Australian Government

Department of Climate Change
and Energy Efficiency

CARBON FARMING INITIATIVE:

Management of large feral herbivores (camels) in the Australian rangelands draft methodology

This proposed methodology is the subject of an application for patent that is pending approval (Australian Patent Application Number 2011200432; SYSTEM AND METHOD FOR OBTAINING CARBON OFFSET CREDIT OR EMISSIONS PERMIT BASED ON MANAGEMENT OF A FERAL HERBIVORE)

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Methodology applications should be submitted to:
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Section 1: Applicant details

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Section 2: Expert consultation

Have you consulted technical experts in the development of this methodology? If yes, please provide names and affiliations.		
Name	*Affiliation*	*Does this expert endorse all or part of the draft methodology?*
We have consulted with a significant range of interested parties and experts in feral animal removal. However, while they may have had input into the development of potential approaches to MRV, and consideration of technical challenges associated with such issues as leakage and baseline determination, we do not expect to ask those individuals or organisations to commit to endorsing the work presented.		

Section 3: Existing methodologies

3.1 Has a similar methodology already been approved for use under the CFI? If yes, outline how the new methodology proposal is different.
Given there have been no methodologies accepted for use under the CFI, and there are no globally relevant examples of the approach provided herein, this methodological approach to determining the emission reduction benefit created by the management of large feral herbivores (camels) is completely novel.

3.2 Is the draft methodology an adaptation of an existing methodology that has been approved under an international offsets scheme or an offsets scheme in another Australian jurisdiction? If yes, provide a reference for the existing methodology and describe any major differences between the draft methodology and the existing methodology.
There are no comparable existing methodologies to the one proposed herein.

Section 4: Methodology glossary

Provide a glossary of terms that are specific to the draft methodology.
Feral camel means an un-owned Arabian (dromedary) camel (*Camelus dromedarius*) ranging freely in the Australian rangelands **Rangelands** mean any ecosystem in Australia that includes grasslands, shrublands, woodlands and savanna. The lands are mainly unimproved, where rainfall is typically too low or too variable to allow pasture production, and the dominant land use is grazing stock animals on native pastures. **Removal** means an activity described in the methodology that causes the untimely demise of the feral animal (camel) through humane means.

Section 5: Methodology (or activity) scope

5.1 Describe the specific abatement activities, technologies or management practices to which the methodology applies. Explain how the abatement activities, technologies or management practices will reduce or avoid emissions or remove and sequester greenhouse gases from the atmosphere.
The principle of the emission reduction benefit of the project management activities described here are based actions taken by project participants that cause the untimely demise of the feral camels (removal), with the emissions reduction benefit based on the difference between the estimated age of the animal at removal, and the predicted average age of natural mortality (detailed in the baseline description here). There will be at least four main activities of feral camel removal that will result in emissions reductions under this methodology. There is likely to be a benefit to regeneration of non-Kyoto forests and vegetation through the reduction of grazing pressure by removal of camels; however the methodology presented here does not look to lay claim to the benefit of sequestered carbon in vegetation. This will be dealt with in a separate land management methodology. Method A: The first method of removal is shoot-to-lie, where aerial based platforms (such as helicopter mounted, animal welfare trained and accredited marksmen) shoot the animals according to welfare standards identified in the Model Code of Practice for the Welfare of Animals: The Camel (*Camelus dromedarius*) (PISC 2006) and locally relevant Standard Operating Procedures (SOPs), and the carcasses are left. This will be a common approach to removals in the remote and arid centre of Australia, where road and rail infrastructure is absent, animal population densities are low, or groups of animals are moving too rapidly to be able to be trapped meaning that mustering for harvest is not a viable alternative. Method B: The second method of removal is ground based shoot-to-lie. This is for all intents and purposes the same as for the aerial shoot-to-lie activity, except the platform for operators in the activity is ground based (e.g. four wheel drive) rather than an aerial one. Method C: is mustering for harvest where camels are mustered to an accessible location, from where they can be transported to an abattoir. Where regional infrastructure such as roads and permanent or mobile abattoirs exist, this may be a viable approach to permanent removal, supported by revenue from carbon credits. Method D: The final form of removal activity may be undertaken by field based pet meat operations, where the removed feral camels are processed on site, rather than transported to an off-site abattoir. All animal removals will be humanely undertaken in line with existing animal welfare regulations and legislation regarding production of meat for animal or human consumption, as locally specified, as well as including newly developed standards recommending

approaches to all aspects of treatment of animals removed via mustering or culling.

The project abatement methodology meets the CFI requirements for additionality, permanence, avoidance of leakage, measureable and verifiable emissions reductions, conservative estimation of benefit, is consistent with international accounting procedures, and is well supported by peer-reviewed literature.

5.2 List the circumstances or conditions under which the activities, technologies or management practices are to be implemented. If they can be implemented under different circumstances or conditions (for example, climatic conditions, soil types and other regionally specific conditions), specify any differences in implementation for each of the different circumstances or conditions.

The methodology is applicable under the following conditions:

- The continued presence of the feral camel population is not limited by any natural phenomenon (i.e. non-human induced condition) which includes natural predation, disease, limited food supply or other ecological considerations;
- Landholder consent has been explicitly given for the location and method of the removal of feral camels;
- Project proponent is able to show adherence to all relevant animal welfare standards as specified in this methodology;
- Project proponent has all relevant licences and permits to undertake specific activities, in line with existing legislation or regulation in which the project activities take place;
- Removal activity must result in untimely demise of camel (where export to rural production will lead to emissions from owned animal being accounted for under that pastoralists emissions reporting under Agriculture).
- The methodology is able to be used across all areas of the Australian rangelands where feral camels exist. The distribution of camels across the Australian Rangelands is shown in Figure 1.

Figure 1. Distribution of feral camels in Australian rangelands (adapted from Saalfeld and Edwards, 2008).

5.3 (Optional) Provide background information about the abatement activities, technologies or management practices. This could include case studies that demonstrate the successful implementation of the abatement activities, technologies or management practices.

Context and background to the issue of feral camel population in Australia.

Exotic pest animals have major economic, environmental, and social impacts across Australia (Natural Resource Management Ministerial Council, 2007). In arid Australia, one of the most significant feral pest populations is that of camels. Australia now has the largest wild camel population in the world, with the current feral camel population estimates of >1 million (Saalfeld & Edwards, 2008), and growing. The size of the feral camel herd makes the Australian camel population the fifth largest in the world behind Somalia, Sudan, Ethiopia, and Mauritania (Zeng & McGregor, 2008). The feral camel population in Australia is distributed across 3.3 million km^2, covering approximately 37% of the Australian mainland (see Figure 1; Saalfeld & Edwards, 2008).

The feral camel population growth rate has been estimated at 10% per year, with an estimated population doubling every nine years (Saalfeld & Edwards, 2008). There are few factors to limit growth of camel populations in arid zones of Australia, and the reasons for the explosive growth rates of the feral camel population can be simply summarised such:

- Camels can survive without water for long periods
- Camels can travel up to 70 kilometres a day, range freely and are not territorial.
- Camels suffer from few diseases in Australia
- Camels have no natural predators in Australia
- Camels usually have an adequate food supply (being able to feed on more than 80% of the available plant species)
- Camels eat up to 3.5 kilograms of food per day, grazing on low shrubs or vegetation up to 3.5 metres (~1.2Mt vegetation consumed by the feral camel population each year)
- Camels live for up to 50 years, breed for 30 years of their life, and the cows give birth to a single calf on average every 2 years (Saalfeld & Edwards, 2008).

While the camel populations continue to grow unchecked, the populations are causing significant environmental and cultural damage in the areas they inhabit. Significant damage is caused by camels through the following actions.

1. Damage to atmosphere through greenhouse gas emissions. As ruminant animals, the digestive processes camels undergo when consuming food sources leads to the release of methane. Methane is a potent greenhouse gas, with a global warming potential of 21 times the global warming potential of carbon dioxide. Each tonne of methane emitted to the atmosphere causes the same damage as the release of 21 tonnes of carbon dioxide.

2. Trampling. Given their large hoof size, and attraction en masse to watering points, camels cause significant trampling damage to culturally important and sensitive environmental assets. Large camel herds are also able to trample and trash stock fences, causing significant (and expensive) damage to pastoral infrastructure.

3. Competition. Given their large population size and commensurate demand for food resources, feral camel populations are creating a significant threat to biodiversity through overgrazing, and competition with native populations for scarce food and water resources. It is known that camel grazing is threatening regional extinction of mulga and quandong plants. Marsupials are also facing extinction threats as the result of competition with camels. Given that camels take up a physical ecological niche that has not otherwise been occupied in the Australian arid lands for millennia, they are able to graze sections of plants that are otherwise inaccessible to native grazers.

4. Infrastructure damage. Increasing numbers of feral camels are causing damage to pastoral infrastructure including fencing, yards and water points, and occurrences of localised damage in remote communities are believed to be increasing.

The Australia's Fifth National Communication on Climate Change prepared by the Department of Climate Change identified feral animal management as an emission reduction causing action (Department of Climate Change, 2010). *The Carbon Credits (Carbon Farming Initiative) Bill (Draft)* 2011 Part 1, Section 5 identifies the "introduced animal" as a potential source of emissions considered by the Bill, and Division 10, Section 44 identifies:

(d) a project to avoid emissions of methane from the digestive tract of an introduced animal; or

(e) a project to avoid emissions of:

(i) methane; or
(ii) nitrous oxide;
from the decomposition of:
(iii) introduced animal urine; or
(iv) introduced animal dung.

Given that emissions from feral animals are currently not included in the greenhouse gas inventory of Australia, either under Kyoto Protocol or UNFCCC accounting, any emission reductions caused by feral camel control will be counted as a voluntary benefit, until the accounting protocols are changed.

The aim of this methodology is to reduce the feral camel population across the Australian rangelands, in line with current Federal Government policy on invasive species that states the aim of feral management should be to ensure "Australia's biodiversity, agricultural assets and social values are secure from the impacts of vertebrate pest animals" (Natural Resource Management Ministerial Council, 2007). This approach to *in-situ* protection of biodiversity through management of feral or invasive animals is in line with Article 8(h) of the Convention on Biological Diversity (1993), to which Australia is a signatory and ratifying

party.

Section 6: Identifying the baseline

6.1 Specify the process for identifying the project baseline.
The baseline condition in the absence of the project activity is continued presence of feral camels in Australia, with only *ad hoc* removals being undertaken in line with historical annual averages (i.e. the *status quo*) prior to 2008. Equations 4 and 5 contained in this methodology describe the calculation steps to determine a project proponent's baseline.
6.2 List and justify the assumptions on which the baseline is based.
Discussed in detail in the text provided.

Section 7: Greenhouse gas assessment boundary

7.1 Describe the steps and/or processes involved in undertaking the abatement activity and identify all emissions sources and sinks directly or indirectly affected by the activity. Identify any emissions sources or sinks affected by the activity that will be excluded from the greenhouse gas assessment boundary. Flowcharts may be used to illustrate typical greenhouse gas assessment boundaries.

