Case ID: 1385

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Private Bag x14, Springbok 8240, Andia Building, Voortrekker Street, Springbok 8240
Tel: 027- 712 8163. Fax 027-7121959; E-mail: deidre.williams@dmr.gov.za.
Ref: NCS 30/5/1/2/3/2/1(521)MR

19 April 2011

REGISTERED MAIL
The Director
SAHRA
P O Box 4937
CAPE TOWN
8000

CONSULTATION IN TERMS OF SECTION 40 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT 28 OF 2002) FOR THE APPROVAL AMENDMENT OF THE APPROVED ENVIRONMENTAL MANAGEMENT PROGRAMME IN RESPECT OF THE FARMS LANGHOOGTE NO 184, NUTTABOOI NO 199, STRYDRIVIER NO 188 AND STAANHOEK NO 198 ADMINISTRATIVE DISTRICT: NAMAQUALAND

APPLICANT: DE BEERS CONSOLIDATED MINES – NAMAQUALAND(BUFFELS INLAND RIGHT)

1. Attached herewith, please find a copy of additional information to the Environmental Management Programme received from the above-mentioned applicant, for your comments.
2. It would be appreciated if you could forward any written comments or requirements your department may have in the case in hand to this office on or before **30 May 2011.**
3. Consultation in this regard has also been initiated with other relevant Sate departments.

4. Your co-operation will be appreciated.

Yours faithfully

REGIONAL MANAGER: MINERAL REGULATION
NORTHERN CAPE REGION

7.8 Environmental awareness plan

De Beers Consolidated Mines Limited is actively involved in environmental awareness training throughout its Namaqualand Mines, as is evident in the implementation of the following procedures:

- Environmental Monitoring and Measurement, De Beers' document NM-PR-17-SHHE (Appendix B); and
- Identification of Environmental Awareness and Competency Training, De Beers' document NM-PR-05-SHHE (Appendix C).

These documents are also implemented within the BIR.

7.9 Emergency procedures

Namaqualand Mines has emergency environmental and social response procedures in place for the entire mine site, as stipulated in the De Beer's policy for Emergency Preparedness and Response NM-PR-22-SHHE (Appendix D).

The same emergency response procedure is and will be applicable during the operation, decommissioning and closure of the BIR.

7.10 Proposed timetable, duration and sequence

It is currently foreseen that mine operations would continue to about 2023 and thereafter the following would apply however, due to ongoing prospecting and anticipated sale and transfer of the mine within the next two years the operational life of the mine will probably be extended albeit on a smaller scale.

- Cessation of mining;
- Decommissioning;
- Monitoring and maintenance;
- Closure;
- Site relinquishment; and
- Post relinquishment.

7.11 Financial provision

The Namaqualand Mines 2009 Closure Cost Model as provided by Golder and Associates was the first of its kind for a mine on the Namaqualand West Coast. This model was developed in line with the philosophies and standards of the time. There is currently no standard for this environment as it is significantly different from the majority of mining environments in South Africa. Several of the components incorporated in the 2009 Closure Cost Model were included based on solutions typical to inland mines. Some of these components were deemed impractical; however these cost values still remained within the model due to a lack of alternative solutions.

The 2009 Closure Cost Model has been adapted to accommodate rehabilitation methods and principles were further developed to suit the environmental conditions on the Namaqualand West Coast. Given data gathered and additional information acquired from sustainability investigations, it has become apparent that various components of the closure model can be adjusted, placing greater emphasis on a more realistic closure plan.

A mine closure cost estimate was undertaken as at September 2009 and revised during 2010. This included a comprehensive analysis of the site-specific closure costs requiring scheduled (planned) and unscheduled (unplanned) financial provision for the entire Namaqualand Mines (Golder, 2010), covering all the mining

DE BEERS
A DIAMOND IS FOREVER

Namaqualand Mines: Closure Cost Estimate 2010

NAMAQUALAND MINES

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List of terms used

Reclamation	The re-instatement of a disturbed area into a usable state (not necessarily its pre-mining state) as defined by broad land use and related performance objectives.
Remediation	To assist in the reclamation process by enhancing the quality of an area through specific actions to improve especially bio-physical site conditions.
Rehabilitation	The return of a disturbed area to its original state, or as close as possible to this state.
Scheduled closure	Closure that happens at the planned date and/or time horizon.
Unscheduled closure	Immediate closure of a site, representing decommissioning and reclamation of the site in its present state.
Decommissioning	This relates to the situation after cessation of operations involving the deconstruction/removal and/or transfer of surface infrastructure and the initiation of general site reclamation.
Care and maintenance	This involves the maintaining and corrective action as required as well as conducting the required inspection and monitoring to demonstrate achievement of success of the implemented measures.
Closure	This involves the application for closure certificate and initiation of transfer of ongoing care and maintenance to third parties.
Site relinquishment	Receipt of closure certificate and handover to third parties for ongoing care and maintenance, if required.
Post-closure	The period of ongoing care and maintenance, as per arrangement with third parties.
Preliminary and Generals (P&Gs)	This is a key cost item which is directly related to whether third party contractors are employed for site reclamation. This cost item comprises both fixed and time-related charges. The former makes allowance for establishment (and de-establishment) of contractors on site, as well as covering their operational requirements for their offices (electricity/water/communications, latrines), etc. Time-related items make allowance for the running costs of the fixed charged items for the contract period.
Contingencies	This is used for making reasonable allowance for possible oversights/omissions and possible work not foreseen at the time of compilation of the closure costs. Allowance of between 10 percent and 20 percent would usually be made based on the accuracy of the estimations. The South African Department of Minerals and Energy Guideline (January 2005) requires an allowance of 10 percent.

Following on from the 2009 closure cost review carried out by Golder, further adjustments / exclusions were made by NM during the 2010 review (using the previous work completed by Golder as the base case).

3.0 AVAILABLE INFORMATION

The closure costs for the mine were mainly based on drawings, previous closure costs conducted by Golder in 2004 and 2009, reflecting both the scheduled and unscheduled closure situation.

The information listed in the table below was utilised for the costing as applicable.

