

APPENDIX D: DETAILED ASSESSMENT OF POTENTIAL IMPACTS

DETAILED ASSESSMENT OF POTENTIAL IMPACTS

The potential impacts described in this appendix have been identified by the EIA project team with input from specialists, regulatory authorities and I&APs. The sequence in which these issues are listed are in no order of priority or importance. The assessment and rating of potential impacts has been informed by specialist studies, where relevant. These are attached as appendices to the EIA and EMPr.

Identified impacts are first discussed and assessed incrementally to understand the potential contribution to impacts as a result of the project. Cumulative assessment commentary is included in the impact assessment under the various aspect headings. This takes account of current operations including surface infrastructure changes, the pit extension (as assessed in the 2007 EIA and EMPr and subsequent amendments where applicable) and the plant expansion.

The potential impacts are rated with the assumption that no mitigation measures are applied and then again with mitigation, unless otherwise stated.

The mitigated assessment assumes that technical design controls, as included in the project scope (see Section 3.2), would be included in the detailed design of the project and implemented when the project components are constructed and operated.

A) IMPACT ON BIOPHYSICAL ENVIRONMENT

1. ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Project-related infrastructure and activities would be developed within PPM's existing mineral processing plant complex and TSF footprint. The areas earmarked for development are either occupied by existing mine infrastructure or have been disturbed by activities within the plant complex and TSF. No new areas would be disturbed. Community based projects have mainly been established within PPM's plant complex, except the vegetable garden and nursery which has been established immediately adjacent to the TSF's return water dam.

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add negligible additional impacts. It follows that the proposed project will not change the significance of the impacts associated with the approved operations albeit that some of these that could be associated with the plant have the potential to occur for an extended period. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **MEDIUM** with mitigation.

2. ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH CONTAMINATION

Description of impact

In the context of mining- and mineral processing related operations, soils play a key role in rehabilitation of disturbed areas and establishing ecosystem functionality. This in turn supports post-closure land uses.

Although infrastructure and activities would be developed within PPM's existing mineral processing plant complex, the proposed project still has the potential to damage soil resources through contamination. Sources of contamination would exist during both the construction and operational phases. In the construction phase these activities are temporary in nature, usually existing from a few weeks to a few

months. Although the sources are temporary in nature, the potential related pollution can have long term effects. The operational phase would present more long term activities. Contamination of soils also has the potential to indirectly (through runoff and seepage) impact surface and groundwater resources (discussed further in Sections A6 and A8) which could indirectly impact biodiversity resources (discussed further in Section A4).

Impact assessment

During construction, contamination of soil resources would occur through the use and handling of construction materials and the presence of construction type equipment and machinery on site leaking or spilling hydrocarbons. During operations contamination of soil resources could occur through the use and handling of processing plant raw materials and chemicals, spillages of sewage as well as tailings spillages. Additionally poor waste management practices could result in soil contamination. This could alter the soil composition, negatively impacting on the chemistry of the soils and affecting the use of the soils as part of site rehabilitation at decommissioning.

The existing reagent storage area would be extended to cater for the handling and storage of raw materials needed for the additional UG2 circuit. This would include provision for the containment of 125% of the largest possible volume spill, in the event a spill occurs. For the storage and handling of coal and chemicals for the KELL process, it is planned for PPM to apply the same containment measures. These would be within the KELL process building. In addition due to the hazardous nature of these chemicals, any storage on site would comply with standards for hazardous installation. As part of the proposed project the sewage treatment plant at PPM will be upgraded, minimising the potential for spillage events.

During both construction and operations, although contaminant events are possible, it is expected that the scale and frequency of contaminant events would be relatively low given the control measures that are already in place for the existing plant and TSF. Where there are quick reaction times and effective remediation measures applied, the duration and probability of potential impacts reduces.

Contamination of soil resources through project-related activities is therefore considered to be of **MEDIUM** significance without mitigation and **LOW** with mitigation (see Table E1 below).

With an extension to the life of PPM's mineral processing facilities, the duration of contamination impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add minor additional impacts. It follows that the proposed project will not change the significance of the impacts associated with the approved operations albeit that some of these that could be associated with the plant have the potential to occur for an extended period. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **LOW** with mitigation.

Mitigation

In addition to applying mitigation measures as per PPM's EMPrs, the mitigation measures outlined below will be applied to project-specific activities:

- Storage of coal and chemicals will be within appropriately designed containment measures within the existing plant boundary.
- Hazardous installations will comply with applicable standards to ensure that containment and safety risks are appropriately addressed and managed.

Monitoring

Monitoring will include visual inspections of areas for signs of contamination as part of auditing (Section 29).

Emergency situations

Major spillage incidents will be handled in accordance with the emergency procedure attached in Section 30.2.

TABLE E1: IMPACT SUMMARY – CONTAMINATION OF SOIL RESOURCES

Issue: Loss of soil resources and land capability through contamination		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor deterioration	Minor deterioration
Duration	Quickly reversible	Quickly reversible
Extent	Localised	Localised
Consequence	Low	Low
Probability	Possible	Unlikely
Significance	Medium	Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Mainly reversible where bioremediation of soils takes place.	
Degree to which impact may cause irreplaceable loss of resources	Low due to the already disturbed nature of the project footprints.	
Degree to which impact can be mitigated	High.	
Residual impacts	With mitigation, no residual impacts are expected.	

3. ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY

Project-related infrastructure and activities would be developed within PPM's existing mineral processing plant complex and TSF footprint. The areas earmarked for development are either occupied by existing mine infrastructure or have been disturbed by activities within the plant complex and TSF. No new areas would be disturbed. Community based projects have mainly been established within PPM's plant complex, except the vegetable garden and nursery which has been established immediately adjacent to the TSF's return water dam.

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add negligible additional impacts. It follows that the proposed project will not change the significance of the impacts associated with the approved operations albeit that some of these that could be associated with the plant have the potential to occur for an extended period. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **HIGH-MEDIUM** with mitigation.

4. ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Description of impact

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. Biodiversity and ecosystems influence soil, food and fuel supply, shelter and building materials, water, atmospheric gases, climate and weather, pests and diseases and genetic resources.

All project-related infrastructure and associated activities would be undertaken within PPM's existing mineral processing plant complex; no additional footprints would be disturbed. A number of activities associated with the establishment of additional infrastructure and changes to the mineral processing operations have the potential to disturb biodiversity in the broadest sense given PPM's location in an area that has both habitat and species richness.

Impact assessment

Sensitive ecological environments of relevance to the proposed project include a number of rocky ridges located adjacent to the north, south and east of the plant and TSF, as well as two non-perennial tributaries of the Motlhabe River located downstream of the plant and TSF (Figure 6-2). Existing activities at PPM would have influenced biodiversity and more specifically these sensitive environments in the following ways:

- lighting can attract large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances;
- power lines can lead to bird kills;
- people may kill various types of species for food, for sport, for fire wood etc;
- people may illegally collect and remove vegetation, vertebrate and invertebrate species;
- excessive dust fallout from various dust sources may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation;
- noise and vibration pollution may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate and hunt prey, may be forced to leave the vicinity of noisy, vibrating activities;
- the presence of vehicles in the area can cause road kills especially if drivers speed;
- the presence of mine water impoundments and pipelines may lead to drowning of fauna; and
- contamination emissions (water and air) and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

The establishment of additional infrastructure during the construction phase and changes in the mineral processing operations have the potential to add to these through requirements for additional lighting, increased workforce on site or people seeking employment, dust fallout during construction, additional noise and vibration sources, and a change in air emissions. The severity of project related impacts would to a certain extent be mitigated by existing controls that have been implemented by PPM.

Disturbance to biodiversity through project-related activities is therefore considered to be of **MEDIUM** significance without mitigation and **LOW** with mitigation (see Table E2 below).

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the mineral processing plant, with the potential to disturb biodiversity, would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add minor additional impacts. It follows that the proposed project will not change the significance of the impacts associated with the approved operations albeit that some of these that could

be associated with the plant have the potential to occur for an extended period. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **HIGH-MEDIUM** with mitigation.

Mitigation

Mitigation measures as per PPM's EMPs will be applied to project-specific activities.

Monitoring

The following monitoring will be added to PPM's biodiversity monitoring programme (Section 29):

- Inclusion of the ridge habitat as part of the monitoring programme.

Emergency situations

None identified.

TABLE E2: IMPACT SUMMARY – GENERAL DISTURBANCE OF BIODIVERSITY

Issue: General disturbance of biodiversity		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor deterioration	Minor deterioration
Duration	Beyond closure	Life of the project
Extent	Beyond the site boundary	Beyond the site boundary
Consequence	Medium	Low
Probability	Possible	Seldom
Significance	Medium	Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Partially reversible once disturbance activities no longer take place, however this will take time.	
Degree to which impact may cause irreplaceable loss of resources	Possible, if unmitigated, because the plant and TSF are located between three isolated ridges considered to be sensitive ecologically environments.	
Degree to which impact can be mitigated	High	
Residual impacts	With mitigation, limited residual impacts are expected.	

