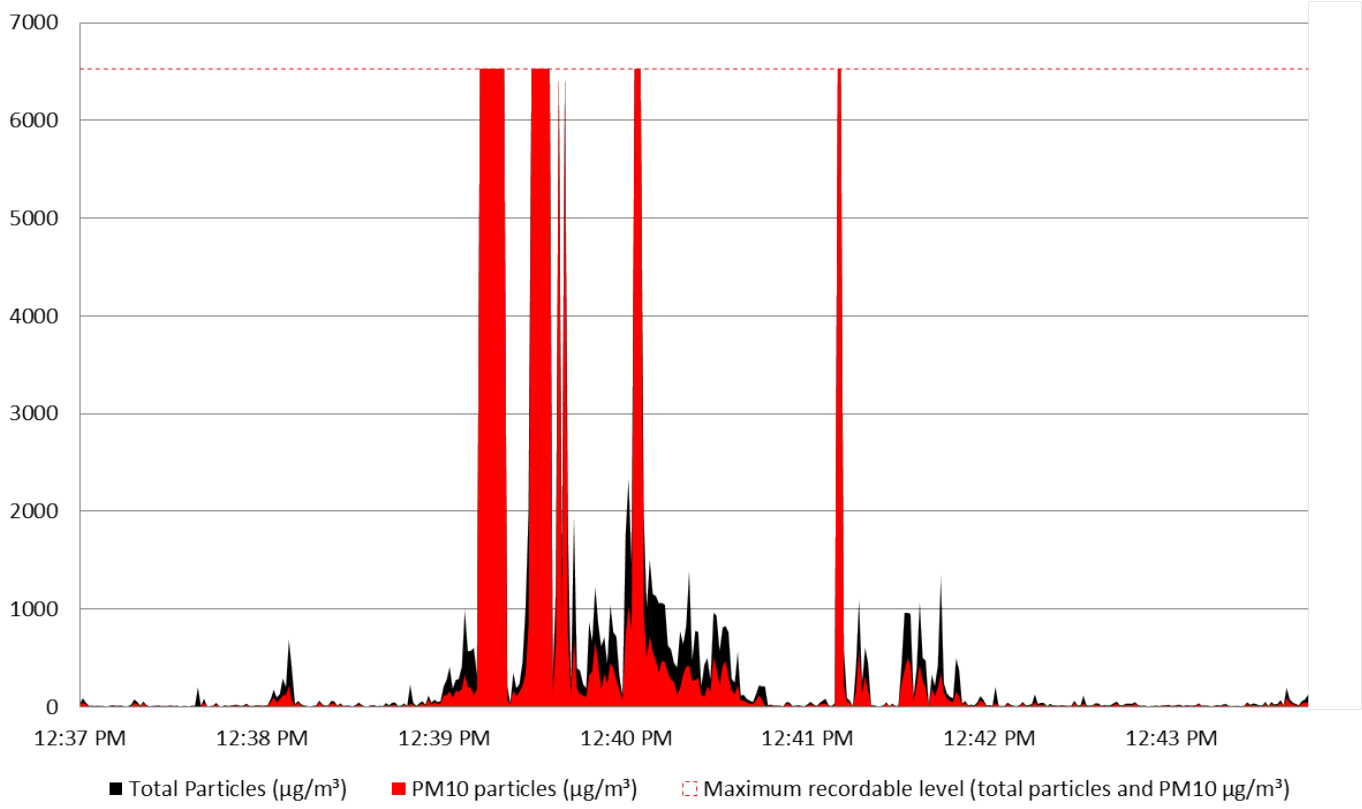
Off the Scale:

Peak Pollution Events at Jondaryan Coal Stockpile



Community Air Quality Monitoring Study

Clean Air Queensland

November 2013

About Clean Air Queensland

Clean Air Queensland is a community alliance of groups and individuals including the Lock the Gate Alliance, Friends of the Earth, Rosewood District Protection Organisation, Oakey Coal Action Alliance, Parents Against Coal Dust, and Clean Air Wynnum. The alliance has formed as a result of community concern about the health impacts of coal dust.

Acknowledgements

Clean Air Queensland would like to acknowledge the support and involvement of:

- Associate Professor Adrian Barnett, Queensland University of Technology for his assistance in designing the study and analysis of results
- Mike Fry of Turnkey Instruments who provided excellent technical advice.
- The members of Clean Air Queensland's alliance of residents, community and environment groups
- The volunteers who assisted with the project.

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Glossary

$\mu g/m^3$	micrograms per cubic metre
km	kilometre
m	metre
Mtpa	million tonnes per annum
PM_{10}	Particulate matter with a diameter of 10 micrometres or less
$PM_{2.5}$	Particulate matter with a diameter of 2.5 micrometres or less
TSP	Total suspended particulates (with a diameter 50 micrometres or less)

Acronyms

BoM	Bureau of Meteorology
CAQ	Clean Air Queensland
DEHP	Queensland Department of Environment and Heritage Protection

Executive summary

This study was initiated and managed by the Clean Air Queensland alliance. The alliance was formed in July 2013 to respond to growing concern that communities living along the 'coal corridor' on the West Moreton rail line, including the Jondaryan community in proximity to a large coal stockpile, are exposed to elevated levels of particle pollution. Exposure to particulate pollution is known to cause a range of serious short-term and long-term health impacts and can occur when peak exposures of short duration (ranging from less than an hour up to a few hours) lead to immediate physiological changes.[i]

The study was entirely designed and conducted by members of community groups. They were advised and assisted by experts and academics and used industry-standard equipment.

