RESPONSE TO OEPA SUBMISSIONS

Please note that all tables and figures are presented at the back of the main table

OEPA Comment	Proponent Response 1	OEPA Response to Proponent Response	Proponent Response 2
Flora and Vegetation			
Please provide additional detail regarding the management, monitoring and mitigation of indirect impacts to Flora and Vegetation as a result of the construction and operation of the haul road. Where possible indirect impacts should be quantified. Indirect impacts which should be addressed in the Response to Submissions include the following: • Increases in weed species and densities; • Changes to surface water hydrology; • Dust; • Changes to fire regimes; and • Erosion.	**As outlined in the Haul Road Management Plan Section 4.3.2 the indirect potential impacts to flora and vegetation from the Project include:** • **modification of surface and groundwater flows (surface hydrology and erosion);** • **introduction and spread of weeds;** • **generation of dust from mining activities and haul road;** • **use of saline water and binding agent along the haul road; and** • **alteration of fire regime.** **A complete monitoring program for flora and vegetation will be developed once impacts have been quantified, however, a plan cannot be developed until on-ground surveys and the final design of the haul road have been completed.** **Once these tasks have been complete a Flora and Vegetation Monitoring Plan will be develop that includes: a monitoring framework, monitoring program, trigger values and mitigation, management and contingency measures for any indirect impacts from the Project.**	Lost Sands response does not provide any attempt to quantify the indirect impacts to Flora and Vegetation. For example, no modelling of dust had been attempted to demonstrate how many hectares of vegetation within the GVDRN would be impacted by dust deposition during the operations of the haul road. No justification has been provided as to why this comment has not been addressed. The OEPA acknowledges Lost Sands' assertion that precise quantification of infrastructure impacts cannot be provided to the completion of detailed road design, but expects that some attempt on broad estimation of indirect be made in the Response to Submissions. The OEPA acknowledges Lost Sands' assertion that detailed monitoring and management plans cannot be finalised prior to the quantification of impacts and final design of the haul road. However, the OEPA considers that further information is required as to the level of management which Lost Sands would consider practicable for the proposal, relative to acknowledge best practice. In particular, Lost Sands should provide an indication of their commitments to weed management including staff hours and other resources which would be committed to management of weeds within the GVDNR, subject to criteria being met	**Although a precise quantification of infrastructure impacts cannot be provided to the completion of detailed road design, the following section provides a broad estimate and assessment of indirect impacts of the construction and operations of the haul road within the GVDNR. The proposed haul road will be the only infrastructure within the GVDNR. The estimation of indirect impacts includes additional modelling activities related to indirect impacts of dust and hydrological processes on the GVDNR.** **<u>Indirect impacts resulting from the generation of Dust from the</u> Haul Road** **Information regarding the indirect impact resulting from dust depositing on vegetation along corridors is limited, with the majority of information centered on mines in the mid-west, Goldfields and Pilbara regions of WA. Hence, the majority of the available literature refers to dust generated from iron-ore mining operations. The dust generated from these operations, including the use of internal unsealed haul roads was reviewed to determine if dust deposition on native vegetation can indirectly impact the health and condition of vegetation. A Dust Management Plan has been develop for implementation by the Project avoid and minimise potential direct and indirect impacts of dust on vegetation, flora, fauna and human health from Project operations at the mine, along the haul road and a the Forest Rail Siding.** **A recent review from the Jack Hills mine operated by Crosslands Resources identified elevated dust levels up to 2 km from the mining operations (Turner 2013). The elevated dust loads were not necessarily considered to be detrimental to the natural processes of vegetation recorded in the region, however, a distance of less than 600 m from the active mine was considered to be the critical threshold for vegetation disturbance for the Jack Hills project (Turner 2013). The indirect impact on vegetation was significantly reduced beyond the 600 m distance. The dust load created from an active mine is considered to be significantly higher than from a haul road with road trains making eight trips per day.** **Iluka Resources Limited (Iluka) have been undertaking a research program on the effects of dust deposition and smothering on *Maireana sedifolia* (Law and Lee 2014). Vegetation monitoring transects and dust deposition gauges have been established a varying distances (0, 1 and 2.5 km) from the mine site, with only pearl bluebush (*Maireana sedifolia*) chosen to assess dust impacts due to the ability to trap and hold dust with the aid of trichomes (thick layer of fine hairs) on the leaves and stems. The results of the 2012-2013 monitoring indicated that dust deposition is highest nearer the source, with the additional dust loading on plants appearing to have a negative impact on the overall health of plants and the health of leaf growth, however, monitored shrubs do not show any effects for flowering and canopy cover (Law and Lee 2014). Pearl bluebush occurs within the Project along the entire length of the haul road in varying densities.** **The use of the haul road is likely to create 'Settled Dust' which is the coarse fraction that typically arises due to mechanical disturbance of the surface (e.g. truck wheels on a gravel road) (Metreo 2014). Dust of this particle size typically settles out completely within 400 m of the source (in this case, an unsealed road), with the majority of it settling out within 50 m (Metreo 2014).** **Pacific Environment Limited (PEL) were commissioned to undertake an emissions assessment of the haul road within the GVDNR to provide an indication of the potential distance that dust may be dispersed from the haul road (Attachment 3). In determining the extent of dust loading on vegetation, PEL adopted an indicative assessment criteria of 4.2g/m^2/30 days (PEL 2016). This value was determined based on the critical dust load of 5g/m^2 recommended by Turner (2013).** **The emissions were modelled at discrete receptors at 50 m intervals downwind of the haul road until 1 km and then every 1 km until 5 km (PEL 2016). The PEL (2016) dust modelling indicated that less than 0.6 g/m^2/30 days will settle out at the 400 m mark, with significantly higher levels at the 50 and 100 m level. If the elemental composition of the settled dust is benign, then the potentially significant impacts of this type of dust is confined to smothering of vegetation and fauna habitats and nuisance soiling.**

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			In a worst case scenario, it is expected that the criteria will potentially be exceeded up to 150 m downwind of the haul road, with no exceedance expected further downwind (PEL 2016). This is considered to be a very conservative assessment and is based on a constant westerly wind (also applicable for easterlies). Depending on the direction of the wind, the impact can be expected to be significantly lower (i.e. for a southerly wind the deposition will be along the haul road section with minimal deposition of the surrounding vegetation) (PEL 2016). **The calculation of the maximum extent assumes a 150 m corridor for the length of the haul road (240 km) with the entire length of the haul road consisting of vegetation that is considered to be susceptible to dust impacts resulting in a loss of health. This value is considered to be a worst case scenario and review of the vegetation associations and the dominant flora species was undertaken to determine if the communities would be more susceptible to dust impacts resulting from the loss of key dominant flora species.** **Turner (2013) identified that the traits considered to be impacted detrimentally from dust included flat, striate leaves and hairy leaves. Plant height and leaf orientation did not significantly contribute to dust load, while surface roughness (i.e. the presence of hairs or trichomes) and leaf posture were key traits that could predict dust loads (Turner 2013). This was supported by Butler (2009) who determined that rough leaves trapped more dust than glabrous leaves, while shrubs less than 2 m tall with hairy leaves collected 40 times more dust than other vegetation with different attributes.** **The key dominant perennial species from each of the vegetation associations along the entire haul road was reviewed to determine if the leaf (or phyllode) structure was either flat and striated or hairy (i.e. tomentose, pubescent). Key assumptions were made regarding the leaf structure, while these are considered to be very simplified, they do provide some measure of susceptibility to dust impacts. A total of 60 trees and shrubs were reviewed, utilising Florabase (WAH 2015), Chinnock (2007) and DoE (2015), to determine the simplified leaf structure).** **The extent of the vegetation associations within 300 m of the haul road centreline has been mapped to provide a broader extent of dust susceptibility based on the presence of the 60 species and their dominance within the vegetation association. The 300 m extent allows for 150 m either side of the centreline assuming either a straight westerly or straight easterly wind.** **Assuming a worst case scenario that the dust will settle out and impact vegetation within the first 150 m of the haul road and the vegetation likely to be impacted consists of either flat, striate leaves (for example *Acacia aneura*) (Turner 2013) or sub-shrubs with hairy leaves (for example *Eremophila forrestii*) (Butler 2009), the maximum extent of indirect impact is approximately 3,600 ha along the length of the haul road.** **The susceptibility to dust impacts was rated based on a 'High', 'Medium' and 'Low' rating (Table 2) with regards to the leaf traits and information obtained from the literature.** **The extent of vegetation within 300 m along the entire haul road considered to have a 'High' dust susceptibility is 2,442 ha, with approximately 1,614 ha of the total located within the GVDNR. An additional 2,675 ha (of which 2,582 ha is located within the GVDNR) has a 'Medium to High' rating, while the remaining 2,274 ha (356 ha located within the GVDNR) is considered to have a 'Low' dust susceptibility rating (Figure 1).** **The review of the dominant trees and shrubs identified five (*Acacia aneura, Acacia ayersiana*, *Acacia caesaneura, Acacia kempeana* and *Acacia mulganeura*) species that would have a high susceptibility to dust damage and an additional four species (*Acacia aptaneura, Acacia minyura, Acacia oswaldii* and *Acacia papyrocarpa*) that were rated as 'Medium to High' based on the leaf traits** **A further 14 species were rated as 'Medium', while the remaining 36 species were rated as 'Low'** **).** **In determining the susceptibility of the vegetation associations to dust, a few key assumptions have been made which need to be considered when reviewing the response with regards to quantifying the indirect impact of dust on vegetation. The key assumptions are:** • **Dust suppression and management/mitigation measures have not been included in determining the extent of dust impacts.**

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			• The dust produced from the haul road is considered to only comprise of inert, 'Settled' dust. • The dust will impact vegetation to an extent of 150 m from the source (i.e. the haul road). • The 150 m extent is considered to be a worst case scenario. • The indicative assessment criteria of 4.2g/m2/30days was adopted (PEL 2016), based on the work of Turner (2013). • No account for the size of dust particles has been made. • Very broad, simplified conclusions have been made regarding the size, shape and structure (i.e. nerves, indumentum, resin, glabrous etc.) of the leaves from the 59 species. • Only 59 (or approximately 16%) flora species from the 369 flora species recorded were reviewed further. These species were chosen because they were considered to be the dominant or co-dominant species of the 43 described vegetation associations. The loss of these key species would impact on the association and the habitat they provide for the local fauna assemblage. • Annuals, grasses, short-lived perennials and ephemerals were not considered due to their short-lived nature, with dust considered to be a negligible factor in relation to the survival of these species. • Only the vegetation associations along the 240 km haul road were reviewed. <u>Indirect impacts resulting from an increase in weed diversity/density</u> Twelve introduced flora were recorded from the Study Area during the 2013 and 2014 surveys (Outback Ecology 2014). Of the 12 introduced flora recorded, none are considered to be Weeds of National Significance (WONS), while two are listed as Declared Plant Pests (DPPs) under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), however, not for the Shires of Menzies and Laverton and the City of Kalgoorlie-Boulder, which the Project is located within. Five (**Brassica tournefortii, *Carrichtera annua, *Erodium aureum, *Erodium cicutarium* and **Heliotropium europaeum*) of the 12 introduced species recorded may potentially become invasive within the Study Area. The remaining seven introduced species are not considered to be invasive and occur in low isolated numbers across the Study Area. In addition to the 12 introduced species recorded from the Study Area, an additional seven introduced species (Table 3) have previously been recorded from the subregions the Study Area occurs within. Of the seven additional introduced species, two, **Carthamus lanatus* and **Cenchrus ciliaris*, are considered to be invasive. Buffel Grass (**Cenchrus ciliaris*) was nominated for listing as a 'Key Threatening Process' under the EPBC Act in 2012, however, was not included in the final listing (DEC 2013). Saffron Thistle (**Carthamus lanatus*) is regarded an environmental weed in all states and territories (except Tasmania). The likelihood of introducing new weed species along the haul road, with particular regard to the GVDNR, is considered to be unlikely. The management and mitigation measures, including vehicle hygiene washdown locations (see Response 4), will ensure no new weed species are introduced. In addition, if the weed monitoring identifies any new species, these locations will be managed to ensure they do not establish and spread along the haul road corridor. Annual comprehensive weed monitoring (in accordance with the 2011 DEC - *Standard Operating Procedure for Mapping Weed Distribution and Cover in Bushland* (SOP No: 22.1)), as well as quarterly visual monitoring will occur during the life of the project. The proposed monitoring will actively identify any new populations or species, while existing populations will be monitored to ensure they are not increasing or spreading beyond the baseline levels. Further information of weed monitoring and management is provided in Response 4. As a result, the indirect impacts to vegetation along the haul road corridor as a result of weed diversity/density is considered to be negligible and is unlikely to exceed current levels. If an increase is recorded during the monitoring programs, appropriate mitigation measures will be triggered (see Response 4) to either eradicate (where achievable), or reduce the extent to baseline levels. <u>Indirect impacts resulting from changes to surface water hydrology</u>

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			The surface water catchments across the proposed haul road are small, locally limited and not well defined. Surface water expressions when present are typically trapped pools or gullied ruts from local slopes. Due to the combination of flat topography and arid climate, watercourse will flow infrequently and only following heavy rain. Depending on the intensity of the rainfall event, flow may occur for only a short period of time. Surface water flows in flood events will likely flow along the line of the sand dunes and eventually attenuate due to a combination of flat topography, poorly defined drainage, infiltration and evaporative losses. **Two major and four minor drainage lines cross the proposed haul road. The peak flows through the major and minor drainage lines are difficult to determine due to the poorly defined catchments. As a result, the indirect impacts to native flora and vegetation is difficult to quantify.** **Flood hydrology was developed for two catchments crossing the proposed road alignment. Catchment and sub-catchment areas were delineated from the available 1-second digital elevation model (DEM), with a grid size of approximately 30 m x 30 m. Design rainfall was based on the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data.** **The north and south catchment areas are 452 and 3,171 km², respectively. Based on an indicative life of mine of 10 years, the event corresponding to a 20% risk of occurrence over that timeframe would be between the 20-year average recurrence interval (ARI) and the 50-year ARI events. For haul roads and other facilities that would not be damaged or could be repaired relatively quickly following inundation, a lower ARI design standard may be warranted. A 20-year ARI design flow was used for this assessment.** **Further information regarding the surface hydrology models developed is provided in Response 19, under Hydrological Processes.** **The north catchment area discharge of 30 m3/s results in a flow depth of approximately 1.4 m. The average flow velocity at this peak flow rate is estimated at approximately 0.5 m/s.** **The south catchment area discharge of 35 m3/s results in a flow depth of approximately 1.5 m. The average flow velocity at this peak flow rate is estimated at approximately 0.5 m/s. Although the south catchment is significantly larger than the north catchment, a combination of lower catchment rainfall (point rainfall converted to catchment rainfall, where, for the same storm duration, a bigger reduction will apply to larger catchments) and higher storage losses in the long reaches associated with the larger catchment (routing of flows through the longer reaches resulting in increased attenuation compared to the smaller catchment) result in comparatively lower peak flows.** **These depths exceed safe crossing thresholds and the haul road would be expected to be closed well in advance of the arrival of design flow rates. Velocities are relatively low, and the erosive forces associated with these flows would not typically warrant the placement of substantial armour material, except potentially where localised drains enter channels. This will have to be determined during concept and detailed design stage.** **Assuming that the haul road will be at or very close to grade and will include a series of floodways at creek crossings, little impact is expected on the flow rates crossing the haul road. Either, floodway type crossings (i.e. road at grade) or a raised crossing with engineered designs (i.e. culverts) will be sufficient to direct water across the road and largely maintain natural flow patterns. Pending the design used, some pooling may occur upstream of the road, which could result in indirect impacts on vegetation upstream of the road. Impacts are likely to be insignificant and short-lived, given the ephemeral nature of the area and high infiltration and evaporative losses.** **Where low flows and sheet flows are intercepted and/or modified there is an increased potential for localised ponding to occur immediately upstream and water shadows to develop immediately downstream of the haul road. This impact is most likely to occur when sheet flows are interrupted and is less likely to occur if channelised drainage is intercepted.** **It is, however, noted that most watercourses in the area are short and ephemeral and surface water expressions are restricted to salt plains, pools and non-perennial lake systems. Indirect impacts of the road can therefore be expected to be insignificant or limited to small areas downstream of the road. Areas of impact will however depend on the final road design, including whether the road will be**

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			elevated above grade and whether measures such as environmental culverts are incorporated into the design to maintain upstream and downstream flow connectivity to reduce potential impacts. **The road design would also be expected to include sufficient armouring or bank stabilisation at concentrated flow crossing locations to prevent excessive erosion and downstream deposition of sediments.** **The roadway design, supported by detailed studies, would need to be progressed to be able to quantify indirect impacts with reasonable confidence.** **<u>Indirect impacts resulting from erosion</u>** **The indirect impacts resulting from the erosion of soil and land surfaces along the proposed haul road are considered to be minor and concentrated along the culverts and floodways. The flow of surface water through the culverts and across the floodways may scour and erode the soil surface during high flow events (i.e. flooding after heavy rainfall).** **Standard floodway and culvert mitigation measures, including armouring and bank stabilisation will reduce the likelihood of severe erosion. As discussed above, the peak flow discharge rates (of 30 and 36 m^3/s) for the two catchments are considered to have low flow velocities, and the erosive forces associated with these flows would not typically warrant the placement of substantial armour material, except perhaps where localised drains enter channels.** **<u>Indirect impacts resulting from changes to fire regimes</u>** **The recognised threats to the conservation values of the GVDNR, as identified during consultation with relevant stakeholders, include; inappropriate fire regimes and feral herbivores (particularly camels) (PER, Section 5.8.3 Page 132).** **Construction and operation of the haul road is acknowledged to have at least the potential to result in the initiation of fire that may spread to the surrounding vegetation if not controlled (PER, Section 5.1.2.6 Page 87). Construction and operation of the haul road could initiate unintentional fires along its length by increasing sites for ignition. Furthermore, if these ignitions are not controlled broadscale wildfire could result affecting desired fire regimes for native vegetation.** **Conversely the haul road would act as a fire break facilitating the control of broadscale wildfire detrimental to vegetation communities and facilitate access for fire-fighting equipment.** **Public access to the haul road will be prevented during construction and operation; the haul road will remain private throughout the life of the mine, with access made available to the Pila Nguru and the Department of Parks and Wildlife (DPaW) (PER, Page 88), thereby mitigating any potential ignition sources from the public. Therefore the Pila Nguru and minesite staff / contractors will be the only potential sources for fire ignition and mitigation can be facilitated via appropriate training and inductions.** **A Fire Minimisation Plan and Haul Road Management Plan has been developed (PER, Appendix C). The objective of the Fire Minimisation Plan is to prevent the occurrence and spread of fire within the Project area. The key performance indicator of this plan is to maintain the project area as bushfire free - and to effectively control any fire that occurs within the Project area. This performance indicator applies equally to all fires irrespective of their ignition source. Hence the plan incorporates: training, prevention and containment, detection and reporting, available equipment, and fire response procedures to mitigate any unintentional ignition.** **A Fire-Fighting Procedure will also be developed to ensure relevant fire-fighting supplies and equipment are suitable and available and to ensure fire-fighting and communications protocols are clearly identified and understood by relevant Project personnel.** **Inductions and correspondence to all employees, contractors, and stakeholders including the Pila Nguru will reinforce the key components of the Fire Minimisation Plan including training, prevention**

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			and containment, detection and reporting, equipment available, and fire response procedures (PER, Appendix C: Fire Minimisation Plan). **Records of all fires initiated from, or impacting the Project area, will be included in the Annual Environmental Report (AER). This will include dates, ignition source, size and response undertaken, and include relevant GIS spatial information.** **A Wildfire Threat Analysis will be also undertaken for the portion of the GVDNR managed by Lost Sands (PER Table 5-6), which will be used to support a Fire Management Plan that will be developed in collaboration with DPaW and the Pila Nguru to re-establish fire regimes sympathetic with conservation values within the GVDNR.** **During operations the haul road would act as a fire break facilitating the control of broadscale wildfire and will also facilitate access for fire-fighting equipment not previously available, and therefore has the potential to improve outcomes for the GVDNR. Comprehensive monitoring of vegetation along the haul road will be undertaken annually as described in the Vegetation and Flora Management Plan (PER, Appendix C).** **<u>Indirect impacts resulting from the use of saline water and binding agents on the proposed</u> Haul Road<u>.</u>** **The vegetation immediately adjacent to the proposed haul road may be indirectly impacted by the presence of saline water used for dust suppression as outlined as a management strategy within the Dust Management Plan. The salts may also migrate sub-surface and impact on the roots of the vegetation. The salinity of the water to be used for dust suppression is currently not known, however the groundwater to be obtained from the proposed bores is considered to be less saline than seawater (<30,000 mg/L).** **The use of saline water for dust suppression on the proposed haul road is not considered to be a significant indirect impact to the health of the vegetation. The vegetation recorded across the majority of the proposed haul road within the GVDNR has components that would be considered to be halophytic or mildly halophytic (i.e. members of the Chenopodiaceae family, *Maireana, Atriplex*, *Tecticornia, Sclerolaena* and *Salsola*). As such, the use of saline water to suppress dust is not considered to significantly impact, directly or indirectly, the vegetation adjacent to the proposed haul road.** **Loch and Squires (2010) undertook a rainfall simulator study to investigate rates of mobilisation of salts (sodium bicarbonate) from compacted soil surfaces simulating an unsealed road. The study considered the effects of the amount of precipitated salt on the soil surface and variation in rainfall intensity. The study found that the initial peak runoff had a high salt concentration in the first flush of runoff, and relatively rapid reduction through time in those concentrations(Loch and Squires 2010). The relatively small volume of run-off produced directly by the road could be expected to predominantly infiltrate in the table drain adjoining the road. These salts would then either leach to depth or be diluted by less saline runoff events (Loch and Squires 2010).** **The study indicated, particularly for mine sites, that the use of saline water in dust suppression on unsealed roads is unlikely to impact significantly on the wider surrounding environment (Loch and Squires 2010).** **The binding agent currently being investigated to assist in the suppression of dust on the haul road is called 'Titan'; this is a polymer product that will be used to treat the road base on a once off basis (0.07L/m3). The other agent is a called 'Heavy Water Dynamic' and is a dust suppressant that will be applied at a rate of 1:10,000. These products have been used extensively in the industry and have not been known to cause detrimental health impacts to native flora and fauna at the proposed rates. Both polymers are 100% bio-absorbable with extremely strong affinity for solid particles to prevent leaching, migrating or re-solubilising from the areas where they are applied. They are only water soluble until they contact solid particles where they are removed from the water and cannot be re-mobilised. As a result, the indirect impacts to the flora, vegetation and fauna present adjacent to the proposed haul road is considered to be negligible.**

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The likelihood of successful rehabilitation of the haul road in the Great Victorian Desert Nature Reserve (GVDNR) is unknown, as stated in the PER document. Generally, the information provided in Section 5.7 is not specific to the proposal area and is based on general mine closure basics. It is expected that the agreed land use and outcomes for rehabilitation in the GVDNR is to restore the current environmental values and functions of the Nature Reserve. Please provide additional detail to demonstrate that rehabilitation and closure of the haul road has been considered based on site specific information.	**There are limited examples of rehabilitation techniques specific to the GVD that have been documented and were available for review, as mining is relatively new to this area.** **The Cyclone Project straddles two bioregions, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA) classification system: the GVD bioregion and the Nullarbor bioregion. The GVD region is further divided in to six subregions, GVD 01 through to GVD 06. The mining development envelope and northern part of the haul road development envelope lie in the Maralinga subregion (GVD 03) of the GVD bioregion. The southern aspect of the haul road development envelope traverses the Carlisle and Nullarbor Plain subregions of the Nullarbor bioregion (NUL 01 and NUL 02, respectively).** **A search was undertaken for mining projects within arid desert regions of Australia. Two mines were identified: Tropicana Gold Mine (Tropicana) (owned by Tropicana Joint Venture), located approximately 375 km west-southwest of the Cyclone mine site, and the Jacinth-Ambrosia Mineral Sands Mine (J-A) (owned by Iluka Resources Ltd (Iluka)), located approximately 405 km southeast of the Cyclone mine site in SA. Both Tropicana and the J-A mine are situated in the GVD; the J-A mine has an average annual rainfall of approximately 174 mm.** **Due to the relatively recent commencement of mining at these operations, there is little publically available information outlining the learnings from rehabilitation trials at the sites. However, the literature that was available for review, on rehabilitation at the J-A mineral sand mine did not highlight any mine closure principals that were unique to this region. As no site specific information is available to present, the information presented is based on rehabilitation activities in similar environments and situations.** **Lost Sands is committed to enhancing the current understanding of the environmental values and functions of the Nature Reserve, and has expanded its**	The OEPA acknowledges the lack of site specific information related to rehabilitation. Please provide information regarding mitigation or offset actions which may be undertaken in the event that agreed completion criteria cannot be achieved within a reasonable timeframe.	**Lost Sands recognise that the revegetation of sustainable native vegetation communities using local species requires consideration of a number of key components. Lost Sands is committed to enhancing the current understanding of the environmental values and functions of the Nature Reserve, to ensure that successful rehabilitation outcomes are achieved.** **The following mitigation actions, as detailed in the Preliminary Mine Closure Plan, are designed to close out current knowledge gaps. Lost Sands anticipates that successful rehabilitation can be achieved if the current knowledge gaps are closed out and the learnings from the proposed trials are applied.** **To ensure that agreed criteria are met within a reasonable timeframe Lost Sands will commence their investigations as soon as possible, subsequent to approval of the operation.** **Lost Sands propose to investigate the following vegetation and biological characteristics of key species within the GVDNR:** • **limiting factors to growth;** • **rooting depths;** • **effects of dust smothering;** • **seasonal growth, flowering and reproductive biology; and** • **symbiotic relationships of key species.** **Lost Sands are also cognisant that as a result of the long term storage of topsoil, the reliance on seed to achieve targets is increased. Due to the remoteness of the Project area, information on site and species specific requirements is not available. The following trials are also considered by Lost Sands to be relevant to the rehabilitation success of the Project area:** • **seed viability and germination;** • **seed longevity;** • **effect of seasonal temperature;** • **effects of saline water, and salt accumulation in soil, on seed germination and growth** • **collection timing; and** • **effects of storage conditions and duration.** **The outcomes of these trials will help Lost Sands identify:** • **timing of seed harvest to maximise seed quality, viability and storability;** • **what species need to be targeted for seed collection to supplement rehabilitation areas, and at what interval;** • **correct seed handling to ensure seed is not damaged during the collection and cleaning phases;** • **adequate and appropriate storage of seed; and** • **seed priming and sowing time.** **In the event that application of the learnings from the proposed trials does not result in successful rehabilitation, Lost Sands will investigate the potential reasons for failure of any rehabilitation and ascertain if it is possible to mitigate this occurring again, prior to undertaking additional rehabilitation where required. In the event that agreed completion criteria cannot be achieved within a reasonable timeframe, Lost Sands are committed to continuing rehabilitation activities, along with relevant offset activities, until such time as completion criteria, consistent with the values of the GVDNR are achieved.**

