NewGen Neerabup Gas Pipeline Fauna Clearance Summary

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Issued:
Prepared by:
For NewGen Neerabup Pty Ltd

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a	5/08/09	Fauna Pipeline Clearance Summary	Pat Cullen		

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1 Introduction

In Mid September 2008, NewGen Neerabup Partnership (NNP) commenced construction of a 26 inch diameter undergrounds steel gas transmission pipeline originating from a hot tap on the Dampier to Bunbury Natural Gas Pipeline (DBNGP) north of Muchea and terminating at the Neerabup Industrial Estate. The pipeline will supply natural gas to a 330 MW Gas-Fired Peaking Power Station that will provide additional power into the South West interconnected System (SWIS) during times of peak demand.

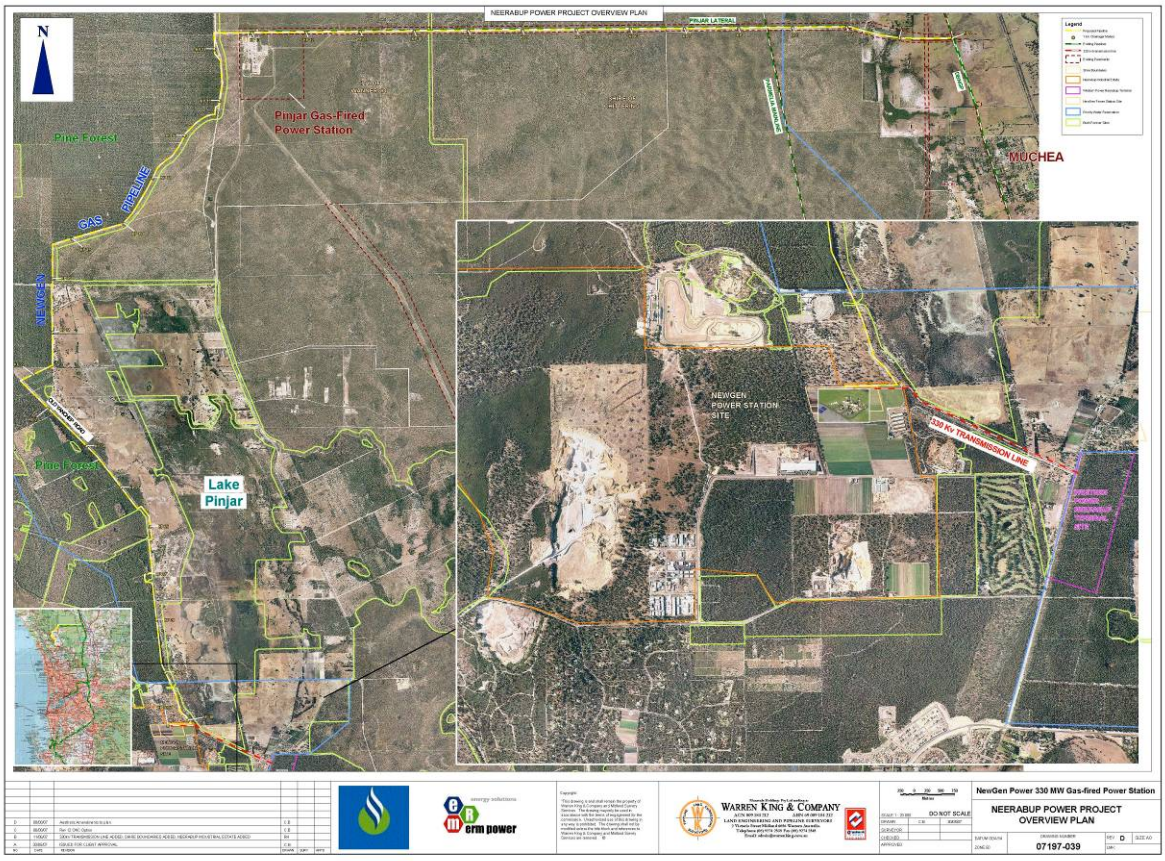

Plate 1.1 Neerabup Gas Pipeline Route.

1.1 Pipeline construction

Pipeline construction works were typically carried out within a 30 m wide construction corridor using a production line approach. A reduced corridor width was implemented in Environmentally Sensitive Areas (ESA) to minimise environmental impacts. An indicative cross section of the construction corridor is shown in Plate 1.2.

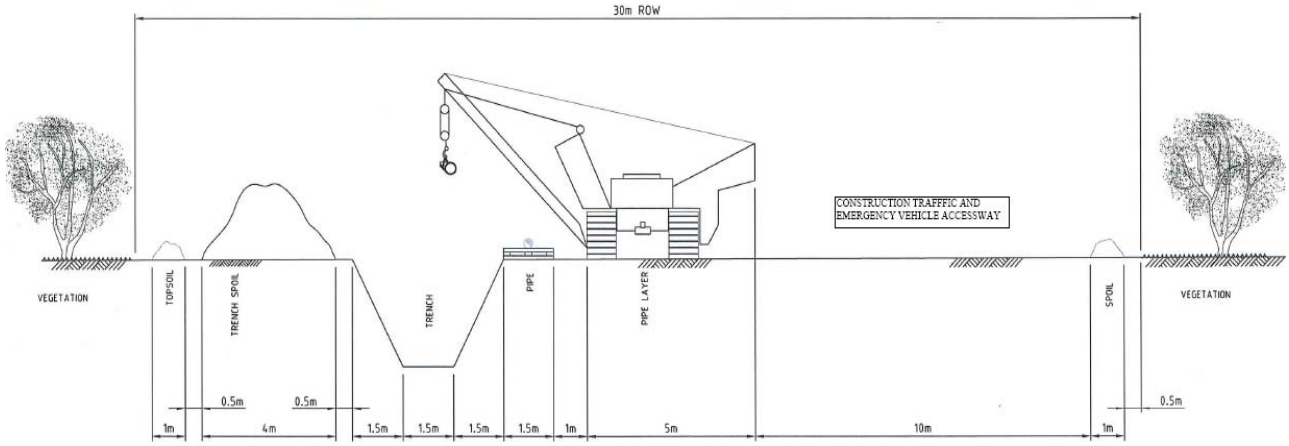

Plate 1.2 Typical Construction RoW

Pipeline construction involves a number activities that progess in a systematic sequence. A brief description of each activity is described in order of sequence in table 1-1 below.

Table 1-1 Typical pipeline construction activities

Activity	Description
Detailed Survey	Engineering, environmental and cultural heritage surveys are used both in route selection and to determine if any special construction techniques or mitigation measures are required. Once the preferred pipeline route has been determined, the centreline is surveyed and engineering aspects are finalised. Markers (pegs) are placed to identify the pipeline route and right-of-way.
Fencing	Fences are severed and construction gates installed to allow access for both property boundary and internal fences.
Clear and Grade	Graders and bulldozers are used to clear an area to provide for construction activities. This clearing will be within the construction corridor (this may be greater than 20 m in Environmentally Sensitive Areas where safety requires). The remaining area will be used to stockpile cleared vegetation. The cleared area may include excavations through sand dunes to establish a construction corridor. For safety reasons, dependent on soil type (e.g. heavy sand), an additional width may need to be cleared in areas to allow for trench and stockpile stability. The top 100 to 150 mm of topsoil shall be removed from: • all areas subject to excavation • all areas where spoil from excavations is to be stored • all areas where soil inversion or loss of topsoil is likely as a result of any activities associated with construction (including at facilities such as camp or office sites, lay down areas, etc). Overburden will be stockpiled adjacent to the excavation, in areas with no, or limited vegetation cover, where practicable.
Stringing	Steel pipe is trucked to the construction site and sections, each approximately 18 m long, are laid end-to-end next to the trench. The sections are placed on sandbags and raised on blocks of wood (timber skids) to protect the pipe from corrosion and coating damage.
Bending	Where required, pipe sections are bent to match changes in either elevation or direction of the route.
Welding	Pipe sections are welded together.
Non-destructive Weld Testing	The pipe welds are inspected using x-ray or ultrasonic equipment as per AS 2885.2.
Joint Coating	The area around the weld is grit blasted and then coated with a protective coating to prevent corrosion.

