Three Kings Quarry
26th February 2018 – Site Liaison Group Meeting
Site Monitoring Report

WINSTONE AGGREGATES

February 2018 Site Monitoring Report

This Site Monitoring Report is a summary of environmental monitoring data collected since the last Site Liaison Group meeting and includes:

- Groundwater Level Monitoring Results
- Groundwater Chemistry Monitoring
- Air Quality Monitoring Results
- Noise Monitoring Results

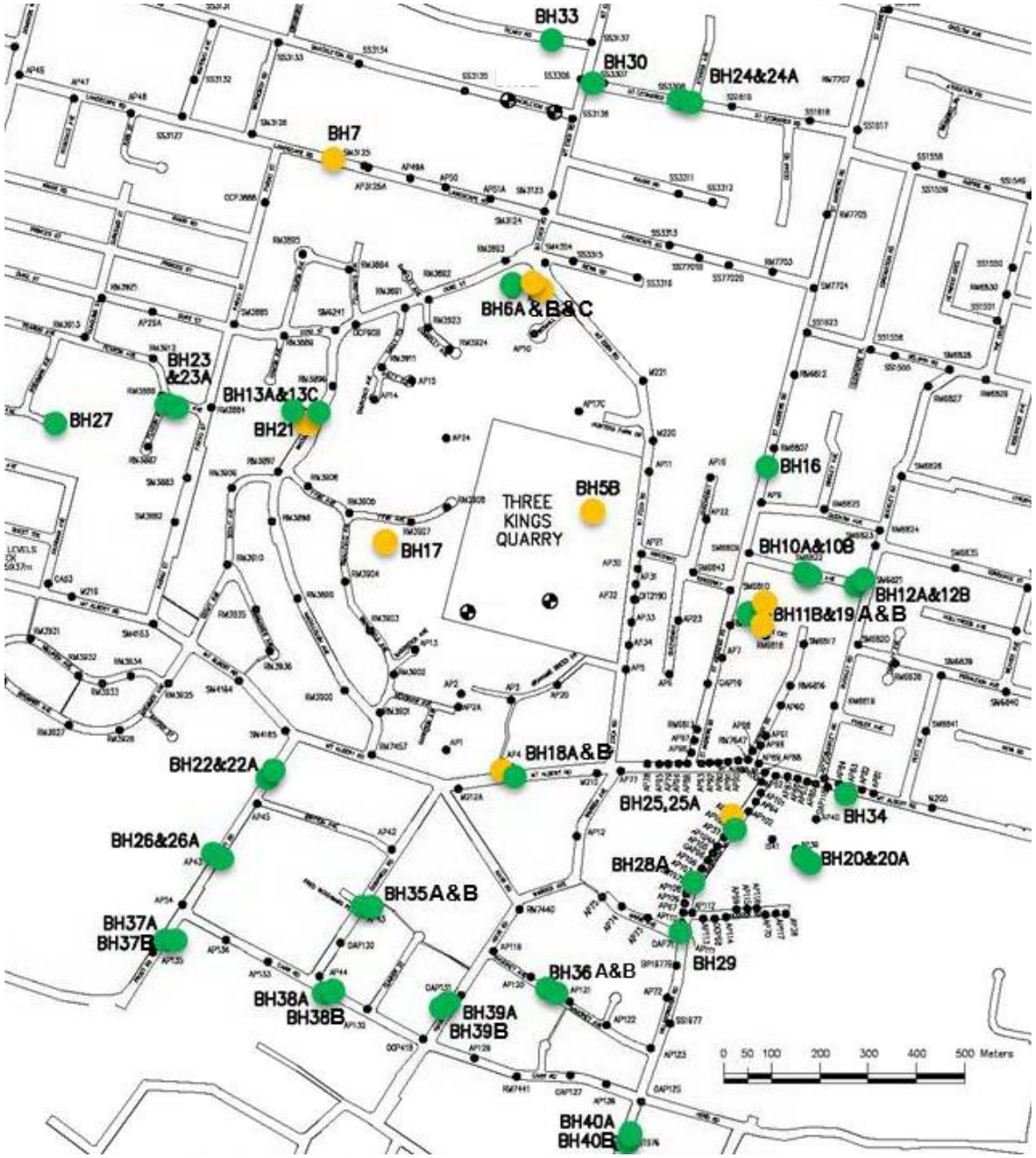
WINSTONE AGGREGATES

Groundwater Level Monitoring

- Dewatering of Three Kings Quarry commenced in March 1999
- Groundwater levels within Three Kings Quarry have been held above RL34m since October 2002