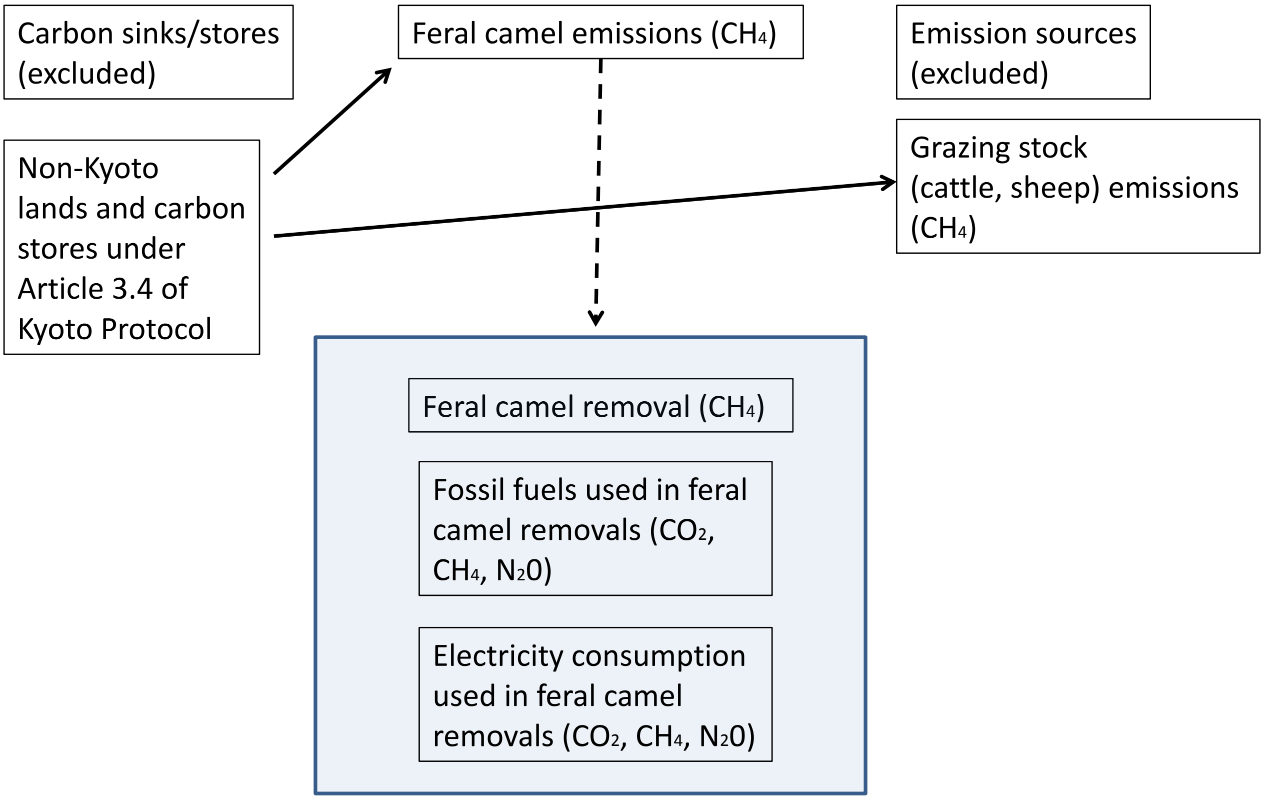

Figure 2. Greenhouse emissions sources and sinks in the project area. Project emissions considered are inside the shaded blue box, related to feral camel emissions by the hatched line. Business-as-usual is prepresented by feral camels consuming native vegetation in the rangelands. Project activity aims to remove feral camels, thereby avoiding methane (CH_4) emissions from the feral camels by prematurely causing their deminse. Exclusions to project boundary are changes in carbon storage on Kyoto Protocol Article 3.4 carbon sinks or stores, and changes in number of grazing stock on the rangelands. Included in project boundary are emissions from fossil fuel and electricity ocurring as a result of removal activities.

7.2 In the table below:

List all emissions sources and sinks affected by the project. Indicate whether the source or sink is to be included or excluded from the baseline or greenhouse gas assessment boundary and provide justification for any exclusions.

All emissions sources and sinks identified in Section 7.1 should be listed in this table. Expand the table to include additional sources and sinks, as necessary.

Additional information justifying the exclusion of emissions sources and sinks can be provided in Section 7.3.

Source		Gas/ Pool	Included?	Justification / Explanation
Baseline	Large Feral Herbivores	CO_2	No	Any CO_2 produced by the feral herbivores in the baseline scenario is biogenic and part of the short term carbon cycle.
		CH_4	Yes	Emissions from the large feral herbivores caused by enteric fermentation.
		N_2O	No	Nitrous oxide emissions occurring as a result of introduced animal waste (urine and dung) are not considered a significant source of emissions (*de minimis* <5% project baseline emissions). This exclusion is seen to be conservative in the estimation of net benefit.
Project activity	Article 3.4 carbon stores	CO_2	No	Loss of woody and herbaceous carbon stores caused by camel grazing are excluded. This exclusion is seen to be conservative in the estimation of net benefit of this project activity, but may be included in a separate methodology where increased stores of carbon are expected to occur in Article 3.4 stores.
	Stock (owned) grazing animals	CH_4	No	There is not expected to be a discernable change in numbers or total emissions occurring from stock animals as the result of removal of feral camels, over and above variations in stock numbers related to climatic variability.
	Agricultural soils (feral camel wastes)	CH_4, N_2O	No	Methane emissions caused by the decomposition of carcasses is not included as this occurs in both the baseline scenario and under the project activity. Methane and nitrous oxide emissions occurring as a result of introduced animal waste (urine and dung) are not considered a significant source of emissions (*de minimis* <5% project baseline emissions). This exclusion from consideration of avoidance of agricultural soils emissions as a result of feral camel removal is seen to be conservative in the estimation of net benefit.

	Fossil fuels combusted in vehicles	CO_2	Yes	Emissions from fossil fuels occur during the project activities
		CH_4	Yes	Emissions from fossil fuels occur during the project activities
		N_2O	Yes	Emissions from fossil fuels occur during the project activities
	Fossil fuels combusted in stationary sources	CO_2	Yes	Emissions from fossil fuels occur during the project activities
		CH_4	Yes	Emissions from fossil fuels occur during the project activities
		N_2O	Yes	Emissions from fossil fuels occur during the project activities
	Pro rata electricity use by abattoir	CO_2	Yes	Scope 2 & Scope 3 emissions occur from electricity use
		CH_4	Yes	Scope 2 & Scope 3 emissions occur from electricity use
		N_2O	Yes	Scope 2 & Scope 3 emissions occur from electricity use

7.3 (If required) Additional information justifying why a source or sink is excluded.

Exclusions

The selection of emission sources to be excluded from this methodology is done so as to ensure conservative estimation of net benefit. The issue of agricultural soils emissions caused by camel dung and urine are considered small relative to the methane emissions from camels, and are therefore excluded.

The exclusion of carbon store losses from feral camel grazing for food are excluded from this methodology, given the challenges in measurement of baseline and change in the vegetation carbon pool. This is seen to be conservative, in that the likely vegetation response is expected to be positive in the absence of feral camel grazing (i.e. the removal of feral camel grazing pressure will lead to increased storage of carbon in vegetation).

It has been commented that feral camel populations negatively impact grazing cattle weight gain, as a result of competition between the species for the same resource. The reference commonly made with regards to this potential issue is to Drucker (2008) where a significant proportion of the findings in this document (Drucker, 2008) are based on the idea that there is an economic disbenfit from having competition between cattle and feral camels. The only reference in Drucker (2008) to support evidence for competition between cattle and camels is McLeod (2004).

Drucker (2008), after proposing that feral camels compete directly with cattle for fodder, goes on to make a series of assumptions without providing any reference or justification of the selection of values. Specifically, Drucker (2008) states:

"We conservatively estimate the net income forgone per annum to the pastoralist from each head of cattle that is replaced by feral camels to be $100. The magnitude of the production loss avoided depends on a number of factors. These include:

- The current feral camel population. This is extrapolated to the present from the most recent census data that is available and varies in future years according to natural growth rates and removal efforts.
- The proportion of the total feral camel population that is found on pastoral stations. This is estimated as 20%.
- The proportion of pastoral properties that provide good grazing and where competition with feral camels actually takes place. This is estimated as 62%. Combined with the previous assumption this means that 12.4% (0.62 x 0.2) of feral camels are directly competing with cattle.
- The degree to which feral camels are considered to compete with cattle for scarce grazing resources. The degree of competition is expressed as a proportion of the feral camel feed requirements to cattle. This is assumed to be 1.5 times higher, that is, 1 feral camel = 1.5 cows."

There are no references or justification for the assumptions made by Drucker, and importantly the inference that there is 100% dietary overlap between cattle and camels, such that a camel will eat 150% mass of the identical food source of an equivalent cow (i.e replacement of stock by feral animals). The values are apparently derived arbitrarily. When examined with regards to the expected level of impact of competition between cattle and camels, McLeod (2004) actually finds very limited evidence or likelihood of competion between the two species. In particular, McLeod (2004) states:

"Research in Central Australia (Dörges and Heucke 1995) has shown that camels and cattle have differing dietary preferences. Camels spend up to 97% of their grazing time feeding on shrubs and forbs. Grasses were only of importance after rain before forbs became available. Because camels and cattle have different dietary preferences, co-grazing them under careful management is a possibility. Indeed, evidence from pastoralists with camels on their stations suggests that cattle perform better under drought conditions when grazed in paddocks with camels, whilst there is no difference in cattle performance under good seasonal conditions. This is thought to be possibly due to a combination of rumen microbe transfer (Miller *et al.* 1996)."

Further to this, McLeod (2004) goes on to suggest a very limited level of "replacement" or dietary overlap:

"There are some dietary overlaps between cattle and camels for preferred tree, shrub and herbage species and for grass at certain times (Dörges and Heucke 1995). To account for this overlap, a minor reduction in cattle and sheep carrying capacity has been included in the costing analysis. The assumptions used are provided in the table above. Aggregate production losses are minor, and the possibility for enhancing production also exists."

McLeod (2004) suggests that the reduction in grazing values to sheep and cattle across Australia caused by feral camels has an economic value of $210,000 per annum at an expected camel population of 300,000 camels, or 1% reduction in stock animal grazing value. Using linear extrapolation, total economic impact of a feral camel population of 1,000,000 suggest a reduction of grazing value of around 3.3% in the regions they co-graze with cattle and sheep, assuming none of the evidence for positive effects of co-grazing occur. Where positive effects of co-grazing occur, it is seen that cattle are able to at least retain weight or have weight gains when co-grazed with camels, thereby limiting any effects of leakage. Given the variation in cattle numbers between years as a consequence of climate far outweigh any potential impacts of leakage or reduction in cattle production values resulting from removal of any potential co-grazing competition between cattle and feral camels under the project scenarios leading to "offsite" increases in cattle production, it is expected that there is little actual significant impact on cattle emissions where cattle and feral camels coexist.

On the basis of conservative estimation applied within the methodology, and using a *de minis* level of 5% (project level), we discount any potential leakage to cattle and sheep grazing as inconsequential in this methodology.

Section 8: Project Area

If applicable, provide instructions to project proponents on how to determine the Project Area.
The project area is defined by an area inhabited by feral camels. This is indicated in a general fashion at Figure 1 previously. Project participants may operate in some or all of the lands on which feral camels are known to range.

