APPENDIX 9

DETAILED IMPACT RATING

CONSTRUCTION PHASE

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
WETLANDS											
Site clearing, vegetation removal and stripping of topsoil	Loss and degradation of wetland systems	Loss of wetland ecosystem services, or degradation of these services. A considerable cumulative impact considering the extent of mining and development in the area, and the already lost wetland areas and associated services.	120 ha of wetlands to be lost	Significance	4	3.33	1.1	Use of existing access routes where possible. Minimising the disturbance footprint area, and the duration of the construction phase	Significance	3	2.33
				Magnitude - Spatial	3		1.2	Demarcate footprint areas to be cleared to avoid unnecessary vegetation clearing. Exposed areas must be ripped and vegetated to increase surface roughness	Magnitude - Spatial	2	
				Magnitude - Temporal	3		1.3	Strip and stockpile topsoil and subsoil separately	Magnitude - Temporal	2	
				Probability	5		1.4	Implement dust suppression such as wetting of roads	Probability	5	
	Erosion and sedimentation of wetland areas	The exposed soils are susceptible to erosion due to wind and runoff, resulting in sedimentation of downstream wetlands. Stockpiles and dumps are also susceptible to erosion.	Local disturbance	Significance	4	2.67	1.5	Adhere to mine driving rules to limit speed and therefore the generation of dust. Vehicles must be in good working order.	Significance	4	1.80
				Magnitude - Spatial	4		1.6	Separate clean and dirty water. Clean water must be diverted and directed around working areas, and measures implemented to manage the discharge and avoid scouring and erosion. Compile a suitable stormwater management plan, which must be implemented from the onset of the project and continued for the life of the project. Create energy dissipation at discharge areas to prevent scouring.	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.7	All personnel and contractors must undergo Environmental Awareness Training. A signed register of attendance must be kept as proof	Magnitude - Temporal	2	
				Probability	4				Probability	3	
FLORA & FAUNA											
Site clearing, vegetation removal and stripping of topsoil	Vegetation and habitat quality	Destruction and fragmentation of the vegetation community (including portions of an Endangered vegetation type (Eastern Highveld Grassland), a Vulnerable ecosystem type, corridors and areas classified as ESAs (wetlands)).	Throughout project area	Significance	5	4.00	1.8	Demarcate areas to be developed so that only these areas are disturbed and to prevent movement of construction personnel and vehicles into sensitive surrounding environments	Significance	2	2.13
							1.9	Demarcate and declare sensitive areas outside of the project area as no-go area and restrict access to this area as far as possible. This should be implemented with the exception of those mining areas in which authorisation for mining has already been granted			
				Magnitude - Spatial	3		(1.1)	Where possible, existing access routes and walking paths must be used and the development of new routes limited	Magnitude - Spatial	2	
							1.10	All laydown and storage areas should be restricted to within the project area			
				Magnitude - Temporal	4		1.11	A qualified ECO must be on site when construction begins to identify species (specifically SCCs) that will be directly disturbed and to relocate flora that is found during construction.	Magnitude - Temporal	4	
							1.12	Areas that are denuded during construction and where no future mining will occur, need to be re-vegetated with indigenous vegetation. This will also reduce the likelihood of encroachment by alien invasive plant species;			
				Probability	5		1.13	Compile and implement an alien vegetation management plan for the entire site. The use of herbicide needs to be monitored and only be used by a qualified person as several species that are protected by the Mpumalanga Schedule 11 was recorded	Probability	4	
							1.14	Implement appropriate fire breaks to restrict the impact fire might have on the endangered vegetation.			
	Faunal habitat quality	Displacement of faunal community (including threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration), destruction of corridors and/or direct mortalities.	Local disturbance	Significance	5	4.00	1.15	During vegetation clearance, methods should be employed to minimise potential harm to faunal species. Clearing must take place in a phased manner and to maximise the potential for mobile species to move to adjacent areas.	Significance	4	2.67
							1.16	Prior and during site clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery			
							1.17	Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste			

CONSTRUCTION PHASE

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
WETLANDS											
Site clearing, vegetation removal and stripping of topsoil	Loss and degradation of wetland systems	Loss of wetland ecosystem services, or degradation of these services. A considerable cumulative impact considering the extent of mining and development in the area, and the already lost wetland areas and associated services.	120 ha of wetlands to be lost	Significance	4	3.33	1.1	Use of existing access routes where possible. Minimising the disturbance footprint area, and the duration of the construction phase	Significance	3	2.33
				Magnitude - Spatial	3		1.2	Demarcate footprint areas to be cleared to avoid unnecessary vegetation clearing. Exposed areas must be ripped and vegetated to increase surface roughness	Magnitude - Spatial	2	
				Magnitude - Temporal	3		1.3	Strip and stockpile topsoil and subsoil separately	Magnitude - Temporal	2	
				Probability	5		1.4	Implement dust suppression such as wetting of roads	Probability	5	
	Erosion and sedimentation of wetland areas	The exposed soils are susceptible to erosion due to wind and runoff, resulting in sedimentation of downstream wetlands. Stockpiles and dumps are also susceptible to erosion.	Local disturbance	Significance	4	2.67	1.5	Adhere to mine driving rules to limit speed and therefore the generation of dust. Vehicles must be in good working order.	Significance	4	1.80
				Magnitude - Spatial	4		1.6	Separate clean and dirty water. Clean water must be diverted and directed around working areas, and measures implemented to manage the discharge and avoid scouring and erosion. Compile a suitable stormwater management plan, which must be implemented from the onset of the project and continued for the life of the project. Create energy dissipation at discharge areas to prevent scouring.	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.7	All personnel and contractors must undergo Environmental Awareness Training. A signed register of attendance must be kept as proof	Magnitude - Temporal	2	
				Probability	4				Probability	3	
FLORA & FAUNA											
Site clearing, vegetation removal and stripping of topsoil	Vegetation and habitat quality	Destruction and fragmentation of the vegetation community (including portions of an Endangered vegetation type (Eastern Highveld Grassland), a Vulnerable ecosystem type, corridors and areas classified as ESAs (wetlands)).	Throughout project area	Significance	5	4.00	1.8	Demarcate areas to be developed so that only these areas are disturbed and to prevent movement of construction personnel and vehicles into sensitive surrounding environments	Significance	2	2.13
							1.9	Demarcate and declare sensitive areas outside of the project area as no-go area and restrict access to this area as far as possible. This should be implemented with the exception of those mining areas in which authorisation for mining has already been granted			
				Magnitude - Spatial	3		(1.1)	Where possible, existing access routes and walking paths must be used and the development of new routes limited	Magnitude - Spatial	2	
							1.10	All laydown and storage areas should be restricted to within the project area			
				Magnitude - Temporal	4		1.11	A qualified ECO must be on site when construction begins to identify species (specifically SCCs) that will be directly disturbed and to relocate flora that is found during construction.	Magnitude - Temporal	4	
							1.12	Areas that are denuded during construction and where no future mining will occur, need to be re-vegetated with indigenous vegetation. This will also reduce the likelihood of encroachment by alien invasive plant species;			
				Probability	5		1.13	Compile and implement an alien vegetation management plan for the entire site. The use of herbicide needs to be monitored and only be used by a qualified person as several species that are protected by the Mpumalanga Schedule 11 was recorded	Probability	4	
							1.14	Implement appropriate fire breaks to restrict the impact fire might have on the endangered vegetation.			
	Faunal habitat quality	Displacement of faunal community (including threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration), destruction of corridors and/or direct mortalities.	Local disturbance	Significance	5	4.00	1.15	During vegetation clearance, methods should be employed to minimise potential harm to faunal species. Clearing must take place in a phased manner and to maximise the potential for mobile species to move to adjacent areas.	Significance	4	2.67
							1.16	Prior and during site clearance any larger fauna species noted should be given the opportunity to move away from the construction machinery			
							1.17	Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste			

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
for infrastructure development		Railway) due to construction activities.		Probability	1				Probability	1	
Site clearing, vegetation removal and stripping of top soil and excavations for infrastructure development	Graves	Damage to the graves due to construction activities		Significance	5	3.33	1.37 1.38	GY02 will not be impacted as a result of the infrastructure development but must be exhumed and relocated before opencast mining is done in the area. For GY01: Demarcate the graveyard with a fence or wall and fit with an access gate. Relatives of the deceased must be located by means of social consultation and to obtain permission for fencing or walling the cemetery	Significance	3	1.40
				Magnitude - Spatial	2		1.39 1.40	For GY01: Regulated visitor hours must be implemented that is compatible with safety rules. This will not be necessary if the graveyard is located next to a public or national road which can provide direct access to the graveyard. For GY01: Corridors of at least 100m should be maintained between the graveyard's border fences and any developmental components such as roads or other infrastructure that may be developed in the future. This buffer zone must be maintained at all times.	Magnitude - Spatial	2	
				Magnitude - Temporal	3		1.41	For GY01: The graveyard should be inspected every three months and noted in an inspection register. The register should outline the state of the graveyard during each inspection. Reports on damages to any of the graves or to the graveyards (fences, walls, gates) should be followed with the necessary maintenance work. Maintenance work should be recorded in the inspection register	Magnitude - Temporal	2	
				Probability	5		1.42	The graveyards should be kept tidy from any invader weeds and any other refuse	Probability	3	
PALAEONTOLOGY											
Excavations for infrastructure development	Palaeontology	Loss of fossils and other palaeontological significant artefacts		Significance	2	0.53	1.43	It is very unlikely that any fossils would be impacted upon by the excavations for the proposed infrastructure since the fossils would occur in the shales associated with the coal seams at greater depth. No mitigation required.	Significance	2	0.53
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	5				Magnitude - Temporal	5	
				Probability	1				Probability	1	
GROUNDWATER											
Construction laydown areas, construction works, movement of materials and construction equipment	Groundwater quality	Hydrocarbon spillages may seep into the underlying aquifer systems an result in the contamination of groundwater		Significance	2	0.93	(1.35)	Avoid soil contamination by hydrocarbons or concrete-containing water. Supply vehicles, machinery and equipment with drip trays when leaking	Significance	2	0.40
				Magnitude - Spatial	3		(1.35)	Equipment, machinery, and vehicles must be repaired immediately or removed from site if it is leaking. A maintenance log must be kept.	Magnitude - Spatial	2	
				Magnitude - Temporal	2		1.44	Hazardous material to be stored in appropriate waste skips	Magnitude - Temporal	2	
				Probability	2		1.45	Contaminated soil must be removed and disposed of at a licenced facility.	Probability	1	
SURFACE WATER											
Construction laydown areas, construction works, movement of materials and construction equipment	Surfcace water quality	Pollution of rivers/streams due to discharge of contaminated water as a result of erosion of soils during rainfall events, as well as hydrocarbon spillages from machinery, vehicles and equipment.	Local impact, depending on extent of contaminated discharge/spillage	Significance	2	1.87	1.46 (1.9)	Minimise the disturbed footprint area as far as possible. Delineate "No-go" zones where the construction plant and personnel are in close proximity to the Olifants River	Significance	1	1.00
				Magnitude - Spatial	3		1.47 1.48	Spill-sorb or a similar product will be kept on site, and used to clean up hydrocarbon spills in the event that they should occur The construction area will largely be within the existing dirty water management area of the mine. Manage storm water in terms of the existing storm water management system	Magnitude - Spatial	2	
				Magnitude - Temporal	2		1.49	Construct surface water management infrastructure, such as storm water canals and silt traps first at the Eastern overburden stockpiles and dirty water management infrastructure area, to ensure that contaminated runoff and dirty water spills are contained.	Magnitude - Temporal	2	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Probability	4		(1.34 & 1.35) (1.35)	Servicing of construction vehicles may take place only in dedicated areas that are equipped with drip trays. Repair leaking equipment immediately or remove from site to facilitate repair.	Probability	3	
	Deterioration of water quality in wetlands	Spills and leaks from machinery, equipment and vehicles entering wetlands and impact on water quality within these systems. The storage and mixing of substances on site also pose a risk to wetlands.	Local impact, depending on extent of contaminated discharge/spillage	Significance	4	2.40	(1.44) (1.45)	Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil. Remove all contaminated soil and place in appropriate containers. Contaminated soil may only be disposed of in a licenced facility;	Significance	4	1.80
				Magnitude - Spatial	3		(1.32) 1.50	Implement appropriate erosion protection measures at steep areas and soil stockpiles. Develop and implement a waste management plan for the construction phase.	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.51 1.52 1.53	Appropriate sewage management will be implemented during the construction phase that would tie into the existing sewage management strategy at Wolvekrans Colliery, i.e. portable chemical toilets which are regularly serviced. Continue with existing water quality monitoring up- and downstream of the construction areas, before and during construction where practical, in order to detect any increase in suspended solids or turbidity. Divert clean upslope runoff around the development footprint. The clean water diversion is to be constructed first, before establishment of the boxcut.	Magnitude - Temporal	2	
				Probability	4		1.54 (1.4 & 1.5)	Review water management around the construction areas if erosion is evident, or if the water quality monitoring indicates an increase in suspended solids. Implement dust suppression measures and adhere to mine driving rules to prevent excessive dust generation;	Probability	3	
	Surface water quantity	Reduction in catchment yield as a result of containment of contaminated runoff water emanating from the site, with no release to the catchment. Change in surface flow characteristics.	0.24% reduction in MAR of Wotbank Dam, which is 190x106 m3	Significance	1	2.00	(1.46)	Minimise the aerial extent of disturbed areas and potentially contaminated areas as far as possible.	Significance	1	1.67
				Magnitude - Spatial	2		1.55	Minimise areas where dirty construction activities are carried out (e.g. servicing areas and workshops, fuel storage areas, waste storage areas) and ensure appropriate bunding of these areas.	Magnitude - Spatial	2	
				Magnitude - Temporal	3		1.56	Divert upslope runoff around the construction activities to minimise the volume of dirty water generated and contained.	Magnitude - Temporal	2	
				Probability	5		1.57	Pump surplus dirty water to existing mechanical evaporators for disposal or re-use on the mine in terms of existing authorisations.	Probability	5	
Removal of material from the boxcut	Surface water quality	Discharge of contaminated water into water resources as a result if erosion of spoil stockpiles during rainfall events, deposition of sediments in local watercourses, and an increase in sulfate and TDS from overburden stockpiles.	Local impact, depending on extent of contaminated discharge	Significance	3	2.40	1.58	Direct runoff and seepage from the overburden dumps located in between the proposed ramps to Vleishaft PCD	Significance	1	0.93
				Magnitude - Spatial	3		1.59	Direct runoff and seepage from the overburden dumps located at the SKS pit to the SKS void	Magnitude - Spatial	3	
				Magnitude - Temporal	3		1.60	Divert runoff and seepage from the Eastern overburden dump via a canal and berm system to silt traps and a set of boreholes which will take all runoff into the underground workings	Magnitude - Temporal	3	
				Probability	4				Probability	2	
	Surface water quality	Pollution of surface water resources by deposition of sediments in the local watercourses and discharging mine-impacted water into the environment.	Local impact, depending on extent of contaminated discharge	Significance	3	2.40	1.61	Contain water on site, at in-pit sumps and pumped from here to either Vleishaft PCD for reuse in the existing mining operations or to existing mechanical evaporators for disposal.	Significance	2	0.93
				Magnitude - Spatial	3		(1.6) 1.62	Implement surface water management measures, such as clean water diversion canals and berms to divert runoff from clean catchment away from mine workings. Comply with the conditions of the water use licence for the dewatering of the opencast pit.	Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	2	
				Probability	4		1.61	Contain water on site, at in-pit sumps and pumped from here to either Vleishaft PCD for reuse in the existing mining operations or to existing mechanical evaporators for disposal.	Probability	2	
NOISE											
Construction works, movement of materials and	Noise	Increased noise levels	Predicted increase in noise levels are expected to result in 'little' reaction with 'sporadic' complaints	Significance	3	2.13	1.63	Keep all diesel-powered equipment and plant vehicles at a high level of maintenance. This should particularly include the regular inspection of and, if necessary, the replacement of intake and exhaust silencers. Any change in the noise emission	Significance	2	1.20

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
construction equipment			from Noise Sensitive Receptors R2, R3 and R8 during the night and 'medium' reaction with 'sporadic' to 'widespread' complaints from R7 during the night					characteristics of equipment should serve as trigger for withdrawing it for maintenance.			
				Magnitude - Spatial	3		1.64 1.65	Continue selecting equipment with lower sound power levels. 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 (i) Minimising individual vehicle engine, transmission, and body noise/vibration through the implementation of an equipment maintenance program; (ii) Maintain road surface regularly to avoid corrugations, potholes etc; (iii) Avoid unnecessary idling times.	Magnitude - Spatial	2	
				Magnitude - Temporal	2		1.66	Where possible, other non-routine noisy activities such as construction should be limited to day-time hours.	Magnitude - Temporal	2	
				Probability	4		1.67	A complaints register must be kept.	Probability	3	
VISUAL											
Clearing of vegetation, stripping ot topsoil and development of infrastructure	Visual	Visual disturbance due to dust generated from construction activities, as well as views of the activities themselves	At completion of structures, visual impact will reach some 8-9km from the structures	Significance	2	1.67	(1.2) 1.68	Only clear vegetation when and where necessary; Only remove topsoil when and where necessary.	Significance	1	1.33
				Magnitude - Spatial	2		(1.28) 1.69	Topsoil stockpiles should be vegetated where possible to lessen the visual intrusion. Ensure that stockpiles are placed away from surface water and drainage lines, where possible.	Magnitude - Spatial	2	
				Magnitude - Temporal	1		(1.32) 1.70	Monitor and fix any erosion in the landscape or on stockpiles; If possible, rehabilitate dumps concurrently	Magnitude - Temporal	1	
				Probability	5		1.71	Ensure that construction and operations are undertaken in line with GNR1147(as amended), or any other applicable legislation at the time of implementation.	Probability	5	
AIR QUALITY											
Clearing of vegetation, stripping ot topsoil and development of infrastructure	Air quality	Increased particulate matter (PM10) as a result of construction activities	8.41 tons/month	Significance	2	1.40	1.72	Implement dust suppression (e.g. wetting or chemical suppression) at materials storage, handling and transfer operations, as well as spoils handling areas and earthmoving operations (continuous as required) where feasible	Significance	2	1.20
				Magnitude - Spatial	3		(1.4)	Implement dust suppression (e.g. wetting or chemical suppression) on unpaved roads	Magnitude - Spatial	2	
				Magnitude - Temporal	2		1.73	Restrict haul trucks to specified haul roads using the most direct route	Magnitude - Temporal	2	
				Probability	3		1.74	Reduce unnecessary traffic that can generate dust.	Probability	3	
		Increased particulate matter (PM2.5) as a result of construction activities	16.83 tons/month	Significance	1	1.00	(1.5)	Implement strict on-site speed control according to the mine driving rules	Significance	1	0.80
				Magnitude - Spatial	2				Magnitude - Spatial	1	
				Magnitude - Temporal	2		1.75	Reduce the extent of open area to minimise the time between clearing and construction of infrastructure	Magnitude - Temporal	2	
				Probability	3				Probability	3	
		Increased dust generation as a result of construction activities	43.14 tons/month	Significance	1	0.80	1.76	Implement stabilisation such as chemical, rock cladding or vegetation of disturbed soils	Significance	1	0.80
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	2		(1.12)	Re-vegetate areas that will not be mined in future	Magnitude - Temporal	2	
				Probability	3				Probability	3	
SOCIAL ENVIRONMENT											
Construction of infrastructure and	Social environment		Local impact	Significance	2	1.60	1.77	Give preference to communities within close proximity to the mining activities if any new employment opportunities are created	Significance	2	1.40

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
establishment of opencast mining area		Employment opportunities, procurement and inflow of workers		Magnitude - Spatial	4		1.78	Procurement and recruitment of individuals should be undertaken through formalised structures and according to processes that are in line with international best-practice standards	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.79	Procurement of goods, services, material and equipment should be focused on the local area where economically feasible	Magnitude - Temporal	2	
				Probability	3		1.80	Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration	Probability	3	
		Inflow of jobseekers		Significance	3	2.13	1.81	The communication strategy with regards to the recruitment process and use of contractors to the local residents should ensure that unrealistic employment expectations are not created.	Significance	2	1.87
				Magnitude - Spatial	3		(1.77)	Maximise the use of local labour if required and where possible	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.82	South32 should support efforts of the ELM to limit in-migration to the area and the subsequent development or extension of informal settlements in the area	Magnitude - Temporal	2	
				Probability	4		(1.80)	Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration	Probability	4	
		Impact on daily living and movement patterns		Significance	2	1.40	(1.5)	Strict adherence by contractors to mine driving rules should be enforced	Significance	2	0.93
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.83	Disciplinary action for reckless driving within the mining area should be implemented	Magnitude - Temporal	2	
				Probability	3				Probability	2	
		Residential proximity and possible relocation		Significance	2	1.40	1.84	Adhere to mitigation measures proposed by specialists and relevant regulations to limit noise and dust pollution	Significance	2	0.93
							1.85	Heavy vehicles should be in good working order to limit any noise and dust pollution			
				Magnitude - Spatial	3		(1.4)	Dust suppression methods should be strictly implemented	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.86	Possible negative impacts on the surrounding landowners and nearby residents should be limited to minimise any possible negative impacts on these residents' quality of life.	Magnitude - Temporal	2	
				Probability	3		1.87	Also refer to mitigation measures for impact for sense of place, safety and security risks, health risks, and noise related impacts..	Probability	2	
		Impact on Agricultural Activities		Significance	2	1.40	1.88	Effective management of the mining activities associated with the infrastructure development would be required to avoid any environmental pollution (e.g. water) and limiting any increase in dust levels.	Significance	2	1.40
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	3				Probability	3	
		Impact on Sense of Place		Significance	2	1.40	1.89	Undertake appropriate site management as stipulated by the specialist to limit the visual impact	Significance	2	1.40
				Magnitude - Spatial	3		1.90	Risks of accidents should be recognised. Safety training should continue and focus on the designated drivers (employees) of heavy vehicles. The mine driving rules should be adhered to.	Magnitude - Spatial	3	
				Magnitude - Temporal	2		1.91	Strict codes of conduct should be implemented for personnel operating heavy and light vehicles to minimize traffic hazards within the mining area	Magnitude - Temporal	2	
				Probability	3		1.92	Construction and upgrade of roads within the mining area should be done in a manner which would facilitate safe and efficient movement of material, employees, as well as other mining vehicles	Probability	3	
		Safety and Security Risks		Significance	2	1.40	1.93	Maintain roads to ensure safety	Significance	2	0.93
				Magnitude - Spatial	3		1.94	Emergency procedures should be established that provide immediate response should an accident occur within the mining area	Magnitude - Spatial	3	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Magnitude - Temporal	2		1.95	Appropriate firefighting equipment should be on site and construction workers, as well as permanent employees should be appropriately trained for fire fighting	Magnitude - Temporal	2	
				Probability	3				Probability	2	
		Health Risks		Significance	2		1.96 (1.5)	Gaseous emissions should be minimised through proper operation and maintenance of vehicles Vehicles should be in a good working order and adhere to mine driving rules	Significance	2	
				Magnitude - Spatial	3	1.40	(1.4) 1.97	Implement dust suppression measures Fugitive dust emissions should be controlled through the implementation of appropriate mitigation measures e.g. ongoing rehabilitation	Magnitude - Spatial	3	0.93
				Magnitude - Temporal	2		1.98	Possible negative impacts on the surrounding landowners and nearby residents should be limited by ensuring that health risks are minimised and mitigation measures are implemented as stipulated in the Air Quality Impact Assessment and EMPr	Magnitude - Temporal	2	
				Probability	3				Probability	2	
		Noise Related Impacts	As per noise	Significance	2		(1.84)	Mitigation measures to limit any increase in noise as recommended by the noise specialist should be adhered to.	Significance	2	
				Magnitude - Spatial	2				Magnitude - Spatial	2	
				Magnitude - Temporal	2	1.20	(1.67)	A noise monitoring program should be implemented to ensure noise from activities and equipment meet or fall below noise guidelines Keep a complaint register.	Magnitude - Temporal	2	0.80
				Probability	3				Probability	2	

OPERATIONAL PHASE

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
WETLANDS											
Operation of surface infrastructure associated with opencast mining includeing the topsoil stockpile and overburden dumps, as well as the use and maintenance of machines, vehicles and equipment.	Wetland systems	Further loss of wetland ecosystem services, or degradation of these services.	Local, depending on size of disturbance	Significance	5	4.00	2.1	Separate clean and dirty water. Clean water must be diverted and directed around working areas and overburden dumps, and measures or structures created to manage the discharge to avoid scouring and erosion	Significance	4	3.33
							2.2	Ablution facilities must be provided for all staff and maintained for proper and correct use			
				Magnitude - Spatial	3		2.3	Waste must be collected in appropriate containers to accommodate volumes, these bins must be serviced. Recycling of waste must be encouraged, and in the event that waste cannot be recycled, the waste must be disposed of at a licenced facility. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site.	Magnitude - Spatial	2	
							2.4	Dust suppression must be implemented, and mine driving rules must be maintained. Vehicles must be in good working order.			
				Magnitude - Temporal	4		2.5	Spills of hydrocarbons must be prevented as far as possible. Spill kits containing spill-sorb or a similar type product must be available and on hand to clean spills and should be reported to the appropriate authorities as required	Magnitude - Temporal	4	
							2.6	All personnel and contractors to undergo Environmental Awareness Training, including topics such as wetland, faunal and flora importance and the procedure to follow should fauna be encountered. A signed register of attendance must be kept for proof			
				Probability	5		2.7	Implement an alien vegetation management plan for the site. The use of herbicide needs to be monitored and only used by a qualified person as several species that are protected by the Mpumalanga Schedule 11 was recorded	Probability	5	
							2.8	Implement and maintain a suitable stormwater management plan, including stormwater measures at stockpiles			
	Water quality impairment of wetlands due to spills and leaks, as well as sedimentation and further deterioration in PES	Spills and leaks from machinery, equipment and vehicles as well as the storage and mixing of substances on site, pose a risk to wetlands if contaminated runoff or material with pollution potential enters wetlands.	Local, depending on size of disturbance	Significance	4	2.67	2.9	Dirty water must be contained in suitable containment facilities and re-used or treated before it is discharged into the water resource.	Significance	4	2.00
							2.10	Where applicable, hazardous materials, chemicals and additives must be stored in appropriate waste skips. Materials must also be stored in bunded areas which can accommodate the required volumes			
				Magnitude - Spatial	3		2.11	Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when leaking or when being serviced. A maintenance log must be kept.	Magnitude - Spatial	3	
							2.12	No servicing of equipment on natural or rehabilitated areas			
				Magnitude - Temporal	3		2.13	Leaking equipment shall be repaired immediately or be removed from site to facilitate repair	Magnitude - Temporal	3	
							2.14	All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages. All re-fuelling and servicing of equipment is to take place in demarcated areas.			
				Probability	4		2.15	All contaminated soil shall be removed and be placed in appropriate containers. Contaminated soil may only be disposed of in a licenced facility	Probability	3	
							2.16	A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site.			
AQUATIC ECOSYSTEM											
Discharge of treated water from the modular WTP via wetland system into the Olifants River	Aquatic ecosystem	Habitat inundation as a result of additional water volumes	Local, depending on size of disturbance	Significance	1	0.80	2.17	Maintain erosion protection and energy dissipating measures at the discharge point.	Significance	1	0.80
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	1		2.18		Magnitude - Temporal	1	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Probability	4			The quality of the water discharged will be closely monitored to ensure that it complies with the specified RQO at all times.	Probability	4	
FLORA & FAUNA											
Operation of surface infrastructure associated with opencast mining	Vegetation and habitat quality	Continued fragmentation of an Endangered vegetation community (Eastern Higveld Grassland) including portions of wetlands and areas classified as ESA due to the activities, as well as encroachment by alien invasive plant species.	Throughout project area	Significance	4	4.00	2.19	Highly sensitive areas outside of the project area should be declared a no-go area and access to this area must be prevented as far as possible. This should be implemented with the exception of those mining areas for which authorisation for mining has already been granted	Significance	2	2.13
				Magnitude - Spatial	3				Magnitude - Spatial	2	
				Magnitude - Temporal	5		(2.7)	Implement an alien vegetation management plan for the site. The use of herbicide needs to be monitored and only be used by a qualified person as several species that are protected by the Mpumalanga Schedule 11 was recorded	Magnitude - Temporal	4	
				Probability	5				Probability	4	
Opencast Pit (Area not previously authorised)	Vegetation and habitat quality	Continued removal and fragmentation of an Endangered vegetation community (including portions of wetlands and areas classified as ESA) due to the activities and potential encroachment by alien invasive plant species.		Significance	5	4.67	2.20	Implement appropriate fire breaks to restrict the impact fire might have on the endangered vegetation	Significance	4	2.93
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	5				Magnitude - Temporal	4	
				Probability	5				Probability	4	
Operation of surface infrastructure associated with opencast mining	Faunal habitat quality	Continued displacement and fragmentation of the faunal community due to ongoing anthropogenic disturbances (noise, dust and vibrations) and habitat degradation/loss (litter, road mortalities and/or poaching).	Local disturbance	Significance	4	4.00	2.21	Implement an ad hoc monitoring programme to record sightings and to track the breeding success and distribution of the two SCCs observed on the project area: Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*)	Significance	2	2.13
				Magnitude - Spatial	3		(2.3)	Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site.	Magnitude - Spatial	2	
				Magnitude - Temporal	5		2.22	No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals	Magnitude - Temporal	4	
				Probability	5		2.23	Noise and vibrations must be kept to a minimum to reduce the impact of the development on the fauna residing on the site	Probability	4	
Opencast Pit (Area not previously authorised)	Faunal habitat quality	Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances (noise, dust and vibrations) and habitat degradation/loss (litter, road mortalities and/or poaching).		Significance	4	3.67	(2.6)	Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered.	Significance	3	2.67
				Magnitude - Spatial	3		2.24	Wherever possible, corridor areas (which links the CBA, ONA and ESAs to the north) must be maintained to facilitate the movement of wildlife within and between any natural areas	Magnitude - Spatial	3	
				Magnitude - Temporal	4		(2.14)	All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas	Magnitude - Temporal	4	
				Probability	5				Probability	4	
SOILS, LAND CAPABILITY AND LAND USE											
Operations of stockpiles, storing of wastes on insitu soils Opencast mining of areas not previously authorised	Soils, Land Capability and Land Use	Stockpiling on top of soil will continue in loss of soil resource land capability. Vehicle movement will result in compaction of soils. Soil contamination by hydrocarbons, waste stockpiles and evaporators.	Local, depending on size of disturbance	Significance	4	3.33	2.25	Excavated soils should be stockpiled.	Significance	4	3.33
							2.26	Stockpiles are to be clearly demarcated on site layout plans. Also indicate the material in each stockpile to ensure that topsoil and spoils are not mixed.			
							2.27	Soil stockpiles are to be maintained in a fertile, vegetated, and erosion free state. If this can't be achieved due to design of stockpiles, then financial provision must be made to reinstate soil chemistry (fertiliser, lime, organic material) and physical structure (placement of topsoil, no compaction) and the associated specialist studies to inform these measures prior to the start of rehabilitation			
				Magnitude - Spatial	2		(2.8)	Ensure proper storm water management measures are in place at stockpiles.	Magnitude - Spatial	2	
							2.28	Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles.			
							2.29	Stockpiled soil to be reserved for rehabilitation purposes only.			
				Magnitude - Temporal	4		2.30	Monitor and fix any erosion in the landscape or on stockpiles. If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place.	Magnitude - Temporal	4	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
							(2.5)	Prevent any spills from occurring. If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities as required			
				Probability	5		(2.14) (2.11 & 2.13)	All vehicles are to be serviced in designated areas Leaking vehicles, equipment and machinery should have drip trays placed under them where the leak is occurring and be repaired as soon as possible or removed from site. A maintenance log must be kept.	Probability	5	
HERITAGE											
Opencast mining not previosuly authorised	Historical structures	Damage to historical structures identified (i.e. Douglas pump station, SAR pump station, Vandyksdrift Railway)	None (Douglas pumps station: 120m2; SAR pump stations: 30m2 - will not be directly impacted)	Significance	4	0.47	2.31	Implement a chance-find procedure. If any employees find any heritage resources during any developmental activity all work at the site must be stopped and kept on hold. Chance finds must be reported to supervisors and through supervisors to the senior manager on site.	Significance	4	0.47
				Magnitude - Spatial	2				Magnitude - Spatial	2	
				Magnitude - Temporal	1				Magnitude - Temporal	1	
				Probability	1				Probability	1	
Opencast mining not previosuly authorised	Graves	Damage to the graves due to opencast construction activities	GY01: 31 graves GY02: 13 graves	Significance	5	3.33	2.32 2.33	GY02 must be exhumed and relocated before opencast mining is done in the area. For GY01: Demarcate the graveyard with a fence or wall and fit with an access gate. Relatives of the deceased must be located by means of social consultation and to obtain permission for fencing or walling the cemetery.	Significance	3	1.40
				Magnitude - Spatial	2		2.34	Regulated visitor hours must be implemented that is compatible with safety rules. This will not be necessary if the graveyard is located next to a public or national road which can provide direct access to the graveyard.	Magnitude - Spatial	2	
				Magnitude - Temporal	3		2.35	For GY01: Corridors of at least 100m should be maintained between the graveyard's border fences and any developmental components such as roads or other infrastructure that may be developed in the future. This buffer zone must be maintained at all times.	Magnitude - Temporal	2	
				Probability	5		2.36 2.37	The graveyard should be inspected every three months. Inspections should be noted in an inspection register. The register should outline the state of the graveyard during each inspection. Reports on damages to any of the graves or to the graveyards (fences, walls, gates) should be followed with the necessary maintenance work. Maintenance work should be recorded in the inspection register. The graveyards should be kept tidy from any invader weeds and any other refuse	Probability	3	
PALAEONTOLOGY											
Opencast mining	Palaeontology	Loss of fossils and other palaeontological significant artefacts	196ha (opencast mining not yet authorised)	Significance	2	2.13	2.38	Implement Chance Find Protocol as included in the EMPr	Significance	2	2.13
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	5		2.39	If recognisable fossils are found by the responsible person monitoring the excavated sediments, then a palaeontologist should be approached to do an assessment.	Magnitude - Temporal	5	
				Probability	4				Probability	4	
GROUNDWATER											
Waste management and storage associated with opencast mining	Groundwater quality	Potential deterioration in quality of baseflow to rivers and water abstracted from boreholes as a result of seepage from the following facilities: - Overburden dumps and Dragline Spoils - Mixed ROM and slurry stockpile areas - Mechanical evaporators	Localised, depending on extent of spill	Significance	4	2.67	2.40	The Eastern overburden dump and Mixed ROM coal and slurry areas must be lined with at least compacted clay to prevent contamination from entering the aquifer system	Significance	3	1.07
				Magnitude - Spatial	2		2.41	Groundwater monitoring must be instituted upgradient and downgradient of these facilities to monitor and intercept any potential contamination timeously	Magnitude - Spatial	2	
				Magnitude - Temporal	4		2.42	Groundwater monitoring boreholes must continue at designated positions based on infrastructure layout, as recommended	Magnitude - Temporal	3	
				Probability	4		2.43	Evaporation sprayers are likely to cause significant contaminant build-up over time at the selected discharge points. However, this	Probability	2	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		- Final Rejects Dump - No. 5 Seam and No. 4 Seam Stockpiles - Vleishaft Dam PCD						contamination is likely to be similar to the geochemical nature of backfill material where the sprayers will be constructed. Modelling indicates no impact to sensitive receptors and it is likely that mobilised contamination will move into the VDDC opencast. No actions are therefore required in the vicinity of the sprayers during mining except occasional removal of salt build-up and disposal at an appropriate facility.			
Opencast mining	Lowering of groundwater levels during mining	Dewatering of the surrounding aquifer as a result of pumping from the pit as opencast mining proceeds. Surrounding water users may experience a decrease in available volumes such as baseflow to rivers, borehole abstraction availability and dewatering of wetland areas.	Regional, depending on volume of water that is removed from surrounding aquifers	Significance	3	2.40	(2.1) 2.44	Separate clean and dirty water to limit the dirty water make. Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one kilometre surrounding the mine to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately.	Significance	2	0.27
				Magnitude - Spatial	3		2.45 2.46	Should surface water monitoring show that the Olifants River or its tributaries are affected by mine dewatering, discharge of clean water from the modular WTP (if implemented) into the watercourses should be considered. The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network should be audited every 5 years.	Magnitude - Spatial	1	
				Magnitude - Temporal	3		2.47 2.48	Update the numerical model using measured inflows, water levels and any potential future drilling and pump test information, to re-calibrate and refine the impact prediction. This should be done every 5 years during operation of the opencast Dewatering and groundwater abstraction for mining purposes should be monitored so as to prevent negative impacts on the underlying aquifer	Magnitude - Temporal	1	
				Probability	4		2.49	Areas in the opencast where the defunct underground is intersected could be sealed with blasted overburden with engineered designs to limit groundwater ingress	Probability	1	
SURFACE WATER											
Dust suppression on haul roads	Surface water quality	Pollution of surface water resources by spillage of dust suppression water into the watercourses, and contaminated runoff from these areas entering watercourses, with resultant deterioriation of water quality in terms of elevated salinity and sulfate	Local, depending on extent of dust suppressant used	Significance	3	2.40	2.50	Develop and implement a formal procedure for dust suppression to ensure that dust suppression application rates are carefully controlled to prevent the excessive application of water, ponding and excessive runoff of dust suppression water into the watercourses	Significance	2	0.80
				Magnitude - Spatial	3				Magnitude - Spatial	1	
				Magnitude - Temporal	3		2.51	No dust suppression should be carried out on surfaces that are already moist.	Magnitude - Temporal	3	
				Probability	4		2.52	Dust suppression with contaminated water should be confined to isolated dirty water management areas.	Probability	2	
Opencast pit and related infrastructure	Surface water quality	Pollution of surface water resources by contaminated stormwater runoff entering watercourses, contaminated seepage from overburden dumps, leakage of contaminated water from pipelines, erosion at clean canal discharge points, and clean water runoff entering the dirty water management area.	Local impact, depending on extent of contaminated discharge/spillage	Significance	5	3.20	2.53 2.54 (2.17)	All infrastructure areas with the potential to generate dirty storm water runoff, including washdown water will be located within the designated dirty water areas. Divert clean runoff around the designated dirty areas by means of cut-off canals, sized to accommodate at least the 1:50 year peak flow event Install and maintain adequate erosion protection at the clean canal discharge locations	Significance	3	1.33
				Magnitude - Spatial	4		2.55 2.56 2.57	Manage general and hazardous wastes according to the existing waste management plan for Wolvekrans Colliery. Inspect all pipeline routes regularly to enable early detection of leaks. Collect all contaminated storm water and dirty water generated at the proposed activities and pump to Vleishaft PCD, Re-use water, or evaporate at mechanical evaporators and treat surplus water at mobile WTP if required.	Magnitude - Spatial	4	
				Magnitude - Temporal	3		(2.1) 2.58	Divert runoff from clean catchments draining towards the Eastern overburden dump, around the dump. Implement an inspection and maintenance plan on the storm water system to ensure that all silt traps are maintained, and that storm water canals and pipelines remain unblocked and free flowing (monthly inspections will be carried out)	Magnitude - Temporal	3	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Probability	4		(2.5) 2.59	Spill-sorb or a similar type product must be kept on site and used to clean up hydrocarbon spills in the event that they should occur. Use the overburden material in the concurrent rehabilitation of the opencast pit.	Probability	2	
Transport of coal via haul roads for processing	Surface water quality	Spillage of contaminated water and coal particulates resulting in pollution of surface water resources	Local impact, depending on extent of contaminated discharge/spillage	Significance	2	1.60	(2.57)	The majority of haul roads is located within the dedicated dirty water management area, and haulage of coal will therefore take place within the dirty water management area. Runoff will drain either to the opencast pit or to Vleishaft PCD, where it will be contained.	Significance	1	0.93
				Magnitude - Spatial	3		2.60	All dirty water containment facilities should be designed, operated and maintained to have a risk of spill of 2% or less (1:50 year recurrence interval) in any one year.	Magnitude - Spatial	3	
				Magnitude - Temporal	3		2.61	As far as is practical, ROM coal should be allowed to drain within the pit before being loaded onto the haul trucks, to prevent spillage of water from the haul truck load boxes onto the haul roads.	Magnitude - Spatial	3	
				Probability	3		2.62	Loading of trucks will be carefully controlled to ensure that overloading will not take place.	Probability	2	
Forced evaporation at mechanical evaporation on SKS pit	Surface water quality	Wind-blown contamination results in the release of contaminated water into the catchment, with resultant deterioration in water quality. Salinisation of water to be evaporated over time due to combined evaporation of brine from WTP.	Localised, depending on extent of forced evaporation	Significance	3	2.93	2.63	Consideration to be given to temporarily halt mechanical evaporation during high wind conditions.	Significance	2	1.80
				Magnitude - Spatial	4		2.64	Where forced evaporation occurs over seeded areas, it is recommended that monitoring of soils by a soil specialist be undertaken.	Magnitude - Spatial	4	
				Magnitude - Temporal	4		2.65	Limit forced evaporation to spray only over pits. Where evaporators are in close proximity to watercourses (i.e. evaporators at SKS void) monitoring should be implemented and corrective action taken if monitoring show an impact on water quality	Magnitude - Temporal	3	
				Probability	4		2.66	Monitor salination of water managed through the evaporation system due to the combined evaporation with brine from the WTP and take corrective action if needed.	Probability	3	
Operation of the modular WTP	Surface water quality	Pollution of surface water resources by spillage of chemical additives, water treatment waste products, and discharge of water that does not meet the discharge standards.	Local impact, depending on extent of contaminated discharge/spillage	Significance	4	3.20	2.67 2.68	The modular WTP will be isolated within a designated dirty water management area and containerised. All spills from the WTP will be collected in a sump, from where water will be directed to the Vleishaft PCD or SKS Pit.	Significance	2	1.07
				Magnitude - Spatial	4		(2.10)	All chemicals and additives will be stored in dedicated bunded areas, where any spills will be contained.	Magnitude - Spatial	2	
				Magnitude - Temporal	4		2.69	An inspection and maintenance plan will be implemented to ensure that the water treatment plant and brine storage tanks always operate within specification.	Magnitude - Temporal	4	
				Probability	4		(2.18) 2.70	Discharge water quality will be continuously monitored for early detection of water quality non-compliant with the discharge standard. Should upset conditions occur, or poor discharge water quality be detected, the WTP discharge will be directed to the Vleishaft PCD or SKS Pit.	Probability	2	
Handling and storage of waste from the WTP	Surface water quality	Pollution of surface water resources by: - Spillage of brine onto the ground or into water resources - Inadequate containment where brine is stored - Leakage from containment facilities for brine	Local impact, depending on extent of contaminated discharge/spillage	Significance	4	3.20	2.71	Brine will be stored in existing closed tanks at the SKS pit and are located within the designated dirty water management area.	Significance	2	1.07
				Magnitude - Spatial	4		2.72	Spills will enter the SKS pit or will be pumped to the Vleishaft PCD.	Magnitude - Spatial	2	
				Magnitude - Temporal	4		(2.69)	An inspection and maintenance plan will be implemented to ensure that the water treatment plant and brine storage tanks always operate within specification.	Magnitude - Temporal	4	
				Probability	4				Probability	2	
Discharge of treated water from the modular WTP via wetland system into the Olifants River	Surface water quality	Release of surplus treated water into the catchment will influence the water quality of the receiving resource. Due to the current impacted state of the Olifants River, the quality of water due is expected to improve due to the dilution effects.	Downstream of treated water discharge point	Significance	4	3.20	(2.17)	Install and maintain dissipating structure at the discharge point as required. Install and maintain erosion protection measures at the discharge point.	Significance	4	3.20
				Magnitude - Spatial	4				Magnitude - Spatial	4	
				Magnitude - Temporal	4				Magnitude - Temporal	4	
				Probability	4				Probability	4	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		Some erosion may occur at the discharge point.									
	Surface water quantity (hydrology and lfow regimes)	Release of surplus treated water into the catchment will increase in yield, which is regarded as positive. The change in the water quantity of the receiving resource and may impact on the aquatic ecology by changing the seasonal flow patterns in the river system and also result in altered hydrology of the wetland into which the discarge form the Northern Canal takes place.	Catchment level impact	Significance	3	2.67	(2.18)	The quality of the water discharged will be closely monitored to ensure that it complies with the specified RQO at all times.	Significance	3	2.67
				Magnitude - Spatial	4				Magnitude - Spatial	4	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	4	
Isolation of dirty catchment as a result of containment of runoff from dirty water managemnet areas	Surface water quantity	Containment of runoff from dirty water management area alter the infiltration of the catchment, reduce the availability of water and change surface flow characteristics of wetlands.	Local, depending on treated water discharged into the Olifants River	Significance	3	2.67	2.73 2.74	The site layout has been designed to minimise the dirty footprint, and therefore to minimise the impact on the catchment yield. The site layout may not be changed without obtaining the necessary approvals. Rehabilitate areas no longer in use, or that will not be mined in future, to increase the footprint of the clean water management area from which clean runoff is discharged into the environment.	Significance	3	1.80
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	3	
		Change in flow resulting in change in aquatic ecosystem	Local, depending on size of disturbance	Significance	3	2.13	(2.1) 2.75	Divert clean runoff around the working areas Concurrent rehabilitation will take place as far as practicable, once the mining direction changes. Rehabilitated area will be shaped to be free draining.	Significance	3	1.60
				Magnitude - Spatial	2				Magnitude - Spatial	2	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	3	
		Local reduction in catchment yield (i.e. immediately downstream at the Witbank Dam)	0.24% reduction in MAR of Witbank Dam, which is 190x106 m3	Significance	3	1.33	2.76	Where rehabilitated areas are sloped towards the active opencast pit, berms and canals will be constructed to maximise the area that is free draining.	Significance	3	1.33
				Magnitude - Spatial	4				Magnitude - Spatial	4	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	2				Probability	2	
		Regional reduction in catchment yield (i.e. Loskop Dam)	0.11% reduction in MAR of Witbank Dam, which is 190x106 m3	Significance	2	0.80	2.77	Discharge treated water from the modular WTP to compensate for loss	Significance	2	0.80
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	2				Probability	2	
Mining and infrastructure development within floodlines	Flood events (surface water)	Flooding of mine or mine infrastructure during extreme flood events with an impact on mining operations	Localised, associated with the mining infrastructure (~1 400 ha)	Significance	3	1.33	2.78 2.79	No mining will take place within the 1:100 year floodline areas without the relevant authorisations, in terms of GN R704 exemptions and Section 21(c) and (i) water use licenses (in terms of the NWA). Conduct an investigation into the status of Attenuation Dam 1 dam wall, to determine any required upgrading or stabilisation to reduce the potential risk to mining in this area before mining commences.	Significance	3	0.93
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	1	
				Probability	2				Probability	2	
Discharge of mine impacted water to watercourses	Deterioiration in surface water quality	Pollution of surface water resources by runoff entering mining areas and coming into contact with carbonaceous material, and dirty runoff and mine water make discharging into the environment.	Localised, depending on stormwater management on site	Significance	4	3.20	(2.57) 2.80	Pumping of all dirty water generated at the VDDC workings and proposed infrastructure areas to Vleishaft PCD Reuse of dirty water in the operations at VDDC	Significance	3	1.33
				Magnitude - Spatial	4		2.81 2.82	Treatment of excess dirty water (water pumped from Vleishaft PCD to the mobile water treatment plant or evaporators). Provide water management facilities with a risk of spill that is lower than 2% in any one year as per the Golder water balance.	Magnitude - Spatial	4	
				Magnitude - Temporal	4		2.83	Continue with the surface water quality monitoring programme and expand the existing network as per the specialist recommendation.	Magnitude - Temporal	3	
				Probability	4		2.84	Implement a water balance monitoring programme to enable calibration of the water balance.	Probability	2	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
NOISE											
Opencast mining operations	Noise	Increased noise levels	Predicted increase in noise levels are expected to result in 'little' reaction with 'sporadic' complaints from Noise Sensitive Receptors R2, R3 and R8 during the night and 'medium' reaction with 'sporadic' to 'widespread' complaints from R7 during the night	Significance	3	2.40	2.85	Keep all diesel-powered equipment and plant vehicles at a high level of maintenance. This should particularly include the regular inspection of, and if necessary, the replacement of, intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.	Significance	2	1.40
				Magnitude - Spatial	3		2.86 2.87	Continue selecting equipment with lower sound power levels. 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 (i) Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program; (ii) Maintain road surface regularly to avoid corrugations, potholes etc; (iii) Avoid unnecessary idling times.	Magnitude - Spatial	2	
				Magnitude - Temporal	3		2.88	Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.	Magnitude - Temporal	3	
				Probability	4		2.89	A complaints register must be kept on site.	Probability	3	
VISUAL											
Operation and increase in height of stockpiles, storing of wastes on site	Visual	Stockpiles will increase in size, increasing in visibility over time. Vehicle movement and evaporators will also be visible.	At completion of structures, visual impact will reach some 8-9km from the structures	Significance	3	3.33	(2.27)	Topsoil stockpiles should be vegetated where possible to lessen the visual intrusion	Significance	3	3.33
				Magnitude - Spatial	3		2.90	Ensure all stockpiles are placed away from surface water and drainage lines where possible	Magnitude - Spatial	3	
				Magnitude - Temporal	4		(2.30)	Monitor and fix any erosion in the landscape or on stockpiles	Magnitude - Temporal	4	
							2.91	Ensure that operations are undertaken in line with the GNR1147 Annual Rehabilitation Plan.			
				Probability	5		(2.27)	Topsoil stockpiles should be vegetated where possible to lessen the visual intrusion	Probability	5	
AIR QUALITY											
Operation of surface infrastructure associated with opencast mining e.g. stockpiles and overburden dumps, as well as driving on unpaved roads.	Air quality	Increased particulate matter (PM10) as a result of operational activities associated with infrastructure management, including stockpiles and overburden dumps.	At 2041: Emission rate of 63 tpa. Daily non-compliance of PM10 within 6 km of the mining operations Annual non-compliance of PM10 within 5 km of the mining operations.	Significance	3	2.40	2.92	Regular wetting of exposed areas and haul ramps	Significance	3	2.40
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	4	
		Increased particulate matter (PM2.5) as a result of operational activities associated with infrastructure management, including stockpiles and overburden dumps.	At 2041: Emission rate of 165 tpa. Simulated PM2.5 complied with daily limit.	Significance	2	1.87	2.93	Water sprays and/or chemical stabilisation of on- and offsite haul roads	Significance	1	1.60
				Magnitude - Spatial	2				Magnitude - Spatial	2	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	4	
		Increased dust generation as a result of operational activities associated with infrastructure management, including stockpiles and overburden dumps.	At 2041: Calculated emission rate of 452 tpa	Significance	2	1.60	2.94	Water sprays on drilling operations	Significance	1	1.33
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	4	
Opencast mining activities	Air quality	Increased particulate matter (PM10) generated from operational activities associated with opencast mining.	At 2041: Calculated emission rate of 30 tpa.	Significance	3	2.13	2.95	Regular wetting of exposed areas and haul ramps. Water sprays and/or chemical stabilisation of haul roads. Enclosure or covering of haul trucks.	Significance	3	1.60
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	2				Magnitude - Temporal	2	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Probability	4		2.96	Reduce the drop height of the dragline	Probability	3	
		Increased particulate matter (PM2.5) generated from operational activities associated with opencast mining.	At 2041: Emission rate of 165 tpa. Simulated PM2.5 complied with daily limit.	Significance	3	2.13			Significance	3	1.60
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	4				Probability	3	
		Increased dust generation as a result of operational activities associated with opencast mining.	At 2041: Calculated emission rate of 426 tpa	Significance	2	1.33	2.97	Rehabilitation and revegetation of the mined areas as soon as practical, with the option of using watering to suppress dust emissions during dry and windy conditions	Significance	1	0.80
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	4				Probability	3	
SOCIAL ENVIRONMENT											
Opencast mining operations	Social environment	Employment opportunities, procurement and inflow of workers	Local	Significance	1	1.40	2.98	Give preference to communities within close proximity to the mining activities if any new employment opportunities are created	Significance	2	1.60
				Magnitude - Spatial	3		2.99	Procurement and recruitment of individuals should be undertaken through formalised structures and according to processes that are in line with international best-practice standards.	Magnitude - Spatial	3	
				Magnitude - Temporal	3		2.1	Procurement of goods, services, material and equipment should be focused on the local area where economically feasible	Magnitude - Temporal	3	
				Probability	3		2.101	Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration	Probability	3	
		Inflow of jobseekers		Significance	2	1.60	2.102	The communication strategy with regards to the recruitment process and use of contractors to the local residents should ensure that unrealistic employment expectations are not created	Significance	2	1.07
				Magnitude - Spatial	3		(2.98)	Maximise the use of local labour if required and where possible	Magnitude - Spatial	3	
				Magnitude - Temporal	3		2.103	South32 should support efforts of the ELM to limit in-migration to the area and the subsequent development or extension of informal settlements in the area	Magnitude - Temporal	3	
				Probability	3		(2.101)	Sub-contractors should adopt a recruitment policy to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration	Probability	2	
		Impact on daily living and movement patterns		Significance	2	1.60	(2.4)	Strict adherence by contractors to mine driving rules should be enforced	Significance	2	1.07
				Magnitude - Spatial	3		2.104	Disciplinary action for reckless driving within the mining area should be implemented	Magnitude - Spatial	3	
				Magnitude - Temporal	3		(2.4)	Strict adherence by contractors to mine driving rules should be enforced	Magnitude - Temporal	3	
				Probability	3				Probability	2	
		Residential proximity and possible relocation		Significance	3	2.40	2.105	Adhere to mitigation measures proposed by specialist and relevant regulations to limit noise and dust pollution	Significance	3	1.80
				Magnitude - Spatial	3		2.106	Heavy vehicles should be in good working order to limit any noise and dust pollution	Magnitude - Spatial	3	
							(2.4)	Dust suppression methods should be strictly implemented			
				Magnitude - Temporal	3		2.107	Possible negative impacts on the surrounding landowners and nearby residents should be limited to minimise any possible negative impacts on these residents' quality of life.	Magnitude - Temporal	3	
				Probability	4		2.108	Also refer to mitigation measures for impact for sense of place, safety and security risks, health risks, and noise related impacts	Probability	3	
		Impact on Agricultural Activities		Significance	3	2.40	2.109	Effective management of the mining activities associated with the infrastructure development would be required to avoid any	Significance	3	1.80
				Magnitude - Spatial	3				Magnitude - Spatial	3	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Magnitude - Temporal	3			environmental pollution (e.g. water) and limiting any increase in dust levels.	Magnitude - Temporal	3	
				Probability	4				Probability	3	
		Impact on Sense of Place		Significance	3	2.40	2.110	Undertake appropriate site management as stipulated in the EMPr to limit the visual impact	Significance	3	1.80
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	3	
		Safety and Security Risks		Significance	3	1.80	2.111	Risks of accidents should be recognised. Safety training should again be implemented focused on the designated drivers (employees) of heavy vehicles. The mine driving rules should be adhered to.	Significance	3	1.20
				Magnitude - Spatial	3		2.112 2.113	Strict codes of conduct should be implemented for personnel operating heavy and light vehicles to minimize traffic hazards within the mining area Construction and upgrade of roads within the mining area should be done in a manner which would facilitate safe and efficient movement of material, employees, as well as other mining vehicles	Magnitude - Spatial	3	
				Magnitude - Temporal	3		2.114 2.115	Maintain roads to ensure safety Emergency procedures should be established that provide immediate response should an accident occur within the mining area	Magnitude - Temporal	3	
				Probability	3		2.116	Appropriate firefighting equipment should be on site and construction workers, as well as permanent employees should be appropriately trained for fire fighting.	Probability	2	
		Health Risks		Significance	3	1.80	2.117 (2.4)	Gaseous emissions should be minimised through proper operation and maintenance of vehicles Implement dust suppressant measures on roads within the mining area.	Significance	3	1.20
				Magnitude - Spatial	3		(2.4) 2.118	Vehicles should be in a good working order and adhere to mine driving rules. Fugitive dust emissions should be controlled through the implementation of appropriate mitigation measures e.g. ongoing rehabilitation	Magnitude - Spatial	3	
				Magnitude - Temporal	3		2.119	Possible negative impacts on the surrounding landowners and nearby residents should be limited by ensuring that health risks are minimised and mitigation measures are implemented as stipulated in the Air Quality Impact Assessment and EMPr	Magnitude - Temporal	3	
				Probability	3				Probability	2	
		Noise Related Impacts		Significance	2	1.40	2.121	Mitigation measures to limit any increase in noise as recommended by the noise specialist should be adhered to.	Significance	2	0.93
				Magnitude - Spatial	2				Magnitude - Spatial	2	
				Magnitude - Temporal	3		(2.89)	Keep a complaint register	Magnitude - Temporal	3	
				Probability	3				Probability	2	
BLASTING											
Blasting activities associated with opencast mining	Blasting	Ground vibration	Perceptible levels of vibration that may be experienced up to 3375 m, unpleasant up to 1527 m and intolerable up to 651 m.	Significance	4	2.67	2.122 2.123 2.124 2.125	Do blast design that considers the actual blasting and the ground vibration levels to be adhered to. Only apply electronic initiation systems to facilitate single hole firing. Consider design for smaller diameter blast holes that will use fewer explosives per blast hole. Relocate the POI / acquire the POI of concern – mined owned.	Significance	3	1.60
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	2	
				Probability	4				Probability	3	
		Air blast	Levels predicted for the maximum charge ranges between 111.5 and 147.6	Significance	4	2.00	2.126	Use proper charging methodology irrespective of the blast hole diameter and patterns used	Significance	3	1.80
				Magnitude - Spatial	3				Magnitude - Spatial	3	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
			dB for all the POI's considered	Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	3				Probability	3	
		Fly rock	Minimum unsafe zone is 365 m	Significance	4	2.67			Significance	3	1.60
				Magnitude - Spatial	3				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	2	
				Probability	4				Probability	3	

DECCOMMISIONING, CLOSURE AND POST-CLOSURE PHASE

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
WETLANDS											
Use and maintenance of machines, vehicles and equipment.	Water quality impairment and deterioration of wetlands	Sedimentation from rehabilitated areas. Spills and leaks from machinery, equipment and vehicles will also impact on water quality of wetlands.	To be determined at decommissioning	Significance	3	2.40	3.1 3.2	Make use of existing access routes where possible. Any possible spills of hydrocarbons, concrete or concrete water must be avoided. Spill kits containing spill-sorb or a similar type product must be available and on hand to clean these spills before infrastructure is demolished.	Significance	3	1.80
				Magnitude - Spatial	3		3.3 3.4	Where applicable, hazardous materials must be stored in leak-proof, sealable containers or packaging. Materials must also be stored in bunded areas which can accommodate the required volumes. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when leaking or when being serviced.	Magnitude - Spatial	3	
				Magnitude - Temporal	3		3.5 3.6	No servicing of equipment on natural or rehabilitated areas. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.	Magnitude - Temporal	3	
				Probability	4		3.7 3.8	All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages. All contaminated soil shall be removed and be placed in containers. Contaminated soil may only be disposed of in a licenced facility placed on the discard facilities prior to their rehabilitation.	Probability	3	
Shaping and contouring of the area to achieve final land use	Altered and lost hydrodynamics and flow regime for the catchment area	The sloping and landscaping will restore to some extent the hydrodynamics of the catchment, but this will not be natural.	To be determined at decommissioning	Significance	3	2.67	3.9	Decommission cut-off berms,drains and other stormwater management structures last to restore surface flow dynamics	Significance	3	1.80
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	4				Probability	3	
General decommissioning and rehabilitation including decommissioning of water management infrastructure	Deterioration of wetland areas	Exposed soils during decommissioning of infrastructure are susceptible to wind and runoff erosion, resulting in sedimentation of wetands.	To be determined at decommissioning	Significance	3	2.00	3.10 3.11 (3.9)	Separate clean and dirty water. Develop and implement a storm water management plan for the decommissioning phase. Implement dust suppression measures. Decommission cut-off berms and drains last to restore surface flow dynamics.	Significance	2	1.60
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	3				Magnitude - Temporal	3	
				Probability	3				Probability	3	
AQUATIC ECOSYSTEM											
Decommissioning of surface infrastructure associated with opencast mining	Change in water quality resulting in deterioration of aquatic ecosystem	Increased dissolved solids, increased dissolved metals, alteration of pH, increased suspended solids	Local, depending on extent of spills/ potential erosion	Significance	5	3.73	3.12 3.13 3.14 3.15	Heavy vehicles must not be allowed to indiscriminately drive within riparian habitats. Any watercourse crossings of roads must be outside of the riparian and instream areas, unless authorised. Rehabilitate diversion berms and/or trenches where they are no longer required Rip and re-vegetate the disturbed areas as soon as possible.	Significance	3	0.73
				Magnitude - Spatial	4				Magnitude - Spatial	3	
				Magnitude - Temporal	5				Magnitude - Temporal	5	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
				Probability	4		3.16	Implement appropriate water treatment measures after decommissioning, which could include passive measures	Probability	1	
FLORA & FAUNA											
Decommissioning and rehabilitation activities	Vegetation and habitat quality	Continued encroachment by alien invasive plant species, as well as erosion due to disturbed soils.	To be determined at decommissioning	Significance	4	2.93	3.17 (3.1)	Highly sensitive areas outside of the project area, including the Olifants River, should be declared a no-go area and access to this area must be prevented as far as possible. Where possible, existing access routes and walking paths must be made use of, and the development of new routes limited;	Significance	3	1.40
				Magnitude - Spatial	3		3.18	All laydown, storage areas etc should be restricted to within the disturbed mining area	Magnitude - Spatial	2	
				Magnitude - Temporal	4		3.19	Compile and implement an alien vegetation management plan. The use of herbicide needs to be monitored and only be used by a qualified person as several species that are protected by the Mpumalanga Schedule 11 was recorded; and	Magnitude - Temporal	2	
				Probability	4		3.20	Appropriate fire breaks should be implemented to restrict the impact fire might have on the endangered vegetation	Probability	3	
Decommissioning and rehabilitation activities	Faunal habitat quality	Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing disturbances (noise, dust and vibrations).	To be determined at decommissioning	Significance	3	3.00	3.21	Two SCCs were observed on the project area: Serval (*Leptailurus serval*) and Cape Clawless Otter (*Aonyx capensis*), an ad hoc monitoring programme should be implemented with sightings recorded for these two species to specifically monitor their breeding success and distribution.	Significance	3	1.40
							3.22	An appropriate waste management plan must be developed for the decommissioning phase			
				Magnitude - Spatial	3		3.23 3.24	No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals; Noise and vibrations must be kept to a minimum to reduce the impact of the development on the fauna residing on the site	Magnitude - Spatial	2	
				Magnitude - Temporal	3		3.25	Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered;	Magnitude - Temporal	2	
				Probability	5		3.26 (3.7)	Wherever possible, corridor areas (which links the CBA, ONA and ESAs to the north) must be established to facilitate the movement of wildlife within and between any natural areas; All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas.	Probability	3	
SOILS, LAND CAPABILITY AND LAND USE											
Rehabilitation of VDDC infrastructure project sites and opencast area	Soils and land capability	Positive impact: Rehabilitation of soil, land capability and land use by replacing stockpiled soils over disturbed areas and bringing back a form of land	To be determined at decommissioning	Significance	1	1.00	3.27 3.28	Ensure that the rehabilitation changes the land use from mining back to grazing. The spoil should be shaped taking the pre-mining landscape into consideration	Significance	3	1.40
				Magnitude - Spatial	1		3.29	The designed post mining landforms should be modelled to establish the post mining landscape	Magnitude - Spatial	1	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		capability that can support an alternative end use					3.3	stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil			
				Magnitude - Temporal	3		3.31 3.32	Soil compacted under stockpiles to be ripped at least 600mm deep and rehabilitated as per the end land use requirements The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis	Magnitude - Temporal	3	
				Probability	3		3.33	The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment	Probability	3	
GROUNDWATER											
Opencast Mining	Discharge of contaminated mine water after mining (decant)	Contaminated water may impact surrounding watercourses	Surface decant elevation is approximately 1 530 mamsl, with a discharge volume of approximately 0.5 ℓ/s.	Significance	4	2.93	3.34 3.35 3.36 3.37 3.38 3.39	Following mine closure and rehabilitation of the pit, the backfill will form an artificial aquifer which is likely to discharge. A decant management plan should be developed and should include measures such as the containment of seepage or decant water in appropriate facilities. All sulfate-containing waste material should be stored at the bottom of the opencast pit and should be left to be flooded as soon as possible to exclude oxygen. Backfill material should be compacted and surface water flow should be routed around the backfillled opencast to reduce recharge to a maximal extent. Groundwater monitoring boreholes should be sited at designated positions based on infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended. The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network should be audited during each occasion. The water level in the backfilled opencast should be controlled by pumping to not exceed 1530mamsl to prevent decant. The water level in the pit should be maintained approximately 5m below the sub-surface discharge elevation as a safe management level. Alternatively, an interception trench must be constructed to capture contaminated subsurface seepage.	Significance	2	0.53
				Magnitude - Spatial	2				Magnitude - Spatial	1	
				Magnitude - Temporal	5				Magnitude - Temporal	1	
				Probability	4				Probability	2	
Waste management and storage during decommissioning	Groundwater quality	Potential deterioration in quality of baseflow to rivers and water abstracted from boreholes as a result of seepage from the following facilities:	To be determined at decommissioning	Significance	4	2.93	3.40 3.41 3.42	Vleishaft PCD, mechanical evaporators (and associated salt build-up), to be removed and the area remediated the area as per the rehabilitation plan. Capping of the final rejects dump must be implemented as per approved rehabilitation designs	Significance	3	0.60
				Magnitude - Spatial	3				Magnitude - Spatial	2	
				Magnitude - Temporal	4				Magnitude - Temporal	4	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		- Mechanical evaporators - Final Rejects Dump - Vleishaft Dam PCD		Probability	4			Maintain monitoring and contaminated seepage management at the final rejects dump to minimise contamination of groundwater.	Probability	1	
SURFACE WATER											
General decommissioning and rehabilitation including decommissioning of water management infrastructure	Surface water quality	Pollution of surface water resources as a result of: - Erosion of soils during rainfall events resulting in elevated suspended solids in watercourses - Hydrocarbon spillages from machinery, vehicles, and equipment.	To be determined at decommissioning	Significance	2	1.87	(3.1) (3.17) (3.9)	Minimise the disturbed footprint area as far as possible. Delineate "no-go" zones where the decommissioning activities are near the Olifants River Decommission the storm water management measures last, if at all, to ensure adequate storm water management during the rehabilitation phase.	Significance	1	0.67
				Magnitude - Spatial	3		(3.4) (3.3) (3.2) 3.43	Equipment, machinery, and vehicles will only be serviced in dedicated areas that are bunded and equipped with drip trays Hazardous material to be stored in sealable containers within bunded areas Spill-sorb or a similar product will be kept on site and used to clean up hydrocarbon spills in the event that they should occur. Erosion protection measures will be implemented at steep areas as determined by a surface water specialist.	Magnitude - Spatial	2	
				Magnitude - Temporal	2		(3.22) (3.2) (3.8)	A waste management plan will be developed for the decommissioning phase, which will include the handling of contaminated materials / soils found on site. All traces of hydrocarbons and residual waste will be removed before infrastructure is demolished. Contaminated soils will be excavated and placed on the discard facilities prior to their rehabilitation or removed from site by an appropriately licensed waste contractor.	Magnitude - Temporal	2	
				Probability	4		3.44 3.45 3.46	An appropriate sewage management strategy will be implemented during the decommissioning phase. Water quality monitoring will be undertaken downstream of the decommissioning areas, before and during decommissioning where practical, in order to detect any increase in suspended solids or turbidity. If erosion is evident, or the water quality monitoring indicates an increase in suspended solids, water management around the decommissioning areas will be reviewed.	Probability	2	
Decant of mine water make	Surface water quality	Pollution of surface water resources by decanting acid mine drainage. The water balance indicates that an average water make in the order of 5 800 m^3/day can be expected. Based on a sulfate concentration of around 3	To be determined at decommissioning	Significance	4	4.00	3.47	The pit will be backfilled without a final void, rehabilitated and made free draining in order to minimise the post closure water make.	Significance	4	1.60
				Magnitude - Spatial	4		3.48	Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes.	Magnitude - Spatial	4	
				Magnitude - Temporal	4		(3.34)		Magnitude - Temporal	4	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		000 mg/ℓ, this equates to around 17.4 tons SO_4 per day, or around 6 351 tons SO_4 per year.		Probability	5			A water management strategy, including a decant management plan will be developed five (5) years prior to mine closure which will consider passive treatment.	Probability	2	
NOISE											
Decommissioning and rehabilitation activities	Noise	Increased noise levels	To be determined at decommissioning	Significance	3	2.13	3.49	Keep all diesel-powered equipment and plant vehicles at a high level of maintenance. This should particularly include the regular inspection of and, if necessary, the replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.	Significance	2	1.20
				Magnitude - Spatial	3		3.50 3.51	Select equipment with lower sound power levels. 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 (i) Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program; (ii) Maintain road surface regularly to avoid corrugations, potholes etc; (iii) Avoid unnecessary idling times.	Magnitude - Spatial	2	
				Magnitude - Temporal	2		3.52	Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.	Magnitude - Temporal	2	
				Probability	4		3.53	A complaints register must be kept.	Probability	3	
VISUAL											
Decommissioning and rehabilitation activities	Visual	Positive impact: Decommissioning/dismantling of infrastructure and replacing stockpiled soils over disturbed areas and returning to a natural mimicking topography that can support an alternative end use	To be determined at decommissioning	Significance	1	1.00	3.54	Ensure that rehabilitation takes place in line with the Land and Rehabilitation Management Plan (Old_Wvk_Prod_Sop_035) for Wolvekrans, or the rehabilitation plan developed in terms of GNR1147.	Significance	2	1.60
				Magnitude - Spatial	1		3.55	Ensure that all unnecessary infrastructure/dumps or stockpiles are demolished/removed.	Magnitude - Spatial	3	
				Magnitude - Temporal	3		3.56	Rehabilitate all areas where infrastructure/stockpiles/dumps have been removed.	Magnitude - Temporal	3	
				Probability	3				Probability	3	
AIR QUALITY											
Rehabilitation of VDDC infrastructure and opencast area	Air quality	Increased particulate matter (PM10) as a result of decommissioning and rehabilitation activities	To be determined at decommissioning	Significance	2	1.40	3.57	Regular wetting of exposed areas, temporary stockpiles and haul ramps.	Significance	2	1.20
				Magnitude - Spatial	3				Magnitude - Spatial	2	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	3				Probability	3	
		Increased particulate matter (PM2.5) as a result of decommissioning and rehabilitation activities		Significance	1	1.00	3.58	Chemical stabilisation of on- and offsite haul roads.	Significance	1	0.80
				Magnitude - Spatial	2				Magnitude - Spatial	1	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	3				Probability	3	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	SIZE & SCALE	PRE-MITIGATION	Score	Rating	Ref	MITIGATION	POST-MITIGATION	Score	Rating
		Increased dust generation as a result of decommissioning and rehabilitation activities		Significance	1	0.80	3.59	Rehabilitation and revegetation of the cleared areas as soon as practical, with the option of using watering to suppress dust emissions during dry and windy conditions.	Significance	1	0.80
				Magnitude - Spatial	1				Magnitude - Spatial	1	
				Magnitude - Temporal	2				Magnitude - Temporal	2	
				Probability	3				Probability	3	