NAME OF APPLICANT: SAMANCOR CHROME LIMITED

REFERENCE NUMBER: LP 30/5/1/2/3/2/1 (38) EM

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

SUBMITTED FOR AN APPLICATION FOR A MINING RIGHT IN TERMS OF SECTION 39 AND OF REGULATIONS 50 AND 51 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002, (ACT NO. 28 OF 2002) (the Act)

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Samancor Chrome Limited

Eastern Chrome Mines

Lwala Chrome Mine

Location: Surbiton 115 KT,

Hackney 116 KT,

Forest Hill 117 KT

Clapham 118 KT

Twickenham 114 KT

Local Municipality: Greater Tubatse Local Municipality

Province: Limpopo Province

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SECTION 1

ENVIRONMENTAL IMPACT ASSESSMENT

REGULATION 50 (a)

1 Description of the baseline environment

1.1 Concise description of the environment on site relative to the environment in the surrounding area

The Lwala Chromite Mine is located between the Matadi River, an unnamed tributary of the Moopetsi River and the Moopetsi River all of which are season and only flow during the a rainfall event.The area is characterised by rugged mountains and broad, flat-bottomed valleys in which extensive community crop farming takes place. The valley in which mining will take place, is divided by two koppies (hills), namely Matadi Hill (1094 metres above mean sea level (mamsl)) and Sekgoshi Hill (924 mamsl) that rise from the valley floor.

Though the area can be considered a greenfield area, communal land on site and in the surrounds is used for informal cropping and this as well as the overgrazing of the veld increased erosion potential in the area.The R37 traverses some of the applicable farm portions. Surrounding land uses include housing (villages), informal agriculture and mining.

1.2 Concise description of each of the existing environmental aspects both on the site applied for and in the surrounding area which may require protection or remediation

1.2.1 Soils

The soil environment in the region is characterised by shallow soils on rocky riges and red apedalic freely drained soils on gently to flat mid slopes where Mispah, Glenrosa, Avelon and Hutton Soils are found.In the area where the proposed opencast is situated the dominant soil form was Hutton.

The area can be considered dry with little surface and groundwater resources. The little resource that is available should be conserved with water management measures planned from the start to allow the minimization of water use.

1.2.2 Natural vegetation plant life (Flora)

The majour vegetation type in the area is Mixed Bushveld which is poorly conserved and it has also been influenced by fire and grazing. In the area where surface impacts is expected four vegetation units were delineated, namely, *Accacia karroo* scrub land, *Aloe castanaea* hill vegetation, fallow lands and *Sterculia rogersii* rocky outcrops. Rare or endangered plant species may occur on site though the area proposed for the opencast area has been impacted by agricultural activities already. However, most of the site has been impacted by subsistance agriculture thus very little natural vegetation remain

on site with the exception of the two hills located on site.

1.2.3 Animal life (Fauna)

No endangered or red data species were noted on site but may occur in the regional area.

1.2.4 Surface water

The study area is located within the B71E quaternary drainage region as part of the Middel Olifants component / sub area. With regards to surface water the Middle Olifants sub-area has a natural Mean Annual Runoff (MAR) of 481 million m^3/annum and requires an Ecological Reserve of 69 m^3/annum. This area has indicated increasing needs for water which is mostly attributed to the mining activities that has increased in the area.

The water quality problems in the Middle Olifants are salinity, eutrophication, toxicity and sediment. It is believed that the salinity and eutrophication problems are due to the irrigation return flows and sewage treatment plant discharges, while the toxicity problems have been related to the use of pesticides and herbicides in the irrigation schemes. The sediment is related to poor agricultural practise as a result of overgrazing in the rural areas.

Three main watercourses traverse or are located near the complete study area these are the Motse River, The Moopetsi River and the Matadi River. The Matadi River merges with the Moopetsi River which is a tributary of the Motse River. The Motse River will not be impacted as no surface infrastructure is proposed that intersect the Motse River. However, the Matadi River and several unnamed ributaries of the Moopetsi Rivers will be influenced and affected by the proposed surface infrastructure.

No wetlands were identified on site.

1.2.5 Groundwater

The Rustenburg Layered Suite rocks typically act as secondary aquifers (intergranular and fractured rock aquifers) . However, the multi-layered weathering system present on these rocks could prove to have up to two aquifer systems present in the form of a shallow, saprolitic aquifer with a weathered, intergranular soft rock base associated with the contact of fresh bedrock and the weathering zone; and a fractured bedrock aquifer.

Groundwater levels, varying between 7.7m and 46.5m below ground level, were measured during these surveys.

Groundwater use in the area is mainly for domestic, livestock and irrigation purposes and in most instances this is also the sole source of reliable and clean domestic water. A total of 32 boreholes and 1 spring were identified during the hydrocensus study.

It was found that the groundwater in the area is of good quality. If all the data is taken into account, it can be concluded that the groundwater in the area can generally be classified as Class I (acceptable) according to the SABS Guidelines for Drinking Water in terms the cations and anions. The only exceptions in this regard are that most of the water contained elevated concentrations of magnesium and chloride, with elevated TDS values. The high Magnesium (Mg) concentrations most probably derived from the geology as the Bushveld Complex comprises of a suite of igneous rocks containing abundant magnesium iron silicates.

1.2.6 Archaeological

Numerous Iron Age sites were recorded within the project area (surface infrastructure area only) but has been damaged by the historic agricultural activities. A graveyard with 34 graves was also recorded.

1.3 Concise description of the specific land uses, cultural and heritage aspects and infrastructure on the site and neighbouring properties/farms in respect of which the potential exists for the socio-economic conditions of other parties to be affected by the proposed mining operation

1.3.1 Land use

The current land use on site (surface infrastructure area) is communal agriculture. Based on the ENPATT database the land use is classified as Vacant/Unspecified and Subsistence farming, while these two are also present in the surrounds, residential land use is added.

1.3.2 Archaeological and Cultural

Numerous Early Iron Age and Middle Iron Age sites were located on the demarcated terrain and consisted of pottery fragments, village remains such as cattle enclosures and middens, and cultural material such as pottery, metal working debris, ostrich eggshell beads and very distinctive grinding stones; Some hut and metal working debris were also observed. .All/most of these sites have been damaged or destroyed by cultivation. A graveyard with historic and modern grave stones were also observed, scatterd graves at ruins of homesteads may occur. This Hills on the project area are considered to be of cultural importance to the surrounding communities.

1.3.3 Infrastructure

Currently there is no surface infrastructure on site, on the surrounding properties there are roads and houses, fences etc.

1.4 Annotated map showing the spatial locality and aerial extent of all environmental, cultural/heritage, infrastructure and land use features

identified on site and on the neighbouring properties and farms

Please refer to Appendix 1.

1.5 Confirmation that supporting documents in the form of specialist studies are attached as appendices

- Appendix 4: Mine works plan (2012)
- Appendix 5: Air Quality Assessment (2009)
- Appendix 6: Ecological Assessment (2003)
- Appendix 7: Flood line determination (2003, 2013)
- Appendix 8: Geo-hydrological Assessment (2003, 2013)
- Appendix 9: Heritage Assessment (2003)
- Appendix 10: Noise and Vibration Assessment (2003)
- Appendix 11: Social Assessment (2003)
- Appendix 12: Land Use and Land Capability (2003)
- Appendix 13: Traffic Assessment (2003)
- Appendix 14: Visual Assessment (2002)
- Appendix 15: Surface Water Assessment (2003, 2013)
- Appendix 16: Social and Labour Plan (2012)
- Appendix 17: Closure cost estimates (2012)
- Appendix 18: Closure cost estimates per year (Tables only and based on assumptions 2013)

2 The proposed mining operation.

2.1 The mineral to be mined

The minerals to be targeted are chromite and the associated minerals.

2.2 The mining method to be employed at the level of opencast, underground, stoping, stooping, total extraction, bord and pillar, block caving, shrinking, dredging, pumping, monitoring, etc.and provide **a** concise description of the intended magnitude thereof, in terms of volumes, depth and aerial extent

2.2.1 Opencast mining

Two opencast sections will be established on both sides of Sekghosi Hill. The opencast east of Sekghosi hill will be established first.The opencast high wall will be limited to 50 m with a crown pillar of 30 m and would yield 2.6 million tons (MT). The two opencasts consists of an area of 321 548.2 m^2 (32.15482 Hectare).

2.2.2 Underground mining

The LG6 seam will be mined underground for approximately 1 950 m along dip and 9 100 m along strike.Depth: Mining is planned at depths ranging from 0m to 600m below surface. As the total mineral resource is 114.8 MT and 2.6 MT is allocated to the opencast section underground mining would yield 112.2 MT.

The underground section will be mined by a hybrid mining method.Reef drives are planned at 150 meter intervals going out at 5º - 7º above strike. Perpendicular to the reef drives will be centre gully raises connecting the reef drives with each other. Stoping will then be done from these raises with 21-m panels mined on breast. There will be no off reef development (no footwall drives and crosscuts). It is planned to mine the package only in areas where trackless equipment is planned and mine only the LG6 conventionally in the stopes.

All drilling in the stopes (LG6) will be done by means of handheld machines. Drilling in the other areas will be by means of mechanised low profile drill rigs. Systematic support will be used in the stopes with spot bolting in other areas. Due to the hybrid mining system it is planned to blast with emulsion in the shafts and reef drive development and use Anfex in the stopes.In-stope cleaning will be by means of scraper winches.Face winches will scrape the material into a “gulley” at the downdip side of the stope from where it will be scraped to a centre gully. The centre gulley winch will then scrape the ore onto the conveyor belt.

For the first five years two underground mining areas area proposed, Lwala underground 1 located on the farms Surbiton 115 KT, Hackney 116 KT, Forest Hill 117 KT and Clapham 118 KT and constitutes 1 705 Hectares. Underground 2 is located on Surbiton 115 KT and Twickenham 114 KT and constitutes 1 116 Hectares.

2.3 List of the main mining actions, activities, or processes, such as, but not limited to, access roads, shafts, pits, workshops and stores, processing plant, residue deposition sites, topsoil storage sites, stockpiles, waste dumps, access roads dams, and any other basic mine design features

The following activities, actions or processes will take place:

- Construction phase: Construction of:
    - Access and Internal Roads
    - Fence
    - General surface infrastructures: Offices, Workshops, Lamp room, Change rooms, parking areas, stores
    - Waste Water Treatment Works (Sewage Plant)
    - Crushing and Screening plant

  - Beneficiation plant
  - Tailings Dams
  - Storm water / Return water dam
  - Storm water infrastructure
  - Conveyor belt
  - Waste Rock Dump
  - Electrical substation and power lines
  - Salvage yard
  - Potable and process water pipelines
  - Initial boxcut area
  - Adits / shafts
  - Overburden and topsoil stockpiles as a result of the removal of topsoil
- Operational phase: management and operation of
  - Opencast mining areas
  - Underground mining areas and adits
  - Crushing and screening of ROM
  - Beneficiation of ROM
  - Overburden and soil stockpiles
  - Product stockpiles
  - Waste Rock Dump
  - Storm water / return water dams
  - Tailings dam
  - Waste Water Treatment Works (Sewage Works)
  - Process and potable water
- Rehabilitation, Closure and post closure phase: management and operation of:
  - Opencast mining areas
  - Closure of shafts / adits
  - Removal of unneeded surface infrastructures, e.g. roads, offices etc.
  - Stockpiles, overburdens
  - Tailings dam, storm water / return water dams

2.4 Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes as required to calculate the financial provision in accordance with the Department's published guideline (Reg.51 (b) (v))

Please refer to Appendix 2.

2.5 Listed activities (in terms of the NEMA EIA regulations) which will be occurring within the proposed project

This is a comprehensive list and will need to be refined as more detail on infrastructure becomes available.

2.5.1 Government Notice Regulation R544 of 2010 (Basic Assessment Activities):

According to the list of activities identified in terms of sections 24 and 24D of the National Environmental Management Act, 1998 (R 544, 18 June 2010), the proposed development may trigger the following listed activities (Listing Notice 1), which must undergo a Basic Assessment:

- 9. The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -
  - with an internal diameter of 0,36 metres or more; or
  - with a peak throughput of 120 litres per second or more
  - Excluding where: a) such facilies or infrastructure are for bulk transportation of water, sewage or storm water or storm water draiange inside a road reserve
- 10. The construction of facilities/infrastructure for the transmission of electricity
  - ii) outside urban areas / industrial complexes with a capacity of 33 – 275 kV
- 11. The construction of:
  - canals;
  - channels;
  - bridges;
  - dams;
  - weirs;
  - bulk storm water outlet structures;
  - marinas;
  - jetties exceeding 50 square metres in size;
  - slipways exceeding 50 square metres in size;
  - buildings exceeding 50 square metres in size; or
  - infrastructure or structures covering 50 square metres or more
  - where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.
- 12. Construction of facilities/infrastructure for the off-stream storage of water, including dams and reservoirs with a combined capacity of 50,000 m^3 or more unless such storage falls within the ambit of activity 19 of Notice 545 of 2010 (*I.e.wall higher than 5 meters, and cover an area of 10 Ha or more*)

- 13. The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 80 cubic meters but less than 500 cubic meters at any one location or site.
- 22. The construction of a road, outside urban areas,
  - with a reserve wider than 13,5 meters or,
  - where no reserve exists where the road is wider than 8 metres, or
  - for which an environmental authorisation was obtained for the route determinatiobn in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010
- 23. The transformation of undeveloped, vacant / derelict land to
  - residential, retail, commercial, recreational, industrial / institutional use inside an urban area & where the area to be transformed is 5 hecates or more but less than 20 hactares
  - residential, retail, commercial, recreational, industrial / institutional use outside an urban area and where the area to be transformed is bigger than 1 hectare but less than 20 hactares
  - except where such transformation takes place for linear activities
- 24. The transformation of land bigger than 1 000 square meters in size, to residential, retail, commercial, ndustrial or instituional use, where at the time of coming inot effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.
- 26. Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004) (*i.e.removal of listed plant species etc.*)
- 46. The widening of a road by more than 6 meters, or the lengthening of a road by more than 1 kiometer-
  - where the existing road is wider than 13,5 meters; or
  - where no reserve exists, where the existing road is wider than 8 meters; -
  - Excluding widening or lenthening occuring inside urban areas
- 56. Phased activities fo all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extnsions, will exceed a specific threshold; -
- Excluding the following activities listed in this Schedule: 2, 11(i)-(vii); 16(i)-(iv); 17; 19; 20; 22(i) and (iii); 25, 26, 27(iii) and (iv), 28, 39, 45(i)-(iv) and (vii)-(xv), 50, 51, 53, as well as 54.

2.5.2 Government Notice Regulation R545 of 2010 which may require an EIA:

- 3. The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.
- 5. The construction of facilities or infrastructure for the any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release

of emissions, pollution or effluent which is not identified in Notice No.544 of 2010 or inlcuded in the list of waste management activities published in terms of Section 19 of the National Environmental Management: Waste Act, 2008 (Act No 59 of 2008) in which case that Act will apply.

- 8. The construction of facilities or infrastructure for the transmission and distribution of electricity with a cpacity of 275 kilovolts or more, outside an urban area or industrial complex.
- 15. The physical alteration of undeveloped, vacant / derelict land for residential, retail, commercial, recreational, industrial / institutional use where the total area to be transformed is 20 ha or more;
  - Except where such physical alteration takes place for:
  - linear development activities; or
  - agriculture or afforrestation where activity 16 in this Schedule will apply.
- 19. The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 meter or higher or where the high-water mark of the dam covers an area of 10 hectares or more.

2.5.3 Government Notice Regulation R546 of 2010 which may require a Basic Assessment:

- 4. The construction of a road wider than 4 m with a reserve less than 13,5 meters
  - (ii) Outside urban areas in:
    - (aa) a protected area identified in terms of NEMPAA, excluding conservancies;
    - (bb) national protected Area Expansion Strategy Focus areas;
    - (cc) Sensitive areas as identified in an environmental management framework as contemplated in chaper 5 of the Act as adopted by the competent auhtority;
    - (dd) Sites or areas identified in terms of an International Convention;
    - (ee) Sites or areas identified in systemci biodiversity adopted by the compentent auhority or in bioregional plans;
    - (ff) Core areas in biosphere reserves;
    - (gg) areas within 10 kilometers from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a bioshpere reserve.
- 10. The construction of facilities/infrastructure for the storage / storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 m^3 but not exceeding 80 m^3
  - (ii) Outside urban areas in:
    - (aa) a protected area identified in terms of NEMPAA, excluding conservancies;
    - (bb) national protected Area Expansion Strategy Focus areas;
    - (cc) Sensitive areas as identified in an environmental management framework as

contemplated in chaper 5 of the Act as adopted by the competent auhtority;

- (dd) Sites or areas identified in terms of an International Convention;
- (ee) Critical biodiversity areas as identifed in systemci biodiversity plans adopted by the competent auhtority or in bioregional plans;
- (ff) Core areas in biosphere reserves;
- (gg) areas within 10 kilometers from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a bioshpere reserve;
- (ii) Areas on the watercourse side of the development setback line or within 100 meters from the edge of a watercourse where no such setbackl ine has been determined.

- 12 The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation.
  - (a) within any critically endangered or endangered ecosystems listed in terms of Section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;
  - (b)Within critical biodiversity areas identified in bioregional plans.
- 13. The clearance of an area of 1 ha or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (1) the undertaking of aprocess or activity included in the list of waste management activities published in terms of Section 19 of the NEMWA, 2008, in which case the activity is regarded to be excluded from this list (2) the undertaking of a linear activity falling below the threshold mentioned in Listing Notice 1 in terms of GN No.544 of 2010:
  - (a) Critical bodiverity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority;
  - (b) National Protected Area Expansion Strategy focus area;
  - (c) (ii) Outside urban areas, the following;
    - aa) a protected area identified in terms of NEMPAA, excluding conservancies;
    - (bb) national protected Area Expansion Strategy Focus areas;
    - (cc) Sensitive areas as identified in an environmental management frameowrk as contemplated in chapter 5 of the Act as adopted by the competent auhtority;
    - (dd) Sites or areas identified in terms of an International Convention;
    - (ee) Core areas in biosphere reserves;
    - (gg) areas within 10 kilometers from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a bioshpere reserve;
    - (ii) Areas on the watercourse side of the development setback line or within 100 meters

from the edge of a watercourse where no such setback line has been determined.

- 14. The clearance of an area of 5 hectares or more of vegetation where 75 % or more of the vegetation over constitutes indigenous vegetation, except whre such removal of vegetation is required for (1) purposes of agriclure or afforestation inside areas identified in spatial instruments adopted by the compotent authority for agriculture or afforestation purposes, 92) the undertaking of a process or activity included in the list of waste management activities publised in terms of Section 19 of NEMWA, 2008 in which case the activity is regarded to be excluded from this list, (3) the undertaking of a linear activity falling below the threshold in Notice 544 of 2010:
  - In all areas outside urban areas.
- 16. The construction of (iii) buildings with footprint exceeding 10 m^2 in size or more, or ((iv) infrastructure covering 10 m^2 or more where such construction occurs within a watercourse or within 32 meters of a watercourse measured from the edge of a watercourse, excluding where such construction will occur below the development setback line:
  - (ii) Outside urban areas, in;
    - (aa) a protected area identified in terms of NEMPAA, excluding conservancies;
    - (bb) national protected Area Expansion Strategy Focus areas;
    - (cc) World heritage sites;
    - (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act as adopted by the competent authority;
    - (ee) Sites or areas identified in terms of an International Convention;
    - (ff) Critical biodiversity areas or ecosystem service areas as identifed in systematic biodiversity plans adopted by the competent auhtority or in bioregional plans;
    - (gg) Core areas in biosphere reserves;
    - (gg) areas within 10 kilometers from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a bioshpere reserve.

2.5.4 Government Notice Regulation 718 of 2009 Category A which require a Basic Assessment:

- 1. The storage including temporary storage of general waste at a facility that has the capacity to store in excess of 100 m^3 of general waste at any one time, excluding the storage of general waste in lagoons.
- 2. The storage including temporary storage of hazardous waste at a facility that has the capacity to store in excess of 35 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons.
- 11. The treatment of effluent, wastewater or sewage with an annual throughout capacity of more than 2000 m^3 but less than 15 000 m^3.
- 14. The disposal of inert waste in excess of 25 tons and with a total capacity of 25,000 tons,

excluding of such waste for the purposes of levelling and building which has been authorized by or under other legislation.

- 18 The construction of facilities for activies listed in Category A of this Schedule.

2.5.5 Government Notice Regulation 718 of 2009 Category B which require an EIA:

- 5. The treatment of hazardous waste using any form of treatment regardless of the size or capacity of such facility to treat such waste.
- 7. The treatment of effluent, waste water or sewage with an annual throughput capacity of 15 000 m^3 or more.
- 9. The disposal of any quantity of hazardous waste to land.
- 10. The disposal of general waste to land covering an area in excess of 200m^2.
- 11. The construction of facilities for activities listed in Category B of this Schedule.
- 18. The construction of facilities for the activities listed in Category A.

2.6 Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the implementation of these actions, activities or processes and infrastructure

2.6.1 Design, Investigation and Construction phase, 2012 – 2018:

The mine will start with a bulk sample in order to conduct a pre-feasibility study on the plant and mine design. On completion of this process a full feasibility study will be conducted and all financial resources will be obtained. Construction activities will simultaneously start for the construction of the general surface infrastructure (please refer to Section 2.3) and other infrastructure such as the opencast sections, waste rock dump, access portals and the plant. It is estimated that this will take approximately 5 years before the mine will be in full production.

2.6.2 Operational phase, 2013 – 2068:

The life of the operation is estimated to be about 55 years using a production rate of 1.63 MT per annum using the current evaluated mineral resources. Should the production be increased to 3 MT per annum the life of mine will be reduced to 30 years. Therefore, the maximum life for a new order mining right of 30 years would be required, and subsequent extensions applied for when necessary. Please refer to Section 2.3 for activities that will take place during this phase.

2.6.3 Closure phase, 2068 – 2073:

Rehabilitation, including maintenance and monitoring activities are envisioned to take approximately 5 years. While rehabilitation activities would be completed in approximately 2 years, maintenance and monitoring activities are envisaged to take an additional 3 years. Please refer to Section 2.3 for activities that will take place during this phase.

2.7 Confirmation if any other relevant information is attached as appendices

Mine Works Plan attached as Appendix 4.

3 The potential impacts

3.1 List of the potential impacts, on environmental aspects separately in respect of each of the aforesaid main mining actions, activities, processes, and activities listed in the NEMA EIA Regulations (include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

Information was obtained as follows:

- Geology, Topography, Land Use, Land Capability, Soils, Fauna (Animal life), Vegetation (Flora), Air Quality, Noise and Vibration, Visual and Archaeological: EMPR dated 2004 (WMB, 2004). As the EMPR focussed on the opencast area only it impacts was extrapolated to include additional surface infrastructure and the underground mining area.
- Surface water: Menco (2012)
- Geo-hydrological Assessment: WMB (2004) and GPT (2013)

Activities was numbered as follows for referencing in the list of impacts table.

Construction of all identified surface infrastructures:	
1. Access and Internal Roads	121 days
2. Fence	90 days
3. General surface infrastructures: Offices, Workshops, Lamp room, Change rooms, parking areas, stores	180 days
4. Waste Water Treatment Works (Sewage Plant)	365 days
5. Crushing and Screening plant	365 days
6. Beneficiation plant	365 days
7. Tailings Dams	180 days
8. Storm water / Return water dam	180 days
9. Storm water infrastructure	180 days
10. Conveyor belt	365 days
11. Waste Rock Dump	30 years +
12. Electrical substation and power lines	365 days
13. Salvage yard	180 days
14. Potable and process water pipelines	180 days
15. Initial box cut area	90 days
16. Adits / shafts / Opencast	365 days
17. Overburden and topsoil stockpiles as a result of the removal of topsoil and vegetation removal	90 days
Operation and management of:	
18. Opencast mining areas	5 years
19. Underground mining areas and adits	30 years plus
20. Crushing and screening of ROM	30 years plus
21. Beneficiation of ROM	30 years plus
22. Overburden and soil stockpiles	30 years plus

23. Product stockpiles	30 years plus
24. Waste Rock Dump	30 years plus
25. Storm water / return water dams	30 years plus
26. Tailings dam	30 years plus
27. Waste Water Treatment Works (Sewage Works)	30 years plus
28. Process and potable water	30 years plus
Rehabilitation, Closure and post closure phase: management and operation of:	
29. Opencast mining areas	To be confirmed closer to the closure and post closure phase
30. Closure of shafts / adits	
31. Removal of unneeded surface infrastructures, e.g. roads, offices etc.	
32. Stockpiles, overburdens	
33. Tailings dam, storm water / return water dams	

Ref.	Aspect	Impact	Activity	NEMA / NEMWA
1	**Construction phase**			
1.1.1	Geology	Disturbance of in-situ geology	16, 18, 19	N/A
1.1.2	Topography	Alteration of topography	All	GN R 544: 9, 10, 11, 12, 13, 22, 23, 24, 46 GN R 545: 3, 5, 8, 15, 19 GN R 546: 4, 10, 12, 16 GN R 718 (A)18, B)11
1.1.3 A	Soil	Disturbance of soils	1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 22, 23, 24, 26	GN R 544: 9, 10, 11, 12, 13, 22, 23, 24, 46 GN R 545: 5, 8, 19 GN R 546: 4, 10, 16 GN R 718 (A)18, (B)11
1.1.3 B		Reduction of viability of soils in stockpiles	All	N/A
1.1.4 A	Land capability	Reduction in land capability in other areas	All	N/A
1.1.4 B		Increased erosion in other areas	All	N/A
1.1.5 A	Land use	Loss of access to land	All	GN R 544: 23, 24 GN R 545: 15 GN R 546: 12, 13, 14 GN R718(A)18, (B)11
1.1.5 B		Increased pressure on land	All	N/A
1.1.5 C		Clearance of new land in other areas		GN R546: 12, 13
1.1.6 A	Ecology	Damage to terrestrial ecosystems	All	GN R 544: 23, 24, 26
1.1.6 B		Damage to aquatic ecosystems	All	GN R 544: 23, 24, 26
1.1.7 A	Surface water	Surface water quality	All	GN R 544:9, 11, 12 GN R 545: 19 GN R 718: (A)18, (B)11
1.1.7 B		Surface water quantity	8, 9, 15	GN R 544:9, 11, 12 GN R 545: 19 GN R 718: (A)18, (B)11
1.1.7 C		River characteristics (Beds, Banks, Course)	9,25	GN R 544:11
1.1.8 A	Groundwater	Deterioration of groundwater quality during the construction phase: Oil, diesel and chemical spills	1-17	N/A
1.1.8 B		Deterioration of groundwater quality during the construction phase: Contamination of mine material exposed during mine construction	1-17	N/A
1.1.9	Air quality	Reduction in air quality due to the site construction	All	N/A
1.1.10 A	Noise & Vibration	Noise due to road transport	All	N/A
1.1.10 B		Noise due to construction activities	All	N/A

Ref.	Aspect	Impact	Activity	NEMA / NEMWA
1.1.10 C		Vibration due to construction activities	All	N/A
1.1.11	Visual	Visual impacts	All	N/A
1.1.12 A	Socio -Economic	Construction cost to Samancor	All	N/A
1.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	All	N/A
1.1.12 C		Restricted access to land and other destinations (obstruction)	All	N/A
1.1.12 D		Increased pressure on water supply and sanitation as a result of inward migration	All	N/A
1.1.12 E		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	All	N/A
1.1.12 F		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	All	N/A
1.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	All	N/A
1.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	All	N/A
1.1.12 I		Increase in road safety risks due to increased road traffic	All	N/A
1.1.12 J		Increase in noise and vibration	All	N/A
1.1.12 K		Reduction in sense of place	All	N/A
1.1.13 A	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	Destruction of or damage to archaeological remains and loss of information	All	SAHRA permit
1.1.13 B		Disturbance of graves and human remains	1-17	SAHRA permit
2	**Operational phase: management and operation of**			
2.1.1	Geology	Disturbance of in-situ geology	Refer to Ref. 1.1.1	N/A
2.1.2	Topography	Alteration of topography	Refer to Ref. 1.1.2	GN R 544: 9, 10, 11, 12, 13, 22, 23, 24, 46 GN R 545: 3, 5, 8, 15, 19 GN R 546: 4, 10, 12, 16 GN R 718 (A)18 (B) 11
2.1.3 A	Soil	Disturbance of soils	Refer to Ref. 1.1.3	Refer to Ref. 1.1.3
2.1.3 B		Reduction of viability of soils in stockpiles		N/A
2.1.3 C		Soil contamination due to spills		N/A
2.1.4 A	Land capability	Reduction in land capability in other areas	Refer to Ref. 1.1.4	N/A
2.1.4 B		Increased erosion in other areas		N/A
2.1.5 A	Land use	Loss of access to land	Refer to Ref. 1.1.5	Refer to Ref. 1.1.5 A
2.1.5 B		Increased pressure on land		N/A

Ref.	Aspect	Impact	Activity	NEMA / NEMWA
2.1.5 C		Clearance of new land in other areas		N/A
2.1.6 A	Ecology	Damage to terrestrial ecosystems	Refer to Ref. 1.1.6	Refer to Ref. 1.1.6
2.1.6 B		Damage to aquatic ecosystems		
2.1.7 A	Surface water	Surface water quality	Refer to Ref. 1.1.7	GN R 544: 9, 11, 12 GN R 545: 19 GN R 718: (A) 2, 7,11, 14, 18, (B)1, 4, 5, 6, 7, 11
2.1.7 B		Surface water quantity		
2.1.7 C		River characteristics (Beds, Banks, Course)		
2.1.8 A	Groundwater	Groundwater quantity-lowering of groundwater table and impact on water supply of groundwater users	18, 19	N/A
2.1.8 B		Groundwater quantity-lowering of groundwater table and potential impact on base flow of streams	18, 19	N/A
2.1.8 C		Groundwater quality - Contamination of groundwater and deterioration of quality down gradient of the mining operations	18-28	N/A
2.1.8 D		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of Oil, diesel and chemical spills/leaks from machinery and storage facilities	18-28	N/A
2.1.8 E		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of sewage related contamination	27, 28	N/A
2.1.9 A	Air quality	Reduction in air quality due to site operations	Refer to Ref. 1.1.9	GN R 544: 22, 46, 56 GN R 546: 4
2.1.9 B		Reduction in air quality due to dust from ore haulage trucks		
2.1.10 A	Noise & Vibration	Noise due to general production activities	Refer to Ref. 1.1.10	N/A
2.1.10 B		Noise due to blasting		
2.1.10 C		Noise due to road transport		
2.1.10 D		Vibration due to blasting		
2.1.10 E		Vibration due to general production activities		
2.1.11	Visual	Visual impacts	Refer to Ref. 1.1.11	N/A
2.1.12 A	Socio -Economic	Operating cost to Samancor	Refer to Ref. 1.1.12	N/A
2.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities		N/A
2.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration		Refer to Ref. 1.1.12 D
2.1.12 D		Reduced water level in Madikane supply borehole and effect on yield		N/A
2.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation		N/A
2.1.12 F		Increase in *methemoglobinemia* due to possible increased nitrate in boreholes		N/A
2.1.12 G		Reduction in nutrition and food security as a result of loss of access		N/A

Ref.	Aspect	Impact	Activity	NEMA / NEMWA
		to subsistence agricultural land		
2.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources		N/A
2.1.12 I		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration		N/A
2.1.12 J		Increase in noise and vibration	Refer to Ref. 1.1.10	N/A
2.1.12 K		Increase in traffic		N/A
2.1.12 L		Reduction in sense of place	Refer to Ref. 1.1.11	N/A
2.1.13	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	No additional impact	N/A	N/A
3	**Rehabilitation, Closure and post closure phase: management and operation of:**			
3.1.1	Geology	Disturbance of in-situ geology	Refer to Ref. 1.1.1	N/A
3.1.2	Topography	Alteration of topography	All	N/A
3.1.3 A	Soil	Mixing and dilution of soils	29-33	N/A
3.1.3 B		Erosion of replaced soils	29-33	N/A
3.1.3 C		Reduction of viability of replaced soils	29-33	N/A
3.1.4	Land capability	Reduction in land capability when available once more	All	N/A
3.1.5	Land use	Loss of access to land	Refer to Ref. 1.1.5	Refer to Ref. 1.1.5 A
3.1.6 A	Ecology	Damage to terrestrial ecosystems	Refer to Ref. 1.1.6	Refer to Ref. 1.1.6
3.1.6 B		Damage to aquatic ecosystems	All	
3.1.7 A	Surface water	Surface water quality	Refer to Ref. 1.1.8	Refer to Ref. 1.1.8 A
3.1.7 B		Surface water quantity	33	Refer to Ref. 1.1.8 B
		River characteristics (Beds, Banks, Course)	Refer to Ref. 1.1.8	Refer to Ref. 1.1.8 C
3.1.8 A	Groundwater	Decant	29, 30, 33	N/A
3.1.8 B		Groundwater quantity – change in groundwater level and the potential (positive) impact on base flow of streams-(not predicted)	29-33	N/A
3.1.8 C		Groundwater quality: Deterioration of groundwater quality down gradient of the mining operations due to plume movement	29-33	N/A
3.1.8 D		Groundwater quality deterioration as a result of contaminants emanating from historic Oil, diesel and chemical spills and facilities	29-33	N/A
		General	29-33	N/A
3.1.9 A	Air quality	Reduction in air quality due to rehabilitation works and exposure of rehabilitated surfaces	Refer to Ref. 1.1.9	N/A
3.1.9 B		Cumulative reduction in air quality		N/A
3.1.10	Noise & Vibration	Noise due to rehabilitation and closure activities	Refer to Ref. 1.1.10	N/A
3.1.11	Visual	Visual impacts	Refer to Ref. 1.1.11	N/A

Ref.	Aspect	Impact	Activity	NEMA / NEMWA
3.1.12 A	Socio - Economic	Decommissioning and Closure cost to Samancor	Refer to Ref. 1.1.12	N/A
3.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities		N/A
3.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration		Refer to Ref. 1.1.12 D
3.1.12 D		Reduced water level in Madikane supply borehole and effect on yield		N/A
3.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation		N/A
3.1.12 F		Increase in health risk due to increased nitrate in borehole water		N/A
3.1.12 G		Poorer health care as a result of inward migration and increased pressure on medical resources		N/A
3.1.12 H		Reduction in sense of place	Refer to Ref. 1.1.11	N/A
3.1.13	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	No additional impact	Refer to Ref. 1.1.13	N/A
4	**All phases**			
4.1.1 B	Groundwater	Acid mine drainage	7, 16, 18, 19, 23, 26, 29, 30, 32, 33	N/A
4.1.2 A	Socio -Economic	Loss of income from agriculture land	All	N/A
4.1.2 B		Economic impact of supporting other households	All	N/A
4.1.2 C		Population growth	All	N/A
4.1.2 D		Relocation of households	All	N/A
4.1.2 E		Increased pressure on existing infrastructure	All	N/A
4.1.2 F		Social conflict due to possible inward migration of outsiders, associated effects and competition for benefits within and between communities	All	N/A

3.2 List of all potential cumulative environmental impacts

- Geology – as more mining rights in the area are awarded more ore will be removed resulting in less geological resouces.
- Topography: as develpoment in the area increase the topogrphy of a wider area may be affected by surface infrastructure development (flattening of area and artifical “hills” as a result of soil stocpiles, Waste rock dumps and tailing dams).
- Land use and land capability: as more and more mining activity occur in the area less space will be available for agricultural purposes and residential development.
- Soil: as a result of increased topsoil removal to allow for the development of infrastructure and mining activities, the soil resource in the area may become less and as a result of the impact on the viability of soils due to stockpiling the impact will increase.
- Fauna and Flora: as development increase less natural area will be available resulting in greater impoverished natural environment.
- Surface water – Deterioration in water quality as a result of discharges (not only from the Lwala Project but also upstream discharges and potential increased erosion as a result of further overgrazing of surrounding available land) does collect and concentrate in the environment and ultimately impact on downstream water users.
- Ground water – Deterioration in Water Quality as a result of seepage will add to the existing levels of salts already detected in the boreholes in the area. In addition the water level may drop as a result of dewatering and potentially increased abstraction from potable water boreholes as a result of inward migration.
- Air Quality – Emissions into the environment is cumulative with the emissions from other mining and industrial operations, entrained and erosive dust sources and household air emissions.
- Noise – Operational noise is cumulative with existing noises in the area (such as traffic on the R37).
- Visual aspects – The visibility of the mining infrastructure cumulative with the visuals of other mines creates a cumulative impression of the area for visitors.
- Socio-economic – Influx of job-seekers and squatter settlements as a result of cumulitve impacts due to multiple mining developments
- Archaeological and cutural: as more development occurs the potential to relocat graves increase. In addition more archaelogical finding may be made and where possible identified for conservation.

