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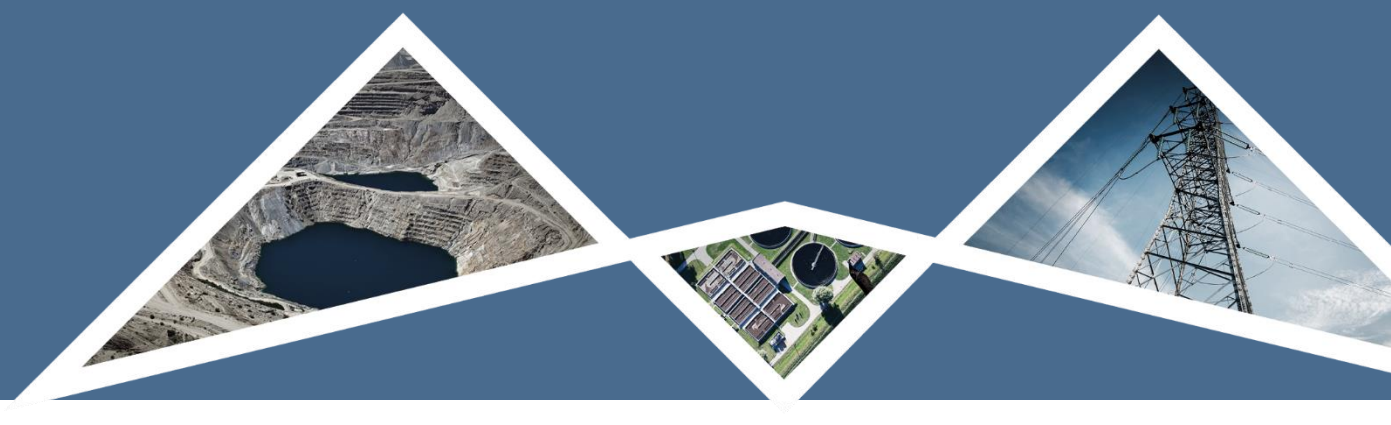
CLOSURE AND FINANCIAL PROVISION ASSESSMENT

FORZANDO SOUTH COLLIERY: KALABASFONTEIN PROJECT

MP30/5/1/3/3/2/1/380 EM



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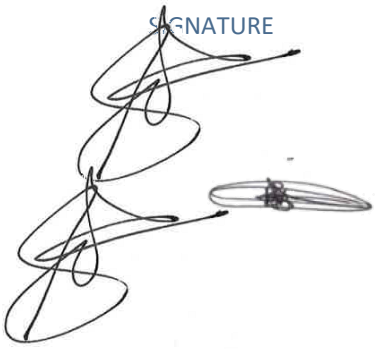
COMPILED:	Liam Whitlow		2020/07/14
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1 INTRODUCTION

Forzando Coal Mines (Pty) Ltd (hereafter referred to as Forzando), has applied for the extension of the current mining areas (under Section 102 of Minerals and Petroleum Resources Development Act - Act No. 28 of 2002 - MPRDA) of the Forzando South Colliery (MP 30/5/1/2/2/380- hereafter referred to as Forzando South) to incorporate contiguous areas which are held under Prospecting Rights 1035PR and 1170PR into the Mining Right (hereafter referred to as the Kalabasfontein area). Forzando has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) to act as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed Kalabasfontein project. An application for the amendment to the existing Mine Works Programme (MWP) and Environmental Management Programme Report (EMPR), through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is, required to support an application for environmental authorisation (EA), in accordance with the National Environmental Management Act (Act 107 of 1998- NEMA).

The Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal. It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality. The project area comprises two prospecting rights, 1035PR and 1170PR, which covers a total area of ~1 547.8296ha over portions 7, 8, Remaining Extent (RE), 11 and 13 of the farm Kalabasfontein 232 IS. A new ventilation shaft will be located on Portion 22 of the farm Uitgedacht 229 IS as part of the Kalabasfontein project. The proposed extension of the current mining area will require minimal new surface infrastructure as the mining method to be employed is underground mining and existing surface infrastructure from the Forzando South mine will be used. It should be noted that application for an additional ventilation shaft has also been included in the EIA and, where necessary, the associated applications.

This report aims to support the application for S102 and EA, and aims to determine the quantum of the financial provision required for the rehabilitation of negative impacts associated with any activities under the proposed Kalabasfontein Project (including the proposed new ventilation shaft), and more specifically in the case of pre-mature/un-scheduled closure. This report has been prepared with specific reference to the Department of Minerals and Energy (now Department of Mineral Resources, DMR) 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMR Guideline). The closure cost has been determined both through the use of contractor based real cost rates.

2 LEGISLATIVE CONTEXT FOR MINE CLOSURE

This section provides an overview of the applicable legislative requirements pertaining to the calculation of the quantum for financial provisions for un-scheduled closure of a mine. The environmental requirements pertaining to the planning, operations, and eventual closure of a mine in South Africa were recently, and continue to, exist in a transitional period as regulation moves from the MPRDA to the NEMA. In this respect, although this report is compiled to comply with the requirements of the MPRDA, the legislative context for mine closure is presented in terms of the MPRDA as well as the NEMA.

2.1 MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT

The following extracts relate to the principle of closure for any right issued under the MPRDA:

- Provisions related to financial provision for remediation of environmental damage (recently repealed by the NEMA):
    - Section 41. (1): An applicant for a prospecting right, mining right or mining permit must, before the Minister approves the environmental management plan or environmental management programme in terms of section 39(4), make the prescribed financial provision for the rehabilitation or management of negative environmental impacts.
    - Section 2: If the holder of a prospecting right, mining right or mining permit fails to rehabilitate or manage or is unable to undertake such rehabilitation or to manage any negative impact on the environment, the Minister may, upon written notice to such holder, use all or part of the

financial provision contemplated in subsection (1) to rehabilitate or manage the negative environmental impact in question.

- Section 3: The holder of a prospecting right, mining right or mining permit must annually assess his or her environmental liability and increase his or her financial provision to the satisfaction of the Minister.
- Section 4: If the Minister is not satisfied with the assessment and financial provision contemplated in this section, the Minister may appoint an independent assessor to conduct the assessment and determine the financial provision.
- Section 5: The requirement to maintain and retain the financial provision remains in force until the Minister issues a certificate in terms of section 43 to such holder, but the Minister may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent or residual environmental impacts.

- Provisions related to Issuing of a closure certificate:
  - Section 43 (1): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the EA and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned.
  - Section 43 (4): An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.
  - Section 43 (5): No closure certificate may be issued unless the Chief Inspector and each government department charged with the administration of any law which relates to any matter affecting the environment have confirmed in writing that the provisions pertaining to health and safety and management pollution to water resources, the pumping and treatment of extraneous water and compliance to the conditions of the EA have been addressed.
  - Section 43 (7): The holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, or the person contemplated in sub-section (2) must plan for, manage and implement such procedures and such requirements on mine closure as may be prescribed.
  - Section 43 (8): Procedures and requirements on mine closure as it relates to the compliance of the conditions of an EA, are prescribed in terms of the National Environmental Management Act, 1998.

It is important to note that prior to November 2015 rehabilitation and closure of mining and associated activities was regulated under the MPRDA. The MPRDA regulations (GNR527; April 2004) provide further specific content requirements applicable to mine rehabilitation and closure. Of specific reference to this report are the following provisions in the MPRDA Regulations:

- Regulation 53 (Methods for financial provision):
  - (1) Financial provision required in terms of Section 41 of the Act to achieve the total quantum for the rehabilitation, management and remediation of negative environmental impacts must be provided for by one or more of the following methods:

        - (a) An approved contribution to a trust fund as required in terms of section 10(1)(cH) of the Income Tax Act, 1962 (Act No. 58 of 1962) and must be in the format as approved by the Director-General from time to time;
        - (b) a financial guarantee from a South African registered bank or any other bank or financial institution approved by the Director-General guaranteeing the financial provision relating to the environmental management programme or plan in the format as approved by the Director-General from time to time;
        - (c) a deposit into the account specified by the Director-General in the format as approved by the Director-General from time to time; or
        - (d) any other method as the Director-General may determine.
    - (2) In the case of sub regulation (1)(c), proof of payment must be submitted to the office of the relevant Regional Manager prior to the approval of the environmental management plan or environmental management programme, as the case may be.

- 54. Quantum of financial provision:
    - (1) The quantum of the financial provision as determined in a guideline document published by the Department from time to time, include a detailed itemization of all actual costs required for-
        - (a) premature closure regarding- (i) the rehabilitation of the surface of the area; (ii) the prevention and management of pollution of the atmosphere; and (iii) the prevention and management of pollution of water and the soil; and (iv) the prevention of leakage of water and minerals between subsurface formations and the surface.
        - (b) decommissioning and final closure of the operation; and
        - (c) post closure management of residual and latent environmental impacts.
    - (2) The holder of a prospecting right, mining right or mining permit must annually update and review the quantum of the financial provision -
        - (a) in consultation with a competent person;
        - (b) as required in terms of the approved environmental management programme or environmental management plan; or
        - (c) as requested by the Minister.
    - (3) Any inadequacies with regard to the financial provision must be rectified by the holder of a prospecting right, mining right or mining permit -
        - (a) in an amendment of the environmental management programme or environmental management plan, as the case may be;
        - (b) within the timeframe provided for; or
        - (c) as determined by the Minister.

2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

Prior to 8 December 2014, the environmental aspects of mining activities were regulated in terms of the MPRDA. Recent legislative amendments, and the drive towards a 'one environmental system' have resulted in the inclusion of the requirement for rehabilitation, decommissioning and closure planning and associated financial provisions into the NEMA. Specific sections of the act relating to rehabilitation and closure are extracted below:

- Section 24P: Financial provision for remediation of environmental damage:

    (1) An applicant for an EA relating to prospecting, exploration, mining or production must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.

    (2) If any holder or any holder of an old order right fails to rehabilitate or to manage any impact on the environment or is unable to undertake such rehabilitation or to manage such impact, the Minister responsible for mineral resources may, upon written notice to such holder, use all or part of the financial provision contemplated in sub-section (1) to rehabilitate or manage the environmental impact in question.

    (3) Every holder must annually-

        a. assess his or her environmental liability in a prescribed manner and must increase his or her financial provision to the satisfaction of the Minister responsible for mineral resources; and

        b. submit an audit report to the Minister responsible for mineral resources on the adequacy of the financial provision from an independent auditor.

    (4)

        a. If the Minister responsible for mineral resources is not satisfied with the assessment and financial provision contemplated in this section, the Minister responsible for mineral resources may appoint an independent assessor to conduct the assessment and determine the financial provision.

        b. Any cost in respect of such assessment must be borne by the holder in question.

    (5) The requirement to maintain and retain the financial provision contemplated in this section remains in force notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002 to the holder or owner concerned and the Minister responsible for mineral resources may retain such portion of the financial provision as may be required to rehabilitate the closed mining or prospecting operation in respect of latent, residual or any other environmental impacts, including the pumping of polluted or extraneous water, for a prescribed period.

    (6) The Insolvency Act, 1936 (Act No. 24 of 1936), does not apply to any form of financial provision contemplated in sub-section (1) and all amounts arising from that provision.

    (7) The Minister, or an MEC in concurrence with the Minister, may in writing make sub-sections (1) to (6) with the changes required by the context applicable to any other application in terms of this Act.

- Section 24 R: Mine closure on EA:

    (1) Every holder, holder of an old order right and owner of works remain responsible for any environmental liability, pollution or ecological degradation, the pumping and treatment of polluted or extraneous water, the management and sustainable closure thereof notwithstanding the issuing of a closure certificate by the Minister responsible for mineral resources in terms of the Mineral and Petroleum Resources Development Act, 2002, to the holder or owner concerned.

    (2) When the Minister responsible for mineral resources issues a closure certificate, he or she must return such portion of the financial provision contemplated in Section 24 P as the

Minister may deem appropriate to the holder concerned but may retain a portion of such financial provision referred to in sub-section (1) for any latent, residual or any other environmental impact, including the pumping of polluted or extraneous water, for a prescribed period after issuing a closure certificate.

(3) Every holder, holder of an old order right or owner of works must plan, manage and implement such procedures and requirements in respect of the closure of a mine as may be prescribed.

(4) The Minister may, in consultation with the Minister responsible for mineral resources and by notice in the Gazette, identify areas where mines are interconnected, or their impacts are integrated to such an extent that the interconnection results in a cumulative impact.

(5) The Minister may, by notice in the Gazette, publish strategies to facilitate mine closure where mines are interconnected, have an integrated impact or pose a cumulative impact.

On 20th November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA. The regulations aim to regulate the determination and making of financial provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future.

In accordance with Regulation 17B of the Financial Provisioning Regulations: "Unless regulation 17A applies, a holder, or holder of a right or permit, who applied for such right or permit prior to 20 November 2015, regardless when the right or permit was obtained-

(a) must by no later than 19 June 2021 comply with these Regulations; and

(b) shall, until 19 June 2021, be regarded as having complied with the provisions of these Regulations, if such holder has complied with the provisions and arrangements regarding financial provisioning, approved as part of the right or permit issued in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

It is consequently understood that due to the fact that the Kalabasfontein project will be an extension of the existing Forzando South Mining Right, and not a new Right, that the requirements of the NEMA Financial Provisioning Regulations are not yet a requirement for Forzando. However, Exxaro has taken a policy decision to ensure that the determination of its closure cost is carried out in accordance with the NEMA Financial provisions based on the GN 1147 Regulations.

