TRANS HEX

TRANS HEX OPERATIONS (PTY) LTD

MYEZO ENVIRONMENTAL MANAGEMENT SERVICES

Environmental Stewardship

FINAL REPORT - OCTOBER 2010 / APPLICANT: TRANS HEX OPERATIONS (PTY) LTD

ENVIRONMENTAL MANAGEMENT PROGRAM REPORT FOR A MINING RIGHT CONVERSION APPLICATION ON:

FARM BRAZIL 329 AND CORRESPONDING SURF ZONE

Ref No. NCS 30/5/1/2/3/2/1(539)

VOLUME I OF II

MAIN REPORT

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Table of Contents

Tables

Figures

Plates

Orthophoto

Flow Diagram

Appendices

Appendix 1: Public Involvement

- Appendix 1-1: Site notices
- Appendix 1-2: Adverts
- Appendix 1-3: Letters/communication sent out to IAPs
- Appendix 1-4: Comments from IAPs
- Appendix 1-5: Interested and Affected Parties list

Appendix 2: Archaeology study information

- Appendix 2-1: Archaeological study for Trans Hex marine concession areas
- Appendix 2-2: Letters sent to Heritage Specialists requesting quotes for archaeological study and quotes received

Appendix 3: Trans Hex Company Policy

Appendix 4: ISM Procedures

Appendix 5: Photographic record

INTRODUCTION

Trans Hex Operations (Pty) Ltd (Trans Hex) have prospected and mined on the Brazil surf zone areas opposite Farm 329 since 1986. The mining activities are being conducted in terms of the existing mining licence (ML 25/93). The regional and locality plan depicting the mining right application area is shown in Figure 1.2-1and Figure 1.2-2. The nearest towns are Port Nolloth, Kleinzee and Hondeklip Bay. The sea operations are managed by means of independently contracted shallow water shore unit operators. It is now planned to also utilise deep water shore units operators.

The land based activities on the Farm Brazil included drilling and the results did not prove viable at this stage for continued land based prospecting activities on this farm and further prospecting has thus been temporarily terminated. The environmental impacts for the drilling activities were covered under an environmental management plan for the Farm Brazil 329, which was approved in 2004. The environmental impacts for surf zone operations were managed under the EMP for Sea Concessions 5(a), 6(a) and 7(a) including surf zone concessions opposite farms 'Brazil" and 'Hondeklip' and admiralty strip opposite 'Brazil'. Mineral processing is undertaken at the existing De Punt facility, and previously in Port Nolloth facility which has subsequently been temporarily closed. Figure 1.2-1 shows the position of concessions 5(a), 6(a) and 7(a) and the Farm Brazil at a regional scale. The application area is about 75.9968 ha in extent.

Trans Hex has now subsequently applied for the conversion of the old mining right in terms of Item 6 (2) of Schedule II of Minerals and Petroleum Resources Development Act No.28 of 2002 (MPRDA). The existing EMP is thus being upgraded to be in line with Section 39 of MPRDA and both the land and surf zone operations will be covered under a single EMP.

Myezo Environmental Management Services cc, has subsequently thus been commissioned by Trans Hex to compile this EMP.

The EMP compilation is based on environmental impact assessment (EIA) and associated public participation, as required in terms of Regulation 48 and 49 of MPRDA. The original EMP for adjacent Brazil surf zone and admiralty strip (excluding the land -based operations, which are now covered under this existing EMP update) was compiled by Pisces Environmental Services in 2003. Therefore this existing EMP has provided much of the background information utilized in the EMP update.

Approach to Environmental management Programme

A phased approach has been adopted in undertaking the environmental studies for the Brazil Project. The planned approach is presented in Table 1.1-1: EIA phased approach.

The EMP compilation was based on environmental impact assessment (EIA) and associated public participation, as required in terms of Regulation 48 and 49 of MPRDA.

The EMP has been undertaken in phases and is currently at the final phase, the reporting phase. The purpose of each phase and the activities during each phase are outlined in Table 1.1-1. The EIA team members, who contributed in the compilation of this EMPR, are listed in Table 2.

Public involvement was an integral part of the EIA process. More information on the public involvement is presented in Section 2.16.

Table 1.1-1: EIA phased approach

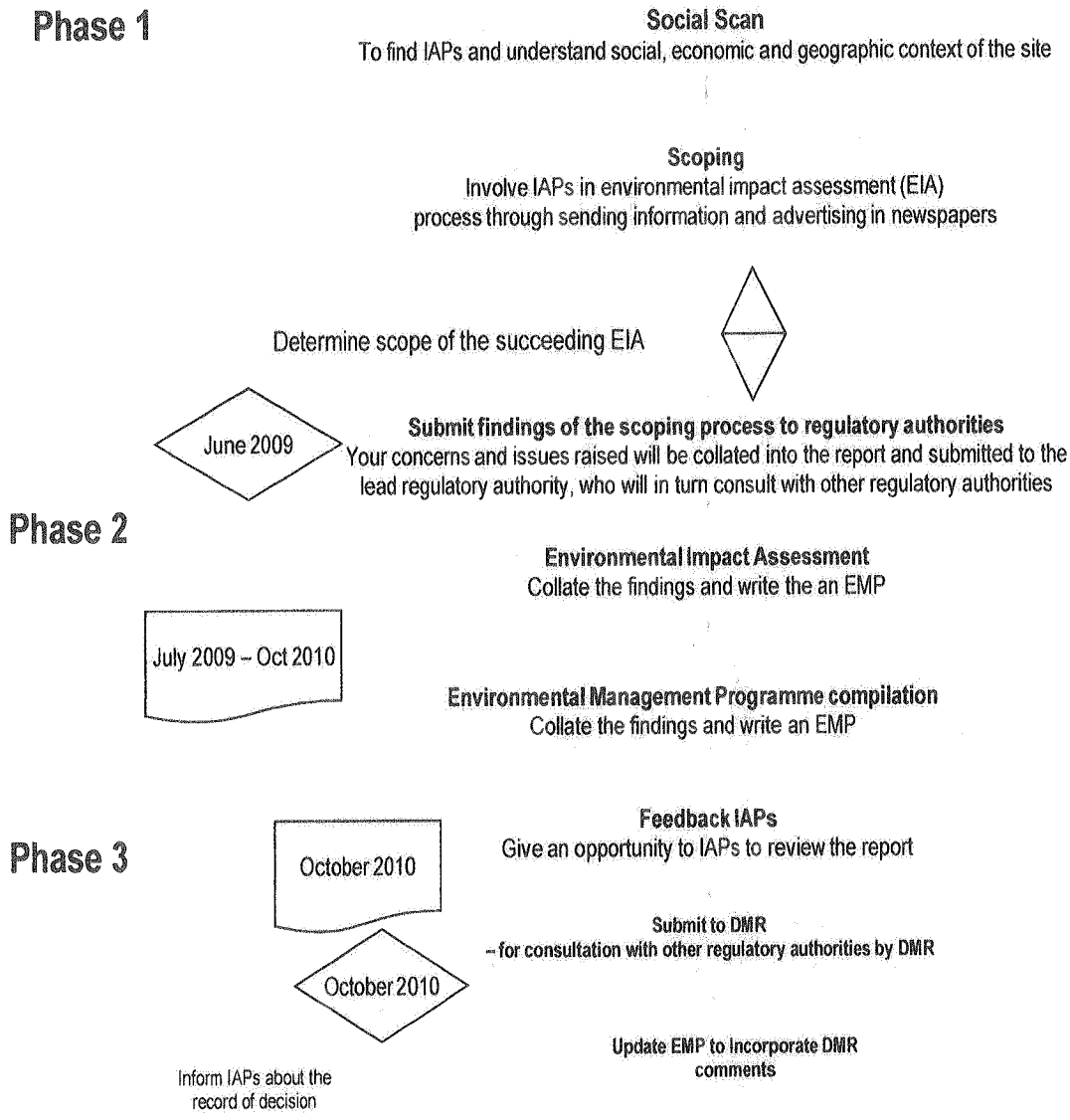

Table 2: EIA Project Team

Company details	EMP contribution
Trans Hex Operations (Pty) Ltd	Project description
Mr Pierre Kotze	
Pisces Environmental Services	Previous Project-specific EMPR for Marine diamond mining in 5(a), 6(a) And 7(a), the surf zone Concessions opposite farms Brazil and Hondeklip Respectively, and the admiralty Strip opposite Brazil, 2003
Myezo Environmental Management Services cc	Environmental Impact Assessment Practitioner
Ms Babalwa Fatyi	Project Manager
Ms Abegail Makgato	Environmental Coordinator
Trans Hex Operations (Pty) Ltd	Mapping
Ms Nicki Mitchell	

1. BRIEF PROJECT DESCRIPTION

1.1 Contact Details of the Applicant

Name of applicant and address	Trans Hex Operations (Pty) Ltd PO Box 723 Parow 7499
Contact person	Mr Vincent Madlela: General Manager: Stakeholder Relations
Telephone and fax number	(011) 403-2275 Fax: (011) 403 2363
Nature of activity or development	Mining Right Conversion Application

1.2 Land Ownership and Title Deed Description

Trans Hex currently has an existing old order right (ML 25/93), conversion of which in terms of Item 7 of Schedule II of the MPRDA has been lodged with Department of Mineral Resources (DMR). Brazil is a state owned farm, on which Trans Hex has a mining licence . Farm Brazil and the corresponding surf zone is bordered to the north by Concession 5 (a), and the land opposite Concession 5 (a) is owned by De Beers Consolidated Mines.

The other neighboring concessions are tabulated below in Table 1.2-1.

Table 1.2-1: Neighboring sea concession areas

Concession	Latitude N	Latitude S	Concession Area
Concession 5(a)	29° 37' 43"S	29° 54' 19"S	3161.8 ha
Concession 6(a)	29° 54' 19"S	30° 10' 57"S	3320 ha
Concession 7(a)	30° 10' 57"S	30° 26' 36"S	3195.2 ha
Surf Zone Brazil	29° 47' 56"S	29° 54' 46"S	602 ha
Surf Zone Hondeklip	30° 17' 26"S	30° 21' 34"S	Not separately

			defined or surveyed

1.2.1 Historical permits and licences

1.2.1.1 Background to the Project

Trans Hex have prospected and mined on the Brazil surf zone areas opposite Farm 329 since 1986. The mining activities are being conducted in terms of the existing mining licence (ML 25/93).

REGIONAL SETTING OF BRAZIL SURF ZONE

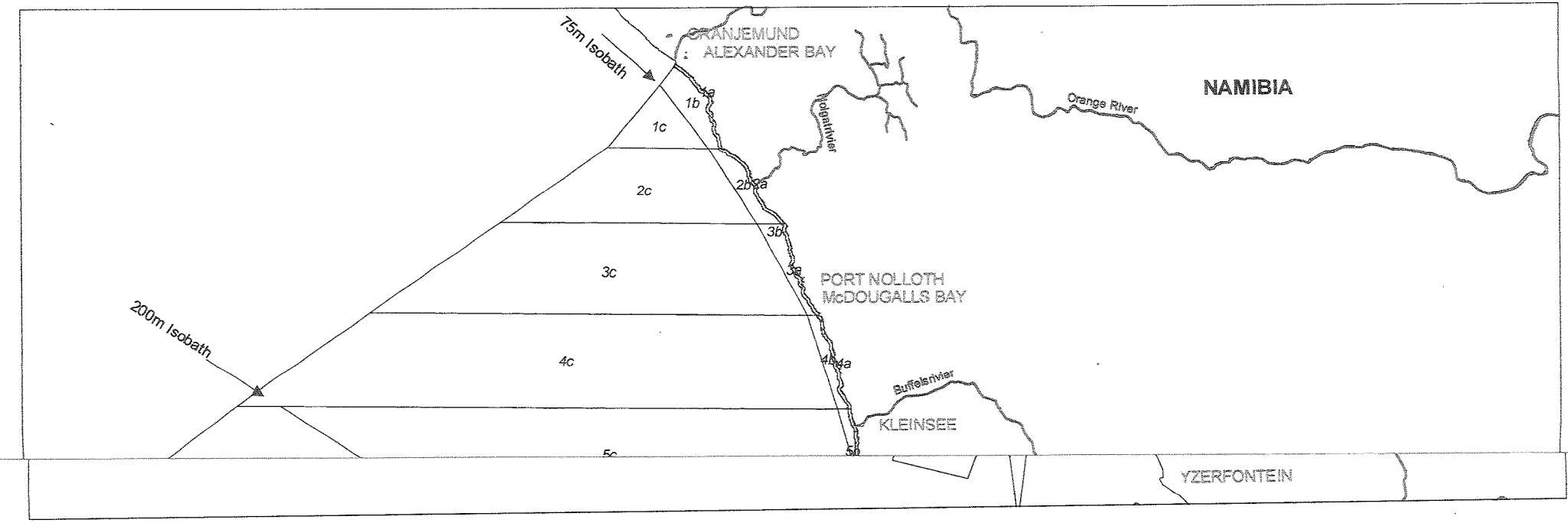

FIGURE 1.2-1

O

0 25 50 100

Kilometers

SCALE: 1 800 000

THG

LEGEND:

- Brazil concession
- Rivers
- Sea Concession Boundaries
- Brazil farm

Map Document: (D:\5a\mxd\EMPR-Brazil\Fig1.2-1_Regional Setting.mxd)
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LOCAL SETTING OF BRAZIL SURF ZONE

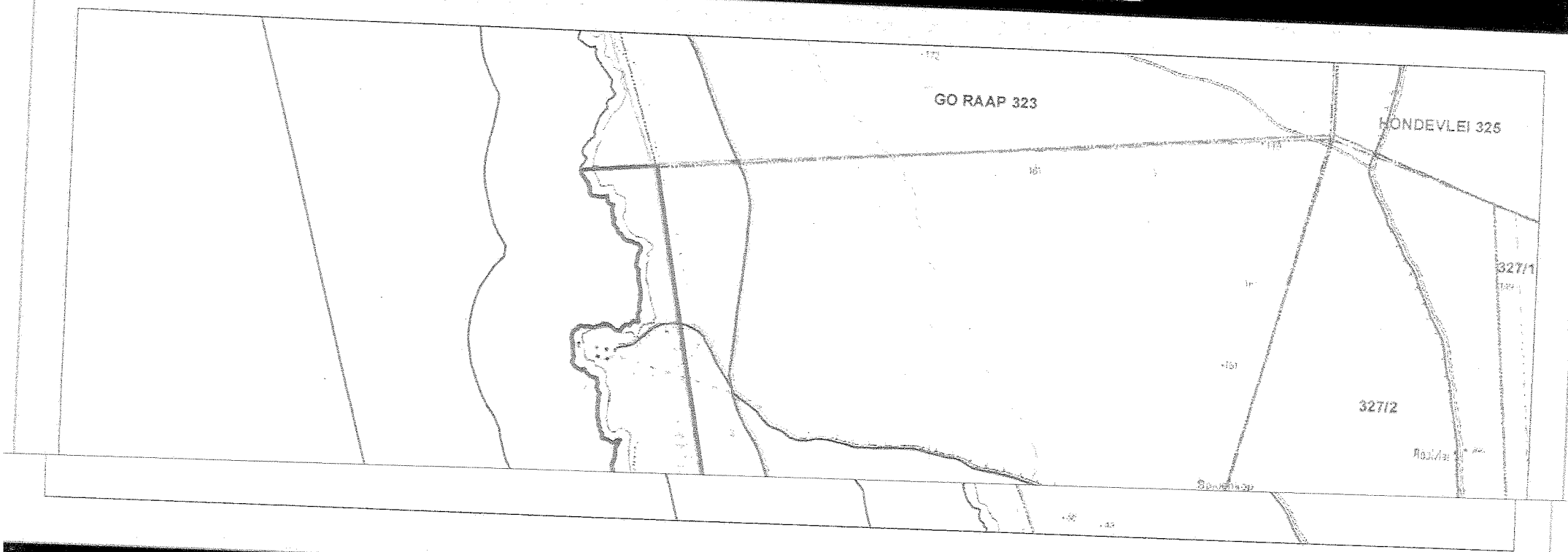

FIGURE 1.2-2

N

0 0.5 1 2 3

Kilometers

SCALE: 50 000

THG

LEGEND:

- Brazil concession
- Rivers
- Contours
- Farm Boundaries
- Sea Concession Boundaries

Map Document: (D:\5a\mxd\EMPR-Brazil\Fig1.2-1_Regional Setting.mxd)
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THE MINING AREA AND THE SURROUNDING MUNICIPAL AREAS

FIGURE 1.3-1

0 5 10 20

Kilometers

SCALE: 400 000

LEGEND:

- Brazil concession
- Local Municipalities
- National Roads
- Main Roads
- Towns

Map Document: (D:\5a\mxd\EMPR-Brazil\Fig1.3-1_MunicipalBoundaries.mxd)
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1.3.2 Surface Infrastructure

The onshore logistic facility associated with the Farm Brazil 329 is situated on private land at Trans Hex's offloading jetty ±2 km south of the centre of Port Nolloth. The jetty falls within the port limits. However, this Port Nolloth facility has been temporarily closed. Currently an on shore logistic facility in De Punt is currently being used. Surface infrastructure layout for the Brazil is provided in Figure 1.3-2.

Figure 1.3-2: Surface infrastructure

1.4 Brief Description of Proposed Project

1.4.1 Mineral Deposit and Target Minerals in the Brazil Operations

Mineral being mined is diamonds.

Geological structure of the mineral deposit

Rugged rocky cliffs bound the concession are on its eastern landward side. The water depths in this dynamic surf zone are generally less than 10 metres. As such the seabed in this zone comprises mainly rock reefy terrain with a dynamic and variable fine sand overburden that is regularly moved by currents and storm action. The features that host the potentially diamond – bearing gravels are mainly localised in high – energy boulder strewn gully and/or pothole type trap sites. The dynamic wave and wave affected areas of the surf zone concession areas are well known for their high grade though erratic diamond mineralization. These areas of less than 10m water depth have proved to be rewarding areas for diamond diving mining operations in the areas to the south and north of Farm Brazil.

Due to the dynamic wave action and shallow reefs found in the water depths of 10 metres and less, there is no method or equipment available to accurately assist in delineating and determining an area reserve, gravel is controlled by the exceptionally few days of favourable sea conditions experienced on the harsh Wet Coast. The only mining operation that has proved a successful and sustainable method of exploitation in these surf zone areas is more suited for diver assisted suction pumps, making use of well– equipped and experienced independent diving contractors. Despite these restrictions, the location and laborious extraction of gravels from favourable trapsites by diver operations in this instance, have given encouraging returns and when incorporated with the efforts in the adjacent 5a – concession area do support sustainable diver operations.

Historical damage in Brazil

There are other historic mining activities on this surf zone including prospecting and mining conducted prior to Trans Hex obtaining their existing mining licence. As such there are existing historic disturbances on the conversion application area (Figure 1.4-1 to Figure 1.4-4). In some areas past mining operations have resulted in severe disturbance and alteration of the physical profile of the coastal strip by extensive excavations, and tailings disposal.

In some areas past mining operations have resulted in severe disturbance and alteration of the physical profile of the coastal strip by extensive excavations, and tailings disposal. Prior to the Minerals Act (No. 51 ofof 1991), no rehabilitation and restoration of mining-impacted areas was required, and much of the prospecting/mining conducted on the coastal plain and fore dune area was uninformed, unscientific and uncontrolled. This has

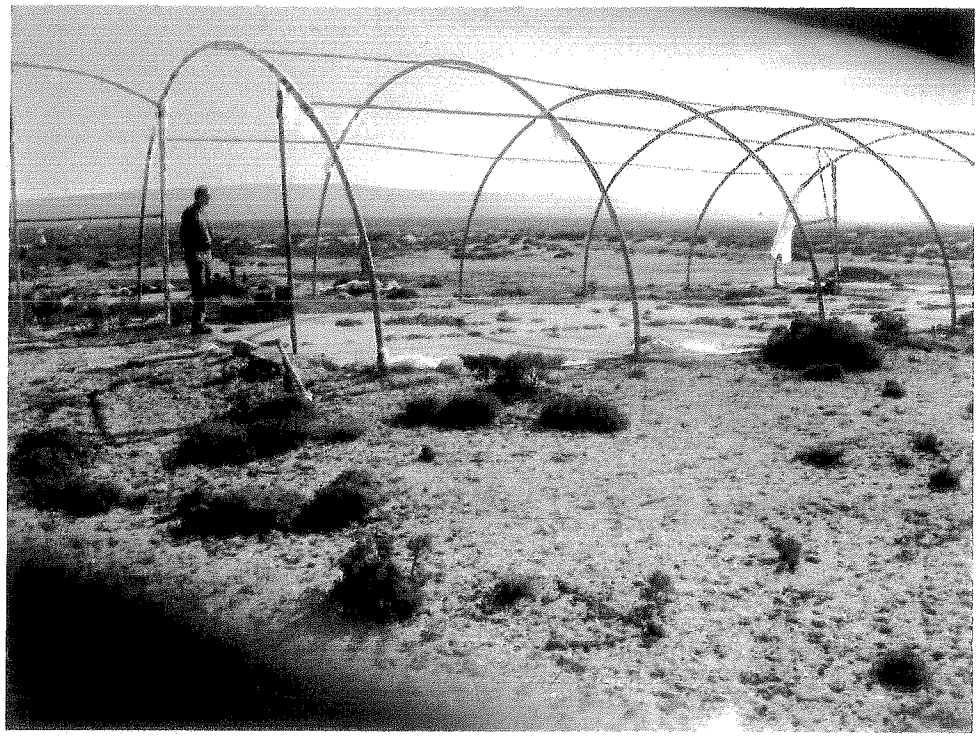
resulted in severe long-term / permanent scarring of the landscape. Most of the coastline adjacent to the 5, 6 and 7 group of sea concessions is owned by De Beers Namaqualand Mines who still operate largescale mines at Kleinzee and Swartlintjies, as well as recovering diamond resources in the surf-zones and admiralty strips.

Sites of previous damage on the Farm Brazil have been indicated on 1:10 000 georeferenced Orthophotos (Figure 1.4-1 to Figure 1.4-4). Each disturbance is supported by numbered, annotated photographs (Appendix 5). The position of each photograph has been plotted on the orthophotos and is referenced with a unique number which corresponds with the photograph number In addition, the position of each photograph has been tabulated in Table 11-1, together with a brief description of the disturbance. In this way the reader can refer to the orthophoto for a illustrative position, and the table for a description of the disturbance, whilst simultaneously viewing the corresponding photograph. All co-ordinates are expressed in WGS84 chart.

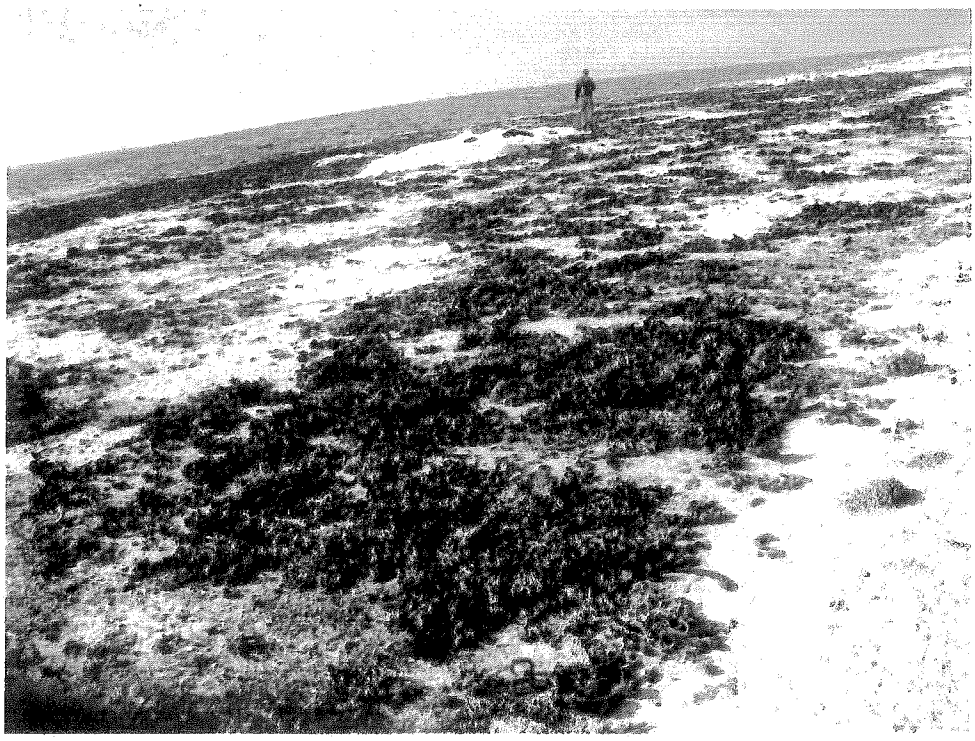
Some of the existing old diggings on the Farm Brazil are shown in Photograph 1, old tailings (Photograph 2) and the kelp farming, [Kelp farmers dry their kelp on the application area before collecting it for processing) (Photograph 3 and 4)].

Photograph 1: Old diggings: (Coordinates: S - 29° 48' 45.6" E - 17° 04' 49.1")

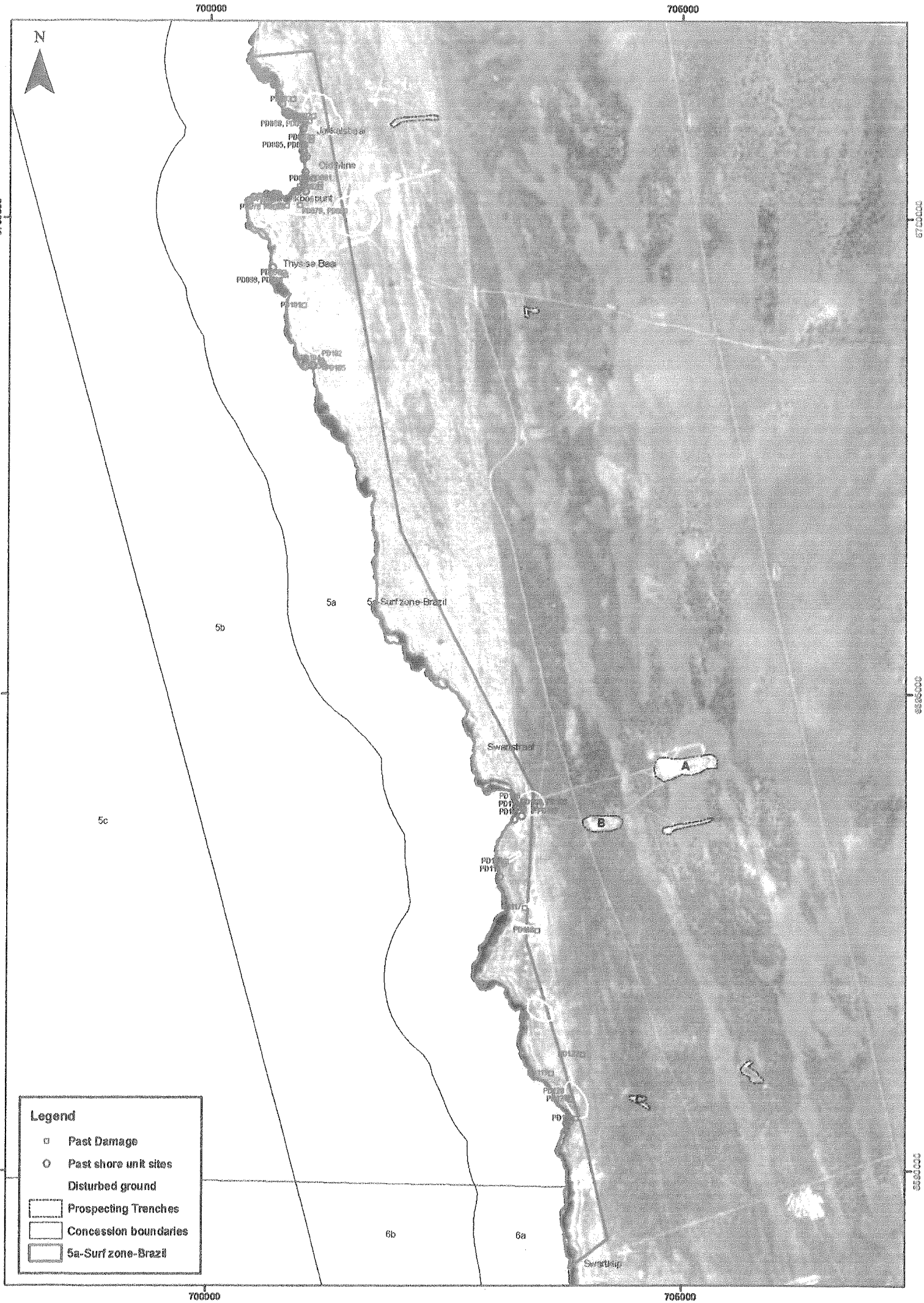
Photograph 2: Old tailings (Coordinates: S - 29° 48' 45.2", E - 17° 04' 46.9")

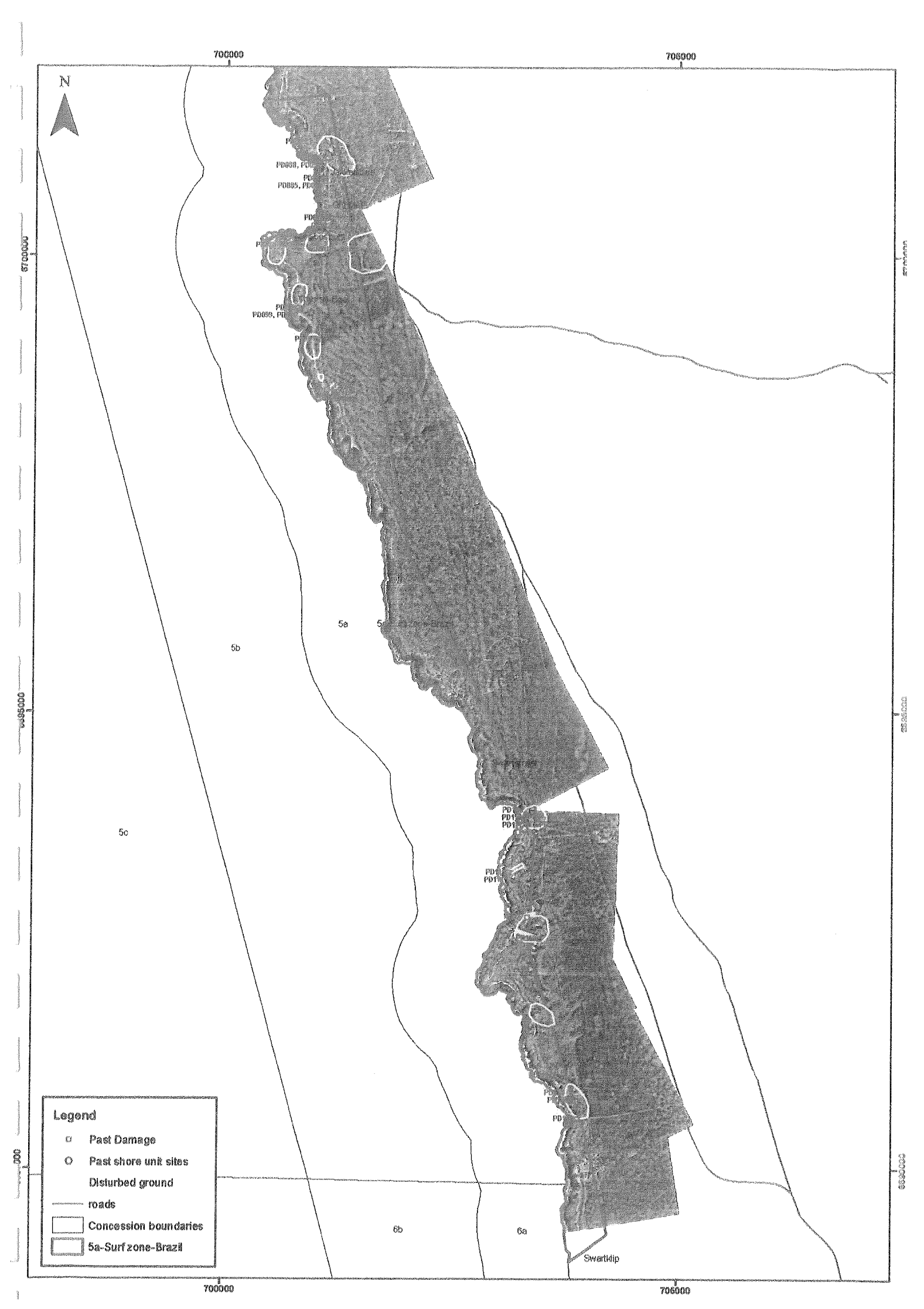


Photograph 3: Kelp drying area (Coordinates: S - 29° 48' 40.0", E - 17° 04' 54.3")

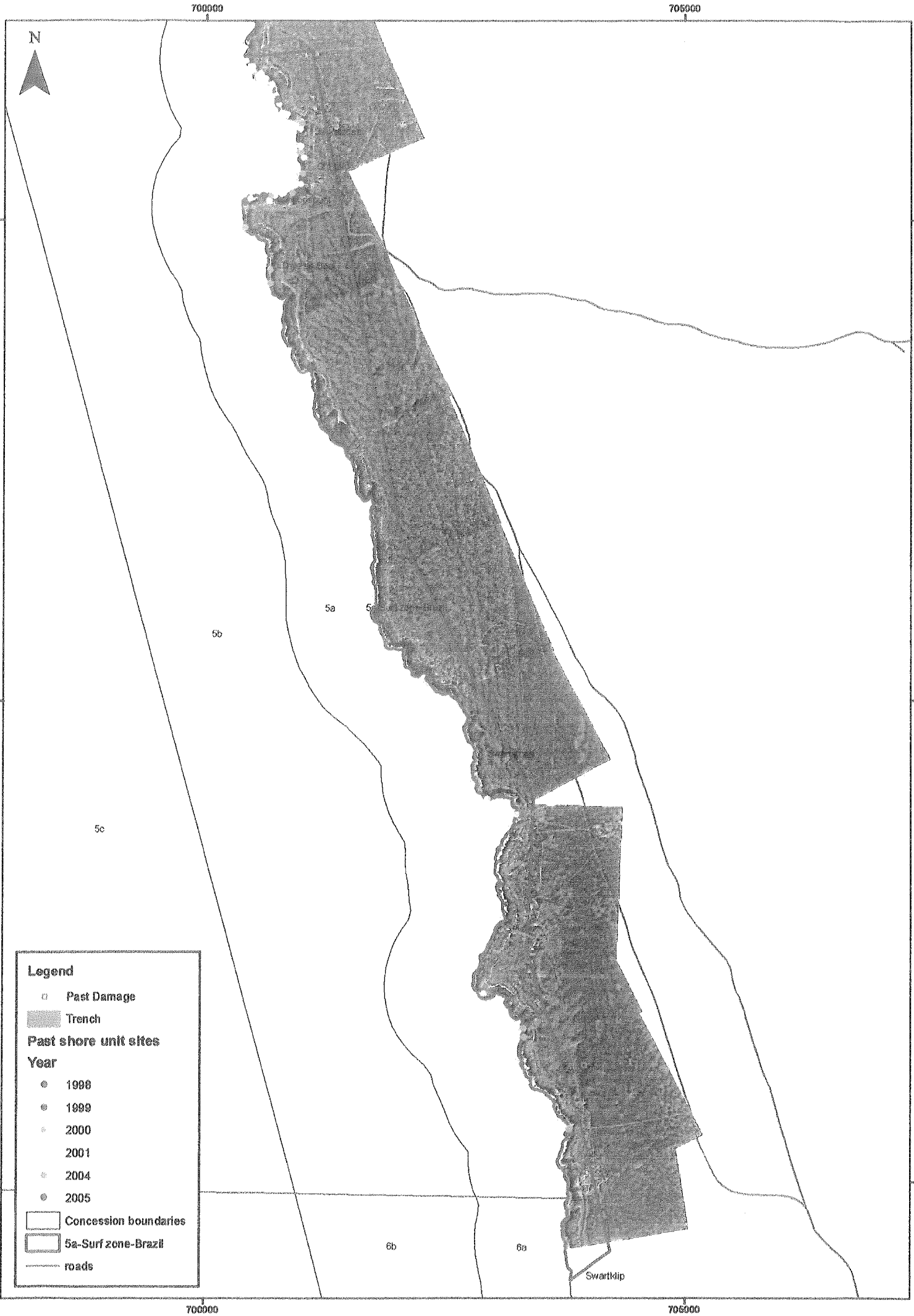


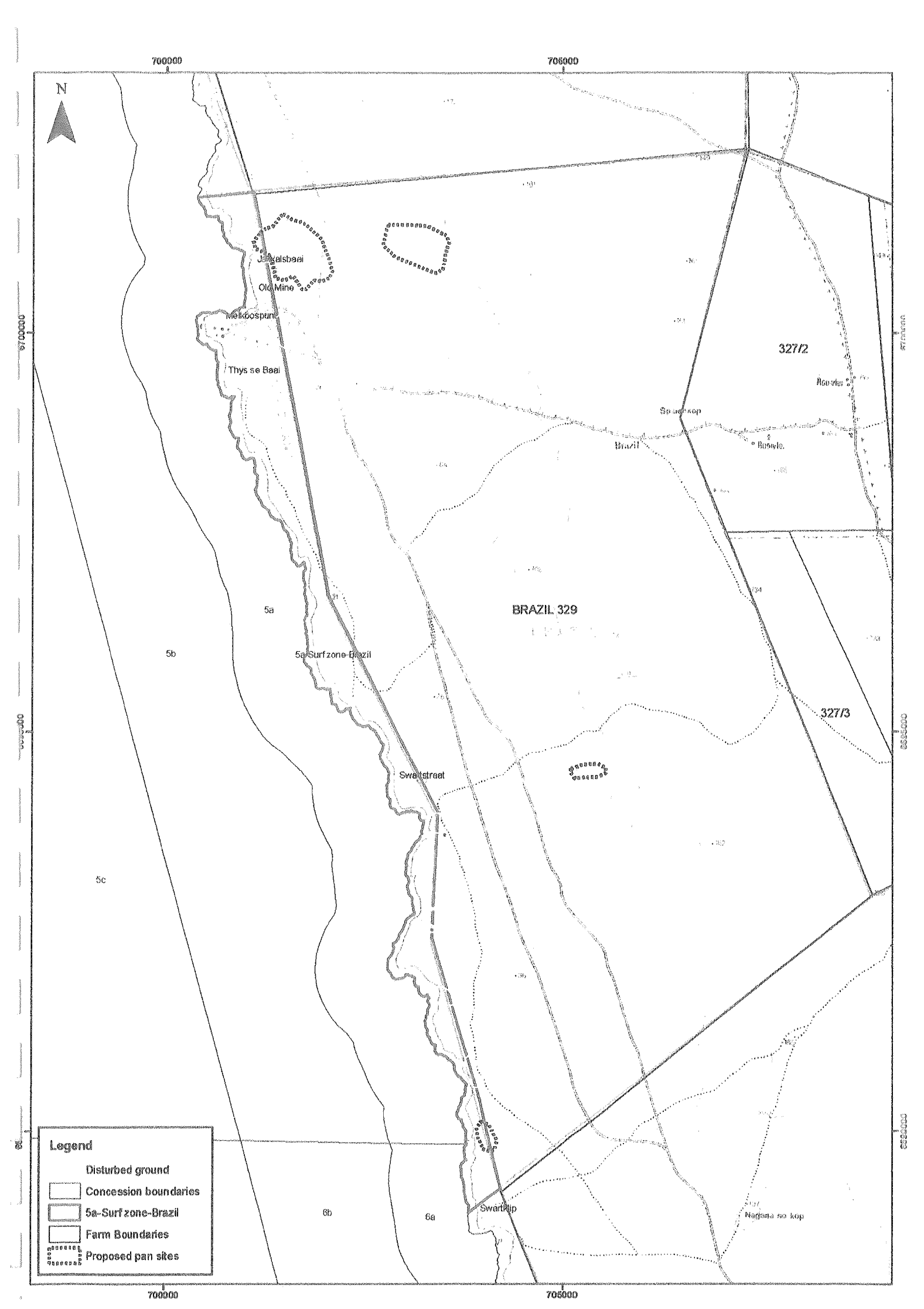
Photograph 4: Kelp drying area (Coordinates: S - 29° 48' 43.3", E - 17° 05' 0.8")


700000
706000
N
Thyssen Bea
5a
5a-Surf zone-Brazil
5b
5c
6b
6a
A
B
Legend
Past Damage
Past shore unit sites
Disturbed ground
Prospecting Trenches
Concession boundaries
5a-Surf zone-Brazil


700000
705000
N
5a
5b
5c
6a
6b
Swartklip
Legend
Past Damage
Past shore unit sites
Disturbed ground
roads
Concession boundaries
5a-Surf zone-Brazil


700000
706000
N
5a
5b
5c
6a
6b
Swartklip
Legend
Past Damage
Past shore unit sites
Disturbed ground
roads
Concession boundaries
5a-Surf zone-Brazil


700000
705000
N
5a
5b
5c
6a
6b
Swartklip
Legend
Past Damage
Trench
Past shore unit sites
Year
1998
1999
2000
2001
2004
2005
Concession boundaries
5a-Surf zone-Brazil
roads


700000
706000
N
Jakalsbaai
Old Mine
Melkbospunt
Thys se Baai
327/2
Brazil
BRAZIL 329
5a
5b
5a-Surf zone-Brazil
327/3
Swartstraat
5c
6b
6a
Swartkop
Legend
Disturbed ground
Concession boundaries
5a-Surf zone-Brazil
Farm Boundaries
Proposed pan sites

1.4.2 Production rate

Approximately ±1650m³/month expectancy of project undetermined, on the corresponding surf zone, mining will continue until exhaustion of ore reserves. Production rates details are given Table 1.4-1below.