5. ISSUE: ALTERATION OF SURFACE DRAINAGE PATTERNS

The development of infrastructure has the potential to alter drainage patterns by reducing the volume of run-off into the downstream catchments. Project-related infrastructure and activities however would be developed within PPM's existing stormwater management system. No additional footprint would be added to the mineral processing plant complex or the TSF. Community based projects have mainly been established within PPM's plant complex, except the vegetable garden and nursery which has been established immediately adjacent to the TSF's return water dam. Where projects require the capturing of potential dirty stormwater runoff, these occur within the boundaries of PPM's stormwater management system. No incremental impacts are expected.

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the loss of runoff to downstream catchments, as a result of the stormwater containment measures at the mineral processing plant, would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

When considering the project's impact cumulatively with the approved PPM operations, no cumulative impacts would occur. The significance rating for the overall mine remains **HIGH** without mitigation and **LOW** with mitigation.

6. ISSUE: CONTAMINATION OF SURFACE WATER

Description of impact

The construction of additional infrastructure, increased activities on site and changes in the mineral processing operations have the potential to present additional sources of surface water contamination. In the construction phase these activities are temporary in nature, usually existing from a few weeks to a few months. Although the sources are temporary in nature, the potential related contamination can have long term effects. The operational phase would present more long term activities. These sources could impact on downstream surface water uses including livestock watering. Potential impacts on biodiversity have been assessed in Section A8 above.

Impact assessment

During construction, contamination of surface water could occur through the use and handling of construction materials and the presence of construction type equipment and machinery on site, leaking or spilling hydrocarbons. During operations contamination of surface water could occur through the use and handling of additional processing plant reagents and chemicals and spillages of sewage. Activities and sources associated with the proposed project would be similar to those already taking place on site with the addition of coal and chemical storage and handling for the KELL process. At elevated concentrations these contaminants can be harmful to humans and livestock if ingested directly and possibly even indirectly through contaminated vegetation, vertebrates and invertebrates.

Given the development and operation of the proposed project within the boundaries of existing stormwater management measures, any potential contamination is expected to be contained within PPM's stormwater management system (see Section 3.2.7). An increase in activity on site is likely to have a minor contribution to cumulative impacts. The stormwater dam at the plant has been confirmed to have sufficient capacity to cater for PPM's dirty stormwater runoff if abstraction and re-use from the dam is done at a specific rate (SLR, 2019b). Tailings handling and deposition will be done taking into account the capacity, safety and stability of the PPM TSF (see Section 3.2.5) and within the existing stormwater management system of PPM's TSF. Therefore any potential spillages would be avoided or contained during normal operations.

Surface water monitoring results from PPM's monitoring programme does show a decrease in water quality in the non-perennial tributaries of the Motlhaba River, downstream of the plant and TSF when compared to pre-mining baseline water qualities of the Motlhaba River (see Section 6.4.1.6). It is also noted by PPM that two extreme rainfall events have occurred at the mine resulting in flood-related discharges to the environment from the plant stormwater dam.

Important to note is that there is no significant reliance on surface water for community consumption or livestock watering because of the fact that the watercourses are dry for most of the year. Aquatic ecosystem reliance is also expected to be limited due to the ephemeral nature of the flow in the streams (only for a few days following rain).

Contamination of surface water resources through project-related activities is therefore considered to be of **MEDIUM** significance without mitigation and **LOW** with mitigation (see Table E3 below).

With an extension to the life of PPM's mineral processing facilities, the duration of contamination impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

When considering the project's impact cumulatively with the approved PPM operations, although an increase in activity on site is likely to have a minor contribution to cumulative impacts, the significance rating for the overall mine remains **HIGH** without mitigation and **LOW** with mitigation.

Mitigation

In addition to continuing to implement mitigation measures as per PPM's EMPs, the mitigation measures outlined below will be applied to project-specific activities:

- Ensure all project-related activities (construction and operational) take place within the boundaries of existing containment measures and existing stormwater management measures.
- Operate the plant SWD and TSF RWD in line with Regulation 704 and ensure re-use is in line with maintaining sufficient capacity within the dam to cater for a 1:50 year storm event.
- Ensure tailings are handled and deposited taking into account the capacity, safety and stability of the PPM TSF (see Section 3.2.5).
- A study should be conducted by PPM to trace the source of pollutants on site.
- The water balance and storm water management plan must be reviewed and updated throughout the life of the mine and operations until determination of closure liabilities for the PPM Mine.

Monitoring

Monitoring will continue as per the approved EMP (see Section 29). A sampling point should be established downstream and closer to the PPM plant to be able to separate the impacts of the PPM plant and the waste rock dump. Where monitoring shows exceedances of applicable limits as a result of PPM's activities, additional mitigation will be implemented in consultation with an appropriately qualified specialist.

Emergency situation

In the event of a significant contamination incident and/or failure of the dam or TSF, the emergency response procedures outlined in Section 30.2 would be implemented.

TABLE E3: IMPACT SUMMARY – CONTAMINATION OF SURFACE WATER

Issue: Contamination of surface water		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor deterioration	Negligible change
Duration	Beyond closure	Less than the project life
Extent	Beyond the site boundary	Within the site boundary
Consequence	Medium	Low
Probability	Possible	Unlikely
Significance	Medium	Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Partially reversible once disturbance activities no longer take place, however this will take time.	
Degree to which impact may cause irreplaceable loss of resources	Possible given the importance of drainage systems as sensitive ecologically environments	
Degree to which impact can be mitigated	High	
Residual impacts	With mitigation, no residual impacts are expected.	

7. ISSUE: REDUCTION OF WATER AVAILABILITY TO THIRD PARTIES

Water for the project would be sourced from PPM's existing Magalies Water Board allocation. No additional water sources would be developed for the proposed project. No incremental impacts are expected from the proposed project.

With an extension to the life of PPM's mineral processing facilities, the use of water from Magalies Water associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the life of the mining operations. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan and the use of water for mining activities associated with the Tuschenkomst pit would cease.

When considering the project's impact cumulatively with the approved PPM operations, no cumulative impacts would occur. The significance rating for the overall mine remains **HIGH** without mitigation and **MEDIUM-LOW** with mitigation.

8. ISSUE: GROUNDWATER CONTAMINATION

Description of impact

The construction of additional infrastructure and increased mineral processing activities on site can result in seepage of contaminants into the groundwater system. In the construction phase these activities are temporary in nature, usually existing from a few weeks to a few months. Although the sources are temporary in nature, the potential related contamination can have long term effects. The operational phase would present more long term activities. These sources could impact on third party groundwater users including community supply and livestock watering. Potential impacts on biodiversity have been assessed in Section A4 above.

Impact assessment

On-going monitoring and water management at the mine has identified the presence of a contamination plume migrating from the TSF, as previously predicted in the 2007 EIA and EMPr. A potential source of contamination has also been identified to occur within the plant. Mitigation measures including seepage capturing boreholes have been implemented at the TSF to control the migration of seepage from the TSF (Exigo, 2019). A borehole within the plant, previously used for water supply, is being operated as seepage capturing borehole to minimise the migration of contamination from the plant area. In addition the source of the contamination from the plant is being investigated.

The ore processed at the additional UG2 circuit would be sourced from Sedibelo Platinum Mine (SPM), located adjacent to PPM's current Tuschenkomst pit. The geology and therefore the ore from SPM is similar to that mined at PPM. As a result tailings from this additional circuit would have similar characteristics to PPM's existing tailings stream. No incremental impacts on potential groundwater contamination as a result of the additional UG2 circuit are expected.

Seepage from spillages of fuels and lubricants, process reagents and chemicals, sewage and other potential contaminants could result in contamination of groundwater resources. The incremental increase in related groundwater contamination is assessed by the specialist to be of **MEDIUM** significance without mitigation and of **LOW** significance with mitigation during the construction and operational phases (see Table E4 below). No impacts are expected at closure.

When considering the deposition of tailings, geochemical analysis of the combined KELL and PPM tailings stream indicated that the tailings would not be acid generating (same as the current PPM tailings), the seepage volume would not change significantly, and that nickel concentrations from the proposed combined KELL and PPM tailings may pose a potential environmental risk during the operational and post-operational (drainage) phases prior to closure (see Section 6.4.1.1).

Groundwater modelling was conducted to quantify the potential impact on the groundwater due to the geochemical properties of the combined KELL and PPM tailings. Although nickel was identified as a potential pollutant of concern in the geochemical analyses, the groundwater study has concluded that nickel would not migrate more than 50 m (using a conservative mobility factor) from the source. The modelling, using sulphate (SO₄) concentrations, simulated a current scenario, the potential contamination plume at the end of the life of the PPM TSF (assuming no reprocessing) and 50 years post the operational phase of the TSF. The modelling results present the findings outlined below (Exigo, 2019).

