



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT And ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Modikwa Platinum Mine (MPM)

TEL NO: 013 230 2000

FAX NO: 013 320 2192

POSTAL ADDRESS: Private Bag X9120, Driekop ,1229

PHYSICAL ADDRESS: Steelpoort Region, Onverwacht 293 KT Farm Portion 0 (Remaining Extent)

FILE REFERENCE NUMBER SAMRAD: 129MR

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or Mining Right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

- (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (d) determine the—
 - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
 - (ii) degree to which these impacts—
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources, and
 - (cc) can be avoided, managed or mitigated;
- (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- (g) identify suitable measures to manage, avoid or mitigate identified impacts; and
- (h) identify residual risks that need to be managed and monitored.

Executive Summary

Introduction, Background and Scope of the Environmental Impact Assessment

Modikwa Platinum Mine (MPM) is an operational mine situated approximately 20 km west of Burgersfort and 18 km north of Steelpoort within the Sekhukhune District Municipality in the Limpopo Province.

MPM proposes to amend and consolidate their Environmental Management Programme (EMPr), which was approved in 2001, to include the activities associated with the Doornbosch Mining Right, granted in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

This amendment and consolidated EMPr provides an overview of activities and infrastructure included in each of the approved EMPrs and EMPs, along with the mitigation measures to assist with the implementation and monitoring of the management measures.

MPM's current mining right includes portions of the farms: Maandagshoek 254 KT, Driekop 253 KT, Hendriksplaats 281 KT, Onverwacht 292 KT, Winterveld 293 KT and Doornbosch 294 KT.

In addition, MPM has an approved Prospecting EMPr dated 25 June 2003 for a prospecting area of 14041 ha on the following properties:

- Driekop 253 KT;
- Maandagshoek 254 KT;
- Hendriksplaats 281 KT;
- Onverwacht 292 KT; and
- Winterveld 293 KT.

Mining at MPM began in 2001 with underground operations and open pit operations commencing in June 2010. MPM has an installed plant capacity of 240 kilo tonnes per month (ktpm) with current production from the existing operational shafts (i.e. North 1, including Mid shaft, South 1, including Hill shaft and South 2 Shaft) averaging approximately 200 ktpm. The expected LOM for MPM is up to November 2043 as stipulated in the Mining Right 129MR.

It is proposed that the Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. The Doornbosch addition will relate only to the underground mining of the resource, which is in line with MPM's approved Mining Works Programme (MWP).

The Doornbosch Mining Right represents approximately 0.3% of the amended MPM overall Mining Right. The Doornbosch Mining Right will not attribute any additional employment opportunities as it will only be a gap filler whilst the South 2 Shaft project is executed.

MPM is applying for environmental authorisation by undertaking the EMPr amendment process for the inclusion of the Doornbosch Mining Right and the consolidation of the Original EMPr and EMPr amendments in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998) Environmental Impact Assessment (EIA) Regulation 2014, as amended.

The proposed inclusion of the Doornbosch Mining Right into the MPM EMPr will trigger the following listed activity in terms of NEMA EIA Regulation 2014 GNR 982, as amended:

GNR 984 Listing 2 - Activity 17, which states that:

Any activity including the operation of that activity which requires a Mining Right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—

(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.

During the amendment of the MPM EMPr to include the activities associated with the mining of the Doornbosch reserve, the original EMPr and the amendments to the EMPr have been consolidated into a single document. The consolidation process involved the collation of the original EMPr approved in 2001, and a number of EMPr amendments, which were developed and approved for additional activities not included in the original EMPr.

Project need and desirability

The mineral extraction at MPM is considered to be in the best interest of the public at large by generating earning power both locally, nationally and internationally.

As platinum is sold globally, MPM is an earner of foreign exchange for South Africa. In addition, the mine also has a positive impact on the economic growth of the Limpopo Province, particularly in the communities around the mine.

Environmental responsibility

This consolidated EMPr contains management measures aimed at mitigating potential negative impacts on the environment as a result of the mining and processing operations at MPM.

MPM operates under an approved Water Use License (WUL), previous issued WULs in 2007, 2010 and 2016 have been superseded by the current 2017 WUL No 04/B41J/ABCDEFGHIJ/4312 issued on the 11th of October 2017. Monitoring of water consumption takes place at MPM and is used to track and minimise water usage throughout the mining operation. Reduction targets are set and revised annually. MPM also reviews and revises its water management strategy on an on-going basis as part of a philosophy of continual improvement.

MPM participates in the Greater Tubatse Environmental Forum. Currently AAP and ARM MC are part of the Joint Water Forum (JWF), along with other mining groups. The focus of the JWF is water supply, which is in line with the Internal Strategic Perspective key objective to ensure equitable access to water and protection of groundwater resources in the over allocated Olifants catchment.

Socio-Economic Benefits

MPM has spent around R100 million over a five year period (2009-2013) on the key identified programs in the Social and Labour Plan (SLP) and is planning to spend additional R76 million over the next five years (2014-2018). MPM is committed to making effective and sustainable use of limited resources to create an environment to enable ordinary people to assume greater control of their lives.

The MPM has funded community projects such as a sewing factory and an engineering workshop. It also has progressive approaches to improving local participation in employment and procurement. Contractors, for example, are required to enter into joint ventures with local companies for at least 30% of a contract where appropriate. Contractors must also ensure that they employ local community members on their teams.

No-Go Option

If MPM does not mine the resource associated with the Doornbosch Mining Right, it will limit the expansion of its current operation. The reserves would remain underutilised, which will have an impact on revenue, employment and local economic opportunities.

Alternatives Considered

Alternatives with regards to location, infrastructure and transportation were considered for the authorisation of the South 2 Shaft EMPr. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. As such, all the alternatives assessed as part of South 2 Shaft will apply.

The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. As such, no property, activity, design, layout, technology or operational alternatives were viable to be considered for this project.

Specialist Studies

Extensive specialist studies were undertaken for each of the MPM existing approved EMPs and associated Record of Decisions (RoDs) and Environmental Authorisations (EAs). These specialist studies have been used to develop the consolidated EMPr. As the Doornbosch Mining Right will be mined as an extension of the existing MPM South 2 Shaft operations, no surface disturbance will take place. Therefore additional specialist studies over and above the specialist studies undertaken as part of the approved South 2 Shaft authorisations is not required. Specialist input have over been sought to determine and confirm that the mining of the Doornbosch reserve will not lead additional impacts which have not been previously been assessed during the approved South 2 Shaft environmental authorisation processes.

Summary of the Baseline Environment

Baseline environmental information for MPM were obtained from the original Modikwa EMPr, subsequent EMPr Amendments, and previous specialist studies. All the original specialist studies, containing the detailed information regarding each environmental aspects is kept at the mine as part of the individual EMP and EMPs.

Geology and Topography - The geology of the area consists mainly of the Critical and Main Zones of the Rustenburg Layered Suite of the Bushveld Igneous Complex. The area encompasses intrusive igneous rocks, mainly norite and pyroxenite. The lithology has mainly a south south-eastern strike and dips at an angle of $\pm 10-15^\circ$ in a westerly direction. The MPM mining area lies in a relatively flat north south trending valley which on the east and west is bounded by the Leolo Mountain range. The valley floor has a gentle dip to the north with a gradient of approximately 1:110 from an elevation of 980mamsl to the Maandagshoek Mission Hospital with an elevation of 900mamsl.

Climate - The regional climate of the area is classified as a warm to hot climate with a relatively high humidity in summer, with average daily temperatures varying from 32°C in January to 24°C in July. Rainfall occurs mostly between November and April with highest rainfall during January. The prevailing wind direction is mostly from the south-south east to north-north west.

Soils and Land Capability – Soils in the area include those of the Hutton, Clovelly, Swartland, Valsrivier, Rensburg, Bonheim, Willowbrook, Mayo, Arcadia, Sepane, Westleigh, Kroonstad, Glencoe, Mispah and Katspruit Forms.

The soils derived from the in-situ parent materials are generally moderate to shallow, sandy loams to sandy clay loams, and occur in the middle and upper slopes. The transported colluvial and alluvial soils make up the majority of the soils in the area are of a silty clay loam to clay loam nature.

In general, the soils are moderately deep to deep (800 - +1 500mm) and are poorly drained, and highly structured with relatively small areas of well drained material.

The agricultural potential of these soils is limited, and should be confined to natural grassland grazing with a low stocking ratio, or preferably managed as conservation areas.

Land capability classification/classes have been determined using the Chamber of Mines Classification System (Chamber of Mines of South Africa, 1981). The original MPM EMPr soil survey was used as a base from which to assess the land capability:

- Arable Land (2.48Ha): 0.45%
- Grazing land (339.9Ha): 62.71%
- Wetlands (52.6Ha): 9.7%
- Wilderness (93.4Ha): 17.23%.

Biodiversity – Modikwa Platinum Mine falls within the Savanna biome (Rutherford & Westfall, 1994), which is further divided into different bioregions, which are spatial terrestrial units possessing similar biotic and physical features, and processes at a regional scale. The area is situated within the Central Bushveld Bioregion (Mucina & Rutherford, 2006) and the following vegetation types are present within the area; Sekhukhune Mountain Bushveld and Sekhukhune Plains Bushveld.

Searsia batophylla shrubs, which is listed as Vulnerable, have been positively identified within the MPM area. Three protected tree species, namely *Sclerocarya birrea* subsp. *caffra* (Marula), *Catha transvaalensis* (Sekhukhune Bushman's Tea) and *Catha edulis* (Bushmans Tea), which are listed as 'protected' by the National Forest Act (Act 84 of 1998) are present within the MPM area (Refer to Table 13-9).

Areas within the MPM area, especially in the transformed habitat unit, have been identified as being affected by the alien and invasive vegetation species.

Various medicinal plant species (some regarded as alien invasive weeds) have been identified within the MPM area. The identified medicinal plant species are considered to be common and widespread species and were not confined to any specific habitat unit within the area.

No RDL fauna species have been identified at MPM. It is not likely that any RDL or sensitive fauna species will utilise the area within or directly adjacent to the mine area due to the high levels of anthropogenic and mining activities already taking place in the area.

Wetlands - Based on the South African National Biodiversity Institute (SANBI) Wetland Inventory (2006) and National Freshwater Ecosystem Priority Areas (NFEPA) database, (2011), aspects applicable to the aquatic ecology of the wetland or river systems in the area and surrounds include the following:

- The sub-WMA (Tubatse and Moopetsi/Tubatse tributaries) is not classified as a flagship or a Freshwater Ecosystem Priority Area (FEPA) River;
- The sub-WMA is not listed as a fish FEPA and is not considered important in terms of translocation and relocation zones for fish, however, the Tubatse River is indicated as being a fish support area or corridor area with one species highlighted for conservation purposes. This species *Opsaridium peringueyi* (Southern Barred Minnow) is however considered of Least Concern and is widespread and fairly common throughout the remainder of its range;
- No wetland features are indicated on the NFEPA wetland database layer within the MPM area; and

- The sub-WMA is thus not regarded important in terms of fish sanctuaries, rehabilitation or ecological corridors.

The wetland/river resources in the South 2 Shaft area can largely be defined as valley bottom river systems with deeply incised eroded channels of varying size and upper foothill river systems including some side branches that have become eroded (SAS, 2014). . A variety of wetland types are present within the larger wetland/river system, with the majority of WMU consisting of non-perennial, intermittent, non-vegetated river systems with only two palustrine valley bottom wetlands identified.

Surface Water - The mining lease area falls within quaternary catchment B41J within the Olifants Water Management Area (WMA) and the Steelpoort sub-WMA. The catchment comprises steep-sided, open and undulating valleys with areas of significant erosion associated with wide, open and eroded (incised) drainage lines. The bulk of the operations fall within the Moopetsi River catchment with the South 2 Shaft area falling within the Tubatsane River catchment. The Moopetsi and Tubatsane rivers are both tributaries of the Tubatse River, formerly known as the Steelpoort River, a major tributary of the Olifants River system. The Tubatse River in the vicinity of the confluences with the Moopetsi and Tubatsane rivers is perennial, wide and channelled, and the surrounding vegetation consists mainly of grasses and trees.

The Moopetsi River and associated tributaries are ephemeral with the exception of the Moopetsi tributary flowing across the South 2 pit area. Surface water surrounding the South 2 Shaft area flows via a number of unnamed ephemeral tributaries and drainage lines into the perennial Tubatsane River, which is wide and shallow downstream of South 2 Shaft prior to the confluence with the Tubatse River. The surrounding vegetation consists mainly of shrubs. At South 2 terrace shaft there are two streams, one each side of the shaft, which confluence into what is known as the Kgoduopong Stream, a tributary of the Tubatsane River, just downstream of the shaft area. .

Ground Water – the following aquifers were identified within the MPM area:

- A shallow secondary weathered bedrock aquifer restricted to the deeply weathered broad valley between the two mountains; and
- Deeper secondary fractured bedrock aquifers associated with geological structures such as faults, fracture zone and dyke intrusion contacts.

Borehole yields in the area are normally low, in the order of $\pm 0.1 - 2.0$ l/s.

One spring (MHS1) has been identified at MPM and is located on Maandagshoek 254 KT, north of the existing North Shaft operations.

Air Quality - A dust fallout monitoring programme has been established at MPM. All the current monitoring sites at Modikwa Platinum Mine monitoring network did comply with the National Dust control Regulations, 2013 for the period of February 2016 to January 2017.

Cultural Heritage - The predominant human history in the area ranges from middle and Late Stone Age sites close to Ohrigstad, Early Iron Age site close to Lydenburg and Klingbeil to Late Iron Age site stretching from Lydenburg to Nelspruit and Badplaas, the site area also consists of Colonial Era sites.

Sites found during previous and current surveys in the surrounding environment and MPM area with cultural significance include the following:

- Middle Stone Age hand axe;
- Middle Stone Age tools found in erosion dongas;
- Late Iron Age smelting furnaces, grinding stones and stone walling were identified on the farm Onverwacht 292 KT;
- A lower grinding stone;
- Early Iron Age pottery shard;
- Graves; and

- Culturally important trees e.g. Mohluludi, Marula, Molope, Sycamore and Acacia were identified.

Socio-Economic - MPM is largely bordered by rural traditional settlements and other mining related facilities/ operations (mainly chrome and platinum).

The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors. Other important sectors include construction, trade, services and transport. .

MPM has spent around R 100 million over a five year period (2009-2013) on the key identified programs in the SLP and is planning to spend in the region of an additional R 76 million over the next five years (2014-2018). MPM is committed to making effective and sustainable use of limited resources to create an environment to enable ordinary people to assume greater control of their lives.

There are seven Traditional Authority areas (TAs) in close proximity to MPM, these TAs have jurisdiction over a number of villages falling under them, and are all situated in the GTLM. These are:

- Mamphahlane Community under the leadership of Baroka ba Mamphahlane TA (Kgoshi Ralph Kgoete);
- Sehlaku Community under the leadership of Banareng TA (Kgoshi Isaac Kgwete);
- Mpuru community under the leadership of Kone Phuti TA (Kgoshi Emmanuel Mpuru);
- Maroga community under the leadership of Pulana Maroga TA (Kgoshi Sidwell Maroga);
- Diphale community under the leadership of Mohlala TA (Kgoshi Masia Mohlala);
- Seuwe community under the leadership of Tswako Mohlala TA (Kgoshi Bethuel Mohlala; and
- Matimatjati community under the leadership of Swazi Ngobe TA (Kgoshi Joseph Nkosi).

Stakeholder Engagement Process

The stakeholder engagement process being undertaken for this project aims to comply with the NEMA EIA Regulations (GN R 982 amended). Details relating to the specific stakeholder engagement activities including introductory meetings, announcement of the project, focus group meetings, availability of draft and final reports are included in this report.

Key comments, raised by stakeholders during the engagement process up to the Final Scoping Report includes comments relating to Job creation, training and consultation. All comments raised by stakeholders throughout the process are recorded and included in the comments and responses report.

Impact Assessment

The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. Therefore it is anticipated that the impacts associated with the Doornbosch addition will be limited.

Groundwater

Boreholes drilled within the same geology at South 2 Shaft indicate that the deepest water strikes were observed at depths of 11 to 50 metres below surface (mbs). The piezometric surface in MMB29 (the closest borehole) is 11 mbs. Mining is anticipated to be 70 to 200 mbs and is therefore anticipated to be below the regional aquifer in the area. Deeper water strikes could be observed where there is increased fracturing along preferential pathways such as dyke contacts and/or faults. Based on the geological map, no preferential flow paths are anticipated within this area. Inflows at depths > 70 mbs, in the absence of major structures, would therefore be expected to be minimal and as such can be managed within the existing infrastructure.

Surface Water

Existing dirty water containment infrastructure at South 2 Shaft was designed to accommodate the original South 2 Shaft mine plan and associated surface infrastructure. Based on the current information, observations from South 2 Shaft and the limited Doornbosch mining area, is not anticipated that the addition of the Doornbosch Mining Right to the existing MPM Mining Right will have an impact on the receiving environment as it expected to be managed within the existing dirty water containment infrastructure.

Closure and Rehabilitation

The mining of the Doornbosch area will not increase the existing liability associated with MPM's operations as no additional surface infrastructure will be constructed.

The final rehabilitation plan will only be developed once sufficient information is achieved from the monitoring of areas where rehabilitation concurrent with mining activities has been undertaken. The learnings from the areas already rehabilitated will be utilised to inform scientifically sound, safe and technically feasible solutions to achieving the rehabilitation objectives.

Environmental Management

The Doornbosch addition and consolidation project will lead to the development of a more effective environmental management tool for MPM's current operations. The consolidated EMPr allow for a greater level of alignment between the different EMPrs in terms of management measures and monitoring reporting requirements.

It is anticipated that the management measures associated with the South 2 shaft will be adequate to manage the impacts association with the mining of the Doornbosch resource.

It is recommended that the existing water management measures as approved for the South 2 Shaft operations continues to be implemented. If material changes to the groundwater ingress is observed during the mining of the Doornbosch area appropriate actions should be taken.

Conclusion

SRK Consulting has undertaken the required environmental authorisation process for MPM to amend and consolidate their EMPr, to include the activities associated with the Doornbosch Mining Right, granted in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

During the amendment of the MPM EMPr to include the activities associated with the mining of the Doornbosch reserve, the original EMPr and the amendments to the EMPr have been consolidated into a single document. The consolidation process involved the collation of the original EMPr approved in 2001, and a number of EMPr amendments, which were developed and approved for additional activities not included in the original EMPr.

The process included a stakeholder engagement process which sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process

To date, there are no flaws that have been identified with regards to the proposed mining of the proposed Doornbosch resource. It is anticipated that the existing management measures associated with the South 2 shaft will be adequate to manage the impacts association with the mining of the Doornbosch resource. If material changes to the groundwater ingress is observed during the mining of the Doornbosch resource, it is recommended that appropriate actions should be taken

It is recommended that the proposed mining of the Doornbosch resource is allowed to proceed, considering the positive social impacts associated with the project. .

Table of Contents

Executive Summary	ii
Disclaimer.....	xviii
List of Abbreviations	xix
1 Part A: Environmental Impact Assessment (EIA) Report	1
1.1 Introduction, Background and Scope of EIA.....	1
2 Contact Person and Correspondence Address	6
2.1 Details of EAP who prepared the report	6
2.2 Expertise of the EAP	6
2.2.1 Qualifications of the EAP.....	6
2.2.2 Summary of EAPs past experience	6
2.3 Modikwa Platinum Mine Details	7
2.4 Details of Specialists	8
2.5 Provincial Authorities Details	8
2.6 Municipality and Ward Details.....	8
3 Description of Property.....	10
3.1 Locality Map	10
4 Description of the scope of the proposed overall activity	12
4.1 Listed and specified activities	12
4.2 Description of the activities to be undertaken	13
5 Policy and Legislative Context.....	15
5.1 Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	17
5.2 National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	17
5.3 National Water Act, 1998 (Act No. 36 of 1998) (NWA).....	17
5.4 Other applicable legislation	17
5.4.1 The Constitution of South Africa, 1996 (Act No. 108 of 1996)	17
5.4.2 The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).....	18
5.4.3 The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)	18
5.4.4 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA).....	18
5.4.5 National Environmental Management: Air Quality Act, 2004 (Act no. 39 of 2004) (NEM:AQA)	19
5.4.6 The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA)	19
5.5 Municipal Plans and Policies	20
5.5.1 The GTM Greater Tubatse Municipality Integrated Development Plan	20
6 Need and desirability of the proposed activities	21
6.1 Mining Benefits.....	21
6.1.1 Environmental responsibility	21
6.1.2 Socio-Economic Benefits	21
6.1.3 No-Go Option	22

7	Modikwa Platinum Mine Current Operation	23
7.1	Modikwa Platinum Mine Structure	23
7.2	Location of Modikwa Platinum Mine	23
7.2.1	Properties Associated with MPM's Mining Right Area	23
7.2.2	Surface Right Owners Associated with Modikwa Platinum Mine.....	24
7.3	Traditional Authorities	26
7.4	Employment	26
7.5	Mine Work Programme	26
7.6	Previously Approved EMPs and EMPs.....	26
7.7	Overview and Summary of MPM Operations	28
8	Existing Surface Infrastructure and Activities Associated with Modikwa Platinum Mine	32
8.1	Mining via Shafts.....	38
8.1.1	North 1 and Surface Winze Shaft.....	38
8.1.2	Maandagshoek Surface Winze Shaft.....	39
8.1.3	South 1 Shafts.....	39
8.1.4	South 2 Shaft.....	39
8.1.5	Onverwacht Hill Mining Project – Hill Adits	40
8.2	Ventilation Shafts	41
8.3	Open Pit Mining.....	43
8.3.1	Main North UG2 Open Pit	43
8.3.2	South 1 and South 2 Open Pits.....	43
8.3.3	Merensky Open Pit.....	43
8.3.4	UG2 Open Pits	44
8.4	Waste Rock Dumps	45
8.5	Fine Residue Deposit.....	45
8.6	Crusher Plants	46
8.7	Ore Stockpiles.....	46
8.8	Concentrator Plant	46
8.9	Chrome Extraction Plant	47
8.10	Tailings Storage Facility.....	47
8.10.1	Method of Deposition	47
8.10.2	Tailings Storage Facility Layout	48
8.10.3	Return Water Dam	52
8.10.4	Tailings Dump Reclaiming.....	52
8.11	Housing sites.....	52
8.12	Topsoil Stockpiles	52
8.13	Electricity Supply.....	52
8.14	Water Supply.....	53
8.14.1	Potable Water Supply.....	53
8.14.2	Process Water Supply.....	53

8.15 Bulk Fuel Storage Facilities	53
8.16 Pipelines.....	56
8.17 Roads	56
8.18 Disturbance of Water Courses.....	57
8.19 Waste Management Facilities Domestic and Industrial Waste.....	57
8.20 Non-Mineral Waste	59
8.20.1 Domestic Waste	59
8.20.2 General Waste - Industrial waste: wood, rubber, paper and refurbishable waste (pumps, valves etc.)	59
8.20.3 Hazardous waste: hydrocarbon or chemical contaminated waste, battery waste, sewage sludge, recovered oil	60
8.20.4 Medical waste: sharps and biological material.....	60
8.20.5 SHE bin waste.....	60
8.21 Waste Separation.....	60
8.22 Water Pollution Management Facilities.....	63
8.22.1 Sewage Treatment Plants	63
8.22.2 Mining and process operations	64
8.22.3 Residential Sewage Treatment Plants	65
8.22.4 Polluted Water Treatment Plants	65
8.23 Conveyors	65
8.24 Support Infrastructure	66
8.24.1 Change houses	66
8.24.2 Workshops and Stores	66
8.24.3 Offices	66
8.24.4 Transport of ore	66
8.25 Stormwater Management.....	67
8.25.1 Open pits	67
8.25.2 River crossings.....	67
8.26 Proposed Future Projects	67
9 Period for which the Environmental Authorisation is required.....	68
10 Description of the process followed to reach the proposed preferred site	69
11 Details of Alternatives Considered	70
11.1 Property Alternatives.....	70
11.2 Activity Type Alternative.....	70
11.3 Design/Layout Alternative	70
11.4 Technology alternatives	70
11.5 Operational Alternatives.....	70
11.6 No-Go Alternative.....	70
12 Details of the public participation process followed to date	71
12.1 Objectives of stakeholder engagement.....	71
12.1.1 During Scoping.....	71

12.1.2 During Impact Assessment	71
12.1.3 During the Decision-making Phase	71
12.2 Stakeholder identification	71
12.2.1 Identification of landowners	72
12.2.2 Identification of District and Local Municipalities	73
12.2.3 Identification of relevant Government Departments	73
12.3 Introductory meetings with key stakeholders	73
12.4 Stakeholder engagement during scoping	73
12.4.1 Announcement	73
12.4.2 Meetings with local authorities	76
12.4.3 Opportunities to comment	76
12.5 Availability of the Draft Scoping Report for public comment	76
12.6 Stakeholder engagement during the EIA phase	77
12.6.1 Opportunities to comment	77
12.7 Availability of the Draft EIA/EMPr for public comment	77
12.8 Community Meeting and Key Stakeholder Workshop	78
12.9 Comment and Response Report	78
13 Environmental Attributes Associated with the Sites	81
13.1 Geology	81
13.2 Topography	81
13.3 Visual	81
13.3.1 Visual Character	81
13.3.2 Sense of Place	82
13.4 Climate	82
13.4.1 Regional Climate	82
13.4.2 Rainfall and Evaporation	82
13.5 Soils and Land Capability	83
13.5.1 Soils	83
13.5.2 Land Capability	84
13.6 Surface Water	86
13.6.1 Water Management Area	86
13.6.2 Floodlines	86
13.6.3 Surface Water Quality	88
13.6.4 Biomonitoring	90
13.6.5 Toxicity Testing	92
13.6.6 Surface Water User Survey	93
13.8 Biodiversity	98
13.8.1 Flora	98
13.9 Water Balance	108
13.10 Air Quality	108
13.10.1 Ambient air quality monitoring	108

13.11Noise	109
13.12Archaeological and cultural heritage	109
13.13Socio-economic Structure	111
13.14Description of specific environmental features and infrastructure on site	112
13.15Description of current land uses	112
14 Impacts Identified	114
14.1 Groundwater	114
14.2 Surface Water	114
15 The positive and negative impacts that the proposed activity and alternatives	115
16 Possible Mitigation Measures that could be applied and the level of risk	116
17 Motivation where no alternatives were considered	117
18 Statement motivating the preferred site	118
19 Environmental Impact Assessment	119
19.1 Description of Specialist Recommendations	119
19.2 Environmental Impact Statement	119
19.2.1 Summary of key findings of the environmental impact assessment	119
19.2.2 Final site map	119
19.2.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives	120
19.2.4 Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr	120
19.2.5 Final proposed alternatives	120
19.2.6 Aspects for inclusion as conditions of Authorisation	120
19.2.7 Description of any assumptions, uncertainties and gaps in knowledge	120
19.2.8 Reasoned opinion as to whether the proposed activity should or should not be authorised	121
19.2.9 Period for which the Environmental Authorisation is required	121
19.2.10 Undertaking	121
19.3 Financial Provision	121
19.4 Deviations from the approved scoping report and plan of study	121
19.5 Other information required by the Competent Authority	122
19.5.1 Impact on the socio-economic conditions of any directly affected person	122
19.5.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act	122
19.5.3 Other matters required in terms of Sections 24(4)(a) and (b) of the Act	122
20 Part B: Environmental Management Programme Report	123
20.1 Details of EAP	123
20.2 Description of the Aspects of the Activity	123
20.3 Composite Map	123
20.4 Description of Impact management objectives including management statements	123
20.5 Determination of closure objectives	123

20.6 Potential risk of acid mine drainage	124
20.7 Has a water use licence has been applied for?	124
20.8 Impacts to be mitigated in their respective phases	124
20.9 Financial Provision	124
20.10 Rehabilitation Plan	125
20.11 Future land use after decommissioning	125
20.12 Monitoring Plan	125
20.12.1 Monitoring Requirements	126
20.12.2 Surface Water	126
20.12.3 Biomonitoring	128
20.12.4 Toxicity testing	128
20.12.5 Groundwater	128
20.12.6 Water Reporting Requirements	128
20.12.7 Noise Monitoring	129
20.12.8 Soils Monitoring	129
20.12.9 Air Quality	129
20.12.10 Biodiversity	134
20.12.11 Post rehabilitation monitoring and maintenance	134
20.13 Indicate the frequency of the submission of the performance assessment report	134
20.14 Environmental Awareness Plan	134
20.15 Specific information required by the Competent Authority	135
20.16 Undertaking Regarding Correctness of Information	135
21 Statement of SRK Independence	137
22 Conclusions and Recommendations	138
23 References	140
Appendices	141
Appendix 1: EAP Qualifications	142
Appendix 2: EAP CV's	143
Appendix 3: Locality Map	144
Appendix 4: Listed Activity Map	145
Appendix 5: MPM Mining Right and Prospecting Right	146
Appendix 6: Windeed	147
Appendix 7: Surface Infrastructure	148
Appendix 8: MPM pipeline Layout	149
Appendix 9: Stakeholder Engagement	150
Appendix 10: MPM Master Map	165
Appendix 11: Removal of Trees permit	166
Appendix 12: Summary of Heritage Sites	167
Appendix 13: Management Measures	168

Appendix 14: Summary of impacts	169
Appendix 15: Summary of specialist recommendations	170
Appendix 16: Environmental Awareness Plan.....	171

List of Tables

Table 1-1: Properties associated with Modikwa Platinum Mine Mining Right.....	2
Table 2-1: EAP Contact Details.....	6
Table 2-2: EAP Qualifications	6
Table 2-3: EAP Expertise	7
Table 2-4: MPM Responsible persons: names and contact details	7
Table 2-5: Competent authority details	8
Table 2-6: Local and district municipality details.....	8
Table 3-1: Description of Property.....	10
Table 4-1: Listed Activities	12
Table 5-1: Policy and Legislative Context	16
Table 7-1: Modikwa Platinum Mine in relation to Adjacent Towns.....	23
Table 7-2: Properties associated with Modikwa Platinum Mine Mining Right.....	24
Table 7-3: Surface right owners associated with Modikwa Platinum Mine Infrastructure and Activities	24
Table 7-4: Summary of Modikwa Platinum Mine's approved EMPs and associated key infrastructure....	27
Table 7-5: Overview of the MPM mining operation	28
Table 8-1: Key infrastructure and Associated Activities at Modikwa Platinum Mine Operations.....	33
Table 8-2: Ventilation shafts associated with Modikwa Platinum Mine operations.....	41
Table 8-3: Mine design statistics	44
Table 8-4: Existing and planned overburden dumps at Modikwa Platinum Mine	45
Table 8-5: Existing and planned waste rock dumps at Modikwa Platinum Mine	45
Table 8-6: Total Storage Capacity of Fuel, Oil and Lubricants storage areas at MPM.....	54
Table 8-7: Areas where waste is generated, stored or handled	58
Table 8-8: Waste separation scheme at Modikwa Platinum Mine	61
Table 12-1: Adjacent Landowners in Terms of the Proposed Amendment Project	72
Table 12-2: District and Local Municipalities	73
Table 12-3: Relevant Government Department	73
Table 12-4: Meeting details with local authorities	76
Table 12-5: Summary of previous and existing stakeholder engagement	79
Table 12-6: Summary of stakeholder comments during the Doornbosch Project	80
Table 13-1: Rainfall and evaporation data for the Modikwa Platinum Mine region.....	82
Table 13-2: Rainfall and evaporation data	83
Table 13-3: Surface water monitoring points for the MPM area	88
Table 13-4: Process water monitoring points for the MPM area	89
Table 13-5: Biomonitoring points.....	90

Table 13-6: Toxicity testing sampling points	92
Table 13-7: Groundwater monitoring points.....	96
Table 13-8: Resource Class.....	103
Table 13-9: Summary of the delineated management units at Modikwa.....	104
Table 13-10: Summary of the South 2 Shaft area aquatic assessment that informs the PES	106
Table 13-11: Summary of biodiversity assessment results in the South 2 Shaft area.....	107
Table 13-12: Dust fallout monitoring locations	108
Table 14-1: Proposed Project related activities during different project phases.....	114
Table 20-1: EAP Contact Details.....	123
Table 20-2: Recommended noise levels for specific noise areas (SANS 10103 of 2008)	129
Table 20-3: Noise measuring positions	129

List of Figures

Figure 1-1: Overall Mine Plan and Mining Right Area	4
Figure 1-2: MPM original EMPr and amendments to the original EMPr	5
Figure 2-1: District and local municipalities and wards relevant to Modikwa Platinum Mine	9
Figure 3-1: Regional Locality Map.....	11
Figure 4-1: Production timeframes for Doornbosch	14
Figure 7-1: Surface rights owners and traditional authorities in the vicinity of Modikwa Platinum Mine	25
Figure 8-1: Infrastructure Layout and Operational areas associated with Modikwa Platinum Mine Operations 37	
Figure 8-2: Ventilation shafts associated with Modikwa Platinum Mine operations.....	42
Figure 8-3: Layout of the tailings storage facility at Modikwa Platinum Mine.....	51
Figure 8-4: Bulk storage of fuel associated with Modikwa Platinum Mine	55
Figure 8-5: Sewage flow at Modikwa Platinum Mine.....	64
Figure 12-1: Location of public places and site notices.....	75
Figure 13-1: Soils types associated with Modikwa Platinum Mine	85
Figure 13-2: Floodlines associated with Modikwa Platinum Mine	87
Figure 13-3: Biome, bioregion and vegetation types associated with the Modikwa area	99
Figure 13-4: Riparian areas associated with Modikwa Platinum Mine.....	102
Figure 13-5: Heritage sites in the vicinity of Modikwa Platinum Mine operations	110
Figure 13-6: Current Land Use Map.....	113
Figure 20-1: Surface and process water monitoring points.....	127
Figure 20-2: Biomonitoring and toxicity testing locations associated with Modikwa Platinum Mine	130
Figure 20-3: Borehole monitoring locations associated with Modikwa Platinum Mine.....	131
Figure 20-4: Noise monitoring points and noise sensitive areas associated with Modikwa Platinum Mine.....	132
Figure 20-5: Dust fallout monitoring points associated with Modikwa Platinum Mine.....	133

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Modikwa Platinum Mine (Pty) Ltd (MPM). The opinions in this Report are provided in response to a specific request from MPM to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

AAP	Anglo American Platinum Limited
ARM	African Rainbow Minerals
ARM: MC	African Rainbow Minerals Mining Consortium Limited
BA	Basic Assessment
BID	Background Information Document
CA	Competent Authority
CV	Curriculum Vitae
DAFF	Department of \agriculture, Forestry and Fisheries
DMR	Department of Minerals Resources
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EMPr	Environmental Management Programme Report
GTLM	Greater Tubatse Local Municipality
GTM	Greater Tubatse Municipality
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IWWMP	Integrated Water and Waste - Management Plan
JWF	Joint Water Forum
km	Kilometres
km ²	Square kilometres
ktpm	Kilo tons per month
LOM	Life of Mine
m	metres
m ³	Cubic metres
MHSA	Mine Health Safety Act, 1996 (Act No. 29 of 1996)
MPM	Modikwa Platinum Mine
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MWP	Mine Works Program
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act no. 39 of 2004)
NEM:BA	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFA	The National Forestry Act, 1998 (Act No. 84 of 1998)
NHRA	The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PGM	Platinum group metals

RoD	Record of Decision
RPM	Rustenburg Platinum Mines
S&EIA	Scoping and Environmental Impact Assessment
SRK	SRK Consulting (Pty) Limited
SRM	Sekhukhune District Municipality
TA	Traditional Authority
ToR	Terms of Reference
TSF	Tailings Storage Facility
WMA	Water Management Area
WRD	Waste Rock Dump
WUL	Water Use Licence
WULA	Water Use Licence Application

1 Part A: Environmental Impact Assessment (EIA) Report

1.1 Introduction, Background and Scope of EIA

Modikwa Platinum Mine (MPM) is an operational mine situated approximately 20 km west of Burgersfort and 18 km north of Steelpoort within the Sekhukhune District Municipality in the Limpopo Province.

MPM is a Joint Venture between Rustenburg Platinum Mines (RPM), and is a wholly owned subsidiary of Anglo American Platinum (Ltd) (AAP) and African Rainbow Minerals Mining Consortium Limited (ARM: MC), a subsidiary of African Rainbow Minerals (ARM) Limited. ARM Mining Consortium holds 50% of MPM, with a 17% stake in ARM Mining Consortium being held by two Section 21 companies representing communities around Modikwa.

MPM proposes to amend and consolidate their Environmental Management Programme (EMPr), which was approved in 2001, to include the activities associated with the Doornbosch Mining Right, granted in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

This amendment and consolidated EMPr provides an overview of activities and infrastructure included in each of the approved EMPrs and EMPs, along with the mitigation measures to assist with the implementation and monitoring of the management measures.

Updated information and data from the following documentation developed for MPM have been used in this consolidated EMPr:

- Specialist studies;
- Water Use Licence (WUL);
- Integrated Water and Waste Management Plans (IWWMP);
- Waste Management Plan (WMP);
- Monitoring results;
- Environmental Assessments; and
- Design reports.

MPM's current mining right includes portions of the farms: Maandagshoek 254 KT, Driekop 253 KT, Hendriksplaats 281 KT, Onverwacht 292 KT, Winterveld 293 KT and Doornbosch 294 KT.

In addition, MPM has an approved Prospecting EMPr (Appendix 5) dated 25 June 2003 for a prospecting area of 14041 ha on the following properties:

- Driekop 253 KT;
- Maandagshoek 254 KT;
- Hendriksplaats 281 KT;
- Onverwacht 292 KT; and
- Winterveld 293 KT.

Mining at MPM began in 2001 with underground operations and open pit operations commencing in June 2010. MPM has an installed plant capacity of 240 kilo tonnes per month (ktpm) with current production from the existing operational shafts (i.e. North 1, including Mid shaft, South 1, including Hill shaft and South 2 Shaft) averaging approximately 200 ktpm. The expected LOM for MPM is up to November 2043 as stipulated in the Mining Right 129MR. The overall mine plan and the properties associated with MPM's Mining Right are listed in Table 1-1 and shown in Figure 1-1.

Table 1-1: Properties associated with Modikwa Platinum Mine Mining Right

Farm	Portion	Title Deed	Owner
Maandagshoek 254 KT	0 (Remaining Extent)	T6394/1944	National Government of the Republic of South Africa
Hendriksplaats 281 KT	0 (Remaining Extent)	T14449/2001	Modikwa Platinum Mine Pty Ltd
Onverwacht 292 KT	0 (Remaining Extent)	T88050/2011	Hwashi-Difagate Community Trust *
	1	T88050/2011	Hwashi-Difagate Community Trust *
Winterveld 293 KT	0 (Remaining Extent)	T133491/1997	Samancor Chrome Ltd
Driekop 253 KT	0 (Remaining Extent)	T16453/1951	National Government of the Republic of South Africa
Doornbosch 294 KT [#]	2 (Remaining Extent)	T13249/949	Samancor Chrome Ltd

* There is a Land Claim Settlement Agreement with the Hwashi-Difagate Community Trust

[#] Future Mining

It is proposed that the Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. The Doornbosch addition will relate only to the underground mining of the reserve, which is in line with MPM's approved Mining Works Programme (MWP).

The Doornbosch Mining Right represents approximately 0.3% of the amended MPM overall Mining Right. The Doornbosch Mining Right will not attribute any additional employment opportunities as it will only be a gap filler whilst the South 2 Shaft project is executed.

MPM will apply for environmental authorisation by undertaking the EMPr amendment process for the inclusion of the Doornbosch Mining Right and the consolidation of the Original EMPr and EMPr amendments in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998) Environmental Impact Assessment (EIA) Regulation 2014, as amended.

The proposed inclusion of the Doornbosch Mining Right into the MPM EMPr will trigger the following listed activity in terms of NEMA EIA Regulation 2014 GNR 982, as amended:

GNR 984 Listing 2 - Activity 17, which states that:

Any activity including the operation of that activity which requires a Mining Right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—

(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.

Activities listed in Listing Notice 2, require a Scoping and Environmental Impact Assessment Process.

During the amendment of the MPM EMPr to include the activities associated with the mining of the Doornbosch reserve, the original EMPr and the amendments to the EMPr have been consolidated into a single document. The consolidation process involved the collation of the original EMPr approved in 2001, and a number of EMPr amendments, which were developed and approved for additional activities not included in the original EMPr.

The original EMPr and the amendments to the EMPr, as shown in Figure 1-2, have been consolidated into a single document. The consolidated EMPr provides MPM with a more effective environmental management tool for their current operation as it will:

- Bring the authorised activities in line with what is happening on the ground;
- Describe the existing approved infrastructure and activities in one document;
- Update the status of environmental impacts and associated management measures based on the current activities;
- Allow for a greater level of alignment between the different EMPrs in terms of management measures and monitoring reporting requirements; and
- Rationalise repeated information and management measures contained in the amended EMPrs.

