



Road Building, Borrow Pits, Construction Material, Quarries:

Affects on the Commercial Quarry Industry



FORWARD

Aspasa has been working on the issue of trying to get level playing fields in the quarry industry for many years.

The issue of illegal mining, borrow pits and inconsistent issuing of mining permits have been a focus area.

This document is a working document addressing the issues that need attention to ensure a healthy and vibrant quarry industry.

Input to Aspasa will be appreciated.

**NICO PIENAAR
DIRECTOR**

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ROAD BUILDING, BORROW PITS, CONSTRUCTION MATERIAL, QUARRIES: AFFECTS ON THE COMMERCIAL QUARRY INDUSTRY

1. BACKGROUND

Over many years Aspasa has had to defend the formal quarry industry against illegal mining, misuse of borrow pits and unfair competition.

Aspasa has had to convince authorities that the playing fields have not been level while there are clear rules and legislation governing the mining industry in SA which includes quarries, borrow pits or any other form of extraction from the earth.

At the Road Pavement Forum held in November 2012, Resolution was passed that reads as follows:

“RPF to form a task team led by Dave Rose:

- *To create a common understanding of the impacts of current legislation on borrow pits approval/usage amongst all public and private sector stakeholders operating in road delivery.*
- *To raise the concerns of the road industry with DMR and DEA and to identify and agree on appropriate approaches to enable road authorities to fulfil their mandates”*

The reason for this resolution was that there was a “blockage”: on Borrow Pits by the DMR.

At the recent meeting held in Cape Town 7 – 8 March 2013, Mr. Rose reported back that he had not achieved much and that there was still a problem.

A new Resolution was passed in May 2013 which read as follows:

“With respect to the planned negotiation with DMR and other bodies on the issue of Borrow Pits, that Aspasa be included in the exercise, and that Aspasa be tasked to work together with the COTO Road Materials Committee to resolve this critical issue’.

Aspasa has indicated that it needs to be involved and some understanding, services, etc. could be forthcoming if the matter is resolved in such a way that Aspasa members with formal quarries are not jeopardised.

The problem that is being experienced by some of the contractors is due to the pressure Aspasa has been putting on the DMR, Green Scorpions and SARS due to the whole illegal mining issue and serious misuse of borrow pits

2. INTRODUCTION

Sand, gravel and crushed stone are the main types of material aggregate. They are all essential resources for use in construction today.

The manner in which these resources are mined are under more scrutiny today because of some bad practices in the past not only in the formal quarry industry but largely also due to the way construction materials have been extracted in S.A over many years.

The formal aggregate and sand industry has been focused on by authorities but the informal industry has, it seems, been left out of the scenario.

Over the last few years Aspasa has been requested to become more involved with Government agencies in setting up and develop best management practices for part of the mining industry.

Aspasa and its members have made huge commitments on issues such as Health and Safety and Environmental issues. Compulsory Audits have been introduced on these subjects to ensure member companies are legally compliant.

The present issues being raised is due to pressure that ASPASA has been putting on Regulators to ensure the playing fields are level.

Aspasa's goal is to ensure sustainability in the Aggregate production for the future. To rebuild deteriorating roads, highways, bridges, airports, seaports, waste disposal and treatment facilities, water and sewer treatment systems and private and public buildings will require enormous quantities of aggregate to be mined.

An area's geology, land ownership, land use and transportation infrastructure are factors that affect aggregate supply. Although potential sources of sand, gravel and crushed stone are wide spread and large, land-use choices, economic considerations and environmental concerns may limit their availability

Providing aggregate resources for S.A.'s increasing needs will be an ongoing challenge.

Aggregate resources are vital to our way of life because they are the major raw materials used in the construction of roads, bridges, rail lines, hospitals, schools, homes and factories.

Aggregate producers can meet the nation's demand for aggregate without causing undue harm to the environment. The question is how to achieve a balance among economic, social and environmental aspects of aggregate resource development.

3. **WHY A COMMITTEE TO LOOK AT AGGREGATE RESOURCES AND THE WAY FORWARD**

As stated in the background section there has been a need established for issues concerning the need for and the use of aggregate resources. The use of this resource is ubiquitous, usually overlooked and under developed – but critical to contemporary society.

Aspasa created this committee to examine aggregate issues because of their national importance and several pressing concerns. The need for infrastructure in S.A. is leading to a stronger economy and growing population is driving an increased demand for aggregate resources. The question being asked is:

“Will this resource be available and at what costs, financial, environmental and social?”

Aspasa estimates that the annual demand for aggregate is over 150 million tons per year, but due to bad record keeping by the institutions regulating the industry; it is difficult to get a true reflection on the real figure. Aspasa has for many years been requesting true figures from the DMR, Stats SA, etc.

The Quarry Industry – Commercial Aggregate and Sand Producers supply aggregates and sand in all provinces of S.A. Operations are forced to supply resources further from where they are mined, which results in delivered material costs increasing dramatically due to

transport costs of the material, therefore competing with unfairly advantaged suppliers, makes it important to focus on the problem.

Commercial operations have to contend with environmental and social costs associated with mining aggregates and delivering them to the marketplace. The mining of aggregate and sand is often opposed by neighbouring residents objecting to noise, dust and the increased traffic needed to deliver commodities to the marketplace.

Furthermore, when a quarry proposal becomes public, even in a jurisdiction where local zoning and comprehensive planning are in place and mining is a permitted use, the response to the proposal by local government varies.

The Aspasa Committee has proposed that certain recommendations be put forward as part of this exercise:

- 3.1 That Best Practices for aggregate mining be developed, both in the Commercial operations as well as other operations that remove material from the earth's crust.

This best practice be discussed and agreed to by all role players in the industry, including regulating bodies etc.

- 3.2 Minimum rehabilitation standards must be developed for all aggregate and sand mining.

There is a national set of legislation for mining and also municipal standards. All of these are confusing, not implemented, not regulated fairly or equitably which forces the Commercial Quarry Industry to have to comply, but the "others" are not focused on.

Recent court cases have shown that better regulations have been demanded.

Operating concerns such as noise, dust, hours of operation, traffic, and final rehabilitation are frequently addressed in local authorisations. The regulations are not conforming to each other and different standards apply to commercial and non-commercial aggregate and sand operations.

