

Appendix 15 – Summary of Specialist Recommendations

EMP NAME AND DATE	SPECIALIST STUDY	ASPECT DESCRIPTION	RECOMMENDATION
Maandagshoek Platinum Project EMP, Volume 2, July 2000 (Metago Environmental Engineers)	Detailed Petrological and Land Capability Survey: Groundwater Consulting Services CC. May 2000	Management of Soils – Operational phase (Post mining)	<ul style="list-style-type: none"> The soils will be effected throughout the construction, as well as the operational phases. Although some rehabilitation may be started during the operational phase, and possibly areas on the tailings dam might be in a position to be rehabilitated, it is unlikely that large scale rehabilitation of the majority of the disturbed sites will start until all mining activities have stopped. Rehabilitation should be ongoing throughout the mining operation, and any area that is no longer to be used should be rehabilitated during the operation if it is feasible to do so. These soils, of the well-drained variety, will require very little management other than care as regards compaction and erosion/drainage. The wet soils, on the other hand, will require a substantial amount of cultivation and reworking due to the dewatering of the high clays and the resultant heavy structure. Fertilisation of these soils should not be necessary and should be avoided if possible. If however, on completion of the operation or during rehabilitation, sampling of the topsoil indicates a need for fertilisation, it is recommended that the required mix (to be determined from sampling at the time) be applied in small quantities on a frequent basis. The final rehabilitated land surface should reflect the pre-mining topography as closely as possible. To this end the soils and land surface should be contoured to facilitate good drainage during the operation as well as on completion of the operation.
		Land capability – Operational (Post Mining)	<ul style="list-style-type: none"> If, the rehabilitation program as stated, is carried out to plan, the land capability for this site can be expected to be the same, or in places better than prior to the mining operation. The land capability will be moderate to poor, and in places very poor. The land should not be used for anything other than well controlled (low intensity) grazing, with possibly some subsistence farming on the better soils (mid and upper midslopes), but preferably the land should be left as wilderness or conservation land if possible., and particularly on the heavy clay rich and sensitive colluvial soils within the valley bottom and low lying depositional areas.
		Soils- Decommissioning and Closure	<ul style="list-style-type: none"> All mining related infrastructure including roads, stockpiles, buildings and processing facilities will be demolished on closure. All rubble on site will be backfilled into the void areas compacted and top dressed with sufficient material and the appropriate vegetation. All waste rock will be removed from contaminated areas and deposited onto the discard dump at (the specific areas that are being/are to be rehabilitated are listed in table 6.3 Roadways will be ripped to correct any compaction created by the heavy traffic utilized during the mining operation. The final voids will be backfilled using the stockpiled material, and material from the pollution control structures (berms), placed in the appropriate sequence. The tailings dam and any remaining waste rock dumps (if present) will be top dressed and re-vegetated. The top dressed areas will then be rolled and seeded, preferably in February/March, or as soon as the soil moisture is sufficient (monitor with tensiometers) to guarantee that the seed has a chance of germinating. A suitable seed mix (to be determined from the vegetation survey) should be used to stabilize the replaced soils. The planting will be undertaken with water, either by hydro seeding the seed mix onto the ground, or having pre wet the soils prior to planting, with a weekly watering program (15 to 20mm/ha/week) for one month after planting, or until germination has occurred. The areas to be planted will need to be levelled and engineered to a slope not greater than 1:5 where possible. The soils will then be ripped to a depth of 20mm to loosen the soil, and all weeds will be removed. A fertilizer mix if required (of 2:3:2 (22) Zn at a rate of 300 to 350kg/ha) will be applied at time of planting. In addition, and if available, chicken litter should be applied to at bulk to the heavy clay rich soils. For areas that are considered too steep, and where a gradient of 1:5 cannot be achieved, the use of Vetiver grass (<i>Vetiveria zizanoides</i>) is recommended, and in places will be essential to prevent erosion, and to stabilize the soils. The Vetiver will be planted according to the slope gradient, length of slope, and degree of erosion potential. A spacing of approximately one row every five (5m) meters of vertical drop is recommended. This might alter as the slope becomes very steep, or very shallow. It is recommended that the specialists (Specialized Soil Stabilization) are used for the specific areas of concern. The grass stands will be examined by a horticulturist one year after planting to ensure that the grass has established itself satisfactorily. A soil sample will be taken in the June following planting, and analysed to determine the required fertilizer applications. The establishment of grass will prevent erosion and dust. Vegetation and soil rehabilitation will continue until the land is self-sustainable, well grassed and until closure. The soils have a high erosion potential and therefore specific attention must be paid to the implementation of rigorous erosion control measures
Preliminary Botanical Report, Prof Dites Bester, August 1999	Biodiversity	<ul style="list-style-type: none"> Relocate legally protected plants. Do not construct road through rocky outcrops, avoid the peaks, do not unnecessarily remove big trees. Plan storm-water drainage to prevent erosion. Develop a rehabilitation program when/if the road is abandoned or has served its purpose. Social consultation with locals and thereby identifying herbalists, may at least lead to some medicinal plants being used instead of just being destroyed. Gates should be put at entrances to keep out vehicles (wood-collecting, game snaring and other criminal activities). The developer needs expert advice on rehabilitation in this area. There is no mitigation for the existing road except that immediate attention must be given to storm-water management to prevent further erosion. Should the road(s) be upgraded, then a more detailed study is necessary during summer/spring (after rains). The site where the endangered plants grow should be completely avoided in so far as development is concerned. The proposed road to the Saddle (Hill 2 - 3) must not enter/cross the wooded ravine as a rich plant diversity, including endemic is found here. The Saddle (Hill 2 - 3) should be given special attention as the road may destroy protected Mountain Cabbage Trees. Social consultation is of primary importance as the Headman (Moroka and Sikiti villages) has not been informed of developments and local herbal doctors should be allowed to collect medicinal plants in the demarcated area when construction commences. It has been mentioned that the new roads are being used for criminal activities and therefore, to prevent social misuse and public entrance, it would be advisable to put up gates wherever circumvention of these is impossible. This should be done after social consultation only (contact Joseph Magabane at Sikiti Village). Once these roads have served their purpose (exploration) they MUST be rehabilitated to prevent misuse/erosion 	

