

Project # 136965



### **Targeted Species Report**

Growling Grass Frog *Litoria raniformis*, Dwarf Galaxias *Galaxiella pusilla* and Yarra Pygmy Perch *Nannoperca obscura*

Armstrong Creek West Precinct

27 May 2011

Prepared by M. Aberton and L. McKinnon for Armstrong Creek Developments Pty Ltd

**Armstrong Creek West Precinct**  
Subject

**This report has been prepared from the office of CPG in conjunction with Aquaprime Consulting for Armstrong Creek Development Pty Ltd**

CPG Level 2 /10 Moorabool Street PO Box 4032 Geelong 3220 T 5249 6888

Aquaprime Consulting 1A Lockwood St Point Lonsdale 3225 T 0407987011

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| 27 May 2011       | 2                  | M. Aberton and<br>L. McKinnon | M. Aberton     |                 |

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## 1 Introduction

This assessment has been prepared at the request of the Department of Sustainability and Environment (DSE) and City of Greater Geelong (COGG) to provide targeted species assessments to inform the authorities of the fauna associated with the waterways of Armstrong Creek west precinct prior to approval for subdivision.

### 1.1 Background

CPG in association with Aquaprime Consulting were commissioned by Villawood Properties, Armstrong Creek Developments Pty Ltd. A flora and fauna assessment of the Armstrong Creek west precinct was carried out in 2010 by CPG identifying some flora and fauna value associated specifically with Armstrong Creek and its immediate surrounds. Further to the assessment, Council officers and DSE requested that targeted species surveys be carried out specifically for Growling Grass Frog (*Litoria raniformis*), Dwarf galaxias (*Galaxiella pusilla*), Yarra pygmy perch (*Nannoperca obscura*). A previous assessment carried out for VicRoads in October 2008 titled Geelong Ring Road section 4- Detailed Net Gain and Ecological Assessment (Aecom 2010) was used as background information.

The aim of this project was to determine the composition of fish assemblages and Growling Grass Frog presence at five pre-determined sites in Armstrong Creek – West Precinct.

#### 1.1.1 Review of Previous Reports

- Biodiversity Precinct Structure Planning Kit (DSE 2010)
- Aecom 2010;
- Close *et al.* 2002;
- Ryan and McGuckin 2007;
- McKinnon and Ryan 2008;
- Saddler *et al.* 2010

#### 1.1.2 Study Area

The Armstrong Creek west precinct is bounded by Ghazepore Road in the west, SurfCoast Highway (east), largely Whites Road in the south and largely Boundary Rd in the north (refer to site diagram, Figure 1). Five sites were selected along the creekline within the bounds of the precinct based on habitat features, available access and suitable overhanging vegetation. Initially, the five sites proposed were provided to DSE's FFG officer Nathan MacDonald.

#### 1.1.3 Nomenclature

The Growling Grass Frog *Litoria raniformis* is also known as Green and Golden Frog, Southern Bell Frog, Warty Swamp Frog. Dwarf galaxias (*Galaxiella pusilla*), also known as Eastern little galaxias, Eastern Dwarf galaxias and Yarra pygmy perch (*Nannoperca obscura*) were the focus of this study.



#### 1.1.4 Conservation Status

The Growling Grass Frog is listed vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is also listed as threatened under the Victorian Flora and Fauna Guarantee (FFG) Act 1988 and similar listing is NSW and Tasmania. Dwarf galaxias is listed as Vulnerable under both Flora and Fauna Guarantee Act (1988) and the EPBC Act. Yarra pygmy perch is listed as Threatened under the FFG Act (1988) and Vulnerable under the EPBC Act.

#### 1.1.5 Distribution

##### **Growling Grass Frog**

A widespread but only locally common frog, populations of which may be in decline. The Growling Grass Frog was once widespread and common through much of south-eastern Australia and Tasmania, but the range and numbers of the frog have declined since the 1980s with many populations disappearing. It has disappeared completely from the ACT and is now recognised as threatened over the rest of its range (DSE 2007). Within the Geelong region, several occurrences are known west of Geelong and in the Surf Coast Shire (Aberton pers comm.).

Adults are usually found close to or in water or very wet areas in woodlands, shrublands, and open and disturbed areas. Eggs and tadpoles can be found in permanent lakes, swamps, dams, and lagoons with still water Hero *et al.* 1991).

##### **Dwarf Galaxias and Yarra Pygmy Perch**

The Dwarf Galaxias *Galaxiella pusilla* is a tiny freshwater fish endemic to south-eastern Australia, where it occurs in Tasmania, South Australia and Victoria. The species is still widely distributed, but populations are fragmented and patchy across the landscape. It is likely that the species has suffered a significant decline in abundance due to habitat changes to shallow freshwater wetlands, especially wetland drainage. This decline appears to be continuing, as several populations have become extinct in recent decades. Major threats to the Dwarf Galaxias include wetland drainage, climate change, habitat damage through grazing and lack of regeneration, and feral fish competitors and predators (Saddler *et al.* 2010).

Both dwarf galaxias and Yarra pygmy perch have been recorded in the Barwon River catchment in the Geelong region (YPP specifically the Waurm Ponds Creek just 5km north of Armstrong Creek), suggesting a moderate likelihood of populations of either or both species occurring in Armstrong Creek (Close *et al.* 2002; Ryan and McGuckin 2007; McKinnon and Ryan 2008).



#### 1.1.6 **Habitat Requirements**

Permanent or seasonally flooded water bodies used for breeding. Breeding usually occurs in still or slow moving water. Tadpoles have an aquatic period which can vary between two and 15 months. Aquatic vegetation provides microhabitats for foraging and shelter for both frogs and tadpoles. Loss or degradation of aquatic habitat and/or disruption to hydrological regimes can lead to population declines and local extinctions. Aquatic eggs and larvae may also be vulnerable to fish predators, particularly mosquito fish, redfin and carp. Susceptible to the waterborne fungal pathogen *Batrachochytrium dendrobatidis* which causes the disease chytridiomycosis (chytrid fungus).

