

Three Kings Quarry

27 November 2017 – Site Liaison Group Meeting

Site Monitoring Report



November 2017 Site Monitoring Report

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

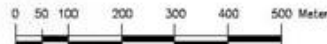
- Groundwater Level Monitoring Results
- Groundwater Chemistry Monitoring Results
 - Air Quality Monitoring Results
 - Noise Monitoring

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

The map displays the Three Kings Quarry area with numerous borehole locations marked by colored dots and labels. The locations include BH7, BH33, BH24&24A, BH27, BH23&23A, BH13A&13C, BH21, BH17, BH5B, BH16, BH10A&10B, BH12A&12B, BH11B&19A&B, BH18A&B, BH22&22A, BH26&26A, BH37A, BH37B, BH35A&B, BH38A, BH38B, BH39A, BH39B, BH40A, BH40B, BH28A, BH29, BH20&20A, BH34, and BH25,25A. A scale bar at the bottom right indicates distances from 0 to 500 Meters.

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



Groundwater Chemistry Monitoring

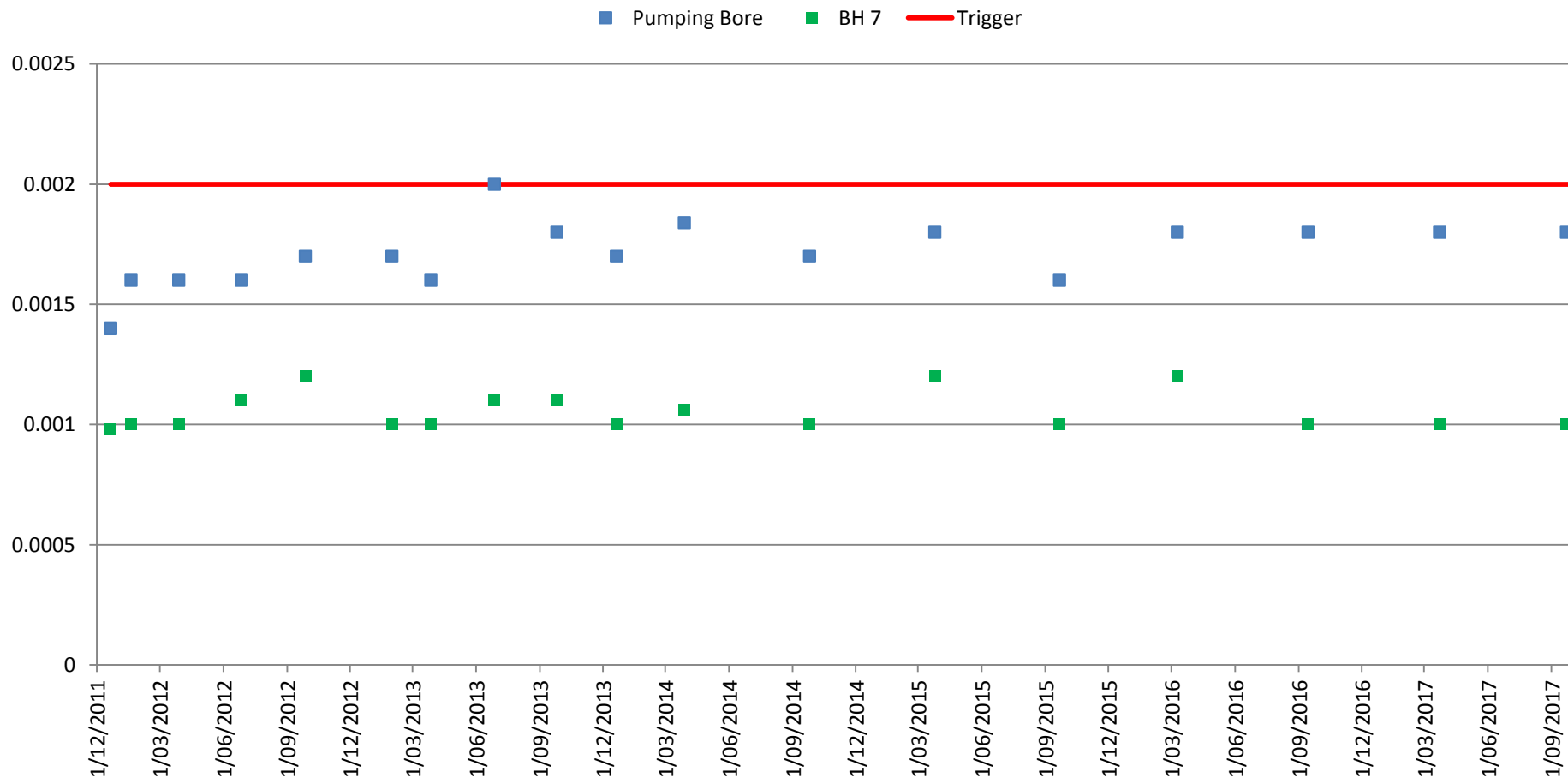
- Monitoring of Groundwater Chemistry commenced in December 2011 following the granting of Resource Consents to fill Three Kings Quarry.
- Samples were taken at three monthly intervals from the Pumping Bore within Three Kings Quarry and from BH 7 on Landscape Road for analysis of a suite of chemical 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).
- Results from the September 2017 monitoring round have been received since the last SLG meeting. All parameters were less than the trigger limits with the exception of Zinc in BH7. BH7 currently has no direct groundwater link to Three Kings Quarry. Auckland Council and Watercare were notified of the trigger exceedance.

Groundwater Chemistry Results

The following figure show all the results for Arsenic since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Arsenic