3 METHODOLOGY

This report has been prepared with specific reference to the 2005 DMR 'Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMR Guidelines). It is noted that the NEMA Financial Provisioning Regulations will, as from June 2021, be the legislated mechanism under which a mines rehabilitation, closure and associated financial provisioning must be determined. However, it is understood that the transitional arrangement associated with the NEMA Financial Provisioning Regulations allow for the continuation of the past process as defined by the DMR Guideline, until this date. Exxaro has taken a policy decision to ensure that the determination of its closure cost is carried out in accordance with the NEMA Financial provisions GN 1147 Regulations. For this reason, whilst this report is structured to comply with the requirements of the DMR Guidelines, the closure cost has been determined in line with the NEMA Financial Provisions (GN 1147).

The approach to this closure report and associated cost determination is guided and defined by the following:

- The DMR Guideline document will be used as the base methodology for this report (except for the closure cost determination).

- This report will address the closure activities and associated costs for the addition of the Kalabasfontein area only and not the entire Forzando Mining Right area. Once the Section 102 is approved it is expected that the consolidated closure costing and financial provisions will need to be updated to include the Kalabasfontein project into the Forzando Mining Right.
- Real contract cost rates are applied in alignment with the NEMA Financial Provisions Regulations (GN1147).
- This is a greenfield project and therefore the battery limits and quantities are based on the available plans for the proposed mining areas.

The closure cost determination process in respect of the Kalabasfontein Project is presented in Section 6. It is important to note that this evaluation of the quantum for closure related financial provision applies only to the proposed Kalabasfontein Project and not the entire Forzando South Colliery. The Forzando South Colliery is subject to a separate annual review, assessment, and determination of quantum associated with its current operations.

4 MINE OVERVIEW

4.1 MINE LOCATION AND EXTENT

Kalabasfontein project area is situated in Mpumalanga, 20 kilometres north of Bethal and 20 kilometres east of Ga-Nala (Kriel). It is located to the east and south of the existing Forzando South 380MR and Forzando North 381MR respectively which fall within the Msukaligwa Local Municipality, see attached locality plan (Figure 1). The project area comprises two prospecting rights, 1035PR & 1170PR, which covers a total area of ~1 547.8296ha over portions 7, 8, RE, 11 and 13 of the farm Kalabasfontein 232 IS. An additional ventilation shaft will also be required within the Forzando South mining area and will be built on Portion 22 of the farm Uitgedacht 229 IS (refer to Figure 1 below).

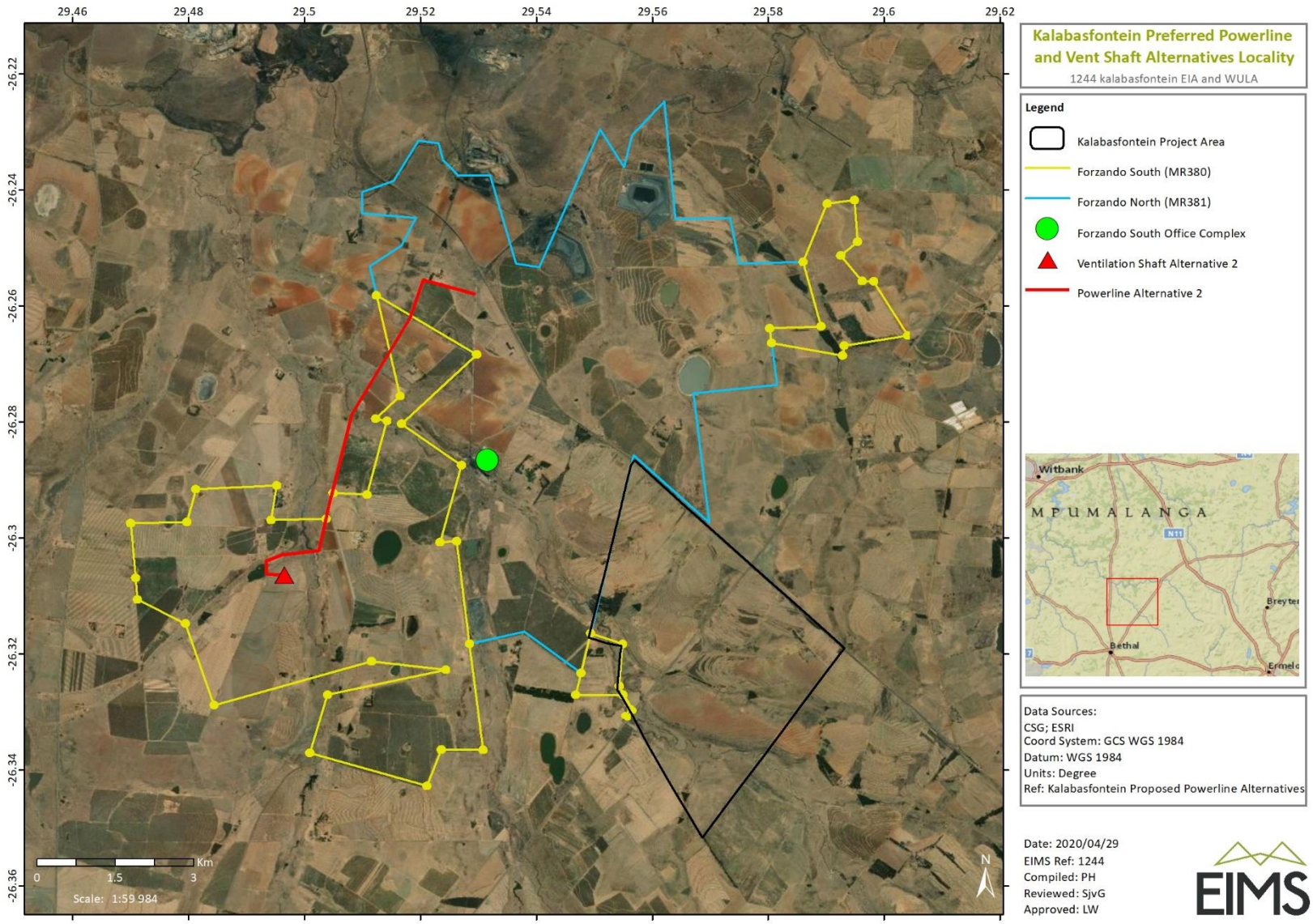

Figure 1: Locality map of Kalabasfontein project area and new ventilation shaft.

4.2 PROPOSED OPERATIONS

Although Kalabasfontein annexation is intended to extend the Life of Mine (LOM) of Forzando South Coal Mine, it will come into production a year after the annexation is granted by the DMRE. The Kalabasfontein will increase the Forzando South reserve base by 11.7 Mt which translates to a 24% increase in the Forzando South reserve base, with the project schedule and timeframe being based on the Forzando South equipment availabilities, efficiencies and both skilled and unskilled labour force. Mining in the Kalabasfontein project area is based on two Continuous Miner (CM) sections.

The access corridor to Kalabasfontein Reserves was identified during exploration drilling. Reserves will be mined through access from one of Forzando South Reserves block. This will eliminate intense preparation work of developing a new incline, as there will be infrastructure available at the face.

Currently, Forzando South mine is scheduled until 2037. However, the Kalabasfontein portion will be mined as soon as permission is granted, in order to ensure sustained production volumes and quantities from the 5 CM sections that are currently being mined. The mine will maintain its production rate of 2.2 Million tonnes (Mt) per annum. Commissioning of Kalabasfontein will not add to the production of Forzando South but will provide relocation areas for existing Forzando South sections. Since the Kalabasfontein project will be mined concurrently with Forzando South, production decline will be due to depletion of Reserves. In the second quarter of year 17 (2037), the first section will pull out and leave the one section to deplete the remaining Reserves. Figure 2 below indicates the production schedule over the estimated LoM of 17 years.

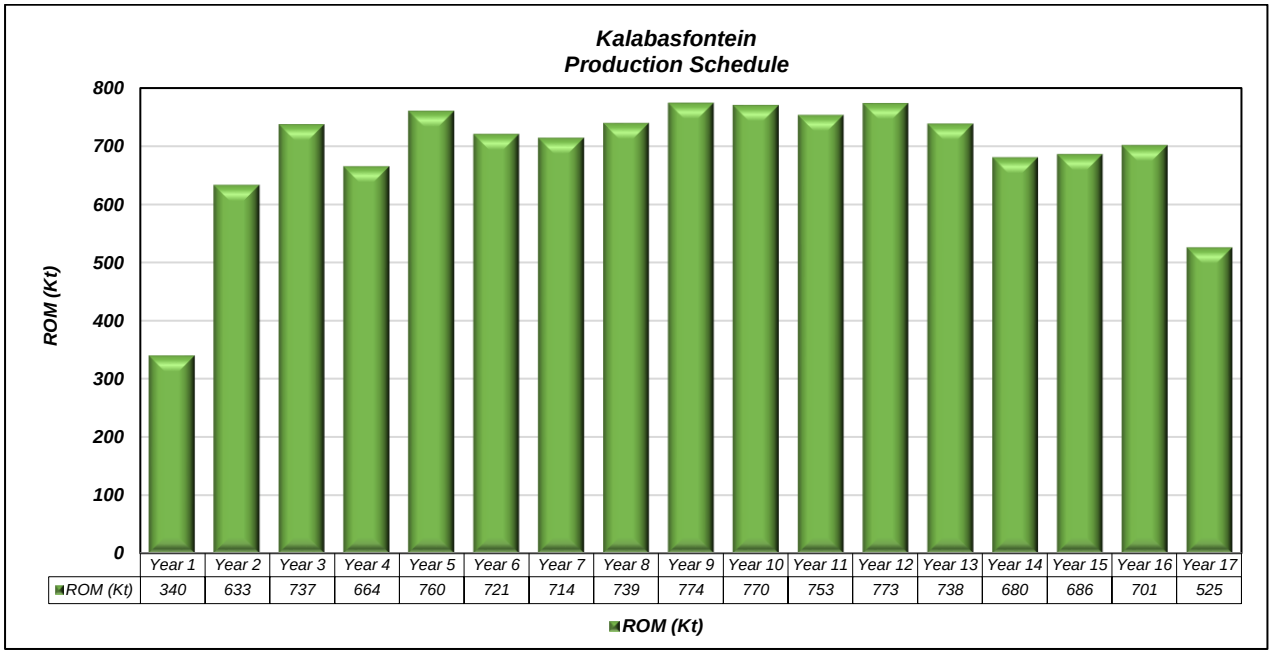

Figure 2: Kalabasfontein production schedule

Considering that the RoM coal emanating from the Kalabasfontein projects will be incorporated into the existing Forzando operations, the actual new infrastructure associated with the project is limited to the underground mining and a single ventilation shaft complex. Table 1 presents the infrastructure and features associated with the Kalabasfontein project.

Table 1: Kalabasfontein closure cost features and infrastructure.

Aspect	Description
Mining area:	• Underground mining area roads, including: ○ Mining area access roads. ○ Parallel roads and splits associated with the Bord and Pillar areas. • Bulk water pipelines- In.

	• Bulk water pipelines- Out. • Electrical power supply.
Ventilation Shaft:	• Access Road. • Boundary fencing. • Powerline. • Electrical sub-station. • Fans and Top Hat.

Figure 3 provides the preliminary design of the proposed new ventilation shaft.

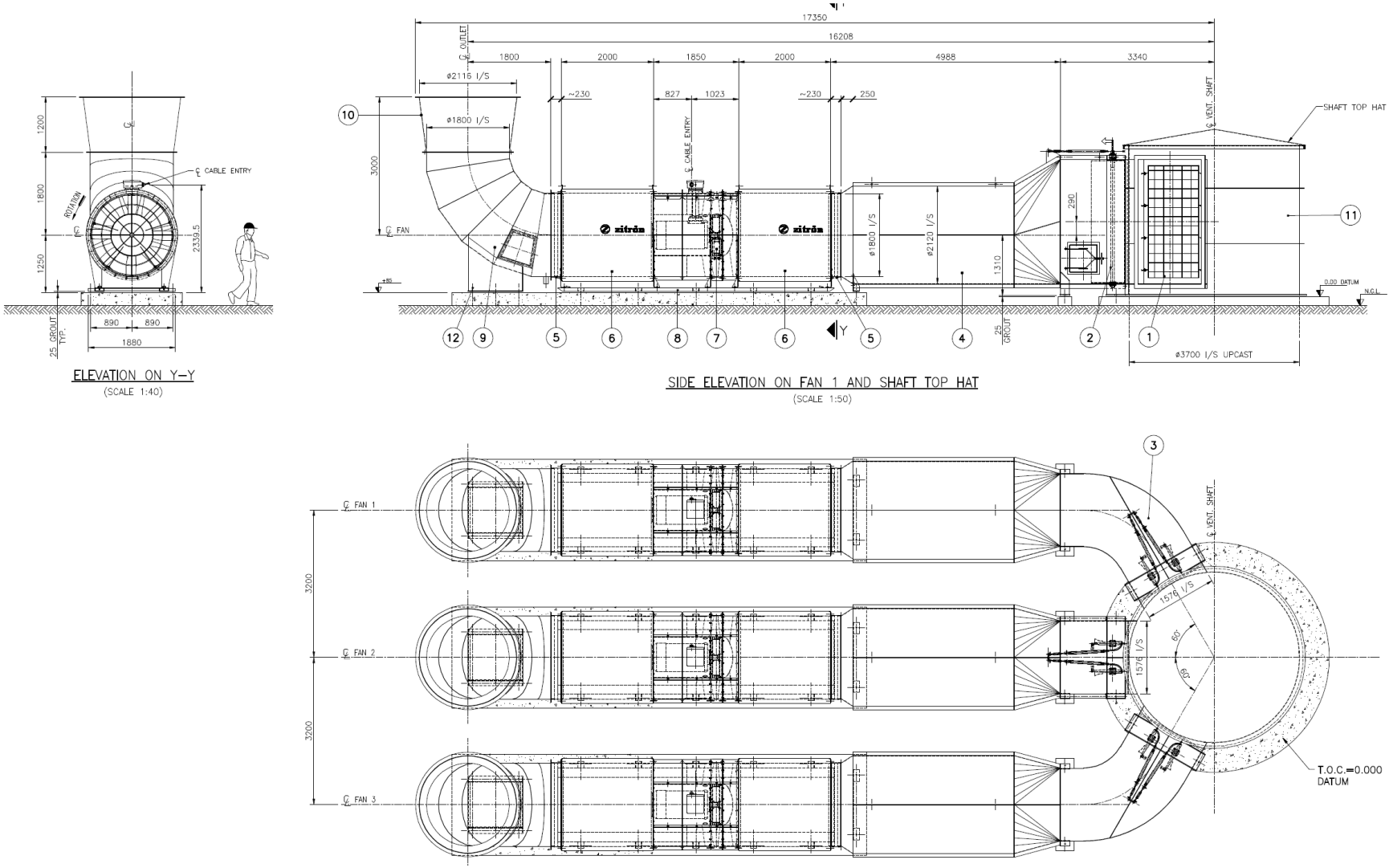

Figure 3: Plan view of the proposed ventilation shaft.