3.3 State specifically whether or not there is **a** risk of acid mine drainage or potential groundwater contamination associated with the mineral to be mined (If such **a** risk is associated with the mineral to be mined provide **a** summary of the findings and recommendations of **a** specialist geo-

hydrological report in that regard)

Although no rock material was available for acid-base accounting, an ABA analysis for a previous study at a nearby mine was available, which mines the same lithologies as those at Lwala. The sample that was submitted for ABA analysis was collected from the tailings storage facility at the said mine site.. The acid base analysis (ABA) results showed non-acid forming material. These results may not be completely applicable to Lwala, but may still give a good indication of the acid generation capacity of the rock on site. Based on the similar rock types between Lwala and the area where this sample was collected, it could possibly be inferred that acid rock drainage (ARD) is unlikely to occur from the mining and discard areas at Lwala. Please refer to Appendix 8 for more information.

REGULATION 50 (b)

4 The alternative land use or developments that may be affected

4.1 Concise description of the alternative land use of the area in which the mine is proposed to operate

Alternatively to the mining land use the area could be used for dry land agriculture, residential development and wilderness, although it is mainly used by the livestock of the local communities.

4.2 List and description of all the main features and infrastructure related to the alternative land uses or developments

- Agriculture:
  - Crop establishment in fields;
  - Installtion of irrigation equipment (potentially);
  - Constuction of kraals to contain cattle / goats.
- Residential:
  - Construciton of roads and other service infrastructures e.g. houses, potable and sewage supply pipelines, waste water treatment works, potable water reservoir, commercial development etc.
- Wilderness:
  - None.

4.3 Plan showing the location and aerial extent of the aforesaid main features of the alternative land use and infrastructure related to alternative land developments identified during scoping

Please refer to Appendix 3.

5 The potential impacts of the alternative land use or development

5.1 List of the potential impacts of each of the aforesaid main features and infrastructure related to the alternative land use or development and related listed activities

Feature and infrastructure	Aspect	Impact
Agriculture:		
Crop establishment in fields	Geology, Topography, Socio-economic, Land use, Land capability. Noise, Visual	No impact other than existing
	Soil	Disturbance of a greater area to increase crop areas

Feature and infrastructure	Aspect	Impact
	Fauna/Animal life	Disturbance of a greater area to increase crop areas
	Flora / vegetation	Disturbance of a greater area to increase crop areas
	Surface water	Potential for increased erosion could lead to water quality impacts and further disturbance of the ecology on the watercourse beds and banks
	Groundwater	Should fertilizers be used ground water quality impacts could be expected
	Air quality	No impact other than existing, though a greater field area could result in increased dust
	Archaeological / Cultural	Should more crop areas be established more archaeological artefacts / areas could be ploughed through
Installation of irrigation equipment (potentially)	All	No additional impacts to that for the field establishment are expected
Construction of kraals to contain cattle / goats	All	No additional impacts to that for the field establishment are expected
Residential:		
Construction of roads and other service infrastructures e.g. houses, potable and sewage supply pipelines, waste water treatment works, potable water reservoir, commercial development etc.	Geology	No impact other than existing
	Topography	Area may be sloped to allow for housing, road and other infrastructure development
	Land use / land capability	Less areas will be available for agricultural activities and mining development
	Soil	Disturbance of a greater area to establish residential area
	Fauna/Animal life	Disturbance of a greater area to establish residential area
	Flora / vegetation	Disturbance of a greater area to establish residential area
	Surface water	Potential for water quality impacts as a result of hydrocarbon spills (private vehicles) and increased erosion
	Groundwater	Potential for increased groundwater quality problems as a result of pit latrines
	Air quality	No impact other than existing
	Noise	Increased noise due to private vehicles and residential noises e.g. TV's Radios etc.
	Visual	The construction of houses will have a visual impact
	Socio-economic	No impact expected however, the establishment of a residential area will necessitate the construction of commercial areas which could result in employment opportunities
	Archaeological / Cultural	Disturbance of a greater area to establish residential area
Wilderness:		

Feature and infrastructure	Aspect	Impact
None	No additional impact	None

5.2 Description of all potential cumulative impacts of the main features and infrastructure related to the identified alternative land uses or developments

- Geology – None.
- Topography: as develpoment in the area increase the topogrphy of a wider area may be affected by surface infrastructure development.
- Land use and land capability: as more and more mining activities and residential development occur in the area less space will be available for agriculural purposes.
- Soil: as a result of increased topsoil removal to allow for the development of housing infrastructure, filed establishment and mining activities the soil resource in the area may become less and as a result of the impact on the viability of soils due to stockpiling and potential erosion the impact will increase.
- Fauna and Flora: as development increase less natural area (wilderness) will be available resulting in greater impoverished natural environment.
- Surface water – Deterioration in water quality as a result of discharges (mining areas) and the potential increased erosion as a result of erosion from agriculture areas that is not managed correctly could impact on downstream water users.
- Groundwater – Deterioration in groundwater quality as a result of seepage (mining waste areas) pit latrines from residential areas and fertilisers in agriculture areas will lead to increase groundwater quality deterioration.
- Air Quality – No additional impacts expected.
- Noise –No aditional impacts expected.
- Visual aspects – The visibility of the mining infrastructure cumulative with the visuals of residential areas creates a cumulative impression of the area for visitors.
- Socio-economic –Cumulitve impacts due to multiple mining developments and resulting commercial areas for resentidial areas could have a positive effect in terms of employment oppertunities
- Archaeological and cutural: as more development occurs the potential to relocate graves increase. In addition more archaelogical findings may be made and where possible identified for conservation.

REGULATION 50 (c)

6 Identification of potential social and cultural impacts

6.1 List of potential impacts of the proposed mining operation on the socio-economic conditions of other parties' land use activities (include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

Surface infrastructure area (refer also to Section 3.1):

- All phases of development: Strengthening of regional and local economy due to income and knock on oppertunities.
- All phases: Economic impact of supporting other households.
- All phases: Increase in water-borne diseases as a result of inward migration and increased pressure on water supply and sanitation.
- All phases: increased pressure on water supply and sanitation as a result of inward migration.
- All phases: Increasing pressure on existing infrastructure.
- All phases: Loss of income from agricultural land.
- All phases: Poorer health care as a result of inward migration and increased pressure on medical resources.
- All phases: Population growth.
- All phases: Reduction in sense of place.
- All phases: Relocation of households.
- Construction and operatiolnal phase: Restricted access to land and other destinations.
- Construction and operatiolnal phase: restriction of access roads due to increased traffic.
- Construction and operation phases: Reduction in nutrition and food security as a result of access to subsistance agricultural land.
- Construction and operational phases: Increase in noise and vibration.
- Construction and opertaional phases: Increase in sexually transmitted disease and HIV/AIDS as a result of inward migration.
- Construction phase: Increase in road safety risk due to increased road traffic.
- Operational phase: Increase in traffic.
- Operational, Decommissioning and closure phases: Increase in methemoglobinemia due to possible increased nitrate in boreholes.
- Operations, Decommissioning and Closure phases: Reuced water level in Madikane supply borehole and effect on yield.

- All phases: Social conflict due to possible inward migration of outsiders, associated effects and competition for benefits within and between communties.

6.2 Description of the cultural aspect that will potentially be affected, and describe the potential impact on such cultural aspect (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable)

6.2.1 Surface infrastructure area and its operations (refer also to Section 3.1)

6.2.1.1 During the Construction and operational phases destruction of or damage to archaeoligcal remains and loss of information

Several identified archaeological sites lie within the proposed footprint of the opencast pits and proposed surface infrastructure area and these would definitely be destroyed if mining goes ahead. Some of these sites date from the Doornkop and Klingbeil phases of the Early Iron Age (7th – 10th century) and are considered to be of medium significance. These sites have been damaged or destroyed by cultivation, but most retain high scientific value for village layout and pottery classification, as well as artefact collection. Other sites are representative of Middle Iron Age Eiland culture (11th century AD), and is considered to be of medium significance. These sites have also been heavily damaged by ploughing, but is a good representative of the Middle Iron Age sites identified. Late Iron Age (17th century – colonial times) sites have also been identified and is considered to be of medium significance.

A number of graves or sites with the potential to contain human remains were detected during the field survey and any of the identified homestead ruins could contain unmarked graves, especially those of infants who could traditionally be buried inside the hut, or under the roof drip line. These sites must therefore be regarded as sensitive.However, mining will not occur on the hill and in consultation and coordination with the mine, communities will be allowed access the hill for ceremonial purposes.

The area that was investigated is rich in significant archaeological material dating from the Early Iron Age, although the archaeological remains have been extensively damaged through years of recent human activities. A general lack of data exists for the Iron Age sequence and cultural history of this particular area and little is known about the occurrence and distribution of the Early Iron Age Doornkop or the Middle Iron Age Eiland cultural traditions in this particular area. It pre-dates the Late Iron Age Sotho speaking Pedi communities whose descendants now occupy the area. As a result of this, the scientific importance of these sites must bear considerable weight. The Early and Middle Iron Age sites identified have been evaluated as of low or medium significance and none as of high significance. This is due to the fact that they have all had a varying degree of damage. Furthermore, it is impractical to prescribe protection status for these sites because of the nature of the mining

development, and the fact that the local community does not regard them as significant because they have no ancestral links with these sites. Neither the Local nor Provincial Authorities have the capacity to enforce and monitor their protection.

Human remains may be exposed during construction or mining activities. Such arrangements must be treated in accordance with the National Heritage Resources Act.

The cultural resources consultants are of the opinion that the potential socio-economic benefits of the Lwala Chromite Mine outweigh the conservation value of the heritage sites identified during the field studies and recommend that the mine should go ahead, if the loss of the archaeological sites is mitigated.

6.2.1.2 During all phases access to the cultural importance (Magoshi (Matadi) Hill and Sekgoshi (M'panglele) Hill) will be reduced

In consultation and coordination with the mine, communities will be allowed access to the hill for ceremonial purposes.

6.2.2 Underground mining area

No impacts is expected.

6.3 Description of heritage features and the potential impact on such heritage feature (In cases where such features are not applicable the applicant must still include the item in the list and describe it as not applicable)

Please refer to Section 6.2.

6.4 Quantification of the impact on the socio-economic conditions of directly affected persons, as determined by the findings and recommendations of a specialist report in that regard

No specialist report was conducted thus information is based on data from nearby sites, specifically that date for the Samancor Eastern Chrome Mines proposed Jagdlust Project.

6.4.1 The amount of the quantified potential impact on property or infrastructural assets

6.4.1.1 Opencast and surface infrastructure area and operations

From infromation obained from the Jagdlust Project the potential income form 1 hectare dryland agriculture is approximately R10 000.00 per annum. The surface area to be impacted constitutes 570.9 Ha of of ploughing/agricultural fields of the community around the area thus the potential income loss as a result of the opencast and other surface infrastructure is approximately R 5 709 000.00 per annum.

6.4.1.2 Underground mining area:

No financial loss is expected as surface will not be impacted.

6.4.2 State the amount of the quantified potential impact on commercial, economic or business activity which will be impacted upon as a result of the mining activity

The only potentiall economic activity that is currently taking place is agriculture thus no commercial or business activity is taking place. This is a result of the agricultural activities being done for subsistance and not for commercial / business reasons. The calculation for the loss of economic activity is the same as for the agricultural loss as determined in Section 6.4.1. No additional impact will result of the proposed underground mining activities.

6.4.3 The sum of the amounts, referred to in paragraphs 6.6.1 and 6.6.2 above

Agricultural and Economic loss is estimated at R 5 709 000 per year.

7 Assessment and evaluation of potential impacts

7.1 List of each potential impact identified in paragraphs **3** and **6** above (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

Please refer to the table attached below under Section 7.3.

7.2 Concomitant impact rating for each potential impact listed in paragraph 7.1 above in terms of its nature, extent, duration, probability and significance (Provide **a** definition of the criteria used for each of the variables used for rating potential impacts and ensure that the potential impacts are rated specifically with the assumption that no mitigation measures are applied)

The Impact Assessment Criteria are described below:

- Magnitude/Intensity: The Mangitdue/Intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as
  - *Insignificant [2]* - The impact alters the affected environment in such a way that the natural processes or functions are not affected.
  - *Moderate [6]* - The affected environment is altered, but functions and processes continue, albeit in a modified way.
  - *Very High [10]* - Function or process of the affected environment is disturbed to the extent

where it temporarily or permanently ceases.

- Duration: The lifetime of the impact that is measured in relation to the lifetime of the proposed development.
  - *Temporary [1]* - The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
  - *Short term [2]* - The impact will be relevant through to the end of a construction phase (1.5 – 2 years).
  - *Medium term [3]* - The impact will last up to the end of the development phases, where after it will be entirely negated.
  - *Long term [4]* - The impact will continue or last for the entire operational lifetime i.e.exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
  - *Permanent [5]* - This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact is transient.
- Spatial scale/Extend: Classification of the physical and spatial scale of the impact.
  - *Footprint [1/0]* - The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
  - *Site [2]* - The impact could affect the whole, or a significant portion of the site.
  - *Regional [3]* - The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
  - *National [4]* - The impact could have an effect that expands throughout the country (South Africa).
  - *International [5]* - Where the impact has international ramifications that extend beyond the boundaries of South Africa.
- Probability: This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:
  - *Improbable [1]* - The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
  - *Possible [2]* - The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
  - *Likely [3]* - There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
  - *Highly Likely [4]* - It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring

is defined as 75 %.

- *Definite [5]* - The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

- Sum of (Nature (out of 10) + Duration (out of 5) + Extent (out of 5)) x Probability (out of 5) = Impact Significance.

Information in this section was obtained from the original EMPR (WMB, 2004) as well as the specialist studies conducted in 2012. Where information from the EMPR (WMB, 2004) was used terminology was changed to reflect the new method used to determine the signficiance of impacts. In addition, the proposed additional underground mining activities was also taken into consideration for these sections.

Please refer to the table attached below under Section 7.3.

7.3 Indication of the phases (construction, operational, decommissioning) and estimated time frames in relation to the potential impacts rated

Time allocation for each activity is indicated under Section 3.1.

- M: Magnitude;
- D: Duration;
- S: Spatial scale;
- P: Probability;
- SR: Significance rating.

Ref.	Aspect	Impact	Significance before mitigation						Significance after mitigation					
			M	D	S	P	SR	Rating	M	D	S	P	SR	Rating
1	Construction phase													
1.1.1	Geology	Disturbance of in-situ geology	4	5	1	5	50	Medium	4	5	1	5	50	Medium
1.1.2	Topography	Alteration of topography	4	5	1	4	40	Medium	2	5	1	4	32	Medium
1.1.3 A	Soil	Disturbance of soils	6	3	1	5	50	Medium	6	3	1	5	50	Medium
1.1.3 B		Reduction of viability of soils in stockpiles	6	4	1	4	44	Medium	4	3	1	2	16	Low
1.1.4 A	Land capability	Reduction in land capability in other areas	6	4	2	3	36	Medium	6	4	2	3	36	Medium
1.1.4 B		Increased erosion in other areas	6	4	2	5	60	Medium	4	4	2	5	50	Medium
1.1.5 A	Land use	Loss of access to land	8	4	1	5	65	High	4	4	2	5	50	Medium
1.1.5 B		Increased pressure on land	6	4	2	5	60	Medium	4	4	2	5	50	Medium
1.1.5 C		Clearance of new land in other areas	8	4	2	4	56	Medium	4	4	2	5	50	Medium
1.1.6 A	Ecology	Damage to Terrestrial ecosystems	2	4	1	4	28	Low	2	4	1	4	28	Low
1.1.6 B		Damage to Aquatic ecosystems	2	4	3	1	9	Low	2	4	3	1	9	Low
1.1.7 A	Surface water	Surface water quality	10	3	3	4	64	High	5	4	2	2	22	Low
1.1.7 B		Surface water quantity	9	4	3	5	80	High	5	3	2	3	30	Low
1.1.7 C		River characteristics (Beds, Banks, Course)	10	5	3	5	90	High	4	3	1	5	36	Low
1.1.8 A	Groundwater	Deterioration of groundwater quality during the construction phase: Oil, diesel and chemical spills	6	3	2	3	33	Medium	4	1	1	3	18	Low
1.1.8 B		Deterioration of groundwater quality during the construction phase: Contamination of mine material exposed during mine construction	6	4	3	4	52	Medium	4	3	2	3	27	Low
1.1.9	Air quality	Reduction in air quality due to the site construction	6	2	2	5	50	Medium	4	2	2	3	24	Low
1.1.10 A	Noise & Vibration	Noise due to road transport	6	2	2	5	50	Medium	4	2	2	5	40	Medium
1.1.10 B		Noise due to construction activities	4	2	2	5	40	Medium	4	2	2	5	40	Medium
1.1.10 C		Vibration due to construction activities	2	2	2	5	30	Low	2	2	2	5	30	Low
1.1.11	Visual	Visual impacts	6	3	2	5	55	Medium	4	3	2	5	45	Medium
1.1.12 A	Socio -Economic	Construction cost to Samancor	8	2	1	5	55	Medium	8	2	1	5	55	Medium
1.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	6	5	3	4	56	Medium	6	5	3	4	56	Medium
1.1.12 C		Restricted access to land and other destinations (obstruction)	4	3	2	5	45	Medium	4	3	2	5	45	Medium
1.1.12 D		Increased pressure on water supply and sanitation as a result of inward migration	4	5	2	3	33	Medium	4	5	2	3	33	Medium
1.1.12 E		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	8	5	2	3	45	Medium	8	5	2	3	45	Medium
1.1.12 F		Increase in water-borne diseases, as a result of	8	5	2	3	45	Medium	6	5	2	3	39	Medium

Ref.	Aspect	Impact	Significance before mitigation						Significance after mitigation					
			M	D	S	P	SR	Rating	M	D	S	P	SR	Rating
		inward migration and increased pressure on water supply and sanitation												
1.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	6	4	2	5	60	High	4	4	2	5	50	Medium
1.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	6	5	3	3	42	Medium	6	5	3	3	42	Medium
1.1.12 I		Increase in road safety risks due to increased road traffic	4	2	3	5	45	Medium	4	2	3	5	45	Medium
1.1.12 J		Increase in noise and vibration	6	2	2	5	50	Medium	6	2	2	5	50	Medium
1.1.12 K		Reduction in sense of place	4	5	2	3	33	Medium	4	5	2	3	33	Medium
1.1.13 A	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	Destruction of or damage to archaeological remains and loss of information	6	5	3	5	70	High	2	5	3	5	50	Medium
1.1.13 B		Disturbance of graves and human remains	8	5	2	5	75	High	4	5	2	5	55	Medium
2	Operational phase													
2.1.1	Geology	Disturbance of in-situ geology	4	5	1	5	50	Medium	4	5	1	5	50	Medium
2.1.2	Topography	Alteration of topography	4	5	1	4	40	Medium	2	5	1	4	32	Medium
2.1.3 A	Soil	Disturbance of soils	6	3	1	5	50	Medium	6	3	1	5	50	Medium
2.1.3 B		Reduction of viability of soils in stockpiles	6	4	1	4	44	Medium	4	3	1	2	16	Low
2.1.3 C		Soil contamination due to spills	6	5	1	5	60	Medium	2	3	1	2	12	Low
2.1.4 A	Land capability	Reduction in land capability in other areas	6	4	2	3	36	Medium	6	4	2	3	36	Medium
2.1.4 B		Increased erosion in other areas	6	4	2	5	60	Medium	4	4	2	5	50	Medium
2.1.5 A	Land use	Loss of access to land	8	4	1	5	65	High	4	4	2	5	50	Medium
2.1.5 B		Increased pressure on land	6	4	2	5	60	Medium	4	4	2	5	50	Medium
2.1.5 C		Clearance of new land in other areas	8	4	2	4	56	Medium	4	4	2	5	50	Medium
2.1.6 A	Ecology	Damage to terrestrial ecosystems	2	4	1	4	28	Low	2	4	1	4	28	Low
2.1.6 B		Damage to aquatic ecosystems	2	4	3	1	9	Low	2	4	3	1	9	Low
2.1.7 A	Surface water	Surface water quality	No additional impacts											
2.1.7 B		Surface water quantity	No additional impacts											
2.1.7 C		River characteristics (Beds, Banks, Course)	No additional impacts											
2.1.8 A	Groundwater	Groundwater quantity-lowering of groundwater table and impact on water supply of groundwater users	6	4	3	5	65	High	2	4	2	5	40	Medium
2.1.8 B		Groundwater quantity-lowering of groundwater table and potential impact on base flow of streams	No impact on streams predicted											
2.1.8 C		Groundwater quality - Contamination of groundwater and deterioration of quality down gradient of the mining operations	8	5	3	5	80	High	6	5	2	3	39	Medium

Ref.	Aspect	Impact	Significance before mitigation						Significance after mitigation					
			M	D	S	P	SR	Rating	M	D	S	P	SR	Rating
2.1.8 D		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of Oil, diesel and chemical spills/leaks from machinery and storage facilities	6	2	1	3	27	Low	2	1	1	3	12	Low
2.1.8 E		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of sewage related contamination	6	4	3	3	39	Medium	4	2	2	3	24	Low
2.1.9 A	Air quality	Reduction in air quality due to site operations	6	2	2	5	50	Medium	4	2	2	3	24	Low
2.1.9 B		Reduction in air quality due to dust from ore haulage trucks	6	2	3	4	44	Medium	2	2	3	3	21	Low
2.1.10 A	Noise & Vibration	Noise due to general production activities	10	2	2	5	70	High	4	2	2	5	40	Medium
2.1.10 B		Noise due to blasting	8	1	2	5	55	Medium	6	1	2	5	45	Medium
2.1.10 C		Noise due to road transport	4	2	2	5	40	Medium	4	2	2	5	40	Medium
2.1.10 D		Vibration due to blasting	6	1	2	5	45	Medium	6	1	2	5	45	Medium
2.1.10 E		Vibration due to general production activities	2	2	2	5	30	Low	2	2	2	5	30	Low
2.1.11	Visual	Visual impacts	6	3	2	5	55	Medium	4	3	2	5	45	Medium
2.1.12 A	Socio -Economic	Operating cost to Samancor	8	2	1	5	55	Medium	8	2	1	5	55	Medium
2.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	6	5	3	4	56	Medium	6	5	3	4	56	Medium
2.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration	Refer to Ref. 1.1.12 D											
2.1.12 D		Reduced water level in Madikane supply borehole and effect on yield	2	4	2	5	40	Medium	2	4	2	5	40	Medium
2.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	8	5	2	3	45	Medium	6	5	2	3	39	Medium
2.1.12 F		Increase in methemoglobinemia due to possible increased nitrate in boreholes	8	4	2	3	42	Medium	2	4	2	3	24	Low
2.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	6	4	2	5	60	High	4	4	2	5	50	Medium
2.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	6	5	3	3	42	Medium	6	5	3	3	42	Medium
2.1.12 I		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	8	5	2	3	45	Medium	8	5	2	3	45	Medium
2.1.12 J		Increase in noise and vibration	6	2	2	5	50	Medium	6	2	2	5	50	Medium
2.1.12 K		Increase in traffic	4	2	3	4	36		4	2	3	4	36	
2.1.12 L		Reduction in sense of place	4	5	2	3	33		4	5	2	3	33	

Ref.	Aspect	Impact	Significance before mitigation						Significance after mitigation					
			M	D	S	P	SR	Rating	M	D	S	P	SR	Rating
2.1.13	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	No additional impact												
3	Rehabilitation, Closure and post closure phase													
3.1.1	Geology	Disturbance of in-situ geology	4	5	1	5	50	Medium	4	5	1	5	50	Medium
3.1.2	Topography	Alteration of topography	2	5	1	4	32	Medium	2	5	1	4	32	Medium
3.1.3 A	Soil	Mixing and dilution of soils	6	5	1	4	48	Medium	4	1	5	3	30	Low
3.1.3 B		Erosion of replaced soils	6	5	1	4	48	Medium	6	5	1	3	36	Medium
3.1.3 C		Reduction of viability of replaced soils	6	4	1	4	44	Medium	4	3	1	2	16	Low
3.1.4	Land capability	Reduction in land capability when available once more	4	4	2	3	30	Low	4	4	2	3	30	Low
3.1.5	Land use	Loss of access to land	8	4	1	5	65	High	4	4	2	5	50	Medium
3.1.6 A	Ecology	Damage to Terrestrial ecosystems	2	4	1	4	28	Low	2	4	1	4	28	Low
3.1.6 B		Damage to Aquatic ecosystems	2	4	3	1	9	Low	2	4	3	1	9	Low
3.1.7 A	Surface water	Surface water quality	No additional impacts											
3.1.7 B		Surface water quantity	No additional impacts											
3.1.7 C		River characteristics (Beds, Banks, Course)	No additional impacts											
3.1.8 A	Groundwater	Decant	No Decant is predicted											
3.1.8 B		Groundwater quantity – change in groundwater level and the potential (positive) impact on base flow of streams-(not predicted)	8	5	3	4	64	High	This is a positive impact					
3.1.8 C		Groundwater quality: Deterioration of groundwater quality down gradient of the mining operations due to plume movement	8	5	3	4	64	High	4	5	2	3	33	Medium
3.1.8 D		Groundwater quality deterioration as a result of contaminants emanating from historic Oil, diesel and chemical spills and facilities	6	2	2	3	30	Medium	2	1	1	3	12	Low
3.1.9 A	Air quality	Reduction in air quality due to rehabilitation works and exposure of rehabilitated surfaces	4	3	2	5	45	Medium	2	3	2	3	21	Low
3.1.9 B		Cumulative reduction in air quality	4	3	2	5	45	Medium	2	3	2	3	21	Low
3.1.10	Noise & Vibration	Noise due to rehabilitation and closure activities	2	3	2	3	21	Low	2	3	2	3	21	Low
3.1.11	Visual	Visual impacts	4	5	2	3	33	Medium	4	5	2	3	33	Medium
3.1.12 A	Socio - Economic	Decommissioning and Closure cost to Samancor	8	3	1	5	60	Medium	8	3	1	5	60	Medium
3.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	2	5	3	4	40	Medium	2	5	3	4	40	Medium
3.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration												

Ref.	Aspect	Impact	Significance before mitigation						Significance after mitigation					
			M	D	S	P	SR	Rating	M	D	S	P	SR	Rating
3.1.12 D		Reduced water level in Madikane supply borehole and effect on yield												
3.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	8	5	2	3	45	Medium	6	5	2	3	39	Medium
3.1.12 F		Increase in health risk due to increased nitrate in borehole water	8	4	2	3	42	Medium	2	4	2	3	24	Low
3.1.12 G		Poorer health care as a result of inward migration and increased pressure on medical resources	6	5	3	3	42	Medium	6	5	3	3	42	Medium
3.1.12 H		Reduction in sense of place	4	5	2	3	33	Medium	4	5	2	3	33	Medium
3.1.13	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	No additional impact												
4	All phases													
4.1.1 A	Groundwater	General	N/A											
4.1.1 B		Acid mine drainage	6	5	3	2	28	Low	No further prediction necessary					
4.1.2 A	Socio -Economic	Loss of income from agriculture land	8	4	2	5	70	High	4	4	2	5	50	Medium
4.1.2 B		Economic impact of supporting other households	6	4	2	5	60	High	4	4	2	5	50	Medium
4.1.2 C		Population growth	0	5	1	4	24	Low	0	5	1	4	24	Low
4.1.2 D		Relocation of households	0	0	2	0	0	Low	0	0	2	0	0	Low
4.1.2 E		Increased pressure on existing infrastructure	6	5	2	3	39	Medium	6	5	2	3	39	Medium
4.1.2 F		Social conflict due to possible inward migration of outsiders, associated effects and competition for benefits within and between communities	6	5	2	3	39	Medium	6	5	2	3	39	Medium

REGULATION 50 (d)

8 Identification of the alternative land uses which will be impacted upon (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

8.1 Opencast mining and surface infrastructure

The development of the mine and associated opencast and other surface infrastructure will prevent livestock grazing the site area, and may also slightly impede the free movement of livestock to access the vegetation areas on the koppies. This land use may again be available to the local community subject to conditions the land owner may set.

Agricultural land uses will be prevented on the area located within the security fence of the mining area. It is also possible that the mine will impede the agricultural land use on neighbouring properties due to the opencast activities and the needed buffer zone.

Both of the impacts above will last untill after the closure and decomissioniong phases when access will be restored though to a reduced area as access to areas such as tailing dams, storm / return water dams and waste rock dump may be prohibited.

The anticipated duration of the impacts as outlined above will range from 30 – 55 years depending on the rate of mining.

8.2 Underground mining activities

No impact on land use is expected as all activities will occur below the surface.

9 Listed results of a specialist comparative land use assessment (Refer to the concomitant section of the guideline posted on the official website of the Department and attach the specialist study as an appendix)

Information was inferred from the EMPR (WMB, 2004) and the Mine Works Plan (2012) and no site specific comparative land use assessment was done.

- Cost benefits of agricultural activities (Please refer to Section 6.4.1.1):
  - R 5 709 000 per annum.
- Cost benefits of mining activities:

- Salaries payable to the extend of R 66 914 982 per annum;
- UIF contributions: R 5 821 796 per annum;
- Skills development levies: R 7 0998 571 per annum;
- Rent payble to the community: R 280 000 per annum;
- Social and Labour Plan costs: R 500 000 per annum.