Because of their semi-permeable skin, growling grass frogs may be susceptible to pollutants such as those found in biocides (that is, herbicides, pesticides etc.) or from surface runoff. Adult frogs move across open ground (for example grasslands) to access local foraging resources and breeding sites. Terrestrial vegetation, fallen logs and ground debris surrounding water bodies provide essential shelter and hibernation (over-wintering) sites for adult frogs. Movement between breeding sites (water bodies) is crucial, allowing temporal variation in habitat use and/or recolonisation of sites following local extinction, and maintains genetic diversity (DEWHA 2009).



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## **2 Methodology**

### **2.1 Site Selection**

Five sites were selected prior to assessment based on potentially suitable habitat for both the targeted fish species and Growling grass frog. DSE were shown the site selections and were given an opportunity to comment on these prior to commencement of the surveys. Site access was not permissible for one of the original sites in the upper reaches of the creek, however a nearby site was selected (Site 5a) and dams and waterbodies nearby were opportunistically surveyed. Frog surveys were based on the presence of habitat such as emergent vegetation, areas of slow flow, semi-permanent deeper open water and rocky protected areas. Fish sites were broadly selected from those previously monitored for water quality (during growling grass frog surveys) and aquatic ecology, however final site selection for this survey was based on the presence of habitat suitable for native fish, particularly small bodied species such as pygmy perches and galaxiids, water flow and depth. Sites comprising submerged and emergent aquatic vegetation, woody debris and/or rock with sections of relatively deep water (>1m) were preferred. Generally, all sites contained overhanging vegetation and a diversity of pools, riffles and runs. Each site is described thoroughly in the results section. All fish and frog surveys were carried out at sites 1-4. However, as timing of fish and frog surveys differed, site 5 was separated into 5a and 5b because the original selection (site 5b) did not contain sufficient water for fish surveys when they were carried out on December 23 and 24<sup>th</sup>. However, sufficient water was present for Growling Grass Frog assessments because they generally occurred after a rainfall event.

The sites are illustrated on the Site map (Appendix 1).

### **2.2 Field Surveys**

Field surveys for the GGF were carried out between November and January while targeted fish surveys were carried out on 23-34th December 2010. The following Table 1 shows activity and timing of assessments. Permission to access land was sought prior to all nocturnal surveys and landowners notified for approximate timings of daytime access where applicable.



**Table 1: Summary of Assessment times**

| Date                     | Nocturnal survey  | Day Survey                      | Other   |
|--------------------------|-------------------|---------------------------------|---|
| <b>Amphibian Surveys</b> |                   |                                 |   |
| 11/2010                  |                   | Water sampling                  | Original sites 1-5  |
| 25/11/2010               | Sites 1, 2 and 5b |                                 | Opportunistic-dams on Boundary Road, Ghazepore Road. Reference site |
| 9/12/2010                | Sites 3, 4 and 5b | Site selection for fish surveys | Briefly at sites 1 and 2. Reference site                            |
| 16/12/2010               | Site 1, 2 3 and 4 |                                 | Dam off site 2. Reference site                                      |
|                          |                   | Sites 1-5b                      | Water monitoring  |
| 20/01/2010               |                   | Sites 1-5b                      | Particularly 5b   |
| 23/12/2010               |                   |                                 | Sites 1-5a (concurrent with fish sampling)                          |
| <b>Fish surveys</b>      |                   |                                 |   |
| 9/12/2010                |                   | Site selection for fish surveys |   |
| 23 and 24/12/2010        |                   | Sites 1, 2, 3, 4 and 5a*        | Electrofishing and netting  |

\*Site 5b (originally site 5) was not sampled because of insufficient water, this was replaced with site 5a.

### 2.3

#### **Growling Grass Frog (GGF) methodology**

The weather conditions were observed and recorded at the commencement of each nocturnal survey including: air temperature, wind speed, cloud cover, Moon phase and the rain fall in the previous 24 hour period and current.

Ideal survey period is during mating season (October-November) as males will be calling. However, the mating season depends on seasonal conditions and can extend into December in a good, (wet) year. Given that spring and early summer 2010 had considerable rainfall, the survey was carried into December with diurnal survey carried in late December and January. A reference site at Hendy Main Road, Moriac was used and calls were observed on every night that was surveyed, usually triggered by call playback.



### 2.3.1 **Growling Grass Frog Nocturnal Surveys**

Nocturnal survey was conducted between sunset and 2 am, this included two visits (of up to 90 minutes) at each site where the following activities were conducted

1. Quiet listening at locations along each site of water body for 5 mins.
2. Recorded male advertisement call projected for several minutes followed by quiet listening.
3. Spotlighting (using a low wattage/voltage light).
4. Call playback of immediate areas linking to water body (e.g. adjacent dam)

### 2.3.2 **GGF Diurnal Surveys**

1. Search of ground level habitat, rock rolling, vegetation searches and under hard litter.
2. Search for tadpoles and metamorphs in areas of standing water or low-flowing water. Netting and fish traps were used as part of the fish surveys in late December 2010 to compliment searches. The fish traps were set for two nights. Active searching for metamorphs was conducted around the perimeter of the sites in January with sampling using a dip net.

### 2.3.3 **Measurement of Habitat Variables GGF:**

The habitat of the site was observed and the follow aspects were recorded and are reported in the results.