- Groundwater levels are currently being measured monthly in 51 boreholes and piezometers located in and around Three Kings Quarry
- Groundwater levels are generally following seasonal trends

WINSTONE AGGREGATES

Borehole Location Plan with Jan 2018 Groundwater Levels Included



LEGEND

- 34 – 36 RL m
- 36 – 45 RL m
- >45 RL m

WINSTONE AGGREGATES

Groundwater Chemistry Monitoring

- Monitoring of Groundwater Chemistry commenced in December 2011 following the granting of Resource Consents to fill Three Kings Quarry.

- Samples were taken at three monthly intervals from the Pumping Bore within Three Kings Quarry and from BH 7 on Landscape Road for analysis of a suite of chemical parameters for the first 2 years of monitoring.

- Following 2 years of monitoring, samples for chemical analysis are required to be taken at 6 monthly intervals from the Pumping Bore within Three Kings Quarry and from BH 7 on Landscape Road (March and September).

- The next round of groundwater chemistry sampling is scheduled for March 2018.

WINSTONE AGGREGATES

Continuous Groundwater Quality Monitoring

- Continuous monitoring of electrical conductivity (EC) and pH is required to be undertaken in the Three Kings Quarry pumping bore.

- New pH & EC probes were installed at the Three Kings Quarry pumping bore in August 2015.

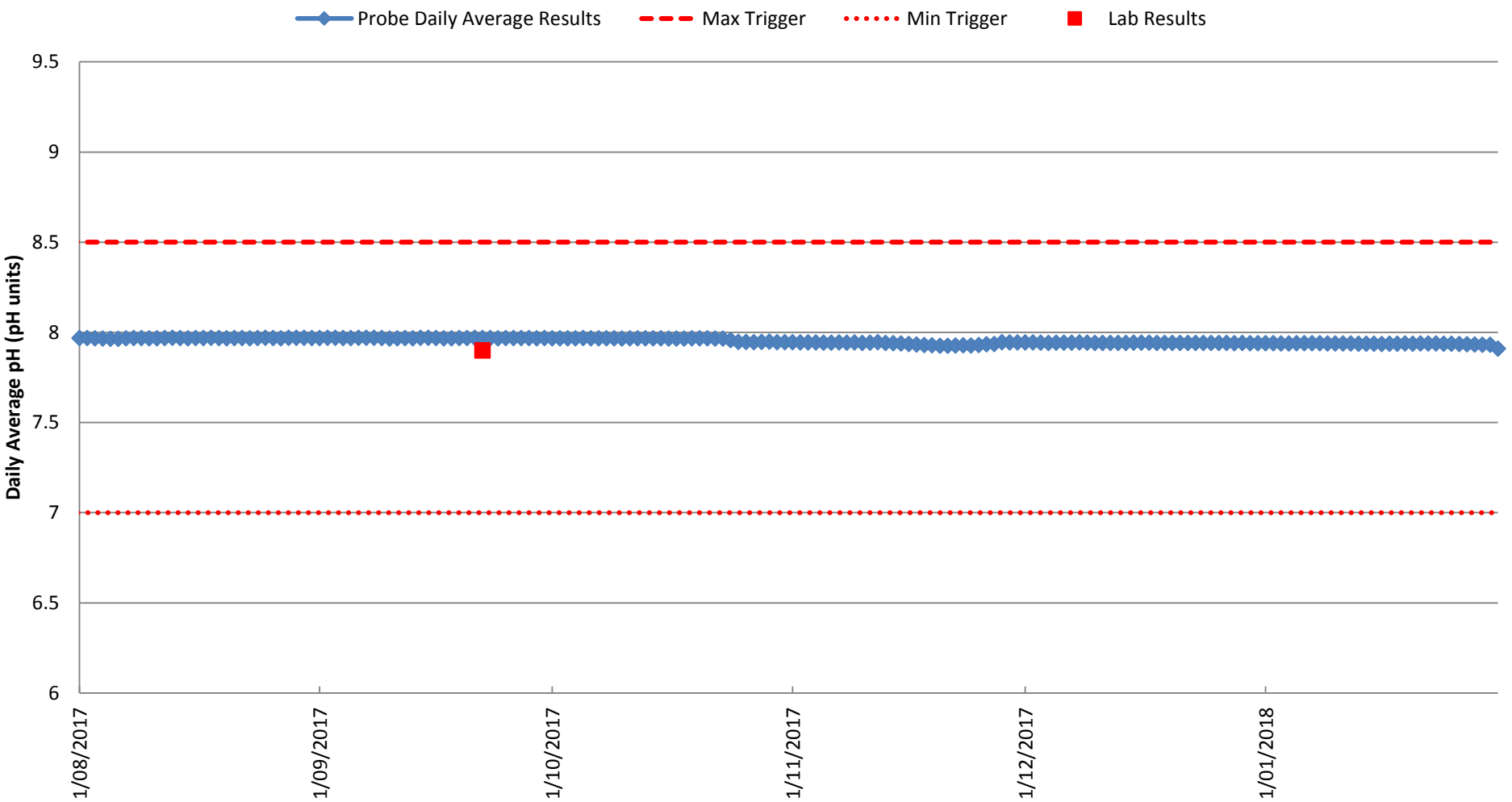
- The pH & EC probes are calibrated quarterly by an external technician and the pH electrode has been replaced annually in July 2016 and July 2017.