- The current approved tailings dam source contains a modelled SO₄ concentration of 208 mg/ℓ - the surrounding mass migration does not exceed the SANS drinking water limits but does exceed DWS's Class 1 water type limit of 200 mg/ℓ.
- During operations:
 - The combined KELL and PPM tailing's SO₄ concentration was calculated, through geochemical modelling, to be 435 mg/ℓ, at source (below the TSF) which is under the SANS drinking water limit.
 - The tailing's seepage quality associated with the combined KELL and PPM tailings is predicted to take approximately seven years to seep from the TSF pool on the surface of the TSF to the bottom of the tailings (Solution H+, 2019).
 - The simulated migration plume in the unmitigated scenario (considering no additional seepage capturing boreholes) would migrate from the TSF at a concentration below the SANS drinking water limit.
 - Mitigation (making provision for an additional 10 seepage capturing boreholes) would reduce the predicted impact zone by 36% when compared to the unmitigated scenario. This mitigation would be required regardless of the proposed project and is in line with the impact assessment and mitigations measures as included in the 2007 EIA and EMPr. No third party boreholes are located within the mitigated impact zone.
- Post-closure phase of the TSF:
 - The combined KELL and PPM tailing's SO₄ concentration was calculated, through geochemical modelling, to be 1 595 mg/ℓ at source (below the TSF).
 - The simulated SO₄ migration plume in the unmitigated scenario (considering no additional seepage capturing boreholes and active pumping ceases 5 years post operation) and the mitigated scenario (making provision for an additional 10 seepage capturing boreholes, active pumping ceases 5 years post operation, and rehabilitation of the TSF surfaces) exceeds the baseline groundwater concentration at the Muthlabe River approximately 1.5 km downstream of the TSF but does not exceed the SANS 241:2015 drinking water limit.
 - Mitigation would reduce the predicted impact zone by 16% when compared to the unmitigated scenario. No third party boreholes are located within the unmitigated or mitigated impact zones.

The incremental increase in groundwater contamination and related potential for health impacts as a result of the additional KELL plant, is assessed to be of **LOW** significance even without mitigation in the operational phase; of **MEDIUM** significance without mitigation and **LOW** significance with mitigation in the decommissioning and closure phase and of **MEDIUM** significance without and with mitigation in the post-closure phase (see Table E4 below). The medium significance post-closure is influenced to a large extent by the conservative geochemical modelling and does not take into account active pump and treat mechanisms. Where pump and treat mechanisms and the final rehabilitation of the TSF prevent the migration of a contamination plume affecting third party boreholes, the significance post-closure would be reduced.

With an extension to the life of PPM's mineral processing facilities, the duration of contamination impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project has the potential to add additional impacts if unmitigated, specifically in the post-closure phase, depending on operational mitigation measures and the source concentration of the TSF. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **MEDIUM-LOW** with mitigation. The medium significance post-closure is influenced to a large extent by the conservative geochemical modelling and does not take into account active pump and treat mechanisms. Where pump and treat mechanisms and the final rehabilitation of the TSF prevent the migration of a contamination plume affecting third party boreholes, the significance post-closure would be reduced.

Mitigation

In addition to continuing to implement mitigation measures as per PPM's EMPs, the mitigation measures outlined below will be applied to project-specific activities:

- Telemetry will be installed at all relevant boreholes to monitor the real-time aquifer conditions.
- Geochemical modelling will be reviewed, prior to deposition of the combined KELL and PPM tailings, to verify the results of the current geochemistry modelling (the conclusion from the groundwater specialist is that the geochemical modelling is very conservative).
- The geochemical numerical modelling will be updated to include reactive transport modelling to take the possible precipitation and adsorption of sulphate into account.
- Tailings will be deposited at a ratio of 1.2 % KELL tailings to 98.8 % PPM tailings as this is the ratio that specialist assessments have been based on. In the event that the PPM TSF is developed according to a different schedule to that assumed in the geochemistry assessment, the source term presented will be revised and updated. The groundwater model will be updated to include the revised source term and if necessary additional mitigation implemented in consultation with a specialist.
- PPM will sample the tailings at suitable intervals during the operational life of the TSF to evaluate the heterogeneity in physical and chemical composition. This will provide a data set that allows refined estimates of the post-closure impacts of the TSF to be developed ahead of mine closure.
- KELL tailings will be re-slurried and mixed with recycled process water prior to the PPM tailings thickener to achieve a supernatant water quality equal to or better than the current PPM tailings supernatant.
- Additional seepage capturing boreholes will be established as recommended in the groundwater specialist study.
- Seepage capturing boreholes will be pumped as per the recommended rates in the groundwater specialist study to ensure the desired effect of each hole.
- The TSF surface will be rehabilitated to mimic a recharge of 3% of mean annual runoff from five years post the operational phase. The rehabilitation would include the planting of trees which have a high evapotranspiration rate to effectively minimise the net infiltration of water from the facility and a clay sealing cap to prevent recharge to the decommissioned TSF. The rehabilitated scenarios must be included in an updated model to demonstrate the efficiency.
- Revegetation trials (and hence the sustainability of any rehabilitation works) must be investigated as part of operations.
- Surface and groundwater remediation will be informed through ongoing surface and groundwater monitoring and by carrying out risk assessment and water pollution potential studies/investigations during mine operations.
- Where studies indicate the potential for contamination of third-party groundwater use post-closure, PPM will implement an active pump and treat system.

Monitoring

Monitoring will continue as per the approved EMP (see Section 29). Where monitoring shows exceedances of applicable limits as a result of PPM's activities, additional mitigation will be implemented in consultation with an appropriately qualified specialist.

Emergency situation

In the event of a significant contamination incident and/or failure of the dam or TSF, the emergency response procedures outlined in Section 30.2 would be implemented.

TABLE E4: IMPACT SUMMARY – CONTAMINATION OF GROUNDWATER

Issue: Contamination of groundwater affecting third party water use		
Phases: Operations and Closure		
Criteria	Without Mitigation	With Mitigation
Severity	Moderate to minor change	Minor (Slight) change
Duration	Life of the project	Life of the project
Extent	Beyond the site boundary, local	Within the site boundary
Consequence	Medium	Low
Probability	Possible	Possible - Unlikely (with pump and treat mechanisms)
Significance	Medium	Medium-Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Possible with pumping and treatment.	
Degree to which impact may cause irreplaceable loss of resources	Possible but with mitigation this can be minimised.	
Degree to which impact can be mitigated	High if long term measures are implemented where required.	
Residual impacts	The potential for residual impacts depends on the success of any pump and treat mechanisms and the final rehabilitation of the TSF to prevent the migration of a contamination plume affecting third party boreholes post-closure.	

9. ISSUE: CHANGE IN AMBIENT AIR CONCENTRATIONS

Description of impact

The construction of additional infrastructure and changes in the mineral processing operations presents activities that would contribute to ambient air concentrations. Ambient air concentrations can result in odour, nuisance (dust fallout) and health inhalation impacts. The specialist is of the opinion that odour impacts from gaseous pollutants will be negligible (Airshed, 2019a) and therefore the assessment below focuses on dust fallout and health inhalation impacts.

The UG2 milling and flotation circuit is not expected to result in atmospheric emissions apart from dust generated during the construction of the plant. The hydrometallurgical (KELL) plant is expected to be the only additional source of emissions from the proposed project during the operational phase (Airshed, 2019a).

Pollutants of concern associated with the proposed project include particulates (PM₁₀ and PM_{2.5}), for all project components, and for the KELL process, gaseous combustion pollutants (SO₂ and NO₂), chlorine (Cl₂), hydrogen chloride (HCl), hydrogen fluoride (HF) and possibly ammonia (NH₃). Emissions from the community aggregate crusher were simulated in 2016 and included as part of the baseline for this assessment. In order to understand the potential for health inhalation impacts, the simulated results have been compared to available South African National Ambient Air Quality Standards (SA NAAQS) for PM₁₀, PM_{2.5}, SO₂, and NO₂ and international guidelines (in the absence of South African standards) for Cl₂, HCl, HF and NH₃. Information on potential impacts on vegetation and grazing quality is limited to dust and based on European studies. No information is available on potential impacts as a result of exposure to gaseous pollutants (Airshed, 2019a).

The construction phase presents activities that are temporary in nature. The operational phase would present more long term activities and related emission sources. It is expected that residential (including grazing and outdoor community related activities) and eco-tourism facilities would be most vulnerable to health risks from air quality. Potential air quality impacts on biodiversity are discussed in Section A4.

Impact assessment

During construction dust generated during earthworks, demolition of existing infrastructure and the movement of vehicles may contribute to elevated particulate matter levels in the air. This could result in increased dustfall on a local scale and higher particulate matter loads. Given that the construction phase is relatively short, the related significance is considered by the specialist to be **LOW** even without mitigation. Given that dust related impacts could occur during the construction phase, the significance remains **LOW** with mitigation (Airshed, 2019a). The same would apply to the decommissioning phase.

Given that the UG2 milling and flotation circuit is not expected to result in atmospheric emissions during the operational phase, the discussion below focuses on the KELL process. The operational KELL process presents a new emission profile for the PPM operations. Atmospheric emissions would be generated from the leach extraction and heat generating (using coal) processes in the plant. Where the KELL Plant is operated at or below the Subcategory 4.17 New Plant Minimum Emission Standards, the air quality modelling predicted the following for the KELL plant (Airshed, 2019a):

- Daily SO₂ concentrations could exceed the SA NAAQS for an area in the immediate vicinity of the KELL Plant (mainly within the PPM plant boundary) (this is due to the use of coal as a fuel source);
- Hourly SO₂ and NO₂ concentrations could exceed the SA NAAQS limit values for up to 2 km north east and north west from the PPM plant boundary and around the base of the ridge to the north and south of the PPM Plant and TSF (this is due to the use of coal as a fuel source);
- Annual Cl₂ concentrations could exceed the identified chronic (i.e. third party exposure of 365 days or more) guidelines for Cl₂ for up to 500 m north of the PPM plant boundary, up to 2 km south west of the PPM plant boundary and around the base of the ridge to the north and south of the PPM Plant and TSF;
- Daily Cl₂ concentrations could exceed the identified sub-chronic (i.e. third party exposure of 14 to 364 days or more) guidelines for Cl₂ for up to 400 m north, north east and south west of the PPM plant boundary and around the base of the ridge to the north of the PPM TSF;
- Hourly Cl₂ concentrations could exceed the identified acute (i.e. third party exposure of 1 to 14 days or more) guidelines for Cl₂ for up to 200 m north east of the PPM plant boundary;

All other pollutants of concern are below the SA NAAQS or international guidelines.