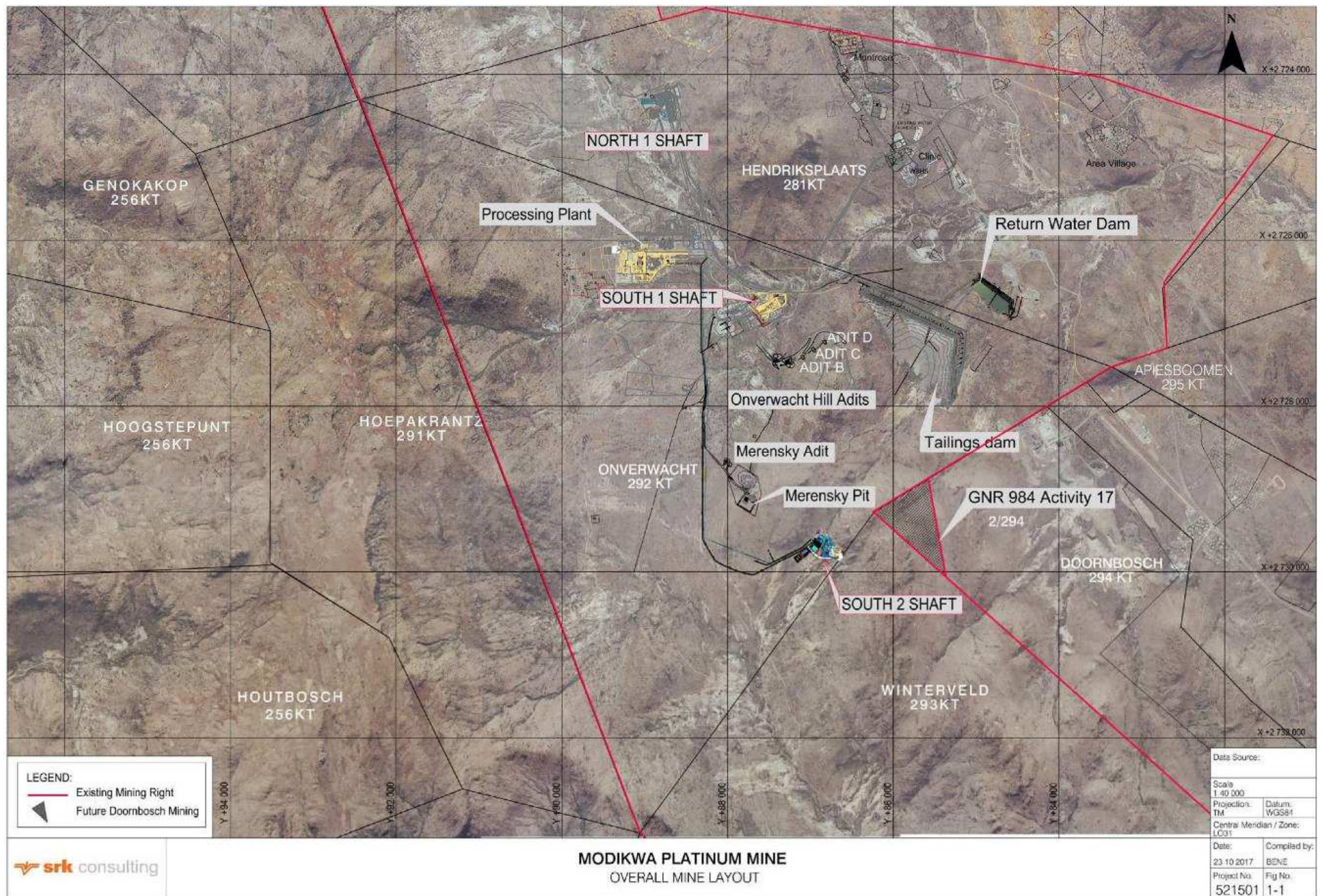


Figure 1-1: Overall Mine Plan and Mining Right Area

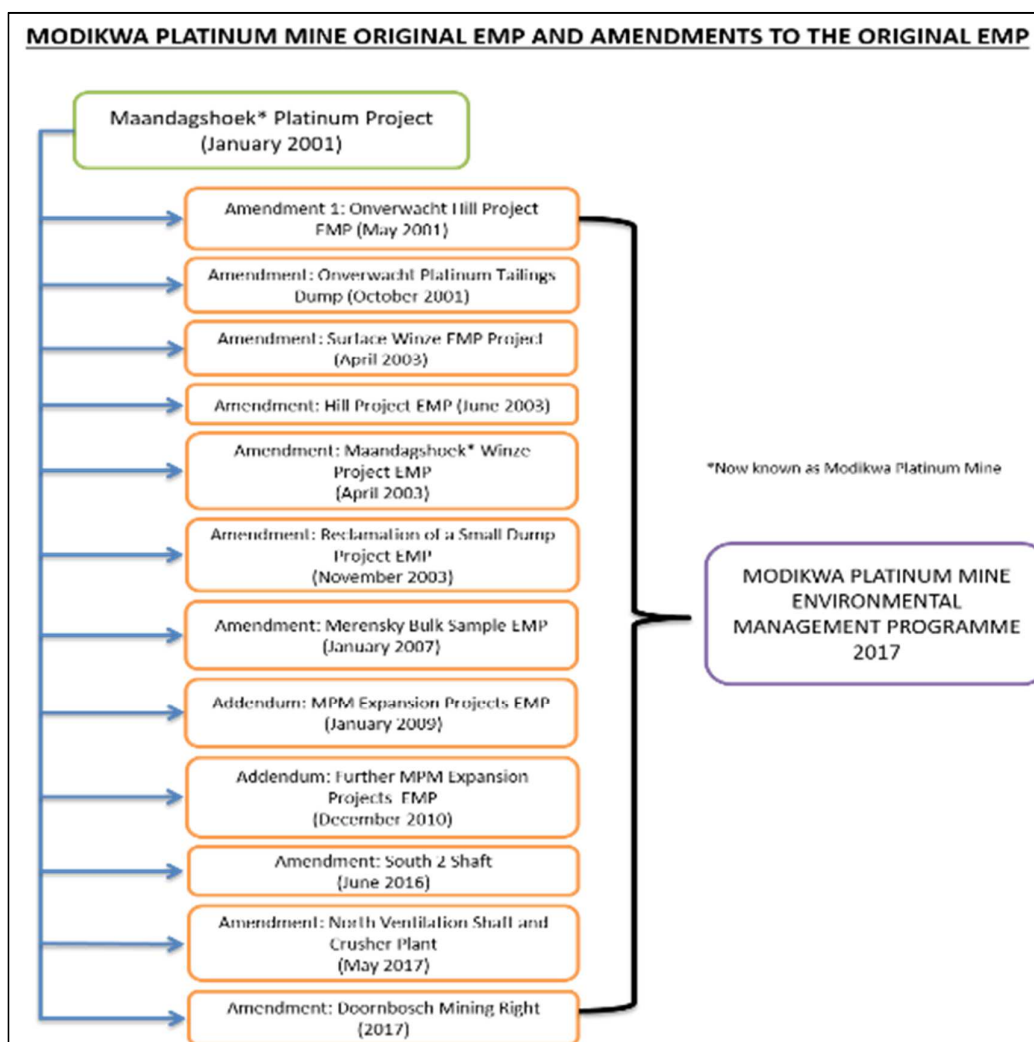


Figure 1-2: MPM original EMPr and amendments to the original EMPr

The consolidated EMPr will ultimately provide an overview of activities and infrastructure included in each of the approved EMPs, summarise specialist recommendations and consolidate mitigation measures to assist with the implementation and monitoring of the management measures.

2 Contact Person and Correspondence Address

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by MPM as the independent Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisation process and associated stakeholder engagement process to meet the requirements of NEMA. Below are the details of the EAP, MPM contact person, specialist, provincial authorities, municipal and ward contacts.

2.1 Details of EAP who prepared the report

The EAPs involved in the compilation of this EMPr consolidation Report and their contact details are provided in Table 2-1 below.

Table 2-1: EAP Contact Details

EAP Name	Contact Number	Fax Number	Email Address
Darryll Kilian	011 441 1111	086 506 1737	dkilian@srk.co.za
Franciska Lake	011 441 1111	086 555 0886	flake@srk.co.za
Natasha Anamuthoo	011 441 1111	086 296 6617	NAnamuthoo@srk.co.za
Estie Retief	011 441 1111	086 503 2498	eretief@srk.co.za
Helen Mushiane	011 441 1111	086 506 3365	hmushiane@srk.co.za

2.2 Expertise of the EAP

The section below provides the qualifications of the EAP, summary of EAP project experience, Modikwa contact details, specialist studies as well as municipal and provincial details for the proposed project at Modikwa.

2.2.1 Qualifications of the EAP

The qualifications of the EAPs are provided for in Table 2-2 below, and copies of the qualifications are provided in Appendix 1.

Table 2-2: EAP Qualifications

EAP Name	Qualifications	Years' Experience
Darryll Kilian	MA (Environmental and Geographical Science)	23
Franciska Lake	B.Sc Hons (Zoology)	16
Natasha Anamuthoo	B Soc Sc Hons (Geography and Environmental Management)	11
Estie Retief	MA (Environmental Management)	11
Helen Mushiane	(Hons) Environmental Science	4

2.2.2 Summary of EAPs past experience

The EAPs' expertise is provided for in Table 2-3 below. Detailed CVs of the project team is provided in Appendix 2.

Table 2-3: EAP Expertise

EAP Name	Expertise
Darryll Kilian	<p>Darryll Kilian has been involved in the field of environmental management, consulting and research work in Africa for the past 24 years. His expertise includes:</p> <ul style="list-style-type: none"> • Project performance monitoring and review; • Due diligence; • Environmental reporting; • Strategy and policy development; • Environmental and social impact assessment; • Environmental and social research; and • Facilitation and stakeholder engagement
Franciska Lake	<p>Franciska Lake has been involved in water management environmental impact assessments and environmental management programmes for the last 16 years. Her expertise includes:</p> <ul style="list-style-type: none"> • Water Management; • Water Use Licensing for Mines And Industry; • General Environmental Management; • Environmental Impact Assessments; • Environmental Management Programmes; and • Environmental Audits.

2.3 Modikwa Platinum Mine Details

This section of the MPM Consolidation report provides the reader with an overview of MPM in general and the details of the responsible persons at MPM.

The details of the responsible persons at MPM are presented in Table 2-4.

Table 2-4: MPM Responsible persons: names and contact details

Rustenburg Platinum Mines Limited and Arm Mining Consortium Limited (In Joint Venture) for Modikwa Platinum Joint Venture		
Physical address: Modikwa Platinum Joint Venture 292 KT Onverwacht Hill Steelpoort Region Mpumalanga	Postal address: Modikwa Platinum Joint Venture Private Bag X9120 Driekop 1129	Contact Details Mr James Ndou Environmental Leader Telephone - (013) 230 2326 Email - James.Ndou@angloamerican.com
Responsible Persons		
Name	Designation	Responsibilities
Modikwa Platinum Mine		
Mr. Vusimuzi Khumalo	Business Leader	Section 4.1 MHSA
Mr. Hope Tyira	Business Area Leader – Sustainable Development	Sustainable Development and environment
Mr. James Ndou	Environmental Leader	Environment
Anglo American Platinum		
Mr. Frank Pieterse	Environmental Manager	Environmental management for Eastern Limb
ARM Mining Consortium Limited		
Mr. Tsietsi Letanta	SHEQ Manager	Safety, health, environment and quality

2.4 Details of Specialists

Extensive specialist studies were undertaken for each of the MPM existing approved EMPs and associated Record of Decisions (RoDs) and Environmental Authorisations (EAs). These specialist studies have been used to develop the consolidated EMP. As the Doornbosch Mining Right will be mined as an extension of the existing MPM South 2 Shaft operations, no surface disturbance will take place. Therefore additional specialist studies over and above the specialist studies undertaken as part of the approved South 2 Shaft authorisations is not required. Specialist input have over been sought to determine and confirm that the mining of the Doornbosch reserve will not lead additional impacts which have not been previously been assessed during the approved South 2 Shaft environmental authorisation processes.

Recommendations from the previous specialist studies undertaken have been summarised and included Section 19.1 of this report.

2.5 Provincial Authorities Details

Environmental authorisation for the proposed amendment project is required from the DMR. Details of the relevant authorities are given in Table 2-5 below.

Table 2-5: Competent authority details

Department	Contact Person	Contact Details	
DMR (Polokwane Office)	Mr Thivhulawi Kolani	Telephone:	015 287 4761
		Email:	Thivhulawi.Kolani@dmr.gov.za

2.6 Municipality and Ward Details

MPM is located within the jurisdiction of the Greater Sekhukhune District Municipality (GSDM) and Greater Tubatse Local Municipality (GTLM) and falls in Ward 2. Details of the relevant municipalities and wards are provided Table 2-6 and shown in Figure 2-1.

Table 2-6: Local and district municipality details

Municipality	Contact Person	Contact Details
Sekhukhune District Municipality	Ms N.T Maseko	Tel: 013 262 8300 Email: Tjatjiet@sekhukhune.gov.za
Fetakgomo –Tubatse local Municipality	Cllr P Makine	Tel: 013 231 1000 Email: patrickmakine@gmail.com
Fetakgomo –Tubatse local Municipality	Mr. NP Busane (Acting Municipal Manager)	Tel: 082 479 2926 Email: npbusane@tubatse.gov.za

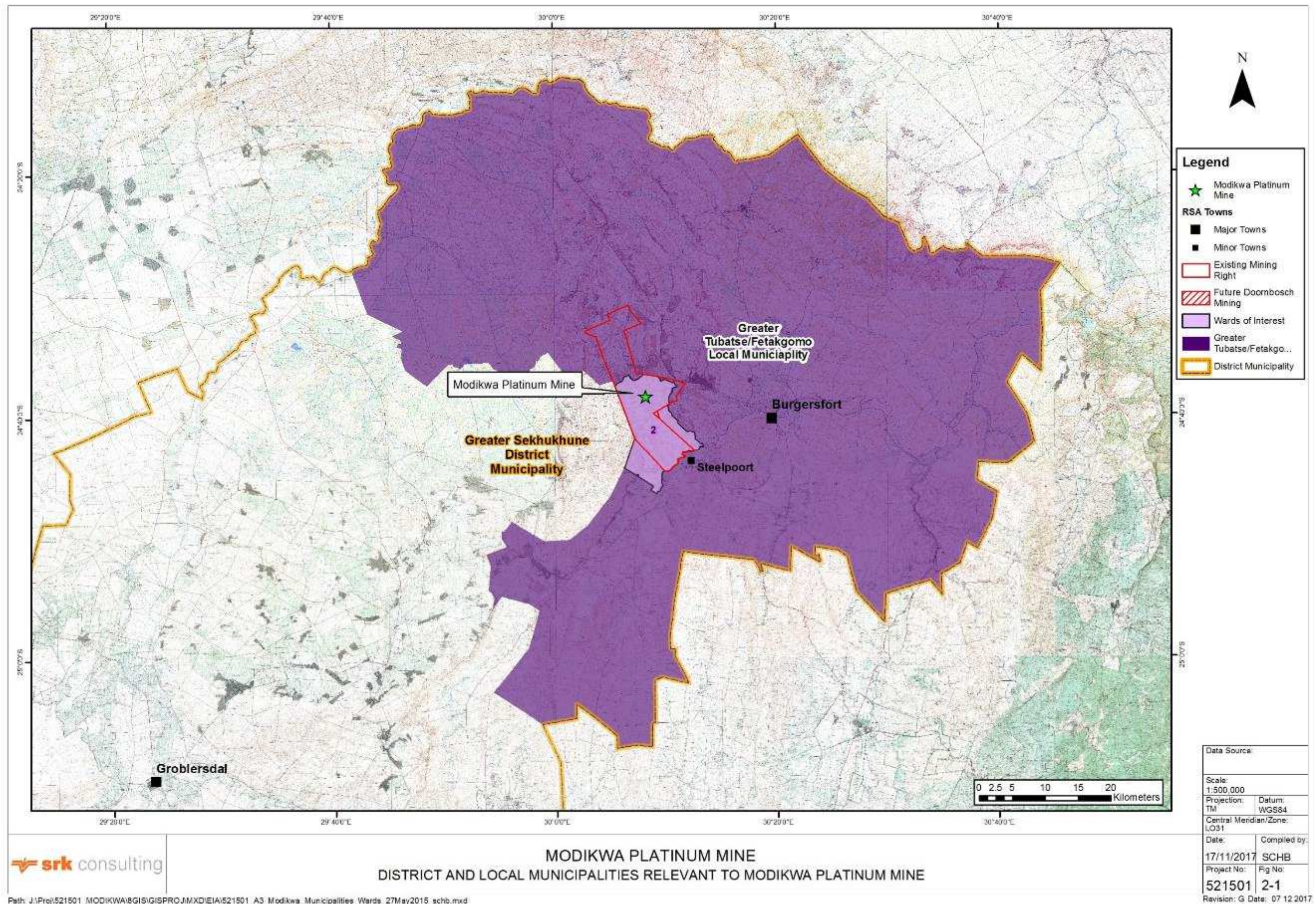


Figure 2-1: District and local municipalities and wards relevant to Modikwa Platinum Mine

3 Description of Property

MPM is located approximately 20 km west of Burgersfort and 18 km north of Steelpoort on the Eastern Limb of the Bushveld Complex, situated in the Greater Tubatse Local Municipality (GTLM) within the Greater Sekhukhune District Municipality (GSDM) of the Limpopo Province

MPM's existing mining area and associated mining activities take place on portions of the farms Maandagshoek 254 KT, Driekop 253 KT, Hendriksplaats 281 KT, Onverwacht 292 KT, Winterveld 293 KT and Doornbosch 294 KT. Access to the area is from the regional road (R37) from Burgersfort, with a tarred road to the mine.

MPM proposes to amend and consolidate their Environmental Management Programme (EMPr), which was approved in 2001, to include the activities associated with the Doornbosch Mining Right, on Portion 2 of the farm Doornbosch 294 KT. The details associated with Portion 2 of the farm Doornbosch 294 KT is presented in Table 3-1.

Table 3-1: Description of Property

Detail	Description
Farm Name:	Doornbosch 294 KT, Portion 2
Application Area (Ha)	Farm Area: 960.1337 Ha Approved Doornbosch MR Area: 43.8949 Ha (on Doornbosch 294 KT Portion 2) MPM Amended Approved MR Area: 14136.5640 Ha
Magisterial District:	Magisterial District of Tubatse
Distance and direction from nearest town	8.93km from Burgersfort
21 Digit Surveyor General Code for each farm portion:	T0KT00000000029400002

3.1 Locality Map

MPM is located approximately 20 km west of Burgersfort and 18 km north of Steelpoort on the Eastern Limb of the Bushveld Complex, situated in the Greater Tubatse Local Municipality (GTLM) within the Greater Sekhukhune District Municipality (GSDM) of the Limpopo Province. Refer to Figure 3-1 and Appendix 3 for a locality map for the listed activity (GNR 984, Activity 17).

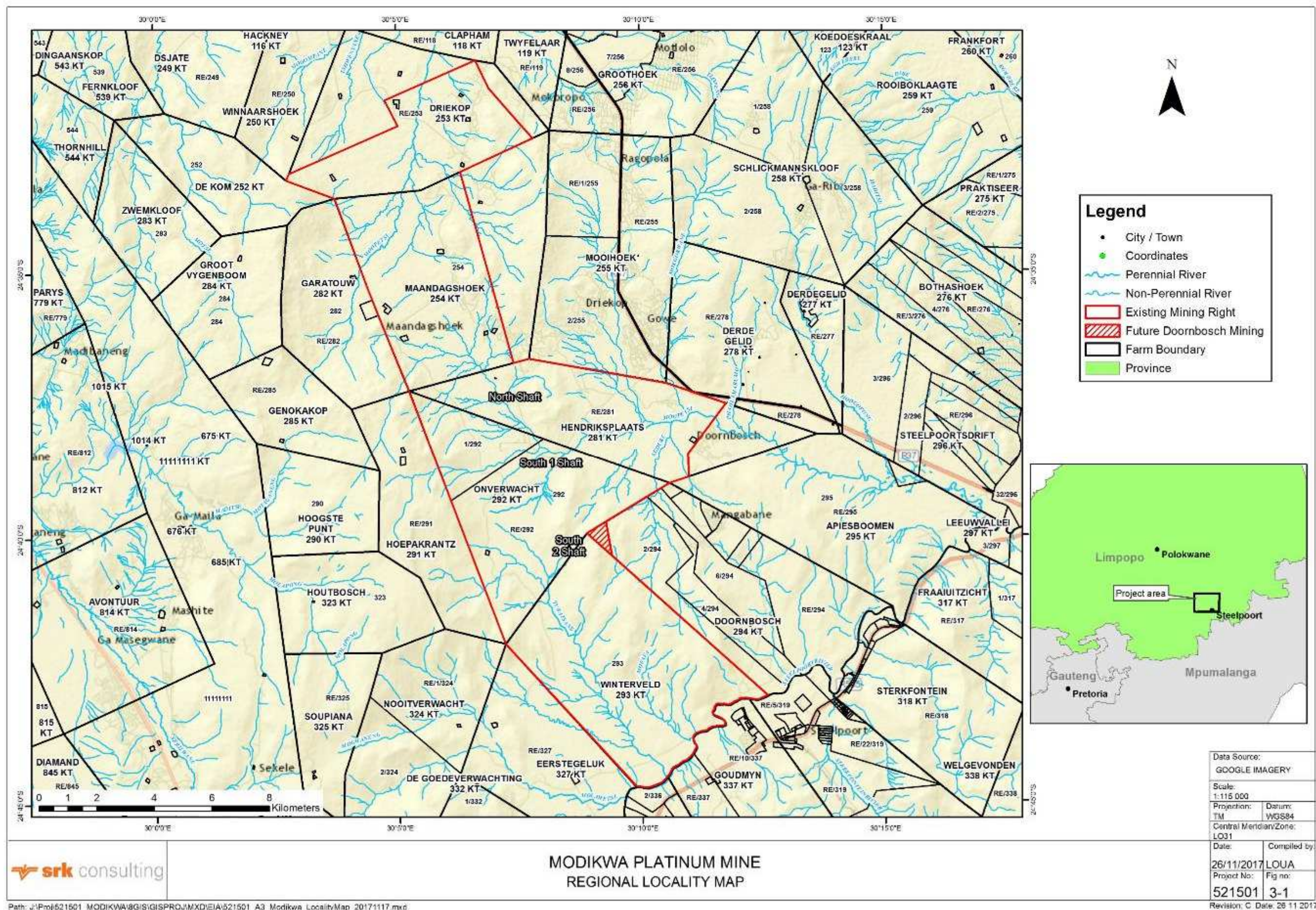


Figure 3-1: Regional Locality Map

4 Description of the scope of the proposed overall activity

4.1 Listed and specified activities

As detailed above, the Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. Table 4-1 provide the listed activities applicable to the mining of the Doornbosch Mining Right reserve. The items associated with the activities shaded in grey in will not be applicable as no additional surface infrastructure is required as a result of the mining of the reserve associated with the Doornbosch Mining Right.

Table 4-1: Listed Activities

NAME OF ACTIVITY (All activities including activities not listed)	Aerial extent of the Activity Ha or m ²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546)/NOT LISTED
Extension of Mining Right	Approved Doornbosch MR Area: 43.8949 Ha (on Doornbosch 294 KT Portion 2)	X	GNR 984 Listing 2 - Activity 17
Excavations	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Blasting	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Stockpiles	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Discard Dumps	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Dams	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Loading	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Hauling	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Transport	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Water supply dams	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Water Supply Boreholes	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Accommodation	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Offices	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Ablution	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Stores	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Workshops	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable

NAME OF ACTIVITY (All activities including activities not listed)	Aerial extent of the Activity Ha or m ²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546)/NOT LISTED
Processing Plant	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Storm water control	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Berms	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Roads	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Pipelines	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Powerlines	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable
Conveyors	Not Applicable	Not Applicable, all existing infrastructure to be utilised.	Not Applicable

The listed activity map is provided in Appendix 4.

4.2 Description of the activities to be undertaken

MPM proposes to amend and consolidate their Environmental Management Programme (EMPr), which was approved in 2001, to include the activities associated with the Doornbosch Mining Right, granted in terms of Section 102 of the Minerals and Petroleum Resources Development Act 28 of 2002.

It is proposed that the Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure is required as a result of the mining of the reserve associated with the Doornbosch Mining Right.

The Doornbosch Mining Right represents approximately 0.3% of the amended MPM overall Mining Right. The Doornbosch Mining Right will not attribute any additional employment opportunities as it will only be a gap filler whilst the South 2 Shaft project is executed.

Mineral Content/Distribution applicable to the approved Doornbosch Mining Right includes Platinum Group Metals including Gold, Base Metals and Chrome.

The primary strike development will be undertaken with mechanised equipment on reef. Conventional access development will be done to intersect the reef while the raises will be developed with hand held drills. The ore will be transported into muck bays. The stoping will be conducted predominately on strike utilising a breast layout. The drilling will be done with hand held drills and ore will be scraped along ASG's developed for this purpose and then down the centre raise into the ore-passes. LHDs and Dump trucks will reload this ore on a conveyor belt taking it to surface as well as trucking the ore to surface through the existing South 2 Shaft decline from where it will be further processed at the existing MPM facilities.

The Doornbosch addition of the Mining Reserve is represented in Figure 4-1.

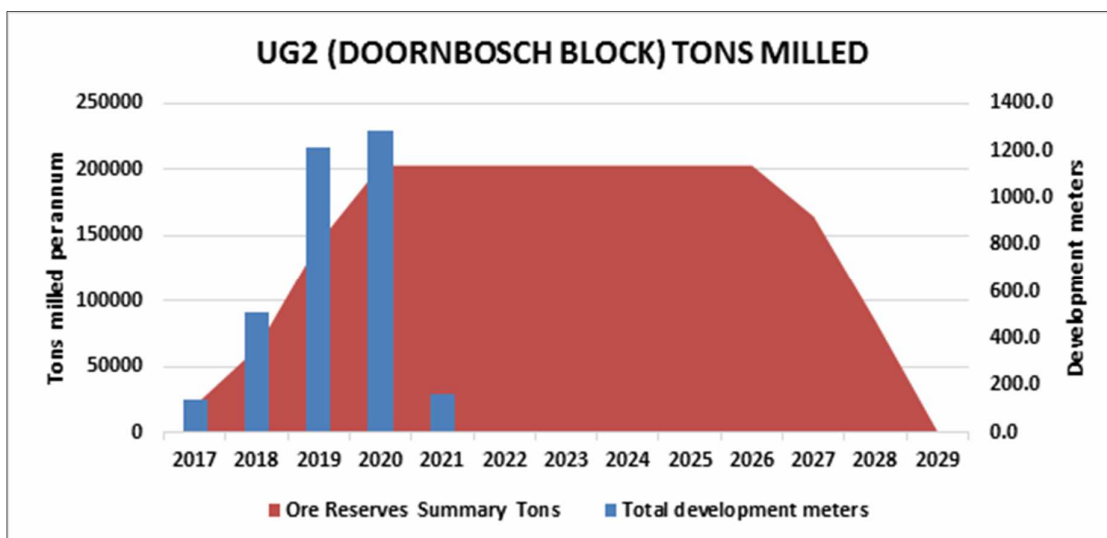


Figure 4-1: Production timeframes for Doornbosch

5 Policy and Legislative Context

This section provides an overview of the policy and legislative context within which the Doornbosch Mining Right and the MPM Consolidation Process is proposed. It identifies all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process, which may be applicable or have relevance to the proposed project. Table 5-1 outlines the legislation applicable to the MPM Consolidation project.

Table 5-1: Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
Constitution of South Africa	Throughout the Environmental Impact Assessment Report	The proposed activities shall be conducted in such a manner that significant environmental impacts are avoided, where significant impacts cannot all together avoided be minimised and mitigated in order to protect the environmental rights of South Africans.
MPRDA	Throughout the Environmental Impact Assessment Report	MPM's original EMPr was approved in January 2001, in terms of the Minerals Act. Subsequent EMPr amendments were made which were converted to the MPRDA (Original RoD Reference Number: 6/2/2/477 and LP129MRC).
NEMA	Throughout the Environmental Impact Assessment Report	MPM has two (2) Environmental Authorisations (EAs) authorised under NEMA. (12/1/9/2 - GS40 for South 2 Shaft Project, and LP30-5-1-2-3-2-1-129EM for North Ventilation Shaft and Crusher Plant). The addition of the Doornbosch approved MRA will require authorisation in terms of NEMA GNR 984 Activity 17.
NWA	Throughout the Environmental Impact Assessment Report	MPM operates under an approved Water Use License (WUL), previous issued WULs in 2007, 2010 and 2016 have been superseded by the current 2017 WUL No 04/B41J/ABCDEFGHIJ/4312 issued on the 11th of October 2017.
NHRA	Throughout the Environmental Impact Assessment Report	Sites of archaeological and heritage significance will not be affected as part of the proposed amendment project
NEM:BA	Throughout the Environmental Impact Assessment Report	The proposed project is limited to the inclusion of the approved Doornbosch MRA into the MPM Mining Right Area and to consolidate the EMPs for MPM. No further impacts on Biodiversity are expected.
NEM:WA	Throughout the Environmental Impact Assessment Report	MPM has approved Waste Management Licences issued under NEM:WA for the operation of their existing Sewage Treatment Plants.
NEM;AQA	Throughout the Environmental Impact Assessment Report	No Air Quality impacts are expected as part of this proposed project.
NFA	Throughout the Environmental Impact Assessment Report	A permit has been issued to MPM from the Department of Agriculture, Forestry and Fisheries (DAFF) which authorises the removal and transplantation of trees for activities associated with the South 2 Shaft. No further impacts on Biodiversity are expected.

5.1 Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

The MPRDA requires that a reconnaissance permission, prospecting right, Mining Right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right, production right, prospecting work programme; exploration work programme, production work programme, mining work programme, environmental management programme, or an environmental authorization issued in terms of the National Environmental Management Act, 1998, as the case may be, may not be amended or varied (including by extension of the area covered by it or by the addition of minerals or a share or shares or seams, mineralized bodies, or strata, which are not at the time the subject thereof) without the written consent of the Minister.

5.2 National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

Listed Activities are activities identified in terms of Section 24 of the NEMA, which are likely to have a detrimental impact on the environment, and which may not commence without Environmental Authorisation (EA) from the Competent Authority (CA). EA required for Listed Activities is subject to the completion of either a Basic Assessment (BA) process or full Scoping and Environmental Impact Assessment (S&EIA) with applicable timeframes associated with each process. The EA must be obtained prior to the commencement of those listed activities.

The addition of the Doornbosch approved MR will require authorisation in terms of NEMA GNR 984 Activity 17.

5.3 National Water Act, 1998 (Act No. 36 of 1998) (NWA)

MPM operates under an approved Water Use License (WUL), previous issued WULs in 2007, 2010 and 2016 have been superseded by the current 2017 WUL No 04/B41J/ABCDEFGHIJ/4312 issued on the 11th of October 2017.

Based on the current information, observations from South 2 Shaft and the limited Doornbosch mining area, it is not anticipated that the addition of the Doornbosch Mining Right to the existing MPM Mining Right and the associated mining of the reserve will require further authorisation in terms of the NWA.

5.4 Other applicable legislation

5.4.1 The Constitution of South Africa, 1996 (Act No. 108 of 1996)

The Bill of Rights is the cornerstone of democracy in South Africa, ensuring the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law and states that everyone has the right to:

“An environment that is not harmful to their health or well-being; and have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: Prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.

The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed.

5.4.2 The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)

The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations.

The Act requires all developers (including mines) to undertake cultural heritage studies for any development exceeding 0.5 ha. It also provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities.

Numerous heritage assessments have historically been undertaken within the MPM area. The location of the identified heritage sites have been included in the consolidated EMPr.

Extensive heritage specialist studies were undertaken during the environmental authorisation process for the existing South 2 Shaft operation. As the proposed mining of the Doornbosch Mining Right reserve will not require any surface infrastructure, no impact on cultural and archaeological environment is anticipated.

5.4.3 The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

MPM falls within the Sekhukhune centre of endemism (SKC), which is a floristically important and sensitive area. In excess of 2 200 species are believed to be present in the SKC with two endemic/near endemic genera and more than 100 endemic/near endemic species (4.5%) (BAP, 2009).

Extensive biodiversity specialist studies were undertaken during the environmental authorisation process for the existing South 2 Shaft operation. As the proposed mining of the Doornbosch Mining Right reserve will not require any surface infrastructure, it is anticipated that there will be no additional impact on the biodiversity of the area.

5.4.4 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA) commenced on 1 July 2009. In terms of this Act, all listed waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with the environmental impact assessment process. Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEMWA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority.

One of the major amendments effected by the National Environmental Management Amendment Act 2014 is the insertion of section 24S, as a result of which the NEMWA became applicable to mining residue deposits and residue stockpiles, as follows:

"Management of residue stockpiles and residue deposits 24S.

Residue stockpiles and residue deposits must be deposited and managed in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), on any site demarcated for that purpose in the environmental management plan or environmental management programme in question.”

Mining residues were classified as hazardous wastes by default in terms of Section 18, Schedule 3 of the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEMWAA), which commenced on 2 June 2014. In terms of Regulations GN R.632 and R.633, which commenced on 24 July 2015, mining residues must be characterised and classified, and the design and management of residue stockpiles and deposits must be based on an assessment of the potential impacts and risks.

As the proposed mining of the Doornbosch Mining Right reserve will not require any surface infrastructure, a Waste Management Licence will not be required.

5.4.5 National Environmental Management: Air Quality Act, 2004 (Act no. 39 of 2004) (NEM:AQA)

The main objectives of NEM:AQA are to protect the environment by providing reasonable legislative and other measures to:

- Prevent air pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development in alignment with Sections 24a and 24b of the Constitution of the Republic of South Africa.

The Act has devolved the responsibility for air quality management from the national sphere of government to local spheres of government (district and local municipal authorities), who are tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and development of emissions reduction strategies. The National Ambient Air Quality Standards (NAAQS) for common pollutants, as set in terms of the NEM:AQA.

The National Dust Control Regulations (GN R.827), which were promulgated on 1 November 2013, define acceptable dust fall rates for residential areas as <600 (mg/m²/day) taken over a 30 day average (with no more than 2 exceedances per year, in non-sequential months), and non-residential areas as dust fallout >600<1200 (mg/m²/day) taken over a 30 day average (with no more than 2 exceedances per year, in non-sequential months).

An extensive air quality specialist study was undertaken during the environmental authorisation process for the existing South 2 Shaft operation. As the proposed mining of the Doornbosch Mining Right reserve will not require any surface infrastructure, it is anticipated that there will be no additional impact on air quality.

5.4.6 The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA)

The NFA protects against the cutting, disturbance, damage, destruction or removal of protected trees. A permit has been issued to MPM from the Department of Agriculture, Forestry and Fisheries (DAFF) which authorises the removal and transplantation of trees for activities associated with the South 2 Shaft.

There will be no additional impact on protected tree species, as the proposed mining of the Doornbosch Mining Right reserve will not require any surface infrastructure.

5.5 Municipal Plans and Policies

5.5.1 The GTM Greater Tubatse Municipality Integrated Development Plan

Spatial planning and development are key priorities as identified in the GTM Integrated Development Plan (IDP). The eastern limb of the Bushveld Igneous Complex (mining belt) is emerging as important structuring element of the municipality's spatial development, which will be increasingly dominant in future. The mining activities will affect mainly the western quadrant of the municipality. It is expected that retail and service businesses will respond to the opening of mines and the development of housing by also locating close to these areas. In time, this may eventually alter the current fragmented spatial pattern by creating few large urban settlements, if the expected scale of mining activities materializes.

Burgersfort is one of the major trading towns in Limpopo. Steelpoort is identified as the second order of settlement hierarchy within the GTM. Whereas Steelpoort comprises more manufacturing industries and mining related suppliers Burgersfort is more dominated by retail and service activities. This growth point mostly serves the mining community.

6 Need and desirability of the proposed activities

6.1 Mining Benefits

South Africa produces three quarters of the world's platinum but less than one tenth of the finished manufactured platinum product. Global demand for platinum rose in 2006, supported by an increase in the use of this metal for auto catalysts and a range of industrial applications. The metal is also used in the jewellery sector. However, the demand has subsequently decreased following the global recession and reduction in cars and jewellery sales, amongst other factors. MPM expects platinum demand to recover to support the full projected life of mine (LOM).

The mineral extraction at MPM is considered to be in the best interest of the public at large by generating earning power both locally, nationally and internationally. At present there is no significant alternative employment opportunities in the area.

As platinum is sold globally, MPM is an earner of foreign exchange for South Africa. In addition, the mine also has a positive impact on the economic growth of the Limpopo Province, particularly in the communities around the mine, and through its contribution to rates and taxes to the National fiscus.

The expected LOM for MPM is up to November 2043 as stipulated in the Mining Right 129MR.

6.1.1 Environmental responsibility

MPM has various existing approved EMPs and EMPs. The purpose of this document is to consolidate the existing approved EMPs and EMPs into one comprehensive document. This consolidated EMP contains management measures aimed at mitigating potential negative impacts on the environment as a result of the mining and processing operations at MPM.

MPM operates under an approved Water Use License (WUL), previous issued WULs in 2007, 2010 and 2016 have been superseded by the current 2017 WUL No 04/B41J/ABCDEFGHIJ/4312 issued on the 11th of October 2017. Monitoring of water consumption takes place at MPM and is used to track and minimise water usage throughout the mining operation. Reduction targets are set and revised annually. MPM also reviews and revises its water management strategy on an on-going basis as part of a philosophy of continual improvement.

MPM participates in the Greater Tubatse Environmental Forum. Currently AAP and ARM MC are part of the Joint Water Forum (JWF), along with other mining groups. The focus of the JWF is water supply, which is in line with the Internal Strategic Perspective key objective to ensure equitable access to water and protection of groundwater resources in the over allocated Olifants catchment.

6.1.2 Socio-Economic Benefits

MPM has spent around R100 million over a five year period (2009-2013) on the key identified programs in the Social and Labour Plan (SLP) and is planning to spend additional R76 million over the next five years (2014-2018). MPM is committed to making effective and sustainable use of limited resources to create an environment to enable ordinary people to assume greater control of their lives.

The MPM has funded community projects such as a sewing factory and an engineering workshop. It also has progressive approaches to improving local participation in employment and procurement. Contractors, for example, are required to enter into joint ventures with local companies for at least 30% of a contract where appropriate. Contractors must also ensure that they employ local community members on their teams.

Analysis of socio-economic data indicates that the following opportunities exist for improving the livelihoods of communities that may potentially be impacted on by MPM operations:

- Provision of infrastructure requires special attention to be paid to the establishment of quality housing, sanitation services and environmentally sound and sustainable sources of energy;
- Improvement in the levels of education and skills within the area, thus creating a potential pool of labour required for the proposed project and other projects in the area;
- Up-skilling of the local communities to ensure there is a consistent supply of service providers for the proposed project;
- Establishment of information distribution mechanisms;
- Improving communication with communities;
- Creation of agriculture-based sustainable livelihoods; and
- Creation of poverty eradication and employment creation projects to address the unemployment levels in the area.

6.1.3 No-Go Option

If MPM does not mine the resource associated with the Doornbosch Mining Right, it will limit the expansion of its current operation. The reserves would remain underutilised, which will have an impact on revenue, employment and local economic opportunities.

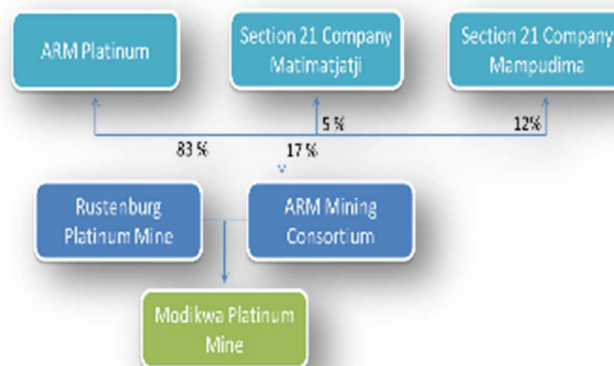
Local, regional and national socio-economic impacts may include the following:

- Local and regional: planned socio-economic initiatives within the surrounding communities would not be able to go ahead and employees and contractors' workers would be impacted; more than half of whom are semi-skilled/unskilled and thus would not easily find alternative employment; and
- National: Reduction in foreign exchange for South Africa will be incurred due to the decrease in mine product sales internationally.

7 Modikwa Platinum Mine Current Operation

7.1 Modikwa Platinum Mine Structure

MPM is a Joint Venture between Rustenburg Platinum Mines (RPM), and is a wholly owned subsidiary of Anglo American Platinum (Ltd) (AAP) and African Rainbow Minerals Mining Consortium Limited (ARM: MC), a subsidiary of African Rainbow Minerals (ARM) Limited. ARM Mining Consortium holds 50% of MPM, with a 17% stake in ARM Mining Consortium being held by two Section 21 companies representing communities around Modikwa. The structure of MPM is shown in the adjacent diagram.



7.2 Location of Modikwa Platinum Mine

MPM is located approximately 20 km north of Burgersfort and 18 km north-west of Steelpoort on the Eastern Limb of the Bushveld Complex, in the Greater Tubatse Local Municipality within the Greater Sekhukhune District Municipality of the Limpopo Province and exploits the platinum ore reserves of the UG2 layer.

MPM's existing mining area and associated mining activities take place on portions of the farms Maandagshoek 254 KT, Driekop 253 KT, Hendriksplaats 281 KT, Onverwacht 292 KT, Winterveld 293 KT and Doornbosch 294KT. Access to the area is from the regional road (R37) from Burgersfort, with a tarred road to the mine.

There are no formal towns adjacent to the project site. The nearest established towns to MPM are shown in Table 7-1.

Table 7-1: Modikwa Platinum Mine in relation to Adjacent Towns

Town	Approximate distance and direction in terms of MPM (line of sight)
Steelpoort	18 km in a Southerly direction
Burgersfort	20 km in an Easterly direction
Ohrigstad	45 km in an East-South-Easterly direction
Lydenburg	56 km in a South-South-Easterly direction
Groblersdal	95 km in a South-Westerly direction
Jane Furse	30 km in a West-South- Westerly direction

7.2.1 Properties Associated with MPM's Mining Right Area

MPM was the holder of an Item 7 Schedule II old order mineral right, for Platinum Group Metals (PGM's), as well as other minerals, in terms of the Minerals Act (Act No. 50 of 1991) (ML 11/2003). This right was issued by the Department of Minerals and Energy (DME), now known as the DMR. The old order mining right was converted to a new order mining right in August 2013 (DMR Ref No: 129 MR), refer to Appendix 5, and will be in force for a period of 30 years ending in 2043.

The properties associated with MPM's mining right are listed in Table 7-2 and shown in Figure 7-1.

Table 7-2: Properties associated with Modikwa Platinum Mine Mining Right

Farm	Portion	Title Deed	Owner
Maandagshoek 254 KT	0 (Remaining Extent)	T6394/1944	National Government of the Republic of South Africa
Hendriksplaats 281 KT	0 (Remaining Extent)	T14449/2001	Modikwa Platinum Mine Pty Ltd
Onverwacht 292 KT	0 (Remaining Extent)	T88050/2011	Hwashi-Difagate Community Trust *
	1	T88050/2011	Hwashi-Difagate Community Trust *
Winterveld 293 KT	0 (Remaining Extent)	T133491/1997	Samancor Chrome Ltd
Driekop 253 KT	0 (Remaining Extent)	T16453/1951	National Government of the Republic of South Africa
Doornbosch 294KT [#]	2 (Remaining Extent)	T13249/949	Samancor Chrome Ltd

* There is a Land Claim Settlement Agreement with the Hwashi-Difagate Community Trust

[#] Future Mining

7.2.2 Surface Right Owners Associated with Modikwa Platinum Mine

The surface right owners are presented in Table 7-3 and illustrated in Figure 7-1.