Table 1: Information utilised for the closure costing of Namaqualand Mines

Drawing/report title	Drawing/report number	Date
Namaqualand Mines Closure Cost Estimates November 2004	6951-6567-1-E	November 2004
Environmental Management Programme for the various complexes of NM:	Various report numbers:	September 2007
▪ Buffels Marine Complex;	▪ 6951-9374-3-E;	
▪ Buffels Inland Complex;	▪ 6951-9376-4-E;	
▪ Dikgat Complex;	▪ 6951-9377-5-E;	
▪ Brand-se-Baai Complex;	▪ 6951-9378-6-E;	
▪ Samson's Bak Complex;	▪ 6951-9379-7-E;	
▪ Koingnaas Complex; and	▪ 6951-9380-8-E;	
▪ Groenrivier Complex.	▪ 6951-10280-9-E.	
General arrangement drawings of the mine site from reclamation planning		
Rehabilitation designs of the mass earth works that were done based on the 2007 survey of the entire mine. The conceptual designs completed in 2007 were refined to detailed design level (in terms of volume movement only) to produce the profiling model. The volumes were re-calculated according to the new inclusion/ exclusion boundaries provided by the mine assessment.		
The aerial assessment based on the mines GIS information conducted by the mine and the integration thereof with the profiling model.		

Other initiatives for alternative land uses being considered include the Living Edge of Africa project. These projects could lead to further areas being excluded from the reclamation liability at a later stage.

4.1 Division of complexes

The mining complexes have been divided into included and excluded categories according to their reclamation requirements and their relation to the profiling model. These areas are particularly applicable to the mining aspects of each of the complexes mentioned above.

Similar to the 2008 closure cost estimates the entire NM area has been sub-divided into various categories based on the survey database for purposes of reclamation. These areas have assumptions which indicate the work required for each area.

4.1.1 Areas affected by profiling/reclamation modelling

These are areas that fit into the profiling model compiled by Golder. These are the areas that have been identified as areas to be included for closure.

The conceptual profiling model completed has been refined to remove all materials movement less that 0.1m in depth (inherent "noise" in the model). The removal of the "noise" in the profiling model defined clear materials movement clusters. The portions of the survey categories covered by the profiling model have been removed from that specific category and reported on as excluded. The clusters of profiling identified by the model then take priority as the reclamation activity to be completed. The remaining surface area covered by the category is then reported on as included (see 4.1.3). Small pockets of one or two points of profiling indicated by the model were not given the status of a cluster, the survey category according to which the area is classified as, and then received precedence above the profiling model.

4.1.2 Virgin areas affected by profiling/ reclamation modelling

There was no specific survey information for this category. It was indicated through combining the survey categories and the materials movement boundaries of the Golder profiling model. These are areas that were not disturbed by the mining operations but would be disturbed while profiling disturbed areas during reclamation operations. Given the slow growth rate and the natural revegetation of the majority of dumps, it has been decided to preserve the growth surrounding dumps by adjusting various profiles and limiting the amount of damage to surrounding areas. These adjustments have been made to the final model.

5.0 ASSUMPTIONS AND QUALIFICATIONS

5.1 General

- The closure cost estimate is aligned to the generic Guideline Document for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine, by the DME (January, 2005).

Reclamation requirements for specific closure components are listed below:

Table 2: Survey categories for Namaqualand Mines

Category	Description
Roads ripped	Roads that have already been ripped. Allowance has been made for general shaping and levelling, salt/salinity remediation, monitoring and maintenance in these areas.
Roads	No reclamation conducted on these roads to date. Allowance has been made for ripping, general shaping and levelling, salt/salinity remediation, monitoring and maintenance in these areas.
Profiled	Areas already profiled in reclamation activities. Allowance has been made for, netting, seeding, monitoring and maintenance. **No allowance has currently been made for replacing growth medium.**
Borrow pits	This category of borrow pits exclude those next to the roads, which are assumed to be left to remain operational. These are borrow pits in the mining areas that require reclamation, therefore allowance has been made for minor shaping and levelling, netting, seeding, monitoring and maintenance.
Damaged areas	Areas around plant and mining activities which have been disturbed, but where topsoil was not removed but compacted. Allowance has been made for light agricultural ripping, monitoring and maintenance. Not requiring vegetation.
Dumps	These are small dumps that are assumed not to require profiling. Allowance has been made for netting, seeding, monitoring and maintenance. **Some of these dumps will be classified as topsoil storage facilities and utilized as growth medium according to the growth medium identification and quantification exercise to be done in the near future.**
Highwalls	These are assumed to be shallow high walls ranging from 1 to 3 m in height. Allowance has been made for topsoil removal, shaping, replacing of topsoil, netting, seeding and monitoring and maintenance.
Stripped Ore	It is assumed that all piles of stripped ore would be processed by closure. Allowance has been made for netting, seeding, monitoring and maintenance
Green areas	Areas that have been fully reclaimed and signed off as such by the mine. Allowance has been made for monitoring and maintenance.
Naturally reclaimed areas	Areas that have over time been reclaimed naturally. Allowance has been made for supplementing a portion of the area with vegetation packs, monitoring and maintenance.
Netted areas	Areas that have been netted.

- Civil engineers involved in shaping/profiling as well as stabilisation of areas disturbed by the removal of mining- and manufacturing-related facilities; and
- Demolition practitioners, focussing on the mechanical costs and associated professional fees required to dismantle and/or demolish steel, brick and concrete infrastructure.

Based on the above, Golder compiled a unit rate-specific database that is utilised for the overall determination of closure costs. This database and relevant unit rates are updated quarterly.

6.1 General surface shaping

It has been assumed that general surface shaping would be required over most of the areas where surface infrastructure had been removed, as well as fugitive disturbed areas, as part of the overall surface reclamation. For this purpose it has been assumed that shaping would involve the movement of material at about 500 to 700 mm average thickness.

6.2 Establishment of vegetation (see Appendix C for full restoration method)

6.2.1 Planting of restoration packs

No allowance has been made for growth medium amelioration prior to the establishment of vegetation. The cost of planting restoration packs, including labour, amounts to R 3 846/ha. This is assuming that the restoration packs are planted in block formations and every alternate block is planted, therefore in a 2 ha area, 1 ha is planted with restoration packs.

6.2.2 Netting

The latest cost of the nets is R 6/m, the netting is used three times, therefore the cost of netting is R 4 000/ha. The cost of droppers is R 8/each, which are also used three times therefore the cost of droppers is R 2667/ha. Further cost include anchors at R 520/ha, bind wire at R 60/ha and boxes at 1893/ha. The total cost for netting amounts to R 9 140/ha. This cost includes maintenance of the netting. Total costs for netting and seeding 1ha is R16,833.27

6.3 Surface water monitoring

It has been assumed that surface water quality monitoring at ten locations has to continue at a quarterly frequency for at least three years post-closure.

