PROPOSED BROOME BY-PASS

GIS PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

Prepared for:

MAIN ROADS WESTERN AUSTRALIA

Kimberley Region

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DERBY WA 6728

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Acknowledgments

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to provide a GIS based Preliminary Environmental Impact Assessment in accordance with the scope of services set out in the contract between KBR and Main Roads Western Australia (MRWA) ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

KBR derived the data in this report primarily from examination of records in the public domain, interrogation of databases provided by MRWA and sourced by KBR, and interviews with individuals with information about the site. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to the Lancelin Road passing lane project provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

The findings, observations and conclusions expressed by KBR in this report are not, and should not be considered, an opinion concerning the success or otherwise of any applications submitted to any regulator for assessment and approval. No warranty or guarantee, whether expressed or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon MRWA supplied data, desktop survey reports, examination of records in the public domain, interviews with individuals with information about the site and approval processes in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures		
			Originated by	Checked by	Authorised by
B	08/11/05	Issued for internal review	EM	JR	JR
C	18/11/05	Issued for client review	EM	KT	KT
0	16/1/06	Final issued to client	[signature]	[signature]	[signature]

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1 Introduction

Kellogg Brown & Root (KBR) was appointed by Main Roads Western Australia (MRWA) to undertake a Geographical Information System (GIS) based Preliminary Environmental Impact Assessment (PEIA) for the proposed Broome By-Pass. The project is scheduled to commence in June 2006.

The objective of the PEIA is to identify the key environmental constraints associated with the proposed works, and to identify any requirements for the project to be referred under the *Environmental Protection Act 1986* and the *Environmental Protection and Biodiversity Conservation Act 1999*. The report will also provide a basis for discussion with environmental agencies about the need to refer the proposal for statutory approval. An Environmental Assessment Report (EAR) of this project was undertaken in 1999 by McDonald, Hales & Associates. KBR utilised a copy of this report during the investigations and as a comparison for this GIS based PEIA. The GIS PEIA will provide guidance for further environmental impact investigations as required.

The Broome Highway is proposed to be realigned to improve access for heavy vehicles to the Port of Broome. The realignment starts south of Tanami Road on Broome Highway and travels west via the existing section of Gubinge Road to Gantheaume Point Road where it then joins back to Port Drive north of Archer Street (MRWA, 2005). Figures 4 and 5 provide more detailed information in the environmental areas of interest.

This PEIA assesses the environmental impacts of the proposed By-pass works. Figure 1 contains an overview of the study area. Figures 2 and 3 contain details of the environmental constraints associated with the proposed works.

KBR obtained the information in this report from a desktop assessment based on existing database records, information provided by MRWA and literature available in the public domain.

2 Assessment of Aspects and Impacts & Management Recommendations

Evaluation of potential Impacts and Management Recommendations

Aspect	Evaluation of Potential Impacts and Management Recommendations
Air quality	The objective of the proposed works is to improve access for heavy vehicles to the Port of Broome. Increased traffic flows are not expected as a result of these works, therefore minimal changes in air quality are expected to result from the project. Consequently, a local air quality assessment as described in the MRWA Environmental Guideline *Air Quality* is not recommended irrespective of the current background air quality and the proximity to sensitive receivers. Machinery emissions which could impact adjacent land users and occupiers may be generated during the construction works. These impacts can be effectively managed by MRWA standard air quality management. Provided that these management commitments are followed, impacts on air quality during construction are not considered to be significant.
Dust	Dust is likely to be an issue during construction earthworks as there is generally a westerly wind blowing in the afternoon. Wind speed is variable and can be strong at any time of the year (McDonald *et al.*1999). Excessive dust therefore may impact upon adjacent land users, vegetation and traffic. As recommended in the 1999 EAR, wind speed and direction should be monitored throughout construction. Visual monitoring of dust should also be undertaken, as well as dust suppression with non-saline water, throughout the project. If dust is impacting adjacent land users then works should be temporarily halted until dust can be controlled. In addition, standard MRWA dust minimisation techniques are recommended to be followed during construction.
Vegetation – clearing	Vegetation clearing is associated with the proposed works, with the total amount of native vegetation requiring clearing being 8ha. New legislation was gazetted in 2003 in regards to clearing of native vegetation. Under the Environmental Protection (Native Vegetation Protection) Regulations 2003. A clearing permit is required and will be applied for once DPI have given their approval for MRWA to take the Unallocated Crown Land (pers. comm. - Mark Salt, MRWA, 2005).
Vegetation – TECs / DRF / Priority Flora	One Declared Rare Flora (DRF) species, Conservation Code R, and four Priority species were identified in 1999 as potentially occurring within the vicinity of proposed works in the 1999 EAR. These were: **Rare:** *Pandanus spiralis* var. *flammeus* **Priority:** *Glycine pindanica* (PI) *Keraudrenia* sp. Broome (BJ Carter 501) (P1) *Nicotiana heterantha* (P1) *Pittosporum moluccanum* (P4) However when a flora survey was undertaken in 1999 none of these were found within

Aspect	Evaluation of Potential Impacts and Management Recommendations
	the proposed area and the report states that "…the area is not considered by Muir Environmental to be particularly floristically rich." One DRF species is in very close proximity to the project area and may be impacted by the proposed works which was not identified in the 1999 report (Figure 2). This species should be identified, marked and avoided. If destruction of the DRF can not be avoided a permit must be obtained from the Department of Conservation and Land Management (CALM) prior to any clearing. Part of the proposed works are located within the buffer of a Threatened Ecological Community (TEC) (Figure 2). An ecological community is an assemblage of native species that inhabits a particular area and is ecologically distinct from other assemblages. TEC's are ecological communities which are presumed to be extinct, endangered, vulnerable or rare. As clearing activities are required within the buffer of a TEC Discussion with CALM has indicated that because there is an existing development within the TEC (the existing road), that they would not oppose the project however they raised concerns over potential changes to drainage into the TEC. These area addressed under section 'Surface waters and drainage'. (pers.comm. Troy Sinclair, TEC Manager, CALM).
Vegetation – weeds	No Declared Plants under the *Agriculture and Related Resources Act 1976* (ARRP) are known to occur within the project area (pers.comm. Cristy Cooper, Department of Agriculture). However, two environmental weeds were identified within the project area in the 1999 report. These are kapok bush (*Aerva javanica*) which is considered alien to Western Australia and the invasive creeper *Merremia dissecta*. It is recommended that standard MRWA weed hygiene management practices are employed to prevent the introduction of new weed species into the area and to limit the spread of existing weeds within the project area.
Vegetation – dieback	The vegetation disease, dieback, caused by the plant pathogen *Phytophthora cinnamomi* is unlikely to occur in the project area as it is too hot and too dry for the pathogen to survive (pers. comm. Kevin Veer, CALM). Generally the pathogen is only found south of Kalbarri, however if the pathogen is present in a transplanted species and irrigated (mainly in gardens) it may cause dieback, however *Phytophthora cinnamomi* would not survive in the natural environment within the project area (pers. comm. Kevin Veer, CALM). Consequently, no management recommendations apply.