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	Preliminary Botanical Report, Prof Dites Bester, April 2000:	Biodiversity: Flora, fauna, land use and tourism Concentrator Plant	<ul style="list-style-type: none"> There is no mitigation for lost grazing land/scrub-forest. A location alternative is suggested: and implies no disturbance of the eastern section/border (i.e. the riverine habitat at least up to me 00 meters from the banks for the full length of the site; and no disturbance of the south and south-eastern rocky outcrops/stony ridges. These are Red Flag areas, botanically. The chosen site will have a positive effect/impact as it will prevent access to the hill which is presently being denuded by wood-collection; as well as no construction/disturbance of the natural courses of the seasonal tributaries. if these requests are not practical, delay any construction activities in these spots until the orchid and Aloe species have been finally identified by NBT in Pretoria, or have been *officially collected (these plants must be in flower for identification); Furthermore it is recommended that locals are allowed to collect medicinal plants/wood after the site has been clearly demarcated, before construction; an *1 official collection of the unidentified species be organized before construction; storm water drainage is planned properly to prevent erosion and surface/ underground water pollution; a plant rescue operation be planned before construction begins; rocky outcrops (south/south-east and riverine area be conservation areas; the northern part of the proposed site be used for most activities/construction as this part is mostly old fallow fields, now bush-encroached (from the big donga north to the next ditch/donga); no construction camps outside demarcated area; proper management of solid/liquid waste or effluent (health hazards/pollution of river).
		Biodiversity: Southern shaft and haulage roads	<ul style="list-style-type: none"> No location alternatives are suggested but to mm1m1ze negative effects the following steps are advised/recommended: Do not disturb/destroy vegetation around demarcated area(s); remove as few trees/plants/shrubs/grass cover as possible to prevent erosion and to keep the natural system intact during construction; Remove/relocate the few rare/protected plants to office gardens (in the latter, cacti - declared weeds - and other alien/exotic plants should be destroyed by burning). If advice is needed, I can be contacted; keep the existing road open for social contact between villages otherwise trespassing will occur with consequent conflict: allow (through Civic/Tribal Committees) the local village herbal/traditional healers to collect medicinal plants before construction; allow closest village(s) to collect firewood, poles for fencing, etc. after area has been demarcated properly (they must produce signed document from chief/headman/civics organizations); plan and manage storm water properly as the area is prone to erosion and natural rehabilitation is slow - river water can also be polluted if proper management is not applied; no construction camps outside demarcated area; prevention of veldfires and hunting; proper management of solid/liquid waste or effluent to prevent underground and surface water pollution.
		Biodiversity: North Shaft next to Mulungwane Village	<p>A location alternative is suggested simply because of social effects - (water, clay, footpath to river and other villages). Unless RDP standards are applied (tap 100 m from each home), the client should seriously consider moving its shaft-borders \pm 100 m away (to the south) from the water-source and clay-collection sites : also in order to allow footpath access to the river.</p> <p>The normal migratory measures (as part of the EMP) are advised :</p> <ul style="list-style-type: none"> do not remove vegetation unnecessarily; relocate/transport rare/endemics to official gardens/schools, etc.; allow locals to harvest wood and other natural resources that are to be removed; allow traditional healers to collect medicinal plants; only the demarcated area; plan construction to prevent further erosion; do not construct access roads through a village (dust pollution, safety hazards); plan during pre-construction phase to prevent heavy metal/dust pollution of the natural drainage system (stream) on the northern side as well as of the river lower down. This type of pollution eradicates plants and ones a health hazard.
		Biodiversity: North Shaft in village at tower and graveyard	<p>If the client still decides to use this site, notwithstanding the social arguments against it, the following migratory measures should be taken:</p> <ul style="list-style-type: none"> do not block access to river; upgrade road across river; allow locals to harvest whatever of the stunted, shrubby trees they need; take action against erosion and do not add to the dumping of building rubble/trash heaps here as health hazards already exist and can be worsened by an added impact; do not enter/destroy/claim part of the cultivated fields; construct an access road which does not go through an inhabited area.
		Biodiversity: Upgrading of existing access road from main tar road to office block	<p>No location alternatives are suggested and no relocation procedures need to be implemented but the following steps are advised/recommended:</p> <ul style="list-style-type: none"> do not disturb or encroach on areas bordering on the road reserve; remove as few trees/shrubs as possible during construction; control dust pollution during construction in an inhabited area (health purposes); remove the very few protected species and transplant in office garden; allow locals to collect removed shrubs/trees/medicinal plants during/before construction within a demarcated area; plan and manage storm water drainage very carefully in an area where erosion is rife, especially close to the river
		Biodiversity: Road (upgrading) from office block to concentrator plant	<p>No location alternatives are suggested but the following steps are suggested to minimize negative impacts:</p> <ul style="list-style-type: none"> do not disturb/encroach on areas bordering the demarcated zone - especially in the rocky area as rehabilitation is slow on ultramafic soils and erosion will follow; only remove plants where/when absolutely necessary after local traditional healers and population have been allowed to harvest medicinal plants, wood, etc. from demarcated area; remove and plant endemics/rare/protected plants to official gardens; plan and manage storm water drainage carefully; during operational phase, dust should be limited as plants can be negatively affected - road surfacing is to be properly done to prevent pollution.

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		Biodiversity: Access road from concentrator plant to north shafts (1 and 2)	<p>As it is an area characterized by disturbance , erosion and overgrazing (pioneer grass species in most of area) , the project will not have seriously negative effects (as it would have had in a pristine area) and effects will be limited, local.</p> <p>The botanical and ornithological survey was extensive and detailed enough to decide that no Red Flag situations exist.</p> <p>It is, however, important to prevent extensive destruction of plants, especially along riverbanks, rivulets, dongas and those growing on rocky outcrops. If this is impossible (as it would seem) relocation and rescue operations are suggested:</p> <ul style="list-style-type: none"> • only remove those plants/trees that are really in the way; • allow locals/traditional healers identified by locals, to harvest wood/medicinal plants within demarcated area only; • transplant the protected, rare, endemic species in the office gardens or in the concentrator plant area (if there is protection); • if above-mentioned suggestion is not practicable, organize a plant rescue operation (contact Conservation Dept.); • storm-water management is of prime importance as- • river water is presently the only source of drinking-water for most villagers (not to be polluted by heavy metal ore/dust/mud, etc.); serious erosion in area seems just to expand unchecked by land-owner(s), • road upgrading/new road should under no circumstances run through any of the villages (dust pollution/noise/increase in traffic - accidents - schools - social responsibility of client and long-term social relations may be compromised or negatively affected).
		Biodiversity: Tailings Dam	<p>No location alternatives can be suggested due to the topography of the whole property.</p> <p>There is no mitigation for lost grazing land, habitat for birds and small mammals. The following steps are suggested to ameliorate the negative impacts:</p> <ul style="list-style-type: none"> • do not de-bush unless absolutely necessary (around the perimeter); • relocate protected and endemic plants to official gardens; • the plant diversity (flowering plants) merits a rescue operation by IAP's; • allow local population to harvest medicinal plants (traditional healers) and wood in a clearly demarcated area; • do not open up rest of site/area by allowing free road access to locals (game snaring, theft of wood. etc.); • water pollution (heavy metals) is a threat and careful planning is needed to prevent a natural seepage/drainage valley from polluting the river lower down; • do not allow access to hillsides and hilltops where rare endemics grow.
	Groundwater: Groundwater Consulting Services CC: June 2000	Groundwater	<ul style="list-style-type: none"> • Decanting is likely to take place at the southern shaft at an estimated rate of ± 80 m³/day. In order to minimize the decant volume it is essential that the underground workings should be sealed of in such a manner to prevent any surface water from entering the underground workings directly. The quality of the decant water will be such to allow direct catchment discharge.
Maandagshoek Platinum Project EMP, Volume 3, July 2000 (Metago Environmental Engineers)	Preliminary Archaeological Impact Assessment, Archaeo- Info, August 1999		<p>Area 1:</p> <ul style="list-style-type: none"> • These sites have all been plotted and described in the past and does not constitute a historical feature of major importance. No mitigatory work is necessary on these trenches and their location should only be noted. <p>Area 2:</p> <ul style="list-style-type: none"> • This site lies directly on the proposed route or road and will be damaged to a great extent if any further development continues. It is essential that this site must be surveyed in detail and a few test trenches excavated to determine the ceramic sequence to fit the site in a chronological time frame. The information derived from the site layout and the excavations can then be compared to studies done by J.H.N. Loubser to determine the spatial distribution of similar sites in the region. The excavations will be on a small scale, concentrating on the ashmidden and some of the enclosures. • Due to its recent nature this site does not have archaeological value and no further work is recommended. The two graves on the site are, however, of concern. Any further development of the roads must take these graves into consideration and effort must be made to try and avoid them. If it is not possible, arrangements should be made to relocate them (see Addendum B). <p>Area 3:</p> <ul style="list-style-type: none"> • No further work is recommended for this site. The graves must be taken in consideration during the development of the road. Efforts must be made to avoid them. If not, they would have to be relocated (see Addendum 8). <p>Area 4:</p> <ul style="list-style-type: none"> • A detailed survey to plot the concentrations of stone tools found has to take place. A surface collection of stone tools and other artifacts has to be done. From these it will become evident if this was a production site and it will also be possible to make a stone tool typological series to determine the site's scientific value. <p>Area 5:</p> <ul style="list-style-type: none"> • Due to its low archaeological value, no further work is recommended. If the grave is found to be in the way of further development. See Addendum B for further action. <p>Area 6:</p> <ul style="list-style-type: none"> • No sites of archaeological or cultural importance were identified on this stretch. Provided construction takes place above the foot of the hill no problems should be encountered. Several younger sites of occupation are however found along the foot of the hill and some graves were also encountered. Should the road be moved further down these will have to be moved
	Archaeological Sensitivity Report , Archaeo- Info, August 1999		<p>The study area indicated to Archaeo-Info shows above average potential for containing sensitive cultural heritage sites. Special attention should be given to the occurrence of Late Stone Age, Iron age and rock art sites. The area has historically been occupied by a variety of cultures and is still surrounded by large communities. For this reason, it is also important to document and mitigate features with historic and cultural value to these communities. Of particular importance is the handling of the abundance of graves found in the study area. It is significant to note that the surveying of access roads alone in the area identified more than 35 sites of historic and cultural importance. It is the opinion of Archaeo-Info that the responsible process would be to perform detailed surveys of any area identified for development.</p>