If it is assumed that three man-days would be required to conduct a monitoring event (including travelling), this would equate to R12,000. Allowance has also been made for chemical sample analysis at R1,500/sample. Hence, these costs amount to R 27,000 per sampling event which can be rounded to

7.2 Exclusion of Pre 1980 areas

The regulations to the Mines and Works Act ("Mines and Works Regulations") were amended on 21 March 1980. The amended regulations required that a rehabilitation programme be submitted to the Inspector of Mines if requested by the Inspector of Mines and that rehabilitation of the surface at any open cast mine shall form an integral part of the mining operations. As from 21 March 1980 the Mines and Works Act enforced rehabilitation of the surface of land at mines. The Mines and Works Regulations imposed a positive obligation for the rehabilitation of the environment disturbed by mining operations and this obligation was carried through to the Minerals Act. Based on the promulgation of these regulations in March 1980, NM is therefore only obligated to rehabilitate environmental disturbances caused by mining operations as from 21 March 1980.

Having said this NM has already committed significant resources to the rehabilitation and making safe of these areas, the latter of which, will continue to ensure a safe area post closure.

7.3 Site clean-up

In all areas that were disturbed during operation, site clean-up would be necessary. In accordance with the EMP's, the following assumptions have been made regarding measures to be taken for site clean-up:

- Site inspections will be conducted to determine possible sources of soil contamination. Specific attention will be given to areas that have been exposed to possible soil contamination during the operational life of the tailings storage facility and surrounding areas.
- Soil tests to identify the possible nature of contamination will be conducted (i.e., organic or inorganic contamination).
- If the contamination is primarily of an organic nature, the following will be done:
- Conduct sampling at two horizons (0-150 mm and greater than 150 mm).
- Conduct shake-flask or other appropriate tests and analyse for Total Petroleum Hydrocarbons (TPH). In the cases where the TPH standard of 1 000 mg/kg is not applicable, other appropriate standards such as the Dutch Intervention Values for Soil Contaminants or US EPA Risk Based Concentrations or action levels for Industrial Soil Remedial Goals (PRGs) for Direct Contact Exposure Pathways or other procedures considered as best practice at the time of closure, must be applied.
- Interpret chemical analysis results and assess the potential for contamination.
- If the TPH concentrations are below 1 000 mg/kg, no remediation is required. If the TPH concentrations are above 1 000 mg/kg, the contaminated soil will be removed if it is in manageable volumes. The collected soil will be taken to a bioremediation facility for reclamation. Reclamation will continue until the TPH analyses of three composite samples indicate that the average TPH concentration is below 1 000 mg/kg.
- Note: If large volumes of organically contaminated soil and/or small areas with organic contamination other than normal petroleum products such as diesel, petrol (gasoline), and lubrication oil are found, the area will be assessed by a suitably qualified person and an appropriate remediation strategy devised.
- Collect composite soil samples within the identified contaminated area and analyze for total petroleum hydrocarbons (TPH). If the TPH concentrations are below 500 milligrams per kilogram, no decontamination is required. If the TPH concentrations are above 500 milligrams per kilogram, the

7.6 Demolition and removal of infrastructure

- All non-usable buildings will be demolished, including plant and related surface infrastructure. This will be completed by a contractor on a cost neutral basis
- General demolition waste will be safely disposed of by the responsible contractor in accordance with the required regulation.
- Asbestos waste will be safely removed in accordance with regulations and disposed off-site in an appropriate waste disposal facility.
- Resultant demolition waste and any other inert non-hazardous materials that cannot be reused or recycled as stipulated in the initial reclamation and closure plan and/or subsequent plans.
- Any hazardous material that accumulated on components of the buildings, machinery and equipment will be identified and removed for safe off-site disposal.
- Machinery, equipment, and storage tanks will be cleaned and disposed of as above.
- Concrete structures, foundations and slabs will be removed to 1 m below final ground level.
- Buried support infrastructures (tanks, pipes, underground services etc.) will be decommissioned and removed in a safe, acceptable manner. Buried infrastructure remaining on site will be identified on site closure maps.
- Decommissioned septic tanks will be filled with inert material and cover.
- Steel and scrap metal will be decontaminated for salvaging and recycling, if valuable.
- Hazardous material will be encapsulated or disposed of off-site.
- An assessment of contaminated soils will be conducted and will be ameliorated and/or disposed of accordingly.
- Areas from which buildings and surface infrastructure have been removed will be cleaned-up.
- Areas from which surface infrastructure has been removed will be checked for organic contamination and remediated.
- Areas from which buildings, plant and surface infrastructure have been removed will be shaped to roughly emulate the natural surface topography, especially terraces and hard stand areas.
- NM has outsourced the demolition of these infrastructural aspects as per the description above, and has proven it can be done cost neutrally. In essence the contractor will demolish free of charge and his profit will be derived from the sale of equipment and scrap steel.

7.7 Fugitive tracks

In accordance with the EMP's, the following assumptions have been made:

- Barriers that would prevent access by vehicles will be erected.
- The road will be allowed to colonise naturally. If the width of the disturbed area <50 m and adjacent to natural vegetation, natural dispersal and succession is sufficient for restoration.

- The FTMR's are also considered assets to any future small mining operations, as the establishment and permitting of a new facility would come at significant cost. This would reduce the profitability of future mining operations, negatively impacting on sustainable development.
- The FTMR's are stable, but provision is made for the netting of areas which may be affected by dust plumes in extreme cases.
- FTMR's will be fenced off to "make safe" and to restrict access.

7.11 Overburden and spoil

In accordance with the EMP's, and the profiling model, the following assumptions have been made:

- Spoils will be dozed, loaded and hauled into the existing voids according to the profiling model to achieve a 1:3 or 1:5 slope. The volume to be moved is split into 75% dozing and 25% load and haul based on rehabilitation experience in the area.
- The mine has identified areas where the dragline could be effectively utilized to do reclamation according to the profiled model. The volume of material to be moved in the specified areas was split into 80% dragline work and 20% conventional dozing and load and haul methods costed in accordance with the weighted averages attached to the three scenarios. The following is noteworthy regarding the dragline use as specified:
- Of the total volume to be moved (about 42 million m^3 included areas), 28,5 million m^3 has to be moved in the BMC alone (67.5%). The volume assigned to the dragline for this exercise is 9,7 million m^3. If the current planning is implemented then the dragline will move 34.11% of the BMC total volume and 23.04% of the total NM volume.
- The total volume to be moved in the areas indicated for dragline utilization amounts to approximately 12 million m^3. The 80% dragline utilization and 20% load and haul split of this volume yields a 47.35%, 49.81% and 50.91% saving on the 90%-10%, 80%-20% and 75%-25% scenarios respectively (materials movement costs only).
- Seeds, seedlings and transplants of indigenous species will be added and the soil ameliorated in a manner that benefit from ecological dynamics. Specifications to be determined by soil type and habitat.

