

Our Ref: 1646A/PJ/ARG/160113

16 January 2013

Mr David Kitto
Director, Mining & Industry Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear David

Re: Traffic Movements, Traffic Noise Assessment and OEH Submission

Further to discussions with Paul Freeman, please find following further information in regard to traffic movements and traffic noise to supplement the information provided in the Environmental Assessment (EA) for modification of the haul route for Major Project 08_0142 Mod1.

In addition also please find information responding to OEH submission dated 14 December 2012 in regard to targeted flora surveys (*Cryptostylis hunteriana* and *Duiris praecox*), biodiversity offsets and Aboriginal cultural heritage matters.

1. Traffic Movements - Hours of Operation

Sections 4.6 and 4.7 of the EA (Umwelt October 2012) states that Mackas Sand is seeking approval to transport sand from Lot 218 operations 24 hours per day, 7 days per week.

Mackas Sand has revised this and is now seeking to transport sand from Lot 218 during the same hours as is approved for operations at Lot 220 being:

- 5.00 am to 10 pm Monday to Saturday; and
- 8.00 am to 12 pm Sundays and Public Holidays.

2. Traffic Movements - Traffic Flow

Several of the submissions raised concerns in regard to potential impact of proposed truck movements on the capacity of the roundabout at the junction of Nelson Bay Road and Richardson Road at Salt Ash. TPK & Associates, the traffic consultant on the project, concluded no analysis was required for the roundabouts for the reasons set out below:

- Intersection capacity determination is the outcome of the analysis of all approach traffic volumes.
- The outcome of analysis provides guidance to the appropriate level of traffic control required (be it simply Give Way signs up to Grade Separated standard). The outcomes of capacity calculations or modelling provides measures such as Level of Service and Degree of Saturation to assist design or determined

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required upgrades. These measures come from analysis of actual volumes against design capacity levels per lane on each approach.

- The necessity to undertake this analysis for any increase in traffic at intersections with significant traffic controls already in place (e.g. a roundabout) is typically generated by only significant traffic volume increases.
- On the roundabouts to be used as part of product transport associated with operations on Lot 218, the directional increase will typically be on one approach movement.
- Nelson Bay Road has maximum peak hour flows of up to 700 vehicles per hour (as counted by TPK & Associates) in each direction. The maximum of 8 trucks per hour that will utilise the Nelson Bay Road/Richardson Road roundabout to return to Lot 218 extraction area is around a 1% increase in that direction. This is not considered to be a significant increase in traffic volumes.
- The truck arrivals will be spread over any hour as they are controlled by the loading process on departure and the range of destinations for the return trips. Therefore 8 trips, in either direction spread over the peak hour equates to an additional vehicle every 6 to 8 minutes on the relevant approach. This increase for any roundabout approach is not a demand that will impact on intersection capacity.
- In project discussions with RMS prior to project submission, the requirement for analysis of the roundabouts was never raised.

3. Traffic Noise

Mackas Sand is seeking approval to construct and utilise a proposed new access road from Nelson Bay Road to access the approved sand extraction area on Lot 218 in DP 1044608 (Lot 218), Salt Ash. The route, as shown on **Figure 1**, is approximately 2 kilometres long and traverses Lot 4 DP 1121457, Lot 1 DP 177679, Lot 810 DP 1008279, Lot 58 DP 753192 and Lot 122 DP 753192. The preferred access route to Nelson Bay Road is via a right of way from Nelson Bay Road to Lot 122 DP 753192 which adjoins the northern boundary of Lot 218. B & R B Mackenzie FT Pty Ltd, which is associated with the development, has a right-of-way over these land parcels.

This noise assessment has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Mackas Sand to investigate the noise impacts associated with the movement of heavy vehicles along the proposed access road.

This noise assessment has been prepared in accordance with the *NSW Industrial Noise Policy* (INP) [Environment Protection Authority (EPA) 2000] and *NSW Road Noise Policy* [Department of Environment, Climate Change and Water (DECCW) 2011].

Assessment Methodology

The proposed new route from Nelson Bay Road to Lot 218 has been considered, in accordance with the INP (EPA, 2000), as a part of the industrial development. Therefore, the proposed new route should be assessed under the INP (EPA, 2000). The residences most likely to be affected by the proposed new access road are the properties immediately adjacent to the proposed new intersection on Nelson Bay Road (shown as Locations 1 to 6 on **Figure 1**). Of these residences at Locations 2 and 4 will be potentially the most affected by traffic noise from trucks while using the private haul road. At the closest point, these residences are approximately 50 metres (Location 4) and 100 metres (Location 2) from the private haul road.

The INP (EPA, 2000) has two components for the assessment of industrial noise sources, intrusive noise impacts and noise amenity levels. When assessing the noise impact of industrial sources both components are considered for residential receivers. The noise environment adjacent to Nelson Bay Road was recorded during the preparation of the original EA (Umwelt, 2009). The results of the monitoring program and resulting criteria are discussed below.



Source: Cadastral - Department of Lands (2009), Aerial - SKM (2011)

Legend

- Proposed Alternate Haul Route
- Proposed Intersection Design
- Noise Receiver Location

FIGURE 1

Noise Receiver Locations

Section 6 of the INP (EPA 2000) requires the prediction of noise levels taking into account all the possible noise sources, operational durations, representative locations, topography and meteorological conditions. The noise impacts associated with traffic movements generated by the vehicles on the proposed new access road and the noise levels generated by Nelson Bay Road were modelled using the US Federal Highway Administration (FHWA) Traffic Noise Model (TNM). TNM is a highway traffic noise prediction and analysis model used to analyse highway geometries including vehicle speeds, vehicle type, setback distances and the effectiveness of barriers. Due to the proximity of the residential receivers to the proposed new access road and to Nelson Bay Road, topography and meteorological effects were not included in the noise modelling.