Table 1.4-1: Production rate for Sea Concession 5a,6a,7a, Hondeklip Bay and Brazil

Sea Concession area	Gravel m³	Year
5a	49503	2005
Hondeklip	140	2005
7a	773	2005
Brazil	655	2005
7a	2	2006
5a	37559	2006
5a	22401	2007
7a	313	2007
7a	3433	2008
5a	10762	2008
5a	14073	2009
6a	900	2009
7a	100	2009
Hondeklip	400	2010
7a	3350	2010

5a	6550	2010

1.4.3 Planned Life of the Mine

Expectancy of project is undetermined, on the corresponding surf zone, mining will continue until exhaustion of ore reserves.

1.4.4 Mineral processing

The gravels produced by the contractor diver operations were previously transported to the centrally located Trans Hex DMS and Final Recovery Plant at Port Nolloth for processing. The gravel used to be offloaded by the boats to a safe storage space, from where it was transported to Port Nolloth.

The DMS plant at Port Nolloth is a 10 tph plant that is equipped with a Barmac crusher at its front end to remove the excess shell commonly associated with the marine gravels. The concentrate produced by the DMS plant passes to a sizing screen from where the respective classifications are individually fed through a series of two Flowsort X – Ray machines. Infrared lamps dry the product from the X – Ray machines and the final recovery of the diamonds is done in the secure confines of a glove box. Mineral processing flow chart is presented in Flow diagram 1.

Currently, the gravels produced by the contractor are transported to Trans Hex DMS and Final Recovery Plant at De Punt for processing. Since the Port Nolloth facility is temporarily mothballed. The process flow chart for the De Punt facility is similar to the Port Nolloth one and shown on Flow diagram 1.

2. DESCRIPTION OF THE PRE-MINING ENVIRONMENT

2.1 Geology

The basement geology of Brazil surf zone comprises mainly quartzite and arkose with interbedded tuffs and lavas of the Stinkfontein Formation. Much of the sediment presently found in bedrock depressions and palaeo-channels on the inner shelf is of palimpsest nature. Depressions on the inner-shelf platform are filled or partially filled with marine gravels, with rounded pebbles and boulders of basement rocks, shelly quartzose sands and gravelly sands. Natural seasonal redistribution of sediments is characteristic of the subtidal regions to ±40 m depth along this stretch of the coastline.

Outcrops occur only along the coast where exposure of metaquartzites of the Holgat formation intercalated with granite-gneiss of the Namaqualand Metamorphic complex are found. The remainder of farm is covered by Aeolian sand varying in thickness from <1m on the coastal plain to 30m eastward.

2.2 Climate

The Farm Brazil falls within the arid and dry West Coast Region. The climate is influenced by the Atlantic Ocean upwelling system. Oceanic fog occurs on an average of 123 days per year. Rainfalls occurs in winter and vary from about 40 mm to about 200mm/year from north to south (Alexander bay to Elandsbaai). There are strong southeasterly winds with temperatures of greater than 30°C tending to occur in summer.

2.3 Physical Oceanography

Currents

The west coast of southern Africa is strongly influenced by the NW-flowing Benguela Current, whose primary forcing function is the moderate to strong equatorward winds characteristic of the region. Significant poleward flow of subthermocline water, however, also occurs both on the continental shelf and at the shelf break. The NW-flowing surface currents appear to be topographically steered, and current velocity varies accordingly with increased speeds in areas of steep topography and reduced velocities in areas of regular topography. Over and above this there is southward flow of between 12-20 cm/s near the surface close inshore which occurs during periods of barotropic reversals, and during the winter.

Waves and Tides

Tides are semi-diurnal. As is typical of the West Coast, the coastline opposite the Farm Brazil has strong wave action, except where there are extensive kelp beds. Largest waves originate from the S-SW sectors and may reach 4 - 7m. These are generated by mid-latitude cyclones. There is no strong seasonal variation in the wave regime except for slight increases in swell from WSW-W direction in winter. Minimal swell originates from the WNW-SE direction sector. On occasion, the prevailing south-westerly winds can reach gale force velocities in excess of 70 km/h, producing swells up to a maximum height of 10 m. Average breaking wave height is ±2.5 m, which allows diver-based mining activities around 15% of the time.

2.4 Topography

The topography on the coastal plains adjacent to Farm Brazil 329 is homogeneous. The coastline of concession 5(a), north of Kleinzee, is characterized by fine grained sandy beaches backed by dune formations. South of Kleinzee the shoreline is dominated by wavecut platforms. These terminate in isolated fine grained sandy beaches and pebble beaches near Swartstraat. Further south, the coastline of concessions 6(a) and 7(a) is dominated by exposed rocky headlands,alternating with isolated fine grained sandy beaches. Estuarine environments are limited to around the mouths of the Buffels and Swartlintjies Rivers. The emergent reefs off the

Buffels River mouth near Kleinzee and the rock promontory Robeiland support the largest Cape fur seal breeding colony in South Africa.

The farm consists of the coastal plains averaging 1.5 km in width rising gently eastwards to 140mamsl.

2.5 Soils and Land Capability

Prevailing soils are yellow-red-brown silty sands of Pleistocene origin, often overlain by a calcrete layer varying in depth and compaction. Quartz outcrops and gravel plains occur on the northern part of the coast. Wind blown sands overly the calcrete layer. The unconsolidated nature of the sediment leads to high potential for erosion by runoff and wind where it is disturbed by excavation or vehicles.

The soils are clay and varying from 0,5m on the coastal plain to 30m inland. The depth of the soils is such that topsoil can be available for rehabilitation. Topsoil will be stripped and stockpiled to be spread after the areas had been backfilled.

2.6 Land use

Twelve settlements occur on the West Coast, between Cape Columbine and the Orange River, with an increasing number further south. Of those in the vicinity of concessions 5, 6 and 7, Port Nolloth falls within the Richtersveld District Municipality, Kleinzee (in the Nama Khoi Municipal district) is a mining town controlled by De Beers and out of bounds to the general public, while Hondeklip Bay is administered by the Kamiesberg District Municipality in Garies. Port Nolloth is the largest settlement (>3500), with Kleinzee and Hondeklip Bay having populations of ±2800 and ±580, respectively. The economy of the region relies primarily on fishing and diamond mining and to a lesser extent on tourism/recreation. Little marine recreational activity and tourism takes place along the coastline adjoining concessions 5(a), 6(a) and 7(a) owing mostly to the presence of security controlled diamond areas and poor road infrastructure. There is a building which Trans Hex is using to house the sea concession contractor. The building is also availed for accommodation for other people who are working on the concession or public servants visiting the area.

In order to promote the development of a sustainable regional economy to support the conservation of the Succulent Karoo Biome (a globally recognised Biodiversity Hotspot) and replace downsizing diamond mining as the engine of the Namaqualand economy, Conservation International (CI), in partnership with the Kamiesberg Municipality, De Beers Consolidated Mines (DBCM) and the Eden Project/Post Mining Alliance are pursuing the development of the Living Edge of Africa Project (LEAP). LEAP is a new tourism destination which will showcase low-carbon means of living and include a range of enterprises including mariculture and innovative dry lands agriculture, which will highlight the economically productive and environmentally friendly reuse of mining legacy.

LEAP is intended to downscale diamond mining along the Namaqua Coast, not as a threat, but as an opportunity and to recognise mining's physical legacy as a potential asset rather than a liability. Diamond mining's legacy is of stark contrasts – expanses of disturbed landscape (barren mine dumps, pits and super-saline fine residue dams) alongside pristine patches of coastal veld, dunes and coastlines, which have been protected as a result of diamond mining. Both aspects and the stark contrast between them are the legacy of mining and their juxtaposition creates a special place and unique opportunities.

The LEAP will be a model of conservation-based, low-carbon environmentally responsible development; its central theme will be to conserve and reuse, effective "Recycling a Mine." The disturbed landscapes, including roads, towns, processing plants and sea water intakes; and the trained mining personal will provide its core. This approach will create a win-win scenario, for people (the former miners, the citizens of the Kamiesberg, Namaqualand, and South Africa) and for the environment (including the globally important biodiversity).

A high level LEAP business case has been developed and approved by the partners as a beginning point. It has been agreed that further work needs to be undertaken in a pre-feasibility phase which will run from November 2008 – July 2009. In order to take this work forward, CI is putting together a team that will develop the LEAP Integrated Development Framework (LEAP-IDF). (Provincial coastal committee minutes, February 2009)

Leap will cover 30 000 hectares of De Beers owned land (the Koingnaas and Michell's Bay Mines) and 10 000 hectares of land owned by the Department of Public Works including the town of Hondeklip Bay and an area previously mined by Trans Hex, a description of the legacy of 40 years of mining on the site and the outlook for future mining, including the current situation in which DBCM is in discussions with Trans Hex concerning the transfer of their mining operations and potentially aspects of ownership.

The main aim is to create as sustainable new economy for Namaqualand, without giving disregard to mining which has been a major driving economic force in this region. Thus, the spatial land use and development plan as well as tourism development framework will be designed to ensure that synergies between mining and tourism are retrieved where feasible. The future development plans included Mariculture business units and green town transition, coupled with renewable power generation. Amongst other development plans as part of LEAP are:

- Habitat restoration plan including priority areas in terms of suitability for restoration based on a restorability index and costing for restoring the disturbed areas.
- Arid agriculture demonstration vegetable production, likely based on Seawater Greenhouse technology. The focus will be on the production of vegetables and other produce for local consumption by LEAP visitors and as a LEAP demonstration activity.

Institutional and legal arrangements the institutional arrangements proposed in the business case will be further developed based on discussions between the major partners (CI, DBCM and Trans Hex), the Kamiesberg Municipality, the Northern Cape Provincial Government and the Eden Project). The alternatives for land

development for this proposed application are therefore not handled in isolation by Trans Hex but are part of a conglomerate of diverse plans for the whole Namaqualand region.

As indicated in Section 1.4.1, terrestrial mining and prospecting for diamonds has occurred along the coastline south of the Orange River mouth since the 1930's. In some areas past mining operations have resulted in severe disturbance and alteration of the physical profile of the coastal strip by extensive excavations, and tailings disposal. Most of the existing, historical mining impacts are being further aggravated by:

- beach access and drying beds of the kelp collectors,
- the increased, uncontrolled and indiscriminate use of access roads by
- members of the public,
- ad hoc and illegal camping, and
- increased recreational and coastal use.

Historic mining damage concerning the marine area associated with Farm Brazil 329 and corresponding surf zone is illustrated in Figure 1.4-1 to Figure 1.4-4 as explained in Section 1.4.1.

2.7 Coastal zone habitat

Several endangered or rare species of invertebrates, amphibians, reptiles, birds, and small mammals have been reported for the coastal zones adjacent to concession areas 5(a), 6(a) and 7(a). However, whilst much of the Northern subregion (Orange River to south of Kleinzee) has been studied in detail, there is comparatively little information available for the Central subregion (south of Kleinzee to north of the Sout River). The vegetation characterising the coastal zone of concessions 5, 6 and 7 is classified as Strandveld Succulent Karoo. It consists of many stem and leaf succulents and ephemeral geophytes, with grasses being uncommon annuals in this area, and trees occurring mainly on rocky outcrops and along drainage lines. Dwarf shrub vegetation, less than 1m tall and with sparse canopy cover (15% to 50%) dominates. There is a mass flowering during spring, following the winter rains. The Succulent Karoo biome is a hotspot of biodiversity with ±7000 plant species of which 35% are endemic and 996 species are regarded as Red Data species. The West coast succulent karoo vegetation is poorly conserved, however, with only 0.4% being protected in conservation areas. Only 3817 km2 of the succulent karoo vegetation type is estimated to remain along the West Coast, of which 24% is transformed or disturbed. The flora of the coastal zones adjacent to concessions 5(a), 6(a) and 7(a) has been little -studied, however, and vegetation sensitivity north of Kleinzee has not been mapped. Available information is limited to the CSIR's ECRU estuary reports and the Red Data List of Southern African Plants.

There are no cultivated lands. On the coastal plain the vegetation is sparse and does not exceed 30cm in height. The most common shrubs are zygophyllum cordifolium, euphorbia karroensies and othanna sedifolia.

Inland the vegetation increases to a height of 1m. The most popular species found are stoeberia frutescens and zygophyllum morgsana.

There are no known endangered species on the property. Special care will be taken not to disturb the natural vegetation. All prospected sites and tracks will be fully rehabilitated

Source: Acocks, j.p.h. (1975). Veld types of South Africa. Botan. Surv. S. Afr., mem. 40, 128pp

2.8 Marine habitat

The marine flora and fauna in the concession areas are typical of the Namaqua biogeographic province. Benthic communities on sandy beaches in the supralittoral zone (above HWM) comprise isopods (*Tylos* and *Niambia* sp.) and amphipods (*Talorchestia* spp) Benthic communities on rocky shores in the supralittoral zone are dominated by the tiny gastropod *Littorina africana* and red algae. Further down the shore, numerous species of anemones, limpets and a diversity of gastropods and algae occur. Fish habitats and representative species include intertidal rock pools (klipfish and sucker fish); rocky reefs (hottentot, galjoen, snoek, maned blennies, harder, pilchard and strepie); surf zones (29 species have been recorded, dominated by harders, silverside, stumpnose, False Bay klipfish and two species of goby); nearshore soft sediments (shallow water hake and gurnards, West Coast sole, kob, St Josef sharks and hound sharks) and inshore pelagic zones (beyond breakers) (shoals of anchovy, pilchard, round herring, chub and horse mackerels).

2.8.1 Commercial and Recreational Fishing activities

Linefishing effort in the region is centred around Port Nolloth, targeting primarily snoek and hottentot. Fishing is conducted primarily from tiny rock lobster bakkies belonging to the local rock lobster factories, although larger deckboats from may visit the area during the snoek and yellowtail seasons. As most of the fishing is undertaken after the rock lobster nets have been deployed, or during the rock lobster closed season, the boats operate very close to the shore. Within ±25 km of Port Nolloth, the inshore catch of linefish amounts to >15 t/km coastline/year, but this drops to <5 t/km/yr in Concession 5(a), 6(a) and 7(a).

The closest treknet and drift net fishery in the region is likewise centred around Port Nolloth to the north of concessions 5(a), 6(a) and 7(a), as access to much of the remaining coastline is restricted.

Concessions 5(a), 6(a) and 7(a) fall within Subarea 9 of Area 1, and Subarea 1 or Area 2 of the commercial rock lobster fishing zones. Subarea 9 of Area 1 stretch from Penguin Rock (near Natgooier to Kleinzee, whereas subarea 1 of Area 2 extends southwards to just north of the Groen River. Commercial catches of rock lobster in the area around Port Nolloth and Hondeklip Bay are confined to shallower water (<30 m) with almost all the catch being taken in <15 m depth. Lobster fishing is conducted with hoopnets from a fleet of small dinghies/bakkies. The majority of these work directly from the shore within a few nautical miles of the harbours,

with only 30% of the total numbers of bakkies partaking in the fishery being deployed from larger deck boats. These larger boats may occasionally set rock lobster traps out to 50 m depth. As a result, lobster fishing tends to be concentrated close to the shore within a few nautical miles of Port Nolloth and Hondeklip Bay. The lobster industry is an important income source for West Coast fishermen.

Existing recreational fishing activities include rock lobster fishing and angling and, to a lesser extent, swimming and surfing. Recreational line-fishing is confined largely to rock and surf angling near Hondeklip Bay, with catches consisting mainly of hottentot and galjoen. Recreational rock lobster catches are made primarily by diving or shore-based fishing using baitbags. Boat angling or hoop-netting for rock lobster is not common along this section of the coast. Fishing effort is estimated at <1 angler/km/day. The majority of the recreational take of rock lobster (±68%) is made by locals resident in areas close to the resource.

2.8.2 Harvesting of other marine Biota

No other marine fisheries currently exist in the concession 5(a), 6(a) and 7(a) area, although some consideration has been given to a potential future experimental fishery for intertidal limpets. The concessions, however, overlap with Seaweed Concession 15 for the collection of beached kelp. The concession is held by Rekaofela Kelp (Pty) Ltd, The collection of beach casts of the kelps *Ecklonia maxima* and *Laminaria pallida* is a common activity on parts of the West Coast. Kelp is collected, initially dried just above the HWM before being transported to drying beds in the foreland dune area. The dried product is used locally as food for cultured abalone, or is ground before being exported for production of alginic acid (alginate). The actual level of kelp collection activity varies substantially through the year, being dependant on storm action to loosen kelp from subtidal reefs, or the amount of kelp cut by diamond divers in accessing gravel deposits. In addition, however, permits also allow the harvesting of live kelp by hand using a knife or sickle, and using a diver from a boat or the shore, although this is seldom undertaken by the permit holders on the West Coast. No kelp plants with a stipe <50 cm long may be cut or harmed.

Kelp collecting has had significant impacts on the West Coast including:

- Kelp beach casts that are dragged up the beach to above the HWM and left to dry in drying beds kill land plants in the area; such areas are difficult or impossible to rehabilitate,
- Removal of beach casts reduces the food source of isopods and insects and therefore of coastal birds,
- Trucks and tractors transport kelp collectors to the shore and kelp to central collection points above the HWM, creating many well-established tracks through vegetated and unvegetated dune areas (Raal, 1994), and
- Camps and associated waste in areas where kelp collectors live on site during the week or for short spells.

2.8.3 Mariculture

There are existing ventures are underway at Kleinzee for onshore culturing of Pacific oyster *Crassostrea gigas*, abalone *Haliotis midae*, and red algae *Gracilaria* spp in the seawater reservoirs at the Kleinzee min. Port Nolloth Sea Farms also releases cultured abalone hatchlings per month into the sea to a depth of 20 m along a 10 km strip of coastline coincident with the 'a' concessions, with the view of harvesting 'wild' populations once the animals have grown to a marketable size.

2.8.4 Marine Recreational Activities and Coastal Tourism

Little marine recreational activity and tourism takes place along the coastline adjoining concessions 5(a), 6(a) and 7(a) owing mostly to the presence of security controlled diamond areas and poor road infrastructure. Ownership of most of the land by De Beers Consolidated Mines results in most of the coastline adjacent to concessions 5(a) and 6(a) being inaccessible to the general public. None-the-less, *ad hoc* camping is common at all popular sites along the coast (e.g. Thys-se-Baai at Melkbospunt). These unofficial campsites have been traditional annual holiday venues for the farming community for many years. Recreational areas in concession 7(a) are limited to a few access points in unrestricted areas around Hondeklip Bay.

2.9 Water

Seawater in the study area is predominantly South Atlantic Central Water (SACW) which has temperatures between 6°C and 16°C and salinities between 34.5‰ and 35.5‰ (Shannon, 1985). This is the primary source water that upwells against the coastal margin whereafter it is modified by sun-warming and mixing (Nelson and Hutchings, 1983).

The Buffels and Swartlintjies River mouths are only intermittently, or seasonally, open to the sea. The catchments of both these rivers drain the edge of the Namaqualand escarpment. The coastal hinterland absorbs much if not all of the rivers' flow before it reaches the mouths. The river mouths are almost always closed, but due to overtopping during extreme high tides, pools may persist in the mouth area throughout the year providing a valuable habitat for estuarine vegetation and fauna. Even if water is not always present, these estuaries are important temporary habitats for migrant water birds and should be protected as they contribute to the continued function of the wetland chain. A set of barchan dunes which are reported to be shifting northwards lie in the Buffels River mouth, and an extensive shifting dune field occurs north of the Swartlintjies River mouth. Access to the estuaries and coastline is limited as the surrounding land is owned by De Beers Namaqualand Mines. None-the-less, mining, recreation and water offtake in the area of the river mouths, especially that of the Buffels River, have reduced the viability of this environment. Furthermore, road crossings constructed upstream of both rivers make inadequate provision for floodwater flow. River offtake from the

Kleinzee aquifer on the Buffels River, and the north bank of the Swartlintjies estuary may affect both surface and subsurface flow regimes.

2.10 Ground water

There are aquifers in Port Nolloth and Kleinzee. The use of water from the aquifers is complemented by a piped water supply from the Orange River.

2.11 Air quality

There are no existing sources of air pollution on Farm Brazil 321, except for untarred access roads and old prospecting mine residue dumps.

2.12 Noise

There are no significant existing sources of noise at the Farm Brazil except the kelp cutters who dry kelp at some areas of this Farm. There is also a De Beers owned road providing access to the site

- ⇒ Vehicle access to the coastal zone is regulated by NEMA (Act No 107 of 1998) off road vehicles regulations promulgated in December 2001
- ⇒ There are also 4X4 users, fishermen and shore contractors which generate some noise

2.13 Archaeology

Large stretches of coastline south of Port Nolloth as far as Hondeklip Bay have been surveyed for archaeological sites for De Beers Namaqualand. The most commonly occurring types of archaeological site along the coastline are shell middens dating back to the Late Stone Age. To a lesser extent cave deposits and open habitation sites with stone tools dating to the Early and Middle Stone Age also occur - the latter being more common further inland. The occurrence of shell middens shows a strong correlation with exposed rocky headlands and wavecut rocky platforms.

Trans Hex is currently in a process of sourcing a relevant updated Heritage specialist to perform the Phase 1 Heritage study for the Brazil operations. This study will be forwarded to DMR as well as SAHRA as soon as it is completed.

The information provided above was extracted from an existing archaeological study, which will be complimented by the new updated study being in trhe process of being commissioned. The progress regarding commissioning of a heritage specialist is attached as Appendix 2.

2.14 Socio-economic

Farm Brazil falls within the the Namaqualand District Municipality. Port Nolloth is the largest settlement within this district municipality followed by the De Beers controlled mining town: Kleinzee and Hondeklip Bay. The economy of the region is sustained by fishing, mining and tourism. A private gravel road runs parallel to the coast through De Beers Consolidated Mines Property.

2.15 Stakeholder engagement.

The process of engagement of Interested and Affected Parties (I&APs) is presented in Table 2.15-1. The issues raised by IAPs are presented in Table 2.15-2. The supporting documentation to public participation is presented in Appendix 1. The supporting documentation is structured as follows:

- Site notices (Appendix 1-1)
- Adverts (Appendix 1-2)
- Letters/communication sent out to IAPs (Appendix 1-3)
- IAP register (Appendix 1-4)
- I&APs register (Appendix 1-5)

The public participation process started out by identifying Interested and Affected Parties (I&APs).

Table 2.15-1: Process of engagement of IAPs for EMP

Project phases	Project stage	Activity and Task	Objectives	Output
Project Planning	Project initiation Site visits	Meeting was held with Trans Hex Desktop study	• To agree on scope of work and get project description and various alternatives • To determine the social, cultural and socio-economic status of the project environment • To source available data and surveyed plans	Project programme, showing time frames (Table 1.1-1)

Project phases	Project stage	Activity and Task	Objectives	Output
Social scan (Preliminary identification of interested and affected parties and preparation for their engagement)	Regulatory authority identification and involvement	Telephonic contact was established with key regulatory authorities for pre-clarification of the proposed scope of work	• To clarify legislative and administrative requirements. To determine the process to be followed in updating the EMPR since this application is for conversion • It was determined that the scoping process would have to be undertaken even though there was already an existing EMPR • To investigate various options for the EMPR • Define the scope of the succeeding environmental impact assessment (EIA) and as far as possible	

Project phases	Project stage	Activity and Task	Objectives	Output
	Preliminary identification Interested and affected parties	• Identification of key stakeholders • Gathering of interested and affected parties data base by : • Calling IAPs and confirming their contact details from the previous engagement and preferred methods of communication : • These written forms of communication were indicated by IAPs: ➢ Fax ➢ Registered post ➢ E-mail The preferred languages were English, and Afrikaans • Development of background information documents to facilitate participation • BIDs were developed in both English and Afrikaans and were distributed to IAPs according to their preferred method of communication listed above • Consolidating preliminary environmental issues to ensure that they are captured in the succeeding scoping phase	• To identify key environmental issues which attention needs to be focussed on during scoping • Develop public involvement strategy which meet the needs of the IAPs and which builds on the previous consultation which was undertaken	• An IAP register which was then used to engage the IAPs (Appendix 1-5).

Project phases	Project stage	Activity and Task	Objectives	Output
Feedback meetings	• Notification of IAPs about the availability of the draft EMP	• EMP has been compiled • Letters of invitation to review the EMP and request for the meeting will be sent to authorities • EMP will either couriered or hand delivered to regulatory authorities. • Comments on the EMP will be collated and the EMP updated	• To give IAPs a chance to view the identified impacts and proposed management measures at an open day session. • Gather issues and concerns concerning the project and ensure that they are addressed in the EIA.	• Letters of invitations to review the EMP • Comments from IAPs

Table 2.15-2: Identified issues and concerns

Issue	Raised by	Response
Phase 1 of Heritage Impact Assessment to be done	SAHRA	There is an existing archaeological study done for marine operations (Attached as Appendix 2-1). Request for proposals for land operation at Farm Brazil have been sent to Archaeologists as well as Paleontologists to get quotes and Trans Hex will appoint the suitable Specialist to undertake the study (Letters attached as Appendix 2-2).
The scoping report does not indicate the measures that will be implemented to avoid pollution of the marine environment in case of accidental dumping of solids waste and liquids (lubrication oil, diesel) at sea and in the coastal zone. This needs to be included in the EIA.	Department of Environmental Affairs (DEA)	Comment noted and is included in the EIA in Section 6, Table 6-1 Activity 5.3.1.
The possibility of a chemical or oil spillage is high during refueling of vessels and other activities such the use of hydrolic equipment and oils. If any chemicals or oil spillage occurs it must be reported to the DEA: Marine and Coastal Management branch, local municipality and the relevant provincial department of Environment		Comment noted and recommended management Table measure will be adhered to. This is addressed in sections Section 6, 6-1 Activities 5.2.1-5.2.5, and Section 9.2.
Following an emergency of chemical or oil spillage an accident report must be submitted to the above mentioned authorities within 14 days, in accordance with Section 30 of the National Environmental Management Act		

Issue	Raised by	Response
Dumping at sea of any form of materials without consulting DEA: Marine and Coastal Management branch is strictly prohibited. If there is any need to dump material at sea, an application is required from the above-mentioned department		Comment noted and recommended management measure will be adhered to. These comments are addressed in the EIA report in Sections 5.3.1 and 5.3.2.

3. MOTIVATION FOR THE PROPOSED PROJECT

As employment levels and opportunities on the West Coast are low, activities associated with diamond mining and processing facilities along the west coast are one of the major providers of employment, and substantially increase the strength of the local economy through utilisation of services in the region. Prior to 2005, De Punt facility used to provide employment for some 197 persons, with job levels ranging from managerial and administrative personnel, through machine operators and labourers and the contractors as well as the contractors workforce. The exchange rate has dramatically affected the profitability of the operation since 2005.

When the rand is strong, as it is at present, nearshore mining operations can rapidly become unprofitable, particularly if this coincides with the other unfavourable oceanographic or geological factors. Under these conditions, many contractors abandon mining and seek other employment until exchange rates become more favourable for exports. Nearshore mining is highly weather dependent, and heavy swell conditions render it impossible for either shore-based on vessel-based contractors to work in nearshore areas. On average, along the Cape west coast, weather conditions permit contractors to work for less than ten days per month, typically only permitting operations on fewer than five days per month. Heavy seas predominate in winter, and contractors can be prevented from working at all for much of the winter months. Under these conditions, contractors will often abandon mining and seek other employment, particularly if the exchange rate is also unfavourable.

De Punt was recently affected by the conditions described above and the current mining model at the time was no longer profitable. The operation was thus scaled down and the entire workforce was given retrenchment package options and others were absorbed in existing Trans Hex Operations such as Baken Mine in the Northern Cape. The current model only allows for the use of contractors and the contractors workforce. Trans Hex only employs about 7 permanent personnel to manage the operations. The other workforce was thus absorbed by the contractors.

Nevertheless, the mining operation still provides a form of income and contributes the socio-economic well being of the region. Details of projects the mine is engaged on as part of their social and labour plan (SLP) commitment are presented in Section 2.10.

During its normal operation, De Punt Mine employs 7 shore unit contractors who employ about 51 workers. There is only 1 beach mining contractor who however, employes about 9 workers. The boats have 7 contractors, who all employ 40 workers. There are also 3 permanent maintenance contractors. The mine benefits about 100 people and considering multiplier effects the contributing people are more than 100. Currently, De Punt has 4 vessels.

Currently the Brazil operations has one contractor on site. It is planned that ±14 shore units will be introduced to operate on ?Brazil and Concession 5a The non-approval of this mining operation would impact negatively on the employment rate for the region and the families who are likely to benefit from the positive employment opportunities.

The diamond industry is an international trade and one that involves a number of processes between the mining and extraction of the rough product through to the polished diamond jewellery of the retail sector. Commonly referred to as the 'pipeline', put simply, this consists of the mining for processing, wholesale dealing, manufacturing, polished wholesale, jewellery manufacturing and the retail sector. Being a producer, Trans Hex sells its production to the dealing

and rough manufacturing sectors of the pipeline. In order to promote the South African diamond industry, the entire rough diamond production of the Trans Hex is put up for tender in South Africa. South African diamond cutting factories and dealers thus have the opportunity to buy some of the best rough diamonds produced in the world at source. In today's market, it is rare to find entire run-of-mine production available to all industry participants. Etruscan Diamonds offers the production to the South African manufacturing industry under the terms of its Section 59 Agreement with the SA Diamond Board at the Johannesburg Diamond Bourse. This Agreement ensures that the South African manufacturing industry has full access to the Etruscan Diamonds production prior to any exports.

To accommodate and help satisfy the needs of as many as possible of the South African cutters and dealers, there are two types of tenders currently totaling eleven sales per annum. The "large" tenders typically consist of fifty to sixty parcels, worth in total from $15 to $30 million while the "small" tenders held five times per annum are made up of around fifty small parcels ranging from 1 to 4 diamonds each with a total value of between $400 000 and $ 500 000. The "small" tenders are held specifically in order to make more diamonds available to the "smaller" cutters and / or dealers and provide an opportunity for new entrants to the industry, especially the previous disadvantaged, to obtain quality rough diamonds.

The production from Brazil Surf Zone is expected to have an average stone size of around 0.25 carats.

3.1.1 No-Go option

The No-Go option would cut all the benefits provided above in section 3.

3.1.2 Land Use or Development Alternatives

The current land use as well as the development alternatives are discussed under section 2. Alternative land uses for the proposed mining area include the use of the land for farming, mariculture (as is currently the case). The use of the area for mining will, however, not alter the existing land use over an extended area. The post-closure land use is proposed to be farming, mariculture as well as LEAP projects. Once mine closure is complete, the area will be rehabilitated to the satisfaction of the MEM of the DMR and all other activities will continue.

4. DETAILED DESCRIPTION OF THE PROPOSED PROJECT

4.1 Surface Infrastructure

The mine- associated infrastructure and support services necessary for the success of the project (e.g harbours, jetties, gravel transport routes and processing facilities) are all already established and operational and no new large scale construction will be required. Figure 1.3-2 shows surface layout infrastructure plan.

4.1.1 Mine, Associated Infrastructure and support Services

The mine associated infrastructure and support services necessary for the success of the project (e.g harbours, jetties, gravel transport routes and processing facilities), are already established and operational, and no new large scale construction will be required.

4.1.2 Solid Waste Management Facilities

Refuse Generation and Disposal

Domestic waste generated at the house in Brazil is collected into black plastic bags and gets collected by transported to De Punt mine by a bakkie. The waste is then disposed off at De Punt landfill site. No domestic refuse is incinerated at sea. About 20 kg of biodegradable and non-biodegradable domestic and industrial waste is generated by the mining fleet per day. It is bagged and brought shore at the Port Nolloth jetty and Hondeklip Bay for collection and disposal at various dump facilities. At Port Nolloth refuse from mining vessels is removed and handled by the jetty manager and disposed of at the municipal dump. Liquid wastes generated onboard the mining vessels and/or at the Port Nolloth processing facility are collected in 200-litre drums for recycling, and suitably disposed of by a contracted company. Hazardous and toxic wastes are hardly ever produced during the normal course of marine diamond mining operations.

With the exception of Port Nolloth and De Beers Namaqualand Mines, no waste or landfill sites in the Nama Khoi and Kamiesberg Municipalities have permits from Department of Water Affairs (DWA). As existing permitting procedures and requirements are under review by the DWAF, applications for registration of the landfill sites are currently being deferred.

There will be chemical toilets put on site during land based prospecting activities. Positions cannot be defined at this stage. No one will camp or stay on the property and all staff will work only during daylight hours. Chemical toilets use chemicals to disinfect and deodorize the waste. After a certain number of uses, the contents of the toilets will be pumped out and transported to a wastewater treatment facility in the Namaqualand Municipality. Usually the disposal period can go up to about two months depending on the use.