Section 9: Estimating abatement

9.1 Provide instructions to project proponents on how to calculate baseline emissions and removals. Provide formulas and define parameters in each formula, including units. Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

Under the baseline scenario (*ad hoc* camel removals, continued presence of feral camel population) the population of camels is expected to grow to beyond 2 million by 2020 (see modelling of feral camel population). The projected greenhouse gas emissions from feral camels in Australia are therefore likely to exceed 1.9 million tonnes of CO_2e per annum by 2020 as shown in the equation below.

Equation 1: Forecasted emissions from camels in Australia in 2020

$$National\ Camel\ Emissions\ in\ 2020 = 2{,}000{,}000\ camels\ \times\ 0.96\ tCO_2e/camel/year$$

However, from the perspective of this program, and to meet the requirements of project based crediting of activity under the CFI, the modelled future scenario of emissions baseline, while able to give an indication of *ex-ante* emissions for the baseline, is unlikely to allow for conservative determination of *ex-post* emissions reduction benefit.

Baseline Emissions

To determine a conservative approach to *ex-ante* and *ex-post* emission reductions estimation, a mathematical approach is used to determine the difference between age of natural mortality of an individual feral camel and the average age of a feral camel at the time of removal, based on an understanding of population ecology.

It is generally not possible to gauge accurately the actual age of the removed camels, particularly from an aerial or ground based platform. To accurately and conservatively calculate the baseline case it is assumed that all camels removed are of "average age", and would have lived until the "average life expectancy", in the absence of the project activity.

A range of values for average life expectancy of camels is reported from various sources. In their summary of feral camel ecology Saalfeld & Edwards (2008) give examples of reports that quote life spans variously of 50 years, 40 years and 'somewhat more than 30 years'. They also note that there is limited impact on camel populations by disease and central Australian conditions are near ideal and therefore provide a proposed lifespan of 30 years.

Other sources give the lifespan of wild dromedary camels as 50 years (Paroz, 2008) and 40 years (Grzimek, 1990; Denver Zoo), making the proposed average lifespan of 30 years a conservative choice.

The Australian feral camel population demographics have been detailed in Pople & McLeod (2010).

The staged population model given by Pople & McLeod (2010) divides the camel life cycle into 3 phases as shown in the figure below.

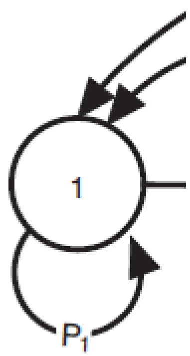

Figure 3: Life-cycle corresponding to the staged population model and projection matrix (Pople & McLeod, 2010)

The phases in Figure 3 above are:

- Stage 1: Yearling, 0-1 years
- Stage 2: Sub-adults, 2-6 years
- Stage 3: Adults, 6-40 years

The additional parameters in Figure 3, known as transition probabilities, are:

- F_i: the stage-specific fertility (number of births per animal in each stage)
- G_i: the probability of moving from stage *i* to stage *i+1*
- P_i: the probability of surviving and remaining in the same stage

To model population these transition probabilities are put into a projection matrix such as shown below, where k(t+1) = k(t)A

Equation 2: Population projection matrix

$$\begin{bmatrix} k_1(t+1) \\ k_2(t+1) \\ k_3(t+1) \end{bmatrix} = \begin{bmatrix} P_1 & F_2 & F_3 \\ G_1 & P_2 & 0 \\ 0 & G_2 & P_3 \end{bmatrix} \begin{bmatrix} k_1(t) \\ k_2(t) \\ k_3(t) \end{bmatrix}$$

Where $k_i(t)$ is the number of camels of stage *i* in year *t.*

For the feral camel population in Australia Pople & McLeod then produced a projection matrix A, derived from the work of Dörges and Heucke (1995, as referenced in Pople & McLeod, 2010) which they then optimised through minimisation the sum-of-square differences between the stage-structured population projection and the best unstructured projection. The resulting optimised parameters produced the projection matrix A′ given at Equation 3.

Equation 3: Optimal population projection matrix

$$A' = \begin{bmatrix} 0 & 0.0169 & 0.196 \\ 0.848 & 0.791 & 0 \\ 0 & 0.198 & 0.961 \end{bmatrix}$$

Using these transition probabilities a model of the Australian feral camel population was modelled in excel. This model found that for any population >0, the average age of the feral camel population converges on 14.23 years. The spreadsheet showing the modelling based on the staged population model is submitted with this draft methodology.

Given these assumptions, the emissions under the baseline scenario are calculated as follows:

Equation 4: Baseline emissions for project participant in year t (where t=0 is project start)

$$BEt = (BQ) \times M \times GWP_{Methane} \times (L - age)$$

Where:

BE_t	=	Baseline emissions reductions for project activities in the year *t* (t CO_2e)
BQ	=	The baseline number of camels removed by the project participant as an average number of animals removed per year over the period 2004 - 2008 to activities from all removal methods, as shown in Equation 5 below

M	=	Methane emissions per camel per year (t CH_4/yr)
$GWP_{methane}$	=	Global Warming Potential of Methane (dimensionless)
L	=	Life expectancy of feral camels in the Australian Rangelands in years = 30 years
Age	=	Average age of feral camels in the Australian Rangelands = 14.23 years

Equation 5: Quantity of camels removed in year y

$$Q_y = \sum_a Q_{a,y} + \sum_b Q_{b,y} + \sum_c Q_{c,y} + \sum_d Q_{d,y}$$

Where:

$Q_{,y}$	=	Quantity of camels removed by project proponent in year *y*
$Q_{a,y}$	=	Quantity of camels removed through activity *a* in year *y*
b	=	Activity undertaken using camel activity b.
$Q_{b,y}$	=	Quantity of camels removed through activity *b* in year *y*
c	=	Activity undertaken using camel activity c.
$Q_{,c,y}$	=	Quantity of camels removed through activity *c* in year *y*
d	=	Activity undertaken using camel activity d.
$Q_{d,y}$	=	Quantity of camels removed through activity *d* in year *y*

9.2 Provide instructions to project proponents on how to calculate project emissions and removals.
Provide formulas and define parameters in each formula, including units.
Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

The project emissions accounted for in this methodology are those related to fossil fuel use by land and aerial based vehicles that are used in the undertaking of project activities, and electricity consumed at facilities where the facility is connected to the grid. Project emissions are determined using the CDM Methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02).
Project emissions are calculated as follows:

Equation 6: Project emissions for year y

$$\boldsymbol{PE_y = EMA_y + EMB_y + EMC_y + EMD_y}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2e)
EMA_y	=	Emissions in year *y* from activities undertaken using camel removal activity A (t CO_2e)
EMB_y	=	Emissions in year *y* from activities undertaken using camel removal activity B (t CO_2e)
EMC_y	=	Emissions in year *y* from activities undertaken using camel removal activity C (t CO_2e)
EMD_y	=	Emissions in year *y* from activities undertaken using camel removal activity D

		($t\ CO_2e$)
y	=	year being assessed

Equation 7: Project fossil fuel emissions from energy consumption

Emissions from fuel use should be calculated for each fuel type (j) and each greenhouse gas, g, (i.e. CO_2, N_2O, CH_4). This calculation must be made for each greenhouse gas and each different fuel used using equation 7.

$$E_{jg} = (Q_j \times EC_i \times EF_{ijoxec})/1000$$

Where:

E_{jg}	=	is the emissions of gas type (*g*), being carbon dioxide, methane or nitrous oxide, released from project activity, the combustion of fuel type (*j*) from the operation of the project during the year (*y*) measured in t CO_2e
Q_i	=	is the quantity of fuel type (*j*) combusted from the operation of the project for: (a) stationary energy purposes; and (b) transport energy purposes during the year measured in kilolitres and estimated under National Greenhouse & Energy Reporting Measurement Determination 2008.
EC_j	=	is the energy content factor of fuel type (*j*) estimated under National Greenhouse & Energy Reporting Measurement Determination 2008 measured in GJ/kL.
EF_{ijoxec}	=	is the emission factor for each gas type (*i*) released from the operation of the facility during the year (which includes the effect of a oxidation factor) measured in kilograms CO_2e per GJ of fuel type (*j*) (a) for stationary energy purposes and (b) for transport energy purposes of the National Greenhouse & Energy Reporting Measurement Determination 2008

Note: Emissions from fuel use (ES, EV, EA and ET) for activity A, B, C, and/or D during year *y* in equations 8, 9, 11 and 16 below can be calculated using equation 7 by substituting volume of fuel consumed in each emission source (ES, EV, EA and ET as Q_j in Equation 7).

Activity A – Aerial based shoot to lie

Equation 8: Emissions from activities undertaken under camel removal activity A

$$EMA_y = \sum (ES_{a,y} + EV_{a,y} + EA_{a,y})$$

Where:

$ES_{a,j,y}$	=	Total emissions from stationary equipment for activity *a* during year *y* (tCO_2-e)
$EV_{a,j,y}$	=	Total emissions from ground vehicles for activity *a* during year *y* (tCO_2-e)
$EA_{a,j,y}$	=	Total emissions from aerial vehicles in activity *a* carried out under during year *y* (tCO_2-e)

Activity B – Ground based shoot to lie

Equation 9: Energy consumption from activities undertaken under camel removal activity B

$$\mathbf{EMB_y = \sum_j (ES_{b,j,y} + EV_{b,j,y} + EA_{b,j,y})}$$

Where:

$ES_{b,j,y}$	=	Total emissions from stationary equipment for activity *b* during year *y* (tCO_2-e)
$EV_{b,j,y}$	=	Total emissions from ground vehicles for activity *b* during year *y* (tCO_2-e)
$EA_{b,j,y}$	=	Total emissions from aerial vehicles in activity *b* carried out under during year *y* (tCO_2-e)

Activity C – Mustering and transport to abattoir

Equation 10: Emissions from activities undertaken under camel removal activity C.

Equation 10 represents the sum of equations 11 and 13.

$$\boldsymbol{EMC_y = \sum_c (FE_{c,y} + EE_{c,y})}$$

Where:

FE_{cy}	=	Emissions from fuel combusted in activity *c* in year *y*
$EE_{c,y}$	=	Emissions from electricity used in activity *c* in year *y*
c	=	Activity undertaken using camel removal method C.

Equation 11: Energy consumption from fuel combusted in undertaking activity C

$$\mathbf{FE_{cy} = \sum_j (ES_{c,j,y} + EV_{c,j,y} + EA_{c,j,y} + ET_{c,j,y})}$$

Where

$ES_{c,j,y}$	=	Total emissions from stationary equipment for activity *c* during year *y* (tCO_2-e)
$EV_{c,j,y}$	=	Total emissions from ground vehicles for activity *c* during year *y* (tCO_2-e)
$EA_{c,j,y}$	=	Total emissions from aerial vehicles in activity *c* carried out under during year *y* (tCO_2-e)
$ET_{c,j,y}$	=	Total emissions from the transport of camels from the mustering point to the abattoir (tCO_2e)

Equation 12: Fuel consumed in the transport of camels in undertaking activity C

$$\boldsymbol{TFC_{c,j,y} = TD_{c,y} \times TFE_j / 1000}$$

Where

$TD_{c,y}$	=	Is the road distance travelled by the truck transporting camels from the muster point to the abattoir (km)

TFE_j	=	The fuel efficiency of the transport truck in litres of fuel *j* per kilometre.

