Maules Creek Coal Mine
Community Consultative Committee
Meeting #29

Environmental Monitoring Report
For the Q1 period, January – March 2020

Attended Noise Monitoring

Attended noise monitoring was undertaken at six locations during January, February and March 2020 by an independent acoustic consultant. The measured noise level ($LA_{eq\ 15\ minute}$) attributed to Maules Creek Coal Mine (MCCM) and applicable criteria for each location are shown in the tables below.

LAeq, 15minute GENERATED BY MCCM AGAINST OPERATIONAL NIGHT NOISE CRITERIA – JANUARY TO MARCH 2020.

Table 1 - January Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	29/01/2020 22:34	1.1	0	35	Yes	IA	Nil
NM2	29/01/2020 23:45	3.0	0	39	Yes	<20	Nil
NM3	29/01/2020 23:30	1.7	0	35	Yes	IA	Nil
NM4	29/01/2020 23:15	0.9	0	35	Yes	IA	Nil
NM5	29/01/2020 22:06	1.3	0	35	Yes	IA	Nil
NM6	30/01/2020 00:14	3.6	0	35	No	IA	NA

Table 2 - February Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	17/02/2020 22:30	1.4	0.0	35	Yes	IA	Nil
NM2	17/02/2020 23:17	1.8	0.0	39	Yes	30	Nil
NM3	17/02/2020 23:45	3.3	0.0	35	No	<25	NA
NM4	17/02/2020 22:54	2.2	0.0	35	Yes	IA	Nil
NM5	17/02/2020 22:00	1.1	0.0	35	Yes	IA	Nil
NM6	17/02/2020 23:43	3.3	0.0	35	No	<20	NA

Table 3 - March Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	17/03/2020 22:27	4.5	0.0	35	No	IA	NA
NM2	17/03/2020 23:30	3.5	0.0	39	No	25	NA
NM3	17/03/2020 23:45	2.8	0.0	35	Yes	NM	Nil
NM4	17/03/2020 23:00	3.4	0.0	35	No	<25	NA
NM5	17/03/2020 22:00	3.9	0.0	35	No	IA	NA
NM6	17/03/2020 23:56	2.5	0.0	35	Yes	<20	Nil

(1). Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres);
(2). Estimated or measured LAeq,15minute attributed to MCCM;
(3). NA in exceedance column means criterion is not applicable, either due to atmospheric conditions outside those specified in project approval or due to property acquisition by MCC; and
(4). Indicates the application of a 2dB low frequency modifying factor.
IA/NM – Inaudible NM – Not measurable

During Q1 no measurement satisfied the conditions for further assessment when reviewed for the applicability of low frequency modification factors in accordance with the EPA's Noise Policy for Industry.

Maules Creek Coal (MCC) EPL 20221 also has a '1 Minute - Night' criteria (LA1) that applies from 10pm to 7am Monday to Saturday & 10pm to 8am Sundays and Public Holidays. The results for the LA1 monitoring are shown below. The results show that mine operations did not exceed the applicable LA1 criteria during attended noise monitoring in Q1 2020.

LA1, 1minute GENERATED BY MCC AGAINST OPERATIONAL NIGHT NOISE CRITERIA – January to March 2020.

Table 4 - January Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	29/01/2020 22:34	1.1	0	45	Yes	IA	Nil
NM2	29/01/2020 23:45	3.0	0	45	Yes	<20	Nil
NM3	29/01/2020 23:30	1.7	0	45	Yes	IA	Nil
NM4	29/01/2020 23:15	0.9	0	45	Yes	IA	Nil
NM5	29/01/2020 22:06	1.3	0	45	Yes	IA	Nil
NM6	30/01/2020 00:14	3.6	0	45	No	IA	NA

Table 5 – February Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	17/02/2020 22:30	1.4	0.0	45	Yes	IA	Nil
NM2	17/02/2020 23:17	1.8	0.0	45	Yes	35	Nil
NM3	17/02/2020 23:45	3.3	0.0	45	No	<25	NA
NM4	17/02/2020 22:54	2.2	0.0	45	Yes	IA	Nil
NM5	17/02/2020 22:00	1.1	0.0	45	Yes	IA	Nil
NM6	17/02/2020 23:43	3.3	0.0	45	No	<20	NA

Table 6 - March Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	17/03/2020 22:27	4.5	0.0	45	No	IA	NA
NM2	17/03/2020 23:30	3.5	0.0	45	No	45	NA
NM3	17/03/2020 23:45	2.8	0.0	45	Yes	NM	Nil
NM4	17/03/2020 23:00	3.4	0.0	45	No	26	NA
NM5	17/03/2020 22:00	3.9	0.0	45	No	IA	NA
NM6	17/03/2020 23:56	2.5	0.0	45	Yes	<20	Nil

Notes:

1. *Noise emission limits do not apply during periods of rainfall or wind speeds greater than 3 metres per second (at 10 metres);*
2. *Estimated or measured LAeq,15minute attributed to MCCM;*
3. *Estimated or measured LA1,1minute attributed to MCCM;*
4. *NA in exceedance column means atmospheric conditions outside those specified in Project Approval and criterion is not applicable.*

IA – Inaudible NM – Not measurable

Wind Direction during Attended Monitoring

Wind direction data is collected from the MCCM Automated Weather Station (AWS). Wind data for the duration of the attended monitoring assessment, recorded at the MCCM AWS is presented in the table below.

Table 7 - Prevailing Wind Direction

Monitoring Date	Prevailing Wind Direction
January	NE
February	SW
March	SE

Blast Monitoring

There were 22 blasts at MCCM during Q1 2020. All blast monitoring results recorded within the reporting period have complied with applicable overpressure and ground vibration limits specified in the respective approvals.

Table 8 - Blast Results Summary Quarter 1 2020

Parameter	Units	Frequency	Number	Average	Max	100% Limit	Exceedance (Yes / No)
Noise	dB (Lin Peak)	All	22	96.7	115.3	120	No
Vibration	mm/s		22	0.16	0.53	10	No

Air Quality

Total Depositional Dust

The 12 monthly rolling annual average remains below the relevant Project Approval criteria of 4gm/m^2/month for the respective monitoring points except for at MC4 as shown in the below graph.

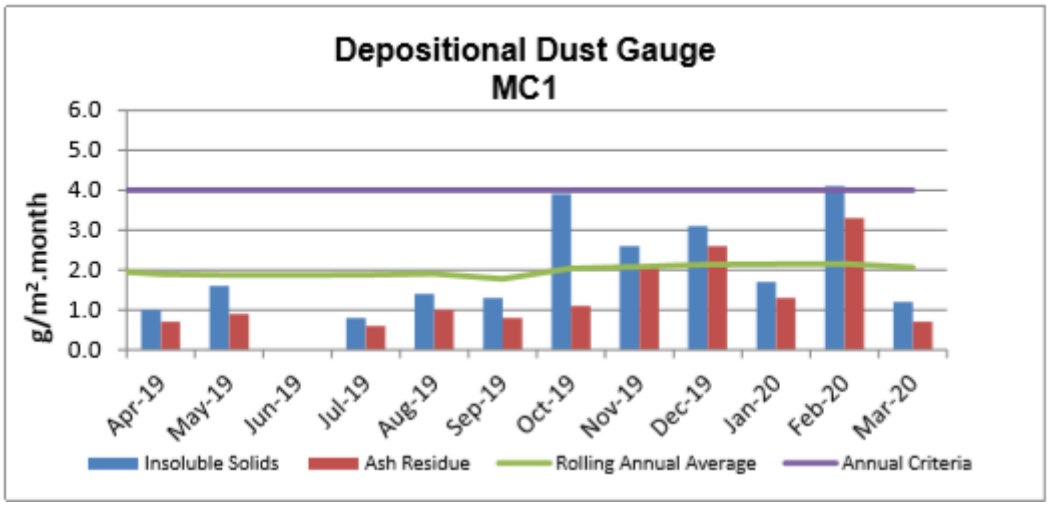
Whilst MC4 was above the 12 month rolling average this was however attributed to a highly contaminated sample during the bushfires and dust storms in October 2019.

February saw increase in monthly deposited matter, these have been attributed to dust storms which presented in conjunction with storm fronts.

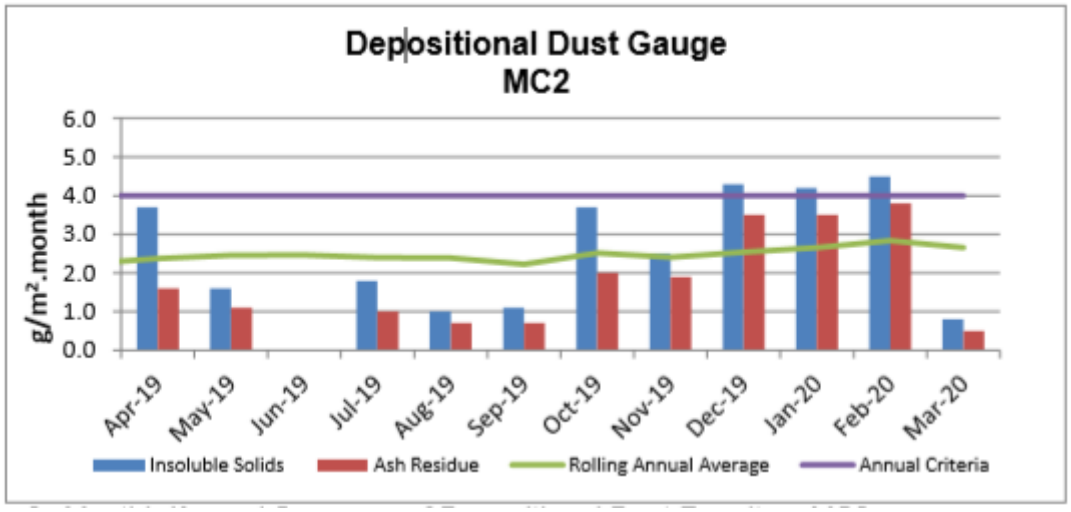
Table 9 – Deposited Dust Gauge Results

MONTH	MC1	MC2	MC3	MC4
January -20	1.7	4.2	2.2	3.3
February-20	4.1	4.5	3.5	9.8
March-20	1.2	0.8	0.8	1.2
12 MONTH ROLLING AVERAGE	2.1	2.7	2.7	**6.9**

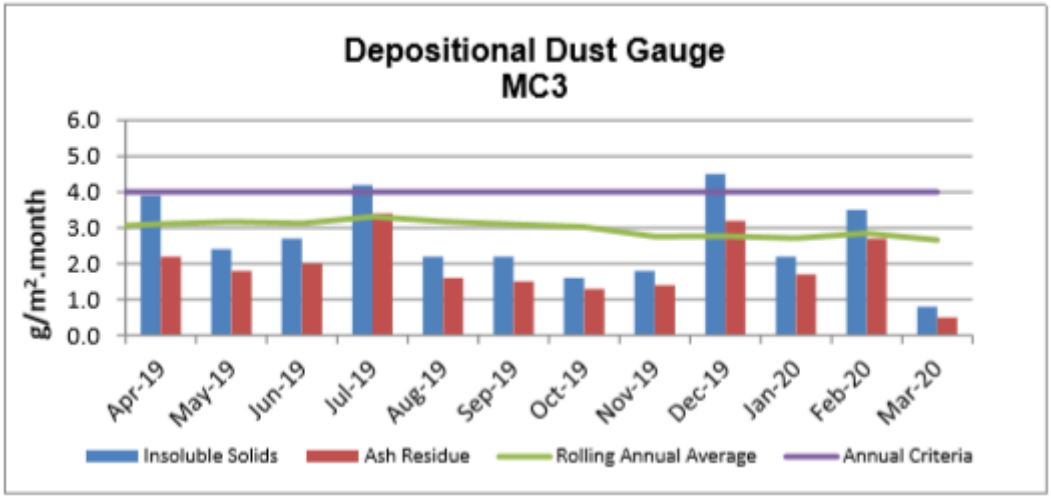
[g/m^2/month]



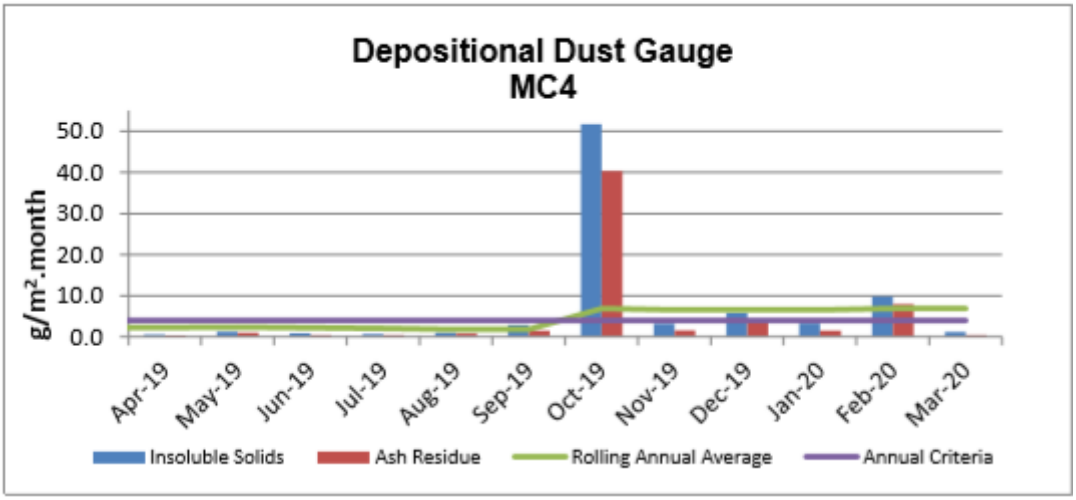
** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*



** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).** Exceedances recorded in December were attributed to the regional events*



** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*
*** Exceedances recorded in December were attributed to the regional events.*

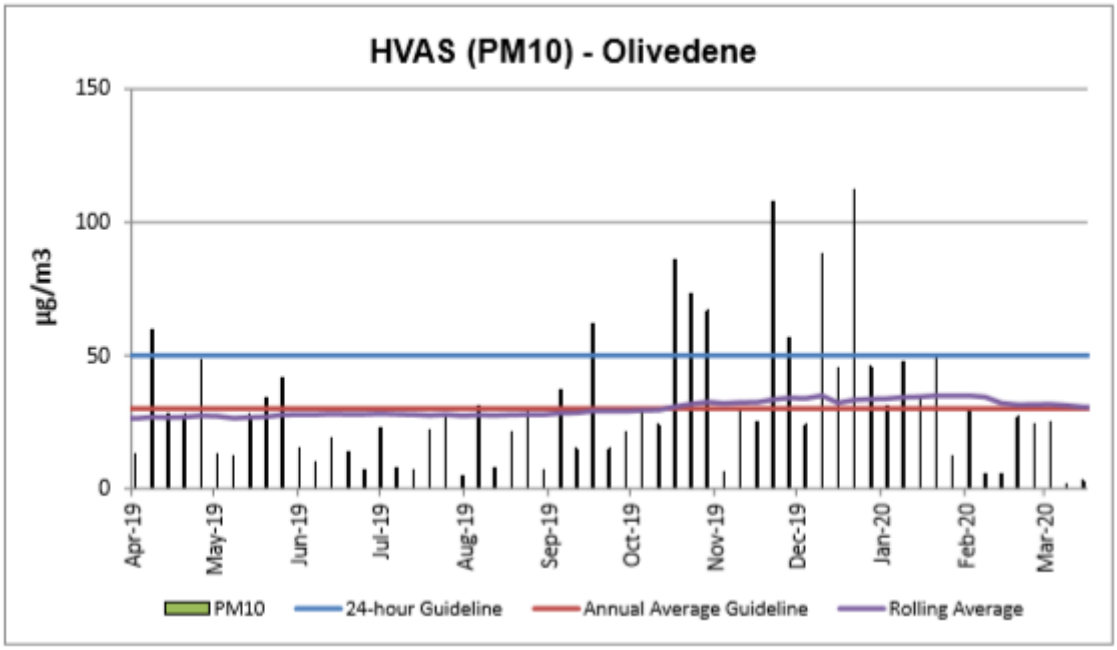


** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).** Exceedances recorded in October were attributed to the regional events and potential contamination.*

High Volume Air Sampling (HVAS)

The HVAS monitor is located on the property '*Olivedene*,' a mine owned property on Therribri Road. During Q1 there were no exceedances of the 24 hour average of 50 µg/m^3.

HVAS PM_{10} Rolling Annual Average during Q1 2020 was elevated above the Annual Average Guideline 30 µg/m^3. Recalculations of this figure have been undertaken to remove all extraordinary events as per approval conditions. Recalculated annual averages were below the Annual Average Guideline of 30 µg/m^3.

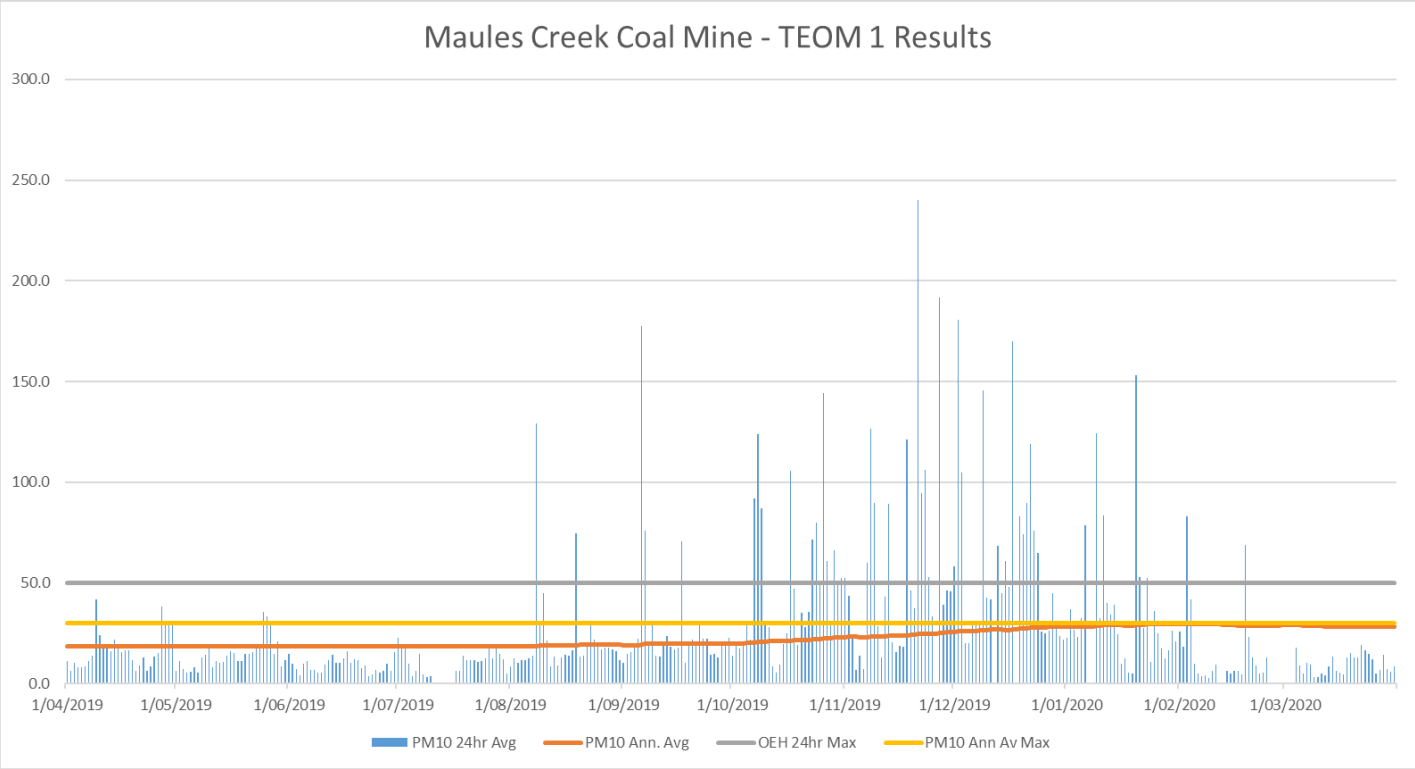


** Exceedances recorded in September, October, November and December were attributed to the regional events and discussed at the February, May, August and October 2019 CCC meetings*

TEOM - PM_{10} Results

The annual average for PM_{10} at the Maules Creek Coal TEOM is below the Project Approval annual average criteria of 30µg/m^3 as shown in the following figure. There have been six exceedances of the 24 hour average for Q1, these have all been attributed to regional air quality events.