7.12 Virgin areas

In the virgin areas, which are adjacent to the areas being profiled, and would be disturbed during profiling, it is assumed that the growth medium would be dozed at a depth of 0.5 m and stockpiled. It is further assumed that the growth medium would be replaced at a depth of 0.3 m The shaping and levelling, netting, seeding, monitoring and maintenance of these areas is covered under the profiling model as the surface area falls within the materials movement boundaries.

7.13 Shallow and deep swept bedrock areas

In accordance with the EMP's, discussions with the mine and the profiling and GIS system analysis, the following assumptions have been made:

Many other opportunities have arisen, creating win-win scenarios for the future communities and NM. These include the following projects, many of which have progressed to a significant level:

- Marine Aqua-culture – Oysters and Abalone
- Wind Energy
- Correctional Services Training and Rehabilitation facility
- Hazardous Waste Site

7.16 Other

In accordance with the EMP for the BMC, the following assumptions have been made:

- Regular monitoring and measurement relating to dust will be conducted after reclamation is complete.
- To prevent surface erosion, it is assumed the following will be done:
- Slopes will be stabilised by shaping and contouring, emulating local stable land forms providing suitable conditions for sustaining vegetation.
- Create suitable conditions (growth medium, vegetation mix, etc) for sustainable vegetation cover to contribute/assist with the prevention of surface erosion.
- Over and above the other measures that would protect the surface water bodies, local drainage lines will also be reinstated as far as possible as part of site reclamation as stated in the initial reclamation and closure plan and/ or subsequent plans.
- Remaining chemicals, reagents and hydrocarbon products will be consumed during mine decommissioning and/or returned to their respective suppliers.
- No product of the above nature would be disposed of on the mine site.
- Throughout the operational life certain areas would have been progressively reclaimed. In these areas the following actions will still take place:
- Confirm that the area under consideration is suitably reclaimed.
- Confirm the planned land use and alignment with regional developmental initiatives.
- Confirm alignment with sustainable development initiatives
- Compile business plan to confirm feasibility if transferred to third party, especially if to be used for commercial farming.
- Compile progressive closure plan, obtain approval and implement

8.0 REMEDIATION COST ASSESSMENT

The sub-sections following below give an overview of the specific actions considered and allowed for as part of the closure costing.

	Remediation cost assessment	
	will take place as per 7.9 ▪ CRD's and FRD's will be fenced and netted where required to ensure they are safe and stable.	
Virgin areas affected by profiling	▪ Allowance is made for the stripping of 500 mm of soil from the area before the shaping and replacing 300 mm after shaping. Where possible virgin areas will not be destroyed to make way for profiling	▪ Allowances are the same as for the unscheduled scenario
Areas outside the profiling/reclamation model boundary	**Roads ripped**	
	Allowance has been made for the following: ▪ Shaping and levelling of disturbed areas; and ▪ Salt and salinity remediation with gypsum.	▪ Allowances are the same as for the unscheduled scenario except that a significant number of areas will have been rehabilitated by scheduled closure.
	Roads	
	Allowance have been made for the following: ▪ Ripping of compacted areas ▪ Shaping and levelling of disturbed areas; and ▪ Salt and salinity remediation with gypsum.	▪ Allowances are the same as for the unscheduled scenario except that a significant number of areas will have been rehabilitated by scheduled closure.
	Profiled areas	
	Allowance has been made for the following: ▪ Netting and seeding of profiled areas where required	▪ Allowances are the same as for the unscheduled scenario except that a significant number of areas will have been rehabilitated by scheduled closure.
	Borrow pits	
	Allowance has been made for the	▪ Allowances are the same as for the unscheduled

Remediation cost assessment	
Naturally reclaimed areas	
Allowances have been made for the following: ▪ Supplementing areas assumed to establish vegetation naturally with vegetation pockets.	▪ No allowances have been made as this will be completed by scheduled closure.
Netted area	
Allowances have been made for the seeding of netted areas.	▪ Allowances are the same as for the unscheduled scenario except that a significant number of areas will have been rehabilitated by scheduled closure.
Swept areas	
Allowances have been made for the following: ▪ Netting and seeding of swept areas where required.	▪ Allowances are the same as for the unscheduled scenario except that a significant number of areas will have been rehabilitated by scheduled closure.

8.4 Water management

Closure cost component	Remediation cost assessment	
	Unscheduled (Jan 2010)	Scheduled
	▪ No provision was made as there is little or no ground water.	▪ No provision was made as there is little or no ground water.

8.5 Post-closure aspects

Closure cost component	Remediation cost assessment

8.6 Additional allowances

Closure cost component	Remediation cost assessment	
	Unscheduled (Jan 2010)	Scheduled
Contingencies	▪ An additional allowance of 10 percent has been made in the total infrastructure and related aspects to allow for contingencies.	▪ An additional allowance of 10 percent has been made in the total infrastructure and related aspects to allow for contingencies.
Preliminary and General (P&G's)	▪ An allowance of 6% has been made.	▪ An allowance of 6% has been made.

9.0 ASPECTS REQUIRING FURTHER ATTENTION

Since the closure planning and associated costing for Namaqualand Mines is well advanced, limited (if any), aspects are outstanding that could require intermediate attention to improve future closure costing. The roll-out and implementation of the conceptualised land use plan and the transfer of responsibilities within this plan to third parties is the main aspect that will influence the costing.

Another aspect is the rate and nature of surface rehabilitation currently being conducted and the process of obtaining sign-off / approval from the regulatory authorities for areas as these are rehabilitated. If acceptably rehabilitated and the associated vegetation is self-sustaining, the closure costs for these areas can be omitted from the closure costs. This process has been established in conjunction with a third party ecology consultant and the DMR and future closure cost updates will take any such sign-off / approval.

10.0 CONCLUSION

The closure costs as reflected in this report were based on the closure costing compiled by Golder and adjusted as per information gathered during the actual rehabilitation process over the past three years. These changes are confirmed by site specialists in a third party capacity. In those cases where the required information was not available, estimates were made based on experience. Unit rates for the costing were obtained from Golder's database and specific input from Namaqualand Mines to reflect site-specific conditions and associated rates.