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	approach to developing this knowledge, and achieving successful rehabilitation outcomes in Attachment 1.		
Planning for 5 years of rehabilitation in relation to the haul road may not be sufficient. Rehabilitation success or failure will be dependent on timing rehabilitation works with future rainfall events, as well as contingency actions. Timing of works should be flexible and discussed in detail in the Mine Closure Plan. Please provide a discussion of any reasonable scenarios which may occur, including extension of the life of mine and failure of rehabilitation efforts.	**Lost Sands acknowledge that planning for five years of rehabilitation in relation to the haul road may not be sufficient, and propose to extent this time frame out to a ten year period.** **The timing of works will be flexible and will be discussed in detail in the revised MCP, which will be submitted concurrent with the Mining Proposal. This includes, but is not limited to: the outcomes of the proposed trials (see Attachment 1), the subsequent development of quantitative criteria and the ability to meet these criteria within the proposed timeframe.** **Lost Sands recognise that if the mine life is extended that there is a greater opportunity to refine the outcomes of the proposed trials and therefore develop criteria that are specific, measurable, attainable, realistic and timely. If failure of the rehabilitation occurs, Lost Sands will investigate the potential reasons for this occurrence and ascertain if it is possible to mitigate this occurring again prior to undertaking additional rehabilitation where required.**	The OEPA considers that the Response to Submissions should include a commitment to continuing rehabilitation activities, along with relevant offset activities, until such time as completion criteria developed to the satisfaction of the EPA on advice from the Department of Parks and Wildlife are achieved. In the event that completion criteria consistent with the values of the GVDNR cannot be achieved within a reasonable timeframe, Lost Sands should be prepared to commit to additional mitigation and offset activities.	**Lost Sands are committed to continuing rehabilitation activities, along with relevant offset activities, until such time as completion criteria, consistent with the values of the GVDNR are achieved.** **Lost Sands are committed to engaging with DPaW throughout the development of the completion criteria to ensure that they are developed to the satisfaction of the EPA.**

It is the OEPA's view that weed management and hygiene, as well as reducing grazing pressure, will most likely be significant management issues in rehabilitating this area.
Please provide additional detail to demonstrate how increases in weed populations and grazing pressure in the haul road area would be managed, monitored and mitigated.
	Section 6.3 of the Weed Management Plan discusses weed hygiene management in detail for a number of stages of the project. It also includes contingency actions if weed monitoring demonstrates new species or new outbreaks of existing weeds species.
	Lost Sands have committed to undertaking a baseline weed assessment that will identify and record the location of the weed species located within a designated corridor (approximately 25 m either side of a final haul road centreline) in the Nature Reserve. The survey will extend beyond the northern and southern boundaries (a distance is yet to be determined, but may include the entire project area) of the Nature Reserve.
	At the completion of this information gathering exercise, the impact of weeds (including the increase of known populations and the introduction of new species) can be quantified. The impact of
		The management, monitoring and mitigation actions in the Weed Management Plan should be bought forward into the Response to Submissions, which will be publically available with the EPA Report and Recommendations. Further detail should be provided for some aspects of the proposed management, for example;
		• Mapping of weed species – provide details of the proposed timing (season) and extent of mapping for weeds which is proposed;
		• Vehicle washdown procedures – indicate the potential locations and design of washdown stations;
		• Monitoring of weed species – provide details regarding the proposed monitoring of weeds, including justification of proposed frequency, season, location and personnel qualifications;
			<u>Weed management, monitoring and mitigation actions as outlined within the Weed Management Plan include:</u>
			***Land Clearing Weed Management Strategies*:**
			• **Develop a Weed Management Plan that focuses on the prevention, identification and eradication of existing and new weed infestations at the Project.**
			• **Map identified populations of weeds to delineate infestations and adjust construction, operational and closure activities accordingly.**
			• **Areas to be stripped for clearing and topsoil will be assessed and classified for weed occurrence prior to clearing commencing.**
			• **Ground Disturbance Permits will incorporate weed management aspects, including knowing the weed status of an area before clearing commences and implementing vehicle hygiene procedures during all clearing operations.**
			• **Avoid vegetation clearing where possible and keep to a minimum where not possible, as detailed in the Vegetation and Flora Management Plan, in order to minimise the introduction and spread of weeds.**
			• **Avoid clearing areas that have known weed infestations during wet conditions.**
			• **Road design will incorporate established vehicle hygiene standards for road construction and maintenance including:**
			  ○ **storage of all materials on hard, well-drained surfaces that do not drain towards vegetation;**
			  ○ **grading of material from upslope to down-slope; and**
			  ○ **confinement of all soil and drainage to catchments.**

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	weeds will concentrate on Weeds of National Significance, Declared Plant Pests and significant environmental weeds (weeds with a high or very high weed prioritisation rating). **The key impacts relating to weeds and the construction and operation of the haul road include:** • **spread of existing environmental weeds; and** • **introduction of environmental weeds.** **A weed monitoring program will be developed following the completion of the weed baseline survey. The monitoring program will identify effective management and mitigation procedures and protocols to ensure introduced taxa are not introduced and/or spread throughout the project area, with particular emphasis on the Great Victoria Desert Nature Reserve.** **Weeds in the region are generally associated with high trafficable areas, drainage lines, previously disturbed areas and areas of stock grazing. The region includes aboriginal reserves, nature reserves and mineral exploration. As such, the likelihood of weed species being spread throughout the region is unlikely. Most weeds will be congregated along access corridors, settlements and drainage lines, with the main vector for weed dispersal being feral herbivore (i.e. camels) movement.** **The high risk areas and feral herbivores will be managed accordingly, to ensure that no new weeds are introduced into the Nature Reserve, while maintaining the size of existing populations with the goal of eradication where feasible.** **The Fauna Management Plan commits to developing an Introduced Fauna Management Procedure that will specifically address any impacts from increase grazing pressure from introduced species in the instance that an increased population is measure from introduction species monitoring activities.**	• Feral animal control – indicate what potential feral animal control measures would be considered practicable; and • Mitigation (Eradication) - provide details of what form eradiction of weeds would take, where possible provide the results of similar eradiction programs which have been undertaken for weed species expected to occur in the project area.	• **Development of a weed identification guide, to be made available to all personnel that are managing clearing activities.** ***Operations and Closure Weed Management Strategies:*** • **Develop an ongoing Weed Monitoring Procedure and Weed Monitoring Program that includes existing populations and new weed populations.** • **Recently burnt areas will be monitored for weeds, particularly in consideration of 'edge effects' and the ecological opportunity for weeds to establish, and treated accordingly.** • **Appropriate fire management and response procedures will be implemented according to the Fire Minimisation Plan, in order to minimise introduction and spread of weeds after fire. Known sites with weeds that has been recently burnt will be monitored for weed presence, density and diversity.** • **Implement an Introduced Species Management Procedure to monitor and manage feral herbivores around the Project that may be increasing the distribution of weeds throughout the Project area.** • **Implement a progressive rehabilitation program to ensure disturbed areas are rehabilitated as soon as practicable.** • **Create a flora and fauna awareness program for staff and contractors including potential impacts, objectives and management strategies. This program should include inductions, ongoing training and site communications.** • **Ensure conditions are included in all applicable contracts to ensure contractors adhere to the requirements of the Weed Management Plan.** • **Implement dust control measures along the haul road to minimise the indirect and direct impacts to flora, which may subsequently promote weed invasion In accordance with the Dust Management Plan. Dust control measures can include the use of dust suppressants, watering haul roads and limiting vehicle speeds.** • **An Incident Reporting and Investigating Procedure will be developed that that enables identification of new weed infestations to be reported to site environmental staff and recorded in site systems.** • **Develop a Weed Monitoring and Eradication Procedure that outlines triggers for weed eradication, and includes when and how weeds will be managed.** ***Vehicle Hygiene Management Strategies:*** • **Develop a Vehicle Hygiene Procedure that outlines the methods of vehicle hygiene onsite, including a washdown station and management of this station, hygiene certification and mine access restrictions.** • **Design and implement a vehicle washdown station at the southern end of the haul road at the rail siding and the northern end of the haul road at the minesite. This will mitigate the potential for vehicles, plant and equipment travelling into the Project to introduce new or existing weeds species to the area. This is especially relevant for earth moving equipment during construction.** • **Vehicles, plant and equipment will be inspected after washdown to ensure that all visible soil and vegetation material has been removed. Inspections will be documented and include areas of the vehicle to inspect (i.e. wheel wells, dozer tracks, radiators), date, time, vehicle ID and registration. The inspection documentation will be required to be carried in the vehicle while onsite.** • **All personnel will be restricted from driving on non-essential roads and tracks. No unnecessary tracks will be created.** • **The haul road will be sign posted as a private road, and access will be restricted to mine personnel, DPaW staff, traditional owners and other authorised visitors. Public access will be restricted.**

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			In addition to the management measures outlined above the following contingency actions will be implemented in the event of the following triggers:
			• **Trigger 1: If monitoring demonstrates an increased density or distribution of existing weed populations.**
			• **Contingency Actions 1:**
			  ○ **raise as Environmental Incident;**
			  ○ **implement control measures to limit spread;**
			  ○ **investigate to determine the cause of weed spread; and**
			  ○ **undertake eradication as required**
			• **Trigger 2: If monitoring demonstrates new species or new outbreaks of existing weeds species.**
			• **Contingency Actions 2:**
			  ○ **raise as Environmental Incident;**
			  ○ **implement control measures to limit spread;**
			  ○ **investigate to determine the cause of weed spread;**
			  ○ **eradication measures will be implemented as soon as practicable; and**
			  ○ **vehicle hygiene procedures will be reviewed.**
			
			• **Trigger 3: If weeds are reported to environmental staff through identification in the field.**
			• **Contingency Actions 3:**
			  ○ **area will be inspected to determine if it is within an existing known weed population;**
			  ○ **if new weed population, area will be monitored to determine the extent of weed infestation; and**
			  ○ **monitoring and control measures will be implemented including eradication.**
			• **Trigger 4: If incidents such as uncontrolled vehicle access, failure to follow vehicle hygiene procedures or incorrect soil or drainage management occur.**
			• **Contingency Actions 4:**
			  ○ **raise as Environmental Incident;**
			  ○ **investigate cause of breach;**
			  ○ **re-induct responsible personnel; and**
			  ○ **review procedures**
			
			<u>Additional Weed Management Information</u>
			<u>Baseline Weed Mapping</u>
			The flora and vegetation survey report, existing literature and distribution information for weeds species (i.e. Florabase, NatureMap) occurring in the Nullarbor and Great Victoria Desert bioregions were reviewed to identify a list of weed species known to occur or potentially occur along the proposed haul road through the Great Victoria Desert Nature Reserve (GVDNR). The review identified a list of 19 weed species (Table 3).
			Of the 19, none are considered to be Weeds of National Significance (WONS), while one (*_Carthamus lanatus_) is listed as a Declared Plant Pest (DPP) under Section 22 of the _Biosecurity and Agriculture Management Act 2007_ (BAM Act).
			In addition to *_Carthamus lanatus_, *_Tribulus terrestris_ is a declared plant with various regional management actions in South Australia, while, _Cenchrus ciliaris_ and _Echium plantagineum_ are notifiable in part of South Australia only. *_Echium plantagineum_ and *_Heliotropium europaeum_ are listed as DPPs

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			in several Western Australian local government areas, however, not for the local governments (City of Kalgoorlie-Boulder and the Shires of Laverton and Menzies) the haul road traverses. **The proposed haul road is located in the arid region of Western Australia and experiences sporadic rainfall. As a result, the optimal time for completing the surveys and monitoring events would need to be flexible to allow response after significant rainfall events during the year.** **The optimal survey period for identifying the weed species was tabulated to determine the most appropriate month to record all or the majority of the weed species (Table 4). The most appropriate period for conducting weed surveys, including the baseline survey, is considered to be between August to November with 17 to 18 of the 19 weed species flowering or having a high confidence of being identifiable. This survey period is based on the life form (annual or perennial), habit (shrub, climber or herb) and flowering period (Table 3 and Table 5).** **The density and diversity of the weeds will be mapped, while the exact method will be determined in consultation with DPAW, however, it will most likely include standard weed surveying methods, as detailed in the Standard Operating Procedure (SOP) for mapping weed distribution and cover in bushland (SOP No: 22.1 DEC 2011).** **It is expected that the baseline survey will occur along the final haul road alignment and include a corridor width of 50 m (equates to 25 m either side of the road alignment centerline).** **While completing the baseline survey, proposed areas for the establishment of monitoring sites (control and impact) will be assessed. The sites will include areas of high and low weed density/diversity and areas considered to be free from weeds that could be used as a control site. The control sites will be located further away from the proposed haul road to ensure it is not influenced by the haul road.** **The personnel assigned to complete the baseline surveys, the annual monitoring surveys and the quarterly preliminary assessments are currently not known. However, all personnel assigned to complete baseline surveys and the annual monitoring surveys will be qualified botanists or environmental specialist with experience in conducting weed surveys and identifying weeds. The baseline and annual monitoring surveys will be led by an experienced botanist, who will provide training and support to the other team members, including the site environmental officers. The site environmental officers will utilise the training and the SOP to complete the quarterly preliminary assessments.** **<u>Vehicle Hygiene/Washdown</u>** **To assist in reducing the incidence of weed introduction and the spread of weeds within the GVDNR, two vehicle washdown stations are proposed. The vehicle washdown locations will be finalised prior to the commencement of ground disturbance activities. The location of the washdown facilities is key to ensuring weeds are not introduced to the GVDNR. The two locations of the washdown stations will be:** • **Forrest: all vehicles, trucks, equipment and machinery entering the haul road at Forrest will have to be cleaned and inspected; and** • **Mine site: all vehicles, trucks, equipment and machinery that have traveled off the haul road circuit at the mine site will have to be cleaned before returning to the haul road.** **The washdown stations will be designed in consultation with DPAW and the Department of Agriculture and Food Western Australia (DAFWA). The washdown stations may include:** • **A dry washdown facility, to be used during dry soil conditions, and a wet washdown facility to be used when vehicles and trucks have passed through wet tracks;** • **The dry washdown facility will include an air compressor to blow sand and vegetative material from the vehicles and trucks, including the undercarriage. The station will be designed to ensure material is not blown straight into the adjacent vegetation, but captured in a sump or similar area.** • **The wet washdown facility will utilise a high pressure hose and water to remove wet soil/mud and vegetative material from vehicles and trucks, with particular emphasis on the undercarriage. The water, soil and vegetative material will be collected in a sump.**

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			• **The location of the washdown facilities will be inspected regularly to determine if weeds are present. If present, the weeds will be removed/controlled in an appropriate manner (i.e. manual removal, or chemical foliar spray).** • **Vehicle/truck hygiene forms will be developed for each washdown facility to record, track and audit the use and effectiveness of the facilities.** **<u>Weed Monitoring</u>** **The density and diversity of weeds along the haul road in the GVDNR will be monitored to ensure triggers are not exceeded. The details of the Weed Monitoring Procedure will be finalised in consultation with DPAW and prior to the any ground disturbance.** **The monitoring of the weeds will occur annually during the life of the project. This annual survey will be considered as a comprehensive monitoring assessment and will be undertaken by qualified botanists or environmental scientists with sufficient experience in completing weed surveys. The annual monitoring will be supplemented by additional assessments along the proposed haul road by vehicle on a quarterly basis to provide a broad visual assessment of weed extent along the edge of the haul road.** **The annual monitoring frequency is considered appropriate due to the majority of the weed species being annual and flowering in the spring period (or following significant rainfall events) (Table 5). It is considered unlikely that weed species will germinate, flower and proliferate between monitoring events due to the low sporadic rainfall and high evaporation rates in the Nullarbor and Great Victoria Desert bioregions.** **The preliminary weed monitoring events that will occur on a quarterly basis will be undertaken by the site environmental officer and will assist in capturing any new weed locations or existing locations that expand rapidly during the year. Follow-up monitoring and control will be assigned to the quarterly preliminary weed assessments if locations are deemed to have increased in size based on visual observations.** **Separate weed monitoring events will occur after (approximately 6 weeks) significant rainfall events to monitor weed diversity and density. These separate events will be undertaken by qualified botanists or environmental scientists and will occur on an as required basis, but will most likely occur in the summer and autumn months after heavy rainfall associated with large storm events.** **The annual weed monitoring survey will occur in August to maximise the likelihood of recording the majority of the known, and with potential, to occur weed species (Table 4). Monitoring events occurring at different times of the year may result in some of the weed species not being present or identifiable at the time of the survey.** **<u>Feral Animals</u>** **The effective control of total grazing pressure is required for almost all rehabilitation programs in WA and is not an unusual management consideration. Rehabilitation completion criteria are stipulated within the Preliminary Mine Closure Plan, in addition to a series of proposed trials, which will be implemented to determine the best means to restore vegetation (PER, Appendix L). However, it is likely that effective grazing animal control will likely be required before these criteria are attained.** **The species most likely to impact rehabilitation of the haul road is the camel. It is also likely that camels will be a significant source of weed spread throughout GVDNR. An Offset Strategy that includes a Camel Control Plan for the GVDNR will be prepared within one year of operations (PER, Table 5-6, Page 132) and will therefore be implemented many years prior to the proposed timing of rehabilitation of the haul road. This Plan will recognise the crucial importance of haul road rehabilitation to the GVDNR, and effective control of camels over that area will be a key focus. Operational management actions will include restriction of artificial watering points and restriction of access to any watering points (particularly at appropriate times) (PER, Appendix C: Haul Road Management Plan). The Camel Control**

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			Plan for the GVDNR will recognise the potential attraction of the haul road to camels, particularly following rainfall events, and effective control of camels over this area will be included as a key focus. **Specific management strategies will be implemented along the haul road, with particular strategies required during operational activities and rehabilitation activities as discussed below:** **Introduced Fauna Management Strategies are included in the Fauna Management Plan and Haul Road Management Plans (PER, Appendix C). Water shed from the haul road has the potential to increase the growth of palatable species along the haul road, and the provision of surface water, thereby attracting camels. However, maintenance of the haul road will minimise pooling of water and roadside vegetation growth by using a binding agent and the prevention of water overspray (PER, Appendix C: Haul Road Management Plan, Page 16). Additionally, the Project's arid climate with low rainfall (200mm) and high evaporation rates will prevent the ponding of water for significant periods.** **<u>Rehabilitation</u>** **Rehabilitation Management Strategies are included in the Preliminary Mine Closure Plan (PER, Appendix L). Seven management commitments in relation to the haul road are itemised (PER, Appendix L, Page 45) and thirteen investigation and trial commitments are itemised (PER, Appendix L, Page 76) including trials to determine the likely success and timeframe for rehabilitation to meet completion criteria. Grazing controls include strategic culling operations and fencing of discrete areas.** **Rehabilitation will be monitored against specific completion criteria, developed in conjunction with DPaW.** **Rehabilitation monitoring for at least the first three years following rehabilitation will be undertaken, with performance reviewed after three years (PER, Appendix L, Page 78). Proposed monitoring frequency and duration will be reduced to biennial monitoring if rehabilitation performance is attaining targets.** **The species most likely to impact rehabilitation of the haul road is likely to be the camel. An Offset Strategy that includes a Camel Control Plan for the GVDNR (PER, Table 5-6, Page 132) will recognise the crucial importance of haul road rehabilitation to the GVDNR, and effective control of camels over that area will be a key focus.** **<u>Eradication</u>** **The eradication of weed species will only occur if it is considered feasible and directly related to the use of the proposed haul road. The potential eradication of weeds will only occur within the haul corridor managed by Lost Sands. The environmental significance of each weed species is varied, with some weeds considered to have a limited or low impact to the environment. The eradication of these weeds will have a lower priority as opposed to the eradication of significant environmental weeds, for example WONS and DPPs listed under Section 22 of the BAM Act.** **Weed species will be controlled and/or eradicated in a manner approved by DAFWA. Chemical foliar spraying, manual removal and mowing or slashing are several weed control measures that will be implemented prior to any on-ground disturbance. These methods are currently utilised by DPAW in the Great Western Woodlands (DEC 2013).**
Holding topsoil for 17 years as roadside windrows is not likely to retain any biological value for rehabilitation. Additional information in the Response to Submissions should take this into consideration.	**Lost Sands are cognisant that as a result of the long term storage of topsoil, the reliance on seed to achieve targets is increased. Lost Sands recognise the following knowledge gaps exist within the Project area:**	The OEPA acknowledges that Lost sands has committed to rehabilitation trials to fill knowledge gaps relating to rehabilitation in the project area.	**No response required**

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	• **the seed dormancy and germination limitations of target species;** • **what seed germination enhancement technologies are best suited to the key species; and** • **the interactions of seed-use technologies with post mining landscapes to optimise plant regenerative capacity.** **Lost Sands has identified in Attachment 1 the proposed trials which will close out these gaps, and enable successful rehabilitation with topsoil that has limited biological value.**		
The OEPA considers that the information provided in the PER for rehabilitation and closure currently provides no certainty that the EPA's objective can be met. Please provide additional detail to demonstrate that the EPA's objective for rehabilitation and closure can be met based on rehabilitation activities in similar environments and situations.	**Please refer to Attachment 1.**	The OEPA acknowledges that no similar examples exist to demonstrate the potential for rehabilitation success in the project area. Please provide information regarding mitigation or offset actions which may be undertaken in the event that agreed completion criteria cannot be achieved within a reasonable timeframe	**Lost Sands recognise that the revegetation of sustainable native vegetation communities using local species requires consideration of a number of key components. Lost Sands is committed to enhancing the current understanding of the environmental values and functions of the Nature Reserve, to ensure that successful rehabilitation outcomes are achieved.** **Please refer to Response 2, which outlines mitigation actions, as detailed in the Preliminary Mine Closure Plan.** **In the event that agreed completion criteria cannot be achieved within a reasonable timeframe, Lost Sands are committed to continuing rehabilitation activities, along with relevant offset activities, until such time as completion criteria, consistent with the values of the GVDNR are achieved.**
The proposed Offsets Strategy should be revised and further developed in consultation with Parks and Wildlife, the Conservation Commission and the Office of the Environmental Protection Authority. Please provide details of a revised Offsets Strategy in the Response to Submissions, following adequate consultation and negotiation with stakeholders.	**The Offsets Strategy will be revised and further developed in consultation with DPaW, the Conservation Commission and OEPA post assessment.**	The OEPA acknowledges that at the time of preparation of the Response to Submissions, Offsets discussions are ongoing.	**No response required**
Following the close of the public review period, the OEPA was contacted by the Directors of the Forrest Airport. A number of concerns were expressed during this conversation including the following: • the nature of the Forrest Airport business has been understated within the PER; • dust generation from the transport road in proximity to the airport is a significant concern; and • further consultation with Forrest Airport is required to ensure that the business of the Forrest Airport is not impacted by the proposal. Lost Sands is not required by the OEPA to address concerns raised outside of the	**Phil McMurtrie form Lost Sands contacted one of the Directors of the Forrest airport (Miranda Forte) on 9/9/15 to discuss the concerns she raised outside of the public review period in relation to the nature of the business and potential dust impacts. Miranda did not appear to have any major concern and would like to meet with Neil McIntyre or Phil McMurtrie the next time that they are in Perth to discuss the Project further.** **Phil forwarded through the Dust Assessment, Dust Management Plan, the Haul Road Management Plan and some information regarding the additives that are available for minimising dust on the haul road.**	The OEPA acknowledges Lost Sands continuing consultation with the Directors of the Forrest airport.	**No response required**

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public review period. However, it should be noted that such concerns may be raised during the appeal period for the proposal. Lost Sands may consider providing additional discussion in the Response to Submissions regarding the potential for dust impacts to the Forrest Airport and proposed management and mitigation measures.	**This consultation is indicative of Lost Sands ongoing commitment to consultation with Forrest Airport through the next phases of the Project.**		

