DE BEERS GROUP

ANNUAL AMBIENT AIR QUALITY MONITORING REPORT

FOR

VENETIA MINE

LIMPOPO PROVINCE

AS REQUIRED BY THE ATMOSPHERIC EMISSIONS LICENSE 12/4/12L-V7 ISSUED BY THE LIMPOPO PROVINCE DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

REPORTING PERIOD: FEBRUARY 2020 - JANUARY 2021

De Beers Consolidated Mines Proprietary Limited

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A member of the Anglo American plc group

REPORT 20/R1957

DISCIPLINE: ENVIRONMENT

ANNUAL AMBIENT AIR QUALITY MONITORING REPORT

FOR

DE BEERS GROUP OF COMPANIES VENETIA MINE, LIMPOPO

REPORTING PERIOD: FEBRUARY 2020 - JANUARY 2021

E&OE

This Annual Monitoring Report has been prepared on behalf of Venetia Mine by Levego Environmental Services. The plan fulfils part of the monitoring requirements of the Atmospheric Emissions License, of which Venetia Mine's Environmental Manager is the custodian. Any questions, comments or queries should be directed to the Environmental Manager.

I declare that information provided in this plan is in all respect factually accurate and complete to best of my knowledge as of the date of my signature.

_____

Venetia Mine Environmental Manager

Nirvana Ramlal

Date: _____

I, Hlayiseka Mishack Yingwani in my capacity as Project Manager for Levego Environmental Services (Pty) Ltd (LES) certify that I have reviewed and verified this report and that information provided is complete, accurate and representative of the reporting timeframes and reporting requirements.

Building R6, Pinelands Site, Ardeer Rd, Modderfontein, 1645. P O Box 422, Modderfontein 1645

Your Reference: Order no. **4100713972**

Our Reference: **LES0001AM** Quotation 17/QF10723/vj

Enquiries: H. M. Yingwani
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Date: 25 February 2020

DBCM (PTY) LTD VENETIA MINE
VENETIA MINE SITE
83 KM FROM MUSINA ON THE ALLDAYS ROAD
37 KM FROM ALLDAYS ON THE MUSINA ROAD

Attention: Nirvana Ramlal

Dear Madam,

REPORT No: 20/R1957 – ANNUAL AMBIENT AIR QUALITY MONITORING REPORT FOR FEBRUARY 2020 – JANUARY 2021 FOR VENETIA MINE – MUSINA, LIMPOPO

Please find attached our final De Beers Venetia Mine Annual Ambient Air Quality Monitoring Report for February 2020 – January 2021 period.

We thank you for this opportunity to be of service, and trust that the attached meets your approval.

If you have any queries, please do not hesitate to contact us at the number provided above.

Yours sincerely,

H. M. Yingwani
Project manager
On behalf of
Levego Environmental Services

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List of abbreviations, acronyms, and symbols (where applicable)	
AEL	Atmospheric Emission Licence
ASTM	American Society for Testing and Materials
BDL	Below detection limit
DBCM	De Beers Consolidated Mines
EMPR	Environmental Management Programme
FRD	Fine Residue Disposal Area
GN	Government Notice
GNR	Government Notice Regulation
LDAR	Leak Detection and Repair
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LES	Levego Environmental Services (Pty) Ltd
MES	Minimum Emission Standards
MCERTS	UK Environment Agency Monitoring Certification Scheme
mg	Milligram
MPRDA	The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEM:AQA	National Environment Management: Air Quality Act (Act No. 39 of 2004)
NSD	North Seepage Dam
RWD	Return Water Dam
SANAS	South African National Accreditation System
TEA	Triethanolamine
TOPAS	Turnkey Optical Particle Analysis System
TVOCs	Total Volatile Organic Compounds
US EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
VUP	Venetia Underground Project

1. BACKGROUND

Venetia Mine is located on portions 1, 2, 3, 4 and 5 of the farm Venetia 103MS, portion 1 of the farm Krone 104MS, the farm Elesger 98MS, the farm Drumsheugh 99MS, and the farm Rugen 105MS. The mine is situated approximately 83 km west of the town Musina and 37 km northeast of the town Alldays in the Musina Local Municipality, which is a part of the Vhembe District Municipality in the Limpopo Province (Refer to Figure 1).

Venetia Mine was issued an Atmospheric Emissions License (AEL) on the 10th of April 2017. Following a request for clarity to the Department (letter dated 13th of April 2017) the Department submitted a formal response on the 24th of April 2017 which addressed, among others the monitoring requirements. This letter has since been used in conjunction with the AEL for implementation.

2. ROUTINE REPORTING AND RECORD KEEPING

In terms of the requirements stipulated in the Venetia mine atmospheric emissions license (AEL), number 12/4/12 L V7, License Holder must complete and submit to the Licensing Authority a Annual Report no later than thirty (30) days after the end of each reporting period. The report must include information for the period under review. The Annual report must include, but not limited to, the following:

2.1 COMPLAINTS REGISTER

The License Holder must maintain a Complaints Register at its premises, and such register must be available for inspections. The Complaints register must include the following information on the complainant, namely, the name, physical address, telephone number, data and time when complaint was registered. The register should also provide space for noise, dust and offensive odours complaints. Furthermore, the License Holder is to investigate and, Annual, report to the Licensing Authority in a summarised format on total number of complaints lodged. The complaints must be reported in the following format with each component indicated as may be necessary.

a) Air pollution complaints received;

b) Date the complaint was received and the date the facility responded;

c) Investigations to determine the cause of the complaint;

d) Results of the investigation; and

e) Any actions taken to resolve the complaint.

The Licensing Authority must also be provided with a copy of the Complaints Register upon request.

Venetia Mine is ISO14001-certified and has a documented process to follow to receive and manage complaints. The Environmental Management System (EMS) procedures allow for receipt and management of complaints from both internal and external stakeholders. As part of the process:

- An investigation is launched.
- Action plans are drafted (where necessary).
- Progress on the complaint is tracked electronically via the mine's electronic management system.
- All records are documented including final responses.
- The final written response to the complainant is provided within 14 days of receipt of the complaint.

The mine has not received any emissions-related complaints during the reporting period (throughout 2020 to date).

Table 1: Emissions-related Environmental Complaints during the Reporting period (Feb 2020 – Jan 2021).

Reporting Period	Environmental Complaints
February 2020 – April 2020	0
May 2020 – July 2020	0
August 2020 – October 2020	0
November 2020 - January 2021	0

2.2 OPERATION AND PRODUCTION RECORDS

The license Holder must track and record the operation and production such that source-wide emissions can be estimated on a daily basis. Records must include, but not be limited to:

a) Daily hours of operation;

b) Daily raw material and fuel consumption rate.

c) Ash and Sulphur content percentage of any fuel used.

The AEL license requires the submission of daily operation and consumption records through the Annual report, however, as indicated in the Department's letter (dated 24

April 2017) the department will allow for the submission of monthly operation and production records, with daily records to be available upon request. Table 2, Table 3, Table 4 and Table 5 provide an overview of the operation's hours for quarter 1, quarter 2, quarter 3 and quarter 4 respectively for the reporting period. It is important to note that Venetia Mine is a 24-hour operation. Employees and contractors work through public holidays and on weekends. In the first quarter of the reporting period, the operation was forced to stop operating due to the Level 5 National Lockdown that was imposed by the government in response to the COVID-19 pandemic.

2.2.1 MONTHLY HOURS OF OPERATION

Table 2: Monthly hours of Operation (February 2020 – April 2020).

Unit Process	Operating Hours	*Monthly Hours of Operation – February 2020	*Monthly Hours of Operation – March 2020	*Monthly Hours of Operation – April 2020	No. Days Operation per Year
[$]Open-pit and underground mining	24	696	744	93.28	365/year
Primary crushing and conveying	24	417	426	92	327/year
Ore preparation (Secondary crushing and screening, tertiary crushing, handling, conveying, and stockpiling of ore and disposal of residue)	24	565.56	581.86	154.67	327/year
[†]Recovery and Tailings Treatment Facility (Conveying and disposal of tailings and wet milling in RATT plant)	24	179.91	177.23	121.60	327/year
Handling of petroleum products (listed activity)	24	696	744	108	365/year
Storage of petroleum products (listed activity)	24	696	744	108	365/year
Open burning of explosive packaging (listed activity)	8.5	246.5	263.5	0	96/year
Diesel generators	4	16	16	16	52/year

*Note that data is based on production months and not calendar months.

Table 3: Monthly hours of Operation (May 2020 – July2020).

Unit Process	Operating Hours	*Monthly Hours of Operation – May 2020	*Monthly Hours of Operation – June 2020	*Monthly Hours of Operation – July 2020	No. Days Operation per Year
[$]Open-pit and underground mining	24	744	720	744	365/year
Primary crushing and conveying	24	431	517	464	327/year
Ore preparation (Secondary crushing and screening, tertiary crushing, handling, conveying, and stockpiling of ore and disposal of residue)	24	528.75	641.95	559.42	327/year
[†]Recovery and Tailings Treatment Facility (Conveying and disposal of tailings and wet milling in RATT plant)	24	696	583	482	327/year
Handling of petroleum products (listed activity)	24	744	720	744	365/year
Storage of petroleum products (listed activity)	24	74	720	744	365/year
Open burning of explosive packaging (listed activity)	8.5	8.5	17	17	96/year
Diesel generators	4	16	16	16	52/year

*Note that data is based on production months and not calendar months.

Table 4: Monthly hours of Operation (August 2020 – October 2020).

Unit Process	Operating Hours	*Monthly Hours of Operation – August 2020	*Monthly Hours of Operation – September 2020	*Monthly Hours of Operation – October 2020	No. Days Operation per Year
[$]Open-pit and underground mining	24	744	720	744	365/year
Primary crushing and conveying	24	485	598	539	327/year
Ore preparation (Secondary crushing and screening, tertiary crushing, handling, conveying, and stockpiling of ore and disposal of residue)	24	517.35	601.47	549.18	327/year
[†]Recovery and Tailings Treatment Facility (Conveying and disposal of tailings and wet milling in RATT plant)	24	548	644	549	327/year
Handling of petroleum products (listed activity)	24	744	720	744	365/year
Storage of petroleum products (listed activity)	24	74	720	744	365/year
Open burning of explosive packaging (listed activity)	8.5	8.5	8.5	8.5	96/year
Diesel generators	4	16	16	16	52/year

*Note that data is based on production months and not calendar months.

Table 5: Monthly hours of Operation (November 2020 – January 2021).

Unit Process	Operating Hours	*Monthly Hours of Operation – November 2020	*Monthly Hours of Operation – December 2020	*Monthly Hours of Operation – January 2021	No. Days Operation per Year
[$]Open-pit and underground mining	24	720	744	744	365/year
Primary crushing and conveying	24	596	434	482	327/year
Ore preparation (Secondary crushing and screening, tertiary crushing, handling, conveying, and stockpiling of ore and disposal of residue)	24	600.47	506.44	566.65	327/year
[†]Recovery and Tailings Treatment Facility (Conveying and disposal of tailings and wet milling in RATT plant)	24	551	415	460	327/year
Handling of petroleum products (listed activity)	24	720	744	744	365/year
Storage of petroleum products (listed activity)	24	720	744	744	365/year
Open burning of explosive packaging (listed activity)	8.5	8.5	8.5	8.5	96/year
Diesel generators	4	16	16	16	52/year

*Note that data is based on production months and not calendar months.

2.2.2 MONTHLY RAW MATERIAL AND FUEL CONSUMPTION RATE

The consumption rates for the reporting period are listed in tables below. The fuel data is based on total consumption per month. It is not possible to measure consumption from individual tanks, as tanks are interlinked.

Table 6: Consumption Rates for the Reporting Period (February 2020 – April 2020).

Raw Material Type	Actual Consumption Rate (Quantity)	Design Consumption Rate (Quantity)	Actual Consumption February 2020	Actual Consumption March 2020	Actual Consumption April 2020	Units (quantity /period)
Explosive packaging	1000 (250 kg/week)	1000 (250 kg/week)	199	236	0	kg/month
Two 23m^3 subterranean petrol storage tanks	46	46	1.416	1.128	0.398	m^3
Two 23m^3 subterranean diesel storage tanks	46	46	2361.171	2517.714	313.482	m^3
Three 110 m^3 diesel storage tanks	330	330				m^3
Ten 83m^3 diesel storage tanks	830	830				m^3
Two 28m^3 diesel storage tanks	56	56				m^3
One 5m^3 diesel storage tank	5	5				m^3
One 60m^3 diesel storage tank	60	60				m^3

Table 7: Consumption Rates for the Reporting Period (May 2020 – July 2020).

Raw Material Type	Actual Consumption Rate (Quantity)	Design Consumption Rate (Quantity)	Actual Consumption May 2020	Actual Consumption June 2020	Actual Consumption July 2020	Units (quantity/ period)
Explosive packaging	1000 (250 kg/week)	1000 (250 kg/week)	153	342	522.79	kg/month
* One 23m^3 subterranean petrol storage tanks	23	23	0.481	0.475	0.891	m^3
* One 23m^3 subterranean petrol storage tanks	23	23	1.792	3.060	1.500	m^3
One 23m^3 subterranean diesel storage tanks	23	23	129.045	140.419	152.600	m^3
One 23m^3 subterranean diesel storage tanks	23	23	1 810.810	2050.616	1605.365	m^3
Three 110 m^3 diesel storage tanks	330	330				m^3
Ten 83m^3 diesel storage tanks	830	830				m^3
Two 28m^3 diesel storage tanks	56	56				m^3
One 5m^3 diesel storage tank	5	5				m^3
One 60m^3 diesel storage tank	60	60				m^3
One 83m^3 used oil storage tank	83	83	10.132	16.590	18.586	m^3
Three 23m^3 used oil storage tanks	69	69				m^3
One 4.5m^3 used oil storage tank	4.5	4.5				
Seven 23m^3 bulk oil storage tank	161	161	79.205	85.075	72.692	m^3
Seven 2.55m3 bulk oil storage tanks	12.75	12.75				m^3

Table 8: Consumption Rates for the Reporting Period (August 2020 – October 2020).

Raw Material Type	Actual Consumption Rate (Quantity)	Design Consumption Rate (Quantity)	Actual Consumption August 2020	Actual Consumption September 2020	Actual Consumption October 2020	Units (quantity/ period)
Explosive packaging	1000 (250 kg/week)	1000 (250 kg/week)	71	222	152	kg/month
* One 23m^3 subterranean petrol storage tanks	23	23	0.786	0.800	0.520	m^3
* One 23m^3 subterranean petrol storage tanks	23	23	1.792	3.060	1.500	m^3
One 23m^3 subterranean diesel storage tanks	23	23	129.045	140.419	152.600	m^3
One 23m^3 subterranean diesel storage tanks	23	23	1 562.540	2 085.982	2 114.632	m^3
Three 110 m^3 diesel storage tanks	330	330				m^3
Ten 83m^3 diesel storage tanks	830	830				m^3
Two 28m^3 diesel storage tanks	56	56				m^3
One 5m^3 diesel storage tank	5	5				m^3
One 60m^3 diesel storage tank	60	60				m^3
One 83m^3 used oil storage tank	83	83	10.132	16.590	18.586	m^3
Three 23m^3 used oil storage tanks	69	69				m^3
One 4.5m^3 used oil storage tank	4.5	4.5				
Seven 23m^3 bulk oil storage tank	161	161	79.205	85.075	72.692	m^3
Seven 2.55m3 bulk oil storage tanks	12.75	12.75				m^3

Table 9: Consumption Rates for the Reporting Period (November 2020 – January 2021).

Raw Material Type	Actual Consumption Rate (Quantity)	Design Consumption Rate (Quantity)	Actual Consumption November 2020	Actual Consumption December 2020	Actual Consumption January 2021	Units (quantity/ period)
Explosive packaging	1000 (250 kg/week)	1000 (250 kg/week)	0	210	96	kg/month
***** One 23m^3 subterranean petrol storage tanks	23	23	1.969	0.617	0.432	m^3
One 23m^3 subterranean diesel storage tanks	23	23	1 858.897	1 499.993	1 351.609	m^3
Three 110 m^3 diesel storage tanks	330	330				m^3
Ten 83m^3 diesel storage tanks	830	830				m^3
Two 28m^3 diesel storage tanks	56	56				m^3
One 5m^3 diesel storage tank	5	5				m^3
One 60m^3 diesel storage tank	60	60				m^3
One 83m^3 used oil storage tank	83	83	53.038	46.047	8.342	m^3
Three 23m^3 used oil storage tanks	69	69				m^3
One 4.5m^3 used oil storage tank	4.5	4.5				
Seven 23m^3 bulk oil storage tank	161	161				m^3
Seven 2.55m3 bulk oil storage tanks	12.75	12.75				m^3

2.2.3 ASH AND SULPHUR CONTENT (%) OF ANY FUEL USED

Table 10 outlines the total diesel consumption for the reporting period, as well as the sulphur content of such, while Table 11 outlines the total petrol consumption during the reporting period.

Table 10: Total diesel consumption rate for the reporting period (February 2010 – January 2021).

Materials for Energy Source (Diesel)	Actual Diesel Consumption Rate (Quantity)	Units (Quantity /Period)	Materials Characteristics	
			Sulphur Content (%)	Ash Content (%)
February 2020	2 361 171	litre/month	0.05	0.01
March 2020	2 517 714	litre/month	0.05	0.01
April 2020	313 482	litre/month	0.05	0.01
May 2020	8 810 810	litre/month	0.05	0.01
June 2020	2 050 616	litre/month	0.05	0.01
July 2020	1 605 365	litre/month	0.05	0.01
August 2020	1 562 504	litre/month	0.05	0.01
September 2020	2 085 982	litre/month	0.05	0.01
October 2020	2 114 632	litre/month	0.05	0.01
November 2020	1 858 897	litre/month	0.05	0.01
December 2020	1 499 993	litre/month	0.05	0.01
January 2021	1 351 609	litre/month	0.05	0.01

Table 11: Total petrol consumption rate for the reporting period (November 2020 – January 2021).

Materials for Energy Source (Petrol)	Actual Petrol Consumption Rate (Quantity)	Units (Quantity /Period)	Materials Characteristics	
			Sulphur Content (%)	Ash Content (%)
February 2020	1 416	litre/month	0.05	0.01
March 2020	1 128	litre/month	0.05	0.01
April 2020	398	litre/month	0.05	0.01
May 2020	2 273	litre/month	0.05	0.01
June 2020	3 535	litre/month	0.05	0.01
July 2020	2 391	litre/month	0.05	0.01
August 2020	786	litre/month	0.05	0.01
September 2020	800	litre/month	0.05	0.01
October 2020	520	litre/month	0.05	0.01
November 2020	1969	litre/month	0.05	0.01
December 2020	617	litre/month	0.05	0.01
January 2021	432	litre/month	0.05	0.01

2.3 AIR QUALITY IMPROVEMENT AND SOCIAL RESPONSIBILITY

a) Ambient air quality monitoring results;

b) Air quality improvement initiatives;

c) Public education and awareness campaigns.

Items A-C in the AEL license (Page 28 of 29) relate to ambient air quality results, air quality improvement initiatives and public education and awareness campaigns.

LES drafted the five-year Public Education and Awareness Plan and Fugitive Emissions/Dust Management Plan, as well as Leak Detection and Repair (LDAR) programme for Venetia Mine.

The updated plans for the Mine were approved on the 24th of March 2020. Due to the COVID-19 pandemic, the Department reissued the approval letter effective from the 13th of August 2020. The approval letter indicated that implementation of such plans and programmes should take place within one month of approval. The Fugitive Emissions and Dust Management Plan and Leak Detection and Repair Programme was implemented immediately. A service provider (Airshed) has been appointed for the implementation of the

plan. Implementation plan extends over 2021 and includes adjustment of communication mechanisms to mitigate for any COVID-19 related risks.

3. APPLICABLE LEGISLATION

The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) has shifted the approach of air quality management from source-based control to receptor-based control. The Act makes provision for the setting and formulation of national ambient air quality standards for 'substances or mixtures of substances which present a threat to health, well-being or the environment'. More stringent standards can be established at the provincial and local levels.

The new Act introduced a system based on ambient air quality standards and corresponding emission limits to achieve them. Three significant regulations derived from NEM: AQA have been promulgated in this regard and are as follows:

- GNR 1210 on 24 December 2009 (Government Gazette 32816) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): National Ambient Air Quality Standards.
- GNR 248 on 31 March 2010 (Government Gazette 33064) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): List of Activities Which Result in Atmospheric Emissions Which Have or May Have a Significant Detrimental Effect on the Environment, Including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage (Updated by GNR 893 on 22 November 2013 (Government Gazette 37054).
- GNR 486 on 29 June 2012 (Government Gazette 35463) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): National Ambient Air Quality Standard for Particulate Matter with Aerodynamic Diameter less than 2.5 Micron Metres ($PM_{2.5}$).

3.1 DUST DEPOSITION

The legislated standards for dustfall were promulgated by the Minister of Water and Environmental Affairs in the form of the National Environment: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA): National Dust Control Regulations. The purpose of the regulations is to prescribe general measures for the control of dust in all areas.

The National Dust Control Standard allows for both residential and non-residential dust fall out standards Table 3 below represents the legally allowed amount of dustfall for both residential and non-residential areas.

Table 3: Acceptable Dustfall Rates as per the National Dust Control Regulations (GNR 827, 01 November 2013).

Restriction Areas	Dustfall rate (D) ($mg/m^2/day$) 30 day average	Permitted frequency of exceeding dustfall rate	Reference Method
Residential Area	D < 600	Two within a year, not sequential months	ASTM D1739
Non-Residential Area	600 < D < 1200	Two within a year, not sequential months	ASTM D1739

The method to be used for the measuring of dustfall rates and the guideline for locating sampling points as recommended by the standard is the ASTM D1739, or equivalent method approved by any internationally recognised body.

A dustfall monitoring program may need to be developed and implemented upon the written request of an air quality officer. A person or facility required to implement a dust fall monitoring programme, must within a specified period, submit a dust fall monitoring report to the air quality officer.

Within three months after submission of the report, the facility must develop and submit a dust management plan to the local air quality officer for approval. Such a plan must:

- Identify all possible sources of dust within the affected site;
- Detail the best practicable measures to be undertaken to mitigate dust emissions;
- Detail an implementation schedule;
- Identify the line management responsible for implementation;
- Incorporate the dustfall monitoring plan; and
- Establish a register for recording all complaints received.

The above requirements were met with the submission of the Fugitive Emissions Management and Dust Management Plan to the Regulator.

3.2 PARTICULATE MATTER

Ambient air quality standards have been developed for eight criteria air pollutants in South Africa. These are pollutants that are known to have a negative impact on human health and environmental quality. National ambient air quality standards, including allowable frequencies of exceedence and compliance timeframes, were issued by the Minister of Water and Environmental Affairs on 24 December 2009. The pollutant of concern at the Venetia Mine was identified as particulate matter (PM_{10}).

The PM_{10} standard, as applicable to the ambient air quality monitoring at the Venetia Mine is tabulated below (Table 4). $PM_{2.5}$ pollutant, although not required by the AEL, is also being monitored (Table 5).

National standards for $PM_{2.5}$ were established by the Minister of Water and Environmental Affairs on 29 June 2012 and stipulate a phased approach towards the implementation of national ambient air quality standards.

Table 4: National ambient air quality standards for Particulate Matter (PM_{10}).

Averaging Period	Concentration	Frequency of exceedence	Compliance Date
24 hours	75 µg/m^3	4	1 January 2015
1 year	40 µg/m^3	0	1 January 2015

Table 5: National ambient air quality standard for Particulate Matter ($PM_{2.5}$).

Averaging Period	Concentration	Frequency of exceedence	Compliance Date
24 hours	40 µg/m^3	4	1 January 2016 – 31 December 2029
24 hours	25 µg/ m^3	4	1 January 2030
1 year	20 µg/ m^3	0	1 January 2016 – 31 December 2029
1 year	15 µg/ m^3	0	1 January 2030

The control and management of emissions in the NEM: AQA relates to the listing of activities that are sources of emission and the issuing of emission licences. Listed activities are defined as activities which 'result in atmospheric emissions and are regarded as having a significant detrimental effect on the environment, including human health'. Listed activities have been identified by the Minister of the Department of Environmental Affairs and minimum atmospheric emission standards have been established for each of these activities.

These listed activities now require an AEL to operate. The issuing of emission licences for Listed Activities is the responsibility of the Metropolitan and District Municipalities. If a metropolitan or district municipality has delegated its functions of licensing authority to a provincial organ of state in terms of section 238 of the Constitution, that provincial organ of state must, for the purposes of the NEM: AQA, be regarded as the licensing authority in the area of that municipality.

Those listed activities applicable to the current report are summarised in Table 6 and

Table 7.

The NEM: AQA requires all persons undertaking listed activities in terms of Section 21 of the Act to obtain an AEL.

According to the amended list of activities (GN 893:2013), an AEL is required for all permanent immobile liquid storage facilities at a single site with a combined storage capacity of greater- than 1000 cubic meters under Category 2: Petroleum Industry, the production of gaseous and liquid fuels as well as petrochemicals from crude oil, coal, gas or biomass, Sub-Category 2.4: Storage and Handling of Petroleum Products, and for facilities that are disposing more than 100 kg of waste material from the manufacture of explosives and contaminated explosive packaging per week, under Category 8: Thermal treatment of General and Hazardous Waste, Sub-Category 8.3: Burning Grounds.

Category 2.4 prescribes special arrangements that apply for control of Volatile Organic Compounds (VOCs) from storage of raw materials, intermediate and final products with a vapour pressure above 14 kPa at operating temperature. The special arrangement stipulates that alternative control measures that can achieve the same or better results as the prescribed abatement technologies may be used.

Government Notice 893 (commonly known as the "Minimum Emission Standards (MES)") makes it compulsory for all Subcategory 2.4 Listed Activities to institute a LDAR programme in accordance with United States Environmental Protection Agency (US EPA) Method 21 (entitled "Determination of Volatile Organic Compound Leaks"). Furthermore, Government Notice 893 also requires that the LDAR programme be approved by the Licensing Authority prior to implementation.

The following transitional arrangement shall apply for the storage and handling of raw materials, intermediate and final products with a vapour pressure greater than 14 kPa at operating temperature:

- LDAR programme approved by the licensing authority to be instituted, by the date stipulated in the AEL.
    - The following special arrangements shall apply for control of Total VOCs (TVOCs) from storage of raw materials, intermediate and final products with a vapour pressure of up to 14 kPa at operating temperature, except during loading and offloading. (Alternative control measures that can achieve the same or better results may be used).
    - The roof legs, slotted pipes and/or dipping well on floating roof tanks (except for domed floating roof tanks or internal floating roof tanks) shall have sleeves fitted to minimise emissions.
    - Relief valves on pressurised storage should undergo periodic checks for internal leaks.

- This can be carried out using portable acoustic monitors or if venting to atmosphere with an accessible open end, tested with a hydrocarbon analyser as part of an LDAR programme.

Table 6: Category 2: Petroleum Industry, the production of gaseous and liquid fuels and well as petrochemicals from crude oil, coal, gas or biomass, Subcategory 2.4: Storage and Handling of Petroleum Products, special arrangement (4)(b)(i).

Application	**All permanent immobile storage facilities at a single site with a combined storage capacity greater than 1000 cubic metres**
True vapour pressure of contents at product storage temperature	**Type of tank or vessel**
Type 1: Up to 14 kPa	Fixed roof tank vented to atmosphere, or as per Type 2 and 3.
Type 2: Above 14 kPa and up to 91 kPa with a throughput of less than 50 000 m^3 per annum	Fixed-roof tanks with Pressure Vacuum Vents fitted as a minimum, to prevent "breathing losses", or as per Type 3.
Type 3: Above 14 kPa and up to 91 kPa with a throughput greater than 50 000 m^3 per annum	a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20 m, or b) Fixed-roof tank with internal floating deck/roof fitted with primary seal, or c) Fixed roof tank with vapour recovery system.
Type 4: Above 91 kPa	Pressure vessel

Burning grounds, as per sub category 8.3 of the notice, are described as facilities where waste material from the manufacture of explosives and contaminated explosive packaging material are destroyed. This applies to all installations disposing of more than 100 kg of material per week (Refer to Table 7). The open burning or explosive packaging at the Venetia Mine therefore require licensing as per Section 22 of NEM: AQA.

Based on records taken of the type and quantity of explosive packaging burned from the year 2012, it was determined that an average of 128 kg is burned at a time over a period of three hours.

Table 7: Category 8: Thermal treatment of General and Hazardous Waste, Sub-Category 8.3: Burning Grounds.

Description:	Facilities where waste material from the manufacture of explosives and contaminated explosive packaging material are destroyed.		
Application:	All installations disposing of more than 100 kg of material per week		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under normal conditions of 273 Kelvin and 101.3 kPa.**
Common name	**Chemical symbol**		
Dust fall	N/A	New	a
		Existing	a
Sulphur dioxide	SO_2	New	b
		Existing	b
[a] Three months running average not to exceed limit value for adjacent land use according to dust control regulations promulgated in terms of section 32 of the NEM: AQA, 2004 (Act No. 39 of 2004), in eight principal wind directions. [b] Twelve months running average not to exceed limit value as per GN 1210 of 24 December 2009. Passive diffusive measurement approved by the licensing authority carried out monthly.			

The relevant standard for SO_2 as per GN 1210 of 24 December 2009 is presented in Table 8.

Averaging Period	**Concentration**	**Frequency of exceedence**	**Compliance Date**
10 minutes	500 µg/m^3 (191ppb)	526	Immediate
1 hour	350 µg/m^3 (134ppb)	88	Immediate
24 hours	125 µg/m^3 (48ppb)	4	Immediate
1 year	50 µg/m^3 (19ppb)	0	Immediate

Table 8: National ambient air quality standard for Sulphur Dioxide (SO_2).

4. METHODOLOGY

Levego Environmental Services (Pty) Ltd (hereafter LES) were appointed to conduct ambient air quality monitoring (inclusive of fall-out dust monitoring) and reporting on behalf of Venetia Mine. All samples are delivered to SANAS-accredited laboratories.

4.1 METEOROLOGICAL MONITORING

Meteorological conditions affect how pollutants emitted into the air are directed, diluted and dispersed within the atmosphere, as well as in assisting with the interpretation of spatial and temporal trends.

To accurately assess the impact of meteorological conditions on the dust fallout and fine particulate matter originating from Venetia Mine, and to compare the temporal trends and to generate the wind roses, the meteorological data for the sampling period was obtained from the met station on-site. Wind speed and wind direction recorded at the Timbila office Met Station was used to generate wind roses. Data was available for rainfall, temperature and relative humidity.

4.2 DUSTFALL MONITORING

American Society for Testing and Materials (ASTM) standard method for collection and analysis of dustfall (ASTM D1739) has now been defined in the local context in the National Dust Control Regulations as the standard test method for collection and measurement of dustfall.

The deviation from the 2017 version of the ASTM standard is noted with respect to the application of distilled water in the collector so that the level stands at one half the collector depth when the test is started. Sufficient amount of copper sulphate is added to the collector as an algaecide to give a concentration of 15 mg/l if the collector fills. Under the latter condition copper cannot be determined.

The ASTM D1739 method covers a procedure for the field collection of particulates settling from atmosphere, and for preliminary characterisation of the sample matter.

Containers are thoroughly cleaned with water and mild detergent and rinsed with water at the laboratory before sampling. Containers are then sealed with their lids and labelled for identification purposes.

Containers are transported to the sampling sites in crates.

Open-top collectors of a specified size and shape are located carefully outdoors to provide particulate samples that are representative of the area being studied.

At the sampling site, the lids of the containers are removed and containers are placed onto the stands.

The location of each container and the date and time of collection is accurately recorded.

Containers are left in the field for a calendar month (± 2 days), or a maximum of 32 days.

Collected material is taken to the laboratory in a closed container for weighing and analysis. The containers are placed in the crate and transported back to the laboratory. No attempt is to be made to remove collected particulate sample from the collector at the field site.

At the laboratory, each filter paper is numbered and dried at the temperature of 105ºC for one hour. The filter is cooled and weighed to the nearest 0.1 mg. This will be the pre-weight. The filter is then placed in the funnel and the funnel is placed on the filter flask.

Water is added to the container to bring the volume of liquid in the container to 200 ml. It is important to ensure that all particulate matter is entrained in the water. The content is poured into the funnel. The container is rinsed again and water poured into the funnel. The filter paper is removed from the funnel and dried in the oven for at least 90 minutes. The dried filter is cooled and weighed again to the nearest 0.1 mg.

The sample inspection, collection and analysis were undertaken as per the ASTM D1739 protocol, the details of which are summarised as follows:

4.2.1 DUSTFALL SAMPLER INSPECTIONS

The integrity of each of the 25 samplers (17 samplers that monitor dustfall around the stockpile areas, slimes dams, as well as along the site boundary and 8 monitoring sites that specifically address the dustfall from the open burning grounds area) were inspected and the status recorded on 19 February 2020, 19 March 2020, 20 May 2020, 19 June 2020, 20 July 2020, 19 August 2020, 17 September 2020, 19 October 2020, 19 November 2020, 17 December 2020 and 18 January 2021. The samplers were reconditioned for correct sampling operation. This involved replacing the previous bucket with a new one at every sampler location, ensuring each one is in an upright and stable position and the bucket is firmly in place, and enduring that the extensions and wind shields are in place.

4.2.2 DUSTFALL SAMPLER COLLECTION

Sample exposures dates for the monitoring period (February 2020 – January 2021) are presented in Table 9. All of the samples complied with prescribed sampling period as per NDCR for all sampling cycles. Sample change for dustfall involved removal of the exposed sample bucket, and sealing the lid. The sample was replaced with a new (laboratory prepared) clean sample bucket with clean water and a mild algaecide solution to prevent algae build-up in the sample.

Table 9: Sampling dates and comments for the De Beers Venetia Mine dustfall monitoring network for

Sampling Period (Reporting Month)	Start and End Date	Compliance with NDCR (30±2 days)	Comments
February 2020	20 January 2020 – 19 February 2020	Yes (31 days)	100 % sampling return
March 2020	19 February 2020 – 19 March 2020	Yes (29 days)	100 % sampling return
April 2020*	19 March – 20 May 2020	No (62 days)	100 % sampling return
May 2020*	19 March – 20 May 2020	No (62 days)	100 % sampling return
June 2020	20 May 2020 – 19 June 2020	Yes (30 days)	100 % sampling return
July 2020	19 June 2020 – 20 July 2020	Yes (31 days)	100 % sampling return
August 2020	20 July – 19 August 2020	Yes (30 days)	100 % sampling return
September 2020	19 August 2020 – 17 September 2020	Yes (29 days)	100 % sampling return
October 2020	17 September 2020 – 19 October 2020	Yes (32 days)	100 % sampling return
November 2020	19 October 2020 – 19 November 2020	Yes (31 days)	100 % sampling return*
December 2020	19 November – 17 December 2020	Yes (28 days)	100 % sampling return**
January 2021	17 December 2020 – 18 January 2021	Yes (32 days)	100 % sampling return

February 2020 to January 2021 monitoring period.

*April and May dustfall samples were exposed for 62 days. Due to the nationwide lockdown, the samples could not be replaced as planned on the 20 April 2020. This extended exposure period has been accounted for in the calculation of the results for each month.

4.2.3 SAMPLE ANALYSIS

The samples were delivered to the SANAS Accredited laboratory on return from the field sites for settling and subsequent gravimetric filtration of each bucket's contents. The laboratory analysis and report included total dust mass (as mg) on a dry basis, by gravimetric analysis (filtration). LES then determined the dustfall rate by dividing the total dry mass (insoluble particulate matter) by the cross-sectional area of the bucket opening and the exposure duration in days.

4.2.4 SITE SELECTION

LES deployed dustfall samplers at twenty-five locations at Venetia Mine. Eleven dustfall monitoring sites were established in 2009, however, the monitoring protocols showed that the sampling periods did not comply with recommended standards at the time. The monitoring network was operated and maintained by the Venetia mine staff. As of 2011, Venetia mine corrected the sampling procedures, as well as sampling periods, and in 2013, six new monitoring sites were added to the existing monitoring network. In November 2013, National Dust Control Regulations were promulgated and the existing monitoring equipment was not compliant with the newly introduced NCDR standard. The seventeen monitoring sites were selected based on predominant wind directions and identified sources of air pollution as per AEL requirements, NDCR compliant monitoring equipment was deployed at the existing sites, and eight new dustfall monitoring sites were established in eight principal wind directions to monitor dustfall deposition in the vicinity of the open burning grounds. Monitoring sites for the dustfall samplers were selected according to:

- Potential pollutant sources;
- Site shape and plant layout;
- Predominant wind patterns;
- Neighbouring land use or activities;
- Historical data.

Table 10 presents site classifications, coordinates for each dustfall monitoring unit, as well as sampler type, whilst Figure 2 and Figure 3 illustrate the monitoring locations at the mine and open burning grounds respectively, the yellow pins representing the sampling locations.
Venetia Mine approached Limpopo Department: Economic Development, Environment and Tourism (LEDET) with regards to re-location of certain sampling stations in February 2019.

ASTM D1739 Standard Method for Collection and Analysis of Dustfall (Settleable Particulates) states that sampling station shall have free exposure so that the sample is collected by gravity settling only. It must be free from undue local sources of pollution and free from interference from buildings or other higher objects or structures, under 6.5.1. In case of sampling stations O, P, and Q, it is clear that local sources of air pollution (site clearing, transport of material by trucks along the mine haul roads, and construction of shafts) had undue influence to the dust fallout levels measured at these sampling stations. Station L was located in the Venetia Limpopo Nature Reserve (VLNR) and was inaccessible during the rainy season and there was danger with regards to wild animals, while sampling station M was located close to the Main Office and close to the open pit area. LEDET approved the re-location of these five sampling stations to the more representative locations along the mine fence-line.

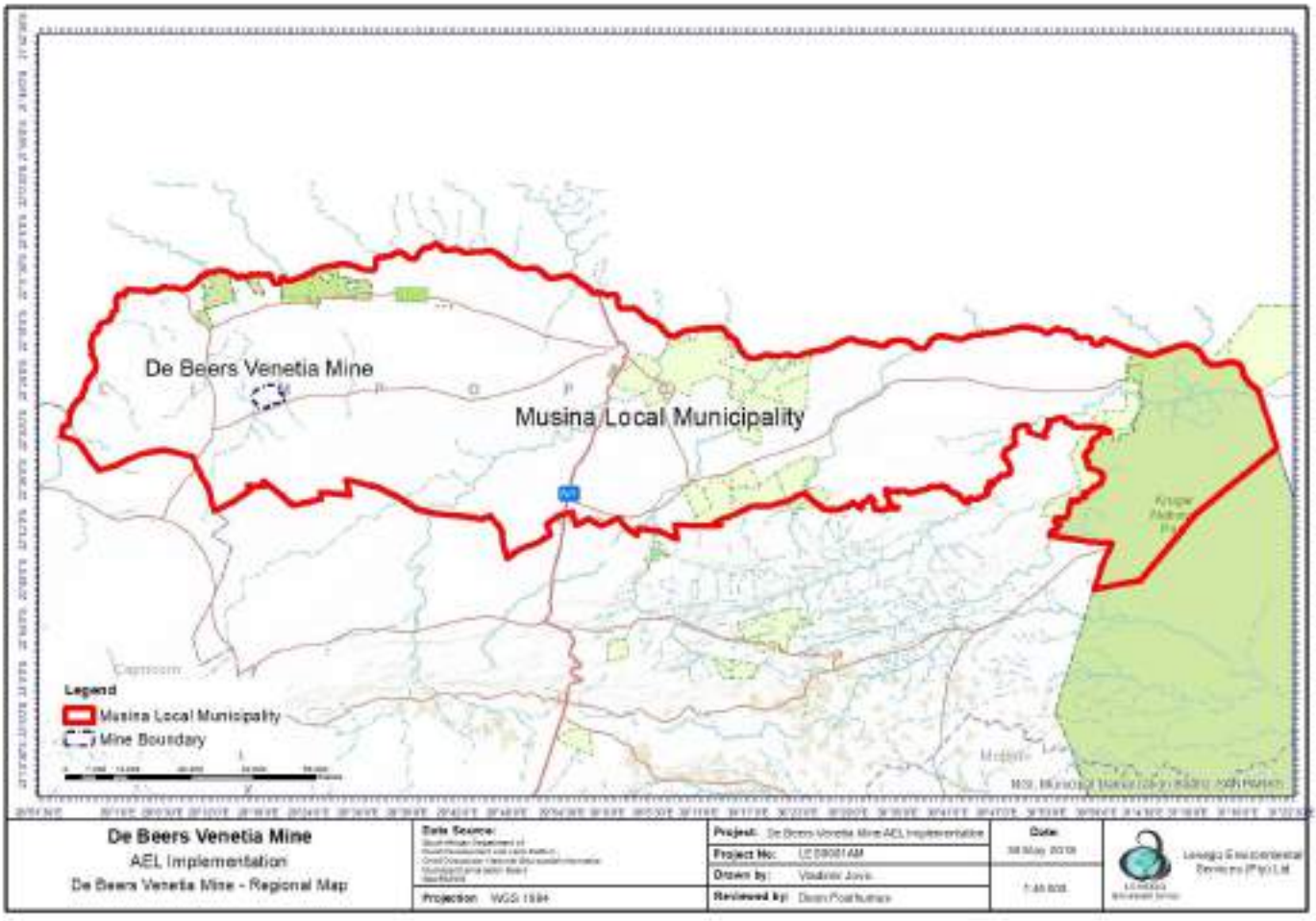


Figure 1: Location of Venetia Mine in Musina Municipality presented on the satellite image map.

Figure 2: Location of 17 dust fallout monitoring sites along the site boundary of Venetia Mine presented on the satellite image map.

Figure 3: Location of Burning Grounds dustfall monitoring sites at Venetia Mine presented on the satellite image map.

Figure 4: Location of Particulate Matter monitoring sites at Venetia Mine presented on the satellite image map.

Figure 5: Location of Weather Station at Venetia Mine presented on the satellite image map. The Main Office Continuous Particulate monitor is located 4 m away from the Weather station.

Figure 6: Location of Radiello SO_2 Passive monitoring sites at Venetia Mine presented on the satellite image map.