4.1.3 Waste Emissions, Discharges, Refuse generation, and Process Materials

Atmospheric Discharges

The vessels used by Trans Hex and their contractors to mine diamonds in the (a)-concessions produce exhaust emissions from onboard diesel generators no different from those emitted by other vessels (fishing, mining, freight, passenger) operational in, or passing through, the area. As operations are limited to on average a few hours each day, diesel fume generation is considered negligible. The processing plant at Port Nolloth does not produce emissions as the diamond extraction process is a wet process; and even dust is naturally suppressed. The ±3 m^3 of bio-degradable and non-biodegradable household and industrial refuse generated each month by mining and associated operations is deposited at the Hondeklip Bay and Port Nolloth municipal land fill sites. No refuse is incinerated at sea.

Discharges into the Sea

During normal vessel-based operations, no oil or produced oily water, deck drainage and other drainage, machinery and ballast water, detergents, hydraulic fluids or other contaminated material or substances are discharged into the environment. Liquid wastes are collected in 200-litre drums for recycling and offloaded at Hondeklip Bay and Port Nolloth harbours as necessary. Hazardous and toxic wastes are hardly ever produced during the normal course of marine diamond mining operations.

Contractor vessels do not have onboard sewage storage or treatment facilities, and this is discharged overboard. Sewage discharge is estimated not to exceed 250 litres annually by all contractor vessels. Any waste that is offloaded at brazil is transported by road to Port Nolloth.

4.1.4 Utilisation of Resources

Service water

Small volumes of seawater are used to screen gravel in the classifiers onboard the vessels, and in the case of the shore-units in the intertidal area. Seawater is used as the service water for the processing facility in Port Nolloth. This is pumped from the ocean via two 3" pumps installed below the jetty. Average monthly seawater usage in the plant is ±1 680 m^3

Drinking water

The general lack of surface water along the West Coast places a high priority on groundwater resources. The low rainfall leads to low recharge of aquifers and there is therefore a high potential for overexploitation of groundwater. Most towns along the coast obtain water from aquifers, nearby rivers or a combination of both. The town of Port Nolloth obtains its water from an aquifer but its' limited supply has led to supplementing the town supply by piped water from the Orange River. Hondeklip Bay obtains limited volumes of water from the borehole at Koiingnaas. Fresh water consumption on the mining vessels, at the Hondeklip Bay divers' quarters and at the Port Nolloth offices is restricted to that necessary for domestic use. The fresh water demand by the Trans Hex is thus insignificant.

Power supply

Power in both Hondeklip Bay and Port Nolloth is supplied at 132 kV from Eskom grid.

4.2 Description of the Prospecting, Mining and Processing Operations

The concession areas under the jurisdication of Trans Hex are leased to smaller shore based beach mining or vessel-based contractors who mine specific areas on behalf of the company. For the purpose of this project specific EMPR, the mining methods employed n the extraction of diamondiferous in concessions 5a, and the corresponding surf zones and the admirality strips are divided according to their area of operation on the shore. The two methods used to mine marine gravels are:

- Shore-based surf-zone mining using diver-assisted suction pumps to extract gravels from subtidal gullies and potholes to ~10 m depth. Gravels are fed to a tractor-driven classifier located in the intertidal area,
- Vessel-based surf-zone and (a)-concession mining using diver-assisted suction pumps to extract gravels from gullies and potholes to ~25 m depth. Gravels are fed to a classifier located on the vessel.
- As part of the Brazil operations, shoul the prospecting activites on the farm produce desired results, mining will be conducted to include: Land based activities where all land based infrastructure common to the Trans Hex concession areas in the region, such as landing facilities and transport routes, the gravel processing facility and accommodation facilities, as well as waste management

For the purposes of marine diamond mining the surf-zone is defined as that area extending from the high water mark (HWM) to 31.49 m (100 Cape feet) beyond the low water mark. Mining in this zone, and to depths of 10 m in the (a)-concessions, is primarily shore-based. The operations are confined to small bays, and are typically conducted using small-scale, diver-assisted suction equipment, as described above. Large size fraction tailings (+25 mm) are accumulated around the classifier and the fine tailings (-2 mm) are returned to the sea across the intertidal zone as a sediment slurry. Care is taken to deposit oversize tailing below the HWM to allow natural redistribution by wave action.

A shore-based operation typically consists of 2-4 divers, their assistants, and a tractor-driven classifier. The divers operate on surface supplied air, and guide the distal end of the suction hose into the gravel deposits, which are sucked up and delivered directly to the classifier. Target ore bodies are subtidal gravels residing in gullies and potholes, and to access these, the divers may need to remove large rocks and boulders. In areas of dense kelp (Laminaria pallida) coverage, kelp may need to be cut to allow easy movement of the suction hoses and airlines when attempting to reach the diamondiferous deposits in the surf-zone and beyond. Mining rates for diver/tractor systems are about 0.25 m of gravel supplied to the classifier per hour. Because of the tidal cycle and weather/sea state limitations plants operate for less than 6 hours per day for an average of 5–6 days per month.

Consequently each diver/tractor unit processes approximately 100 m^3 of gravel per year. The overall extent of the concessions mined is low, being estimated as <0.03% per year of the available (a)-concession area. To gain access to the water, the contractors attempt to locate their equipment as close to the sea as possible in the supratidal and intertidal regions. The network of existing roads is more than adequate to provide contractors with access to their mining sites, and no new roads need to be created. Unlike for beach mining, substantial upgrading of these tracks will, however, not be necessary as vehicles and equipment used for shore-based operations are lighter than those used in beach mining. Nonetheless, those roads and tracks used regularly by contractors are maintained by Trans Hex. The topography of the bays targeted by shore contractors, enables the storage of classifiers and hoses above the HWM on site. As classifiers and suction hoses are too cumbersome to be removed from the site each time pumping operations are interrupted for short periods, this circumvents excessive use of the tracks. The equipment storage areas are usually restricted to an area of <5 m^2 and damage to strandveld vegetation is thus limited.

Mining of sand areas is generally unprofitable for the small-scale operators due to the large volumes of overburden that have to be removed before it is possible to gain access to the heavier gravel. However, some vessels operating in shallower waters are fitted with blowers to displace the overlying fine surficial sediment from the seabed thereby allowing exploitation of deeper gravel deposits in areas dominated by sand which were previously uneconomic to recover. Shallow-water diamond mining is opportunistic in nature being highly dependent on weather and sea conditions. These effectively limit the periods in which mining can take place. Five days of mining per month by diver-operated systems are considered a good average for the South African west coast although longer individual periods may be workable, particularly in the summer months. Sea conditions also control where safe operations can be conducted, as these often have to be in areas with some wave shelter. Swell conditions and underwater visibility can vary enormously over small spatial and temporal scales, making it necessary to choose appropriate mining sites on specific days rather than sequentially mining a concession from one end to the other. A phased approach to mining the surf-zone and (a)-concessions is thus not possible, leading to the public misconception that shallow-water mining is conducted in an ad hoc fashion, and impacts the entire concession area.

4.2.1 Description of Mining Vessels

Vessel based Vessel-based divers operate on surface supplied diving equipment, and due to the water depths involved (±5m - 25 m), their bottom-working time is limited by decompression commitments. The terminal end of the suction hose is guided into gullies, potholes and basin areas to retrieve the diamond-bearing gravel deposits, which are sucked up and delivered to the classifier. In the mining process large rocks may either be exposed, or removed by divers to allow the suction nozzle to reach deeper gravel layers. The rocks are sometimes accumulated by the divers into rock piles. The gravels are processed through a classifier mounted on the vessel. Fine material (-1.6 mm) discharged from the screening units washes directly back into the sea whilst the oversize fraction (+19 mm) is discharged directly

overboard on site. The diamond-bearing gravel is bagged, offloaded at the Port Nolloth or Hondeklip Bay jetty, and transported to Trans Hex's processing facility in Port Nolloth.

There are currently 13 vessels working out of Port Nolloth in concession 5(a), of which only 10 vessels are regularly operative. A further vessel operates out of Hondeklip Bay in concession 7(a). There are currently no vessels operating in concession 6(a). Although the number of contractors may vary, it is unlikely to exceed 20 vessels operational in all three concessions over the next few years.

During mining operations all the mining vessels are self-contained and self-sufficient mining units. Contractors are bound to acceptable environmental practices as stipulated under the environmental obligations and undertakings in their contracts with Trans Hex. For those vessels operational in concessions 5(a), 6(a) and 7(a), victualling, servicing and crew changes, as well as lay-ups during unfavourable weather and sea conditions, are undertaken in Port Nolloth and Hondeklip Bay harbours.

4.2.2 Description of shore based operation

Shore units will be introduced in Brazil as detailed in section 4.1. 5.

Shore based surf zone mining using diver- assisted suction pumps to extract gravels from subtidal gullies and potholes to ± 10 m depth will be used. Gravels are fed to a tractor-driven classifier located in the intertidal area.

Boat-based mining generally only operates in exposed rocky shore areas where gravel is pumped from deeper gullies, or on the edges of sandy bays where the layer of overburden is relatively thin. For these areas the amount of gravel removed in total from the sea floor averages 150 m^3/year per vessel, depending on the layer of overburden which needs to be removed before the diamondiferous deposits can be accessed. This amounts to between 5 -15 % of the actual material disturbed on the seabed during mining. In other words, 85-95 % of the gravel pumped during mining, remains on the seabed in the form of large boulders, or is returned to the sea from the classifier as oversize or fine tailings.

4.2.3 Land based activities

4.2.3.1 Landing Facilities and Transport Routes

Previously, gravel mined in concession 5(a) was offloaded by the mining vessels at a purpose - built concrete jetty in Port Nolloth harbour. Only Trans Hex contractors are authorised to offload at the jetty. The jetty is located outside the major fisheries section of the harbour in order to keep interaction with activities associated with the fisheries quay to a minimum. The jetty, which is ±120 m x 5 m offers well-equipped gravel offloading facilities in the form of a 1.5 tonne hydraulic crane (Plates 1 & 2). Gravel bags are offloaded directly from the vessels with slings, transferred to a truck and transported down the jetty into the adjacent processing plant (Plates 3 & 4). Water depth at the jetty head is 4 m and all of Trans Hex's contactor vessels are kept on private moorings nearby. Trans Hex owns two moorings within the harbour area for larger mining vessels. There is an existing boat launching site owned by Trans Hex at Hondeklip Bay. Trans Hex is also planning to have a boat launching site at Brazil to launch the boats into the sea. Environmental authorisation for the boat launching site is currently underway. Should Trans Hex's plans to have a boat launching site in Brazil succeed, an environmental authorisation for the site will be applied for. Harbour duties and mooring fees are paid by the mining vessels contracted by Trans Hex, although payment remains the responsibility of the individual contractors.

A fuel line leads from a bunded diesel surface storage tank at the entrance to the Trans Hex Processing Facility, along the southern edge of the jetty to a pump on the jetty head for refuelling the mining vessels (Plates 2 & 3). A pipeline supplying town water to a 5000 litre fresh water container on the jetty head likewise leads along the piperack, as does the power supply to three spotlights. A concrete "skip" has been constructed on the jetty head for the temporary storage of refuse bags and gravel (Plate 5).

Gravels are collected as explained above but transported by a bakkie to De Punt via Kooignaas, Hondeklip Bay- Garies route. Gravels may be treated at Port Nolloth once the economic situation has improved.

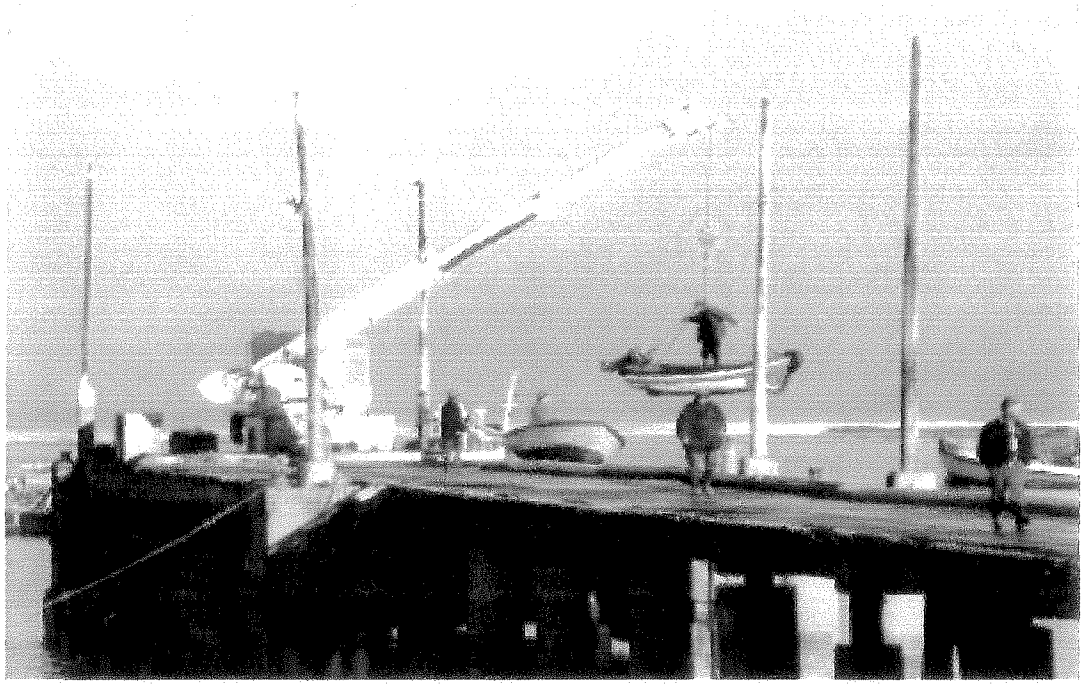


Plate 1. The Trans Hex purpose-built jetty for offloading gravel at Port Nolloth.

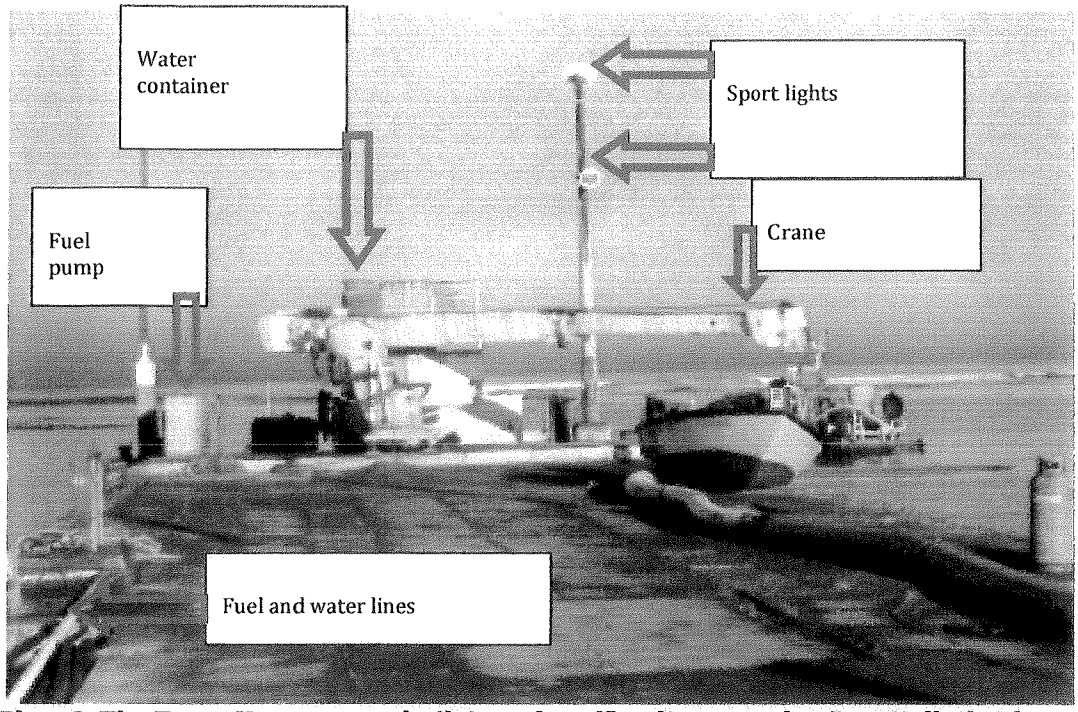


Plate 2. The Trans Hex purpose-built jetty for offloading gravel at Port Nolloth. The hydraulic crane, fuel pump, water container, fuel and water lines, and lighting are shown.

Plate 3: The Trans Hex gravel processing facility at . Workshops, offices and decompression facilities are located in the right-hand building and the processing plant in the left-hand building. Port Nolloth Security fence, fuel store and jetty approach are also shown.

Plate 4:The Trans Hex gravel processing plant at Port Nolloth. The slimes dam is located behind the wall adjacent to the beach in the left of the photograph. Clean seawater from the dam percolates back onto the beach. Tailings are stored in the hoppers and frequently collected by building contractors.

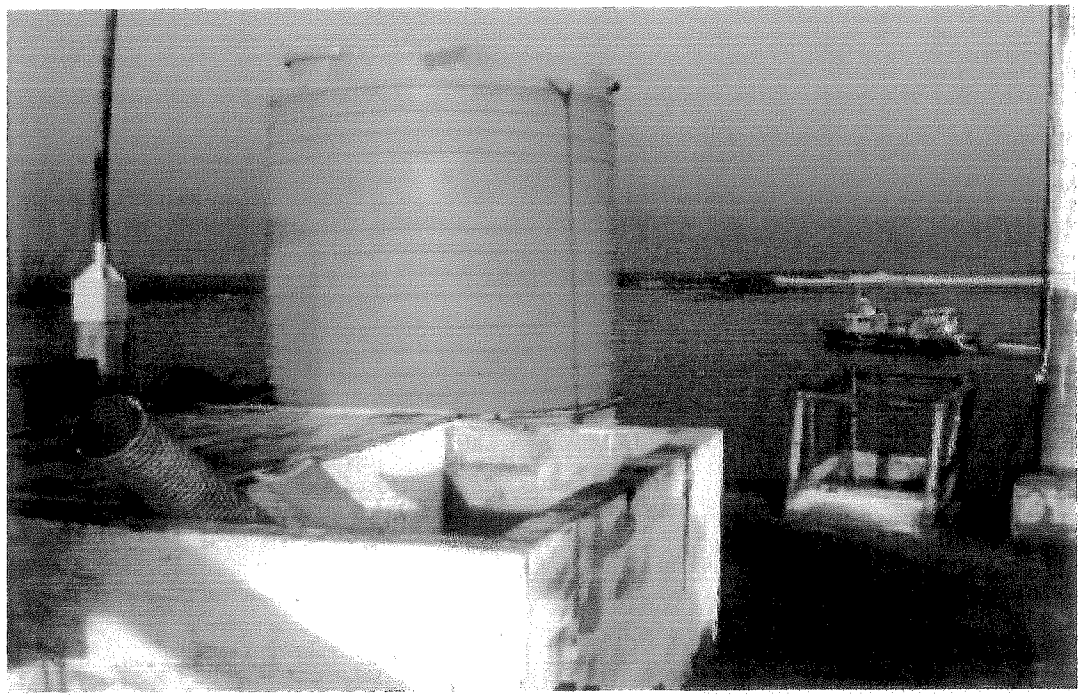


Plate 5. The water container and concrete skip on the Trans Hex jetty at Port Nolloth.

Plate 6. The Trans Hex gravel processing plant at Port Nolloth. Clean seawater from the dam percolates back onto the beach. The dam is frequently emptied and the contents sold to building contractors.

4.2.4 Onshore Logistical Support, Stockpiling and Processing Facility

4.2.4.1 Gravel Processing Facility

Currently, the Port Nolloth operations are on halt due to economic status and gravel from Brazil is now being processed at De Punt. Gravels are collected as explained above but transported by a bakkie to De Punt via Kooignaas, Hondeklip Bay- Garies route. Gravels may be treated at Port Nolloth once the economic situation has improved. Both De Punt and Port Nolloth facilities are operating in the same way. The only difference is their sizes. Below is the descriptions of the two facilities.

Port Nolloth

In Port Nolloth, Trans Hex uses a 10 ton/hour dense medium separation (DMS) plant where the gravels from all the surf-zone and marine concessions are treated. The plant is capable of treating 6000 m^3/month of gravel, in combination with a Flowsort wet-circuit X-ray machine. A diagrammatic representation of the gravel processing and ferro-silicon (FeSi) recovery operations in the plant is provided in Flow diagram 1. The concentration and recovery process is described briefly below.

The plant is situated at Trans Hex's offloading jetty ±2 km south of the village centre, and at full production employs 13 workers, and 10 casual labourers for the offloading and handling of gravel. Once offloaded, the bagged gravel is stockpiled in a secure store within the processing plant. The gravel from each vessel is stored and processed separately. The gravel bags are manually emptied through a receiver hopper onto a feed conveyor belt. After removal of the coarse

fraction (>16 mm), which may constitute 15% of the material brought ashore, the finer fraction proceeds to a mixing box where the ferrosilicon (FeSi) is added. From there it is pumped to the DMS via a 300 mm washing cyclone where material with a specific gravity of >2.8 g/cm^3 is separated out. This fraction is run through a scrubber or ball-mill, containing 38 mm diameter balls, to crush shelly material which may still be present. The resulting fines (<0.9 mm) are pumped as a seawater slurry to a 40 m^3 settling dam on the premises where the solids settle out and the clear seawater percolates back into the ocean. The dam is periodically emptied with a front-end loader. After passing through the scrubber, the concentrate is classified into two fractions <6 mm and >6 mm, each of which is separately fed through the Flowsort X-ray sorter and subsequently hand-picked for diamonds. The barren fraction or discards goes onto a float screen where the FeSi is magnetically separated while the remainder of the float is fed onto a tailings conveyor and then onto the tailings dump.

The majority of the FeSi used in the DMS plant is recycled by magnetic separation. Approximately ±6.25 tons FeSi used annually in Port Nolloth processing plant., and consumption is monitored monthly. The slimes-dam which receives the fine discarded residues from the plant, covers an area of approximately 12 m x 5 m, and has a maximum depth of 2 m. It is situated just above the high water mark within the boundaries of the property and clean water percolates from the dam back onto the beach. No watercourse is therefore impacted by the discharged service water from the gravel processing facility. Monthly slimes production amounts to ±120 m^3 necessitating excavation of the dam approximately once a month. At current production rates, approximately 2400 m^3 of tailings are produced by the plant annually. Old tailings are temporarily stockpiled in a hopper outside the plant. Both the coarse and fine tailings are in high demand by building contractors in Port Nolloth.

De Punt

On their property at De Punt, Trans Hex uses a 25 ton/hour dense medium separation (DMS) plant, where the gravels from all the surf-zone and marine concessions are treated. At full production, the De Punt gravel processing plant employs 12 workers. A diagrammatic representation of the gravel processing and ferrosilicon (FeSi) recovery operations in the plant is provided in Flow diagram 1. The concentration and recovery process is described briefly below.

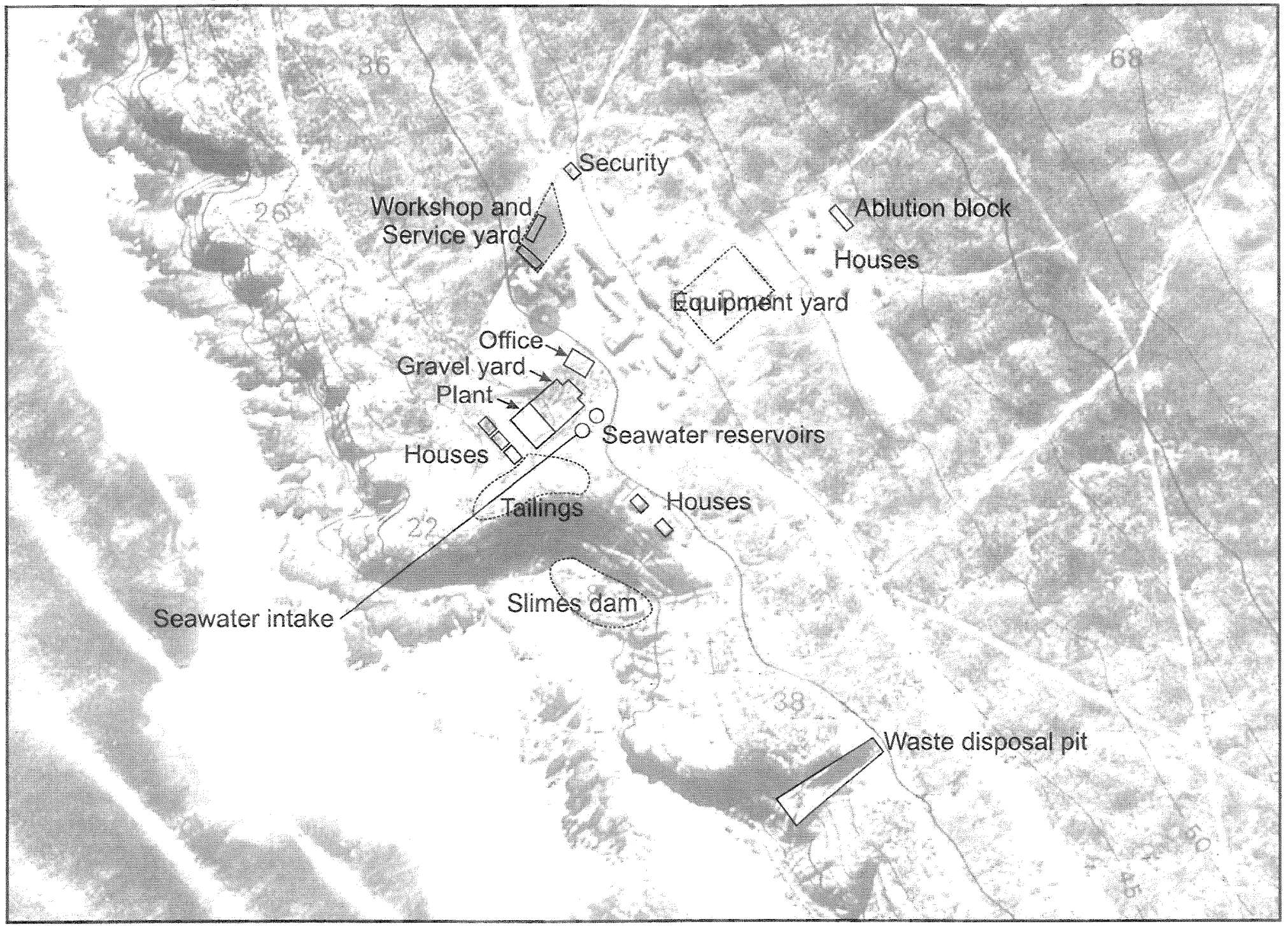
The bagged gravel from the various production points is manually emptied through a receiver hopper (1) onto a feed conveyor belt (3) which transports the gravel via a Barmac crusher (4) onto an intake screen (5) where 10-15% (sand and crushed shelly material -1.6 mm) by volume is washed out. This fine underflow material goes to the effluent sump (6) from where it is pumped to the water recovery cyclone (8). The overflow from the water recovery cyclone (8) returns to the water supply sump (9). The underflow passes over a 1.6 mm screen (11), with material +1.6 mm reporting to the waste gravel stockpile (13) via waste conveyor belt (12). Material -1.6 mm flows to the tailings sump (14), from where it gets pumped as a seawater slurry to a mine residue dam at the foot of the cliff where the solids settle out and the clear seawater percolates back into the ocean. The coarser fraction (+1.6mm and -25mm) passes over the preparation screen (5) and drops into a mixing box (16) where water and FeSi are added until the correct density is reached. From there it is pumped under high pressure (approximately 190 KPa) to the washing cyclone (18) where material with a specific gravity of >2.6 g/cm3 is separated out. This constitutes the concentrate which reports to the sink side screen (19), while material with a density lower than three (tailings) flows to the float side screen (20). After passing over the sink screen (19) to the concentrate sump (21), the concentrate is forwarded to the final recovery section (23). Sorting of diamonds from the heavy fraction is done by a Flowsort wet-circuit X-ray sorter and subsequent hand-picking. The barren fraction or discards (+1.6mm) onto a (20) where the FeSi is magnetically separated while the remainder of the float is fed onto a tailings conveyor (12) and then onto the tailings dump (13). Most of the FeSi is washed through the initial segment of the sink (19) and float (20) screens (underflow) to return into the circulating medium sump (24). The under flow from the last sections of the screens is transported to the dilute medium sump (32), from where it is pumped to the densifying cyclone (34) by the dense medium pump (33). Densifying cyclone (34) underflow passes into a splitter box (35) which can be set to direct flow to the circulating medium sump (24), magnetic separator (37) or to both. Cyclone overflow also passes through a splitter (36) where it may be fed to the dilute medium sump (32), magnetic separator (37) or to both. The magnetic separator (37) recovers FeSi and feeds it to the circulating medium sump (24). The underflow from the magnetic separator goes to the effluent sump. The amount of flow is controlled by valve 39 to ensure there is always an overflow on the magnetic separator (37), and to prevent FeSi losses to the effluent sump.

The majority of the FeSi used in the DMS plant is recycled by magnetic separation. A proportion is lost, however, in the service water and through adhesion to shell fragments and gravel. Whilst FeSi loss will increase iron levels in the discard water, it is an inert substance. Although biological impacts of FeSi have not been quantified, they are expected to be negligible at current loss rates. Approximately 18 t of FeSi are used annually at the De Punt processing plant, and consumption is monitored monthly.

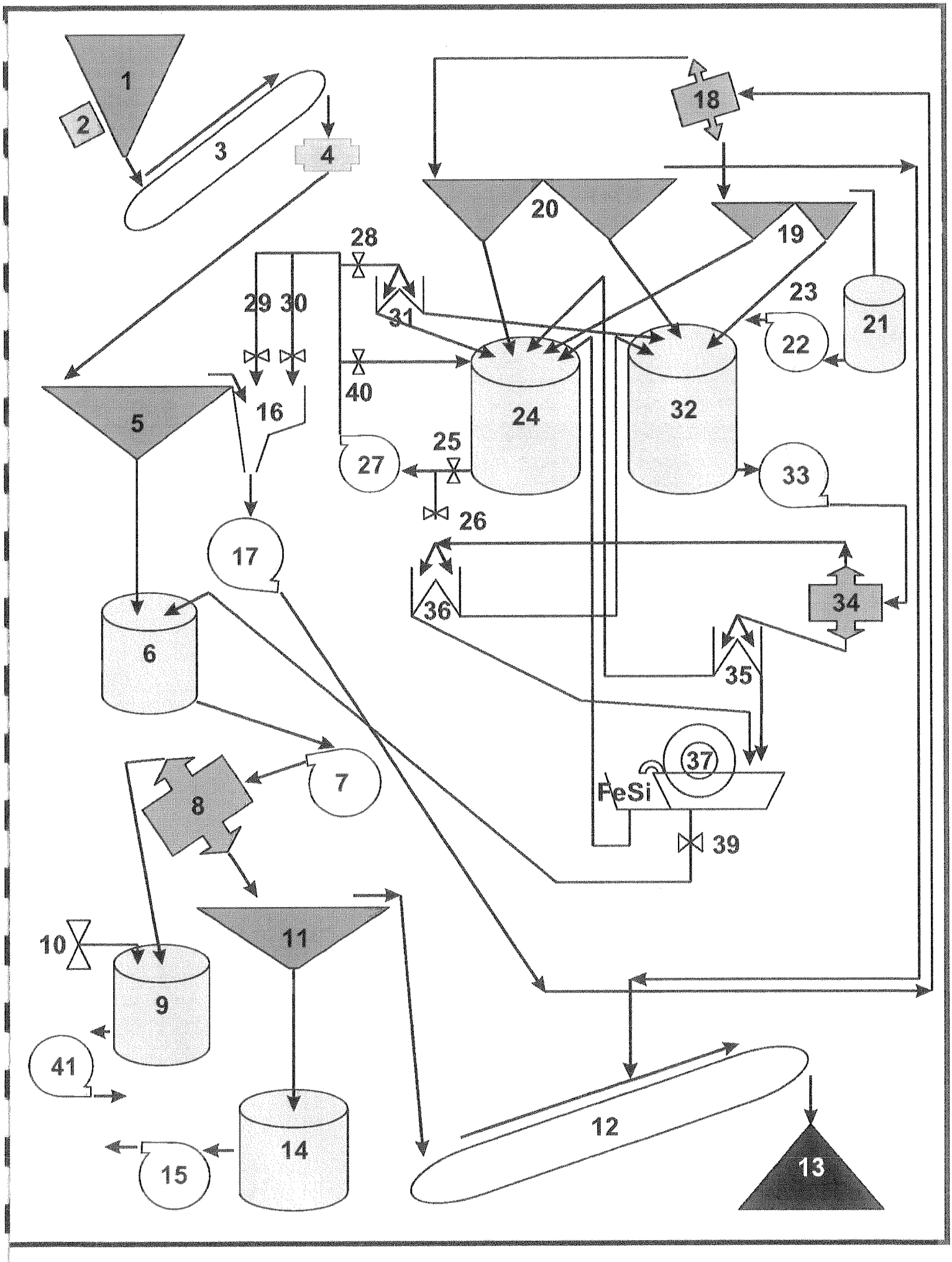
Seawater is used as the service water for the processing facility. This is pumped into two reservoirs to the south of the plant, from a seawater intake at the base of the cliff (Orthophoto A and Plate 7). Average monthly seawater usage in the plant is ±7 200 m^3. The slimes-dam situated at the base of the cliff which received the fine discarded residues from the plant, covers an area of approximately 50 m x 20 m, and has a maximum depth of 3 m. Annual slimes production

amounts to 1000-1500 m^3 necessitating excavation of the dam every 2-3 years using bucket-shovels and dump-trucks. Excavated slimes are used to reinforce the slimes-dam wall and re-fill old mining trenches on the De Punt property. At current production rates, approximately 7700 m^3 of tailings are produced by the plant annually. Old tailings are stockpiled near the plant and re-used as dust control around offices and housing, to stabilize the garbage disposal site, and for filling erosion gullies on roads and tracks.

Plate 7: The slimes residue dams at the base of the cliff below the gravel processing plant. Fine materials from the diamond extraction process are pumped to this dam as a sediment slurry. The fines settle out and the clean seawater percolates back into the sea.



Orthophoto A: Seawater used as the service water for the processing facility



Flow diagram 1: De Punt and Port Nolloth plants flow diagram

Table 4.2-1: Port Nolloth and De punt plants table

Item	Description	Item	Description
1	Feed Hopper	22	Concentrate Pump
2	Hopper Vibrator	23	Final Recovery Section
3	Feed Conveyer	24	Circulating Medium Sump
4	Crusher	25	Circulating Medium Sump Outlet Valve
5	Preparation Screen (1.6mm slots)	26	Circulating Medium Pump Water Inlet Valve
6	Effluent Sump	27	Circulating Medium Pump
7	Effluent sump	28	By Pass Valve
8	Water recovery Cyclone	29	Mixing Box Feed Valve
9	Water Supply Sump	30	NMixing Box Pressure Valve
10	Water Supply Valve	31	Medium Splitter Box
11	Tailings Sizing Screen (1.6mm slots)	32	Dilute Medium Sump
12	Waste Gravel Conveyor Belt	33	Dilute Medium Pump
13	Waste Gravel Stockpile	34	Densifying Cyclone
14	Tailings Sump	35	Densifying Cyclone Underflow Splitter Box
15	Tailings Pump	36	Densifying Cyclone Overflow Splitter Box
16	Mixing Box	37	Magnetic Separator
17	Washing Cyclone Feed Pump	38	Pressure Pump To Screen Water Sprays
18	Washing Cyclone	39	Magnetic Seperator Overflow Level Control Valve

Item	Description	Item	Description
19	Sink Screen (1.6mm slots)	40	By Pass Valve
20	Float Screen	41	Plant Water Supply Pump
21	Concentrate Sump		

4.2.5 Accommodation facilities

Currently, there is only one contractor on site and he is residing in at an existing house in Brazil, which is used as an accommodation facility. During normal operation, when not at sea divers and contractors working out of Brazil reside in the village, either in private homes, or at this house or quarters situated on state land just south of the town. In Port Nolloth, contractors and staff reside in private accommodation in the village. In order to minimise impact on the coastal zone, the accommodation formerly provided for shore-based contractors at Jakkalsbaai on the Farm Brazil adjacent to concession 5(a) is no longer being used, and plans are underway to hand over these facilities to the Prieska tourism board. Trans Hex does not have any campsites along the coast. At the gravel processing facility in Port Nolloth, offices, tearoom and conference room, ablution facilities, workshops, spares supplies, and a decompression chamber and doctors consulting room, are provided. The grounds are fenced and have 24-hour security. Ever since the mining economic situation declined, currently working at Brazil surf zone and he resides at the Brazil guest house when he is not on duty.

Housing, Recreation and Other Employee Facilities

As part of the social and labour plan initiatives, the mine will promote provision of housing infrastructure in the main labour sending areas. Details of alternatives and scenarios being investigated are detailed in the social and labour plan.