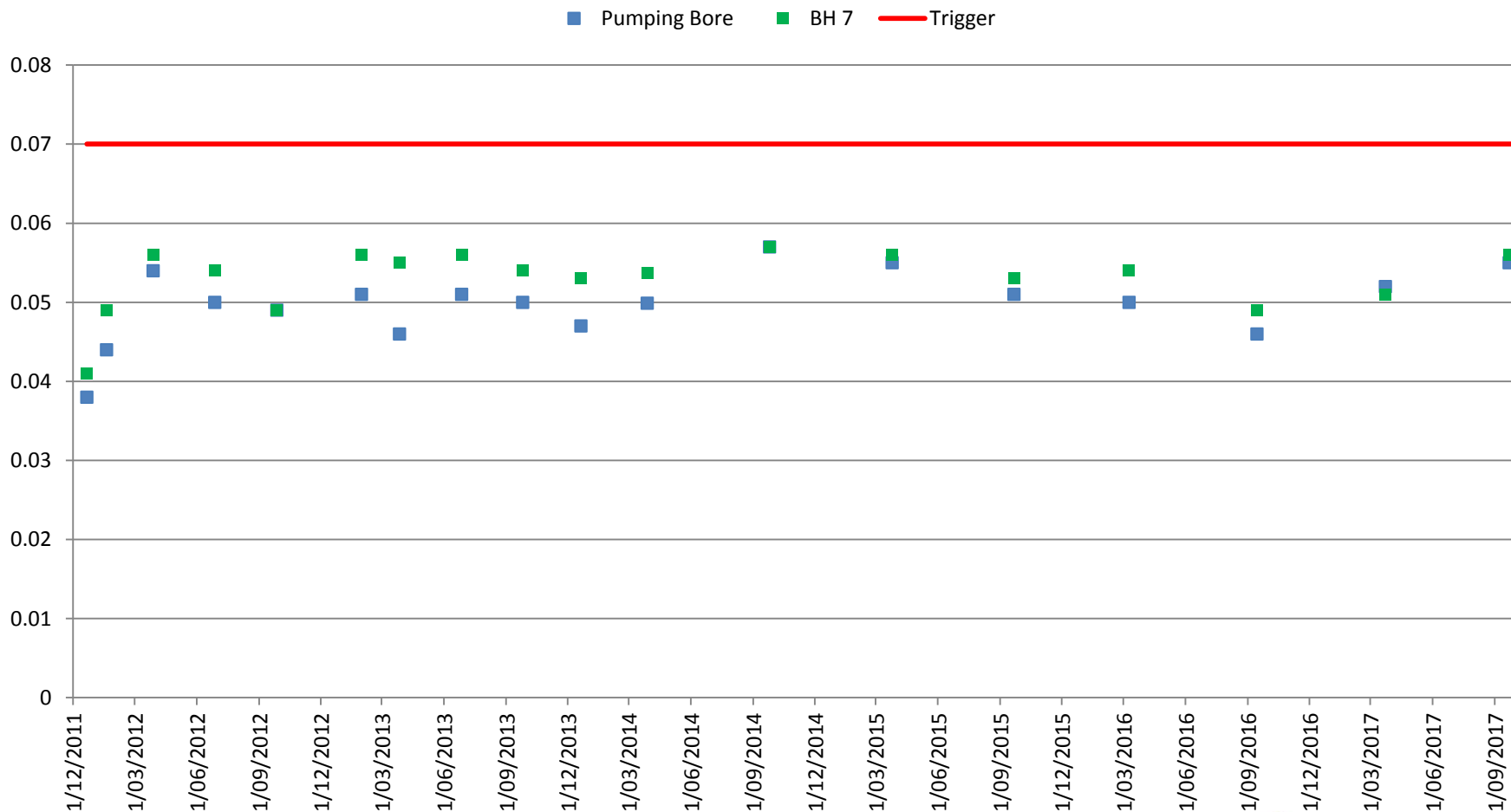


Groundwater Chemistry Results

The following figure show all the results for the Boron since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Boron

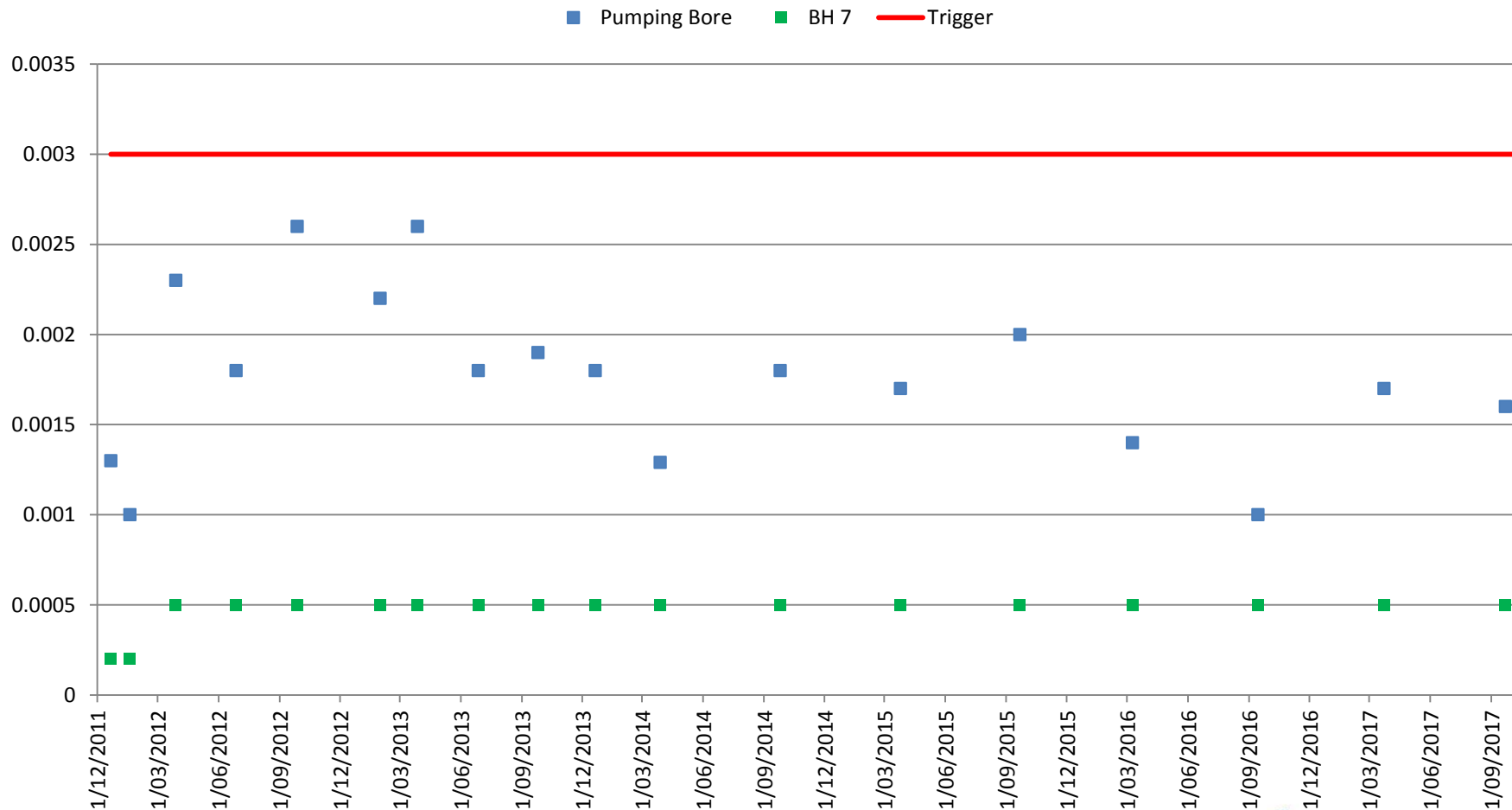


Groundwater Chemistry Results

The following figure show all the results for the Copper since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Copper