Aspect	Evaluation of Potential Impacts and Management Recommendations
Fauna	Interrogation of the Federal Environmental Protection and Biodiversity Conservation (EPBC) database identified fourteen threatened fauna species and forty migratory bird species that could potentially exist in the vicinity of the project area (refer to Commonwealth Environmental Approvals section below and Appendix B). However nine of the fourteen species listed are marine species and will therefore not be found within the project area. The threatened species include the following: **Birds:** Gouldian finch, Australian painted snipe and masked owl (northern); **Mammals:** Blue whale, mulgara, greater bilby and humpback whale; **Reptiles:** Loggerhead turtle, green turtle, leathery turtle, hawksbill turtle and flatback turtle; **Sharks:** Freshwater sawfish and whale shark; The migratory species potentially using the area are listed in Appendix B. A search of CALM threatened and priority fauna databases found the following recent records within the project and surrounding areas. Other species records were identified, however, only records later than 1997 are included in the list below. For a full list refer to Appendix B. **Schedule 1 - Fauna that is rare or is likely to become extinct** *Macrotis lagotis* bilby (dead specimen recorded) *Rostratula benghalensis australis* Australian painted snipe **Priority 4 Species** *Polytelis alexandrae* Princess parrot *Phaps histrionica* Flock bronzewing *Numenius madagascariensis* Eastern curlew *Turnix castanota magnifica* Chestnut-backed button-quail *Falco hypoleucos* Grey falcon *Ixobrychus minutus* Little bittern The bilby shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths and has suffered a large decline and contraction in distribution (CALM,2005). It may be present within the project area, however it is unlikely due to the large number of feral cat and dog prints along the project area as noted in the 1999 EAR. The Australian painted snipe is a rare summer visitor to the watered areas of the north-west and is unlikely to be impacted by the proposed works. The little bittern and the grey falcon are unlikely to inhabit the area due to a lack of appropriate habitat in the project area. Habitat suitable for the eastern curlew may be present within the project area, however this species prefers the coastal estuaries and is more likely to inhabit Roebuck Bay than the project area. Overall the impact on fauna is most likely to be negligible and no fauna specific management commitments are required. However it is recommended as part of final design that minimal vegetation clearing is specified to minimise impacts on fauna. Additionally, MRWA should consider revegetation on completion of works to offset the potential loss of fauna habitat.
Commonwealth Environmental Approvals	A search of the EPBC register identified numerous flora and fauna species that may occur in the project area that constitute Matters of National Environmental Significance (Appendix D). The project is planned for construction between Tanami Rd on the existing Broome Highway extending to meet Port Drive south of Archer Street. There may also be an upgrade of the intersection at DeCastilla Street but these works will be confined to the existing road reserve. The current program of work does not extend to the Gantheaume

Aspect	Evaluation of Potential Impacts and Management Recommendations
	Point area (Commonwealth Heritage Site) (pers. comm. Mark Salt - MRWA, Jan. 2006) and as such should not need referral to DEH. It is ultimately planned that the dual carriage way will extend as shown in Figure 2 all the way to the port within 20-30 years and it is expected that another study will be required at this stage and advice sought from DEH at that time.
European heritage	There are many heritage sites in the Broome region, and Broome itself is listed on the Register of National Estate (Place ID 18704). Cable Beach is named as such due to the laying of a cable between Broome and Java which came ashore on the western end of Cable Beach Road East. The cable followed an easterly route that ran nearly parallel with the present runway at Broome Airport. It was most likely buried below the surface and not removed when it was no longer required. During a heritage survey in 1999 *et al.* time was spent trying to find evidence of this cable link, however it was recognised that as the cable has been buried for some time, it was more than likely that physical evidence of the cable on the surface would not be present (McDonald *et.al.*,1999) However, the survey concluded that "…there is the very real possibility that the road widening activity will uncover evidence of the overseas cable link." Consequently, it is recommended that: Construction crews are briefed on the recognition of non-indigenous heritage materials and strategies to be adopted should such materials be uncovered during the course of bypass construction works and in the event of a discovery being made during construction (particularly the original overseas cable link), a suitably qualified archaeologist be appointed to inspect and take any other appropriate steps to document the find(s). The current study has identified that part of the proposed route is located within "Gantheaume Point" which is listed on the Register of National Estate (Place ID 18631). Gantheaume Point, contains abundant fossil dinosaur footprints and plants fossils preserved in the Broome Sandstone, which is of late Early Cretaceous age. There are several sets of footprints, all of them concealed except at very low tide, representing a number of different dinosaur types. Because of the abundance of dinosaur tracks in the area, it seems likely that fossil remains of dinosaurs should be present somewhere in the area. Gantheaume Point contains the most diverse dinosaur fauna known in Australia, and is a research site of very great importance of Australian and international workers (DEH, 2005). Consultation with the Museum of Western Australia indicates that the proposed works will not impact on any dinosaur footprints or fossils or plant fossils, as the proposed course of the road does not pass in the vicinity of known fossil dinosaur footprints or fossil plant localities. These are all in the cliffs in the immediate vicinity of the lighthouse at Gantheaume Point and on rocks exposed at low tide (*pers. comm*. Ken McNamara, Senior Curator Palaeontology, WA Museum, November 2005). However all personnel should be briefed on this potential issue and works must cease if footprints are found and the Museum of WA contacted. No works are to continue until it has been approved by the Museum of WA. The 1999 EAR concluded that apart from rubbish and litter, no other evidence of past European activity was found along the proposed route.
Aboriginal heritage	Numerous Aboriginal heritage sites were identified in the search area. These are listed in appendix A. A total of 81 sites overlap within a 500m buffer of the road design, (Figure 3), however many of the sites are listed as 'Closed' sites. A Closed access code is used where informants have requested the information to remain confidential. Accordingly, DIA requires the written approval of appropriate informant's before allowing access to persons who wish to view Closed site files. DIA maps the locations of all sites, including Closed sites, as accurately as the information submitted to the Department allows. However, to preserve the confidentiality of Closed sites their locations are published within one or more 2 km square boxes. These 2 km boxes act as indicators for the presence of sites rather than as the exact boundaries of the sites. Therefore more detailed information is required to determine the exact locations of the sites. An ethnographic survey is recommended to