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	Preliminary Archaeological Impact Assessment: Archaeo- Info, August 2000	Heritage	Area 1: Archaeo-Info recommends that the wall of the proposed Tailings should move further east to avoid the graveyard and to exclude it from the areas needed for construction purposes. The safest way is to fence it off and in so making it a no-go area for construction vehicles to avoid possible damages to the graves. A gate in the fence will provide free access to the families of the deceased to visit the graveyard and to pay their respects.
Addendum to approved EMPR: Modikwa Platinum Mine Expansion Projects on farm Onverwacht 292 KT: South 2 Shaft: Gudani Consulting, September 2008	Evaluation of the vegetation of Modikwa Platinum Mine: Dr Faan van Wyk, July 2008	Biodiversity	A follow-up evaluation should be done during summer to assure that all the species with conservation status are identified; If expansion and development in the TSF area, shaft area and opencast area is unavoidable, species with conservation status (protected, endangered and rare) should be conserved as far as possible by means of: <ul style="list-style-type: none"> • Avoidance of unnecessary disturbance of natural vegetation during construction and operational phases. • Transplanting specimens into similar localities in nature or • Transplanting specimens into a nursery until it can be relocated or • Transplant specimens into the gardens surrounding offices where it can be properly maintained. • It should be noted that permits for certain activities are required according to national as well as regional ordinances and laws as far as indigenous flora is concerned. • Wherever possible, any soil that can serve as a growth medium for plants must be stripped and stockpiled for future rehabilitation purposes; • Construct the TSF, rock dumps, overburden dumps etc. in such a way that slopes with a maximum of but preferably less than 18° are constructed; • Water control structures should be constructed to minimize erosion and to create a favourable habitat for the establishment of vegetation during rehabilitation.
	Results of a phase ii Heritage Impact Assessment study: an investigation of late iron age (including initiation cairns) and mining heritage remains on the farm Onverwacht 292kt : Dr Julius CC Pistorius December 2005	Heritage	<ul style="list-style-type: none"> • Modikwa Platinum intends to expand its mining activities on part of the farm Onverwacht 292KT in the Steelpoort Valley in the Mpumalanga and Limpopo Provinces of South Africa. The development project will include the establishment of a new (decline) shaft, a mobile office, roads and a compression. Consequently, A Phase I Heritage Impact Assessment (HIA) study was done for Modikwa Platinum during April 2004. The Phase I report recommended that certain Phase II work be undertaken as the development project may impact on some of the heritage resources. • This report described the Late Iron Age site (Site LIA01), including initiation sites, and the mining heritage remains on Onverwacht 292KT and provided, where possible, explanations for the meaning and the significance of these remains. As Modikwa Platinum is located in the heartland of the pre-historical and the historical Pedi chiefdom the description and explanation of Site LIA01 and the initiation sites was done by using oral tradition and ethnographic information with regard to the historical origins and past life-ways of the Pedi. However, Modikwa Platinum is also associated with a rich mining heritage. Consequently, historical information was used to explain the significance of the mining heritage remains on Onverwacht 292KT. • Site LIA01 is marked by stone walled terraces that serve as retaining walls to create a stepped site located against the lower eastern slope of the Leolo Mountain Range. The site, however, is severely damaged in places as it was re-occupied in more recent times when a local community established their village on top of the older remains. It seems as if the terraces may have contained dwellings, such as huts, and that small enclosures may have been used to keep small stock. No large enclosures for cattle occur near the site. The presence of metal slag that is possibly derived from the smelting of iron may suggest that limited iron working was done in certain parts of Site LIA01. Archaeological remains such as pot shares occur in limited numbers on the terraces. • Site LIA01 seems to have been occupied during at least two periods, namely during the Late Iron Age (c. AD1700 onwards) into the historical period (c. AD1840 onwards, until the last few decades of the 20th century). The second, recent occupational period explains the presence of tin plate, pieces of glass and the foundations of square mud dwellings on the High Upper Part (HUP). • The large terraces in the HUP of the site followed by the smaller, less complicated and spacious terraces in the Central Part (CP) and in- the Lower Part (LP) of the site, suggests some form of social stratification of the site with the royalty (high status community members) living in the higher part of the village and the commoners down below. • At least two initiation sites, each with at least two stone cairns were mapped in the project area. It seems as if the initiation cairns can either be associated with the people who occupied Site LIA01 or with descendants of the people who lived in the stone walled site and who already have abandoned the site but who erected these cairns in close proximity of Site LIA01. These sites can be linked with the initiation school for boys (bodika) and were used to keep the ashes from the initiation lodge (mepatho). The larger initiation cairn was called the hyena (phin) and the smaller cairn the hyena cub (phisana) and respectively kept the ashes from the fire places of the boys that were part of the royalty and the boys that were from common rank. • Two main types of mining heritage remain occur in the Modikwa Platinum project area, namely the remnants of the abandoned Onverwacht Platinum Mine's open cast pit and a series of incline shafts sunk along the lower eastern slope of part of the Leolo Mountains. Both the incline shafts and the Onverwacht Platinum Mine date from the early decades of the 20th century when the exploration for and mining of platinum commenced in the Steelpoort. The Onverwacht Platinum Mine (Ltd) was the third most important role player in the platinum industry in South Africa during the first half of the 20th century. After the collapse of the platinum industry in the 1930's, only two companies remained and amalgamated namely Rustenburg Platinum Ltd. • Since the Phase I investigation was undertaken Modikwa Platinum has altered their expansion programme to such an extent that no heritage resources will be affected by the new development project in the near future. Only one of the adits (shafts) along the side of the Leolo Mountain will be re-utilised as this shaft will be used to gain access into the platinum bearing deposits in the mountain range. • The graveyard [GY01] will also not be affected by Modikwa Platinum's proposed expansion activities. This feature will be left undisturbed in its present location where it will be accessible to family members and friends of the deceased to make pre-arranged visits to the graveyard. Modikwa Platinum should consider demarcating the graveyard with a fence in order to prevent any accidental damage occur to this site. • The exceptionally deep Onverwacht open pit has been demarcated by Modikwa • Platinum as part of the mine's safety regulations. The measures will simultaneously contribute to the conservation of this unique heritage site. • No specific mitigation measures are proposed for the heritage resources in the Modikwa Platinum Mine. However, it is recommended that Modikwa Platinum consider monitoring all heritage sites in the mine lease area by means of completing a checklist drawn up for each type/range of heritage resource. This checklist must be updated annually. New heritage sites that are discovered must be added to this