Within the above context, the reflected remediation costs as at January 2010 provide a good basis for the provisions to be made in the De Beers Consolidated Mines Limited – Namaqualand Mines financial statements.

APPENDIX A

Summary of Scheduled and Unscheduled Closure Costs

	INFRASTRUCTURE AND RELATED ASPECTS	BIR	BNR	DOR	KNR	SER	BSER	TOTAL
1	Infrastructural aspects	R 0.00	R 62,500.00	R 0.00	R 12,500.00	R 0.00	R 0.00	**R 75,000.00**
2	Mining aspects	R 0.00	R 0.00	R 0.00	R 0.00			**R 0.00**
3	General surface reclamation	R 1,382,694.39	R 6,756,046.80	R 537,159.58	R 6,109,518.01	R 0.00	R 0.00	**R 14,785,418.78**
4	Water management	R 0.00	R 0.00	R 0.00	R 0.00			**R 0.00**
	SUB-TOTAL 1 (Infrastructure and related aspects)	**R 1,382,694.39**	**R 6,818,546.80**	**R 537,159.58**	**R 6,122,018.01**	**R 0.00**	**R 0.00**	**R 14,860,418.78**
5	Post closure aspects	R 741,532.97	R 3,656,756.88	R 288,076.34	R 3,283,211.53	R 0.00	R 0.00	R 7,969,577.71
	SUB-TOTAL 2 (Post-closure aspects)	**R 741,532.97**	**R 3,656,756.88**	**R 288,076.34**	**R 3,283,211.53**	**R 0.00**	**R 0.00**	**R 7,969,577.71**
6	**ADDITIONAL ALLOWANCES**							
6.1	Preliminary and general (6 percent)	R 82,961.66	R 409,112.81	R 32,229.57	R 367,321.08	R 0.00	R 0.00	R 891,625.13
6.2	Contingencies (10 percent)	R 138,269.44	R 681,854.68	R 53,715.96	R 612,201.80	R 0.00	R 0.00	R 1,486,041.88
6.3	Engineering & project management (0 percent)	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
6.4	Management/staff cost (0 percent)	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
	(Additional allowances)	**R 221,231.10**	**R 1,090,967.49**	**R 85,945.53**	**R 979,522.88**	**R 0.00**	**R 0.00**	**R 2,377,667.00**

	INFRASTRUCTURE AND RELATED ASPECTS	BIR	BMR	DGR	KNR	SBR	BSBR	TOTAL
1	Infrastructural aspects	R 0	R 62,500	R 0	R 12,500	R 0	R 0	R 75,000
2	Mining aspects	R 0	R 0	R 0	R 0			R 0
3	General surface reclamation	R 6,777,035	R 105,651,111	R 1,904,793	R 60,652,819	R 2,872,381	R 0	R 177,858,139
4	Water management	R 0	R 0	R 0	R 0			R 0
	SUB-TOTAL 1 (Infrastructure and related aspects)	R 6,777,035	R 105,713,611	R 1,904,793	R 60,665,319	R 2,872,381	R 0	R 177,933,139
5	Post closure aspects	R 303,542	R 4,734,884	R 85,315	R 2,717,183	R 128,653	R 0	R 7,969,578
	SUB-TOTAL 2 (Post-closure aspects)	R 303,542	R 4,734,884	R 85,315	R 2,717,183	R 128,653	R 0	R 7,969,578
6	**ADDITIONAL ALLOWANCES**							
6.1	Preliminary and general (6 percent)	R 406,622	R 6,342,817	R 114,288	R 3,639,919	R 172,343	R 0	R 10,675,988
6.2	Contingencies (10 percent)	R 677,704	R 10,571,361	R 190,479	R 6,066,532	R 287,238	R 0	R 17,793,314
6.3	Engineering & project management (0 percent)							R 0
6.4	Management/staff cost (0 percent)							R 0
	SUB-TOTAL 3 (Additional allowances)	R 1,084,326	R 16,914,178	R 304,767	R 9,706,451	R 459,581	R 0	R 28,469,302

APPENDIX B

Unit rates used for Demolition, Reclamation and Related Work

APPENDIX C

NM Rehabilitation and Restoration Procedure

REHABILITATION AND RESTORATION

1. OBJECTIVE

The objective of this procedure is to establish and maintain an effective rehabilitation and restoration method.

2. SCOPE

This procedure applies to all employees and other persons at Namaqualand Mines (NM) involved in the rehabilitation and restoration activities.

3. LEGISLATION

- Constitution of The Republic of South Africa Act 108 of 1996; Section 24;
- Minerals and Petroleum Resources Development Act no 28 of 2002; and
- National Environmental Management Act No. 107 of 1998

4. DEFINITIONS

Disturbed area: An area that was previously mined and is stripped of natural vegetation. These areas include bedrock sites, mine dumps, exploration trenches and open pits.

5. RESPONSIBILITY

5.1 The **Rehabilitation Manager** is responsible for administering this procedure.

5.2 The **Rehabilitation Officer** is responsible for contractors involved with restoration to ensure compliance to the procedure and addenda.

attached addenda for methodology).

a) Netting:
Netting is erected on areas that have received topsoil or growth medium in order to stabilize the movement of the soil. The use of nets mimics the effect of larger plant in the natural ecosystems. The nets are set up in such a way that it is perpendicular to the dominant wind direction of the area in order to minimize wind erosion.

b) Seed collecting and processing:
Collecting and processing seeds are in accordance with the specifications as set out by the ecologist. This entails physically going out into the field and collecting seeds from naturally occurring plants. The seeds are dried and processed to get them out of their protective shields and enable germination. Further more the processed seeds are put into seed-packs to ensure a mixture of seeds from different species.

c) Restoration packs:
Restoration packs consist of planting cardboard boxes in the field and planting the processed seed-packs inside. The restoration packs are planted in patches of ten. These patches have two different seed-pack recipes planted together, five of each, to form the ten individual packs per patch. The boxes mimic the smaller to medium sized plants in the field, and provide protection against the wind for the seeds planted inside them. The specifications for the combination of seeds needed for restoration packs are determined by the ecologist depending on what species occur naturally in the area.

d) Transplants:
Transplants are plants that are removed from the field and planted in patches of ten between the restoration packs. These plants are removed from the natural veldt and/or from areas that are earmarked to be stripped for mining within the next year.

7.3 DEMOLITION AND REHABILITATION OF INFRASTRUCTURE

The demolition and rehabilitation of infrastructure, e.g. plants and workshops, will be handled within the mine closure plan. If infrastructure will be demolished, the same steps of landforming and restoration will be followed after the demolition has occurred.