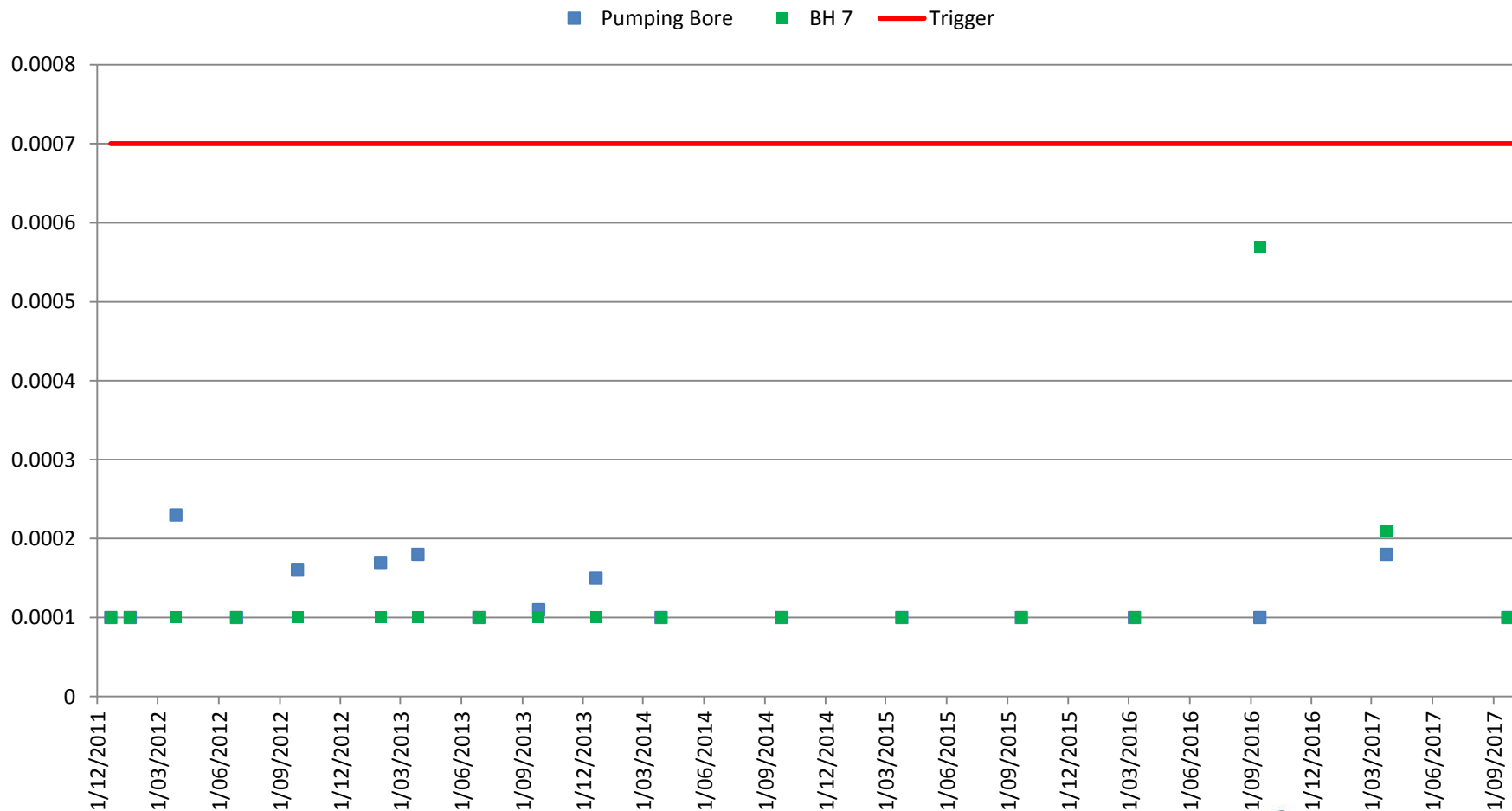


Groundwater Chemistry Results

The following figure show all the results for the Lead since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Lead

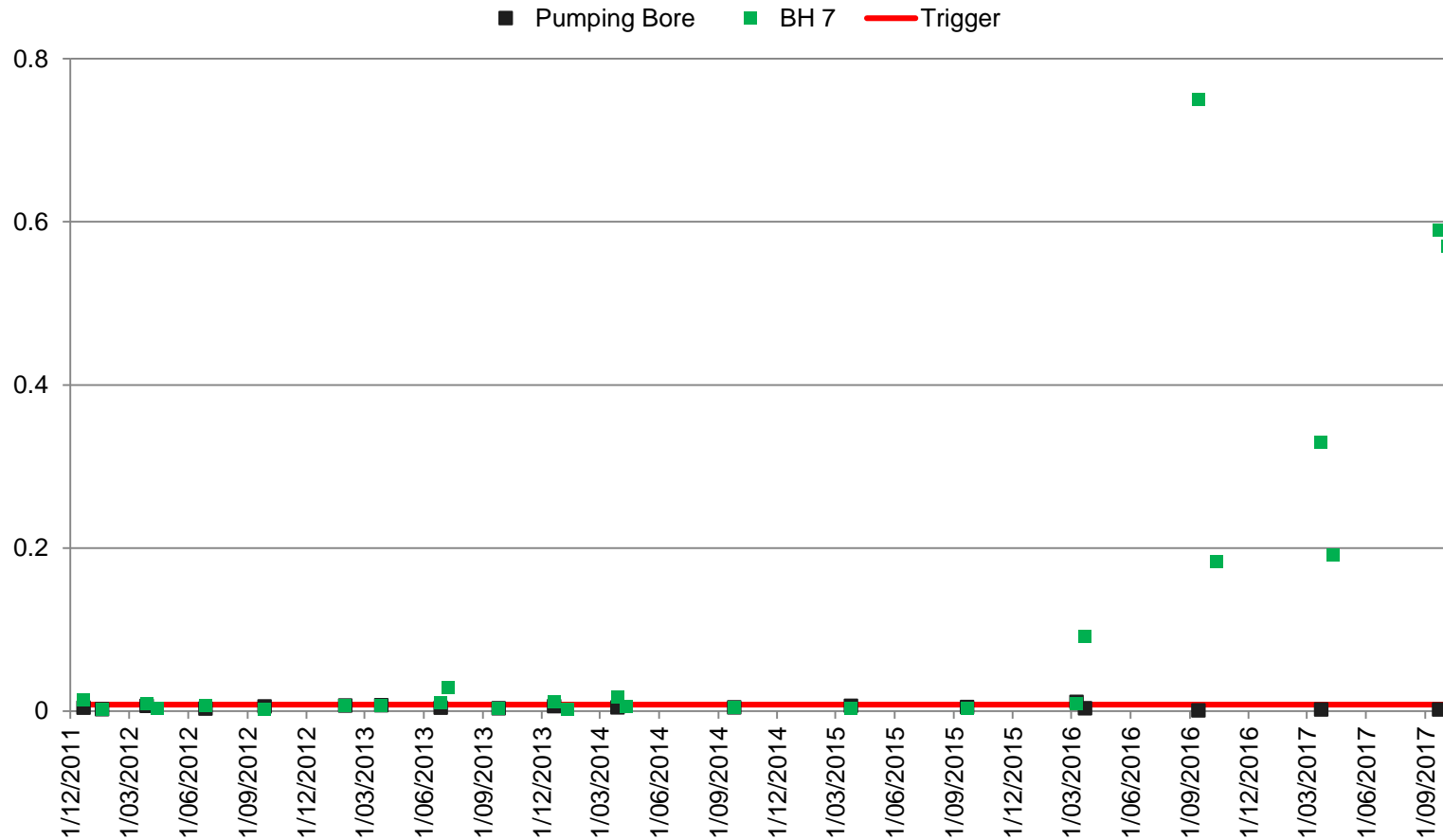


Groundwater Chemistry Results

The following figure show all the results for the Zinc since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Zinc

