TECHNICAL MEMORANDUM

DATE 6 February 2019 **Reference No.** 18112341_TechMem_001

TO Dr Thuli Khumalo
Department of Environmental Affairs

CC L Coetzee

FROM A Bennett **EMAIL ABennett@golder.com**

HOTAZEL MANGANESE MINES (PTY) LIMITED (MAMATWAN MINE): APPLICATION FOR THE POSTPONEMENT OF COMPLIANCE TIME FRAMES SUPPORTING JUSTIFICATION AND REASONINGS DOCUMENTATION

Golder Associates Africa (Pty) Limited (Golder) was appointed by Hotazel Manganese Mines (Pty) Limited (MMT) to assist them with an application for the postponement of the minimum emission standards compliance time frames as contemplated the 2017 National Framework for Air Quality Management in the Republic of South Africa (2007) published in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004).

This document details:

- The need and justification for the postponement application (this document);
- Serves as MMT's formal postponement application with attached supporting documentation including:
  - MMT's Atmospheric Emissions Impact Report in the prescribed format;
  - MMT's proposed Emissions Reduction Strategy; and
  - The Public Participation Report detailing the public participation process undertaken as part of the project.

1.0 BACKGROUND

1.1 Brief history

The MMT sintering operations was built in 1988 with an operational capacity of 500 kt/annum. The plant produces primarily two products, namely a high-grade sinter with a manganese content of 48% and a medium grade sinter with a manganese content 43.5%. MMT was established to service the need of the four furnaces at the Metalloys manganese smelter in Meyerton as well as a few other smaller domestic customers. At the time there was no export market for sinter. The Metalloys smelter produces high and medium carbon Feromanganese. The original plant included the establishment of a De-Dust#1 to mitigate the particulate emissions from the sintering process.

In 1998, the MMT sinter operations underwent minor upgrades to increase the production capacity to 570 kt/annum at a cost of R1.6 million.

This upgrade included:

- Redesign waste gas and cooling fan impellers for increased capacity;
- The 800 kW motors were replaced with 1 200 kW units;
- The strand speed was increased; and
- A fog spray system was installed.

Buy March 1999, the plant's capacity has been further upgraded to 900 kt/annum at an additional cost of R85 million. This upgrade included the following:

- A strand for sintering only without cooling;
- An Off-strand Rotary Cooler (OSC with its own 800 kW fan;
- A Steel Bucket Apron Conveyor (FS1);
- Two 1 200 kW motors and new waste gas fans;
- An additional Electro Static Precipitator (ESP); and
- A second stacker for the material handling stockpiling section of the operation.

As part of the initial design, the system consisted of one waste gas fan and one ESP. With the upgrades of the second phase, 28% of the R85 million capital spent was on the construction of a second in line ESP and an additional waste gas fan, and 31% of R85 million spent on the OSC. In addition, De-Dust#2 was installed to accommodate and mitigate the particulate emissions from the FS1 and OSC. In 2012, De-Dust#3 was installed to add further particulate emissions mitigation capacity to the sintering process and De-Dust#1 was refurbished between 2012 and 2013. In 2015, De-Dust#2 was refurbished.

1.2 Basic process description

Manganese ore, recycled sinter fines, anthracite/coke and reductants are mixed and then stored in feed silos. The mixture is then placed on a moving grate machine where it is ignited to produce an agglomerated sinter. The sinter product is discharged from the moving grate into a crusher to break the sinter ore into manageable sized clumps and is then air cooled on the off-strand cooler (MMT AEL, 2015)

The cooled down and crushed sintered ore is then graded according to size with the material larger than 6 mm placed on the final product stockpile from where it is shipped to markets via rail or road transport. The screened material smaller than 6 mm is recycled back into the feed mixer where it is included in the feed ore. Fugitive dust is extracted from the process through a series of extraction ducts with the particulate matter being captured in one of three de-dusting bag-houses (MMT AEL, 2015).

Dust from baghouse no 1 and 2 are recycled back into the feed mixer to be included into the feed ore. Dust from baghouse no. 3 is captured in bulk bags for sale as reduced sinter fines. Off gas and particulate matter from the moving grate machine is extracted and scrubbed through an Electrostatic Precipitator. Figure 1 below illustrate the overall balance sheet of inputs, outputs and emissions at the site of work.

The design capacities, actual production and maximum capacities of all the components in the process flow chart is depicted in Figure 2 to Figure 4 and a simplified process flow diagram is depicted in Figure 5. Figure 6 provides a basic sinter plant layout diagram.