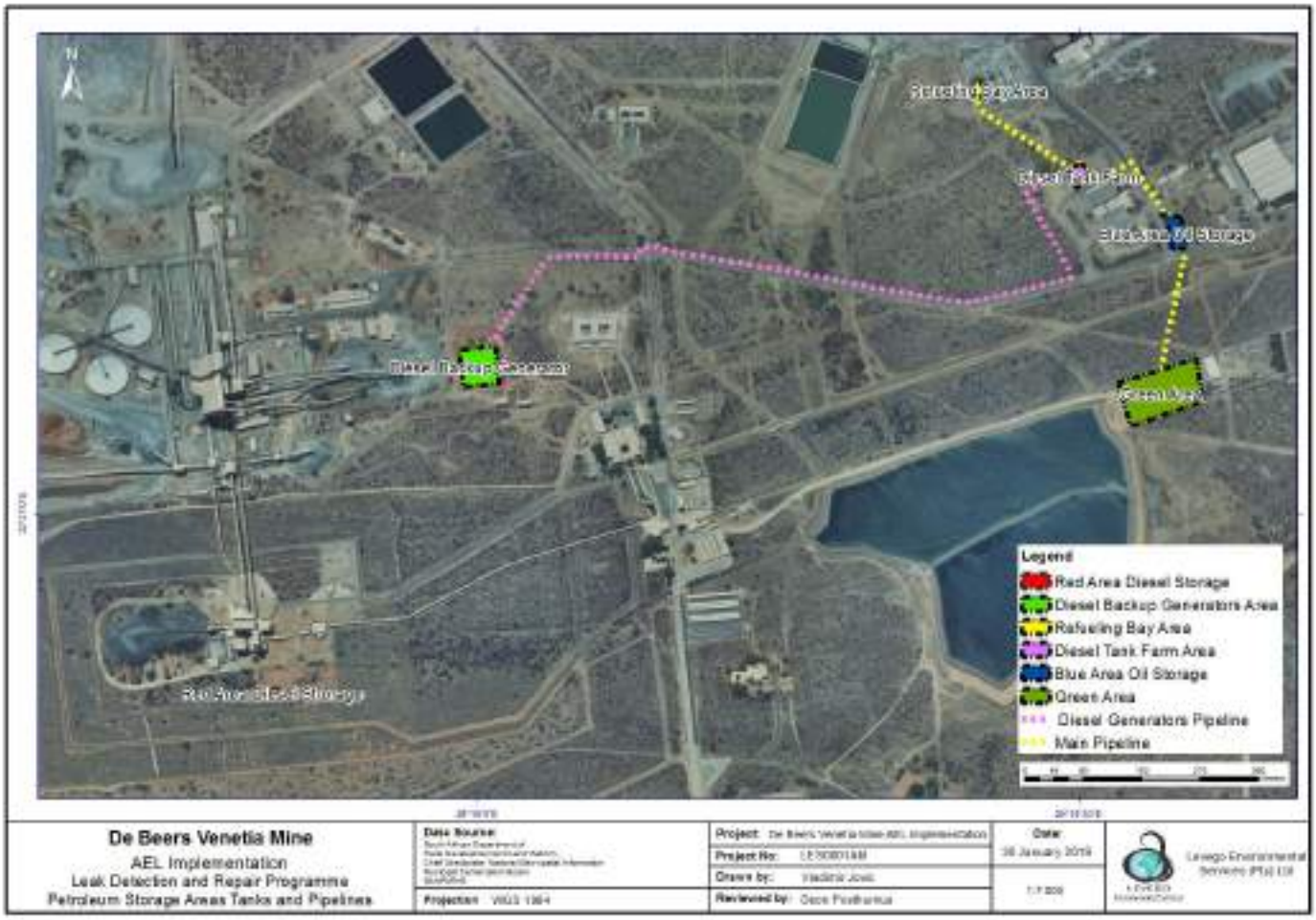


Figure 7: Leak detection and repair programme monitoring areas and pipelines on the satellite image map.

Table 10: Dustfall site coordinates and classifications.

Site ID	Classification	Latitude (S)	Longitude (E)	Sampler type
Station A	Non-residential	22.45502286	29.32049717	Single bucket ASTM D1739 Compliant
Station B	Non-residential	22.45556667	29.29810000	Single bucket ASTM D1739 Compliant
Station C	Non-residential	22.44310000	29.29178333	Single bucket ASTM D1739 Compliant
Station D	Non-residential	22.41846667	29.29610000	Single bucket ASTM D1739 Compliant
Station E	Non-residential	22.41316667	29.31161667	Single bucket ASTM D1739 Compliant
Station F	Non-residential	22.41056667	29.32400000	Single bucket ASTM D1739 Compliant
Station G	Non-residential	22.41526667	29.33870000	Single bucket ASTM D1739 Compliant
Station H	Non-residential	22.42521667	29.34118333	Single bucket ASTM D1739 Compliant
Station I	Non-residential	22.43305000	29.34538333	Single bucket ASTM D1739 Compliant
Station J	Non-residential	22.44218333	29.34181667	Single bucket ASTM D1739 Compliant
Station K	Non-residential	22.45194444	29.33527778	Single bucket ASTM D1739 Compliant
Station N	Non-residential	22.44921074	29.29286389	Single bucket ASTM D1739 Compliant
Station R1	Non-residential	22.43969155	29.33683323	Single bucket ASTM D1739 Compliant
Station R2	Non-residential	22.43945256	29.33683114	Single bucket ASTM D1739 Compliant
Station R3	Non-residential	22.43939655	29.3370704	Single bucket ASTM D1739 Compliant
Station R4	Non-residential	22.43935448	29.33728931	Single bucket ASTM D1739 Compliant
Station R5	Non-residential	22.43947994	29.33739077	Single bucket ASTM D1739 Compliant
Station R6	Non-residential	22.43973953	29.33747543	Single bucket ASTM D1739 Compliant
Station R7	Non-residential	22.43993418	29.33723019	Single bucket ASTM D1739 Compliant
Station R8	Non-residential	22.43988446	29.33688940	Single bucket ASTM D1739 Compliant
Station S	Non-residential	22.44666700	29.32715000	Single bucket ASTM D1739 Compliant
Station T	Non-residential	22.45516700	29.31070000	Single bucket ASTM D1739 Compliant
Station U	Non-residential	22.43286700	29.28630000	Single bucket ASTM D1739 Compliant
Station V	Non-residential	22.42806700	29.28875000	Single bucket ASTM D1739 Compliant
Station W	Non-residential	22.41596700	29.30388300	Single bucket ASTM D1739 Compliant

4.1 PM_{10} MONITORING

While specialist studies have been done historically, PM_{10} monitoring was not routinely monitored on site. As such, two PM_{10} monitors were installed in March 2018. Equipment (two TOPAS (Turnkey Optical Particle Analysis System) monitoring units from Turnkey Instruments Ltd) were purchased. Equipment installation, maintenance and calibration were outsourced to Levego Environmental Services (Pty) Ltd. The instruments were installed and started sampling on the 28th March 2018.

The TOPAS monitor is one of the few particulate laser instruments that is a MCERTS Certified Product (Cert #: Sira MC 090158/01). The instrument has also been successfully tested in accordance with EN12341, as per the national ambient air quality standard regulations.

The TOPAS monitor is a robust monitor intended for long-term monitoring, which simultaneously monitors TSP, PM_{10}, $PM_{2.5}$ and PM_1, as well as being installed with wind speed and direction sensors. The instrument features an internal data logger, continuously logging data at intervals defined by the user. The TOPAS incorporates a pump, which continuously draws a sample of air through the nephelometer, which analyses individual particles as they pass through the laser. The nephelometer's dedicated micro-processor can analyse individual particles, which allows size fractions to be determined at concentrations up to several mg/m^3.

The TOPAS monitors are installed on stands with custom designed solar systems providing a continuous power supply.

The Turnkey TOPAS monitors were installed at the Main Office (Timbila Building) and close to the western fence. The Main Office location was selected because it is close to the existing weather station and in direct line of site of the open pit, and it is located within the predominant wind vector from the open pit and stockpiles that are situated at the eastern part of mine. The TOPAS monitor installed at the western fence is downwind from the entire mine site, and should give an indication of the amount of dust that is exiting the site, given that it is in line with predominant wind direction in the mine area (east-northeast and east direction). Table 11 gives details of monitoring sites and Figure 4 depicts the locations of the sites on Venetia Mine premises.

Table 11: Particulate Matter site coordinates.

Site ID	Classification	Latitude (S)	Longitude (E)	Sampler type
Main Office (Timbila Building)	Non-residential	22.447767°	29.318784°	TOPAS - Turnkey Optical Particle Analysis System
Western Fence	Non-residential	22.432450°	29.286817°	TOPAS - Turnkey Optical Particle Analysis System

4.2 SO_2 MONITORING

As with PM_{10}, SO_2 monitoring was not routinely conducted on site, however, monitoring equipment was installed on the 28th March 2018 and passive diffusive measurements of SO_2 are now continuously undertaken around the open burning grounds at four locations.

The passive sampling technique chosen to monitor sulphur dioxide (SO_2) is based on the molecular diffusion of gases. It is therefore referred to as 'diffuse' or 'passive' sampling interchangeably.

The passive diffusive monitoring of SO_2 is conducted by deploying Radiello™ passive samplers and is carried out monthly, with samples exchanged fortnightly.

The Radiello monitors/samplers are passive air sampling devices designed to measure average airborne ambient concentrations of a variety of contaminant compounds using compound specific samplers.

They are ideally positioned at a height of approximately 1.7 metres above the ground, to measure in the breathing zone. Gas molecules diffuse into the samplers, where they are quantitatively collected on an impregnated filter or absorbent material, giving a concentration value integrated over the exposure time. The duration for which the samplers are required to be exposed to the gas molecules depends on the indicator being monitored, the anticipated concentration range and the stability of the indicator in the sampling medium.

Passive or diffusive sampling relies on the unassisted molecular diffusion of gaseous agents (analytes) through a diffusive surface onto an adsorbent. Unlike active (pumped) sampling, passive samplers require no electricity (expensive pumps), have no moving parts, and are simple to use (no pump operation or calibration). After sampling, the adsorbed analytes are desorbed off the adsorbent by solvent or thermal desorption.

The following are the main benefits of passive/diffusive sampling:

- Compact, portable, unobtrusive, and inexpensive;
- Offers indication of average pollution levels over time periods of 8 hours to weeks/months;
- Requires no supervision, is noiseless and can be used in hazardous environments;
- Low cost allows for sampling at multiple locations (e.g., for highlighting pollution "hotspots"; or determining long term data trends in a specific geographical area);
- Amenable to personal monitoring (breathing zone), indoor air analysis, and outdoor ambient air analysis.

The diffusive sampling does not involve the use of heavy and encumbering pumping systems, does not have energy power supply problems, does not require supervision, is noiseless, is not flammable and does not represent an explosion hazard, can be performed by everybody everywhere and with very low costs.

Though SO_2 is converted into sulphite and sulphate ions with variable ratios, the sum of the two ion equivalents is linear with exposure to SO_2. To obtain calibration curves, solutions are prepared that contain both ions at concentrations ranging from 5 to 50 mg/l. The ion chromatography analysis of the standard solutions and the extraction solutions from Radiello cartridges is performed in the same way according to the usual laboratory practice.

Radiello™ sampling system is made up of a cylindrical adsorbing cartridge housed coaxially inside a cylindrical diffusive body of polycarbonate and microporous polyethylene. It combines different characteristics common to both types: the diffusive surface is the cylinder itself, the sampling area is large, and the diffusion length is short. Diffusion is radial, and the analyte passes across a microporous cylinder before reaching an inner stainless-steel net cylinder. The SO_2 cartridge is made of microporous polyethylene coated with triethanolamine (TEA).

Sulphur (SO_2) dioxide is chemiadsorbed onto TEA as sulphite or sulphate ions. Sulphite and sulphate are analysed by ion chromatography.

Sampling is selective for gaseous molecules: any airborne sulphite or sulphate will not cross the diffusive membrane.

Radiello™ passive samplers were deployed and exposed at four on-site locations surrounding the open burning grounds for the measurement of the selected pollutant to determine its concentration and spatial distribution. Passive samplers were deployed for specific time periods, to allow for adequate adsorption of the gas onto the sorbent material for analytical measurement, but to avoid saturation point or a result below detection limit (BDL). The selected sample locations and pollutant indicators were used to determine the level of pollution being experienced by surrounding communities, and not as indicators of the immediate air quality within the Venetia Mine property.

Ambient concentrations of the pollutant (SO_2) were determined over two fortnightly periods using internationally accepted Radiello™ passive sampling devices. After the exposure period, the samplers were sealed and returned to a SANAS Accredited Laboratory for analysis.

The rate of adsorption of the samplers is known and with the recorded exposure period, a gas concentration can be calculated. Figure 8 shows the adsorption process. For this survey LES deploys radial samplers.

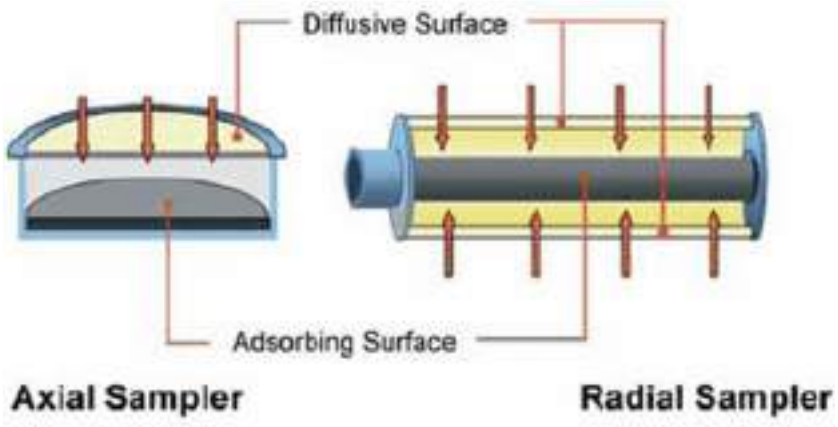


Figure 8: Diffusive and Adsorbing Surfaces of a Passive Sampler (from Passive (Diffusive) Sampling Overview, Sigma - Aldrich®).

At the laboratory, the samples were analysed by way of ion chromatography.

The sample inspection, collection and analysis were undertaken as per the protocol described in the Radiello™ Manual (2006), the details of which are summarised as follows:

4.2.1 SAMPLER INSPECTIONS

The integrity of each batch of the 4 (four) samplers was assessed before deployment for any visual non-conformities before field deployment. Adsorbing cartridges were contained in plastic tubes, wrapped up in a transparent polyethylene thermo-welded bag during the deployment and collection. During field sampling, the diffusion tubes remained sealed within plastic tubes and the original laboratory packaging until immediately before deployment. When adsorbing cartridges were retrieved, they were immediately returned to the plastic tubes, kept cold and sent to laboratory for analysis.

4.2.2 PASSIVE SAMPLER COLLECTION

Monthly sample exposure for SO_2 passive sampling follows the same exposure dates as those for dustfall monitoring network (Table 9).

The procedure for sampler collection is as follows: keep note of the date and time of the end of exposure. Place the cartridge into the tube, peel off the label and stick it onto the tube such that the barcode is parallel to the axis of the tube. Then place the exposed cartridge in its original tube, identified by the code printed on the plastic bag.

4.2.3 SAMPLE ANALYSIS

The samples were delivered to the SANAS Accredited Laboratory on return from the field sites for subsequent analysis through ion chromatography.

The Radiello™ SO_2 passive diffusive monitors were installed at the four principal directions around the open burning grounds and co-located with dustfall monitoring samplers. The samplers should give good indication of amount of SO_2 that is generated from burning explosives packaging at the burning ground site. Table 12 gives information regarding the monitoring sites and Figure 6 depicts the monitoring sites on the map.

Table 12: SO_2 Passive monitoring site coordinates.

Site ID	Classification	Latitude (S)	Longitude (E)	Sampler type
BG West	Non-residential	22.43548°	29.30930°	Radiello passive sampler
BG North	Non-residential	22.43969°	29.33683°	Radiello passive sampler
BG East	Non-residential	22.43940°	29.33707°	Radiello passive sampler
BG South	Non-residential	22.43948°	29.33739°	Radiello passive sampler

4.3 LEAK DETECTION AND REPAIR (QUARTERLY MONITORING)

4.3.1 METHODOLOGY

The amended Listed Activities and Associated Minimum Emission Standards document (GN 893:2013) gives the list of referenced documents that are indispensable for the application of the Notice. The Annexure A - Methods for Sampling and Analysis of this document lists under EPA Methods the United States Environmental Protection Agency (US EPA) Method 21 as a reference method for detecting VOC leaks.

Method 21 is an US EPA protocol for monitoring VOC leaks to ensure that fugitive emissions are identified and eliminated to control air pollution and protect the public's health.

This method is applicable for the determination of VOC leaks from the process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

The US EPA Method 21 (entitled "Determination of Volatile Organic Compound Leaks") standard states that it is important to regulate equipment leaks, as VOCs from petroleum refineries and manufacturing facilities.

A portable instrument was used to detect VOC leaks from individual sources. A photoionization based analytical instrument (PID) was calibrated (zero and span checks) before the survey according to the manufacturer's instructions for best practice. The PID is capable of measuring ten different VOCs at any one time and is capable of measuring a range of 0 to 10,000 ppm for total VOCs. The instrument is calibrated against the isobutylene compound to give a reliable measurement of total organic compounds (TOCs).

All accessible areas within the diesel and oil storage areas were subject to an audit using a photoionization detector PID (MiniRAE 3000) instrument during normal working hours. The accessible components of the diesel and oil storage areas were analysed during the survey. The instrument was held above a potential source (component of the storage area) for a minimum of 15 seconds to record a short-term VOC concentration. Where possible, the instrument was held approximately 0.5 cm above a source for the reading, and then approximately 100 cm above a source for a second reading to take account of the rapid reactions and dilution in VOC concentrations over relatively short distances. This allowed for analysis of concentrations to be measured immediately above a source, as well as analysis of dispersed concentrations moving away from the source.

Measurements recorded 0.5 cm from a source were considered not to be influenced by dispersion or dilution. The readings from the instrument were however affected by air movement as the instrument was moved away from potential sources. Dilution is thus rapid as one moves away from a potential source; this being the nature of VOCs. This is further supported by the low concentrations measured at some areas of the diesel and oil storage. For this reason, concentrations recorded at a distance more than 1 cm were not documented.

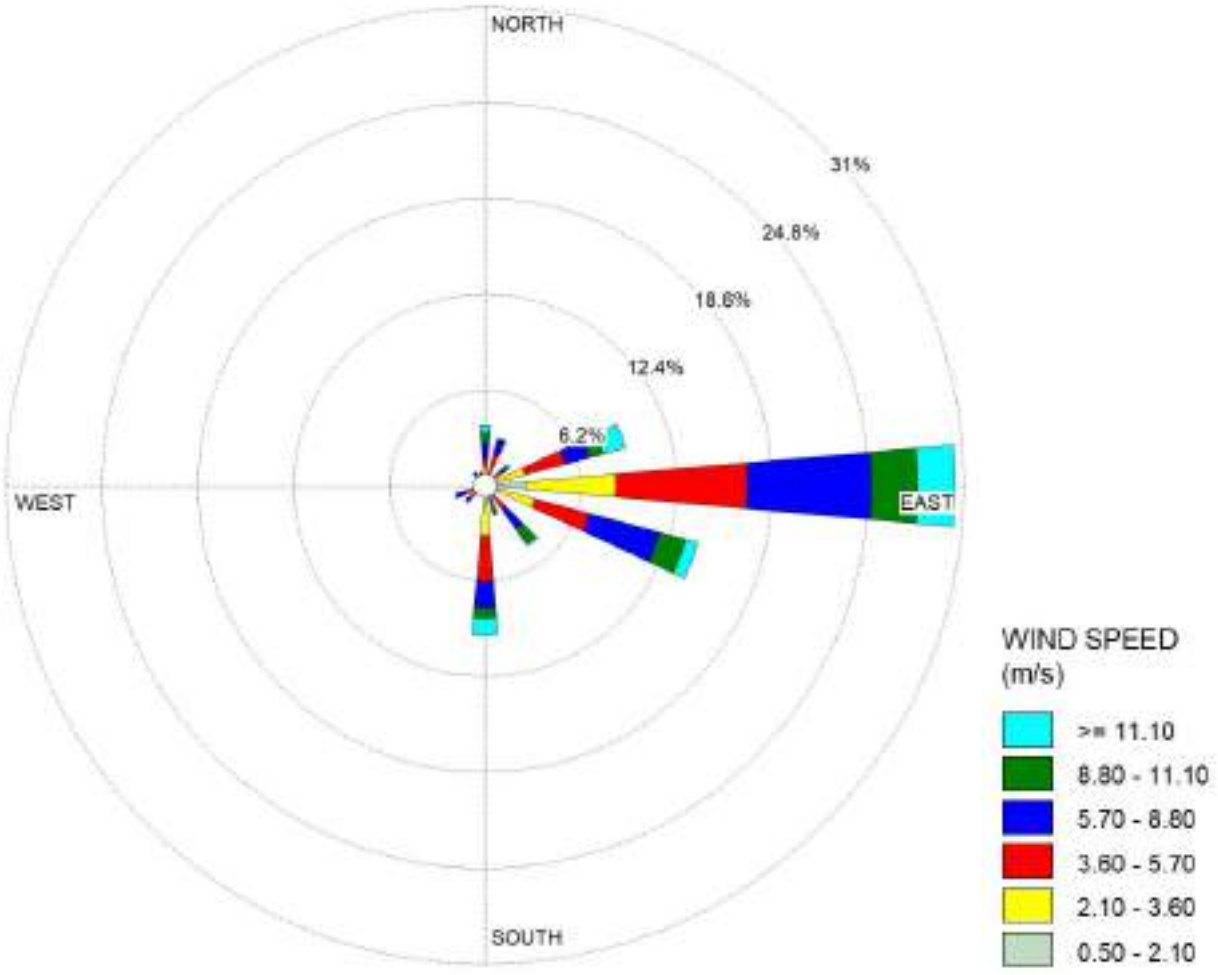
The US EPA developed the Best Practices Guide for LDAR programs, to be used in conjunction with Method 21. The guide provides TVOC concentrations which may be indicative of a leak. The New Source Performance Standards (NSPS) use a leak definition value of 10,000 ppm, while the National Emission Standards for Hazardous Air Pollutants (NESHAP) apply a leak definition of either 500 ppm or 1000 ppm. According to the EPA Best Practice Guideline, the lowest possible leak definition level should be applied to ensure all leaks are detected. Hence, in-line with this recommendation, Levego Environmental Services has applied a leak definition of 500 ppm.

5. MONITORING RESULTS

5.1 METEOROLOGICAL DATA

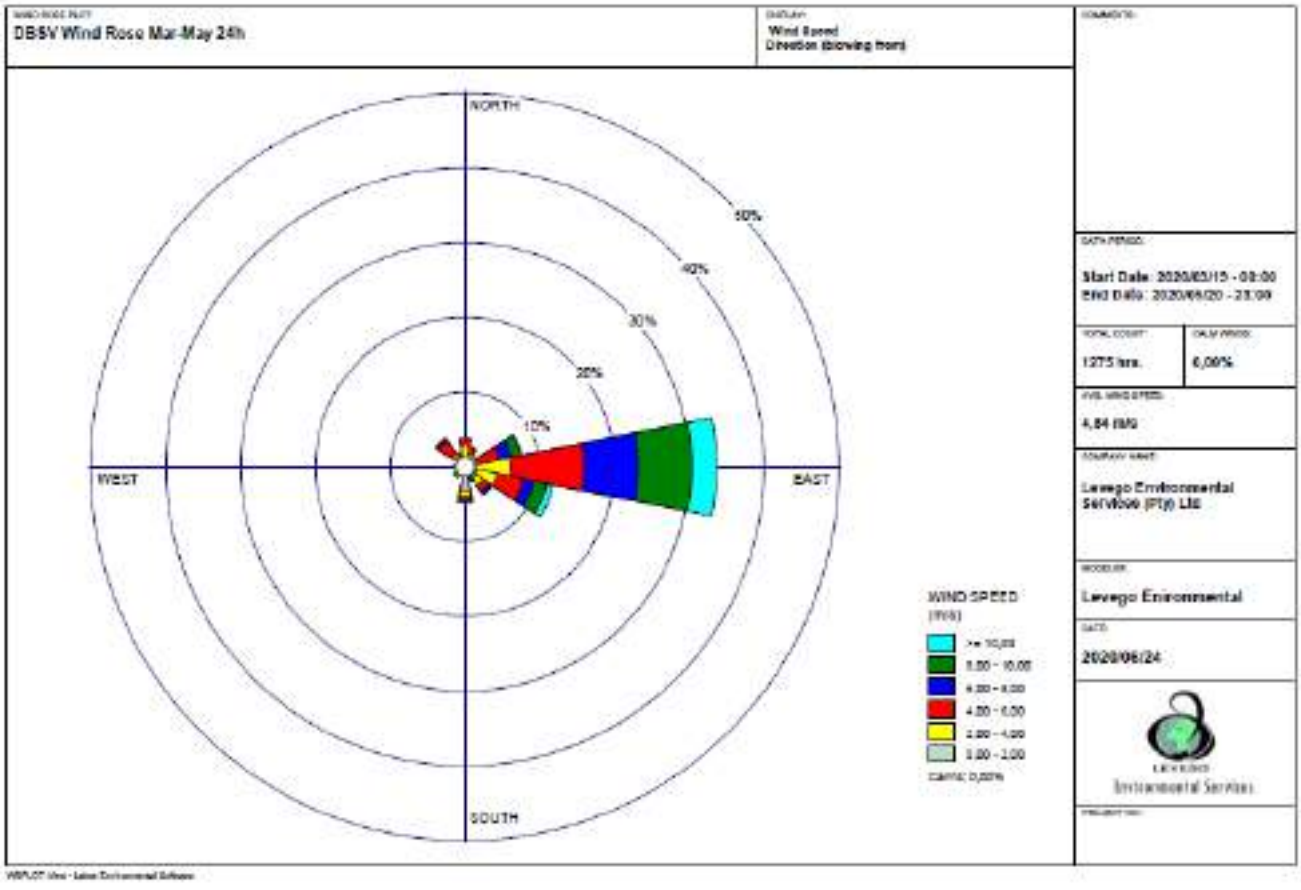
The wind speed and direction data for the monitoring period are presented as wind roses in Figure 9 to Figure 19. Rainfall, temperature and relative humidity data are shown in Figure 20 to Figure 31. Data from the Timbila Meteorological Station that is located near the main offices by the mine. The Meteorological Station was operational during the monitoring period and data is reported for the period February 2020 – January 2021.

Location: Met Station at Timbila (Main Office)



Average Wind Speed (m/s): 5.79	**Calm Winds Frequency (%):** 2.15
Data Period: February 2020	**Plot:** Thabang Matsieng

Figure 9: Wind rose showing average wind direction and speed during for February 2020.



Location: Met Station at Timbila (Main Office)

Figure 10: Wind rose showing average wind direction and speed during for March, April and May 2020.

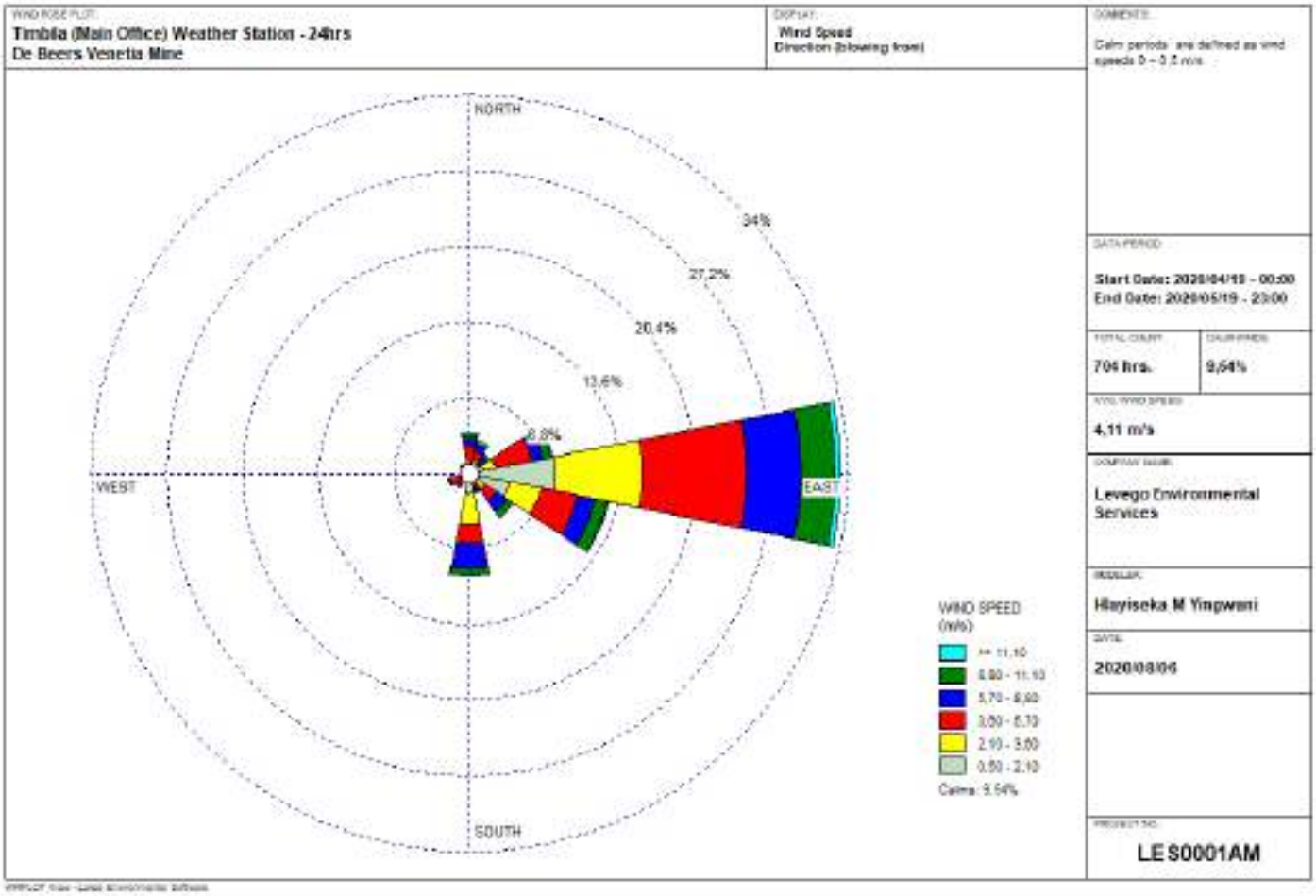


Figure 11: Wind rose showing average wind direction and speed during for May 2020

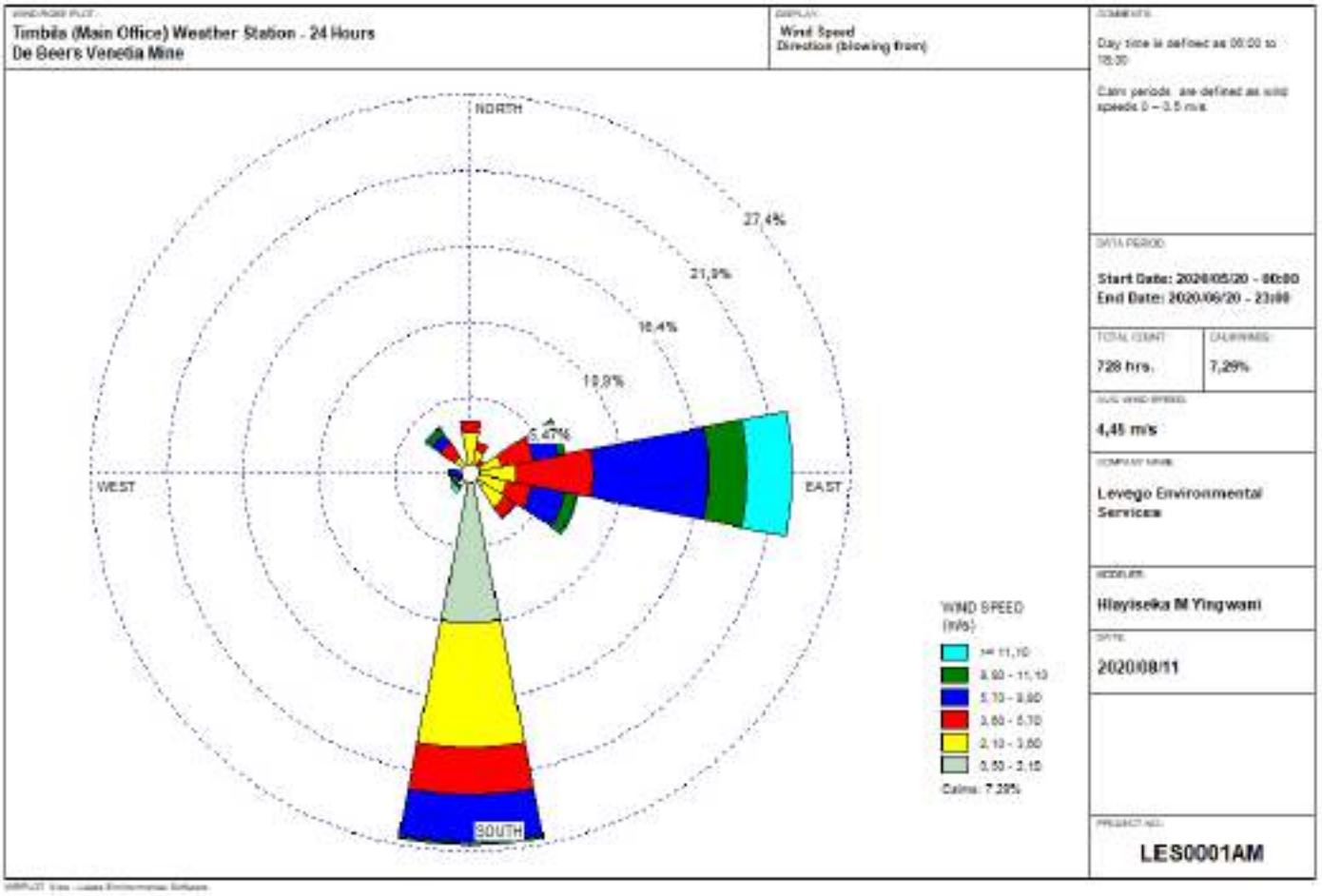


Figure 12: Wind rose showing average wind direction and speed during for June 2020.

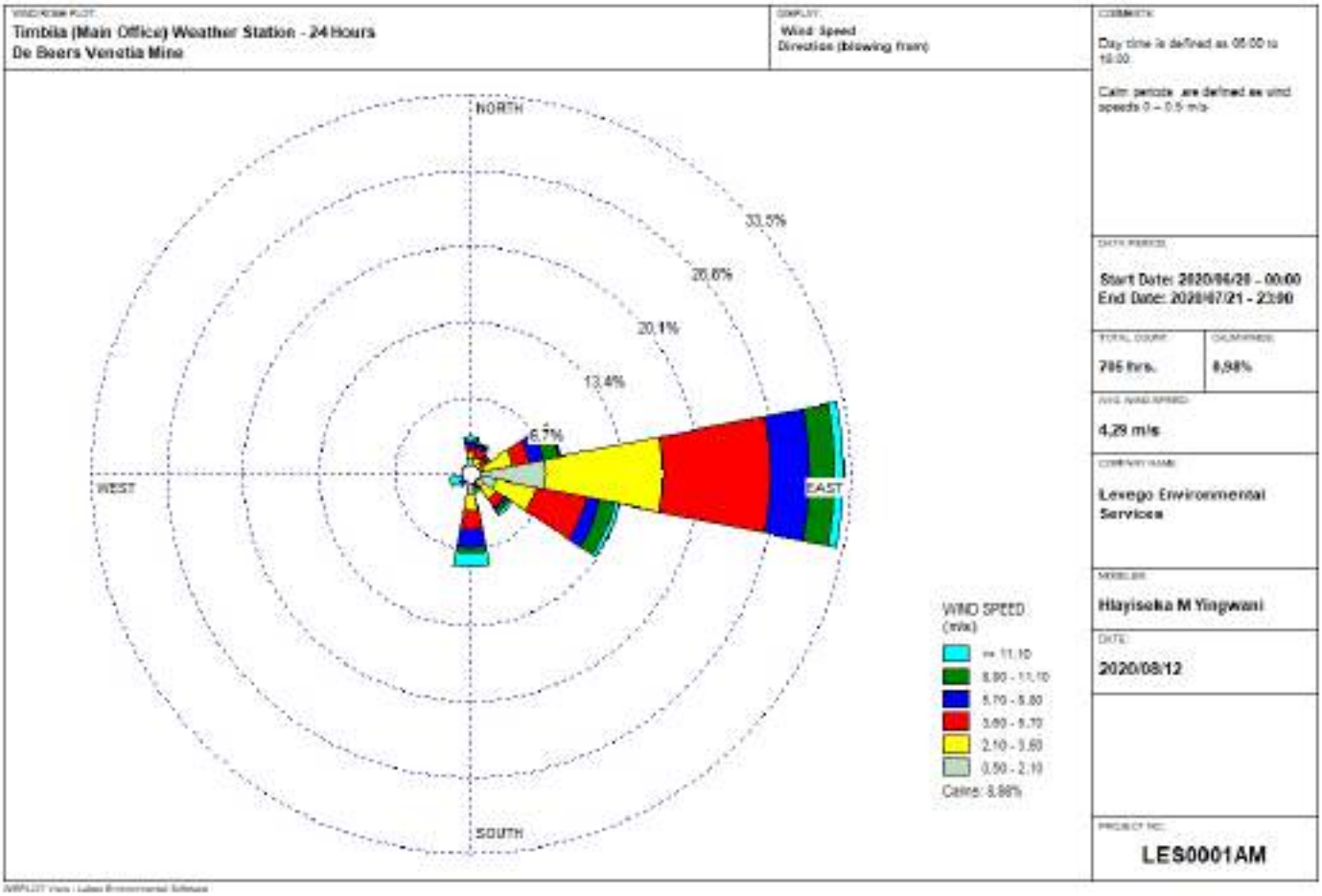


Figure 13: Wind rose showing average wind direction and speed during for July 2020.

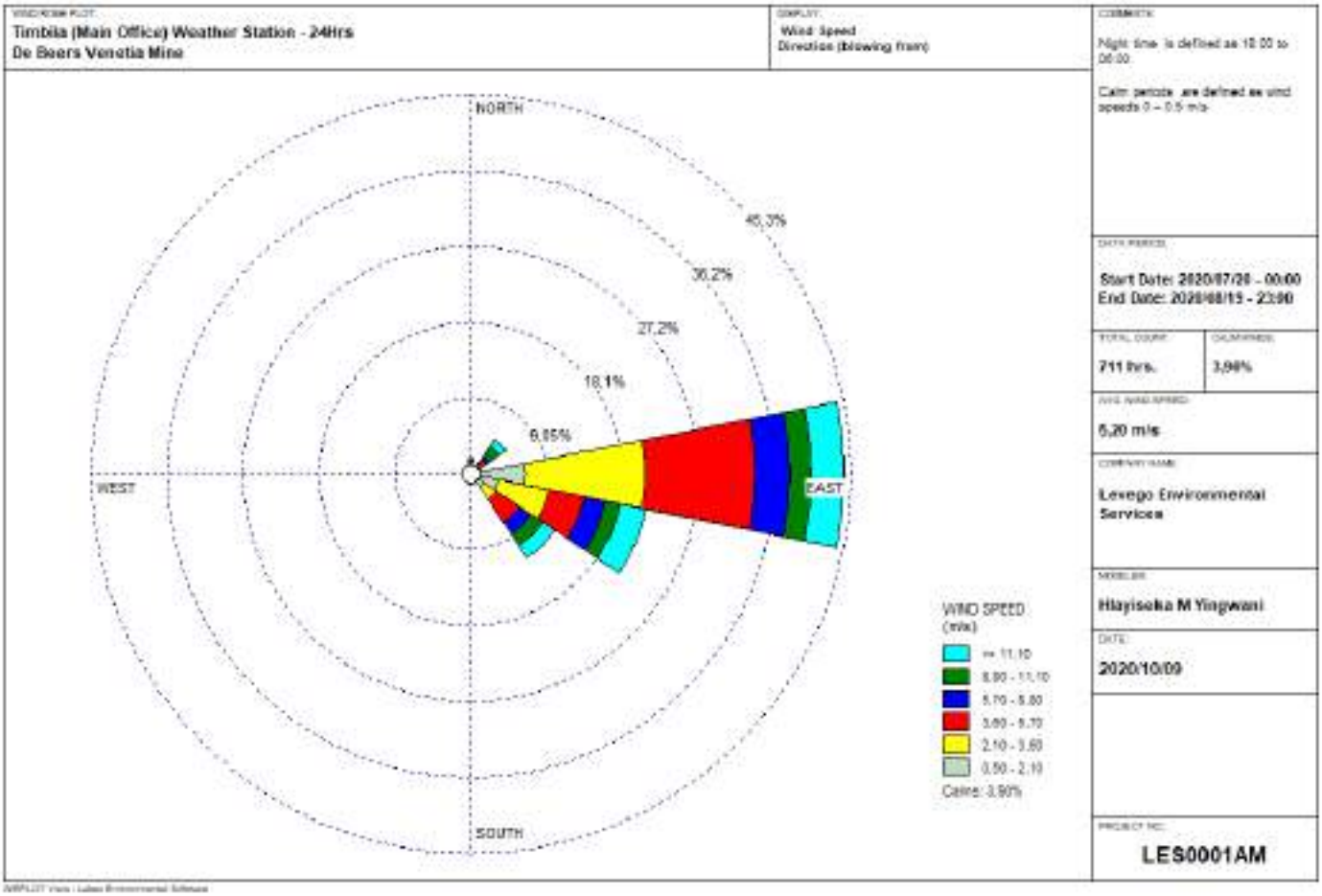


Figure 14: Wind rose showing average wind direction and speed during for August 2020.