- Australian Map Grid co-ordinates
- Size and type of waterbody (e.g. farm dam, drain, waterway)
- Attributes of potential habitat
- Analysis of percentage cover of emergent, submerged, floating and fringing vegetation and terrestrial vegetation at both occupied (including sites where successful breeding is occurring) and unoccupied sites
- Percentage cover of terrestrial refuge sites (e.g. rocks, logs, debris) surrounding waterways and wetlands
- Information regarding water levels at sites including basic chemistry of water
- Habitat affected by drought that would have previously provided suitable habitat for the species shall be recorded
- Type of surrounding habitat within 30 metres of each site
- Presence and overall abundance of aquatic (Plague Minnow *Gambusia holbrooki* and other fish) and terrestrial predators (e.g. foxes, cats, birds).
- Indicate potential dispersal routes and linked habitat.

### 2.3.4 **Survey Hygiene**

To reduce the risk of infection and spread of amphibian disease, particularly chytrid fungus, the handling, collection and preservation of all specimens followed the standards used by the NSW National Parks and Wildlife Service (NPWS 2001). All Field personnel were briefed on these standards prior to involvement in field surveys.



## **2.4 Targeted Fish Survey Techniques**

### **2.4.1 Site selection**

Sites were broadly selected from those previously monitored for water quality and aquatic ecology, however final site selection for this survey was based on the presence of habitat suitable for native fish, particularly small bodied species such as pygmy perches and galaxiids, water flow and depth. Sites comprising submerged and emergent aquatic vegetation, woody debris and/or rock with sections of relatively deep water (>1m) were preferred. By the time the survey was undertaken (23-24th December 2010) flow in Armstrong Creek had subsided substantially from those exhibited on 9<sup>th</sup> December 2010. This required the change in location for Site 5 only, from upstream (west) of Airport Road to immediately downstream of Airport Road (east). The final locations of the five sites sampled are detailed in Figure 1, site locations.

### **2.5 Fish survey methods**

The basic fish survey equipment and methods were undertaken according to the recommendations of the Biodiversity Precinct Structure Planning Kit for dwarf galaxias (*Galaxiella pusilla*) (DSE 2010). Dipnetting amongst aquatic vegetation was undertaken at each site to confirm presence/absence of fish. Backpack electrofishing using a Kainga EFM 300 backpack unit (Appendix 2, Figure1) was undertaken where possible, although dense vegetation and lack of flow reduced the effectiveness of this method as small fish in particular, became trapped amongst vegetation and were not able to be reliably observed. Eight collapsible bait traps (Appendix 2, Figure 2) and up to three fine-meshed fyke nets (Appendix 2, Figure 3) were set overnight at each site to maximize fishing effort and increase the likelihood of collecting a representative sample of the fish assemblage at each site.

All fish caught were maintained in freshwater, identified, counted and released alive at the point of capture. At Sites 2 and 4, representative samples of southern pygmy perch were measured to the nearest millimeter to provide some basic information on the population biology of this species in Armstrong Creek.



### **3.1 Qualifications and Limitations**

Although weather conditions were considered when sampling, fish surveys during December resulted in a lack of flow and sufficient water for site 5b (formerly site 5), therefore site 5a was substituted. The non-permission of access to an original site meant that this was not accessible. However, given that the night was still it would have been expected that all calls originating from that site would have been audible from site 5b and dams on Boundary Road. Calls can carry up to 2km on a still night (M. Aberton pers comm..).

## 4 Results and Discussion

### 4.1 Site Descriptions

Sites are described briefly below and site locations summarised within tables with site photos included in Appendix 1.

#### 4.1.1 Sites

**Table 2: Site Locations**

| Site Number | Easting       | Northing       |
|-------------|---------------|----------------|
| 1           | 38°13'57.34"S | 144°19'46.11"E |
| 2           | 38°13'53.12"S | 144°20'0.79"E  |
| 3           | 38°13'42.49"S | 144°19'23.33"E |
| 4           | 38°13'38.15"S | 144°19'17.90"E |
| 5a          | 38°13'30.88"S | 144°19'6.63"E  |
| 5b          | 38°13'30.80"S | 144°19'6.60"E  |

#### 4.1.2 Description of sites

The following descriptions of each site are tailored to Growling Grass Frog methodology requirements as shown in the Precinct Planning Kit (DSE 2010). A photo of each site is shown in Appendix 1.

##### Site 1

- Site 1 comprises of the section of Armstrong Creek west of the SurfCoast Highway. There was water contained within this section of the creek throughout the duration of the surveys with varying flow velocity and depths. The creek meanders through a closed River Red Gum community and is largely covered with canopy except for the eastern most area of the site where dead, old River Red Gums are present (refer inset photo, Figure 1). The creek is generally 1-2m wide and depth increases from 0.4m adjacent to the Surfcoast Highway to 1m in deeper pools adjacent to dead trees. A farm dam is located south of the creek at this site.
- Potential habitat for the Growling Grass Frog includes dead logs (Refer inset photo, figure 1) and surrounding emergent vegetation. The low-lying areas are covered with sedges (e.g. *Juncus* spp.) and emergent grasses such as Couch grass that may provide protection and calling sites for various frog species. Some Water Ribbons *Triglochin procerum* is located in pools of water. At various times after localized flooding the vegetation was pushed over (Refer inset photo, figure 1). The dominant terrestrial species included Toowoomba Canary Grass *Phalaris aquatic* and sedges with partial coverage from River Red Gums. There is however a lack of suitable rocks for coverage.
- Percentage cover of vegetation is: emergent species 25%, submerged 10%, floating 2 % and fringing vegetation 90% and terrestrial vegetation 90%
- Percentage cover of terrestrial refuge sites is low, rocks 0%, logs 2% debris 5-10% surrounding the creek



- Water levels were generally high with water present throughout the duration of the survey period, there was clear evidence of overbank flow prior to the final diurnal survey in January with vegetation stuck to overhanging fences. Refer to water quality assessment table (Table 6) for basic water quality parameters.
- The type of surrounding habitat within 30 metres of this site consisted of low quality to the north within a cultivated paddock, a dam to the south lacking in emergent and fringing vegetation. The Surfcoast Highway to the east would be a potential source of deaths to frogs crossing from other parts of the eastern precinct. Habitat to the west was determined to be site 2, upstream.
- There was no Plague Minnow *Gambusia holbrooki* located, however other fish such as Southern Pygmy perch, Shortfin eel and Common Galaxias were captured. Terrestrial predators such as foxes, cats and birds are likely to frequent the site however there is a large amount of protection from overhanging vegetation that would minimize their predatory effect on frog populations. A Barn owl was frequently observed in a dead stag overhanging this site.
- Potential dispersal routes and linked habitat exists mainly of the creek corridor with minimal habitat located within the nearby dam and the Surfcoast Highway a potential barrier.