The study undertook preliminary particle pollution monitoring at the Jondaryan coal stockpile in order to ascertain the nature of coal stockpile pollution, including every day, background pollution levels and peak pollution events, in response to residents long-term pollution and health concerns.

The study aimed to answer the following research questions:

- What is the particulate pollution profile of the Jondaryan stockpile?
- What particulate pollution events occur on the Western side of the stockpile, adjacent to the town of Jondaryan?
- How often do particulate pollution events occur on the Western side of the stockpile, adjacent to the town of Jondaryan?

Over the course of two monitoring sessions, various pollution events were monitored at the stockpile. The corresponding pollution data was analysed to generate particulate profiles which depict particle concentrations before, during and after the pollution events. Eight pollution event profiles are examined in this study, as a sample of the events observed. These 'event profiles' were selected to demonstrate an indicative range of pollution events under various conditions (wind direction, wind speed, event type eg coal loading and unloading etc).

Study results indicated that there **are frequent peak pollution events at the Jondaryan coal stockpile** over the course of a day, with PM_{10} pollution levels reaching over 6000 micrograms per cubic metre. The analysis showed that increases during a pollution event ranged from 518% of the pre-event levels, to 23391%. Based on this limited monitoring project, it appears that 1-2 peak events per hour is not uncommon.

Such events have the potential to cause serious short term and long term health problems for exposed residents and workers. With the New Acland coal mine set to expand, residents are concerned this will mean a worsening of the current coal dust problems, with increased stockpile size, coal movements and dust events.

The results of this study warrant decisive action by the Queensland Government. Clean Air Queensland commends this study to Premier Campbell Newman and calls on the Queensland Government to:

- Direct the state's coal industry to enclose all coal stockpiles, or introduce a buffer zone to remove them to safe distances from residential areas, as a matter of urgency
- Implement Health Impact Assessments as part of all coal project approval processes
- Monitor and regulate peak pollution events
- Review current Occupational Health and Safety protocols at Jondaryan coal stockpile in relation to dust mitigation and protection of employees health
- Revise the standards for PM10 pollution to take into account new peer reviewed evidence on the health impacts of air pollution, including impacts of peak pollution events.
- Commission an independent assessment of the health impacts of particulate pollution in Jondaryan and all along the West Moreton rail corridor to assess the social and economic impacts of current particle concentrations and model the impacts of increased coal movements as a result of the proposed Acland stage 3 mine expansion.

These recommendations are consistent with the findings of the Senate Inquiry into the Impacts on Health of Air Quality in Australia[ii], and the National Environment Protection (Ambient Air Quality) Measure Review[iii].

1. Background

This study was initiated and managed by the Clean Air Queensland alliance. The alliance was formed in July 2013 to respond to growing concern that communities living along the 'coal dust corridor' on the West Moreton rail line, including the Jondaryan community in proximity to a large coal stockpile, are exposed to elevated levels of particle pollution.

Exposure to particulate pollution is known to cause a range of serious short-term and long-term health impacts and can occur when peak exposures of short duration (ranging from less than an hour up to a few hours) lead to immediate physiological changes.[iv] Community groups and individuals have become increasing concerned about the impact coal dust is having on our health.

According to local residents, community members in Jondaryan have suffered from high levels of coal dust nuisance for many years, with many experiencing severe chronic and acute respiratory and other health problems. Eye and throat irritation is widespread and frequently experienced in the community. With coal stockpile heights of up to 30 metres, and regular frequent coal movements causing high pollution events, residents have become increasingly concerned about the impacts of particulate pollution and supportive of measures to reduce this pollution.

The coal stockpile is approximately 550 metres from the nearest home in Jondaryan. It is fed by uncovered quad trailer trucks bringing coal from the Acland coal mine, and coal is subsequently loaded onto uncovered coal trains that travel through Ipswich, Toowoomba and Brisbane to the Port of Brisbane.

On Tuesday 5 and Friday 8 November members of Clean Air Queensland monitored particle pollution levels adjacent to the Jondaryan coal stockpile. With expert advice and assistance, we monitored particle pollution concentrations over several time periods corresponding to low and high coal movement activity at the stockpile. The industry standard Osiris equipment used for the study allowed for concurrent monitoring of various particle sizes: PM_1 and $PM_{2.5}$ that are associated with combustion (e.g. train locomotives, truck engines) and the larger PM_{10} particles, which are indicative of coal.

This snapshot study was designed as a pilot for a larger investigation onto particulate emissions near coal mining infrastructure in proximity to the community, including mines, stockpiles, transport lines (rail and road) and ports.

2. Health Impacts of Air Pollution

The health impacts of particulate air pollution are documented by a large body of international evidence. The World Health Organization recently classified particulate pollution as a carcinogen[v], and the Australian Medical Association, in their submission to the Senate Inquiry into Impacts on Health of Air Quality, highlighted the fact that particulate air pollution causes more deaths each year in Australia than traffic accidents[vi]. Exposure is known to cause a range of serious short-term and long-term health impacts and can occur with peak exposures of short duration (ranging from less than an hour up to a few hours) leading to immediate physiological changes.[vii]

Fine particles of ten microns or less in diameter (PM_{10}) and 2.5 microns or less in diameter ($PM_{2.5}$) are readily inhaled, causing asthma, heart disease, respiratory diseases, lung cancer and premature death[viii]. A study published in July in the Lancet found that with a 10 microgram increase in PM_{10} levels, the risk of lung cancer increased by 22%.[ix]

The mining and transportation of coal generates large quantities of dust: for example, the National Pollutant Inventory estimates 42,000,000 kg of dust is produced in the Hunter Valley each year from coalmining[x].

The AMA submission to the 2013 Senate Committee Inquiry into the impacts on health of air quality in Australia noted that current air quality standards in Australia lag behind international standards and have failed to keep pace with scientific evidence, and urged better monitoring, compliance and exposure targets.[xi]

At the Inquiry hearing in Brisbane on 11 June 2013, submissions were received from residents and community groups concerned about coal dust in the SEQ region including Jondaryan and Brisbane. Senators were urged to reduce air pollution by groups including the Clean Air Society of Australia and New Zealand, the CSIRO and the Australian Medical Association.

There is also a growing body of evidence that peak or extreme particulate events which may not be detected by conventional analytical approaches may contribute to local complaints regarding intermittently dusty conditions, with meaningful and perceptible effects on local residents health concerns.

3. Objectives

Clean Air Queensland aims to provide the community with independent information and advice on pollution events related to the Jondaryan coal stockpile. Of particular interest are coarse particulate levels (PM_{10}) during peak pollution events, as PM_{10} is most closely associated with coal dust.

4. Method

4.1. Research Questions

- What is the particulate pollution profile of the Jondaryan stockpile?
- What particulate pollution events occur on the Western side of the stockpile, adjacent to the town of Jondaryan?
- How often do particulate pollution events occur on the Western side of the stockpile, adjacent to the town of Jondaryan?

4.2. Site selection

The monitoring sites were selected in accordance with the following criteria:

- Proximity to and downwind of the coal stockpile. Equipment was positioned within 200 metres of the Jondaryan stockpile.
- Proximity to residential areas, within 600 metres of residents of Jondaryan.
- Ability to respond to wind and weather conditions.

The truck stop on the opposite side of the Warrego Highway to the stockpile satisfied the above criteria and was used as the main site for this study.

Figure 1 is a map showing the coal stockpile, residential areas, and the monitoring site.

4.3. Monitoring duration and techniques

Monitoring equipment was located according to the manufacturers' specifications, avoiding areas of over-hanging trees etc. The equipment was set to record second by second PM10. An event log was kept to record the time and type of activities at the stockpile that may cause increases in the pollution levels, and watches were synchronised to the Osiris equipment time to ensure the log was accurate. Video footage of pollution events will also be taken during peak pollution events.

The background level of PM10 levels at the site was recorded to differentiate between pollution events at the stockpile and pollution from the traffic of the Warrego Highway and other local sources. Peak pollution events were defined as periods when TSP and PM10 reached above 100 and 50 $\mu g/m^3$ respectively. Monitoring took place for 8 hours in total – to give an indication of the particulate pollution profile of the stockpile on an average day. The peak events shown in this report are a sample of the events recorded.

Equipment was placed next to the well-established Queensland EPA equipment at Rocklea for a period of 48 hours, to calibrate the equipment and ensure accuracy in recorded results. Weather data was collected from the Bureau of Meteorology for periods of testing to distinguish the impact of rain and other on the results.

Volunteers and staff assisted in the monitoring and received training in key tasks. Tasks included setting up the equipment, collecting data on the timing and duration of the pollution event, recording time and type of activity at the stockpile that may cause the pollution event (an event log), basic local weather

measures (i.e, if it rained during the collection) and other non-target events that may impact PM levels (e.g., trains passing, trucks and cars).

4.4. Equipment

Equipment was hired from Turnkey Instruments for $1795/unit/month plus freight (ex Perth) and GST. This was funded through donations from individuals and community groups. The equipment is capable of simultaneously measuring Total Suspended Particles (TSP), PM10, PM2.5 and PM1 particulates. The equipment does this every one second with the results saved to memory. The stored data was downloaded using the AirQ32 software which allows trending graphs, tables, and in the case of the Osiris equipment with wind inputs, a pollution rose indicating the direction from which the particulates were travelling from towards the sampling location at the time of measurement.

4.5. Review process

Results were interpreted though comparison to concurrent results from monitoring stations operated by Queensland EPA, and through reference to the national standard for PM10. In future analyses, results will also be interpreted through literature on the health impacts of particulate pollution, in particular at peak levels of pollution.

Statistical analyses to characterise the 'pollution event' included a technique to judge when the rise in particulate have returned to baseline, and when they reach their peak.

Importantly, the data captures, for each pollution event, a comparison of the baseline average ambient air before the event occurs (possible one or two minutes of measures) with particulate readings during the event (one or two minutes at peak concentrations). We plot the average levels during a pollution event and also plot the average background levels.

Associate Professor Adrian Barnett, Queensland University of Technology, assisted in the analysis and review of our results.

5. Data analysis and findings

5.1 Equipment calibration

To ensure accuracy in our results, we benchmarked our equipment in two ways: one Osiris monitor against another Osiris monitor, and an Osiris monitor against the DEHP TEOM monitor at Rocklea. The first calibration (Osiris vs. Osiris) was conducted for 29 hours with PM_{10} using one minute averages.

µg/m³	Osiris 1 PM_{10}	Osiris 2 PM_{10}
Average	19.4	19.3
Standard deviation	8.8	12.6

Using one hour averages to eliminate noise, the correlation between the two sets Osiris readings and for PM_{10} was r=0.980, showing that the readings are very highly correlated.

The second calibration (Osiris vs. TEOM) was conducted for 48 hours with PM_{10} using 10 minute averages.

µg/m³	Osiris PM_{10}	TEOM PM_{10}
Average	10.0	12.6
Standard deviation	5.9	5.3

Using one hour averages to eliminate noise, the correlation between Osiris readings and TEOM readings for PM_{10} was r=0.573, showing that readings are fairly highly correlated, and that Osiris readings PM_{10} were lower than TEOM readings by about 20%.

5.2 Data analysis and findings

Data collected was analysed to describe the relationship between peak pollutant concentrations and baseline levels (low observable coal movement activity). The peak events were characterised by sudden extreme elevations of particulates, followed by a period of 26 to 171 seconds during which between one to six discrete extreme spikes occurred. The peak events were deemed to conclude when TSP and PM10 returned to levels generally below 100 and 50 µg/m³ respectively.

Figure 2: Peak event 1 – Coal truck unloading 1:06pm Tuesday 5th November

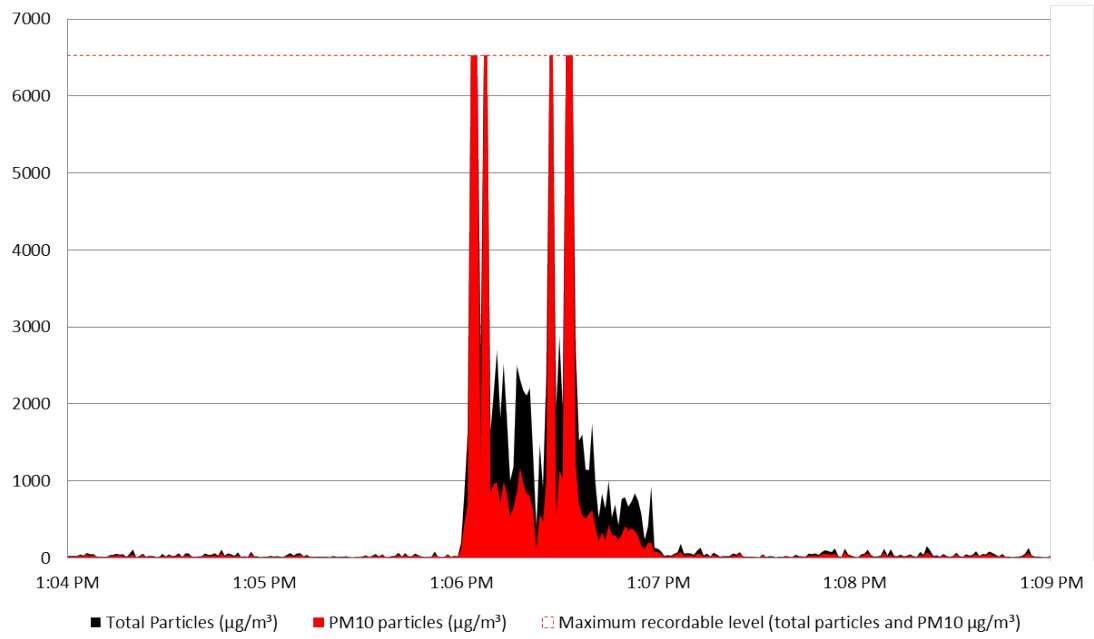

Figure 2 shows extreme particulate peaks associated with a coal truck unloading at the stockpile and the resultant observable dust cloud. **The results go beyond the recordable level of the monitoring equipment.**

This peak event lasted for approximately 61 seconds, from the sharp spike in pollution that occurred at 1:06:04pm until 1:07:05pm, when TSP and PM10 levels tapered off to below 100 and 50 $\mu g/m^3$ respectively.

Table 1: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	31.3	19.9
during peak event*	2171.0	1540.5
2 mins after	43.7	25.5
% increase from before to during the peak event*	6842%	7650%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 1 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the monitoring equipment. Nevertheless, the 6842% and 7650% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to close to pre-peak event levels, with some relatively small lingering elevation.

Figure 3: Peak event 2 – Coal truck driving around at stockpile, 1:38pm Tuesday 5th November

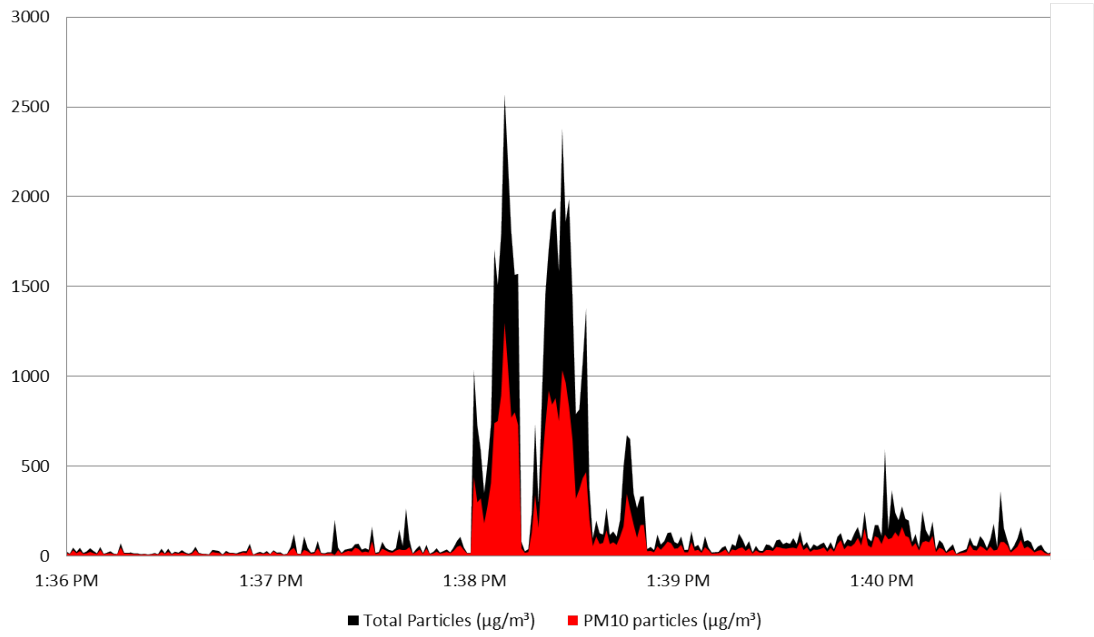

Figure 3 shows very high particulate peaks associated with a coal truck driving around at the stockpile and the resultant observable dust cloud.

This peak event lasted for approximately 51 seconds, from the sharp spike in pollution that occurred at 1:38:24pm until 1:39:15pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 2: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	36.1	19.8
during peak event	905.9	425.0
2 mins after	93.2	48.6
% increase from before to during the peak event	2407%	2044%

Table 2 shows the difference of TSP and PM10 levels before, during and after the peak event. The 2407% and 2044% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to levels that were significantly elevated from pre-peak event levels.

Figure 4: Peak event 3 – Coal train being loaded; dust devil, 1:57pm Tuesday 5th November

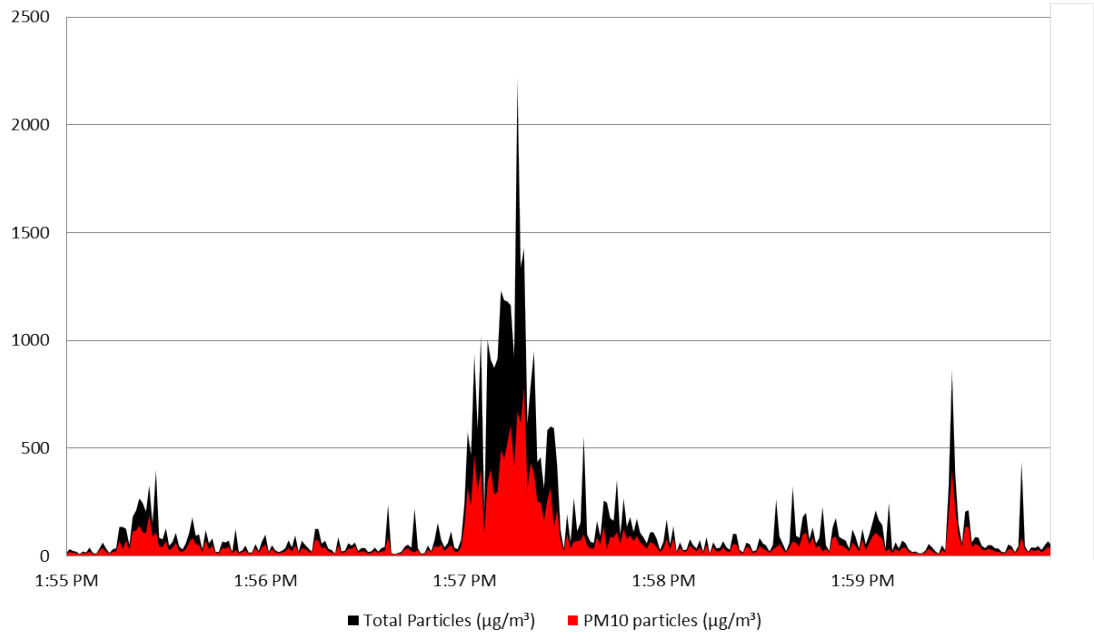

Figure 4 shows very high particulate peaks associated with a coal train wagon being loaded, and also coinciding with a small dust devil moving across the road from the coal stockpile.

This peak event lasted for approximately 58 seconds, from the relatively sharp spike in pollution that occurred at 1:57:29pm until 1:58:27pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 3: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	67.1	35.1
during peak event	496.3	216.9
2 mins after	86.2	44.6
% increase from before to during the peak event	639%	518%

Table 3 shows the difference of TSP and PM10 levels before, during and after the peak event. The 639% and 518% increases in TSP and PM10 levels respectively represent a very large increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to close to pre-peak event levels, with some relatively small lingering elevation.

Figure 5: Peak event 4 – Thick dust cloud drifting across from stockpile 12:21pm Friday 8th November

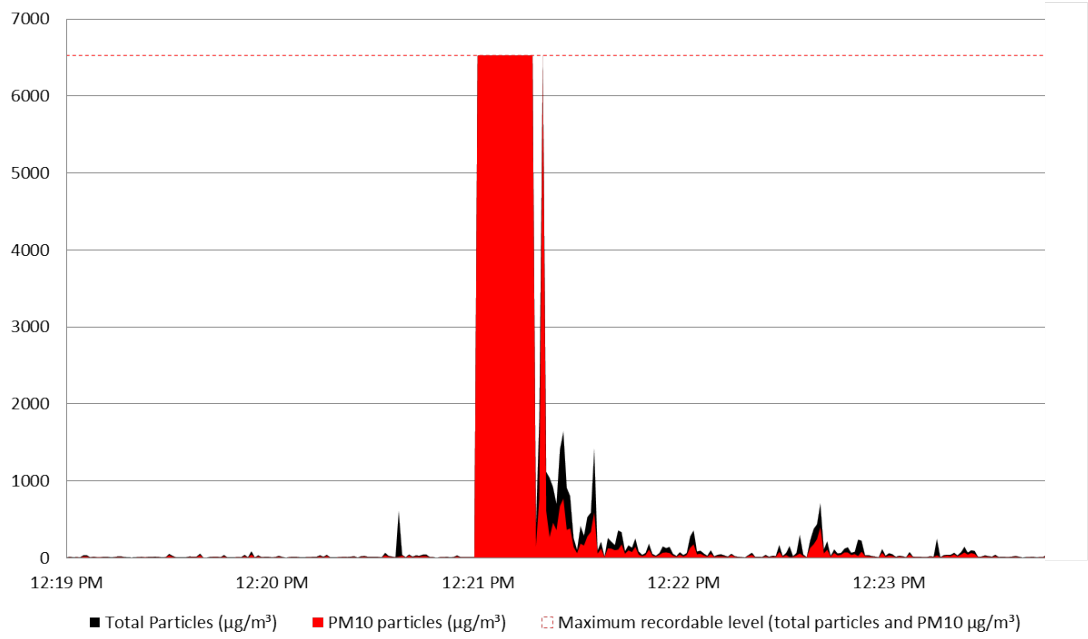

Figure 5 shows the first in a series of extreme particulate that were associated with a thick dust cloud drifting across from the stockpile. The specific source of the dust cloud was not observable from the monitoring site. **The results go beyond the recordable level of the monitoring equipment.**

This peak event lasted for approximately 47 seconds, from the sharp spike in pollution that occurred at 12:21:55pm until 12:22:42pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 4: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	22.8	11.3
during peak event*	2855.4	2664.6
2 mins after	73.8	37.0
% increase from before to during the peak event*	12434%	23391%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 4 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the OSIRIS equipment to measure. Nevertheless, the 12434% and 23391% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to levels that were significantly elevated from pre-peak event levels.

Figure 6: Peak event 5 – Thick dust cloud drifting across from stockpile 12:35pm Friday 8th November

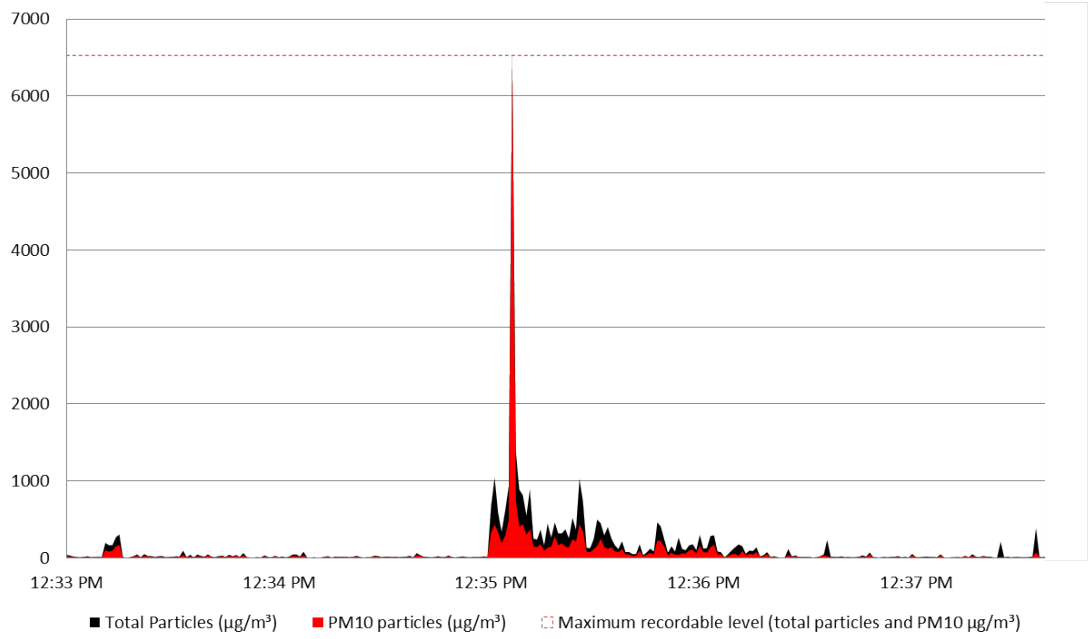

Figure 6 shows the second in a series of extreme particulate peaks that were associated with a thick dust cloud drifting across from the stockpile. The specific source of the dust cloud was not observable from the monitoring site. **The results go beyond the recordable level of the monitoring equipment.**

This peak event lasted for approximately 38 seconds, from the sharp spike in pollution that occurred at 12:35:24pm until 12:36:02pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 5: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	28.0	16.8
during peak event*	639.4	400.2
2 mins after	63.6	31.4
% increase from before to during the peak event*	2184%	2280%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 5 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the OSIRIS equipment to measure. Nevertheless, the 2184% and 2280% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to levels that were significantly elevated from pre-peak event levels.

Figure 7: Peak event 6 – Thick dust cloud drifting across from stockpile 12:36pm Friday 8th November

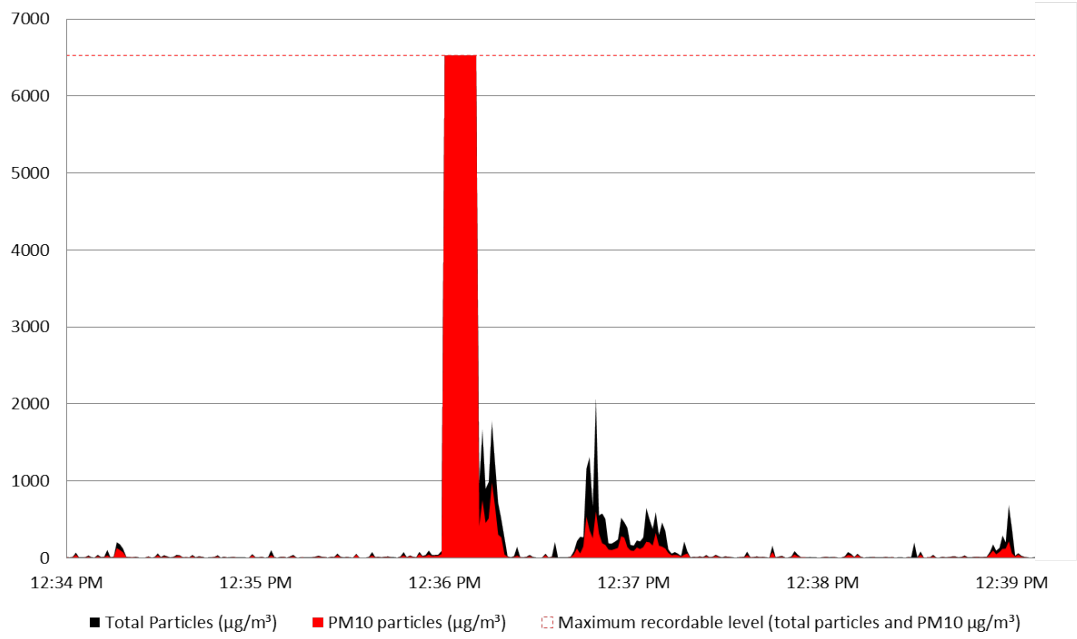

Figure 7 shows the third in a series of extreme particulate that were associated with a thick dust cloud drifting across from the stockpile. The specific source of the dust cloud was not observable from the monitoring site. **The results go beyond the recordable level of the monitoring equipment.**

This peak event was recorded less than one minute after peak event 5, nearby on a different OSIRIS machine, so could arguably be described as the same peak event.

This peak event lasted for approximately 71 seconds, from the sharp spike in pollution that occurred at 12:36:08pm until 12:37:20pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 6: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	24.7	14.9
during peak event*	1349.4	1159.9
2 mins after	39.9	19.0
% increase from before to during the peak event*	5373%	7665%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 6 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the OSIRIS equipment to measure. Nevertheless, the 5373% and 7665% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to close to pre-peak event levels, with some relatively small lingering elevation.

Figure 8: Peak event 7 – Thick dust cloud drifting across from stockpile 12:39pm Friday 8th November

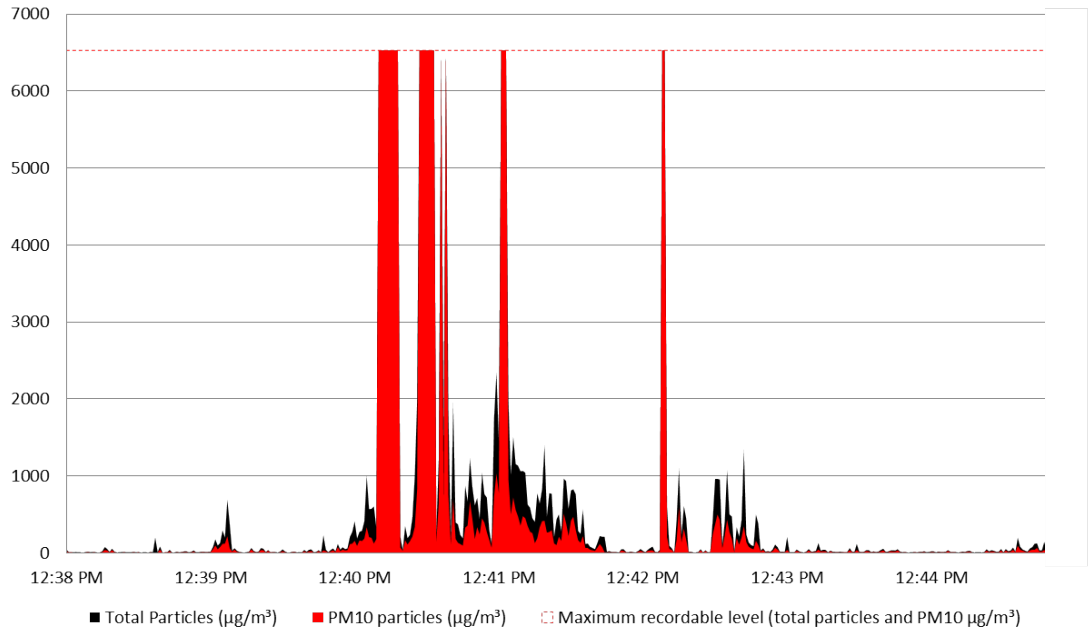

Figure 8 shows the fourth in a series of extreme particulate that were associated with a thick dust cloud drifting across from the stockpile. The specific source of the dust cloud was not observable from the monitoring site. **The results go beyond the recordable level of the monitoring equipment.**

This peak event lasted for approximately 171 seconds, from the sharp spike in pollution that occurred at 12:39:58pm until 12:42:49pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 7: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	40.9	19.6
during peak event*	1298.4	1063.5
2 mins after	31.5	17.2
% increase from before to during the peak event*	3078%	5337%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 7 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the OSIRIS equipment to measure. Nevertheless, the 3078% and 5337% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution over a sustained period of almost 3 minutes.

After the peak event concluded, TSP and PM10 returned to levels that were slightly below pre-peak event levels.

Figure 9: Peak event 8 – Dust devil moving across from stockpile 2:04pm Friday 8th November

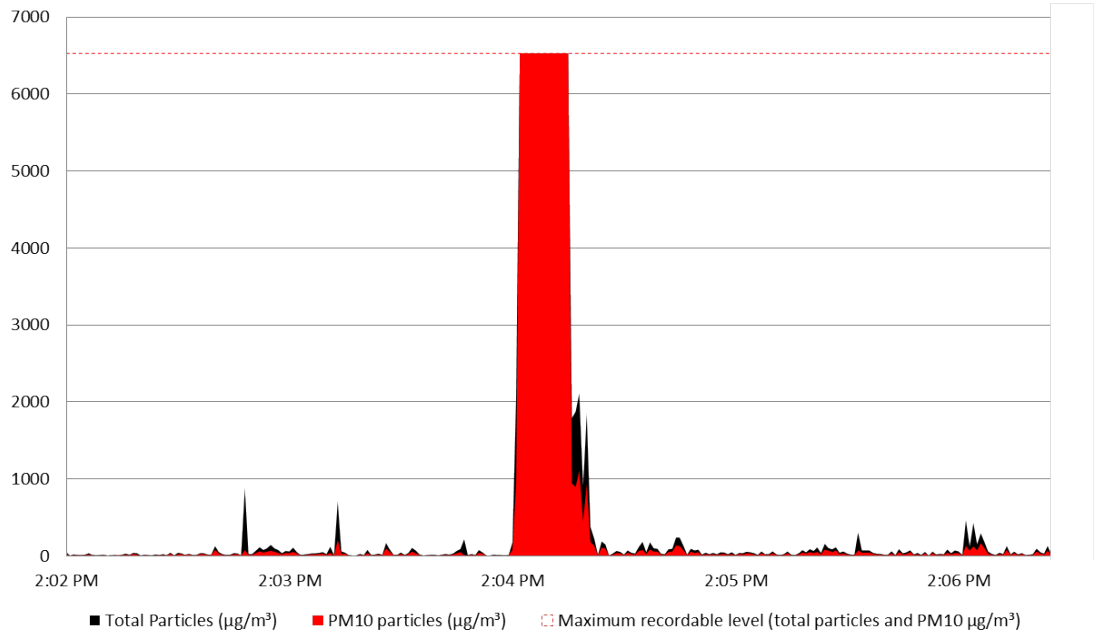

Figure 9 shows the extreme particulate peaks that were associated with a small dust devil moving across from the stockpile. **The results go beyond the recordable level of the monitoring equipment.**

This peak event lasted for approximately 26 seconds, from the sharp spike in pollution that occurred at 2:04:48pm until 2:05:04pm, when TSP and PM10 levels tapered off to below 100 and 50 µg/m^3 respectively.

Table 8: Mean TSP and PM10 levels before, during and after the peak event

	mean TSP	mean PM10
2 mins before peak event	47.7	21.5
during peak event*	3967.6	3741.4
2 mins after	66.3	35.0
% increase from before to during the peak event*	8213%	17328%

*Due to the limitations of the equipment, the upper threshold of the extreme peaks was unable to be recorded, so these values therefore represent the minimum mean/percentage during this peak event.

Table 8 shows the difference of TSP and PM10 levels before, during and after the peak event. The percentage increases of TSP and PM10 during the peak event represent the minimum increase since the upper threshold levels were beyond the ability of the OSIRIS equipment to measure. Nevertheless, the 8213% and 17328% increases in TSP and PM10 levels respectively represent an extreme increase in particulate pollution.

After the peak event concluded, TSP and PM10 returned to levels that were significantly higher than pre-peak event levels.

Summary of peak events

Of the eight peak events that were recorded, TSP increased between 639%-12434% from pre-peak event levels to during the peak events. Likewise, PM10 increased between 518%-23391% from pre-peak event levels to during the peak events. Once again, it should be noted that the upper threshold of TSP and PM10 during peaks events was beyond the measurement capacity of the Osiris equipment, so the actual levels were likely to be significantly higher. Nevertheless, the maximum recorded increases of TSP and PM10 during peak events were more than 125 times and 234 times than pre-peak levels.

6. Conclusions

As highlighted by Orkin et al, peak pollution events have a negative impact on communities and are currently not accounted for by standard monitoring processes. "Peak event analysis underscored extreme particulate events that may contribute to local complaints regarding intermittently dusty conditions. These outlier events may not appear through conventional analytical approaches. In comparison with conventional descriptive approaches, peak event analysis provided a more analytical and data-driven means to identify suspended particulate events with meaningful and perceptible effects on local residents."[xii]

This study found that peak pollution events at the Jondaryan stockpile occur regularly and are characterised by extremely high levels of PM_{10} pollution. The events were seen to be caused by a range of activities at the stockpile, including the loading and unloading of coal trains and trucks. Recorded peak pollution levels were influenced by other factors including wind direction and speed, with higher readings occurring when the wind was coming from the direction of the stockpile. The analysis showed that increases during a pollution event ranged from 518% of the pre-event levels, to 23391%. Based on this limited monitoring project, it appears that 1-2 peak events per hour is not uncommon.

Any increases in particulate air pollution in Jondaryan and along the West Moreton rail corridor will have adverse health impacts. There is no safe level of particulate pollution. Short term exposures can be harmful, especially to vulnerable people such as children, the elderly or those with existing illnesses. The peak pollution events recorded in this study show that tougher dust mitigation measures and stringent health assessments are required for all activities where coal dust may be an issue.

7. Recommendations

The results of this study warrant decisive action by the Queensland Government. Clean Air Queensland commends this study to Premier Campbell Newman and calls on the Queensland Government to:

- Direct the state's coal industry to enclose all coal stockpiles, or introduce a buffer zone to remove them to safe distances from residential areas, as a matter of urgency
- Implement Health Impact Assessments as part of all coal project approval processes
- Monitor and regulate peak pollution events
- Review current Occupational Health and Safety protocols at Jondaryan coal stockpile in relation to dust mitigation and protection of employees health
- Revise the standards for PM10 pollution to take into account new peer reviewed evidence on the health impacts of air pollution, including impacts of peak pollution events.
- Commission an independent assessment of the health impacts of particulate pollution in Jondaryan and all along the West Moreton rail corridor to assess the social and economic impacts of current particle concentrations and model the impacts of increased coal movements as a result of the proposed Acland stage 3 mine expansion.

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