Activity	Description
Trenching	After the route is cleared, a trench (minimum 1500 mm deep) is dug for the pipeline by either a trenching machine or an excavator in accordance with pre-defined depths of burial. The required depths are determined by the AS2885.1 risk assessment process. Trench spoil is stockpiled on the right-of-way, usually on the non-working side. Trench spoil is stockpiled separately to topsoil. The trench will be monitored daily for fauna entrapment and refuges (hessian bags or similar) placed in the trench to provide protection for fauna that temporarily occupy the trench. The trenches will be ramped at regular intervals to allow larger fauna to escape. The period that any part of a trench will be left open will be minimised. Trenches will be stopped and started at regular intervals with "plugs" between these sections to allow for unimpeded movement of livestock and fauna. Where possible, trenching will be delayed until completion of the welding and joint coating to minimise the amount of time that the trench is left open.
Padding	Where required, padding machines are used to sift the excavated subsoil to remove coarse materials to prevent damage to the pipe coating. The remaining fine material is used to pad beneath and on top of the buried pipe. It is not expected that sand or foam pillows will need to be imported for use as padding.
Lowering-in	Side booms (bulldozers with cranes) or excavators are used to lower the welded pipe into the trench.
Backfilling	Trench spoil is returned to the trench and material compacted to minimise the likelihood of subsidence of material over the pipe.

1.2 Activities likely to impact on fauna

There are a number of activities that are likely to impact native fauna during pipeline construction, these include:

1. Clear and Grade has a high risk of injuring fauna particularly fossorial animals (burrowing fauna such as skinks, blind snakes etc) that inhabit the top 100-150 mm of the topsoil. During clear and grade operations the topsoil is graded into a windrow by a grader along the edge of the cleared easement and there is the potential for injury or death during this activity. To a lesser extent there is a risk of fauna injury or death during the initial clearing but this can largely be mitigated by inspection of trees for habitat hollows by a suitably trained or experienced fauna handler prior to clearing, and to ensure that the clearing is carried out in a systematic and consistent manner that will drive the fauna away from the clearing area and ensure no habitat islands are formed (there is very little risk of this occurring in a pipeline scenario when it is a lineal construction corridor).
2. Open trenches pose a high risk to large fauna such as emu's, macropods and livestock and can cause injury or death should they fall into the trench. Previous pipeline experience has shown that the risks to fauna falling are largely mitigated by the placing welded lengths of pipe on one side of the trench and a continuous mound of trench spoil on the other. Any large fauna that do fall in typically are not injured and can exit the trench of their own volition (evidence to suggest this is footprints out of the exit ramps). On previous pipeline projects the greatest risk to large vertebrates was after the pipe was lowered into the trench but the pipe was not backfilled for whatever reason. There seemed to be a higher risk of large fauna encountering the trench after the welded pipe was no longer a barrier, and the risk of injury was vastly increased when the fauna fell in and was wedged between the wall of the trench and the exposed pipe. Open trenches have also proven on previous projects to be a high risk to smaller vertebrate fauna such as reptiles, frogs, marsupials and rodents through exposure to the elements (this includes heat exhaustion, desiccation or hypothermia), drowning from a heavy rainfall event when the trench is flooded as well as increased predation due to lack of refugia.
3. There is also a risk of burial of small vertebrates within the trench during backfill operations if the trench is not checked prior to backfilling it.
4. The welding of the pipeline can pose a risk of bushfire through the use of welding equipment and grinders however this risk can be largely mitigated by clearing the full 30 metre construction corridor ensuring the stockpiles of cleared vegetation are a suitable distance from the hot works and the use of canvas awnings to contain sparks. The addition of fire fighting equipment and training with the welding crew dramatically decreases the risk of any fire from this activity.

2 Soils and Vegetation

The type and condition of vegetation communities, and the type of soil can determine the species richness and fauna abundance of an area. Thus, soil and vegetation types can influence the likelihood of fauna interacting with the construction corridor.

A total of 13 plant communities (detailed below), occur along the fringes of the pipeline (Mattiske 2007) and these include plant communities E1, G1, H1, I1, J1, J2, K1, K6, the disturbed or degraded versions of I1d, J1d, K1d, the disturbed areas (Dist) and the pine plantations (Pines). None of these communities are listed as Threatened Ecological Communities (TEC) at the State or Federal levels (DEC 2008). The E1 community occurs on the Spearwood dune system and the G1, H1, I1, J1, K1 and K6 occur on the Bassendean dune system. The communities K1 and K6 occur on the damplands and wetter swampy areas within the Bassendean and Pinjarra Plain systems.

2.1 Plant communities along the Neerabup Gas Pipeline:

E1: Low Open Woodland of *Banksia attenuata - Banksia menziesii* over *Eremaea fimbriata*, *Xanthorrhoea preissii*, *Synaphea spinulosa* subsp. *spinulosa*, *Stirlingia latifolia* and *Melaleuca scabra*

G1: Low Woodland to Low Open Woodland of *Banksia attenuata - Banksia menziesii – Eucalyptus todtiana - Nuytsia floribunda* with occasional *Allocasuarina fraseriana* and *Banksia grandis* over *Leucopogon conostephioides, Scholtzia involucrata, Eremaea pauciflora* var. *pauciflora*, *Melaleuca scabra, Boronia purdieana* subsp. *purdieana* and *Astroloma xerophyllum*

H1: Low Woodland to Low Open Woodland of *Banksia attenuata - Banksia menziesii – Banksia ilicifolia - Nuytsia floribunda* over *Beaufortia elegans, Leucopogon polymorphus, Melaleuca systena, Calytrix angulata, Calytrix flavescens, Stirlingia latifolia, Dasypogon bromeliifolius, Leucopogon conostephioides, Lyginia barbata, Macrozamia riedlei* and *Xanthorrhoea preissii*

I1: Low Open Woodland of *Banksia attenuata - Banksia menziesii* over *Verticordia nitens, Dasypogon bromeliifolius, Melaleuca seriata* and *Patersonia occidentalis*.

I1d: I1 community in degraded or disturbed state

J1: Woodland of *Corymbia calophylla - Banksia attenuata - Banksia menziesii – Melaleuca preissiana* over *Xanthorrhoea preissii, Hypocalymma angustifolium, Pultenaea reticulata, Adenanthos obovatus, Regelia ciliata* and *Jacksonia furcellata*

J1d: J1 community in degraded or disturbed state

J2: Woodland of *Corymbia calophylla* over *Xanthorrhoea preissii, Hibbertia subvaginata* and *Gompholobium scabrum*

K1: Open Forest of *Eucalyptus rudis* subsp. *rudis - Melaleuca preissiana - Banksia ilicifolia* with occasional *Banksia attenuata, Banksia menziesii, Nuytsia floribunda* and *Eucalyptus todtiana* over *Kennedia prostrata, Lyginia barbata, Xanthorrhoea preissii, Hypocalymma angustifolium, Dasypogon bromeliifolius, Pericalymma ellipticum* var. *ellipticum, Astartea scoparia, Lepidosperma tenue, Jacksonia furcellata, Kunzea ericifolia* subsp. *ericifolia* and *Bossiaea eriocarpa*

K1d: K1 community in degraded or disturbed state

K6: Open Forest of *Melaleuca rhaphiophylla - Eucalyptus rudis* subsp. *rudis* over *Baumea* and *Meeboldina* species

Pines: Pine plantations

Dist: Disturbed and completely degraded areas.