- No pH triggers have been recorded since the last SLG meeting.

WINSTONE AGGREGATES

Continuous Groundwater Quality Monitoring

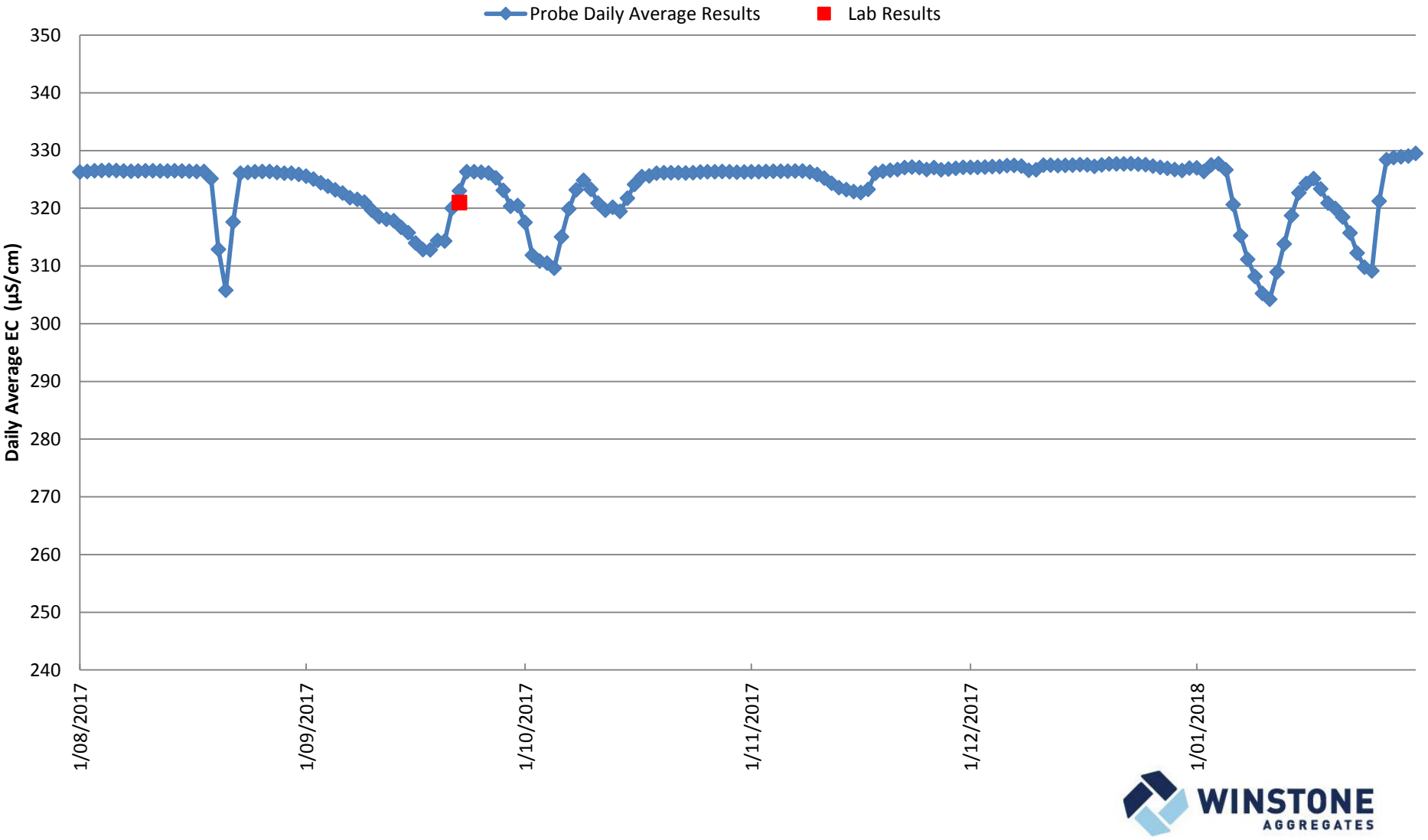
Average Daily pH Graph



WINSTONE AGGREGATES

Continuous Groundwater Quality Monitoring

Average Daily EC Graph



WINSTONE AGGREGATES

Air Quality Monitoring

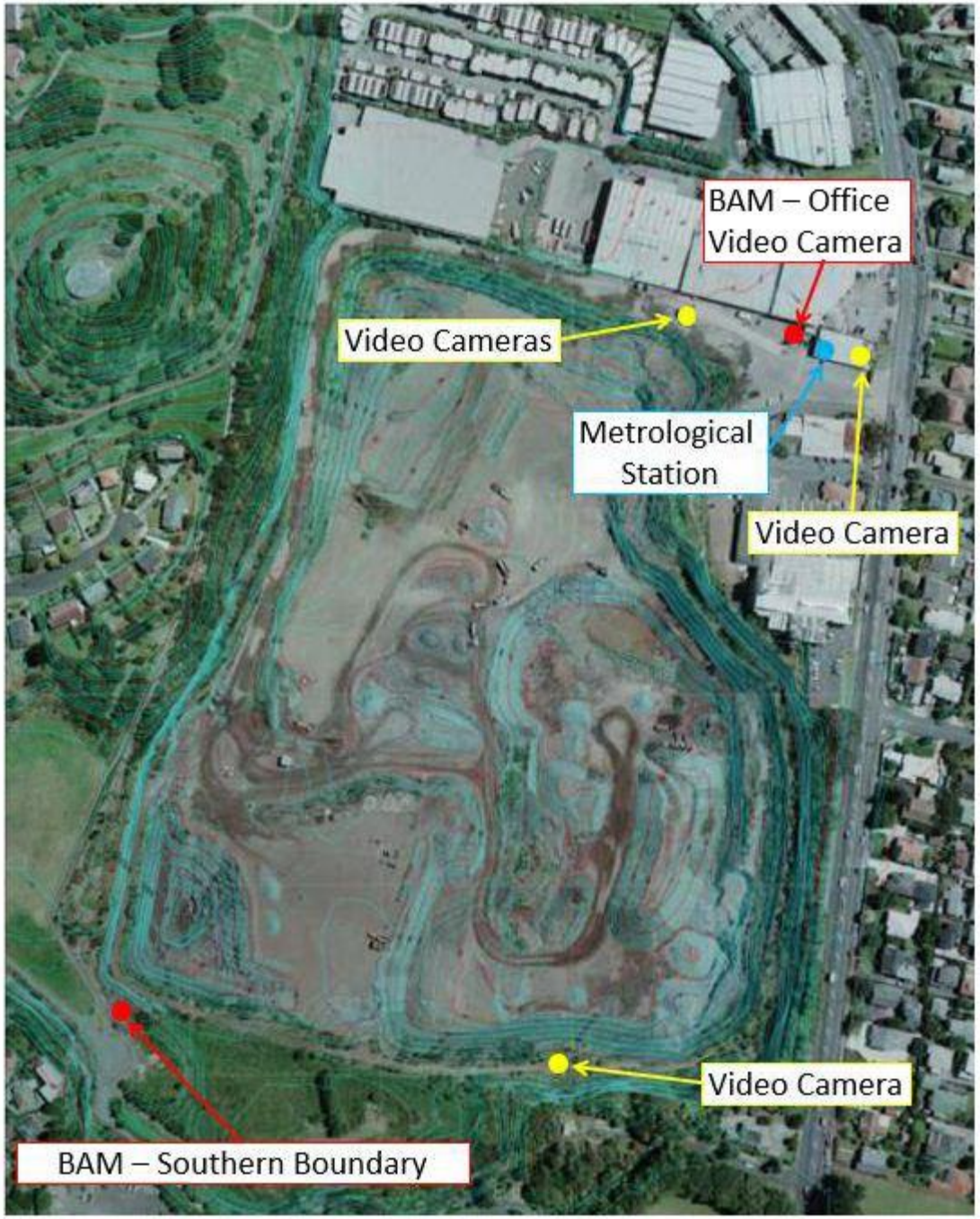
- Air Quality Monitoring equipment at Three Kings Quarry consists of two Continuous Real Time Beta Attenuation Monitors (BAM), time lapse video cameras and a metrological station

- The BAM monitor located on the roof of the site office has been operating since April 2008. A second BAM monitor was commissioned in April 2012 in the south-western corner of Three Kings Quarry

- The Air Discharge Consent for Three Kings Quarry was renewed in February 2015.

- The air quality trigger was changed from 80 micrograms per cubic metre as a 24hour average (all results) to 60 micrograms per cubic metre as a 24hour average as measured by the BAM units.

