

BEFORE THE NATIONAL GREEN TRIBUNAL
EASTERN ZONE BENCH, KOLKATA

ORIGINAL APPLICATION NO. 121/2021/EZ

BETWEEN

TRIBUNAL ON ITS OWN MOTION

RE: OZONE SPIKE & IN KOLKATA

..... APPLICANT(S)

VERSUS

STATE OF WEST BENGAL & ORS.

..... RESPONDENT(S)

AFFIDAVIT ON BEHALF OF THE RESPONDENT THE WEST
BENGAL POLLUTION CONTROL BOARD.

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Filed by

Dipanjana Ghosh

DIPANJAN GHOSH
ADVOCATE
HIGH COURT AT CALCUTTA

31 JAN 2022



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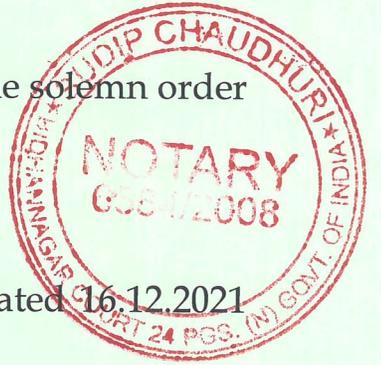
Most Respectfully Sheweth

I, Sri Subrata Ghosh, son of Shri Biswanath Ghosh, aged about 58 years, by faith-Hindu, by Occupation- Service, residing at Narkelbagan, Gorosthan, Chinsurah, District - Hooghly, do hereby solemnly declare and say as follows :-

01. That, I am the Chief Engineer, West Bengal Pollution Control Board (hereinafter will be referred to as the 'State Board') and look after this case and as such I am well acquainted with the facts and circumstances of the case. I have been duly authorized by the Respondent to affirm this Affidavit on its behalf and as such, I am competent to do so.

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02. That, this affidavit is being affirmed in pursuance to the solemn order passed by the Hon'ble Tribunal dated 16.12.2021.



03. That, Hon'ble National Green Tribunal vide order dated 16.12.2021 constituted a Committee to examine the air quality contents of the article and suggest remedial measures of a permanent nature. The West Bengal Pollution Control Board was directed to act as the nodal office for all logistic purposes. That the said Committee gave a report on Ozone Spike in Kolkata with regard to the said order dated 16.12.2021.

Copy of the report of the Committee is annexed herewith and marked with letter "R".

04. It is therefore respectfully prayed that Hon'ble Tribunal may pass such order/orders as it deems fit and proper in the interest of justice.

Sd/- Dip Chaudhuri
Dip Chaudhuri
Advocate
WBPCB

Sd/- Subrata Basu
DEPONENT

BEFORE THE NOTARY PUBLIC
AT BIDHANNAGAR
DIST.-NORTH 24 PARGANAS

VERIFICATION

Verified at Kolkata by the deponent above named on this the 13th day of January, 2022 and say that the contents of this affidavit made in paragraph nos. 1 is true to my knowledge and those made in paragraph no. 2 to 3 is true to my information derived from records and rest are my respectful submission before this Hon'ble Tribunal.



Sd/- Dip Chaudhuri
Dip Chaudhuri
Advocate
WBPCB

S. CHAUDHURI
★ NOTARY ★
GOVT. OF INDIA
Regd. No.-6584/08
Bidhannagar Court
Dist.-North 24 Pgs.

13 JAN 2022

Sd/- Subrata Basu
DEPONENT
Identified By Me

MANOJ BASU ADVOCATE
Advocate
Enrolment No.-F-247/2008
Bidhan Nagar Court
Kolkata-700091

—A—

Annexure 'R'

Report on Ozone Spike in Kolkata with regard to order of Hon'ble National Green Tribunal (NGT), Eastern Zone Bench, Kolkata (O.A No.121/2021/EZ) dated 16.12.2021

1.0 Introduction:

Hon'ble National Green Tribunal (NGT) Eastern Zone Bench, Kolkata issued an order in respect to the news article published in 'The Times of India' on 13.12.2021 with the heading "Ozone Spike in Kolkata raises concern". In response to that a committee has been constituted comprising:

