brown Goshawk	*Accipiter fasciatus*	2003	89	-	Ma	S
Collared Sparrowhawk	*Accipiter cirrhocephalus*	1999	24	-	-	S
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	1846	1	-	-	-
Spotted Harrier	*Circus assimilis*	1991	6	-	-	-
Swamp Harrier	*Circus approximans*	1977	5	-	Ma	-
Wedge-tailed Eagle	*Aquila audax*	2008	145	-	-	S
Little Eagle	*Hieraaetus morphnoides*	2003	43	-	-	-
Nankeen Kestrel	*Falco cenchroides*	2007	113	Partial	Ma	S
Brown Falcon	*Falco berigora*	2007	179	-	-	S
Australian Hobby	*Falco longipennis*	2006	34	-	-	-
Black Falcon	*Falco subniger*	1999	5	-	-	S
Peregrine Falcon	*Falco peregrinus*	2003	44	Partial	-	S
Purple Swamphen	*Porphyrio porphyrio*	2002	16	-	-	S
Lewin's Rail	*Lewinia pectoralis pectoralis*	1991	1	-	Mi	-
Buff-banded Rail	*Gallirallus philippensis*	2001	3	-	-	-
Baillon's Crake	*Porzana pusilla palustris*	1975	3	-	Ma	-
Australian Spotted Crake	*Porzana fluminea*	1975	1	-	-	-
Spotless Crake	*Porzana tabuensis*	1991	1	-	Ma	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Dusky Moorhen	*Gallinula tenebrosa*	2007	57	-	-	S
Eurasian Coot	*Fulica atra*	2007	18	-	-	-
Australian Bustard	*Ardeotis australis*	1846	1	-	-	-
Bush Stone-curlew	*Burhinus grallarius*	1846	1	-	-	-
Sooty Oystercatcher	*Haematopus fuliginosus*	1950	2	-	Ma	-
#Australian Pied Oystercatcher	*Haematopus longirostris*		1	-	Ma	-
Red-necked Avocet	*Recurvirostra novaehollandiae*	1846	1	-	Ma	-
Red-capped Plover	*Charadrius ruficapillus*	2008	1	-	Ma	-
Black-fronted Dotterel	*Elseyornis melanops*	1998	16	-	-	-
Red-kneed Dotterel	*Erythrogonys cinctus*	1977	2	-	-	-
Banded Lapwing	*Vanellus tricolor*	2004	11	-	-	-
Masked Lapwing	*Vanellus miles*	2007	111	-	-	S
Plains-wanderer	*Pedionomus torquatus*	1949	5	-	-	-
Latham's Snipe	*Gallinago hardwickii*	1979	10	-	Mi/Ma	-
Common Sandpiper	*Actitis hypoleucos*	1977	1	-	Mi/Ma	-
Common Greenshank	*Tringa nebularia*	1977	1	-	Mi/Ma	-
Little Stint	*Calidris minuta*	1996	1	-	Mi/Ma	-
Red-necked Stint	*Calidris ruficollis*	1977	1	-	Mi/Ma	-
Sharp-tailed Sandpiper	*Calidris acuminata*	1977	3	-	Mi/Ma	-
Curlew Sandpiper	*Calidris ferruginea*	1977	1	-	Mi/Ma	-
Stilt Sandpiper	*Calidris himantopus*	1990	6	-	-	-
Painted Button-quail	*Turnix varia*	1990	10	-	-	-
Red-chested Button-quail	*Turnix pyrrhothorax*	1956	1	-	-	-
Little Button-quail	*Turnix velox*	1846	1	-	-	-
Welcome Swallow	*Petrochelidon neoxena*	2007	248	Partial	-	S
Superb Parrot	*Polytelis swainsonii*	1846	1	Total	-	-
Caspian Tern	*Hydroprogne caspia*	1977	1	-	Mi/Ma	-
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii graptogyne*	1846	1	Total	Mi	-
Whiskered Tern	*Chlidonias hybridus javanicus*	1975	2	-	Ma	-
Silver Gull	*Chroicocephalus novaehollandiae*	2004	12	-	Ma	-
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	2006	29	Total	-	-
Galah	*Eolophus roseicapilla*	2007	208	Total	-	S

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Long-billed Corella	*Cacatua tenuirostris*	2006	43	Total	-	S
Little Corella	*Cacatua sanguinea*	2006	10	Total	-	S
Sulphur-crested Cockatoo	*Cacatua galerita*	2006	239	Total	-	S
Cockatiel	*Nymphicus hollandicus*	1986	6	Total	-	-
Rainbow Lorikeet	*Trichoglossus haematodus*	2007	12	Total	-	S
Musk Lorikeet	*Glossopsitta concinna*	2007	37	-	-	S
Little Lorikeet	*Glossopsitta pusilla*	2001	20	-	-	-
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	2008	63	Total	-	-
Australian King-Parrot	*Alisterus scapularis*	1846	1	Total	-	-
Crimson Rosella	*Platycercus elegans*	2005	173	Total	-	S
Eastern Rosella	*Platycercus eximius*	2006	219	Total	-	S
Red-capped Parrot*	*Purpureicephalus spurius*	2008	1	-	-	-
Swift Parrot	*Lathamus discolor*	2007	15	Total	Ma	-
Red-rumped Parrot	*Psephotus haematonotus*	2006	163	-	-	S
Budgerigar	*Melopsittacus undulatus*	1988	3	Partial	-	-
Blue-winged Parrot	*Neophema chrysostoma*	1986	4	Partial	-	-
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	2006	54	-	Ma	-
Black-eared Cuckoo	*Chrysococcyx osculans*	2000	3	-	Ma	-
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	2000	30	-	Ma	-
Pallid Cuckoo	*Cuculus pallidus*	2006	61	-	Ma	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	2002	55	-	-	H
Brush Cuckoo	*Cacomantis variolosus*	1975	1	-	-	-
Powerful Owl	*Ninox strenua*	1975	1	Total	-	-
Barking Owl	*Ninox connivens connivens*	1975	2	Total	-	-
Southern Boobook	*Ninox novaeseelandiae*	2008	41	Total	Ma	H
Masked Owl	*Tyto novaehollandiae novaehollandiae*	1975	1	Total	-	-
Pacific Barn Owl	*Tyto javanica*	1991	18	Partial	-	S, H
Azure Kingfisher	*Alcedo azurea*	1987	3	-	-	-
Laughing Kookaburra	*Dacelo novaeguineae*	2006	169	Total	-	S
Sacred Kingfisher	*Todiramphus sanctus*	2003	46	Partial	Ma	-
Rainbow Bee-eater	*Merops ornatus*	1999	19	-	Mi/Ma	-
White-throated Treecreeper	*Cormobates leucophaeus*	2000	80	Total	-	H

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Red-browed Treecreeper	*Climacteris erythrops*	1976	6	Total	-	-
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	1991	23	Total	-	-
Satin Bowerbird	*Ptilonorhynchus violaceus*	1975	4	-	-	-
Superb Fairy-wren	*Malurus cyaneus*	2007	260	-	-	S
White-browed Scrubwren	*Sericornis frontalis*	2002	92	-	-	S
#Striated Fieldwren	*Calamanthus fuliginosus*		1	-	-	-
Speckled Warbler	*Chthonicola sagittatus*	1990	25	-	-	-
Weebill	*Smicrornis brevirostris*	2001	37	-	-	-
Western Gerygone	*Gerygone fusca*	2005	3	-	-	-
White-throated Gerygone	*Gerygone olivacea*	1975	2	-	-	-
Striated Thornbill	*Acanthiza lineata*	2001	55	-	-	S
Yellow Thornbill	*Acanthiza nana*	2007	108	-	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2007	246	-	-	S
Buff-rumped Thornbill	*Acanthiza reguloides*	2006	38	-	-	S
Brown Thornbill	*Acanthiza pusilla*	2006	121	-	-	S
Southern Whiteface	*Aphelocephala leucopsis*	1995	13	-	-	-
Spotted Pardalote	*Pardalotus punctatus*	2007	105	-	-	S, H
Striated Pardalote	*Pardalotus striatus*	2006	150	Partial	-	-
Eastern Spinebill	*Acanthorhynchus tenuirostris*	1999	49	-	-	-
Yellow-faced Honeyeater	*Lichenostomus chrysops*	2001	55	-	-	-
Singing Honeyeater	*Lichenostomus virescens*	1990	4	-	-	-
White-eared Honeyeater	*Lichenostomus leucotis*	2001	38	-	-	-
Yellow-tufted Honeyeater	*Lichenostomus melanops*	1995	15	-	-	-
Yellow-plumed Honeyeater	*Lichenostomus ornatus*	2006	3	-	-	-
Fuscous Honeyeater	*Lichenostomus fuscus*	1990	8	-	-	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	2007	235	-	-	S
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	2008	13	-	-	S
Bell Miner	*Manorina melanophrys*	2005	6	-	-	-
Noisy Miner	*Manorina melanocephala*	2007	79	-	-	-
Little Wattlebird	*Anthochaera chrysoptera*	2006	9	-	-	-
Regent Honeyeater	*Anthochaera phrygia*	1975	4	-	Mi	-
Red Wattlebird	*Anthochaera carunculata*	2006	186	-	-	S