2.2 Condition of the vegetation

The pipeline corridor occurs on mostly disturbed areas, tracks and in proximity to existing tracks from near Muchea and the southern end of Lake Pinjar. Disturbances range from clearing for agricultural and forestry uses, infrastructure to weed encroachment.

The rest of the pipeline corridor occurs on agricultural lands, pine plantations and areas close to roads. Parts of the corridor that occur on agricultural land and native vegetation will be restored back to its previous condition.

2.3 Fauna habitat

Types of fauna habitat along the construction corridor are shown in the following plates 2.1-2.5

Plate 2.1 Open Paddock and *Melaleuca* /dampland

Plate 2.2. Banksia and Marri Woodlands

Plate 2.3 Pine plantation.

Plate 2.4 *Kunzea* flats

Plate 2.5 Paddocks and degraded road verges

2.4 Habitat Trees

There were very few trees of significant size and age along the construction RoW due to previous disturbance within the Infrastructure corridor by the three existing transmission lines on the southern side and the Pinjar Gas Pipeline on the northern boundary of the infrastructure corridor (refer to plate 2.6 below).

Potential habitat trees were identified during the initial vegetation survey along the proposed alignment and two trees with hollows, potentially suitable for larger birds such as Carnaby's Cockatoo, were identified (one at (GDA94) 50J 391923 mE 6508374 mN and the other 50J 394042 mE 6508391 mN). However, an assessment of these potential habitat trees by a fauna specialist indicated that these were not hollows which were suitable for nesting. There was also no evidence of breeding fauna during construction. This was not surprising considering the majority of the pipeline easement has been previously disturbed as well as the time period the pipeline was constructed (November – March). A fauna handler was present during the clearing of any trees with hollows. No fauna was found in any hollows other than the introduced honey bee *(Apis mellifera).*

Plate 2.6 Old growth habitat trees can be seen outside the infrastructure corridor.

3 Fauna

3.1 Potential impacts

Trenching, habitat disturbance and vehicle/equipment movements are the primary project activities with the potential to affect fauna values. Potential impacts include:

- loss or displacement of fauna habitat and habitat fragmentation (temporary, except in the case of habitat trees)
- injury or death through falling into, and becoming trapped in, open trenches or through accidental collisions with construction vehicles
- interruption to fauna behaviour from noise and light emissions and provision of artificial watering sites (temporary)
- increased predation from feral animals due to increased clearing and lack of cover, and improved access for feral predators
- introduced and/or spread of weeds and bushfire risk.

3.1.1 Habitat disturbance and fragmentation

A total area of around 30 ha of native vegetation was temporarily disturbed within the corridor for the construction of the NewGen Neerabup Gas Pipeline.

The removal or disturbance of vegetation has the potential to decrease faunal breeding and foraging grounds. Large trees may provide nesting hollows or shelter for animals. The cleared corridor may also have created a temporary barrier for fauna movement such as between nesting and foraging grounds. For example, mammals and reptiles generally prefer not to cross large expanses of cleared land, where they are more vulnerable to predation. Clearing a 30 m wide corridor may fragment potential habitats for these species and/or create barriers to feeding and breeding ranges.

3.1.2 Injury or death of fauna

Species vary in their likelihood of occurrence and sensitivity to impacts from the pipeline. There is the possibility for ground-dwelling fauna to fall into open trenches becoming injured or perishing as demonstrated on previous pipeline projects. Vehicle movements may also cause death to local fauna, and bushfires can potentially harm fauna values (e.g. death or loss of habitat). On this basis, it is predominantly ground-dwelling reptiles and mammals that are most at risk during the pipeline construction.

Some potential impacts associated with particular species or groups are:

- *Frogs:* a group that travels along the ground surface and therefore is highly susceptible to falling into trenches. The group may occur in high to extreme densities in some localities or seasons, and is extremely susceptible to heat stress or desiccation if trapped in the trench
- *Geckoes:* a group that has many predominantly terrestrial members and, therefore, is highly susceptible to falling into trenches. Geckoes may occur in high densities in some localities or seasons, and are vulnerable to heat stress or desiccation if trapped in the trench

- *Dragons:* a group that has many predominantly terrestrial members that move quickly across the ground surface and are likely to encounter trenches. Dragons may occur in high densities in some localities or seasons and may be vulnerable to heat stress or desiccation if trapped in the trench
- *Emus:* a species that has a moderately high likelihood of injury if they fall into a trench
- *Nesting birds:* a group that may occur in high densities in some localities or seasons and may be susceptible to disturbance or habitat clearing (e.g. waterbirds, honeyeaters)
- *Macropods* (kangaroos, wallabies): species that have a moderate likelihood of injury if they fall into the trench
- *Honey possum:* a species that regularly travels across the ground, may occur in high densities in some areas or seasons and, may be trapped in the trench in large numbers.

3.1.3 Feral animals

There were numerous opportunistic sighting of feral animals or their tracks along the RoW including the Red Fox *(Vulpes vulpes),* Feral Cat *(Felis catus)* and the Rabbit *(Oryctolagus cuniculus*; Plate 3.1). There was some evidence of foxes and cats patrolling short sections along the top of the trench on a number of occasions. No feral animals were caught in the pipeline trench and it was not ERM's Policy to release feral animals if caught. .

Plate 3.1 Feral animals sighted along the RoW

3.1.4 Bushfire

There were no bushfires as a result of the pipeline construction; however a large bushfire event occurred in the vicinity of the pipeline construction corridor on the 16th of January, 2009. There was no increase in trench captures as a result of the bushfire event. Open trench was within the pine plantation during the fire event which may have been why fauna captures were not affected by the fire.

Plate 3.2 Bushfire event in January, 2009

3.1.5 Interruption to fauna behaviour

The effect of artificial light on fauna was not considered to be an issue as the majority of construction activities were undertaken during daylight hours.

Construction activity may have resulted in temporary, short-term disturbances to fauna from noise emissions. This may have deterred some fauna from the construction area and contributed to the low trench capture rate. However, due to the short duration of construction activities, noise emissions are not expected to have had any prolonged effect on local fauna.

3.2 Threatened Fauna species

A range of Threatened and Priority fauna species were highlighted in database searches as potentially occurring within the project area (DEC 2008). These species were the Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999 (Cwth) and Vulnerable under the Wildlife Conservation Act 1950 (WA), the Peregrine Falcon (*Falco peregrinus*), the Graceful Sunmoth (*Synemon gratiosa*), a cricket (*Austrosaga spinifer*) and two native bees (*Hylaeus globuliferus* and *Leioproctus contrarius*).

The Carnaby's Cockatoo was commonly seen and is of major conservation significance (Plate 3.3). The Carnaby's Cockatoo has undergone a dramatic decline in recent years due to the loss of either food resources, destruction of their habitat, or as a result of their low reproductive rate (Johnstone and Storr 1998).

Carnaby's Cockatoo feed on proteaceous plants such as *Banksias*, and pine plantations have also become an important food resource. Sections of the pipeline alignment pass through *Banksia* and Marri woodland that may have been used as major food sources by the Carnaby's Cockatoo. However, these sections have been degraded by past clearing and maintenance activities for the powerlines and pipeline in the infrastructure corridor. Of the 30 ha cleared, 29 ha have been rehabilitated. The disturbed areas are also adjacent to the Gnangara pine plantation (20,000 ha) and Bush Forever Site 380 (8,000 ha), and therefore are not likely to represent a significant loss of food source for these birds.