REGULATION 50 (e)

10 List of all the significant impacts as identified in the assessment conducted in terms of Regulation 50 (c) (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
1	**Construction phase**					
1.1.1	Geology	Disturbance of in-situ geology	Medium	Medium	Minimise the footprint of the mining operation and the degree of disturbance to geology and soils where possible	16, 18, 19
1.1.2	Topography	Alteration of topography	Medium	Medium	Minimize footprint and degree of disturbance	All
					Blend surfaces with surrounding topography	3, 4, 7, 11, 15, 16, 17, 18, 22, 23 ,24, 26
					Backfill final voids using material in the waste rock dumps	15, 16, 18
1.1.3 A	Soil	Disturbance of soils	Medium	Medium	Strip all usable soil to a depth of at least 1 500 mm	All
					Stockpile box cut soils, and soils stripped from the mining infrastructure for later use in rehabilitation.	
					Implement soil conservation and management measures, as per the soils stripping and conservation plan	
					Place stripped topsoil directly onto re-profiled and shaped areas to minimise the volume of soil to be stockpiled	
					Stockpiles must be sited upslope from any development	
					Construct storm water diversion berms for all stockpiles to protect against erosion and dirty water contamination	
					Re-vegetate top soiled areas to prevent loss of soil through erosion	
					Place stripped topsoil directly onto re-profiled and shaped area to minimise volume of soil that needs to be stockpiles	All
					Conduct soil fertility analysis prior to seeding and fertilise accordingly to create growing conditions	

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Lime soils at the time of placement if necessary to bring soil pH to a level as close to a neutral pH as possible	
1.1.3 B		Reduction of viability of soils in stockpiles	Medium	Low	Use containment and sealed surfaces to prevent soil contamination by fuels, oils etc.	All
					Clean up any areas of soil contamination	
					Test areas for chemical contamination and ameliorite	
					Sample soil underlying hazardous waste sites	
					Cleaned areas should be free-draining and re-vegetated immediately	
1.1.4 A	Land capability	Reduction in land capability in other areas	Medium	Medium	Implement soil conservation and management measures, and replace stripped soil to a depth of 750 mm in re-profiled mined out areas	All
					Re-establish surface drainage and a free draining land form	
					Implement soil protection and conditioning measures	
					Monitor rehabilitated areas to assess performance of the rehabilitation approach employed	
1.1.4 B		Increased erosion in other areas	Medium	Medium	Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at agricultural improvement to ensure benefits of compensation can be applied effectively	All
					See also above	
1.1.5 A	Land use	Loss of access to land	High	Medium	Provide monetary compensation to land owners, through the medium of a community trust	All
					Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at agricultural improvement to ensure benefits of compensation can be applied effectively	All
					Cooperate with the Department of Land Affairs and the local tribal communities in the development of an implementation strategy and plan to ensure effective implementation of mitigation	All
					Reshape, topsoil and vegetate mined areas as described in	All
					Replace topsoil to achieve a minimum depth of 750 mm	All
					Ensure soil fertility levels are appropriate for arable use	All
1.1.5 B		Increased pressure on land	Medium	Medium	Ensure the slope of rehabilitated areas is less than seven degrees to enable arable use.	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Where necessary, construct storm water control berms to prevent erosion.	All
					Ensure soil fertility levels are appropriate for arable use	All
1.1.5 C		Clearance of new land in other areas	Medium	Medium	This impact will occur outside the boundaries of the project	N/A
1.1.6 A	Ecology	Damage to Terrestrial ecosystems	Low	Low	Limit the mine infrastructure footprint to reduce the area of influence	All
					Protect trees not directly affected by the opencast area	15, 16
					Develop a management plan for immediate clean-up in case of pollution incidents at streams, rivers and drainage crossings	All
					Fire breaks should be constructed and maintained along the inside of the blast exclusion zone	All
					Do not clear vegetation on the hills within the blasting safety zone	All
					Do not allow mine personnel, or appointed contract staff, to harvest any indigenous vegetation from the hillside areas	All
					Avoid unnecessary clearance of indigenous vegetation, such as trees in non-mining areas within the exclusion zone	All
					Maintain the blast zone free of exotic vegetation	All
					Following soil placement during rehabilitation, all top soiled areas should be seeded to encourage vegetation establishment	All
1.1.6 B		Damage to Aquatic ecosystems	Low	Low	The appropriate seed mixture should be used (2 kg/ha *Eragrostis teff*, 5 kg/Ha Smuts finger grass, 5 kg/ha Rhodes grass)	All
					Do not use pioneering rhizomatous grasses (kweek / couch grass)	All
					Protect all natural elements such as trees and rocky outcrops since they provide shelter for a variety of animals and reptiles	All
					Limit the footprint of mine infrastructure, so as to reduce the area of influence of such infrastructure	All
					No hunting or trapping should be allowed on the site or in the rocky outcrop and hill areas	All
1.1.7 A	Surface water	Surface water quality	High	Low	Construct river diversion infrastructure in the dry season	3

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Construct storm water management infrastructure to be compliant to environmental legislation	8,9, 25
					Design and manage all storm water infrastructure to comply with the regulations	8, 9, 25
					Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops); No other measures are required as the rest of the area is a “clean area”	All
					Samancor will implement the surface water control measures in accordance with the requirements of Regulation 704 and the corresponding DWAF M6.1 Operational Guideline. These measures must be implemented during the commencement of the construction phase.	8, 9, 25
					There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years.	7,8,9, 25, 26, 27, 28
					The operating protocol is as follows: The Crushing and screening Plant beneficiation (including dust suppression) must take water from: The Return and/or Storm water dam unless it is empty; Water from the opencast sump unless it is empty; Water from Underground. Water for domestic purposes will be obtained from the Labalelo line. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs.	All
					Samancor will avoid contamination of soils and will implement appropriate remedial measures if incidents of spillage occur. Samancor will implement responsible waste management practices. Samancor will implement all management measures pertaining to waste and water management as per the design reports.	All
					The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall.	
					Clean water diversion (bunds/ canals). Good housekeeping (clean-up of spills and minimise informal storage of materials) Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops)	All
					Leak detection through inspection; Good housekeeping (maintenance of equipment); Infrastructure located within "dirty area"	4, 7, 8, 9, 14, 24 25, 26, 27, 28
					Run-off from roads will be contained;	1, 9, 25
					Vehicle will be maintenance	All
					Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them	All
					Monitor quantities and qualities of all water that is discharged	4, 7, 8, 9, 24, 25, 26, 27, 28
					Operate the storm water dam to have 0.8 m freeboard	8, 9, 25
					Design sump with a 1:50 year holding capacity	8, 9, 25, 26
					Implement storm water management before land clearing start	8, 9, 25, 26
					Install toilets with a dual flush system and showerheads that reduce water use. Re-use "waste water" before using potable water in the beneficiation proses	All
1.1.7 B		Surface water quantity	High	Low	Implement storm water management to divert clean water around the mining area	8, 9, 15
					Contour shaping of the opencast area to pre-mining topography as far as possible	All
					Implement rehabilitation strategy for the stream diversions	8, 9, 25
					Design all culverts and bridges with sufficient capacity	1,9, 25
					Clean water diversions (bunds and canals) will be constructed and maintained	9, 25

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Implement the selected river diversion strategy as per the design document	9, 25
					Monitor water quality and if good discharge to the nearest water resource	4,7,8, 24, 25, 26, 27
					Investigate water treatment options to treat poor quality water before discharge	4,7,8, 24, 25, 26, 27
1.1.7 C		River characteristics (Beds, Banks, Course)	High	Low	In compliance with the GN 704 Regulations (or the latest publication), Samancor will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. It will ensure that its storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event.	9,25
					ECM must apply for a Water Use Licence from the Department of Water Affairs before making any changes to the drainage lines.	4,7,8,9
					The reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed.	9,25
					A 100 m buffer zone is placed alongside the “riparian” banks of all water courses and that no mining should occur within this area.	All
					The necessary mitigation is put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas.	All
					“Riparian” habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic. This will be especially important if the flow dynamics of the streams is changed due to discharged water from the site.	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					As the streams are generally dry it is not suitable for SASS5 aquatic invertebrate assessment, it is thus proposed that diatom sampling be conducted (if the streams are flowing) before mining commences and as part of the monitoring plan for the mine.	All
					These sites should mainly consist of an upstream and downstream point in the Matadi and Moopetsi Rivers and unnamed tributaries of the Moopetsi River.	All
1.1.8 A	Groundwater	Deterioration of groundwater quality during the construction phase: Oil, diesel and chemical spills	Medium	Low	It must be ensured that a credible company removes used oil after vehicle servicing	1-17
					A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills	1-17
					Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment	1-17
1.1.8 B		Deterioration of groundwater quality during the construction phase: Contamination of mine material exposed during mine construction	Medium	Low	Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed before constructing the coal handling facilities and adit(s)	1-17
					Implement the EMP's of other environmental related aspects, including pollution prevention and impact minimisation	1-17
					Groundwater monitoring boreholes should be sited with the aid of geophysics at designated positions based on final infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended	1-17
					Groundwater monitoring boreholes should be installed to comply with the minimum requirements as set by governmental guidelines	1-17
1.1.9	Air quality	Reduction in air quality due to the site construction	Medium	Low	Employ appropriate dust suppression measures on roads	All
					Suppress dust at the crusher an run of mine tip by means of dust suppression sprays	All
					Minimise the area of exposed soils	All
					Damp down prior to blasting	15,16, 18
					Utilise correct blast design to minimise dust	15,16, 18
					Compact and rehabilitate land surfaces as soon as practical and vegetate if appropriate	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Install dust fallout monitoring buckets adjacent to the crusher and active mining area: - 1 bucket between the crusher and community east of the mine - 1 bucket between the mine pit and community west of mine - 1 bucket between the mine pit and community east of mine	All
					Install directional dust fallout buckets in order to distinguish between dust moving onto, or off, the mine site	All
1.1.10 A	Noise & Vibration	Noise due to road transport	Medium	Medium	Construct screening berms at sensitive receptors	All
					Only work during daylight hours Monday - Friday	All
					Maintain infrastructure, machinery and vehicle exhausts in good working order	All
					A screen of suitable indigenous trees will be planted to screen the mining operations from the community east of the mine ad from the tar road	All
					Ensure all people are outside of the blast exclusion zone prior to blasting	All
1.1.10 B		Noise due to construction activities	Medium	Medium	Use electronic or Nonel detonators whenever possible	All
					Develop and implement a blasting programme that defines a window of time when in the day blasting will occur	All
					Communicate the blasting programme to the public and land owners	All
					Fence the blast exclusion zone prior to commencement of mining	All
					Ensure that the blast exclusion zone is cleared prior to blasting	All
					Announce all imminent blasts by means of a blast claxton/ siren	All
1.1.10 C		Vibration due to construction activities	Low	Low	Implement additional safety measures when blasting within 500m of the Marula mine road, e.g. notification of blast times, temporarily interrupt traffic flows, patrol area, carry out blast, inspect road surface and remove material from road, reinstate traffic	All
1.1.11	Visual	Visual impacts	Medium	Medium	Minimising the size and height of buildings and structures;	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Paint buildings and structures in colours to match surroundings	All
					Constructing screening berms from receptors; rehabilitate disturbed areas, as soon as practical, to match the surrounding land use	All
					Manage trees in the screening barrier to ensure that, as the trees grow in size and the screening benefit of the tree barrier is not lost through the back	All
1.1.12 A	Socio - Economic	Construction cost to Samancor	Medium	Medium	Assist communities to develop a community development strategy to address the potential impacts of the mining in the area	All
1.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	Medium	Medium	Establish, and communicate qualification criteria for, a bursary scheme for community members to focus on core mining skills	All
					Mentor empowerment groups	All
					Implement employment equity	All
1.1.12 C		Restricted access to land and other destinations (obstruction)	Medium	Medium	Improved pedestrian access should be considered if any of the roads comprising the haulage route are upgrade, especially R37 (SANRAL)	All
1.1.12 D		Increased pressure on water supply and sanitation as a result of inward migration	Medium	Medium	Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population growth (Samancor Chrome)	All
					Provide additional formal water supply infrastructure to affected communities from the Labalelo pipeline (Department of Water Affairs)	All
					Provide formal sanitation or semi-permanent sanitation facilities to affected communities (Government or aid agency)	All
					Provide technical training to selected community members to allow them to operate boreholes and pumps effectively and to fix them when in need of repair (Samancor Chrome)	All
1.1.12 E		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	Medium	Medium	Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population	All
1.1.12 F		Increase in water-borne	Medium	Medium	Advertise and disseminate information regarding the low	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
		diseases, as a result of inward migration and increased pressure on water supply and sanitation			employment prospects at the mine, to minimise inward migration and pressure on supplies (Samancor Chrome)	
1.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	High	Medium	Provide monetary compensation to land owners to provide for purchase of food, through the medium of a community trust	All
1.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	Medium	Medium	Cooperate with the Department of Land Affairs in the development of an implementation strategy and plan to ensure effective implementation of mitigation, especially monetary compensation and technical training	All
1.1.12 I		Increase in road safety risks due to increased road traffic	Medium	Medium	Enforce good driving standards	All
					Communicate to the communities the nature of existing groundwater quality issues with respect to nitrate and discuss possible measures to address the problem	All
					Make alternative water supplies available to affected communities if monitoring shows a significant increase in nitrate concentrations	All
					Provide additional formal water supply infrastructure e.g., planned Labalelo pipeline community supply	All
					Provide additional medical facilities to affected communities (government or aid agency)	All
					Assist in the promotion of a health education campaign, covering water and sanitation	All
1.1.12 J		Increase in noise and vibration	Medium	Medium	Refer to Noise and vibration aspects	
1.1.12 K		Reduction in sense of place	Refer to Visual aspects			
1.1.13 A	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	Destruction of or damage to archaeological remains and loss of information	High	Medium	Avoid disturbance of archaeological remains, graves and human remains as far as possible	All
					Demarcate and protect sites within the exclusion zone that need not be directly disturbed	All
					Undertake archaeological investigations of the remains prior	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					regulatory requirements	
					Immediately report any finds during mine development and operation, and avoid disturbance until they are examined by regulatory authorities	All
1.1.13 B		Disturbance of graves and human remains	High	Medium	Refer to mitigation measures as prescribed in the Construction phase	
2	**Operational phase: management and operation of**					
2.1.1	Geology	Disturbance of in-situ geology	Medium	Medium	No additional mitigation other than as described in Construction phase	18,19
2.1.2	Topography	Alteration of topography	Medium	Medium	No additional mitigation other than as described in Construction phase	All
2.1.3 A	Soil	Disturbance of soils	Medium	Medium	No additional mitigation other than as described in Construction phase	18,22,23,24,26
2.1.3 B		Reduction of viability of soils in stockpiles	Medium	Low		22
2.1.3 C		Soil contamination due to spills	Medium	Low		18,19,20,21
2.1.4 A	Land capability	Reduction in land capability in other areas	Medium	Medium	No additional mitigation other than as described in Construction phase	All
2.1.4 B		Increased erosion in other areas	Medium	Medium		All
2.1.5 A	Land use	Loss of access to land	High	Medium	No additional mitigation other than as described in operational phase	All
2.1.5 B		Increased pressure on land	Medium	Medium		All
2.1.5 C		Clearance of new land in other areas	Medium	Medium		All
2.1.6 A	Ecology	Damage to Terrestrial ecosystems	Low	Low	No additional mitigation other than as described in Construction phase	All
2.1.6 B		Damage to Aquatic ecosystems	Low	Low		25
2.1.7 A	Surface water	Surface water quality	No additional mitigation other than as described in Construction phase			All
2.1.7 B		Surface water quantity	No additional mitigation other than as described in Construction phase			All
2.1.7 C		River characteristics (Beds, Banks, Course)	No additional mitigation other than as described in Construction phase			All
2.1.8 A	Groundwater	Groundwater quantity-lowering of groundwater table and impact on water	High	Medium	Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one to two kilometres surrounding the opencasts to ensure that any deviation of	18, 19

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
		supply of groundwater users			the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately	
					If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply	
					The numerical model should be updated during mining by using the measured water ingress, water levels, mining and geophysics information to re-calibrate and refine the impact prediction	
2.1.8 B		Groundwater quantity- lowering of groundwater table and potential impact on base flow of streams	No impact on streams predicted		N.A	18, 19
2.1.8 C		Groundwater quality - Contamination of groundwater and deterioration of quality down gradient of the mining operations	High	Medium	Mine sections should be sealed where possible during mining to reduce the contact of water and air with remaining sulphides	18-28
					All potential sources of pollution, such as tailings and pollution control dams should be lined to prevent ingress of contamination into the groundwater system	
					Install water collection and pumping systems within the mining areas capable of rapidly pumping water out, so minimising contact of water with the geochemically reactive material	
					Clean and dirty water systems should be separated	
					Groundwater quality must be monitored on a quarterly basis	
					The monitoring results must be interpreted annually by a qualified hydro geologist and the monitoring network should be audited annually to ensure compliance with regulations	
					Numerical groundwater model must be updated by calibrating the model with monitoring data	
					Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine	

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
2.1.8 D		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of Oil, diesel and chemical spills/leaks from machinery and storage facilities	Low	Low	It must be ensured that a credible company removes used oil after vehicle servicing A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment	18-28
2.1.8 E		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of sewage related contamination	Medium	Low	Sewage effluent emanating from latrines or ablution blocks should be treated to acceptable levels before discharge into the environment	27, 28
2.1.9 A	Air quality	Reduction in air quality due to site operations	Medium	Low	No additional mitigation other than as described in Construction phase	18, 20, 21, 22, 23, 24, 26
2.1.9 B		Reduction in air quality due to dust from ore haulage trucks	Medium	Low		18,19, 20, 21, 23
2.1.10 A	Noise & Vibration	Noise due to general production activities	High	Medium	No additional mitigation other than as described in Construction phase	All
2.1.10 B		Noise due to blasting	Medium	Medium		18, 19
2.1.10 C		Noise due to road transport	Medium	Medium		All
2.1.10 D		Vibration due to blasting	Medium	Medium		18, 19
2.1.10 E		Vibration due to general production activities	Low	Low		All
2.1.11	Visual	Visual impacts	Medium	Medium	No additional mitigation other than as described in Construction phase	All
2.1.12 A	Socio - Economic	Operating cost to Samancor	Medium	Medium	No additional mitigation other than as described in Construction phase	All
2.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	Medium	Medium		All
2.1.12 C		Increased pressure on	Refer to Ref. 1.1.12 D			All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
		water supply and sanitation as a result of inward migration				
2.1.12 D		Reduced water level in Madikane supply borehole and effect on yield	Medium	Medium		All
2.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	Medium	Medium		All
2.1.12 F		Increase in methemoglobinemia due to possible increased nitrate in boreholes	Medium	Low		All
2.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	High	Medium		All
2.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	Medium	Medium		All
2.1.12 I		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	Medium	Medium		All
2.1.12 J		Increase in noise and vibration	Medium	Medium		All
2.1.12 K		Increase in traffic	Refer to Ref. 1.1.10			All
2.1.12 L		Reduction in sense of place	Refer to Ref. 1.1.11			All
2.1.13	Archaeological / Cultural (also	No additional impact	Refer to Ref. 1.1.13		No additional mitigation other than as described in Construction phase	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
	refer to Sections 6.2 and 6.3)					
3	**Rehabilitation, Closure and post closure phase: management and operation of:**					
3.1.1	Geology	Disturbance of in-situ geology	Medium	Medium	No additional mitigation other than as described in Construction phase	
3.1.2	Topography	Alteration of topography	Medium	Medium	Minimise the mine footprint and degree of disturbance	All
					Backfill final voids using material in the waste rock dumps	
					Deplete and clear the chromite stockpiles at the completion of mining	
					Blend rehabilitated surfaces with surrounding topography	
					No fixed infrastructure will be established on the Lwala Chromite Mine site. Service infrastructure will be removed on cessation of mining.	
					Mine residue deposits will be vegetation and inspected annually. Storm water infrastructure around waste deposits will be maintained and inspected annually.	
					Underground workings adits will be sealed.	
					Rehabilitation of the opencast mined areas on site will follow the mining cut and be completed within the operational phase of the project. Box cut spoils will be used to close the final void. The entire mined pit area will be in filled and covered with usable soil and returned to agricultural use.	
					With the exception of the mine residue sites it is not anticipated that any post mining maintenance on the established vegetation community will be necessary because the land will return to community use as subsistence agricultural land. The tufted grass community established during rehabilitation to stabilise the site and limit soil erosion from site is likely to be ploughed up by the community, on return of the land, in preparation for planting of food crops.	
					With regards to the opencast pit area it is not anticipated that significant or large scale surface subsidence will occur associated with the opencast mined block because the	

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					spoils will be deposited by truck and the spoil areas will grow incrementally. Some minor and localised settlement may occur. However, the pit is located on a very gentle north-facing slope and local settlement is unlikely to result in ponding of water. Should localised small depressions form, they will be in filled with useable soil and the disturbed area re-vegetated.	
3.1.3 A	Soil	Mixing and dilution of soils	Medium	Low	No additional mitigation other than as described in Construction phase	29-33
3.1.3 B		Erosion of replaced soils	Medium	Medium		
3.1.3 C		Reduction of viability of replaced soils	Medium	Low		
3.1.4	Land capability	Reduction in land capability when available once more	Low	Low	Refer to Ref. 1.1.4	All
					Monitor rehabilitated areas annually to assess performance of the rehabilitation approach employed in order to identify:	All
					- occurrence of surface erosion	
					- vegetation die back	
					- to establish whether salinization of soil is occurring	
					- fertility status of rehabilitated land	
					- the emergence of alien / exotic vegetation	
3.1.5	Land use	Loss of access to land	High	Medium	Refer to Ref. 1.1.5	
3.1.6 A	Ecology	Damage to Terrestrial ecosystems	Low	Low	Refer to Ref. 1.1.6	
					Seed all top soiled areas during rehabilitation to encourage vegetation growth	All
3.1.6 B		Damage to Aquatic ecosystems	Low	Low	No pioneering rhizomatous grasses such as *Cynodon dactylon* should be used as these species will pose problems for later agricultural cropping of the land	All
3.1.7 A	Surface water	Surface water quality	No additional impacts		Maintenance will be required on structures such as storm water diversion channels and berms associated with the routing of storm water around the operating pit and mining infrastructure areas.	9, 32, 33
3.1.7 B		Surface water quantity	No additional impacts		The structures will be inspected regularly and maintenance work carried out as required.	9, 32, 33
					Inspections will take place immediately prior to the rainy season.	9, 32, 33
					Vegetation of residue deposits must be carried out as described for the general area above with topsoil and	32, 33

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					vegetation establishment.	
					Vegetation must be investigated annually.	32, 33
3.1.7 C		River characteristics (Beds, Banks, Course)	No additional impacts		Mitigation measures as prescribed in the Construction phase	33
3.1.8 A	Groundwater	Decant			N/A	29, 30, 33
3.1.8 B		Groundwater quantity – change in groundwater level and the potential (positive) impact on base flow of streams-(not predicted)	High	Positive impact	All sulphate containing waste material should be stored underground and flooded as soon as possible to exclude oxygen: As needed	29-33
					Major underground fractures encountered while mining must be sealed by grouting, both on inflow and outflow areas: As needed	19, 30
3.1.8 C		Groundwater quality: Deterioration of groundwater quality down gradient of the mining operations due to plume movement	High	Medium	All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite: Continuous	29-33
					The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas: Continuous	29
					The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts: Continuous	29
					Groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends: Quarterly	All
					Audit the monitoring network annually	All
					Conduct a final update the numerical model to predict post mining impacts on the groundwater regime and to access potential liabilities: During closure phase	All
3.1.8 D		Groundwater quality deterioration as a result of contaminants emanating from historic Oil, diesel and chemical spills and facilities	Medium	Low	Remove or remediate areas of hydrocarbon contaminated soils by following a risk based approach, take action if a negative risk is found. A risk assessment should be conducted by a qualified hydro-geologist: Continuous	29-33
		General	N/A		A detailed mine closure plan should be prepared during the operational phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWA	29-33

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
					Best Practice Guidelines: Before final closure	
					The implementation of the mine closure plan and the application for the closure certificate can be conducted during the decommissioned phase.	All
3.1.9 A	Air quality	Reduction in air quality due to rehabilitation works and exposure of rehabilitated surfaces	Medium	Low	No additional mitigation other than as described in Construction phase	29-33
3.1.9 B		Cumulative reduction in air quality	Medium	Low	No additional mitigation other than as described in Construction phase	29-33
3.1.10	Noise & Vibration	Noise due to rehabilitation and closure activities	Low	Low	No additional mitigation other than as described in Construction phase	29-33
3.1.11	Visual	Visual impacts	Medium	Medium	Refer to Ref. 1.1.10	29-33
3.1.12 A	Socio - Economic	Decommissioning and Closure cost to Samancor	Medium	Medium	No additional mitigation other than as described in Construction phase	All
3.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	Medium	Medium		
3.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration	Refer to Ref. 1.1.12 D			
3.1.12 D		Reduced water level in Madikane supply borehole and effect on yield	Refer to Ref. 1.1.12 D			
3.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	Medium	Medium		
3.1.12 F		Increase in health risk due to increased nitrate in borehole water	Medium	Low		
3.1.12 G		Poorer health care as a	Medium	Medium		

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
		result of inward migration and increased pressure on medical resources				
3.1.12 H		Reduction in sense of place	Medium	Medium		
3.1.13	Archaeological / Cultural (also refer to Sections 6.2 and 6.3)	No additional impact			Refer to Ref. 1.1.13	All
4	**All phases**					
4.1.1 A	Groundwater	General	N/A		All the monitoring data needs to be collated and analysed on at least a bi-annual basis and included in management reports. This information will also be required by government departments (Department of Water Affairs, Department of Environmental Affairs) for compliance monitoring: Bi-annually	All
					After 2 years from start of mining, the monitoring information collated should be used to update the groundwater flow and geochemical models. These models should thereafter be updated so that sufficient mitigation measures can be implemented. Management and mitigation plans should be continuously adapted using the monitoring data: propose within 2 years of mining starting and thereafter every 5 years	All
4.1.1 B		Acid mine drainage	Low	N/A	No mitigation needed as potential to generate AMD is low, however proper lining systems for tailings dam must be implemented and dirty storm water generated on site must be kept on site in suitably constructed dams	7, 16, 18, 19, 23, 26, 29, 30, 32, 33
4.1.2 A	Socio - Economic	Loss of income from agriculture land	High	Medium	Provide monetary compensation to land owners, through the medium of a community trust	All
4.1.2 B		Economic impact of supporting other households	High	Medium	Cooperate in the development of an implementation strategy and SMMEs	All
4.1.2 C		Population growth	Low	Low	Maximise local employment creation and targeted local procurement	All

Ref.	Aspect	Impact	Significance before mitigation	Significance after mitigation	Mitigation measures	Activity
4.1.2 D		Relocation of households	Low	Low	Provide assistance with technical training (at schools & in-house), capacity building and skills development	All
4.1.2 E		Increased pressure on existing infrastructure	Medium	Medium	Apply appropriate social investment funding	All
4.1.2 F		Social conflict due to possible inward migration of outsiders, associated effects and competition for benefits within and between communities	Medium	Medium	Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population growth	All
					No relocation will be required	All
					Possible provision of additional infrastructure by external (government or aid) agency	All
					Control (mitigation) of these effects must come from within the existing community structure	All
					Assist communities to develop a community development strategy to address the potential impacts	All
					Avoid the establishment of a common trust account for the affected communities. Compensation issues will need to be dealt with separately for each community.	All
					Facilitate better communication between mine & communities revision of the composition of Clapham Community Working Committee and to function more effectively	All
					Provide training to the Clapham Community Working Committee in respect of its key functions	All
5	**Cumulative impact (average of all the impacts identified above)**					
5	All above	All above	Medium	Medium	N/A	N/A

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11 Identification of interested and affected parties (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report)

The following sectors of society have been afforded the opportunity to comment (the full stakeholder distribution list, consists of more than 280 entries):

- National, provincial and local government;
- Agriculture, including local land owners;
- Local previously disadvantaged communities, including tribal authorities and development bodies in the immediate vicinity;
- Industry and mining;
- Commerce;
- Environmental bodies, both as authorities and NGOs;
- Tourism concerns and associations;
- Labour unions and the unemployed;
- Community representatives and CBOs;
- Local groupings in the vicinity, including church groups, women's groups i.e. youth groups;
- Schools, voluntary associations, and others.

12 The details of the engagement process (Including the community, and list as identified according to the scoping report guideline and identified in the scoping report and any further consultation since the compilation of the scoping report)

12.1 2002 process

The opportunity for stakeholders to participate in the EIA was announced as follows:

- Several hundred copies of a Background Information Document were distributed to stakeholders in the area since May 2002 in Northern Sotho and English as a first step to announce the opportunity for comment. These documents were also left in various public places such as the Steelpoort Post office and Greater Tubatse Municipality. Copies were also left with stakeholders for further distribution to their colleagues and constituents.
- 280 stakeholders received a letter of invitation to comment, addressed to them personally.
- More than 100 telephone calls were made to stakeholders in the area.
- Advertisements were placed in the Lydenburg News and Steelburger.

- Personal telephonic briefings were given to groups of stakeholders such as local businesses, labour unions, Irrigation Boards and local mining and industry. In addition, a range of meetings were held with previously disadvantaged stakeholders such as tribal authorities and local Development Committees of the communities in the area.
- The draft scoping report was made available for comment for three weeks.
- Community briefeings were held on the content of the EIA.

12.2 2012/2013 process

Land Claims were confirmed as followed by Ms. Makhanana Senwana (Manager Operations) on the 23rd of November 2012:

Farm	KRP	Claimants	Status
Surbiton 115 KT	1493	Magadimana Ntweng	Research process in progress
	2585	Sekhukhune Kingdom	Research process in progress
Hackney 116 KT	1447	Roka Mashabela	Gazetted and Research not started
Forest Hill 117 KT	1442	Roka Mashishi	Gazetted and Research not started
	1446	Kgoete M	Research process in progress
Clapham 118 KT	1442	Roka Mashishi	Gazetted and Research not started
	1446	Kgoete M	Withdrawn
	12176	Bakone-Ba-Manyaka	Gazetted and Research not started

Clapham 118 KT: The research has been finalised in favour of Manyaka and there is piece of land that is inhabited by Mashishi people. Negotiations are underway to annex that piece of land for the benefit of Mashishi people and thus far an agreement has not been reached due resistance by Manyaka Tribal Leadership.

The newspaper advert was placed on the following newspaper informing and inviting members of the public and any other interested and affected parties (I&APs) about the environmental impact assessment process underway and to comment on the proposed EMP amendment for the Lwala Section mining project: Steelburger issue of 15th February 2013.

In addition pamphlet notices and background information documents (BID) were distributed at various local schools for various stakeholders and I&APs within Ga-Mashishi village area. Distribution was done on the 30th January 2013. Pamphlet and BID distribution for Ga-Manyaka village is scheduled for 20 th February 2013.

Pamphlets were distributed at the following schools in order for pupils/students to take them home, inviting parents and interested and affected parties to attend the public meetings: a) Mashishi Primary School and; b) Consultation letters were also handed over to community leaders Ga-Mashishi Tribal Office and the Tubatse Municipality Ward Councillor for Mashishi and Manyaka.

To inform the surrounding public, I&APs, communities and immediately adjacent landowners to Twikenham 114 KT, Surbition 115 KT, Forrest Hill 117 KT and Clapham 118 KT farms about the

proposed EMP amendment project, site notices were placed at various places and locations which are visible and accessible within Ga-Mashishi and surrounding farm homestead on the 13th November 2012 and 30th January 2013. Site notices were placed at the following points/sites:

- Ga-Mashishi (13/11/2012): Moropang General Dealer, Mashishi Tribal Office, Mashishi Road Side Restaurant, Mashishi Supermarket.
- Ga-Manyaka (13/11/2012): Manyaka Tribal Office, Mankgarube Liquor Store, Baroka Restaurant, Vodacom Phone Box.
- Ga-Mashishi (30/01/2013): James Hair Salon, Mahlako Liquor Store, Moropang General Dealer, Mashishi General Dealer, Moselane Liquor Restaurant, Mashishi Tribal Office.

Consultation with the members of the public and I&APs were undertaken through acommunity meeting at Ga-Mashishi was carried out on the 03rd February 2012 at Ga-Mashishi Moshate (11h00 – 13h00). The community meeting for Ga-Manyaka was held on the 24th February 2013 at 11h00.

This document was made available for public comment in February and March of 2013 for a total of 30 days. Thereafter after a request from the DMR a scoping report was drafted and submitted for comment to the public from 9 May to 18 June 2013 and submitted to the DMR. No comments was received on the Scoping report. Wth the exception of the Issues and Response report that included the information from the meetings held, the contents if this document did not change from the document that was made available for comment and thus was not made available for comment again.

13 Details regarding the manner in which the issues raised were addressed (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

The description of the environment was compiled by specialist and was made avaialble to the public for comment. Below follows an outline of the issues raised during the public participation processes initiated during the 2002 and 2012/2013.

2002 Public Participation process

Issues Raised	Commentator(s)	Response
Air Quality		
That dust pollution must be addressed by the EIA. How will dust impact on neighbouring houses?	Mr Gabriel Makgoga, NUM, Tweefontein Mine, Steelpoort; Mr Adam Makofane, Kgwete Development Forum	Noted, and will be assessed in the impact assessment phase of the EIA.
That the necessary steps are taken to control the dust.	Mr M S Mashishi, Chief Roka, Mashishi Tribal Authority	Specific dust suppression measures will be prescribed through the EIA and captured in the EMPR which will become legally binding on the mine should the project be approved.
That there will be air pollution; that it will need to be controlled.	Mr Collen Kgwete, Kgwete Development Forum; Mr Dithomo Napo, Lekwebepe Recruiting Agency, Burgersfort	Dust will be the main form of air pollution, and will be assessed during the impact assessment phase of the EIA, and captured in the EMPR which will become legally binding on the mine should the project be approved.
That the air quality will stay the same.	Dr. W J Fouche, Medical Practitioner, Burgersfort	An air quality study will be commissioned during the impact assessment phase of the EIA. The outcome of this study will feed design criteria through to the final design of the mine as well as define a procedure for air quality monitoring, where the baseline condition will be the current air quality prior to mining.
That the proposed ferrochrome smelting plant will cause air-pollution.	Mr Koos and Mrs S M Venter, Steelpoort Mining Supplies, Steelpoort	The proposed smelter will fall into the third phase of the total possible mine development. At this stage there is no certainty that a smelter will in fact be developed. For this reason the second and third phases of the overall possible mine development have been excluded from this EIA, as described under section 3 of the final Scoping Report. Should phases two and three ever go ahead, these phases will be subjected to a separate EIA which would lead to an amendment of the EMPR that will be developed for phase one of the mine.
Groundwater supply and quality		
That the impacts on groundwater in terms of quantity and quality must be addressed by the EIA.	Ms Margaret von Mollendorf, DW AF, Nelspruit; Mr Dithomo Napo, Lekwebepe Recruiting Agency, Burgersfort	A detailed ground water study will be commissioned in the next phase of the EIA that will evaluate these issues.
That proper borehole census studies must be performed in the area.	Ms Margaret von Mollendorf, DW AF, Nelspruit	The groundwater study to be undertaken during the impact assessment phase will include a borehole census.
That groundwater pollution be considered.	Stakeholder, Kgwete Development Forum	This will be considered in the EIA and, if required, mitigation measures will be proposed.
That borehole water is unhealthy as it is not purified and thus the communities should receive water from the same pipes used by the mine.	Kgosigadi Mtlhaoleng Kgoete, Mashishi School, Driekop	The water that the mine has secured from the Lebalelo Water Scheme is raw untreated water, suitable for mining but not drinking. Drinking water requirements fall under the jurisdiction of the Lebalelo Water Users Association.

