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Subject: 2016 Winter Nest Box Monitoring – Newcastle Gas Storage Facility

This report outlines the 2016 findings of the annual nest box monitoring program on the Newcastle Gas Storage Facility (NGSF) site at Tomago, NSW.

Background

In August 2012, 100 nest boxes were installed on AGL owned land adjacent to the Newcastle Gas Storage Facility as a requirement under Section 75J of the *Environmental Planning & Assessment Act 1979*, Application No. MP 10_0133. Due to the low number of large trees in regenerating native forest at the site [Minister for Planning and Infrastructure required 80 boxes to be mounted on treated timber posts which were cemented into the ground. The remaining boxes were placed on trees in mature forest. Four different box types were installed to suit a variety of arboreal mammals including:

- Sugar/Squirrel Glider (40 boxes);
- Brushtail/Ringtail Possum (15 boxes);
- Pygmy Possum (15 boxes); and
- Microchiropteran bat (30 boxes).

The Fauna Hollow Management Plan (AGL, 2012) specified annual inspections of boxes for five years to evaluate native fauna usage, and to ensure they remain operational and available for use.

Following the 2014 monitoring surveys, nine nest boxes were found to be destroyed by fire. All nine boxes were replaced in September 2014.

Monitoring methods

Two Kleinfelder staff with experience and accreditation in handling animals and working at heights attended the site on the 10th August 2016.

Nest boxes were monitored using a wireless GoPro™ camera mounted on an extension pole capable of reaching heights of over 6 m. A live video feed is transferred wirelessly from the camera to an iPhone device capable of capturing still HD images or video. Images were captured in the field and processed in the office.

A handheld GPS, pre-loaded with co-ordinates, was used to locate the boxes. Once a box was located, the pole camera was used to open the lid and to observe the contents.

Status of the boxes were recorded as either:

- A – Animal present;
- E1 – Fresh evidence of use (i.e. fresh nest or scats);
- E2 – Moderately fresh evidence of use (i.e. green leaves but beginning to age);
- E3 – Old signs of use (i.e. old leaf nest, old scats);
- N – No evidence of use;
- NA – Not available for use; and
- X – Missing.

If a box was found to be occupied, an attempt was made to capture the animal for positive identification and to evaluate the health of the animal.

Signs of use include the presence of hair, scats or nesting material. Samples of hair and scats were collected for microscopic analysis to identify the species. Hair analysis was undertaken by Luke Foster following Brunner and Coman (1974).

Boxes which contained wasp nests or other pest species, had lids which were open or missing, or were missing/destroyed were deemed to be not available for use by target animals.

Results

In 2016, the total number of boxes exhibiting any signs of use was 54 (54%) compared to 62% in 2015 and 41% in 2014 (**Figure 1**). A total of 95 boxes out of 100 were available for use in 2016 compared to 97 in 2015 and 81 boxes in 2014. The percentages shown in **Figure 1** have been calculated out of 100 total boxes regardless of box availability.