Plate 3.3 Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)

3.2.1 Potentially Threatened Invertebrates

There were four Invertebrates listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999 identified on a desktop survey as potentially occurring within the Project area. These were the Graceful Sunmoth (*Synemon gratiosa*), a cricket (*Austrosaga spinifer*) and two native bees (*Hylaeus globuliferus* and *Leioproctus contrarius*).

There were no encounters of these listed invertebrates during construction or opportunistic searches along the RoW. A number of potential short-range endemic invertebrate taxa (those know to have small distributions) were recorded within the trench and collected for identification. A Trapdoor spider (Mygalomorphae) was collected from the trench but was identified as a sub adult and thus unable to be more accurately identified. It was released close to where it was collected.

A number of millipedes were also removed from trench but were identified as the introduced Portuguese millipede and of no interest to the Western Australian Museum.

Plate 3.4 Potential SRE invertebrates removed from trench.

3.3 Expected Fauna

There were 65 terrestrial vertebrate species from 16 families that were identified as potentially occurring along the RoW (Mattiske report 07). These were identified from previous fauna surveys in the surrounding area as well as records from The Museum of Western Australia.

Table 3.1 Expected Terrestrial Verebrate Families

REPTILES		MAMMALS		AMPHIBIANS	
Family	**Number of Species**	**Family**	**Number of Species**	**Family**	**Number of Species**
AGAMIDAE (Dragons)	2	TACHYGLOSSIDAE (Egg-laying Mammals)	1	MYOBATRACHIDAE (Burrowing Frogs)	7
GEKKONIDAE (Geckoes)	4	DASYURIDAE (Carnivorous Marsupials)	3		
PYGOPODIDAE (Legless Lizards)	7	PERAMELIDAE (Bandicoots and Bilby)	1		
SCINCIDAE (Skinks)	14	MACROPODIDAE (Kangaroos and wallabies)	1		
VARANIDAE (Monitors)	1	PHALANGERIDAE (Possums)	1		
TYPHLOPIDAE (Blind Snakes)	1	BURRAMYIDAE (Pygmy Possums)	1		
BOIDAE (Pythons)	1	TARSIPEDIDAE (Honey Possum)	1		
ELAPIDAE (Venomous front fanged snakes)	12				
Total Species	**42**	**Total Species**	**9**	**Total Species**	**7**

3.4 Fauna Clearance Methodology

The standard fauna clearance methodology used on gas pipeline construction involves teams of two people walking on either side of the trench, each with an extendable net and jigger, and a GPS enabled data recording kit per team. Fauna clearance would typically be within 5 hours of sunrise each morning and each team will typically cover 10 -15 kilometres per morning.

Due to the short amounts of trench open (typically less than 1.5kms) only a single experienced fauna handler was used on the Neerabup pipeline with a second trained fauna handler on site if required to assist in any way. To ensure all corners of the trench were adequately checked the fauna handler walked both sides of each section of trench before moving to the next section (past the fauna ramps that were installed every 1200 metres).

3.4.1 Fauna Handling Equipment

The fauna handler's equipment included a PDA with GPS function to record all fauna data (plate 3.5), extendable net and jigger, snake bandages, digital camera, radio communication, calico bags, gloves and zoological field guides and keys.

Plate 3.5 GPS Enabled Data Kit and extendable net and jigger for capturing fauna

3.4.2 Fauna Handler Competency

The experience of the Fauna handlers that inspected the trench on the Neerabup Gas Pipeline is summarised in table 3.2 and was approved by DEC Management Branch.

Table 3.2. Fauna Handler Experience

FAUNA HANDLERS EXPERIENCE							
NAME	EXPERIENCE (as per section 8.6 of the Fauna Interaction Protocol)						
	Fauna Identification, capture and handling (inc venomous snakes)	*Identification of tracks, scats, burrows and nests of conservation significant*	*Fauna Vouchering*	*Assessing injured fauna for suitability for release, rehabilitation or euthanasia*	*Familiarity with the ecology of the species that may be encountered in order to be able*	*Performing Euthanasia*	Interacting with venomous snakes
Pat Cullen	8 years terrestrial vertebrates survey work with DEC and Zoological Consultants. 4 Pipeline Projects. 5 years Volunteer Reptile Removal (Perth Region)	Opportunistic search for SW Carpet Python during field surveys (metro area), Radio tracking Mulgara in the goldfields (DEC), Trapping Bilbies Meentheena Conservation Park (DEC), opportunistic searches for Pebble mounds and mulgara burrows.	8 years collecting voucher specimens in a zoological consultant capacity. Assisting DEC and WAM Staff vouchering on DEC surveys and the Pilbara Biological Survey.	5 years as a volunteer reptile remover in the Perth Region rescuing and relocating injured and venomous reptiles. 5 years - assessed injured fauna from pipelines and mine sites for transport to a carer or euthanasia.	Participated in numerous zoological surveys in the last 8 years within the Swan Coastal Plain region traversed by the Neerabup Gas Pipeline.	Performed euthanasia to voucher specimens via lethal injection under direct supervision of WAM and DEC staff. Performed euthanasia on macropods and large vertebrates in remote regions of the state using firearms and blunt trauma.	5 years venomous snake removal (snake Busters). 8 years Biological surveys. Personally relocated thousands of snakes on the Telfer pipeline and stages 4 and 5A of DBNGP expansion.
Backup Fauna Handlers							
Lee Warrington	Stage 5A DBNGP licenced Fauna Handler. Venomous snake training	N/A	N/A	Trained by Senior Fauna handlers during Stage 5A DBNGP	N/A	Performed euthanasia on macropods and large vertebrates using blunt trauma and Cervical Dislocation.	5 years venomous snake removal from rural dwelling and workplaces.

3.4.3 Data Loggers

Data loggers were trialled on this project to supply locally accurate temperature and relative humidity data to assist with analysing fauna capture and mortality trends. The Data loggers worked extremely well and collected very accurate data. However, the capture rates were so low that it is not possible to draw any significant conclusions.

3.4.4 Trench Clearance Times

The fauna handler would typically commence the inspection at 7.00 AM each morning. This, however, grew progressively later as the section of open trench moved further away from the power station site and access roads. The trench was then checked again in the afternoon typically around 5.30 PM but was always completed before the last crew left the site for safety reasons. The trench was also checked prior to lowering and backfill for fauna.

3.4.5 Fauna Shelters

Fauna shelters made from hessian sacks were progressively installed by the trenching foreman as the trench was excavated and were removed each morning in front of the lowering in by the fauna handler. The fauna handler would also check the compliance of ramps and shelters to ensure ramps were installed every 1200m at an angle less than 45 degrees and shelters were installed every 100 metres.