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			checklist which must serve as the basis of a cultural heritage register, which must be kept by reputed mines. This task must be undertaken by an archaeologist accredited with the Association for Southern African Professional Archaeologists (ASAPA).
Integrated Environmental Authorisation Process for the Modikwa Platinum Mine-South 2 Shaft Amendment Project: SRK Consulting, February 2015	Visual Impact Assessment, SRK Consulting, September 2014	Visual	<p>The role of mitigation is important in finding design / rehabilitation solutions that will be visually acceptable. Potential mitigation measures have been taken into consideration during the design phase, as discussed above and is also provided by natural features in the area. Only effective, economically feasible, appropriate and visually acceptable mitigation measures are recommended and these should form part of an EMP to be implemented should the project be approved. In some instances, where there is an overlap with other potential impacts, the recommendations by those respective specialists will take precedence.</p> <p>For the purposes of the VIA Report the following recommendations are put forward for comment. By no means is the list exhaustive and the list will be updated throughout the EIA process, taking into consideration the findings of other specialists, closure objectives, IAP input and any potential changes to the design of the structures. Table 5.2 summarised the specific mitigation measures proposed for each major component of the infrastructure and activities associated with the South 2 Shaft Project which could have a visual impact to receptors in the surrounding area and the following provides a combined summary of the proposed mitigation measures to be followed.</p> <ul style="list-style-type: none"> Natural vegetation, wherever practical, must be retained on and around the construction sites; The re-vegetation of the disturbed areas around the proposed infrastructure, including on the WRD, during the operational phase should be considered only if it does not interfere with operations or pose a risk to the health and safety of people and animals. Vegetation around these structures will break the outline of the structure against the landscape and will therefore allow for the structure to be less pronounced. Encouraging vegetation growth in disturbed areas can reduce the visual scarring of the landscape and potentially reduce the visual impacts on potential visual receptors; During the construction and operation of the mine measures must be taken to reduce dust, as cumulatively this could lead to a visual impact on a wider audience-due to the scale of the dust that could be generated. Suitable dust suppression must be undertaken during construction and active dust management must be undertaken when the infrastructure and activities associated with the South 2 Shaft project becomes operational, as recommended by the air quality specialist. In addition, the retention of vegetation and the re-establishment of groundcover will automatically reduce (mitigate) particulate emissions associated with wind erosion; The on-site nursery must be maintained and expanded if possible during the LOM to assist with mitigation and progressive rehabilitation; If feasibly possible, or raised as a concern during the EIA process, a lane of low canopy shrubs could be planted between the Matimatjati Community (perimeter) and the Shaft 2 area (next to access road on community's side), as this is the only community that could be visually impacted by the WRD. This can be done at the onset of construction, to aid in shielding viewers from the construction and operational activities; The colour of the proposed infrastructure should be consistent with the existing infrastructure, as not to draw attention to them. The precise colour mix for the ventilation shaft should be discussed with an architect, based on the predominant colours of the natural background elements such as rocks, soils and vegetation. Seasonal variability in vegetation and colour should also be considered when deciding on a colour for the vent shaft. Litter and dust management measures should be in place at all times; The sites should be kept neat and tidy at all times; With regards to lighting, if construction or operation is to occur during the night, all lights used for illumination should be faced inwards and shielded to avoid light escaping above the horizon; Upon closure remove all equipment and infrastructure on site and rehabilitate the impacted areas by ripping the soil, cover the area with a suitable growth medium and vegetate the area with indigenous vegetation, or encourage the growth of natural vegetation by providing a suitable environment; and In terms of post-closure rehabilitation it is important that the closure objective includes the restoration of the environment to a condition that is consistent with the surrounding area.
	Soils and Land Capability: Earth Science Solutions, October 2014	Soils and Land Capability	<p>The following maintenance is recommended:</p> <ul style="list-style-type: none"> The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining; Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges (Refer to Appendix 3) etc.); Traffic should be limited where possible while the vegetation is establishing itself; Plants should be watered and weeded as required on a regular and managed basis where possible and practical; Check for pests and diseases at least once every two weeks and treat if necessary; Replace unhealthy or dead plant material; Fertilise, hydro seeded and grassed areas soon after germination, and Repair any damage caused by erosion.
	Faunal, floral, aquatic and wetland ecological assessment, as part of the EMP amendment process for proposed new mining infrastructure at the Anglo American Platinum Modikwa south 2 shaft Scientific Aquatic Solutions, September 2014	Aquatic Ecological Assessment	<p>Based on the findings of this assessment several recommendations are made to minimise the impact on the wetland and aquatic ecology of the area, which are presented in the points below:</p> <ul style="list-style-type: none"> Measures to contain and reuse as much water as possible within the mine process water system and water from underground dewatering activities should be sought. A return water structure should be developed where mine process water is stored in a lined dam in order to prevent impacts on the receiving aquatic environment. As far as possible all mining infrastructures should remain out of the riparian zones and associated buffer zones in line with the requirements of Regulation GN704 of the National water Act. No dirty water runoff must be permitted to reach the wetland and riverine resources during the entire life of mine, and clean and dirty water management systems must be put in place to prevent the contaminated runoff (suspended solids and salts and water with low pH) from entering the receiving aquatic environment. All dirty water containment structures should be designed to contain a minimum storm event of a 24 hour 1 in 50 year flood event. Any dirty water runoff containment facilities must remain outside of the defined wetland and aquatic areas and their buffers as a measure to minimise the footprint areas of mining within sensitive wetland and aquatic areas.

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			<ul style="list-style-type: none"> • Adequate stormwater management must be incorporated into the design of the proposed development in order to prevent erosion and the associated sedimentation of the riparian and instream areas, as these systems have aquatic communities which rely on stream substrates clear of sediment and on clear, fast flowing water. In this regard, special mention is made of: • Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed. • Runoff from paved surfaces should be slowed down by the strategic placement of berms. • During any construction phase or exploration drilling activities no vehicles should be allowed to indiscriminately drive through the wetland and aquatic areas and vehicles must remain on designated roadways. • All areas of increased ecological sensitivity near to mining operations should be clearly marked as “out of bounds” areas for all mining staff. <p>During the construction and operational phases of the proposed mining development erosion berms should be installed to prevent gully formation and siltation of the wetland resources. The following points should serve to guide the placement of erosion berms:</p> <ul style="list-style-type: none"> • Where the track has slope of less than 2%, berms every 50m should be installed. • Where the track slopes between 2% and 10%, berms every 25m should be installed. • Where the track slopes between 10%-15%, berms every 20m should be installed. • Where the track has slope greater than 15%, berms every 10m should be installed. • No dumping of waste should take place within the riparian zone Tubatsane River as well as in the tributary at site MD1. If any spills occur, they should be immediately cleaned up. • Upon closure it is deemed essential that all MRD's be rehabilitated and stabilised using a suitable grass mix to prevent sedimentation of the aquatic resources in the area. • Throughout the life of mine measures to control alien vegetation must be implemented and specific attention to riverine features should be paid. • Upon closure all haul and access roads as well as all unnecessary mining infrastructure should be removed in order to minimise the impacts on the aquatic resources of the area beyond the life of mine. • Close monitoring of water quality must take place. Monitoring of water quality should take place at a minimum frequency of once a month during which time major salts and basic metals, are monitored along with basic parameters such as pH, TSS and TDS, dissolved oxygen and EC. • Ongoing biomonitoring of the aquatic resources in the vicinity of the Study area must take place. Biomonitoring should take place at points located upstream and downstream of the mining activities near the Tubatsane River and tributaries as long as there is sufficient habitat to do so. Biomonitoring should take place on 6 monthly basis as a minimum in the summer and winter of each year. Biomonitoring should take place using the SASS5, IHAS and MIRAI indices. Biomonitoring should take place throughout the life of the mine, including the closure and aftercare phases. The results of the biomonitoring program should be compared to the results of this study to allow any temporal trends to be observed. Should any problems be indicated measures to minimise or prevent the impact should be implemented. <p>Toxicity testing at points MD1, MD2, MD3 and MD4 should take place concurrently with the biomonitoring program in order to monitor the toxicological risk of the process water system to the receiving environment. Tests should include the following test organisms as a minimum:</p> <ul style="list-style-type: none"> • <i>Vibrio fischeri</i> • <i>Daphnia pulex</i> • Algal Growth Potential • Definitive toxicological testing according to the DEEEP protocol should take place should it become evident that process water discharge or decant of underground water will occur.
		Wetland Assessment	<ul style="list-style-type: none"> • After conclusion of this assessment, it is the opinion of the ecologists that the proposed mining development be considered favourably, provided that the recommendations below are adhered to: • A sensitivity map has been developed for the study area, indicating the various riparian features which are considered to be of increased ecological importance. It is recommended that this sensitivity map be considered during the planning/ pre- construction and construction phases of the proposed development activities to aid in the conservation of ecology within the study area. • It must be ensured that planning of mining infrastructure, with particular reference to riparian crossings, includes consideration of adjacent riparian areas to ensure that these areas are avoided as far as possible. • The project footprint must fall outside of the 1:100 year floodline of the riparian features or 100m from the edge of the feature, whichever distance is the greatest unless exemption from Regulation 704 is applied for and obtained. • The development footprint area must be limited to what is absolutely essential in order to minimise environmental damage. • All demarcated sensitive zones outside of the construction and operational area must be kept off limits during the life of the mine. • The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • Development impacts on the affected riparian features should be managed to minimise impacts on adjacent riparian features. • The existing, identified mine related impacts should be addressed to reduce the impact and/or rehabilitate the affected areas to minimise impacts on adjacent riparian features. • Edge effects of activities including erosion and alien/ weed control need to be strictly managed in these areas. • Access into adjacent riparian areas, particularly by vehicles, is to be strictly controlled. • All vehicles should remain on designated roads with no indiscriminate driving through adjacent riparian features. • Run-off from dirty water areas entering riparian habitats must be prevented and clear separation of clean and dirty water in the vicinity of the proposed shaft must take place. Oil must be prevented from entering the clean water system. • Ensure that seepage from dirty water systems is prevented as far as possible. • It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • All spills should be immediately cleaned up and treated accordingly. • Appropriate sanitary facilities must be provided for the life of the mine and all waste removed to an appropriate waste facility.