## Site 2

- The site is a continuation of the Armstrong creek, upstream of Site 1. However, this site is narrower in the upper reaches and is connected to a farm dam by a drainage line. The dam is an open water body consisting of approximately 400m<sup>2</sup>. There is generally denser shrubby mid storey layer dominated by Hedge Wattle *Acacia paradoxa* and Gorse *Ulex europeus* that shades the creekline with occasional scattered River Red Gum and Sheoaks *Allocasuarina* sp. Emergent species included Common Spike Rush *Eleocharis acuta*, Water Ribbons, Water couch and a large quantity of Common Watermilfoil *Myriophyllum papillosum* that was later washed away by the January high flow event. Fringing vegetation consisted of Sedges and shrubs while terrestrial vegetation was dominated by Toowoomba Canary Grass, Sedges, Hedge Wattle and other Wattles.
- Percentage cover of vegetation is: emergent 25%, submerged 5%, floating 10% and fringing vegetation 40% and terrestrial vegetation 90%.
- Percentage cover of terrestrial refuge sites surrounding the site was low, with logs 10% present and lacking other cover such as rocks and litter.
- The water level was high and low during the period of assessment indicating that the body would become ephemeral in dry years. Refer to water quality assessment table (Table 6) for basic water quality parameters.
- The dam connected by a drain to this site was full and was assessed using dip netting and call playback. The dam is connected by a low lying drain that contains emergent vegetation such as Common Spike Rush and the edges of the dam also contain this species with occasional sedges and Dock *Rumex* sp.



However, other areas around the dam consist of Toowoomba Canary Grass and a crop of wheat. Pasture grasses surround the adjacent areas to the creek and there is generally a lack of overhanging vegetation to the west where grazing to the creek edge has occurred. Upstream, there were narrower channels where permanent water would be lacking.

- No Plague Minnow *Gambusia holbrooki* was recorded, however short fin eel and southern pygmy perch were recorded in fish surveys. It is likely that terrestrial predators such as foxes would utilize the site with a large amount of harbor present.
- Potential dispersal routes include the farm dam and creekline corridor which is linked habitat.

### Site 3

- Site 3 is part of Armstrong creek on a highly modified stretch that contains River Red Gum canopy and a heavily modified understorey. There are occasional interferences to the natural flow including dumped bricks and housing debris. The dominant understorey species includes Toowoomba Canary Grass and Gorse on the bank with Marsh Clubrush *Bolboschoenus fluviatilis* the dominant instream vegetation. Terrestrial vegetation was dominated by Gorse, Sweet Briar Rose *Rosa rubiginosa* and Toowoomba Canary Grass with overhanging canopy of River Red Gum. There were frequent areas of rocks on the creek bed throughout this site. The depth varied but was generally between 5 and 25cm deep.
- The percentage cover consisted of: emergent 50%, submerged 5%, fringing vegetation 30% and terrestrial vegetation 60%.
- Percentage cover of terrestrial refuge sites included 30% rocks, 5% logs and 5% debris.
- The water level was relatively low, with mainly shallow runs between rock, however an overbank flood event had occurred in mid January 2011. Refer to water quality assessment table (Table 6) for basic water quality parameters. It was noted that there was a high level of algae instream on rocks and vegetation, this is likely to be a result of high nutrient levels entering the stream from the eastern side of Airport Road (Refer Site 5a).
- There is generally a lack of suitable habitat within 30 metres of each side of this site other than the corridor of Armstrong creek.
- There was no indication of Plague Minnow and other fish included Southern Pygmy Perch and a Yabby *Cherax destructor*. Terrestrial predators were not observed but it is likely that foxes would be present.
- Potential dispersal routes and linked habitat include the Armstrong Creek waterway only.



#### **Site 4**

- Site 4 comprised of slow flowing and deeper pooling Armstrong Creek with depths varying from 1m to 10cm, averaging 50cm. The site was dominated by an overstorey of River Red Gum, shading the creek. Understorey was dominated by instream emergent vegetation such as Marsh Clubrush with Couch Grass and Spike rush also present. Hedge Wattle, Gorse and Toowoomba Canary Grass were the dominant terrestrial species with Kangaroo Grass *Themeda triandra* also occurring within the woodland on the southern side of the creek. Distinct man-made barriers were present with a concreted rock walkway present adjacent to a fallen tree. These may impede larger tadpoles in low flow events, however would not restrict access of frogs that would be likely to climb over the structures.
- Percentage cover of vegetation consisted: emergent 40%, submerged 2%, floating 1%, fringing vegetation 50% and terrestrial vegetation 80%
- Percentage cover of terrestrial and instream refuge sites was high with rocks 35%, logs 5% debris 5% within and surrounding the waterway.
- The water level was relatively high with recent evidence of overbank event (mid January 2011). Several slow flowing pools were present and would be likely to provide sufficient depth for the duration of metamorphosis in a good season. Refer to water quality assessment table (Table 6) for basic water quality parameters. It was noted that there was a high level of algae in-stream on rocks and vegetation, this is likely to be a result of high nutrient levels entering the stream from the eastern side of Airport Road (Refer Site 5a).
- Type of surrounding habitat within 30 metres of this site was consistent with the creek corridor and alack of still water nearby the only potential dispersal routes along the linked habitat of the creek.
- Other fish located Common and Spotted Galaxias, Short fin eel and Southern Pygmy Perch. There is potential for roaming cats and foxes to predate on any frogs located within this site.