RESPONSE TO PUBLIC SUBMISSIONS

1. The proposal – General comments

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Wildflower Society of WA	Provide a discussion addressing concerns that the Proposed haul road is inconsistent with the purpose for which the land was reserved. The haul road proposed for the Project passes through the Great Victoria Desert Nature Reserve (GVDNR) Under the *Conservation and Land Management Act 1984*, commercial and development activities can only be undertaken in nature reserves if they are consistent with the purpose which the land was reserved for. The haul road is not consistent with the purpose for which the land within the GVDNR was reserved for.	**The proposed haul road will not be a permanent feature and will be rehabilitated at the end of the mine life. In addition, the proposed offsets will improve the conservation value of the GVDNR.** **The design phase of the Project initially considered eight options for the haul road, and three of these were subsequently selected for further consideration. These included two alternative routes for the haul road, western and eastern options, in addition to the central option discussed in this PER. All three haul road options were found to have similar vegetation types. The western option, which skirts the western boundary of the GVDNR, was ruled out due to the unacceptable impacts to Aboriginal heritage that would result in the development of this route. In addition, this route would have been significantly longer, resulting in 405 km of road and an estimated clearing of 810 ha of native vegetation, creating a substantially larger disturbance area than the other two options.** **If administrative boundaries are not taken into account, both the central haul road option and eastern haul road option would result in fragmentation of an extensive continuous conservation reserve. The eastern haul road option will partially impact both the GVDNR and the Mamungari Conservation Park, as well as pass through the Forrest Lakes system and a large area of sand dune habitat between Cyclone and Forrest Lakes, suggesting there will not be any conservation benefit of using this option and potentially an impact to a greater diversity of habitats. In**	The Proponent response does not address the comment. Please provide a discussion of the purpose of the GVDNR, and how the proposed haul road may be consistent with those values. If the proposal is not consistent with the established purpose of the GVDNR, this should be acknowledged and a discussion establishing that the values of the GVDNR would not be decreased may be appropriate.	**Lost Sands acknowledge that the development of a haul road through the GVDNR is not consistent with the purpose for which the land was reserved.** **The results of biological survey work that has been undertaken, and presented within the PER, indicates that the values of the GVDNR would not be decreased by the development of the haul road.** **The extensive number of existing roads within the GVDNR is depicted in Figure 2. To facilitate the preservation of the values of the GVDNR, Lost Sands can assist DPaW with an assessment of all the existing roads within the GVDNR. The knowledge and learnings that are gained from the proposed trials could be applied to the rehabilitation of these areas.**

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		addition, 33 km of the northern section of the proposed haul road is an existing road. For these reasons the central haul road option through the GVDNR was chosen as the preferable haul road route.		
Department of Parks and Wildlife	Provide details of proposed arrangements for access management, including the development of protocols for use and maintenance of the haul road and retention or closure of existing access tracks in consultation with Parks and Wildlife and the Traditional Owners.	***Haul Road Access*** **Haul road access will be restricted to Project personnel, traditional owners, DPaW and other authorised users. The road will be sign posted as 'Private' at the southern terminus. Considering that this is a remote area through traffic will minimal.** ***Retention or closure of existing tracks*** **This will be completed in consultation with DPaW and the Traditional owners. Until the final alignment of the haul road is confirmed, tracks to be left opened or closed cannot be defined. All Project staff will be instructed to utilise only Project specific tracks and roads, and to avoid any unnecessary travel within the Project broadly, and in the GVDNR specifically.** **It is expected that existing tracks which are not required by Lost Sands, the TOs or DPaW will be temporarily closed off to prevent unauthorised access,** **Protocols for establishing which roads are left open or closed will be determined when the final alignment of road is confirmed, and the tracks required for operations are identified.** **It is the intention of the Proponent to close and rehabilitate the haul road at the completion of mining.**	Please provide evidence to support the statement that through traffic would be minimal as a result of the remote nature of the proposal, and that sign posting would be effective. Please provide an example of protocols which may be used to establish whether existing tracks would be closed, and an example of how the closure would prevent unauthorised access. Please also see comments relating to Heritage.	**The main access to the proposed Haul Road in the east-west direction is the Aboriginal business road which can only be used with permission from the Pila Nguru. There is limited traffic on this road, as it is mostly used by residents (approximately 100 – 200 people) of Tjuntjuntjarra and Oak Valley as a link between the two towns, which are 400 km apart. These people occasionally visit parts of their country along tracks which branch from the business road.** **The generally flat terrain and low density of vegetation along the proposed haul road would normally allow cross country travelers to access the road at many locations. However, Lost Sands anticipate that the only east-west track that will be formed up to connect to the haul road is the Aboriginal business road.** **All other tracks that the Haul Road crosses would not connect to the Haul Road unless requested to be kept open by the Pila Nguru or DPaW.** **Unauthorised access will be restricted from other tracks by the placement of a windrow of vegetation and soil across the track, construction of a table drain beside the haul road, and signs advising that access to the Haul Road requires authorisation. These protocols will be established at any road that intersects the proposed Haul Road, unless otherwise requested.** **There will be access to the southern end of the proposed Haul Road at Forrest. This will be authorised access only and will be monitored to control access. Signs will be erected at appropriate locations. Lost Sands personnel and Forrest Airport personnel will advise desert travelers that the road is private and is not to be used by the public.** **Tracks used by Lost Sands at the northern end of the Haul Road for mine access purposes would remain open for authorised use only. Use of these tracks would be easily monitored by mine personnel to prevent unauthorised access to the Haul Road.** **An Incident Reporting and Response Plan will ensure that unauthorised vehicles are dealt with quickly. Truck drivers and other authorised vehicles will be responsible for immediately reporting any vehicle that is suspected of being unauthorised. A company representative will be dispatched to escort the vehicle off the Haul Road.**
Department of Parks and Wildlife	Identify contingency options where possible and a framework for determining contingency actions for potential risks such as storm events or unavailable borrow materials (including communication protocols for mitigation measures), if required, should be considered.	**Section 8 of the Haul Road Management Plan include a section on contingency actions for several triggers. This plan will be updated to include storm events and unavailable borrow as triggers.** **Maintenance of a trafficable haul road surface will be a safety, environmental and production concern, and will be incorporated into procedures for managing each of these aspects at the Project.** **Adequate sources of borrow will be identified before any construction commences, and the road will be maintained as per initial**	Please bring management and contingency actions identified in the haul road management plan forward into the Response to Submissions. The Response to Submissions should acknowledge that no borrow pits would be permitted within the GVDNR.	**The following section outlines the management and contingency actions identified within the Haul Road Management Plan (HRMP).** **General Management Strategies:** • **A haul road-specific environmental induction will be completed by all personnel involved in building the haul road within the GVDNR.** • **Utilise the Project's internal system of ground disturbance permits; all mechanical clearing or excavation is forbidden without a valid permit. This process should include a review of ground disturbance permit applications against approvals to ensure only approved clearing areas are cleared.** • **Ensure all clearing areas are demarcated by surveyors and marked clearly in the field before clearing commences. Ensure field markings of clearing areas correlate with the ground disturbance permits.**

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		construction standards, including before and after storm events.
		
		Initial road construction will use shallow borrow from the road corridor and additives for consolidation and dust minimisation. As soon as mining commences high quality calcrete road base material will be available from the overburden for road maintenance. Recent advances in additives provides improved resistance to storm damage
				• **All personnel will be restricted from driving on non-essential roads and tracks, unless off-track driving authorisation has been obtained. No unnecessary tracks will be created.**
				• **Ensure all construction and maintenance equipment is fitted with spill management kits and fire extinguishers**
				• **The haul road will be sign posted as a private road, and access will be restricted to mine personnel, DPaW staff, traditional owners and other authorised visitors. Public access will be restricted.**
				
				Haul Road Weed Management Strategies:
				• **Design and implement a vehicle washdown station at the southern end of the haul road at the rail siding. This will ensure that all vehicles, plant and equipment travelling into the Project do not carry in any new introduced weeds species. This would be especially relevant for earth moving equipment during construction. A second washdown station will also be located on the mine site.**
				• **Vehicles, plant and equipment will be inspected after washdown to ensure that all visible soil and vegetation material has been removed. Inspections will be documented and include areas of the vehicle to inspect (i.e. wheel wells, dozer tracks, radiators) date, time, vehicle ID and registration. Inspection documentation will need to be carried in vehicle while onsite.**
				• **Areas to be stripped for clearing and topsoil will be assessed and classified for weed occurrence prior to clearing commencing.**
				• **Avoid clearing areas that have known weed infestations during wet conditions.**
				• **Road design will incorporate established vehicle hygiene standards for road construction and maintenance including:**
				  ○ **Storage of all materials on hard, well-drained surfaces that do not drain towards vegetation;**
				  ○ **Grading of material from upslope to down-slope; and**
				  ○ **Confinement of all soil and drainage to catchments.**
				• **Development of a weed identification guide, to be made available to all personnel that are managing clearing activities.**
				
				Haul Road Dust Management Strategies:
				• **Keep clearing and land disturbance to the absolute minimum required to construct the haul road.**
				• **Rehabilitate surplus area as soon as practicable to reduce dust generation.**
				• **A liquid polymer binding agent 'Titan' will be used during construction of the road only. The total quantity used for road construction will be in the order of 20,000 litres (L) of which 13,000 L will be in the GVDNR.**
				• **A liquid polymer dust suppressant 'Heavy Water Dynamic' will be used in the water regularly applied to the road for dust control. The annual usage will be approximately 3,500 L per year for the full length of the road of which 2,100 L will be in the GVDNR. This will be applied weekly as a very dilute solution (1:10,000) in water.**

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				• **Implement regular dust suppression along the haul road.** • **Regularly check the water sprays on the vehicles used for dust suppression to ensure that the sprays are angled appropriately to maximise dispersion on road surface and minimise over-spray on road edges as well as avoiding impacts on the topsoil/ and vegetative material stockpiles.** • **Stockpile topsoil/vegetative material on either side of the proposed road formation, no more than 2 m high.** • **Limit haul road speed near dust sensitive vegetation and ensure road speeds are managed on other roads to reduce dust generation and safety issues.** • **Demarcate topsoil stockpiles, rip topsoil stockpiles to encourage vegetative cover. Many of these vegetative species generate from stored seed to minimise dust generation. Avoid moving topsoil stockpiles after initial placements and ripping.** • **Ensure that any maintenance of the road only occurs following rainfall or with sufficient watering to avoid dust lift-off as per dust suppressant guidelines.** • **Signage will be posted around the boundary of the Project to provide contact details for queries and complaints.** **Flora and Fauna Haul Road Management Strategies:** • **Minimise pooling of water throughout the Project, particularly in borrow pits along the haul road.** • **Where possible, schedule clearing outside of breeding times of species of conservation significance.** • **Minimise destruction of potential breeding habitats, particularly trees with hollows (or potential to develop hollows).** • **Where possible, undertake progressive clearing to allow fauna to disperse to other suitable habitats in the surrounding area.** • **Retain corridors or linkages between habitats to allow fauna to move between different habitats, particularly in the GVDNR. Use culverts under roads in key habitats to maintain linkages.** • **Erect safety bunds around all excavations and avoid leaving open trenches for long periods of time to reduce the risk of fauna entrapment within the GVDNR.** • **Implement a Traffic Management Plan (as per the Haul Road Management Plan) that enforces speed limits in areas that are known to contain fauna that may be susceptible to vehicle strikes.** • **Ensure haul road watering operations use targeted water sprays that prevent overspray onto road verges, and encourage fauna to the roadside through vegetation establishment. Haul road maintenance to remove vegetation regrowth from previously cleared road shoulders.** • **Demarcate and avoid conservation significant flora.** • **Report all sightings of introduced animals and conservation significant fauna on the Project haul road to the Environmental Manager who will in turn report to DPaW.**

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				Water Haul Road Management Strategies:
				• **Design haul road to be as close to the existing topography wherever possible and use floodway crossings rather than culverts where appropriate to allow natural drainage lines to convey runoff along their natural flow paths.**
				• **Avoid interrupting natural water flow along the haul road where possible, particularly within the GVDNR. Ensure surface water remains available to vegetation associations 36, 4b, 39 and 31 in particular, as they appear reliant on sporadic surface water availability.**
				• **Use environmental culverts which re-distribute sheet flow downstream of the road through the use of a transverse channel or swale.**
				• **Locate temporary mobile construction camps, stockpiles, borrow pits, laydown areas and storage areas away from creek beds and drainage lines where possible.**
				• **Divert any surface flows away from current construction area, borrow pits, laydown areas and temporary mobile construction camps through the use of temporary bunding.**
				• **Avoid transport of material for road building activities into shallow depressions and other low-lying areas within the GVDNR.**
				• **Maintain diversion channels, outfalls, pipelines, swales, bunds, culverts and floodway channels to ensure they function optimally.**
				
				Haul Road Management Contingency Actions:
				• **Trigger 1: Decline in health of vegetation at monitoring sites.**
				• **Contingency Actions 1:**
				  ○ **Initiate investigations to identify source of impact;**
				  ○ **Raise as Environmental Incident if determined to be Project related cause of decline; and**
				  ○ **Implement appropriate control mechanisms.**
				
				• **Trigger 2: Observation of visible excessive dust**
				• **Contingency Actions 2:**
				  ○ **Initiate investigations to identify source of impact;**
				  ○ **Raise as Environmental Incident if dust related;**
				  ○ **Settled dust samplers or automated instrumentation would be deployed to determine background levels of settled dust as well as levels at the site of the observed excessive dust as per relevant Australian Standards;**
				  ○ **Assess dust levels and compliance with environmental and health guideline;**
				  ○ **Implement additional control measures as appropriate;**
				  ○ **Moderate activities generating dust if actions above are inadequate to reduce dust emissions;**
				  ○ **If exceedance is attributable to high winds, cease work until conditions exist; and**

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				○ **Report occurrences in Annual Environmental Report.** • **Trigger 3: Spill of saline water** • **Contingency Actions 3:** ○ **Immediately stop, control and contain the impacting activity;** ○ **Raise as Environmental Incident;** ○ **Initiate investigations to identify source of impact;** ○ **Review management plan and develop corrective actions to minimise re-occurrence; and** ○ **Rehabilitate if required.** • **Trigger 4: Uncontrolled vehicle access** • **Contingency Actions 4:** ○ **Immediately correct or stop the impacting activity;** ○ **Raise as Environmental Incident;** ○ **Initiate investigations to identify source of impact; and** ○ **Review management plan and develop corrective actions to minimise re-occurrence.** • **Trigger 5: Disturbance of native vegetation outside approved clearing areas** • **Contingency Actions 5:** ○ **Immediately correct or stop the impacting activity;** ○ **Raise as Environmental Incident;** ○ **Initiate investigations to identify source of impact;** ○ **Review management plan and develop corrective actions to minimise re-occurrence; and** ○ **Rehabilitate if required.** • **Trigger 6: Increased densities or increased extent/ distribution of existing or new weed populations** • **Contingency Actions 6:** ○ **Determine source of weed spread;** ○ **Implement control measures; and** ○ **Implement management measures in accordance with Weed Management Plan.** • **Trigger 7: Fauna death reported onsite** • **Contingency Actions 7:** ○ **Report to Environmental Manager;** ○ **Raise as Environmental Incident;** ○ **Inform DPaW if fatality of fauna species of conservation significance; and**

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				○ Investigate cause and implement corrective actions to mitigate reoccurrence. • **Trigger 8: Multiple death or injury of fauna at single location** • **Contingency Actions 8:** **○ Investigate whether area is a fauna corridor;** **○ Apply speed restrictions;** **○ Sign posting;** **○ Site communications; and** **○ Consider fauna access such as culverts or crossings.** • **Trigger 9: Increased presence of introduced fauna** • **Contingency Actions 9:** **○ Review Introduced Fauna Management Procedure;** **○ Reiterate management actions to all staff and site personnel; and** **○ Implement additional control measures.** • **Trigger 10: Observed presence of fauna species of conservation significance (through sightings, monitoring, mortalities)** • **Contingency Actions 10:** **○ Report sightings to DPaW as soon as possible; and** **○ Implement Significant Species Management Plan.** **Lost Sands acknowledges that no borrow pits would be permitted within the GVDNR.**
Department of Parks and Wildlife	Specify reporting and communication protocols for factors relating to the haul road with Parks and Wildlife.	**Broader reporting and communication protocols will be established during the more detailed planning phases of the Project. In these initial phases, it is excepted that regular communication will be completed on an ad hoc basis as data becomes available, such as after more detailed flora surveys, identification of significant flora or fauna populations and after final haul road alignments.** **Specific communication protocols have been included in management plans, and these plans will be updated to reflect the changing protocols as the Project develops. An example of this includes the reporting to DPaW of any sightings or fatalities of conservation significant fauna as outlined in the Fauna Management Plan.**	Further detail is required in relation to this comment. Communication protocols identified in management plans should be bought forward into the Response to Submissions. It is noted that the External Reporting schedule in Table 2 of the Environmental Policy document included in Appendix C indicates annual reporting schedules for most Decision making Authorities but does not mention DPaW. The proponent should consult with DPaW regarding appropriate reporting schedules and formats for activities within Nature Reserves and include a commitment to reporting to DPaW on an agreed schedule.	**The following sections outline the communications protocols outlined within the Management Plans for factors relating to the haul road with DPaW.** **Haul Road Management Plan Communication Protocols:** • **A haul road-specific environmental induction will be completed by all personnel involved in building the haul road within the GVDNR this will outline all reporting requirements.** • **Report all sightings of introduced animals and conservation significant fauna on the Project haul road to the site environmental department who will in turn report to DPaW as soon as possible.** • **Report all fatalities of introduced animals and conservation significant fauna on the Project haul road to the site environmental department who will in turn report to DPaW on a quarterly basis.** **Fauna Management Plan Communication Protocols:** • **Create a flora and fauna awareness program for staff and contractors detailing how impacts to fauna of conservation significance can be minimised during site operations. This program should include inductions, ongoing training and site communications and reporting protocols including awareness posters and environment components incorporated into pre-start meetings.**

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				• **Develop a Significant Species Management Plan if resident populations of fauna of conservation significance are detected.**
				• **Report all environmental incidents that relate to fauna as per the Incident Reporting and Investigating Procedure. These may include:**
				  ○ **injury or death of fauna;**
				  ○ **Introduced fauna brought to site**
				  ○ **trapping of fauna; and**
				  ○ **fire arms onsite.**
				• **The site environmental department will in turn report injury or death of fauna of conservation significance and occurrences of new introduced species to DPaW as required.**
				• **Report sightings of conservation significant species to DPaW as soon as possible.**
				• **Report any incidents relating in injury or death of conservation significant species to DPaW on a quarterly basis.**
				Fire Minimisation Plan Communication Protocols:
				• **Prior to commencement of the Project, arrangements will be made for a coordinated approach for bushfire control with the Pila Nguru, DPaW and the relevant Shires.**
				• **Develop fire history maps for the Project area in consultation with Pila Nguru and DPaW prior to construction activities.**
				• **Firebreaks will be planned and established around all Project activities and will conform to the requirements of the *DEFS Firebreak Location, Construction and Maintenance Guidelines*. DFES and DPaW will be consulted in regard to the firebreak location and design for Project activities within the GVDNR.**
				• **Any fire(s) detected by employees or contractors within the region will be reported immediately to the Occupational Health and Safety Department who will communicate the location and details of the fire(s) to the Pila Nguru and those fires within the GVDNR will also be reported to DPaW Information to be provided when reporting a fire includes:**
				  ○ **location;**
				  ○ **description;**
				  ○ **extent;**
				  ○ **direction fire is headed**
				  ○ **wind direction; and**
				  ○ **wind speed.**
				• **Small fires will be extinguished immediately if safe to do so, and will then be reported accordingly.**
				• **Fire-fighting activities in respect to bushfires will be guided by DFES, DPaW and the Pila Nguru. Fire-fighting Standard Operating Procedures (SOPs) will be developed in consultation with Pila Nguru, DPaW and DEFS staff.**
				• **In the event of a fire being reported within the project area or surrounds, the response will be:**
				  ○ **identify location, extent, direction and status of fire;**

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				○ **report immediately to the Safety Coordinator or deputy;** ○ **relay report to Pila Nguru;** ○ **relay report to DPaW if the fire is within the GVDNR;** ○ **prepare the emergency response team if required;** ○ **Fire-fighting Procedure will be coordinated by the identified Safety Coordinator;** ▪ **Lost Sands will offer full support within its capabilities under the discretion of the Mine Manager.** ○ **implement the Emergency Response Plan and Evacuation Procedures for mine-site personnel if and when required; and** ○ **update the 'fire register'.** **Lost Sands will consult with DPaW regarding appropriate reporting schedules and formats for activities within the GVDNR once the detailed road design is finalised and prior to operational activities. This consultation process will include the development of an agreed reporting schedule for communications of relevant activities and incidents within the GVDNR**.
Department of Parks and Wildlife	Discuss potential key performance indicators for factors relating to the haul road.	**Objectives and key performance indicators for the haul road were included within the Haul Road Management Plan Section 5 (page 11-12) that was appended to the PER.**	Objectives and key performance indicators from the Haul Road Management Plan (HRMP) should be bought forward into the Response to Submissions. It is noted that the HRMP does not include objectives relating to increases in feral animal access to the reserve, or to prevention or management of human access to the GVDNR. These objectives should be included in the Response to Submissions.	**The following section outlines the objectives and key performance indicators for the haul road, as provide within the Haul Road Management Plan (HRMP).** **<u>Objectives and Performance Indicators</u>** **Objectives are defined as the result that Lost Sands intends to achieve; and** **Performance indicators are defined as a measure of the success of achieving the objectives, i.e. if the performance indicator is met, then the objective is achieved.** **The objectives and associated performance indicators for avoiding and minimising potential impacts to the GVDNR from the construction of the haul road are detailed below:** • **Objective 1: Where clearing is unavoidable, it will be managed to minimise impacts on significant fauna habitats and habitat features.** • **Performance Indicator 1: Identification and conservation of significant habitats and habitat features.** • **Objective 2: Known resident populations of fauna of conservation significance within the Project will be managed to avoid adverse impacts.** • **Performance Indicator 2: Identification and protection of resident populations of fauna of conservation significance.** • **Objective 3: Manage Project activities to minimise the impacts on fauna, particularly from fire, introduced fauna and vehicle strikes.** • **Performance Indicator 3: Fire Minimisation, Introduced Fauna Management Procedure and Traffic Management Plans are implemented. .** • **Objective 4: Clearing will be managed to avoid breeding times of fauna.**

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				• **Performance Indicator 4: Timing of clearing planned around breeding times of fauna, wherever possible.** • **Objective 5: Maintain health of vegetation and flora within GVDNR by aiming to prevent potential impacts to flora and vegetation from dust, dust suppressant and changes in surface water flow.** • **Performance Indicator 5: Vegetation and flora monitoring demonstrates minimal decline in the health of the vegetation within the GVDNR due to impacts from the Project.** • **Objective 6: Prevent the occurrence and spread of fire within the Project area.** • **Performance Indicator 6: Project area is maintained as bushfire free, or if any fire occurs within the Project area, it is adequately and effectively controlled.** • **Objective 7: Maintain the quality and rate of surface water flow where possible.** • **Performance Indicator 7: Where surface water flow is interrupted due to mine area infrastructure or the haul road, surface water controls are implemented. No decline in surface water quality.** • **Objective 8: Prevent the spread of new and known weed infestations within the Project area.** • **Performance Indicator 8: Weed monitoring indicates the spread of known weed populations has not been increased as a result of the Project's operations.** • **Objective 9: Vehicle hygiene practices will limit the introduction and spread of weed infestations within the Project.** • **Performance Indicator 9: Vehicle hygiene infrastructure and practices are developed and utilised across site.** • **Objective 10: Prevent the increase of feral animal's access to the GVDNR.** • **Performance Indicator 10: Implementation of the Introduced Fauna Management Procedure.**
Department of Parks and Wildlife	Monitoring and management of indirect and second order impacts of the haul road have not been adequately described in the PER or the appended Haul Road Management Plan to provide confidence that the measures proposed will be able to identify and address potential indirect impacts on the nature reserve and its values.	**A complete monitoring program for flora and vegetation will be developed once impacts have been quantified, however, a plan cannot be developed until on-ground surveys and the final design of the haul road have been completed.** **Once these tasks have been complete a Flora and Vegetation Monitoring Plan for both the Mine and the haul road, will be develop that includes monitoring framework, monitoring**	The OEPA acknowledges that detailed management and monitoring actions may not be available until further design work is undertaken. The proponent should acknowledge that the absence of appropriately detailed management plans during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring adequate management	**Lost Sands acknowledges that the absence of appropriately detailed management plans during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring adequate management plans to be provided and approved prior to the commencement of construction.**

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	For each factor addressed, the indirect impacts component of the Haul Road Management Plan should: • provide adequate information on monitoring sites, factors to be monitored, methodology (not just visual monitoring, but a properly developed scientific monitoring program) and frequency of monitoring and reporting based on clearly defined SMART (specific, measurable, attainable, relevant, time-bound) objectives and outcomes and BACI (before, after, control, impact) design principles. • Include trigger values for the implementation of investigations and mitigation/management actions. • Include reporting (including reviews) and communications protocols.	**program, trigger values, mitigation, management and contingency measures for any indirect impacts from the Project.** **During the development of the design of the vegetation monitoring component of the Flora and Vegetation Monitoring Plan, DPaW will be consulted and it will be developed to be consistent with aims of the IUCN reservation for the GVDNR. The plan will be updated prior to any ground disturbance and DPaW will be asked to provide comment on the proposed methodology.** **An adaptive management and monitoring framework will be developed that encompasses a BACI (Before, After, Control, Impact) experimental design. Adaptive management is based on a circular management process, which allows for information collected to feedback into the monitoring program and supporting management plan so that improvements in management practices are continually occurring (Kingsford and Biggs 2012). Management decision making consists of the following interlinked phases:** • **Planning;** • **Resource allocation;** • **Implementation;** • **Monitoring and evaluation; and** • **Feedback and Reporting.** **The success of the monitoring program incorporates the contextual issues that could influence management decisions and, by aligning with the World Conservation Union/IUCN monitoring and evaluation framework (Kingsford and Biggs 2012), will allow for concise evaluation mechanisms. The framework and plan will have set trigger levels that when measured on a biannual frequency (to be determined in consultation with DPaW, however, it may occur in autumn and spring) will determine the spatial and temporal condition of the selected vegetation associations sampled.** **Key measurement techniques will aim to accurately and easily determine the vegetation cover and species richness on a spatial and temporal scale. The line intercept method using 50 m permanent transects will capture the species richness and vegetation cover. A minimum of four transects per vegetation association will be installed in representative locations throughout the**	plans to be provided and approved prior to the commencement of construction.	