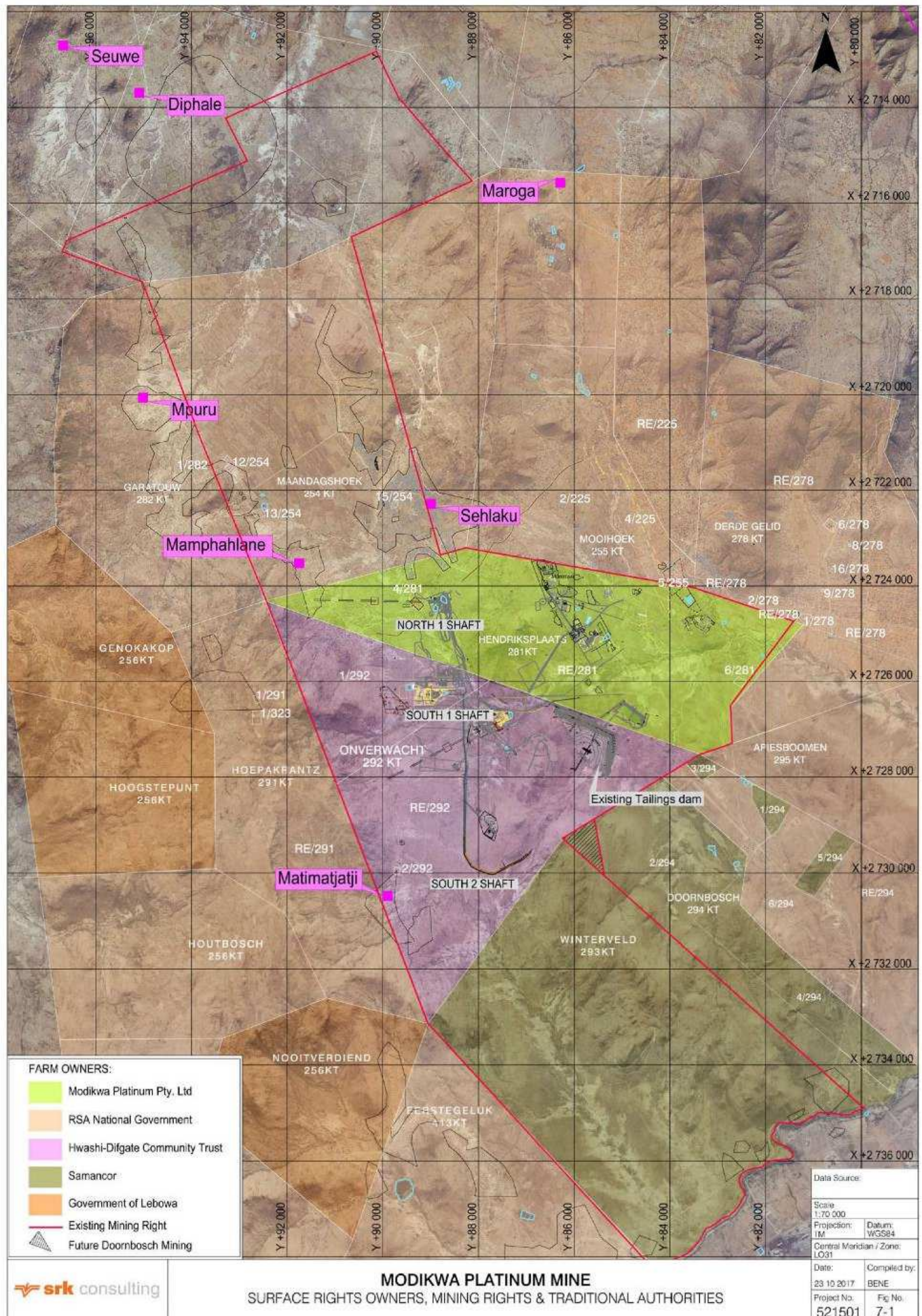
Land ownership has been determined using WINDEED and the property information obtained from WINDEED has been provided in Appendix 6. The farm Onverwacht 292 Remaining Extent is owned by the Hwashi-Difagate Community Trust; there is a Land Claim Settlement Agreement with the Hwashi-Difagate Community Trust for which MPM has a lease agreement (dated July 2011) with the community trust. Please refer to Figure 13-6 for a map relating to land uses associated with the agreement.

Table 7-3: Surface right owners associated with Modikwa Platinum Mine Infrastructure and Activities

Farm	Portion	Title Deed	Owner
Maandagshoek 254 KT	0 (Remaining Extent)	T6394/1944	National Government of the Republic of South Africa
Hendriksplaats 281 KT	0 (Remaining Extent)	T14449/2001	Modikwa Platinum Mine Pty Ltd
Onverwacht 292 KT	0 (Remaining Extent)	T88050/2011	Hwashi-Difagate Community Trust *
	1	T88050/2011	Hwashi-Difagate Community Trust *
Winterveld 293 KT	0 (Remaining Extent)	T133491/1997	Samancor Chrome Ltd
Doornbosch 294 KT [#]	2 (Remaining Extent)	T13249/949	Samancor Chrome Ltd

* There is a Land Claim Settlement Agreement with the Hwashi-Difagate Community Trust

[#] Future Mining



7.3 Traditional Authorities

Seven Traditional Authority (TA) areas, as listed below, are located within the MPM area. These TAs have jurisdiction over a number of villages falling under them, and are all situated in the Greater Tubatse Local Municipality (GTLM). The location of the Traditional Authorities in relation to MPM is shown in Figure 7-1.

- Mamphahlane Community under the leadership of Baroka ba Mamphahlane TA (Kgoshi Ralph Kgoete);
- Sehlaku Community under the leadership of Banareng TA (Kgoshi Isaac Kgwete);
- Mpuru community under the leadership of Kone Phuti TA (Kgoshi Emmanuel Mpuru);
- Maroga community under the leadership of Pulana Maroga TA (Kgoshi Sidwell Maroga);
- Diphale community under the leadership of Mohlala TA (Kgoshi Masia Mohlala);
- Seuwe community under the leadership of Tswako Mohlala TA (Kgoshi Bethuel Mohlala); and
- Matimatjatji community under the leadership of Swazi Ngobe TA (Kgoshi Joseph Nkosi).

7.4 Employment

MPM currently employs 4767 people of which 3948 are MPM employees and 819 are labour hire and working cost contractors. No additional employment will be required for the Doornbosch project, as the existing labour force will be utilised by MPM.

7.5 Mine Work Programme

MPM exploits the UG2 reef and the Merensky (MER) reef of the Bushveld Igneous Complex through underground and open pit operations. The minerals which are mined are the Platinum Group Metals (PGM) including base metals and chrome. The concentrate produced at MPM is sold to the Anglo American Platinum Polokwane Smelter where the product is marketed internationally.

The total mineral resource inclusive for 2014 was 266.24 Mt for UG2 ore and 208.84 Mt for MER ore.

The liabilities for 2017 were calculated using the DMR methodology and amounts to R 194,703,893.

7.6 Previously Approved EMPs and EMPs

A summary of MPM's previously approved EMPs and EMPs and the key infrastructure associated with each EMP is illustrated in Table 7-4.

Table 7-4: Summary of Modikwa Platinum Mine’s approved EMPs and associated key infrastructure

	January 2001	May 2001	October 2001	April 2003	April 2003	June 2003	November 2003	January 2007	January 2009	December 2010	June 2016	May 2017
EMPr	MPM Original EMPr	Amendment 1: Hill project	Amendment 2: Onverwacht Platinum Tailings Dump	Amendment: Surface Winze project	Amendment: Maandagshoek Winze project	Amendment: Hill project	Amendment: Reclamation of Small Historical Dump	Amendment: Merensky Bulk Sample	Addendum: MPM expansion projects	Addendum: Further MPM expansion projects	Amendment: South 2 Shaft	Amendment: North Ventilation Shaft and Crusher plant
Farms where mining related activities are taking place	Onverwacht 292 KT Winterveld 293 KT Hendriksplaats 281 KT Maandagshoek 254 KT Driekop 253 KT	Onverwacht 292 KT	Onverwacht 292 KT	Hendriksplaats 281 KT	Maandagshoek 254 KT	Onverwacht 292 KT	Maandagshoek 254 KT	Onverwacht 292 KT	Onverwacht 292 KT	Onverwacht 292 KT Hendriksplaats 281 KT	Onverwacht 292 KT	Hendriksplaats 281 KT
Key Project Components	Two decline shafts (North & South) Concentrator Plant Tailings storage facility Two waste rock dumps Production: 200Kt/m UG2 platinum ore	Four adits and a short decline in close proximity to South 1 Shaft complex Production: 60Kt/m UG2 platinum ore	Establishment of a mobile retreatment plant for the retreating of an old 1920’s tailings material Tailings material treated– 50 000m ³ Production: 1 kt/m Primary concentrate treated at commercial plant Waste residue encapsulated in Modikwa Tailings Storage Facility	Two decline portals to access additional resources Terraces	Use of old shaft infrastructure to access resources Production: 10 kt/m UG2 platinum ore	Extension of surface infrastructure (terrace) Additional offices, a lamp room and change houses Production: 60Kt/m UG2 platinum ore	Reclaiming a small historical dump (18 564m ²) to extract platinum and palladium Treatment at existing concentrator plant. Production: 95 736t	Procurement of the bulk sample (250 000 tonnes) from the southern two adits of the ten adits, namely Juliet adit. Adit I to the north was used for ventilation purposes.	South 2 Shaft (decline), Open pit, Ventilation shaft, Fine Residue Deposit, Merensky adit, chrome extraction plant. Production: South 2 Shaft - 220-280Kt/m UG2 platinum ore. Merensky Adit - 60Kt/m. Chrome extraction plant - 25kt/m	UG2 open pits (Main North, North 2, South 1 and South 2) Crusher plant Production: 60Kt/m UG2 platinum ore	Waste rock dump at South 2 Shaft Waste rock transfer storage facility Reef transfer stockpile Ventilation shaft Sewage treatment plant (360m ³ /day) and sludge drying beds Production: refer to MPM expansion projects	Ventilation Shaft Crusher Plant.
Life of Mine/Project	In excess of 50 years	7 Years	5-6 months	7 years	36 months	7 years	4 Weeks	18 Months	In excess of 50 years	In excess of 50 years	Approximately 25 years	Up to end of life of mine - 2043
Key Infrastructure	Roads: Sealed and gravel access/haul roads Water: overland pipeline from Olifants River (195ML/m) Power: 11Kv overhead power lines Waste: sewage plant (450m ³ /day), Domestic and industrial waste dumps Other: admin and other buildings, conveyors, storm water structures, pollution structures.	Roads: Gravel access/haul roads from South Shaft Water: pipeline under access road from South Shaft Power: 11Kv overhead power lines Waste: Make use of facilities at South Shaft Other: ramp over conveyor, storm water structures, and pollution structures.	Roads: No additional roads needed Water: Temporary mobile water container Power: Not required Waste: temporary toilet facilities	Roads: Gravel road from the main road to the winze terrace Water supply: pipeline from the North Shaft Power: 11Kv overhead power lines Waste rock: Existing facilities at North Shaft will be used Waste: Make use of existing facilities Transportation of ore: Via truck Other: Terracing	Roads: existing roads widened and levelled Water supply: water tanks and 3 boreholes Water management: Evaporation dams Power: obtained from existing 88kV Eskom power line Waste rock: Approximately 4000 tons - disposed of at existing site Waste: Sceptic tanks and a honey sucker Transportation of ore: Via truck Other: offices, workshop, change houses, compressor house, storm water structures	Roads: Access road to terrace from South Shaft Water: Process - from existing Arabie Dam. Potable - existing borehole supply. Power: Existing 11Kv overhead power lines Waste: 4/5 sceptic tanks and a honey sucker Other: 3 office, lamp room, 10 change houses, parking area, bridge connection from existing infrastructure to proposed infrastructure.	Roads: No additional roads needed Water: Not required Power: Not required Waste: chemical toilet facilities Other: bund wall to contain slurry	Road: existing roads Water: 4 X 10 000 litre zozo storage tanks Waste: Waste rock, domestic refuse Power: 11Kv overhead power lines	Roads: Gravel access/haul roads Water: Overland pipeline , storage tanks Power: 4 x 33Kv overhead power lines Waste: Open pit waste rock, fine residue deposit Other: conveyor, concrete structures for buildings , parking area, explosive storage area, stream crossings, waste water structures and treatment, pollution structures, brake test ramp, starter wall, waste oil sumps, concrete paved bunded storage areas, stockpiled topsoil	Roads: Gravel access/haul roads Water: two water tanks Power: 11Kv overhead power lines Waste: toilets Other: dewatering infrastructure, offices and other buildings, diesel tank with bund wall, bunded storage area, parking area, cone crusher, three screens, two excavators, twister, culverts, electrical circuit, waste water structures, pollution structures	Roads: Gravel access roads and overland conveyor service road Water: Diversion of an ephemeral drainage line, potable water purification plant Power: refer to MPM expansion projects Waste: conservancy tank for the handling of sewage, portable toilets Other: Overland ore conveyor, ore storage silo, drainage line crossing.	Roads: Gravel access/haul roads Water: Temporary water recycling sump and water bowzers Power: Mobile generator and from existing plant Waste: Open pit waste rock.

7.7 Overview and Summary of MPM Operations

A summary of the operations and water and waste management systems associated with the current operations and proposed future approved projects at MPM, is summarised in Table 7-5. A detailed map of the surface infrastructure at MPM can be found in Appendix 7.

Table 7-5: Overview of the MPM mining operation

Aspect	Method/system
Mining and beneficiation	
Life of mine	The expected LOM for MPM is up to November 2043 as stipulated in the Mining Right 129MR but the operation could continue for at least the next sixty years. Mining is currently around 200 ktpm and is below the steady state design tonnage of 240 ktpm. Over the medium to long term the mine may expand to a maximum production of 480 ktpm.
Mining via shafts	<p>MPM has the following shafts:</p> <ul style="list-style-type: none"> Operational: <ul style="list-style-type: none"> North 1 Shaft decline South 1 Shaft decline South 2 Shaft decline (Phase 2 for South 2 Shaft is still at conceptual stage) Onverwacht Hill adits Dormant and under care and maintenance <ul style="list-style-type: none"> Merensky adit Mid shaft decline Maandagshoek winze shaft Mining uses the conventional scattered breast mining method (on-reef mining) methodology supported by footwall infrastructure which will be developed ahead of on-reef operations and will be conducted by means of Trackless Mechanised Mining Ore from the shafts is transported to the primary crusher and plant via conveyor. Ore from South 2 Shaft will be transferred underground to Onverwacht Hill shaft and then on surface to South 1 Shaft via a new conveyor. Eventually all underground workings will be connected as the UG2 reef is exploited.
Open pit mining	<ul style="list-style-type: none"> Open pit operations follow conventional open cast methods, involving strip mining at 40 to 60 ktpm with concurrent backfill. Only Main North open pit has been fully developed comprising 7 ha of which 4 ha has been backfilled and 3 ha has been mined to a depth of 30-40 m. One pit has been mined and is undergoing rehabilitation: North 1 pit comprises 7 ha of which 4 ha has been backfilled and 3 ha has been mined to a depth of 30-40 m. Final rehabilitation of the North 1 open pit will include placement of soil and revegetation by end 2017. Bulk sampling initiated at Merensky Open Pit in November 2011. Planned open pits include, North open pit 2, South open pit 1 and South open pit 2. Further open pits are planned, which include Merensky Winterveld and Onverwacht open pits, these open pits shall require the relevant environmental authorisations.

Aspect	Method/system
	<ul style="list-style-type: none"> Ore from the open pits is extracted by a combination of excavation, crushing, washing and concentration The ore is transported via truck to the primary crusher stockpile and waste rock is disposed to waste dumps on surface
Current beneficiation (platinum)	<ul style="list-style-type: none"> Ore from the crusher stockpile is put through a process of crushing, screening and flotation The final concentrate comprises platinoid minerals, namely platinum, rhodium, palladium, ruthenium, iridium and osmium with gold, copper and nickel, cobalt and chrome as by-products in the final concentrate The concentrate is trucked to the smelter at Polokwane via 32-tonne trucks A chrome extraction plant proposed for removal of chrome prior to tailings deposition was described in the 2008 EMPr Amendment
Support infrastructure	<ul style="list-style-type: none"> Additional mine and community support infrastructure includes the central office, Montrose Village, Area Village, a clinic and roads
Topsoil stockpiles	<ul style="list-style-type: none"> Soil is stripped and stockpiled from each area where construction of the mine infrastructure takes place
Water supply	<ul style="list-style-type: none"> Raw water is supplied to the mine via an off-take from the Lebalelo pipeline. Modikwa has an allocation from the Lebalelo Water User Association (LWUA) of 8 Ml/day with current daily use (potable and make-up) in the region of 5 Ml/day (maximum use anticipated is in the region of 6.6 Ml/d). The licence for this water currently falls under LWUA but will in future be issued to Modikwa as explained at the end of this table. Water is released from the Arabie Dam into the Olifants River and supplied to Modikwa from LWUA from the Havercroft Weir. Water is stored in the 24ML concrete dam on site from where it is treated for potable purposes via sand filtration and ozone to disinfect the water. Potable water supply to South 2 Shaft is via one borehole (MMB16). The water is treated for potable purposes. Process water is sourced from mine water (dewatering of mine workings, excess North shaft water, tailing return water and dirty stormwater runoff), treated sewage effluent and augmented with raw water as required. A constructed wetland upgradient of the return water dam, east of the proposed irrigation area, may be considered for treatment of excess shaft water prior to entry into the return water dam or 24ML dam for reuse. However, due to implementation of a Consolidated Dewatering Strategy at MPM, excess water is decreasing and a wetland may no longer be required.
Water and waste management systems	
Waste Rock	<ul style="list-style-type: none"> Waste rock is disposed of onto two existing waste rock dumps: one at North Shaft and one at South Shaft. An 8.4 ha waste rock dump is under construction at South 2 Shaft. Previously waste rock from South 2 Shaft was trucked to South 1 waste rock dump. Waste rock has been used as construction material for the development of the approved South 2 Shaft terrace. For the proposed pits concurrent rehabilitation is planned. Provision in the design is made for temporary overburden stockpiles from which backfill will take place. The overall effect of this mining method is that all the waste rock and overburden material will be used to backfill the open pit void. Waste rock / overburden excavated from the North Pit 1 has been stored adjacent to the pit for use in backfill (partly completed) and final rehabilitation. An area where waste rock at North Shaft and North Pit 1 encroached within 100 m of a watercourse has been cleared and the

Aspect	Method/system
	<p>area has been ripped and demarcated with pegs to prevent reoccurrence of deposition within the 100 m buffer zone. Rehabilitation will continue with ripping of the area and self-vegetation will be allowed to occur. Should self-vegetation not be adequate based on monitoring findings then seeding of the area will be done. Monitoring is to take place according to the rehabilitation plan.</p> <ul style="list-style-type: none"> Waste rock minimisation at Modikwa is being achieved by crushing the rock for reuse at the crusher plant located near South 1 Shaft. The crusher plant has been established as a community-run micro enterprise. Waste rock produced at the concentrator is used in construction and is sometimes stockpiled at the concentrator prior to use.
Tailings	<ul style="list-style-type: none"> The tailings disposal system comprises a tailings storage facility (TSF) including a two-compartment return water dam and a silt sump at the return water dam inlet. The tailings delivery system is designed to transfer 300 t/h of dry solids at a maximum slurry density of 1.5 t/m³. The remaining life of the TSF is approximately thirty years. An additional TSF and return water dam planned for the proposed chrome extraction expansions as described in the 2008 EMPr Amendment have not been developed or applied for as Section 21(g) water uses.
Domestic and industrial waste	<ul style="list-style-type: none"> MPM manages waste according to the site's waste management procedure (MOD-ALL-ENV-PRO-021). All domestic solid waste is removed to the municipal landfill site at Burgersfort. Old motor oils and filters and grease are collected in specially built containers and collection sumps at the earth moving contractor's yard. The oils and grease are removed from these sites by various recycling companies/contractors. Spillage around the collection points is strictly controlled. Other recyclable waste is sorted and stored at the salvage yard for removal by various recycling companies/contractors.
River diversions and alterations	<ul style="list-style-type: none"> No major watercourse diversions are associated with the shafts except for South 2 Shaft where an alteration of a watercourse was required to accommodate the South 2 Shaft terrace Drainage lines in the South 2 Shaft WRD area (two) have been diverted around the WRD Drainage lines crossing the planned open pits will be diverted around the open pits by river diversion canals and embankments. No river diversion is required for North open pit 2 or Merensky pits as they fall outside the 1:100 year floodlines
Dewatering (mine water production)	<ul style="list-style-type: none"> Shaft dewatering due to groundwater ingress is ongoing with decant anticipated post closure at South 1 Shaft Pit dewatering is required from open pit production depths of around 18 m and deeper Dewatered water is settled in settling dams and stored in the available dirty water containment dams on the mine for reuse in the process water circuit. At South 2 Shaft underground water is settled in a concrete lined silt trap, from where the settled water overflows to two HDPE lined mine return water dams From the return water dams, the settled water is pumped to the mine service water tank, namely a Braithwaite tank (steel) for reuse underground No decanting is expected at South 2 Shaft as this shaft will eventually become connected with the underground operations from the neighbouring Onverwacht Hill and South 1 Shaft operations. As South 1 Shaft is topographically the lowest point and the total underground workings become flooded, decanting will occur from South 1 Shaft

Aspect	Method/system
Sewage	<ul style="list-style-type: none">• Sewage effluent at MPM is treated at the Central sewage treatment plant and the final treated effluent is stored in the plant stormwater dam for re-use in the plant. The sludge drying beds are cleaned as needed and the dried sludge is disposed of at the municipal landfill site• A new 360 m3/day sewage plant has been built at South 2 Shaft; the final treated effluent is reused underground as mine service water• Sewage plants associated with the mine accommodation villages (Montrose and Area Village) have been upgraded but the upgraded sections are not yet operational• Sewage sludge from the shaft and village accommodation sewage plants are dried at the Central sewage plant• Sludge from the sewage treatment plants will be dried in sludge drying beds and appropriately disposed of in accordance with the Guidelines: for the Utilization and Disposal of Wastewater Sludge, Volumes 1 to 5, published by the Water Research Commission (2006 – 2009)

8 Existing Surface Infrastructure and Activities Associated with Modikwa Platinum Mine

The current activities and infrastructure at MPM as well as the status of the activities is given in Table 8-1 and shown in Figure 8-1. MPM does not have an approved mine closure and rehabilitation plan, however, there are closed and rehabilitated sites / activities and those have been documented. Closure objectives have been developed and is provided in Section 20.5.

Table 8-1: Key infrastructure and Associated Activities at Modikwa Platinum Mine Operations

Operational Area		Key Infrastructure	Farm	Status
<u>North</u>	Maandagshoek Surface Winze	Decline shaft	Maandagshoek 254 KT	Completed and Rehabilitated
		Waste rock dump (WRD)		
		Roads		
		Water management infrastructure		
		Workshops, administration buildings, compressor house and change houses		
	Maandagshoek Tailings Dump as part of Maandagshoek surface winze	Platinum tailings dump		Completed and rehabilitated
		Roads		
		Residue from reclamation		
	North 1 Shaft	Decline shaft with WRD	Hendriksplaats 281 KT	Operational
		Sewage Treatment Facility		
		Water management infrastructure		
		Conveyor systems		
		Access roads		
		Topsoil stockpile		
		Domestic and industrial waste management areas		
		Ventilation Shafts		
		Power supply		
		Administration buildings, change houses and other buildings		
		Explosive Storage Facility		
	North UG2 Open Pits	Opencast mining at the North Open Pit (mined out) and North Open Pit 2		North 1 UG2: mined out, rehabilitation in progress North 2 UG2: future project
		Overburden Stockpiles – North 1		
		Haul roads		
		Power supply		
		Water management infrastructure		
		Two decline portals		

Operational Area		Key Infrastructure	Farm	Status
	Surface Winze Shaft (Mid Shaft Decline)	Terraces	Onverwacht 292 KT portion 1	Surface infrastructure removed, underground access under care and maintenance
		Water and air pipelines		
		Roads		
		Power supply		
<u>Concentrator</u>	Chrome extraction plant	Chrome extraction plant	Onverwacht 292 KT portion 1	Future Approved Project
		Workshop and administration buildings		
		Domestic and industrial waste management areas		
		Water management infrastructure		
	Concentrator	Concentrator with Primary Crusher	Onverwacht 292 KT portion 0	Operational
		Concentrator Stormwater Dam		
		Domestic waste disposal site		
		Operation of the water management infrastructure, i.e. stormwater sump, settling pond, oil sump, etc.		
		Workshops, administration buildings and other buildings		
	Tailings Storage Facility	Operation of the Tailings Storage Facility (TSF)	Onverwacht 292 KT portion 0	
		Operation of the Return Water Dam (RWD)	Hendriksplaats 281 KT	
<u>Central Areas</u>		Offices	Onverwacht 292 KT portion 1	Operational
		Helicopter Pad		
		Central Salvage yard		
<u>South</u>	Merensky Adits	Adits	Onverwacht 292 KT portion 1	Operational
		Ventilation Shaft		
		Roads and brake test ramp		
		Workshops, administration buildings and other buildings		
		Domestic and industrial waste management areas		
		Power supply		
		Water management infrastructure		

Operational Area		Key Infrastructure	Farm	Status		
		Explosive Storage Facility				
	South 1 Shaft	Water management infrastructure	Onverwacht 292 KT portion 1	Operational		
		Administration buildings, change houses and other buildings				
		Decline shaft with WRD	Onverwacht 292 KT portion 0			
		Sewage Treatment Facility				
		Conveyor systems				
		Topsoil stockpile				
		Domestic and industrial waste management areas				
		Ventilation Shafts				
		Crusher Plant				
		Power supply				
		Access road				
		Explosive Storage Facility				
		South 2 Shaft	Decline shaft with WRD		Onverwacht 292 KT portion 0	Operational
			Ventilation Shafts		Winterveld 293 KT	
	Sewage Treatment Facility		Onverwacht 292 KT portion			
	Water management infrastructure					
	Conveyor systems		Doornbosch 294 KT portion 2			
	Topsoil stockpile					
	Domestic and industrial waste management areas					
	Access and haul roads					
	Power supply					
	Bulk fuel storage					
	Workshops, Administration buildings, change houses and other buildings					
	Explosive Storage Facility					
	Onverwacht Hill Adits	Operation of four adits		Operational		

Operational Area		Key Infrastructure	Farm	Status
		Operation of the Stockpiles	Onverwacht 292 KT portion 0	
		Stores and workshops		
		Gravel roads		
		Power supply		
		Water management infrastructure		
		Terraces		
		Workshop, admin and other buildings		
	South UG 2 Open Pits	Opencast mining (South open pit 1 and South open pit 2)	Onverwacht 292 KT portion 0	Future Approved Project
		Overburden Stockpiles		
		Haul roads		
		Power supply		
		Water management infrastructure		
	Merensky Open Pit	Opencast mining at the Merensky Onverwacht Open Pit (Initiated)	Onverwacht 292 KT portion 0	Care and Maintenance
		Overburden Stockpiles		
		Haul roads		
		Power supply		
		Water management infrastructure		
	Onverwacht Tailings Dump	Platinum tailings dump	Onverwacht 292 KT portion 0	Completed and Rehabilitated
		Residue from reclamation		
		Topsoil stockpile		
		Mini return water dam		
	Fine Residue Deposit	Fine residue deposit	Onverwacht 292 KT portion 0	Future Project
		Water management infrastructure		

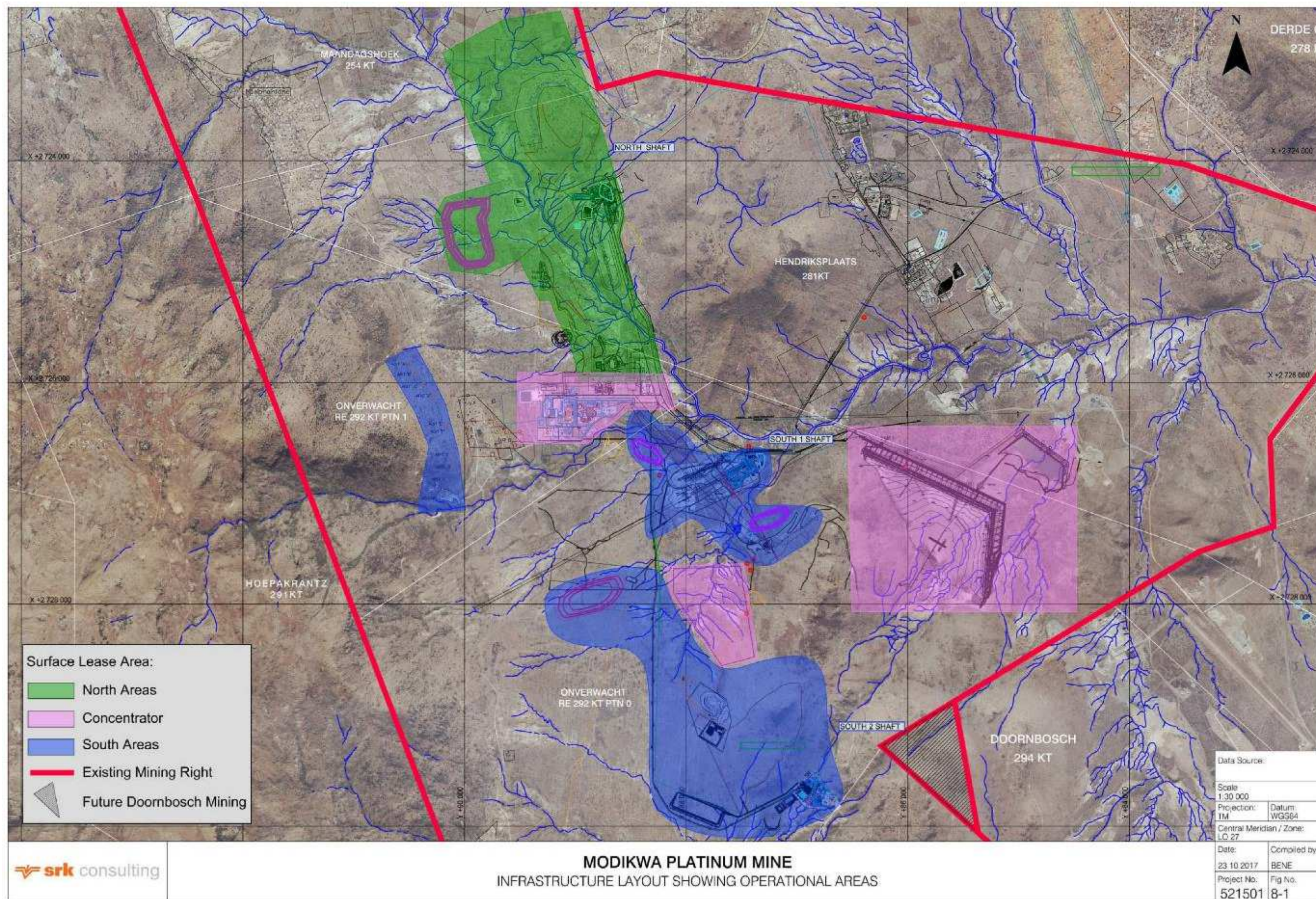


Figure 8-1: Infrastructure Layout and Operational areas associated with Modikwa Platinum Mine Operations

8.1 Mining via Shafts

MPM uses the conventional scattered breast mining method (on-reef mining methodology supported by footwall infrastructure which will be developed ahead of on-reef operations and is conducted by means of Trackless Mechanized Mining).

MPM has five operational shafts which are North 1 Shaft decline, South 1 and South 2 Shaft declines, Onverwacht Hill adits and the Merensky adit; as well as South 2 Shaft decline which is currently under construction. The ore is currently transported from the shafts to the primary crusher and plant via conveyors and trucks from south 2 Shaft.

8.1.1 North 1 and Surface Winze¹ Shaft

Access to North 1 shaft is by means of inclined twin declines. The twin declines are used as follows:

- One decline is fitted with a conveyor for the removal of ore and waste rock from the underground workings and for man access at the beginning and end of each shift;
- One decline is fitted with a trackless delivery system for the transportation of materials underground; and
- A chairlift adjacent to the decline transporting materials underground.

During 2002, MPM two additional side by side declines at North 1 Shaft were developed to access ore reserves as part of Surface Winze Shaft Project. A revised mining plan was developed to make changes to the sequence of mining due to unexpected underground conditions which could not have been foreseen during the feasibility studies.

The purpose of the winze surface project was to maintain the production target of the approved Maandagshoek EMPr and not to increase production or the area to be mined. Other than roads and power lines no additional infrastructure were established as part of the winze shaft projects as the shaft makes use of existing infrastructure established as part of the approved Maandagshoek EMPr.

Infrastructure associated with North 1 Shaft includes the following:

- North 1 Shaft Decline Area;
- Shaft offices, workshops, stores and tuck shop;
- Change houses;
- Salvage transfer yard;
- Wash bay and service area;
- Parking area;
- Contractors yards;
- Fuel and material storage and handling facilities;
- Explosive storage and waste explosive materials and packaging destruction areas;
- Access roads;
- Topsoil stockpile areas;
- Electricity provision and distribution facilities;
- Security;
- Stormwater channels and pipes;
- Pollution control dams;
- Settling dams;
- Dirty water management infrastructure such as clean and dirty water separation channels;

¹ A **winze** is a minor connection between different levels in an underground mine.

- Conveyor system; and
- Ore storage area.

8.1.2 Maandagshoek Surface Winze Shaft

MPM used an old abandoned shaft, used for chrome mining in the past, approximately 1.5Km North-West of North Shaft and established associated infrastructure in order to mine underground for a period of 3 years which started in April 2003. Waste rock generated by the development of the Maandagshoek Winze Shaft have been stored at this WRD site.

8.1.3 South 1 Shafts

Access to South 1 shaft is by means of inclined twin declines. The twin declines are used as follows:

- One decline is fitted with a conveyor for the removal of ore and waste rock from the underground workings and for man access at the beginning and end of each shift.
- One decline is fitted with a trackless delivery system for the transportation of materials underground.

Infrastructure associated with South 1 Shaft includes the following:

- South 1 Shaft Decline Area;
- Shaft offices, workshops, stores and tuck shop;
- Change houses;
- Salvage transfer yard;
- Wash bay and service area;
- Parking area;
- Contractors yards;
- Fuel and material storage and handling facilities;
- Explosive storage and waste explosive materials and packaging destruction areas;
- Access roads;
- Topsoil stockpile areas;
- Electricity provision and distribution facilities;
- Security;
- Stormwater channels and pipes;
- Pollution control dams;
- Settling dams;
- Dirty water management infrastructure such as clean and dirty water separation channels;
- Waste Rock Dump and handling area;
- Conveyor system; and
- Ore storage area.

8.1.4 South 2 Shaft

Access to South 2 shaft is by means of a vehicle access road and chair lift into two separate portal entrances.

The UG2 ore reserve is exploited by the shaft and is in excess of 5 million tonnes and the planned production rate will be approximately 120ktpm.

Infrastructure associated with South 2 Shaft includes the following:

- South 2 Shaft terrace;
- Shaft offices, workshops, stores and tuck shop;
- Change houses;

- Salvage transfer yard;
- Wash bay and service area;
- Parking area;
- Overland conveyor and silo from South 2 Shaft to South 1 Shaft;
- Contractors yards;
- Fuel and material storage and handling facilities;
- Explosive storage and waste explosive materials and packaging destruction areas;
- Access and service roads;
- Topsoil stockpile areas;
- Electricity provision and distribution facilities;
- Security;
- River diversions and river crossings;
- Sewage Treatment Plant and associated sewage sludge drying beds;
- Stormwater channels and pipes;
- Pollution control dams;
- Waste Rock Dump;
- Topsoil dumps;
- Pipelines;
- Ventilation shafts;
- Ore reef material transfer stockpile storage facility;
- Waste rock transfer storage facility;
- Settling dams; and
- Dirty water management infrastructure such as clean and dirty water separation channels.

8.1.5 Onverwacht Hill Mining Project – Hill Adits

The Onverwacht Hill Mining Project is an option to mine 60 ktpm from the hill near Maandagshoek South Shaft in order to accelerate the tonnage build-up to meet the mill requirements. The Onverwacht Hill project exploits the PGM's of the UG2 reef and is mined in conjunction with North and South 1 Shaft. Much of the services at the Hill Mining area are shared such as offices, change houses and underground equipment.

The hill deposit are accessed by via four adits and a short decline to establish four production levels

The south shaft bank associated with South 1 Shaft will suffice as a shared service for change houses, lamp rooms, stores, explosives and everything else required on surface except roads and transport. The conveyor to the plant have a ramp built over it and the dump trucks tip directly onto the belt. The hill and decline share a stockpiling facility.

Subsequent to the approval of the Onverwacht Hill Mining Project it was found that the ground conditions at the Hill Shaft operation are poor and would result in unsafe working conditions if the operation at the current ore level continued.

The operation was deepened to mine the next ore. Deepening the operation required a larger workforce which in turn required the extension of the existing terrace at the lower Adit (Adit D) to accommodate three additional offices, a lamp room, ten change houses and a parking area ten cars and septic tanks.

The hill deposit is accessed by four adits and a short decline to its four production levels. Approximately 60ktpm of UG2 Platinum Ore are mined through these adits.

The deposit has four portals at 23m elevation intervals. Each production drive handle a maximum of 20ktpm trammed out by a 50t truck down the hillside road to the stockpile or belt situated next to South Shaft.

The waste rock produced at the hill deposit is trucked to the South 1 Shaft WRD where it is deposited.

8.1.6 Merensky Adits A-J

A Merensky reef bulk sample was obtained, during 2006, through two of ten adits sunk in the 1920's by Hans Merensky during his exploration in the area. These adits were sunk on the side of the Leolo Mountains and have not been in use since 1920's and have not been sealed since the exploration.

The project consisted of the procurement of a bulk sample (of 250 000 tonnes) from the southern-most two adits of the ten adits, originally named 'J' adit, but now referred to as Juliet adit. This adit lies west of the concentrator plant.

The entire chrome-to-chrome package to a thickness of approximately 200 cm was extracted. This adit was selected as it was considered to have the least impact on the environment and the community and where the least capital needs to be spent.

The initial winzes were developed from the existing adits (Juliet and I) by conventional methods. On surface the material were loaded by Front End Loaders (FEL) into dump trucks and hauled and tipped at the existing North or South Shafts after which it was milled and treated in the concentrator as a sludge to give an initial indication of the milling and metallurgical properties of the Merensky reef.

Currently the Merensky reef is accessed by an on-reef winze which was developed into the mountain in a westerly direction and is 1.5m wide by 2.2m high. A twin decline system, one on reef and the other in the footwall adjacent to the Juliet adit was constructed to provide access for mining.

The adjoining adit to the North, I adit, is used for ventilation purposes, all fans are equipped with at least one silencer on the intake air side. At critical positions fans are equipped with silencers on both sides of the fan.

The planned production rate was 60ktpm of UG2 Platinum Ore. Waste rock produced will be trucked to the South Shaft WRD.

8.2 Ventilation Shafts

There are currently 10 ventilation shafts at MPM these are shown in Figure 8-2 and described in Table 8-2.

Table 8-2: Ventilation shafts associated with Modikwa Platinum Mine operations

Ventilation Shaft Name	Coordinates	
North Vent Shaft 1	30° 6' 27.43" E	24° 37' 16.94" S
North Vent Shaft 2	30° 6' 57.62" E	24° 37' 15.82" S
North Vent Shaft 3	30° 5' 49.34" E	24° 37' 22.92" S
South 1 Shaft	30° 7' 30.36" E	24° 38' 53.61" S
Hill Shaft 1	30° 8' 19.33" E	24° 38' 53.75" S
Hill Shaft 2	30° 8' 17.15" E	24° 39' 15.54" S
South 2 Vent Shaft 1	30° 8' 51.21" E	24° 39' 46.51" S
South 2 Vent Shaft 2	30° 8' 41.59" E	24° 40' 1.77" S
South 2 Vent Shaft 3	30° 8' 36.64" E	24° 40' 11.15" S
South 2 Vent Shaft 4	30° 8' 51.93" E	24° 40' 33.10" S

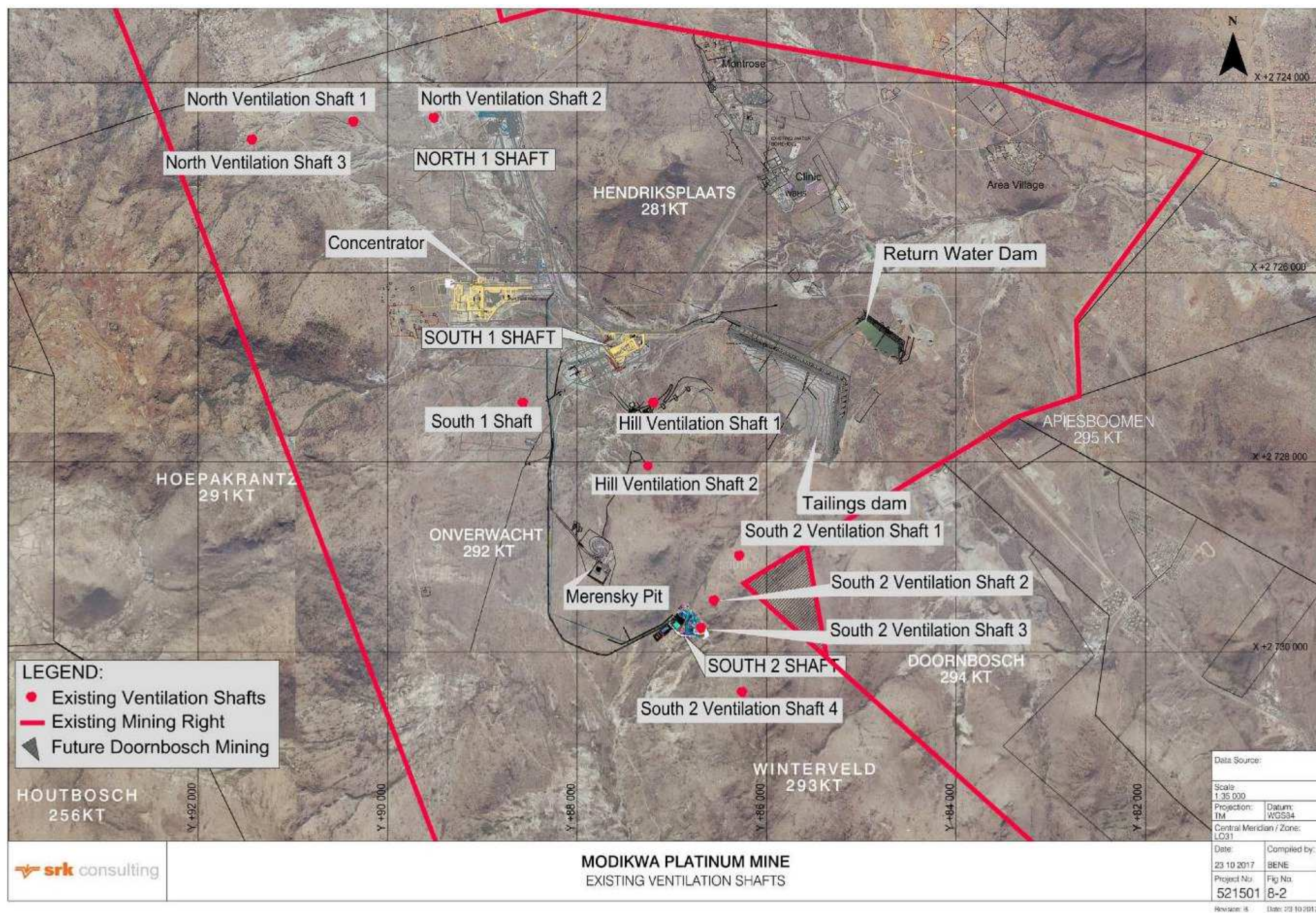


Figure 8-2: Ventilation shafts associated with Modikwa Platinum Mine operations

8.3 Open Pit Mining

Open pit operations at MPM follow conventional open cast methods, involving strip mining at 40 to 60 ktpm with concurrent backfill. Ore from the open pits is extracted by a combination of excavation, crushing, washing and concentration. The ore is transported via truck to the primary crusher stockpile and waste rock is disposed to waste dumps on surface.