Aspect	Evaluation of Potential Impacts and Management Recommendations
	ensure that the impact of the project on the heritage is minimised and works are undertaken in compliance with Aboriginal Heritage Act 1972 (AHA). Under the *Aboriginal Heritage Act 1972*, consultation with the DIA and the relevant informants is required. If there are impacts proposed to any site, a section 18 application to disturb the sites is also required under the *Aboriginal Heritage Act 1972*. Under the MRWA guideline 6707/01 referral to the EPA is triggered if disturbance of aboriginal heritage sites are to be impacted.
Native Title	A search of the National Native Title Tribunal (NNTT) database identified two Native Title Claims covering the project area. • The Rubibi Community claim is fully determined and native title was found to exist. The claim was determined on 7/11/2001. • The Walman Yawuru claim, which was registered on 16/12/2004, NNTT Number WC 04/9. It was noted in the 1999 EAR that the road looked relatively new and much of the proposed works pass through bushland. Given this, native title may exist within the project area and may not be automatically extinguished in the road reserve. Native title is extinguished over public works including dedicated roads on Crown Land if constructed before 1/1/1994 and freehold land if validly vested prior to 31/12/1996. Consultation with the National Native Title Tribunal and Crown Law Native Title Unit is recommended.
Surface waters/drainage	As the proposed works include the construction of a two lane road, significant changes to surface water and drainage flows will occur within the project area. However, according to McDonald *et al (1999).* there are only two drainage lines along the route, one near Howe Drive and another on the north side of a cycle path just south of Di Marchi Rd. The report recommended that if Gubinge Road is widened to the west, this drain will need to be relocated or engineered to prevent erosion of the road margin. Excavation for establishment of surface drainage along side the road alignment is required for road drainage and maintenance of the natural surface water flow. The material excavated from the drain will be used as fill in the road construction. This will avoid excavation and disturbance of other sites. Any other material required for fill will be sourced from new drainage sumps located in accordance with the Shire's Town Drainage plan (pers, comm. M. Salt, MRWA). Works are required to be undertaken in the buffer zone of a TEC. This TEC already receives additional drainage from new housing developments. The road design must not contribute to an increase in drainage run of to the TEC as excess nutrients and pollutants may adversely affect it. (pers.comm. Troy Sinclair, CALM). Consultation with the local CALM office in Broome should be undertaken prior to works commencing.
Wetlands	No other wetlands, salt marshes, indications of salt-scalding, or other surface drainage features along or near the route were identified in 1999. However it should be noted that the project site is located within 10km of Roebuck Bay which is a registered Ramsar Site. As there will be no disturbance to Roebuck Bay or the flood prone areas of land (including altering flows to these) as part of this project, referral of this project to the EPA due to this trigger is not required. The location of hazardous substance storage and vehicle refuelling sites must be at least 100m from all watercourses and wetlands.
Groundwater	Water will be sourced from the Shire of Broome for this project and as such, there will be minimal impact on the groundwater in the area. Water use should be minimised.
Noise and vibration	It is expected that noise and vibration levels will increase during construction and after completion of the road as heavy vehicles use the by-pass, which may adversely impact adjacent land users, vegetation and passing traffic. A noise survey, undertaken in 1999, concluded that in order for noise criteria to be met in the year 2000 at existing

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	residential areas, some form of control will need to be implemented along sections of the by-pass. Given that this survey was completed 5 years ago and it is likely that there has been an increase in residential development in Broome, noise impacts may have increased. Therefore an additional survey, targeted at new residential developments is recommended. Methods recommended for reducing noise levels in 1999 were changing road seal to a more acoustically absorbent surface in applicable areas. The installation of solid fencing was also recommended for noise attenuation. Survey of noise levels during and after construction of the by-pass should be undertaken to ensure noise levels meet statutory and community requirements. MRWA noise and vibration management procedures are recommended to be followed by the construction contractor.
Visual amenity	The proposed works entail the construction of a heavy vehicle By-pass route and four intersection modifications. It is anticipated that there will be an impact on visual amenity due to the size of the project. However unsealed road is present along approximately 50% of the route, and the bypass will contribute positively to the community and safety of Broome as it will remove heavy vehicles from the town centre. The new road alignment will be sealed. Where vegetation clearing is required, landscaping should take place following construction to restore visual amenity.
Public safety and risk	The proposed works should improve overall public safety and risk in Broome through decreasing the amount of heavy vehicles on town roads. A risk to the public could be posed during construction, however, provided traffic management and signage to Main Roads standards is employed, none of the proposed works present significant hazards to public safety. Traffic management and signage to Main Roads standards is recommended.
Reserves / Conservation areas	There are several Reserves identified within the proposed route. These are listed below: • Reserve 43080 Coastal Park (Recreation, Conservation and Protection of Aboriginal heritage. Size 207.3770 ha (unvested). • Reserve 41255 for "Recreation and Drainage". Size 1.0145 ha (unvested). • Reserve 41258 for "Pumping Station" is vested in the Water Corporation. • Reserve 42309 for "Transport Terminal" is 10.2360 ha and is vested in the Shire of Broome. The remainder of the land along the proposed route is vacant crown land (VCL) (McDonald *et al.* 1999). Written approval is required from manager of the reserve. Where the land is not vested DLI must approve any works and will liase with the relevant stakeholders on MRWA behalf. Written approval is required from the Water Corporation for Reserve 41258 and the Shire of Broome for Reserve 42309. Where the Reserves are not vested then a written application to the Department of Land Information (DLI) is required. DLI will liaise with appropriate organisations and respond accordingly to MRWA (*pers. comm*. Leanne Shore, DLI, October 2005).
Contamination	The land uses adjacent to the project area would not suggest a previous history of being contaminated or being adjacent to any contaminated sites. However a search of the Department of Environment (DoE) contaminated sites database under Freedom of Information is recommended prior to works commencing. Standard construction measures for refuelling, machinery servicing etc should be followed to avoid the introduction of hazardous chemicals into the project area.

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Acid Sulfate Soils (ASS)	Information on Acid Sulfate Soils (ASS) in the Broome area is limited, however according to WA Planning Bulletin No. 64, acid sulfate soils are likely to be found in the northern parts of the WA coastline including the Kimberley coastline and therefore may be present within the project area. Towards the southern end of the project the proposed route is located near some low lying inundated areas which are prone to ASS, which may further indicate that ASS are present. The elevation of the project area is approximately 8m above sea level (McDonald *et al*. 1999) and the volume of excavation is expected to be >100m3. Therefore a Preliminary Site Assessment in accordance with Department of Environment guideline "Identification and Investigation of Acid Sulfate Soils" 2004 should be undertaken.
Statutory Land Use Planning	No issues relevant to statutory land use planning apart from those described in the 'Reserves/ Conservation areas"were identified within or adjacent to the study area. No further management commitments are recommended should be undertaken.