5 MINE CLOSURE

Mine closure is the period when the ore-extracting activities of the mine have ceased, and final rehabilitation, decommissioning and mine rehabilitation are being completed. Mine closure for the purposes of this report can be divided into three distinct phases, namely: Rehabilitation, decommissioning/closure, and post closure. It is crucial that the mine closure aligns with the commitments made in the mines original EIA and EMPR and specifically that the end land-use agreed upon in the EIA is strived for. Considering that the proposed Kalabasfontein Project is an extension of the existing Forzando South Operations it is expected that the current closure plans and objectives would generally apply to the decommissioning, rehabilitation and closure of the Kalabasfontein project area and the new ventilation shaft. Consequently, this section describing the likely closure plan has been extracted from the 'Amended Environmental Impact Assessment and Environmental Management Programme (EIA/EMP) Report Version 2; (GCS (Pty) Ltd, 2010)' for Forzando South. If closure objectives and plans are identified for the Kalabasfontein project specifically, these have also been incorporated and indicated as such.

5.1 CLOSURE OBJECTIVES

The 2010 EIA and EMPR report (GCS (Pty) Ltd, 2010) lists the following main environmental closure objectives:"

- With regard to every activity the mitigation of all environmental impacts and addressing all environmental aspects on the basis of the EMP;
- To ensure an effective surface runoff control system in order to deal with the separation of clean and dirty water environment;
- Rehabilitate areas as soon as possible;
- The sustainable and safe rehabilitation of all activities, in order to address all environmental impacts as far as practical according to the EMP;
- The sustainable rehabilitation of all activities and the mining area as a whole in order to ensure a sustainable end use for the majority of the activity sites/areas;
- Return of land to its pre-mining state where possible (i.e. agriculture/grazing for the majority of the mine's lease area);
- Make all areas safe for both humans and animals;
- Ensure that all areas remaining upon closure are stable, which will prevent dust and water erosion;
- Minimise the impact on the local community;
- Minimise the impact on the surrounding economic environmental and other mining activities;
- Maintenance requirements for rehabilitated activity areas/sites need to be established and documented within the capability of the subsequent land user;
- Financial provision for post closure maintenance cost of rehabilitation activity area/sites will at all times be appropriate to provide for premature closure in terms of the MPRDA;
- No rehabilitation work, demolition of buildings shall take place without the approval of the General Manager in consultation with the Manger (Group Environmental Manager); and
- Final rehabilitation of all infrastructures shall be completed within a period as specified in the appropriate closure document and rehabilitation activities will comply with the specifications as per the appropriate closure document. Should the mine, due to unforeseen circumstances, need to deviate from the closure plan, approval from the DME (now DMR) and relevant State Departments will be obtained.

The aim of the maintenance measures is to ensure that the area affected by the mining operations is rehabilitated according to the closure plan and to apply for closure. The objective is for the area to be rehabilitated sustainably (ensuring self-succession of plants and the associated return of natural wildlife; as well as the improvement of the natural watercourses and groundwater systems)."

The closure objectives presented above remain unchanged for the mine moving forward. It should be noted that in the next annual assessment and determination of financial provisions, and/or the compilation of the NEMA Financial Provisioning Reports, these closure objectives should be reviewed and, where applicable, amended.

5.2 CLOSURE RISKS

Table 2 provides the environmental risks identified for the Kalabasfontein project during the rehabilitation, decommissioning, closure and post closure phases. In addition, the applicable targets, management and mitigations are presented.

Table 2: Rehabilitation, decommissioning, closure and post closure risks.

#	Impact	Alternative	Project Phase	Pre-Mitigation Score	Suggested Management and Mitigation Measures	Post-Mitigation Score

1	Groundwater: Contaminated groundwater seepage to streams (salt load) from Rehabilitated surface areas - Discard, Plant, PCDs, etc	Underground Mining (Alt 1)	Decommissioning	-10.5	• Some degree of shallow seepage from the underground mine workings may occur. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons.
					• It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.
					• During the Operational Phase the groundwater pumped from the underground mine workings must be re-used as far as possible. The volumes de-watered and re-used must be measured by flow meters and reported in a database on a monthly basis.
					• Adequately sized pollution control facilities should be constructed and lined. Contain poor quality runoff from dirty areas and divert this water to pollution control dam for re-use.
					• Excess water must be pumped to dedicated underground storage dams and/or surface dirty water dams or pollution control facilities. Longer residence times in the underground workings results in higher overall TDS values due to prolonged exposure.
					• The numerical model should be updated at least every three (3) years by using the measured water ingress, mine schedule and water levels to re-calibrate and refine the impact prediction scenarios.
					• 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 DWAF Best Practice Guidelines. The implementation of the mine closure plan, and the application for the closure certificate can be conducted during the Closure Phase.
					• Best Practice Guideline - A6: Water Management for Underground Mines – DWA, July 2008 states the following: Plan, design, operate and close the underground mining operations in a manner that reduces the ingress of clean water into the mine, minimizes the volume of water used in mining operations, maximizes water reuse, minimizes the water quality deterioration within the mine and minimizes the impacts on the water resource.
					• The following general management strategies must be considered to manage any long term AMD:
					  ○ Plan for closure with regard to understanding where water enters the mine and would normally accumulate, how it flows, how it should preferably flow in order to minimize water quality deterioration.
					  ○ Adits can be major sources of surface and groundwater ingress if not properly sealed. It is therefore recommended that all potential mine entry points like boreholes, old ventilation shafts, old rescue bays and mine portals/adits be sealed off as per the DMR regulations.
					  ○ Sufficient pillars must be left underground, as part of sound mine planning, to avoid subsidence of the roof to surface along the shallower areas (where underground mining is less than 40m from surface). This will ensure that the rate of recharge to the underground workings remain at natural rates and will minimise decant from the workings post-closure.
						-5.5

2	Groundwater: Contamination of streams due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining (Alt 1)	Decommissioning	-11.25	• Some degree of shallow seepage from the underground mine workings may occur and these zones are also demarcated on the map in Figure 9 8. These were demarcated as a precautionary management tool and need to be re-calibrated after field confirmations. Field confirmations will include EC profiling of streams during wet and dry seasons. • The groundwater and surface water monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network must be audited annually to ensure compliance with regulations. The monitoring network should be re-evaluated by a qualified hydrogeologist at least 2 years before mine closure so that decommissioning and closure strategies pertaining to groundwater level rebound and decant assessments can be confirmed. • The rate of flooding and water level recovery as well as water quality in the underground voids should be monitored towards mine closure. Stage curves should be calibrated with the updated information to aid in the management of the Closure Phase (refer to the "Post Closure Impact" section below for the existing stage curve prediction. • It is recommended that the geochemical assessment is updated during the life of the mine in order to calibrate and validate its results and to construct an effective closure plan.	-7
3	Groundwater: Contamination of farm boreholes due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining (Alt 1)	Decommissioning	-11.25	See measures in impact #1.	-7
4	Groundwater: Contaminated groundwater seepage to streams (salt load) from Rehabilitated surface areas - Discard, Plant, PCDs, etc	Underground Mining (Alt 1)	Rehab and closure	-10.5	See measures in impact #1.	-5.5

5	Groundwater: Contamination of streams due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining (Alt 1)	Rehab and closure	-11.25	See measures in impact #2.	-7
6	Groundwater: Contamination of farm boreholes due to mine decant and weathered aquifer seepage from old mine workings	Underground Mining (Alt 1)	Rehab and closure	-11.25	See measures in impact #1.	-7
7	Soil: Loss of Land Capability	Alternative Shaft (Alt 2)	Decommissioning	-12	• The primary mitigation measure recommended for the project area is for there to be no development in the high-sensitivity wet areas, rocky ridges and grasslands portions of the project area where species of conservation concern occur; • The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report; • Where the proposed powerline crosses wetland areas (if it is unavoidable to do so otherwise), appropriate bird mitigation measures should be put in place to avoid bird collisions and direct impacts to the infrastructure. This includes the use of 'bird-flappers' and bird-friendly powerline structures; • If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. This is applicable to all species, even smaller species such as rodents, reptiles and amphibians; • Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; • The areas rated as highly sensitive in the project area as defined in this report, should be declared a 'no-go' area during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery; and • No domestic animals are to be allowed into the project area under any circumstances, especially any dogs and cats. Any and all feral cats which may enter the project area must be removed immediately by an appropriate specialist. • As far as possible, the proposed developments should be placed in areas that have already been disturbed (low sensitivity areas as defined in this report), and no further loss of secondary grassland or wetlands should be permitted; • The proposed ventilation shaft areas and associated powerlines should be positioned (as far as feasible) in areas that are already disturbed (such as along existing road verges) or in areas that are regarded as least sensitive based on this report; • Wherever possible, the new powerline development should avoid crossing sensitive CBAs or wetland areas; • It is recommended that areas to be developed be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All work areas, and access roads must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances; • Areas of indigenous vegetation, even secondary communities should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste; • Areas rated as highly sensitive in this report, should be declared as 'no-go' areas during the construction phase and operational phase and all efforts must be made to prevent access to this area from construction workers and machinery; • It should be made an offence for any staff to bring any plant species into any portion of the project site, including offices. No plant species whether indigenous or exotic should be brought into the project area, to prevent the spread of exotic or invasive species; • An experienced, qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that are found during construction (this includes all species of flora and fauna including reptiles and amphibians); • Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. No dust is allowed, whether intentionally or otherwise, to be blown across the wetland areas as they are demarcated in this report; • Areas of indigenous vegetation should be delineated, and rehabilitation measures implemented in areas where the indigenous community is still present but degraded; • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species; • Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation	-11
8	Soil: Loss of Land Capability	Alternative Shaft (Alt 2)	Rehab and closure	-10.5		-3.5
9	Soil: Loss of Land Capability	Powerline (Alt 2)	Decommissioning	-7.5		-7.5
10	Soil: Loss of Land Capability	Powerline (Alt 2)	Rehab and closure	-9.75		-3.5
11	Soil: Loss of Land Capability	Underground Mining (Alt 1)	Decommissioning	-10.5		-9.75
12	Soil: Loss of Land Capability	Underground Mining (Alt 1)	Rehab and closure	-9.75		-3.5

