

REGULATION 60 RESPONSE

**REVIEW OF AMG_s OPERATIONS AGAINST THE
NON-FERROUS METAL INDUSTRIES BEST AVAILABLE TECHNIQUES
CONCLUSIONS DOCUMENT JUNE 2016**

Prepared for:

**AMG RESOURCES
LIMITED**

November 2016

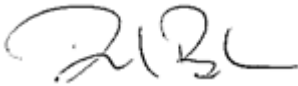
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REVIEW OF AMG's OPERATIONS AGAINST THE NON-FERROUS METAL INDUSTRIES BEST AVAILABLE TECHNIQUES CONCLUSIONS DOCUMENT JUNE 2016

1. INTRODUCTION

1.1. Environmental Compliance Limited ("ECL") have been commissioned on behalf of AMG Resources Limited ("AMG") to provide a response to the Regulation 60 request issued by Natural Resources Wales ("NRW"). NRW require the information in order to be able to undertake a review of AMG's Environmental Permit following the publication of the revised Best Available Techniques ("BAT") Reference Document for the Non-Ferrous Metals Industries.

1.2. The information required is as follows:

1. *Confirm whether or not you currently comply with the requirements of the BAT Conclusion, including and associated emission levels, providing a description of the techniques in place and how they meet the standard.*
2. *If you do not comply with the BAT conclusion, carry out a BAT Assessment.*
3. *Where there is a BAT Associated Emission Level (BAT AEL) specified in the BAT conclusion, with which you will not comply, you must provide sufficient technical and commercial information to demonstrate that achieving that BAT AEL would lead to costs that are disproportionately high, compared with environmental benefits.*
4. *Where compliance with the BAT conclusions leads to the substantial refurbishment or installation of new combustion plant with an aggregate thermal input of greater than 20MWth, which generates more than 100kWth of waste heat, you must provide sufficient technical and commercial evidence to demonstrate compliance with Article 14, paragraph 5 of directive 2012/27/EU on Energy Efficiency. This must include an assessment of the technical feasibility and costs and benefits associated with installing a combined heat and power (CHP) system or providing district heating and, where this assessment shows that the costs are not disproportionate to the benefits, proposals to incorporate these measures into your plant.*
5. *For all discharges to surface waters from the site, you must provide emissions data following for the following hazardous pollutants: cadmium, mercury, nickel, lead, benzene, polyaromatic hydrocarbons and any other relevant substances. The emissions monitoring for these substances should be carried out using the methods and standards described in the M18 guidance on "Monitoring of discharges to water and sewer".*
6. *With reference to the risk assessment guidance on the gov.uk website entitled "Surface water pollution risk assessment for your environmental permit" (accessible via this link: <https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit>), carry out the following assessments:*

- Screening tests for mercury, cadmium, nickel, lead, benzene, polyaromatic hydrocarbons and any other relevant substances.
- Screening tests for the following priority hazardous pollutants: mercury, cadmium, polyaromatic hydrocarbons and any other relevant priority hazardous substances.
- For any substance which is not screened out by the screening tests you will need to carry out modelling, as described in the risk assessment guidance “Surface water pollution risk assessment for your environmental permit”

You must provide us with the results from the emissions monitoring, the results from the screening tests and the results from any modelling. You can use the H1 electronic screening tool to present the emissions data and to carry out the screening tests. We will provide a copy of the tool to your local representative at the site address. With regard to the screening a full list of relevant substances is provided on the “Surface water pollution risk assessment for your environmental permit” pages of the gov.uk website. You should review the list and carry out the screening for any substances, in addition to those specified in this letter, that you think may be present in your discharges to surface water. With regard to screening for priority hazardous pollutants, a full list of relevant priority hazardous substances and their associated annual significant loads is given on the “Surface water pollution risk assessment for your environmental permit” pages of the gov.uk website.

7. Where your activity involves the use, production or release of relevant hazardous substance (as defined in Article 3(18) of the Industrial Emissions Directive) carry out a risk assessment considering the possibility of soil and groundwater contamination at the installation with substances. Where any risk of such contamination is established either;

- Prepare and submit a baseline report containing information necessary to determine the current state of soil and groundwater contamination.
- or
- Provide a summary report referring to information previously submitted where you are satisfied that such information represents the current state of soil and groundwater contamination.

so as to enable a quantified comparison to be made with the state of soil and groundwater contamination upon cessation of activity. Where you have concluded that there are no risks of soil or groundwater contamination, provide a copy of the risk assessment

- 1.3. The points above that are relevant to AMG are points 1,2,3 and 7, consequently only these have been considered in this response.
- 1.4. Section 2 of this report considers the BAT requirements applicable to AMG, namely BAT1-19 and 90-107, and confirms compliance or otherwise.
- 1.5. Section 3 discusses compliance with BAT AELs.
- 1.6. Section 4 considers soil and groundwater contamination at the site.

2. COMPLIANCE WITH BAT CONCLUSIONS

- 2.1. The BAT conclusions that are potentially applicable to AMG are BAT 1-19 and 90-107. Table 1 summarises the conclusions, confirms relevance or otherwise to AMG's operations and provides a description of the techniques in place.

Table 1: Compliance with BAT Conclusions

BAT Ref	Description	Techniques in Place	BAT Achieved?
1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the features listed.	AMG has an EMS in place that is compliant with ISO14001, although is not formally accredited. The requirements of the BAT conclusions are all requirements of the 14001 standard. The scope and nature of the EMS is proportionate to the scope and nature of the activities at the installation.	YES
2	In order to use energy efficiently, BAT is to use a combination of the techniques listed.	AMG monitor energy efficiency on a monthly basis and the energy management policy is reviewed on an annual basis by top management. Energy efficiency measures are in place and are reviewed on an annual basis (See ECL Report R033 – Energy Efficiency Report March 2016).	YES
3	In order to improve overall environmental performance, BAT is to ensure stable process operation by using a process control system together with a combination of the techniques listed.	Raw materials selection is covered within the sites Quality Management System ("QMS") (ISO9001:2008) which is formally accredited. Raw materials are inspected on arrival, appropriately segregated and suitably mixed prior to treatment. Material feed rates are visually observed. Process temperatures are manually recorded as appropriate within the detinning process. The tin pot itself is thermostatically controlled.	YES
4	In order to reduce channelled dust and metal emissions to air, BAT is to apply a maintenance management system which especially addresses the performance of dust abatement systems as part of the environmental management system (see BAT 1).	There is a planned preventative maintenance programme ("PPMP") which ensures that all plant and equipment are adequately maintained to reduce emissions to air. The PPMP is contained within both the Quality Management System ("QMS") and EMS.	YES
5	In order to prevent or, where this is not practicable, to reduce diffuse emissions to air and water, BAT is to collect diffuse emissions as much as possible nearest to	Diffuse (fugitive) emissions are reviewed on an annual basis. The operations at AMG are not considered to give rise to significant amounts of dust and metal emissions. There is an extraction system (bag filter plant) fitted to the tin pot to reduce emissions during the melting process. There are no diffuse emissions to water.	YES

BAT Ref	Description	Techniques in Place	BAT Achieved?
	the source and treat them		

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
6	In order to prevent or, where this is not practicable, to reduce diffuse dust emissions to air, BAT is to set up and implement an action plan on diffuse dust emissions, as part of the environmental management system (see BAT 1).	The main sources of dust emissions are from the shredding of the raw material in the hammer mill and used can plant. In the event that significant quantities of dust are generated then water suppression techniques are employed.	YES
7	In order to prevent diffuse emissions from the storage of raw materials, BAT is to use a combination of the techniques listed.	The raw materials used are post consumer metal packaging and used cans – they are not dust forming materials. Covered storage is also not considered applicable as the raw materials do not contain any water soluble materials. All tanks that contain process liquids/chemicals are resistant to the materials contained therein, and are bunded to contain any spillages. The whole process area is on concrete hardstanding which drains to a central collection pit. Any liquids collected within the pit are subsequently recycled into the process.	YES
8	In order to prevent diffuse emissions from the handling and transport of raw materials, BAT is to use a combination of the techniques listed.	Raw materials are transferred within screw conveyors, and subsequently are in solution. No diffuse emissions occur from the handling and transport of raw materials.	Not Applicable
9	In order to prevent or, where this is not practicable, to reduce diffuse emissions from metal production, BAT is to optimise the efficiency of off-gas collection and treatment by using a combination of the techniques	Mechanical pre-treatment of the secondary raw material includes shredding and removal of organic material (such as paper and plastics). Emissions from tin melting pass through appropriate abatement.	YES
10	BAT is to monitor the stack emissions to air with at least the frequency given listed and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality	Monitoring is undertaken twice per year for particulate, copper, lead, zinc, cadmium, arsenic, nickel and tin. Monitoring for particulates is undertaken in accordance with BS EN 13284, and BS14385 for the metals.	YES

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
11	In order to reduce mercury emissions to air (other than those that are routed to the sulphuric acid plant) from a pyrometallurgical process, BAT is to use one or both of the techniques listed.	The process does not give rise to mercury emissions.	Not Applicable
12	In order to reduce emissions of SO ₂ from off-gases with a high SO ₂ content and to avoid the generation of waste from the flue-gas cleaning system, BAT is to recover sulphur by producing sulphuric acid or liquid SO ₂	Not applicable.	Not Applicable
13	In order to prevent NO _x emissions to air from a pyrometallurgical process, BAT is to use one of the techniques given below	The process (i.e. the production of tin) does itself not give rise to NO _x emissions. NO _x emissions do occur from the boiler which is used to generate steam in the chemical treatment phase of the process. The boiler is fitted with low-NO _x burners.	YES
14	In order to prevent or reduce the generation of waste water, BAT is to use one or a combination of the techniques listed.	No waste water is generated. All process waters are recycled within the process.	YES
15	In order to prevent the contamination of water and to reduce emissions to water, BAT is to segregate uncontaminated waste water streams from waste water streams requiring treatment	No waste water is generated. All process waters are recycled within the process.	YES
16	BAT is to use ISO 5667 for water sampling and to monitor the emissions to water at the point where the emission leaves the installation at least once per month (¹) and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality	There are no process emissions to water.	Not applicable