- 3.3 That mine planning be filed for all aggregate mining operations. This includes the 5Ha permit sites as well as the borrow pits, municipal pits etc. Each mine plan will describe all aspects of mining including interim and final rehabilitation. This will be the same as what is presently required from a commercial operation that is legal.
- 3.4 That all parties in the bigger picture of aggregate mining, which includes sand mining, gravel mining recognises that the consequences of the depletion of the construction aggregate resources will have a serious impact on the economy. The viability of S.A. Aggregate resources is fundamental for the public's good. If aggregate resources are not properly identified and managed, both the environment and the public will suffer detrimental consequences.

It is therefore essential that other interested parties be educated which includes the public, local government, national government and all those responsible for the permitting of aggregate mining. The goal of this type of education would be to minimise the detrimental consequences should long term planning and conservation of the aggregate resources be ignored.

4. **MINING LICENSE SCALE OPERATIONS**

Again Section 22 of the MPRDA requires the necessary application for authorisation to mine.

Section 23 titled '**Granting and duration of mining right**' makes provision for the Minister to issue a **MINING LICENSE** for mining activities larger than those of a Mining Permit and for periods up to 30 years.

The Mining Permit application requirements are well set out in the DMR web site address

<http://portal.samradonline.co.za/forms/login.aspx?ReturnUrl=%2fdefault.aspx>

Look for the page titled '**SAMRAD ONLINE APPLICATION**' and extend to the sub-section titled '**MINING RIGHT**'.

The requirements for the issue of a MINING LICENSE are more detailed and stringent than those required for the issue of a MINING PERMIT and are too detailed to be included here. Users of this Guideline should refer to the DMR Guideline document included under the MINING RIGHT section titled –

“Guideline for the Compilation of an Environmental Impact Assessment and an Environmental Management Programme”.

5. **MINING AND REHABILITATION GUIDELINES**

Whether mining under a **Mining Permit** or a **Mining License** the basic environmental management principles and legal requirements remain the same. All mining must comply with –

- 5.1 the requirements of the Approved Environmental Management Plan for a Mining Permit, or an Environmental Management Programme for a Mining License;
- 5.2 requirements of the MPRDA and MHSAct;
- 5.3 requirements of 'other' applicable legislation, in particular Section 37 of the MPRDA refers to the requirements of NEMA. Other legislation includes, but is not limited to, the NEM:AQA; NWA, NFA, NVFFA, NHRA etc;
- 5.4 requirements of any authority imposed condition or directive – included in letters of approval and/or directives from the Authorities;
- 5.5 the requirements of the operations Environmental Policy; and,
- 5.6 the requirements of any community or industry agreements the operation may have entered into.

A rehabilitation plan or programme description should be compiled to outline a staged approach to mining and, wherever possible should include 'Concurrent Rehabilitation'. The plan needs to cover the 'Pre-mining Environment' (wherever possible), the 'Development Phase', the 'Operational Phase' and the 'Decommissioning Phase' of the operation – essentially a **“Cradle to Grave”** approach. The plan should also deal with 'Closure

Rehabilitation' and possible post-closure care and maintenance where it is suspected this will be required.

Typically the following aspects might be covered in a successful plan –

- 5.7 Objectives of the programme with attention to land use and environment of the neighbouring areas and to the proposed end-use of the site;
- 5.8 Sectors to be rehabilitated in successive stages including the timing of these stages, or justification for delaying rehabilitation until operations are completed;
- 5.9 Rehabilitation techniques embracing earthworks, top-soil and overburden return, ripping and any other soil amelioration leading to seedbed preparation, plant species selection and establishment techniques to be used;
- 5.10 Outline of any anticipated rehabilitation maintenance programme covering such aspects as periodic watering, re-fertilisation, irrigation, control of alien and invasive species, control of vermin, insects and diseases, replacing significant losses, control of erosion and/or water resource pollution or degradation, etc.; and,
- 5.11 Intended removal or retention of the various services (water, power, telephone etc.) and infrastructure elements (unnecessary buildings, foundations, roads, stockpile areas and berms) on completion of operations, through to the disposal of waste and the final site clean-up.

6. **PUTTING ISSUES IN PERSPECTIVE**

Aggregate and sand (includes gravel) mining may be one of the least-regulated of all mining activities, however aggregate and sand commercial operations have to follow all National and Provincial regulatory procedures but the informal borrow pits, municipal and sand wetting operations don't seem to have to comply. Developers of buildings often "mine" under the auspicious that they are not mining but building, the problem being that the "mined" material is sold.

The mining permit applications for the 5Ha (hectares) don't require stringent rules where as the formal operation has to comply to various standards.

Issues such as appropriate application forms, proof of right to mine the land, maps of the vicinity and site and rehabilitation plans, a mining plan including plans for pollution control and water stream protection, a rehabilitation plan, and a rehabilitation fund, all need to be included in all mining activities.

NB:

The running of a proper commercial operation has various steps that have to be met:

Also see Aspasa's document on "Environmental Management of Quarries".

6.1 Pre-Mining Phase:

The pre-mining phase of a project requires advanced planning of the mining process itself and consideration of post-closure options for the site. The property to be mined should be evaluated to determine whether a sufficient amount of reserves of adequate quality exists in order to profitably mine the site. This evaluation also typically includes the location of the property with respect to existing transportation network and the end market.

6.2 Site Evaluation

The target property to be mined should be evaluated in terms of how the overall mining process will take place. This is typically called a Mine Plane. The typical location of the processing plant, office and support facilities, haul road and/or access routes, product staging areas and overburden placement are important. An evaluation of the soil type(s) in the area planned for mining is valuable. Susceptibility of erosion to these aggregates should be known in the pre-planning stages. Since sands, silts and clays act differently when worked by earthmoving equipment, knowledge of the geology can reduce the cost incurred during site preparation.

6.3 Understanding Site Drainage

It is important to determine the pre-existing drainage patterns and the areas where concentrated flow may exist for a potential mine site. Drainage areas are those locations of the site where runoff will flow in one preferential direction or towards particular discharge points.

6.3.1 Surface Water Flow

Identifying the receiving water (i.e. lake, stream, pond or wetland) is vital before site preparation can take place. If sensitive water bodies are downstream (i.e. wild and scenic rivers, recreational streams, natural aquatic sites, private ponds and lakes or receiving streams) extra erosion measures may be needed.

6.3.2 Ground Water Conditions

It is important to preserve the quality of ground water. Ground water comes from aquifers which transmit water through the subsurface. It is important to understand that mining of potable aquifer can negatively affect the well yield of a potable well.