8. RECORDS

Description	Responsible	Location	Retention	Status*
Reports	Y6	SHE Department	LOM	A
CAD / Maps	G1 / M1	MRM Department	LOM	A

* A = Archive; D= Destroy

9. AMENDMENT RECORD SHEET

ANNEXURE A

RESTORATION NETTING METHODOLOGY

1. MATERIAL SPECIFICATIONS (NETS, DROPPERS, ANCHORS AND WIRE)

- Net height: 0.75m
- Net length: 225m
- Net material: 40% density, green shade, Eyelets top and bottom, pockets every 2.5m
- Droppers length: 1.2m
- Dropper diameter: 10 mm
- Dropper material: steel (reinforced steel or normal farm dropper)
- Anchor material: Steel
- Anchor length: 1.4m and 0.7m
- Anchor type (Post fence, Y or K type)
- Wire type for droppers: 1.6mm galvanised
- Wire type for anchors: 2.5mm galvanised

2. NET ERECTION

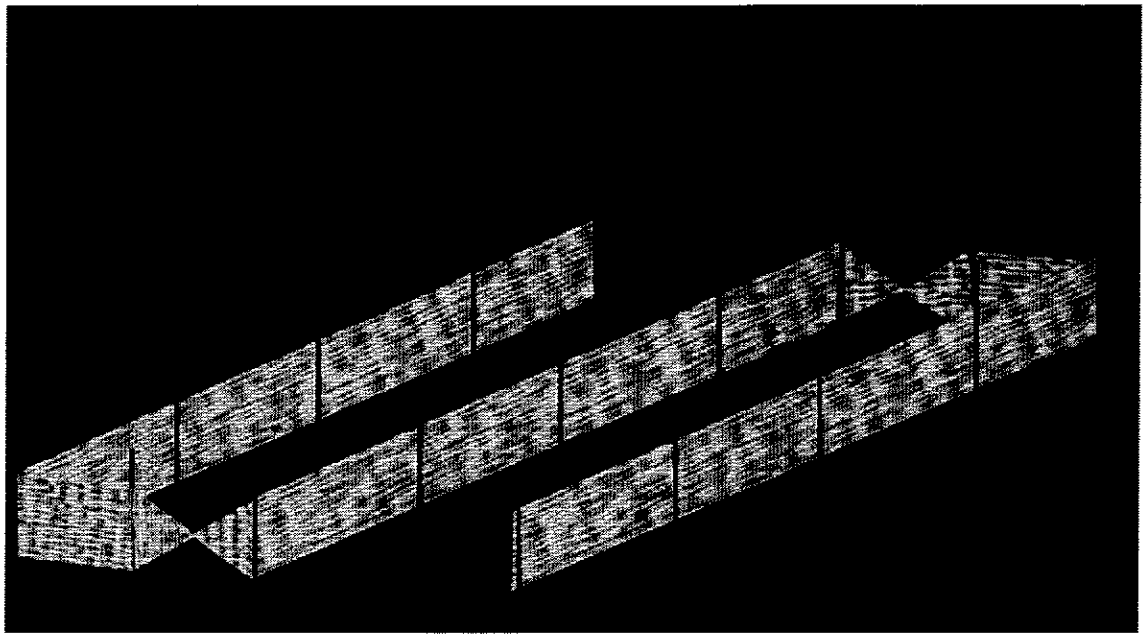
Intervals: 5-6m (a maximum of 6m intervals) in an east-west direction on all restoration areas (topsoil and overburden).

Direction: Running east-west direction (Perpendicular to predominant southerly wind)

Method:

- Use anchor poles at each end of every net to anchor netting (y-poles, K- poles or old thicker droppers).
- Wrap net around the top of the 1.4m anchor pole 3 or 4 times to prevent tearing. Hit this anchor into ground in an upright position until net touches ground.
- In case of unstable conditions (very loose sand or shallow cover) insert a short 0.7m anchor at a 45° angle into the soil and use 2.5mm bind wire to tie to upright anchor.
- Insert droppers every 2.5m along the length of the net in the sleeves provided for this purpose.
- Pull netting tight and drive dropper into soil (Do not cut dropper off if not deep enough)
- Do not cut nets at the end of the line. Rather wrap the net at 90° to the start of the next line, and then use the rest of the roll for the next line (see figure 1).
- Ensure that the dropper sleeve is always facing south (i.e. the droppers are to the south of the net). Twist the net upside down at the end of the line where it is wrapped to the next line, thereby ensuring that the droppers are to the south of the net on the next line (see figure 1).
- Where the restoration site is wider than 225m in the east-west direction, gaps in the netting should be left for access roads every 225m (i.e. the length of one net). These access roads are to be used for setting out restoration packs, watering of restoration packs and maintenance of netting. There should be no access roads around the perimeter of the site, as this will prevent seeds from surrounding natural vegetation to be dispersed into the restoration site. Access roads (gaps in netting) should be a maximum of 5m wide, and should not run directly downslope, in order to avoid erosion. The road should not run directly north-south, in order to avoid the formation of a wind channel.

C



3. NET MAINTENANCE

Do maintenance checks on all nets at monthly intervals, and include the following:

- **Lift up netting** (& droppers) where soil has accumulated against the nets. Ensure the net and droppers are on top of the new soil level.
- The 'eyes' (holes) along the top edge of the nets are to be hooked around the droppers where the nets have stretched, in order to **make them tight**.
- Where nets have sagged down along the dropper, they need to be lifted up and tightened, as described above.
- Scoop away heavy sand built up with spades and level away from netting.
- Repair torn netting.

4. NET REMOVAL

Remove netting in areas where no longer needed as per request of the rehabilitation manager.

- Remove netting in such a way as not to damage it so it can be reused
- Reuse netting where possible
- Neatly stack material in grouped heaps for removal

Enough seeds should be collected for the designated number of RP's in the target restoration area.

The necessary permits for seed collection should be obtained from the authorities. These deem that no more than 20% of the seeds of a population may be collected in the same year (by law).

3. SEED STORAGE

Seeds should always be dried prior to storage. Seeds and the associated plant material can be dried by placing them in open, shallow cardboard boxes or similar shallow containers. These boxes should be place indoors in a well ventilated place that is safe from rodents or other granivores. Seeds should also be fumigated as soon as possible after collection to eliminate any beetles or larvae that are already inside the seed storage bodies, as well as being treated with anti-mould treatments. This is best done during the drying time since seeds are spread in thin layers.