#### **Site 5a and b**

##### **Site 5a**

- Site 5a was not recorded for Growling Grass frogs but could be considered to be similar to sites 3 and 4 in description.



#### Site 5b

- This waterbody consists of a shallow, rocky creek with an average depth of 10cm, best described as an upper reach of the Armstrong Creek. It is located just west of Airport Road and apart from the roadside culvert with extends to 1m deep, the remainder of the creek varies considerably. The site has a combination of River Red Gum and Sheoak dominated canopy and areas lacking canopy vegetation and grazed to the creek's edge. Instream vegetation is dominated by couch in open slow flowing pools with fringing/emergent vegetation dominated by River Clubrush *Schoenoplectus validus* and Common Spikerush. Two recent floods (December and January) have resulted in a fence that is heavily weighed down with leaf litter, restricting the movement of water downstream. A dam is situated to the south of the creek and this contains Cumbungi *Typha orientalis* and Water Lily *Nymphaea* sp..
- The percentage cover of vegetation is: emergent 25%, submerged 1 %, fringing vegetation 35% and terrestrial vegetation 60%.
- The percentage cover of terrestrial refuge sites was low although instream rocks were present. Terrestrial refuge consisted of rocks 5%, logs 2% debris 3 % surrounding the waterway.
- The water level fluctuated considerably and was in fact insufficient during fish survey. However, the observation of one large metamorph (Pobblebonk) in January indicates that there is was sufficient water for breeding frogs to reproduce successfully. Refer to water quality assessment table (Table 6) for basic water quality parameters. A high flood level was noted both in December and January visits with a fence crossing the creek fully covered with vegetative debris.
- The dam to the south of the creek at this site could provide a potential breeding opportunity, however no Growling grass frog was heard calling from this dam for the duration of the entire project. In addition, roadside drains adjacent to Airport Road were often full with water with species such as the Pobblebonk regularly heard calling. Upstream from this site there was generally low water levels as the catchment would be unlikely to receive as much water.
- There was a lack of fish habitat within this site due to the low water levels and dipnetting did not locate any predatory species. However, given the location of nearby houses there is a possibility of predation of frogs from domestic cats and potential for foxes to occur.
- Potential dispersal routes include the drains on Airport Road, dam top the south of this site and the corridor of Armstrong Creek which provides habitat linkages upstream.



## 4.2 Growling Grass Frog surveys

### 4.2.1 Previous Records in the area.

No known records of GGF have occurred in the immediate vicinity of Armstrong Creek west precinct. An assessment of the western end in spring 2009 did not locate the species (Aecom 2010). In addition, the western employment precinct abutting the Armstrong Creek west precinct did not contain the species during targeted species assessment (Ecology Partners 2011). However, GGF is known to occur at Moriac, some 10km west of the subject site (Aberton *pers comm.*) and Aecom 2010 referenced observations 5km northeast of Ghazepore Road in DSE's fauna database (AVW) from the Belmont Common and Barwon River.

### 4.2.2 Weather Conditions on each nocturnal survey

The following table (Table 3) summarises weather conditions at the time of nocturnal surveys.

**Table 3: Weather data on nights of survey**

| Date       | Sites assessed | Air temp.    | Rainfall (24hrs) mm | Rainfall (current) | wind  | Cloud cover         | Moon phase      | Other species |
|------------|----------------|--------------|---------------------|--------------------|-------|---------------------|-----------------|---------------|
| 25/11/2010 | 1, 2, 5b       | 18C-14C late | 33                  | Light/misty        | light | o/cast              | Waning gibbous  | S,C,P,B       |
| 9/12/2010  | 3, 4, 5b       | 18C-15C late | 5                   | Nil, 1hr prior     | none  | o/cast to scattered | Waxing crescent | S,C,P,B       |
| 16/12/2010 | 1, 2,3,4       | 16C-12C late | 0.4                 | nil                | none  | scattered           | Waxing gibbous  | P,B           |

Key to other species: S-Spotted Marsh Frog, C-Common Froglet, P-Pobblebonk, B-Brown Tree Frog

### Frog population

Armstrong Creek provides some habitat for frogs and this is demonstrated by the presence of four common species heard during nocturnal searches: Pobblebonk, Spotted Marsh Frog, Southern Brown tree Frog and the Common Froglet. These species would be suited to the ephemeral type water body that Armstrong Creek usually exhibits and are opportunistic breeders. The Common Froglet particularly can use roadside drains and puddles to breed. There was evidence that the Pobblebonk has had successful breeding period by the presence of metamorphs, though in small numbers. Available habitat including a tree canopy over rocky waterway is considered suitable for a suite of frog species, however there is generally a lack of woody structures and leaf litter other than that on fences to provide habitat. The absence of Growling Grass Frogs along the creek and within adjacent dams suggests that there is a lack of this species and this may be a result of the creek and surrounding areas modification, and lack of standing water with suitable emergent vegetation and low amount of food source (other frog species).



As described by Anstis (2002) the species generally lay eggs in shallow water at the sides of waterbodies amongst vegetation. When hatching out of eggs, tadpoles hide among vegetation in the shallows of large waterbodies, few of which are located at Armstrong creek west. In addition, the Growling Grass Frog has not been previously recorded within the immediate area.

Dams and the Ghazepore Road water body opportunistically surveyed contained higher numbers of Common Froglet, Pobblebonk and Spotted Marsh Frog but no Growling Grass Frogs because of a general lack of habitat.

