NORTHERN QUOLL MONITORING PROGRAM

1. Introduction

Atlas Iron Limited (Atlas) has sought approval to develop their Mt Dove Direct Shipping Ore (DSO) Project (the Project) located in the Pilbara region of Western Australia, approximately 68 km south of Port Hedland. The Project has a disturbance footprint of approximately 219 ha and will involve the development of an open pit mine using conventional drill and blast, load and haul methods to extract the currently identified iron ore resource of approximately 2.3 Mt. This monitoring program forms part of the Significant Species Management Plan (SSMP) required under EPBC approval EPBC (2011/5848).

The Project will result in the direct removal of 64% of Rocky Ridge/ northern quoll habitat occurring within the study area and immediate surrounds (10 km radius). Consequently, Atlas have committed to the creation of artificial habitat potentially suitable for northern quolls at Mt Dove (for more detail see the Northern Quoll Artificial Habitat Scope of Work, Appendix 4 of the Significant Species Management Plan). Additionally, Atlas have committed to conducting exclusion trapping and relocation of northern quolls from Rocky Ridge habitat immediately prior to ground disturbance at Mt Dove, to the newly created area of artificial habitat.

This monitoring program has been developed to satisfy the following condition attached to the Commonwealth approval:

> **2.** The person taking this action must prepare a Significant Species Management Plan for the approval of the Minister, that maximises the ongoing protection and long term conservation of EPBC Act listed threatened fauna species. The plan must address, but is not limited to, the following criteria:
>
> **d**. A fauna monitoring program, including methodology, timing, scope, duration and reporting over the duration of the fauna monitoring program, to investigate EPBC Act listed threatened species, including the following:
>
> **ii.** the extent to which EPBC Act listed threatened fauna species[1] colonise artificial habitat that will be constructed outside the Mt Dove project area. the monitoring of artificial habitat must be on-going throughout the life of the mine and for two years subsequent to mine closure.
>
> **iii.** the extent to which a 20 metre buffer around Pilbara Leaf-nosed Bat caves is suitable for the continued use or re-colonisation of this species after mining.
>
> **e.** Performance criteria and corrective actions; and

[1] EPBC Act listed threatened fauna includes the northern quoll (*Dasyurus hallucatus*) and the Pilbara leaf-nosed bat (*Rhinonicteris aurantia* (Pilbara Form)) as defined by the SEWPAC.

f. Reporting on milestones and compliance with this plan.

A report outlining the results of monitoring required by conditions **2 (d) (ii)** and **2 (d) (iii)** in this plan must be submitted to the department within one year of completion of the monitoring activity. The person taking the action cannot commence construction until the Significant Species Management Plan is approved. The approved Significant Species Management Plan must be implemented.

The primary objective of this monitoring program is to further the scientific knowledge of the species' response to disturbance, as opposed to guiding on-site environmental management. Monitoring will involve two stages:

- Relocation and disturbance monitoring, during initial clearing and ground works at Mt Dove to determine the species response to disturbance (and relocation).
- Annual monitoring, to determine the persistence of the species within the artificial habitat/Project area during and following operations.

Broadly, this monitoring program addresses the following monitoring requirements for the northern quoll:

- Continue to conduct a population survey to provide quantitative data on northern quoll demographics and distributions in the Mt Dove Study Area, consistent with the methodology employed during the initial monitoring survey conducted during May 2011.
- Investigate the extent to which the northern quoll colonises artificial habitat that will be constructed outside the Mt Dove Project area.
- Gather additional information on the physiology and morphology of the northern quoll in the Study Area.
- Develop future monitoring and management recommendations for the northern quoll.

A separate monitoring program has been developed for the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia* (Pilbara Form)) (Appendix 6 of the SSMP).

2. Target Species

The northern quoll (*Dasyurus hallucatus*) is listed as endangered under the EPBC Act and listed as Schedule 1 under the WA *Wildlife Conservation* (WC) *Act 1950*. There are extensive knowledge gaps with respect to northern quolls in the Pilbara region, including home range and dispersal, reproductive biology, population ecology and genetics, diet, critical habitat requirements and the response of populations to fire.

The range of the northern quoll spans northern Australia, extending from south-east Queensland through the Northern Territory and into Western Australia, both on the mainland and some offshore islands. In Western Australia it occurs in both the Pilbara and Kimberley regions (SEWPAC 2011a). In the Pilbara region, the distribution of quolls is fragmented and the species is mostly confined to ironstone formations and some river systems (Hill and Ward 2010). Regionally, the northern quoll is most likely to occur in rocky areas such as granite outcrops and ironstone, sandstone and greenstone ridges (OES, 2011).