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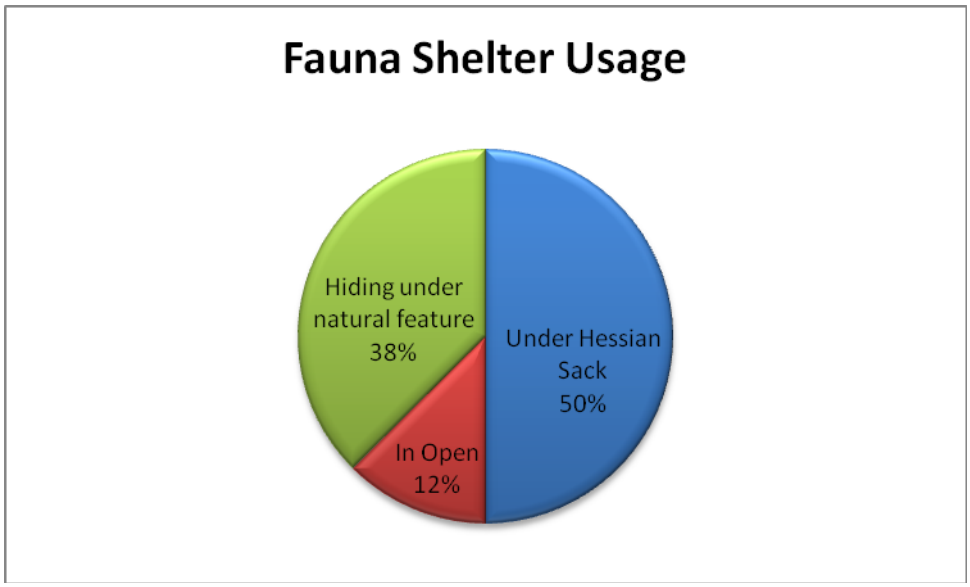

Figure 3.1. Shelter usage by fauna in trench

3.4.6 Capture, Translocation and Release

Captured animals were immediately translocated, where possible, in a manner that minimised stress and risk of injury to both fauna and the handler. Translocation to suitable habitat at a suitable distance from the disturbance was the primary objective, as determined by an experienced Fauna Officer. Fauna translocated from the ROW were released into a sheltered location to allow them protection until such time that they have "de-stressed" and were ready to move to another location. See plate 3.6 below

There was sometimes a trade-off between distance from disturbance (and, therefore, chance of re-encounter) and habitat or species requirements (and, therefore, species' survival). For small species with small home ranges, or species that have reasonably specific habitat requirements, this meant that the optimum release point was near the point of disturbance. For example, species from rocky habitats need to be released in rocky habitats even if these lie only 20-30 meters from the pipeline route. For large species, species with broad home ranges, or species that have broad/general habitat requirements, the release point could be over 100 meters from the pipeline route. An experienced Fauna Officer was always responsible for the management of this process. They would also be responsible for deciding if an injured animal should be released or dealt with in another way.

Plate 3.6. Fauna released from trench.

4 Results

4.1 Trench Summary

The trench was open for a total of 58 days averaging 712m of open trench per day and a total distance of 41 300 metres of open trench for the project. The maximum distance of trench open overnight was 1800 metres.

	Captures	Days Open	Open Trench (m)	Max Temp ('C)	Min Temp ('C)	Humidity Max (%)	Humidity Min (%)
Total	**8**	58	41300	N/A	N/A	N/A	N/A
Average	0.14	N/A	712.07	31.92	16.16	77.17	38.45
Max	2	N/A	1800	42.5	22	92.5	64
Min	0	N/A	100	25	6	39	10.5

Table 4.1 Trench Summary

4.1.1 Trench Open

The trench was open for very short periods of time (typically 1 or 2 days), but was left open for 5 days on one occasion at a road crossing and there were 7 sections of 100m that were open for 3 days. No trench was open during construction breaks. There was no clear correlation between the amount of trench open and the capture rate (refer to figure 4.2)

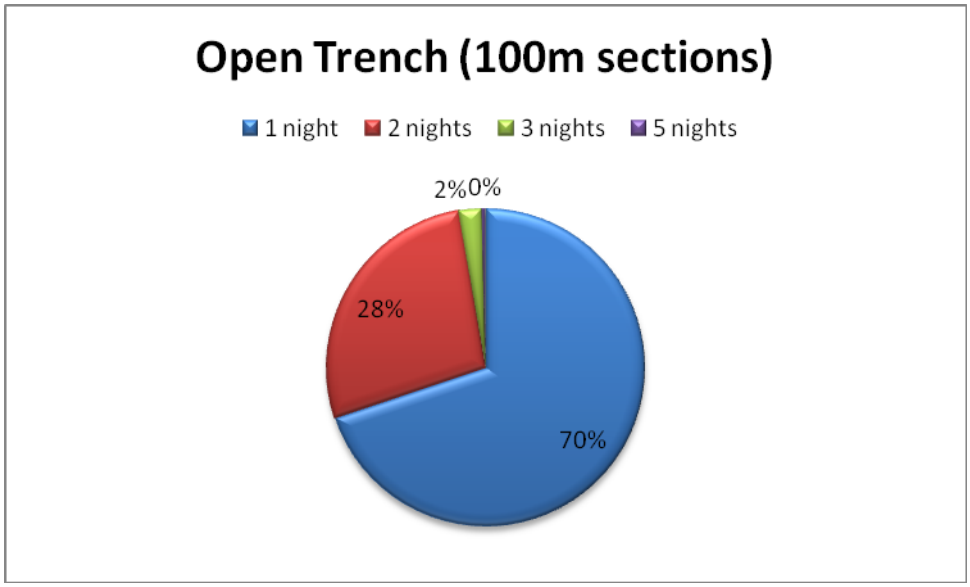

Figure 4.1 Breakdown of 100m trench sections by the number of nights open

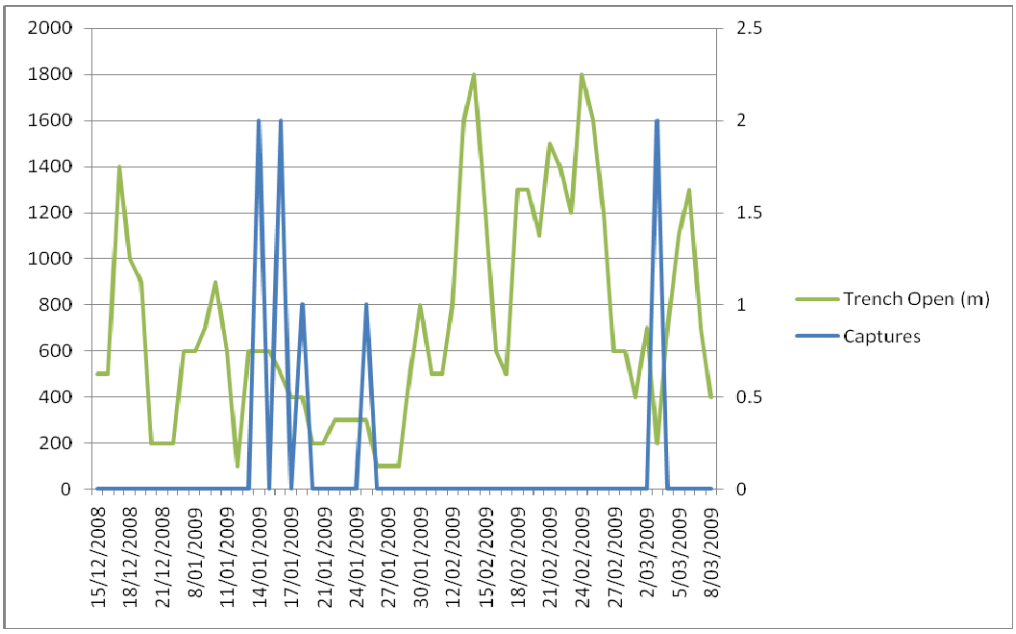

Figure 4.2 Distance of open trench VS Fauna captures.

4.2 Fauna Captures

A total of 8 fauna were captured during the 58 days of open trench. They comprised of 5 Families, 5 Genera and 5 species. All fauna were recovered un-injured and alive (refer to table 4.2 below). All fauna were captured using the net and jigger except for the Western Grey Kangaroo which exited via an exit ramp upon being driven towards it.