Hours of Operations

It is understood that to meet market requirements, transport of sand would typically occur during the day-time and evening periods (i.e. up to 10 pm). To enable early access to the site, truck movements would commence at 5.00 am requiring the assessment of noise impacts during a morning shoulder period from 5.00 am to 7.00 am. The EA proposes a maximum rate of laden truck movements hauling sand from Lot 218 of eight trucks per hour (i.e. 16 movements per hour).

Receiver Locations

The *Environmental Assessment of Modifications to Mackas Sand Extraction Operations on Lot 218 and Lot 220 Salt Ash NSW*, (Umwelt, 2012) identified that the proposed modification to use the alternate access road alignment would not result in any additional noise impacts from those set out in the original EA (Umwelt, 2009) other than for residences immediately adjacent to the proposed new intersection on Nelson Bay Road. The location of these residential properties is shown on **Figure 1**.

Existing Noise Environment

The noise environment of properties adjacent to Nelson Bay Road was recorded at 2251 Nelson Bay Road as a part of the Noise Impact Assessment for the original EA (Umwelt, 2009). 2251 Nelson Bay Road is located approximately 800 metres to the west of the proposed intersection on Nelson Bay Road. The noise logger was located 80 metres from the centreline of Nelson Bay Road. The results of the monitoring program, reported as the underlying Rating Background Level (RBL) and the Mean LAeq, period (where 'period' equals day, evening and night) are presented in **Table 1**.

Table 1 - Monitoring Results, dB(A)

Location		2251 Nelson Bay Road			
Period		Day	Evening	Night	Shoulder
RBL		37.6	37.8	30.0	33.8
Intrusiveness (RBL+5)		43	43	35	39
Acceptable Amenity (recpr type)		50	45	40	-
Measured LAeq		55.4	54.6	52.7	-
Table 2.2 industrial noise adjustment		-	-	-	-
High traffic noise adjustment		-10	-10	-10	-
Amenity Criterion		45	45	43	44
PSNL	LAeq, 15 min	43	43	35	39
	LAeq, period	43	43	35	39

Monday to Saturday, Day-time 7.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night-time 10.00 pm-7.00 am.

Sundays and Public Holidays, Day-time 8.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night-time 10.00 pm-8.00 am.

During the monitoring program, data affected by rain or wind speeds in excess of 5 m/s was excluded in accordance with the Section 3.4 of the INP (EPA, 2000). Meteorological data was obtained from the Bureau of Meteorology (BoM) Williamstown automatic weather station (AWS) located approximately 2 kilometres to the west of the proposed intersection.

The noise levels presented in **Table 1** represent the underlying level of noise present at the monitoring location and show influence of traffic travelling along Nelson Bay Road.

Application of the Noise Assessment Guidelines

Project-specific Noise Levels

The INP has two components for the assessment of industrial noise sources, intrusive noise impacts and noise amenity levels. When assessing the noise impact of industrial sources both components are considered for residential receivers.

The monitoring results presented in **Table 1** show that the rated background noise levels (RBL) at 2251 Nelson Bay Road are between 30 to 38 dB(A). The proximity of Nelson Bay Road to the monitoring location has some impact on the background noise environment during the day time and evening periods due to road traffic noise. The Intrusiveness Criteria, presented in **Table 1**, range from 35 dB(A) (the minimum possible intrusiveness criterion under the INP (EPA, 2000)) during the night to a maximum of 43 dB(A) during the day-time and evening periods.

The ambient noise levels, measured as $LA_{eq,period}$, at the monitoring location are affected by road traffic noise from Nelson Bay Road. The INP (EPA, 2000) notes that where the ambient noise level are affected by road traffic noise the amenity criteria would be set at 10 dB below the existing measured road traffic effected noise level. The Amenity Criteria, presented in **Table 1**, at 2251 Nelson Bay Road ranges from 43 dB(A) during the night-time period to a maximum of 45 dB(A) during the day-time and evening periods.

The day-time, evening and night-time project-specific noise levels (PSNL) for the properties adjacent to the proposed new access road are presented in **Table 1**. In accordance with the INP (EPA, 2000) the PSNL for the morning shoulder period is the average of the night-time and day-time PSNLs.

Sleep Disturbance Criteria

The sleep disturbance criteria are based on the guideline publication of the OEH *Noise Guide for Local Government* (DECCW, 2010), which suggests that to prevent sleep disturbance, the $LA_{1,1minute}$ or LA_{max} level of a noise source should not exceed the LA_{90} background noise level by more than 15 dB when measured outside the bedroom window. The sleep disturbance criteria during the morning shoulder period for the properties adjacent to the proposed new access road would be 49 dB(A).

Construction Noise Criteria

The construction activity associated with the development of the proposed new access road would occur during day-time period. OEH's *Interim Construction Noise Guideline* (DECCW, 2009) provides criteria for construction activities as presented in **Table 2** for residences. The criteria are intended to guide the need for and the selection of feasible and reasonable work practices to minimise construction noise impacts.

Table 2 - DECCW Construction Noise Criteria at Residences, dB(A)

Construction Time	Construction Noise Criterion LAeq, 15 minute
Recommended standard hours Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Rating Background Noise Level + 10 dB
Outside recommended standard hours	Rating Background Noise Level + 5 dB

The noise criteria for construction during standard hours at the properties adjacent to the proposed new access road would be 48 dB(A).

Road Traffic Noise Criteria

The OEH's *NSW Road Noise Policy* (DECCW, 2011) sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments or planned building developments.

Table 3 outlines the criteria relevant for the predicted increase in traffic volumes on Nelson Bay Road due to the construction of the proposed new route.

