AIRSHED PLANNING PROFESSIONALS (Pty) Ltd

Reg. No.: 2002/023269/07

30 SMUTS DRIVE
HALFWAY GARDENS
P O BOX 5260, HALFWAY HOUSE, 1685

TEL +27 (0)11 805 1940
FAX +27 (0)11 805 7010
e-mail hanlie@airshed.co.za

Ref: MEE/11/23 I001-59

25 November 2011

Impala Platinum Shafts Project: Specialist Opinion

Airshed Planning Professionals (Pty) Ltd was requested by SLR Consulting Africa (Metago) to provide a specialist opinion on the air quality impacts from the proposed vertical shaft complexes (No 18 and 19) at Impala Platinum near Rustenburg. Shaft No 19 is located approximately 4 km north east from the proposed tailings storage facility (TSF) and shaft No 18 is located approximately 8 km to the north of the TSF. A number of informal settlements have been identified in close proximity to shaft No 19, with some located approximately 1 km to the north east and some ~1.5 km to the south west.

Airshed conducted an air quality impact assessment of Impala No 16 Shaft in 2004 (Venter and Liebenberg-Enslin, 2004) and a qualitative impact assessment for the proposed No 17 Shaft in 2006 (Petzer and Liebenberg-Enslin, 2006). A comprehensive air quality impact assessment, including a baseline study, was recently conducted for the entire Impala Platinum operations (Liebenberg-Enslin and Krause, 2011). These studies provide the basis for a qualitative impact assessment of the proposed vertical shaft complexes (No 18 and 19).

1. Background Data

Typical sources of emissions from a shaft include:

- Vent emissions (NOx, CO and particulates);
- Materials handling operations (e.g. tipping of waste rock and ore);
- Vehicle activity on paved and unpaved roads; and
- Wind erosion from exposed working surfaces (e.g. waste rock dumps).

Such dust emissions constitute both nuisance value, mainly in the immediate area of the source (large particle deposition) and potential increased health impacts (small, inhalable particles).

All emissions included in the impact assessment for Impala No 16 Shaft are listed in Table 1. It is assumed that the sources of emissions will be similar for Shafts No 18 and 19, and therefore the impacts should be similar.

The main findings from the Shaft No 16 project are as follows:

- Ground level PM_{10} concentrations predicted to occur at the closest community to No 16 Shaft (i.e. Kanana, located ~ 500 m east of the shaft) were 0.4 µg/m³ and 0.05 µg/m³ for highest daily and annual averages, respectively. These are very low, comprising less than 1 % of the National Ambient Air Quality Standards (NAAQS) for 2015 of 75 µg/m³ (daily) and 40 µg/m³ (annual).

- Dust fallout is predicted to be 1 mg/m²/day which is insignificant in comparison to the proposed SA Standard for dustfall of 600 mg/m²/day for residential areas.

The main findings from the Impala baseline assessment are as follows:

- Measured ambient PM_{10} concentrations indicate non-compliance of the NAAQS (2015) of 75 µg/m³ with 4 allowable exceedances per year and 40 µg/m³ over an annual average, at all the monitoring stations.

- Predicted deposition rates, on average, are below the industrial limit of 1 200 mg/m²/day and the residential limit of 600 mg/m^2/day at most of the sensitive receptors.

2. Qualitative Air Quality Assessment

Based on the findings from previous Shaft studies and the known baseline at Impala Platinum, the following conclusions can be reached:

- Even though the throughputs are more or less double that of Shaft No 16, concentrations and dust fallout should be similar for the sensitive receptors located near No 19 Shaft, since these residences are about 3 times further (1.5 km) away.

- Given the expected impacts from the two new shafts, the baseline situation should not be materially changed except for unpaved access roads running past residential houses. Was no mitigation on these roads, the impacts on the nearby houses may be an acceptably high.

Table 1: Activities, aspects and their associated mitigation measures identified for the operations at No 18 and No 19 Shafts.