The presence of northern quolls within the study area has been confirmed in two separate surveys:

- During baseline surveys in 2010, nine individual quolls were captured, with all of these captured in Rocky Ridge habitat. One of these individuals was also captured in *Acacia* Shrubland on Footslope habitat, although it was unlikely to be a resident within this habitat as it did not contain features typically used by the species for denning (e.g. caves, crevices, hollow logs and trees).
- During the baseline northern quoll trapping program conducted in May 2011, seven individuals were captured, with all of these captured in Rocky Ridge habitat. One of these individuals was also captured in Stony Rise habitat, although it was unlikely to be resident within this habitat as it did not contain features typically used by the species for denning (e.g. caves, crevices, hollow logs and trees).

3. Relocation and Post Disturbance Monitoring

3.1 Purpose and scope

Relocation and post-disturbance monitoring will involve the relocation of northern quolls from the project area to newly created artificial habitat (see the Northern Quoll Artificial Habitat Scope of Work, Appendix 4 of the Significant Species Management Plan) prior to disturbance (e.g. pre-stripping) and the use of radio tracking to determine the movements of relocated quolls post-release. Specific objectives of the relocation and post disturbance monitoring is to:

- Conduct exclusion trapping for northern quolls within Rocky Ridge habitat at Mt Dove immediately prior to clearing and relocate individuals from disturbance areas to artificial habitat.
- Monitor the Mt Dove northern quoll population using techniques consistent with SEWPAC and DEC requirements and guidelines to determine the response of relocated Northern Quolls to disturbance.
- Determine the extent to which northern quolls colonise artificial habitat.

3.2 Survey Timing and Site Selection

Relocation and disturbance monitoring will be undertaken over a four week period, one week prior to commencement and four weeks after pre-stripping and removal of rocky habitat at Mt Dove. Pre-stripping is scheduled to commence in the second quarter of 2012, pending receipt of necessary environmental approvals. This coincides with the optimum season to trap/relocate quolls prior to their breeding season and during the cooler weather conditions and is the same time of the year that annual monitoring is conducted.

Exclusion trapping will be undertaken at sites A, B and C used in both the 2010 baseline survey and the 2011 northern quoll monitoring program (Figure 1). These sites are located within the Rocky Ridge habitat and neighbouring stony rise habitat where quolls have previously been captured.

As this monitoring event will also serve as the first round of annual monitoring (2012) (Refer to Section 4), this trapping program will be extended to include non-exclusion trapping of the other sites (D, E and F) sampled during the 2010 baseline survey and the 2011 northern quoll monitoring program (Figure 1). These additional sites will be sampled as per the methodology in Section 4.3.

3.3 Exclusion Trapping

Guidelines for targeted surveys suggest that trapping effort can be determined by the formula $y = 50x^{0.5}$, where y is the number of trapping nights and x is the area of potential habitat (SEWPAC, 2011a). Based on an area of 22 ha of Rocky Ridge habitat, a minimum of 235 trap nights is required.

Twenty traps will be set for seven nights at Site A, B and C (Figure 1) resulting in a trapping effort of 420 trap nights. Traps will be cleared every morning for seven nights, or until no quolls are captured for three consecutive nights.

Trapping will be conducted using large Elliott box traps (15 x 15 x 45 cm) or Sheffield cage traps (20 x 20 x 60cm) or a combination of both. Traps will be baited with a mixture of peanut butter, rolled oats and sardines in oil and rebaited with fresh bait at least every second day. Traps will be opened in the afternoon and cleared every morning.

3.4 Motion Sensor Cameras

Motion sensor cameras will be used as a non invasive technique in addition to exclusion trapping techniques discussed in Section 3.3. Two cameras will be set for seven nights, one at artificial habitat (Site G) and one within remnant Rocky Ridge habitat (Site H). The camera set at the artificial habitat will be baited to increase the chance of capturing images of northern quolls. However, the camera set within remnant Rocky Ridge habitat will not be baited, to prevent encouraging quolls to return.

3.5 Marking and Measuring

Up to six radio collars will be placed on suitable individuals prior to relocation (i.e. weight of 400g or more, not pregnant or visibly injured or poor condition). Transport and handling of animals will be undertaken in accordance with the DEC guidelines on transport and temporary holding of wildlife (DEC, 2009a).

The following parameters will be measured and recorded for each individual:

- Weight.
- Sex.
- Pes (left hind foot measurement).
- Tail diameter.
- Presence/absence of bite marks and parasites.
- Age (juvenile or adult).
- GPS coordinates.
- Scrotal diameter of males.

- Notes on reproductive condition of females - distended pouch, extended teats or pouch young.