Clearing of Native Vegetation

Under the amended *Environmental Protection Act 1986* (*EP Act*), clearing of native vegetation must be under the authority of a clearing permit, unless subject to an exemption. An exemption applies for clearing activities that are required for road widening and realignment projects, where the clearing has been completed before 8 January 2006. The exemption does not apply in Environmentally Sensitive Areas (ESA). The exemption covers all clearing activities that are required to deliver the road project such as:

- clearing for the construction footprint;
- clearing to search for road base materials;
- extracting road base materials;
- constructing temporary vehicular tracks;
- construction work camps;
- clearing for stockpile areas; and
- establishing new sightlines.

MRWA have already applied for a clearing permit for this project.

In assessing whether the project is likely to have a significant impact on the environment, the project was assessed against the Department of Environment (DoE) 10 principles of clearing, as derived from the *Environmental Protection Act 1986,* shown in Table 1 below.

Table 1: Assessment of project against the DoE 10 principles of clearing.

Clearing Principle	*Yes/No*
Does the area to be cleared comprise a high level of biological diversity?	No
Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia?	No

Clearing Principle	*Yes/No*
Does the area to be cleared include, or is necessary for the continued existence of, rare flora?	No, but there is rare flora in close proximity to the project area.
Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of, a threatened ecological community?	Yes
Is the area to be cleared significant as a remnant of native vegetation in an area that has been extensively cleared?	No
Is the area to be cleared within, or in association with, an environment associated with a watercourse or wetland?	No
Is the clearing of the vegetation likely to cause appreciable land degradation?	No
Is the clearing of the vegetation likely to have an impact on the environmental values of any adjacent or nearby conservation area?	No
Is the clearing of the vegetation likely to cause deterioration in the quality of surface or underground water?	No
Is the clearing of the vegetation likely to cause, or exacerbate, the incidence or intensity of flooding?	No

One of the principles of vegetation clearing may be impacted and further investigation is recommended. Vegetation clearing will be associated with the proposed works. Proposed works are planned within the existing road reserve and will be minimised to include only clearing absolutely necessary for intersection modifications.

The project has been assessed against the Department of Environments 10 principles of clearing, which is included in Table 1 and is not considered to have a significant impact. One DRF species was identified within the project area, however will not be impacted by the proposed works. A TEC has been identified in the vicinity of the proposed works and a flora survey is recommended to determine the presence/absence of TEC within the project area itself, as it is a trigger for formal referral to the EPA. The work is close to Roebuck Bay, however this will not be impacted by the proposed works. Therefore there is no requirement for a RIWI permit or referral to the EPA. However, if this wetland is impacted, referral of these works to the EPA may be required.

These works intersect the buffer zone for the TEC as shown in Figure 2. Under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004,* TEC (including TEC buffer zone as specified by CALM) constitute ESA's and a clearing permit is required to be obtained from the DoE prior to works commencing. A clearing permit is required and will be applied for once DPI have given their approval for MRWA to take the Unallocated Crown Land (*pers. comm*. - Mark Salt, MRWA, January 2006).

Minimum vegetation clearing protocols are recommended where practicable. Where vegetation clearing occurs, removal of mature trees should be minimised and

vegetation clearing limits should be clearly established as part of the final project design. Areas outside the project area must not be disturbed as part of the proposed works. It is recommended that holding bays are located in areas of previously disturbed vegetation, and that vegetation clearing be minimised where practicable. Additionally, MRWA should consider revegetation on completion of works to offset significant tree losses.

3 Recommendations

The following section describes the environmental management commitments that are recommended to address potential environmental impacts that were identified in Section 2 above. Where no impact has been identified, no recommendation is made.

Land Clearing

According to this preliminary assessment, the project will require a clearing permit as clearing is proposed in Environmentally Sensitive Area's (ESA) (figure 5). The buffer zone of a TEC has been identified within the project area, which is classified as an ESA under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. A vegetation survey is recommended to confirm the presence/absence of the TEC within the location of proposed works. Exemptions for clearing permits apply for clearing for certain activities with respect to road projects which are carried out before 8 January 2006, however the exemption does not apply in ESA's.

Where clearing occurs, removal of mature trees should be minimised and vegetation clearing limits should be clearly established as part of the final project design. Areas outside the project area must not be disturbed as part of the proposed works.

Referral to the Environmental Protection Authority

The proposed works contain a potential trigger for referral to the Environmental Protection Authority (EPA) which is the TEC (buffer zone). If the proposed works are expected to have significant impact on the TEC site, referral to the EPA will be required. Advice from CALM will be provided regarding the impact on the TEC. This will guide the decision for referral of the project.

Referral to Department of the Environment and Heritage

Many species were identified as potentially being present in the area in a search of the Environmental Protection and Biodiversity Conservation (EPBC) register. However, given the habitat present and the results of the CALM Threatened and Priority fauna search it is unlikely that fauna will be impacted and therefore does not trigger referral to the DEH. The current phase of work does not extend into the Gantheaume Point area (Commonwealth Heritage Site) and as such should not need referral to DEH.

Fauna

Interrogation of the Federal EPBC database identified five terrestrial threatened fauna species that could potentially exist in the vicinity of the project area (see Appendix C). A search of CALM Threatened and Priority Fauna indicated that there may potentially be several Threatened and Priority species in the area (Appendix D). However due to the habitat within the project area it is unlikely that the identified species are present within the project area. Therefore impacts on fauna will be negligible to none and no management recommendations are required.

Clearing will result in fauna habitat disturbance however the impact is not expected to be significant. It is recommended that, where possible, works are located in areas of previously disturbed vegetation, that vegetation clearing be minimised where practicable and that MRWA conduct revegetation on completion of works to offset potential loss of fauna habitat.

Flora

Three TEC sites were identified (refer to Figure 2), with the proposed works impacting the 500 m buffer zone around one of the TEC sites, consultation with CALM indicates that the TEC itself will not be impacted by the proposed works and therefore no further action is required (pers. comm. Troy Sinclair, CALM). One DRF species is present within the project area and this must be avoided or an application to CALM made (refer to Appendix A, figure 2).

Vegetation management - weeds and dieback

No Declared Plants were identified by the Department of Agriculture as occurring in the project area (*pers.comm*. - Kristie Cooper, Department of Agriculture, October 2005). However the 1999 EAR identified two environmental weeds.

There is a potential for construction activities to spread weeds through vegetation disturbance, excavation, and the movement of personnel and machinery. It is expected that standard MRWA weed hygiene management practices will adequately manage these weeds.

Aboriginal heritage

Due to the presence of numerous Aboriginal heritage sites within the area an archaeological and ethnographic survey is required to be undertaken prior to works commencing. Depending on the outcome of the survey section 18 applications may be required to disturb the sites.

