

POLLUTION PREVENTION PLAN PROGRESS REPORT FOR 2018

ANGLO AMERICAN COAL SOUTH AFRICA

COMPANY DETAILS

Name	Anglo Operations Proprietary Limited	Anglo American Inyosi Coal Proprietary Limited
Company registration no.	1921/006730/07	2005/016701/07
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CONTENTS

1. PURPOSE	4
2. DEFINITIONS AND ACRONYMS	4
3. OVERVIEW.....	4
3.1. COMPANY STRUCTURE.....	4
4. DETAILS OF METHODOLOGY.....	7
4.1. FUEL COMBUSTION ACTIVITIES (USE OF MOBILE MACHINERY)	7
4.1.1. <i>CO₂^{eq} from Fossil fuels</i>	7
4.2. FUGITIVE EMISSIONS FROM COAL MINING AND HANDLING	7
4.2.1. <i>CH₄ and CO₂ from coal mining and post-mining</i>	7
5. TOTAL EMISSIONS FOR 2018	8
6. PLANNED MITIGATION MEASURES.....	11
7. RESULTS OF MITIGATION INTERVENTIONS	12

1. PURPOSE

The purpose of this document is to provide progress on the approved Pollution Prevention Plan for Anglo American Coal SA for 2018.

2. DEFINITIONS AND ACRONYMS

AACSA	Anglo American Coal South Africa
AOL	Anglo Operations (Pty) Ltd
AAIC	Anglo American Inyosi Coal (Pty) Ltd
DEA	Department of Environmental Affairs
DOE	Department of Energy
ECO ₂ MAN	Energy and CO ₂ Management
GHG	Greenhouse Gas
OC	Opencast
UG	Underground

3. OVERVIEW

3.1. Company Structure

Anglo American Coal South African (AACSA) is part of the Anglo American Coal business unit, which includes operations in South Africa, Australia, Colombia and Canada. In South Africa, Anglo Operations (Pty) Ltd. (AOPL) (an operating division of Anglo American plc.) wholly owns and operates seven operations and jointly owns and operates two additional mines as Anglo American Inyosi Coal (AAIC), a joint venture between AOL (73%) and Inyosi Coal (Pty) Ltd. (27%). Anglo American has since sold three of its coal mines, which supply coal solely to Eskom. These mines are referred to as the “Eskom-tied Mines”. Of these three mines, New Vaal is an opencast mine, Kriel is both opencast and underground and New Denmark is underground only.

Figure 3-1 below shows the structure, ownership and mines in AACSA. It also shows by means of a dotted box and arrows, those operations that have been sold.