					• All dumping of waste material, especially bricks and contaminated materials or soils, must be prevented; and • Implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas.	
13	Hydropedological services: Loss / degradation of hydropedological drivers to wetlands	Alternative Shaft (Alt 2)	Decommissioning	-4	• Underground workings must adhere to a safety factor that will minimise the risk of subsidence. • Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed. • Separate clean and dirty water. • Construct diversion berms and drains around working areas. • Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths. • No cleaning of vehicles, machines and equipment in water resources. • No servicing of machines, vehicles and equipment on site. • Storage of potential contaminants in bunded areas. • All contractors must have spill kits available and be trained in the correct use thereof. • All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems. • Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses. • Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydrodynamics. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”, • Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area. • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. • Compile a suitable stormwater management plan. • Construct cut-off berms downslope of working areas. • Demarcate footprint areas to be cleared to avoid unnecessary clearing. • Exposed areas must be ripped and vegetated to increase surface roughness. • Create energy dissipation at discharge areas to prevent scouring. • Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching. • Separate clean and dirty water continue with surface water and biomonitoring programmes. • All chemicals and toxicants during construction must be stored in bunded areas. • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.	4
14	Hydropedological services: Loss / degradation of hydropedological drivers to wetlands	Alternative Shaft (Alt 2)	Rehab and closure	-4		2.5
15	Hydropedological services: Loss / degradation of hydropedological drivers to wetlands	Underground Mining (Alt 1)	Decommissioning	-7.5		3
16	Hydropedological services: Loss / degradation of hydropedological drivers to wetlands	Underground Mining (Alt 1)	Rehab and closure	-7.5		1.5
17	Socio-economic: Road Traffic Safety	Underground Mining (Alt 1)	Rehab and closure	-23.75	• Heavy vehicle deliveries must be limited to daylight periods. • Abnormal loads must be limited to daylight periods and dry weather, escort must be provided, and stop-go control must apply at locations of restricted road width. • A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to immediately repair road surface damage that may occur on D638 • D638 north of the mine entrance must be graded at such intervals as deemed necessary by the road inspector, so as to maintain the road surface free from large stones, potholes and corrugation. • A road maintenance team, under the guidance of a dedicated road inspector, must be on standby to repair road surface damage that may occur on D638 north of the mine entrance.	-5.5
18	Socio-economic: Safety and Security (i.e. access to properties, theft, fire hazards, etc	Underground Mining (Alt 1)	Rehab and closure	-12	• All mining contractors and employees should wear appropriate identification. • Vehicles should be clearly marked for ease of identification. • Entry and exit points at the mine should also be controlled. • Adequate control of any combustion of coal stockpiles must immediately be initiated.	-4.5
19	Socio-economic: Safety and Security (i.e. access to properties, theft, fire hazards, etc	Underground Mining (Alt 1)	Decommissioning	-12		-4.5
20	Socio-economic: Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Underground Mining (Alt 1)	Rehab and closure	-12	• An asset and infrastructure baseline of any new public and/or private infrastructure that may be affected by mining activities must be compiled. • A copy of the baseline records should be given to the relevant landowner/s or service providers, and a master document kept by the applicant. • If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause.	-4.5
21	Socio-economic: Impact on Existing Infrastructure (i.e. roads, fences, etc.)	Underground Mining (Alt 1)	Decommissioning	-12		-4.5

22	Socio- economic: Inability of the community to capture economic benefits & managing expectation	Underground Mining (Alt 1)	Rehab and closure	-12	• Perceptions and expectations must be managed through ongoing, open and transparent communication with affected stakeholders, communities, landowners and occupiers.	-4.5
23	Socio-economic: Inability of the community to capture economic benefits & managing expectation	Underground Mining (Alt 1)	Decommissioning	-12		-4.5
24	Socio-economic: Employment Opportunities	Underground Mining (Alt 1)	Decommissioning	-12	• Recruitment for any additional labour or services should be focused in the local area and preference given to the local communities if possible	-4.5
25	Socio-economic: Employment Opportunities	Underground Mining (Alt 1)	Rehab and closure	-12		-4.5
26	Wetland: Loss / degradation of wetland habitat	Alternative Shaft (Alt 2)	Decommissioning	-8.25	• Underground workings must adhere to a safety factor that will minimise the risk of subsidence. • Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed. • Separate clean and dirty water. • Construct diversion berms and drains around working areas. • Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths. • No cleaning of vehicles, machines and equipment in water resources. • No servicing of machines, vehicles and equipment on site. • Storage of potential contaminants in bunded areas. • All contractors must have spill kits available and be trained in the correct use thereof. • All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems. • Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses. • Clean and dirty water must be separated. This water could be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydrodynamics. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”. • Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area. • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems. • Compile a suitable stormwater management plan. • Construct cut-off berms downslope of working areas. • Demarcate footprint areas to be cleared to avoid unnecessary clearing. • Exposed areas must be ripped and vegetated to increase surface roughness. • Create energy dissipation at discharge areas to prevent scouring. • Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching. • Separate clean and dirty water continue with surface water and biomonitoring programmes. • All chemicals and toxicants during construction must be stored in bunded areas. • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.	-4.5
27	Wetland: Loss / degradation of wetland habitat	Alternative Shaft (Alt 2)	Rehab and closure	-8.25		2.5
28	Wetland: Loss / degradation of wetland habitat	Underground Mining (Alt 1)	Decommissioning	-7.5		-2.5
29	Wetland: Loss / degradation of wetland habitat	Underground Mining (Alt 1)	Rehab and closure	-7.5		2.5
30	Hydrology: Erosion of soils	Alternative Shaft (Alt 2)	Decommissioning	-11	• Suitable erosion control should be utilised where necessary. • Disturbed areas or areas rehabilitated with soils should be stabilised as soon as possible using plants (e.g. grass) or other mechanical methods (e.g. profiling or erosion control blankets). • A rehabilitation plan for the site inclusive of topsoil replacement, a re-vegetation strategy and maintenance/aftercare and should be developed for disturbed areas.	-2.5
31	Hydrology: Erosion of soils	Alternative Shaft (Alt 2)	Rehab and closure	-8.25		-2.5
32	Hydrology: Pollutants entering the surface water environment	Alternative Shaft (Alt 2)	Decommissioning	-9	• An emergency response plan for unforeseen hydrocarbon spills should be developed while the existing surface water monitoring for the Forzando South Colliery and associated mining should be extended to include Kalabasfontein Project. • Handle hydrocarbons carefully to limit spillage. • Ensure vehicles are regularly serviced so that hydrocarbon leaks are limited. • Designate a single location for refuelling and maintenance where possible. • Keep a spill kit on site to deal with any hydrocarbon leaks. • Remove soil from the site which has been contaminated by hydrocarbon spillage.	-1.75
33	Hydrology: Pollutants entering the surface water environment	Alternative Shaft (Alt 2)	Rehab and closure	-9		-1.75

					• Undertake surface water monitoring to enable change detection related to contaminants originating from the site.	
34	Hydrology: Increase in runoff water	Alternative Shaft (Alt 2)	Decommissioning	-5.25	• Limiting the time and area over which machinery operates will limit the compaction of soils on the site. • Laydown areas should likewise be kept to a minimum with regards to area and time. • The influence of hardstanding cannot be mitigated.	-3.5
35	Hydrology: Increase in runoff water	Alternative Shaft (Alt 2)	Rehab and closure	-4.5		-3
36	Hydrology: Potential Flooding	Alternative Shaft (Alt 2)	Decommissioning	-6.75	• Maintain the pillar system to prevent failure. • Monitor surface levels to detect any change that may indicate possible subsistence or sinkhole development. • A low berm around the ventilation shafts would add additional protection from flooding, whether from surface water run-on or from the river • The powerline should be offset above, and the pylons placed outside of the 1:100 year flood-line or the 100m river buffer (where flood-lines are not available) to protect against high velocity flood flows or associated debris. • Works should ideally not take place within 100m of the river or within the 1:100 year flood-line so as to limit the applicability of Section 21 water uses and GN704 Condition 4. •	-1.75

37	Geology and Topography: Subsidence of surface due to failure of pillars	Underground Mining (Alt 1)	Rehab and closure	-7.5	• The following mine design will apply when mining in the area:
					  ○ Pillar Centres Range: Minimum 15.0 m x 15.0 m and Maximum of 18.0 m x 18.0 m
					  ○ Bord width: 7.2 m
					  ○ Mining Height: Total seam thickness extraction
					  ○ Pillar design process will be such that the Probability of survival criterion for the different surface features is met or satisfied.
					• Surface elevation monitoring points should be installed at positions surrounding the sensitive structures such as building and tarred road at convenient points. During mining, surveys should be conducted monthly and continued monthly for three months after mining has ceased for a period of three months. Thereafter the periods can be relaxed to quarterly for a further year and after that annual surveys should be conducted;
					• Survey beacons should consist of 20 mm rebar and be anchored in concrete with the anchor at least a metre deep. The protruding end of the beacon should not protrude more than 10 cm, to avoid accidental damage; and
					• Similar beacons should be installed in an area with similar ground conditions, more than 200 m away from any undermining to serve as control measurements.
						-3.5

38	Ecology: Further impacts due to the spread and/or establishment of alien and/or invasive species.	Alternative Shaft (Alt 2)	Decommissioning	-9.75	See measures in impact #7.	-9
39	Ecology: Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).	Alternative Shaft (Alt 2)	Decommissioning	-9.75		-9
40	Ecology: Further impacts due to the spread and/or establishment of alien and/or invasive species.	Powerline (Alt 2)	Decommissioning	-9.75		-4
41	Ecology: Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).	Powerline (Alt 2)	Decommissioning	-9.75		-4
42	Ecology: Further impacts due to the spread and/or establishment of alien and/or invasive species.	Underground Mining (Alt 1)	Decommissioning	-16		-9
43	Ecology: Continued displacement, direct mortalities and disturbance of faunal community (including multiple threatened species) due to habitat loss and disturbances (such as dust and noise).	Underground Mining (Alt 1)	Decommissioning	-16		-9
44	Ecology: Spread and/or establishment of alien invasive plant species.	Alternative Shaft (Alt 2)	Rehab and closure	-9.75		6.75
45	Ecology: Soil erosion.	Alternative Shaft (Alt 2)	Rehab and closure	-9.75	See measures in impact #30.	6.75
46	Ecology: Possible re-establishment of indigenous vegetation.	Alternative Shaft (Alt 2)	Rehab and closure	-9.75	See measures in impact #7.	6.75
47	Ecology: Spread and/or establishment of alien invasive plant species.	Powerline (Alt 2)	Rehab and closure	-9.75		6.75
48	Ecology: Soil erosion.	Powerline (Alt 2)	Rehab and closure	-9.75	See measures in impact #30.	6.75

49	Ecology: Possible re-establishment of indigenous vegetation.	Powerline (Alt 2)	Rehab and closure	-9.75	See measures in impact #7.	6.75
50	Ecology: Spread and/or establishment of alien invasive plant species.	Underground Mining (Alt 1)	Rehab and closure	-16		-9
51	Ecology: Soil erosion	Underground Mining (Alt 1)	Rehab and closure	-16	See measures in impact #30.	-9
52	Ecology: Subsidence and alteration of surface geology, hydrology will impact on habitats	Underground Mining (Alt 1)	Rehab and closure	-16	See measures in impact #7 and 37.	-9
53	Loss / degradation of aquatic habitat and biota	Alternative Shaft (Alt 2)	Decommissioning	-4	• The construction of linear infrastructure such as the powerline, ventilation shafts, roadways and conveyor systems should consider the following mitigation actions when encountering wetland systems and watercourses: ○ No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured for crossings; ○ The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation; ○ The amended powerline should be suspended over the river crossings rather then buried underneath rivers. It can be attached to existing river crossing structures (bridges and culverts) such as those as sites J1 and V3; ○ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ○ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled; ○ Erosion prevention mechanisms such as gabions must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ○ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions; ○ Diversion trenches and berms should convey dirty water to temporary ditches so as to contain runoff. These trenches and ditches can be vegetated to improve soil stability and clean the water; ○ Soils adjacent to the river that have been compacted must be loosened to allow for germination of vegetation; and ○ Stockpiling of removed soil and sand must be done outside the 1:100 flood line or riverine buffer (whichever is greater). This will prevent solids from washing into the river during high flow events. • The removal of vegetative cover, as well as the construction of roads has been recognised as being responsible for increased runoff, sedimentation and subsequent water and habitat quality degradation in downstream portions of river systems (WRC, 2014). As such the careful management of vegetation removal and sedimentation control should take place. This can be achieved through the brief points below: ○ Minimise the removal of vegetation in the infrastructure footprint area; ○ Re-vegetation of the construction footprint as soon as possible; ○ Where storm water enters river systems, sediment/silt and debris trapping, as well as energy dissipation control measures must be put in place; ○ Storm water must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of storm water flow; ○ Sequential removal of the vegetation (not all vegetation immediately); and ○ The vegetation of unpaved roadsides/margins. • During the operational phase of the proposed project, the storage and handling of carboniferous material can result in the degradation of downstream aquatic ecosystems. In order to prevent this, the use of diversion and containment management is of importance. This can be achieved through effective groundwater and surface water management. Important management actions are briefly listed below: ○ Diversion trench and berm systems which diverts clean storm water around pollution sources and convey and contain dirty water to central pollution control impoundments; ○ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from stockpiles and pollution control facilities from entering the local aquatic systems; ○ Where storm water enters river systems from disturbed sites, sediment and debris trapping, as well as energy dissipation control measures must be put in place; and ○ The planting of indigenous vegetation around pollution control impoundments and structures as well as along roadsides on routes used to transport coal should be completed as this has been shown to be effective in erosion and nutrient control.	-1.5
54	Loss / degradation of aquatic habitat and biota	Alternative Shaft (Alt 2)	Rehab and closure	-4		-1.25
55	Impaired water quality in watercourses	Alternative Shaft (Alt 2)	Decommissioning	-5.25		-3
56	Impaired water quality in watercourses	Alternative Shaft (Alt 2)	Rehab and closure	-6.75		-1.5
57	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Alternative Shaft (Alt 2)	Decommissioning	-4		-3
58	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Alternative Shaft (Alt 2)	Rehab and closure	-4		-2.5
59	Impaired water quality in watercourses	Powerline (Alt 2)	Decommissioning	-10		-4
60	Impaired water quality in watercourses	Powerline (Alt 2)	Rehab and closure	-4.5		-1.25
	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Powerline (Alt 2)	Decommissioning	-9		-3
	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Powerline (Alt 2)	Rehab and closure	-4.5		-1
	Loss / degradation of aquatic habitat and biota	Underground Mining (Alt 1)	Decommissioning	-9.75		-5.5
	Loss / degradation of aquatic habitat and biota	Underground Mining (Alt 1)	Rehab and closure	-12		-8.25
	Impaired water quality in watercourses	Underground Mining (Alt 1)	Decommissioning	-12.75		-10.5
	Impaired water quality in watercourses	Underground Mining (Alt 1)	Rehab and closure	-17		-14
	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Underground Mining (Alt 1)	Decommissioning	-15		-9.75
	Alterations in hydrological regime (flow of surface and sub-surface water) and surface topography	Underground Mining (Alt 1)	Rehab and closure	-15		-14

					• As described in the potential impacts of this proposed project, there is potential for Acid Mine Drainage to develop as a result of underground mining activities. The only mitigation possible for potential mine water decant is the use of passive or active water treatment. This is therefore recommended.
					• General mitigation measures would include the following:
					  ○ An experienced, qualified environmental control officer must be on site when construction begins to oversee environmental compliance to the proposed mitigation;
					  ○ Dust-reducing mitigation measures must be put in place and must be strictly adhered to;
					  ○ Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation;
					  ○ All dumping of waste material, especially bricks and contaminated materials or soils, must be prevented; and
					  ○ Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the aquatic and wetland areas
					• See measures in impact #30.
					• See measures in impact #30.	