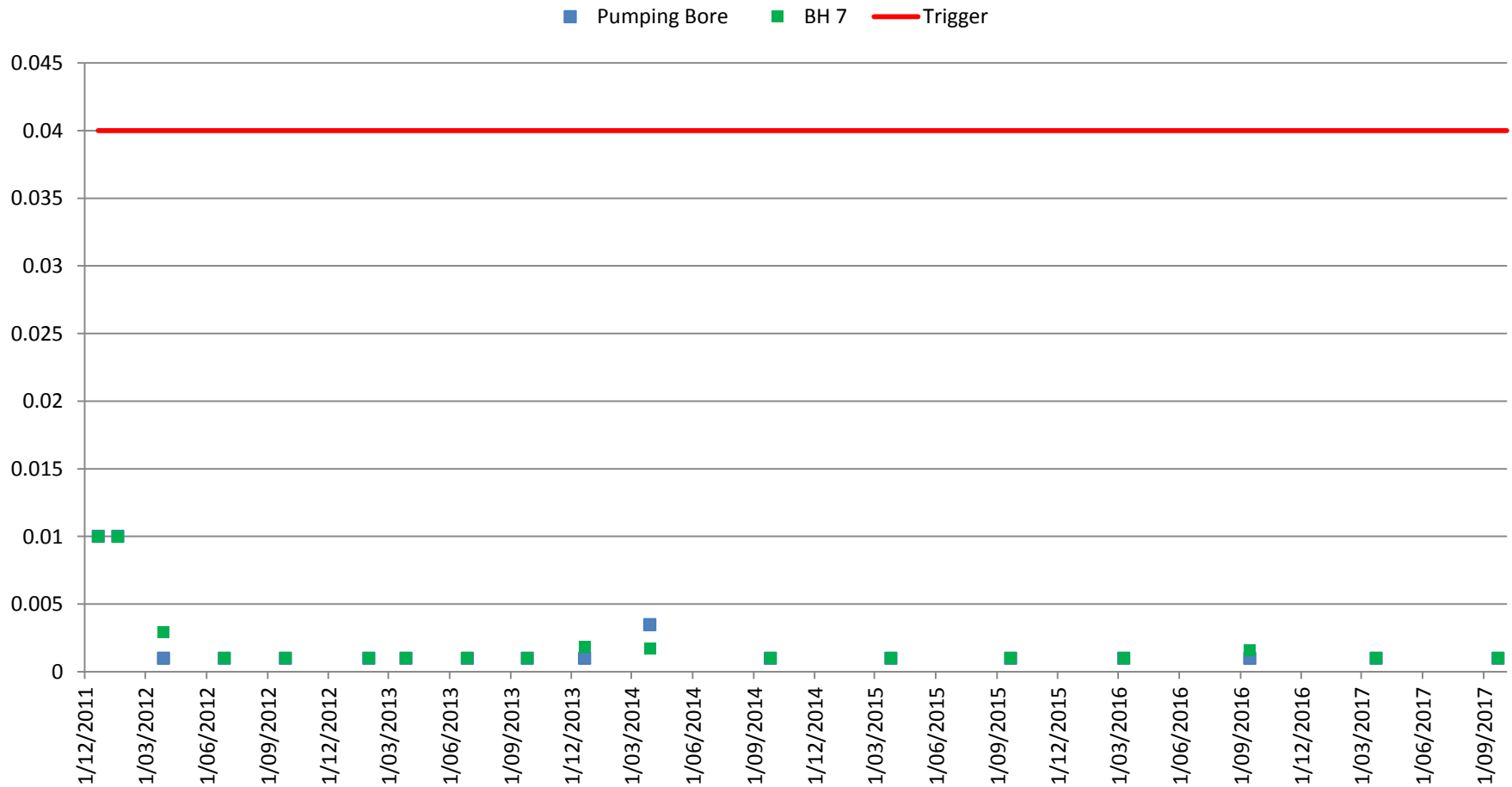


Groundwater Chemistry Results

The following figure show all the results for the Cyanide since the commencement of sampling.

All results are in g/m³ unless otherwise stated.

Cyanide

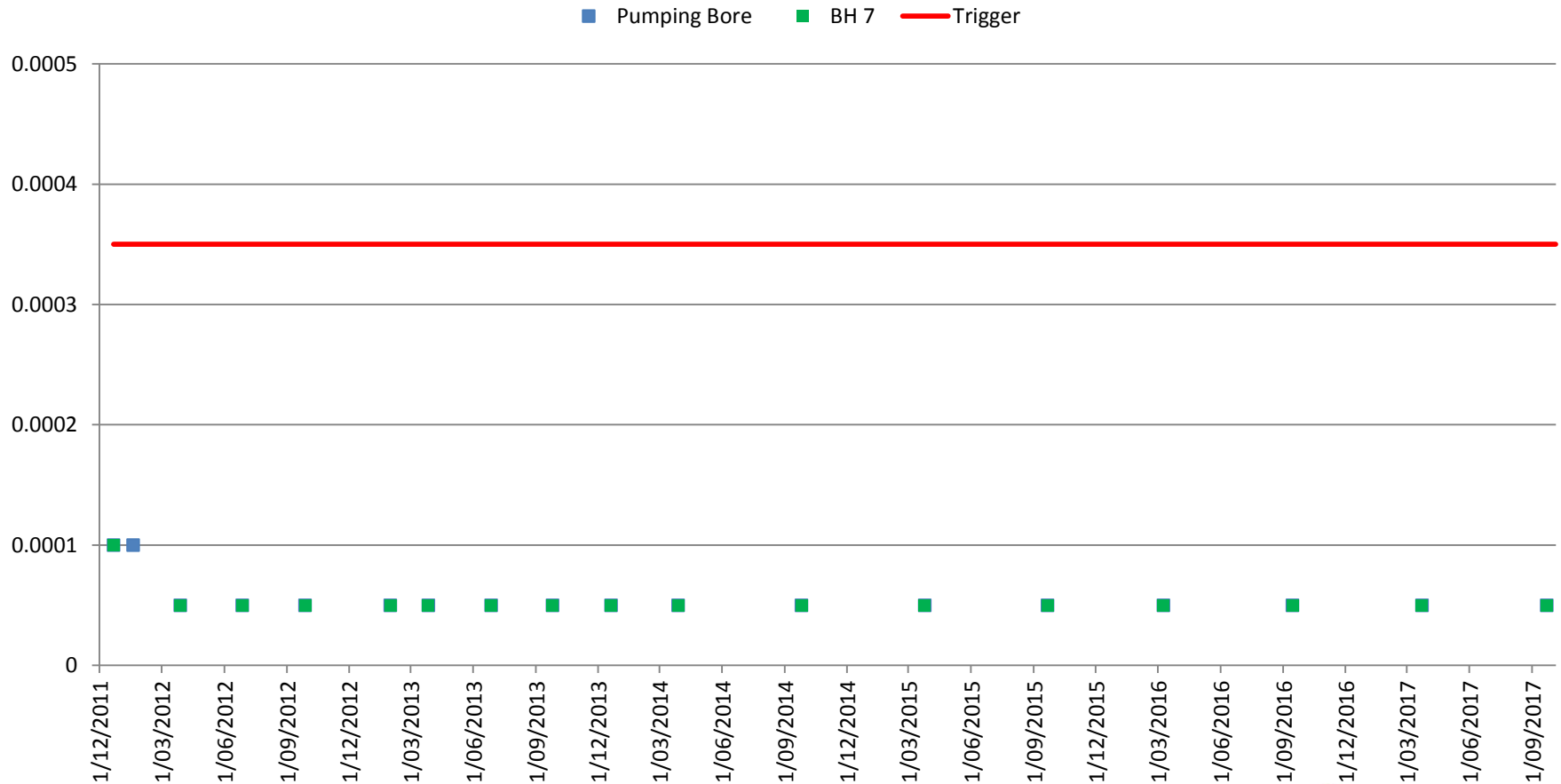


Groundwater Chemistry Results

The following figure show all the results for BaP(eq) since the commencement of sampling.

All results are in g/m³.

BaP (eq)