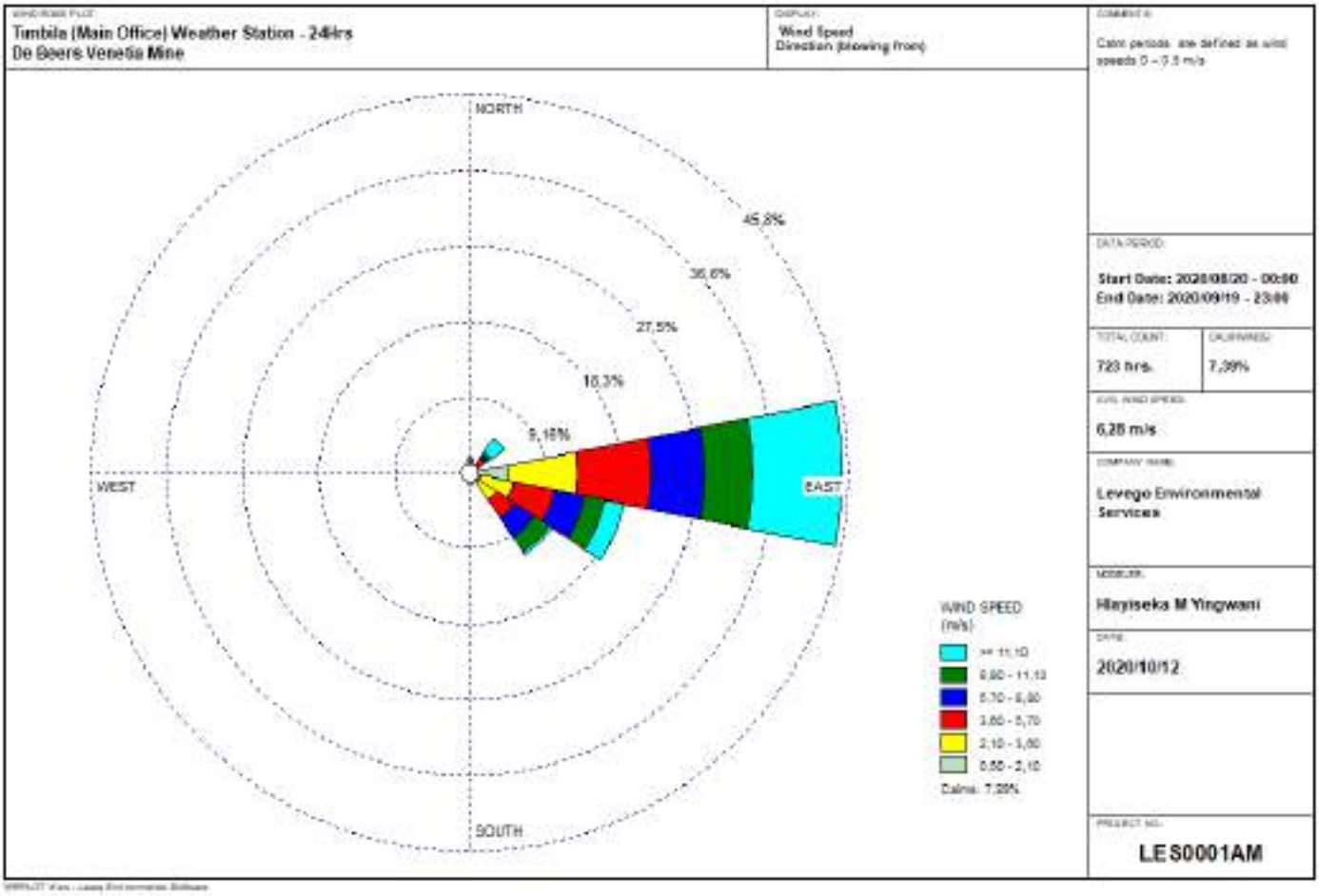


Figure 15: Wind rose showing average wind direction and speed during for September 2020.

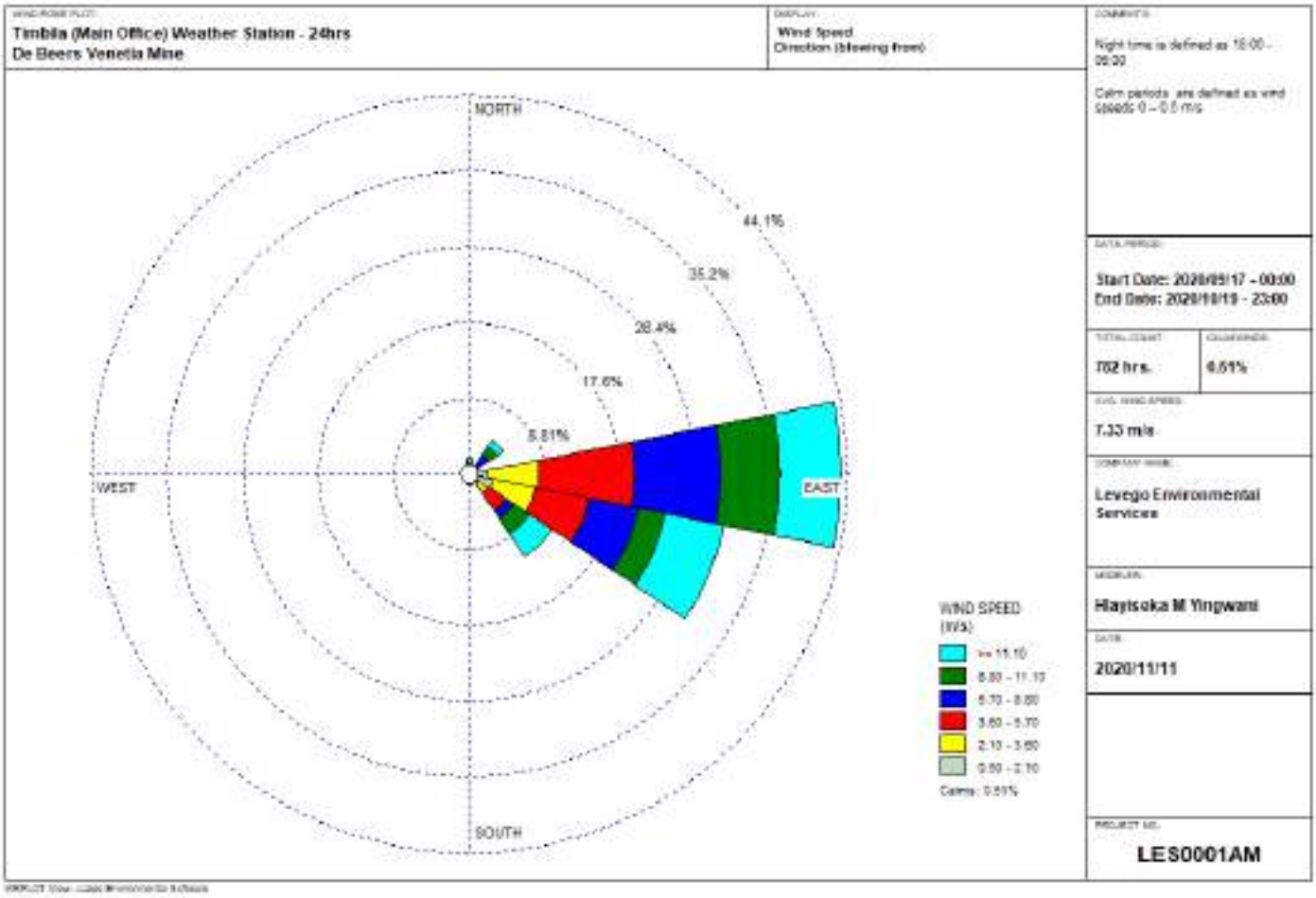


Figure 16: Wind rose showing average wind direction and speed during for October 2020.

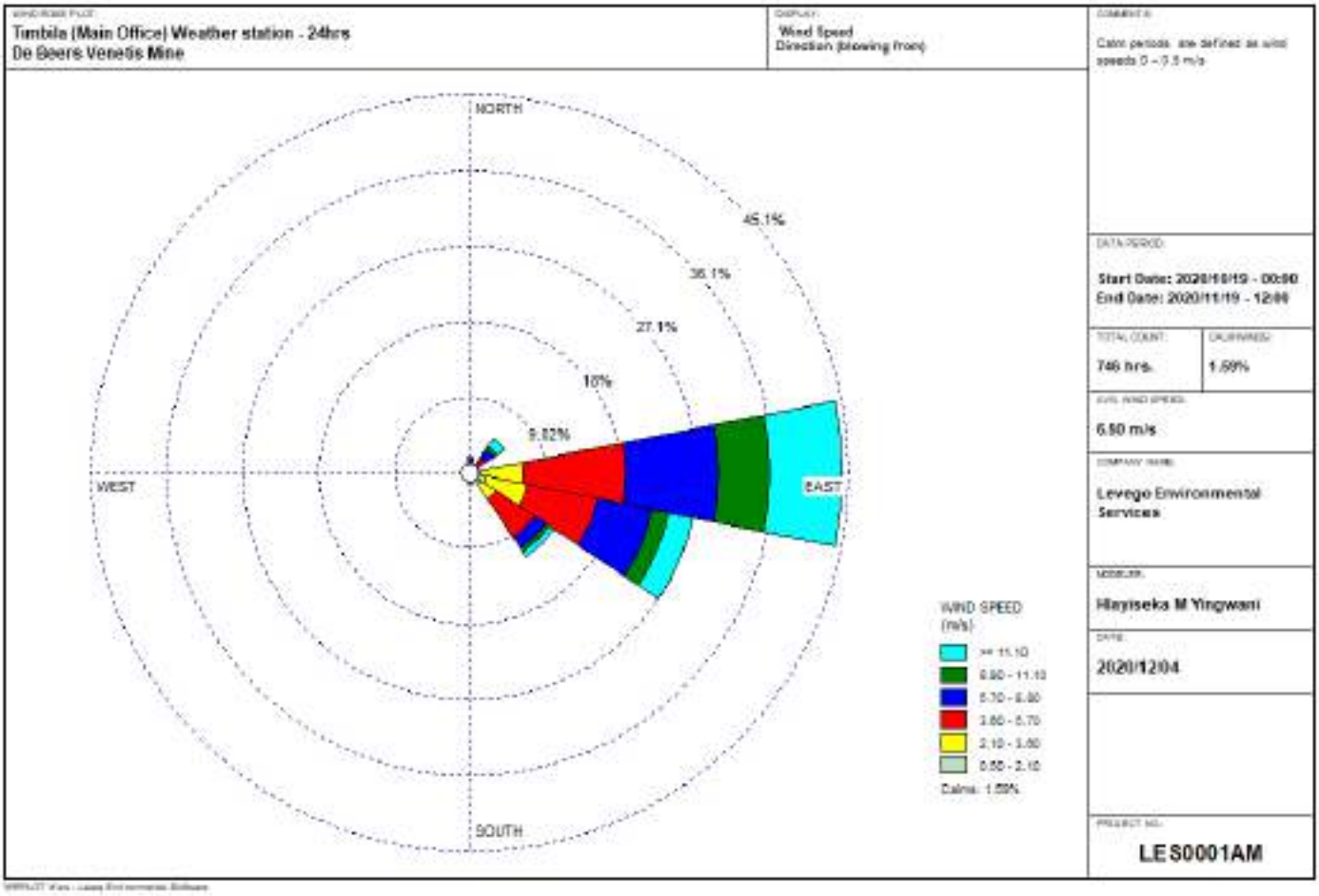


Figure 17: Wind rose showing average wind direction and speed during for November 2020.

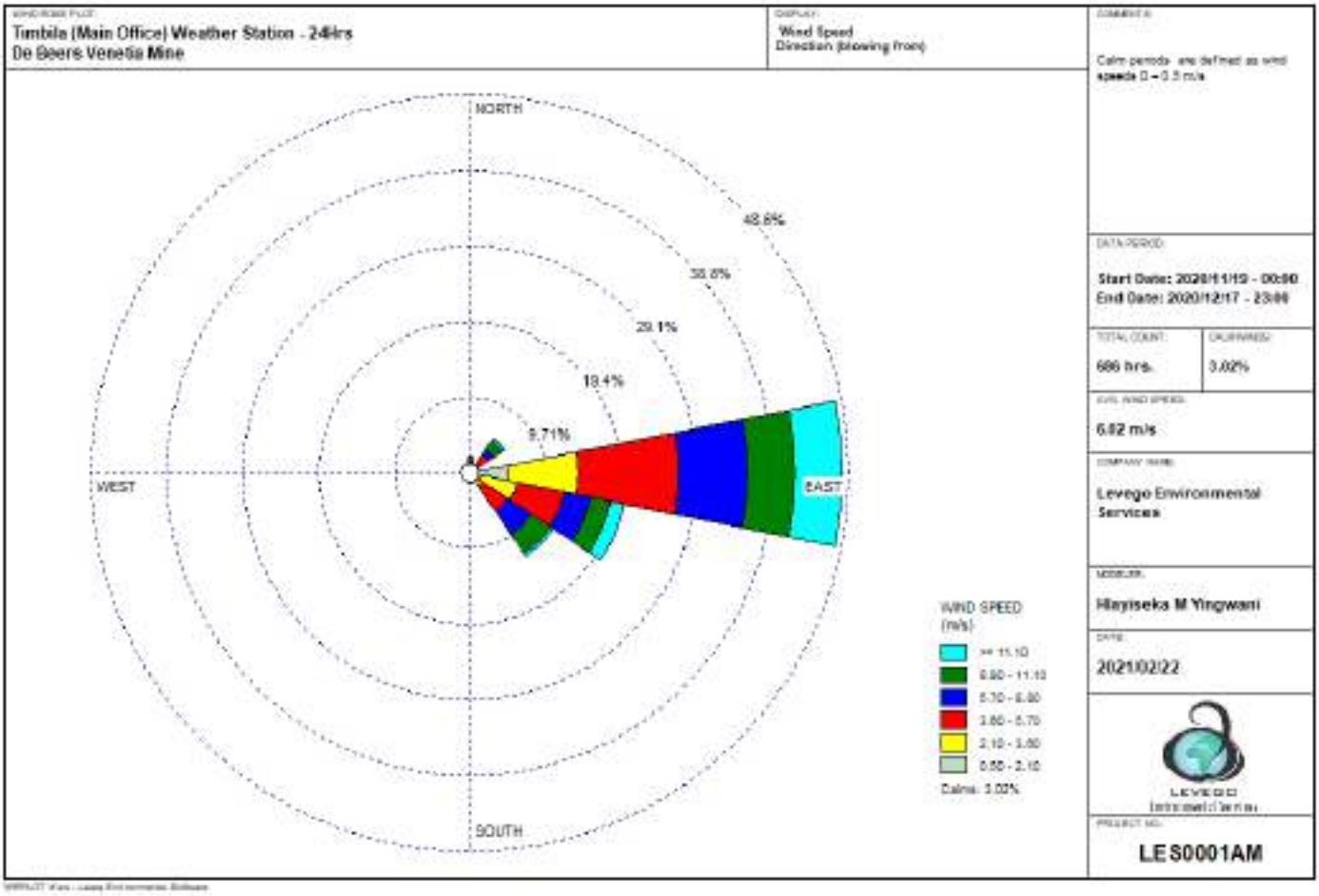


Figure 18: Wind rose showing average wind direction and speed during for December 2020.

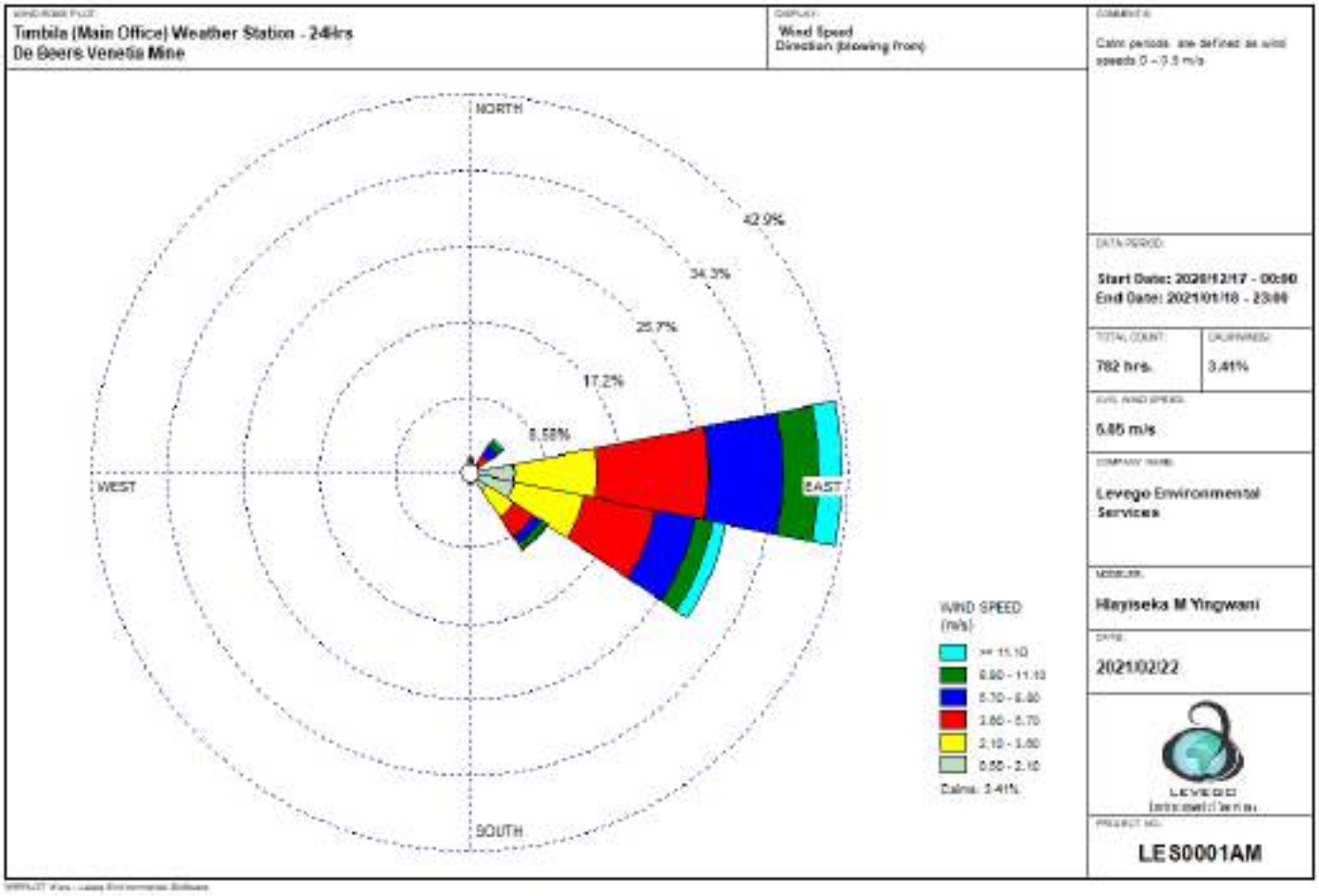


Figure 19: Wind rose showing average wind direction and speed during for January 2021.

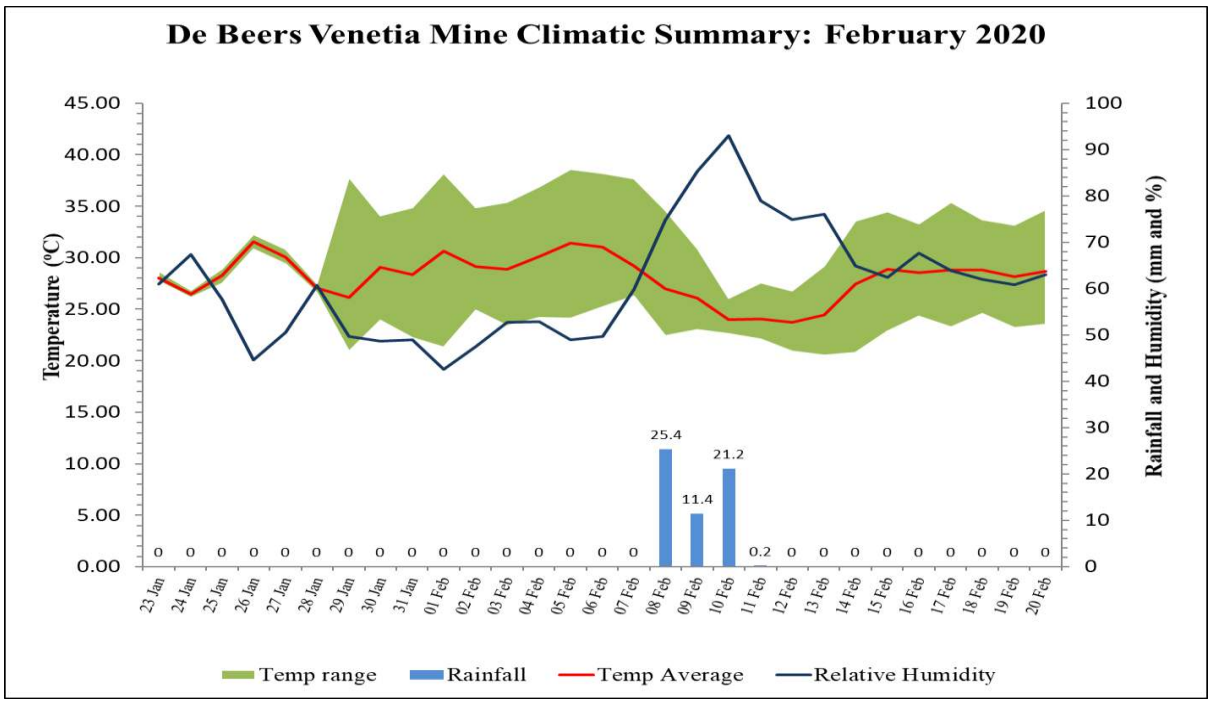


Figure 20: Daily average temperature and temperature variations, rainfall and relative humidity for February 2020

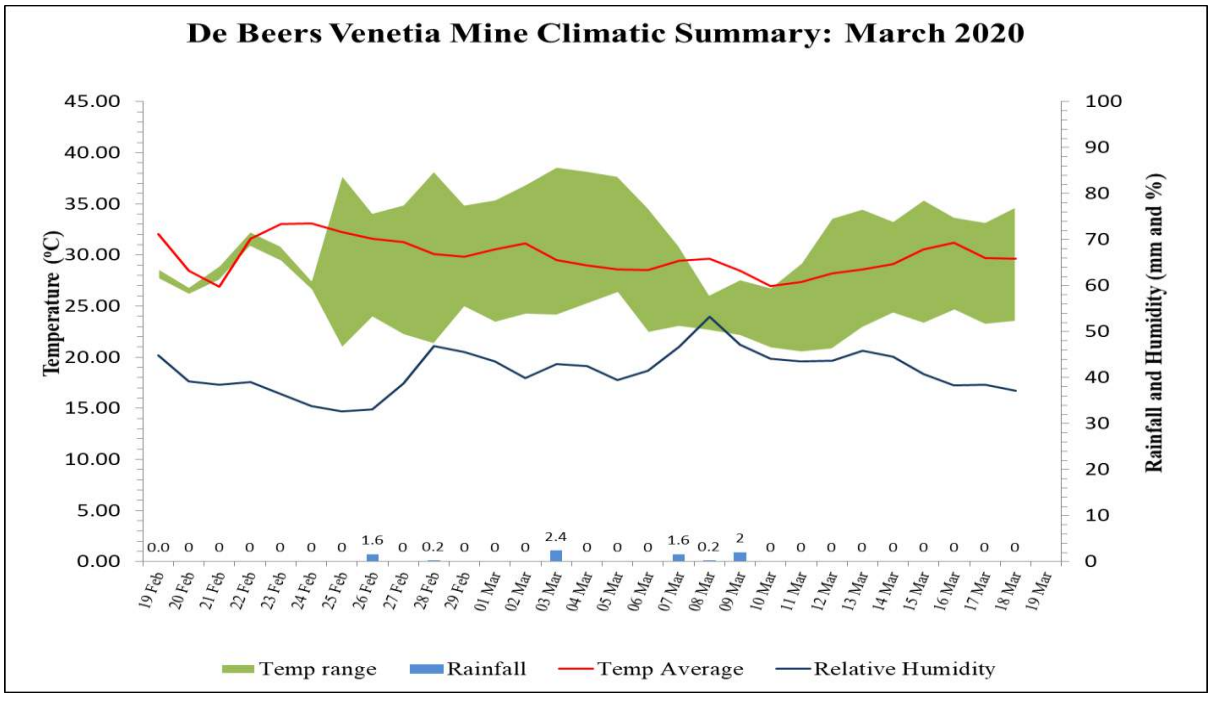


Figure 21: Daily average temperature and temperature variations, rainfall and relative humidity for March 2020

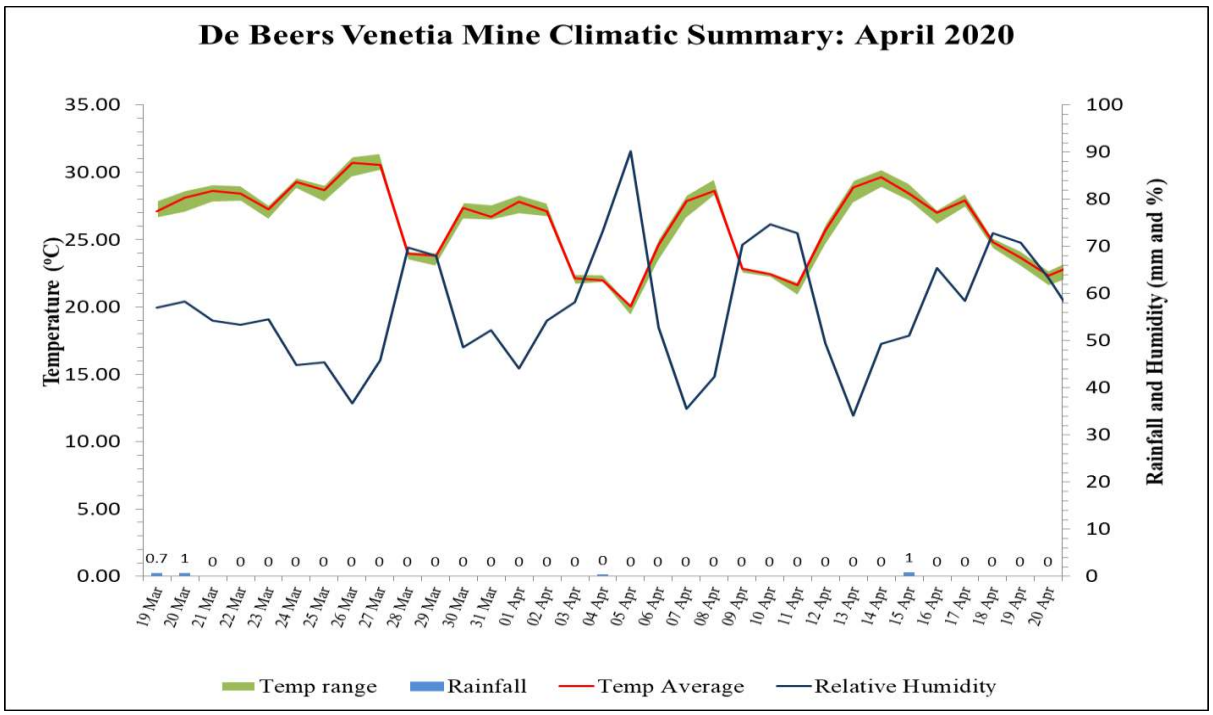


Figure 22: Daily average temperature and temperature variations, rainfall and relative humidity for April 2020

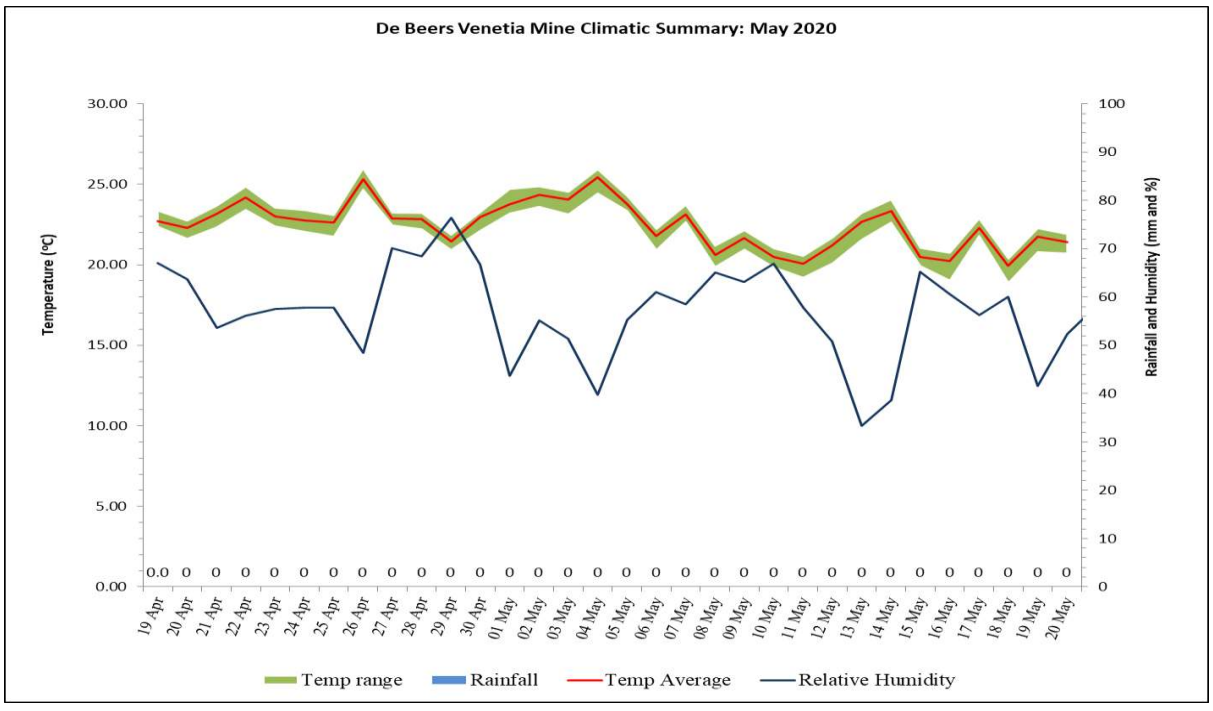


Figure 23: Daily average temperature and temperature variations, rainfall and relative humidity for May 2020

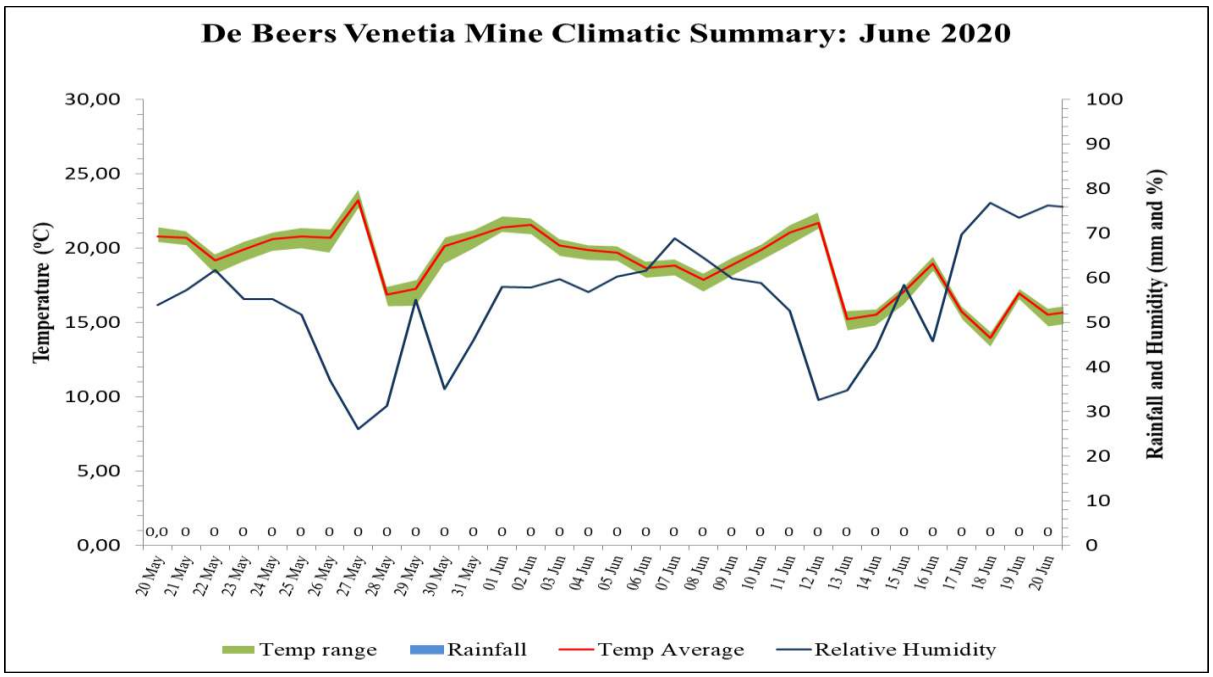


Figure 24: Daily average temperature and temperature variations, rainfall and relative humidity for June 2020

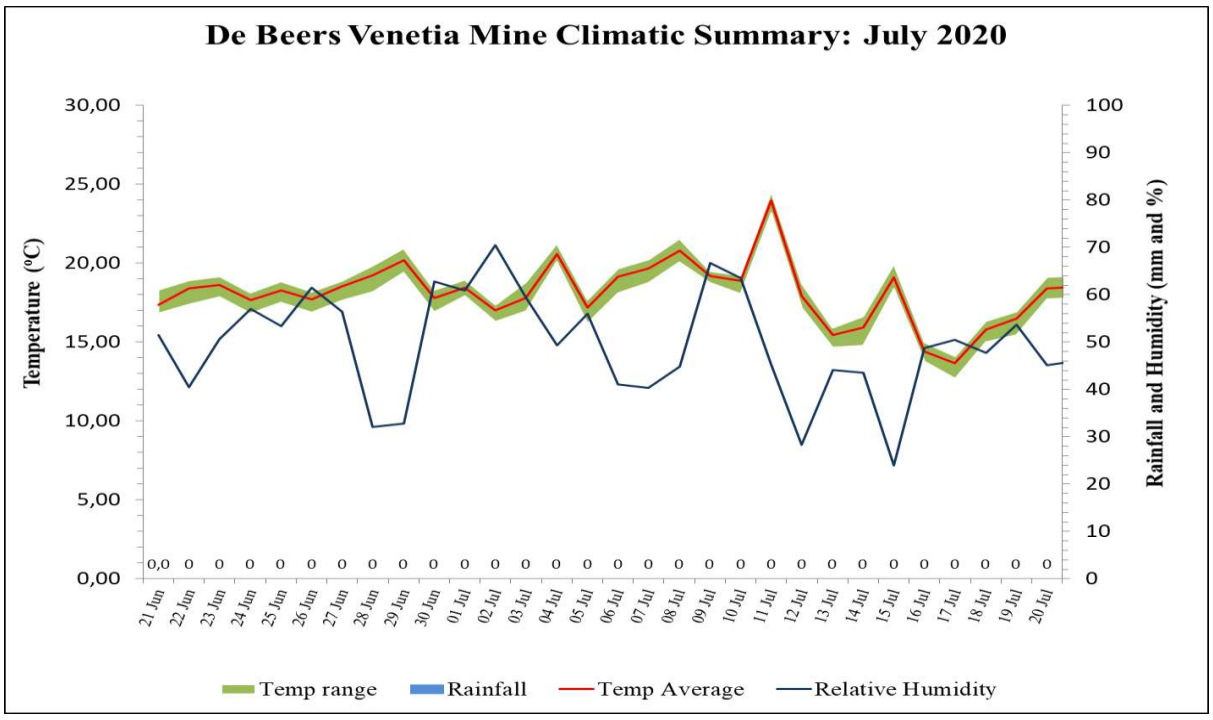


Figure 25: Daily average temperature and temperature variations, rainfall and relative humidity for July 2020

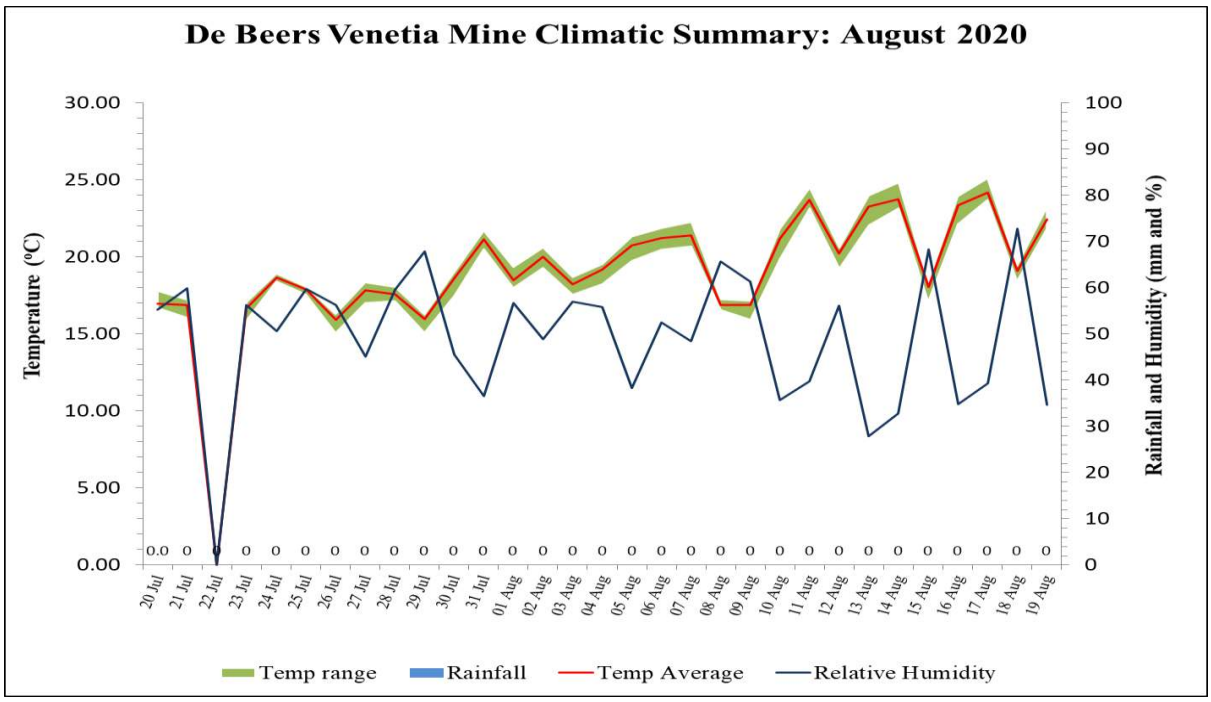


Figure 26: Daily average temperature and temperature variations, rainfall and relative humidity for August 2020

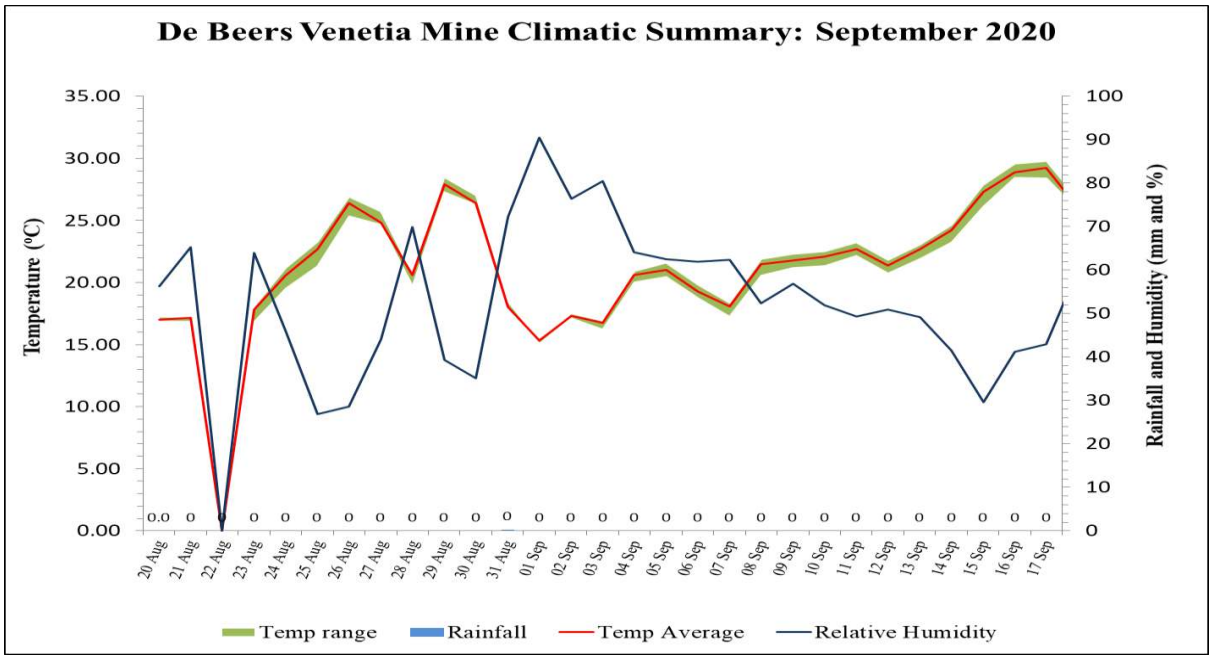


Figure 27: Daily average temperature and temperature variations, rainfall and relative humidity for September 2020

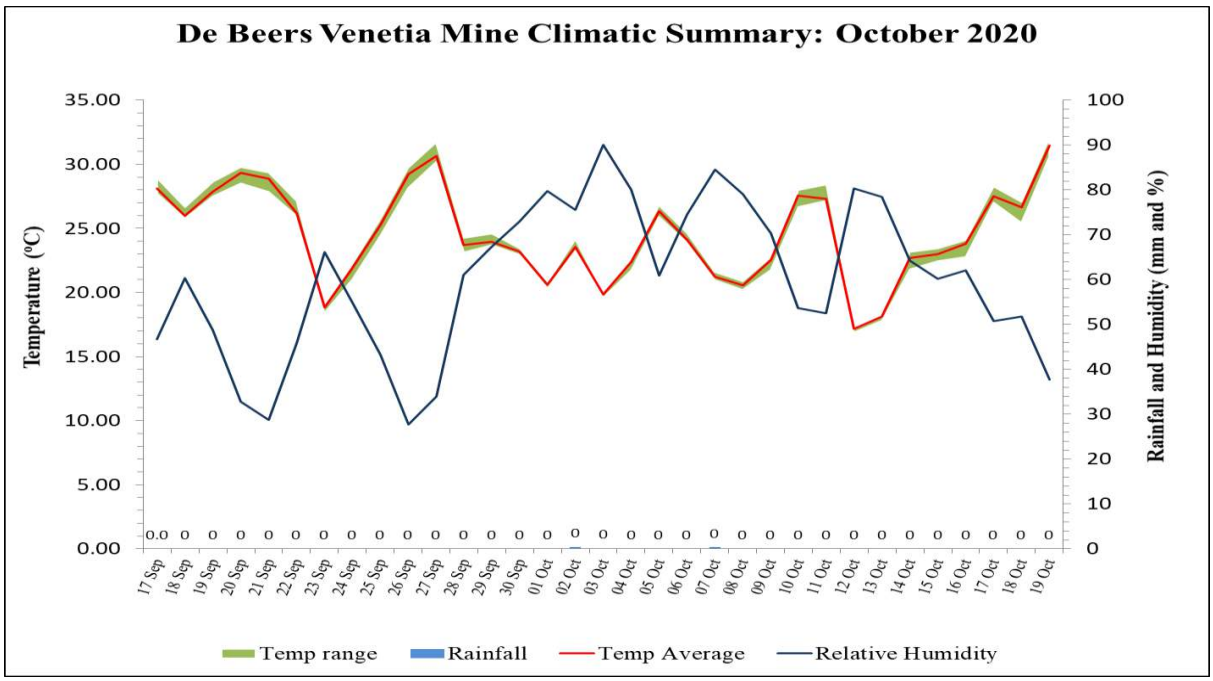


Figure 28: Daily average temperature and temperature variations, rainfall and relative humidity for October 2020