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
White-fronted Chat	*Epthianura albifrons*	2006	32	-	-	S
Scarlet Honeyeater	*Myzomela sanguinolenta*	2008	1	-	-	-
Tawny-crowned Honeyeater	*Phylidonyris melanops*	1986	1	-	-	-
Crescent Honeyeater	*Phylidonyris pyrrhoptera*	1987	10	-	-	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	2007	55	-	-	S
Black-chinned Honeyeater	*Melithripterus gularis gularis*	1991	11	-	-	-
Brown-headed Honeyeater	*Melithreptus brevirostris*	2001	79	-	-	-
White-naped Honeyeater	*Melithreptus lunatus*	2000	55	-	-	-
Noisy Friarbird	*Philemon corniculatus*	2000	2	-	-	-
Painted Honeyeater	*Grantiella picta*	1990	1	-	-	-
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	1933	2	-	-	-
White-browed Babbler	*Pomatostomus superciliosus*	1986	6	-	-	-
Spotted Quail-thrush	*Cinclosoma punctatum*	1989	9	-	-	-
Varied Sittella	*Daphoenositta chrysoptera*	2001	68	-	-	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	2006	159	-	Ma	S, H
White-bellied Cuckoo-shrike	*Coracina papuensis*	2000	2	-	Ma	-
White-winged Triller	*Lalage sueurii*	2000	28	-	-	-
Crested Shrike-tit	*Falcunculus frontatus*	2000	27	-	-	-
Olive Whistler	*Pachycephala olivacea*	1976	5	-	-	-
Golden Whistler	*Pachycephala pectoralis*	2002	92	-	-	S
Rufous Whistler	*Pachycephala rufiventris*	2001	66	-	-	-
Grey Shrike-thrush	*Colluricincla harmonica*	2005	118	Partial	-	S
Crested Pigeon	*Ocyphaps lophotes*	2007	37	-	-	S
Olive-backed Oriole	*Oriolus sagittatus*	2000	15	-	-	-
Masked Woodswallow	*Artamus personatus*	2006	3	-	-	-
White-browed Woodswallow	*Artamus superciliosus*	2006	8	-	-	-
Dusky Woodswallow	*Artamus cyanopterus*	2002	49	Partial	-	S
Grey Butcherbird	*Cracticus torquatus*	1990	13	-	-	-
Australian Magpie	*Gymnorhina tibicen*	2007	366	-	-	S
Pied Currawong	*Strepera graculina*	2005	30	-	-	-
Grey Currawong	*Strepera versicolor*	2005	56	-	-	-
Rufous Fantail	*Rhipidura rufifrons*	2000	19	-	Mi/Ma	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Grey Fantail	*Rhipidura albiscarpa*	2006	203	-	-	S
Willie Wagtail	*Rhipidura leucophrys*	2006	239	-	-	S
Australian Raven	*Corvus coronoides*	2007	109	-	-	S
Little Raven	*Corvus mellori*	2007	238	-	Ma	S
Leaden Flycatcher	*Myiagra rubecula*	1975	2	-	-	-
Satin Flycatcher	*Myiagra cyanoleuca*	1988	11	-	Mi/Ma	-
Restless Flycatcher	*Myiagra inquieta*	2001	57	-	-	-
Magpie-lark	*Grallina cyanoleuca*	2007	221	-	-	S
White-winged Chough	*Corcorax melanorhamphos*	1993	43	-	-	-
Jacky Winter	*Microeca fascinans*	2001	33	-	-	-
Scarlet Robin	*Petroica boodang*	2001	89	-	-	S
Red-capped Robin	*Petroica goodenovii*	2001	22	-	-	-
Flame Robin	*Petroica phoenicea*	2008	101	-	-	S
Rose Robin	*Petroica rosea*	2000	8	-	-	-
Pink Robin	*Petroica rodinogaster*	1975	3	-	-	-
Hooded Robin	*Melanodryas cucullata cucullata*	1988	9	-	-	-
Eastern Yellow Robin	*Eopsaltria australis*	2008	46	-	-	-
Horsfield's Bushlark	*Mirafra javanica*	2006	24	-	-	S
European Skylark*	*Alauda arvensis*	2007	108	-	-	-
Golden-headed Cisticola	*Cisticola exilis*	2006	45	-	-	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	2002	23	-	Mi/Ma	S
Little Grassbird	*Megalurus gramineus*	2002	18	-	-	-
Rufous Songlark	*Cincloramphus mathewsi*	2006	20	-	-	-
Brown Songlark	*Cincloramphus cruralis*	1990	30	-	-	-
Silvereye	*Zosterops lateralis*	2006	134	-	Ma	S
White-backed Swallow	*Cheramoeca leucosternus*	1961	1	-	-	-
Fairy Martin	*Petrochelidon ariel*	2007	47	Partial	-	-
Tree Martin	*Petrochelidon nigricans*	2005	88	Total	Ma	-
#Red-whiskered Bulbul*	*Pycnonotus jocosus*		15	-	-	-
Bassian Thrush	*Zoothera lunulata*	1976	7	-	-	-
Common Blackbird*	*Turdus merula*	2006	184	-	-	S, C
Song Thrush*	*Turdus philomelos*	2008	10	-	-	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Common Starling*	*Sturnus vulgaris*	2007	277	Partial	-	S, C
Common Myna*	*Acridotheres tristis*	2007	213	-	-	S
Mistletoebird	*Dicaeum hirundinaceum*	2000	60	-	-	S
Zebra Finch	*Taeniopygia guttata*	1991	8	-	-	-
Red-browed Finch	*Neochmia temporalis*	2002	151	-	-	S
Diamond Firetail	*Stagonopleura guttata*	2005	22	-	-	-
House Sparrow*	*Passer domesticus*	2007	233	-	-	S
Eurasian Tree Sparrow*	*Passer montanus*	2004	24	-	-	-
Australasian Pipit	*Anthus novaeseelandiae*	2007	129	-	Ma	S
European Greenfinch*	*Carduelis chloris*	2006	58	-	-	-
European Goldfinch*	*fam. Fringillidae gen. Carduelis*	2007	237	-	-	S
Domestic Goose*	*fam. Anatidae gen. Anser*	2007	1	-	-	-
	REPTILES					
Long neck tortoise	*Chelodina longicollis*	2000	2	-	-	-
Marbled Gecko	*Christinus marmoratus*	1991	4	Partial	-	-
Striped Legless Lizard	*Delma impar*	2001	2	-	-	-
Tree Dragon	*Amphibolurus muricatus*	1991	15	Partial	-	-
Bearded Dragon	*Pogona barbata*	1988	1	Partial	-	-
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	1990	1	-	-	-
Large Striped Skink	*Ctenotus robustus*	1992	30	-	-	-
Cunningham's Skink	*Egernia cunninghami*	2004	27	-	-	-
Black Rock Skink	*Egernia saxatilis intermedia*	1990	1	Partial	-	-
White's Skink	*Liopholis whitii GROUP*	1958	2	-	-	-
Southern Water Skink	*Eulamprus tympanum tympanum*	2002	20	-	-	-
Garden Skink	*Lampropholis guichenoti*	2006	41	-	-	-
Bougainville's Skink	*Lerista bougainvillii*	1992	28	-	-	T
Southern Grass Skink	*Pseudemoia entrecasteauxii*	1988	2	-	-	-
Tussock Skink	*Pseudemoia pagenstecheri*	2003	2	-	-	-
Weasel Skink	*Saproscincus mustelinus*	1989	2	-	-	-
Eastern Three-lined Skink	*Bassiana duperreyi*	2003	17	-	-	-
Blotched Blue-tongued Lizard	*Tiliqua nigrolutea*	1990	4	-	-	-
Common Blue-tongued Lizard	*Tiliqua scincoides*	2007	41	-	-	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Stumpy-tailed Lizard	*Tiliqua rugosa*	1988	1	-	-	-
Lowland Copperhead	*Austrelaps superbus*	2001	23	-	-	-
White-lipped Snake	*Drysdalia coronoides*	2002	1	-	-	-
Tiger Snake	*Notechis scutatus*	2006	24	-	-	-
Red-bellied Black Snake	*Pseudechis porphyriacus*	1990	6	-	-	-
Eastern Brown Snake	*Pseudonaja textilis*	2006	41	-	-	-
Eastern Small-eyed Snake	*Rhinoplocephalus nigrescens*	1990	3	-	-	-
Little Whip Snake	*Suta flagellum*	2004	29	-	-	-
	AMPHIBIANS					
Plains Froglet	*Crinia parasignifera*	-	-	-	-	H
Common Froglet	*Crinia signifera*	2008	114	-	-	H
Victorian Smooth Froglet	*Geocrinia victoriana*	2004	1	-	-	-
Southern Bullfrog (ssp. unknown)	*Limnodynastes dumerilii*	2006	33	-	-	-
Pobblebonk Frog	*Limnodynastes dumerilii dumerilii*	1968	4	-	-	S
Striped Marsh Frog	*Limnodynastes peronii*	2003	2	-	-	-
Spotted Marsh Frog (race unknown)	*Limnodynastes tasmaniensis*	2007	83	-	-	-
Spotted Marsh Frog SCR	*Limnodynastes tasmaniensis SCR*	2005	44	-	-	H
Common Spadefoot Toad	*Neobatrachus sudelli*	2007	18	-	-	-
Brown Toadlet	*Pseudophryne bibronii*	1990	22	-	-	-
Southern Toadlet	*Pseudophryne semimarmorata*	1960	1	-	-	-
Southern Brown Tree Frog	*Litoria ewingii*	2007	19	-	-	-
Southern Brown Tree Frog SOUTHERN	*Litoria ewingii SOUTHERN*	2005	24	-	-	H
Lesueur's Frog	*Litoria lesueuri*	2006	38	-	-	-
Growling Grass Frog	*Litoria raniformis*	2006	31	-	-	-
Whistling Tree Frog	*Litoria verreauxii verreauxii*	2008	23	-	-	H
	FISH					
Short-finned Eel	*Anguilla australis*	2007	61	-	-	T
Broad-finned Galaxias	*Galaxias brevipinnis*	1999	1	-	-	-
Common Galaxias	*Galaxias maculatus*	2005	21	-	-	-
Mountain Galaxias	*Galaxias olidus*	2007	30	-	-	-
Australian Smelt	*Retropinna semoni*	2005	32	-	-	T
Rainbow Trout*	*Oncorhynchus mykiss*	1969	2	-	-	-