6.4 Site Preparation

Site preparatory activities should be initiated at the mine site only after surface water drainage and ground water conditions are thoroughly understood.

Once the proposed mine site is understood in terms of surface water drainage and ground water conditions, site preparation can be initiated.

6.4.1 Construction of Access and Haul Roads

Accesses or secondary and/or haul roads are a necessary component of a sand and gravel mining operation, especially on a large piece of property which can require the construction of several roads. Care must be taken in the construction of those roads so as to minimise affecting the environment. Roads should be designed to drain at all time by using crowning, graveling, compacting, ditching, and/or culverting. Proper construction and maintenance of permanent or temporary access or haul roads is of vital importance. Road systems should be kept in serviceable condition to minimise erosion by rainfall runoff and normal vehicle use.

Where necessary, road surfaces should be gravelled if the base does not already contain sufficient aggregate.

- 6.4.1.1 **Crowning of Roads** – Road surfaces, when constructed, should be crowned or out-sloped to dissipate surface runoff and minimise erosion of the road bed.
- 6.4.1.2 **Graveling and Compacting** – Graveling and compacting of the road surface allows for a more permanent and less maintenance-required road surface. It minimises loose sediment runoff or tracking of sediment during wet periods onto public roadways or highways.
- 6.4.1.3 **Ditching and Culverting** – Ditches v (diversion, lateral and/or wing ditches) and culverts can be temporary or permanent drainage structures that, when adequately sized for specific use, carry water flow from rainfall alongside or underneath a roadbed. Ditches and culverts should be sized based on anticipated rainfall events for the specific region of the country where it is being constructed. These structures should be installed at the time of roadway construction. Ditches should be sloped to prevent silting and to allow for maintenance (i.e., digging out of sediment build-up). Ditches and culverts should be kept free of debris and obstructions in order for them to allow unrestricted passage of water. Typically ditches can be used for routing surface water flow away from adjacent properties offsite.

6.5 Land Clearing and Grubbing Activities

Experienced and trained equipment operators should be used during this stage of the mining process so that soil disturbance, compaction and displacement are only provided on those areas ready for immediate use. It is prudent construction practice to install/construct sediment holding basins before major site grading takes place. These basins can catch and hold surface runoff before it leaves the site. Additionally, diverting up-slope water around a planned area for disturbance is also good practice. It is strongly recommended that areas not to be disturbed until absolutely necessary. The time of year of land clearing and grubbing activities takes place can also minimise the impact that inclement weather can have on disturbed/.affected areas. If possible, disturbed areas should be temporarily stabilised or covered as soon as possible to minimise impacts on the environment.

It is very important to only clear and grub acreage needed for the immediate term. Clearing or grubbing too much land too early in the construction phase of the mining operation will dramatically increase the potential for environmental impacts from surface water runoff and will increase the cost to control runoff from the mining site.

6.6 Stripping Activities

Stripping is a term used to describe the removal of overburden material or material which is present atop the valuable sand and gravel reserves. The overburden material is typically comprised of the valuable topsoil near the immediate ground surface and then the vadose zone soil (i.e., soil above the normal water table). Composition or makeup of the overburden material is typically clay, silt and fine sand. The topsoil material can be temporarily stockpiled for future use in post-mining activities.

However, physical space limitations may limit the amount of overburden material that may be stockpiled at any given time. The cost to strip the material, typically using a trackhoe and haul truck, can outweigh the value of holding on to this material for future use. Once mining operations has created a mine pit, concurrent rehabilitation allows for much of the overburden material to be place back into the mine pit. This negates or minimises the cost of hauling it an area of the mine property for temporary storage.

During the stripping phase of the mining process, care should be taken to not affect or disturb too great of an area such that surface runoff cannot be controlled effectively. Such a case might allow an excessive build-up of silt or clay in ditches constructed to control the surface water flow across the site. Normally, surface water flow is directed to the pit to keep the water table high in extended periods of dry weather.

7. **MINING PHASE**

7.1 Aggregate Wash Plant Area (Wet Processing)

Process waste water is any water that is used for or results from the production, clean-up, or use of any raw material, intermediate product, finished product, by-product, or waste product. Wastewater treatment alters the characteristics of the wastewater before discharge and it is often required to achieve compliance. Examples of treatment include pH adjustment and either physical or chemical means to settle solids prior to discharge to surface water.

Requirements during this portion of the mining process include proper berming and/or ditching of pump water from the dredge to the wash plant and back into the mining pit to avoid unpermitted process water from potentially leaving the property.

Runoff from the stockpiles should be controlled by routing this water back to the open pit. Rainfall runoff from these stockpiles should also be directed to the open pit.

7.2 Aggregate Processing Plant Area (Dry Processing)

Although significant amounts of sand and gravel are used for fill, bedding, sub base, and base course without processing, most domestic sand and gravel is processed prior to use. The processing of sand and gravel for a specific market involves the use of different combinations of washers, screens, and classifiers to segregate particle sizes; crushers to reduce oversized material; and storage and loading facilities.

After being transported to the processing plant, the wet sand and gravel (raw feed) is stockpiled or emptied directly into a hopper, which typically is covered with a set of parallel bars to screen trash or debris. From the hopper the material is transported to fixed or vibrating scalping screens by gravity, belt conveyors, hydraulic pump, or bucket elevators. The scalping screens separate the oversize material from the smaller size reduction, to produce crushed aggregate or manufactured sand. Crushing generally is carried out in one or two stages. Following crushing, the material is returned to the screening operation for additional sizing.

Alternatively, oversize material may be used for erosion control, rehabilitation, or other uses. The material that passes through the scalping screen is feed into a battery of sizing screen, which generally consist of horizontal or sloped, single or multi-deck vibrating screens. Rotating trammel screens with water sprays are used to process and wash wet sand and gravel. Screening separates the sand and gravel into different sizes. Water is sprayed onto the material throughout the screening process

in order to remove clays and other deleterious material. After screening, the sized gravel is transported to stockpiles, storage bins, or, in some cases, to crushers by belt conveyors, bucket elevators, or screw conveyors. The sand is freed from the clay and organic impurities by log washers or rotary scrubbers. After scrubbing, the sand typically is sized by water classification. Wet and dry screening is rarely used to size the sand. After classification, the sand is dewatered using screw, cyclones, or hydro separators.