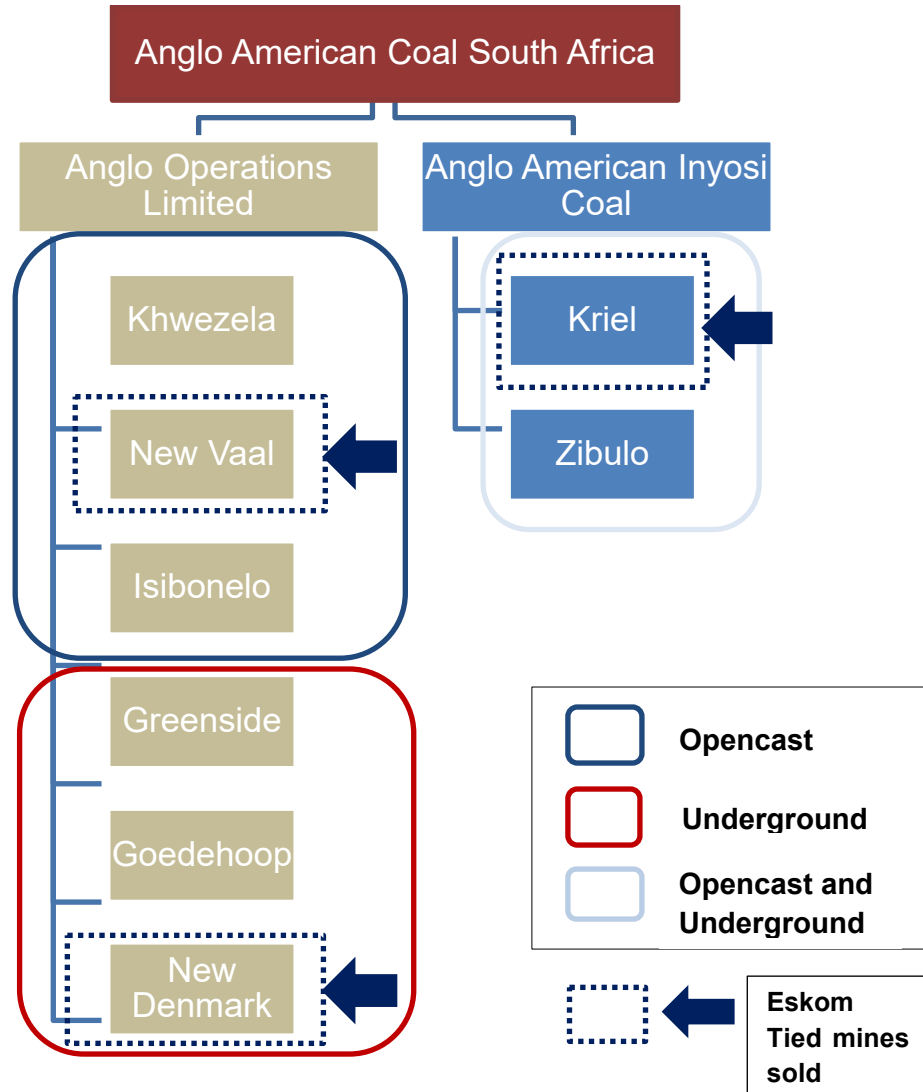


Figure 3-1. Map indicating the location of the various Anglo American Coal SA operations. Numbered items are the operations included in this plan.

Anglo American Coal South Africa publicly reports scope 1 and 2 emissions for all managed operations. From 2018, the emissions from the Eskom Tied Mines will not be reported on by AACSA. During the course of 2017, the Kleinkopje and Landau operations were merged into one operation, Khwezela Colliery, for organisational efficiency purposes. The two operations are adjacent to one another in Witbank.

Table 3-1. List of operations included in this plan.

Mine	Duration in scope	Mining Method	Total attributable production 2018*
1. Goedehoop	2016 - 2020	UG	5.4 Mt
2. Greenside	2016 - 2020	UG	4.4 Mt
3. Khwezela	2016 - 2020	OC	5.5 Mt
5. Isibonelo	2016 - 2020	OC	4.5 Mt
6. Zibulo	2016 - 2020	UG & OC	6.3 Mt
Total South African Production			32.0 Mt**

* Source: Anglo American Plc Annual Report 2018

** Note that divested operations and joint ventures are not listed in scope of the PPP, but total production includes them.

4. DETAILS OF METHODOLOGY

4.1. Fuel combustion activities (use of mobile machinery)

4.1.1. CO₂^{eq} from Fossil fuels

Fossil fuels consumed at operations release GHG as a result of the combustion process in mobile machinery.

IPCC 2006 Guideline factors are applied, as per the National GHG Inventory (DEA, 2014).

Table 4-1: Emission factors applied to fuel combustion

	Diesel (t/TJ)	Petrol (t/TJ)
CO ₂	74.1	69.3
CH ₄	3.9	33
N ₂ O	3.9	3.2

4.2. Fugitive emissions from coal mining and handling

Coal-mine methane is the in-situ seam gas that is released from the mined coal seams during the mining process and post-mining.