Common name	Scientific name	Last documented record	Total # of documented records	Hollow use	Mi/ Ma	Present survey
Brown Trout*	*Salmo trutta*	2005	43	-	-	-
Goldfish*	*Carassius auratus*	2005	6	-	-	-
Gambusia*	*Gambusia holbrooki*	2007	12	-	-	T
Carp*	*Cyprinus carpio*	2005	6	-	-	-
Oriental Weatherloach*	*Misgurnus anguillicaudatus*	2005	1	-	-	-
Roach*	*Rutilus rutilus*	1981	2	-	-	-
Southern Pygmy Perch	*Nannoperca australis*	2005	6	-	-	-
Redfin*	*Perca fluviatilis*	2007	17	-	-	T
Flat-headed Gudgeon	*Philypnodon grandiceps*	2005	28	-	-	T
Tench*	*fam. Cyprinidae gen. Tinca*	2007	36	-	-	T
MUSSELS & CRUSTACEANS						
Common Freshwater Shrimp	*Paratya australiensis*	2007	30	-	-	T
Upland Burrowing Crayfish	*Engaeus lyelli*	1999	1	-	-	-
Yabby	*Cherax destructor*	2007	5	-	-	-
INVERTEBRATES						
Golden Sun Moth	*Synemon plana*	2008	32	-	-	-

Source used to determine number of records and year: Victorian Biodiversity Atlas (DSE 2011b)

Source used to determine hollow use: Victorian Fauna Database (Viridans 2011b)

Source used to determine migratory and marine: Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Christidis& Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996); Fish (Nelson 1994); Mussels & Crustaceans (Alphabetical); Invertebrates (Alphabetical).

#Additonal information from

Appendix 1.2 – Significant fauna species

Table A1.2. Significant fauna within 10 kilometres of the study area.

Habitat characteristics of significant fauna species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area were assessed to determine their likelihood of occurrence. The likelihood of occurrence rankings for each of the threatened species are:

1	High Likelihood	• Known resident in the study area based on site observations, database records, or expert advice; and/or, • Recent records (i.e. within five years) of the species in the local area (VBA 2011); and/or, • The study area contains the species' preferred habitat.
2	Moderate Likelihood	• The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, • Previous records of the species in the local area (DSE 2011b); and/or, • The study area contains some characteristics of the species' preferred habitat.
3	Low Likelihood	• The species is likely to visit the study area occasionally or opportunistically whilst en route to more suitable sites; and/or, • There are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, • The study area contains few or no characteristics of the species' preferred habitat.
4	Unlikely	• No previous records of the species in the local area; and/or, • The species may fly over the study area when moving between areas of more suitable habitat; and/or, • Out of the species' range; and/or, • No suitable habitat present.

EPBC *Environment Protection and Biodiversity Conservation Act 1999* (EPBCAct)
FFG *Flora and Fauna Guarantee Act 1988* (FFG Act)
DSE Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2007); Advisory List of Threatened Invertebrate Fauna in Victoria (DSE 2009)
NAP National Action Plan (Cogger et al 1993; Duncan et al. 1999; Garnet and Crowley 2000;Lee 1995; Maxwell et al. 1996;Sands and New 2002; Tyler 1997)

EX Extinct
RX Regionally extinct
CR Critically endangered
EN Endangered
VU Vulnerable
RA Rare
NT Near threatened
CD Conservation dependent
LC least concern

DD Data deficient (insufficiently or poorly known
L Listed as threatened under FFG Act
I Invalid or ineligible for listing under the FFG Act
Listed on the Protected Matters Search Tool
* Additional information from the Victorian Fauna Database

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	DSE	FFG	NAP	Likely use of study area
NATIONAL SIGNIFICANCE								
#Spot-tailed Quoll	*Dasyurus maculatus maculatus*	1883	1	EN	EN	L	VU	4
#Eastern Barred Bandicoot	*Perameles gunnii*	2003	10	EN	CR	L	CR	4
# Brush-tailed Rock-wallaby	*Petrogale penicillata*	-	-	VU	CR	L	VU	4
# New Holland Mouse	*Pseudomys novaehollandiae*	-	-	VU	VU	L	-	4
# Smoky Mouse	*Pseudomys fumeus*	-	-	EN	CR	L	RA	4
# Grey-headed Flying-fox	*Pteropus poliocephalus*	-	-	VU	VU	L	VU	3
#Australasian Bittern	*Botaurus poiciloptilus*	1975	5	EN	EN	L	VU	3
# Australian Painted Snipe	*Rostratula australis*	-	-	VU	CR	L	VU	3
Plains-wanderer	*Pedionomus torquatus*	1949	5	VU	CR	L	EN	4
# Fairy Tern	*Sternula nereis*	-	-	VU	EN	L	-	4
Superb Parrot	*Polytelis swainsonii*	1846	1	VU	EN	L	VU	4
Red-tailed Black-Cockatoo	*Calyptorhynchus banksii graptogyne*	1846	1	EN	EN	L	EN	4
#Swift Parrot	*Lathamus discolor*	2007	15	EN	EN	L	EN	1
#Regent Honeyeater	*Anthochaera phrygia*	1975	4	EN	CR	L	EN	3
# Malleefowl	*Leipoa ocellata*	-	-	VU	EN	L	VU	4
#Striped Legless Lizard	*Delma impar*	2001	2	VU	EN	L	VU	2
#Grassland Earless Dragon	*Tympanocryptis pinguicolla*	1990	1	EN	CR	L	VU	2
#Growling Grass Frog	*Litoria raniformis*	2006	31	VU	EN	L	VU	1
# Australian Grayling	*Prototroctes maraena*	-	-	VU	VU	L	VU	3
# Dwarf Galaxias	*Galaxiella pusilla*	-	-	VU	VU	L	VU	3
#Golden Sun Moth	*Synemon plana*	2008	32	CR	CR	L	-	2
STATE SIGNIFICANCE								
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	1846	1	-	VU	L	-	4
Brush-tailed Phascogale	*Phascogale tapoatafa tapoatafa*	1985	12	-	VU	L	NT	3
Common Dunnart	*Sminthopsis murina murina*	1990	1	-	VU	-	-	2
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	1932	1	-	-	L	LC	3
Musk Duck	*Biziura lobata*	1977	5	-	VU	-	-	3
Australasian Shoveler	*Anas rhynchotis*	1977	4	-	VU	-	-	3
Hardhead	*Aythya australis*	1991	5	-	VU	-	-	1
Diamond Dove	*Geopelia cuneata*	1999	1	-	NT	L	-	4