Table 3 - Road Noise Criteria, dB(A)

Road Category	Type of project/land use	Assessment Criteria dB(A)	
		Day (7.00 am - 10.00 pm)	Night (10.00 pm - 7.00 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15 hour) 60 (external)	LAeq(15 hour) 55 (external)

Source: *NSW Road Noise Policy* (DECCW 2011)

Where the criteria in **Table 3** are not achievable through feasible and reasonable mitigation measures, Section 3.41 of the *NSW Road Noise Policy* (DECCW, 2011) gives further guidance stating: 'any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

Noise Modelling

Propose New Access Road

It has been assumed using sound power levels from trucks accessing Mackas Sand operation on Lot 220, that trucks on the proposed new access will travel at 40 km/hr and have a sound power level ranging from 99 to 103 dB(A) depending on speed and road surface.

The noise impacts from use of the proposed new access road were modelled using two different analysis techniques to predict and validate noise levels. Those techniques being:

- a line-of-site attenuation over distance model based on time of exposure for different vehicle speeds and setback distances; and
- the US Federal Highway Administration (FHWA) *Traffic Noise Model* (TNM). TNM is a highway traffic noise prediction and analysis model used to analyse highway geometries including vehicle speeds, vehicle type, setback distances and the effectiveness of barriers.

The predicted received LAeq,15minute noise level associated with truck on the proposed access road entering and leaving the site is presented in **Table 4**.

Table 4 - Predicted LAeq,15minute Noise Levels, dB(A)

Receiver	R1	R2	R3	R4	R5	R6
Intrusiveness Criteria						
Day	43					
Evening	43					
Night	35					
Morning Shoulder	39					
Predicted noise level						
16 movement/hour	34	40	34	41	38	40
10 movement/hour	32	38	32	39	36	38

The results in **Table 4** indicate that at proposed maximum truck movements of 16 trucks per hour, the LAeq,15minute noise levels due trucks entering and leaving the site would achieve the day-time and evening intrusiveness criteria at all the properties adjacent to the proposed new access road. The results indicate that noise levels from 16 trucks per hour could exceed the morning shoulder criteria at R4 by 2 dB. Limiting truck movements to 10 movements per hour in the morning shoulder period as is proposed would result intrusiveness criteria being achieved at all the properties adjacent to the proposed new access road.

Sleep Disturbance

Noise sources that could lead to sleep disturbance are typically transient noises and often have tonal characteristics. The activities occurring within the night period (5.00 am–7.00 am) of the morning shoulder period that could lead to sleep disturbance would be the public road trucks entering and leaving the site.

The predicted received LA1,1 minute noise level associated with a truck entering or leaving the site is presented in **Table 5**.

Table 5 - Predicted LA1,1minute Sleep Disturbance Noise Levels, dB(A)

Receiver	R1	R2	R3	R4	R5	R6
Sleep Disturbance Criteria	49					
Potentially worst case noise level	43	51	44	55	49	49

The results in **Table 5** indicate that the LA1,1 minute noise levels associated with trucks entering and leaving the site during the night period (5.00 am–7.00 am) could potentially lead to sleep disturbance at the resident Locations 2 and 4 adjacent to the proposed new access road.

Based on the noise monitoring at 2251 Nelson Bay Road, the traffic on Nelson Bay Road generated LA1,1minute noise levels ranging from 60 to 65 dB(A).

Construction Noise Impacts

Construction work that is potentially audible at any sensitive receiver location will be undertaken between 7.00 am and 6.00 pm Monday to Friday, 8.00 am to 1.00 pm on Saturdays.

The predicted worst case LAeq,15minute construction noise levels could exceed the OEH's construction noise criteria at the nearest properties to the proposed new access road due to the proximity of the construction activities to the nearest properties. Machine selection and placement and operating times are the key factors to controlling the noise impacts. Therefore a Construction Management Plan will need to be prepared that addresses the management and control of noise impacts at the properties adjacent to the proposed new access road.

Nelson Bay Road

The traffic volumes generated by the Project will result in a minor increase in the traffic volumes on Nelson Bay Road (TPK and Associates, 2012).

The US FHWA Traffic Noise Model (TNM) was used to model the pre and post noise impacts associated with the movement of traffic generated by the truck movements to and from Lot 218 operations on Nelson Bay Road. The predicted increase in road traffic noise impacts due to the Lot 218 traffic are presented in **Table 6**.

Table 6 - Predicted Increase in Road Traffic Noise Levels, dB(A)

Receiver	Criteria	Traffic Noise Levels, LAeq					
		Existing - 2012			Predicted - 2022		
		No Project	With Project	Predicted Increase	No Project	With Project	Predicted Increase
Resident 1	60 dB(A) - Day LAeq,15hr	59.4	59.7	0.3	61.1	61.3	0.2
	55 dB(A) - Night LAeq,9hr	51.8	53.2	1.4	53.3	54.3	1.0
Resident 2	60 dB(A) - Day LAeq,15hr	65.9	66.1	0.2	67.5	67.7	0.1
	55 dB(A) - Night LAeq,9hr	58.2	59.3	1.0	59.7	60.5	0.8
Resident 3	60 dB(A) - Day LAeq,15hr	62.0	62.3	0.2	63.6	63.8	0.2
	55 dB(A) - Night LAeq,9hr	54.3	55.6	1.2	55.8	56.7	0.9
Resident 4	60 dB(A) - Day LAeq,15hr	62.0	62.3	0.2	63.6	63.8	0.2
	55 dB(A) - Night LAeq,9hr	54.3	55.6	1.2	55.8	56.7	0.9
Resident 5	60 dB(A) - Day LAeq,15hr	65.9	66.1	0.2	67.5	67.7	0.1
	55 dB(A) - Night LAeq,9hr	58.2	59.3	1.0	59.7	60.5	0.8
Resident 6	60 dB(A) - Day LAeq,15hr	65.9	66.1	0.2	67.5	67.7	0.1
	55 dB(A) - Night LAeq,9hr	58.2	59.3	1.0	59.7	60.5	0.8

The results presented in **Table 6** indicate the existing traffic volumes on Nelson Bay Road could, depending on setback distances from the road, result in road traffic noise levels exceeding the *NSW Road Noise Policy* (DECCW, 2011) criteria presented in **Table 3**.