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
17	In order to reduce emissions to water, BAT is to treat the leakages from the storage of liquids and the waste water from non-ferrous metals production, including from the washing stage in the Waelz kiln process, and to remove metals and sulphates by using a combination of the techniques listed.	There are no process emissions to water.	Not applicable
18	In order to reduce noise emissions, BAT is to use one or a combination of the techniques listed.	A number of noise complaints were received in 2014, however, in November 2014 the installation ceased night-time operations, and there have been no further complaints. The majority of complaints were attributable to mobile plant and worn bearings. AMG have a preventative maintenance procedure in place which will ensure that all plant and machinery on site is kept in good working order which, it is anticipated, will mitigate future complaints. No further noise mitigation measures are considered to be required at this point.	YES
19	In order to reduce odour emissions, BAT is to use one or a combination of the techniques listed.	No odours materials are stored or handled onsite.	Not Applicable
90	In order to prevent or reduce diffuse emissions from preparation (such as metering, mixing, blending, crushing, cutting, screening) of primary and secondary materials (excluding batteries), BAT is to use one or a combination of the techniques given below	There is potential for dust emissions from the shredding of the tinplate scrap or used cans. In the event that significant quantities of dust are generated then water suppression techniques are employed.	YES
91	In order to prevent or reduce diffuse emissions from material pretreatment (such as drying, dismantling, sintering, briquetting, pelletising and battery crushing, screening and classifying) in primary lead and secondary lead and/or tin production, BAT is to use one or both of the techniques listed.	The screw conveyors were historically enclosed, however, due to the nature of the material handled (i.e. metallic fines) the screw conveyors were becoming frequently blocked. Consequently, the conveyors are enclosed on three sides which ensures that material has space to rotate around the screw thus preventing a build up of material and subsequent blockages. Within the detinning process, the conveyors are not enclosed as the process requires evaporation.	Not applicable.

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
92	In order to prevent or reduce diffuse emissions from charging, smelting and tapping operations in lead and/or tin production, and from pre-decoppering operations in primary lead production, BAT is to use an appropriate combination of the techniques given below	All operations are undertaken within the confines of the building. There is bag filter extraction system fitted to the tin pot to reduce metal and particulate emissions. The tin pot is adequately sealed and insulated. From a review of the BAT conclusions there are a number of improvements to the tin melting and tapping operations which need to be considered. However, at this time AMG are not currently using the tin pot. Prior to commencement of tin production AMG will undertake a full BAT assessment of this element of operations and will implement the required BAT prior to operation.	Not Currently
93	In order to prevent or reduce diffuse emissions from remelting, refining and casting in primary and secondary lead and/or tin production, BAT is to use a combination of the techniques given	There is a lid on the tin pot and it is thermostatically controlled. From a review of the BAT conclusions there are a number of improvements to the tin melting and tapping operations which need to be considered. However, at this time AMG are not currently using the tin pot. Prior to commencement of tin production AMG will undertake a full BAT assessment of this element of operations and will implement the required BAT prior to operation.	Not currently
94	In order to reduce dust and metal emissions to air from raw material preparation (such as reception, handling, storage, metering, mixing, blending, drying, crushing, cutting and screening) in primary and secondary lead/or and tin production, BAT is to use a bag filter	A variation application was submitted to and approved by NRW to remove the emission point A1 which was the dust extraction system for the used can plant, as the plant was only extracting ambient air.	Not applicable.
95	In order to reduce dust and metal emissions to air from battery preparation (crushing, screening and classifying), BAT is to use a bag filter or a wet scrubber	Not applicable – no battery preparation.	Not applicable
96	In order to reduce dust and metal emissions to air (other than those that are routed to the sulphuric acid or liquid SO ₂ plant) from charging, smelting and tapping in primary and secondary lead and/or tin production, BAT is to use a bag filter	A bag filter plant is fitted to the tin pot to reduce dust and metal emissions. Emissions of particulate from the last round of emissions testing were recorded as 0.34mg/m ³	YES

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
97	In order to reduce dust and metal emissions to air from remelting, refining and casting in primary and secondary lead and/or tin production, BAT is to use the techniques listed.	A bag filter plant is fitted to the tin pot to reduce dust and metal emissions. Emissions of particulate from the last round of emissions testing were recorded as 0.34mg/m ³	YES
98	In order to reduce emissions of organic compounds to air from the raw material drying and smelting process in secondary lead and/or tin production, BAT is to use one or a combination of the techniques listed	Organic materials are removed during the de-tinning process, consequently are not present during the tin melting process.	Not applicable.
99	In order to reduce PCDD/F emissions to air from the smelting of secondary lead and/or tin raw materials, BAT is to use one or a combination of the techniques listed.	Testing for dioxins was initially a permit requirement, however, following a number of rounds of testing, it was proved that there were no releases of dioxins/furans from the process.	Not applicable.
100	In order to prevent or reduce SO ₂ emissions to air (other than those that are routed to the sulphuric acid or liquid SO ₂ plant) from charging, smelting and tapping in primary and secondary lead and/or tin production, BAT is to use one or a combination of the techniques given below.	There are no SO ₂ emissions from the process.	Not applicable.
101	In order to prevent the contamination of soil and groundwater from battery storage, crushing, screening and classifying operations, BAT is to use an acid-resistant floor surface and a system for the collection of acid spillages.	The process does not involve batteries.	Not applicable

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
102	In order to prevent the generation of waste water from the alkaline leaching process, BAT is to reuse the water from the sodium sulphate crystallisation of the alkali salt solution	There is no alkaline leaching.	Not applicable.
103	In order to reduce emissions to water from battery preparation when the acid mist is sent to the waste water treatment plant, BAT is to operate an adequately designed waste water treatment plant to abate the pollutants contained in this stream	The process does not involve batteries.	Not applicable
104	In order to reduce the quantities of waste sent for disposal from primary lead production, BAT is to organise operations on site so as to facilitate process residues reuse or, failing that, process residues recycling, including by using one or a combination of the techniques listed.	The process is not primary lead production.	Not applicable.
105	In order to allow the recovery of the polypropylene and polyethylene content of the lead battery, BAT is to separate it from the batteries prior to smelting	The process does not involve batteries.	Not applicable
106	In order to reuse or recover the sulphuric acid collected from the battery recovery process, BAT is to organise operations on site so as to facilitate its internal or external reuse or recycling, including one or a combination of the techniques	The process does not involve batteries.	Not applicable

Table 1: Compliance with BAT Conclusions (cont)

BAT Ref	Description	Techniques in Place	BAT Achieved?
107	In order to reduce the quantities of waste sent for disposal from secondary lead and/or tin production, BAT is to organise operations on site so as to facilitate process residues reuse or, failing that, process residues recycling, including by using one or a combination of the techniques listed.	The residues from the process – detinners mud, and tin dross – are sent to a specialist re-processor in order to extract any residual tin.	YES

3. BAT ASSOCIATED EMISSION LEVELS

- 3.1. AMG comply with all BAT associated emission levels.

4. SOIL AND GROUNDWATER

4.1. Historical Reports

- 4.1.1. An IPPC Site Report (ExCAL Report Reference ES1303/Secton1.3/KKE) was submitted as part of the original IPPC Permit Application in December 2001. This report concluded the site occupied by AMG Resources is *"contaminated by metals and oils but that a high proportion of the contamination I due to past industries and not associated with AMG. The contamination has low leachability potential and should not, in theory, pose a risk to the environment. However, chemical analysis of samples of groundwater have shown some degree of contamination."*
- 4.1.2. Further information was also submitted in April 2002 in response to a Schedule 4 Notice (ExCAL Reference JB/ES1303/KE2087) which also proposed baseline conditions. The information provided within the IPPC Site Report provides sufficient information to represent the condition of the site at permit application, and will consequently allow a quantified comparison to be made with the state of the soil and groundwater contamination upon cessation of the activity.
- 4.1.3. Bi-annual groundwater monitoring is undertaken, the results of which are graphed and have been included in Appendix 1 for reference.
-

4.2. Materials Inventory

- 2.1.1. All materials held on site that could cause potential environmental damage have been assessed to determine the risk associated with their use/presence. The list includes the raw materials used in the process, waste materials and other potentially hazardous maintenance fluids, such as diesel. Maintenance materials such as release agents, greases, antifreeze etc, have not been assessed as it is considered that these are not stored in sufficient quantity to pose an environmental risk.
- 2.1.2. For the purposes of this assessment, the materials that have been considered are listed in Table 1. Tables 2 discusses the nature of the material, the quantity used on site and the environmental impact. Please note that detinning operations have currently been suspended and a number of materials listed in Table 1 are no longer held on site. However, as detinning operations may re-commence, these materials have been include in this assessment but are highlighted in grey.