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	DSE	FFG	NAP	Likely use of study area
Eastern Great Egret	*Ardea modesta*	1991	22	-	VU	L	-	2
Intermediate Egret	*Ardea intermedia*	1975	1	-	CR	L	-	2
Royal Spoonbill	*Platalea regia*	1989	7	-	VU	-	-	3
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	1846	1	-	VU	L	-	4
Black Falcon	*Falco subniger*	1999	5	-	VU	-	-	1
Lewin's Rail	*Lewinia pectoralis pectoralis*	1991	1	-	VU	L	NT	4
Baillon's Crake	*Porzana pusilla palustris*	1975	3	-	VU	L	-	4
Australian Bustard	*Ardeotis australis*	1846	1	-	CR	L	NT	4
Bush Stone-curlew	*Burhinus grallarius*	1846	1	-	EN	L	NT	4
Common Sandpiper	*Actitis hypoleucos*	1977	1	-	VU	-	-	4
Red-chested Button-quail	*Turnix pyrrhothorax*	1956	1	-	VU	L	-	4
Caspian Tern	*Hydroprogne caspia*	1977	1	-	NT	L	-	4
Powerful Owl	*Ninox strenua*	1975	1	-	VU	L	-	4
Barking Owl	*Ninox connivens connivens*	1975	2	-	EN	L	NT	4
Masked Owl	*Tyto novaehollandiae novaehollandiae*	1975	1	-	EN	L	NT	4
Brown Treecreeper (south-eastern ssp.)	*Climacteris picumnus victoriae*	1991	23	-	NT	-	NT	3
Speckled Warbler	*Chthonicola sagittatus*	1990	25	-	VU	L	NT	2
Painted Honeyeater	*Grantiella picta*	1990	1	-	VU	L	NT	4
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	1933	2	-	EN	L	NT	4
Hooded Robin	*Melanodryas cucullata cucullata*	1988	9	-	NT	L	NT	4
Diamond Firetail	*Stagonopleura guttata*	2005	22	-	VU	L	NT	2
Brown Toadlet	*Pseudophryne bibronii*	1990	22	-	EN	L	DD	2
Southern Toadlet	*Pseudophryne semimarmorata*	1960	1	-	VU	-	-	4
REGIONAL SIGNIFICANCE								
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	1989	9	-	NT	-	-	2
Brown Quail	*Coturnix ypsilophora australis*	2005	4	-	NT	-	-	1
Pied Cormorant	*Phalacrocorax varius*	1990	2	-	NT	-	-	2
Nankeen Night Heron	*Nycticorax caledonicus hillii*	1986	9	-	NT	-	-	2
Spotted Harrier	*Circus assimilis*	1991	6	-	NT	-	-	3
Sooty Oystercatcher	*Haematopus fuliginosus*	1950	2	-	NT	-	-	4

Common name	Scientific name	Last documented record	Total # of documented records	EPBC	DSE	FFG	NAP	Likely use of study area
Latham's Snipe	*Gallinago hardwickii*	1979	10	-	NT	-	-	2
Little Button-quail	*Turnix velox*	1846	1	-	NT	-	-	4
Whiskered Tern	*Chlidonias hybridus javanicus*	1975	2	-	NT	-	-	4
Black-eared Cuckoo	*Chrysococcyx osculans*	2000	3	-	NT	-	-	3
Azure Kingfisher	*Alcedo azurea*	1987	3	-	NT	-	-	2
Black-chinned Honeyeater	*Melithripterus gularis gularis*	1991	11	-	NT	-	-	2
Spotted Quail-thrush	*Cinclosoma punctatum*	1989	9	-	NT	-	-	4
Bearded Dragon	*Pogona barbata*	1988	1	-	DD	-	-	3

Data source: Victorian Biodiversity Atlas (DSE 2011b); Victorian Fauna Database (Viridans 2011b);Protected Matters Search Tool (SEWPaC 2012).

Taxonomic order: Mammals (Strahan 1995 *in* Menkhorst & Knight 2004); Birds (Christidis& Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 *in* Cogger 1996); Fish (Nelson 1994); Mussels & Crustaceans (Alphabetical); Invertebrates (Alphabetical).

Appendix 1.3 – Fauna survey results by site

Table A1.3.1. Fauna recorded at Mount Holden Reserve during the present surveys (March – May 2000) and recorded on the Hume Fauna Sightings Database, Hume City Council (2004-2012).

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera
R Record

* Introduced species

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
MAMMALS			
Eastern Grey Kangaroo	*Macropus giganteus*	S	R
Black Wallaby	*Wallabia bicolor*	HT, C	-
White-striped Freetail Bat	*Tadarida australis*	A	-
Gould's Wattled Bat	*Chalinolobus gouldii*	A	-
Chocolate Wattled Bat	*Chalinolobus morio*	A	-
Unidentified Long-eared Bat	*Nyctophilus sp.*	A	-
Large Forest Bat	*Vespadelus darlingtoni*	A	-
House Mouse*	*Mus musculus*	HT	-
Black Rat*	*Rattus rattus*	HT	-
Red Fox*	*fam. Canidae gen. Vulpes*	I	-
European Rabbit*	*Oryctolagus cuniculus*	I	-
BIRDS			
Australian Shelduck	*Tadorna tadornoides*	S	-
Pacific Black Duck	*Anas superciliosa*	S	-
Australasian Grebe	*Tachybaptus novaehollandiae*	S	-
Australian White Ibis	*Threskiornis molucca*	S	-
Black-shouldered Kite	*Elanus axillaris*	S	-

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
Brown Goshawk	*Accipiter fasciatus*	S	-
Wedge-tailed Eagle	*Aquila audax*	S	R
Nankeen Kestrel	*Falco cenchroides*	S	-
Brown Falcon	*Falco berigora*	S	R
Masked Lapwing	*Vanellus miles*	S	-
Welcome Swallow	*Petrochelidon neoxena*	S	-
Superb Fairy-wren	*Malurus cyaneus*	S	-
Yellow-rumpedThornbill	*Acanthiza chrysorrhoa*	S	-
Buff-rumpedThornbill	*Acanthiza reguloides*	S	-
Brown Thornbill	*Acanthiza pusilla*	S	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	S	-
Red Wattlebird	*Anthochaera carunculata*	S	-
White-fronted Chat	*Epthianura albifrons*	S	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	S	-
Dusky Woodswallow	*Artamus cyanopterus*	S	-
Australian Magpie	*Gymnorhina tibicen*	S	-
Grey Fantail	*Rhipidura albiscarpa*	S	-
Willie Wagtail	*Rhipidura leucophrys*	S	-
Australian Raven	*Corvus coronoides*	S	-
Little Raven	*Corvus mellori*	S	-
Magpie-lark	*Grallina cyanoleuca*	S	-
Silvereye	*Zosterops lateralis*	S	-
Common Starling*	*Sturnus vulgaris*	S	-
Common Myna*	*Acridotheres tristis*	S	-
House Sparrow*	*Passer domesticus*	S	-
European Goldfinch*	*fam. Fringillidae gen. Carduelis*	S	-
REPTILES			
Blue-tongued Lizard (species unknown)	*Tiliqua* sp.	-	R
FROGS			
Common Froglet	*Crinia signifera*	H	R

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
Southern Bullfrog (ssp. unknown)	*Limnodynastes dumerilii*	-	R
Striped Marsh Frog	*Limnodynastes peronii*	-	R
Spotted Marsh Frog (race unknown)	*Limnodynastes tasmaniensis*	-	R
Spotted Marsh Frog SCR	*Limnodynastes tasmaniensis SCR*	H	-
Southern Brown Tree Frog	*Litoria ewingii*	-	R
Growling Grass Frog	*Litoria raniformis*	-	R

Taxonomic order: Mammals (Strahan 1995 in Menkhorst and Knight 2004); Birds (Christidis and Boles, 2008); Reptiles and Amphibians (Cogger *et al.* 1983 in Cogger 1996).