4.2.1. CH₄ and CO₂ from coal mining and post-mining

The methodology and emission factors used in the National GHG Inventory (DEA, 2014) were used as the basis for calculating the CH₄ and CO₂ emissions from mining and post-mining activity. These are the specific emission factors for South Africa, which are lower than those in the IPCC 2006 guidelines.

These factors are applied to the Run of Mine tonnages.

Formula used:

$$CH_4 = ROM\ production * Gas\ content * 1000\ L / Gas\ constant * molar\ weight / 1000\ 000\ grams$$

CH₄ (ton/yr)

ROM Production (ton/yr)

Gas Constant 22.4

Molar weight 16.04

Gas content = emission factor as shown in table 5-2.

Table 4-2: Emission factors for CH₄ and CO₂ from coal mining and handling

Mining method	Activity	CH₄ Gas Content (m³/tonne)	CO₂ Gas content (m³/tonne)
Underground mining	Coal mining	0.77	0.077
	Post-mining	0.18	0.018
Surface mining	Coal mining	0	0
	Post-mining	0	0

CH₄ (ton/yr) released is then multiplied by the GWP of 23 to achieve annual CO₂e emissions.

5. TOTAL EMISSIONS FOR 2018

Emissions are provided in table 6-1 below based on Table 1 in the Template provided in the Guidelines for Development of Pollution Prevention Plans.

Table 5-1: Total annual emissions from each activity measured as CO₂e for the preceding calendar year.

Name of Data Provider	Anglo Operations (Pty) Ltd																
Data Provider ID												170500172					
Date of Submission:												31-Mar-18					
Year of data:												2018					
Comments: Although not required by the regulations, emissions from mobile combustion of fossil fuels on site have been included in alignment with the Anglo American Coal South Africa Carbon Budget																	
IPCC Code (see Annexure 1)	Sub category[4] (disaggregated by fuel / product type / production process)	Activity data[5]			Emissions (tonnes/year)												
		Name of activity data	Value of activity data	Units of activity data	CO2			CH4									
					Value	Tier	Ref	Value	Tier	Ref	Value	Tier	Ref				
1B	1B1a	Coal mining and handling	25719859	tonnes	2006.29		GHG technical guidelines and IPCC 2006	2	7,345.44		GHG technical guidelines and IPCC 2006	2					

Name of Data Provider	Anglo American Inyosi Coal
Data Provider ID	170500180
Date of Submission:	31-Mar-19
Year of data:	2018

Comments: Although not required by the regulations, emissions from mobile combustion of fossil fuels on site have been included in alignment with the Anglo American Coal South Africa Carbon Budget

IPCC Code (see Annexure 1)	Sub category[4] (disaggregated by fuel / product type / production)	Activity data[5]			Emissions (tonnes/year)								
		Name of activity data	Value of activity data	Units of activity data	CO2			CH4					
					Value	Tier	Ref	Value	Tier	Ref	Value	Tier	Ref
1B	1B1a	Coal mining and handling	7913256	tonnes	1,174		GHG technical guidelines and IPCC 2006	4,299.77		GHG technical guidelines and IPCC 2006			

6. PLANNED MITIGATION MEASURES

The Scope 1 emissions in our business emanate from the fugitive methane from coal mining and from combustion of fossil fuels in mobile machinery.

We currently do not have any capital approved projects for fossil fuel combustion. As such, we have included the following two projects in our Pollution Prevention Plan.

1. Advanced Process Control (APC) on Coal Processing Plants:

Advanced Process Control Technology will be installed at three coal processing plants. The technology will be installed at one plant in late 2018, with operation expected in March 2019. The installation at the other two plants will follow with the technology to be operational in Q4 2019.

Currently the coal processing plants do not have any automated control that considers multiple variables to optimise the plant efficiency in real time.

This system is a proven control and optimisation technology that will deliver measurable and sustainable improvements in process stability, product yield/recovery, energy optimisation and process throughput/capability.