Once seeds and all the plant material that is amongst the seeds has been completely dried out, the seeds can be stored in bigger, closed cardboard boxes or similar containers that will allow them to 'breathe' (not plastic bags or containers). These boxes should be kept in a granivore-safe place that is cool, dry and preferably dark.

4. SEED CLEANING

Seeds should be removed from the coverings that surround them prior to being used in RP's.

The following methods are recommended by the NRI:

4.1 Cement Mixer

Seeds with hard capsules or coverings can be placed in a cement mixer together with 5 to 10 pieces of hard, heavy firewood (more, larger pieces for hard seed coverings; fewer, smaller pieces for soft seed coverings). The mixer bowl should not be filled more than half, otherwise it will not be efficient. Once the mixer is on, the pieces of wood will fall on the capsules or coverings and break them open, thus releasing the seeds.

The released seeds should be sieved out (see below) periodically to avoid them being damaged by the wood. For soft seed coverings this can be done every 20-30 minutes, and for hard seed coverings this can be done every 1 to 1.5 hours
e.g. Tetragonia, Zygophyllum, Lebekia, Tetragonia, Didelta, most of the Mesembryanthemaceae

4.2 Sieves

Seeds that have been released by the cement mixer process can be separated from the remaining plant material by using an appropriate sieve mesh size or set of sieves with varying mesh sizes. This is useful to gain a more accurate estimate of the numbers of seeds, as well as reducing the volume for storage and packaging purposes.

Seeds with soft or leathery seed coverings, soft seeds or small seed coverings can often not be broken by the cement mixer, or may be damaged by the cement mixer. These seeds can be ground through an appropriately sized mesh sieve, so that the seeds fall through, but the unbroken coverings do not. A wooden or rubber block can be used to grind the seed coverings through the sieve.

RESTORATION PACK (RP) METHODOLOGY:

6. PURPOSE OF RESTORATION PACKS

Restoration packs are a cost-effective method to rehabilitate an area that maximizes the effectiveness of seeds, and facilitates the rehabilitation of a degraded area to:

- Introduce and establish natural and preferred species to an area in order to have better balanced species diversity in the area.
- Improve the ecological stability of the area, for instance stabilizing and preventing sand movement and the creation of sand plumes.
- Re-establish the ecological structure of an area, which will allow natural plant and animal establishment in the future
- Increase the natural and preferred species abundance, cover & biomass to a specific area

7. RESTORATION PACK TYPES

If small seeds are covered to deep they will not germinate. For this reason restoration packs are divided into two types: **large seed** and **small seed** restoration packs.

Each **large seed restoration pack** should contain the following species and seed number:

Large seed restoration pack

Othonna cylindrica	4
Pteronia glabrata	250
Pteronia onobromoides	250
Tripteris oppositifolium	22
Didelta carnosa carnosa	20
Arctotis scullyi	14
Tetragonia fruticosa	70
Atriplex semibaccata	100
Manochlamys albicans	160
Zygophyllum morgsana	50
TOTAL	940

Each **small seed restoration pack** should contain the following species and seed numbers:

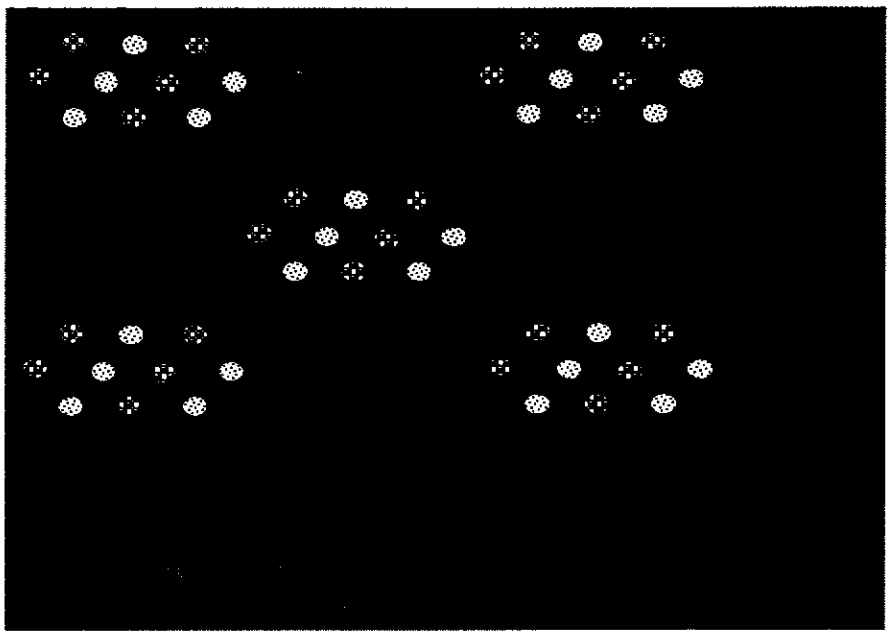
Small seed restoration pack

Amphibolia laevis	1000
Drosanthemum hispidum	500
Psilocaulon spp	500
Jordaaniela spongiosa	1000
Ruschia aggregata	2000
Stoeberia beetzii	150
TOTAL	6150

8. RESTORATION PACK MATERIALS SPECIFICATIONS (BOXES, SEEDS AND FERTILISER)

- Any left over soil further than **± 40 cm** can be left in piles as uneven surfaces are good for restoration.

- Group restoration packs into patches of 10 and leave a slightly gap between each patch of 10 restoration packs.
- Ensure patches are spaced well across the area in order to cover the full extent of each ha (Do not cramp all RP's into one corner). Space the RP's evenly over the restoration site. The distance *X* between restoration pack patches will vary between restoration sites, and will be determined by density of RPs / ha. This will be set out in the specifications for each particular site.