Table 1: Materials Inventory

Raw Material	Waste Material	Maintenance
Sodium Hydroxide Sodium Nitrite	Detinners mud Spent Caustic Caustic Slurry	Gas Oil

Table 2: Materials Assessment

Name	Chemical Nature/ Composition	Average Quantity Used on Site per Annum (tonnes)	Hazard Identification	Handling & Storage Arrangements	Containment Measures	Process Use/Fate	Environmental Impact
Sodium hydroxide	Clear or slightly turbid liquid 50% Concentration (by volume) Colourless Odourless	111	Corrosive	30,000 litre Steel Tank	Bunded area	Involved in the process as an electrolyte. After the tinplate scrap has undergone the initial preparation process it is immersed in sodium hydroxide, which is used to de-lacquer the tinplate. Is used throughout the process. Some is recycled through the process, some remains within the product and some is disposed in detinners mud.	Has a high pH and will cause severe localised damage to flora and fauna. The effect is short term as sodium hydroxide is converted, by absorption of atmospheric carbon dioxide, to sodium carbonate which is of lower environmental concern. Does not bio-accumulate and has no BOD. Can cause damage to aquatic plants and vegetation in sufficient concentrations.
Sodium nitrite	Colourless to pale yellow aqueous solution Odourless	67	Oxidising Toxic	30,000 litre Steel Tank	Bunded area	Used as an oxidant in the dissolution stage of the chemical leaching process Is used throughout the process. Some is recycled through the process, some remains within the product and some is disposed in detinners mud.	Sodium nitrite has a low potential for bioaccumulation, however is very toxic to aquatic organisms. Predicted to have high mobility in the soil.

Table 3: Materials Assessment

Name	Chemical Nature/ Composition	Average Quantity Used on Site per Annum (tonnes)	Hazard Identification	Handling & Storage Arrangements	Containment Measures	Process Use/Fate	Environmental Impact
Detinners Mud	Classified as hazardous waste due to high sodium hydroxide content, also contains organic matter and traces of tin, aluminium and iron.	38	Corrosive	Base of detinning tanks.	The detinning tanks are located on concrete hard standing, which drains to a collection pit.	The tank muds arise from the detinning tanks. When sufficient quantities have accumulated in the base of the tank, a vacuum tanker is used to suck the muds from the tanks and they are removed off-site for treatment at a suitably licensed hazardous waste treatment facility	Has a high pH and will cause severe localised damage to flora and fauna. The effect is short term as sodium hydroxide is converted, by absorption of atmospheric carbon dioxide, to sodium carbonate which is of lower environmental concern. Does not bio-accumulate and has no BOD. Can cause damage to aquatic plants and vegetation in sufficient concentrations.
Spend Caustic	Classified as hazardous waste due to high sodium hydroxide content, also contains organic matter and traces of tin, aluminium and iron.	795	Expected to be corrosive, oxidising and toxic	Base of detinning tanks and collection pit		The caustic slurry is a slurry that collects in the base of the tanks during settlement. When sufficient quantities have accumulated in the base of the tanks a vacuum tanker is used to suck the muds from the tanks and they are removed off site for treatment at a suitably licensed hazardous waste treatment facility. The spent caustic is process solution that has been recycled a number of times, but can no longer be used as it has picked up to much contamination	Expected to be as sodium hydroxide and sodium nitrite.

Table 4: Materials Assessment

Name	Chemical Nature/ Composition	Average Quantity Used on Site per Annum (tonnes)	Hazard Identification	Handling & Storage Arrangements	Containment Measures	Process Use/Fate	Environmental Impact
Diesel	Complex mixtures of distillate hydrocarbons mainly paraffinic, naphthenic and aromatic in the range C10-C28 Straw coloured to amber fluid – may be dyed red	87	Harmful Dangerous to the environment	8,000 litre tank	Double walled diesel storage tank, surrounded by Armco barrier.	Used for the mobile plant	Harmful to aquatic organisms, may cause long-term adverse effects in the environment. Some short term toxicity to aquatic and marine organisms Not readily biodegradable Expected to bio accumulate

4.3. Hazardous Substances Risk Assessment

4.3.1. A risk assessment for each of the substances identified in Table 2 has been undertaken which considered the possibility of soil and groundwater contamination at the installation. The risk assessment for the storage and use of each material, together with likely accidents is provided in Tables 3 - 10, as follows:

- Table 3 – Diesel;
- Table 4 - Sodium hydroxide and sodium nitrite;
- Table 5 - Detinners mud and Detinning Tanks;
- Table 6 – Caustic slurry and spent caustic;
- Table 7 – Vandalism; and
- Table 8 - Loss of mains electrical power.

Table 3: Assessment of Accident Risks: *Gas Oil*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Spillage of gas oil during transfer from bulk tanker	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	During any transfer of diesel, checks are undertaken to ensure that all transfer equipment is intact and that there is sufficient capacity in the tank to which diesel oil is being transferred. Spill kits are kept on site.	Unlikely	Contamination of ground and groundwater	Not significant
Leak from the diesel storage tank	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	The diesel tank is self bunding. Spill kits are kept on site. The tank is checked on a regular basis in accordance with the site's EMS.	Unlikely	Contamination of ground and groundwater	Not significant
Spillage of diesel during transfer to the mobile plant.	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	During any transfer of diesel, checks are undertaken to ensure that all transfer equipment is intact and that there is sufficient capacity in the tank to which diesel is being transferred. The diesel filling pump and associated hose is also located within the bunded area, thus any small leaks (i.e. due to inadequate seals) would be captured. The diesel filling pump is locked when not in use to prevent spillage and theft. Spill kits are kept on site.	Unlikely	Contamination of ground and groundwater	Not significant

Table 4: Assessment of Accident Risks: *Sodium Hydroxide (NaOH)* and *Sodium Nitrite (NaNO₂)*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Spillage of NaOH/NaNO ₂ during transfer from bulk tanker	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	During any transfer of NaOH/NaNO₂, checks are undertaken to ensure that all transfer equipment is intact and that there is sufficient capacity in the tank to which NaOH is being transferred. The filling coupling is also located within the bunded area, thus any small leaks (i.e. due to inadequate seals) would be captured. From experience gained, the “pumps men” know the exact procedures to follow to ensure that tanks are filled to an appropriate level. Training is given to any new staff who would be involved in this procedure. All other pipe work associated with the storage tank is located within the bund. Spill kits are kept on site.	Unlikely	Contamination of ground and groundwater	Not significant
Leak from the NaOH storage tank	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground.	The NaOH/NaNO₂ storage tank is located in a bunded area. The bund is made of impermeable materials and would not be degraded by NaOH/NaNO₂. The bund is greater than 25% of the combined volume of the tanks. Spill kits are kept on site. The bund is checked on a regular basis in accordance with the site’s EMS.	Unlikely	Contamination of ground and groundwater	Not significant

Table 5: Assessment of Accident Risks: *Detinners Mud*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Overflow of the detinning tanks	Made ground outside main process building	Downward migration through the made ground	The detinning tanks have an automatic float valve system to top them up with rinse water to compensate for drag out and evaporation. This is only used when the plant is in operation and attended by suitably trained personnel. Any malfunction, either too much, or too little is immediately apparent and corrected. In the unlikely event of overflow the detinning solution would be collected in drainage channels and directed to the Pit Area. Only small quantities would be released as the detinning tanks are located on concrete hardstanding with drainage directed to a catchment pit. All tanks are regularly checked throughout the shift to ensure their integrity. Spill kits are kept on site.	Very Unlikely	Contamination of ground and groundwater	Not significant
Failure of containment of the detinning tanks	Made ground outside main process building	Downward migration through the made ground	The detinning tanks are located on concrete hardstanding with drainage directed to a catchment pit. All tanks are regularly checked throughout the shift to ensure their integrity. Spill kits are kept on site.	Unlikely	Contamination of ground and groundwater	Not significant
Spillage of detinners mud during transfer to vacuum tanker	Made ground outside main process building	Downward migration through the made ground	During any transfer of detinners mud checks are undertaken to ensure that all transfer equipment is intact and that there is sufficient capacity in the tank to which muds are being transferred. Spill kits are kept on site.	Very Unlikely	Contamination of ground and groundwater	Not significant

Table 6: Assessment of Accident Risks: *Caustic Slurry / Spent Caustic*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Failure of containment of the storage tanks	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	The tanks are located in a bunded area. The bund is made of impermeable materials and would not be degraded by the rinse water. The bund is 25% of the total capacity of the tanks. Spill kits are kept on site. The bund is checked on a regular basis in accordance with the site's EMS.	Unlikely	Contamination of ground and groundwater.	Not significant
Spillage during transfer to vacuum tanker	Initially the made ground surrounding the tank, and potentially the groundwater.	Downward migration through the made ground	During any transfer of checks are undertaken to ensure that all transfer equipment is intact and that there is sufficient capacity in the tanker to which the caustic slurry/spent caustic is being transferred. Spill kits are kept on site.	Very Unlikely	Contamination of ground and groundwater.	Not significant.