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			<ul style="list-style-type: none"> • Effective waste management must be implemented in order to prevent construction related waste from entering the riparian features. • All adjacent riparian systems must be monitored for erosion and incision. • All riparian areas must be rehabilitated upon decommissioning to ensure that riparian functions are re-instated during decommissioning and all disturbed riparian areas adjacent to the mining development must be revegetated with indigenous riparian species. • As much vegetation growth as possible should be promoted within the proposed development area in order to protect soils. In this regard special mention is made of the need to use indigenous vegetation species where hydro seeding and rehabilitation planting (where applicable) are to be implemented. • It must be ensured that all activities potentially impacting on geohydrological resources are managed according to the relevant DWAS Licensing regulations and groundwater monitoring requirements. • Post closure groundwater management will need to be very carefully managed to ensure that no impact on the riparian features in the area takes place after mine closure has taken place. • Future mine planning should ensure that mining activities do not lead to a reduction of stream flow or dewatering of any riparian features and connectivity of the riparian features in the vicinity of mining activities should be maintained.
		Faunal Assessment	<p>After conclusion of this faunal assessment, the following recommendations are made:</p> <ul style="list-style-type: none"> • It must be ensured that, as far as possible, all proposed infrastructure is placed outside of sensitive faunal habitat areas such as the Sekhukhune Mountain Bushveld and Riparian Habitat Units. • Areas of increased ecological importance and sensitivity should be considered during all phases of mine planning and construction activities. • No future activities are to be undertaken which may infringe upon these sensitive areas or associated buffer zones. • The boundaries of the development footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • The proposed development footprint areas should remain as small as possible. • Demarcation of sensitive habitats may be considered. • Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed in all areas of increased ecological sensitivity. • It must be ensured that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones. • All areas of increased ecological sensitivity should be designated as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss. • It must be ensured that the mine process water system is managed in such a way as to prevent discharge to the receiving environment. • Should any RDL faunal species be noted within the development footprint areas, these species should be relocated to similar habitat within or in the vicinity of the subject property with the assistance of a suitably qualified specialist? • It is recommended that a speed limit of 40km/h is implemented on all roads running through the subject property in order to minimise risk to RDL and other fauna from vehicles. Speed humps may be constructed to help slow vehicles and help mitigate collision with faunal species. • Education and awareness campaigns on faunal species and their habitat are recommended to help increase awareness, respect and responsibility towards the environment for all staff and contractors. • No trapping or hunting of fauna is to take place and access control into sensitive areas must be implemented to ensure that no illegal trapping or poaching takes place. • All informal fires in the vicinity of mining operations and new construction areas should be prohibited. • It must be ensured that migratory connectivity is maintained, especially with respect to the Riparian and Sekhukhune Mountain Bushveld Habitat Units. • All soils compacted as a result of construction activities falling outside development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout the all phases of the development and beyond decommissioning. • All disturbed habitat areas must be rehabilitated and planted with indigenous floral species as soon as possible to ensure that faunal ecology is re-instated.
		Floral Assessment	<p>Upon conclusion of the floral assessment, the following recommendations are proposed:</p> <p>Development footprint</p> <ul style="list-style-type: none"> • A sensitivity map has been developed for the study area, indicating the Riparian and Sekhukhune Mountain Bushveld Habitat Units, which are considered to be of increased ecological importance. It is recommended that this sensitivity map be considered during all development phases to aid in the conservation of floral habitat within the study area. • Such areas of increased ecological importance and sensitivity should be considered during all phases of mine planning and construction activities. • No activities are to infringe upon these sensitive areas or associated buffer zones. • The boundaries of the development footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • The proposed development footprint areas should remain as small as possible. • For future development, all areas of increased ecological sensitivity should be considered during planning. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • Planning of temporary roads and access routes should take the site sensitivity plan into consideration. Such roads should be constructed a distance from the more sensitive riparian and rocky outcrop areas and not directly adjacent thereto. • Where existing road crossings over riparian features are situated, culverts must be upgraded in order to ensure that hydrological connectivity upstream and downstream of the crossings are maintained.

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			<ul style="list-style-type: none"> • It must be ensured that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones. <p>Alien floral species</p> <ul style="list-style-type: none"> • Edge effects of all construction and operational activities, such as alien plant species proliferation, which may affect floral habitat, need to be strictly managed in all areas of increased ecological sensitivity. • Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the mine expansion and development footprint areas. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled. • Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases. <p>Species specific and area specific eradication recommendations:</p> <ul style="list-style-type: none"> • Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. • Footprint areas should be kept as small as possible when removing alien plant species. • No vehicles should be allowed to drive through designated sensitive riparian areas during the eradication of alien and weed species. <p>Soils</p> <ul style="list-style-type: none"> • Edge effects of all construction and operational activities, such as erosion, which may affect floral habitat, need to be strictly managed in all areas of increased ecological sensitivity. • It must be ensured that the mine process water system is managed in such a way as to prevent discharge to the receiving environment. • In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss. • All soils compacted as a result of construction activities falling outside of development footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all development including decommissioning phases to prevent loss of floral habitat. • To prevent the erosion of top soils, management measures may include berms, soil traps, hessian curtains and stormwater diversion away from areas susceptible to erosion. It must be ensured that topsoil stockpiles are located outside of any drainage lines and areas susceptible to erosion. Stockpiles should be placed away from areas known to contain hazardous substances such as fuel and if any soils are contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site. <p>During the construction and operational phases of the proposed mining expansion erosion berms may be installed to prevent gully formation and siltation of the riparian resources. The following points should serve to guide the placement of erosion berms:</p> <ul style="list-style-type: none"> • Where the track has a slope of less than 2%, berms every 50m should be installed. • Where the track slopes between 2% and 10%, berms every 25m should be installed. • Where the track slopes between 10% and 15%, berms every 20m should be installed. • Where the track has a slope greater than 15%, berms every 10m should be installed. <p>Rehabilitation</p> <ul style="list-style-type: none"> • All disturbed habitat areas must be rehabilitated as soon as possible to ensure that floral ecology is re-instated. • Reseeding with indigenous grasses should be implemented in all affected areas and strategic planting of bushveld tree species should take place to re-establish microclimates and niche habitats. <p>Fires</p> <ul style="list-style-type: none"> • Informal fires in the vicinity of mining activities should be prohibited during all development phases. • It is recommended that the local communities residing within and in the vicinity of the study area, as well as mining and construction personnel, should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the study area. <p>Dust control</p> <ul style="list-style-type: none"> • It must be ensured that all roads and construction areas are regularly sprayed with water in order to curb dust generation. This is particularly necessary during the dry season when increased levels of dust generation can be expected. These areas should not be over-sprayed causing water run-off and subsequent sediment loss into waterways and drainage lines in the vicinity of the study area. • RDL and Protected floral species • Expand and manage the existing nursery. • It is recommended that the nursery employs members of local communities, which with their knowledge of flora endemic to the region will prove to be valuable assets. Their involvement with the nursery will aid in employment and contribute financially to local communities through the multiplier effect. • Sensitive floral species are to be handled with care and the relocation of sensitive plant species is to be overseen by a botanist. • Should any RDL or protected plant species be encountered within the proposed development footprint areas, the following should be ensured: • If any threatened species, or nationally or provincially protected floral will be disturbed, ensure effective relocation of individuals to suitable similar habitat. • All rescue and relocation plans should be overseen by a suitably qualified specialist. • <i>Sclerocarya birrea</i> subsp. <i>caffra</i> and <i>Catha transvaalensis</i> (Sekhukhune Bushman's Tea) trees are difficult to transplant once mature, due to the risk of damaging the root system. It is suggested that these species, along with <i>Searsia batophylla</i> and any other protected floral species which may be encountered are propagated in the nursery area in order to offset potential loss of protected trees due to mining infrastructure development. It is recommended that for each tree destroyed, two additional trees of the same species are to be planted.