All of the small vertebrate fauna were found under shelter of some form (either the shelter bags or natural debris in the trench such as tree roots, cracks in the trench or under clumps of dirt).

Table 4.2 Fauna Records Raw Data

Date	Observer	Location	Status	Group	Family	Species	Common Name	Shelter
16/01/2009	Pat Cullen	31°36'36.1772" S 115°46'49.75" E	Alive	Lizards	*Pygopodidae*	*Delma greyii*	Grey's Legless Lizard	Bag
14/02/2009	Pat Cullen	31°33'33.8633" S 115°48'49.80" E	Alive	Lizards	*Agamidae*	*Ctenophorus adelaidensis*	South Western Heath Dragon	Bag
14/02/2009	Pat Cullen	31°33'33.8635" S 115°48'49.80" E	Alive	Lizards	*Scincidae*	*Menetia greyii*	Grey's Menetia	Natural
4/03/2006	Pat Cullen	31°33'33.6284" S 115°48'49.98" E	Alive	Lizards	*Scincidae*	*Menetia greyii*	Grey's Menetia	Bag
4/03/2006	Pat Cullen	31°33'33.5435" S 115°48'50.10" E	Alive	Lizards	*Scincidae*	*Menetia greyii*	Grey's Menetia	Bag
18/02/2009	Pat Cullen	31°33'33.2808" S 115°48'57.07" E	Alive	Lizards	*Agamidae*	*Ctenophorus adelaidensis*	South Western Heath Dragon	Natural
25/02/2009	Pat Cullen	31°33'33.2808" S 115°52'54.79" E	Alive	Mammals	*Macropodidae*	*Macropus fuliginosus*	Western Grey Kangaroo	In open
2/03/2009	Pat Cullen	31°33'33.2842" S 115°54'3.28" E	Alive	Amphibians	*Limnodynastidae*	*Limnodynastes dorsalis*	Pobblebonk Frog	Natural

.

4.2.1 Fauna removed from open trench

Plate 4.1 Greys Legless Lizard (*Delma greyii)*

Plate 4.2 South West Heath Dragon *(Ctenophorus adeiladensis)*

Plate 4.3.Western Grey Kangaroo (*Macropus fuliginosus)*

Plate 4.4 Dwarf Skink (*Menetia greyii)*

Plate 4.5.Pobblebonk *(Lymnodynastes dorsalis)*

4.2.2 Fauna observed during construction

Plate 4.6. Emu (*Dromaius novaehollandiae)*

Plate 4.7. Sand Monitor *(Varanus gouldii)*

Plate 4.8. Dugite (*Pseudonaja a. Affins)*

Plate 4.9.Carnaby's Cockatoo *(Calyptorhynchus f. Latirostris)*

Plate 4.9. Garden Skink (*Cryptoblepharus plagiocephalus)*

Plate 4.10. Bobtail *(Tiliqua r. Rugosa)*

4.3 Temperature and Humidity Data

Temperature and Humidity data was collected every hour, 24 hours a day during trenching operations and the daily Max/Min were used for analysis. One result of interest was that the average minimum temperature decreased from December to March but the average daily max slightly increased during the same period.

There does not appear to be any correlation between Max/Min Temperature or humidity with capture rates.

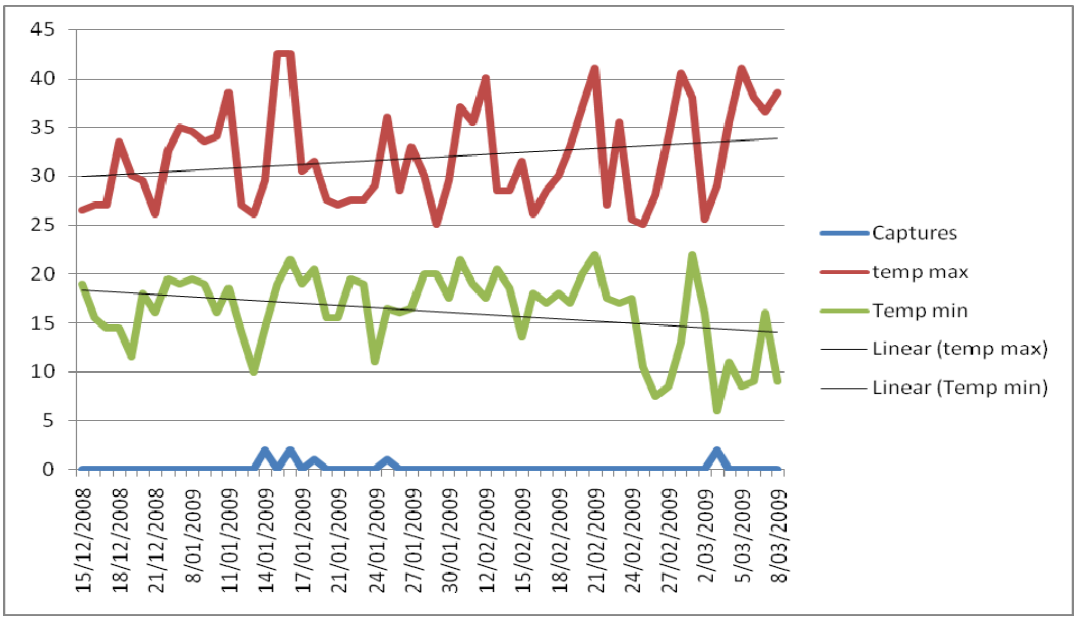

Figure 4.3 Temperature Vs Capture rates

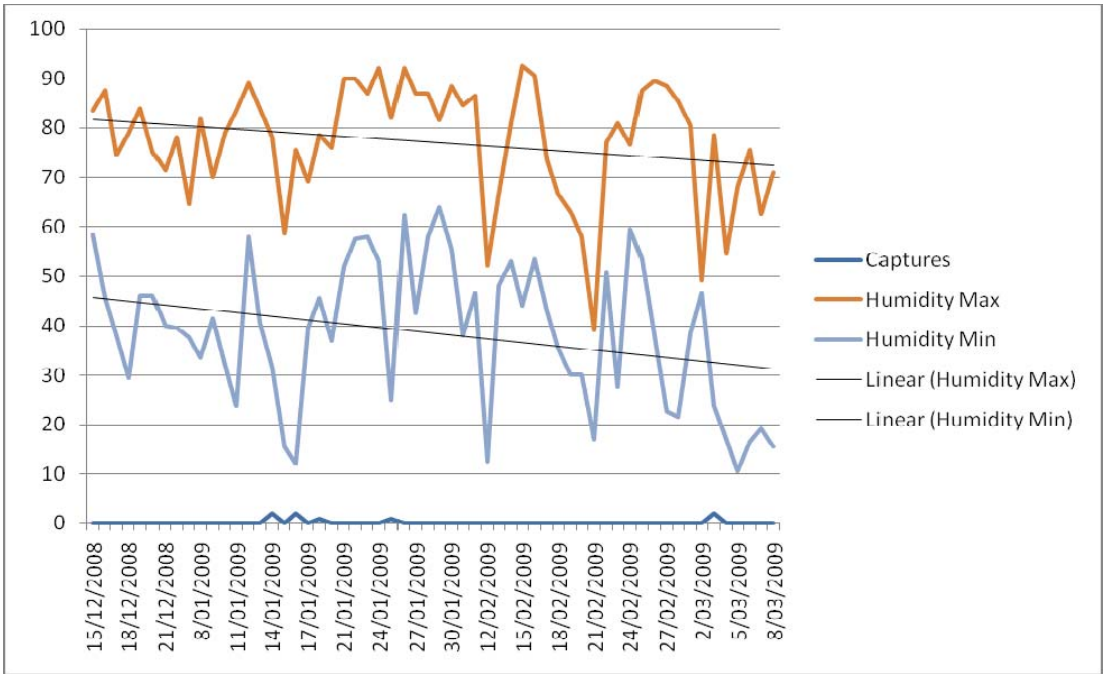

Figure 4.4Humidity Vs Capture rates

4.4 Comparison with other Pipeline Projects

Fauna capture and mortality rates for this project were low compared to those experienced during construction of other recent gas pipelines. Mortality of 0% was experienced compared to 4.8% for the DBNGP Stage 4 pipeline, 38.2% for the Port Hedland to Telfer pipeline construction, 3.5% for the Nifty pipeline and 3% for construction of the Eastern Gas Pipeline. Table 4.3. shows key characteristics related to fauna capture and mortality for Neerabup and other gas pipeline construction projects.