7.3 Maintenance Areas

Good site management is critical to the control of contamination of storm water. Storm water quickly picks up pollutants from improperly stored materials, spills and erosion. Coverage for toxic materials, site grading, channelling of storm water, preventative maintenance, and employee training are very usual and prudent to curtail potential problems associated with pollutant-laden storm water discharge. Source control should be provided for activities such as fuelling, loading and unloading liquids, and outside storage of raw materials. A Spill Prevention Control & Countermeasures (SPCC) Plan must be in place to implement spill prevention and response. Ongoing inspection assures that site management is having the desired effect.

Fuel and oil storage and handling facilities should be located some distance from the main sediment and wash water retention facilities. All such facilities should be equipped with approved containment, monitoring, and collection systems. It is recommended that fuel storage be done above ground. Runoff from adjacent surfaces should be routed to a retention pond that can be monitored and cleaned in the event of a spill.

7.4 Oil Discharge Response & Cleanup

In the event of an oil discharge within the plant area, all manpower and equipment available should be utilised to prevent the discharge from reaching a navigable waterway. The most important steps that need to be taken are stopping the discharge and controlling its impact to the environment.

7.5 Procedure to be followed in the event of discharge:

- 7.5.1 The first person to notice the discharge should immediately notify the plant manager, the other service, in turn, should simultaneously implement best management practices to capture the discharge.
- 7.5.2 Depending on the size of the spill, the Local Emergency Services should be notified.
- 7.5.3 If possible, the source of the leak should be plugged and/or valves closed to prevent further leakage.
- 7.5.4 A front-end loader should be immediately available to build a berm or dike with dry sand to absorb the discharge if the secondary containment should fail
- 7.5.5 If the discharge is too large for plant personnel to contain and clean-up, a contractor should be contacted.

After the leak is repaired, the discharged product should be recovered from the secondary containment and used as intended, if possible, or disposed of in accordance with current local or national regulations. If contaminated surface soils are generated, they must be disposed of in accordance with current local or national regulations.

If the amount of discharge is sufficient to be reportable or if the discharge leaves the plant property, notification should be made to the appropriate environmental department as soon as possible.

8. **POST-MINING PHASE**

8.1 Site Stabilization

The Post Mining Phase rehabilitation is dependent on the agreement with the landowner. These activities may involve the stabilisation of the inactive mining pit or borrow area with herbaceous perennial plants, stabilising the soil, preventing wind or water erosion from causing on-site or off-site damage and improving the aesthetic appeal and the ability of the site to support wildlife. This practice is applicable to sand and gravel borrow areas which have had the soil profile replaced to approximate original conditions or where the soil profile has been removed.

Soil characteristics need to be evaluated to help maintain soil stability and prevent erosion. Some sites may require specific and detailed engineering plans, while others should apply general guidelines to meet site stabilisation objectives. The following guidelines may be used to ease the tasks of meeting site stabilisation objectives.

- 8.2 Slope stability: Cut and fill slopes should not exceed 2:1 to provide better stability. Gentler slopes (3:1) are preferred to facilitate seeding efforts. Long slopes should be avoided to help prevent erosion and to allow access for seeding, mulching, and maintenance.
- 8.3 Diversion: Construct diversion at tops of slope to divert runoff away from the slope banks to a stable outlet.
- 8.4 Chutes: Construct aggregate lined chutes or equivalent to conduct concentrated flow of water to stable outlets.
- 8.5 Soil Conservation: Rehabilitation of abandoned roads requires reshaping, re-contouring, and resurfacing with topsoil and seeding for vegetative growth. Removal of structures such as bridges, culverts, cattle guards and signs is recommended. In addition, the regarding of sand stockpiles should be removed from property boundaries to eliminate the potential for offsite discharge from storm water flow.

It is prudent to practice good soil conservation and seed bare ground during the post-mining phase to aid in minimising and/or reducing the potential for storm water to wash sediment loads from un-vegetated areas into nearby waterways. Natural regeneration takes time and during that process much sediment could be washed away as sheet, rill or gully erosion over that period.

If active re-vegetation is selected, seeds that are conducive to the season and type of soil present should be used to vegetate any bare areas. Mulching (using hay or erosion control blankets, for example) also aids in seed germination and helps prevent or minimise sheet, rill and gully erosion.

8.6 Debris & Waste Removal

Typical debris from sand and gravel mining usually involves trees and shrubs generated from the land clearing stage of the mining process. These trees and shrubs may be placed back into the mined portion of the property and covered with overburden material. This debris can also be stockpiled and burned if the local Fire Department and local authority allows and approves of this process beforehand.

The following guidelines apply to the open burning of trees, brush, grass, wood, and any vegetation in the clearing of land, right-of-way maintenance operations, and agricultural crop burning. This includes the open burning of structures and material for fire training; open burning for management of forest and wildlife or disposal of a fire hazard.

- 8.6.1 Prevailing winds during the burn should always be away from any city or occupied residence likely to be affected by the smoke to the best extent possible;
- 8.6.2 The amount of dirt in the material being burned should be minimised to reduce smouldering;
- 8.6.3 Oils, rubber tyres, railroad ties, treated wood, and any other material creating unreasonable amounts of smoke or air pollutants may not be burned;
- 8.6.4 No hazardous waste or material shall be burned;
- 8.6.5 Opening burning should be conducted between sunrise and before sunset. This allows for good smoke dispersion;
- 8.6.6 Fuel should not be added outside the timeline listed above;
- 8.6.7 An open burn should be extinguished completely to ensure smouldering of material does not persist;
- 8.6.7 Open burning should not obscure visibility or create a traffic hazard on any public road or airport right of way;
- 8.6.8 The following entities should be notified of when and where the open burn will occur: local fire department, *municipality nearest the burn*, *South African Police Services*, and *any military, commercial, or private airport or landing strip* that may be affected by the open burn. Many complaints and disputes can be avoided by informing people ahead of time of the open burn. It is very important to contact your local fire department. This will ensure that sufficient personnel will be available in the event that control of the burn is lost;
- 8.6.9 Common sense precautions, such as having someone watch the fire until it is extinguished and assuring smoke doesn't impact residences or impair vehicular travel on highways should be followed.

8.7 Property Grading

After the mining activities are completed, grading of the property should be conducted. This minimises non-point source storm water pollution (i.e., sediment fines) from impacting potential pathways such as stream, creeks tributaries, lakes etc.