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	Surface Water Specialist Report, SRK Consulting, October 2014	Surface water	<ul style="list-style-type: none"> The most important impacts that will need to be managed include erosion, scouring and discharge of contaminated water. The most important mitigation measures that would need to be included in the designs will include the following: The pillars where the conveyor crosses the river should be placed as far as possible from the edge of the watercourse on both banks to minimise disruption to low flows and erosion and scouring during higher flows; The pillars should be designed to withstand extreme flood events; The bottom of the conveyor must be above the 1:100 year flood level; The runoff from the waste rock dump could potentially be contaminated and separation of clean and dirty water is required, including the construction of paddocks and upstream clean water diversion; Excess water from South 2 shaft will need to be reused in the MPM mine water circuit as there is no additional capacity for reuse at the shaft. The excess water from the 1:50 year storm will also need to be reused in the overall mine water balance; The potential for a scouring effect on stream banks and bed due to releases from the clean water diversion around the WRD will require erosion protection especially at the exit point; and Areas of exposed soils will need to be protected against erosion during construction.
	Modikwa Platinum Mine - Geochemical Characterisation of Waste Rocks, SRK Consulting, July 2013	Geochemistry	<ul style="list-style-type: none"> Based on the findings of the geochemical characterisation, it is recommended that the proposed Waste Rock Facility to accommodate the waste rocks to be generated from the mining of the UG2 reef from South 2 Shaft requires a level of engineering that comprises a low permeability base, such as a compacted clay layer, to limit seepage into groundwater environment and stormwater management requirement to adhere with GN 704. <p>Given the uncertainties related to using a single composite sample to represent the bulk of the waste rock material, the following additional geochemical work is recommended to confirm and validate the key findings of this phase of assessment:</p> <ul style="list-style-type: none"> Sampling of individual lithologies constituting the waste rock is recommended to identify the lithological unit that may classify as PAG and NAF for the purposes of ARD management, On-going geochemical characterisation throughout the operational phase of the mine as MPM develops at South Shaft 2 to manage the ARD risk that might potentially arise from the proposed Waste Rock Facility and the findings should be used to update the ARD management plan, Additional assessment on the waste rock in terms of NO3 leaching potential that might be associated with blasting activities and might potentially impact on groundwater quality, and On-going surface and groundwater quality monitoring to assess pollution plume migration that might potentially be associated with the proposed Waste Rock Dump at South 2 Shaft.
	South 2 Shaft - Hydrogeological Investigation: GCS Consultants, June 2014	Groundwater	<ul style="list-style-type: none"> Groundwater monitoring will be undertaken according to SANS and DWA requirements Groundwater monitoring will be undertaken to establish the following: The impact of mine dewatering on the surrounding aquifers. This will be achieved through monitoring of groundwater levels in the monitoring boreholes. No private boreholes are identified within the zone of impact on groundwater levels; Groundwater inflow into the mine workings. This will be achieved through monitoring of groundwater levels in the monitoring boreholes; Groundwater quality trends. This will be achieved through sampling of the groundwater in the monitoring boreholes as well as groundwater found underground; The rate of groundwater recovery and the potential for decant after mining ceases and full rehabilitation. This will be achieved through drilling of additional boreholes into the underground workings for monitoring purposes. These boreholes must be drilled in the deepest sections of the mine. Laboratory analysis techniques will comply with SANS guidelines. The groundwater monitoring database will be updated on a monthly basis as information becomes available. The database will be used to analyse the information and evaluate trends noted. <p>Technical Recommendations</p> <ul style="list-style-type: none"> It is recommended that all surface dams be lined. Based on the Australian Standard Leaching Procedure (ASLP) Waste classification the South 2 Shaft waste rock is low risk with some potential for contaminant release and can be classified as Type 3. This requires deposition in a Class C waste disposal facility. Steep topographical gradients together with low transmissivity within the underlying bedrock and shallow soils make the site ideal for geotechnical design to minimise impacts. Compaction of the area before storage activities begins to reduce seepage into underlying aquifers. Other mitigation measures will include up-gradient surface water diversion to ensure the containment of runoff and subsequent seepage into underlying aquifers. From here the water will evaporate. The groundwater contaminant model has shown that the latter will have a positive effect on the final concentrations that will enter the groundwater environment and also consequently the Tubatsane River. The alternative is to line the WRD, which will have a cost implication. That the monitoring programme be implemented as soon as possible. This data will later play a crucial role in the decision making process for mine management. The results from the groundwater flow model show that groundwater inflow into the underground operations is relatively low. Groundwater inflow volumes must be recorded in order to update predictions. Numerical groundwater model must be updated and recalibrated every year to properly quantify and characterise the impacts. The water control dams should be designed such that they can easily contain a 1:50 year flood. Fuel tanks and any fluid container areas should be constructed properly with cement or concrete flooring installed to prevent infiltration of any spilled fluids into the soil. The establishment of a long term stream surface water monitoring point, downstream of South 2 Shaft surface infrastructure as well as downstream of the WRD. New surface layout for the terrace at South 2 Shaft shows that monitoring borehole MMB 17 might be too close to the new proposed terrace and that it might be damaged during the construction process. Therefore it is recommended that MMB17 is replaced with a new monitoring borehole further downstream.

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	Atmospheric impact report / air quality impact assessment, EnviroNgaka CC, October 2014	Air Quality	<p>The following actions are therefore recommended as planned / future actions of S2S's air quality management plan:</p> <ul style="list-style-type: none"> • Although it does not form part of the specific project, it is believed and recommended that further attention needs to be given towards implementing more efficient / effective dust suppression techniques at the existing tailings dam and/or consider potential options to reduce the silt fraction, etc.; • With due consideration of the properties of such fugitive dust, it is not believed or foreseen that dust fallout monitoring alone will provide sufficient information to assess the efficacy of the control/mitigating measures implemented at the tailings dam, and it is therefore recommended to plan ahead for continuous ambient monitoring of PM10 and/or PM2.5 near the communities located to the NE / E of the tailings dam, or at another location which is deemed to be more relevant/applicable; • It is also recommended that S2S plan to conduct inexpensive passive sampling of NO2 to the south of its perimeter in order to establish a profile or trend of the concentration thereof before the project and into the project. This will assist management to assess to what extent NO2 ambient concentrations are impacted in order to plan further; • The installation of an enclosed overland conveyor. It is understood that the conveyor will reduce the quantity of material hauled by road, which will bring about a potential significant reduction in fugitive dust emissions as well as noxious vehicle exhaust fumes;
	Environmental Noise Impact Assessment, dBA Acoustics, June 2014	Noise	<p>The following three primary variables should be considered when designing acoustic screening measures for the control of noise:</p> <ul style="list-style-type: none"> • The source • The transmission path • The receiver • Essentially it requires and it is important to understand the problem, to identify which part of the proposal itself could produce noise and where are the key receptors. The baseline noise information on the different noise sources, the location, type of equipment and the atmospheric conditions for a specific area will play an important role in the design of the acoustic screening measures. The last option to screen off the sound at the receiver was not considered as it will not be environmental sustainable. <p>The following acoustic measures must be implemented as a management control system: Noise attenuation measures:</p> <ul style="list-style-type: none"> • Maintain the internal and roads leading to the mine in a good order at all times. Monitor the speed of the trucks and the speed limit of 40km/h for heavy-duty vehicles to be adhered to at all times. The condition of the road surface to be kept free of potholes on a daily basis. <p>The following are the Environmental, Health and Safety Guidelines of the International Finance Corporation of the World Bank, which should be considered at all times:</p> <ul style="list-style-type: none"> • Selecting equipment with lower sound power levels • Installing silencers for fans; • Installing suitable mufflers on engine exhausts and compressor components; • Installing acoustic enclosures for equipment causing radiating noise; • Installing vibration isolation for mechanical equipment; • Limiting the hours of operation for specific equipment and mobile sources with high sound power outputs; • Re-locate noise sources to areas which are less noise sensitive, to take advantage of distance and natural shielding; • Taking advantage during the design stage of natural topography as a noise buffer; • Develop a mechanism to record and respond to complaints. • An ongoing noise monitoring programme to be initiated for the construction and operational phases of the project. • The raise bore drill method whereby the drilling machine is situated above ground level and the waste rock drop down in the shaft will be used to construct the ventilation shafts and this method is illustrated in Figure 4.
	A report on a Cultural Heritage Impact assessment done for the Anglo American Platinum and African Rainbow Minerals Modikwa Platinum Mine South Shaft 2, Archaetnos Culture and Cultural Resources Consultants, April 2014	Heritage	<ul style="list-style-type: none"> • No sites of heritage significance were found in any of the surveyed areas (this include the new sites identified). Therefore the proposed development may continue. • The developer needs to take note of the other sites discussed. Apart from the graves, none is regarded as being of a high cultural significance. Since it is outside of the area to be developed it should be left in situ. No specific measures are needed. • The grave sites (site OWR007, and site 1-4) are of high importance. There are two possibilities of handling this. • The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. This is recommended since it is outside of the area of direct impact. • However, the mine should ensure that no direct impact is experience (e.g. caving in of the soil). Should any danger be posed to the graves, option 2 will have to be taken. This is to exhume the mortal remains and then to have it relocated. For this a detailed motivation will have to be written and applied for to SAHRA. If approved, the specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation. • It is always is difficult when confronted with issues of a social, even supernatural matter. This is the case with the trees identified. Community members indicated that only the large ones are important as it is believed that the ancestors sleep in these. They indicated that the smaller ones may be demolished. However, no specific important trees were indicated and not many large ones were seen in the surveyed area. It is recommended that a fauna specialist identify any large trees of the species indicated inside of the area to be developed and that the community be consulted on these. • After implementation of the mitigation measures recommended, the proposed development may continue. • It should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts is always a distinct possibility. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence.
	Socio-Economic Baseline and Impact Assessment, SRK Consulting, October 2014	Social - Constructions	<ul style="list-style-type: none"> • MPM and contractors to identify as many jobs as possible for local people so that MPM policies on local procurement can be optimally applied. • MPM and contractors to identify as many jobs as possible for local people so that MPM policies on local procurement can be optimally applied. • Use local labour as far as possible. Provide adequately serviced accommodation for non- local contractors. MPM and contractors to set and enforce rules of behaviour for non-local contract employees that will not compromise safety, health and peace of locals.