TEOM Result Figures – Particulate Matter $PM_{10µg/m3}$



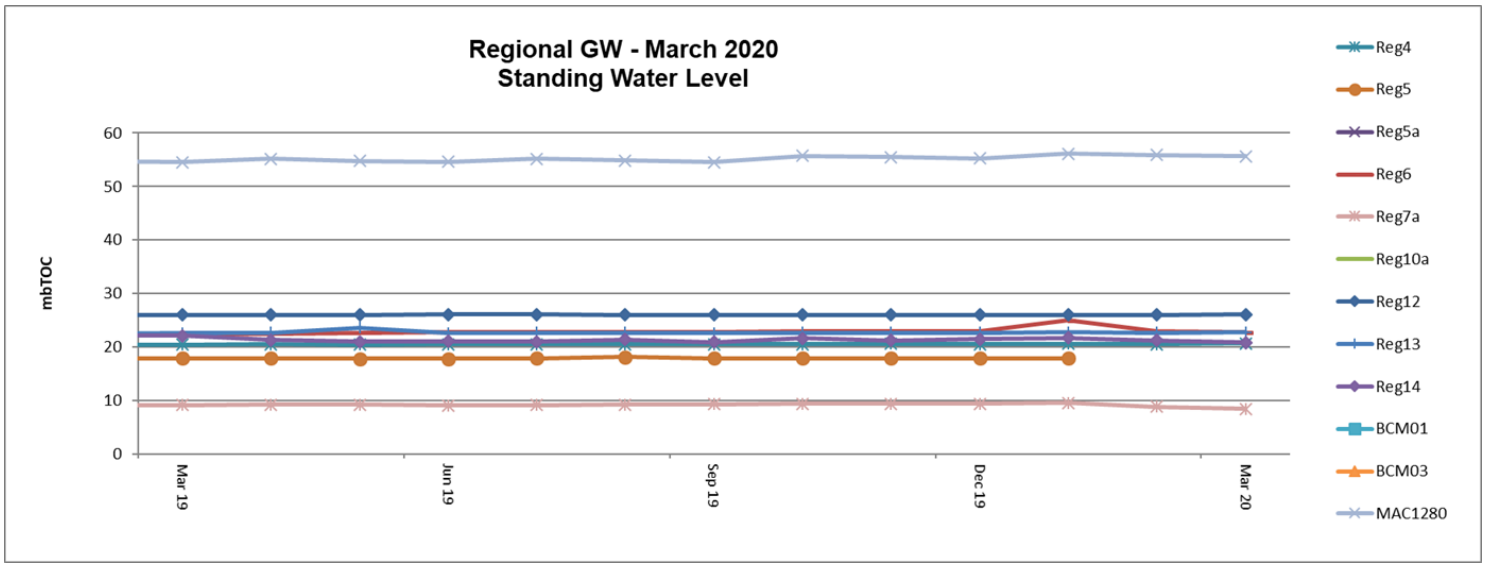
** Blank columns indicate sample periods where there was either power outage, maintenance or other related causes.*

*** Exceedances of the OEH 24hr Maximum over the past 12 months have been non mine related and have been attributed to regional dust events, all previous exceedances have been discussed at CCC meetings.*

Water Monitoring

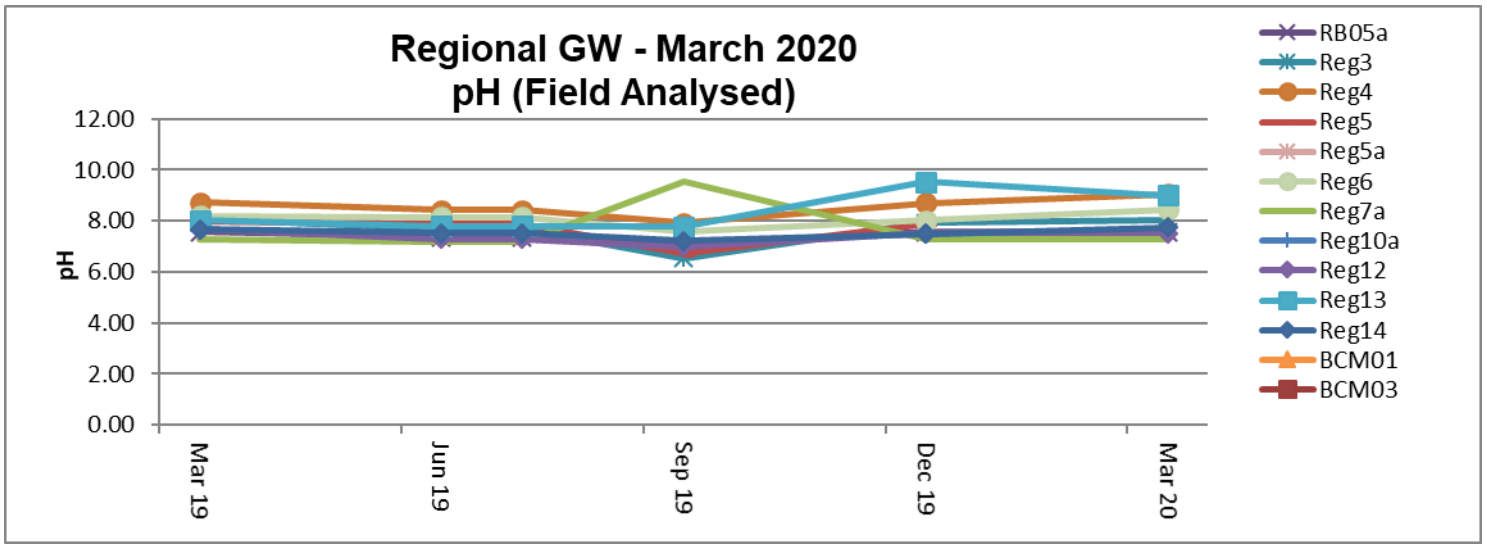
Groundwater

Groundwater monitoring results in open standpipe piezometers show levels to be relatively stable. The Regional bores were installed between Q4, 2013 and Q1, 2014. BCM01, BCM03, Reg10 are shallow bores which have remained dry since construction in 2013.



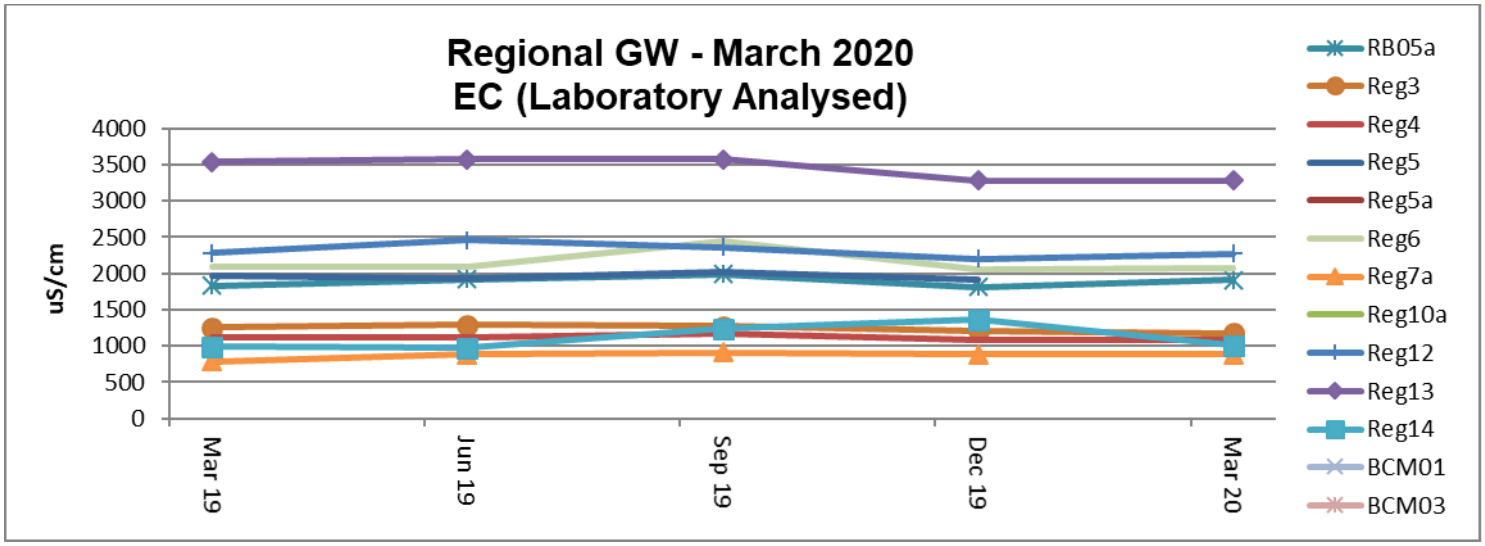
Acidity / Alkalinity (pH)

Over the past twelve months pH readings across the regional bores have remained static with very little fluctuation.



Electrical Conductivity

Laboratory Electrical Conductivity (EC) levels are all within historic groundwater EC range of 500µs/cm to 2,500µs/cm, with the exception of monitoring bore Reg13 which has a historic groundwater EC range of 2,500µs/cm to 4,100µs/cm.
Within the last twelve months EC has remained static.

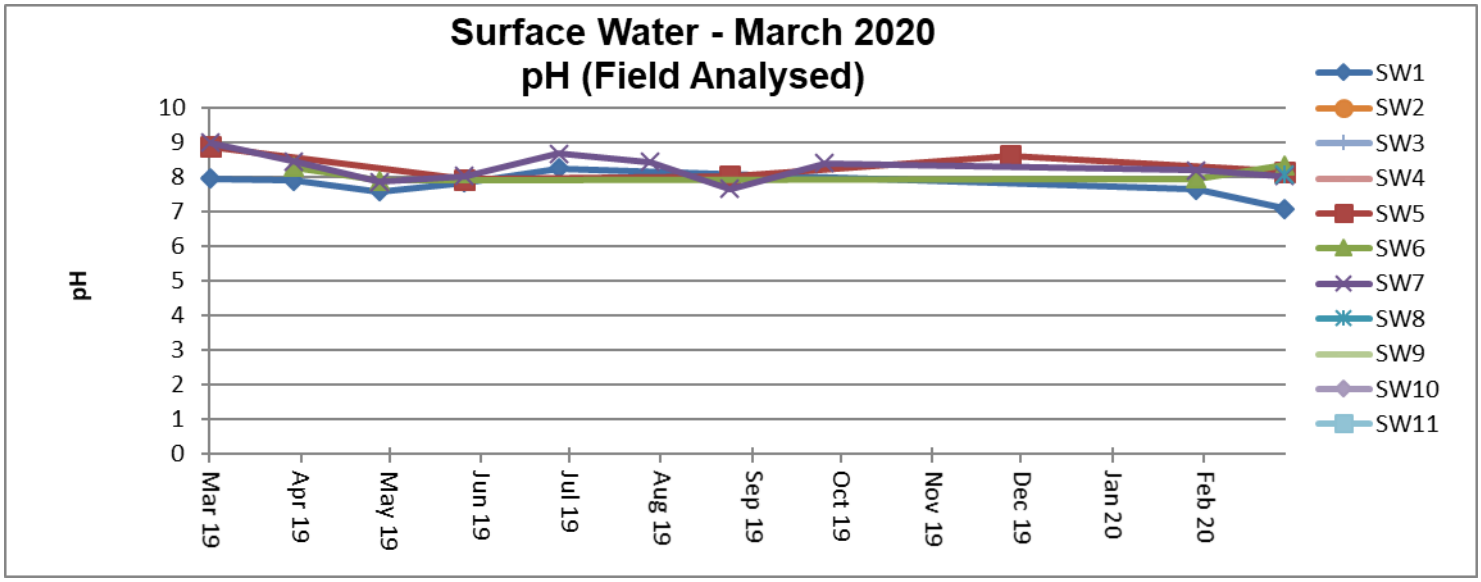


Surface Water – Creeks and Rivers

Routine surface water monitoring is conducted in surrounding creeks and rivers on a monthly basis. Results for parameters including pH, EC and Total Suspended Solids (TSS) are shown in the figures below. There are 11 surface water monitoring points, however only five were able to be sampled during the twelve month period.

Acidity / Alkalinity (pH)

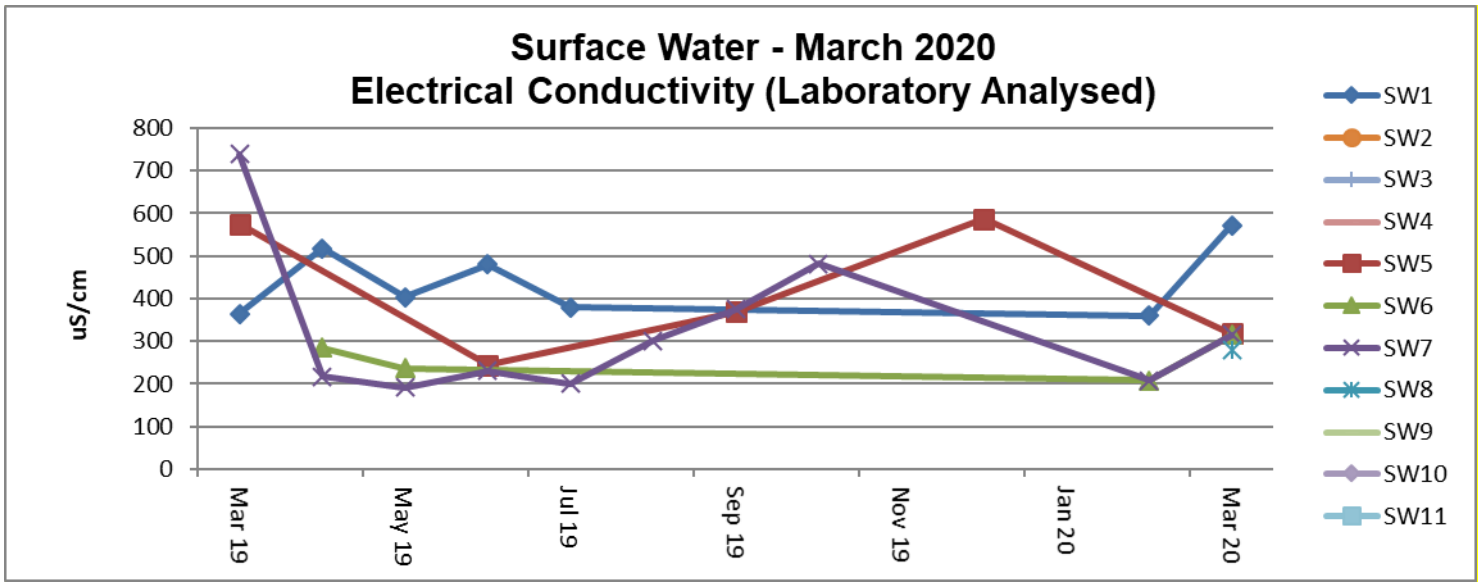
Monitoring results for pH in creeks and rivers surrounding MCCM are all trending within the ANZECC range for Irrigation, Ecosystem Health and Recreation.



**0 values indicate no water to sample due to the creek being dry*

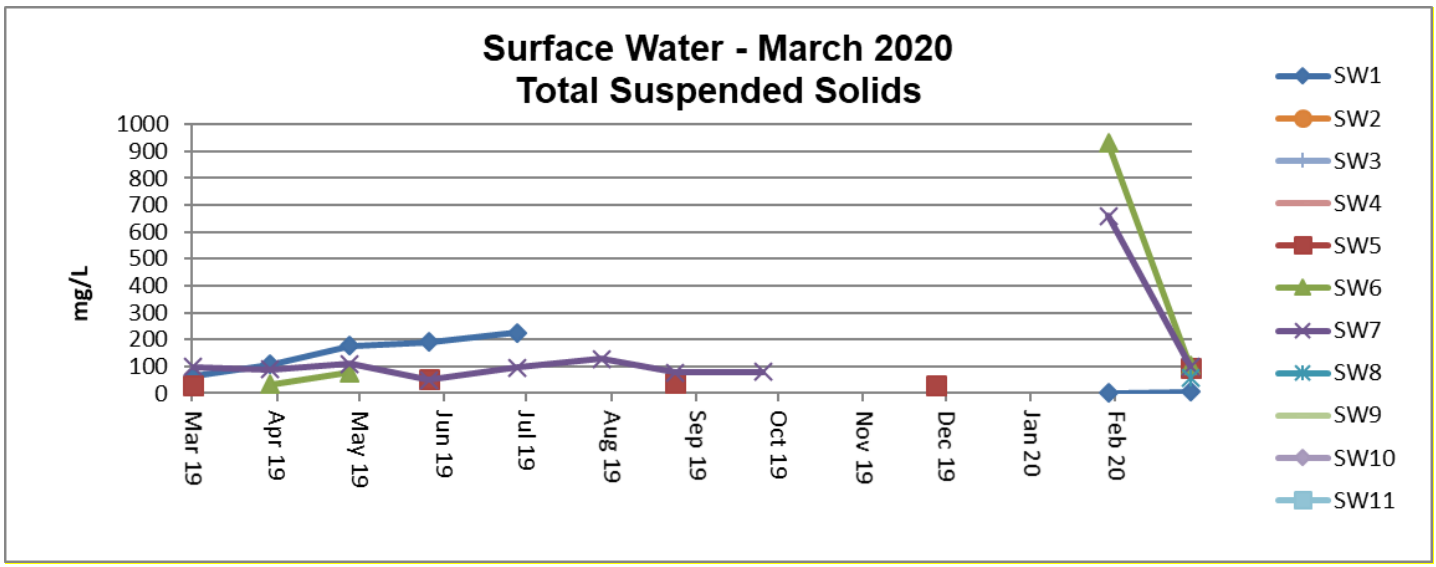
Electrical Conductivity

Surface water EC trends have remained consistent with SW5, SW6, SW7 and SW8 all historically variable. SW5, SW6, SW7 and SW8 are points along the Namoi River which are subject to regulated and variable flow regimes.



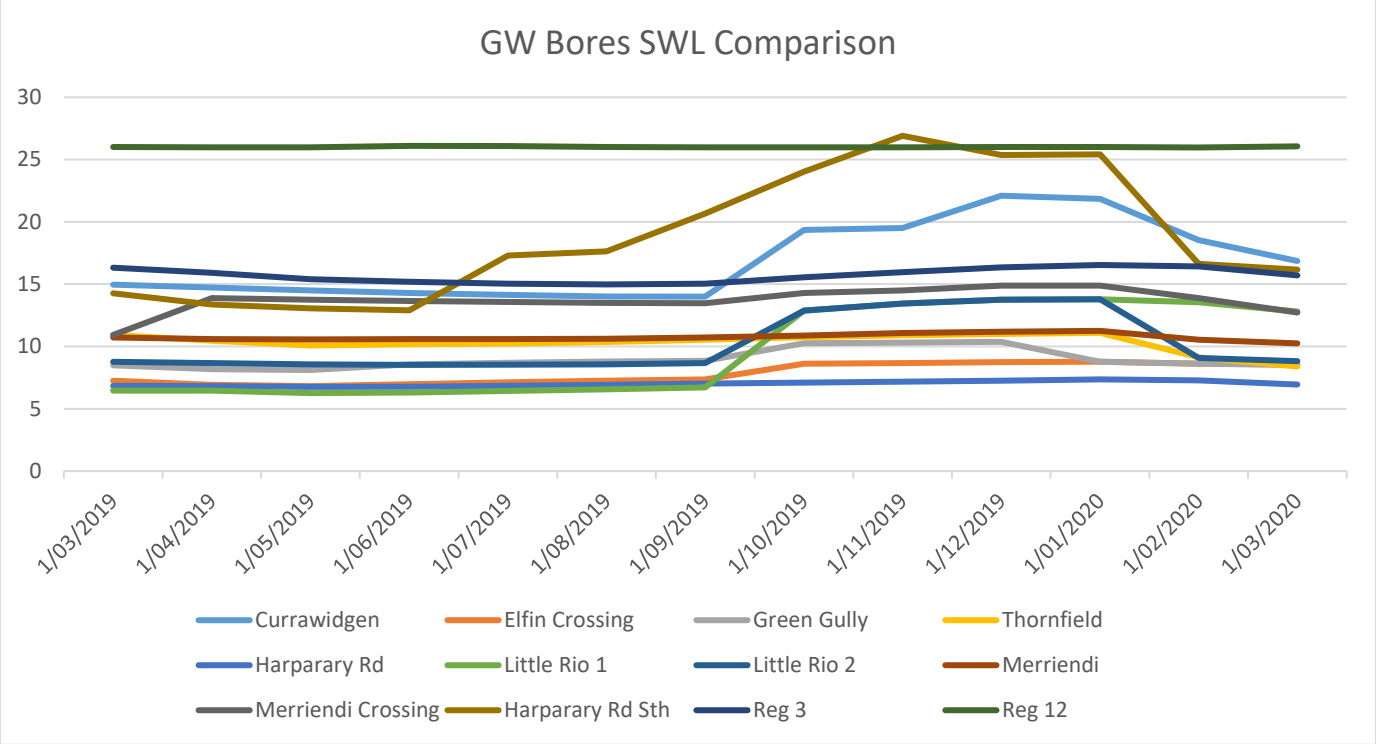
Total Suspended Solids (TSS)

Surface water TSS trends have remained generally consistent with historical results. SW5, SW6, SW7 and SW8 are historically variable as they are located along the Namoi River which is subject to regulated and variable flow regimes. There were elevated levels of TSS in Q1 due to significant rainfall events.



Regional Groundwater monitoring

Maules Creek Coal Mine monitors regional bores across the region.



Rehabilitation

Rehabilitation works are ongoing, bulk reshape and topsoiling is currently being completed.

Feral Animal Management

During the most recent routine Whitehaven Offset Area Feral Animal Control program (March 2020) the results included:

- 6 out of total 59 pigs trapped were from the Maules Creek/Boggabri area; and
- 28 out of a total 156 fox baits (1080) taken were from the Maules/Boggabri area.

Revegetation

- Undertaken ground preparation for upcoming tree planting program of over 600ha on the Maules Creek Offset areas.

Fire Management

- The fire break maintenance program has continued following the wet weather.

Community Complaints

- 3 complaints were received during Q1 CY2020. Please refer to the Community Complaints Register on the Whitehaven Coal Maules Creek website.

Maules Creek Coal Mine
Community Consultative Committee
Meeting #30

Environmental Monitoring Report
For the Q2 period, April – June2020

Attended Noise Monitoring

Attended noise monitoring was undertaken at six locations during April, May and June 2020 by an independent acoustic consultant. The measured noise level ($LA_{eq\ 15\ minute}$) attributed to Maules Creek Coal Mine (MCCM) and applicable criteria for each location are shown in the tables below.

LAeq, 15minute GENERATED BY MCCM AGAINST OPERATIONAL NIGHT NOISE CRITERIA – APRIL TO JUNE 2020.

Table 1 - April Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	01/04/2020 22:30	0.4	0.0	35	Yes	39	**4**
NM1	01/04/2020 23:13	0.4	0.0	35	Yes	IA	Nil
NM2	02/04/2020 00:03	0.2	0.0	39	Yes	<20	Nil
NM3	01/04/2020 23:30	0.2	0.0	35	Yes	IA	Nil
NM4	01/04/2020 23:41	0.1	0.0	35	Yes	IA	Nil
NM5	01/04/2020 22:00	0.2	0.0	35	Yes	IA	Nil
NM6	01/04/2020 23:56	0.3	0.0	35	Yes	IA	Nil

Table 2 - May Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	14/05/2020 22:30	3.2	0.0	35	No	IA	NA
NM2	14/05/2020 23:30	2.6	0.0	39	Yes	<30	Nil
NM3	14/05/2020 23:30	2.6	0.0	35	Yes	<25	Nil
NM4	14/05/2020 23:01	2.7	0.0	35	Yes	<20	Nil
NM5	14/05/2020 22:00	3.6	0.0	35	No	IA	NA
NM6	15/05/2020 00:01	1.8	0.0	35	Yes	IA	Nil

Table 3 - June Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	03/06/2020 22:30	0.6	0.0	35	Yes	<25	Nil
NM2	03/06/2020 23:30	0.1	0.0	39	Yes	28	Nil
NM3	03/06/2020 23:39	0.1	0.0	35	Yes	<25	Nil
NM4	03/06/2020 23:00	0.3	0.0	35	Yes	<20	Nil
NM5	03/06/2020 22:00	0.3	0.0	35	Yes	IA	Nil
NM6	03/06/2020 23:59	0.1	0.0	35	Yes	NM	Nil

(1). Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres);
(2). Estimated or measured LAeq 15minute attributed to MCCM;
(3). NA in exceedance column means criterion is not applicable, either due to atmospheric conditions outside those specified in project Approval or due to property acquisition by MCC; and
(4). Indicates the application of a 2dB low frequency modifying factor.
IA/NM – Inaudible NM – Not measurable

During Q2 one measurement satisfied the conditions for further assessment when reviewed for the applicability of low frequency modification factors in accordance with the EPA's Noise Policy for Industry.