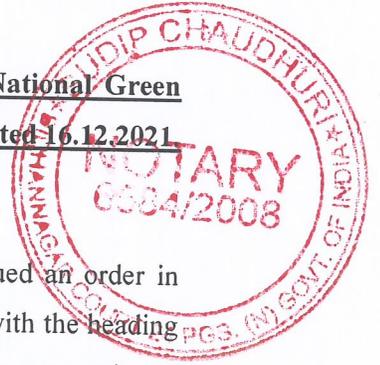
- i) Senior Scientist from West Bengal Pollution Control Board;
- ii) Senior Scientist from Central Pollution Control Board, Regional Office, Kolkata

In Kolkata out of seven Continuous Ambient Air Quality Monitoring Stations (CAAQMS) stations, one of the CAAQMS station is in operation inside the Victoria Memorial premises which measure air pollutants namely Sulfur dioxide (SO₂), Oxides of Nitrogen (NO_x), Ammonia (NH₃), Carbon Monoxide (CO), Ozone (O₃), Particulate matter (PM_{2.5} & PM₁₀) and Volatile Organic Compounds (VOC) along with meteorological parameters.

As the news report highlights the Ozone count in Central Kolkata (Victoria Memorial) was 60% more than the safe levels which was 160 mg/ cubic meter. In response to this article the following report is being produced. This report comprises of three-year (2019-2021) Ozone data for the months of October, November and December, for Victoria Memorial CAAQMS station and two-days Monitoring of Ozone profile (08 hourly, during 8 am to 4 pm) at Victoria Memorial, Kolkata was taken into account.

The concerned pollutant in this report is ozone, to be more specific ground level ozone. The Ozone is a gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level. Ozone can be good or bad, depending on where it is found.

Good Ozone can be signified as the Stratospheric Ozone or Atmospheric ozone. Ozone at ground level is a harmful air pollutant, because of its effects on people and the environment, and it is the main ingredient in "smog." Ozone (O₃) is both a toxicant and a greenhouse gas. At ground level, it is a noxious pollutant. In the higher atmosphere, it is beneficial to life. It also acts as a greenhouse gas.



2.0 Ground Level Ozone:

Ground-level ozone is a colourless and highly irritating gas that forms just above the earth's surface. It is a secondary pollutant as it is produced when two primary pollutants -nitrogen oxides (NO_x) and volatile organic compounds (VOCs) - react in sunlight and stagnant air.

Unlike natural stratospheric ozone, which protects us from the sun's ultraviolet radiation, ground-level ozone is a pollutant. It forms when heat and sunlight allow the reaction of two other pollutants: nitrogen oxides and volatile organic compounds. These chemicals come from industrial plants, electric utilities, vehicle exhaust, wildfire smoke, oil and gas extraction. High heat can accelerate this process. The resulting ground-level ozone can build up to unhealthy levels—especially without wind or rain to mix up the air.

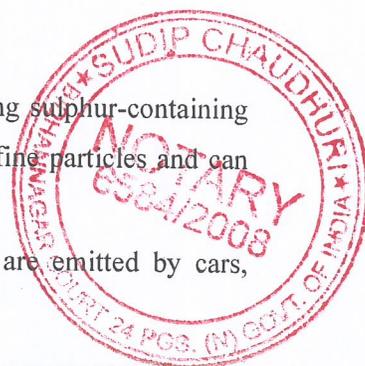
2.1 Road transport augmenting Ozone concentration:

Vehicular pollution is the introduction of harmful material into the environment by motor vehicles. These materials, known as pollutants, have several bad effects on human health and the ecosystem. Transportation is a major source of air pollution in many countries around the world due to the high number of vehicles that are available on the roads today. Vehicular pollution has grown at an alarming rate due to growing urbanisation in India. The air pollution from vehicles in urban areas, particularly in big cities, has become a serious problem.

The following are the major pollutants associated with motor vehicles:

- Ozone- The primary ingredient in urban smog, ozone is created when hydrocarbons and nitrogen oxides—both of which are chemicals released by automobile fuel combustion—react with sunlight.
- Particulate matter- These particles of soot, metals, and pollen give smog its murky color. Among vehicular pollution, fine particles pose the most serious threat to human health by penetrating deep into lungs.
- Nitrogen oxides- These vehicular pollutants can cause lung irritation. In addition, they assist in the formation of ozone and particulate matter.
- Carbon monoxide- This odorless, colorless gas is formed by the combustion of fossil fuels such as gasoline. Cars and trucks are the source of nearly two-thirds of this pollutant.

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- Sulphur dioxide- Motor vehicles create this pollutant by burning sulphur-containing fuels, especially diesel. It can react in the atmosphere to form fine particles and can pose a health risk to young children and asthmatics.
- Hazardous air pollutants- These chemical compounds, which are emitted by cars, trucks, refineries, gas pumps, and related sources.

The importance of ozone as a pollutant, and the importance of road transport in causing it, raises many concerns like fuel type (gasoline, diesel, Liquefied Petroleum Gas (LPG) and electricity), vehicle type, road fleet and traffic congestion.

Table 1: National Ambient Air Quality Standard (NAAQS), 2009:

The national ambient air quality standards, dated 18th November, 2009 for ozone is presented in the table:

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)
Ozone (O ₃) µg/m ³	8 Hours **	100	100
	1 Hour **	180	180

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

3.0 Comparison of Ozone Concentration in the month of October, November & December for three Consecutive years (2019, 2020 & 2021):

3.1 Ozone Profile for the month of October for three Consecutive years (2019, 2020 & 2021):

A comparative study was done for consecutive three years (2019, 2020 & 2021) for the month of October, November and December. Each day the time period was divided into three time zones ranging from 12:00AM to 8:00AM, 08.00AM to 04:00 PM and lastly 04:00PM to 12:00 AM which corresponds to 8 hours range of data. This was done so that it could be easily compared with the NAAQS,2009 8 hourly standards for Ozone (O₃).

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Fig. 1 depicts the Ozone concentration profile for the month of October, in which it was observed that, for all the three years evident spikes in concentration occurred for the duration of 8 hours period (08:00 A.M to 04:00 PM). However, during the mid-night to early morning hours (12:00AM to 08:00AM), ozone concentration remain mostly with in the permissible limit as prescribed by NAAQS, 2009. The same thing was observed for the late afternoon to midnight hours (04:00PM to 12:00 AM). So, it can be concluded that the ozone spike was high when emissions from anthropogenic sources was high, i.e., vehicular congestion and other daily activities are at its peak. The variation in data was due to the presence of sunlight, which was more in 08:00AM to 04:00 PM, augmenting the Ozone formation, in combination with vehicular emissions.

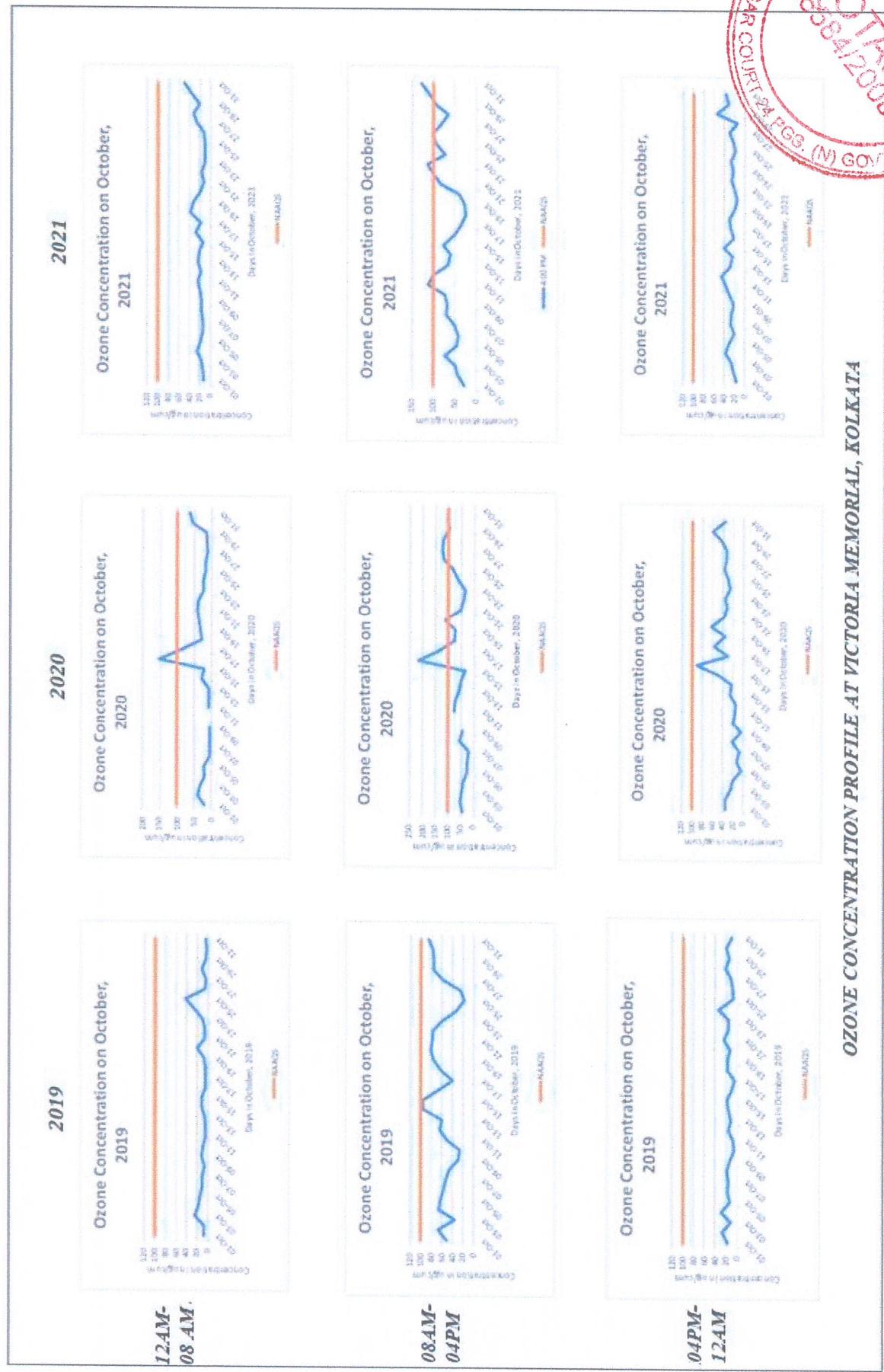
3.2 Ozone Profile for the month of November for three Consecutive years (2019, 2020 & 2021):

Fig. 2 depicts the Ozone concentration profile for the month of November, due to the onset of temperature inversion, mostly the ozone concentration spike was observed during the period of 08:00 A.M to 4:00 PM, for both the months .This time period was only in focus due to heavy vehicular load and other anthropogenic activities along with presence of intense sunlight which was less during the mid-night to early morning hours (12:00AM to 08:00AM and 04:00PM to 12:00 AM).), Ozone concentration remain mostly within the permissible limit as prescribed by NAAQS,2009.

3.3 Ozone Profile for the month of December for three Consecutive years (2019, 2020 & 2021):

As for the Fig. 3, for the month of December similar trend was observed as for the month of November. Temperature inversion also plays an important part in this month. The Ozone concentration was above the NAAQS 2009 standard in this segment for some days during the period of 08:00 AM to 04:00 PM. This result also indicates that both sunlight and vehicular load played an important factor for raise in ozone concentration.

Trend in Ozone concentration observed in the month of October, November and December for the year 2019,2020 & 2021.

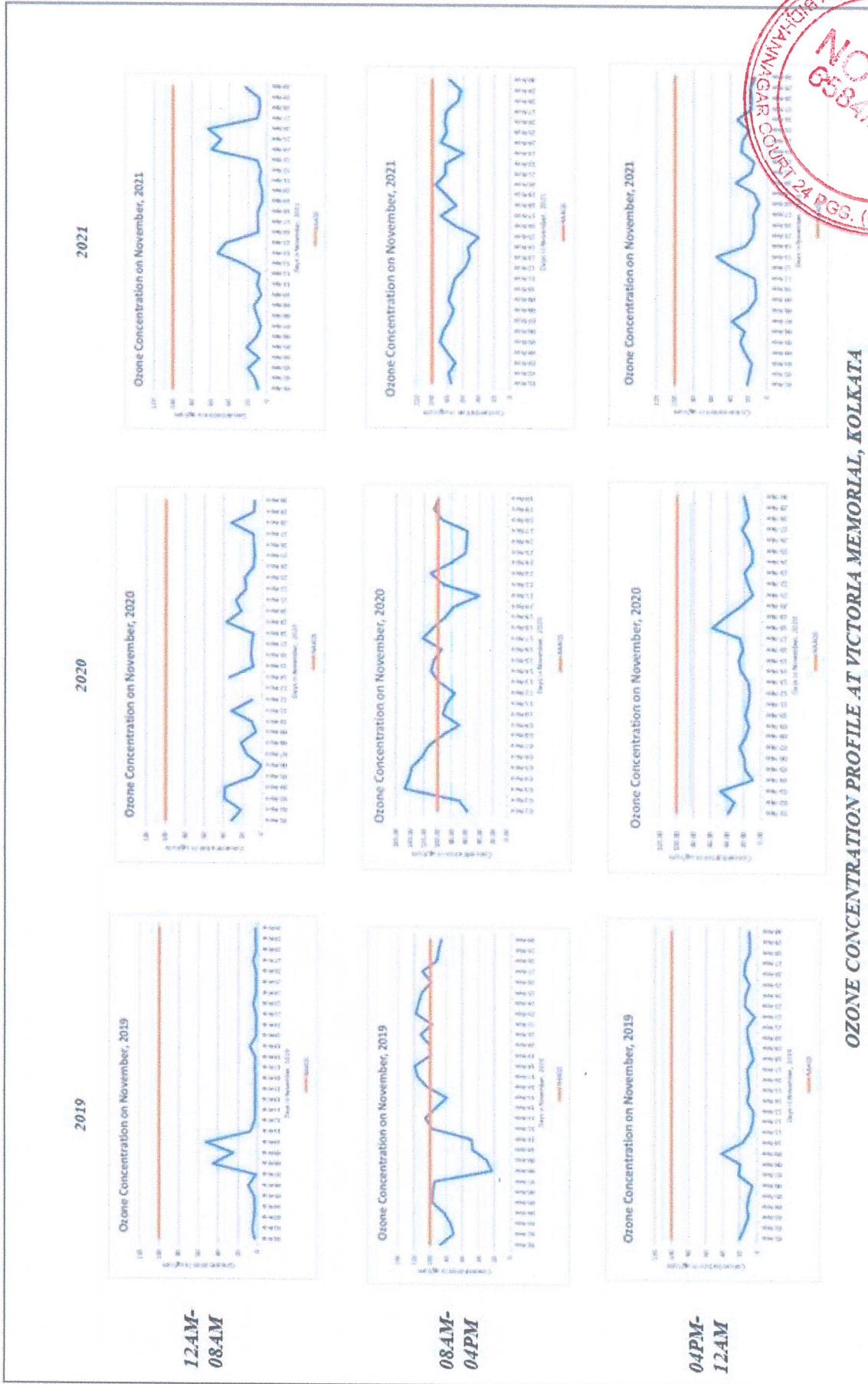


OZONE CONCENTRATION PROFILE AT VICTORIA MEMORIAL, KOLKATA

Fig. 1. Ozone concentration profile for the month of October

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OZONE CONCENTRATION PROFILE AT VICTORIA MEMORIAL, KOLKATA



Fig. 2. Ozone concentration profile for the month of November

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Fig. 3. Ozone concentration profile for the month of December

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4.0 Discrepancies observed in News Item published in The Times of India on 13.12.2021 with the heading "Ozone spike in Kolkata raises concern" :

1. Eight hourly concentrations for Sunday 12.12.2021, was mentioned in the article as 160 mg/cubic meter. However as per the data available for Ozone with West Bengal Pollution Control Board for Sunday, dated 12.12.2021 shows as follows:

Parameter	Time	Concentration ($\mu\text{g}/\text{m}^3$)*
Ozone	12.00 AM to 08.00 AM	65.52
	08.00 AM to 4.00 PM	126.76
	04.00 PM to 12.00 AM	14.96

*Represents 8 hourly average data for the said period.

It is evident from the above table that the ozone concentration never attained the value of 160.

2. The unit mentioned in the TOI article is in mg/cubic meter, however the unit of measurement for Ozone according to NAAQS.2009 is $\mu\text{g}/\text{cubic meter}$.
3. In India we follow the National Ambient Air Quality Standard dated 18th November 2009 for Ozone (No. B-29016/20/90/PCI-I) published by the Central Pollution Control Board in the Gazette of India vide notification No(s). S.O.384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998 instead of World Health Organization (WHO) standard as mentioned in the NGT order in OA No 121/2021/EZ dated 16.12.2021.

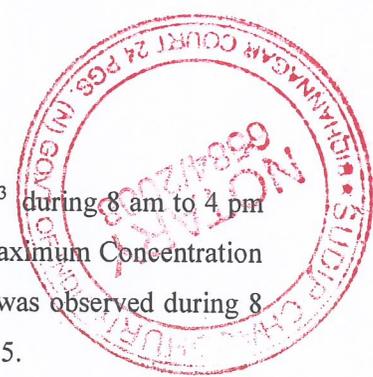
5.0 Monitoring of Ozone Level at Victoria Memorial, Kolkata by CPCB & WBPCB:

With reference to Hon'ble NGT order dated 16.12.2021 in OA No 121/2021/EZ, the Committee shall examine the air quality contents of the article. The Committee assessed the ozone level at Victoria Memorial, Kolkata, at Latitude-22.54481438 and Longitude-88.3438723. Monitoring of ozone was conducted two days, on working day (Friday, 31.12.2021) and on holiday (Sunday, 02.01.2022). The observed values were tabulated in Table-2 and Table-3 respectively.

In accordance with NAAQS standard 2009, manual sampling and analysis of ozone carried out using Chemical method.

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6.0 Observations:

- Ozone concentration was observed in the range of 15-48 $\mu\text{g}/\text{m}^3$ during 8 am to 4 pm on working day (Friday, 31.12.2021) as depicted in Table 2. Maximum Concentration was observed during 1 pm-2 pm and minimum concentration was observed during 8 am-9 am and 8 hourly average was 34 $\mu\text{g}/\text{m}^3$ as depicted in Fig. 5.
- Ozone concentration was observed in the range of 6.5-50 $\mu\text{g}/\text{m}^3$ on holiday (Sunday, 02.01.2022) as depicted in Table 3. Maximum Concentration was observed during 1 pm-2 pm and minimum concentration was observed during 8 am-9 am and 8 hourly average was 29 $\mu\text{g}/\text{m}^3$ as depicted in Fig.6.
- Data reveals that 8 hourly average ozone concentration was slightly higher on working day compared to holiday as depicted in Fig.4, may be because of more traffic movement on working day. In both the days the 8 hourly average ozone concentration level was within the prescribed limit of 100 $\mu\text{g}/\text{m}^3$.

Table -2 O ₃ concentration as on 31.12.2021				
S No	Date	Time	Ozone Conc. ($\mu\text{g}/\text{m}^3$)	NAAQS Standard
1	31.12.2021	08AM-09AM	15	1 hourly prescribed norm:- 180 $\mu\text{g}/\text{m}^3$
2		09AM-10AM	19	
3		10AM-11AM	21	
4		11AM-12PM	43	
5		12PM-01PM	44	
6		01PM-02PM	48	
7		02PM-03PM	47	
8		03PM-04PM	31	
8 Hourly Average			34	8 hourly prescribed norm:- 100 $\mu\text{g}/\text{m}^3$

Table -3 O ₃ concentration as on 02.01.2022				
S No	Date	Time	Ozone Conc. ($\mu\text{g}/\text{m}^3$)	NAAQS Standard
1	02.01.2022	08AM-09AM	7	1 hourly prescribed norm:- 180 $\mu\text{g}/\text{m}^3$
2		09AM-10AM	19	
3		10AM-11AM	20	
4		11AM-12PM	27	
5		12PM-01PM	30	
6		01PM-02PM	50	
7		02PM-03PM	39	
8		03PM-04PM	39	
8 Hourly Average			29	8 hourly prescribed norm:- 100 $\mu\text{g}/\text{m}^3$

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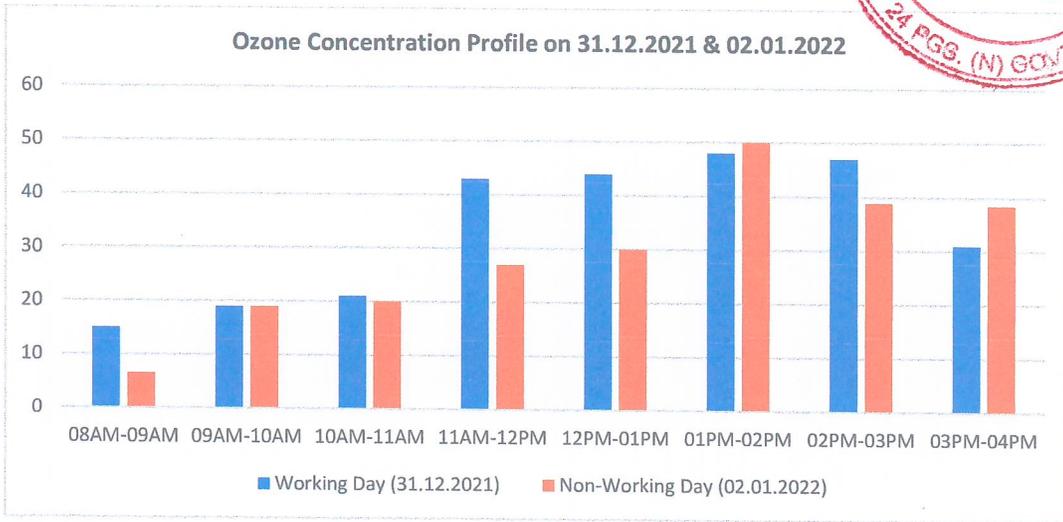
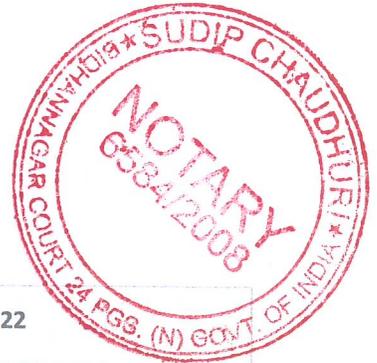


Fig.:4

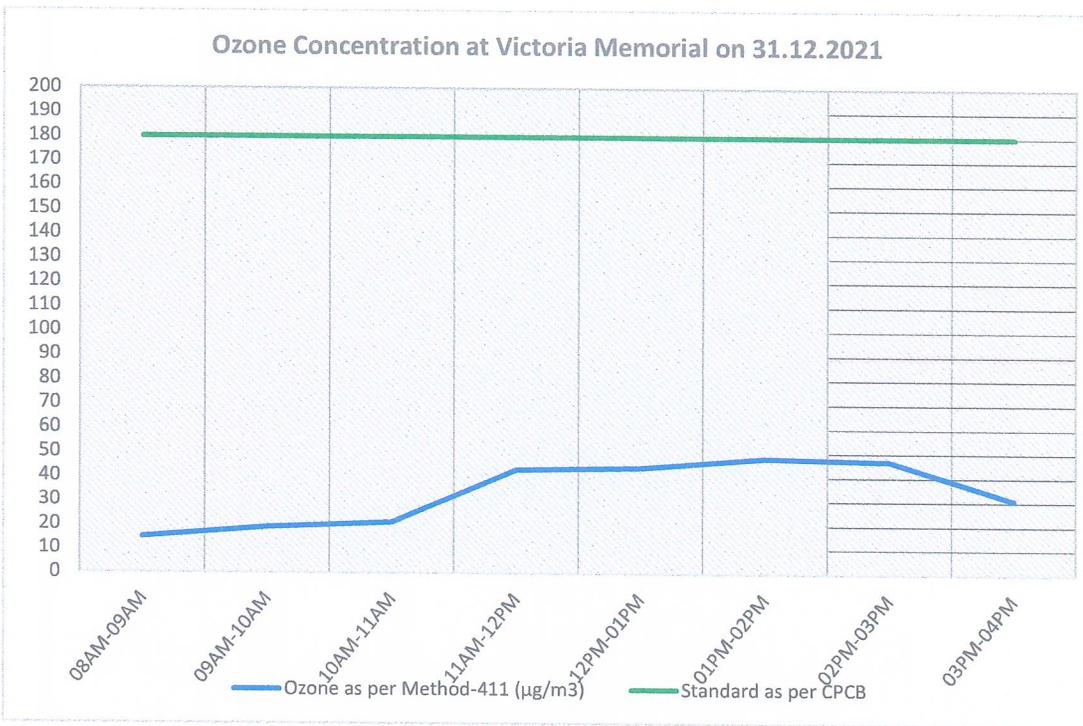


Fig.:5

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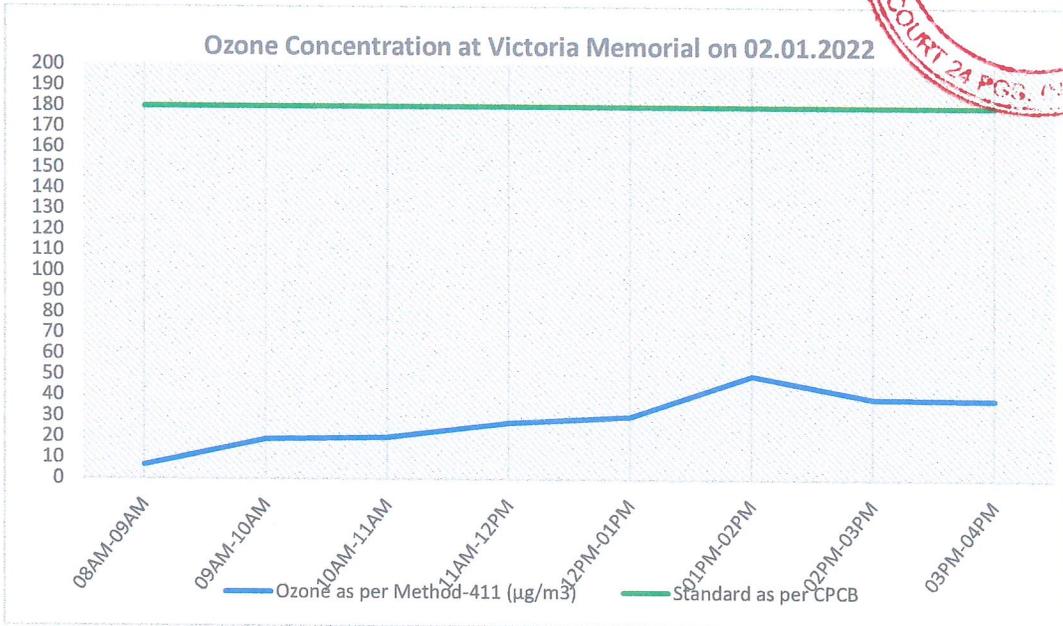
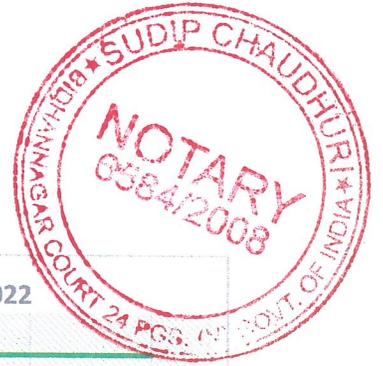


Fig.:6

7.0 Conclusion:

1. The 8 hourly average ozone concentration level in Victoria Memorial was within the NAAQS prescribed limit of $100 \mu\text{g}/\text{m}^3$ on both the days i.e. on working day (Friday) and on Holiday (Sunday).
2. Comparison of three months data (October-December) during the year 2019-2021, reveals that most of the days the 8 hourly average Ozone level are within the prescribed norms of NAAQS.

8.0 Remedial measures:

Vehicles are a dominant source of pollution in Kolkata and can remain a daunting challenge with growing motorization. Along with motorization, use of diesel has also increased in the city due to growth in the number of high mileage commercial vehicles and dieselization of the personal vehicle segment. This is not only contributing to the particulate but also the NO_x load which may results in formation of ozone in presence of VOC and sunlight. However, the following remedial measures are recommended for keeping the ozone level within the prescribed limit throughout the year.

1. The major thoroughfare in and around Victoria Memorial should be free from Traffic Congestion.
2. Strict enforcement of No Parking Rules in and around Victoria Memorial.


 Dr. Debashis Chakrabarty
 Senior Scientist
 West Bengal Pollution Control Board


 Smt. Susmita Ekka
 Scientist 'D'
 Central Pollution Control Board

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