Although exceedances of applicable health screening limits (for SA NAAQS) or maximum risk levels (for international guidelines) have the potential to occur outside the PPM plant boundary, no exceedances are predicted to occur at any third party residential or ecotourism receptors. Exceedances are however predicted to occur where grazing takes place and at the community-based projects south of the PPM plant. It should however be noted that the maximum risk levels (for international guidelines) considers the people most sensitive to substance-induced effects. Exposure to a level above the maximum risk level does not mean that adverse health effects will occur but is an indication of the related potential.

With regards to chlorine, short term exposure to high concentrations of chlorine gas has the potential to damage tissues if it comes into contact with moist tissues such as the eyes, throat, and lungs. Long-term complications in humans may occur after breathing in high concentrations of chlorine. Exposure to environmental concentrations result in similar physiological responses, the results are likely to be much less severe.

Animals in general are more resilient to air pollutants than humans. Regardless, it is considered unlikely that cattle would be grazing in the short term exceedance zone or would remain in the long term exceedance zone for extended periods.

The mitigated incremental impact on air quality as a result of the KELL process is considered by the specialist to be of **NEGLIGIBLE** significance for dust fallout, **LOW** significance for particulate, SO₂ and NO₂ emissions and **MEDIUM** significance for Cl₂, HCl, HF and NH₃ emissions (see Table E5 below). Only the mitigated assessment for Cl₂, HCl, HF and NH₃ emissions is reflected in the table below as this is the more significant impact associated with the KELL plant. In addition, the KELL plant will need to be designed and implemented in such a manner that emissions comply with the Minimum Emission Standards for a New Plant (see Section 3.1.3).

Emissions from the KELL process would occur over a long period (potentially greater than 40 years). The only other emissions associated with the mineral processing plant relate to vehicle entrainment from unpaved roads. With the extension to the life of the mineral processing plant the duration of impacts would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained as part of a separate process. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

The specialist has concluded that the contribution of the KELL plant to existing cumulative impacts is expected to be negligible for the following reasons (Airshed, 2019a):

- PM₁₀ and PM_{2.5} impacts from the KELL Plant are simulated to be localized to the KELL Plant operations;
- SO₂ and NO₂ impacts from the current PPM operations are insignificant based on dispersion modelling simulations previously completed for the current PPM operations and SO₂ and NO₂ sampling conducted in the vicinity of the current Genset;
- Cl₂, HCl, HF and NH₃ are not emitted by the current PPM operations.

When considering the above discussion, the cumulative significance rating remains **HIGH** without mitigation and **LOW** with mitigation, for all emissions except the KELL plant. For the KELL plant, the significance rating is **MEDIUM** with mitigation for Cl₂, HCl, HF and NH₃.

Mitigation

In addition to continuing to implement mitigation measures as per PPM's EMPrs, the mitigation measures outlined below will be applied to project-specific activities:

- Stack heights at the KELL Plant will be maximised as far as is economically viable (minimum of 12 m in height).
- KELL Plant will be designed so that emissions from all point sources are in compliance with the Subcategory 4.17 MES.
- All stacks will be sampled as soon as the plant is operational, and if any pollutants are in exceedance of the Subcategory 4.17 MES, additional mitigation measures will be implemented.
- PPM employees and members of the surrounding communities will be educated on the effects of Cl₂ (as well as HCl and HF) exposure and that all symptoms be reported on the PPM complaints register.

Monitoring

In addition to monitoring as per PPM's EMPrs, the monitoring outlined below will be applied to project-specific activities (see Section 29):

- All stacks will be sampled as soon as the plant is operational.
- Monitoring will be undertaken in line with an AEL.
- Annual passive diffusive sampling of Cl₂, HCl and HF at PPM plant boundary to the north and south and at the closest sensitive receptor locations namely the villages of Mothlabe and Ngweding. If sampled concentrations exceed the assessment criteria, sources of these pollutants should be investigated and mitigation measures implemented if applicable.

Where monitoring shows exceedances of applicable limits as a result of PPM's activities, additional mitigation will be implemented in consultation with an appropriately qualified specialist.

Emergency situation

In the event of exposure to high concentrations of chlorine, the emergency response procedures outlined in Section 30.2 would be implemented.

TABLE E5: IMPACT SUMMARY – AMBIENT AIR CONCENTRATIONS

Issue: Increase in ambient air concentrations		
Phases: Construction and operations		
Criteria	Without mitigation	With Mitigation
Severity	-	Substantial deterioration
Duration	-	Life of the project
Extent	-	Beyond the site boundary
Consequence	-	Medium
Probability	-	Possible
Significance	-	Medium
Nature of cumulative impacts	Negligible	
Degree to which impact can be reversed	Once the plant is decommissioned, the source of impacts would cease. However where health related impacts occur, these may not be reversible.	
Degree to which impact may cause irreplaceable loss of resources	Not applicable	
Degree to which impact can be mitigated	High.	
Residual impacts	With mitigation, it is unlikely that air quality health impacts would be felt at sensitive receptors.	

10. ISSUE: INCREASE IN AMBIENT NOISE LEVELS

Description of impact

Construction of the additional infrastructure and changes to the mineral processing operations present activities that could contribute to ambient noise levels both during the day and at night. Project activities have the potential to cause a noise disturbance and/or nuisance at potentially sensitive receptors. A maximum increase in noise levels of 3 dBA above background levels was used to inform the assessment (IFC noise guideline). For a person with average hearing acuity, an increase of less than 3 dBA in the general ambient noise level is not detectable (Airshed, 2019b).

Noise pollution will have different impacts on different receptors because some are very sensitive to noise and others are not. It is expected that conservation and eco-tourism, residential and educational facilities would be most vulnerable to noise disturbances from the proposed project. Potential noise impacts on biodiversity are discussed in Section A3.

Impact assessment

Based on noise monitoring surveys, the daytime acoustic environment at all sampling locations was influenced by birds, insects, some livestock (goats) and local community activities while at night, mining activities (specifically heavy mining vehicles) were audible at the Ngweding and Black Rhino Game Reserve sampling sites. Although mining activities were audible, the night-time acoustic environment was below the SANS 10103 (2008) suburban and rural limits, respectively (Section 6.4.1.9).

Noise modelling undertaken for the proposed project predicted that the additional stationary and mobile equipment associated with changes to the mineral processing operations would result in a less than 1 dBA increase in ambient noise levels both during the day and at night at potential receptor sites. According to SANS 10103 (2008) no reaction would be expected from the community for increased noise levels up to 1

dBA. Reverse alarms and other impulsive sounds would have a nuisance effect, especially where these activities take place at night.

The incremental impact on human noise receptors is considered by the specialist to be of **LOW** significance even without mitigation (see Table E6 below).

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained through a separate process. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

When considering the project's impact cumulatively with the approved PPM operations, and that the contribution of noise sources from the proposed project would have a negligible effect on cumulative impacts, the significance rating for the overall mine remains **MEDIUM** without and with mitigation.

Mitigation

In addition to continuing to implement mitigation measures as per PPM's EMPs, the mitigation measures outlined below will be applied to project-specific activities:

- All diesel-powered equipment and plant vehicles must be kept at a high level of maintenance. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
- Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels.
- In managing noise specifically related to truck and vehicle traffic, efforts should be directed at:
 - Minimise individual vehicle engine, transmission, and body noise/vibration through the implementation of an equipment maintenance programme.
 - Maintaining road surfaces regularly to avoid corrugations, potholes etc.
 - Avoiding unnecessary idling times.
- Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, will be limited to day-time hours.
- A noise incidents register will be kept.

Monitoring

Monitoring will continue as per the approved EMP (see Section 29). Where monitoring shows exceedances of applicable limits as a result of PPM's activities, additional mitigation will be implemented in consultation with an appropriately qualified specialist.

Emergency situations

None identified.

TABLE E6: IMPACT SUMMARY – INCREASE IN AMBIENT NOISE LEVELS

Issue: Increase in ambient noise levels affecting potential human receptors		
Phases: Construction, operation and decommissioning		
Criteria	Without Mitigation	With Mitigation
Severity	Change not measurable	Change not measurable
Duration	Life of the project	Life of the project
Extent	Localised	Localised
Consequence	Low	Low
Probability	Seldom/Unlikely	Seldom/Unlikely
Significance	Low	Low

Nature of cumulative impacts	Negligible
Degree to which impact can be reversed	Once the plant is decommissioned, the source of impacts would cease.
Degree to which impact may cause irreplaceable loss of resources	Not applicable.
Degree to which impact can be mitigated	High.
Residual impacts	With mitigation, no residual impacts are expected.