For identification of individuals, animals will be marked at the time of capture using passive implant transponders (PIT tags, Trovan unique ID100 transponders), which will be placed beneath the skin of the animal between the shoulders. Ear tissue clips will be collected and stored in 100% ethanol, and submitted to the Western Australian Museum for genetic analysis.

Animals will be scanned with a PIT tag reader prior to PIT tag insertion, to determine whether the individual has previously been captured. If existing PIT tags are present, implanting of additional tags or sampling for genetic material will not be required and the details of the recapture will be recorded.

3.6 Release

All trapped individuals will be released at artificial habitat located to the west of Mt Dove (Figure 1). Individuals will be released during the morning immediately after the conclusion of trapping (and within three hours of sunrise) to minimise handling, time of confinement and to increase the likelihood that individuals will remain within the habitat immediately subsequent to release.

3.7 Radio Tracking

Techniques used to track relocated northern quolls will be consistent with techniques outlined by DEC on ground-based radio-tracking (DEC, 2009b). Individuals will be radio tracked using the homing technique, with the last known location of the individual used as the starting point. Each animal relocated will be tracked for four weeks. Locations of individuals will be established daily during daylight hours to within an accuracy of approximately 50m within the first week of radiotracking, to avoid disturbance to individuals. In situations where locating individuals during the day is not possible because animals are sheltering within rocky dens, individuals will be tracked during the night. The frequency of radio tracking may be reduced in each subsequent week of monitoring (no less than every third day), in the event northern quoll behaviour becomes more predictable.

At the conclusion of this period collars will be retrieved via intensive trapping of individuals at last known locations as determined by radio tracking. Mortalities of translocated northern quolls will be reported to the DEC and SEWPAC.

3.8 Reporting

Findings of relocation and post-disturbance monitoring will be included in the specialists 2012 annual northern quoll monitoring report (refer to Section 4.7) and provided to Atlas within 3 months of completion of the annual monitoring event.

Specific to the relocation and post disturbance monitoring this report will include:

- The location, dimensions and attributes of artificial northern quoll habitat constructed outside the Project footprint.
- Any estimates of post-disturbance mortality, day time den locations and home ranges from the radio tracking component of the Project.
- The extent to which northern quolls have colonised artificial habitat constructed outside the Mt Dove Project area.

Findings of the relocation and post-disturbance monitoring will also be summarised in Atlas' Annual Environmental Report, which will be provided to DEC and SEWPAC within one year of the monitoring activity being conducted, along with the specialist report.

4. Annual Monitoring

4.1 Purpose and Scope

Annual monitoring of northern quolls will be undertaken throughout the life of the Project and for 2 years subsequent to mine closure. Specific objectives of annual monitoring are to:

- Continue to conduct a population survey to provide quantitative data on northern quoll demographics and distributions in the Mt Dove study area.
- Investigate the extent to which the northern quoll colonises artificial habitat.
- Gather additional information on the physiology and morphology of the northern quoll in the Study Area.
- Develop future monitoring and management recommendations for the northern quoll.

The relocation and post-disturbance monitoring discussed in Section 3 will fulfil the requirements of Atlas first round of annual monitoring (2012).

This section addresses the annual monitoring methodology to be undertaken following the 2012 monitoring event (from 2013 onwards), in consideration of project disturbance to existing monitoring sites.

4.2 Survey Timing and Site Selection

Annual monitoring is to be undertaken between the months of May and August coinciding with the optimum season to trap quolls prior to their breeding season and the cooler weather conditions. Monitoring will be ongoing for the life of the project and will continue for two years subsequent to mine closure (i.e. completion of mining, product processing and transport).

Following pre-stripping and clearing, a number of the survey sites used during the relocation and post-disturbance/2012 annual monitoring event, as well as the 2010 baseline study and the 2011 northern quoll monitoring program, will have been disturbed and so annual monitoring sites from 2013 onwards (i.e., post disturbance) will need to be revised.

While the exact location and number of sites will need to be finalised following examination of Project disturbance and remaining habitat, six annual monitoring sites are planned to be established as part of the annual monitoring program from 2013 onwards. These sites are indicatively depicted on Figure 1 and include:

- Continued monitoring at existing/undisturbed monitoring sites D, E and F.
- A new monitoring site within:
  - Artificial northern quoll habitat (Site G).

– Remnant Rocky Ridge habitat immediately adjacent to the Mt Dove mine (Site H).
– Disturbed Rocky Ridge habitat (Site I).

4.3 Trapping Technique

Trapping methods incorporated in this monitoring program are based upon Commonwealth referral guidelines for the northern quoll (SEWPAC, 2011a) and Survey Guidelines for threatened mammals (SEWPAC, 2011b).