Native title

Native Title (Rubibi Claim) exists in the area of proposed works (refer to Section 2) which may not be automatically extinguished depending on when the road was constructed. Native title is extinguished over public works if constructed prior to 1/1/94. Consultation with National Native Title Tribunal (NNTT) and claimants is required prior to works commencing. Legal advice from Crown Law Native Title Unit should be sought on this issue.

Reserves and conservation areas management

Written approval is required from the organisation that the Reserve is vested in. Therefore written approval is required from the Water Corporation for Reserve 41258 and the Shire of Broome for Reserve 42309. Where the Reserves are not vested a written application to the Department of Land Information (DLI) is required. DLI will liaise with appropriate organisations and respond accordingly to MRWA (pers. comm. L. Shore, DLI).

Dust and air quality management

Visual dust monitoring should be undertaken due to the varying wind speeds and winds in the direction of the town in the afternoon. Additionally, standard MRWA dust and air emission management measures should be followed during construction to minimise potential air quality impacts. These may include watering of construction areas and unsealed roads, confining works to non-peak periods and to periods of low wind speed and regular machinery inspection and servicing.

Noise and vibration management

Increases in noise and vibration that may affect adjacent residential areas, vegetation and traffic during construction can be effectively managed by standard MRWA noise and vibration management procedures. The guidelines should be followed by the construction contractor.

Contaminated sites

The previous land uses do not indicate that contamination will be an issue along the proposed route. However this should be confirmed with a contaminated sites search from the DoE.

Standard MRWA procedures for refuelling, machinery servicing etc should be followed to avoid the introduction of hazardous chemicals into the project area.

Public safety management

A risk to the public could be posed during construction. Therefore, traffic management and signage practices to Main Roads standards are recommended during construction.

EAA process

As per the Main Road's Environmental Assessment and Approvals (EAA) process, the Project Manger should forward a copy of his/her referral recommendation and a copy of this GIS based preliminary environmental impact assessment report to the Manager Environment MRWA for review and endorsement.

4 Datasets

As part of the GIS Preliminary Environmental Impact Assessment process developed between MRWA and KBR, spatial datasets provided by MRWA have been used where possible for the identification of environmental constraints associated with the proposal. This process has been used to improve the efficiency and timeliness of the PEIA process. MRWA obtained spatial datasets from the relevant custodians, and KBR has been entrusted with maintaining their currency.

Spatial datasets referred to in this report include Declared Rare and Priority Flora (DRF), threatened ecological communities (TEC) and Conservation Reserves (Conservation and Land Management), Aboriginal Heritage Sites (Department of Indigenous Affairs), European Heritage (Department of the Environment and Heritage and Heritage Council of Western Australia), Environmentally Sensitive Areas (MRWA), Public Drinking Water Supply Areas (Department of Environment) and wetlands (Department of Environment).

Datasets used for this assessment were provided by MRWA in April 2005 with updates as required and this assessment assumes that all data is accurate at this date. Where no spatial datasets were available, KBR has used conventional means for obtaining information, including liaison with regulatory authorities, internet searches and database searches.

5 References

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Department of Environment and Heritage. 2005. EPBC search. Viewed 3 November 2005 <http://www.deh.gov.au/epbc/>

Department of Indigenous Affairs (DIA), 2005 Aboriginal Sites Register. Viewed 2 November 2005 http://www.dia.wa.gov.au/internetsitesquery2004

Heritage Council of Western Australia. 2005. Places database Search. Viewed 7 November 2005 <http://register.heritage.wa.gov.au/>

Main Roads Western Australia (MRWA) Environmental Guideline, No. 6707/001 Issue Date 1/11/04. Environmental Assessment and Approval, Appendix E, MRWA.

McDonald, Hales & Associates, 1999. Environmental Assessment Report - Proposed Broome By-Pass Broome, Western Australia. Prepared for Main Roads Western Australia, December 1999.

Western Australian Planning Commission. 2003. Acid Sulfate Soils. Planning Bulletin No 64.

Appendix A

ENVIRONMENTAL CONSTRAINTS FIGURES

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8018000.000000 8015000.000000 8012000.000000 8009000.000000

Legend

- Roads
- Broome Bypass Road Design

Broome Highway

Tanami Rd

Gubinge Road

Port Road

Dec Asmus

Current Proposed Works Area

415000.000000 418000.000000 421000.000000

Prepared for Main Roads Western Australia	N; 0 0.25 0.5 1 Kilometers; 1:30,000 @A3	Kellogg, Brown & Root Pty Ltd KBR	TITLE: Project Area Broome Bypass
	SOURCE All data supplied by Main Roads Western Australia, October 2005 (sourced through the relevant custodians).	Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317 *256 St Georges Terrace PERTH WA 6000*	FIGURE No. 1
	GIS FILE G:\Projects\MRWA\2_PEIA\015_Broome\GIS\MXDs\Fig2_BroomeEC.mxd; PROJECTION GDA 1994 MGA Zone 51; FINAL APPROVAL KT; DATE 10/1/06	Drawn by K. Ross	PROJECT No. PEN372_015

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Legend

- Declared Rare and Priority Flora
- Threatened Ecological Communities
- Roads
- Broome Bypass Road Design
- Bush Forever sites - none present
- CALM Reserves
- European Heritage (Commonwealth)
- European Heritage (WA)
- Environmentally Sensitive Areas
- Public Drinking Water Source Areas - none present
- Wetlands - none present
- TEC Buffer

Broome Highway

Tanami Rd

Gubinge Road

Port Road

Derastra Dr

18631

Current Proposed Works Area

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Prepared for Main Roads Western Australia	N; 0 0.25 0.5 1 Kilometers; 1:30,000 @A3	Kellogg, Brown & Root Pty Ltd KBR	TITLE: Environmental Constraints Broome Bypass
	SOURCE All data supplied by Main Roads Western Australia, October 2005 (sourced through the relevant custodians).	Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317 *256 St Georges Terrace PERTH WA 6000*	FIGURE No. 2
	GIS FILE G:\Projects\MRWA\2_PEIA\015_Broome\GIS\MXDs\Fig2_BroomeEC.mxd; PROJECTION GDA 1994 MGA Zone 51; FINAL APPROVAL KT; DATE 10/1/06	Drawn by K. Ross	PROJECT No. PEN372_015