5.3 REHABILITATION, DECOMISSIONING AND CLOSURE PLAN

The plan presented in this section has primarily been extracted from the current approved EMPR for the Forzando operations (GCS (Pty) Ltd, 2010). Reference must be made to the specific impact assessments presented in the Forzando EMP and the associated management and mitigation measures. Where relevant and applicable specific comment and recommendations applicable to the Kalabasfontein project have been incorporated. It should be noted that the plans presented herein are preliminary in nature and are based on high level outcomes for closure. At the time when closure is imminent a revised detailed closure plan will need to be developed in accordance with the requirements of the MPRDA and the NEMA to support formal applications for Closure Certificates and EA's. Relevant specialist studies will need to be updated to inform the final closure planning. It is understood that an EA under NEMA must be obtained prior to commencing with the decommissioning.

As mentioned in the introduction to this section mine closure can be divided into three distinct phases, namely: Decommissioning and rehabilitation, closure, and post closure. The scope of each if these phases is presented in this sub-section and represents both the plans presented in the approved EMPR for Forzando (GCS (Pty) Ltd, 2010) as well as suggestions for the Kalabasfontein Project.

5.3.1 DECOMMISSIONING PHASE

The decommissioning phase will commence once the mining operation has reached the end of life, and will typically involve:

- Demolishment of all infrastructure (plants, ancillary, etc.):
    - All infrastructures will be removed and rehabilitated, should no alternative use be found for the structures.
    - An alternative use for the brick structures will first be sought i.e. they can either be sold/donated to the post-mining landowner on sale of the land. If an alternative use cannot be found, the buildings will be demolished.
    - All material recovered from the demolition of buildings and/or structures will either be transported to a permitted disposal site, sold as scrap or made available to the local community as building materials (provided they are in a satisfactory condition following demolition).
- Removal of linear infrastructure (conveyors, railway, roads and pipelines):
    - Linear infrastructure constructed by the mine (i.e. roads, conveyors, railways and power lines) will be removed if it proves to inhibit land use at decommissioning. Where possible infrastructure will remain for social investment opportunities, this will be decided in conjunction with Integrated Development Plan (IDP) of the area and the local authorities (i.e. municipality). The soils and land capability will be rehabilitated to near pre-mining conditions.
    - All haul roads, and access roads not being handed over to the landowner, will be rehabilitated.
    - All fences erected around the mine will be dismantled and either disposed of at a permitted disposal site or sold as scrap (provided these structures will no longer be required by the post-mining land owner). Fences erected to cordon-off dangerous excavations will remain in place and will be maintained as and when required.
    - The overland conveyors and railway line, if not used as a community initiative, will be disassembled and the components removed from the site. The material can either be sold (as a unit) or the components sold as scrap.

- Decommissioning of dams:
    - All containment dams will be maintained to ensure that no leakages occur.
    - Overflow pipes and /or spillways will be kept clean.
    - Sumps will be kept clean and all pumps will be maintained.
    - The containment dams will only be demolished should the area proof to be free draining with no pollution potential after rehabilitation.
- Underground closing: All shaft adits will be made safe by sealing this infrastructure.
- Decanting into underground: The extent of decant to be defined and informed by an updated groundwater model.

Following cessation from mining activities and processing, it is planned that all infrastructure will be decommissioned and removed from site in a systematic and regulated matter.

The decommissioning phase for the Kalabasfontein project would align with the general activities listed above. The following specific actions should also be considered at the time of developing a final closure plan:

- All material and machinery (including mine machinery, pipelines, electrical infrastructure, water facilities, ablutions, etc) which can be recycled, reused, or salvaged should be removed from the underground workings. Any remnant equipment should be rendered safe for disposal and abandonment.
- Any potentially contaminated areas (including refuelling areas, hazardous material stores, etc) should be tested for contamination and where applicable remediated, and/or contaminated materials removed and disposed of at a licenced facility. It should be noted that the current plans do not include dedicated refuelling facilities for the Kalabasfontein Project and the existing facilities in place for Forzando South will be used.
- All “conduits” like exploration boreholes, emergency boreholes and ventilation shafts be sealed off after closure.
- An updated numerical groundwater model should be prepared and where applicable the closure of the underground workings should consider the need to isolate and separate certain mining areas to allow for more effective post closure water management. The model should also identify the need to install water monitoring infrastructure to monitor and inform the long-term water management.
- A survey should be conducted on the pillar conditions in the applicable mining area to inform the long-term post closure pillar collapse and subsidence predictions.
- The vent shaft must be closed in accordance with the recommendations of an updated groundwater model and a suitable plug and cap must be designed by a qualified engineer. In principle the vertical hydraulic connectivity between various intercepted aquifers must be prevented.
- An updated risk assessment on the potential for methane gas or other hazardous substances migrating through the ventilation shaft must be carried out and applicable management and mitigation measures implemented.

5.3.2 REHABILITATION

The concept of progressive rehabilitation and decommissioning should be implemented throughout the life of mine. Progressive rehabilitation and decommissioning will assist in reducing the final closure cost as well as informing the mine of suitable closure strategies for final closure. The mine must consider all options for progressive rehabilitation and decommissioning at each interval for the development and submission of both the annual rehabilitation plan and the final rehabilitation, decommissioning, and closure plan to be submitted in accordance with the NEMA financial provisioning regulations.

In accordance with the EMPR for Forzando (GCS (Pty) Ltd, 2010) the following active rehabilitation of the area will be undertaken:

- Recovery of all saleable infrastructure, including the conveyor system.
- Demolition and removal of all buildings and structures.
- Ripping of all compacted areas, which will be followed with soil amelioration and vegetation.
- Ensure that all remaining piles and slopes are sufficiently shaped to blend in with the surrounding environment.
- Soil amelioration and vegetation of all disturbed areas.
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover.
- Monitoring of key environmental variables (i.e. soils, vegetation, groundwater and surface water) in order to demonstrate stability of rehabilitated areas.
- Weed management after closure, limited to areas disturbed by mining or included as infrastructure related to the mine.

The opportunities for progressive rehabilitation of the aspects associated with the Kalabasfontein project are limited. The progressive decommissioning of the underground working areas should be implemented as and when the mining is complete.

5.3.3 CLOSURE PHASE

Section 43 (1) of the MPRDA states that '*the holder of a prospecting right, mining right, retention permit, mining permit, or previous holder of an old order right or previous owner of works that has ceased to exist, remains responsible for any environmental liability, pollution, ecological degradation, the pumping and treatment of extraneous water, compliance to the conditions of the environmental authorisation and the management and sustainable closure thereof, until the Minister has issued a closure certificate in terms of this Act to the holder or owner concerned*'. Further, Section 43 (4) states that '*an application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the required information, programmes, plans and reports prescribed in terms of this Act and the National Environmental Management Act, 1998.*' Consequently, the mine will need to apply for a closure certificate once the decommissioning and rehabilitation has been conducted in accordance with the EMPR and the obligations provided by the NEMA EA for decommissioning have been complied with.

According to the EMPR for Forzando (GCS (Pty) Ltd, 2010), when the decision is taken to decommission the mine, the activities below will be implemented[1]:

- Recovery of all saleable infrastructure.
- Rehabilitation of the railway loop to be feasible for future agricultural transportation system in conjunction with consultation with the relevant stakeholders.
- Demolition of all buildings and structures.
- Ripping of all compacted areas, which will be followed with amelioration and vegetation should self-succession not take place.
- Ensure that all remaining stockpiles and slopes are sufficiently shaped to blend in with the surrounding environment and to ensure sustainable rehabilitation in the form of self-succession.

[1] It is important to note that a NEMA EA will be required prior to the implementation of the decommissioning activities.

- Soil amelioration and vegetation of all disturbed areas where necessary.
- Maintenance of all re-vegetated areas up until such areas initiate succession and create a sustainable cover.
- Monitoring of key environmental variables (i.e. soils, vegetation, groundwater, surface water and air quality) in order to demonstrate stability of rehabilitated areas.
- Weed management by local people for three (3) years after closure, limited to areas disturbed by mining or included in the mining area.
- Monitoring will be undertaken for three (3) years after closure or up until such time all areas create a sustainable cover and ecosystem.

According to the Forzando EMPR (GCS (Pty) Ltd, 2010), the following maintenance measures will be implemented as part of the closure and post-closure process:

- All natural physical, chemical and biological processes for which a closure condition has been specified must be monitored for three (3) years after closure or as long as deemed necessary at the time. Such processes include erosion of the rehabilitated surfaces, surface water drainage, air quality, surface water quality, groundwater quality, vegetative regrowth, weed encroachment and colonization by animals.
- Measures must be implemented to curb environmental impacts and to ensure that they do not worsen/cumulate over time.
- All rehabilitated areas will be monitored and maintained until such time as required to enable the mine to apply for closure of these different areas.
- The following activities will be included:
    - The closure costs (demolition, removal, re-shaping and rehabilitation quotes per key quantity) for each facility must be included in the database so that the total closure cost can be determined.
    - All facilities that become redundant during the life of the mine must be rehabilitated concurrently to lighten the rehabilitation process at the end of the mine's life.
    - Attention must be paid to the latest developments in the mine rehabilitation sciences.
    - Rehabilitation should be done as soon as possible, to ensure that the rehabilitation work required is kept to a minimum at the end of the life of the mine.
    - Ensure that the area is free draining.
    - Ensure that self-succession has been implemented.
    - Ensure that all slopes are safe in the long term.
    - Submission of closure report and application for closure to the authorities.
    - Environmental monitoring and maintenance for three years after closure.

Although it is assumed that all impacts will be managed and rehabilitated by the above objectives, some residual impacts will however still be present.

In so far as the Kalabasfontein project is concerned, the key activity during this phase (i.e. post decommissioning) will be to ensure effective rehabilitation as well as monitoring. In addition to the actions listed above it is suggested that the need for closure phase monitoring of explosive gases from the underground workings and ventilation shaft should be informed by a risk assessment undertaken prior to decommissioning.

5.4 POST CLOSURE

Residual impacts above will continue into post closure phases. During closure and post-closure phases, the main activities will be monitoring and maintenance. Any residual impacts, particularly those discussed in the decommissioning phase regarding groundwater will be monitored and specialist advice will be obtained should any issues arise. The following specific post closure residual risks and prosed management and mitigation must be considered:

5.4.1 LONG TERM WATER QUALITY AND DECANT

A specialist groundwater assessment and associated numerical groundwater model has been undertaken for the Kalabasfontein project by GCS Water and Environmental Consultants (GCS (Pty) Ltd, 2018). Relevant findings of this assessment are used to inform this section.

5.4.1.1 **IMPACT ASSESSMENT**

Once mining has ceased, Acid Rock Drainage (ARD) is likely to form in the underground workings given the unsaturated conditions in the facility causing oxidation of sulphide minerals which, when in contact with infiltrated groundwater, creates sulphuric acid. Influx of groundwater into the underground workings results in plume migration. Therefore, groundwater contaminant plumes are likely to migrate from the mining areas once the water level in the underground voids have reached long term steady state conditions. The specialist assessment and model provide the following key findings:

- Contamination plume:
    - The contaminant plume emanating from the underground voids will have an impact on the groundwater quality as seen in the post mining simulations. The sulphate plume is basically restricted to the mine workings area and limited down-stream migration will occur after closure.
    - Several “sensitive” areas can be highlighted from the predicted sulphate contour maps (Figure 4 and Figure 5). These areas represent a worst-case scenario of expected groundwater seepage from the underground workings which may reach the shallow upper aquifer zone. It is recommended that groundwater and surface water monitoring points be installed in certain areas to monitor any seepages. Experience has shown that the plume stagnates after about 50 years, and no further movement after such time is expected. This statement is also supported by the geochemical modelling which indicates either a decrease or flattening of predicted concentrations.