Table 6 indicates the existing noise levels could exceed the day-time LAeq(15 hour) criteria of 60 dB(A) and night-time LAeq(9 hour) criteria of 55 dB(A) presented in **Table 3**. The predicted noise levels are not associated with traffic generated by transport of sand from Lot 218. The predicted increase in traffic noise levels from vehicle movements associated with the transport of sand from Lot 218 will be less than the maximum increase of 2 dB recommended in Section 3.41 of the *NSW Road Noise Policy* (DECCW, 2011).

24 Hour Operation

Section 4.6 of the EA (Umwelt, 2012) indicated that Mackas Sand was seeking transport sand from Lot 218 24 hours per day. Before heavy vehicles could access the site during the night-time it is believed a number of additional source related aspects would need to be considered in order to manage the noise impacts associated with heavy vehicles.

The first would be the condition of the road surface. The first 200 metres of the proposed new access route is to be constructed with a bitumen surface. It is important that the quality of the road surface is maintained at all times.

The second aspect to be considered would be vehicle speed. It has been assumed a truck moving at 40 km/hr has a sound power level ranging from 99 to 103 dB(A) depending on speed and road surface. It is likely there will be an optimum speed for the vehicles on the access road that could further reduce the maximum noise level and the LAeq,15minute noise level.

A third noise management issues is the use of exhaust brakes. During the night-time the truck drivers should be instructed to not use the exhaust brakes on their trucks when approaching the intersection.

Prior to any consideration of 24 hour transport operations from Lot 218, it is recommended that site specific noise monitoring be undertaken once the intersection has been constructed to assess the suitability of night-time site access for heavy vehicles.

4.0 Targeted Surveys - Flora (OEH)

4.1 Targeted Leafless Tongue Orchid (*Cryptostylis hunteriana*) Surveys

To address concerns raised by the NSW Office of Environment and Heritage (OEH) in their review of the submissions report (ref:DOC12/51439;FIL12/12562) in regards to adequacy of surveys for the leafless tongue orchid (*Cryptostylis hunteriana*), a targeted leafless tongue orchid (*Cryptostylis hunteriana*) survey was undertaken on 8 January 2013 within the proposed alternate haul route. Suitable habitat within the proposed alternate haul route was identified and parallel transects spaced approximately 2 metres apart were walked by an Umwelt ecologist whilst actively searching for the orchid species. No individuals were observed during this survey.

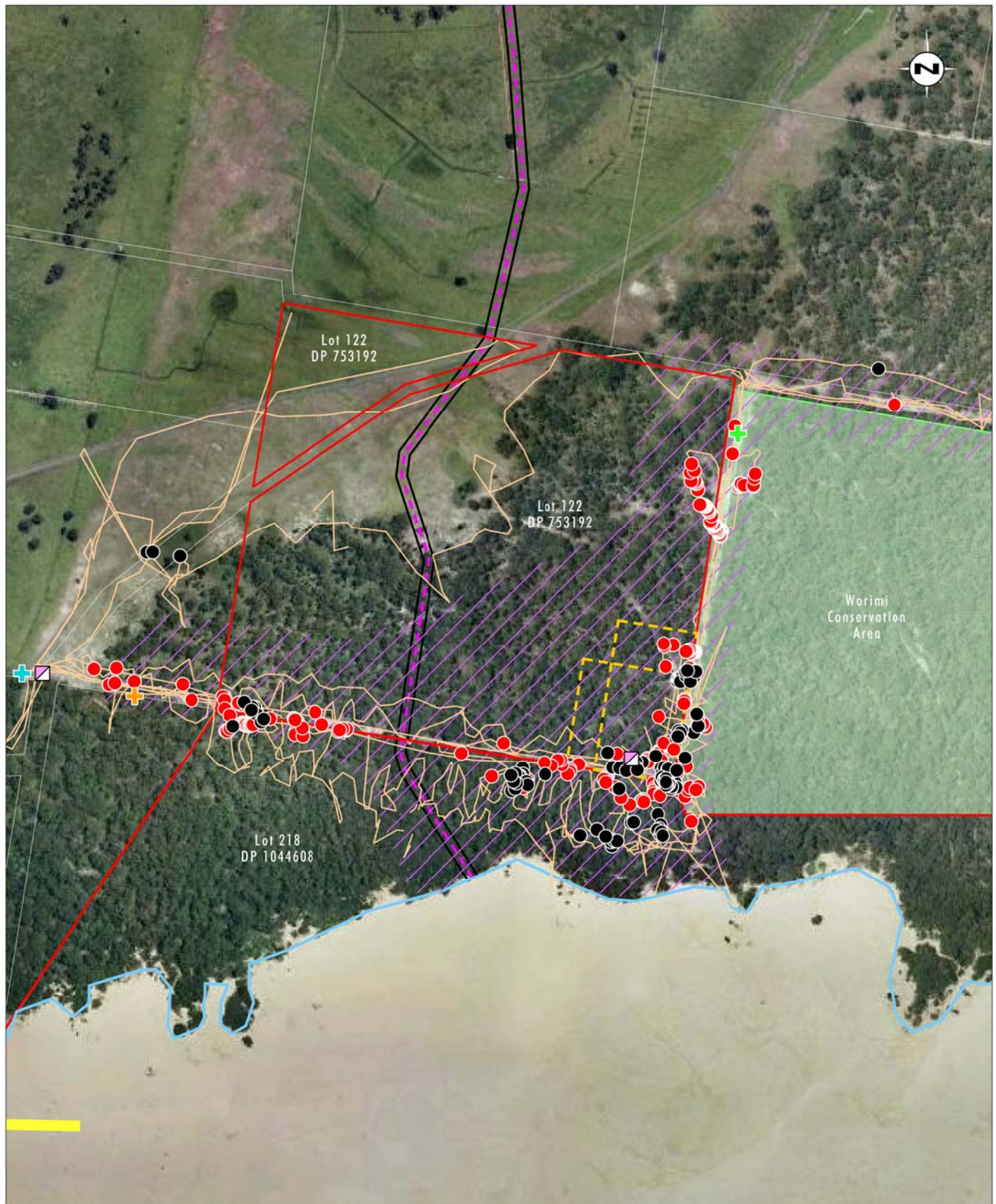
Although no individuals were observed during the survey, the assessment of significance undertaken within the original ecological assessment would remain largely unchanged by this result and the precautionary principle would still be applied to this situation. Whilst it is still the opinion of the Umwelt botanists that selected areas of the proposed alternate haul route may provide habitat for this species, it is considered that a large population is unlikely to occur within the proposed alternate haul route and, as such, a significant impact is unlikely.