8.3.1 Main North UG2 Open Pit

Only the Main North open pit has been fully developed comprising 7ha of which 4ha has been backfilled and 3ha has been mined to a depth of 30-40m. Final rehabilitation of the Main North open pit will include placement of soil and revegetation. North 2 open pit is expected to be mined to a depth of 20-30m with a strip ratio of 18:1 and will exploit UG2 Platinum Ore.

Waste rock / overburden excavated from the Main North open pit has been stored adjacent to the open pit for use in final rehabilitation. The initial waste rock excavated from the Main North open pit has been dumped on a new 151,000 m³ capacity waste rock dump for use in final rehabilitation. When the second strip is mined, this waste rock will be used to backfill the excavation of the first strip. Provision in the design is made for temporary overburden stockpiles from which backfill will take place. The overall effect of this mining method is that all the waste rock and overburden material will be used to backfill the open pit void. A similar waste rock handling approach will be followed at the other proposed open pits.

8.3.2 South 1 and South 2 Open Pits

The South 1 and South 2 open pits are planned but neither of the open pits has been constructed. The open pits will exploit the UG2 Platinum Ore. The planned average depth is 23m and 19m for the South 1 and South 2 open pits respectively and the designed strip ratio is 22:1 and 17:1 respectively.

The waste rock / overburden which is mined out will be stored adjacent to the pits for use in final rehabilitation. The same method of stockpiling and backfilling which was used in the mining of the Main North open pit will be implemented for the two south open pits.

The planned production for North and South open pits is 40-60ktpm with an overall production of 200kt. It is anticipated that 500kt of waste rock / overburden rock will be produced from the mining of the open pits.

8.3.3 Merensky Open Pit

The Merensky Onverwacht open pit is planned to exploit the Merensky Platinum Reef, and is proposed to cover an area of 37 Hectares. The estimated ore reserve to be mined is in excess 300kt with a planned production rate of 60-100ktpm and will be mined using conventional open cast methods, the ore will be extracted by a combination of excavation, crushing, washing and concentration. The open pit will be mined to a depth of 60 m, going down in benches of approximately 12m high x 8-10m wide, the overall pit slope will vary between 40 – 45° and ore will be transported to the primary crusher stockpile and WRD's on surface.

Approximately 83 million tonnes of waste rock / overburden material will be mined out of the open pit, the initial waste rock excavated from the open pit is temporarily dumped on a portion of the Fine Residue Deposit (FRD) site (refer to Section 7.5), adjacent to the open pit. When the second strip is mined, the waste will be used to backfill the excavation of the first strip. The overall effect of this mining method is that all the waste rock and overburden material will be used to backfill the open pit void, and as such no new WRD will be created.

A bulk sampling were initiated at Merensky open pit in November 2011.

8.3.4 UG2 Open Pits

The South 1 and South 2 open pits are planned and neither of the pits has been developed. The open pits will exploit the UG2 Platinum Ore. The planned average depth is 23m and 19m for the South 1 and South 2 open pits respectively and the designed strip ratio is 22:1 and 17:1 respectively.

The waste rock / overburden which is mined out will be stored adjacent to the open pits for use in final rehabilitation. The same method of stockpiling and backfilling which was used in the mining of the Main North open pit will be implemented for the two south open pits.

Approximately 5 000 000 tonnes of waste rock and overburden material will be mined out of the UG2 open pits. The planned mining method will be strip mining, where the initial waste rock excavated from the open pit is dumped on the adjacent north shaft WRD. When the second strip is mined, the waste thereof will be used to backfill the excavation of the first strip.

The overall effect of this mining method is that all the waste rock and overburden material will be used to backfill the open pit void, and such no new WRD will be created.

The planned production for North and South open pits is 40-60ktpm with an overall production of 200kt.

UG2 mining will be conducted through a series of smaller open pits along the entire UG2 ore body, and these will be referred to as:

- North open pit 2 - planned
- South open pit 1 and South open pit 2 - planned

The UG2 reef and outcrop will be mined using conventional open cast methods and the ore will be extracted by combination of excavation, crushing, washing and concentration. The waste and ore mining will take place in 10 m high benches. The blasted material is loaded into large mechanical drive trucks by either a large hydraulic shovel or rope shovels. The ore will be transported to the primary crusher stockpile and waste rock to waste dumps on surface.

The overall open pit slope will vary between 40° for the first 30m below surface and 55° in the open pit above 30m in depth. The nominal bench width with 10m high benches is 7.3m. All final faces will be pre-split to improve the stability of the high walls. The mine design statistics are provided in Table 8-3 below.

Table 8-3: Mine design statistics

Description	Average Pit Depth	Deepest Pit Depth	Designed Strip Ration
Main North Open Pit (Mined out)	26m	49m	24:1
North Open Pit 2 (Planned)	20m	33m	18:1
South Open Pit 1 (Planned)	23m	41m	22:1
South Open Pit 2 (Planned)	19m	34m	17:1

Access to the open pits will be by haul roads along the widths of the pit benches. The width of the roadways will be relative to the size of the haul trucks selected and nominal width of 8-10m is recommended. In compliance with the design parameters used generally by truck manufacturers a maximum main haul road gradient of 105 has been used in the open pit road system design.

Ore from the open pit will be transported by truck to the existing primary crusher and concentrator plant and processed. Overburden will be transported to the overburden dumps.

Approximately 5 000 000 tonnes of waste rock and overburden material will be mined out of the UG2 open pits. The planned mining method will be strip mining, where the initial waste rock excavated from the open pit is dumped on the adjacent north shaft WRD. When the second strip is mined, the

waste thereof will be used to backfill the excavation of the first strip. The overall effect of this mining method is that all the waste rock and overburden material will be used to backfill the open pit void, and such no new WRD will be created.

Refer to Table 8-4 for details on the overburden dumps.

Table 8-4: Existing and planned overburden dumps at Modikwa Platinum Mine 2

Overburden Dump	Volume	Approximate Area (ha)
Main North Pit Overburden Dump	1 532 050 tonnes	15 ha
UG2 Open Pits Overburden Dumps	5 000 000 tonnes	Future Project
Merensky Onverwacht Pit Overburden Dump	83 000 000 tonnes	Future Project

8.4 Waste Rock Dumps

Waste rock produced at the underground mining operations at each of the North and South 1 and South 2 Shafts is stored at a site in close proximity to the shafts. Waste rock produced from the Hill Shaft is temporarily stored at each of the Hill adits and then stored at the WRD at South 1 Shaft.

Waste rock from South 2 Shaft is currently transferred to the existing South 1 Shaft WRD; a new WRD at South 2 Shaft has been authorised at South 2 Shaft. Refer to Table 8-5 for further detail.

Waste rock from the Merensky Adit was transported by truck to the existing North and South Shaft WRD's. There is an existing old WRD at the Maandagshoek Surface Winze Shaft area which was used and established when the proposed shaft was used for chrome mining in the past.

Waste rock produced from the surface Winze Shaft is stored at the existing North Shaft WRD.

Waste rock is used throughout the LOM for construction purposes as fill or aggregate, erosion control placement in dongas and erosion channels around the mining area. Waste rock is also transported to the South 1 Shaft waste rock crusher plant to be used by industry for similar uses off site to minimise the volumes stored on site.

Table 8-5: Existing and planned waste rock dumps at Modikwa Platinum Mine 3

Waste Rock Dump (WRD)	Capacity	Approximate Area (ha)
South 1 Shaft WRD	714 220 tonnes	~5 ha
North Shaft WRD	407 000 tonnes	~11 ha
South 2 Shaft WRD	540 000 tonnes	8.4 ha

8.5 Fine Residue Deposit

The Fine Residue Deposit is planned to be located on the farm Onverwacht 292 KT portion 0 and is currently used to temporarily stockpile waste rock / overburden from the Merensky Onverwacht open pit.

Once the Merensky Onverwacht open pit has been mined out the fine residue from the existing concentrator plant will be pumped to the FRD via a pipeline. The FRD will cover 135ha and approximately 240kt of fine residue will be deposited on the new FRD per month. The FRD will rise to a maximum height of 40m, at a slope angle of 1:3.

² Information for the capacity of the waste rock dumps has been sourced from the MPM Consolidated IWWMP

³ Information for the capacity of the waste rock dumps has been sourced from the South 2 Shaft IWWMP

Two return water dams will be associated with the FRD and will each cover 5ha. Surface water will be removed via penstock systems to the return water dams from where it will be recycled back to the plant water circuit.

8.6 Crusher Plants

Waste rock minimization at Modikwa is being achieved by crushing the rock for reuse at the crusher plant located near South 1 Shaft and North Shaft. The crusher plant has been established as a community-run micro enterprise. The crushed waste rock is used to for the supply of road aggregate and construction material in the vicinity of MPM.

The crusher plant adjacent to South 1 Shaft operates at a crushing rate of approximately 26 000 tons per month and the crusher plant situated at North 1 Shaft operations at approximately 30 000 tons per month. The WRD's associated with these crusher plants has waste rock in excess of 30 years.

8.7 Ore Stockpiles

There are two ore stockpiles located on Onverwacht 292 KT near South Shaft; these are Two Rivers Stockpile and Twickenham Stockpile. These stockpiles are used in the concentrator when MPM does not have sufficient ore stockpiled for the concentrator. Temporary ore stockpiles are also located at each of the shaft areas.

8.8 Concentrator Plant

The concentrator plant is a zero effluent discharge plant when operating under normal conditions and consists of the following infrastructure:

- Ore Storage Facility;
- Crusher;
- Natural Fines Circuit;
- Mills;
- Flotation;
- Concentrate Handling;
- Tailings Handling and Disposal; and
- Reagent Storage and Handling.

Ore is transported to the Run of Mine (ROM) pad from the North, South 1, South 2 Merensky adits and Onverwacht Hill adits. Ore from these areas are transported using overland conveyors, which operate 24 hours a day, and via truck from the Hill Shaft to South 1 Shaft from where it is conveyed to the concentrator plant.

Wood fragments from the underground workings are removed by hand from the ROM stockpile for disposal in the salvage yard. Scrap metal are also removed from the ROM stockpile for recycling.

Ore is transferred from the ROM stockpile to the vibrating grizzly which has a spacing set of 180 mm. Any oversize material passes from the grizzly onto the primary jaw crusher, which has an open side setting of 170 mm. The combined primary jaw crushed product and grizzly undersize is then transferred by conveyor to the mill feed storage silos where it is separated by screens into coarse (>100 mm) and fine (>100 mm) feed. Scrap steel from the underground is removed from the ROM by an electro magnet suspended over the grizzly feed conveyor. The combined mill feed, comprising either the coarse and fine mill feed or a combined product is fed to the natural fines vibrating screens where it is wet screened to produce:

- +1 mm feed for the ROM mill
- -1 mm feed for further classification

The undersize product is then pumped through a cyclone/screen circuit before passing through the NF flotation circuit.

Mill feed, comprising coarse, fine and oversize material from the NFC is delivered to the primary ROM autogenous mill. The mill product is screened at 750 microns. The primary ROM mill product then passes through the main rougher flotation circuit. These separate feeds (silicate and chrome circuits) then pass into secondary regrinding ball mills

The mill and natural fines products pass through the respective flotation process to produce concentrate and silicate and chrome tailings. The flotation product passes into the concentrator. The tailings are pumped separately to a tailings handling section.

The concentrate is pumped to a high capacity thickener where it is thickened to approximately 60 % m/m solids. The final product is then pumped to a filter for dewatering to approximately 11% moisture. The filter product is transferred to the storage hoppers for loading into road transport.

Road haulage is carried out by a haulage contractor, which is responsible for all vehicle maintenance etc. All trucks are fitted with dust covers.

Tailings from the silicate scavenger are pumped to the Tailings Storage Facility (TSF) for disposal from where water is returned to the plant via the return water dam located adjacent to the TSF.

The final concentrate comprises platinoid minerals, namely platinum, rhodium, palladium, ruthenium, iridium and osmium with gold, copper and nickel cobalt and chrome as by-products in the final concentrate. The concentrate is trucked to the Polokwane smelter via 32-tonne trucks.

A Helicopter pad is situated to the west of the concentrator plant.

8.9 Chrome Extraction Plant

A chrome extraction plant is planned to be located adjacent to the existing concentrator plant and within the footprint to intercept and re-process UG2 Slime material prior to the final disposal at the FRD. Slime material from the slimes dam (FRD) will also be pumped back to the chrome extraction plant for processing. The planned production rate associated with the chrome extraction plant will be 250 000 tonnes of chrome concentrator per month.

8.10 Tailings Storage Facility

8.10.1 Method of Deposition

The Tailings Storage Facility (TSF) is situated in a valley between the old Montrose and Winterveld Chrome Mines, approximately 3km east of the plant site.

The tailings disposal system comprises a TSF, a two-compartment return water dam and a silt sump at the return water dam inlet. The tailings delivery system is designed to transfer 300 t/h of dry solids at a maximum slurry density of 1.5 t/m³ (45% solids). The life of the tailings dam is expected to be forty years to a final height of 945 mamsl.

The TSF has been designed for a maximum safe height of approximately 70m with an average outer slope of 1V:3H. The dam was also designed to accommodate a monthly production rate of 240 000 tpm over a period of 50 years. The return water dam has a standby and an operating compartment with a total capacity of approximately 280 000m³.

The conventional spigot method of deposition is employed on the TSF.

The TSF is situated over the foot wall of the UG2 reef and is traversed by two small streams draining down the valley. Due to the steepness of the valley sides it is not feasible to divert the streams around

the valley and therefore the tailings dam was designed to impound the run-off from the external catchment as a result of a significant storm event.

The area outside the perimeter of the tailings dam footprint has been undermined by the extraction of chrome ore.

Pertinent features from for the TSF are the following as per the design report:

Production rate	=	240 000 tpm
Hydraulically placed in situ dry density	=	1650 kg/m ³
Life of Mine	=	50 years
Top area of dam at closure	=	113 Ha
Total volume of tailings stored	=	65 x 10 ⁶ m ³
Height of tailings dam at closure	=	70m
Height of starter wall at highest point	=	16.5m
Rate of rise at top of starter wall	=	3.5m/yr
Rate of rise at closure	=	1.2m/yr

8.10.2 Tailings Storage Facility Layout

- **Access Roadway**

A dump rock access roadway has been constructed around the perimeter of the tailings dam and to the pump house downstream of the return water dam.

- **Fencing**

The tailings dam complex and return water dam have been completely fenced with a 4 strand stock fence with two gates provided on the southern fence line.

- **Solution Trench**

A concrete lined solution trench has been constructed around the tailings dam perimeter to convey the seepage water to the return water dam. The solution trench has been constructed deeper than normally required (1.5 to 2.0m) on the northern side of the tailings dam to collect seepage water flowing along the interface of the alluvium and norite during the early stages of dam development. The solution trench crosses the access road on the northern side of the tailings dam via 2 No. 600mm Class 100D spigot and socket stormwater pipes and gravitates to the silt trap on the northern side of the road. The solution trench has been concrete lined to eliminate standing water in areas with relatively flat gradients and thus reduce vegetation growth in the solution trench.

- **Catchment Paddocks**

A series of catchment paddocks have been constructed adjacent to the solution trench around the perimeter of the tailings dam. The paddocks consist of a catchment paddock wall, an outer toe wall and paddock cross walls. The paddocks are approximately 60m long x 25m wide along the western side, 30m long x 25m wide on the eastern side of the tailings dam and collect the contaminated rain water runoff and eroded solids from the outer face of the dam wall below the first step-in.

- **Main Outlet Drains**

Precast concrete chimney inlet structures filled with 6mm stone are constructed approximately 60m inside the starter toe wall on the western flank of the tailings dam. These structures are

spaced at 60m centres and will become operational following installation of the elevated curtain drain. Water is drained from each chimney structure by means of a 150mm diameter vitrified clay pipe with open netlon joints placed in a filter drain consisting of 19mm stone, filter sand and geofabric to the outer toe wall. From the outer toe wall the drain continues as a 150mm diameter vitrified clay pipe with hepsleeve couplings (closed jointed) to the solution trench. At the solution trench a 45° bend encased in concrete has been installed to form a water trap thereby reducing the possibility of the formation of bacterial and algae growth on the inside of the pipe.

- **Inner Toe Drain**

A 3m wide inner toe drain has been constructed inside the starter wall around the perimeter of the tailings dam. The function of this drain is to collect the seepage water from the tailings dam during the early stages of dam development, prior to the main future elevated curtain drain becoming operational.

The inner toe drain has been constructed as a graded filter drain and comprises a graded filter sand cover, a layer of 6mm stone and a layer of 19mm stone protected by geofabric. 150mm diameter vitrified clay collector pipes with netlon open joints have been placed and covered by the 19mm stone layer.

The collector pipes are connected to the outlet drains to facilitate conveyance of the seepage water in the proximity of the inner toe wall to the solution trench.

- **Elevated Curtain Drain**

As the height of the tailings progresses to a level of approximately 1.5m above the concrete chimney intake structures, the future elevated curtain drain will be constructed. The drain is also extended with each 1.5m lift of tailings. This drain is installed to control the phreatic surface thereby ensuring the stability of the outer face of the tailings dam. The drain will comprise a 0.7m wide graded filter drain of filter sand.

- **Penstock Pipeline**

A 675mm nominal diameter spigot and socket precast concrete penstock pipeline Class 150D has been installed from the pool wall to the solution trench on the north side of the new tailings dam. This pipeline will act as the main penstock outlet. Three single and one double intermediate penstock intake structures have been provided along the length of the penstock pipe to facilitate the decanting of water.

Two final penstock intake towers will be constructed as part of the Phase 4 development. Initially water will be decanted from the pool by means of the intermediate double inlet structure until the tailings dam reaches the height of the final penstock intake towers.

The eventual final penstock intake towers will be utilised for decanting water for the remaining lifespan of the tailings dam by progressively extending their height by means of conventional penstock rings.

A secondary penstock pipeline has been installed to the north west of the main penstock pipeline to assist in and facilitate proper pool control during the early stages of dam development. The secondary penstock pipeline is a 600 ND spigot and socket precast penstock pipeline Class 150 ND. This penstock pipeline has however been sealed off and is no longer operational.

- **Silt Trap**

A silt trap structure has been installed at the end of the main penstock pipeline to retain excess solid particles that might have been decanted from the tailings dam. The silt trap comprises of a stilling basin, an operating compartment and a standby compartment. Seepage water from the

tailings dam is also conveyed to the silt trap via the solution trench. The silt trap is emptied or de-silted on a regular basis to prevent the return water dam from silting.

The layout for the TSF layout is illustrated in Figure 8-3.

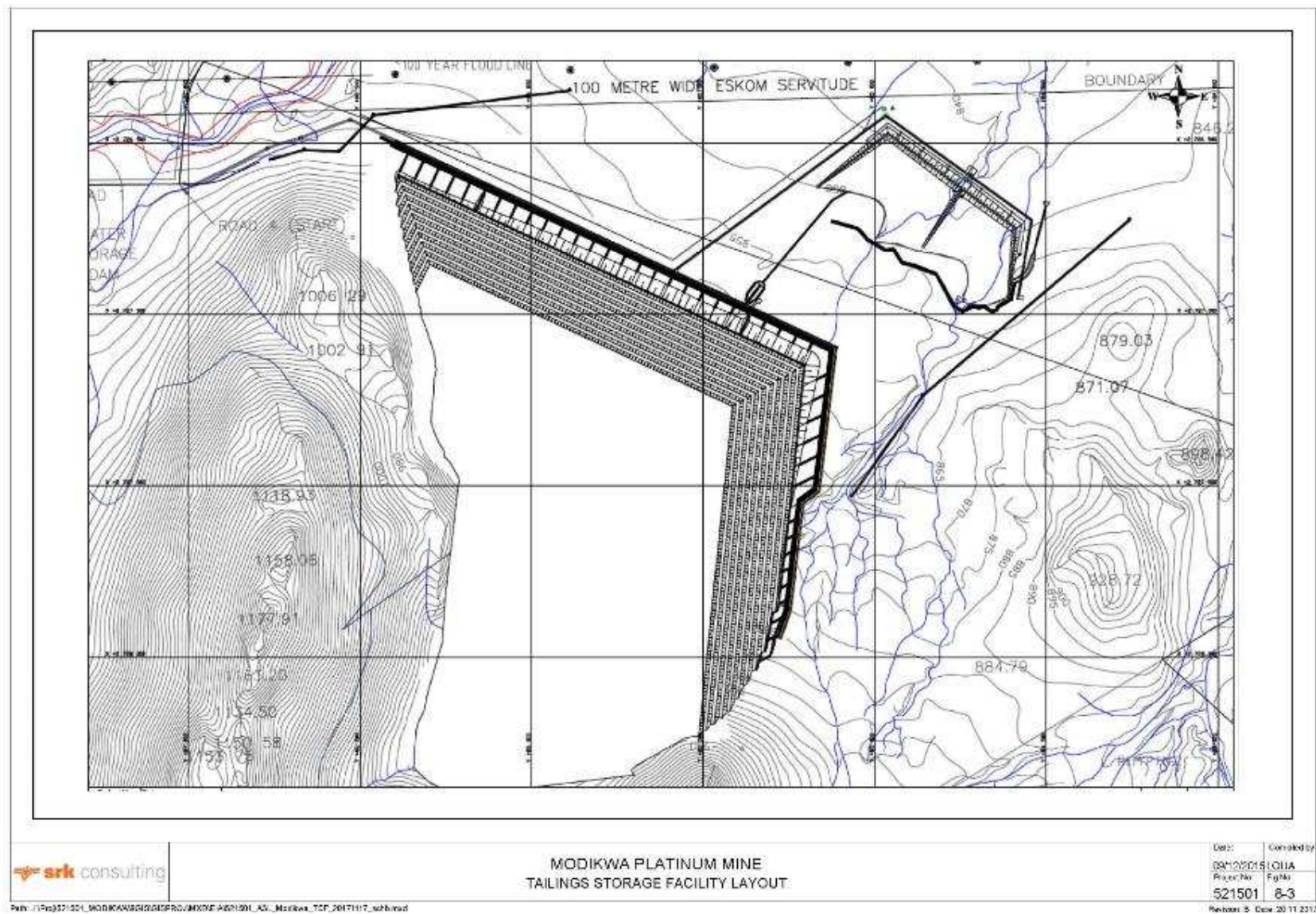


Figure 8-3: Layout of the tailings storage facility at Modikwa Platinum Mine

8.10.3 Return Water Dam

The return water dam is constructed downgrade of the tailings dam complex. The dam has an approximate capacity of 200 000m³ plus 0.8m freeboard to give a full supply volume of approximately 280 000m³.

The dam consists of an operating compartment and a standby compartment.

The dam wall with a 4m crest width has been constructed with material excavated from the dam basin. The dam wall crest level is at elevation 850 mamsl and has a maximum height of 9m above natural ground level. The wall has a cut-off key extending downwards into the competent norite and has central core drain to collect any seepage water within the wall. A 5m wide and 850mm deep spillway, protected with rip-rap has been constructed on the eastern side of the return water dam wall.

8.10.4 Tailings Dump Reclaiming

A small historical tailings dump, referred to as the Maandagshoek dump, was reclaimed to recover platinum and palladium metals. The material was a product of an abandoned early 19th century chrome mining operation. The Maandagshoek dump, with a surface area of 18 564 m² was situated on the Farm Maandagshoek 254 KT at the eastern foot of Swale Hill about 5km North East of MPM's Main administration offices. The material was processed at the existing concentrator plant and tailings deposited on the existing tailings storage facility. The duration of the reclamation was approximately 6-9 weeks and was undertaken during last quarter of 2003

8.11 Housing sites

There are two housing sites at MPM; these are Area Village and Montrose Village. Senior management stays at Area Village; general employees and contractors stay in Montrose Village. Other employees are housed in accommodation in Burgersfort.

Thirty single accommodation units were constructed and handed over to the local company to manage as part of the enterprise development.

8.12 Topsoil Stockpiles

Soil was stripped and stockpiled from each area where construction of the mine infrastructure took place. The position of the existing stockpiles is provided in Appendix 7

8.13 Electricity Supply

MPM operations is provided by ESKOM via overhead power lines which are either 11Kv or 33Kv. Electricity is supplied via an ESKOM substation located on the farm Hendriksplaats 281 KT, approximately 300m from the Dilokong Hospital via 88KV power lines. Electricity is supplied from this sub-station to each mining area (North Shaft and South Shafts) as well as the Concentrator Plant via a network of power lines spanning the mine area.

The Hill Project

Electricity supply to the Hill Project has a single feed electricity supply via an 11KV overhead line from the substation situated at South 1 Shaft. The Hill Project have a single feed via an 11 kV overhead line from the 11 kV substation situated at the South shaft. Allowance has been made for a prefabricated substation situated at B adit.

Maandagshoek Surface Winze Shaft

Electricity supply for the Maandagshoek Surface Winze Shaft is sourced from the existing 88kV Eskom power line which is situated in close proximity to the shaft.

South 2 Shaft

Electricity supply to South 2 Shaft and the Merensky Onverwacht open pit area is provided by an electricity substation and switching yard via 4 33KV overhead power lines:

- 1 X 11 KV to the South Portal
- 2 x 11 KV to the Ventilation Shaft
- 1 X 11KV to the open pit areas

Merensky Adit

Electricity is supplied to the Merensky Adit from the existing High Tension (HT) sub-station at the concentrator plant via an 11 KV overhead line to the sub-station near the Juliet adit, where a 630 KV mini-sub has been established.

Chrome Extraction Plant

Electricity for the chrome extraction plant is supplied from the existing supply to the concentrator plant, approximately 1.5MVA is required for the chrome extraction plant.

UG2 Open Pits

Electricity supply to the UG2 open pits will be supplied via 1 11 KV overhead power lines.

8.14 Water Supply

8.14.1 Potable Water Supply

Raw water is supplied to the mine via an off-take from the Lebalelo pipeline. MPM has an allocation from the Lebalelo Water User Association (LWUA) of 8 MI/day with current daily use (potable and make-up) in the region of 5 MI/day (maximum use anticipated is in the region of 6.6 MI/d). The license for this water use falls under LWUA.

Water is released from the Arabie Dam into the Olifants River and then Modikwa abstracts the water at the Havercroft Weir. Water is stored in the 24MI concrete dam on site.

8.14.2 Process Water Supply

Process water is sourced from mine water (dewatering of mine workings, tailing return water, treated sewage effluent and dirty stormwater runoff) and when required raw water is added to the process water. The reticulation system at MPM is provided in Appendix 8.

8.15 Bulk Fuel Storage Facilities

Fuel and lubricant storage was included in the original Environmental Management Plan (EMPr) as approved in terms of the Minerals Act, 1991 (Act No 50 of 1991) in January 2001. Locations, size and capacities were however not detailed.

MPM applied for authorisation to amend their storage capacity for fuel and lubricants, and received authorisation on 19 September 2013. Table 8-6 below provides a breakdown of the capacity for the storage of fuel and lubricants as per the Environmental Authorisation 12/1/9/1/GS55, as amended. The positions of the existing Storage Capacities including South 1 is shown in Figure 8-4.

Table 8-6: Total Storage Capacity of Fuel, Oil and Lubricants storage areas at MPM

Site	Total Approved (m ³) (Ref: 12/1/9/1/GS55)		Current Storage (m ³)	
	Diesel	Lubricants	Diesel	Lubricants
North 1 Shaft	69	54	46	47.7
South 2 Shaft	116	36	55	16
South 1 Shaft	0	0	69	47.7
Central Workshop	69	4	46	0
Merensky Opencast Pit ⁴	116	36	0	0
UG2 South Opencast Pit ⁵	46	36	0	0
Sub Totals	416	166	216	111.4
Grand Total	582		327.4	

⁴ Authorised, but not utilised – no storage taking place

⁵ Authorised, but not utilised – no storage taking place

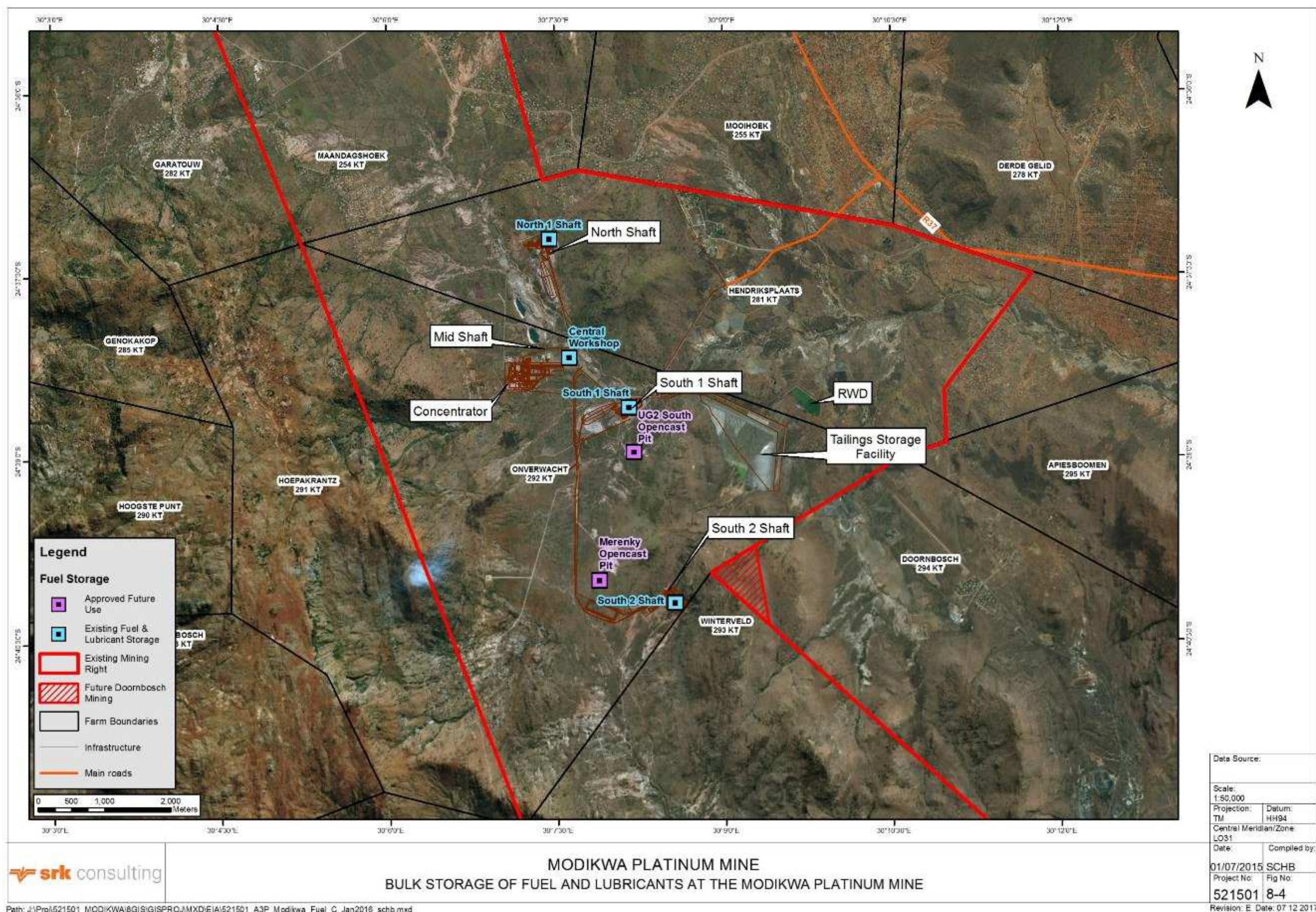


Figure 8-4: Bulk storage of fuel associated with Modikwa Platinum Mine

8.16 Pipelines

MPM transports potable water, raw sewage, dirty water, raw water, slurry, return water and effluent through pipelines which are distributed throughout MPM's operations. Refer to the Figure in Appendix 8 for an illustration of the pipelines at MPM.

8.17 Roads

Access to the area is from the regional road (R37) from Burgersfort, with a tarred road to the mine. Within the mine some of the access roads are tarred while other access and haul roads are gravel. Dust suppression is carried out when needed with process water. The roads at MPM include the following:

- Main access road to the concentrator plant and offices from the R37;
- Main access road between the southern and northern shafts;
- Access roads to villages on Maandagshoek 254 KT; and
- Tailings storage facility access road.

Surface Winze Shaft

As part of the Surface Winze Shaft project a dirt road was developed from the main mine access road to the winze terrace.

Maandagshoek Surface Winze Shaft

Existing roads for the transportation of materials to and from the Maandagshoek Surface Winze Shaft is used to access the area.

Merensky Onverwacht Open Pit and South 2 Shaft

Access to the Merensky Onverwacht open pit is via haul roads constructed to accommodate the different sized haul trucks associated with open pit mining.

A new access and haul road was constructed from the Merensky Onverwacht open pit and South 2 Shaft to the concentrator. An existing exploration track from South Shaft passing west of the Onverwacht Hill has been upgraded to a gravel surface road and provides alternative access to the open pit and South 2 Shaft areas for all vehicles. Dust is controlled by watering when required. Acceptable crossings have been built at all stormwater drainage crossings.

Merensky Adits

For access to the Merensky Adits an existing track from the south-west corner of the concentrator plant were upgraded to a gravel surface road which provided access to the offices and the adit for all vehicles. Trucks transporting ore make use of this road to transport ore to the weigh bridge at South Shaft. This road were designed to comply with all the safety and environmental requirements. Dust are controlled by watering when required. Acceptable stream crossings were built at all stream crossings to avoid soil pollution in streams and to accommodate floods.

Shaft Crusher Plants

Access to the South Shaft Crusher Plant is via a 3 km gravel road through the MPM mining area towards Matimatjati village. The road passes south west of the Crusher Plant and south shaft, and east of the magazine on the farm Onverwacht 282 KT.

Access to North 1 Shaft crusher plant is via an existing road leading to the North Shaft area.

8.18 Disturbance of Water Courses

Access to and operation of mine infrastructure required disturbance of watercourses in the form of watercourse crossings and diversions. At Modikwa there are several existing and planned water course crossings associated with roads, pipelines and overland conveyors. These crossings occur within the 1:50 year flood-line and within a horizontal distance of 100 m from the Moopetsi and Tubatsane rivers and associated tributaries. Main access road crossings consist of culverts and are protected against erosion by providing inlet and outlet transition zones consisting of grouted stone pitching.

An energy dissipater is also provided at the downstream section of the culvert crossings to dissipate the concentrated flow before it enters the natural watercourse or diversion structure.

Causeway crossings have been planned at secondary road crossings which do not have regular traffic. The causeway is protected against erosion by constructing a concrete slab with cut-off beams on both the upstream and downstream sides. Alternatives to the road crossings are not possible as access to the mining operation is reliant on road access.

Where possible, conveyors are used to haul the ore to the plant to minimise the need for haul road crossings. As far as possible plinths supporting the pipeline and conveyor crossings are placed outside the main watercourse channel to minimise disturbance to the watercourse. Where required appropriate erosion controls are provided.

No watercourse diversions are associated with the shafts except for South 2 Shaft (Tubatsane River). Drainage lines (tributaries of the Moopetsi River) crossing the planned open pits will be diverted around the pits by river diversion canals and embankments.

No river diversion is required for North Pit 2 or Merensky pits as these fall outside the 1:100 year floodlines, however clean water is diverted around operational areas. The diversions will cater for the 1:50 year flood event and include energy dissipation to ensure impact on downstream watercourse functionality is minimal. The clean water diversions are protected against erosion at turbulent flow areas using appropriate erosion protection measures such as gabion baskets or hyson cells. Crossings and diversions are managed according to the current water use licence conditions.

8.19 Waste Management Facilities Domestic and Industrial Waste

MPM produces waste from different areas such as the shaft areas, concentrator plant, workshops, offices, villages, clinic and dressings stations. Waste generated include, but is not limited to, scrap metal, wood, glass, oil, batteries, grease, paint, chemicals, tyres, paper, etc., separate to the mineral wastes/residues in tailings, waste rock etc.

Table 8-7 shows a summary of areas where waste is generated, stored or handled.

Table 8-7: Areas where waste is generated, stored or handled

Modikwa Mining Areas⁶			
North 1 Shaft	South 1 Shaft	South 2 Shaft	Onverwacht Hill Shaft
<ul style="list-style-type: none"> Central Salvage Yard Laydown area Workshop Shaft office Change house and offices Project and regional offices Contractors laydown area First aid station Oil treatment facility Central sewage treatment plant Central workshop Hazardous waste North Shaft sewage treatment plant North 1 Shaft temporary waste storage area North 1 Waste rock dump (WRD) Topsoil stock piles Run of mine (ROM) stockpiles 	<ul style="list-style-type: none"> South 1 Shaft temporary waste storage area Waste tip bin Electrical instrumentation workshop Mechanical workshop Medical centre Offices Change house South 1 Domestic waste area South 1 sewage treatment plant Tailings facility South 1 WRD Topsoil stock piles ROM stockpiles 	<ul style="list-style-type: none"> South 2 Shaft temporary waste storage area Waste tip bin Laydown area Workshop Change house and offices South 2 Shaft sewage treatment plant South 2 Shaft WRD Topsoil stock piles ROM stockpiles 	<ul style="list-style-type: none"> Hill adit temporary waste storage area Laydown area Waste tip bin Workshop Change house and offices Access roads Temporary septic tanks Lamp room

⁶ Mid shaft decline and Maandagshoek Winze shaft are under care and maintenance or dormant at this stage. Merensky adit is no longer operational. There are four additional open pits planned for the future at MPM.

8.20 Non-Mineral Waste

Waste is collected at the various temporary waste storage areas and transported to the Central Salvage Yard where separation and recycling takes place. Separation is not undertaken at the smaller various temporary waste storage areas associated with each operation, as indicated in MPM Operational Waste Management Procedure.

The Central Salvage Yard where waste streams are separated in segregated areas, skips and mounds, is enclosed with a concrete wall

Waste stream at MPM are separated, as per MPM's Waste Management Procedure, into:

- Domestic waste ⁷
- General waste⁸
 - Industrial waste: pipes, timber, conveyor belt, rubber, paper and refurbishable waste (pumps, valves etc.);
 - Hazardous waste: hydrocarbon or chemical contaminated waste, battery waste, sewage sludge, recovered oil;
 - Other waste: building and garden waste; and
 - Medical waste: sharps and biological material.

8.20.1 Domestic Waste

Domestic waste is all waste associated with office areas and is disposed into Blue Bins on site and collected by a designated transport vehicle. Domestic waste transferred to the Central Salvage Yard is collected into a skip which is then transported by a waste contractor for disposal to the current municipal landfill at Burgersfort⁹.

- Domestic waste should be segregated at source, as far as possible; to make recyclables available for reuse i.e. uncontaminated paper, cans, plastics etc. generated at the office areas should be collected separately, rather than disposed of at the landfill;
- The sites for domestic waste collection could accommodate bins for food products only and recyclable items.

8.20.2 General Waste - Industrial waste: wood, rubber, paper and refurbishable waste (pumps, valves etc.)

Industrial waste are disposed of into White Skips and taken to the Central Salvage Yard.

- Scrap metal is sorted at the Central Salvage Yard for return to suppliers and reuse. Metal wastes and scrap are to be sold to scrap dealers;
- Used tyres are taken back to the suppliers;
- Used conveyor belt is taken back to the suppliers and recycled;
- Wood is taken to an area outside the mining area for reuse by the community (the wood is placed outside the salvage yard);
- Fluorescent tubes, batteries and paints are separated for disposal as hazardous waste;
- Contaminated soils and oil and grease contamination is treated at the Central Salvage Yard, currently by Oil Separation Solutions, and then removed from site; and
- Plastic (PVC, HDPE, HDPR, plastic containers, electrical cables) are also generated, plastic generated is sent for recycling.

⁷ MPM uses domestic waste definitions as being all waste produced at the office areas, including food and any other overall (general) waste.

⁸ General waste is classified as includes all waste not produced from the office areas, this comprises building, other (general), garden, industrial and hazardous waste.

⁹ Burgersfort landfill, located on a part of portion 10, of the farm Mooifontein 313 KT, district of Lydenburg. The landfill has a DWA Operational Licence (16/2/7/B400/D66/Z1/P292) issued in 1998, and is managed by the Greater Sekhukhune municipality

8.20.3 Hazardous waste: hydrocarbon or chemical contaminated waste, battery waste, sewage sludge, recovered oil

- Hazardous waste is temporarily stored in different disposal containers before being dispatched to a licensed hazardous waste disposal site;
- Hazardous waste is currently taken to EnviroServe's Holfontein site by on-site waste contractor and the safe-disposal waste manifest is provided to MPM;
- Used oil (hazardous waste) is to be collected in red bins for recycling by approved contractors; and
- Hydrocarbon waste materials are collected in red skips for disposal or recycling by an approved contractor.

8.20.4 Medical waste: sharps and biological material.

- Medical waste generated at MPM includes used bandages, used dressings, urine cups, used HIV kits, used needles and syringes and used urine test strips;
- Red plastic bags are provided for the disposal of medical waste, once the bag is full the bag is placed in a red bin and locked in a steel cage until collection by a registered medical waste company;
- Sharp medical waste transporter collects the medical waste every two weeks; and
- Medical waste is currently taken to an approved waste facility.







8.20.5 SHE bin waste







- SHE bin waste is disposed inside the plastic bag then inside the White Bin.
- An approved contractor collects the SHE bin every fortnight for incineration at an authorised facility.