11. ISSUE: CHANGE IN LANDSCAPE AND RELATED VISUAL IMPACTS

Description of impact

An impact on the visual environment is assessed by considering the change to the visual landscape as a result of project related infrastructure and activities. The visual landscape is determined by considering: landscape character, sense of place, scenic quality, sensitivity of the visual resource and sensitive views.

The existing PPM mine and other surrounding mining activities already have a high negative effect on the visual environment of the study area (Newton Landscape Architects, 2019). Although project related infrastructure will be developed within PPM's existing operational footprint, the establishment of additional infrastructure and changes to mineral processing activities has the potential to further alter the landscape character of the site and surrounding area.

Although the specific operational area of PPM, where the proposed project is planned, is considered to have a low scenic quality, the flat savannah plains and treed hills are considered to have a moderate to high value. As a result the overall landscape character is considered to evoke an aesthetically pleasing scene with a strong sense of place. Key to these factors is that PPM (and the proposed plant expansion project) is in close proximity to the PNP and within the proposed Heritage Park Corridor (Section 6.4.1.10).

The more significant activities and structures that would contribute to the visual impact would be an increase in activities during construction of the structures; the physical presence of structures during operations; changes to the mineral processing activities that would extend the life of the PPM processing plant by an additional 40 years; and night lighting on the upper levels of the structures needed for safety purposes. During the decommissioning / closure phases the visibility of the project would be influenced by activities associated with the disassembly of structures (Newton Landscape Architects, 2019).

Impact assessment

Within the context of the current plant's most prominent structures i.e. the silos and the DMS plant which are approximately 42m and 36m high respectively, only the tallest components of the proposed project i.e. UG2 milling and flotation circuit (23m) would be partially visible to sensitive receptors visiting and living in the Black Rhino Nature Reserve (BRNR), the Pilanesberg National Park (PNP) and Legkraal village located to the south west and south of PPM. The hydrometallurgical plant (5m) and its stack (using an assumed height of 15m for the purposes of this assessment) would be visible from the PNP and Legkraal village but not BRNR. However, the facilities would be seen in the background of views and would blend with existing structures. The physical presence of these structures would therefore result in a minor increase in visual intrusion. Additional lights from the proposed project would contribute to the existing negative impact of mining / plant activities at night on sensitive tourist and residential areas (Newton Landscape Architects, 2019).

It is predicted by the specialist that the project, in the unmitigated scenario, would exert a **MEDIUM** significance incremental impact on the visual and aesthetic environment when compared against the landscape baseline comprised of mining, village and tourist land use activities (Figure E1) (see Table E7 below). Project components would be built into existing mineral processing operations located on the farms

Witkleifontein 136 JP and Tuschenkomst 135 JP (Figure E2). With mitigation, the predicted incremental significance would be **MEDIUM during construction** and **LOW during operations**.

At closure, facilities would be removed and the incremental impact of the proposed project would be insignificant with the implementation of mitigation measures.

With an extension to the life of PPM's mineral processing facilities, the duration of visual impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained through a separate process. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add moderate additional impacts during construction and minor additional impacts during operations. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **MEDIUM-HIGH** with mitigation.

Mitigation

Mitigation measures as per PPM's EMPs will be applied to project-specific activities.

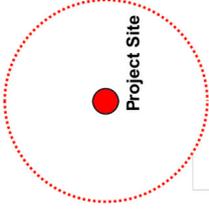
Emergency situations

None identified.

TABLE E7: IMPACT SUMMARY – NEGATIVE LANDSCAPE AND VISUAL IMPACTS

Issue: Change in the landscape and related visual impacts affecting sensitive views		
Phases: Construction, Operation, Decommissioning		
Criteria	Without Mitigation	With Mitigation
Severity	Minor loss or alteration	Minor loss or alteration
Duration	Life of the project	Less than the project life
Extent	Far beyond the site boundary	Localised
Consequence	Medium	Low
Probability	Possible	Possible (during construction) Unlikely (during operations)
Significance	Medium	Medium (during construction) Low (during operations)
Nature of cumulative impacts	Moderate contribution to cumulative impacts during construction although it should be noted that this is a relatively short period. Minor contribution to cumulative impacts during operations. Impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Removal of infrastructure and rehabilitation would reverse the impact.	
Degree to which impact may cause irreplaceable loss of resources	Low. The visual environment of the project site has already been compromised by existing operations.	
Degree to which impact can be mitigated	High, when considering glare and lighting mitigation measures.	
Residual impacts	No residual impact is anticipated. Once built the structure would form part of the altered visual environment and aesthetics of the site.	

LEGEND

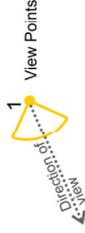
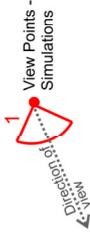


Zone of Potential Influence 10km Fore (1km) and Middle-ground views around project site (up to 5km)

VIEWSHED OFFSET

The offsets used are the heights of the proposed buildings as provided by the developer.

Note: Although the viewshed indicates high visibility - due to the existing push, only the upper portions of the taller buildings will be visible from public viewing areas along the R104 and R512/3 roads.

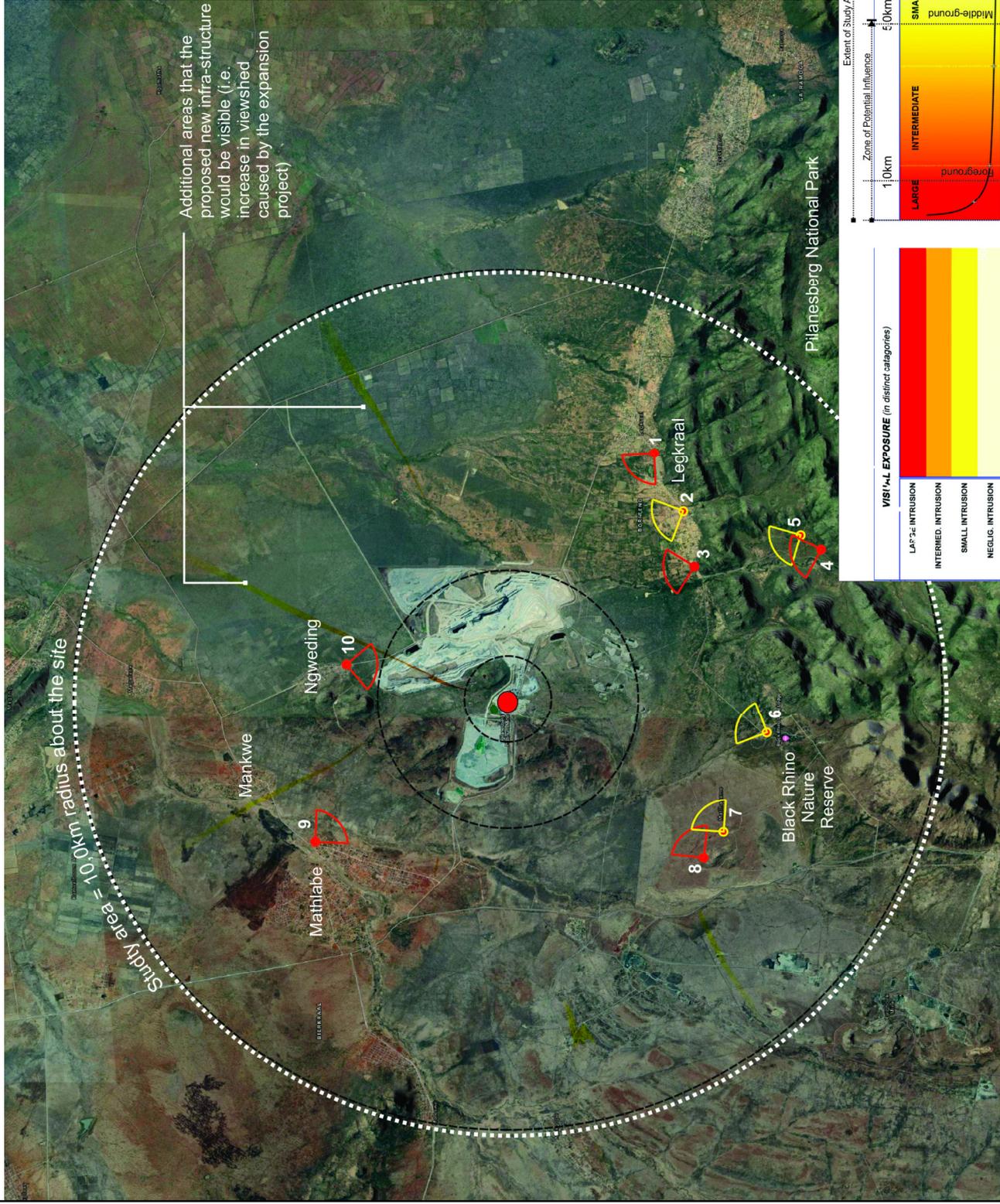


POTENTIAL CONFLICT AREAS

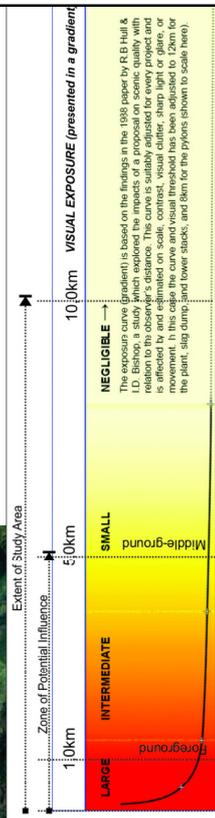
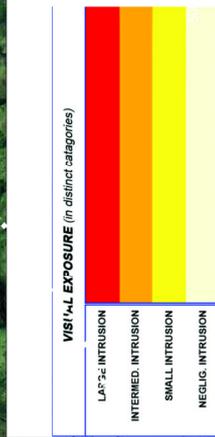
Conflict areas are a sensitive viewing point occurring within a 50km radius of the proposed project site i.e. fore and middleground views that occur within the zone of potential influence (study area).