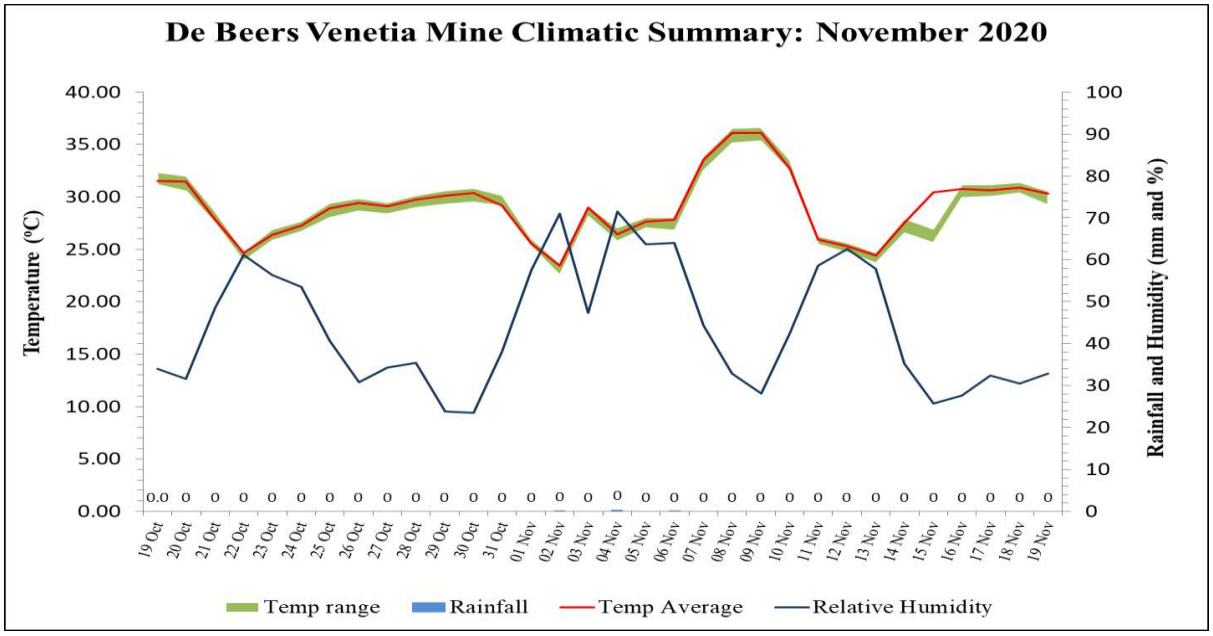


Figure 29: Daily average temperature and temperature variations, rainfall and relative humidity for November 2020

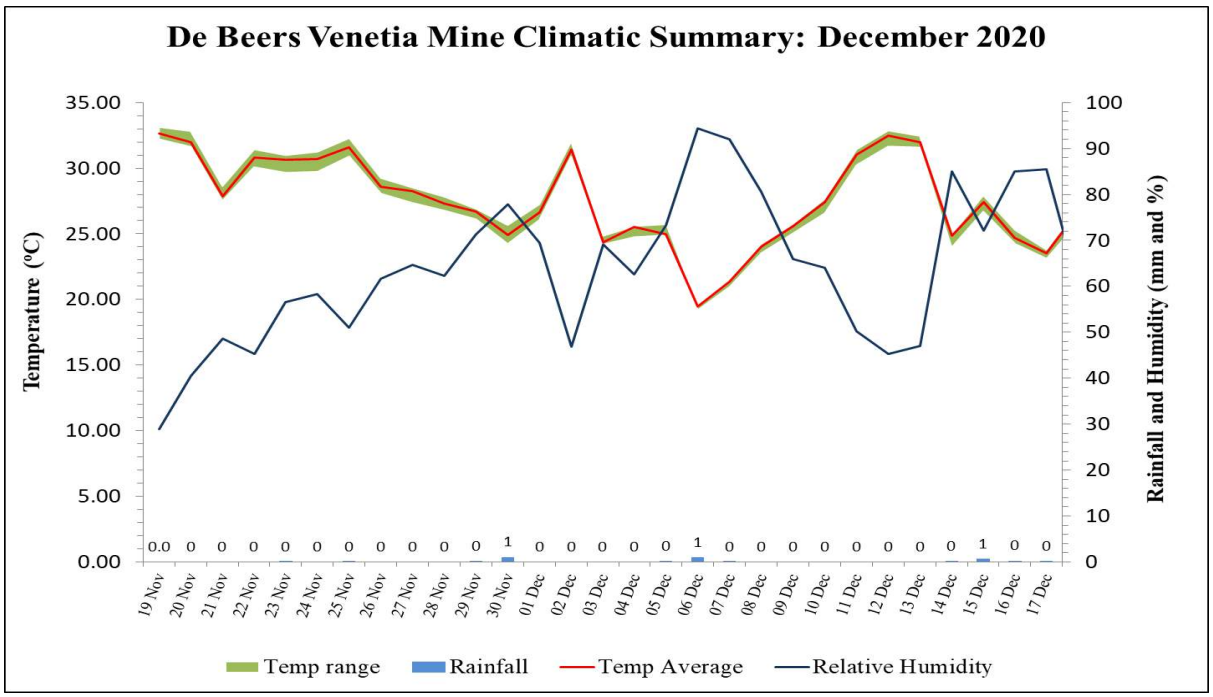


Figure 30: Daily average temperature and temperature variations, rainfall and relative humidity for December 2020

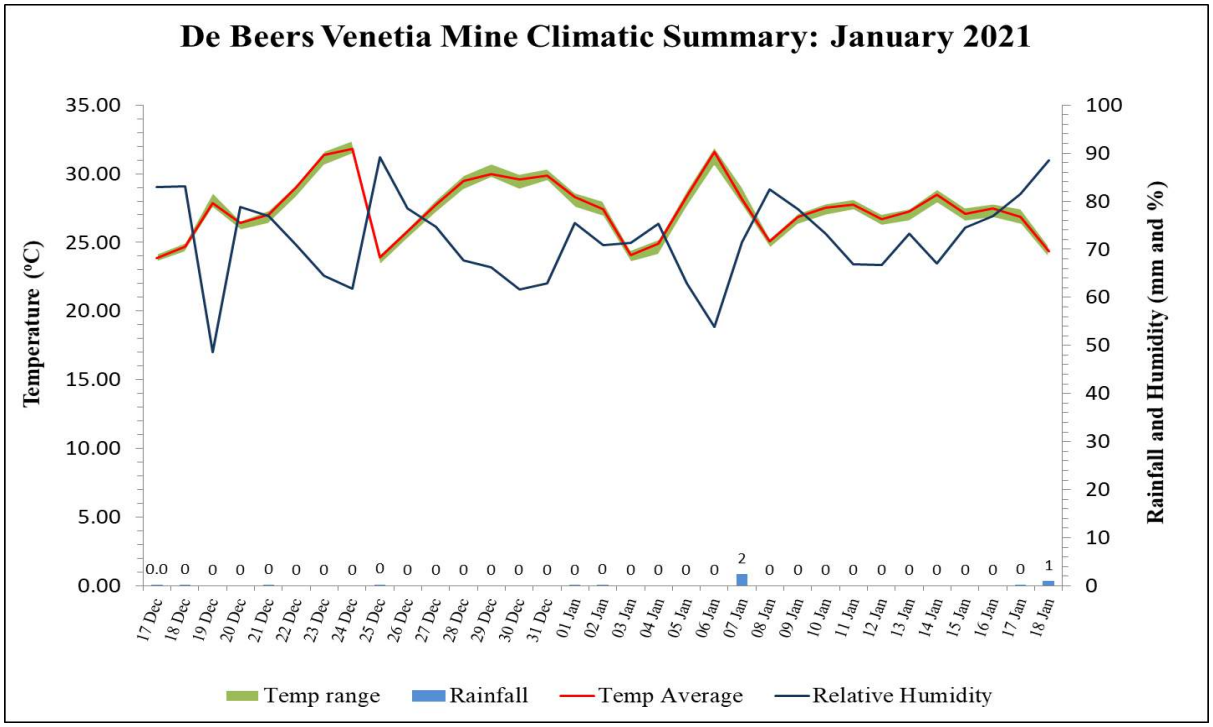


Figure 31: Daily average temperature and temperature variations, rainfall and relative humidity for January 2021

5.2 DUSTFALL MONITORING DATA

The SANAS Accredited Laboratory results for February 2020 - January 2021 dust fallout monitoring samplers are presented in Figure 32 to Figure 35, with compliance assessment against the prevailing NDCR standards. A summary of dustfall results is also included in Table13.

It should be noted that Venetia Mine embarked on the construction of the North Seepage Dam (NSD) in 2019 that will be located north of Fine Residue Dam 2 (FRD2), between sampling stations D and E, and close to sampling station W (~250 m) as per Figure 15. Venetia Mine informed the Department prior to commencement of construction activities for NSD that included bush clearing and topsoil stripping. To date, bulk excavations for the NSD and the associated sumps have been completed. The project has since been halted (since April 2020) due to the appointed contractor being unable to meet contractual obligations (exacerbated by the COVID situation). The mine has commenced with procurement processes to replace the contractor. The estimated timeframe of the NSD project completion is therefore estimated at December 2021. The mine acknowledges that the proximity of the construction work to the sampling stations resulted in exceedances (specifically at station D) and was therefore non-compliant with the NDCR standard in 2020 due to sequential months exceedences during February 2020/March 2020. Mitigation measures were continuously executed throughout the construction activities to suppress dust using water trucks to suppress dust on haul roads. The mine engaged with the Department as well as the appointed monitoring specialist on the relocation of Station D as well as other stations in the vicinity that could potentially be affected by construction activities (once these recommence). The Department advised in their response letter dated 23.11.2020 that if Venetia decided to move the sampling points/stations, it should ensure that the areas/sites in which the stations are relocated to, are more representative. The monitoring specialist has however advised that a relocation would not be representative of Venetia's fallout dust impact on the neighbouring Diamcor Mine as well as the Venetia Limpopo Nature Reserve. The recommendation is that the stations should remain at the current locations with the understanding that these may log consecutive exceedances during the duration of the project however mitigation measures should still be maintained (dust suppression etc.).

Station E was not compliant with the NDCR standard during the June 2020 and September monitoring period, with readings of over 1200 mg/m2/day. Bird droppings were observed in the dustfall bucket, resulting in the possible elevation of the fallout results in station E. This exceedance was logged onto the mine's environmental management system for investigation. The station design should have prevented the bird droppings. The mine has procured a new contractor and with the scope of works, the monitoring units will be replaced.

The mine is updating its Air Dispersion Modelling in 2021 and will consider these impacts (however short-term) as part of this assessment.

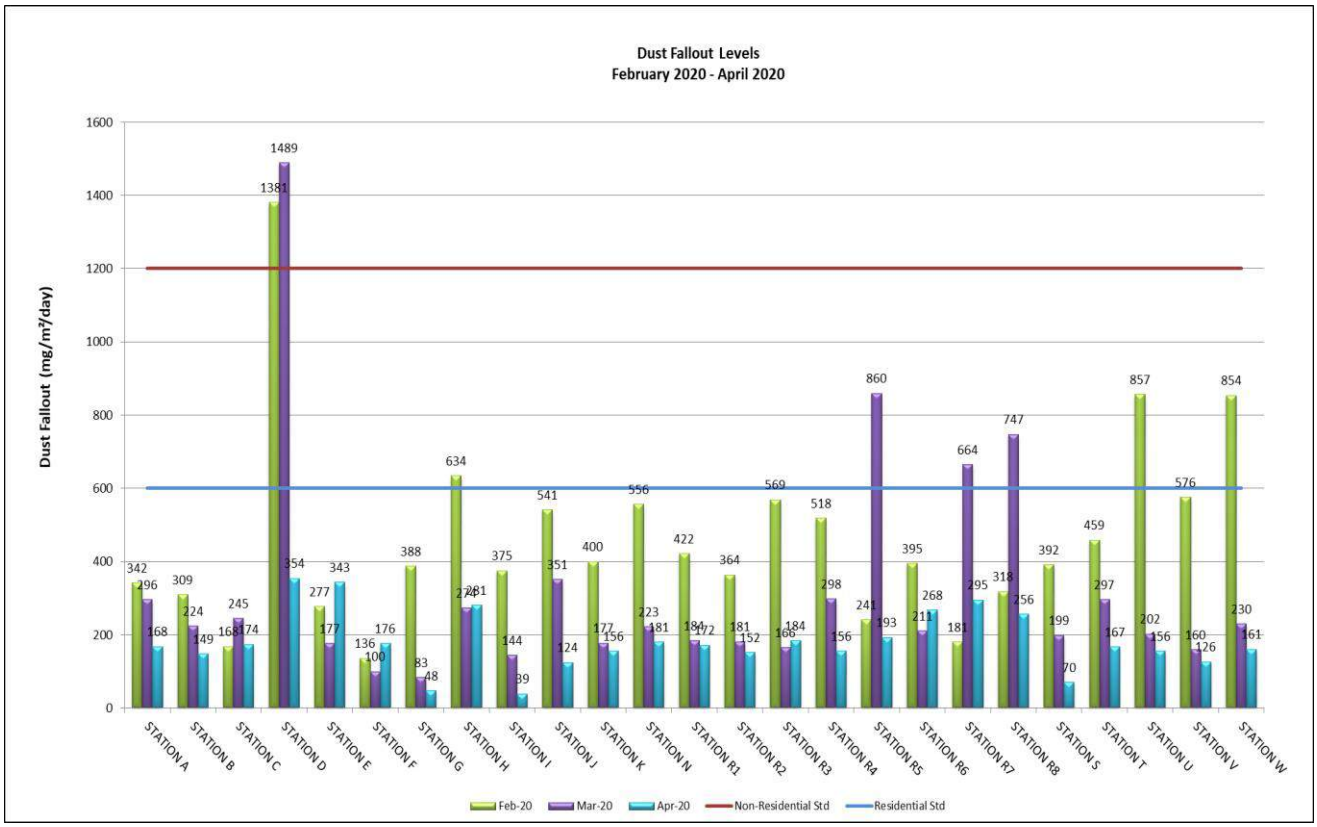


Figure 32: Dustfall monitoring results, February 2020 – April 2020 according to NDCR classification.

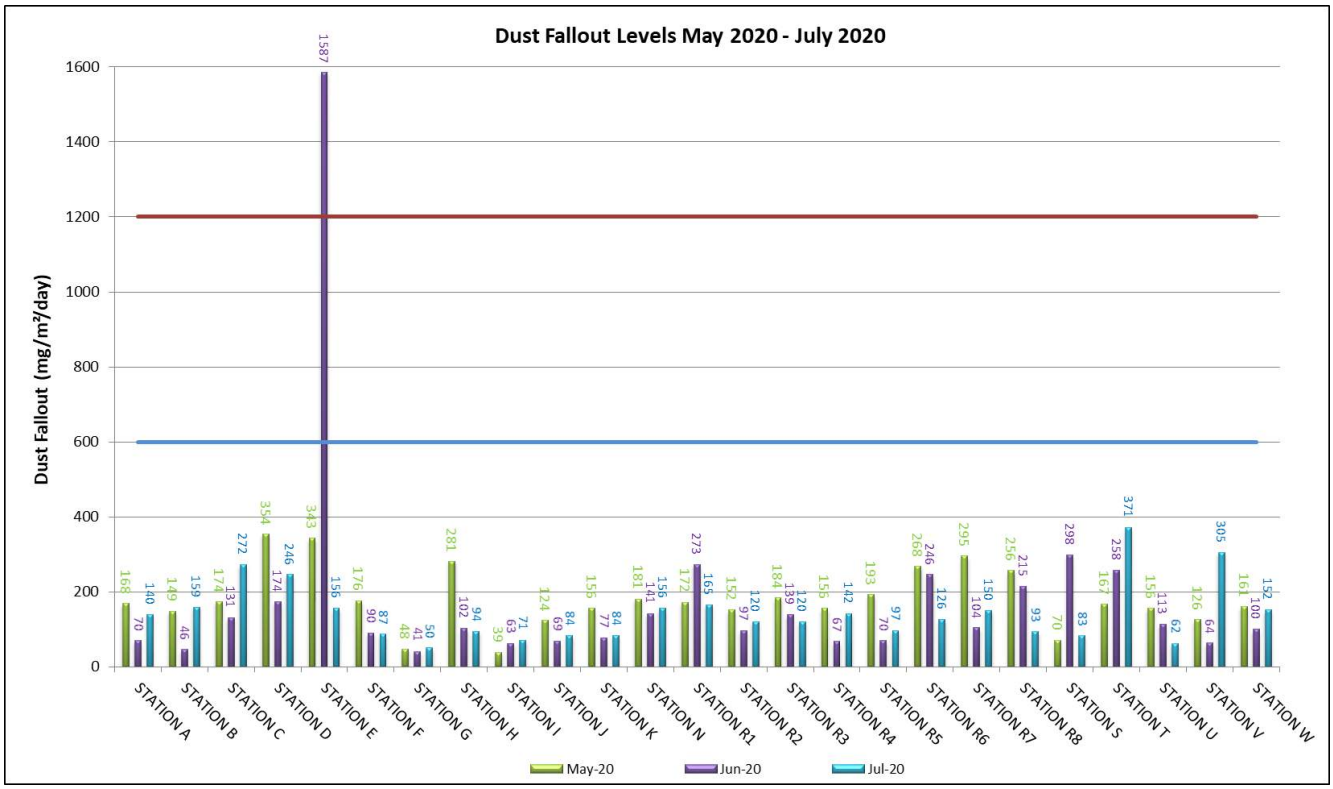


Figure 33: Dustfall monitoring results, May 2020 – July 2020 according to NDCR classification.

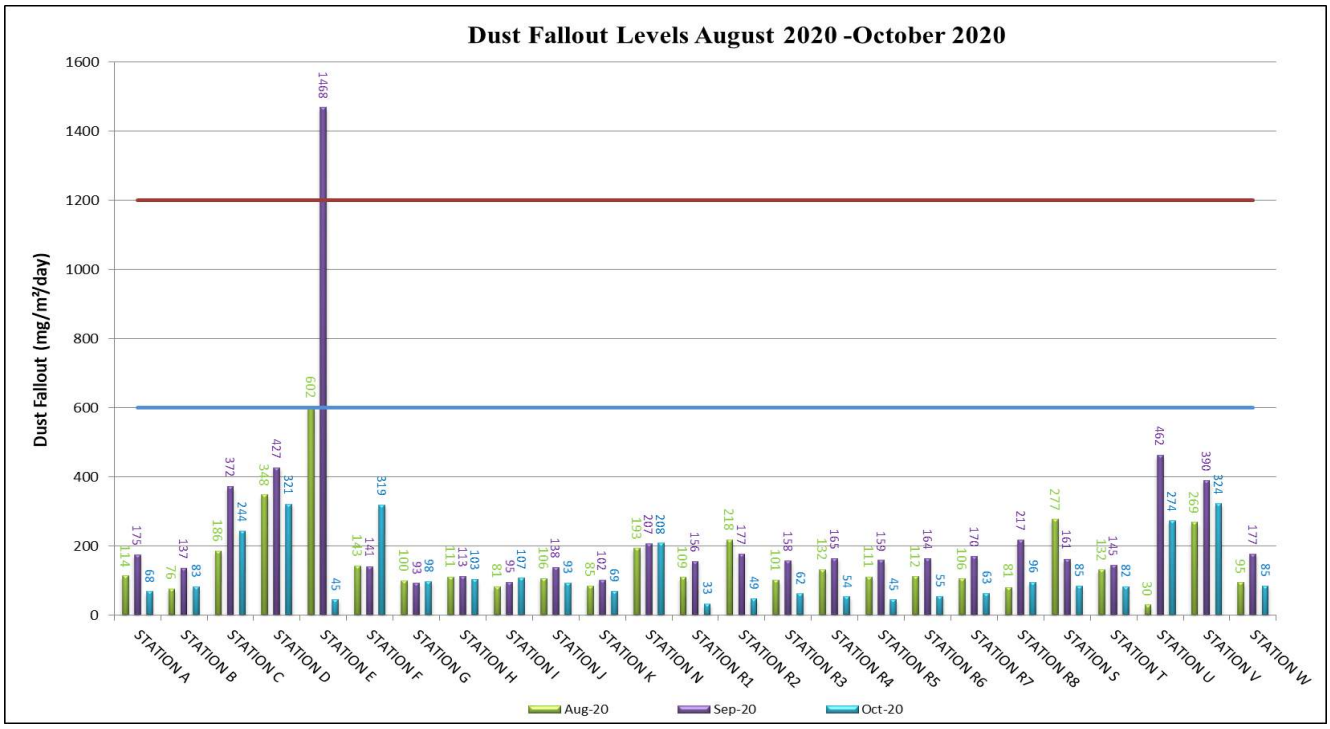


Figure 34: Dustfall monitoring results, August – October 2020 according to NDCR classification.

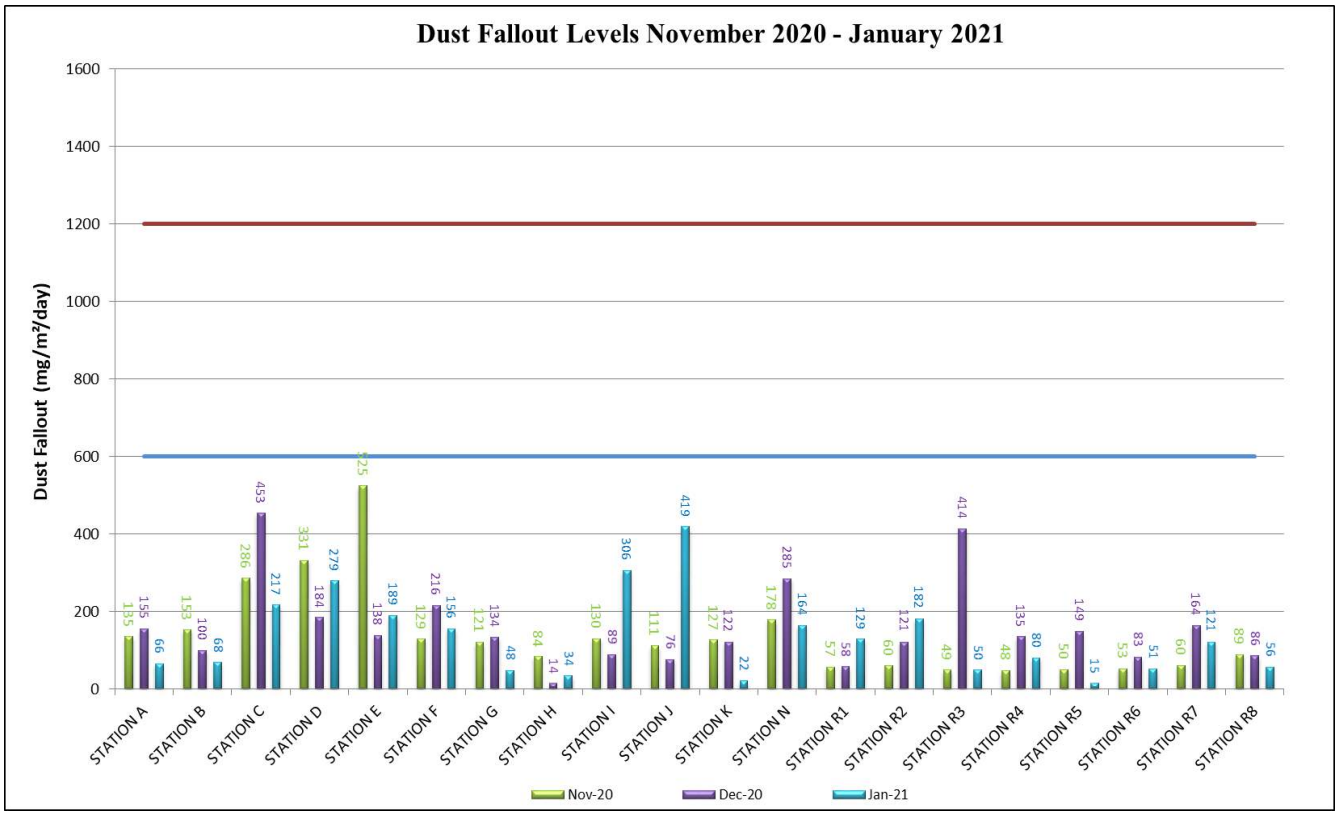


Figure 35: Dustfall monitoring results, May 2020 according to NDCR classification.

Table 13: Dustfall results and compliance for at De Beers Venetia Mine for February 2020 – January 2021 (NDCR: red = above non-residential standard).

Site Code	NDCR Classification	Dust Fallout (mg/m^2/day)												Compliance (2020/2021)
		FEB 20	MAR 20	APR 20**	MAY 20**	JUN 20	JUL 20	AUG 20	SEP 20	OCT 20	NOV 20	DEC 20	JAN 21	
Station A	Non- Residential	342	296	168	168	70	140	114	175	68	135	155	66	Yes
Station B	Non- Residential	309	224	149	149	46	159	76	137	83	153	100	68	Yes
Station C	Non- Residential	168	245	174	174	131	272	186	372	244	286	453	217	Yes
Station D	Non- Residential	**1381**	**1489**	354	354	174	246	348	427	321	331	184	279	No
Station E	Non- Residential	277	177	343	343	**1587**	156	602*	**1468***	45	525	138	189	Yes
Station F	Non- Residential	136	100	176	176	90	87	143	141	319	129	216	156	Yes
Station G	Non- Residential	388	83	48	48	41	50	100	93	98	121	134	48	Yes
Station H	Non- Residential	634	274	281	281	102	94	111	113	103	84	14	34	Yes
Station I	Non- Residential	375	144	39	39	63	71	81	95	107	130	89	306	Yes
Station J	Non- Residential	541	351	124	124	69	84	106	138	93	111	76	419	Yes
Station K	Non- Residential	400	177	156	156	77	84	85	102	69	127	122	22	Yes
Station N	Non- Residential	556	223	181	181	141	156	193	207	208	178	285	164	Yes
Station S	Non- Residential	392	199	70	70	298	83	277	161	85	88	280	99	Yes
Station T	Non- Residential	459	297	167	167	258	371	132	145	82	66	146	125	Yes
Station U	Non- Residential	857	202	156	156	113	62	30	462	274	270	319	493	Yes
Station V	Non- Residential	575	160	126	126	64	305	269	390	324	313	301	230	Yes

Site Code	NDCR Classification	Dust Fallout (mg/m^2/day)												Compliance (2020/2021)
		FEB 20	MAR 20	APR 20**	MAY 20**	JUN 20	JUL 20	AUG 20	SEP 20	OCT 20	NOV 20	DEC 20	JAN 21	
Station W	Non- Residential	854	230	161	161	100	152	95	177	85	68	138	298	Yes
Station R1	Non- Residential	422	184	172	172	273	165	109	156	33	57	58	129	Yes
Station R2	Non- Residential	364	181	152	152	97	120	218	177	49	60	121	182	Yes
Station R3	Non- Residential	569	166	184	184	139	120	101	158	62	49	414	50	Yes
Station R4	Non- Residential	518	298	156	156	67	142	132	165	54	48	135	80	Yes
Station R5	Non- Residential	241	860	193	193	70	97	111	159	45	50	149	15	Yes
Station R6	Non- Residential	395	211	268	268	246	126	112	164	55	53	83	51	Yes
Station R7	Non- Residential	181	664	295	295	104	150	106	170	63	60	164	121	Yes
Station R8	Non- Residential	318	747	256	256	215	93	81	217	96	89	86	56	Yes

5.3 CONTINUOUS PARTICULATE MATTER MONITORING DATA

The TOPAS continuous particulate matter monitors are capable of measuring a number of size fractions simultaneously, namely: TSP, PM_{10}, $PM_{2.5}$ and PM_1. Concentrations of PM_{10} and $PM_{2.5}$ are included below as this is the size range for which health effects are internationally accepted and are therefore used for compliance assessment in terms of the National standards for ambient air quality.

TOPAS instruments are also equipped with wind monitors that allow for peak concentrations to be correlated with wind speed and wind direction data, making it possible for peaks to be traced back to the probable source. As described in Section 3.1, two instruments are deployed on the Venetia mine property, the results of which are presented below. The PM_{10} and $PM_{2.5}$ data have been graphically presented using the 24-hour averages for each day to enable a comparison with the current National ambient average 24-hour standards (75 $\mu g/m^3$ for PM_{10} and 40 $\mu g/m^3$ for $PM_{2.5}$).

5.3.1 MAIN OFFICE (TIMBILA BUILDING) MONITORING SITE

The area in which Main Office unit is located has historically been known to record high dustfall whenever there was activity in the vicinity, such as moving machinery, construction of overhead power lines, or on-going construction related to the VUP project. It is also located downwind of the main pit and stockpiles.

5.3.2 WESTERN FENCE MONITORING SITE

Western Fence is located in an area which is downwind from the entire mine and in the vicinity of Fine Residue Disposal (FRD) area that was identified by previous studies as PM_{10} and $PM_{2.5}$ emission source. It is necessary that PM_{10} and $PM_{2.5}$ be monitored in this region of the mine site, so as to fully quantify mine's impact on the surrounding environment.

Data from Main office and Western Fence monitoring stations for February 2020 – January 2021 monitoring period are presented in Figure 36 to Figure 83, with the summary on Table 14 to Table 25.

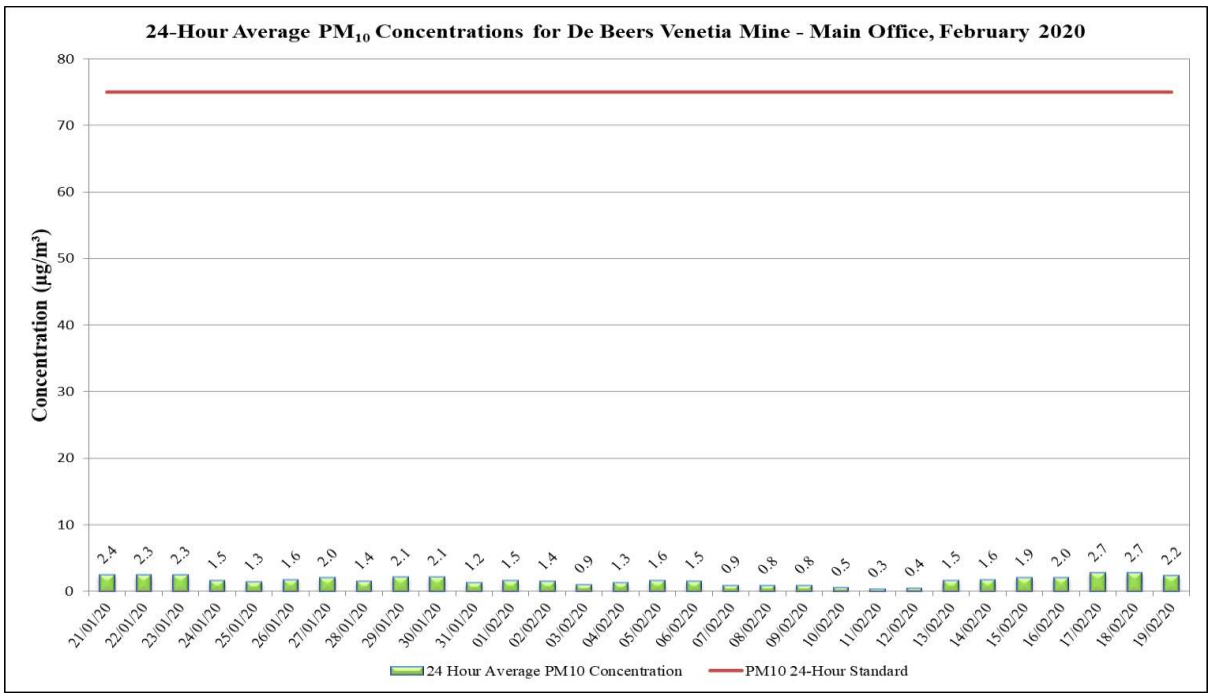


Figure 36: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for February 2020 reporting period.

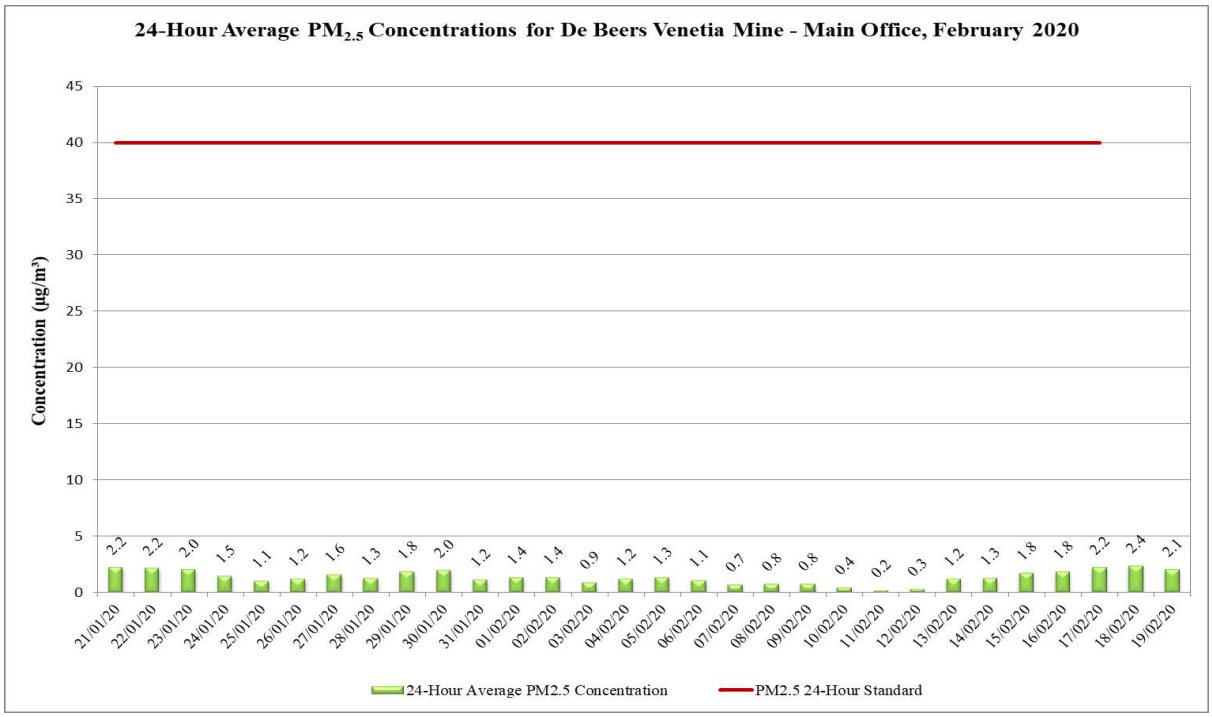


Figure 37: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for February 2020 reporting period.

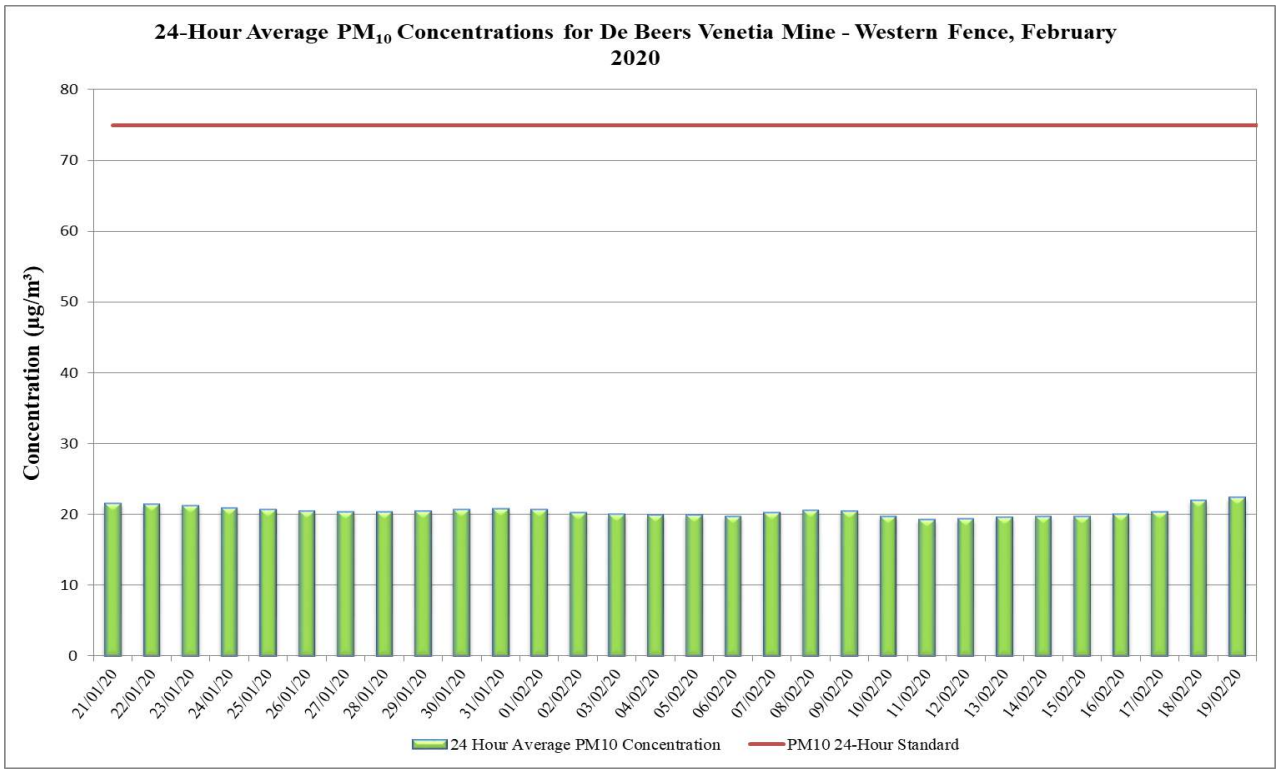


Figure 38: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for February 2020 reporting period.

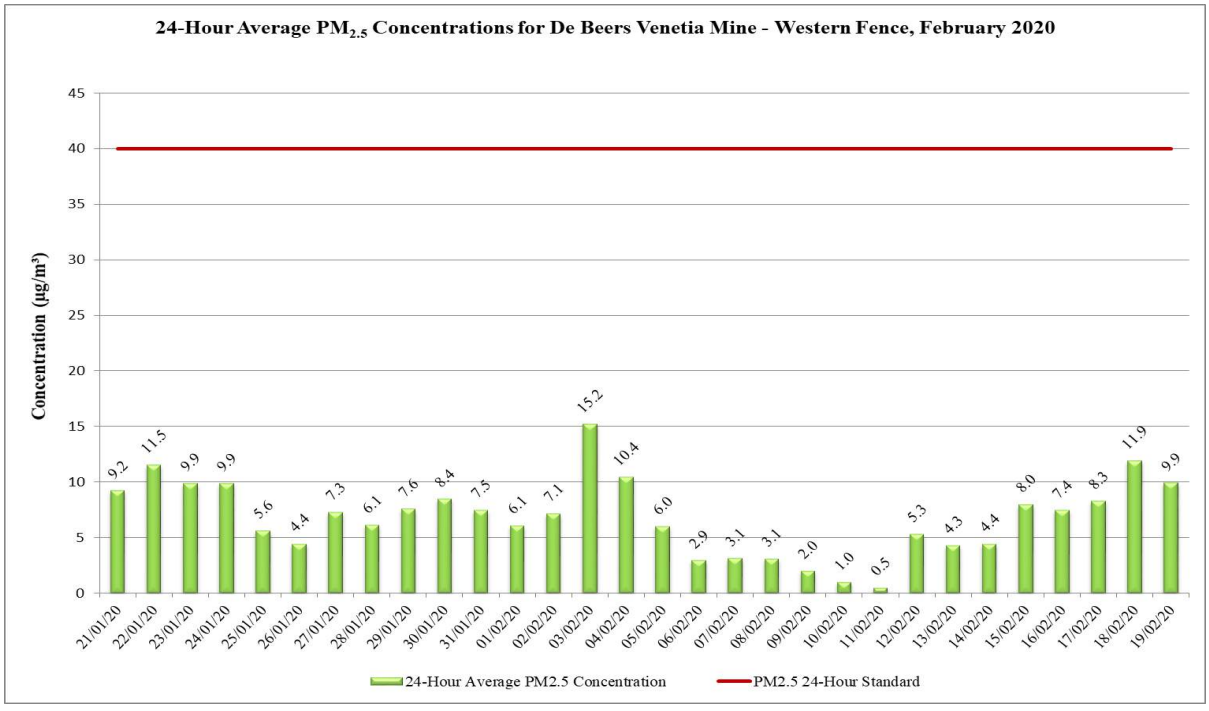


Figure 39: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for February 2020 reporting period.