The system reads the real-time data from the SCADA and other relevant sources and then automatically controls the plant operation to ensure stable performance and allow for predictive maintenance.

2. Continuous Methane Monitors:

The gas concentrations of the vent air methane are so low that there are currently no known technologies that can reduce these emissions (globally). As was outlined above, we currently use the IPCC Tier 2 methodology for South Africa as the basis for our emissions estimates. However, there is a large amount of inaccuracy in these estimates as they were based on a limited number of samples at a limited number of sites over a very short period of time. Our ad-hoc monitoring indicates that the methane levels in our underground coal mines are lower than what we are currently reporting.

As such, we have installed a continuous methane monitor at a new ventilation shaft at Greenside Colliery and at Zibulo Colliery. See Table 8-1 below for further details (based on table 2 of Annexure 1 of the Guidelines).

It is important to note that this technology will NOT reduce the actual emission but will rather provide us with a true reading of what our methane emissions are. This will have benefits for the country in the long term, as it is likely that the methane emissions from fugitives are being overestimated at many mines.

7. RESULTS OF MITIGATION INTERVENTIONS

Advanced Process Control.

The first controllers of the Advanced Process Control (APC) system was commissioned at Greenside Colliery in September and October 2018. There are several upgrades underway to improve instrumentation and several other controllers need to be implemented during 2019 to have the system fully commissioned and delivering savings.

Table 7-1: Savings resulting from the installation of the APC system

Operation	Implementation start date	Planned completion date	Energy savings (%) (2018)	T CO ₂ savings (2018)
Greenside	Sep 2018	May 2019	0*	0*
Khwezela	Mar 2019	Dec 2019	0	0

** No savings were planned for this period as per the PPP, however initial savings were observed from the commissioning date, but a verification process needs to be completed before reporting the results.*

Table 7-2: Details of planned mitigation measures

Mitigation Measure	Description of mitigation measure	Anticipated implementation date	Assumptions used to estimate anticipated GHG emission reduction	Affected GHG	Anticipated Emission Reduction (tonnes CO ₂ e)					
					2016	2017	2018	2019	2020	Total over 5 years
Advanced Process Control on Coal Processing Plants	<p>Installation of Advanced Process Control Technology at 3 coal processing plants. The technology will be installed at one plant in late 2018, with operation expected in March 2019. The installation at the other two plants will follow with the technology to be operational in Q4 2019.</p> <p>This system is a proven control and optimisation technology that will deliver measurable and sustainable improvements in process stability, product yield/recovery, energy optimisation and process throughput/capability.</p> <p>The system reads the real-time data from the SCADA and other relevant sources and then automatically controls the plant operation to ensure stable performance and allow for predictive maintenance.</p>	Plant 1 March 2019 Plants 2 and 3 September 2019	The electrical energy savings is anticipated to be approximately 3% per annum per plant	CO ₂	0	0	0	1330	2854	4184

<p>Continuous methane monitoring</p>	<p>The accuracy of the South African IPCC Tier 2 emission factors for fugitive methane from coal mining is low as the numbers are based on a spot measurement from a small number of samples from a limited number of mines. In South African, methane levels in coal seams is very low and can be highly variable. It would benefit South Africa to have a more accurate estimate of fugitive methane levels. We have installed continuous methane monitors on a ventilation shaft at each of our Greenside and Zibulo mines. The continuous methane monitor measures the methane concentration at regular intervals (15 or 30 minutes) intervals with a high level of accuracy. Although the technology does not reduce the emissions, it does provide us with accurate readings of the methane levels, which initial results are showing are much lower than estimates calculated using the IPCC Tier 2 methodology.</p>	<p>Starting January 2017 and anticipated to be completed by end 2020.</p>	<p>The continuous methane monitor is not expected to decrease emissions per say, but rather to give an actual reading of what the emission are for an individual mine.</p>	<p>CH₄</p>	<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>	<p>0</p>
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