8.21 Waste Separation

MPM operations have storage collection systems for the disposal of different waste types, as described in Table 8-8:

Table 8-8: Waste separation scheme at Modikwa Platinum Mine

Storage	Waste Type	Details	Disposal Method	Disposal container
Blue Bin	Domestic waste - (excluding compostable waste)	<ul style="list-style-type: none"> • packaging, • non-toxic chemical containers, • paper/card board box, • glass • other kitchen waste, • perished foods, etc. 	Further divided for Recycling and Disposal at landfill site	
Red Bin	Hazardous - Oily wastes:	<ul style="list-style-type: none"> • used oil, • oily rags, • absorbent material, • grease, • hazardous waste chemicals etc. 	Recycle and Disposal at a hazardous landfill site	
Grey Bin	Re-useable PPE wastes	<ul style="list-style-type: none"> • boots, • ear plugs and muffs, • dust masks etc. 	Recycling and landfill site	
White Skip	Industrial waste and other general waste.	<ul style="list-style-type: none"> • plastic, • PVC material, • scrap steel, • rubber, • metals, • cans/tins • cables, etc. 	Further divided for Recycling, reuse, and local community	
Red Skip	Hydrocarbon waste materials.	<ul style="list-style-type: none"> • oil contaminated materials, • contaminated drums, • filters, etc. 	Disposal at a hazardous landfill site	
Green Skip	Renewable waste	<ul style="list-style-type: none"> • garden waste, • wood, etc. 	Further divided for Recycling, reuse, and local community	

Storage	Waste Type	Details	Disposal Method	Disposal container
Orange Skip	E Waste	<ul style="list-style-type: none"> computers, batteries CDs screens, key boards, etc. 	Recycling and landfill site	
Fluorescent Crusher	Hazardous waste	<ul style="list-style-type: none"> fluorescent tubes, globes, lamps, etc. 	Storing, crushing and disposal at a hazardous landfill site	
Yellow Bins	Health care contaminated waste	<ul style="list-style-type: none"> syringes, gloves, plasters, bandages, etc. 	Disposal at a hazardous landfill site	
Waste area	General waste	Scraps tyres	Recycled	
Spill Kit	Hydrocarbon spill management		Disposal at a hazardous landfill site	
Sludge drying beds	Sewage waste	<ul style="list-style-type: none"> Sewage sludge 	Refer to Standard Operating Procedure	

8.22 Water Pollution Management Facilities

8.22.1 Sewage Treatment Plants

Sewage effluent produced at the MPM operations excluding South 2 Shaft are treated at the Central sewage treatment plant (STP) (450m³/d) while a second STP is being constructed at South 2 Shaft and will treat the sewage effluent produced at South 2 Shaft (360m³/d). The central STP is a sequential batch reactor activated sludge plant while the new STP constructed at South 2 Shaft is a modular STP.

The final treated effluent from the central STP is stored in the plant stormwater dam for re-use in the plant, while the final treated effluent from the South 2 Shaft STP is re-used underground.

At Montrose Village (250m³/d) and Area Village (32.5m³/d) the sewage plants have been upgraded and include septic tanks, reedbed systems and oxidation ponds (Area Village) in order to treat the sewage effluent produced. The final treated effluent from Montrose Village is discharged while final treated effluent from Area Village is discharged or is utilised for irrigation.

Sludge drying beds at the central STP are used for all MPM operations and village accommodation, the drying beds are cleaned as needed and the dried sludge is disposed of at a municipal landfill site.

Sepptic tanks are used in operational areas where there are no sewage treatment plants. A honey sucker drains the septic tanks on a daily basis and a contractor with a licensed sewage disposal site in Steelpoort has a contractual agreement with MPM.

The sewage treatment works include Central, South 2 Shaft, Montrose Village, and Area Village sewage treatment plants (STPs). Figure 8-5: shows how raw sewage and final treated effluent is dealt with across MPM.

For the effective management of all STPs associated with MPM a Standard Operating Procedure (SOP) has been developed with regards to the sewage screenings, pump sump and septic tank sludge and scum, waste activated sludge and reedbeds. .

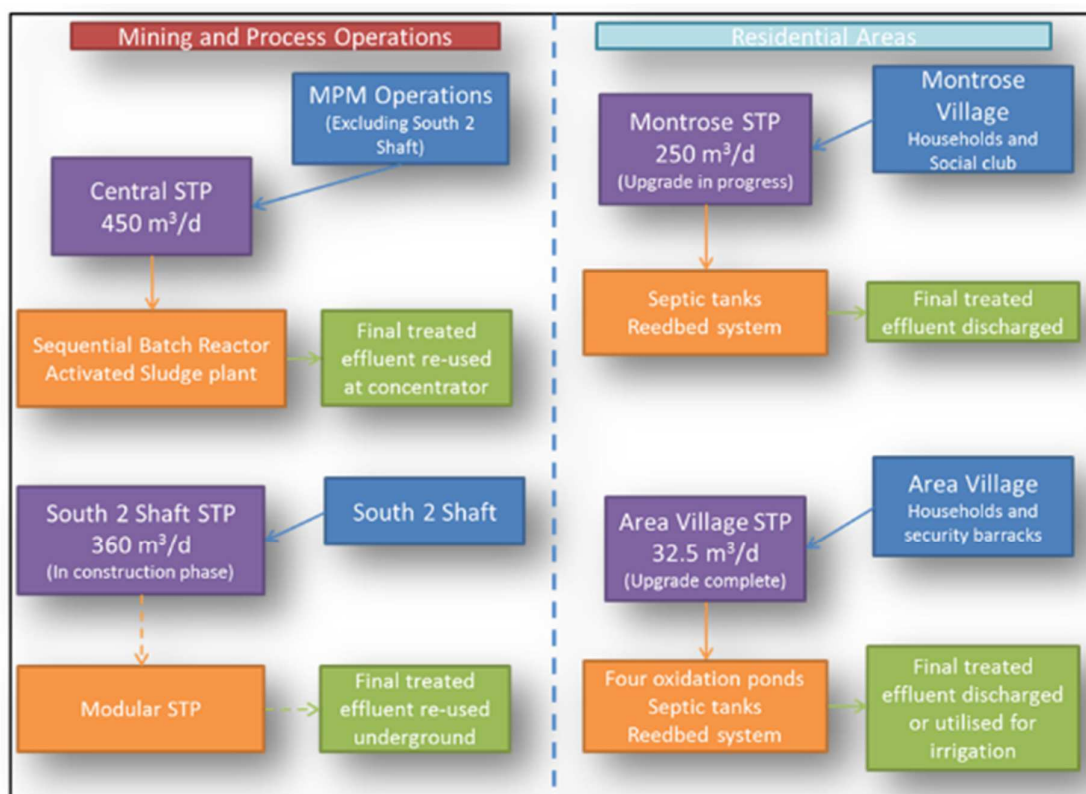


Figure 8-5: Sewage flow at Modikwa Platinum Mine

8.22.2 Mining and process operations

Central STP

Modikwa Central STP is capable of treating 450 m³ of raw sewage per day. Central STP is a Sequential Batch Reactor (SBR) utilising activated sludge technology. The Central STP serves the North and South 1 Shafts, Concentrator plant, central offices as well as the general mine site ablutions and has been registered in terms of the NWA and classified as a Class C STP (certificate issued on 29 January 2015).

The treatment process involves incoming sewage collected in the equalisation tank, from where it is pumped to the aeration and settlement basin. This is the sequential process i.e. fill, aerate, settle and drain, after which the cycle is repeated again. The STP produces waste activated sludge that is dried on sludge drying beds prior to disposal. The sludge drying beds are cleaned as needed and the dried sludge is disposed of at the municipal landfill site.

The treated effluent is chlorinated and then routed to the plant stormwater dam for re-use at the concentrator plant, as part of the zero emissions policy.

South 2 Shaft STP

The South 2 Shaft STP is capable of treating 360 m³ of raw sewage daily and utilises mechanical screening and removal of solids and grit at the head works. It is then released for primary settling including an anaerobic reactor, sludge storage and an aeration chamber. Following primary settling the next process entails the anoxic phase, where the removal of nitrogen takes place followed by an aerobic aeration chamber reactor for final microbial settlement. After settling the effluent is passed through a second anoxic zone to complete the de-nitrification process.

The final settled sludge is returned via an anoxic zone to the first primary settling anaerobic reactor. The activated sludge is then mixed with incoming raw sludge and stored. Disposal of waste sewage sludge is to an appropriate facility or used as soil conditioner in the rehabilitation programme for disturbed land upon appropriate classification.

The final process is the disinfection of the treated effluent with chlorine. The final treated effluent is transferred directly to the service water dam for reuse underground.

8.22.3 Residential Sewage Treatment Plants

Area Village STP

The STP at Area Village is capable of treating 32.5 m³ of raw sewage per day and serves houses and a security barracks. Currently the houses are linked to a sewerage reticulation system which drains by means of an outlet sewer to a facultative pond system, comprising four oxidation ponds.

Treated effluent emanating from the reed bed is discharged but is authorised for both discharge and irrigation (small-scale irrigation by the adjacent farmer to augment borehole supply).

The final treated effluent is discharged but may be utilised for irrigation on nearby farms.

Montrose Village STP

Montrose Village, has constructed a new 250 m³/d reed bed sewage treatment system located some 100 m from the previous septic tank serving Montrose Clinic and the staff village. The reed bed system design is fully operational.

Sewage will be treated to the effluent quality standards set by DWS and it is expected that the treated effluent will be discharged into the nearby stream. Sludge is at this stage envisaged to be dried and subsequently utilised in accordance with the “Permissible Utilization and Disposal of Sewage Sludge” published by the Water Research Commission. The specific utilization of the dried sludge is still being investigated.

8.22.4 Polluted Water Treatment Plants

Water collected and stored in the pollution control facilities at each of the shafts, open pit areas, concentrator and tailings storage facility is re-used on the mine. There are currently no polluted water treatment plants at MPM.

8.23 Conveyors

Surface Conveyors

Conveyors are operated and utilised at the mineral processing plants, as well as within the plants, to transport ore for processing. An ore silo and overland ore conveyor (to be situated closest to Onverwacht Hill) and service road, will be developed for the transportation of ore from South 2 Shaft to South 1 Shaft via the Onverwacht Hill for further processing at the mineral processing plant.

Underground Conveyors

There will be an underground ore conveyor system that will transport the ore from South 2 Shaft to Onverwacht Hill to an above ground silo from where it will be conveyed to South 1 Shaft for further processing.

The proposed details of the overland ore conveyor system, including a maintenance walkways, are as follow:

- The highest point of the overland ore conveyor infrastructure will be on top of the ore silo, and will be approximately 50 m in height;

- The width of the overland ore conveyor structure will be approximately 3 m; and
- The length of the overland ore conveyor will be approximately a 1 000 m.

8.24 Support Infrastructure

8.24.1 Change houses

Change house facilities are located at the North and South 1 Shafts. Onverwacht Hill Mining Project has ten change houses which was required when the operation was deepened. At the Merensky Adits portable containers were erected on a flat lying area to the south of the Juliet adit for a change house and ablution block. There are existing change house facilities on the South 2 Shaft terrace. The Maandagshoek Winze Shaft also has change houses available.

8.24.2 Workshops and Stores

Workshops and stores at MPM are located at the following areas:

- Workshops and stores are located in close proximity to the concentrator plant;
- Workshops and store facilities are located at North Shaft and South 1 Shaft;
- The Maandagshoek winze shaft has a workshop and a compressor house;
- At the Merensky Adits portable containers were erected on a flat lying area to the south of the Juliet adit for a workshop, storage area and a lamp room;
- The chrome extraction plant will have a workshop area when construction on the plant commences;
- South 2 Shaft has existing workshops and stores which is used during the operational phase; and
- At MPM there is additional mine and community support infrastructure which includes the central office, Montrose Village, Area Village, a clinic and roads.

8.24.3 Offices

Offices at MPM are located at the following areas:

- Main office located adjacent to the concentrator to the plant;
- North, South 1 and South 2 shaft operations;
- Concentrator plant offices are located in close proximity to the concentrator;
- At the Merensky Adit portable containers were erected on a flat lying area to the south of the Juliet adit for new offices and a resuscitation room;
- The chrome extraction plant will have an office area when construction on the plant commences;
- There are offices at the Merensky Adits and the Maandagshoek Winze Shaft.

8.24.4 Transport of ore

Ore produced at the various shafts at MPM are transported to the concentrator plant as follows:

- Ore from South 1 Shaft is transported from the underground operation to the concentrator plant via an incline conveyor belt;
- Ore from North Shaft is transported to a stockpile at the shaft using an incline conveyor belt system, from the North Shaft ore stockpile area the ore is transported via a conveyor adjacent to the North Shaft access road;
- Ore from The Maandagshoek Winze Shaft is transported by truck from the reef stockpile to the concentrator plant; and
- Ore from the South 2 Shaft underground operation will be transported by an underground conveyor system to Onverwacht Hill to an above ground silo from where it will be conveyed to South 1 Shaft for further processing.

8.25 Stormwater Management

8.25.1 Open pits

Clean stormwater runoff are diverted around the open pits in clean water diversions designed to address both hydrological and ecological requirements.

Stormwater runoff entering the pit that does not evaporate will be contained in the pit and then pumped to pit settling dams. The settled water will be transferred to the existing mine water system.

8.25.2 River crossings

The main mine access road crossings have been designed to handle the 1:100 year flood event and erosion protection measures are included in the design with the exception of the North Shaft ventilation shaft access road crossing, (upstream of the Moopetsi mid-stream monitoring point) and existing community road crossings used by MPM near the open pits.

An access and haul road has been constructed along the existing exploration track from the open pit and South 2 Shaft to the existing concentrator plant and entails several river crossings, the location of which are presented on the layout in Appendix 10.

8.26 Proposed Future Projects

Future projects are planned within the current MPM Mining Right as part of the ongoing development of MPM. These future projects includes the mining development developed on the Onverwacht and Winterveldt Open Pits as well as an additional Shaft planned to be situated on the farm Winterveld 293 KT, which forms part of MPM current Mining Right. In addition an additional shaft is planned on the farm Maandaghsoek 254 KT.

These future projects will be subject to approval through the relevant environmental authorisation processes.

9 Period for which the Environmental Authorisation is required

The EA is required to be in line with MR Approval in line with the MPRDA, for which end of Life of Mine is 2043.

10 Description of the process followed to reach the proposed preferred site

The project relates to the addition of the Doornbosch Mining Right to the existing MPM Mining Right, as such no preferred sites were applicable. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. As such, no property alternatives were viable to be considered for this project.

Refer to Figure 1-1 for the location of the area in regards to the overall MPM layout.

11 Details of Alternatives Considered

Alternatives with regards to location, infrastructure and transportation were considered for the authorisation of the South 2 Shaft EMP. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. As such, all the alternatives assessed as part of South 2 Shaft will apply.

11.1 Property Alternatives

The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. As such, no property alternatives were viable to be considered for this project.

11.2 Activity Type Alternative

The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. As such, no activity alternatives were viable to be considered for this project.

11.3 Design/Layout Alternative

The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. As such, no layout alternatives were viable to be considered for this project.

11.4 Technology alternatives

No technological alternative were considered for this project. The existing technology utilised by MPM, and specifically South 2 Shaft for their existing operations will be utilised for the mining phase of the Doornbosch addition. Refer to Section 4.2.

11.5 Operational Alternatives

No operational alternatives were considered for this project. The Doornbosch Mining Right will be operated in line with and concurrent to the existing MPM Operational activities.

11.6 No-Go Alternative

Refer to Section 6.1.3 for details regarding the “No-Go option” The project relates to the addition of the Doornbosch Mining Right to the existing MPM Mining Right, as such no alternatives were applicable.

12 Details of the public participation process followed to date

12.1 Objectives of stakeholder engagement

The objectives of stakeholder engagement for the phases of the application are presented below. All supporting documentation associated with the stakeholder engagement process is provided in Appendix 9.

12.1.1 During Scoping

The objectives of the stakeholder engagement during scoping phase is to provide sufficient and accessible information to stakeholders in an objective manner to enable them to raise issues of concern and suggestions for enhanced benefits and to verify that their issues have been recorded. The stakeholders can also provide input into the terms of reference (TOR) for specialist studies, impact assessment and management planning and contribute relevant local and traditional knowledge to the environmental assessment.

12.1.2 During Impact Assessment

The objectives of the stakeholder engagement during the EIA phase is to verify that their issues have been considered in the environmental assessment and to further comment on the findings of the environmental assessment.

12.1.3 During the Decision-making Phase

Following the outcome of the decision-making process by authorities, stakeholders will be informed of the outcome and how and by when the decision can be appealed.

12.2 Stakeholder identification

The NEMA EIA Regulations (GN R 982 amended) require identification of and consultation with communities and I&AP's. In terms of Section 24.0 (2) of NEMA, specific State Departments were identified and recognised as commenting authorities on aspects of this EMPr Amendment. Representatives from these departments are included in the stakeholder database.

A register of I&AP in terms of Section 42 of the EIA Regulations (GN R 982 of 2014) was compiled. This regulation requires that the register contain full contact details of registered I&APs and be submitted to the competent authority. In order to maintain privacy of I&APs contact details, the register of I&APs in this report will not contain contact details but will be kept on record.

Stakeholders identified in previous environmental decision-making processes undertaken by SRK, together with lists of stakeholders that MPM has regular contact with, and networking and referral formed the basis for the development of the stakeholder database.

The initial database comprises of 20 stakeholders, representing various sectors of society. Refer to Appendix 9 for the full database of stakeholders that include:

- National Government: such as the Department of Water and Sanitation (DWS);
- Provincial Government: Limpopo Department of Mineral Resources (DMR);
- Limpopo Department of Rural and Land Reform (DRDLR);
- Limpopo Department of Agriculture, Forestry and Fisheries (DAFF);
- Limpopo Department of Cooperative Governance, Human Settlement and Traditional Affairs (COGHSTA);

- Local and District Government: Sekhukune District Municipality (SDM), Fetakgomo- Tubatse Local Municipality (FGTM);
- Traditional Authorities: Baroka ba Mamphahlane (Mamphahlane community), Kone Phuti (Mpuru community), Mohlala (Diphale community), Banareng (Sehlaku community), Pulana Maroga (Maroga community) and Swazi Ngobe (Matimatjatji community);
- South African Heritage Resources Agency (SAHRA);
- Landowner: Hwashi-Difagate Community Trust and Samancor;
- Adjacent landowners; and
- Community Based Organisations: Section 21 Companies for Matimatjatji.

The stakeholder database will be reviewed and updated after each round of engagement during the EMPr Amendment process. Refer to the box below for more information between I&AP's and registered I&APs.

Box 1. Distinction between I&AP's and Registered I&APs

The NEMA Regulations (GN 982 amended) distinguishes between I&AP's and registered I&APs.

I&AP's, as stated in Section 24(4)(d) of the NEMA include: (a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity.

In terms of the Regulations "**registered interested and affected parties**" means:

An interested and affected party whose name is recorded in the register opened for that application.

For that purpose, an EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

- All persons who have submitted written comments or attended meetings with the applicant or EAP;
- All persons who have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and
- All organs of state which have jurisdiction in respect of the activity to which the application relates.

12.2.1 Identification of landowners

The identification of landowners in the area is an important part of the stakeholder engagement process. SRK conducted a deeds search to identify landowners adjacent to and in the immediate surroundings of MPM. Refer to Table 12-1.

Table 12-1: Adjacent Landowners in Terms of the Proposed Amendment Project

Farm Name	Portion	Title deed	Owner	Stakeholder Status
Onverwacht 292 KT	1	T88050/2011	Hwashi-Difagate Community Trust	Adjacent Landowner
Apiesboomen 295 KT	0 (Remaining Extent)	T22747/1975	National Government of the Republic of South Africa	Adjacent Landowner
Garatouw 282 KT	0 (Remaining Extent)	T56533/2009	National Government of the Republic of South Africa	Adjacent Landowner
Hoepakrants 291 KT	0	T44071/1989	National Government of the Republic of South Africa	Adjacent Landowner
Winterveld 293 KT	0	T133491/1997	Samancor Chrome LTD	Potentially Affected Landowner
Doornbosch 294 KT	0	T25231/1971	National Government of the Republic of South Africa	Adjacent Landowner

Farm Name	Portion	Title deed	Owner	Stakeholder Status
Doornbosch 294 KT	1	T84360/2007	Samancor Chrome LTD	Adjacent Landowner
	2	T84360/2007	Samancor Chrome LTD	Adjacent Landowner
	3	T84360/2007	Samancor Chrome LTD	Adjacent Landowner
	4	T133491/1997	Samancor Chrome LTD	Adjacent Landowner
	5	T133491/1997	Samancor Chrome LTD	Adjacent Landowner

12.2.2 Identification of District and Local Municipalities

MPM falls within the jurisdiction of the Greater Sekhukhune District Municipality and the Fetakgomo-Tubatse Local Municipality in the Limpopo Province. Details of the relevant municipalities and respective ward councillors are provided in Table 12-2.

Table 12-2: District and Local Municipalities

Municipality	Contact Person	Office number
Sekhukhune District Municipality	Ms N.T Maseko	013 262 8300
Greater Tubatse Local Municipality	Mr. NP Busane (Acting Municipal Manager)	082 479 2926
Greater Tubatse Ward Councillor Ward 2	Cllr M Makine	076 828 1420

12.2.3 Identification of relevant Government Departments

The relevant authority applicable to the environmental authorisation process for the proposed project is the DMR and contact details are provided in Table 12-3.

Table 12-3: Relevant Government Department

Department	Contact Person	Office number
DMR (EMPr Amendment and consolidation) - Polokwane Office	Mr Thivhulawi Kolani	015 287 4761

12.3 Introductory meetings with key stakeholders

An introductory meeting was held with the Hwashi-Difagate Community Trust and the Matimatjati Section 21 Company on 8 September 2017. In addition a meeting was held with Kgoshi's of the communities closest to MPM and representatives of the Matimatjati Section 21 Company on the 20 September 2017.

These meetings were undertaken to introduce the stakeholders to the project, explain the proposed decision making process and provide an overview of the DSR.

Copies of the all the attendance registers can be found in Appendix 9 and the Powerpoint Presentations for the above mentioned meetings can be found in Appendix 9.

12.4 Stakeholder engagement during scoping

12.4.1 Announcement

The project was announced from **24 August to 12 September 2017**. Stakeholders were notified of the opportunity to comment on the proposed project and to register as an I&AP as follows:

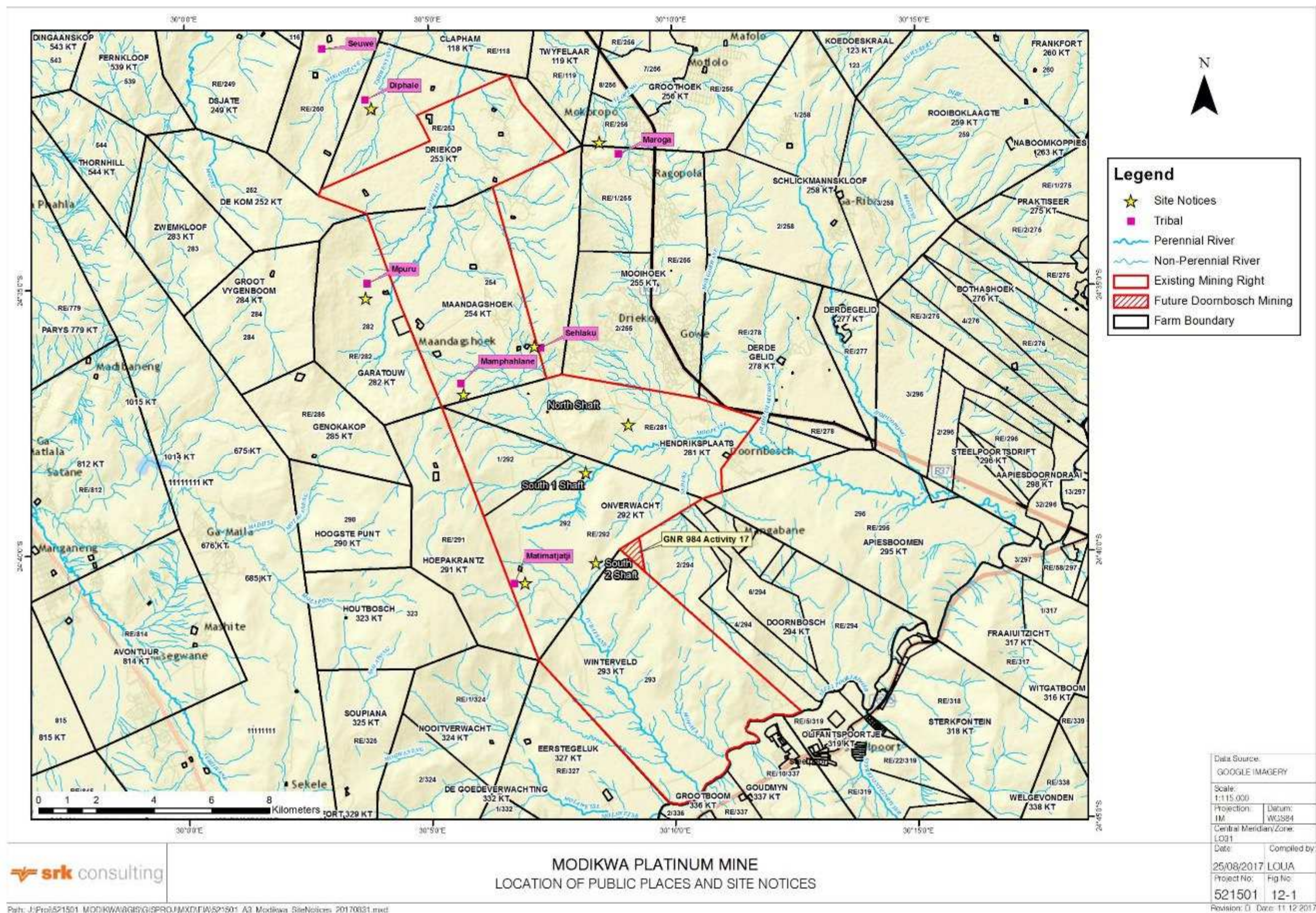
- Distribution by email, of notification letters accompanied by a Background Information Document (BID), and registration and comment form in English and Sepedi. A copy of the letters addressed to the landowners, the Hwashi-Difagate Community Trust and Samancor are also included;

- Hand delivery of notification letters, BIDs and registration and comment forms (English, Sepedi) to the Kgoshi's and Tribal Authority offices in close proximity to MPM;
- Advertisements in one local newspaper the Polokwane Observer (English), Thursday 24 August 2017;
- Erecting two A2 sites notices (in English and Sepedi) at the site for the Modikwa main security gate, South 2 Shaft Notice Board, Modikwa Clinic and at the Tribal Authorities' offices;
- Placing the BID, invitation letter and comment forms in accessible venues in the area for stakeholders to collect and provide their input and comments; and
- Placement of site notices at the Tribal Authority Offices close to MPM, namely:
 - Baroka ba Mamphahlane (Mamphahlane community)
 - Kone Phuti (Mpuru community)
 - Mohlala (Diphale community)
 - Banareng (Sehlaku community)
 - Pulana Maroga (Maroga community)
 - Swazi Ngobe (Matimatjatji community)
 - Tswako Mohlala (Seuwe community).

The location of public places and site notices is shown in Figure 12-1.

25 BIDs, 25 letters and 25 comment sheets for both English and Sepedi were distributed at the following locations:

- Tribal Authorities' offices;
- South 2 Shaft notice board;
- Modikwa main security gate; and
- Modikwa Clinic.



12.4.2 Meetings with local authorities

Details of meetings held with the authorities during project announcement are shown in Table 12-4.

Table 12-4: Meeting details with local authorities

Meeting details	Venue	Number of attendees
DMR Consultation Pre-Consultation Meeting 24 July 2017, 11:00-12:30	DMR Offices, Polokwane	5

12.4.3 Opportunities to comment

Stakeholders were encouraged to submit their written comments to the stakeholder engagement office through the contact details provided. Stakeholders could also fill in comment forms at one of the public places shown in Figure 12-1. Stakeholders could also contact the SRK stakeholder engagement team via telephone, email or fax to submit comments and to discuss any issues of concern.

All comments raised by stakeholders throughout the process were recorded and are provided in Appendix 9 and summarised in Table 12-6.

12.5 Availability of the Draft Scoping Report for public comment

The Draft Scoping Report was made available for public comment from **Monday 4 September 2017 to Tuesday 3 October 2017**. The availability of the DSR was announced as follows:

- Distribution of a personally addressed letter to stakeholders on the database, accompanied by a registration and comment form (in English and Sepedi), inviting stakeholders to comment on the DSR and to register as an I&AP;
- Posting the DSR, announcement letter and comment form on the SRK website;
- The DSR, announcement letters and comment forms were made available for public viewing and comment at the following places:
 - Modikwa Main Security: A copy of the DSR and 20 Sepedi and 20 English stakeholder letters with comment sheets
 - Modikwa Clinic: A copy of the DSR and 20 Sepedi and 20 English stakeholder letters with comment sheets
 - Modikwa Entrance to South 2 Shaft: A copy of the DSR and 20 Sepedi and 20 English stakeholder letters with comment sheets;
- Distribution of a personally addressed letters to each of the following Kgoshi's including information flyers in Sepedi (x 30) and English (x 20) as well as single comment sheets (x 20):
 - Kgoshi Isaac Kgwete
 - Kgoshi Maroga
 - Kgoshi Masia Mohlala
 - Kgoshi Mohlala
 - Kgoshi Mporu
 - Kgoshi Nkosi
 - Kgoshi Ralph Kgoete;
- A2 site notices in Sepedi and English where placed at the Modikwa Main Security, Modikwa Clinic and the Modikwa entrance to South 2 Shaft. Copies of the site notices in Sepedi and English and photographs of the site notices can be found in Appendix 9;
- The notification of availability of the DSR was made available via email to the following commenting authorities on 4 September 2017:
 - Department of Agriculture- Mr Moeng and Mr Ntsoane
 - Department of Rural Development and Land Reform – Mr Makamu
 - Cooperative Governance, Human Settlements and Traditional Affairs - Mr Moyo
 - Limpopo Department of Economic Development, Environment and Tourism – Mr Mongwe

- Department of Water and Sanitation – Mr Ramalisa
- Fetakgomo Tubatse Local Municipality – Mr Lesufi
- Greater Sekhukhune District Municipality – Mrs Mokoko and Mr Mphahlele;
- The following commenting authorities requested copies of the DSR. The DSR was emailed on 6 September 2017:
 - Greater Sekhukhune District Municipality – Mr Mphahlele
 - Department of Agriculture - Mr Ntsoane; and
- Notification of the proposed project was sent to Samancor Chrome on 24 August 2017. Request for consultation has been made to Samancor Chrome, however to date no response has been received.

12.6 Stakeholder engagement during the EIA phase

The FSR was submitted to the DMR on the 4th of October 2017, whereafter acknowledgement of receipt of the FSR from the DMR were received on 18 October 2017. DMR acceptance of the FSR were received on 30 November 2017, whereafter the EIA/EMPr were finalised for public comment. Refer to Appendix 9 for copies of acknowledgement and acceptance letters from the DMR.

12.6.1 Opportunities to comment

Stakeholders are encouraged to submit their written comments to the stakeholder engagement office through the contact details provided. Stakeholders can also fill in comment forms at one of the public places shown in Figure 12-1. In addition stakeholders can contact the SRK stakeholder engagement team via telephone, email or fax to submit comments and to discuss any issues of concern.

All comments raised by stakeholders throughout the process will be recorded and included in the comments and responses table provided in Appendix 9.

12.7 Availability of the Draft EIA/EMPr for public comment

The Draft EIA/EMPr will be made available for public comment from **Wednesday 24 January 2018 to Thursday 22 February 2018**.

The availability of the Draft EIA/EMPr will be announced as follows:

- Distribution letter to registered stakeholders on the database, accompanied by a comment form (in English), inviting stakeholders to comment on the Draft EIA/EMPr;
- Posting the Draft EIA/EMPr and comment form on the SRK website: <http://www.srk.co.za/en/za-modikwa-platinum-mine-empr-amendment>;
- The Draft EIA/EMPr, and comment form, were made available for public viewing and comment at the following places:
 - Modikwa Main Security: A copy of the Draft EIA/EMPr and comment form.
 - Modikwa Clinic: A copy of the Draft EIA/EMPr and comment form.
 - Modikwa Entrance to South 2 Shaft: A copy of the Draft EIA/EMPr and comment form.
- Distribution of a personally addressed letters to each of the following Kgoshi's including:
 - Kgoshi Isaac Kgwele
 - Kgoshi Maroga
 - Kgoshi Masia Mohlala
 - Kgoshi Mohlala
 - Kgoshi Mporu
 - Kgoshi Nkosi
 - Kgoshi Ralph Kgoete;
- A2 notices in Sepedi and English placed at the Modikwa Main Security, Modikwa Clinic and the Modikwa entrance to South 2 Shaft. Copies of the notices in Sepedi and English can be found in Appendix 9; and

- The notification of availability of the Draft EIA/EMPr was made available via email to the following commenting authorities:
 - Department of Agriculture - Mr Moeng and Mr Ntsoane
 - Department of Rural Development and Land Reform – Mr Makamu
 - Cooperative Governance, Human Settlements and Traditional Affairs - Mr Moyo
 - Limpopo Department of Economic Development, Environment and Tourism – Mr Mongwe
 - Department of Water and Sanitation – Mr Ramalisa
 - Fetakgomo Tubatse Local Municipality – Mr Lesufi
 - Greater Sekhukhune District Municipality – Mrs Mokoko and Mr Mphahlele.
 - South African Heritage Resources Agency

12.8 Community Meeting and Key Stakeholder Workshop

A public open house will be held during the public review period. The objective of this meeting will be to present the consolidated EMPr and the findings of the impact assessment relating to the mining of the Doornbosch MR. The public open house will be held at the Montrose Club on 14 February 2018.

12.9 Comment and Response Report

Stakeholder Engagement has been undertaken as part of the development of the existing approved EMPr's and EMPs associated with MPM. A summary of the Stakeholder Engagement processes previously undertaken as part of the original EMPr and subsequent EMPr Amendment processes is provided in Table 12-5 below. A summary of all comments received during the stakeholder engagement undertaken as part of the mining of the Doornbosch MR project is provided in Table 12-6 and detailed comments provided in Appendix 9.

Table 12-5: Summary of previous and existing stakeholder engagement

EMPs and EMPr's	Key Components	Date	Stakeholder Engagement undertaken
Maandagshoek Platinum Project (Original EMPr)	<ul style="list-style-type: none"> North a South decline shafts Concentrator plant Tailings storage facility Two WRD's 	September 2000	Regulatory authorities meetings (February-March & May 2000) Public information sharing meetings (March 2000) Public consultation meeting (April, August 2000)
Hill Project	<ul style="list-style-type: none"> Four adits Short decline close to south 1 shaft 	May 2001	Department of Minerals and Energy (DME) Meetings
Surface Winze Project	<ul style="list-style-type: none"> Two decline portals Terraces 	August 2002	Meeting with DME (July 2002)
Extension of Surface Infrastructure at Hill Project	<ul style="list-style-type: none"> Extension of terrace Additional offices, a lamp room and change houses 	February 2003	Meeting with DME (January 2003)
Maandagshoek Winze Project	<ul style="list-style-type: none"> Use of an old shaft infrastructure to access resources 	April 2003	DME Meeting (January 2003) Community Directors meeting (February 2003) Community meeting (March 2003)
Reclamation of a Small Dump	<ul style="list-style-type: none"> Reclaiming a small historical dump to extract platinum and palladium 	September 2003	Community Directors meeting (September 2003) Community meeting Regulatory authorities meetings
MPM Expansion Projects	<ul style="list-style-type: none"> South 2 shaft decline Open pit Ventilation Shaft New fine residue deposit Merensky adit Chrome extraction plant Settlement pond 	September 2008	Regulatory authorities meeting Community meeting (August 2008)
Further MPM Expansion Projects	<ul style="list-style-type: none"> UG2 open pits (Main North, North 2, South1 and South 2) Crusher Plant 	August 2009	Community meeting (June 2009)
South 2 Shaft Amendment Project	<ul style="list-style-type: none"> Overland ore conveyor and ore storage silo WRD Access road to the WRD 	January 2015	Regulatory authorities meetings (April, June 2014) Introductory meeting with key stakeholders (April 2014) Community meeting (June 2014, November 2014)

EMPs and EMPr's	Key Components	Date	Stakeholder Engagement undertaken
	<ul style="list-style-type: none"> Ventilation Shaft 		Focus group meeting (June 2014) Key stakeholder workshop (November 2014)
North Ventilation Shaft and Crusher Plant Project	<ul style="list-style-type: none"> North Shaft Ventilation Shaft 	January 2016	Traditional authority meeting (September 2015) Landowner meeting (January 2016) Regulatory stakeholder engagement process (January 2016)

Table 12-6: Summary of stakeholder comments during the Doornbosch Project

Stages	Key Components	Issues raised
Announcement and Scoping phase	Job Creation	<ul style="list-style-type: none"> Local Employment Employment opportunities Division of shares between ARM and communities Eradicating poverty through employment Consideration of disable people in job creation
	Training	<ul style="list-style-type: none"> Bursary from the mine Skills training Inclusion of locals in procurement
	Consultation	<ul style="list-style-type: none"> Misunderstanding of the BID and Scoping report Request for focus group meeting
	Other	<ul style="list-style-type: none"> Provision of basic needs by the mine Local customs of using Section 21 Companies and Kgoshi's to recruit people for jobs placement Empty promises by the mine

13 Environmental Attributes Associated with the Sites

This section of the report presents an overview of the existing environment context at MPM. Available information from the original Modikwa EMPr and subsequent EMPr Amendments, previous specialist reports were used for this section. All the original specialist studies, containing the detailed information regarding each environmental aspects is kept at the mine as part of the individual EMP and EMPrs.

As previously discussed, the Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right.

13.1 Geology

The geology of the area consists mainly of the Critical and Main Zones of the Rustenburg Layered Suite of the Bushveld Igneous Complex. The area encompasses intrusive igneous rocks, mainly norite and pyroxenite. The lithology has mainly a south south-eastern strike and dips at an angle of $\pm 10-15^\circ$ in a westerly direction.

Various post-Bushveld dykes and faults have been identified within the area. Two main dyke and fault orientations have been identified, namely a main northeast - southwest orientation and a less prominent west-southwest – east-northeast orientation. These structures are often associated with deeper weathering, while preferential weathering also takes place within pyroxenite-dominant zones. Weathering to a depth of 45 m has been reported.

The igneous rocks have a groundwater environment that supports aquifers of an intergranular and fractured type.

13.2 Topography

The MPM mining area lies in a relatively flat north south trending valley which on the east and west is bounded by the Leolo Mountain range. The valley floor has a gentle dip to the north with a gradient of approximately 1:110 from an elevation of 980mamsl to the Maandagshoek Mission Hospital with an elevation of 900mamsl.

The topography is greatly influenced and related to the underlying geology and past and present climatic conditions. The valleys are characterised by less resistant lithological units (norites and anorthosite) that are fractured and faulted; while the ridges are characterised by more resistant and competent lithological units.

13.3 Visual

13.3.1 Visual Character

The predominant land use of the area in which MPM is situated, is characterised by existing mining activities and rural settlements. The wider area is scenic and natural, characterised by an undulating landscape comprising mountains, hills and valleys which is still pristine in some areas. The landscape is however influenced by mining and industrial activities scattered throughout the area.

MPM is situated in a valley between adjoining hills and the Lealo Mountain to the south. From all the MPM infrastructure and activities the South 1 Shaft area, Hill Shaft and the TSF are partially visible from the main road – R37 from Burgersfort to Polokwane. The North Shaft, South 1 Shaft, South 2 Shaft, concentrator plant site, access roads and conveyors is visible to the surrounding land owners.

Some dust entrainment from the tailings dam, waste dumps, open areas and gravel roads may occur during dry windy periods, especially during the winter months.

13.3.2 Sense of Place

The sense of place for the area surrounding MPM could be considered to be that of a rural nature. With many small communities and grazing areas scattered in the landscape, it could be assumed that the main source of livelihood in the area is that of subsistence farming and potentially income earned from the surrounding mines. There are no tourism facilities in close proximity to the current infrastructure and activities at MPM. Tourists may however pass the site in transit to other tourism facilities located near Burgersfort.

The topography, however, shields many of the mines and the general sense of place when driving on the main roads in the area is that of a natural environment interspersed with transient views of mines. There seems to be a localised sense of place relating to mining closer to the communities.

13.4 Climate

13.4.1 Regional Climate

The mine is situated in an area which has a warm to hot climate and a relatively high humidity in summer. Average daily temperatures vary from 32°C in January to 24°C in July. The wind direction is mostly from the south-south east to north-north west.

13.4.2 Rainfall and Evaporation

The wettest 6 months of the year are November to April, with maximum precipitation normally occurring in January. The mean annual precipitation recorded at the closest weather station, with the longest record (89 years) namely Gemsbokpoort (No. 0589342) is 630 mm.

Monthly rainfall and evaporation data and data for the wettest ten years are presented in Table 13-1 and Table 13-2, respectively.

Table 13-1: Rainfall and evaporation data for the Modikwa Platinum Mine region

Month	Rainfall (mm) WB 0589342 (1903 to 2000)			Evaporation (mm) B4E001	
	Average	Maximum	Minimum	A-pan	S-pan
September	14.7	86.2	0	160.0	123.9
October	49.0	152.9	0	187.5	149.4
November	97.2	273.5	4.5	178.4	141.0
December	103.2	274.8	10.4	193.8	155.2
January	123.6	328.3	18.6	190.8	152.5
February	88.0	204.6	15	163.5	127.1
March	82.6	224.6	4.2	161.7	125.4
April	40.6	166.1	0	130.4	96.5
May	14.4	133.3	0	114.0	81.2
June	3.5	42.7	0	97.5	66.0
July	4.8	76.2	0	104.3	72.2
August	7.9	94.2	0	129.5	95.6
Totals	630	1104	150	1811	1386

Annual evaporation as recorded at the closest station (B4E001) is 1 811mm for A-pan evaporation and 1 386 mm for S-pan evaporation. Refer to Table 13-1 for monthly rates.

Table 13-2: Rainfall and evaporation data

The wettest years during the past 89 years were	Year	Total Rainfall for 6 months	Total Evaporation for 6 months (Station B4E001)
Wettest Year	1975	970	1000
2nd wettest	1921	918	978
3rd wettest	1955	853	964
4th wettest	1939	833	952
5th wettest	2001	824	946
6th wettest	1991	779	937
7th wettest	1928	768	934
8th wettest	1946	764	927
9th wettest	1953	764	924
10th wettest	1936	762	904

13.5 Soils and Land Capability

Soils in the area include those of the Hutton, Clovelly, Swartland, Valsrivier, Rensburg, Bonheim, Willowbrook, Mayo, Arcadia, Sepane, Westleigh, Kroonstad, Glencoe, Mispah and Katspruit Forms.