4.2.6 Process Materials disposal

Port Nolloth

Small amounts of tailings –1.6 mm and +19 mm are discharged on site by the mining vessels and shore-based contractors. The proportion discharged depends largely on the size composition of the target gravels; on average 5 -15 % of the total volume of gravel pumped is processed, with the remainder (85-95%) being returned to the sea, on site, as tailings. At current production rates total on-site discards from vessel-based mining operations amount to ±16 500 m^3 annually. Seawater is used as process water onboard the vessels, and at the Port Nolloth plant. On-site classifying of gravel produces small amounts of discharged process water containing fine marine sediments. This is discharged on site. At Port Nolloth, the fine discarded residues from the plant are pumped as a seawater slurry to a small slimes-dam where the solids settle out and the clear seawater percolates back into the ocean. Annual slimes production amounts to ±120 m^3. Ferrosilicon is used in the diamond extraction process in the Port Nolloth plant. Although most is recycled by magnetic separation, a proportion is lost in the service water and through adhesion to shell fragments and gravel. Whilst FeSi loss will increase iron levels in the discard water, it is an inert substance. Although biological impacts of FeSi

have not been quantified, they are expected to be negligible at current loss rates. Approximately ±6.25 tons FeSi used annually in Port Nolloth processing plant., and consumption is monitored monthly.

De Punt

Small amounts of tailings –2 mm and +19 mm/ +25 mm are discharged on site by the mining vessels and shore-based and beach contractors. The proportion discharged depends largely on the size composition of the target gravels; on average ±2/3 of the total volume of gravel pumped is processed, and 1/3 is discarded on site as tailings. At current production rates total on-site discards from all mining operations amount to ±3800 m^3 annually. Seawater is used as process water onboard the vessels, for the shore-based classifiers and at the De Punt plant.

On-site classifying of gravel produces small amounts of discharged process water containing fine marine sediments. This is discharged on site. At De Punt, the fine discarded residues from the plant are pumped as a seawater slurry to a slimes-dam where the solids settle out and the clear seawater percolates back into the ocean. About 20 kg of biodegradable and non-biodegradable domestic waste is generated by the mining fleet (contractor vessels and MV Pafuri) per day. It is bagged and brought to the jetties at Lamberts Bay and Doringbaai for collection and disposal at various dump facilities. At Lamberts Bay refuse from mining vessels is removed and handled by the jetty manager and disposed of at the unlicenced municipal dump, whilst at Doringbaai refuse is handled by the local council and disposed of at the unlicenced local landfill site. Refuse generated by beach mining and shorebased operations is minimal estimated at <1 kg per day per contractor-unit. At De Punt and Schaap Vley Hills ±3m^3 and ±1m^3 of bio-degradable and nonbiodegradable household and industrial refuse generated each month, respectively.

TABLE OF CONTENTS

Volume 1 – Main report

CHAPTER 5

5 ENVIRONMENTAL IMPACT ASSESSMENT

The criteria below were used to assess the significance of the impacts. The cut-off points have been defined in relation to characteristics of mining, but those for Probability, Intensity/Severity and Significance are subjective, based on rule-of-thumb and experience. In assessing the significance of the impact, natural and existing mitigation measures will be considered. These natural mitigation measures will be defined as natural conditions, conditions inherent in the project design and existing management measures that alleviate (control, moderate and curb) impacts. Table 5.1-1 provides an assessment of the impact for the Brazil operations.

In the Assessment summary of impact table: ("PM" is Post mitigation analysis)

	WEIGHT	Environmental Risk Profile						Hazard Effect or Severity	Scope/ Extent	Duration
		Tolerate/ALARP	High Risk - Intolerable							
	6	6	12	18	24	30	36	Disastrous	Trans boundary effects	Residual
	5	5	10	15	20	25	30	Catastrophic/major	National//Severe environmental damage	Residual
	4	4	8	12	16	20	24	High/Critical/serious	Regional effect	Decommissioning
	3	3	6	9	12	15	18	Medium/ slightly harmful	Immediate surroundings / local/outside mine fence	Life of operation
	2	2	4	6	8	10	12	Minimal/potentially harmful	slight permit deviation/on-site	Short term/ construction (6months-1yrs)
	1	1	2	3	4	5	6	Insignificant/non-harmful	Activity specific/No effect /Controlled	Immediate (0-6months)
Weight Number		1	2	3	4	5	6			
Frequency		L	K	J	I	H	G			
Probability	Frequency of impact	Highly unlikely	Rare	Low likelyhood	Probable /possible	Can happen/ Likely	Regular / Almost /Certain			

		Practically impossible	Conceivable but very unlikely	Only remotely possible (has happened some where)	Unusual but possible	Quite possible (50/50 chance)	Is the most likely
	Frequency of Activity	Annually or less	6monthly / temporarily	Infrequent	Life of Operation	Daily	

Risk Rating = (RR)= Consequence x Probability

	Intolerable	High impact	A level of risk that is so high as to require significant and urgent actions to reduce its magnitude. If these risk levels cannot be reduced to ALARP or tolerable level, the project objective and operating philosophy must be fundamentally reviewed by the management. Put management measures in place.
	Tolerate /ALARP	Medium impact	Improve current management measures / Tolerable if reduction is impracticable of if cost are grossly disappropriate
	Maintain	Low impact	Maintain current mitigation measures / maintain assurance that risk remains at this level

Activity: a distinct process or task undertaken by an organisation for which a responsibility can be assigned.

Environmental aspect: an element of an organisation's activities, products or services which can interact with the environment or cause an environmental impact.

Environmental impacts: consequences of these aspects on environmental resources or receptors.

Receptors: comprise, but are not limited to people or man-made structures.

Resources: include components of the biophysical environment.

Frequency of activity: refers to how often the proposed activity will take place.

Frequency of impact: refers to the frequency with which a stressor will impact on the receptor.

Severity: refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

Spatial scope: refers to the geographical scale of the impact.

Duration: refers to the length of time over which the stressor will cause a change in the resource or receptor

The impacts table is divided into four categories namely:

- Benefits of the project
- Impacts associated with land based operations,
- Impacts associated with shore based operations and
- Impacts associated with vessel based operations

Management measures column should be read in conjunction with activities referred to in chapter 6.

Table 5-1: Potential impacts related to the Brazil operations

BENEFITS OF THE PROJECT

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management Measures</th></tr>
<tr><td colspan="4">BENEFITS OF THE PROJECT</td></tr>
<tr><td>Socio economic</td><td>Provision of employment</td><td>Diamond mining activities along the Namaqualand coast are one of the major providers of employment in an area where employment levels and opportunities are low. Job levels range from divers through machine operators and labourers, ~10% can be classified as low-skill. Job numbers range from 6 to 10 per mining unit, depending on the size of the operation. Trans Hex's operations in 5(a), 6(a), 7(a) and at the Port Nolloth processing facility, during normal operations about 84 persons get employment.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Regional (4) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>11 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM - 3)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (66)</td><td colspan="2">Medium Positive (6)</td></tr>
</table></td><td>Activity 1.2.3</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management Measures</th></tr>
<tr><td></td><td>Payment of royalties and taxes to the State</td><td>Mining generates taxes and revenues for central government, which contribute to national wealth. R 4.4 M have been paid in royalties and income taxes over the past 3 years by Trans Hex's northern West Coast Operations.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4)</td><td>National (5)</td><td>Life of operation (3)</td><td>12</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (72)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
<tr><td></td><td>Stimulation of local economy</td><td>Mining operations will add to economic activity and diversification in the Hondeklip Bay-Port Nolloth region as they are provisioned from local suppliers and utilise local services and industry.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4)</td><td>National (5)</td><td>Residual (5)</td><td>14</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive(84)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management Measures</th></tr>
<tr><td>Socio economic</td><td>Upliftment and maintenance of harbours</td><td>Mining vessels pay berthing fees that help to financially sustain harbours. This is especially important in the smaller harbours such as Hondeklip Bay. Use of harbours by mining companies may result in infrastructural development such as the building and/or maintenance of jetties, and erection of cranes.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4)</td><td>Regional (4)</td><td>Residual (5)</td><td>13</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (78)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
<tr><td></td><td>Sponsorship of education and community projects</td><td>The mining company sponsors education and community upliftment projects in areas largely neglected by successive RSA governments
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Regional (4) (PM- 1)</td><td>Residual (5) (PM-1)</td><td>13 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (78)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management Measures</th></tr>
<tr><td></td><td>Infrastructural development</td><td>Mining presence can lead to infrastructure development in poorly developed coastal areas, in the form of extension of the water and power supply grids, and the establishment and maintenance of coastal roads.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Regional (4) (PM- 1)</td><td>Residual (5) (PM-1)</td><td>13 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (78)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
<tr><td></td><td>Research and development</td><td>The harsh environment on the West Coast provides the mining industry with logistic and technological challenges in achieving economic success. This has led to creative modifications and development in mining technologies making Southern African marine mining groups world leaders in this type of resource utilization.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>National (5) (PM- 1)</td><td>Residual (5) (PM-1)</td><td>14 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (84)</td><td colspan="2"></td></tr>
</table></td><td>N/A</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management Measures</th></tr>
<tr><td colspan="4">COMMUNICATIONS</td></tr>
<tr><td></td><td>Communications with I&APs and local community representatives</td><td>Communications with I&APs and local communities will avoid misunderstandings concerning activities associated with mining and prospecting operations.
Communications with local communities may result in a provision of employment opportunities.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High positive (36)</td><td colspan="2">Medium positive (6)</td></tr>
</table></td><td>Activity 1.2.1</td></tr>
</table>

<table>
<tr>
<td></td>
<td>Instructions to contracted personnel</td>
<td>Content of EMP and required adherence to environmental management is communicated to all personnel including contractors, skippers and divers
Mining companies have to conduct their operations in an environmentally responsible manner. Development of environmental management expertise within the mining company enhances its ability to achieve this, and avoid or manage conflict with other user groups.
Establishing formal communication links with I&APs, staff and contractors expands the national skills base in this field.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (36)</td><td colspan="2">Medium positive (6)</td></tr>
</table>
</td>
<td>Activities 1.3.1, 1.3.2, and 1.3.3</td>
</tr>
</table>

IMPACTS ASSOCIATED WITH LAND OPERATIONS

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td>Geology</td><td></td><td>No impact associated with sterilisation of mineral resources</td><td>N/A</td></tr>
<tr><td>Topography</td><td>Impacts on topography will arise from the following activities:
Dumping of temporary overburden dumps (since on-going rehabilitation will be promoted)
Construction of logistical structures</td><td>The development of processing facilities and associated infrastructure (including access roads, housing, tailings dumps and slimes dams) may aesthetically and physically degrade the landscape thereby devaluing coastal land for other uses. The frequency of the activity will thus be permanent due to the slimes being a permanent feature. The frequency of the impact will thus be definite. As the general topography of the area is relatively flat, the severity of the impact will be significant. The spatial scope is the local area and the duration permanent. The pre-mitigation impact significance is thus high.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Residual (5) (PM-1)</td><td>11 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (55)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 1.2, 2.1, 4.1, 5.1, 17.1, 18.1</td></tr>
<tr><td></td><td>Discard of oversize tailings</td><td>Tailings heaps accumulated around processing facilities may be subjected to wind erosion and/or wind driven creep, especially of the finer fractions. This can affect vegetation both by inundation and sand blasting
Unmanaged dumps are unsightly and negatively affect aesthetics
If located near a watercourse, saline seepage from tailings mounds can pollute aquifers
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
</table></td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (35)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td>Soils</td><td>Fuel and lubricant management:
Storage of fuels.
Facility construction
Field management of lubricants.
Recycling of oils
Oil spills.
Run-off from workshops</td><td>Construction of the infrastructure and various facilities in the mining area can result in loss of soil due to erosion. Vegetation will be stripped in preparation for placement of infrastructure, thus leaving bare areas which are susceptible to erosion. The topsoil that is stripped and piled on the surrounding area can be eroded during rainy seasons. The stock piled soil, which is intended to be used during rehabilitation, will be carried away through run off to certain areas on which, it will not be beneficial. Although the cleared area will be rehabilitated after use, full restoration of the soil might occur over a number of years, subsequent to the re-establishment of vegetation. Therefore the impact will have moderate severity, throughout the duration of the mine
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Medium (3)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>8
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Possible (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (28)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activities 1.3, 2.3, 4.3, 6.1, 7.1, 15.1, 16.2, 17.2 and 18.4</td></tr>
<tr><td>Land capability</td><td>Topsoil removal/disturbance
Placement of surface infrastructure</td><td>Possible loss of drying kelp beds areas due to trenching and mining as the kelp farmers are using some of the farm areas as patches of kelp beds for drying kelp beach casts
Loss of camps in areas where kelp collectors live on site during the week or for short spells.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Intermediate surrounding mining</td><td>Life of Operation (3)
(PM-4)</td><td>8
(PM-6)</td></tr>
</table>
</td><td>Activities 1.4, 2.2, 4.2 and 16.1</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>area (3)
(PM- 1)</td><td></td><td></td></tr>
<tr><td colspan="4">PROBABILITY Certain 4 (PM-6)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (32)</td><td colspan="2">Medium (12)</td></tr>
</table>
</td><td></td></tr>
<tr><td>Land use</td><td>Placement of infrastructure</td><td>There are buildings which Trans Hex is using to house the sea concession contractor. The buildings are also availed for accommodation for other people who are working on the concession or public servants visiting the area
Should mining not be conducted in a sustainable manner, the impacts might be severe on the land use
Any development should also not be in contradiction but in harmony with the LEAP initiatives to ensure that land use plans by the Department of Public Works and Key stakeholders are consolidated in mining development.
Loss of drying kelp beds areas due to trenching and mining as the kelp farmers are using some of the farm areas as patches of kelp beds for drying kelp beach casts
Loss of camps in areas where kelp collectors live on site during the week or for short spells.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Medium (3)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Possible 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (35)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activities 1.5 and 11.2.</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td>Road maintenance</td><td>Inadequate and unsuitable maintenance of roads will lead to destabilization of road surfaces and erosion of soils.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (40)</td><td colspan="2">Low (6)</td></tr>
</table></td><td rowspan="2">Activities 1.5 and 11.2.</td></tr>
<tr><td></td><td>Increase in traffic on roads</td><td>The transport of gravel to the processing facilities at Port Nolloth and De Punt as well as general operational traffic associated with the plant will result in an increase in traffic volume on the local access roads.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-6)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (66)</td><td colspan="2">Low (6)</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td>Establishment of exclusion zones</td><td>Excluding other users from mining bases and adjacent lands through the establishment of security zones limits other potentially beneficial developments from occurring. There is also potential for conflict with other users of marine resources (commercial and recreational fishing, kelp harvesting and tourism) through limiting access to the coast.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (3) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-6)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (48)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 1.5 and 11.2.</td></tr>
<tr><td>Vegetation</td><td>Mine activities such as vegetation clearing during construction</td><td>Loss of population/communities of conservation value due to vegetation clearing during construction activities will disturb vegetation. The dominant vegetation covers most of the site and thus this loss will be compensated by areas which will not be disturbed. The probability of impact occurrence is certain. However areas of disturbance will be limited to prospecting activities and vehicular movement outside these demarcated areas will be restricted.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Decommission (4) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (36)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 1.6, 3.1, 4.5 , 5.2, 6.2, 7.3, 11.3 16.3 and 18.5.</td></tr>
<tr><td>Fauna</td><td>Vegetation clearing Noise generation activities</td><td>Loss of animal population/communities of conservation value due to loss of habitat during vegetation clearing for mining activities as well as noise generation during these activities</td><td>Activities 3.2, 4.6, 7.2, 11.1 and18.6</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (4) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (40)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td>Surface Water</td><td>Topsoil removal
Suspended solids from erosion of disturbed soil and oversize discards
Chemical pollutants from construction materials.</td><td>Contamination of watercourses by construction and operational activities
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (3) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (40)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td rowspan="2">Activities 2.5, 6.3, 7.4, 8.2, 11.4, 15.2 and 18.2</td></tr>
<tr><td>Overflow from return water dam
Spillages and wash water from the plant (Ferrosilicon, oils and lubricants</td><td>Deterioration in water quality as a result of diffuse pollution from the mine. The potential overflow of the return water dam, thus carrying sediments and silt into drainage channels will be minimised by active pumping of water back into the process water system.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>High (40)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td>Groundwater</td><td>Downward infiltration of contaminated process/slurry water</td><td>Impact of dewatering on other ground water users
Contamination of ground water resources due lack of ground water monitoring
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>National (5)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>8
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (40)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activities 1.7, 2.6, 6.4, 7.5, 8.1, 8.3, 11.5, 12.1,15.3 and 18.3,</td></tr>
<tr><td>Air quality</td><td>Vehicle entrainment emissions from:

the initial hauling of ore from the mine access to the plant
Sources within the processing plant, including:
Materials handling
Primary, secondary and tertiary crushing
Screening
Vehicle tailpipe emissions from plant personnel vehicles and haul trucks.</td><td>Decreased ambient air quality due to wind blown respirable particulates
Potential for health impacts due to predicted suspended fine particulate concentrations during construction, operational and decommissioning phases
Nuisance dust due to predicted dust deposition rates during construction, operational and closure Phases
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (35)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activities 1.8, 2.4, 3.3, 4.4, 5.4, 6.6, 11.7 and 15.5.</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Mitigation measures</th></tr>
<tr><td>Pollution</td><td>Generation of domestic wastes, and discarded mining wastes</td><td>Wastes generated by mining operations and discarded into the environment can lead to local pollution, aesthetic degradation and/or human health problems
Waste disposal can affect local infrastructure such as landfill sites, which if incorrectly placed can pollute aquifers
Materials such as small volume plastic wastes, and disused mining equipment constitute litter if discarded anywhere outside of formal landfills
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (3) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (48)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 7, 11.2 and 12</td></tr>
<tr><td>Archaeology</td><td>Placement of infrastructure
Vandalism</td><td>Disturbance/loss of archaeological/historical remains within the surface infrastructure area. The site of heritage significance will be protected and no infrastructure will be sited within 100m of these sites.
Should the heritage sites be disturbed, the impact will be of national concern.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>National (5) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (60)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 10.1, 14.1 and 21.1</td></tr>
<tr><td>Sensitive Landscape / Visual Impact</td><td>Surface infrastructure
Tailings dam
Plant
Return water dam</td><td>Visual intrusion due to infrastructure during operational phase
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
</table></td><td>Activities 1.10, 4.7, 11.8 and 16.4</td></tr>
</table>

Environmental Element	Activity / Aspect	Potential Impact					Mitigation measures
	Waste rock dump	Minimal (2) (PM-1)	On-site (2) (PM- 1)	Life of operation (3) (PM-1)	7 (PM-3)		
		PROBABILITY Certain 6 (PM-2)					
		SIGNIFICANCE OF IMPACT (pre-mitigation)		SIGNIFICANCE OF IMPACT (post-mitigation)			
		High (42)		Low (6)			

IMPACTS ASSOCIATED WITH SHORE BASED OPERATIONS

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td colspan="4">HABITAT DESTRUCTION/ REMOVAL</td></tr>
<tr><td>Vegetation and fauna</td><td>Use of underwater explosives and chemical rock splitting</td><td>Intertidal habitats and biota can be impacted and altered through the use of chemical rock splitting methods used to access dive sites. These methods are sometimes employed by contractors in an attempt to locate their machinery as close to the water as possible deposits.
Subtidal habitats and biota can be impacted and altered through the use of underwater explosives to access gravel
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Major (5) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>11 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-1)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (11)</td><td colspan="2">Low (4)</td></tr>
</table></td><td>Activity 3.1</td></tr>
<tr><td></td><td>Relocation of rocks / boulders</td><td>Movement by divers of rocks and boulders from potholes and gullies within 10-10m depth zone may be necessary to access deeper gravel deposits. These are generally accumulated into rock piles, or in some cases dragged from the gully at low tide using tractors and chains.
Boulders piles may become unstable in high wave conditions and, through movement, crush benthos. Stable boulder piles, on the other hand, increase habitat or cover for some benthic species such as rock lobster.
Dragging of boulders across the intertidal zone will physically alter the habitat, and crush the benthos
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Probable 4 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (32)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 3.3</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Discard of oversize tailings</td><td>Discharged coarse tailings accumulate around classifiers. These cover exposed reef areas and affect benthos in terms of both mortalities and displacement of mobile species. <50% of gravel pumped is dumped, and if located in the intertidal, can be redistributed by wave action.
If tailings mounds are positioned above the HWM, natural re-distribution by wave action cannot occur. Onshore tailings dumps may be subjected to wind erosion and/or wind driven creep, especially of the finer fractions. This can affect vegetation by inundation and sand blasting. Further, unmanaged dumps negatively affect aesthetics.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 3.2</td></tr>
<tr><td></td><td>Discharge of undersize tailings across the intertidal</td><td>Discarding undersize tailings across the intertidal has the effect of scouring the discharge area thereby affecting benthos in terms of mortalities and displacement of mobile species.
Small scale sediment plumes may be generated by discharges of undersize sediment during mining. These increase turbidity in the nearshore area and may impact algae and filter feeders by increasing light scattering, altering particle size distributions and modifying ratios of food and non-food particles. The ecological effect is limited, however, as plumes are rapidly dispersed in nearshore areas, and the high wave energy itself leads to naturally high turbidity levels.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>None</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Kelp cutting to allow access to suction hose and airlines</td><td>Kelp may need to be cut to allow safe access to inshore gravel deposits by shore-based divers and air hoses. Kelp cutting and pipe dragging through kelp beds or over inter-tidal rocks with associated fauna can directly and indirectly compromise the structure and ecological function of kelp beds and the nearshore ecosystem. Kelp itself is a major primary producer in the nearshore area and kelp beds shelter commercially important communities such as rock lobster and juveniles of other fished species as well as reducing wave energy reaching the shore. Extensive damage to kelp beds can effect these resources detrimentally.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (3) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>9 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (9)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 2.1.2 Kelp is very Seldom cut</td></tr>
<tr><td></td><td>Damage to Archaeological sites</td><td>The West Coast contains a wealth of shell middens, cave deposits, historical artefacts such as fish traps, palaeontological sites and ship wrecks. All known wrecks along the West Coast are located either on or in close proximity to the coast. It is thought that only a small proportion of shell middens have been discovered to date. All archaeological sites and ship wrecks older than 50 years are protected by law. Shore-based gravel pumping activities can potentially disturbed, damaged or destroy such sites causing loss of historical information or culturally important areas.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Residual (5) (PM-1)</td><td>12 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (12)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 6.1.1,6.1.2, 6.1.3</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Damage and/or disturbance of environmentallySensitive areas</td><td>The presence and/or expansion of shorebased mining activities can potentially damage or disturb environmentally sensitive areas and aesthetically degrade the landscape to the extent that the potential for future use by other user groups are reduced.
Coastal dune systems and coastal vegetation may be disturbed by construction and use of access roads to beaches through dunes or over vegetation.
Equipment storage sites and the human effects of trampling, uncontrolled fires and littering can lead to reduced areas of natural habitat for flora and fauna.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>High (4) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (10)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 7.2.1 And 7.2.2</td></tr>
<tr><td colspan="4">IMPACTS ON LIVING RESOURCES</td></tr>
<tr><td></td><td>Presence of mining activities</td><td>Noise generation, pollution, egg collection, disturbance of birds and seals on mainland colonies can disrupt breeding and/or feeding success. Human presence can negatively affect bird breeding areas, thereby reducing breeding success and impacting entire bird populations. Likewise, disturbance of breeding seals can lead to pup mortalities through abandonment or injury by fleeing adults.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Medium (3) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>9 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (9)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 7.1.5</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Illegal rock lobster fishing</td><td>It is alleged that the divers partake in illegal rock lobster fishing.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 7.1.2 and 7.1.3</td></tr>
<tr><td></td><td>Unintentional pumping of rock lobster</td><td>It may occasionally occur that rock lobsters are accidentally sucked up the pump nozzle. Lobsters are, however, easily able to avoid the pump nozzle, and are seldom sucked up during normal operations. Research by Barkai & Bergh (1992) suggests that over 70% of lobsters (<60mm carapace length) survive after being pumped up and passed through a classifier.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 7.1.1</td></tr>
<tr><td colspan="4">POLLUTION FROM MINING OPERATIONS</td></tr>
<tr><td>Pollution</td><td>Presence of mining activities</td><td>The development and use of access roads, the proliferation of mining sites and associated campsites, physical scarring of areas above the HWM through mining waste discharges, damage to vegetation by mining associated activities, fires, plant picking, littering and disposal of old equipment can severely degrade the coastal landscape and devalue it as a resource.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
</table></td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Generation of domestic waste and sewage</td><td>The disposal of sewage and domestic wastes on the shore, and into the sea leads to accumulating pollution of nearshore waters and beaches, resulting in aesthetic degradation of the coast. This applies particularly to small volume plastic wastes , which constitute litter if discarded anywhere outside of formal landfills.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>**Activities 5.1.1, 5.2.1 and 5.2.2**</td></tr>
<tr><td></td><td>Disposal of old equipment</td><td>Discarded suction pipes, flanges and other plant material may be hazardous to human and other traffic on the shore. Disposal of discarded mining gear physically degrades the landscape thereby devaluing coastal land for other uses. Degradation periods are long (decades).
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>Minimal (7)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Hydraulic equipment and other oils</td><td>Leakages of hydraulic fluids and oils from accidental spillages and burst hoses during mining operations could lead to pollution of the shore and contamination of the soil. Disposal of oils, hydraulic fluid and diesel from tractors, classifiers and compressors parked on the shore can lead to contamination of the soil.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activity 5.1.3</td></tr>
<tr><td colspan="4">ESTABLISHMENT OF EXCLUSION ZONES AROUND MINING OPERATIONS</td></tr>
<tr><td></td><td>Establishment of exclusion zones</td><td>There is potential for conflict with other users of marine resources (commercial and recreational fishing, kelp harvesting and tourism) and their development through limiting access to beach areas and mining sites.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
</table>
</td><td>Public has free access to the coast and mining sites</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>Minimal (7)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Road maintenance</td><td>Inadequate and unsuitable maintenance of roads and tracks will lead to destabilization of road surfaces and erosion of soils.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td colspan="4">4.5.3 DECOMMISSIONING PHASE</td></tr>
<tr><td></td><td>Seawalls and discarded overburden</td><td>Whilst fine sediment is rapidly eroded from the seawalls by wave action, the rocks and boulders used to stabilize the bases of the walls, and tailings mounds accumulated higher on the shore, remain visible for longer periods. This results in an artificial distribution of rocks and pebbles on the beach resulting in aesthetic degradation of the coast
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Local (3)
(PM- 1)</td><td>Short term (2)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT</td><td colspan="2">SIGNIFICANCE OF IMPACT</td></tr>
</table>
</td><td>Activities 4.2.2 and 4.3.1</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>(pre-mitigation)</td><td>(post-mitigation)</td></tr>
<tr><td>Minimal (7)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Disposal of old equipment</td><td>Discarded suction pipes, flanges and other plant material may be hazardous to human and other traffic on the shore. Disposal of discarded mining gear physically degrades the landscape thereby devaluing coastal land for other uses. Degradation periods are long (decades).
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activities 4.2.3, 5.1.1, 5.2.3 and 5.2.4</td></tr>
<tr><td></td><td>Vehicle & equipment storage areas</td><td>Failure to restore and rehabilitate vehicle and equipment storage areas can lead to:
• physical degradation of the landscape by scarring and destroying coastal vegetation,
• unstable surfaces and increased erosion.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td>Activity 4.3.1</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Informal roads and tracks</td><td>Inadequate restoration and/ or rehabilitation of access tracks can lead to:
• physical degradation of the landscape by scarring,
• destabilization of road surfaces and erosion of soils.
This will be further aggravated by ncreased use of the tracks by other users and members of the public.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Short term (2) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">Minimal (7)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activity 4.3.2</td></tr>
</table>

IMPACTS ASSOCIATED WITH VESSEL BASED ACTIVITIES

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td>Geology</td><td></td><td>No impact associated with sterilisation of mineral resources</td><td></td></tr>
<tr><td colspan="4">HABITAT DESTRUCTION/ REMOVAL</td></tr>
<tr><td>Vegetation and fauna</td><td>Use of underwater explosives</td><td>Subtidal habitats and biota can be impacted and altered through the use of underwater explosives to access gravel deposits.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
</table></td><td>Activities 3.1.1</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>High (42)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Relocation/removal of boulders</td><td>Movement by divers of rocks and boulders from potholes and gullies within 5-20 m depth zone may be necessary to access deeper gravel deposits. These are generally deposited in 'non-gravel' areas in piles, thereby altering substrate distributions.
Boulders piles may become unstable in high wave conditions and, through movement, crush benthos.
Stable boulder piles, on the other hand, increase habitat or cover for some benthic species such as rock lobster
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (35)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Removal/relocation of sediments</td><td>Displacement of overburden sediment from the sea bed within 5-20 m depth zone, may be necessary to access deeper gravel deposits.
Modifications to diving vessels have facilitated the development of 'blowing' techniques that wash the extensive overburden cover away from the target gravel, thereby expanding the potential mine area in the inshore zones.
The exposure of the gravel modifies substrate distributions and can influence the distribution of benthos
The 'blowing' process generates suspended sediment plumes of mainly fine – coarse sands
The displaced sediment may inundate reef areas adjacent to the 'blowing' operations
As mining removes and processes sediment., the sediment distributions are modified and disturbed
In the sediment removal process the in- and epi-fauna will also be removed. This may have knock-on effects to commercial fish resources in the nearshore areas, eg rock lobster
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>On site (2)
(PM-1)</td><td>6
(PM-3)</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td colspan="2">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>High (36)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Discard of oversize tailings by mining vessels</td><td>Although <50% of gravel pumped is dumped, coarse tailings discharged from classifiers/ screens may cover exposed reef areas and affect benthos in terms of both mortalities and displacement of mobile species
Deposited tailings could temporarily modify sediment distributions
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Local (2)
(PM-1)</td><td>8
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Discharge of fine tailings by mining vessels</td><td>Small scale sediment plumes may be generated by discharges of undersize sediment during mining/ prospecting. These increase the overall turbidity of the nearshore area and may impact both algae and filter feeders by increasing light scattering, altering particle size distributions and modifying ratios of food and non-food particles. The ecological effect is limited, however, as the high wave energy itself leads to naturally high turbidity levels, and local fauna are adapted to these conditions
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Local (2)
(PM-1)</td><td>6
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (36)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>Kelp cutting</td><td>Kelp may need to be cut to allow safe access to inshore gravel deposits by divers and air hoses. Kelp cutting and pipe dragging through kelp beds can directly and indirectly compromise the structure and ecological function of kelp beds and the nearshore ecosystem. Kelp itself is a major primary producer in the nearshore area and kelp beds shelter commercially important communities such as rock lobster and juveniles of other fished species as well as reducing wave energy reaching the shore. Extensive damage to kelp beds can effect these resources detrimentally.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Rare 2 (PM-1)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (14)</td><td colspan="2">Low (3)</td></tr>
</table></td><td></td></tr>
<tr><td colspan="4">IMPACTS ON LIVING RESOURCES</td></tr>
<tr><td>Presence of mining vessels</td><td>Noise generating activities</td><td>Noise generation, pollution, egg collection, disturbance of birds and seals on islands can disrupt breeding and/or feeding success. Human presence on islands can negatively affect bird breeding areas, thereby reducing breeding success and impacting entire bird populations. Likewise, disturbance of breeding seals can lead to pup mortalities through abandonment or injury by fleeing adults.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>Activities 7.1.4 and 7.1.5</td></tr>
<tr><td></td><td>Illegal rock lobster fishing</td><td>It is alleged that the crew of mining vessels partake in illegal rock lobster fishing
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE</td></tr>
</table></td><td></td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td></td><td></td><td>(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Rare 2 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (14)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Unintentional pumping of rock lobster</td><td>It may occasionally occur that rock lobsters are accidentally sucked up the pump nozzle. However, they tend to avoid mining areas, and are seldom seen by divers in >5m depth
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Highly unlikely 1 (PM-1)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (7)</td><td colspan="2">Low (3)</td></tr>
</table>
</td><td></td></tr>
<tr><td colspan="4">**POLLUTION FROM MINING VESSELS**</td></tr>
<tr><td>**Pollution of marine environment**</td><td>Disposal of old equipment</td><td>Discarded suction pipes, flanges and other plant material may be hazardous to human and other traffic on the shore. Disposal of discarded mining gear physically degrades the environment thereby devaluing coastal land for other uses. Degradation periods are long (decades).
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>8
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
</table>
</td><td>**Activities 3.1.3, 4.1.2 and 5.2.1**</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td>SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td>High (48)</td><td>Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Bilge water, sewage and waste disposal</td><td>The pumping of bilges, and disposal of sewage and domestic wastes into the sea leads to accumulating pollution of nearshore waters and beaches.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>8
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (40)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Use of hydraulic equipment and other oils</td><td>Chemical and oil spillages may occur during refuelling of vessels and other activities such as the use of hydraulic equipment and oils and these will also cause pollution of nearshore waters and beaches
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>On-site (2)
(PM- 1)</td><td>Life of operation (3)
(PM-1)</td><td>7
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Discharge of undersize tailings</td><td>Fine tailings from mineral processing plants are pumped into mine residue dams located above the HWM. In these dams the solids settle out and the clear seawater percolates back into the sea across the intertidal zone
If slimes dams are located near aquifers, or in areas where the water table is high, leakages into these fresh water sources may occur
If incorrectly managed, sediment overflow from slimes dams can alter the coastline topography
Wind blown sediment from slimes dams can have negative effects on vegetation downstream of the</td><td>**Activity 1.4.3**</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>plumes through salinisation of soils
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (42)</td><td colspan="2">Low (6)</td></tr>
</table></td><td></td></tr>
<tr><td>Archaeology</td><td>Damage to archaeological wreck sites</td><td>Disturbance/loss of archaeological/historical remains
All archaeological sites and ship wrecks older than 50 years are protected by law. Gravel pumping activities can potentially disturbed, damaged or destroy such sites causing loss of historical information or culturally important areas.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>National (5) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>10 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Likely 5 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (50)</td><td colspan="2">Low (6)</td></tr>
</table></td><td>**Activity 6.1.1**</td></tr>
<tr><td colspan="4">**ESTABLISHMENT OF STANDARD MARITIME SAFETY ZONES AROUND MINING OPERATIONS**</td></tr>
<tr><td></td><td>Establishment of exclusion zones</td><td>There is potential for conflict with users of marine resources (commercial and recreational fishing, kelp harvesting and tourism) and their operation and/or development through limiting access to nearshore waters due to exclusion zones around mining vessels.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2)</td><td>On-site (2)</td><td>Life of operation (3)</td><td>7</td></tr>
</table></td><td></td></tr>
</table>

Environmental Element	Activity / Aspect	Potential Impact	Management measure
		(PM-1) (PM- 1) (PM-1) (PM-3) PROBABILITY Certain 6 (PM-2) SIGNIFICANCE OF IMPACT (pre-mitigation): High (42) SIGNIFICANCE OF IMPACT (post-mitigation): Low (6)	
POLLUTION OF NEAR SHORE WATERS			
Water	Use of hydraulic equipment and other oils	Leakages of Leakages of hydraulic fluids and oils from accidental spillages and burst hoses during mining operations could lead to pollution of nearshore waters. Severity: Minimal (2) (PM-1); Spatial Scope: On-site (2) (PM- 1); Duration: Life of operation (3) (PM-1); CONSEQUENCE (sub-total): 8 (PM-3) PROBABILITY Likely 5 (PM-2) SIGNIFICANCE OF IMPACT (pre-mitigation): High (40) SIGNIFICANCE OF IMPACT (post-mitigation): Low (6)	
	Use of seawater to screen marine gravels	Seawater is used in mineral processing plants to screen the diamondiferous gravels and extract the diamonds. This seawater is pumped to the processing plant from a seawater intake on the jetty. The seawater effluent can contaminate soils and aquifers if not correctly managed and returned to the sea. Severity: Minimal (2) (PM-1); Spatial Scope: On-site (2) (PM- 1); Duration: Local (4) (PM-1); CONSEQUENCE (sub-total): 8 (PM-3) PROBABILITY Certain 6 (PM-2) SIGNIFICANCE OF IMPACT (pre-mitigation): High (40) SIGNIFICANCE OF IMPACT (post-mitigation): High (32)	

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td>FeSi loss</td><td>Excessive loss of ferrosilicon from mineral processing plants can result in elevated iron levels in discharged process water
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>On-site (2) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>7 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Low likelihood 3 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (21)</td><td colspan="2">Low (6)</td></tr>
</table></td><td></td></tr>
<tr><td></td><td>Consumption of freshwater and discharge of domestic effluents</td><td>Mining operations and the associated infrastructure consumes freshwater and may compromise quality through contamination of aquifers through domestic effluent discharges
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2) (PM-1)</td><td>Local (3) (PM- 1)</td><td>Life of operation (3) (PM-1)</td><td>8 (PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-2)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT (pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT (post-mitigation)</td></tr>
<tr><td colspan="2">High (48)</td><td colspan="2">Low (6)</td></tr>
</table></td><td></td></tr>
<tr><td colspan="4">SOCIAL AND ECONOMIC INFRASTRUCTURE</td></tr>
<tr><td></td><td>Establishment and operation of mining near towns</td><td>Through utilisation of local infrastructure and utilities and purchases of supplies and services mining contributes money to local population centres. This helps to create and/or maintain businesses and associated employment.
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE (sub-total)</td></tr>
<tr><td>Minimal (2)</td><td>Regional (4)</td><td>Residual (5)</td><td>11</td></tr>
</table></td><td>Activity 1.2.3</td></tr>
</table>

<table>
<tr><th>Environmental Element</th><th>Activity / Aspect</th><th>Potential Impact</th><th>Management measure</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>(PM-1)</td><td>(PM- 1)</td><td>(PM-1)</td><td>(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-4)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (66)</td><td colspan="2">Medium Positive (12)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Utilization of harbours and landing facilities</td><td>Mining vessels pay berthing fees that help financially sustain harbours
<table>
<tr><td>Severity</td><td>Spatial Scope</td><td>Duration</td><td>CONSEQUENCE
(sub-total)</td></tr>
<tr><td>Minimal (2)
(PM-1)</td><td>Regional (4)
(PM- 1)</td><td>Residual (5)
(PM-1)</td><td>11
(PM-3)</td></tr>
<tr><td colspan="4">PROBABILITY Certain 6 (PM-4)</td></tr>
<tr><td colspan="2">SIGNIFICANCE OF IMPACT
(pre-mitigation)</td><td colspan="2">SIGNIFICANCE OF IMPACT
(post-mitigation)</td></tr>
<tr><td colspan="2">High (66)</td><td colspan="2">Medium Positive (12)</td></tr>
</table>
</td><td></td></tr>
</table>

5.1 Assessment of Cumulative Impacts

Evaluation and monitoring of the cumulative impacts of mining are important aspects to consider. Cumulative impacts can be separated into three main categories:

- Impacts arising as a consequence of the "knock-on" effects of an activity (e.g. disturbance of seals, seabirds and terrestrial animals, effects on eco-tourism),
- Impacts resulting from multiple effects of the same activity (e.g. repetitive mining of the same bay), and
- Impacts arising due to increases of an activity on a spatial and temporal scale (e.g. increase in number of mining vessels).