Issues Raised	Commentator(s)	Response
That the groundwater will be contaminated by seepage.	Mr Koos and Mrs S M Venter, Steelpoort Mining Supplies, Steelpoort	The EIA will prescribe surface and ground water management measures. In addition, a groundwater monitoring system will be established, where the baseline condition will be the ground water quality prior to the commencement of mining.
That underground mining will have an impact on water supply and resources.	Mr J J H Booysen, ASA Metals	Should underground mining be considered at a later stage, the effect that such mining has on water will be determined during a separate EIA that would need to be carried out before underground mining could commence.
That there should be enough water to control the dust at the crusher.	Dr W J Fouche, Medical Practitioner, Burgersfort	Through Samancor's investment in the Lebalelo Pipeline, its water allocation is sufficient for the planned operations, including dust control.
That there is not enough water for the proposed smelter.	Mr J J H Booysen, ASA Metals	The smelter is only in concept at this stage, but adequate water has been secured through the Lebalelo Pipeline Scheme.
That the law apparently says that underground water may not be used for mining purposes. This confuses people because they see that mines do use groundwater in various areas.	Ms Julia Makofane, Environmental Justice Networking Forum. Public Meeting, August 2002	The National Water Act (Act 36 of 1998) does not prevent mining companies from using groundwater. However, companies may only use groundwater if they have a license from the Department of Water Affairs and Forestry. Licenses have strict conditions that also consider the requirements of other users. Samancor does not, however, intend to use groundwater for its proposed new mine, but water from the Lebalelo Water Scheme, from which it has an allocation of six mega litres per day.
That the sludge dams be lined – no seepage to be allowed.	Dr W J Fouche, Medical Practitioner, Burgersfort	The dams will be designed according to best practice guidelines, which will consider the impacts associated with the sludge. The groundwater study to be undertaken during the EIA will evaluate impacts associated with disposal of the sludge.
Surface water supply and quality		
That the impacts on surface water in terms of quantity and quality must be addressed by the EIA.	Ms Margaret von Mollendorf, DWAF, Nelspruit	This will be determined through the ground and surface water studies that are scheduled for the next phase of the EIA, the impact assessment phase. Mitigation measures will be prescribed for significant impacts.
That the river running through these farms be investigated in terms of quality and quantity.	Dr W J Fouche, Medical Practitioner, Burgersfort	Yes, a surface water impact assessment will be carried out during the EIA and the current water quality and flows will be determined in order to measure future performance of the mining activities.
That the Matadi and the Moopatsi Rivers are subterranean perennial rivers feeding in to the Motse River. The Motse River supplies the communities situated on the farms Clapham, Forest Hill and Surbiton.	Mr Lerulane Mathole, Kgwete Development Forum	Please see above response.
That surface water pollution be considered, including as	Stakeholder, Kgwete Development Forum	Samancor will not mine Magoshi (Matadi) Hill, but may make this

Issues Raised	Commentator(s)	Response
a result of underground mining of the Magoshi (Matadi) Hill.		resource available to an emerging mining company. Should such a company take up this offer they would have to do a separate EIA before they could obtain approval to mine. However, the latest indications are that Magoshi (Matadi) Hill is not viable to mine. In terms of surface water pollution from Samancor's proposed Phase 1 Opencast mine, a surface water assessment will form part of the impact assessment phase of the EIA, which will address this issue.
Water resource management and regulatory control		
That no water use may be practiced without a license from DWAF; that the licensing process is cumbersome and that a time schedule should be drafted in consultation with DWAF.	Ms Margaret von Mollendorf, DWAF, Nelspruit	This will be taken up in parallel with the surface water study scheduled for the next phase of the EIA.
That was mentioned in the Scoping Report some chromite ore from the proposed mine will be processed at the Tubatse Ferrochrome smelter. The smelter is presently undergoing an expansion of its operations, presumably in preparation for the increase in chromite ore from this proposed mine.	Mr Paul Herbst, DWAF, Pretoria	This is not the case; the expansion of Tubatse Ferrochrome is unrelated to this project and is in fact in response to envisaged ferrochrome market demand.
That the smelter is not in possession of a licence in terms of the National Water Act for its current water uses or for the expansion of its operations and is therefore operating as well as conducting its expansion illegally.	Mr Paul Herbst, DWAF, Pretoria	The environmental requirements of the Tubatse Smelter have been defined and are being addressed through a separate process. However, this remains a complex issue and a meeting with DWAF, DME and Samancor will be arranged to deal with this.
That until such time as the smelter/s that will be processing the proposed mine's ore are in possession of the necessary licences for their current and future operations, no additional chromite ore may be transported to this/these smelters.	Mr Paul Herbst, DWAF, Pretoria	The environmental requirements of the Tubatse Smelter have been defined and are being addressed through a separate process. However, this remains a complex issue and a meeting with DWAF, DME and Samancor will be arranged to deal with this.
That no approval of this mine's EIA or EMPR may therefore be given until the necessary licences have been issued to the smelter/s who will be processing the proposed mine's chromite ore.	Mr Paul Herbst, DWAF, Pretoria	The environmental requirements of the Tubatse Smelter have been defined and are being addressed through a separate process. However, this remains a complex issue and a meeting with DWAF, DME and Samancor will be arranged to deal with this.
That the Department may be contacted for copies of the licences once they have been issued.	Mr Paul Herbst, DWAF, Pretoria	Noted.
That should there be any enquiries the Directorate Water Quality Management may be contacted.	Mr Paul Herbst, DWAF, Pretoria	As indicated above a meeting between DWAF, DME and Samancor will be set up to deal with any enquiries.
That DWAF should ensure that the requirements of the new National Water Act will be upheld.	Mr M Maponya, National African Farmers Union	The EIA will address all applicable legislation, which includes the new National Water Act. DWAF will form part of the approval

Issues Raised	Commentator(s)	Response
		process of the environmental assessment.
That care be taken not to pollute surface and ground water.	Mr Howard Maimela, Manyaka Development Committee	Yes, a surface water impact assessment will be carried out during the EIA and mitigation measures will be prescribed for impacts of significance.
That water abstraction by the mine should not exceed the community's consumption.	Mr John Kgwete, Kgwete Development Forum	Agreed, hence Samancor participated in the Lebalelo Water Scheme, from which it has an allocation of six mega litres per day. As a result, Samancor does not envisage that it will use groundwater for its proposed new mine.
Think of how water would be supplied to the Sekhukhune area, maybe from the Steelpoort River or any other available water source, and that will enable us to speak louder because there is no successful activity without water.	Mr Thabeng Monana, Sekhukhune Environment, Sekhukhuna	This is an issue that falls under the jurisdiction of the Lebalelo Water Users Association.
Social issues		
That local schools should be improved in terms of, for example, water supply and buildings; That the quality of public education should be improved, by means of community libraries and halls.	Kgosigadi Mtlhaoleng Kgoete, Mashishi School, Driekop	This is a government responsibility and therefore falls outside the scope of the planned mining project and the EIA. However, BHP Billiton has an on-going social plan which considers all such requests.
That Samancor should develop local communities as they have not done this in the past; that communities should benefit from the mining industry.	Kgosigadi Mtlhaoleng Kgoete, Mashishi School, Driekop	Communities can assist by listing the types of benefits they seek.
That the proposed mine will bring economic upliftment and benefits to the community.	Mr M S Mashishi, Chief Roka, Mashishi Tribal Authority	A new large development in the area such as a new mine is likely to bring economic benefits and upliftment to the area and its people. Within this broader socio-economic upliftment, the social studies in the EIA will investigate how community benefits can be optimised. Samancor and its parent company BHP Billiton have an on-going social programme, and this is driven by the Samancor Foundation. However, this programme has only recently started in the area and has not yet reached the potentially affected communities. Communities should hold discussions and indicate to Samancor those benefits that would best benefit the communities and also how they can link into a possible social development programme. Typical activities of the Samancor Foundation included adult literacy programmes, funding to schools, assistance with establishment of small businesses, and capacity building such as for improved farming practices.
We hope that the establishment of this mine will be worthwhile for community development, job creation for the poor and unemployed local people and the general development programmes for our school and the neighbouring schools.	Mrs Madisane Matenchi, Hlahlane School, Burgersfort	
That it be indicated whether, and how, the community will benefit from the proposed project.	Mr Kgoshi Ntwampe, Mr Jomo Mashale, Public Meeting, August 2002	
That it be indicated whether Samancor's social programme is already in place or whether the programme is still to be developed. Samancor should indicate what projects and programmes, if any, the Samancor Foundation has already funded in the area of the proposed new mine.	Mr Jomo Mashale, Public Meeting, August 2002	
That it be indicated exactly where Samancor stands in terms of its current involvement in the area in terms of	Mr Lazarus Mashabela, Public Meeting, August 2002	

Issues Raised	Commentator(s)	Response
social responsibility.		
That Samancor enters into a social arrangement with the community, based on the recommendations of the EIA/EMPR.	Stakeholder, Manyaka Development Committee	Supported in principle.
That the company's social responsibilities include the health of the people.	Ms Julia Makofane, Environmental Justice Networking Forum.	Supported in principle and will be addressed in collaboration with local and government authorities.
That our school is hardly 300 m away from the mine and it is of utmost concern that our health and working conditions are addressed in terms of dust pollution, noise, visual impacts and water supply.	Mrs Madisane Matenchi, Hlahlane School, Burgersfort	Agreed, will be addressed during the EIA.
That, once the mine is functional, a centralised technical school be provided in the Clapham / Forest Hill communities as a matter of urgency.	Mr Leshabela Maduane, Makgamarhu Secondary School, Driekop	This will be discussed further should the project proceed.
The new Minerals Bill will be promulgated by the end of 2002, so now is the ideal time for the socio-economic study, which will assist the mine to determine its social responsibility programme. At the same time, the community should not think that the mine is fully responsible for them – government is. But, depending on its available funds, the mine can contribute to the community social issues and this should be discussed, negotiated and agreed upon. However, the local community needs to be defined because the entire Burgersfort area cannot be seen as the local community for the purpose of this new project.	Mr Nkopane, Department of Minerals and Energy. Public Meeting, August 2002	Thank you for these comments and guidance. They will be referred to in the EIA studies and EMPR.
That the aftercare after a mine has been rehabilitated is most important. Water will be available for local farmers. Will Samancor also train farmers in intensive farming practices to assist with upliftment?	Mr Kutse, DACE, Mpumalanga	This is typically the type of socio-economic development work that the Samancor Foundation could become involved with.
That priority should be given to those who will be highly impacted by the project.	Mr Lerulane Mathole, Kgwete Development Forum	This will be considered in the social impact assessment, and recommendations made.
That the community that will be most directly affected must be considered in the process and should, in fact, benefit most from the proposed project. However, since there are four communities, there must be equitable distribution of resources and opportunities amongst them.	Mr Mokwena, Public Meeting, August 2002	This will be considered in the socio-economic study that will be done during the EIA.
That the community of Ntoampe is situated further away	Mr William Mashabela, Ntoampe	Please see above response.

Issues Raised	Commentator(s)	Response
from the site and it may therefore be the last to benefit from the mine development (eg: social and employment benefits).	Development Forum	
A mine has to have a trust fund in terms of the Minerals Act. The four communities should think in terms of establishing and registering a trust fund through which the resources could be distributed equally between the four.	Ms Julia Makofane, Environmental Justice Networking Forum. Public Meeting, August 2002; Mr Howard Maimela, Manyaka Development Committee	Thank you for this suggestion.
That landowners must be adequately identified and the number of hectares to be impacted determined so that people may be compensated fairly.	*Mr Council Mafahla, Manyaka Development Committee*	This will be dealt with through the socio-economic study that will form part of the next phase of the EIA
That people whose agricultural fields are traversed for the construction of access roads must be compensated.	Mr Howard Maimela, Manyaka Development Committee	The effect of mine roads in the affected area will be considered in the next phase of the EIA.
That it be indicated whether relocation of communities will be required, and how disputes will be resolved.	Mr Phineas Mashabela, Public Meeting, August 2002; Mr Captain Magowa, Ntoampe Development Forum; Ms Mokgitledi Manyaka, Manyaka Development Committee; Mr Memphis Mathole, Kgwete Development Forum.	This has already been evaluated and it has been determined that no relocation of communities will be necessary.
That Samancor establish living quarters at Steelpoort and employees be transported daily to their places of employment.	Chief Manyaka, Manyaka Development Committee	There are existing living quarters in the Steelpoort area, which may be utilised.
Where will the mine's employees, especially those who come from outside, be housed?	Mr Lerulane Mathole, Kgwete Development Forum	There are existing living quarters in the Steelpoort area, which may be utilised.
That there should be no single quarters built on site.	Mr SO Ntoampe, Mr William Mashabela, Ntoampe Development Forum	No worker accommodation will be built on site.
That the influx of people in the area be controlled by the mine.	Mr M S Mashishi, Chief Roka, Mashishi Tribal Authority	This will be assessed in the EIA. Recommendations will be made for managing this.
That there is no place to settle outsiders.	Mr Dolph Mashabela, Mashishi Development Committee	No worker accommodation will be built on site.
That foreigners / migrant labour will bring diseases into the area.	Chief Mashishi, Mashishi Development Committee; Mr Dithomo Napo, Lekwebepe Recruiting Agency, Burgersfort	A social impact assessment will be done during the impact assessment phase of the EIA, to evaluate these issues and to make recommendations.
That the influx of foreigners will impact heavily on the traditional leadership of the area. There will no longer be respect for the traditional leadership.	Chief Mashishi, Mashishi Development Committee	
That the existence of the mine and influx of people	Mr Memphis Mathole, Kgwete	

Issues Raised	Commentator(s)	Response
should not have any impact on the community's culture.	Development Forum	
That the local leadership be firm in ensuring that the local cultures and traditions are observed.	Mr W illiam Manyaka, Manyaka Development Committee	
That mining should not deprive the community of a place to collect fuel wood.	Ms Josephine Phokwane, Kgwete Development Forum	Supported, will be addressed during the vegetation survey that will be carried out during the EIA.
What will happen to the graves?	Ms Francina Moela, Ntoampe Development Forum	Should any graves be in the mine path, these will be relocated with the proper regard for cultural procedures and community requirements.
That there is a history of political dispute among the Magosi.	Ms S Cachalia, Department of Land Affairs	This is a sensitive issue that Samancor will take due cognisance of during all aspects of their involvement in the area.
Socio-economic issues		
That the promise to use local labour must not be lip-service but a reality and the only outsiders must be the technical specialists; That mining houses make promises about employing local people but do not fulfil their promises.	Kgosigadi Mtlhaoleng Kgoete, Mashishi School, Driekop; Chief Mashishi, Mashishi Development Committee	Samancor has indicated that it will specify in the contracts of the contractors who will actually do the mining that as many local people as possible must be employed. This will be considered in the social impact assessment that will be done during the impact assessment phase of the EIA.
That the local people should get the first option for job opportunities.	Mr M S Mashishi, Chief Roka, Mashishi Tribal Authority	Please see above response.
That employment priority should be given to local labour.	Mr Magoshi Thobejane, Ntoampe Development Forum	
How will local people benefit from the project in terms of jobs etc.?	Mr Tobias Mahlakoane, Ntoampe Development Forum	
That the local people be employed and living standards improved.	Mr Koos and Mrs S M Venter, Steelpoort Mining Supplies, Steelpoort	Preference will be given to employment of local people, which will result in improved living standards.
That the situation of the local people improves regarding employment and economic opportunities.	Mr M Maponya, National African Farmers Union	This will be determined and defined through a socio-economic study that will be undertaken during the next phase of the EIA.
That there be socio-economic benefits to the community.	Dr W J Fouche, Medical Practitioner, Burgersfort	This will be determined and defined through a socio-economic study that will be undertaken during the next phase of the EIA.
That local and community development is required; That the proposed chrome mine must use a local recruiting broker or employment agency that does not discriminate in order to satisfy local community needs and address the unemployment crisis and to enhance the positive impact of the project.	Mr Dithomo Napo, Lekwebepe Recruiting Agency, Burgersfort	Supported in principle.
That Samancor makes provision for skills development before mining starts; That Samancor has a policy to develop the capacity of its people.	Mr William Manyaka, Manyaka Development Committee; Mr Dolph Mashabela, Mr Raymond Malatji, Mr Jomo Mashabela, Mashishi Development	This will be considered in the social impact assessment that will be done during the impact assessment phase of the EIA.

Issues Raised	Commentator(s)	Response
	Committee; Mr SO Ntoampe, Ms Maria Tseke, Ntoampe Development Forum; Mr/Ms Komani, Manyaka Development Committee	
That those local people who are untrained also be employed.	Ms Emily Manyaka, Manyaka Development Committee	
That the criteria for hiring labour, both temporary and permanent, be defined.	Mr W illiam Makofane, NUM, Steelpoort Mine	BHP Billiton and Samancor have existing recruitment procedures, which enable preference being given to local inhabitants. This principle will also be captured in the EMP.
Reports say that the developer must employ local people, but contractors often bring in their own labourers and the local people are not employed. This introduces the social ills of influx of people and disease. Will there be a written undertaking concerning local employment in the reports?	Ms Julia Makofane, Environmental Justice Networking Forum. Public Meeting, August 2002	Socio-economic concerns such as local employment will be evaluated in the EIA. The findings of the EIA are converted into an Environmental Management Plan (EMP) which becomes the law and is thus legally binding should the proposed project go ahead. If the developer acts against the EMP, he is breaking the law. The EMP is therefore very important and should include all issues of concern (such as local employment). Separate undertakings are not necessary.

2012/2013 process

Issue Raised	Date	Commentator	Response
Stakeholder Management			
According to the presentation a Social Labour Plan (SLP) was submitted in 2012, if that is the case what needs and recommendations were captured in that SLP if the Community Meeting is only being done today. I Suggest that the needs should be added to the final report to be submitted and the community must be involved in this issue because it affects their lives and make sure all their needs are addressed in the report.	03-02-2013	Cllr. N.C Moropane	Concern/Comment Noted- Samancor will make sure a Copy is submitted to Moshate offices and all community members are welcome to put their comments.
The matter of the local's cultivated lands should be taken into consideration more than anything because this involves people's livelihoods and source of income. The mine will definitely impact on the land, so Samancor must address the compensation of local farms before any decisions can be brought forward to the community.	03-02-2013	Mr.Mashabela	Comment Noted- This matter will brought forward to Samancor.
The ECM activities in some cases does not take of a whole field and that the field owners will only be compensated for the area rented by ECM, there should be compensation for the whole field as they will not be able to cultivate it	03-02-2013	Mr. Maleka	Comment Noted.
If the underground mine will be 600 m deep and 2003 Hydro test/results will be used for 2013 scenario, we believe new tests should be made to make sure they accommodate new boreholes that could be affected during the mining project.	03-02-2013	Mr. Morapane	Concern Noted- In December 2012 an Underground Hydro-census was performed and the results will be

Issue Raised	Date	Commentator	Response
			explained clearly on the presentation .
If tests were really done, the tribal office does not know of that Hydro census because the specialist did not report to the tribal office when conducting the study. It is likely that specialist did not know where all the boreholes are located in the village. If the specialist report to the tribal office he/she would have been guided throughout the census to be certain of the boreholes in the village. We therefore need to know who that person was and they must come back for a proper and thorough hydro census.	03-02-2013	Mr. Mashishi (Chief)	It is not certain of the actual date when the census was made. This will be verified and reported back to the community. Samancor will be notified of this matter and reporting channels when visiting the project site.
Samancor should not take shortcuts with this community because the knowledge Samancor has more knowledge on mining compared to the villagers of Mashishi, so they must be honest and open and let the community know what they have discovered on their grounds. Today they have come with another proposal of mining underground, this will have a major impact on our homes in terms of vibrations and explosives that will be operated on the mine so that should also be taken into careful consideration.	03-02-2013	Mr. Moss Mashabela	Comment Noted and will be addressed in the EMP amendment.
Results of research done on the land capability (specifically agriculture potential) must be provided to show what the agriculture potential is of rehabilitated opencast areas vs. pre-mining agriculture potential. The soils to be used for rehabilitation should be of good quality and not affect the agriculture of this land. According to one of the slides in the presentation about sulphide deposit, will the sulphide be deposited in the underground or boreholes?	03-02-2013	Mr. Mashabela	Comment Noted-But from the previous projects done on mining rehabilitation the land will be put back into its original state pre-mining. Sulphide reacts with oxygen so lots of material will be put on top underground so there is no reaction to occur.
The depression of the Open cast will it not affect the water quality of the boreholes? There are people who own farms around the area of Ga-Mashishi but do not live around, we suggest that you take note of the contacts and keep us updated of any decisions to made so that we are not overpowered of our land regarding the issues of compensation etc.	03-02-2013	Mr. Robert Mashabela	No it will not affect the quality of the water as this will be confined only to the pit area. Concern Noted. Contacts will be recorded and submitted to Samancor.
Which method will be used to make sure that water that will be used from the mine does not accumulated into the ground and contaminate our water-table.	24/02/2013	Silas Mahloko	A dam will build which will be aligned with concrete to make sure water is stable and compacted on a bund-wall-line so that the waste is deposited on a lining though it should be monitored and renewed after a specific time which is what the Environmental Co-ordinator from Samancor (Aili Zeeman) will be responsible for. DWA Regulations states clearly that no waste from the mine should move/ flow towards any natural water resource nearby the mine or the community must remain within

Issue Raised	Date	Commentator	Response
			the mining area.
If the decrease of boreholes will be 20m how is this problem going to be resolved for the community in terms drilling those boreholes to reach the water-table.	24/02/2013	Matlou Thomas	The affected community and its boreholes will be monitored and that's where you can report the matter of a borehole decrease to the tribal office to be assisted in drilling etc. otherwise according to the Hydro-census that was conducted all boreholes are within 1km of the mining area.
Who do we consult with water related issues?	24/02/2013	Mashabane Serage	On issues regarding water you are welcome to report to the Tribal office and the matters will addressed and contacted through to SAMANCOR and DWA.
What will the Radius of blasting for the open-cast mining be and how is the dust going to be monitored because area like Atok have had incidents where dust was a big problem amongst the communities near the mines.	24/02/2013	Pilato Ngoato	There method used of blasting depends on area-size and what requires large of small quantity of blasting otherwise there are also vibration meters that are used to measure how effective vibrations will be on the houses for instants at a specific distance and to what level. From the knowledge and experienced we have had before working with Chrome mines, during the production Chrome unlike minerals like Platinum which produce high level of dust, chrome
This mining project was proposed almost 9 years back and still no operation is being done and today there is still another proposition regarding adding an underground mining and our community is suffering our children need jobs.	24/02/2013	L.R Mapeya	The licence for mining is already there and Open-Cast mining can start anytime, but because of procedures to follow in terms of including Environmental Assessments which were not conducted 9 years ago, and Water Use Licensing and also the addition of underground mining SAMANCOR needs all this dealt with before the mine can be erected in order

Issue Raised	Date	Commentator	Response
			to avoid being closed or stopped at a later stage because of important documents not submitted and not complied with according to DMR regulations.
From the presentation that was made regarding mining permit/license does that mean if there is no license there will not be a mine?	24/02/2013	Mohlamatsi S.	The licence for mining is already there and Open-Cast mining can start anytime.
What method will be used to appoint workers?	24/02/2013	Moses Mosomane	Samancor had consultations with committee and the Kgoshi on the matter of employment and appointing members of the community and training is also available for those unskilled and it was concluded that there will be a Labour Desk available at the Tribal Office, where members can submit forms with their details this also includes experience that a person will be having so that they can be captured in the data-base which Samancor offices will also have available and when a post is available they can use the data base for recruitments. If you haven't submitted your details there is still ample time to bring the forms to the tribal offices.
The water that is used in the mine will be pumped in our fields or the river we depend on for water, how will this matter be corrected in terms of cleaning etc.	24/02/2013	Tommy Ngoato	No water that is used in any Samancor mine is pumped outside the mining area, most of time the water that is re-processed is used for dust suppression around the mine or watering of the gardens.
What are the methods to be used to minimise the noise from the blasting to done? Since only the issue of water is raised what about the issues concerning electricity	24/02/2013	Silas Mahloko	Unfortunately noise will be there in any ways, BUT a scheduled time-table will be issued any time to let the community know or be aware of the day and time blasting will occur it can be in a method of a siren etc.

Issue Raised	Date	Commentator	Response
			Issues regarding water and electricity will be discussed and resolved in a meeting to schedule with the tribal authorities.
How is our livestock going to be accommodated since the Grazing land will be affected during the mining period	24/02/2013	Richard Manyaka	This will be an agreement amongst the community/farm owners and Samancor for compensation purposes.
Will the labourers also be included during the process of hiring workers?	24/02/2013	Enos Seerane	Everyone is welcome to submit their information in the forms whether skilled or unskilled including labourers too.
Amongst the community of Manyaka, which procedures will be undertaken to make sure that the water supply is not affected and that water will not be scares?	24/02/2013	Moses Mosomane	The Local Municipality and Tribal authorities will have to schedule a meeting to resolve water related issues.
Which ways should a farm owner have to go about in terms of compensation of his land?	24/02/2013	M.P Mafohla	Consult and the Tribal office and you will be guided on which way about of being compensated.

REGULATION 50 (g)

14 The appropriate mitigatory measures for each significant impact of the proposed mining operation

14.1 Adequacy of predictive methods utilised

14.1.1 Air quality – Margot Saner and Assocaites (2009)

Meteorological data was collectd from the regions for the South African Weather Service station located near Lydenbrug and imported into AerMet View (meteorological preprocessor software) in order to create a suitable MET file for use in the AERMOD Dispersion Model. The atmospheric dispersion model (AERMOD) was simulated over a 50 km x 50 km area over DEM topography of the local terrain. The extents form the boundaries of the modelling domain into which all emission outputs was stacked and plotted. In order to establish an emissions inventory and permit modeling of current baseline conditions at the proposed site, fugitive sources of particulate emissions from Eastern Chrome Mines were quantified.

For the purposes of this study, use as made of the AERMOD dispersion modelling system – a complete and powerful Windows air dispersion modeling system developed by Lakes Environmental software which is fully approved by the United States Environmental Protection Agency (US EPA). The diagram below shows how all the input parameters are entered into the model in order to generate the concentration outputs. Following manipulation these concentration outputs (isopleths) are plotted on relevant basemaps.

The AERMOD atmospheric dispersion modeling system is an integrated system that includes three modules:

- A steady-state dispersion model designed for short-range (up to 50 kilometers) dispersion of air pollutant emissions from stationary industrial sources.
- A meteorological data preprocessor (AERMET) that accepts surface meteorological data, upper air soundings, and optionally, data from on-site instrument towers. It then calculates atmospheric parameters needed by the dispersion model, such as atmospheric turbulence characteristics, mixing heights, friction velocity, Monin- Obukov length and surface heat flux.
- A terrain preprocessor (AERMAP) whose main purpose is to provide a physical relationship between terrain features and the behavior of air pollution plumes. It generates location and height data for each receptor location. It also provides information that allows the dispersion model to simulate the effects of air flowing over hills or splitting to flow around hills.

14.1.2 Ecological Assessment (Fauna and Flora) – ECO assessments (2003)

Observation only and no prediction methods required.

14.1.3 Floodline Assessment – MWB (2003) and PG Consulting (2012)

2003: Flood peaks were calcualted using Hydrosim and compared with the Rational method. Hydrosim is a hydrological kinematic rainfall-runoff simulation model suirable for application to both urban and rural environments. The model has been varified and used extensively on a wide range of catchments both local and overwseas. The peak flows were entered into the Hec-Ras backwter programme and the floodlines were determined.

2012: The following methods was used:

- Rational method - Implementation 3: Based on the regional DDF-equations representing the HRU 1/78 DDF-relationships ("Op ten Noort & Stephenson" - 1982).
- Peak Factor method (PFM) – based on point rainfall isohyetal maps derived for Southern Africa. This is a modified form of the rational method developed by Dr. B.H. Sinské ("Sinské" – 1999) for large catchments.
- Empirical Method (TR137) – Regional maximum floods based on "Francou- Rodier" K-values ("Kovacs" - 1988) - Commonly used by DWA for catchments >10km².

14.1.4 Geo-hydrological Report – MWB (2003) and GPT (2013)

As the 2013 study condcuted by GPT is the latest the information will be refelcted here. A desktop study, hydrocensus, sampling of boreholes and modelling was done. Recharge was estimated using the RECHARGE programme which includes using qualified guesses as guided by various schematic maps.

The finite difference numerical model was created using the US Department of Defence Groundwater Modelling System (GMS8.1) as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes.

MODFLOW is a 3D, cell-centred, finite difference, saturated flow model developed by the United States Geological Survey. MODFLOW can perform both steady state and transient analyses and has a wide variety of boundary conditions and input options. It was developed by McDonald and Harbaugh of the US Geological Survey in 1984 and underwent several overall updates since. The latest update (Modflow 2000) incorporates several improvements extending its capabilities considerably, the most important being the introduction of the new package called the Layer-Property Flow Package.

MT3DMS is a 3-D model for the simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. MT3DMS uses a modular structure similar to the structure utilized by MODFLOW, and is used in conjunction with MODFLOW in a two-step flow and transport simulation. Heads are computed by MODFLOW during the flow simulation and utilized by

MT3DMS as the flow field for the transport portion of the simulation.

14.1.5 Surface Water Assessment – MWB (2003) and MENCO (2012)

Observation, the study involved the physical and chemical assessment of the unnamed tributaries of the affected Rivers that forms part of the Olifants River WMA based on the guidelines as developed by DWA.The objective of the study was to define the current/existing surface water condition to be used as a benchmark against which future surface water impacts could be measured.

14.1.6 Heritage Report – Frans Roodt (2003)

Observations and local informants, no predictive modelling required.

14.1.7 Noise and Vibration Assessment – JH Consulting (2003)

The SABS 0210:1196 (road traffic) and SABS 0103: 1194 (Environmental noise) were used.

14.1.8 Social Impact Assessment - (Site, 2012) – WMB)2003)

Desktop study and Site assessment from questionnaire and observations, no predictive modelling required.

14.1.9 Land use and land capability – WMB (2003)

Observations, sit visit and analyses, no predictive modelling required.

14.1.10 Traffic Impact Assessment – Calyx Environmental cc (2003)

Observations desk top study considering design principles, no predictive modelling required.

14.1.11 Visual Impact Assessment – Newton Landscape Architects (2002)

Observations and site visit, no predictive modelling required.

14.2 Adequacy of underlying assumptions

14.2.1 Air quality – Margot Saner and Assocaites (2009)

While a number of assumptions were used an data from Tweefontein Section and Lannex was excluded (due to the distance) the resulting information should be adequate to determine potential risks with regards to air pollution.

14.2.2 Ecological Assessment (Fauna and Flora) – ECO Assessments (2003)

Observation only and no assumptions were made.

14.2.3 Floodline Assessment – MWB (2003) and PG Consulting (2012)

The methodology and model is used internationally, but the model only consider “average” conditions because it assumes that the flood producing rainfall event is spread uniformly across the entire catchment and the duration of the event is equal to the ‘Time of Concentration’, the time it takes for a water drop to flow from the furthermost point of the catchment to the catchment outlet. The

calculations are simplistic but use historic data gathered over a few decades that improves assumptions.

For the 2012 study the following assumptions was made:

- All the calculations were based on Manning's formula using the following average "n"-values for the different flow sections. Main channel flow (MC)- 0,040 · Left bank flow (LB)- omitted · Right bank flow (RB)- omitted.
- The overbank flows were omitted in the analysis model as no significant differences were found between the flow conditions within the watercourse channel and the adjacent banks.
- For the specific tributary section an "s" - value of 0,02088m/m as determined from the contours was adopted for both the upstream and downstream boundary conditions.
- All the computations were based on "steady flow stage" conditions with a "mixed flow regime".

14.2.4 Geohydrological Report – GPT (2013)

The following methods/sources were used to estimate the recharge: Soil information, Geology, Groundwater Recharge Map (Vegter), Acru Recharge Map (Schulze), Harvest Potential Map , Chloride (Cl) method. The RECHARGE programme incorporates all the different methods to calculate recharge. The following assumptions are necessary for successful application of the Cl Method:

- There is no source of chloride in the soil water or groundwater other than that from precipitation.
- Chloride is conservative in the system.
- Steady-state conditions are maintained with respect to long-term precipitation and chloride concentration in that precipitation, and in the case of the unsaturated zone.
- A piston flow regime, which is defined as downward vertical diffuse flow of soil moisture, is assumed.

Numerical groundwater modelling is considered to be the most reliable method of anticipating and quantifying the likely impacts on the groundwater regime. This methodology was selected to provide worst-case scenario results within the limitations of homogeneous assumptions.

14.2.5 Surface Water Assessment – MWB (2003) and MENCO (2012)

Observation and no assumptions were made.

14.2.6 Heritage Report – Frans Roodt (2003)

Observation and no assumptions were made.

14.2.7 Noise and Vibration Assessment – JH Consulting (2003)

Modelling considered a worst-case scenario, with meteorological conditions optimal for sound propagation with all equipment operating simultaneously and under full load.

14.2.8 Social Impact Assessment (Site, 2012) – WMB)2003)

Desk top assessment and Site assessment from questionnaire and observations, no assumptions were made.

14.2.9 Land use and land capability – WMB (2003)

Observations, sit visit and analyses, no predictive modelling required.

14.2.10 Traffic Impact Assessment – Calyx Environmental cc (2003)

Observation and Desktop study - no assumptions were made.

14.2.11 Visual Impact Assessment – Newton Landscape Architects (2002)

Observation assuming that the proposed development will be similar to other developments in the area.

14.3 Uncertainties in the information provided.

14.3.1 Air quality – Margot Saner and Assocaites (2009)

- The study was done to establish cumulative impacts should the proposed smelter be constructed and not for the proposed mining activities.
- In order to establish the cumulative impacts on regional Air Quality current baseline ground level concentrations of PM10 were modelled by accounting for the Eastern Chrome Mines operations in terms of mining activities. Due to the size and layout of the modeling domain (50 000m horizontally x 50 000m vertically), the Lannex and Tweefontein mines could not be included in the modeling domain. The contributions to emissions made by these sites are therefore not accounted for in this study.
- In order to account for emissions from the proposed Lwala Smelter Complex, use was made of stack monitoring results measured by Ecoserv (Pty) Ltd at the Samancor Chrome Witbank Ferrometals site and included in the Airshed Report No APP/08SCR-03. This surrogate site has a total production volume of 1 464 620 TPA or 1.46 Megatonnes per annum.
- The additional mining activities necessary to supply ore to the proposed Lwala Smelter Complex were accounted for by extrapolating the existing Emissions Inventory for the Eastern Crown Mines.
- Meteorological data was obtained from the South African Weather Service weather station located in Lydenburg. This station is located some 75 km distant from the proposed Lwala Smelter Complex. Whilst it is always preferable to make use of onsite meteorological data in dispersion modeling, no such data is currently available for the proposed site. The Lydenburg weather station is the nearest reliable source of meterological data suitable for use in computer modeling exercises.
- Ambient (background) air monitoring data for the region was unavailable for this assessment. As the study area does not fall within the Highveld Priority Area this lack of background ambient data

was not viewed as a serious limitation. It is expected that Air Quality within this region will not routinely exceed acceptable Air Quality standards.

- Whilst care has been taken to assess the potential air pollution impact from the proposed development, changes to the proposed design after this assessment may result in different conclusions. This is a limitation rather than a conclusion or recommendation. No emission data from the surrounding industries were available for inclusion in the simulations. Furthermore, no ambient air monitoring was available to aid the assessment of cumulative impacts. This is also a limitation.

14.3.2 Ecological Assessment (Fauna and Flora) – ECO assessments (2003)

Observation and no prediction methods required. The study did not cover the entire footprint of the proposed fenced area.

14.3.3 Floodline Assessment – MWB (2003) and PG Consulting (2012)

Calculations are largely based on statistical analysis of decades worth of historic data. Impossible to predict how weather may change in the future.

14.3.4 Geo-hydrological Report – GPT (2013)

The modelling was done within the limitations of the scope of work of this study and the amount of monitoring data available. Although all efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained from this exercise should be considered in accordance with the assumptions made. Especially the assumption that a fractured aquifer will behave as a homogeneous porous medium can lead to error. However, on a large enough scale (bigger than the REF, Representative Elemental Volume) this assumption should hold reasonable well.

In addition the modelling was done on the basis of the site layout and mining areas provided and may change should the site layout and mining method change. Also uncertainties with regards to faults and fracture may result in a change in the model should these exists on site.

14.3.5 Surface Water Assessment – MWB (2003) and MENCO (2012)

Identification of impacts was based on the provided site layout plan which may change.

14.3.6 Heritage Report – Frans Roodt (2003)

Observations, no predictive modelling required.

14.3.7 Noise and Vibration Assessment – JH Consulting (2003)

Type of equipment that will be used in the operation, the times that this equipment will be operating and the noise emission levels of this equipment.Worst-case scenario considered based on precautionary principle.

14.3.8 Social Impact Assessment (Site, 2012) – WMB)2003)

Site assessment from questionnaire and observations. No predictive modelling required, however data obtained in 2003 may be outdated.

14.3.9 Land use and land capability – WMB (2003)

Study did not cover the whole of the proposed mining area.

14.3.10 Traffic Impact Assessment – Calyx Environmental cc (2003)

As the study was done in 2003 data may be outdated.

14.3.11 Visual Impact Assessment – Newton Landscape Architects (2002)

Observations, no predictive modelling required.

REGULATION 50 (h)

15 Arrangements for monitoring and management of environmental impacts

15.1 List of identified impacts which will require monitoring programmes

Surface Water	Water Quality Monitoring at identified points
	Diatom monitoring at identified point
	Water Quantity Monitoring
Groundwater Monitoring	Impact on groundwater quantity
	Impact on groundwater quality
Air Quality Monitoring	Increase in dust: dust buckets at selected sites
Noise Monitoring	Increase in noise levels
Waste Monitoring	Waste quantities disposed
Vegetation establishment	On site

15.2 Functional requirements for the said monitoring programmes

15.2.1 Surface Water Monitoring -

Five possible watercourse quality and quantity monitoring points as indicated below is proposed.

Sampling point	Coordinates	Chemical Water Quality	Flow (Visual confirmation only)	Diatoms**	SASS5
SWM 1	S-24.494910º E 30.101401º	Monthly	Monthly	Once per year when flowing	N/A
SWM 2	S-24.476655º E 30.081156º	Monthly	Monthly		
SWM 3	S-24.457800º E 30.074982º	Monthly	Monthly		
SWM 4	S-24.483023º E 30.112256º	Monthly	Monthly		
SWM 5	S-24.454090º E 30.086854º	Monthly	Monthly		
SWM 6*	S-24.442780º E 30.051440º	Monthly	Monthly	Twice per year (1 wet season, 1 x dry season)	Twice per year (1 wet season, 1 x dry season)
SWM 7*	S-24.411087º E 30.075123º	Monthly	Monthly		
SWM 8* (Fountain)	S-24.419º E 30.073º	Monthly	N/A	N/A	N/A
* These sites were added as a result of the potential pollution plume in the shallow aquifer that could reach the Motse River as indicated in the 2013 Groundwater assessment report (Appendix 8). ** Only if expertise is available in South Africa.					