13.5.1 Soils

Chemical characteristics

The soils derived from the in-situ parent materials are generally moderate to shallow, sandy loams to sandy clay loams, and occur in the middle and upper slopes. The transported colluvial and alluvial soils make up the majority of the soils in the study area are of a silty clay loam to clay loam nature. Chemical analysis show moderate to heavy textured soils with a pH (KCl) of between 5.45 and 6.80, a base status ("S" Value) ranging from 16.90 to 38.9me% (colluvium), and nutrient levels ranging from (Ca, Mg, K, and Na) 48, 50, 1, and 1.1 on the shallow eutrophic ("S" value 16.1me%) to 75, 24, 1 and 0.1 on the deep mesotrophic Hutton forms. In general, the Ca, Mg and Na ratios are of a range compatible with good growth regimes for most agriculture crops. Potassium ratios are variable ranging from low to very low, while the Ca to Mg ratios for the majority of the forms sampled are favorable retuning ratios of 1.0 to 1.5.

Soil erodibility

Erodibility of the soils range from Modertate to High, with Rensburg/Bonheim/Willowbrook and Rensburg/Arcadia scoring high.

Soil Depth

On average, the Hutton and Clovelly soil Forms returned rooting depths between 800mm and + 1500mm, while the Westleigh, Kroonstad and Katspruit Forms returned depths between 300mm to 600mm. The Swartland and Valsrivier are generally between 700mm and 1 200mm, and the Rensburg and Bonheim soil forms returned shallow to very shallow depths of between 200 and 400mm. The Genrosa, Mayo and Mispah forms returned shallow soils between 100mm and 300mm on average. The depth of the alluvial/volluvial accumulation I the form of saprolitic material varies from 800mm to over 5 000mm (5m) as exposed in the drilling logs.

Soil Utilisation Potential

In general, the soils are moderately deep to deep (800 - +1 500mm) and are poorly drained, and highly structured with relatively small areas of well drained material. These soils will be difficult to work, both from a stripping and rehabilitation point of view.

The agricultural potential of these soils is limited, and should be confined to natural grassland grazing with a low stocking ratio, or preferably managed as conservation areas.

13.5.2 Land Capability

Pre mining land capability

Land capability classification/classes have been determined using the Chamber of Mines Classification System (Chamber of Mines of South Africa, 1981). The original MPM EMPr soil survey was used as a base from which to assess the land capability:

- Arable Land (2.48Ha): 0.45%
- Grazing land (339.9Ha): 62.71%
- Wetlands (52.6Ha): 9.7%
- Wilderness (93.4Ha): 17.23%.

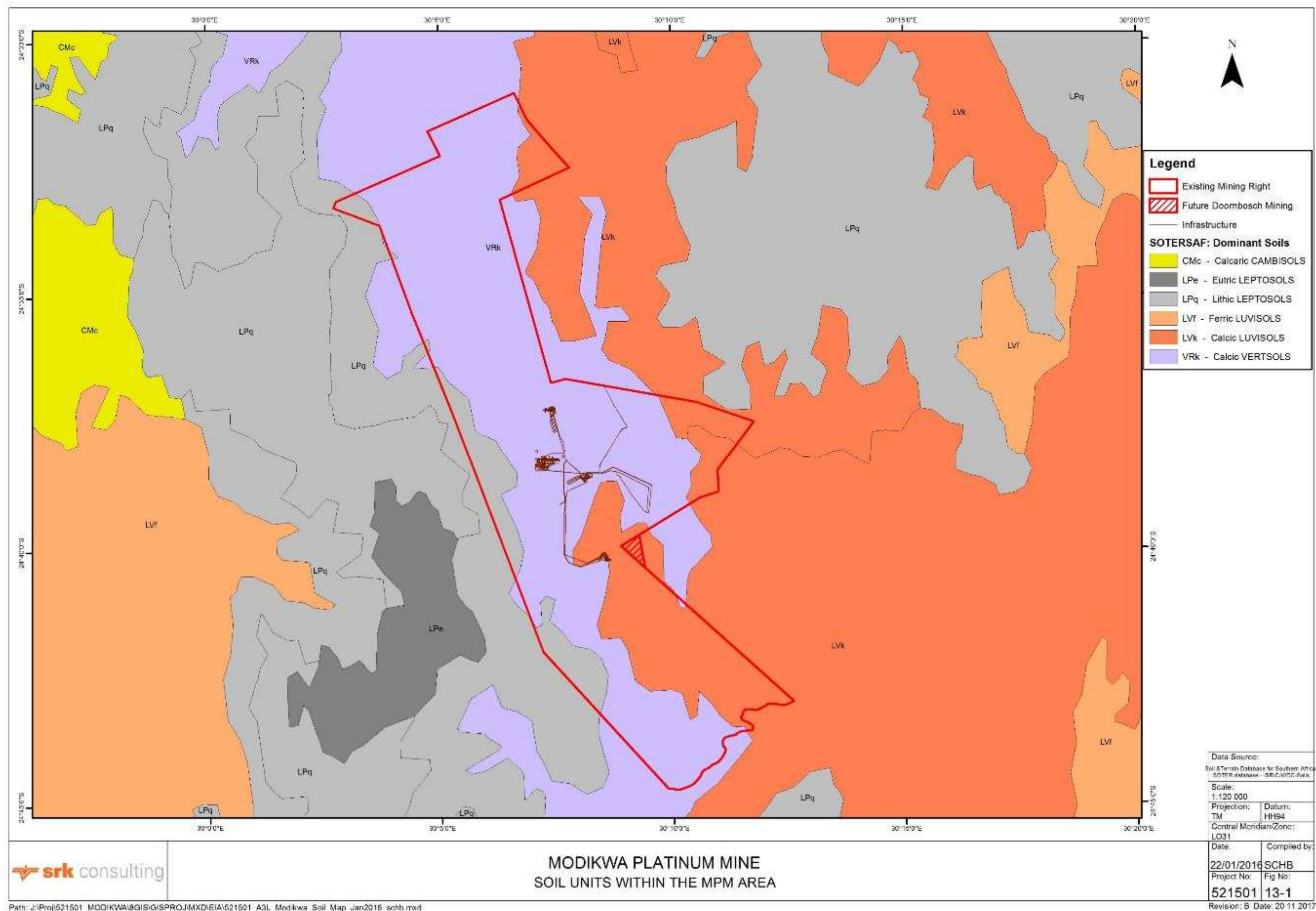


Figure 13-1: Soils types associated with Modikwa Platinum Mine

13.6 Surface Water

13.6.1 Water Management Area

The mining lease area falls within quaternary catchment B41J within the Olifants Water Management Area (WMA) and the Steelpoort sub-WMA. The catchment comprises steep-sided, open and undulating valleys with areas of significant erosion associated with wide, open and eroded (incised) drainage lines. The bulk of the operations fall within the Moopetsi River catchment with the South 2 Shaft area falling within the Tubatsane River catchment. The main rivers are indicated on the layout in Appendix 10. The Moopetsi and Tubatsane rivers are both tributaries of the Tubatse River, formerly known as the Steelpoort River, a major tributary of the Olifants River system. The Tubatse River in the vicinity of the confluences with the Moopetsi and Tubatsane rivers is perennial, wide and channelled, and the surrounding vegetation consists mainly of grasses and trees.

The Moopetsi River and associated tributaries are ephemeral with the exception of the Moopetsi tributary flowing across the South 2 pit area. Surface water surrounding the South 2 Shaft area flows via a number of unnamed ephemeral tributaries and drainage lines into the perennial Tubatsane River, which is wide and shallow downstream of South 2 Shaft prior to the confluence with the Tubatse River. The surrounding vegetation consists mainly of shrubs. At South 2 terrace shaft there are two streams, one each side of the shaft, which confluence into what is known as the Kgoduopong Stream, a tributary of the Tubatsane River, just downstream of the shaft area. .

The mine and shaft access roads cross several drainage lines or unnamed tributaries of the Moopetsi and Tubatsane rivers and the Moopetsi River itself.

13.6.2 Floodlines

Floodlines with 1:100 year recurrence interval have been determined for the Moopetsi River and relevant tributaries as well as the 1:50 year floodline and extends to the Tubatsane River tributary near the South 1 Shaft. Additional floodlines were undertaken for the tributaries in the vicinity of South 2 Shaft. The floodlines are presented in Figure 13-2.

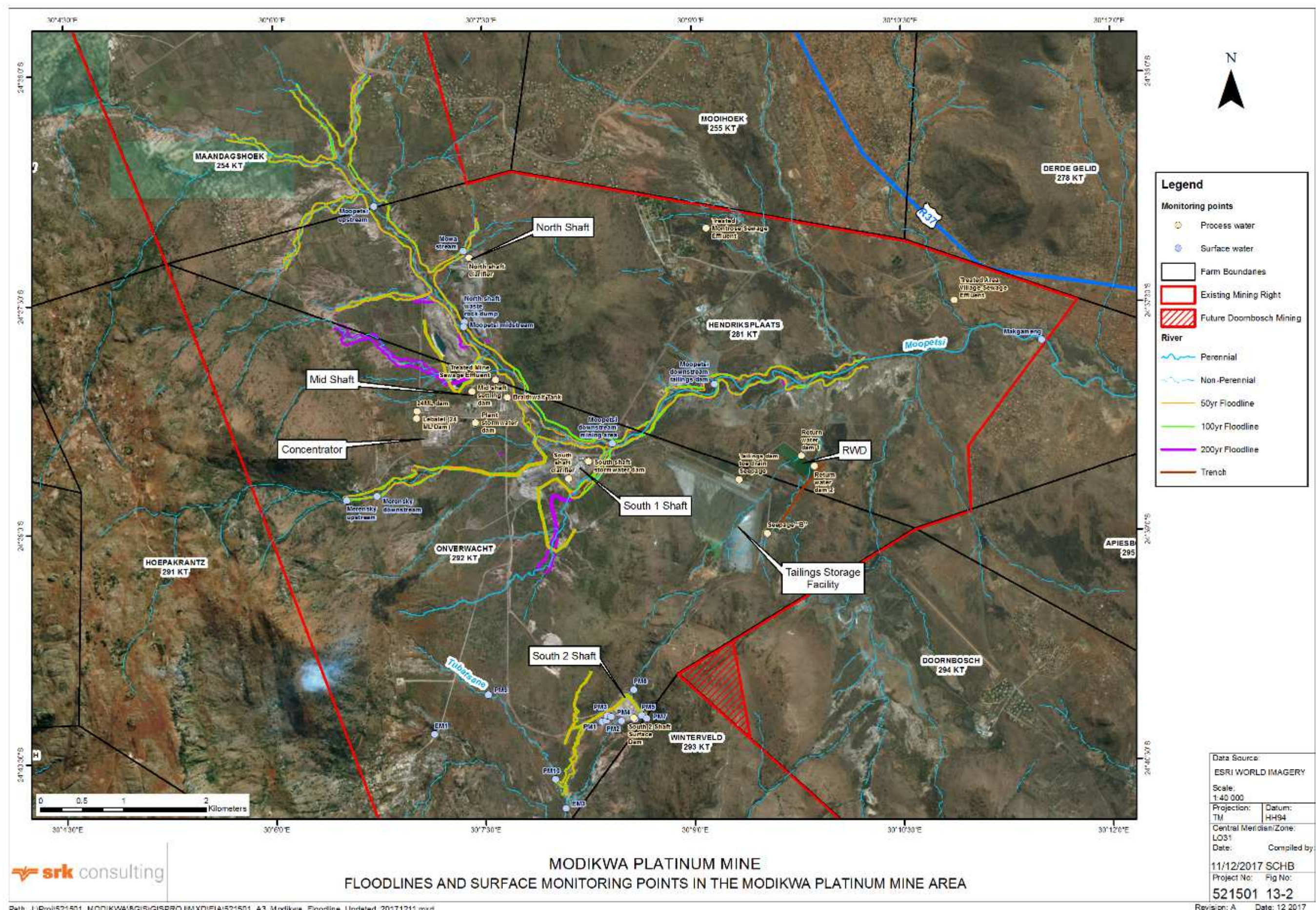


Figure 13-2: Floodlines associated with Modikwa Platinum Mine

13.6.3 Surface Water Quality

Baseline data for MPM (limited to the Moopetsi catchment) was obtained in 2000 and routine (monthly) surface water monitoring began in May 2003. At South 2 Shaft monitoring of mine process water in the settling dams began in April 2011 and monitoring of the Tubatsane Stream began in July 2013. There is no monitoring in the proposed South 2 Shaft conveyor crossings area the watercourse seldom flows but functions as a drainage line for run-off during the rainy season.

Details of the surface and process water monitoring points for MPM are presented in Table 13-3 and Table 13-4.

respectively and shown in Appendix 10. In addition to the routine variables assessed, soap, oil and grease (SOG) is monitored at the shafts, Central workshop, Difagate tank and Lebalelo pipeline.

Water quality is reported on an annual basis in line with the requirements of the WUL.

Table 13-3: Surface water monitoring points for the MPM area

Monitoring point	Co-ordinates	Description
Merensky upstream	S 24° 38' 47.0" E 30° 06' 31.0"	Upstream of Merensky decline shaft. Merensky decline shaft mining operations ceased January 2009
Merensky downstream	S 24° 38' 45.5" E 30° 06' 44.1"	Downstream of Merensky decline shaft. Downstream of human activities (stream crossing, laundry, livestock drinking point)
Mowa stream (SW2)	S 24° 37' 09.2" E 30° 07' 21.7"	Tributary of Moopetsi stream. Upstream of North shaft and North shaft waste rock dump
Moopetsi upstream of open pit	Proposed prior to mining	Moopetsi river, upstream of North Pit 2
Moopetsi upstream (SW1)	S 24° 37' 19.2" E 30° 07' 45.6"	Moopetsi river, upstream of mining activities
North shaft waste rock dump	S 24° 37' 37.1" E 30° 07' 22.1"	Tributary of Moopetsi stream. Downstream of North Shaft and North shaft waste rock dump
Moopetsi midstream	S 24° 37' 39.0" E 30° 07' 21.7"	Moopetsi river, downstream of North shaft and North shaft waste rock dump
Moopetsi downstream mining area (SW3)	S 24° 38' 25.1" E 30° 08' 25.3"	Moopetsi river, downstream of South Shaft. Previously called "Moopetsi Downstream"
Moopetsi downstream tailings dam (SW4)	S 24° 38' 02.1" E 30° 09' 09.3"	Moopetsi river, downstream of tailings dam and the above monitoring point. Over time, this monitoring point has been moved successively upstream.
Makgameng (SW5)	S 24° 37' 45.4" E 30° 11' 30.1"	Moopetsi river, downstream of all mining activities including Montrose and Area villages, at perimeter of Modikwa property
Tubatsane Stream Crossing	S 24° 40' 48.01" E 30° 08' 04.37"	Crossing near South 2 shaft
Tubatsane upstream	S 24° 40' 16.68" E 30° 07' 45.15"	Upstream South 2 shaft
Tubatsane downstream	S 24° 41' 43.91" E 30° 08' 25.15"	Downstream South 2 shaft

Table 13-4: Process water monitoring points for the MPM area

Monitoring point	Co-ordinates	Description / Purpose
South 2 shaft Surface Dam (S2SD)	S 24° 40' 13.0" E 30° 08' 33.9"	<ul style="list-style-type: none"> Water from underground in lined settling dams
South 2 shaft stormwater dam (future point)	S24°40' 11 .2" E 30°08'22.0"	<ul style="list-style-type: none"> HDPE lined dam Water reused underground
South 2 shaft Mine Service Water (future point)	S 24°40'11.809" E 30°08'37.025"	<ul style="list-style-type: none"> Settled underground water, excess water from stormwater dam and final treated sewage effluent to be returned underground for reuse
North shaft clarifier	S 24° 37' 11.9" E 30° 07' 24.2"	<ul style="list-style-type: none"> Clarifier
North shaft stormwater dam	S 24° 37' 20.09" E 30° 07' 18.57"	<ul style="list-style-type: none"> HDPE lined stormwater dam
North shaft rock: waste dump seepage (NSRWDS)	S 24° 37' 37.1" E 30° 07' 22.1"	<ul style="list-style-type: none"> Seepage from waste rock dump
24ML dam	S 24° 38' 12.1" E 30° 07' 01.4"	<ul style="list-style-type: none"> Concrete lined dam storing water comes from the Lebalelo pipeline. May receive cleaner shaft fissure water for distribution for reuse
Lebalelo (24 ML Dam)	S 24° 38' 14.8" E 30° 07' 01.3"	<ul style="list-style-type: none"> Pipeline discharging water into 24 ML dam
Plant stormwater dam (PSWD)	S 24° 38' 16.6" E 30° 07' 26.5"	<ul style="list-style-type: none"> Concrete-lined dam
Mid shaft settling dam* (MSSWD)	S 24° 38' 04.4" E 30° 07' 25.1"	<ul style="list-style-type: none"> HDPE lined dam
Braithwaite Tank	S 24° 38' 06.9" E 30° 07' 40.2"	<ul style="list-style-type: none"> Drinking water. Comes from 24ML dam
South shaft clarifier	S 24° 38' 39.0" E 30° 08' 06.4"	<ul style="list-style-type: none"> Clarifier
South shaft stormwater dam (SSWD)	S 24° 38' 32.2" E 30° 08' 14.9"	<ul style="list-style-type: none"> Concrete lined dam Water evaporates
Tailings dam toe drain Seepage	S 24° 38' 39.8" E 30° 09' 19.8"	<ul style="list-style-type: none"> Water emerges from the bottom of the tailings dam Water is piped to return water dams
Seepage "B"	S 24° 39' 00.9" E 30° 09' 31.7"	<ul style="list-style-type: none"> Water emerging from the bottom of the tailings dam
Return water dam 1 (RWD1)	S 24° 38' 30.5" E 30° 09' 46.5"	<ul style="list-style-type: none"> Unlined dam for storage of water from the tailings dam (seepage and decant from the penstocks) & excess water from the underground workings Water is reused as part of the ore processing process
Return water dam 2 (RWD2)	S 24° 38' 34.7" E 30° 09' 52.1"	<ul style="list-style-type: none"> Unlined dam Contains the overflow from return water dam 1
Treated mine sewage effluent	S 24° 37' 59.9" E 30° 07' 35.2"	<ul style="list-style-type: none"> Final effluent Discharged into plant stormwater dam for reuse
South 2 shaft Treated Sewage Effluent (future point)	S 24°40'14.149" E 30°08'21.700"	<ul style="list-style-type: none"> Final treated sewage effluent
Treated Area Village sewage effluent	S 24° 37' 29.59" E 30° 10' 52.64"	<ul style="list-style-type: none"> Final effluent Irrigated to land or discharged into watercourse

Monitoring point	Co-ordinates	Description / Purpose
Treated Montrose sewage effluent	S 24°37'59.9" E 30°07'35.2"	<ul style="list-style-type: none"> Final effluent Irrigated to land or discharged into watercourse

Baseline pre-mining

Baseline data for the Moopetsi River were obtained for SW2 upstream of the plant area and SW1 downstream of the mine area. The data indicated that the water was suitable for livestock watering, subsistence irrigation and domestic use in terms of the parameters assessed. Evidence of domestic use was obtained during the user survey conducted in October 2011.

Current data

The long-term TDS trend (2009-2016) for the up- and downstream monitoring points on the Moopetsi River and shorter term trend (2014-2016) for the Tubatsane River shows the Moopetsi upstream trend has remained constant and within the SANS241: 2015 limits noting that data at this point is limited as flow is typically only present after significant rainfall events. The downstream monitoring points fluctuate seasonally with trends slightly increasing over the long term although remaining below the SANS241: 2015 limits (there are no 2016 WUL limits for the receiving water environment). Some recovery downstream of the TSF and further downstream at the Makgameng point is evident indicating that mining (shaft operations) has a greater overall impact on the surface water resource than the TSF. The TDS trends for the Tubatsane are constant up- and downstream although the levels downstream are slightly higher than upstream.

The long-term nitrate as N trend (2009-2016) along the Moopetsi River and shorter term trend (2014-2016) for the Tubatsane River shows the nitrate in the Moopetsi River downstream of operations is above SANS241: 2015 and the livestock watering guidelines but improves slightly downstream of the mine. There is a long term decreasing trend in the Moopetsi River. In the Tubatsane River nitrate levels are below SANS241: 2015 and the livestock watering guideline but the levels downstream are higher than upstream and an increasing trend downstream is evident.

It is likely that the mining operations are also contributing TDS, and nitrate to the receiving water environment as the quality of the water deteriorates downstream of the operations in both the Moopetsi and Tubatsane rivers.

13.6.4 Biomonitoring

No baseline biomonitoring was undertaken pre-mining but assessments have since been undertaken biannually upstream and downstream in the Moopetsi River at three points when flow is available. Four sites were identified as suitable sampling points in terms of the aquatic assessment for the South 2 Shaft Amendment Project. The biomonitoring points are presented in Table 13-5 and the location of these monitoring points provided in Appendix 10.

Table 13-5: Biomonitoring points

Monitoring point	Co-ordinates	Description
Tubatsane and Tubatse catchment		
MD1	24°40'48.28"S 30° 8'4.69"E	<ul style="list-style-type: none"> Reference site on the non-perennial tributary of the Tubatsane River.
MD2	24°44'12.67"S 30°10'14.39"E	<ul style="list-style-type: none"> Downstream assessment point site on the Tubatsane River.
MD3	24°45'50.06"S 30° 9'40.79"E	<ul style="list-style-type: none"> Upstream reference site on the Tubatse River.

Monitoring point	Co-ordinates	Description
MD4	24°44'15.04"S 30°10'56.04"E	<ul style="list-style-type: none"> Downstream reference site on the Tubatse River.
Moopetsi catchment		
M1	24°37'51.42"S 30°10'20.67"E	<ul style="list-style-type: none"> Immediately downstream of all the active areas of the mine
M2	24°37'44.63"S 30°11'26.60"E	<ul style="list-style-type: none"> Downstream of M1 at the Makgameng Bridge (Makgameng WUL surface water compliance point)
M3	24°37'49.56"S 30° 7'32.39"E	<ul style="list-style-type: none"> Upstream spatial reference site

Biomonitoring in 2015/2016 was limited to the three sampling points (M1-M3) on the Moopetsi River. At each of the sites, the following aspects form part of the overall aquatic assessment (SASS, 2016):

- Visual assessments;
- In situ water quality sampling;
- Intermediate Habitat Integrity Assessment (IHIA);
- Invertebrate Habitat Assessment System (IHAS);
- Average score per taxon (ASPT);
- South African Scoring System 5 (SASS5); and
- Toxicity testing.

The main findings are summarised below (SAS, 2016).

Biota Specific Water Quality

Biota specific water quality is summarised below:

- The data indicate seasonal variation but overall the latest (April 2016) data indicates an overall improvement at each site compared to the 2009 baseline data;
- Spatially, the EC has improved significantly in a downstream direction from Site M3. This can be seen as an improvement in the water quality of the Moopetsi River. The North shaft waste rock dump seepage, located upstream of the M3 site, is likely to contribute to the salt load in the system. However, the lack of flow upstream and potential presence of other unidentified upstream point and diffuse sources of pollution confounds any attempt to quantify the potential contribution by the North shaft waste rock dump;
- Absolute pH values at the time of the assessment can be considered as largely natural; and
- All three sites comply with the DO guidelines and can be considered as suitable in sustaining a diverse and sensitive aquatic community at the time of the assessment.

Habitat Integrity Assessment

Habitat conditions associated with the biomonitoring points is summarised below:

- General habitat conditions can be considered to be largely modified, where a large loss of natural habitat, biota and basic ecosystem functions has occurred giving an IHAS of Class D;
- The latest (April 2016) data indicates a slight overall deterioration at each site compared to the 2009 baseline data (refer to summary tables below);
- From the results of the application of the IHAS index, it is evident that the habitat diversity and structure at all three sites is inadequate for supporting a diverse aquatic macro-invertebrate community; Spatially, the SASS5 scores increases from M3 to M1 with a further increase to M2; and
- The absence of vegetation biotope at all three sites is likely to significantly limit the diversity of the aquatic community in this segment of the Moopetsi River.

Aquatic Macro-Invertebrate Assessment

Aquatic macro invertebrate data, associated with the biomonitoring points, is summarised below:

- The data indicate seasonal variation with the latest (April 2016) data comparable to the 2009 baseline data; and
- Although the July 2015 results indicate recovery between Sites M3 and M2, the latest (April 2016) results indicate deterioration. The long term data indicate that the macro-invertebrate community within the Moopetsi River is experiencing stress throughout the whole system. Cumulative impacts on the Moopetsi River from upstream chrome mining, processing activities, the local settlements in the area and the North shaft waste rock dump seepage is thus considered likely. However, the largest constraining factor on the aquatic community in this section of the stream is likely to be a lack of suitable habitat and low flow, with the effects of erosion and sedimentation contributing to the loss of instream habitat and bankside cover.

13.6.5 Toxicity Testing

Toxicity testing of process water in order to quantify the risk that the mine's process water poses to the environment was initiated at the return water dam in 2009 and is conducted biannually. An additional site was initiated in the South 2 Shaft area in 2013. The suite of toxicological tests includes the daphnia (*Daphnia pulex*), the guppy test (*Poecilia reticulata*), Bacterial bioluminescence (*Vibrio fischeri*) and Algal growth (*Selenastrum capricornutum*). The toxicity testing points are described in Table 13-6.

An overview of recent toxicity data is presented below:

Table 13-6: Toxicity testing sampling points

Monitoring point	Co-ordinates	Description
M4	24°38'39.18"S 30° 9'51.85"E	• Return water dam overflow at spillway
M5	24°37'12.17"S 30° 7'18.18"E	• North shaft overflow into a canal which leads to the Moopetsi River
M6	24°37'34.97"S 30° 7'23.86"E	• Seepage water from the top of the North shaft waste rock dump.
M7	24°37'9.01"S 30° 7'21.88"E	• Mowa Stream
MD1	24°40'48.28"S 30° 8'4.69"E	• Reference site on the non-perennial tributary of the Tubatsane River.

Moopetsi, Tubatsane and Tubatse river systems

Toxicity data over the last few years indicates the following range in toxicity:

- Return water dam: slight acute hazard (Class 2) to high acute hazard (Class 4) with most recent data indicating Class 2;
- Mowa Stream: slight acute hazard (Class 2) to acute hazard (Class 3) with most recent data indicating Class 2;
- North shaft waste rock dump seepage: acute hazard (Class 3) with most recent data indicating high acute hazard (Class 4); and
- South 2 Shaft (MD1) shows no acute toxicology impact (Class 1), therefore no potential negative impact is taking place on the Tubatsane River from this source.

Implementation of the dewatering strategy is one of the key mitigation measures in place to minimise a further decline in the water quality at these points so as to minimize the toxicological risk these water sources may pose to the receiving environment.

13.6.6 Surface Water User Survey

Due to the ephemeral nature of the Moopetsi River and limited flow in the Tubatsane River tributaries in the vicinity of the mine, there is limited use of surface water within the mine lease area with most communities reliant on the groundwater resources

A surface water user survey was conducted in October 2011 in the southern area of MPM focusing on the Tubatsane catchment, which had not previously been surveyed. The survey identified communities using surface water for domestic purposes (mostly bathing and clothes washing with limited potable use), livestock watering and subsistence agriculture.

13.7 Groundwater

13.7.1 Aquifer characterisation

The igneous rocks have a groundwater environment that supports aquifers of an intergranular and fractured type, i.e. where groundwater occurrence is associated with both shallower weathered material and deeper fractured bedrock. The following aquifers were identified within the MPM area:

- A shallow secondary weathered bedrock aquifer restricted to the deeply weathered broad valley between the two mountains; and
- Deeper secondary fractured bedrock aquifers associated with geological structures such as faults, fracture zone and dyke intrusion contacts.

The most important aquifer can be described as leaky and associated with fracturing, just below or on the contact with the weathered zone, which contains a large fraction of the aquifer storage. The secondary structures (faults and dyke contacts), areas associated with pyroxenite (mainly along the contact of the Critical and Main Zone rocks) and other mafic intrusions play a major role in controlling aquifer potential and show preferential weathering.

Fractured aquifers, associated with near vertical fracture zones, are usually present within the slightly weathered to fresh rock below the weathered zone. In addition fractured aquifers tend to form along the fractured metamorphic contact zones between the dolerite dykes/sill contacts and the host rock.

Fractures and joints can also develop along brittle deformation zones, such as faults and fracture zones.

The dykes and faults in the mine area have north-northeast – south-southwest traces. Aquifers are furthermore predominantly developed in the topographically lower lying Moopetsi Stream valley, compared to the surrounding ridges, which are less weathered. Weathering extends typically 11 - 20 metres below surface (mbs), while weathering of up to ± 45 mbs has been reported. Norite and anorthosite lithologies are much less susceptible to weathering. Average aquifer thickness is in the order of 20 – 30 m.

Borehole yields in the area are normally low, in the order of $\pm 0.1 - 2.0$ l/s. However, some faulting was identified in the South 2 Shaft area which could result in higher borehole yields (GCS, 2015).

The aquifer system, based on Parsons Classification System (1995), is defined as a Minor Aquifer System, which is described as:

“These (aquifer systems) can be fractured or potentially fractured rocks which do not have a high permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important both for local supplies and in supplying base flow for rivers.”

The groundwater potential of the South 2 Shaft area is low to moderate (GCS, 2015).

At South 2 Shaft the depth of weathering varies generally between 0 m (surface outcrop of norite) and 15 mbs. The intergranular aquifer is developed in areas which have sufficient depth of weathering to allow saturation (GCS, 2015).

The aquifers are mostly confined with water levels rising above water strikes. Most water-strikes occur above 40 mbs, and 70 mbs could be seen for all practical purposes as the base of the water bearing strata. There is a linear relationship between topography and groundwater levels with the deeper water levels at higher topographic elevations and vice versa. Topographically high areas have a low frequency of aquifers and are often not connected to lower lying area aquifers and can be classified as localised seepage zones. Hydraulic gradients thus tend to follow the topography with the observed groundwater gradients in the mine area varying between 0.01 and 0.005. The groundwater flow directions vary throughout the area but are generally towards the Moopetsi River.

13.7.2 Groundwater Levels

The relationship between topography and groundwater level elevation indicate that the groundwater flow direction mimics the topography. It is also evident that there is currently no external influence such as large-scale abstraction on the groundwater resources in the area.

Groundwater levels are affected by natural recharge, and hence show seasonal fluctuations. Recharge for the area typically varies between 2 and 5 % of mean annual precipitation. Levels are also affected by mining activities such as dewatering. Artificial recharge to groundwater has occurred in the past.

Groundwater depths as measured in the newer monitoring boreholes (refer to Table 13-7) are 2.9 - 40.5 mbs. The shallower water levels (2.9 – 9.8 mbs) are associated with areas which are not affected by dewatering mining activities, while the deeper water levels of 21 – 40 mbs are due to dewatering. Depths are in the region of 20 - 25 mbs at the Montrose STP site and only about 4 – 5 mbs in the area around the Area Village STP site.

Depths are 6 - 25 mbs in the South 2 Shaft area with a mean of 14 mbs. The observed values compare well with other studies in the surrounding area that show groundwater depths of 10 - 30 mbs.

The differences in water level between the pre-mining water levels and the water levels measured in August 2011 were used to create a water level drawdown contour map. This map shows the areas which have been dewatered due to underground dewatering activities and open pit mining activities (limited to North Pit 1 where dewatering began in December 2010).

13.7.3 Aquifer parameters

Expected aquifer storage coefficients, based on aquifer type and weathering are likely to vary between 0.001 and 0.05 (average ± 0.005). Transmissivities show a typical lognormal distribution with the weathered zone transmissivities ranging from 0.4 – 300 m²/day and the fractured aquifer transmissivities ranging from 0.4 to 336 m²/day.

The typical storage of Bushveld Igneous Complex aquifers is in the order of 0.001, which was verified by the groundwater model calibration.

13.7.4 Springs

One spring (MHS1) has been identified at MPM and is located on Maandagshoek 254 KT, north of the existing North Shaft operations.

13.7.5 Groundwater quality

Baseline data was obtained in 2000 and routine (quarterly) groundwater monitoring began in July 2003. The current monitoring points are provided in Table 13-7 and shown in Appendix 10.

Five new monitoring boreholes were drilled in April 2010 to assess impacts associated with the TSF and a further eight boreholes have been drilled in the open pit area to assess the impact on rest water levels associated with pit dewatering as well as the quality of the dewatered water. In addition, two replacement boreholes have been drilled (MMB3a and MMB6a).

Table 13-7: Groundwater monitoring points

Monitoring point	Co-ordinates	Description
Difagate Tank	S 24° 38' 22.3" E 30° 06' 44.4"	<ul style="list-style-type: none"> Borehole in neighbouring community. Water sample taken from tank.
MR1	S 24° 38' 47.2" E 30° 06' 40.0"	<ul style="list-style-type: none"> Down-gradient of Merensky decline shaft. Suitable as reference boreholes. Between Merensky upstream and Merensky downstream surface monitoring points.
M1	S 24 ° 37' 51.42" E 30 ° 10' 20.67"	<ul style="list-style-type: none"> Up-gradient of South shaft.
M2	S 24 ° 37' 44.63" E 30 ° 11' 26.60"	<ul style="list-style-type: none"> Up-gradient of concentrator plant.
M3	S 24 ° 37' 49.56" E 30 ° 07' 32.39"	<ul style="list-style-type: none"> Down-gradient of oil separation yard.
MMB01	S 24° 38' 38.8" E 30° 09' 19.9"	<ul style="list-style-type: none"> Below tailings dam, downstream.
MMB02	S 24° 38' 27.3" E 30° 09' 45.1"	<ul style="list-style-type: none"> Below return water dam 1, downstream.
MMB03a	S 24° 37' 06.3" E 30° 07' 27.3"	<ul style="list-style-type: none"> Up-gradient of North shaft – replaces MMB3 which was accidentally destroyed in 2010.
MMB04	S 24° 37' 21.9" E 30° 07' 16.4"	<ul style="list-style-type: none"> Down-gradient of North shaft and North shaft stormwater dam.
MMB05	S 24° 38' 28.2" E 30° 08' 04.9"	<ul style="list-style-type: none"> Down-gradient of South shaft.
MMB06a	S 24° 38' 31.0" E 30° 08' 16.3"	<ul style="list-style-type: none"> Down-gradient of South shaft and stormwater dam – replaces MMB3 which was accidentally destroyed in 2010.
MMB07	S 24° 38' 46.1" E 30° 09' 41.8"	<ul style="list-style-type: none"> Downstream of tailings dam.
MMB08	S 24° 38' 14.7" E 30° 09' 55.0"	<ul style="list-style-type: none"> Downstream of return water dams, close to Moopetsi River and upgradient of Area Village sewage treatment plant.
MMB09	S 24° 38' 22.2" E 30° 09' 27.0"	<ul style="list-style-type: none"> Downstream of return water dams. Drilled into old underground workings.
SRK 1	S 24° 38' 14.7" E 30° 09' 32.9"	<ul style="list-style-type: none"> Downstream of return water dams.
SRK 2 (Deep)	S 24° 38' 14.5" E 30° 09' 28.4"	<ul style="list-style-type: none"> Below and north of return water dam. Close to MMB 9.
SRK 2 (Shallow)	S 24° 38' 14.5" E 30° 09' 28.4"	<ul style="list-style-type: none"> Below and north of return water dam. Close to MMB 9.
SRK3	S 24° 38' 30.3" E 30° 09' 02.7"	<ul style="list-style-type: none"> Next to TSF, downstream.
MMB10	S 24 ° 39' 22.1" E 30 ° 09' 03.5"	<ul style="list-style-type: none"> Drilled in April 2010 Upgradient of TSF.
MMB11	S 24 ° 38' 46.0" E 30 ° 09' 45.4"	<ul style="list-style-type: none"> Drilled in April 2010 Downgradient of TSF / return water dam.
MMB12	S 24° 38' 02.5" E 30 ° 10' 03.0"	<ul style="list-style-type: none"> Drilled in April 2010 Downgradient of TSF / return water dam, upgradient of Area Village sewage treatment plant.
MMB13	S 24 38' 24.2" E 30 ° 09' 30.9"	<ul style="list-style-type: none"> Drilled in April 2010 Downgradient of TSF / return water dam.

Monitoring point	Co-ordinates	Description
MMB14	S 24° 38' 24.9" E 30° 09' 13.8"	<ul style="list-style-type: none"> • Drilled in April 2010 • Downgradient of TSF / return water dam.
MMB15	S 24° 40' 15.6" E 30° 7' 45.3"	<ul style="list-style-type: none"> • Downgradient South 2 decline shaft.
MMB16	S 24° 40' 31.8" E 30° 7' 58.6"	<ul style="list-style-type: none"> • Upgradient South 2 decline shaft.
MMB17	S 24° 40' 4.1" E 30° 8' 32.3"	<ul style="list-style-type: none"> • Downgradient South 2 decline shaft (no longer monitored as now covered by shaft infrastructure).
MMB18	S 24° 40' 16.3" E 30° 8' 31.6"	<ul style="list-style-type: none"> • Downgradient South 2 decline shaft.
MMB19	S 24° 39' 40.17" E 30° 07' 45.73"	<ul style="list-style-type: none"> • Downgradient Merensky open pit.
MMB20	S 24° 38' 29.7" E 30° 07' 55.7"	<ul style="list-style-type: none"> • Downgradient South shaft waste rock dump.
MMB21	S 24° 37' 26.6" E 30° 07' 06.3"	<ul style="list-style-type: none"> • Northern side (upstream) of North Pit 1.
MMB22	S 24° 38' 29.4" E 30° 07' 41.4"	<ul style="list-style-type: none"> • Between South Pit 1 and underground workings.
MMB23	S 24° 37' 52.8" E 30° 07' 27.1"	<ul style="list-style-type: none"> • Between River and North Pit 1 (downstream of pit).
MMB24	S 24° 37' 43.6" E 30° 07' 06.3"	<ul style="list-style-type: none"> • Between North Pit 1 (upstream) and underground workings.
MMB25	S 24° 37' 42.0" E 30° 07' 20.7"	<ul style="list-style-type: none"> • Between North Pit 1 (downstream) and North shaft waste rock dump (dump is on opposite of Moopetsi River).
MMB26	S 24° 38' 57.2" E 30° 08' 05.5"	<ul style="list-style-type: none"> • Between South Pit 2 (upstream) and underground workings.
MMB27	S 24° 37' 12.7" E 30° 07' 03.4"	<ul style="list-style-type: none"> • Monitor water levels up gradient of North Open Pit.
MMB28	S 24° 37' 12.6" E 30° 07' 07.2"	<ul style="list-style-type: none"> • Monitor water level between North Shaft and Moopetsi River.
MMB29	S 24° 40' 16.30" E 30° 8' 40.50"	<ul style="list-style-type: none"> • Monitoring of water levels in the immediate area of South 2 Shaft (upgradient borehole).
MMB30	S 24° 40' 20.00" E 30° 7' 54.31"	<ul style="list-style-type: none"> • Monitoring of water levels and groundwater quality down gradient of proposed Waste Rock Dump at South 2 Shaft.
Area Village	S 24° 37' 32.5" E 30° 10' 52.6"	<ul style="list-style-type: none"> • Water monitoring borehole.
Montrose	S 24° 37' 16.6" E 30° 09' 21.3"	<ul style="list-style-type: none"> • Water monitoring borehole.
Meshwaneng Water Well	S 24° 37' 30.1" E 30° 10' 49.5"	<ul style="list-style-type: none"> • Monitoring well to detect any pollution from sewer.

Baseline pre-mining

The results indicate that most of the boreholes sampled comply with the SANS241:2015 limits. The baseline groundwater quality data (2000) of the surrounding area was characterised as calcium/magnesium – bicarbonate water. Baseline data sourced in March 2011 in the South 2 Shaft area indicates generally good quality with a similar calcium/magnesium – bicarbonate character, indicating recently recharged groundwater.

Relatively high concentrations of nitrate (exceeding the SANS241: 2015 limit of 11 mg/l as N) were observed in all the groundwater supply boreholes, possibly as a result of contamination by septic systems, unprotected borehole areas and cattle kraals (especially when there is little vegetation to use the nitrate). Nitrate contamination, common in these populated areas, confirms aquifer recharge and the vulnerability of the groundwater system.

Water chemistry in pyroxenite rock aquifers (ELM4 & ELM8) tended to be more magnesium than calcium dominant. This is due to the relative ease with which pyroxenite weathers and the fact that the major mineral pyroxene and its weathering products are magnesium rich. The water was furthermore relatively hard, with hardness values as mg/l of CaCO₃ above 300 mg/l. The groundwater quality was in general inferior to the ambient surface water quality.

Concentrations of minor and trace elements, such as metals, were low in all boreholes sampled.

Current data

The key findings from the annual monitoring report (GCS, 2016) for the 2015 groundwater with additional comment based on the 2016 data, as applicable, are as follows:

- Most of the groundwater has slightly elevated TDS, calcium, magnesium and hardness values due to natural water-rock interactions. The current concentrations are not associated with mining or other activities;
- Nitrate concentrations are the primary concern for groundwater quality. Nitrate occurs naturally in the mining area, but nitrate and ammonium are also components of the explosives used in the mining industry. Other sources of nitrate include fertilizers and human and animal waste;
- Area Village and Montrose boreholes had relatively good water quality during 2015; and
- Nitrate remained slightly elevated in Meshwaneng Water Well during 2015 but is well within SANS241:2015 of 11 mg/l as N.

13.8 Biodiversity

13.8.1 Flora

Modikwa Platinum Mine falls within the Savanna biome (Rutherford & Westfall, 1994), which is further divided into different bioregions, which are spatial terrestrial units possessing similar biotic and physical features, and processes at a regional scale. The area is situated within the Central Bushveld Bioregion (Mucina & Rutherford, 2006) and the following vegetation types are present within the area; Sekhukhune Mountain Bushveld and Sekhukhune Plains Bushveld (Figure 13-3).