Maules Creek Coal (MCC) EPL 20221 also has a '1 Minute - Night' criteria (LA1) that applies from 10pm to 7am Monday to Saturday & 10pm to 8am Sundays and Public Holidays. The results for the LA1 monitoring are shown below. The results show that mine operations did not exceed the applicable LA1 criteria during attended noise monitoring in Q1 2020.

LA1, 1minute GENERATED BY MCC AGAINST OPERATIONAL NIGHT NOISE CRITERIA – APRIL TO JUNE 2020.

Table 4 - April Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	01/04/2020 22:30	0.4	0.0	45	Yes	39	Nil
NM1	01/04/2020 23:13	0.4	0.0	45	Yes	IA	Nil
NM2	02/04/2020 00:03	0.2	0.0	45	Yes	<20	Nil
NM3	01/04/2020 23:30	0.2	0.0	45	Yes	IA	Nil
NM4	01/04/2020 23:41	0.1	0.0	45	Yes	IA	Nil
NM5	01/04/2020 22:00	0.2	0.0	45	Yes	IA	Nil
NM6	01/04/2020 23:56	0.3	0.0	45	Yes	IA	Nil

Table 5 – May Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	14/05/2020 22:30	3.2	0.0	45	No	IA	NA
NM2	14/05/2020 23:30	2.6	0.0	45	Yes	38	Nil
NM3	14/05/2020 23:30	2.6	0.0	45	Yes	<25	Nil
NM4	14/05/2020 23:01	2.7	0.0	45	Yes	<20	Nil
NM5	14/05/2020 22:00	3.6	0.0	45	No	IA	NA
NM6	15/05/2020 00:01	1.8	0.0	45	Yes	IA	Nil

Table 6 - June Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	03/06/2020 22:30	0.6	0.0	45	Yes	27	Nil
NM2	03/06/2020 23:30	0.1	0.0	45	Yes	39	Nil
NM3	03/06/2020 23:39	0.1	0.0	45	Yes	27	Nil
NM4	03/06/2020 23:00	0.3	0.0	45	Yes	<20	Nil
NM5	03/06/2020 22:00	0.3	0.0	45	Yes	IA	Nil
NM6	03/06/2020 23:59	0.1	0.0	45	Yes	NM	Nil

Notes:

1. *Noise emission limits do not apply during periods of rainfall or wind speeds greater than 3 metres per second (at 10 metres);*
2. *Estimated or measured LAeq,15minute attributed to MCCM;*
3. *Estimated or measured LA1,1minute attributed to MCCM;*
4. *NA in exceedance column means atmospheric conditions outside those specified in Project Approval and criterion is not applicable.*

IA – Inaudible NM – Not measurable

Wind Direction during Attended Monitoring

Wind direction data is collected from the MCCM Automated Weather Station (AWS). Wind data for the duration of the attended monitoring assessment, recorded at the MCCM AWS is presented in the table below.

Table 7 - Prevailing Wind Direction

Monitoring Date	Prevailing Wind Direction
April	N
May	SE
June	SE

Blast Monitoring

There were 28 blasts at MCCM during Q2 2020. All blast monitoring results recorded within the reporting period have complied with applicable overpressure and ground vibration limits specified in the respective approvals.

Table 8 - Blast Results Summary Quarter 2 2020

Parameter	Units	Frequency	Number	Average	Max	100% Limit	Exceedance (Yes / No)
Noise	dB (Lin Peak)	All	28	96.7	115.3	120	No
Vibration	mm/s		28	0.16	0.53	10	No

Air Quality

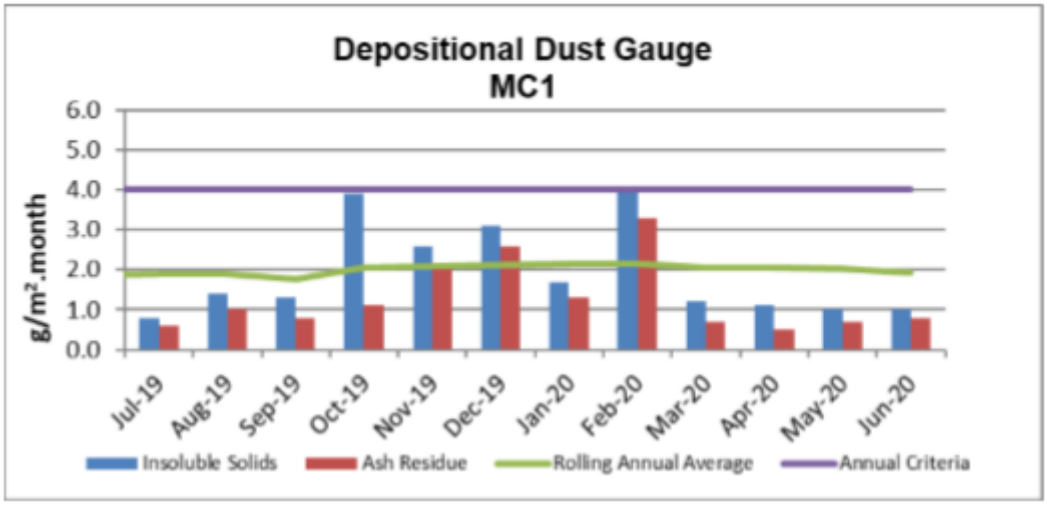
Total Depositional Dust

The 12 monthly rolling annual average remains below the relevant Project Approval criteria of 4g/m^2/month for the respective monitoring points except for at MC4 as shown in the below graph.
Whilst MC4 was above the 12 month rolling average this was however attributed to a highly contaminated sample during the bushfires and dust storms in October 2019.
May-20 saw MC4 to be excessively contaminated with insoluble solids (i.e. bird droppings, insects and vegetation).

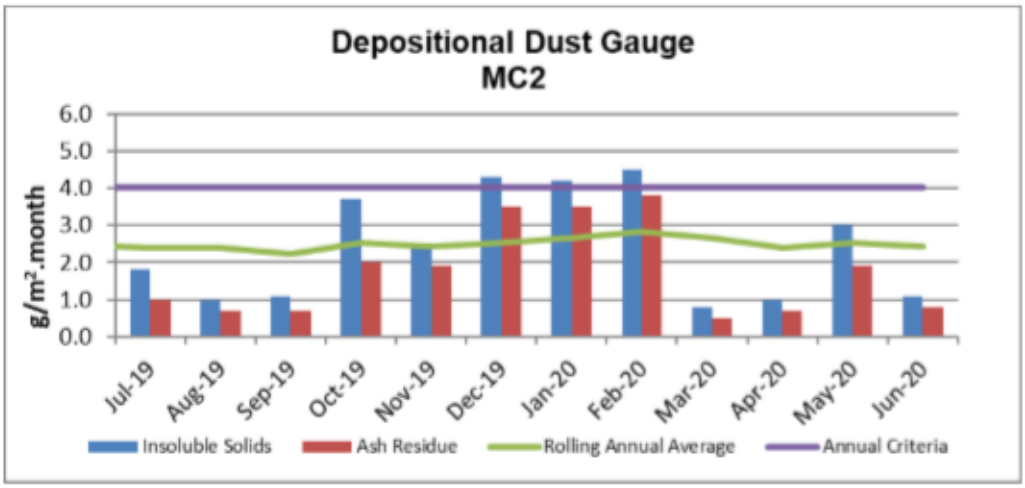
Table 9 – Deposited Dust Gauge Results

[g/m^2/month]

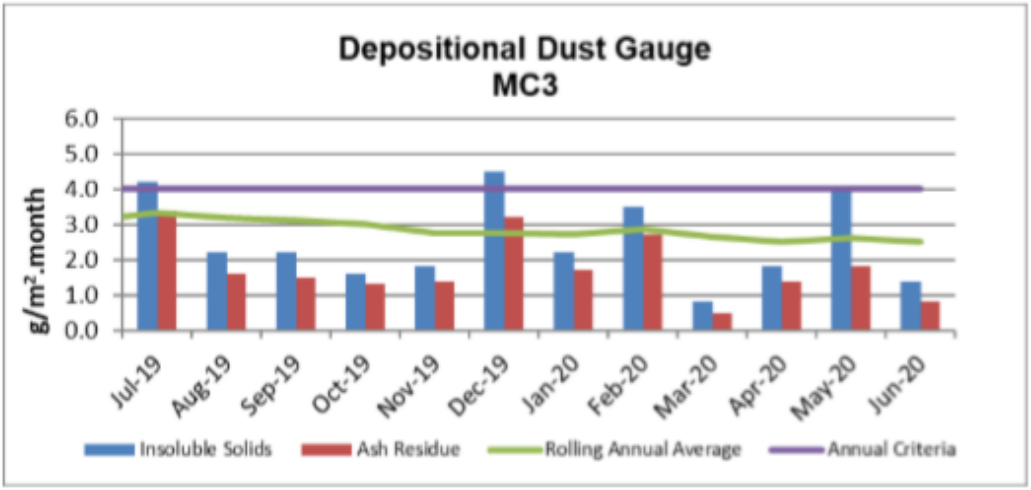
MONTH	MC1	MC2	MC3	MC4
April -20	1.1	1.0	1.8	1.6
May-20	1.0	3.0	4.0	8.4
June-20	1.0	1.1	1.4	2.4
12 MONTH ROLLING AVERAGE	1.9	2.4	2.5	**7.7**



** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*



** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*



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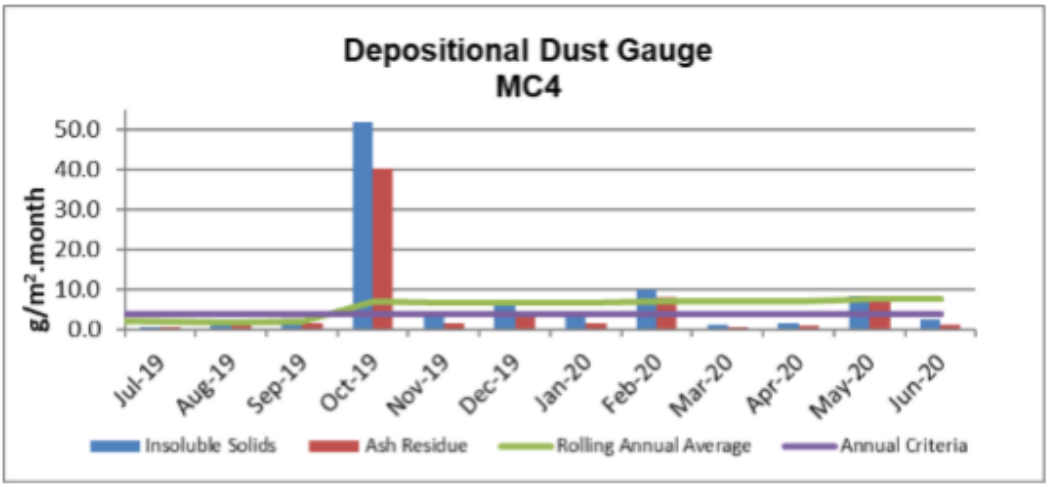

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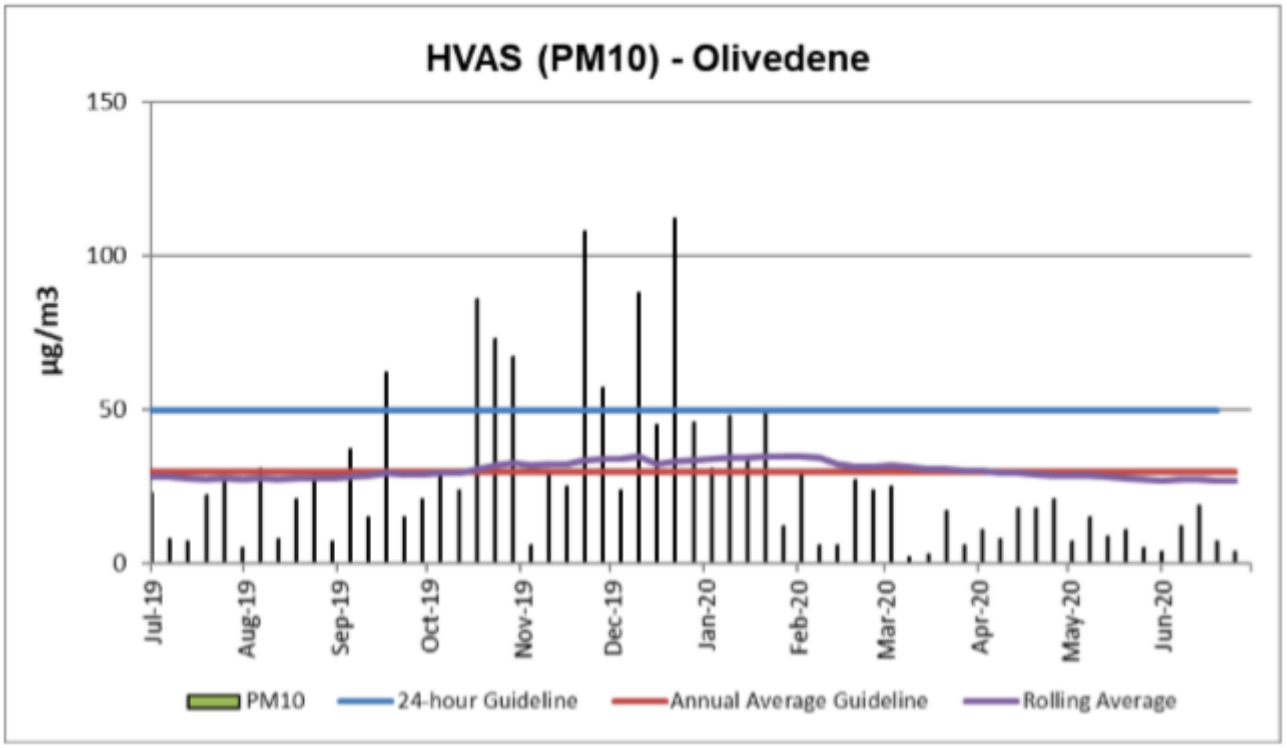
High Volume Air Sampling (HVAS)

The HVAS monitor is located on the property '*Olivedene*,' a mine owned property on Therribri Road. During 2020 there have been no exceedances of the 24 hour average of 50 µg/m^3.

HVAS PM_{10} Rolling Annual Average during Q2 2020 is **27 µg/m^3**, which is below the Annual Average Guideline of 30 µg/m^3.

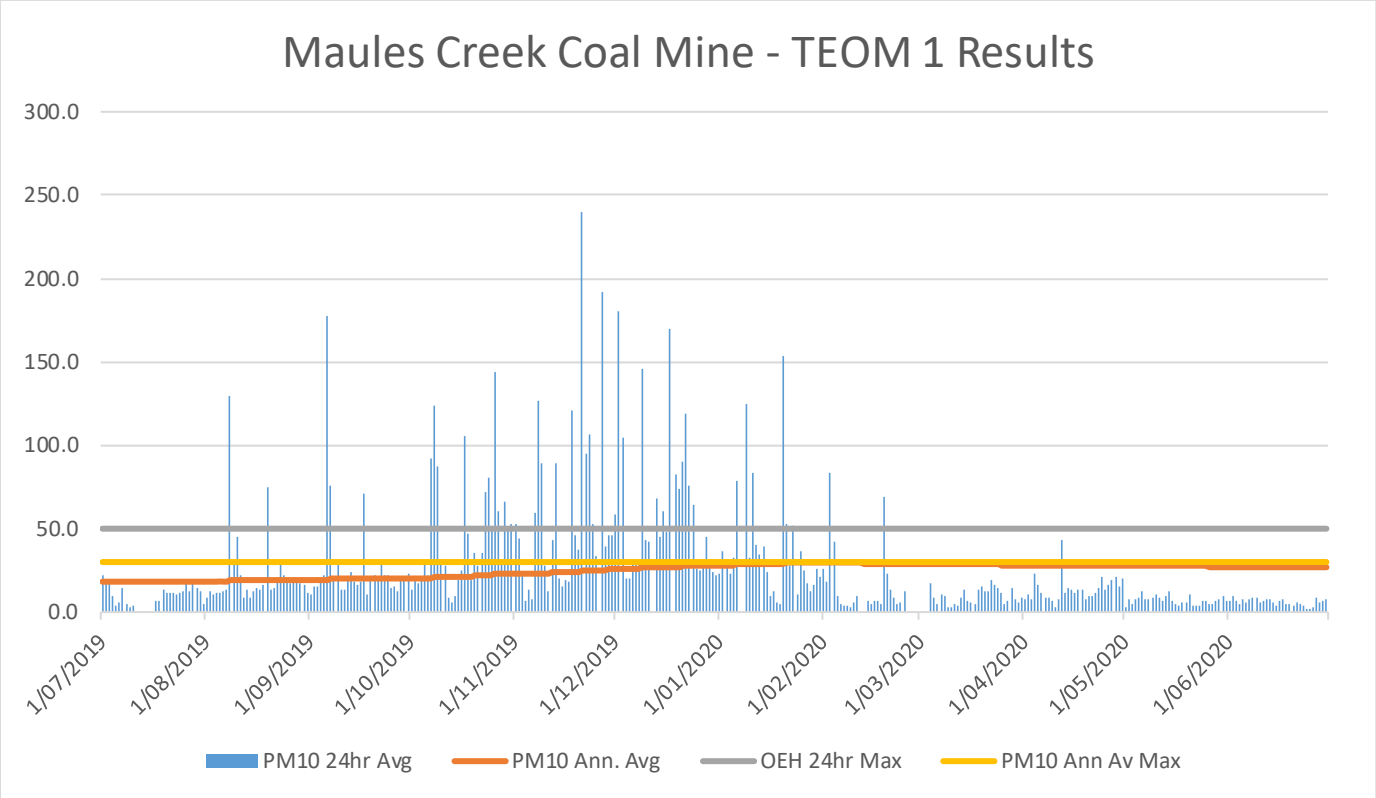


** Exceedances recorded in September, October, November and December were attributed to the regional events and discussed at the August and October 2019 meetings.*

TEOM - PM_{10} Results

The annual average for PM_{10} at the Maules Creek Coal TEOM is **26.9 µg/m³**, which is below the Project Approval annual average criteria of 30µg/m³ as shown in the following figure. There have been no exceedances of the 24 hour average for Q2.

TEOM Result Figures – Particulate Matter $PM_{10µg/m^3}$



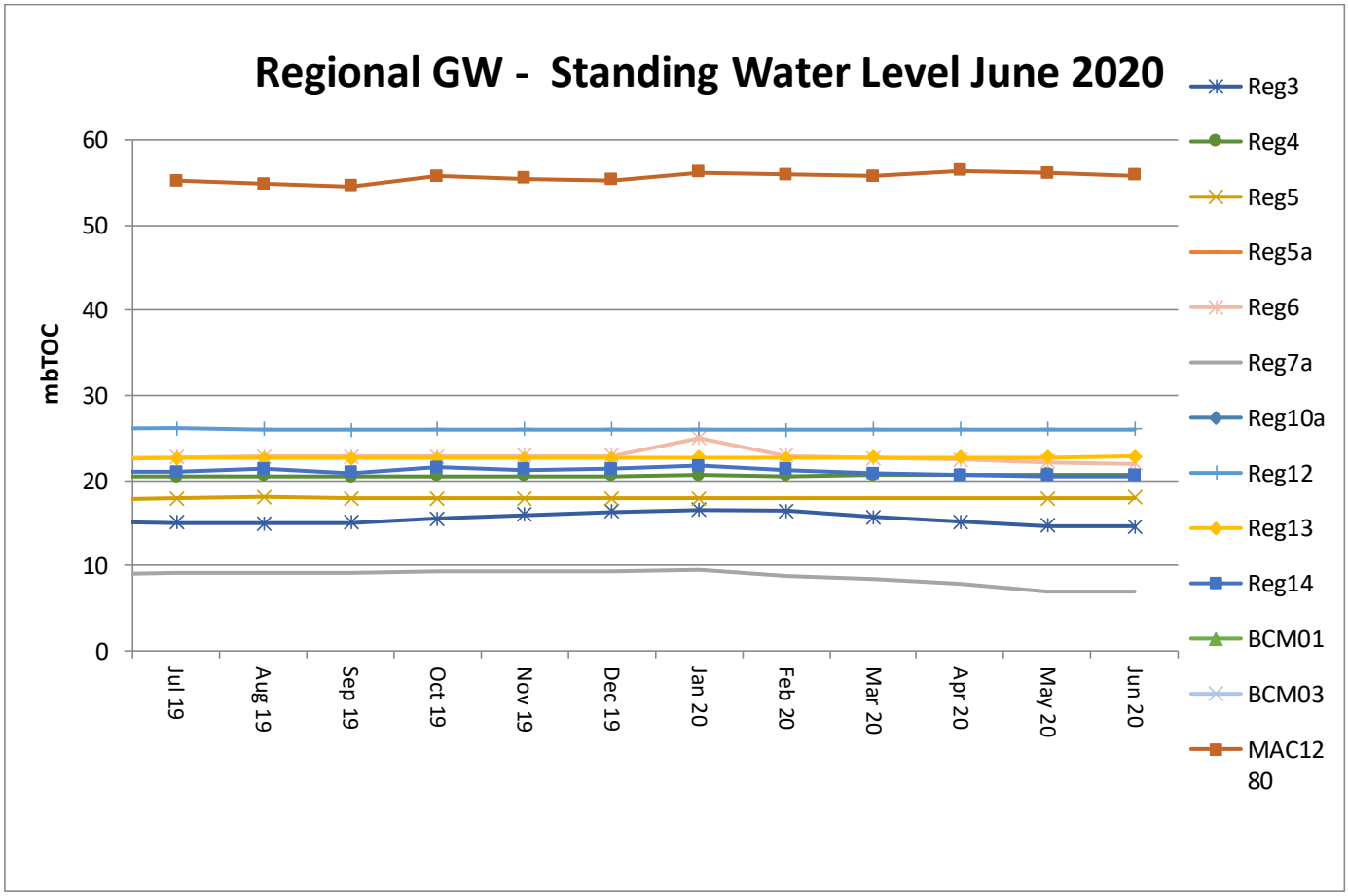
** Blank columns indicate sample periods where there was either power outage, maintenance or other related causes.*

*** Exceedances of the OEH 24hr Maximum over the past 12 months have been non mine related and have been attributed to regional dust events. All previous exceedances have been discussed at CCC meetings.*

Water Monitoring

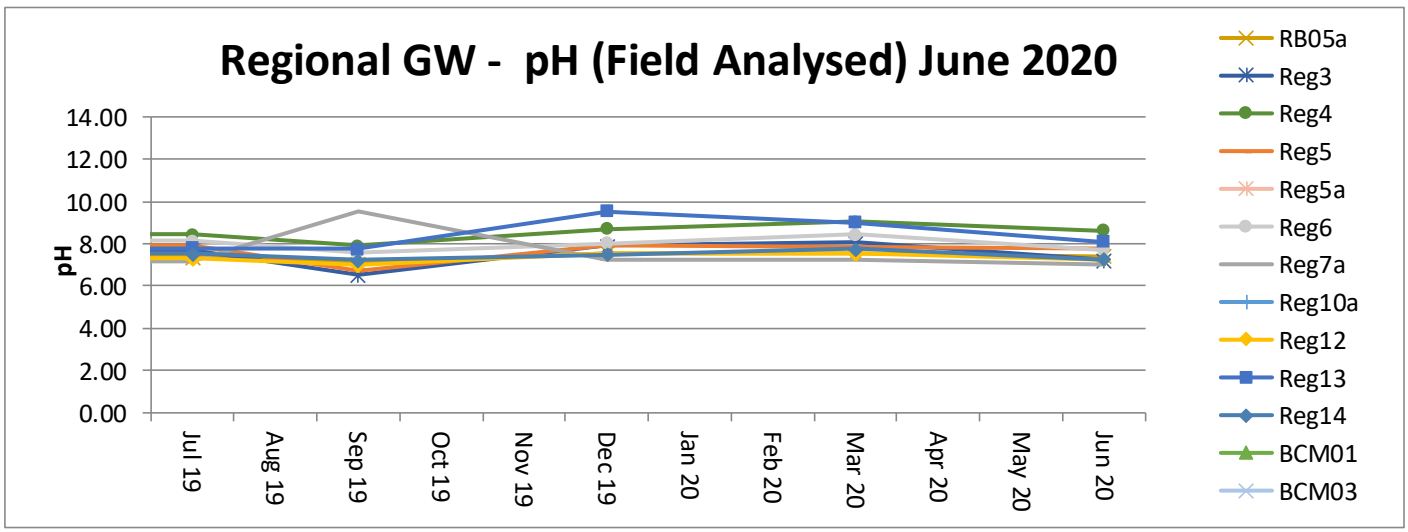
Groundwater

Groundwater monitoring results in open standpipe piezometers show levels to be relatively stable. The Regional bores were installed between Q4, 2013 and Q1, 2014. BCM01, BCM03, Reg10 are shallow bores which have remained dry since construction in 2013.