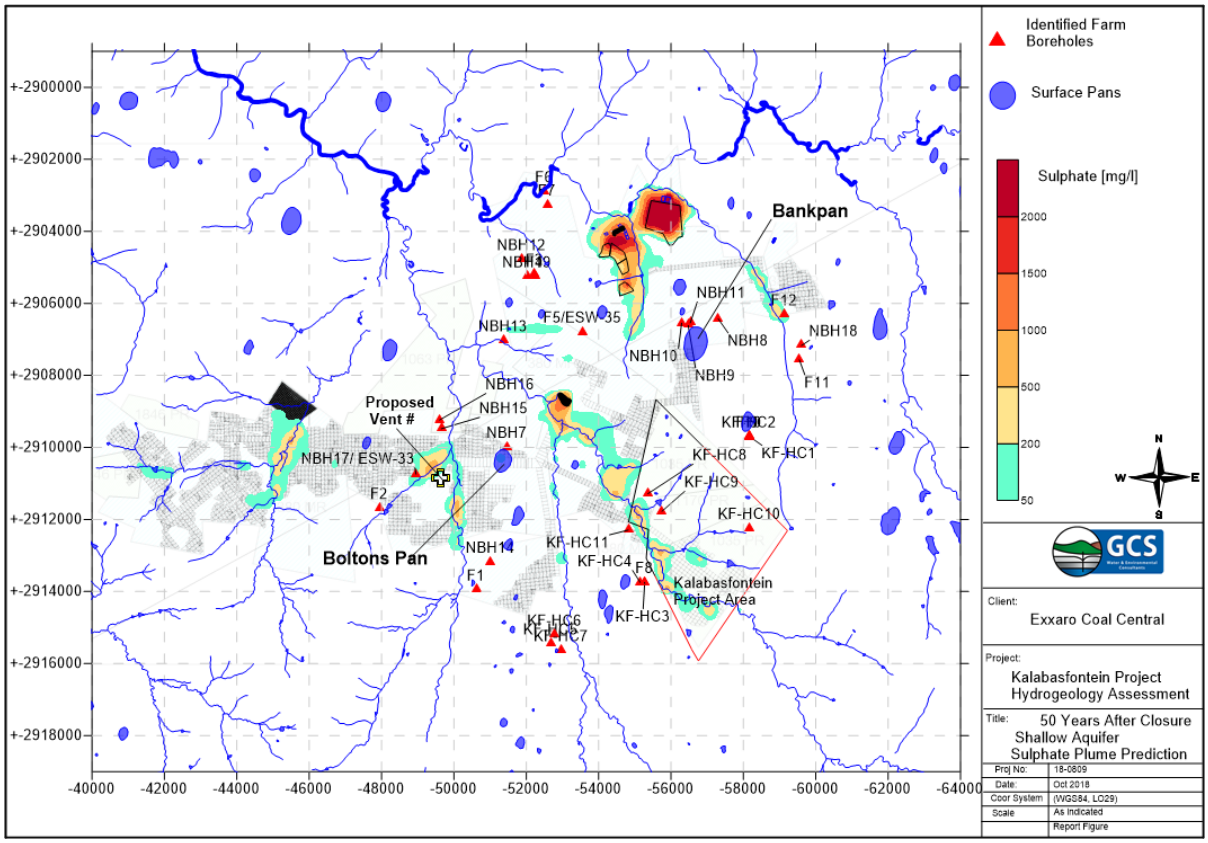

Figure 4: Forzando Coal Mines sulphate contours in [mg/l] 50 years after final closure - Shallow Aquifer

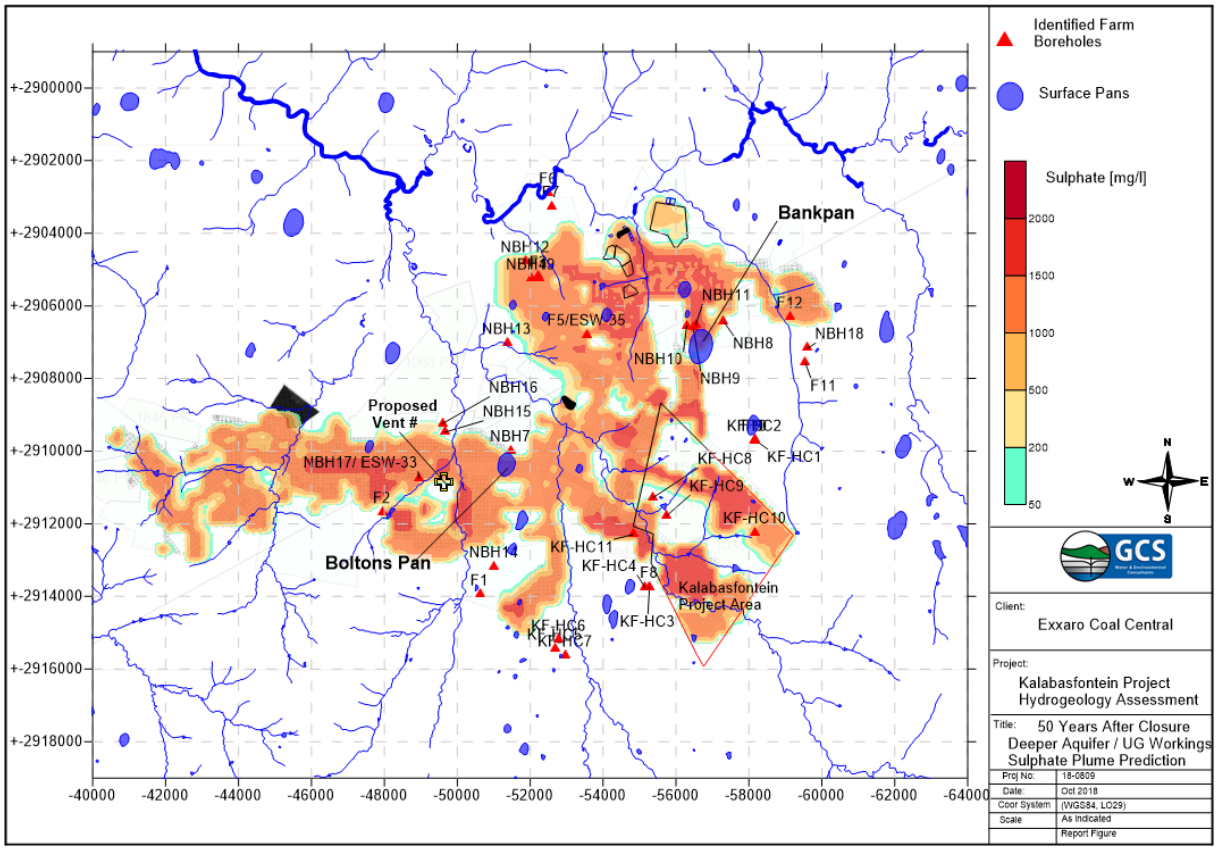

Figure 5: Forzando Coal Mines deeper coal seam horizon sulphate contours in [mg/l] 50 years after closure

- Mine water decants:
    - Total recovery of groundwater levels will be in the region of 40 to 50 years after closure based on 3 % recharge. As the underground workings will recover due to normal rainfall recharge and regional aquifer inflow, water should rise to its original level.
    - The assessment indicates that it is highly unlikely that direct decant will occur according to the existing layout and adit positions.
    - The risk of subsidence becomes greater where underground mining occurs along shallow zones. Subsidence will subsequently result in additional recharge. Sound geotechnical and/or rock mechanical principles must be applied during mining to prevent subsidence, especially in areas where the underground workings are shallow.
    - Additional recharge from rainfall into the underground workings: If recharge becomes higher than what is naturally occurring, surplus water will be generated that exceeds the aquifers storage capacity and will subsequently migrate along the shortest route to the surface. The natural recharge is between 2 and 4% of annual rainfall. If more recharge is allowed through old exploration boreholes, surface cracks, shallow underground workings, etc then upward plume migration will occur.
    - An unplugged borehole acts as a conduit for flow and a preferential pathway for decant if no other pathways exist. Unless boreholes will be used for monitoring, it should be sealed at closure to limit the possibility of decanting. It is also critical that any future monitoring boreholes that will be installed to measure rebound in the underground workings be placed outside the sensitive areas.
    - The “Up-thrust” compartment is bound by dolerite dykes; the degree of weathering and possible recharge into this compartment must be confirmed by looking at current inflows and possible connection from ground surface to the underground workings.
- Surface and Groundwater interactions:
    - The Viskuile Spruit flows through the proposed Kalabasfontein project area and next to the Forzando South Adit area in a northerly direction. It is not foreseen that the proposed new Kalabasfontein project and Forzando South will have any related impacts after closure on the Viskuile Spruit due to seepage from any surface mine infrastructure; the coal stockpile areas will be removed and the areas rehabilitated after closure.

5.4.1.2 **LONG TERM AMD STRATEGIES**

The following general management strategies must be considered to manage any long-term AMD:

- Plan for closure regarding understanding where water enters the mine and would normally accumulate, how it flows, how it should preferably flow in order to minimize water quality deterioration.
- Seal all boreholes, old ventilation shafts, old rescue bays and mine portals/adits. These holes need to be plugged from the bottom where they intersect the workings and then grouted through to surface. It would be advantageous if the bord can be backfilled (e.g. with ash) to give further support to the roof to reduce the risk of bord failure which could destroy the plug and grouting thus allowing water to ingress into the workings.
- Adits can be major sources of surface and groundwater ingress if not properly lined.
- Sufficient pillars must be left underground, as part of sound mine planning, to avoid subsidence of the roof to surface along the shallower areas (where underground mining is less than 40m from surface). This will ensure that the rate of recharge to the underground workings remain at natural rates and will minimise decant from the workings post-closure.

The focus areas for AMD management should be:

- To reduce oxygen ingress into the old mine workings. Oxygen usually enters the mine where mine workings are not flooded or via excessive rainfall recharge/inflows. Shallow areas where the overburden is less than 30m are more susceptible to higher rainfall ingress, oxygen ingress and AMD.
- To reduce excessive rainfall recharge/inflows into the underground workings after flooding.

It can be concluded from available data that:

- Probability for AMD generation in the underground workings is low if oxidation can be reduced.
- Certain areas will be more sensitive and prone to oxygen ingress into the UG working than other areas. The sensitive areas are typically associated with shallower areas.
- Saline drainage will be more likely to occur where sulphate concentration dominates the underground water quality after closure. It is normally restricted to the underground workings and only migrates away from the workings along zones of higher aquifer hydraulic conductivity. Such zones are normally associated with geological structures like fault zones and dolerite dykes.
- Saline drainage may also enter the shallow weathered aquifer zones along the shallow mining areas at the sensitive areas.

- 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.
- Audit the monitoring network annually.
- Rehabilitation must include closing of the adit and ventilation shaft locations so no open connection exists between the surface and the underground mine voids. Covering with a topsoil layer as well as vegetation must be included. Installation of a soil cover will significantly decrease water infiltration and contamination.
- The discard dump closure and rehabilitation plan must ensure that the amount of seepage from rainfall into the discard dump is minimised.

The volume of decant that the proposal Kalabasfontein is expected to contribute to the regional decant as a result of the Forzando complex is low. Forzando has, in their 2019 closure costing (Green Gab (Pty) Ltd, 2019), made provision for water treatment plant to manage contaminated water emanating from the mine complex. The cost applied to the financial provisions makes allowance for treatment if water for a 20-year period from the date that the excess mine water make manifests. The selected treatment process includes a 1600m^3/day triple stage RO plant with chemical dosing at each RO stage. Based on discussion with the Groundwater Specialist that expected additional water make from the Kalabasfontein Project is unlikely to increase the water make from the complex beyond the 1600m^3/day.

5.4.2 SUBSIDENCE

Pillar failure in the underground mining areas has the potential to result in various impacts that need to be considered in the post closure phase. These may include:

- Surface subsidence resulting in damage to surface structures (e.g. roads, houses, linear infrastructure, etc).
- Surface and sub-surface subsidence may impact on the surface and shallow groundwater systems which may have an impact on local wetlands, ecology and biodiversity.
- Sub-surface collapse may affect the shallow geology to the extent that there may be indirect effects on the groundwater systems.

It is understood that the probability of subsidence occurring over the long term is dependent on numerous factors, including:

- The nature of the overlying geology;
- The depth of the mine workings;
- The time taken for the underground working to flood with water; and
- The safety factors applied to the design of the pillars.

The EIA report for the Kalabasfontein project provides a description of the likely subsidence risk associated with the current mine design. The key findings of this include:

- Pillar stability: All the pillars were found to have a probability of survival more than 99.995% which is recommended for the highly sensitive surface structures. This therefore implies a probability of failure of < 0.005%. Pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures.

- Sinkhole formation: A maximum caving height of 14.0 m was calculated for all areas should roof failure occur. No sinkhole is therefore expected in the reserve area as the maximum caving height does not progress to / intersect the weathered zone in any of the boreholes. Cognisance must also be given to the fact that the overburden is comprised of at least 39% competent sandstone layers. Competent means any lithological units with a thickness of at least 1.0 m and a composition of at least 80% sandstone. A minimum sandstone thickness of 15 m in the overburden was found during the investigation. This layer has an unsupported stable span of at least 20 m when jointed and 49 m when unjointed. Thus, pillar failure must occur before the overburden can fail. This means that sinkhole hole probabilities are low in the area.