Table A1.3.2. Fauna recorded at Emu Valley Reserve during the present surveys (March – May 2000) and recorded on the Hume Fauna Sightings Database, Hume City Council (2004-2012).

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera
R Record

* Introduced species

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
	MAMMALS		
Common Brushtail Possum	*Trichosurus vulpecula*	S, C	-
Eastern Grey Kangaroo	*Macropus giganteus*	S	-
Black Wallaby	*Wallabia bicolor*	S, C	-
White-striped Freetail Bat	*Tadarida australis*	A	-
Gould's Wattled Bat	*Chalinolobus gouldii*	A	-
Chocolate Wattled Bat	*Chalinolobus morio*	A	-
Little Forest Bat	*Vespadelus vulturnus*	A	-
House Mouse*	*Mus musculus*	HT	-
Black Rat*	*Rattus rattus*	HT, C	-
Cat*	*Felis catus*	HT, C	-
European Rabbit*	*Oryctolagus cuniculus*	S	-
	BIRDS		
Stubble Quail	*Coturnix pectoralis*	S	-
Australian Wood Duck	*Chenonetta jubata*	S	-
Pacific Black Duck	*Anas superciliosa*	S	-
Common Bronzewing	*Phaps chalcoptera*	S	-
Little Pied Cormorant	*Microcarbo melanoleucos*	S	-
Black-shouldered Kite	*Elanus axillaris*	S	-
Wedge-tailed Eagle	*Aquila audax*	S	-

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
Brown Falcon	*Falco berigora*	S	-
Dusky Moorhen	*Gallinulat enebrosa*	S	-
Masked Lapwing	*Vanellus miles*	S	-
Welcome Swallow	*Petrochelidon neoxena*	S	-
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	-	R
Galah	*Eolophus roseicapilla*	S	-
Long-billed Corella	*Cacatua tenuirostris*	S	-
Little Corella	*Cacatua sanguinea*	S	-
Sulphur-crested Cockatoo	*Cacatua galerita*	S	-
Rainbow Lorikeet	*Trichoglossus haematodus*	S	-
Eastern Rosella	*Platycercus eximius*	S	-
Red-rumped Parrot	*Psephotus haematonotus*	S	-
Pacific Barn Owl	*Tyto javanica*	S	-
Laughing Kookaburra	*Dacelo novaeguineae*	S	-
Superb Fairy-wren	*Malurus cyaneus*	S	-
White-browed Scrubwren	*Sericornis frontalis*	S	-
Yellow-rumpedThornbill	*Acanthiza chrysorrhoa*	S	-
Brown Thornbill	*Acanthiza pusilla*	S	-
Spotted Pardalote	*Pardalotus punctatus*	H	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	S	-
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	S	-
Red Wattlebird	*Anthochaera carunculata*	S	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	S	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	H	-
Crested Pigeon	*Ocyphaps lophotes*	S	-
Dusky Woodswallow	*Artamus cyanopterus*	S	-
Australian Magpie	*Gymnorhina tibicen*	S	-
Grey Fantail	*Rhipidura albiscarpa*	S	-
Willie Wagtail	*Rhipidura leucophrys*	S	-
Little Raven	*Corvus mellori*	S	-

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
Scarlet Robin	*Petroica boodang*	S	-
Flame Robin	*Petroica phoenicea*	S	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	S	-
Silvereye	*Zosterops lateralis*	S	-
Common Blackbird*	*Turdus merula*	S, C	-
Common Myna*	*Acridotheres tristis*	S	-
Red-browed Finch	*Neochmia temporalis*	S	-
	FROGS		
Plains Froglet	*Crinia parasignifera*	H	-
Common Froglet	*Crinia signifera*	H	-
Victorian Smooth Froglet	*Geocrinia victoriana*	-	-
Southern Bullfrog (ssp. unknown)	*Limnodynastes dumerilii*	-	R
Southern Brown Tree Frog SOUTHERN	*Litoriaewingii SOUTHERN*	H	-
	FISH		
Short-finned Eel	*Anguilla australis*	T	-
Gambusia*	*Gambusia holbrooki*	T	-
Redfin*	*Percaf luviatilis*	T	-
Flat-headed Gudgeon	*Philypnodon grandiceps*	T	-
Tench*	*fam. Cyprinidae gen. Tinca*	T	-
	CRUSTACEANS		
Common Freshwater Shrimp	*Paratya australiensis*	T	-

Taxonomic order: Mammals (Strahan 1995 in Menkhorst& Knight 2004); Birds (Christidis& Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996); Fish (Nelson 1994); Mussels & Crustaceans (Alphabetical).

Table A1.3.3 Fauna recorded at Emu Bottom Wetlands Reserve during the present surveys (March – May 2012) , by Christina Cheers, Jacksons Creek Eco-Network (2000-2012), recorded on the Hume Fauna Sightings Database, Hume City Council (2004-2012) and significant species records from Biodiversity Interactive Maps (DSE 2012).

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera

* Introduced species
R Record

Common name	Scientific name	Present survey	Christina Cheers' Sightings	Hume Fauna Sightings Datbase	Biodiversity Interactive Map
MAMMALS					
Platypus	*Ornithorhynchus anatinus*	-	S	R	-
Short-beaked Echidna	*Tachyglossus aculeatus*	S	-	R	-
Common Brushtail Possum	*Trichosurus vulpecula*	S, C	-	-	-
Common Ringtail Possum	*Pseudocheirus peregrinus*	S	-	-	-
Eastern Grey Kangaroo	*Macropus giganteus*	S	-	-	-
Black Wallaby	*Wallabia bicolor*	HT, C	-	R	-
White-striped Freetail Bat	*Tadarida australis*	A	-	-	-
Southern Freetail Bat	*Mormopterus sp. 4*	A	-	-	-
Gould's Wattled Bat	*Chalinolobus gouldii*	A	-	-	-
Chocolate Wattled Bat	*Chalinolobus morio*	A	-	-	-
Eastern Falsistrellus	*Falsistrellus tasmaniensis*	A	-	-	-
Unidentified Long-eared Bat	*Nyctophilus sp.*	A	-	-	-
Large Forest Bat	*Vespadelus darlingtoni*	A	-	-	-
House Mouse*	*Mus musculus*	HT, C	-	-	-
Black Rat*	*Rattus rattus*	S, C	-	-	-
Cat*	*Felis catus*	S, C	-	-	-
BIRDS					-
Australian Wood Duck	*Chenonetta jubata*	S	S	-	-