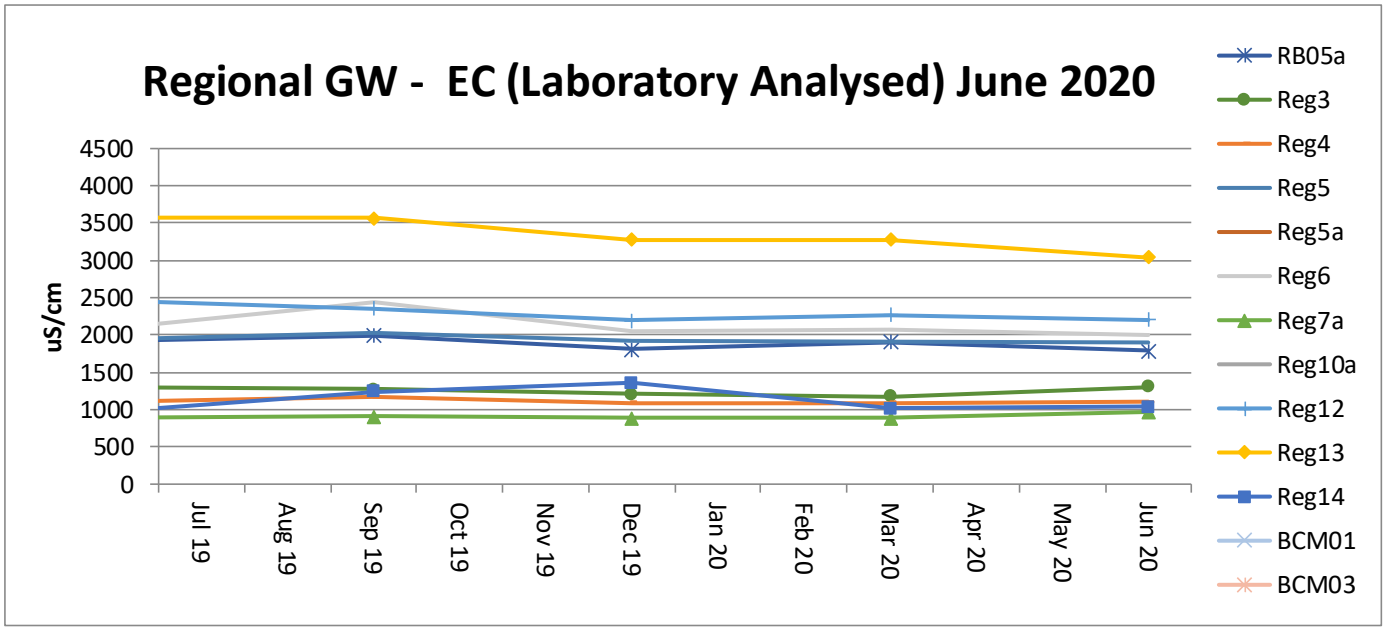
Acidity / Alkalinity (pH)

Over the past twelve months pH readings across the regional bores have remained static with very little fluctuation.



Electrical Conductivity

Laboratory Electrical Conductivity (EC) levels are all within historic groundwater EC range of 500 $\mu s/cm$ to 2,500 $\mu s/cm$, with the exception of monitoring bore Reg13 which has a historic groundwater EC range of 2,500 $\mu s/cm$ to 4,100 $\mu s/cm$.
Within the last twelve months EC has remained static.

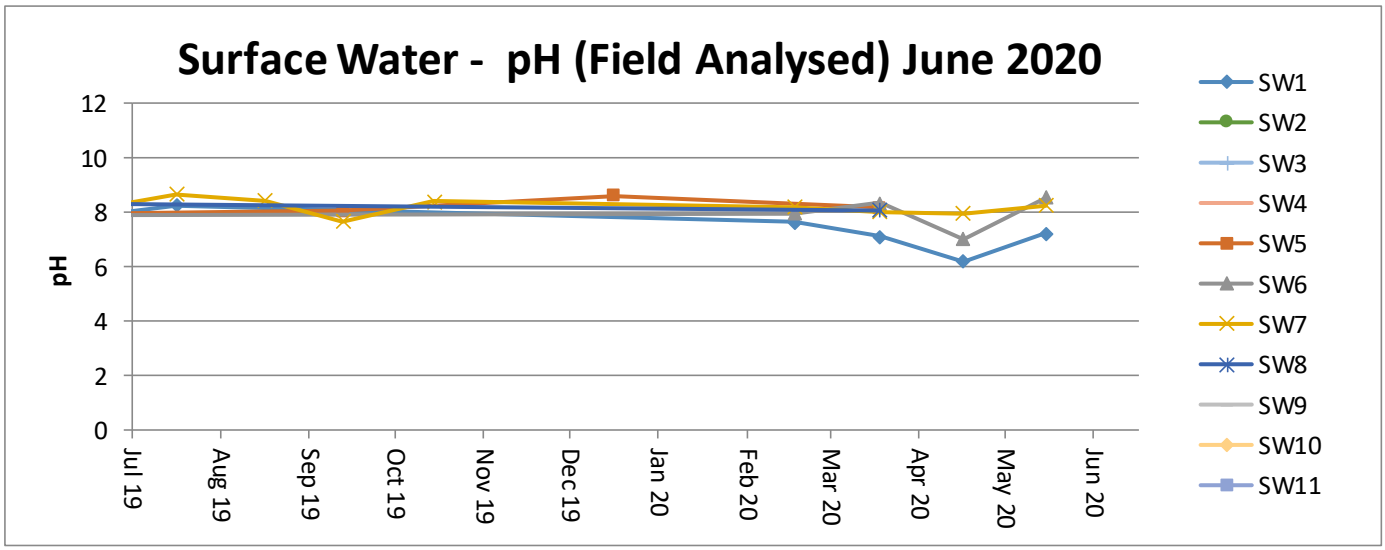


Surface Water – Creeks and Rivers

Routine surface water monitoring is conducted in surrounding creeks and rivers on a monthly basis. Results for parameters including pH, EC and Total Suspended Solids (TSS) are shown in the figures below. There are 11 surface water monitoring points, however only five were able to be sampled during the twelve month period.

Acidity / Alkalinity (pH)

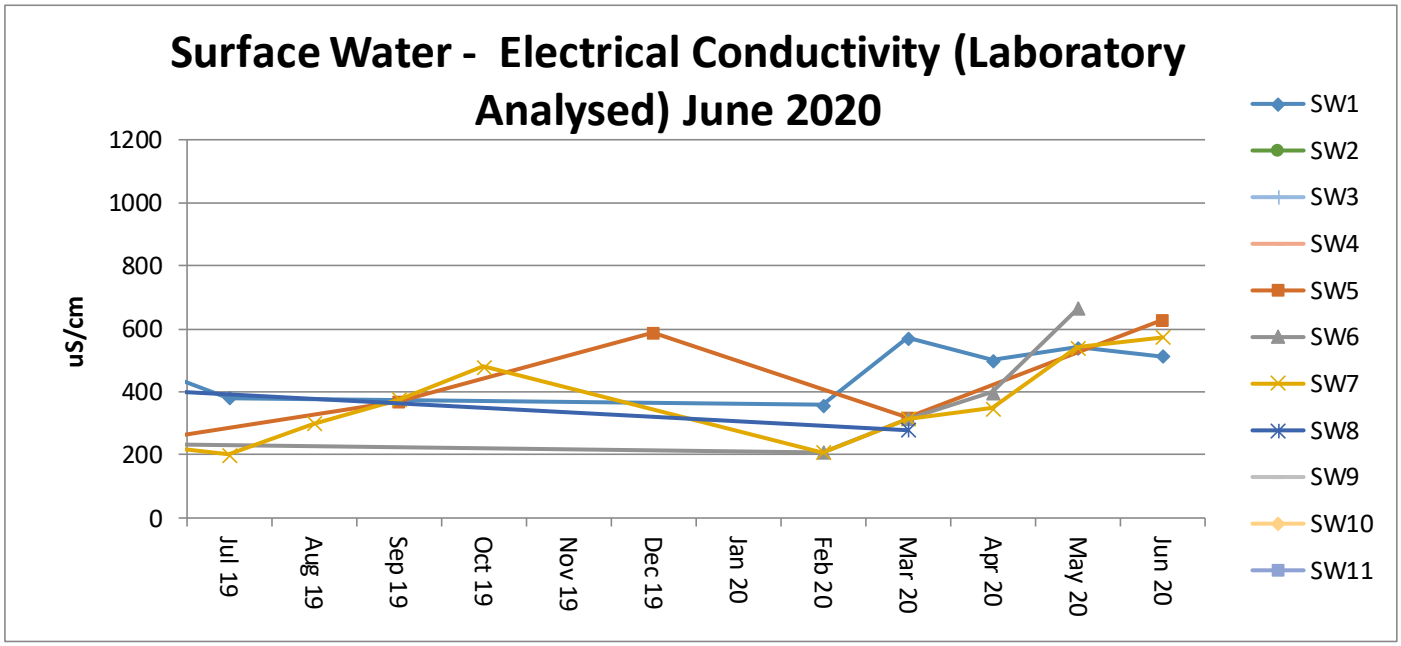
Monitoring results for pH in creeks and rivers surrounding MCCM are all trending within the ANZECC range for Irrigation, Ecosystem Health and Recreation.



**0 values indicate no water to sample due to the creek being dry*

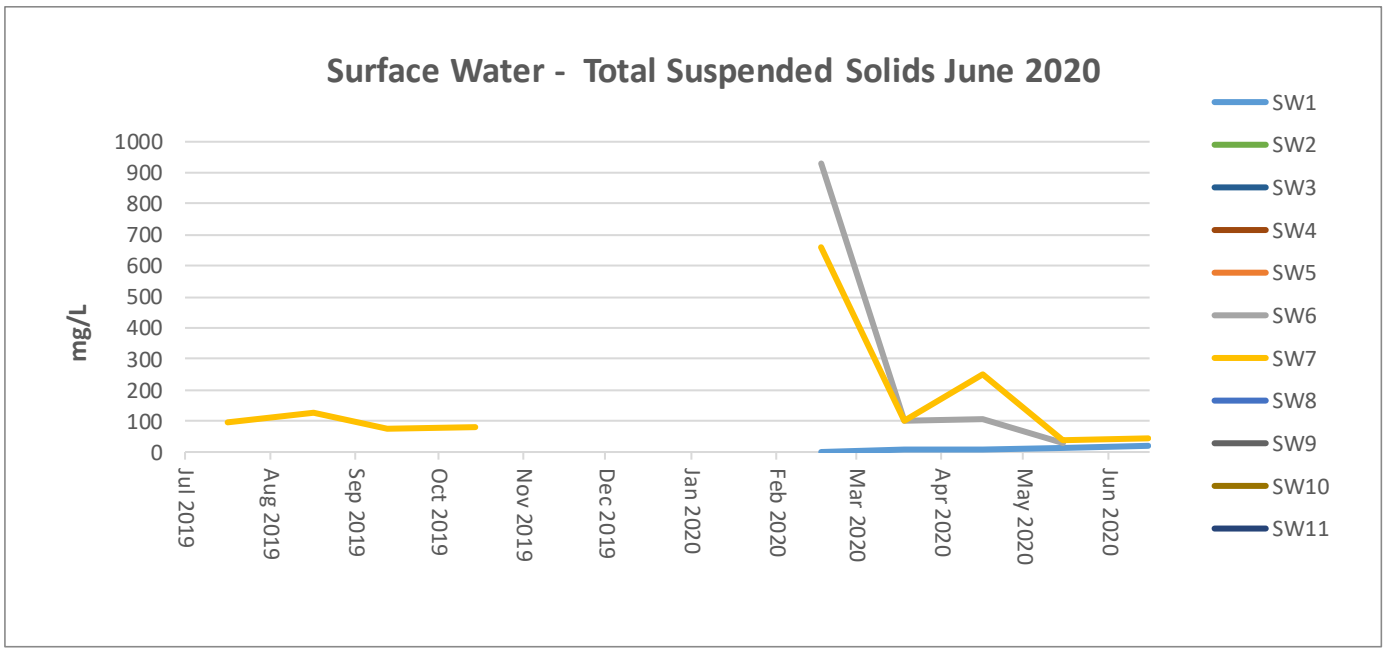
Electrical Conductivity

Surface water EC trends have remained consistent with SW5, SW6, SW7 and SW8 all historically variable. SW5, SW6, SW7 and SW8 are points along the Namoi River which are subject to regulated and variable flow regimes.



Total Suspended Solids (TSS)

Surface water TSS trends have remained generally consistent with historical results. SW5, SW6, SW7 and SW8 are historically variable as they are located along the Namoi River which is subject to regulated and variable flow regimes. There were elevated levels of TSS in Q1 due to significant rainfall events.



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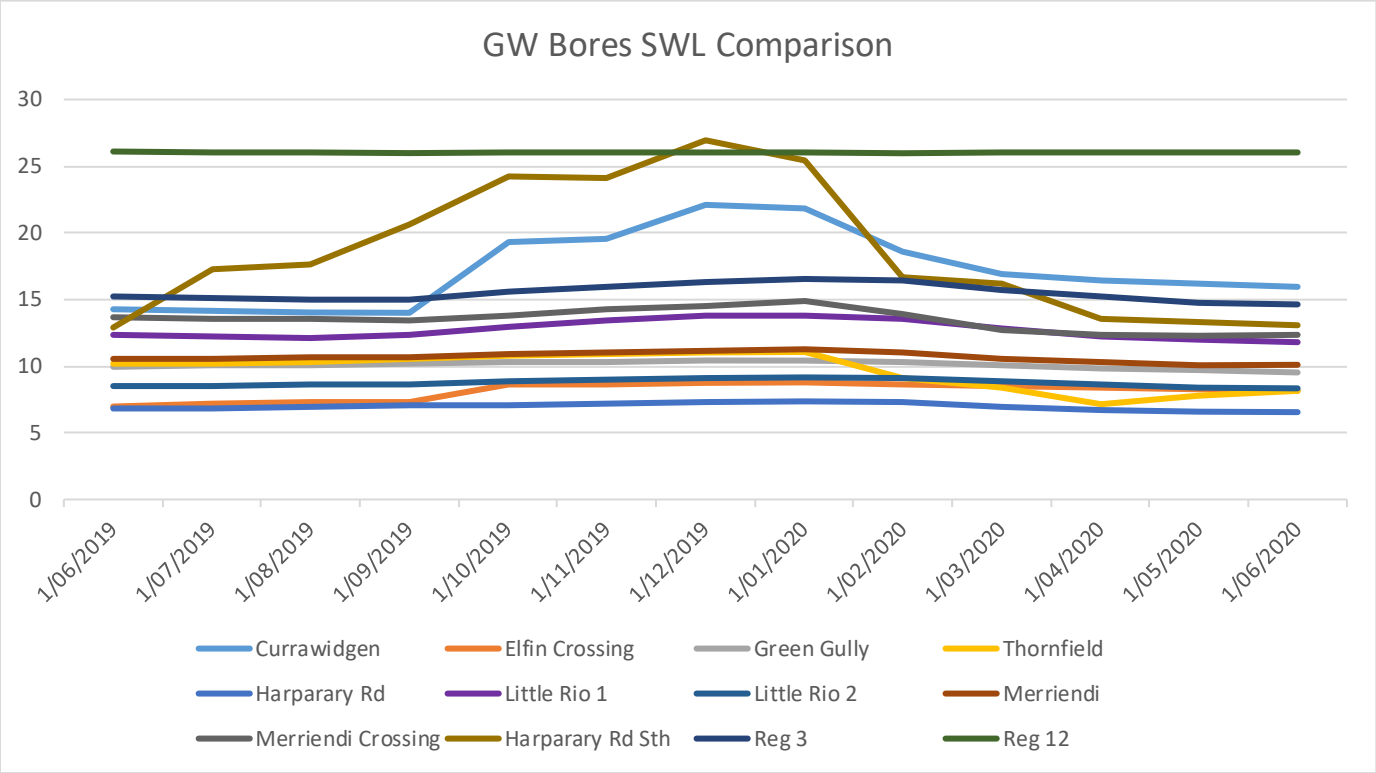
Maules Creek Coal Mine monitors regional bores across the region.



Rehabilitation

Rehabilitation works are ongoing, bulk reshape and topsoiling is currently being completed.

Feral Animal Management

During the most recent routine Whitehaven Offset Area Feral Animal Control program (June 2020) the results included:

- 56 out of total 100 pigs trapped were from the Maules Creek/Boggabri area; and
- 142 out of a total 286 fox baits (1080) taken were from the Maules/Boggabri area.

Revegetation

- Undertaken tree planting on Kelso, Velyama, Louenville and Onavale Offsets.

Fire Management

- Continued fire break maintenance program.
- Preparation work for ecological burn program.

Community Complaints

- 2 complaints were received during Q2 CY2020. Please refer to the Community Complaints Register on the Whitehaven Coal Maules Creek website.

Monitoring

- Redundant Infrastructure Removal ongoing now that former internal fences have been removed from Maules Offset;
- Demarcation fencing for Maules Offset Areas ongoing as well as annual inspection of Heritage and Threaten Flora fenced areas.

Maules Creek Coal Mine
Community Consultative Committee
Meeting #31

Environmental Monitoring Report
For the Q3 period, July – September 2020

Attended Noise Monitoring

Attended noise monitoring was undertaken at six locations during July, August and September 2020 by an independent acoustic consultant. The measured noise level ($LA_{eq\ 15\ minute}$) attributed to Maules Creek Coal Mine (MCCM) and applicable criteria for each location are shown in the tables below.

LAeq, 15minute GENERATED BY MCCM AGAINST OPERATIONAL NIGHT NOISE CRITERIA – JULY TO SEPTEMBER 2020.

Table 1 - July Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	09/07/2020 00:04	1.4	0	35	Yes	IA	Nil
NM2	08/07/2020 23:35	1.1	0	39	Yes	IA	Nil
NM3	08/07/2020 22:00	2.3	0	35	Yes	<20	Nil
NM4	08/07/2020 23:08	1.5	0	35	Yes	<25	Nil
NM5	09/07/2020 00:35	2.6	0	35	Yes	IA	Nil
NM6	08/07/2020 22:36	3.2	0	35	No	<25	NA

Table 2 - August Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	03/08/2020 22:26	1.6	0.0	35	Yes	IA	Nil
NM2	03/08/2020 23:11	1.9	0.0	39	Yes	IA	Nil
NM3	04/08/2020 00:02	1.3	0.0	35	Yes	IA	Nil
NM4	03/08/2020 22:50	1.1	0.0	35	Yes	IA	Nil
NM5	03/08/2020 22:00	2.1	0.0	35	Yes	<25	Nil
NM6	03/08/2020 23:37	1.5	0.0	35	Yes	IA	Nil

Table 3 - September Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	01/09/2020 22:30	0.6	0	35	Yes	<25	Nil
NM2	01/09/2020 23:30	0.5	0	39	Yes	<20	Nil
NM3	01/09/2020 23:31	0.5	0	35	Yes	IA	Nil
NM4	01/09/2020 23:00	0.5	0	35	Yes	IA	Nil
NM5	01/09/2020 22:00	0.7	0	35	Yes	<20	Nil
NM6	01/09/2020 23:58	0.4	0	35	Yes	IA	Nil

(1). Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres);
(2). Estimated or measured LAeq 15minute attributed to MCCM;
(3). NA in exceedance column means criterion is not applicable, either due to atmospheric conditions outside those specified in project Approval or due to property acquisition by MCC; and
(4). Indicates the application of a 2dB low frequency modifying factor.
IA/NM – Inaudible NM – Not measurable

During Q3 no measurements satisfied the conditions for further assessment when reviewed for the applicability of low frequency modification factors in accordance with the EPA's Noise Policy for Industry.