8.8 About Borrow Pits

A borrow pit is a land use involving the excavation or digging of material for use as fill at another site and includes the pit area, stockpiles, haul roads, entrance roads, scales, crusher, and all related facilities.

8.9. Buffer Areas

- 8.9.1 The buffer between the property line of a pit and adjacent parcels containing a residence or public/semi-public-building shall be 30 meters in order to qualify as a residence or public/semi-public use, such a parcel must have the principal structure within 91 meters of the property line adjacent to the

proposed pit. The 30 meter buffer may be altered through an agreement with the adjacent property owner. Proof of the agreement shall be filed with the DMR and mines validity and the agreement shall specifically state what activities may take place within the buffer area.

8.9.2 The buffer area may be used under the following circumstances:

8.9.2.1 It may contain the haul road if it is determined by the public road authority that the pit access needs to be within the buffer area because of safety purposes.

8.9.2.2 The haul road may be placed in the buffer area to avoid wetlands.

In either case 1 or 2 above, the haul road must be moved away from the property line as soon as possible unless permission is obtained by the adjacent property owner.

8.9.3 There shall be a 15 meter no disturbance buffer area for all other parcels not listed above, unless the adjacent property owner provides a written authorisation of reduced buffer. The 15 meter buffer shall apply to all highways and the buffer area shall begin at the edge of the highway right-of-way.

8.10 Hours of Operation

Hours of operation shall be limited to 7:00 am to 8:00 pm. Monday through Saturday. The hours may be expanded either through conditional use permit approval or by the pit operator obtaining the signatures of two thirds of the resident property owners within one quarter mile of the pit. The petition must be renewed on an annual basis.

8.10.1 Equipment maintenance may take place at any time if done within an enclosed structure or if maintenance is part of an extended hour petition.

8.10.2 Hours and days of operation may also be extended when an emergency exists. An emergency is a short-term, unplanned and unexpected event where an immediate need for borrow material exists in order to address a significant threat to the public safety.

8.10.3 No operations may take place on Public holidays.

8.11 Hot Mix Facilities

8.11.1 Permanent hot mix facilities require specific approval from the DMR/Municipality or Department of Environmental Affairs.

8.11.2 Portable hot mix facilities are allowed for special projects without a permit if no residence is located within 300 feet of the pit and the facility is limited to being in the pit two working days per 1,000 tons of hot mix. The time of the pit shall begin with the start-up of production.

9. **OTHER USES OF THE PIT**

A borrow pit shall be used solely for operations directly related to a borrow pit. Any other use shall require a conditional use approval from the DMR/Environmental Affairs.

It shall be the responsibility of the pit operator or owner to control activity within the pit area and to clean up debris or other material left on site. If done in conjunction with a hot mix operation, the recycling of asphalt may be done in a borrow pit. Storage of asphalt, including concrete, is permitted in a general purpose or public works pit provided it is part of an on-going recycling effort.

9.1 Pit Access Road and Hauling

- 9.1.1 All entrances and exits shall be constructed so as to avoid creating a safety hazard. The pit access road shall be placed in a manner that minimises the view into the pit from the public road or any residence unless the road authority required improved visibility for safety purposes.
- 9.1.2 During the hours of pit operation, “Trucks Hauling” signs shall be placed along all public roadways leading to the pit at a distance not less than 500 feet from the pit access road.
- 9.1.3 A pit shall have a barrier controlling access and such barriers shall be clearly visible to prevent safety hazards to the public. The use of cable, chain or similar barrier is prohibited. The control barrier shall deny access when the pit is not in operation.
- 9.1.4 Dust control measures shall be utilised on non-paved routes in accordance with the policy of the local road authority. Dust control measures shall also take place within the pit itself, if adjacent properties would be affected by dust leaving the site.

9.2 Visual Screening

Existing vegetation shall remain as a screen between the pit site and surrounding residences, public roads, or parks. If screening is not sufficient to block the view of the borrow pit from any residence, road or park, the Regulator may require additional screening or placement of a fence and/or berm, when such additional screening is topographically feasible.

9.3 Excavation below the Water Table/Water Use

Excavation below the water table is permitted with appropriate Department of Water permits provided there is no adverse impact upon the quality and quantity of nearby surface water or wells.

The Department shall receive proof of any authorisation from the Department of Mineral Resources for use of surface or ground water used in borrow pit operations.

9.4 Property Lines

All property lines shall be located by a Registered Land Survey – or with the line location approved by the Surveyors. This requirement may be waived if the adjacent property owners and the borrow pit owner/operator agree to the property lines and the agreement is recorded and submitted to the DMR.

9.5 Utility Easements

All utility easements shall be observed and any encroachment into the utility right of way shall only be permitted with the written approval of the utility.

9.6 Road Weight Limits

All road weights limits and other road restrictions placed in effect by the local road authority shall be observed.

9.7 Erosion Control

- 9.7.1 Erosion control measures must be taken in all parts of the pit operation, including the access road, in order to avoid potential damage to adjacent land and to control sedimentation that has potential to leave the site.
- 9.7.2 Erosion and sediment control measures shall conform to the standards of the Department of Environment.

- 9.7.3 All erosion and sediment control measures must be approved by the Department of Environment. The owner or operator shall maintain all such practices until the pit area is permanently stabilised or reclaimed.

9.8 Concurrent Rehabilitation

- 9.8.1 A concurrent rehabilitation plan shall be submitted and approved by the DMR. The stripping and stockpiling of the upper six inches of soil is a required component and all rehabilitation plans. These stock piles shall be seeded and only used for rehabilitation purposes.

10. THE WAY FORWARD

To meet the industry needs properly, regulations and control is required.

The control of borrow pits is not yet optimal. Commercial quarries are discarding suitable material, which is being supplied by nearby borrow pits. The granting of commercial licences does not consider density or cumulative impact.

There is a growing awareness of the importance of sound environmental management amongst Aspasa members. Strategies need to be developed to offset inconsistencies and non-availability of comprehensive regulatory standards and guidelines, as well as monitoring and enforcement.