Common name	Scientific name	Present survey	Christina Cheers' Sightings	Hume Fauna Sightings Datbase	Biodiversity Interactive Map
Chestnut Teal	*Anas castanea*	-	S	-	-
Pacific Black Duck	*Anas superciliosa*	S	S	-	-
Hardhead	*Aythya australis*	-	S	-	-
Hoary-headed Grebe	*Poliocephalus poliocephalus*	-	S	-	-
Tawny Frogmouth	*Podargus strigoides*	S	-	-	-
Darter	*Anhinga novaehollandiae*	-	S	-	-
Little Pied Cormorant	*Microcarbo melanoleucos*	-	S	-	-
Pied Cormorant	*Phalacrocorax varius*	-	S	-	-
Australian Pelican	*Pelecanus conspicillatus*	-	S	-	-
White-necked Heron	*Ardea pacifica*	-	S	-	-
Intermediate Egret	*Ardea intermedia*	-	S	-	-
Cattle Egret	*Ardea ibis*	-	S	-	-
White-faced Heron	*Egretta novaehollandiae*	S	S	R	-
Australian White Ibis	*Threskiornis molucca*	S	S	-	-
Straw-necked Ibis	*Threskiornis spinicollis*	-	S	-	-
Yellow-billed Spoonbill	*Platalea flavipes*	-	S	-	-
Black-shouldered Kite	*Elanus axillaris*	S	S	-	-
Whistling Kite	*Haliastur sphenurus*	-	S	-	-
Collared Sparrowhawk	*Accipiter cirrhocephalus*	S	-	-	-
Wedge-tailed Eagle	*Aquila audax*	S	S	R	-
Little Eagle	*Hieraaetus morphnoides*	-	S	-	-
Nankeen Kestrel	*Falco cenchroides*	-	S	-	-
Brown Falcon	*Falco berigora*	S	S	R	-
Purple Swamphen	*Porphyrio porphyrio*	S	-	-	-
Dusky Moorhen	*Gallinula tenebrosa*	S	S	-	-
Eurasian Coot	*Fulica atra*	-	-	-	-
Australian Bustard	*Ardeotis australis*	-	S	-	-
Masked Lapwing	*Vanellus miles*	S	S	-	-
Welcome Swallow	*Petrochelidon neoxena*	S	S	-	-

Common name	Scientific name	Present survey	Christina Cheers' Sightings	Hume Fauna Sightings Datbase	Biodiversity Interactive Map
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	-	S	-	-
Galah	*Eolophus roseicapilla*	S	S	-	-
Long-billed Corella	*Cacatua tenuirostris*	S	S	-	-
Little Corella	*Cacatua sanguinea*	-	S	-	-
Sulphur-crested Cockatoo	*Cacatua galerita*	-	S	R	-
Musk Lorikeet	*Glossopsitta concinna*	S	-	-	-
Crimson Rosella	*Platycercus elegans*	-	S	-	-
Eastern Rosella	*Platycercus eximius*	S	-	-	-
Swift Parrot	*Lathamus discolor*	-	S	-	-
Red-rumped Parrot	*Psephotus haematonotus*	S	S	-	-
Southern Boobook	*Ninox novaeseelandiae*	-	S	-	-
Pacific Barn Owl	*Tyto javanica*	S, H	H	-	-
Azure Kingfisher	*Alcedo azurea*	-	-	-	R (1987)
Laughing Kookaburra	*Dacelo novaeguineae*	S	-	-	-
Superb Fairy-wren	*Malurus cyaneus*	S	S	-	-
White-browed Scrubwren	*Sericornis frontalis*	S	-	-	-
Striated Thornbill	*Acanthiza lineata*	S	-	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	S	S	-	-
Buff-rumped Thornbill	*Acanthiza reguloides*	S	-	-	-
Spotted Pardalote	*Pardalotus punctatus*	S	-	-	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	S	-	-	-
Red Wattlebird	*Anthochaera carunculata*	S	S	-	-
New Holland Honeyeater	*Phylidonyris novaehollandiae*	S	S	-	-
Crested Pigeon	*Ocyphaps lophotes*	S	S	-	-
Dusky Woodswallow	*Artamus cyanopterus*	-	S	-	-
Australian Magpie	*Gymnorhina tibicen*	S	S	-	-
Grey Fantail	*Rhipidura albiscarpa*	S	S	-	-
Willie Wagtail	*Rhipidura leucophrys*	-	S	-	-
Little Raven	*Corvus mellori*	S	S	-	-

Common name	Scientific name	Present survey	Christina Cheers' Sightings	Hume Fauna Sightings Datbase	Biodiversity Interactive Map
Magpie-lark	*Grallina cyanoleuca*	S	S	-	-
Scarlet Robin	*Petroica boodang*	S	-	-	-
Red-capped Robin	*Petroica goodenovii*	-	-	-	-
Flame Robin	*Petroica phoenicea*	-	S	-	-
European Skylark*	*Alauda arvensis*	-	S	-	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	S	-	-	-
Silvereye	*Zosterops lateralis*	S	-	-	-
Common Blackbird*	*Turdus merula*	S, C	-	-	-
Common Starling*	*Sturnus vulgaris*	S	-	-	-
Common Myna*	*Acridotheres tristis*	S	S	-	-
Red-browed Finch	*Neochmia temporalis*	S	S	-	-
House Sparrow*	*Passer domesticus*	S	-	-	-
Australasian Pipit	*Anthus novaeseelandiae*	-	S	-	-
European Goldfinch*	*fam. Fringillidae gen. Carduelis*	S	-	-	-
AMPHIBIANS					
Plains Froglet	*Crinia parasignifera*	H	-	-	-
Common Froglet	*Crinia signifera*	H	-	-	-
Pobblebonk Frog	*Limnodynastes dumerilii dumerilii*	S	-	-	-
Spotted Marsh Frog SCR	*Limnodynastes tasmaniensis SCR*	H	-	-	-
Southern Brown Tree Frog SOUTHERN	*Litoria ewingii SOUTHERN*	H	-	-	-
Growling Grass Frog	*Litoria raniformis*	-	-	-	R (1987)
FISH					
Short-finned Eel	*Anguilla australis*	-	T		
Australian Smelt	*Retropinna semoni*	T	-	-	-
Flat-headed Gudgeon	*Philypnodon grandiceps*	T	-	-	-
MUSSELS AND CRUSTACEANS					-
Common Freshwater Shrimp	*Paratya australiensis*	T	T	-	-

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Christidis& Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996); Fish (Nelson1994); Mussels & Crustaceans (Alphabetical); Invertebrates (Alphabetical).

Table A1.3.4. Fauna recorded at Albert Road Nature Reserve during the present surveys (March – May 2000), recorded on the Hume Fauna Sightings Database, Hume City Council (2004-2012) and significant species records from Biodiversity Interactive Maps (DSE 2012)

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera
R Record (Year)

* Introduced species

Common name	Scientific name	Present survey	Hume Fauna Sightings Database	Biodiversity Interactive Map
MAMMALS				
Short-beaked Echidna	*Tachyglossus aculeatus*	-	R	-
Common Dunnart	*Sminthopsis murina murina*	-	-	R (1990)
Koala	*Phascolarctos cinereus*	-	R	-
Common Brushtail Possum	*Trichosurus vulpecula*	S	-	-
Eastern Grey Kangaroo	*Macropus giganteus*	S, C	R	-
Black Wallaby	*Wallabia bicolor*	HT	-	-
White-striped Freetail Bat	*Tadarida australis*	A	-	-
Gould's Wattled Bat	*Chalinolobus gouldii*	A	-	-
Chocolate Wattled Bat	*Chalinolobus morio*	A	-	-
Eastern Falsistrellus	*Falsistrellus tasmaniensis*	A	-	-
Unidentified Long-eared Bat	*Nyctophilus sp.*	A	-	-
Large Forest Bat	*Vespadelus darlingtoni*	A	-	-
House Mouse*	*Mus musculus*	HT	-	-
Black Rat*	*Rattus rattus*	HT	-	-
Red Fox*	*fam. Canidae gen. Vulpes*	S	-	-
European Rabbit*	*Oryctolagus cuniculus*	I	-	-
BIRDS				
Brown Quail	*Coturnix ypsilophora australis*	-	-	R (2005)
Australian White Ibis	*Threskiornis molucca*	S	-	-
Wedge-tailed Eagle	*Aquila audax*	-	R	-
Peregrine Falcon	*Falco peregrinus*	S	-	-
Masked Lapwing	*Vanellus miles*	S	-	-
Galah	*Eolophus roseicapilla*	S	-	-
Long-billed Corella	*Cacatua tenuirostris*	S	-	-
Sulphur-crested Cockatoo	*Cacatua galerita*	S	-	-
Rainbow Lorikeet	*Trichoglossus haematodus*	S	-	-
Crimson Rosella	*Platycercus elegans*	S	-	-
Eastern Rosella	*Platycercus eximius*	S	-	-
Southern Boobook	*Ninox novaeseelandiae*	H	-	-
Pacific Barn Owl	*Tyto javanica*	H	-	-
White-throated Treecreeper	*Cormobates leucophaeus*	H	-	-
Superb Fairy-wren	*Malurus cyaneus*	S	-	-
Speckled Warbler	*Chthonicola sagittatus*	-	-	R (1990)