Table 7: Assessment of Accident Risks: *Vandalism*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Vandalism causing a spillage of various liquids	Made ground and/or groundwater	Downward migration through the made ground	The site is secured by a fence and large gate which are locked when the site is non operational. A remote CCTV monitoring system is in place. Any motion detected by the cameras is reported to a control centre where security view the feed and determine if further action is needed	Unlikely	Contamination of ground and groundwater.	Not significant

Table 8: Assessment of Accident Risks: *Loss of Mains Electrical Power*

Hazard	Receptor	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Loss of power resulting in release of process materials	Made ground and/or groundwater	Downward migration through the made ground	All processes would shut down in a safe manner. Processes that restart on resumption of power would do so safely. Competent personnel would check all areas In the event of this happening out of hours, security would inform management as soon as possible.	Unlikely	Contamination of ground and groundwater.	Not significant
Vandalism due to lack of power	Made ground and/or groundwater	Downward migration through the made ground	Lighting, telephones and CCTV would be off until power re-starts, however site security would increase the frequency of site patrols and if required additional security would be called to site.	Unlikely	Contamination of ground and groundwater.	Not significant

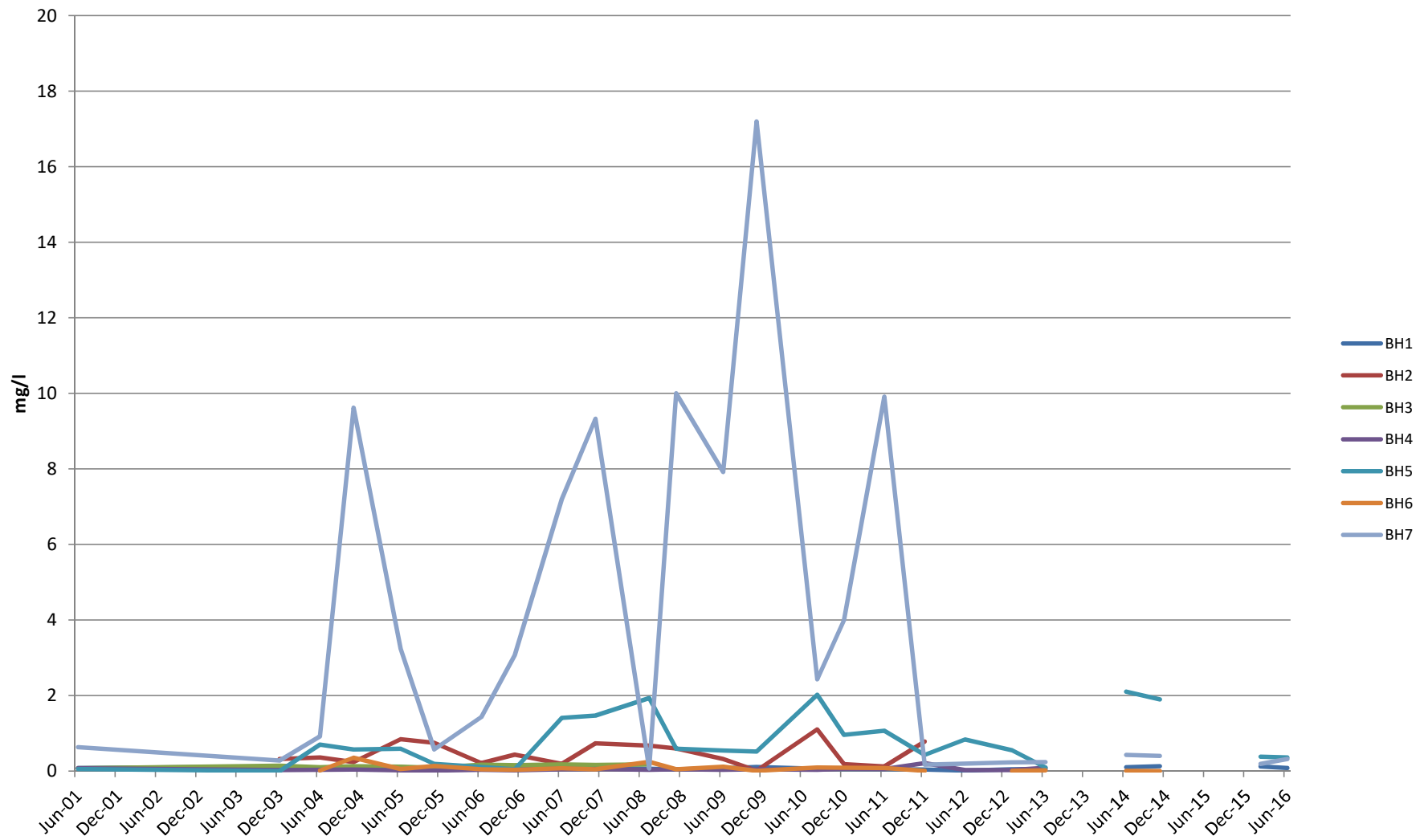
5. CONCLUSIONS

- 5.1. AMG Resources were required to respond to NRW in relation to a Regulation 60 Notice issued with respect to the revised BAT reference document for the Non-Ferrous Metals Industry.
- 5.2. A review of the relevant BAT conditions has been undertaken, and AMG comply with all BAT conclusions, with the exception of BAT 92 and 93. There are a number of improvements to the tin melting and tapping operations which need to be considered. However, at this time AMG are not currently using the tin pot. Prior to commencement of tin production AMG will undertake a full BAT assessment of this element of operations and will implement the required BAT prior to operation.
- 5.3. AMG comply with all BAT Associated Emission Levels.
- 5.4. Risk assessments considering the possibility of soil and groundwater contamination at the installation have been undertaken and have concluded that the overall risk is not significant.
- 5.5. It can therefore be concluded that there is sufficient information contained within this response to all NRW to vary EPR Permit BM2381IQ.