Targeted surveys for the leafless tongue orchid (*Cryptostylis hunteriana*) did not locate any individuals within or adjacent to the proposed alternate haul route. This survey was undertaken during the known flowering period for this species (November to February). There is still a potential for impact because of the cryptic nature of this species although it is unlikely to be significant. Further to this, a Biodiversity Offset Strategy has been developed which will conserve and appropriately manage one hectare of potential habitat for this species.

4.2 Newcastle Doubletail (*Diuris praecox*) Survey Clarification

Surveys for *D. praecox* were undertaken in September 2011 during peak flowering. Targeted surveys were undertaken in areas of preferred habitat for this species along the disturbed perimeter of Lot 218 and Lot 122 as well as other areas to the north within the forest habitat on Lot 122 effectively covering over half the potential habitat within the alternate haul route (refer to **Figure 2**). No *D. Praecox* were recorded within the potential haul route during these surveys.

Additional surveys were undertaken across the remainder of the alternate haul route disturbance area in September 2012, following the timing of the previous year's surveys. *D. praecox* was not



Source: Aerial: Google Earth (2009), Cadestral: Department of Lands (2009)

0 50 100 200m
1:5 000

Legend

- | | | |
|---|--|--|
| Lot Boundary | 2011 General Survey Area | ● <i>Diuris praecox</i> |
| Approved Operational Area | 2011 Targeted Orchid Survey Area | |
| Worimi Conservation | + Grey-headed Flying-fox | |
| Proposed Biodiversity Offset Area | + Little Bentwing-bat | |
| Proposed Alternate Haul Route Footprint | + Grey-crowned Babbler | |
| Proposed Alternate Haul Route | + Greater Broad-nosed Bat | |
| Approved Access Route | ● <i>Diuris arenaria</i> | |

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FIGURE 2

Proposed Biodiversity Offset Area and
Targeted Orchid Survey Locations

recorded flowering within the known habitat that was identified in 2011, during this survey. OEH has expressed concerns that the “reference site” surveyed by Umwelt ecologists at Bob’s Farm approximately 4 kilometres from the proposed haul road, does not contain verified samples of the target species. The reference site was identified in an earlier survey for another project and was used to gain a broader understanding if *D. praecox* was flowering in the general area. The exact location of the reference site can be provided to OEH.

Umwelt ecologists are very experienced in the conduct and identification of orchid species and the utilisation of reference sites is considered to be crucial to the conduct of appropriately timed surveys. While it is noted that it is likely that locally occurring *Diuris* species flowered earlier than previous years or not at all during 2012, surveys proposed to the study area were postponed following assessment of reference sites in order to maximise the probability of detection, which is in accordance with flora survey guidelines (DEC, 2004).

D. praecox was recorded along the boundaries of Lot 122, Lot 218 and Worimi Conservation lands during targeted surveys in September 2011 with approximately 250 plants being recorded at this time. The 2011 surveys included all of the disturbed lands where *D. praecox* is likely to occur in the vicinity of the currently proposed haul route alignment and where undertaken at a time when *D. praecox* was highly visible and easily detected. As shown on **Figure 2**, only a small section of the forested area that the haul road passes through was not surveyed at this time. The alignment through the forested section was chosen to avoid disturbance of *D. praecox* recorded in the September 2011 targeted surveys.

An assessment of significance was undertaken whereby the alternate haul route was considered to represent potential habitat and the presence of *D. praecox* was assumed despite the lack of records. The closed and undisturbed nature of the forested section of the alternate haul route does not provide the habitat favoured by these cryptic orchids. Consequently it was considered unlikely that a significant population of *D. praecox* would occur in the short unsurveyed portion of the haul route and it is unlikely therefore that the species’ would be impacted such that a local population could be placed at risk of extinction.

This small unsurveyed area was taken into consideration during the assessment of significance in the original assessment and it was considered unlikely that a significant population would occur in the unsurveyed portion of the haul route and it is unlikely therefore that the species’ would be impacted such that a local population could be placed at risk of extinction.

Further to this, a Biodiversity Offset Strategy has been developed which will conserve and appropriately manage one hectare of known habitat for this species containing approximately 55 recorded *D. praecox* which provides a long term conservation outcome for this species.

5.0 Proposed Biodiversity Offset Strategy (OEH)

Mackas Sand proposes to establish a biodiversity offset to compensate for impacts on biodiversity as a result of the development of the proposed alternate haul route. The proposed Biodiversity Offset Strategy will centre on the establishment of a dedicated biodiversity offset area located within Lot 122 DP 753192 and bordering Worimi Conservation Land (refer to **Figure 2**). The aim of the Biodiversity Offset Strategy is to provide long term protection of the biodiversity through mechanisms to be negotiated with DP&I.