Diatom monitoring to be done only if available in South Africa at that stage.If not then a visual assessment of the integrety of the streams needs to be done on an annual basis.

In addition, monitoring of the water quality in the storm and/ or Return water dam(s) will be done on a quarterly (October, January, April, July) basis and include the variables as specified below. The water

quality will be representative of:

- Seepage/run off from the mining areas;
- Seepage from waste rock dump;
- Dewatering of the mining areas;
- Run off from the waste rock dump.

Water quality parameters that need to be monitored are:

Variable	Unit
Aluminium as Al	mg/l
Calcium as Ca	mg/l
Chloride as Cl	mg/l
Chromium $^{3+}$	mg/l
Chromium $^{6+}$	mg/l
Electrical Conductivity as EC	mS/m
Fluoride as F	mg/l
Iron as Fe	mg/l
Magnesium as Mg	mg/l
Manganese as Mn	mg/l
Nitrate as NO_3	mg/l
pH	
Potassium as K	mg/l
Phosphate as P	mg/l
Sodium as Na	mg/l
Sulphate as SO_4	mg/l
Suspended Solids as SS	mg/l
Total alkalinity	mg/l
Total Dissolved Solids as TDS	mg/l
Total hardness as $CaCO_3$	mg/l

The following points also need to be monitored:

- Water levels of storm water dam(s);
- Volume of waste rock generated;
- Water pumped from the storm and / or return water dam(s) to the plant and mining areas;
- Water inflow to the plant;
- Water pumped from the opencast to the storm water dam (if present);
- Potable water abstracted from the Lebalelo water pipeline.

DWA may also request toxicity testing of the water in the Storm / Return Water dams on a quarterly basis.

15.2.2 Groundwater monitoring –

The following groundwater monitoring plan is proposed.

Sampling point	Coordinates	Water Levels	Chemical Water Quality	Frequency
BH9	-24.399ºS 30.019ºE	X	X	Quarterly
BH10	-24.406ºS 30.008ºE	X	N/A	Quarterly

BH11	-24.389ºS 30.011ºE	X	N/A	Quarterly
BH12	-24.402ºS 30.044ºE	X	X	Quarterly
BH13	-24.399ºS 30.058ºE	X	X	Quarterly
BH28	-24.421ºS 30.075ºE	X	X	Quarterly
BH30	-24.444ºS 30.093ºE	X	X	Quarterly
BH31	-24.474ºS 30.122ºE	X	N/A	Quarterly
BH32	-24.483ºS 30.114ºE	X	X	Quarterly

The parameters for quality is the same as for the surface water. However, the following needs to included where applicable:

- Petroleum hydrocarbon contaminants (near workshops and petroleum handling facilities).
- Sewage related contaminants (E.Coli, faecal coliforms) in borehole in proximity to septic tanks or sewage plants.

With the exception of boreholes BH12, BH28 and BH32 the above monitoring boreholes only measure the regional groundwater situation. It is thus also recommended that 10 new monitoring boreholes be drilled around each potential pollutant upstream and downstream of the site. These boreholes should be drilled as close possible to the opencast and monitored appropriately. Construction of these boreholes should be overseen by a qualified hydrogeologist to monitor the upper weathered as well as lower fractured aquifer.

The monitoring network should be dynamic and thus should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.

15.2.3 Air Quality Monitoring -

The main pollutant that would need to be monitored is dust fallout as dust will be generated during the construction and operational phase.It is thus recommended that a dust fallout monitoring programme be initiated by the Lwala mine in alignment with the American Society for Testing and Materials standard method for collection and analysis of windblown dust deposition (ASTM D1739) with at least 12 dust fallout buckets around the proposed mining operations.

In addition a fine particulate monitoring programme, which will include at least one particulate monitor to monitor PM10 from the mining site needs to be established. This unit will measure wind speed, wind direction, air temperature, barometric pressure and precipitation. This unit should be installed at least one year prior to the construction phase to allow for the collection of a baseline data set.

A meteorological station om site needs to be installed.

15.2.4 Noise Monitoring -

Measurements to be made using the equivalent continuous A-weighted sound pressure level, $L_{AEQ,I}$, in accordance with the South African Bureau of Standards (SABS) code of practice for noise measurement and assessment, SANS 10103:2004.

The number of complaints with regards to noise must be logged, including the name of the receptor, the location, nature of sound and the time when the noise were experienced.

Bi-annual noise monitoring should take place over a 24 hour period at the location of the two closest receptors.

15.2.5 Waste Monitoring -

Cumulative mine waste rock produced, product send for beneficiation, domestic waste produced, tailings waste disposed on the tailings dam, all hazardous waste produced (type, method of disposal and to where) and any other waste disposed must be recorded on a monthly basis, e.g.sewage waste, domestic waste, used oil.

15.2.6 Vegetation monitoring

The establishment of vegetation during all mining phases needs to be investigated for the presence of alien invasive species.This assessment should be done on a yearly basis.

15.3 Roles and responsibilities for the execution of the monitoring programmes

15.3.1 Surface Water Monitoring

- Quality: Environmental department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.
- Diatom: DWA Accredited field technician as appointed by Eastern Chrome Mines.
- Quantity: Environmental department of Eastern Chrome Mines together with plant manager/supervisor.
- Toxicity: Environmental department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.

15.3.2 Groundwater Monitoring -

Environmental department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.Correct monitoring protocol critical and boreholes should be purged before sampling.

15.3.3 Air Quality Monitoring -

Environmental department of Eastern Chrome Mines using an independent laboratory for the analysis

of the samples and data (annual report) or a separate independent specialist contractor (Approved Inspector Authority).

15.3.4 Noise Monitoring -

- OSHA requirements – Approved Inspector Authority as appointed by Eastern Chrome Mines
- Environmental Noise – Acoustic specialist as appointed by Eastern Chrome Mines

15.3.5 Waste Monitoring -

Environmental department of Eastern Chrome Mines together with plant manager/supervisor.

15.3.6 Vegetation montioring

Environmental department of Eastern Chrome Mines together with appointed specialist

15.4 Time frames for monitoring and reporting

15.4.1 Surface Water Quality Monitoring -

- Monthly surface environmental water quality and quantity as indicated in Section 15.2.1.
- Yearly diatom environmental water quality as indicated in Section 15.2.1 (if available in South Africa at that stage).If not then a visual assessment of the integrety of the streams needs to be done on an annual basis.
- Quarterly toxicity testing of retirn / storm water dams water.
- Daily recording of all water abstraced (Lebalelo, Return / Storm water dams, opencast , underground mining area).
- Daily recoding of dam water levels.
- Daily recording of waste generated (Tailings, return / storm water, waste rock dump).
- Daily recording of water pumped to the plant and mining areas.

Reporting of the above will be provided to the DWA as required in the water use license (to be applied for) generally the following is applicable:

- January and June: records of volume of water abstracted and waste produced;
- March: records of water quality, quantity and toxicity testing.

15.4.2 Groundwater Monitoring -

Quarterly monitoring for water levels and quality and annual / bi-annual reports as requested by the DWA.

15.4.3 Air Quality Monitoring -

Monthly monitoring, annual report.

15.4.4 Noise Monitoring -

Six-monthly monitoring and report.

15.4.5 Waste Monitoring -

Monthly cumulative production/disposal and annual report.

15.4.6 Vegetation monitoring

Annual assessment and report

REGULATION 50 (i)

16 Technical and supporting information (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

The following specialist studies were conducted:

- Appendix 4: Mine works plan (2012);
- Appendix 5: Air Quality Assessment (2009);
- Appendix 6: Ecological Assessment (2003);
- Appendix 7: Flood line determination (2003, 2013);
- Appendix 8: Geo-hydrological Assessment (2003, 2013);
- Appendix 9: Heritage Assessment (2003);
- Appendix 10: Noise and Vibration Assessment (2003);
- Appendix 11: Social Assessment (2003);
- Appendix 12: Land Use and Land Capability (2003);
- Appendix 13: Traffic Assessment (2003);
- Appendix 14: Visual Assessment (2002);
- Appendix 15: Surface Water Assessment (2003, 2013);
- Appendix 16: Social and Labour Plan (2012);
- Appendix 17: Closure cost estimates (2012);
- Appendix 18: Closure cost estimates per year (Tables only and based on assumptions 2013);
- Appendix 19: Public participation documents (2003, 2013).

SECTION 2

ENVIRONMENTAL MANAGEMENT PROGRAMME

Regulation 51 (a)

1 DESCRIPTION OF ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR MINE CLOSURE

1.1 Environmental aspects that describe the pre-mining environment

The pre-mining environment is desccribed by the following environmental aspects:

- Geology;
- Topography;
- Land use;
- Land capability;
- Soils;
- Fauna (animal life);
- Flora (Vegetation);
- Surface water;
- Groundwater (geohydrological);
- Air quality;
- Noise and vibration;
- Visual;
- Socio-economic;
- Archaeological / Cultural.

1.2 Measures required to contain or remedy any causes of pollution or degradation or the migration of pollutants, both for closure of the mine and post-closure

1.2.1 Surface Water

Management Component	Infrastructure	Management Commitment
Pollution prevention	Mining area	• Dirty water that is generated will be contained prior to re-used • Clean water diversions in accordance with GN 704 will be constructed prior to commencement of mining • Regular maintenance and inspection of surface water management infrastructure to be done in order to prevent silt build up
	Storm water dam	• The dirty water containment facility will be designed and constructed to contain a 1:50 year storm event and maintaining a 0.8 m freeboard • The facility will be clay lined to prevent seepage and groundwater pollution

Management Component	Infrastructure	Management Commitment
	General Mine Layout	• The design of the mining complex will be inclusive of bunding and concreting appropriate areas to ensure the containment of hazardous substances within the bunded area • Crushing and Screening Plant / beneficiation area will be bunded and compacted to minimise seepage and infiltration • Collection drains will be constructed to ensure separation of clean and dirty water • Storm water containment will be done in accordance with GN 704 specifications
	Tailings dam	• Compact footprint area to reduce seepage to the groundwater resource • Investigate lining methods that will be financial viable
Waste Minimisation	Mine Residue Deposits	• Waste rock will be used where possible to maintain roads and in the rehabilitation of opencast pit areas
Resource Protection	Haul roads	• Storm water runoff from roads will be attenuated using energy dissipation to reduce risk of erosion of water courses • Catch pits and silt traps will be constructed at strategic locations to reduce siltation of the water courses • Regular maintenance of roads and associated surface water management structures will be undertaken
	Monitoring	Monitoring of water resources will be carried out in accordance with an approved monitoring programme

1.2.2 Groundwater

Since it is inevitable that a mining operation of this scale will impact on the groundwater regime, measures to reduce these impacts to the absolute minimum must be considered.

Boreholes will have to be drilled especially for monitoring purpose. At least some of these boreholes must be drilled before mining commences. About 10 boreholes are recommended, namely:

- Three upstream and to the south of the mining area to monitor background water quality.
- Another seven or more to the north of the shallow mining area where the plume is predicted to spread.
- These boreholes should be carefully selected based on geophysical exploration results to identify preferred groundwater flow structures, as well as the hydrogeological information presented in this report.

Water samples must be taken from all the monitoring boreholes by using approved sampling techniques and adhering to recognised sampling procedures. Samples should be analysed for both organic as well as inorganic pollutants, as mining activity often lead to hydrocarbon spills in the form of diesel and oil, please refer to Section 15.2.2 in Section 1 (EIA).

1.2.2.1 Lowering of Groundwater Levels during Mining

Since very little can be done about the lowering of the groundwater table, the following measures directed at identify affected groundwater users are recommended:

- The static level of groundwater in all boreholes within a distance of less than two kilometres from the mine must be measured regularly to establish a database against which future groundwater levels can be compared.
- Such measurements must be made preferably quarterly, but at least biannual, following the dry and rainy seasons.
- In the event of unacceptable decrease of the yield of any affected boreholes, alternative water supply should be supplied to the affected parties until such time that the groundwater recovers.

1.2.2.2 Spread of Groundwater Pollution Post-mining

Predictions regarding groundwater pollution have been based on the assumption that the groundwater seeping through the abandoned mine will be a constant source of sulphate pollution at 1 000 mg/l, representing a worst-case scenario. With appropriate measures, the oxidation rate of pyrite can be limited, resulting in lower starting concentrations.

To minimise the effect of groundwater pollution on the receiving environment, the following measures are suggested:

- Mined areas should be flooded as soon as practical to reduce the exposure of remaining pyrite to atmospheric oxygen. Sealing and flooding of abandoned sectors will aid in accomplishing this goal.
- Adits are especially vulnerable to decanting, and must be sealed properly such that no groundwater can seep through or around the seal.
- Opencasts must be rehabilitated such that runoff is directed away from the opencast, not to contribute to inflow into the opencasts.
- Regular sampling and chemical analyses of the groundwater is imperative to establish a sound database.
- Groundwater in all boreholes within a distance of less than two kilometres from the mined areas must be sampled regularly to establish a database against which future groundwater levels can be compared.
- Sampling must be preferably quarterly, but at least twice annually, following the dry – and rainy seasons.
- Constituents to be sampled for are listed in a previous paragraph of the report.
- If it is found during such a sampling event that groundwater from any production borehole is polluted beyond acceptable standards, alternative water will have to be supplied to the affected party.

2 Description of environmental objectives and specific goals for the management of identified environmental impacts emanating from the proposed mining operation (as informed by the information provided in the EIA in terms of Regulation 50 (h))

2.1 List of identified impacts which will require monitoring programmes

- Surface Water Impacts (Quality, Quanity, Diatom / Habitat Integrity, Toxcity);
- Groundwater Impacts (Quality, Groundwater Levels);
- Air Quality Impacts;
- Noise impacts;
- Waste Impacts;
- Vegetation impacts.

2.2 List of the source activities that are the cause of the impacts which require to be managed

The following activities, actions or process will take place:

- Construction phase: Construction of:
  - Access and Internal Roads;
  - Fence;
  - General surface infrastructures: Offices, Workshops, Lamp room, Change rooms, parking areas, stores;
  - Waste Water Treatment Works (Sewage Plant);
  - Crushing and Screening plant;
  - Beneficiation plant;
  - Tailings Dams;
  - Storm water / Return water dam;
  - Storm water infrastructure;
  - Conveyor belt;
  - Waste Rock Dump;
  - Electrical substation and power lines;
  - Salvage yard;
  - Potable and process water pipelines;
  - Initial boxcut area;
  - Adits / shafts;
  - Overburden and topsoil stockpiles as a result of the removal of topsoil.
- Operational phase: management and operation of:

- Opencast mining areas;
- Underground mining areas and adits;
- Crushing and screening of ROM;
- Beneficiation of ROM;
- Overburden and soil stockpiles;
- Product stockpiles;
- Waste Rock Dump;
- Storm water / return water dams;
- Tailings dam;
- Waste Water Treatment Works (Sewage Works);
- Process and potable water.

- Rehabilitation, Closure and post closure phase: management and operation of:
  - Opencast mining areas;
  - Closure of shafts / adits;
  - Removal of unneeded surface infrastructures, e.g.roads, offices etc.;
  - Stockpiles, overburdens;
  - Tailings dam, storm water / return water dams.

2.3 Management activities which, where applicable, will be conducted daily, weekly, monthly, quarterly, annually or periodically as the case may be in order to control any action, activity or process which causes pollution or environmental degradation

Please refer to the table attached below Section 5.2 for information on time frames.

2.3.1 Geology

- Minimise the footprint of the mining operation and the degree of disturbance to geology and soils where possible: Continuously.
- Develop a closure and decommissioning plan that will include filling in pit voids: Once off 5 years before closure.

2.3.2 Topography

- Create a closure topogrphay where no residual change of the area following decommissioning and closure of the mine is noticable: Once off 5 years before closure.
  - Minimize the mine footprint and degree of disturbance during construction and operations;
  - Backfill final voids using material in the waste rock dumps;
  - Deplete and clear the chromite stockpiles at the completion of mining;
  - Blend rehabilitated surfaces in with the surrounding topography.

2.3.3 Soils

- Preserve topsoil (Continuously):
  - Strip all usable soil to a depth of at least 1,500 mm;
  - Boxcut soils, and soils stripped from the mining infrastructure footprint should be stockpiled for later use in rehabilitation;
  - Soils stripped from successive mining cuts should be placed directly onto mined out areas, where the spoils have been levelled in preparation for rehabilitation;
  - Soil stockpiles must be sited upslope from any mining / development activities and should be protected from erosion by stormwater, through construction of a stormwater berm around the stockpile area;
  - Ensure that all soil stockpiles have a stormwater diversion berm for protection against erosion and dirty water contamination;
  - Topsoiled area should be re-vegetated to prevent loss of soil through erosion.
- Preserve topsoil fertility (Continuously):
  - Where possible, place stripped topsoil directly onto re-profiled and shaped areas to minimise the volume of soil that needs to be stockpiled;
  - Conduct soil fertility analysis prior to seeding and fertilise accordingly to create growing conditions that are suitable for plant growth, in areas re-vegetated;
  - Lime soils at the time of placement if necessary to bring the soil pH to a level between as close to a neutral pH (6-7) as possible.
- Prevent soil contamination (Continuously):
  - Fuels, oils and lubricants will be managed according to accepted practices and will be stored in areas with sealed surfaces and appropriate containment structures;
  - Contain and clean contaminated areas resulting from spills or failures of piping or storage structures;
  - Test areas for chemical contamination and ameliorate if necessary.A suitably qualified person should conduct the assessment;
  - The soils underlying any areas, from which hazardous waste is removed, should be sampled to ensure that no residual contamination remains;
  - Cleaned areas should be free-draining and re-vegetated immediately.

2.3.4 Land Capability

- Return the mined area to an arable land capablility: After mining ends:
  - Implement soil conservation and management measures and replace stripped soil to a depth of not less than 750 mm in re-profiled mined out areas;
  - Re-establish surface drainage and a free draining land form;
  - Implement soil protection and conditioning measures.

- Monitor of rehabilitated areas to assess performance of the rehabilitation approach employed Rehabilitated areas should be monitored annually to identify:
  - occurrence of surface erosion;
  - vegetation die back;
  - to establish whether salinisation of the soil surface is occurring;
  - fertility status of rehabilitated land;
  - the emergence of alien / exotic vegetation.

2.3.5 Land use

- Reduce the impact resulting from the loss of alnd or access to land which results in a reduction in income, nutrition and food security (Continuous):
  - Samancor Chrome to provide monetary compensation to land owners to provide for purchase of food, through the medium of a community trusts;
  - Co-operate with the Department of Land Affairs and the local tribal communities in the development of an implementation strategy;
  - Arrange for technical assistance from developmental agri-business specialists skilled in empowering communities, aimed at agricultural improvement, to ensure optimal benefits from the compensation paid.
- Return the land to a similar condition to the pre-mining arable conditions: After mining closes:
  - Ensure that mined areas are reshaped, topsoiled and vegetated;
  - Replace topsoil (usable A and B horizon material) to achieve a minimum depth of 750 mm;
  - Ensure soil fertility levels are appropriate for arable use;
  - Ensure the slope of rehabilitated areas is less than seven degrees to enable arable use;
  - Where necessary, construct stormwater control berms to prevent erosion.

2.3.6 Natural vegetation / Plant life / Flora

- Limit the disturbance to the natural vegetation within the demarcated zone (Continuous):
  - Although waste rock dumps and mine infrastructure would be constructed within the 500 m blasting safety zone and the area outside of the mining footprint, disturbances will be kept as small as possible;
  - The *Balanites maughamii* (Torchwood) tree, and all *Sclerocarya birrea* (Marula) and *Boscia albitrunca* (Shepherd's tree) trees not directly affected by the opencast area must be protected;
  - All other existing indigenous trees not located in the area to be mined, should be protected when the site is established.All construction workers should be made aware of the trees to be protected on the site.Any trees removed during construction should be provided to the local inhabitants for use as fuel wood and material;

- Develop a management plan which details the immediate clean-up action should pollution incidents occur at stream, river and drainage crossings;
- Fire breaks should be constructed and maintained along the inside of the blast exclusion zone;
- Do not clear vegetation on the hills within the blasting safety zone;
- Do not allow mine personell, or appointed contract staff, to harvest any indigenous vegetation from the hillside areas;
- Avoid unnecessary clearance of indigenous vegetation within the blasting safety zone and protect existing trees in non-mining areas;
- Maintain the blast zone free of exotic vegetation.

- Re-vegetate areas disturbed by mining to prevent erosion(Continuous):
  - Following soil placement during rehabilitation, all topsoiled areas should be seeded to encourage vegetation establishment;
  - Seeding should comprise of the following seed mixture:
    - 2 kg/ha *Erogrostis teff* (Tef);
    - 5 kg/ha *Digitaria eriantha* (Smuts finger grass);
    - 5 kg/ha *Chloris gayana* (Rhodes grass).
  - No pioneering rhizomatous grasses such as Cynodon dactylon (Kweek or couch grass) should be used as these species will pose problems for later agricultural cropping of the land.

- Ensure that rehabilitated land becomes self-sustaining: After closure:
  - Samancor Chrome will conduct annual inspections of rehabilitated areas for the first five years after rehabilitation.
  - Annual inspections will include monitoring, where Samancor Chrome will institute remedial or corrective action if shortcomings, with respect to stability of the rehabilitated land surface, (erosion, vegetation die back) and species abundance and/or vegetation coverage, or the incidence of invader species and/or declared weeds are noted occur.

2.3.7 Animal life

- Protect and reduce impacts to the general loss of habitat (Continuous):
  - Any natural element such as trees and rocky outcrops should be protected against ad hoc construction activities;
  - Limit the footprint of mine infrastructure, so as to reduce the area of influence of such infrastructure;
  - Rocky outcrops should be protected as such areas will provide shelter for a variety of animals especially reptile species;
  - No hunting or trapping should be allowed on any areas of the site or in the rocky outcrops and hill areas during site establishment, construction and operational phases.

2.3.8 Surface Water

- Mine infrastructure layout to be based on site selection to prevent the construction of pollution control facilities on sensitive areas such as drainage lines: Prior to construction phase.
- Contaminated water will be contained within an isolated dirty water system : On-going.
- Generation of contaminated water to be reduced as far as possible. All pit water to be pumped to the storm water dam on a continuous basis to minimise exposure to waste material : On-going.
- The integrity of all dirty water dams will be maintained to prevent spillages, leaks and seepage from the impoundment to the natural water resource: On-going.
- The bulk of the contained dirty water will be re-used and a small volume will be allowed to evaporate: On-going.
- The location and sizing of the storm water drain must ensure that contaminated water emanating from the disturbed area is contained: On-going.
- Continuous update of the water and salt balance for the mine: On-going.
- The storm water diversion trenches will be kept free from obstructions to ensure that their efficiency is not rendered negatively. Storm water control measures will be incorporated with open pit mining progression to enhance the efficiency of the system: On-going and synchronised with each new box cut.
- No construction or maintenance of roads, berms or any water management facility will be undertaken with carbonaceous material: On-going.
- The water pollution control management facilities will be operated in such a way as to ensure that the available capacity and freeboard requirements as depicted in GN 704 are adhere to at all times: On-going.
- Water management measures for potable water supply and waste water disposal measures will be implemented and maintained as described in the EMP(R): On-going.
- Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining: On-going with concurrent rehabilitation.
- Monitoring of surface water: On-going.
- Mine to apply for the required water use authorisation: Prior to the commencement of mining.
- Construct river diversion infrastructure: Prior to the commencement of mining.
- Conduct monitoring: As prescribed.

Environmental objective	Proposed mitigation measures
Issue: Containment and use of precipitation, excess and storm water on site	
• Reduce impact on catchment yield • Return post mining topography to as close to pre-mining situations	• Implement storm water management to divert clean water around the mining area: Continuous • Contour shaping of the opencast area to pre-mining topography as far as possible: Continuous • Implement rehabilitation strategy for the stream diversions:

Environmental objective	Proposed mitigation measures
as possible • Return surface water flow to original flow areas or as close as possible • Design culverts and bridges so that the flood times and water retention do not impact on mining infrastructure	Continuous • Design all culverts and bridges with sufficient capacity: Continuous
Issue: Deterioration in water quality as a result of discharges or river diversions	
• Limit the impact on the Olifant's River tributaries during construction of the river diversions • Dirty storm water designs to be compliant to Environmental legislation	• Construct river diversion infrastructure in the dry season: As needed • Construct storm water management infrastructure to be compliant to environmental legislation: as needed
Issue: Reduction in surface water quantity due to river diversions and underground mining	
• Implement the selected river diversion strategy so that surface water quantity to the Olifants River (as the main River in the area) is not compromised	• Clean water diversions (bunds and canals) will be constructed and maintained: as needed • Implement the selected river diversion strategy as per the design document: as needed
• Release underground water to the nearest water resource	• Monitor water quality and if good discharge to the nearest water resource: As prescribed • Investigate water treatment options to treat poor quality water before discharge: Continuous
Issue: Alteration of Drainage patterns	
• Minimize the impacts on the environment (ecological, economical, and social) due to the alteration of drainage patterns in the project area.	• In compliance with the GN 704 Regulations (or the latest publication), Samancor will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. It will ensure that its storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event: Continuous • ECM must apply for a Water Use Licence from the Department of Water Affairs before making any changes to the drainage lines: as needed • The reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed: Continuous
• Minimize impact on riparian habitat and restore once mining has finalised	• A 100 m buffer zone be placed alongside the “riparian” banks of all water courses and that no mining should occur within this area: Continuous • The necessary mitigation be put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas: Continuous • “Riparian” habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic. This will be especially important if the flow dynamics of the streams is changed due to discharged water from the site

Environmental objective	Proposed mitigation measures
Issue: Contamination of surface water / surface water quality (General)	
• To ensure compliance with GN 704 Regulations (or latest publication) • To prevent discharges of contaminated water to the environment. • To prevent pollution of water resources in the vicinity of the project. • Recycle and re-use water where possible • Ensure that storm water design complies with DWA regulations and have sufficient capacity • Monitor on site surface water quality and quantity	• Design and manage all storm water infrastructure to comply with the regulations: Continuous • Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops); No other measures are required as the rest of the area is a "clean area" : Continuous • Samancor will implement the surface water control measures in accordance with the requirements of Regulation 704 and the corresponding DWAF M6.1 Operational Guideline. These measures must be implemented during the commencement of the construction phase: Continuous • There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years: Continuous • The operating protocol is as follows: The Crushing and screening Plant beneficiation (including dust suppression) must take water from: The Return and/or Storm water dam unless it is empty; Water from the opencast sump unless it is empty; Water from Underground. Water for domestic purposes will be obtained from the Lebalelo line. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs: Continuous • Samancor will avoid contamination of soils and will implement appropriate remedial measures if incidents of spillage occur. Samancor will implement responsible waste management practices. Samancor will implement all management measures pertaining to waste and water management as per the design reports: Continuous • The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall • Clean water diversion (bunds/ canals). Good housekeeping (clean-up of spills and minimise informal storage of materials) Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops) : Continuous • Leak detection through inspection; Good housekeeping (maintenance of equipment); Infrastructure located within "dirty area" : Continuous Run-off from roads will be contained • Vehicle will be maintenance and vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them: Continuous • Monitor quantities and qualities of all water that is discharged: Continuous • Operate the storm water dam to have 0.8 m freeboard: Continuous • Design sump with a 1:50 year holding capacity: Continuous • Implement storm water management before land clearing start: Continuous
Issue: Use of potable water	
• Reduce volume of potable water used	• Install toilets with a dual flush system: Continuous • Install showerheads that reduce water use: Continuous • Re-use "waste water" before using potable water in the

Environmental objective	Proposed mitigation measures
	beneficiation process: Continuous

2.3.9 .Groundwater

Impact	Actions/Mitigations
Issue: Deterioration of groundwater quality during the construction phase	
• Oil, diesel and chemical spills from machinery	• It must be ensured that a credible company removes used oil after vehicle servicing: Continuous • A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills: Continuous • Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment: Continuous
• Contamination potential of mine material exposed during mine construction	• Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed before constructing the ore handling facilities and adit(s): Before mining starts • Implement the EMP's of other environmental related aspects, including pollution prevention and impact minimisation: Continuous • Groundwater monitoring boreholes should be sited with the aid of geophysics at designated positions based on final infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended: Before mining starts • Groundwater monitoring boreholes should be installed to comply with the minimum requirements as set by governmental guidelines: Before mining starts
Issue: Groundwater quantity-lowering of groundwater table during the operational phase	
• Impact on water supply of groundwater users surrounding mine	• Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one to two kilometres surrounding the opencasts to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be re-acted on appropriately: Quarterly • If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply: As needed • The numerical model should be updated during mining by using the measured water ingress, water levels, mining and geophysics information to re-calibrate and refine the impact prediction: proposed within 2 years of mining and every 5 years thereafter
• **Issue: Groundwater quantity-lowering of groundwater table during the operational phase**	
• Potential impact on base flow of streams	• No impacts on the streams are predicted, and no special measures are thus required
• **Issue: Groundwater quality - Contamination of groundwater during the operational phase**	
• Deterioration of groundwater quality down gradient of the mining operations	• Mine sections should be sealed where possible during mining to reduce the contact of water and air with remaining sulphides: As needed • All potential sources of pollution, such as tailings and pollution control dams should be lined to prevent ingress of contamination into the groundwater system: Continuous • Install water collection and pumping systems within the mining areas capable of rapidly pumping water out, so minimising contact of water the geochemically reactive material: Continuous • Clean and dirty water systems should be separated: Continuous • Groundwater quality must be monitored on a quarterly basis • The monitoring results must be interpreted annually by a qualified hydro-geologist and the monitoring network should be audited annually to ensure compliance with regulations: Annually • Numerical groundwater model must be updated by calibrating the model

	with monitoring data: Proposed within 2 years of mining and every 5 years thereafter • Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine: Continuous
• **Issue: Groundwater quality - Contamination of groundwater during the operational phase**	
• Oil, diesel and chemical spills/leaks from machinery and storage facilities	• It must be ensured that a credible company removes used oil after vehicle servicing: Continuous • A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills: Continuous • Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment: Continuous
• Sewage related groundwater contamination	• Sewage effluent emanating from latrines or ablution blocks should be treated to acceptable levels before discharge into the environment: Continuous
• **Issue: Groundwater quantity – change in groundwater level during the decommissioning and post mining phase**	
• Decant volume • Potential (positive) impact on base flow of streams-(not predicted)	• No decant is predicted • All sulphate containing waste material should be stored underground and flooded as soon as possible to exclude oxygen: As needed • Major underground fractures encountered while mining must be sealed by grouting, both on inflow and outflow areas: As needed
• **Groundwater quality - Contamination of groundwater during the decommissioning and post mining phase**	
• Deterioration of groundwater quality down gradient of the mining operations due to plume movement	• All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite: Continuous • The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas: Continuous • The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts: Continuous • Groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends: Quarterly • Audit the monitoring network annually • Conduct a final update the numerical model to predict post mining impacts on the groundwater regime and to access potential liabilities: During closure phase
• **Groundwater quality - Contamination of groundwater during the decommissioning and post mining phase**	
• Contaminants emanating from historic Oil, diesel and chemical spills and facilities	• Remove or remediate areas of hydrocarbon contaminated soils by following a risk based approach, take action if a negative risk is found. A risk assessment should be conducted by a qualified hydro-geologist: Continuous
• **Groundwater management: All phases**	
• All the monitoring data needs to be collated and analysed on at least a bi-annual basis and included in management reports. This information will also be required by government departments (Department of Water Affairs, Department of Environmental Affairs) for compliance monitoring: Bi-annually • After 2 years from start of mining, the monitoring information collated should be used to update the groundwater flow and geochemical models. These models should thereafter be updated so that sufficient mitigation measures can be implemented. Management and mitigation plans should be continuously adapted using the monitoring data: propose within 2 years of mining starting and thereafter every 5 years	
• **Groundwater management: Closure phase**	
• A detailed mine closure plan should be prepared during the operational phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWA Best Practice Guidelines: Before final closure • The implementation of the mine closure plan, and the application for the closure certificate can be	

2.3.10 Visual Aspects -

- Control dust at the mine to the point where its contribution to overall air quality in the area would not be appreciable: Continuous.
    - Suppress dust on haulroads by proven acceptable methods.
    - Suppress dust at the crusher and run of mine tip by means of dust suppression sprays.
    - Limit the extent of exposed soil areas by rehabilitating mined areas concurrently with the advance of mining.
    - Install dust fallout monitoring buckets adjacent to the crusher and active mining area.The position of these monitoring buckets should be finalised when the detailed mine plan is finalised, but as a minimum should include:
        - one dust fallout bucket between the crusher and community east of the mine;
        - one dust fallout bucket between the mine pit and community west of the mine; and
        - one dust fallout bucket between the mine pit and community east of the mine.
- Dust fall out monitoring buckets should be located at the edge of the mine area of control.Given the disturbed nature of the surrounding subsistence agricultural land, it will be advisable to install directional dust buckets in order to distinguish between dust moving onto, or off, the mine site.

2.3.11 Noise

- Limit the impact of noise from the mine site on adjacent communities: Continuous:
    - During final design of the mine and associated infrastructure layout, evaluate relocation of the crusher to the west of the hill between the two pits to allow the hill to screen the crusher noise from the communities east of the mine.If the crusher is repositioned, the impact of the crusher on communities west of the pit must be evaluated.
    - Construct a berm to screen the crusher and ROM tip. The screening berm will comprise waste rock clad with soil, or be constructed from soft over burden material.
    - Mining and processing activities will be confined to daylight hours during a five day work week.
    - Maintain infrastructure, machinery and vehicle exhausts in good working order.
    - A screen of suitable indigenous trees will be planted to screen the mining operations from the community east of the mine, and from the tar road.
- Minimise the startle effect of blast noise on the receiving public: Continuous
    - Ensure all people are outside of the blast exclusion zone prior to blasting.
    - Use electronic or Nonel detonators whenever possible.
    - Develop and implement a blasting programme that defines a window of time when in the day blasting will occur.
    - Communicate this programme to the public and directly affected landowners (neighbouring

communities) so that they can anticipate and / identify blasts as being part of the mining operation.

- Minimise the risk to the public associated with blast fly rock: Continuous:
  - Fence the 500 meter blast exclusion zone prior to commencement of mining.
  - Ensure that the blast exclusion zone is cleared prior to blasting.
  - Announce all imminent blasts by means of a blast claxton / siren
  - When mining advances to within 500 meters of the Marula mine access road, the steps proposed to prevent risk to motorists are as follows:
    - Notify the neighbouring mine of the blast frequency and daily timing of blasts;
    - Temporarily interrupt traffic flow on the access road;
    - Patrol the isolated area to ensure that no vehicles remain in the area;
    - Carry out blast;
    - After the blast, inspect the road surface to ensure that no fugitive material has landed on the road surface.Remove such material from the road surface if present;
    - Reinstate traffic flow.