Maules Creek Coal (MCC) EPL 20221 also has a '1 Minute - Night' criteria (LA1) that applies from 10pm to 7am Monday to Saturday & 10pm to 8am Sundays and Public Holidays. The results for the LA1 monitoring are shown below. The results show that mine operations did not exceed the applicable LA1 criteria during attended noise monitoring in Q3 2020.

LA1, 1minute GENERATED BY MCC AGAINST OPERATIONAL NIGHT NOISE CRITERIA – JULY TO SEPTEMBER 2020.

Table 4 - July Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	09/07/2020 00:04	1.4	0	45	Yes	IA	Nil
NM2	08/07/2020 23:35	1.1	0	45	Yes	IA	Nil
NM3	08/07/2020 22:00	2.3	0	45	Yes	<20	Nil
NM4	08/07/2020 23:08	1.5	0	45	Yes	<25	Nil
NM5	09/07/2020 00:35	2.6	0	45	Yes	IA	Nil
NM6	08/07/2020 22:36	3.2	0	45	No	26	NA

Table 5 – August Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	03/08/2020 22:26	1.6	0.0	45	Yes	IA	Nil
NM2	03/08/2020 23:11	1.9	0.0	45	Yes	IA	Nil
NM3	04/08/2020 00:02	1.3	0.0	45	Yes	IA	Nil
NM4	03/08/2020 22:50	1.1	0.0	45	Yes	IA	Nil
NM5	03/08/2020 22:00	2.1	0.0	45	Yes	29	Nil
NM6	03/08/2020 23:37	1.5	0.0	45	Yes	IA	Nil

Table 6 - September Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	01/09/2020 22:30	0.6	0	45	Yes	<25	Nil
NM2	01/09/2020 23:30	0.5	0	45	Yes	23	Nil
NM3	01/09/2020 23:31	0.5	0	45	Yes	IA	Nil
NM4	01/09/2020 23:00	0.5	0	45	Yes	IA	Nil
NM5	01/09/2020 22:00	0.7	0	45	Yes	22	Nil
NM6	01/09/2020 23:58	0.4	0	45	Yes	IA	Nil

Notes:

1. *Noise emission limits do not apply during periods of rainfall or wind speeds greater than 3 metres per second (at 10 metres);*
2. *Estimated or measured LAeq,15minute attributed to MCCM;*
3. *Estimated or measured LA1,1minute attributed to MCCM;*
4. *NA in exceedance column means atmospheric conditions outside those specified in Project Approval and criterion is not applicable.*

IA – Inaudible NM – Not measurable

Wind Direction during Attended Monitoring

Wind direction data is collected from the MCCM Automated Weather Station (AWS). Wind data for the duration of the attended monitoring assessment, recorded at the MCCM AWS is presented in the table below.

Table 7 - Prevailing Wind Direction

Monitoring Date	Prevailing Wind Direction
July	S
August	W
September	SSE

Blast Monitoring

There were 34 blasts at MCCM during Q3 2020. All blast monitoring results recorded within the reporting period have complied with applicable overpressure and ground vibration limits specified in the respective approvals.

Table 8 - Blast Results Summary Quarter 3 2020

Parameter	Units	Frequency	Number	Average	Max	100% Limit	Exceedance (Yes / No)
Noise	dB (Lin Peak)	All	34	97.73	116.5	120	No
Vibration	mm/s		34	0.27	4.07	10	No

Air Quality

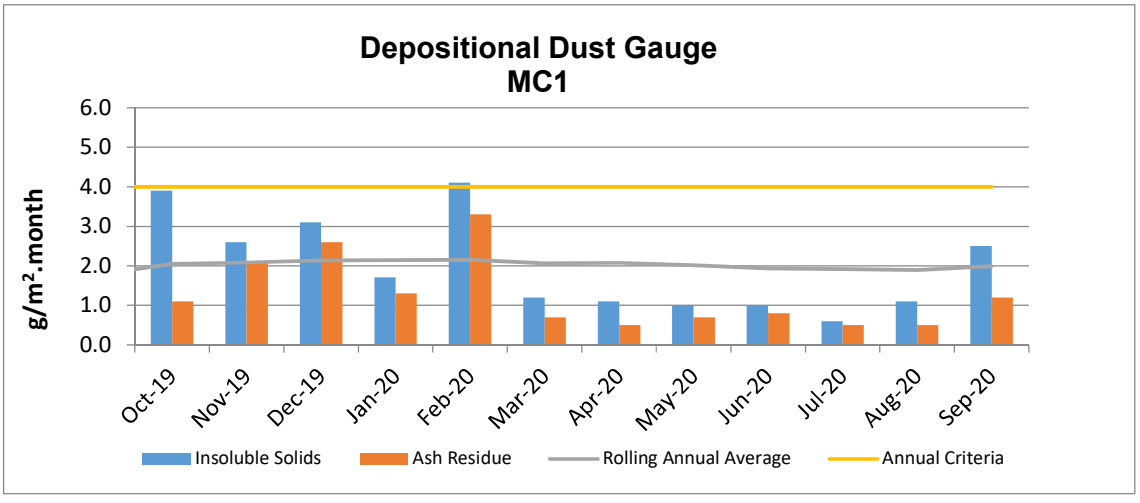
Total Depositional Dust

The 12 monthly rolling annual average remains below the relevant Project Approval criteria of 4g/m^2/month for the respective monitoring points except for at MC4 as shown in the below graph.

Whilst MC4 was above the 12 month rolling average this was however attributed to a highly contaminated sample during the bushfires and dust storms in October 2019.

Table 9 – Deposited Dust Gauge Results [g/m^2/month]

MONTH	MC1	MC2	MC3	MC4
July -20	0.6	1.7	2.0	2.4
August-20	1.1	2.8	1.4	0.8
September-20	2.5	2.9	1.4	0.7
12 MONTH ROLLING AVERAGE	2.0	2.7	2.2	**7.6**



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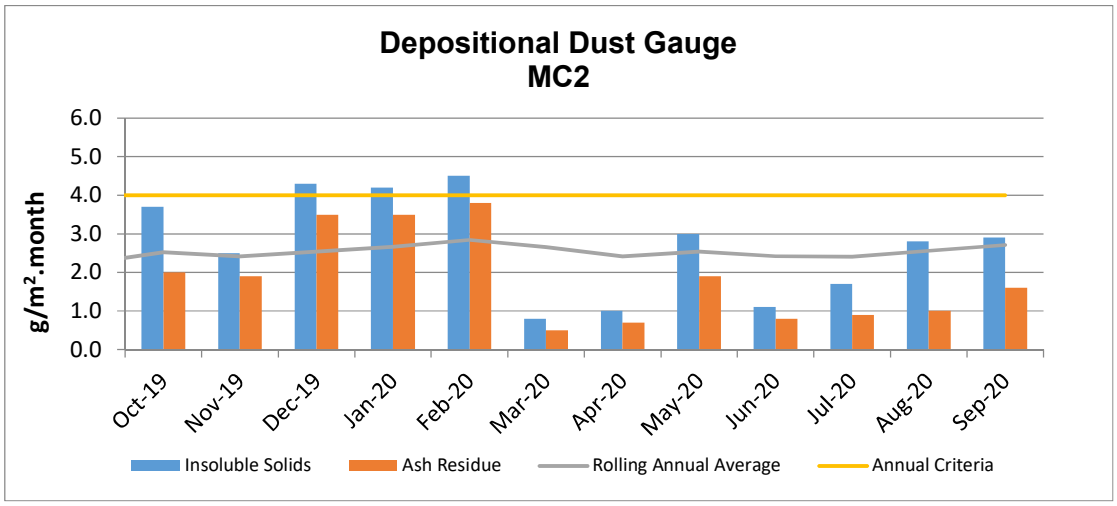

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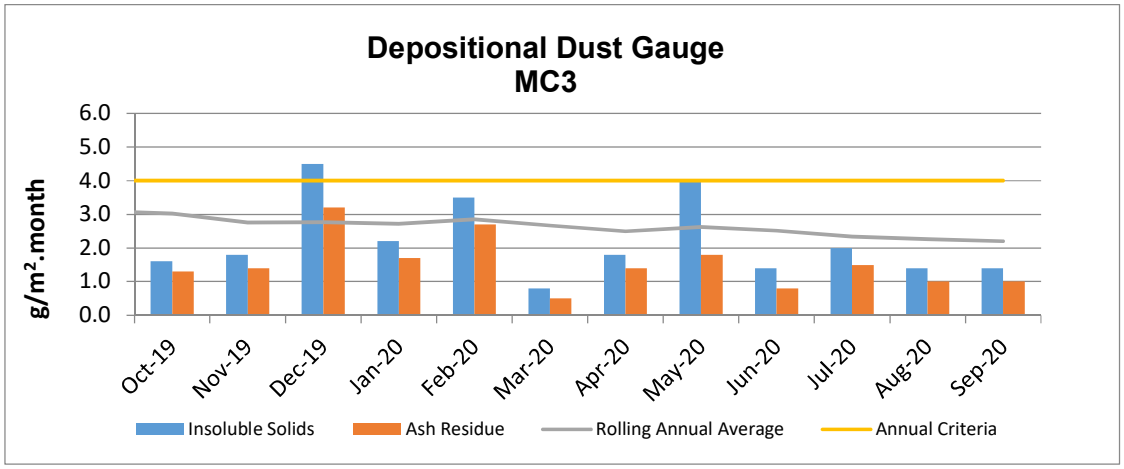

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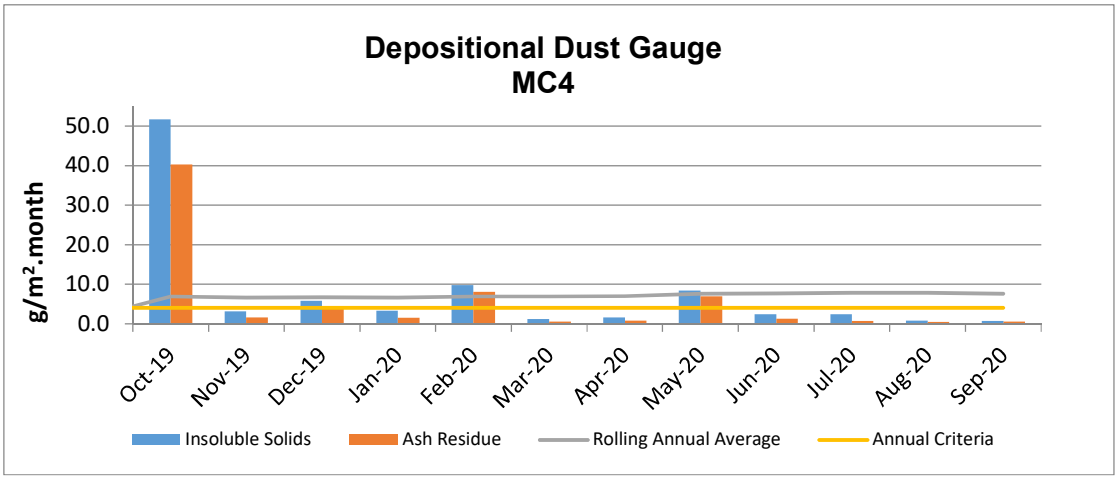

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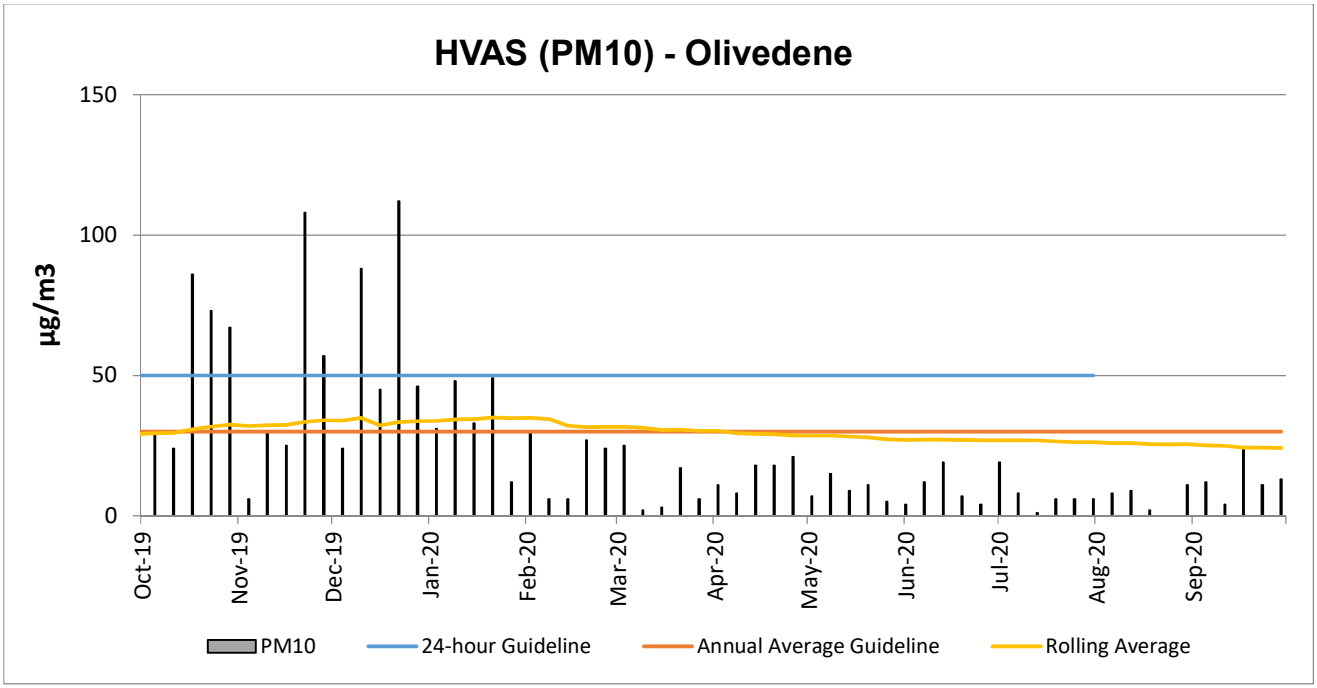
High Volume Air Sampling (HVAS)

The HVAS monitor is located on the property '*Olivedene*,' a mine owned property on Therribri Road. During 2020 there have been no exceedances of the 24 hour average of 50 µg/m^3.

HVAS PM_{10} Rolling Annual Average during Q2 2020 is **24.1 µg/m^3**, which is below the Annual Average Guideline of 30 µg/m^3.



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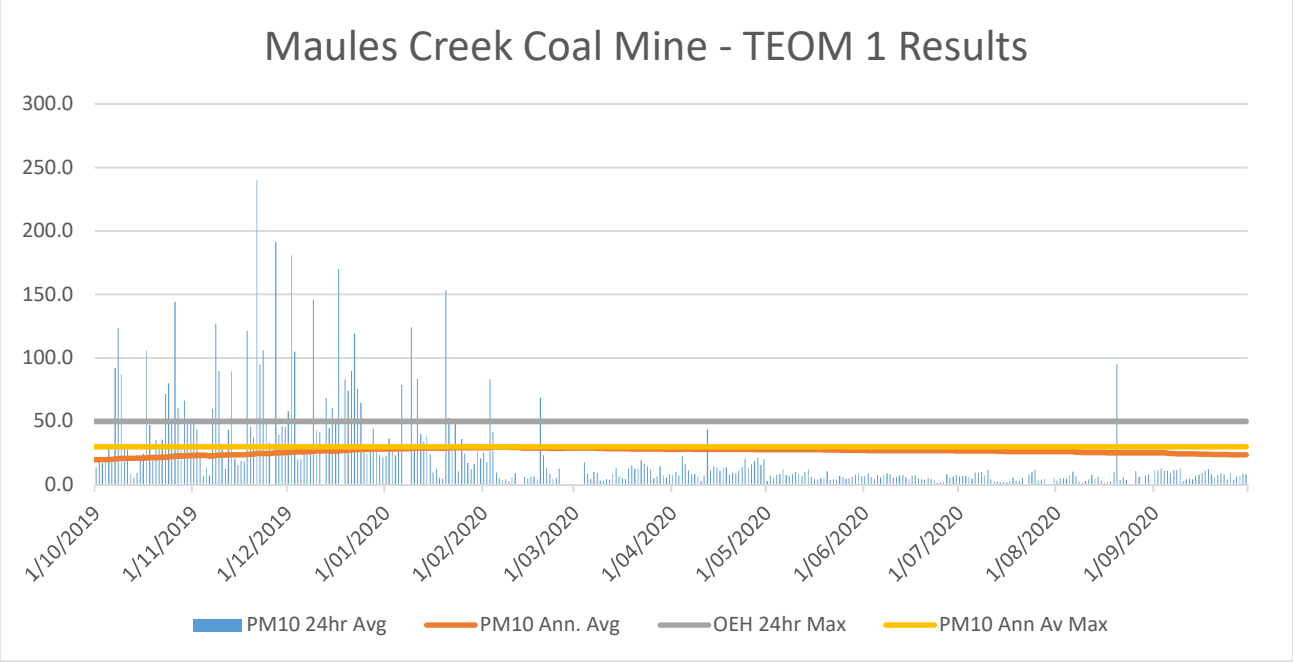
TEOM - PM_{10} Results

The annual average for PM_{10} at the Maules Creek Coal TEOM is **23.7 µg/m³**, which is below the Project Approval annual average criteria of 30µg/m³ as shown in the following figure. There has been one exceedances of the 24 hour average for Q3.

TEOM Result Figures – Particulate Matter $PM_{10µg/m^3}$



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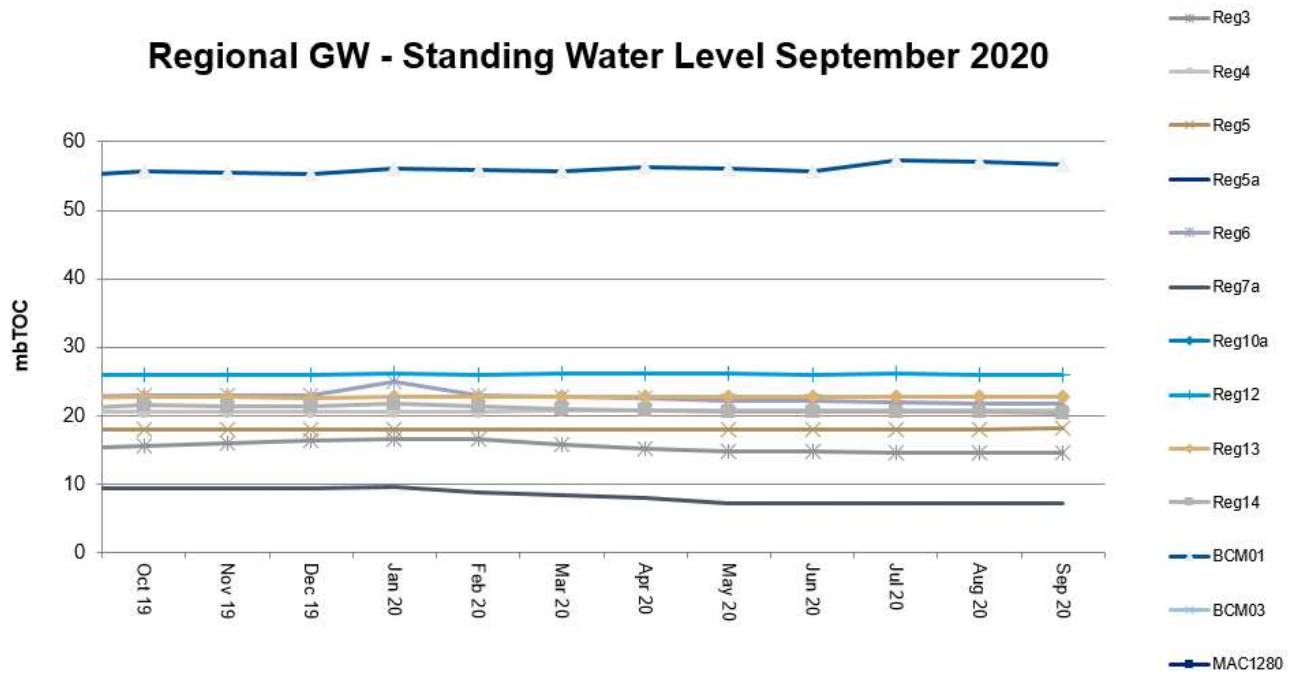
Groundwater monitoring results in open standpipe piezometers show levels to be relatively stable. The Regional bores were installed between Q4, 2013 and Q1, 2014. BCM01, BCM03, Reg10 are shallow bores which have remained dry since construction in 2013.



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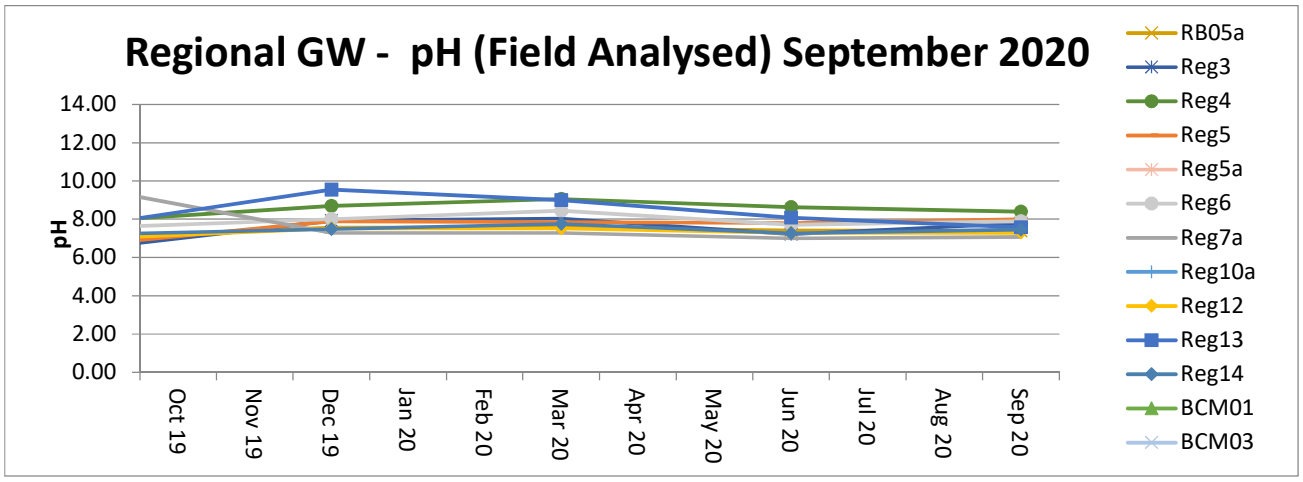
Over the past twelve months pH readings across the regional bores have remained static with very little fluctuation.