These areas include residential areas as well as tourist roads / destinations.

Within this range the viewer could experience high (foreground view 0 - 1.0km) to moderate (middle-ground view 1.0km - 5.0km) visual exposure of the proposed development



Additional areas that the proposed new infra-structure would be visible (i.e. increase in viewshed caused by the expansion project)

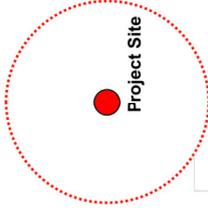


SIMULATED VIEWSHED SHOWING INCREMENTAL INCREASE IN VISIBILITY

02/2019
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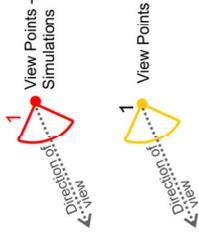
FIGURE E-1

LEGEND



Zone of Potential Influence 10km Fore (1km) and Middle-ground views around project site (up to 5km)

VIEWSHED OFFSET
The offsets used are the heights of the proposed buildings as provided by the developer.
Note: Although the viewshed indicates high visibility - due to the existing bush, only the upper portions of the taller buildings will be visible from public viewing areas along the R104 and R512/3 roads.

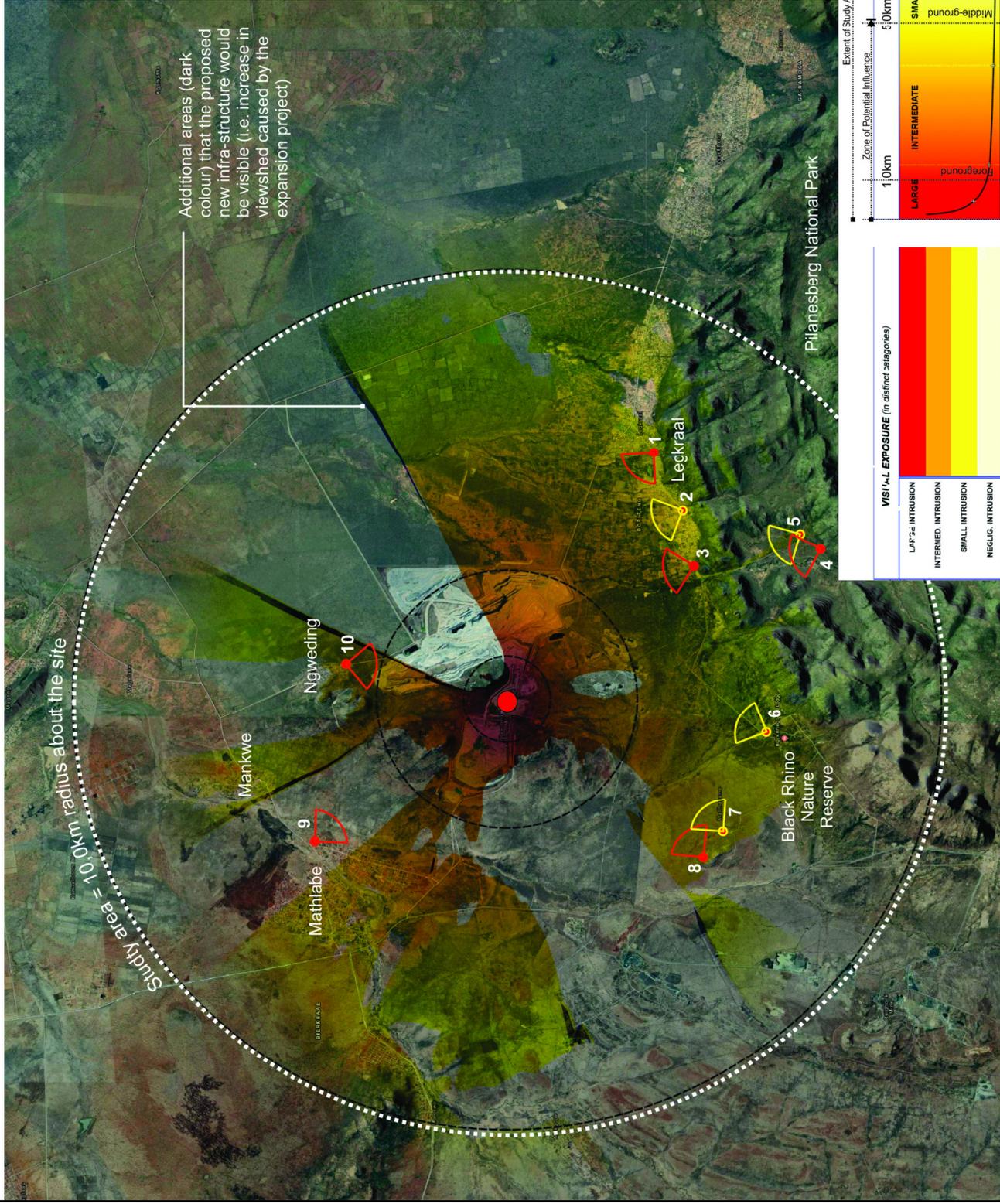


POTENTIAL CONFLICT AREAS

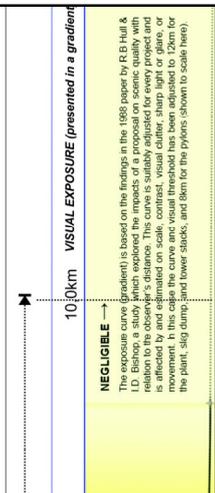
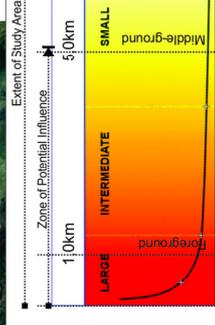
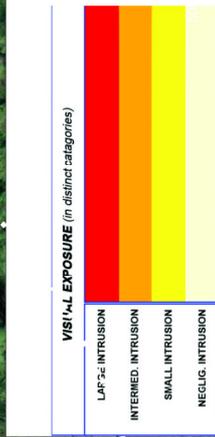
Conflict areas are a sensitive viewing point occurring within a 2.0km radius of the proposed project site i.e. foreground and middle-ground views that occur within the zone of potential influence (study area).

These areas include residential areas as well as tourist roads / destinations.

Within this range the viewer could experience high (foreground view 0 - 1.0km) to moderate (middle-ground view 1.0km - 5.0km) visual exposure of the proposed development



Additional areas (dark colour) that the proposed new infra-structure would be visible (i.e. increase in viewshed caused by the expansion project)



SIMULATED VIEWSHED SHOWING THE CUMULATIVE VISIBILITY OF THE EXISTING PLANT WITH THE ADDITIONAL PROCESSING OPERATIONS

02/2019
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FIGURE E-2

B) IMPACT ON SOCIO-ECONOMIC ENVIRONMENT

1. ISSUE: ECONOMIC IMPACT

Description of impact

The proposed project has the potential to continue to impact on the local and regional economy on both a positive and negative level. Negative impacts may arise from the potential loss in land value and loss of economic activities associated with current and potential future land use opportunities. It should however be noted that several mines, including PPM are already operating, or in development stage, in the area and existing economic activities, particular those associated with tourism have been exposed to mining in the region for a number of years. It should also be noted that the eco-tourism ventures in the region continue to function in the context of existing and developing mining activities in the area (Mercury Financial Consultants, 2019). Positive impacts may arise from increased foreign investment and income; direct benefits such as wages, taxes and profits; indirect benefits such as the procurement of goods and services, and the increased spending power of employees induced impacts as a result of increased personal income or spending power.

Impact assessment

The proposed project will add to mineral processing activities on site and extend the life of the plant by an additional 40 years. For the KELL process, the life of the plant could extend beyond this. The related economic impacts include (Mercury Financial Consultants, 2019):

- sustaining the employment of 365 people (working at the current mineral processing operations) - this equates to a present economic value of R1.93 billion over 40 years;
- creating opportunity for additional job creation with approximately:
 - 370 jobs in the construction phase equating to a present economic value of R93.8 million over a 24-month construction period;
 - 140 jobs in the operational phase equating to R323 million in present economic value over 33 years;
- community-based projects would continue to employ additional members from the local community and support local economic development;
- revenue could potentially increase as a result of an additional 2% recovery through the KELL process, additional chrome recovery, and additional metal recovery from the tailings re-treatment plant – no additional PGM reserves will be accessed and therefore a potential increase in revenue will only be associated with additional metal recovery;
- concentrate does not need to be transported to an off-site smelter, which will result in an operational cost saving and potentially increased profits;
- existing toll smelting and base metals refining contracts with external smelting operations would be terminated, negatively impacting on the revenue of these operations, although toll treating is often not the main source of revenue.