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			<ul style="list-style-type: none"> • Ensure at the end of the contract that contractors do not move into informal housing. • Use local labour as far as possible. MPM and contractors to promote HIV/AIDS prevention amongst non-local contract employees. Anti-retroviral therapy must be available at local clinics. MPM to work with police to curb prostitution activities.
		Social – operational	<ul style="list-style-type: none"> • MPM to increase the probability of retaining staff by implementing the MPM policy of upskilling employee skills where necessary and possible. MPM to transfer staff to other operations as far as possible. • MPM must inform companies it procures goods and services from of any procurement gaps during its changeover to South 2 Shaft, so that affected companies can plan accordingly. To increase the magnitude of the impact, MPM to ensure locals also benefit by applying MPM requirements for contractors to go into joint ventures with local companies for a minimum of 30% of the contract value • To increase magnitude of the impact, increase the probability of retaining staff by implementing the MPM policy of upskilling employees where necessary. Transfer employees to other operations as far as possible. • Maintain sanitation infrastructure to ensure functional capacity throughout mine's operations phase. • Promote hygiene practices and proper use of sanitation. • Maintain conveyor system so that it will not be necessary to revert to the use of trucks on the road to transport ore.
		Social- closure and rehabilitation	<ul style="list-style-type: none"> • Contractors to identify potential jobs for locals so that they are able to apply MPM requirements for contractors to go into joint ventures with local companies and to employ a certain minimum percentage or number of employees. MPM to identify job opportunities for locals such as those for employing rehabilitation measures to prevent soil erosion. • Liaise with local government to explore possibility of transferring the sewage treatment works and road to local government when mine closes. • Employ measures in MPM Social and LABOUR Plan (SLP) to build mine workers' entrepreneurship, vocational and technical skills during operations phase. • MPM to work with Hwashi Difagate to align rehabilitation measures with the latter's plans for their land uses following closure of the mine and end of lease period. • Opportunity for MPM to support capacity building in Hwashi Difagate for implementing post closure planned use of the land.
Proposed construction of a new vent shaft and crusher plant at the Modikwa Platinum mine north shaft mining complex (November 2015)	Terrestrial Ecological Assessment, Scientific Aquatic Solution, November 2015	Biodiversity: Terrestrial Ecology	<p>After conclusion of this assessment, it is the opinion of the ecologists that the proposed mining infrastructure development be considered favourably, provided that the recommendations below are adhered to:</p> <p>Development footprint</p> <ul style="list-style-type: none"> • A sensitivity map has been developed for the study area, indicating the Drainage Line and Sekhukhune Mountain Bushveld Habitat Units, which are considered to be of increased ecological importance. It is recommended that this sensitivity map be considered during all development phases to aid in the conservation of floral habitat within the study area. • It is recommended that as much of the proposed infrastructure as possible is situated in the transformed habitat unit. Crusher plant alternative positions one and two (Areas 1 & 2) are supported in this regard. • It is recommended that the ventilation shaft and the crusher plant be situated outside of any drainage features. • The footprint of the ventilation shaft must be minimised and all disturbed areas must be rehabilitated after construction. • The boundaries of the development footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • The proposed development footprint areas should remain as small as possible. • All areas of increased ecological sensitivity should be designated as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities. • Planning of temporary roads and access routes should consider the site sensitivity plan. Such roads should be constructed a distance from the more sensitive habitat units and not directly adjacent thereto. • Where existing road crossings of drainage features are situated, culverts must be upgraded in order to ensure that hydrological connectivity upstream and downstream of the crossings are maintained. <p>Drainage Lines</p> <ul style="list-style-type: none"> • The project footprint must fall outside of the 1:100 year floodline of the drainage features or 100m from the edge of the feature, whichever distance is the greatest unless exemption from Regulation 704 is applied for and obtained. • Access into adjacent drainage lines, particularly by vehicles, is to be strictly controlled. • All vehicles should remain on designated roads with no indiscriminate driving through adjacent drainage features. • Run-off from dirty water areas entering drainage lines must be prevented and clear separation of clean and dirty water in the vicinity of the proposed shaft must take place. Oil must be prevented from entering the clean water system. • Ensure that seepage from dirty water systems is prevented as far as possible. • It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • All adjacent drainage lines must be monitored for erosion and incision. • All drainage lines must be rehabilitated upon decommissioning to ensure that drainage line functions are re-instated during decommissioning and all disturbed drainage lines adjacent to the development must be revegetated with indigenous riparian species. • It must be ensured that all activities potentially impacting on geohydrological resources are managed according to the relevant DWS Licensing regulations and groundwater monitoring requirements. <p>Alien floral species</p>

EMP NAME AND DATE	SPECIALIST STUDY	ASPECT DESCRIPTION	RECOMMENDATION
			<ul style="list-style-type: none"> • Edge effects of all construction and operational activities, such as alien plant species proliferation, which may affect floral habitat, need to be strictly managed in all areas of increased ecological sensitivity. • Proliferation of alien and invasive species is expected within any disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the development footprint areas. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled. • Removal of the alien and weed species encountered on the property must take place in order to comply with the NEMBA Alien and Invasive Species Regulations (2014)). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases. • Species specific and area specific eradication recommendations: • Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. • Footprint areas should be kept as small as possible when removing alien plant species. • No vehicles should be allowed to drive through designated sensitive riparian areas during the eradication of alien and weed species. <p>Rehabilitation</p> <ul style="list-style-type: none"> • All disturbed areas must be rehabilitated as soon as possible to ensure that floral ecology is re-instated. • Reseeding with indigenous grasses should be implemented in all affected areas and strategic planting of bushveld tree species should take place to re-establish microclimates and niche habitats. <p>Fires</p> <ul style="list-style-type: none"> • Informal fires should be prohibited during all development phases. • It is recommended that the local communities residing within and in the vicinity of the study area, as well as mining and construction personnel, should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the study area. <p>Dust control</p> <ul style="list-style-type: none"> • It must be ensured that all roads and construction areas are regularly sprayed with water in order to curb dust generation. This is particularly necessary during the dry season when increased levels of dust generation can be expected. These areas should not be over-sprayed causing water run-off and subsequent sediment loss into waterways and drainage lines in the vicinity of the study area. <p>Fauna</p> <ul style="list-style-type: none"> • It is recommended that a speed limit of 40km/h is implemented on all roads running through the subject property in order to minimise risk to fauna from vehicles. Speed humps may be constructed to help slow vehicles and help mitigate collision with faunal species. • Education and awareness campaigns on faunal species and their habitat are recommended to help increase awareness, respect and responsibility towards the environment for all staff and contractors. • No trapping or hunting of fauna is to take place and access control into sensitive areas must be implemented to ensure that no illegal trapping or poaching takes place. <p>Floral SCC</p> <ul style="list-style-type: none"> • Expand and manage the existing nursery. • It is recommended that the nursery employs members of local communities, which with their knowledge of flora endemic to the region will prove to be valuable assets. Their involvement with the nursery will aid in employment and contribute financially to local communities through the multiplier effect. • Sensitive floral species are to be handled with care and the relocation of sensitive plant species is to be overseen by a botanist. • Should any RDL or protected plant species be encountered within the proposed development footprint areas, the following should be ensured: • If any threatened species, or nationally or provincially protected floral will be disturbed, ensure effective relocation of individuals to suitable similar habitat. • All rescue and relocation plans should be overseen by a suitably qualified specialist. • <i>Sclerocarya birrea</i> subsp. <i>caffra</i> (Marula) and <i>Lydenburgia cassinoides</i> (Sekhukhune Bushman's Tea) trees are difficult to transplant once mature, due to the risk of damaging the root system. It is suggested that these species and any other protected floral species which may be encountered are propagated in the nursery area in order to offset potential loss of protected trees due to mining infrastructure development. It is recommended that for each tree destroyed, two additional trees of the same species are to be planted.
	<p>A Cultural Heritage Impact Assessment, Archaetos Culture and Cultural Resource Consultants, October 2015</p>	<p>Heritage Study</p>	<p>The following is recommended by the heritage specialist:</p> <p>Crusher Plant Areas</p> <ul style="list-style-type: none"> • Two sites were identified, both within Area C. • Site no. 1 (explosives magazine) is likely younger than 60 years and therefore is given a rating of low cultural significance. This Phase 1 report is seen as sufficient recording and it may therefore be demolished if necessary. • Site no. 2 (Iron Age pottery) is regarded as having a low cultural significance since it was found out of context. This means that this Phase 1 report is seen as sufficient recording and it may be demolished if necessary. • There is no specific preference for any of the three alternatives for the placement of the Crusher Plant. It may therefore be placed at any one.