Equation 13: Emissions from consumed electricity

$$EE_{c,y} = \sum_{k} EC_{c,k,y} \times (EF2_{k,y} + EF3_{k,y})$$

Where:

$EC_{c,k,y}$	=	Electricity consumed from electricity grid *k* in year *y* as part of activity *c* (MWh)
$EF2_{k,y}$	=	Scope 2 emissions factor for electricity from grid *k* in year *y* (tCO_2e /MWh)
$EF3_{k,,y}$	=	Scope 3 emissions factor for electricity from grid *k* in year *y* (tCO_2e/MWh)
k	=	Is the electricity grid from which the management activity sources its electricity.

Equation 14 Calculation of *pro rata* electricity consumption in abattoirs required for camel processing

$$EC_{c,k,y} = \sum_{ab} EC_{ab,k,y} \times \frac{CM_{ab,c,y}}{CA_{ab,y}}$$

Where:

$EC_{ab,k,y}$	=	Total electricity consumed by abattoir *ab* from grid *k* in year *y* (MWh)
$CM_{ab,c,y}$	=	Total number of camel carcasses processed in abattoir *ab* in year *y* from management activity *c*
$CA_{ab,y}$	=	Total number of carcasses of all types processed in abattoir *ab* in year *y*

Activity D: field based processing of feral camels for pet meat

Equation 15: Energy consumption from fuel combusted in undertaking activity D

$$\mathbf{EMD_y = \sum_j (ES_{d,j,y} + EV_{c,j,y} + EA_{c,j,y} + ET_{d,j,y})}$$

Where:

$ES_{d,j,y}$	=	Total emissions from stationary equipment for activity *d* during year *y* (tCO_2-e)
$EV_{d,j,y}$	=	Total emissions from ground vehicles for activity *d* during year *y* (tCO_2-e)
$EA_{d,j,y}$	=	Total emissions from aerial vehicles in activity *d* carried out under during year *y* (tCO_2-e)
$ET_{d,j,y}$	=	Total emissions from the transport of the camel meat harvested in activity *d* to market, in year *y* (tCO_2-e)

Equation 16: Fuel consumed in the transport of field processed camel as pet meat

$$TFC_{d,j,y} = TD_{d,y} \times TFE_j$$

Where

$TD_{d,y}$	=	Is the road distance travelled transporting pet meat from the location of activity *d* to market (km)
TFE_j	=	The fuel efficiency of the transport truck in litres of fuel *j* per kilometre.

9.3 Provide instructions to project proponents on how to calculate *net greenhouse gas abatement*. This should be the difference between the baseline and project emissions and removals.

Net greenhouse abatement for a project is determined by

Equation 17: Net project abatement for year $_y$

$$P_{ay} = [Qy \times M \times GWP_{methane} \times (L - Age) - PE_y] - BEt$$

Where:

P_{ay}	=	Net project abatement in year *y* (t CO_2e)
$Q_{,y}$	=	Number of camels removed by management activities undertaken as part of the project activity in year *y,* from all removal methods, as shown in Equation 5
M	=	Methane emissions per camel per year (t CH_4/yr)
$GWP_{methane}$	=	Global Warming Potential of Methane
L	=	Life expectancy of feral camels in the Australian Rangelands in years = 30 years
Age	=	Average age of feral camels in the Australian Rangelands = 14.23 years
PE_y	=	Project emissions in year *y* (t CO_2e)
BE*t*	=	Baseline emissions reductions for project activities in the year *t* (t CO_2e)

Note: it may be possible for negative values to occur in this equation. If $P_{ay} \leq 0$, there is no emission reduction benefit accrued by the project participant in year *y*.

9.4 For bio-sequestration projects provide instructions on the procedures to be used to account for variations that are likely to occur in the amount of carbon stored as a result of climatic cycles or harvesting over 100 years.

While there is likely to be an emission storage or net sequestration benefit occurring as the result of feral camel management, this methodology does not propose to quantify this benefit. It is likely that such a methodology will be developed in due course.

9.5 Provide instructions to project proponents on how to calculate net abatement number or net sequestration number for reporting purposes, *if different from the estimate of net greenhouse gas abatement (Section 9.3)*. For bio-sequestration projects, this calculation should take into account any adjustments to the abatement estimate to address variability, and any abatement already reported and credited.
Not applicable.

9.6 Indicate whether the estimation methods and emissions factors are from the NGER (Measurement) Determination or Australia's National Greenhouse Accounts. If not, explain why new or different estimation methods are proposed. Note that the methods set out in the NGER (Measurement) Determination must be used to estimate emissions covered by NGERS.
The emission source (feral camels) is not reported under the NGER (Measurement) Determination or Australia's National Greenhouse Accounts. The approach to reporting emissions from slaughter of commercial livestock under Agriculture simply relates to the month of activity, and treats this month as representation of the proportion of the year the animal is not creating emissions. For example, EF cattle Tier 1 = 1.3 t CO_2e/head/year. If an animal is slaughtered for food production in month 3 of the year, then the emissions reported for the animal are on a proportional basis (i.e 3/12 x EF). The approach here is different in that the emissions reduction benefit as calculated (net abatement) is deemed to occur at the point of removal, as is done for generation of small scale solar Renewable Energy Certificates, where the future renewable energy generation potential is deemed at point of installation. This is a reasonable approach, given that there is no market replacement for the feral camel, whereas a stock animal is replaced due to market demand and the emissions source is then continued.

9.7 Provide a detailed description of any formulas used and detailed explanations of the parameters included in each formula, along with a description of how each parameter is derived(noting that detailed instructions to proponents on data collection methods for deriving parameters are to be provided in Section 10). Where applicable, provide a citation for the source of equations and/or parameters.
Previously provided in Section 7

Section 10: Data Collection

Provide instructions to project proponents on data collection methods for deriving the parameters used to calculate *baseline emissions and removals* (Section 9.1) and *project emissions and removals* (Section 9.2). Instructions may be provided in the table below.

Parameters that are not monitored

In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply. The parameters below are not monitored for any of the removal activities A, B, C or D.

Data / parameter:	M
Data unit:	(tCH_4/camel/year)
Description:	Methane emissions per camel per year
Source of data:	The latest version of the IPCC Guidelines for National Greenhouse Inventories, using tier 1 methodology as recommended in the guidelines.
Measurement procedures (if any):	No measurements will be performed.
Any comment:	

Data / parameter:	$GWP_{methane}$
Data unit:	Number
Description:	Global warming potential of methane
Source of data:	The latest version of the IPCC Guidelines for National Greenhouse Inventories
Measurement procedures (if any):	No measurements will be performed
Any comment:	

Data / parameter:	L
Data unit:	Years
Description:	Life expectancy of feral camels in the absence of the project activity
Source of data:	Peer reviewed scientific journals (Saalfeld & Edwards, 2008)
Measurement procedures (if any):	No measurements will be performed
Any comment:	

Data / parameter:	Age
Data unit:	Years
Description:	Average age of feral camels in Australia
Source of data:	See attached population demographic model based on the work of Pople & McLeod, 2010
Measurement procedures (if any):	No measurements will be performed
Any comment:	

Data / parameter:	BQ
Data unit:	Number
Description:	Baseline number of feral camel removals for the project participant
Source of data:	Historical records of Project Proponents
Measurement procedures (if any):	
Any comment:	

Data / parameter:	EF_{gjoxec}
Data unit:	Number
Description:	Emission factor for gases released from the combustion of fossil fuels (carbon dioxide, methane, nitrous oxide)
Source of data:	National Greenhouse & Energy Reporting Measurement Determination 2008 (as updated from time to time)
Measurement procedures (if any):	
Any comment:	

Data and parameters monitored

The data and parameters that are monitored are separated into activities under each of the four camel removal methods described in Section **Error! Reference source not found.**.

Activity A: Aerial based platform removals

Parameters Monitored for Activities that include removal activity A are:

Data / parameter:	$Q_{a,y}$
Data unit:	
Description:	Number of camels removed via shooting from aerial platforms (activity A) by the project activity in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Project participant to provide: - Detailed record of removal activities recorded by GPS marks on each individual animal removed - Records of ammunition used in the undertaking of the project activities - Signed and witnessed declarations from the accredited marksman, pilot and government official or company director with overall responsibility for the activities stating the dates, number of camels that have been removed, and that the removals have been undertaken in accordance with animal welfare guidelines.
Monitoring frequency:	Instant for removals during activity, warranted daily by operators, cross checking with ammunition usage at end of each field deployment.
QA/QC procedures:	The stated number of camels removed will be cross-checked with GPS records and the ammunition used. Animal welfare guidelines require a specified number of pieces of ammunition per individual for suitably qualified marksman. The amount of ammunition used will therefore correlate to the number of camels removed. Sighted warrant by company director and accredited marksman.
Any comment:	

Data / parameter:	Q_i
Data unit:	kilolitres
Description:	Amount of fuel type *j* combusted in year *y* under the management activity *(which includes activity types A, B, C, D and fuel consumed for ES, EV, EA, ET)*
Source of data:	As specified for ES, EV, EA, ET
Measurement procedures (if any):	Recording of all fuel purchased for use in stationary equipment during the management activities. Where fuel has been purchased for general use and it is not known what proportion was used in the stationary equipment and what proportion was used for vehicles, all fuel will be assumed to have been combusted in vehicles, as the N_2O, CH_4 and CO_2e coefficient of emissions for fuel combusted in vehicles is higher than the corresponding factor for combustion in stationary equipment.
Monitoring frequency:	As fuel is purchased
QA/QC procedures:	Updated as required
Any comment:	

Data / parameter:	$EA_{a,j,y}$
Data unit:	tCO_2e
Description:	Emissions from fuel type j combusted in aircraft (helicopters, spotter planes, etc.) in year y under the management activity *a*
Source of data:	Invoices or flight logs provided by project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EA_{a,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these aircraft during the management activities Option 2) Recording of all aircraft and fuel types and flight times for aerial vehicles For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the aerial vehicle per hour of flight time and multiplying this by the hours of flight time undertaken as part of the management activity as per the equation below: $$QA_{a,j,y} = \sum_{av} \frac{AH_{av,a,j,y} \times LPH_{av,j}}{1000}$$ Where: $AH_{av,a,j,y}$ = Flying hours undertaken by aircraft *av* using fuel type *j* in undertaking the management activities *a* in year *y* $LPH_{av,j}$ = Litres of fuel type *j* combusted per hour of flight time for aerial vehicle *av*
Monitoring frequency:	As fuel is purchased and consumed, daily at post flight briefing
QA/QC procedures:	Cross check with budgets
Any comment:	

Data / parameter:	$EV_{a,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in ground vehicles in year *y* under the management activity *a*
Source of data:	Invoices or vehicle logs from project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EV_{a,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these vehicles during the management activities Option 2) Recording of all ground vehicle and fuel types and odometer readings before and after management activities. For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the vehicle as a litres per kilometre figure and multiplying this by the kilometres of travel undertaken as part of the management activity, then divided by 1000 to convert to kiloLitres, as per the equation below: $$QV_{a,j,y} = \sum_{gv} \frac{GD_{gv,a,j,y} \times LPK_{gv,j}}{1000}$$ Where: $GD_{gv,a,j,y}$ = Ground distance travelled by vehicle *gv* using fuel type *j* in undertaking the management activities *i* in year *y* $LPK_{gv,j}$ = Litres of fuel type *j* combusted per kilometre for vehicle *gv*
Monitoring frequency:	As fuel purchased, daily vehicle logs
QA/QC procedures:	Cross check with budgets where fuel costs a recompensed
Any comment:	