At each trapping site, a combination of twenty traps of either large Elliott box traps (15 x 15 x 45 cm) or Sheffield cage traps (20 x 20 x 60cm) will be set. Traps will be baited with a mixture of peanut butter, rolled oats and sardines in oil and rebaited with fresh bait at least every second day. Traps will be opened each afternoon and cleared each morning for a period of seven consecutive nights, unless two or more individuals are captured on consecutive nights, in which case traps will be closed after four nights.

Trapping sites will generally consist of a 500 m trap line through suitable northern quoll habitat, with traps positioned at 50 m intervals along the trap line. Placement of individual traps is to be determined with consideration given to favourable micro-habitat, and protection for exposure to sun, wind and rain. Trap locations are to be recorded via GPS device to allow for replication in subsequent surveys.

4.4 Marking and Measuring

The following parameters are to be measured and recorded for each individual:

- Weight.
- Sex.
- Pes (left hind foot measurement)
- Tail diameter
- Presents/absents of bite marks and parasites
- Age (juvenile or adult).
- GPS coordinates.
- Scrotal diameter of males
- Notes on reproductive condition of females - distended pouch, extended teats or pouch young.

The above parameters provide valuable information as to the overall condition and health of the northern quoll population allowing comparison between monitoring years. For example, northern quolls store fat in their tails so an increase in tail diameter would indicate an increase in condition of the northern quoll. Notes on reproductive condition will provide an indication as to the breeding cycle of the population at Mt Dove and determine if females are pregnant, lactating or weaning

their young. The age of a northern quoll can be determined through a combination of factors such as weight and pes (hind foot length) (Oakwood, 2000).

To identify recaptured individuals, animals will be marked at the time of capture using passive implant transponders (PIT tags, Trovan unique ID100 transponders), which will be placed beneath the skin of the animal between the shoulders. PIT tags will be used in preference to tattoos as they are considered to minimise stress to the animal, and are the most reliable method available for the long-term identification of individuals.

Genetic material for all northern quolls will be collected for submission to the WA Museum. A small sample of ear tissue will be placed 100% ethanol; and all samples sent to the WA Museum.

Prior to PIT tag insertion and sampling of genetic material, animals should be scanned for PIT tags to determine whether the individual has previously been captured. If existing PIT tags are present, implanting of additional tags or sampling for genetic material will not be required and the animal can be released at the point of capture.

4.5 Motion Sensor Cameras

Motion sensor cameras will be used as a non invasive technique in addition to trapping techniques discussed in Section 3.3. Two cameras will be set for seven nights at each monitoring site. Cameras will be baited to increase the chance of capturing images of northern quolls.

4.6 Environmental data

Climatic data will be sourced from weather stations at Indee Station and Port Hedland. Observations relating to relevant environmental parameters will be recorded (e.g. vegetation condition, presence of surface water). This information may assist in interpretation of trapping data. Non-indigenous fauna captured during trapping, captured on camera traps or observed opportunistically during monitoring will also be recorded.

4.7 Reporting

The fauna specialist will report to Atlas on the results of the annual monitoring program within three months of completion of the monitoring activity. This report will discuss/include:

- Any estimates of population abundance, demographics, body condition and behaviour.
- The extent to which the northern quoll colonises artificial habitat.
- Any additional information on the physiology and morphology of the northern quoll in the Study Area.

- Anecdotal records of northern quolls recorded within the Atlas Incident Report System (i.e. opportunistic sightings or potential vehicle strikes).
- Comparison of monitoring results with those obtained during the previous monitoring sessions at both Mt Dove and Abydos and Wodgina.
- Future monitoring and management recommendations for the northern quoll.

Findings of the annual monitoring will be summarised in Atlas' Annual Environmental Report, which will be provided to DEC and SEWPAC within one year of the monitoring activity being conducted, along with the specialist report.

5. References

DEC, 2009. DEC Nature Conservation Service Standard Operating Procedure: Transport and temporary holding of wildlife. Department of Environment and Conservation, Western Australia.

DEC, 2009. DEC Nature Conservation Service Standard Operating Procedure: Ground-based radio-tracking. Department of Environment and Conservation, Western Australia.

EPA, 2004. Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56. Environmental Protection Authority, Western Australia.