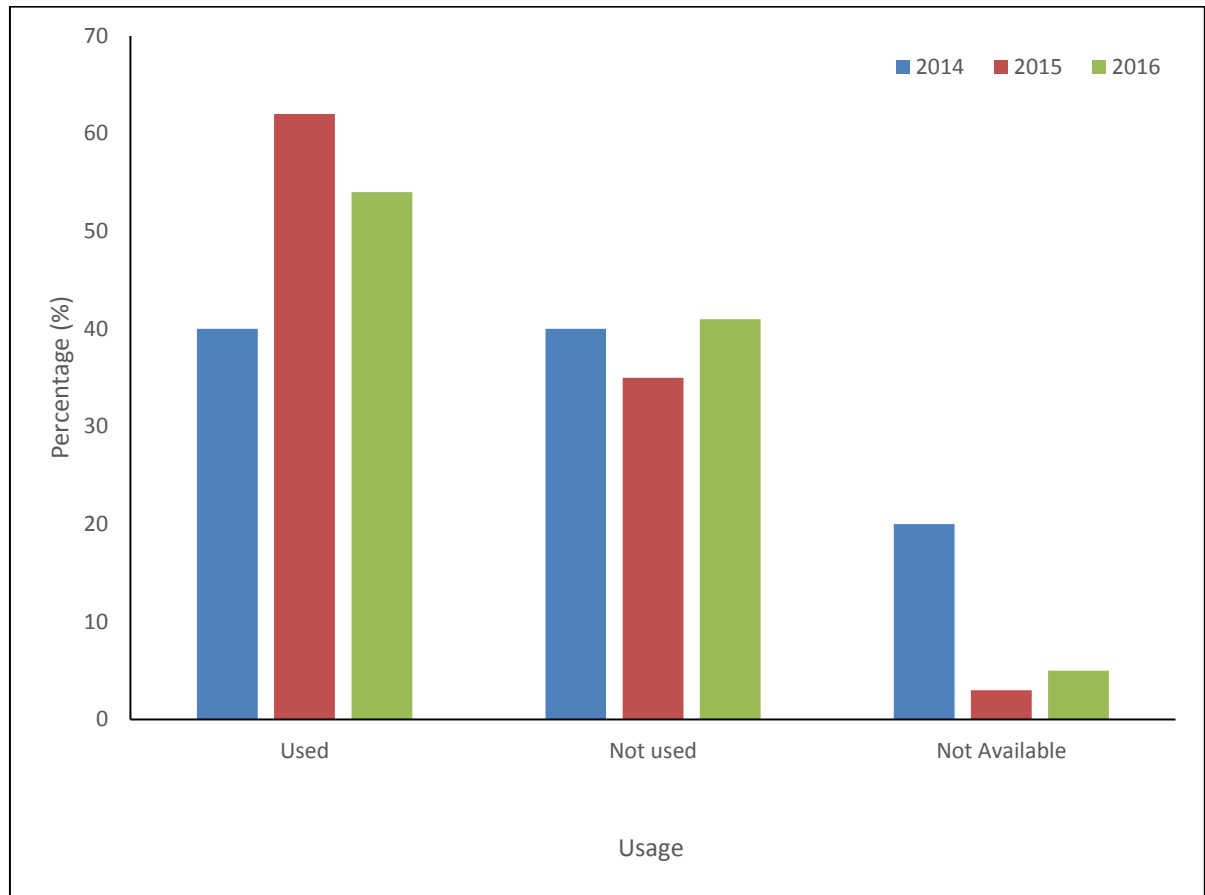


Figure 1: General usage rates of nest boxes (n=100)

The number of animals present (A) declined slightly in 2016 to eight boxes. Nine boxes contained animals in 2015 and seven in 2014. Evidence of use (E1 & E2) also saw a slight decline in 2016 dropping from 41 to 38. This value is still significantly greater than evidence obtained in the 2014 surveys (**Figure 2**).