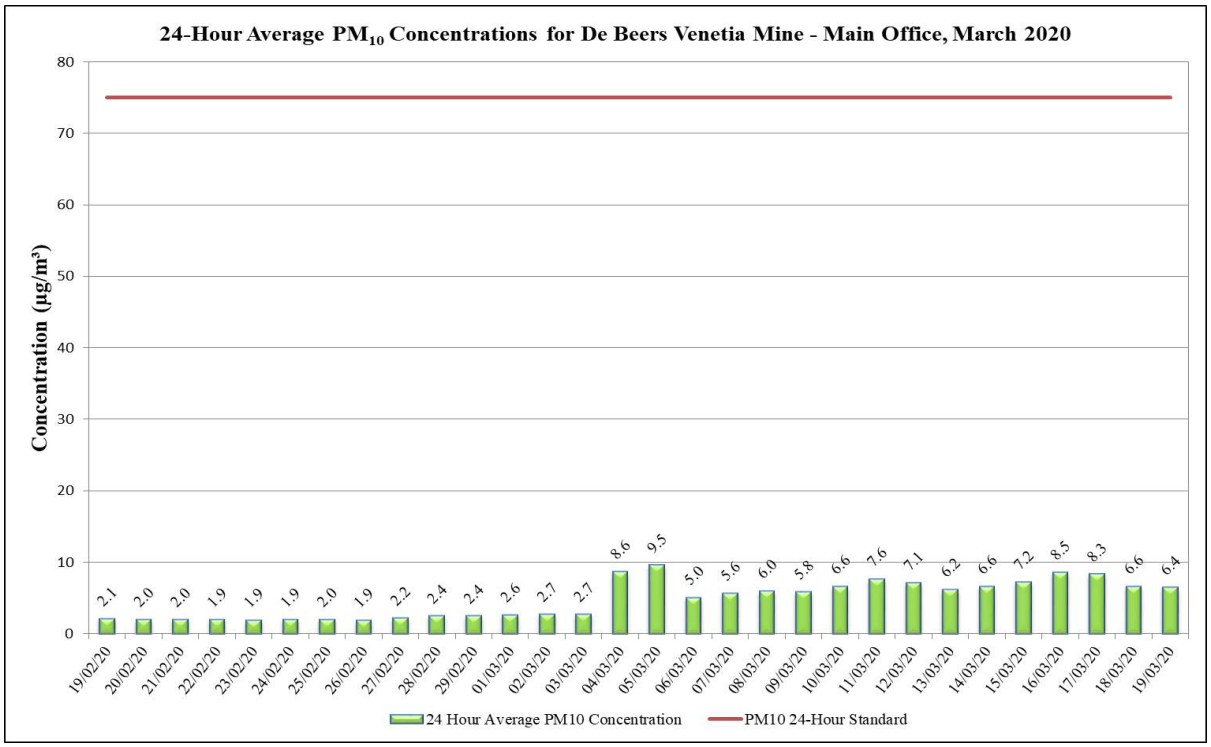


Figure 40: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for March 2020 reporting period.

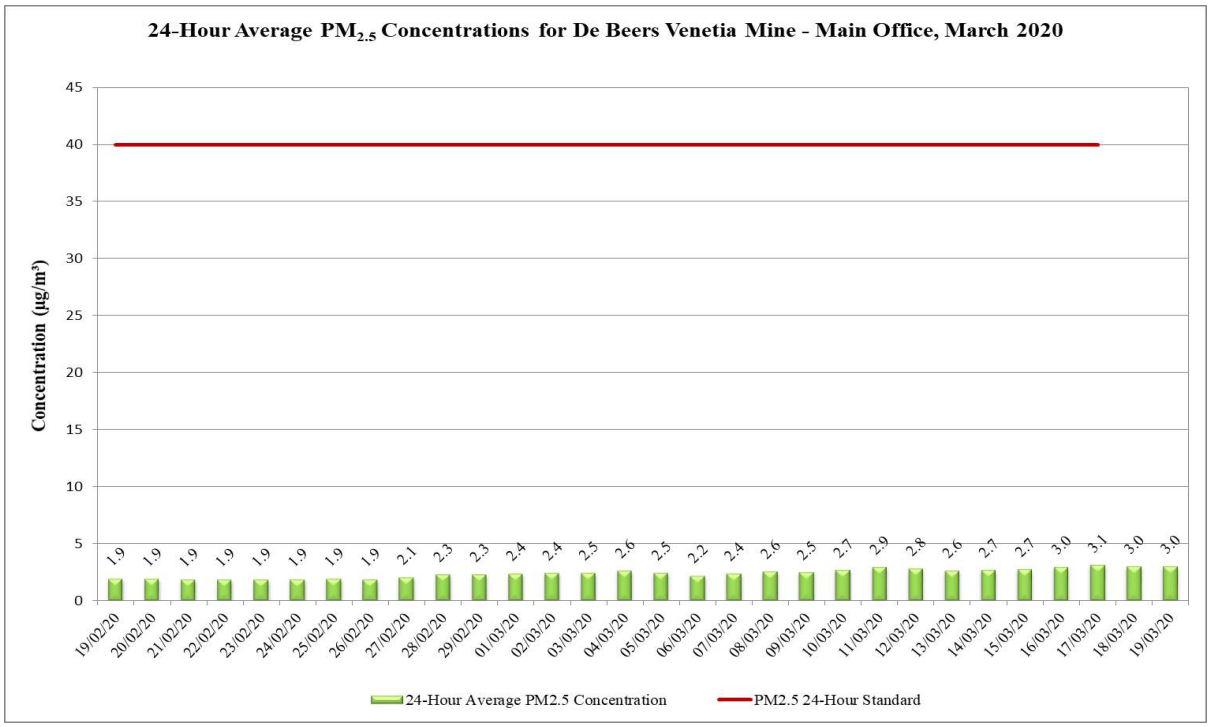


Figure 41: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for March 2020 reporting period.

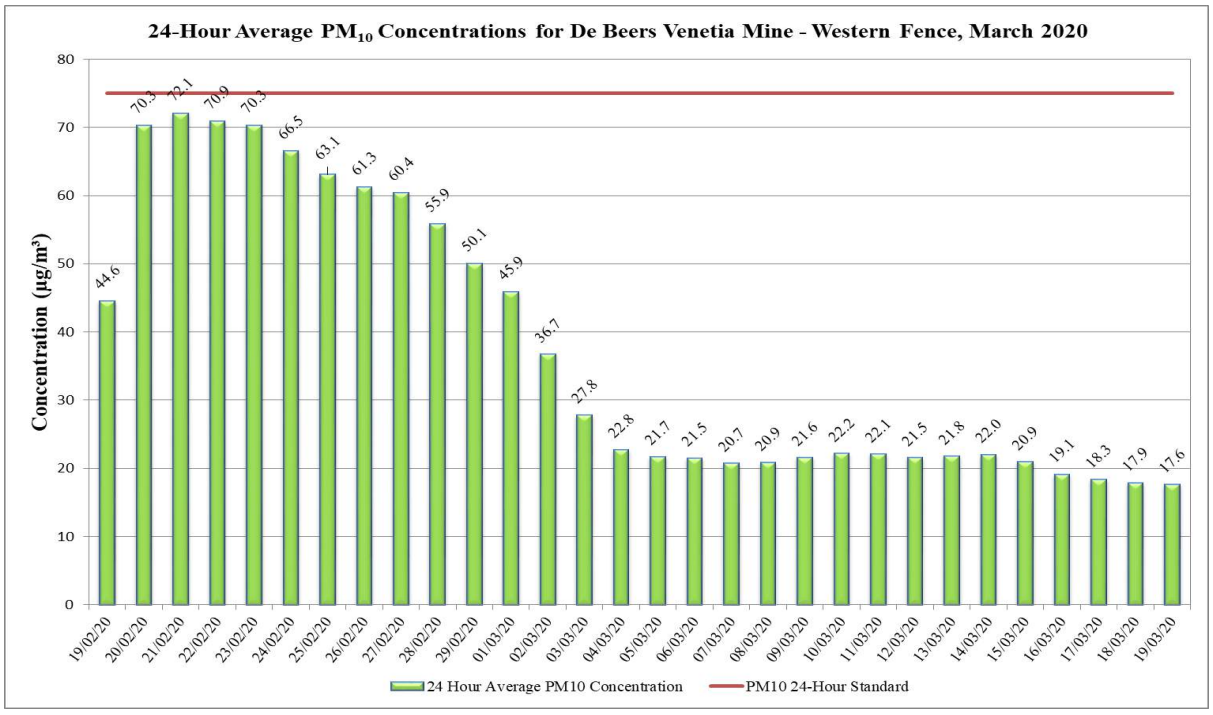


Figure 42: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for March 2020 reporting period.

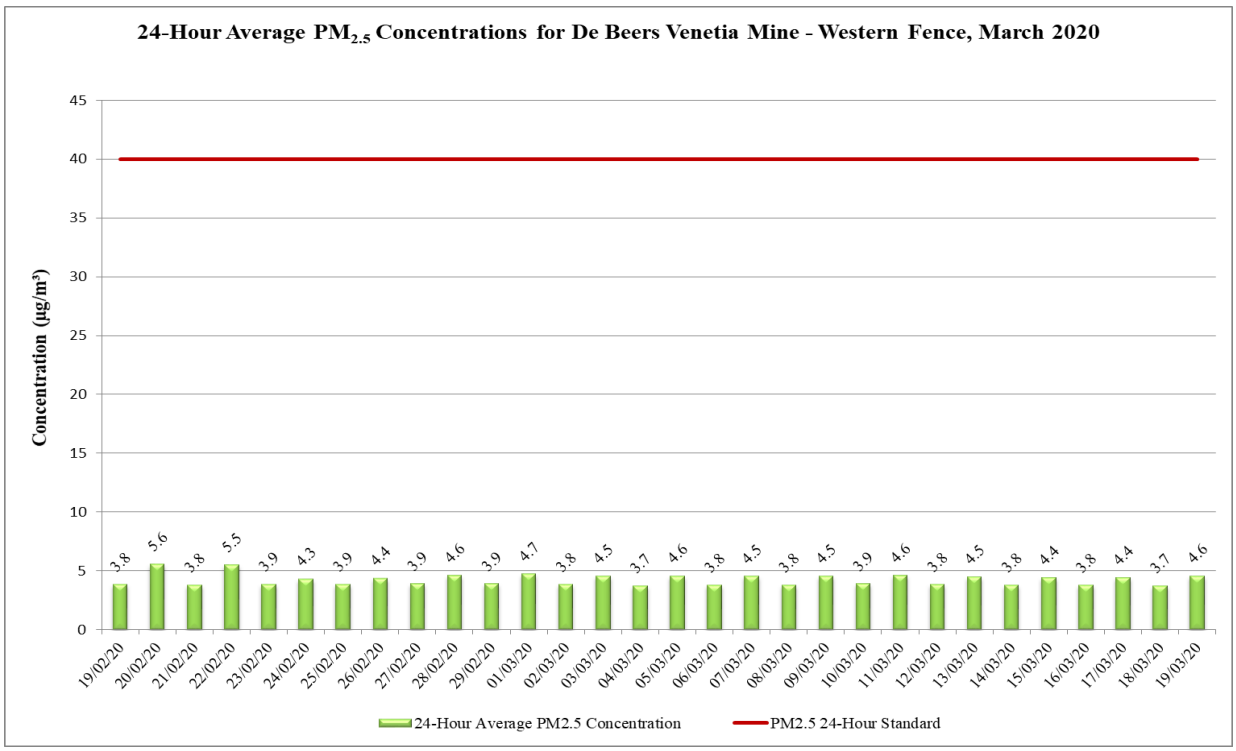


Figure 43: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for March 2020 reporting period.

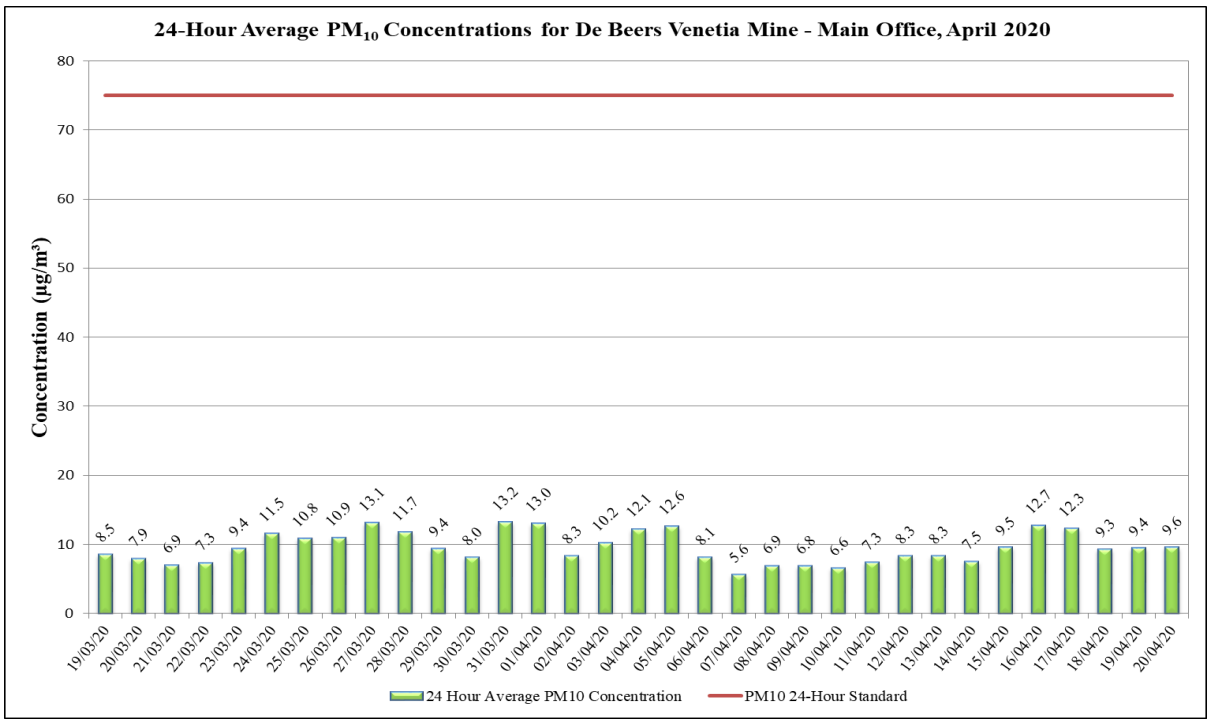


Figure 44: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for April 2020 reporting period.

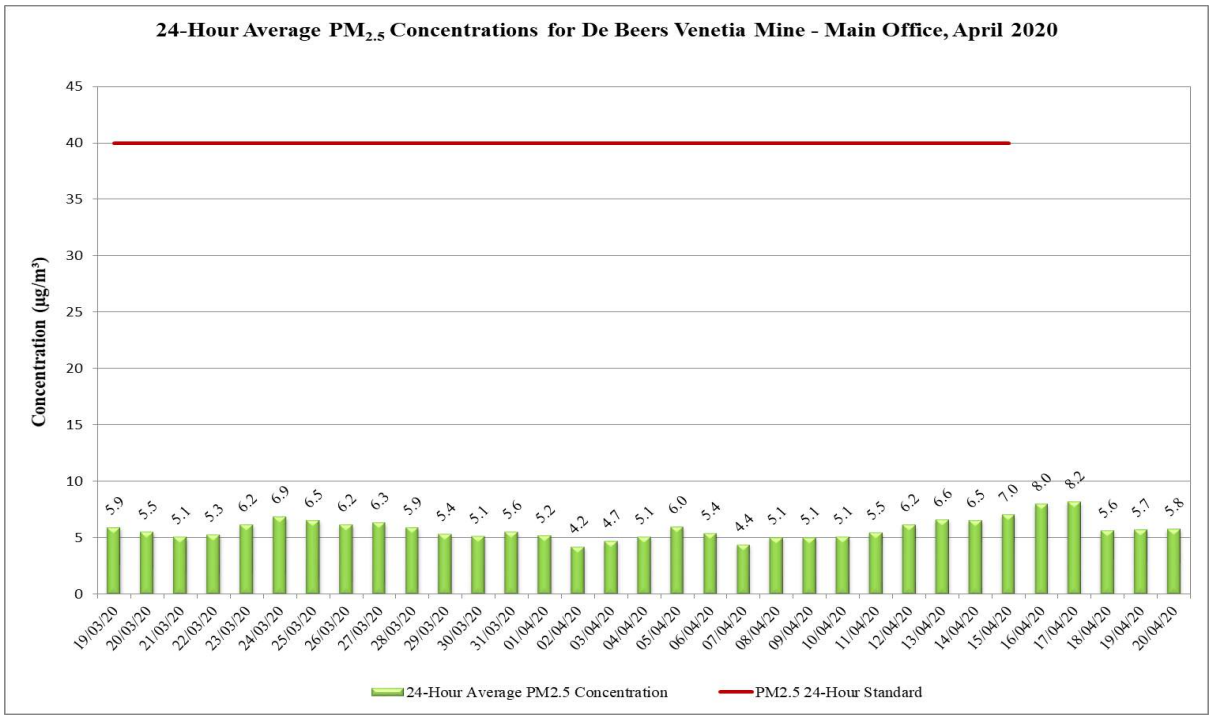


Figure 45: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for April 2020 reporting period.

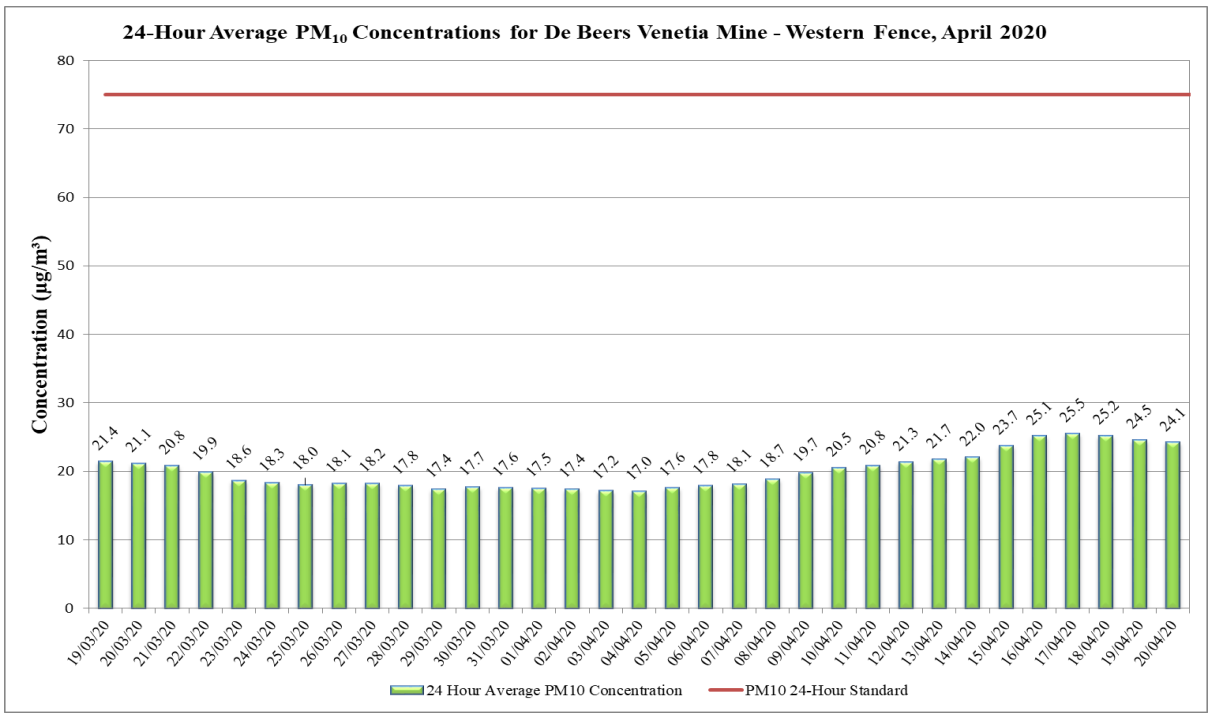


Figure 46: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for April 2020 reporting period.

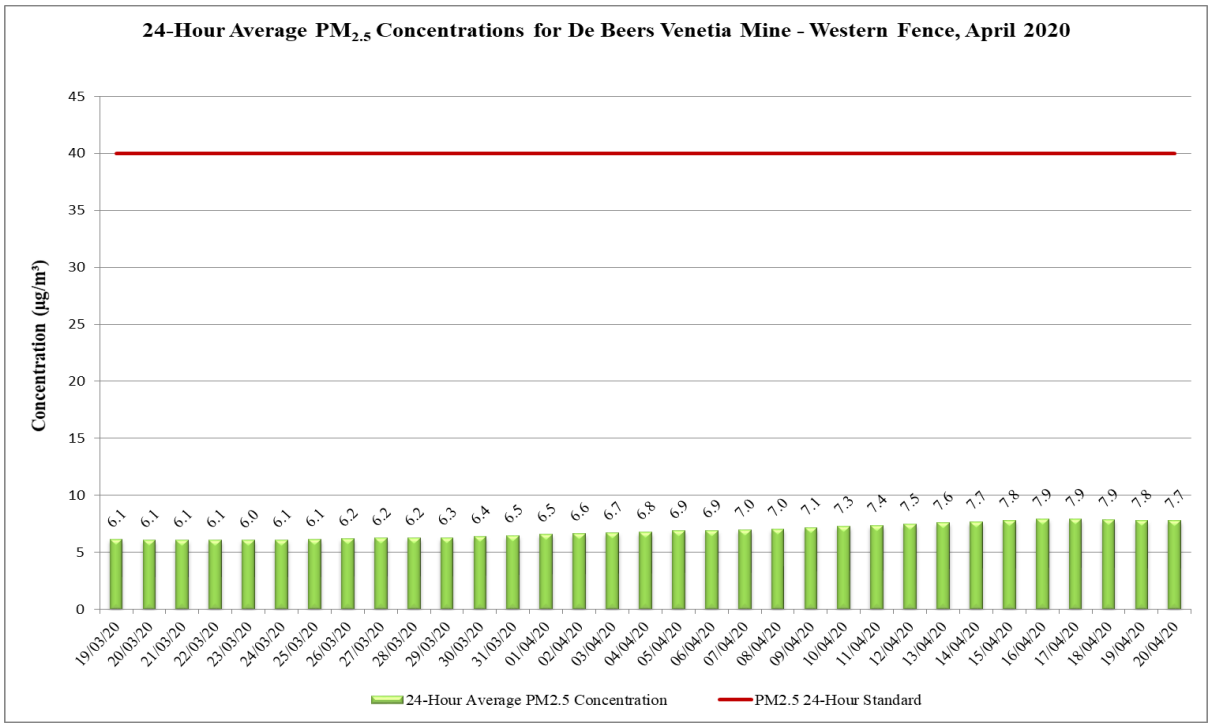


Figure 47: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for April 2020 reporting period.

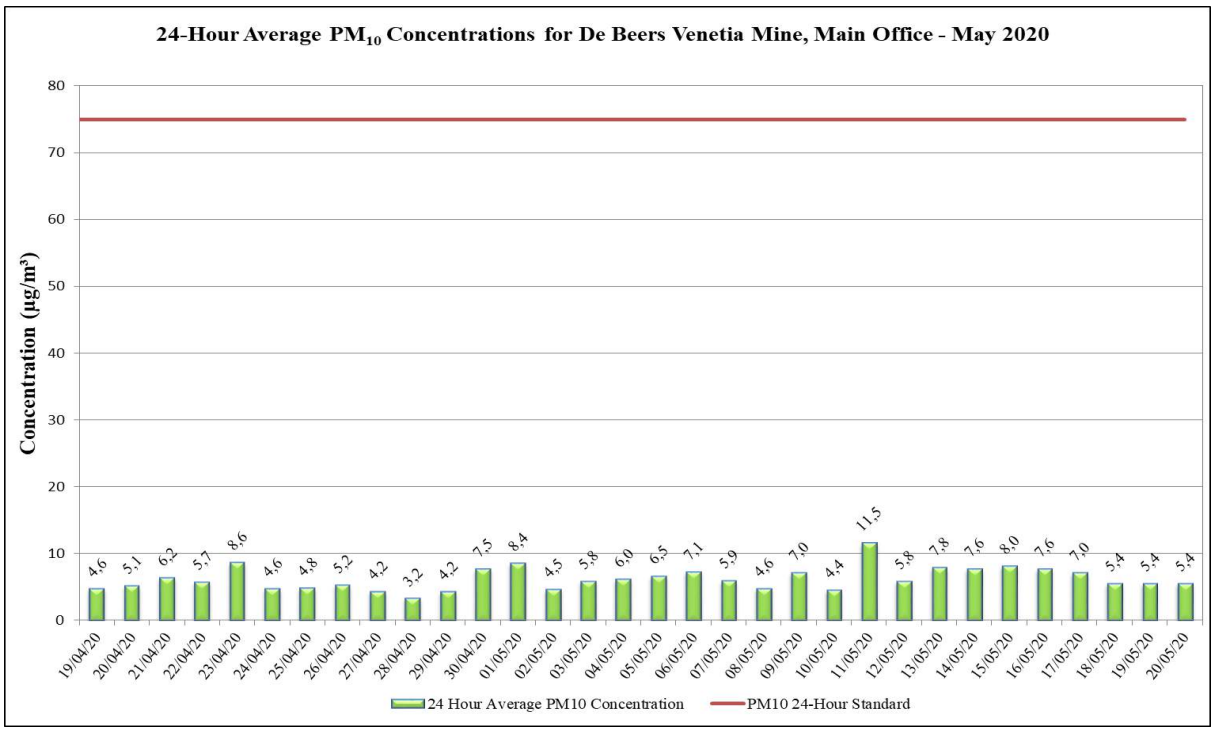


Figure 48: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for May 2020 reporting period.

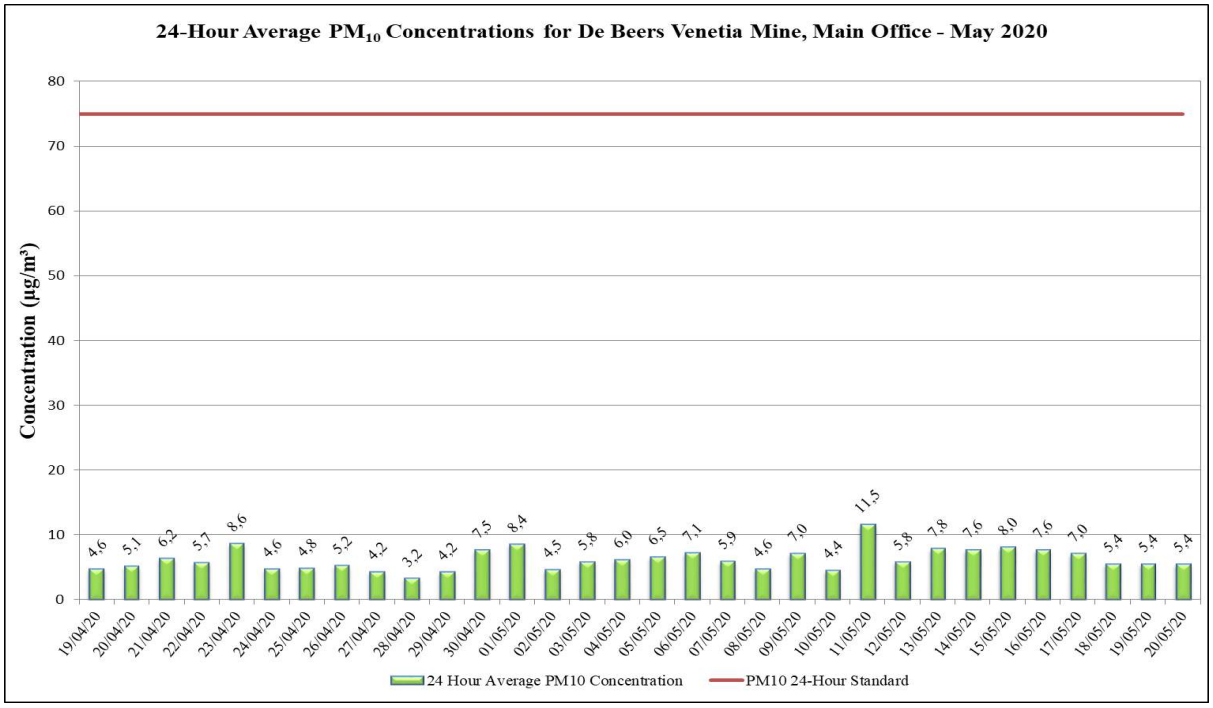


Figure 49: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for May 2020 reporting period.

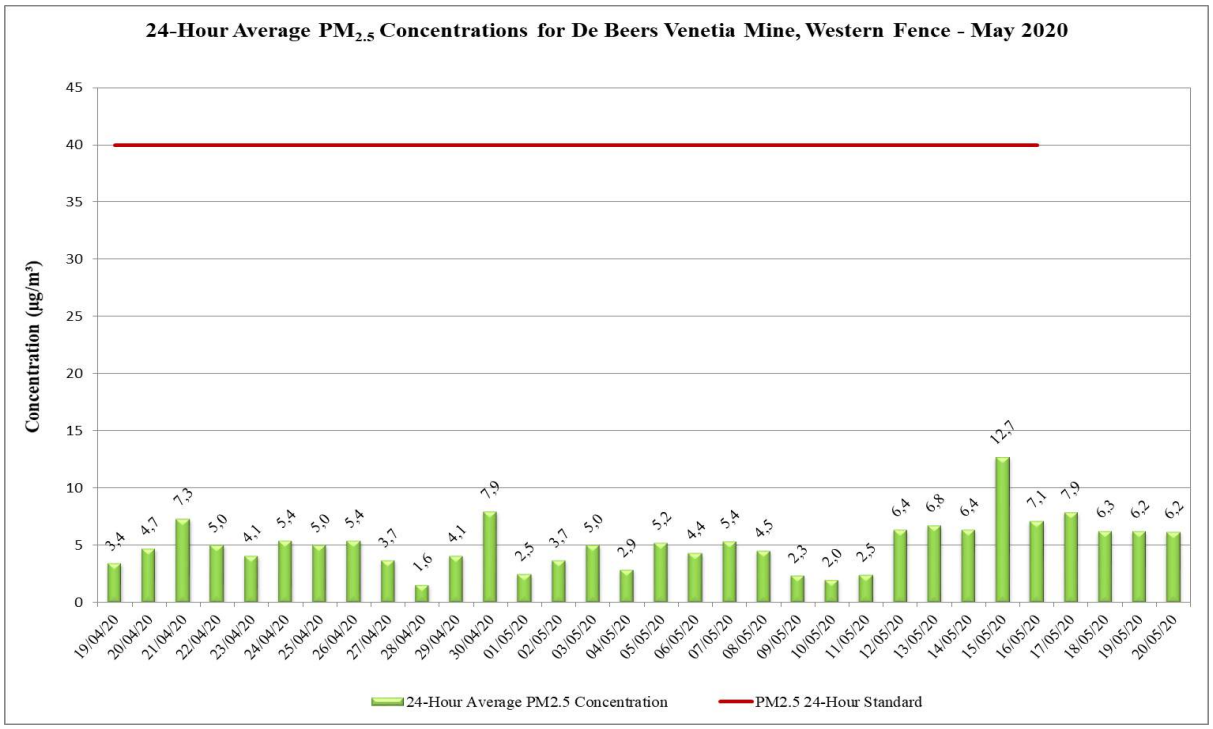


Figure 50: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for May 2020 reporting period.

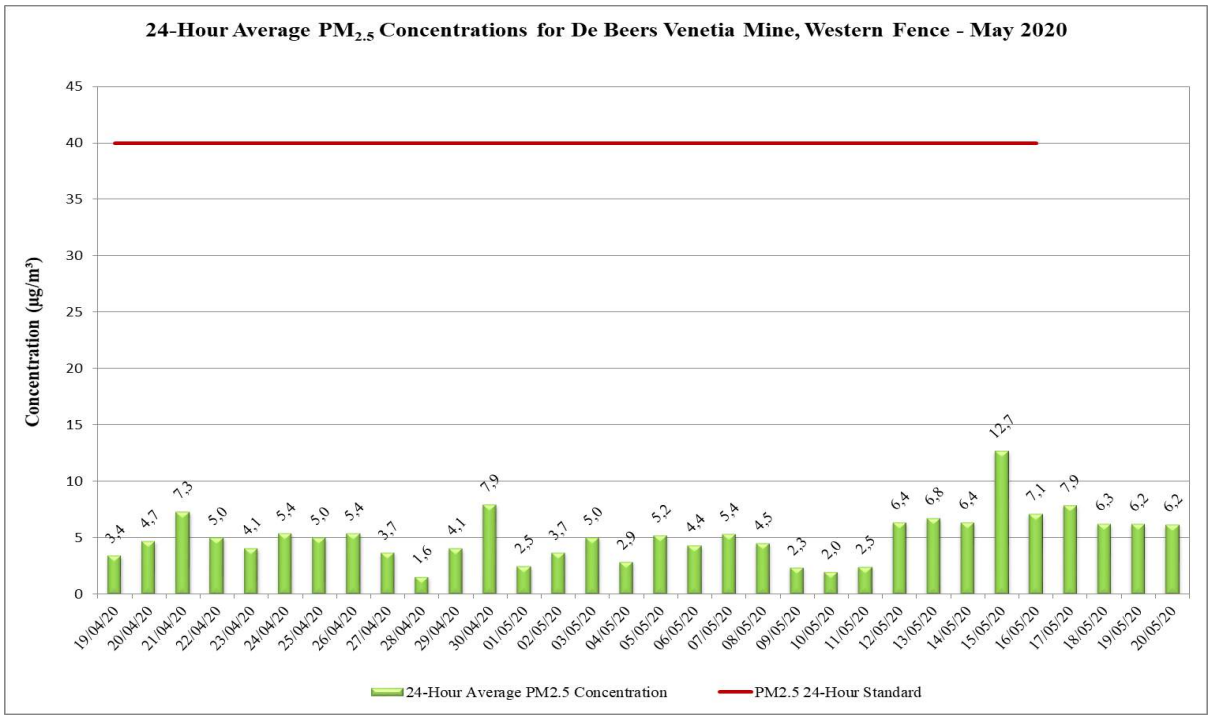


Figure 51: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for May 2020 reporting period.

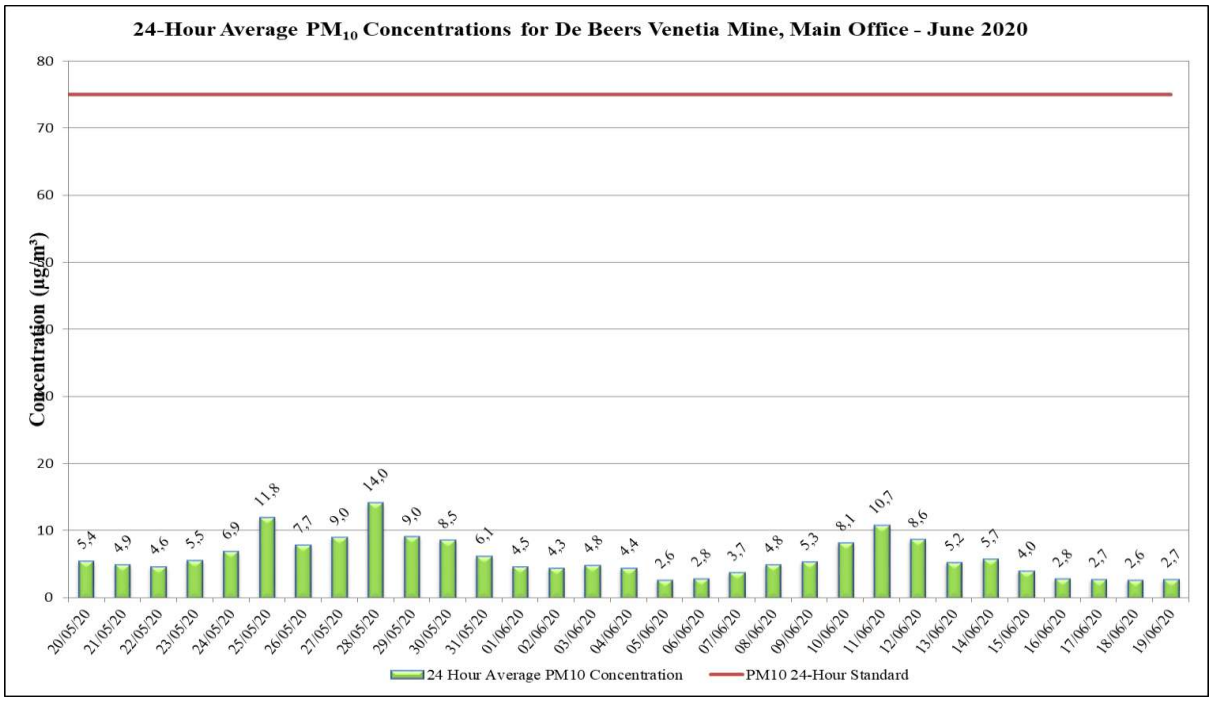


Figure 52: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for June 2020 reporting period.

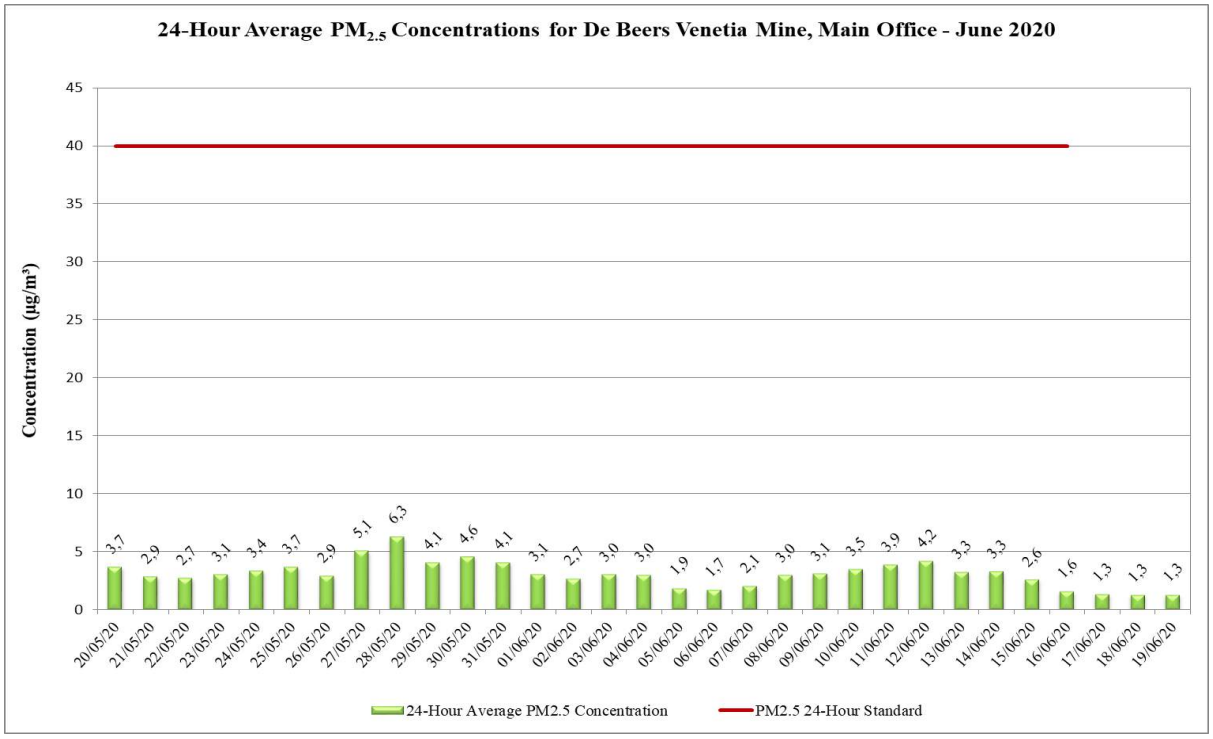


Figure 53: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for June 2020 reporting period.

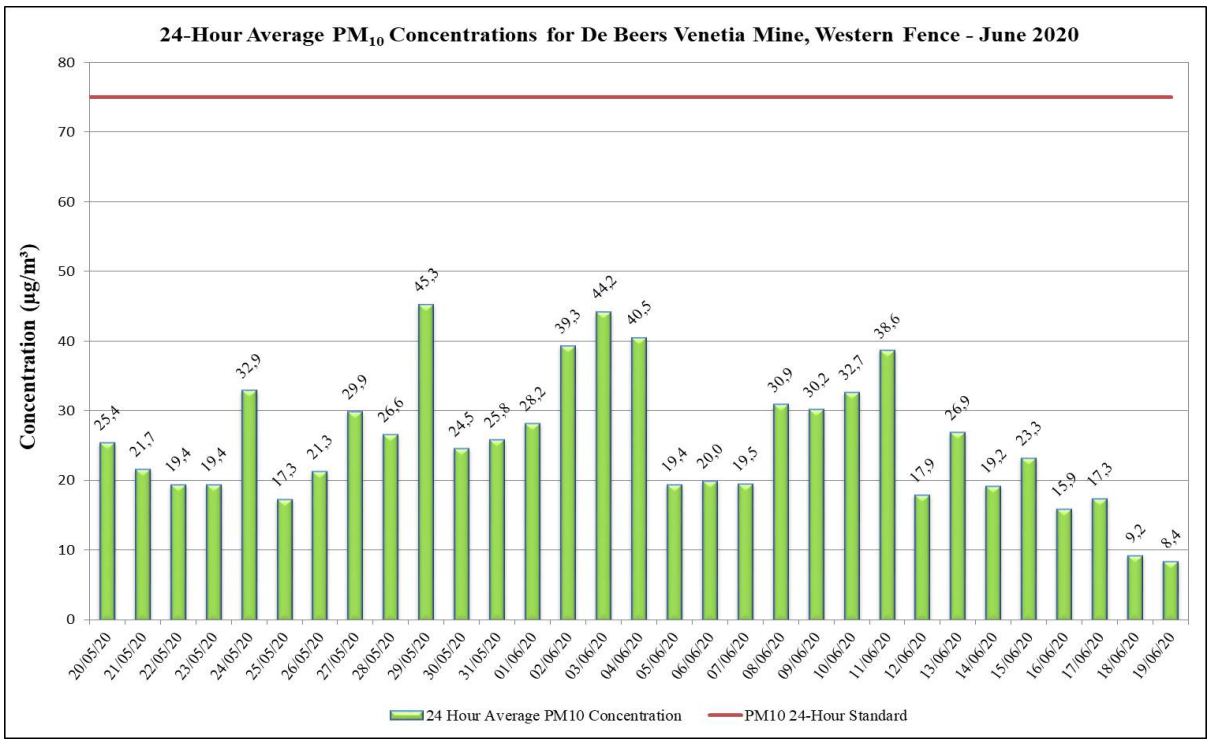


Figure 54: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for June 2020 reporting period.

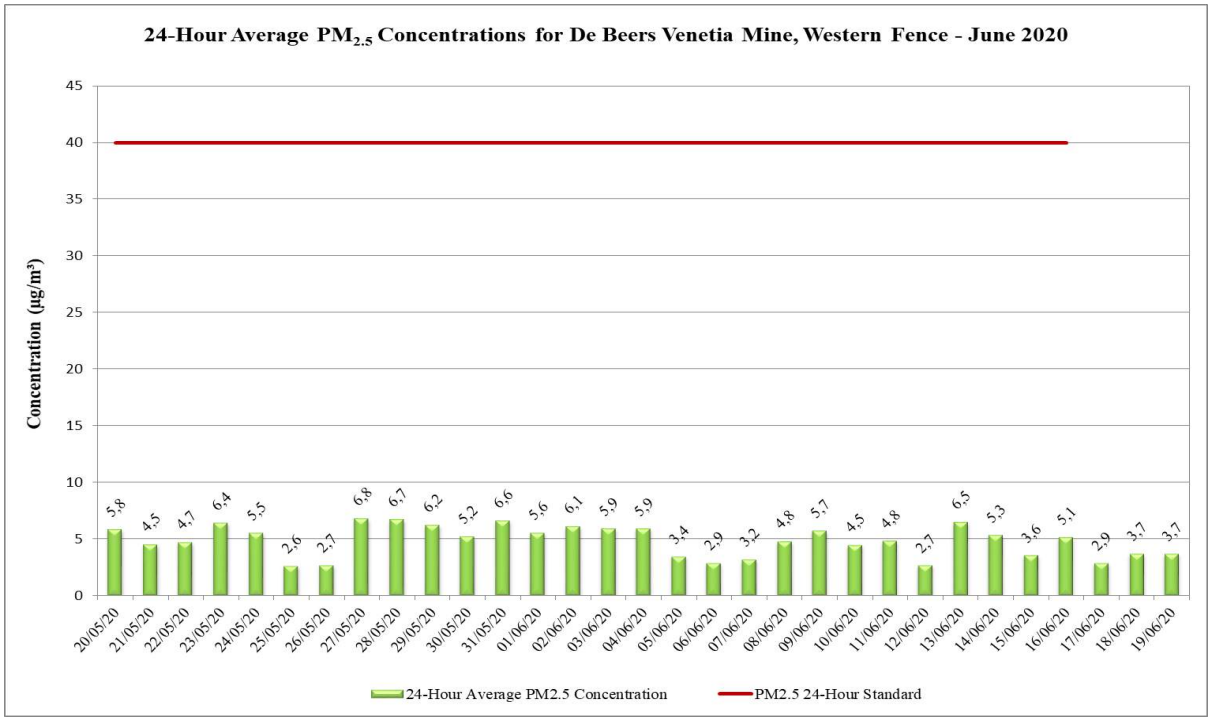


Figure 55: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for June 2020 reporting period.

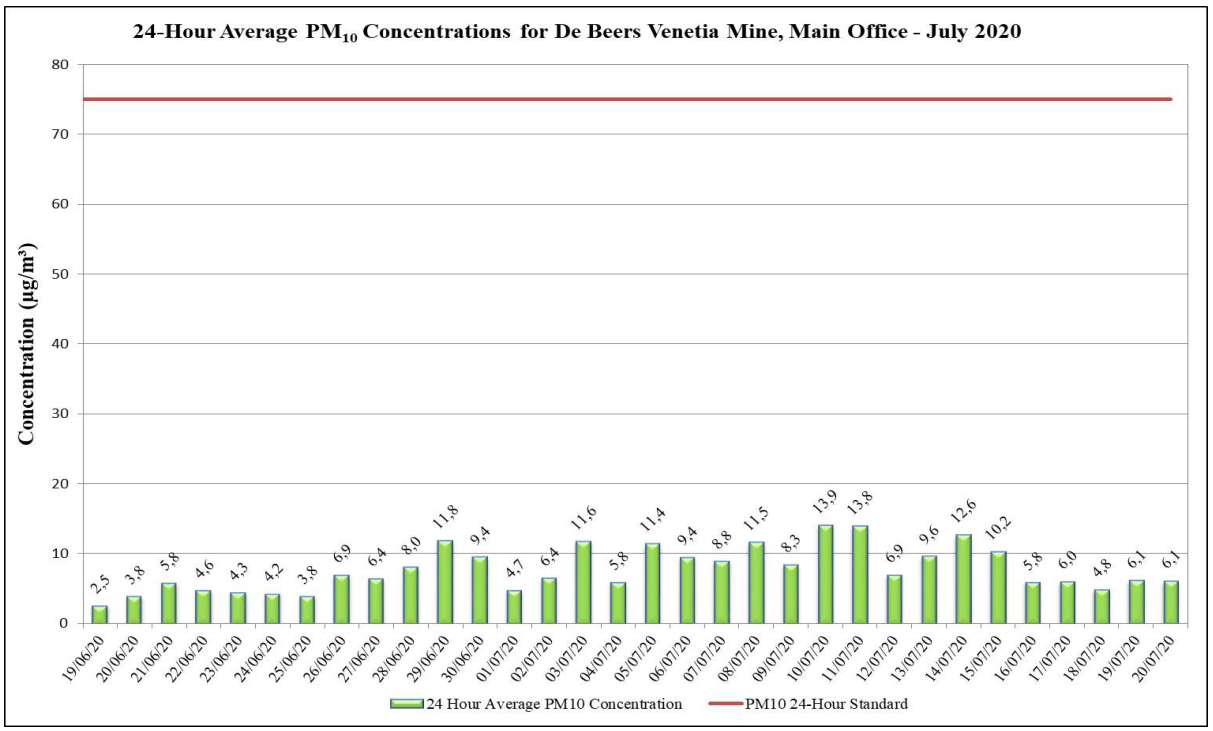


Figure 56: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for July 2020 reporting period.

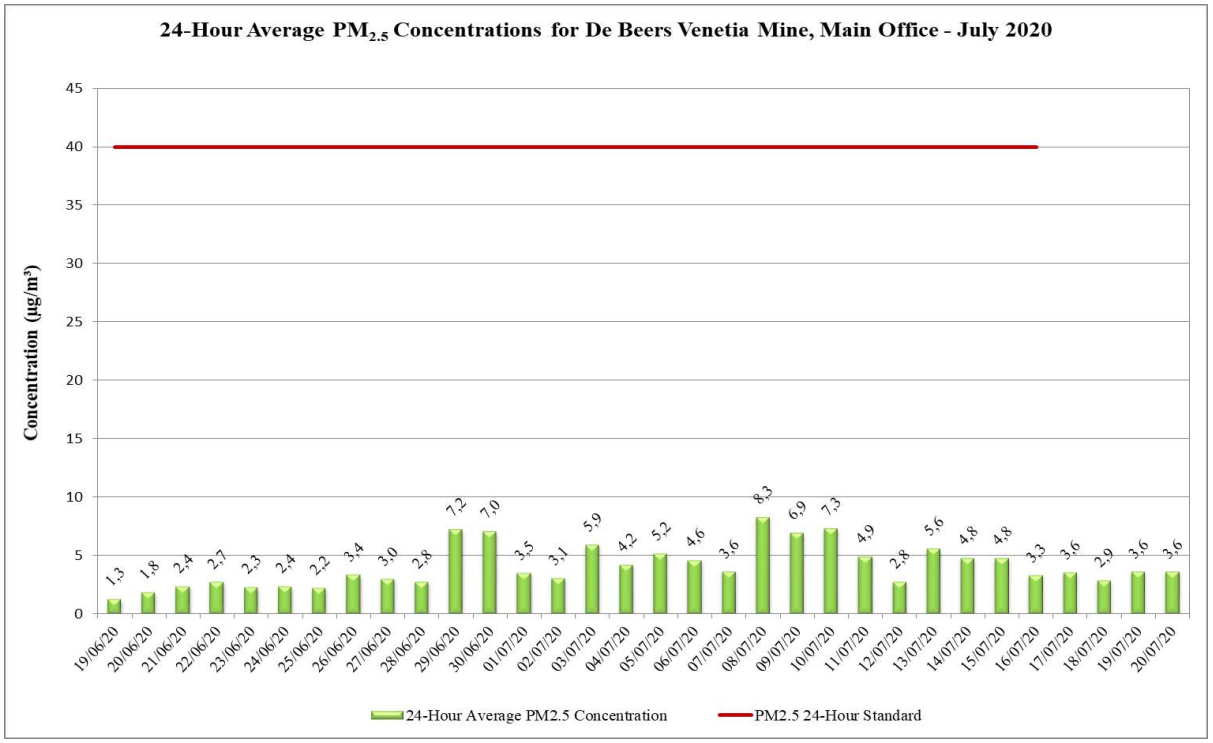


Figure 57: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for July 2020 reporting period.

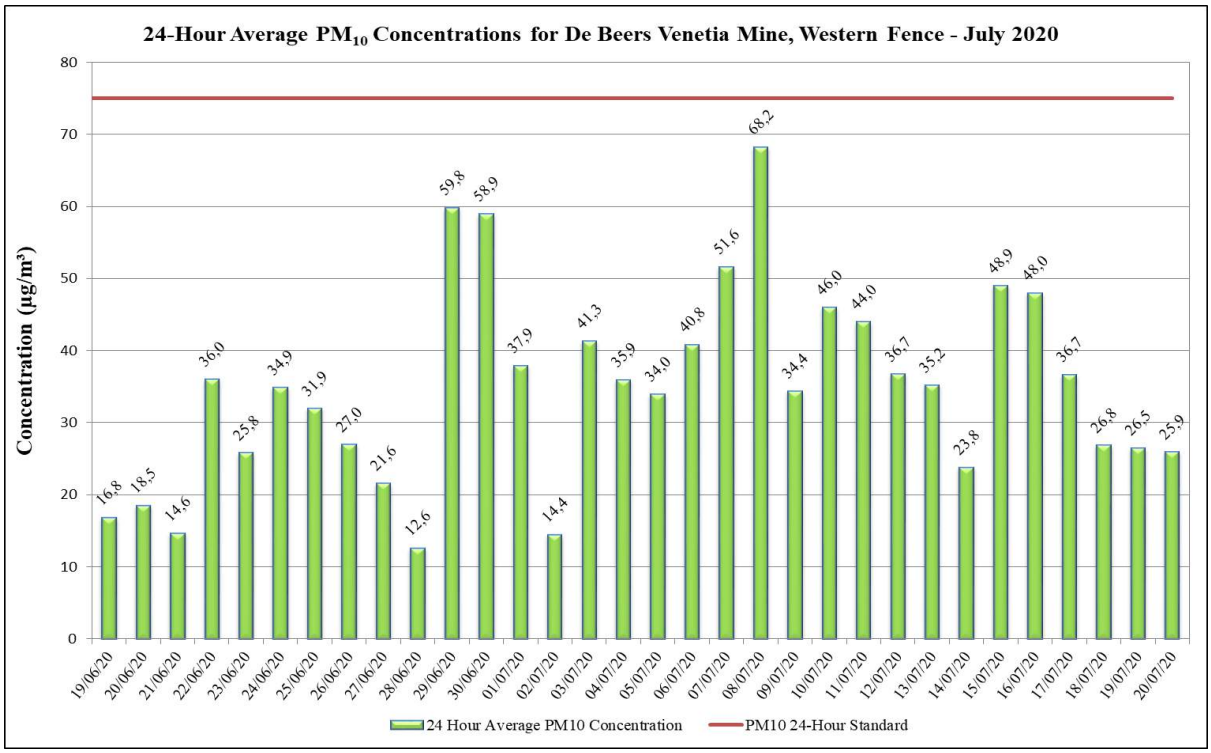


Figure 58: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for July 2020 reporting period.

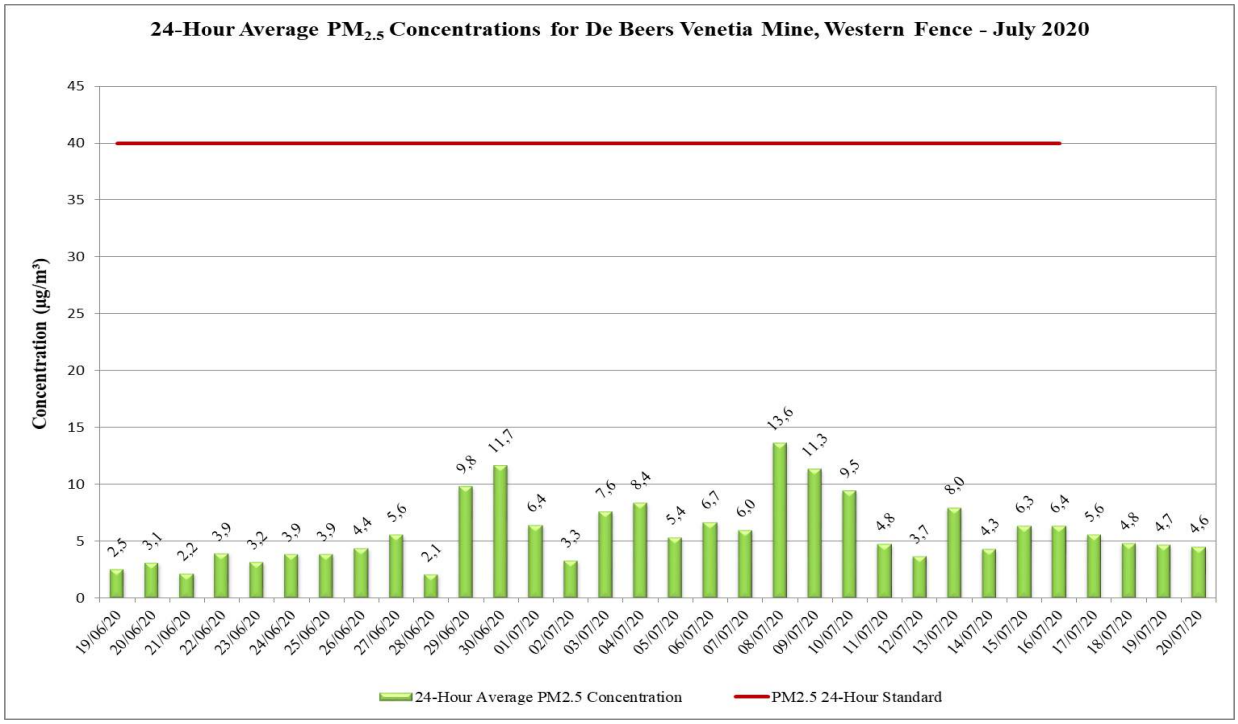


Figure 59: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for July 2020 reporting period.

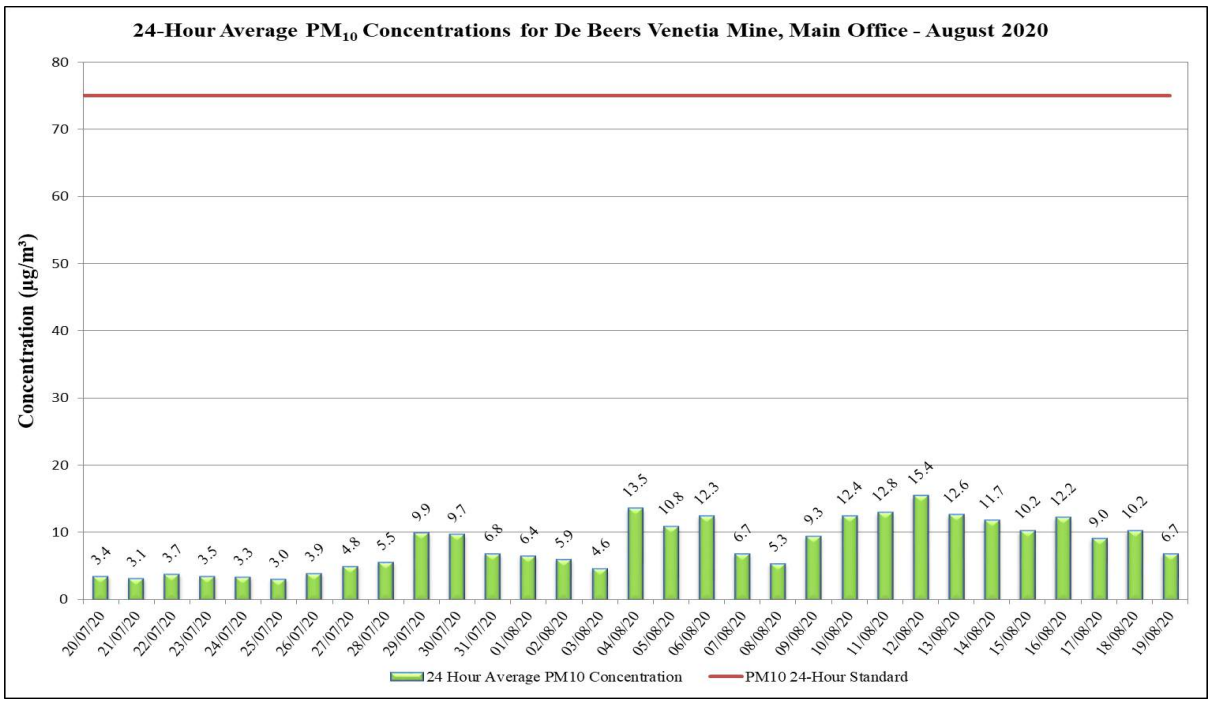


Figure 60: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for August 2020 reporting period.

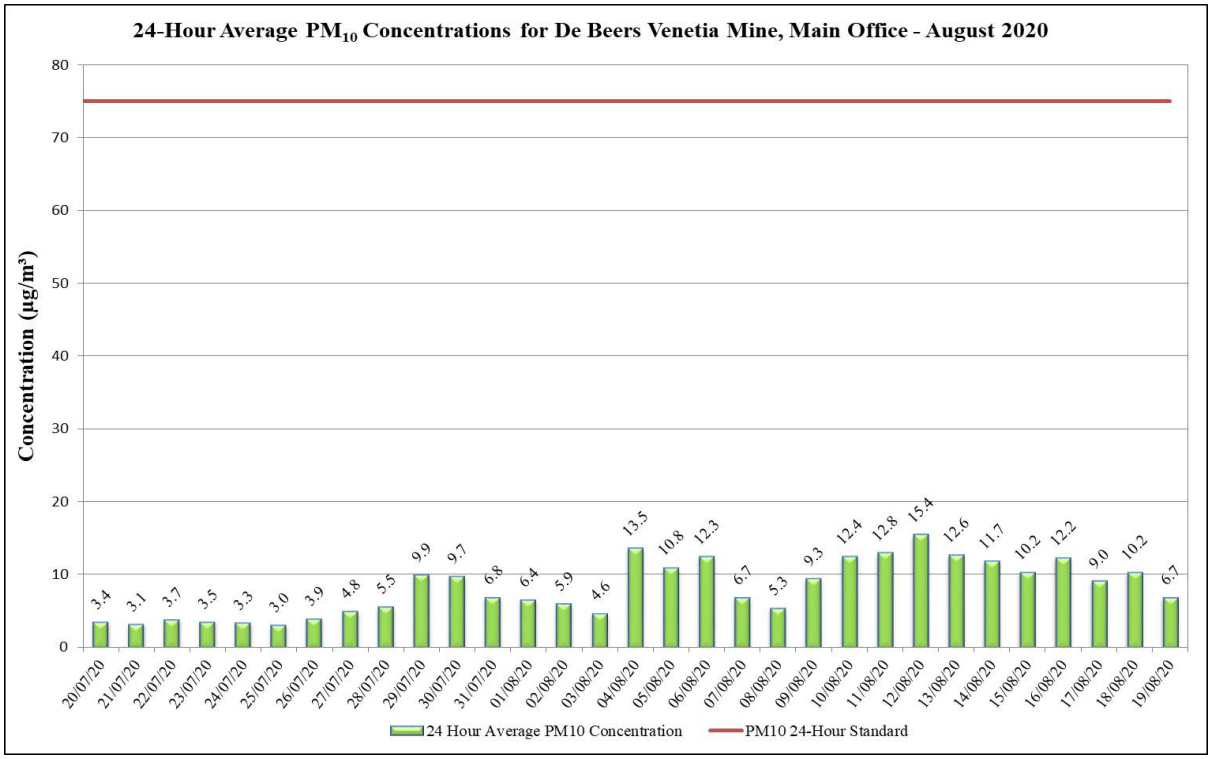


Figure 61: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for August 2020 reporting period.

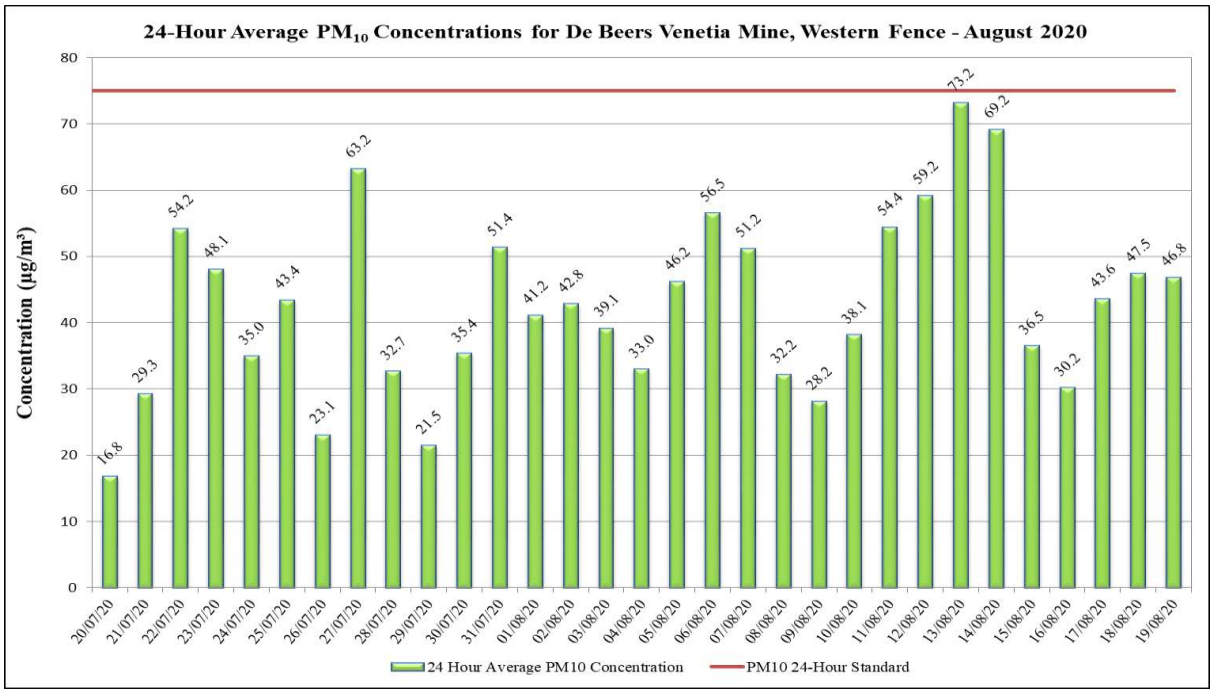


Figure 62: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for August 2020 reporting period.

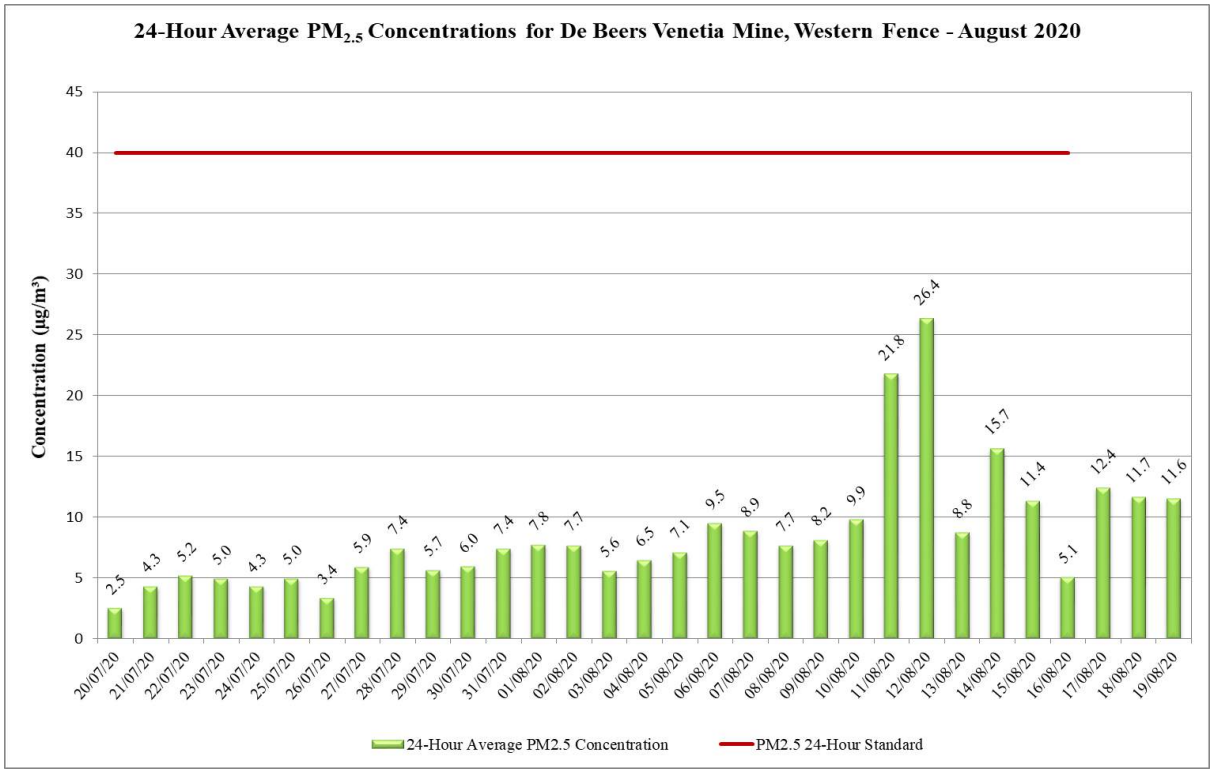


Figure 63: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for August 2020 reporting period.

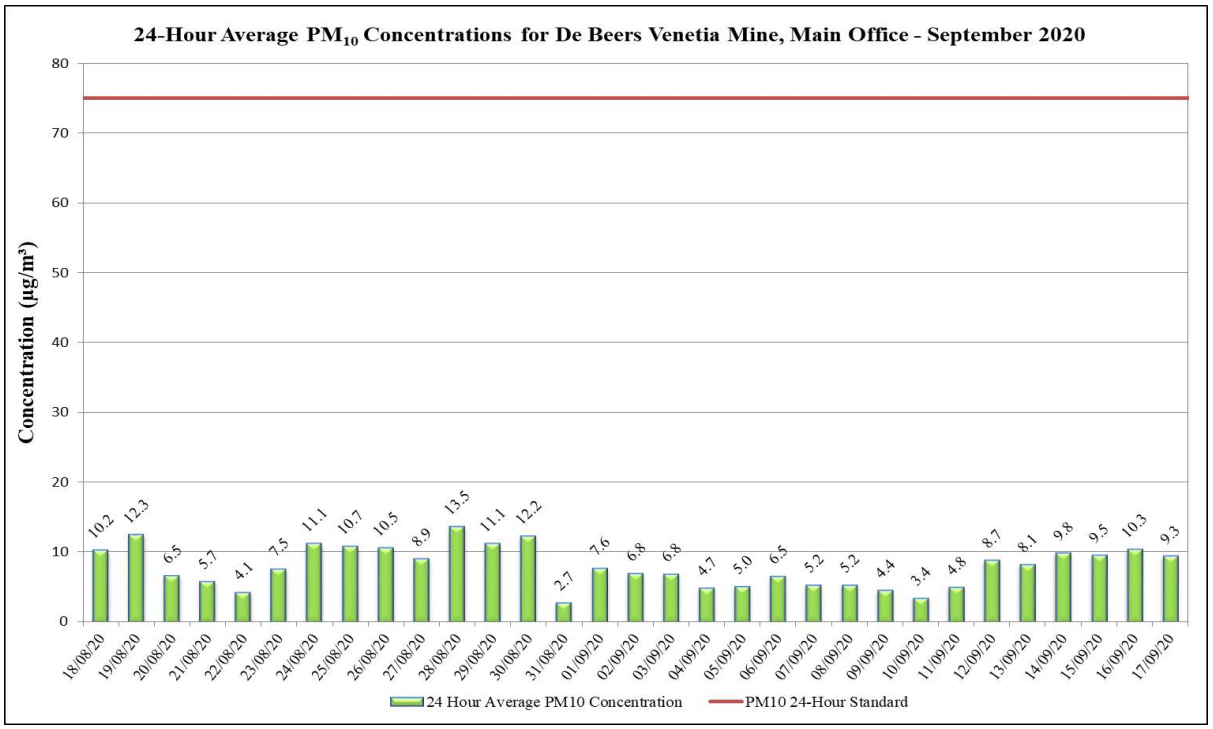


Figure 64: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for September 2020 reporting period.

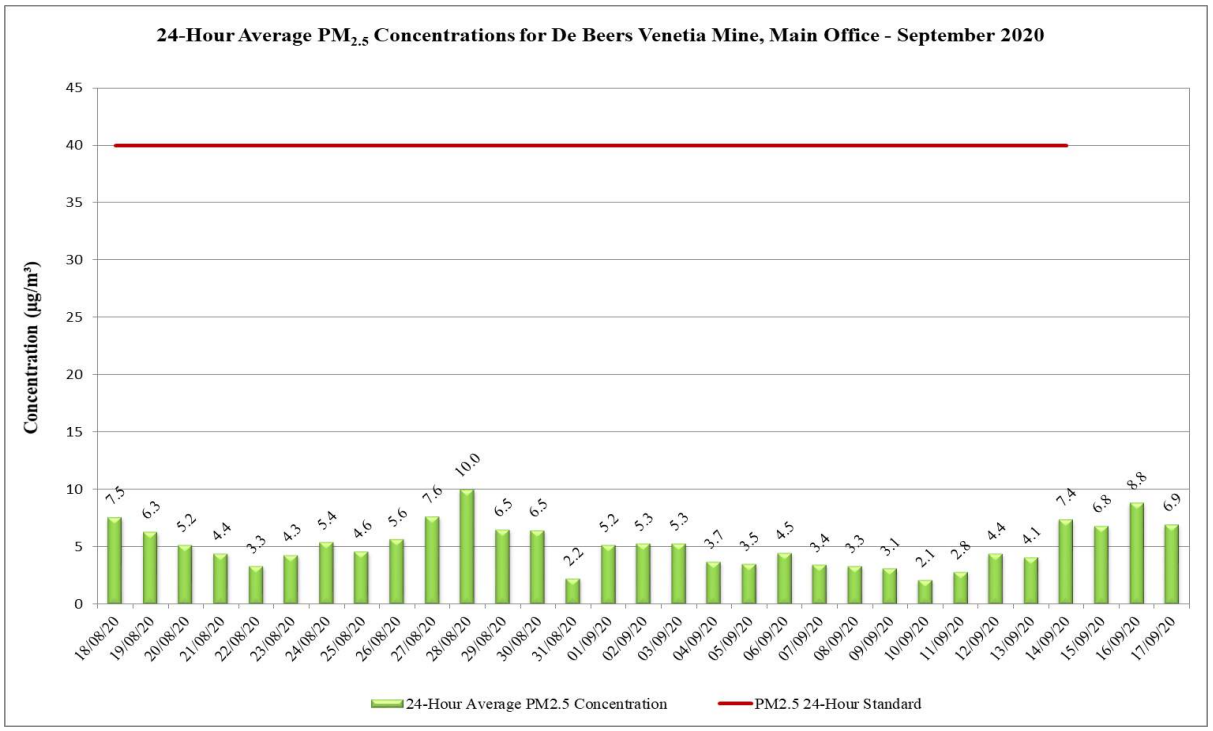


Figure 65: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for September 2020 reporting period.

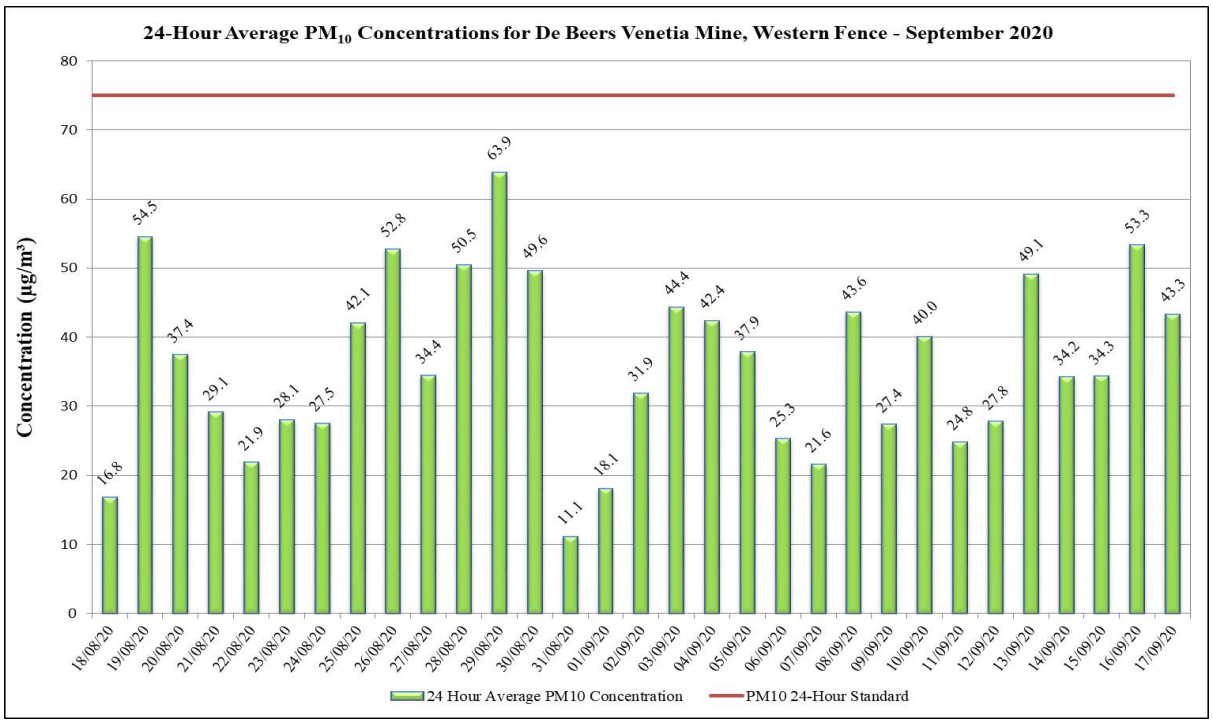


Figure 66: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for September 2020 reporting period.

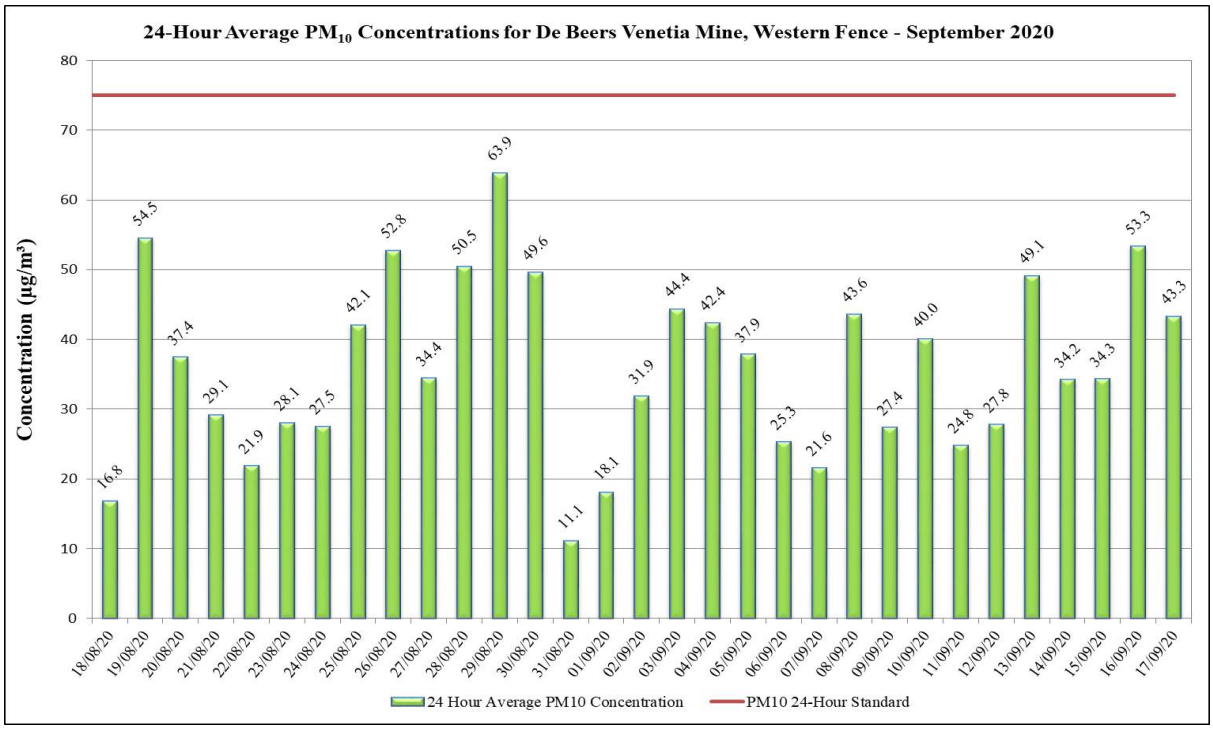


Figure 67: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for September 2020 reporting period.

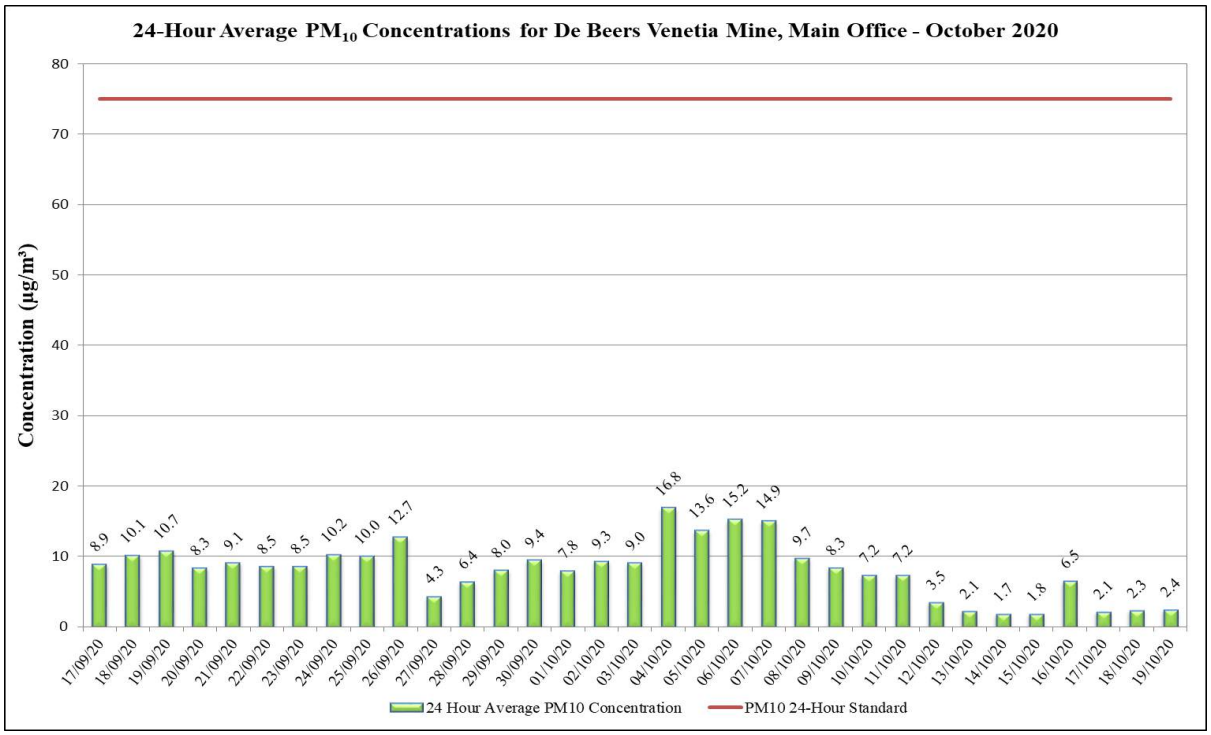


Figure 68: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for October 2020 reporting period.

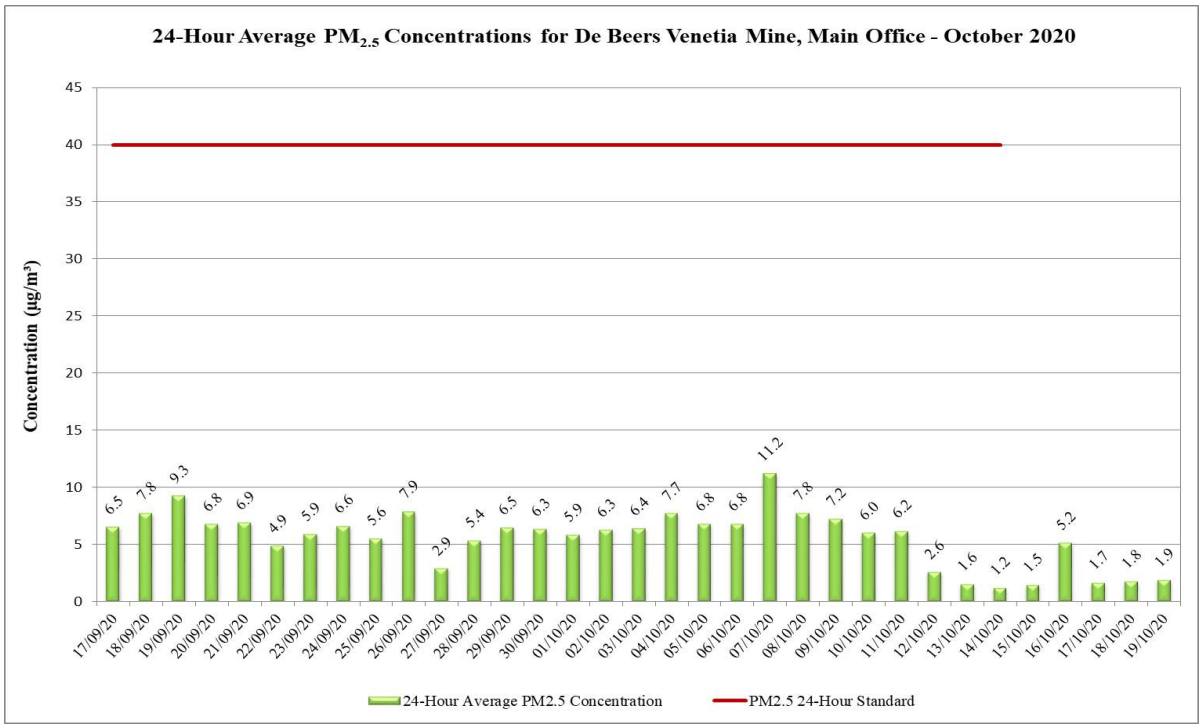


Figure 69: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for October 2020 reporting period.

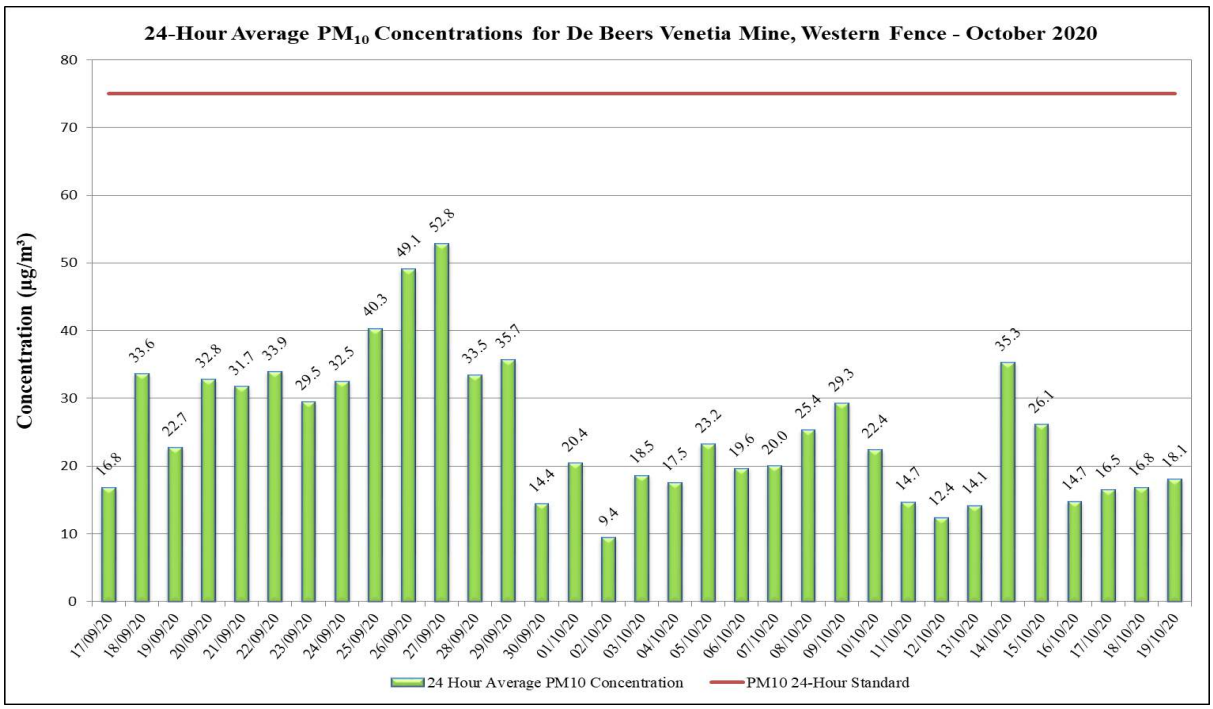


Figure 70: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for October 2020 reporting period.

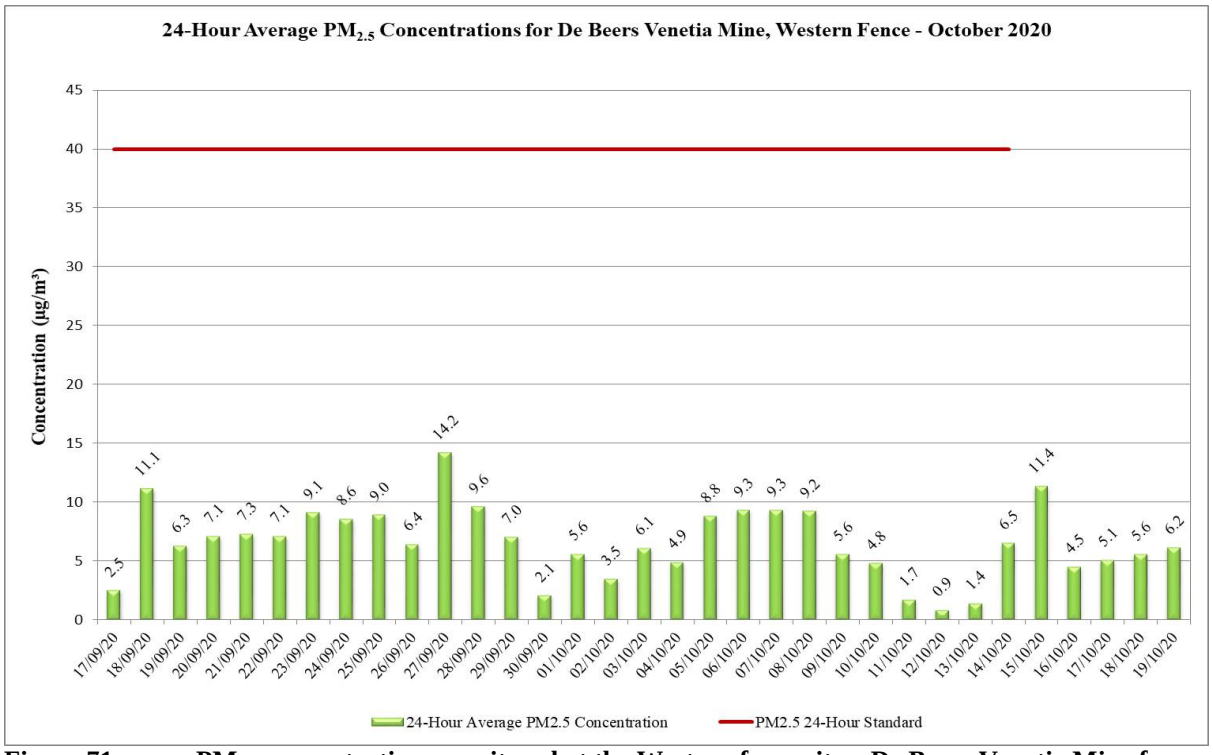


Figure 71: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for October 2020 reporting period.

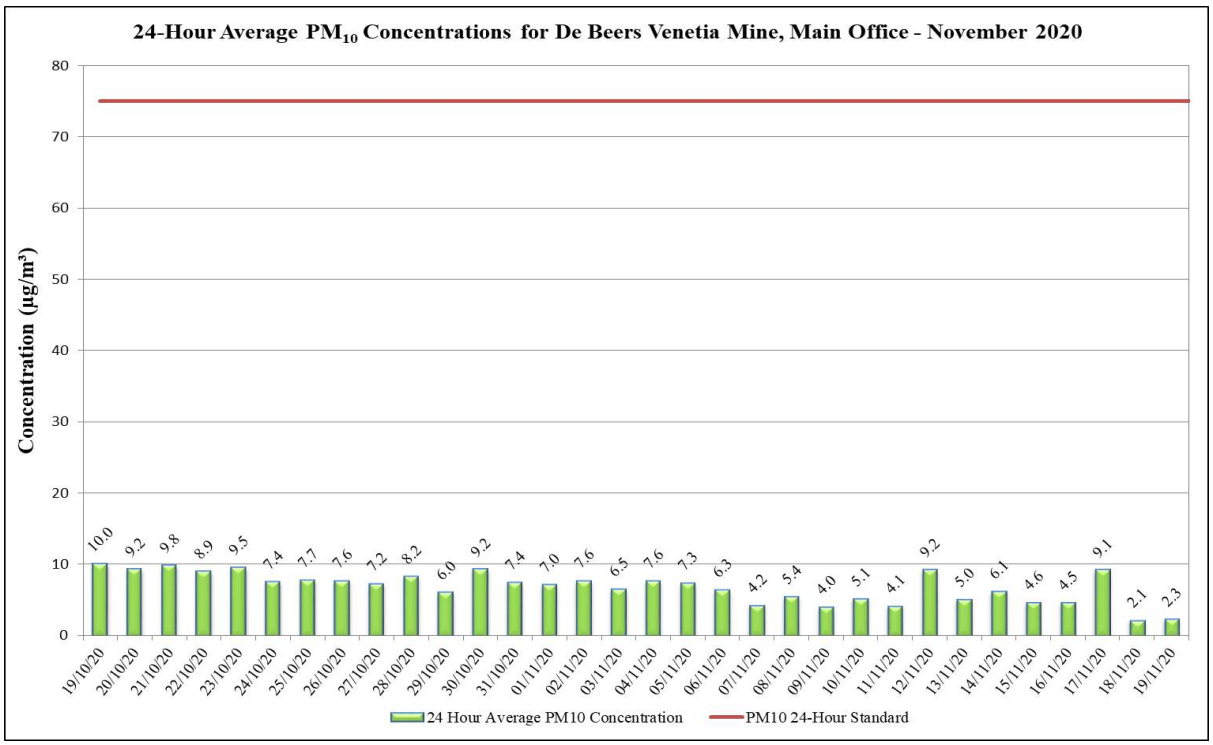


Figure 72: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for November 2020 reporting period.

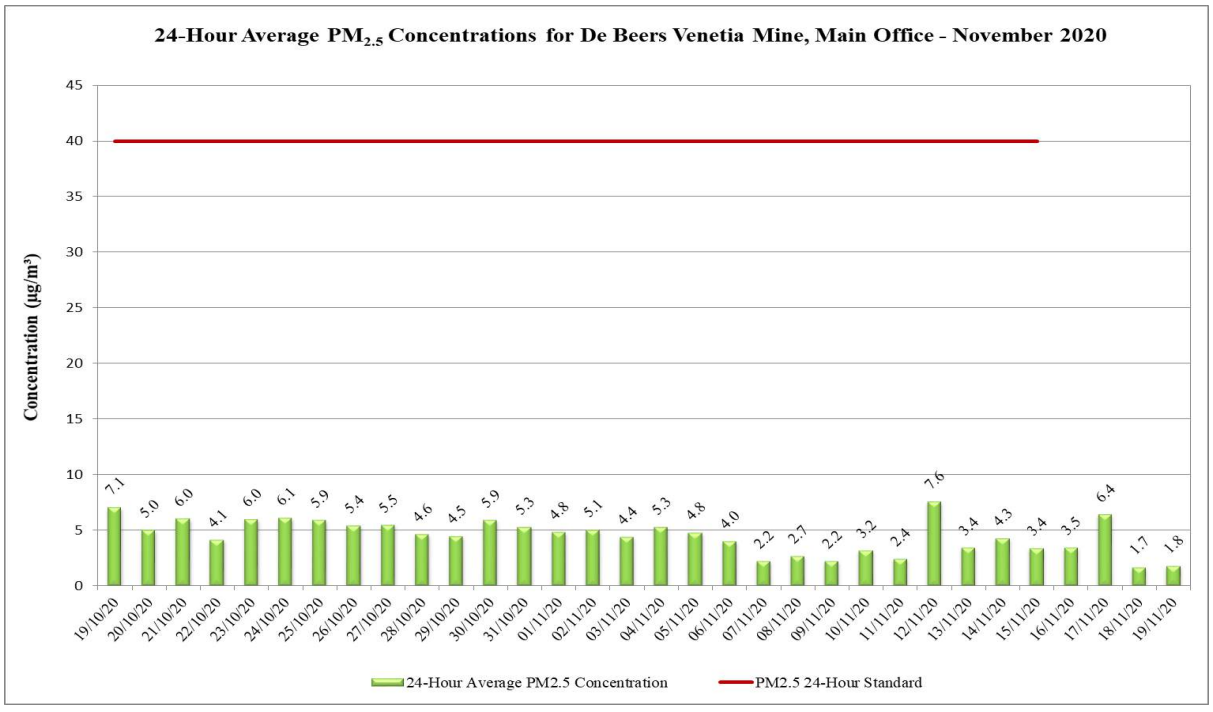


Figure 73: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for November 2020 reporting period.

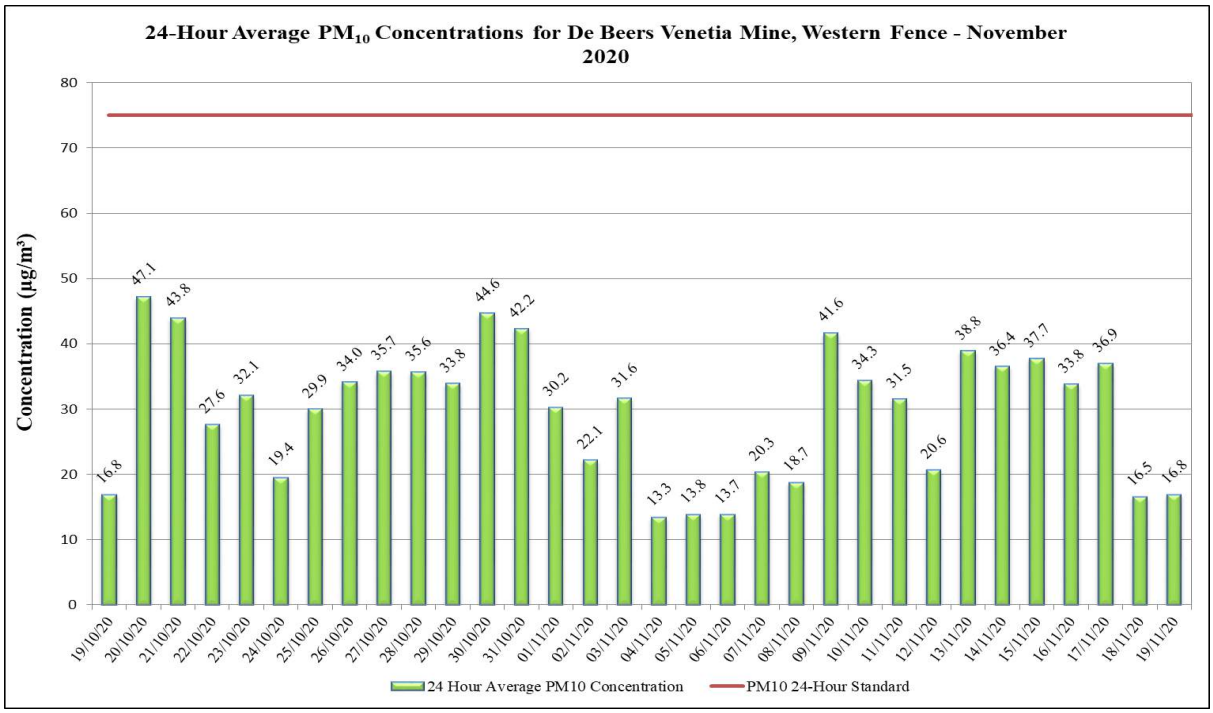


Figure 74: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for November 2020 reporting period.

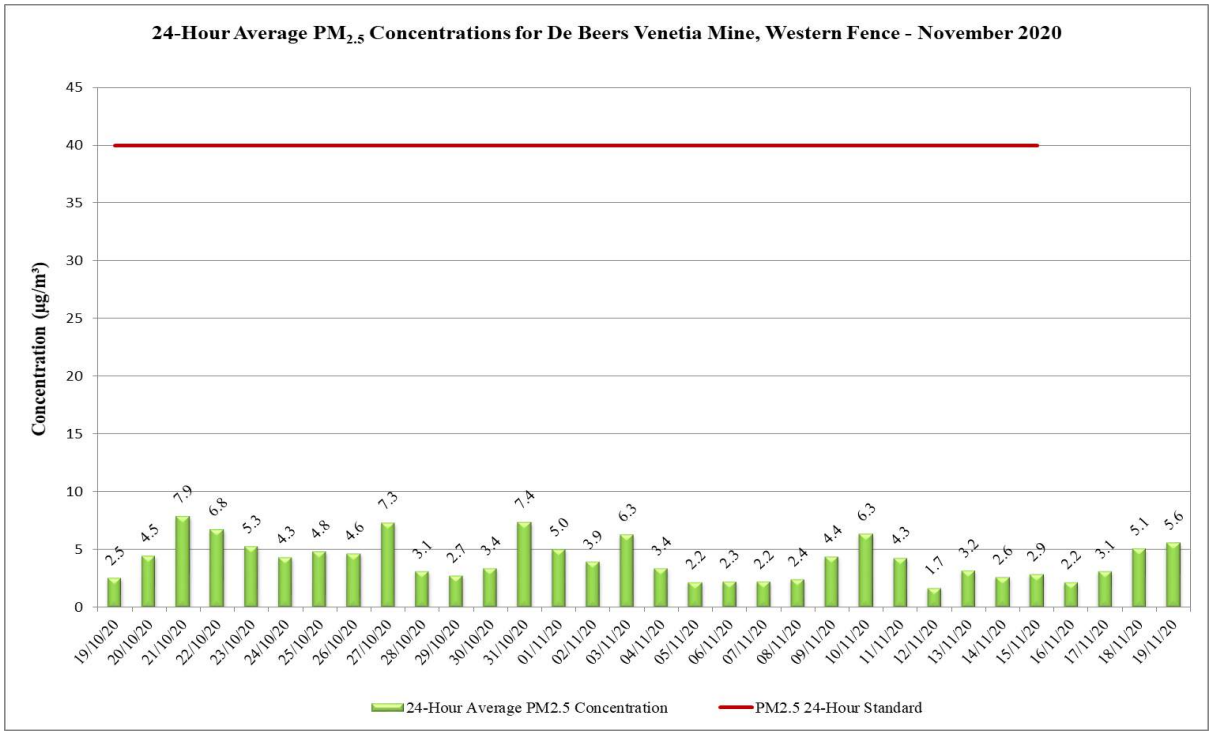


Figure 75: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for November 2020 reporting period.

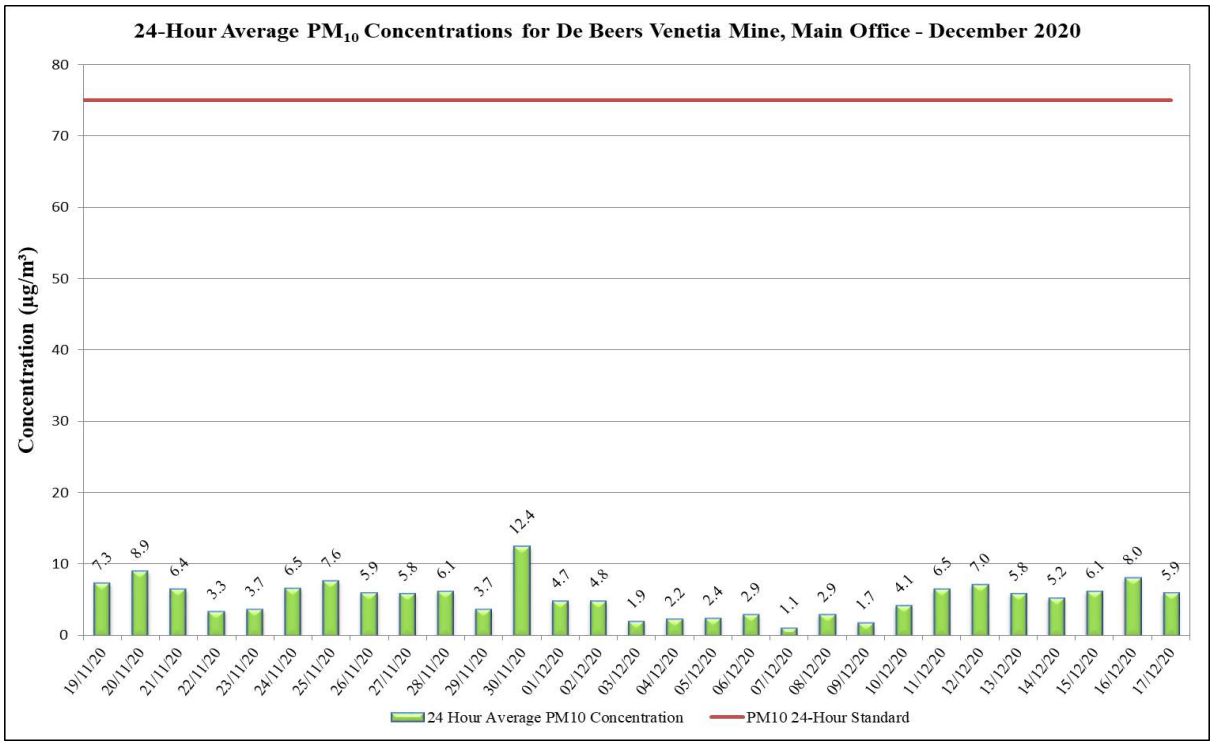


Figure 76: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for December 2020 reporting period.

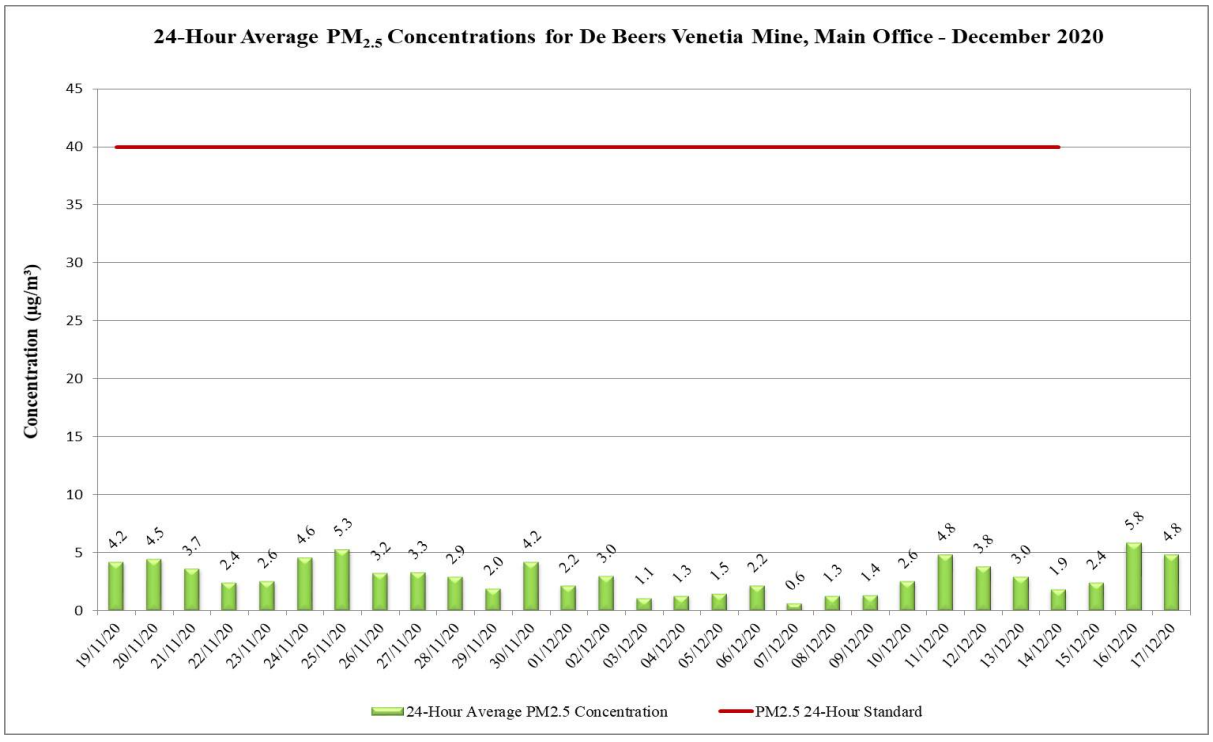


Figure 77: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for December 2020 reporting period.

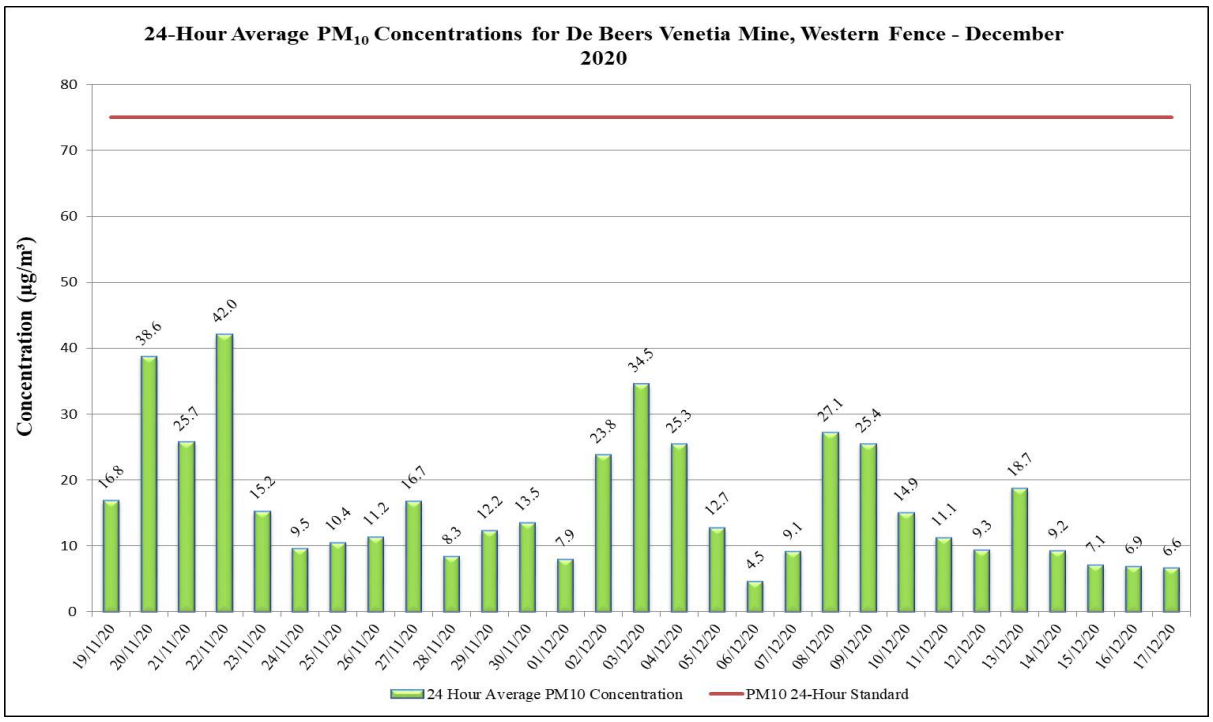


Figure 78: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for December 2020 reporting period.

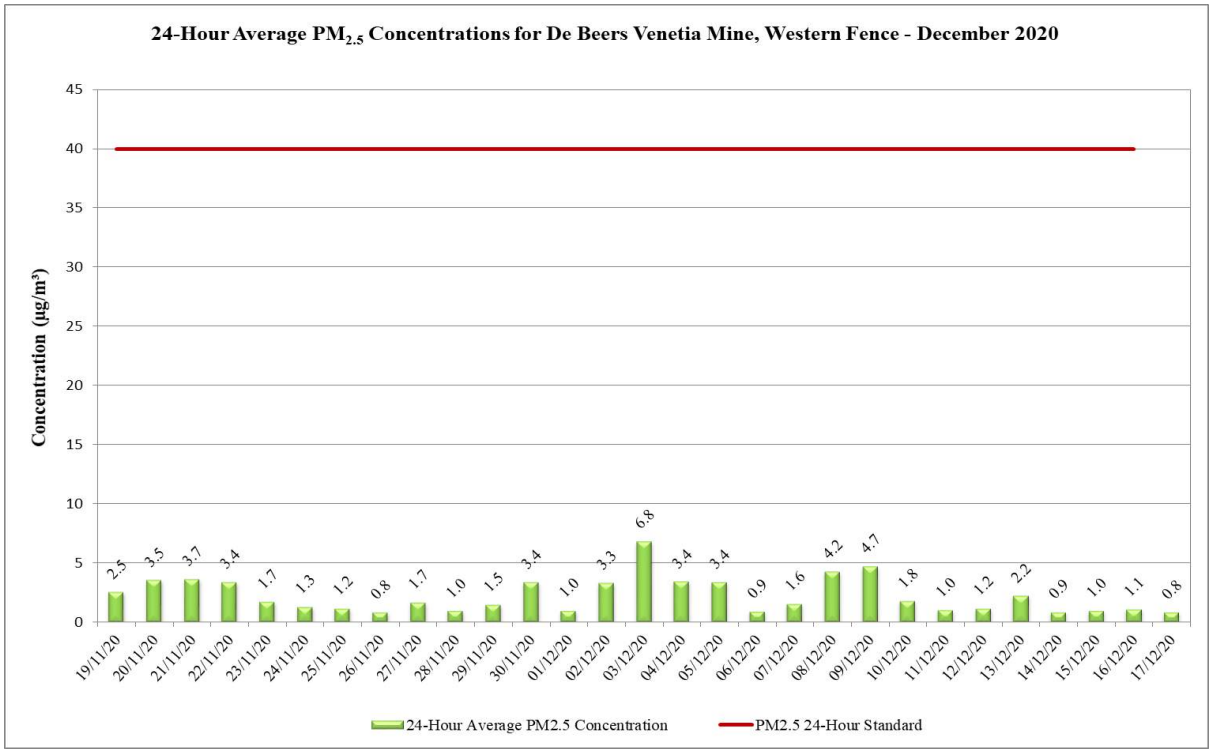


Figure 79: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for December 2020 reporting period.

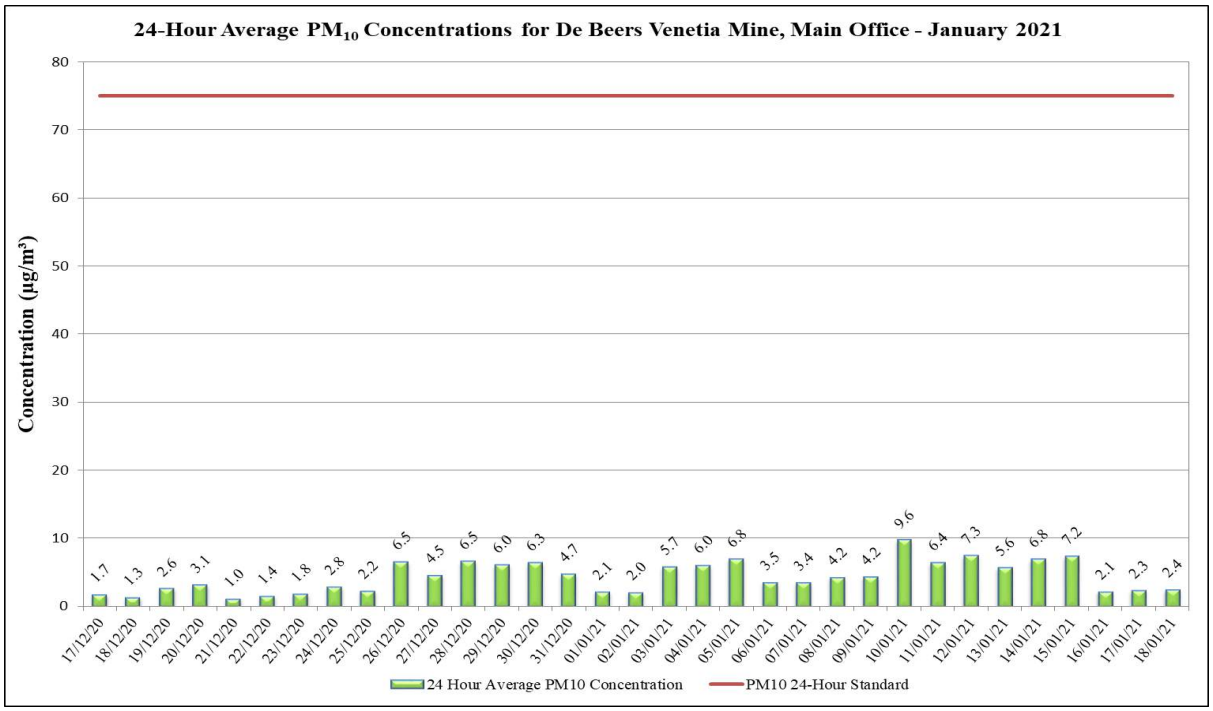


Figure 80: PM_{10} concentrations monitored at the Main Office site – De Beers Venetia Mine for January 2021 reporting period.

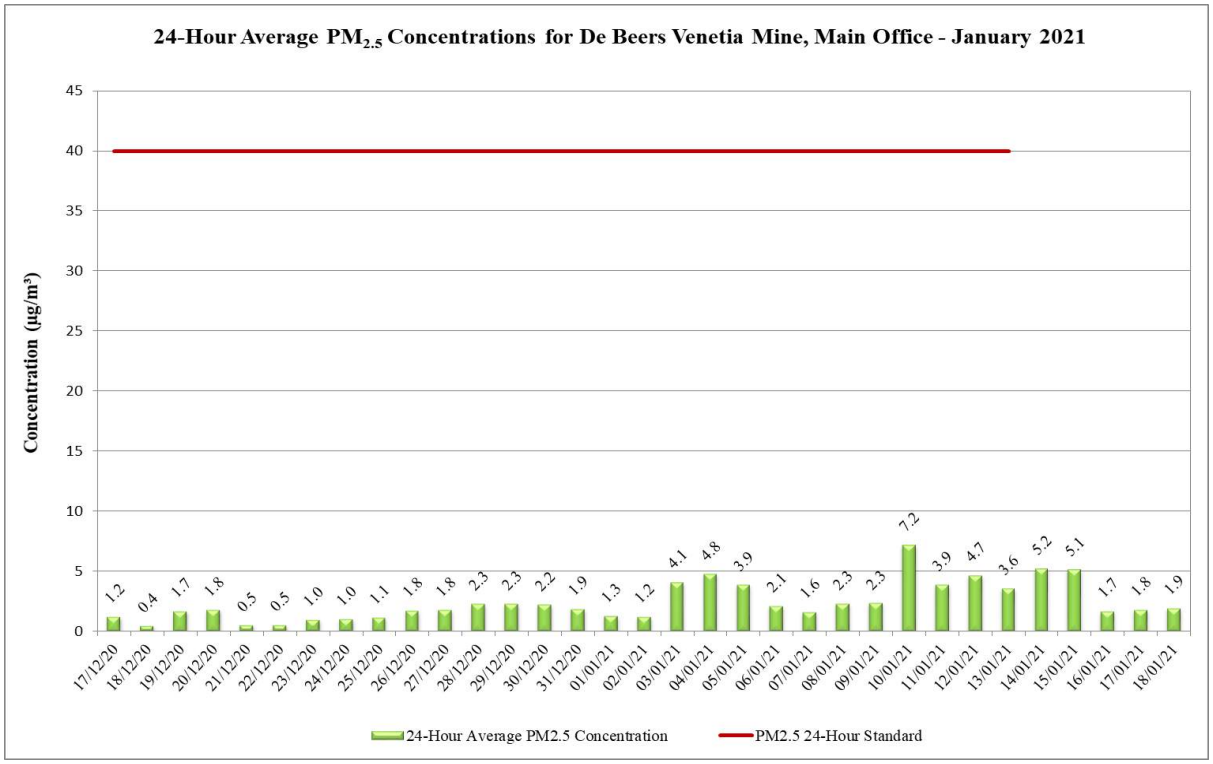


Figure 81: $PM_{2.5}$ concentrations monitored at the Main Office site – De Beers Venetia Mine for January 2021 reporting period.

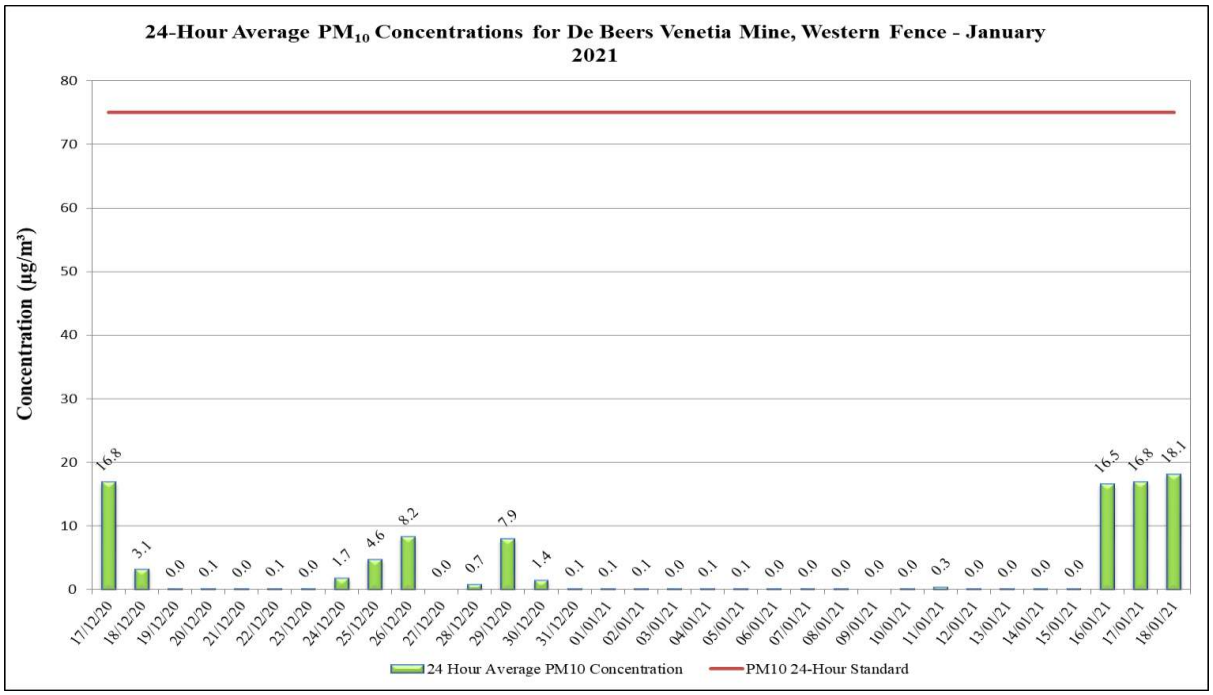


Figure 82: PM_{10} concentrations monitored at the Western fence site – De Beers Venetia Mine for January 2021 reporting period.

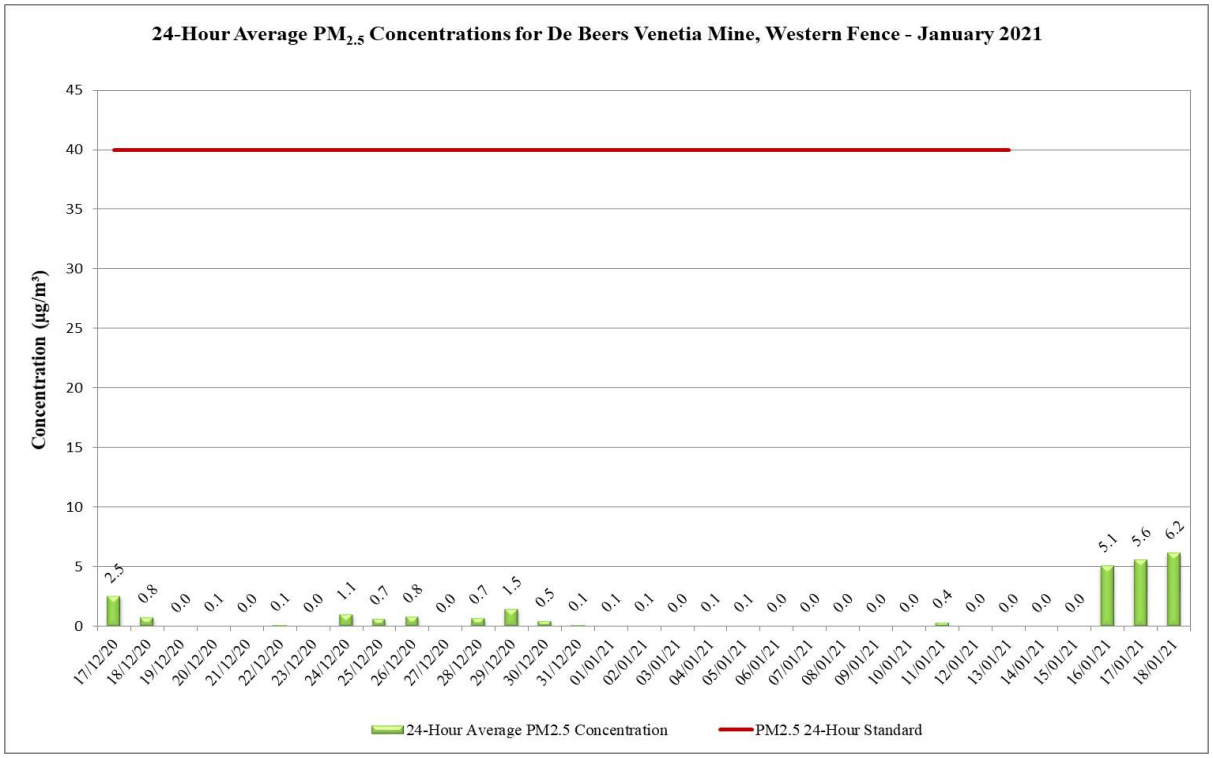


Figure 83: $PM_{2.5}$ concentrations monitored at the Western fence site – De Beers Venetia Mine for January 2021 reporting period.

Table 14: Summary of PM_{10} and $PM_{2.5}$ data for February 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
21 January 2020	2.40	2.23	19.92	9.20
22 January 2020	2.32	2.16	19.82	11.51
23 January 2020	2.33	2.03	21.98	9.89
24 January 2020	1.53	1.47	39.95	9.87
25 January 2020	1.32	1.06	26.14	5.62
26 January 2020	1.60	1.20	18.81	4.44
27 January 2020	1.95	1.60	33.28	7.25
28 January 2020	1.43	1.28	13.28	6.10
29 January 2020	2.07	1.84	19.36	7.55
30 January 2020	2.10	1.98	22.92	8.44
31 January 2020	1.24	1.16	33.40	7.47
01 February 2020	1.54	1.37	26.57	6.05
02 February 2020	1.40	1.36	25.28	7.15
03 February 2020	0.92	0.94	19.96	15.17
04 February 2020	1.26	1.20	54.40	10.42
05 February 2020	1.57	1.32	24.98	5.97
06 February 2020	1.47	1.12	13.91	2.93
07 February 2020	0.87	0.70	17.26	3.13
08 February 2020	0.78	0.77	9.99	3.11
09 February 2020	0.82	0.79	4.40	2.00
10 February 2020	0.45	0.45	2.68	0.97
11 February 2020	0.26	0.19	3.75	0.49
12 February 2020	0.41	0.31	41.88	5.30
13 February 2020	1.54	1.21	15.55	4.26
14 February 2020	1.64	1.29	22.01	4.42
15 February 2020	1.93	1.77	45.70	7.98
16 February 2020	1.98	1.84	30.06	7.43
17 February 2020	2.69	2.25	44.19	8.25
18 February 2020	2.65	2.40	21.95	11.89
19 February 2020	2.23	2.07	43.46	9.89

Table 15: Summary of PM_{10} and $PM_{2.5}$ data for March 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 February 2020	2.08	1.95	44.56	3.83
20 February 2020	2.00	1.90	70.26	5.56
21 February 2020	1.95	1.86	72.09	3.78
22 February 2020	1.93	1.87	70.92	5.49
23 February 2020	1.90	1.88	70.33	3.87
24 February 2020	1.93	1.87	66.52	4.31
25 February 2020	1.98	1.90	63.11	3.86
26 February 2020	1.90	1.88	61.26	4.36
27 February 2020	2.15	2.06	60.42	3.90
28 February 2020	2.43	2.29	55.86	4.60
29 February 2020	2.43	2.30	50.09	3.88
01 March 2020	2.63	2.40	45.89	4.71
02 March 2020	2.68	2.43	36.71	3.82
03 March 2020	2.68	2.45	27.84	4.53
04 March 2020	8.63	2.63	22.76	3.72
05 March 2020	9.50	2.45	21.72	4.57
06 March 2020	5.00	2.20	21.52	3.77
07 March 2020	5.63	2.39	20.71	4.51
08 March 2020	5.95	2.57	20.85	3.78
09 March 2020	5.80	2.47	21.57	4.53
10 March 2020	6.55	2.67	22.16	3.88
11 March 2020	7.60	2.95	22.07	4.60
12 March 2020	7.05	2.82	21.54	3.82
13 March 2020	6.15	2.64	21.75	4.48
14 March 2020	6.55	2.68	22.04	3.79
15 March 2020	7.18	2.74	20.94	4.41
16 March 2020	8.53	2.97	19.14	3.76
17 March 2020	8.25	3.11	18.31	4.41
18 March 2020	6.55	3.01	17.86	3.73
19 March 2020	6.43	3.02	17.60	4.57

Table 16: Summary of PM_{10} and $PM_{2.5}$ data for April 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 March 2020	8.53	5.92	21.38	6.09
20 March 2020	7.88	5.52	21.11	6.07
21 March 2020	6.94	5.08	20.78	6.07
22 March 2020	7.30	5.30	19.85	6.07
23 March 2020	9.38	6.17	18.60	6.03
24 March 2020	11.54	6.88	18.25	6.08
25 March 2020	10.80	6.54	18.00	6.14
26 March 2020	10.90	6.17	18.11	6.17
27 March 2020	13.08	6.34	18.19	6.22
28 March 2020	11.68	5.90	17.84	6.23
29 March 2020	9.37	5.37	17.35	6.27
30 March 2020	8.04	5.14	17.65	6.37
31 March 2020	13.15	5.56	17.58	6.46
01 April 2020	13.02	5.19	17.47	6.55
02 April 2020	8.27	4.24	17.37	6.63
03 April 2020	10.18	4.72	17.15	6.72
04 April 2020	12.14	5.08	17.00	6.77
05 April 2020	12.55	6.00	17.56	6.85
06 April 2020	8.08	5.44	17.83	6.91
07 April 2020	5.56	4.39	18.09	6.96
08 April 2020	6.87	5.06	18.74	7.03
09 April 2020	6.82	5.06	19.67	7.15
10 April 2020	6.58	5.10	20.46	7.26
11 April 2020	7.32	5.48	20.79	7.35
12 April 2020	8.27	6.18	21.28	7.46
13 April 2020	8.25	6.61	21.68	7.57
14 April 2020	7.45	6.53	21.98	7.66
15 April 2020	9.51	7.03	23.66	7.78
16 April 2020	12.70	8.00	25.07	7.88
17 April 2020	12.26	8.20	25.47	7.89
18 April 2020	9.26	5.64	25.16	7.86
19 April 2020	9.41	5.72	24.53	7.79
20 April 2020	9.57	5.81	24.14	7.74

Table 17: Summary of PM_{10} and $PM_{2.5}$ data for May 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 April 2020	4.6	3.1	10.4	3.4
20 April 2020	5.1	3.7	11.0	4.7
21 April 2020	6.2	4.2	28.6	7.3
22 April 2020	5.7	3.8	23.4	5.0
23 April 2020	8.6	3.7	19.6	4.1
24 April 2020	4.6	3.4	24.6	5.4
25 April 2020	4.8	3.4	15.9	5.0
26 April 2020	5.2	3.7	20.2	5.4
27 April 2020	4.2	2.9	8.4	3.7
28 April 2020	3.2	2.0	4.4	1.6
29 April 2020	4.2	2.1	18.8	4.1
30 April 2020	7.5	2.6	29.2	7.9
01 May 2020	8.4	3.6	17.1	2.5
02 May 2020	4.5	2.4	22.1	3.7
03 May 2020	5.8	3.0	16.4	5.0
04 May 2020	6.0	2.8	17.0	2.9
05 May 2020	6.5	4.3	19.9	5.2
06 May 2020	7.1	4.0	19.4	4.4
07 May 2020	5.9	4.1	25.4	5.4
08 May 2020	4.6	2.5	23.7	4.5
09 May 2020	7.0	2.1	14.7	2.3
10 May 2020	4.4	1.4	16.2	2.0
11 May 2020	11.5	3.8	13.0	2.5
12 May 2020	5.8	3.5	24.1	6.4
13 May 2020	7.8	4.3	27.7	6.8
14 May 2020	7.6	4.1	29.7	6.4
15 May 2020	8.0	6.2	36.8	12.7
16 May 2020	7.6	5.0	24.6	7.1
17 May 2020	7.00	4.67	37.23	7.87
18 May 2020	5.44	3.72	28.98	6.26
19 May 2020	5.44	3.69	28.87	6.22
20 May 2020	5.45	3.66	28.76	6.17

Table 18: Summary of PM_{10} and $PM_{2.5}$ data for June 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
20 May 2020	5.44	3.72	25.44	5.84
21 May 2020	4.86	2.85	21.65	4.53
22 May 2020	4.61	2.75	19.41	4.74
23 May 2020	5.53	3.05	19.43	6.40
24 May 2020	6.86	3.39	32.90	5.52
25 May 2020	11.85	3.73	17.28	2.63
26 May 2020	7.74	2.94	21.29	2.70
27 May 2020	8.96	5.07	29.90	6.83
28 May 2020	14.04	6.30	26.60	6.72
29 May 2020	9.04	4.06	45.25	6.24
30 May 2020	8.47	4.57	24.54	5.22
31 May 2020	6.14	4.09	25.83	6.62
01 June 2020	4.53	3.07	28.20	5.57
02 June 2020	4.32	2.72	39.33	6.13
03 June 2020	4.81	3.03	44.16	5.91
04 June 2020	4.39	3.03	40.51	5.89
05 June 2020	2.56	1.88	19.41	3.45
06 June 2020	2.82	1.73	19.95	2.91
07 June 2020	3.70	2.07	19.53	3.22
08 June 2020	4.83	2.97	30.89	4.80
09 June 2020	5.30	3.10	30.19	5.74
10 June 2020	8.11	3.52	32.67	4.49
11 June 2020	10.73	3.90	38.61	4.82
12 June 2020	8.61	4.23	17.88	2.66
13 June 2020	5.19	3.28	26.90	6.51
14 June 2020	5.72	3.32	19.24	5.32
15 June 2020	3.96	2.59	23.26	3.55
16 June 2020	2.77	1.62	15.86	5.13
17 June 2020	2.73	1.32	17.35	2.87
18 June 2020	2.63	1.27	9.23	3.73
19 June 2020	2.74	1.32	8.41	3.70

Table 19: Summary of PM_{10} and $PM_{2.5}$ data for July 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 June 2020	2.51	1.27	16.80	2.53
20 June 2020	3.80	1.84	18.50	3.13
21 June 2020	5.75	2.39	14.58	2.18
22 June 2020	4.64	2.73	36.04	3.93
23 June 2020	4.33	2.33	25.79	3.17
24 June 2020	4.17	2.39	34.85	3.86
25 June 2020	3.83	2.24	31.94	3.90
26 June 2020	6.88	3.37	26.96	4.39
27 June 2020	6.37	2.99	21.61	5.58
28 June 2020	7.99	2.77	12.60	2.09
29 June 2020	11.77	7.24	59.81	9.83
30 June 2020	9.43	7.04	58.95	11.66
01 July 2020	4.70	3.49	37.92	6.43
02 July 2020	6.40	3.06	14.44	3.34
03 July 2020	11.61	5.92	41.30	7.63
04 July 2020	5.81	4.20	35.88	8.40
05 July 2020	11.36	5.17	33.96	5.35
06 July 2020	9.39	4.60	40.82	6.69
07 July 2020	8.84	3.63	51.63	5.98
08 July 2020	11.50	8.28	68.24	13.62
09 July 2020	8.34	6.95	34.41	11.34
10 July 2020	13.93	7.29	45.95	9.46
11 July 2020	13.76	4.92	43.97	4.76
12 July 2020	6.89	2.77	36.70	3.68
13 July 2020	9.56	5.59	35.20	7.97
14 July 2020	12.58	4.79	23.80	4.32
15 July 2020	10.19	4.78	48.95	6.34
16 July 2020	5.77	3.29	47.97	6.36
17 July 2020	5.97	3.55	36.68	5.59
18 July 2020	4.78	2.90	26.83	4.82
19 July 2020	6.08	3.62	26.50	4.68
20 July 2020	6.07	3.62	25.92	4.55

Table 20: Summary of PM_{10} and $PM_{2.5}$ data for August 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
20 July 2020	3.41	1.97	16.80	2.53
21 July 2020	3.11	1.76	29.27	4.33
22 July 2020	3.73	2.34	54.18	5.23
23 July 2020	3.45	2.08	48.05	4.98
24 July 2020	3.30	2.26	34.95	4.31
25 July 2020	3.00	2.02	43.41	5.00
26 July 2020	3.88	2.10	23.08	3.38
27 July 2020	4.84	2.92	63.19	5.94
28 July 2020	5.54	4.37	32.67	7.43
29 July 2020	9.85	5.28	21.50	5.69
30 July 2020	9.67	5.00	35.37	5.95
31 July 2020	6.79	4.63	51.35	7.44
01 August 2020	6.44	4.47	41.15	7.76
02 August 2020	5.90	4.42	42.83	7.72
03 August 2020	4.58	3.14	39.13	5.60
04 August 2020	13.47	6.72	33.00	6.47
05 August 2020	10.84	4.99	46.21	7.13
06 August 2020	12.33	7.54	56.53	9.53
07 August 2020	6.74	4.58	51.20	8.89
08 August 2020	5.31	3.92	32.22	7.66
09 August 2020	9.33	4.77	28.16	8.16
10 August 2020	12.35	6.12	38.15	9.85
11 August 2020	12.83	8.68	54.45	21.83
12 August 2020	15.35	8.50	59.20	26.39
13 August 2020	12.57	5.86	73.19	8.77
14 August 2020	11.71	8.86	69.16	15.70
15 August 2020	10.22	7.23	36.53	11.38
16 August 2020	12.15	5.78	30.21	5.08
17 August 2020	8.99	7.26	43.60	12.41
18 August 2020	10.22	7.71	47.45	11.71
19 August 2020	6.74	4.58	46.82	11.58

Table 21: Summary of PM_{10} and $PM_{2.5}$ data for September 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
18 August 2020	10.16	7.54	16.80	2.53
19 August 2020	12.32	6.30	54.53	8.25
20 August 2020	6.51	5.18	37.45	10.72
21 August 2020	5.71	4.39	29.13	8.88
22 August 2020	4.13	3.31	21.86	6.10
23 August 2020	7.51	4.29	28.06	5.37
24 August 2020	11.10	5.38	27.53	5.20
25 August 2020	10.71	4.58	42.05	4.16
26 August 2020	10.48	5.64	52.77	5.92
27 August 2020	8.94	7.63	34.43	13.14
28 August 2020	13.54	9.98	50.46	14.20
29 August 2020	11.08	6.49	63.90	7.96
30 August 2020	12.16	6.45	49.60	6.45
31 August 2020	2.67	2.23	11.12	5.21
01 September 2020	7.63	5.17	18.08	6.14
02 September 2020	6.81	5.26	31.90	6.60
03 September 2020	6.77	5.29	44.36	8.77
04 September 2020	4.73	3.72	42.36	6.87
05 September 2020	5.01	3.53	37.85	5.99
06 September 2020	6.45	4.46	25.31	6.50
07 September 2020	5.21	3.41	21.57	4.30
08 September 2020	5.20	3.35	43.59	5.42
09 September 2020	4.43	3.11	27.36	4.83
10 September 2020	3.36	2.13	40.03	4.61
11 September 2020	4.84	2.80	24.81	3.62
12 September 2020	8.72	4.40	27.76	4.52
13 September 2020	8.10	4.06	49.13	5.63
14 September 2020	9.81	7.40	34.23	7.91
15 September 2020	9.50	6.82	34.31	8.37
16 September 2020	10.27	8.82	53.31	11.48
17 September 2020	9.31	6.95	43.31	11.18

Table 22: Summary of PM_{10} and $PM_{2.5}$ data for October 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
17 September 2020	8.88	6.52	16.80	2.53
18 September 2020	10.12	7.76	33.59	11.15
19 September 2020	10.73	9.26	22.70	6.27
20 September 2020	8.29	6.78	32.82	7.14
21 September 2020	9.07	6.92	31.71	7.31
22 September 2020	8.51	4.88	33.92	7.14
23 September 2020	8.53	5.94	29.51	9.14
24 September 2020	10.22	6.63	32.46	8.61
25 September 2020	9.95	5.56	40.33	8.98
26 September 2020	12.67	7.90	49.06	6.45
27 September 2020	4.26	2.93	52.83	14.22
28 September 2020	6.37	5.38	33.47	9.63
29 September 2020	7.96	6.49	35.74	7.04
30 September 2020	9.42	6.35	14.38	2.09
01 October 2020	7.85	5.87	20.41	5.63
02 October 2020	9.25	6.29	9.42	3.53
03 October 2020	9.03	6.42	18.55	6.09
04 October 2020	16.83	7.73	17.53	4.93
05 October 2020	13.64	6.81	23.21	8.83
06 October 2020	15.15	6.81	19.57	9.35
07 October 2020	14.92	11.22	20.02	9.34
08 October 2020	9.70	7.76	25.36	9.25
09 October 2020	8.29	7.25	29.30	5.59
10 October 2020	7.23	6.03	22.42	4.82
11 October 2020	7.22	6.20	14.66	1.72
12 October 2020	3.46	2.61	12.38	0.88
13 October 2020	2.15	1.57	14.10	1.44
14 October 2020	1.73	1.21	35.29	6.55
15 October 2020	1.76	1.48	26.13	11.39
16 October 2020	6.45	5.16	14.70	4.54
17 October 2020	2.12	1.70	16.48	5.10
18 October 2020	2.25	1.81	16.78	5.59
19 October 2020	2.43	1.95	18.05	6.15

Table 23: Summary of PM_{10} and $PM_{2.5}$ data for November 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 October 2020	9.99	7.07	16.80	2.53
20 October 2020	9.24	5.01	47.10	4.47
21 October 2020	9.78	6.02	43.84	7.86
22 October 2020	8.91	4.13	27.56	6.76
23 October 2020	9.50	6.01	32.05	5.28
24 October 2020	7.44	6.12	19.45	4.33
25 October 2020	7.68	5.91	29.89	4.81
26 October 2020	7.62	5.42	34.03	4.64
27 October 2020	7.19	5.46	35.74	7.32
28 October 2020	8.21	4.63	35.61	3.10
29 October 2020	5.99	4.48	33.81	2.74
30 October 2020	9.21	5.91	44.55	3.40
31 October 2020	7.35	5.28	42.16	7.40
01 November 2020	7.03	4.83	30.20	5.02
02 November 2020	7.63	5.06	22.08	3.92
03 November 2020	6.46	4.39	31.58	6.28
04 November 2020	7.57	5.28	13.30	3.38
05 November 2020	7.31	4.80	13.80	2.19
06 November 2020	6.35	4.01	13.71	2.26
07 November 2020	4.16	2.24	20.27	2.22
08 November 2020	5.38	2.70	18.70	2.43
09 November 2020	3.95	2.24	41.60	4.38
10 November 2020	5.08	3.19	34.33	6.33
11 November 2020	4.09	2.45	31.48	4.30
12 November 2020	9.16	7.57	20.60	1.66
13 November 2020	5.00	3.43	38.81	3.20
14 November 2020	6.13	4.26	36.40	2.59
15 November 2020	4.57	3.41	37.65	2.87
16 November 2020	4.53	3.47	33.75	2.20
17 November 2020	9.13	6.40	36.92	3.11
18 November 2020	2.12	1.70	16.48	5.10
19 November 2020	2.25	1.81	16.78	5.59

Table 24: Summary of PM_{10} and $PM_{2.5}$ data for December 2020 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19 November 2020	7.26	4.19	16.80	2.53
20 November 2020	8.94	4.46	38.63	3.55
21 November 2020	6.42	3.65	25.67	3.65
22 November 2020	3.28	2.42	42.02	3.41
23 November 2020	3.67	2.57	15.21	1.72
24 November 2020	6.54	4.59	9.54	1.31
25 November 2020	7.63	5.31	10.44	1.19
26 November 2020	5.91	3.23	11.23	0.82
27 November 2020	5.81	3.34	16.68	1.70
28 November 2020	6.11	2.93	8.33	0.95
29 November 2020	3.65	1.95	12.20	1.45
30 November 2020	12.38	4.19	13.45	3.38
01 December 2020	4.74	2.16	7.88	1.00
02 December 2020	4.82	3.03	23.77	3.33
03 December 2020	1.94	1.09	34.55	6.80
04 December 2020	2.25	1.27	25.33	3.42
05 December 2020	2.43	1.46	12.67	3.40
06 December 2020	2.93	2.20	4.54	0.90
07 December 2020	1.09	0.64	9.08	1.56
08 December 2020	2.89	1.31	27.08	4.24
09 December 2020	1.72	1.36	25.41	4.71
10 December 2020	4.12	2.55	14.91	1.79
11 December 2020	6.47	4.84	11.14	1.03
12 December 2020	7.04	3.85	9.34	1.18
13 December 2020	5.81	2.95	18.67	2.22
14 December 2020	5.24	1.89	9.25	0.88
15 December 2020	6.11	2.45	7.09	0.99
16 December 2020	8.04	5.85	6.86	1.07
17 December 2020	5.91	4.84	6.56	0.82

Table 25: Summary of PM_{10} and $PM_{2.5}$ data for January 2021 monitoring period

Date	Main Office		Western Fence	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
17 December 2020	1.70	1.24	16.80	2.53
18 December 2020	1.27	0.44	3.08	0.80
19 December 2020	2.55	1.70	0.01	0.02
20 December 2020	3.08	1.80	0.08	0.08
21 December 2020	1.02	0.50	0.01	0.01
22 December 2020	1.45	0.54	0.13	0.13
23 December 2020	1.76	0.98	0.00	0.02
24 December 2020	2.80	1.02	1.69	1.06
25 December 2020	2.21	1.15	4.63	0.66
26 December 2020	6.47	1.76	8.23	0.82
27 December 2020	4.49	1.78	0.00	0.00
28 December 2020	6.51	2.30	0.71	0.72
29 December 2020	6.00	2.31	7.89	1.45
30 December 2020	6.31	2.23	1.41	0.46
31 December 2020	4.68	1.88	0.12	0.13
01 January 2021	2.09	1.27	0.07	0.07
02 January 2021	2.00	1.24	0.13	0.10
03 January 2021	5.72	4.11	0.01	0.01
04 January 2021	5.97	4.76	0.08	0.08
05 January 2021	6.85	3.89	0.05	0.05
06 January 2021	3.48	2.14	0.02	0.03
07 January 2021	3.42	1.63	0.04	0.04
08 January 2021	4.19	2.33	0.03	0.03
09 January 2021	4.24	2.34	0.00	0.00
10 January 2021	9.61	7.18	0.02	0.02
11 January 2021	6.35	3.92	0.35	0.36
12 January 2021	7.34	4.67	0.03	0.04
13 January 2021	5.57	3.58	0.01	0.01
14 January 2021	6.83	5.25	0.02	0.02
15 January 2021	7.24	5.13	0.02	0.02
16 January 2021	2.12	1.70	16.48	5.10
17 January 2021	2.25	1.81	16.78	5.59
18 January 2021	2.43	1.95	18.05	6.15

Table 26: Compliance during February 2020 – January 2021 monitoring period and year to date with National Ambient Air Quality Standards for PM_{10} and $PM_{2.5}$.

Continuous Particulate Matter Monitoring site	Main Office	Western Fence
Number of exceedences PM_{10} during monitoring period	0	0
Number of Exceedences $PM_{2.5}$ during monitoring period	0	0
Number of Exceedences PM_{10} Year to Date	0	0
Number of Exceedences $PM_{2.5}$ Year to Date	0	0

5.4 SO_2 MONITORING DATA

Four (4) samplers were deployed at specifically selected locations (four cardinal directions) around the perimeter of the open burning grounds. Ambient concentrations of the pollutant sulphur dioxide (SO_2) should have been determined over two two-week periods using internationally accepted Radiello™ passive sampling devices. After the exposure period, the samplers were sealed and returned to a SANAS accredited laboratory for analysis. It should be noted that the concentrations were measured over a ~14-day period, and are compared with an annual standard (running average).

The concentration of SO_2 at the open burning grounds during the monitoring period was measured to be below 0.50 µg/m^3 at all monitoring locations. These levels are well below the NEM: AQA long term standard running average for sulphur dioxide (SO_2) of 50 µg/m^3.

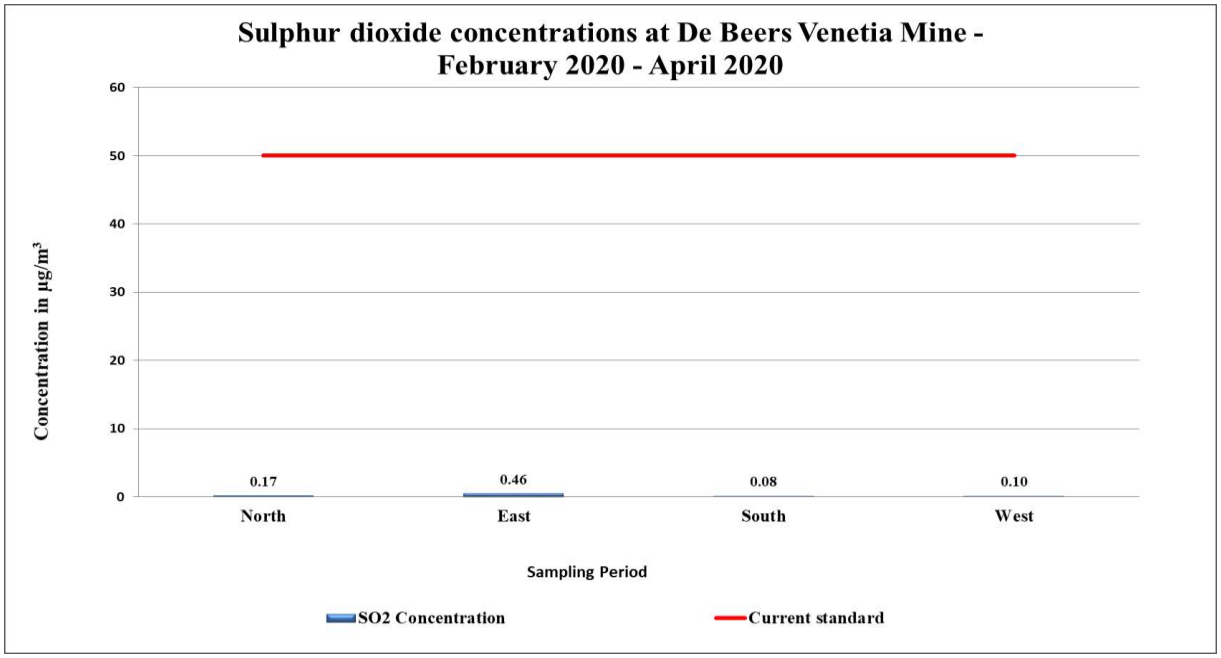


Figure 84: Graph indicating the SO_2 levels during February 2020 – April 2020 and the National Ambient Air Quality Standard for 1 year Averaging Period for SO_2.

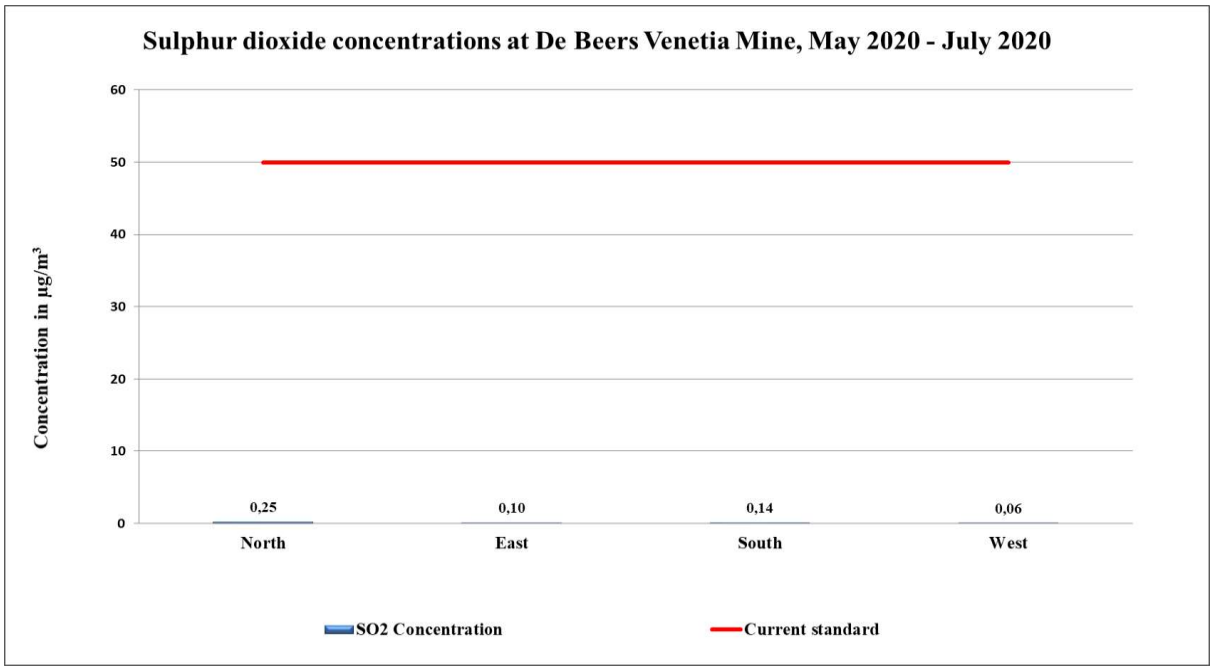


Figure 85: Graph indicating the SO_2 levels during May 2020 – July 2020 and the National Ambient Air Quality Standard for 1 year Averaging Period

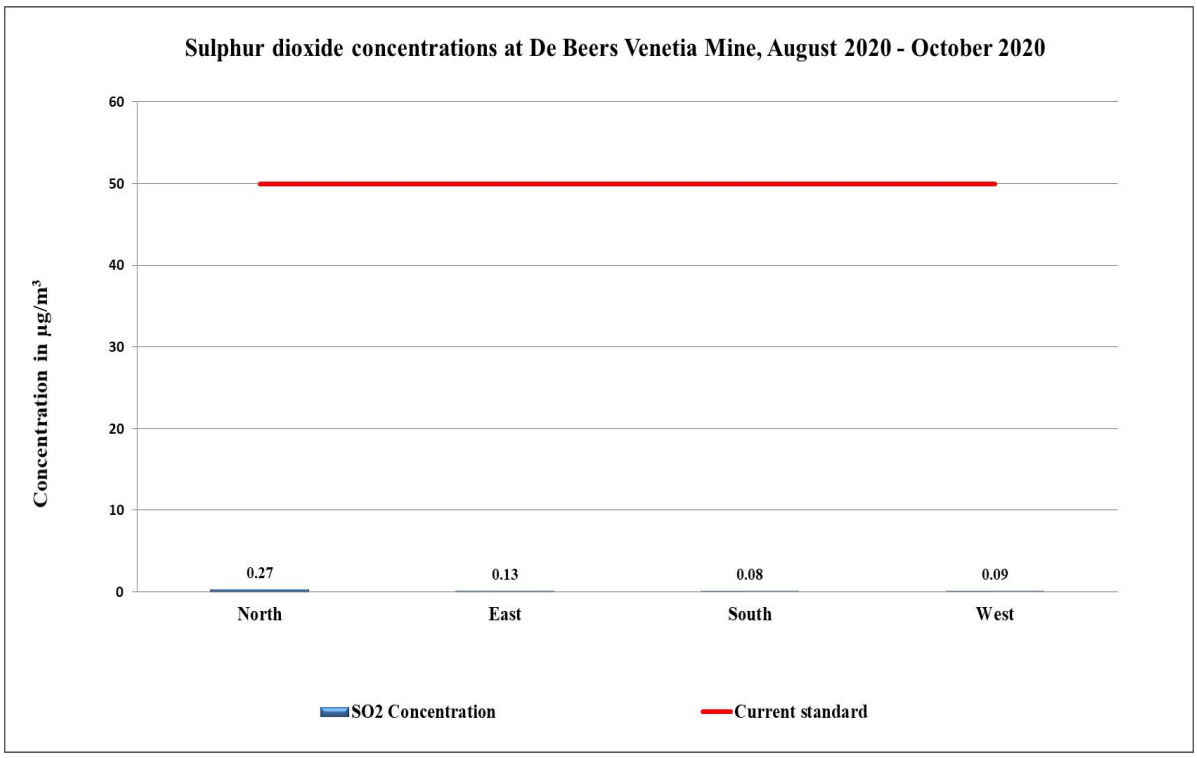


Figure 86: Graph indicating the SO_2 levels during August 2020 – October 2020 and the National Ambient Air Quality Standard for 1 year Averaging Period

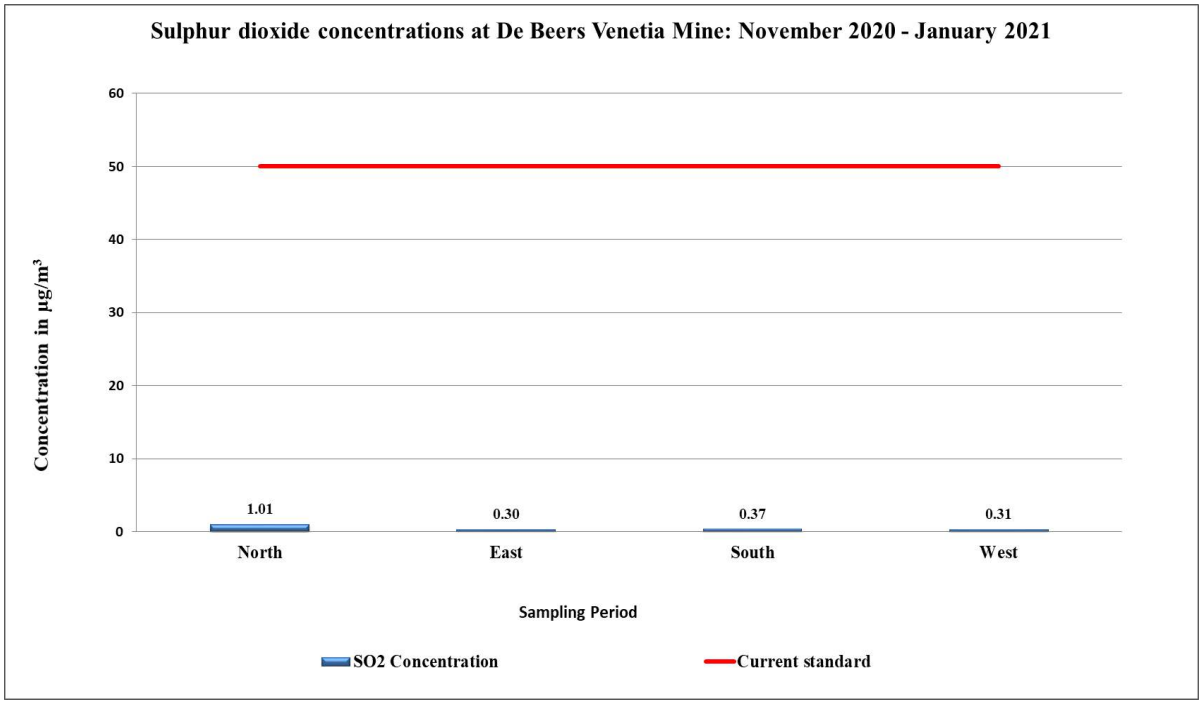


Figure 87: Graph indicating the SO_2 levels during November 2020 – January 2020 and the National Ambient Air Quality Standard for 1 year Averaging Period

5.5 LDAR MONITORING DATA

There are six different areas where the fuel and oil products are stored at Venetia Mine (Figure 7). These are:

- Green Area Outside Tank Farm
- Blue Area Bulk Oil Storage Area
- Diesel Tank Farm Area
- Refuelling Bay Area
- Diesel Backup Generators Area; and
- Red Area.

The above-mentioned areas are connected by a network of pipelines that originate at the Outside Tank Farm area, where the contractors deliver fuels and oils that are necessary for mine operations. The pipelines from the Outside Tank Farm area proceed to the Blue Area bulk oil storage area, and then to the Diesel Tank Farm. From the Diesel Tank Farm, the pipelines continue to the Refuelling Bay Area, and from there to the Diesel Backup Generators area, where the pipelines end.

The assessment was carried out over the warm hours of the day (on average > 25°C), largely between 08:00 and 16:00, when VOC emissions were likely to be highest. Two

leaking monitoring points were tagged with identification tags to ensure consistency for future monitoring campaigns, as well as for the onsite identification of areas where leaks were detected. Table 27 presents the tag numbers, description of the source monitored and the values recorded at the monitoring points. No source exceeded the prescribed leak definition of 500 ppm, and both identified sources were tagged only for observation, as possible future source of leak.

Table 27: Description of sources of VOC leakage at Venetia Mine where tags were installed during February 2020 - January 2021.

Tag No.	Equipment Description		PID Reading		Description/Comments /Notes
	Equipment Type	Equipment Size	Ambient Value (ppm)	Tag Item PID Value (ppm)	
LES00071	Pipe joint	150 mm	0.2	19.4	Refuelling Bay, 1 Stop (Green Area)
LES00072	Pump	400 mm	0.2	10.8	Diesel Tank Bay (Green Area)

6. DATA INTERPRETATION, DISCUSSION AND CONCLUSION

6.1 METEOROLOGICAL DATA

The predominant winds during the February 2020 – April 2020 monitoring period were originating from the east, east-southeast and east-northeast quadrants with strong winds originating from east, south east-southeast and east-northeast quadrant directions. Observed wind speeds were light to fresh breezes and occasional gusts, with a maximum hourly wind speed of 19.3 m/s and an average hourly wind speed during the period of 5.55 m/s. 10% calms were recorded during the sampling period. Day-time and night-time windroses show a mixture of east, east-northeast, and east-southeast breezes, as well as few strong winds from east, east-southeast and east-northeast during day-time hours, and southeast by quarter south and south-southeast during the night-time. Data recovery during this monitoring period was 89.40%.

The predominant winds during the May 2020 – July 2020 monitoring period were originating from the east, east-southeast and east-northeast quadrants with strong winds originating from east, south east-southeast and east-northeast quadrant directions. There was an observed prolonged wing blowing from the south during June 2020. Observed wind speeds were light to fresh breezes and occasional gusts, with a maximum hourly wind speed of 13.4 m/s and an average hourly wind speed during the period of 4.28 m/s. 8.60% calms were recorded during the sampling period. Data recovery during this monitoring period was 94.29%.

The predominant winds during the August 2020 – October 2020 monitoring period were originating from the east, east-southeast and east-northeast quadrants with strong winds originating from east, south east-southeast and east-northeast quadrant directions. There was an observed prolonged wing blowing from the south during October 2020. Observed wind speeds were light to fresh breezes and occasional gusts, with a maximum hourly wind speed of 25.7 m/s and an average hourly wind speed during the period of 6.27 m/s. 3.93% calms were recorded during the sampling period. Data recovery during this monitoring period was 97.16%.

The predominant winds during the November 2020 – January 2021 monitoring period were originating from the east, east-southeast and east-northeast quadrants with strong winds originating from east, south east-southeast and east-northeast quadrant directions. There was an observed prolonged wing blowing from the south during October 2020. Observed wind speeds were light to fresh breezes and occasional gusts, with a maximum hourly wind speed of 22.5 m/s and an average hourly wind speed during the period of 5.05 m/s. 3.39% calms were recorded during the sampling period. Data recovery during this monitoring period was 98.73%.

6.2 DUSTFALL MONITORING AND TRENDS

The analysed samplers from the majority of monitoring sites returned dustfall rates lower than the Non-Residential standard (1200 mg/m^2/day). The sparse and erratic rainfall throughout the year in this region does not influence dustfall rates significantly. These findings align well with field observations and expectations from previous experience.

Results indicated that 24 out of 25 monitoring sites that were sampled and analysed during the February 2020 – April 2020 monitoring period were compliant with the NDCR standards. Station D was not in compliance with the NDCR standard for February 2020 and March 2020 with readings of over 1200 mg/m^2/day. Station D is located approximately 550 m west southwest and downwind from the NSD construction site.

Station E was not compliant with the NDCR standard during the June 2020 and September 2020 monitoring periods, with readings of over 1200 mg/m^2/day. Bird droppings were observed in the dustfall bucket for station E, resulting in the possible elevation of the fallout results. This exceedance was logged onto the mine's environmental management system for investigation. The station design should have prevented the bird droppings. The mine has procured a new contractor and with the scope of works, the monitoring units will be replaced.

6.3 NDCR REGULATORY COMPLIANCE

The vertical single dustfall samplers allow for direct comparison with acceptable dustfall rates as prescribed in NDCR.

Station D exceeded the Non-Residential standard during February 2020 and March 2020 monitoring period, and is not in compliant with prescribed NDCR standards as it had exceeded the standard in sequential months in this calendar year however this is due to the proximity of the Station to the construction area (temporary project) as indicated above. All the other monitoring sites demonstrated compliance with NDCR regulations, with all of samplers returning dustfall rates in accordance to Non-Residential standard during February 2020 – April 2020.To date, bulk excavations for the NSD and the associated sumps have been completed. The project has since been halted (since April 2020) due to the appointed contractor being unable to meet contractual obligations (exacerbated by the COVID situation). The mine has commenced with procurement processes to replace the contractor with an estimated project completion date of December 2021.

The mine engaged with the Department as well as the appointed monitoring specialist on the relocation of Station D as well as other stations in the vicinity that could potentially be affected by construction activities (once these recommence). The Department advised in their response letter dated 23.11.2020 that if Venetia decided to move the sampling points/stations, it should ensure that the areas/sites in which the stations are relocated to, are more representative. The monitoring specialist has however advised that a relocation would not be representative of Venetia's fallout dust impact on the neighbouring Diamcor Mine as well as the Venetia Limpopo Nature Reserve. The recommendation is

that the stations should remain at the current locations with the understanding that these may log consecutive exceedances during the duration of the project however mitigation measures should still be maintained (dust suppression etc.).

Station E was not compliant with the NDCR standard during the June 2020 and September monitoring period, with readings of over 1200 mg/m2/day. Bird droppings were observed in the dustfall bucket, resulting in the possible elevation of the fallout results in station E. This exceedance was logged onto the mine's environmental management system for investigation. The station design should have prevented the bird droppings. The mine has procured a new contractor and with the scope of works, the monitoring units will be replaced.

6.4 PARTICULATE MATTER (PM_{10} AND $PM_{2.5}$)

PM_{10} and $PM_{2.5}$ data recovery for the Main Office monitoring site during February 2020 – April 2020 monitoring period was 98.06%, while data recovery for the Western Fence monitoring site was 97.96%. Both instruments were calibrated February 2020.

PM_{10} and $PM_{2.5}$ data recovery for the Main Office monitoring site during May 2020 – July 2020 monitoring period was 99.43%, while data recovery for the Western Fence monitoring site was 98.93%.

PM_{10} and $PM_{2.5}$ data recovery for the Main Office monitoring site during August 2020 – October 2020 monitoring period was 100%, while data recovery for the Western Fence monitoring site was 100%.

PM_{10} and $PM_{2.5}$ data recovery for the Main Office monitoring site during November 2020 – January 2021 monitoring period was 100%, while data recovery for the Western Fence monitoring site was 100%

6.5 SO_2 PASSIVE SAMPLING

All sulphur dioxide concentrations recorded on-site during February 2020 – January 2021 demonstrate full compliance with the twelve months running average. Annual average concentrations for the February 2020 – January 2021 are compliant with the relevant standard of 50 $\mu g/m^3$.

6.6 LDAR SAMPLING

Majority of valves, pumps, connectors, pressure relief devices and open-ended lines were found to be emission free, with TVOC concentrations correlating to normal ambient concentrations at the diesel and oil storage areas.

Methods to repair leaking components, following best practice where practicable and appropriate, include:

- Tightening bonnet bolts;

- Replacing bonnet bolts;
- Tightening packing gland nuts;
- Injecting lubricant into lubricated packing.

Other methods such as 'drill and tap' can be employed where feasible. Most repairs can be technically feasible without requiring process unit shutdown. Modifying or replacing leaking equipment with "leakless" components can be considered as a last option.

Fuel spills / leaks and standing product, including bunded wall areas, can be a significant contributor to fugitive emissions on-site, especially where moisture, heat and direct sunlight is present. Regular checks and maintenance are essential to prevent emissions from the diesel storage areas. It must be noted that daily visual checks are conducted by the mine in addition to the LDAR monitoring that takes place annually.

Two minor leaking monitoring points were tagged with identification tags to ensure consistency for future monitoring campaigns, as well as for the onsite identification of areas where leaks were detected. None of the sources exceeded the prescribed leak definition of 500 ppm. These points were only identified for observation, as possible future source of leaks.

7. REMARKS

Venetia Mine remains committed to comply with all regulatory and statutory requirements and hope to continue our effective working relationship with LEDET.

Should you have any queries or concerns, please do not hesitate to contact the Environmental Manager Nirvana Ramlal on 015 575 2773 or via email at Nirvana.Ramlal@debeersgroup.com.

Levego Environmental Services (Pty) Ltd would like to take this opportunity to thank the De Beers Venetia Mine personnel that assisted us in the compilation of the report. We consider the report to be accurate reflection of the operational conditions at Venetia Mine at the time of monitoring.

Yours sincerely,

H. M. Yingwani

Approved by (Technical Signatory)
Levego Environmental Services