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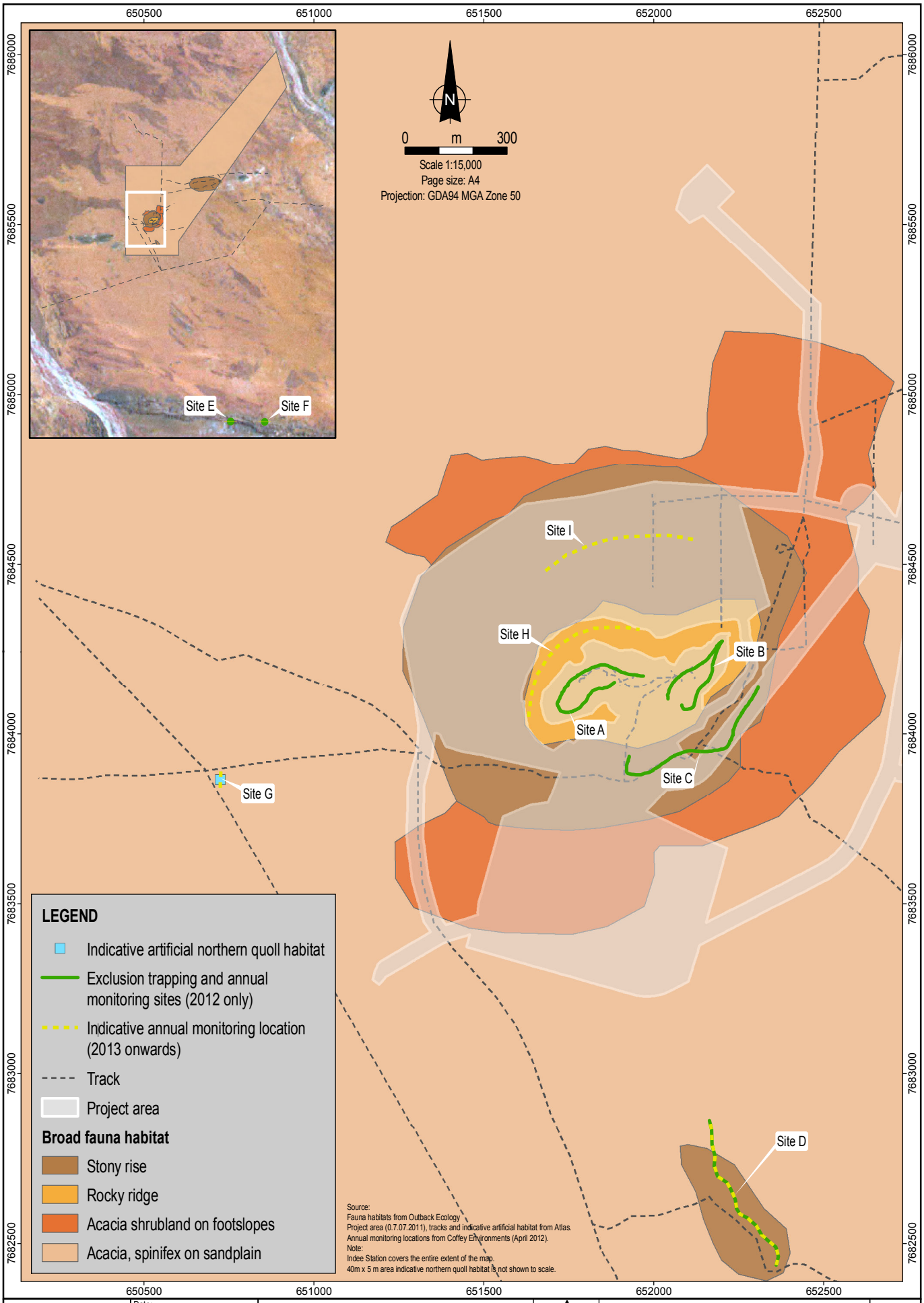
Oakwood, M., 2000. Reproduction and demography of the northern quoll, Dasyurus hallucatus, in the lowland savanna of northern Australia. Australian Journal of Zoology 48: 519-539.

OES, 2010. Atlas Iron Wodgina DSO Project: Northern quoll Annual Monitoring (Baseline Survey). Report prepared for Atlas by Outback Ecology Services.

OES, 2011. Atlas Iron Mt Dove DSO Project: Northern Quoll Annual Monitoring Program: Baseline Survey. Report prepared for Atlas by Outback Ecology Services.

SEWPAC, 2011a. Environmental Protection and Biodiversity Conservation Act 1999 referral guidelines for the endangered northern quoll *Dasyurus hallucatus*, EPBC Act policy statement 3.25. Australian Government Department of Sustainability, Environment, Water, Population and Communities

SEWPAC, 2011b. Survey guidelines for Australia's threatened mammals. Australian Government Department of Sustainability, Environment, Water, Population and Communities.



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Mt Dove DSO Project

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Northern quoll monitoring locations

Figure No: 1