Some suggestions are:

- 10.1 The DMR, Environmental Agency like DEA, Water Affairs, and Municipalities have the responsibility of prescribing standards and guidelines to prevent all forms of environmental damage including sand and gravel borrow pits. This should be done in consultation and harmonisation with formal Commercial Quarries and/or Aspasa. It should also be done Nationally, Provincially and by Municipalities.
- 10.2 The Regulators need to ensure that gravel pits, borrow pits, construction pits and municipal quarries adhere to guidelines and standards as outlined in the present legislation. In the case of failure to adhere to the prescribed guidelines proposed should therefore deny the contractor the right to mine.
- 10.3 An Integrated Environmental Assessment Management and Monitoring program should be part of any gravel, borrow pit or other extraction operation and encouraged at national, regional municipal and local levels. Assessment should be used to predict possible environmental impacts and to encourage public participation at the decision level. A mitigation and restoration strategy should be included in any management programme. Monitoring must be used to determine if the assessments were correct to detect environmental changes, and to support future decisions.
- 10.4 Best Management Practices will be followed for the general investigation measures for the borrow pit, gravel or municipal quarries:
- 10.5 Minimising the surface area of the borrow pit where possible;
- 10.6 Minimise rock and borrow pit cuts where possible;
- 10.7 Maintain the floor of the borrow pit slightly above the elevation of the surrounding area to promote drainage to avoid creating quarry lakes and to prevent permanent degradation in borrow pits;
- 10.8 Prevent erosion and sedimentation through appropriate control measures;
- 10.9 Protect archaeological resources
- 10.10 Maintain air quality through dust control/suppression;
- 10.11 Use progressive rehabilitation in closing borrow pits no longer than needed.

11. ONCE BORROW PIT IS CLOSED

During the course of borrow pit excavations, operations should be planned in such a way that the amount of work that will be necessary for the finishing off of the borrow pit is reduced as far as possible. Indiscriminate excavation without due regard for the desired final shape of the borrow pit should not be permitted and should be rectified immediately.

12. PLANNING FOR THE BORROW PIT

Ideally **Closure Objectives should have been set as part of the Mining Plan**. These objectives would guide environmental management during the cessation of mining operations and subsequent closure and determine the “*legacy of what gets left behind*” pursuant to the abandonment of the site. At the point where closure is eminent, the **Closure Objective should be revisited and reviewed, and the measures that need to be implemented to achieve these objectives should be confirmed as part of a closure/rehabilitation process**. It may be appropriate at this stage to revisit any potential residual impacts and ensure that the identified measures are adequate to address these.

13. WHAT ABOUT NO MINING PLANS?

Yes, there are often circumstances where a Mining Plan may not have been developed for a particular borrow pit, e.g. where the pit is a historic site, which has been abandoned, or where the development and operation of the pit preceded the legal and good practice requirements were not followed. In these circumstances, a Closure Plan would need to be developed to identify the key Closure Objectives and highlight the remedial/rehabilitation measures required to achieve these.

The first step in formulating a Closure Plan would be to undertake a risk assessment. During the development of this Closure plan **the key questions are “What mitigation measures are required to leave the borrow pit in an acceptable state” and “What are the potential residual risks and how should these be mitigated”**.

14. WHEN IS RABHILITATION NECESSARY?

The timing of rehabilitation is important, and rehabilitation of disturbed areas should ideally be programmed to occur as soon as practically possible following the cessation of the work in a specific area. The period between cessation of activities associated with the mining of materials and the onset of rehabilitation for that area should ideally not exceed 1 month.

Rehabilitation operations should ideally be conducted in parallel with extraction. Accordingly, progressive rehabilitation, in which depleted sections of a borrow pit are reclaimed while extraction is on-going in other sections of the same pit is encouraged. This approach is particularly well suited to large borrow pits and to long-term operations, and is especially effective when the intended end-use is “nature area”, as it enhances the establishment of plant communities. In addition to this approach:

- 14.1 **Reduces the visual impact** of the borrow pit or quarry;
- 14.2 Facilitates adequate conservation and utilisation of topsoil;
- 14.3 Simplifies the **management of runoff** and attended erosion;
- 14.4 Minimises the effect of operations on nearby **communities and plan/animal population**.

15. **LEFT OPEN BORROW PITS**

In SA there are many borrow pits that have been left with no rehabilitation or measures taken to secure the areas. Public safety has not been seen as an important issue in the past and many animals and children have drowned in abandoned borrow pits.

16. **OPERATORS SHOULD TAKE CERTAIN MEASURES TO ENSURE THAT THESE AREAS ARE SECURED – SOME IDEAS:**

- 16.1 Where the borrow pit is likely to impose a significant risk after rehabilitation, e.g. dangerous slopes (steeper than 1 : 2 or unstable), not free draining, developed as a farm dam, not visible etc., then the perimeter of the borrow pit, as defined by the expropriation or landowner agreement, should be secured with permanent fencing.
- 16.2 Stock-proof fencing, in concert with appropriate signage, should be utilised as a minimum and should be maintained in a satisfactory condition.
- 16.3 A gate should be provided to permit access to the site for the on-going monitoring and management of the site rehabilitation.
- 16.4 Care should be taken not to damage existing fences and gates.

17. **WHAT HAPPENS AFTER THE CONTRACTOR OPERATOR LEAVES THE AREA?**

It is essential that site areas are cleaned up and returned to an acceptable state when an operation is closed down.

Some measures to assist with this are:

- 17.1 Infrastructure that has been erected at the site should be demolished and removed.
- 17.2 All equipment, plant, concrete footings, fencing, etc., should be removed from site;
- 17.3 All services should be dismantled and removed from site;
- 17.4 All foreign materials should be removed from site;
- 17.5 Domestic or other waste should not be disposed of in the borrow pit, but should be removed from site and disposed of at an appropriate landfill; and
- 17.6 Soil contaminated with oil, grease, fuel or other hydrocarbon should not be disposed of in the excavation.

18. **WHAT ABOUT THE ROADS AND VEGETATION ON THE SITE?**

Access roads should be:

- 17.7 Made specifically for the mining activities, and which are not required by the landowner, should be rehabilitated.
- 17.8 Be rehabilitated by ripping the surface crust to ensure the re-growth of vegetation. In some cases it may be necessary to plough the area and re-vegetation to ensure that a sustainable and desirable land use is achieved.
- 17.9 The requisite permanent drainage works and erosion protection measures should be set in place.

19. **TOPSOIL REQUIREMENTS**

- 19.1 Approximately 50 to 100mm of previously stripped and stockpiled overburden material should be applied to the newly shaped and scarified/.ripped borrow pit.
- 19.2 Before placing topsoil, all visible weeds should be removed from the placement areas and from the topsoil. The previously stripped and stockpiled topsoil should generally be spread evenly over the prepared surface to a depth of 75 to 150mm on slopes of 1: 3 or steeper.
- 19.3 Topsoil placement shall occur in a phased manner, concurrent with the phased operation of the borrow pit. Topsoil should be placed in the same areas from which it was stripped.
- 19.4 Where amounts are inadequate to cover the entire area, slopes should receive priority treatment.