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		disturbance corridor of the Nature Reserve. The following measurements will be taken: • **line start/finish measurements of each flora species that intersects the transect line; and** • **photographs from the start and finish looking down the transect.** **Multivariate analyses will determine if community structures and cover are changing over time and when compared to analogue/control sites. In addition, Remote Sensing using Normalised Difference Vegetation Index (NDVI) Imagery will be used to determine change over a broad-scale.** ***Kingsford, R.T., and Biggs, H.C., (2012) Strategic Adaptive Management (SAM) Guidelines for Effective Conservation of Freshwater Ecosystems. IUCN WCPA Freshwater Taskforce, Australian Wetlands and Rivers Centre, Sydney.**		
Department of Parks and Wildlife	Provide a discussion regarding the proponent's intentions in relation to provision for assisting Parks and Wildlife, including meeting the cost of increased travel to the reserve associated with the construction, use and closure of the road (cost recovery). It is likely to be necessary for Parks and Wildlife to be involved in inspecting the road during and at the completion of the construction period, during operation if incidents occur that impact on the nature reserve, and around the time of proposed closure and hand-back.	**Lost Sands has agreed to fund the following:** • **the cost of travel to and from the Project site, for one DPaW representative to undertake one trip during construction of the road;** • **the cost of travel to and from the Project site, for one DPaW representative to undertake one trip at the completion of road construction; and** • **the cost of travel to and from the Project site, for one DPaW representative to undertake one trip during closure of the road.** **It is expected that any other visits to the haul road by DPaW will be undertaken as part of usual GVDNR management activities.**	No further response	**Lost is currently in further discussions with DPaW and the OEPA regarding this aspect.**

2. Flora and vegetation

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Wildflower Society of WA	Provide evidence that specimens from all Priority Flora, potentially new species and range extensions identified during the Flora and Vegetation surveys have been lodged with Western Australian Herbarium. If this has not occurred to date, provide a reasonable timeline within	**Acceptance of specimens by the Western Australian Herbarium is undertaken at the curator's discretion. Specimens were retained in house at MWH in suitable conditions during the PER process to enable easy access as required.** **A detailed list of available specimens has recently been provided to the herbarium**	Please provide further information indicating why the provision of specimens to the herbarium would be linked to the timing of the EPA report and recommendations. Please advise whether further information has been received from the Western Australian Herbarium.	**MWH initially retained the specimens in-house during the assessment process to ensure they were easily accessed, if required. MWH has subsequently submitted the relevant specimens and Rare Flora Report Forms.** **MWH has received further communication from Karina Knight, (Collections Manager at the WA Herbarium), regarding the lodgment of specimens. The following options were made available for submission:**

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	which this will occur, or a justification as to why specimens will not be lodged.	**curator to assist in the suitability of submission of these specimens.** **If requested by the Western Australian Herbarium, specimens will be vouchered soon after the EPA's decision and recommendations to the WA Minister for Environment on the PER.**		**1. Lodge all the specimens and the herbarium will assess which ones they wish to retain. A cost of $25 plus GST per specimen would be charged, which includes both assessment and lodgment.** **2. MWH assesses the specimens based on the Herbarium's Acquisition policy; and lodges only those required by the Herbarium.** **MWH has confirmed with Karina that Option 1 was selected. Submission forms have been completed and submitted along with the relevant specimens to the Herbarium (sent on 3 December 2015).**
Wildflower Society of WA	Provide a quantitative estimate of the amount of native vegetation to be indirectly impacted by the proposed haul road through: • Modification of surface and groundwater flows; • Introduction and spread of weeds; • Generation of dust from haul road; • Use of saline water and binding agent along haul road; Alteration of fire regime (Lost Sands 2015, p. 75).	**A quantitative estimate of the amount of native vegetation to be indirectly impacted by the proposal cannot be undertaken until the detailed road design has been completed. This design will also take into consideration the final locations of borrow pits, passing lines and surface water drainage features which will be used to determine the final indirect impacts including:** • **modification of surface and groundwater flows;** • **introduction and spread of weeds;** • **generation of dust from haul road;** • **use of saline water and binding agent along haul road; and** **alteration of fire regime**	It is noted that the response to this submission indicates that the detailed road design will take into consideration the final location of borrow pits. The Response to Submissions should acknowledge that no borrow pits would be permitted within the GVDNR. The OEPA acknowledges that precise quantification of indirect impacts cannot be provided prior to the completion of detailed road design, but expects that some attempt at broad estimation of indirect impacts be made in the Response to Submissions.	**Although a precise quantification of infrastructure impacts cannot be provided until completion of the detailed road design, the following section provides a broad estimate and assessment of indirect impacts of the construction and operations of the haul road within the GVDNR. The proposed haul road will be the only infrastructure within the GVDNR.** **The estimation of indirect impacts includes additional modelling activities related to indirect impacts of dust and hydrological processes on the GVDNR.** **See Responses 1 and 4 for additional information on the indirect impacts to native vegetation.** **Lost Sands acknowledges that borrow pits will not be permitted in the GVDNR.**
Wildflower Society of WA and 1 Anonymous submitter	Provide a discussion demonstrating that the Flora and Vegetation surveys carried out within the GVDNR met the requirements of Guidance Statement 51, which; • addresses in detail the concerns detailed in the Wildflower Society's submission under the heading "There are *Inadequacies in the Vegetation Survey Method*" (Attachment 3); provides further information with regard to the concerns raised in Response ID ANON-DV9P-F4AT-J (Attachment 3)	**The response to these queries are providing in the following sections of the table.**	No further response	
Department of Parks and Wildlife	The Indirect impacts section of the Haul Road Management Plan should Target protection of conservation significant species (especially the Priority 2 *Eremophila undulata* and threatened fauna habitat) and communities in the monitoring. Indirect impacts addressed in the Haul Road Management Plan should include but not be limited to:	**The Haul Road Management Plan includes the following indirect potential impacts to flora and vegetation:** • **modification of surface and groundwater flows (surface hydrology and erosion);** • **introduction and spread of weeds;** • **generation of dust from mining activities and haul road;**	The response does not address the comment. Please provide additional information regarding whether specific management actions would be required for each of the conservation significant flora and vegetation species identified in the GVDNR section of the proposed haul road corridor, for example, whether species may be particularly susceptible to dust, erosion, changes to fire regimes or surface water flow, and how the locations of these species may influence the design and management of the haul road.	**A review of the conservation significant flora species recorded during the flora and vegetation survey indicates that three Priority (P) species: *Eucalyptus canescens* subsp*. canescens* (P3), *Eucalyptus pimpiniana* (P3) and *Acacia eremophila* numerous veined variant (A.S. George 11924) (P3), occur in the Mine Site, the haul road or associated infrastructure. The remaining conservation significant species are considered to occur at a distance where impacts associated with the Project will be minor to non-existent. No Declared Rare Flora will be impacted by the Project.** **For example, dust is only considered to have a potential indirect impact to vegetation for the initial 150 m (depending on wind strength and direction) from the haul road (PEL 2016). The indirect impacts associated with the smothering**

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	• Weed invasion and increased density/distribution; • Changed surface hydrology (quality, quantity, flow); • Changed fire behaviour (haul road may act as a fire break I increase sites for ignitions); • Dust • Increase in access by humans; and • Erosion.	• **use of saline water and binding agent along the haul road;** • **alteration of fire regime; and** • **increase in access by humans.** **Potential indirect impacts and associate management strategies to minimise impacts during haul road construction and operation as described above will be minimised through implementation of the following management plans (Appendix C in the PER):** • **Overarching Environmental Management Plan;** • **Vegetation and Flora Management Plan;** • **Fauna Management Plan;** • **Haul Road Management Plan;** • **Weed Management Plan;** • **Dust Management Plan;** • **Fire Minimisation Plan;** • **Water Management Plan; and** • **Aboriginal Cultural Heritage Management Plan.**		**of vegetation beyond 150 m is minor to negligible (see Response 1 for further information).** **The majority of the known conservation significant flora locations are beyond 150 m from the proposed haul road corridor. The *Eremophila undulata* (P2) records from the Mine Site indicated that this species is located greater than 180 m to the west of the development envelope, (beyond the 150 m mark identified by PEL (2016) for the haul road, where vegetation smothering by dust may be an issue). The locations will be clearly demarcated prior to any on-ground disturbance to ensure there is no incidental impacts to the population.** **The Vegetation and Flora Management Plan developed for the Project commits to the monitoring of flora and vegetation surrounding the mine site. The monitoring will include the *Eremophila undulata* population located west of the Mine. The monitoring will include annual visits to the population to record the health of the population and if there has been any loss or recruitment to the population.** **The leaf traits of *Eremophila undulata* were reviewed to determine if the smothering of leaves from dust may have an indirect impact to the health of the population. Based on the description of the leaves from Chinnock (2007), *Eremophila undulata* has a medium dust susceptibility rating (based on the description provided in Table 2). Utilising the information presented by PEL (2016) for the haul road as a guide, the *Eremophila undulata* population is located greater than 150 m from a source of dust. Therefore, the worst case scenario suggests the population should only have minor to negligible impacts associated with dust.** **The *Eremophila undulata* population is located in association with sand dunes where surface water changes associated with the Mine should not have a significant impact on the population. The sand dunes attenuate the surface flow into the swales which then flows to the west.** ***Eucalyptus canes*wcens subsp*. canescens* (P3) and *Eucalyptus pimpiniana* (P3) form a lignotuber and in most situations will readily recover from wildfires. Like most Acacia's, *Acacia* eremophila numerous veined variant (A.S. George 11924) (P3) will readily germinate from the soil seed bank following a wildfire.** **The intensity and frequency of the fires may have a detrimental impact to the regeneration of the two eucalypts and the Acacia, however, a Fire Minimisation Plan has been developed to ensure that, should a fire be initiated, it can be promptly brought under control and not spread outside the Project area, including the haul road.** **The design of the final haul road corridor will account for the known locations of conservation significant flora species. In addition, the haul road corridor has taken into account the location of sand dune habitat and where achievable, disturbance to the dunes has been minimised. As a result, vegetation communities and habitat that may potentially support several of the conservation significant flora species (*Eremophila undulata* (P2), *Dampiera? eriantha* (P1), *Eucalyptus canescens* subsp. *beadellii* (P3), *Eucalyptus canescens* subsp. *canescens* (P3) and *Microcorys* sp. 1 (unknown Status)) have been avoided.** **The conservation significant flora located within and in close proximity to the proposed disturbance areas will be clearly demarcated. The implementation of the Vegetation and Flora Management Plan will include the establishment and monitoring of transects (or quadrats) located in association with conservation significant flora to monitor the health of the populations and the surrounding habitat supporting the population.**

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				The monitoring of the populations will occur on an annual basis in association with the annual comprehensive weed monitoring. A qualified and experienced botanist or environmental scientist will complete the annual monitoring. Trigger values will be developed following the initial monitoring events prior to the proposed disturbance to account for any natural variation in population health. **The monitoring will account for changes to surface water flow (if present), wildfires, unauthorized access, impacts resulting from the Project and the presence of weeds and feral animals. Where achievable, additional monitoring sites will be located within conservation significant flora populations located further than 500 m from the Project to provide a control to the sites located within or closer to the Project.** **Prior to ground disturbance a targeted survey will be undertaken along the length of the haul road corridor to map the extent of conservation significant flora. This survey will occur at the same time as the baseline weed survey. If new populations are recorded from the proposed corridor, the final design of haul road will be amended, where possible, to reduce any additional direct impacts to conservation significant flora.** **The indirect impacts to vegetation and fauna habitat resulting from the construction and operation of the haul road is discussed further in Response 1.** **Two significant fauna habitat features, sand dune crests and drainage depressions, were identified from the Project. The two features will be impacted by the Project, however, the extent to be impacted is 3.8% of the mapped sand dune crests and 0.5% of the drainage depressions mapped in the Fauna Study Area (Appendix E of the PER). Furthermore, since the original assessment the Marsupial Mole has been de-listed as a threatened species by both the Federal and State governments.**
Department of Parks and Wildlife	Provide additional discussion regarding the detailed design aspects of the haul road, including materials requirements (e.g. adequate borrow material for construction and maintenance) and locations of key proposal elements, like free-draining borrow pits, turkey's nests, passing bays, culverts and signage, have not been provided.	**Lost Sands does not have access to the proposed road corridor within the GVDNR for the purpose of detailed road design which involves surveying, sampling and geotechnical testing. A preliminary road centreline was initially determined on the basis of information obtained using helicopter surveillance and satellite imagery. The centreline was then modified to avoid areas which were identified as environmental and heritage constraints following completion of flora, fauna and cultural heritage studies.** **The conceptual road centreline follows relatively flat terrain and avoids sand dunes to minimise disturbance and environmental impacts. The centreline also avoids clay pans and depressions that could develop ponding during rain events. The development envelope for the road is sufficiently wide to allow minor changes to the centreline during detailed design when all information for the road design has been obtained.** **Conceptual design criteria have been prepared as the basis for the future detailed design when access within the development**	The proponent should acknowledge that the absence of appropriately detailed design during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring detailed designs to be provided and approved prior to the commencement of construction.	**Lost Sands acknowledges that the absence of appropriately detailed design during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring detailed designs to be provided and approved prior to the commencement of construction**.

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		envelope can be secured under a miscellaneous licence. Sampling and testing of materials outside the reserve have been used to develop the design criteria. Samples of a range of subsoil materials believed to cover the range of materials within the nature reserve have been analysed by Proof Road Design Engineers to determine the conceptual parameters for road construction. **Lost Sands have made every effort to plan a road with minimal disturbance. The average width of disturbance has been restricted to 20 m, which includes disturbance for borrow material. Borrow pits will not be used as all borrow material will be cut from within the road disturbance corridor. Turkey's nests will not be used within the Nature Reserve. The 20 m width is not sufficient to allow construction of a two lane road for its total length. The majority of the road will not be wide enough for safe passing by triple road trains. This decision has been taken to minimise the area of disturbance.** **The normal width of compacted road surface is 6 m in a cleared width of 19.5 m. Passing bays 50 m long with a 12 m wide compacted road surface will be constructed every 2 km within a 39.5 m wide clearing area. The passing bays will allow safe passing by triple road trains and other traffic on the road. The passing bays will also be regularly used by the water truck and any other large vehicles for turning around. This arrangement satisfies the design criteria for an average clearing width not exceeding 20 m.** **The road centreline will avoid depressions and drainage lines wherever possible. The surface is relatively flat. The road will be cleared by pushing the vegetation and a thin layer of surface soil to each side of the cleared area. Subsoil within the cleared area will be mounded to form the raised road profile. Blending of subsoil with different characteristics along the corridor will be required to form the road base. The road profile will be elevated about 300 mm above the original centreline level.** **A binding agent and dust suppressant will be diluted in water and mixed into the road base before compacting to form the road surface. New products are continually being developed and the products used will be**		

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		selected from those available at the time. Selection will involve environmental considerations and performance and efficiency for road construction and maintenance. **Borrow material will be cut from both sides of the road and drains will be constructed to prevent water accumulating beside the road. Pipe culverts will be constructed as required to allow water to flow under the road where a natural drainage line is crossed. Appropriate signage will be used during construction and operation. The road will not be open to the public and operating systems will be used to manage the safe use of the road and prevent unauthorised use.**		
Department of Parks and Wildlife	Provide justification for passing bays every 2 km as requiring bays at this frequency does not appear to minimise the direct (clearing) impact on the nature reserve, particularly for the proposed number of truck movements (12 truck movements in any 24 hour period).	**As discussed in the response above - the normal width of compacted road surface is 6 m in a cleared width of 19.5 m which is not wide enough for safe passing by triple road trains. Passing bays 50 m long with a 12 m wide compacted road surface will be constructed every 2 km within a 39.5 m wide clearing area. The passing bays will allow safe passing by triple road trains and other traffic on the road. The passing bays will also be regularly used by the water truck and any other large vehicles for turning around. This arrangement satisfies the design criteria for an average clearing width not exceeding 20 m.**	No further response	
Department of Parks and Wildlife	Provide additional discussion regarding the potential for laydown areas, storage areas and temporary camps for construction, and where these would be located.	**In order to minimise disturbance during construction of the haul road all borrow material will be will be cut from within the road disturbance corridor.** **The proposed mine bore field will provide a water supply for the construction of the haul road and water will be trucked from the mine for these purposes. As previously mentioned, Turkey's nests will not be used within the GDVNR. Lost Sands will negotiate with Forrest Airport for supply of water for construction purposes in the Forrest area.** **Temporary road construction camps will be located within the road clearing corridor and outside the Nature Reserve. A small quantity of pipe culvert materials may be temporarily stored within the road clearing corridor. Road construction equipment will be temporarily parked along the road construction corridor during construction.**	No further response	

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Anonymous	Provide a discussion of proposed management, monitoring and mitigation actions for Flora and Vegetation in areas outside the GVDNR.	**All proposed management, monitoring and mitigation actions for Flora and Vegetation as outlined in the Vegetation and Flora Management Plan apply to all areas of Vegetation and Flora that may be potentially impacted by the Project, and are not restricted to the GVDNR.**	The response does not address the comment. Please provide advice on whether Lost Sands would be responsible for all weed management, and in what instance weed management would be the responsibility of DPaW as land managers (i.e, at what distance from the road would weed management become the responsibility of DPaW?).	**Annual comprehensive weed monitoring (in accordance with the 2011 DEC - *Standard Operating Procedure for Mapping Weed Distribution and Cover in Bushland* (SOP No: 22.1), as well as quarterly visual monitoring will occur during the life of the Project. The proposed monitoring will actively identify any new populations or species, while existing populations will be monitored to ensure they are not increasing or spreading beyond the baseline levels. Further information on weed monitoring and management is provided in Response 4.** **As a result, the indirect impacts to vegetation along the haul road corridor as a result of weed diversity/density is considered to be negligible and is unlikely to exceed current levels. If an increase is recorded during the monitoring programs, appropriate mitigation measures will be triggered (see Response 4) to either eradicate (where achievable), or reduce the extent to baseline levels.** **A baseline survey will occur along the final haul road alignment and include a corridor width of 50 m (equates to 25 m either side of the road alignment centerline). It is proposed that this baseline survey be extended out to the boundaries of the Miscellaneous Licence in the area where the Haul Road is located within the GVDNR to determine the full extent of weed species within the Lost Sands tenement.** **Lost Sands will be responsible for weed management and eradication within its Miscellaneous Licence tenement boundary. Responsibility for weed management and eradication outside of the Miscellaneous Licence within the GVDNR will be the responsibility of DPaW.** **Lost Sands will also undertake a baseline weed monitoring program on the mine site and along the final haul road alignment and include a corridor width of 50 m in areas outside of the GVDNR. Lost Sands will be responsible for weed management and control to pre-project levels within these areas.** **Further information on management, monitoring and mitigation actions for Flora and Vegetation is provide in Responses 1 and 4.**
Anonymous	Provide justification for the timing of proposed baseline data collection for Flora and Vegetation Monitoring both within and outside of the GVDNR.	**The timing of the flora and vegetation survey undertaken in the Study Area coincide with seasonal rainfall. The main guiding document dictating flora and vegetation surveys in Western Australia, Guidance Statement No. 51 (EPA, 2004), indicates that surveys should be undertaken after appropriate rainfall. Rainfall in the desert and arid regions of Western Australia (i.e. the Great Victoria Desert and the Nullarbor) is sporadic with no designated "wet" seasons. See Attachment 2 for more details.** **The flora and vegetation survey took this into account when determining the most appropriate time to conduct the survey. The survey also had consideration for the optimal flowering period for the majority of the flora expected to occur in the region. The optimal flowering period was determined to be August to October based on information available from the publicly available Florabase (DPaW, 2015).** **The survey was undertaken over two seasons (spring and autumn) as is**	No further response	

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		recommended by Guidance Statement No. 51 (EPA, 2004). The combination of the taxa recorded from the two phases of the survey and the taxa from the reconnaissance survey indicated that 77 to 96% of the theoretical taxa were recorded (Section 4.3.2, Appendix D). **As discussed in Appendix D (Flora and Vegetation Report), the survey was undertaken in October 2013 (Phase 1) and April 2014 (Phase 2) following adequate rainfall in the northern section of the project, while the southern section of the study area experienced adequate rainfall prior the Phase 2 survey but not the Phase 1 survey.** **The expected annual and ephemeral flora known to occur in the region was not as prolific as expected following adequate rainfall, suggesting that the long-term climatic conditions have been poor.** **The monitoring of flora and vegetation (including weeds) within the project, including the GVDNR, will occur following adequate rainfall. This is generally accepted as six weeks following greater than 20 mm of rainfall in a short period of time.** **The six week period allows for the germination and growth of annuals and ephemerals, while ensuring perennials are able to flower and put on new growth.** **Depending on the requirements of the flora and vegetation monitoring, the surveys will occur in early to mid-Autumn (following potential cyclonic rainfall) or late winter to early spring (following potential winter rainfall). Provision will be allowed to ensure the surveys are done following sufficient rainfall.**		
Department of Parks and Wildlife	Provide details regarding protocols and procedures for identifying and documenting areas of conservation significance to be avoided or acceptably impacted by the final alignment. For further information please refer to the Department of Parks and Wildlife submission (Attachment 3).	**An overarching environmental objective of developing the Project will be minimise clearing at all times.** **A key instrument in achieving this objective will be the development of a Clearing Procedure, as discussed in Section 6.1 of the Vegetation and Flora Management Plan. The Clearing Procedure will define protocols for all clearing to be completed at the Project, and outline the requirements to develop a ground disturbance permit process. The ground disturbance permit will contain key features including:** • **consideration of alternatives;**	No further response	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		• **mapping of approved clearing boundaries;** • **mapping of areas of conservation significance, significant habitats and identified weed populations; and** • **Environmental and Senior Management review and sign-off.** **In addition, a decision on the final haul road alignment will be made with consideration to several factors including safety, road construction requirements and a strong focus on the avoidance of conservation significant flora and fauna habitats.**		
Anonymous	Appendix C – Weed Management Plan: include the Biosecurity and Agriculture Management Act 2007 in section 2.1 Key Legislation and Regulations, along with a discussion of how the Act relates to the proposal, or provide justification as to why the Act is not relevant to this proposal.	**The Weed Management Plan will be updated to include reference to the *Biosecurity and Agriculture Management Act 2007 (BAM Act 2007)*.** **The *BAM Act 2007* relates to the Project in terms of the potential introduction and spread of declared pests (vermin and weeds).** **The Project will be operated in accordance with this Act, and all contractors and freight carriers will be made aware of the need to comply with this Act.**	No further response	
Anonymous	Provide a discussion on how weed control will be prioritised if declared pests are recorded on site, and whether the Weed Management Plan takes into account the landholder responsibility for eradicating/controlling and reporting these pests.	**As outlined in the Weed Management Plan, if new weed species or new outbreaks of existing weed species are identified through regular monitoring or day to day activities, the following will apply:** • **Raise as an environmental incident;** • **Implement control measures to limit spread;** • **Implement eradication measures;** • **Investigate to determine the cause of weed appearance and/or spread; and** • **Review hygiene procedures.** **If a declared pest is recorded on site, this will be reported to DPaW and DAFWA in accordance with the *BAM Act 2007*.**	No further response	
Conservation Commission	Provide additional discussion quantifying the impact of the construction of the haul road on the potential spread of weeds more broadly within the Nature Reserve, and	**The quantification of the impact of the construction of the haul road on the potential spread of weeds is difficult to determine at present. Lost Sands have committed to undertaking a baseline weed assessment prior to the clearing of native vegetation within the GVDNR. The baseline weed assessment will identify and record the location of the weed species located within a designated corridor (approximately 25 m either side of a final haul road centreline) in the Nature Reserve. The survey will extend**	The OEPA acknowledges that precise quantification of indirect impacts cannot be provided prior to the completion of detailed road design, but expects that some attempt at broad estimation of indirect impacts be made in the Response to Submissions**.**	