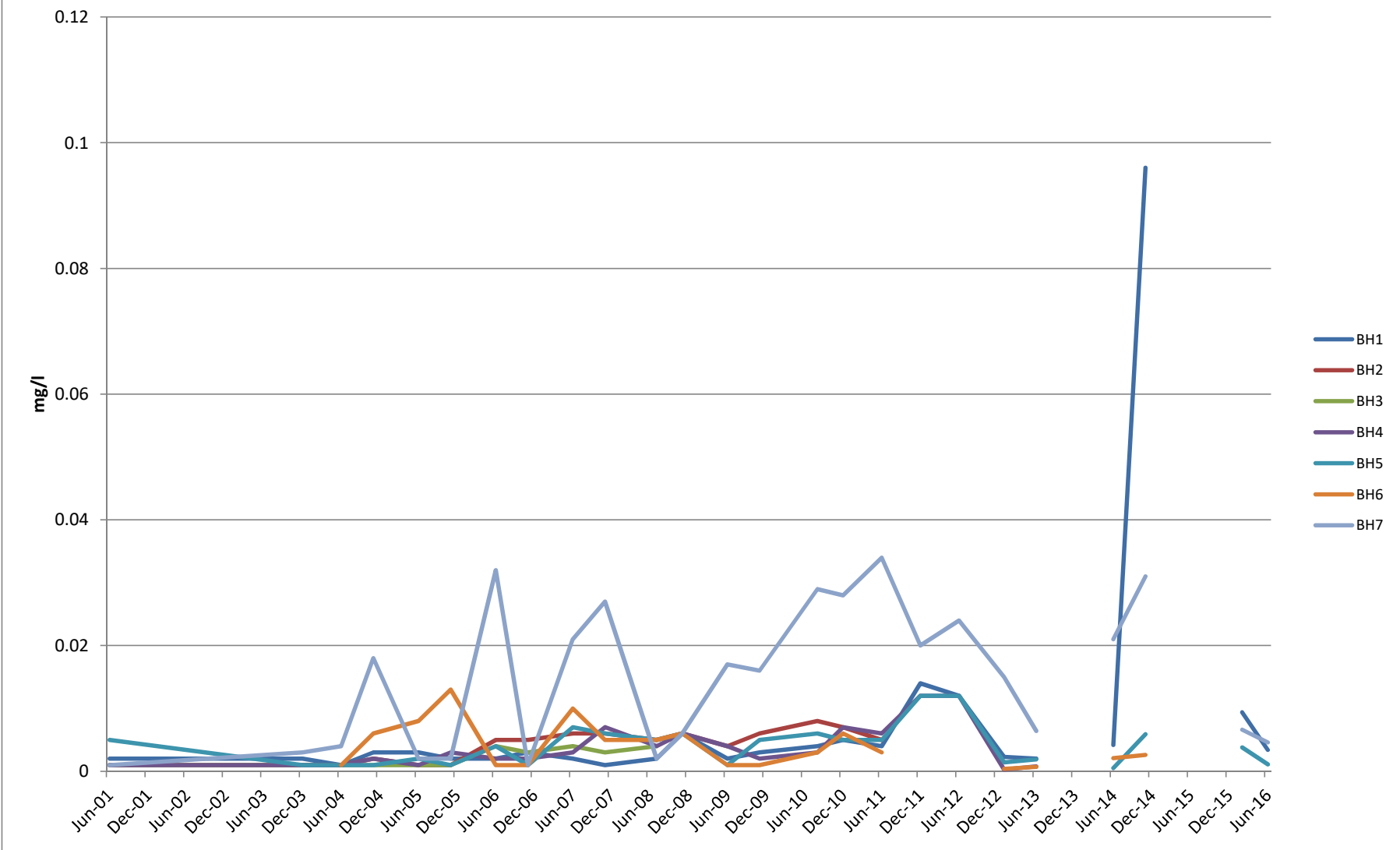
Appendix 1

Groundwater Monitoring Graphs

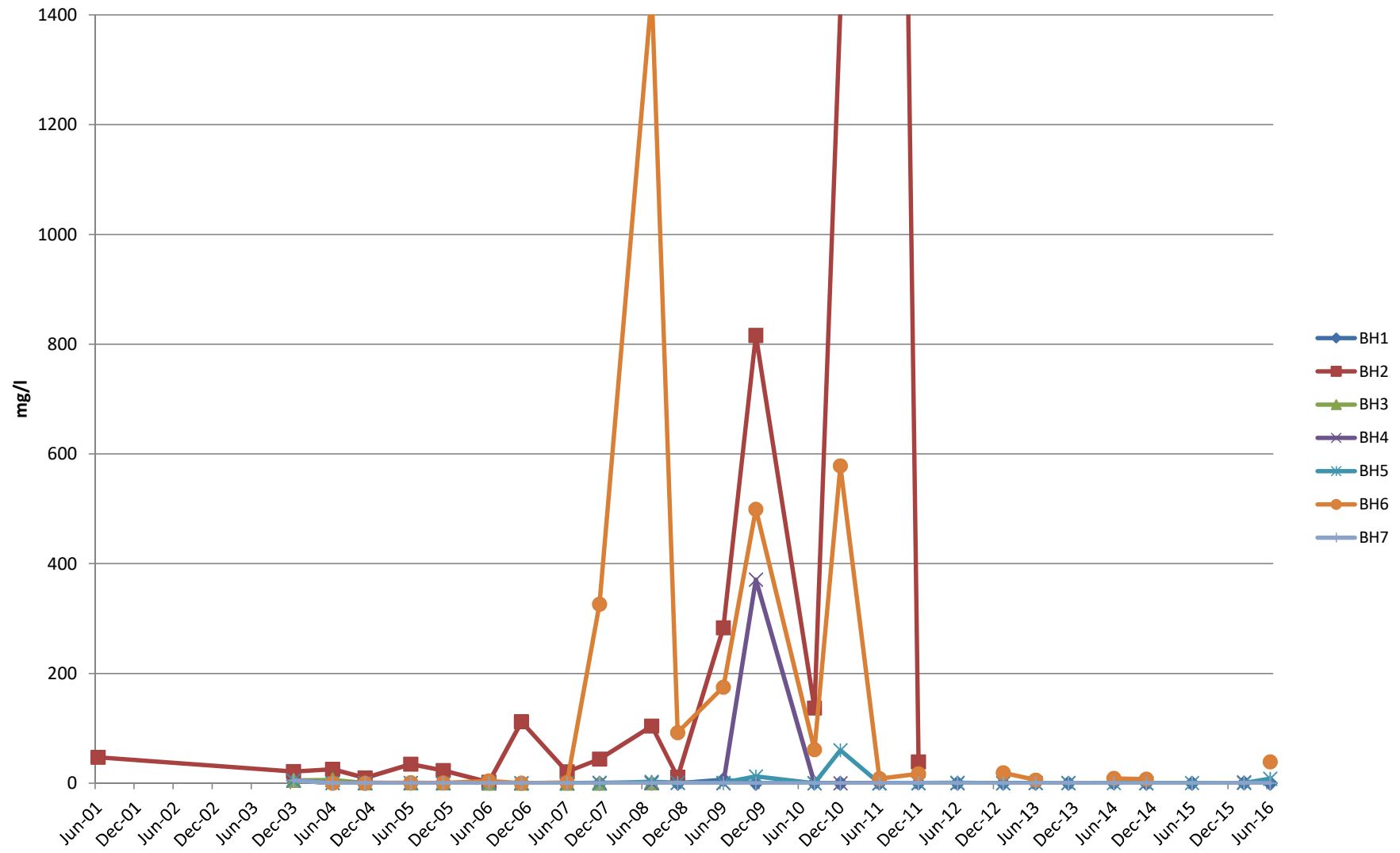
Arsenic



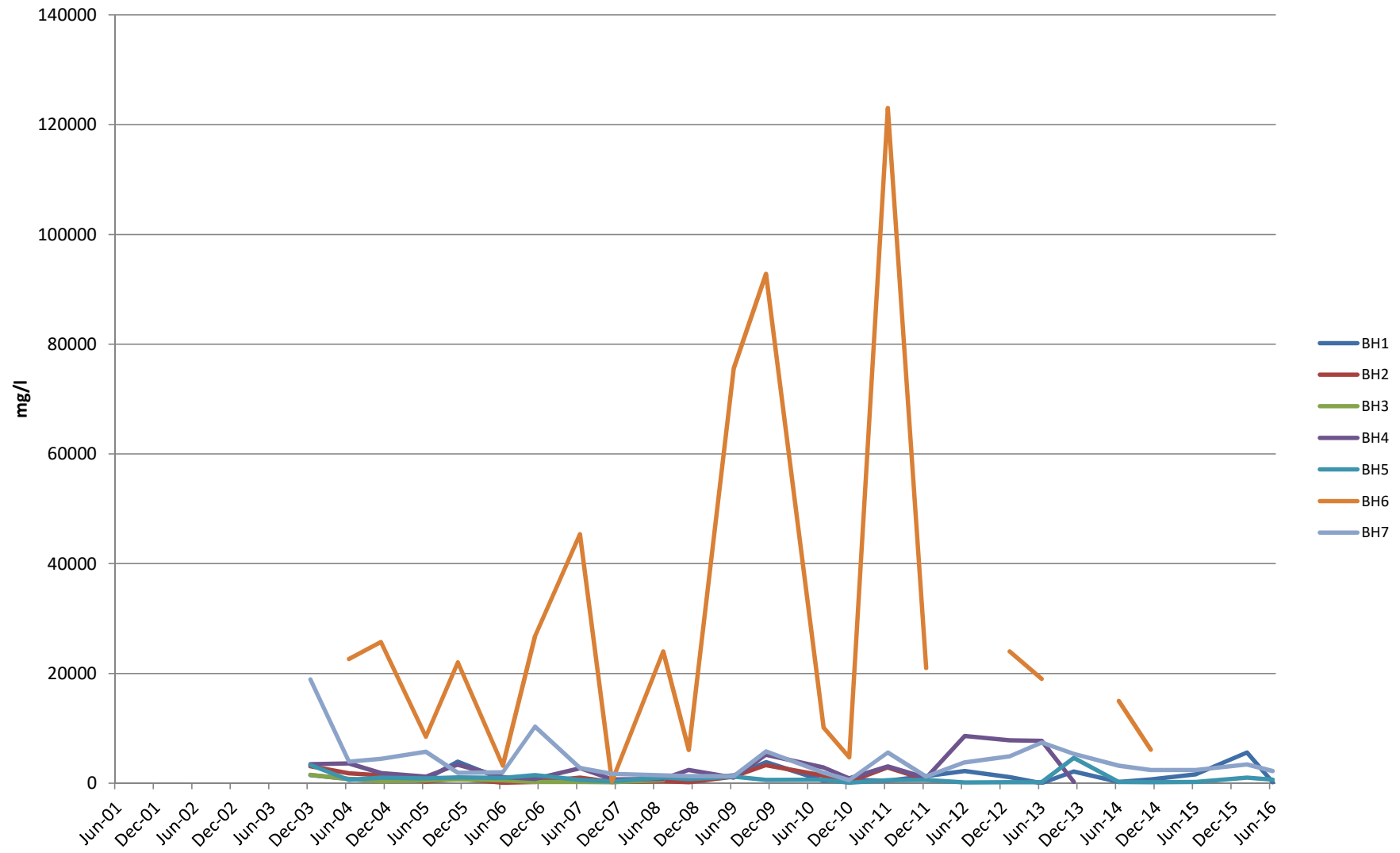