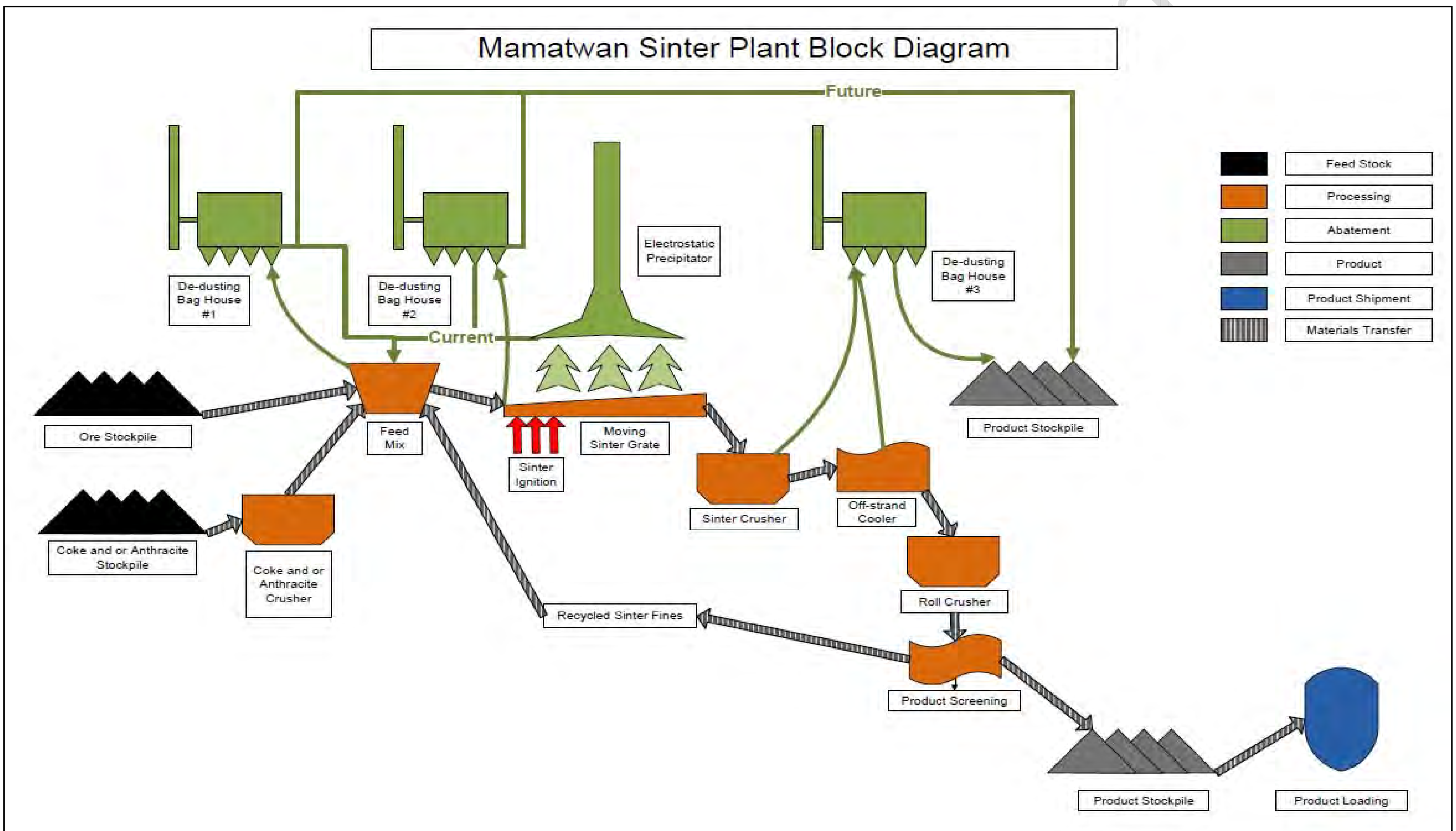

Figure 1: Mamatwan Sinter Plant simplified block diagram (MMT AEL, 2015

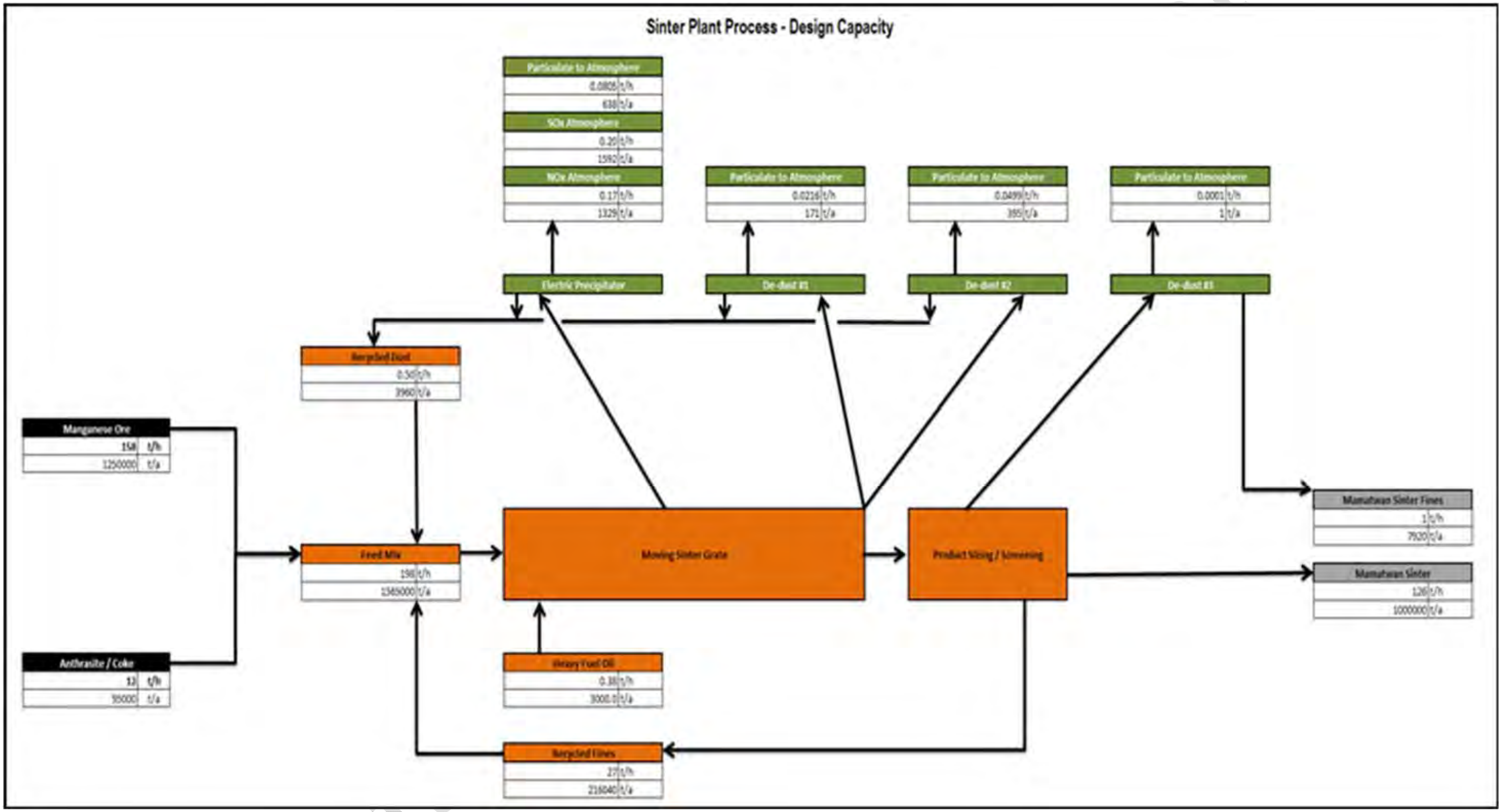

Figure 2: Mamatwan Sinter Plant Process Flow Chart (Design Capacity) (MMT AEL, 2015)

