Review of the Riverton Fire August 2018 Report

Done by:
National Environment and Planning Agency
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Review prepared by:
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This document contains the professional opinion of the Jamaica Environment Trust (JET). In arriving at our opinion, we made every reasonable attempt to ensure that our resource persons are informed and reliable and experts in the area in which their comment and analysis is sought. JET encourages readers to apply their own critical analysis to the information provided in this document and by others, particularly where JET's opinion differs from those others.

On July 29, 2018 a major fire broke out at the Riverton Solid Waste Disposal site operated by the National Solid Waste Management Authority (NSWMA) in Kingston. The fire lasted for several days and negatively impacted air quality across the Kingston Metropolitan Area and sections of South East St. Catherine. In the weeks following, JET and several other civil society stakeholders called on the state environmental regulators, the National Environment and Planning Agency (NEPA), to release the results of air quality monitoring in the area during the fire. On September 11, a report on the fire was released by NEPA on their website.[1]

With technical assistance from Dr. Anthony Greenaway, retired Senior Lecturer in the Department of Chemistry at the UWI Mona campus and expert in environmental pollution and industrial chemistry, and the Environmental Law Alliance Worldwide (ELAW) in Eugene, Oregon the Jamaica Environment Trust (JET) reviewed NEPA's Riverton Fire August 2018 Report. Our review is presented below:

Data Interpretation/Presentation

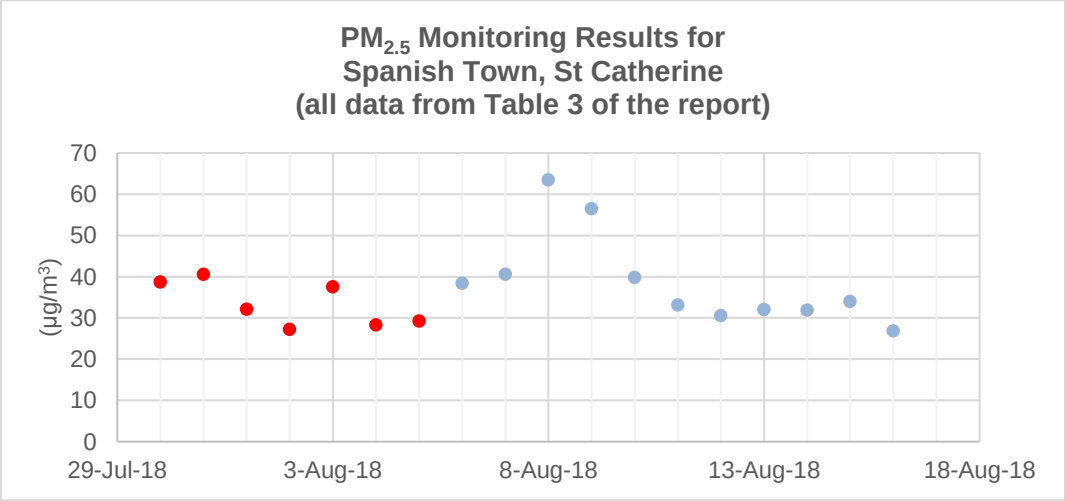
In general, JET finds the air quality data presented by the report to be limited, which makes verification of NEPA's analysis of the results difficult.

Background data are presented for only some pollutants, i.e. $PM_{2.5}$ [2] average hourly concentrations for 2017 and PM_{10}[3] monthly averages for 2018 are compared to readings taken during the 2018 fire, but there is no background data provided for comparison for SO_2, NO_2 or Volatile Organic Compounds (VOCs). Data collected "after the fire" (post incident monitoring) seems to be presented as a proxy for background data, but there is little evidence to support these readings are representative of "normal" air quality conditions in the area. In general, the data analysis is placing too much weight on the very little data from the post incident monitoring period.

The presentation of $PM_{2.5}$ data in the 2018 report represents an improvement in the types of pollutants being monitored by NEPA during the last fire incident of this magnitude at Riverton in 2015. Hourly averages are presented in Figure 4 of the report for the period during the 2018 fire (July 30 to August 5, 2018) and for the calendar year 2017. These show that the $PM_{2.5}$ concentrations were approximately doubled during the fire when compared to 2017, but that the variabilities of the hourly data over a 24-hour period were similar, with peaks occurring at about 8:00am and 8:00pm. This suggests that while the fire did increase the $PM_{2.5}$ particulate concentrations, it did not affect how the concentrations changed over the day; however, without examining the hourly data for each day (rather than the hourly averages over the period) it is difficult to say with absolute certainty that this is the correct conclusion. Hourly readings during the fire have been presented for NO_2 (see Figure 8 of the report), but this has not been done for $PM_{2.5}$**. A presentation of the actual hourly readings (not averages) for all monitored pollutants should have been presented in the report where available.**

[1] NEPA, Riverton Fire August 2018 Report
http://nepa.gov.jm/new/services_products/subsites/air_quality/docs/reports/FINAL_Report_on_Riverton_2018_Fire.pdf
[2] Particulate matter measuring less than or equal to 2.5 micrometers in diameter
[3] Particulate matter measuring less than or equal to 10 micrometers in diameter

The report also contains daily averages of the $PM_{2.5}$ data for the period 30 July to 16 August 2018 (Table 3 and Figure 3 of the report) but there is no 2017 data to compare it with. NEPA conclude that the concentrations of $PM_{2.5}$ declined after the fire as evidenced by the data for August 16 (see page 19 of the report), i.e. the last day of data collection. Figure 3 of the report only plots the data for July 30 to August 5, 2018; however, if ***all*** data in Table 3 of the report are plotted, as has been done in the figure below, it can be seen that the concentrations between August 6 and 16, 2018 "after the fire" (blue dots) are of approximately the same magnitude as those seen during the fire (red dots). NEPA's conclusion seems to place too much emphasis on the August 16 datum point.



The report also concludes that monitoring indicated that Saharan Dust caused an increase in recorded particulate matter (PM_{10} and $PM_{2.5}$) concentrations between August 8 and 9. Unlike smoke (a product of combustion), which is heavily weighted towards very small particles ($PM_{2.5}$ or smaller), Saharan dust (which is unburnt, windblown mineral dust) is heavily weighted toward coarser particles.[4] **While an episode of Saharan Dust might impact PM_{10} levels in Jamaica during the monitoring period, $PM_{2.5}$ levels should not have been significantly impacted by Saharan Dust. Therefore, the peak in particulate material between August 8 and 9 is (at least in part) due to another factor.**

JET also notes the following:

- $PM_{2.5}$ air quality monitoring results from a station in Duhaney Park are referenced several times in the report, but insufficient data are presented for that location to support NEPA's conclusion of a reduction in concentrations following the fire (page 19 of the report)
- Distinct peaks in hourly NO_2 concentrations, which lasted for two to four hours on July 29 (between 3:00am and 4:00am), August 2nd (between 6:00am and 10:00am) and August 4th (between 10:00am – 12 noon), are mentioned as being above the national

[4] Does, Michèlle & Korte, Laura & Munday, Chris & Brummer, Geert-Jan & Stuut, Jan-Berend. (2016). Particle size traces modern Saharan dust transport and deposition across the equatorial North Atlantic. Atmospheric Chemistry and Physics. 16. 13697-13710. 10.5194/acp-16-13697-2016.

air quality standard, but no explanation is given as to the possible cause of these short-lived high concentrations.

- NO_2 data are only from the monitors located at Garmex, Marcus Garvey Drive. This site is upwind of Riverton City and the readings therefore probably do not reflect the maximum impact on air quality of the fire for this parameter.
- VOC data are presented as two readings for each compound – one "during" the fire on July 31 (Table 6 of the report), and the other "after" the fire on August 16 (Table 8 of the report). This quantity of data is too limited to be useful, particularly in the absence of standards or any indication as to the sampling and analytical uncertainties.
- The VOCs that have been analyzed are a set of "common" compounds which are not focused on those which would be expected from fires. For example, oxygenated VOCs such as formaldehyde and acrolein are commonly found in air as a result of fires, however, such compounds were not monitored by NEPA. Oxygenated VOCs are characterized by an unpleasantly sharp smell and capacity to irritate the eyes, nose and throat.
- On page 4 of the report the VOC data are stated to have been collected from the "Spanish Town Road monitoring location" but it is not clear as to whether this is the JPS Offices or the Red Stripe Brewery site (see Table 1 of the report).
- In general, very little information is provided about the sampling methods used to collect the data during the fire.

JET is of the opinion that *all* air quality data used to compile the report should have been proactively disseminated to the public along with the document.

Findings

The findings of the report are predictable. Analysis of the data indicate significant and protracted negative impacts to air quality in communities in both the immediate vicinity of the fire, and several kilometres away.

Both $PM_{2.5}$ and PM_{10} average daily concentrations exceeded World Health Organization (WHO) guideline limits during the fire. Exposure to high concentrations of particulate matter pollution can cause lung irritation and aggravates the severity of chronic lung diseases. $PM_{2.5}$ poses the greatest problems, because they can get deep into lungs, and some may even get into the bloodstream.[5] Children, the elderly and those with pre-existing respiratory conditions are particularly vulnerable to exposure.

Concentrations of both SO_2 and NO_2 are presented in the report as having increased during the fire, but not to levels which were thought should be of concern. It is difficult to verify whether this is a sound conclusion as such limited data are presented for both pollutants. There is also no comparison to WHO guideline limits for either the NO_2 or SO_2 concentrations presented. **Based on the results presented in the report, JET has determined that WHO guideline limits were also exceeded for both SO_2 and NO_2 during the fire.**

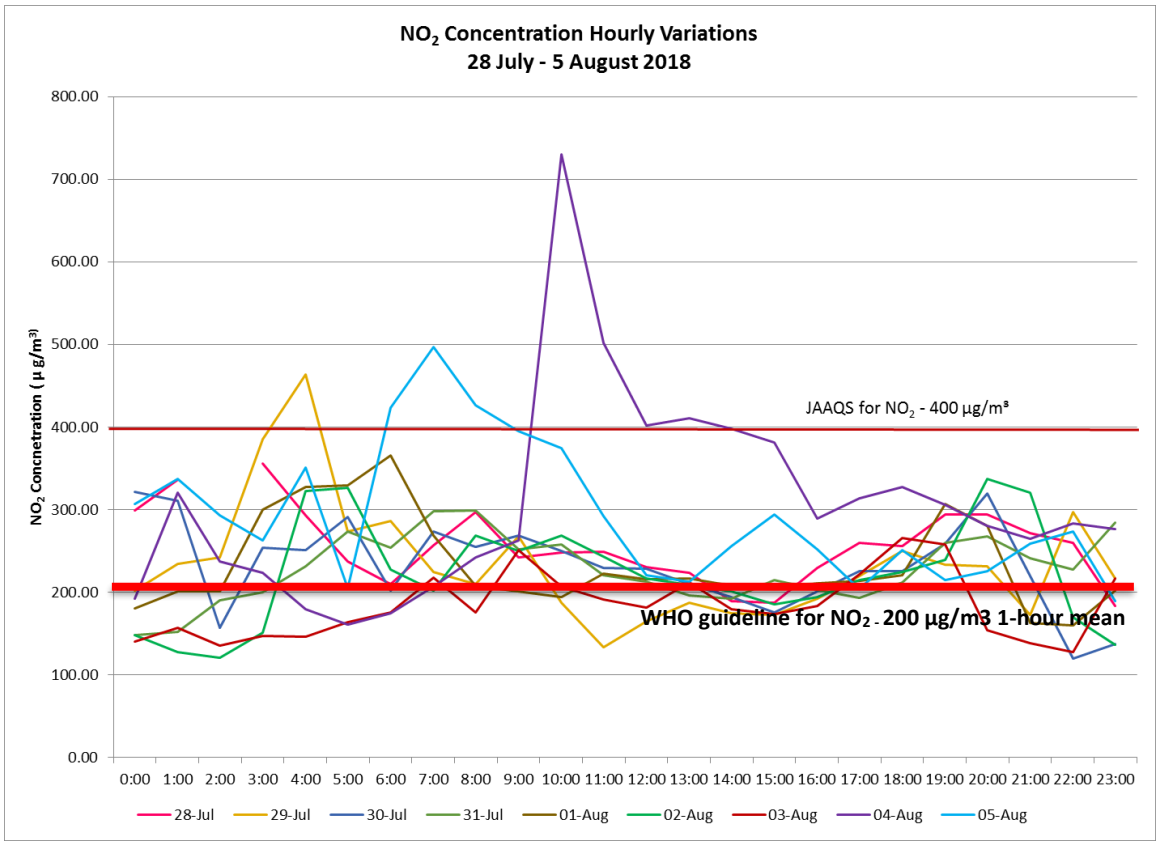
[5] US EPA, Health and Environmental Effects of Particulate Matter (PM). Found at: https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm

SO_2 was detected at daily concentration levels measuring between 34.68 µg/m^3 and 93.48 µg/m^3 during the fire, which exceed the WHO 24-hour mean guideline of 20 µg/m^3. Similarly, the WHO 1-hour mean guideline of 200 µg/m^3 for NO_2 was also exceeded most of the time during the fire.[6]

According to the WHO, SO_2 can affect the respiratory system and the functions of the lungs and causes irritation of the eyes. Inflammation of the respiratory tract can also make people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with higher SO_2 levels. When SO_2 combines with water, it can form sulfuric acid - the main component of acid rain. Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO_2.

The findings presented point to the need for Jamaica's national air quality standards to be updated in line with international guidelines. In the case of PM_{10} and SO_2, concentrations of both pollutants exceeded WHO air quality guideline limits during the fire but were within the Jamaica Ambient Air Quality Standards (JAAQS). In the case of NO_2, a comparison of the data against the WHO guideline (200 µg/m^3 1-hour mean) shows that the limit was exceeded much more frequently than when compared against the JAAQS guideline (400 µg/m^3 1-hour mean) (see figure below).

[6] WHO Air quality guidelines. Found at: http://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health



Limits for $PM_{2.5}$ and many of the VOCs are not included in the JAAQS; therefore, the report has used the WHO guideline limits as a proxy.

Benzene and toluene are the two Volatile Organic Compounds (VOCs) detected at the highest levels during the fire. In the case of benzene, the concentration on July 31 was 40 times higher than the recommended *annual* exposure limit (1 $\mu g/m^3$ annual average) for Jamaica. Acute effects of exposure to benzene may cause headache, dizziness, drowsiness, confusion, tremors and loss of consciousness. Chronic (long-term) exposure to benzene is a well-established cause of cancer in humans.[7] Toluene can have negative effects on the central nervous system and chronic exposure can result in reproductive/developmental effects.[8] There is no local standard for toluene, so the WHO Air Quality Guideline for Europe (260 $\mu g/m^3$ as a weekly average) was used for comparison.

Page 18 of the report states:

> *"While the concentrations of toluene are within the WHO guideline range for industrial zones, residential areas were impacted by these levels of toluene (based on the estimated areas of impact and public complaints) and would likely have negatively impacted the populations"*

[7] WHO, EXPOSURE TO BENZENE: A MAJOR PUBLIC HEALTH CONCERN http://www.who.int/ipcs/features/benzene.pdf

[8] US EPA, Toluene Hazard Summary https://www.epa.gov/sites/production/files/2016-09/documents/toluene.pdf

But unlike benzene, toluene levels did not drop after the fire. Page 22 states:

> *"The concentration of toluene increased from 30.0µg/m3 on July 31, 2018 to 31.8µg/m3 on 12 August 2018. This is an indication that the fire was not the major contributor to the toluene levels; further investigation is needed to determine the possible source(s) of toluene impacting the area."*

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.[9]

$PM_{2.5}$ and PM_{10} are also reported to remain at high levels following the fire. In the case of the two $PM_{2.5}$ stations, concentrations are above WHO guideline limits for daily exposure even after the fire; PM_{10} concentrations also remain above WHO guideline limits in Portmore after the fire. **The report points to ongoing air quality issues in the areas surrounding Riverton, which were exacerbated by the 2018 fire.**

There have been many complaints of poor air quality in the area surrounding Riverton during the past year, and the area is at high risk for air pollution. **The findings of the report highlight the need for an expanded and ongoing air quality monitoring programme for the area.**

Recommendations

Riverton continues to be one of the biggest threats to public health for those living and working in its vicinity. Despite this, the air quality monitoring programme for the Riverton Waste Disposal Site remains inadequate.

- A health impact survey of communities surrounding Riverton is urgently needed; this was promised by the Jamaican government after the last major fire in 2015 fire but has not been done. The survey should assess the public health impacts of living near the disposal site.
- Riverton and its environs should be classified as a critical air pollution exposure site. A set of source specific monitoring sites focused on the Riverton Waste Disposal Site should be established, given the frequent incidents that occur there. The existing industrial monitoring sites were not set up for this purpose and cannot be very easily used.
- The expanded air quality monitoring programme for Jamaica which was announced in March 2018[10] should be fast tracked and emphasis placed on improving air quality monitoring around Riverton. The programme should include more monitoring sites, monitoring of more pollutants and regular updates to the public on air quality in the area.
- Jamaica's air quality standards should be updated to keep them in line with international WHO guideline limits.
- NEPA should focus its air quality monitoring programme for particulates on $PM_{2.5}$ rather than PM_{10} in characterizing the air quality in Jamaica.

[9] ATSDR, Public Health Statement for Toluene https://www.atsdr.cdc.gov/phs/phs.asp?id=159&tid=29
[10] JIS Online, Gov't Earmarks $9m to Strengthen National Air Quality Management Programme https://jis.gov.jm/govt-earmarks-9m-to-strengthen-national-air-quality-management-programme/

- Details of the NEPA enforcement action taken against the NSWMA should be publicized, including what steps have been taken by both agencies following the fire to ensure the conditions of their NEPA permit are met going forward.
- The Government of Jamaica should begin an immediate search for alternative sites for new sanitary landfills and transfer stations, in order to move waste disposal operations away from the Riverton site.

Jamaica Environment Trust
October 8, 2018