Selenium



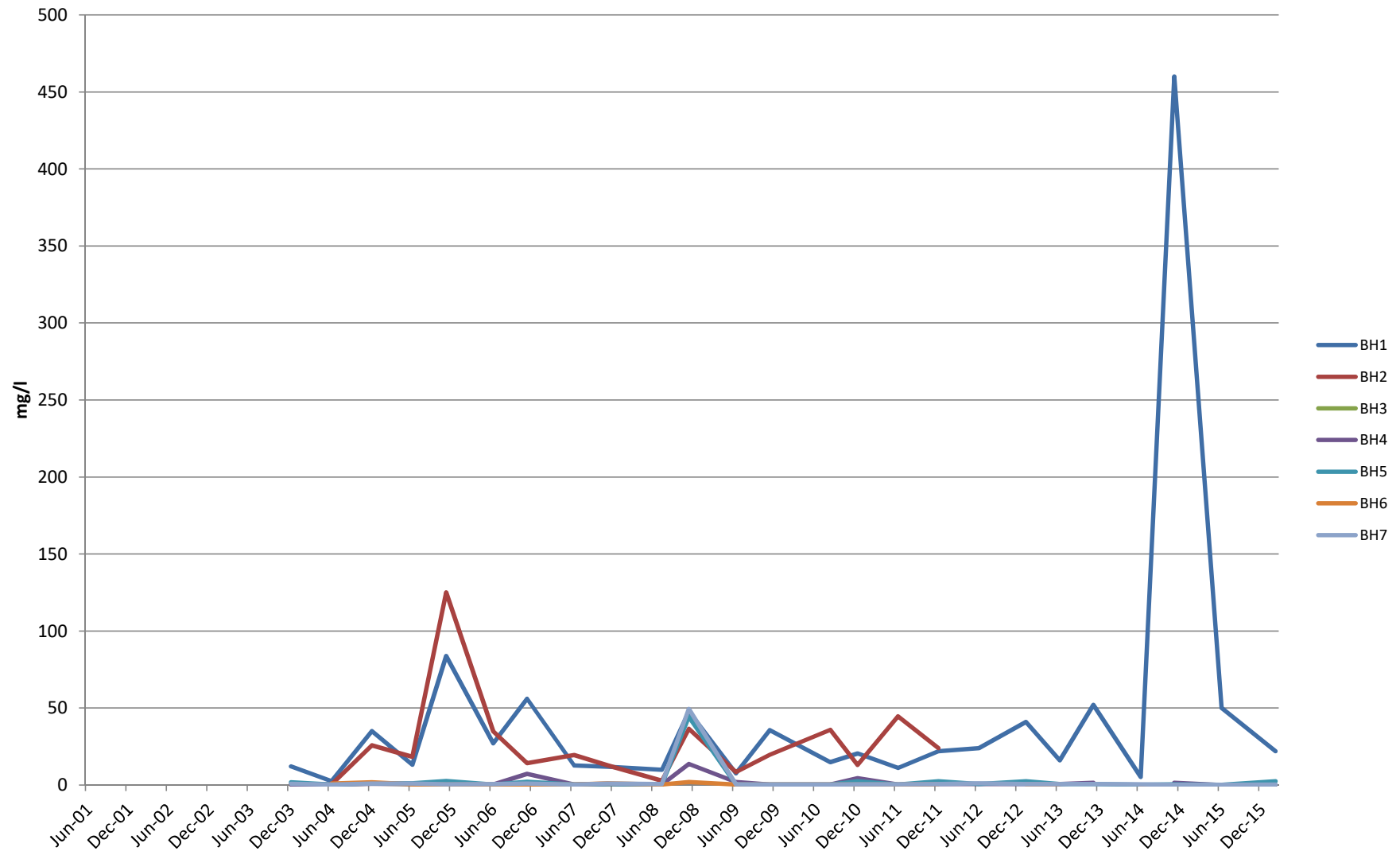
Total Hydrocarbon Oil



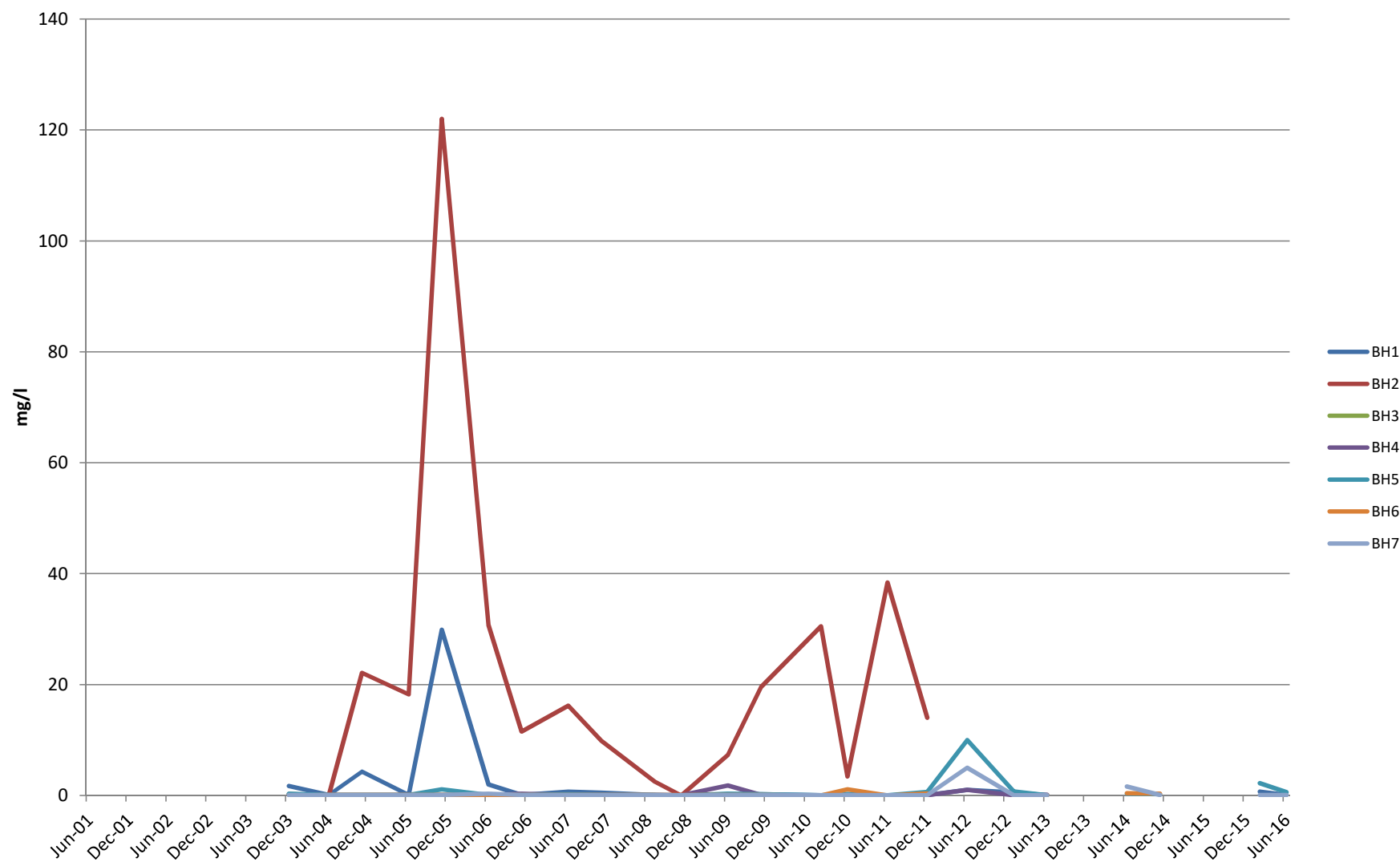
Suspended Solids