Table 4.3. Comparison of Fauna Statistics with Other Projects

	Neerabup Gas Pipeline	DBNGP Stage 5a	DBNGP Stage 4	Nifty Gas Pipeline	Telfer Gas Pipeline	Eastern Gas Pipeline
Length (km)	30.2	571	194	45	442	800
Total fauna captures (count)	8	12,281	3,630	1,804	34,151	7,438
Mortality (percentage)	0.00%	4.42%	4.80%	3.50%	38.20%	3%
Pitfall rate (animals / km)	0.264900662	21.5	18.71	40.01	77.2	9.3

Table 4.4 shows that key fauna characteristics for the Neerabup pipeline are not dissimilar to those collected on Loop 9a and 9b of the DBNGP Stage 5A that were of a comparable distance and geographically very close (Neerabup meets with the Stage 5A Loop 9a).

Table 4.4. Comparison with similar Pipeline Projects

	Neerabup	DBNGP Stage 5a Loop 9a	DBNGP Stage 5a Loop 9b
Total length of trench (km)	30	30	22
Total number of fauna retrieved from trench	8	13	5
Number of fauna retrieved per kilometre	0.137931034	0.1	0.32
Maximum length of open trench	1.8	7.1	1.9
Average length of open trench	0.7	4.5	0.6
Number of days of open trench	58	29	28
Fauna % Alive	100	100	100
Fauna % Dead	0	0	0

5 Summary and Recommendations

5.1 Fauna Management

Fauna Management measures were carried out in compliance with all ministerial conditions and CEMP Protocols. The key management actions are listed in table 5.1 below.

Table 5.1. Summary of key management actions

Key Fauna Management Actions	Compliance
Clear trench of fauna within 3 hours of sunrise	100% Compliance
Clear trench of fauna before sunset	100% Compliance
Fauna shelters not exceeding 100m distance in trench	100% Compliance
Fauna exit ramps no greater than 1200m distance in trench	100% Compliance
Fauna ramps to be of an angle no greater than 45 degress	100% Compliance
Vehicle speeds to not exceed 60 kph along RoW	100% Compliance
Fauna handlers to inspect Habitat trees for fauna prior to felling	100% Compliance
Pipes shall be inspected for fauna prior to welding	100% Compliance
All welded pipeline sections to be capped to prevent fauna entrapment	100% Compliance
The entire base of the trench to be inspected for fauna	100% Compliance
open trench lengths shall not exceed those capable of being inspected by the resources available	100% Compliance
No part of the trench ther than bell holes to remain open for more than 14 days	100% Compliance
Trenches in all conservation areas shall not be left open during construction breaks for longer than 3 days	100% Compliance
In ESA's, no part of the trench to remain open for more than 7 days	100% Compliance
The occurrence of water in trenches shall be managed to ensure the water bodies are no longer than 100m	100% Compliance
Trench that contains water and is not de-watered shall not be open for longer than 7 days	100% Compliance
Trench shall be inspected for fauna half an hour before backfilling	100% Compliance
Open trench in the vicinity of the pipe to be lowered in shall be inspected for fauna	100% Compliance
BoM forcasts to be monitored daily for adverse weather	100% Compliance

5.2 Low Capture Rates

There are a number of likely variables that have contributed to the low trench fauna capture rate. These include the time of year/weather, the condition of the vegetation, the proportion of native vegetation, the fauna that inhabit the surrounding vegetation communities and the distance of trench open at any one time.

5.2.1 Season and Weather

The time of year and the weather directly impacts the abundance of fauna in any given area. As the trenching activity was conducted from December through to March, it coincided with the driest time of year and a period of lower fauna activity (compared to spring). Higher fauna captures would have been expected with the warm nights experienced over the summer period, however the low capture rate is more likely attributed to the other variables.

5.2.2 Proportion of native vegetation

Out of the 30 kilometre easement, only 11.5 kilometres or 37% was native vegetation with the Pine Plantation being the largest land use of 53% of the RoW with 9% Open Paddock/Crops and the remaining 1% was firebreaks, roads etc. The lack of suitable vegetation would have played a key role in the low capture rates experienced on the Neerabup Pipeline. The condition of the vegetation along the corridor was also very poor with almost all areas of vegetation disturbed as the RoW was situated between 2 other infrastructure corridors for the vast majority of the native vegetation areas.

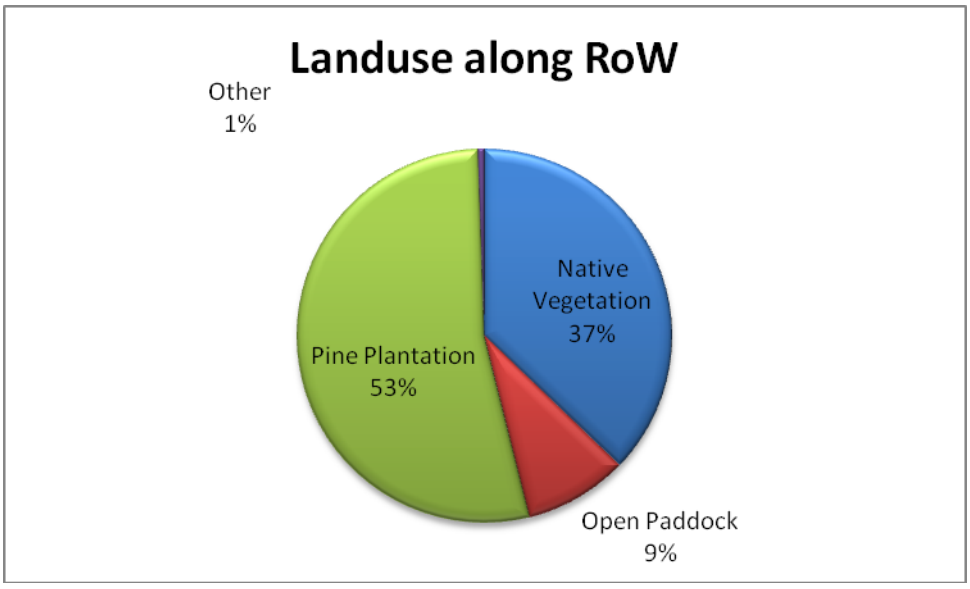

Figure 5.1. Proportion of different landuse along RoW

5.2.3 Other environmental factors

The Neerabup Gas Pipeline runs adjacent to a number of water extraction bores on the Gnangara Mound. The amount of water abstracted for potable water has increased in the last 30 years and has directly influenced the average depth to groundwater across the mound (see Figure 5.2 below). This change in groundwater depth may have had a direct impact on the phreatophytic vegetation communities along the pipeline and the abundance of fauna they support.

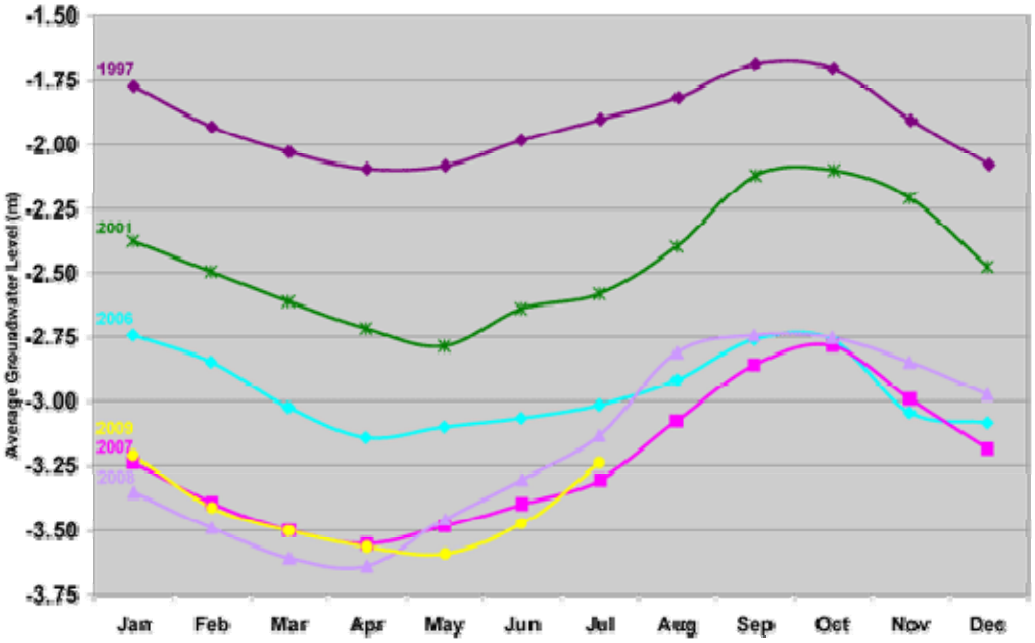

Figure 5.2 Gnangarra mound average depth to groundwater.

5.2.4 Fauna likely to interact with the trench

The species richness, as well as the types of species within an area likely to interact with the trench, influences the overall capture rate. The fauna groups most likely to interact with the trench (as demonstrated on previous pipelines such as the Dampier to Bunbury Stage 5A) are the Dragons (Agamidae), Geckoes (Geckonidae) and native Rodents (Muridae) (see Figure 5.3 below). The species richness of susceptible taxa in the Neerabup area is very low compared to the species richness further north in the Gascoigne, Goldfields and Pilbara regions (see Figure 5.3 below).

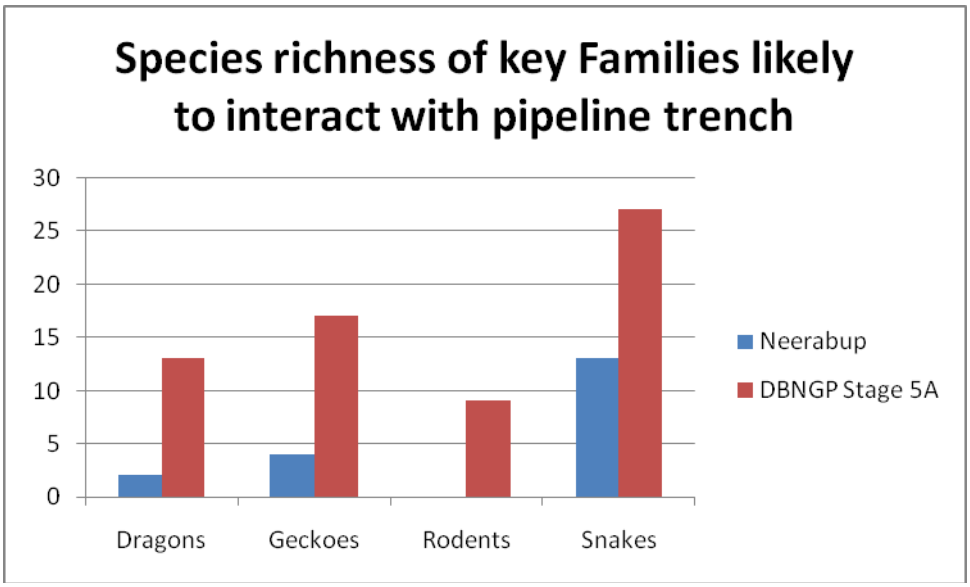

Figure 5.3. Species richness of fauna likley to interact with pipeline trench.

5.3 Recommendations

5.3.1 Fauna Management Methodology

The fauna management methodology worked extremely well and could have dealt with up to another 5kms without increasing the resources or compromising the level of compliance and the safety of fauna. On this project the Proponent took a direct responsibility for the fauna handling and monitored the construction contractor's compliance of all other aspects of the fauna management daily in the field. This approach by the Proponent ensured complete compliance with the fauna management plan and a practical approach to construction at all times.

5.3.2 Afternoon fauna clearance

Clearing the trench by fauna handlers again in the afternoon was a ministerial condition of the Neerabup pipeline that has not been common practice on recent pipeline projects in Western Australia. The Neerabup Gas pipeline project had very small amounts of trench open due to the instability of the sandy trench so could easily manage an afternoon fauna clearance with the resources available without compromising the safety of the fauna handlers (risks of injury from walking on uneven ground, fatigue, dehydration etc). 7 out of the 8 captures were during the afternoon clearance so this may have had lowered the chance of predation within the trench. However, such low capture numbers make it hard to draw accurate conclusions.

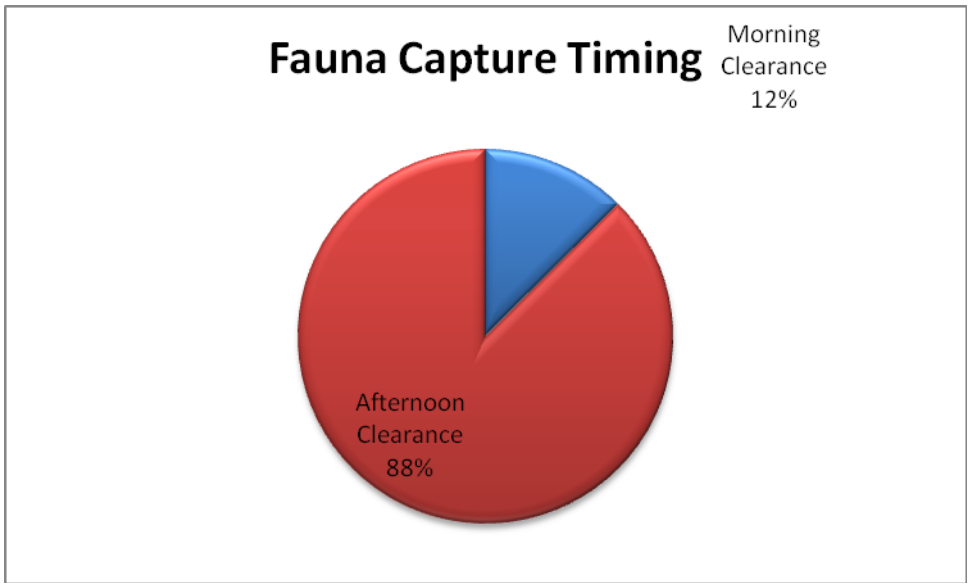

Figure 5.4.Ratio of fauna captured in the afternon and morning clearance.

6 References

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