20. **WHAT ABOUT THE LOOKS OF THE QUARRY AREA?**

- 20.1 Areas not properly rehabilitated are an eye sore and therefore screening is necessary to ensure acceptable and sustainable environmental areas are left behind. Some requirements:
 - 20.1.1 The most effective way to mitigate the visual impacts associated with a borrow pit is via the effective implementation of the rehabilitation process, and the attainment of stable slopes and acceptable vegetation.
 - 20.1.2 For some sights rehabilitation may not be adequate to address the impact on the visual aesthetics. Hence, consideration should be given to the visual screening of sites that are unsightly, are highly visible or are located in visually sensitive areas.
- 20.2 Visual screening could include:
 - 20.2.1 Erecting earth bunds of at least 1 m high on the boundary/periphery of the borrow pit;
 - 20.2.2 Planting vegetation, viz. trees, shrubs or tall grasses. In some areas it may be appropriate to use alien plant species, such as pines, to facilitate visual screening e.g. within or adjacent to forestry plantations.

21. **WHAT HAPPENS TO THE LAND ONCE THE CONTRACTORS HAVE LEFT AND THE AREA HAS BEEN REHABILITATED?**

It is often found that other operators or opportunist visit areas that have been mined to continue with the removal of material. These situations are often than not controlled or regulated and deteriorate into gaping holes.

- 21.1 Re-vegetation should not occur in any areas until all operations within those areas have been complete.
- 21.2 Once re-vegetation, areas should be protected to prevent tramping and erosion.
- 21.3 No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
- 21.4 Only persons or equipment required for the preparation of areas, application of fertilizer and spreading of topsoil should be allowed to operate on these areas.
- 21.5 Where rehabilitation sites are located within actively grazed areas, they should be fenced.
- 21.6 Fencing should be removed once a sound vegetation cover has been achieved.

21.7 Any runnels, erosion channels or wash away developing after re-vegetation should be backfilled and consolidated and the areas restored to a proper stable condition. The erosion should not be allowed to develop on a large scale before effecting repairs and all erosion damage should be repaired as soon as possible.

22. **WHO IS RESPONSIBLE FOR THE AREA ONCE OPERATIONS HAVE BEEN COMPLETED?**

The licence/permit holder stay liable until a Closure Certificate has been issued for the site by the DMR

23. **WHAT ARE THE FINANCIAL IMPLICATIONS?**

In terms of the requirements of the Mineral and Petroleum Resources Development Act, financial provision must be made for the closure or sudden cessation of any work and for any rehabilitation/re-vegetation work

The issue of financial provisions and applicability to road maintenance activities being undertaken by Provinces has specifically been raised with DMR and the following has been agreed:

23.1 Where the road maintenance is undertaken by an independent Contractor, since the Contractor will sign a formal Contract with Province, financial provision for closure or sudden cessation of work be provided for via the Contract Agreement. The financial guarantees provided by the Contractor would also be available for any remedial work. Given the scale of mining activities associated with borrow pits, it is anticipated that this would be more than adequate to meet the remedial requirements.

24. **BORROW PITS MITIGATION MEASURES**

24.1 The ranking of mitigation options is as follows:

- 24.1.1 **Avoidance** – using an alternate site or technology to avoid the adverse effect all together. This is the most desirable;
- 24.1.2 **Minimisation** - taking actions to minimise and/or contain effects to the maximum extent possible during engineering design, construction, operation and closure;
- 24.1.3 **Rectification** – taking actions to rehabilitate or restore the affected environment after the fact; and
- 24.1.4 **Compensation** – this is used as a last resort to offset adverse environmental effects. This is the least desirable.

24.2 Best management practices will employ the following general mitigation measures for the borrow pits:

- 24.2.1 Minimise the surface area of borrow pits where possible;
- 24.2.2 Minimise rock and borrow pit cuts where possible;
- 24.2.3 Maintain the floor of the borrow pits slightly above the elevation of the surrounding area to promote drainage, to avoid creating quarry lakes and to prevent permafrost degradation in borrow pits;
- 24.2.4 Prevent erosion and sedimentation through appropriate control measures;
- 24.2.5 Carry out testing and water quality monitoring in support of mitigation measures;
- 24.2.6 Protect archaeological resources;
- 24.2.7 Maintain air quality through dust control/suppression; and
- 24.2.8 Use progressive rehabilitation in closing borrow pits no longer needed.

25. **MANAGEMENT SYSTEM AUDIT FOR BORROW PITS**

25.1 Introduction

The scope of this audit document is designed to cover the implementation of safety standards associated with the management of all borrow pit operations.

The audit is split up into section covering management systems, induction, procedures and training, statutory compliance, accident/incident reporting and investigation, occupational health, behaviour and culture, mobile plant, fixed plant, workshop, isolation and tagging and emergency plan.

Where, in the intent, the word “verify” is used, this means that it is a regulatory requirement, which is mandatory and has to be complied with. Where, in the intent, the word, “ensure” is used, it is not a mandatory requirement, but it does set out a recommended safe method which, if followed, should minimise the potential for an adverse incident to take place.

25.2 Management Systems

Point	Standard	Standard Met	Comments
1.	There is a current written policy statement that sets out the Safety and Health Policy of the organisation.		
2.	Contractors employed at the site are required to comply with the principal employer’s Safety and Health Policy.		
3.	Management have provided the applicable statutory mine record books required.		
4.	A current site organisation chart is available.		
5.	Management have established documented permit systems for certain categories of work.		
6.	The principal employer has developed and implemented a Safety and Health Plan for the site and each work group.		
7.	Management have established a system of employee input with regard to safety and health.		
8.	Safety and Health Meetings are held.		
9.	Personal protective clothing and equipment (PPE) is provided to all employees at no cost.		
10.	Means of internal and external communications are available on site.		

25.3 Inductions, procedures, training and supervision

Point	Standard	Standard Met	Comments
1.	There is a safety induction process for this site.		
2.	Safe systems of work have been developed and implemented by each employer.		
3.	Management issues clear on the job safety instructions prior to any work being commenced at the site.		
4.	Personnel are trained and assessed as competent to perform allocated tasks.		
5.	Management maintains a file record of each employee's training history.		
6.	Management have appointed competent personnel to supervise employees.		