WINSTONE AGGREGATES



Air Quality Monitoring Equipment

WINSTONE AGGREGATES

Air Quality Monitoring Results

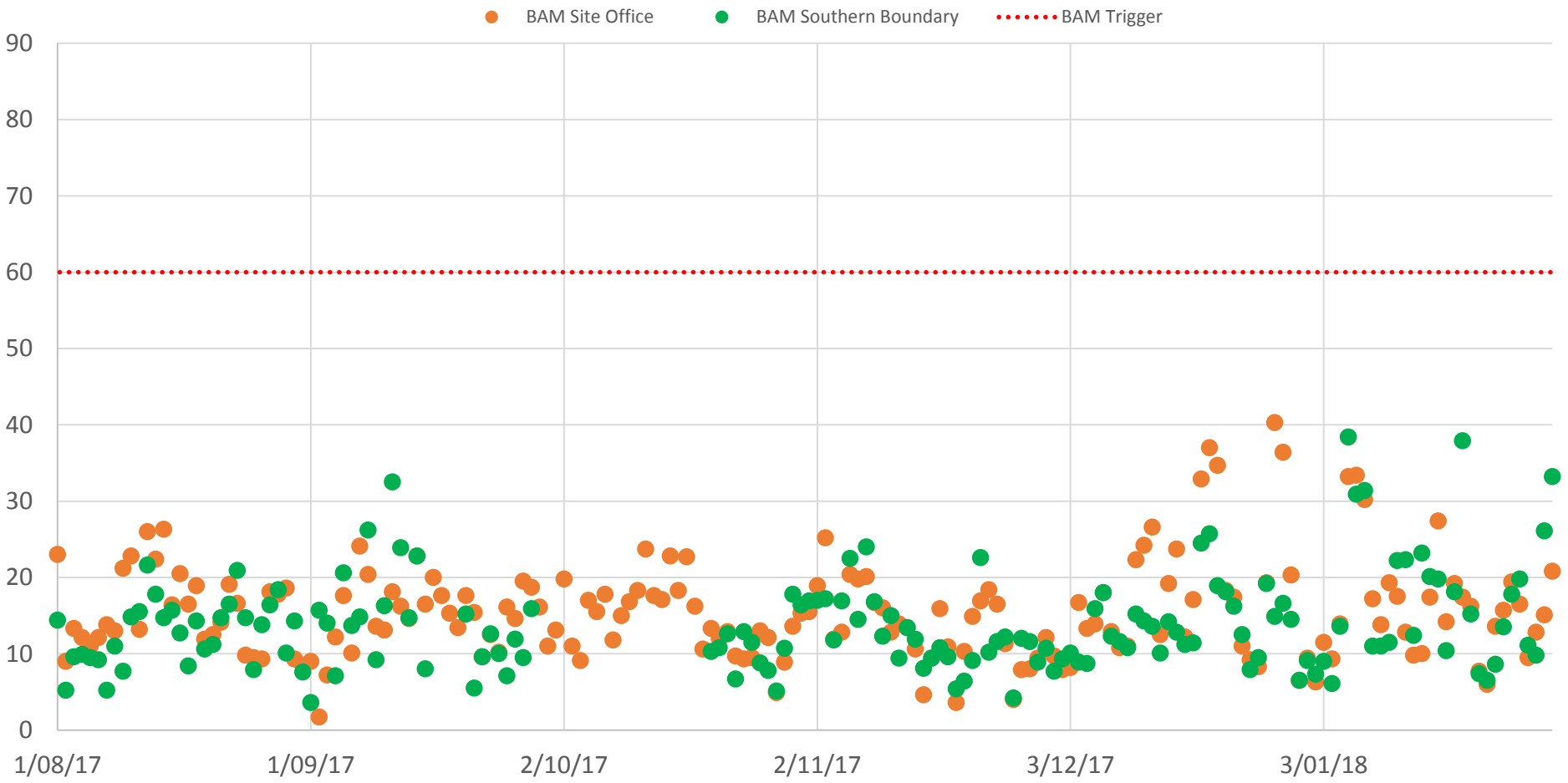
- Continuous air quality monitoring results recorded since the last SLG meeting have been less than 41 micrograms per cubic meter as a 24 hour average.

- No air quality triggers have been recorded since the last SLG meeting.

WINSTONE AGGREGATES

Air Quality Monitoring Results

The following figure shows air monitoring results from 1st August 2017 to 31st January 2018.
All results are in µg/m³.



WINSTONE AGGREGATES

Noise Monitoring

- To ensure that the noise performance standards set in the District Plan and consents authorising filling are met, monitoring on two representative occasions per year is undertaken.

- The District Plan requires that the noise from the quarry and fill operations shall not exceed L_{A10}55dBA at or within the boundary of any residential property

- Noise monitoring was undertaken on the 28th November 2017 by Marshall Day Acoustics Ltd.

- The cumulative acoustic emission from fill operations resulted in sound levels which complied with the relevant noise rules for consented operations on the site at both the Fyvie Avenue measurement position and the Grahame Breed Drive position.

WINSTONE AGGREGATES

Thank you - that concludes the February 2018 Monitoring Report

WINSTONE AGGREGATES