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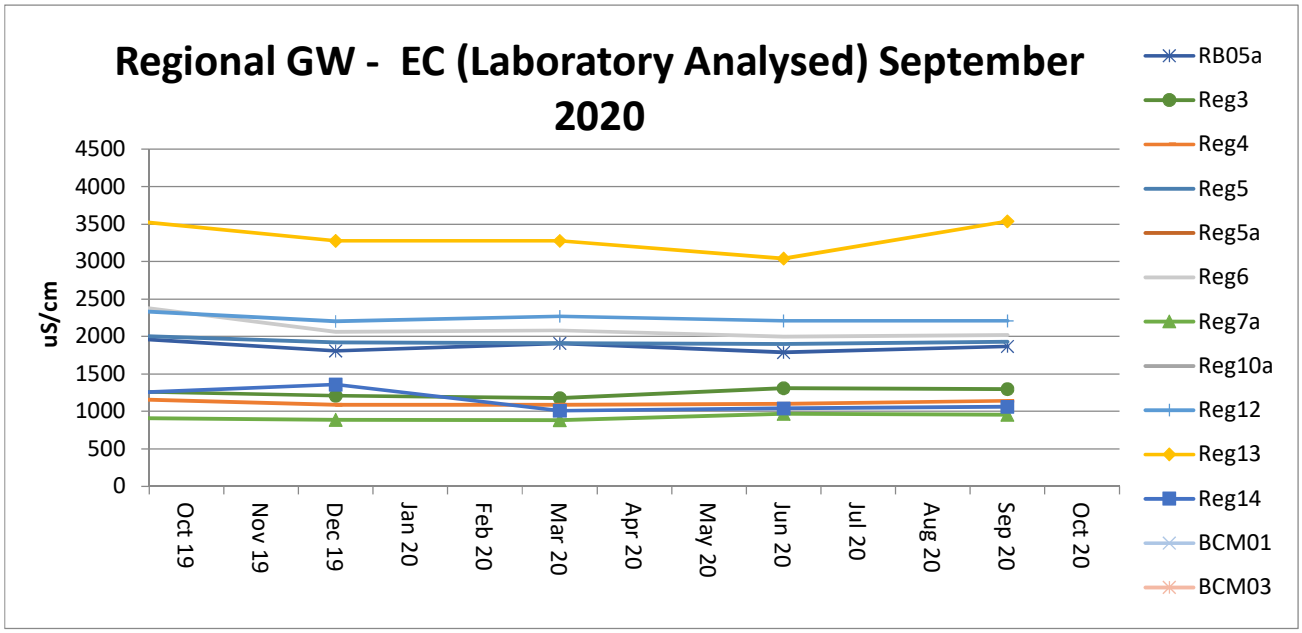

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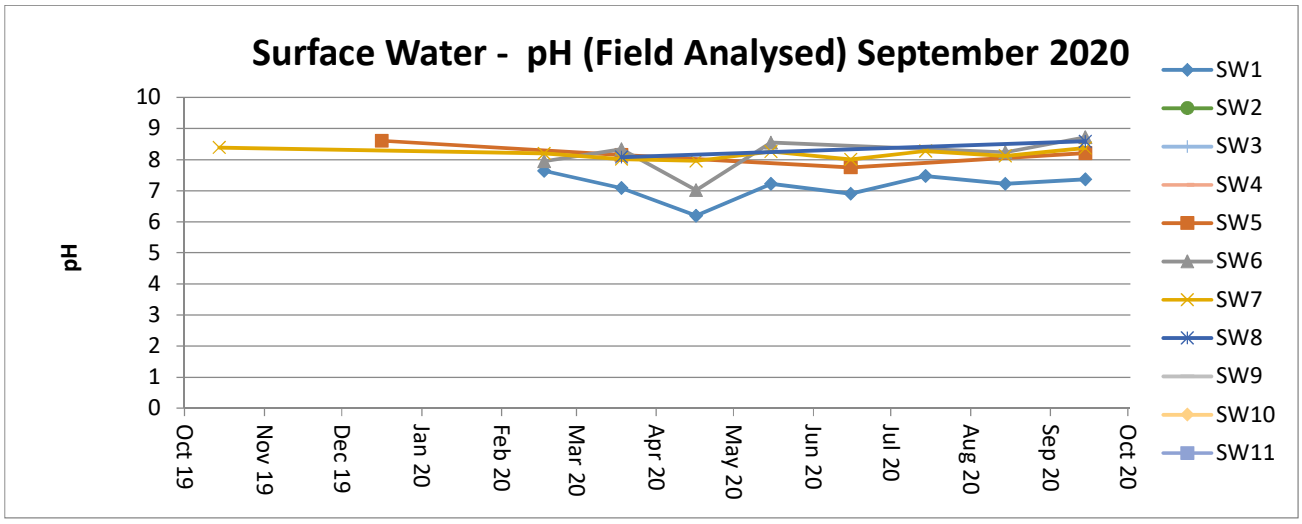

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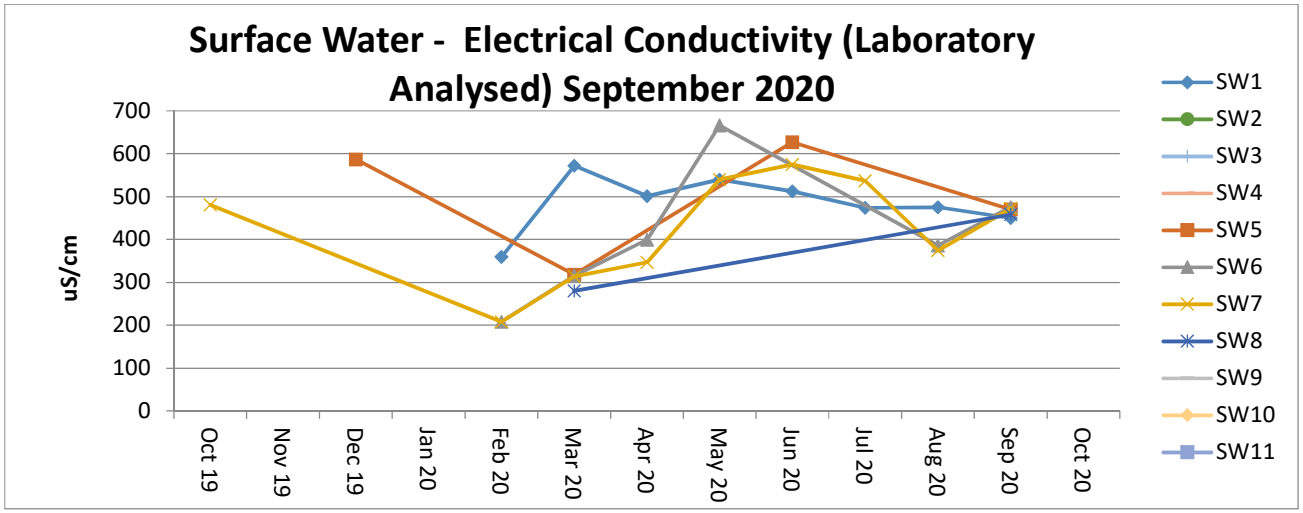

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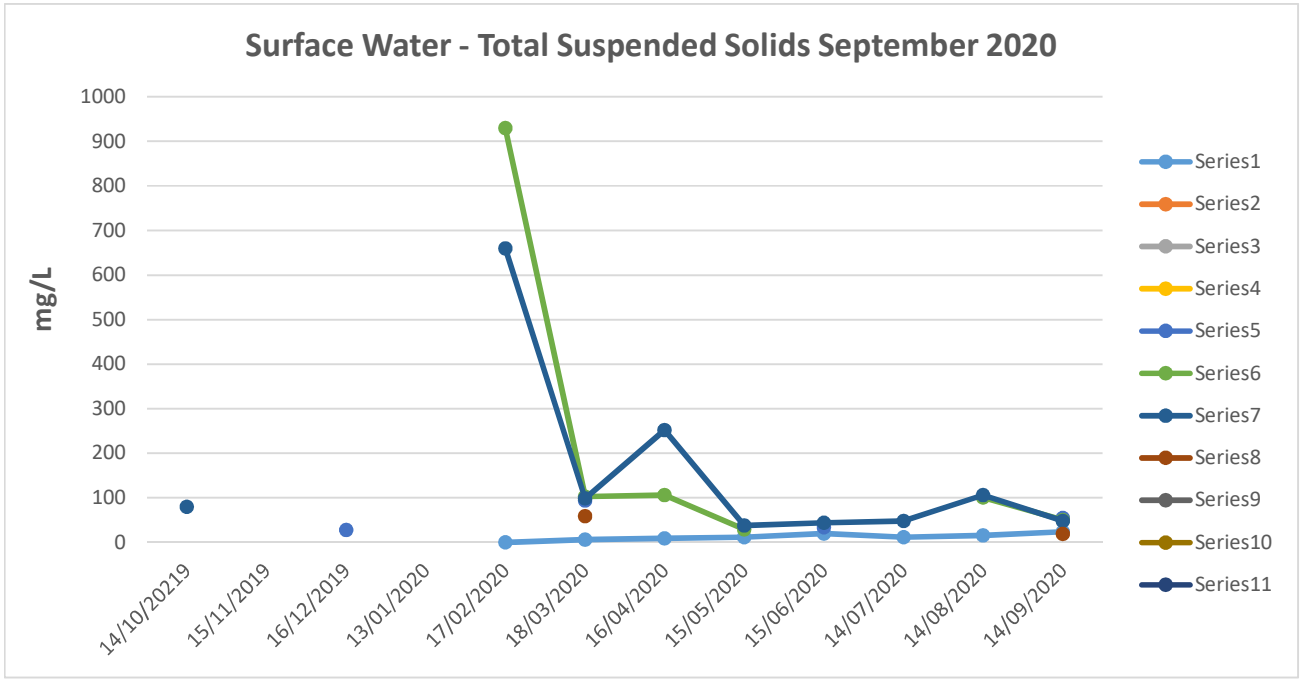

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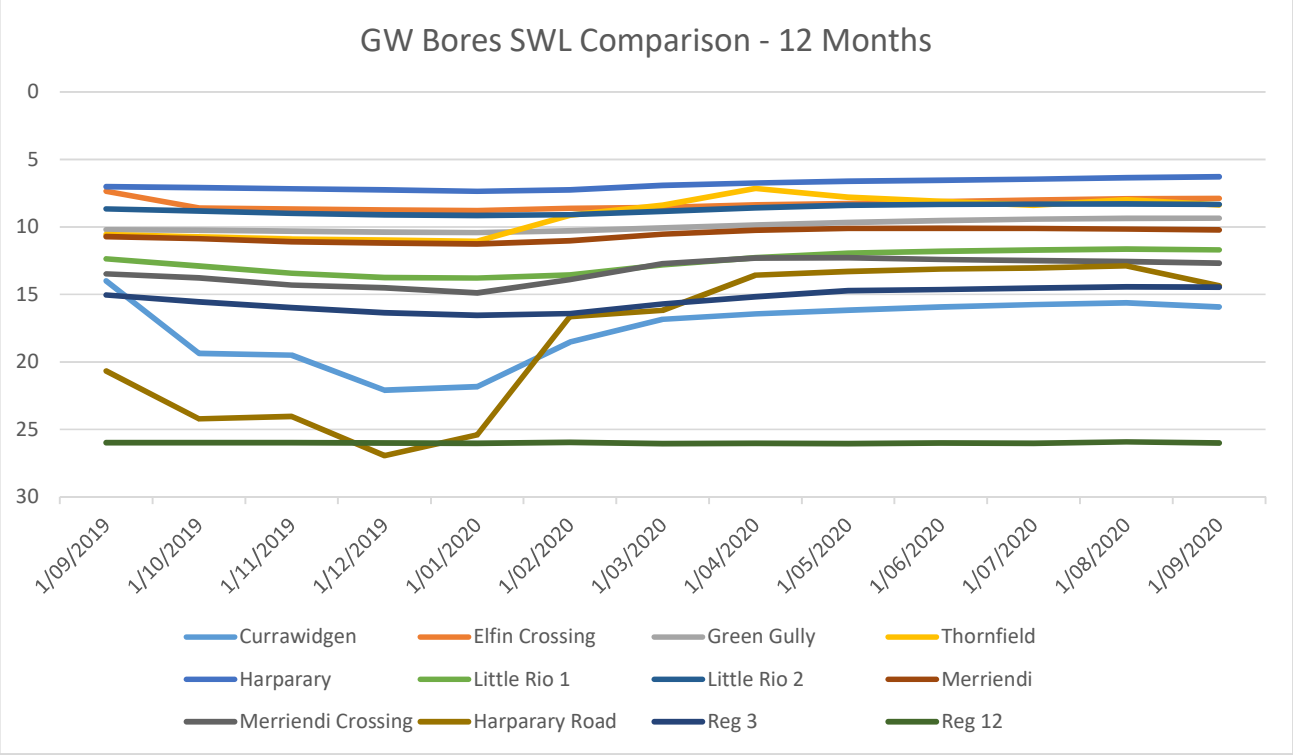
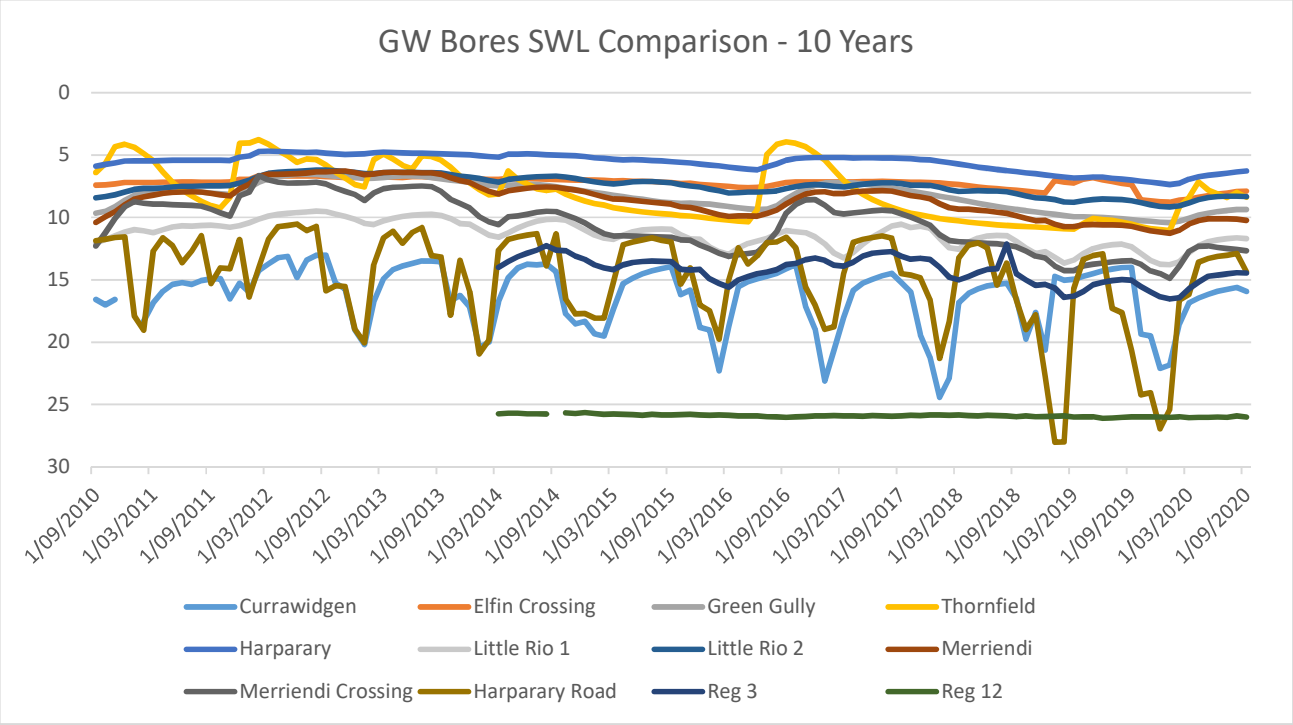




Rehabilitation

Rehabilitation works are ongoing, bulk reshape and topsoiling is currently being completed.

Feral Animal Management

During the most recent routine Whitehaven Offset Area Feral Animal Control program (September 2020) the results included:

- 70 out of total 108 pigs trapped were from the Maules Creek/Boggabri area; and
- 130 out of a total 231 fox baits (1080) taken were from the Maules/Boggabri area.

Revegetation

- Undertaken tree planting on Teston North, Teston South, Tralee Offsets and commenced routine tree watering program.

Weed Control

- Undertaken spring seasonal weed control on Teston North, Tralee, Teston South, Velyama and Kelso plus Wollandilly and Onavale Offsets.

Threatened Flora

- Undertaken routine Inspections and planted 34 Pomaderris queenslandica seedlings on Kelso, Teston South, Louenville and Wollandilly Offsets.

Fire Management

- Continued fire break maintenance program on Onavale, Wollandilly, Tralee, Teston North, Teston South, Kelso, Velyama, Louenville and Wirradale Offsets.

Fencing and Waste Management

- Redundant Infrastructure Removal completed in Onavale, Wollandilly, Tralee, Teston North and Teston South plus Roseglass and Bimbooria Offsets and ongoing for the remainder of Maules Offsets.

Community Complaints

- 4 complaints were received during Q3 CY2020. Please refer to the Community Complaints Register on the Whitehaven Coal Maules Creek website.

Maules Creek Coal Mine
Community Consultative Committee
Meeting #32

Environmental Monitoring Report
For the Q4 period, October – December 2020

Attended Noise Monitoring

Attended noise monitoring was undertaken at six locations during October, November and December 2020 by an independent acoustic consultant. The measured noise level ($LA_{eq\ 15\ minute}$) attributed to Maules Creek Coal Mine (MCCM) and applicable criteria for each location are shown in the tables below.

LAeq, 15minute GENERATED BY MCCM AGAINST OPERATIONAL NIGHT NOISE CRITERIA – OCTOBER TO DECEMBER 2020.

Table 1 - October Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	01/10/2020 22:30	1.6	0.0	35	Yes	35	Nil
NM2	01/10/2020 23:30	2.1	0.0	39	Yes	35	Nil
NM3	01/10/2020 23:35	1.3	0.0	35	Yes	IA	Nil
NM4	01/10/2020 23:00	1.7	0.0	35	Yes	<30	Nil
NM5	01/10/2020 22:00	1.2	0.0	35	Yes	<30	Nil
NM6	01/10/2020 23:55	2.8	0.0	35	Yes	<25	Nil

Table 2 - November Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	09/11/2020 22:30	2.2	0.0	35	Yes	23	Nil
NM2	09/11/2020 23:30	1.0	0.0	39	Yes	29	Nil
NM3	09/11/2020 23:30	1.0	0.0	35	Yes	23	Nil
NM4	09/11/2020 23:00	1.5	0.0	35	Yes	25	Nil
NM5	09/11/2020 22:00	3.5	0.0	35	No	IA	NA
NM6	09/11/2020 23:55	0.8	0.0	35	Yes	24	Nil

Table 3 - December Noise Monitoring

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP L_{Aeq} dB [2]	Exceedance dB [3]
NM1	08/12/2020 22:30	2.2	0.0	35	Yes	23	Nil
NM2	08/12/2020 23:30	0.9	0.0	39	Yes	31	Nil
NM3	08/12/2020 23:31	0.9	0.0	35	Yes	IA	Nil
NM4	08/12/2020 23:00	1.9	0.0	35	Yes	24	Nil
NM5	08/12/2020 22:00	2.3	0.0	35	Yes	IA	Nil
NM6	08/12/2020 23:55	1.0	0.0	35	Yes	<20	Nil

(1). Noise emission limits do not apply during periods of rainfall or winds greater than 3 metres per second (at a height of 10 metres);
(2). Estimated or measured LAeq 15minute attributed to MCCM;
(3). NA in exceedance column means criterion is not applicable, either due to atmospheric conditions outside those specified in project Approval or due to property acquisition by MCC; and
(4). Indicates the application of a 2dB low frequency modifying factor.
IA/NM – Inaudible NM – Not measurable

During Q4 no measurements satisfied the conditions for further assessment when reviewed for the applicability of low frequency modification factors in accordance with the EPA's Noise Policy for Industry.

Maules Creek Coal (MCC) EPL 20221 also has a '1 Minute - Night' criteria (LA1) that applies from 10pm to 7am Monday to Saturday & 10pm to 8am Sundays and Public Holidays. The results for the LA1 monitoring are shown below. The results show that mine operations did not exceed the applicable LA1 criteria during attended noise monitoring in Q4 2020.

LA1, 1minute GENERATED BY MCC AGAINST OPERATIONAL NIGHT NOISE CRITERIA – OCTOBER TO DECEMBER 2020.

Table 4 - October Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	01/10/2020 22:30	1.6	0.0	45	Yes	37	Nil
NM2	01/10/2020 23:30	2.1	0.0	45	Yes	41	Nil
NM3	01/10/2020 23:35	1.3	0.0	45	Yes	IA	Nil
NM4	01/10/2020 23:00	1.7	0.0	45	Yes	<30	Nil
NM5	01/10/2020 22:00	1.2	0.0	45	Yes	<30	Nil
NM6	01/10/2020 23:55	2.8	0.0	45	Yes	<25	Nil

Table 5 – November Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	09/11/2020 22:30	2.2	0.0	45	Yes	28	Nil
NM2	09/11/2020 23:30	1.0	0.0	45	Yes	34	Nil
NM3	09/11/2020 23:30	1.0	0.0	45	Yes	<25	Nil
NM4	09/11/2020 23:00	1.5	0.0	45	Yes	30	Nil
NM5	09/11/2020 22:00	3.5	0.0	45	No	IA	NA
NM6	09/11/2020 23:55	0.8	0.0	45	Yes	25	Nil

Table 6 - December Noise Monitoring – Night

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies [1]	MCCP $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NM1	08/12/2020 22:30	2.2	0.0	45	Yes	28	Nil
NM2	08/12/2020 23:30	0.9	0.0	45	Yes	35	Nil
NM3	08/12/2020 23:31	0.9	0.0	45	Yes	IA	Nil
NM4	08/12/2020 23:00	1.9	0.0	45	Yes	28	Nil
NM5	08/12/2020 22:00	2.3	0.0	45	Yes	IA	Nil
NM6	08/12/2020 23:55	1.0	0.0	45	Yes	<20	Nil

Notes:

1. *Noise emission limits do not apply during periods of rainfall or wind speeds greater than 3 metres per second (at 10 metres);*
2. *Estimated or measured LAeq,15minute attributed to MCCM;*
3. *Estimated or measured LA1,1minute attributed to MCCM;*
4. *NA in exceedance column means atmospheric conditions outside those specified in Project Approval and criterion is not applicable.*

IA – Inaudible NM – Not measurable

Wind Direction during Attended Monitoring

Wind direction data is collected from the MCCM Automated Weather Station (AWS). Wind data for the duration of the attended monitoring assessment, recorded at the MCCM AWS is presented in the table below.