Common name	Scientific name	Present survey	Hume Fauna Sightings Database	Biodiversity Interactive Map
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	S	-	-
Buff-rumped Thornbill	*Acanthiza reguloides*	S	-	-
Brown Thornbill	*Acanthiza pusilla*	S	-	-
Red Wattlebird	*Anthochaera carunculata*	S	-	-
Black-chinned Honeyeater	*Melithripterus gularis gularis*	-	-	R (1990)
Crested Pigeon	*Ocyphaps lophotes*	S	-	-
Australian Magpie	*Gymnorhina tibicen*	S	-	-
Grey Fantail	*Rhipidura albiscarpa*	S	R	-
Willie Wagtail	*Rhipidura leucophrys*	S	-	-
Australian Raven	*Corvus coronoides*	S	-	-
Little Raven	*Corvus mellori*	S	-	-
Magpie-lark	*Grallina cyanoleuca*	S	-	-
Horsfield's Bushlark	*Mirafra javanica*	S	-	-
Silvereye	*Zosterops lateralis*	S	-	-
Common Blackbird*	*Turdus merula*	S	-	-
Common Starling*	*Sturnus vulgaris*	S	-	-
Mistletoebird	*Dicaeum hirundinaceum*	S	-	-
Diamond Firetail	*Stagonopleura guttata*	-	-	R (2005)
House Sparrow*	*Passer domesticus*	S	-	-
REPTILES				
Bougainville's Skink	*Lerista bougainvillii*	T	-	-
FROGS				
Common Froglet	*Crinia signifera*	H	-	-
Spotted Marsh Frog SCR	*Limnodynastes tasmaniensis SCR*	H	-	-
Southern Brown Tree Frog SOUTHERN	*Litoria ewingii SOUTHERN*	H	-	-
Growling Grass Frog	*Litoria raniformis*	-	-	R (2000)
Whistling Free Frog	*Litoria verreauxii verreauxii*	H	-	-

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Christidis& Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996).

Table A1.3.5. Fauna recorded at Sunbury Pop Festival Site during the present surveys (March – May 2000) and recorded on the Hume Fauna Sightings Database, Hume City Council (2004-2012).

H Heard
S Seen
I Incidental (feathers, bones, scats etc)
T Trapped / handheld
A Anabat detector
HT Hairtube
C Infra-red camera
R Record

* Introduced species

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
MAMMALS			
Platypus	*Ornithorhynchus anatinus*	-	R
Unidentified Dasyurid (probably Antechinus)	Probably *Antechinus sp.*	HT	-
Common Brushtail Possum	*Trichosurus vulpecula*	S, C	-
Common Ringtail Possum	*Pseudocheirus peregrinus*	S, I	-
Eastern Grey Kangaroo	*Macropus giganteus*	S	-
Black Wallaby	*Wallabia bicolor*	C	-
White-striped Freetail Bat	*Tadarida australis*	H, A	-
Gould's Wattled Bat	*Chalinolobus gouldii*	A	-
Large Forest Bat	*Vespadelus darlingtoni*	A	-
Water Rat	*Hydromys chrysogaster*	HT	-
House Mouse*	*Mus musculus*	HT	-
Swamp Rat	*Rattus lutreolus*	HT	-
Black Rat*	*Rattus rattus*	C	-
Red Fox*	*fam. Canidae gen. Vulpes*	S, C	-
Cat*	*Felis catus*	C	-
European Rabbit*	*Oryctolagus cuniculus*	S	-
BIRDS			
Stubble Quail	*Coturnix pectoralis*	S	-
Brown Quail	*Coturnix ypsilophora australis*	S	-
Australian Wood Duck	*Chenonetta jubata*	S	-
Pacific Black Duck	*Anas superciliosa*	S	-
Darter	*Anhinga novaehollandiae*	S	-
Little Pied Cormorant	*Microcarbo melanoleucos*	S	-
White-faced Heron	*Egretta novaehollandiae*	S	-
Black-shouldered Kite	*Elanus axillaris*	S	-
Brown Goshawk	*Accipiter fasciatus*	S	-
Wedge-tailed Eagle	*Aquila audax*	S	-
Nankeen Kestrel	*Falco cenchroides*	S	-
Brown Falcon	*Falco berigora*	S	-
Black Falcon	*Falco subniger*	S	-
Purple Swamphen	*Porphyrio porphyrio*	S	-
Dusky Moorhen	*Gallinula tenebrosa*	S	-
Welcome Swallow	*Petrochelidon neoxena*	S	-
Galah	*Eolophus roseicapilla*	S	-

Common name	Scientific name	Present survey	Hume Fauna Sightings Database
Long-billed Corella	*Cacatua tenuirostris*	S	-
Red-rumped Parrot	*Psephotus haematonotus*	S	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	H	-
Laughing Kookaburra	*Dacelo novaeguineae*	S	-
Superb Fairy-wren	*Malurus cyaneus*	S	-
White-browed Scrubwren	*Sericornis frontalis*	S	-
Striated Thornbill	*Acanthiza lineata*	S	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	S	-
Brown Thornbill	*Acanthiz apusilla*	S	-
Spotted Pardalote	*Pardalotus punctatus*	S	-
White-plumed Honeyeater	*Lichenostomus penicillatus*	S	-
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	S	-
Red Wattlebird	*Anthochaera carunculata*	S	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	S	-
Golden Whistler	*Pachycephala pectoralis*	S	-
Grey Shrike-thrush	*Colluricincla harmonica*	S	-
Crested Pigeon	*Ocyphaps lophotes*	S	-
Australian Magpie	*Gymnorhina tibicen*	S	-
Grey Fantail	*Rhipidura albiscarpa*	S	-
Willie Wagtail	*Rhipidura leucophrys*	S	-
Australian Raven	*Corvus coronoides*	S	-
Magpie-lark	*Grallina cyanoleuca*	S	-
Scarlet Robin	*Petroica boodang*	S	-
Flame Robin	*Petroica phoenicea*	S	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	S	-
Silvereye	*Zosterops lateralis*	S	-
Common Blackbird*	*Turdus merula*	S	-
Common Starling*	*Sturnus vulgaris*	S, C	-
Red-browed Finch	*Neochmia temporalis*	S	-
House Sparrow*	*Passer domesticus*	S	-
Australasian Pipit	*Anthus novaeseelandiae*	S	-
European Goldfinch*	*fam. Fringillidae gen. Carduelis*	S	-
FROGS			
Common Froglet	*Crinia signifera*	H	-
Southern Brown Tree Frog SOUTHERN	*Litoria ewingii SOUTHERN*	H	-
FISH			
Short-finned Eel	*Anguilla australis*	T	-
Australian Smelt	*Retropinna semoni*	T	-
Gambusia*	*Gambusia holbrooki*	T	-
Flat-headed Gudgeon	*Philypnodon grandiceps*	T	-
Tench*	*fam. Cyprinidae gen. Tinca*	T	-
CRUSTACEANS			
Common Freshwater Shrimp	*Paratya australiensis*	T	-

Taxonomic order: Mammals (Strahan 1995 in Menkhorst & Knight 2004); Birds (Christidis & Boles, 2008); Reptiles and Amphibians (Cogger et al. 1983 in Cogger 1996); Fish (Nelson 1994); Mussels & Crustaceans (Alphabetical);.

Appendix 2 – Summary of aquatic survey

Table A2.1. Summary of water quality results across the study area.

Waterbody	Waterbody	Site	Latitude	Longitude	Date	Temperature (C˚)	Dissolved oxygen (mg/L)	pH	Conductivity (mS)	Turbidity (NTU)	Total Dissolved Solids (mg/L)
Jacksons Creek	Emu Valley Reserve	Site 1	-37.5245500	144.7353500	22/05/2012	9.77	9.41	7.68	0.549	8.9	0.352
		Site 2	-37.5281600	144.7347500	22/05/2012	10.37	8.31	7.51	0.553	13.8	0.355
		Site 3	-37.5342300	144.738460	22/05/2012	10.20	7.78	7.70	0.551	128.0	0.353
	Sunbury Pop Festival Site	Site 4	-37.6216200	144.753170	21/05/2012	11.80	13.23	8.09	0.689	15.0	0.440
		Site 5	-37.6202800	144.7602500	21/05/2012	11.26	8.47	7.95	0.679	43.7	0.435
	Emu Bottom Wetlands	Site 6	-37.5428300	144.7414300	22/05/2012	10.20	7.78	7.70	0.551	128.0	0.353

Note: Location of the sites are shown in Figure 3.