In addition to the direct and indirect economic impacts discussed above, PPM through its corporate social investments and social and labour plan, contributes towards the local economic development in the area. The proposed project will continue to contribute towards positive socio-economic benefits to its employees and surrounding communities which includes but is not limited to the following:

- community based projects;
- development of skills through its skills development plan – the proposed project would upskill existing employees from the concentrator plant to the KELL plant;
- career progression and mentorship plans, internships and learnership programs to provide learners with an occupational qualification;
- employment equity plan targeting historically disadvantaged South Africans (HDSAs); and
- investment in infrastructure development through local economic development and integrated development programmes.

The proposed project would not contribute to the same level or magnitude as a new mining operation but it will still positively contribute towards to the local, regional and national economy through capital

investment, creation of employment and revenue generation potential (Mercury Financial Consultants, 2019).

Given that infrastructure will be located within the existing PPM operational footprint, there will be no economic displacement of current competing land uses. When considering eco-tourism ventures in the region, these continue to function in the context of existing and developing mining activities in the area and it is not expected that the project will adversely affect these businesses. It is expected that tourists and visitors to the Pilanesberg National Park would continue (Mercury Financial Consultants, 2019). In the unmitigated scenario it is possible that land surrounding the project will experience some degree of additional negative social and environmental impact, which could impact on current land use values. This has been raised as a concern a number of times by landowners at the Black Rhino Game Reserve, with specific reference to noise and visual impacts from PPM. In the scenario where the project successfully implements the stipulated environmental and social management measures, the net substantive change is limited. This is linked to the fact that the proposed project would largely be developed within the current footprint and range of activities at the mine noting that the KELL process is a new technology. In addition, the proposed project would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained as part of a separate process. The remaining life of the mining operations remains unchanged. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

The combined incremental economic impact is considered to be of **MEDIUM (positive)** significance without and **HIGH (positive)** with mitigation (see Table E8 below).

When considering the project's impact cumulatively with the approved PPM operations, the project would have a moderate positive contribution to cumulative impacts. The significance rating for the overall mine remains **MEDIUM positive** without mitigation and **HIGH positive** with mitigation.

Mitigation

PPM will continue to implement mitigation measures as per its approved EMPs.

Emergency situations

None identified

TABLE E8: IMPACT SUMMARY – ECONOMIC IMPACT (POSITIVE AND NEGATIVE)

Issue: Economic impact (positive and negative)		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor improvement	Moderate improvement
Duration	Life of the project	Beyond closure
Extent	Local to regional	Local to regional
Consequence	Medium	High
Probability	Possible	Possible
Significance	Medium (positive)	High (positive)
Nature of cumulative impacts	Moderate positive contribution to cumulative impacts, with an extension to the duration of potential positive impacts.	
Degree to which impact can be reversed	Not applicable	
Degree to which impact may cause irreplaceable loss of resources	Not applicable	

Degree to which impact can be mitigated	High
Residual impacts	Positive economic impacts could extend beyond the life of the plant through training and skills development.

2. ISSUE: LOSS AND STERILISATION OF MINERAL RESOURCES

Mineral resources can be sterilised and/or lost through the placement of infrastructure and activities in close proximity to mineral resources, by preventing access to potential mining areas, and through the disposal of mineral resources onto mineralised waste facilities.

Important to note is that there has been no sterilisation of minerals by the placement of surface infrastructure at the mine. Given that project infrastructure would be located within PPM's existing plant and TSF footprint or adjacent to PPM's operations (for certain of the community-based projects), no sterilisation impacts as a result of the placement of infrastructure are expected. Any PGMs or base metals in the PPM TSF would be available for recovery through future reprocessing of the TSF. In addition, the proposed changes to the mineral processing operations aim to maximise the recovery of PGMs and base metals from the mined ores through the addition of a hydrometallurgical plant. As such the proposed project minimises the loss of economically viable mineral resources through disposal is not considered an issue.

With an extension to the life of PPM's mineral processing facilities, the duration of impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the PPM TSF or the mining operations.

When considering the project's impact cumulatively with the approved PPM operations, no cumulative impacts would occur. The significance rating for the overall mine remains **MEDIUM** without mitigation and **LOW** with mitigation.

3. ISSUE: INWARD MIGRATION

Description of impact

Mining related projects including mineral processing operations tend to bring with them an expectation of employment in all phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. Related to this is the possibility of theft and poaching of wild roaming animals on surrounding land such as the Pilanesberg National Park and Black Rhino Game Reserve.

Impact assessment

The proposed project will create new employment opportunities. The establishment of additional infrastructure and changes in mineral processing operations would take place at an existing operation. Contractors will also be used where required, especially during the construction phase. The potential exists for inward migration of people seeking employment and the associated social issues and pressures. Given the high rate of unemployment and related economic factors, people are seeking job opportunities where possible. The expectation associated with employment opportunities would increase due to the increase in the scale of the operations. Although the increase in the scale of the operations is relatively small given the plant's current capacity, the increase in scale may be perceived to be significant. This would place increased pressure on housing and related infrastructure and services. This situation can be worsened if the mine does not undertake adequate planning for employee and contractor housing and transport.

In the normal course, inward migration and the development of informal settlements would occur at the start of each of the construction and operational phases, but negative social issues associated with inward migration can continue beyond closure. The probability is considered to be low as PPM is an existing

operation and if this impact were to have occurred it would have done so when the mine started. No informal settlements have developed in the surrounding communities. Although mitigation can reduce inward migration, it's unlikely to be eliminated.

The incremental impact is considered to be of **MEDIUM** significance without mitigation reducing to **LOW** significance with mitigation (see Table E9 below).

With an extension to the life of PPM's mineral processing facilities, the expectation associated with employment opportunities could remain for the extended duration of the plant. The proposed project however would not change the remaining life of PPM's mining operations. It may be possible that once the mining activities cease, the expectation for employment would reduce. Nonetheless, as indicated above, negative social issues could extend beyond this period.

In the context of the above discussion and considering the nature and extent of PPM's approved operations, the proposed project will add minor additional impacts, if unmitigated. It follows that the proposed project will not change the significance of the impacts associated with the approved operations albeit that some of these that could be associated with the plant have the potential to occur for an extended period. The net cumulative significance rating for the overall cumulative impacts remains **HIGH** without mitigation and **MEDIUM** with mitigation.

Mitigation

PPM will continue to implement mitigation measures as per its approved EMPs.

Emergency situations

The establishment of informal settlements in the area is considered an emergency situation. In such instances the emergency procedure included in Section 30.2 will be followed.

TABLE E9: IMPACT SUMMARY – INWARD MIGRATION

Issue: Inward migration		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor deterioration	Minor deterioration
Duration	Beyond closure	Beyond closure
Extent	Beyond the site boundary	Beyond the site boundary
Consequence	Low	Low
Probability	Possible	Seldom
Significance	Medium	Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	When PPM activities cease, the expectation of employment would cease however social related issues and pressures would likely remain, if unmitigated.	
Degree to which impact may cause irreplaceable loss of resources	Not applicable	
Degree to which impact can be mitigated	High with co-operation from other operations in the area, the local municipality and the BBKTA.	
Residual impacts	Negative social issues could continue beyond the project.	

4. ISSUE: ROAD DISTURBANCE AND TRAFFIC SAFETY

Description of impact

The establishment of additional infrastructure and changes in mineral processing operations has the potential to contribute cumulatively to traffic related impacts. Traffic impacts are expected from construction through to decommissioning when vehicles will make use of the existing public transport network in and adjacent to PPM.

Access for the proposed project is from PPM's existing access intersection on Road P50-1. The existing access point was evaluated by the traffic specialist in terms of available sight distances, safety and functionality and sufficient space for vehicles passing stationary vehicles waiting to make turning movements. No additional accesses are deemed necessary (Siyazi, 2019).

Traffic furthermore has the potential to impact on noise, air quality and public road safety. Noise and air quality impacts are assessed in Sections A10 and A9, respectively. The assessment below therefore focusses on road capacity and safety related aspects.

Impact assessment

The proposed project would contribute to existing traffic volumes during the construction phase. It is estimated that the proposed project would add an additional 95 private vehicle/taxis a day, 4 x 30-50 ton trucks a month and 4 small trucks a week to the existing transport network (Section 3.2.8). Abnormal loads transporting cranes and plant infrastructure would also take place during construction. This would be for a relatively short period of time (18 to 24 months).

During operations, it is estimated that the proposed project would add an additional 49 private vehicle/taxis a day to the transport network. The transport of approximately 5 000 tons of PGM concentrate off site per month (4 x 50 ton trucks a day) would no longer take place as the concentrate would be processed further within the plant boundaries. This would be replaced by the transport of product off site via road, using 30-ton trucks (with a trailer, if required) and via air (helicopter). The related trips including the delivery of plant chemicals and coal is estimated at 6 trucks or tankers a week (Section 3.2.8).