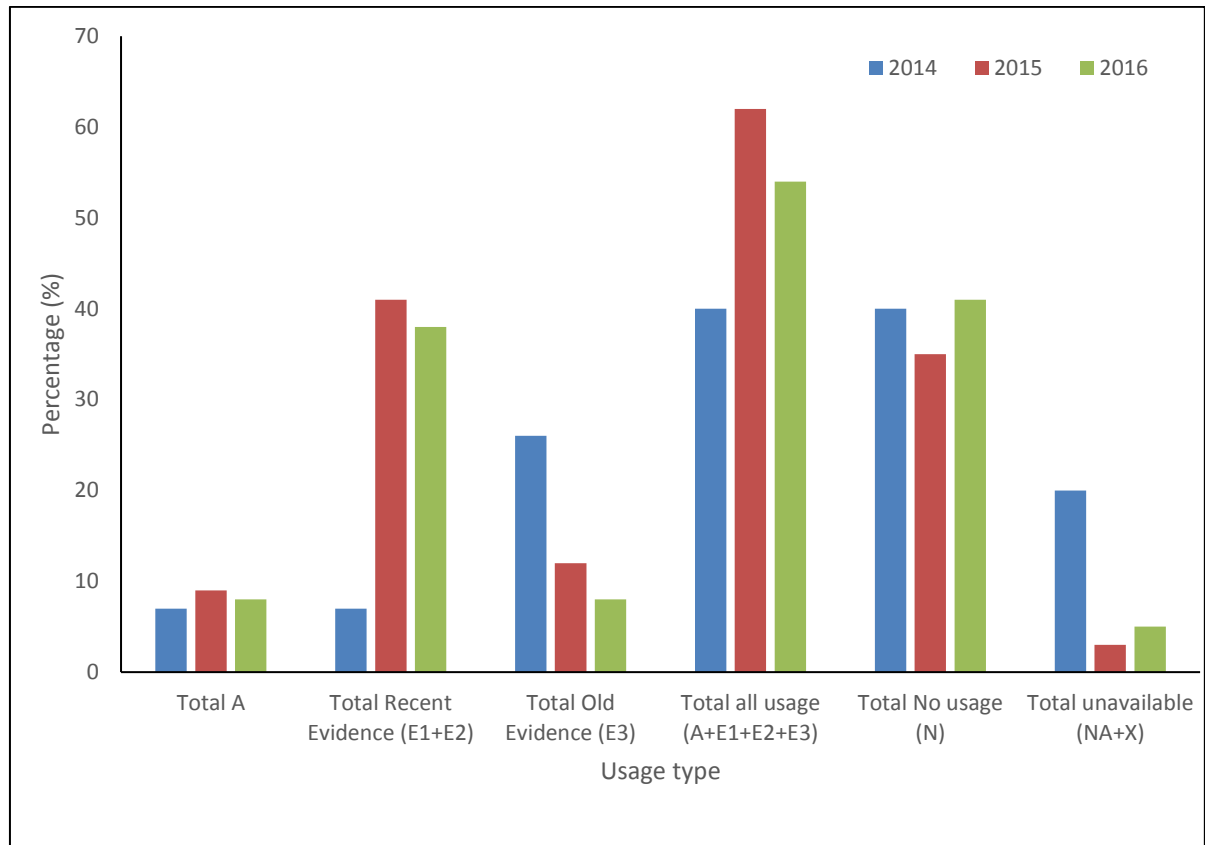


Figure 2: Detailed usage of nest boxes (n=100)

The total number of nest boxes with no signs of use reached the highest levels observed since monitoring began (41). This may be due to the lack of bat nest boxes being used in 2016.

Unavailable boxes also increased compared to 2015 surveys due to a number of nest box lids being open, most likely as a result of moving branches and windy conditions.

Usage per box type in 2016 remains relatively stable since 2015 saw an increase (**Figure 3**). Glider nest boxes saw a slight decline in use most likely attributed to an increase in glider box unavailability observed in 2016.



Figure 3: Usage per nest box type

Four fauna species were detected using boxes in 2016. This included animals present and evidence of use. The species detected were Brown Antechinus (*Antechinus stuartii*), Common Brushtail Possum (*Trichosurus vulpecula*), Sugar Glider (*Petaurus breviceps*) and Squirrel Glider (*Petaurus norfolcensis*).

The Squirrel Glider is listed as Vulnerable under the *Threatened Species Conservation Act 1995* (NSW).

An estimated 10 live animals in eight nest boxes were physically present during the 2016 monitoring event (**Table 1**). All species observed were utilising glider boxes or possum boxes.

Table 1: Actual animals present in 2016

Species recorded occupying box	No. Individuals	Box Type	Mount Type	Box no.
Brown Antechinus (<i>Antechinus stuartii</i>)	1	Pygmy Possum	Post	12
Sugar Glider (<i>Petaurus breviceps</i>)	1	Sugar/Squirrel Glider	Pole	13
Squirrel Glider (<i>Petaurus norfolcensis</i>)	1	Sugar/Squirrel Glider	Pole	21
Squirrel Glider (<i>Petaurus norfolcensis</i>)	2	Sugar/Squirrel Glider	Pole	45
Squirrel Glider (<i>Petaurus norfolcensis</i>)	2	Sugar/Squirrel Glider	Pole	51
Squirrel Glider (<i>Petaurus norfolcensis</i>)	1	Sugar/Squirrel Glider	Pole	74
Common Brushtail Possum (<i>Trichosurus vulpecula</i>)	1	Possum	Pole	70
Common Brushtail Possum (<i>Trichosurus vulpecula</i>)	1	Possum	Pole	72
Total	10			

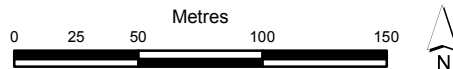
An overview of nest box locations and the results of the 2016 monitoring is shown in **Figure 4**.