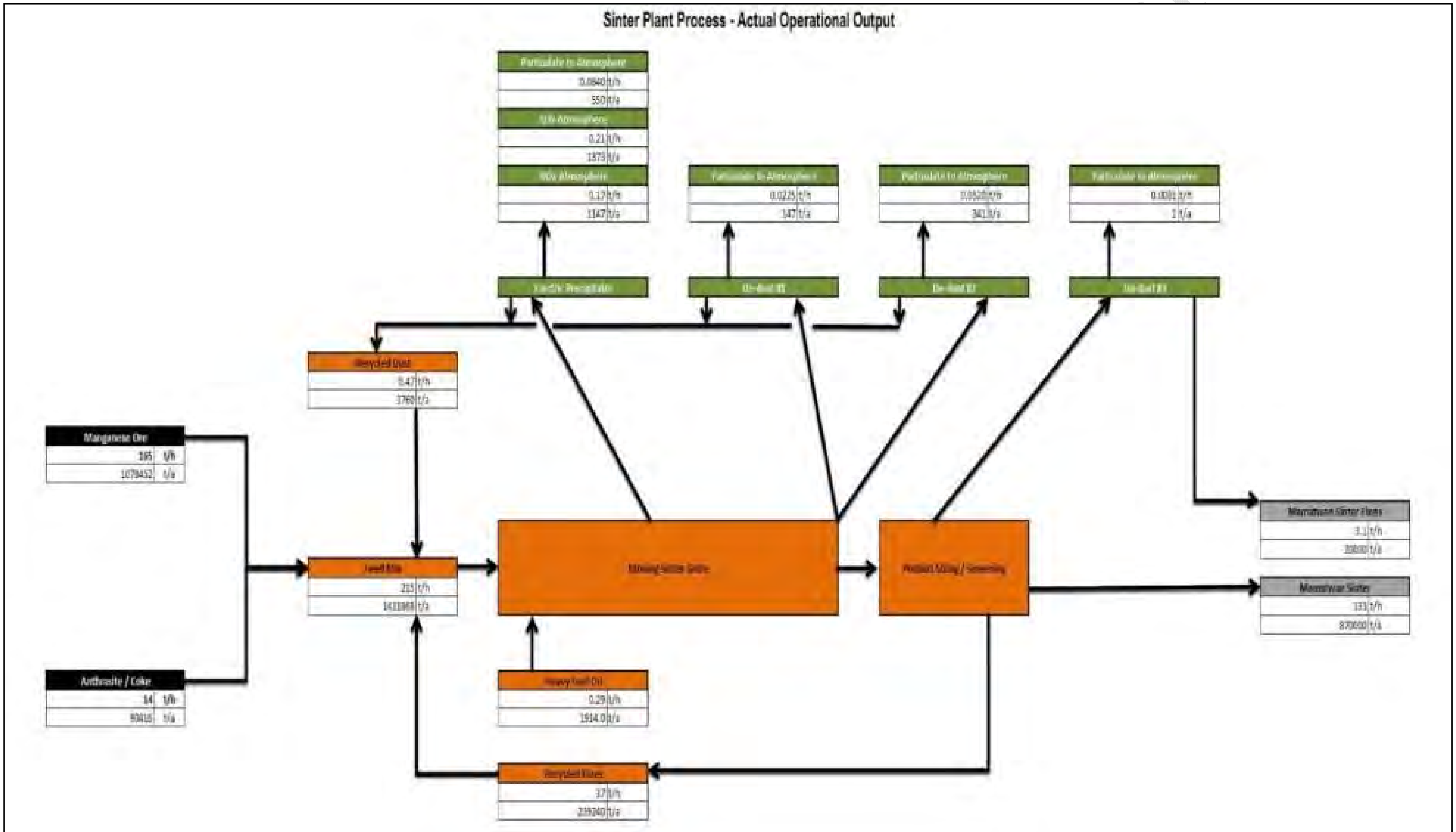

Figure 3: Mamatwan Sinter Plant Process Flow Chart (Actual Production) (MMT AEL, 2015)

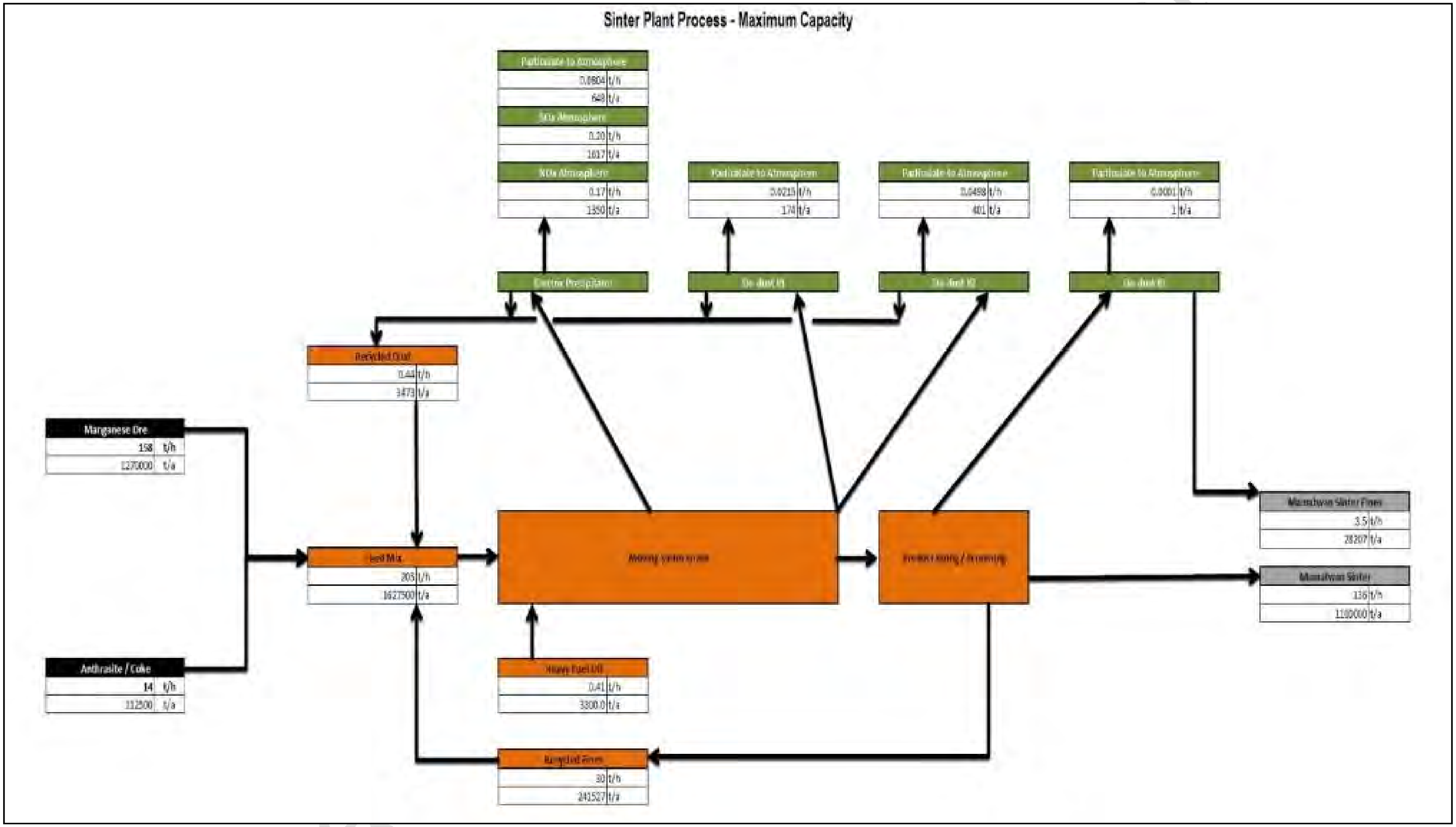

Figure 4: Mamatwan Sinter Plant Process Flow Chart (Maximum Capacity) (MMT AEL, 2015)