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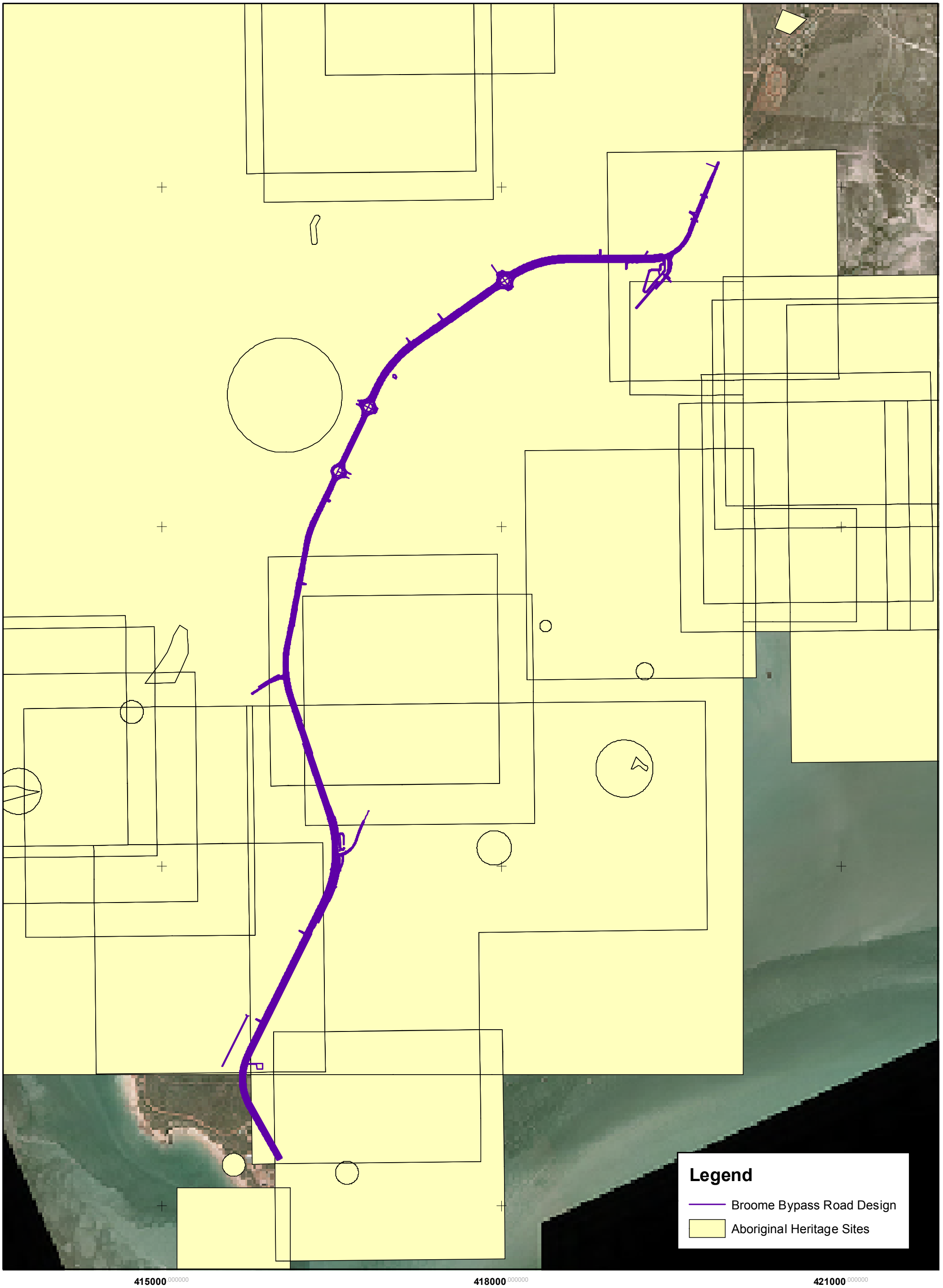

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Prepared for Main Roads Western Australia

N

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1:30,000 @A3

SOURCE All data supplied by Main Roads Western Australia, October 2005 (sourced through the relevant custodians).

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PROJECTION GDA 1994 MGA Zone 51

FINAL APPROVAL KT DATE 10/1/06

Kellogg, Brown & Root Pty Ltd
KBR
Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317
256 St Georges Terrace PERTH WA 6000
Drawn by K. Ross

TITLE

Aboriginal Heritage Broome Bypass

FIGURE No. 3

PROJECT No. PEN372_015

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8009500 000000

Legend

- Declared Rare and Priority Flora
- Broome Bypass Road Design
- Cadastre

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Prepared for Main Roads Western Australia	N 0 10 20 40 Meters 1:1,000 @A3 SOURCE All data supplied by Main Roads Western Australia, October 2005 (sourced through the relevant custodians). GIS FILE G:\Projects\MRWA\2_PEIA\015_Broome\GIS\MXDs\Fig4_CALM_DRPF.mxd PROJECTION GDA 1994 MGA Zone 51 FINAL APPROVAL KT DATE 10/1/06	Kellogg, Brown & Root Pty Ltd KBR Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317 *256 St Georges Terrace PERTH WA 6000* Drawn by K. Ross	TITLE Declared Rare Flora Broome Bypass FIGURE No. 4 PROJECT No. PEN372_015

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8016000 000000

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8015000 000000

8014500 000000

CABLE BEACH ROAD

GUBINGE ROAD

Legend

- Threatened Ecological Communities
- Broome Bypass Road Design
- TEC Buffer

Prepared for Main Roads Western Australia

0 50 100 200 Meters

1:5,000 @A3

SOURCE All data supplied by Main Roads Western Australia, October 2005 (sourced through the relevant custodians).

GIS FILE G:\Projects\MRWA\2_PEIA\015_Broome\GIS \MXDs\Fig5_Broome_CALM_TEC.mxd

PROJECTION GDA 1994 MGA Zone 51

FINAL APPROVAL KT DATE 10/1/06

Kellogg, Brown & Root Pty Ltd

KBR

Kellogg, Brown & Root Pty Ltd ABN 91 007 660 317

256 St Georges Terrace PERTH WA 6000

Drawn by K. Ross

TITLE

CALM TEC Broome Bypass

FIGURE No. 5

PROJECT No. PEN372_015

Appendix B

ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION REGISTER SEARCH

Department of the Environment and Heritage logo

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header images | header images | header images

Protected Matters Search Tool

13 October 2005 16:30

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.deh.gov.au/epbc/assessmentsapprovals/index.html

Map of Search Region including any Buffer

Search Type: Area

Buffer: 0 km

Coordinates: -17.92872,122.19186, -18.01040,122.19186, -18.01040,122.24472, -17.9287,122.24472

Thumbnail Map of Search Region

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.deh.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	Relevant
Threatened Ecological Communities:	None
Threatened Species:	14
Migratory Species:	40

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.deh.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.deh.gov.au/epbc/permits/index.html.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None

Places on the RNE:	20
Listed Marine Species:	79
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information]
(Ramsar Sites)