25.4 Statutory Compliance

Point	Standard	Standard Met	Comments
1.	Management carries out its statutory responsibilities in respect to the inspection of workplaces.		
2.	The Registered Manager ensures that appointed persons perform all duties imposed on them in writing under the Act.		
3.	Management has complied with the primary statutory responsibilities in respect of the installation, operation and licensing of its electrical installation.		
4.	Management carries out its statutory responsibilities in respect of the registration, inspection and maintenance of Classified Plant.		

25.5 Accident / Incident Reporting and Investigation

Point	Standard	Standard Met	Comments
1.	Management have established an immediate hazard/occurrence/accident reporting, control and rectification process.		
2.	Management carries out its statutory responsibilities in respect of the recording and reporting of serious accidents and potentially serious accidents.		
3.	Management carries out its statutory responsibilities in respect of the recording and reporting of injuries to workers and the total hours worked by employees and the number of employees.		
4.	Management carries out its statutory responsibilities in respect of the recording and reporting of occurrences and potentially serious occurrences.		
5.	Formal procedures are in place to investigate accidents, occurrences and property damage.		

25.6 Occupational Health

Point	Standard	Standard Met	Comments
1.	Occupational health hazards have been identified.		
2.	Control measures are in place to reduce occupational health hazards identified.		
3.	The control measures implemented to reduce occupational health hazards are effective.		
4.	Employees have been educated in the occupational health hazards identified.		
5.	The exposure level of employees to occupational health hazards has been evaluated.		
6.	Management has caused a noise report to be complied.		
7.	Where necessary, employees wear appropriate personal protective equipment to reduce exposure to occupational health hazards identified.		

25.7 Behaviour and Culture

Point	Standard	Standard Met	Comments
1.	Disciplinary procedures are in place for unacceptable behaviour and unsafe acts.		
2.	The disciplinary procedure is enforced by management.		

25.8 Mobile Plant

Point	Standard	Standard Met	Comments
1.	A competent person is appointed to supervise maintenance.		
2.	There is a system of maintenance for mobile plant.		
3.	Records are kept for maintenance of mobile plant.		
4.	There is a system to make checks and approve the arrival of all company and contractors' mobile plant.		
5.	There is a document to show that operator pre-start checks are carried out for mobile plant.		
6.	There is a procedure to report operational faults on mobile plant.		
7.	The faults are rectified in an acceptable timeframe.		
8.	Operational mobile plant is provided with a functioning two way radio communication.		
9.	ROPS, where necessary, is provided and maintained.		
10.	FOPS, where necessary, is provided and maintained.		
11.	Mobile plant operators are trained and assessed for competency.		
12.	The access road into the mine is		

	segregated from mobile off-highway earthmoving equipment operations.		
13.	Access roads, haul roads and benches are maintained in a safe condition.		

25.9 Fixed Plant

Point	Standard	Standard Met	Comments
1.	Fixed plant drives and moving parts are suitably guarded.		
2.	Fixed plant is provided with safe access including walkways, platforms.		
3.	Fixed plant and buildings so far as is practicable are provided with alternative means of egress.		
4.	The walkways and platforms provide access to major items for both operation and maintenance.		
5.	Handrails and guard rails are provided for elevated walkways and platforms.		
6.	Items of fixed plant have a primary isolator.		
7.	The applicable items of fixed plant have a local isolator.		
8.	The isolation switches are labelled.		
9.	The isolation switches have provision for securing an isolation device.		
10.	The hazards associated with the manual cleaning of fixed plant have been identified.		
11.	The procedure for the manual cleaning of fixed plant requires that, where a hazard exists, the plant directly involved is stopped, isolated and tagged.		

25.10 Workshop

1.	A workshop facility is provided for the maintenance of fixed and mobile plant.		
2.	The facility is appropriate for the types of tasks undertaken.		
3.	The workshop has adequate facilities for the stable jacking of mobile equipment.		
4.	Proper material handling and support equipment is provided for the tasks undertaken.		
5.	Adequate lighting is available for work to be carried out safely at the workshop.		
6.	The workshop facility is maintained in a tidy condition.		
7.	Signs are provided to warn of possible eye, hearing and other safety hazards.		
8.	Fire control equipment is available at the workshop.		
9.	Machinery is maintained on a regular basis.		
10.	Gas cylinders are restrained.		
11.	Gas hoses and gauges are free from damage.		

12.	Flash back arrestors are adequately sized and fitted to portable and mobile oxy-fuel gas systems for welding, cutting and heating metal.		
13.	Electrical tools and equipment at the workshop are periodically checked and tagged.		
14.	Electrical welding machines are maintained in a safe condition.		

25.11 Isolation and Tagging

Point	Standard	Standard Met	Comments
1.	OUT OF SERVICE tags are used to warn against the use of plant which is unsafe to be used or which may be damaged if it is used.		
2.	DANGER tags are used to prohibit the use of plant on which an employee is undertaking work.		
3.	Each employee removes his own DANGER tag after completing the work and prior to leaving the worksite at the end of the shift.		
4.	OUT OF SERVICE tags are attached prior to removing DANGER tags when work on plant is not completed.		
5.	The effectiveness of devices used to isolate plant is proved prior to attaching DANGER or OUT OF SERVICE tags.		

25.12 Emergency Plan

Point	Standard	Standard Met	Comments
1.	The operation has prepared and emergency plan.		
2.	The emergency plan is known by the site personnel.		
3.	The emergency plan includes a means of employee and visitor control.		
4.	The emergency plan identifies the types of incidents which may affect the site.		
5.	On-site first aid services and facilities are available at the site.		
6.	On-site fire fighting resources, include trained personnel are available.		
7.	Muster points are installed at the site.		
8.	Underground sites have established a mine rescue capability including SCBA, fire fighting and resources and trained personnel.		

26. **IMPORTANT ATTACHMENTS**

The guidelines as per:

26.1 South African Pavement Engineering Manual, Chapter 8, Material Sources will be followed.

(See SANRAL – dated January 2013 – Version 1) -

www.nra.co.za/content/SAPEM_Chapter_8_Jan2013.pdf

26.2 Environmental Management of Quarries (Attached)

This manual to be applicable to all Borrow Pits Nationally, Regionally and by Municipalities, Government Departments, Provincial Departments and Municipalities.