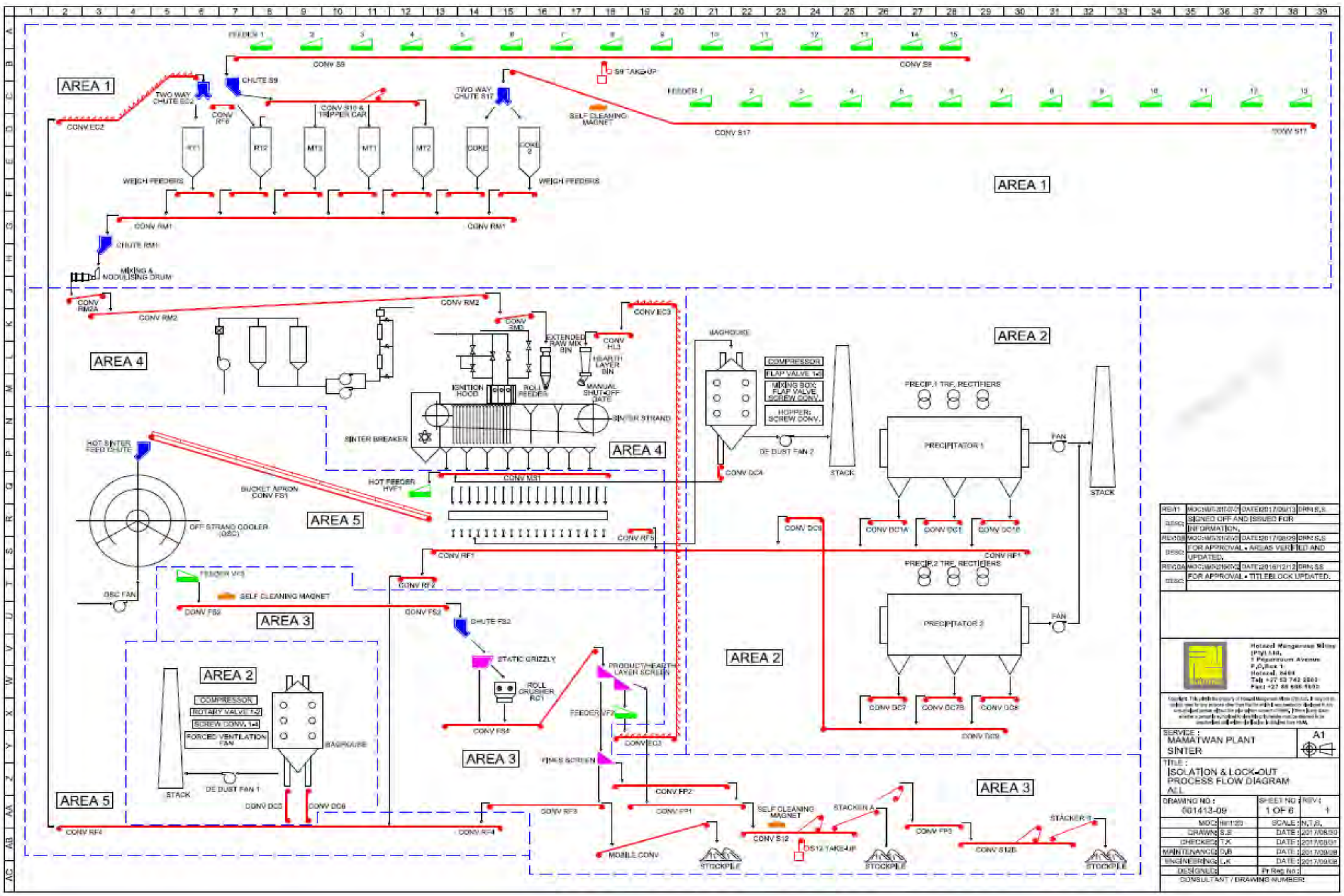

Figure 5: Process flow diagram (MMT, 2019)

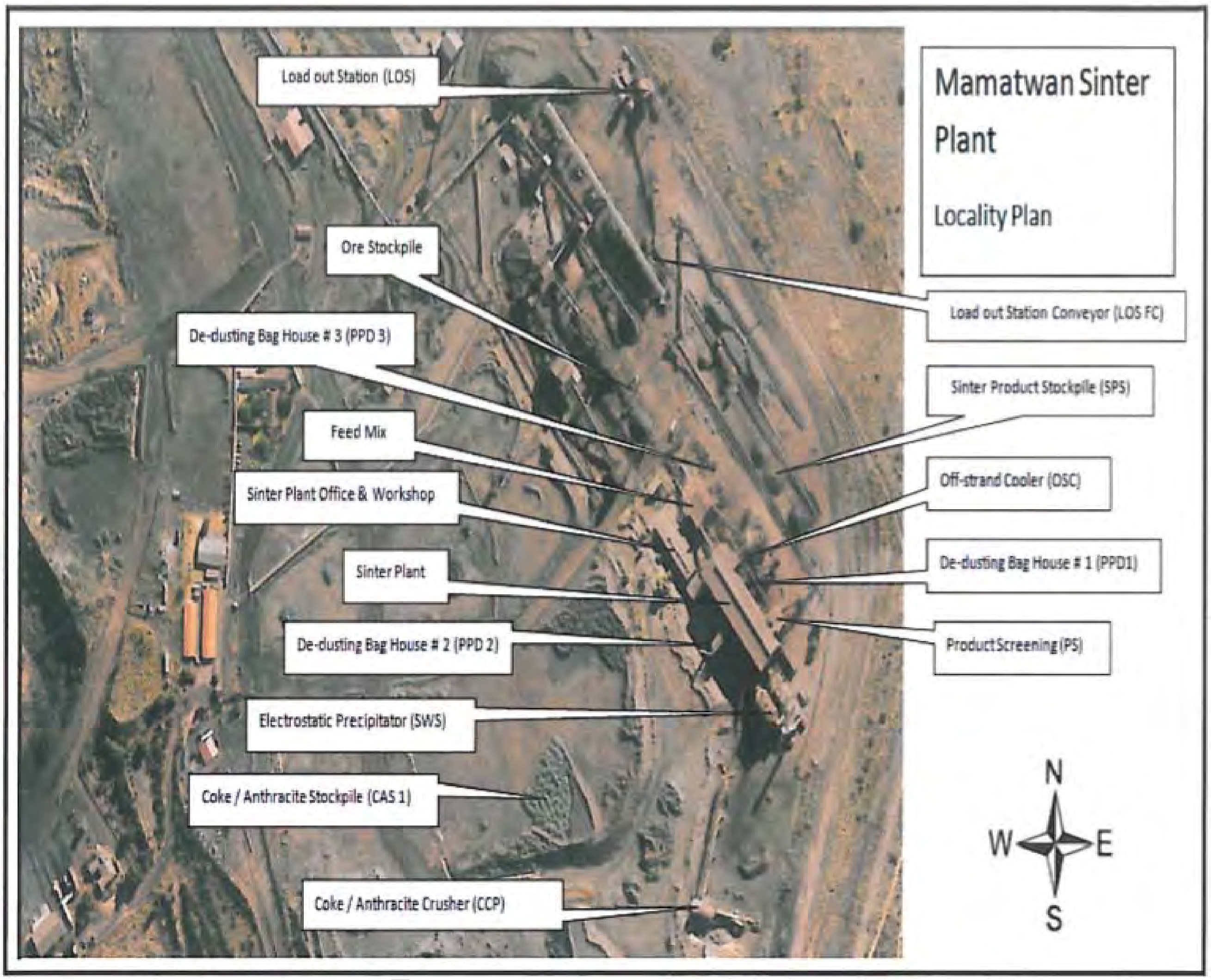

Figure 6: Sinter plant layout diagram (MMT AEL, 2015)

1.3 Origin of particulate emissions at MMT

Particulate emissions are liberated onsite from a range of sources including point, and fugitive (i.e. area and line) sources:

- Point sources:
  - Waste Gas System (SWS): following emissions mitigation via an electrostatic precipitator;
  - De-Dust#1 (PPD1): following emissions mitigation via a bag house;
  - De-Dust#2 (PPD2): following emissions mitigation via a bag house; and
  - De-Dust#3 (PPD3): following emissions mitigation via a bag house.