The biodiversity offset area will be one hectare in size and encapsulate a suite of biodiversity values including known habitat for Newcastle doubletail (*Diuris praecox*) and sand doubletail (*Diuris arenaria*) and potential habitat for leafless tongue orchid (*Cryptostylis hunteriana*). The size and location of the offset area was determined through an assessment process whereby the predicted impacts of the proposed alternate haul route and the anticipated likely biodiversity offset requirements were compared to the OEH guidelines *Principles for the Use of Biodiversity Offsets in NSW* (DECC 2008) and the EPBC Act Environmental Offsets Policy (DSEWPC, 2012) and is appended to this letter as **Attachment 1**. The following sections outline the process involved in preparing the biodiversity offset strategy and overarching management requirements.

5.1 Key Drivers for Biodiversity Offsets

To prepare an appropriate Biodiversity Offset Strategy it was necessary to identify the key drivers for offsetting. For the alternate haul route modification to the Mackas Sand project, the following list of species and communities that will, or could potentially be affected, were considered to represent the key drivers for offsetting:

- Coastal Sand Apple – Blackbutt Forest (0.37 hectares);
- Newcastle doubletail (*Diuris praecox*);
- Sand doubletail (*Diuris arenaria*);
- Leafless tongue orchid (*Cryptostylis hunteriana*) potential habitat;
- Koala (*Phascolarctos cinereus*) habitat;
- Squirrel glider (*Petaurus norfolcensis*) habitat;
- Eastern pygmy possum (*Cercartetus nanus*) habitat;
- New Holland mouse (*Pseudomys novaehollandiae*) habitat;
- Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) habitat;
- Little bentwing-bat (*Miniopterus australis*) habitat; and
- Greater broad-nosed bat (*Scoteanax rueppellii*) habitat.

5.2 Field Survey Methodology

A field survey was undertaken on 8 January 2013 to establish the suitability of the proposed biodiversity offset area in terms of its ability to provide habitat for the key drivers for offsetting as identified. The survey consisted of a general walkover inspection of the one hectare area by an Umwelt ecologist taking note of vegetation assemblages and particular habitat characteristics such as hollow-bearing tree abundance.

Field observations were then compared to the findings of previous ecological assessments undertaken within the area (Umwelt 2004, Umwelt 2009) to accurately describe the vegetation assemblages occurring within the proposed biodiversity offset area.

The position of all hollow-bearing trees were recorded with a global positioning system (GPS) and other attributes including tree species and number and size of hollows were recorded.

5.3 Ecological Values of Biodiversity Offset Area

The proposed biodiversity offset area was selected for its ability to adequately compensate for likely and potential impacts on the key offset drivers identified above as well as providing direct connectivity to approximately 4438 hectares of similar habitat within the Worimi Conservation Land.

The proposed biodiversity offset area contains one hectare of Coastal Sand Apple – Blackbutt Forest which is considered to be of comparable condition to the 0.37 hectares proposed to be removed for the alternate haul route. There is a fire break along the perimeter fence bordering the Worimi Conservation Land, where the mid and lower strata vegetation has been slashed. This area is known to provide favourable conditions for both Newcastle doubletail (*Diuris praecox*) and sand doubletail (*Diuris arenaria*). A total of 55 *D. praecox* and 45 *D. arenaria* were recorded within the proposed offset area in 2011.

During the survey of the proposed biodiversity offset area, 19 hollow-bearing trees were recorded within containing a range of hollows entry sizes from small (25 – 50 millimetres diameter) to large (100 – 300 millimetres diameter). A total of 22 small, 29 medium (50 – 100 millimetre diameter) and eight large hollows were observed providing suitable habitat for a range of fauna guilds including micro-bats, scansorial mammals and forest owls. The shrub layer and mid-stratum contain high densities of flowering Proteaceae species, mainly old-man Banksia (*Banksia serrata*), which provide an important food supply for the squirrel glider (*Petaurus norfolcensis*) and eastern pygmy possum (*Cercartetus nanus*). Hollow logs, leaf litter and reasonably dense pockets of bracken fern (*Pteridium esculentum*) and blady grass (*Imperata cylindrica* var. *major*) also occur within the proposed offset area, providing potential habitat for small terrestrial mammals including the New Holland mouse (*Pseudomys novaehollandiae*).

No pests were observed within the biodiversity offset area and only one weed species, bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*), was observed but in very low density.

5.4 Proposed Management of Biodiversity Offset Area

Effective and site specific management practices are pertinent to the success of any biodiversity offset area. The following sections outline the management practices that are proposed for the biodiversity offset area.

5.5 Signposting

The biodiversity offset area is located on private property with fences already existing on two of the four sides separating it from the Worimi Conservation Land. It is therefore considered that fencing the remaining sides is unnecessary and could be detrimental to fauna movement. Signposts will be erected in the four corners of the biodiversity offset area requesting that human activities are kept to a minimum within the area however this is more of a precautionary measure in the event that members of the public accidentally trespass.

5.6 Biodiversity Monitoring

Biodiversity monitoring is an integral part of managing biodiversity offset areas as it allows the land managers to determine the effectiveness of the management practices being implemented and promotes a more adaptive management style.

Biodiversity monitoring is proposed to be undertaken within the biodiversity offset area on an annual basis for the first three years after establishment and in conjunction with the peak flowering periods for *D. praecox* and *D. arenaria*. It is proposed that one monitoring survey is undertaken in the first two weeks of August each year with an additional survey required in the last two weeks of August if *D. arenaria* is not detected in the first survey. The biodiversity monitoring will include a habitat condition assessment of the entire biodiversity offset area and targeted surveys for and stem counts of *D. praecox* and *D. arenaria*. For the first three years, a yearly letter style report will be prepared and submitted to DP&I and OEH. The report will detail the findings of the monitoring surveys and include recommendations for additional management measures, if needed, to be implemented for the next year.