2.3.12 Archaeological / Cultural impacts

- Reduce the impact resulting from the destruction of, or damage to, archaeological remains: Continuous.
- Following finalisation of the mine plan, determine whether any of the identified sensitive archaeological sites fall within the final pit or infrastructure footprint.If archaeological sites do fall within areas that are to be disturbed by development of mining operations then the measures described below must be implemented. The planned start-up of mining operations allows adequate time for satisfactory completion of such archaeological studies.
- All other archaeological and heritage sites identified in the specialist baseline assessment, that fall within the mining exclusion zone but will be outside of the mining footprint of disturbance, must be protected from accidental damage by fencing off the immediate archaeological site.
- For all identified sensitive archaeological sites that will be disturbed, the following measures must be applied (as needed):
  - Samancor Chrome will appoint a recognised archaeologist and heritage specialist to undertake further archaeological investigation of the sites to be disturbed and to recover information and artefacts of value. Disturbance of the site will only take place once the archeologist has indicated that all material of significant value has been recovered.
  - If new archaeological or cultural finds are located during mine development and operation, Samancor Chrome will immediately isolate the area to avoid further disturbance to the site, call in an archaeologist and heritage expert and notify the authorities of the find. No further disturbance of the site would take place until information of significant value has

been recovered as described above.

- Human remains have been identified at a limited number of localities in the area of the proposed Lwala Chromite mine. The following measures will be applied:
    - Following finalisation of the mine plan, determine whether any of the identified sites that contain human remains (sites 12, 17 and 18) fall within the final pit or infrastructure footprint. If these grave sites do fall within areas that are to be disturbed by development of mining operations then the remains must be removed and re-intered in accordance with community wishes and regulatory requirements.
    - The planned extent of the north pit may be curtailed by the archaeological sensitivity of the area.

2.3.13 Visual aspects

- Reduce the visual impact of the opencast mining pit and associated crushing equipment and infrastructure: Continuous.
    - Provide screening between the community east of the pit and the proposed mine site. The tree screen will be of suitable indigenous trees.
    - Manage trees in the screening barrier to ensure that, as the trees grow in size and the screening benefit of the tree barrier is not lost through die back.

2.4 The roles and responsibilities for the execution of the monitoring and management programmes

2.4.1 Geology / Topography

Surveyor and Planning Department of Eatern Chrome Mines.

2.4.2 Land capability / Land use / Soil / Fauna / Flora / Visual / Archaeological

Appointed contractor as well as the Environmental Department of Eastern Chrome Mines with an appointed specialist.

2.4.3 Surface Water Monitoring

- Quality: Environmental Department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.
- Diatom: DWA Accredited field technician as appointed by Eastern Chrome Mines.
- Quantity: Environmental Department of Eastern Chrome Mines together with plant manager/supervisor.
- Toxicity: Environmental Department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.

2.4.4 Groundwater Monitoring -

Environmental Department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor.Correct monitoring protocol critical and boreholes should be purged before sampling.

2.4.5 Air Quality Monitoring -

Environmental Department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples and data (annual report) or a separate independent specialist contractor (Approved Inspector Authority).

2.4.6 Noise Monitoring -

- OSHA requirements – Approved Inspector Authority as appointed by Eastern Chrome Mines.
- Environmental Noise – Acoustic specialist as appointed by Eastern Chrome Mines.

2.4.7 Waste Monitoring -

Environmental Department of Eastern Chrome Mines together with plant manager/supervisor.

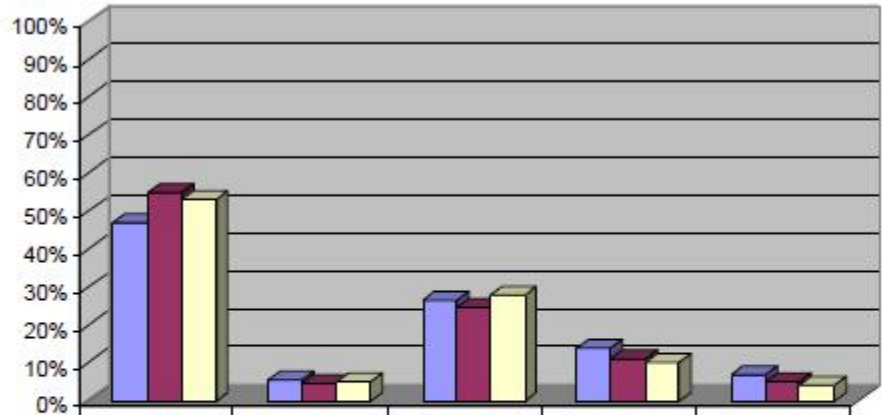
3 Description of environmental objectives and specific goals for the socio-economic conditions as identified in the social and labour plan (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

3.1 Socio-econonomic profile of the area (as per the Social and Labour Plan)

The population in the Limpopo Province (currently estimated at 5 238 286) have shown a steady growth rate of 4.9% over the past years. Despite the increased population in the Limpopo Province, the average household size has increased slightly from 4.2 recorded in 2001, to 4.3 in 2007, which are slightly higher than the national average of 3.9, and an indication of potential socio economic concerns such as an increase in job losses and resultant pressures on employed members of the household.

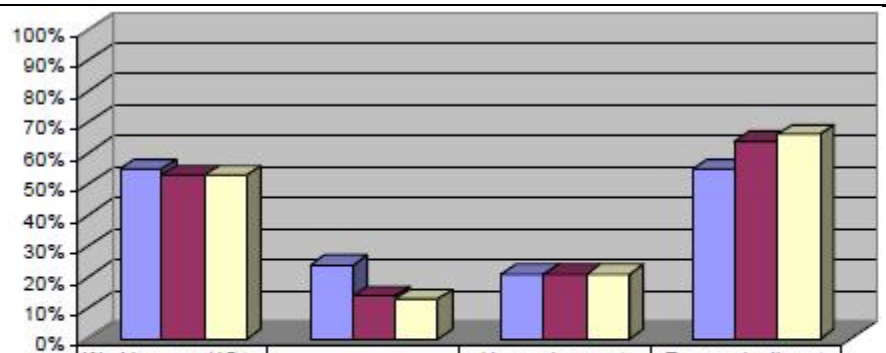
If the population statistics of the GTM are compared with the provincial averages it is evident that the household size is significantly higher at 4.8, an indication of a rural setting and high level of dependency on the employed members of the household.

The educational profile of the working age population are indicated below.



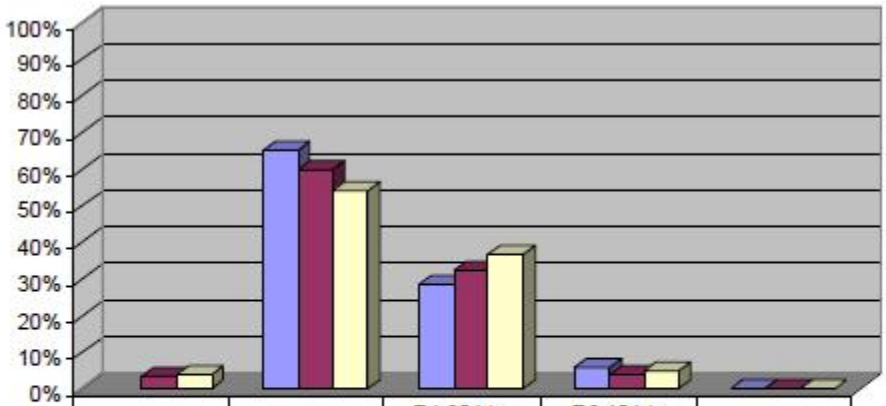
	No or limited Primary Education	Completed Primary Education	Completed some Secondary	Completed Secondary Education	Completed Tertiary Education
Limpopo Province	47%	5.60%	26.30%	14%	7%
Sekhukhune District Municipality	55%	4.60%	24.70%	11%	5%
Greater Tubatse Municipality	53%	5.10%	27.70%	10%	4%

The employment rate and monhly income of the working age population is provided below.



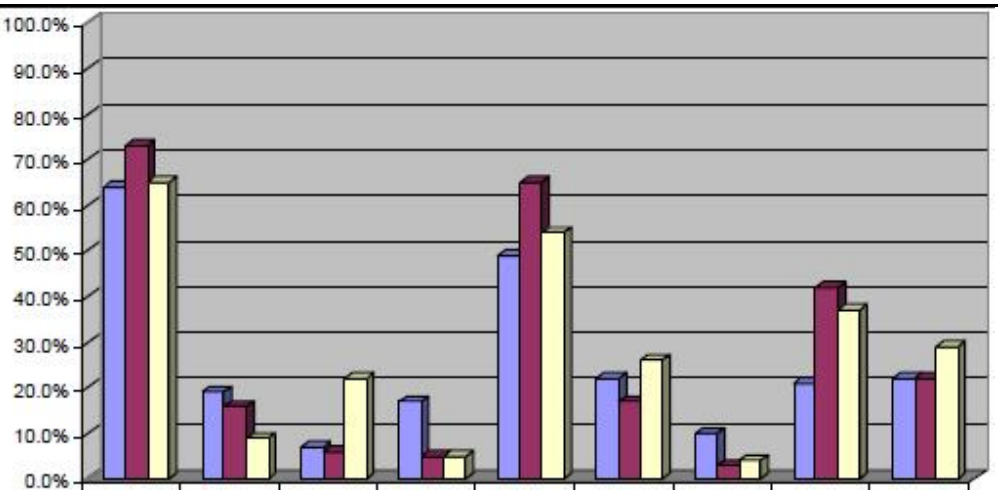
	Working age (15 to 64 years)	Employment rate	Unemployment rate	Economically not active
Limpopo Province	55%	24%	21%	55%
Sekhukhune District Municipality	53%	14%	21%	64%
Greater Tubatse Municipality	53%	13%	21%	66%

The annual income in the area is provide below



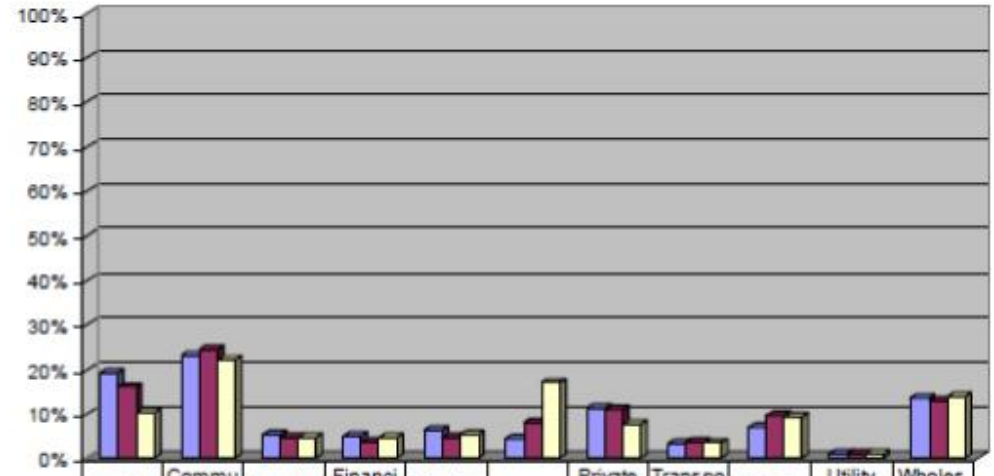
	No income	R1 to R1,600 per month	R1,601 to R6,400 per month	R6,401 to R51,200 per month	R51,201 and above
Limpopo Province		65.0%	28.7%	6.0%	0.3%
Sekhukhune District Municipality	3.4%	60.0%	32.2%	4.0%	0.2%
Greater Tubatse Municipality	3.9%	54.2%	36.9%	4.8%	0.2%

The housing, infrastructure and service delivery in the region is provided below.



	Brick dwelling on	Traditional dwellings	Informal settlements	Flush toilet with sewerage	Pit latrine (without ventilation	No access to any toilet	Piped water in dwelling	No access to piped	Water further than 200
Limpopo Province	64.0%	19.0%	7.0%	17.0%	49.0%	22.0%	10.0%	21.0%	22.0%
Sekhukhune District Municipality	73.0%	16.0%	6.0%	5.0%	65.0%	17.0%	3.0%	42.0%	22.0%
Greater Tubatse Municipality	65.0%	9.0%	22.0%	5.0%	54.0%	26.0%	4.0%	37.0%	29.0%

The key economic activities and sources of employment in the Region is provided below.



	Agriculture	Community services	Construction	Financial & business	Manufacturing	Mining	Private households	Transport & commu	Unknown	Utility supplies	Wholesale & retail
Limpopo Province	19.1%	23.2%	5.5%	5.0%	6.5%	4.4%	11.2%	3.3%	7.1%	1.1%	13.6%
Sekhukhune District Municipality	16.1%	24.4%	4.6%	3.8%	4.7%	7.9%	10.9%	3.8%	9.7%	1.0%	13.0%
Greater Tubatse Municipality	10.3%	22.2%	4.6%	4.6%	5.3%	17.1%	7.7%	3.6%	9.4%	1.2%	14.1%

3.2 Social and Labour Plan Objectives

From the Social and Labour Plan the following objectives as part of the proposed SLP projects have been identified:

- Adult base education and training (ABET): The objective will be to create awareness and inform and educate the community members as well as our employees on matters such as; the subjects offered, duration of the courses, exam criteria, location of the centers but mostly importantly to give and receive feedback in order to strive for continuous improvement of the programme.

- Mentorship and Empowerment partners and SMME: to ensure that communities within which the mine operates enjoy economic benefits.
- Employment Equite plan: ECM supports the Employment Equity Act and Mining Charter objectives and is fully committed to meeting both targets to ensure that the company's broader transformation objectives are achieved. ECM has an Employment Equity Committee which is responsible to monitor progress and to create equal opportunities in the workplace by eliminating all unfair discriminatory policies and practices.

3.3 Other Environmental Objectives

Topography	• To create closure topography where no residual change of the area following decommissioning and closure of the mine is noticeable
Soil	• To preserve and minimize loss of topsoil during construction, operations and closure phases • To maintain or improve the pre-mining fertility status of usable soil • To reduce the probability of spills from fuels, oils and lubricants, as this would contaminate soils
Land capability	• To return the mined area to an arable land capability • To ensure that rehabilitated land becomes self-sustaining
Land use	• To reduce the impact resulting from the loss of land or access to land, which results in a reduction in income, nutrition and food security • To return the land to a similar condition to the pre-mining arable conditions
Natural vegetation	• To reduce disturbances to vegetation and plant life within the demarcation zone • To re-vegetate areas disturbed by mining to prevent erosion
Animal life	• To protect and reduce impacts to the general loss of habitat
Surface water	• To ensure separation of clean runoff from dirty (mine affected) runoff • To maximise the reuse of mine-affected water in order to limit raw water consumption.(Re-use, recycle and minimise or reduce all waste water generated on the site) • To ensure that water pollution control structures remain functional and serve the design requirements • To conduct quantitative and qualitative assessment of the water resources on the mining property to effectively conduct Integrated Water Resource Management • To optimise water use by means of waste minimisation, reuse and recycling • To ensure the effective and efficient use of the existing available water resources in all water use sectors within the mine (Water Conservation and Demand Management: WCDM) • To conduct the development in a responsible manner due to the sensitive environment (drainage lines / Rivers) • To minimisation and where possible prevention of water pollution stemming from mining activities by compliance with and adherence to management commitments as specified in the EMP(R) • To implement appropriate storm water management over the entire footprint of the project area to ensure reduction in pollution of surface water quality; and • To assess the cumulative impacts from nearby mines and agricultural activities with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted

	• To develop an Integrated Water Resource Management Plan • To separation of clean and dirty water systems as part of a Storm Water Management Plan • To reduce the catchment of dirty areas • To contain all contaminated water in dedicated design facilities; and • To reduce impact on catchment yield • To return post mining topography to as close to pre-mining situations as possible • To return surface water flow to original flow areas or as close as possible • To design culverts and bridges so that the flood times and water retention do not impact on mining infrastructure • To limit the impact on the tributaries of the Olifants River during construction of the river diversions • To ensure that the dirty storm water designs are compliant to Environmental legislation • To implement the selected river diversion strategy so that surface water quantity to the Olifants River (as the main River in the area) is not compromised • To release underground water to the nearest water resource if it is of acceptable quality and cannot be used by the mines. Or investigate the use of treatment of the water for potable use • To minimize the impacts on the environment (ecological, economical, and social) due to the alteration of drainage patterns in the project area • To minimize impact on riparian habitat and restore once mining has finalised • Issue: Contamination of surface water / surface water quality (General) • To ensure compliance with GN 704 Regulations (or latest publication) • To prevent discharges of contaminated water to the environment • To prevent pollution of water resources in the vicinity of the project • To reduce the volume of potable water used
Groundwater	• To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quality • To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quantity • To minimise the impact of mining operations on other groundwater users in the area
Air quality	• To control dust at the mine to the point where its contribution to overall air quality in the area would not be appreciable
Noise and vibration	• To limit the impact of noise from the mine site on adjacent communities • To minimise the startle effect of blast noise on the receiving public • To minimise the risk to the public associated with blast fly rock
Visual aspects	• To reduce the visual impact of the opencast mining pit and associated crushing equipment and infrastructure

4 Description of environmental objectives and specific goals for historical and cultural aspects

4.1 Environmental objectives and goals in respect of historical and cultural

aspects identified in specialist studies conducted during the EIA phase

- To ensure full compliance with the National Heritage Resources Act.
- To ensure that the ecology of the to cultural important hills are not damaged due to excessive human traffic.
- To reduce the impact resulting from the destruction of, or damage to, archaeological remains.
- To appoint a recognised archaeologist and heritage specialist to undertake further archaeological investigation of the sites to be disturbed and to recover information and artefacts of value. Disturbance of the site will only take place once the archeologist has indicated that all material of significant value has been recovered.
- To immediately isolate any newly identified areas during the cosntruction phase to avoid further disturbance to the site, to call in an archaeologist and heritage expert and notify the authorities of the find. No further disturbance of the site would take place until information of significant value has been recovered as described above.
- To remove and re-inter any graves that occur wihin the opencast area in accordance with community wishes and regulatory requirements. Graves not impacted by surface infratructure within the site will be fenced.

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Regulation 51 (b) – Outline of the implementation programme

5 The appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspect in each phase of the mining operation, as follows;

5.1 Actions, activities or processes, including any NEMA EIA Regulation listed activities, which cause pollution or environmental degradation (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

The NEMA/NEMWA activities are listed in the Table attached below in Section 5.2.

5.1.1 Construction phase

To reduce redundancy, the description of those environmental and social impacts predicted to occur as a result of construction activities that are the same as those impacts associated with the mining operations will be described in the operations phase below.

5.1.2 Operational phase

5.1.2.1 Geology

Issue and Objective: The removal of material overlying LG6 chromitite unit during opencast mining results in a disturbance of the in-situ geology. Although the moderate significance of this impact cannot be reduced, measures will be implemented to mitigate further potential impacts to geology.

- Minimise the footprint of the mining operation and the degree of disturbance to geology and soils where possible.
- Develop a closure and decommissioning plan that will include filling in pit voids.

5.1.2.2 Topography

Issue: The opencast pit, surface infrastructure and waste storage areas will create an artifical topography that will be different to the pre-mining topography.

Objective: To create a closure topography where no residual change of the area following decommissioning and closure of the mine is noticeable.

- Minimize the mine footprint and degree of disturbance during construction and operations.
- Backfill final voids using material in the waste rock dumps.
- Deplete and clear the chromite stockpiles at the completion of mining.
- Blend rehabilitated surfaces in with the surrounding topography.

5.1.2.3 Soils

Issue: Topsoil will be removed and stored during the construction and operational phase in areas where the opencast, surface infrastructure and waste storage areas will be.

Objective: To preserve and minimize loss of topsoil during construction, operations and closure phases.

- Strip all usable soil to a depth of at least 1,500 mm.
- Boxcut soils, and soils stripped from the mining infrastructure footprint should be stockpiled for later use in rehabilitation.
- Soils stripped from successive mining cuts should be placed directly onto mined out areas, where the spoils have been levelled in preparation for rehabilitation.
- Soil stockpiles must be sited upslope from any mining / development activities and should be protected from erosion by stormwater, through construction of a stormwater berm around the stockpile area.
- Ensure that all soil stockpiles have a stormwater diversion berm for protection against erosion and dirty water contamination.
- Topsoiled area should be re-vegetated to prevent loss of soil through erosion.

Objective: To maintain or improve the pre-mining fertility status of usable soil.

- Where possible, place stripped topsoil directly onto re-profiled and shaped areas to minimise the volume of soil that needs to be stockpiled.
- Conduct soil fertility analysis prior to seeding and fertilise accordingly to create growing conditions that are suitable for plant growth, in areas re-vegetated.
- Lime soils at the time of placement if necessary to bring the soil pH to a level between as close to a neutral pH (6-7) as possible.

Issue: Spills from vehicles and other masjinery may contaminate soils.

Objective: To reduce the probability of spills from fuels, oils and lubricants, which would contaminate soils.

- Fuels, oils and lubricants will be managed according to accepted practices and will be stored in areas with sealed surfaces and appropriate containment structures.

- Contain and clean contaminated areas resulting from spills or failures of piping or storage structures.
- Test areas for chemical contamination and ameliorate if necessary. A suitably qualified person should conduct the assessment.
- The soils underlying any areas, from which hazardous waste is removed, should be sampled to ensure that no residual contamination remains.
- Cleaned areas should be free-draining and re-vegetated immediately.

5.1.2.4 Land capability

Issue: As topsoil is removed mixing and dilution of the topsoil and overburden may occur and this could lead to a reduction in capability.

Objective: To return the mined area to an arable land capability.

- Implement soil conservation and management measures and replace stripped soil to a depth of not less than 750 mm in re-profiled mined out areas.
- Re-establish surface drainage and a free draining land form.
- Implement soil protection and conditioning measures.
- Monitor of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify:
  - occurrence of surface erosion;
  - vegetation die back;
  - to establish whether salinisation of the soil surface is occurring;
  - fertility status of rehabilitated land;
  - the emergence of alien / exotic vegetation.

5.1.2.5 Land use

Issue: As a result of the mining activities the area will not be available for subsistance farming for the duration of the mining activities

Objective: To reduce the impact resulting from the loss of land or access to land, which results in a reduction in income, nutrition and food security.

- Samancor Chrome to provide monetary compensation to land owners to provide for purchase of food, through the medium of a community trusts.
- Co-operate with the Department of Land Affairs and the local tribal communities in the development of an implementation strategy.
- Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at agricultural improvement, to ensure optimal benefits from the

compensation paid.

Objective: To return the land to a similar condition to the pre-mining arable conditions.

- Ensure that mined areas are reshaped, topsoiled and vegetated.
- Replace topsoil (usable A and B horizon material) to achieve a minimum depth of 750 mm.
- Ensure soil fertility levels are appropriate for arable use.
- Ensure the slope of rehabilitated areas is less than seven degrees to enable arable use.
- Where necessary, construct stormwater control berms to prevent erosion.

5.1.2.6 Natural vegetation/plant life

Issue: Areas where surface infrastucture, the opencast and waste storage areas will be located will be cleared of vegetation.

Objective: To reduce disturbances to vegetation and plant life within the demarcation zone.

- Although waste rock dumps and mine infrastructure would be constructed within the 500 m blasting safety zone and the area outside of the mining footprint, disturbances will be kept as small as possible.
- The *Balanites maughamii* (Torchwood) tree, and all *Sclerocarya birrea* (Marula) and *Boscia albitrunca* (Shepherd's tree) trees not directly affected by the opencast area must be protected.
- All other existing indigenous trees not located in the area to be mined, should be protected when the site is established. All construction workers should be made aware of the trees to be protected on the site. Any trees removed during construction should be provided to the local inhabitants for use as fuel wood and material.
- Develop a management plan which details the immediate clean-up action should pollution incidents occur at stream, river and drainage crossings.
- Fire breaks should be constructed and maintained along the inside of the blast exclusion zone.
- Do not clear vegetation on the hills within the blasting safety zone.
- Do not allow mine personell, or appointed contract staff, to harvest any indigenous vegetation from the hillside areas.
- Avoid unnecessary clearance of indigenous vegetation within the blasting safety zone and protect existing trees in non-mining areas.
- Maintain the blast zone free of exotic vegetation.
- Revegetation of rehabilitated areas after mining.
- The post mining land use will be subsitence agriculture. The focus of revegetation will thus be on stabilisation of topsoiled areas to limit erosion during the mining occupation of the site.

Objective: To re-vegetate areas disturbed by mining to prevent erosion.

- Following soil placement during rehabilitation, all topsoiled areas should be seeded to encourage vegetation establishment.
- Seeding should comprise of the following seed mixture:
  - 2 kg/ha *Erogrostis teff* (Tef);
  - 5 kg/ha *Digitaria eriantha* (Smuts finger grass);
  - 5 kg/ha *Chloris gayana* (Rhodes grass).
- No pioneering rhizomatous grasses such as Cynodon dactylon (Kweek or couch grass) should be used as these species will pose problems for later agricultural cropping of the land.

5.1.2.7 Animal life

Issue: The construction and mining activity may disturb, displace or frighten away remaining fauna and bird species.

Objective: To protect and reduce impacts to the general loss of habitat.

- Any natural element such as trees and rocky outcrops should be protected against ad hoc construction activities.
- Limit the footprint of mine infrastructure, so as to reduce the area of influence of such infrastructure.
- Rocky outcrops should be protected as such areas will provide shelter for a variety of animals especially reptile species.
- No hunting or trapping should be allowed on any areas of the site or in the rocky outcrops and hill areas during site establishment, construction and operational phases.

5.1.2.8 Surface water

Environmental objective	Proposed mitigation measures
Issue: Containment and use of precipitation, excess and storm water on site	
• Reduce impact on catchment yield • Return post mining topography to as close to pre-mining situations as possible • Return surface water flow to original flow areas or as close as possible • Design culverts and bridges so that the flood times and water retention do not impact on mining infrastructure	• Implement storm water management to divert clean water around the mining area • Contour shaping of the opencast area to pre-mining topography as far as possible • Implement rehabilitation strategy for the stream diversions • Design all culverts and bridges with sufficient capacity
Issue: Deterioration in water quality as a result of discharges or river diversions	
• Limit the impact on the Olifants River during construction of the river diversions	• Construct river diversion infrastructure in the dry season • Construct storm water management infrastructure to be compliant to environmental legislation

Environmental objective	Proposed mitigation measures
• Dirty storm water designs to be compliant to Environmental legislation	
Issue: Reduction in surface water quantity due to river diversions and underground mining	
• Implement the selected river diversion strategy so that surface water quantity to the Olifants River (as the main River in the area) is not compromised	• Clean water diversions (bunds and canals) will be constructed and maintained • Implement the selected river diversion strategy as per the design document
• Release underground water to the nearest water resource	• Monitor water quality and if good discharge to the nearest water resource • Investigate water treatment options to treat poor quality water before discharge
Issue: Alteration of Drainage patterns	
• Minimize the impacts on the environment (ecological, economical, and social) due to the alteration of drainage patterns in the project area	• In compliance with the GN 704 Regulations (or the latest publication), Samancor will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. It will ensure that its storm water collection facilities and dirty-water holding facilities are designed for the 1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event • ECM must apply for a Water Use Licence from the Department of Water Affairs before making any changes to the drainage lines • The reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed
• Minimize impact on riparian habitat and restore once mining has finalised	• A 100 m buffer zone be placed alongside the “riparian” banks of all water courses and that no mining should occur within this area • The necessary mitigation be put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas • “Riparian” habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic. This will be especially important if the flow dynamics of the streams is changed due to discharged water from the site • As the streams are generally dry it is not suitable for SASS5 aquatic invertebrate assessment, it is thus proposed that diatom sampling be conducted (if the streams are flowing) before mining commences and as part of the monitoring plan for the mine • These sites should mainly consist of an upstream and downstream point in the Matadi and Moopetsi Rivers and unnamed tributaries of the Moopetsi River
Issue: Contamination of surface water / surface water quality (General)	
• To ensure compliance with GN 704 Regulations (or latest publication) • To prevent discharges of contaminated water to the environment • To prevent pollution of water resources in the vicinity of the project • Recycle and re-use	• Design and manage all storm water infrastructure to comply with the regulations • Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops); No other measures are required as the rest of the area is a “clean area” • Samancor will implement the surface water control measures in accordance with the requirements of Regulation 704 and the corresponding DWAF M6.1 Operational Guideline. These measures must be implemented during the commencement of the construction phase

Environmental objective	Proposed mitigation measures
water where possible • Ensure that storm water design complies with DWA regulations and have sufficient capacity • Monitor on site surface water quality and quantity	• There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years • The operating protocol is as follows: The Crushing and screening Plant beneficiation (including dust suppression) must take water from: The Return and/or Storm water dam unless it is empty; Water from the opencast sump unless it is empty; Water from Underground. Water for domestic purposes will be obtained from the Labalelo line. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs • Samancor will avoid contamination of soils and will implement appropriate remedial measures if incidents of spillage occur. Samancor will implement responsible waste management practices. Samancor will implement all management measures pertaining to waste and water management as per the design reports • The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall • Clean water diversion (bunds/ canals). Good housekeeping (clean-up of spills and minimise informal storage of materials) Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops) • Leak detection through inspection; Good housekeeping (maintenance of equipment); Infrastructure located within “dirty area” • Run-off from roads will be contained • Vehicle will be maintenance • Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them • Monitor quantities and qualities of all water that is discharged • Operate the storm water dam to have 0.8 m freeboard • Design sump with a 1:50 year holding capacity • Implement storm water management before land clearing start
Issue: Use of potable water	
• Reduce volume of potable water used	• Install toilets with a dual flush system • Install showerheads that reduce water use • Re-use “waste water” before using potable water in the beneficiation process

5.1.2.9 Groundwater

Issue: Spills of oils and diesel

Objective: To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quality. To minimise the impact of mining operations on other groundwater users in the area.

Measures to prevent and contain such spills should be introduced. The following is suggested:

- It must be ensured that a credible company removes used oil after vehicle servicing.
- A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills.
- Used absorbent fibre must be land-farmed, using approved methodologies
- Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment.
- Remove or remediate areas of hydrocarbon contaminated soils by following a risk based approach, take action if a negative risk is found. A risk assessment should be conducted by a qualified hydro-geologist

Issue: Impact on groundwater quantity.

Objective: To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quantity.

- All potential sources of pollution, such as tailings and pollution control dams should be lined to prevent ingress of contamination into the groundwater system.
- All sulphate containing waste material should be stored underground and flooded as soon as possible to exclude oxygen.
- Clean and dirty water systems should be separated.
- If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply.
- Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine
- Install water collection and pumping systems within the mining areas capable of rapidly pumping water out, so minimising contact of water with the geochemically reactive material.
- Major underground fractures encountered while mining must be sealed by grouting, both on inflow and outflow areas to reduce the contact of water and air with remaining sulphides.
- Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one to two kilometres surrounding the opencasts to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately.
- Numerical groundwater model must be updated by calibrating the model with monitoring data.
- Process water must be stored in a lined pollution control dam and the processing areas should be designed to prevent standing water.
- The monitoring results must be interpreted annually by a qualified hydrogeologist and the

monitoring network should be audited annually to ensure compliance with regulations.

Issue: Impact on groundwater quality.

Objective: To minimize the potential impacts to shallow and deep groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quality.

- A pollution control dam should be used to intercept polluted seepage water.
- All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite.
- Audit the monitoring network annually.
- Conduct a final update the numerical model to predict post mining impacts on the groundwater regime and to access potential liabilities.
- Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed before constructing the coal handling facilities and adit(s).
- Groundwater monitoring boreholes should also be sited similarly at designated positions based on final infrastructure layout, to comply with the design requirements of a groundwater monitoring system.
- Groundwater monitoring boreholes should be sited with the aid of geophysics as recommended in this report, to comply with the minimum requirements as set by governmental guidelines.
- Implement the EMP's of other environmental related aspects, including pollution prevention and impact minimisation.
- Quarterly groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends.
- Regular sampling of the streams upstream and downstream of the mining operations is recommended.
- Sewage effluent emanating from latrines or ablution blocks should be treated to acceptable levels before discharge into the environment.
- The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas.
- The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts.

Objective: General good management practises

- All the monitoring data needs to be collated and analysed on at least a bi-annual basis and included in management reports. This information will also be required by government departments (Department of Water Affairs, Department of Environmental Affairs) for compliance

monitoring.

- After 2 years from start of mining, the monitoring information collated should be used to update the groundwater flow and geochemical models. These models should thereafter be updated so that sufficient mitigation measures can be implemented. Management and mitigation plans should be continuously adapted using the monitoring data.
- A detailed mine closure plan should be prepared during the operational phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWA Best Practice Guidelines.
- The implementation of the mine closure plan and the application for the closure certificate can be conducted during the decommissioned phase.

5.1.2.10 Air quality

Issue: The removal of vegetation and topsoil, blasting in the opencast pit and dust generated by vehicles may impact on the air quality in the region.

Objective: To control dust at the mine to the point where its contribution to overall air quality in the area would not be appreciable.

- Suppress dust on haulroads by proven acceptable methods.
- Suppress dust at the crusher and run of mine tip by means of dust suppression sprays.
- Limit the extent of exposed soil areas by rehabilitating mined areas concurrently with the advance of mining.
- Install dust fallout monitoring buckets adjacent to the crusher and active mining area. The position of these monitoring buckets should be finalised when the detailed mine plan is finalised, but as a minimum should include:
    - one dust fallout bucket between the crusher and community east of the mine;
    - one dust fallout bucket between the mine pit and community west of the mine,;
    - one dust fallout bucket between the mine pit and community east of the mine.
- Dust fall out monitoring buckets should be located at the edge of the mine area of control (500 meter blast barrier). Given the disturbed nature of the surrounding subsistence agricultural land, it will be advisable to install directional dust buckets in order to distinguish between dust moving onto, or off, the mine site.

5.1.2.11 Noise and Vibration

Issue: Vehicles, construction activities and mining and processing activities could lead to increased noise levels in the area. In addition the blasting activities may result in vibrations that could be felt over a distance. Also due to the opencast activities and assocaited blasting fly rock may be generated which could lead to damage to infrastructure or injuries.

Objective: To limit the impact of noise from the mine site on adjacent communities.

- During final design of the mine and associated infrastructure layout, evaluate relocation of the crusher to the west of the hill between the two pits to allow the hill to screen the crusher noise from the communities east of the mine. If the crusher is repositioned, the impact of the crusher on communities west of the pit must be evaluated.
- Construct a berm to screen the crusher and ROM tip. The screening berm will comprise waste rock clad with soil, or be constructed from soft over burden material.
- Mining and processing activities will be confined to daylight hours during a five day work week.
- Maintain infrastructure, machinery and vehicle exhausts in good working order.
- A screen of suitable indigenous trees will be planted to screen the mining operations from the community east of the mine, and from the tar road.

Objective: To minimise the startle effect of blast noise on the receiving public.