- Fugitive sources:
  - Mining and blasting activities to obtain the manganese;
  - Anthracite Crushing Plant (ACP);
  - Anthracite stockpile (CAS);
  - Off Strand Cooler (OSC): air cooling of sinter product;
  - Load Out Station (LOS): loading sinter products onto rail wagons;
  - Load Out Station Feed Conveyor (LOS FC): transfer of sinter from sinter product stockpile to the LOS;
  - Sinter Product Stockpile (SPS): Stockpile of final sintered product prior to shipment by rail to consumers;
  - Stacker Conveyor (SC): Transfer sinter from plant to SPS;
  - Product screening (PS): Sizing of final product;
  - Access roads (AR): Fugitive traffic related dust emissions; and
  - General fugitive emissions from the operational processes through roof vents in the infrastructural units etc.

The particulate emissions are namely generated by the following activities:

- Mining and blasting activities to obtain the raw manganese ore;
- The thermal treatment of the manganese ore, coal and additives during the sintering process;
- Material handling activities throughout the operational plant including: crushing, screening, stockpiling, conveying, cooling and tipping activities; and
- Fugitive transport related emissions from vehicles traveling on unpaved roads onsite and on the main access roads to the operation.

1.4 Historical overview of actions undertaken to address/reduce particulate emissions

MMT has taken various steps and process improvements over the past 10 years to minimise the operations particulate and trace gas emissions as far as possible. In summary, the following has been undertaken:

- De-Dust#3 was installed in 2012 to add further particulate emissions mitigation capacity to the sintering process;
- De-Dust#1 was refurbished between 2012 and 2013 to ensure the mitigation measures continued to operate within the design specifications;
- De-Dust#2 was refurbished in 2015 to ensure the mitigation measures continued to operate within the design specifications;

- Approximately R417 million has been spent on maintenance of the sinter plant and on the three De-dust plants, ESP's and associates waste gas systems; and
- Within the last 6 years (i.e. 2013 – 2018), approximately R8.8 million was spent on the maintenance of the sinter plant's de-dust plants, ESP's and waste gas fans to ensure the mitigation measures continued to operate within the design specifications.

2.0 APPLICABLE AIR QUALITY STANDARDS AND GUIDELINES

The National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA) approach to air quality management is based on the control of the receiving environment. The main objectives of the act are to protect the environment by providing reasonable legislative and other measures that (i) prevent air pollution and ecological degradation, (ii) promote conservation and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development alignment with Sections 24a and 24b of the Constitution of the Republic of South Africa.

2.1 Emission standards

In terms of legal compliance, MMT is required to comply with the South African emission standards under Category 4: Metallurgical Industry, Subcategory 4.5: Sinter Plants. Compliance with these two standards therefore implies that average emissions concentrations are below the limit value and the frequency of exceedance does not exceed the permitted tolerance (Table 1).

Table 1: Emission limits for Category 4: Metallurgical Industry, Subcategory 4.5: Sinter Plants

Common name	Chemical symbol	Plant status	mg/Nm^3 under normal conditions of 273 Kelvin and 101.3 kPa
Particulate Matter	PM	New	50
		Existing	100
Sulphur dioxide	SO_2	New	500
		Existing	1000
Oxides of nitrogen	NO_x expressed as NO_2	New	700
		Existing	1200

2.2 Ambient air quality standards

The South African ambient air quality standards for common pollutants prescribe the allowable ambient concentrations of pollutants which are not to be exceeded during a specified time period in a defined area (Table 2). If the standards are exceeded, the ambient air quality is defined as poor and potential adverse health impacts are likely to occur. MMT's emission contributions to the ambient air quality levels must not exceed or cause exceedances of the ambient air quality standards.

Table 2: South African Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	Limit Value ($\mu g/m^3$)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
NO_2 [(a)]	1 hour	200	106	88	Immediate
	1 year	40	21	0	Immediate
PM_{10} [(b)]	24 hour	75	-	4	Immediate
PM_{10} [(b)]	1 year	40	-	0	Immediate
O_3 [(c)]	8 hours (running)	120	61	11	Immediate
Lead (Pb) [(d)]	1 year	0.5	-	0	Immediate
CO [(e)]	1 hour	30,000	26,000	88	Immediate
	8 hour (calculated on 1 hourly averages)	10,000	8,700	11	Immediate
Benzene (C_6H_6) [(f)]	1 year	5	1.6	0	Immediate
SO_2 [(g)]	10 minute	500	191	526	Immediate
	1 hour	350	134	88	Immediate
	24 hours	125	48	4	Immediate
	1 year	50	19	0	Immediate
$PM_{2.5}$ [(h)]	24 hours	40		4	1 January 2016 – 31 December 2029
	24 hours	25		4	1 January 2030
	1 year	20		0	1 January 2016 – 31 December 2029
	1 year	15		0	1 January 2030

Notes:

a) *The reference method for the analysis of NO_2 shall be ISO 7996.*

b) *The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341.*

Pollutant	Averaging Period	Limit Value (µg/m^3)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date

c) *The reference method for the analysis of ozone shall be the UV photometric method as described in ISO 13964.*
d) *The reference method for the analysis of lead shall be ISO 9855.*
e) *The reference method for analysis of CO shall be ISO 4224.*
f) *The reference methods for benzene sampling and analysis shall be either EPA compendium method TO-14 A or method TO – 17.*
g) *The reference method for the analysis of SO_2 shall be ISO 6767.*
h) *The reference method for the analysis of $PM_{2.5}$ shall be EN 14907.*

2.3 National Dust Control Regulations

On 1 November 2013, the National Dust Control Regulations were promulgated under the National Environmental Management: Air Quality Act (NEM: AQA), 2004 and published in the Government Gazette No. 36974. The dust fall standard defines acceptable dust fall rates in terms of the presence of residential areas (Table 3).

Table 3: Acceptable dust fall rates

Restriction areas	Dust fall rate (mg/m^2/day over a 30 day average)	Permitted frequency of exceedance
Residential areas	Dust fall < 600	Two per annum (not in sequential months)
Non-residential areas	600 < Dust fall < 1 200	Two per annum (not in sequential months)

3.0 COMPLIANCE WITH NEM: AQA

Based on the monitoring data (2016 and 2017), it is clear that MMT faces a significant challenge regarding meeting the new plant emission limit for PM10 by 1 April 2020 as several of the sources display year on year exceedances well above the 50 mg/Nm^3 limit value hence the need for this postponement application (Table 4). Unfortunately, due to practical feasibility and financial constraints, MMT is unlikely to meet the particulate matter standards set out for 2020 and remain economically competitive and thus a financially viable operation. MMT is thus applying for postponement of the compliance timeframes.