In the unmitigated scenario (excluding the current upgrade to the P50-1 road), although the increase in PPM-related traffic could create increased safety risks (in terms of injury and death) to pedestrians and animals in the area as well as other road users, owing to the type, nature and location of the proposed project, the traffic specialist is of the opinion that (Siyazi, 2019):

- the vehicle trips anticipated to be generated during the construction phase will have a manageable impact; and
- the vehicle trips anticipated to be generated during the operational phase will have an insignificant and manageable impact.

Notwithstanding the above, any serious injury or death as a result of project-related traffic is a long term impact in both the unmitigated and mitigated scenarios. Possible accident sites could be located within or outside the project area and the indirect impacts associated with any injuries or fatalities would extend to the communities to which the injured people/animals belong. Although the possibility exists, accidents do not occur on a continuous basis.

The incremental impact of road disturbance and traffic safety is considered to be of **MEDIUM** significance without mitigation reducing to **LOW** significance with mitigation (see Table E10 below).

With an extension to the life of PPM's mineral processing facilities, the duration of road disturbance and traffic safety impacts associated with the mineral processing plant would extend by the same time period. The proposed project however would not change the duration of impacts associated with the mining operations. The remaining life of the mining operations remains unchanged.

When considering the project's impact cumulatively with the approved PPM operations and that the relevant section of the P50-1 is currently being upgraded, the proposed project is expected to have a minor

contribution to cumulative impacts. The significance rating for the overall mine remains **HIGH** without mitigation and **MEDIUM** with mitigation.

Mitigation

In addition to continuing to implement mitigation measures as per PPM's EMPs, the mitigation measures outlined below will be applied to project-specific activities:

- Implement the planned upgrades to the P50-1.
- Construction phase shifts will start and end outside of the main operating shift times.
- Delivery of heavy loads which includes plant construction materials and components will be scheduled at times other than the background traffic peak periods.
- Provide pedestrian walkways along the mine access road to ensure a split between vehicular and pedestrian movements and to ensure a safe environment for pedestrians.
- From a road safety point of view, as part of paving the relevant sections of Road P50-1, dedicated right turn lanes and public transport loading and off-loading facilities will be provided where the road reserves allows.

Emergency situations

In the event of mine related road accidents the emergency procedure included in Section 30.2 will be followed.

TABLE E10: IMPACT SUMMARY – ROAD DISTURBANCE AND TRAFFIC SAFETY

Issue: Road disturbance and traffic safety		
Phases: Construction		
Criteria	Without Mitigation	With Mitigation
Severity	Minor change	Minor change
Duration	Long term	Long term
Extent	Beyond the site boundary	Beyond the site boundary
Consequence	Medium	Medium
Probability	Possible	Seldom
Significance	Medium	Low
Nature of cumulative impacts	Minor given the current upgrade of the P50-1 to address safety related issues.	
Degree to which impact can be reversed	Any accidents that occur as a result of project related traffic is irreversible.	
Degree to which impact may cause irreplaceable loss of resources	Not applicable.	
Degree to which impact can be mitigated	High	
Residual impacts	Any accidents that occur as a result of project related traffic would likely have residual impacts. The potential for accidents would, however, cease when operations cease.	

5. ISSUE: INCREASE IN SAFETY RISKS TO THIRD PARTIES AND COMMUNITIES

Project-related infrastructure and activities would be undertaken within PPM's existing mineral processing plant complex and TSF footprint. Security access and control measures are already in place in these areas. Access to construction sites or operational areas by third parties or animals and exposure to related safety risks is therefore considered highly unlikely. Potential health risks as a result of air emissions are discussed in Section A9 above.

With an extension to the life of PPM's mineral processing facilities, the duration of safety risks associated with the mineral processing plant would extend by the same time period. The proposed project however

would not change the duration of impacts associated with the PPM TSF or the mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs. The remaining life of the mining operations remains unchanged.

When considering the project's impact cumulatively with the approved PPM operations, no cumulative impacts would occur. The significance rating for the overall mine remains **HIGH** without mitigation and **MEDIUM** with mitigation.

6. ISSUE: LAND USE IMPACT

Description of impact

There is potential for current and future land uses in and surrounding the PPM mining right area to be impacted on by the proposed project. These land uses include a mix of community and eco-tourism type land uses including the proposed Heritage Park corridor (HPC).

Impact assessment

Given that infrastructure will be located within the existing PPM operational footprint, there will be no additional loss of community grazing land and no additional footprint loss of the proposed HPC.

With regards to surrounding land uses, in the unmitigated scenario, it is possible that land uses surrounding the project will experience some degree of additional negative environmental and social impacts. The key related potential environmental impacts include off-site emissions of water, air and noise; visual impacts; traffic related safety risks and the influx of job seekers with related social ills. It should however be noted that several mines, including PPM are already operating, or in development stage, in the area and existing land uses have been exposed to mining in the region for a number of years. Important to note is that eco-tourism ventures in the region continue to function in the context of existing and developing mining activities in the area (Mercury Financial Consultants, 2019). In the scenario where the project successfully implements the stipulated environmental and social management measures, potential additional impacts on surrounding land uses can be prevented and/or minimised.

The incremental impact on surrounding land uses is assessed to have a **MEDIUM** significance without mitigation and a **LOW** significance with mitigation (see Table E11 below).

With the extension of the life of the mineral processing operations, the proposed project may potentially delay the onset of alternative land use activities including the use of rehabilitated land for community grazing. Important to note is that the extension of life of the mineral processing facilities does not apply to the PPM TSF or mining operations. Once the TSF reaches its full capacity, deposition of tailings would take place on one of SPML's TSFs and the PPM TSF would be rehabilitated, unless authorisation for the re-processing of the TSF is obtained as part of a separate process. Once mining of the Tuschenkomst pit is complete, rehabilitation of the pit would commence in line with the mine's rehabilitation plan.

With regards to the HPC, given the existing and planned mining operations in the area, alternatives to the dangerous game component of the heritage park corridor have been considered by PPM and the NWPTB. Under this alternative the HPC has been aligned on a westerly route on the farms Zandspruit 168 JP, Rooderand 46 JQ, Witkleifontein 136 JP and Tuschenkomst 135 JP (refer to Figure 6-5). In principle the NWPTB agreed with the revised alignment on 1 August 2011. In the case of the heritage park land use PPM has committed to working with NWPTB and will continue discussing the issue of ensuring that this corridor is maintained at its maximum width while passing through PPM's mining right area (SLR, 2012).

When considering the project's collective land use impact cumulatively with the approved PPM operations, the proposed project is expected to have a minor contribution to cumulative impacts. This is linked to the fact that the proposed project would largely be developed within the current footprint and range of activities at the mine noting that the KELL process is a new technology. The cumulative significance rating for the overall mine remains **HIGH** without mitigation and **MEDIUM to LOW** with mitigation.

Mitigation

The following measures are recommended:

- Effective implementation of all mitigation measures as outlined in the EMPr to reduce the overall impact on the environment and surrounding land uses.

Emergency situation

None identified.

TABLE E11: IMPACT SUMMARY – CHANGE IN LAND USE

Issue: Change in land use		
Phases: All		
Criteria	Without Mitigation	With Mitigation
Severity	Minor change or disturbance	Minor change or disturbance
Duration	Beyond closure	Life of the project
Extent	Beyond the site boundary	Beyond the site boundary
Consequence	Medium	Low
Probability	Possible	Seldom
Significance	Medium	Low
Nature of cumulative impacts	Minor contribution to cumulative impacts, impacts would remain within the range previously assessed.	
Degree to which impact can be reversed	Once the plant is decommissioned, the source of impacts would cease.	
Degree to which impact may cause irreplaceable loss of resources	The degree to which land use impacts can be reversed is linked to the degree that environmental and social impacts as outlined in this report can be reduced.	
Degree to which impact can be mitigated	Mitigation of land use impacts is linked to the mitigation of environmental and social impacts as outlined in this report.	
Residual impacts	With mitigation, limited residual impacts are expected.	

C) IMPACT ON HERITAGE RESOURCES (INCLUDING PALAEOLOGICAL RESOURCES)

7. ISSUE: DAMAGE TO OR DISTURBANCE OF HERITAGE (INCLUDING CULTURAL) AND PALAEOLOGICAL RESOURCES RESULTING IN A LOSS OF THE RESOURCE

Project-related infrastructure and activities would be developed within PPM's existing mineral processing plant complex and TSF footprint. The areas earmarked for development are either occupied by existing mine infrastructure or have been disturbed by activities within the plant complex and TSF. No new areas would be disturbed. Community based projects have mainly been established within PPM's plant complex, except the vegetable garden and nursery which has been established immediately adjacent to the TSF's return water dam. As there will be no disturbance of new areas, no heritage or palaeontological resources will be impacted by the project.

The extension to the life of PPM's mineral processing facilities does affect heritage or palaeontological related impacts at the mine.

When considering the project's impact cumulatively with the approved PPM operations, no cumulative impacts would occur. The significance rating for the overall mine remains **HIGH** without mitigation and **LOW** with mitigation.