Table 7 - Prevailing Wind Direction

Monitoring Date	Prevailing Wind Direction
October	S
November	SSE
December	SSE

Blast Monitoring

There were 28 blasts at MCCM during Q4 2020. All blast monitoring results recorded within the reporting period have complied with applicable overpressure and ground vibration limits specified in the respective approvals.

Table 8 - Blast Results Summary Quarter 4 2020

Parameter	Units	Frequency	Number	Average	Max	100% Limit	Exceedance (Yes / No)
Noise	dB (Lin Peak)	All	28	96.21	112.7	120	No
Vibration	mm/s		28	0.20	1.05	10	No

Air Quality

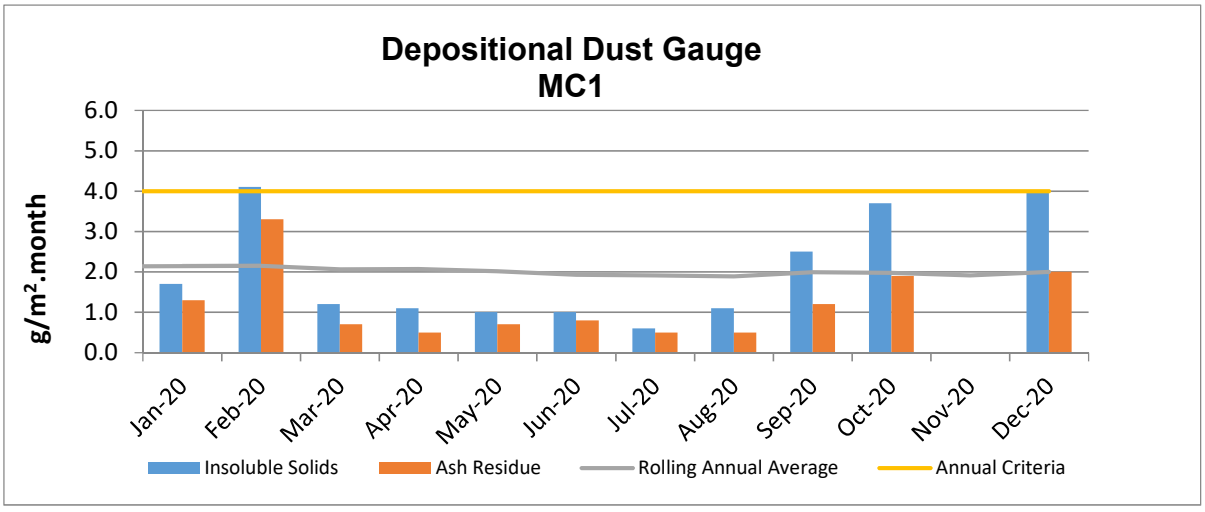
Total Depositional Dust

The 12 monthly rolling annual average remains below the relevant Project Approval criteria of 4g/m^2/month for the respective monitoring points.

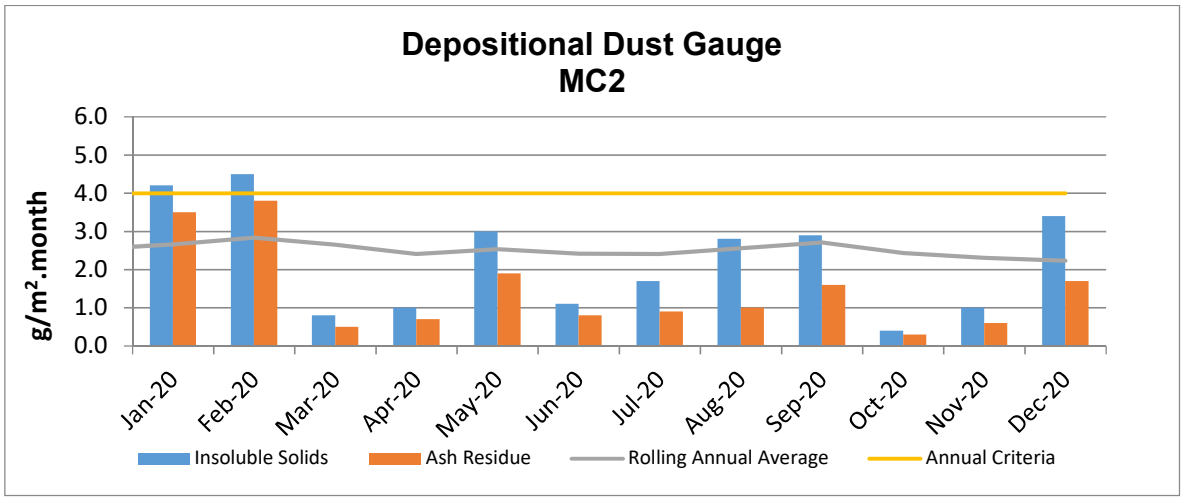
Table 9 – Deposited Dust Gauge Results [g/m^2/month]

MONTH	MC1	MC2	MC3	MC4
October -20	3.7	0.4	0.8	1.1
November-20	3.6[C]	1.0	1.2	1.0
December-20	4.0	3.4	5.1	0.9
12 MONTH ROLLING AVERAGE	2.0	2.2	2.1	2.8

[C]*Average containes samples contamined by bird dropping, decomposed insects or vegetable matter.*



** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*



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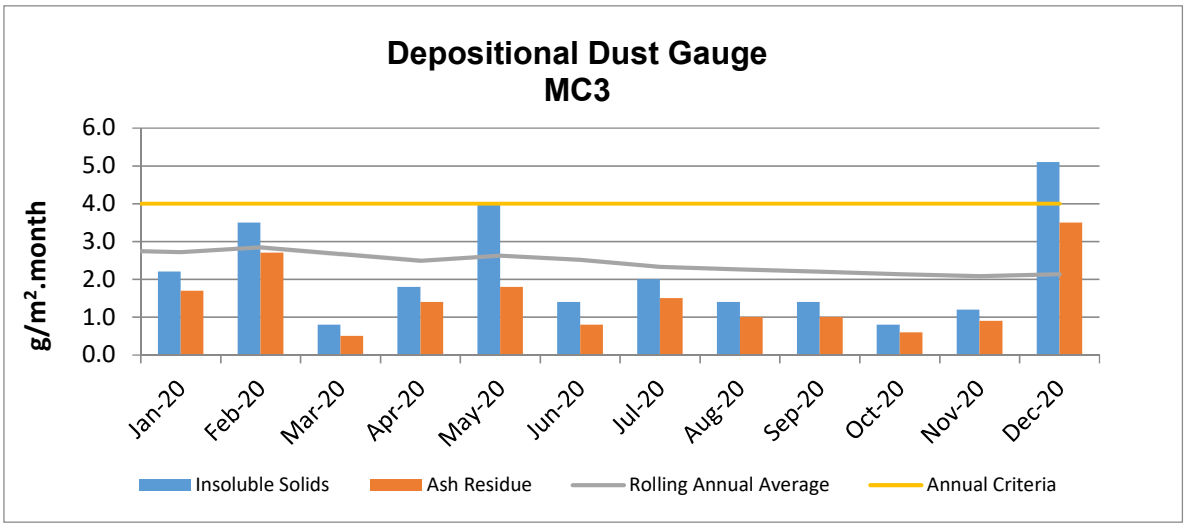

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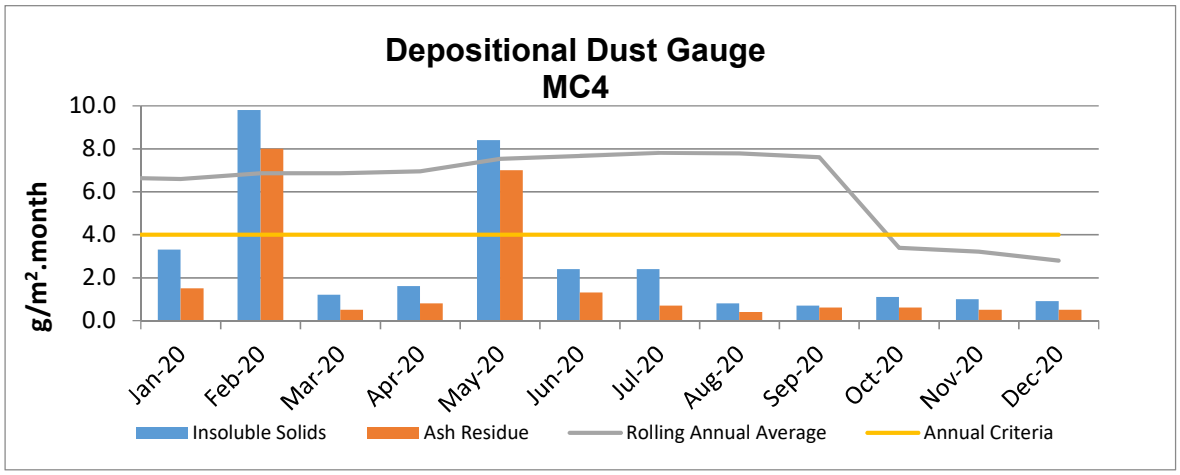
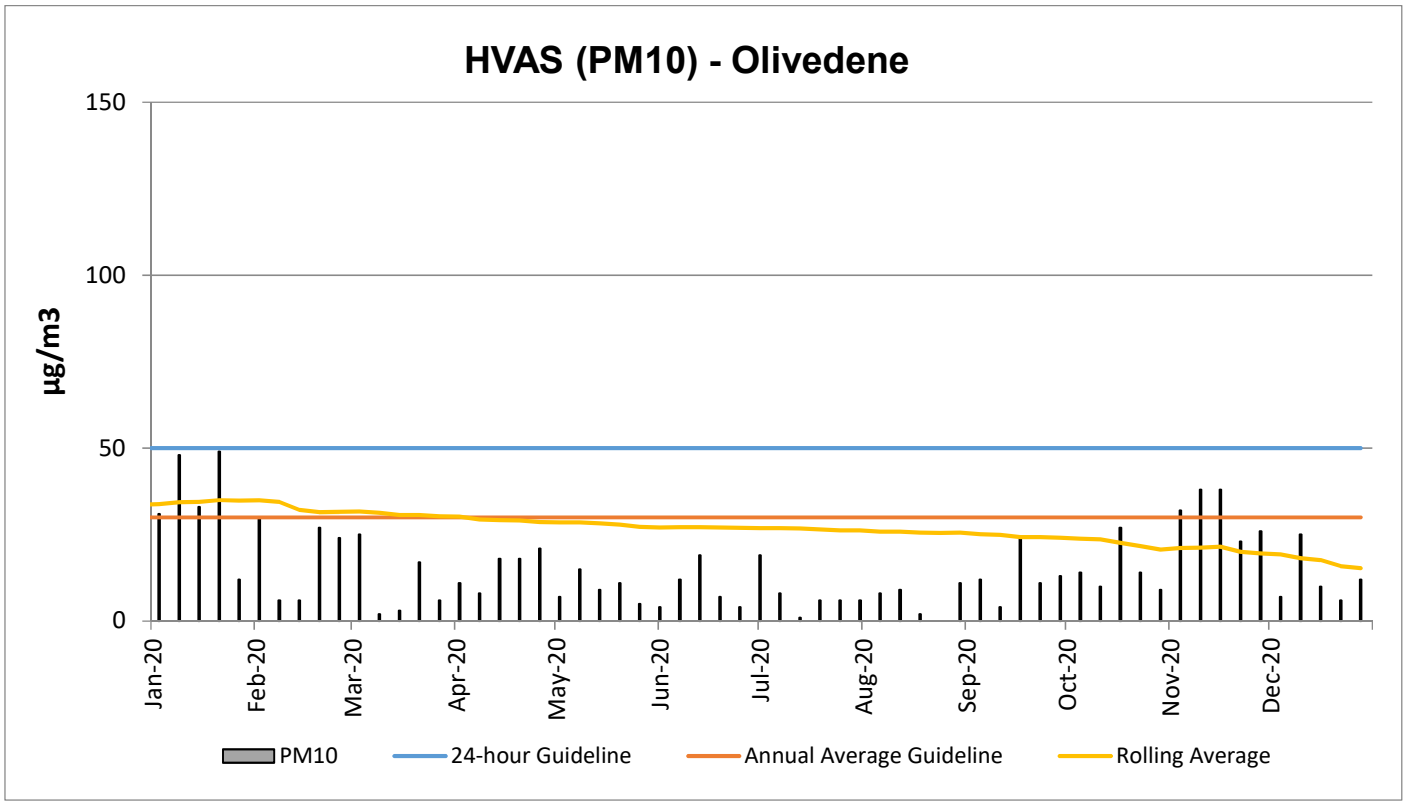


** Blank cells indicate sample periods where the sample has been contaminated and excluded from the results tables due to contaminated material (insect larvae, bird droppings, vegetation etc.).*

High Volume Air Sampling (HVAS)

The HVAS monitor is located on the property '*Olivedene*,' a mine owned property on Therribri Road. During 2020 there have been no exceedances of the 24 hour average of 50 µg/m^3.

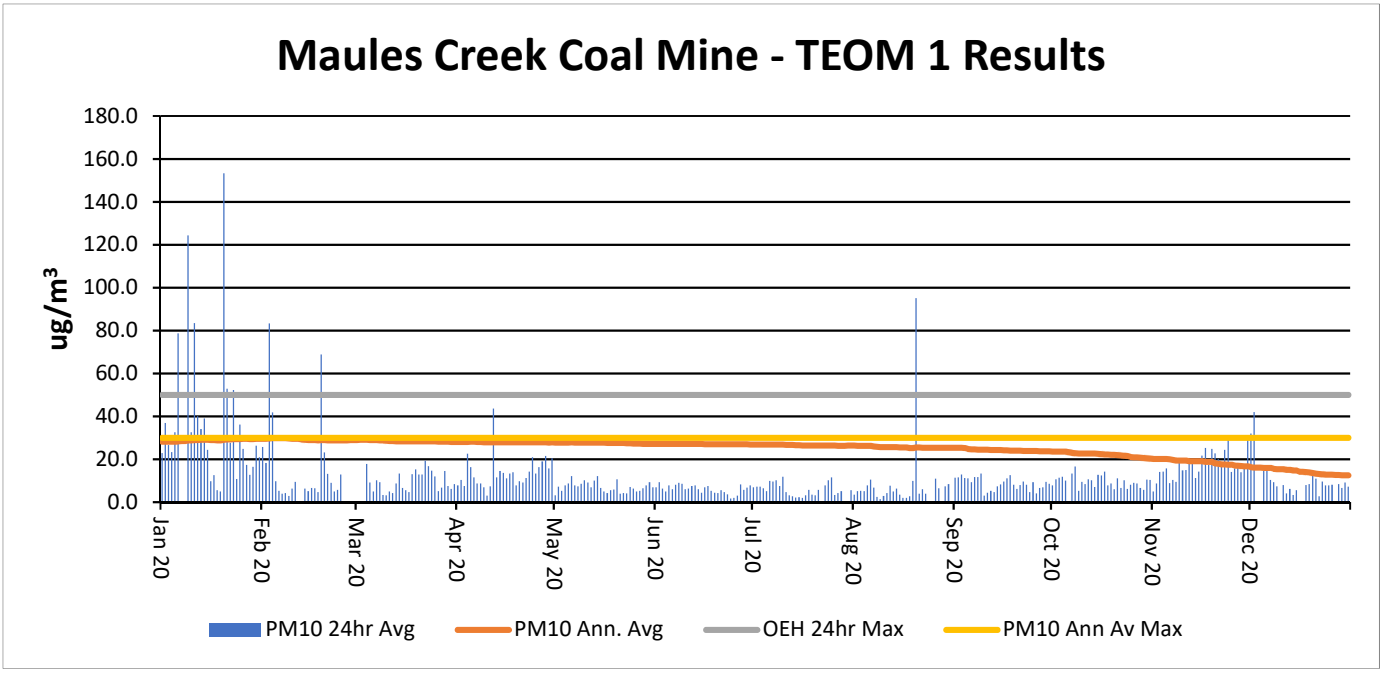
HVAS PM_{10} Rolling Annual Average during Q4 2020 is **15.3 µg/m^3**, which is below the Annual Average Guideline of 30 µg/m^3.



TEOM - PM_{10} Results

The annual average for PM_{10} at the Maules Creek Coal TEOM is **12.5 µg/m³**, which is below the Project Approval annual average criteria of 30µg/m³ as shown in the following figure. There have been no exceedances of the 24 hour average for Q4.

TEOM Result Figures – Particulate Matter $PM_{10µg/m^3}$



** Blank columns indicate sample periods where there was either power outage, maintenance or other related causes.*

*** Exceedances of the OEH 24hr Maximum over the past 12 months have been non mine related and have been attributed to regional dust events. All previous exceedances have been discussed at CCC meetings.*

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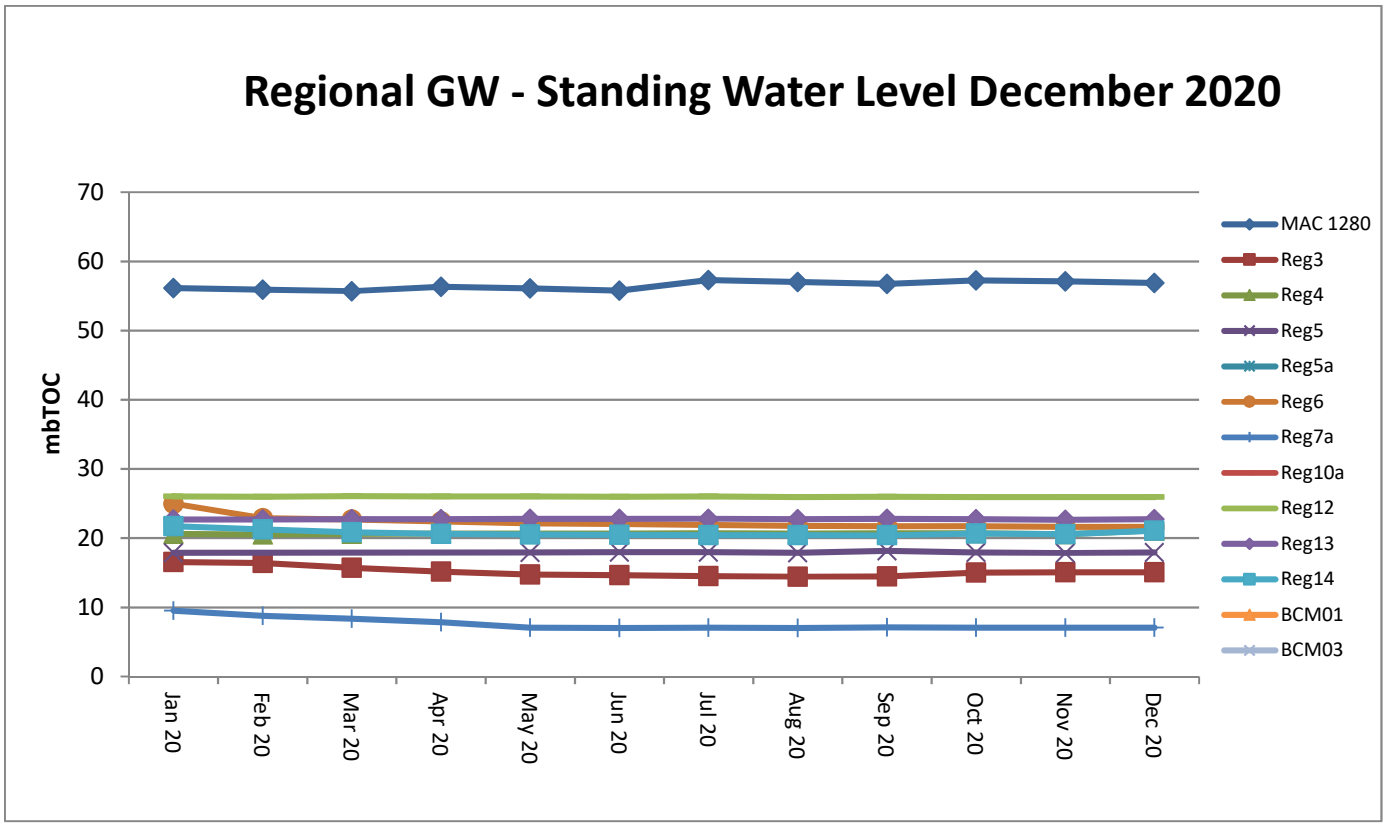
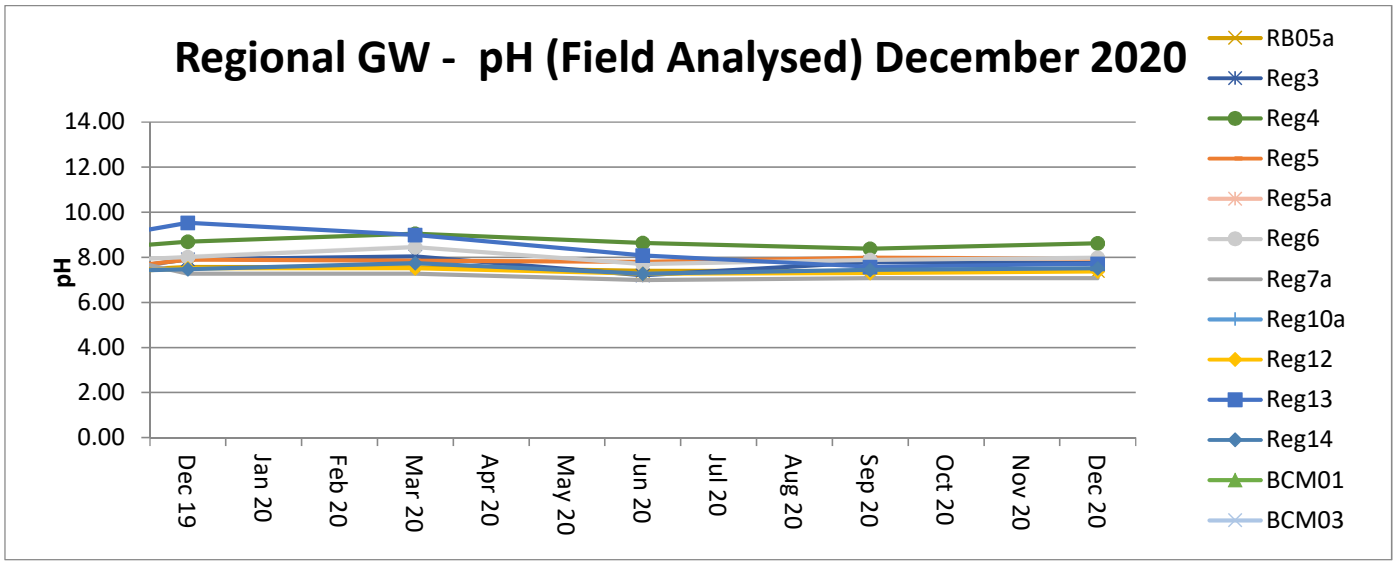
Groundwater

Groundwater monitoring results in open standpipe piezometers show levels to be relatively stable. The Regional bores were installed between Q4, 2013 and Q1, 2014. BCM01, BCM03, Reg10 are shallow bores which have remained dry since construction in 2013.