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Legend

- ▲ Occupied
- ▲ Signs of use
- No signs of use
- Unavailable



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Nest Box Monitoring

AGL Energy Ltd
 Nest Box Monitoring - Winter 2016
 Newcastle Gas Storage Facility
 Old Punt Road Tomago

FIGURE:

4

Discussion

The 2016 monitoring surveys identified a combined usage rate (incorporating animals present, recent and old evidence of use) as 54% (54 boxes out of 100) a slight decline of 8% from 2015 surveys. Even with this high rate of use, it is likely to be underestimated due to the difficulty of gauging use in current microbat nest box designs. Bat boxes contain an opening on the underside of the box, scats and hair left by visiting microbats or other fauna are not retained within the box.

The high rate of nest box usage in young forest is consistent with other studies such as that conducted by Lindenmayer, and colleagues (2009) who found 58% of boxes in 20 year old regrowth were occupied. Boxes placed in mature forest are not thought to be as well used by fauna due to the availability of natural hollows.

As **Figure 2** highlights, the 2016 surveys identified once again a high rate of recent evidence compared to 2014 surveys. This is consistent with other nest box programs where the rate of box usage increases dramatically in the first couple of years as hollow dependent fauna discover the new resource. As monitoring continues it is expected that the rate of usage will plateau (like it has in 2016) to suit the carrying capacity of the local environment.

The high rate of recent evidence of usage could also be attributed to the growth of the local population of hollow dependent species and thus using more boxes as part of their family territories. Squirrel Gliders recorded in 2015 (Kleinfelder 2015) were observed to have had a successful breeding event and the offspring had dispersed to boxes adjacent to that of the parents' box. This was again observed in 2016 by the presence of adult and juvenile gliders in nearby nest boxes.

The species recorded in boxes in this study are consistent with arboreal species detected during baseline fauna surveys for the gas storage facility in 2009 and 2010 (ecobiological 2010). Although the threatened Squirrel Glider was detected from only one capture during baseline surveys, it was recorded three times using both glider (n=2) and pygmy-possum (n=1) boxes at the site in 2014 surveys, again in 2015 using solely glider boxes (n=6) and again in 2016 (n=4).

In the 2015 surveys (Kleinfelder 2015) it was observed that Squirrel Gliders were detected in nest box 50 in both 2014 and 2015 and Squirrel Glider juveniles were recorded in another box only 20 m north of box 50, thus indicating a successful breeding event. In 2016, a very fresh glider bowl was observed in box 50, and Squirrel Glider individuals were recorded in

boxes 21, 45 and 51 (**Table 1**). The close proximity of records in 2016 indicate that once again successful breeding and dispersal of juveniles is occurring. Signs of feeding on preferred feed tree species (*Eucalyptus gummifera*) was also once again noted.

Fifteen pygmy possum boxes were installed at the site as the area was thought to be suitable habitat for this species. Eastern Pygmy Possum are difficult to survey for using conventional trapping and spotlighting techniques and it has been suggested that nest boxes may provide greater opportunities to detect this species through indirect evidence such as characteristic nests or hairs (Beyer and Goldingay 2006). No Eastern Pygmy Possum or their signs have been detected in the three monitoring events.

Nest boxes at the site were installed consistently on warmer north-easterly aspects and so it is assumed that this would make them more likely to be occupied in winter. Other factors such as the presence of canopy shade may also influence the microclimate within the boxes.

Summary

The 2016 nest box monitoring program has shown that the 100 nest boxes installed on the NGSF property continue to provide hollow dependent fauna with a den resource. The observation of the threatened Squirrel Glider and a successful breeding event is a positive sign for this species in the area.

Ongoing monitoring and maintenance of nest boxes is essential for determining the ongoing success of the offset program.

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APPENDIX 1 – FIELD PHOTOS



Squirrel Gliders using Box 45



Common Brushtail Possum using Box 72



Fresh *Antechinus stuartii* nest and scats in Box 58



Feeding signs (Gliders) on a *Eucalyptus gummifera*