Note: An exceedance was noted in the NO_x concentration levels of the Sinter waste gas stack in 2016 however the monitored concentrations were ten orders of magnitude lower in 2017. The 2016 NO_x concentration may be related to an upset condition leading to higher than normal NOx concentration levels in the stack during the monitoring.

Table 4: Annual emissions monitoring and compliance with set emissions limits

Common name	Chemical symbol	Plant status	Emission limit	2016 **						2017 ***							
				Sinter waste gas system stack		De-dust 2		De-dust 3		Sinter waste gas system stack		De-dust 1		De-dust 2		De-dust 3	
				Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance	Emission average (mg/Nm^3) *	Compliance
Particulate Matter	PM_{10}	New	50	91.88	N	1.48	Y	72.21	N	69.92	N	67.06	N	1.57	Y	1.28	Y
		Existing	100		Y		Y		Y		Y		Y		Y		Y
Sulphur dioxide	SO_2	New	500	247.92	Y	N/A	-	N/A	-	275.31	Y	BDL	Y	BDL	Y	1.16	Y
		Existing	1000		Y						Y		Y		Y		Y
Oxides of Nitrogen	NO_x expresses as NO_2	New	700	2640.74	N	N/A	-	N/A	-	228.94	Y	15.46	Y	35.24	Y	BDL	Y
		Existing	1200		N						Y		Y		Y		Y

Note:

* mg/Nm^3 under normal conditions of 273 Kelvin and 101.3 kPa

** Sampling conducted between October 2016 to February 2017

*** Sampling conducted between October 2017 to January 2018

BDL: Below detection level of method

4.0 REASONS FOR APPLYING FOR POSTPONEMENT

4.1 Direct financial implications

The manganese price has always been very volatile but over the years MMT saw good returns and was in a healthy financial position. In 2015, with the rapid global economic deterioration, especially in the steel making sector, the price of manganese fell dramatically and reached an all-time low beneath $2 per dry metric tonne (dmtu). The low commodity price has over a period of time, placed MMT into a financially stressed situation. This situation has been further exacerbated by significant increases in MMT's operational expenditure (OPEX) associated with increased competition from substitute materials; labour costs; power supply and energy reduction policies etc.

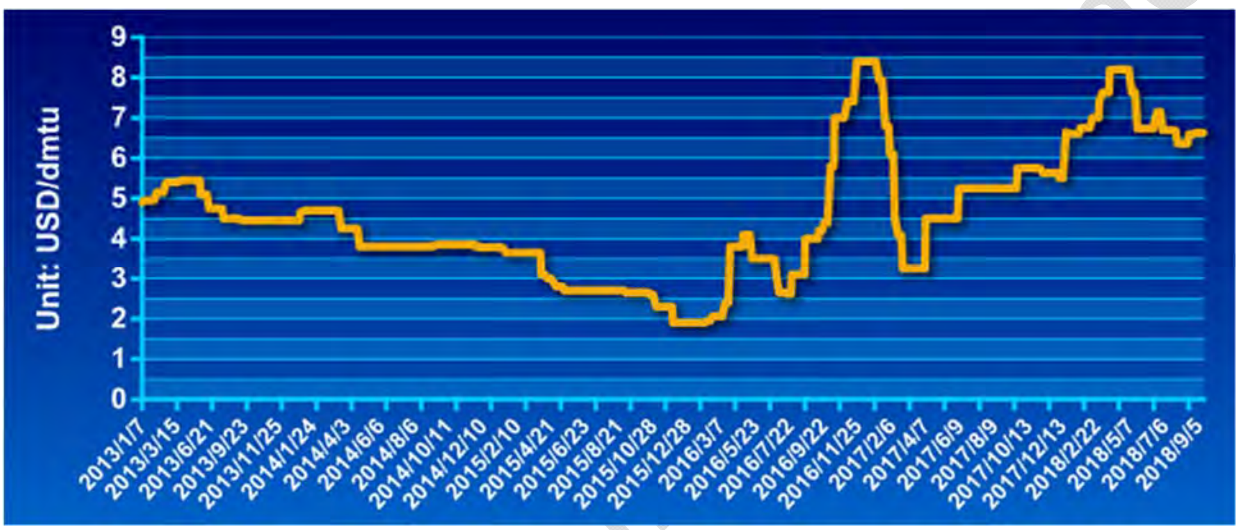

Figure 7: SA manganese ore export price index 2013 to September 2018 (http://www.mining-bulletin.com/index.php/product_5.html, 30 January 2019)

Manganese alloy prices had also seen similar declines and by the end of 2018, three of the four furnaces at the South32 Metalloys operations had been decommissioned, meaning that the Metalloys demand for sintered manganese had dropped by 75%. As a result, the MMT sinter plant was placed on care and maintenance and the majority of the staff retrenched. Ironically, almost immediately the alloys price recovered, and MMT sinter plant was removed from care and maintenance and was returned to operation one month later. Following the restart, the MMT sinter plant production rate was limited to 200 kt/annum as the volatility in the price remained and South32 was hesitant to ramp up to full capacity.

As a result of these challenges over the preceding 18 months, OPEX was curtailed, a lot of maintenance activities had been ceased, and as such, the reliability and efficiency of the MMT was very poor. South32 began allocating capital through the 2018 financial year to get MMT back to a state whereby 350 kt/annum could be produced.

The 2019 financial year saw changes to the environmental legislation in China and as a result, Chinese production of sintered manganese dropped dramatically. With Chinese exports dropping, the South African export market for sintered manganese saw a significant rejuvenation. In 2018, MMT exported its first sinter to Indonesia and China as a trial. Following the successful exports, the production requirements for sinter increase in 2019 to 550 kt/annum.

Following this positive growth in the South African manganese market, the MMT production capacity of 550 kt/annum is to be maintained for the foreseeable future and MMT's operational life is expected to extend well beyond the 2020 changes in the air emission limits. For this reason, capital expenditure (CAPEX) of R 35 million has been allocated for the next 5 years for air emission reduction projects. However, MMT requires time to budget for the CAPEX and OPEX costs such that MMT can remain economically viable in the current South African economic climate.

4.2 Time needed for implementation

Implementation of the proposed emissions reduction plan will extend over several years. The granting of the postponement is thus required to allow for the plant to remain in compliance with NEM: AQA while implementing the emission reduction strategy which may allow for compliance with the NEM: AQA particulate emission standard in the future.

4.3 Sustaining employment

MMT is a significant contributor to the local (John Taolo Gaetsewe District Municipality), regional (Northern Cape) and ultimately South African economy. Should postponement not be granted, MMT will be forced to close during 2020 to maintain compliance with the NEM: AQA. Closure would result in the loss of employment for 1026 permanent employees (MMT SLP, 2012), and fixed-term contractors services would be terminated who are dependent on MMT for their livelihoods. MMT wishes to remain as a key employer within the John Taolo Gaetsewe District Municipality for the foreseeable future and thus postponement is required to assist in this regard.