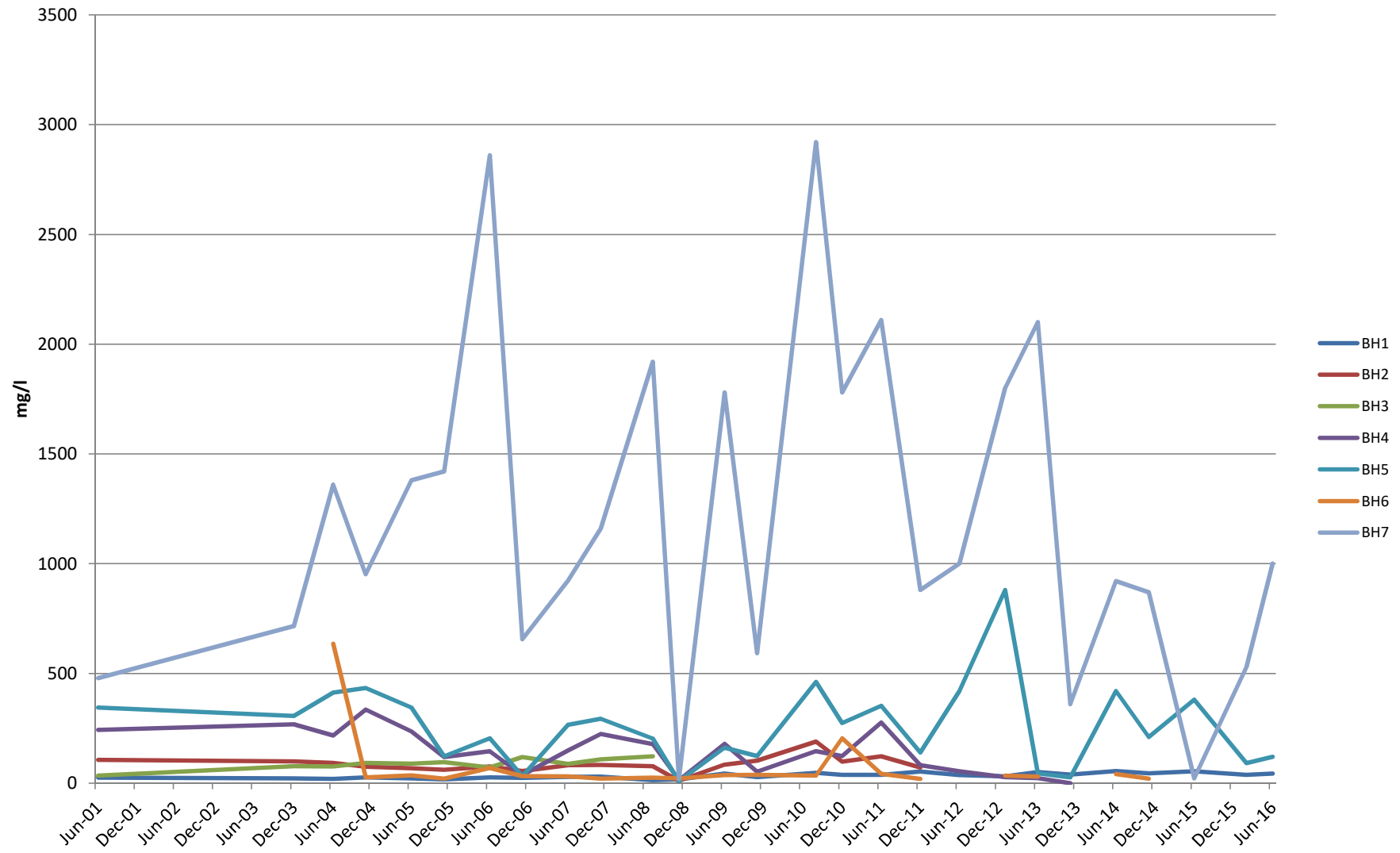
Total Oxidised Nitrogen



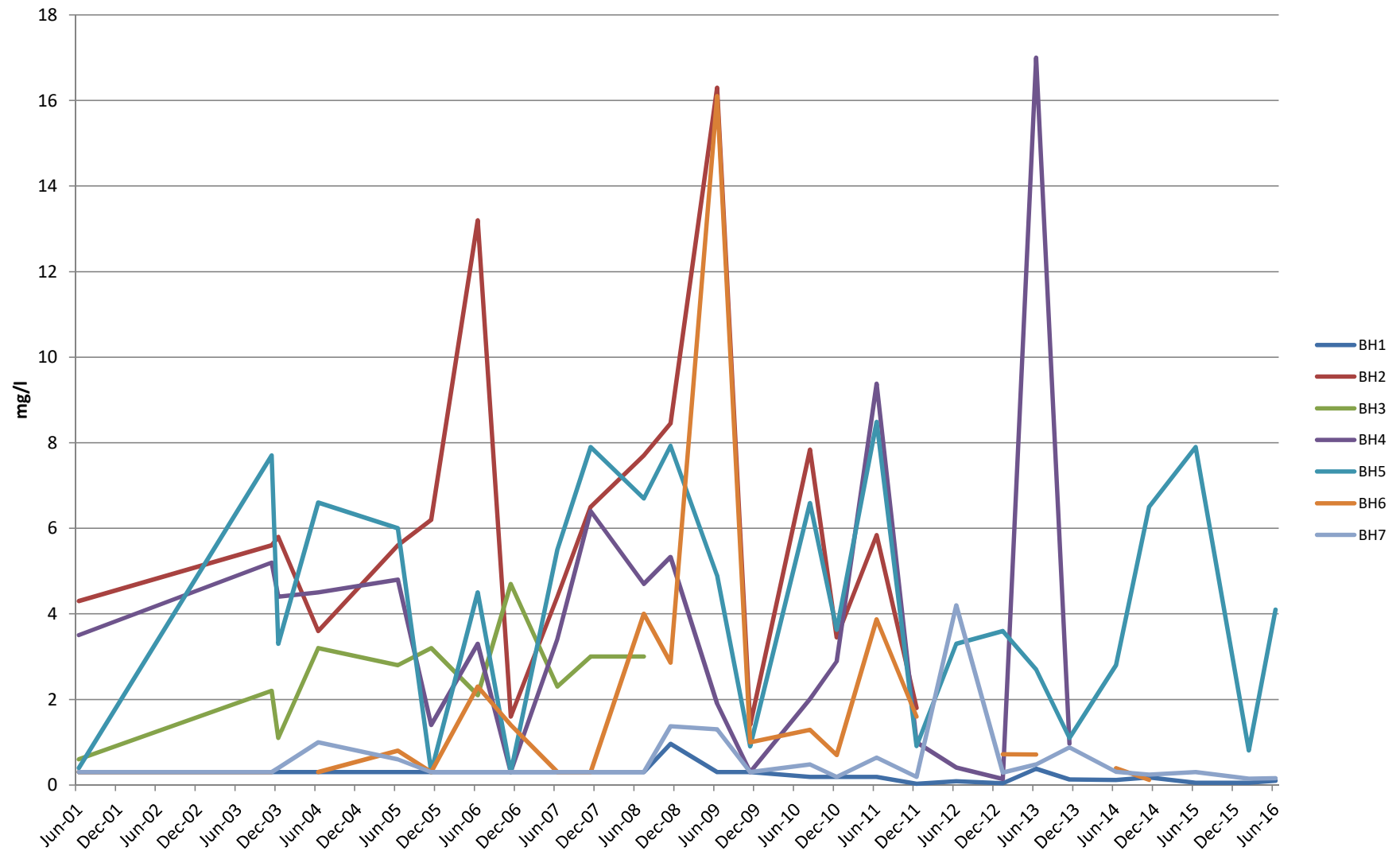
Nitrite



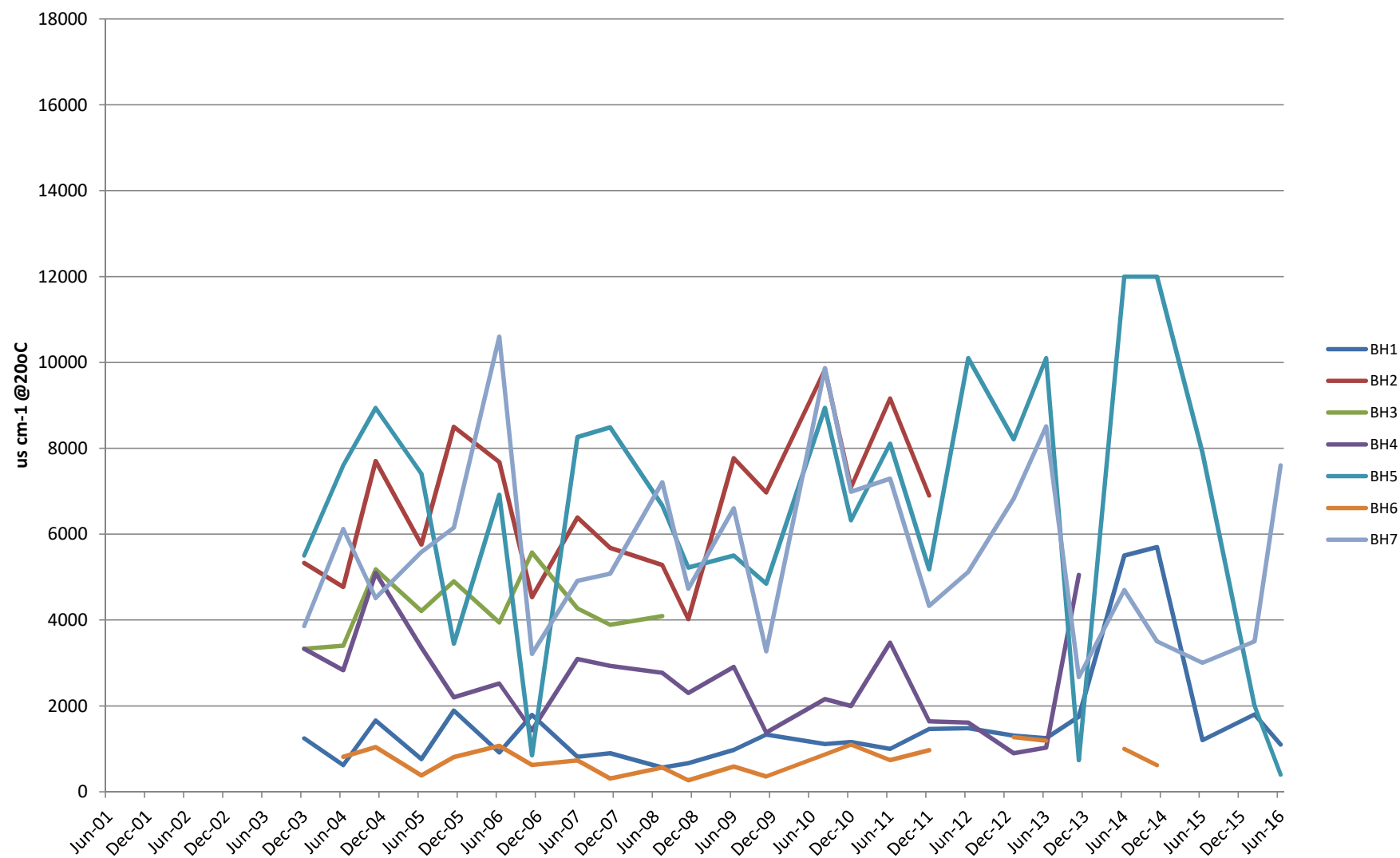
Chloride