- The magnitude of maximum subsidence in a bord and pillar layout is dependent on the unlikely event that panel's pillar system fails. Cognisance must be taken of the fact that the calculated pillar life index and probability of survival are far greater than the recommended minimums, indicating a stable pillar system. The investigation shows that a Class C, D and E subsidence profile will occur in the area in the unlikely event that pillar fails. The subsidence profile will have the following characteristics:

    - Class C: Noticeable in flat terrain, smooth, cracks 2 to 10 cm wide, compression ridges 1 to 5 cm high.
    - Class D: Noticeable in most terrains, visible vertical displacements across cracks, cracks 10 to 50 cm wide, compression ridges 5 to 50 cm high.
    - Class E: Severe profile, almost vertical sides, cracks wider than 50 cm, compression ridges higher than 50 cm.

    Class D & E subsidence will largely be constrained to distal southern and western portion of the reserve area.

Management and mitigation to assist in reducing the likely long-term subsidence risk include:

- Comply with the mine design recommendations presented in the Geotechnical Risk Assessment (Exxaro Coal Central, 2018).
- Ensure that suitably conservative safety factors are incorporated into the mine design, specifically in areas underlying sensitive environmental features, sensitive social and cultural features (including heritage features), and surface structure and infrastructure.
- Carry out periodic monitoring and assessment of the structural integrity of the pillars during the mining operations to assist in informing and calibrating future rock stability models and subsidence risk assessments.
- Surface elevation monitoring points should be installed at positions surrounding the sensitive structures such as building and tarred road at convenient points. During mining, surveys should be

conducted monthly and continued monthly for three months after mining has ceased for a period of three months. Thereafter the periods can be relaxed to quarterly for a further year and after that annual surveys should be conducted. Survey beacons should consist of 20 mm rebar and be anchored in concrete with the anchor at least a metre deep. The protruding end of the beacon should not protrude more than 10 cm, to avoid accidental damage. Similar beacons should be installed in an area with similar ground conditions, more than 200 m away from any undermining to serve as control measurements.

- Carry out a detailed stability /geotechnical assessment and associated risk assessment prior to final closure to identify the likelihood of future subsidence and to identify suitable management and mitigation measures to be implemented prior to closure.
- Utilise the updated risk assessment to refine and adjust the post closure liability assessment and ensure adequate financial provisions for residual and latent risks.

The opportunities for post closure avoidance of subsidence is limited. In this respect it is suggested that a detailed geotechnical/ rock engineering risk assessment is conducted during the decommissioning and closure phases to redefine the potential probability and extent of the long-term subsidence risk.

6 CALCULATION OF FINANCIAL PROVISIONS

This section presents the basis of the calculation of the quantum for financial provisions for closure. The assessment and calculations are based on real contractor rates and consequently aligns with the requirements of the NEMA Financial Provisioning Regulations (GNR1147). The scheduled and unscheduled closure costs are determined based on third party/contractors' rates as at July 2020. It is noted that the long running costs such as care and maintenance were not discounted and are reflected as accumulated present-day costs. The costs are also VAT exclusive. It is noted the closure costs reflected in this report only relate to the activities of Kalabasfontein and exclude Forzando's current mining areas.

6.1 APPROACH TO COST DETERMINATION

The following approach was applied during the review and update of the closure liability:

- Background information such as aerial images, layout drawings and specialist studies, etc. were gathered, collated and synthesized.
- Unit rates were updated to form a dedicated suite of unit rates that reflect site specific conditions;
- Good practice requirements for key closure measures were confirmed and revised, where required;
- Bills of quantities (BoQs) and detailed costing sheets in a format that complies with the requirements of GN R. 1147 were compiled; and
- The closure costing report was compiled, summarising the approach, assumptions and findings applicable to this closure costing update.

6.2 CLOSURE CONTEXT

Section 5 presents the closure objectives and risks as stated in the 2010 EIA and EMPR report. These objectives apply to this closure report and assessment. The aim of the mine closure plan and maintenance measures is to ensure that the area affected by the mining operations is rehabilitated according to the closure plan and to apply for closure. The objective is for the area to be rehabilitated sustainably (ensuring self-succession of plants and the associated return of natural wildlife; as well as the improvement of the natural watercourses and groundwater systems).

6.3 COSTING ASSUMPTIONS AND QUALIFICATIONS

The following assumptions and quantifications apply to this closure cost determination:

- Costs have been determined within the assumption that an outside (third party) contractor would establish an on-site camp and conduct the rehabilitation-related work;
- The closure costs do not cover components such as staffing of the site after decommissioning, the infrastructure and support services (e.g. power supply, etc) for the staff, as well as workforce matters such as separation packages, re- training /re-skilling, etc.
- The fixed ratio of preliminary and general (P&Gs) and contingencies are included in the costs for site establishment by the dedicated contractors that would be commissioned to conduct the rehabilitation;
- The cost estimates allow for post-closure care and maintenance work, as well as compliance monitoring by specialist contractors and consultants;
- No cost off-sets due to possible salvage values were considered as this is not in accordance with GN R. 1147, or internationally accepted good practice. Only gross decommissioning and rehabilitation costs are detailed in this report;
- Both the scheduled and unscheduled closure costs have been determined. The scheduled closure takes place at a planned future date (end of life), in accordance with overall mine planning. The unscheduled closure entails immediate closure of a site, representing decommissioning and rehabilitation of the site in its present state.

However, since the unscheduled scenario is for a new extension (Kalabasfontein Project), the guidance in Appendix 4 from the proposed regulations pertaining financial provisioning as gazetted on 17 May 2019 was followed. As stipulated, all anticipated disturbance during the first year of mining operations, including latent impacts associated with the anticipated disturbance, should be provisioned for.

For the purposes of the Kalabasfontein Project, only the directly impacted surface areas have been included in the calculation of costs for water management. The current geohydrological model predicts that it is highly unlikely that direct decant will occur (GCS (Pty) Ltd, 2018). It is assumed that any excess mine water in the Kalabasfontein workings that may need to be managed upon unscheduled or scheduled closure will be managed by Forzando in their mine wide closure water management plan and provision, as and if required.

6.4 UNIT RATES

Unit rates that were applied during the closure determination were obtained from an existing database. The database is updated in consultation with demolition practitioners and/or civil contractors. The post-closure unit rates that are included in the applied rates are summarised below.

6.4.1 SURFACE WATER MONITORING

It has been assumed that surface water monitoring will be conducted at four monitoring points and would take an independent specialist at least one man-day to conduct the sampling at these points. It is assumed that in this one man-day the preparation of the sampling equipment is included. The professional fees and disbursements would equate to R 7 920 per sampling event. The water sample analyses equate to R 16 800 (R4 200 per sample), therefore totalling to R 24 720 per event. Taking other disbursements (15 %) into account this amount could be rounded to R 28 428 per sampling event, or R 113 712 per year for a quarterly sampling frequency. It has been assumed that surface water monitoring will have to continue for 5 years mine post-closure.

6.4.2 GROUNDWATER MONITORING

To reflect post closure groundwater quality, it has been assumed that at least 10 groundwater monitoring boreholes would be required. If it is assumed that two man-days would be required to conduct a monitoring event (including preparation) the professional fees and disbursements would equate to R 7 920 per day. Allowance has also been made to conduct a chemical analysis at R 4 200 per sample. Hence, these costs amount to about R 42 000 per sampling event. Taking other disbursements (20 percent) into account the costs could be rounded to R 69 408 per sampling event. If sampling has to be conducted at least four times a year, the annual

costs are R 277 632 per year. It has been assumed that groundwater monitoring will have to continue for 10 years post closure.

6.4.3 REHABILITATION MONITORING

For the 0.58ha area of land disturbed land (access road, power line and vent shaft) it is assumed that for unscheduled closure one consultant would be required for one man-day to conduct the rehabilitation monitoring. One event would equate to R4 400, if a R550/hr consultant rate is assumed. The annual costs would amount to R8 800 or roughly R15 172/ha if monitoring is to be conducted twice a year (travelling and accommodation included). Over a five-year period the cost would be R44 000, or R75 862/ha.

6.4.4 REHABILITATION CARE AND MAINTENANCE

It is assumed that this would require 2 days per year of a team of 2 workers and 1 JCB as supporting equipment to conduct the corrective measures over 0.58 ha. It has been assumed that the hourly rate of the workers is R25 and the equipment R 4 000/day (per machine). If accommodation and travelling of R 500 per person is also added, the overall rate is about R 18 966/ha/year. It has been assumed that the workers and equipment would be sourced locally.

6.5 CLOSURE COST DETERMINATION

The closure allowances for the determination of the closure costs are reflected below. The spreadsheets detailing the closure costs are included in Appendix 1. The sub-sections below are aligned to the Cost sheets and should be read in conjunction with these cost sheets.

6.5.1 INFRASTRUCTURE AREA

Component	Unscheduled	Scheduled
Ventilation shaft substation.	The assumption was made that the substation would include a 14m² brick building with two transformer slabs (2 m x 3 m x 0.25 m thick). It was also assumed that the substation is surrounded with a 40 m perimeter security fence.	Same as for unscheduled closure.

6.5.2 MINING AREA

Component	Unscheduled	Scheduled
Ventilation shaft	Allowance was made for the removal of the ventilation shaft fans and top hats (all steel structures) and associated concrete bases and security fences. Allowance was made to plug the ventilation shaft that includes the following activities: • The top of ventilation shaft will be excavated to a depth of 2 meters where the concrete cap will be placed on top of ventilation shaft; • Provision was made for UB beams to support the concrete cap (during construction); • Provision was made for a steel plate on top of the UB beams to act as a fixed formwork below the concrete cap; • A reinforced concrete slab of 1 meter thick will be constructed over the shaft;	Same as for unscheduled closure.

Component	Unscheduled	Scheduled
	• Selected material will be backfilled and vegetated to tie in with surrounding conditions.	
Subsidence	The pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures (Exxaro Coal Central, 2018). Since the probability of failure is extremely low and the extent and magnitude of any subsidence is not known, it is recommended that a sensitivity map and risk assessment be carried out to get a better understanding of this risk. For the unscheduled scenario it is assumed that for the most part only development would have taken place and therefore no allowance was made.	The pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures (Exxaro Coal Central, 2018). Since the probability of failure is extremely low and the extent and magnitude of any subsidence is not known, it is recommended that a sensitivity map and risk assessment be carried out to get a better understanding of this risk. Because of the uncertainties outlined above, a nominal allowance of R100 000 has been made until further scientific data becomes available.

6.5.3 GENERAL SURFACE REHABILITATION

Component	Unscheduled	Scheduled
Ripping of footprint areas	Rip to depth of 500 mm over footprint area with a D7 Dozer	Same as for scheduled closure.
Shaping/levelling of infrastructural footprint areas	Shape and level at an average depth of 500 mm over footprint area with a D7 Dozer	Same as for scheduled closure.
Vegetation establishment on footprint areas	Establish vegetation on ripped and shaped areas	Same as for scheduled closure.

6.5.4 PRELIMINARY AND GENERAL AND CONTINGENCIES

Component	Unscheduled	Scheduled
Preliminary and general	An additional allowance of 12 percent has been included, aligned to the DMR guidelines.	Same as for scheduled closure.
Contingencies	An additional allowance of 10 percent has been included, aligned to the DMR guidelines.	Same as for scheduled closure.

6.5.5 POST CLOSURE PHASE

Component	Unscheduled	Scheduled
Surface water quality monitoring	Quarterly monitoring for 5 years	Same as for scheduled closure.
Groundwater quality monitoring	Quarterly monitoring for 10 years	Same as for scheduled closure.
Rehabilitation monitoring of rehabilitated areas	Bi-annually monitoring for 5 years	Same as for scheduled closure.
Care and maintenance of rehabilitated areas	2 days per year for 5 years (0.51ha per year)	

6.6 SUMMARY OF CLOSURE LIABILITY

Table 3 presents a summary of the closure cost calculations. Detail on the itemised cost breakdown is included in Appendix 1, and the underpinning assumptions are presented in the preceding sections.

Table 3: Scheduled and unscheduled closure liability assessment for Kalabasfontein.

Components	Unscheduled	Scheduled
Infrastructural Areas	R 1 313 776.04	R 1 313 776.04
Mining Areas	R 226 000.00	R 326 000.00
General Surface Rehabilitation	R 22 199.65	R 22 199.65
P&Gs and Contingencies	R 343 634.65	R 365 634.65
Post Closure Phase	R 3 457 572.90	R 3 457 572.90
TOTAL	**R 5 363 183.24**	**R 5 485 183.24**

6.7 CONCLUSION AND RECOMMENDATIONS

The financial provision for rehabilitation and closure for Kalabasfontein is documented in this report. Information was provided by the mine. Assumptions and consequent estimates were made based on experience. The unit rates used in the closure costing were obtained from a database of recent third-party rates. The unit rates were adapted to reflect site specific conditions, where required.

Since the probability of pillar failure is extremely low and the extent and magnitude of any subsidence is not known, it is recommended that a subsidence heat map and risk assessment be carried out to get a better understanding of this risk. Because of the uncertainties outlined above, a nominal allowance of R100 000 has been made (scheduled scenario) until further scientific data becomes available and on which a more informed decision can be made regarding the quantum of closure provisioning needed for subsidence management.

7 ASSUMPTIONS AND LIMITATIONS

The following key assumptions and limitations apply to this report:

- The remainder of the Forzando Mine has not been assessed and included in the calculation of this closure cost. It is understood that Forzando updates and revises their quantum for financial provision

for rehabilitation, decommissioning and closure on an annual basis as part of their Mining Right obligations. Once approved, the Kalabasfontein Project will be included in these regular review and assessments for the Forzando mine.