Activity B: Ground based platform removals

Parameters Monitored for Activities that include removal activity B are:

Data / parameter:	$Q_{b,y}$
Data unit:	
Description:	Number of camels removed via removal from ground based platforms (activity B) under the project activity in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Detailed record of removal activities recorded by GPS marks on each individual removed
Monitoring frequency:	Instant for removals during activity, warranted daily by operators, cross checking with ammunition usage at end of each field deployment.
QA/QC procedures:	The stated number of camels removed will be cross-checked with GPS records and the ammunition used. Animal welfare guidelines require a specified number of pieces of ammunition per individual for suitably qualified marksman. The amount of ammunition used will therefore correlate to the number of camels removed. Sighted warrant by company director and accredited marksman.
Any comment:	

Data / parameter:	$ES_{b,j,y}$ (where gensets are used in the management activity)
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in stationary equipment in year *y* under the management activity *b*
Source of data:	Project participants
Measurement procedures (if any):	Recording of all fuel purchased for use in stationary equipment during the management activities. Where fuel has been purchased for general use and it is not known what proportion was used in the stationary equipment and what proportion for vehicles, all fuel will be assumed to have been combusted in vehicles, as the N_2O, CH_4 and CO_2e coefficient of emissions for fuel combusted in vehicles is higher than the corresponding factor for combustion in stationary equipment.
Monitoring frequency:	As fuel is purchased
QA/QC procedures:	
Any comment:	

Data / parameter:	$EA_{b,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in aircraft (spotter planes where used, etc.) in year *y* under the management activity *b*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EA_{b,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these aircraft during the management activities Option 2) Recording of all aircraft and fuel types and flight times for aerial vehicles For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the aerial vehicle per hour of flight time and multiplying this by the hours of flight time undertaken as part of the management activity as per the equation below: $$QA_{b,j,y} = \sum_{av} \frac{AH_{av,b,j,y} \times LPH_{av,j}}{1000}$$ Where: $AH_{av,b,j,y}$ = Flying hours undertaken by aircraft *av* using fuel type *j* in undertaking the management activities *b* in year *y* $LPH_{av,j}$ = Litres of fuel type *j* combusted per hour of flight time for aerial vehicle *av*
Monitoring frequency:	As fuel is purchased and consumed, at post flight briefing
QA/QC procedures:	Cross check with budgets
Any comment:	

Data / parameter:	$EV_{b,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in ground vehicles in year *y* under the management activity *b*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EV_{b,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these vehicles during the management activities Option 2) Recording of all ground vehicle and fuel types and odometer readings before and after management activities. For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the vehicle as a litres per kilometre figure and multiplying this by the kilometres of travel undertaken as part of the management activity, then divided by 1000 to convert to kiloLitres, as per the equation below: $$QV_{b,j,y} = \sum_{gv} \frac{GD_{gv,b,j,y} \times LPK_{gv,j}}{1000}$$ Where: $GD_{gv,b,j,y}$ = Ground distance travelled by vehicle *gv* using fuel type *j* in undertaking the management activities *b* in year *y* $LPK_{gv,j}$ = Litres of fuel type *j* combusted per kilometre for vehicle *gv*
Monitoring frequency:	As fuel is purchased, daily vehicle logs
QA/QC procedures:	Cross check with budgets where fuel costs a recompensed
Any comment:	

Activity C: Muster for harvest and transport to abattoir

Parameters Monitored for Activities that include removal activity C are:

Data / parameter:	$Q_{c,y}$
Data unit:	
Description:	Number of camels mustered and killed at the abattoir (activity C) as part of the project activity *c* in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Originals or certified copies of: - Waybills or other recognised stock movement documents (vendors Declaration, Animal Health Declaration, or other) detailing date, source location, number and species of animals transported - Slaughter records from abattoir following processing which details date, number, species and sex of animals received and from whom - Where interstate transport has occurred, supporting documentation from stock inspectors at interstate border crossings.
Monitoring frequency:	Daily operation sheets.
QA/QC procedures:	Both animal movement and slaughter records are generally, depending on location of operations, legal documents requiring signatures and witnesses, with penalties applying for deliberately providing false or misleading information. The managing entity will also apply additional penalties of cancelled contracts, null payment and exclusion from any future project participation where evidence of deliberate misinformation is established. Additionally, Federal regulatory oversight through legislation will provide penalties for providing false or misleading information.
Any comment:	

Data / parameter:	$ES_{c,j,y}$ (where gensets are used in the management activity)
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in stationary equipment in year *y* under the management activity *c*
Source of data:	Project participants
Measurement procedures (if any):	Recording of all fuel purchased for use in stationary equipment during the management activities. Where fuel has been purchased for general use and it is not known what proportion was used in the stationary equipment and what proportion was used in vehicles all fuel will be assumed to have been combusted in vehicles, as the N_2O, CH_4 and CO_2e emission factors for fuel combusted in vehicles is higher than the corresponding factor for combustion in stationary equipment.
Monitoring frequency:	As fuel is purchased
QA/QC procedures:	
Any comment:	

Data / parameter:	$QV_{c,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in ground vehicles in year *y* under the management activity *c*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EV_{c,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these vehicles during the management activities Option 2) Recording of all ground vehicle and fuel types and odometer readings before and after management activities. For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the vehicle as a litres per kilometre figure and multiplying this by the kilometres of travel undertaken as part of the management activity, then divided by 1000 to convert to kiloLitres, as per the equation below: $$QV_{c,j,y} = \sum_{gv} \frac{GD_{gv,c,j,y} \times LPK_{gv,j}}{1000}$$ Where: $GD_{gv,c,j,y}$ = Ground distance travelled by vehicle *gv* using fuel type *j* in undertaking the management activities *c* in year *y* $LPK_{gv,j}$ = Litres of fuel type *j* combusted per kilometre for vehicle *gv*
Monitoring frequency:	As fuel is purchased, daily for vehicle usage
QA/QC procedures:	Cross check with budgets where fuel costs a recompensed
Any comment:	

Data / parameter:	$EA_{c,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in aircraft (helicopters, spotter planes, etc.) in year *y* under the management activity *c*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EA_{c,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these aircraft during the management activities Option 2) Recording of all aircraft and fuel types and flight times for aerial vehicles For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the aerial vehicle per hour of flight time and multiplying this by the hours of flight time undertaken as part of the management activity as per the equation below: $$QA_{c,j,y} = \sum_{av} \frac{AH_{av,c,j,y} \times LPH_{av,j}}{1000}$$ Where: $AH_{av,c,j,y}$ = Flying hours undertaken by aircraft *av* using fuel type *j* in undertaking the management activities *c* in year *y* $LPH_{av,j}$ = Litres of fuel type *j* combusted per hour of flight time for aerial vehicle *av*
Monitoring frequency:	As fuel is purchased and consumed, at post flight briefing
QA/QC procedures:	Cross check with budgets
Any comment:	

Data / parameter:	$TD_{c,y}$
Data unit:	Kilometres
Description:	The road distance travelled by the truck transporting camels from the muster point to the abattoir (km)
Source of data:	Log books from the company undertaking the transport
Measurement procedures (if any):	
Monitoring frequency:	Daily
QA/QC procedures:	Check source location and receiving location from waybills or other recognised stock movement documents. Cross check distance given by transport company with distances according to GPS or relevant mapping service.
Any comment:	Animal movement records are legal documents with penalties applying for misinformation.

Data / parameter:	TFE_j
Data unit:	Litres per kilometre
Description:	The fuel consumption rating of the livestock truck used to transport camels mustered under activity *c* to the abattoir.
Source of data:	Manufacturers data
Measurement procedures (if any):	
Monitoring frequency:	As often as transport vehicle is changed
QA/QC procedures:	
Any comment:	

Data / parameter:	$EC_{ab,k,y}$
Data unit:	MWh
Description:	Electricity sourced from grid *k* and consumed by abattoir *ab* in year *y*
Source of data:	Electricity supply invoices
Measurement procedures (if any):	
Monitoring frequency:	At electricity billing frequency
QA/QC procedures:	Sight electricity bill from supplier
Any comment:	

Data / parameter:	$CM_{ab,c,y}$
Data unit:	
Description:	Number of camel carcasses processed by abattoir *ab* in year *y* as part of management activity *c*
Source of data:	Abattoir invoices and records
Measurement procedures (if any):	
Monitoring frequency:	Daily at processors
QA/QC procedures:	License to operate.
Any comment:	

Data / parameter:	$CA_{ab,y}$
Data unit:	
Description:	Total number of carcasses processed by abattoir *ab* in year *y*
Source of data:	Abattoir invoices and records
Measurement procedures (if any):	
Monitoring frequency:	Daily at processors
QA/QC procedures:	License to operate
Any comment:	

Data / parameter:	$EF2_{,k,y}$
Data unit:	Tonnes CO_2e/MWh
Description:	Scope 2 emissions factor for electricity from grid *k* in year *y*
Source of data:	National Greenhouse & Energy Reporting Measurement Determination 2008 as updated from time to time
Measurement procedures (if any):	
Monitoring frequency:	Updated for each crediting period
QA/QC procedures:	
Any comment:	

Data / parameter:	$EF3_{k,y}$
Data unit:	Tonnes CO_2e/MWh
Description:	Scope 3 emissions factor for electricity from grid *k* in year *y*
Source of data:	Most recent National Greenhouse Accounts Factors (2009)
Measurement procedures (if any):	
Monitoring frequency:	Updated for each crediting period
QA/QC procedures:	
Any comment:	

Activity D: Ground based removals for in situ processing as pet food

Parameters Monitored for Activities that include removal activity C are:

Data / parameter:	$Q_{d,y}$
Data unit:	
Description:	Quantity of camels killed, butchered in the field for pet food (activity D) in project activity *d* in year *y*.
Source of data:	Project participants
Measurement procedures (if any):	Original or certified copies of field dressing records showing the identification of the field processor, date, numbers and species of animals field processed and the location of the activity. Originals or certified copies of invoices/tax invoices showing date, species and volumes of meat sold, and to whom.
Monitoring frequency:	As meat is processed, daily field sheets.
QA/QC procedures:	Typically, each jurisdiction (State or Territory) licensing agencies for field meat processors requires that field processors be accredited to meet minimum standards of operation. Generally, record keeping to enable traceability and identification of meat source and processor identify for pet and game meat is underpinned by relevant legislation in each jurisdiction. Typically, there are significant penalties, including fines or jail time, exist for false or misleading statements or records under these legislative instruments in each jurisdiction. Additionally, Federal regulatory oversight through legislation will provide penalties for providing false or misleading information.
Any comment:	

Data / parameter:	$ES_{d,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in stationary equipment in year *y* under the management activity *d.* Stationary equipment includes generators or chillers.
Source of data:	Project participants
Measurement procedures (if any):	Recording of all fuel purchased for use in stationary equipment during the management activities. Where fuel has been purchased for general use and it is not known what proportion was used in the stationary equipment and what proportion was used for vehicles all fuel will be assumed to have been combusted in vehicles, as the N_2O, CH_4 and CO_2e coefficient of emissions for fuel combusted in vehicles is higher than the corresponding factor for combustion in stationary equipment.
Monitoring frequency:	As fuel is purchased
QA/QC procedures:	
Any comment:	

Data / parameter:	$EV_{d,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in ground vehicles in year *y* under the management activity *d*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring $EV_{d,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these vehicles during the management activities Option 2) Recording of all ground vehicle and fuel types and odometer readings before and after management activities. For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the vehicle as a litres per kilometre figure and multiplying this by the kilometres of travel undertaken as part of the management activity, then divided by 1000 to convert to kiloLitres, as per the equation below: $$QV_{d,j,y} = \sum_{gv} \frac{GD_{gv,d,j,y} \times LPK_{gv,j}}{1000}$$ Where: $GD_{gv,d,j,y}$ = Ground distance travelled by vehicle *gv* using fuel type *j* in undertaking the management activities *d* in year *y* $LPK_{gv,j}$ = Litres of fuel type *j* combusted per kilometre for vehicle *gv*
Monitoring frequency:	As fuel is purchased, or log books are reported (daily)
QA/QC procedures:	Cross check with budgets where fuel costs a recompensed
Any comment:	

Data / parameter:	$TD_{d,y}$
Data unit:	Kilometres
Description:	Distance travelled by truck to transport the pet meat from the location of activity *d* to market
Source of data:	Transport company log books and invoices.
Measurement procedures (if any):	
Monitoring frequency:	As transport is undertaken
QA/QC procedures:	Check source location and receiving location from waybills or other recognised stock movement documents. Cross check distance given by transport company with distances according to GPS or relevant mapping service.
Any comment:	

Data / parameter:	$EA_{d,j,y}$
Data unit:	kilolitres
Description:	Emissions from fuel type *j* combusted in aircraft (helicopters, spotter planes, etc.) in year *y* under the management activity *d*
Source of data:	Project participants
Measurement procedures (if any):	There are two options for measuring fuel consumption for $EA_{d,j,y}$ as detailed below. Option 1 is preferred. Option 1) Recording of all fuel purchased or pumped for use in these aircraft during the management activities Option 2) Recording of all aircraft and fuel types and flight times for aerial vehicles For Option 2 the amount of fuel consumed is calculated by taking the fuel consumption rating of the aerial vehicle per hour of flight time and multiplying this by the hours of flight time undertaken as part of the management activity as per the equation below: $$QA_{d,j,y} = \sum_{av} \frac{AH_{av,d,j,y} \times LPH_{av,j}}{1000}$$ Where: $AH_{av,d,j,y}$ = Flying hours undertaken by aircraft *av* using fuel type *j* in undertaking the management activities *d* in year *y* $LPH_{av,j}$ = Litres of fuel type *j* combusted per hour of flight time for aerial vehicle *av*
Monitoring frequency:	As fuel is purchased and consumed, at post flight briefing
QA/QC procedures:	Cross check with budgets
Any comment:	

Section 11: Monitoring and reporting

11.1 Outline the elements of the project that will be monitored and describe how monitoring will be undertaken, including: • frequency of monitoring; • the Australian Standards, or other relevant standards, that project proponents will need to comply with to calibrate and maintain measurement equipment; and • any qualifications that operators will need to operate measurement equipment. The information provided in this section should not duplicate the information provided in Section 10.
Data generated through monitoring will be recorded at the frequencies as specified in Section 10. Project proponents will report activity data on an annual basis. There are no relevant standards for equipment used for measurement such as daily log books or field or processing facility operation sheets. However, there may be different requirements for such reporting in each jurisdiction. Each project proponent is obliged to ensure all operators engaged in removals project activities comply with locally relevant requirements for reporting and licensing to undertake activities.

11.2 Specify the data and other information about the project that must be included in project reports and project records, including: • data required to estimate emissions and removals resulting from the project; • data required to identify and justify baseline scenarios and to support baseline estimation and resetting; and • information about project implementation or changes in environmental conditions that are required to determine whether the project remains within the scope of the methodology.
Project records that need to be recorded at the frequency specified in Section 10 need to be kept in electronic and hardcopy, as applicable, as specified in the National Greenhouse and Energy Reporting Measurement Determination. • Relevant hardcopy records from field reports for all removals activity (for activities a, b, c, d) for period 2004-2008. • All project emission sources from activities a, b, c, d as specified in Section 9 from available data sources, and must be stored for seven years. • Electronic records of all GPS waypoints identifying points of individual removal records must be stored for seven years. Project reporting must include: • project proponent baseline from number of removals undertaken by proponent during the period 2004-2008 for all removal activities • summaries of all emission sources from project for all activities (a, b, c, d,) undertaken by proponent during reporting period, broken down by activity type

- summaries of number of animals removed by each activity (a, b, c, d) undertaken by proponent during reporting period, broken down by activity type
- All project proponents will need to provide verifiable project records that all project activities have been undertaken in line with the relevant animal welfare standards, which include *Model Code of Practice for the Welfare of Animals, feral livestock animals destruction or capture, handling and marketing* (Standing Committee on Agriculture SCARM Report, 2002) and the Primary Industries Standing Committee Model Code of Practice for the Welfare of Animals: The Camel (*Camelus dromedaruis*) Second Edition (Primary Industries Standing Committee PISC Report 86, 2006)
- proof of right to access lands where removals were undertaken, and right to undertake removals by person or entity responsible for each land tenure where removals were undertaken
- warrant made by company director or responsible person to attest to accuracy of information provided in project report

Other legislation and regulation that will be of concern in different jurisdiction may include:

- licences to operate vehicles,
- licences to operate weapons,
- licences to process meat for animal or human consumption,
- licences to transport live animals,
- regulations regarding humane treatment of animals.

Typically, variations will occur between different jurisdictions regarding the details of applicability of legislation and regulation concerning the above mentioned activities. Project proponents will need to be able to demonstrate adherence with locally relevant legislation and regulation in their state or territory of operation to become eligible to apply this methodology, and adherence to locally relevant requirements should be identified in project reports. This will be detailed by each project proponent in their project design documentation, with consideration of the planned method of removal activity and summarised in project reporting.

Section 12: References

Provide a full citation for all reports cited in the draft methodology.

Carey, R., O'Donnell, M., Ainsworth, G., Garnett, S., Haritos, H., Williams, G., et al. (2008). Review of legislation and regulations relating to feral camel management (summary). In G Edwards (Ed.), *Managing the impacts of feral camels in Australia: a new way of doing business* (pp. 125-132). Alice Springs: Desert Knowledge Cooperative Research Centre.

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Change 2010. Canberra: Australian Government.

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Garnett, S. T., Williams, G., Ainsworth, G. B., & O'Donnell, M. (2010). Who owns feral camels? Implications for managers of land and resources in central Australia. *The Rangelands Journal, 32*, 87-93.

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McLeod R. 2004. *Counting the Cost: Impact of Invasive Animals in Australia 2004*. Cooperative Research Centre for Pest Animal Control. Canberra.

National Greenhouse Accounts Factors (2009). Department of Climate Change.

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Primary Industries Standing Committee. (2006). *Model Code of Practice for the Welfare of Animals: the Camel (Camelus dromedarius), Second Edition.* CSIRO Publishing.

Saalfeld, W., & Edwards, G. (2008). Ecology of Feral Camels in Australia. In G. Edwards, B. Zeng, W. Saalfeld, P. Vaarzon-Morel, & M. McGregor (Eds.), *Managing the impact of feralc camels in Australia: a new way of doing business. DKCRC Report 47* (pp. 9-34). Alice Springs: Desert Knowledge Cooperative Research Centre.

Standing Committee on Agriculture, Animal Health Committee. (2002). *Model Code of Practice for the Welfare of Animals, feral livestock animals destruction or capture, handling and marketing.* Collingwood: CSIRO Publishing.

Zeng, B., & McGregor, M. (2008). Review of commercial options for management of feral camels. In G. Edwards, B. Zeng, W. Saalfeld, P. Vaarzon-Morel, & M. McGregor (Eds.), *Managing the impacts of feral camels in Australia: a new way of doing business. DKCRC Report 47* (pp. 221-282). Alice Springs: Desert Knowledge Cooperative Research Centre.

Section 13: Appendices

Append and list below all relevant documentation necessary for the DOIC to assess the methodology including cited reports.
Appendix A: Project Idea Note submitted to DCC February 2010 *Appendix B: Feral camel population growth model (as excel workbook).*

Section 14: Disclosure

Specify documents or parts of documents included as supporting information to the application that are marked CONFIDENTIAL and should not be published and the reasons why.

Acceptable justification would include that the information should not be published if it reveals, or could be capable of revealing:

- trade secrets; or
- any other matter having a commercial value that would be, or could reasonably be expected to be, destroyed or diminished if the information were disclosed.

Document/Part of document	*Reason for maintaining confidentiality*

Section 15: Declaration

This application must be signed by a duly authorised representative of the proponent. The person signing should read the following declaration and sign below.

Division 137 of the Criminal Code makes it an offence for a person to give information to a Commonwealth entity if the person providing the information knows that the information is false or misleading. The maximum penalty for such an offence is imprisonment up to 12 months.

By signing below, the signatory acknowledges that he or she is an authorised representative of the proponent, and that all of the information contained in this application is true and correct. The signatory also acknowledges that any of the information provided in this application may be copied, recorded, used or disclosed by the Department of Climate Change and Energy Efficiency for any purpose relevant to the CFI. Information will not be publicly disclosed by the Department where it has been identified as confidential by the proponent.

Full name of the person signing as representative of the proponent	Dr Timothy Nicholas Moore	*Date*	
Position	Director, Strategy and Origination, Northwest Carbon Pty Ltd		
Signature			

Appendix A

Original Project Idea Note (PIN) submitted to Department of Climate Change February 2010 under NCOS

Project name: Large feral herbivore management
Date submitted: 9th February 2010
Submitted to: Vicki Ratliff, Director
Offsets and Voluntary Action Policy
Submitted by: Engine Room Consulting (Australia) Pty Ltd.