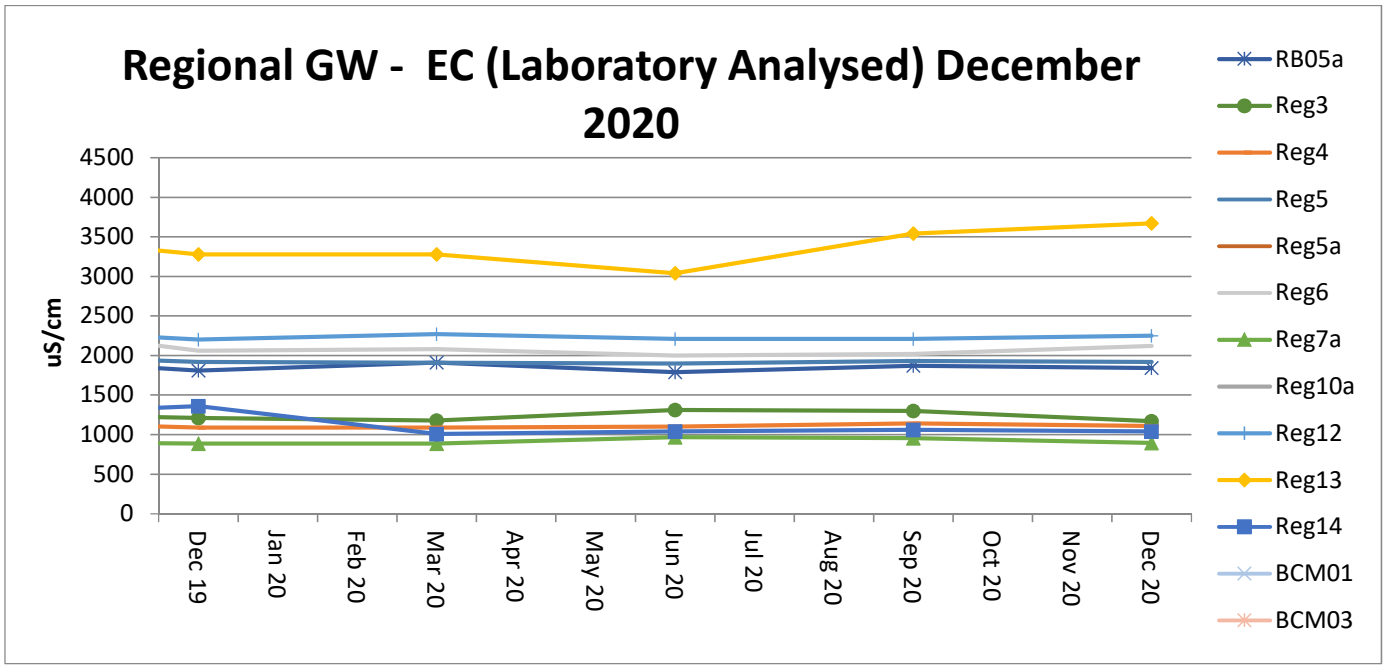
Acidity / Alkalinity (pH)

Over the past twelve months pH readings across the regional bores have remained static with very little fluctuation.



Electrical Conductivity

Laboratory Electrical Conductivity (EC) levels are all within historic groundwater EC range of 500µs/cm to 2,500µs/cm, with the exception of monitoring bore Reg13 which has a historic groundwater EC range of 2,500µs/cm to 4,100µs/cm.
Within the last twelve months EC has remained static.

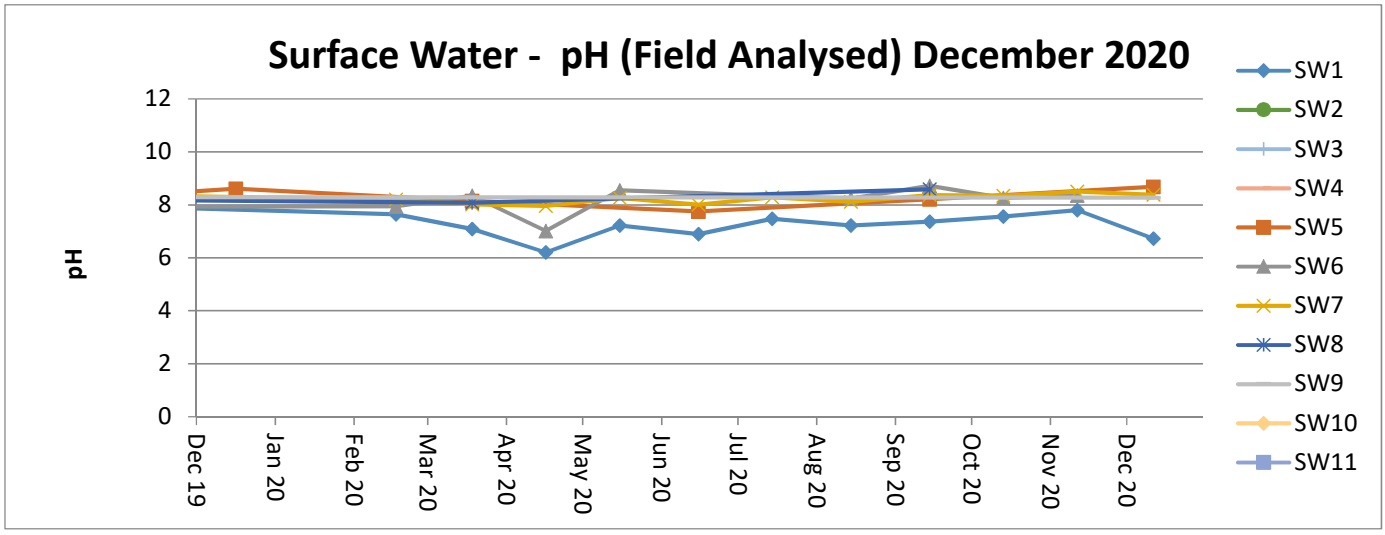


Surface Water – Creeks and Rivers

Routine surface water monitoring is conducted in surrounding creeks and rivers on a monthly basis. Results for parameters including pH, EC and Total Suspended Solids (TSS) are shown in the figures below. There are eleven surface water monitoring points, however only six were able to be sampled during the twelve month period.

Acidity / Alkalinity (pH)

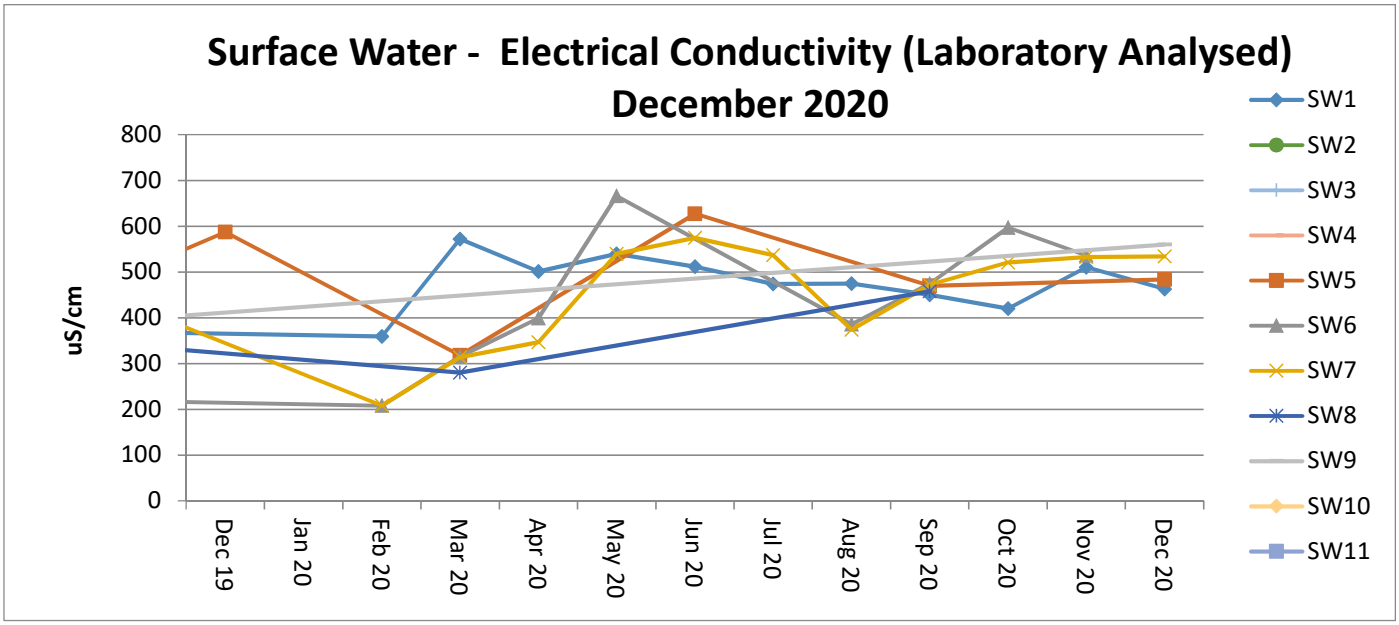
Monitoring results for pH in creeks and rivers surrounding MCCM are all trending within the ANZECC range for Irrigation, Ecosystem Health and Recreation.



**0 values indicate no water to sample due to the creek being dry*

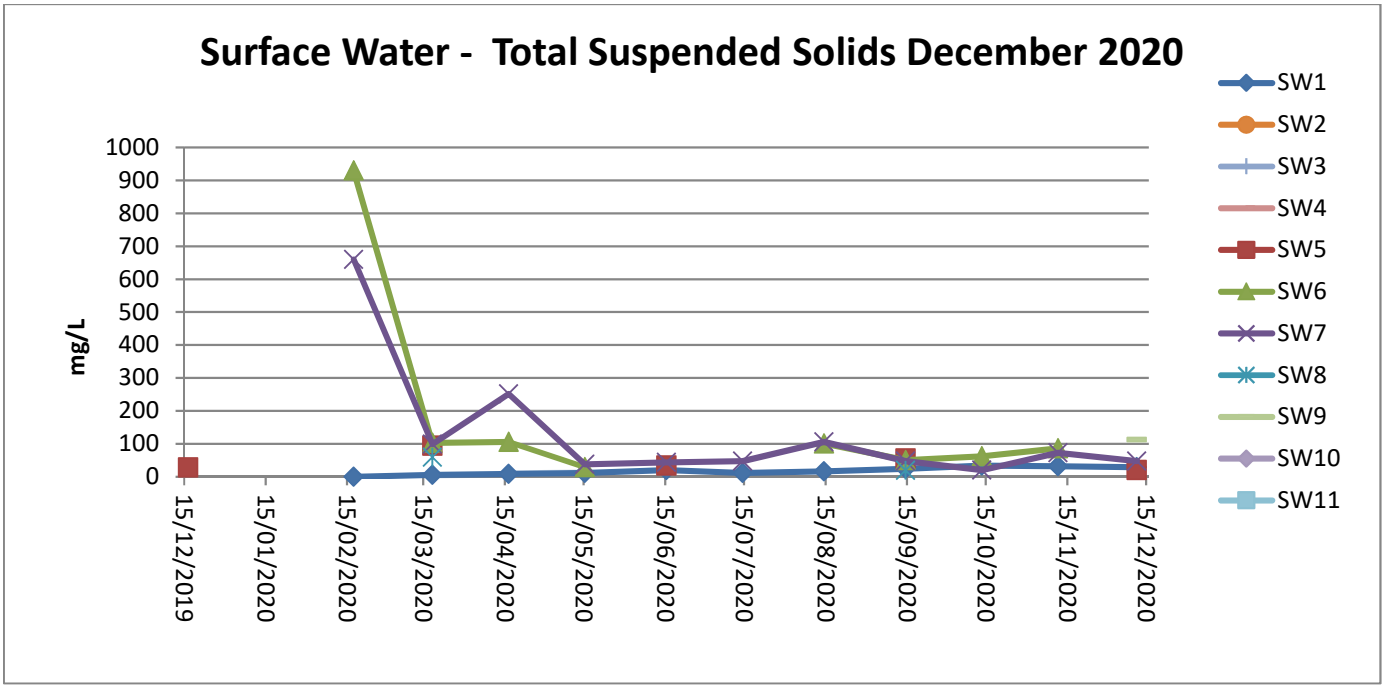
Electrical Conductivity

Surface water EC trends have remained consistent with SW5, SW6, SW7 and SW8 all historically variable. SW5, SW6, SW7 and SW8 are points along the Namoi River which are subject to regulated and variable flow regimes.



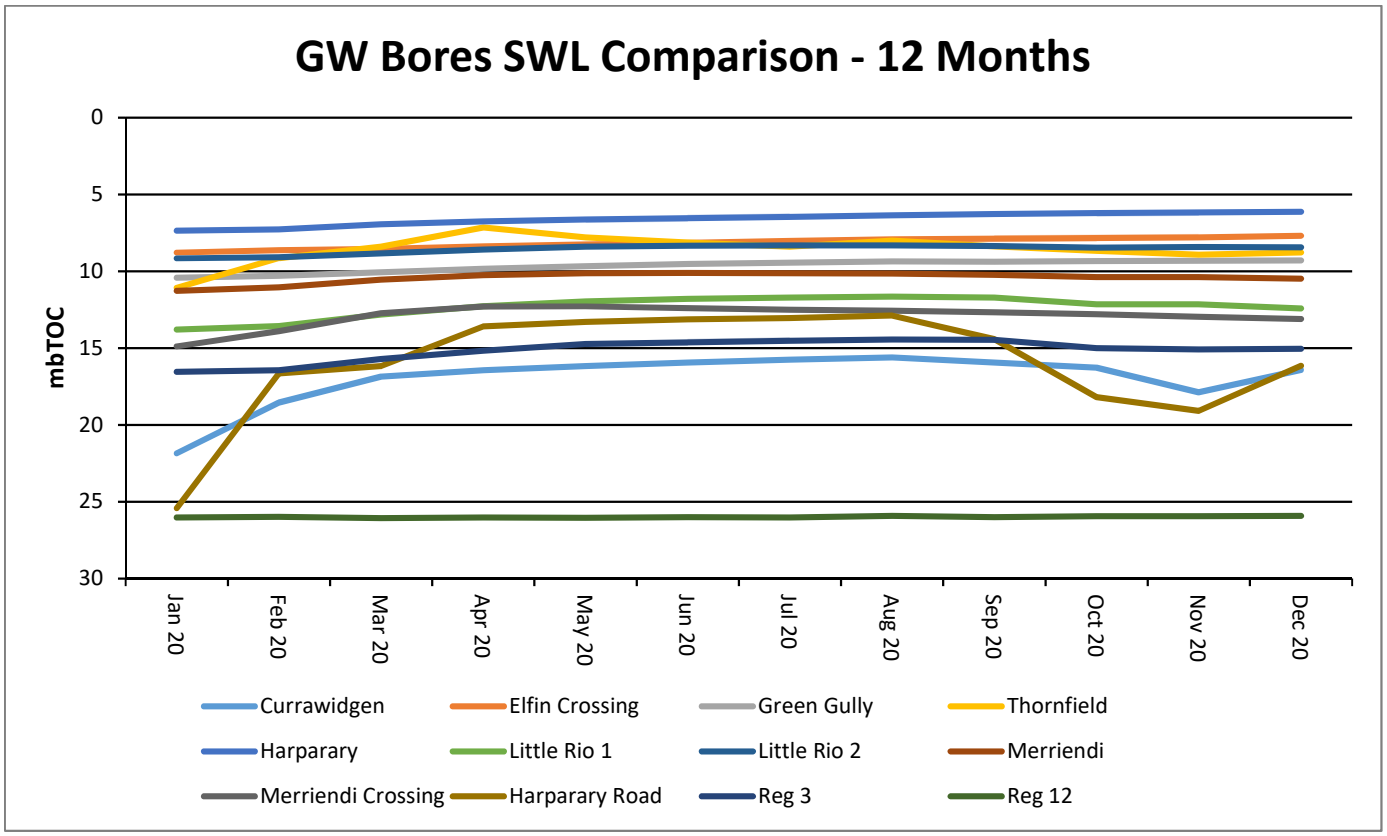
Total Suspended Solids (TSS)

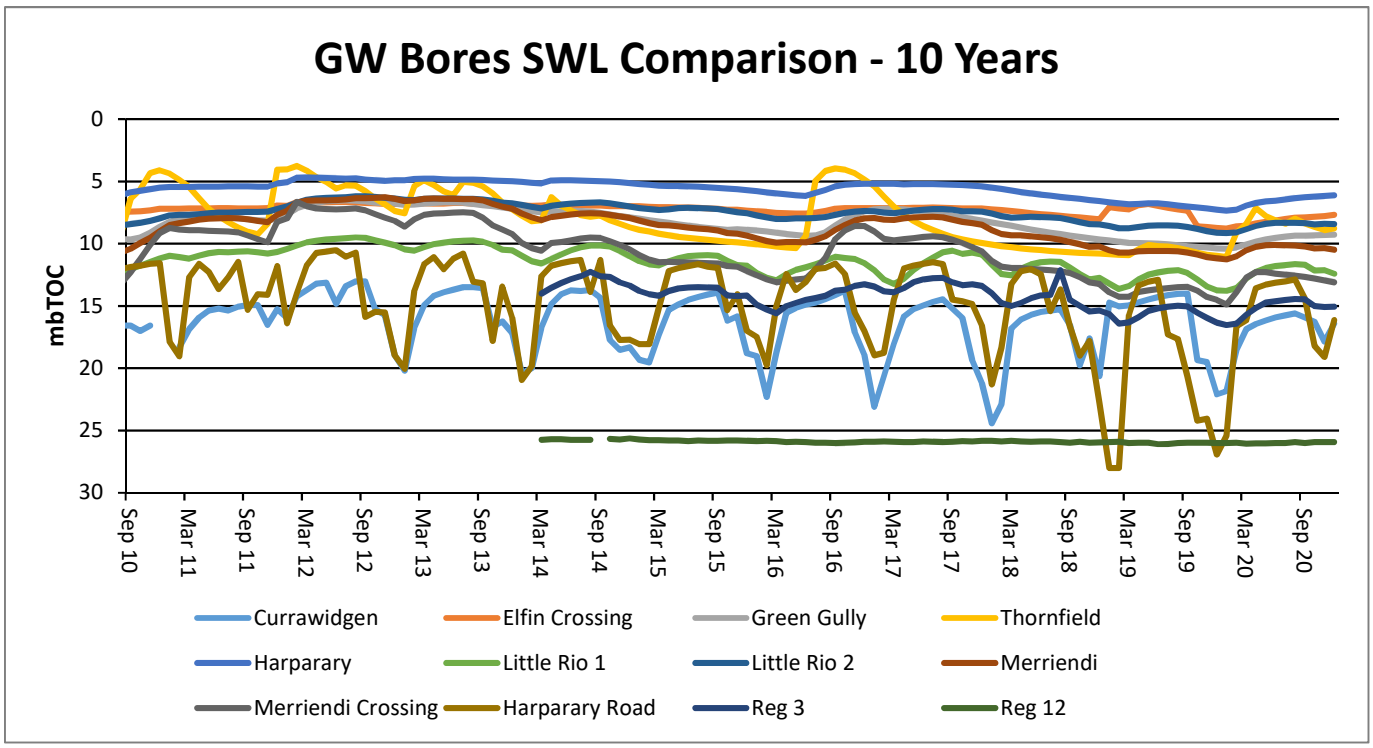
Surface water TSS trends have remained generally consistent with historical results. SW5, SW6, SW7 and SW8 are historically variable as they are located along the Namoi River which is subject to regulated and variable flow regimes. There were elevated levels of TSS in Q1 due to significant rainfall events.



Regional Groundwater monitoring

Maules Creek Coal Mine monitors regional bores across the region.





Rehabilitation

Rehabilitation works are ongoing, bulk reshape and topsoiling is currently being completed. 194ha of rehabilitation was completed in 2020.

Feral Animal Management

During the most recent routine Whitehaven Offset Area Feral Animal Control program (December 2020) the results included:

- 45 out of total 75 pigs trapped were from the Maules Creek offset properties
- 170 out of a total 324 baits (1080) taken were from the Maules Creek offset properties

Revegetation

- Completed 2020 tree planting program on Maules Creek offsets properties
- 60,000 tree seedlings planted over 1100ha
- Initial survival checks confirm very high survival – Good season

Weed Control

- Targeted seasonal weed control along Riparian areas for Green Cestrum

Threatened Flora

- All 34 Pomaderris queenslandica seedlings are surviving. Originally sourced from Leard Forest population.
- Additional Pomaderris seed collected in November from Pilliga

Fire Management

- Completed annual Fuel Load Assessments
- Currently planning 2021 Autumn Ecological Burn Program

Fencing and Waste Management

- New fencing for Wirradale & Mt Lindesay offsets completed in December

Community Complaints

- 1 complaint was received during Q4 CY2020.

Date	Method	Category	Nature Of Complaint	MCCM Response
19/11/2020	Phone	Visual Complaint	Complaint received from Landholder regarding lighting impacts	Investigation undertaken into possible source of light, with review of lighting direction and intensity. Lighting plants were adjusted accordingly.