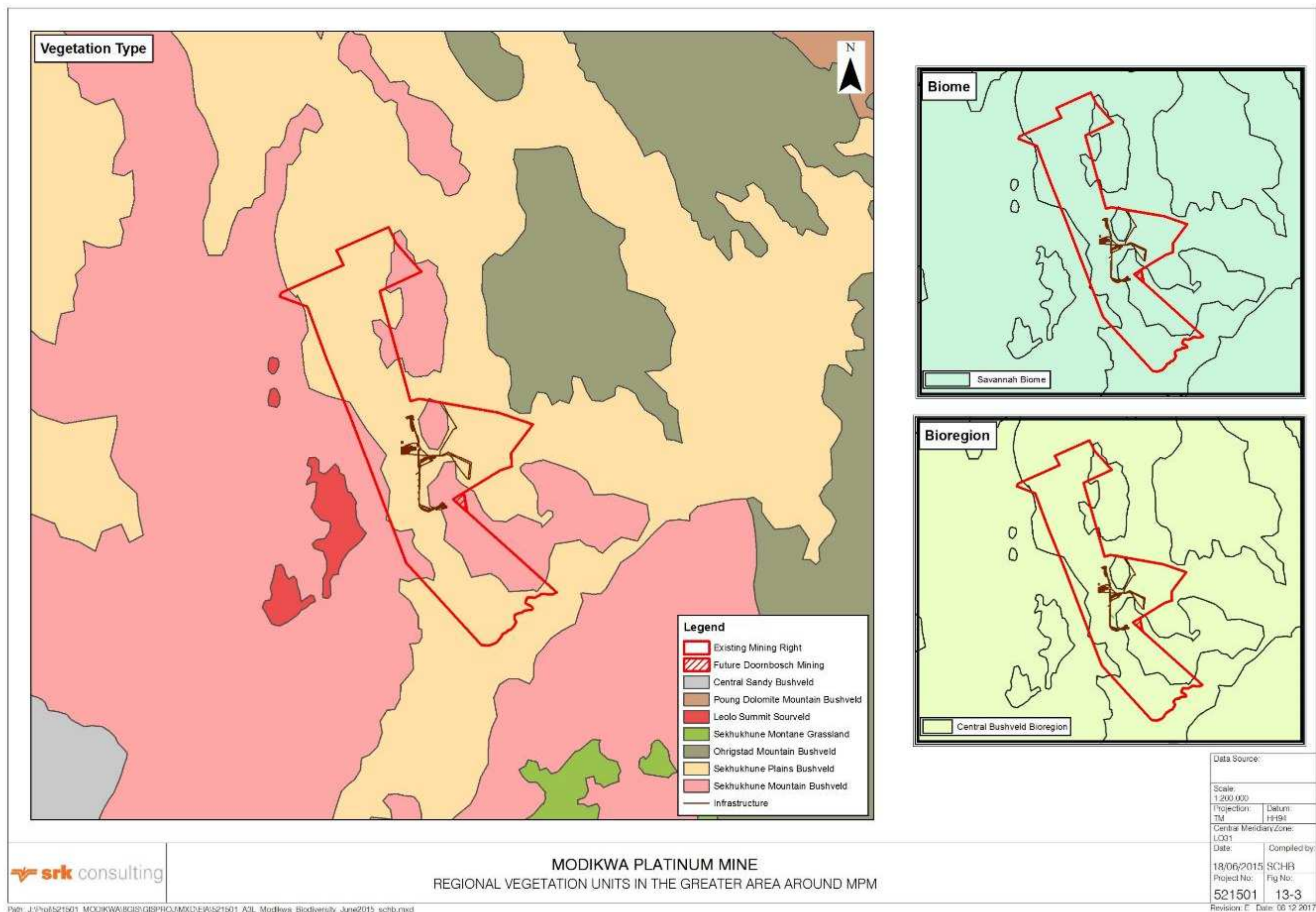


Figure 13-3: Biome, bioregion and vegetation types associated with the Modikwa area

Red Data Listed (RDL) floral and Protected Tree species

Searsia batophylla shrubs, which is listed as Vulnerable, have been positively identified within the MPM area. Three protected tree species, namely *Sclerocarya birrea* subsp. *caffra* (Marula), *Catha transvaalensis*¹⁰ (Sekhukhune Bushman's Tea) and *Catha edulis* (Bushmans Tea), which are listed as 'protected' by the National Forest Act (Act 84 of 1998) are present with the MPM area (Refer to Table 13-9).

A permit has been issued to MPM from the Department of Agriculture, Forestry and Fisheries (DAFF) which authorises the removal and transplantation of trees.

Invasive/alien vegetation

Areas within the MPM area, especially in the transformed habitat unit, have been identified as being affected by the alien and invasive vegetation species.

Medicinal floral species

Various medicinal plant species (some regarded as alien invasive weeds) have been identified within the MPM area. The identified medicinal plant species are considered to be common and widespread species and were not confined to any specific habitat unit within the area. .

13.8.2 Fauna

No RDL fauna species have been identified at MPM. It is not likely that any RDL or sensitive fauna species will utilise the area within or directly adjacent to the mine area due to the high levels of anthropogenic and mining activities already taking place in the area.

13.8.3 Wetland and River Systems

Information in this section has been sourced from the Wetland Delineation Study reports (SAS, 2011 and SAS 2014).

Wetland zone delineation was undertaken in the South 2 Shaft area in the first quarter 2014 (SAS, 2014) and for the rest of the mine in the last quarter 2011 (SAS, 2011). The objectives of the studies were to determine the present ecological state (PES) of the system and determine wetland functionality and service provision in terms of ecological and socio-economic functioning of the system, in order to guide development and future expansion within the MPM area. The delineations took place according to the method presented in the final draft of "A practical field procedure for identification and delineation of wetlands and riparian areas" published by the DWS in February 2005.

Based on the South African National Biodiversity Institute (SANBI) Wetland Inventory (2006) and National Freshwater Ecosystem Priority Areas (NFEPA) database, (2011), aspects applicable to the aquatic ecology of the wetland or river systems in the area and surrounds include the following:

- The sub-WMA (Tubatse and Moopetsi/Tubatse tributaries) is not classified as a flagship or a Freshwater Ecosystem Priority Area (FEPA) River;
- The sub-WMA is not listed as a fish FEPA and is not considered important in terms of translocation and relocation zones for fish, however, the Tubatse River is indicated as being a fish support area or corridor area with one species highlighted for conservation purposes. This species *Opsaridium peringueyi* (Southern Barred Minnow) is however considered of Least Concern and is widespread and fairly common throughout the remainder of its range;
- No wetland features are indicated on the NFEPA wetland database layer within the MPM area; and

¹⁰ Also known as *Lydenburgia cassinoides*.

- The sub-WMA is thus not regarded important in terms of fish sanctuaries, rehabilitation or ecological corridors.

The wetland/river resources in the South 2 Shaft area can largely be defined as valley bottom river systems with deeply incised eroded channels of varying size and upper foothill river systems including some side branches that have become eroded (SAS, 2014). Ten Wetland Management Units (WMU) have been identified on the remainder of the property (Refer to Figure 13-4). A variety of wetland types are present within the larger wetland/river system, with the majority of WMU consisting of non-perennial, intermittent, non-vegetated river systems with only two palustrine valley bottom wetlands identified. These wetlands are in the vicinity of North Pit 1 and South Pit 1.

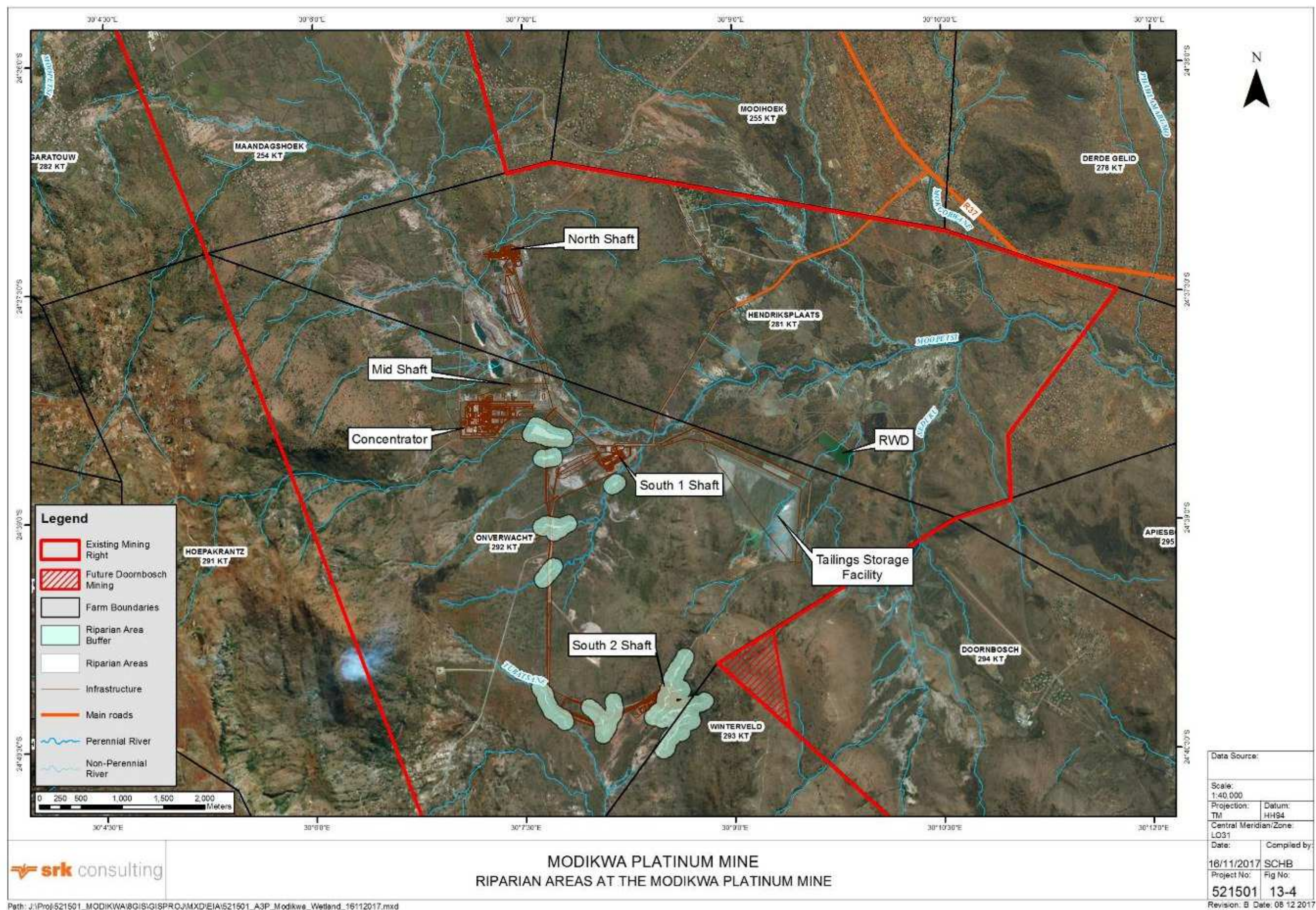


Figure 13-4: Riparian areas associated with Modikwa Platinum Mine

13.8.4 Resource class and river health

The resource classes for the quaternary catchment and catchments within the MPM area are presented in Table 13-8. In terms of Government Gazette No 39943 of 22 April 2016, the DWS has published the classes of water resources and resource quality objectives (RQOs) for the Olifants Catchment. The MPM has noted the various classes and RQOs especially as it applies to the MPM and the Integrated Units of Analysis (IUA). The following IUAs are important, namely:

- No 5: Middle Olifants up to the Flag Boshielo Dam – Class III (sustainable minimal protection and high utilization);
- No 6: Steelpoort (Tubatse) River – Class III (sustainable minimal protection and high utilization);
- No 7: Middle Olifants below Flag Boshielo Dam and upstream of the Steelpoort River – Class III (sustainable minimal protection and high utilization); and
- No 10: Lower Olifants – Class II (moderate environmental protection and moderate utilization).

The respective PES categories for the delineated river and wetland systems within the MPM catchments are presented in Table 13-9 and the Ecological Importance and Sensitivity (EIS) and Recommended Ecological Category (REC) for the South 2 Shaft area delineated river and wetland systems are presented in Table 13-10.

Table 13-8: Resource Class

Source	Resource	Class	EIS	PES	REC
Kleynhans, 2000	Tubatse/Steelpoort	-	HIGH	C	B: Small risk allowed
SAS, 2011 and 2014	Moopetsi	-	C	B – E	C
SAS, 2014	Tubatsane	-	B - C	C – C/D	C
DWS, 2016	Steelpoort (Olifants EWR10c)	-	High	E	D
Government Notice No. 466, 22 April 2016	Olifants: confluence with Steelpoort:	III (sustainable, minimal protection, high utilisation)	Not provided	D	D

Table 13-9: Summary of the delineated management units at Modikwa

Unit No.	Location	System type	Status and functions	Red data species (only plants and no animal red data species were identified)*	Level of ecological function and service provision	PES**
1	Moopetsi River downstream of mining	Riverine, lower perennial, aquatic bed system.	Artificially perennial due to return water dam seepage and overflow. Provides niche habitat, erosion and hydrological control.	<i>Searsia batophylla</i> <i>Catha transvaalensis</i>	Intermediate	Class B – Largely Natural
2	Moopetsi tributaries up and downstream of return water dam	Non-perennial riverine, upper intermittent, non-vegetated wetland; Artificial lacustrine (large, open, water-dominated system) wetland associated with return water dam.	Wetland continuity and connectivity have been largely lost due to construction of the return water dam and canalisation around the dam. However, the dam provides good habitat for maintenance of bird biodiversity and sink for water quality constituents.	None	Intermediate	Class D – Largely Modified.
3	Moopetsi tributaries upstream tailings dam	Riverine, upper intermittent, non-vegetated wetland.	Upper reaches in good ecological state but lower down impacted by tailings dam. Provides biodiversity maintenance.	<i>Searsia batophylla</i>	Intermediate	Class C – Moderately Modified.
4	Central Moopetsi River between surface water monitoring points 'Downstream mining area' and 'Downstream TSF'	Riverine, lower intermittent wetland.	Provides a trap for sediment and assimilation of nitrate and other water quality constituents. Some erosion evident.	<i>Searsia batophylla</i> <i>Catha transvaalensis</i>	Moderately low	Class B – Largely Natural
5	Moopetsi tributaries east of the south shaft complex and waste rock dump	Riverine, upper intermittent, non-vegetated wetland.	Provides some role as a trap for sediment and assimilation of nitrate and other constituents but under pressure from infrastructure encroachment.	<i>Searsia batophylla</i>	Moderately high	Class C – Moderately Modified.
6	Upstream WMU5 and South shaft	Riverine, upper intermittent, non-vegetated wetland.	Provides erosion control and a trap for sediment but not assimilation of nutrients.	<i>Searsia batophylla</i> <i>Catha transvaalensis</i>	Intermediate	Class B – Largely Natural
7	Moopetsi tributaries upstream and downstream of concentrator to the south crossing South Pit 1 area.	Varies between an upper intermittent, non-vegetated wetland and a palustrine valley bottom wetland with emergent vegetation in South Pit 1 area.	Only wetland unit on the area, where wetland plant species such as <i>Phragmites australis</i> is present. Evidence of the presence of the Cape Clawless Otter (<i>Aonyx capensis</i>) has also been found. Altered by rural agricultural activity and roads. Provides niche habitat, erosion and hydrological control and assimilation of water quality constituents.	None	Intermediate	Class C – Moderately Modified.
8	Moopetsi tributaries in vicinity of North Pit 1.	Palustrine, valley bottom wetland with scrub-shrub vegetation.	Altered by construction of roads. Provides niche habitat, erosion and hydrological control and assimilation of water quality constituents.	<i>Searsia batophylla</i>	Intermediate	Class C – Moderately Modified.
9	Mowa River, north of the current mining operations	Riverine, upper-intermittent, non-vegetated wetland feature.	Altered by discharge into the Mowa Stream (causes incision of the streambed) and canalisation. Under threat by vegetation removal, overgrazing, road construction and infrastructure encroachment. Provides erosion control and biodiversity maintenance.	<i>Searsia batophylla</i> <i>Catha transvaalensis</i>	Intermediate	Class E – Extensively Modified.
10	Upper reaches of the Moopetsi River	Riverine, lower intermittent, non-vegetated system.	Serves as a trap for sediment and assimilation of nitrate and other water quality constituents. Provides niche habitat, erosion and hydrological control.	<i>Searsia batophylla</i> <i>Catha transvaalensis</i>	Moderately high	Class C – Moderately Modified.
South 2 Shaft	Lower lying areas of more gentle relief occurring along the access road and proposed conveyor route	Channelled valley bottom wetland features. These systems convey water periodically and can be classified as non-perennial features.	Large sections of the channelled valley bottom features have undergone severe erosion and the banks show forms of collapsible soils and very little vegetation, especially where mining related infrastructure such as pipelines and roads have been constructed. These impacts contribute to increased sediment inputs into the system. Several of the existing causeway road crossings have resulted in disruption of natural flow connectivity causing localised ponding (upgrading of these crossings is planned). Some sections of these features remain intact, which contributes to the ecological functionality of these systems from a socio-cultural ecological service provision perspective.	<i>Catha transvaalensis</i> (Sekhukhune Bushman's Tea tree (<i>Catha edulis</i>) also found in the ridge areas)	Moderately low: Identified impacts affect the capacity of the features to provide important ecological services such as flood attenuation, nutrient and toxicant assimilation, erosion control and habitat for faunal species	C/D: Moderately/ Largely Modified
South 2 Shaft	Within the eastern to southern sections of the area in the steeper ridge sections running through and adjacent to the South 2 Shaft terrace and proposed waste rock dump areas	Upper foothill rivers. These systems are non-perennial drainage lines.	These features have undergone disruption of vegetation structure, severe erosion and loss of general ecological integrity due to disturbances associated with trampling by livestock, road construction and construction of the shaft terrace across one such feature using waste rock. Alteration of this feature (piped subsurface) is included in the 2016 WUL. Higher up in the more inaccessible sections of the ridges, the vegetation structure and general ecological integrity is still largely intact. The larger system is still intact despite the localized disturbances.	<i>Catha transvaalensis</i>	Moderately low for reasons as above	Class C – Moderately Modified

- **Catha transvaalensis* was previously referred to as *Catha cassinoides*, the taxonomic synonym. In addition to the two Red Data listed plant species the plant species, *Vitex obovata*, which is a food source for the rare cycad species. *Pycna sylvia*, also occurs within the WMU boundaries. These species increase the conservation importance of the system.

**Description of PES components and categories (SAS, 2014 as adapted from Kleynhans, 1996, 1999): Refer to Appendix 11 for further details

Ecological Category	Index of Habitat Integrity (IHI)	WET-Health	Description
A	90-100%	0-0.9	Unmodified, natural.
B	80-90%	1-1.9	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions (and/or processes) are essentially unchanged / slight change is discernible.
C	60-80%	2-3.9	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions (and/or processes) are still predominantly unchanged.
D	40-60%	4-5.9	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions (and/or processes) has occurred.
E	20-40%	6-7.9	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions (and/or processes) is extensive.
F	0-20%	8 - 10	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions (and/or processes) have been destroyed and the changes are irreversible.

Table 13-10: Summary of the South 2 Shaft area aquatic assessment that informs the PES

Feature	Function Assessment	WET-Health Assessment	IHI Assessment (IHIA)	EIS* Assessment*	REC*
Channelled Valley Bottom River System	Moderately low	C	C/D	C	C
Upper Foothill Rivers	Moderately low	C	C	B	C

**Description of EIS and REC categories (SAS, 2014): Refer to Appendix 11 for further details

Category	EIS: Ecological Importance and Sensitivity		REC: Recommended Ecological Category
	Description	Range of Median	Description
A	Very high	>3 and <=4	Unmodified, natural
B	High	>2 and <=3	Largely natural with few modifications
C	Moderate	>1 and <=2	Moderately modified
D	Low/marginal	>0 and <=1	Largely modified

The presence of unique, endemic and protected floral species contributed significantly to the calculation of the EIS. The findings of the biodiversity assessment in the South 2 Shaft area are summarised in Table 13-10 and the Red Data species are indicated in Table 13-11. Avoiding any activity in the buffer zone beyond the proposed development footprint is deemed sufficient to maintain the PES of the various river systems, limit any further impact the proposed development could have, and ultimately achieve the REC of Class C for both river systems in the South 2 Shaft area (SAS, 2014).

Table 13-11: Summary of biodiversity assessment results in the South 2 Shaft area.

Aspect	Tubatsane and Tubatse River	Moopetsi River	Comment
Habitat and vegetation assessment	Habitat has been affected by indigenous vegetation removal, alien vegetation encroachment, bank erosion, bed and flow modifications and inundation. Anthropogenic activities contributing to the impacts include solid waste disposal and historical and current agricultural activities that include livestock farming.	Habitat has been affected by indigenous vegetation removal, alien vegetation encroachment, bank erosion, bed and flow modifications and reduction of channel sinuosity (natural curves). Anthropogenic activities contributing to the impacts include sand removal for building, grazing and livestock watering.	A large loss of natural habitat, biota and basic ecosystem functions has occurred. Habitat diversity and structure at all sites is inadequate for supporting a diverse aquatic macro-invertebrate community thus limited macro-invertebrate community can be expected in both water systems.
Aquatic micro invertebrates (SASS5)	The SASS data for the Tubatsane River indicates that the aquatic macro-invertebrate community has suffered a significant loss in integrity throughout the area when compared to the reference score for a pristine Eastern Bankenveld ecoregion system. The sites assessed classify as ecological category Class E (severely impaired) to Class F (critically impaired)	There is a decrease in community integrity in relation to the expected conditions for the site. A decline in conditions has occurred over the short term period compared to an improvement in conditions over the long term. The largest constraining factor on the aquatic community is likely to be a lack of habitat, but the negative effects of the mining activities in the area, cannot be ruled out as a contributing factor to the decline in community integrity observed over the short term.	
Aquatic Macro-invertebrates	The sites assessed classify as ecological category Class E (severely impaired) to Class F (critically impaired). Instream modifications such as sedimentation and bed modification are considered to significantly impact on the fish community in the system and interfering with fish migrations along the rivers. Water quality change is one of the chief impacts which may further affect the fish community if clean and dirty water separation is not adhered to.	Not assessed as not applicable	Drivers of ecological change within the ecoregions are; overgrazing, and dryland cultivation throughout the ecoregions, including in the riparian zone which leads to erosion, and causes high silt levels in the rivers. Increased siltation of in-stream habitats and fish gills results may lead to the loss of fish species.

13.9 Water Balance

MPM has a water balance which is updated on a monthly basis. The water balance reads the actual monthly rainfall and observed monthly water meter data and uses the average evaporation for that particular month of the hydrological year. Average rainfall and other rainfall statistics for the various wet and dry rainfall scenarios are determined from observed long-term rainfall records.

As new monthly water meter and rainfall data become available, it is inserted into the water balance and the water balance diagram is automatically updated allowing the depiction of the water balance for the new month. The average rainfall conditions are also automatically updated as more monthly rainfall data is added to the existing record.

13.10 Air Quality

The existing source of dust in the MPM area before the mine was constructed was limited to gravel roads, but since the establishment of the mine the sources of dust include:

- disturbed land associated with mining activities;
- gravel access and haul roads;
- ore and waste rock stockpiles at the decline shaft sites;
- open pits and overburden dumps;
- topsoil stockpiles at the shafts and open pits;
- conveyor belt transfer points;
- ROM pad and plant site;
- dry surfaces of the Tailings Storage Facility; and
- Ventilation Shafts.

13.10.1 Ambient air quality monitoring

A dust fallout monitoring programme has been established at MPM. The locations of these monitoring stations is described in Table 13-12 and shown in Figure 20-5. The National Dust Control Regulations (Gazette No. 3674 - GN827, 1 Nov 2013), defines two different area classifications:

- Residential areas (6 locations); and
- Non-residential areas (16 locations);

All the current monitoring sites at Modikwa Platinum Mine monitoring network did comply with the National Dust control Regulations, 2013 for the period of February 2016 to January 2017.

Table 13-12: Dust fallout monitoring locations

ID	Monitoring Point	Area Classification	Monitoring Location Coordinates	
MPM 1	T Junction	Non Residential	30° 7' 45.38" E	24° 38' 11.88" S
MPM 2	South Shaft	Non Residential	30° 8' 3.43" E	24° 38' 26.46" S
MPM 3	South of South Shaft	Non Residential	30° 7' 43.14" E	24° 39' 9.85" S
MPM 4	Concentrate Plant	Non Residential	30° 7' 10.13" E	24° 38' 28.82" S
MPM 5	North Shaft Vent Shaft	Non Residential	30° 6' 47.92" E	24° 37' 16.52" S
MPM 6	Return Water Dam	Non Residential	30° 9' 52.50" E	24° 38' 38.62" S
MPM 7	Small Flood Dam	Non Residential	30° 9' 42.57" E	24° 38' 48.51" S
MPM 8	Clinic	Residential	30° 9' 1.37" E	24° 37' 39.06" S
MPM 9	Pump Station	Non Residential	30° 9' 18.52" E	24° 37' 55.14" S
MPM 10	Training Centre	Residential	30° 7' 19.84" E	24° 38' 9.73" S

ID	Monitoring Point	Area Classification	Monitoring Location Coordinates	
MPM 11	Difagate Village	Residential	30°06'50.961"E	24°38'24.108"S
MPM 12	Dilokong Hospital	Residential	30° 10' 14.46" E	24° 37' 0.34" S
MPM 13	Montrose Village	Residential	30° 8' 40.98" E	24° 37' 0.87" S
MPM 14	Area Village	Residential	30° 10' 33.13" E	24° 37' 27.23" S
MPM 15	Merensky Open Pit	Non-Residential	30° 7'38.175"E	24°39'57.182"S
MPM 16	South 2 Shaft EMS-01 (NE)	Non Residential	30° 8'49.62"E	24°39'44.39"S
MPM 17	South 2 Shaft EMS-02 (SE)	Non Residential	30° 8'28.402"E	24°40'47.532"S
MPM 18	South 2 Shaft EMS-03 (S)	Non Residential	30° 8'05.87"E	24°40'52.068"S
MPM 19	South 2 Shaft EMS-04 (SE)	Non Residential	30° 6'57.182"E	24°40'40.127"S
MPM 20	South 2 Shaft EMS-05 (W)	Non Residential	30° 7'41.926"E	24°40'15.809"S
MPM 21	South 2 Shaft EMS-06 (W)	Non Residential	30° 7'12.234"E	24°40'59.677"S
MPM 22	South 2 Shaft EMS-07 (NW)	Non Residential	30° 7'54.119"E	24°40'11.042"S
MPM 23	South 2 Shaft EMS-08 (NW)	Non Residential	30° 7'25.647"E	24°39'25.693"S
MPM 24	Magakgapeng (Farm)	Residential	30° 6'46.55"E	24°37'38.38"S
MPM 25	Letsopeng (House)	Residential	30° 7'35.97"E	24°36'55.37"S
MPM 26	Montrose Village 01	Residential	30° 8'38.05"E	24°36'52.12"S
MPM 27	Temothuo	Residential	30° 10'55.46"E	24°37'15.18"S
MPM 28	Matimatjati Village	Residential	30° 6'55.88"E	24°40'28.02"S
MPM 29	Sewing Factory	Residential	30° 6'55.13"E	24°39'57.84"S

13.11 Noise

Noise monitoring at MPM is undertaken on an annual basis and when specifically required during new projects or as a response to complaints. The noise monitoring points and potential sensitive areas are illustrated in Figure 20-4.

13.12 Archaeological and cultural heritage

The predominant human history in the area ranges from middle and Late Stone Age sites close to Ohrigstad, Early Iron Age site close to Lydenburg and Klingbeil to Late Iron Age site stretching from Lydenburg to Nelspruit and Badplaas, the site area also consists of Colonial Era sites.

Sites found during previous and current surveys in the surrounding environment and MPM area with cultural significance include the following:

- Middle Stone Age hand axe;
- Middle Stone Age tools found in erosion dongas;
- Late Iron Age smelting furnaces, grinding stones and stone walling were identified on the farm Onverwacht 292 KT;
- A lower grinding stone;
- Early Iron Age pottery shard;
- Graves located in close proximity to South 2 Shaft WRD; and
- Culturally important trees e.g. Muhluludi, Marula, Molohe, Sycamore and Acacia were identified.

Figure 13-5 illustrates the locations of the heritage sites in the MPM area and a list of the existing heritage sites is provided in Appendix 12.



Figure 13-5: Heritage sites in the vicinity of Modikwa Platinum Mine operations

13.13 Socio-economic Structure

MPM is largely bordered by rural traditional settlements and other mining related facilities/ operations (mainly chrome and platinum).

The mine property is used by the local population for grazing of cattle and goats and wood harvesting (both medicinal and firewood purposes). The neighbouring villages and other similar villages in the larger part of the eastern region of Limpopo Province are characterized by rural to semi-rural settlements with high levels of unemployment and poverty as well as low literacy levels. Subsistence farming in these settlements is widespread. The region's economy is derived from a variety of sectors, of which mining and agriculture are the main contributors. Other important sectors include construction, trade, services and transport. The houses are well built within clearly defined yards. Access through the villages is by unpaved streets. The area has a complex socio-cultural environment.

Few big businesses are in Steelpoort and Burgersfort area, with the exception of mining operations such as MPM, ASA Metals Chrome Mine (previously Dilokong) and Smelter, and Marula Platinum Mine. This situation has caused people to migrate to the bigger towns especially Burgersfort (identified as a Provincial Growth Point) and Polokwane in search of job opportunities. This has therefore contributed to the growing number of informal settlements in the mining region.

Small enterprises characterise the main type of business activity in the villages around Modikwa which offers a range of basic consumer goods and services. This informal economic activity is also an important source of income in the villages, although by definition it is difficult to quantify income and employment generated in this informal sector.

According to census 2011 results (StatsSA), households in the seven villages were dependent on subsistence farming practices, with a minority of people employed by government and some in the surrounding mines. The census of 2011 (StatsSA) also found that close to 45% of the population was not economically active, suggesting a high dependency rate on those who were employed. Of the economically active population, 30% were employed and 21.5% unemployed.

The MPM has funded community projects such as a sewing factory and an engineering workshop. It also has progressive approaches to improving local participation in employment and procurement. Contractors, for example, are required to enter into joint ventures with local companies for at least 30% of the contract value. Contractors must also ensure that local community members are employed on their teams.

MPM has spent around R 100 million over a five year period (2009-2013) on the key identified programs in the SLP and is planning to spend in the region of an additional R 76 million over the next five years (2014-2018). MPM is committed to making effective and sustainable use of limited resources to create an environment to enable ordinary people to assume greater control of their lives.

There are seven Traditional Authority areas (TAs) in close proximity to MPM, these TAs have jurisdiction over a number of villages falling under them, and are all situated in the GTLM. These are:

- Mamphahlane Community under the leadership of Baroka ba Mamphahlane TA (Kgoshi Ralph Kgoete);
- Sehlaku Community under the leadership of Banareng TA (Kgoshi Isaac Kgwete);
- Mpuru community under the leadership of Kone Phuti TA (Kgoshi Emmanuel Mpuru);
- Maroga community under the leadership of Pulana Maroga TA (Kgoshi Sidwell Maroga);
- Diphale community under the leadership of Mohlala TA (Kgoshi Masia Mohlala);
- Seuwe community under the leadership of Tswako Mohlala TA (Kgoshi Bethuel Mohlala); and
- Matimatjatji community under the leadership of Swazi Ngobe TA (Kgoshi Joseph Nkosi).

13.14 Description of specific environmental features and infrastructure on site

MPM is an existing operating mine, with extensive existing infrastructure. MPM is divided broadly into two mining areas, namely North and South, in which North encompasses North 1 Shaft and South encompasses South 1 and South 2 shafts. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. Refer to Section 8 and Appendix 7 for details relating to the current infrastructure at MPM. No additional infrastructure will be required for the Doornbosch project.

13.15 Description of current land uses

The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT is nestled in between three hills. The hills are substantial in height and comprise rocky slopes which are well vegetated by woody vegetation and grass species.

The current land uses in the area includes arable, grazing and wilderness / conservation. The Doornbosch Mining Right surface area is located on land leased from the Hwashi-Difagate Community Trust for the land uses as indicated in the Figure 13-6 overleaf.

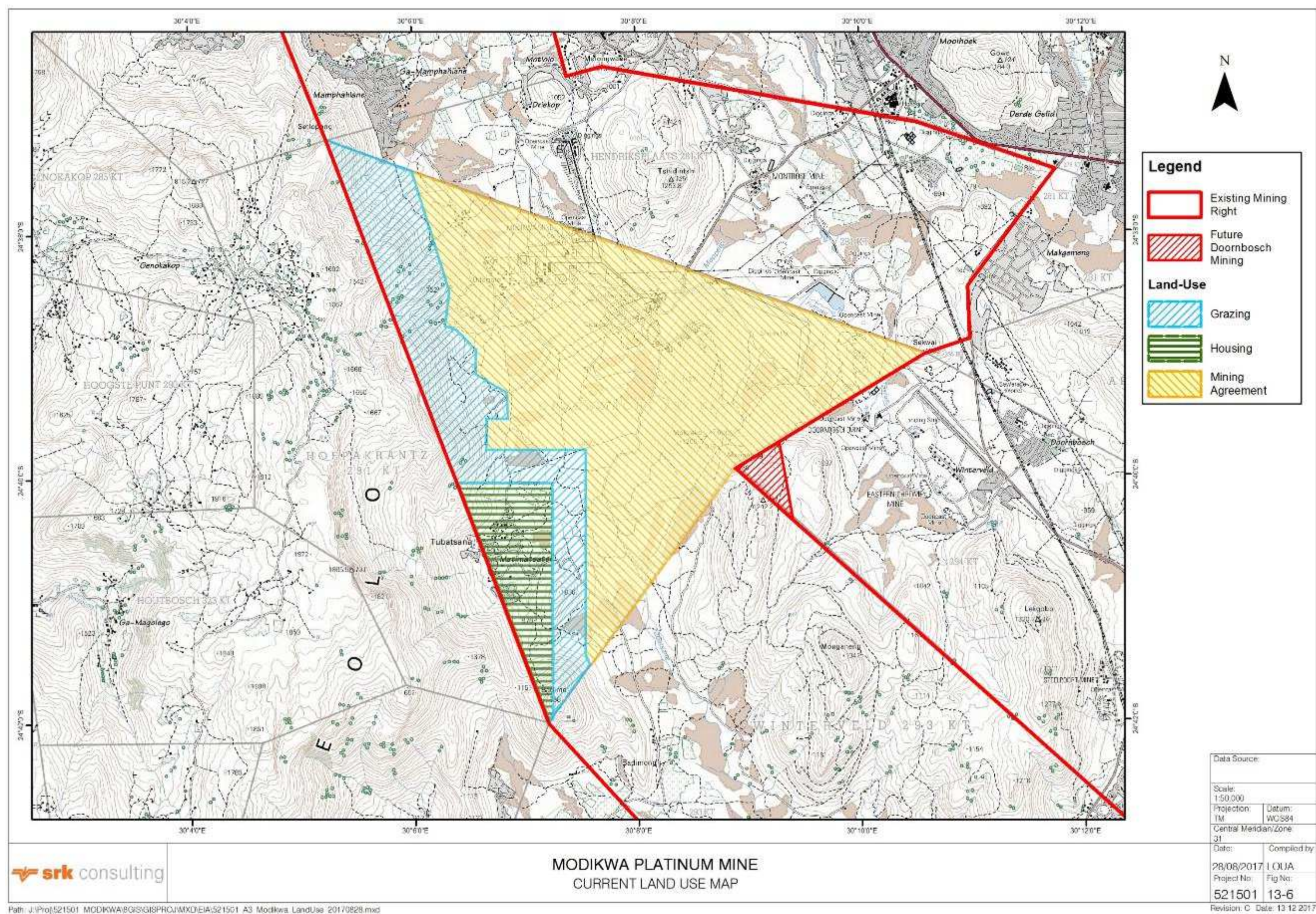


Figure 13-6: Current Land Use Map

14 Impacts Identified

The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. Therefore, the impacts associated with the Doornbosch addition is concided to be limited.

Refer to Table 14-1 for the Doornbosch project related activities. It should be noted that the impacts expected are the same as detailed in the South 2 Shaft previous EMPr, and that the same management measures will apply.

Table 14-1: Proposed Project related activities during different project phases

Project Phase	Activity
Pre-construction	<ul style="list-style-type: none"> Not Applicable – no surface infrastructure associated with the Doornbosch addition
Construction	<ul style="list-style-type: none"> Not Applicable – no surface infrastructure associated with the Doornbosch addition
Operation	<ul style="list-style-type: none"> Mining of reserve (the operation, management and maintenance of all ancillary infrastructure is covered under previously approved South 2 Shaft EMPr's)
Rehabilitation	<ul style="list-style-type: none"> Not Applicable – no surface infrastructure associated with the Doornbosch addition. All infrastructure for rehabilitation is covered under previously approved South 2 Shaft EMPr's
Post-closure	<ul style="list-style-type: none"> In line with MPM's closure and rehabilitation plan.

14.1 Groundwater

Boreholes drilled within the same geology at South 2 Shaft indicate that the deepest water strikes were observed at depths of 11 to 50 metres below surface (mbs). The piezometric surface in MMB29 (the closest borehole) is 11 mbs. Mining is anticipated to be 70 to 200 mbs and is therefore anticipated to be below the regional aquifer in the area. Deeper water strikes could be observed where there is increased fracturing along preferential pathways such as dyke contacts and/or faults. Based on the geological map, no preferential flow paths are anticipated within this area. Inflows at depths > 70 mbs, in the absence of major structures, would therefore be expected to be minimal and as such can be managed within the existing infrastructure.

14.2 Surface Water

Existing dirty water containment infrastructure at South 2 Shaft was designed to accommodate the original South 2 Shaft mine plan and associated surface infrastructure. Based on the current information, observations from South 2 Shaft and the limited Doornbosch mining area, is not anticipated that the addition of the Doornbosch Mining Right to the existing MPM Mining Right will have an impact on the receiving environment as it expected to be managed within the existing dirty water containment infrastructure.

15 The positive and negative impacts that the proposed activity and alternatives

Refer to Section 14 for impacts identified for the proposed project.

16 Possible Mitigation Measures that could be applied and the level of risk

The Doornbosch addition and consolidation project will lead to the development of a more effective environmental management tool for MPM's current operations. The updated EMPr will allow for a greater level of alignment between the different EMPrs in terms of management measures and monitoring reporting requirements. The consolidated management measures for MPM is attached as Appendix 13.

It is anticipated that the management measures associated with the South 2 shaft will be adequate to manage the impacts association with the Doornbosch addition.

It is recommended that the existing water management measures as approved for the South 2 Shaft operations continues to be implemented. If material changes to the groundwater ingress is observed during the mining of the Doornbosch area appropriate actions should be taken.

17 Motivation where no alternatives were considered

Alternatives relating to location, infrastructure and transportation were considered for the authorisation of the South 2 Shaft EMPr. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. As such, all the alternatives assessed as part of South 2 Shaft will apply. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. Hence, no property alternatives were considered for this project.

18 Statement motivating the preferred site

Alternatives relating to location, infrastructure and transportation were considered for the authorisation of the South 2 Shaft EMP. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT, will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. As such, all the alternatives assessed as part of South 2 Shaft will apply. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve. Hence, no property alternatives were considered for this project.

19 Environmental Impact Assessment

The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve and additional impacts, other than those identified in the South 2 Shaft EMPr is anticipated.

19.1 Description of Specialist Recommendations

No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right, therefore no additional specialist studies were undertaken. As part of the consolidation, the MPM measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored have been included in Appendix 13.

A summary of specialist recommendations from the original EMPr and subsequent amendments is provided in Appendix 15.

19.2 Environmental Impact Statement

19.2.1 Summary of key findings of the environmental impact assessment

Groundwater

Boreholes drilled within the same geology at South 2 Shaft indicate that the deepest water strikes were observed at depths of 11 to 50 metres below surface (mbs). The piezometric surface in MMB29 (the closest borehole) is 11 mbs. Mining is anticipated to be 70 to 200 mbs and is therefore anticipated to be below the regional aquifer in the area. Deeper water strikes could be observed where there is increased fracturing along preferential pathways such as dyke contacts and/or faults. Based on the geological map, no preferential flow paths are anticipated within this area. Inflows at depths > 70 mbs, in the absence of major structures, would therefore be expected to be minimal and as such can be managed within the existing infrastructure.

Surface Water

Existing dirty water containment infrastructure at South 2 Shaft was designed to accommodate the original South 2 Shaft mine plan and associated surface infrastructure. Based on the current information, observations from South 2 Shaft and the limited Doornbosch mining area, is not anticipated that the addition of the Doornbosch Mining Right to the existing MPM Mining Right will have an impact on the receiving environment as it expected to be managed within the existing dirty water containment infrastructure.

It is recommended that the existing water management measures as approved for the South 2 Shaft operations continues to be implemented. If material changes to the groundwater ingress is observed during the mining of the Doornbosch area appropriate actions should be taken.

A summary of all previous impact assessments associated with the MPM EMPrs are included in Appendix 14.

19.2.2 Final site map

Refer to Figure 1-1 for the location of the MPM operational area.

19.2.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Impact identification, mitigation and management measures associated with the project is included in Section 14.

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

Identified negative environmental impacts are managed and mitigated whilst positive impacts are enhanced through the implementation of the EMPr. MPM is responsible for ensuring that all environmental obligations are met. The implementation of the EMPr and meeting the environmental objectives and targets is also a responsibility of MPM.

The implementation of the environmental mitigation and management measures is monitored through the EMPr Performance Assessment process, which is reported on to the DMR.

MPM indicates that it strives to maintain a positive impact on the socio-economic environment during the life of mine. The mine is actively involved in the community whereby funds are made available for the development of local infrastructure and social upliftment.

19.2.5 Final proposed alternatives.

The project relates to the addition of the Doornbosch Mining Right to the existing MPM Mining Right, and as such no preferred sites were applicable. The location of the proposed project is constrained to the location of the mineral resource, and proven reserve.

Alternatives with regards to location, infrastructure and transportation were considered for the authorisation of the South 2 Shaft EMPr. The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. As such, all the alternatives assessed as part of South 2 Shaft will apply.

19.2.6 Aspects for inclusion as conditions of Authorisation.

The Environmental Authorisations MPM obtained in 2009 and 2014 must be adhered to. For the Doornbosch Mining Right addition, ongoing water quality and quantity reporting in line with the existing monitoring plan as well as the implementation of the Social and Labour Plan is deemed sufficient to adequately manage the associated impacts.

19.2.7 Description of any assumptions, uncertainties and gaps in knowledge.

The main assumption made during the compilation of the consolidated EMPr and the Doornbosch amendment is that the data used to develop the original EMPr and subsequent amendments to the EMPr is correct and will remain unchanged.