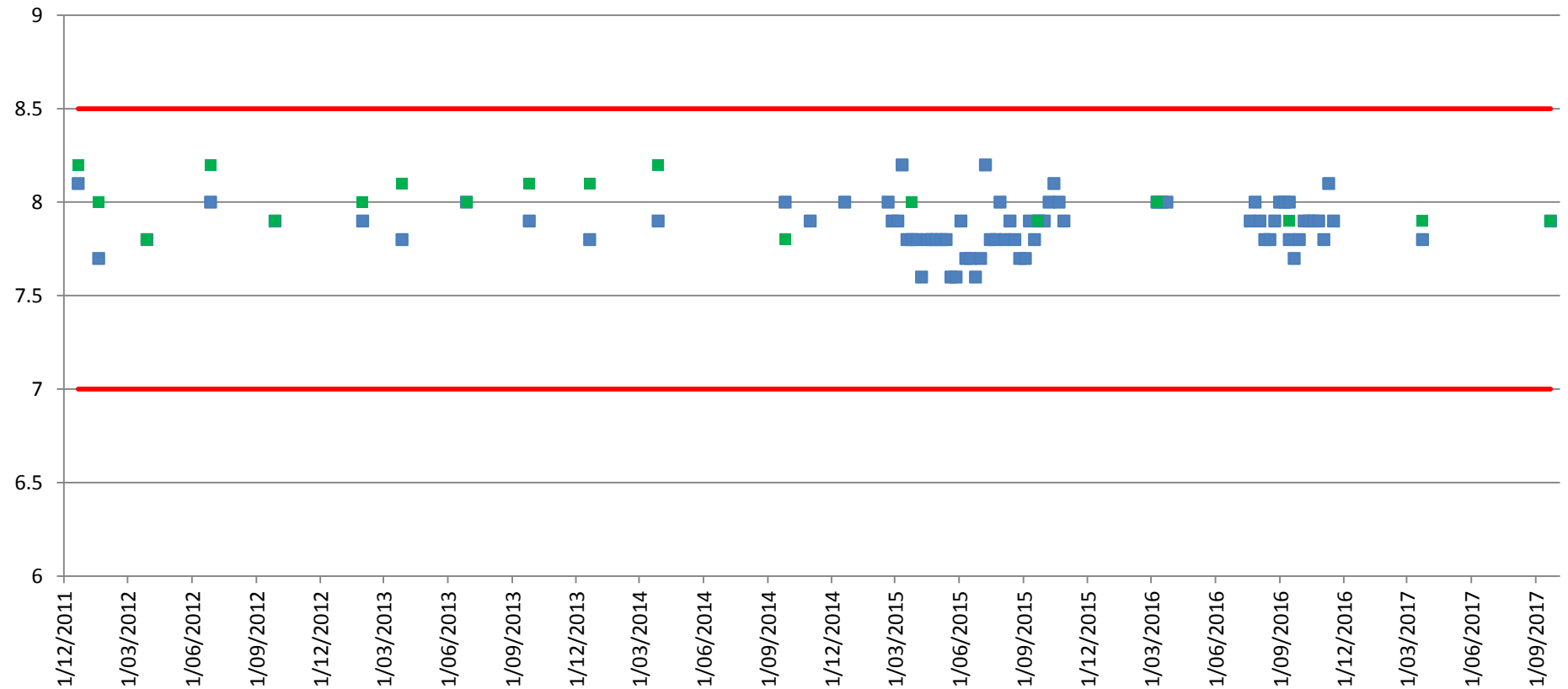
Groundwater Chemistry Results

The following figure show all the results for pH since the commencement of sampling.

All results are in pH Units

pH

■ Pumping Bore ■ BH 7 — Trigger Max — Trigger Min

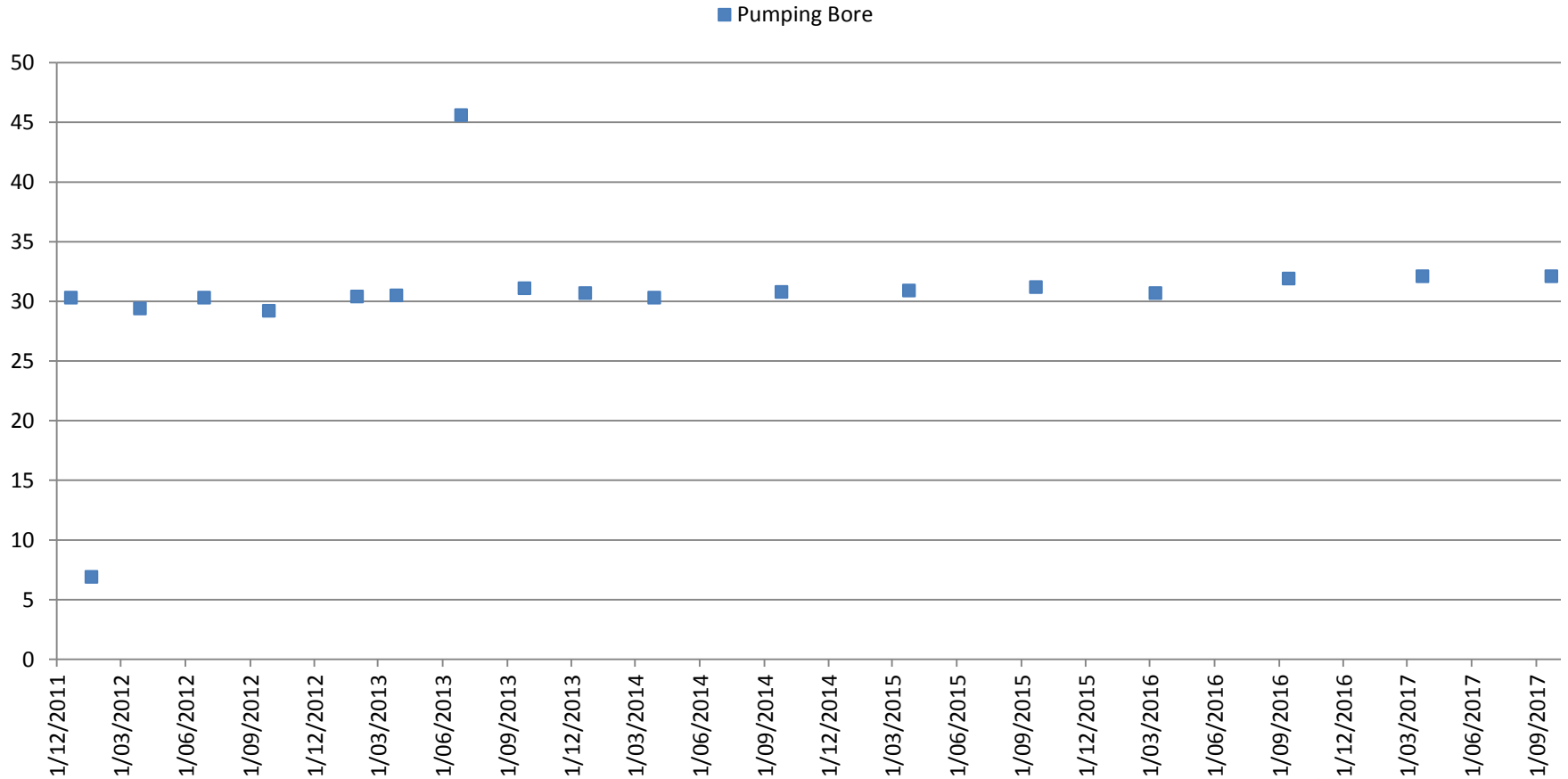


Groundwater Chemistry Results

The following figure show all the results for EC since the commencement of sampling.

All results are in mS/m.