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		beyond the northern and southern boundaries (a distance is yet to be determined, but may include the entire project area) of the Nature Reserve. **At the completion of this information gathering exercise, the impact of weeds (including the increase of known populations and the introduction of new species) can be quantified. The impact of weeds will concentrate on Weeds of National Significance, Declared Plant Pests and significant environmental weeds (weeds with a high or very high weed prioritisation rating).** **The key impacts relating to weeds and the construction and operation of the haul road include:** • **spread of existing environmental weeds; and** • **introduction of environmental weeds.** **A weed monitoring program will be developed following the completion of the weed baseline survey. The monitoring program will identify effective management and mitigation procedures and protocols to ensure introduced taxa are not introduced and/or spread throughout the project area, with particular emphasis on the Great Victoria Desert Nature Reserve.** **Weeds in the region are generally associated with high trafficable areas, drainage lines, previously disturbed areas and areas of stock grazing. The region includes aboriginal reserves, nature reserves and mineral exploration. As such, the likelihood of weed species being spread throughout the region is unlikely. Most weeds will be congregated along access corridors, settlements and drainage lines, with the main vector for weed dispersal being feral herbivore (i.e. camels) movement.** **The high risk areas and feral herbivores will be managed accordingly, to ensure that no new weeds are introduced into the Nature Reserve, while maintaining the size of existing populations with the goal of eradication where feasible.**		
Department of Parks and Wildlife	Provide further details regarding protocols and procedures for identification and management (and if required mitigation) of declared and environmental weeds to ensure that they are appropriately	**The objective of the weed management plan attached to the PER is to identify, control and prevent the spread of existing and new weed infestations, particularly within the GVDNR. This weed management plan will be revised**	No further response	

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and Conservation Commission	managed with the objective that no new species are introduced and no weed species increase in density or distribution through the construction, operation and maintenance activities. Demonstrate how weeds will be monitored and managed using relevant studies or examples of similar proposals where possible.	**and updated once a detailed baseline weed survey of the selected haul road footprint has been undertaken.** **As outlined in the Weed Management Plan, the following will be developed prior to construction:** • **Weed Identification Guide;** • **Weed Hygiene Procedure that outlines the methods of weed hygiene onsite, including a washdown station and management of this station, hygiene certification and mine access restrictions;** • **Weed Monitoring Procedure that outlines the methods for an ongoing weed monitoring and management programme that includes existing populations and new weed populations; and** • **Weed Eradication Procedure that outlines triggers for weed eradication, and includes when and how weeds will be managed.** **The Weed Management Plan will dictate the development of a Weed Monitoring Procedure, which will also include regular consultation with DPaW to ensure it meets the necessary requirements, in particular, within the GVDNR.** **Weed monitoring and management plans prepared for similar projects in similar terrain will be reviewed to determine practices that are currently in use and obtaining positive results with the identification and management of weed species. The documents that have and will continued to be reviewed during the preparation of the monitoring program include:** • **Iluka's Jacinth-Ambrosia Mine in the Great Victoria Desert and Nullarbor regions of South Australia;** • **AngloGold Ashanti's Tropicana Joint Venture in the Great Victoria Desert, Western Australia.** **The weed identification and monitoring surveys will be undertaken by qualified botanists, with the survey concentrated within the GVDNR. Areas of high sensitivity or prone to weed invasion (i.e. borrow pits, rehabilitated sites, high trafficable areas, mine site, camp and airport) will also be targeted during the surveys. The project is considered to be extensive and a comprehensive weed survey is not feasible.**		

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		As a result, the detailed surveys will be concentrated in the high risk areas, while opportunistic observations (vehicle observations, rehabilitation monitoring) will be undertaken throughout the remainder of the project area. **There will be likelihood that some of the weed species recorded during subsequent monitoring surveys has not previously been recorded. The likelihood of this occurring is considered possible due to the extent of the project.** **Highly invasive, noxious, environmentally significant weeds will be of primary concern. These weeds include weeds of national significance (WONS), weeds considered to be declared plant pests under the *Biosecurity and Agriculture Management Act* 2007, listed by the Department of Agriculture and Food Western Australia and weeds considered to have a high or very high prioritisation rating by DPaW. The prioritisation rankings for the Goldfields region (which includes the project area) is currently under revision.** **Of the 12 weed species recorded from the project, none are currently considered to be a WONS or a declared plant pest for the Shire of Laverton, Shire of Menzies and the City of Kalgoorlie-Boulder. The prioritisation ranking for each of the weed species is currently under revision.** **The Weed Monitoring Procedure will include:** • **Borrow pit inspections;** • **Development of simple weed guides to assist with identification by project staff and contractors;** • **A baseline weed mapping survey of the project prior to clearing and construction;** • **A washdown bay will be installed at the southern end of the haul road near the rail siding to minimise the importation of weed species from vehicle movements;** • **Ongoing remedial actions, including weed spraying and manual removal, will occur throughout the life of the project;** • **Feral herbivore control will occur in areas of high density (i.e. water holding sites) to reduce the transportation of weeds from feral herbivores; and**		

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		Annual weed surveys, undertaken six weeks after sufficient rainfall, will occur during the life of the project.		

3. Terrestrial fauna

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Department of Parks and Wildlife	Indirect impacts addressed in the Haul Road Management Plan should include but not be limited to: • Changed fauna behaviour; • Vehicle strikes; Increase in access /population(s) of introduced fauna;	**The Fauna Management Plan addresses these direct and indirect impacts as follows:** ***Changed fauna behaviour*:** **Changed fauna behaviours will potentially be caused by several factors:** • **Land clearing causing habitat loss;** • **Light;** • **Noise; and** • **Dust.** **These factors are addressed in the Fauna Management Plan, and management of the direct and indirect impacts will be the best means to address the indirect impacts.** ***Vehicle Strikes*:** **Fauna impacts include collision with vehicles will be managed by implementing a Traffic Management Plan that enforces speed limits in areas that are known to contain fauna that may be susceptible to vehicle strikes.** ***Increase in access /population(s) of introduced fauna*:** **Predation by feral cats, foxes and wild dogs is a potential impact of the Project if these species are introduced or supported.** **Impacts associated with the presence or increase in populations of introduced fauna will be managed by implementing strategies for the management of introduced fauna, including reporting sightings, minimising ingress of introduced fauna to the Project, and controlling numbers of existing introduced fauna in the Project areas.** **In addition, an Introduced Fauna Management Plan that includes reporting sightings, minimising ingress of introduced fauna to the Project, and controlling numbers of existing introduced fauna in the Project areas.** **During an Increased presence of introduced fauna the following contingency actions will be implemented:** • **review introduced fauna management procedures;**	**No further response**	

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		• **reiterate management actions to all staff and site personnel; and** **implement additional control measures.**		
Department of Parks and Wildlife	Discuss proposed speed limits for travelling through high value areas (e.g. conservation significant fauna habitat) and night travel, as the Traffic Management Plan cited in the PER to address this point is not provided.	**The Traffic Management Plan will be implemented as the Project is developed, along with various other operational management plans and procedures.** **Speed limits will be enforced on an as needs basis, such as in the event that a conservation significant species is being impacted by the haul road and a reduction in speed limits can be implemented to minimise the impact. An example would be during the breeding time of a ground based conservation significant animal with an identified population close to the haul road.** **Key conservation significant fauna habitats, such as marble gums, will be avoided wherever possible.** **Night travel will be avoided where possible, but given the 24 hour status of the operations, some night traffic will be unavoidable. Site training and inductions will highlight the need to be aware of fauna when driving at night, and in particular at dawn and dusk. Signage will reinforce this across site.**	**No further response**	
Conservation Commission	Provide further details regarding proposed actions to manage access to the nature Reserve by feral herbivores and carnivores as a result of construction of the haul road. This is particularly concerning in light of the stated permanent loss of dunefield habitat, a key feature of the northern parts of the GVDNR, and the potential for predation on native fauna by feral dogs, cats and foxes.	**The dunefield habitat was identified in the PER as a high priority habitat. Although only 3% of the dunefield habitat will be impacted by the proposed project footprint, final design and haul road alignments will still focus on minimising impact to this habitat type. Although the road traverses dunefield habitat the conceptual road centreline has been selected to meander around dunes. This will be further refined during detailed design.** **The maintenance of the haul road will be focused on minimising features that may attract introduced animals, specifically pooling of water and roadside vegetation growth. The use of a binding agent and focused road watering to prevent overspray will be key features of this management. The Project's climate characteristics low rainfall and high evaporation will also aid in this management approach.** **The management of introduced fauna will be guided by the Introduced Fauna Management Plan. The current Fauna Management Plan outlines several key focuses of introduced**	**The Response does not address the comment. Please provide further details regarding proposed actions to manage access to the GVDNR by feral animals. This may be addressed through reference to other section of the Response to Submissions.** **The OEPA acknowledges the Lost Sand's commitment to minimise impacts to the dunefield habitat.**	***Note: Dunefield habitat was identified as a high priority fauna habitat in part due to the presence of the Marsupial Mole. Since the original assessment the Marsupial Mole has been de-listed as a threatened species by both the Federal and State governments.** **Predation by European red foxes, and predation by feral cats, are both recognised as key threatening processes by the Federal Department of the Environment. Relatively recently meso-predator release theory and practical examples have suggested that the dingos/wild dogs (apex predators) regulate the abundance of invasive meso-predators such as foxes and feral cats, and the interactions of these three species should be of particular focus when implementing control strategies.** **Feral herbivores (particularly camels) are a recognised threat to the values of the GVDNR (PER, Page 132).** **A Fauna Management Plan has been developed that includes introduced fauna management strategies (PER, Appendix C).** **All the species above are likely to be present in the GVDNR but their abundances are regulated by the carrying capacity of the receiving environment for each particular species.** **Water shed from the haul road has the potential to increase the growth of palatable species along the haul road thereby attracting camels, additionally the provision of surface water can increase the presence of all introduced vertebrate species. Lost Sands has proposed a number of strategies to minimise pooling of water and roadside vegetation growth, as identified in the Haul Road Management Plan and Fauna Management Plans (PER, Appendix C), including maintenance of the haul road by using a binding agent (more information**

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		animal management at the Project. Section 6.3 of the Fauna MP includes: • **implementing an introduced fauna control program;** • **landfill and waste management; and** • **fauna sighting program.** **All of these control measures will be implemented in consultation with the Traditional Owners and DPaW.**		**provided in Response 1) and the prevention of water overspray (Fauna Management Plan, Page 17). Additionally, the Project's arid climate with low rainfall (200 mm) and high evaporation rates will prevent the ponding of water for significant periods.** **Foxes and cats are known to use tracks and roads as routes for access and the haul road has the potential to concentrate distributions, if not carrying capacity. However, the use of tracks and roads as routes for access is more applicable in higher rainfall areas where a dense shrub layer restricts movements rather than the open vegetation and low relief of the study area. As the haul road won't significantly impact the carrying capacity of the receiving environment abundances of introduced vertebrates won't be significantly altered.** **Introduced fauna management strategies are included in the Fauna Management Plan (PER, Appendix C) and will also be included in the Introduced Fauna Management Procedure and will include minimising pooling of water, fencing of landfills and proper hygiene practices, and measures to minimise road kill such as speed limits and fences/barriers where appropriate. An 'Introduced Fauna Control Program' will record the presence of introduced fauna with a review of management procedures, reiteration of management actions, and control measures implemented as required.** **The species most likely to be influenced by haul road due to the potential growth of palatable species is likely to be the camel. An Offset Strategy that includes a Camel Control Plan for the GVDNR (PER Table 5-6) will be prepared and be implemented during operations. This Plan will recognise the potential attraction of the haul road to camels, particularly following rainfall events and effective control of camels over this area will be included as a key focus.**

Department of Parks and Wildlife	Provide a commitment to developing a Significant Fauna Species Management Plan and an Introduced Fauna Management Plan (as referred to in the Fauna Management Plan) to address the management of conservation significant fauna species at risk from the proposal, particularly within the nature reserve.
	Provide a framework on which these plans will be developed including potential management and monitoring actions.
	Conservation significant fauna species and their habitat which are at risk of impact by the proposal and which should be considered in the above mentioned management plans are listed in the Department of Parks and Wildlife submission (Attachment 3)
		Introduced Fauna Management Plan
		The PER and Fauna management plan both provide commitments to implement an Introduced Fauna Management Plan.
		A proposed framework for the Introduced Fauna Management Plan is as follows:
		• **Objectives and Targets**
		• **Roles and Responsibilities**
		• **Background**
		  ○ **Key introduced flora Species**
		  ○ **Key introduced Fauna Species**
		• **Triggers**
		• **Management Actions/Control Options**
		• **Monitoring Programs**
		  ○ **Introduced Species Monitoring**
		  ○ **Impacted Species Monitoring**
		• **Reporting**
		  ○ **Internal**
		  ○ **External**
		Significant Species Management Plan
		A commitment to develop a Significant Species Management Plan is included in Section 6.5 of the Fauna Management Plan, in the event that a resident population of
			No further response	

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		fauna of conservation significance is identified within the Project area. A population may be identified through report sightings, formal surveys or fatalities. This is outlined in Section 8: Contingency Actions of the Fauna Management Plan.
		
		A proposed framework for the development of Significant Species Management Plan to be developed by Lost Sands is as follows:
		• **Objectives and Scope**
		• **Relevant Legislation and Guidelines**
		• **Roles and Responsibilities**
		• **Species Background**
		• **Potential Impacts**
		  ○ **Construction**
		  ○ **Operations**
		  ○ **Closure**
		• **Management Strategy**
		• **Monitoring Guidelines**
		• **Corrective/Contingency Actions**
		• **Reporting Requirements**
		  ○ **Internal**
		  ○ **External**
		
		The Significant Species Management Plan will be developed in accordance with relevant legislation, guidelines, management measures from national recovery plans or the like for the species as defined by DPaW.		

4. Hydrological processes

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments2
Department of Parks and Wildlife	Provide detailed designs (and management requirements) for the two major and four minor drainage crossings of the haul road within the GVDNR.	**Detailed designs and management requirements will be provided at the Mining Proposal stage of approvals, and once access has been given for detailed on-ground surveys.**	The proponent should acknowledge that the absence of appropriately detailed designs during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring detailed designs to be provided and approved prior to the commencement of construction.	**Lost Sands acknowledges that the absence of appropriately detailed designs during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring detailed designs to be provided and approved prior to the commencement of construction.**
Wildflower Society of WA	Provide further discussion and quantification of the indirect impacts associated with modification of surface flows. With particular regard to the concerns raised in the submission provided by the Wildflower Society (Attachment 3)	**A more detailed assessment of indirect impacts associated with modifications of surface flows cannot be undertaken until the road design has been finalised. Once the road design has been finalised it will take into consideration the requirement to maintain surface flows where required via the installation of surface flow management measure such as culverts, floodways and flood crossings.**	The OEPA acknowledges that precise quantification of indirect impacts cannot be provided prior to the completion of detailed road design, but expects that some attempt at broad estimation of indirect impacts be made in the Response to Submissions.	**The following approach was used to develop indicative estimates of indirect impacts associated with the modifications on surface flows on vegetation.** **Flood hydrology was developed for two catchments crossing the proposed road alignment (crossing locations shown in Figure 3 below). Catchment and sub-catchment areas were delineated from the available 1-second digital elevation model (DEM), with a grid size of approximately 30 m x 30 m. Design rainfall was based on the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data (http://www.bom.gov.au/water/designRainfalls/ifd/, accessed January 2016).** **The north and south catchment areas are 452 km² and 3,171 km², respectively. Based on an indicative life of mine of 10 years, the event corresponding to a 20% risk of occurrence over that timeframe would be between the 20-year average**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments2
				recurrence interval (ARI) and the 50-year ARI events. For haul road and other facilities that would not be damaged or could be repaired relatively quickly following inundation, a lower ARI design standard may be warranted. A 20-year ARI design flow was used for this assessment. **A Rainfall Runoff Model (RORB) model was developed to estimate design floods, with input parameters based on regional parameters recommended in Australian Rainfall and Runoff (Pilgrim et al, 2003. Australian Rainfall & Runoff – A Guide to Flood Estimation, Institution of Engineers, Australia). The 20-year ARI peak flow rates for the north and south catchments were estimated at 30 m^3/s and 36 m^3/s, respectively. Peak flows are relatively low, given the large, flat catchments, interspersed with dunefields that impact catchment response and result in significant attenuation of peak flows.** **In order to provide an approximate estimate of the flood depths at these two crossings, representative profiles were cut along the roadway alignment from the 30-m x 30-m DEM, with normal-depth hydraulic calculations used to estimate flow depths and velocities at the crossings.** **It should be noted that the cross sections are indicative only, based on the coarse 30-m DEM; the natural terrain does not include any roadway profile. In order to improve confidence in these estimates, additional analyses using LiDAR data and more detailed hydraulic modelling, including preliminary roadway design, will be undertaken as part of the detailed design process.** **The north catchment area discharge of 30 m^3/s results in a flow depth of approximately 1.4 m. The average flow velocity at this peak flow rate is estimated at approximately 0.5 m/s.** **The south catchment area discharge of 35 m^3/s results in a flow depth of approximately 1.5 m. The average flow velocity at this peak flow rate is estimated at approximately 0.5 m/s. Although the south catchment is significantly larger than the north catchment, a combination of lower catchment rainfall (point rainfall converted to catchment rainfall, where, for the same storm duration, a bigger reduction will apply to larger catchments) and higher storage losses in the long reaches associated with the larger catchment (routing of flows through the longer reaches resulting in increased attenuation compared to the smaller catchment) result in comparatively lower peak flows.** **These depths exceed safe crossing thresholds and the haul road would be expected to be closed well in advance of the arrival of design flow rates. Velocities are relatively low, and the erosive forces associated with these flows would not typically warrant the placement of substantial armour material, except potentially where localised drains enter channels. This will have to be determined during the concept and detailed design stage.** **No design of the haul road has been undertaken to date. Assuming that the haul road will be at or very close to grade and will include a series of floodways at creek crossings, little impact is expected on the flow rates crossing the road. Either floodway type crossings (i.e. road at grade) or a raised crossing with engineered designs (i.e. culverts) will be sufficient to direct water across the road and largely maintain natural flow patterns. Pending the design used, some pooling may occur upstream of the road, which could result in indirect impacts on vegetation upstream of the road. Impacts are likely to be insignificant and short-lived, given the ephemeral nature of the area and high infiltration and evaporative losses. Indirect impacts on downstream vegetation during high flow events will therefore be insignificant.** **Where low flows and sheet flows are intercepted and/or modified there is an increased potential for localised ponding to occur immediately upstream and**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments2
				water shadows to develop immediately downstream of the road. This impact is most likely to occur when sheet flows are interrupted and is less likely to occur if channelised drainage is intercepted. **It is, however, noted that most watercourses in the area are short and ephemeral and surface water expressions are restricted to salt plains, pools and non-perennial lake systems. Indirect impacts of the road can therefore be expected to be insignificant or limited to small areas downstream of the road. Areas of impact will, however, depend on the final road design, including whether the road will be elevated above grade and whether measures such as environmental culverts are incorporated into the design to maintain upstream and downstream flow connectivity to reduce potential impacts.** **The road design would also be expected to include sufficient armouring or bank stabilisation at concentrated flow crossing locations to prevent excessive erosion and downstream deposition of sediments.** **The roadway design, supported by detailed studies, would need to be progressed to be able to quantify indirect impacts with reasonable confidence.**

5. Heritage

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Conservation Commission	Whilst identifying "management considerations for any potential impacts", the PER fails to provide an indication of the potential impacts to Aboriginal culture and heritage. An assessment of impacts to heritage is not only important from a CALM Act perspective but also relevant to the EPA's objective for heritage.	**An impact assessment of Aboriginal Culture and Heritage was provided within the PER and the Aboriginal Cultural Heritage Management Plan as follows:** ***PER Section 5.5.2 Assessment of Potential Impacts*** **No sites of significance have been recorded within the mine area development envelope, although the possibility exists that occasional archaeological finds (manuports, or manually transported objects left on the plains in the past) may be located within the development envelope** **The existing haul road alignment does not impact the cultural heritage significance of the surrounding area and has been cleared for use.** ***Aboriginal Cultural Heritage Management Plan Section 4.5 Impact Assessment and Significance of the Project Area*** **An assessment of potential impacts upon heritage was undertaken within the PER in accordance with the following documents that provide guidance on assessing and managing impacts to Aboriginal Heritage:** • **EPA guidance statement 41: Assessment of Aboriginal Heritage; and**	Comments received from the Conservation Commission indicate that the Conservation Commission has noted the outcome of assessment undertaken by the proponent under EPA guidance Statement 41. However, the concerns expressed by the Commission are in context of the 'value of the land' as it relates to the impact not only on physical sites but on the health of the land and water. The link between the issues raised by the Conservation Commission submission and the direct and indirect impacts of the proposal on environmental values of the GVDNR and the value of the land to Aboriginal people has not been fully explored in the response to submissions. The Conservation Commission specifically noted the statement in the Response to Submissions that "the development of the haul road may result in increased access to significant sites and traditional hunting grounds" The understanding of potential adverse effects arising from increased access should be investigated and documented by Lost Sands, with a well-developed plan to monitor, report on and respond to instances of inappropriate access. The Conservation Commission has also noted Lost Sands suggestion that signage would be effective in preventing unauthorised access and requests that, in order to address the Conservation Commissions concerns, the	**The Conversation Commission comments stated that the proponent shall prepare a Management Plan that has the objective of protecting and conserving the value of the land to the culture and heritage of the Aboriginal persons, in particular from any material adverse effect caused by (i) entry on or the use of the land by other persons or (ii) the taking or removal of the land's fauna, flora or forest produce.** **Limited information on the cultural value of the land is available for the area surrounding the Project. The total project area, including the proposed haul road, has cultural heritage clearance from the Pila Nguru for all proposed project activities.** **The only cultural heritage information that is available has been collected and or identified during Lost Sands consultation with the Pila Nguru, and through the process of anthropological and archaeological surveys using experts selected by Pila Nguru.** **The Pila Nguru did not identify any sites of cultural significance or comment on the type of significance during these surveys. During these consultation sessions and surveys, direct and indirect impacts (potential adverse effects) upon flora, vegetation, fauna and water from both mining activities as well as the construction and presence of the haul road were raised and discussed with the Pila Nguru.** **The only potential negative effects identified were the possibility of increased access to sensitive sites and traditional hunting grounds (Cane 2014). Lost Sands personnel and the public have no knowledge about sites of cultural significance in the region of the proposed haul road. Lost Sands personnel will not be permitted to leave the haul road and any unauthorised vehicles on the haul road will be quickly escorted off the project area.** **The Pila Nguru community is located at Tjuntjuntjara, approximately 120km west of the proposed haul road area where there may be a possibility of impact to potential hunting grounds. Lengthy negotiations leading to agreement of a compensation package for the Pila Nguru with involvement of their legal**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		• **Aboriginal Heritage Due Diligence Guidelines (April 2013). Department of Aboriginal Affairs (DAA).** **The outcome of the assessment was that no sites of significance have been recorded within the mine area development envelope, although the possibility exists that occasional archaeological finds (manuports, or manually transported objects left on the plains in the past) may be located within the development envelope (Cane 2014).** **In addition, the existing haul road alignment does not impact the cultural heritage significance of the surrounding area and has been cleared for use (Cane 2014). However, the development of the haul road may result in increased access to sensitive sites and traditional hunting areas. For this reason the haul road use will be restricted to Project related vehicles, DPaW personnel and the Pila Nguru. It is considered that signage will be effective in preventing unauthorised use of the road as the amount of traffic likely to encounter the road is very minimal. A system will be implemented for monitoring and controlling unauthorised usage of the road and truck drivers will be responsible for reporting sightings of any vehicles that are not regular authorised users.** **The development impacts on Aboriginal culture and heritage arising from the Project are likely to be low, therefore the EPA's objective to ensure that historical and cultural associations are not adversely affected will be met.** **Management strategies have be developed to manage any impacts in accordance with the requirements of the Aboriginal Heritage Act 1972.**	proponent apply greater rigor to resolving the issue of unauthorised access than indicated by the proposed solution.	**advisers and anthropologist did not raise any concerns regarding potential impacts on the area in the vicinity of the haul road for hunting and gathering.** **Access to sensitive sites will be restricted through management of unauthorised access into the GVDNR, along the haul road, in addition to signage and training. The Aboriginal Cultural heritage management plan which will be revised for implementation in conjunction with the Pila Nguru as well as a Cultural Heritage awareness programs will be developed and implemented for site personnel.** **Unauthorised access along the haul road within the GVDNR will be monitored by Lost Sands site personnel who will undertake regular inspections of the haul road, in addition to 'truck drivers' who will notify site personnel of private vehicles using the road. Internal commutation protocols and management processes, including escorting unauthorised persons out of the area will be implemented should unauthorised access along the haul road occur.** **Existing tracks not required by Pila Nguru or DPaW within the vicinity of the haul roads are planned to be closed thereby reducing the risk of unauthorised access to areas of potential cultural significance.** **Extensive consultation between the Pila Nguru and Lost Sands has occurred relating to the development of the haul road on the land for which they are the traditional custodians.** **A compensation agreement between the Pila Nguru and Lost Sands has been prepared and finalised. During the preparation of this Agreement any potential adverse effects upon the cultural and heritage values of the land were raised by the Pila Nguru with guidance from their legal advisers and anthropologist. These have been identified and addressed to the satisfaction of both parties. The Agreement includes compensation to Pila Nguru for all potential impacts to Aboriginal Heritage by the Project including the haul road and its operation.**

6. Human Health

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Radiological Council	Provide data on the uranium and thorium content for the feedstock and heavy mineral concentrate, as the only figures	**Comparison between typical uranium and thorium concentrations in mineral sands operations compared with the Cyclone deposit (IAEA 2003)**	**No further response**	

<table>
<tr><th>Submitter</th><th>Submission and/or issue</th><th>Proponent Response to comments 1</th><th>OEPA Response to Proponent Response</th><th>Proponent Response to comments 2</th></tr>
<tr><td></td><td>that have been provided to date are in relation to the tailings (Table 2-2).</td><td>
<table>
<tr><th>Stream</th><th>Cyclone Thorium levels in ppm</th><th>Typical Thorium levels in mineral sands</th><th>Cyclone Uranium levels in ppm</th><th>Typical Uranium Levels in mineral sands</th></tr>
<tr><td>Feed</td><td>23</td><td>5 to 70</td><td>13</td><td>3 to 10</td></tr>
<tr><td>Testwork HMC</td><td>94</td><td>80 to 100</td><td>135</td><td>< 10 to 70</td></tr>
</table>
The uranium and thorium content is as expected for mineral sands. These elements are typically associated with zircon in the HMC. The Cyclone HMC is 50% zircon whereas typical mineral sand mines are much lower in zircon. This explains the higher than typical uranium content in the HMC.
</td><td></td><td></td></tr>
<tr><td>Radiological Council</td><td>Provide a commitment to submit the Radiation Management Plan and pre-mining radiation surveys as required by the State Mining Engineer to the Radiological Council for information and review.</td><td>Lost Sands commits to a pre- mining radiation survey and development of a Radiation Management Plan (RMP) with consideration to:
the Radiation Safety Act 1975 and WA Radiation Safety Regulations (1983);
WA Mines Safety and Inspection Act 1994, Mines Safety and Inspection Regulations (1995) and DMP NORM-2.2. Preparation of a Radiation Management Plan – Mining and Processing (2010)
The Australian Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA, 2005);
Radiation Safety (Transport of Radioactive Substances) Regulations, WA, 2002 and the ARPANSA Safe Transport of Radioactive Material Code of Practice (2008).
An RMP will be developed for mining and transport, prior to the submission of a Mining Proposal and Project Management Plan to the Department of Mines and Petroleum.