- The potential risk of methane and consequently specific closure management and mitigation measures have not been included.
- The potential risk of spontaneous combustion and associated management have not been included in this closure cost estimate.
- The costs associated with long term water management and where necessary treatment have not been included in this financial provision estimate. It is expected that the long-term water liability and treatment for the greater Forzando Complex will have adequate capacity to accommodate the Kalabasfontein area.

8 RECOMMENDATIONS

The following recommendations apply:

- The mine should prepare the financial provisioning reports as required by the 2015 NEMA Regulations.
- The mine should undertake engagements with the surrounding community to discuss the current closure objectives and plans, and where applicable revise and optimise these.

9 REFERENCE LIST

Exxaro Coal Central. (2018, July 7). Kalabasfontein Project, Forzando Complex: Geotechnical Risk Assessment. Dorstfontein Regional Office, Mpumalanga, South Africa: Exxaro Coal Central.

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Appendix 1: Details Closure Cost Breakdown.

KALABASFONTEIN PROJECT						
Closure Costing						
Comments/Assumptions		**Rehab Activity**	**Units**	**Quantities**	**Rate**	**Activity Cost**
Unscheduled						
	1	**Infrastructural Areas**				**R 1,313,776.04**
	1.1.	**Infrastructure**				
	1.1.1	Ventilation shaft substation				
Soft strip before demolition, excludes disposal of waste. As per Jet Demolition (0.8m³/m² of light concrete)		Soft strip sub-station infrastructure before demolition	m²	14.00	R 440.00	R 6,160.00
Assume 250 mm thick concrete plinths for 2 transformers (2m x 3m each)		Removal of concrete foundation	m³	3.00	R 865.00	R 2,595.00
Assume perimeter of 40 m		Dismantle fencing	m	40.00	R 50.00	R 2,000.00
	1.1.2	Ventilation shaft Fans and Top hat				
Assume up to 800 kg/m² including sheeting		Removal of medium plant structures	m²	129.55	R 1,390.00	R 180,077.42
Heavy duty concrete (500 mm - 7500 mm)		Removal of concrete slabs and shaft	m³	40.95	R 865.00	R 35,423.62
Assume perimeter of 60 m		Dismantle fencing	m	60.00	R 190.00	R 11,400.00
	1.2	**Roads and paved surface**				
Assumption was made that the length of the access road is 740 m and 4 m wide	1.2.1	**Rehabilitation of ventilation shaft access road**				
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		General ripping of surface area	m²	2920.00	R 6.00	R 17,520.00
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		General shaping and levelling of road surface to be free draining and tieing in with the surrounding topography	m²	2920.00	R 11.00	R 32,120.00
General vegetation on flat areas		Vegetate shaped and ripped area	ha	0.29	R 60,000.00	R 17,520.00
Provision made for 2 access roads of 470m and 10m respectively (4 m wide).	1.2.2	**Construction and maintenance access tracks to powerline route**				
		Shape road to be free draining and to tie in with the surrounding area	m²	1920.00	R 190.00	R 364,800.00
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		General ripping of surface area	m²	1920.00	R 6.00	R 11,520.00
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		General shaping and levelling of road surface to be free draining and tieing in with the surrounding topography	m²	1920.00	R 11.00	R 21,120.00
General vegetation on flat areas		Vegetate shaped and ripped area	ha	0.19	R 60,000.00	R 11,520.00
	1.3	**Other linear infrastructure**				
	1.3.1	**Demolish of overland power lines**				
22kv with a total linear distance of 8000 m (plinths every 5 meters with a surface area of 0.4 m²)		Demolish of overland power lines	m	8000.00	R 75.00	R 600,000.00
	2	**Mining Areas**				**R 226,000.00**
	2.1	**Sealing of shafts, adits and inclines**				
	2.1.1	**Demolish ventilation shaft**				

Comments/Assumptions		Rehab Activity	Units	Quantities	Rate	Activity Cost
Assume that top of ventilation shaft will be excavated to a depth of 2 meters where concrete cap will be placed on top of ventilation shaft		Excavation to 2 meter depth	m^3	25.00	R 2,900.00	R 72,500.00
		Remove 2 m of ventilation concrete pipe				
Provision was made for UB beams to support the concrete cap (during construction)		Supply and install 4 x 5 m UB beams (256 x 146 x 31) across the ventilation shaft	t	0.62	R 25,000.00	R 15,500.00
Provision was made for a steel plate on top of the UB beams to act as a fixed formwork below the concrete cap		Supply and install 2 steel plates (4000 x 2000 x 20) to use as fixed formwork below the concrete cap	t	1.27	R 25,000.00	R 31,625.00
The concrete cap will extend over the ventilation shaft		Construct 5 m x 5 m slab (1 000 mm thick) over the ventilation tunnel (35/19 concrete)	m^3	25.00	R 2,900.00	R 72,500.00
		Supply and install 25 x Y20 at 200 mm spacing shape code 60 in both directions	t	1.60	R 21,000.00	R 33,600.00
		Place 1 m topsoil from excavated material on top of slab	m^3	25.00	R 5.00	R 125.00
		Vegetate backfilled area	m^2	25.00	R 6.00	R 150.00
	2.2	**Rehabilitation of subsidised areas**				
The pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures. Since the probability of failure is extremely low and the extent and magnitude of any subsidence is not known, it is recommended that a heat map and risk assessment be carried out to get a better understanding of this risk. For the unscheduled scenario it is assumed that for the most part only development would have taken place and therefore no allowance was made.	2.2.1	Rehabilitation of subsidised areas	Sum	0.00	R -	R -
	3	**General Surface Rehabilitation**				**R 22,199.65**
	3.1	**Infrastructural surface areas**				
	3.1.1	**Rehabilitation of ventilation shaft fan area and associated substation**				
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		Rip surface area	m^2	965.20	R 6.00	R 5,791.21
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		Shaping/levelling of infrastructural footprint areas (500 mm)	m^2	965.20	R 11.00	R 10,617.22
General vegetation on flat areas		Vegetation establishment	m^2	965.20	R 6.00	R 5,791.21
	4	**P&Gs and Contingencies**				**R 343,634.65**
Assume 12% of sub-total	**4.1**	**Preliminaries and general**	Sum	12%	R 1,561,975.68	R 187,437.08
Assume 10% of sub-total	**4.2**	**Contingencies**	Sum	10%	R 1,561,975.68	R 156,197.57
	5	**Post Closure Phase**				**R 3,457,572.90**
Quarterly monitoring for 5 years	**5.1**	**Surface water quality monitoring**	yr	5.00	R 113,712.00	R 568,560.00
Quarterly monitoring for 10 years	**5.2**	**Groundwater quality monitoring**	yr	10.00	R 277,632.00	R 2,776,320.00
Bi-annually monitoring for 5 years	**5.3**	**Rehabilitation monitoring of rehabilitated areas**	ha	0.58	R 86,274.00	R 50,083.80
2 days per year for 5 years (0.58ha per year)	**5.4**	**Care and maintenance of rehabilitated areas**	ha	0.58	R 107,850.00	R 62,609.10
TOTAL						**R 5,363,183.24**

Closure Costing							
Comments/Assumptions		**Rehab Activity**	**Units**	**Quantities**	**Rate**		**Activity Cost**
Scheduled							
	1	**Infrastructural Areas**				**R**	**1,313,776.04**
	1.1.	**Infrastructure**					
	1.1.1	Ventilation shaft substation					
Soft strip before demolition, excludes disposal of waste. As per Jet Demolition (0.8m³/m² of light concrete)		Soft strip sub-station infrastructure before demolition	m²	14.00	R 440.00	R	6,160.00
Assume 250 mm thick concrete plinths for 2 transformers (2m x 3m each)		Removal of concrete foundation	m³	3.00	R 865.00	R	2,595.00
Assume perimeter of 40 m		Dismantle fencing	m	40.00	R 50.00	R	2,000.00
	1.1.2	Ventilation shaft Fans and Top hat					
Assume up to 800 kg/m² including sheeting		Removal of medium plant structures	m²	129.55	R 1,390.00	R	180,077.42
Heavy duty concrete (500 mm - 7500 mm)		Removal of concrete slabs and shaft	m³	40.95	R 865.00	R	35,423.62
Assume perimeter of 60 m		Dismantle fencing	m	60.00	R 190.00	R	11,400.00
	1.2	**Roads and paved surface**					
Assumption was made that the length of the access road is 740 m and 4 m wide	1.2.1	**Rehabilitation of ventilation shaft access road**					
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		General ripping of surface area	m²	2920.00	R 6.00	R	17,520.00
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		General shaping and levelling of road surface to be free draining and tieing in with the surrounding topography	m²	2920.00	R 11.00	R	32,120.00
General vegetation on flat areas		Vegetate shaped and ripped area	ha	0.29	R 60,000.00	R	17,520.00
Provision made for 2 access roads of 470m and 10m respectively (4 m wide).	1.2.2	**Construction and maintenance access tracks to powerline route**					
		Shape road to be free draining and to tie in with the surrounding area	m²	1920.00	R 190.00	R	364,800.00
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		General ripping of surface area	m²	1920.00	R 6.00	R	11,520.00
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		General shaping and levelling of road surface to be free draining and tieing in with the surrounding topography	m²	1920.00	R 11.00	R	21,120.00
General vegetation on flat areas		Vegetate shaped and ripped area	ha	0.19	R 60,000.00	R	11,520.00
	1.3	**Other linear infrastructure**					
	1.3.1	**Demolish of overland power lines**					
22kv with a total linear distance of 8000 m (plinths every 5 meters with a surface area of 0.4 m²)		Demolish of overland power lines	m	8000.00	R 75.00	R	600,000.00
	2	**Mining Areas**				**R**	**326,000.00**
	2.1	**Sealing of shafts, adits and inclines**					
	2.1.1	**Demolish ventilation shaft**					
Assume that top of ventilation shaft will be excavated to a depth of 2 meters where concrete cap will be placed on top of ventilation shaft		Excavation to 2 meter depth	m³	25.00	R 2,900.00	R	72,500.00
		Remove 2 m of ventilation concrete pipe					

Comments/Assumptions		Rehab Activity	Units	Quantities	Rate	Activity Cost
Provision was made for UB beams to support the concrete cap (during construction)		Supply and install 4 x 5 m UB beams (256 x 146 x 31) across the ventilation shaft	t	0.62	R 25,000.00	R 15,500.00
Provision was made for a steel plate on top of the UB beams to act as a fixed formwork below the concrete cap		Supply and install 2 steel plates (4000 x 2000 x 20) to use as fixed formwork below the concrete cap	t	1.27	R 25,000.00	R 31,625.00
The concrete cap will extend over the ventilation shaft		Construct 5 m x 5 m slab (1 000 mm thick) over the ventilation tunnel	m^3	25.00	R 2,900.00	R 72,500.00
		Supply and install 25 x Y20 at 200 mm spacing shape code 60 in both directions	t	1.60	R 21,000.00	R 33,600.00
		Place 1 m topsoil from excavated material on top of slab	m^3	25.00	R 5.00	R 125.00
		Vegetate backfilled area	m^2	25.00	R 6.00	R 150.00
	2.2	**Rehabilitation of subsidised areas**				
The pillar life index calculation shows that all pillars will have a life index of at least 11 046 years before a 50% probability of failure is reached. This is far more than the recommended 2000 years for highly sensitive structures. Since the probability of failure is extremely low and the extent and magnitude of any subsidence is not known, it is recommended that a heat map and risk assessment be carried out to get a better understanding of this risk. Because of the uncertainties outlined above, a nominal allowance of R100 000 has been made until further scientific data becomes available.	2.2.1	Rehabilitation of subsidised areas	Sum	1.00	R 100,000.00	R 100,000.00
	3	**General Surface Rehabilitation**				**R 22,199.65**
	3.1	**Infrastructural surface areas**				
	3.1.1	**Rehabilitation of ventilation shaft fan area and associated substation**				
D 7 dozer - 3 ripper to depth of 500 mm. As per Fraser Alexander		Rip surface area	m^2	965.20	R 6.00	R 5,791.21
D 7 dozer shaping and levelling at an average depth of 500 mm over footprint area		Shaping/levelling of infrastructural footprint areas (500 mm)	m^2	965.20	R 11.00	R 10,617.22
General vegetation on flat areas		Vegetation establishment	m^2	965.20	R 6.00	R 5,791.21
	4	**P&Gs and Contingencies**				**R 365,634.65**
Assume 12% of sub-total	**4.1**	**Preliminaries and general**	Sum	12%	R 1,661,975.68	R 199,437.08
Assume 10% of sub-total	**4.2**	**Contingencies**	Sum	10%	R 1,661,975.68	R 166,197.57
	5	**Post Closure Phase**				**R 3,457,572.90**
Quarterly monitoring for 5 years	**5.1**	**Surface water quality monitoring**	yr	5.00	R 113,712.00	R 568,560.00
Quarterly monitoring for 10 years	**5.2**	**Groundwater quality monitoring**	yr	10.00	R 277,632.00	R 2,776,320.00
Bi-annually monitoring for 5 years	**5.3**	**Rehabilitation monitoring of rehabilitated areas**	ha	0.58	R 86,274.00	R 50,083.80
2 days per year for 5 years (0.58ha per year)	**5.4**	**Care and maintenance of rehabilitated areas**	ha	0.58	R 107,850.00	R 62,609.10
TOTAL						**R 5,485,183.24**