Electrical Conductivity

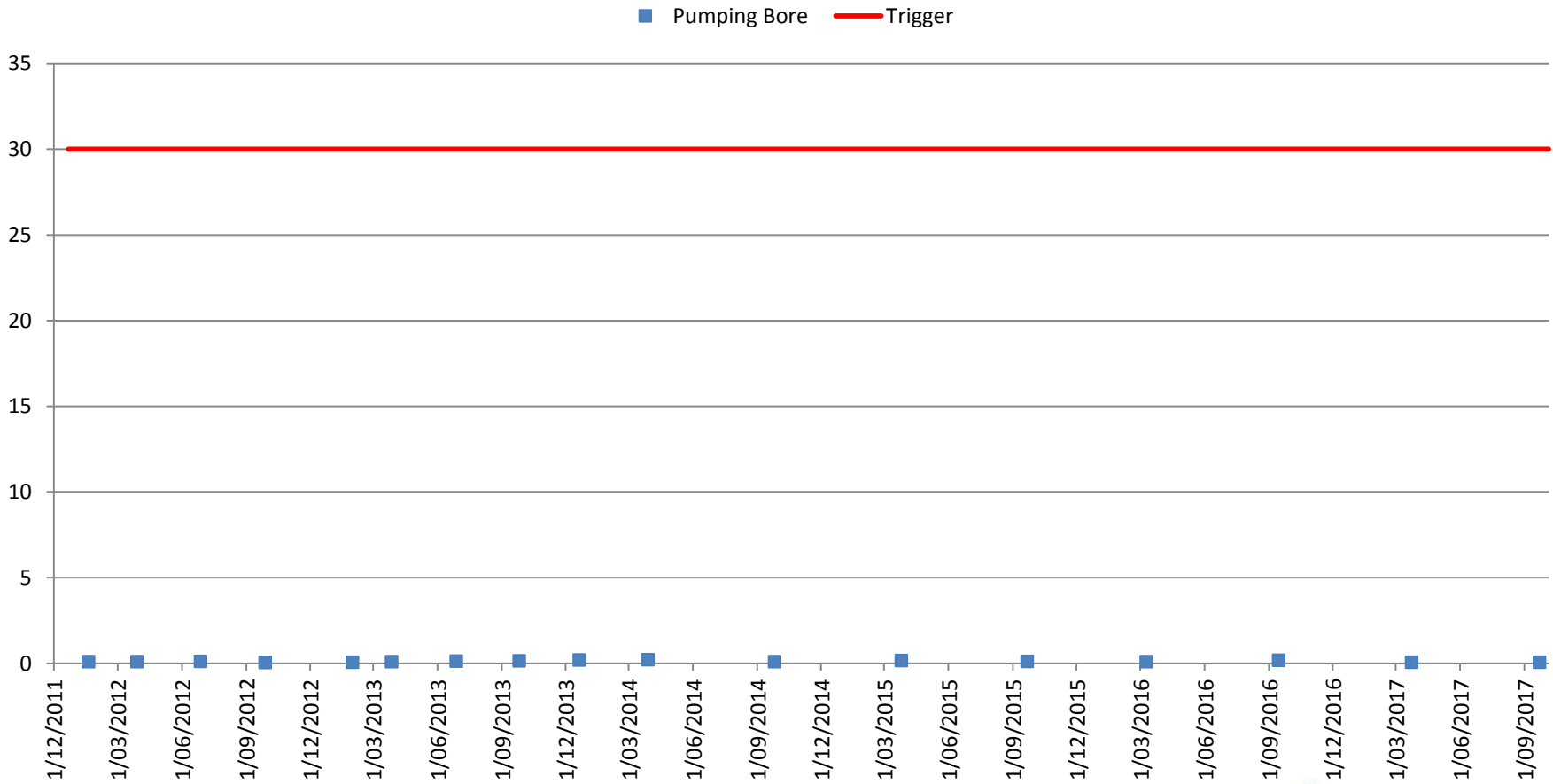


Groundwater Chemistry Results

The following figure show all the results for Turbidity since the commencement of sampling.

All results are in NTU.

Turbidity

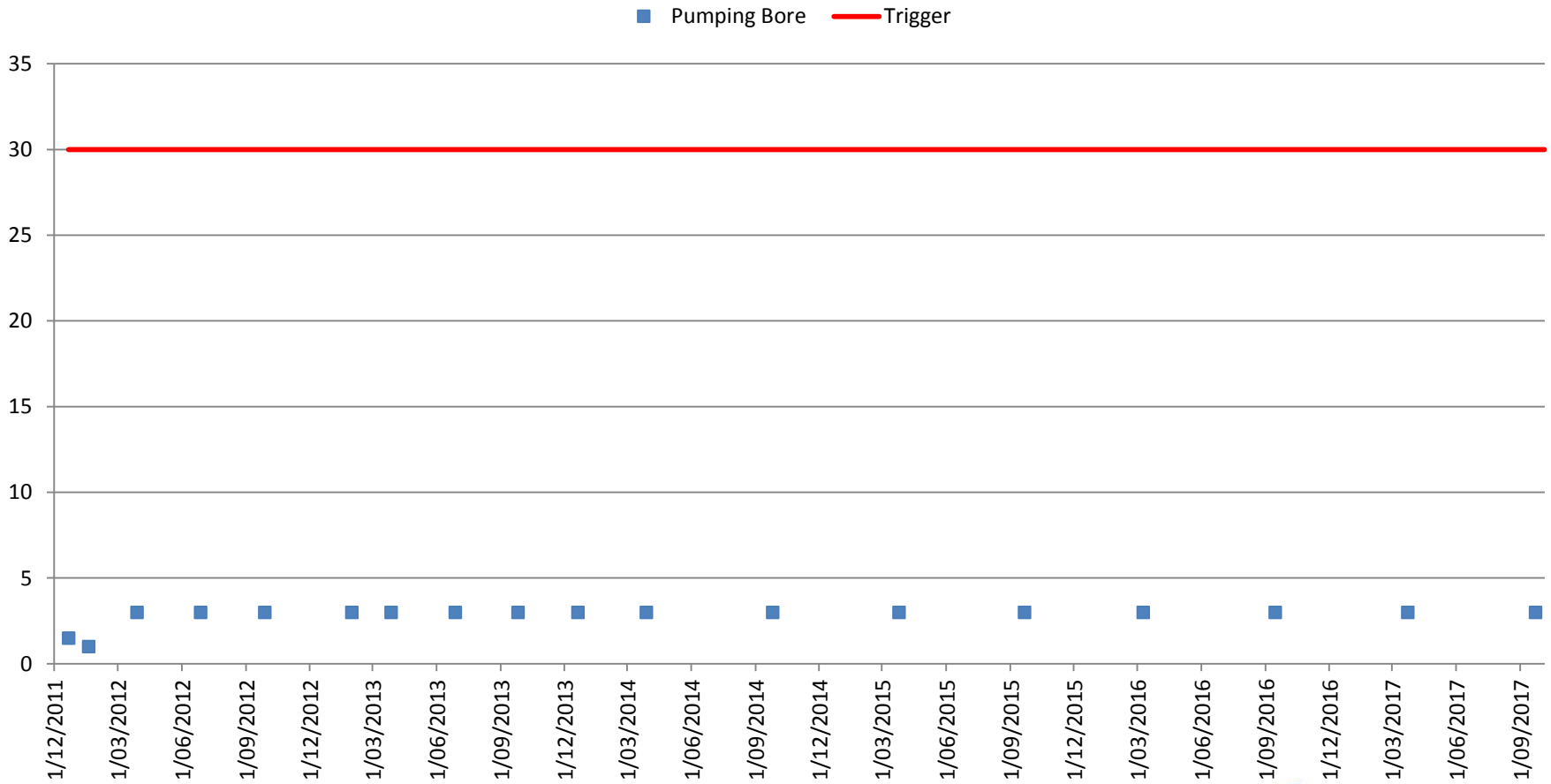


Groundwater Chemistry Results

The following figure show all the results for TSS since the commencement of sampling.

All results are in g/m³.