It is noted that the loss of such employment, should MMT be forced to close, is in direct contrast to the South African governments policies and stance on employment creation as well as not being in the best interest of the South African people.

4.4 Community investment

Other than being a significant employer in the district, MMT also make significant contributions to 25 community bases socio-economic development projects as listed in Table 5. Should MMT be forced to close, the reduction in funding to projects may result in the collapse of such projects which is not in the best interest of the communities who benefit from such projects.

Table 5: MMT Community investment projects

Project Name	Approved Budget	District Municipality	Local Municipality
1. Business Incubation Centre	R 5 000 000	John Taolo Gaetsewe	Joe Morolong
2. Eradication of Invader Plants	R 283 754	John Taolo Gaetsewe	Joe Morolong
3. Ga Phadima Sandmine	R6 000 000	John Taolo Gaetsewe	Joe Morolong
4. High Mast Lights Phase	R 3 454 880	John Taolo Gaetsewe	Joe Morolong

5. HIV and me	R3 420 000	John Taolo Gaetsewe	Joe Morolong
6. Hotazel College	R 14 456 631	John Taolo Gaetsewe	Joe Morolong
7. Hotazel Combined	R 5 094 773	John Taolo Gaetsewe	Joe Morolong
8. Hotazel Library	R 4 600 000	John Taolo Gaetsewe	Joe Morolong
9. Kalahari High School – Technical Unit	R2 930 000	John Taolo Gaetsewe	Ga-Segonyana
10. Kalahari School Hotel Unit	R 1 500 000	John Taolo Gaetsewe	Ga-Segonyana
11. Kimberley Paediatric Hospital (Provincial Hospital)	R 5 000 000	Sol Plaatjie	Sol Plaatjie
12. Kuruman Hotazel Road 2	R17 000 000	John Taolo Gaetsewe	JTG
13. Kuruman to Hotazel Road	R 3 000 000	John Taolo Gaetsewe	JTG
14. Learner development (Star Schools) Phase 1	R 3 211 200	John Taolo Gaetsewe	Joe Morolong and Ga-Segonyana
15. Learner development (Star Schools) Phase 2	R 3 211 200	John Taolo Gaetsewe	Joe Morolong and Ga-Segonyana
16. Mamatwan to Hotazel Road	R 4 500 000	John Taolo Gaetsewe	Joe Morolong
17. Maths and Science Educator Development Programme	R 10 827 500	Provincial	
18. Moshaweng Sanitation	R 3 502 025	John Taolo Gaetsewe	Joe Morolong
19. Moves for Life chess	R1 500 000	John Taolo Gaetsewe	Joe Morolong and Ga-Segonyana
20. Ntswelengwe Sports field	R 5 367 400	John Taolo Gaetsewe	Joe Morolong
21. Rearata Primary	R 4 500 000	John Taolo Gaetsewe	Ga - Segonyana
22. Surprise Cattle Farm	R 6 350 000	John Taolo Gaetsewe	Joe Morolong
23. Tile Factory Feasibility Study	R 120 000	John Taolo Gaetsewe	Joe Morolong
24. Tsineng Road Phase 1	R 4 262 083	John Taolo Gaetsewe	Joe Morolong

25. Tsineng Road Phase 2	R 17 992 567	John Taolo Gaetsewe	Joe Morolong

5.0 EMISSIONS REDUCTION STRATERGY & PLAN

5.1 Approach

A team of specialists from Geecom Air Pollution Control Systems (Pty) Limited (Geecom) were appointed by MMT in January 2019 to develop a road map to reach compliance for the MMT sinter plant. The scope of the assessment being undertaken by Geecom is in three phases:

- Phase 1: Preliminary and information gathering including the following key activities:
  - Conduct an initial review of present installation and gathering of basic data;
  - Planning of necessary shutdowns, site visits and preliminary investigations;
  - Collation of all technical data available, as well as plant philosophy definitions, including the following:
    - ESP design and performance data;
    - Operations manuals and initial ESP design parameters;
    - Previous emission test results;
    - ESP particulate load, coal ash particle size distribution and ash chemical composition and resistivities;
    - Process design parameters;
    - Current process and ESP operating parameters history and proposed future operation;
    - Drawings as required; and
    - Determine an operational baseline of current production and gas cleaning equipment operation and performance.
- Phase 2: Technical evaluation including the following key activities:
  - Detailed external inspection of precipitator units to assess their present condition;
  - Detailed internal inspection of precipitator units to assess condition of the casings and mechanical elements;
  - Isokinetic gas composition and particle sizing tests for both ESP units;
  - Review of existing control systems;
  - Computational Fluid Dynamic modeling (CFD) at one ESP unit, followed by a detailed presentation of the findings to MMT;
  - Develop proposals for process improvements to improve the emission performance of the operation;
  - Resistivity testing of one sample; and

- Compilation of the findings into one technical report document.
- Phase 3: Recommended way forward including the following key activities:
  - Technical verification of the data and tests carried out;
  - Evaluation of emissions for various operating models;
  - Present condition versus recommendations to meet required emission level;
  - Inputs for preparation and submission of detail technical report; and
  - Presentation of the technical report to MMT for consideration and further discussion.

5.2 Detailed road map to reach compliance

Based on Geecom's roadmap, future compliance with the emission limit is possible. Figure 8 displays the associated emissions level associated with each progressive emissions reduction measure implemented as predicted by Geecom. In summary three key phases are to be implemented:

- Existing operational and design improvements to yield particulate concentrations in the order of 100 mg/Nm^3;
- Refurbishment of the plant to yield an approximate particulate concentration in the order of 70 mg/Nm^3; and
- The installation of a new ESP (at an approximate cost of R35 million) and further plant upgrades/refurbishment to yield an approximate particulate concentration in the order of 50 mg/Nm^3 and thus within the 2020 standard.