Most of the incidental or "knock-on" impacts, as well as multiple effects of the same activity in the concessions under review are covered in the EIA. Management of these through mitigation and/or monitoring will be implemented as part of the EMPs, and the information forwarded to DME on a regular basis. Cumulative impacts arising due to increases in vessel-based mining on a spatial and temporal scale are, however, difficult to assess at this stage, and would require co-ordinated monitoring of biological and physical impacts by all mining companies operational along the coast. These data would then need to be analysed and the impacts assessed on a regular basis by a group of independent consultants. It has been proposed that a study on the cumulative impacts on the marine environment of over 60 years of diamond mining on the South African and Namibian west coasts form an initiative of the Benguela Current Large Marine Ecosystem programme, financed by international funding agencies.

5.2 Conclusions of this Assessment

An assessment of the interactions between diamond mining operations in concession 5(a), 6(a), 7(a), the associated surf-zone and admiralty strip concessions, and the environment, identifies the following major issues:

- Compromised water quality and sediment inundation of areas adjacent to those being mined by uncontrolled discharge and dumping of overburden at sea.
- Physical modification of the environment by removal and/ or re-distribution of boulders and sediments in nearshore areas which may directly and indirectly disturb ecological processes and/or important biological resources.

In addition, inadequate operational management may generate the following:

- Visual degradation and pollution of the environment through the dumping of solid waste (domestic waste, scrap equipment) and hazardous liquids (used
- lubrication oil, diesel) at sea and in the coastal zone.
- Disturbance to important biological communities such as kelp beds, seals, birds, whales, dolphins, and sparse west coast terrestrial fauna, and the loss of, or damage to, cultural and heritage sites, kelp beds and ecologically sensitive areas.
- Degrading and scarring of the landscape and vegetation through uncontrolled infrastructure development, increased traffic, inadequate maintenance of access roads and management of processed tailings.
- Counteracting these potentially negative interactions are the beneficial aspects of:

  ⇒ Stimulation of economic activity within the region, and the Northern Cape as a whole

  ⇒ Employment and contribution to job creation in mining for people from both local and other South African communities.

- Income tax, company tax, VAT accrual and royalty revenues that accrue to the State from remuneration to contractors and employees emanating from mining.
- Rates and taxes that accrue to local authorities in the region through the use of services and infrastructure by mining.

- The provision and improvement of infrastructure by mining that support other future-use scenarios.
- Contributions from mining to social development and upliftment.
- Advances in scientific knowledge and mining technology, and an increase in environmental awareness.

Given the limitations imposed on nearshore mining operations by the sea conditions, and the area's current low level of use, the actual and potential negative effects of the proposed operations will not be substantial if properly managed, and will be outweighed by the actual and potential benefits accruing to society. If the management procedures and guidelines contained in Section 6: Section 1 are implemented and adhered to, the negative effects should be reduced to a level acceptable to all stakeholders and interested parties.

Table of contents

Chapter 6

6 ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

The EMP describes the specific management measures for the impacts identified for the Brazil Project as described in Section 5. Table 6.1 gives the proposed management measures per the various environmental issues and impacts. Some of the management measures apply to the mitigation of more than one impact, and are therefore repeated in the subsequent sessions where they also apply. These management measures are binding on the mine and the appointed contractors and will be enforced through contract documents. The effective implementation of the EMP will be undertaken with an assistance of operations manager. These management measures will be implemented during the construction, operational, decommissioning and post-closure phases of the project.

The overall objective of all the management commitments is to comply with the relevant environmental and mining legislation in South Africa as also described under Section 7, more specifically the MPRDA.

The mitigation measures presented in Table 6.1 are divided into four categories namely:

- Benefits of the project
- Proposed management measures associated with land based operations,
- Proposed management measures associated with shore based operations and
- Proposed management measures associated with vessel based operations.

Table 6.1: Management Measures related to the Brazil operations

BENEFITS OF THE PROJECT

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1. ENVIRONMENTAL MANAGEMENT PROGRAMME PROCEDURES, COMMUNICATIONS AND SOCIAL BENEFITS	Environmental objectives are to: • Employ the EMP process so that operations are conducted in an environmentally responsible manner, • Increase understanding about potential impacts of mining operations and environmental management, • Instil in all staff and contract workers an ethic of environmental responsibility, • Maintain good relations with stakeholders on environmental matters of mutual concern, • Promote industrial relations, and otherwise contribute to socio-economic stability, and • Optimise economic benefits to people of South Africa and particularly coastal communities, where feasible.		
1.1 EMP procedure			

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1.1.1 Implementation of the environmental management	Set up and run a Company environmental management system to facilitate successful implementation of the EMP. To do this: • Develop a Company environmental policy statement	**Done (see Appendix 3)**	**Environmental Manager**
	• Define the roles and authorities of staff members (and any specialist consultants) responsible for implementation of the various facets of this EMP;	**Initiated and ongoing**	**Environmental Manager**
	• Address training needs of staff required to implement specialised aspects of the EMP;	**Initiated and ongoing**	**Operations Manager**
	• Establish liaison with marine users and government agencies to inform them of operational plans and ascertain who interested and affected parties may be that should be contacted.	**Done during this EMPR**	**Environmental Manager and Operations Manger**
	• Plan and make adequate provision for rehabilitation, restoration and reclamation activities to run concurrently with mining activities, and	**THO Rehab. Trust Fund established**	**Operations Manager**
	• Maintain records of plans, decisions, data collected, communications made, emergency responses, etc., which document the implementation of the EMP.	**At all times**	
1.1.2 EMP Performance assessments	Undertake EMP performance assessments and report results to the Director: Mineral Development as follows:	**Every 24 months**	**Environmental Manager**
	• Assess Trans Hex's progress in meeting the objectives and targets of the EMP.		
	• Where full compliance with the EMP has not been achieved Trans Hex will provide an explanation of the reasons of non-compliance, and the corrective action to be taken.		
	• Assess the applicability of actions and activities required by the EMPR, and address all new environmental issues arising from changed operations and/ or communications with interested parties, through amendments to the EMP if/ where necessary.		**Environmental**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
			Manager
1.1.3 Mine closure	When Trans Hex intends closing an operation as contemplated in the Act, a final EMP performance assessment shall be conducted and a report shall be submitted to the satisfaction of the Director: Mineral Development to ensure that: • The requirements of the relevant legislation have been complied with; • The closure objectives as described in the EMP have been met. • All residual and latent environmental impacts resulting from THO's operations have been identified, and the risks thereof occurring have been identified, quantified and arrangements for the management thereof have been finalized.	**Closure**	**Operations Manager**
1.2 External Communications & Benefits			
1.2.1 **Communications with interested parties**	• During compilation of an EMPR, or an amendment thereto, Trans Hex will consult with the following to identify their rights and/ or other legitimate interests: • Government departments with jurisdiction over resources or activities in the concession area(s) and/or in adjoining areas, and any others specified by the Director, Mineral Development, DMR. • Those persons with access and user rights within the concession area(s). • All immediate neighbours (concession holders, land owners and users). • Representatives of any other interest group specified by the Director, Mineral Development, DMR.	**Done as part of this EMPR - commenced** **February 2009**	**Environmental Manager**
	• Keep a record of all communications with interested parties, the points raised, and how these points have been addressed.	**At all times**	**Environmental Manager**
	• As necessary, request participation in any relevant communication/ liaison forum to resolve conflict or share information and co-operate with other I&APs.	**At all times**	**Operations Manager**
	• Communicate the requirements for applications for a mining contract to local communities.	**As part of this EMP**	**Operations Manager**
	• Where feasible, comply with the local development objectives, spatial development framework and integrated development planning of the municipality, and promote co-	**At all times**	**Operations**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	operative governance and integrated decision making		Manager
1.2.2 Notification to DMR of intention to start or stop mining	• Notify the Director: Mineral Development of DME in writing, at least 14 days in advance of any commencement or cessation of activities, and provide particulars regarding the location, nature and extent of such operations.	At all times	Operations Manager
1.2.3 Contributions to local economies	Use local South African suppliers of goods and services where economically feasible: • Include local service providers in the tendering process for supplies and services. • Give hiring priority to suitably qualified or experienced local South African citizens, as positions become available.	Part of Trans Hex company Policy	Operations Manager
1.2.4 Communications & undertaking joint projects with other marine operators & managers	Co-operate with joint diamond mining monitoring and research projects implemented and co-ordinated by the MDMA.	Part of Trans Hex company policy	Operations manager
1.3 Internal Communications & Benefits			
1.3.1 Internal communication about the EMP	• All personnel will be made aware of the contents of Trans Hex's Environmental Policy Statement in which the required positive attitude towards the environment is accentuated; • All personnel who are in a position to make decisions or take actions that will influence environmental protection and management will be made aware of the contents, and their respective responsibilities for implementation, of the EMP.	Upon acceptance of EMP	Operations Manager
1.3.2 Role of the persons involved in environmental management	• Specify the job description & responsibilities of persons involved in environmental management.	Upon employment & when responsibilities change	Environmental Manager
1.3.3 Instructions to all staff, including	• Provide instructions and appropriate training to all staff about aspects of the EMP that effect their specific work, including oil pollution prevention and clean-up, general waste management, construction of seawalls, use of access roads, protection of natural resources	Already incorporated into	Environmental Manager

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
contractors & skippers	and rehabilitation, dumping and removal of tailings. • Incorporate environmental factors into contracts, job descriptions & performance appraisals to improve environmental awareness and performance.	**existing contracts**	

PROPOSED MANAGEMENT MEASURES ASSOCIATED WITH LAND BASED OPERATIONS

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1. ALL CONSTRUCTION ACTIVITIES			
1.1 Geology	**Avoid the sterilisation of future resources** • No dumping of materials prior to approval by exploration geologist and ECO	**During construction**	**Operations manager**
1.2 Topography	**Minimise the impact of topographically impacting features** • Prominent natural features will not be disturbed • All temporary infrastructure will be demolished during closure. Waste will be disposed of at Municipal waste disposal site. All disturbed areas will be cleaned and rehabilitated	**Operation & decommissioning**	**Operations manager & Metallurgists**
1.3 Soils	**To avoid and where not possible, minimise the loss/disturbance of soil, to store and handle soils as to prevent contamination and erosion and to maximise use in rehabilitation** • All temporary infrastructure will be demolished during closure. Waste will be disposed off at Trans Hex's De Punt waste disposal site or Port Nolloth municipal landfill site. Agreement to use this site will be sought from the municipality if their site will be used. All disturbed areas will be cleaned and rehabilitated; • The earth walls of the slimes dam impoundments and discard dumps will be grassed during on an ongoing basis. Details of rehabilitation are provided in Section 11.2.1. • Topsoil will be stripped prior to placement of infrastructure, as well as excavating mine pits. Topsoil will be stripped according the soil type and the available soil depth in the areas to be disturbed	**Ongoing**	**Operations manager, Earth moving manager, Plant & maintenance Superintendent & Mechanics**
	• Soil will be stockpiled in windrows not higher than 2m with as little compaction as possible. Stockpiling will be done as close as possible to areas where the soils will be replaced and single handling practiced. Soil stockpiles will be kept in a weed-free condition. Stockpiled soil will be used in ongoing rehabilitation of disturbed areas. Rehabilitation will include: • removing of all debris, • replacement of soil with as little compaction as possible, • reshaping, ploughing or ripping to break compaction, and		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• introduction of organic matter as necessary;		
	• Soil contamination will be prevented through; • bunding of all above-ground storage facilities • (construction on impervious floors) for hazardous substances such as diesel, oil and chemicals, and regular inspection of equipment and vehicles for leaks.		
	• Spillages of oil, grease and hydraulic fluids will be reported. The spillages will be cleaned up by removing the soil and disposing such soil in a waste receptacle called soil farm. A dedicated engineer will be appointed to oversee the soil farm		
	• Contractors, staff and drivers will be trained on how to deal with spillage of slimes, hydrocarbons and other potential contaminants		
	• All domestic and industrial waste generated on site will be contained in skips and appropriate receptacles, collected and if required sorted by the approved contractor, and removed to approved De Punt Mine disposal site.		
	• Linear infrastructure such as roads and pipelines will be inspected at least monthly to check that the associated water management infrastructure is effective in controlling erosion.		
	• All surface water management infrastructure constructed from soil (berms, canals and bunds) will be inspected at least monthly, with more frequent inspections during periods of high rainfall and after major rainfall events		
	• The disturbed areas will be rehabilitated to arable potential and slope gradients will not exceed 5% and appropriate erosion control measures will be implemented. After the overburden have been placed back in the mined open pits, the topsoil/subsoil dumps will be replaced for rehabilitation and re-vegetation purposes. The new ground will then be treated in a conventional agricultural way by fertilising, liming and sowing the pastures.		
1.4 Land capability	**To minimise the negative impacts on land capability** • All construction activities to be restricted within the demarcated areas	**Operation & decommissioning**	**Operations manager & Metallurgists**
	• Surface agreement to be signed with land owners		
	• Check, service and maintain construction vehicles and equipment to minimise the risk of hydrocarbon and chemical leakages and spillages; and		
	• Formulate and implement a waste management plan.		
1.5 Land use	**To reduce negative impacts on land use.** • Should the buildings at Brazil be utilised as a guesthouse an environmental	**Same as land capability**	

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	authorisation in terms of NEMA will have to be sought. • Restrict construction activities to demarcated areas and consider all other areas as no-go areas to minimise loss of arable and land • Strip and stockpile topsoil for rehabilitation purposes • Sign surface agreements with land owners prior to the commencing of construction activities; and • Ensure that land which is not used during construction is made available for farming or grazing. **To mitigate negative impacts on faunal species.** • Service and maintain construction vehicles in order to reduce noise emissions; • Implement a biodiversity monitoring plan, • Avoid sensitive areas, such as pans and streams banks-no infrastructure within 100 m of any road or water course.		**Capability**
1.6 Flora	**To minimise negative impacts on flora.** • Educate employees, contractors and visitors on biodiversity and land management principles; and	**Construction, operation, decommissioning**	**Operations manager & manager Engineering services**
1.7 Ground water	• Implement waste management plan for handling hazardous waste	**Ongoing**	**Operations manager, Water supply manager: Engineering services**
1.8 Air quality	**To minimise negative impacts on air quality** • Minimise removal of vegetation and movement of construction vehicles and equipment;	**Ongoing**	**Operations manager, Metallurgist, manager: Engineering services**
1.9 Noise	**To minimise increases in ambient noise levels** • Restrict construction activities to daytime unless agreements are obtained from landowners to do 24 hr operation • Maintain a noise buffer zone between mining operations (source) and noise sensitive	**Ongoing**	**Operations manager, Engineering services**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	areas (receptors); • Utilise screening mounds and fences or berms • Place a screen between the source and the receptor, particularly for stationary equipment or in areas of continuous noise • Point source of noise away from residential community • Service construction vehicles and equipment on a regular basis to ensure noise suppression mechanisms are functioning; • Adhere to speed limits such as 40 km/hr fro construction sites • Construct enclosures/bunds and berms for pumps, generators and other noise-generating equipment • Equip vehicles with noise silencers • Switch equipment off when not in use • Demarcate and clearly mark noise zones • Adhere to occupation health and safety noise limits • Maintain occupational noise monitoring to determine noise levels from equipment as increased noise may indicate other issues. A noise monitoring programme and grievance procedure must be implemented before construction begins and should be continued throughout construction, operation and closure.		
1.10 Visual	**To minimise visual impacts due to construction activities** • Use natural colour tones for structures, roofs of buildings will be angled so as to not reflect sunlight and night lighting will be minimised; • Carry adjustments to the siting and design of the project, the careful selection of finishes and colours, the use of earthworks (such as berms) and planting to provide visual screening, as well as dust control where required. Penalties for non-compliance should be considered • Screen the site from the surrounding areas by planting fast growing indigenous trees • Avoid up-lighting of structures, but rather direct the light downwards • Utilize light sources of minimum intensity necessary to accomplish the light's purpose. • Turn lights off using a timer or occupancy sensor or manually when not needed • Improve lighting fixtures, so that they direct their light more accurately towards where it is needed, and with less side effects. • Both on-site and off-site landscape rehabilitation of areas affected by the project	**Operation and decommissioning**	**Operations manager & Exploration manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	should be considered...This may include re-instating landforms and natural vegetation, provision of landscaped open space, or other agreed upon facilities.		
1.11 Sensitive areas	**To minimise negative impacts on sensitive areas**	**Operation & decommissioning**	**Operations manager**
	• Avoid all identified wetlands and ensure that no activities take place within wetland areas;		
	• Construct catchment dams in areas that drain towards streams and wetlands, in order to contain dirty water and reduce impacts on wetlands;		
	• Conduct monitoring programme for water, soil and biodiversity		
	• Plan and manage activities as to ensure that the catchment size will not be reduced dramatically;		
	• Introduce a hydrocarbon management system to ensure that hydrocarbon pollution is minimised		
	• Commence with construction during the low flow or during low rainfall in the wet season;		
	• Ensure that infrastructure is constructed outside the 100 year floodline and or within 100m from streams and pans in order to minimise impacts on water courses		
	• Comply with Regulation 704 of the National Water Act of 1998 for all designs of mine residue disposal infrastructure and pollution containment dams		
	• Minimise the removal of vegetation during stripping and dump construction.		
ACCESS ROADS			

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1.12 Traffic and safety	**To reduce negative impacts of increased traffic on and around the site.** • Allocate and adhere to speed limits; • Restrict traffic to demarcated areas; • Public to be given right of • way on public roads and • truck contractors shall make • use of approved methods to control the movement of vehicles so as not to constitute a road hazard;	Ongoing	**Operations manager**
	• Erect safety signs in the local languages to warn people of the danger on roads; • Keep in constant liaison with the local Department of Roads who will need to be aware of any proposed road plans and who may be able to assist in terms of making recommendations and road maintenance; • Ensure that site access points are clearly visible from the main road; • Ensure that all drivers employed are certified with appropriate training levels for the required vehicle; and • Ensure that all vehicles entering and leaving the site use demarcated routes.		
1.13 Use of existing roads	• Use existing provincial and proclaimed roads when transporting gravel from the • offloading facilities to the gravel processing facilities at Port Nolloth.	**Incorporated in this EMP**	**Operations manager & Contractors**
1.14Road maintenance	• Ensure that all regularly used informal roads have acceptable surfaces, are free from erosion, and have effective drainage.	**Existing company policy**	**Operations Manager**
1.15 Sourcing material for road maintenance	• Obtain permission from the landowner about using existing borrow-pits. • Implement all required safety measures when collecting road construction material and during transport thereof.	**Part of Trans Hex company policy**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
2. Infrastructure construction			
2.1 Topography	**To reduce negative impacts on topography**	**Ongoing**	**Operations manager**
	• Engineer and environmental consultant should supervise construction activities in accordance with post mining topographical plan.		
2.2 Land capability	• Plan construction activities to prevent the incorrect stripping of topsoil that leads to the reduction in land capability.	**Ongoing**	**Operations manager**
	• Restrict construction activities to demarcated areas.		
2.3 Soils	**To minimise negative impacts on soils**	**Ongoing**	**Operations manager**
	• Utilise construction vehicles and equipment that will minimise soil compaction.		
	• Restrict construction vehicles and equipment to demarcated area.		
	• Check, service and maintain construction vehicles and equipment to reduce the risk of hydrocarbon and chemical leakages and spillages, thereby contaminating the soil.		
	• Design and incident register for reporting pollution incidents promptly		
	• Remove contaminated soil and decontaminate and rehabilitate the affected area		
	• Stockpile stripped soil for later use in rehabilitation of the area		
	• Stockpile soil in windrows not higher than 2 m with as little compaction as possible. Stockpile as close as possible to areas where the soils will be replaced and single handling should be practiced where possible.		
	• Keep stockpiles in a weed-free condition.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Use stockpiled soil in construction of the earth walls or in ongoing reinstatement of disturbed areas. Reinstatement will include the removing of all debris, replacement of soil with as little compaction as possible, reshaping, ploughing or ripping to break compaction and introduction of organic matter as necessary.		
	• Locate stockpiles in locations to allow for optimal use during rehabilitation.		
2.4 Air quality	**To minimise negative impacts on air quality**	**Ongoing**	**Operations manager**
	• Minimise the removal of vegetation		
2.5 Surface water	**To minimize negative impacts on surface water**	**Ongoing**	**Operations manager**
	• Introduce a hydrocarbon management system;		
	• Handle and store chemicals and the relevant SANS codes, thereby minimising the risk of leakages and spillages; • Avoid contamination through bunding of all above-ground storage facilities (to be construction on impervious floors) for hazardous substances such as diesel, oil and chemicals, and regular inspection of equipment and vehicles for leaks.		
	• Inspect linear infrastructure such as roads and pipelines at least monthly to check that the associated water management infrastructure is effective in controlling erosion. • Inspect all surface water management infrastructure constructed from soil (berms, canals and bunds) will be inspected at least monthly, with more frequent inspections during periods of high rainfall and after major rainfall events.		
	• Keep construction activities away from 100m from any water courses and 1: 00 yr floodlines		
	• Stabilise soil stockpiles with vegetation to reduce erosion and siltation into streams and dams		
	• Minimise the removal of vegetation in order to reduce exposure to erosion and minimise the effects of silt loading of surface water running over exposed soil		
	• Construct soil berms where necessary.		
2.6 Groundwater	**To minimise negative impacts on groundwater quality**	**Ongoing**	**Operations manager**
	• Check, service and maintain construction vehicles and equipment used during		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	infrastructure construction to reduce the risk of hydrocarbon and chemical leakages and spillages • Contain and remediate hydrocarbon or chemical leakages and spillages to prevent leaching into the groundwater; • Develop an emergency spill response plan and train all construction contractors in the emergency spill response procedure; and • Minimise the removal of vegetation during stripping and dump construction, in order to mitigate negative impacts on the groundwater recharge rate.		
3. Vegetation clearing during construction of infrastructure			
3.1 Flora	**To minimise negative impacts on flora** • Ensure that vegetation is not unnecessarily removed; • Remove with care and relocate Red Data List species to avoid destruction; and • Manage and control plan species declared as invasive and declared weeds through appropriate mechanisms.	**Construction**	**Operations manager**
3.2 Fauna	**To minimise negative impacts on fauna** • Avoid the unnecessary removal of vegetation; and • Monitor changes in habitats.	**Construction**	**Operations manager**
3.3 Air quality	**To minimise negative impacts on air quality** • Minimise the removal of vegetation in order to reduce the possibility of dust pollution.	**Construction**	**Operations manager**
4 Topsoil removal, stockpiling, overburden stripping and dump construction			
4.1 Topography	**To reduce negative impacts on topography** • Engineer and environmental consultant should supervise construction activities in accordance with post mining topographical plan.	**Construction**	**Operations manager/Environmental coordinator**
4.2 Land capability	**To minimise the negative impacts on land capability**	**Construction**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Restrict all construction activities to demarcated areas.		
4.3 Soils	To minimise negative impacts on soils. • Vegetate soil stockpiles and berms to minimise the risk of erosion; • Implement erosion control measures, such as contour banks in area prone to erosion, including slopes and uneven ground; • Vegetate preferential flow paths of storm water runoff • Remove soils in dryer months, due to their increased susceptibility to compaction and erosion during rains • Separate topsoil (A horixon) and sub-soils (B horizon) where possible and stockpile separately; • Construct berms around soil stockpiles in order to divert water away from the stockpile to prevent erosion • Restrict stockpile height to less than 3m and shape to reduce soil compaction.	**Construction**	**Operations manager**
4.4 Air quality	**Minimise the removal of topsoil in order to reduce dust and particulate emissions** • Vegetate topsoil stockpiles as soon as possible to reduce dust and particulate emissions; and • Locate topsoil stockpiles in order to reduce its exposure to wind, thereby reducing the likelihood of particle entrainment.	**Construction**	**Operations manager & Contractors**
4.5 Flora	To minimise negative impacts on flora. • Plan and construct strip areas carefully to minimise the impact on flora species	**Construction**	**Operations manager**
4.6 Fauna	To minimise negative impacts on fauna. • Avoid the unnecessary removal of vegetation • Monitor changes in habitats.	**Construction**	**Operations manager**
4.7 Visual	To minimise visual impacts. • Vegetate topsoil stockpiles as soon as possible so as to minimise their visual impact.	**Construction**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
5. Blasting and drilling			
5.1 Topography	To reduce negative impacts on topography. • Rehabilitated according to post mining topographical plan.	**Operation**	**Operations manager**
5.2 Flora	• To minimise negative impacts on flora • Plan and construct strip areas carefully to minimise the impact on flora species.	**Operation**	**Operations manager**
	• Limit as far as is practical, the area of land disturbed and isolated for the purpose of construction, mining and processing activities, to the minimum required for safe and efficient operation.		
	• No unnecessary destruction of vegetation will be allowed and, in particular, construction workers will not be allowed to harvest any trees for sue of firewood or any other purpose.		
	• On completion of the construction phase, disturbed areas will be graded and topsoiled. The topsoiled areas will then be re-vegetated using indigenous pasture species. In general, re-vegetation will be undertaken using a mixture of commercially available seeds that will germinate reliably (high seed viability). The species used will be selected on the basis of their ability to bind and cover soil (to afford effective erosion protection) and their tolerance of the prevailing environmental conditions.		
	• A number of different methods of re-vegetation are available (e.g. hydroseeding, hand seeding and hand sowing) and an appropriate method will be selected.		
	• Following re-vegetation the site will be monitored and maintained until a sound cover that will prevent erosion has been achieved. The monitoring and control of alien invasive species will be very important on all rehabilitated areas. A photographic record of all areas before and after disturbance will be kept, to check the success of rehabilitation.		
5.3 Noise	To minimise increases in ambient noise levels • Restrict construction activities to normal working hours	**Operation**	**Operations manager & Contractors**
	• Maintain a noise buffer zone between mining operations (source) and noise sensitive areas (receptors);		
	• Utilise screening mounds and fences or berms		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Place a screen between the source and the receptor, particularly for stationary equipment or in areas of continuous noise		
	• Point source of noise away from residential areas or affected parties		
	• Switch equipment off when not in use;		
	• Demarcate and clearly mark noise zones;		
	• Train workers in safety and the use of personal protective equipment to prevent damage to their hearing; and		
	• Maintain occupational noise monitoring to determine noise levels from equipment as increased noise may indicate other issues. A noise monitoring programme and grievance procedure must be implemented before construction begins and should be continued throughout construction, operation and closure.		
5. 4 Air quality	To minimise negative impacts on air quality • Drilling and blasting will be monitored for dust pollution, and managed accordingly.	**Operation**	**Operations manager & Contractors**
6. Construction vehicles			
6.1 Soils	To minimise negative impacts on soils. • Check, services and maintain construction vehicles and equipment to reduce the risk of hydrocarbon and chemical leakages and spillages, thereby contaminating the soil;	**Construction**	**Operations manager**
	• Report leakages and accidental spillages immediately; and		
	• Remove contaminated soil and rehabilitate the affected area.		
6.2 Flora	To minimise negative impacts on flora. • Restrict vehicles to road and demarcated areas to prevent damage to vegetation.	**Construction**	**Operations manager**
	• Report and remediate any accidental hydrocarbon soil contamination to prevent damage to vegetation.		
6.3 Surface water	To minimise negative impacts on surface water quality. • Introduce a hydrocarbon management system;	**Construction**	**Operations manager**
	• Handle and store chemicals and hydrocarbons in accordance with applicable legislation and the relevant SANS codes, thereby minimising the risk of leakages and spillages; and		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Ensure that construction activities are at least 100m from wetlands and floodlines.		
6.4 Groundwater	To minimise negative impacts on groundwater quality • Check, service and maintain construction vehicles and equipment used during infrastructure construction to reduce the risk of hydrocarbon and chemical leakages and spillages;	**Construction**	**Operations manager**
	• Contain and remediate hydrocarbon or chemical leakages and spillages to prevent leaching into the groundwater; and		
	• Develop an emergency spill response plan and train all construction contractors in the emergency spill response procedure.		
6.5 Noise	To minimise increases in ambient noise levels. • Restrict construction activities to normal working hours;	**Construction**	**Operations manager**
	• Maintain a noise buffer zone between mining operations (source) and noise sensitive areas (receptors);		
	• Utilise screening mounds and fences or berms;		
	• Service construction vehicles and equipment on a regular basis to ensure noise suppression mechanisms are functioning;		
	• Limit the speed of vehicles to 40km/h;		
	• Train wokers in safety and the use of personal protective equipment to prevent damage to their hearing; and		
	• Maintain occupational noise monitoring to determine noise levels from equipment as increased noise may indicate other issues. A noise monitoring programme and grievance procedure must be implemented before construction begins and should be continued throughout construction, operation and closure.		
6.6 Air quality	To minimise negative impacts on air quality.	**Construction**	**Operations manager**
	• Service, inspect and maintain construction vehicles to minimise the amount of greenhouse being emitted;		
	• Limit the speed of vehicles on haul roads to <40km/h to reduce dust liberation; and		
	• Minimise movement of vehicles to reduce the amount of dust emissions.		
	• Storage areas and vehicles maintenance areas will have appropriate containment measures in place for all three areas, including bunds, concrete, canals, collector drains and interception trenches.		
	• An emergency management system will be implemented, including procedures and		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	training for dealing with incidents.		
	• Appropriate remedial measures will be implemented to deal with incidents of spillages.		
	• Watering of unpaved roads with high traffic volumes on a regular basis and the sweepi8ng of the paved roads at specific areas i.e. intersections with unpaved roads. Should watering of the roads not be a feasible option due to the shortage of water in the area it is recommended that the unpaved roads should be covered in a layer or chemically treated with a dust suppressant. The objective of these measures is to reduce the emissions form the road network by approximately 60% by reducing the silt loading of the road.		
	• The regular sweeping of the haul roads used by the trucks transporting slag is recommended. Spillage of the slag material roads adds to the silt loading and is potentially dangerous for motorists using these roads. The crystalline nature of the slag can cause uncontrolled braking and loss of control of vehicles. This problem has been experienced on other mines where slag reprocessing has been undertaken.		
7. Storage and disposal of waste and hazardous materials			
7.1 Soils	To minimise negative impacts on soils • Dispose of domestic and hazardous waste originating form temporary and permanent offices and workshops at an authorised landfill facility to minimise the risk of soil contamination;	**Construction**	**Operations manager**
	• Make use of portable chemical latrines to handle sewerage, until such time as more permanent facilities have been constructed. Chemical latrines should be services by an outside contractor in accordance with local by-laws. Depending on the number of persons utilising change-house facilities during the surface operational phase, a decision will be made on the construction of appropriate sewerage handling facility. The use of an activated sludge plant is typically indicated where it has to service more than 300 persons. If the decision is made to utilise a septic tank and french drain system, the implementation should take cognisance of the potential to impact on domestic and farming water boreholes; and		
	• Dispose of hazardous waste and effluent at an authorised landfill facility.		
7.2 Fauna	To minimise negative impacts on fauna. • Prevent disposal of waste in non-designated areas and the reputable clearing and disposal of any such waste, as these can cause harm to animals, particularly	**Operation**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	poisonous wastes and plastics.		
7.3 Flora	To minimise negative impacts on flora. • Prevent disposal of waste in non-designated areas and the reputable clearing and disposal of any such waste, as these can cause harm to vegetation, particularly poisonous wastes and plastics.	**Operation**	**Operations manager**
7.4 Surface water	To minimise negative impacts on surface water quality. • Dispose of domestic and hazardous waste originating form temporary and permanent offices and workshops at an authorised landfill facility to minimise the risk of surface water pollution; • Make use of portable chemical latrines to handle sewerage, until such time as more permanent facilities have been constructed. Chemical latrines should be services by an outside contractor in accordance with local by-laws. Depending on the number of person utilising change-house facilities during the surface operational phase, a decision will be made on the construction of appropriate sewerage handling facility. The use of an activated sludge plant is typically indicated where it has to service more than 300 persons. • Dispose of hazardous waste and effluent at an authorised landfill facility.	**Operation**	**Operations manager**
7.5 Groundwater	To minimise negative impacts on groundwater quality • Dispose of domestic and hazardous waste originating from temporary and permanent offices and workshops at an authorised landfill facility to minimise the risk of groundwater pollution; • Make use of portable chemical latrines to handle sewerage, until such time as more permanent facilities have been constructed. Chemical latrines should be serviced by an outside contractor in accordance with local by-laws. Depending on the number of persons utilising change-house facilities during the surface operational phase, a decision will be made on the construction of appropriate sewerage handling facility. The use of an activated sludge plant is typically indicated where it has to service more than 300 persons. If the decision is made to utilise a septic tank and fench drain system, the implementation should take cognisance of the potential to impact on domestic and farming water boreholes; and • Dispose of hazardous waste and effluent at an authorised landfill facility.	**Operation**	**Operations manager**
8. Underground sanitation			

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
8.1 Groundwater	To minimise release of effluent and seepage • Keep sewage in a closed circuit for recycling to metallurgical plant and underground.	**Operation**	**Operations Manager**
8.2 Surface water	**To minimise negative impacts on surface water quality.** • Systems to separate clean and dirty water will be installed and maintained for all new infrastructure		
	• Clean storm water will be diverted around possible pollution sources and released into its catchment. Polluted water (effluent and contaminated runoff) will be contained within the mine infrastructure to be re-used, treated or evaporated		
	• Practice good housekeeping practices and these should be implemented (plant area – washing, spillage prevention, spillage clean-up, bunding, storage etc.)		
	• Any incidents will be reported as soon as possible. Measures will be put in place to prevent similar incidences from occurring. If necessary, remediation of any contamination will be carried out.		
	• Mine surface infrastructure will be maintained. This involves the regular cleaning of trenches, piping etc to maintain effectiveness.		
	• Recycling and re-use of water will be optimised and pollution of water will be minimised.		
8.3 Groundwater	• To minimise negative impacts on groundwater quality due to contaminated inflows into the workings • Divert clean water flow around dirty water areas towards the stream;		
	• Check, service and maintain construction vehicles and equipment used during infrastructure construction to reduce the risk of hydrocarbon and chemical leakages and spillages;	**Operation**	**Operations manager**
	• Contain and remediate hydrocarbon or chemical leakages and spillages to prevent leaching into the groundwater;		
	• Develop an emergency spill response plan and train all construction contractors in the emergency spill response procedure; and		
	• Spillages of ammonium nitrate-based explosives used for blasting will be monitored, remediated and managed to minimise the potential from groundwater pollution.		
8.4 Noise	To minimise increases in ambient noise levels. • Restrict construction activities to normal working hours;		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Maintain a noise buffer zone between mining operations (source) and noise sensitive areas (receptors);		
	• Utilise screening mounds and fences or berms;		
	• Place a screen between the source and the receptor, particularly for stationary equipment or in areas of continuous noise;		
	• Point source of noise away from affected parties;		
	• Demarcate and clearly mark noise zones;		
	• Train workers in safety and the use of personal protective equipment to prevent damage to their hearing; and		
	• Maintain occupational noise monitoring to determine noise levels from equipment as increased noise may indicate other issues. A noise monitoring programme and grievance procedure must be implemented before construction begins and should be continue throughout construction, operation and closure.		
	• Restrict construction vehicles and equipment to demarcated area;		
	• Check, service and maintain construction vehicles and equipment to reduce the risk of hydrocarbon and chemical leakages and spillages, thereby contaminating the soil;		
	• Report leakages and accidental spillages immediately;		
	• Remove contaminated soil and rehabilitate the affected area;		
	• Stockpile stripped soil for later use in rehabilitation of the are; and		
	• Locate stockpiles in locations to allow for optimal use during rehabilitation.		
	• Contain and remediate hydrocarbon or chemical leakages and spillages to prevent leaching into the groundwater; and		
	• Develop an emergency spill response plan and train all construction contractors in the emergency spill response procedure		
	• Spray road surfaces with water and treat it with a dust binding agent to minimise emissions of fugitive dust. The type of dust-binding agent should determine the amount of watering, but allowance will be made for sufficient road spraying; and		
	• Construct, if possible, the haul roads in such a way that the prevailing wind direction cuts across and does not blow along them.		
9. All construction activities			