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			<ul style="list-style-type: none"> • However, should Area C be chosen one will have to be on the lookout for the subterranean presence of archaeological and/or historical sites, features or artifacts, which always is a distinct possibility. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence. <p>Ventilation Shaft Area</p> <ul style="list-style-type: none"> • Four sites were identified. • Site no 3 consist of a single grave and historical housing remains. Site no 4 and 5 are graves. Site no 6 and 7 consist of historical stone walling. • The historical remains (housing remains at site no 3, as well as site no 6 and 7) are not very unique and therefore this Phase 1 report is seen as sufficient recording and it may be demolished if necessary. • Graves are always regarded to be of high cultural significance. There are two possibilities of handling this. • The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. • However, the mine should ensure that no direct impact is experience (e.g. caving in of the soil). Should any danger be posed to the graves, option 2 will have to be taken. This is to exhume the mortal remains and then to have it relocated. For this a detailed motivation will have to be written and applied for to SAHRA. If approved, the specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation • It would be possible to ensure no direct impact on the graves, by placing the ventilation shaft at least 20 m from it. However, if blasting is to be done regularly this buffer zone should be at least 100 m. • Bearing this in mind, Option 1 is recommended. • After implementation of the mitigation measures recommended, the proposed development may continue. • It should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts is always a distinct possibility. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence.
	<p>Environmental Noise Impact Assessment: Anglo American Platinum and African Rainbow Minerals - Modikwa Platinum Mine North 1 Shaft Project: Additional Ventilation Shaft and Crusher Plant, dBAcoustics, November 2015</p>	<p>Noise</p>	<p>The following three primary variables should be considered when designing acoustic screening measures for the control of sound and/or noise:</p> <ul style="list-style-type: none"> • The source - Reduction of noise at the source – Acoustic screening measures at point noise sources exceeding 90.0dBA. • The transmission path - Reduction of noise between the source and the communities to the north and the east – Noise barrier to be constructed. • The receiver – No acoustic recommendations and a safe set-back distance from the source will be adequate. <p>The following are recommendations for the proposed project:</p> <ul style="list-style-type: none"> • Construction activities to take place during daytime periods only (sunrise to sunset); • The noise levels generated by hauling vehicles, machinery, equipment must comply with the manufacturer's specifications and any deviation of these noise levels will have to be immediately addressed and rectified; • Raise bore drilling may only be done during daytime periods and a noise survey to be carried out along the western boundary of the Maphahlane community when such activities are in progress; • Generators must be encapsulated and must not be placed closer than 200m from any house; • A noise evaluation to be carried out before the plant is operational to determine noise mitigatory measures; • An earth berm (height of the crusher plant) of rock and soil to be constructed along the northern and western boundaries of the crusher plant; • The hauling of rock before crushing and shipment off the site will have to take place on gravel roads which is in a good condition and free from any potholes. The speed along these roads may not exceed 40.0km/h. • A maintenance plan for all equipment which may be used at the crushing plant must be in place to identify and rectify any noise sources within 5 working days after such noise source was identified; • Noise management plan to be used during the different phases of the project.
	<p>Terrestrial Ecological Assessment For The Proposed Construction Of A New Vent Shaft And Crusher Plant At The Modikwa Platinum Mine North, Scientific Aquatic Solutions, November 2015</p>	<p>Biodiversity</p>	<p>After conclusion of this assessment, it is the opinion of the ecologists that the proposed mining infrastructure development be considered favourably, provided that the recommendations below are adhered to:</p> <p>Development footprint</p> <ul style="list-style-type: none"> • A sensitivity map has been developed for the study area, indicating the Drainage Line and Sekhukhune Mountain Bushveld Habitat Units, which are considered to be of increased ecological importance. It is recommended that this sensitivity map be considered during all development phases to aid in the conservation of floral habitat within the study area. It is recommended that as much of the proposed infrastructure as possible is situated in the transformed habitat unit. Crusher plant alternative positions 1 and 2 (Areas 1 & 2) are supported in this regard. • It is recommended that the ventilation shaft and the crusher plant be situated outside of any drainage features. • The footprint of the ventilation shaft must be minimised and all disturbed areas must be rehabilitated after construction. • The boundaries of the development footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. • The proposed development footprint areas should remain as small as possible. • All areas of increased ecological sensitivity should be designated as No-Go areas and be off limits to all unauthorised vehicles and personnel. Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the proposed development activities.

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Such roads should be constructed a distance from the more sensitive habitat units and not directly adjacent thereto. • Where existing road crossings of drainage features are situated, culverts must be upgraded in order to ensure that hydrological connectivity upstream and downstream of the crossings are maintained. <p>Drainage Lines</p> <ul style="list-style-type: none"> • The project footprint must fall outside of the 1:100 year floodline of the drainage features or 100m from the edge of the feature, whichever distance is the greatest unless exemption from Regulation 704 is applied for and obtained. • Access into adjacent drainage lines, particularly by vehicles, is to be strictly controlled. • All vehicles should remain on designated roads with no indiscriminate driving through adjacent drainage features. • Run-off from dirty water areas entering drainage lines must be prevented and clear separation of clean and dirty water in the vicinity of the proposed shaft must take place. 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These species should be eradicated and controlled to prevent their spread beyond the development footprint areas. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled. • Removal of the alien and weed species encountered on the property must take place in order to comply with the NEMBA Alien and Invasive Species Regulations (2014)). Removal of species should take place throughout the construction, operational, closure/decommissioning and rehabilitation/ maintenance phases. <p>Species specific and area specific eradication recommendations:</p> <ul style="list-style-type: none"> • Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. • Footprint areas should be kept as small as possible when removing alien plant species. • No vehicles should be allowed to drive through designated sensitive riparian areas during the eradication of alien and weed species. <p>Rehabilitation</p> <ul style="list-style-type: none"> • All disturbed areas must be rehabilitated as soon as possible to ensure that floral ecology is re-instated. • Reseeding with indigenous grasses should be implemented in all affected areas and strategic planting of bushveld tree species should take place to re-establish microclimates and niche habitats. <p>Fires</p> <ul style="list-style-type: none"> • Informal fires should be prohibited during all development phases. • It is recommended that the local communities residing within and in the vicinity of the study area, as well as mining and construction personnel, should be informed about fire control and prevention measures to reduce the frequency of uncontrolled veld fires in areas surrounding and within the study area. <p>Dust control</p> <ul style="list-style-type: none"> • It must be ensured that all roads and construction areas are regularly sprayed with water in order to curb dust generation. 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Their involvement with the nursery will aid in employment and contribute financially to local communities through the multiplier effect. • Sensitive floral species are to be handled with care and the relocation of sensitive plant species is to be overseen by a botanist. <p>Should any RDL or protected plant species be encountered within the proposed development footprint areas, the following should be ensured:</p> <ul style="list-style-type: none"> • If any threatened species, or nationally or provincially protected floral will be disturbed, ensure effective relocation of individuals to suitable similar habitat. • All rescue and relocation plans should be overseen by a suitably qualified specialist.

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