#### 4.3 Fish population

Four native fish species were captured during the survey, including southern pygmy perch (*Nannoperca australis*), shortfin eel (*Anguilla australis*), common galaxias (*Galaxias maculatus*) and spotted galaxias (*G. truttaceus*) (Table) (photographs Appendix 3). Southern pygmy perch was the most abundant species, present at all sites and accounting for over 96% of the fish present, while shortfin eel was present at four sites, common galaxias at two sites and spotted galaxias at one site (4). One yabby and a small number of froglets and tadpoles were also recorded (Table 4). No exotic fish species or any listed threatened species, including dwarf galaxias or Yarra pygmy perch, were recorded during the survey.

The use of a variety of gear types and methods in the survey was effective in maximizing effort and increases the level of confidence in the data collected. The greatest abundance of southern pygmy perch and shortfin eel was recorded in fyke nets while bait traps were effective in catching representatives of each fish species present (Table). Dipnetting was able to quickly determine the presence of small fish at each site, however this method is selective for small fish with a preference for submerged aquatic vegetation, such as pygmy perches and is less effective at sampling amongst woody debris or rock habitat. Backpack electrofishing was found to be of limited use in this survey. The bulk of the fish assemblage comprises small bodied fish which do not exhibit electrotaxis (involuntary attraction to the electrofishing electrode) to the same degree as large bodied fish. In combination with very low flow in the system preventing the drift of stunned fish from within and under cover of dense aquatic vegetation, this resulted in few fish being collected using this method during the survey. Consequently backpack electrofishing was not used extensively during the survey.

The composition of the fish assemblage was roughly consistent between sites. The most notable exceptions are at Site 5a, downstream of Airport Road, where very few fish were recorded, and at Site 4, where a population of spotted galaxias appears to exist, but this species was not recorded at any other site (Table 4).

At Site 5a no fish were recorded in the dipnetting sample and only one shortfin eel and 8 southern pygmy perch were caught in bait traps and fyke nets respectively (Table 4). The single shortfin eel was dead in the bait trap. This is in contrast to the



sampling results for all other sites where significantly higher numbers of all species were caught dipnetting and in bait traps and fyke nets (Table 4).

The absence of introduced fish species is encouraging. Trout (*Salmo trutta*, *Oncorhynchus mykiss*) in particular can have a devastating impact on small native fish species. Galaxiids, including spotted galaxias recorded in this study (Appendix 3), are particularly vulnerable to predation by trout (McDowall and Fulton 1996), thus the presence of spotted galaxias suggests that predation by introduced species may be limited in Armstrong Creek.

**Table 4. Summary of total combined recordings by survey type and site. \*Dead in net.**

| Methodology                        | Species   | SITE |     |     |     |   | 5a | 5b | Total |
|------------------------------------|---|------|-----|-----|-----|---|----|----|-------|
|                                    |   | 1    | 2   | 3   | 4   |   |    |    |       |
| Backpack                           | Shortfin eel  |      |     |     |     |   | 1  | na | 1     |
|                                    | Southern pygmy perch  | 3    |     |     |     |   |    |    | 3     |
| BT                                 | Froglet   |      |     | 2   |     |   |    | na | 2     |
|                                    | Common galaxias   |      |     |     | 2   |   |    |    | 2     |
|                                    | Spotted galaxias  |      |     |     | 12  |   |    |    | 12    |
|                                    | Shortfin eel  | 2    | 2   |     |     |   | 1* |    | 5     |
|                                    | Southern pygmy perch  | 69   | 202 | 94  | 233 |   |    |    | 598   |
| DN                                 | Tadpoles (pobblebonk)   |      |     | 2   |     |   |    |    | 2     |
|                                    | Shortfin eel  |      | 1   |     |     |   |    |    | 1     |
|                                    | Southern pygmy perch  | 62   | 83  | 17  | 58  |   |    |    | 220   |
| FN                                 | Pobblebonk (metamorph)  |      |     |     |     |   | 1  |    | 1     |
|                                    | Common galaxias   | 1    |     |     |     |   |    | na | 1     |
|                                    | Shortfin eel  | 18   | 15  |     | 6   |   |    |    | 39    |
|                                    | Southern pygmy perch  | 81   | 112 | 547 | 356 | 8 |    |    | 1104  |
|                                    | Tadpoles (small)  |      |     | 2   |     |   |    |    | 2     |
|                                    | Yabby   |      |     | 1   |     |   |    |    | 1     |
| Call playback /spotlighting /heard | Southern Brown Tree frog  | 1    |     |     |     |   |    | 3h | 4     |
|                                    | Common Froglet  | 1    |     |     |     | 2 | 1  |    | 4     |
|                                    | Pobblebonk Spotted Marsh Frog   |      |     | 1   |     | 1 | 3  |    | 5     |
|                                    |   | 1    |     | 1   |     | 1 | 1  |    | 4     |
| Intensive search                   | No frog species located throughout sites due to lack of movable habitat |      |     |     |     |   |    |    |       |

na-not applicable at site 5b as this type of sampling was carried out at 5a only

h-heard in distance (within 100m)

**Table 5: Growling Grass frog survey results (Call playback, active searches and various netting techniques)**



| Site number | No of Adults | No of Sub-Adults | No of metamorphs | No. of Tadpoles | Total |
|-------------|--------------|------------------|------------------|-----------------|-------|
| 1           | 0            | 0                | 0                | 0               | 0     |
| 2           | 0            | 0                | 0                | 0               | 0     |
| 3           | 0            | 0                | 0                | 0               | 0     |
| 4           | 0            | 0                | 0                | 0               | 0     |
| 5b          | 0            | 0                | 0                | 0               | 0     |