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
9.1 Socio-economic	To minimise negative and enhance positive impacts on employment • Where possible local service providers and workers will be recruited from the local area to increase employment opportunities during the construction phase	**Construction**	**Operations manager, Human resources manager, Stakeholder liaison manager**
	• The loss of jobs resulting from the loss of farming activities is expected to be minimal and will be managed by the affected farmer;		
	• Ad-hoc, informal recruitment at the gate or through other unapproved channels by setting up recruitment stands in built up areas should be prohibited;		
	• A skills audit should also be undertaken to determine local skills available;		
	• HIV/AIDS awareness programmes/ Voluntary Counselling & Testing Program should be introduced;		
	• Relationships with local government through LED programmes should be developed;		
	• Stakeholder database should be established to identify partners and develop collaborative networks;		
	• Adequate sanitation and		
	• waste services should be provided;		
	• Uncontrolled settlement of contractors outside of the site should be prevented;		
	• The recruitment selection process to promote gender equality and the employment of women wherever possible; and		
	• Oversee the implementation of the Grievance Resolution procedure and receive and sign-off grievances after following the procedure.		
9.2 Interested and affected parties	To minimise negative impacts on safety of residents. • Contractors and mine employees will be made aware that trespassing on private land is an offence. Fencing around the mine to be implemented and incidents reported		
10. All construction activities			
10.1 Heritage resources	To minimise disturbance of or damage to heritage resources. • Issues relating to the removal of graves, access to grave and damage to graves will be handled by the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage resources authority. They will issue permits to ensure that all actions are legal;	**Construction**	**Operations manager, Human resources manager, Stakeholder liaison manager**
	• Should heritage resources be found, a buffer zone should be established;		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• The mine should provide easy and safe access for relatives to the grave yards; and • In the event of an archaeological artefact being unearthed, an accredited archaeologist will inspect the site and make recommendations.		
11. All prospecting activities			
11.1 Fauna	To minimise negative impacts on fauna. • Prevent, as far as possible, any pollution of water, soil and vegetation which can cause harm to aquatic invertebrates and other form of animal life; • Implement a bio-monitoring programme to identify trends of the systems; • Implement and update the Environmental Awareness Plan regularly. This plan relates to biodiversity and land management principles; and	**Operation**	**Operations manager**
11.2 Land Use	To reduce negative impacts on land use. • All temporary infrastructure will be demolished during closure, waste disposed off at a De Punt landfill site and all disturbed areas reinstated and rehabilitated		
11.3 Flora	To minimise negative impacts on flora. • Implement and update the Environmental Awareness Plan regularly. This plan relates to biodiversity and land management principles; • Incorporate an alien invasive eradication and control programme into the rehabilitation efforts. This programme should be formulated according to relevant legislation		
11.4 Surface water	To minimise negative impacts on surface water quality. • Introduce a hydrocarbon management system • Handle and store chemicals and hydrocarbons in accordance with applicable legislation and the relevant SANS codes, thereby minimising the risk of leakages and spillages; • Ensure that construction activities are at least 100m from wetlands and floodlines; • Stabilise soil stockpiles with vegetation to reduce erosion and siltation into streams and dams;	**Operation**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Minimise the removal of vegetation in order to reduce exposure to erosion and minimise the effects of silt loading of surface water running over exposed soil; and • Construct soil berms where necessary.		
11.5 Groundwater	To minimise negative impacts on groundwater quality. • Check, service and maintain construction vehicles and equipment used during infrastructure construction to reduce the risk of hydrocarbon and chemical leakages and spillages; • Contain and remediate hydrocarbon or chemical leakages and spillages to prevent leaching into the groundwater; and • Develop an emergency spill response plan and train all construction contractors in the emergency spill response procedure.	**Operation**	**Operations manager**
11.6 Noise	To minimise increases in ambient noise levels. • Restrict mining activities to normal working hours to reduce the impact of unwanted noise; • Monitor occupational noise to determine noise levels from equipment, as increased noise levels may indicate other issues; • Reduce the noise at the source if possible and consider use of silencers on vehicles; • Fit mining equipment with standard silencing systems to limit noise production; • Maintain silencing systems as specified by the original equipment manufacturer (OEM); • Construct physical noise • control structures to reduce the impact of noise on receptor. This includes the construction of berms around noise-production equipment; and • Implement a noise monitoring programme and grievance procedure throughout the operational phase.	**Operation**	**Operations manager**
11.7 Air quality	To minimise negative impacts on air quality. • Install surface fans will to release dust, blasting flumes and combustion gases from underground; and • Monitor dust and PM10 throughout the operational phase	**Operation**	**Operations manager**
11.8 Visual	To minimise visual impacts due to construction activities.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Avoid up-lighting of structures, but rather direct the light downwards		
11.9 Sensitive areas	To minimise negative impacts on sensitive areas. • Avoid all identified wetlands and ensure that no activities take place within wetland areas. If anticipated impacts occur, a rehabilitation plan should be implemented;		
	• Construct catchment dams in areas that drain towards streams and wetlands, in order to contain dirty water and reduce impacts on wetlands;		
	• Initiate a monitoring programme for water, soil and biodiversity;		
	• Plan and manage activities as to ensure that the catchment size will not be reduced dramatically;		
	• Introduce a hydrocarbon management system to ensure that hydrocarbon pollution is minimised;		
	• Ensure that mining does not take place outside the 100 year floodline. A buffer zone of 100m is recommended from streams and pans in order to minimise impacts on wetlands and streams;		
	• Comply with Regulation 704 of the National Water Act;		
	• Minimise the removal of vegetation during stripping and dump construction;		
	• Obtain permission from DWA before the undermining of streams;		
	• Use necessary safety factors		
	• where streams occur above underground mining; and		
	• Monitor and check for subsidence and the mergence of acid mine drainage through water decants		
	• Stockpile any overburden and soil that is removed and use as backfill for mined-out areas.		
	• Landscaping will under to reduce slope to stable gradients of no more than 1:5.		
12. Storage and disposal of waste and hazardous material			
12.1 Groundwater	To minimise negative impacts on groundwater quality • Dispose of domestic and hazardous waste originating from offices and workshops at an authorised landfill facility to minimise the risk of ground water pollution.	**Operation**	**Operations manager**
13. All activities			

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
13.1 Housing	To reduce negative impacts on housing • Potential effects of blasting operations on housing infrastructure should be monitored by recording the structural integrity of buildings before mining commences, monitoring vibration with all blasts and investigating claims relating to damage caused by blasting. Decisions on compensation for or remediation of the effects of blasting should be made on a case-by-case basis.	**Ongoing**	**Operations manager & Stakeholder liaison manager**
	• It is envisaged that, through the housing subsidy, some of the housing challenges may be mitigated, since others will be able to rent houses for temporary occupation for the duration of the mine and some locals will obtain income through the improvement of their properties and have them leased for the duration of the mine. This will eventually improve the financial incomes and housing systems of		
13.2 Local infrastructure requirements	To bring positive change to local infrastructure requirements • The possible local water projects support by the mine would possibly enhance the local municipality attempts to increase development and support to the neighbouring community regarding additional water demand	**Ongoing**	**Operations manager & Stakeholder liaison manager**
	• The financial injection may have a network of positive impact to the local community and improve the ways and means of access to water. The best mitigation would also be to draw the water system and also make it available to the neighbouring community		
	• The mines contribution to council's water treatment may enhance the pace of municipal delivery plans and offer the locals better opportunity to obtain such services. Unless the mine gets involved directly and in liaison with the local municipality on improvement of sanitation to the neighbouring community, the situation may improve slightly and at a slower pace.		
	• Mining may establish at least a clinic to service the mining labour and where possible offer local population with some of the health services.		
	• The mine will improve awareness to its labor on HIV/AIDS matters and encourage that, the labour takes a better responsibility to combat the spread of HIV/AIDS.		
	• This will be improved by the mine's direct involvement in the campaigns that brings HIV/AIDS awareness to the local communities		
13.3 Interested and affected	To manage I&APs comments and concerns • Implementation of EMP recommendations, involvement of communities in LED	**Ongoing**	**Operations manager &**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
parties	initiatives, ongoing communication to provide feedback and updates; • IAPs must be kept up to date on any changes to transport routes and increase in truck frequency; • Where the mining operations impact on boreholes used for domestic or farming purposes, the supply of alternative water resources should be arranged for on a case-by-case basis; • Outcomes of specialist studies should be co-ordinated with IAPs in terms of current environmental conditions and access to natural resources; • The implementation of the Grievance Resolution Procedure should be overseen and received and sign-off on grievances after following the procedure should be followed; and • A complaints management system should be maintained by the mine to ensure that all issues raised by community members are followed up and addressed appropriately.		**Stakeholder liaison manager**
13.4 Integrated development planning	To adapt to the Municipality's IDP Planning Process. • It will be necessary to adapt to the municipality's IDP planning process to take into account the population increase. • Reach agreement with the municipality regarding mandates and responsibility for issues relating to the upgrading of infrastructure and the allocation of land for housing.		
13.5 Safety and daily movement patterns	To enhance safety of residents • An awareness program that involves making mining employees aware of the safety of the area and inform them about the typical way of living in the vicinity may slightly improve the safety. The support of existing local safety programs by the mines may improve the safety of the locals.	**Ongoing**	**Operations manager & Stakeholder liaison manager**
13.6 Socio-Economic	To reduce negative social impacts and enhance positive impacts • It is recommended that a Community Management and Monitoring Committee (CMMC) must be established. This committee would serve as a communication channel between the community and Trans Hex. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Trans Hex. Such a committee will	**Ongoing**	**Operations manager & Stakeholder liaison manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	play an important role in executing the proposed mitigation measures.		
	• The CMMC must meet on a monthly basis during the construction phase		
	• Local people should be utilised in the construction and operation of the project as far as possible. This will minimise the risk between locals and new comers, and obviate the need for developing temporary housing for construction workers. Since it is expected that there will be an influx of newcomers to the community as result of the proposed development, A system should be in place to ensure that people getting first option on jobs are permanent residents of the area and has been for a while. It is therefore suggested that a list of local contractors and service providers must be compiled by the municipality. Contractors and suppliers can then be chosen from the list. The CMMC should act as a watch dog		
	• Local materials will be used for construction as far as possible.		
	• The local community will not be exploited. If they are employed, they will receive proper contracts in accordance with the Labour Act.		
	• The possible crime problem in the area is of great concern. All sectors of the community will be encouraged to become involved in community policing.		
	• The local authority will specifically be made aware of the impact that the influx of new people can have on services like the police in the area.		
	• Construction teams will be clearly identified by wearing uniforms or identification cards that should be exhibited in a visible place on their body.		
	• The proposed route will not break fields or run to close to houses (100m radius to be maintained).		
	• An Environmental Control Officer will be appointed to ensure contractors conduct themselves in an appropriate way. A fining system, under the custody of the EMMC, must be put in place where those who do not interact with the environment in a respectful way must pay a fine to enable rehabilitation of the afflicted environment.		
	• Community consultation throughout the project is imperative and the community and Trans Hex will work together to obtain the best solution.		
14. All mining activities			
14.1 Heritage	To minimise disturbance of or damage to heritage resources. • Ensure all mitigation measures are implemented as outlined in the archaeological	**Ongoing**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
resources	report; • Awareness training should be undertaken for employees to help identify potential sites of archaeological significance; • Consideration of funding tourism and cultural business ventures, i.e. museum; • Report additional sites of significance to archaeologist, if discovered; • If additional sub-surface archaeological resources are discovered during the operational phase, a qualified archaeologist must be contacted to assess and document the discovery; and • When additional infrastructure is planned and where the development is going to take place an archaeological study should be undertaken.		
15. All decommissioning activities			
15.1 Soils	To minimise negative impacts on soils. • Store hazardous materials, such as hydrocarbons and chemicals, in bunded areas; • Remediate accidental hydrocarbon spillages in situ using appropriate microbial technologies; • Utilise equipment that minimise soil compaction; • Minimise the movement of vehicles to avoid compaction of unaffected areas; • Reshape and vegetate all non-contoured areas to facilitate storm water run-off in such a way as to minimise soil erosion; and • Prevent erosion gullies where possible. Erosion gullies become areas of preferred water flow and result in a major source of soil erosion. In the event of an erosion gully forming, the level of erosion of the gully will determine the action required. The erosion gully will require rehabilitation in the form of filling the gully, vegetating the area and removing the topographical feature that caused the gully to form.	**Decommissioning**	**Operations manager & Environmental coordinator**
15.2 Surface water	To minimise negative impacts on surface water quality • Store hazardous materials, such as hydrocarbons and chemicals, in bunded areas; • Remediate accidental hydrocarbon spillages in situ using appropriate microbial technologies; • Removed sewerage systems of site and rehabilitate if needed; and • Keep pollution control facilities in place until such a time as it is proven they are no longer required.		**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
15.3 Groundwater	To minimise negative impacts on groundwater quality • Store hazardous materials, such as hydrocarbons and chemicals, in bunded areas;	**Decommissioning**	**Operations manager**
	• Remediate accidental hydrocarbon spillages in situ using appropriate microbial technologies;		
	• Removed sewerage systems off site and rehabilitate if need; and		
	• Keep pollution control facilities in place until such a time as it is proven they are no longer required.		
	To reduce AMD • The potential for AMD generation must be assessed to determine the significance of this impact.		
	• Monitoring of the ground water quality in the mine workings will be required until it can be demonstrated that the potential for AMD generation and hence the potential for contamination of the regional aquifer system is low.		
	• The dumps should be contoured and vegetated to reduce the infiltration of water through the dump to the ground water. Monitoring of the water quality in the boreholes in the vicinity of the dumps will be required until it can be demonstrated that there is little or no impact on the regional aquifer.		
15.4 Noise	**To minimise increases in ambient noise levels.** • Restrict mining activities to normal working hours to reduce the impact of unwanted noise;		
	• Monitor occupational noise to determine noise levels form equipment, as increased noise levels may indicate other issues;		
	• Reduce the noise at the source if possible and consider use of silencers on vehicles;		
	• Fit mining equipment with standard silencing systems to limit noise product;		
	• Maintain silencing systems as specified by the original equipment manufacturer (OEM);		
	• Construct physical noise control structures to reduce the impact of noise on receptors. This includes the construction of berms around noise-production equipment; and		
	• Implement a noise monitoring programme and grievance procedure throughout the operational phase.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
15.5 Air quality	To minimise negative impacts on air quality. • Apply dust abatement techniques, such as the watering of roads, during the dismantling of infrastructure;	**Decommissioning**	**Operations manager**
	• Consider dust control measure for open areas, including wet suppression, chemical suppressants, vegetation and wind breaks; and		
	• Monitor air quality levels and where levels exceed the maximum allowance, investigate source points and implement mitigation measures.		
15.6 Traffic and safety	To reduce negative impacts of increased traffic on and around the site. • Allocate and adhere to speed limits;		
	• Restrict traffic to demarcated areas;		
	• The travelling public shall have the right of way on public roads and truck contractors appointed by Trans Hex shall make use of approved methods to control the movement of vehicles so as not to constitute a road hazard;		
	• Erect safety signs in the local languages to warn people of the danger on roads;		
	• Keep in constant liaison with the local Department of Roads who will need to be aware of any proposed road plans and who may be able to assist in terms of making recommendations and road maintenance;		
	• Ensure that site access points are clearly visible from the main road;		
	• Ensure that all drivers employed are certified with appropriate training levels for the required vehicle; and		
	• Ensure that all vehicles entering and leaving the site use demarcated routes.		
16. Rehabilitation			
16.1 Land capability	To minimise the negative impacts on land capability • Potential subsidence of the surface will be addressed by profiling of the surface, filling in of cracks, and preventing ponding on water to ensure free drainage.	**End of mine**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
16.2 Soils	• Vegetate and protect rehabilitated areas to prevent soil loss to erosion; and • Analyse chemical and physical properties of the soil prior to rehabilitation and thereafter, annually until the fertility regime is satisfactory for sustainable growth.	**End of mine**	**Operations manager**
16.3 Flora	To minimise negative impacts on flora. • Identify areas of bare soil and soil erosion to assess the vegetation of the area; • Monitor vegetation in order to determine defoliation requirements, either by mowing, grazing or fire management; • Vegetate all area requiring rehabilitation with pioneer species which should colonise open and disturbed areas relatively quickly; and • Implement an alien invasive eradication and control programme according to relevant legislation.		
16.4 Visual	To minimise visual impacts due to construction activities • Rehabilitate all disturbed areas to reduce visual scarring; and • Blend earthworks and road access cuttings into the landscape.		
17. Revegetation of disturbed areas			
17.1 Topography	To reduce negative impacts on topography. • Plan and perform shaping of disturbed areas to ensure drainage off the site; • Fill voids with stockpiles overburden, topsoil. Revegetate after backfilling; • Perform regular surveys to ensure rehabilitation conforms to the final topographical plan; • Ensure a Subsidence Management Plan is in place if subsidence should occur; and • Profile the final topography to reassemble the pre-mining topography as far as possible.	**End of mine**	**Operations manager**
17.2 Soils	To minimise negative impacts on soils. • Ensure that rehabilitation areas are not compacted more than which is necessary. Placement of soils to be completed by experienced personnel; • Analyse chemical and physical properties of the soil prior to rehabilitation and	**End of mine**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	thereafter, annually until the fertility regime is satisfactory for sustainable growth;		
	• Replace soil as soon as overburden reshaping has been completed. Ideally, soils should be stripped and replaced in a single action if possible, thus eliminating or minimising the need for soil stockpiling;		
	• Monitor rehabilitation to ensure soil depth is adequate and plants are well established. Areas where rehabilitation has taken place will require an assessment by a soil specialist to determine is the rehabilitation can support the end land use; and		
	• Take soil samples during rehabilitation to determine soil fertility, depth, compaction, acidity and mine related pollution. Treatments should then be recommended for soils according to recommendations made from the results obtained.		
18. Ongoing monitoring			
18.1 Topography	To reduce negative impacts on topography. • Monitor regularly to identify, mitigate or repair earth movement; and	**End of mine**	**Operations manager**
	• Monitor rehabilitation efforts to check for drainage problems or erosion issues. In the event of either, it will trigger an action plan to mitigate.		
18.2 Surface water	**To minimise negative impacts on surface water quality** • Monitoring should continue for a period of at least five years after mining, or until a trend is established, in order to determine potential decant points. In the event that water quality is poor, a stream analysis should be performed to determine the possible sources of contamination and recommend mitigation measures;		
	• The pollution control dam should remain on site until all decant water quality is suitable for release into the catchment; and		
	• Should the infrastructure be purchased or taken over by third parties, it should be ensured that the waste water reticulation and treatment facilities are in good condition.		
18.3 Groundwater	**To minimise negative impacts on groundwater quality.** • Monitoring need to be conducted bio-annually during both wet and dry seasons to determine the quantity and quality of the water. If the water quality is not suitable it must be treated according to DWAF specifications before releasing it back into the system;	**End of mine**	**Operations manager**
	• Monitor the recovery of the cone of depression; and		
	• Monitor groundwater and decant points until it can be satisfactorily proven that any		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	potentially contaminated groundwater poses no threat to any receptors.		
18.4 Soils	**To minimise negative impacts on soils.** • Soils chemical and physical properties should be assessed annually to monitor any changes until stability has occurred. This usually implies monitoring for 5 year post-decommissioning; and		
	• Where erosion is taking place, additional rehabilitation is to be initiated.		
18.5 Flora	**To minimise negative impacts on flora.** • Monitor to prevent illegal dumping on site which is harmful and poisonous to plants;		
	• Protect areas that have been rehabilitated from further disturbances. Fences should be erected around certain areas that need extra protection; and		
	• Monitor after closure to ensure rehabilitation efforts are effective.		
18.6 Fauna	**To minimise negative impacts on fauna.** • Monitor to prevent illegal dumping on site which is harmful and poisonous to animals;		
	• Protect areas that have been rehabilitated form further disturbances. Fences should be erected around certain areas that need extra protection; and		
	• Monitor after closure to ensure rehabilitation efforts are effective.		
18.7 Sensitive areas	**To minimise negative impacts on sensitive areas.** • Monitor the aquatic health and status of biodiversity regularly and where changes are detected, implement an action plan to mitigate;		
	• Revegetate exposed, disturbed and open slopes leading down to the wetlands and monitor to determine the success of the rehabilitation;		
	• Seal any decant pint and notify downstream users;		
	• Monitoring should continue for a period of at least five years after mining, or until a trend is established, in order to determine potential decant points. In the event the water quality is poor, a stream analysis should be performed to determine the possible sources of pollution and recommend mitigation measures; and		
	• Undertake aquatic health assessment to establish the extent of damage to sensitive areas.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
19. Ceasing of mining activities	**21.1 Employment** **To minimise negative and enhance positive impacts on employment** • Opportunities for additional resources and redeployment, integration of employees and communities into sustainable LED projects, equip suppliers through mentorship and training;	**End of mine**	**Stakeholder liaison manager/ Human Resources manager/ Operations manager**
	• Increased employment opportunities during decommissioning for local contractors;		
	• Where short term employment opportunities exist during decommissioning, local contractors and jobs seekers will receive preference;		
	• The workforce should undergo multiple skills training during the operation of the mine so that they can be productively absorbed into the local economy after mine closure;		
	• Where retrenchments are unavoidable, they will be managed humanely according to legislative requirements;		
	• There should be adherence to the objectives and management measures stated with the Social and Labour Plan;		
	• The workforce should be empowered to develop skills that will equip them to obtain employment in other sectors of the economy;		
	• The LED plan should be implemented to assist local business development;		
	• The LED plan should be implemented to assist local business development;		
	• Local partners should be supported to diversify economy and decrease dependence on mining;		
	• A retrenchment/downscaling fund should be established to assist retrenches;		
	• A strategy for saving jobs and management of downscaling and/or retrenchment should be implemented;		
	• Assistance should be given for help with redeployment of retrenchees in other operations or assistance with alternative livelihood strategies;		
	• Identify and implement training needs and training programmes for decommissioning and closure;		
	• Working relationships and collaborative effort with local government and tribal administrations should be developed in key matters that are mutually beneficial;		
	• Consultation with communities and local government on future uses for the infrastructure and facilities should be implemented.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
19.2 Interested and affected parties	**To manage I&APs comments and concerns** • Disturbance to stay within confined areas, grievance resolution procedure to be implemented; and	**End of mine**	**Stakeholder liaison manager/ Human Resources manager/ Operations manager**
	• Rehabilitation in accordance with legislative requirements, LED projects focused on diversification of the economy and inclusion of affected parties, ongoing communication channels remain open.		
20. Ongoing monitoring			
20.1 Employment	**To minimise negative and enhance positive impacts on employment** • Establish a monitoring team to report back to Trans Hex on the status of local business ventures and community development plans that have been initiated/supported by Trans Hex;	**End of mine**	**Stakeholder liaison manager/ Human Resources manager/ Operations manager**
	• Where retrenchments are unavoidable, they should be managed humanely according to legislative requirements; and		
	• The workforce should undergo multi-skilling during the operation of the mine so that they may be productively absorbed into the local economy after mine closure.		
21. Dismantling of infrastructure			
21.1 Heritage resources	**To minimise disturbance of or damage to heritage resource.** • In the event of an archaeological artefact being unearthed, an accredited archaeologist will inspect the site and make recommendations; and	**Decommissioning**	**Operations manager**
	• Promote archaeological awareness and investigate sustainable initiatives with communities to promote the local culture.		

PROPOSED MANAGEMENT MEASURES ASSOCIATED WITH SHORE BASED OPERATIONS

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1. **INFRASTRUCTURE & SERVICE PROVISION**	Environmental objectives are to: • Use existing infrastructure and services where possible, and tie in with other planned developments and future uses of the area, • Develop and use infrastructure that does not degrade protection-worthy areas, or the aesthetic values, of the coastal region, • Conserve fresh water, and • Minimise fuel use and optimise recycling.		
1.1 Access Roads			
1.1.1 Control of beach access & use of existing roads	• Use only existing roads or tracks. • Restrict access to mining areas to well defined and stabilised access roads to avoid proliferation of unnecessary tracks in the veld and dune areas, and ensure all mining staff and contractors adhere to this restriction. • Avoid using informal tracks made by others except where no formal access roads exist and access is necessary. • Wherever possible drive below the HWS mark to avoid impacts on the more easily disturbed higher beach area, especially where this may cause dune destabilisation and/or archaeological and/or ecological impacts. • Encourage and negotiate with the landowner or tenant to allow installation of locked gates on access roads to prevent uncontrolled access by unauthorised land users.	**Incorporated in this EMP – Existing company policy**	**Operations Manager and Contractors**
1.1.2 Planning & application procedures for new roads	NB: Only under very special circumstances will the creation of new roads be motivated and applied for.	**Ongoing**	**Operations Manager**
1.1.3 Road	• Clearly mark existing roads and new access road requirements on layout plans to be submitted to DMR.	**At present no new**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
maintenance		roads identified	
	• Obtain DMR approval for new minor private roads.	Incorporated in this EMP	
	• Survey the area where new road access may be required for archaeological sites and avoid passing within 50 m of these areas.		
	• Consult with a roads engineer during the construction of the track restricting the new access route to a temporary nature, using local materials.		
	• Ensure roads have acceptable surfaces, are free from erosion, and have effective drainage.	Existing company policy	
1.1.4 Sourcing material for road construction and maintenance	• Obtain permission from the landowner about using existing borrow-pits.	Part of Trans Hex company policy	
	• Implement all required safety measures when collecting road construction material and during transport thereof.		
1.2 Services & Facilities			
1.2.1 Accommodation & processing facilities	Note: at present THO does not have any campsites along the coast of Concession 5(a). Housing, offices, workshops and gravel processing facilities are provided for THO staff and contractors at De Punt and Port Nolloth. These are dealt with in detail in Section 6.5 below.	Implemented	Operations Manager
1.2.2 Vehicle & equipment	• Restrict vehicle maintenance to the maintenance yard area, except in emergencies. • Maintain mining equipment to ensure that no oils, diesel, fuel or hydraulic fluids are spilled	Existing company policy	Operations Manager

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
maintenance			
1.2.4 Establishing mineral processing areas	In shore-based operations mineral processing areas consist of a tractor-mounted pump, and classifying rotary trommel. During mining activity over low tide periods, these-are parked in the intertidal zone and removed to above the HWM after operations. Although mineral processing areas are of a temporary nature, the following must be adhered to: • Do not establish processing areas within 100m of the edge of a river channel or estuary mouth. • Limit the processing area to the minimum reasonably required and that which will cause least disturbance to the vegetation and natural environment. • Confine ore stockpiles to mineral processing areas and limit the separation process to a specific controlled area.	**Operation**	
2. DIVER OPERATIONS	Environmental objectives are to: • Conduct operations in an environmentally responsible manner, • Ensure high levels of safety and operational health, • Reduce the direct disturbance effects on the environment and its components, and • Reduce the indirect negative effects on the environment and its components.		
2.1 Diver safety & Equipment operation	• The operations manager shall ensure that contractors adhere to all applicable diving regulations.	**Implemented**	
2.2 Kelp cutting	• Do not cut kelp unless diver safety is at stake, or it is essential for the operation.	**As part of this EMPR**	
	• Obtain a permit from Chief Directorate: MCM in the DEA&T before cutting, • collection or removal of kelp.	**By April 2011**	**Operations Manager**
3. TAILINGS OVERBURDEN	Environmental objectives are to: • Minimise direct effects on the environment such as compromised water quality and/or damage to, or loss of, benthic habitat,		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
DISPOSAL	• Reduce possible negative effects on marine faunal populations, and • Develop the information base that will provide improved insight into the potential deleterious effects and recovery there form		
3.1 Accessing of diamondiferous ores in water depths < 25m	• Report, to DME annually, areas mined in terms of location and volume of gravel removed.	**Annual obligation**	**Operations Manager**
	• Restrict mining to the use of current technologies applied in shallow marine mining (diver operated suction systems). This excludes bulk mining and blasting which will require specific evaluations as their environmental effects are excluded from this EMPR.	**Operation**	
3.2 Tailings dumps on beach	• Deposit tailings from the sieving of gravel below the high water mark and as far down the beach as possible to ensure their rapid removal by wave action.	**Existing company policy**	
3.3 Relocation of boulders	• Minimize alteration of natural rock distribution to the extent necessary for effective mining. • Place boulders removed from the ocean floor during mining in the close vicinity of their original location in the sea. • Minimize dragging boulders up on to the beach and/or creating piles of boulders on beaches.	**Ongoing**	
4. REHABILITATION & AESTHETIC IMPACT CONTROL	Environmental objectives are to: • Plan and make adequate provision for rehabilitation, restoration and reclamation activities, • Optimise recovery of post-mining habitat for other beneficial land/seabed use, • Restore the impacted areas to an ecologically stable system in the long term, • Minimise visual/ aesthetic disturbance, and • Remove/ameliorate physical hazards.		
4.1 General Rehabilitation			
4.1.1 Compilation of layout plans & rehabilitation programmes	• Ensure that rehabilitation forms an integral part of mining operations from start-up.	**Ongoing**	**Environmental Manager**
	• Archaeological assessment will be undertaken to identify sensitive areas with special attributes or qualities. These will be accordingly cared for.	**In progress**	

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Identify, and include all necessary steps for rehabilitation of negative impacts in the rehabilitation programme. (Including the removal of abandoned equipment and garbage, minimisation of air and water pollution, tailings handling, control of drainage off surfaces and soil, re-establishment of benthos/ vegetation).	**As part of this EMPR**	
	• Incorporate the suggestions of government authorities and interest groups into plans for rehabilitation. Consider compatibility with the short and long-term potential use of the area after mining, other current users of the concession and adjoining areas, and the proximity to nature protection areas/ islands or population centres.	**As part of this EMPR**	
	• Plan for the demolition and/or removal of all structures and debris on cessation of mining activities, and the restoration of the land surface above HWM.		
	• Clearly allocate timing and responsibility for rehabilitation to mine operators.		**Operations manager**
4.1.2 Funding of rehabilitation	• In order to provide for rehabilitation, Ttrans Hex has established a dedicated Rehabilitation • Trust Fund for end-of-life rehabilitation of all its prospecting and mining operations, as provided for in section 10 (1) of the Income Tax Law, 1962. • All mines contribute to this fund annually. The fund currently stands at R 6.9 million.	**In existence since 1997**	**General Manager**
4.1.3 Responsibility for rehabilitation	• Trans Hex will undertake rehabilitation, as required herein, until the Director: Mineral Development of DMR issues a closure certificate.	**Existing company policy**	**Environmental Manager**
4.2 Rehabilitation below HWM			
4.2.1 Minimization of Impacts	Note: Active rehabilitation of the seabed below the LWM is not required, as rehabilitation within this highly dynamic nearshore area is a rapid and natural process. However, various measures are taken to minimize impacts:		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Trans Hex returns oversize and undersize to the sea in the vicinity of their origin. • Trans Hex does not dump wastes or other materials on the sea bed or into the water column. • Trans Hex facilitates calculation of benthic "rehabilitation" rates by supplying DMR with a map of surface areas and calculations of volumes for each year of mining/ prospecting, and • Trans Hex restricts the rate of mining to <15% per year of the total concession area, until either adequate marine reserve areas as contemplated in the Biodiversity Convention are set aside by Government or confidence in estimates of benthic recovery rates have been improved by the appropriate scientific research.	**Existing company policy**	**Operations Manager**
4.2.2 Removal of waste from beaches	No mining or domestic solid wastes will be discarded on beaches, i.e. Trans Hex will remove all mining waste (e.g. old piping, plastic sheeting, litter etc.) and dispose of as described in **Section 6.**		
4.3 Rehabilitation of land areas above HWM disturbed by activities incidental to shore-based mining			
4.3.1 Restoration & habitat maintenance of processing and equipment storage areas	• Remove all facilities, waste and other features established during mining activities or for accessing a mining site. • Clean up and remove discarded equipment, or abandoned structures within the concession as part of responsible environmental management in new or renewed operations.	**Ongoing and after cessation of operations**	**Operations Manager**
	• Contaminated soil from vehicle maintenance and equipment storage areas will be processed by bio-remediation. • Enhance natural stabilization by reshaping and softening tailing mounds to rounded, natural profiles. • Flatten uncontaminated mounds or heaps of other material, other than topsoil and subsoil, to reduce visual impacts. • Level the disturbed area to a condition resembling its natural profile. The surface should be left bumpy rather than flat to maximise potential for collection of fog, for moisture, and windblown seed in pockets to serve as regeneration and dispersal nodes.		
4.3.2 Nonessential	Note: many of the informal tracks accessing the shore-units are currently used by	**Upon cessation of**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
vehicle tracks, access roads & beach access points	fishermen in 4x4 vehicles. To avoid the formation of yet more informal tracks, establish which tracks are used by other users before barring the entrances to such tracks and attempting rehabilitation. This should be done in collaboration with the land owner, Cape Nature Conservation, and the District Council. For tracks under Trans Hex's jurisdiction, and which are not used by other users, rehabilitate as follows: • Place barriers (e.g. rocks, fences) across the entrances of non-essential informal tracks and signpost intention to rehabilitate. • Remove foreign road-construction materials which may hamper vegetation regrowth and dispose of in an approved manner prior to rehabilitation. • Where the surface of unnecessary tracks has become compacted, plough or rip the surface and temporarily stabilise with mulch until suitable vegetation establishes itself.	**road use**	
5. WASTE MANAGEMENT / POLLUTION CONTROL	Environmental objectives are to: • Prevent pollution of sea and fresh water, • Promote reuse/ recycling of resources, and • Prevent visible "scarring" of marine and coastal areas.		
5.1 General Waste & Pollution Management			
5.1.1 Ultimate responsibility for wastes	• The concession holder must comply with all legal requirements for waste management and pollution control (for air and water quality levels at sea), and employ "good housekeeping" and monitoring practices.	**Existing company policy at all times**	**Operations Manager**
5.1.2 Savings in consumption of fuel & electricity	• Reduce consumption of fuels and other petrochemical materials to minimise the release of green house gases by: • Installing fuel-efficient equipment, • Servicing and repairing all equipment regularly, and • Periodically assess energy use and make improvements where possible.	**Ongoing**	
5.1.3 Storage & Disposal of hazardous materials	• Contain all oils, grease, hydraulic fluids and other hazardous substances in separate, suitable receptacles and transfer to a recognised hazardous waste disposal facility, or contract a private company to regularly remove and dispose of it. • Soil contaminated with hazardous oils will be bioremediated. This involves collecting the	**Ongoing**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	contaminated soil; placing on impermeable surface (PVC or concrete slab); aerating the soil regularly by turning over the soil and later adding microbes. • Keep records of hazardous waste management.		
5.1.4 Use of CFC containing equipment	• Replace CFC containing products and equipment with halogen-free products e.g. carbon dioxide fire extinguishers.		
5.2 Waste & Pollution Management in the Beach/Surf-zone and above HWM			
5.2.1 Disposal of wastes into the sea	• Do not dump or throw solid waste or biodegradable refuse of any kind into the sea. • Do not discharge any oily or waxy effluents into the sea.	**Ongoing**	**Operations Manager and Contractors**
5.2.2 Disposal of domestic solid waste	• Collect and store biodegradable and non-biodegradable refuse (e.g. glass bottles, plastic bags, metal scrap etc) in a suitable container at a collecting point for collection on a regular basis for disposal at the relevant dump sites. • Prevent littering of land, sea or surface water by all personnel (including contractors) involved with mining activities. • Do not leave any litter in any place, except in specially demarcated containers.		
5.2.3 Collection of plastics used during shore pumping activities	• Collect all plastic waste on a regular basis from the beach for disposal at the De Punt garbage disposal facility.		
5.2.4 Removal of construction materials	• Dispose of rubble and other waste construction materials at the nearest designated landfill site in De Punt .		
5.2.5 Removal of scrap metal	• Remove all metal objects from the mining or prospecting site as soon as no longer needed. • Dispose of non-recyclable metal objects at the nearest appropriate waste site De Punt • Recycle metal wastes through resale of scrap metal.		
6. PROTECTION OF THE HISTORICAL ENVIRONMENT	The Environmental Objective is to: • Prevent the loss of information and research material for furthering human understanding of historical and prehistorical eras.		

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
6.1 Cultural Resources			
6.1.1 Disturbance or damage to archaeological or palaeontological sites above HWM	• Do not destroy, damage, alter, excavate or remove shell middens or contents of caves without a permit from SAHRA. • Report any discoveries of archaeological sites during mining activities immediately to the nearest heritage authority • Do not destroy, damage, alter, or excavate any palaeontological sites during mining.	**Ongoing**	**Operations Manager**
	• Do not mine within a horizontal distance of 100m of any surface which it may be necessary to protect because of its cultural, archaeological or palaentological features without obtaining permission from SAHRA.		
6.1.2 Disturbance or damage to archaeological or palaeontological sites	• Record the areas where new access roads or operating areas are required on the layout plan of the mining area and obtain the opinion of a qualified archaeologist on the potential for the existence of heritage sites or features as part of the application for a mining or prospecting license.		
	• Train mining staff to recognise potential archaeological sites in the area, especially shell middens.		
	• Refrain from operating within a distance of 50m from any discovered heritage site until such time as the site has been surveyed and a permit granted authorising its disturbance.		
	• Retain copies of archaeological survey reports. • Retain permits from SAHRA authorising damage or destruction of sites, and copies of other correspondence.		
6.1.3 Disturbance or damage to historical shipwrecks	Do not disturb in any way a shipwreck older than 60 years without a permit from SAHRA. If finding shipwreck material: • Immediately inform the SAHRA if likely shipwreck material is found. • Contract a marine archaeologist to survey the site and, • Avoid mining or prospecting within 200m from the centre of the site until the area has been surveyed and clearance, or a permit to continue activities, has been obtained from SAHRA. • Retain permits and copies of correspondence from SAHRA.	**When necessary**	**Operations Manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
7. PROTECTION OF THE NATURAL ENVIRONMENT	Environmental objectives are to: • Minimise direct disturbance effects on the environment and its components as a result of mining activities, • Minimize general environmental damage to habitats and to maintain ecosystem functioning and biodiversity, and • Optimise societal benefits by facilitating conservation of resources.		
7.1 Biological Resources - at Sea (below HWM)			
7.1.1 Damaging or removing benthic fauna in mining	Educate divers about the importance of benthic fauna in the marine ecosystem, and encourage them to minimise direct and indirect removal or damage through mining activity or dragging of suction pipes across rocky-shore habitats.	**Ongoing**	**Operations Manager and Contractors**
7.1.2 Disturbance of fauna & flora on State Land (including State Farms, the Admiralty reserve, & all land above the LWM)	**To protect fauna and flora above the LWM – Trans Hex personnel and contractors will not:** • Disturb, catch, remove, injure, kill or feed, any wild animal or bird which occurs in the coastal area without a permit. • Break, damage, destroy, disturb or remove any birds egg or nest. • Intentionally remove, injure or kill any sea-life other than incidentally through the gravel pumping process. • Pick, uproot, fell or damage any plant growing in the coastal area without a permit - other than according to the approved EMP which will provide necessary mitigation measures.		
7.1.3 Shellfish collection (lobsters, abalone, mussels)	No shellfish (including abalone, rock lobster, mussels) will be collected without a permit from the Directorate of MCM, DEA. • No shellfish will be collected from closed areas and marine protected areas without written permission from the Directorate of MCM, DEA • Divers operating suction pipes shall not intentionally remove and/or damage rock lobsters during mining.	**Ongoing**	**Contractors**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
7.1.4 Recreational Fishing	• Contractors will be expected to adhere to all fishing regulations under the Marine Living Resources Act.		
7.1.5 Disturbance of birds & seals on islands	• Do not land on any island or wilfully disturb any sea bird or seal without a permit from the provincial nature conservation authority, unless in an emergency.	When applicable	
7.2 Protection of Biological Resources – Onshore (above LWM)			
7.2.1 Driving through ecologically sensitive areas	• Do not drive vehicles in ecologically sensitive areas e.g. salt marsh or mudflat areas near estuaries, as they are important for estuarine functioning and maintenance of birdlife and other fauna	When applicable	Operations Manager
7.2.2 Fire lighting	• Do not light any fires at any place other than amenities provided by the local authority (to avoid the risk of loss of habitat, and reduce hazards posed by uncontrolled fires).	Ongoing	Contractors

PROPOSED MANAGEMENT MEASURES ASSOCIATED WITH VESSEL BASED ACTIVITIES

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
1. **INFRASTRUCTURE & SERVICE PROVISION**	Environmental objectives are to: • Use existing infrastructure and services where possible, and tie in with other planned developments and future uses of the area, • Develop and use infrastructure that does not degrade protection-worthy areas, or the aesthetic values, of the coastal region, • Conserve fresh water, and • Minimize fuel use and optimize recycling.		
1.1 Jetties			
1.1.1 Jetties & landing facilities	• Trans Hex will use existing jetties and offloading facilities at Hondeklip Bay and Port Nolloth.	**Implemented**	**Operations manager**
	• Trans Hex will apply to the relevant controlling authority for permission to use existing jetties and offloading facilities at Hondeklip Bay.	**Implemented**	**Operations manager**
	• If it becomes necessary for Trans Hex to build new jetties, or landing facilities, Trans Hex will apply to the relevant authority for approval.	**Existing company policy**	**Operations manager**
2. DIVER & VESSEL OPERATIONS	Environmental objectives are to: • Conduct operations in an environmentally responsible manner, • Ensure high levels of safety and operational health, • Reduce the direct disturbance effects on the environment and its components, and • Reduce the indirect negative effects on the environment and its components.		
2.1 Divers			
2.1.1 Diver safety & equipment operation	• The operations manager shall ensure that contractors adhere to all applicable diving regulations.	**As part of this EMPR**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
2.1.2 Kelp cutting	• Do not cut kelp unless diver safety is at stake, or it is essential for the operation.	**As part of this EMPR**	**Operations manager**
	• Obtain a permit from Chief Directorate: MCM in the DEA before cutting, collection or removal of kelp.	**By April 2011**	**Operations manager**
2.2 Vessel Operation			
2.2.1 Safety certificates	• Obtain an annual SAMSA Safety Certificate for all mining vessels.	**Annually**	**Vessel owner**
2.2.2 Vessel OM emergencies [fire, grounding or sinking, & collision] & operational safety	• Ensure that all vessels comply with all SAMSA regulations. • Where required, have adequate protection and indemnity insurance cover for oil pollution incidents. • Establish lines of communication with the DOT (SAMSA) through the Hydrographic office at Silvermine, and the DEA.	**As part of this EMPR**	**Operations manager**
	Have the following emergency plans, equipment and personnel in place to deal with all emergencies: • Company Emergency Response Plan, including MEDIVAC plan; • SASAR Manual; • Oil spill contingency plans which describe linkages with existing Coastal Oil Spill Contingency Plan(s) by the DEA.	**As part of this EMPR**	**Operations manager**
2.2.3 Equipment & maintenance	• All mining vessels larger than 25 tons will be equipped with a container for all oily water on board. • Where proper facilities for pumping oily water ashore are not provided, Trans Hex will ensure that empty drums are left at harbours and other landing facilities into which the oily waste should be pumped. • All boats used for mining will be properly maintained and the bilges kept clean. Oil generated during engine services will be pumped ashore and not to bilges. • Maintain all mining equipment to ensure that no oils, diesel, fuel or hydraulic fluids are spilled.	**Implemented**	**Vessel operator**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
2.2.4 Vessel logbooks	Logbooks should be kept by the vessel operator for all mining vessels listing: • Maintenance and servicing of engine and equipment. • Engine problems and equipment failures that arise. • Dates and times of docking in harbours or ports. On vessels larger than 25 tons logbooks should be kept of the volume of oily water generated and amount stored on board.	**Implemented daily**	**Vessel Operator**
2.2.5 Use of fishing harbours and ports	Note: Port Nolloth will be the harbours used during mining operations in admirality strip opposite Farm Brazil as well as Concession 5(a). • Comply with current MCM regulations when entering and using fishing harbours. • Comply with SAMSA permit requirements for use of ports. • When necessary apply to Namaqua Fishing Co. for use of harbour at Hondeklip Bay. • When necessary notify the appropriate fishery control officer when using MCM harbour facilities. • Comply with applicable port regulations when entering and using SAMSA administered ports.	**Existing company policy**	**Vessel operator**
3. TAILINGS / OVERBURDEN DISPOSAL	Environmental objectives are to: • Minimize direct effects on the environment such as compromised water quality and/or damage to or loss of benthic habitat, • Reduce possible negative effects on marine faunal populations, and • Develop the information base that will provide improved insight into the potential deleterious effects and recovery there from.		
3.1 Disturbance of marine habitats			
3.1.1 Accessing of OM diamondiferous ores in water depths < 25m	• Report, to DME annually, areas mined in terms of location and volume of gravel removed.	**Implemented annual obligation**	**Operations manager**
	• Restrict mining to the use of current technologies applied in shallow marine mining (diver operated suction systems). This excludes bulk mining and blasting which will require specific evaluations as their environmental effects are excluded from this EMPR.	**Implemented**	**Operations manager**
3.1.2 Relocation of Boulders in diverbased	• Minimize alteration of natural rock distribution to the extent necessary for effective mining. • Place boulders removed from the ocean floor during mining in the close vicinity of their original location in the sea.	**At all times**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
operations.			
3.1.3 Overburden disposal	• Minimize the dumping of overburden on adjacent reefs by returning it to the mined out area, or depositing it over sandy/muddy seabed where possible.	At all times	Operations manager
4. REHABILITATION BELOW HWM	Environmental objectives are to: • Plan and make adequate provision for rehabilitation, • Optimize recovery of post-mining habitat for other beneficial land/seabed use, • Restore the impacted areas to an ecologically stable system in the long term, and • Remove/ameliorate physical hazards.		
4.1 General Rehabilitation			
4.1.1 Funding of rehabilitation	In order to provide for rehabilitation, Trans Hex has established a dedicated Rehabilitation Trust Fund for end-of-life rehabilitation of all its prospecting and mining operations, as Provided for in section 10 (1) of the Income Tax Law, 1962. All mines contribute to this fund annually. The fund currently stands at R12.9 million.	In existence since 1997	General manager
4.1.2 Minimization of Impacts	Note: Active rehabilitation of the seabed below the LWM is not required, as Rehabilitation within this highly dynamic nearshore area is a rapid and natural process. However, various measures are taken to minimize impacts:- • Trans Hex returns oversize and undersize to the sea in the vicinity of their origin. • Trans Hex does not dump wastes or other materials on the sea bed or into the water column. • Trans Hex facilitates calculation of benthic "rehabilitation" rates by supplying DME with a map of surface areas and calculations of volumes for each year of mining/ prospecting, and • Trans Hex restricts the rate of mining to <15% per year of the total concession area, until either adequate marine reserve areas as contemplated in the Biodiversity Convention are set aside by Government or confidence in estimates of benthic recovery rates have been improved by the appropriate scientific research.	Existing company policy	Operations manager

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Consider compatibility with the short and long-term potential use of the area after mining, other current users of the concession and adjoining areas, and the proximity to nature protection areas/ islands or population centres	As part of this EMPR	Environmental manager
4.1.3 Responsibility for rehabilitation	• Trans Hex will undertake rehabilitation, as required herein, until the Director: Mineral Development of DMR issues a closure certificate.	Existing company policy	Operations manager
5. WASTE MANAGEMENT / POLLUTION CONTROL	Environmental objectives are to: • Prevent pollution of sea and fresh water, and • Promote reuse/ recycling of resources.		
5.1.1 Ultimate responsibility for wastes	• The concession holder is responsible for waste handling, and the ultimate disposal of all wastes generated by operations. • The concession holder must comply with all legal requirements for waste management and pollution control (for air and water quality levels at sea), and employ "good housekeeping" and monitoring practices.	At all times	Operations manager
5.1.2 Savings in consumption of fuel & electricity	Reduce consumption of fuels and other petrochemical materials to minimize the release of green house gases by: • Installing fuel-efficient equipment, • Servicing and repairing all equipment regularly, and • Periodically assess energy use and make improvements where possible.	At all times	Operations manager
5.1.3 Use of CFC containing equipment	• Replace CFC containing products and equipment with halogen-free products e.g. carbon dioxide fire extinguishers.	At all times	Operations manager
5.1.4 Equipment loss	• Establish a hazards database that lists the type of gear left on the seabed and/or in the prospecting/ mining area with the dates of loss and locations. Report these data to SAMSA.	Before start of operations, & then when losses occur	Ship manager & Vessel manager
5.1.5 Removal of wrecked mining vessels	• Notify SAMSA about wrecked vessels (safety and pollution reasons), and the Department of Finance (salvage, customs, royalties). • The owner of a wreck is to remove the wreck and is responsible for cleanup of all debris and leaked material. • Where a wreck cannot be removed, the owner is to remove all refuse, oil and fittings or	In the event of a wreck	Vessel Owner

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	objects which may become loosened during weathering and break-up of the vessel.		
5.2 Management of Hydrocarbons & Other Hazardous Wastes/ Spillages from Vessels at Sea			
5.2.1 Emergencies, MM & oil spill contingency measures	• When required, take out adequate protection and indemnity insurance cover for oil pollution incidents.	**As necessary**	**Marine Operations manager**
	• Inform SAMSA & DEA: Marine and Coastal Management branch, local ,municipality and the relevant provincial department of environment in the event of fire, grounding or sinking, or collision.	**As necessary**	**Marine Operations manager**
	• Notify the Principle Officer of the nearest SAMSA office and the Chief Directorate of Pollution and Waste Management (DEA) in Cape Town immediately in the event of any oil spill. • Provide the following information when reporting a spill includes: i) The volume of oil spilled (so DEA can determine whether or not it is significant). ii) The type and circumstances of incident, ship type, port of registry, nearest agent representing the ship's company. iii) Geographic location of the incident, distance off-shore and extent of oil spill. iv) Prevailing weather conditions, sea state in affected area (wind direction and speed, weather and swell). v) Persons and authorities already informed of the spill. vi) Estimates of the numbers of different species of mammals and seabirds in the vicinity, and of the numbers of each species oiled.	**As necessary**	**Marine Operations manager**
5.2.2 Storage & disposal of hazardous materials	• Contain all oils, grease, hydraulic fluids and other hazardous substances in separate, suitable receptacles and transfer to a recognized land-based hazardous waste disposal facility, or contract a private company to regularly remove and dispose of it.	**At all times**	**Operations manager**
	• Keep records of quantities and types of all hazardous materials and oils taken onboard vessels, and of their method of storage, use and disposal.	**At all times**	**Operations manager**
	• Inform DWA of the final destination of all hazardous wastes.	**Before start of operations**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
5.2.3 Refuelling of vessels	• Refuelling at sea within 50 nautical miles of the coast is not permitted without a specific exemption from SAMSA. • Refuelling of vessels should be undertaken in a controlled environment such as at a jetty or in a harbour. • For accidental spillages whilst refuelling see 5.2.5.	**At all times**	**Vessel Master**
5.2.4 Discharge or release of any oil, bilge water and domestic wastewater generated at sea	• Do not discharge water or other substances containing oil or other hazardous chemicals into the sea within 50 nautical miles of land, unless in case of emergency. This includes the discharge of bilge water. [An oily sheen on the water surface is indicative of water containing more than 15 ppm oil having been released and photographs of which can be used as evidence for prosecution. Fines for small releases of diesel range from R20 000 – R50 000].	**At all times**	**Vessel Master**
	• For smaller mining vessels, retain all oily waste in containers onboard for later disposal to drums or harbour facilities ashore.	**At all times**	**Vessel Master**
5.2.5 Spillage of cleaning solvents, oils & other chemicals	• Use low toxicity biodegradable detergents to clean up spills. • Avoid spilling toxic chemicals but if spillages occur then clean up spilled chemicals immediately and place rags used for this purpose in a toxic waste container for safe disposal ashore. • Where diesel, which evaporates relatively quickly, has been spilled in the sea, agitate the water or mix the oil slick using a propeller boat/dingy to aid dispersal and evaporation. • Keep records of spillages and estimate amounts not retrieved by clean up actions.	**At all times**	**Vessel** **Master**
5.3 Waste & Pollution Management at Sea & in Harbours			
5.3.1 Waste disposal & vessel maintenance in harbours	• Do not dump or throw any solid waste of any kind into harbours. Solid waste should be disposed of by the relevant harbour authority at a recognized facility. • Do not discharge any sewage into harbours.	**At all times**	**Vessel Master**
	• Do not discharge any oily or waxy effluents into a harbour. • Do not discharge effluent or water from any tank contaminated with oil into a harbour.	**At all times**	**Vessel Master**
	• During dry slag blasting and spray painting, take measures to prevent pollution by paint particles, dust and slag of the water as well as the air and land.	**At all times**	**Vessel Master**
5.3.2 Domestic solid waste generated at sea	Specific requirements for prospecting and mining vessels operating in nearshore waters: • Store all solid waste material in suitable containers onboard for safe transfer to and disposal at the De Punt refuse dumps.	**At all times**	**Vessel master**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Do not discharge any plastic materials (including plastic ropes, nets, garbage bags etc.) or any non-biodegradable materials into the sea. • Do not discharge any biodegradable refuse, into the sea within 3 nautical miles of land. • Keep records of estimates of garbage generated.		
	Supply the DWA with information on: • Type of non-combustible waste generated at sea, • Volume and frequency of disposal, • Name of municipal waste disposal site to be used, and • A letter from the controlling authority of the waste site, permitting the applicant to dispose of wastes at the site.	**Before start of operations**	**Vessel Master**
5.3.3 Use of antifouling paints on boats < 25m length	• Do not use antifouling paints containing toxic tributyltin compounds on boats. • Environmentally-friendly hull paints such as "Sigmaplane Ecol Antifouling" will be substituted for Antifouling paints.	**At all times**	**Vessel Master**
5.3.4 Atmospheric emissions from mining vessels	• Minimise emission of exhaust gases (e.g. CO2, CO, SO2 and NOx) and soot through regular maintenance of diesel motors and generators.	**At all times**	**Vessel Owner**
5.3.5 Disposal of sewage at sea	• Do not discharge any treated or untreated sewage from a vessel within 4 nautical miles of the coast. • Where prospecting / mining vessels are not yet equipped with sewage treatment or storage facilities, programmes must be implemented to install / upgrade sewage treatment facilities in order to comply with MARPOL requirements when these become legally implemented.	**When MARPOL requirements are implemented**	**Vessel Owner**
6. PROTECTION OF THE HISTORICAL ENVIRONMENT	The Environmental Objective is to: • Prevent the loss of information and research material for furthering human understanding of historical and pre-historical eras.		
6.1 Cultural Resources			
6.1.1 Disturbance or damage to historical shipwrecks	• Do not disturb in any way a shipwreck older than 60 years without a permit from SAHRA. On finding shipwreck material: • Immediately inform the SAHRA if likely shipwreck material is found, • Contract a marine archaeologist to survey the site,	**When necessary**	**Operations manager**

ACTIVITIES	OBJECTIVES AND MANAGEMENT MEASURES	TARGET DATES	RESPONSIBLE PERSON
	• Avoid mining or prospecting within 200 m from the centre of the site until the area has been surveyed and clearance, or a permit to continue activities, has been obtained from SAHRA, • Retain copies of archaeological survey reports, and • Retain permits and copies of correspondence from SAHRA.		
7. PROTECTION OF THE NATURAL ENVIRONMENT	Environmental objectives are to: • Minimise direct disturbance effects on the environment and its components as a result of mining activities, • Minimize general environmental damage to habitats and to maintain ecosystem functioning and biodiversity, and • Optimize societal benefits by facilitating conservation of resources.		
7.1 Biological Resources below HWM			
7.1.1 Damaging or removing benthic fauna in mining	• Educate divers about the importance of benthic fauna in the marine ecosystem, and encourage them to minimize direct and indirect removal or damage through mining activity.	**Ongoing**	**Operations manager**
7.1.2 Shellfish collection (lobsters, abalone, mussels)	• No shellfish (including abalone, rock lobster, mussels) will be collected without a permit from the Directorate of MCM, DEA. • No shellfish will be collected from closed areas and marine protected areas without written permission from the Directorate of MCM, DEA. • Divers operating suction pipes shall not intentionally remove and/or damage rock lobsters during mining.	**Ongoing**	**Contractors**
7.1.3 Recreational Fishing	• Contractors will be expected to adhere to all fishing regulations under the Marine Living Resources Act.	**Ongoing**	**Contractors**
7.1.4 Disturbance of marine mammals, sharks & turtles	Trans Hex will obtain exemption from DEA for the first of the following regulations (which it is not possible to comply with). The regulations state that: • To avoid disturbance of whales, no vessel may approach within 300 m of a whale. If a whale surfaces within this distance the vessel must immediately proceed to a distance 300 m away. • Do not feed, harass, disturb or kill great white sharks, dolphins or turtles.	**Following acceptance of EMPR**	**Environmental manager**
7.1.5 Disturbance of birds & seals on islands	• Do not land on any island or willfully disturb any sea bird or seal without a permit from the provincial nature conservation authority, unless in an emergency.	**When applicable**	**Operations manager**

6.1 Roles, Responsibilities and Time Frames

Responsible personnel with respect to the roles highlighted under the management commitments in Section 0-Table 6.1 are outlined in Table 6.1-1

Table 6.1-1 Roles and responsibilities

Environ mental Element Affected.	Responsibility	Time Frames and Phases of implementation
1.Topography	Operations Manager and metallurgists	Operation and decommissioning
2.Soils (pollution) and/ or Erosion	Operations Manager, Earth moving manager, plant and maintenance superintendent and mechanics	Ongoing
4.Land Capability and Land Use	Operations Mine Manager and metallurgists	Operation, Decommissioning
5.Ecology	Operations Manager and manager Engineering services	Construction, Operation, Decommissioning
6.Surface water		Ongoing
7.Ground water	Operations e Manager : Water supply, Manager: Engineering services, Metallurgist	Ongoing
8.Air Quality	Operations manager,Metallurgist, Manager: Engineering Services	Ongoing
9.Noise	Operations manager Water supply, Engineering services,	Ongoing
10.Visual	Operation Manager and Exploration Manager	Operation and Decommissioning
11.Archaeology	Operations Manager	Ongoing
12.Socio-economic	Operations Manager, Human Resources Manager, Stake holder Liaison Manager	Ongoing

EMP implementation budget

Costs associated with successful implementation of the EMP are included in the capital costs. These EMP implementation costs include:

- Diesel bowser;
- Workshops;
- Equipment storage yard;
- Wash bay;
- Water tanker for dust suppression;
- Dozer (D9) for rehabilitation

All Divisional Managers will be allocated budget, as part of operational costs, for implementing the EMP activities which fall under their area of responsibility.

7 Statutory requirements

7.1 Legislative framework/Statutory Requirements

There are several Acts, which have bearing on environmental management in South Africa. For the purpose of this report, this section of legal requirements does not deal with all these statutes, but rather focuses on those that have compliance implications for Brazil. This section focuses on those pieces of legislation, which require authorisation or permits. However, various statutes, whose provisions have to be complied with, irrespective of whether a permit is required or not, are summarized in Table 7.1-1. The provided statutes are applicable to mining operations and promotes concepts such as social responsibility, responsibility for latent environmental impacts, the polluter pays principle, the precautionary principle, the involvement of stakeholders and rehabilitation and closure.

The statutory requirements have been categorised according to respective sectors identified in the system developed to track performance of the environmental management programme report e.g. waste management.

Brief descriptions of the specific actions required in terms of each item of applicable environmental legislation are included in the register. The mine will consult relevant legal requirements when assessing, or planning, activities under various environmental sectors. The lead authorities are presented for all the Acts, which are covered in the legal register. It should be noted that different statutes require different environmental authorization applications and have different lead authorities. In some instances uncertainty about, who the lead authority is, could arise. This is because a proposed development could fall under the jurisdiction of more than one Act, thus requiring clarity from the relevant departments. The Mine Health and Safety legislation is not covered in this Section as this area is dealt with under a separate Division of Brazil: Health and Safety.

Table 7.1-1 should also be read in conjunction with Section 4, which details the Project activities at Berazil as well as Section 6, which details management measures for the identified potential impact which might result from the planned activities.

Table 7.1-1: Legal Framework

Item/Sector	Applicable legislation	Approvals and licences which might be required by Trans Hex
MINING AUTHORISATION		
Mining authorisation (Section 22) Environmental authorisation/ approval of the EMP (Section 39) Complementary to the requirement for mining authorisation, is a requirement to submit an EMP ▪ Financial provision (Section 41) ▪ Performance audits (Regulation 55) ▪ Closure certificate (Section 43) ▪ Social and labour plan (Regulation 42)	**Mineral and Petroleum Resources Development Act No. 28 of 2002.** **Lead Authority: Department of Mineral Resources**	**Mining authorisation** **Trans Hex has an existing mining authorisation has to obtain the conversion of this old order right to a new order right and associated environmental approvals for the Brazil operations..** **Social and labour plan** **Financial Provision** **A rehabilitation cost estimate and evidence of ability to provide for these costs has to be provided and updated annually** **EMP approvals** **The conditions of approval for both prospecting and mining EMPs has to be complied with.** **Auditing** **Trans Hex has to submit audit reports to the DMR and other**

Item/Sector	Applicable legislation	Approvals and licences which might be required by Trans Hex
		authorities on a regular basis to prove compliance with its EMP Closure certificate To be sought after decommissioning phase
ENVIRONMENTAL AUTHORISATION		
Environmental authorisation for listed activities	National Environmental Management Act (107 of 1998) (NEMA) Lead authority: Department of Environmental Affairs	Waste disposal Existing Municipal disposal site in De Punt is currently being used. Trans Hex will obtain a proof of a licence for the sites where waste is taken by approved waste collectors A disposal certificate has to be obtained from the waste disposers either than e.g. suppliers.
WATER AUTHORISATION		
Chapter 4 of the National Water Act (Sections 21 to 55) focuses on water use. Generally a water use must be licensed. Water uses that need to be licensed (Section 21) include: Section 21 (a)Taking of water from a water resource Section 21 (g) Disposing of waste in a manner which may detrimentally impact on a water resource Section 21 (j) Removing and/ or discharging of	National Water Act (36 of 1998) Lead authority : Department of Water Affairs	Sea water will be used for Brazil operation. Drinking water is transported from Port Nolloth by a Truck. Currently no further prospecting work is envisage at Farm Brazil, after drilling operations did not provide positive results. Should there be any operation in this Farm, licences would be required for: ▪ a planned slimes dam ▪ removing water from an open pit to continue with mining ▪ storm water design to be approved by DWA

Item/Sector	Applicable legislation	Approvals and licences which might be required by Trans Hex
underground water if it is necessary for the efficient continuation of a activity or for the safety of people Regulation 704		
MATERIALS HANDLING AND STORAGE		
Hazardous substances Group 1 substances are chemical substances, particularly poisons. These exclude registered medicines and agricultural remedies. A permit is required to fore selling these substances Group II substances are defined in South African Bureau of Standards (SABS) 0228 and are typically chemicals Group III substances are electronic products, capable of emitting electromagnetic radiation Group IV substances are radioactive materials. No person shall produce, acquire, dispose import or export any Group IV hazardous substances without the written authority of the Director General.	Hazardous Substances Act (No. 15 of 1973) Lead Authority: Department of Health	▪ Trans Hex will identify any hazardous substances on site and manage these according to the requirements. ▪ X-ray permits might be required for the processing activities in Port Nolloth.
Polychlorinated bi-phenyls (PCBs)		
The SABS Code 0228 classifies polychlorinated biphenyls as a Class 1 toxic hazard. The preferred method of disposal is high temperature incineration, although encapsulation and land co- disposal is allowed.		Trans Hex will ensure that transformers are PCB free or to ensure that transformers will have pollution prevention facilities e.g. bunding to prevent contamination of the environment by PCBs.

Item/Sector	Applicable legislation	Approvals and licences which might be required by Trans Hex
AIR POLLUTION REGISTRATION CERTIFICATE		
	National Environmental Management : Air Quality Act (No. 39 of 2004) Chief Air Pollution Control Officer (CAPCO) in the Directorate of Air Pollution within DEA and local authority inspectors.	There are no identified scheduled processes at Trans Hex.
FLORA: CONTROL OF ALIEN INVASIVE PLANTS		
Conservation of Agricultural Resources Act 43 of 1983: Section 5 of the Act prohibits spreading of weeds.	Conservation of Agricultural Resources Act (No. 43 of 1983) Lead Authority Department of Agriculture	Rehabilitation strategies will be developed Catergorisation of the alien invasive plant will be done
Regulation 15 declares plants that are considered weeds and invaders. It categorises the declared weeds and invaders into three categories (Category 1, 2 and 3).		

Item/Sector	Applicable legislation	Approvals and licences which might be required by Trans Hex
BIODIVERSITY MANAGEMENT		
	National Environmental Management: Biodiversity Act (No. 10 of 2004) Lead Authority Department of Environmental Affairs	
Sea Shore Act No. 21 of 1935		
Sea Fishery Act No. 12 of 1988		Obtain a permit for recreational or subsistence fishing
Sea Birds and Seals Act No. 46 of 1973		
ARCHAEOLOGY		
The National Heritage Resources Act (25 of 1999) (NHRA) requires that an environmental assessment is undertaken for any development exceeding 0.5 ha. All identified archaeological sites must be registered with the South African Heritage Resources Agency (SAHRA). A permit in terms of Section 40 of NHRA is required for disturbance of archaeological sites. Permits in terms of Section 41 of the NHRA are required for disturbance of grave sites. These permits are obtained from SAHRA (or the provincial heritage agency).	National Heritage Resources Act (No. 25 of 1999) (NHRA) Lead authority : SAHRA	A heritage impact study was done on the neighbouring Sea Concession 5 (a) and corresponding surf zone by the archaeology Contracts Office of the University of Cape Town and attached as Appendix .

8 Performance monitoring and reporting

The mine will conduct internal audits to check compliance of project activities with the approved EMP. The site will be visited and any non-compliances will be addressed through development of corrective actions. The corrective actions will be assigned to responsible personnel who will then implement them. EMP performance will be part of weekly project meetings.

All site personnel will be given a copy of the management measures committed to in this EMP, to keep with them during the duration of the drilling activities. Internal audits will be conducted on a weekly and monthly basis to check compliance of drilling and prospecting activities with the approved EMP. During the internal audits, The site will be visited and any non-compliances identified will be addressed through development of corrective actions. The corrective actions will be assigned to responsible personnel on site, who will then implement them. The site manager will follow-up on the corrective actions on a weekly basis and sign them off once satisfied that they have been implemented.

In addition to the above mentioned performance and monitoring commitments, The mine shall adopt the following strategies to ensure that the commitments stipulated in this EMPR are adhered to:

- Develop a procedure for ensuring that the company identifies and allocates human, technical and financial resources necessary to meet its environmental objectives and targets;
- Review environmental management system procedures and ensure that human resources are allocated to set environmental management objectives;
- Define roles and responsibilities and link these to key performance areas to ensure that (Key performance areas of identified environmental responsible personnel to include environmental obligations);
- Describe how environmental performance and compliance information will be communicated to employees, on-site service providers and contractors;
- Review complaints registers or other procedures to ensure that concerns concerning environmental performance and compliance raised by personnel are received and addressed;
- Develop procedures to ensure that responsibilities and accountability of personnel who manage, perform, verify work affecting environment are defined and documented;
- Update environmental awareness plan annually and implement;
- Develop procedure to facilitate training of employees, on-site service providers and contractors
- Focus training on means on enhancing ability of personnel to ensure compliance with environmental requirements,
- Ensure that top management to build awareness and motivate and reward employees
- Develop environmental policy which should be availed to contractors and all employees;

- Conduct environmental inductions for contractors;
- Conduct environmental inductions for employees;
- Identify training needs;
- Evaluate training received;

In order to ensure for continual improvement and full compliance with the management procedures and monitoring requirements of Trans Hex's EMPRs, Operations Implementations Guide for vessel-based operations has been formalised and they are called Trans Hex Operations (Pty) Ltd: Safety Management System: ISM shipboard Manual for vessels (Attached as Appendix 4). These ISM procedures are structured as follows:

Procedures: Incident Management Systems

- Emergency preparedness shore based contingency plan
- Responsibility and Authority
- Resources and Personnel
- Recruitment and Training (on board training plus identification of training needs by vessel master)
- Incident reporting-recording and investigation
- Critical safety equipment maintenance

Reporting Documents: Incident Management Systems

- Safety committee minutes
- Log sheet for environmental management
- Maintenance requirements
- Stock reports (fuel & lubricant oil)
- Incident reports

A similar guide for shore-based operations is also being planned. The document provides operational guidelines for application by the Vessel Master in co-operation with the Mine Manager and the shallow Water Operations Manager. (The latter being located ashore), or the delegated, for:

- recording requirements in terms of the requisite environmental monitoring programmes, and
- instructions/notification requirements in terms of actions that are to be undertaken in special circumstances.

The environmental management and monitoring programmes have been categorized into management, vessel activities, environmental monitoring and pollution management. The specific monitoring programmes as defined in the ISM are listed below:

- Management:
  - ⇒ Environmental non-conformances and corrective action requests
- Vessel:
  - ⇒ Ocean conditions
  - ⇒ Communications with I&APS
  - ⇒ ROV dives
  - ⇒ Observed/Ferry vessels
  - ⇒ Bunkering of fuel
  - ⇒ Port usage
- Environmental Monitoring:
  - ⇒ Intention to sample/mine area
  - ⇒ Mining area
  - ⇒ Tailings sampling (Vessel / Office)
  - ⇒ Plume observations
  - ⇒ Fish life observations
  - ⇒ Marine mammals and seabirds observations
- Jellyfish observations
  - ⇒ Rock lobsters observation
  - ⇒ Pollution Management:
  - ⇒ Consumption (Fuel, oils, H 2 O, FeSi)
  - ⇒ Spillages
  - ⇒ General and hazardous waste products and transfers (refer to Guide for details)

⇒ Discharges to sea

⇒ Discharges to atmosphere

The Mine will develop a monitoring committee which shall consists of the members of the community. The community shall be invited to participate in the monitoring committee. The committee will be part of the internal audit teams and be involved in the implementation of the management measures.

In addition, the following initiatives will be adhered to:

- Have a structured system of internal and external communication linked to the broader company communication strategy;
- New projects to be communicated to relevant affected parties through an agreed formal communication channel and concerns to be incorporated into feasibility decisions;
- Complaints registers to be utilised and reviewed according to available set procedures ;
- Interested and affected parties concern to be incorporated into project implementation;
- A system of ensuring that projects are planned and communicated to regulatory authorities before implementation to be developed;
- Internal communication to be strengthened to support continual improvement.
- Table 8.1-1 shows monitoring plan.

Table 8.1-1: Monitoring plan

Action	Frequency	Method	Period
Monitoring of perimeter fence	Monthly and following any heavy rainfall	Foot or vehicle patrol.	Until closure.
Monitoring of re-vegetation Mined out and rehabilitated areas Levelled and Rehabilitated Dumps Mine residue dam walls Old roads Covered over waste pits Rehabilitation plots	Every 6 months	Foot inspection Initiate set up of test plots Photograph. Transect/ Quadrat Get consultants in if necessary	Until closure.
Monitoring of erosion Roads	Every 6 months and following any heavy rainfall	Visual inspection Walk over rehabilitated areas	Until closure

Action	Frequency	Method	Period
Mine residue dam walls Rehabilitated mined out areas Dumps Pumps and pipelines Any other areas		Drive along roads Check pipelines and pumps; mine residue dams, dumps Photographic records	
Monitoring of alien plants over the whole site	On-going until under control – then every 6 months.	Visual inspection on foot patrol Map presence of invasive plants Plan removal, remove and document area covered on monthly basis Verify Photograph	On-going until closure.
Monitoring of All Rehabilitation Areas. Check compliance with gradients and variation in topography	Every 6 months.	Survey – map new rehabilitated areas. Plot on map and calculate area treated.	Until closure.
Monitoring of stability of mine residue dams and water storage facilities.	Monthly and summarise every 6 months	Follow specifications in mandatory code of practice for slimes dams	Until closure
Monitoring of disposal of metal scrap, old oil, oil filters, old oil drums, oily cloths, batteries, fluorescent tubes, tyres and contaminated soil. (Hazardous waste site)	Monthly and summarise every 6 months.	Record each load sent off the site Give used oils to oilkol Ensure safe disposal certificates are obtained from suppliers if the material are given back to them	Until closure.
Monitoring of maintenance of general waste disposal	All loads of waste to be recorded and quantity extrapolated. Covering of waste pit - Monthly.	Running total of loads of waste taken. Record of waste taken to De Punt waste disposal site or Port Nolloth municipal landfill site. Keeping records of	Until closure

Action	Frequency	Method	Period
		waste taken to disposal site	
Monitoring of condition of septic tanks	Every 6 months	Visual inspection. Record condition.	Until closure
Monitoring of condition of bunded areas around diesel fuel tanks, refuelling area, old oil tank; and underground petrol tank	Every six months.	Visual inspection	Until closure
Monitoring of communications & undertaking joint projects with other marine operators & managers	Monthly	Ensure co-operation with joint diamond mining monitoring and research projects implemented and co-ordinated by the MDMA.	Until closure
Monitoring of water use.	Monthly	Record total water use and water use at different plants by recording flow meters. Ensure compliance with licence.	Until closure

Water Quality Monitoring

The following key indicators which must be analyzed are summarized as follows:

- pH
- EC
- TDS
- SO4
- Fe
- Al
- Mn

The following indicators may be added on the list depending on the activities:

- Oil and Grease near the workshop
- E-Coli, PO4, NO3, NH4 and COD for water born sewage were final effluent is analyzed.

9 Environmental awareness, emergency and non-conformance plans

Trans Hex is committed to identifying training needs and ensuring that all personnel whose work may create a significant impact upon the environment receive appropriate training. The Environmental Awareness Plan (EAP) describes the training available and the manner in which environmental training needs are identified and continually reassessed.

9.1 Environmental Awareness Plan

Environmental awareness will be part of the existing training and development plan. Key personnel with environmental responsibilities will be identified:

- Procedure will be developed to facilitate training of employees, on-site service providers and contractors;
- Environmental awareness to focus on means on enhancing ability of personnel to ensure compliance with environmental requirements;
- Top management will build awareness and motivate and reward employees for achieving environmental objectives;
- Environmental policies will be availed to contractors;
- Environmental inductions will be concluded for contractors;
- Environmental inductions will be conducted for employees;
- There will be an ongoing system of identifying training needs;

Objective of the environmental awareness plan

To ensure that:

- Training needs are identified and all personnel whose work may create a significant impact upon the environment have received appropriate training;
- All employees are aware of the impact of their activities (activities and the environmental components they are likely to impact on are shown in Table 6.1).
- Procedures are established and maintained to make appropriate employees aware of:
  - ⇒ The significant environmental impacts, actual or potential, of their work activities and environmental benefits of improved personal performance;
  - ⇒ Their roles and responsibilities in achieving conformance with environmental policy, procedures and any implementation measures
  - ⇒ The potential consequences of departure from specified operating procedures;

- Personnel performing tasks, which can cause significant environmental impacts, are competent in terms of appropriate education, training and /or experience

Responsibilities and Frequency of Training

The responsibilities in terms of environmental awareness training lie with Trans Hex's human resources Department, which handles overall training for the company. (Detailed in Social and Labour Plan). The Trans Hex's Training Division, which still falls under Human Resource's Department will undertake the generalized environmental awareness training such as inductions which are done on a continuous basis (at least weekly). Specialists may be contracted in by Trans Hex where required for specialized environmental training. Training records will be held by Trans Hex (Quarterly).

Identification of Training Needs

The identification of environmental training and development needs will be derived from the analysis of role descriptions. The role description is used to confirm the category of occupation as per Trans Hex's structure templates. Descriptions of activities, aspects and impacts will be sourced from the Environmental Implementation Plan. Derived from this information. A training and development needs matrix will then be compiled displaying the Environmental responsibility/role, required knowledge and outputs, intervention required and interval of intervention.

Available Training

Training across Trans Hex generally takes the form of general environmental awareness, environmental talk topics, task specific environmental training. General environmental awareness training as part of the induction at Trans Hex is undertaken. The training focuses on :

- General environmental awareness
- Mine's policy and vision concerning environmental management
- Legal requirements
- Mine activities and potential impacts arising from such activities
- Different management measures to manage identified impacts
- Mine personnel's role in implementing environmental management objectives and targets

To ensure that all employees have access to external environmental training the following procedure for requesting training is utilized.

Training Request Procedure

Trans Hex has an existing authorisation form to be used in the training request approval process regardless of whether the training has been budgeted for or it being a new request. The following is the workflow of a Training Request:

- The completed form is forwarded with accompanying quotations (these can be obtained from Head Office where necessary) and justifications to the Operations/Responsible Manager for approval.

- After the Operational/Responsible Manager has signed off the form, it is to be forwarded to the Training and Development department for processing at Head Office with the relevant quotations and justifications.

- After it has been processed at Head Office and approved, it is forwarded to the respective Group Manager for approval.

- If no further approval is required, a copy of the approved form is returned to the Project / Operational Manager, where after the necessary arrangements can be made according to the approved form.

- If further approval is required based on the authorisation levels for the expenditure, the form and quotes are forwarded to the respective approving level. The approved / disapproved form will then be forwarded back to the Project / Operations Manager, where after the necessary arrangements can be made according to the approved form.
- Completion of the form:
- The area / division / mine for which the Training Request authorisation form is applicable should be marked in the respective block.
- The project name and the brief description for what the training request is for should be explanatory to the originator as well as all management levels that have to approve the expenditure.
- Details of item:

  ⇒ Previously budgeted for: Yes or No based on current financial year's budget exercise.

  ⇒ Additional or replacement – do we replace a planned training intervention (budget), or is it an additional intervention?

- Budget Details:

  ⇒ The SAP code should reflect the internal order as per the Training & Development budget. For unbudgeted items, the field should be marked as "Unbudgeted".

  ⇒ The amount that has been approved with the budget exercise.

  ⇒ Motivation for expenditure – A short motivation stating the requirement for training, the expected outcomes and the future benefit of the skills to the Company.

- Quotations:

  ⇒ A quotation from the training providers is required for any training intervention. Details of additional costs such as travel, accommodation and meals should be completed on the form.

- Delegates:

  ⇒ The names, employee numbers and the specific capacity which the delegate fulfils, and for which training is required.

  ⇒ Approval – the approval process should be based on the above workflow to ensure the speedy approval of the training request.

  ⇒ Authorization Review – If any queries arise from the training request, the query will be documented on an addendum form to the training request form by the respective person and forwarded to the originator for a response. Only once a response to the query has been obtained and approved will the application be approved and forward to the relevant department, or Training and Development at Head Office, to go ahead with the necessary arrangements.

  ⇒ Return of Approved form – once the necessary approval has been obtained, a copy of the form is returned to the originator, who upon receiving the completed form, and can liason with the Training and Development department at Head Office to make the necessary arrangements.

- Payment of invoices

  ⇒ Payment of all invoices must be arranged through Head Office.

9.2 Environmental Emergency Plan

Trans Hex is committed to establishing and maintaining procedures to identify potential emergency situations, to respond to emergencies and to mitigate any resulting safety, health and environmental impacts. In addition, the organization will review its emergency procedures (particularly after emergency situations) and periodical test such procedures where practicable.

The following procedures will be developed:

- Handling of hazardous substance spills;
- Dealing with failure of mine residue disposal facilities;
- Identify potential for accidents;
- Respond to accidents and emergency situation
- Prevent and mitigate environmental impacts.

An emergency is defined in this plan as an unplanned situation or event resulting in involvement of the emergency services, police, fire, paramedic or the regulatory authorities. Emergencies include accidents and emergency incidents.

Objectives

To ensure that all environmental emergency situations are identified and are linked to the identified significant risks, made known to employees and surrounding communities that proper response action are in place and are communicated to those who might encounter such emergency situations.

Identification of Potential Environmental Emergencies

Significant environmental aspects and their associated environmental impacts will be identified for all Trans Hex's operational areas. In formulating the emergency plan the following factors were taken into consideration:

- All significant environmental aspects likely to result to emergency conditions;
- Historic emergency events of activities, products and services on/off the site;
- Chemicals, oils and other materials used on site;
- Activities of contractors;
- Concerns of communities and authorities where submitted;
- Proximity to sensitive area such as residential areas, schools, wetlands, rivers Availability of local emergency services;
- Availability of local emergency services;
- Availability of trained, on-site personnel for emergency situations.

Potential emergency situations identified for Trans Hex will include petrochemical/chemical spillages, hazardous material spillages, fires, slimes spillages and failures, untreated effluent spillages, explosions and natural disasters, and electrical failure. A risk assessment was undertaken to identify such potential emergency risk situations.. Emergency plans will be documented for each of these stipulated emergencies, which include responsibilities in emergency situations, corrective and preventative actions and the reporting of such emergencies.

- Identification of evacuation routes;
- Identification of safety showers and eye-wash stations;
- Identification of ire extinguishers;
- Identification of spill containment equipment;
- Effluent drains, storm water channels, sewage treatment and other water systems;
- Site infra-structure such as bulk storage facilities;

- Prevailing wind direction and neighbouring communities and facilities; and
- Emergency generators;

Roles and Responsibility

All Trans Hex's employees and contractors working for Trans Hex are responsible for reporting any accident/emergency to their supervisor immediately,

The Operations Manager is responsible for the annual testing and review of the applicable emergency response procedures in conjunction with the Rescue Team. The rescue team will be identified.

A report, including the above-mentioned information, is to be submitted to the director-General of Environmental Affairs within 14 days in accordance with Section 30 of the National Environmental Management Act.

Emergency Plan

An emergency plan will be developed for each potential emergency situation. Each plan provides easy reference to relevant basic information for handling the situation. The Emergency Plan is not intended to be a comprehensive instruction for handling the emergency. This can only be achieved through training and regular practice drills. Actual emergencies will be reported and followed up by the Safety, Health and Environment Management Procedure for Nonconformity, corrective action and preventative action procedure. Relevant government authorities will be contacted by the in case of the occurrence of an emergency as per legislative requirement.

Information relative to a particular emergency is documented in the respective emergency plan including:

- Description of the emergency;
- Reference to relevant material safety data sheets;
- Responsibilities for management of emergencies;
- Contact telephone numbers (on-site and off-site);
- Equipment required (including locations); and
- Site plan where applicable;

Emergency response team

Personnel nominated as response team members receive appropriate training to manage emergencies. All other personnel are made aware of potential emergencies and trained in evacuation and call out procedures. Where practicable, personnel will participate in regular

practice drills to test the effectiveness of the procedures and plans. Emergency plans are reviewed and tested by practice drill at least annually. The results of drills are reviewed and documented including any amendments to training, changes to procedures, plans or equipment.

Provision of Equipment and Facilities

Equipment associated with the identified emergencies for land operations is maintained as follows:

Equipment	Responsibility
Fire extinguishers **Fire hydrants** **Fire hose reels** **First aid boxes**	**Each working area is responsible for the maintenance of their fire equipment**
Front end loader **Excavator**	**Individual sites maintain vehicles as required.**
Emergency equipment	**Emergency response team**

Notifying the Relevant Government Authorities

Emergencies will be reported within 24 hours by telephone or fax to the relevant government authorities.

- The information reported will include:
- Contact person and contact details;
- Date and time of incident;
- Reference to:
  - ⇒ Sections 28 and 30 of the National Environmental Management Act (Act 107 of 1998);
  - ⇒ Section 20 of the National Water Act (Act 36 of 1998);
- The nature of the incident;
- The substance involved and an estimation of the quantity released and the possible acute effect on persons and the environment and dates needed to assess these effects;
- Initial measures taken to minimize impacts;
- Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure; and
- Measures taken and to be taken to avoid a recurrence of such incidents;

A report, including the above-mentioned information, is to be submitted to the director-General of Environmental Affairs within 14 days in accordance with Section 30 of the National Environmental Management Act.

Review of Procedures

The emergency procedures must be reviewed after each incident or annually during EMS meetings.

9.3 Non conformance plan

As outlined in the Operations Implementations Guide, environmental records will be captured daily, and forwarded to the Vessel Operations Manager on a monthly basis. Non-conformance records will be forwarded immediately after the event. Environmental performance reports will be generated monthly and forwarded to the Group Environmental Manager, who will forward them to DMR quarterly. An external environmental audit will be undertaken once a year, and submitted to DMR.

10 Social and Labour Plan

The social and labour plan for Brazil was submitted to DMR as a separate document and is therefore not discussed in this EMP.

11 Closure plan

This section is divided into two sections namely:

- Land based activities;
- Shore and Vessel based operations

Trans Hex decommissioning for land based operations objectives are as follows:

- Identify potential post-closure uses of the land occupied by Trans Hex's in consultation with the surrounding land owners and land users (this is to be done during the operational phase);
- Rehabilitate disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate disturbed land and mine-residue deposits to a state that facilitates compliance with applicable environmental quality objectives (air-quality objectives and water-quality guidelines) and where the visual impact of the disturbed land is reduced and limited post-closure management is required;
- Limit the impact on staff whose positions become redundant on closure of the mine. (Addressed in the Social and Labour Plan);
- Keep relevant authorities informed of the progress of the decommissioning phase;

- Submit monitoring data to the relevant authorities as outlined in section 8.
- Maintain required pollution-control facilities and rehabilitated land until closure;

The main impacts related to closure and decommissioning, as well as persisting after closure pertain to mine residue deposits and the social issues. These include:

- Failures of mine residue deposits (overburden dumps and tailings dams);
- Changes in topography created by mine surface infrastructure (residue deposits and open pits);
- Erosion of disturbed land and, consequent, development of erosion gulleys;
- Erosion of mine residue deposits;
- Contamination of surface water (seepage from the mine residue deposits);
- Dust from the overburden and tailings dumps;
- Retrenchment of employees at mine closure;
- Post –mining land use and settlement;

Impact: Long-term impacts of the residue deposits related to dust, surface water and groundwater pollution, and stability.

The overburden dump will be permanent features, and the duration of the possible threats to the environment is permanent. In addition, discard dumps and slimes should processing be undertaken on site will also be permanent features of topography. These include wind blown dust generation, surface and groundwater pollution and failure of these structures. The engineering design at closure the impoundment include the draining off of all surface water on the impoundment, drying out of the slimes, and lastly the placing of an engineered capping over the slimes to prevent the ingress of any water into the impoundment, as well as to provide for the shedding of any storm water runoff.

The frequency of the activity will be daily due to the permanent existence of the slimes dam, with the frequency of the impact very seldom due to engineering design and management measures implemented during construction and operation. The severity of the impact will be significant if this feature fails, the spatial scope area specific and the duration permanent. The pre-mitigation impact significance will thus be medium.

The continuous vegetating of the earth embankment walls for slimes and discard dumps during operation, and final rehabilitation at closure, will minimise the potential for dust to be generated from these structures. Stability analysis will also need to be conducted through the life of the slimes dam and the overburden and discard dumps to ensure stability at closure and post closure. These measures will further reduce the frequency and duration of the impact, and thus the overall post-mitigation impact significance to low.

Severity	Spatial Scope	Duration	CONSEQUENCE (sub-total)
Critical (4) (PM-1)	On-site (2) (PM- 1)	Residual (5) (PM-1)	12 (PM-3)
PROBABILITY Certain 6 (PM-2)			
SIGNIFICANCE OF IMPACT (pre-mitigation)		SIGNIFICANCE OF IMPACT (post-mitigation)	
High (72)		Low (6)	

The frequency of the activity will be daily due to the permanent existence of the slimes dam, with the frequency of the impact very seldom due to engineering design and management measures implemented during construction and operation. The severity of the impact will be significant if a feature fails, the spatial scope area specific and the duration permanent. The pre-mitigation impact significance will thus be low-medium.

The continuous vegetating of the earth embankment walls during operation, and final rehabilitation at closure, will minimise the potential for dust to be generated from the dam. Stability analysis will also be conducted through the life of the slimes dam to ensure stability at closure and post closure. These measures will further reduce the frequency and duration of the impact, and thus the overall post-mitigation impact significance to low.

Rehabilitation strategies to ensure that the visual character of the area is not compromised and that the post mining land use is beneficial to the land owners, will be developed. Disturbed areas will be rehabilitated through landscaping, topsoil replacement and the establishment of vegetation in these areas. Rehabilitation will take place during the life of the mine (construction, operational and decommissioning phases). Landscaping will be undertaken to resemble the natural topography of the areas that have been disturbed or, at least, to reduce slopes to stable gradients (not more than 1:3 and preferably 1:5). On closure, all disturbed areas will have been rehabilitated. For the extraction of the diamond resource, sequential, continuous rehabilitation is not always possible. However, pits have been planned such that backfilling is optimised. Topsoil will be conserved and used judiciously in the rehabilitation of disturbed land. Where topsoil is not available for rehabilitation, the surfaces to be rehabilitated (subsoils or mine residues) will be treated (contours, fertilizer, ripping) to ensure that they are able to support self-sustaining plant communities. Topsoil will be stripped (As described in Section 6) and hauled to disturbed areas.

Vegetation establishment in disturbed areas will be undertaken as soon as is practical, with growing season and water availability being the primary time constraints. The waste dumps will not exceed 10m in height ensuring the weight distribution is spread over a larger area. Where disturbed areas cannot be revegetated during the life of the mine, appropriate measures will be taken to control erosion.

These may include:

- The use of energy dissipaters;
- The use of berms and storm-water diversion canals;
- Application of straw mulches or soil binders to exposed soils;

The spread of invader species on disturbed land will be controlled until the vegetation cover is capable of providing sufficient natural weed control.

In general, initial revegetation will be undertaken using a mixture of commercially available seeds that will germinate reliably (high seed viability). The species used will be selected on the basis of their ability to bind and cover soil (to afford effective erosion protection) and their tolerance of the prevailing environmental conditions.

As vegetation cover becomes established on the disturbed areas, indigenous veld species will be introduced to these areas. The vegetation cover will be managed in such a way as to encourage the spread of veld species in rehabilitated areas.

Rehabilitated areas will be monitored and maintained until a self-sustaining plant community that protects soil against erosion has been established. The table below represents the areas where pictures were taken from. The table should be read in conjunction with the Figures 1.4-1 to 1.4-5 as well as photographic record on Appendix 5.

Impact: Retrenchment of employees at closure, and associated post-closure land use and settlement.

During the decommissioning phases and at closure, large-scale retrenchments can flood the job market resulting in people being unable to find new employment for a long period of time. Economic slump of the local towns such as Hondeklip Bay, Port Nolloth and De punt after mine closure is an associated potential impact. People who have derived income directly or indirectly fromthe Brazil operations may be inclined to leave the region in search of employment. This could result in the further decline of the economy of the region as well as the abandonment of infrastructure. It is likely, however that there will be residual positive economic impacts that are not fully reversed with the closure of the mine, and that the economy will not decline to its original level prior to the development of the Brazil project.

Mine-Residue Deposits

Management objectives:

- To ensure that the dumps are stable and that there is an acceptably low risk of failure of these mine-residue deposits during the decommissioning phase and following closure;
- To ensure the visual impact of the overburden and tailings dumps is not unacceptable and to maintain the dumps in a stable state;
- To establish self-sustaining vegetation cover on the slimes dam such that:
  - ⇒ The visual impact of the slimes dam is improved;
  - ⇒ Erosion of tailings and, consequent air and water pollution are prevented;
- To maintain management facilities to prevent water pollution by seepage and leachates from the overburden dumps and slimes dams;

Management Principles:

The tailings dumps and slimes dams will continue to be inspected by a suitably qualified professional engineer to check whether they are stable. If unstable areas are detected, appropriate remedial measures will be implemented.

This monitoring will continue until a suitably qualified professional engineer has attested to the long-term stability of these structures.

Diversion canals, seepage cut-off trenches and the evaporation ponds and paddocks serving the tailings dams will be maintained to ensure that they are both stable and functional. If necessary, these structures may be retained as permanent pollution control facilities.

Infrastructure Area

The objectives are the same as the closure objectives presented above, the addition of the following:

- To ensure that infrastructure identified for removal is successfully demolished and removed;
- To ensure that infrastructure identified to remain post closure is maintained until the issue of a closure certificate.

Management Principles

The plant and associated disused infrastructure will be demolished. Building foundations will be removed to a depth of 0.5m. All land exposed by the demolition of infrastructure and other land disturbed by Trans Hex's activities will be rehabilitated as outlined in Section 11.

Rubble will be disposed of at a suitable site. The site will be selected in consultation with DWA and DMR and will be rehabilitated..

Unsafe excavations and steep embankments will be landscaped and rehabilitated.

Soil that has been contaminated by spillages, seepages, leachates, waste and tailings dust will be sampled and analysed. If necessary, it will be treated, ameliorated or removed to a suitable site. The site will be selected in consultation with the DMR and DWA.

Diversion canals, cut-off trenches and other surface-water management infrastructure will be maintained to ensure they are both stable and functional.

Just before closure, when disturbed land has been rehabilitated and erosion is controlled by vegetation cover, disused surface-water management facilities will be decommissioned.

Water Diversion Canals

Management objective

To backfill and revegetate those water diversion canals which have no further purpose.

Management principles

Just prior to closure, disused water diversion canals will be backfilled and revegetated

Negative Economic Impacts

Management objective

Alleviate the negative socio-economic impacts that will result from closure of Brazil.

Management Principles

Trans Hex will undertake a carefully planned step-wise decommissioning process.

Closure planning will form an integral part of mine planning.

Strategies for sustainable development of surrounding towns have been and will continue to be developed by the project in collaboration with district and local authorities, local businesses and other interested parties. Early warning of impending closure will be given to IAPs.

Coupled with the long-term closure planning, the mine will actively participate in regional and local planning to enhance the economic benefits of the project through development of alternative forms of income generation.

Trans Hex will initiate and participate in regional planning exercises that will mitigate the impacts of closure of Brazil, the local and regional economies and associated abandonment of community infrastructure surrounding Brazil.

The mine will fulfil the requirements for closure and the management of downscaling as contained in the SLP

Maintenance

Management Objective

To maintain required pollution-control facilities and rehabilitated land until closure.

Management Principles

The required pollution-control facilities will be maintained until closure. Rehabilitated land and mine-residue deposits will be maintained until closure.

Rehabilitation of existing disturbances

As mentioned in Section 1.4.1 of this EMP, there has been existing historical diggings on the Farm Brazil. The rehabilitation activities that are planned on this area are presented in Table 11-1. The position of each photograph has been plotted on the orthophotos and is referenced with a unique number which corresponds with the photograph number In addition, the position of each photograph has been tabulated in Table 11-1, together with a brief description of the disturbance. In this way the reader can refer to the orthophoto for a illustrative position, and the table for a description of the disturbance, whilst simultaneously viewing the corresponding photograph. All co-ordinates are expressed in WGS84 chart.

Table 11-1: Rehabilitation Plan for Impacts resulting from Trans Hex's mining activities in surf-zone and admiralty strip concessions associated with the Farm Brazil as well as associated admiralty strip

AREA/LATITUDE	REHABILITATION START DATE	REHABILITATION END DATE	DESCRIPTION	FIGURE AND PICTURE REFERENCE
Jakkalsbaai	Ongoing	End of mine	Trans Hex's Jakkalsbaai shore contractor facilities: • Remove all litter, garbage and scrap from the property, • Remove all old plant and mobile accommodation units • Investigate future use options by other users in the area, • bioremediate soil where necessary.	TH07-03_070, TH07-03_071, TH07-03_072
29°53.391'S			Shore contractor site. • remove all equipment and old plant, • rehabilitate vehicle and equipment storage areas, • bioremediation of soil where necessary, • remove all tailings discarded above HWM and	Figure 2.6-4

			• redistribute in the intertidal.	
29°53.303'S			Shore contractor site. • remove all equipment and old plant, • rehabilitate vehicle and equipment storage areas, • bioremediation of soil where necessary, • remove all tailings discarded above HWM and • redistribute in the intertidal.	Figure 2.6-4
29°53.101'S			Shore contractor site. • remove all equipment and old plant, • rehabilitate vehicle and equipment storage areas, • bioremediation of soil where necessary, • remove all tailings discarded above HWM and • redistribute in the intertidal.	Figure 2.6-4

Trans Hex decommissioning objectives for vessel and shore based activities

Active rehabilitation of the marine environment below the LWM is not required, as rehabilitation within this highly dynamic nearshore area is a naturally occurring process. Restoration and rehabilitation of areas disturbed by Trans Hex's mining operations thus applies primarily to the surf-zones opposite farm Brazil, and the admiralty strip associated with Brazil. Trans Hex is committed to full restoration and rehabilitation of damage caused to the environment as a consequence of their past shore-based mining operations. Rehabilitation plans are detailed in Table 10-1 below. However, correspondence with DMR indicates that Trans Hex (or any other mining company) is not accountable for the rehabilitation of environmental damage or disturbance created prior to 1980 (except where safety, stability or pollution are considerations), or for which they were not responsible. Any rehabilitation and re-vegetation of such areas should be conducted in co-operation between those responsible for creating the impact, and the relevant national and

regional authorities. It must be noted that natural re-vegetation in such historically disturbed areas does occur, although at a very slow rate.

The new regulations regarding vehicle access to beaches should reduce public usage of coastal tracks which provide access to beaches, dunes and estuarine wetlands. However, in remote areas such as Namaqualand, compliance remains a general problem due to lack of policing. As Trans Hex (or any other prospecting or mining right holder) are not legally in a position to prevent the general public from accessing beaches, driving over dunes, creating new tracks etc., this remains the responsibility and obligation of the authorities administering the relevant legislation.

Many of the (often unnecessary) informal tracks on the coastline are used regularly by, or originate from, kelp collectors often with little regard for existing roads or the environment. Consequently, the company cannot be held responsible for the impact caused by road use, or for mitigation and rehabilitation of tracks used in the past.

11.2 Maintenance & Rehabilitation of Roads & Tracks

Trans Hexx undertakes to utilise the proclaimed roads as explained in Section 4.2 for transportation of gravels. Any access to the beach will be through the existing tracks and no creation of new informal track will be accepted. However, the general public also access the Farm Brazil for flower-viewing, hiking, and 4x4 trails. The concession area is open to the public, and diamond mining activities will inevitably interact. However, actual mining activities are only now planned below the HWM, and this interaction will be primarily of an aesthetic nature, and limited to the few active mining and equipment storage localities. The haul roads to be used should mining activities be undertaken inland will be ripped, vegetated and rehabilitated. Trans Hex commits to maintain the roads that are formally used by their contractors.

11.3 Proposed Time table, Duration and Sequence

The shallow nature of the nearshore surf-zone and (a)-concession environment poses obvious restrictions to modern geophysical survey and sampling techniques, with the result that shallow-water mining in itself becomes the prospecting tool. Consequently, it is impossible to accurately determine the economic feasibility of exploitation, and thus a life of mine figure, with the result that the mining licences for most of these concessions have been granted for an indefinite period. The exception is concession 7(a) whose Mining Licence expires on 16 November 2010. However, in terms of the mining lease agreement with the Minister of Mineral Resources, the lease can be revoked at any time should the company not perform as prescribed. Production statistics are submitted on a monthly basis, and the performance of the company is thus under continuous scrutiny by DMR.

Mineral extraction in the shallow-water and surf-zone environments is by necessity opportunistic being highly dependent on weather and sea conditions. Together with the erratic distribution of

reserves, compilation of rigorous mine plans for the (a)- concessions and surf-zone and admiralty strip concessions is thus futile. This is particularly applicable to the vessel-based contractors.

Due to the indefinite nature of the mining licences granted for these concessions, dates of progressive or partial closure applications, decommissioning and aftercare programmes, and for final closure application cannot be estimated, and will commence on exhaustion of ore reserves. The shallow nature of the nearshore surf-zone and (a)-concession environment poses obvious restrictions to modern geophysical survey and sampling techniques, with the result that shallow-water mining in itself becomes the prospecting tool. Consequently, it is impossible to accurately determine the economic feasibility of exploitation, and thus a life of mine figure, with the result that the mining licences for most of these concessions have been granted for an indefinite period. The exception is concession 7(a) whose Mining Licence expires on 16 November 2010. However, in terms of the mining lease agreement with the Minister of Minerals and Energy, the lease can be revoked at any time should the company not perform as prescribed. Production statistics are submitted on a monthly basis, and the performance of the company is thus under continuous scrutiny by DMR.

Mineral extraction in the shallow-water and surf-zone environments is by necessity opportunistic being highly dependent on weather and sea conditions. Together with the erratic distribution of reserves, compilation of rigorous mine plans for the (a)- concessions and surf-zone and admiralty strip concessions is thus futile. This is particularly applicable to the vessel-based contractors.

Due to the indefinite nature of the mining licences granted for these concessions, dates of progressive or partial closure applications, decommissioning and aftercare programmes, and for final closure application cannot be estimated, and will commence on exhaustion of ore reserves.

The production schedules are provided in Section 1 of this EMP.

1.1.1 Prospecting Projects

Date of Issue of prospecting Right	n/a
Date of submission of EMP	
Proposed date of starting, duration and completion of prospecting	

1.1.2 Mining projects

Date of issuing of mining authorisation	Concession 5(a) ML247/93: 10/11/1993 Concession 6(a) ML4/89: 01/03/1986 Concession 7(a) ML3/2000: 17/11/2000 Surf Zone *Brazil* ML25/93: 21/09/1993 Admiralty Strip *Brazil* ML25/93: 21/09/1993 Surf Zone *Hondeklip* ML28/93: 07/10/1993

Date of submission of EMPR	October 2010
Date of starting and duration of construction / setting up period	n/a
Estimated dates of starting of mining, full production and cessation of production	Mining on 5(a) commenced in 1976, on 6(a) in 1987 and on 7(a) in the early 1980s, shortly after granting of initial prospecting/mining authorizations. Operations are currently in full production. Estimated dates of cessation of mining are not known.
Estimated dates of progressive or partial closure applications	On exhaustion of ore reserves
Estimated dates of decommissioning and aftercare programme	
Estimated date for final closure application	

Monitoring Information from monitoring described in Table 8.1-1 will be submitted to regulatory authorities after completion of the monitoring phase.

12 Financial Provision

Rehabilitation of small-scale disturbances resulting from contractor activities in the surf-zones of Hondeklip and Brazil, and admiralty strip of Brazil, are undertaken to the satisfaction of Trans Hex, on the contractors' accounts. This includes removal of all equipment, old plant and garbage, levelling of tailings heaps, removal of concrete structures, gravel platforms, and bioremediation/removal of soils contaminated by oil or diesel spills. Ultimate costs for final rehabilitation of disturbed areas are carried by Trans Hex although the contractor's machinery may be utilized in this regard. Such rehabilitation, restoration and reclamation activities which are run concurrently with mining activities are covered by current operational budgets.

For the purpose of end-of-life rehabilitation of all its mining and prospecting operations, Trans Hex, with the approval of the DMR and South African Revenue Service, established a group trust fund in March 1998. Producing mines all contribute to the trust fund on an annual basis. Annual contributions by the mines are calculated once a year by dividing the estimated remaining life-of mine (in years) by the estimated total end of life rehabilitation liability. Annual contributions in respect of Farm Brazil and concessions 5(a) currently stand at R10 000 and R30 000, respectively. The financial assessment is estimated to be R56 310. The assessment table is provided as Table 12-1.

Shore based activities

Table 12-1 shows the disturbances and rehabilitation to be done. Extensive terrestrial mining and prospecting for diamonds has occurred along the coastline south of the Orange River mouth since the 1930's. In some areas past mining operations have resulted in severe disturbance and alteration of the physical profile of the coastal strip by extensive excavations, and tailings disposal. Prior to the minerals Act of 1991, no rehabilitation and restoration of mining-impacted areas was

required, and much of the prospecting/mining conducted on the coastal plain and fore dune area was uninformed, unscientific and uncontrolled. This has resulted in severe long-term / permanent scarring of the landscape along virtually the whole of the coastline between the Orange River and Spoeg River mouths thereby significantly impacting both the visual quality and topographic form of the coastal environment. Most of the coastline adjacent to the 5, 6 and 7 group of sea concessions is owned by De Beers Namaqualand Mines who still operate largescale mines at Kleinzee and Swartlintjies, as well as recovering diamond resources in the surf-zones and admiralty strips.

Sites of previous damage have been indicated on 1:10 000 georeferenced Orthophotos (Figure 1.4-1 to Figure 1.4-5). Each disturbance is supported by numbered, annotated photographs (Appendix 5). The position of each photograph has been plotted on the orthophotos and is referenced with a unique number which corresponds with the photograph number In addition, the position of each photograph has been tabulated in Table 11-1, together with a brief description of the disturbance. All co-ordinates are expressed in WGS84 chart.

The financial provision is thus provided for the rehabilitation activities outlined in Table 12-1.as a general principle, for current activities. Rehabilitation of small-scale disturbances resulting from contractor activities in the surf-zones of Brazil, and admiralty strip of Brazil, are undertaken to the satisfaction of Trans Hex, on the contractors' accounts. This includes removal of all equipment, old plant and garbage, levelling of tailings heaps, removal of concrete structures, gravel platforms, and bioremediation/removal of soils contaminated by oil or diesel spills. Ultimate costs for final rehabilitation of disturbed areas are carried by Trans Hex, although the contractor's machinery may be utilized in this regard. Such rehabilitation, restoration and reclamation activities which are run concurrently with mining activities are covered by current operational budgets.

Vessel based activities

The potential effect of marine diamond mining on the environment and ecology of the West Coast of Southern Africa has been the focus of various studies and reports (CSIR Report EMAS-C95040b, Barkai and Bergh 1992). The reports conclude that marine diamond mining has a small, short term negative impact on local commercial marine resources and industries reliant on them and an insignificant, short term negative impact on the local ecology.

The proposed mining method causes limited damage as only relatively small areas of the seabed are disturbed at any one time. The proposed work plan envisages a total area of less than 0.01% of the concession area. The sustainable mining rate of a vessel as described above is projected as 10 m^2/h, but only a small portion of this material is screened out for treatment. The larger portion of the dredged sediment (usually > 90%) is immediately returned to the seabed in the area from where it was mined. The remaining screened fraction passes through the DMS plant where the heavy mineral fraction is collected and the tailings are again returned to the sea floor. The heavy mineral fraction amounts to less than 1% of the material originally pumped to the surface and this is also returned to the sea floor once the diamonds have been extracted.

The only discharge to the ocean, generated by the mining process would be the mine tailings. Studies and mathematical modelling of the resultant sediment plume and re-deposition indicates that the bulk (88% to 97%) of the tailings material is deposited back into the mined area (CSIR Report EMAS-C95040b). The finer material stays suspended in the plume, but should not cause a significant increase over the naturally occurring turbidity.

The relatively brief time spent actively mining the ore bodies, as well as the single mining visits would allow for unhindered and rapid re-colonisation of the areas by fauna and flora adversely affected by the mining process. Mining will also be concentrated on larger open sediment patches which are not seen as areas of high biotic diversity or production. These areas are also not preferred crayfish habitats which are usually reef and gully environments.

No toxic chemicals are used in the DMS or X-ray diamond extraction processes and consequently there is no danger of environmental pollution from these processes.

Potentially hazardous waste products from the mining vessel such as used oil, batteries etc. will be retained on board and disposed of through proper controlled methods complying with the recommendations under the International Convention for the Prevention of Pollution from Ships (MARPOL). This will be done during routine harbour visits to Cape Town. Ordinary household waste and garbage will be incinerated on board. No raw sewage will be discharged to the ocean.

The financial provision has thus been calculated considering the above information (Table12-1).

The costs for rehabilitation of individual mining sites are carried by the contractor operating in each area, and contractors are required to implement rehabilitation immediately after cessation of operations at each site. Costs of maintenance and rehabilitation of roads, tracks, parking and storage areas, including provisions for the new maintenance requirements are covered by the annual mine operating budget. The Operations Manager is required to budget for such maintenance, and to conduct regular maintenance and rehabilitation as part of the annual environmental obligations of the processing facility.

Table 12-1 CALCULATION OF THE QUANTUM

Mine:	Brazil	Location:	Northern Cape
Evaluators:		Date:	26 October 2010

No	Description	Unit	A Quantity	B Master rate	C	D Weighting factor 1	E=A*B*C*D Amount (rands)
			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
1	Dismantling of processing plant and related structures (Including overland conveyors and power lines)	m^3		R 6.82	1.00	1.00	R -
2(A)	Demolition of steel buildings and structures	m^2		R 95.00	1.00	1.00	R -
2(B)	Demolition of reinforced concrete buildings and structures	m^2		R 140.00	1.00	1.00	R -
3	Rehabilitation of access roads	m^2		R 17.00	1.00	1.00	R -
4(A)	Demolition and rehabilitation of electrified railway lines	m					R -
4(B)	Demolition and rehabilitation of non-electrified railway lines	m					R -
5	Demolition of housing and/or administration facilities- These structures will be donated to the local community	m^2		R 190.00	1.00	1.00	R -
6	Opencast rehabilitation including final voids and ramps	ha		R 96 700.00	0.52	1.00	R -
7	Sealing of shafts, adits and inclines	m^3					R -
8(A)	Rehabilitation of overburden and spoils	ha	0.3	R 66 400.00	1.00	1.00	R 19 920
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (no pocessing will be done at this stage since no prospecting did not show good results)	ha		R 82 700.00	1.00	1.00	R -
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha					R -
9	Rehabilitation of subsided areas	ha					R -
10	General surface rehabilitation	m^2	140.0	R 100.00	1.00	1.00	R 14 000
11	River diversions	ha					R -
12	Fencing	ha					R -
13	Water management	ha					R -
14	2 to 3 years of maintenance and aftercare	ha	0.5	R 7 000.00	1.00	1.00	R 3 500
15 (A)	Specialist study	Sum		R 1.00	1.00	1.00	R -
15 (B)	Specialist study	Sum					R -
16	Shore and vessel based operation						
	Data collection, capture and processing	Hours	20.0	R 800.00	1.00	1.00	R 16 000
	Plume sample collection & analysis	Hours	12.0	R 600.00	1.00	1.00	R 7 200
						Sub Total 1 (Sum of items 1 to 15 above)	R 37 420
Multiply by Weighting factor 2 (Step 4.4)		1.10				= R →	R 41 162
1	Preliminary and General	Add 6% of Subtotal 1 if Subtotal 1 ≥ R 100 000 000.00					R -
		Add 12% of Subtotal 1 if Subtotal 1 ≤ R 100 000 000.00					R 4 490
2	Contingencies	Add 10% of Subtotal 1					R 3 742
						Sub Total 2 (Subtotal 1 plus sum of management and contingency)	R **41 162**
						Sub Total 3	R **49 394**
						VAT @ 14 % of Subtotal 3	R 6 915
						GRAND TOTAL (Subtotal 3 plus VAT)	R **56 310**

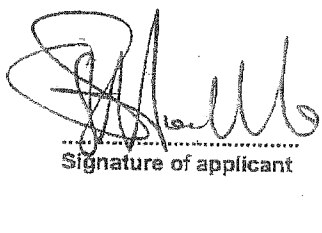
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR DIAMOND MINING ACTIVITIES ON THE FARM BRAZIL 329,CORRESPONDING SURF ZONE INCLUDING CONCESSION 5A AND THE ADMIRALTY STRIP OPPOSITE BRAZIL

SITUATED IN THE MAGISTERIAL DISTRICT OF NAMAQUALAND

UNDERTAKING

I, **Vincent Sebatli Madlela**, the undersigned and duly authorised thereto by **Trans Hex Operations (Pty) Ltd** have studied and understand the contents of this environmental management programme report (EMPR) in it's entirety and hereby duly undertake to implement the environmental management measures provided under Section 6-9 of this EMPR.

Signed at Johannesburg this 29th day of **October 2010**



Signature of applicant

Group Manager: Legal &Stakeholder Relations
Designation