- Ensure all people are outside of the blast exclusion zone prior to blasting.
- Use electronic or Nonel detonators whenever possible.
- Develop and implement a blasting programme that defines a window of time when in the day blasting will occur.
- Communicate this programme to the public and directly affected landowners (neighbouring communities) so that they can anticipate and / identify blasts as being part of the mining operation.
- In order to eliminate the danger of fly rock falling on the public a zone of 500 meters around the projected opencast pit outline will be fenced off from the outset of the mine. This area will be a restricted access area from which the community will be excluded for the duration of the Samancor Chrome Lwala Chromite Mine mining life. This exclusion zone has been agreed with the local communities through the extensive consultation that has taken place to date as part of the EIA and EMPR process.
- When the pit advances to within 500 meters of the Marula mine access road the blasts will be modified to reduce the risk to road infrastructure and users. Certain additional precautions will be taken to minimise the risk of damage caused by fly rock, and are outlined below.
- Mining will only be within 500 meters of the Marula road for a short period, probably during the initial startup period of the mine because the box cut is projected to be located at the southern end of the south pit. This layout is however subject to finalisation of the mine plan.

Objective; To minimise the risk to the public associated with blast fly rock.

- Fence the 500 meter blast exclusion zone prior to commencement of mining.
- Ensure that the blast exclusion zone is cleared prior to blasting.

- Announce all imminent blasts by means of a blast claxton / siren.
- When mining advances to within 500 meters of the Marula mine access road, the steps proposed to prevent risk to motorists are as follows:
  - Notify the neighbouring mine of the blast frequency and daily timing of blasts;
  - Temporarily interrupt traffic flow on the access road;
  - Patrol the isolated area to ensure that no vehicles remain in the area;
  - Carry out blast;
  - After the blast, inspect the road surface to ensure that no fugitive material has landed on the road surface. Remove such material from the road surface if present;
  - Reinstate traffic flow.

5.1.2.12 Archaeological sites

Issue: The potential loss of the identified archaeological resources would remove the chance to gain additional knowledge about the early cultures of the region, and therefore represents an impact of high significance. The disturbance of human remains is a very sensitive issue with communities descended from the deceased, especially in poor rural areas where a cultural link to ancestors may be strong.

Objective: To reduce the impact resulting from the destruction of, or damage to, archaeological remains.

- Following finalisation of the mine plan, determine whether any of the identified sensitive archaeological sites fall within the final pit or infrastructure footprint. If archaeological sites do fall within areas that are to be disturbed by development of mining operations then the measures described below must be implemented. The planned start-up of mining operations allows adequate time for satisfactory completion of such archaeological studies.
- All other archaeological and heritage sites identified in the specialist baseline assessment, that fall within the mining exclusion zone but outside of the mining footprint of disturbance, must be protected from accidental damage by fencing off the immediate archaeological site.
- For all identified sensitive archaeological sites that will be disturbed, the following measures must be applied:
  - Samancor Chrome will appoint a recognised archaeologist and heritage specialist to undertake further archaeological investigation of the sites to be disturbed and to recover information and artefacts of value. Disturbance of the site will only take place once the archeologist has indicated that all material of significant value has been recovered.
  - If new archaeological or cultural finds are located during mine development and operation, Samancor Chrome will immediately isolate the area to avoid further disturbance to the site, call in an archaeologist and heritage expert and notify the authorities of the find. No further

disturbance of the site would take place until information of significant value has been recovered as described above. Human remains have been identified at a limited number of localities in the area of the proposed Lwala Chromite mine. The following measures will be applied:

- Following finalisation of the mine plan, determine whether any of the identified sites that contain human remains fall within the final pit or infrastructure footprint. If these grave sites do fall within areas that are to be disturbed by development of mining operations then the remains must be removed and re-intered in accordance with community wishes and regulatory requirements.
- The planned extent of the north pit may be curtailed by the archaeological sensitivity of the area.

5.1.2.13 Visual aspects

Issue: The proposed opencast, surface infrastructures and waste storage areas will change the visual dynamics of the area.

Objective: To reduce the visual impact of the opencast mining pit and associated mining surface infrastructure and waste storage areas.

- Provide screening between the community east of the pit and the proposed mine site. The tree screen will be of suitable indigenous trees.
- Manage trees in the screening barrier to ensure that, as the trees grow in size and the screening benefit of the tree barrier is not lost through die back.

5.1.2.14 Regional socio-economic structures

Issue: The proposed mining activities will create employment oppertunties and as a result there might be ingress of people coming to the area for employment. The effect will be both positive and negative. In addition surface area users may have a loss of income from the agricultural land that will now be used for mining activities.

The following measures are recommended to mitigate potential impacts to community and social structure:

- Assist communities to develop a community development strategy to address the potential impacts of mining in the area.

Samancor Chrome will commit to:

- Establish, and communicate qualification criteria for, a bursary scheme for community members to focus on core mining skills (e.g., geology, mining, engineering and metallurgy).
- Mentor empowerment groups.

- Implement employment equity at Lwala Mine, including the employment of women.
- Focus on South African HDI's.
- Participate in implementation of Integrated Development Plan (IDP) goals for the region and to align Samancor's social investment with the local IDP.
- To consult with and involve local and provincial governments.
- A broad based Black Empowerment component for the mine, which will involve the Limpopo Government. This initiative will be implemented once mine approvals have been obtained.
- Considering local contractors who will have contracts that specify all the requirements applicable to Samacor Chrome in terms of law, including procurement of capital goals, consumables and services.

Issue: Loss of income from agricultural land

- Provide monetary compensation to land owners, through the medium of a community trust.
- Cooperate in the development of an implementation strategy and SMMEs.
- Maximise local employment creation and targeted local procurement.
- Provide assistance with technical training (at schools and in-house), capacity building and skills development.
- Apply appropriate social investment funding.

Issue: Population growth

- Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population growth.

Issue: Relocation of households

- Current layout does not idnicate that any people will have to be relocated.

Issue: Restricted access to land and other destinations and increased traffic

- Improved pedestrian access should be considered if any of the roads comprising the haulage route are upgraded, especially the R37 (South African National Roads Agency Limited).

Issue: Increased pressure on water supply and sanitation as well as reduced water levels in the Madikane supply borehole and yield

- Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population growth (Samancor Chrome).
- Provide additional formal water supply infrastructure to affected communities from the Lebalelo pipeline (Department of Water Affairs).

- Provide formal sanitation or semipermanent sanitation facilities to affected communities (Government or aid agency).
- Provide technical training to selected community members to allow them to operate boreholes and pumps effectively and to fix them when in need of repair (Samancor Chrome).

Issue: Increase in sexually tranmitted diseases, HIV/AIDS as a result of inward migration; Increase in water-borne diseases due to inward migration and increase pressure on water supply and saniation; Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land. Poorer health care as a result of inward migration and increased pressure on medical resources. Increase in road safety risks due to increased road traffic. Increase in methemoglobinemia due to possible increased nitrate in boreholes.

- Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population.
- Advertise and disseminate information regarding the low employment prospects at the mine, to minimise inward migration and pressure on supplies (Samancor Chrome).
- Provide monetary compensation to land owners to provide for purchase of food, through the medium of a community trust.
- Cooperate with the Department of Land Affairs in the development of an implementation strategy and plan to ensure effective implementation of mitigation, especially monetary compensation and technical training.
- Enforce good driving standards.
- Communicate to the communities the nature of existing groundwater quality issues with respect to nitrate and discuss possible measures to address the problem.
- Make alternative water supplies available to affected communities if monitoring shows a significant increase in nitrate concentrations.
- Provide additional formal water supply infrastructure e.g., planned Lebalelo pipeline community supply.
- Provide additional medical facilities to affected communities (government or aid agency).
- Assist in the promotion of a health education campaign, covering water and sanitation Possible provision of additional infrastructure by an external (government or aid) agency.

Issue: Increased noise and vibration; Increased traffic and a Reduction in the sence of place.

- Minimise noise and vibration as per outlined in the Noise and Vibration section above.
- Enforce good driving standards.

Issue: Social conflict due to possible inward migration of outsiders, associated effects, and competition for benefits within and between communities

- Control (mitigation) of these effects must come from within the existing community structure.
- Assist communities to develop a community development strategy to address the potential impacts.
- Avoid the establishment of a common trust account for the affected communities.
- Compensation issues will need to be dealt with separately for each community.
- Facilitate better communication between mine & communities revision of the composition of Clapham Community Working Committee and to function more effectively.
- Provide training to the Clapham Community Working Committee in respect of its key functions.

Objective: To manage communication between Samancor Chrome and the four affected communities (Kgoshi MW Manyaka, Kgosi MS Manyaka, , Mashishi and Kgoete) surrounding the mine.

The following measures are recommended to facilitate effective communication between Samancor Chrome and the affected communities:

- Establish a new Community Working Committee to replace the existing Clapham Community Working Committee, reflecting the above four affected communities only.
- The Ntwampe community will no longer form part of the Community Working Committee, which will represent the two Manyaka communities, and the Mashishi and Kgoete communities.
- Informally assist the new Community Working Committee in respect of community functions.
- Samancor Chrome will appoint a dedicated community liaison officer, preferably either a trained educator or social worker, and preferably from one of the four affected communities.

Objective: To fairly compensate communities (Manyaka, Mashishi and Kgoete) affected by the proposed Lwala Chromite mine.

The following compensation measures have been agreed in consultation with the affected communities:

- Establish separate trust accounts for the Manyaka (a separate fund for each of the two chiefs), Mashishi and Kgoete communities and deal with compensation issues separately for each community.
- Samancor Chrome will provide monetary compensation to land owners, through the medium of a community trust (Samancor Chrome). Compensation to individuals that will lose access to land for 7 to 8 years will:
    - be paid directly by Samancor to the individual, rather than through a third party. In terms of law, Samancor has to ensure the individuals are fairly compensated.
    - Involve the Department of Land Affairs and Local Council with a Community liaison officer(s) to

help facilitate.

- Develop surface lease agreements through tribal resolutions where the lease fee collected by the Department of Land Affairs, will be paid into trust funds for the communities, as follows:
  - Property Forest Hill: One trust fund each for the Kgoete and Mashishi Communities;
  - Property Clapham: One trust fund for each of the two Manyaka Chiefs;
  - Communities will appoint the trustees for the trust funds;
  - Training will be provided for running the trust funds.
- Samancor will assist in providing appropriate training to those who will be responsible for the management of compensation issues.

In addition to these specific measures Samancor Chrome has committed to:

- Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at agricultural improvement, to ensure benefits of compensation can be applied effectively.
- Cooperate in the development of an implementation strategy and plan to ensure effective implementation of mitigation, especially monetary compensation and technical training.
- Make all employment opportunities first available to local people, and actively seek opportunities to employ them.
- Maximise local employment creation and targeted local procurement.
- Provide assistance with technical training capacity building and skills development.
- Assist the development of SMMEs.
- Informally assist the Lwala Community Working Committee to improve communications.
- Apply appropriate social investment funding in line with identified IDP requirements.

5.1.3 Closure phase and rehabiliation

Issue: During closure infrastructue will be removed and opencast areas will be rehabiliated. In addition the wast stockpile areas needs to be rehabiliated.

Objective: To ensure that rehabilitated land becomes self-sustaining.

- Samancor Chrome will conduct annual inspections of rehabilitated areas for the first five years after rehabilitation.
- Annual inspections will include monitoring, where Samancor Chrome will institute remedial or corrective action if shortcomings, with respect to stability of the rehabilitated land surface, (erosion, vegetation die back) and species abundance and/or vegetation coverage, or the incidence of invader species and/or declared weeds are noted occur.

Issue: Maintenance of water pollution control structures and residue deposits (waste storage areas).

Objective: To ensure that water pollution control structures remain functional and serve the design requirements. To ensure that vegetation cover is established over the waste storage areas (resdiue deposits)

- Maintenance will be required on structures such as stormwater diversion channels and berms associated with the routing of stormwater around the operating pit and mining infrastructure areas.
- The structures will be inspected regularly and maintenance work carried out as required.
- Inspections will take place immediately prior to the rainy season.
- Vegetation of residue deposits must be carried out as described for the general area above with topsoil and vegetation establishment.
- Vegetation must be investigated annually.

Issue: The post mining land use will return to subsistence agriculture, with the rehabilitated land surface being cropped.

Objective: The objective for closure is to create a free draining post mining landscape that has been returned to a productive post mining land use.

- No fixed infrastructure will be established on the Lwala Chromite Mine site. Service infrastructure will be removed on cessation of mining.
- Mine residue deposits will be vegetation and inspected annyually. Storm water infrastructure around waste deposites will be maintained and inspected annually.
- Underground workings adits will be cealsed.
- Rehabilitation of the opencast mined areas on site will follow the mining cut and be completed within the operational phase of the project. Boxcut spoils will be used to close the final void. The entire mined pit area will be infilled and covered with usable soil and returned to agricultural use.
- Submission of closure information will be stipulated in the mine closure plan, but will include at least the following:
    - An evaluation of surface and groundwater water quality at the monitoring points used during operation of the mine for the operational and post closure periods.
    - An audit to reflect compliance with the environmental management programme as described in this EMPR. The audit will be conducted by an independent party and will meet the requirements of the Department of Mineral Resources as stipulated from time to time. Special attention will be given to environmental performance, including the status of surface rehabilitation of opencast mined areas.
    - Review of the mine water balance after cessation of mining and commencement of groundwater recovery in order to calibrate the post closure groundwater model 6.3.6

Maintenance.

- With the exception of the mine residue sites it is not anticipated that any post mining maintenance on the established vegetation community will be necessary because the land will return to community use as subsistence agricultural land. The tufted grass community established during rehabilitation to stabilise the site and limit soil erosion from site is likely to be ploughed up by the community, on return of the land, in preparation for planting of food crops.
- With regards to the opencast pit area it is not anticipated that significant or large scale surface subsidence will occur associated with the opencast mined block because the spoils will be deposited by truck and the spoil areas will grow incrementally. Some minor and localised settlement may occur. However, the pit is located on a very gentle north-facing slope and local settlement is unlikely to result in ponding of water. Should localised small depressions form, they will be infilled with useable soil and the disturbed area re-vegetated.

5.2 Concomitant list of appropriate technical or management options chosen to modify, remedy, control or stop any action, activity, or process which will cause significant impacts on the environment, socio-economic conditions and historical and cultural aspects as identified (attach detail of each technical or management option as appendices)

See section 5.1 and the Table attached under Section 6.1.

6 Action plans to achieve the objectives and specific goals contemplated in Regulation 50 (a)

6.1 Time schedules of deadlines for each action to be undertaken to implement each technical or management option chosen (Include all the items to be included in the list referred to in the concomitant section of the guideline posted on the official website of the Department)

The time frames allocated to each activity during the Construction, operational and closure phase is provided under Section 3.1 of Section 1(EIA).

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
1	**Construction phase**					
1.1.1	Geology	Disturbance of in-situ geology	To mitigate further potentially occurring impacts to geology although its medium significance cannot be reduced	Minimise the footprint of the mining operation and the degree of disturbance to geology and soils where possible	16, 18, 19	Life of mine
1.1.2	Topography	Alteration of topography	To ultimately create a closure topography where no residual change of the area following decommissioning and closure of the mine is noticed	Minimize footprint and degree of disturbance	All	After closure
				Blend surfaces with surrounding topography	3, 4, 7, 11, 15, 16, 17, 18, 22, 23 ,24, 26	Continuous
				Backfill final voids using material in the waste rock dumps	15, 16, 18	Continuous and After closure
1.1.3 A	Soil	Disturbance of soils	To preserve and minimize loss of topsoil	Strip all usable soil to a depth of at least 1 500 mm	All	Prior to construction
				Stockpile box cut soils, and soils stripped from the mining infrastructure for later use in rehabilitation		Continuous
				Implement soil conservation and management measures, as per the soils stripping and conservation plan		Continuous
				Place stripped topsoil directly onto re-profiled and shaped areas to minimise the volume of soil to be stockpiled		Continuous
				Stockpiles must be sited upslope from any development		Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				Construct storm water diversion berms for all stockpiles to protect against erosion and dirty water contamination		Prior to other construction
				Re-vegetate top soiled areas to prevent loss of soil through erosion		Continuous
			To maintain or improve the pre-mining fertility status of usable soil	Place stripped topsoil directly onto re-profiled and shaped area to minimise volume of soil that needs to be stockpiles	All	Continuous
				Conduct soil fertility analysis prior to seeding and fertilise accordingly to create growing conditions		As needed
				Lime soils at the time of placement if necessary to bring soil pH to a level as close to a neutral pH as possible		As needed
1.1.3 B		Reduction of viability of soils in stockpiles	To reduce contamination by spills from fuels, oils and lubricants which would contaminate soils	Use containment and sealed surfaces to prevent soil contamination by fuels, oils etc.	All	Continuous
				Clean up any areas of soil contamination		Continuous
				Test areas for chemical contamination and ameliorate		Before final closure
				Sample soil underlying hazardous waste sites		Before final closure
				Cleaned areas should be free-draining and re-vegetated immediately		Continuous
1.1.4 A	Land capability	Reduction in land capability in other areas	To ultimately return the mined area to an arable land capability	Implement soil conservation and management measures, and replace stripped soil to a depth of 750 mm in re-profiled mined out areas	All	Continuous
				Re-establish surface drainage and a free draining land form		Continuous
				Implement soil protection and conditioning measures		Continuous
				Monitor rehabilitated areas to assess performance of the rehabilitation approach employed		Annually
1.1.4 B		Increased erosion in other areas	To minimise erosion	Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at	All	As needed

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				agricultural improvement to ensure benefits of compensation can be applied effectively		
1.1.5 A	Land use	Loss of access to land	To reduce the impact resulting from the loss of land or access to land, which results in a reduction in income, nutrition and food security	Provide monetary compensation to land owners, through the medium of a community trust	All	Continuous
				Arrange for technical assistance from developmental agribusiness specialists skilled in empowering communities, aimed at agricultural improvement to ensure benefits of compensation can be applied effectively	All	As needed
				Cooperate with the Department of Land Affairs and the local tribal communities in the development of an implementation strategy and plan to ensure effective implementation of mitigation	All	Continuous
				Reshape, topsoil and vegetate mined areas as described in	All	Continuous
				Replace topsoil to achieve a minimum depth of 750 mm	All	When needed
			To return the land to a similar condition to the pre-mining arable conditions	Ensure soil fertility levels are appropriate for arable use	All	When needed
1.1.5 B		Increased pressure on land		Ensure the slope of rehabilitated areas is less than seven degrees to enable arable use	All	During closure
				Where necessary, construct storm water control berms to prevent erosion	All	Before general construction
				Ensure soil fertility levels are appropriate for arable use		When needed
1.1.5 C		Clearance of new land in other areas	N/A as this falls outside the project boundaries			
1.1.6 A	Ecology	Damage to Terrestrial ecosystems	To reduce disturbances to vegetation and plant life within the demarcation zone	Limit the mine infrastructure footprint to reduce the area of influence	All	Continuous
				Protect trees not directly affected by the opencast area	15, 16	Continuous
				Develop a management plan for immediate	All	Before

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				clean-up in case of pollution incidents at streams, rivers and drainage crossings		construction start
				Fire breaks should be constructed and maintained along the inside of the blast exclusion zone	All	Construction phase and continuous
				Do not clear vegetation on the hills within the blasting safety zone	All	Continuous
				Do not allow mine personnel, or appointed contract staff, to harvest any indigenous vegetation from the hillside areas	All	Continuous
				Avoid unnecessary clearance of indigenous vegetation, such as trees in non-mining areas within the exclusion zone	All	Continuous
				Maintain the blast zone free of exotic vegetation	All	Continuous
			To re-vegetate areas disturbed by mining to prevent erosion	Following soil placement during rehabilitation, all top soiled areas should be seeded to encourage vegetation establishment	All	As needed
1.1.6 B		Damage to Aquatic ecosystems	To protect and reduce impacts on the general loss of habitat	The appropriate seed mixture should be used (2 kg/ha Erogrostis teff, 5 kg/Ha Smuts finger grass, 5 kg/ha Rhodes grass)	All	Continuous
				Do not use pioneering rhizomatous grasses (kweek / couch grass)	All	Continuous
				Protect all natural elements such as trees and rocky outcrops since they provide shelter for a variety of animals and reptiles	All	Continuous
				Limit the footprint of mine infrastructure, so as to reduce the area of influence of such infrastructure	All	Continuous
				No hunting or trapping should be allowed on the site or in the rocky outcrop and hill areas	All	Continuous
1.1.7 A	Surface water	Surface water quality	Limit the impact on the Olifants River during construction of the river diversions Dirty storm water designs to be compliant to Environmental	Construct river diversion infrastructure in the dry season	3	Construction phase
				Construct storm water management infrastructure to be compliant to environmental legislation	8,9, 25	Construction phase

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
			legislation To ensure compliance with GN 704 Regulations (or latest publication) To prevent discharges of contaminated water to the environment To prevent pollution of water resources in the vicinity of the project Recycle and re-use water where possible Ensure that storm water design complies with DWA regulations and have sufficient capacity Monitor on site surface water quality and quantity Reduce volume of potable water used	Design and manage all storm water infrastructure to comply with the regulations	8, 9, 25	Before construction start
				Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops); No other measures are required as the rest of the area is a “clean area”	All	Continuous
				Samancor will implement the surface water control measures in accordance with the requirements of Regulation 704 and the corresponding DWAF M6.1 Operational Guideline. These measures must be implemented during the commencement of the construction phase	8, 9, 25	Continuous
				There will be no discharges of dirty water from the mine site unless there is an extreme storm event, with a recurrence interval exceeding 1:100 years	7,8,9, 25, 26, 27, 28	Continuous
				The operating protocol is as follows: The Crushing and screening Plant beneficiation (including dust suppression) must take water from: The Return and/or Storm water dam unless it is empty; Water from the opencast sump unless it is empty; Water from Underground. Water for domestic purposes will be obtained from the Labalelo line. The above protocol must be strictly applied to comply with Regulation GN 704 of the National Water Act of 1998 and to minimise the water treatment and operating costs	All	Continuous
				Samancor will avoid contamination of soils and will implement appropriate remedial measures if incidents of spillage occur. Samancor will implement responsible waste management practices. Samancor will implement all management measures	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				pertaining to waste and water management as per the design reports		
				The water balance for the project will be refined on an on-going basis during the life of the project. Flow meters must be installed in the mine water circuit to enable refinement of the water balance. The water balance will be used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate, taking the operational distribution and use of water into account. An annual report on the project water balance will be submitted to DWA. This will provide information on the status of the water balance in the wet season and the dry season and under conditions of extreme rainfall	All	Annually
				Clean water diversion (bunds/ canals). Good housekeeping (clean-up of spills and minimise informal storage of materials) Isolate pollution sources with roofs, concrete bases, traps, sumps and bund walls (e.g. diesel/petrol storage, wash bays and workshops)	All	Twice per year (and before rainy season)
				Leak detection through inspection; Good housekeeping (maintenance of equipment); Infrastructure located within “dirty area”	4, 7, 8, 9, 14, 24 25, 26, 27, 28	Weekly
				Run-off from roads will be contained	1, 9, 25	Continuous
				Vehicle will be maintenance	All	Continuous
				Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them	All	Continuous
				Monitor quantities and qualities of all water that is discharged	4, 7, 8, 9, 24, 25, 26, 27, 28	As outlined in monitoring report
				Operate the storm water dam to have 0.8 m freeboard	8, 9, 25	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				Design sump with a 1:50 year holding capacity	8, 9, 25, 26	Before construction start
				Implement storm water management before land clearing start	8, 9, 25, 26	Before construction start
				Install toilets with a dual flush system and showerheads that reduce water use. Re-use "waste water" before using potable water in the beneficiation proses	All	Continuous
1.1.7 B		Surface water quantity	Reduce impact on catchment yield Return post mining topography to as close to pre-mining situations as possible Return surface water flow to original flow areas or as close as possible Design culverts and bridges so that the flood times and water retention do not impact on mining infrastructure Implement the selected river diversion strategy so that surface water quantity to the Olifants River (as the main River in the area) is not compromised Release underground water to the nearest water resource	Implement storm water management to divert clean water around the mining area	8, 9, 15	Before construction start
				Contour shaping of the opencast area to pre-mining topography as far as possible	All	During closure
				Implement rehabilitation strategy for the stream diversions	8, 9, 25	Construction phase
				Design all culverts and bridges with sufficient capacity	1,9, 25	Before construction start
				Clean water diversions (bunds and canals) will be constructed and maintained	9, 25	Continuous
				Implement the selected river diversion strategy as per the design document	9, 25	Construction phase
				Monitor water quality and if good discharge to the nearest water resource	4,7,8, 24, 25, 26, 27	Continuous
				Investigate water treatment options to treat poor quality water before discharge	4,7,8, 24, 25, 26, 27	Continuous
1.1.7 C		River characteristics (Beds, Banks, Course)	Minimize the impacts on the environment (ecological, economical, and social) due to the alteration of drainage patterns in the project area	In compliance with the GN 704 Regulations (or the latest publication), Samancor will divert clean runoff from its mine surface infrastructure and collect dirty runoff from the sites of infrastructure. It will ensure that its storm water collection facilities and dirty-water holding facilities are designed for the	9,25	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				1:50 year storm event and that erosion protection and appropriate energy dissipation structures will be provided at each discharge point. There will be no discharges of dirty water from the mine site unless there is an extreme storm event		
				ECM must apply for a Water Use Licence from the Department of Water Affairs before making any changes to the drainage lines	4,7,8,9	Before construction start
				The reinstated drainage lines will be constructed and maintained in such a manner to prevent any erosion of the banks or bed	9,25	During closure phase
			Minimize impact on riparian habitat and restore once mining has finalised	A 100 m buffer zone be placed alongside the “riparian” banks of all water courses and that no mining should occur within this area	All	Continuous
				The necessary mitigation be put in place to accommodate the storm water which would normally have been channelled and buffered by the streams flowing through the boundary and potential opencast areas	All	Continuous
				“Riparian” habitat should be monitored for the spread of invasive or alien species and eradicated where identified. Such a monitoring plan should be implemented immediately to eliminate alien species identify before they become too problematic. This will be especially important if the flow dynamics of the streams is changed due to discharged water from the site	All	Continuous
				As the streams are generally dry it is not suitable for SASS5 aquatic invertebrate assessment, it is thus proposed that diatom sampling be conducted (if the streams are flowing) before mining commences and as part of the monitoring plan for the mine	All	Continuous
				These sites should mainly consist of an	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				upstream and downstream point in the Matadi and Moopetsi Rivers and unnamed tributaries of the Moopetsi River		
1.1.8 A	Groundwater	Deterioration of groundwater quality during the construction phase: Oil, diesel and chemical spills	To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quality To minimise the impact of mining operations on other groundwater users in the area	It must be ensured that a credible company removes used oil after vehicle servicing	1-17	Continuous
				A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills	1-17	Continuous
				Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment	1-17	Continuous
1.1.8 B		Deterioration of groundwater quality during the construction phase: Contamination of mine material exposed during mine construction		Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed before constructing the coal handling facilities and adit(s)	1-17	Before mining starts
				Implement the EMP's of other environmental related aspects, including pollution prevention and impact minimisation	1-17	Continuous
				Groundwater monitoring boreholes should be sited with the aid of geophysics at designated positions based on final infrastructure layout, to comply with the design requirements of a groundwater monitoring system, as recommended	1-17	Before mining starts
				Groundwater monitoring boreholes should be installed to comply with the minimum requirements as set by governmental guidelines	1-17	Before mining starts
1.1.9	Air quality	Reduction in air quality due to the site construction	To control dust at the mine to the point where its contribution to overall air quality in the area would not be appreciable	Employ appropriate dust suppression measures on roads	All	Continuous
				Suppress dust at the crusher an run of mine tip by means of dust suppression sprays	All	Continuous
				Minimise the area of exposed soils	All	Continuous
				Damp down prior to blasting	15,16, 18	As needed
				Utilise correct blast design to minimise dust	15,16, 18	Continuous
				Compact and rehabilitate land surfaces as soon as practical and vegetate if appropriate	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				Install dust fallout monitoring buckets adjacent to the crusher and active mining area: 1 bucket between the crusher and community east of the mine 1 bucket between the mine pit and community west of mine 1 bucket between the mine pit and community east of mine	All	Continuous
				Install directional dust fallout buckets in order to distinguish between dust moving onto, or off, the mine site	All	Continuous
1.1.10 A	Noise & Vibration	Noise due to road transport	To limit the impact of noise from the mine site on adjacent communities	Construct screening berms at sensitive receptors	All	During construction phase
				Only work during daylight hours Monday - Friday	All	Continuous
				Maintain infrastructure, machinery and vehicle exhausts in good working order	All	Continuous
				A screen of suitable indigenous trees will be planted to screen the mining operations from the community east of the mine ad from the tar road	All	During construction phase
				Ensure all people are outside of the blast exclusion zone prior to blasting	All	Continuous
1.1.10 B		Noise due to construction activities	To minimise the startle effect of blast noise on the receiving public	Use electronic or Nonel detonators whenever possible	All	Continuous
				Develop and implement a blasting programme that defines a window of time when in the day blasting will occur	All	Continuous
				Communicate the blasting programme to the public and land owners	All	Continuous
			To minimise the risk to the public associated with blast fly rock	Fence the blast exclusion zone prior to commencement of mining	All	During construction phase
				Ensure that the blast exclusion zone is cleared prior to blasting	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				Announce all imminent blasts by means of a blast claxton/ siren	All	Continuous
1.1.10 C		Vibration due to construction activities		Implement additional safety measures when blasting within 500m of the Marula mine road, e.g. notification of blast times, temporarily interrupt traffic flows, patrol area, carry out blast, inspect road surface and remove material from road, reinstate traffic	All	Continuous
1.1.11	Visual	Visual impacts	To reduce the visual impact of the opencast mining pit and associated crushing equipment and infrastructure	Minimising the size and height of buildings and structures	All	Continuous
				Paint buildings and structures in colours to match surroundings	All	As needed
				Constructing screening berms from receptors; rehabilitate disturbed areas, as soon as practical, to match the surrounding land use	All	Continuous
				Manage trees in the screening barrier to ensure that, as the trees grow in size and the screening benefit of the tree barrier is not lost through the back	All	Continuous
1.1.12 A	Socio - Economic	Construction cost to Samancor	To assist communities in coping with the impacts	Assist communities to develop a community development strategy to address the potential impacts of the mining in the area	All	Continuous
1.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities		Establish, and communicate qualification criteria for, a bursary scheme for community members to focus on core mining skills	All	Continuous
				Mentor empowerment groups	All	Continuous
				Implement employment equity	All	Continuous
1.1.12 C		Restricted access to land and other destinations (obstruction)		Improved pedestrian access should be considered if any of the roads comprising the haulage route are upgrade, especially R37 (SANRAL)	All	Continuous
1.1.12 D		Increased pressure on water supply and sanitation as a result of inward migration		Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population growth (Samancor Chrome)	All	Continuous
				Provide additional formal water supply	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				infrastructure to affected communities from the Labalelo pipeline (Department of Water Affairs)		
				Provide formal sanitation or semi-permanent sanitation facilities to affected communities (Government or aid agency)	All	Continuous
				Provide technical training to selected community members to allow them to operate boreholes and pumps effectively and to fix them when in need of repair (Samancor Chrome)	All	Continuous
1.1.12 E		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration		Assist community chiefs and representatives to develop a strategy to limit and manage possible inward migration and population	All	Continuous
1.1.12.F		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation		Advertise and disseminate information regarding the low employment prospects at the mine, to minimise inward migration and pressure on supplies (Samancor Chrome)	All	Continuous
1.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land		Provide monetary compensation to land owners to provide for purchase of food, through the medium of a community trust	All	Continuous
1.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources		Cooperate with the Department of Land Affairs in the development of an implementation strategy and plan to ensure effective implementation of mitigation, especially monetary compensation and technical training	All	Continuous
1.1.12 I		Increase in road safety risks due to		Enforce good driving standards	All	Continuous
				Communicate to the communities the nature	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
		increased road traffic		of existing groundwater quality issues with respect to nitrate and discuss possible measures to address the problem		
				Make alternative water supplies available to affected communities if monitoring shows a significant increase in nitrate concentrations	All	Continuous
				Provide additional formal water supply infrastructure e.g., planned Labalelo pipeline community supply	All	Continuous
				Provide additional medical facilities to affected communities (government or aid agency)	All	Continuous
				Assist in the promotion of a health education campaign, covering water and sanitation	All	Continuous
1.1.12 J		Increase in noise and vibration	Refer to Noise assessment			
1.1.12 K		Reduction in sense of place	Refer to Visual assessment			
1.1.13 A	Archaeological / Cultural	Destruction of or damage to archaeological remains and loss of information	To reduce the impact resulting from the destruction of, or damage to, archaeological remains	Avoid disturbance of archaeological remains, graves and human remains as far as possible	All	Continuous
				Demarcate and protect sites within the exclusion zone that need not be directly disturbed	All	Continuous
				Undertake archaeological investigations of the remains prior regulatory requirements	All	Continuous
				Immediately report any finds during mine development and operation, and avoid disturbance until they are examined by regulatory authorities	All	Continuous
1.1.13 B		Disturbance of graves and human remains		As above	All	Continuous
2	**Operational phase**					
2.1.1	Geology	Disturbance of in-situ geology	Refer to Ref. 1.1.1	No additional mitigation other than as described in Construction phase	18,19	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
2.1.2	Topography	Alteration of topography	Refer to Ref. 1.1.2	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.3 A	Soil	Disturbance of soils	Refer to Ref. 1.1.3 A	No additional mitigation other than as described in Construction phase	18, 22, 23, 24, 26	Continuous
2.1.3 B		Reduction of viability of soils in stockpiles	Refer to Ref. 1.1.3 B	No additional mitigation other than as described in Construction phase	22	Continuous
2.1.3 C		Soil contamination due to spills	Refer to Ref. 1.1.3 B	No additional mitigation other than as described in Construction phase	18,19,20,21	Continuous
2.1.4 A	Land capability	Reduction in land capability in other areas	Refer to Ref. 1.1.4	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.4 B		Increased erosion in other areas			All	Continuous
2.1.5 A	Land use	Loss of access to land	Refer to Ref. 1.1.5	No additional mitigation other than as described in operational phase	All	Continuous
2.1.5 B		Increased pressure on land		No additional mitigation other than as described in operational phase	All	Continuous
2.1.5 C		Clearance of new land in other areas		No additional mitigation other than as described in operational phase	All	Continuous
2.1.6 A	Ecology	Damage to Terrestrial ecosystems	Refer to Ref. 1.1.6	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.6 B		Damage to Aquatic ecosystems		No additional mitigation other than as described in operational phase	25	Continuous
2.1.7 A	Surface water	Surface water quality	Refer to 1.1.7	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.7 B		Surface water quantity		No additional mitigation other than as described in operational phase	All	Continuous
2.1.7 C		River characteristics (Beds, Banks, Course)		No additional mitigation other than as described in operational phase	9, 25, 33	Continuous
2.1.8 A	Groundwater	Groundwater quantity-lowering of groundwater table and impact on water supply of groundwater users	To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base	Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one to two kilometres surrounding the opencasts to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be	18, 19	Quarterly