Lost Sands commits to submission of the pre-mining radiation survey and Radiation Management Plan to the Radiological Council for information and review.</td><td>No further response</td><td></td></tr>
</table>

7. Offsets

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Department of Parks and Wildlife and the Conservation Commission	Provide additional discussion and commitments regarding how and at what stage the offsets would be further developed, in consultation with Parks and Wildlife and the Conservation Commission of Western Australia.	**The offsets will be further developed post assessment in consultation with DPaW, OEPA and Conservation Commission. This includes finalisation of offset quantification, types of offsets and time scale.**	No further response	
Department of Parks and Wildlife	Provide further discussion regarding the time period over which offsets would be applied. As the proposal is located in an area with limited rehabilitation examples, the current prediction that the environmental values will be returned within five years is not supported by Parks and Wildlife. Further, if the use of the **haul road** extends to more than the predicted ten years of operation the offset will need to	**The offsets would be applied over the life of the mine and until such time that rehabilitation is deemed successful (12 years operations and 10 years rehabilitation)** **As stated in the Offsets Reporting Form within the PER, if operations proceed after the anticipated 12 years of operation, funds will continue to be released at an equivalent annual rate.**	The Response to submissions should acknowledge that, in the event that operations proceed after the anticipated 12 years, any Ministerial Approval for the proposal would need to be amended through Sections 46 and 45C of the Environmental Protection Act 1986. Any offset requirements would be re-evaluated at that time.	**Lost Sands acknowledge that, in the event that operations proceed after the anticipated 12 years, any Ministerial Approval for the proposal would need to be amended through Sections 46 and 45C of the Environmental Protection Act 1986. Any offset requirements would be re-evaluated at that time.**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	be recalculated and based on the actual period of operation and residual impacts.			
Department of Parks and Wildlife	Provide further discussion on the possible on-ground management (offset) activities currently proposed. Note that the currently proposed actions may not be considered by Parks and Wildlife to be particularly relevant to the affected environment or may duplicate other proposed activities under consideration for the nature reserve. Parks and Wildlife would also be seeking linkages for the offsets with other stakeholders like the Traditional Owners, other Government agencies, research institutions or local biosecurity groups to provide the best possible outcome and value for investment.	**Details of offset types will be further discussed and finalised post assessment, in consultation with DPaW, OEPA and Conservation Commission.** **As outlined in the Offsets Reporting Form within the PER, all proposed offsets will be developed and implemented in collaboration with DPaW, Pila Nguru, DAFWA and the South Australian Department of Environment, Water and Natural Resources as deemed necessary.** **The GVD Biodiversity Trust is being investigated as a mechanism to implement both direct and indirect offsets proposed.**	No further response	
Department of Parks and Wildlife	Provide further discussion and justification of how the currently proposed offset was calculated, and what could be achieved through the offset. Refer to the Department of Parks and Wildlife submission (Attachment 3) for further details)	**Offset amount will be determined in consultation with GVD Biodiversity Trust, DPaW and OEPA through the condition setting process.**	No further response	

8. Rehabilitation and decommissioning

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Radiological Council	Provide further evidence and discussion to support the claims in the PER in relation to radiation rehabilitation and closure in the table on page 36.	**The production of titanium minerals is managed under the *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (2005). Lost Sands will augment the updated Mine Closure Plan (to be submitted concurrently with the Mining Proposal), with a pre-mining radiation survey and Radiation Management Plan.** **The Radiation Management Plan will include a Radioactive Waste Management Plan (RWMP) and *"an outline of the proposal for the eventual decommissioning and rehabilitation of the mine", in accordance with* regulation 16.7. The objective of a RWMP is *"to ensure that there is no unacceptable health risk to people, both now and in the future, and no long-term unacceptable detriment to the environment from the waste so managed, and without imposing undue burdens on future generations"* (ARPANSA 2005). The radiation level post mining will be lower than pre-mining due to removal of the higher radiation**	No further response	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		minerals in the concentrate. Therefore, the potential for any form of radiation to impact the environment, including rehabilitation and closure is considered unlikely. **The pre-mining radiation survey will establish the 'baseline' conditions, which is an important part of the development of a RWMP. A monitoring program designed to evaluate baseline conditions will be developed in conjunction with the Radiological Council. Lost Sands will seek advice from the Radiological Council to ensure that the survey is commenced early enough to allow seasonal variations in pre-existing conditions to be evaluated prior to commencement of the project. These 'baseline' conditions will be established prior to any collection of significant amounts of radioactive material through ground disturbance exercises.** **In designing and planning for mine closure, the RWMP will be developed using a risk-based approach (DRET/GS/DEWHA 2010). The RWMP will demonstrate the application of the 'as low as reasonably achievable' (ALARA) and 'best practicable technology' principles (ARPANSA 2005). The RWMP will include appropriate radiation monitoring and be referenced in the updated MCP.**		
Department of Mines and Petroleum	Acknowledge and discuss the requirement for the preliminary MCP to be revised in accordance with the Guidelines for Preparing Mine Closure Plans (2015) for submission with the Mining Proposal. Acknowledge that given the 10 year nominal mine life, the financial provisioning for closure is expected to be further developed prior to submission.	**Lost Sands acknowledge that the preliminary MCP will be revised following EPA approval, and will submitted to the DMP for approval, concurrent with the submission of the Mining Proposal. This MCP will be developed in accordance with the revised joint DMP and EPA *Guidelines for Preparing Mine Closure Plans* (2015).** **Lost Sands acknowledge that a detailed financial closure provisioning model will be developed as a component of the revised MCP, and that a detailed closure costing assumptions report will augment the MCP.**	No further response	
Department of Mines and Petroleum	Note that the Mine Closure Plan must be revised through the life of mine to reflect the contemporary closure requirements of the Project. Typically DMP will review a project's MCP on a triennial basis.	**Lost Sands acknowledge that the MCP will be revised through the life of mine to reflect the contemporary closure requirements of the Project, typically DMP will review a project's MCP on a triennial basis.**	No further response	
Department of Parks and Wildlife	Identify and discuss the implications of using as yet unspecified binding materials and dust suppressant additives (to reduce maintenance costs and water usage on a compacted unsealed road) on rehabilitation and closure outcomes	**Lost Sands acknowledge that the management of the haul road is of particular importance as it passes through the Great Victoria Desert Nature Reserve (GVD NR). The development and management of the road during the operational life of the mine**	The proponent should acknowledge that the absence of appropriately detailed design during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring	**Although a precise quantification of infrastructure impacts cannot be provided to the completion of detailed road design, the following section provides a broad estimate and assessment of indirect impacts of the construction and operations of the haul road within the GVDNR. The proposed haul road will be the only infrastructure within the GVDNR. The estimation of indirect impacts includes**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	(including potential contamination issues). This may be significant given the distances involved in transporting potentially contaminated materials.	**plays is intrinsically linked to potential rehabilitation success of the road post closure.** **Lost Sands acknowledge that the road binding materials are as yet unspecified, however, remain committed to stripping contaminated material from the surface of the haul road and removing it from the confines of the Nature Reserve.**	detailed designs to be provided and approved prior to the commencement of construction.	**additional modelling activities related to indirect impacts of dust and hydrological processes on the GVDNR.** **See Responses 1 and 4 for additional information on the indirect impacts to native vegetation including specific additional information relating to the binding agent.** **Lost Sands acknowledges that the absence of appropriately detailed design during the assessment of the proposal, in particular for disturbance within the GVDNR, is likely to result in the recommendation of conditions requiring detailed designs to be provided and approved prior to the commencement of construction.**
Department of Parks and Wildlife	Provide additional discussion regarding closure outcomes for rehabilitation along the full length of the haul road in the reserve (as a preliminary basis for appropriate completion criteria). Outcomes should include, but not be limited to the following: • The original land profile is reinstated. • Drainage lines and surface water flows are reinstated. • Erosion and long term erosion risk is minimal. • Contaminated materials including soils with elevated salinity have been remediated or removed. • Flora and vegetation is self-sustaining and resilient to fire, introduced animals, weeds and erosion. • Flora and vegetation density, diversity and structure is comparable to surrounding natural vegetation. • Fauna habitat is reinstated, and a range of native fauna have begun utilising the haul road (it has not become a permanent barrier). • Weeds have not been introduced or increased in distribution. Parks and Wildlife does not inherit a management liability.	**As stated above Lost Sands acknowledge that the development and management of the road during the operational life of the mine plays is intrinsically linked to potential rehabilitation success of the road post closure.** **Consequently Lost Sands is committed to the successful implementation of the Haul Road Management Plan, which includes the following indirect potential impacts to flora and vegetation:** • **modification of surface and groundwater flows (surface hydrology and erosion);** • **introduction and spread of weeds;** • **generation of dust from mining activities and haul road;** • **use of saline water and binding agent along the haul road;** • **alteration of fire regime; and** • **increase in access by humans.** **Lost Sands is also committed to the successful implementation of the following management plans:** • **Overarching Environmental Management Plan;** • **Vegetation and Flora Management Plan;** • **Fauna Management Plan;** • **Haul Road Management Plan;** • **Weed Management Plan;** • **Dust Management Plan;** • **Fire Minimisation Plan;** • **Water Management Plan; and**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		• **Cultural Heritage Management Plan.** **The current objectives / outcomes for the haul road (Table 20 of the Mine Closure Plan) include, but are not limited to:** ***Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function*. This objective and associated criteria addresses points 1 and 2.** ***The rehabilitated ecosystem has function and resilience indicative of target ecosystem.* This objective and associated criteria addresses point 3.** ***Salt contaminated soil from the haul road surface will be removed to ensure suitable growing conditions for selected native plant species.* This objective and associated criteria addresses point 4.** ***The final landscape will have the ability to withstand or have the capacity to recover following stochastic occurrences or final land use pressures.* This objective and associated criteria addresses point 5.** ***Vegetation in rehabilitated areas of the haul road crossing through the Great Victoria Desert Nature Reserve (GVD NR) (GVD NR Haul Road) will have values indicative of target ecosystems*. This includes *No new weed species are introduced to the Haul Road*. This objective and criteria addresses points 6 and 8.** ***Where the completion criteria above are attained, fauna utilisation, abundance and diversity will trend towards original levels in the areas rehabilitated*. This objective and associated criteria addresses point 7.** **Subsequent to development of the detailed road design and collation of data associated with all the management plans listed above, Lost Sands will be in a position to utilise the collated information to support refinement of the qualitative criteria. The criteria will become more specific with time.** **Lost Sands will manage the rehabilitation of the haul road until the agreed criteria have been attained, thereby ensuring that DPaW does not inherit a management liability, as per the existing objective: Rehabilitation performance will be monitored until completion criteria have been met.**		

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		Appropriate remediation actions will be taken where completion criteria cannot be achieved.		
Department of Parks and Wildlife	Provide additional discussion in order to provide confidence that the closure outcome for the nature reserve will be acceptable. Refer to the Department of Parks and Wild life Submission Item No. 3 (Attachment 3) for further information.	**Greater detail on the proposed investigation tasks and trials is included in Attachment 1; these trials will close out the existing knowledge gaps. The findings of the proposed trials will be incorporated into the rehabilitation techniques and methodology to facilitate an acceptable closure outcome for the nature reserve.** **Qualitative criteria have been presented within the preliminary MCP, as it is not possible to develop quantitative criteria at this stage of the operation. The findings of the investigation tasks and trials will be utilised to continuously refine the criteria throughout the life of the mine.** **MWH will review the proposed monitoring in light of DPAWs comments, and provide greater detail in the updated MCP.** **MWH will update page 155 of PER to reflect DPaW's comment and will refer the reader to the stakeholder register section. MWH proposes that additional consultation with DPaW regarding end land use, closure objectives and completion criteria can be undertaken when the MCP is updated to augment the Mining Proposal.**	The OEPA acknowledges the lack of site specific information related to rehabilitation. Please provide information regarding mitigation or offset actions which may be undertaken in the event that agreed completion criteria cannot be achieved within a reasonable timeframe.	**Lost Sands recognise that the revegetation of sustainable native vegetation communities using local species requires consideration of a number of key components. Lost Sands is committed to enhancing the current understanding of the environmental values and functions of the Nature Reserve, to ensure that successful rehabilitation outcomes are achieved.** **Please refer to Response 2, which outlines mitigation actions, as detailed in the Preliminary Mine Closure Plan.** **In the event that agreed completion criteria cannot be achieved within a reasonable timeframe, Lost Sands are committed to continuing rehabilitation activities, along with relevant offset activities, until such time as completion criteria, consistent with the values of the GVDNR are achieved.**
Department of Parks and Wildlife	Provide additional discussion of the implications of a decision to retain the haul road, including: • Consultation requirements and information requirements for each step in the decision making process. • Review of the condition of the haul road and adjoining reserve areas and whether there are any positive long-term benefits in retaining the haul road for the nature reserve and its values. This review should address whether the impacts are acceptable, outweigh negative impacts, and provide a clear understanding of any liabilities. • Reviewing the state (standards) of the haul road for hand over: whether portions of the disturbance footprint will be	**The position presented by Lost Sands is that the haul road will be successfully rehabilitated, hence there is no requirement to provide additional discussion on the implications of a decision to retain the haul road. This is a discussion that could potentially be held with DPaW subsequent to approval of the Project.**	The Response to submissions should acknowledge that, in the event that operation of the haul road continues after the anticipated 12 years, any Ministerial Approval for the proposal would need to be amended through Sections 46 and 45C of the Environmental Protection Act 1986. Any management requirements would be re-evaluated at that time	**Lost Sands acknowledge that, in the event that operation of the haul road continues after the anticipated 12 years, any Ministerial Approval for the proposal would need to be amended through Sections 46 and 45C of the Environmental Protection Act 1986. Any management requirements would be re-evaluated at that time.**

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	rehabilitated and to what standards; and requirements and standards for access, signage and / or gates and fences, especially if the road is retained as a private road with access restricted to Parks and Wildlife and the Traditional Owners.			

9. Other

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Conservation Commission	On Page 30 of the PER, Table 3-2, the Conservation Commission is listed as a decision making authority in relation to clearing within an A-class reserve. This is incorrect.	**This is acknowledged.**	**No further response**	
Department of Park and Wildlife.	The PER references the Minister for State Development as having responsibility in relation to the 1978 granting of Mining Act 1978 tenure for the haul road in the nature reserve. This is not correct; however the tenements agreement (concurrence) of the Minister responsible for the reserve (Minister for Environment) is required prior to formal consideration by the Minister for Mines of consent for mining under Section 24 of the Mining Act. When checked in July 2015, the miscellaneous licence(s) tenure for the haul road through the provisions of the Mining Act had not yet been applied for.	**This is acknowledged. Agreement from the Minister for the Environment for the miscellaneous licence tenure through the GVDNR will be obtained prior to formal consideration by the Minister for Mines.** **An application for a Miscellaneous Licence for the road will be submitted to the DMP following completion of the project assessment report by the EPA.**	**No further response**	

Additional Comments from Wildflower Society and Submission ANON-DV9P-F4AT-J

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Wildflower Society of WA	**1. Lodgement of Plant Specimens with WAH** In the Flora and Vegetation Survey undertaken by Outback Ecology (2014), it is stated multiple times that the consultant engaged to undertake the survey would submit specimens from all Priority Flora, potentially new species and range extensions to the Western Australian Herbarium. Any lodgements should be showing up in the databases by now but a search undertaken by the Society determined that there have been	**Acceptance of specimens by the Western Australian Herbarium is undertaken at the curator's discretion. Specimens were retained in house at MWH in suitable conditions during the PER process to enable easy access as required. A detailed list of available specimens has recently been provided to the herbarium curator to assist her in making the decision regarding the suitability of submission of these specimens. MWH is currently awaiting a response to this email.** **The provision of plot data to DPaW has not been requested and is not a requirement of**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	no lodgements to date. It's extremely important for this job that collected specimens be lodged at the Herbarium given that little work has been done in the area of the proposal. Furthermore the consultant should have given their plot data to the Department of Parks and Wildlife (DPaW).	**this PER. Lost Sands has not received a formal request for plot data from DPaW. Lost Sands is open to formal discussions regarding the plot data, however a request to Lost Sands will be required, stating what the plot data will be used for and whether it will be publicly available.**		
Wildflower Society of WA	**2. Survey Constraints and Limitations Section** There are many factual errors in the survey constraints and limitations section of the Flora and Vegetation Survey (Outback Ecology 2014, p. 123) including: 2.1 • Not all of the botanists had 20 years' experience. There was only one botanist that had 20 years' experience;	**Acknowledged, the factual errors have been noted and amended, where relevant. The word combined was mistakenly omitted from this paragraph regarding the experience of the survey team in Appendix D (Flora and Vegetation Survey Report) – see Attachment 2. Elsewhere in the report the combined experience is stated as exceeding 40 years. The Limitations table in the final version of the report has been updated to rectify this.**	**No further response**	
Wildflower Society of WA	2.2 • The helicopter survey over a few days or weeks (they don't elaborate how much time) does not represent a thorough survey. It was a random sampling exercise with many gaps;	**All quadrats, relevés and targeted searches were completed on the ground. The helicopter was utilised as the only suitable form of transport between sites given the limited accessibility within the area.** **The Phase 1 survey was completed by two botanists over nine days, the Phase 2 survey was completed over five days by three botanists. This represents a total approximated 396 person hours (based on minimum 12 hour days). A statement has been added to the report under Section 3.2.2 (now called Survey Personnel and Survey Effort – see Attachment 2) to clarify the time spent on the ground.** **Site selection was not random – As detailed in Section 3.2.3 - indicative sites were selected prior to the field surveys using aerial imagery, land system, geological mapping and the results of the reconnaissance survey. The helicopter was used to gain a better understanding of the vegetation patterns across the entire area and all sites were ground-truthed to identify describe and map vegetation communities and species composition. Additional sites were added as required to ensure appropriate coverage of all vegetation communities across the area.** **Due to the remoteness of the project and the length of the proposed haul road, it was not feasible (or safe) to complete an on-ground survey along the entire length of the project. Lost Sands has committed to**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		completing a baseline weed survey within the project, including the Great Victoria Desert Nature Reserve. This baseline survey will also target conservation significant flora to map and define population extents.		
Wildflower Society of WA	2.3 • The species accumulation curve bears no relevance to how well the area was surveyed overall. It only shows how well it was surveyed in the particular season it was surveyed in. Were two measured plots placed in each vegetation community as per Guidance Statement 51? They don't specify. If not, then it was not surveyed adequately. The last sentence is a bold claim without any basis;	**The purpose of species accumulation curves is to ensure adequate surveying under current conditions. The curve indicates the expected taxa (based on statistical analysis) and whether the survey is reaching asymptote. This provides more clarity and certainty that the survey recorded a sufficient proportion of the flora taxa expected to occur. As discussed in Section 4.3.2 of Appendix D (Flora and Vegetation Survey) the survey identified 77 to 96% of the expected flora, while the curve is not quite at asymptote, which is consistent with the prediction of 77 to 96% of flora taxa recorded.** **The survey was completed in line with EPA Guidance Statement 51 with the exception that six of the 40 vegetation associations were represented by a single sampling site (VA's 6, 11, 27, 30, 46, and 48). The reasons behind this were detailed within the limitations table: This was a result of sites representing small vegetation associations, grades or interzones between two or more VA's or time and logistical constraints preventing access to additional sites. The six vegetation association's that were under-sampled represent less than 1% of the total area mapped. Although it is ideal to have a minimum of two sampling sites per association, in this situation it is not considered to a limiting factor. In addition, only VA 46 of the six associations will be impacted (less than 4% of mapped extent) by the project.** **Section 4.2.2 provides a detailed assessment of vegetation associations recorded including the intersecting sites. Appendix B provides a full list of quadrat and relevé locations that agrees with the statement above regarding number of sites by veg association (see Attachment 2). This appendix has been updated to include site type in the final version of the report.**	**No further response**	
Wildflower Society of WA	2.4 • The seasonality wasn't bad considering the challenges in picking peak season in the region, however, it can't be said that there was no constraints, because the photos (p. 72 onwards) clearly show that conditions	**It is agreed that the area has undergone some long term lower than average rainfall (see details in Sect 3.2.1). The timing of the survey was specifically timed following some rainfall, however, the long term drier conditions appear to have limited annual**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	were dry at a large proportion of the sites the time of the survey;	**growth. A note has been added to the Limitations table within final version of the report with the timing/weather/season/cycle updated as a partial limitation – Limitations table now reads "Rainfall received prior to Phase 1 appears to have been largely restricted to the northern section of the Study Area.** **Poor rainfall in the southern sections of the Study Area (Nullarbor Plain) likely influenced the low species diversity recorded in this region.** **Poor long term rainfall conditions are assumed to have contributed to the limited annual species recorded in both phases although heavy rabbit infestation throughout the area may be a contributing factor.**		
Wildflower Society of WA	2.5 • Were two measured plots placed in each vegetation community as per EPA Guidance Statement 51? The consultant has not been clear anywhere in the document about how many were proper plots and how many were random sample sites (unbounded); and	**See response 2.3 above.**	**No further response**	
Wildflower Society of WA	2.6 • There is a false assumption made about Florabase records in relation to species richness in plots — this is entirely irrelevant. 30 species per plot isn't high. Mulga communities are species rich, and you'd expect double that. They look dry in the photos, particularly the grass and probably herb layer. And many plots had around 10 species, some of these would have been genuinely species poor communities, but not as many as they had. It indicates either poor survey methodology (unbounded plots probably) or an out of season survey. There is no differentiation between bounded and unbounded 'plots'.	**The statement related to Florabase was made as an indication of the paucity of data in the region wording has been changed slightly within the limitations table to provide clarification of this – see Attachment 2. The survey has provided significant flora records for the WA Herbarium and Threatened Species and Communities Unit (DPaW).** **The quality of the seasons the surveys were conducted in has been discussed on numerous occasions. It is noted and previously identified, that the long-term climatic conditions have been dropping gradually, while the two phases of the survey were following adequate rainfall based on falling monthly averages. The rainfall in the region is sporadic with limited weather stations that accurately collect and record the daily rainfall totals. As a result, the survey timing was based on weather stations that are located at the northern and southern ends of the project, with only the southern weather station in close proximity to the project area. As such the reliability of the rainfall records over a vast arid region is open to interpretation and judgement. Approximately 77 to 96% of the expected flora taxa were recorded suggesting the survey was adequate.**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
Wildflower Society of WA	**3. Vegetation Conservation Significance** As per most Flora and Vegetation Survey reports, this has been done poorly for vegetation compared to conservation significance assessment for flora. Conservation significance is discussed briefly on page 127 (paragraph 6 and 7) but the consultant fails to identify that the Rabbit Land System has 36% in the 'study area' and Beard Community 85 (Shepherd coding) has 35% in 'study area'. The Society assumes that the consultant has extrapolated mapping to say that while these might have a large proportion within the 'study area', they have much less in the actual impact area. It's not really clear.	**The consultant has not extrapolated the Land System and Beard Community mapping. The mapping extents have been calculated based on the digital data obtained from the Department of Agriculture and Food Western Australia. The extent of the Land System and Beard Community units has been calculated for the entire State, the Study Area and the Impact Area. This has allowed the percentage extent impacted and remaining to be determined.**	**No further response**	
Wildflower Society of WA	**4. Plot Surveys** The purpose of doing plot surveys is to statistically analyse your plots against a regional plot dataset to show how rare or common your vegetation is. The consultant should confirm with the EPA as to whether or not regional plot data can be sourced from DPaW. I regionally plot data can be sourced then plots should be statistically analysed.	**A regional dataset for the Great Victoria Desert and/or the Nullarbor Plain is unavailable. It is noted and understood that the analysis of the plot data collected from the Study Area with a regional dataset is ideal to determine the regional significance of the vegetation recorded in the Study Area. However, due to this information not being available, a regional analysis has not been performed.** **The OEPA and DPAW have been contacted regarding this, and DPAW has reiterated that there are no useable regional datasets available for the Great Victoria Desert and Nullarbor regions.**	**No further response**	
Wildflower Society of WA	**5. Study Area** There is a lack of clarity as to how much vegetation is in the 'study area' and how much vegetation is in the impact zone. The consultant mention all kinds of numbers that don't match up across the document. The summary says the 'study area' is 134,535 hectares in size, with 1,319 hectares in the impact zone. Then in the introduction, the 'study area' is 16,135 hectares.	**The report has been reviewed for inconsistencies. The 16,135 hectares (ha) quoted as the Study Area in the introduction on page 13 is incorrect. The report has been updated such that the introduction now states the Study Area as being 134,535 ha as quoted throughout the rest of the report (see Attachment 2).** **A review of the report was undertaken and the numbers are now consistent, as follows (rounded to the nearest hectare):** • **Total Study Area: 134,535 ha** • **Haul Road Development Envelope: 2,559 ha;** • **Haul Road Proposed Footprint: 520 ha;** • **Mining Area Development Envelope: 1,028 ha;** • **Mining Area Footprint: 799 ha;**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
		• **Total Indicative Footprint: 1,319 ha; and** • **Total Development Envelope: 3,587 ha.** **No other inconsistencies were identified during the review.**		
ANON-DV9P-F4AT-J	Appendix D Part 1- Part 3: Vegetation association mapping report states that 144 sites (releves and non-permanent quadrats) were used to delineate the vegetation associations. 1. What proportion of the number of quadrats surveyed belongs to each vegetation association? Have they been adequately distributed across the survey area to reflect the proportion of vegetation associations affected by the development envelope?	**The survey was completed in line with EPA Guidance Statement 51 which requires a minimum of two quadrats per association. Where possible, this was achieved, however, six of the 40 vegetation associations were represented by a single sampling site (VA's 6, 11, 27, 30, 46, and 48). The reasons behind this were detailed within the limitations table and are discussed above, point 2.3. This was a result of sites representing small vegetation associations, grades or interzones between two or more VA's or time and logistical constraints preventing access to additional sites.** **Section 4.2.2 provides a detailed assessment of vegetation associations recorded including the intersecting sites. Appendix B provides a full list of quadrat and relevé locations that agrees with the statement above regarding number of sites by vegetation association. This appendix has been updated to include site type in the final version of the report.**	**No further response**	
ANON-DV9P-F4AT-J	2. The spatial distribution of quadrats (especially along the haul road route) does not appear to provide adequate coverage in some sections, areas over 10 km long have been mapped, but do not contain any mapping sites (Appendix D Part 2: Map 11, 12,13 of 30).	**As quoted above some limitations were encountered with regards to logistics, timing and accessibility. The areas mentioned without sites were easily assessed from the helicopter. In situations where further detail was required and a site was not established, the area was traversed and detailed mapping notes taken to confirm vegetation association types.** **Lost Sands have committed to a baseline weed survey along the length of the project. During this assessment, conservation significant flora will be identified, recorded and their population extent delineated. Although this does not include site sampling, the vegetation association will be identified each time a weed or conservation significant flora species is recorded.**	**No further response**	
ANON-DV9P-F4AT-J	How were the quadrats assigned to vegetation associations? There is lack of justification (statistical and descriptive) of whether an inclusive/exclusive approach was taken to site anomalies (especially as the dendrogram is not labelled by any	**Vegetation Associations were determined through a combination of expert assessment in the field incorporating the detailed records of vegetation structure, condition and species composition required as part of a Level 2 assessment. The dendrogram was a**	**No further response**	

Submitter	Submission and/or issue	Proponent Response to comments 1	OEPA Response to Proponent Response	Proponent Response to comments 2
	groupings/assigned vegetation associations). Were the 40 vegetation associations assigned based purely on the 30% arbitrary similarity cut-off in the cluster dendrogram	**component of the work utilised to confirm if the statistical assessment agreed with the on ground assessment and the data.**		
ANON-DV9P-F4AT-J	Whilst the baseline data gathered from the vegetation mapping survey work will prove valuable for future rehabilitation efforts (species richness, diversity, cover, etc), there is no mention (in any of the PER flora and vegetation related documents) of establishing permanent monitoring plots in the pre-construction phase for valid comparisons to assess impacts of the Project once disturbance/clearing starts.	**Establishment of permanent monitoring points was outside the scope of the flora survey and report. Lost Sands have committed to completing vegetation monitoring; permanent monitoring sites will be established during this assessment. The sites will be established prior to any ground disturbance to ensure baseline values are collected. Proposed Monitoring Actions are included in the Cyclone Vegetation and Flora Management Plan**.	**No further response**	

Table 1: Simplified leaf traits and dust susceptibility

Family	Species	Leaf trait	Dust susceptibility
Amaranthaceae	*Ptilotus obovatus*	Small, hairy leaves	Medium
Boraginaceae	*Halgania cyanea* var. Allambi Stn (B.W. Strong 676)	Small, wavy leaves	Low
Casuarinaceae	*Casuarina pauper*	Terete phyllodes	Low
Chenopodiaceae	*Enchylaena tomentosa*	Small hairy leaves	Medium
Chenopodiaceae	Maireana georgei	Small silky leaves	Medium
Chenopodiaceae	Maireana integra	Small, silky leaves	Medium
Chenopodiaceae	Maireana pentatropis	Small, glossy/silky leaves	Medium
Chenopodiaceae	Maireana sedifolia	Small, hairy/silky leaves	Medium/High
Euphorbiaceae	Euphorbia tannensis subsp. eremophila	Glossy/sub-glossy leaves	Low
Fabaceae	*Acacia* eremophila numerous-nerved variant (A.S. George 11924)	Terete nerved leaves	Low
Fabaceae	*Acacia aneura*	Flat, striated leaves	High
Fabaceae	*Acacia aptaneura*	Terete to flat striated leaves	Medium/High
Fabaceae	*Acacia ayersiana*	Flat, striated leaves	High
Fabaceae	*Acacia burkittii*	Very thin striated leaves	Medium
Fabaceae	*Acacia caesaneura*	Flat, striated leaves	High
Fabaceae	*Acacia colletioides*	Terete, small leaves	Low
Fabaceae	*Acacia gilesiana*	Terete glaucous leaves	Low
Fabaceae	*Acacia heteroneura* var. *jutsonii*	Angular, thin leaves	Low
Fabaceae	*Acacia incurvaneura*	Terete to very thin nerved leaves	Low
Fabaceae	*Acacia kempeana*	Flat, striated leaves	High
Fabaceae	*Acacia ligulata*	Thin long leaves	Low
Fabaceae	*Acacia minyura*	Small, flat, striated leaves	Medium/High
Fabaceae	*Acacia mulganeura*	Flat, striated leaves	High
Fabaceae	*Acacia nyssophylla*	Small, spiny leaves	Low
Fabaceae	*Acacia oswaldii*	Small, flat, striated leaves	Medium/High
Fabaceae	*Acacia papyrocarpa*	Flat, thin, striated leaves	Medium/High
Fabaceae	*Acacia pteraneura*	Terete leaves	Low
Fabaceae	*Acacia ramulosa* var. *linophylla*	Terete leaves	Low
Fabaceae	*Acacia tetragonophylla*	Small, spiny leaves	Low
Fabaceae	*Daviesia benthamii* subsp. *acanthoclona*	Terete phyllodes	Low
Frankeniaceae	*Frankenia cinerea*	Small, crowded leaves	Low
Goodeniaceae	*Scaevola collaris*	Small, glossy/glabrous leaves	Low
Malvaceae	*Abutilon otocarpum*	Hairy undulate flat leaves	Medium
Myrtaceae	*Eucalyptus canescens* subsp. *beadellii*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus canescens* subsp. *canescens*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus concinna*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus gongylocarpa*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus gypsophila*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus oleosa* subsp. *oleosa*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus pimpiniana*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus socialis* subsp. *victoriensis*	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus* sp. Great Victoria Desert (D. Nicolle & M. French DN 3877)	Glossy/sub-glossy leaves	Low
Myrtaceae	*Eucalyptus youngiana*	Glossy/sub-glossy leaves	Low
Pittosporaceae	*Pittosporum angustifolium*	Flat, glossy leaves	Low
Proteaceae	*Hakea leucoptera* subsp. *sericipes*	Terete leaves	Low

Family	Species	Leaf trait	Dust susceptibility
Santalaceae	*Santalum acuminatum*	Flat leaves	Medium
Sapindaceae	*Alectryon oleifolius* subsp. *canescens*	Flat glossy leaves	Low
Sapindaceae	*Dodonaea viscosa* subsp. *angustissima*	Thin, flat, vicsid leaves	Medium
Scrophulariaceae	*Eremophila arenaria*	Glabrous to slightly hairy flat leave	Medium
Scrophulariaceae	*Eremophila decussata*	Hairy leaves	Medium
Scrophulariaceae	*Eremophila falcata*	Shiny flat leaves	Low
Scrophulariaceae	*Eremophila latrobei* subsp. *glabra*	Glabrous thin leaves	Low
Scrophulariaceae	*Eremophila longifolia*	Appressed hairs on flat leaves	Medium
Scrophulariaceae	*Eremophila paisleyi* subsp. *paisleyi*	Glabrous thin leaves	Low
Scrophulariaceae	*Eremophila platycalyx* subsp. *platycalyx*	Flat glabrous leaves	Low
Scrophulariaceae	*Eremophila punctata*	Resinous, glabrous flat leaves	Medium
Scrophulariaceae	*Eremophila undulata*	Hairy, wavy leaves	Medium
Scrophulariaceae	*Myoporum platycarpum* subsp. *platycarpum*	Thin, flat glabrous leaves	Low
Solanaceae	*Duboisia hopwoodii*	Thin, flat glossy leaves	Low
Thymelaeaceae	*Pimelea microcephala* subsp. *microcephala*	Small, glossy leaves	Low

Table 2: Dust susceptibility rating

Rating	Description
High	The species has flat, striated leaves that are more susceptible to dust damage and stomatal blockage (Turner 2013).
Medium	The species has hairy leaves that may collect a higher dust load (Butler 2009), or have thin, striated leaves.
Low	The species has terete, or glossy, or glabrous leaves that has a lower capacity to trap dust or be impacted by dust damage and stomatal blockage.

Table 3: Weeds known, or with potential, to occur within the GVDNR

Name	Outback Ecology (2014)	Woodman (2012)	WAH (2015)	DPaW (2015) (GVDNR)	WONS	DPP	Flowering	Lifeform
Acetosa vesicaria	✓		✓	✓	No	No	Jul to Sep	Annual
Asphodelus fistulosus	✓		✓		No	No	Jun to Oct	Annual/ biennial
Brassica tournefortii	✓		✓	✓	No	No	Jun to Nov	Annual
Carrichtera annua	✓	✓	✓	✓	No	No	Sep to Nov	Annual
Carthamus lanatus			✓	✓	No	Yes (C3)	Dec or Jan to Apr	Annual
Cenchrus ciliaris			✓	✓	No	No	Feb to Oct	Perennial
Conyza bonariensis			✓		No	No	Jan to Dec	Annual
Echium plantagineum	✓				No	Yes (C3) Not for site	Sep to Dec or Jan	Annual/ biennial
Erodium aureum	✓		✓	✓	No	No	Jul to Oct	Perennial
Erodium cicutarium	✓				No	No	May to Oct	Annual/ biennial
Heliotropium europaeum	✓			✓	No	Yes (C3) Not for site	Jan to Dec (usually Dec to Mar)	Annual
Lythrum hyssopifolia			✓	✓	No	No	Sep to Dec or Jan	Annual
Malva parviflora			✓		No	No	Mar or Jul to Nov	Annual/ Perennial
Malvastrum americanum	✓	✓			No	No	Apr to Jul	Perennial
Nicotiana glauca	✓				No	No	Mar or May or Aug to Dec	Perennial
Salvia verbenaca			✓	✓	No	No	Apr or Jul to Oct	Perennial
Solanum nigrum			✓		No	No	Jan to Dec	Perennial
Sonchus oleraceus	✓		✓	✓	No	No	Jan to Dec	Annual
Tribulus terrestris	✓				No	No	Jan to Dec	Annual

WONS – Weeds of National Significance; DPP – Declared Plant Pests under Section 22 of the *Biosecurity and Agriculture Management Act 2007*.

Table 4: Identification reliability for the 19 weed species

Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acetosa vesicaria												
Asphodelus fistulosus												
Brassica tournefortii												
Carrichtera annua												
Carthamus lanatus												
Cenchrus ciliaris												
Conyza bonariensis												
Echium plantagineum												
Erodium aureum												
Erodium cicutarium												
Heliotropium europaeum												
Lythrum hyssopifolia												
Malva parviflora												
Malvastrum americanum												
Nicotiana glauca												
Salvia verbenaca												
Solanum nigrum												
Sonchus oleraceus												
Tribulus terrestris												
# of weeds identifiable	11	9	10	11	13	16	16	18	17	17	18	12

Likelihood

High – Flowering and/or fruiting; identifiable from vegetation material

Medium – Potentially flowering and/or fruiting; identifiable from vegetative material

Low – Unlikely to be flowering and/or fruiting; identification difficult from vegetative material

Table 5: Flowering periods for the 19 weed species

Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acetosa vesicaria												
Asphodelus fistulosus												
Brassica tournefortii												
Carrichtera annua												
Carthamus lanatus												
Cenchrus ciliaris												
Conyza bonariensis												
Echium plantagineum												
Erodium aureum												
Erodium cicutarium												
Heliotropium europaeum												
Lythrum hyssopifolia												
Malva parviflora												
Malvastrum americanum												
Nicotiana glauca												
Salvia verbenaca												
Solanum nigrum												
Sonchus oleraceus												
Tribulus terrestris												

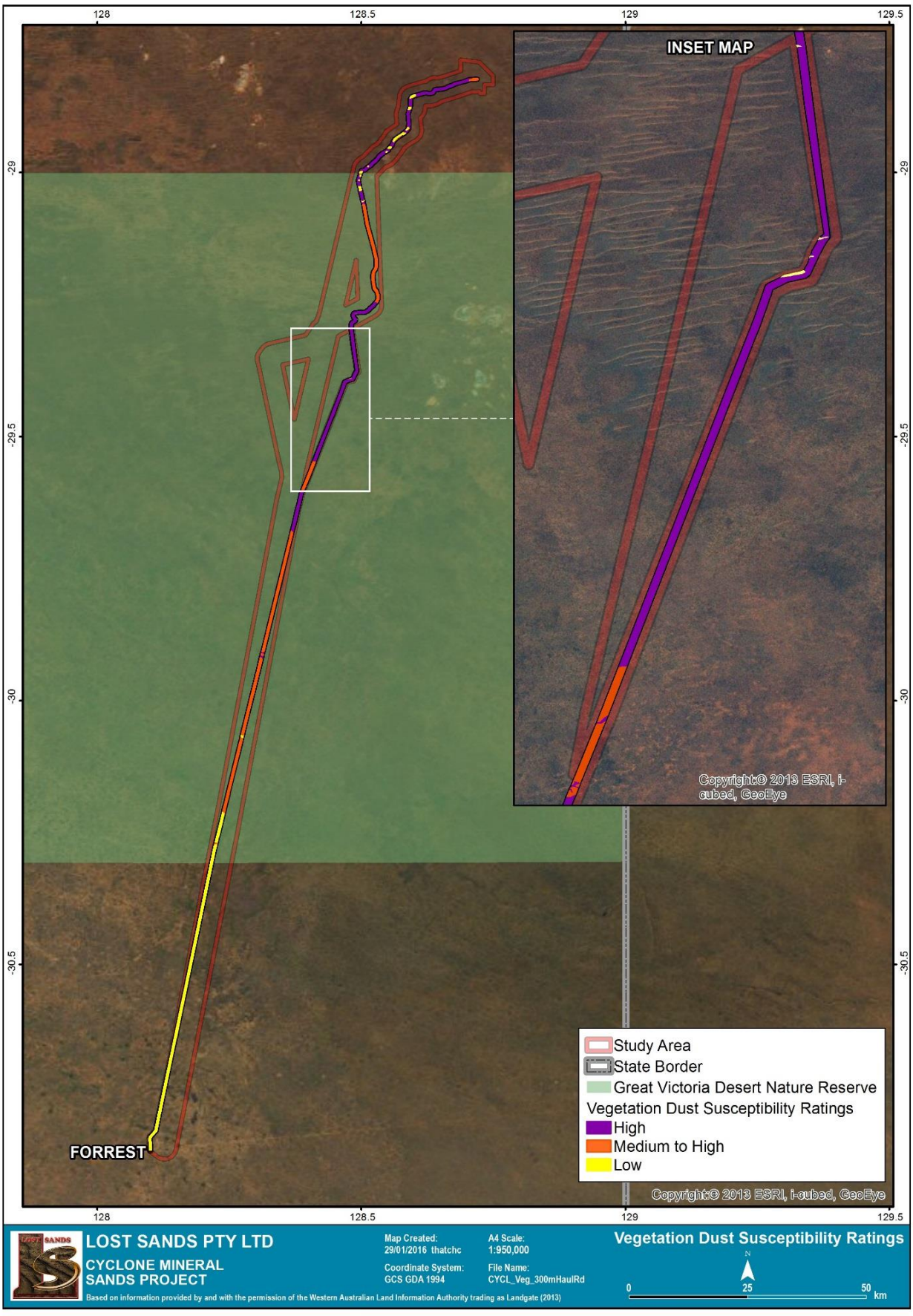

Figure 1: Susceptibility to Dust

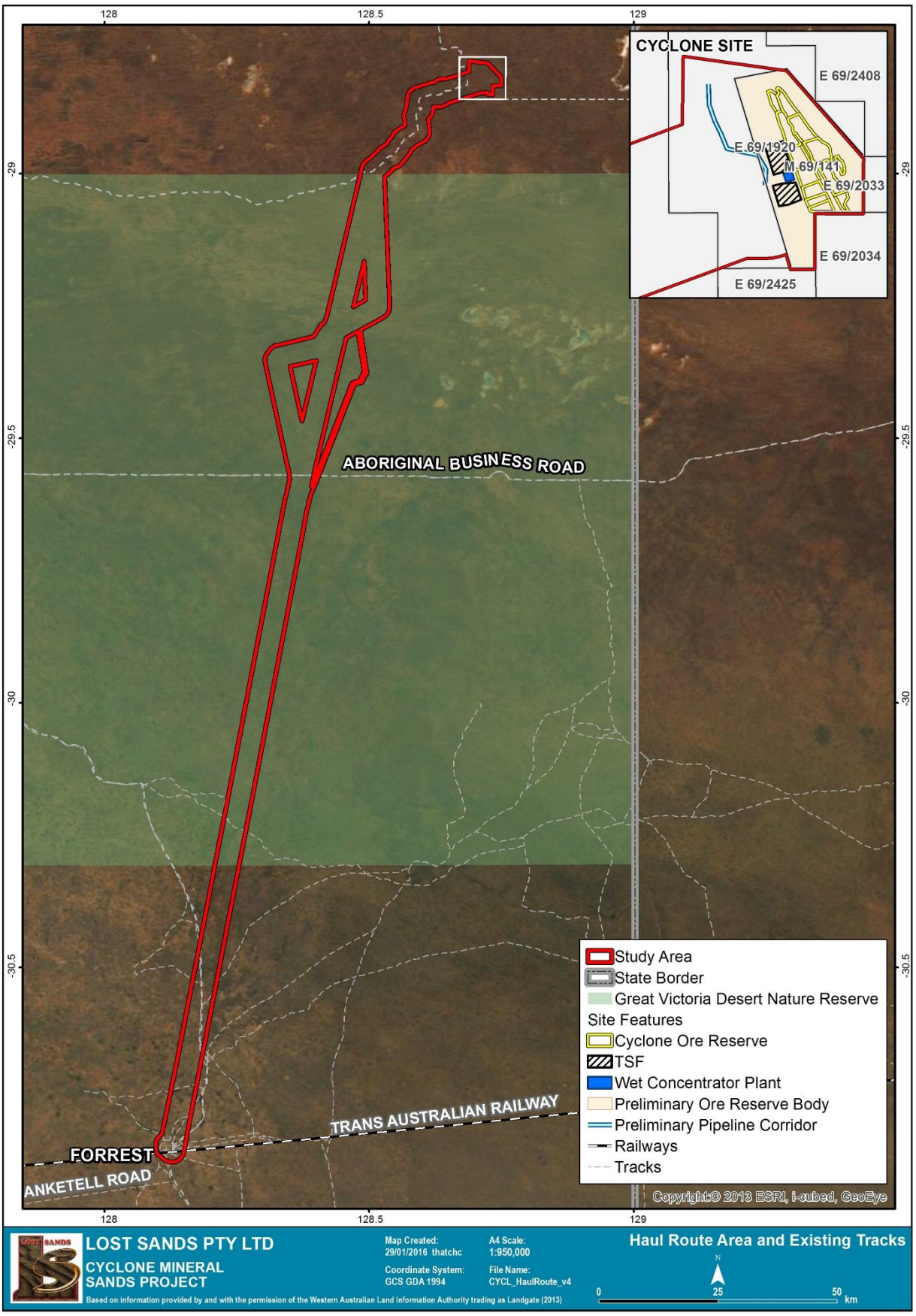

Figure 2: Existing roads within the Great Victoria Desert Nature Reserve (see Comment 6)

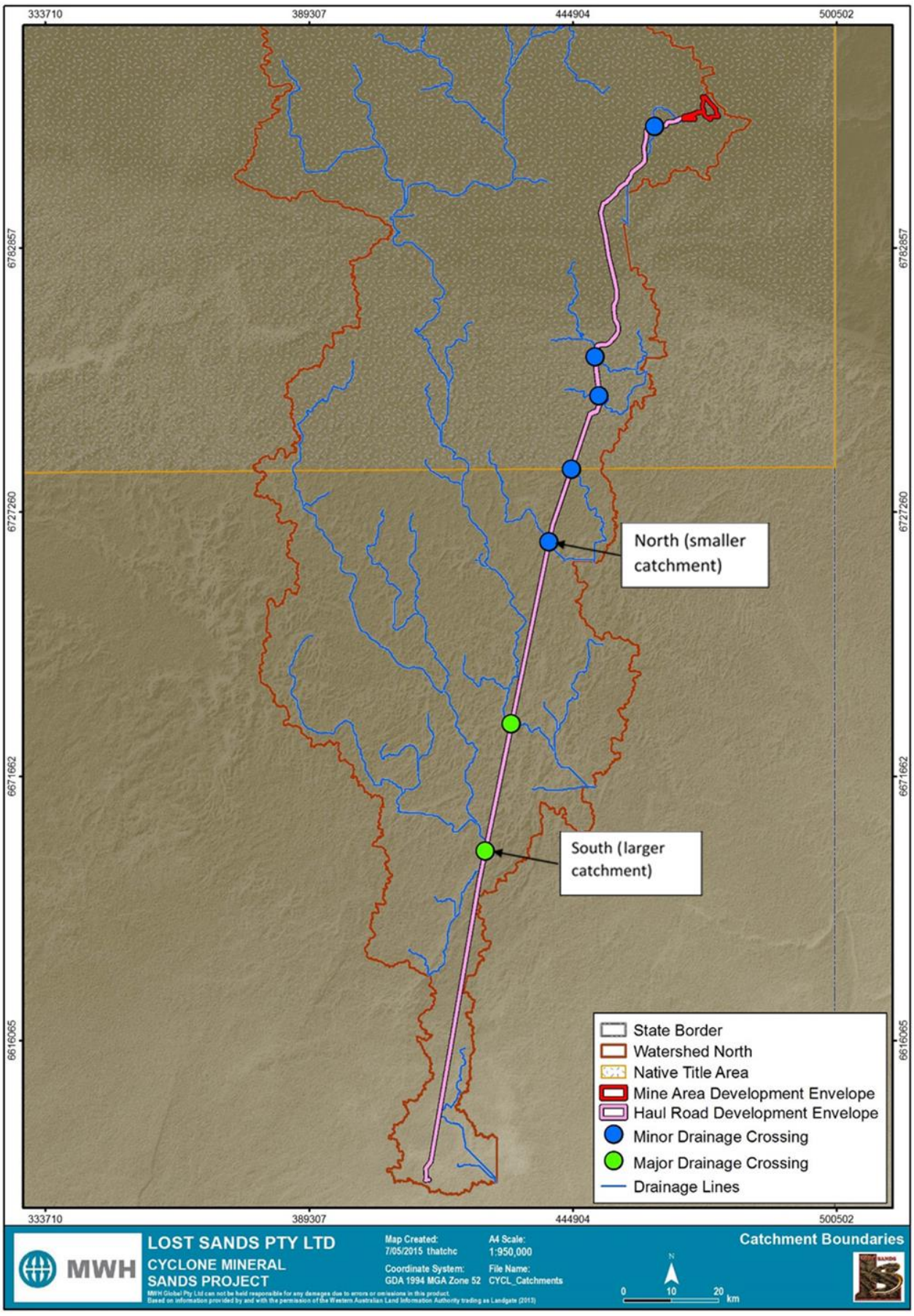

Figure 3: Drainage Crossings used for impact assessment (see Comment Reference 19)

10. References

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Attachment 1 – Revised sections of the Mine Closure Plan

The following provides relevant sections of the Lost Sands Pty Ltd Cyclone Project Preliminary Mine Closure Plan that have been revised and updated based upon received submissions. All of the following text has been updated.