A. Project Company/Sponsor/Developer/Advisor and Related-Party Information

Project developer and advisor	
Name of the project company	Engine Room Consulting Pty Ltd
Organizational category	Private company
Legal status	Australian Privately held company
Street Address (include web address, if any)	
Contact person	Dr Tim Moore Principal
Telephone/ email	
Main activities	*Engine Room Consulting is a specialist carbon offset project advisor and originator. Engine Room Consulting specialises in identification of viable offset opportunities, and development of methodologies to achieve financial return for emission reduction activity. The current focus for Engine Room Consulting in Australia is the development and progression to market of emission reduction projects in the agricultural sector. Project activities in the country are expected to include reducing emissions at source and permanent sequestration of greenhouse gases.*
Summary of company background	Engine Room Consulting is a newly formed company, which was established by Dr Tim Moore, the founder of Australian emissions management company BalanceCarbon (www.balancecarbon.com) and founder of Emission Reduction Company (www.emissionreductionco.com) which is a turn-key CDM project developer and manager. Engine Room Consulting was formed to work with the Australian agricultural sector to reduce greenhouse gas emissions through the development of viable new technology, processes and practices that have ancillary environmental, economic and social benefits to regional Australia.
Key Business Partners/Entities (where applicable)	
Major shareholders	Engine Room Consulting is wholly owned by Dr Tim Moore. ERC

	is an Australian owned company. Engine Room Consulting has the financial resources to ensure project and product delivery through a series of grant based and commercial activities. Dr Tim Moore has 10 years experience of environmental management, with a focus on greenhouse gas emission management over the last 4 years, since he founded BalanceCarbon. He is a member of the Waste Management Association of Australia National Carbon Committee, is a member of the Adelaide and Mount Lofty Natural Resource Management Board and was a member on the World Resources Institute Scope 3 Technical Working Group. His academic background focused on the cycling of carbon through natural systems, with consideration of economic valuation of biodiversity and ecosystem function.
Fuel supply	There are no current requirements for fuel supply contracts for the proposed project activity.
Power purchase	There have been no negotiations for power supply contracts from the proposed project. Given that this project is based on emissions avoidance, there are no direct power generation activities proposed by Engine Room Consulting within the project boundaries. However, the project may value add to renewable energy projects (e.g. use of camel fat in renewable power generation).
Contractual Arrangements	At present, it is envisioned that Engine Room Consulting will look to take a forward contract for the sale of emission reduction units to be generated the proposed project activity.

B. Project Summary: Type, Location, Description, and Schedule

Type of the project	
Greenhouse gases (GHG) targeted	Methane- CH_4
Activity Category	GHG Avoidance
Agriculture	Appropriate management causing untimely demise of large feral herbivores in the Australian rangelands leading to instant and future emissions avoidance.
Location of the project	
Region	South East Asia
City, Country	The project is a regionally based, broad scale activity. States of focus will include Western Australia, South Australia, Northern Territory and Queensland. The activity will take place in all areas where large feral herbivores roam, and as such distinct GPS coordinates are not given here at this stage.
Brief description of the plant or facility site	*The Australian rangelands cover a vast area of the Australian "Outback". The areas of the rangelands spread across the entire continent, with all rangelands areas having, to a greater or lesser extent, significant environmental, economic and social issues with the presence of large feral herbivores.* *Feral, exotic or pest herbivores are species of vertebrate herbivores. These herbivores are included in the category of animals that have been deliberately imported into Australia, both*

	legally and illegally, for pastoral production, transportation, pets, pest control or for other purposes. *Feral vertebrate herbivores ("feral herbivores") in this specification also include camels, goats, horses, donkeys, pigs, buffalo, rabbits and feral stock animals.* *Feral animals have many impacts in Australia. Some animal species cause significant damage to crops and seriously affect Australia's livestock industries by preying on stock, competing for pasture , limiting or reducing native vegetation biomass or causing severe land degradation by promoting soil erosion, create unnecessary stream turbidity and spread weeds further than would otherwise be the case. Many pest animal species threaten the survival of native plants and animals through competition, habitat destruction and predation. As well as the impacts on the natural environment, feral animals are the cause of unwanted degradation pressure on sites of significant cultural value to Aboriginal communities, especially water holes.* *The lack of clear legislation and failure to enforce any legislation requiring the control of feral herbivores (where such legislation exists) has meant uncontrolled expansion of feral herbivore populations in the Australian rangelands. The feral herbivores are a significant source of greenhouse gas emissions.*
Project details	
Project description and proposed activities (including a technical description of the project)	Engine Room Consulting is in the process of developing a methodology to accurately and conservatively determine the actual emissions reductions that are caused by project activities that lead to the untimely demise of large feral herbivores. [redacted] Engine Room Consulting has engaged in consultation with key state regulators and management agencies who have given strong support for the proposed project activity. The management of large feral herbivores (including camels) that causes the untimely demise of large feral herbivores has significant emissions reduction benefits. Untimely deaths of large feral herbivores means that the term of their natural lives are not lived out, thereby providing significant emissions reductions compared to a business-as-usual situation (i.e. camels dying of natural causes). A scientifically robust mathematical approach to determination of actual emissions (*ex-post*) will be applied as per the developed and agreed new methodology. Importantly, feral herbivore management that leads to their untimely demise is permanent (a managed camel will not come back to life), additional (not being required by legislation or regulation) and verifiable (using advanced tracking and monitoring approaches). By stopping the source of emissions in a fashion that leads to no leakage (i.e. replacement elsewhere), this project approach has significant emissions reduction benefits, alongside substantial ancillary benefits for regional development, as well as

	environmental and social benefits.
Technology to be employed	The technology and technological approach will be based on best available technology and best practice in line with relevant existing and developing Australian approaches to manage large feral herbivores. This may include aerial based culling, trapping, herding, mustering or otherwise moving animals to a central point where they are used for multiple uses such as food, pet meat and other animal products. This will be done with due regard to site and regional specific considerations, and in consultation with all relevant stakeholders, and at all times adhering to relevant animal welfare standards.
Business Rationale & Commercial Strategy	The project is primarily designed to ensure that methane generated by the large and growing feral herbivore population in Australia (that includes a herd of around 1 million feral camels) is reduced by causing the untimely demise of said herbivores. This will lead to a significant emissions reduction benefit by stopping the animals from continuing to produce methane for the duration of their natural lives. In the absence of a carbon price, and valuation of emissions reduction relative to business-as-usual, it is expected that the feral camel herd in Australia alone will approximately double over the next ten years, to 2 million individuals by 2020, with a commensurate increase in feral herbivore emissions. Management actions undertaken specifically to induce the untimely demise of large feral herbivores will have a quantifiable emissions reduction benefit relative to business-as-usual. While the emissions source (large feral herbivores) is uncovered (by the proposed Carbon Pollution Reduction Scheme) and uncounted (i.e. not recorded against the Australian Kyoto accounts), the only possible emissions market to enter emissions reduction units or benefits for sale into is the voluntary market, hence this application to the National Carbon Offset Standard. However, given previous policy statements by DCC with regard to future treatment of approved NCOS projects (i.e. they will be transferred to the compliance market should international accounting rules change), it is anticipated that at some point in the future, the large feral herbivore source will become a “counted, uncovered” source leading to a conversion of the project into a compliance unit eligible activity. The commercial focus of the activity is actively managing large feral herbivores for an emissions reduction benefit. The commercial focus is to develop emission reduction units for sale into carbon markets, by significantly shortening the lifespan of feral herbivores in Australia. The project activity has commensurate benefits to regional economic development, as well as protection and improvement of social and environmental conditions where the project activity is undertaken. Without the value of the sale of emission reduction units delivered as a result of large feral herbivore management, the proposed project activities have no or severely restricted commercial value.
Capability in implementing the project	Engine Room Consulting has a strong grounding in innovation, natural resource management and carbon trading. Dr Tim Moore

	has a strong background in both environmental impact assessment and management, and carbon trading. Dr Moore was the founder of BalanceCarbon, which is currently one the largest voluntary carbon trading companies in Australia, in terms of volume of carbon credits sold. Dr Moore has experience in carbon and the natural resource sector through appointments to Natural Resource Management Boards. Engine Room Consulting is currently being funded in part through a project by the Western Australian Department of Agriculture and Food for the development of a market based instrument for the control of feral herbivores, and as such as resources required to achieve the project goals.
Sector Background	
General structure and organization	The explosion of growth rates in larger feral herbivore populations in arid Australia is well exemplified by the case of feral camels, but is also similar for goats, pigs, horses and donkeys and feral stock animals. Feral animals, by definition, have no owner. While the problem of feral animals is not globally unique to Australia, the specific Australian context presents a suite of challenges seen nowhere else. Australia unique island biogeography and historical separation from other landmasses has led to the evolution of a unique set of flora and fauna co-adapted to survival in the Australian rangelands. The introduction of feral animals such as horses, camels, donkeys pigs and goats as led to a set of pressures on the native ecosystems through massive expansions of these feral populations. The feral animals have few if any native diseases or predators, and as such face few limitations to their population growth. Given that no-one legally owns the feral animals, and there is a general absence of legislation of regulation requiring feral animal management, dischordant trans-boundary (inter-state) legislation sets regarding management of feral animals, failure to enforce feral animal management regulation and the very large distances and relative isolations away from significant human settlements (i.e. the problem is “out of sight”) the feral animal populations in rural and regional Australia have exploded. These population explosions have had a commensurate negative set of impacts on environmental, economic and social assets where they exist. The draft National Feral Camel Action Plan suggests the development of a national cohesive strategy to reduce the impacts of feral camels (although the issues are consistent for other feral herbivores in arid Australia). The core focus of the action plan suggests that economic, environmental and social co-benefits should be examined through a range of market based developments are required to lead to mitigating of the negative impacts of feral camels in Australia. However, the project action plan is non-specific in that is has not identified a single or even an ideal set of approaches to market based development of management strategies. This proposed carbon based market instrument aligns entirely with the majority of enterprises suggested in the action plan, and has the capacity to add to the potential economic returns of feral animal management

	in Australia. The approach proposed in this project will lead to significant emissions reductions, alongside ancillary economic, environmental and social development outcomes.
Challenges & opportunities	Current challenges to the development and application of feral herbivore management for emissions reduction come from several aspects. 1. Trans-boundary (inter-state and intra-state) challenges will exist to the project from having to deal with multiple sets of legislation or regulation for management actions, as well as dealing with a range of different land tenures. 2. There is yet to be a consistent national approach to feral herbivore management, and agencies that have historically undertaken management actions are typically poorly funded, with respect to the scale of the problem. 3. Some stakeholders may not fully endorse the proposed management actions (removals) owing to religious or spiritual beliefs, and have issues with “shoot-to-waste” activities that may be required where other commercial or market based solutions are not viable due to remoteness of the population. Opportunities include potential to educate all stakeholders with respect to the importance of appropriate feral herbivore management, and engagement of the communities in the solution to feral herbivore management. Along with this education and engagement, there is significant scope for the development of ”feral industries” to be developed to value add to feral herbivore management over and above the shoot to waste programs, leading to sustainable rural endeavours and employment. As a result of the implementation of emission reduction projects through feral herbivore management, there is the significant opportunity for additional external funds from commercial services providers such as to regional and remote Australia and work with local stakeholders and governments to improve both economic and scientific knowledge regarding feral herbivore management, and to mean that the regional areas of Australia are able to be a committed part of the national push to reduce the impacts of the agricultural sectors’ impact on climate change.
Expected schedule	
Earliest project start date	September 2009
Estimate of time required before becoming operational	Project is already operational. Management actions are already underway, and ownership of emission rights is being negotiated at present. No physical infrastructure is required directly by the proposed project; however infrastructure development that may lead to emission reduction management actions (e.g. abattoir construction) may be undertaken during the project period. Month & Year of expected financial close: December 2010 for finalizing sale of first tranche of emission reduction units Month & Year for completing legal matters: December 2010 for methodology and approved project design document, along with

	monitoring methodology. Month & Year in which negotiations for emission reduction purchases will be completed: August 2010 Month & Year in which construction will be completed: No infrastructure construction required in the initial project design
Expected date of first emission reduction unit delivery (post-certification)	December 2010
Proposed crediting period for the project (no. of years)	21 (3 x 7 year renewable periods), although this is expected to be negotiated with DCC/NCOS according to developing policy
Project lifetime (no. of years)	21 although this is expected to be negotiated with DCC/NCOS according to developing policy
Current status or phase of the project	• Initial feasibility completed; • contract assigning emission reduction rights from feral herbivore management developed, and negotiations with project participants being undertaken; • new project methodology development underway, based on new Australian Provisional Patent EMISSION AVOIDANCE METHOD BASED ON LARGE FERAL HERBIVORE REMOVAL; • stakeholder consultation initiated.
Current status of acceptance by the Host Country	**With the submission of this PIN, Engine Room Consulting is seeking a *Letter of Endorsement* from the Department of Climate Change.**
The position of the Host Country regarding the Kyoto Protocol	**The Host Country (Australia) has signed and ratified the Kyoto Protocol.** **It must be noted that the emission source (large feral herbivores) is not acknowledge by the Australian Government currently as a reportable emission source under its obligations to the Kyoto Protocol, and the emissions source is not covered by the proposed Carbon Pollution Reduction Scheme.**