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
			flow in terms of water quality To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quantity To minimise the impact of mining operations on other groundwater users in the area.	reacted on appropriately		
				If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply	All	As needed
				The numerical model should be updated during mining by using the measured water ingress, water levels, mining and geophysics information to re-calibrate and refine the impact prediction	All	proposed within 2 years of mining and every 5 years thereafter
2.1.8 B		Groundwater quantity-lowering of groundwater table and potential impact on base flow of streams		As above	18, 19	
2.1.8 C		Groundwater quality - Contamination of groundwater and deterioration of quality down gradient of the mining operations		Mine sections should be sealed where possible during mining to reduce the contact of water and air with remaining sulphides	18-28	As needed
				All potential sources of pollution, such as tailings and pollution control dams should be lined to prevent ingress of contamination into the groundwater system	25,26,27,28	Continuous
				Install water collection and pumping systems within the mining areas capable of rapidly pumping water out, so minimising contact of water with the geochemically reactive material	18,19	Continuous
				Clean and dirty water systems should be separated	All	Continuous
				Groundwater quality must be monitored on a quarterly basis	All	Quarterly

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				The monitoring results must be interpreted annually by a qualified hydro geologist and the monitoring network should be audited annually to ensure compliance with regulations	All	Annually
				Numerical groundwater model must be updated by calibrating the model with monitoring data	All	Proposed within 2 years of mining and every 5 years thereafter
				Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine	All	Continuous
2.1.8 D		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of Oil, diesel and chemical spills/leaks from machinery and storage facilities		It must be ensured that a credible company removes used oil after vehicle servicing	18-28	Continuous
				A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills		Continuous
				Store all potential sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment		Continuous
2.1.8 E		Groundwater quality - Contamination of groundwater and deterioration of quality as a result of sewage related contamination		Sewage effluent emanating from latrines or ablution blocks should be treated to acceptable levels before discharge into the environment	27, 28	Continuous
2.1.9 A	Air quality	Reduction in air quality due to site operations	Refer to Ref. 1.1.9	No additional mitigation other than as described in Construction phase	18, 20, 21, 22, 23, 24, 26	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
2.1.9 B		Reduction in air quality due to dust from ore haulage trucks		No additional mitigation other than as described in Construction phase	18,19, 20, 21, 23	Continuous
2.1.10 A	Noise & Vibration	Noise due to general production activities	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.10 B		Noise due to blasting	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	18, 19	Continuous
2.1.10 C		Noise due to road transport	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.10 D		Vibration due to blasting	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	18, 19	Continuous
2.1.10 E		Vibration due to general production activities	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.11	Visual	Visual impacts	Refer to Ref. 1.1.11	No additional mitigation other than as described in Construction phase	All	
2.1.12 A	Socio - Economic	Operating cost to Samancor	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities		No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 D		Reduced water level in Madikane supply borehole and effect on yield	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
		on water supply and sanitation				
2.1.12 F		Increase in methemoglobinemia due to possible increased nitrate in boreholes	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 G		Reduction in nutrition and food security as a result of loss of access to subsistence agricultural land	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 H		Poorer health care as a result of inward migration and increased pressure on medical resources	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 I		Increase in sexually transmitted disease and HIV/Aids as a result of inward migration	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 J		Increase in noise and vibration	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 K		Increase in traffic	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	All	Continuous
2.1.12 L		Reduction in sense of place	Refer to Ref. 1.1.11	No additional mitigation other than as described in Construction phase	All	continuous
2.1.13	Archaeological / Cultural	No additional impact	Refer to Ref. 1.1.13	No additional mitigation other than as described in Construction phase		Continuous
3	**Rehabilitation, Closure and post closure phase**					
3.1.1	Geology	Disturbance of in-situ geology	Refer to Ref. 1.1.1	No additional mitigation other than as described in Construction phase		
3.1.2	Topography	Alteration of topography	To create a closure topography where no residual change of the area following	Minimise the mine footprint and degree of disturbance	All	Continuous
				Backfill final voids using material in the	29, 30	During

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
			decommissioning and closure of the mine is noticeable	waste rock dumps		closure
				Deplete and clear the chromite stockpiles at the completion of mining	32	During closure
				Blend rehabilitated surfaces with surrounding topography	All	During closure
			The objective for closure is to create a free draining post mining landscape that has been returned to a productive post mining land use	No fixed infrastructure will be established on the Lwala Chromite Mine site. Service infrastructure will be removed on cessation of mining	31	During closure
				Mine residue deposits will be vegetation and inspected annually. Storm water infrastructure around waste deposits will be maintained and inspected annually	32,33	Con
				Underground workings adits will be sealed.	30	As needed
				Rehabilitation of the opencast mined areas on site will follow the mining cut and be completed within the operational phase of the project. Box cut spoils will be used to close the final void. The entire mined pit area will be in filled and covered with usable soil and returned to agricultural use	29	Continuous
				With the exception of the mine residue sites it is not anticipated that any post mining maintenance on the established vegetation community will be necessary because the land will return to community use as subsistence agricultural land. The tufted grass community established during rehabilitation to stabilise the site and limit soil erosion from site is likely to be ploughed up by the community, on return of the land, in preparation for planting of food crops	32,33	During closure
				With regards to the opencast pit area it is not anticipated that significant or large scale surface subsidence will occur associated with the opencast mined block because the spoils will be deposited by truck and the	29	during closure

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				spoil areas will grow incrementally. Some minor and localised settlement may occur. However, the pit is located on a very gentle north-facing slope and local settlement is unlikely to result in ponding of water. Should localised small depressions form, they will be in filled with useable soil and the disturbed area re-vegetated		
3.1.3 A	Soil	Mixing and dilution of soils	Refer to Ref. 1.1.3	No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.3 B		Erosion of replaced soils	Refer to Ref. 1.1.3	No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.3 C		Reduction of viability of replaced soils	Refer to Ref. 1.1.3	No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.4	Land capability	Reduction in land capability when available once more	To return the mined area to an arable land capability that is self-sustaining	Refer to Ref. 1.1.4	All	Continuous
				Monitor rehabilitated areas annually to assess performance of the rehabilitation approach employed in order to identify:	All	Annually
				- occurrence of surface erosion		
				- vegetation die back		
				- to establish whether salinization of soil is occurring		
				- fertility status of rehabilitated land		
				- the emergence of alien / exotic vegetation		
3.1.5	Land use	Loss of access to land	Refer to Ref. 1.1.5	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.6 A	Ecology	Damage to Terrestrial ecosystems	Refer to Ref. 1.1.6	Refer to Ref. 1.1.6	All	Continuous
			To return the land to a similar condition to the pre-mining arable conditions	Seed all top soiled areas during rehabilitation to encourage vegetation growth	All	During closure phase
3.1.6 B		Damage to Aquatic ecosystems		No pioneering rhizomatous grasses such as *Cynodon dactylon* should be used as these species will pose problems for later agricultural cropping of the land	All	Continuous
3.1.7 A	Surface water	Surface water quality	Refer to Ref. 1.1.8	Maintenance will be required on structures such as storm water diversion channels and berms associated with the routing of storm	9,32,33	During and after closure

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				water around the operating pit and mining infrastructure areas.		
3.1.7 B		Surface water quantity	To ensure that water pollution control structures remain functional and serve the design requirements. To ensure that vegetation cover is established over the waste storage areas (residue deposits)	The structures will be inspected regularly and maintenance work carried out as required.	9, 32, 33	During and after closure
				Inspections will take place immediately prior to the rainy season.	9, 32, 33	During and after closure
				Vegetation of residue deposits must be carried out as described for the general area above with topsoil and vegetation establishment.	32, 33	During and after closure
				Vegetation must be investigated annually.	32, 33	During and after closure
3.1.7 C		River characteristics (Beds, Banks, Course)	Refer to Ref. 1.1.8	No additional mitigation measures other than as indicated in the construction phase	33	Continuous
3.1.8 A	Groundwater	Decant	To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quality To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quantity To minimise the impact of mining operations on other groundwater users in the area.	N/A	29, 30, 33	Continuous
3.1.8 B		Groundwater quantity – change in groundwater level and the potential (positive) impact on base flow of streams- (not predicted)		All sulphate containing waste material should be stored underground and flooded as soon as possible to exclude oxygen	29-33	As needed
				Major underground fractures encountered while mining must be sealed by grouting, both on inflow and outflow areas	19, 30	As needed
3.1.8 C		Groundwater quality: Deterioration of groundwater quality down gradient of the mining operations due to plume movement		All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite	29-33	Continuous
				The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas	29	Continuous
				The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge to the opencasts	29	Continuous
				Groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends: Quarterly	All	Quarterly

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
				Audit the monitoring network annually	All	Annually
				Conduct a final update the numerical model to predict post mining impacts on the groundwater regime and to access potential liabilities	All	During closure phase
3.1.8 D		Groundwater quality deterioration as a result of contaminants emanating from historic Oil, diesel and chemical spills and facilities		Remove or remediate areas of hydrocarbon contaminated soils by following a risk based approach, take action if a negative risk is found. A risk assessment should be conducted by a qualified hydro-geologist	29-33	Continuous
		General		A detailed mine closure plan should be prepared during the operational phase, including a risk assessment, water resource impact prediction etc. as stipulated in the DWA Best Practice Guidelines: Before final closure	29-33	Before final closure
				The implementation of the mine closure plan, and the application for the closure certificate can be conducted during the decommissioned phase	All	During closure phase
3.1.9 A	Air quality	Reduction in air quality due to rehabilitation works and exposure of rehabilitated surfaces	Refer to Ref. 1.1.9	No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.9 B		Cumulative reduction in air quality		No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.10	Noise & Vibration	Noise due to rehabilitation and closure activities	Refer to Ref. 1.1.10	No additional mitigation other than as described in Construction phase	29-33	Continuous
3.1.11	Visual	Visual impacts	Refer to Ref. 1.1.11		All	Continuous
3.1.12 A	Socio - Economic	Decommissioning and Closure cost to Samancor	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
3.1.12 B		Strengthening of regional and local economy due to the income and knock on opportunities	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 C		Increased pressure on water supply and sanitation as a result of inward migration	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 D		Reduced water level in Madikane supply borehole and effect on yield	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 E		Increase in water-borne diseases, as a result of inward migration and increased pressure on water supply and sanitation	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 F		Increase in health risk due to increased nitrate in borehole water	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 G		Poorer health care as a result of inward migration and increased pressure on medical resources	Refer to Ref. 1.1.12	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.12 H		Reduction in sense of place	Refer to Ref. 1.1.11	No additional mitigation other than as described in Construction phase	All	Continuous
3.1.13	Archaeological / Cultural	No additional impact	Refer to Ref. 1.1.13	No additional mitigation other than as described in Construction phase	All	Continuous
4	**All phases**					
4.1.1 A	Groundwater	General	To minimize the potential impacts to shallow groundwater resources in	All the monitoring data needs to be collated and analysed on at least a bi-annual basis and included in management reports. This	All	Bi-annually

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
			proximity to the mining activities and the nearby surface water resources base flow in terms of water quality	information will also be required by government departments (Department of Water Affairs, Department of Environmental Affairs) for compliance monitoring: Bi-annually		
			To minimize the potential impacts to shallow groundwater resources in proximity to the mining activities and the nearby surface water resources base flow in terms of water quantity	After 2 years from start of mining, the monitoring information collated should be used to update the groundwater flow and geochemical models. These models should thereafter be updated so that sufficient mitigation measures can be implemented. Management and mitigation plans should be continuously adapted using the monitoring data: propose within 2 years of mining starting and thereafter every 5 years	All	After 2 years of mining and thereafter every 5 years
			To minimise the impact of mining operations on other groundwater users in the area	As described in Ref. 1.1.7 and 2.1.7 and 3.1.7	All	Continuous
4.1.1 B		Acid mine drainage	No mitigation needed as potential to generate AMD is low, however proper lining systems for tailings dam must be implemented and dirty storm water generated on site must be kept on site in suitably constructed dams		7, 16, 18, 19, 23, 26, 29, 30, 32, 33	Continuous
4.1.2 A	Socio - Economic	Loss of income from agriculture land	To assist the communities in coping with the identified impacts	Provide monetary compensation to land owners, through the medium of a community trust	All	Continuous
4.1.2 B		Economic impact of supporting other households		Cooperate in the development of an implementation strategy and SMMEs	All	Continuous
4.1.2 C		Population growth		Maximise local employment creation and targeted local procurement	All	Continuous
4.1.2 D		Relocation of households		Provide assistance with technical training (at schools & in-house), capacity building and skills development	All	Continuous
4.1.2 E		Increased pressure on existing infrastructure		Apply appropriate social investment funding	All	Continuous
4.1.2 F		Social conflict due to possible inward		Assist community chiefs and representatives to develop a strategy to limit and manage	All	Continuous

Ref.	Aspect	Impact	Objectives	Mitigation measures	Activity	Time allocated
		migration of outsiders, associated effects and competition for benefits within and between communities		possible inward migration and population growth		
				No relocation will be required	All	Continuous
				Possible provision of additional infrastructure by external (government or aid) agency	All	Continuous
				Control (mitigation) of these effects must come from within the existing community structure	All	Continuous
				Assist communities to develop a community development strategy to address the potential impacts	All	Continuous
				Avoid the establishment of a common trust account for the affected communities. Compensation issues will need to be dealt with separately for each community	All	Continuous
				Facilitate better communication between mine & communities revision of the composition of Clapham Community Working Committee and to function more effectively	All	Continuous
				Provide training to the Clapham Community Working Committee in respect of its key functions	All	Continuous

7 Procedures for environmentally related emergencies and remediation (An environmental emergency plan that includes all the items referred to in the concomitant section of the guideline posted on the official website of the Department)

7.1 Ongoing monitoring and management measures to provide early warning systems

Generally the possible environmental emergencies that have been identified are:

- The spillage of water from the return/storm dams during a rainfall event larger than 1:50 years flood event. For the reason that the site will be enclosed with a storm water system with pollution control dams, it is possible that the water quality in the pollution control system may be unfit for environmental release.
- Spillage of untreated sewage from source to the waste water treatment works could result in environmental degradation should this water reach a watercourse.It could also impact on groundwater quality. The same goes for the release of poorly treated sewage effluent and if the plant is not sealed correctly and seepage occurs to the groundwater resouces.
- Tailings dam wall breakage may occur if the friatic line moves to above the started wall and as the location of the proposed tailings dam is approximately 100 m from the unnamed tributary of the Moopetsi River. Environmental degradation could occur should the spill reach the watercourse.

As an ISO14000 accredited company Samancor Eastern Chrome Mines has a formal Environmental Emergency Plan which will be adhered to and implemented at all times. The following is thus general monitoring and management measures that needs to be implemented for the above identified Environmental Incidents.

It must be ensured that the pollution control dams are operated at minimum level to allow for sufficient capacity should a 1:50 year rainfall event occur in the area. As per Regulation 704 (R.77 of 2010) the storm water system will be designed cater for a 1:50 year flood event without spilling. Daily level monitoring will be conducted to ensure that the system is managed in such a manner to ensure sufficient capacity.

Sewage pipelines to the Waste Water Treatment Works must be inspected on a weekly basis to ensure that there are no leaks or spills from the pipeline or the manehols. Inflow into the WWTW needs to be monitored on a daily basis as well as outflows. Final effluent quality must be taken on a monthly basis to ensure proper functioning of the works.

With regards to the Tailings dam the rate of rise must be monitored on a weekly basis and daily

inspections of the walls of the tailings dam must be conducted.

7.2 Emergency procedures

In the case of any spill (poor qualiity water / tailings) reaching a watercourse Samancor Chrome will immediately (within 24 hours) notify the Department of Water Affairs, the Eastern Chrome Mines Environmental Department will collect samples of the spilled material or the effluent being discharged as well as in up- and downstream locations of the receiving water resource. A Pollution Incident Report will be compiled and submitted to the DWA as per departmental requirements. The volume of effluent released will also be recorded on a daily basis. The report submitted to the DWA must also include remediating measures to rehabiliate the affected watercourse.

In the event of a tailing dam wall failure the following Departments will be notified within 24 hours:

- Department of Water Affairs;
- Department of Mineral Resources;
- Local Municipality;
- Local Police.

The following will also be implement:

- Production will cease unless a second tailings dam is available to receive the waste product;
- Spilled tailings will be removed and returned to the tailings dam;
- The tailings dam will be repaired;
- An investigation into why the wall failed will be conducted and the findings will be forwarded to the DWA and DMR.

7.3 Technical, management and financial options

Samancor ECM includes various environmental aspects into their annual budget and the current annual environmental management costs for the existing ECM mines (Lannex, Doornbosch and Tweefontein) are currently running at R4 384 000. This includes salaries, bonusses, pensions, UIF and skills development for the Environmental Department. Also included in this cost is costs for conducting specialist studies and the monitoring water resources.

Samancor ECM also has a fund for closure costs and concurrent rehabiliation at all each sections.

8 Planned monitoring and environmental management programme performance assessment

8.1 Description of planned monitoring of the aspects of the environment which may be impacted upon (Include all the items referred to in the concomitant section of the guideline posted on the official website of the

Department)

As the main implementors the Environmental Department of ECM must ensure that they keep electronic records off all the monitoring to be conducted on site as outlined below.

8.1.1 Surface Water Monitoring -

Five possible watercourse quality and quantity monitoring points as indicated below is proposed.

Sampling point	Coordinates	Chemical Water Quality	Flow (Visual confirmation only)	Diatoms**	SASS5
SWM 1	S-24.494910º E 30.101401º	Monthly	Monthly	Once per year when flowing	N/A
SWM 2	S-24.476655º E 30.081156º	Monthly	Monthly		
SWM 3	S-24.457800º E 30.074982º	Monthly	Monthly		
SWM 4	S-24.483023º E 30.112256º	Monthly	Monthly		
SWM 5	S-24.454090º E 30.086854º	Monthly	Monthly		
SWM 6*	S-24.442780º E 30.051440º	Monthly	Monthly	Twice per year (1 wet season, 1 x dry season)	Twice per year (1 wet season, 1 x dry season)
SWM 7*	S-24.411087º E 30.075123º	Monthly	Monthly		
SWM 8* (Fountain)	S-24.419º E 30.073º	Monthly	N/A	N/A	N/A
* These sites were added as a result of the potential pollution plume in the shallow aquifer that could reach the Motse River as indicated in the 2013 Groundwater assessment report (**Appendix 8**). ** Only if expertise is available in South Africa.					

Water quality monitoring is to be conducted by the environmental department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples or a separate independent specialist contractor. The water quality must comply with the Resource Quality Objectives (RWO) as set by DWA for the receiving environment. In the instances where the resulting water quality does not comply with the RQO Eastern Chrome Mines will compile a Catchment Assessment report coupled with a Water and Salt Balance to trace the origin of the potential pollution source.

In addition, monitoring of the water quality in the storm and/ or Return water dam(s) will be done on a quarterly (October, January, April, July) basis and include the variables as specified below. The water quality will be representative of:

- Seepage/run off from the mining areas;
- Seepage from waste rock dump;
- Dewatering of the mining areas;
- Run off from the waste rock dump.

Diatom monitoring to be done only if available in South Africa at that stage. If not then a visual assessment of the integrety of the streams needs to be done on an annual basis. As per DWA

requirements, the monitoring will be conducted by a DWA Accredited field technician using the IHAS and SASS5 methodologies. This will be used to define the present ecological state as well as the ecological sensitivity class, allowing a comparison of the state of the river as defined by DWA.

Water quality parameters that needs to be monitored are:

Variable	Unit
Aluminium as Al	mg/l
Calcium as Ca	mg/l
Chloride as Cl	mg/l
Chromium^{3+}	mg/l
Chromium^{6+}	mg/l
Electrical Conductivity as EC	mS/m
Fluoride as F	mg/l
Iron as Fe	mg/l
Magnesium as Mg	mg/l
Manganese as Mn	mg/l
Nitrate as NO_3	mg/l
pH	
Potassium as K	mg/l
Phosphate as P	mg/l
Sodium as Na	mg/l
Sulphate as SO_4	mg/l
Suspended solids as SS	mg/l
Total alkalinity	mg/l
Total Dissolved Solids as TDS	mg/l
Total hardness as $CaCO_3$	mg/l

The following points also need to be monitored (this is generally done by the contractor on site or the plant manager):

- Water levels of storm water dam(s): Daily.
- Volume of waste rock generated: Weekly (summed at the end of each month).
- Water pumped from the storm and / or return water dam(s) to the plant and mining areas (Daily, summed at the end of each month).
- Water inflow to the plant (Daily, summed at the end of each month).
- Water pumped from the opencast to the storm water dam (if present) (Daily, summed at the end of each month).
- Potable water abstracted from the Lebalelo water pipeline (Daily, summed at the end of each month).

As indicated the monitoring indicated above is to be conducted by environmental department of Eastern Chrome Mines together with plant manager/supervisor or the appointed contractor. All data is to be kept electronically by the Environmental Department for compliance against the conditions of the Water Use License. In addition, the data is critical for a salt and water balance and required as per licence conditions (as expected from DWA).

DWA may also request toxicity testing of the water in the Storm / Return Water dams on a quarterly basis. The samples can be collected by the ECM Environmental Department but test must be conducted by an accredit laboratory.

8.1.2 Groundwater monitoring -

The following groundwater monitoring plan is proposed.

Sampling point	Coordinates	Water Levels	Chemical Water Quality	Frequency
BH9	-24.399ºS 30.019ºE	X	X	Quarterly
BH10	-24.406ºS 30.008ºE	X	N/A	Quarterly
BH11	-24.389ºS 30.011ºE	X	N/A	Quarterly
BH12	-24.402ºS 30.044ºE	X	X	Quarterly
BH13	-24.399ºS 30.058ºE	X	X	Quarterly
BH28	-24.421ºS 30.075ºE	X	X	Quarterly
BH30	-24.444ºS 30.093ºE	X	X	Quarterly
BH31	-24.474ºS 30.122ºE	X	N/A	Quarterly
BH32	-24.483ºS 30.114ºE	X	X	Quarterly

The parameters for quality is the same as for the surface water. However, the following needs to included where applicable:

- Petroleum hydrocarbon contaminants (near workshops and petroleum handling facilities).
- Sewage related contaminants (E.Coli, faecal coliforms) in borehole in proximity to septic tanks or sewage plants.

With the exception of boreholes BH12, BH28 and BH32 the above monitoring boreholes only measure the regional groundwater situation. It is thus also recommended that 10 new monitoring boreholes be drilled around each potential pollutant upstream and downstream of the site. These boreholes should be drilled as close possible to the opencast and monitored appropriately. Construction of these boreholes should be overseen by a qualified hydrogeologist to monitor the upper weathered as well as lower fractured aquifer.

The monitoring network should be dynamic and thus should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.

8.1.3 Air Quality Monitoring -

The main pollutant that would need to be monitored is dust fallout as dust will be generated during the construction and operational phase. It is thus recommended that a dust fallout monitoring programme be initiated by the Lwala mine in alignment with the American Society for Testing and Materials standard method for collection and analysis of windblown dust deposition (ASTM D1739) with at least 12 dust fallout buckets around the proposed mining operations.

In addition a fine particulate monitoring programme, which will include at least one particulate monitor to monitor PM10 from the mining site needs to be established. This unit will measure wind speed, wind direction, air temperature, barometric pressure and precipitation. This unit should be installed at least one year prior to the construction phase to allow for the collection of a baseline data set.

A meteorological station on site needs to be installed.

Work to be completed by environmental department of Eastern Chrome Mines using an independent laboratory for the analysis of the samples and data (annual report) or a separate independent specialist contractor (Approved Inspector Authority). The data is to be compared with the guidelines as set by the Department of Environmental Affairs in terms of the National Environmental Management Act: Air Quality Act and its Regulations.

8.1.4 Noise Monitoring -

Measurements to be made using the equivalent continuous A-weighted sound pressure level, $L_{AEQ,I}$, in accordance with the South African Bureau of Standards (SABS) code of practice for noise measurement and assessment, SANS 10103:2004.

The number of complaints with regards to noise must be logged, including the name of the receptor, the location, nature of sound and the time when the noise were experienced.

Bi-annual noise monitoring should take place over a 24 hour period at the location of the two closest receptors.

Occupational noise monitoring as per OSHA requirements must be done by an approved Inspectorate Authority with environmental noise done by an Acoustic specialist. Environmental noise to be measured at the boundary of the site as well as the closest receptors simultaneously during a period where noise may be highly detectable (such as night if the noise is generated at night). Noise levels should comply with the National Noise Control Regulations as well as the Urban Noise Rating Level as defined in SANS 10103:2008.IN the case of non-compliance Samancor must implement measures to reduce noise levels as to comply with the set standards.

8.1.5 Waste Monitoring -

Cumulative mine waste rock produced, product send for beneficiation, domestic waste produced, tailings waste disposed on the tailings dam, all hazardous waste produced (type, method of disposal and to where) and any other waste disposed must be recorded on a monthly basis, e.g.sewage waste, domestic waste, used oil.

Monitoring to be done by the environmental department of Eastern Chrome Mines together with plant manager/supervisor and appointed contractors.

8.1.6 Vegetation monitoring

The establishment of vegetation during all mining phases needs to be investigated for the presence of alien invasive species.This assessment should be done on a yearly basis.

8.2 Provide a description as to how the implementation of the action plans contemplated in regulation 51 (b) (ii) as described will be monitored as described in paragraph 6 of the EMP will be monitored

Due to the extreme importance of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002): Minerals and Petroleum Resources Development Regulations (R527), and to ensure that the construction, mining and processing operations are in accordance with current legislation, Samancor Chrome will audit the EMPR and environmental performance in accordance with regulation 55 on an annual basis.

In addition the requirments of the Water Use License and Environmental authorisations (to be appleid for) will require annual internal and external audits to be conducted for the period of which the license or authorisation is valid.

8.3 Frequency of proposed reporting for assessment purposes

A performance audit report will be submitted to the DMR after the audit done every second year.

Generally the Water use license require that an internal and external audit be conducted on an annual basis and the external audit report will be forwarded to the DWA.

In addition it is expted that the Environmental Authorisation will require bi-annual external audits to be conducted and these reports will be forwarded to the Department of Environmental Affairs. It should be noted that the frequency of these audits may be changed depending on the conditions of the Environmental Audit.

9 Financial provision in relation to the execution of the environmental management programme:-

Samancor ECM appoints contractors in January every year to determine the financial provision needed based on the current infrastructure on site and using the previous years master rates. As a result the 2013 financial provisioning will only be available in 2014 and will thus be submitted to the DMR in a separate report.

9.1 Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes anticipated (Include all the items referred to in the concomitant section of the guideline posted on the

official website of the Department)

Please refer to Error! Reference source not found..

9.2 Annual forecasted financial provision calculation (Refer to the concomitant section of the EIA and EMP guideline)

The closure costing was based on a scheduled closure in terms of the rates used by Golder for the 2012 evaluation and these rates was then escalated at an annual rate of about 5%. It will be required that this closure costing's be reviewed on an annual basis one the mining commences. The costs are based on the surface plan made availbale in 2012 and some assumptions as made:

Year 0: 2012 (As conducted by Golder)	-	R 4 352 863.32
Year 1: 2013	-	R 19 775 085.85
Year 2: 2014	-	R 21 389 056.58
Year 3: 2015	-	R 23 136 825.48
Year 4: 2016	-	R 25 029 484.41
Year 5: 2017	-	R 27 079 044.78
Year 6: 2018	-	R 40 079 805.99
Year 7: 2019	-	R 43 377 038.02
Year 8: 2020	-	R 46 947 610.57
Year 9: 2021	-	R 50 814 183.60
Year 10: 2022		R 55 001 295.52

9.3 Confirmation of the amount that will be provided should the right be granted

Estimated amount after first year of operation, R 4 352 863.32

9.4 The method of providing financial provision contemplated in Regulation 53

Samancor have a combined trust fund known as the "Samancor Rehabilitation Fund". Each operation has a breakdown of their relative funds, with all the various operations contributing to this central fund for their rehabilitation requirements. The total amount in the fund was R57,4 million as on the 1st of June 2007.

Eastern Chrome Mines will increase their rehabilitation trust fund on an annual basis after an Closure

quantum has been done.It is expected that for the Lwala section an additional R 4 352 863.32 will have to be added to the fund.

10 Environmental Awareness Plan (Section 39 (3) (c)) (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department)

ECM has developed formal procedures for environmental awareness as documented in their ISO 14000 system. This procedure defines the process for identifying and planning environmental training and awareness. It pertains to all employees and contractors whose work may create a significant impact upon the environment.Personnel performing the tasks, which can cause significant environmental impacts shall be competent on the basis of appropriate education, training and/or experience.

This environmental awareness is relevant to all areas and department within Eastern Chrome Mines.

Training records and Needs Analysis Matrix are completed and maintained to identify the level of instruction needed by personnel whose jobs may create a significant impact on the environment.

Environmental awareness shall be implemented as specified in ECM circular SHE-E009: Environmental Communication and Complaint Handling Procedure.

Environmental awareness is part of the induction programme that is compulsory to all new, part-time and transferred employees, as well as onsite contractors.

Three basic categories of training are required. The first is induction training, the second is environmental awareness training and the third is technical training. All people entering the site are required to complete the induction training.

Environmental awareness training are further divided into Level 0 (Contractors), Level 1 (C-Lower grade to A grade) and Level 2 (C-Upper up to E-grade).

Environmental training is divided into Level 3 (Operational Training), Level 4 (Specialist training – ISO 14001 auditing course), Level 5 (Internal auditors – external companies) and Level 6 (Strategic and Risk Management Training).

- Level 0 training levels includes: Team briefings; General environmental awareness covering specific do's and don'ts; Monthly topics.
- Level 1: Induction training to all ECM staff.
- Level 2: The environmental policy of ECM; Impacts that ECM may have on the environment; Roles and responsibilities in achieving conformance with the Environmental policy; the training is in the form of a video and team briefings.

- Level 3: Awareness training covers the principles, legislation and reasons for an Environmental System and the requirements of the ISO 14001 standard; Short training sessions for senior personnel.
- Level 4: Technical training given to operational personnel whose activities have a direct influence on significant environmental aspects; Training based on the relevant controls as per the Aspect Register.
- Level 5: Course given by an external training organization; Training material is examinable and will cover the Environmental Management Systems Auditing relevant to the internal auditors (EMS).
- Level 6: Strategic and Risk Management Training.

The standard operating procedures with regards to Environmental training and awareness as well as Environmental Communication and compliant handling is provided in Appendix 20.

11 Attachment of specialist reports, technical and supporting information (Provide a List)

The following specialist studies were conducted:

- Appendix 4: Mine works plan (2012);
- Appendix 5: Air Quality Assessment (2009);
- Appendix 6: Ecological Assessment (2003);
- Appendix 7: Flood line determination (2003, 2013);
- Appendix 9: Heritage Assessment (2003);
- Appendix 10: Noise and Vibration Assessment (2003);
- Appendix 11: Social Assessment (2003);
- Appendix 13: Traffic Assessment (2003);
- Appendix 14: Visual Assessment (2002);
- Appendix 15: Surface Water Assessment (2003, 2013);
- Appendix 16: Social and Labour Plan (2012);
- Appendix 17: Closure cost estimates (2012);
- Appendix 18: Closure cost estimates per year (Tables only and based on assumptions 2013).

12 SECTION 39 (4) (a) (iii), Capacity to manage and rehabilitate the environment (Include all the items referred to in the concomitant section of the guideline posted on the official website of the Department)

Current annual environmental management costs for the existing ECM mines (Lannex, Doornbosch and Tweefontein) are currently running at R4 384 000. Based on the complexity and size of this

development it is estimated that the environmental budget would be approximately 50% of this amount with the following components (seen as operational costs but with a separate budget).

- Salary - Normal R 478 730
- Salary - Leave Liability R 109 545
- Salary - Production Bonus R 19 411
- Salary - Pension / Provident Fund R 62 295
- Salary - UIF R 1 497
- Salary - Skills Development Levy R 5 345
- Salary - Life Policy Insurance R 8 461
- Salary - Medical Aid R 7 136
- Salary - RDO/Market/Bush Allowance R 36 000
- Functions R 1 500
- Employee Travel Benefits R 28 920
- Cell phone Costs R 3 600
- Contractors-Pest Control R 36 000
- Environmental-Other R 417 750
- Water sampling R 326 700
- Minor Capital R 4 752
- Mtc_Instruments-OnSite R 4 596
- Contr-Environmental (Waste Management) R 25 002
- Training-Other (Awareness training -ISO14001 and policy) R 50 000
- Environmental Studies R 565 000

Other costs specifically covered in the Mine Works Programme.

- Plant Rehabiliation R 0
- Annual contribution – Closure R 2 519 954
- SLP Projects execution R 1 166 701

Environmental Management functions and control generally will be provided from the operational budget, and is covered under Production costs in the Mine Works Programme.Annual Closure contributions and SLP Projects are covered in the Mine Works Programme as part of the financial plan.

13 UNDERTAKING

13.1 The Environmental Management Programme will, should it comply with the provisions of section 39 (4) (a) of the Act and the right be granted, be approved and become an obligation in terms of the right issued. As part of the proposed Environmental Management Programme, the applicant is required to provide an undertaking that it will be executed as approved and that the provisions of the Act and regulations thereto will be complied with.

COMMITMENT/UNDERTAKING BY THE APPLICANT

I, ..., the undersigned and duly authorised thereto by the undertake to adhere to the requirements and to the conditions as set out in the EMPR submitted to the Director: Mineral Development and approved on.....

Signed at.....on this..... day.....

Signature of applicant .....

Designation.....

14 IDENTIFICATION OF THE REPORT

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above report comprises EIA and EMP compiled in accordance with the guideline on the Departments official website and the directive in terms of sections 29 and 39 (5) in that regard.	
Full Names and	
Identity Number	

-END-

Appendix 1: Annotated map showing spatial location and aerial extend of environmental, cultural/heritage, infrastructure and land use features on site and neighbouring properties and farms

Requirement of Section 1(EIA): Section 1.4

Appendix 2: Plan showing the location and aerial extent of the aforesaid main mining actions, activities, or processes as required to calculate the financial provision in accordance with the Department's published guideline.(Reg.51 (b) (v))

Requirement of Section 1(EIA): Section 2.4 and of Section 2 (EMP): Section 9.1

Appendix 3: Plan showing the location and aerial extent of the aforesaid main features of the alternative land use and infrastructure related to alternative land developments identified.

Requirement of Section 1(EIA): Section 4.3

Appendix 4: Mine works plan (2012)

Appendix 5: Air Quality Assessment (2009)

Appendix 6: Ecological Assessment (2003)

Appendix 7: Flood line determination (2003, 2013)

Appendix 8: Geo-hydrological Assessment (2003, 2013)

Appendix 9: Heritage Assessment (2003)

Appendix 10: Noise and Vibration Assessment (2003)

Appendix 11: Social Assessment (2003)

Appendix 12: Land Use and Land Capability (2003)

Appendix 13: Traffic Assessment (2003)

Appendix 14: Visual Assessment (2002)

Appendix 15: Surface Water Assessment (2003, 2013)

Appendix 16: Social and Labour Plan (2012)

Appendix 17: Closure cost estimates (2012)

Appendix 18: Closure cost estimates per year (Tables only and based on assumptions 2013)

Appendix 19: Public participation documents (2003, 2013)

Appendix 20: Standard operating procedures

Appendix 21: Summary of all impacts, NEMA / NEMWA, time lines and mitigation measures

Appendix 22: Storm water Management Plan (2013)