Lost Sands is committed to enhancing the current understanding of the environmental values and functions of the Nature Reserve, and has expanded its approach to developing this knowledge, and achieving successful rehabilitation outcomes through the proposed trials and investigations.

Relevant information from the Jacinth-Ambrosia (J-A) mineral sands mine and the Restoration Technology Project has been utilised to identify and guide the potential investigation and research trials. Subsequent to approval, Lost Sands proposes to engage with J-A to ascertain the effectiveness of trials that they have undertaken, and if there are any additional shared learnings that can be applied to the proposed Lost Sands trials to provide the best outcome with respect to attaining rehabilitation success.

Lost Sands recognise that the revegetation of sustainable native vegetation communities using local species requires consideration of a number of key components including: identifying the community's constituents and their attributes. Lost Sands will continue to refine their current knowledge of the soil types, underlying geology, hydrology and topographical conditions necessary for the establishment and persistence of the communities along the proposed haul; road and within the mine site area.

Lost Sands are committed to minimising the environmental impact of the operation, achieving successful rehabilitation and the eventual relinquishment of tenements back to the state.

3.7.4.1 Lost Sands proposed approach to vegetation characteristics and biology

Lost Sands recognise that understanding the vegetation characteristics and biology of the key species present across the diverse habitats within the Cyclone Project area is critical to rehabilitation success.

Lost Sands will investigate the potential to undertake, but not be limited to, understanding the following biological factors of key species along the haul road through the Nature Reserve:

- limiting factors to growth;
- rooting depths;
- effects of dust smothering;
- seasonal growth, flowering and reproductive biology; and
- symbiotic relationships of key species.

It is also proposed that Lost Sands will establish trials to identify which of the native grass species are fast growing, with appropriate root density and structure, and lifespan. A component of the trials would need to focus on how the density of these species affects other slower growing species that will be present in the rehabilitated areas. The establishment of grasses, and other fast growing plants, will play a key role in the stabilisation of soil. The main benefit of grasses is they slow the movement of water, reducing its erosive potential.

3.7.4.2 Lost Sands proposed approach to seed viability, longevity and germination requirements

Subsequent to approval, Lost Sands will engage with both the South Australian Seed Conservation Centre (SASCC), and the WA Seed Technology Centre (WASTC). The WASTC has been involved in the collection, storage and testing of Western Australian native plant seed for over 40 years. Seeds from over 3,500 different plant species are stored in the WA seedbank and maintained to International Standards. The SASCC was the leading scientific group behind the seed trials undertaken for the J-A mine.

Lost Sands are cognisant that as a result of the long term storage of topsoil, the reliance on seed to achieve targets is increased. Due to the remoteness of the Project area, information on site and species specific requirements is not available.

Lost Sands recognise the following knowledge gaps exist within the Project area:

- the seed dormancy and germination limitations of target species;
- what seed germination enhancement technologies are best suited to the key species; and
- the interactions of seed-use technologies with post mining landscapes to optimise plant regenerative capacity.

The following trials are considered by Lost Sands to be relevant to the rehabilitation success of the Project area:

- seed viability and germination;
- seed longevity;
- effect of seasonal temperature;
- effects of saline water, and salt accumulation in soil, on seed germination and growth
- collection timing; and
- effects of storage conditions and duration.

The outcomes of these trials will help Lost Sands identify:

- timing of seed harvest to maximise seed quality, viability and storability;
- what species need to be targeted for seed collection to supplement rehabilitation areas, and at what interval;
- correct seed handling to ensure seed is not damaged during the collection and cleaning phases;
- adequate and appropriate storage of seed; and
- seed priming and sowing time.

Attachment 2 - Revised Sections of Lost Sands Pty Ltd Cyclone Project Level 2 Vegetation and Flora Survey and Impact Assessment

The following provides relevant sections of the Lost Sands Pty Ltd Cyclone Project Level 2 Vegetation and Flora Survey and Impact Assessment that have been revised and updated based upon received submissions. Updated text has been highlighted in yellow.

Project Location and Description

Lost Sands Pty Ltd ("Lost Sands"), a subsidiary of Diatreme Resources Limited, has identified a mineral sands resource on its mining tenement M69/141 in the Eucla Basin of Western Australia. Lost Sands have proposed the Cyclone Mineral Sand Project ('the Project') to develop the resource, which is comprised of zircon, rutile and other titanium minerals. The Project includes pits, processing infrastructure, an accommodation camp, airstrip, water supply infrastructure, access roads and a Haul Road. It is proposed that mineral sands concentrate will be trucked south to a rail siding on the Trans-Australian Railway.

The Study Area comprises 134,535 ha which includes the Mining Development Envelope (tenement M69/141) located 25 km from the South Australian border and the Haul Road Development Envelope extending south-southwest approximately 230 km to the Trans-Australian Railway at Forrest (**Figure 1**).

Survey Personnel and Survey Effort

Phase 1 of the Level 2 survey was completed by Outback Ecology botanists Jeni Alford and Chad Hughes between 2nd and 10th October 2013. Phase 2 was conducted by Jeni Alford, Chad Hughes and Chid Gilovitz from 1 April to 5th April 2014(**Table 4**). An estimated total of 396 person hours were spent completing the field survey components (based on minimum 12 hour days). All personnel were experienced botanists with experience in conducting level 2 vegetation and flora surveys, with over 40 years of accumulated experience in Australian botany and field survey.

Table 6: Potential limitations of the survey

Aspect	Constraint	Comments regarding the vegetation and flora survey
Competency/experience of consultants	No	Members of the survey team were flora specialists employed by Outback Ecology, with more than 20 years' experience combined undertaking vegetation and flora assessments of this kind within Australia.
Scope	No	The scope was clearly defined and realistically achievable within the designated timeframe.
Proportion of flora identified	No	Of the 369 taxa collected during the 2013 survey a number of taxa could not be identified. The majority of these were due to sterile specimen quality, and for this reason most taxa were collected multiple times to overcome this issue. Around 1,200 specimens were collected over Phase 1 and 2. Where specimens could not be identified it was either because the specimens lacked adequate flowering material or the taxonomy of these species is under review or poorly known.

Aspect	Constraint	Comments regarding the vegetation and flora survey
		Unidentifiable taxa were compared to conservation significant species in order to remove the possibility of missing a significant species. Where specimens could not be identified to species level and there was cause to suspect they could either be conservation significant or potentially new species, specimens were submitted to the herbarium of Western Australia for formal classification.
Information sources (e.g. historic or recent)	No	Few local and regional studies have been completed. However, available data was reviewed prior to commencement of the survey.
Proportion of task achieved, and further work which might be needed	No	All identified vegetation communities were recorded in quadrats, relevés and mapping notes during the survey. A Species Accumulation Curve suggests that around 75 to 90% of the expected flora was recorded. Given the number of new flora records and range extensions for the region and State, the proportion of the task achieved is considered sufficient.
Timing / weather / season / cycle	Partial	Rainfall received prior to Phase 1 appears to have been largely restricted to the northern section of the Study Area. Poor rainfall in the southern sections of the Study Area (Nullarbor Plain) likely influenced the low species diversity recorded. Poor long term rainfall conditions are assumed to have contributed to the limited annual species recorded in both phases although heavy rabbit infestation throughout the area may be a contributing factor. Both Phase 1 surveys were undertaken following significant rains around 2 months prior within the Great Victoria Desert, and this was reflected in the diversity of Asteraceae recorded. Phase 2 surveys occurred after significant rains within both the Nullarbor Plain and Great Victoria Desert; rainfall was evidenced in the Nullarbor Plain by new growth of some species, particularly *Salsola australis*.
Disturbances	No	The northern section of the Study Area (Great Victoria Desert) has been little disturbed and was rated as being in “Very Good” to “Excellent” condition. The Southern portions of the Study Area associated with the Nullarbor Plain exhibited a high degree of disturbance resulting from rabbit grazing and weed infestations. As this is widespread over the region these disturbances are unavoidable.

Aspect	Constraint	Comments regarding the vegetation and flora survey
Intensity	No	Survey intensity was in accordance with Guidance Statement 51. The scope of works undertaken meets the requirements for a Level 2 survey. The survey has provided significant flora records for the WA Herbarium and Threatened Species and Communities Unit (DPaW).
Completeness	Yes/Maybe	Upwards of 30 species were commonly encountered per quadrat. This was higher than anticipated given that FloraBase lists 110 species for the Eastern Maralinga subregion (DPaW 2014). However, this is likely to be a reflection of the paucity of regional surveys conducted in the region. The survey has provided significant flora records for the WA Herbarium and Threatened Species and Communities Unit (DPaW). Surveys were conducted in April and October, the October 2013 survey followed significant rainfall events and all habitat types encountered were surveyed including post burn scar areas. The survey resulted in in a total of 44 vegetation associations being described and 259 species were recorded. Species accumulation curves utilising site data indicated that between 70 and 95% of species present were recorded indicating the Level 2 assessment is complete under current conditions. Six of the 40 vegetation associations were represented by a single sampling site (VA's 6, 11, 27, 30, 46, and 48). This was a result of sites representing small vegetation associations, grades or interzones between two or more VA's or time and logistical constraints preventing access to additional sites.
Resources	No	Western Australian Herbarium specimens; taxonomic guides; DEC database searches and the FloraBase database were all used to prepare for the field surveys and used for the identification of unknown species and the confirmation of known species. Resources were adequate to carry out the survey.
Remoteness / access problems	No	The Study Area was considered to be very remote, and large tracts were unreachable via vehicle, however a helicopter was on hand and used for the majority of the Survey to adequately subsample the Study Area and representative vegetation associations.
Availability of contextual information	No	Information was available from the Interim Biogeographic Regionalisation for Australia (IBRA), FloraBase, DPaW lists and the Bureau of Meteorology; furthermore, documents detailing contextual information relevant to the Project have been reviewed in the Desktop Study and Preliminary

Aspect	Constraint	Comments regarding the vegetation and flora survey
		Reconnaissance Survey reports by Woodman Environmental Consulting.

APPENDIX B

Quadrat and Relevé Locations

Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)	
		Easting	Northing			Easting	Northing			Easting	Northing			Easting	Northing			Easting	Northing
C2-101	RDW	439029	6723918	C2-64	Q	452009	6790257	CHR07b	RD	447189	6768589	JA672	R	472970	6814455	CV55	Q	427758	6652702
C2-102	RDW	448109	6761247	C2-65	RDW	450196	6762668	CHR10	RD	443761	6748032	CV02	Q	461033	6807819	CV56	Q	424130	6628629
C2-103	RDW	448113	6761093	C2-OPP	RDW	453058	6780698	JAQ813	Q	417095	6599699	CV03	Q	460160	6802599	CV57	Q	460795	6808073
C2-104	Q	453010	6764457	C3-Q	RDW	449296	6791503	JAQ846	Q	434456	6695047	CV04	Q	459845	6804670	CV58	Q	450962	6751722
C2-105	RDW	452630	6789930	C3-R	RDW	450166	6792194	JAQ850	Q	434409	6695157	CV05	Q	439236	6718024	CV59	Q	450426	6750098
C2-106	Q	451960	6790523	C3-S	Q	454100	6794600	JAQ859	Q	439225	6721270	CV06	Q	420588	6613348	CV60	Q	459986	6803645
C2-107	Q	458171	6799448	C3-T	Q	455917	6795485	JAQ909	Q	456112	6795238	CV07	Q	438646	6727666	CV61	Q	459686	6800750
C2-108	Q	459996	6801944	C3-U	Q	456284	6795244	JAQ915	Q	437901	6728434	CV08	Q	455648	6795371	CV62	Q	452420	6788978
C2-109	RDW	465915	6809366	C3-V	RDW	459219	6800980	JAR648	R	469245	6813262	CV09	Q	429041	6663959	CVC01	Q	414119	6587774
C2-110	RDW	465885	6809532	C3-W	Q	459248	6800874	JAR683	R	470552	6813748	CV101	Q	465916	6809365	CVC02	Q	417801	6588641
C2-12	Q	452702	6790996	C3-X	Q	459359	6800606	JAR815	R	417189	6599260	CV14	Q	417653	6588378	CVC03	Q	440325	6722862
C2-13	Q	453083	6782693	C3-Y	Q	459441	6800333	JAR819	R	423312	6606464	CV15	Q	429210	6659031	CVC04	Q	436466	6702161
C2-13a	RDW	452958	6773651	C3-Z	RDW	461505	6808197	JAR843	R	448966	6761525	CV17	Q	467528	6810114	CVC05	Q	436308	6702367
C2-13b	RDW	453017	6772026	CHQ01	Q	469377	6811324	JAR904	R	456215	6795214	CV18	Q	465885	6809533	CVC06	Q	438350	6714013
C2-14	Q	452925	6770647	CHQ02	Q	469238	6811441	JAR941	R	419769	6602126	CV19	Q	466475	6810574	CVC06b	Q	433537	6688679
C2-15	Q	452899	6770727	CHQ03	Q	430283	6672755	M-04b	Q	470391	6811168	CV20	Q	467017	6810999	CVC07	Q	427618	6652432
C2-16	Q	449545	6762681	CHQ05	Q	415008	6587869	M-01-A	Q	469411	6811268	CV21	Q	459506	6801480	CVC08	Q	426673	6649353
C2-18	RDW	437501	6753238	CHQ06	Q	436359	6720214	M-01-B	Q	473191	6814602	CV22	Q	448508	6777942	CVC09	Q	450750	6746402
C2-19	RDW	437372	6752481	CHQ07	Q	436490	6720254	M-05	Q	473446	6812140	CV29	Q	438865	6734720	CVC10	Q	450823	6746331
C2-19a	RDW	437174	6752515	CHQ08	Q	447109	6768733	M-06	Q	473068	6810856	CV30	Q	450667	6752100	CVC11	Q	450864	6746257
C2-20	RDW	437535	6755022	CHQ09a	Q	447357	6768786	M-07	Q	473489	6812019	CV32	Q	446678	6742506	CVC12	Q	442270	6728868
C2-20a	RDW	436951	6754157	CHQ09b	Q	452902	6790762	M-08	RDW	473507	6808995	CV33	Q	447453	6744686	CVC14	Q	450800	6776474
C2-21	RDW	435255	6743442	CHQ10	Q	438012	6728303	MS-03	Q	416743	6591124	CV34	Q	439450	6729172	CVC15	Q	453296	6775319
C2-24	RDW	437990	6737854	CHQ11	Q	427580	6650409	MS-04	Q	418299	6593988	CV35	Q	445452	6738450	CVC16	R	453616	6766895
C2-24a	RDW	438013	6737840	CHQ12	Q	419796	6602078	MS-05B	Q	420138	6603446	CV36	Q	438473	6714154	CVC18	R	449150	6759675
C2-25	RDW	436969	6731598	CHQ13	Q	418144	6594846	MS-06	Q	424249	6627068	CV37	Q	437719	6708067	CVC19	Q	421431	6617641
C2-26	Q	437788	6727267	CHQ14	Q	443552	6747982	MS-07	Q	424922	6635286	CV38	Q	435902	6702329	CVC20	Q	422660	6635105

Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)		Site name	Site Type*	UTM (GDA 94 Z52)	
		Easting	Northing			Easting	Northing			Easting	Northing			Easting	Northing			Easting	Northing
C2-26a	RDW	437498	6727235	CHR01	RD	473088	6810734	MS-08	Q	428366	6660492	CV39	Q	436055	6702231	CVC21	Q	420462	6656403
C2-27	RDW	438642	6723762	CHR02	RD	469397	6811227	MS-09B	Q	428300	6661249	CV41	Q	433806	6688659	CVC21b	Q	443859	6734507
C2-32	Q	433226	6690941	CHR03a	RD	459265	6801156	MS-10	Q	429686	6668150	CV42	Q	439110	6735043	CVG01	Q	444080	6756287
C2-38	Q	427509	6650846	CHR03b	RD	470023	6810448	MS-11	RDW	430409	6672611	CV43	Q	441864	6728326	CVG02	Q	441975	6730057
C2-41	RDW	425738	6641524	CHR04	RD	430386	6672862	MS-11B	Q	430394	6672663	CV45	Q	440230	6722070	CVG03	Q	440655	6728988
C2-61	Q	453006	6790800	CHR05	RD	430347	6672699	MS-12	RDW	494147	6794345	CV47	Q	439759	6720247				
C2-62	Q	453489	6790700	CHR06	RD	416769	6591175	MS-14	RDW	487347	6800831	CV51	Q	452625	6789932				
C2-63	RDW	453197	6790543	CHR07a	RD	420128	6603452	MS-17	RDW	456005	6796245	CV54	Q	426951	6649163				

#This list includes sites from Reconnaissance Survey conducted by Woodman in 2012, Phase 1 Survey Sites (October 2013) and Phase 2 Survey Sites (April 2014)

* Q = Quadrat, R = Relevé, RD = Detailed Relevé , RDW = Detailed Relevé completed by Woodman only

Attachment 3 – PEL Emissions Assessment of the Haul Road within the GVDNR

13/01/2016

Sarah Osborne
Discipline Lead, Approvals & Mine Support
MWH Global

Email:Sarah.Osborne@mwhglobal.com

Dear Sarah,

Lost Sands Dust Impact Assessment from Haul Roads

Further to your request to undertake dust modelling of emissions from the proposed 240km haul road from proposed Lost Sands mine to the Forrest Railway Station through the Great Victorian Desert Nature Reserve (GVDNR), please find enclosed Pacific Environment Limited's (PEL) brief report.

Should you have any queries or require clarification, then please let me know.

Yours sincerely

Jon Harper
Manager, Western Australia

BACKGROUND

Lost Sands Pty Ltd, a subsidiary of Diatreme Resources Ltd is proposing to develop a minerals sands mine approximately 317km north of Eucla. It involves open cut mine pits, processing infrastructure including TSFs, processing facilities, backfill of mined pits, water storage facility, an approximately 240 km long haul road through GVDNR, from the mine to Forrest railway station and siding, supporting infrastructure including access and haul roads, an accommodation camp, power station and airstrip and groundwater abstraction from a borefield with supporting infrastructure.

The intent of the project is to provide Lost Sands with an indication of the potential distance that dust may be dispersed from the haul road. This will assist in quantitatively calculating potential resultant impacts upon vegetation and flora adjacent to the proposed Haul Road.

METHODOLOGY

Site-specific details were used to estimate emissions from haulage activity. Emissions were input into the Gaussian Plume model 'AUSPLUME' together with the base meteorological file 'METSAMP' to conduct a screening level assessment. The model was run for a single hour and the results extrapolated out for a day based on the percentage distribution of stability classes expected in the region. This approach ensures that the model results are not overly conservative.

The modelling did not include the entire length of the haul road. As this is a screening level assessment, a section of the haul road was selected and modelled. The results, which will be conservative, are applicable over any required section of the haul road.

EMISSION ESTIMATION

Haulage will comprise of four triple road trains round trips and two water cart round trips. The majority of the haul road will have approximately 10% of materials under 75µm in diameter. The other site specific details of relevance to the emission estimation process are provided in Table 1.

Table 1: Site Specific Information

Details	Value	Unit, if applicable	Comment
Silt content (s)	10	%	Based on information received from Phil Mcmurtrie on 12th Dec 2015
Road Train Length	53.5	m	Applicable for Triple Road Trains, Source: https://www.mainroads.wa.gov.au/UsingRoads/HeavyVehicles/Permits/Pages/ortbd.aspx
Road Train Width	3.5	m	Applicable for Triple Road Trains, Source: https://www.mainroads.wa.gov.au/UsingRoads/HeavyVehicles/Permits/Pages/ortbd.aspx
Road Train Wheel Height	1	m	Assumed
Road Train empty weight	40	Tons	Based on information received from Phil Mcmurtrie on 12th Dec 2015
Road Train Loaded Gross weight	140	Tons	Based on information received from Phil Mcmurtrie on 12th Dec 2015
Road trains	8	Round trips per day	4 Loaded and 4 empty trips per day; Based on information received 12th Jan 2016
Water cart	2	Round trips per day	Assumed
Water cart empty weight	36	Tons	DA40 water carts; http://www.moxy-wa.com.au/product-range/DA40-Water-Cart-Brochure.pdf
Water cart loaded weight	72	Tons	DA40 water carts; http://www.moxy-wa.com.au/product-range/DA40-Water-Cart-Brochure.pdf
Mean Vehicle Kilometer Travelled (VKT)	1920	VKT/day	Calculated
Gross weight	82.8	Tons	Calculated
Chemical suppression for dust control – RST Product	80	%	Control efficiency, SKM (2005).

Reference was made to USEPA Unpaved Haul Roads equation (USEPA, 2006) applicable for emissions from vehicles travelling on unpaved surfaces at industrial sites; this equation is of relevance as the mine access road will be restricted to public with primarily haulage. Emissions were estimated for Total Suspended Particles (TSP) using Equation 1. Dust control as detailed in Table 1 was applied. The uncontrolled and controlled emission rates are presented in (Table 2).

Equation 1

$$Emission\ factor\ E = \frac{0.4536}{1.6093}\left(\frac{s}{12}\right)^{0.7}\left(\frac{W}{3}\right)^{0.45}$$

Where

E = emission rate in kg/VKT

S = silt content in %

W = Mean vehicle weight (tons)

Table 2: TSP Emission rate

Details	Value	Unit
Uncontrolled emission rate	0.04	kg/VKT
	0.977	g/s
Controlled emission rate	0.195	g/s

Particle size distribution as detailed in Table 3 was used to estimate particle dry deposition. It is noted that wet deposition was not modelled for the study; although conservative, it is considered appropriate given the annual rainfall in the region being in the order of 230mm with just above 30 days receiving rains above 1mm (BoM, 2015)

Table 3: Particle size distribution

Particle Diameter	Mass Fraction	Reference
Less than 2.5µm	3%	USEPA (2006)
2.5µm – 10µm	27.6%	
10µm – 30µm	69.4%	

ASSSESSMENT CRITERIA

There is no formal dust deposition criterion available in WA. As such reference has been made to the New South Wales (NSW) criteria (DEC, 2001) for deposited dust and they are normally applied for assessments in WA. The NSW criteria set a maximum increase of 2g/m^2/month in dust levels with a maximum total deposited dust level of 4g/m^2/month. Deposited dust is assessed as insoluble solids as defined by AS 3580.10.1-1991. It is noted that the above criterion were set to address nuisance dust and not as an indicator for predicting impact on vegetation.

More recently, a detailed study was undertaken in WA to estimate the effects of iron ore mine dust on two species of Acacia: *Acacia aneura* and *Acacia rhodophloia*; a critical dust load of 5g/m^2 was recommended which equates to 4.2g/m^2/30days (Turner 2013) and will be adopted as the indicative assessment criteria for this report.

DISCRETE RECEPTORS & RESULTS

Emissions were modelled at discrete receptors 50m intervals downwind of the haul road until 1km and then every 1km until 5km (Table 4). The predicted maximum hourly concentration by stability class at each receptor was converted into an average hourly concentration based on the stability distribution typical for the region (Table 5). The average hourly concentrations were then converted into daily values by applying a factor of 1/3 (i.e., 1 triple road train every 3 hours over a day including return trips) and are detailed in Table 5.

It is expected that the criteria (4.2g/m^2/month) will potentially be exceeded up to 150m downwind of haul road; with no exceedance expected further downwind. It is noted that this is a very conservative assessment as it is based on a constant westerly wind (also applicable for easterlies); depending on the

direction of wind, this impact would be lower: i.e., for a southerly wind, the dust deposition will be along the haul road section with minimal impact expected on surrounding vegetation.

Table 4: Discrete Receptor Results

Receptor	Easting (m)	Northing (m)	Distance downwind from source (m)	Dust Deposition (g/m2/month)
Receptor 1	400217	6699970	50	36.76
Receptor 2	400267	6699970	100	11.91
Receptor 3	400317	6699970	150	4.86
Receptor 4	400367	6699970	200	2.53
Receptor 5	400417	6699970	250	1.56
Receptor 6	400467	6699970	300	1.05
Receptor 7	400517	6699970	350	0.74
Receptor 8	400567	6699970	400	0.55
Receptor 9	400617	6699970	450	0.43
Receptor 10	400667	6699970	500	0.35
Receptor 11	400717	6699970	550	0.28
Receptor 12	400767	6699970	600	0.24
Receptor 13	400817	6699970	650	0.20
Receptor 14	400867	6699970	700	0.17
Receptor 15	400917	6699970	750	0.15
Receptor 16	400967	6699970	800	0.13
Receptor 17	401017	6699970	850	0.11
Receptor 18	401067	6699970	900	0.10
Receptor 19	401117	6699970	950	0.09
Receptor 20	401167	6699970	1000	0.08
Receptor 21	402167	6699970	2000	0.02
Receptor 22	403167	6699970	3000	0.01
Receptor 23	404167	6699970	4000	0.007
Receptor 24	405167	6699970	5000	0.005

Table 5: Stability Class Distribution

Stability Class	Percentage	Source
A	0.90%	Air Assessments (2013)
B	8.20%	
C	19.70%	
D	35.20%	
E	19.10%	
F	16.90%	

CONCLUSION

Assuming a worst case scenario, the potential dust impact on vegetation may occur within 150m downwind of the haul road. This is based on easterly and westerly winds and the impact distance will be greatly reduced for winds originating in other directions.

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