Total Suspended Solids

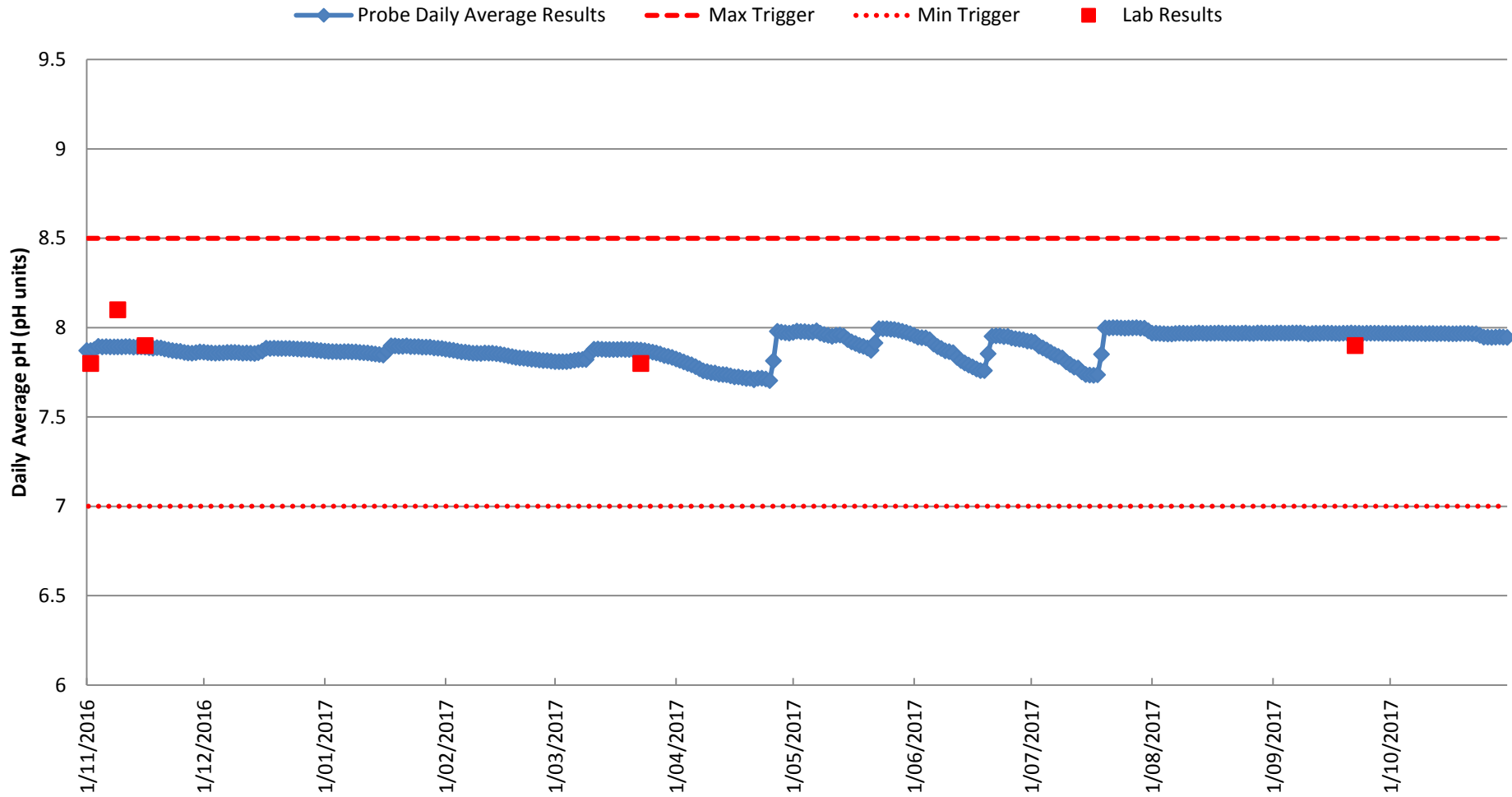


Continuous Groundwater Quality Monitoring

- 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.

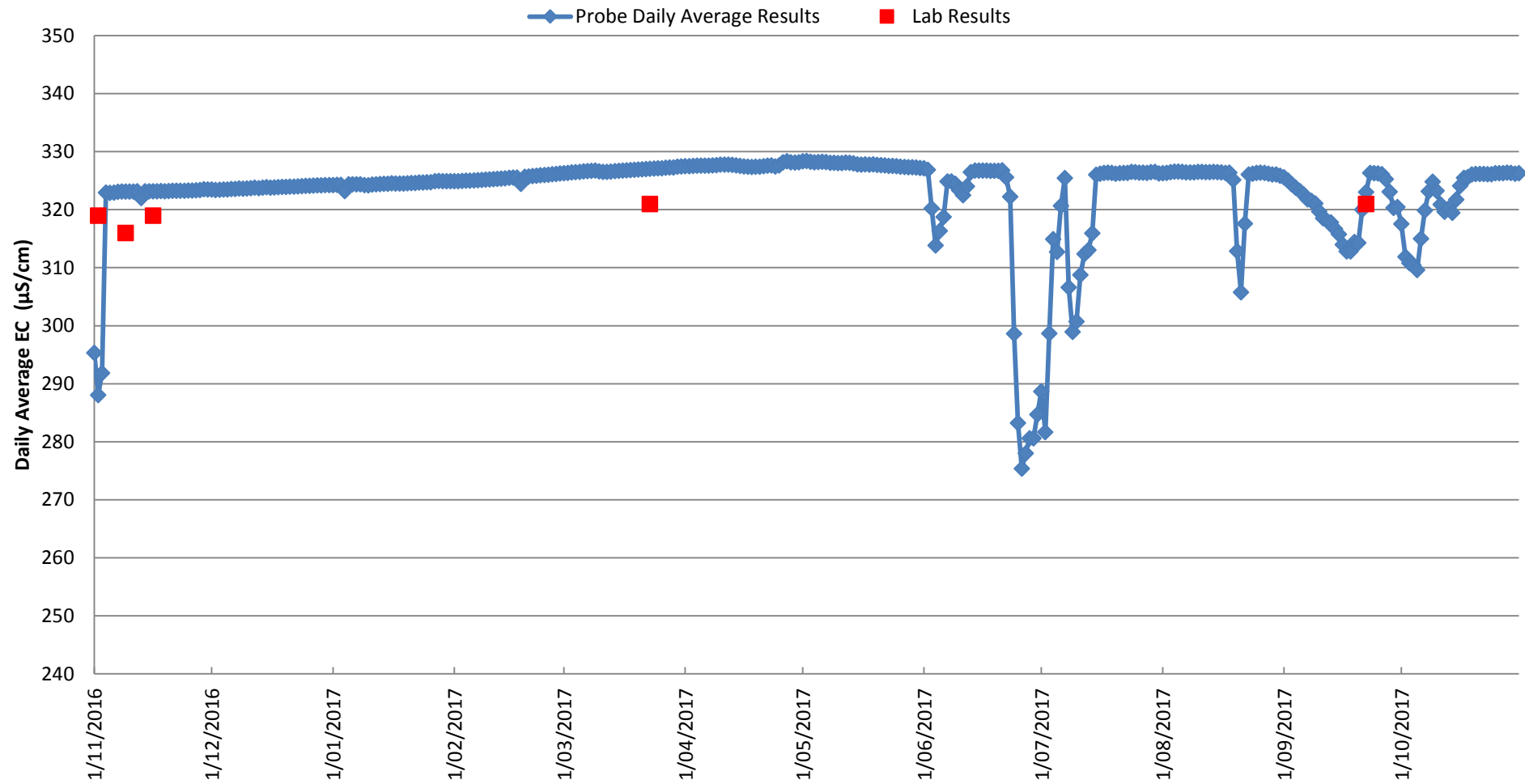
Continuous Groundwater Quality Monitoring