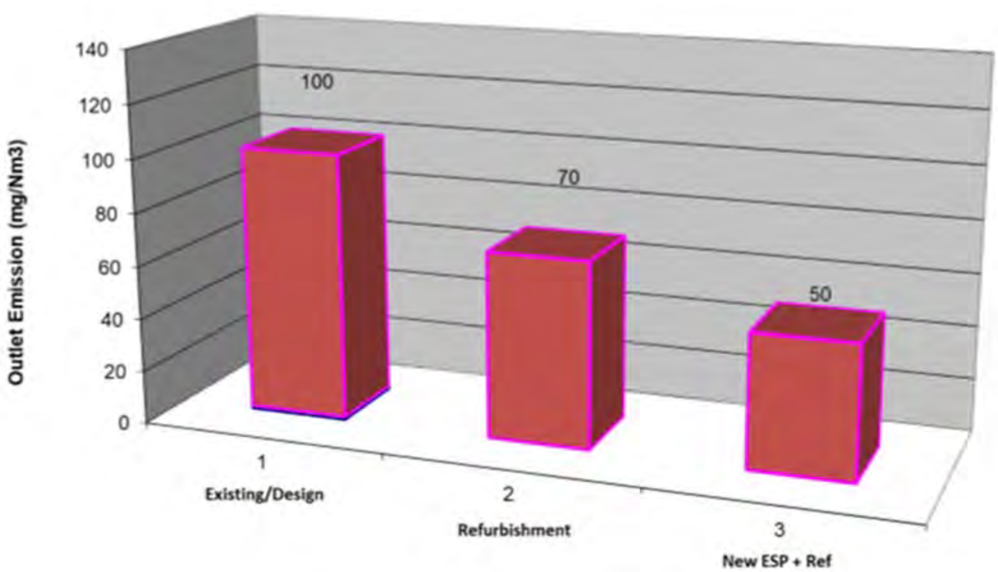

Figure 8: Emission levels expected following proposed upgrades

Table 5 provides the envisaged detailed roadmap to reach compliance and the estimated period to reach compliance. Based on the estimated time periods, it is likely that the road map could be executed in approximately 24 to 36 months assuming MMT is in the financial position to carry the CAPEX and OPEX costs and if minimal environmental authorization processes are required in relation to the plant upgrades. If more detailed environmental authorization processes are required (i.e. Environmental Impact Assessment, Atmospheric Emissions Licensing amendment process, Environmental Management Program Report amendment process etc.), the implementation may be extended out to 48 to 54 months which is well beyond the 2020 compliance deadline hence the need for postponement.

Table 6: Proposed roadmap to reach compliance

Objective	Methodology	Technology/Tasks	Period	Comments
Confirm technical data as per actual operational conditions	Investigations and carrying out relevant elemental and performance test	Resistivity tests	Completed	Completed
		Internal Inspection	Completed	Completed
		Isokinetic/Performance Tests	2 Months	Monitoring undertaken in January 2019 - Emissions monitoring report pending, due end March 2019
Evaluation of results and proposal of possible technical alternatives for eventual emission compliance	Formulas and models relevant to electrostatic precipitation and application of Electrostatic Precipitators for dust emission control		3 Months	Based on Isokinetic test results by 22/02/2019, this task is expected to be completed by 29/03/2019
Possible Options for emission compliance being investigated				
Reduction of present emissions to the present design value (i.e. 100 mg/Nm^3 and increase operational availability)	Optimisation of Existing ESPs	Carry out a CFD (Computational Fluid Dynamic) model of the existing gas flow geometry inside one ESP to allow for possible and/or necessary corrections.	2 Months	Correction of gas flow offers substantial improvements to ESP efficiency.
		***Note*: Corrections to be evaluated for implementation suitability at both ESPs**	3 Weeks	May require replacement of inlet guide vanes, as well as inlet and outlet screens.

Objective	Methodology	Technology/Tasks	Period	Comments
		Implement findings of Internal Inspection report. ***<u>Note:</u>*** *Could be carried out in order to mitigate emissions during the evaluation and approval of the final technical solution*	4 Months (i.e. manufacture & installation)	Replacement of critical elements based on inspection results and agreed implementation
		Replacement of existing HV Control Systems i.e. Control Panel / Controller and HV Transformer rectifier with High Frequency (HF) power supply & control systems.	3 months	Such HF Control System replacement to be carried out **<u>only</u>** after completion of proposed performance tests and ensuring mechanical soundness of each Field at each ESP.
Reduction of emissions to <100 mg/Nm³	Refurbishment and possible sectionalisation	Replacement of all internals with latest state-of-the-art systems and components.	6 Months	Replacement of Collector as well as Discharge Electrode and corresponding Side Drive Rapping Systems.
		Sectionalisation is based on split of existing 3 into 6 Fields i.e. parallel split	6 Months	Mechanical structures to ensure sectionalised Fields.
				Application of HF Power & Control systems at all field sections

Objective	Methodology	Technology/Tasks	Period	Comments
Reduction of emission to <50 mg/Nm³	Implementation of a new ESP in conjunction with the use of one of the existing ESPs. Re-routing of inlet gas volume with higher rate going through new ESP	Re-route gas inlet to 2 ESPs with New ESP taking 60% of gas volume and other ESP 40% of gas volume ***Note 1:*** *Preferred and highly recommended solution*	10 Months	Relevant ducting would be designed, connected and installed accordingly.
		Note 2: *New ESP could be sized to handle 100% of total gas volume resulting in applicable redundancy during planned or unplanned maintenance shutdowns of the ESPs*	2 Weeks	New ESP could be installed in an area parallel to the existing ESP without disturbing the operation of the existing plant. Once Unit is completed, a short tie-in period would apply to reroute the full sinter plant off-gas to the new ESP thus allowing for shutting of existing ESP and carrying out of necessary refurbishment work
		Design, planning, manufacture of necessary elements within period allocated for the implementation of the new ESP solution	2 Months	Refurbishment of existing ESP is imperative to render it effective and operationally sound.
Compliance with the NEMA: EIA regulations	Environmental authorisation process for plant upgrades	Environmental authorisation process for significant plant upgrades – Basic Assessment process	8 - 12 Months	If required. Clarification regarding the required environmental

Objective	Methodology	Technology/Tasks	Period	Comments
				authorisation processes will require further assessment based on final proposed measures to be implemented
Compliance with the NEMA: AQA Listed activities	AEL amendment process	The changes in the plant design etc. will influence the emission levels generated by MMT and thus an AEL amendment process will be required	3 Months	Attainable three months after the environmental authorisation is received

5.3 Progress made

To-date, the following progress has been achieved regarding the road map since January 2019:

- Geecom appointed to assist MMT address the emissions challenges;
- Phase 1: Geecom have conducted an initial review of present installation and has gathered basic data from the operation;
- Phase 2:
  - A detailed external inspection of precipitator units to assess their present condition has been undertaken;
  - A detailed internal inspection of precipitator units to assess the condition of the casings and mechanical elements has been undertaken;
  - Isokinetic gas composition and particle sizing tests for both ESP units has been undertaken and the emissions monitoring report is due end March 2019; and
  - Resistivity testing of one sample has been undertaken.

MMT remains committed to addressing their particulate emissions such that they may comply with the particulate emission standards in the future. In this regard, MMT is fully committed to implementation of the Geecom "roadmap to reach compliance".

6.0 POSTPONEMENT PERIOD SOUGHT

MMT requests postponement for a 5-year period until 31 March 2025 such that:

- Allow MMT to remain in legal compliance with the NEM: AQA and the associated emission standards;
- Allow MMT time to continue with the implementation of the proposed emissions reduction strategy and plan (i.e. the Geecom roadmap); and
- Allow for the implementation of the emissions reduction plan which is practically/realistically on an engineering basis, and at an acceptable cost to maintain the financial viability of MMT.

7.0 CONCLUSIONS

MMT is committed to meeting the 2020 NEM: AQA new plant emission standards and is thus applying for the postponement of the minimum emission standards compliance time frames, to allow for additional time to continue their investigations into finding an environmentally sustainable and financially viable solution to their particulate emissions challenge.

We respectfully request your understanding of the above scenario when deliberating as to whether to grant postponement. Please do not hesitate to contact me should you need further clarification on this matter.

Kind regards

Adam Bennett
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Lance Coetzee
Senior Air and Noise Specialist

AB/LC/jep

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