#### 4.4 Water Quality monitoring

**Table 6: Results from 5 monitoring sites**

| Site No. | Dissolved Oxygen (ppm) | Conductivity (TDS) | pH   | Temp |
|----------|------------------------|--------------------|------|------|
| 1        | 3.38                   | 693                | 7.39 | 22.6 |
| 2        | 1.77                   | 554                | 5.72 | 18.1 |
| 3*       |                        |                    |      |      |
| 4*       | 1.75                   | 1854               | 6.40 | 21.0 |
| 5        | 3.89                   | 709                | 7.41 | 20.1 |

\*Sites 3 and 4 were combined as they border each other

##### 4.4.1 Electrical Conductivity & Total Dissolved Solids

Conductivity is a measure of the amount of dissolved salts in water, and therefore an indicator of salinity. In fresh water, low conductivity indicates a preferred environment for a healthy ecosystem with lower nutrient levels. The higher the nutrient level the higher the conductivity. While an appropriate concentration of salts is vital for aquatic plants and animals, salinity that is beyond the normal range for any species of organism will cause stress or even death to organisms and can also affect the availability of nutrients to plant roots. However, observations over a variety of sites during the past few seasons has shown that Growling Grass frogs are able to cope with higher salinity levels that may provide protection against disease such as chytrid fungus ( M. Aberton pers comm.).

At this time ANZECC/ARMCANZ 2000 has no current indicative normal ranges for conductivity; therefore normal ranges have been sourced from Melbourne Water as per Table 7 below.

**Table 7: Water type and expected range**

| Water           | Reading (uS/cm) |
|-----------------|-----------------|
| Deionised water | 0.5-3           |



|                      |            |
|----------------------|------------|
| Pure rainwater       | <15        |
| Freshwater rivers    | 0-800      |
| Marginal river water | 800-1600   |
| Brackish water       | 1600-4800  |
| Saline water         | >4800      |
| Seawater             | 51 500     |
| Industrial waters    | 100-10 000 |

Source: Suttar S., Ribbons of Blue Handbook. Scitech, Victoria, 1990

Most of the results fall in the freshwater river waters range, indicating that they are still relatively low Conductivity levels and therefore low salinity levels are present. However, sites 3 and 4 combined had higher levels in the brackish water range, potentially a result of the outfall from Grovedale. There is also a higher content of algae in the water which correlates from higher nutrient levels associated with the high salinity.

#### 4.4.2 Dissolved Oxygen

Dissolved oxygen is a measure of the quantity of oxygen present in water and is essential for life processes of most aquatic organisms. Low concentrations of dissolved oxygen usually indicate the presence of excessive organics (organic runoff) within the system, while high values can indicate excessive plant production (eutrophication). Many aquatic organisms will suffocate if there is insufficient volume of dissolved oxygen in the water.

Seasonal cycles directly correlates to dissolved oxygen levels in a waterway, for example during summer on sunnier days, in highly turbulent water, supersaturated conditions are more likely to occur, which is when water contains too much oxygen. Supersaturation is dangerous for aquatic animals as the oxygen concentration in their blood rises.

ANZECC/ARMCANZ 2000 water quality guidelines indicate that dissolved oxygen should exceed 8.0mg/L for a healthy aquatic system. Melbourne Water have indicated that dissolved oxygen concentrations below 3 mg/L are stressful to most aquatic organisms and at least 5-6 mg/L or 9ppm or greater are required for fish growth and activity. The dissolved oxygen levels are lower than those causing stress to most aquatic organisms at sites 2-4, the location of least vegetation cover and containing the most algae. It is possible that runoff from Grovedale stormwater is the cause of the reduction in water quality. In sites one and five the levels are above those considered to be stressful to aquatic organisms. Those sites generally had a larger content of aquatic vegetation and in the case of site 1, the highest population of fish.

#### 4.4.3 pH

pH is a measure of the acidity or alkalinity of water. Changes to pH can be caused by a range of potential water quality problems. Extremes in pH (less than 6 or greater than 9) can indicate toxicity to aquatic organisms. Most aquatic animals



and plants are adaptive to pH ranges between 6 and 9. Many freshwater systems have a pH close to 7.0, in marine waters the pH is normally close to 8.2. Table 8 indicates general guidelines for pH and water quality.

**Table 8: Ranges of pH and descriptive quality**

|          | Excellent | Good          | Fair    | Poor               | Degraded     |
|----------|-----------|---------------|---------|--------------------|--------------|
| pH range | 6.0-7.5   | 5.5-6 or <8.0 | 8.0-8.5 | 5.0-5.5 or 8.5-9.0 | <5.0 or >9.0 |

ANZECC/ARMCANZ 2000 current normal guideline ranges for pH are 6.5 – 8.5. Sites 1 and 5 are slightly alkaline and in good range while sites 2-4 were slightly acidic with site 2 in good category and site 4 the excellent category.

#### 4.4.4

#### Temperature

The temperature of waterways can directly affect physical, biological and chemical characteristics of the system with warm waters more susceptible to eutrophication. Oxygen is less soluble in warmer water and this can affect aquatic life, in contrast salts are more soluble in warmer water, so temperature can affect the water's salinity.

Temperature directly affects the metabolic rate of plants and animals. Aquatic species have evolved to live in water of specific temperatures. ANZECC / ARMCANZ 2000 current normal guidelines for temperature do not exceed 18° C. The temperatures recorded for the sites ranged between 18.1 and 22.6° C, potentially accounting for some of the algae.



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**5 Management Recommendations**

Results located no indication of any of the targeted species residing at Armstrong Creek west precinct. To improve water quality for other species appropriate stormwater treatment is recommended from runoff, including the water from Grovedale which runs directly into the creek at Airport Road. An improvement to stormwater may provide higher quality water entering the creek and reduce the effects of high nutrient loading a possible explanation for the high levels of algae growing between sites 5a and 3.