ROEBUCK BAY — Within 10 km of Ramsar site

Commonwealth Marine Areas [Dataset Information]

Approval may be required for a proposed activity that is likely to have a significant impact on the environment in a Commonwealth Marine Area, when the action is outside the Commonwealth Marine Area, or the environment anywhere when the action is taken within the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Within 3 Nautical Mile Limit

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Erythrura gouldiae * Gouldian Finch	Endangered	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
*Tyto novaehollandiae kimberli** Masked Owl (northern)	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus * Blue Whale	Endangered	Species or species habitat may occur within area
Dasycercus cristicauda * Mulgara	Vulnerable	Species or species habitat likely to occur within area

Macrotis lagotis * Greater Bilby	Vulnerable	Species or species habitat may occur within area
Megaptera novaeangliae * Humpback Whale	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta * Loggerhead Turtle	Endangered	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Vulnerable	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Vulnerable	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Vulnerable	Species or species habitat may occur within area
Sharks		
Pristis microdon * Freshwater Sawfish	Vulnerable	Species or species habitat likely to occur within area
Rhincodon typus * Whale Shark	Vulnerable	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Erythrura gouldiae Gouldian Finch	Migratory	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow	Migratory	Species or species habitat may occur within area
Migratory Wetland Species		
Birds		
Actitis hypoleucos Common Sandpiper	Migratory	Species or species habitat likely to occur within area
Arenaria interpres Ruddy Turnstone	Migratory	Species or species habitat likely to occur within area
Calidris alba Sanderling	Migratory	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot	Migratory	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper	Migratory	Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint	Migratory	Species or species habitat likely to occur within area

Calidris tenuirostris Great Knot	Migratory	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover	Migratory	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Migratory	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Migratory	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler	Migratory	Species or species habitat likely to occur within area
Limicola falcinellus Broad-billed Sandpiper	Migratory	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit	Migratory	Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit	Migratory	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew	Migratory	Species or species habitat likely to occur within area
Numenius minutus Little Curlew, Little Whimbrel	Migratory	Species or species habitat may occur within area
Numenius phaeopus Whimbrel	Migratory	Species or species habitat likely to occur within area
Pluvialis squatarola Grey Plover	Migratory	Species or species habitat likely to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank	Migratory	Species or species habitat likely to occur within area
Xenus cinereus Terek Sandpiper	Migratory	Species or species habitat likely to occur within area

Migratory Marine Species

Mammals

Balaenoptera edeni Bryde's Whale	Migratory	Species or species habitat may occur within area
Balaenoptera musculus * Blue Whale	Migratory	Species or species habitat may occur within area
Dugong dugon Dugong	Migratory	Species or species habitat likely to occur within area
Megaptera novaeangliae * Humpback Whale	Migratory	Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin	Migratory	Species or species habitat may occur within area

Orcinus orca Killer Whale, Orca	Migratory	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Migratory	Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	Migratory	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta * Loggerhead Turtle	Migratory	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Migratory	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Migratory	Species or species habitat likely to occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Migratory	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Migratory	Species or species habitat may occur within area
Sharks		
Rhincodon typus Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper	Listed	Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly	Species or species habitat may occur within area

	marine area	
Arenaria interpres Ruddy Turnstone	Listed	Species or species habitat likely to occur within area
Calidris alba Sanderling	Listed	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot	Listed - overfly marine area	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper	Listed - overfly marine area	Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint	Listed - overfly marine area	Species or species habitat likely to occur within area
Calidris tenuirostris Great Knot	Listed - overfly marine area	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover	Listed	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Listed	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Listed - overfly marine area	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Heteroscelus brevipes Grey-tailed Tattler	Listed	Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow	Listed - overfly marine area	Species or species habitat may occur within area
Limicola falcinellus Broad-billed Sandpiper	Listed - overfly marine area	Species or species habitat likely to occur within area
Limosa lapponica	Listed	Species or species habitat likely to

Bar-tailed Godwit		occur within area
Limosa limosa Black-tailed Godwit	Listed - overfly marine area	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew	Listed	Species or species habitat likely to occur within area
Numenius minutus Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat may occur within area
Numenius phaeopus Whimbrel	Listed	Species or species habitat likely to occur within area
Pluvialis squatarola Grey Plover	Listed - overfly marine area	Species or species habitat likely to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank	Listed - overfly marine area	Species or species habitat likely to occur within area
Xenus cinereus Terek Sandpiper	Listed - overfly marine area	Species or species habitat likely to occur within area
Fishes		
Campichthys tricarinatus Three-keel Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys flavofasciatus Yellow-banded Pipefish, Network Pipefish	Listed	Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish	Listed	Species or species habitat may occur within area
Doryrhamphus excisus Indian Blue-stripe Pipefish, Blue-stripe Pipefish	Listed	Species or species habitat may occur within area

Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish	Listed	Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish	Listed	Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish	Listed	Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish	Listed	Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish	Listed	Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish	Listed	Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Seadragon, Ribboned Pipefish	Listed	Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse	Listed	Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse	Listed	Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse	Listed	Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse	Listed	Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish	Listed	Species or species habitat may occur within area
Solegnathus hardwickii Pipehorse	Listed	Species or species habitat may occur within area
Solegnathus lettiensis Indonesian Pipefish, Gunther's Pipehorse	Listed	Species or species habitat may occur within area
Solenostomus cyanopterus Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
Syngnathoides biaculeatus Double-ended Pipehorse, Alligator Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bend Stick Pipefish, Short-tailed Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus longirostris Long-nosed Pipefish, Straight Stick Pipefish	Listed	Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong	Listed	Species or species habitat likely to occur within area
Reptiles		
Acalyptophis peronii	Listed	Species or species habitat may occur

Horned Seasnake		within area
Aipysurus apraefrontalis Short-nosed Seasnake	Listed	Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake	Listed	Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake	Listed	Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake	Listed	Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake	Listed	Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake	Listed	Species or species habitat may occur within area
Caretta caretta * Loggerhead Turtle	Listed	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Listed	Species or species habitat may occur within area
Crocodylus johnstoni Freshwater Crocodile	Listed	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Listed	Species or species habitat likely to occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Listed	Species or species habitat may occur within area
Disteira kingii Spectacled Seasnake	Listed	Species or species habitat may occur within area
Disteira major Olive-headed Seasnake	Listed	Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake	Listed	Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake	Listed	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Listed	Species or species habitat may occur within area
Hydrelaps darwiniensis Black-ringed Seasnake	Listed	Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake	Listed	Species or species habitat may occur within area
Hydrophis mcdowelli	Listed	Species or species habitat may occur within area
Hydrophis ornatus a seasnake	Listed	Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake	Listed	Species or species habitat may occur within area
Natator depressus *	Listed	Species or species habitat may occur