After the three years a comprehensive report will be prepared for DP&I assessing the outcomes of the management practises in terms of measurable impacts on habitat for the key identified drivers for offsetting and any significant population changes of *D. praecox* and *D. arenaria* compared to the 2011 survey results (Umwelt, 2012). Monitoring will then be reduced to a biennial basis up until year nine. At this stage another comprehensive report will be prepared for DP&I with further recommendations made about the need for ongoing monitoring.

The proposed Biodiversity Offset Strategy will compensate for the loss of biodiversity as a result of the development of the proposed alternate haul route. The proposed Biodiversity Offset Strategy will include the establishment of a dedicated biodiversity offset area located within Lot 122 DP 753192 and bordering Worimi Conservation Land which will provide a suitable long term biodiversity offset for the ecological features considered to be potentially impacted upon by the development of the alternate haul route.

References

Department of Environment and Climate Change (DECC) (2008) *Principles for the Use of Biodiversity Offsets in NSW*.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2012) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, October 2012.

Umwelt (Australia) Pty Limited, 2004. Flora and Fauna Assessment for Proposed Rezoning of Lot 218, Stockton Bight. Draft report prepared for Worimi Local Aboriginal Land Council.

Umwelt (Australia) Pty Limited, 2009. Ecological Assessment of Sand Extraction Operations from Lot 218 DP 1044608 and Lot 220 DP 1049608, Salt Ash. Prepared for Mackas Sand.

6. Aboriginal Cultural Heritage

In relation to the commitment to update the Aboriginal Cultural Heritage Management Plan (ACHMP) for the project, the recommendation to incorporate the recent legislative Aboriginal cultural heritage reforms into the review of the ACHMP is noted and will be undertaken.

It is understood that OEH requires further discussion of 'contrary or differing positions to those of the RAPs if there is disagreement with the outcomes of the assessment process' including any information on efforts to address concerns identified by the registered Aboriginal parties. As documented in Sections 2 and 10 and Appendix 1 of the Aboriginal cultural heritage assessment, consultation with the registered Aboriginal parties regarding the project has been ongoing. Section 10 and Appendix 1 of the Aboriginal cultural heritage assessment include comments from Worimi LALC who support the development and four Aboriginal parties (Nur-Run-Gee Pty Ltd., Mur-Roo-Ma Inc., Carol Ridgeway-Bissett and Viola Brown) regarding their lack of support the development proposal.

Worimi LALC states that the recommendations provided in Section 9.1 provide adequate protection for Aboriginal objects of cultural value to Aboriginal people of the area.

The objections of the other four parties were initially voiced by the same Aboriginal parties in relation to previously proposed alternate haul routes, as initiated in February 2010 and discussed in the current Aboriginal cultural heritage assessment. In response to concerns raised by Aboriginal parties and in recognition of the potential archaeological value of sections of the alternate haul route, the proposed construction methods for the section of the alternate haul route were modified to involve laying geotextile over the natural ground surface and introducing fill material to provide a suitable road surface. As described in Section 8, the use of this construction method dictates that it will not be necessary to undertake significant ground disturbance works within A3 and sub-surface deposits will be protected from impacts associated with construction and use of the alternate haul route.

In correspondence received in relation to alternate haul routes, Mur-Roo-Ma acknowledged this approach, stating that while they generally support the management recommendations provided in the draft report in relation to proposed mitigation activities, 'we strongly believe this proposed access road should not be passed, while there is access to the sand extraction face under DA-08-0142 approved by the planning department.' Similarly, Nur-Run-Gee acknowledged that the research design and methodology for additional archaeological investigations is appropriate but that 'no further destructive plans be submitted for that area as there already exists an agreement which utilises, sensibly and reasonably, a previous haulage road.' It is our understanding that both of these parties accept that the change in construction method and the proposed archaeological investigation methodology are designed to mitigate impacts to cultural heritage, they feel that the appropriate cultural option would be to avoid construction of the road altogether. This input is considered and noted in the Aboriginal cultural heritage assessment, as required under the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECC, 2010:19). However, as the proponent identified that use of the approved construction route was no longer considered viable, this option was not proposed in the Aboriginal cultural heritage assessment (as specified in DECC, 2010:19).

Further comments were received via phone from Carol Ridgeway-Bissett with regard to the wider Environmental Assessment (EA). Carol requested that a range of factors be considered within the

wider EA. The factors discussed and where addressed is presented in Table 7. Carol also commented on the need for ongoing commitment to any rehabilitation measures within consent documentation after the completion of initial works. Carol was satisfied with the affirmation of Umwelt that the EA would cover all potential for impacts as required by the Department of Planning and Infrastructure, and the detailing of ongoing reporting processes to ensure effectiveness of any rehabilitation or other ongoing consent requirements.

Table 7 - Relevant EA Sections

Factor raised by Carol Ridgeway-Bissett	Section where addressed in EA
Flora and Fauna	Section 4.3
Cultural Landscape	Section 4.4
Tangible and Intangible Record	Section 4.4
Acid Sulphate Soils	Section 3.3.2
Reburial of Artefacts	Managed through ACHMP
Traffic	Section 4.6
Rehabilitation	Section 4.10

Please don't hesitate to contact either Andy Goodwin or Peter Jamieson on (02) 4950 5322 if you would like to discuss any aspects of this response further.

Yours faithfully



Peter Jamieson
Director

Attachment 1

Assessment of the Biodiversity Offset Strategy against Offsetting Guidelines

This attachment documents the Biodiversity Offset Strategy against the NSW and Commonwealth guidelines for biodiversity offsetting.

1.0 Assessment of the Biodiversity Offset Strategy against the Principles for Biodiversity Offsetting (DECC 2008)

The following provides an assessment of the Mackas Sand Access Road Modification Project (alternate haul route) Biodiversity Offset Strategy against these principles.

1. Impacts must be avoided first by using prevention and mitigation measures.

The alternate haul route has been designed in a manner that aims to avoid disturbance to the ecological features. In particular, the design of the alternate haul route was such that it avoided all known locations of Newcastle doubletail (*Diuris praecox*) and sand doubletail (*Diuris arenaria*).