Although remnant riparian vegetation and native submerged and emergent aquatic flora provides some habitat for fish and frog species, there would be advantages to planting more. Noxious weeds occurring in the corridor provide harbour for pests and these should be controlled using appropriate weed control techniques by the land manager and replanted with native plant and tree species where these are lacking. Additional trees in modified areas would provide shading to the stream, improve instream habitat characteristics and reduce erosion in the riparian zone and siltation of the creek.

The physical habitat attributes of Armstrong Creek could be further improved by the removal of physical rubbish in the creek bed. Such material may leach pollutants, and can act as a barrier to fish migration. Habitat improvement can be achieved more effectively using natural materials such as rock and timber as and where required. There is a general lack of wood on and adjacent to the bank which would provide further frog habitat.



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6

**Conclusion**

Suitable targeted surveys did not locate any of the three FFG and EPBC listed species within the Armstrong Creek west precinct. Given that this spring/summer period was ideal conditions in other areas known for Growling Grass Frog breeding, it can be suggested that there is unlikely to be a population of this species currently using Armstrong Creek west precinct. A site at Moriac, approximately 10km west of Armstrong Creek exhibited Growling Grass Frog calls throughout the duration of the survey period and this population continued to call into late January 2011.

Four common species of frog: Pobblebonk, Spotted Marsh Frog, Southern Brown tree Frog and the Common Froglet were located during the survey but in low densities suggesting the populations are not thriving. Dams close to roads were opportunistically surveyed and contained higher densities of Common Froglet, Pobblebonk and Spotted Marsh Frog but Growling Grass Frogs were absent and habitat was not suitable for this species.

Armstrong Creek supports a robust population of southern pygmy perch which is likely to be widespread throughout the system, particularly in and around submerged and emergent aquatic vegetation. Short-finned eels, common galaxias and spotted galaxias are also present in Armstrong Creek. Dwarf galaxias and Yarra pygmy perch were not recorded in Armstrong Creek during this survey. Given the thorough sampling undertaken using methods developed for targeting small native fish species, the likelihood of either species existing in Armstrong Creek is low. No introduced fish species were recorded in Armstrong Creek during this survey which is encouraging and may explain the high densities of southern pygmy perch observed at some sites.



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**8**

**Appendices:**

Appendix 1: Site Location and Study site

Appendix 2: Fish Survey equipment

Appendix 3: Photographs

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**Appendix 1: Site Location and Study site**

CPG



Figure 1 - Targeted Growing Grass Frog (GGF) and Fish Survey Sites



Survey Site 1



Survey Site 2



Survey Site 3



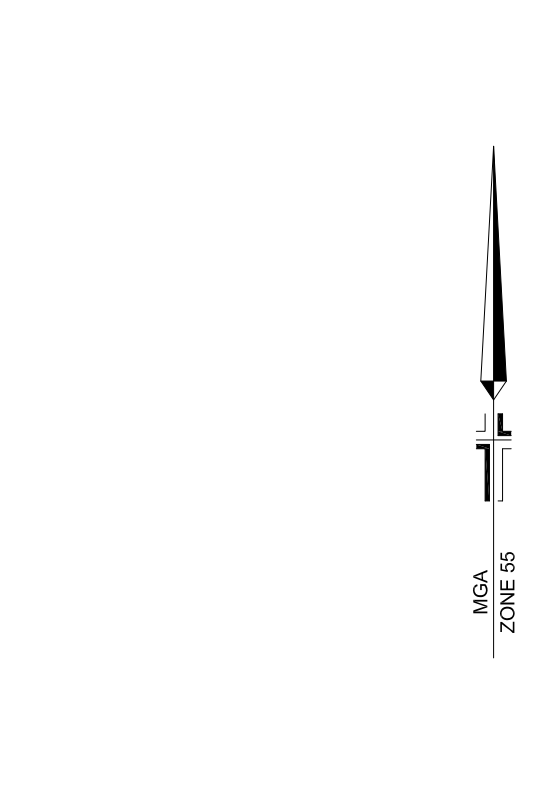
Survey Site 4



Survey Site 5a



Survey Site 5b



**Legend**


- Precinct boundary
- SS1   GGF and Fish Survey Sites
- SS5a   Fish Survey Site Only
- SS5b   GGF Survey Site Only

**Armstrong Creek West Precinct  
Targeted Growing Grass Frog (GGF)  
and Fish Survey Sites**

|           |                       |
|-----------|-----------------------|
| Scale A3  | 125 0 125 250 375     |
| 1 : 12500 | Lengths are in metres |

|                   |                   |            |    |      |          |
|-------------------|-------------------|------------|----|------|----------|
| Co-ordinate Datum | MGA55             | Sheet      | 1  | of   | 1        |
| Drawing No.       | 136965FS01        | Version    | -  |      |          |
| CAD Ref.          | G:\13\136965\ACAD |            |    |      |          |
| Drawn By          | JD                | Checked By | MA | Date | JAN 2011 |

|     |                             |          |            |
|-----|-----------------------------|----------|------------|
| -   | FOR CLIENT APPROVAL - DRAFT | MA       | 25/01/2011 |
| REV | AMENDMENT                   | APPROVED | DATE       |



**CPG**  
 10 Moorabool Street  
 PO Box 4032  
 Geelong Vic 3220  
 T 61 3 5249 6888  
 F 61 3 5249 6899  
 cpg-global.com  
 A subsidiary of Downer EDI Limited

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**Appendix 2: Fish Survey equipment**

CPG



**Kainga EFM 300 backpack electrofishing unit used in the surveys**



**Collapsible bait trap used in the fish survey.**



**Fine meshed fyke net used in the fish survey.**

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**Appendix3: Photographs**



Sample of adult and juvenile (0+) southern pygmy perch from Site 2.



Spotted galaxias from Site 4.