Average Daily pH Graph



Continuous Groundwater Quality Monitoring

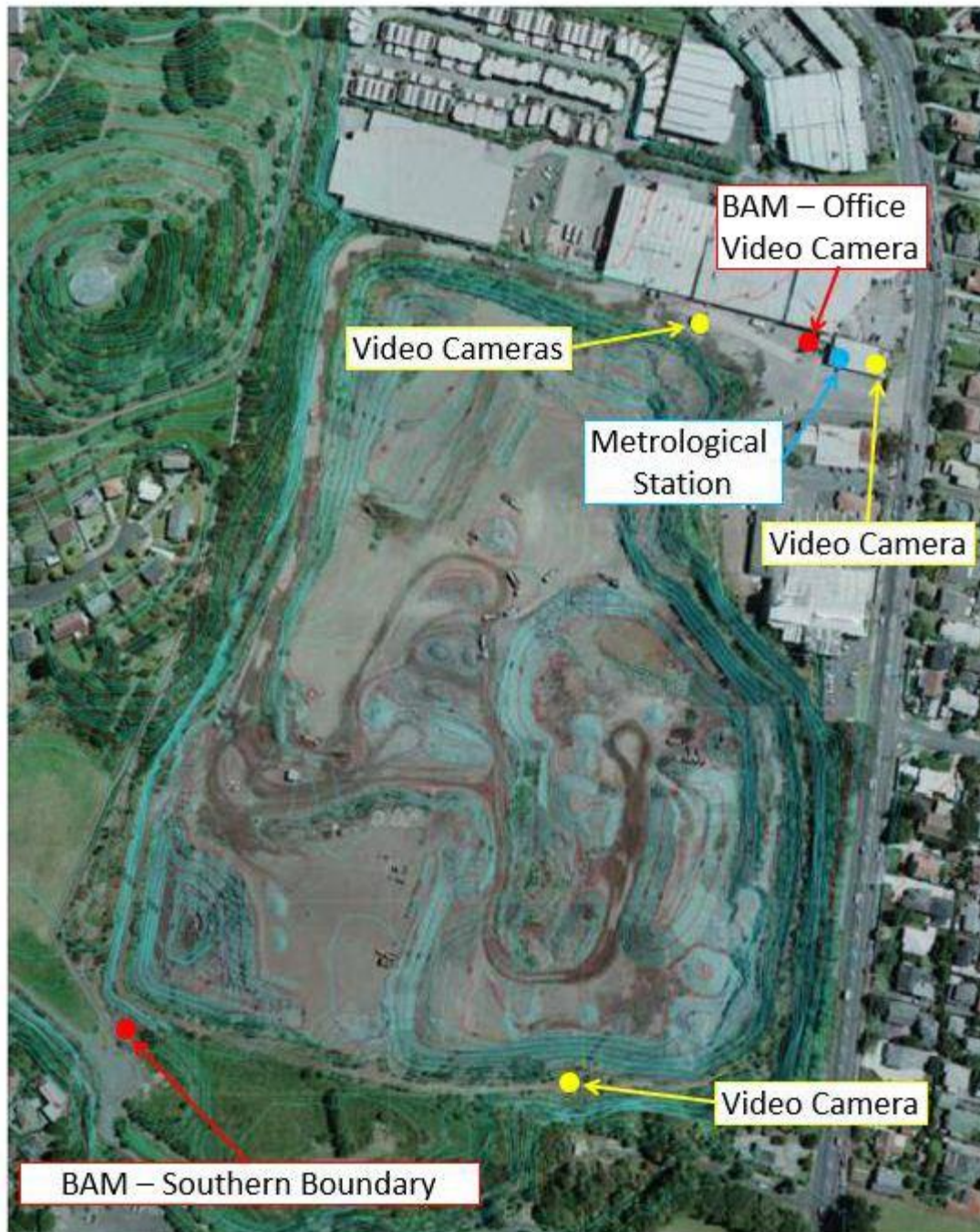
Average Daily EC Graph



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.

Air Quality Monitoring Equipment



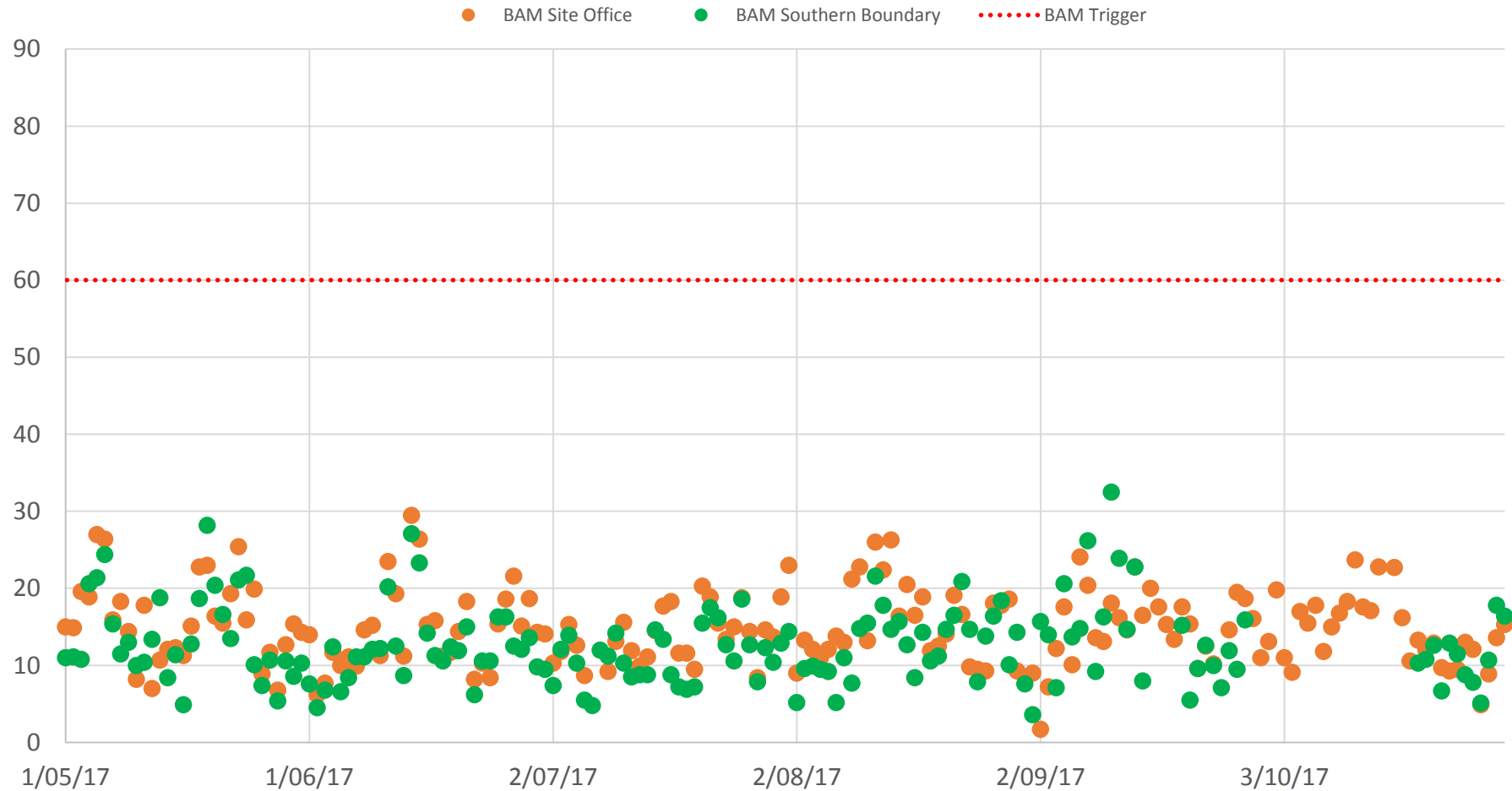
Air Quality Monitoring Results

- Continuous air quality monitoring results recorded since the last SLG meeting have been less than 40 micrograms per cubic meter as a 24 hour average
- No air quality triggers have been recorded since the last SLG meeting.
- The Southern Boundary BAM unit began to show unusual fluctuations in the TSP measurements at the end of September 2017. After extensive investigation by the external technician, the cause was found to be a fault in the unit's detector system. Data from the SB BAM unit was deemed either invalid or unavailable from the period 29th September - 19th October 2017. A new detector was installed and the unit has resumed producing stable TSP measurements. Auckland Council was notified.

Air Quality Monitoring Results

The following figure shows air monitoring results from 1st May to 31st October 2017.

All results are in $\mu\text{g}/\text{m}^3$.



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 $L_{A10}55\text{dBA}$ at or within the boundary of any residential property
- The next round of noise monitoring will be undertaken in November/December 2017

**Thank you - that concludes the
November 2017 Monitoring Report**