Table A2.2. Summary of habitat quality results across the study area.

Waterbody	Location	Site	Bank Erosion (%)	Riparian Vegetation Cleared (%)	Overhanging Vegetation (%)	Large Woody Debris (%)	Coarse Particulate Organic Matter (%)	Macrophyte cover (%)	Dominant Substrate	Macrophytes
Jacksons Creek	Emu Valley Reserve	Site 1	0	70	5	1	10	20	Bedrock	*Phragmites australis; Paspalum distichum; Juncus* sp.; *Triglochin* sp.; *Azolla sp.*
		Site 2	0	60	35	<1	20	20	Gravel	*Phragmites australis; Juncus* sp.; *Triglochin* sp.; *Cyperus* sp.
		Site 3	3	95	5	<1	10	35	Cobble	*Phragmites australis; Paspalum distichum; Juncus* sp.; *Triglochin* sp.; *Myriophyllum* sp.; *Eleocharis sphacelata; Cyperus* sp.; *Eleocharis acuta; Bolboschoenus medianus*
	Sunbury Pop Festival	Site 4	5	80	15	4	20	5	Clay/Silt	*Phragmites australis; Persicaria decipiens; Juncus* sp.; *Triglochin* sp.; *Lemna* sp.
		Site 5	<5	85	20	2	10	5	Cobble	*Phragmites australis; Juncus* sp.; *Persicaria decipiens; Cyperus* sp.
	Emu Bottom Wetlands	Site 6	0	85	25	0	20	10	Gravel	*Phragmites australis; Paspalum distichum; Juncus* sp.; *Triglochin* sp.

Note: Location of the sites are shown in Figure 3.

Table A.2.3. Aquatic fauna recorded across the study area.

Waterbody	Location	Site	Trap Type (Number of traps/effort)	Australian Smelt *Retropinna semoni*	Eastern Gambusia* *Gambusia holbrooki*	Flathead Gudgeon *Philypnodon grandiceps*	Freshwater Shrimp *Paratya australiensis*	Redfin* *Perca fluviatilis*	Short-finned Eel *Anguilla australis*	Tench* *Tinca Tinca*
Jacksons Creek	Emu Valley Reserve	Site 1	Bait Trap (10)		1	2	76			
			Fyke Net (2)			3	83	1		
		Site 2	Bait Trap (10)		1	4	28			
			Fyke Net (2)						4	3
		Site 3	Bait Trap (10)			2	10			
			Fyke Net (2)				8		1	
	Sunbury Pop Festival	Site 4	Bait Trap (15)	1	4	14	145			1
			Fyke Net (2)			2	37		1	
		Site 5	Bait Trap (10)	1	5	12	28			
			Fyke Net (1)			1				
	Emu Bottom Wetlands	Site 6	Bait Trap (10)	2		11	41			
All Sites			**All traps**	**4**	**11**	**51**	**456**	**1**	**6**	**4**

Notes: Locations of the sites are shown in Figure 3. *Indicates introduced fish species.

Appendix 3 – Summary of hair tube and camera results

Table A3.1. Summary of species detected using hair tubes and cameras in each reserve (✓= definite identification, ? = probable identification)

Reserve	Transect Number	Hairtube/ Camera Number	Unidentified dasyurid Probably *Antechinus* sp.	Common Brushtail Possum *Trichosurus vulpecula*	Eastern Grey Kangaroo *Macropus giganteus*	Black Wallaby *Wallabia bicolor*	Black Wallaby *Paratya australiensis*	Water Rat *Hydromys chrysogaster*	House Mouse* *Mus musculus*	Swamp Rat *Rattus lutreolus*	Black Rat * *Rattus rattus*	Red Fox* *Vulpes vulpes*	Cat* *Felis cattus*
Albert Road Nature Reserve	1	T1 – camera			✓						✓		
		T2				?							
		T3							✓				
		T4							✓				
		T5											
		T6											
		T7											
		T8 – camera				✓							
		T9											
		T10											
Emu Bottom Wetlands Reserve	1	T1 – camera				✓			✓		✓		✓
		T2							✓				
		T3							✓				

Reserve	Transect Number	Hairtube/ Camera Number	Unidentified dasyurid Probably *Antechinus* sp.	Common Brushtail Possum *Trichosurus vulpecula*	Eastern Grey Kangaroo *Macropus giganteus*	Black Wallaby *Wallabia bicolor*	Black Wallaby *Paratya australiensis*	Water Rat *Hydromys chrysogaster*	House Mouse* *Mus musculus*	Swamp Rat *Rattus lutreolus*	Black Rat * *Rattus rattus*	Red Fox* *Vulpes vulpes*	Cat* *Felis cattus*
		T4											
		T5				✓							
		T6											
		T7-camera		✓		✓			✓		✓		
		T8							✓				
		T9							✓				
		T10				✓							
Emu Valley Reserve	1	T1 – camera		✓		✓					✓		✓
		T2											✓
		T3							✓				
		T4											
		T5											
		T6											✓
		T7							✓				
		T8											
		T9 – camera				✓			✓				
		T10							✓				

Reserve	Transect Number	Hairtube/ Camera Number	Unidentified dasyurid Probably *Antechinus* sp.	Common Brushtail Possum *Trichosurus vulpecula*	Eastern Grey Kangaroo *Macropus giganteus*	Black Wallaby *Wallabia bicolor*	Black Wallaby *Paratya australiensis*	Water Rat *Hydromys chrysogaster*	House Mouse* *Mus musculus*	Swamp Rat *Rattus lutreolus*	Black Rat * *Rattus rattus*	Red Fox* *Vulpes vulpes*	Cat* *Felis cattus*
Mount Holden Reserve	1	T1							✓				
		T2				✓							
		T3									✓		
		T4							✓				
		T5 – camera				✓							
		T6									✓		
		T7							✓				
		T8							✓				
		T9									✓		
		T10									✓		
	2	T1									✓		
		T2									✓		
		T3				✓							
		T4									?		
		T5 – camera				✓			✓				
		T6									✓		
		T7											

Reserve	Transect Number	Hairtube/ Camera Number	Unidentified dasyurid Probably *Antechinus* sp.	Common Brushtail Possum *Trichosurus vulpecula*	Eastern Grey Kangaroo *Macropus giganteus*	Black Wallaby *Wallabia bicolor*	Black Wallaby *Paratya australiensis*	Water Rat *Hydromys chrysogaster*	House Mouse* *Mus musculus*	Swamp Rat *Rattus lutreolus*	Black Rat * *Rattus rattus*	Red Fox* *Vulpes vulpes*	Cat* *Felis cattus*
		T8							✓				
		T9									✓		
		T10											
Sunbury Pop Festival Site	1	T1							✓				
		T2									✓		
		T3							✓		✓		
		T4							✓				
		T5											
		T6 – camera		✓							✓		
		T7											
		T8											
		T9									✓		
		T10							✓				
	2	T1								?	?		
		T2	✓										
		T3							✓				
		T4							✓				
		T5								✓			

Reserve	Transect Number	Hairtube/ Camera Number	Unidentified dasyurid Probably *Antechinus* sp.	Common Brushtail Possum *Trichosurus vulpecula*	Eastern Grey Kangaroo *Macropus giganteus*	Black Wallaby *Wallabia bicolor*	Black Wallaby *Paratya australiensis*	Water Rat *Hydromys chrysogaster*	House Mouse* *Mus musculus*	Swamp Rat *Rattus lutreolus*	Black Rat * *Rattus rattus*	Red Fox* *Vulpes vulpes*	Cat* *Felis cattus*
		T6						✓					
		T7									✓		
		T8 – camera		✓		✓			✓		✓	✓	✓

Notes: Locations of the sites are shown in Figure 3. *Indicates introduced species.