<table>
<tr><th>ASPECT</th><th>SOURCE</th><th colspan="2">ACTIVITY</th><th>COMMENTS/ ASSUMPTIONS</th></tr>
<tr><td colspan="5">Routine operations</td></tr>
<tr><td rowspan="5">Fugitive dust, gaseous emissions</td><td rowspan="5">Shaft Vent</td><td colspan="2">Vent dimensions:
• Diameter (inner): 3 m, dimensions: 3 m × 3 m
• Height: 7 m
• Gas exit rate: 900 kg/s
• Gas exit temperature: 20 ºC</td><td>Typical dimensions as taken from Shaft No 16 report (Venter and Liebenberg-Enslin, 2004)</td></tr>
<tr><td colspan="2">Concentrations and calculated emission rates</td><td rowspan="3">900 kg/s = 746 m^3/s if it is assumed that it is air with a molecular weight of 29 g/mole at 20 ºC (given) and atmospheric pressure of 101.325 kPa (Venter and Liebenberg-Enslin, 2004)</td></tr>
<tr><td>Normal operating conditions</td><td>Upset operating conditions</td></tr>
<tr><td>NO_x = 5 ppm (0.0016 g/s)
CO = 24 ppm (0.0058 g/s)
Dust = 20 mg/m^3 (0.0041 g/s)(1)</td><td>NO_x = 2 ppm (0.0007 g/s)
CO = 8 ppm (0.0019 g/s)
Dust = 1 mg/m^3 (0.0002 g/s)(1)</td></tr>
<tr><td>Fugitive dust</td><td>Materials handling operations</td><td colspan="2">Tipping of waste rock onto waste rock dump (35 ktpm)
Tipping of waste rock onto waste rock dump (35 ktpm)
Tipping or ore into silo (225 ktpm)
Tipping of ore into silo (225 ktpm)</td><td>No controls in place</td></tr>
<tr><td>Fugitive dust</td><td>Vehicle activity on paved roads</td><td colspan="2">7 ton material trucks (one trip every second day)
30 ton timber trucks (one trip every day)
7 ton explosive trucks (one trip every second day)
1 ton bakkies (10 trips every day)
8 ton busses (8 trips every day)</td><td>No controls in place
As taken from Shaft No 16 report (Venter and Liebenberg-Enslin, 2004)</td></tr>
</table>

ASPECT	SOURCE	ACTIVITY	COMMENTS/ ASSUMPTIONS
		20 Taxis (twice a day) 200 Private vehicles (twice a day) Paved roads include existing road (~4.6 km) and roads leading to the shaft (~ 1,4 km). Average speed of material trucks, timber trucks, explosive trucks and bakkies ~ 40 km/hr, average speed of busses, taxis and private vehicles ~ 60 km/hr Width of road = 7 m	
Fugitive dust	Vehicle activity on unpaved haul roads	7 ton material trucks (one trip every day) 30 ton timber trucks (one trip every day) 7 ton explosive trucks (one trip every day) 1 ton bakkies (one trip every day) Average speed = 20 km/hr	No controls in place As taken from Shaft No 16 report (Venter and Liebenberg-Enslin, 2004)
Fugitive dust	Wind erosion	Waste rock dump (total volume 300 0000 m^3)	No controls in place

Notes: Taken as a PM_{10} and TSP emission rate in simulations.

- According to the EPA of South Australia on recommended separation distances from various activities, a buffer zone of 300 m from the nearest sensitive receptor is required when quarry type operations occur without blasting. A distance of 500 m is required where blasting occurs.

It can be concluded that with no mitigation in place, the expected impacts from the unpaved access roads on the nearby residential houses may be unacceptable. With mitigation in place (i.e. tarring of main access road, dust suppression while still unpaved, general dust suppression over construction site etc.) the impacts from the two proposed shaft complexes are not expected to result in noticeable increases in the ambient air quality.

3. References

AEPA, 2000: Guidelines for Separation Distances – Consultation Draft. Australian Environmental Protection Agency, August 2000.

Liebenberg-Enslin H and Krause N (2011). *Air Quality Impact Assessment for the proposed Impala Tailings Dam and Open Pits Expansion Projects*, Project done on behalf of Metago Environmental Engineers, Report No. APP/10/MEE-17 Draft, September 2011.

Petzer G and Liebenberg-Enslin H (2006). *Air Quality Impact Assessment Study for the Impala Platinum No 17 Shaft*, Project done on behalf of Golder Associates Africa, Report No. APP/06/GAA-02 Rev 1, July 2006.

Venter C and Liebenberg-Enslin H (2004). *Air Quality Impact Assessment Study for the Impala Platinum No 16 Shaft*, Airshed Planning Professionals, July 2004.

Yours Sincerely,

Hanlie Liebenberg-Enslin

Director