Flatback Turtle		within area
Pelamis platurus Yellow-bellied Seasnake	Listed	Species or species habitat may occur within area
Whales and Other Cetaceans [Dataset Information]	Status	Type of Presence
Balaenoptera edeni Bryde's Whale	Cetacean	Species or species habitat may occur within area
Balaenoptera musculus * Blue Whale	Cetacean	Species or species habitat may occur within area
Delphinus delphis Common Dolphin	Cetacean	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus	Cetacean	Species or species habitat may occur within area
Megaptera novaeangliae * Humpback Whale	Cetacean	Species or species habitat may occur within area
Orcaella brevirostris Irrawaddy Dolphin	Cetacean	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca	Cetacean	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Cetacean	Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin	Cetacean	Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	Cetacean	Species or species habitat likely to occur within area
Tursiops aduncus Spotted Bottlenose Dolphin	Cetacean	Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin	Cetacean	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Defence

Unknown

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

Ah Fats Cottage WA

Anglican Church of the Annunciation including Belfry WA

Broome Cemetery Japanese Section WA

Broome Courthouse WA

Broome Pioneer Cemetery WA

Chinatown Conservation Area WA

Customs House (former) WA

Dampier Memorial WA

J Kennedy Family Home WA

Male Family Residence WA

Maurice Lyons House WA

McAlpine House WA

McDaniel Homestead WA

Napier Terrace Cottages WA

Old Police Lockup WA

Pa Normans House WA

Roebuck Bay Hotel WA

Streeter and Male Group of Stores WA

Sun Pictures Gardens WA

Natural

Roebuck Bay Area including Roebuck Plains and Lake Eda WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCLIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Appendix C

THREATENED AND PRIORITY FAUNA SEARCH - CALM

Attachment

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

THREATENED FAUNA INFORMATION

Conditions In Respect Of Supply Of Information

* All requests for data to be made in writing to the Executive Director, Department of Conservation and Land Management, Attention: Senior Zoologist, Wildlife Branch.

* The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided without the prior consent of the Executive Director, Department of Conservation and Land Management.

* Specific locality information for Threatened Fauna is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for Threatened Fauna may not be used in reports without the written permission of the Executive Director, Department of Conservation and Land Management. Reports may only show generalised locations or, where necessary, show specific locations without identifying species. The Senior Zoologist is to be contacted for guidance on the presentation of Threatened Fauna information.

* Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data, they may be present. The Department of Conservation and land Management accepts no responsibility for this.

* Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.

* It should be noted that the supplied data do not necessarily represent a comprehensive listing of the Threatened Fauna of the area in question. Its comprehensiveness is dependent of the amount of survey carried out within a specified area. The receiving organisation should employ a biologist/zoologist, if required, to undertake a survey of the area under consideration.

* Acknowledgment of the Department of Conservation and Land Management as the source of data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Conservation and Land Management, Attention; Senior Zoologist, Wildlife Branch.

18.0715 °S 122.507 °E / 17.7529 °S 122.182 °E Broome

*	Date	Certainty	Seen	Location Name	Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Isoodon auratus auratus **Golden Bandicoot (Wintarru)** *1 records*

The mainland subspecies of the Golden Bandicoot has suffered a drastic decline and contraction in distribution. It is known to occur in a wide range of habitats but is vulnerable to predation by foxes and cats.

1895	0	12	Broome	

Macrotis lagotis **Bilby** *4 records*

This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution.

1965	1	1	Dampier Peninsula	
1970	2	1	Roebuck	Night sighting
1970		1	Roebuck	
1998	1	1	Roebuck	Dead

Rostratula benghalensis australis **Australian Painted Snipe** *2 records*

A rare summer visitor to the watered areas of the north-west and swamps on the Swan Coastal Plain.

1993	1	1	Waterbank	Day sighting
1999	1	2	Roebuck	Day sighting

Schedule 4 - Other specially protected fauna

Falco peregrinus **Peregrine Falcon** *1 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.

1909	1	1	Broome	Day sighting

Priority Two: Taxa with few, poorly known populations on conservation lands

Ixobrychus flavicollis australis **Black Bittern** *1 records*

This species inhabits freshwater pools, swamps and lagoons, well screened with trees.

1898	1	1	Broome	Dead

Priority Three: Taxa with several, poorly known populations, some on conservation lands

Wyulda squamicaudata **Scaly-tailed Possum** *1 records*

This species of possum lives in rugged rocky country often associated with rainforest patches.

1970	2	1	Broome

Priority Four: Taxa in need of monitoring

Hydromys chrysogaster **Water-rat (Rakali)** *1 records*

This species occurs in waterways and wetlands that support its main prey items such as molluscs and crustaceans.

1971	1	1	Broome	Day sighting

Mesembriomys macrurus **Golden-backed Tree-rat** *1 records*

This species occurs in a variaty of near-coastal habitats in the north-west Kimberley.

1895	1	3	Waterbank	Caught or trapped

Orcaella heinsohni **Australian Snubfin Dolphin** *1 records*

18.0715 °S 122.507 °E / 17.7529 °S 122.182 °E Broome

*	Date	Certainty	Seen	Location Name	Method
	2004	1	6	Roebuck Bay	Day sighting

Ixobrychus minutus **Little Bittern** *1 records*

This cryptic species inhabits dense reeds and rushes bordering swamps, lakes and watercourses.

2001	1	1	Waterbank	Day sighting

Falco hypoleucos **Grey Falcon** *5 records*

A nomadic species inhabiting lightly timbered riverine plains.

1901	1	1	Broome	Day sighting
1997	1	1	Broome	Day sighting
1997	1	3	Roebuck Bay	Day sighting
1999	1	1	Broome	Day sighting
2002	1	1	Roebuck	Day sighting

Turnix castanota magnifica **Chestnut-backed Button-quail** *1 records*

2000	1	8	Roebuck Plains	

Numenius madagascariensis **Eastern Curlew** *4 records*

This species is a migratory visitor and has been observed on reef flats and sandy beaches along the West Australian coast and in coastal estuaries.

1998	1	13	Broome	Day sighting
1998	1	167	Broome	Day sighting
1999	1	53	Roebuck Bay	Day sighting
2001	1	20	Roebuck Bay	

Phaps histrionica **Flock Bronzewing** *1 records*

This species is gregarious and occurs in treeless or sparsely wooded grassy plains within reach of open water.

1988	1	1	Roebuck Plains	Day sighting

Polytelis alexandrae **Princess Parrot** *1 records*

Little is known about this species as its occurrence is sporadic through the arid interior. Occurs on red desert sandplains and dunes and along tree-lined watercourses.

1999	2	1	Broome	Day sighting

***** Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation