6.9 Fauna

This section is based on information provided by the terrestrial ecology specialist, 3Foxes Biodiversity Solutions (refer to the Terrestrial Ecology Impact Assessment, Appendix 11F).

6.9.1 Mammals

More than 1700 faunal images were captured (with camera traps) over the course of two sampling periods. Twenty-two terrestrial mammals were confirmed present in the study area including: Steenbok *Raphicerus campestris*, Duiker *Slyvicapra grimmia*, Cape porcupine *Hystrix africaeaustralis*, African Wild Cat *Felis silvestris*, Cape Fox *Vulpes chama*, Bat-eared Foxes *Otocyon megalotis*, Honey Badger *Mellivora capensis*, Striped Polecat *Ictonyx striatus*, Aardvark *Orycteropus afer*, Cape Hare *Lepus capensis*, Caracal *Caracal caracal*, Small Spotted Genet *Genetta genetta*, Yellow Mongoose *Cynictis penicillata*, Cape Grey Mongoose *Galerella pulverulenta*, Water Mongoose *Atilax paludinosus*, and Meerkat *Suricata suricatta*. A number of small mammals were captured in the Sherman Traps or in the pitfalls and include Lesser Dwarf Shrew *Suncus varilla*, Four-striped Grass Mouse *Rhabdomys pumilio*, Bush Vlei Rat *Otomys unisulcatus* and Hairy-footed Gerbil *Gerbillurus paeba*.

The relative abundance of the larger mammals is dominated by Steenbok, Common Duiker and Cape Porcupine with Cape Fox and African Wild Cat the most common predators (Figure 61). Notable species observed include the Honey Badger, Small Spotted Genet and Water Mongoose (Figure 62). The Water Mongoose is common across the area despite the fact that there is little perennial water available. The Water Mongoose are most likely using the coast as their main movement corridor. Genet use the taller Strandveld vegetation on deep sands for cover. Although Honey Badger were previously red-listed, they have been revised to *Least Concern* in the latest red-list assessment but are nevertheless uncommon mammals which occur at a low density.

There do not appear to be any significant differences between the mammalian community structure in the study area and the broader area. This is expected as the range of habitats is similar. The only discernible spatial patterns that were observed was that Cape Hare and Suricate were observed only within areas of short Strandveld on shallow soils. It is not clear why Cape Hare avoided these areas, but for Suricate, this is most likely related to the lack of suitable burrow sites within the areas of deep soils. There are no specific faunal habitats of high sensitivity within Farm Geelwal Karoo 262.

The beaches appear to be important for several predators such as African Wild Cat and Black-backed Jackal which regularly visit the beaches to look for carrion. Both the Cape Golden Mole *Chrysochloris asiatica* and the Namib Golden Mole *Eremitalpa granti* (*Vulnerable*) could occur at the site and it was not possible to ascertain which species was present although it is more likely that it is the Cape Golden Mole.

In 2012 a Brown Hyaena *Hyaena brunnea* (*Near Threatened*) was found killed on the road east of the Olifants River Estuary and it is considered likely that a small population still exists in this area, especially towards the north of the Estuary (Birdlife SA). This species was not captured by the camera traps and, although it may be present, it would be very rare and occur at a very low density.

Figure 61: The most common herbivores at Farm Geelwal Karoo 262 are Steenbok, Duiker and Porcupine, and the most abundant predators are African Wild Cat, Cape Fox and Bat-eared Fox

Source: 3Foxes Biodiversity Solutions, 2018

Figure 62: Species that were not previously recorded in the area or which were unexpectedly abundant include the Honey Badger, Small-spotted Genet and Water Mongoose

Source: 3Foxes Biodiversity Solutions, 2018

6.9.2 Reptiles

According to the South African Reptile Conservation Assessment database and du Preez and Carruthers (2009), the study area falls within the distribution range of at least 58 reptiles, comprising 5 chelonians, 23 snakes, 24 lizards and skinks, 12 geckos and 1 chameleon. Of these, 11 were confirmed present including several of the West Coast endemics. Species observed include common tortoises, lizards and snakes such as Angulate Tortoise *Chersina angulata*, Cross-marked Grass Snake *Psammophis crucifer*, Karoo Girdled Lizard *Karusasaurus polyzonus*, Cape Skink *Trachylepis capensis*, Variegated Skink *Trachylepis variegata* and Spotted Sand Lizard *Pedioplanis lineoocellata*. Several West Coast endemics were also confirmed present including Gronovi's Dwarf Burrowing Skink *Scelotes gronovii*, Southern Blind Legless Skink *Typhlosaurus caecus*, Austen's Gecko *Pachydactylus austeni* and the Western Dwarf Chameleon *Bradypodion occidentale*

(Figure 63). While these species are restricted to sandy coastal habitats, Gronovi's Dwarf Burrowing Skink is of most significance and is listed as *Near Threatened*.

Figure 63: Notable reptiles and amphibians observed at the site include, clockwise from top left, Gronovi's Dwarf Burrowing Skink, Austen's Gecko, Namaqua Rain Frog and Southern Blind Legless Skink

Source: 3Foxes Biodiversity Solutions, 2018

Species that have previously been recorded but were not observed include the Spiny Ground Agama *Agama hispida*, the Speckled Padloper *Homopus signatus*, and the Puffadder *Bitis arietans arietans*.

6.9.3 Amphibians

Only the Namaqua Sand Frog was detected at the site during fieldwork. Given the scarcity of surface water at the site and in the wider area, it is not surprising that only species independent of water were detected. The density of Namaqua Sand Frogs appears to be relatively high as it was captured multiple times in different pitfall traps. The only other species that is likely to be present is the Karoo Toad *Vandijkophrynus gariepensis* but, as this species requires standing water for breeding, it is not likely to be abundant in the study area as there are no suitable breeding sites near the study area.

6.9.4 Avifauna

Approximately 188 terrestrial and coastal bird species have been recorded in the study area and surrounds (including the Olifants River Estuary), based on data obtained from the Southern African Bird Atlas Project 1 (SABAP 1), and more recently the Southern African Bird Atlas Project 2 (SABAP 2,). Of this total, 19 species (10%) are considered endemic and 30 (16%) near-endemic to South Africa (Taylor et al., 2015), while 12 species (6%) are listed as *Threatened* and six (3%) as *Near Threatened*. A total of 60 bird species were recorded during the site visit.

The landscape of the area is dominated by a flat to slightly undulating coastal peneplain, with coastal areas featuring mostly small sandy beaches interspersed with low rocky shores. These distinguishable features of the landscape represent the two primary avifaunal habitats, namely (i) the Strandveld shrubland of the interior sandy plains, and (ii) the coastal shore (high-water mark to the offshore surf).

Avifaunal Community of the Strandveld

The interior plains of the study area support succulent-dominated Strandveld. The habitat supports a fair diversity of bird species (~ 80 species) comprising mostly small passerines (~ 52 species, 65%). While none of

these passerines are red listed, 14 species are endemic and 19 near-endemic to South Africa (Taylor et al., 2015).

The most commonly encountered and typical species include the following: Bokmakierie *Telophorus zeylonus*, Karoo Prinia *Prinia maculosa*, Grey-backed Cisticola *Cisticola subruficapilla*, Karoo Scrub-robin *Cercotrichas coryphoeus*, Pied Starling *Lamprotornis bicolor*, African Stonechat *Saxicola torquatus*, Yellow Canary *Crithagra flaviventris*, Anteating Chat *Myrmecocichla formicivora*, Cape Long-billed Lark *Certhilauda curvirostris*, Southern Double-collared Sunbird *Cinnyris chalybeus*, Bar-throated Apalis *Apalis thoracica*, White-throated Canary *Crithagra albogularis*, Cape Weaver *Ploceus capensis*, Cape Bulbul *Pycnonotus capensis*, Karoo Lark *Calendulauda albescens*, and Chat Flycatcher *Bradornis infuscatus*.

Non-passerines make up a third (35%) of all shrubland species, with the following of particular importance (with red list status): the *Endangered* Ludwig's Bustard *Neotis ludwigii*, Black Harrier *Circus maurus* and Martial Eagle *Polemaetus bellicosus*, the *Vulnerable* Southern Black Korhaan *Afrotis afra*, Lanner Falcon *Falco biarmicus*, and Secretarybird *Sagittarius serpentarius*, and the *Near Threatened* Kori Bustard *Ardeotis kori* (Figure 64).

No sensitive or unique areas with respect to foraging, breeding or roosting were identified within the Strandveld habitat, although most of the above red listed species utilise the habitat to varying degrees. There are also no terrestrial Important Bird Areas (IBAs), Coordinated Avifaunal Roadcount routes (CAR) or Coordinated Waterbird Count sites (CWAC) near the proposed inland mining areas. The nearest IBA is the Olifants River Estuary approximately 20 km south, which is also a registered CWAC site. This would not be affected by the proposed project.

Figure 64: Kori Bustard (left) and Secretarybird (right)

Source: 3Foxes Biodiversity Solutions, 2018

Avifaunal Community of the Coastal Shore

The coastal zone is characterised mainly by low rocky shores (Figure 65) and associated kelp beds, interspersed by numerous sandy beaches. Approximately 35 bird species are almost exclusively associated with the coastal shore, including cormorants, gulls, terns, oystercatcher (Figure 66) and resident and migratory shorebirds. These are all non-passerine species with a very low incidence of endemism, yet a relatively high number are red listed (9 species, 25%).

The most commonly encountered species throughout the year include the Endangered Cape Cormorant *Phalacrocorax capensis*, White-breasted Cormorant *Phalacrocorax carbo*, Hartlaub's Gull *Larus hartlaubii*, Kelp Gull *Larus dominicanus*, White-fronted Plover *Charadrius marginatus*, Swift Tern *Sterna bergii*, Grey Heron *Ardea cinerea*, and African Black Oystercatcher *Haematopus moquini*. The latter is no longer red listed as numbers have increased by 37% since 1980, while its population has experienced an eastward range expansion (Taylor *et al*., 2015). Red listed species which are uncommon include the *Endangered* Bank Cormorant *Phalacrocorax neglectus*, the Vulnerable Cape Gannet *Morus capensis*, and the *Near Threatened* Crowned Cormorant *Phalacrocorax coronatus*.

Figure 65: Rocky shore habitat used for roosting and foraging

Source: 3Foxes Biodiversity Solutions, 2018

Figure 66: A pair of African Black Oystercatchers

Source: 3Foxes Biodiversity Solutions, 2018

In summer the local avifauna is augmented by a number of migratory shorebirds, the most common being Common Greenshank *Tringa nebularia*, Curlew Sandpiper *Calidris ferruginea*, Common Whimbrel *Numenius phaeopus*, Grey Plover *Pluvialis squatarola*, Little Stint *Calidris minuta*, Sanderling *Calidris alb*), Ruddy Turnstone *Arenaria interpres*, and Ruff *Philomachus pugnax*. These species use both sandy beaches and rocky shores for foraging during their annual migrations (Hockey *et al*., 2005). Migratory terns also use the rocky shores and beaches for loafing in mixed flocks. A flock of nearly 500 terns containing mostly Common Tern (~ 250), Swift Tern (~ 100) and Sandwich Tern (~ 50) was observed on Beach 7 during the site visit in May 2017 (Figure 67). However, such aggregations are of a temporary nature related to the proximity of dynamic food resources, and hence not restricted to specific sites.

Figure 67: A large mixed flock of terns resting on the beach, accompanied by Kelp Gulls

Source: 3Foxes Biodiversity Solutions, 2018

There are no known breeding colonies for any of the three cormorant species near the study area (Taylor et al., 2015). Only a few cormorant roosts were noted during the site visit, but these contained few birds and were recorded on low rocks near breaking waves (Figure 68). The largest and most prominent cormorant roost was located to the south of the proposed beach mining area, approximately 5 km north of the processing plant (S 31°31'00", E 18°03'00"). No highly sensitive avifaunal habitats were identified in the study area, particularly with respect to communal breeding sites. The absence of large boulders, separated from the mainland by inter-tidal waters at low tide, is perhaps the primary reason for the absence of cormorant breeding sites and permanent tern roosting sites.

Figure 68: A small group of Cape Cormorants perched on low rocks

Source: 3Foxes Biodiversity Solutions, 2018

The Olifants River Estuary to the south of the study area frequently supports the *Near Threatened* Greater Flamingo *Phoenicopterus ruber* and Lesser Flamingo *Phoenicopterus minor*, the *Vulnerable* Caspian Tern *Sterna caspia* and Great White Pelican *Pelecanus onocrotalus*, and the *Endangered* African Marsh Harrier *Circus ranivorus*. The *Critically Endangered* Damara Tern *Sterna balaenarum* has also been recorded foraging in the estuary (Marnewick *et al*., 2015), although has not been recorded breeding (Taylor *et al*., 2015). The proposed activities are, however, some distance from the Estuary. Sometimes flamingos use mining voids along the coast for foraging, but as the beach mining voids are short-lived, they are not likely to be attractive to flamingos.

6.10 Conservation Areas

Elephant Rock Island Reserve ("Robeiland"), located 9 km south of the processing plant, is a declared protected area managed by CapeNature.

7 Socio-economic Environment

7.1 Socio-economic Setting

The WCDM is located on the west coast of the Western Cape Province, with a coastline on the Atlantic Ocean which stretches over 400 km. The WCDM borders the Northern Cape Province in the north and the Cape Metro and Cape Winelands District Municipalities of the Western Cape Province in the south and south-east.

The West Coast road (R27) is an important regional economic driver and links Cape Town to coastal towns such as Saldanha Bay and Paternoster. An equally significant economic corridor is the national road (N7) which bisects the WCDM and links Cape Town to towns such as Malmesbury, Moorreesburg, Piketberg, Clanwilliam, Vanrhynsdorp and Bitterfontein.

The Saldanha Bay export harbour falls within the WCDM, and the export market (including product from Tormin) forms an important aspect of the regional economy, and opportunities for future economic development. Tourism in the district is also viewed as an important growth sector.

Residents closest to the Mine comprise farmers and farmworkers, with the nearest formal communities located more than 13 km to the east of the Mine, along the Olifants River. The three main settlements of Vredendal, Lutzville and Koekenaap are described in more detail below due to their size and regional importance, as well as the large number of Tormin employees that reside in these towns. Other smaller communities located in the MLM include:

- Ebenhaeser – a mission settlement on the lower Olifants River;
- Strandfontein – a coastal town popular as a holiday destination;
- Doringbaai – a small coastal town south of Strandfontein;
- Klawer – a small agricultural town on the Olifants River; and
- Vanrhynsdorp – a small agricultural town located further inland on the banks of an Olifants River tributary.

Tormin Mine sustains more than 200 direct and many more indirect employment opportunities. A number of companies in surrounding towns, and in the district, provide services to the Mine.

7.1.1 Vredendal

Vredendal (Figure 69) is the largest town in the MLM with an estimated population in 2014 of 20 400 (Matzikama Municipality SDF, 2014). The town serves as the commercial and administrative centre for the region and is the seat of the MLM. The town's economy relies mainly on the agricultural sector, primarily wine production and, to a lesser extent, vegetable and fruit production. The town has well-developed infrastructure, including an airfield, shopping centres and has good road access. Vredendal also serves as a base from where trips to Namaqualand, coastal towns on the West Coast and the Cederberg mountains can be undertaken and as such has an active tourism industry with many guesthouses and several restaurants (SRK, 2014a).

Vredendal comprises three components:

- Vredendal South: the original settlement located at the crossing point over the Olifants River and situated on fertile land within the floodplain of the Olifants River;
- Vredendal North: originally an apartheid dormitory area inhabited by the town's Coloured and Black communities; and

- The rail station, industrial and civic areas.

The urban quality of the three components differs considerably (Matzikama Municipality SDF, 2014). Vredendal South displays a higher urban quality and lower population growth rate than that of Vredendal North (Matzikama Municipality SDF, 2014).

The intention is to integrate the three components to improve commuting and access between them (Matzikama Municipality SDF, 2014). However, this presents a challenge considering that the barriers that separate the components (i.e. the Olifants River and agricultural land in its floodplain) are fundamental to the ongoing environmental and economic sustainability of the area.

In 2015, there were 4 359 people on the waiting list for housing in Vredendal (Matzikama Municipality IDP, 2015). The vast majority of land allocated for new housing (85%) will be required for subsidised housing units.

Figure 69: Vredendal (Church Street) as seen from the north-west

Source: http://madeliefiemakietie.co.za

7.1.2 Lutzville

The small town of Lutzville (Figure 70) experienced rapid population growth between 1991 and 2001, with the increase in mining activities in the area, but the annual growth rate reduced to around 1.43% per year in 2011. The Lutzville population was estimated at 8 000 in 2014 (Matzikama Municipality SDF, 2014). The town's population is employed mainly in the mining and agricultural sectors, the latter entailing largely viniculture and tomatoes (SRK, 2014a).

Lutzville comprises two components:

- The main town which is the centre of social and economic services and infrastructure; and
- Lutzville-West which predominantly comprises a small housing cluster located outside of the town.

The rural population in Lutzville is declining, indicative of increasing urbanisation within the area (Matzikama Municipality IDP, 2014).

Figure 70: Lutzville as seen from the north-west

7.1.3 Koekenaap

The settlement of Koekenaap (Figure 71) had an estimated population of 1 330 in 2014 (Matzikama Municipality SDF, 2014). Although small entrepreneurial businesses have been established within the area, Koekenaap's most viable long term function is as an agricultural service centre for the surrounding farms.

Economic challenges for the settlement include very weak local demand thresholds and competition from nearby settlements such as Lutzville and Vredendal, which offer a higher level of goods (Matzikama Municipality SDF, 2014).

On account of a small population size, Koekenaap does not reach the thresholds necessary to warrant most public facilities. Lack of economic growth over the past few years and close proximity to settlements with much greater economic potential have led to high unemployment and poverty levels, with most of the employed population working elsewhere (SRK, 2014). As such, Koekenaap does not occupy a high priority in terms of spending scarce public funds on fixed infrastructure that could create wider benefits elsewhere (Matzikama Municipality SDF, 2014).

Figure 71: Koekenaap's shops and post office

7.2 Economic and Social Indicators for West Coast District Municipality

7.2.1 Population

In 2016 the WCDM had an estimated population of approximately 436 000 (Figure 72). The population growth rate between the years of 2015 and 2020 is projected to be 6.8% per annum (Provincial Treasury, 2016). This represents an increase from 4.9% in 2001, indicating that the population of the region is growing at an increasing rate. The district covers an area 31 099 km^2 and the population density is 14 people / km^2.

The population of the MLM was approximately 71 000 in 2016. In 2015, the population growth rate was projected to be 5.4% (Provincial Treasury, 2016). The population density was estimated at ~5.4 people / km^2 in 2015, lower than the district average of 14 people per km^2.

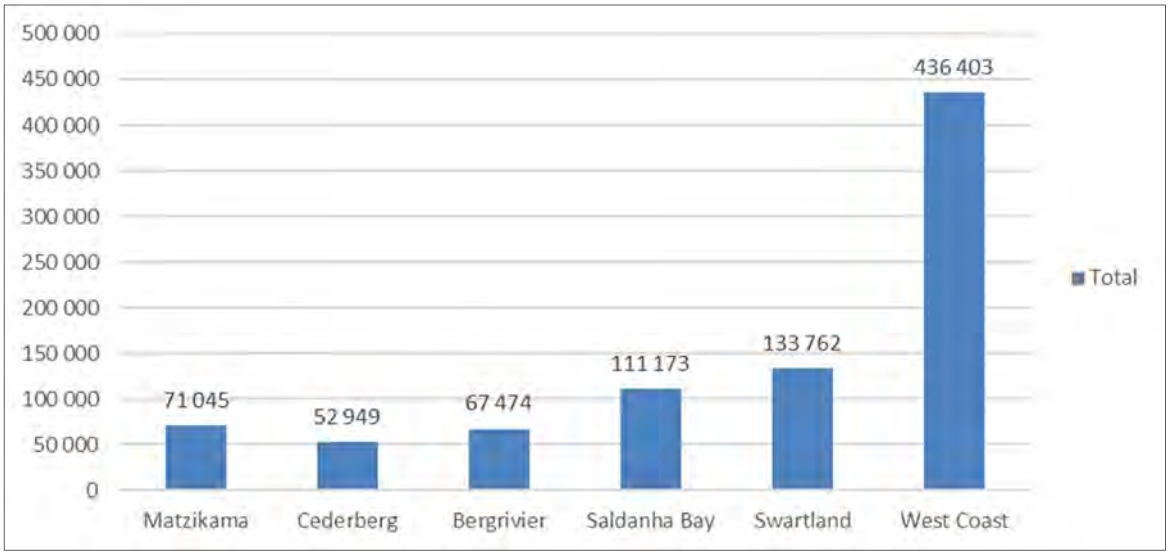

Figure 72: Regional population

Source: StatsSA: Community Survey, 2016

7.2.2 Age and Gender Distribution

Both MLM and WCDM follow a similar pattern for population age and sex distribution (~ 50:50 split).

For both the MLM and WCDM, a large proportion of the population fall within 0 to 19 years, as well as within the working age group between 20 and 34 years. This will have particular implications for the provision of educational facilities as well as a greater need for employment opportunities (Provincial Treasury, 2015).

7.2.3 Population Groups

The Coloured population group (68.2% of total population in WCDM) was by far the most populous group in the WCDM (Figure 73). The White population group comprised 15.3 % of the total population in 2016, while Africans represented 16.3%. Between 2007 and 2016, the proportion of Africans in the population doubled (9% - 2007; 16.3% - 2016) (StatsSA, 2016).

In 2016 the MLM had the highest proportion of Coloureds (81.8%) and the second lowest proportion of Whites (12.3%) and Africans (5.9%) compared to other local municipalities in the district (Figure 73).

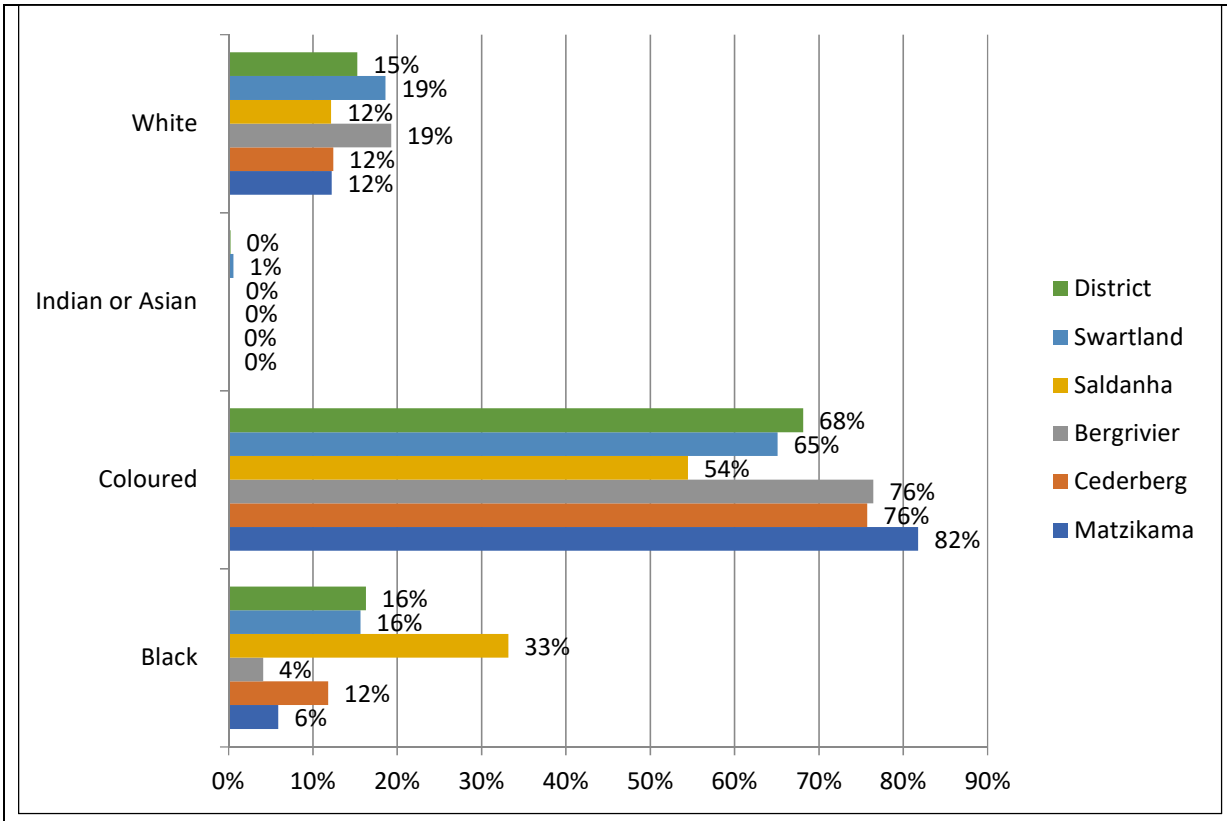

Figure 73: Breakdown of district population by population group

Source: StatsSA: Community Survey, 2016

7.2.4 Size and Structure of the District and Local Economy

Figure 74 shows the regional Gross Value Added (GVA-R) for the WCDM (including local municipalities), and indicates that the value of production in the WCDM economy was R21 billion in 2015.

GVA-R and GVA-R per capita for the MLM were R3.17 billion and R44 600 respectively (~15% of district GVA-R from an area covering ~42% of the total district area). The low population density for the local municipality is indicative of this predominantly low carrying capacity, arid agricultural region with limited urbanisation. This inference is supported by the high contribution of the agricultural sector to the local economy (29.7% of GVA-R) (Figure 75). The Olifants River and its associated canal systems underpin the agricultural sector, which is dominated by orchards and viticulture.

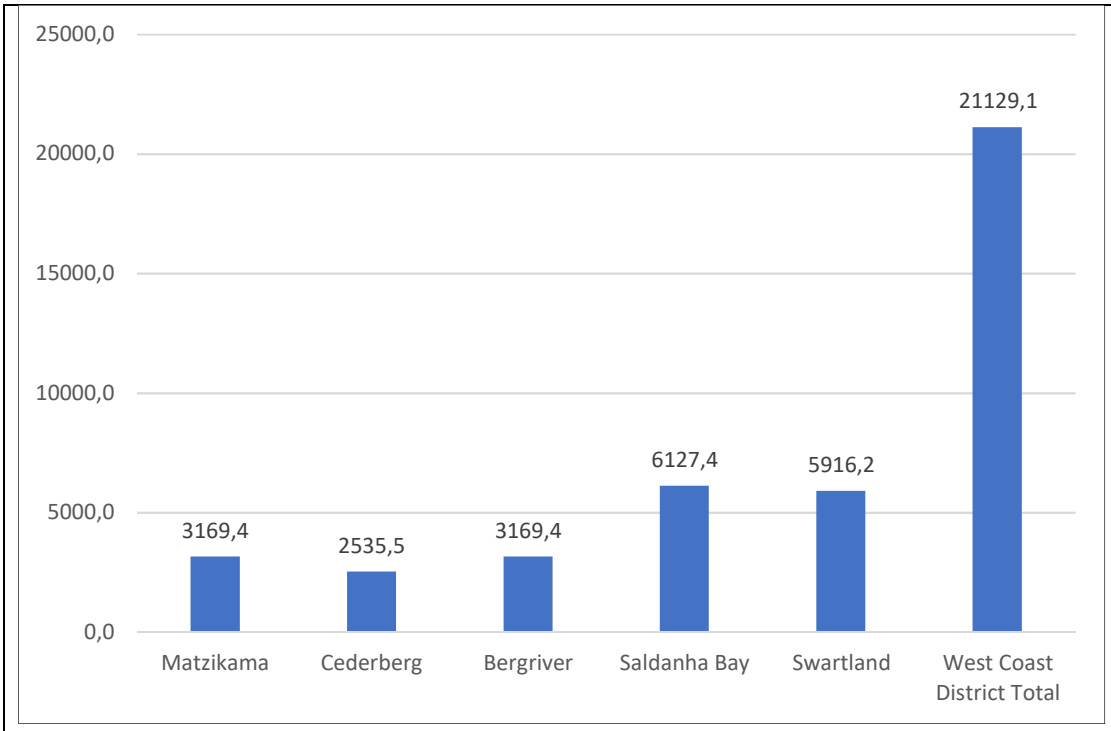

Figure 74: 2015 GVA-R for the West Coast District at 2015 prices (R 000's)

Source: Provincial Treasury, 2016

Figure 75 indicates the sectoral contribution to the GVA-R of WCDM and local municipalities. In 2015, at district level, agriculture (29,7%), trade (15.3%) and manufacturing (12.5%) contributed most to GVA-R.

A noteworthy feature of the local economy is the importance of the mining sector in the MLM compared to its profile in the district economy (2.9% and 0.5% respectively). Diamonds, heavy mineral (both of which are along the coast) and gypsum are mined in MLM. Mining makes by far the largest contribution to the MLM compared to other WCDM local municipalities and is therefore considered to be an important socio-economic driver locally.

Vredendal is a well-developed town and functions as MLM's administrative centre. The strength of the financial sector locally is largely accounted for by economic activities in this town (Figure 75).

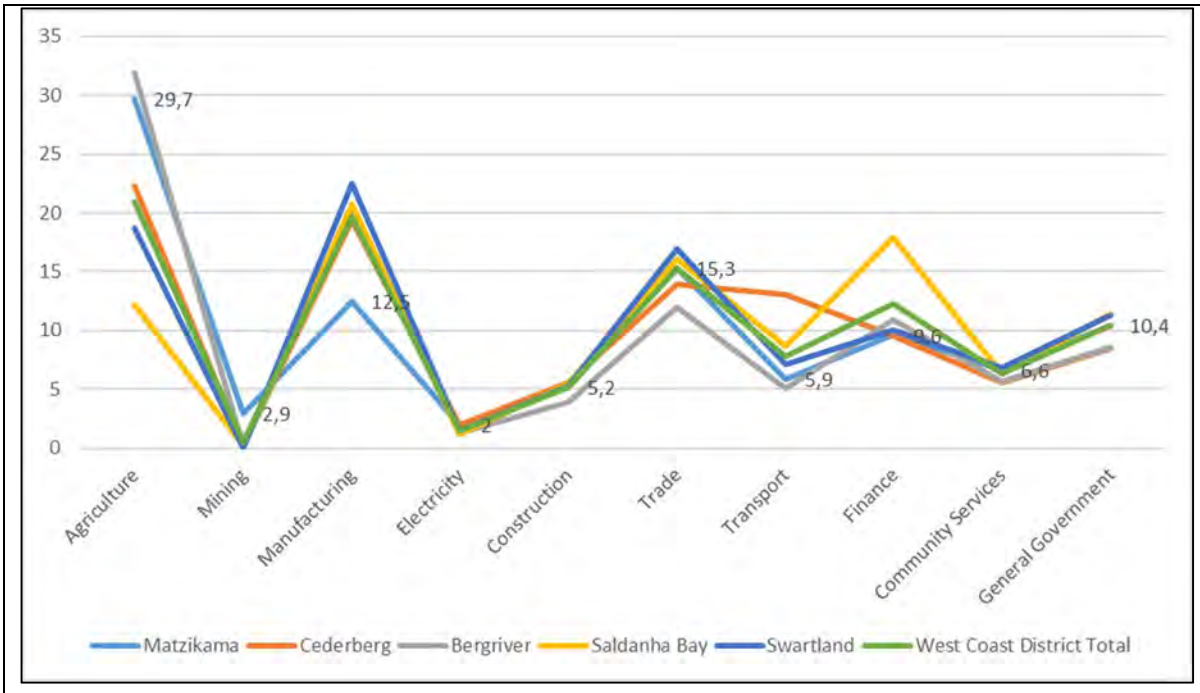

Figure 75: Contribution to West Coast District Municipality GVA-R by sector (2015)

Source: Provincial Treasury, 2016

Figure 76 indicates the population density and GVA-R per capita for the WCDM for 2015, and shows that district GVA-R per capita was estimated at ~R48 400 per annum and population density at 14 people per km^2 in 2015. The low population density is indicative of the low carrying capacity of this water scarce region. The GVA-R per capita for the MLM is estimated to have been ~R44 600 and that the population density is only 5.5 people per km^2 in 2015.

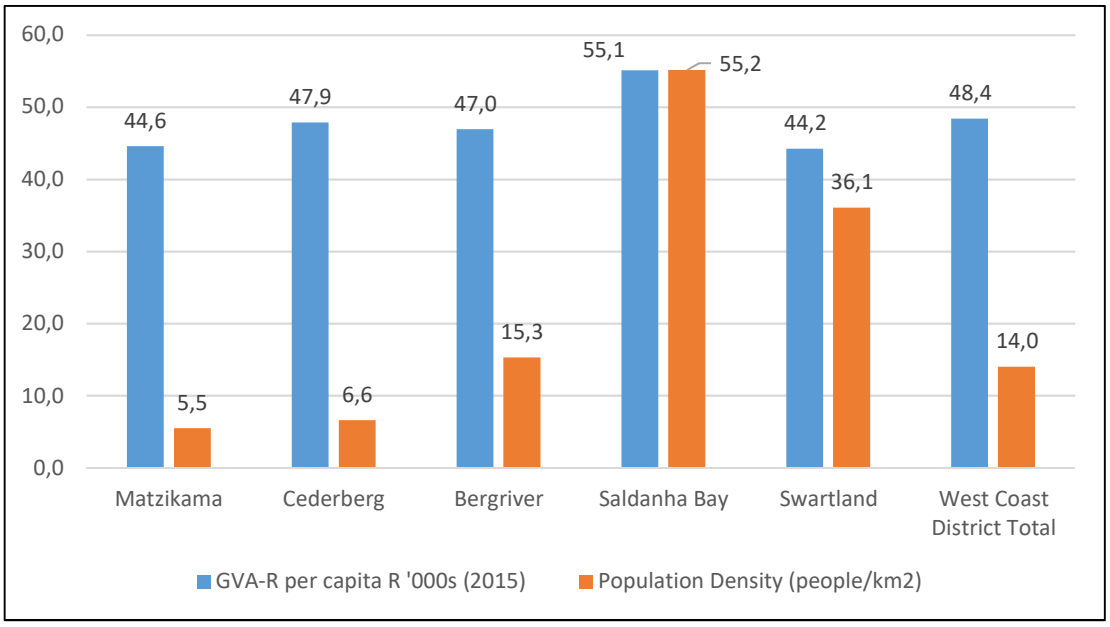

Figure 76: Population density and GVA-R for the WCDM (2015)

Source: Provincial Treasury, 2016 and StatsSA, Community Survey, 2016

7.2.5 Education, Employment and Income

Figure 77 shows the level of education of the WCDM population over the age of 20 (including local municipalities) in 2016. Approximately 62% of WCDM's population over the age of 20 years either has no

education (4%) or has not achieved Grade 12 (58%), indicative of very low education levels in the district. According to the IDP, low levels of education in the region are attributed to challenges such as poor quality infrastructure, high drop-out rates (e.g. due to teen pregnancies), language challenges and lack of access to transport.

Education levels in the MLM are in line with the district average: 4% of the local population over the age of 20 years has no schooling (4% for WCDM) and 51% of those with an education did not achieve Grade 12 (Figure 77). Only 35% of the MLM population over 20 years old achieved a matric pass or better.

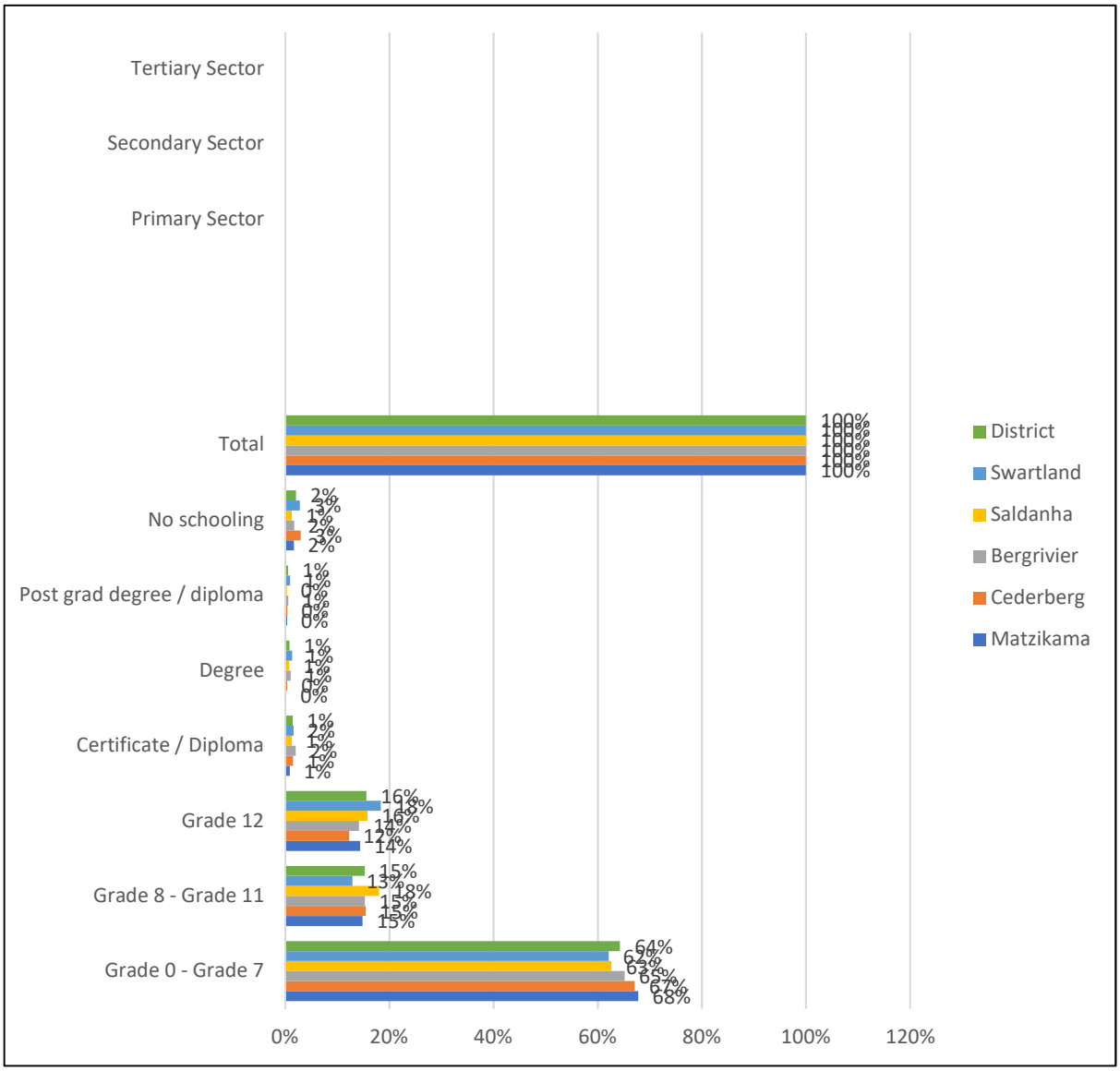

Figure 77: Education levels in WCDM (over the age of 20 years)

Source: StatsSA: Community Survey, 2016

Figure 78 indicates that the WCDM has an unemployment rate of 15% (i.e. 15% of the economically active population who are actively seeking jobs are unemployed), while 85% of those seeking employment are employed.

Approximately 23 806 people are employed in MLM (in 2016), while 3 889 are unemployed. The MLM has a relatively high unemployment rate (14%) (Figure 78), corresponding with poor levels of education.

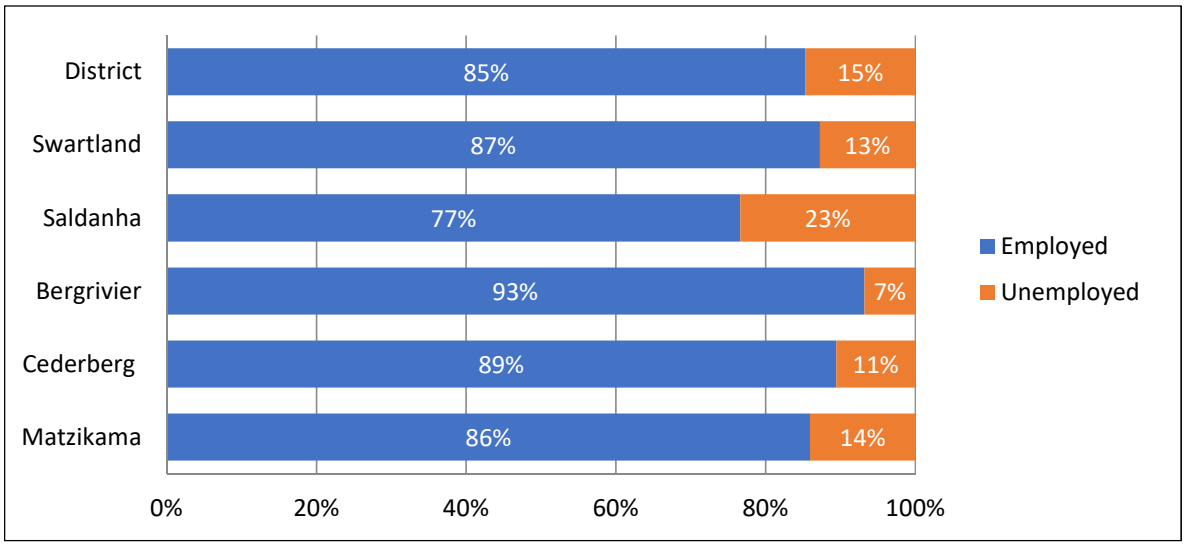

Figure 78: Employment in the WCDM

Source: StatsSA: Community Survey, 2016

Figure 79 indicates the sectoral contribution to employment in the WCDM for 2015[9] (Provincial Treasury, 2016). The majority of district employment was in the tertiary sector (35%), while the contributions to employment were 21%, 26% and 17% for primary, secondary and quaternary sectors respectively. Figure 75and Figure 79 show that the primary sector contributes proportionately more to employment than other sectors, although wages are expected to be correspondingly low.

The majority of employment opportunities in the MLM are in the primary sector (33%), reinforcing the importance of the agricultural and mining sectors to the local economy; although there is also a relatively high level of employment in the tertiary sector in the MLM (31%) (Figure 79).

[9] The division of labour refers to proportions of the labour force employed in the primary, secondary tertiary, and quaternary sectors. The primary sector includes people employed in agriculture, forestry, fishery and mining. The secondary sector refers to manufacturing, construction, and energy production (electricity). The tertiary sector includes commerce, transport, and the financial institutions. The quaternary sector refers to public and private services.

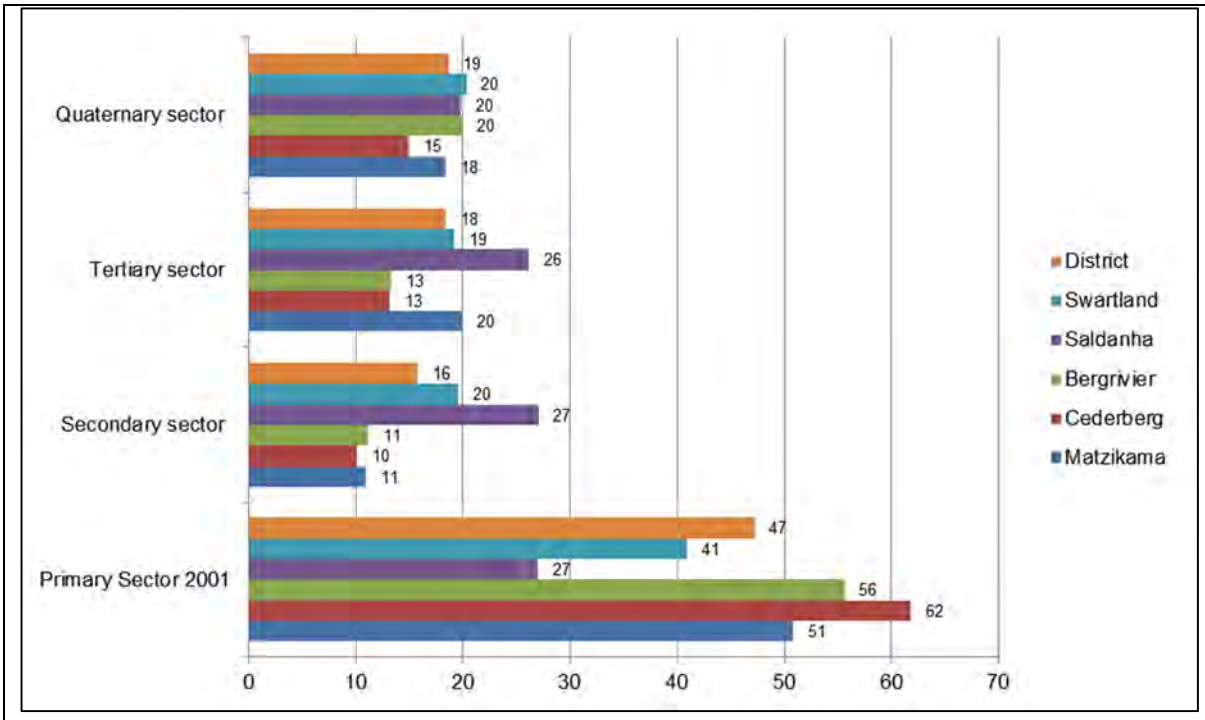

Figure 79: Sectoral contribution (% of total people employed) to WCDM employment (2015)

Source: StatsSA: Community Survey, 2016

Figure 80 depicts monthly household income for municipalities in the WCDM. The majority (52%) of WCDM households earn less than R4 218 per month (R50 616 per annum), and fall within the low income bracket (R 0 – R 4 218 per month).

More than half of the MLM households earn low income (55%), indicating a scope for human development within the MLM.

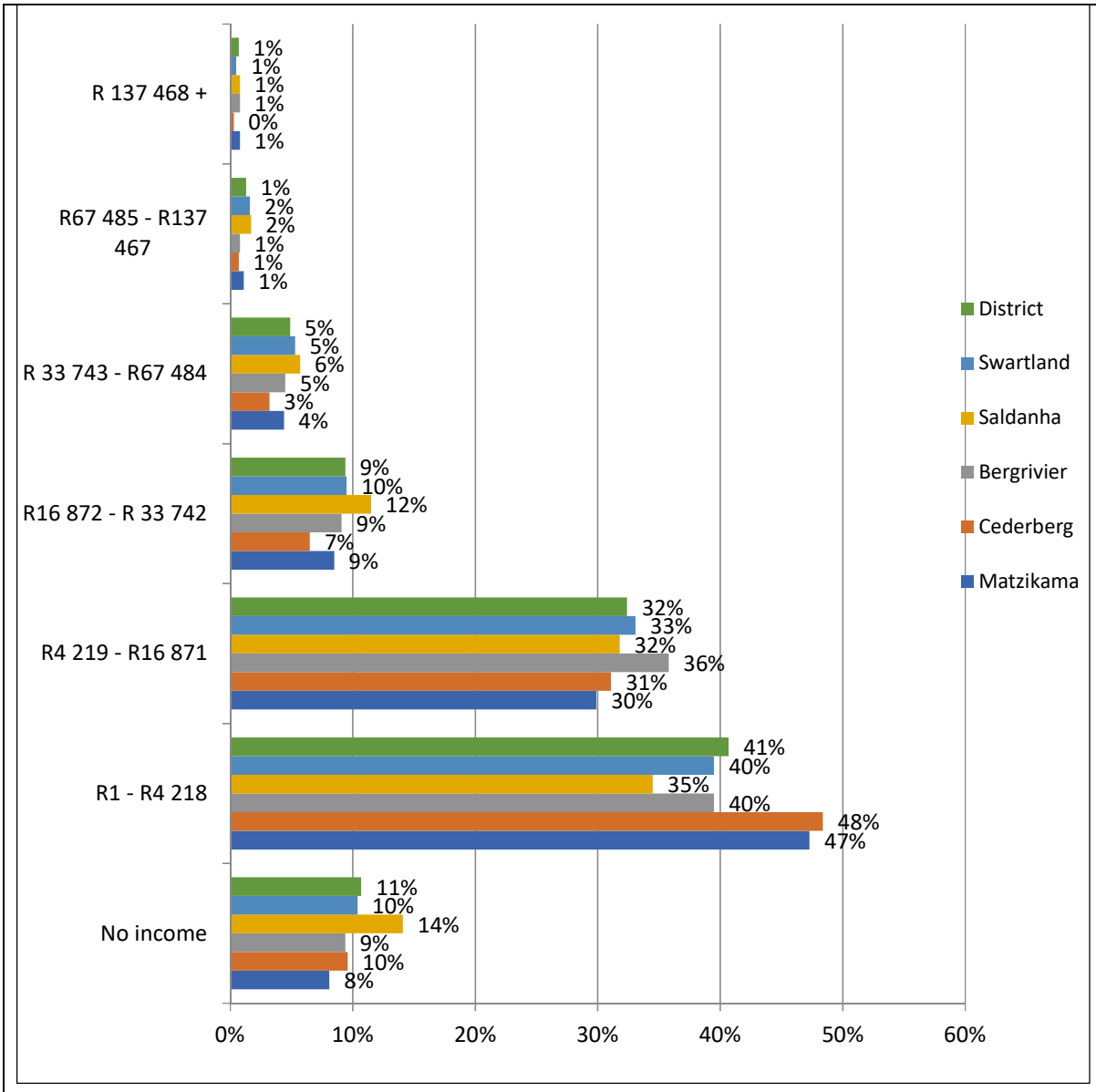

Figure 80: Monthly household income categories for WCDM (2016)

Source: Provincial Treasury, 2016

The GVA-R per capita for the WCDM in 2015 was ~R48 400, compared to R74 274 for the Western Cape in 2015. This indicates that the personal income of the WCDM is lower than in the Western Cape and the national situation.

7.2.6 Poverty

The intensity of poverty and Headcount Ratio are two different methods of measuring and reporting poverty.

The intensity of poverty is measured by calculating the Poverty Gap Index[10], while the Headcount Ratio is the proportion of people within a population group that is living below a certain predetermined poverty level or line (a threshold level of income below which people are considered to live in a condition of poverty). The Headcount Ratio is slightly more restrictive tool in that it counts all the people below a poverty line, in a given population, and considers them equally.

Both indices are reported on in Figure 81.

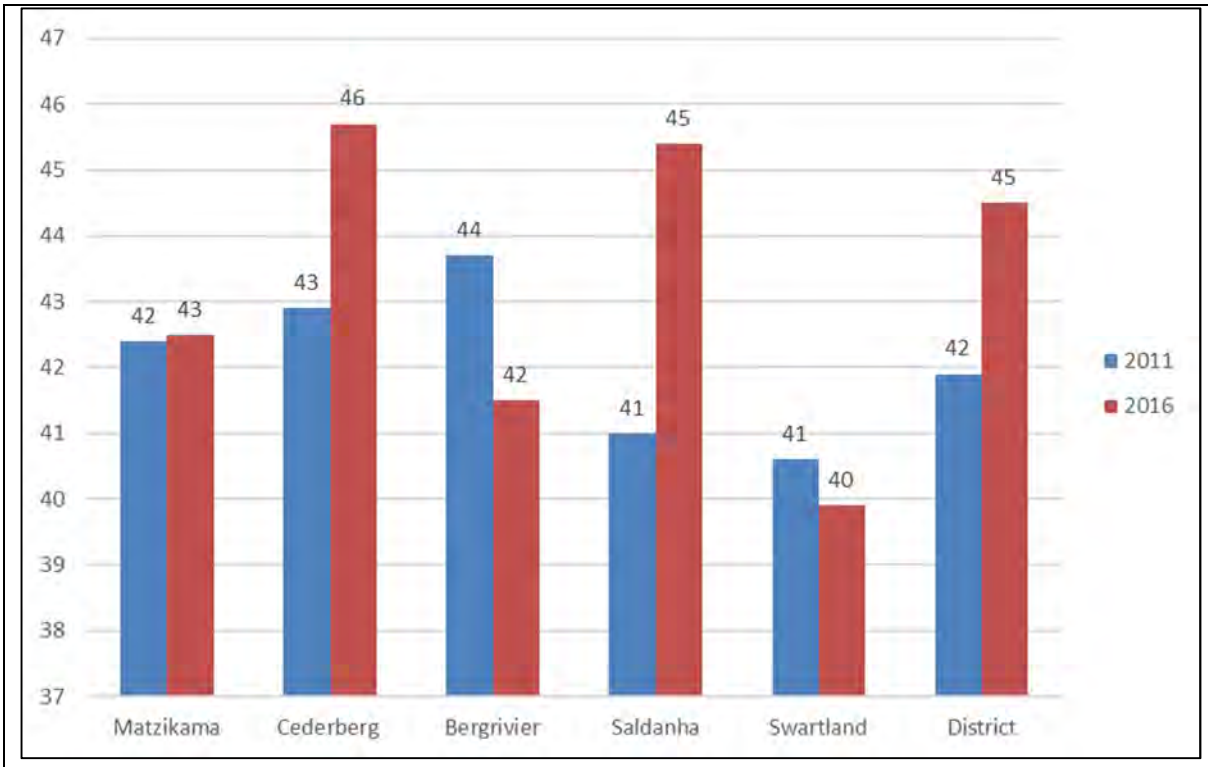

Figure 81: Headcount ratio (top) and poverty intensity in the WCDM (2016)

Source: Provincial Treasury, 2016

The intensity of poverty within the WCDM increased from 42% in 2011 to 45% in 2016.

The poverty intensity graph indicates that the MLM poverty intensity marginally increased by 1% between 2011 and 2016. Of the three municipalities which experienced increases in poverty intensity between 2011 and 2016 (MLM, Cederberg and Saldanha), MLM had the smallest increase (1%).

7.2.7 Health

Access to Health Care Facilities

Table 32 indicates that there are a total of 74 and 19 health care facilities in the WCDM and MLM respectively. The table also shows that that there are more health care facilities per person in the WCDM than in the MLM, suggesting a slightly lower level of health service provision in the local municipality compared to the district.

[10] The Poverty Gap Index is the average poverty gap in the population as a proportion of the poverty line. It estimates the depth of poverty by considering how far, on the average, the poor are from that poverty line.

Table 32: Access to health care facilities

Health Care Facility	WCDM	Persons per Facility - WCDM	MLM	Persons per Facility - MLM
Community Day Centres	1	409 929	0	0
Clinics	26	15 767	5	14 179
Satellite Clinics	15	27 329	4	17 723
Mobile Clinics	25	16 398	9	7 877
District Hospitals	7	58 561	1	70 891
Regional Hospitals	0	0	0	0
Total	**74**	**5 540**	**19**	**3 731**

Source: Provincial Treasury, 2015

Burden of Disease

Immunisation protects both adults and children against preventable infectious diseases. The full coverage rate in MLM (78%) was above the WCDM average of 74% (Provincial Treasury, 2015).

While regional HIV/Aids infection rates are expected to be somewhat higher, Table 33 indicates that 1.5% of the district and 1.2% of the local population are receiving antiretroviral treatment (Provincial Treasury, 2015).

The HIV epidemic has led to an increase in the number of Tuberculosis (TB) cases (Provincial Treasury, 2015). Individuals with HIV are far more susceptible to TB infection, and are less able to fight it off.

The TB patient load in the WCDM was 0.8% of the district population in 2015 (Table 33). The MLM patient load decreased to 950 in 2015 from 1 015 previously recorded in 2014.

Table 33: Anti-Retroviral Treatment (ART) and Tuberculosis (TB) prevalence and care (2015)

Municipality	Patient Load		Patient Load % of pop.		Treatment Sites	
	ART	TB	ART	TB	ART	TB
WCDM	6 521	3 593	1.5	0.8	41	73
MLM	901	950	1.2	2.7	8	21

Source: Provincial Treasury, 2015

7.2.8 Service Provision

Access to Housing

Figure 82 indicates that 88% of household structures in the WCDM are formal and 11% are informal, while no households in the district are traditional. Within the MLM, 87% of household structures are formal and 12% are informal (only 5% of households in the MLM were informal in 2007).

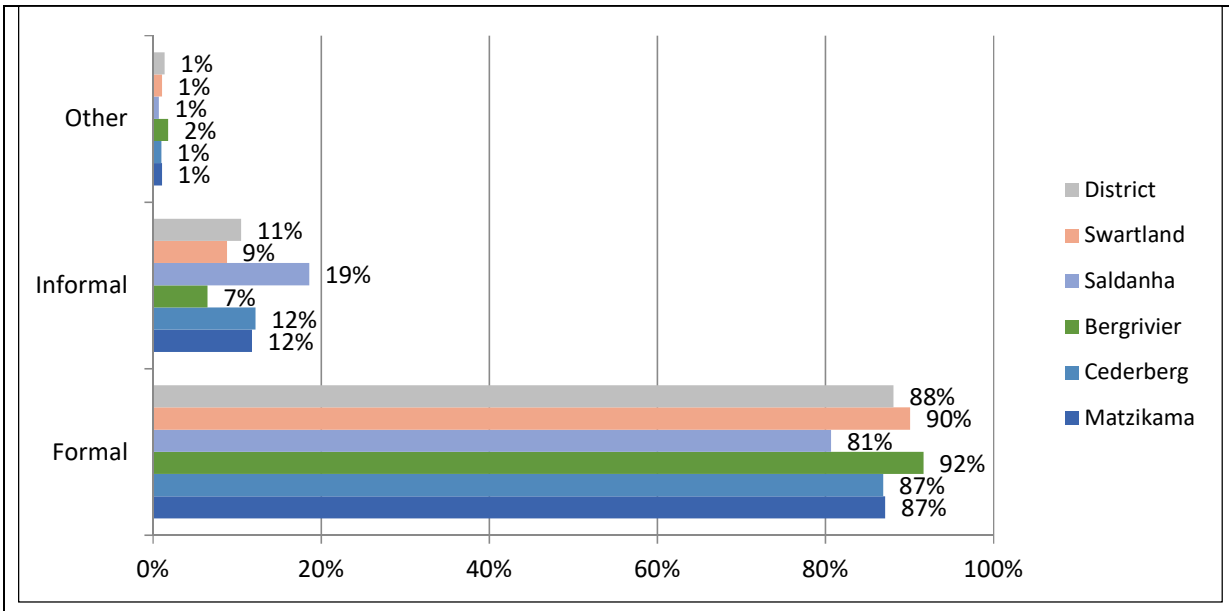

Figure 82: Household types in the WCDM (2016)

Source: Provincial Treasury, 2016

Water

Figure 83 indicates that ~95% of all households in the WCDM (~99% in the MLM) have access to piped water, although only about ~84% had access to water inside their dwelling.

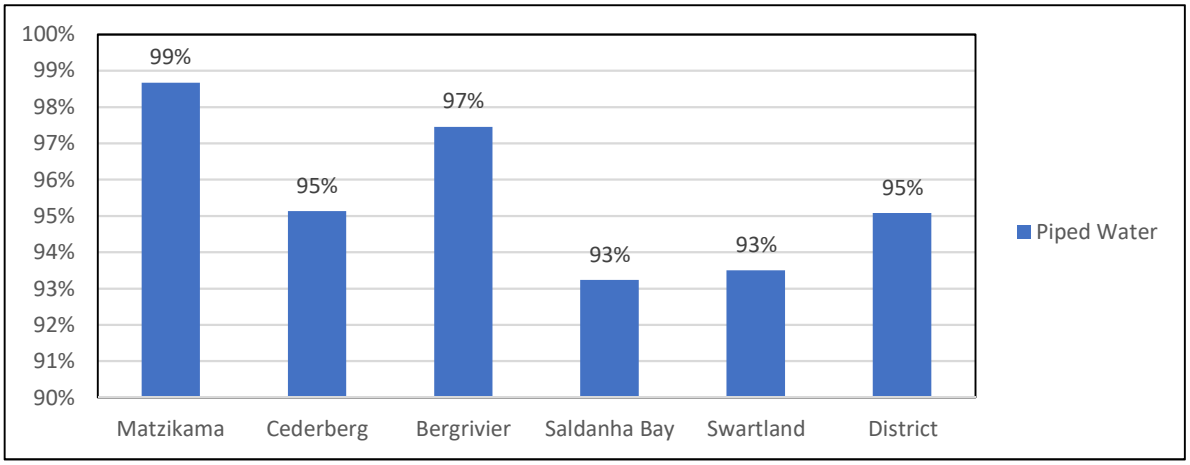

Figure 83: Household access to piped water in the WCDM (2016)

Source: StatsSA, Community Survey, 2016

Electricity

Roughly 92% of households in the WCDM had access to electricity for cooking in 2016 (Figure 84). The proportion of households with access to electricity in WCDM has increased from 89.71% in 2007. About 95% of households in the MLM has access to electricity for cooking – the second highest of all local municipalities in the WCDM after Swartland (~97%).

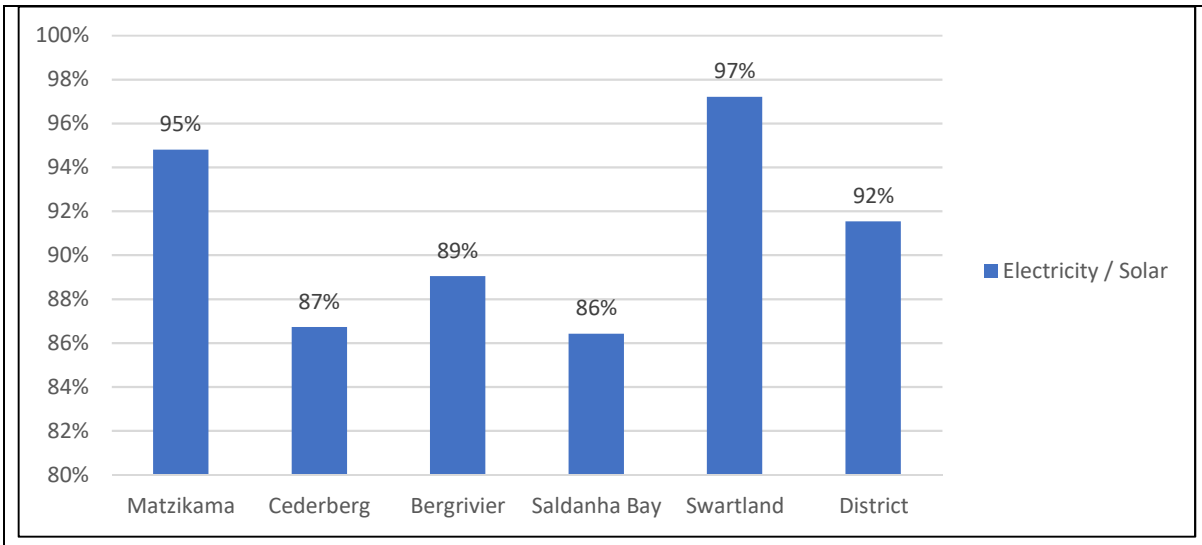

Figure 84: Household access to electricity for cooking in the WCDM (2016)

Source: StatsSA, Community Survey, 2016

Sanitation

Access to sanitation is a crucial basic service as it directly affects health and the dignity of human beings (Provincial Treasury, 2013). Figure 85 shows that ~94% of households in the WCDM had access to flush toilets in 2016. The proportion of households with access to sanitation in the WCDM has increased only slightly from 93 % in 2007.

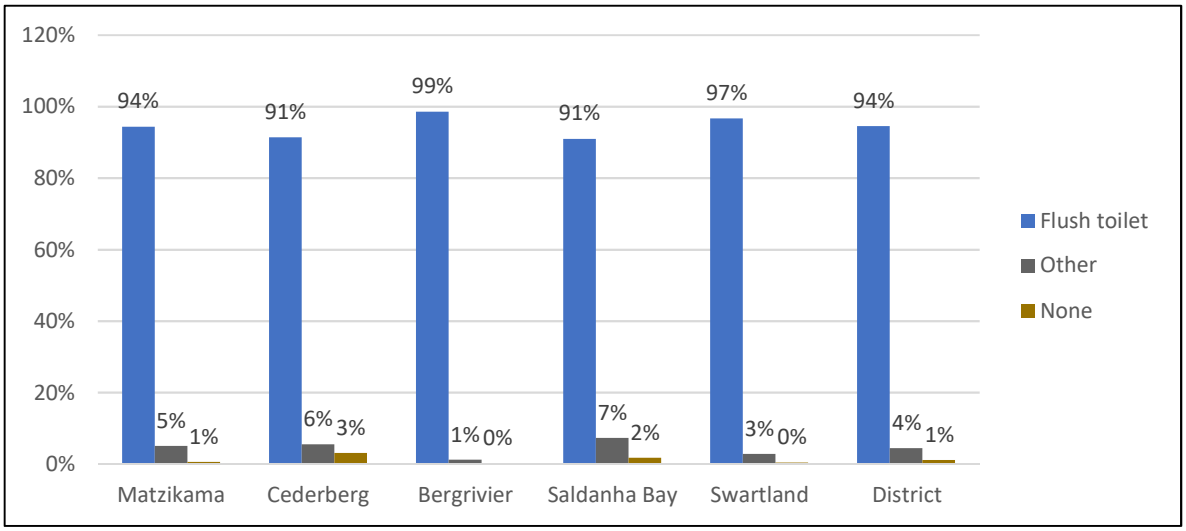

Figure 85: Household access to flushed toilets in the WCDM (2016)

StatsSA, Community Survey, 2016

Solid Waste Management

There are four categories of refuse removal, *viz*.: 'removal by private company / local authority', 'communal refuse dump', 'own refuse dump' and 'other' forms of refuse disposal (StatsSA, 2016). The category of refuse disposal available to households is considered indicative of general welfare.

Figure 86 indicates that 88% of households in the WCDM had their refuse removed by the local authority or private company in 2016 (the highest level of access in the WCDM). The proportion of households with access to refuse removal in the WCDM has increased from 84.5% in 2007.

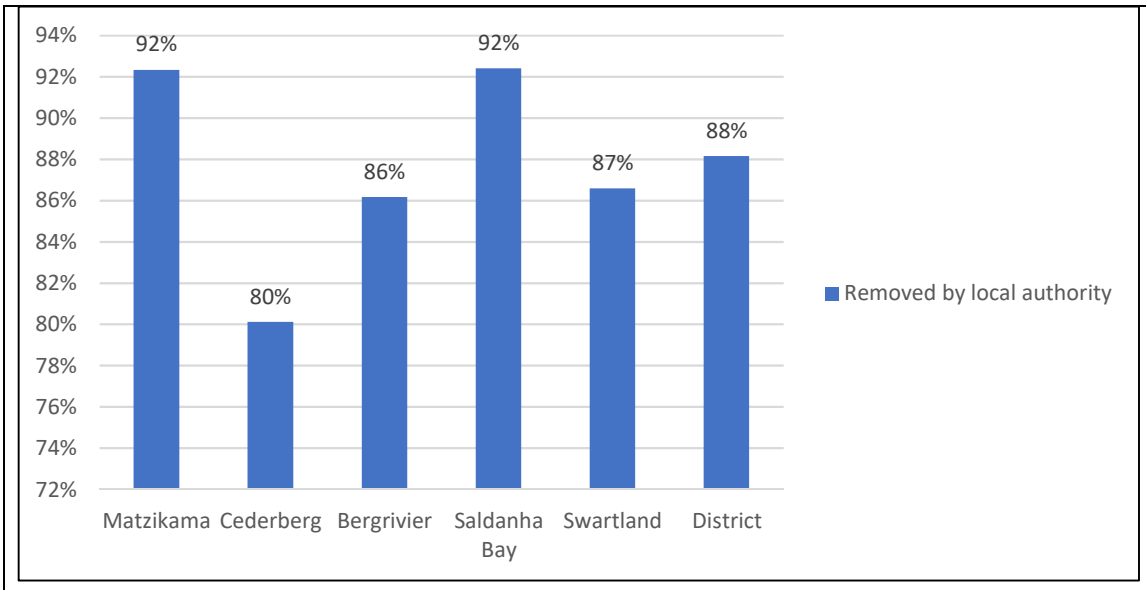

Figure 86: Household refuse removal by private company or local authority in the WCDM (2016)

Source: StatsSA, Community Survey, 2016

7.3 Coastal Access

According to Section 18(1) of NEM: ICMA, coastal access land is defined as strips of land adjacent to coastal public property that secure public access to public property along the coast. Coastal public property consists of the coastal waters, islands and submerged land along the seashore up to the continental shelf.

Coastal access along the West Coast is largely inequitable, with local residents having limited access points to marine resources they previously utilised. Thus, to ensure improved coastal access in the West Coast region, the Western Cape Government (2003) defined goals to help guide and direct utilisation of the coast and its resources. These goals included ensuring that all communities have the right of physical access to the sea to and along the seashore, on a managed basis, and that all communities have the right to equitable access to the opportunities and benefits of the coast on a managed basis (SRK, 2013).

In furtherance of these goals, the NEM:ICMA makes specific provision for:

- A District Municipality to develop a “by law that designates strips of land as coastal access land to secure public access to that coastal public property; and
- The establishment of a “public access servitude in favour of the local municipality within whose area of jurisdiction it is situated and in terms of which members of the public may use that land to gain access to coastal public property”.

Coastal access in the MLM is largely centred on the coastal villages. Access to the coast is particularly limited north of the Olifants River Estuary. WCDM ICMP (SRK, 2013) identifies Gert du Toit-se-Baai as a key coastal access area north of the Olifants Estuary although the ICMP does identify illegal camping and refuse dumping as threats to the coastal environment.

Irregular access is also leading to various types of environmental degradation (Figure 87). Informal coastal access points to the northern beaches have been identified in Figure 3 to Figure 10, Appendix 5.

The development of tourism in the Municipal area is a key objective for the MLM and the provision of access to appropriate coastal areas and the management of such sites and any necessary access infrastructure will be important to facilitate the tourism trade.

Figure 87: Informal access routes to the coast north of Tormin Mine

7.4 Cultural and Historic

This section is based on information provided by the heritage specialist, ACO and Associates (refer to the Archaeology Impact Assessment, Appendix 11G), and the palaeontology specialist, John Pether (refer to the Palaeontology Impact Assessment, Appendix 11H).

7.4.1 Palaeontological Environment

Koingnaas Formation

The white, kaolinitic quartz gravels and sands of this formation form the cliffs along most of the shore of Farm Geelwal Karoo 262. Similar deposits have been intersected in boreholes inland on the farms Karoovlei 454 and Schaap Vley 158 and include lignitic peat beds with plant fossils and a fossil pollen assemblage of broadly early Miocene age (Cole & Roberts, 1996). Silicified fossil wood of tropical trees, including mahogany has been found in the Olifants River gravels near Vredendal and were presumably reworked from Koingnaas Formation deposits exposed somewhere in the valley.

The Koingnaas Formation on Farm Geelwal Karoo 262 is basically a fluvial deposit resembling the “Channel Clays” encountered in palaeochannels elsewhere in Namaqualand, although not usually over such a wide expanse. The bedrock outcrops in places along the Geelwal shore, indicating an uneven erosional base and overall the formation thins to the north (Elferink, 2005).

The presence of organic-rich laminae in the Geelwal exposures is reported by Elferink (2005) but have apparently not been analysed for pollen content. There is a low possibility that fossil logs and other plant material may occur in the formation. Impressions of plants and trace fossils may be found in a silcrete layer of the formation.

The exposures of the Koingnaas Formation along Farm Geelwal Karoo 262 are the most extensive available on the Namaqualand coastal plain. As largely natural exposures and although eroding slowly, their longevity relative to diamond-mine pits makes for their long-term importance for study into the future. Only general descriptions exist and the detailed observations, sampling and analyses required for palaeo-environmental diagnosis in terms of modern, multi-disciplinary approaches are yet to be done.

Pliocene Marine Formations

Avontuur Formation / 50 m Package

Visser & Toerien (1971) recorded a “27 m terrace” and an “18 m terrace” as “boulder lines” along the cliffs. At that stage the zone fossils shells were not well known and the deposits were not distinguished on a fossil basis.

This was no longer the case when De Beer et al. (2002) recognized that the 50 m Package zone fossil *Donax haughtoni* (surf clam) occurred in exposures of the "27 m terrace", while *Donax rogersi* (large surf clam) was characteristic of the "18 m terrace". Subsequently, Elferink (2005) mapped the marine formations on Farm Geelwal Karoo 262 (as the 50 and 30 m packages) in terms of a combination of the occurrence of the zone fossils, or when fossils were absent, on elevation.

The early Pliocene Avontuur Formation is mainly exposed above the high cliffs in the southern portion of Farm Geelwal Karoo 262. Here the formation is thickest and is overlain by a particularly thick accumulation of aeolianite formations. Fossil shells are quite common.

North of these exposures the marine deposits are mainly covered by aeolianites. It is expected that the 50 m Package deposits are present in places beneath the 30 m Package gravels.

Hondeklipbaai Formation / 30 m Package

North of the central part of Farm Geelwal Karoo 262, the Hondeklipbaai Formation is continuously present beneath the aeolianites forming the coastal slope.

Fossil Preservation

Most of the marine deposits on the Namaqualand coast have been decalcified and lack fossils. The fossils which remain are the robust, calcitic oysters and thick, large shells. In places, more diverse assemblages with small forms may be preserved – these were originally very shelly beds that buffered themselves from dissolution by the sheer quantity of carbonate or occur in thick deposits in upper layers where net exposure to groundwater was less.

The fossil shell content of both marine formations in the study area is typical of that found wider afield in Namaqualand. The gravels on the bedrock were host to aquifers in the past and rendered barren or with oysters and other big shells, nearly exclusively *D. rogersi*. Where shells occur higher in the section in thicker deposits more delicate shells are preserved.

Fossil shells selected from exposures in the area featured in the earliest palaeontological findings about the marine deposits (Haughton, 1926, 1928, 1932) and are kept at the IZIKO South African Museum, but lack precise locations. No systematic bulk sampling of the assemblages in shelly spots has been undertaken. Thus, the suspected biogeographic gradient in the fossil fauna southwards from the central Namaqualand sites towards the Saldanha area lacks material for study and enquiry.

Curlew Strand Formation Raised Beaches

Exposures of the Last Interglacial raised beach are present at Gert du Toit-se-Baai and at Skulpbaai. Other small occurrences may be preserved along the northern coastal stretch, but most have been mined away or are very disturbed.

The best example of the Holocene High raised beach is also preserved along Gert du Toit-se-Baai, where it forms the shelly terrace above the high-water mark upon which the holidaying campers set up their camps.

The older, mid-Quaternary, 8-12 m beach has not been recognized, and if preserved, is evidently under cover.

Aeolian Formations

Site CP537 of Stynder and Reed (2015) is a site near the northern boundary of Farm Geelwal Karoo 262 where fossil bones are eroding out of a channel fill within the aeolianite succession (Figure 88). These fossils include *Numidocapra crassicornis*, a bovid found only in North Africa and Ethiopia where the age range for this fossil species is 2.5-1.7 Ma. Also found were teeth of *Dinofelis barlowi*, an extinct sabre-toothed felid, indicating an age range of 2.5-1.9 Ma.

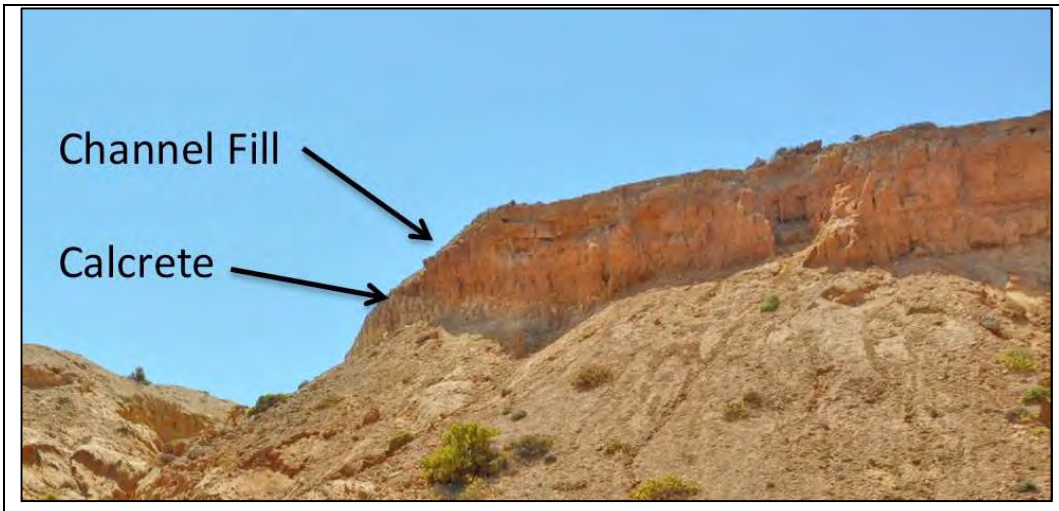

Figure 88: The site CP537 exposure

Source: Pether, 2018

The marine Hondeklipbaai Formation (late Pliocene ~3 Ma) is basal to the sequence at CP537. It is a residual shelly gravel on the cliff top, lacking cementing or an upper pedocrete. The capping pedocrete representing surface stabilization appears to have been eroded, with the succeeding channel fill "pluvial" fossiliferous deposits having been derived/re-deposited from sediments dating between 2.5 and 1.7 Ma. It may represent a potentially distinct "pluvial" unit" useful for correlation and for its fossil potential, with fossils from the surrounds flushed into concentrations in the run-off channels.

A notable feature of the Olifantsrivier Formation aeolianites is the occurrence of the spherical, crudely-laminated termitaria ("fungal gardens") which seem to be a feature of the upper part of the formation.

7.4.2 Archaeological Environment

Pre-Colonial

Early Stone Age (EStA) occurrences have been reported from Brand-se-Baai, Hondeklipbaai, Kleinsee and Koingnaas, Brand and Doringbaai. Many of the classic EStA forms, such as the handaxe and cleaver, have been found in isolated scatters, particularly along the coastal margin.

Dewar & Orton (2013) have reported that at least 90 Middle Stone Age (MSA) open sites have been recorded from northern Namaqualand. MSA artefacts deflate down through the red aeolian sands and collect on a hard compact surface known as the Dorbank, typical of the Namaqualand coastal plain. In southern Namaqualand MSA artefacts are frequently encountered in borrow pits or mining trenches where removal of the surface sands has exposed the harder deposits below. In general, like with EStA sites, the stone artefacts are found in open contexts and are not associated with bone, shell or ostrich eggshell. Their information is therefore of limited value except in indicating the distribution of MSA settlement.

However, of particular interest are those MSA sites which are associated with large numbers of ostrich egg shells, fossilised or mineralised bone fragments and amounts of shell, predominantly of *Scutellastra argenvillei.* Such sites have been reported from Kleinsee (Orton & Webley 2012), near the Groen River mouth (Halkett 2001) and at Brand-se-Baai (Parkington & Poggenpoel 1991, Halkett and Hart 1993, Parkington et al 2004). These sites are extremely rare and carry very high heritage significance because of their information content.

Many thousands of Later Stone Age (LSA) sites have been recorded on the Namaqualand coast during the last 30 years (Dewar & Orton 2013). The majority consist of shell middens or shell scatters with artefacts associated. Previous studies by ACO Associates have suggested that the bulk of the visible archaeological sites lie within 500 m of the coast where sea level has remained largely constant over most of the Holocene (last 10,000 years). This spatial patterning reflects that people (typically in an arid environment) tend to focus their

settlements, mostly of short duration, close to resource rich areas. Further inland of of the coast, archaeological sites are more scarce (Orton 2010), being limited to ephemeral scatters in occasional deflation hollows. Where there are rocky outcrops with shelters or overhangs, or any place with potential for providing water, evidence of occupation can be prolific. Orton's (2010) assessment of a water pipeline along the DR2225 in the vicinity of Koekenaap, noted that while scatters of shell are found at the site of the Sere wind energy facility on the coast to the west, they diminish in frequency inland to the east.

Hart's (2007) survey of the Sere wind energy facility, immediately east of Tormin Mine, some 3 km from the coast, identified at least 65 occurrences of an archaeological nature and a number of LSA shell middens. While these were individually of low conservation status (Grade IIIB-C), Hart noted that they had high group value and were academically significant. He concluded that the shell middens were concentrated around an old pan, since dried up.

eThembeni Cultural Heritage's survey (2007) suggested that "the entire landward extent of the project area, between the beach and the gravel road running parallel to the shore, should be considered as an extended archaeological and palaeontological landscape, consisting of a palimpsest of discrete sites". They considered the archaeological sites in the study area to have medium to high significance at all levels due to their scientific values.

Graves

As they generally lack surface markers, the locations of pre-colonial graves cannot easily be precisely identified. Occasionally, graves may be marked by stone cairns, although these may be confused by later prospecting and surveying activities which have also resulted in similar features. Usually, however, these burials are more likely to be found in coastal dune areas in association with LSA shell middens than at random locations, and the denser the shell midden occurrences, the more likely it is to find associated burials. Earlier human remains from the MSA and EStA are very rare and will most likely be found associated with MSA/EStA sites where bone is preserved, but also in palaeontological contexts, particularly those associated with brown Hyena accumulations.

Due to the difficulty in pre-identifying locations of pre-colonial burials, they are almost always uncovered by natural erosion processes or during development, where they are often inadvertently, partly or wholly disturbed in the process, compromising the details of burial style and other forensic information.

More recent burials may be marked more conventionally with crosses or other grave furniture, but often are covered with rocks and perhaps marine shells and/or quartz stones. Simple head and/or footstones of local rocks may be present. These tend to be found close to old settlements or places where prior mining activity took place.

Alan Morris' (1992) Master Catalogue of Holocene Human Skeletons from South Africa was consulted, but no burials had been reported or collected along this section of the coast. eThembeni Cultural Heritage state that they did not identify any graves or human remains in their three day survey (2007).

Built Environment

Colonial period heritage is extremely scarce in the study area and immediate vicinity. An examination of the Surveyor General's maps for the farms in the area, indicate that:

- Farm Geelwal Karoo 262 was surveyed in 1871 (S.G. 816/1871), prior to this date, it was Crown Land;
- To the north, Klip Vley Karoo Kop 153 was surveyed in 1871 (S.G. 818/1871). The northern portion of this narrow strip of land, bordering on Graauw Duinen, was called "Water Bak" indicating a source of fresh water which would have attracted pre-colonial and colonial settlement alike;
- To the east, Else Erasmus Kloof 158 was surveyed in 1878 (S.G. 1364/1878);

- To the south Elephant Rock Heights 171 was surveyed in 1871 (S.G. 817/1871); and
- To the south, at the mouth of the Olifants River, The Point 267, was also surveyed in 1871 (S.G. 815/1871) and was Crown Land prior to this. The “lease areas” of the diamond companies date to 1962.

Built structures are limited to the small farm werf on Farm Geelwal Karoo 262 which appears to date to the late 19th/early 20th century (Figure 89). It is reported by eThembeni (2007) to have been used as a Police Station at some point but the specialist has been unable to confirm this.

Figure 89: The “Police Station” on Farm Geelwal Karoo 262

Source: ACO, 2018

Cultural Landscape

There has been very little discussion in the literature about the cultural landscape of the Namaqualand coast. Hart (2007:8) described the landscape on the adjoining property to the east (Sere wind energy facility) thus: “The cultural landscape qualities of the place are that of a relatively undisturbed landscape imprinted over by the archaeological sites of the Late Stone Age hunter gatherers, then within the last 2 000 years, the transhumant Khoekhoen pastoralists”. The landscape has an “unspoiled” character and is somewhat bleak with wide open spaces and uninterrupted views despite the scarring of years of diamond mining and exploration. A windfarm is now located to the east of the mine ~1.8 km from the coast and dominates the skyline of the area and so the “unspoiled” character of the landscape has changed somewhat. Although mining activities are ongoing at Farm Geelwal Karoo 262, the impacts to the landscape are limited to the plant, roads and beaches.

The scarring left by decades of diamond mining along the old raised beaches, along with the numerous associated coastal tracks, is inescapable and will remain this way as there are no funds available from the state to rectify the situation, and many of the original companies have long since ceased to function. The main coastal road and the numerous rough tracks continue to be used by members of the public who camp along this section of the coast (state land) and several informal beach huts are found at sheltered locations.

While the coastline to the north of Farm Geelwal Karoo 262 is of a more conventional West Coast nature, pronounced cliff lines are found along the coastline adjacent to Farm Geelwal Karoo 262 extending down as far as the Olifants River. These cliffs are composed of successions of overlapping coastal sediments and rocky areas and the erosion of these deposits exposes older palaeontological and archaeological traces.

eThembeni Cultural Heritage (2007) described the landscape in the vicinity of Tormin Mine as “typical of the West Coast rural coastline, characterised by large tracts of open farmland with the Atlantic Ocean as a backdrop. Infrastructure and buildings occur far apart. The terrain is typically characterised as plains with open low hills or ridges to the north of the property with open high hills and ridges to the south”. They considered the landscape in and around the study area to have medium heritage significance with respect to its historical, scientific and aesthetic value.

Heritage indicators are the few farming and mining structures (some derelict) found on the coastal strip. Occasional old cultivated fields are noted inland, but do not seem to come within ~2 km of the coast. Other features are typical farming related features such as fences, windmills and reservoirs.

The heritage specialist grades the landscape as Generally IIIC with some coastal areas perhaps graded as IIIB despite disturbance.

Site Finds

Northern Coastline

Archaeological resources, include EStA/MSA and LSA sites, are situated on higher ground (above the high-water mark) and are often concentrated along rocky shores. The specialist's survey identified mainly LSA shell middens along the coastline, although this does not mean that MSA or EStA remains are not present below the cover sands.

It is unclear if any shipwreck material is located along any of these beaches. The South African Heritage Resources Agency (SAHRA) noted that the nearest recorded wreck is that of the Catherine Isabella which lies approximately 18 km south of Beach 1 off Robeiland. SAHRA indicated that there are no known shipwrecks within the development area.

The highest concentration of LSA shell middens are found inland of Beach 9 (Figure 90).

Figure 90: Shell middens near Beach 9

Source: ACO, 2018

Farm Geelwal Karoo 262

Archaeological sites tend to concentrate on rocky headlands, while fewer sites are found inland of sandy beaches since pre-colonial groups were attracted to the shell fish which could be gathered from the rocks. It must be emphasised, that this is a LSA distribution pattern and it is not yet known whether EStA and MSA groups followed a similar strategy with respect resource exploitation and settlement. LSA sites are easily visible and may be more frequently recorded by archaeologists.

Fossil bone-rich archaeological sites have been recorded at Cliff Point (southern extent of Farm Geelwal Karoo 262) and adjoining areas in the past. These sites are extremely rare and considered to be valuable heritage resources.

A number of sites with fossilised bone were recorded both at Cliff Point (Figure 91), and further north on the boundary between Farm Geelwal Karoo 262 and Klip Vley Karoo Kop 153/RE. It was not always clear whether they were associated with nearby scatters of MSA material, or whether the association was fortuitous. Nevertheless, both Orton (2011) and Hart (2011) have highlighted the possibility of recovering MSA sites with preserved bone and possibly shell and the high significance these would have.

Figure 91: Fossilised bone from Cliff Point

Source: ACO, 2018

The surface fossilised bone and EStA and MSA artefacts in disturbed areas along the coastal margin is due to erosion or the mining of overburden resulting in the exposure of buried older land surfaces. Due to the large amounts of aeolian sands covering the study area, most of the earlier material, though invisible, is probably quite extensive throughout the area. The artefacts/bone/shell lies on the buried hardpan or Pleistocene "dorbank" horizon, where it has become conflated and concentrated by natural processes over thousands of years (Figure 92 and Figure 93). The depth of the dorbank horizon is variable but usually shallow. Since the material tends to be conflated onto a single horizon, the provenance (context) and associations of different materials becomes problematic and as such, is generally considered of lower significance than material where context is secure.

Away from the coast around the Tormin processing plant, the cover sands do not appear calcareous or fossiliferous, but there is possibility that fossil bone and/or archaeological material may occur below.

The proposed footprints of the mining areas and infrastructure / plant expansion area were intensively surveyed by the specialist for traces of archaeological resources. Although the specialist had expected to find some LSA scatters with marine shell and artefacts (such as were present on the adjacent wind energy facility site), most of what was identified consisted of isolated stone artefacts of either LSA or MSA affiliation in either quartz or quartzite, with occasional silcrete being observed. In some places, the dorbank layer is very shallow at ~150 mm below surface. The dorbank layer is significant since archaeological material that has been subject to deflation will collect on its surface and may be exposed during mining. Although MSA or EStA material is expected, the specialist is unable to predict the density at this time, or if any fossilised organic remains may be found in association.

A single isolated quartzite flake was identified on the powerline route inside the Farm Geelwal Karoo 262 property. No sites were recorded by Orton and Hart (Hart 2007) along the section of powerline route inside the adjacent property.

Some of the material observed on Farm Geelwal Karoo 262 is of high significance, particularly the material near Cliff Point. The surface finds in the areas proposed for inland mining and infrastructure expansion were isolated finds of low significance. It is difficult to predict what may be found below surface, but as bioturbated surface material is sometimes an indication of what may be observed underground, large volumes of LSA shell middens are not anticipated.

Figure 92: Distribution of stone artefacts on shallow dorbank

Source: ACO, 2018

Figure 93: Some of the EStA stone artefacts recovered from the dorbank
Source: ACO, 2018

7.5 Visual and Aesthetic

7.5.1 Visual Character

The basis for the visual character of the area is provided by the geology/topography, vegetation and land use of the area, giving rise to an undulating landscape under predominantly natural cover with significant influence from the ocean with limited rural and mining activities (Figure 94). Most of the area can therefore be defined as a *natural transition landscape* as it is mostly natural scenery but man-made elements (e.g. homesteads, wind turbines, mining infrastructure) are visible in the landscape.

Figure 94: Visual character of the study area

7.5.2 Visual Quality

The visual quality of the overall area is largely determined by the open, stark character of the landscape with limited human influence. Views over the Atlantic Ocean contribute to this sense of 'openness'.

The dynamic coastline of coastal cliffs, rocky outcrops and sandy beaches increases the visual quality of the area.

The low-growing character of the vegetation does not add any visual interest although the predominantly natural state of the landscape and lack of human influence creates a sense of 'starkness'.

The wind turbines of the Sere wind energy facility (Figure 95) which add visual interest in the landscape. The red deposits on the beaches (Garnet mineral) give the beaches along this stretch of coastline a unique aesthetic. In some ways the Tormin processing plant provides interest in the landscape. However, mining activities and mine infrastructure along the coast are incongruent when viewed near these elements.

The scarring and erosion along the coast from current and historic mining / prospecting activities (Figure 95) and beach access roads detract from the visual quality of the area. Nevertheless, the visual quality of the study area is *moderate*.

Figure 95: Sere wind energy facility (left) and prior mining / prospecting (right)

7.5.3 Sense of Place

The region has scenic value in terms of its open stark setting and sense of wilderness and expansiveness invoked when visiting, partly due to the relatively limited human influence throughout the region. The study area possesses visual-spatial qualities related to the rural character of the inland portion of the study area (farmsteads, small holdings along the river, windmills, rolling hills) and the predominantly natural landscape and the topographical features along the coastline (Olifants River Estuary, coastal cliffs, rocky promontories,

sandy bays). The sense of place is also highly influenced by the coast, the views over the ocean and the harsh coastal conditions. Visitors are attracted to the coast for camping and other recreational uses.

There are elements that adversely affect the sense of place including the mining operations and mine infrastructure and visual scars on the landscape (cleared vegetation and erosion).

A person's connection or relationship to a place when defining sense of place is also important. Cross (2011) defines six categories of relationships with place (Table 34): biographical, spiritual, ideological, narrative, cognitive and dependent.

Table 34: Relationship to place

Type of Relationship	Process
Biographical (historical and familial)	Being born in and living in a place. Develops over time.
Spiritual (emotional, intangible)	Feeling a sense of belonging.
Ideological (moral and ethical)	Living according to moral guidelines for human responsibility to place. Guidelines may be religious or secular.
Narrative	Learning about a place through stories, family histories, political accounts and fictional accounts.
Cognitive (based on choice and desirability)	Choosing a place based on a list of desirable traits and lifestyle preferences.
Dependent	Constrained by lack of choice, dependency on another person or economic opportunity.

Source: Adapted from Cross, 2011

The relationship of receptors in the study area to place is likely to be predominantly biographical or habitual / spiritual. Visitors to, Gert du Toit-se-Baai, for example, may have a connection to this stretch of coastline because they and their families have been visiting the same campsite year after year. Or, a farmer whose farm has been in the family for generations will have an emotional attachment to the area. Other receptors may have decided to move to the area because they were attracted to the tranquil atmosphere or dramatic coastline (cognitive relationship).

7.5.4 Visual Receptors

Receptors are important insofar as they inform visual sensitivity. The sensitivity of viewers is determined by the number of viewers and by how likely they are to be impacted upon (Table 35). Potential viewers include the following:

- **Holiday-makers and recreational users**: The coastline is used by campers and other recreational users. Coastal destinations including Brand-se-Baai, Duiwegat, Die Toring, Robeiland and Gert du Toit-se-Baai (Figure 96). Visibility of the project from the coast, particularly the beach mining extension, will be high;
- **Motorists**: Visibility to motorists on the R362 between Lutzville and Strandfontein and on the R363 between Lutzville and Nuwerus will be insignificant because of screening provided by topography and the distance from the project. The public (gravel) road OP9764 provides access to the coastline north of Tormin Mine. This road is used sporadically by farmers and is one of the few vehicular roads providing access to the coast for the public. This road will be used by the haul trucks and the public moving through this area will have a clear view of beach mining operations; and
- **Residents in surrounding settlements and farmsteads**: Visibility from many of the households in Koekenaap, Strandfontein, Papendorp, Ebenhaeser, and Olifantsdrift and smallholdings and farmsteads in the surrounding area is likely to be insignificant, as the topography (e.g. ridgelines) screens views of the mine extension areas.

Table 35: Receptor sensitivity criteria

Sensitivity	Criteria
Number of people that will see the project (exposure factor)	
High	Towns and cities, along major national roads (i.e. thousands of people)
Moderate	Villages, typically less than 1000 people
Low	Less than 100 people (i.e. a few households)
Receptor perception of the project and visual landscape (perceived landscape value factor)	
High	People attach a high value to aesthetics - in or around national parks, coastlines, pristine forest areas.
Moderate	People attach a moderate value to aesthetics - smaller towns where natural character is still plentiful.
Low	People attach a low value to aesthetics, when compared to employment opportunities, for example - industrial areas, cities, towns.

Source: Adapted from Golder Associates, 2012

The sensitivity of viewers or visual receptors potentially affected by the visual impact of the project is *moderate* because the remoteness of the project area ensures that there are only a limited number of receptors, but those receptors are likely to attach a high value to the visual landscape of the area.

Figure 96: Gert du Toit-se-Baai campsite

7.6 Traffic

This section is based on information provided by the traffic specialist, ITS Engineers (refer to the Traffic Impact Assessment, Appendix 11I).

7.6.1 Existing Road Network

The important characteristics of the major roadway facilities in the study area and roads impacted by the project are summarised in Table 36.

Table 36: Existing roadway facilities

Roadway	Classification	Posted Speed (km/h)	Road Surface
N7	National Road	120	Tar
R27(TR16/1)	Provincial Trunk Road	100/80/60	Tar
R362 (MR548)	Provincial Main Road	100	Tar
R362 (MR552)	Provincial Main Road	100	Tar
R363 (MR547)	Provincial Main Road	100	Tar
DR2225	Provincial Divisional Road	60	Gravel
OP9764	Provincial Minor Road	Not posted	Gravel

Source: ITS Engineers, 2018

All the existing intersections in the study area are stop controlled intersections with stop-control on the minor roads. All the paved roads are two lane roads, one lane per direction.

The N7 has 3.7 m lanes with 2 m paved shoulders. All Provincial trunk roads and main roads have 3.3 m lanes with gravel shoulders. The gravel roads are typically 8 m wide with narrower sections in some areas. Refer to Figure 97 to Figure 100 for the typical cross-sections of the major roads in the study area.

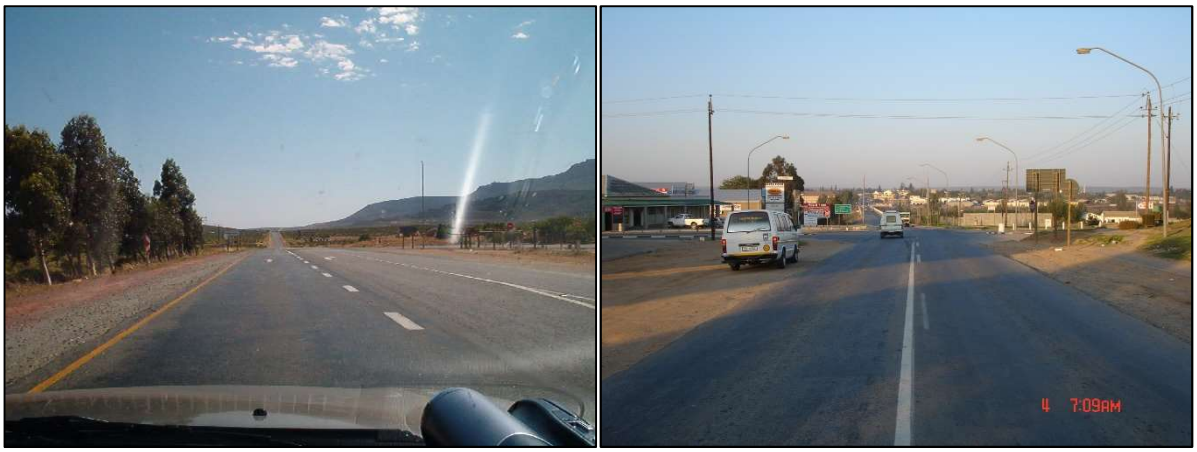

Figure 97: Northbound view along the N7 past the weigh bridge at Klawer (left) and southbound view along the R27 towards the town Vredendal (right)

Figure 98: Northbound view along the R362 (MR548) towards the R27 in Vredendal (left) and southbound view along R362 (MR552) towards the R27 in Vredendal (right)

Figure 99: Northbound view along the R363 (MR547) towards Koekenaap (left) and westbound view along the DR2225 from Koekenaap (right)

Figure 100: Westbound view along OP9764 from DR2225 (left) and northbound view along OP9764 (right)

Source: ITS Engineers, 2018

7.6.2 Existing Traffic Volumes

The table below shows the current annual average daily traffic volumes (AADT), the peak hour volumes and the percentage heavy vehicles on the road network in the study area.

Table 37: Traffic volumes

Road	AADT	Peak Hour Volume	% Heavy Vehicles
N7	3 000	240	19%
R27(TR16/1)	2 800	370	9%
R362(MR548)	1 500	100	13%
R362(MR552)	2 000	170	7%
R363(MR547)	800	140	6%
DR2225	<100	<50	50%
OP9764	<50	<10	30%

These volumes are low and there is sufficient spare capacity on the road network to accommodate increases in traffic volumes. Based on historic traffic count information along the roads in the study area, the traffic volumes along the roads in the study area have not changed much over the past 10 years. The bulk of the traffic volumes along DR2225 is traffic from Tormin Mine. During the December holiday period, and to a lesser extent the Easter weekend period, the traffic volumes along DR2225 and OP9764 (Figure 101) are significantly

higher due to holiday makers camping along the coast line. However, it is clear that the traffic volumes on the roads in the study area are low and there is sufficient spare capacity on the road network with the current infrastructure to accommodate increased traffic volumes.

Figure 101: Typical cross-sections of OP9764

Source: ITS Engineers, 2018

(b) Description of the current land uses.

Tormin Mine is located on and adjacent to Farm Geelwal Karoo 262 on the West Coast of South Africa, north of the Olifants River Estuary and approximately 25 km west of Lutzville.

Mining and extensive agriculture are the primary land uses in the study area although tourism is of increasing significance in the region. Land cover within the study area is mostly natural because of limited urban development and the relative low impact of mining and agriculture. Low-intensity small stock farming is the primary agricultural activity in the study area although intensive (irrigated) crop farming occurs along the Olifants River to the south and east of Tormin Mine.

Both diamonds and heavy minerals have been successfully mined in the coastal zone north of the Olifants River. Mining at Brand-se-Baai (~ 30 km north) has had a large impact on the natural vegetation in the coastal zone.

The study area is sparsely populated with less than 10 people per km^2 mostly concentrated within the small towns and villages of the area (Savannah, 2008). Koekenaap is a rural village located ~ 20 km east of Tormin Mine. Strandfontein, ~ 26 km south of Tormin Mine is a holiday destination and therefore has a low residential density. Papendorp (~ 20 km), Ebenhaeser (~ 15 km) and Olifantsdrift (~ 15 km) are small isolated settlements located on the banks of the Olifants River.

Isolated farmsteads are scattered throughout the surrounding area. An extensive network of sandy/gravel farm roads connect the various farms. On some of the farms, tracts of land have been cleared of natural vegetation and planted with crops (strip cultivation). There is a higher concentration of farms (smallholdings) along the Olifants River which is the only reliable source of water in the region.

Although there are no mining activities on Farm Geelwal Karoo 262, the Tormin processing plant is located on the elevated coastal plain on Farm Geelwal Karoo 262 inland of MSR's Mining Rights area (MR162 and MR163).

Areas along the coast have been disturbed from prior and current mining and/or prospecting activities (refer to Section 1.4 and Appendix 6), as well as by people accessing the coastline on a network of informal beach access roads. The public (gravel) road OP9764 provides access to the coastline north of Tormin Mine. This road is used by farmers and visitors to the coastline. The coastline is used by campers and other recreational users.

Eskom's Sere wind energy facility, consisting of 46 turbines, is located on the ridgeline inland of Tormin Mine and is a prominent feature in the landscape.

(c) Description of specific environmental features and infrastructure on the site.

Refer to the Baseline Environment section above.

(d) Environmental and current land use map.

(Show all environmental, and current land use features)

See Appendix 9.

ii) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

Refer to the detailed Impact Assessment (Appendix 10).

iii) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

Table 38: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. *Extent* *– the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g. the development site and immediate surrounds)	1
Regional	The region (District Municipality or Quaternary catchment)	2
(Inter) national	Nationally or beyond	3
B. ***Intensity*** *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. ***Duration*** *– the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years and reversible	1
Medium-term	2 to 15 years and reversible	2
Long-term	More than 15 years and irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 39: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below.

Table 40: Probability classification

Probability *– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in the table below.

Table 41: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below.

Table 42: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

INSIGNIFICANT: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.

VERY LOW: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.

LOW: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.

MEDIUM: the potential impact **should** influence the decision regarding the proposed activity/development.

HIGH: the potential impact **will** affect the decision regarding the proposed activity/development.

VERY HIGH: The proposed activity should only be approved under special circumstances.

iv) The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

MSR owns Farm Geelwal Karoo 262, the property on which the Tormin Mine and the inland strand line is located.

The locations of the VHM beach deposits and inland deposits are fixed, which dictates possible mining locations / layouts. MSR is applying for extension into areas in immediate proximity to existing operations, infrastructure and facilities at Tormin Mine to take advantage of such infrastructure and facilities and maximise operational efficiency. Location / site / layout alternatives for the mine sites have thus not been considered for assessment.

MSR proposed a layout alternative for the infrastructure / plant expansion area that extended close to the eastern (fenced) boundary of Farm Geelwal Karoo 262 (refer to Figure 23). On advice of the terrestrial ecology specialist, MSR revised the layout of the infrastructure / plant expansion area (refer to Appendix 5, Figure 12) to increase the ecological corridor between the infrastructure / plant expansion area and the eastern fenceline. This layout was selected for assessment and no other layout alternatives were assessed.

v) The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

The comments and concerns raised by stakeholders are included in the Section 2(g)(iii) and the Issues and Responses Summary (Appendix 8B). Comments from stakeholders, together with input from specialists and experienced SRK EAPs, have informed the mitigation measures. Refer to the Impact Assessment (Appendix 10) for the detailed impact assessment and Table 43 for a summary of the identified impacts, the key mitigation / optimisation measures and the significance rating without and with mitigation.

vi) Motivation where no alternative sites were considered.

Alternatives have been considered for this project, as listed above in Section 2 (h)(i). Where alternatives have not be considered for assessment, reasons have been provided in Section 2 (h)(i).

vii) Statement motivating the alternative development location within the overall site. **(Provide a statement motivating the final site layout that is proposed)**

MSR owns Farm Geelwal Karoo 262, the property on which the Tormin Mine and the inland strand line is located.

The locations of the **VHM beach deposits and inland deposits are fixed**, which dictates possible mining locations. MSR is applying for extension into areas in immediate proximity to existing operations, infrastructure and facilities at Tormin Mine to take advantage of such infrastructure and facilities and maximise operational efficiency. No mining location alternatives have therefore been assessed.

Possible **location alternatives for the MSP** were initially considered by MSR during the pre-feasibility phase. Based on capital costs, operating costs and hauling costs, MSR identified Tormin Mine as the most feasible location for the MSP and no location alternatives were assessed for the MSP.

MSR identified an **alternative access road to Beach 1** to reduce the potential impact on a drainage line (refer to Appendix 5, Figure 3). Both access road alternatives to Beach 1 have been considered by the relevant specialists.

MSR proposed a **layout alternative for the infrastructure / plant expansion area** that extended close to the eastern (fenced) boundary of Farm Geelwal Karoo 262 (refer to Figure 23). On advice of the terrestrial ecology specialist, MSR revised the layout of the infrastructure / plant expansion area (refer to Appendix 5, Figure 12) to increase the ecological corridor between the infrastructure / plant expansion area and the eastern fenceline. This layout was selected for assessment and no other alternatives were assessed.

b) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity. (Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

Several specialist studies were undertaken during the Impact Assessment Phase to investigate the key potential direct, indirect and cumulative impacts (negative and positive) identified during Scoping. These specialist impact studies are as follows:

- Soil and Land Capability Impact Assessment;
- Air Quality Impact Assessment;
- Groundwater Impact Assessment;
- Marine Ecology Impact Assessment;
- Freshwater Ecology Impact Assessment;
- Terrestrial Ecology Impact Assessment;
- Archaeology Impact Assessment;
- Palaeontology Impact Assessment;
- Traffic Impact Assessment; and
- Geotechnical Impact Assessment.

These specialist reports are attached as Appendices 11A to 11J to this report. Noise, socio-economic and visual impacts were assessed by experienced EAPs and SRK specialists, and stand-alone specialist studies were not considered necessary.

The significance of the identified impacts is assessed using SRK's proven impact rating methodology (see Section 2 (g)(vi)). Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures.

Appendix 10 presents the detailed impact assessment and a summary of the potential impacts is provided in Table 43.

c) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Table 43 below summarises the potentially significant impacts and their significance ratings before and after application of mitigation and/or optimisation measures. The supporting impact assessment conducted by the specialists and EAP is included as Appendix 10[11].

Table 43: Summary of impacts

Potential negative impacts are shaded in reds, benefits are shaded in greens. Insignificant impacts have not been shaded. Only key (non-standard essential) mitigation / optimisation measures are presented.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
CONSTRUCTION PHASE IMPACTS				
LC	**Impacts on Soil and Land Capability**			
LC1	Soil compaction caused by construction traffic	Medium	Medium	• Restrict construction activities to the project footprint areas. • Restrict vehicle movements to haul roads and construction areas and prohibit vehicle parking or storage of construction materials outside these areas.
LC2	Loss of fertile topsoil	Medium	Low	• Minimise vegetation clearance and the footprint of construction activities to what is essential. • Restrict construction activities to the project footprint areas. • Strip the topsoil layer of the infrastructure / plant expansion area prior to construction and stockpile the topsoil in a demarcated area for rehabilitation. • Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation.
LC3	Soil chemical pollution from construction activities	Very Low	Insignificant	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any spillage of fuel, oil, etc. • Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.
LC4	Loss of land capability	Low	Low	• Restrict construction activities to the project footprint areas. • Rehabilitate disturbed areas incrementally and as soon as possible, not necessarily waiting until completion of the Construction Phase.

[11] Current mining activities at Tormin Mine are not assessed in the EIA.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
LC5	Loss of soil ecosystem services	Medium	Low	• Use conserved topsoil as soon as possible to maintain soil nutrient cycles. • Do not stockpile topsoil higher than 4 m to ensure that the nutrient cycles are maintained over a large surface to volume ratio. • Rehabilitate disturbed areas incrementally and as soon as possible, not necessarily waiting until completion of the Construction Phase.
A	**Impacts on Air Quality**			
A1	Impaired human health from increased pollutant concentrations associated with construction activities	Low	Very Low	• Limit and phase vegetation clearance and the construction footprint to what is essential. • Avoid clearing of vegetation until necessary (i.e. just before earthworks). • Reduce airborne dust through e.g.: o Dampening dust-generating areas, roads and stockpiles with seawater; and o Utilise screens in high dust-generating areas. • Use high quality diesel for construction vehicles / equipment. • Maintain all generators, vehicles, and other equipment in good working order to minimise exhaust fumes.
A2	Increased dustfall from construction activities	Very Low	Insignificant	
N	**Noise Impacts**			
N1	Increased noise and vibration levels during construction	Very Low	Insignificant	• Comply with the applicable municipal and / or industry noise regulations. • Maintain all generators, vehicles and other equipment in good working order to minimise excess noise. • Enclose diesel generators used for power supply to reduce unnecessary noise. • Respond rapidly to complaints and take appropriate corrective action.
G	**Impacts on Groundwater**			
G1	Groundwater contamination during construction of the infrastructure / plant expansion area	Very Low	Insignificant	• Store hazardous liquids in above ground containers in bunded areas or on drip trays. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
ME	**Impacts on Marine Ecology**			
ME1	Disturbance and/or mortality of marine life during construction of beach access roads	Low	Very Low	• Confine the spatial extent of access road construction to the minimum required to minimise disturbance within the coastal zone. • Inform all staff about sensitive marine habitats. • Ensure that a 10 m buffer zone from the toe of the dune/cliffs remains undisturbed outside of the construction footprint. • Ensure that stringent waste management practices are in place at all times. • Prohibit vehicle maintenance and refuelling on the beach. • Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use. • Use drip trays and bunding where spills / losses are likely to occur. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility. • Subject mobile equipment, vehicles and power generation equipment to monthly noise tests. • Respond rapidly to complaints and take appropriate corrective action.
ME2	Mortality of marine fauna caused by construction waste	High	Medium	• Inform all staff about sensitive marine species and the responsible disposal of construction waste. • Do not dispose of any waste in the marine environment. • Display and explain waste handling and disposal protocols. • Reduce, reuse, recycle all waste generated on site.
ME3	Increased turbidity in the water column during construction of beach access roads	Insignificant	Insignificant	• No mitigation is required.
FE	**Impacts on Freshwater Ecology**			
FE1	Destabilisation of watercourses caused by road widening and increased vehicle movements during construction	Low	Very Low	• Utilise the alternative access road to Beach 1. • Plan for the management of water runoff during infrequent but potentially destructive storms. • Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels. • Install pipe culverts or similar at the road crossing points to allow for the uninterrupted flow of water under / across the road. Culvert design must include allowance for effective dissipation of flow downstream, and multiple pipes must be used to prevent concentration of flows. • Avoid piling graded vegetation and soils along the road edges, where they will contribute to blockage of surface runoff and add sources of loose sediment to enter watercourses. Incorporate this material into road fill or shape to ensure dissipation occurs. • Minimise the disturbance corridor during road widening.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Regularly maintain stormwater outlets / dissipation channels. • Ensure that construction-associated waste (e.g. plastic, rubble) is disposed of appropriately on a frequent and ongoing basis. • Ensure that vehicle and machinery refuelling / storage is managed to minimise pollution opportunities.
TE	**Impacts on Terrestrial Ecology**			
TE1	Loss of vegetation and plant species of conservation concern (SCC) during construction	Medium	Medium	• Appoint a suitably qualified specialist to undertake a preconstruction walk-through to identify SCC and protected species within the construction footprint and oversee the rescue and relocation of these species. • Obtain a permit from CapeNature for the removal and/or destruction of SCC. • Limit vegetation clearance and the footprint of construction activities to the minimum required. • Clearly define the boundary of the construction footprint area and ensure that all activities remain within the defined footprint area. • Ensure all new haul and access roads on Farm Geelwal Karoo 262 are constructed within the boundaries of the proposed mining area or infrastructure / plant expansion area. • Locate laydown areas or other temporary use areas within the construction footprint or the existing approved processing area. • Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand.
TE2	Disturbance to terrestrial fauna and loss of habitat during construction	Medium	Medium	• Appoint a suitably qualified specialist to undertake a preconstruction walk-through of the construction footprint to demarcate and clear burrows. • Limit vegetation clearance and the footprint of construction activities to the minimum required. • Confine construction vehicles and staff to designated roadways and construction areas and strictly prohibit the indiscriminate movement of construction vehicles and staff through vegetation outside of the construction footprint. • Limit vehicle speeds on internal and haul roads to 40 km/hr. • Conduct environmental induction for all construction staff to increase awareness in fauna protection. • Prohibit trapping, collecting and hunting of fauna. • Flush any faunal species within the construction footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer. • Ensure hazardous materials (especially fuel storage) are stored in suitable hazardous material storage facilities. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility. • Do not leave trenches open for extended periods.
TE3	Disturbance to avifauna and loss of habitat during	Medium	Medium	• Check for nests within the construction footprint during the preconstruction walk-through. • Limit vegetation clearance and the footprint of construction activities to the minimum required.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
	construction			• Confine construction vehicles and staff to designated roadways and construction areas and strictly prohibit the indiscriminate movement of construction vehicles and staff through vegetation outside of the construction footprint. • Keep the construction site clear of litter and especially plastic, twine and string.
S	**Socio-Economic Impacts**			
S1	Investment in and contribution to the economy	Medium	Medium	• Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.
S2	Increased employment, income and skills development	Low	Low	• Maximise use of local skills and resources through preferential employment of locals where practicable. • Develop and implement a fair and transparent labour and recruitment policy. • Ensure gender equality in recruitment, as far as possible. • Provide suitable training. • Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.
S3	Reduced access to the coast	Insignificant	Insignificant	• Restrict construction activities to the development footprint. • Install appropriate signage and information regarding coastal access.
S4	Possible decline of tourism	Insignificant	Insignificant	• Restrict construction activities to the development footprint. • Install appropriate signage and information regarding coastal access. • Install appropriate screening of construction sites in line with the scenic nature of the area.
H1	**Heritage Impacts**			
H1	Loss of archaeological resources during road widening	Low	Low	• Limit clearance and the footprint of construction activities to what is essential. • Alert personnel to possibility of finding archaeological resources and follow “Finds Procedure”. • Appoint an archaeologist to monitor construction activities and sample affected archaeological resources as required.
H2	Loss of archaeological resources during construction of infrastructure / plant expansion area	Low	Low	
H3	Loss of fossil bones during road widening	Low	Medium	• Limit clearance and the footprint of construction activities to what is essential. • Alert personnel to possibility of finding rare fossil bones / shells and follow “Fossil Finds Procedure”. • Cease construction on (chance) discovery of fossil bones / shells and protect fossils from further damage.
H4	Loss of fossil shells during road widening	Very Low	Very Low	
H5	Loss of fossil bones	High	High	

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
	during construction of infrastructure / plant expansion area			• Send information and photographs to a palaeontologist for assessment and to determine preservation, collection and record keeping procedures.
V	**Visual Impacts**			
V1	Altered sense of place and visual intrusion caused by construction activities	Very Low	Very Low	• Limit and phase vegetation clearance and the footprint of construction activities to what is essential. • Avoid excavation, handling and transport of materials which may generate dust under high wind conditions. • Prepare/review a detailed dust suppression/control management programme, such as regular wetting and/or use of non-contaminating agents, to reduce dust on dust-generating facilities (e.g. roads), especially during the dry season and when conditions are windy. • Ensure speed limits on all gravel roads are respected at all times. • Keep construction sites tidy and all activities, material and machinery contained within an area that is as small as possible. • Control litter and keep construction sites as clean and neat as possible. • Rehabilitate disturbed areas incrementally and as soon as possible, not necessarily waiting until completion of the Construction Phase. • Maintain all generators, vehicles and other equipment in good working order. • Minimise the use of night-lighting. No high mast or spot-light security lighting or up-lighting allowed.
V2	Altered sense of place from increased traffic during construction	Very Low	Very Low	• Restrict construction deliveries to Mondays to Saturdays between the hours of 08h00 and 17h00. • Maintain all vehicles in good working order.
T	**Traffic Impacts**			
T1	Increased nuisance on existing road users and surrounding residents from construction traffic and road widening	Very Low	Very Low	• Restrict construction deliveries to Mondays to Saturdays between the hours of 08h00 and 17h00. • Maintain all vehicles in good working order. • Manage construction sites and activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of construction vehicles. • Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of construction activities. • Maintain and repair roads damaged by construction vehicles, in consultation with relevant road authorities. • Ensure large construction vehicles are suitably marked to be visible to other road users and pedestrians.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Ensure that all safety measures are observed and that drivers of construction vehicles comply with the rules of the road. • Schedule road widening of OP9764 during “off season” (low visitor) periods. • Investigate and respond to complaints about traffic.
GT	**Geotechnical Impact**			
No impacts identified.				
OPERATIONAL PHASE IMPACTS				
LC	**Impacts on Soil and Land Capability**			
LC6	Soil erosion caused by operational activities	High	Very Low	• Undertake vegetation clearance and soil stripping immediately prior to mining activities. • Implement drainage control measures and culverts to manage the natural flow of surface runoff around the infrastructure / plant expansion area. • Use conserved topsoil as soon as possible or vegetate topsoil stockpiles if the topsoil cannot be used immediately. • Use geotextiles on topsoil stockpiles to stabilise the stockpile and prevent soil erosion if vegetation cover is insufficient.
LC7	Soil compaction caused by hauling and stockpiles	Medium	Low	• Restrict hauling to designated haul roads and no additional roads or turn-around areas should be created. • Do not stockpile topsoil higher than 4 m.
LC8	Soil chemical pollution from operational activities	Medium	Low	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any spillage of fuel, oil, etc. • Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility. • Design processing areas to effectively manage and dispose of contaminated storm water and process water. • Ensure equipment / vehicle maintenance and washdown areas are contained and appropriate systems provided for treating and disposing of contaminated liquids and solids. • Regularly inspect effluent and process systems for leaks.
LC9	Loss of land capability	Medium	Low	• Restrict activities to the project footprint areas. • Undertake concurrent rehabilitation to prevent stockpiled topsoil from losing its inherent fertility.
A	**Air Quality Impacts**			
A3	Impaired human health	Low	Very Low	

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
	from increased pollutant concentrations associated with mining and processing activities			• Reduce airborne dust through dampening roads with water (control efficiency of minimum 75%). • Partially enclose MSP product stockpiles (control efficiency of minimum 70%). • Use high quality diesel for construction vehicles. • Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.
A4	Increased dustfall associated with mining and processing activities	Very Low	Very Low	
A5	Impaired human health from increased pollutant concentrations associated with increased product truck movements	High	Medium	
A6	Increased dustfall associated with increased product truck movements	Low	Low	
N	**Noise Impacts**			
N2	Increased noise and vibration levels during operations	Medium	Low	• Comply with the applicable municipal and / or industry noise regulations. • Maintain all generators, vehicles, vessels and other equipment in good working order to minimise excess noise. • Enclose diesel generators used for power supply to reduce unnecessary noise. • Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays). • Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays. • Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00. • Ensure speed limits are respected at all times. • Respond rapidly to complaints and take appropriate corrective action.
G	**Impacts on Groundwater**			
G2	Groundwater contamination during inland mining	Medium	Low	• Inspect mining vehicles and equipment for oil/fuel leaks prior to entering the mining area and frequently in the mining area. • Regularly service mining vehicles and equipment. • Store hazardous liquids in above ground containers in bunded areas or on drip trays. • Clean up hydrocarbon spills immediately.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Collect and dispose of polluted soil at a licensed waste disposal facility. • Discontinue (inland) mining if groundwater is intersected. • Undertake a geophysical survey south-east of the infrastructure / plant area to determine groundwater flow and install four boreholes in this zone for aquifer characteristic testing. • Install monitoring boreholes up and down gradient of the mining area and analyse data regularly, taking corrective action as and if required. • Produce a numerical groundwater model prior to mining and update the model biannually based on groundwater monitoring results.
G3	Groundwater contamination from the infrastructure / expansion area	Medium	Very Low	• Inspect vehicles and equipment for oil/fuel leaks. • Regularly service vehicles and equipment. • Store hazardous liquids in above ground containers in bunded areas or on drip trays. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility.
G4	Groundwater contamination from pipeline spills	Medium	Insignificant	• Ensure pipelines are accessible along the entire length. • Implement measures to detect, contain and fix pipeline leaks within 48 hours.
ME	**Impacts on Marine Ecology**			
ME4	Shoreline erosion and altered beach profiles caused by beach mining	High	Low	• Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no mining or disturbance may take place. • Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented). • Undertake primary processing on the beach and distribute tailings evenly above the mid-line of the beach from where it was mined. • Avoid discharging tailings from a centralised point. • Actively backfill mined beaches and profile the mining area to resemble the natural beach profile. • Remove sand berms (or similar) and any artificial structures on completion of each mining episode. • Rehabilitate all access roads built over coastal areas as soon possible, not necessarily waiting for the end of LoM. • Minimise disturbance of the intertidal and subtidal areas.
ME5	Changes in macrofaunal community structure caused by beach mining	High	Medium	
ME6	Disturbance and/or mortality of marine life caused by beach mining	High	Medium	• Enforce a 10 m buffer zone from the toe of sand dunes and cliffs towards the sea in which no mining may take place. • Ensure efficient and effective return of tailings to the beach to allow for dispersion by tidal action. Should this not be effective, manual landscaping of the beach back to its original profile must be undertaken within a maximum of 24 hours of cessation of mining. • Actively backfill mined beaches and profile the mining area to resemble the natural beach profile.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Reduce disturbance of beach habitat adjacent to mining pits through stringent environmental management and good house-keeping practices. • Inform all staff about sensitive marine species and the responsible disposal of waste. • Do not dispose of any waste in the marine environment. • Display and explain waste handling and disposal protocols. • Reduce, reuse, recycle all waste generated on site. • Ensure that stringent waste management practices are in place at all times. • Prohibit vehicle maintenance and refuelling on the beach. • Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use. • Use drip trays and bunding where spills / losses are likely to occur. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility. • Subject mobile equipment, vehicles and power generation equipment to monthly noise tests. • Respond rapidly to complaints and take appropriate corrective action.
ME7	Smothering of reefs and macrofauna caused by increased sedimentation from beach mining	Low	Very Low	• Prohibit mining closer than 10 m to rocky shore habitats. • Actively backfill mined beaches and profile the mining area to resemble the natural beach profile.
ME8	Increased turbidity in the water column caused by beach mining	Insignificant	Insignificant	• No mitigation is required.
FE	**Impacts on Freshwater Ecology**			
FE2	Destabilisation of watercourses caused by increased vehicle movements during operations	Medium	Low	• Utilise the alternative access road to Beach 1. • Strictly control the passage of vehicles on the road. No vehicles should be allowed to turn in or pull over into areas abutting the road, other than where formally designated turning or pullover areas have been created and managed. • Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels. • Install multiple culverts or other appropriate structures at Watercourse 2 to convey water runoff under / across the road and into the natural watercourse downstream of the road such that it does not result in erosion or channel constriction downstream. • Maintain culverts by removing sand and debris and dispose material outside of the affected watercourse so that it does not create additional blockages. • Implement measures (adjusting the routing of flows, dissipating runoff and/or establishing vegetation) to address erosion nick-points along the roads.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Undertake monthly auditing of access roads to assess erosion with a photographic record. • Compile a stormwater management plan that outlines a strategy for the management of stormwater flows off all hardened surfaces and off roads to inform ongoing management.
TE	**Impacts on Terrestrial Ecology**			
TE4	Loss of vegetation, plant SCC and ecological connectivity during inland mining	High	Medium	• Appoint a suitably qualified specialist to undertake a pre-mining walk-through to identify SCC and protected species within the mining footprint and oversee the rescue and relocation of these species. • Obtain a permit from CapeNature for the removal and/or destruction of SCC. • Limit vegetation clearance and the footprint of mining activities to the minimum required. • Clearly define the boundary of the inland mining area and haul roads and ensure that all activities remain within the defined footprint area. • Only clear vegetation when a new area is to be mined. Remove the vegetation and soil simultaneously and, where possible, immediately place this material in an area prepared for rehabilitation to reduce the duration of topsoil storage.
TE5	Disturbance to the coastal environment and loss of ecological connectivity during beach mining	Medium	Low	• Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no mining or disturbance may take place. • Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented). • Rehabilitate disturbed areas incrementally and as soon as possible. • Confine vehicles, machinery and staff to designated beach access roads and strictly prohibit the indiscriminate movement of vehicles, machinery and staff outside of the designated roads and mine areas. • Level and contour beach tailings material to allow the sea to restore the natural beach profile. Do not dispose tailings material beyond the setback line or on the foredunes. • Ensure hazardous waste is stored in suitable hazardous material storage containers and is removed from the beaches every day. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.
TE6	Disturbance to fauna and loss of habitat during mining	High	Medium	• Clearly define the mining boundaries and ensure that all activities remain within the defined footprint area. • Rehabilitate disturbed areas incrementally as new mining blocks are opened and previous blocks are closed. • Prohibit unnecessary driving at night. • Limit vehicle speeds on internal and haul roads to 40 km/hr. • Conduct environmental induction for all construction staff to increase awareness in fauna protection. • Prohibit trapping, collecting and hunting of fauna.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Flush any faunal species within the mining footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer. • Ensure hazardous materials (especially fuel storage) are stored in suitable hazardous material storage facilities. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility. • Do not leave trenches open for extended periods.
TE7	Disturbance to avifauna and loss of habitat during mining	Medium	Low	• Undertake avifaunal monitoring of the powerline route according to the Birdlife-developed Guidelines. • Install bird flight diverters along the length of the powerline. • Insulate the pylons and other exposed infrastructure to avoid avifauna electrocution. • Limit vegetation clearance and the footprint of mining activities to the minimum required. • Confine vehicles, machinery and staff to designated mining areas and haul / access roads and strictly prohibit the indiscriminate movement of vehicles, machinery and staff outside of the designated roads and mine areas. • Keep the operational areas clear of litter and especially plastic, twine and string. • Limit the number of beaches mined simultaneously. • Conduct environmental induction for all construction staff to increase awareness in avifauna protection. • Prohibit trapping and hunting of avifauna and egg collecting. • Undertake counts at regular roosting sites to determine impact on avifauna.
TE8	Increased erosion during mining	Medium	Low	• Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no mining or disturbance may take place. • Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented). • Rehabilitate disturbed areas incrementally and as soon as possible. • Only clear vegetation in the inland mining areas when a new block is to be mined. Remove the vegetation and soil simultaneously and, where possible, immediately place this material in an area prepared for rehabilitation to reduce the duration of topsoil storage. • Monitor rehabilitated areas and, if wind erosion is evident, install wind barriers. • Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand. Maintain the wind screens in place three years after beach mining is complete. • Install runoff control measures on all roads and hardened surfaces. • Clearly define the boundary of the mining areas and haul / access roads and ensure that all activities remain within the defined footprint area.
TE9	Proliferation of alien and invasive species during mining	Low	Very Low	• Compile an Alien Plant Management Plan. • Undertake regular monitoring for alien plants within the development footprint.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Conduct regular alien clearing using the best-practice methods for the species concerned. Avoid using herbicides as far as possible.
S	**Socio-Economic Impacts**			
S5	Investment in and contribution to the economy	Medium	High	• Establish and support Corporate Social Investment projects and / or networks that provide training and support for small and medium enterprises in the local municipality to benefit from the opportunities generated by the project. Initiate such programmes as early as possible. • Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible. • Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.
S6	Increased employment, income and skills development	Medium	Medium	• Maximise use of local skills and resources where practicable. • Provide suitable training. • Develop and implement a fair and transparent labour and recruitment policy. • Ensure gender equality in recruitment, as far as possible. • Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.
S7	Reduced access to the coast	Very Low	Very Low	• Implement management measures (e.g. road signs, speed limits, etc.) to ensure that the public is still able to safely use OP9764 to access this stretch of coast. • Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).
S8	Possible decline of tourism	Very Low	Very Low	• Implement management measures (e.g. road signs, speed limits, etc.) to ensure that the public is still able to safely use OP9764 to access this stretch of coast. • Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).
H	**Heritage Impacts**			
H6	Loss of maritime archaeological resources during beach mining	Low	Very Low	• Alert machine operators to possibility of finding shipwreck material. • Establish protocol if any shipwreck material is found, including reporting the find/s to SAHRA. • Maritime archaeologist to assess the material (if any identified) and propose the way forward. • Collect / excavate any exposed maritime archaeological resources using appropriate methods to record provenance.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
H7	Loss of archaeological resources during strand line mining	Medium	Low	• Appoint an archaeologist to monitor mining activities. • Monitor mining for archaeological resources. Initially this will need to be semi-permanent until it can be established if any resources are present or not. Based on initial observations, work out a program for ongoing or regular monitoring. • Alert personnel to possibility of finding archaeological resources and follow “Finds Procedure”. • Collect any archaeological resources that are exposed using appropriate methods to record provenance.
H8	Loss of fossil bones during beach mining	High	High	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by mining. • Alert personnel to possibility of finding rare fossil bones and follow “Fossil Finds Procedure”. • Cease mining on (chance) discovery of fossil bones and protect fossils from further damage. • Contact appointed palaeontologist providing information and images. • Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for preservation, collection and record keeping. • Record and sample exposed fossiliferous sections in earthworks by appointed palaeontologist.
H9	Loss of fossil shells during beach mining	Very Low	Very Low	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by earthworks. • Alert personnel to possibility of finding a substantial temporary exposure of marine shelly beds that may require sampling and recording. • Notify the appointed palaeontologist in the event of a large exposure of shell beds and provide the palaeontologist with information and images. • Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for sample collection and record keeping. • Record and sample selected exposed fossiliferous sections in earthworks by appointed palaeontologist.
H10	Loss of fossil bones during strand line mining	High	High	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by earthworks. • Alert personnel to possibility of finding rare fossil bones and follow “Fossil Finds Procedure”. • Cease mining on (chance) discovery of fossil bones and protect fossils from further damage. • Contact appointed palaeontologist providing information and images. • Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for preservation, collection and record keeping. • Record and sample exposed fossiliferous sections in earthworks by appointed palaeontologist.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
H11	Loss of fossil shells during strand line mining	Medium	Medium	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by earthworks. • Alert personnel to possibility of finding a substantial temporary exposure of marine shelly beds that may require sampling and recording. • Notify the appointed palaeontologist in the event of a large exposure of shell beds, and provide the palaeontologist with information and images. • Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for sample collection and record keeping. • Record and sample selected exposed fossiliferous sections in earthworks by appointed palaeontologist.
V	**Visual Impacts**			
V3	Altered sense of place and visual intrusion caused by mining activities and associated infrastructure	Low	Very Low	• Limit and phase vegetation clearance and the footprint of mining activities to what is essential. • Keep all areas neat, clean and organised to portray a general tidy appearance. • Keep material and machinery contained within an area that is as small as possible. • Progressively and continually rehabilitate mined out areas and project components. • Maintain all generators, vehicles and other equipment in good working order. • Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays). • Reduce the footprint of the infrastructure areas to a workable minimum. • Restrict infrastructure along the coast to the north of Tormin Mine as far as possible. • Consolidate or cluster structures together at the infrastructure expansion area to avoid the visual scatter of structures. • Avoid excavation, handling and transport of materials which may generate dust under high wind conditions.
V4	Altered sense of place from increased traffic during operations	Medium	Low	• Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays. • Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00. • Ensure speed limits are respected at all times. • Maintain all vehicles in good working order.
V5	Altered sense of place and visual quality caused by light pollution at night	Low	Very Low	• Limit lighting only to essential activities and facilities. • Direct lighting inwards and downwards towards activities and facilities to avoid light spillage and trespass. External lights should be fitted with reflectors (“full cut-off” luminaires) to direct illumination downward and inward to the specific illuminated areas.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
T	**Traffic Impacts**			
T2	Reduced traffic capacity on haul roads	Low	Very Low	• Manage beach mining activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of haul vehicles. • Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of hauling activities. • Ensure that large vehicles are suitably marked to be visible to other road users. • Ensure that all safety measures are observed and that drivers of vehicles comply with the rules of the road. • Investigate and respond to complaints about traffic.
T3	Reduced traffic capacity on the regional road network	Insignificant	Insignificant	• No mitigation is required.
T4	Compromised road surface integrity of the haul roads	Low	Very Low	• Ensure that vehicle axle loads do not exceed the technical design capacity of the road. • Maintain and repair roads damaged by trucks, in consultation with relevant road authorities.
T5	Compromised road surface integrity of the regional road network	Medium	Low	• Ensure that vehicle axle loads do not exceed the technical design capacity of the road. • Seal DR2225, in consultation with relevant road authorities. • Maintain and repair damage caused by trucks on DR2225, in consultation with relevant road authorities.
GT	**Geotechnical Impacts**			
GT1	Cliff failure caused by the construction of the infrastructure / expansion area	Very Low	Very Low	• Set and maintain a minimum buffer zone of 143 m between the infrastructure / plant expansion area and the cliff. • Monitor cliff geometry changes and adapt the expansion plan, if required, accordingly to maintain the buffer zone. • Ensure water is managed to limit groundwater flow to the cliff area. • Place heavy equipment and material stockpiles as far from the cliff as possible. • Monitor additional loading within the infrastructure / plant expansion area so as not to exceed the values used for the cliff stability assessment (21.1 kN/m2).
GT2	Cliff / dune failure caused by beach mining	Very Low	Very Low	• Set and maintain beach mining limits according to the mine bench toe, assuming that the bench will form a 35° natural repose angle slope. • Restrict beach mining depth to 6 m. • Delineate the mining limits (buffer zones) on mine plans and on the beaches.
GT3	Cliff failure caused by inland mining	Very Low	Very Low	• Set and maintain a minimum buffer zone of 220 m between inland mining and the cliff. • Restrict the mining depth to 30 m and the mining extent to within the planned inland mine boundaries.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				• Monitor cliff geometry changes and adapt the mining plan, if required, accordingly to maintain the buffer zone. • Ensure water is managed to limit groundwater flow to the cliff area.
CLOSURE PHASE IMPACTS				
LC	**Soil and Land Capability Impacts**			
LC10	Soil compaction caused by closure activities	Very Low	Insignificant	• Restrict closure activities to the project footprint areas. • Restrict vehicle movements to haul roads and work areas and prohibit vehicle parking or storage of materials outside these areas.
LC11	Soil chemical pollution from closure activities	Very Low	Insignificant	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any spillage of fuel, oil, etc. • Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.
A	**Air Quality Impacts**			
A7	Impaired human health from increased pollutant concentrations associated with closure activities	Low	Very Low	• Reduce airborne dust through e.g.: o Dampening dust-generating areas, roads and stockpiles with water; and o Utilise screens in high dust-generating areas. • Use high quality diesel for vehicles / equipment. • Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.
A8	Increased dustfall associated with closure activities	Very Low	Insignificant	

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
N	**Noise Impacts**			
N3	Increased noise and vibration levels during closure	Very Low	Insignificant	• Comply with the applicable municipal and / or industry noise regulations. • Maintain all generators, vehicles, vessels and other equipment in good working order to minimise excess noise. • Enclose diesel generators used for power supply to reduce unnecessary noise. • Respond rapidly to complaints and take appropriate corrective action.
G	**Impacts on Groundwater**			
G5	Groundwater contamination during closure of the infrastructure / plant expansion area	Insignificant	Insignificant	• Remove all hazardous materials from site and dispose at a licensed waste disposal facility. • Do not bury any materials on site. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility.
ME	**Impacts on Marine Ecology**			
ME9	Disturbance and/or mortality of marine life during closure of beach access roads	Low	Very Low	• Confine the spatial extent of access road closure to the minimum required to minimise disturbance within the coastal zone. • Inform all staff about sensitive marine habitats. • Ensure that a 10 m buffer zone from the toe of the dune/cliffs remains undisturbed outside of the closure footprint. • Ensure that stringent waste management practices are in place at all times. • Prohibit vehicle maintenance and refuelling on the beach. • Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use. • Use drip trays and bunding where spills / losses are likely to occur. • Clean up hydrocarbon spills immediately. • Collect and dispose of polluted soil at a licensed waste disposal facility. • Subject mobile equipment, vehicles and power generation equipment to monthly noise tests. • Respond rapidly to complaints and take appropriate corrective action.
ME10	Mortality of marine fauna caused by waste	High	Medium	• Inform all staff about sensitive marine species and the responsible disposal of waste. • Do not dispose of any waste in the marine environment. • Display and explain waste handling and disposal protocols. • Reduce, reuse, recycle all waste generated on site.
ME11	Increased turbidity in the water column during rehabilitation of beach access roads	Insignificant	Insignificant	• No mitigation is required.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
FE	**Impacts on Freshwater Ecology**			
FE3	Destabilisation of watercourses caused by increased vehicle movements during closure	Very Low	Insignificant	• Rehabilitate eroded areas (e.g. eroded channels, dongas). • Plan for the management of water runoff during infrequent but potentially destructive storms. • Remove or shape graded vegetation and soils along the road edges to ensure dissipation occurs. • Regularly maintain stormwater outlets / dissipation channels. • Ensure that waste (e.g. plastic, rubble) is disposed of appropriately on a frequent and ongoing basis. • Ensure that vehicle and machinery refuelling / storage is managed to minimise pollution opportunities.
TE	**Impacts on Terrestrial Ecology**			
TE10	Disturbance to terrestrial fauna during closure	Very Low	Insignificant	• Limit the footprint of closure activities to the minimum required. Prohibit the indiscriminate movement of vehicles and staff through vegetation outside of the affected footprint. • Limit vehicle speeds on internal and haul roads to 40 km/hr. • Conduct environmental induction for all staff to increase awareness in fauna protection. • Prohibit trapping, collecting and hunting of fauna. • Ensure hazardous materials (especially fuel storage) are stored in suitable hazardous material storage facilities. • Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility. • Do not leave trenches open for extended periods.
TE11	Disturbance to avifauna during closure	Very Low	Insignificant	• Limit the footprint of closure activities to the minimum required. Prohibit the indiscriminate movement of vehicles and staff through vegetation outside of the affected footprint. • Keep the site clear of litter and especially plastic, twine and string.
S	**Socio-Economic Impacts**			
S9	Investment in and contribution to the economy	Very Low	Very Low	• Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
S10	Increased employment, income and skills development	Very Low	Very Low	• Maximise use of local skills and resources through preferential employment of locals where practicable. • Develop and implement a fair and transparent labour and recruitment policy. • Ensure gender equality in recruitment, as far as possible. • Provide suitable training. • Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.
S11	Reduced access to the coast	Insignificant	Insignificant	• Restrict closure / closure activities to the affected footprint. • Install appropriate signage and information regarding coastal access.
S12	Possible decline of tourism	Insignificant	Insignificant	• Restrict closure activities to the affected footprint. • Install appropriate signage and information regarding coastal access.
H	**Heritage Impacts**			
No impacts identified.				
V	**Visual Impacts**			
V6	Altered sense of place and visual intrusion caused by closure and rehabilitation activities	Very Low	Very Low	• Use dark green or black (non-glossy) wind screens. • Remove rehabilitation wind screens as soon as vegetation is viable.
T	**Traffic Impacts**			
T6	Increased nuisance on existing road users and surrounding residents from closure traffic	Insignificant	Insignificant	• Restrict traffic along DR2225 to Mondays to Saturdays between the hours of 08h00 and 17h00. • Maintain all vehicles in good working order. • Manage closure / rehabilitation sites and activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of vehicles. • Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of closure activities. • Maintain and repair roads damaged by large vehicles, in consultation with relevant road authorities. • Ensure that large vehicles are suitably marked to be visible to other road users and pedestrians. • Ensure that all safety measures are observed and that drivers of vehicles comply with the rules of the road. • Investigate and respond to complaints about traffic.
GT	**Geotechnical Impacts**			
No impacts identified.				

d) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Soil and Land Capability Impact Assessment	**Construction Phase**		
	• Restrict construction activities to the project footprint areas.	**X**	Appendix 11A, Section 6.1
	• Restrict vehicle movements to haul roads and construction areas and prohibit vehicle parking or storage of construction materials outside these areas.		
	• Minimise vegetation clearance and the footprint of construction activities to what is essential.		
	• Strip the topsoil layer of the infrastructure / plant expansion area prior to construction and stockpile the topsoil in a demarcated area for rehabilitation.		
	• Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation.		
	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.		
	• Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	• Use conserved topsoil as soon as possible to maintain soil nutrient cycles.		
	• Do not stockpile topsoil higher than 4 m to ensure that the nutrient cycles are maintained over a large surface to volume ratio.		
	• Rehabilitate disturbed areas incrementally and as soon as possible, not necessarily waiting until completion of the Construction Phase.		
	Operational Phase		
	• Restrict hauling to designated haul roads and no additional roads or turn-		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	around areas should be created.	X	Appendix 11A, Section 6.2
	• Do not stockpile topsoil higher than 4 m.		
	• Undertake vegetation clearance and soil stripping immediately prior to mining activities.		
	• Implement drainage control measures and culverts to manage the natural flow of surface runoff around the infrastructure / plant expansion area.		
	• Use conserved topsoil as soon as possible or vegetate topsoil stockpiles if the topsoil cannot be used immediately.		
	• Use geotextiles on topsoil stockpiles to stabilise the stockpile and prevent soil erosion if vegetation cover is insufficient.		
	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.		
	• Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	• Design processing areas to effectively manage and dispose of contaminated storm water and process water.		
	• Ensure equipment / vehicle maintenance and washdown areas are contained and appropriate systems provided for treating and disposing of contaminated liquids and solids.		
	• Regularly inspect effluent and process systems for leaks.		
	• Restrict activities to the project footprint areas.		
	• Undertake concurrent rehabilitation to prevent stockpiled topsoil from losing its inherent fertility.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	Closure Phase		
	• Restrict closure activities to the project footprint areas.	**X**	Appendix 11A, Section 6.3
	• Restrict vehicle movements to haul roads and work areas and prohibit vehicle parking or storage of materials outside these areas.		
	• Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.		
	• Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storge facilities must have bund containment capacity equal to 110% of the largest container.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	Best Practice		
	• Use tracked vehicles where possible.		Appendix 11A, Section 6.1 – 6.3
	• Park construction vehicles in areas already affected by compaction. Temporary parking areas should be utilised for a short period (one to two weeks) before being moved to another area.		
	• Ensure all topsoil stockpiles are clearly and permanently demarcated and located in defined no-go areas.		
	• Do not use topsoil for other purposes e.g. filling material for roads, ramps etc.		
	• Park construction vehicles and equipment in designated areas where vehicles can regularly be checked for oil leaks.		
	• Check contractors' and visitors' vehicles for potential oil / fuel leaks before entering the Mine.		
Air Quality Impact Assessment	**Construction Phase**		
	• Limit and phase vegetation clearance and the construction footprint to what is		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	essential.	X	Appendix 11B, Section 6
	• Avoid clearing of vegetation until necessary (i.e. just before earthworks).		
	• Reduce airborne dust through e.g.: o Dampening dust-generating areas, roads and stockpiles with water; and o Utilise screens in high dust-generating areas.		
	• Use high quality diesel for construction vehicles / equipment.		
	• Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.		
	Operational Phase		
	• Reduce airborne dust through dampening roads with water (control efficiency of minimum 75%).	X	Appendix 11B, Section 7.3
	• Partially enclose MSP product stockpiles (control efficiency of minimum 70%).		
	• Use high quality diesel for construction vehicles.		
	• Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.		
	Closure Phase		
	• Reduce airborne dust through e.g.: o Dampening dust-generating areas, roads and stockpiles with water; and o Utilise screens in high dust-generating areas.	X	Appendix 11B, Section 8.2
	• Use high quality diesel for vehicles / equipment.		
	• Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.		
	Best Practice		
	• Use diesel particulate filters or selective catalytic reduction or other similar tailpipe technologies.		Appendix 11B, Section 6, 7.3 and 8.2

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Groundwater Impact Assessment	**Construction Phase**		
	• Clean up hydrocarbon spills immediately.	**X**	Appendix 11C, Section 6.1
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		
	• Store hazardous liquids in above ground containers in bunded areas or on drip trays.		
	Operational Phase		
	• Inspect mining vehicles and equipment for oil/fuel leaks prior to entering the mining area and frequently in the mining area.	**X**	Appendix 11C, Section 6.2
	• Regularly service mining vehicles and equipment.		
	• Store hazardous liquids in above ground containers in bunded areas or on drip trays.		
	• Clean up hydrocarbon spills immediately.		
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		
	• Discontinue (inland) mining if groundwater is intersected.		
	• Undertake a geophysical survey south-east of the infrastructure / plant area to determine groundwater flow and install four boreholes in this zone for aquifer characteristic testing.		
	• Install monitoring boreholes up and down gradient of the mining area and analyse data regularly, taking corrective action as and if required.		
	• Produce a numerical groundwater model prior to mining and update the model biannually based on groundwater monitoring results.		
	• Ensure the pipelines are accessible along the entire length.		
	• Implement measures to detect, contain and fix pipeline leaks within 48 hours.		
	Closure Phase		
	• Clean up hydrocarbon spills immediately.	**X**	Assessed by the EAP
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Store hazardous liquids in above ground containers in bunded areas or on drip trays.		
	Best Practice		
	None.		
Marine Ecology Impact Assessment	**Construction Phase**		
	• Confine the spatial extent of impacts to the minimum required to minimise disturbance within the coastal zone.	**X**	Appendix 11D, Section 4.1.1 and 4.2.1
	• Limit duration of construction activities in the coastal zone.		
	• Inform and empower all staff about sensitive marine habitats.		
	• Ensure that a 10 m buffer zone from the toe of the dune/cliffs remains undisturbed outside of the construction footprint.		
	• Inform all staff about sensitive marine species and the responsible disposal of construction waste.		
	• Do not dispose of any waste in the marine environment.		
	• Display and explain waste handling and disposal protocols.		
	• Reduce, reuse, recycle all waste generated on site.		
	• Ensure that stringent waste management practices are in place at all times.		
	• Prohibit vehicle maintenance and refuelling on the beach.		
	• Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.		
	• Use drip trays and bunding where spills / losses are likely to occur.		
	• Clean up hydrocarbon spills immediately.		
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		
	• Subject mobile equipment, vehicles and power generation equipment to monthly noise tests.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Respond rapidly to complaints and take appropriate corrective action.		
	• Rehabilitate the disturbed area.		
	Operational Phase		
	• Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no mining or disturbance may take place.	**X**	Appendix 11D, Section 4.1.2 and 4.2.2
	• Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented).		
	• Undertake primary processing on the beach and distribute unwanted sediment evenly above the mid-line of the beach from where it was mined.		
	• Avoid discharging tailings from a centralised point.		
	• Actively backfill mined beaches and profile the mining area to resemble the natural beach profile.		
	• Remove sand berms (or similar) and any artificial structures on completion of each mining episode.		
	• Rehabilitate all access roads built over coastal areas as soon possible, not necessarily waiting for the end of Life of Mine.		
	• Minimise disturbance of the intertidal and subtidal areas.		
	• Ensure efficient and effective return of tailings to the beach to allow for dispersion by tidal action. Should this not be effective, manual landscaping of the beach back to its original profile must be undertaken within a maximum of 24 hours of cessation of mining.		
	• Reduce disturbance of beach habitat adjacent to mining pits through stringent environmental management and good house-keeping practices.		
	• Prohibit mining closer than 10 m to rocky shore habitats.		
	• Inform all staff about sensitive marine species and the responsible disposal of waste.		
	• Do not dispose of any waste in the marine environment.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Display and explain waste handling and disposal protocols.		
	• Reduce, reuse, recycle all waste generated on site.		
	• Ensure that stringent waste management practices are in place at all times.		
	• Maintain high safety standards and employ “good housekeeping”. This should incorporate plans for emergencies.		
	• Prohibit vehicle maintenance and refuelling on the beach.		
	• Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.		
	• Use drip trays and bunding where spills / losses are likely to occur.		
	• Clean up hydrocarbon spills immediately.		
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		
	• Subject mobile equipment, vehicles and power generation equipment to monthly noise tests.		
	• Respond rapidly to complaints and take appropriate corrective action.		
	Closure Phase		
	• Confine the spatial extent of impacts to the minimum required to minimise disturbance within the coastal zone.	**X**	Appendix 11D, Section 4.1.3 and 4.2.3
	• Limit duration of closure activities in the coastal zone.		
	• Inform and empower all staff about sensitive marine habitats.		
	• Ensure that a 10 m buffer zone from the toe of the dune/cliffs remains undisturbed outside of the affected footprint.		
	• Inform all staff about sensitive marine species and the responsible disposal of waste.		
	• Do not dispose of any waste in the marine environment.		
	• Display and explain waste handling and disposal protocols.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Reduce, reuse, recycle all waste generated on site.		
	• Ensure that stringent waste management practices are in place at all times.		
	• Prohibit vehicle maintenance and refuelling on the beach.		
	• Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.		
	• Use drip trays and bunding where spills / losses are likely to occur.		
	• Clean up hydrocarbon spills immediately.		
	• Collect and dispose of polluted soil at a licensed waste disposal facility.		
	• Subject mobile equipment, vehicles and power generation equipment to monthly noise tests.		
	• Respond rapidly to complaints and take appropriate corrective action.		
	• Rehabilitate the disturbed area.		
	Best Practice		
	• Perform a thorough search of the construction footprint for bird nests and eggs and relocate to within the 10 m buffer zone before commencing construction or mining activities.		Appendix 11D, Section 4.1.1 – 4.2.3
	• Position PBCs on the haul roads or on the beach access roads above the high tide mark to reduce the risk of fuel spillage.		
Freshwater Ecology Impact Assessment	**Construction Phase**		
	• Utilise the alternative access road to Beach 1.	**X**	Appendix 11E, Section 6.3
	• Plan for the management of water runoff during infrequent but potentially destructive storms.		
	• Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels.		
	• Install pipe culverts or similar at the road crossing points to allow for the uninterrupted flow of water under / across the road. Culvert design must include		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	allowance for effective dissipation of flow downstream, and multiple pipes must be used to prevent concentration of flows.		
	• Avoid piling graded vegetation and soils along the road edges, where they will contribute to blockage of surface runoff and add sources of loose sediment to enter watercourses. Incorporate this material into road fill or shape to ensure dissipation occurs.		
	• Minimise the disturbance corridor during road widening.		
	• Regularly maintain stormwater outlets / dissipation channels.		
	• Ensure that construction-associated waste (e.g. plastic, rubble) is disposed of appropriately on a frequent and ongoing basis.		
	• Ensure that vehicle and machinery refuelling / storage is managed to minimise pollution opportunities.		
	Operational Phase		
	• Utilise the alternative access road to Beach 1.	**X**	Appendix 11E, Section 6.4
	• Strictly control the passage of vehicles on the road. No vehicles should be allowed to turn in or pull over into areas abutting the road, other than where formally designated turning or pullover areas have been created and managed.		
	• Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels.		
	• Install multiple culverts or other appropriate structures at watercourse 2 to convey water runoff under / across the road and into the natural watercourse downstream of the road such that it does not result in erosion or channel constriction downstream.		
	• Maintain culverts by removing sand and debris, and dispose material outside of the affected watercourse so that it does not create additional blockages.		
	• Implement measures (adjusting the routing of flows, dissipating runoff and/or establishing vegetation) to address erosion nick-points along the roads.		
	• Undertake monthly auditing of access roads to assess erosion with a		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	photographic record.		
	• Compile a stormwater management plan that outlines a strategy for the management of stormwater flows off all hardened surfaces and off roads to inform ongoing management.		
	Closure Phase		
	• Rehabilitate eroded areas (e.g. eroded channels, dongas).	**X**	Appendix 11E, Section 6.7
	• Plan for the management of water runoff during infrequent but potentially destructive storms.		
	• Remove or shape graded vegetation and soils along the road edges to ensure dissipation occurs.		
	• Regularly maintain stormwater outlets / dissipation channels.		
	• Ensure that waste (e.g. plastic, rubble) is disposed of appropriately on a frequent and ongoing basis.		
	• Ensure that vehicle and machinery refuelling / storage is managed to minimise pollution opportunities.		
	Best Practice		
	• Engage in active rehabilitation of the existing erosion channels on Farm Geelwal Karoo 262. Measures to dissipate flow, increase topsoil and allow the establishment of stabilising vegetation along and in the channels should be implemented.		Appendix 11E, Section 6.2 – 6.7
Terrestrial Ecology Impact Assessment	**Construction Phase**		
	• Appoint a suitably qualified specialist to undertake a preconstruction walk-through to identify SCC and protected species within the construction footprint and oversee the rescue and relocation of these species.	**X**	Appendix 11F, Page 38
	• Obtain a permit from CapeNature for the removal and/or destruction of SCC.		
	• Limit vegetation clearance and the footprint of construction activities to the minimum required.		
	• Clearly define the boundary of the construction footprint area and ensure that		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	all activities remain within the defined footprint area.		
	• Ensure all new haul and access roads on Farm Geelwal Karoo 262 are constructed within the boundaries of the proposed mining area or infrastructure / plant expansion area.		
	• Locate laydown areas or other temporary use areas within the construction footprint or the existing approved processing area.		
	• Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand.		
	• Appoint a suitably qualified specialist to undertake a preconstruction walk-through of the construction footprint to demarcate and clear burrows.		
	• Limit vehicle speeds on internal and haul roads to 40 km/hr.		
	• Conduct environmental induction for all construction staff to increase awareness in fauna protection.		
	• Prohibit trapping, collecting and hunting of fauna.		
	• Flush any faunal species within the construction footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer.		
	• Ensure hazardous materials (especially fuel storage) are stored in suitable hazardous material storage facilities.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	• Do not leave trenches open for extended periods.		
	• Check for nests within the construction footprint during the preconstruction walk-through.		
	• Keep the construction site clear of litter and especially plastic, twine and string.		
	Operational Phase		
	• Appoint a suitably qualified specialist to undertake a pre-mining walk-through to identify SCC and protected species within the mining footprint and oversee	**X**	Appendix 11F, Page 41

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	the rescue and relocation of these species.		
	• Obtain a permit from CapeNature for the removal and/or destruction of SCC.		
	• Limit vegetation clearance and the footprint of mining activities to the minimum required.		
	• Clearly define the boundary of the mining area and haul / access roads and ensure that all activities remain within the defined footprint area.		
	• Confine vehicles, machinery and staff to designated areas and strictly prohibit the indiscriminate movement of vehicles, machinery and staff outside of the designated roads and mine areas		
	• Rehabilitate disturbed areas incrementally and as soon as possible.		
	• Only clear vegetation when a new block is to be mined. Remove the vegetation and soil simultaneously and, where possible, immediately place this material in an area prepared for rehabilitation to reduce the duration of topsoil storage.		
	• Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no mining or disturbance may take place.		
	• Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented).		
	• Level and contour beach tailings material to allow the sea to restore the natural beach profile. Do not dispose tailings material beyond the setback line or on the foredunes.		
	• Ensure hazardous waste is stored in suitable hazardous material storage containers and is removed from the beaches every day.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	• Prohibit unnecessary driving at night.		
	• Limit vehicle speeds on internal and haul roads to 40 km/hr.		
	• Conduct environmental induction for all construction staff to increase awareness in fauna and avifauna protection.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Prohibit trapping, collecting and hunting of fauna / avifauna and egg collecting.		
	• Flush any faunal species within the construction footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer.		
	• Do not leave trenches open for extended periods.		
	• Undertake avifaunal monitoring of the powerline according to the Birdlife-developed Guidelines.		
	• Install bird flight diverters along the length of the powerline.		
	• Insulate the pylons and other exposed infrastructure to avoid avifauna electrocution.		
	• Keep the operational areas clear of litter and especially plastic, twine and string.		
	• Limit the number of beaches mined simultaneously.		
	• Conduct environmental induction for all construction staff to increase awareness in avifauna protection.		
	• Undertake counts at regular roosting sites to determine impact on avifauna.		
	• Monitor rehabilitated areas and, if wind erosion is evident, install wind barriers.		
	• Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand. Maintain the wind screens in place three years after beach mining is complete.		
	• Install runoff control measures on all roads and hardened surfaces.		
	• Compile an Alien Plant Management Plan.		
	• Undertake regular monitoring for alien plants within the development footprint.		
	• Conduct regular alien clearing using the best-practice methods for the species concerned. Avoid using herbicides as far as possible.		
	Closure Phase		
	• Limit the footprint of closure activities to the minimum required. Prohibit the indiscriminate movement of vehicles and staff through vegetation outside of the	**X**	Assessed by EAP

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	affected footprint.		
	• Limit vehicle speeds on internal and haul roads to 40 km/hr.		
	• Conduct environmental induction for all staff to increase awareness in fauna protection.		
	• Prohibit trapping, collecting and hunting of fauna.		
	• Ensure hazardous materials (especially fuel storage) are stored in suitable hazardous material storage facilities.		
	• Clean up spills immediately and dispose of contaminated soil at a licensed waste disposal facility.		
	• Do not leave trenches open for extended periods.		
	• Keep the site clear of litter and especially plastic, twine and string		
	Best Practice		
	None		
Heritage Impact Assessment	**Construction Phase**		
	For archaeology finds:	**X**	Appendix 11G, Archaeology Impact Assessment, Section 6.1
	• Limit clearance and the footprint of construction activities to what is essential.		
	• Alert personnel to possibility of finding archaeological resources and follow “Finds Procedure”.		
	• Appoint an archaeologist to monitor construction activities and sample affected archaeological resources as required.		
	For fossil bone finds:		Appendix 11H, Palaeontology Impact Assessment, Section 6.5
	• Limit clearance and the footprint of construction activities to what is essential.		
	• Alert personnel to possibility of finding rare fossil bones and follow “Fossil Finds Procedure”.		
	• Cease construction on (chance) discovery of fossil bones and protect fossils from further damage.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Send information and photographs to a palaeontologist for assessment and to determine preservation, collection and record keeping procedures.		
	For fossil shell finds:		
	• Limit clearance and the footprint of construction activities to what is essential.		
	• Alert personnel to possibility of finding fossil shells and follow "Fossil Finds Procedure".		
	• Cease construction on (chance) discovery of fossil shells and protect fossils from further damage.		
	• Send information and photographs to a palaeontologist for assessment and to determine preservation, collection and record keeping procedures.		
	Operational Phase		
	For archaeology finds:	**X**	Appendix 11G, Archaeology Impact Assessment, Section 6.2
	• Alert machine operators to possibility of finding archaeological resources.		
	• Appoint an archaeologist to monitor inland mining activities.		
	• Monitor mining for archaeological resources. Initially this will need to be semi-permanent until such time as it can be established if any resources are present or not. Based on the initial observations, work out a program for ongoing or regular monitoring.		
	• Collect / excavate any archaeological resources that are exposed using appropriate methods to record provenance.		
	• Archaeologist to assess the material and propose the way forward.		
	• Establish protocol if any material is found, including reporting the find/s to Heritage Western Cape or SAHRA.		
	For fossil bone finds:		Appendix 11H, Palaeontology Impact Assessment, Section 6.5
	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by mining.		
	• Alert personnel to the possibility of finding rare fossil bones and follow "Fossil		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	Finds Procedure".		
	• Cease mining on (chance) discovery of fossil bones and protect fossils from further damage.		
	• Contact appointed palaeontologist providing information and images.		
	• Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for preservation, collection and record keeping.		
	• Record and sample exposed fossiliferous sections in earthworks by appointed palaeontologist.		
	For fossil shell finds:		
	• Identify and appoint a stand-by palaeontologist should paleontological finds be uncovered by earthworks.		
	• Alert personnel to possibility of finding a substantial temporary exposure of marine shelly beds that may require sampling and recording.		
	• Notify the appointed palaeontologist in the event of a large exposure of shell beds, and provide the palaeontologist with information and images.		
	• Palaeontologist to assess information and establish suitable response, such as the importance of the find and recommendations for sample collection and record keeping.		
	• Record and sample selected exposed fossiliferous sections in earthworks by appointed palaeontologist		
	Closure Phase		
	None.		
	Best Practice		
	None.		
Traffic Impact Assessment	**Construction Phase**		
	• Restrict construction deliveries to Mondays to Saturdays between the hours of		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	08h00 and 17h00.	X	Assessed by the EAP
	• Maintain all vehicles in good working order.		
	• Manage construction sites and activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of construction vehicles.		
	• Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of construction activities.		
	• Maintain and repair roads damaged by construction vehicles, in consultation with relevant road authorities.		
	• Ensure that large construction vehicles are suitably marked to be visible to other road users and pedestrians.		
	• Ensure that all safety measures are observed and that drivers of construction vehicles comply with the rules of the road.		
	• Schedule road widening along OP9764 during “off season” (low visitor) periods.		
	• Investigate and respond to complaints about traffic.		
	Operational Phase		
	• Manage beach mining activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of haul vehicles.	X	Appendix 11I, Section 8.4.1
	• Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of hauling activities.		
	• Ensure that large vehicles are suitably marked to be visible to other road users.		
	• Ensure that all safety measures are observed and that drivers of vehicles comply with the rules of the road.		
	• Investigate and respond to complaints about traffic.		
	• Ensure that vehicle axle loads do not exceed the technical design capacity of the road.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Seal DR2225, in consultation with relevant road authorities.		
	• Maintain and repair roads damaged by trucks, in consultation with relevant road authorities.		
	Closure Phase		
	• Restrict traffic along DR2225 to Mondays to Saturdays between the hours of 08h00 and 17h00.	**X**	Assessed by the EAP
	• Maintain all vehicles in good working order.		
	• Manage closure / rehabilitation sites and activities so as to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of vehicles.		
	• Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of closure activities.		
	• Maintain and repair roads damaged by large vehicles, in consultation with relevant road authorities.		
	• Ensure that large vehicles are suitably marked to be visible to other road users and pedestrians.		
	• Ensure that all safety measures are observed and that drivers of vehicles comply with the rules of the road.		
	• Investigate and respond to complaints about traffic.		
	Best Practice		
	• Undertake an economic analysis for OP9764 to determine the optimum upgrade related to the long-term cost benefits.		Appendix 11I, Section 8.4

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Geotechnical Impact Assessment	**Construction Phase**		
	None.		
	Operational Phase		
	• Set and maintain a minimum buffer zone of 143 m between the infrastructure / plant expansion area and the cliff.	**X**	Appendix 11J, Section 5
	• Monitor cliff geometry changes and adapt the expansion plan, if required, accordingly to maintain the buffer zone.		
	• Ensure water is managed to limit groundwater flow to the cliff area.		
	• Place heavy equipment and material stockpiles as far from the cliff as possible.		
	• Monitor additional loading within the infrastructure / plant expansion area so as not to exceed the values used for the cliff stability assessment (21.1 kN/m^2).		
	• Set and maintain beach mining limits according to the mine bench toe, assuming that the bench will form a 35° natural repose angle slope.		
	• Restrict beach mining depth to 6 m.		
	• Delineate the mining limits (buffer zones) on mine plans and on the beaches		
	• Set and maintain a minimum buffer zone of 220 m between inland mining and the cliff.		
	• Restrict the mining depth to 30 m and the mining extent to within the planned inland mine boundaries.		
	• Monitor cliff geometry changes and adapt the mining plan, if required, accordingly to maintain the buffer zone.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Ensure water is managed to limit groundwater flow to the cliff area.		
	Closure Phase		
	None.		

The specialist Impact Assessment reports are attached as Appendix 11A to Appendix 11J.

e) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment

The proposed Tormin Mine extension project will entail so-called triple bottom line costs, i.e. social, environmental and economic costs. The triple bottom line concerns itself with environmental (taken to mean biophysical) sustainability, social equity and economic efficiency and is typically employed by companies seeking to report on their performance. The concept serves as a useful construct to frame the evaluation of environmental impacts of the project.

The challenge for DMR is to take a decision which is sustainable in the long term and which will probably entail trade-offs between social, environmental and economic costs and benefits. The trade-offs are documented in the report, which assesses environmental impacts and benefits and compares these to the No-Go alternative. SRK believes it will be instructive to reduce the decision factors to the key points which the authorities should consider. These points constitute the principal findings of the EIA:

- MSR owns and operates the Tormin Mine on the West Coast of South Africa, near Lutzville. The mine holds two Mining Rights (MR162 and MR163), covering an area of 119.9 ha, and an approved EMPr to mine VHM on beaches below the high-water mark adjacent to Farm Geelwal Karoo 262.
- MSR proposes to extend mining operations at Tormin Mine in terms of Section 102 of the MPRDA, into ten beaches along a stretch of coastline north of Tormin Mine comprising 43.7 ha mining and ~ 6 ha road widening; inland “strand line” mining area on the Farm Geelwal Karoo 262, comprising 75 ha mining; and an infrastructure / plant expansion area of ~64 ha.
- The coastline of Farm Geelwal Karoo 262 consists of wide beaches separated by rugged rocky promontories. Steep dunes and rocky cliffs (between 30 and 50 m above mean sea level) are a feature of the area. The coastline to the north of Tormin Mine is characterised by a rocky shoreline with isolated beaches in small bays. The character of the coastline changes further north, as longer beaches and primary dune systems become more prominent.
- Mining and extensive agriculture are the primary land uses in the study area although tourism is of increasing significance in the region. Land cover within the study area is mostly natural because of limited urban development and the relative low impact of mining and agriculture. Low-intensity small stock farming is the primary agricultural activity in the study area although intensive (irrigated) crop farming occurs along the Olifants River to the south and east of Tormin Mine.
- Areas along the coast have been disturbed from prior and current mining and/or prospecting activities, as well as by people accessing the coastline on a network of informal beach access roads. The public (gravel) road OP9764 provides access to the coastline north of Tormin Mine. This road is used by farmers and visitors to the coastline. The coastline is used by campers and other recreational users.
- The potential environmental impacts associated with the proposed Tormin Mine extension project considered in the S&EIR process include soil and land capability, air quality, noise, groundwater, marine ecology, freshwater ecology, terrestrial ecology, socio-economic, heritage, visual, traffic and geotechnical impacts. Assuming that the recommended mitigation measures will be effectively implemented, the proposed mine expansion is not projected to have unacceptably significant adverse impacts, while socio-economic benefits are noteworthy.
- The impacts associated with the Tormin Mine extension are considered to be acceptable.
- The No-Go alternative implies no change in the sites’ *status quo* and thus no additional impacts on the coast, on Farm Geelwal Karoo 262 and on surrounding residents and visitors to the coast. The No-Go alternative will have major implications for the sustainability of Tormin Mine as it is likely that mining operations will need to be scaled down or closed for Care and Maintenance should resource

grades remain low.

- A number of mitigation and monitoring measures have been identified to avoid, minimise and manage potential environmental impacts associated with the proposed development. These are further laid out in the EMPr.

(ii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers.

The specialists did not identify any specific areas of high sensitivity within the proposed mining and infrastructure footprints that should be designated as "exclusion zones".

Specialists recommended that MSR must enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea (and from rocky shores) in which no mining or disturbance may take place (this buffer zone cannot be indicated at a suitable scale on a single map). MSR will be required to take weekly photographs of beach mining areas (dunes and cliffs) which will track their compliance with this requirement.

(iii)Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

This evaluation and summary is undertaken in the context of:

- The project information provided by the proponent;
- The assumptions made for this EIA Report;
- The assumption that the recommended (essential) mitigation measures will be effectively implemented; and
- The assessments provided by specialists.

This evaluation aims to provide answers to a series of key questions posed as objectives at the outset of this report, which are repeated here:

- Assess in detail the environmental and socio-economic impacts that may result from the project;
- Identify environmental and social mitigation measures to address the impacts assessed; and
- Produce an EIA Report that will assist DMR to decide whether (and under what conditions) to authorise the proposed development.

The evaluation and the basis for the subsequent discussion are represented concisely in Table 43, which summarises the potentially significant impacts and their significance ratings before and after application of mitigation and/or optimisation measures.

Relevant observations with regard to the overall impact ratings, assuming mitigation measures are effectively implemented, are:

- The predicted impacts on *soil and land capability* are rated as *insignificant* to *medium* during construction, *very low* to *low* during operations, and *insignificant* during closure. Land capability impacts are low because of the affected areas' very low grazing capacity and the change in land use will not cause any loss to agricultural production in the area.
- The predicted *air quality* impacts, mainly associated with the generation of Particulate Matter (dust) emissions and the resulting health and nuisance effects, are rated as *insignificant* to *very low* during construction, *very low* to *medium* during operations and *insignificant* to *very low* during closure.

Residents along DR2225 are likely to be most affected from increased transport of product.

- The predicted *noise* impacts are rated as *insignificant* during construction, *low* during operations and *insignificant* during closure. Beach mining is likely to increase noise and vibration levels to visitors to the coast and increased product hauling is likely to increase noise and vibration levels to residents along the DR2225.
- The predicted impacts on *groundwater* are rated as *insignificant* during construction, *insignificant* to *low* during operations, and *insignificant* during closure. Impacts on groundwater are low because the likelihood of groundwater occurring in the area is low and there are no downgradient water users in the area.
- The predicted impacts on *marine ecology* are rated as *insignificant* to *medium* during construction and closure as beach access road construction and closure could have a medium-rated impact on marine life but increased turbidity in the water column is likely to be insignificant. The predicted impacts on *marine ecology* are rated as *insignificant* to *medium* during operations because, although beach mining will severely alter the beaches, beach faunal communities are able to recover relatively rapidly and these communities are not considered to be unique to the region. The most significant impacts from beach mining (medium rating) are changes to macrofaunal community structure and disturbance / mortality of marine life.
- The predicted impacts on *freshwater ecology* are rated as *very low* during construction, *low* during operations, and *insignificant* during closure as neither of the two watercourses (drainage lines) that may be affected by the Tormin Mine extension are of significant conservation importance.
- The predicted impacts on *terrestrial ecology* are rated as *medium* during construction, *very low* to *medium* during operations, and *insignificant* during closure. CBAs and ESAs will be affected by the Tormin Mine extension, but vegetation diversity in the study area is moderate with a relatively low abundance of species of conservation concern. There is relatively high faunal diversity, with the confirmed presence of numerous West-Coast endemics and species of conservation concern.
- The predicted *socio-economic* benefits are rated as *low* to *medium* during construction, *medium* to *high* during operations and *very low* during closure. Adverse socio-economic impacts are rated as *insignificant* during construction, *very low* during operations and *insignificant* during closure.
- The predicted *archaeological* impacts are rated as *low* during construction and *very low* to *low* during operations, but only if the mitigation measures are implemented and if archaeological resources are identified and preserved. The predicted *palaeontological benefits* are rated as *very low* to *high* during construction and operations, but only if the mitigation measures are implemented and if exposed fossils are identified and preserved. There are no predicted heritage impacts during closure.
- The predicted *visual* impact is rated as *very low* during construction, *very low* to *low* during operations and *very low* during closure. Visual impacts are low because the proposed activities will be visible to a limited number of receptors.
- The predicted *traffic* impact is rated as *very low* during construction, *insignificant* to *low* during operations and *insignificant* during closure.
- The predicted *geotechnical* impact is rated as *very low* during operations as the cliff stability analysis indicates that the infrastructure / plant expansion area, inland mining and beach mining are unlikely to adversely affect the dunes / cliffs.

f) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr;

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

The purpose of the EMPr is to demonstrate how environmental management and mitigation measures will be implemented to ensure that potential environmental pollution and degradation can be minimised, if not prevented. The EMPr guides construction, operations and closure activities and provides a framework for the ongoing assessment of environmental performance.

The objectives of the EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines;
- Ensure sufficient allocation of resources;
- Verify environmental performance;
- Respond to changes in project implementation not considered in the EIA;
- Respond to unforeseen events; and
- Provide feedback for continual improvement in environmental performance.

g) Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

MSR owns Farm Geelwal Karoo 262, the property on which the Tormin Mine and the inland strand line is located.

The locations of the **VHM beach deposits and inland deposits are fixed**, which dictates possible mining locations. MSR is applying for extension into areas in immediate proximity to existing operations, infrastructure and facilities at Tormin Mine to take advantage of such infrastructure and facilities and maximise operational efficiency. No mining location alternatives have therefore been assessed. The impacts associated with beach and inland mining are considered to be acceptable.

Possible **location alternatives for the MSP** were initially considered by MSR during the pre-feasibility phase. Based on capital costs, operating costs and hauling costs, MSR identified Tormin Mine as the most feasible location for the MSP and no location alternatives were assessed for the MSP. The impacts associated with the MSP are considered to be acceptable.

MSR identified an **alternative access road to Beach 1** to reduce the potential impact on a drainage line. Both access road alternatives have been considered by the relevant specialists. The impacts associated with either access road to Beach 1 are considered to be acceptable, but the freshwater ecology specialist identified the alternative access road to Beach 1 as the preferred alternative.

MSR proposed a **layout alternative for the infrastructure / plant expansion area** that extended close to the eastern (fenced) boundary of Farm Geelwal Karoo 262. Under advice of the terrestrial ecology specialist, MSR revised the layout of the infrastructure / plant expansion to increase the ecological corridor between the infrastructure / plant expansion area and the eastern fenceline. This layout was selected for assessment and no other alternatives were assessed. The impacts associated with the infrastructure / plant expansion area are considered to be acceptable.

h) Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

All identified management and mitigation measures have been included in the EMPr.

i) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

As is standard practice, the report is based on several assumptions and is subject to certain limitations. These are as follows:

- Information provided by MSR, other consultants and specialists is assumed to be accurate and correct;
- SRK's assessment of the significance of impacts of the proposed development on the affected environment has been based on the assumption that the activities will be confined to those described in Section 3;
- Where detailed design information is not available, the precautionary principle, i.e. a conservative approach that overstates negative impacts and understates benefits, has been adopted;
- The air quality impacts were determined quantitatively through emissions calculation and simulation, but without monitoring data as no sampling occurs in the study area;
- No water-bearing boreholes were identified (13 dry boreholes were identified). With a low confidence in groundwater depths, no yield test data and limited data on the subsurface depth of the sands, a numerical groundwater model could not be generated. The groundwater specialist developed a conceptual model to assess potential groundwater impacts;
- For the purposes of the marine ecology impact assessment, impacts are assessed for the northern beaches collectively and do not consider each beach separately, and since beaches will likely be re-mined at least once during the life of the project (i.e. 11 years), impacts are considered over a medium-term period;
- The site visit to identify wetland areas was undertaken in the dry season. However, the freshwater ecology specialist is confident that all aquatic ecosystems have been identified;
- The drought (and late rains) that persisted during the terrestrial ecology specialist's fieldwork is a limitation for vegetation sampling. However, to address this limitation, the specialist undertook a habitat-based approach to compare the composition of the vegetation within the project footprint to that outside the project footprint (33 sample plots). It is assumed that if the perennial vegetation in and outside of the footprint is similar, then the other components are also likely to be similar;
- It is difficult to predict the locations of buried archaeological and palaeontological resources based on surface assessments. The specialists consider regional potential, survey findings and visible heritage resource indicators when predicting the impact on heritage resources;
- The cliff stability assessment assumed a maximum load of 21.11 KN/m^2 imposed by the infrastructure / plant expansion area and bench face angles (for beach and inland mining) at repose of ±30°-35°;
- It is assumed that the stakeholder engagement process undertaken during the S&EIR process has identified all relevant concerns of stakeholders;
- MSR will in good faith implement the agreed mitigation measures identified in this report. To this end it is assumed that MSR will commit sufficient resources and employ suitably qualified personnel.

Notwithstanding the above, SRK is confident that these assumptions and limitations do not compromise the overall findings of the report.

j) Reasoned opinion as to whether the proposed activity should or should not be authorised

i) Reasons why the activity should be authorized or not.

This draft EIA Report has identified and assessed the potential biophysical and socio-economic impacts associated with the Tormin Mine extension project along the West Coast.

In terms of Section 31 (n) of NEMA, the EAP is required to provide an opinion as to whether the activity should or should not be authorised. In this section, a qualified opinion is ventured, and in this regard SRK believes that sufficient information is available for DMR to take a decision.

The Tormin Mine extension project will result in unavoidable adverse environmental impacts. None of these adverse impacts are considered unacceptably significant and all can be managed to tolerable levels through the effective implementation of the recommended mitigation measures. In addition, the project will directly and indirectly benefit the local and regional economy.

Working on the assumption that MSR is committed to ensuring that beach mining, inland mining and the associated processing activities are undertaken to high standards, achieved through implementation of the recommended mitigation measures and ongoing monitoring of performance, SRK believes and the EIA Report demonstrates that through effective implementation of the stipulated mitigation measures, the adverse impacts of this project can be reduced to levels compliant with national (and international) standards or guidelines.

The fundamental decision is whether to allow the development, which brings economic benefits and is generally consistent with development policies for the area, but which may have limited biophysical impacts.

SRK believes that the specialist studies have shown that the Tormin Mine extension project is generally acceptable. The EIA has also assisted in the identification of essential mitigation measures that will mitigate the impacts associated with these components to within tolerable limits.

In conclusion SRK is of the opinion that on purely 'environmental' grounds (i.e. the project's potential socio-economic and biophysical implications) the application as it is currently articulated should be approved, provided the essential mitigation measures are implemented. Ultimately, however, the DMR will need to consider whether the project benefits outweigh the potential impacts.

ii) Conditions that must be included in the authorisation

(1) Specific conditions to be included into the compilation and approval of EMPr

Key recommendations, which are considered essential, are:

- Implement the EMPr to guide construction, operations and closure activities and to provide a framework for the ongoing assessment of environmental performance;
- Appoint an Environmental Control Officer (ECO) to oversee the implementation of the EMPr;
- Implement management measures (e.g. road signs, speed limits, etc.) to ensure that the public is still able to safely use OP9764 to access this stretch of coast;
- Avoid beach mining near "tourist" beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays);
- Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays;
- Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00;
- Enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea in which no

mining or disturbance may take place. Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented).

- Undertake primary processing on the beach and distribute tailings evenly above the mid-line of the beach from where it was mined;
- Actively backfill mined beaches and profile the mining area to resemble the natural beach profile.
- Install monitoring boreholes up and down gradient of the infrastructure / plant area and analyse data regularly, taking corrective action as and if required. Produce a numerical groundwater model prior to mining and update the model biannually based on groundwater monitoring results;
- Appoint a suitably qualified specialist to undertake a pre-mining walk-through of the inland mining areas to identify SCC and protected species within the mining footprint and oversee the rescue and relocation of these species;
- Implement the Rehabilitation Plan;
- Only clear vegetation when a new inland area is to be mined. Remove the vegetation and soil simultaneously and, where possible, immediately place this material in an area prepared for rehabilitation to reduce the duration of topsoil storage. Rehabilitate disturbed areas incrementally and as soon as possible;
- Seal DR2225, in consultation with relevant road authorities;
- Maintain the buffer zones between the infrastructure / plant expansion area, the inland mining areas and the cliff; and
- Obtain other permits and authorisations as may be required, including, but not limited to: Water Use Authorisation; and permits for the disturbance or translocation of species of conservation concern.

(2) Rehabilitation requirements

A Rehabilitation Plan is provided in Appendix 6 of the Terrestrial Ecology Impact Assessment (Appendix 11F).

k) Period for which the Environmental Authorisation is required.

All non-operational activities (i.e. construction activities) will be completed within five (5) years.

The LoM is anticipated to be ~11 years.

Closure activities will be completed within three (3) years.

l) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

Refer to the EAP Affirmation.

m) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

The financial provision required to manage and rehabilitate the environment for the Tormin Mine Extension project and its associated infrastructure is R 13 170 408.23 (excluding VAT).

A detailed breakdown of the costing is included as Appendix 14.

i) Explain how the aforesaid amount was derived.

The liability for rehabilitation / closure of the aspects associated with the Tormin Mine Extension project was determined using the approach advocated in the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005).

A detailed breakdown of the costing is included as Appendix 14.

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

MSR has confirmed that the financial provision can be provided for from operating expenditure and the cost is included in the MWP.

n) Deviations from the approved scoping report and plan of study.

i) Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

The following changes have been made to the project as described in the approved Scoping Report:

- The Scoping Report (Section 3.8.1), indicated that a Reverse Osmosis (RO Plant) would be installed to provide freshwater to wash the concentrates in the MSP and for domestic purposes. MSR has removed the RO Plant (and therefore the associated seawater / brine discharge pipelines and freshwater dam) from the project scope. At this stage, it is assumed that washing (of) concentrates is not required, and a Washing Circuit is excluded from the MSP (refer to Section 3.7.1 of the EIA Report) and MSR will continue to truck in freshwater from Lutzville. A Coastal Waters Discharge permit will also not be required as no brine will be discharged into the marine environment.
- The Scoping Report (Section 3.8.2), indicated that additional process water dams would be required to accommodate increased water consumption rates for strand line mining, and to ensure an adequate water supply for the processing plant. MSR has removed the process water dams from the project scope and will manage the additional process water volumes within the existing process water dams.
- Sections of the public road OP9764 from Farm Geelwal Karoo 262 to the northern beaches are less than 6 m wide and cannot accommodate two-way traffic. The traffic specialist advised that road OP9764 must be widened to 8 m to meet South African Road Safety Standards (refer to Section 3.3.1 of the EIA Report). SRK therefore requested relevant specialists to amend their studies to reflect and assess the widened road OP9764. The impacts of the widened northern haul road (OP9764) have been assessed (refer to Appendix 10).
- DMR requested MSR to amend the infrastructure / plant expansion area layout to exclude the section 24G application areas. To relocate the affected facilities (such as the MSP) from the section 24G areas, some additional layout changes needed to be made to the infrastructure / plant expansion area to accommodate the relocated facilities (Figure 12, Appendix 5).

ii) Motivation for the deviation.

Motivation for the deviations is provided above.

o) Other Information required by the competent Authority

i) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

(1) Impact on the socio-economic conditions of any directly affected person.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as **Appendix 2.19.1** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

All potential socio-economic impacts are assessed in Section 2.8 of the detailed impact assessment (Appendix 10).

Four potential direct socio-economic impacts were identified during the construction, operational and closure phases:

- Investment in and contribution to the economy;
- Increased employment, income and skills development;
- Reduced access to the coast; and
- Possible decline in tourism.

The socio-economic impacts are included in the summary of impacts (Table 43).

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(*i*)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

All potential heritage (archaeology and palaeontology) impacts are assessed in Section 2.9 of the detailed impact assessment (Appendix 10). The assessment on heritage resources is based on the Archaeology Impact Assessment undertaken by ACO Associates (Appendix 11G) and the Palaeontology Impact Assessment undertaken by John Pether (Appendix 11H).

Two potential construction phase impacts on the archaeology resources of the area were identified:

- Loss of archaeological resources during road widening; and
- Loss of archaeological resources during construction of infrastructure / plant expansion area.

Three potential direct construction phase impacts on the palaeontology resources of the area were identified:

- Loss of fossil bones during road widening;
- Loss of fossil shells during road widening; and
- Loss of fossil bones during construction of infrastructure / plant expansion area.

Two potential operational phase impacts on archaeology resources of the area were identified:

- Loss of maritime archaeological resources during beach mining; and
- Loss of archaeological resources during strand line mining.

Four potential operational phase impacts on palaeontology resources of the area were identified:

- Loss of fossil bones during beach mining;

- Loss of fossil shells during beach mining;
- Loss of fossil bones during strand line mining; and
- Loss of fossil shells during strand line mining.

The heritage impacts are included in the summary of impacts (Table 43).

p) Other matters required in terms of sections 24(4)(a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as **Appendix 4)**.

Alternatives have been considered for this project, as listed above in Section 2 (h)(i). Where alternatives have not be considered for assessment, reasons have been provided in Section 2 (h)(i).

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft environmental management programme.

a) **Details of the EAP,** (Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

The details and expertise of the EAP are provided in Part A, Section 1(a).

b) **Description of the Aspects of the Activity** (Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

The activities covered by the EMPr are provided in Part A, Section 1(d).

c) Composite Map

(Provide a map **(Attached as an Appendix**) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

The specialists did not identify any specific areas of high sensitivity within the proposed mining and infrastructure footprints that should be designated as “exclusion zones”. Specialists recommended that MSR must enforce a 10 m buffer zone from the toe of the sand dunes and cliffs towards the sea (and from rocky shores) in which no mining or disturbance may take place (this buffer zone cannot be indicated at a suitable scale on a single map). MSR will be required to take weekly photographs of beach mining areas (dunes and cliffs) which will track their compliance with this requirement.

d) Description of Impact management objectives including management statements

i) Determination of closure objectives. (ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

The closure vision and objectives for the mine expansion project are based on the objectives previously developed by GCS for Tormin Mine (2012 and 2014). The objectives are also informed by the environment specifically affected by the proposed expansion activities. The overall closure vision for Tormin Mine is to ensure operations are safe, stable and non-polluting over the long-term to integrate with the current agricultural, eco-tourism and economic activities of the area in which the mine is located. The vision is underpinned by the objectives provided below: - Undertake on-going (concurrent) rehabilitation to ensure that the area will return to near pre-mining land use capability (refer to Part A, Section 6.2.3, “Land Capability”) as soon as possible after closure;

- Ensure all areas are stable and there is no risk of erosion;
- Prevent alien plant invasion on the site until the site is in a stable state;
- Ensure that all areas are free-draining and non-polluting; and
- Ensure reshaped areas are visually suited to the surrounding landscape.

According to the terrestrial ecology specialist (refer to Appendix 6 of the Terrestrial Ecology Impact Assessment, Appendix 11F), the ultimate goals of rehabilitation are to:

- Restore ecological function; and
- Remediate and improve the visual impact of the post-mining landscape.

In terms of restoring ecological function, the main metrics of success are vegetation cover and structure. While diversity is important in the long-term, the short- to medium-term focus should be to restore a self-sustaining cover of perennial vegetation to protect the soil and facilitate the natural (fauna and flora) recolonisation of the area.

ii) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

Table 44 to Table 46 provide management measures intended to avoid, minimise and / or remediate negative impacts and optimise positive impacts. These management measures address the potential for environmental damage, pollution or ecological degradation.

iii) Potential risk of Acid Mine Drainage. (Indicate whether or not the mining can result in acid mine drainage).

Acid Base Accounting analysis was undertaken to determine the Total Acid Potential and the Neutralisation Potential of the mine residue (waste). The results of the Acid Base Accounting analysis (provided in Table 10) indicate that the waste is non-acid generating. Mining will not result in acid mine drainage. Refer to the Waste Classification Study undertaken by SRK (Appendix 13).

iv) Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

See above.

v) Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.

Based on the outcome of the residue characterisation study and mine waste classification, no engineering or mine design solutions are required to avoid or remedy acid mine drainage.

vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Based on the outcome of the residue characterisation study and mine waste classification, there will be no residual or cumulative impact from acid mine drainage.

vii) Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

Currently, MSR extracts 337 m^3/h seawater for production and dust suppression. It is anticipated that with production improvements (Part A, Section 3.6), and if mining of the current beaches recommences, seawater extraction may increase to 500 m^3/h (Table 14).

viii) Has a water use licence has been applied for?

The proposed widening of the northern haul road and the access road to Beach 1 triggers water use activities in terms of section 21 (c) and (i) of the NWA. MSR will apply for Water Use Authorisation from DWS prior to the widening of these roads.

ix) Impacts to be mitigated in their respective phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

The environmental management and mitigation measures that must be implemented at the Mine during the **Construction Phase**, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 44 below. Activities in the Construction Phase include:

- Widening and upgrade of beach access roads and northern haul road;
- Construction of the infrastructure / plant expansion area and installation of facilities within this area (e.g. MSP);
- Installation of the powerline; and
- Installation of pipelines (e.g. seawater intake, process water and tailings discharge pipelines).

Table 44: Environmental management and mitigation measures that must be implemented during the *Construction Phase*

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
Environmental compliance	1.	Appoint a suitably qualified Environmental Control Officer (ECO) to oversee construction activities.	• MSR	• Before activities commence	• ECO to send inspection reports to MSR management and authorities on request	• Regular ECO site visits and reports
	2.	Compile monthly inspection reports for submission to MSR management and authorities on request.	• ECO	• Throughout construction		
	3.	Ensure that all required licences and permits have been obtained before the start of construction including Water Use Authorisation for the widening of the access roads to the northern beaches.	• MSR	• Before activities commence	• Keep record of all permits, licences and authorisations	• Required licences/permits on file • Water Use Authorisation obtained
	4.	Include the EMPr in all tender documents to ensure that sufficient resources are allocated to environmental management by the Contractor.		• Prior to call for tenders	• MSR to check tender documents and contract	• Incorporated in tender documents
Planning and Design	5.	Survey proposed beach access roads and communicate alignments with land owners.	• MSR • Engineer	• Prior to construction phase	• MSR to check engineering drawings	• Communication with landowners

[12] Unless otherwise indicated, monitoring will be undertaken by the ECO, supported by the authorities where the requirement is specifically stipulated in a licence or permit.

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	6.	Utilise the alternative access road to Beach 1.				• Specified in engineering drawings
	7.	Allow for pipe culverts or similar at road crossing points for the uninterrupted flow of water across the road. Culvert design must include allowance for effective dissipation of flow downstream, and multiple pipes must be used to prevent concentration of flows.				
	8.	Locate all pipelines above-ground.				
	9.	Ensure all new haul and access roads on Farm Geelwal Karoo 262 are constructed within the boundaries of the proposed mining area or infrastructure / plant expansion area.				
	10.	Set a minimum buffer zone of 143 m between the infrastructure / plant expansion area and the cliff.				
Site camp	11.	Submit a Method Statement for Site Camp establishment for approval by the ECO at least two weeks prior to the start of construction activities.	• Contractors	• Start of construction	• Visual inspections • Method Statement	• Approved Method Statement • Site boundaries demarcated • Signage in place
	12.	Establish a suitably fenced Site Camp at the start of the contract, which will allow for site offices, vehicle, equipment, material and waste storage areas to be consolidated as much as possible. Locate the Site Camp within the infrastructure / expansion area at a position approved by the ECO.				
	13.	Demarcate construction site boundaries upon establishment. Control security and access to the site. Fence off site boundaries to the satisfaction of the ECO and ensure that plant, labour and materials remain within site boundaries.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	14.	Designate the area beyond the boundary of the site as “No Go” areas for all personnel on site. No vehicles, machinery, materials or people shall be permitted in the “No Go” area at any time without the express permission of the Environmental Manager in consultation with the ECO.				
	15.	Locate laydown areas or other temporary use areas within the construction footprint or the existing approved processing area				
Employment	16.	Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.	• MSR • Contractors	• Throughout construction	• Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
	17.	Maximise use of local skills and resources through preferential employment of locals where practicable.				
	18.	Develop and implement a fair and transparent labour and recruitment policy.				
	19.	Ensure gender equality in recruitment, as far as possible.				
	20.	Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
Environmental Awareness Training	21.	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of construction waste and activities on the environment; • Suitable disposal of construction waste and litter; • Key measures in the EMPr relevant to worker's activities; and • How incidents and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	• Contractors	• Before workers start working on-site • Before new activities are undertaken	• Check training attendance register • Observe whether activities are executed in line with EMPr requirements	• Proportion of workers that completed environmental training • Compliance of workers with EMPr
Complaints Register / Grievance Mechanism	22.	Maintain and disclose a complaints register. The register must record: • Complainant name and contact details; • Date complaint was lodged; • Person who recorded the complaint; • Nature of the complaint; • Actions taken to investigate the complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to complainant.	• MSR • Contractors	• Duration of construction activities	• Keep record of all complaints	• Register on site • Complaints followed up and closed out
Hazardous materials	23.	Design and construct hazardous material storage facilities, especially fuel storage, with suitable impermeable materials and a minimum bund containment capacity equal to 110% of the largest container.	• Contractors	• Throughout construction	• Visual inspection of hazardous materials handling and storage areas	• Number of incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials
	24.	Ensure that contaminants (including cement) are not placed directly on the ground (e.g. mix cement on plastic sheeting).				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	25.	Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.				• Number of spills of hazardous materials, including waste materials • Cost of cleaning up spills • Evidence of contamination and leaks
	26.	Avoid unnecessary use and transport of hazardous substances.				
	27.	Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.				
Vegetation clearing	28.	Restrict construction activities to the project footprint areas and minimise vegetation clearance to what is essential.	• Contractors	• Throughout construction	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Size of area cleared relative to development footprint • Size of area disturbed outside of construction site boundary • Number of SCC relocated • Permit on file
	29.	Designate areas outside the construction site boundary as “No Go” areas.				
	30.	Ensure that no vegetation is removed or disturbed outside the delineated construction site boundary.				
	31.	Appoint a suitably qualified specialist to undertake a preconstruction walk-through to identify SCC and protected species within the construction footprint and oversee the rescue and relocation of these species.				
	32.	Obtain a permit from CapeNature for the removal and/or destruction of SCC.				
Topsoil stockpiling	33.	Limit construction and lay down areas to areas within the project footprint.	• Contractors	• Before construction commences	• Visual inspection • Regular monitoring of stockpile areas	• Incidents of erosion and • Incidents of incorrect storage and harvesting of topsoil
	34.	Designate areas outside the development footprint as “No Go” areas.				
	35.	Designate and demarcate areas to be used for topsoil stockpiling.				
	36.	Remove topsoil prior to the commencement of construction activities and stockpile topsoil in a designated area for rehabilitation.		• During vegetation clearing		

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	37.	Locate topsoil stockpiles in an area protected from the wind, and agreed to with the ECO and in an area where the topsoil will not have to be relocated prior to replacement for final rehabilitation.				
	38.	Do not stockpile topsoil higher than 4 m or for longer than 6 months to ensure that the nutrient cycles are maintained over a large surface to volume ratio.				
	39.	Ensure suitable control of run-off during the construction phase to prevent erosion of topsoil on adjacent land and undeveloped portions of the site.		• During construction		
	40.	Replace harvested topsoil in areas that are to be rehabilitated as soon as sections of the works are completed (i.e. not only following the completion of all works) to maintain soil nutrient cycles.				
Concrete/Cement Work	41.	Use Ready-Mix concrete rather than batching where possible.	• Contractors	• Throughout construction	• Visual inspection and approval by ECO.	• Number of incidents of batching outside works footprint • Contamination of water and soil
	42.	Ensure that no cement truck delivery chutes are cleaned on site. Cleaning operations are to take place off site at a location where wastewater can be disposed of in the correct manner. If this is not possible a suitable washing facility is to be developed on site in consultation with the ECO.				
	43.	Batch cement in a bunded area within the boundaries of the development footprint only (where unavoidable).				
	44.	Ensure that cement is mixed on mortar boards and not directly on the ground (where unavoidable).				
	45.	Physically remove any remains of concrete, either solid, or liquid, immediately and dispose of as waste.				
	46.	Place cement bags in bins and dispose of bags as waste to a licensed waste disposal facility.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	47.	Sweep / rake / stack excess aggregate / stone chip / gravel / pavers into piles and dispose at a licensed waste disposal facility.				
Waste management	48.	Submit a Method Statement for waste management (including hazardous waste).	• Contractors	• Before start of activities on site • Throughout construction	• Method Statement • Visual inspection of waste collection and disposal areas • Visual inspection of construction areas (litter) • Check waste disposal slips	• Presence of litter • Availability of rubbish bins and skips • Degree to which rubbish bins and skips are filled • Total volume of general and hazardous waste storage capacity • Total volume of general and hazardous waste stored on site • Degree to which different waste is separated • Frequency of waste collection
	49.	Aim to minimise waste through reducing and re-using material.				
	50.	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.				
	51.	Collect all waste in bins and/or skips at the construction site.				
	52.	Prevent littering by construction staff at work sites by providing bins or waste bags in sufficient locations.				
	53.	Provide separate bins for hazardous / polluting materials and mark these clearly. Store hazardous / polluting materials on impermeable ground until it is disposed of / collected.				
	54.	Dispose of waste appropriately to prevent pollution of soil and groundwater.				
	55.	Do not allow any burning or burying of waste on site.				
	56.	Do not dispose of any waste in the marine environment.				
	57.	Display and explain waste handling and disposal protocols.				
Contaminated Water/Run-off management	58.	Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into any water sources and/or the environment.	• Contractors	• Throughout construction	• Visual inspection of fuel/workshop/equipment washing areas and concrete swills	• Implementation of preventative actions • Visibility of water pollution
	59.	Direct run-off from fuel/workshop/equipment washing areas and concrete swills into conservancy tanks to be disposed of at a site approved by the ECO.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
Stormwater management	60.	Collect stormwater from bunded areas in a suitable container and remove from the site for appropriate disposal.	• Contractors	• Throughout construction	• Inspect bunded areas and roads • Inspect stormwater channels and high erosion potential areas • Maintenance procedures	• Incidents of stormwater contamination • Visible leaks/ water wastage • Visible surface erosion
	61.	Use berms and stormwater drainage systems to prevent surface run-off from entering construction areas.				
	62.	Plan for the management of water runoff during infrequent but potentially destructive storms.				
	63.	Implement measures to maximise the infiltration of stormwater on site.				
	64.	Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels.				
	65.	Avoid piling graded vegetation and soils along the road edges, where they will contribute to blockage of surface runoff and add sources of loose sediment to enter watercourses. Incorporate this material into road fill or shape to ensure dissipation occurs.				
	66.	Regularly maintain stormwater outlets / dissipation channels.				
Marine / coastal management	67.	Limit beach access road construction activities to the proposed road widths.	• Contractors	• Throughout construction	• Visual inspection of beach access roads and beaches	• Size of area cleared relative to development footprint • Size of area disturbed outside of construction site boundary • Setback zones demarcated • Windscreens installed • Evidence of contamination and leaks on the beach
	68.	Designate areas outside the construction footprint as “No Go” areas.				
	69.	Limit the duration of construction activities in the coastal zone to as short a time as possible.				
	70.	Ensure that a 10 m setback zone from the toe of the dune/cliffs remains undisturbed outside of the construction footprint.				
	71.	Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand.				
	72.	Prohibit vehicle maintenance and refuelling on the beach.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	73.	Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.				• Evidence of waste / litter on the beach • Number of animals harmed
	74.	Inform and empower all staff about sensitive marine habitats and species and the responsible disposal of waste.				
Air quality management	75.	Avoid vegetation clearing until absolutely necessary (i.e. just before excavations).	• Contractors	• Throughout construction	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off construction site • Dust mitigation measures in place • Number of days that dust plumes are visible • Number of registered complaints • Size of disturbed areas
	76.	Stabilise exposed surfaces as soon as is practically possible.				
	77.	Avoid excavation and handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.				
	78.	Minimise dust generated off stockpiles: • Locate piles in sheltered areas where possible; • Place the stockpile lengthwise into the wind; • Minimise the slope of the stockpile (maximum slope of 2:1); • Limit stockpile sizes; and • Use the last in – first out system of stockpile management.				
	79.	Limit vehicle speeds to 40 km/h on unconsolidated and non-vegetated areas.				
	80.	Cover trucks transporting loose material to or from site with tarpaulins, plastic or canvas.				
	81.	Ensure that any material spilled from trucks during transport to or from the site is cleaned up immediately.				
	82.	Limit the number of vehicles allowed on-site and restrict the movement of these vehicles over unsurfaced or unvegatated areas once they are on site to reduce dust problems.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	83.	Reduce airborne dust at construction sites through: • Dampening dust-generating areas with seawater; and • Utilising screens in high dust-generating areas.				
	84.	Use high quality (low sulphur) diesel for construction vehicles / equipment.				
	85.	Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.				
Noise management	86.	Comply with the applicable municipal and/or industry noise regulations.	• Contractors	• Throughout construction	• Visual inspections • Random noise tests	• Results of noise measurements • Number of registered complaints
	87.	Maintain all generators, vehicles and other equipment in good working order to minimise exhaust fumes and excess noise.				
	88.	Enclose diesel generators used for power supply on site to reduce unnecessary noise.				
	89.	Respond rapidly to complaints and take appropriate corrective action.				
Fire Management	90.	Ensure that no fires are permitted on or adjacent to site except in areas designated for this purpose. Any such designated areas should be situated as far as possible from vegetated areas and/or flammable material stores. Suitable firefighting equipment must be readily available in this area.	• Contractors	• Throughout construction	• Inspect attendance register for training sessions • Inspect fire extinguishers and certificates	• Number of fire incidents • Certified extinguishers in appropriate locations
	91.	Ensure that no smoking is permitted on the site except for within a designated area in the Site Camp (to be included in the Site Camp Method Statement). Suitable firefighting equipment must be readily available in this area.				
	92.	Ensure that sufficient fire-fighting equipment is available on site.				
	93.	Equip all fuel stores and waste storage areas with fire extinguishers.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	94.	Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated.				
	95.	Suitably maintain firefighting equipment.				
Transportation and refuelling	96.	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.	• Contractors	• Throughout construction	• Inspect vehicles, machinery and refuelling/maintenance areas	• Number of incidents of non-compliance • Number of leaks and spills • Cost of cleaning up spills
	97.	Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps.				
	98.	Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.				
	99.	Clean up any spills immediately, through containment and removal of free product and appropriate disposal of contaminated soils				
	100.	Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site.				
Fauna Management	101.	Appoint a suitably qualified specialist to undertake a preconstruction walk-through of the construction footprint to demarcate and clear burrows.	• Contractors	• Throughout construction	• Visual inspection • Appointment of fauna specialist	• Number of animals harmed • Time period trenches are left open • Number of incidents of animals found in trenches • Bird flight diverters in place • Powerline infrastructure insulated
	102.	Flush any faunal species within the construction footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer.				
	103.	Check for nests within the construction footprint during the preconstruction walk-through.				
	104.	Do not harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	105.	Backfill trenches as soon as pipes have been laid to ensure that the time the trench is exposed is kept to a minimum.				
	106.	Open trenches must be inspected on a daily basis for animals which may have fallen or become trapped.				
	107.	Safely remove and relocate any fauna that may be physically harmed by construction activities.				
	108.	Keep the construction site clear of litter and especially plastic, twine and string.				
	109.	Limit vehicle speeds to 40 km/h on unconsolidated and non-vegetated areas.				
	110.	Install bird flight diverters along the length of the powerline.				
	111.	Insulate the pylons and other exposed infrastructure to avoid avifauna electrocution.				
Protection of heritage resources	112.	Inform employees and contractors that archaeological or paleontological artefacts might be exposed during construction activities and that the Fossil Finds Procedure must be followed.	• MSR • Contractors	• Before construction commences	• Visual inspection • Keep records of finds	• Records of heritage finds • Number of incidences of loss/damage to heritage resources
	113.	Appoint an archaeologist to monitor construction activities and sample affected archaeological resources as required.		• During earthworks		
	114.	Empower staff to stop works on (chance) discovery of heritage resources at the site.				
	115.	On discovery of fossil bones / shells, send information and photographs to a palaeontologist for assessment and to determine preservation, collection and record keeping procedures.				
Traffic Management	116.	Restrict construction deliveries to Mondays to Saturdays between the hours of 08h00 and 17h00.	• All contractors operating vehicles	• Throughout construction	• Keep record of vehicles entering / leaving the site • Keep record of incidents and complaints	• Number of incidents and complaints
	117.	Maintain all vehicles in good working order.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	118.	Manage construction sites and activities to minimise impacts on road traffic as far as possible.			• Visually inspect vehicles for any obvious faults or overloading	• Number of vehicles travelling to / from site each day • Condition of vehicles
	119.	Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points when necessary.				
	120.	Maintain and repair roads damaged by construction vehicles, in consultation with relevant road authorities.				
	121.	Ensure large construction vehicles are suitably marked to be visible to other road users and pedestrians.				
	122.	Ensure that all safety measures are observed and that drivers comply with the rules of the road.				
	123.	Schedule road widening of OP9764 during “off season” (low visitor) periods.				
	124.	Ensure that vehicle axle loads do not exceed the technical design capacity of roads utilised by the project.				
	125.	Investigate and respond to complaints about traffic.				
Visual aspects	126.	Limit and phase vegetation clearance and the footprint of construction activities to what is essential.	• Contractors	• Throughout construction	• Visual inspection • Dust management programme • Targets for local labour	• Number of complaints • Percentage of local labour target
	127.	Avoid excavation, handling and transport of materials which may generate dust under high wind conditions.				
	128.	Prepare/review a detailed dust suppression/control management programme, such as regular wetting and/or use of non-contaminating agents, to reduce dust on dust-generating facilities (e.g. roads), especially during the dry season and when conditions are windy.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	129.	Ensure speed limits on all gravel roads are respected at all times.				
	130.	Keep construction sites tidy and all activities, material and machinery contained within an area that is as small as possible.				
	131.	Control litter and keep construction sites as clean and neat as possible.				
	132.	Rehabilitate disturbed areas incrementally and as soon as possible, not necessarily waiting until completion of the Construction Phase.				
	133.	Maintain all generators, vehicles and other equipment in good working order.				
	134.	Minimise the use of night-lighting. No high mast or spot-light security lighting or up-lighting allowed.				
	135.	Restrict construction deliveries to Mondays to Saturdays between the hours of 08h00 and 17h00.				
Coastal access and tourism	136.	Restrict construction activities to the construction footprint.	• Contractors	• Throughout construction	• Visual assessment of coastal access points • Inspect signage • Inspect screening	• Signs in place • Safe access to the coast • Number of accidents • Number of complaints
	137.	Install appropriate signage and information regarding coastal access.				
	138.	Install appropriate screening of construction sites in line with the scenic nature of the area.				
Ablution facilities	139.	Ensure there are sufficient ablution facilities for all site staff at the Processing Plant.	• MSR	• Throughout construction	• Visual inspections of ablutions	• Number of incidents of staff not using facilities
Response to environmental pollution	140.	Compile a Method Statement for response to environmental pollution for approval by the ECO.	• Contractors	• Before construction commences	• Review Method Statement • Maintain register of pollution events and response • Inspect repaired equipment to ensure proper functioning	• Method Statement • Number of incidents • Time activities stopped • Number of recurring incidents
	141.	In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.		• Throughout construction		
	142.	Only resume activity once the problem has been stopped.				

Construction Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[12]**	**Performance Indicators**
	143.	Repair faulty equipment as soon as possible.				• Availability and completeness of register
	144.	Install additional bunding / containment structures around the equipment that was the source of the leak / spillage.				
	145.	Treat hydrocarbon spills, e.g. during refuelling, with adequate absorbent material, which then needs to be disposed of at a suitable landfill.				
Site rehabilitation	146.	Ensure that slopes are immediately stabilized to prevent erosion, using geofabric or other appropriate erosion stabilisation techniques.	• Contractors	• Once construction is complete; or • Throughout construction if it takes place in phases / different areas sequentially	• Visual inspection of site • Keep record of rehabilitation measures	• Rehabilitation forms an integral part of construction
	147.	Remove all construction equipment, vehicles, equipment, waste and surplus materials, including site offices, temporary fencing and other facilities, from the site.				
	148.	Clean up and remove any spills and contaminated soil in the appropriate manner.				
	149.	Ensure that no discarded materials are buried on site or on any other land not designated for this purpose.				
	150.	Ensure that affected areas are rehabilitated following construction.				
	151.	Rehabilitate areas adjacent to the site (if disturbance is unavoidable) to at least the same condition as was present prior to construction.				
	152.	Use harvested topsoil for rehabilitation following construction.				
	153.	Rehabilitate any disturbed areas as soon as construction in the area is complete.				
	154.	Rehabilitate all project areas as soon as possible after completion of activities in each area, including removing and/or remediating any contaminated soils.				

The environmental management and mitigation measures that must be implemented at the Mine during the **Operational Phase**, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 45 below. Activities in the Operational Phase include:

- Beach mining;
- Inland strand line mining; and
- Related operational activities (e.g. hauling, processing, tailings disposal).

Table 45: Environmental management and mitigation measures that must be implemented during the *Operational Phase*

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
Environmental compliance	1.	Ensure that all required licences and permits have been obtained before the start of mining.	• MSR	• Throughout operations	• Keep record of all permits, licences and authorisations	• Required licences/permits on file
	2.	Include applicable environmental management measures in contracts for external service providers.			• MSR to check contracts	• Environmental management measures in contract documents
	3.	Maintain an environmental incidents register.			• Keep record of all incidents	• Environmental incidents register
Inland mine planning and management	4.	Survey mine areas and demarcate (inland) mine areas and roads upon establishment.	• MSR	• Before start of mining activities • Throughout operations	• Survey reports • Visual inspection of "No Go" areas	• Survey pegs / poles placed
	5.	Designate the area beyond the boundary of the mine area as a "No Go" area for all personnel on site. No vehicles, machinery, materials or people shall be permitted in the "No Go" area at any time without the express permission of the Environmental Manager.				
	6.	Review the Rehabilitation Plan and ensure that responsibilities and sufficient resources are allocated to (for example): • Specialist horticulturalist; • Nursery; and • Hydroseeding.			• Reviewed Rehabilitation Plan	• Resources allocated to rehabilitation

[13] Unless otherwise indicated, monitoring will be undertaken by the ECO, supported by the authorities where the requirement is specifically stipulated in a licence or permit.

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	7.	Restrict all operations to within the approved mining footprint.			• Incidents register • Visual inspection of "No Go" areas	• Number of interventions beyond the approved mining footprint
	8.	Ensure that virgin land within the approved mining footprint and rehabilitated areas is not used for mine infrastructure (e.g. stockpiles) or other mining activities until topsoil harvesting commences.				• Number of interventions beyond the active mining footprint
	9.	Record interventions beyond the active mining footprint (including roads) as environmental incidents.				• Incidents recorded and observed
	10.	Restrict topsoil harvesting to the next mining area only.				• Areas cleared prior to active mining
	11.	Schedule topsoil harvesting in such a way that areas to be mined are left exposed for the minimum possible period.			• Inspect topsoil management procedures	• Areas cleared prior to active mining
	12.	Commence rehabilitation in mined out areas as soon as practically possible to do so. Implement the actions of the Rehabilitation Plan.			• Visual inspection of mined out areas • Review monitoring reports and Rehabilitation Plan	• Rehabilitation of mined out areas • Monitoring results • Effectiveness of rehabilitation • Updated Rehabilitation Plan
	13.	Monitor the effectiveness of rehabilitation and review and update the Rehabilitation Plan accordingly.				
	14.	Set and maintain a minimum buffer zone of 220m between inland mining and the cliff.			• Visual inspection of buffer zone and mining extent • Review of mine plans • Visual inspection of cliff	• Number of interventions beyond approved buffer zones • Occurrences of cliff instability
	15.	Restrict the mining depth to 30 m and the mining extent to within the planned inland mine boundaries.				
	16.	Monitor cliff geometry changes and adapt the mining plan, if required, accordingly to maintain the buffer zone.				
	17.	Maintain a minimum buffer zone of 143m between the infrastructure / plant expansion area and the cliff.			• Visual inspection of buffer zone and infrastructure / plant extent	

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	18.	Monitor cliff geometry changes and adapt the expansion plan, if required, accordingly to maintain the buffer zone			• Visual inspection of cliff	
	19.	Place heavy equipment and material stockpiles as far from the cliff as possible.				
	20.	Monitor additional loading within the infrastructure / plant expansion area so as not to exceed the values used for the cliff stability assessment (21.1 kN/m^2).				
Beach mine planning and management	21.	Utilise the alternative access road to Beach 1.	• MSR	• Prior to beach mining • Throughout mining	• Visual inspection of beaches • Inspect setback zones • Visual assessment of beach profiles after mining • Mine schedule	• Size of area disturbed outside of mining boundaries • Setback zones demarcated • Beaches returned to natural profiles • Number of complaints • Weekly photographs
	22.	Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).				
	23.	Apply a 10 m setback from the toe of the cliffs and/or dunes on the back beach in which no mining or disturbance may take place.				
	24.	Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented).				
	25.	Prohibit mining closer than 10 m to rocky shore habitats.				
	26.	Undertake primary processing on the beach and distribute tailings evenly above the mid-line of the beach from where it was mined. Do not dispose tailings material beyond the setback line or on the foredunes.				
	27.	Avoid discharging tailings from a centralised point.				
	28.	Actively backfill mined beaches. Level and contour beach tailings material to allow the sea to restore the natural beach profile.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	29.	Should tidal action not be effective in dispersing tailings, manual landscaping of the beach back to its original profile must be undertaken within a maximum of 24 hours of cessation of mining.				
	30.	Remove sand berms (or similar) and any artificial structures on completion of each mining episode.				
	31.	Limit the number of beaches mined simultaneously.				
	32.	Erect wind screens along beach access roads in areas of mobile sands to limit and contain wind-blown sand. Maintain the wind screens in place three years after beach mining is complete.				
	33.	Rehabilitate all access roads built over coastal areas as soon possible, not necessarily waiting for the end of LoM.				
	34.	Monitor rehabilitated areas and, if wind erosion is evident, install wind barriers.				
	35.	Set and maintain beach mining limits according to the mine bench toe, assuming that the bench will form a 35° natural repose angle slope.			• Visual inspection of buffer zone and beach mining extent • Review of mine plans • Visual inspection of dunes / cliffs	• Number of interventions beyond approved buffer zones • Occurrences of dune / cliff instability
	36.	Restrict beach mining depth to 6 m.				
	37.	Delineate the mining limits (buffer zones) on mine plans and on the beaches.				
Employment	38.	Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.	• MSR	• Throughout operations	• Keep record of staff by origin • Keep record of training and support provided	• Percentage of local staff • Percentage of BEE staff
	39.	Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.				
	40.	Maximise use of local skills and resources through preferential employment of locals where practicable.				
	41.	Develop and implement a fair and transparent labour and recruitment policy.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	42.	Ensure gender equality in recruitment, as far as possible.				
	43.	Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.				
	44.	Establish and support Corporate and Social Investment projects and / or networks that provide training and support for small and medium enterprises in the local municipality to benefit from the opportunities generated by the project.		• At commencement of operations and ongoing		
Environmental Awareness Training	45.	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of waste and activities on the environment; • Suitable disposal of waste and litter; • Fauna and avifauna protection; • Sensitive marine species; • Key measures in the EMPr relevant to worker's activities; and • How incidents and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	• MSR	• Before workers start working on-site • Before new activities are undertaken	• Check training attendance register • Observe whether activities are executed in line with EMPr requirements	• Proportion of workers that completed environmental training • Compliance of workers with EMPr
	46.	Provide regular environmental training during normal working hours, e.g. in toolbox talks. Choose varying topics for these talks, with a focus on key measures in the EMPr relevant to worker's activities.		• Throughout operations		

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
Complaints Register / Grievance Mechanism	47.	Maintain and disclose a complaints register. The register must record: • Complainant name and contact details; • Date complaint was lodged; • Person who recorded the complaint; • Nature of the complaint; • Actions taken to investigate the complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to complainant.	• MSR	• Throughout operations	• Keep record of all complaints	• Register on site • Complaints followed up and closed out
Hazardous materials	48.	Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.	• MSR	• Throughout operations	• Visual inspection of hazardous materials handling and storage areas	• Number of incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials • Number of spills of hazardous materials, including waste materials • Cost of cleaning up spills • Evidence of contamination and leaks
	49.	Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container.				
	50.	Avoid unnecessary use and transport of hazardous substances.				
	51.	Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.				
	52.	Ensure that contaminants (including cement) are not placed directly on the ground (e.g. mix cement on plastic sheeting).				
	53.	Removed hazardous materials from the beaches at the end of every day.				
Vegetation management	54.	Compile an Alien Plant Management Plan.	• MSR	• At commencement of operations	• Visual inspection • Appointment of vegetation specialist • Search and Rescue Report	• Size of area cleared relative to development footprint
	55.	Limit activities to the project footprint areas and minimise vegetation clearance to what is essential.		• Throughout operations		

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	56.	Designate areas outside the project footprint boundary as “No Go” areas and ensure that no vegetation is removed or disturbed outside the delineated boundary.				• Size of area disturbed outside of construction site boundary • Number of SCC relocated • Permit on file • Alien Plant Management Plan • Extent of alien vegetation
	57.	Restrict hauling to designated haul roads and no additional roads or turn-around areas should be created.				
	58.	Appoint a suitably qualified specialist to undertake a pre-mining walk-through to identify SCC and protected species within the mining footprint and oversee the rescue and relocation of these species.				
	59.	Obtain a permit from CapeNature for the removal and/or destruction of SCC.				
	60.	Undertake vegetation clearance and soil stripping immediately prior to mining activities.				
	61.	Undertake regular monitoring for alien plants within the project footprint.				
	62.	Conduct regular alien clearing using the best-practice methods for the species concerned. Avoid using herbicides as far as possible				
Topsoil stockpiling	63.	Designate and demarcate areas to be used for topsoil stockpiling. Locate topsoil stockpiles in an area protected from the wind, and in an area where the topsoil will not have to be relocated prior to replacement for final rehabilitation.	• MSR	• Prior to mining	• Visual inspection of topsoil stockpile areas	• Incidents of incorrect storage and harvesting of topsoil
	64.	Remove the vegetation and soil simultaneously and, where possible, immediately place this material in an area prepared for rehabilitation to reduce the duration of topsoil storage.				
	65.	If immediate placement is not possible, stockpile topsoil in the designated area.		• Throughout operations		
	66.	Do not stockpile topsoil higher than 4 m or for longer than 6 months to ensure that the nutrient cycles are maintained over a large surface to volume ratio.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	67.	Vegetate topsoil stockpiles if the topsoil cannot be used in the short-term.				
	68.	Use geotextiles on topsoil stockpiles to stabilise the stockpile and prevent soil erosion if vegetation cover is insufficient.				
Waste management	69.	Aim to minimise waste through reducing and re-using material.	• MSR	• Throughout operations	• Visual inspection of waste collection and disposal areas • Visual inspection operational areas (litter) • Check waste disposal slips	• Presence of litter • Availability of rubbish bins and skips • Degree to which rubbish bins and skips are filled • Total volume of general and hazardous waste storage capacity • Total volume of general and hazardous waste stored on site • Degree to which different waste is separated • Frequency of waste collection
	70.	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.				
	71.	Collect all waste in bins and/or skips at the Processing Plant.				
	72.	Prevent littering by staff at work sites by providing bins or waste bags in sufficient locations.				
	73.	Provide separate bins for hazardous / polluting materials and mark these clearly. Store hazardous / polluting materials on impermeable ground until it is disposed of / collected.				
	74.	Dispose of waste appropriately to prevent pollution of soil and groundwater.				
	75.	Do not allow any burning or burying of waste on site.				
	76.	Do not dispose of any waste in the marine environment.				
	77.	Display and explain waste handling and disposal protocols.				
Contaminated Water/Run-off management	78.	Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into any water sources and/or the environment.	• MSR	• Throughout operations	• Visual inspection of fuel/workshop/equipment washing areas and concrete swills	• Implementation of preventative actions • Visibility of water pollution
	79.	Collect stormwater / run-off from fuel/workshop/equipment washing / bunded areas and concrete swills into conservancy tanks and remove from site for appropriate disposal.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	80.	Design processing areas for the effective management and disposal of contaminated stormwater and process water.				
	81.	Ensure equipment / vehicle maintenance and washdown areas are contained and appropriate systems provided for treating and disposing of contaminated liquids and solids.				
	82.	Regularly inspect effluent and process systems for leaks.				
Stormwater management	83.	Plan for the management of water runoff during infrequent but potentially destructive storms.	• MSR	• Prior to mining activities	• Availability of plan	• Stormwater Management Plan • Incidence of stormwater contamination • Visible leaks/ water wastage • Visible surface erosion • Culverts in place and well maintained • Annual stormwater audits (with photographic records)
	84.	Compile a stormwater management plan that outlines a strategy for the management of stormwater flows off all hardened surfaces and off roads to inform ongoing management.				
	85.	Implement measures to maximise the infiltration of stormwater outside disturbed areas.		• Throughout operations	• Visual inspection	
	86.	Install runoff control measures on all roads and hardened surfaces.				
	87.	Implement measures (adjusting the routing of flows, dissipating runoff and/or establishing vegetation) to address erosion nick-points along the roads.				
	88.	Allow for the dissipation of runoff into the surrounding veld from multiple side drains, rather than for the concentration of flows along or off the road in major channels.				
	89.	Implement drainage control measures and install culverts to manage the natural flow of surface runoff around the infrastructure / plant expansion area.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	90.	Install multiple culverts or other appropriate structures at watercourse 2 [refer to Freshwater Ecology Impact Assessment report] to convey water runoff under / across the road and into the natural watercourse downstream of the road such that it does not result in erosion or channel constriction downstream.				
	91.	Undertake ongoing maintenance of culverts by removing sand and debris and dispose material outside of the affected watercourse so that it does not create additional blockages.				
	92.	Undertake monthly auditing of access roads to assess erosion with photographic records.				
Groundwater management	93.	Undertake a geophysical survey south-east of the infrastructure / plant area to determine groundwater flow and install four boreholes in this zone for aquifer characteristic testing.	• MSR	• Prior to mining activities	• Visual inspection • Monitoring data	• Geophysical report • Monitoring boreholes installed • Pipeline inspection and maintenance procedures in place • Numerical groundwater model updated
	94.	Install monitoring boreholes up and down gradient of the inland mining area and analyse data regularly, taking corrective action as and if required.				
	95.	Produce a numerical groundwater model prior to mining and update the model biannually based on groundwater monitoring results.				
	96.	Discontinue (inland) mining if groundwater is intersected.		• Throughout operations	• Visual inspection of mining areas • Inspect vehicles and equipment • Maintenance procedures • Inspect pipelines	• Mining ceases immediately if groundwater intersected • Incidence of groundwater contamination • Number of spills of hazardous materials, including waste materials • Cost of cleaning up spills
	97.	Inspect mining vehicles and equipment for oil/fuel leaks prior to entering the mining area and frequently in the mining area.				
	98.	Regularly service mining vehicles and equipment.				
	99.	Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	100.	Ensure pipelines are accessible along the entire length and implement measures to detect, contain and fix pipeline leaks within 48 hours.				• Evidence of contamination and leaks
	101.	Clean up hydrocarbon spills immediately.				
	102.	Collect and dispose of polluted soil at a licensed waste disposal facility.				
Marine / coastal management	103.	Enforce a 10 m buffer zone from the toe of sand dunes and cliffs towards the sea in which no mining may take place.	• MSR	• Throughout operations	• Visual inspection of beaches • Inspect setback zones • Review weekly photographs • Visual assessment of beach profiles after mining	• Size of area disturbed outside of mining boundaries • Setback zones demarcated • Evidence of contamination and leaks on the beach • Evidence of waste / litter on the beach • Number of animals harmed • Weekly photographs
	104.	Take weekly photographs of beach mining areas (dunes and cliffs) and cease work if deviations are recorded (until mitigation measures are implemented).				
	105.	Prohibit mining closer than 10 m to rocky shore habitats.				
	106.	Minimise disturbance to the intertidal and subtidal zones.				
	107.	Prohibit vehicle maintenance and refuelling on the beach.				
	108.	Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.				
	109.	Clean up any spills immediately, through containment and removal of free product. Dispose of contaminated soil at a licensed waste disposal facility.				
	110.	Inform and empower all staff about sensitive marine habitats and species and the responsible disposal of waste. Suitable handling and disposal protocols must be clearly explained and sign boarded.				
	111.	Rehabilitate all access roads as soon possible, not necessarily waiting for the end of LoM.				
Air quality management	112.	Avoid vegetation clearing until necessary (i.e. just before mining).	• MSR	• Throughout operations	• Visual assessment of dust plumes	• Visibility of dust plumes

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	113.	Stabilise exposed surfaces as soon as is practically possible.			• Visual assessment of dust control measures	• Dust mitigation measures in place • Number of days that dust plumes are visible • Number of registered complaints • Size of disturbed areas
	114.	Avoid excavation and handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.				
	115.	Minimise dust generated off stockpiles: • Locate piles in sheltered areas where possible; • Place the stockpile lengthwise into the wind; • Minimise the slope of the stockpile (maximum slope of 2:1); • Limit stockpile sizes; and • Use the last in – first out system of stockpile management.				
	116.	Limit vehicle speeds to 40 km/h on unconsolidated and non-vegetated areas.				
	117.	Cover trucks transporting loose material to or from site with tarpaulins, plastic or canvas.				
	118.	Ensure that any material spilled from trucks during transport to or from the site is cleaned up immediately.				
	119.	Limit the number of vehicles allowed on-site and restrict the movement of these vehicles over unsurfaced or unvegatated areas once they are on site to reduce dust problems.				
	120.	Reduce airborne dust through: • Dampening dust-generating areas with seawater (control efficiency of minimum 75%); and • Utilising screens in high dust-generating areas.				
	121.	Use high quality diesel for vehicles / equipment.				
	122.	Partially enclose MSP product stockpiles (control efficiency of minimum 70%).				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	123.	Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.				
Noise management	124.	Comply with the applicable municipal and/or industry noise regulations.	• MSR	• Throughout operations	• Visual inspections • Random noise tests • Mine schedule • Keep record of vehicles entering and leaving • Keep record of incidents and complaints	• Number of registered complaints • Noise test results
	125.	Maintain all generators, vehicles and other equipment in good working order to minimise exhaust fumes and excess noise.				
	126.	Enclose diesel generators used for power supply on site to reduce unnecessary noise.				
	127.	Ensure speed limits are respected at all times.				
	128.	Avoid beach mining near “tourist” beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).				
	129.	Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays.				
	130.	Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00.				
	131.	Respond rapidly to complaints and take appropriate corrective action.				
Fire Management	132.	Ensure that no fires are permitted on or adjacent to site except in areas designated for this purpose. Any such designated areas should be situated as far as possible from vegetated areas and/or flammable material stores. Suitable firefighting equipment must be readily available in this area.	• MSR	• Throughout operations	• Inspect attendance register for training sessions • Inspect fire extinguishers and certificates.	• Number of fire incidents • Certified extinguishers in appropriate locations
	133.	Ensure that no smoking is permitted except for within a designated area. Suitable firefighting equipment must be readily available in this area.				
	134.	Ensure that sufficient fire-fighting equipment is available on site.				
	135.	Equip all fuel stores and waste storage areas with fire extinguishers.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	136.	Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated.				
	137.	Suitably maintain firefighting equipment.				
Transportation and refuelling	138.	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.	• MSR	• Throughout operations	• Visual inspection of vehicles, machinery and refuelling/maintenance areas • Keep record of vehicles entering and leaving • Keep record of incidents and complaints	• Number of incidents of non-compliance • Number of leaks and spills • Cost of cleaning up spills
	139.	Inspect mining vehicles and equipment for oil/fuel leaks prior to entering the mining area and frequently in the mining area.				
	140.	Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps.				
	141.	Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.				
	142.	Equip all mobile diesel bowsers with drip trays.				
	143.	Clean up any spills immediately, through containment and removal of free product and appropriate disposal of contaminated soils.				
	144.	Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site.				
	145.	Restrict hauling to designated haul roads and no additional roads or turn-around areas should be created. No vehicles should be allowed to turn in or pull over into areas abutting the road, other than where formally designated turning or pullover areas have been created and managed.				
	146.	Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays.				
	147.	Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
Fauna Management	148.	Undertake a pre-mining walk-through to flush any faunal species within the mining footprint towards more suitable habitat within the surrounding areas. Threatened fauna should be relocated by a suitably qualified environmental officer	• MSR	• Prior to mining each area	• Visual inspection of areas to be mined • Inspect trenches and operational areas • Inspect powerline • Monitor roosting sites	• Number of animals harmed • Time period trenches are left open • Number of incidents of animals found in trenches • Monitoring reports
	149.	Check for nests during the pre-mining walk-through.				
	150.	Do not harm, catch or kill animals by any means, including poisoning, trapping, shooting, setting of snares and egg collecting.		• Throughout operations		
	151.	Backfill trenches as soon as possible to ensure that the time the trench is exposed is kept to a minimum.				
	152.	Open trenches must be inspected on a daily basis for animals which may have fallen or become trapped.				
	153.	Keep the operational areas clear of litter and especially plastic, twine and string.				
	154.	Limit vehicle speeds to 40 km/h on internal and haul roads.				
	155.	Prohibit unnecessary driving at night.				
	156.	Undertake avifaunal monitoring of the powerline according to the Birdlife Guidelines.				
	157.	Undertake counts at regular roosting sites to determine impact on avifauna.				
Protection of heritage resources	158.	Inform employees that shipwreck material may be exposed during beach mining.	• MSR	• Throughout beach mining	• Visual inspection • Keep records of finds	• Fossil finds procedure • Records of heritage finds
	159.	Establish protocol if any shipwreck material is found, including reporting the find to SAHRA.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	160.	On discovery of shipwreck material, cease mining, and contact a maritime archaeologist to assess the material and propose the way forward. If required, collect / excavate any exposed maritime archaeological resources using appropriate methods to record provenance.				• Number of incidents of loss/damage to heritage resources
	161.	Inform employees and contractors that paleontological artefacts resources may be exposed during beach mining and that the Fossil Finds Procedure must be followed.				
	162.	Cease mining on (chance) discovery of fossil bones and protect fossils from further damage.				
	163.	On discovery of fossil bones / shells, send information and photographs to an identified palaeontologist for assessment and to determine preservation, collection and record keeping procedures.				
	164.	Inform employees and contractors that archaeological or paleontological artefacts might be exposed during operations and that the Fossil Finds Procedure must be followed.	• MSR • Archaeologist	• Throughout inland mining	• Visual inspection • Keep records of finds	• Fossil finds procedure • Appointment of archaeologist • Records of heritage finds • Number of incidents of loss/damage to heritage resources
	165.	Appoint an archaeologist to monitor mining activities until it can be established if heritage resources are present.				
	166.	Based on initial observations, work out a program for ongoing or regular monitoring.				
	167.	Empower staff to stop works on (chance) discovery of heritage resources at the site.				
	168.	On discovery of heritage resources, send information and photographs to an archaeologist or palaeontologist for assessment and to determine preservation, collection and record keeping procedures.				
Traffic Management	169.	Seal DR2225, in consultation with relevant road authorities.	• MSR	• Prior to operations	• Review of contract documents • Visually inspect DR2225	• DR2225 is sealed

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	170.	Manage beach mining activities to minimise impacts on road traffic as far as possible, e.g. minimise the unnecessary movement of haul vehicles.	• MSR and all contractors	• Throughout operations	• Keep record of vehicles entering and leaving • Keep record of incidents and complaints • Visually inspect vehicles for any obvious faults or overloading	• Number of incidents and complaints • Number of vehicles travelling to / from site each day • Condition of vehicles
	171.	Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points where necessary to inform other road users of hauling activities.				
	172.	Implement management measures (e.g. road signs, speed limits, etc.) to ensure that the public is still able to safely use OP9764 to access this stretch of coast.				
	173.	Ensure that large vehicles are suitably marked to be visible to other road users.				
	174.	Ensure that all safety measures are observed and that drivers of vehicles comply with the rules of the road.				
	175.	Investigate and respond to complaints about traffic.				
	176.	Ensure that vehicle axle loads do not exceed the technical design capacity of the road.				
	177.	Maintain and repair roads damaged by trucks, in consultation with relevant road authorities.				
	178.	Ensure contractors use the designated roads for hauling product to Ports of Saldanha and Cape Town.				
Visual aspects	179.	Limit and phase vegetation clearance and the footprint of construction activities to what is essential.	• MSR	• Throughout operations	• Visual inspection • Dust management programme • Targets for local labour	• Number of complaints • Percentage of local labour target
	180.	Keep all areas neat, clean and organised to portray a general tidy appearance. Keep material and machinery contained within an area that is as small as possible.				
	181.	Progressively and continually rehabilitate mined out areas and project components.				

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	182.	Maintain all generators, vehicles and other equipment in good working order.				
	183.	Avoid beach mining near "tourist" beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).				
	184.	Reduce the footprint of the infrastructure areas to a workable minimum.				
	185.	Restrict infrastructure along the coast to the north of Tormin Mine as far as possible.				
	186.	Consolidate or cluster structures together at the infrastructure expansion area to avoid the visual scatter of structures.				
	187.	Avoid excavation, handling and transport of materials which may generate dust under high wind conditions.				
	188.	Limit hauling operations from the northern beaches to Mondays to Fridays during Easter and Christmas holidays.				
	189.	Limit product transport from Tormin Mine along DR2225 to Mondays to Saturdays between the hours of 07h00 and 17h00.				
	190.	Ensure speed limits are respected at all times.				
	191.	Maintain all vehicles in good working order.				
	192.	Limit lighting only to essential activities and facilities.				
	193.	Direct lighting inwards and downwards towards activities and facilities to avoid light spillage and trespass. External lights should be fitted with reflectors ("full cut-off" luminaires) to direct illumination downward and inward to the specific illuminated areas.				
Coastal access and tourism	194.	Implement management measures (e.g. road signs, speed limits, etc.) to ensure that the public is still able to safely use OP9764 to access this stretch of coast.	• MSR	• Prior to and throughout operations	• Visual inspection of coastal access points • Mine schedule	• Signs in place • Safe access to the coast

Operational Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods[13]**	**Performance Indicators**
	195.	Avoid beach mining near "tourist" beaches (e.g. Gert du Toit-se-Baai), during peak holiday season (Easter and Christmas holidays).				• Number of accidents • Number of complaints
Ablution facilities	196.	Ensure there are sufficient ablution facilities for all site staff at the processing plant.	• MSR	• Throughout operations	• Visual inspections of ablutions	• Number of incidents of staff not using facilities
Response to environmental pollution	197.	In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.	• MSR	• Throughout operations	• Maintain register of pollution events and response • Inspect repaired equipment to ensure proper functioning	• Number of incidents • Time activities stopped • Number of recurring incidents • Availability and completeness of register
	198.	Only resume activity once the problem has been stopped.				
	199.	Repair faulty equipment as soon as possible.				
	200.	Install additional bunding / containment structures around the equipment that was the source of the leak / spillage.				
	201.	Treat hydrocarbon spills, e.g. during refuelling, with adequate absorbent material, which then needs to be disposed of at a suitable landfill.				

Closure Plan

The overall closure vision for Tormin Mine is to ensure operations are safe, stable and non-polluting over the long-term to integrate with the current agricultural, eco-tourism and economic activities of the area in which the mine is located.

The vision is underpinned by the closure objectives:

- Undertake on-going (concurrent) rehabilitation to ensure that the area will return to near pre-mining land use capability as soon as possible after closure;
- Ensure all areas are stable and there is no risk of erosion;
- Prevent alien plant invasion on the site until the site is in a stable state;
- Ensure that all areas are free-draining and non-polluting;
- Ensure reshaped areas are visually suited to the surrounding landscape; and
- Obtain a Closure Certificate from DMR.

The objective of this section is to provide recommendations for the decommissioning, closure and rehabilitation of the affected areas[14] at the end of the operational lifespan of Tormin Mine, to achieve sustainable land use conditions and avoid or minimise costs and long-term liabilities to MSR.

The environmental management and mitigation measures that must be implemented at the Mine during the **Closure Phase**, as well as responsibilities and timelines for the implementation of these measures and monitoring thereof, are laid out in Table 46 below.

Table 46: Environmental management and mitigation measures that must be implemented during the *Closure Phase*

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
General	155.	Review the Closure Plan.	• MSR	• Approximately 1 year before planned closure	• Review of progress by MSR Management	• Approved Closure Plan • Approved Rehabilitation Plan
	156.	Review the Rehabilitation Plan and ensure that responsibilities and sufficient resources are allocated to (for example): • Specialist horticulturalist; • Nursery; and • Hydroseeding.				

[14] The affected areas include the beach access roads and infrastructure / plant expansion area and associated infrastructure. Mining areas will be rehabilitated during the Operational Phase - each beach will be rehabilitated once the VHM deposit has been mined (although MSR may return to the beach at a later stage if the VHM deposit has been replenished) and the inland mining areas will be rehabilitated as soon as the mining path allows.

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	157.	Identify and assess any potential environmental and societal risks associated with the preferred method of closure.				
	158.	Address potentially significant environmental and societal risks by amending the proposed method of closure to prevent any significant adverse impacts.				
	159.	Discuss the preferred method of closure of the beach access roads with the Provincial Roads Authority.				
	160.	Remove all infrastructure from the affected areas.	• Contractors	• Throughout closure	• Visual inspection of rehabilitated areas • Monitoring as per the requirements of the Rehabilitation Plan	• Success of rehabilitation • Removal of infrastructure, vehicles, equipment and waste
	161.	Remove all vehicles, equipment, waste and surplus materials from site.				
	162.	Reinstate all areas disturbed by activities, including improvement of adjacent degraded habitats in accordance with the Rehabilitation Plan.				
	163.	Provide adjacent landowners with contact details to register any observations and complaints following closure.	• MSR	• Before the end of closure	• Notifications sent	• Closure certificate issued
	164.	Notify relevant authorities and key stakeholders when closure is complete.		• After closure		
Financial provision	165.	Undertake a review of the requirements for closure and ensure the adequacy of the financial provision is assessed to include the affected areas.	• MSR	• Annually	• Review of progress by MSR Management	• Updated financial provision
Employment	166.	Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.	• MSR • Contractors	• Throughout closure	• Keep record of staff by origin • Keep record of training provided	• Percentage of local staff • Percentage of BEE staff
	167.	Maximise use of local skills and resources through preferential employment of locals where practicable.				
	168.	Develop and implement a fair and transparent labour and recruitment policy.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	169.	Ensure gender equality in recruitment, as far as possible.				
	170.	Provide ancillary training to workers on maximising the use of income and training to further future economic prospects, potentially through projects initiated as part of a social upliftment programme.				
Environmental Awareness Training	171.	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of construction waste and activities on the environment; • Suitable disposal of construction waste and litter; • Key measures in the EMPr relevant to worker's activities; and • How incidents and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	• Contractors	• Before workers start working on-site • Before new activities are undertaken	• Check training attendance register • Observe whether activities are executed in line with EMPr requirements	• Proportion of workers that completed environmental training • Compliance of workers with EMPr
Complaints Register / Grievance Mechanism	172.	Maintain and disclose a complaints register. The register must record: • Complainant name and contact details; • Date complaint was lodged; • Person who recorded the complaint; • Nature of the complaint; • Actions taken to investigate the complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to complainant.	• MSR • Contractors	• Throughout closure	• Keep record of all complaints	• Register on site • Complaints followed up and closed out
Vegetation clearing	173.	Rehabilitate the affected areas as required in terms of the intended future land use and the Rehabilitation Plan.	• Contractors	• Throughout closure	• Visual inspection of rehabilitated areas • Monitoring reports	• Success of rehabilitation

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	174.	Monitor the success of rehabilitation in terms of the Rehabilitation Plan.				• Size of area disturbed outside of site boundary
	175.	Ensure that no vegetation is removed or disturbed outside the delineated boundary.				
	176.	Prohibit the indiscriminate movement of vehicles and staff through vegetation outside of the affected footprint and prohibit vehicle parking or storage of materials outside the affected footprint.				
	177.	Conduct regular alien clearing for 3 years after closure using the best-practice methods for the species concerned. Avoid using herbicides as far as possible.		• After closure	• Visual inspection	• Presence of alien vegetation
Hazardous materials	178.	Ensure hazardous materials (especially fuel) are stored in suitable hazardous material storage facilities constructed from impermeable materials. The storage facilities must have bund containment capacity equal to 110% of the largest container.	• Contractors	• Throughout closure	• Visual inspection of hazardous materials handling and storage areas	• Number of incidents of non-compliance with safety procedures concerning hazardous materials, including waste materials • Number of spills of hazardous materials, including waste materials • Cost of cleaning up spills • Evidence of contamination and leaks
	179.	Ensure that contaminants (including cement) are not placed directly on the ground (e.g. mix cement on plastic sheeting).				
	180.	Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.				
	181.	Avoid unnecessary use and transport of hazardous substances.				
	182.	Keep Material Safety Data Sheets for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.				
Waste management	183.	Aim to minimise waste through reducing and re-using material.	• Contractors	• Throughout closure	• Visual inspection of waste collection and disposal areas • Visual inspection of work areas (litter)	• Presence of litter • Availability of rubbish bins and skips
	184.	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.				
	185.	Collect all waste in bins and/or skips.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	186.	Prevent littering by staff at work sites by providing bins or waste bags in sufficient locations.			• Check waste disposal slips	• Degree to which rubbish bins and skips are filled • Total volume of general and hazardous waste storage capacity • Total volume of general and hazardous waste stored on site • Degree to which different waste is separated • Frequency of waste collection
	187.	Provide separate bins for hazardous / polluting materials and mark these clearly. Store hazardous / polluting materials on impermeable ground until it is disposed of / collected.				
	188.	Dispose of waste appropriately to prevent pollution of soil and groundwater.				
	189.	Do not allow any burning or burying of waste on site.				
	190.	Do not dispose of any waste in the marine environment.				
	191.	Display and explain waste handling and disposal protocols.				
Contaminated Water/Run-off management	192.	Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into any water sources and/or the environment.	• Contractors	• Throughout closure	• Visual inspection of fuel/workshop/equipment washing areas	• Implementation of preventative actions • Visibility of water pollution
	193.	Direct run-off from fuel/workshop/equipment washing areas and concrete swills into conservancy tanks to be disposed of at a licensed waste disposal facility.				
	194.	Ensure that waste (e.g. plastic, rubble) is disposed of appropriately.				
Stormwater management	195.	Rehabilitate eroded areas (e.g. eroded channels, dongas).	• Contractors	• Throughout construction	• Inspect bunded areas and roads • Inspect stormwater channels and high erosion potential areas • Maintenance procedures	• Incidents of stormwater contamination • Visible leaks/ water wastage • Visible surface erosion
	196.	Plan for the management of water runoff during infrequent but potentially destructive storms.				
	197.	Remove or shape graded vegetation and soils along the road edges to ensure dissipation occurs.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	198.	Maintain stormwater outlets / dissipation channels for 1 year after closure.		• After closure	• Visual inspection	• Condition of stormwater outlets / dissipation channels
Marine / coastal management	199.	Restrict beach access road closure activities to the minimum required.	• Contractors	• Throughout closure	• Visual inspection of beach access roads and beaches	• Size of area disturbed outside of site boundary • Setback zones demarcated • Evidence of contamination and leaks on the beach • Evidence of waste / litter on the beach • Number of animals harmed
	200.	Ensure that a 10 m buffer zone from the toe of the dune/cliffs remains undisturbed outside of the closure footprint.				
	201.	Limit the duration of closure activities in the coastal zone to as short a time as possible.				
	202.	Prohibit vehicle maintenance and refuelling on the beach.				
	203.	Park vehicles / plant / machinery on beach access roads rather than on the beach when not in use.				
	204.	Inform and empower all staff about sensitive marine habitats and species and the responsible disposal of waste.				
Air quality management	205.	Stabilise exposed surfaces as soon as is practically possible.	• Contractors	• Throughout closure	• Visual assessment of dust plumes • Visual assessment of dust control measures	• Visibility of dust coming off work areas • Dust mitigation measures in place • Number of days that dust plumes are visible • Number of registered complaints • Size of disturbed areas
	206.	Avoid excavation and handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.				
	207.	Minimise dust generated off stockpiles: • Locate piles in sheltered areas where possible; • Place the stockpile lengthwise into the wind; • Minimise the slope of the stockpile (maximum slope of 2:1); • Limit stockpile sizes; and • Use the last in – first out system of stockpile management.				
	208.	Limit vehicle speeds to 40 km/h on unconsolidated and non-vegetated areas.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	209.	Cover trucks transporting loose material to or from site with tarpaulins, plastic or canvas.				
	210.	Ensure that any material spilled from trucks during transport to or from the site is cleaned up immediately.				
	211.	Limit the number of vehicles allowed on-site and restrict the movement of these vehicles over unsurfaced or unvegatated areas once they are on site to reduce dust problems.				
	212.	Reduce airborne dust through: • Dampening dust-generating areas with seawater; and • Utilising screens in high dust-generating areas.				
	213.	Use high quality (low sulphur) diesel for vehicles / equipment.				
	214.	Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.				
Noise management	215.	Comply with the applicable municipal and/or industry noise regulations.	• Contractors	• Throughout closure	• Visual inspections • Random noise tests	• Results of noise measurements • Number of registered complaints
	216.	Maintain all generators, vehicles and other equipment in good working order to minimise exhaust fumes and excess noise.				
	217.	Enclose diesel generators used for power supply on site to reduce unnecessary noise.				
	218.	Respond rapidly to complaints and take appropriate corrective action.				
Fire Management	219.	Ensure that no fires are permitted on or adjacent to site except in areas designated for this purpose. Any such designated areas should be situated as far as possible from vegetated areas and/or flammable material stores. Suitable firefighting equipment must be readily available in this area.	• Contractors	• Throughout closure	• Inspect attendance register for training sessions • Inspect fire extinguishers and certificates	• Number of fire incidents • Certified extinguishers in appropriate locations

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	220.	Ensure that no smoking is permitted on the site except for within a designated area. Suitable firefighting equipment must be readily available in this area.				
	221.	Ensure that sufficient fire-fighting equipment is available on site.				
	222.	Equip all fuel stores and waste storage areas with fire extinguishers.				
	223.	Ensure that all personnel on site are aware of the location of firefighting equipment on the site and how the equipment is operated.				
	224.	Suitably maintain firefighting equipment.				
Transportation and refuelling	225.	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.	• Contractors	• Throughout closure	• Inspect vehicles, machinery and refueling / maintenance areas	• Number of incidents of non-compliance • Number of leaks and spills • Cost of cleaning up spills
	226.	Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps.				
	227.	Use appropriately sized drip trays for all refuelling, repairs done on vehicles / machinery or when vehicles are parked – ensure these are strategically placed to capture any fuel / oil spills.				
	228.	Clean up any spills immediately, through containment and removal of free product and appropriate disposal of contaminated soils.				
	229.	Keep spill containment and clean-up equipment at all work sites and for all polluting materials used at the site.				
Fauna Management	230.	Flush any faunal species within the work areas towards more suitable habitat. Threatened fauna should be relocated by a suitably qualified environmental officer.	• Contractors	• Throughout closure	• Visual inspection of work areas and trenches	• Number of animals harmed • Time period trenches are left open • Number of incidents of
	231.	Do not harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	232.	Inspect open trenches daily for animals which may have fallen or become trapped. Do not leave trenches open for extended periods				animals found in trenches
	233.	Safely remove and relocate any fauna that may be physically harmed by closure activities.				
	234.	Keep the site clear of litter and especially plastic, twine and string.				
	235.	Limit vehicle speeds to 40 km/h on unconsolidated and non-vegetated areas.				
Protection of heritage resources	236.	Inform employees and contractors that archaeological or paleontological artefacts might be exposed during closure activities and that the Fossil Finds Procedure must be followed.	• Contractors	• Before closure commences	• Visual inspection • Keep records of finds	• Records of heritage finds • Number of incidences of loss/damage to heritage resources
	237.	Empower staff to stop works on (chance) discovery of heritage resources at the site.		• Throughout closure		
	238.	On discovery of heritage resources, send information and photographs to an archaeologist / palaeontologist for assessment and to determine preservation, collection and record keeping procedures.				
Traffic Management	239.	Restrict traffic to Mondays to Saturdays between the hours of 08h00 and 17h00.	• Contractors	• Throughout closure	• Keep record of vehicles entering / leaving the site • Keep record of incidents and complaints • Visually inspect vehicles for any obvious faults or overloading	• Number of incidents and complaints • Number of vehicles travelling to / from site each day • Condition of vehicles
	240.	Maintain all vehicles in good working order.				
	241.	Manage closure / rehabilitation sites and activities to minimise impacts on road traffic as far as possible.				
	242.	Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points when necessary.				
	243.	Maintain and repair roads damaged by large vehicles, in consultation with relevant road authorities.				
	244.	Ensure large vehicles are suitably marked to be visible to other road users and pedestrians.				

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
	245.	Ensure that all safety measures are observed and that drivers comply with the rules of the road.				
	246.	Investigate and respond to complaints about traffic.				
Visual aspects	247.	Use dark green or black (non-glossy) wind screens for rehabilitation.	• Contractors	• Throughout closure	• Visual inspection	• Number of complaints
	248.	Remove rehabilitation wind screens as soon as vegetation is viable.				
	249.	Avoid excavation, handling and transport of materials which may generate dust under high wind conditions.				
	250.	Ensure speed limits on all gravel roads are respected at all times.				
	251.	Keep work areas tidy and all activities, material and machinery contained within an area that is as small as possible.				
	252.	Control litter and keep work areas as clean and neat as possible.				
	253.	Maintain all generators, vehicles and other equipment in good working order.				
	254.	Minimise the use of night-lighting. No high mast or spot-light security lighting or up-lighting allowed.				
Coastal access and tourism	255.	Restrict closure activities to the construction footprint.	• Contractors	• Throughout closure	• Visual assessment of coastal access points • Inspect signage • Inspect screening	• Signs in place • Safe access to the coast • Number of accidents • Number of complaints
	256.	Install appropriate signage and information regarding coastal access.				
Ablution facilities	257.	Ensure there are sufficient ablution facilities for all staff.	• Contractors	• Throughout closure	• Visual inspections of ablutions	• Number of incidents of staff not using facilities

Closure Phase Measures						
Aspect	**ID**	**Mitigation measure / Procedure**	**Responsible**	**Implementation Timeframe**	**Monitoring Methods**	**Performance Indicators**
Response to environmental pollution	258.	Compile a Method Statement for response to environmental pollution for approval by the Environmental Manager.	• Contractors	• Before closure commences	• Review Method Statement • Maintain register of pollution events and response • Inspect repaired equipment to ensure proper functioning	• Method Statement • Number of incidents • Time activities stopped • Number of recurring incidents • Availability and completeness of register
	259.	In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.		• Throughout closure		
	260.	Only resume activity once the problem has been stopped.				
	261.	Repair faulty equipment as soon as possible.				
	262.	Install additional bunding / containment structures around the equipment that was the source of the leak / spillage.				
	263.	Treat hydrocarbon spills, e.g. during refuelling, with adequate absorbent material, which then needs to be disposed of at a suitable landfill.				
	264.	Rehabilitate all project areas as soon as possible after completion of activities in each area, including removing and/or remediating any contaminated soils.				

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph

The impact management outcomes are included in Table 44 to Table 46 as “Performance Indicators”.

f) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

The impact management actions are included in Table 44 to Table 46 .

i) Financial Provision

(1) Determination of the amount of Financial Provision.

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

The closure vision and objectives for the mine expansion project are based on the objectives previously developed by GCS for Tormin Mine (2012 and 2014). The objectives are also informed by the environment specifically affected by the proposed expansion activities.

The overall closure vision for Tormin Mine is to ensure operations are safe, stable and non-polluting over the long-term to integrate with the current agricultural, eco-tourism and economic activities of the area in which the mine is located.

The vision is underpinned by the objectives provided below:

- Undertake on-going (concurrent) rehabilitation to ensure that the area will return to near pre-mining land use capability (refer to Part A, Section 6.2.3, “Land Capability”) as soon as possible after closure;
- Ensure all areas are stable and there is no risk of erosion;
- Prevent alien plant invasion on the site until the site is in a stable state;
- Ensure that all areas are free-draining and non-polluting; and
- Ensure reshaped areas are visually suited to the surrounding landscape.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

The EIA and EMPr Report will be released for public review and comment during the stakeholder engagement process in the Impact Assessment Phase. Stakeholders will have the opportunity to review the project scope; the affected environment description; the findings of the specialist studies and impact assessment; the recommended management/mitigation measures developed to address the potential impacts; and the closure objectives, plan and financial provision.

(c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

A Rehabilitation Plan is provided as Appendix 6 of the Terrestrial Ecology Impact Assessment (Appendix 11F).

Environmental management and mitigation measures that must be implemented for rehabilitation during the construction, operational and decommissioning / closure phases have been included in the EMPr, including the requirement to review and update the Rehabilitation Plan (with the input from a qualified specialist) to ensure that responsibilities and sufficient resources are allocated to rehabilitation.

(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

According to the terrestrial ecology specialist (refer to Appendix 6 of the Terrestrial Ecology Impact Assessment, Appendix 11F), the ultimate goals of rehabilitation are to:

- Restore ecological function; and
- Remediate and improve the visual impact of the post-mining landscape.

In terms of restoring ecological function, the main metrics of success are vegetation cover and structure. While diversity is important in the long-term, the short- to medium-term focus should be to restore a self-sustaining cover of perennial vegetation to protect the soil and facilitate the natural (fauna and flora) recolonisation of the area.

The rehabilitation goals of the Rehabilitation Plan are compatible with MSR's closure objectives.

(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

The financial provision required to manage and rehabilitate the environment for the Tormin Mine Extension project and its associated infrastructure is R 13 170 408.23 (excluding VAT).

The liability for rehabilitation / closure of the aspects associated with the Tormin Mine Extension project was determined using the approach advocated in the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provisions Provided by a Mine (2005).

A detailed breakdown of the costing is included as Appendix 14.

(f) Confirm that the financial provision will be provided as determined.

MSR has confirmed that the financial provision can be provided for from operating expenditure and the cost is included in the MWP.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) Monitoring of Impact Management Actions
h) Monitoring and reporting frequency
i) Responsible persons
j) Time period for implementing impact management actions
k) Mechanism for monitoring compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
• Northern haul road and beach access roads • Inland mining • Infrastructure / plant expansion area	Alien plant infestation	Visual inspection of the affected footprints and immediate surroundings.	• Suitably qualified Contractor's Designated Environmental Officer	• Ongoing throughout the construction phase
			• ECO	
			• Environmental Manager	• Ongoing throughout the operational phase
			• Suitably qualified Contractor's Designated Environmental Officer	• Ongoing throughout the closure phase
			• Suitably qualified specialist	• Annually for 3 years after closure
• Inland mining areas • Infrastructure / plant expansion area	Contamination of groundwater	Install four boreholes south-east of the infrastructure / plant expansion area for aquifer characteristic testing.	• Environmental Manager	• Prior to mining • Groundwater quality and quantity monitoring for 6-month period.
		Install monitoring boreholes up and down gradient of the inland mining area and analyse data regularly.		• Prior to mining each mine area • Quarterly groundwater quality and quantity monitoring and reporting.

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
• Beach mining	Disturbance and or mortality of marine life	Sampling of rocky shores, sandy beaches and subtidal benthic environments. Before-After / Control-Impact Monitoring	• Suitably qualified specialist	• Pre-mining • Every second year during mining • Post-mining until communities have recovered to 80% of pre-mining state
• Hauling	Destabilisation of watercourses	Audit access roads to assess erosion.	• Environmental Manager	• Monthly with photographic records
• Powerline • Beach mining • Inland mining	Loss of avifauna and avifauna habitat	Undertake avifaunal monitoring of the powerline according to the Birdlife Guidelines.	• Environmental Manager	• Quarterly throughout the operational phase
		Undertake counts at regular roosting sites to determine impact on avifauna.		• Annually throughout the operational phase
• Infrastructure / plant expansion area • Inland mining	Loss of heritage resources	Appoint an archaeologist to monitor construction activities and sample affected archaeological resources as required.	• Environmental Manager	• Monthly throughout the construction phase
		Appoint an archaeologist to monitor mining activities until it can be established if heritage resources are present (based on initial observations, revised monitoring procedures must be developed).		• Monthly for the first 6 months of inland mining

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
• Beach access roads • Beach mining • Inland mining • Infrastructure / plant expansion area	Rehabilitation progress	Monitor the success of rehabilitation in terms of the Rehabilitation Plan.	• Internal audit: Environmental Manager	• Annually throughout the operational phase
			• External audit: Suitably qualified specialist	• Every two years throughout the operational phase • Annually for 3 years after closure
• Beach access roads • Beach mining • Inland mining • Infrastructure / plant expansion area	EMPr performance	Audit the performance of MSR against environmental commitments.	• Suitably qualified independent specialist	• Bi-annually throughout the operational phase • Performance Assessment reports to be submitted to DMR

l) Indicate the frequency of the submission of the performance assessment report.

The EMPr performance assessment (audit) must be undertaken every two years by an external auditor, and a report must be compiled and submitted to DMR.

m) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

MSR and contractors employed at Tormin Mine will be required to provide environmental awareness training to all employees on site during the construction, operational and closure phases (refer to Table 44 to Table 46). Training will include discussion of:

- Potential impact of waste and activities on the environment;
- Suitable disposal of waste and litter;
- Fauna and avifauna protection;
- Sensitive marine species;
- Key measures in the EMPr relevant to worker's activities; and
- How incidents and suggestions for improvement can be reported.

Employees will be required to attend environmental awareness training before work commences on site and before any new activities are undertaken. Employees will be required to sign an attendance register.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

The management measures provided in the EMPr are recommended to avoid pollution or the degradation of the environment as far as possible.

Prior to the commencement of construction and/or closure activities, Contractors will be required to submit a Method Statement for response to environmental pollution for approval by the ECO or Environmental Manager (refer to Table 44 and Table 46).

MSR has existing procedures in place to prevent and respond to environmental incidents at Tormin Mine (e.g. oil spill clean-up, protection of archaeological resources, protection of no-go areas). MSR will update and apply these procedures in the management of operations for the Tormin Mine extension project.

n) Specific information required by the Competent Authority

(Among others, Confirm that the financial provision will be reviewed annually).

In terms of Section 41, Regulations 53 and 54 of the MPRDA, MSR is required to make financial provision for the interim and final rehabilitation activities on the site. This provision will be reviewed annually for adequacy and amended to compensate for new activities and/or inflation. During the annual review, confirmation will be provided that this amount can be provided for from operating expenditure.

2) UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☒

b) the inclusion of comments and inputs from stakeholders and I&APs; ☒

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

-END-

Prepared by

Scott Masson

Senior Environmental Consultant

Reviewed by

Chris Dalgliesh

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

SRK Report Distribution Record

Report No.	507228/3A
Copy No.	

Name/Title	Company	Copy	Date	Authorised by
Regional Manager	DMR	1-2HC + CD	13 September 2018	MASS
Adri La Meyer	DEA&DP	3HC + 5xCDs		
M Tshikalange	DWS	4HC + CD		
Funanani Ditinti	DEA:O&C	5HC + 2xCDs		
Andrew September	HWC	6HC + CD		
Basson Geldenhuys	DPW	7HC + CD		
Malcolm Watters	Western Cape Department of Transport and Public Works	8HC +CD		
Alana Duffell-Canham	CapeNature	9HC + CD		
Cor van der Walt	Western Cape Department of Agriculture	CD		
Municipal Manager	West Coast District Municipality	10HC + CD		
Municipal Manager	Matzikama Local Municipality	11HC + CD		
Librarian	Vredendal Library	12HC		
Librarian	Lutzville Library	13HC		
Sibonelo Mkhize	MSR	14HC + CD		
Library	SRK	CD		
Scott Masson	SRK	15-16HC + CD		
Website	SRK	pdf		

Approval Signature: