5th August 2020

For the attention:
Hoagy Moscrop-Allison
Senior Planner – Major Assessment
City Development Branch
Council of City of Gold Coast

Dear **Hoagy Moscrop-Allison,**

Objection submission COM/2019/81 - Dust Limits exceeded in modelled data

Please find below further information that I think should be considered re this development Application and its 'Noise and Dust' Submission.

I have already identified how the Dust analysis assessment, that was submitted as part of the development application, failed to include any consideration for the cumulative dust effects of close industry i.e. Bullrin Quarry 400m, Holcim concrete batching facility 200m (identified in Attachment A1). Please see objection: "Modelled Dust Submission results are culpably misleading, incorrect and highly dangerous", dated 17th July 2020 for further info if required.

The submitted Dust Analysis fails to include wind erosion appropriately, it underestimates the number and effect of the haulage trucks and also ignores the immense amount of dust generated during the regular blasting events (as highlighted in the objection of 17th July 2020 also).

Even ignoring these vast swathes of additional dust sources, that I believe should have been considered in the modelled data, it is still blatantly obvious that Nucrush, by its own admission, cannot meet the air quality objectives that it is claimed and/or required to meet. My additional concerns are highlighted below:

Stage 1 (Years 0 to 19) Dust Deposition Exceeded

The 'Noise and Dust Assessment' submitted figure A7.5 titled: "Stage 1 Operations (Northern Haul Route) plus ambient Maximum Monthly Dust Deposition Rates" (reproduced in Attachment B1) clearly show how the Department of the Environment Air impacts guideline of 120 mg/m²/day (Attachment A3) and Environmental Authority EA0002207 (Attachment A4) is exceeded throughout a distance of over a kilometre along the public highway (Maudsland Road and Tamborine-Oxenford Road) and also at the entrance to the MK Wake park and the Aqua Park at '34 Maudsland Road'. It is also above the maximum permitted concentration at '304 Tamborine Oxenford Road' which is a public open space and also at '241 Tamborine Oxenford Road' (Zoned 'Open space' and not owned by Nucrush).

Therefore, I fail to see how this Development application can be considered when it is clear to see, using the development application submitted information, that for the next twenty years (Stage 1, Attachment A6) the Dust Deposition rate will be exceeded on a permanent basis in public places, on public roads and at '241 Tamborine Oxenford Road', '304 Tamborine Oxenford Road' and '34 Maudsland Road' (none of which are owned by Nucrush).

The Queensland Air quality bulletin (Attachment A5) identifies that Dust Deposition above the 120mg/m² per day limit (averaged over one month) is used to assess dust nuisance. And highlights that these public and private area will be submitted to dust nuisance above the guidelines.

Stage 1 (Years 0 to 19) PM10 '24 hour average' concentrations

Similarly, the submitted figure A7.1 titled: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted Maximum PM10 '24-hour average' concentrations" (Reproduced in Attachment B2) clearly show how the 50µg/m³ limit (Attachment A2 and A4) is exceeded along the public highway (Maudsland Road and Tamborine-Oxenford Road) and also at the entrance to the MK Wake park and the Aqua Park at '34 Maudsland Road'. It is also above the maximum permitted concentration at '304 Tamborine Oxenford Road' which is a public open space and also at '241 Tamborine Oxenford Road' (none of these owned by Nucrush).

Therefore, I again fail to see how this Development application can be considered when it is clear to see, using the development application own submitted information, that for the next twenty years the PM10 '24 hour average' concentrations will be exceeded on a permanent basis in public places, and on public roads and at '241 Tamborine Oxenford Road', '304 Tamborine Oxenford Road' and '34 Maudsland Road' also (none of which are owned by Nucrush).

Stage 1 (Years 0 to 19) PM2.5 'annual average' concentrations

Similarly, the submitted figure A7.4 titled: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted Maximum PM2.5 annual average concentrations" (Reproduced in Attachment B3) clearly show how the 8µg/m³ limit (As defined in the Australian Ambient Air quality standards, Attachment A2) is exceeded outside the quarry entrance on a seemingly permanent basis.

Therefore, I again fail to see how this Development application can be considered when it is clear to see, using the development applications own submitted information, that for the next twenty years the PM2.5 annual average concentrations will be exceeded on a chronic 24/7 **permanent** basis in a public place, namely the Maudsland Road.

Stage 1 (Years 0 to 19) TSP annual average concentrations

Similarly, the submitted figure A7.6 titled: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted TSP annual average concentrations" (Reproduced in Attachment B4) clearly show how the 90µg/m³ limit (As defined in the Australian Ambient Air quality standards, Attachment A2) is exceeded outside the quarry entrance on a seemingly permanent basis.

Therefore, I again fail to see how this Development application can be considered when it is clear to see, using the development application submitted information, that for the next twenty years the TSP annual average concentrations will be exceeded on a chronic 24/7 **permanent** basis in a public place namely the Maudsland Road.

Stage 5 - Years 34 to 37

It can be clearly seen from attachment C1 through to C4 that the failings in Stage 1 (years 0 to 19) are carried through to years 34 to 37 also (data for Stages 2, 3, 4 or years 20 through to 33 is not provided by the development application).

Therefore, I again fail to see how this Development application can be considered when it is clear to see, using the development application submitted information, that for the next thirty seven years the Dust Deposition, the PM10 24 hour average, the PM2.5 annual average and the TSP annual average concentrations will ALL be exceeded in public and privately owned places.

Stage 7 - Years 40 to 96

It can be clearly seen from attachment D1 through to D4 that the failings in Stage 1 (years 0 to 19) and Stage 5 (Years 34 to 37) are carried through to years 40 to 96 also (data for Stages 2, 3, 4 and 6 not supplied).

Additionally, it can be seen the Dust Deposition on the Freshwater lake ('366 Tamborine Oxenford Road') would be exceeded for the chronic 24/7 exposure of the public use of this lake for swimming, fishing and skiing, amongst other water sports (Attachment D1). Also, '304 Tamborine Oxenford Road' and '241 Tamborine Oxenford Road' would be receiving enhanced levels of chronic exposure.

Likewise the PM10 '24 hour average' is now throughout the freshwater lake area ('366 Tamborine Oxenford Road') and encompassing '304 Tamborine Oxenford Road' and all of '241 Tamborine Oxenford Road' to the North. However, this is hard to decipher as the area that is exceeding the maximum permitted concentration for PM10 is by this Stage way off the submitted diagram (Attachment D2). Therefore, we are unable to ascertain how far the actual area that the PM10 '24 hour average' maximum permitted concentration is exceeded actually extends! Does it reach the houses to the North? We are unfortunately unable to ascertain this from the inconclusive submitted data.

If, however, the PM10 'annual average' figure had been plotted (which is far more appropriate for chronic exposure of vulnerable children and adults), I am sure this would have made very dismal reading.

Are these submitted modelled Noise and Dust 'Annual average' figures correct?

There appears to be a troubling discrepancy in the submitted figures.

From the Particle Size distribution, which was submitted as part of the Noise and Dust Submission (reproduced in Attachment E1) it can be seen that the particle size distribution for PM2.5 is 5.3% of the total suspended particulate (TSP) or 100% of the dust particles.

When you look at, for example Stage 7, the PM2.5 annual average concentration is shown as 8µg/m³ (coincidentally the maximum permitted concentration) right along the North Western boundary from the entrance right up to where the Quarry meets Lot 1 on RP138386 to the North (241 Tamborine Oxenford Road) as show in Figure A12.4 (reproduced in Attachment D3). Whereas the TSP annual

average for the same boundary threshold is shown as 90 µg/m³, coincidentally the maximum permitted concentration also (reproduced in attachment D4)!

However, basic assumptions is that if the PM2.5 particle size distribution is 5.3% of the TSP then the '8 µg/m³' of PM2.5 particles (5.3% of the TSP) will translate into an approximate TSP of '151 µg/m³' (8ug / 5.3% * 100%). Which is way beyond the maximum permitted concentration of '90 µg/m³'.

In my opinion, it is blatantly obvious that both the PM2.5 'annual average' (Attachment D3) and the TSP 'annual average' (Attachment D4) maximum permitted concentrations have apparently been 'shoe horned' to fit within the quarry boundary. However, a cursory glance at these figures highlights there is a serious discrepancy that look suspiciously like culpable manipulation to appear compliant when it would seem they clearly are not.

To summarise, if PM2.5 'annual average' at the quarry western boundary is '8 µg/m³' (as shown in Attachment D3) then the TSP 'annual average' would be in the region of '151 µg/m³'. This is way above the TSP 'maximum acceptable concentration' of '90 µg/m³' (Attachment A7) that is claimed (and is shown in Attachment D4).

PM10 'annual average' figures

Under the National Environment Protection Measure for ambient air quality Australian governments have set a national ambient air quality standards for particulate matter. These guidelines state PM10 outdoor averaged over a 24 hour period is '50 µg/m³' and an outdoor average over a year of '25 µg/m³' (reproduced in Attachment E2).

It is considered that the 24 hour average exposure more commonly used to establish eight hour exposure for a time weighted average (TWA) of healthy young quarry workers, provided with appropriate personal protective equipment (PPE), rather than the annual average more suitable for chronic 24/7 exposure of vulnerable children and adults who obviously have not been provided with any form of PPE. Given the proximity of local residents to the quarry boundaries, and given the reduced separation buffers down to 200m, it would seem more pertinent to use 'annual average' figures. However, unfortunately, and maybe culpably, the PM10 annual average figures have not been submitted.

However, we can estimate the PM10 average annual figures based on the TSP annual average and the PM2.5 annual average figures submitted:

Using PM2.5 figures

From the Particle Size distribution of the Noise and Dust Submission (reproduced in Attachment E1) it can be seen that the particle size distribution for PM10 is 35% of the total suspended particulate (TSP). Therefore, given the PM2.5 is '8 µg/m³' (which is 5.3% of the TSP) shown up the North west boundary (Attachment D3) it can be assumed that the average annual PM10 figure will be approximately: '53 µg/m³' (8ug / 5.3% * 35%). i.e. 5.3% of particle matter is '8 µg/m³', therefore 35% will be approximately '53 µg/m³'. Which is over double the maximum permitted concentration of '25 µg/m³' for annual average exposure.

Using TSP figures

To double check, the TSP is claimed to be 90µg/m³ at this North west boundary (Attachment D4). The PM10 constituent part of this is 35% (Attachment E1). Therefore, it can be assumed that the average

annual PM10 figure will be approximately: '32 µg/m³' (90ug /100% * 35%). i.e. 100% of particle matter is '90 µg/m³', therefore 35% will be approximately '32 µg/m³'. Which is still over the maximum permitted concentration of '25 µg/m³' for annual average exposure.

PM10 Annual average Summary

Therefore, calculating the approximate annual PM10 figures using the PM2.5 submitted figures gives a double annual exposure at the boundary of '53 µg/m³'. Whereas calculating the approximate annual PM10 figures using the TSP submitted figures gives an above limit annual exposure at the boundary of approximately '32 µg/m³'.

This shows that whichever way it is calculated, the PM10 annual exposure at the boundary will be exceeded. However, the difference in the figures that were derived suggest the submitted data (TSP and/or PM2.5) is inaccurate and requires urgent further investigation.

Given the PM10 '24 hour average' figures (Attachment D2) show that up to '40 µg/m³' level will be exposed to homes to the East (at receptor R3) and given that the PM10 'annual average' figure is calculated at between '32 and 53 µg/m³' it would appear that homes to the East will be chronically exposed 24/7 to an above annual average limit of PM10 i.e. above the maximum permitted concentration of '25 µg/m³'.

This is for Stage 7, however, the same appears to be true for the submitted stages 1 and 5 also (Attachment B2 and C2). Therefore, it appears that homes to the east will be chronically exposed24/7 to an inhalable and respirable PM10 annual average above the Australian limit throughout every stage of the one hundred year plus plan for this extension/expansion. And, of course this is without the cumulative effect of surrounding industry, or any allowance for dust from blasting or the reduced wind erosion modelled data submitted, or the reduced number of haulage trucks modelled.

Thus, it would appear that the residents to the East will receive 24/7 chronic exposures that is above the inhalable and respirable PM10 'annual average' limits even higher than shown here and on a seemingly permanent basis!

Wind Effect

It should also be noted that the modelled data makes seemingly no allowance for any wind conditions. This would make these already astonishingly tight limits, that are teetering (we are required to believe) on the very edge of quarry boundaries, exceeded on a routine basis with the very slightest of breezes.

I hope the effects of wind dissipation of the raised dust levels (PM2.5, PM10, Dust deposition and TSP) is taken into consideration by the Council Planners when considering this development application and its effect on vulnerable children and adults submitted to the chronic exposure of raised dust levels due to the unfortunate reduced separation buffers they are being unwittingly subjected to.

Conclusion

It should be remembered, that despite functioning as a quarry over the last twenty seven years it has chosen, for its Dust assessment, to model the dust data despite having the ability to collate actual real data results. This is suspicious, especially as the development application claims to be merely extending its current program rather than increasing its output.

What did the quarry have to hide by not using real data? Well for a start this enabled it to ignore the cumulative effect of neighbouring industry. It also enabled it to apparently underestimate the wind erosion effect. It also enabled it to underestimate the number of haulage trucks. It also enabled it to forget to include any of the immense dust clouds generated during blasting that have been seemingly ignored in the modelled data.

However, despite all these factors omitted from their modelled data, the submitted data still shows how Nucrush will be unable to fall within the maximum acceptable concentrations for the PM2.5, PM10, TSP and Dust Deposition limits required.

Their modelled data submission shows how all of these parameters will be exceeded in public places and adjoining lots for an envisaged chronic exposure of twenty-four hours a day seven days a week for the whole of the proposed one hundred plus years expansion / extension requested.

It should also be remembered that the PM10 figures submitted are '24 hour average' and therefore more appropriate for occupational exposure for generally fit healthy young quarry workers, who are provided with appropriate personal protective equipment, facing an eight hour time weighted average (TWA) exposure. However, given the urban environment that the quarry is located and that the dust limits are already exceeded in public areas it would be far more appropriate to submit the chronic exposure non-occupational limits more accurately reflected in the PM10 'annual average'. Unfortunately, these have been omitted. But, would show far worse exposure in the public areas and the adjoining lots identified and many homes to the East. Thus, the chronic 24/7 effect on vulnerable children and adults would be far greater than what the 'PM10 24 hour average' figures might otherwise suggest.

I fail to see how this development application could possibly be accepted when, by its own omission, it cannot meet the maximum acceptable air quality objectives throughout any of its planned one hundred plus year plan.

I hope the Council Planners and the Councillors deciding this development application will understand the dangers of allowing enhanced dust pollution levels, within a suburban environment and in public places that are clearly over limit for chronic 24/7 exposure for vulnerable children and adults.

To accept this development application, given that the dust deposition, the total suspended particles (TSP) and the PM2.5 and PM10 parameters are exceeded beyond their boundaries and in public and privately owned places, throughout its one hundred year plan, as proven by their submitted documentation, would be absolutely heinous.

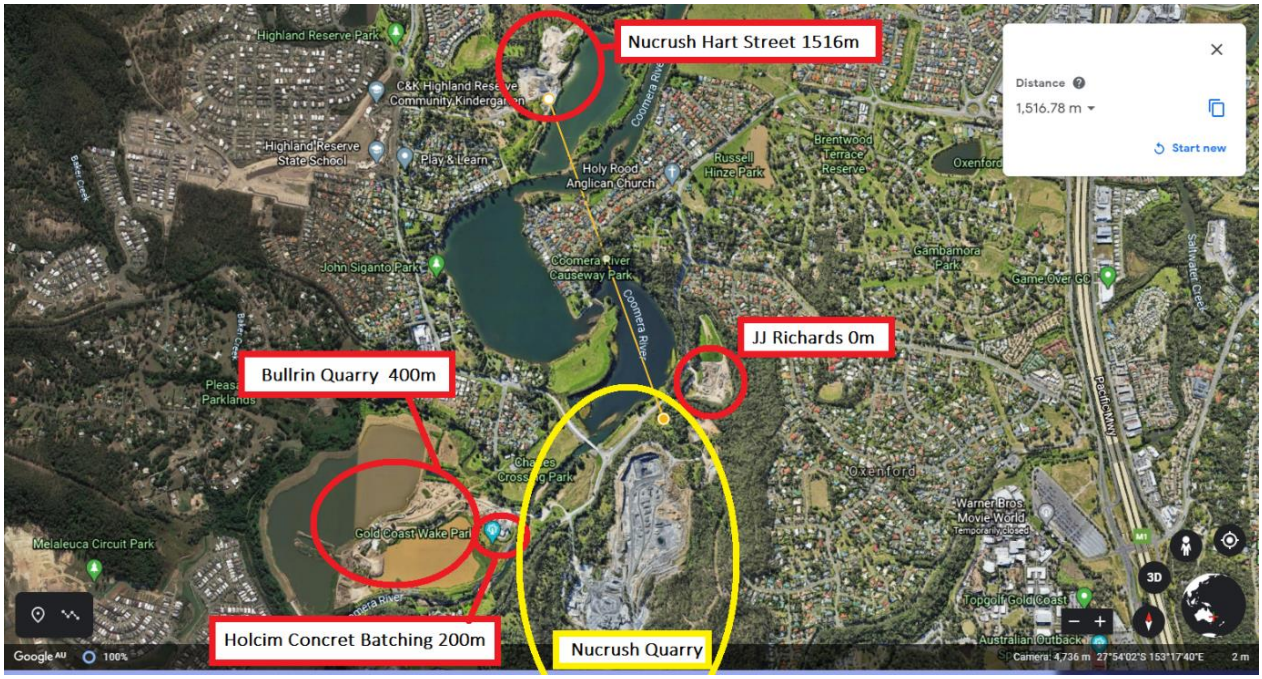
Thank you for considering my objection,

Kind regards

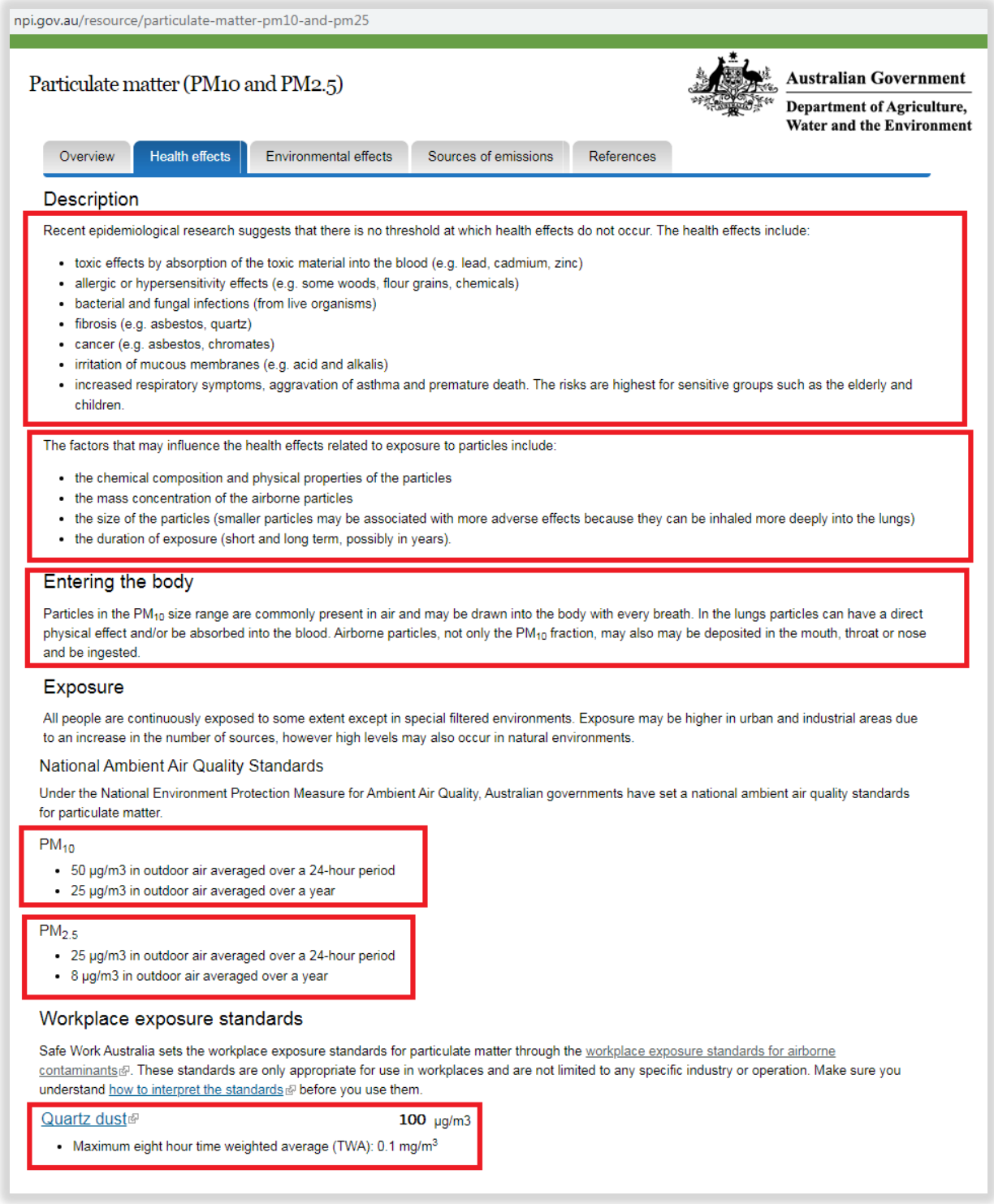
Tony Potter

* Disclaimer. Please note my findings are believed correct and are to the best of my ability. However, there may be errors and assumptions I have made that are incorrect. I do not believe this to be the case, but, realise with the vast amounted of submitted data from the applicant, errors and assumptions on my part may occur. Hopefully this is not the case, but please accept my apologises if this is so. Thank you.

Attachment A1 - Industrial activity affecting local ambient conditions



Attachment A2 - Australian National Ambient Air Quality Standards



npi.gov.au/resource/particulate-matter-pm10-and-pm25

Particulate matter (PM10 and PM2.5)

Australian Government
Department of Agriculture, Water and the Environment

Overview | Health effects | Environmental effects | Sources of emissions | References

Description

Recent epidemiological research suggests that there is no threshold at which health effects do not occur. The health effects include:

- toxic effects by absorption of the toxic material into the blood (e.g. lead, cadmium, zinc)
- allergic or hypersensitivity effects (e.g. some woods, flour grains, chemicals)
- bacterial and fungal infections (from live organisms)
- fibrosis (e.g. asbestos, quartz)
- cancer (e.g. asbestos, chromates)
- irritation of mucous membranes (e.g. acid and alkalis)
- increased respiratory symptoms, aggravation of asthma and premature death. The risks are highest for sensitive groups such as the elderly and children.

The factors that may influence the health effects related to exposure to particles include:

- the chemical composition and physical properties of the particles
- the mass concentration of the airborne particles
- the size of the particles (smaller particles may be associated with more adverse effects because they can be inhaled more deeply into the lungs)
- the duration of exposure (short and long term, possibly in years).

Entering the body

Particles in the PM_{10} size range are commonly present in air and may be drawn into the body with every breath. In the lungs particles can have a direct physical effect and/or be absorbed into the blood. Airborne particles, not only the PM_{10} fraction, may also may be deposited in the mouth, throat or nose and be ingested.

Exposure

All people are continuously exposed to some extent except in special filtered environments. Exposure may be higher in urban and industrial areas due to an increase in the number of sources, however high levels may also occur in natural environments.

National Ambient Air Quality Standards

Under the National Environment Protection Measure for Ambient Air Quality, Australian governments have set a national ambient air quality standards for particulate matter.

PM_{10}

- 50 µg/m3 in outdoor air averaged over a 24-hour period
- 25 µg/m3 in outdoor air averaged over a year

$PM_{2.5}$

- 25 µg/m3 in outdoor air averaged over a 24-hour period
- 8 µg/m3 in outdoor air averaged over a year

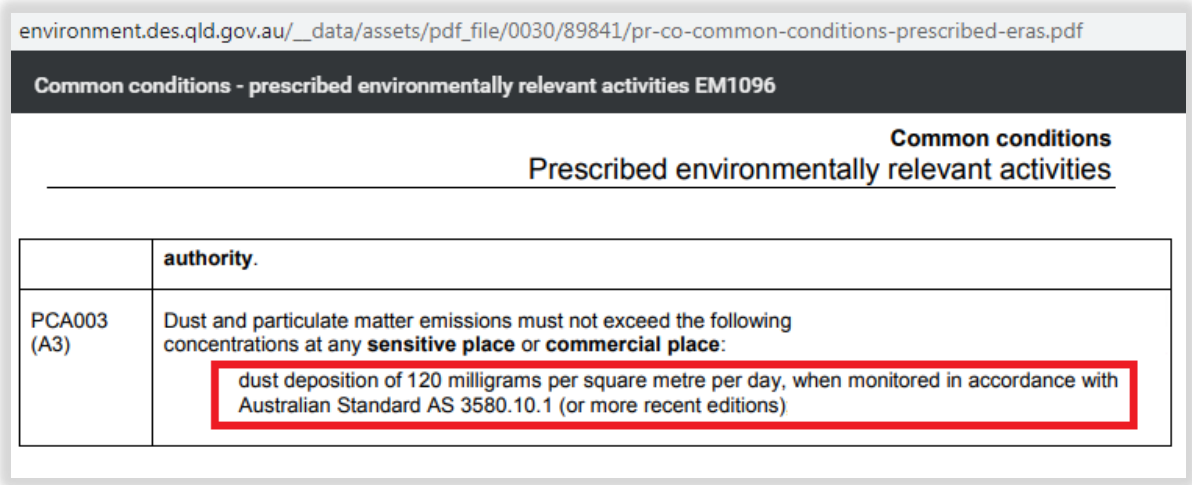
Workplace exposure standards

Safe Work Australia sets the workplace exposure standards for particulate matter through the workplace exposure standards for airborne contaminants. These standards are only appropriate for use in workplaces and are not limited to any specific industry or operation. Make sure you understand how to interpret the standards before you use them.

Quartz dust **100** µg/m3

- Maximum eight hour time weighted average (TWA): 0.1 mg/m^3

Attachment A3 Department of the Environment and Science Dust Deposition Limit 120 mg/m²



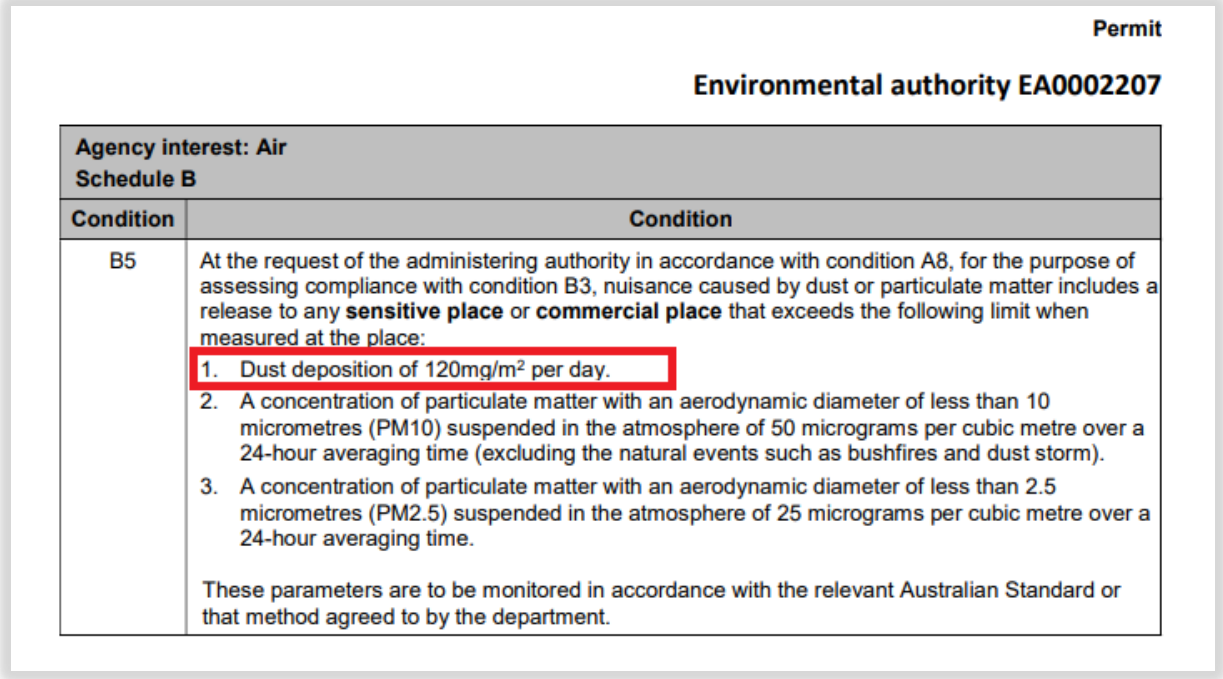
environment.des.qld.gov.au/__data/assets/pdf_file/0030/89841/pr-co-common-conditions-prescribed-eras.pdf

Common conditions - prescribed environmentally relevant activities EM1096

Common conditions
Prescribed environmentally relevant activities

	authority.
PCA003 (A3)	Dust and particulate matter emissions must not exceed the following concentrations at any **sensitive place** or **commercial place**: dust deposition of 120 milligrams per square metre per day, when monitored in accordance with Australian Standard AS 3580.10.1 (or more recent editions)

Attachment A4 Des Environmental Authority EA0002207 Dust Deposition Limit 120 mg/m²

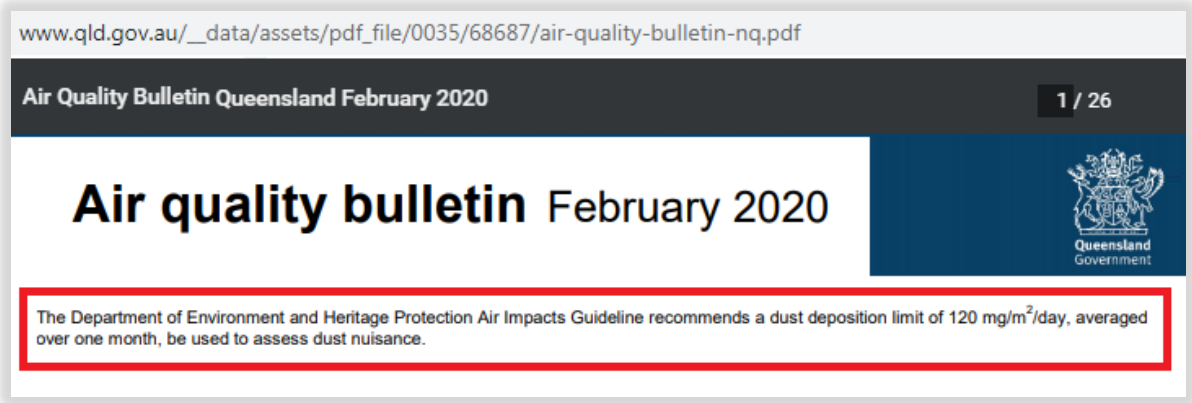


Permit

Environmental authority EA0002207

Agency interest: Air **Schedule B**	
Condition	**Condition**
B5	At the request of the administering authority in accordance with condition A8, for the purpose of assessing compliance with condition B3, nuisance caused by dust or particulate matter includes a release to any **sensitive place** or **commercial place** that exceeds the following limit when measured at the place: 1. Dust deposition of 120mg/m² per day. 2. A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time (excluding the natural events such as bushfires and dust storm). 3. A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM2.5) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time. These parameters are to be monitored in accordance with the relevant Australian Standard or that method agreed to by the department.

Attachment A5 - Queensland Air quality Bulletin highlighting the Dust Deposition Limit is used to assess dust nuisance


www.qld.gov.au/__data/assets/pdf_file/0035/68687/air-quality-bulletin-nq.pdf

Air Quality Bulletin Queensland February 2020 1 / 26

Air quality bulletin February 2020

Queensland Government

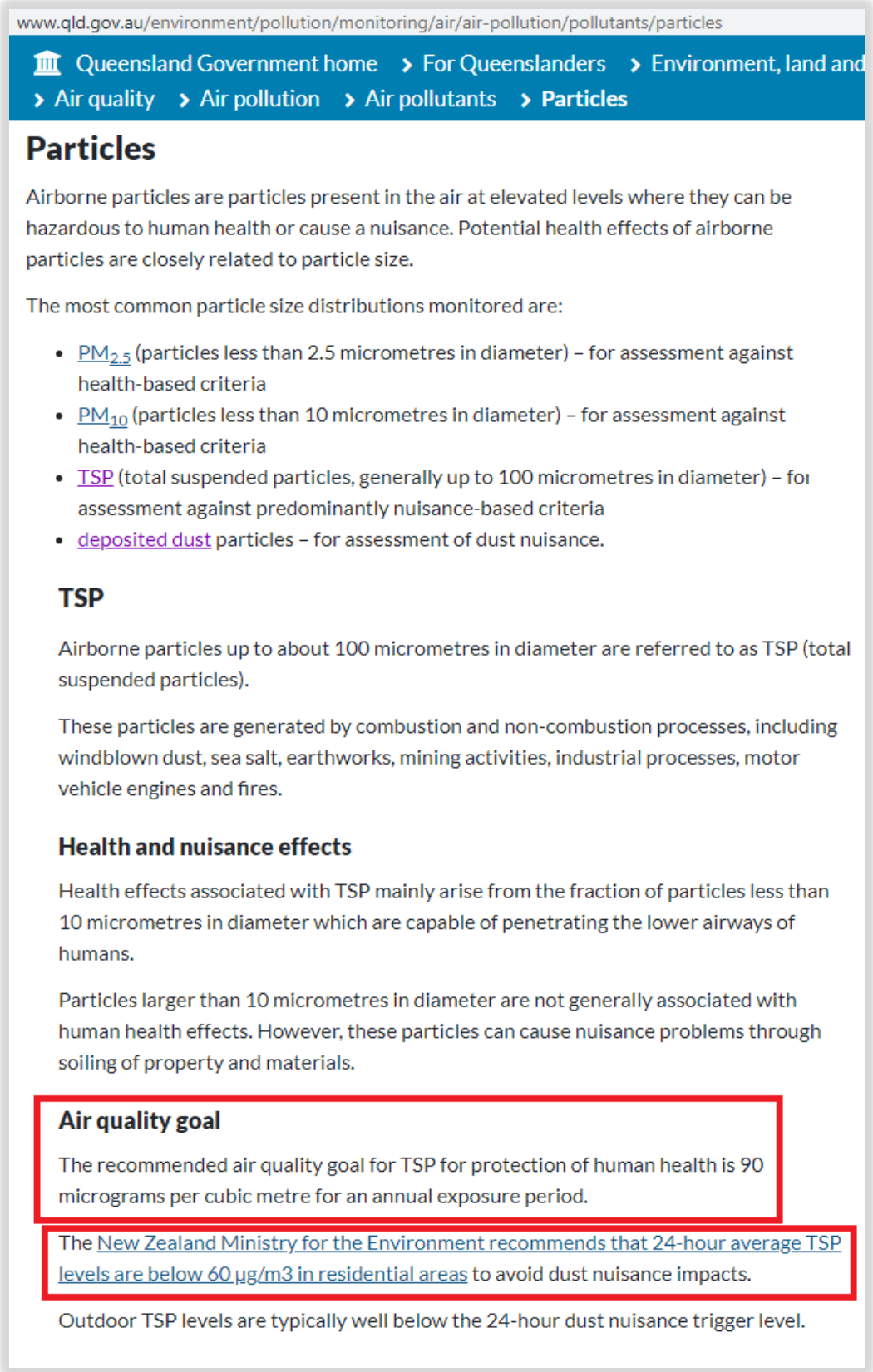
The Department of Environment and Heritage Protection Air Impacts Guideline recommends a dust deposition limit of 120 mg/m^2/day, averaged over one month, be used to assess dust nuisance.

Attachment A6 - Development Application 100 year plus plan

The extraction will be staged over the life of the quarry operation, which is likely to continue for approximately 100 years. The staging sequence for pit development and, hence, subsequent rehabilitation, will be dependent on resource demand and cannot be forecast accurately for the life of the quarry. Estimated (subject to change) stage timing for the development of the pit is as follows:

- Stage 1 - Year 0 to 19
- Stage 2 - Year 19 to 25.
- Stage 3 - Year 25 to 30.
- Stage 4 - Year 30 to 34.
- Stage 5 - Year 34 to 37.
- Stage 6 - Year 37 to 40.
- Stage 7 - Year 40 to 96.
- Stage 8 - Year 96 to 100+.
- Stage 9 - Year 100+.
- Stage 10 – Rehabilitated.

Attachment A7 - Total Suspended Particles (TSP) Limit is 90 µg/m³



www.qld.gov.au/environment/pollution/monitoring/air/air-pollution/pollutants/particles

Queensland Government home › For Queenslanders › Environment, land and
› Air quality › Air pollution › Air pollutants › **Particles**

Particles

Airborne particles are particles present in the air at elevated levels where they can be hazardous to human health or cause a nuisance. Potential health effects of airborne particles are closely related to particle size.

The most common particle size distributions monitored are:

- $PM_{2.5}$ (particles less than 2.5 micrometres in diameter) – for assessment against health-based criteria
- PM_{10} (particles less than 10 micrometres in diameter) – for assessment against health-based criteria
- TSP (total suspended particles, generally up to 100 micrometres in diameter) – for assessment against predominantly nuisance-based criteria
- deposited dust particles – for assessment of dust nuisance.

TSP

Airborne particles up to about 100 micrometres in diameter are referred to as TSP (total suspended particles).

These particles are generated by combustion and non-combustion processes, including windblown dust, sea salt, earthworks, mining activities, industrial processes, motor vehicle engines and fires.

Health and nuisance effects

Health effects associated with TSP mainly arise from the fraction of particles less than 10 micrometres in diameter which are capable of penetrating the lower airways of humans.

Particles larger than 10 micrometres in diameter are not generally associated with human health effects. However, these particles can cause nuisance problems through soiling of property and materials.

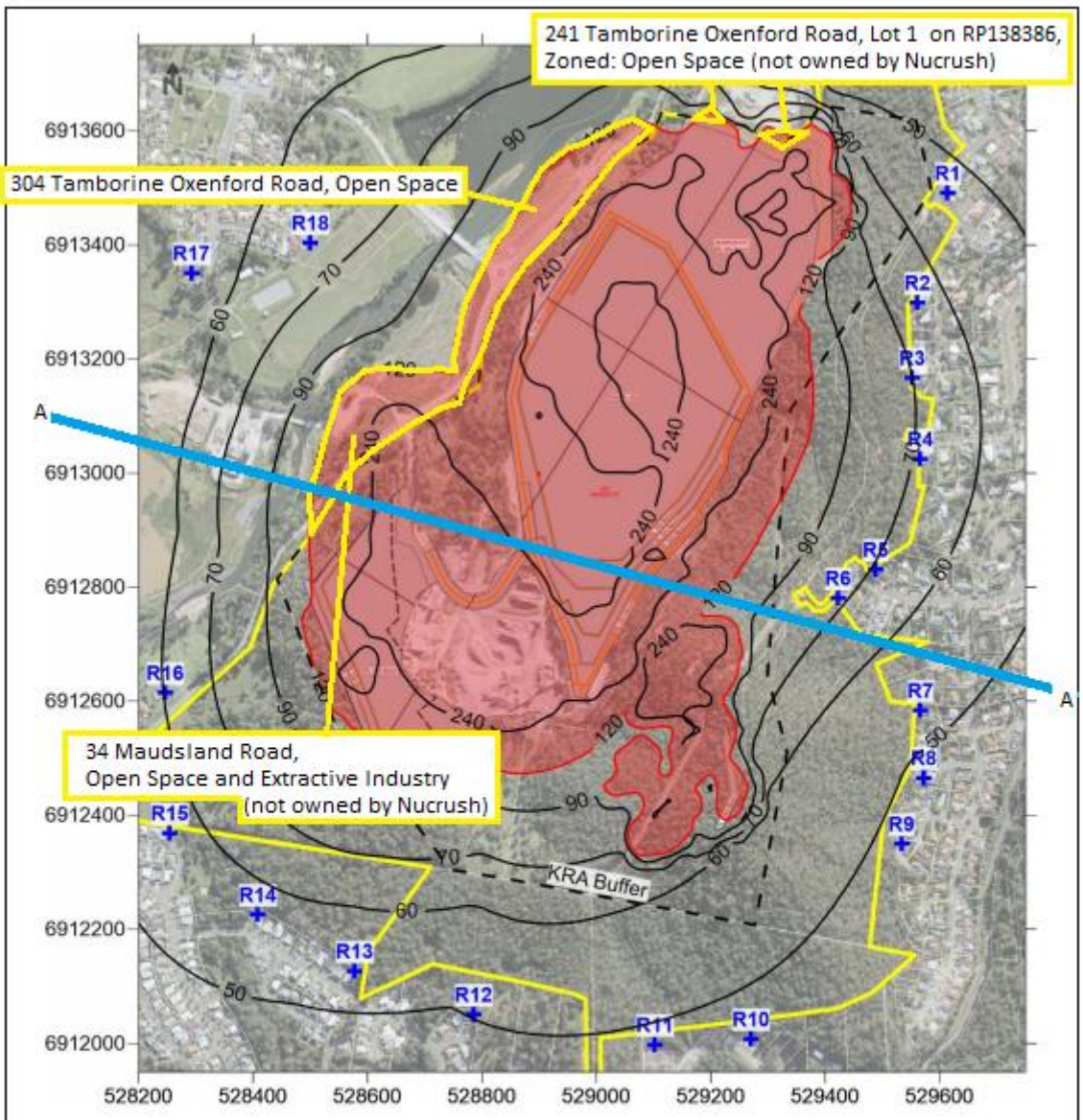
Air quality goal

The recommended air quality goal for TSP for protection of human health is 90 micrograms per cubic metre for an annual exposure period.

The New Zealand Ministry for the Environment recommends that 24-hour average TSP levels are below 60 µg/m3 in residential areas to avoid dust nuisance impacts.

Outdoor TSP levels are typically well below the 24-hour dust nuisance trigger level.

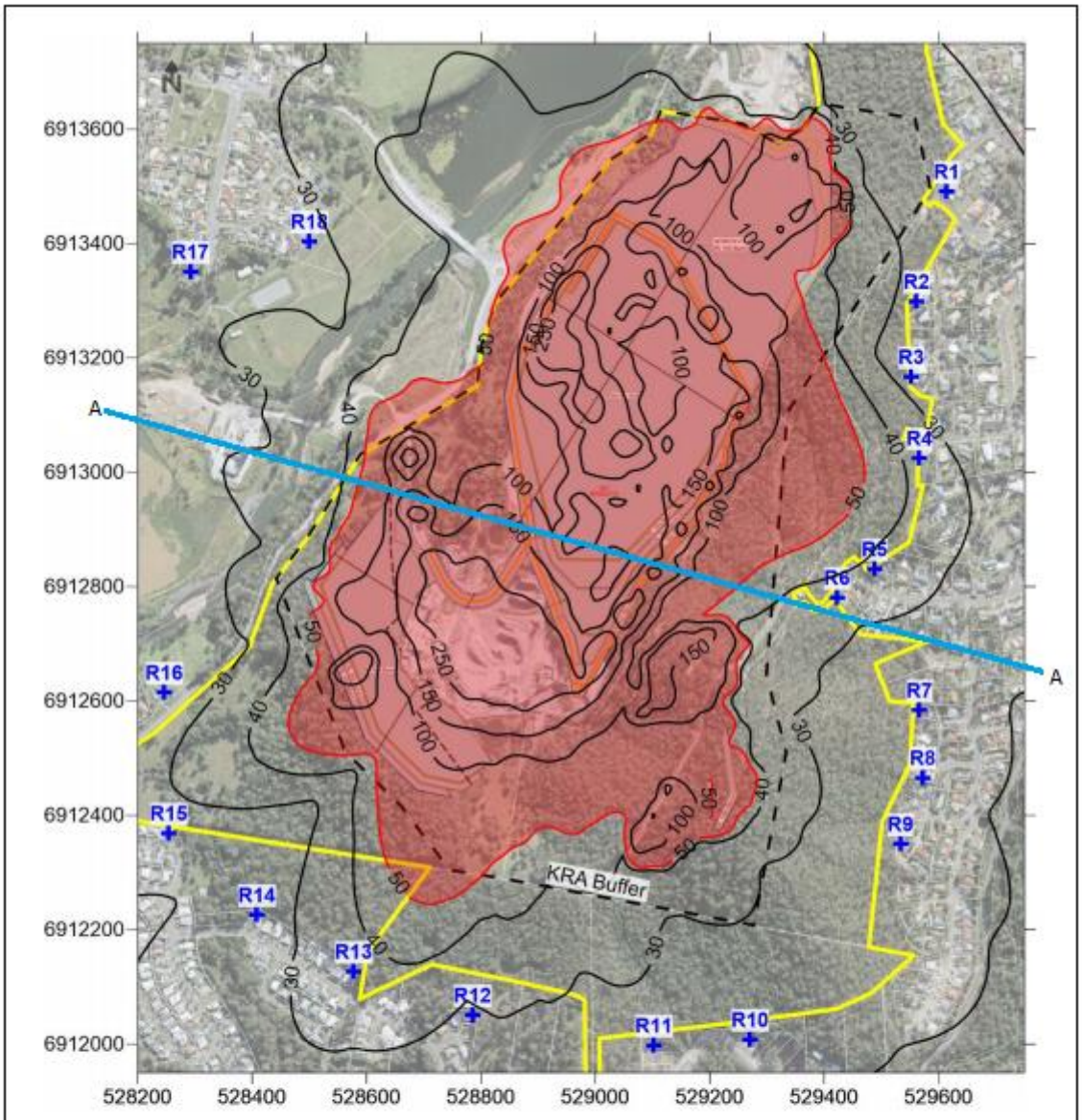
Attachment B1 - Figure A7.5: "Stage 1 Operations (Northern Haul Route) plus ambient Maximum Monthly Dust Deposition Rates"



Stage 1 Operations (Northern Haul Route) plus Ambient Maximum Monthly Dust Deposition Rates

Figure A7.5	Pollutant	Averaging Period	Background Deposition Rate	Common ERA Guideline	Date
mwa ENVIRONMENTAL	Dust Deposition	Maximum Monthly Average	40 mg/m²/day	120 mg/m²/day	2019-01-22

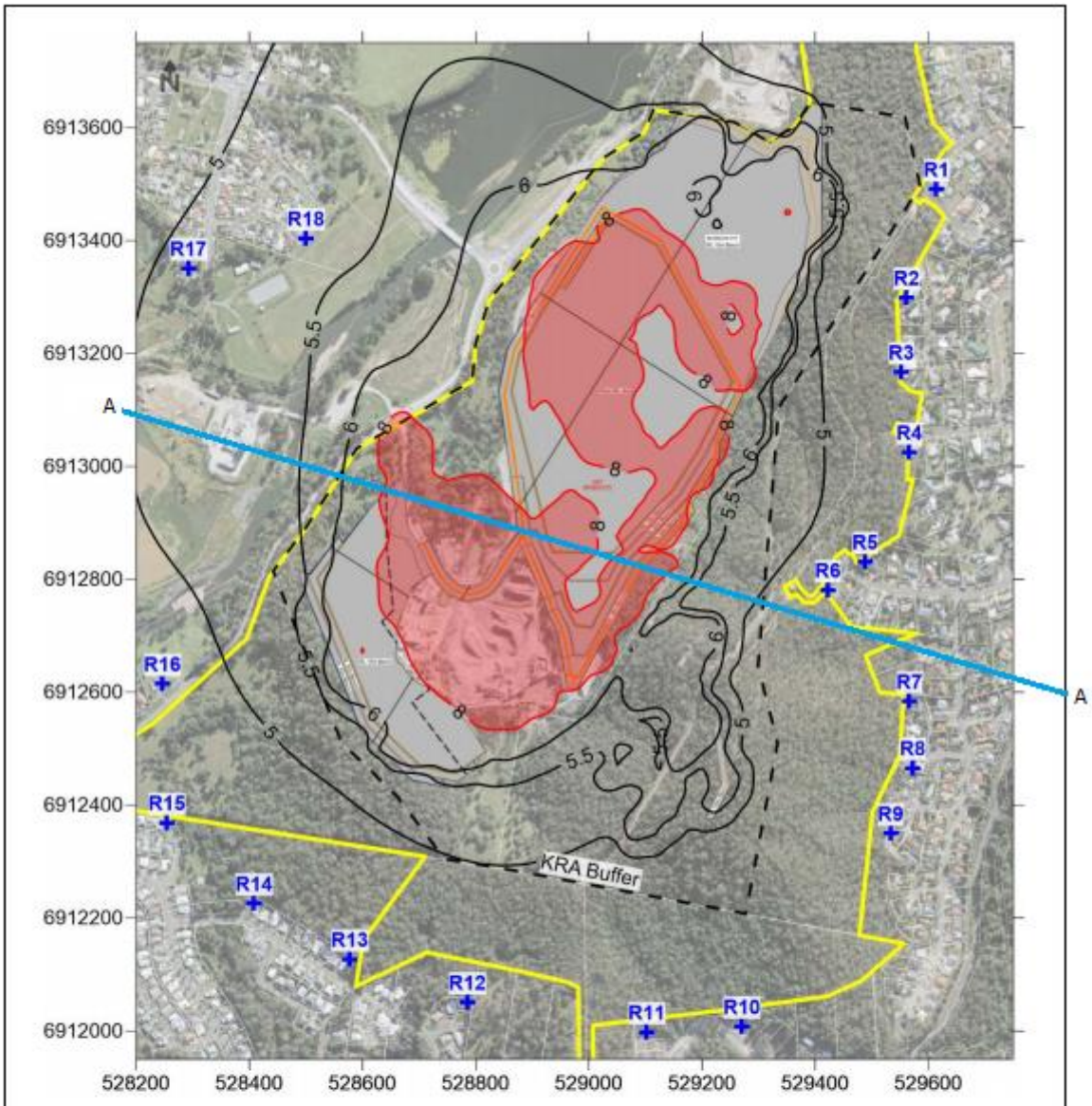
Attachment B2 - Figure A7.1: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted Maximum PM10 24 hour average concentrations"



Stage 1 Operations (Northern Haul Route) plus Ambient Predicted Maximum PM_{10} 24-hour average concentrations

Figure A7.1	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	PM_{10}	Maximum 24-hour average	14.6 µg/m³	50 µg/m³	2019-01-22

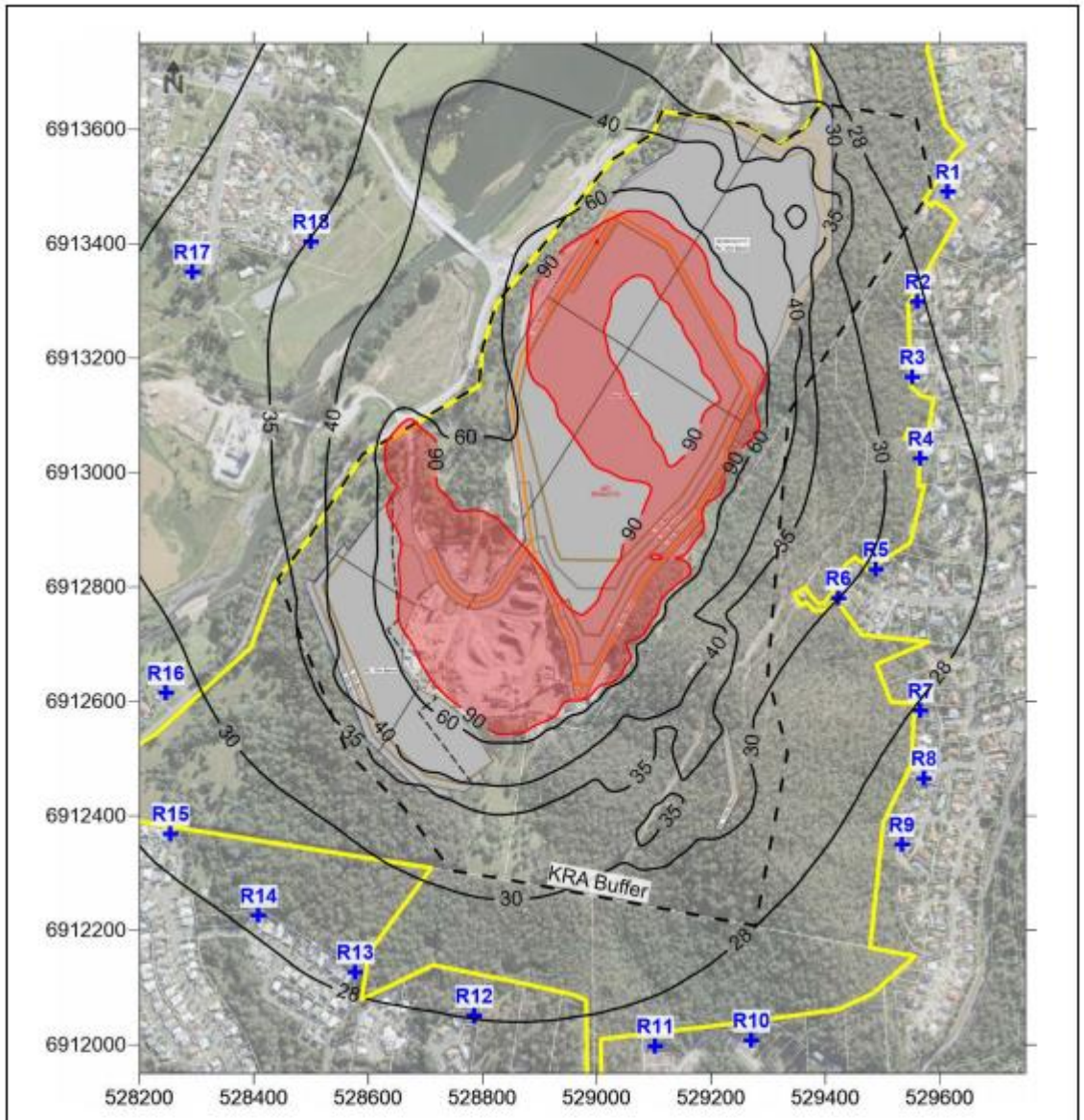
Attachment B3 - Figure A7.4: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted Maximum PM2.5 annual average concentrations"



Stage 1 Operations (Northern Haul Route) plus Ambient Predicted $PM_{2.5}$ annual average concentrations

Figure A7.4	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	$PM_{2.5}$	Annual Average	4.9 µg/m³	8 µg/m³	2019-01-22

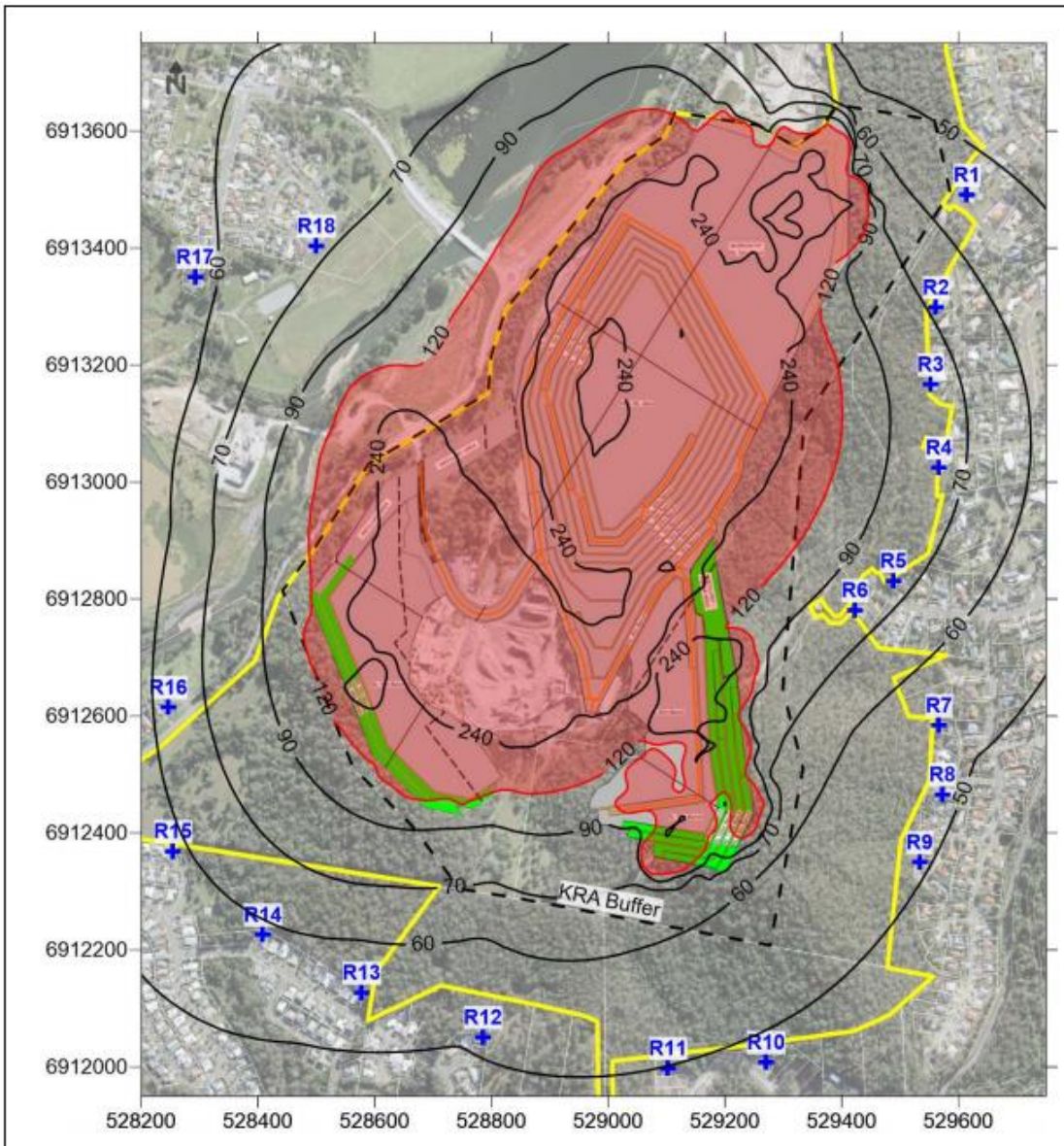
Attachment B4 - Figure A7.6: "Stage 1 Operations (Northern Haul Route) plus ambient Predicted TSP annual average concentrations"



Stage 1 Operations (Northern Haul Route) plus Ambient Predicted TSP annual average concentrations

Figure A7.6	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	TSP	Annual Average	26.2 µg/m³	90 µg/m³	2019-01-22

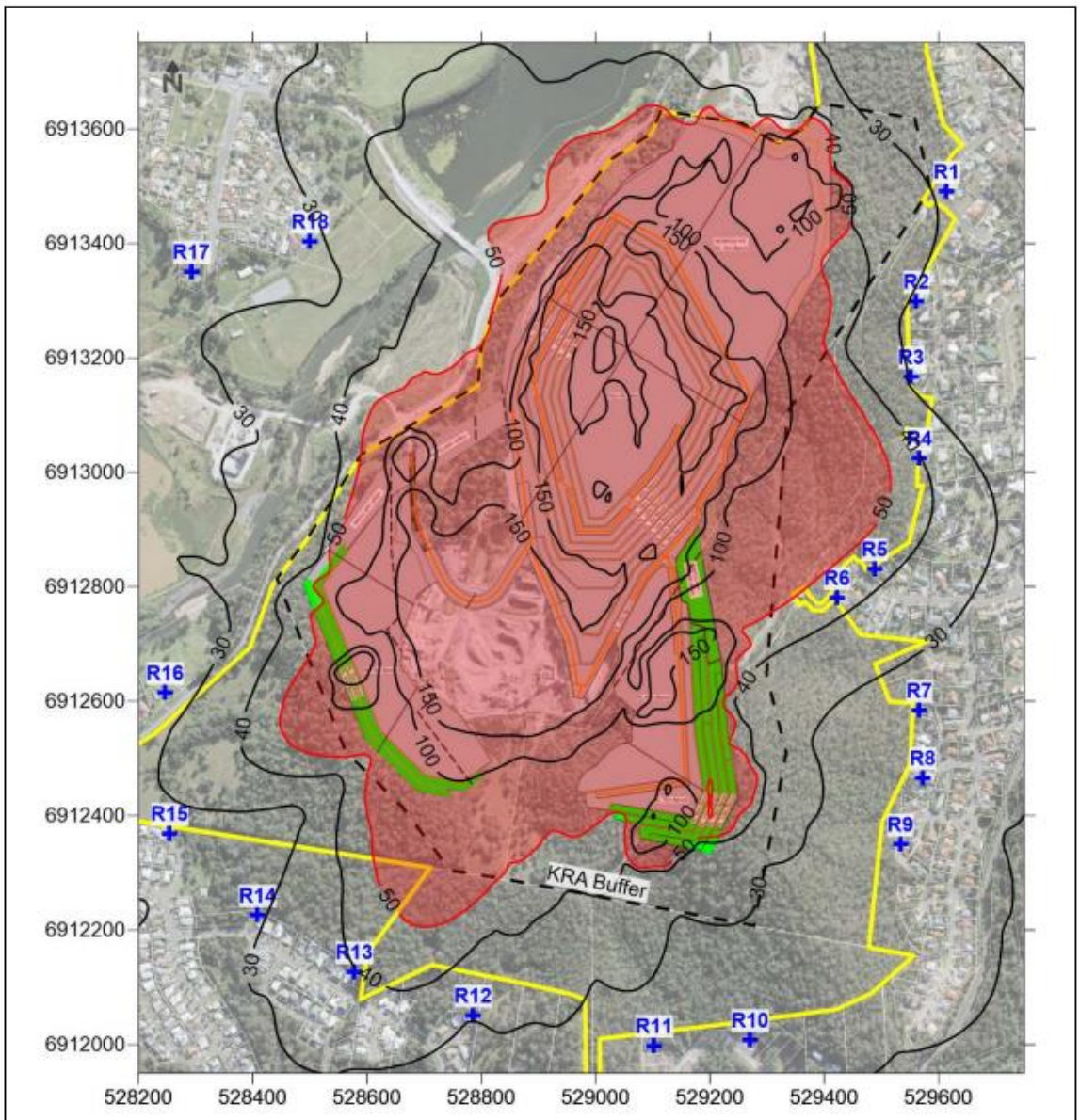
Attachment C1 - Figure A10.5: "Stage 5 Operations (Northern Haul Route) plus ambient Maximum Monthly Dust Deposition Rates"



Stage 5 Operations (Northern Haul Route) plus Ambient Maximum Monthly Dust Deposition Rates

Figure A10.5	Pollutant	Averaging Period	Background Deposition Rate	Common ERA Guideline	Date
mwa ENVIRONMENTAL	Dust Deposition	Maximum Monthly Average	40 mg/m²/day	120 mg/m²/day	2019-01-22

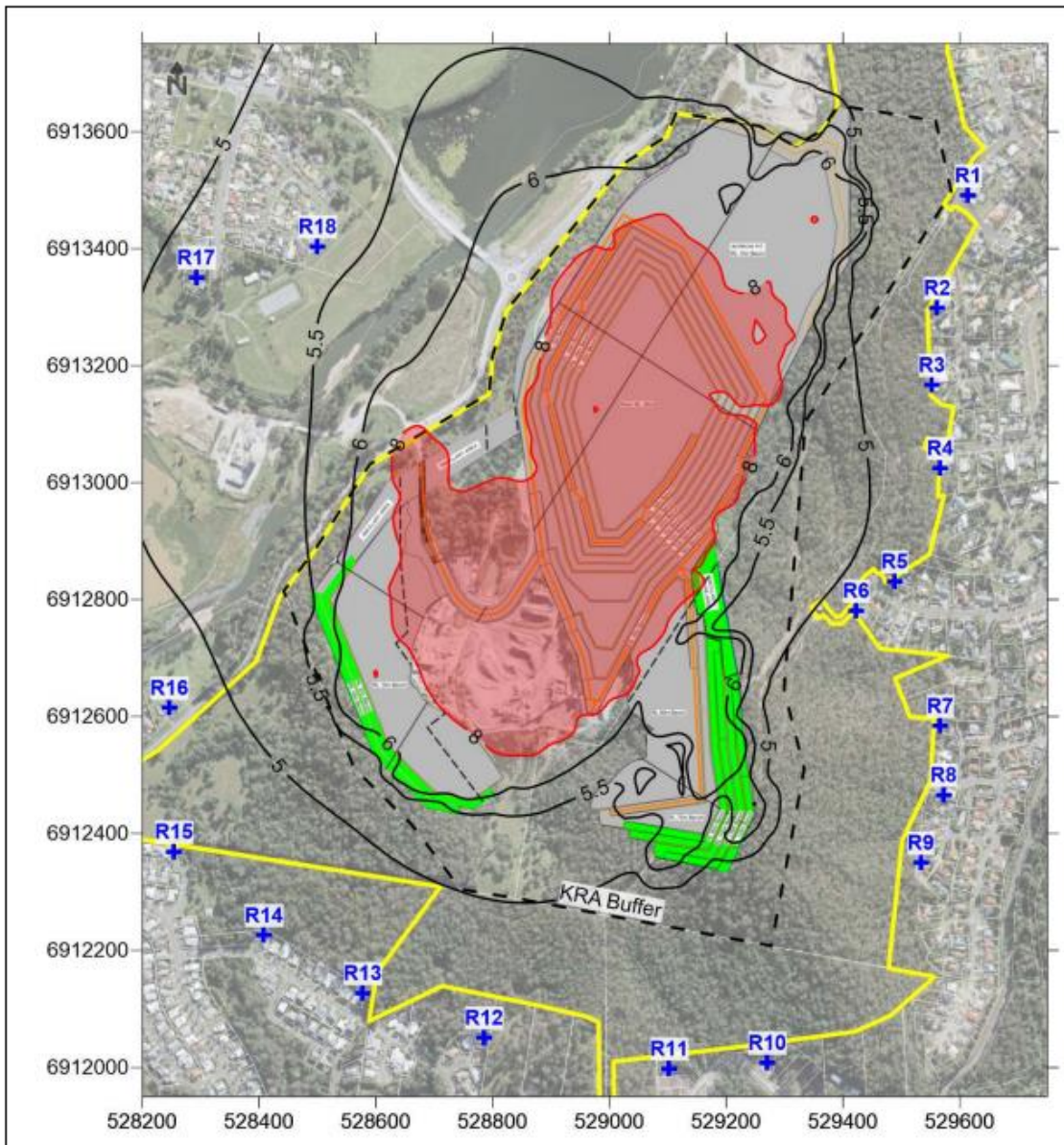
Attachment C2 - Figure A10.1: "Stage 5 Operations (Northern Haul Route) plus ambient Predicted Maximum PM10 24 hour average concentrations"



Stage 5 Operations (Northern Haul Route) plus Ambient Predicted Maximum PM_{10} 24-hour average concentrations

Figure A10.1	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	PM_{10}	Maximum 24-hour average	14.6 µg/m³	50 µg/m³	2019-01-22

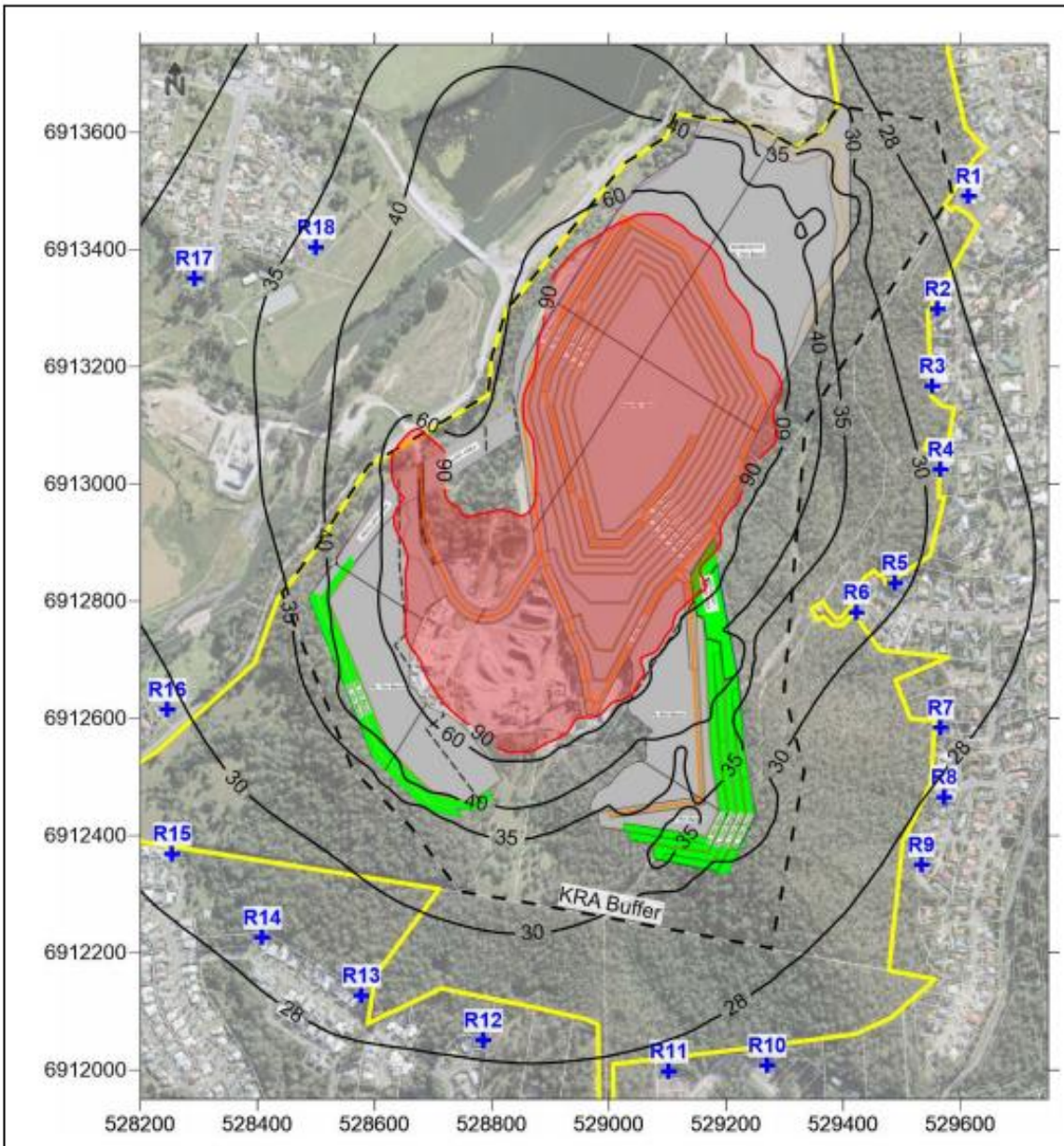
Attachment C3 - Figure A10.4: "Stage 5 Operations (Northern Haul Route) plus ambient Predicted Maximum PM2.5 annual average concentrations"



Stage 5 Operations (Northern Haul Route) plus Ambient Predicted $PM_{2.5}$ annual average concentrations

Figure A10.4	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	$PM_{2.5}$	Annual Average	4.9 µg/m³	8 µg/m³	2019-01-22

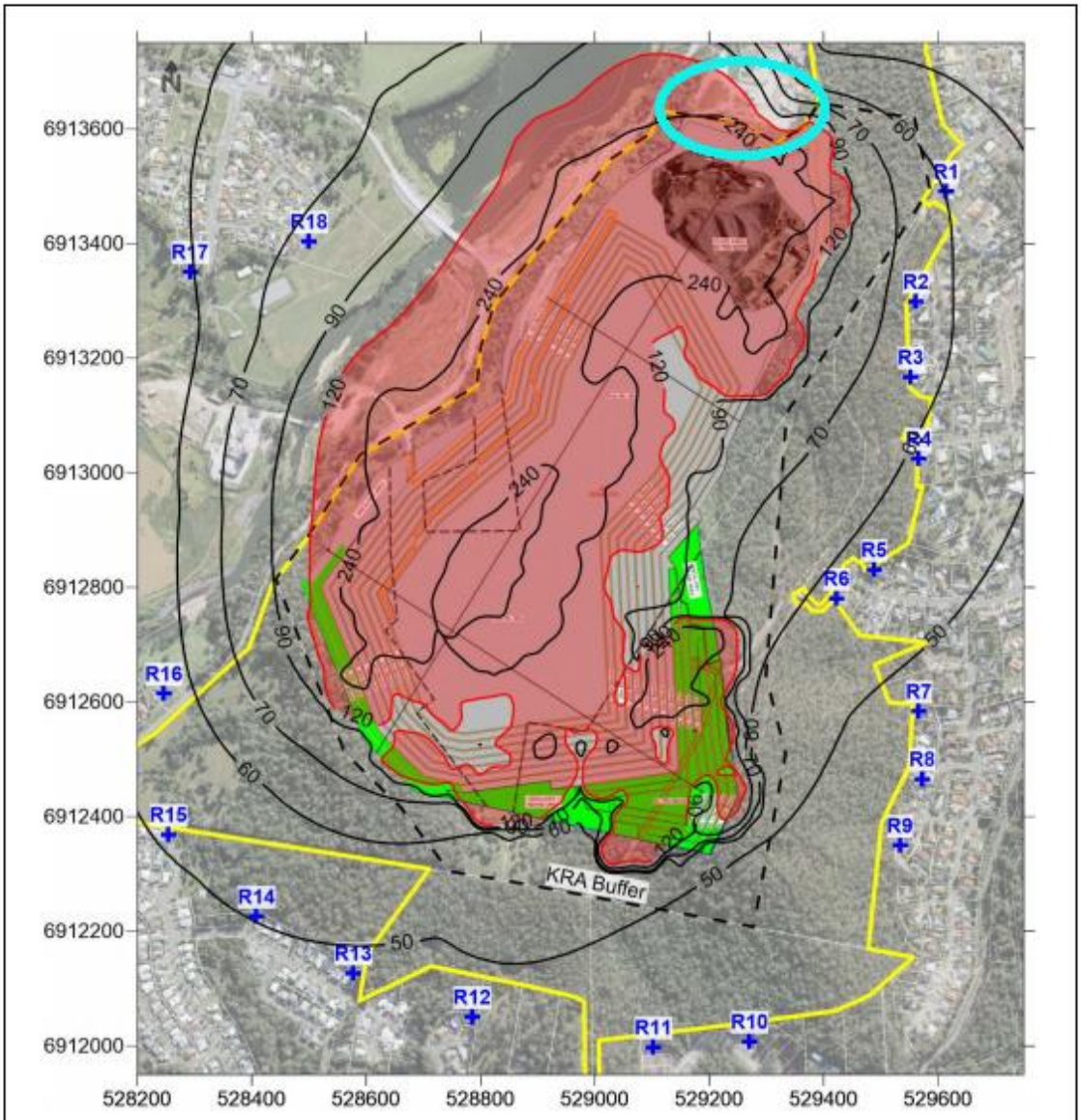
Attachment C4 - Figure A10.6: "Stage 5 Operations (Northern Haul Route) plus ambient Predicted TSP annual average concentrations"



Stage 5 Operations (Northern Haul Route) plus Ambient Predicted TSP annual average concentrations

Figure A10.6	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	TSP	Annual Average	26.2 µg/m³	90 µg/m³	2019-01-22

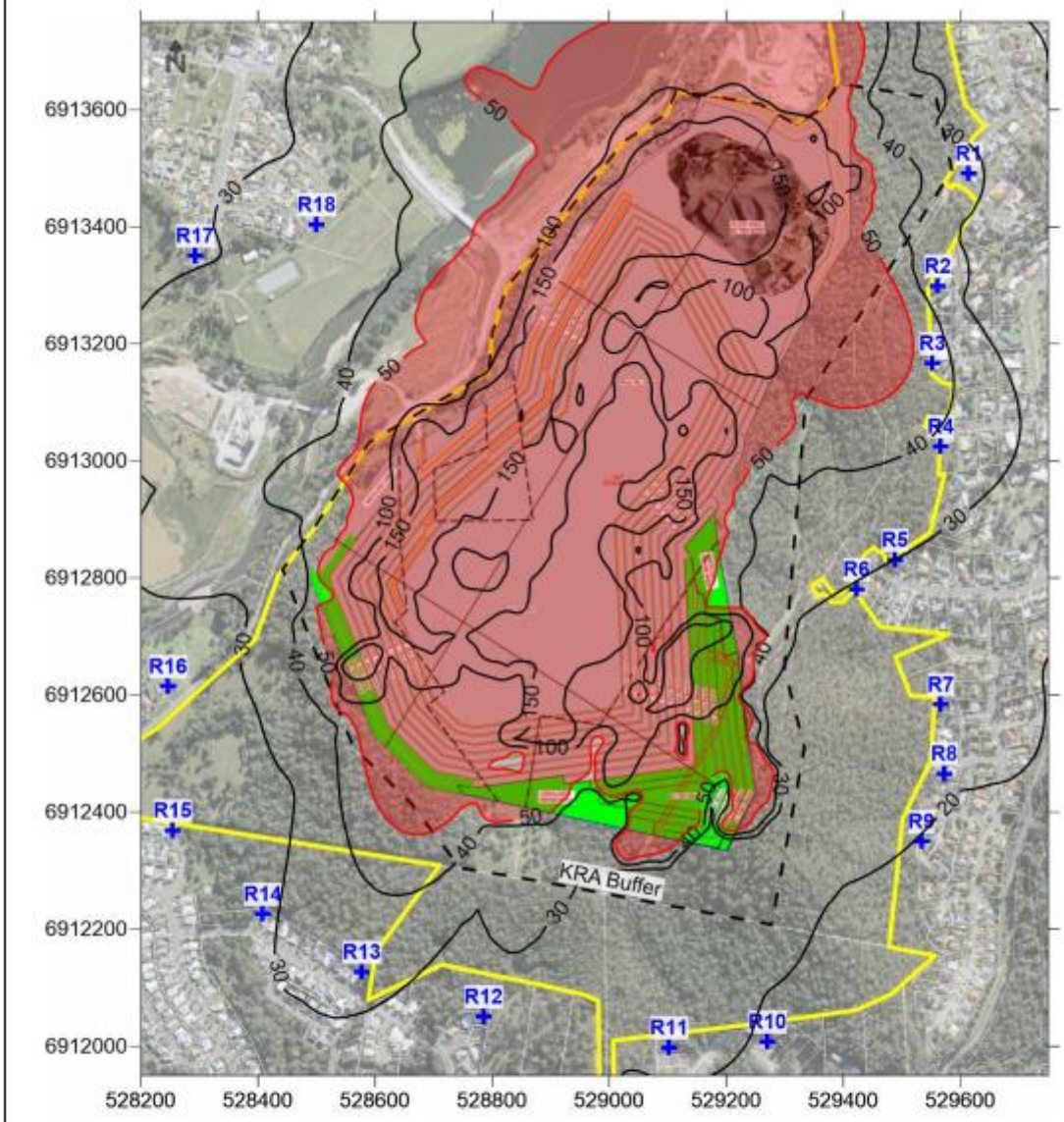
Attachment D1 - Figure A12.5: "Stage 7 Operations plus ambient Maximum Monthly Dust Deposition Rates"



Stage 7 Operations plus Ambient
Maximum Monthly Dust Deposition Rates

Figure A12.5	Pollutant	Averaging Period	Background Deposition Rate	Common ERA Guideline	Date
mwa ENVIRONMENTAL	Dust Deposition	Maximum Monthly Average	40 mg/m^2/day	120 mg/m^2/day	2019-01-22

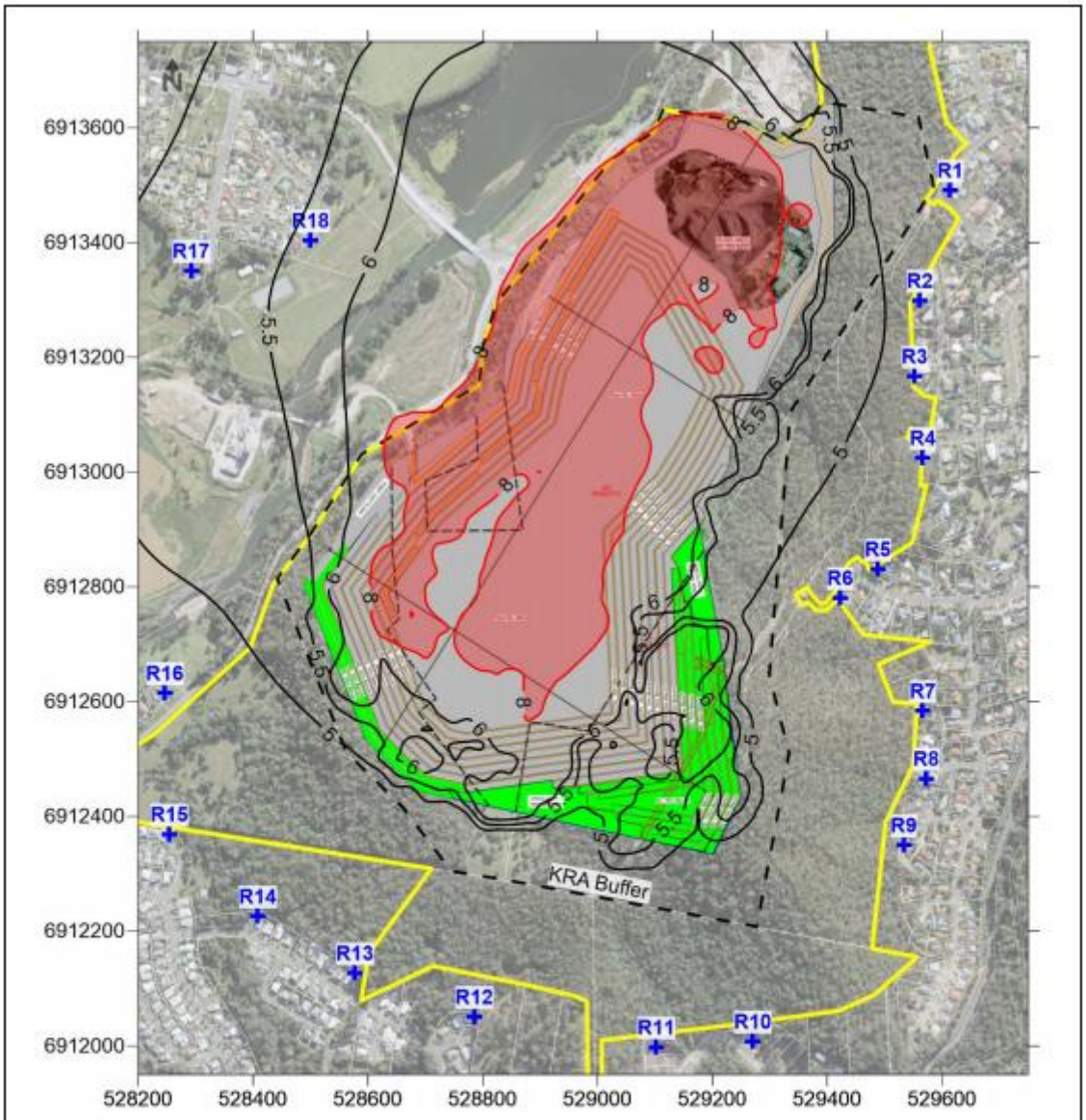
Attachment D2 - Figure A12.1: "Stage 7 Operations plus ambient Predicted Maximum PM10 24 hour average concentrations"



Stage 7 Operations plus Ambient
Predicted Maximum PM_{10} 24-hour average concentrations

Figure A12.1	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	PM_{10}	Maximum 24-hour average	14.6 µg/m³	50 µg/m³	2019-01-22

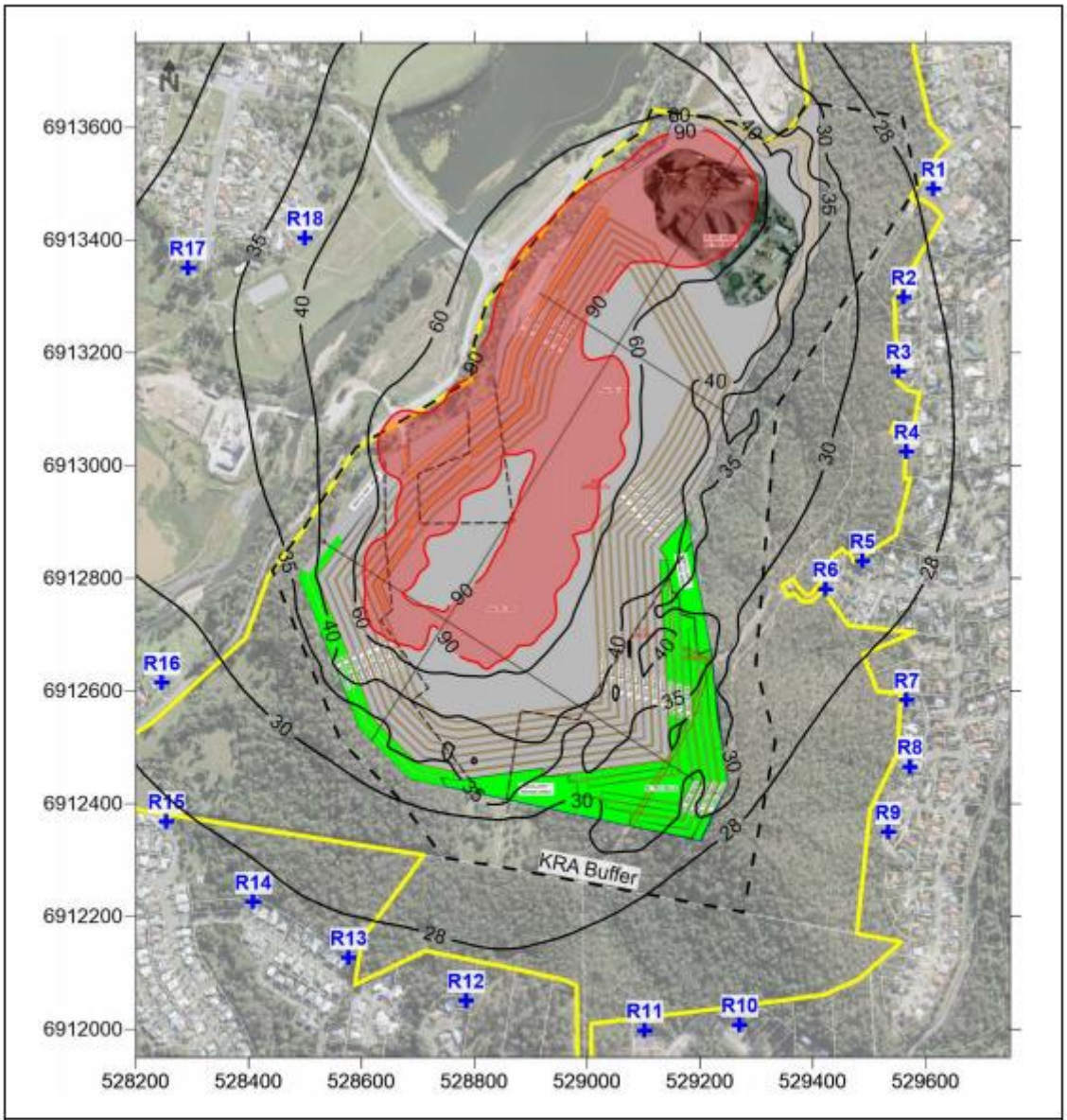
Attachment D3 - Figure A12.4: "Stage 7 Operations plus ambient Predicted Maximum PM2.5 annual average concentrations"



Stage 7 Operations plus Ambient
Predicted $PM_{2.5}$ annual average concentrations

Figure A12.4	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	$PM_{2.5}$	Annual Average	4.9 µg/m³	8 µg/m³	2019-01-22

Attachment D4 - Figure A12.6: “Stage 7 Operations plus ambient Predicted TSP annual average concentrations”



Stage 7 Operations plus Ambient
Predicted TSP annual average concentrations

Figure A12.6	Pollutant	Averaging Period	Ambient Concentration	EPP Objective	Date
mwa ENVIRONMENTAL	TSP	Annual Average	26.2 µg/m³	90 µg/m³	2019-01-22

Attachment E1 - Development application Particle Size distribution

Noise and Dust.pdf

PARTICLE SIZE DISTRIBUTION

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

TSP 100%

FRACTION #	1	2	3	4	5	6
PARTICLE SIZE (MICRONS)	>30	<30	<15	<10	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS)	**40**	**22.5**	**12.5**	**7.5**	**3.75**	**1.25**
% OF TOTAL	**0.26**	**0.26**	**0.13**	**0.15**	**0.147**	**0.053**
STANDARD DEVIATION	**0**	**0**	**0**	**0**	**0**	**0**
	26%	26%	13%	15%	14.7%	5.3%

PM10 35%

FRACTION #	4	5	6
PARTICLE SIZE (MICRONS)	<10	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS)	**7.5**	**3.75**	**1.25**
% OF TOTAL	0.15	0.147	0.053
% OF <PM10	**0.428571**	**0.42**	**0.151429**
STANDARD DEVIATION	**0**	**0**	**0**

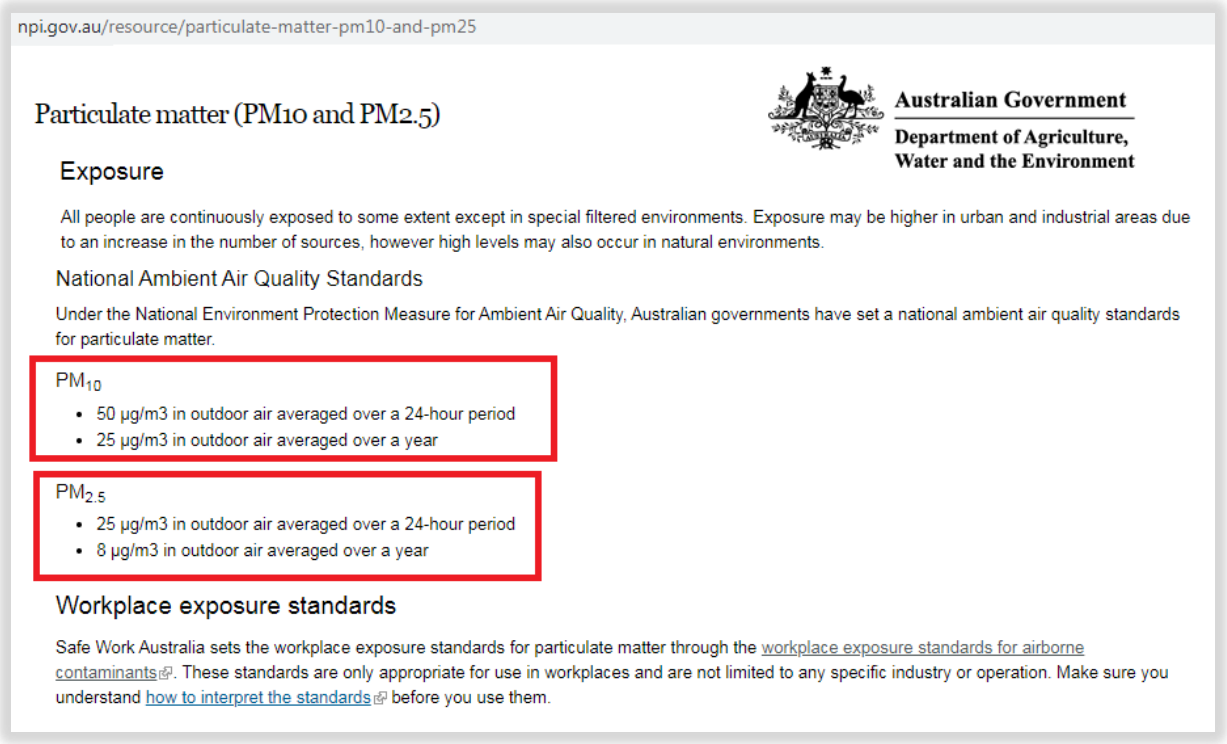
PM5 20%

FRACTION #	5	6
PARTICLE SIZE (MICRONS)	<5	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS	**3.75**	**1.25**
% OF TOTAL	0.147	0.053
% OF <PM2.5	73.5%	26.5%
STANDARD DEVIATION	**0**	**0**

PM2.5 5.3%

FRACTION #	6
PARTICLE SIZE (MICRONS)	<2.5
ASSUMED MEAN PARTICLE SIZE (MICRONS	**1.25**
% OF TOTAL	0.053
% OF <PM2.5	**100**
STANDARD DEVIATION	**0**

Attachment E2 - National Standards for PM10 and PM2.5



npi.gov.au/resource/particulate-matter-pm10-and-pm25

Particulate matter (PM10 and PM2.5)

Australian Government
Department of Agriculture, Water and the Environment

Exposure

All people are continuously exposed to some extent except in special filtered environments. Exposure may be higher in urban and industrial areas due to an increase in the number of sources, however high levels may also occur in natural environments.

National Ambient Air Quality Standards

Under the National Environment Protection Measure for Ambient Air Quality, Australian governments have set a national ambient air quality standards for particulate matter.

PM_{10}

- 50 µg/m3 in outdoor air averaged over a 24-hour period
- 25 µg/m3 in outdoor air averaged over a year

$PM_{2.5}$

- 25 µg/m3 in outdoor air averaged over a 24-hour period
- 8 µg/m3 in outdoor air averaged over a year

Workplace exposure standards

Safe Work Australia sets the workplace exposure standards for particulate matter through the workplace exposure standards for airborne contaminants. These standards are only appropriate for use in workplaces and are not limited to any specific industry or operation. Make sure you understand how to interpret the standards before you use them.