2. All regulatory requirements must be met.

The Biodiversity Offset Strategy has been developed in accordance with the necessary offsetting regulatory requirements.

3. Offsets must never reward ongoing poor performance.

The proposed offset area is well managed and has been historically been left undisturbed except for the sand track that is located along the eastern boundary of Lot 122 and is managed as a firebreak between Lot 122 and Worimi Conservation lands.

4. Offsets will complement other government programs.

The biodiversity offset area is located adjacent to the Worimi Conservation Lands which are co-managed by the Aboriginal traditional owners and National Parks and Wildlife Service and therefore is complementary to the government reserve system.

5. Offsets must be underpinned by sound ecological principles.

The Biodiversity Offset Strategy has been developed with the aim to maintain or improve the biodiversity values. The biodiversity offset area has been selected because of the ecological features it contains and its direct connection with the Worimi Conservation Lands.

6. Offsets should aim to result in a net improvement in biodiversity over time.

The proposed Biodiversity Offset Strategy has been developed with the aim to maintain or improve the biodiversity values. With the various impact mitigation and offset strategies to be employed it is likely that such an improvement will occur, particularly given that the offset area is situated next to a conservation reserve.

7. Offsets must be enduring and they must offset the impact of the development for the period that the impact occurs.

The biodiversity offset area will be secured for long-term conservation. The mechanism for securing this conservation will be determined in consultation with DP&I, OEH, and DSWEPC, as required.

8. Offsets should be agreed prior to the impact occurring.

The Biodiversity Offset Strategy allows for the up-front protection and conservation management of the biodiversity offset area, to provide immediate compensation for loss of habitat from the development of the alternate haul route. It is anticipated that all offsets will be agreed prior to the impact occurring.

9. Offsets must be quantifiable and the impacts and benefits must be reliably estimated.

The area of impact and offset benefits has been derived from detailed GIS mapping and the ecological survey, mapping and impact assessments have been completed by qualified ecologists with considerable experience in the region.

All relevant ecological features of the offset sites are quantifiable.

10. Offsets must be targeted.

The development of the Biodiversity Offset Strategy has been based on addressing the identified ecological impacts of the proposed alternate haul route. These impacts have been identified via a thorough survey and assessment process and the application of the precautionary principle where necessary. The selection of the biodiversity offset area focused on areas providing 'like for like' features and reserve connectivity.

11. Offsets must be located appropriately.

The biodiversity offset area is located in an area that contains the relevant ecological features required for offsetting the impacts of the alternate haul route. Additionally, the biodiversity offset area is located adjacent to the alternate haul route and adjacent to Worimi Conservation Lands

12. Offsets must be supplementary.

The biodiversity offset area proposed does not overlap with any other government funded protection or habitat restoration program.

13. Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

It is expected that the Biodiversity Offset Strategy will be included within the project approval conditions, and any other relevant legally binding consents. As noted previously, the biodiversity offset area will be secured for long-term conservation. The mechanism for securing this conservation will be determined in consultation with DP&I, OEH, and DSWEPC, as required.

2.0 Assessment of the Biodiversity Offset Strategy against the Commonwealth Environmental Offsets Policy 2012

This section provides an assessment of the biodiversity offset strategy proposed against the Environmental Offset Policy.

1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.

The proposed Biodiversity Offset Strategy has been developed with the aim to maintain or improve the biodiversity values. With the various impact mitigation and offset strategies to be employed it is likely that an improvement will occur, particularly given that the offset area is situated next to a conservation reserve.

The biodiversity offset area will be secured for long-term conservation. The mechanism for securing this conservation will be determined in consultation with DP&I, OEH, and DSWEPC, as required.

2. Suitable offsets must be built around direct offsets but may include other compensatory measures.

The Biodiversity Offset Strategy comprises a direct land-based offset that occurs adjacent to the area of proposed impact.

3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.

The level of statutory protection that applies to the potentially impacted Matters of National Environmental Significance (MNES) was considered during offset area selection to ensure that adequate offsets were obtained, commensurate with the status of the threatened or migratory species.

4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.

No MNES were recorded or considered likely to be significantly impacted by the development of the alternate haul route. One species, Newcastle doubletail (*Diuris praecox*), has been recorded in the vicinity and was considered when developing the Biodiversity Offset Strategy. The biodiversity offset area has been positioned such that a total of at least 55 *D. praecox* will be conserved.

5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding.

The Biodiversity Offset Strategy is based on the use of a direct land-based offset located adjacent to the proposed alternate haul route. The biodiversity offset area provides known habitat for the MNES that may potentially be impacted upon thereby reducing the risk that habitat utilisation of the site will be limited by unmeasured factors.

6. Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.

As discussed above, the biodiversity offset area proposed does not overlap with any other government funded protection or habitat restoration program.

7. Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.

The proposed biodiversity offset area is currently owned by Mackas Sand and as such the dedication of the biodiversity offset area will be efficient, effective and timely. The proposed biodiversity offset area is located adjacent to the proposed alternate haul route and as such has been studied to varying extents in each of the previous ecological surveys (Umwelt 2004, Umwelt 2008 and Umwelt 2012) surveyed again on 8 January 2013.

The area of impact and offset benefits has been derived from detailed GIS mapping and the ecological survey, mapping and impact assessments have been completed by qualified ecologists with considerable experience in the region ensuring that the Biodiversity Offset Strategy is scientifically robust, transparent and reasonable.

8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced

It is expected that the Biodiversity Offset Strategy and integrated monitoring program will be included within the project approval conditions, and any other relevant legally binding consents. As noted previously, the biodiversity offset area will be secured for long-term conservation. The mechanism for securing this conservation will be determined in consultation with DP&I, OEH, and DSWEPC, as required.