C. Financial Details

Total project costs estimate *(Please provide a breakdown and/or explanation where appropriate)*	
Development cost	Au $200,000
Installed project cost	No capital infrastructure is being developed within the proposed project boundary
Other costs	Au $600,000 for project originator, with a yet to be confirmed annual cost of emissions management activities.
Total project cost	Au$0.8 million excluding ongoing operational management costs. More detailed financial analyses will be presented if required in the PDD.
Sources of finance identified	
Equity	

	No equity partners are being sought to develop and deliver the proposed project, given the current positive and supported position of the project proponent (Engine Room Consulting).
Total emission reduction unit funding contribution sought	As the project activity is not able to generate any revenues in and of itself *per se* (i.e. feral animal management such as shoot to waste has no opportunity to attract revenue returns other than from the sale of emission reduction units), the entire project financing is reliant on emission reduction unit sale funding.
Emission reduction unit contribution expected in advance payments	No emission reduction unit funding is being sought as advance payments, as initial consultation and project development costs are being covered by Engine Room Consulting. Project development and ongoing management costs will be borne by stakeholder parties (who may or may not be named as project participants in the PDD), with revenues coming from the sale of issued emission reduction units.
Expected Price of the CER in case of a contract to purchase for:	
Indicate projected financial IRR for project with and without emission reduction unit revenues.	As a result of no commercial or legislated requirements for feral herbivore management, the applications of any funds to achieve a reduction in methane release from this emission source in Australia no commercial value without any revenues derived from emission reduction unit sales. As such, the proposed project has strongly negative IRR, and a positive IRR above the hurdle rate with a carbon price in the range [redacted] Some commercial activities (such as meat production at abattoirs) within the project description (see patent described above) have a lower requirement to achieve the benchmark IRR but are still not commercially viable without a strong carbon price signal.

D. Expected environmental benefits

Estimate of Greenhouse Gases abated (in tonnes of CO_2-equivalents)	Annual: 1.75 $mtCO_2e$/year Up to a period of 10 years: 17.5 $mtCO_2e$ Year 1: 0.225 $mtCO_2e$ Year 2: 1.5 $mtCO_2e$ Year 3: 2.25 $mtCO_2e$ Year 4: 4.5 $mtCO_2e$ Year 5: 6.0 $mtCO_2e$ Year 6: 0.75 $mtCO_2e$ Year 7: 0.75 $mtCO_2e$ Year 8: 0.75 $mtCO_2e$ Year 9: 0.75 $mtCO_2e$ Year 10: 0.75 $mtCO_2e$
Baseline scenario/analysis [Note: A validated baseline will be required if project is considered for potential purchase of emission reductions.]	Emission reduction projects must result in GHG emissions being lower than "business-as-usual" in the Host Country. Here, we indicate our initial projections for baseline projections for emissions and the project activity. The proposed emission reduction project will be avoiding future methane emissions from large feral herbivores in the Australian rangelands, such as those produced by camels. In the absence of a significant effort to manage the growth in population of large feral herbivores (as is currently the case), feral herbivore populations continue to grow unchecked. Current scientific estimates set the Australian feral camel population at 1 million, which expected to double by 2020 in the absence of a substantial and concerted effort to reduce this growth rate and reduce the absolute population density. The baseline scenario is one where the current business as-usual condition continues, and feral herbivore population growth rates and absolute population densities increase. In amongst all of the potential business-as-usual baselines, there are several apparent candidates. Baseline estimates for future emissions in the absence of the proposed project management activity could be based on the predicted growth in emission levels as a function of population growth estimates. Ex-post estimates of actual emissions reductions are also able to be based on the reduction of years lived as a result of management activity undertaken on an individual of average age or other methods for determination of age structure of animals managed as describe in the patent associated with this proposed project activity. Baseline business-as-usual emission estimates to 2020 are (for feral camel populations only) rising from the current 1 million tonnes CO_2e per annum to 2 million tonnes CO_2e per annum. These emissions would occur for an ongoing and presumably ever increasing rate until some natural mortality factor or population carrying capacity factor was reached which leads to a slowing in the growth of the feral herbivore populations. Given

	that it is not known what factors could actually limit feral herbivore populations in the wild, no upper bounds are presented here other than the forward estimate for 2020 which is based on sound scientific research. The longevity of the project will be influenced by feral herbivore population densities, carbon price and resource availability to undertake management actions. Biological or commercial extinction of the feral herbivore populations may be reached within 10 years. Given the size of the projected emission reductions, the proposed emission reduction project activity will be a large scale one (i.e. greater than 60,0000 tCO_2e/year . The lifetime of the baseline will be until the project is completed, or until a national regulation is enforced for compulsory management of large feral herbivores is implemented and enforced. This is unlikely to occur in the next decade, given the historical conditions that have allowed the problem to occur, and the admission of ownership of feral animals that would be incurred by enacting legislation requiring management of said feral animals. Source of emissions that will be taken into account in the baseline projection will include any fossil fuel or electricity used in the project activity to manage large feral herbivores. The most important source of emissions to be considered in the project will be the baseline methane emissions from the large feral herbivores, primarily as methane. The project baseline and additionality will be examined using a newly developed methodological tool specific to this project (given the uniquely Australian nature of the problem, there is no comparable methodology anywhere in the world at present), as well as the UNFCCC CDM/JI methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 02.2). Any uncertainties in baseline emissions estimations may be attributed to uncertainty of model outputs, uncertainties related to total numbers of individual feral herbivores actually in the wild, uncertainties related to the actual and average ages of the populations of individual feral herbivores in the wild, and uncertainties due to the actual growth rate of the feral herbivore populations.
Specific global & local environmental benefits	
Which guidelines will be applied to ensure environmental quality?	At present, in the absence of current guidance, Engine Room Consulting will be pleased to work in close consultation with the Department of Climate Change in Australia to work towards the development of a clear set of guidelines required for project development, but clear and careful consideration must be given to existing and current animal welfare regulations. Engine Room Consulting will be working towards the general principles of sustainable development to ensure“intergenerational

	equity, between business community and society, and between developed and developing nations". Engine Room Consulting will engage with and consult relevant stakeholders to ensure that their concerns with regards to the project activity are appropriately and adequately addressed in project delivery.
Local benefits	• Environmental: improved environmental management leading to protection of biodiversity and important environmental values such as water quality, improved local carbon sequestration through reduction of grazing pressure on non-pastoral lands, improved plant recruitment for some species, reduced competition for local fauna species for space and resources; • Economic: enhanced economic values through direct job creation for managing large feral herbivores in regional and remote areas, redued costs to pastoralists for repair to infrastructure (fences, yards, grazing lands, water sources), reduce cattle escapes, reduced impact on commercial bush tucker resources, reduced damage to out stations and community infrastructure, and reduced risk of traffic accidents; • Social: reduced damage to culturally sensitive sites, including places of birth, places where spirits of dead people are said to dwell, improved resource availability (including bush tucker resources), less interference with hunting of native animals, creation of safer driving conditions, and improved safety on airstrips. Also, there will be improved economic conditions through direct employment and education regarding the issue of large feral herbivores, leading to increased interest in and uptake of sustainable environmental management.
Global benefits	Reduction in greenhouse gas emissions from feral animals, protection of biodiversity and cultural values in the Australian rangelands.
Stage of the environment issues review	There is a substantial body of work that has reviewed the impacts of feral herbivores (including camels) that indicate the vast range of negative environmental outcomes associated with the failure to manage the feral animal population. This work will be specifically referenced in the project design documentation and supporting evidence.
Social and economic aspects	
Which guidelines will be applied to ensure social quality?	As agreed with the Department of Climate Change
What are the possible <u>direct effects</u>?	Local employment during construction and operation phases of project Improved capacity for local education on natural resource management, improved productivity and economic value to regional businesses and communities through direct employment and improvement of business practice through reduced operations costs (see improved economic outcomes highlighted above).
Stage of the social issues review	Early consideration is being given to how as to best engage with local indigenous communities and the operators of indigenous lands. On pastoral lands, engagement with land holders and

	management agencies has been positive to date. Following the outcomes of future stakeholder consultation and surveys, a more detailed needs analysis will be undertaken, with subsequent and more wide reaching stakeholder consultation undertaken.
Environmental strategy/ priorities of the Host Country	This project is in alignment with the local, regional and national Federal Government of Australia with respect to sustainable development, and reducing the impact of the agricultural management sector on climate change.
Public Consultation	As outlined above, stakeholder consultation with relevant land magers and agencies who undertake management actions on feral herbivores. More extensive consultation will be undertaken with associated parties as the program progresses. The results will be provided in detail in the subsequent project PDD.

E. Project-Related Risks and Outstanding Issues

Project risks and issues	
Project risks and mitigation	*Project risks have been identified to include:* ***Failure to manage large feral herbivores*** *This will be addressed by engaging and ongoing consultation with relevant agencies who have historically undertaken management actions to cause the untimely demise of large feral herbivores. This will be undertaken with a view to ensure that a revolving carbon fund dedicated to large feral herbivore management is established to ensure successful ongoing feral herbivore removals.* *Expert advice and technical input to project design will be garnered from relevant specialists as required.* ***Additionality and baseline challenges*** *It is not expected that within the first 10 years of project activity that additionality or baseline conditions will change or reduce the applicability of emission reduction derived funding for the project to continue.* ***Animal welfare*** *Given the historical experience of potential project partners in managing large feral herbivores and adhering to the guidelines for animal welfare, historical approaches will continue to be employed as the project progresses. This will include the use of humane control methods, as well as the use of competently trained and appropriately qualified personnel involved in management actions. Independent third party verification will be applied as is necessary to ensure adherence to relevant animal welfare standard are met during management actions.* ***Stakeholder concerns: religious or cultural significance of feral animals*** *We will work carefully with local communities to ensure that*

	appropriate education and employment opportunities are provided with respect to the impacts of feral animals, including camels and the need for their appropriate management. Where indicated that such management actions are considered inappropriate or local communities are not supportive of actions to be undertaken on lands under their control, no such actions will be undertaken. *Other environmental and social stakeholder issues may become apparent during the ongoing consultation phases. Issues raised will be dealt with through negotiation and design phases of the project development, with ongoing consultation during the operational phases of the project to ensure that all legal, environmental and social concerns are adequately addressed, and so that all stakeholders are confident that their concerns have been validly considered and addressed.*