10. RESTORATION PACK MAINTENANCE

In order to prevent seedlings from dying during a dry period the RP's need to be monitored and watered as explained:

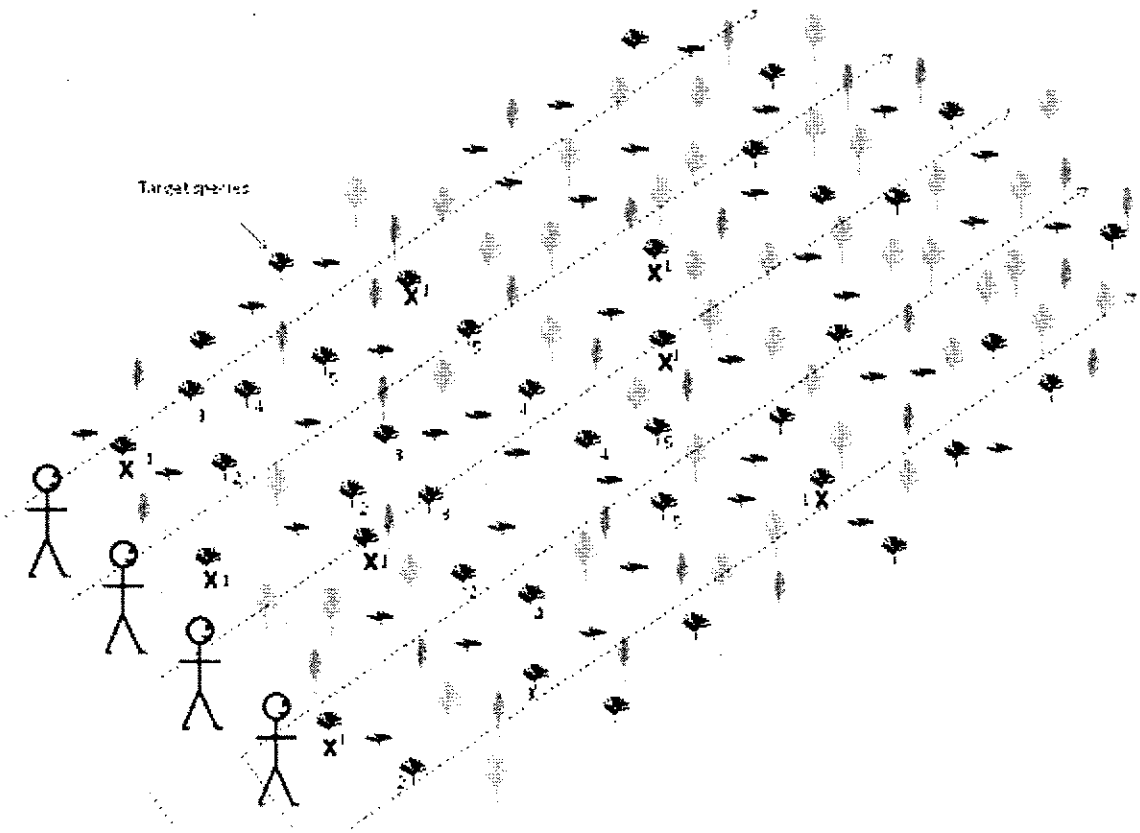
- Monitor restoration packs on a two-weekly basis for the winter and spring season:
  - Monitored rainfall - if there has been no a rainfall event of greater than **4mm** in a 2 week period, the restoration packs should be watered. (1.5-2 litres of water per pack). This only applies until the end of October.
  - Where a box has collapsed entirely, cut the box off at the base and remove it from the site if it can not be lifted and kept opened.

- **Succulent stems** (e.g. Euphorbiaceae, some Asteraceae, few Mesembryanthemaceae)
- **Underground storage organs** (e.g. Amaryllidaceae, most Iridaceae, some Hyacinthaceae)

[Also refer to *Best practice guidelines for minimizing impacts on the flora of the southern Namib* by Antje Burke for further information on which plants are suitable for transplanting.]

Middle and late succession species should be used preferentially to early succession species. Unsuitable species should not be transplanted, since they will not survive transplanting, or benefit the restoration site. If these species are transplanted, they will not be paid for.

4.2 Pristine / undisturbed sites within the mining area:
Collect only 10% of the approved transplant species' individuals located in the demarcated area. This means that in a given population of the target species, a team should only collect 1 out of every 10 plants of that species. Transplants should be removed evenly throughout the site. One way to ensure systematic collection would be to line up transplant collectors standing a few meters apart on one side of the site. As each collector walks towards the opposite end of the site, they focus on collecting transplants only in the area ahead of them (on their 'line') (Figure 1). Once their bag / box is full of transplants, they should leave a marker (a spade or something else) where they have stopped, allowing them to return to and start from the same spot again after they have taken the full box / bag back to the bakkie.



- Place the transplants in a box or hessian bag (streepsak). Transplants can be kept cool on hot days by wetting the bag, or by placing a wet bag on top of the transplants in a box.
- Where more than one species is removed, they should be kept in different boxes / bags. Never leave transplants inside a vehicle, or exposed to full sun as this will dry them out.

9. HOW SHOULD TRANSPLANTS BE PLANTED INTO A RESTORATION SITE?

- Transplants should **always** be planted into the restoration site **on the same day** as they were removed from the natural veld.
- Select an area which is already in a **natural depression or dip** (this collects water when it rains, giving the plant a greater chance of survival) (Figure 2).
- Dig a hole that is about twice the size of the roots of the transplant in the depression.
- Place one plant in the hole. While holding the plant up slightly, spread the roots out in the hole and fill the hole with soil in such a way that some soil is placed in between the roots and there are no air spaces left around the roots.
- Before the final soil is replaced in the hole, add the appropriate amount of nutrients evenly around the transplant (35g).
- Place the last bit of soil around the transplant, and press down firmly with the palm of your hand to compact the soil (overburden should not be overly compacted).
- Creating a slight depression around the transplant will aid catching additional water and nutrients (Figure 2).
- The transplant should then be **watered the same day as being planted** (1.5 liters of water per transplant) to ensure that the roots settle well and all the roots are in contact with the soil (there are no air spaces). This prevents the roots from drying out, allows the roots to take up water and nutrients from the soil immediately, and the plant to rapidly develop and replace the small roots damaged during transplanting (these responsible for nutrient and water uptake).
- Do not plant the transplants in rows or grids, but plant them in mixed species patches of 10 transplants per patch.

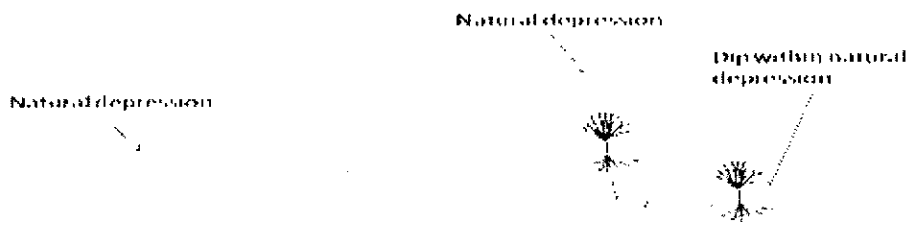


Figure 2. Transplants should be planted in natural depressions in the restoration site. A dip should be made within the natural depression to maximize the amount of water that the transplant gets when it rains.