During the impact assessment phase of previous EMPrs, all specialists conducted their individual specialist assessment and compiled the relevant specialist reports. However, during the compilation and assessment of their studies, some specialists have identified gaps within the data they worked with, or highlighted some assumptions made during their discussion of their results or discussed some limitations to their studies. These assumptions still apply to the consolidated EMPr.

The groundwater model was not updated for the Doornbosch addition. The impact identification in terms of groundwater was based on current historical data with regards to water volumes currently being pumped by the mine for safe working conditions associated with the approved mining of South 2 Shaft. Existing groundwater and geology reports associated with the existing South 2 Shaft were referred to for context.

All assumptions and information gaps from the previously approved EMPs for MPM still apply.

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

The addition and mining of the Doornbosch Mining Right within the existing MPM Mining Right should proceed as the mining right is underground and no additional surface infrastructure will be constructed. With the necessary mitigation measures in place, and provided the management recommendations outlined in this report are implemented, no additional impacts on the environment are anticipated. Furthermore, utilisation of the already authorised and existing South 2 Shaft infrastructure allows for the operation to economically and optimally utilise the resource. Should mining not occur now through the existing South 2 Shaft infrastructure and in future access through South 2 Shaft potentially becomes limited, there is a risk that additional surface infrastructure may be required to access Doornbosch, which will lead to additional impacts on the environment.

Given the absence of significant alternative employment opportunities in the area, mining at MPM is considered to be in the best interest of the public at large as it generate economic benefit locally, regionally and internationally.

The socio-economic benefits at a local scale in terms of retaining the existing workforce and regional economy for the ongoing implementation of the SLP is considered to be positive.

19.2.9 Period for which the Environmental Authorisation is required

The EA is required to be in line with MR Approval in line with the MPRDA, for which end of Life of Mine is 2043.

19.2.10 Undertaking

The undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to the Environmental Management Programme report. The EA is required to be in line with MR Approval in line with the MPRDA, for which end of Life of Mine is 2043.

19.3 Financial Provision

The mining of the Doornbosch area will not increase the existing liability associated with MPM's operations as no additional surface infrastructure will be constructed. The MPM liabilities for 2017 were calculated using the DMR methodology and amounts to R 194,703,893.

The liability will be funded through the purchase of an appropriate bank guarantee. The annual cost of servicing the guarantee will be budgeted for in the operational budget and will be carried by MPM, until such time the mine is closed.

19.4 Deviations from the approved scoping report and plan of study.

There are no deviations as reported in the final approved scoping report.

19.5 Other information required by the Competent Authority

19.5.1 Impact on the socio-economic conditions of any directly affected person.

The socio-economic benefits at a local scale in terms of retaining the existing workforce and regional economy for the ongoing implementation of the SLP is considered to be positive.

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

Given that the proposed project comprises underground mining of the Doornbosch Mining Right reserve, no impacts are anticipated on sites of historical and cultural importance.

19.5.3 Other matters required in terms of Sections 24(4)(a) and (b) of the Act

Not Applicable.

20 Part B: Environmental Management Programme Report

20.1 Details of EAP

The EAPs involved in the compilation of this EMPr consolidation Report and their contact details are provided in Table 20-1 below.

Table 20-1: EAP Contact Details

EAP Name	Contact Number	Fax Number	Email Address
Darryll Kilian	011 441 1111	086 506 1737	dkilian@srk.co.za
Franciska Lake	011 441 1111	086 555 0886	flake@srk.co.za
Natasha Anamuthoo	011 441 1111	086 296 6617	nanamuthoo@srk.co.za
Estie Retief	011 441 1111	086 503 2498	eretief@srk.co.za
Helen Mushiane	011 441 1111	086 506 3365	hmushiane@srk.co.za

20.2 Description of the Aspects of the Activity

Refer to Section 8 of the report that detailed the aspects related to this activity.

20.3 Composite Map

Refer to Figure 1-1 for the location of the MPM operational area. The current activities and infrastructure at MPM as well as the status of the activities is given in Table 8-1 and shown in Figure 8-1. It is also shown in Appendix 10.

20.4 Description of Impact management objectives including management statements

During the amendment of the MPM EMPr to include the activities associated with the mining of the Doornbosch reserve, the original EMPr and the amendments to the EMPr was consolidated into a single document, which involved the collation of the original EMPr (as approved in 2001) and a number of EMPr amendments, which were developed and approved for additional activities not included in the original EMPr. A detailed list of all impact management measures as approved, are provided for in Appendix 14.

20.5 Determination of closure objectives

The mining of the Doornbosch area will be in line with the current closure objectives for MPM as no additional surface infrastructure will be constructed.

The main objective of closure will be to rehabilitate the areas disturbed by mining activities to an acceptable end land-use as per prior commitments made for each existing and approved EMPrs (refer to Section 13):

- All surface infrastructure, with the exception of infrastructure determined to be required for residual pollution control at the TSF and WRDs to remain in situ, must be removed from the MPM site;
- Agricultural potential should be suitable for low intensity grazing purposes;
- Vegetation across the rehabilitated footprint must be established and self-sustaining;
- Promote biodiversity and biological sustainability to the maximum extent practicable;
- Dust generated from the WRDs, TSF and denuded areas, prior to vegetation establishment, must adhere to applicable limits (currently the National Dust Control Regulations, GNR827 of 2013);

- The soil must be considered uncontaminated according to applicable legislation (currently Part 8 of Chapter 4 of the National Environmental Management: Waste Act, No. 59 of 2008 (NEMWA);
- Water management infrastructure to remain in situ post-closure for residual pollution control must meet the requirements of GN704 of 1999;
- Ensure that all disturbed riparian features are rehabilitated to ensure that the functions of the riparian features are re-instated and the pre-mining Present Ecological State of the riparian features is restored or improved;
- The rehabilitated landform must be free draining and adhere to applicable best practice in terms of water management for mine closure (currently the 2006 DWA Best Practice Guideline);
- Runoff and seepage from rehabilitated areas must not exceed the discharge water quality limits specified in the issued water use licence and any subsequent amendments, as applicable; and
- The rehabilitated areas must ultimately be rendered safe for the nearby communities and animals, for the foreseeable future in compliance with relevant standards (currently the Occupational Health and Safety Act No. 85 of 1993 and relevant Regulations).

20.6 Potential risk of acid mine drainage

The mineralogy indicate that no potentially acid forming sulphidic minerals are detected. This was confirmed through the Acid Base Accounting which indicated that the samples contain an excess of neutralising minerals relative to potentially acid forming minerals indicating that the samples geochemically classify as non-acid forming.

20.7 Has a water use licence has been applied for?

MPM operates under an approved Water Use License (WUL), previous issued WULs in 2007, 2010 and 2016 have been superseded by the current 2017 WUL No 04/B41J/ABCDEFGHIJ/4312 issued on the 11th of October 2017.

Based on the current information, observations from South 2 Shaft and the limited Doornbosch mining area, is not anticipated that the addition of the Doornbosch Mining Right to the existing MPM Mining Right and the associated mining of the reserve will require further authorisation in terms of the NWA.

20.8 Impacts to be mitigated in their respective phases

The Doornbosch Mining Right associated with portion 2 of the farm Doornbosch 294 KT will be mined as an extension of the existing MPM South 2 Shaft operations through the existing South 2 Shaft infrastructure. No additional surface infrastructure will be required as a result of the mining of the reserve associated with the Doornbosch Mining Right. The Doornbosch addition will relate only to the underground mining of the reserve, in line with MPM's approved Mining Works Programme (MWP).

20.9 Financial Provision

The mining of the Doornbosch area will not increase the existing liability associated with MPM's operations as no additional surface infrastructure will be constructed. The MPM liabilities for 2017 were calculated using the DMR methodology and amounts to R 194,703,893.

The liability will be funded through the purchase of an appropriate bank guarantee. The annual cost of servicing the guarantee will be budgeted for in the operational budget and will be carried by MPM, until such time the mine is closed.

The environmental objectives relating to closure have been included in the Draft EIA/EMPr report that will be made available to registered interested and affected parties for public review.

20.10 Rehabilitation Plan

The mining of the Doornbosch area will not increase the existing liability associated with MPM's operations as no additional surface infrastructure will be constructed. The MPM liabilities for 2017 were calculated using the DMR methodology and amounts to R 194,703,893.

The liability will be funded through the purchase of an appropriate bank guarantee. The annual cost of servicing the guarantee will be budgeted for in the operational budget and will be carried by MPM, until such time the mine is closed.

The final rehabilitation plan will only be developed once sufficient information is achieved from the monitoring of areas where rehabilitation concurrent with mining activities has been undertaken. The learnings from the areas already rehabilitated will be utilised to inform scientifically sound, safe and technically feasible solutions to achieving the rehabilitation objectives. The intention of the plan will be to achieve the objectives in Section 20.5.

20.11 Future land use after decommissioning

The closure objectives have already been determined by way of the existing and approved EMPs and ultimately limited the closure alternatives available. All surface infrastructure, with the exception of infrastructure determined to be required for residual pollution control, must be removed from the MPM site. However, as an alternative to the above, MPM will consider the Local Economic Development (LED) strategy for the area, and will take into account the potential benefits of leaving useful infrastructure (i.e. roads, power lines and sewage treatment plants) in place post-closure for use by the surrounding communities. MPM will also consider alternative uses for surface infrastructure e.g. office buildings which can be converted to a clinic. An application to the DMR will be made to transfer the responsibility regarding maintaining the sewage plants, tarred roads and services to the relevant authority after a closure certificate is issued.

20.12 Monitoring Plan

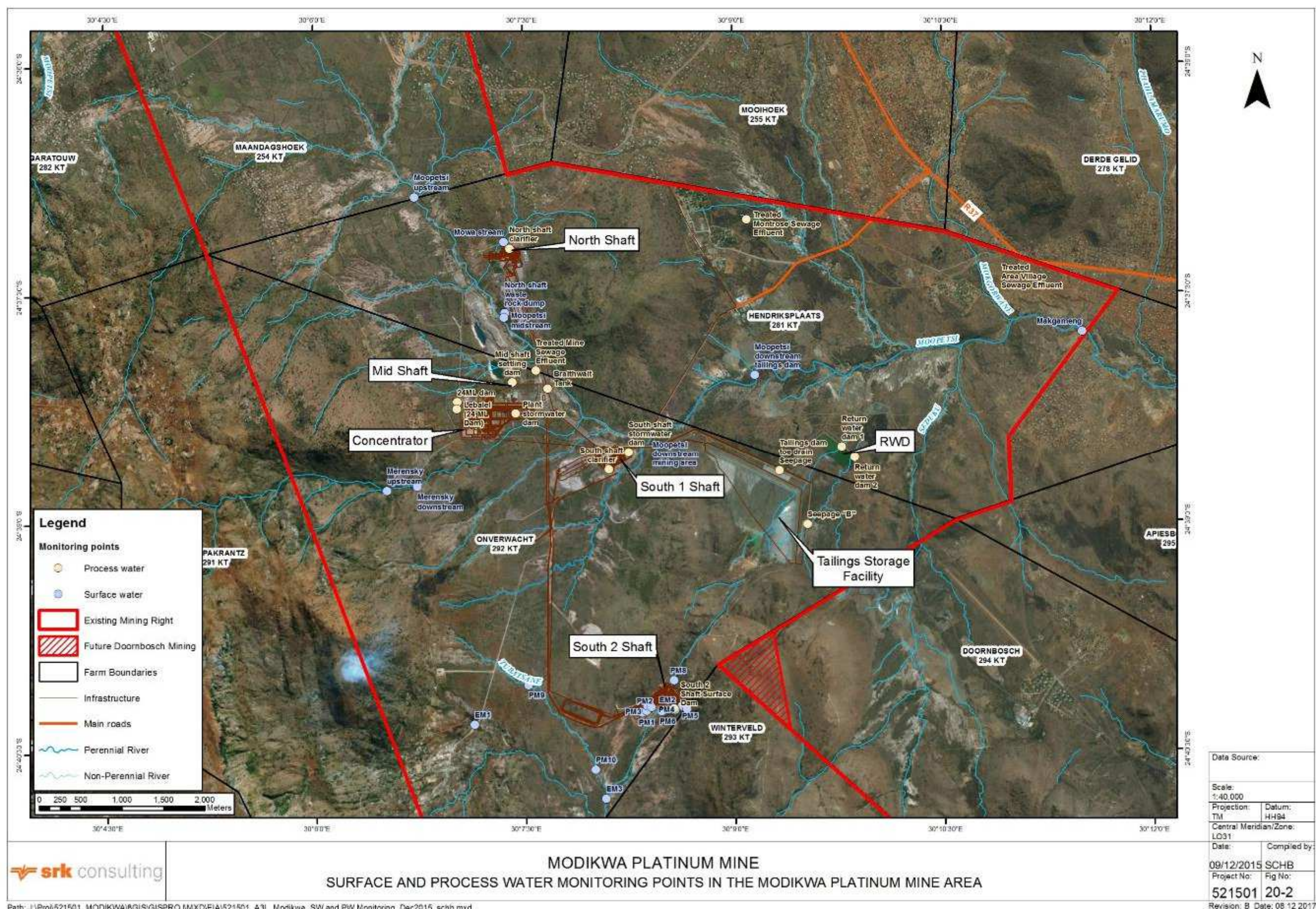
On-going environmental monitoring is being conducted at the MPM as indicated in the remainder of this section. These points may however vary based on management requirements, additional infrastructure requirements, closing and care and maintenance of infrastructure, and requirements in terms of the WUL.

A formal audit of the performance assessment of the EMP will take place every year as stipulated in the MPM EMP Environmental Authorisations.

20.12.1 Monitoring Requirements

20.12.2 Surface Water

Surface Water Monitoring is undertaken according to South African National Standards (SANS) and DWS WUL requirements on a monthly basis at the monitoring points provided in Table 13-3 and Table 13-3 these points are indicated in Figure 20-2.



20.12.3 Biomonitoring

Biomonitoring at MPM is undertaken biannually at seven points when flow is available. The biomonitoring points are presented in Figure 20-2 and details are provided in Table 13-5.

20.12.4 Toxicity testing

Toxicity testing of process water in order to quantify the risk that the mine's process water poses to the environment was initiated at the return water dam in 2009 and is conducted biannually. An additional site was initiated in the South 2 Shaft area in 2013. The suite of toxicological tests includes the daphnia (*Daphnia pulex*), the guppy test (*Poecilia reticulata*), Bacterial bioluminescence (*Vibrio fischeri*) and Algal growth (*Selenastrum capricornutum*). The toxicity testing points are illustrated in Figure 20-2 and described in Table 13-6.

20.12.5 Groundwater

Monitoring: Groundwater

Groundwater monitoring is undertaken at the locations specified in Table 13.7 and Figure 20-3.

20.12.6 Water Reporting Requirements

Reporting requirements are proposed as follows:

- It is the responsibility of the appointed person(s) to ensure that extensive records are kept of all inspections of water management control structures. These records are to include photographs, observations made and any remedial actions required as part of the monitoring, inspection and maintenance regime;
- Water quality monitoring results are also to be recorded in a format that allows a clear and concise review and comparison with baseline and historical data for the project. In the event that an exceedance is recorded then the contingency plan will be enacted to attempt to manage the factors contributing to the water quality impact;
- Environmental performance will be reported in accordance with the WUL and included in the Annual Water Report to DWS;
- Any incidents that cause water or environmental pollution or have the potential to water or environmental pollution will be reported to DWS as soon as possible (within 24 hours) as per the relevant WUL condition;
- Data from water quality and flow monitoring will be assessed against the applicable limits in and subjected to trend analysis and waste load calculations.
- During decommissioning and closure, water level data will be collected to assess groundwater rebound post closure. It is recommended that monitoring be continued for at least three years after closure of the WRD or as specified in the approved closure plan;
- Should any concerning trends become evident, measures to minimise the impact should be investigated and implemented as appropriate;
- If changes in bio-monitoring, wetland assessment data from baseline condition can be attributed to water quality contamination the above steps will be followed. If changes are attributed to other factors the source of the changes will be investigated and the necessary correct action implemented;
- Solid waste monitoring in the form of recorded disposal volumes, all waste removal documents, waste manifests and certificates of safe disposal will be kept for audit purposes for at least the life of mine or as required by legislation; and
- Monitoring data and actions carried out in response to the data are reported on a monthly basis to mine management. Reporting of water quality monitoring data to DWS is done through the annual water report. The reporting frequency in future will be in accordance with the WUL.

20.12.7 Noise Monitoring

Noise levels are monitored throughout MPM to assess the noise levels in relation to the recommended noise levels as tabulated in Table 20-2.

Table 20-2: Recommended noise levels for specific noise areas (SANS 10103 of 2008)

Noise Area/Zone	Equivalent continuous rating level ($L_{Req,T}$) for ambient noise - dBA					
	Outdoors			Indoors, with open windows		
	Day-night L_{Rdn}	Daytime L_{Reqd}	Night-time L_{Reqn}	Day-night $L_{R,dn}$	Daytime $L_{Req,d}$	Night-time $L_{Req,n}$
Industrial districts	70	70	60	60	60	50
Rural District	45	45	35	35	35	25

The coordinates of the noise monitoring points are listed in Table 20-3 and are illustrated in Figure 20-4.

Table 20-3: Noise measuring positions

Position	Coordinates	
1	30° 8' 24.54" E	24° 38' 29.10" S
2	30° 8' 9.24" E	24° 38' 29.94" S
3	30° 7' 44.52" E	24° 38' 13.62" S
4	30° 7' 39.36" E	24° 39' 13.20" S
5	30° 7' 15.96" E	24° 39' 58.26" S
6	30° 7' 9.84" E	24° 40' 17.34" S
7	30° 6' 57.54" E	24° 40' 30.18" S
8	30° 7' 36.72" E	24° 40' 57.96" S
9	30° 7' 51.96" E	24° 40' 34.02" S
10	30° 8' 22.80" E	24° 41' 16.86" S
11	30° 8' 49.14" E	24° 40' 10.98" S
12	30° 7' 52.98" E	24° 43' 26.76" S
13	30° 10' 24.42" E	24° 36' 42.42" S
14	30° 9' 54.90" E	24° 37' 5.88" S
15	30° 8' 41.40" E	24° 37' 5.94" S

During the operational phase, noise monitoring is recommended to occur on a bi-annual basis, at the recommended points.

20.12.8 Soils Monitoring

Monitoring and maintenance

Ongoing evaluation of the nutrient status of the growth medium is needed throughout the life of the mine and into the rehabilitation phase.

During the rehabilitation exercise preliminary soil quality monitoring must be carried out to accurately determine the fertiliser requirements that will be needed. Additional soil sampling should also be carried out annually until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth.

20.12.9 Air Quality

A dust monitoring programme is undertaken on a monthly basis at MPM, the locations are shown in Figure 20-5 and described Table 13-12.

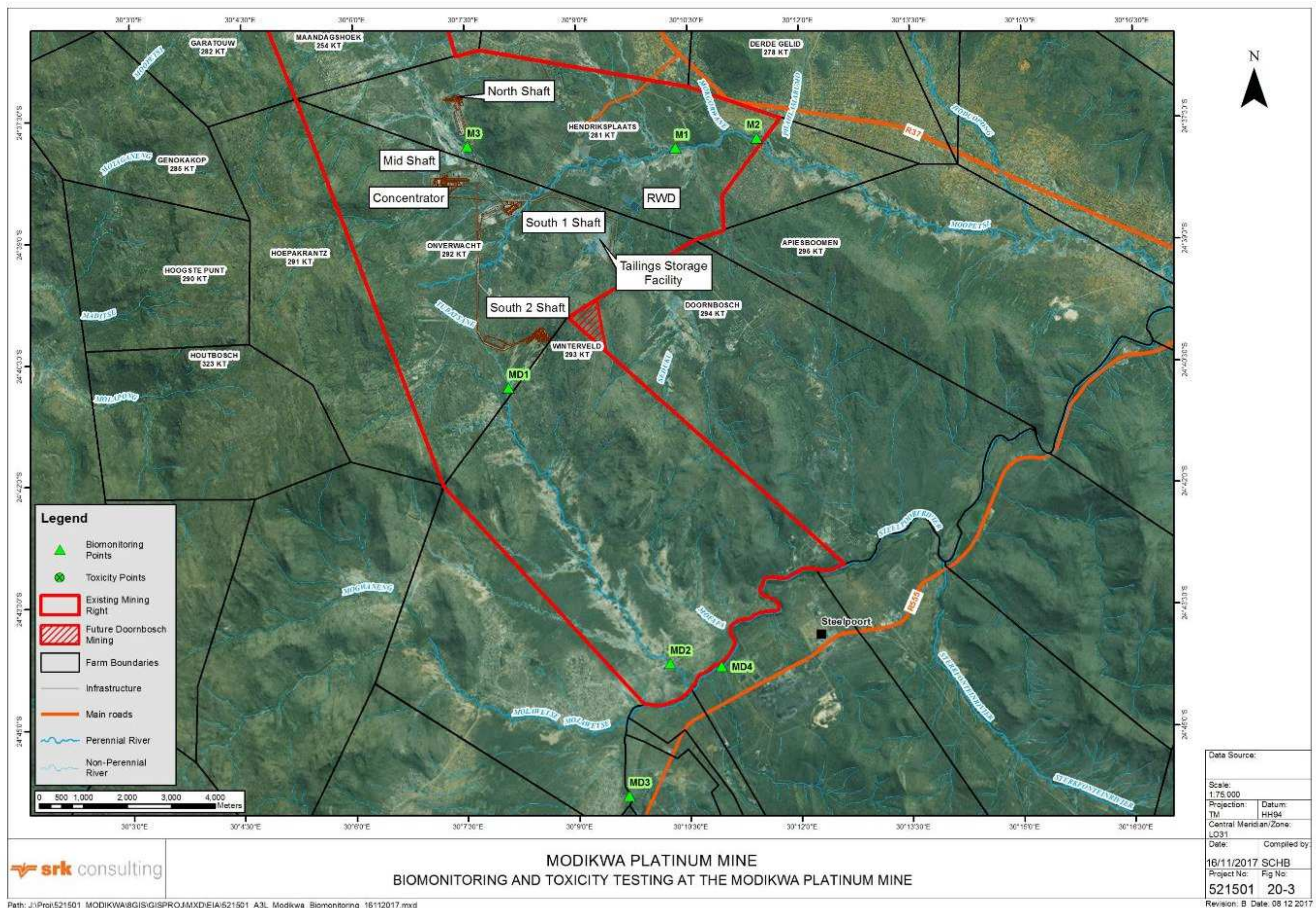


Figure 20-2: Biomonitoring and toxicity testing locations associated with Modikwa Platinum Mine

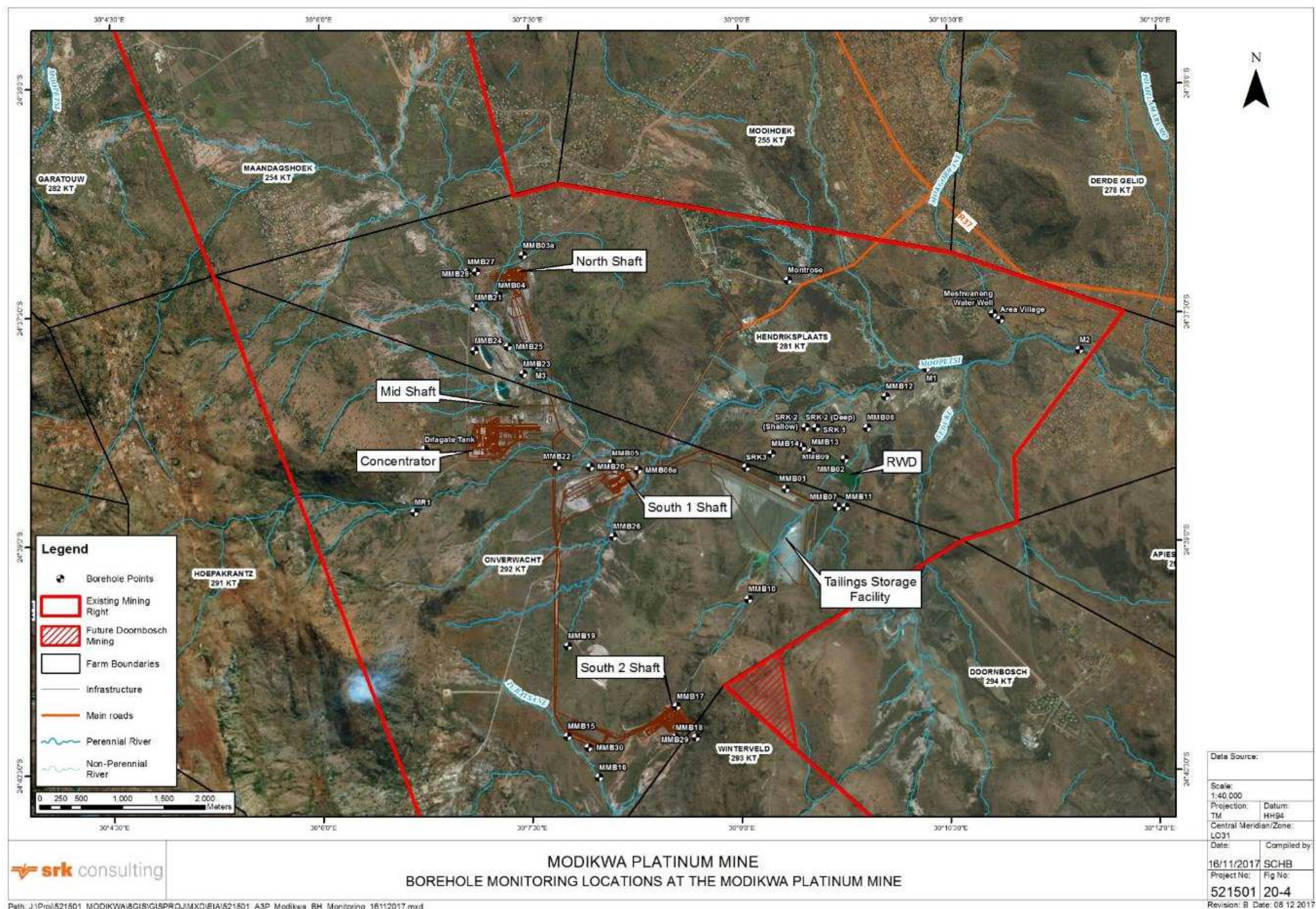


Figure 20-3: Borehole monitoring locations associated with Modikwa Platinum Mine

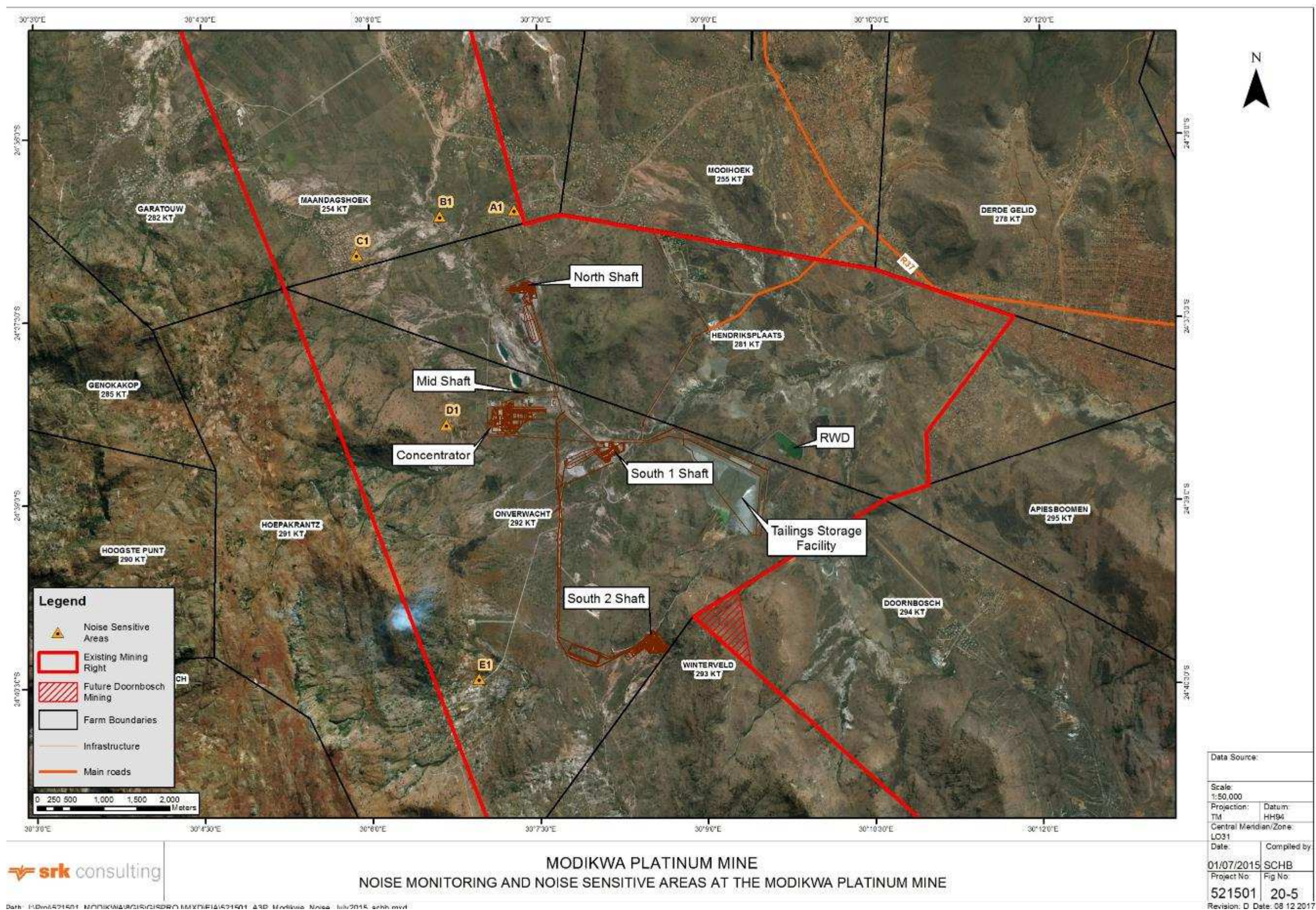


Figure 20-4: Noise monitoring points and noise sensitive areas associated with Modikwa Platinum Mine

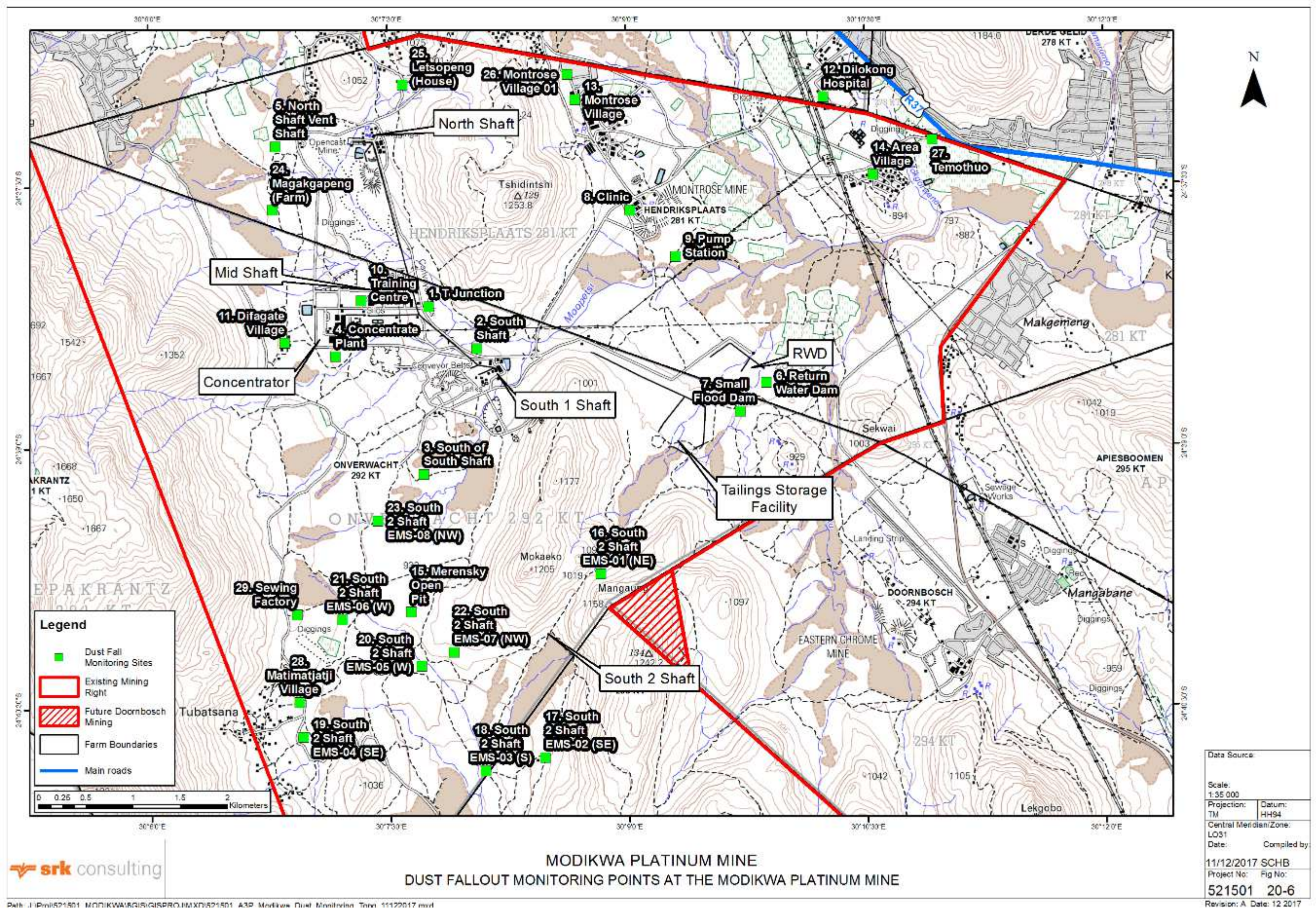


Figure 20-5: Dust fallout monitoring points associated with Modikwa Platinum Mine

20.12.10 Biodiversity

Monitoring associated with biomonitoring is provided below and include the monitoring of flora, fauna, riparian areas and biomonitoring.

Floral Data Capturing

Monitoring should occur on an annual basis in the summer growing season. In order to ensure that temporal comparisons can be made assessments should take place at the same time each year.

Faunal Data Capturing

Monitoring should occur every two years in the summer season. In order to ensure that temporal comparisons can be made assessments should take place at the same time each year.

Riparian Data Capturing

Monitoring should occur on an annual basis in the summer growing season. In order to ensure that temporal comparisons can be made assessments should take place at the same time each year.

Aquatic Biomonitoring and toxicological

Biomonitoring and toxicological testing should be undertaken twice a year at the points indicated in the baseline biodiversity description.

20.12.11 Post rehabilitation monitoring and maintenance

The objective of the monitoring program will be to track the recovery of the mine area towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring program will be designed to collect information to demonstrate that the relinquishment criteria have been achieved. The anticipated monitoring will include:

- Surface Water – Quality monitoring against parameters as required by the WUL. Sampled monthly for a three-year post-closure period;
- Groundwater – Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a three year post-closure period;
- Erosion monitoring. This will take the form of developing a representative reference site on both footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a three year post-closure period;
- Vegetation establishment: Vegetation will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, for a three year post-closure period; and
- Photographic records should be maintained together with findings, follow up actions and close out records as part of the MPM Environmental Management System.

20.13 Indicate the frequency of the submission of the performance assessment report

The MPRDA Record of Decision (RoD) stipulates that annual audits should be conducted.

20.14 Environmental Awareness Plan

MPM operates under ISO 14001 Environmental Management System (EMS), which requires that the organisation shall identify training needs, and that all personnel whose work may create a significant impact upon the environment will receive appropriate training. This procedure details the approach to identification of training and development needs and the types of environmental training available at MPM.

The environmental awareness plan applicable to the MPM is attached in Appendix 16 of this report

20.15 Specific information required by the Competent Authority

MPM commit to undertake the following actions with regards to ongoing identification and management of impacts relating to their operational activities:

- Annual Performance Assessment Reviews;
- Annual update of groundwater model;
- Annual update of Financial Provision for Closure; and
- Ongoing monitoring of:
 - Water quality
 - Dust/air quality
 - Noise quality
 - Soils
 - Biomonitoring
 - Post rehabilitation
 - Biodiversity
 - Toxicity Testing

20.16 Undertaking Regarding Correctness of Information.

I Helen Mushiane herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

SRK Consulting – Certified Electronic Signature
 **srk consulting**
521501/43123-Report
932-2411-5017-M.U.S.
This signature has been printed digitally. The Authority given permission for its use for this document. The details are stored in the SRK Signature Database.

Signature of the EAP

DATE: 23/01/2018

I Estie Retief herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

SRK Consulting - Certified Electronic Signature
 *Estie Retief*
521501/43120/Report
9725-2000-6257-RETE
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database

Signature of the EAP

DATE: 23/01/2018

I Franciska Lake herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

SRK Consulting - Certified Electronic Signature
 *Franciska Lake*
521501/43120/Report
8715-2168-7792-LAKF
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database

Signature of the EAP

DATE: 23/01/2018

21 Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no prior association with MPM in regard to the mineral assets that are the subject of this Report. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

22 Conclusions and Recommendations

SRK Consulting has undertaken the required environmental authorisation process for MPM to amend and consolidate their EMPr, to include the activities associated with the Doornbosch Mining Right, granted in terms of Section 102 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

During the amendment of the MPM EMPr to include the activities associated with the mining of the Doornbosch reserve, the original EMPr and the amendments to the EMPr have been consolidated into a single document. The consolidation process involved the collation of the original EMPr approved in 2001, and a number of EMPr amendments, which were developed and approved for additional activities not included in the original EMPr.

The process included a stakeholder engagement process which sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process

To date, there are no flaws that have been identified with regards to the proposed mining of the proposed Doornbosch resource. It is anticipated that the existing management measures associated with the South 2 shaft will be adequate to manage the impacts associated with the mining of the Doornbosch resource. If material changes to the groundwater ingress is observed during the mining of the Doornbosch resource, it is recommended that appropriate actions should be taken

It is recommended that the proposed mining of the Doornbosch resource is allowed to proceed, considering the positive social impacts associated with the project.

Prepared by

SRK Consulting - Certified Electronic Signature
 **srk consulting**
521501/43120/Report
932-2411-4077-MUSH
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database.

Helen Mushiane
Environmental Scientist

SRK Consulting - Certified Electronic Signature
 **srk consulting**
521501/43120/Report
9725-2000-6257-RETI
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database.

Estie Retief
Environmental Scientist

Peer Reviewed by

SRK Consulting - Certified Electronic Signature
 **srk consulting**
521501/43120/Report
8718-2188-7792-LAKE
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database.

Franciska Lake
Principal Environmental Scientist

Reviewed by

SRK Consulting - Certified Electronic Signature
 **srk consulting**
521501/43120/Report
5765-8795-6694-KILI
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database.

Darryll Kilian
Partner

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

23 References

Maandaghoek Platinum project, Environmental Management Programme Report, volume 2 : Metago Environmental Engineers (Pty) Ltd, July 2000

Maandaghoek Platinum project, Environmental Management Programme Report, volume 3: Metago Environmental Engineers (Pty) Ltd , July 2000

Maandaghoek Platinum project, Environmental Management Programme Report, Amendment 1: Metago Environmental Engineers (Pty) Ltd, May 2001

EMPR Amendment to the Modikwa Platinum Mine, EMPR for the inclusion of the surface Winze Project: Metago Environmental Engineers (Pty) Ltd, August 2002

Approval of the Environmental Management Programme: Addendum to the Modikwa Mine EMP for prospecting purposes: Modikwa Platinum Mine: Department of Minerals and Energy Limpopo Region, 2003

Environmental Management Programme Report amendment for the reclamation of a small dump: Metago Environmental Engineers (Pty) Ltd, September 2003

Maandaghoek Platinum project, Environmental Management Programme Report: Metago Environmental Engineers (Pty) Ltd, September 2000

EMPR amendment for Modikwa Platinum Mine for the extension of surface infrastructure at the Hill mining operation: Metago Environmental Engineers (Pty) Ltd, February 2003

EMPR amendment for Maandagshoek Winze : Metago Environmental Engineers (Pty) Ltd, April 2003

Addendum to approved EMPR: Modikwa Platinum Mine expansion projects on the farm Onverwacht 292 KT: South 2 Shaft, Open pit, New fine residue deposit, Merensky adit and Chrome extraction plant. Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMP): Gudani Consulting, September 2008.

Amendment to Environmental Management Programme – proposed expansion projects: UG2 open pit mining, Crusher plant & access road farm Onverwacht 292 KT and Henrikplaats 281 KT Greater Tubatse Local Municipality: Gudani Consulting, September 2009

Modikwa Platinum Mine Integrated Water and waste Management Plan: SRK Consulting, February 2015

Appendices

Appendix 1: EAP Qualifications

Appendix 2: EAP CV's

Appendix 3: Locality Map

Appendix 4: Listed Activity Map

Appendix 5: MPM Mining Right and Prospecting Right

Appendix 6: Windeed

Appendix 7: Surface Infrastructure

Appendix 8: MPM pipeline Layout

Appendix 9: Stakeholder Engagement

Appendix 9-1

I & AP Database

Appendix 9-2

Attendance Registers

Appendix 9-3

Public Participation Presentation

Appendix 9-4

Background Information Document

Appendix 9-5

Advertisements

Appendix 9-6

Site notices (Announcement)

Appendix 9-7

Stakeholder Letters (DSR)

Appendix 9-8

Site Notice (DSR)

Appendix 9-9

Photos (DSR)

Appendix 9-10

Email of availability of DSR

Appendix 9-11

Stakeholder Letter (Draft EIA/EMPr)

Appendix 9-12

Notices (Draft EIA EMPr)

Appendix 9-13

DMR Communication

Appendix 9-14

Comments and Responses Report

Appendix 10: MPM Master Map

Appendix 11: Removal of Trees permit

Appendix 12: Summary of Heritage Sites

Appendix 13: Management Measures

Appendix 14: Summary of impacts

Appendix 15: Summary of specialist recommendations

Appendix 16: Environmental Awareness Plan

SRK Report Distribution Record

Report No.

521501

Copy No.

Name/Title	Company	Copy	Date	Authorised by
James Ndou	Modikwa Platinum Mine security office	1	23/01/2018	Darryll Kilian
James Ndou	Modikwa Clinic	2	23/01/2018	Darryll Kilian
James Ndou	Modikwa South 2 Shaft	3	23/01/2018	Darryll Kilian

Approval Signature:



This report is protected by copyright vested in SRK (South Africa) (Pty) Ltd. It may not be reproduced or transmitted in any form or by any means whatsoever to any person without the written permission of the copyright holder, SRK.