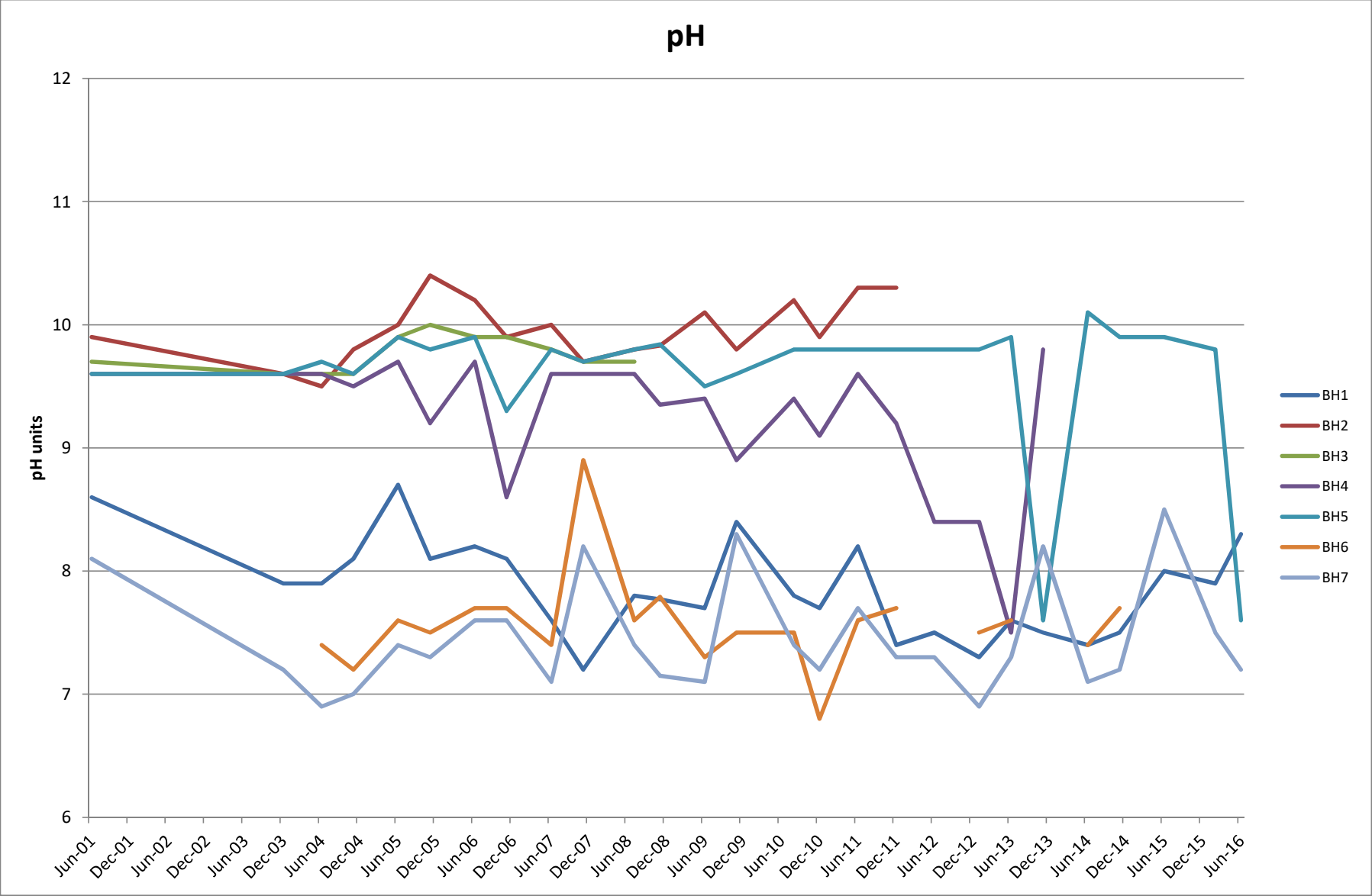


Ammoniacal Nitrogen

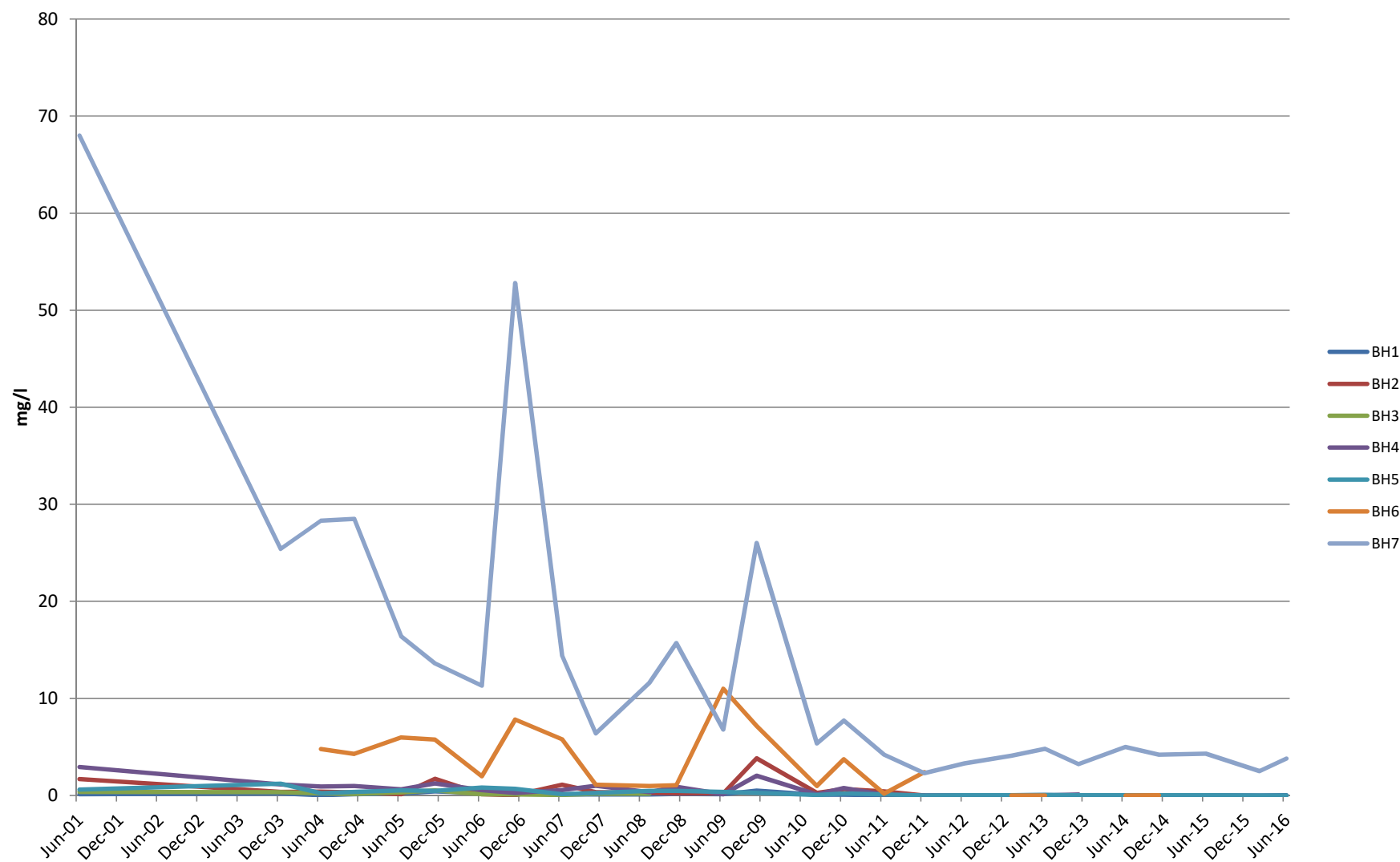


Conductivity

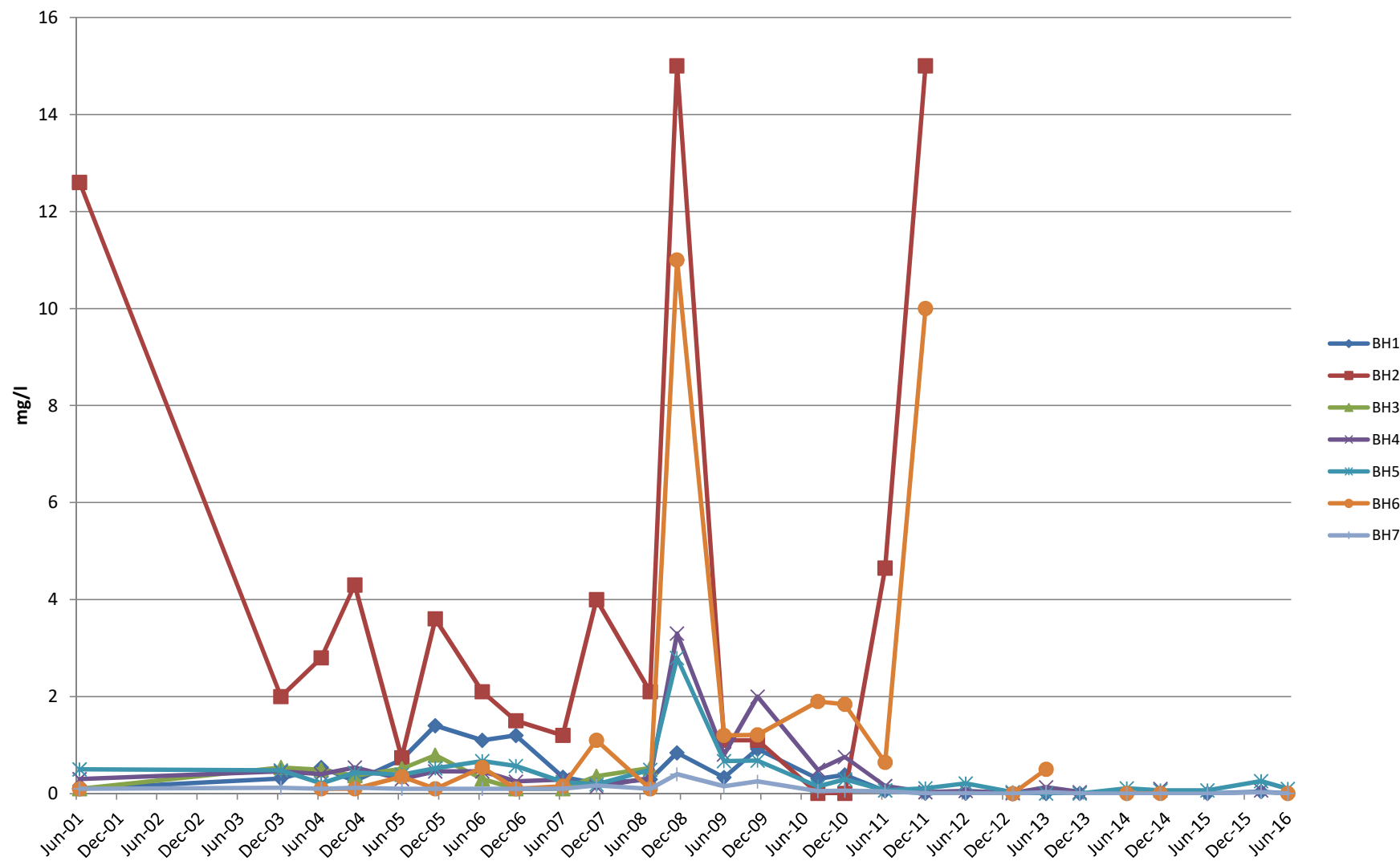




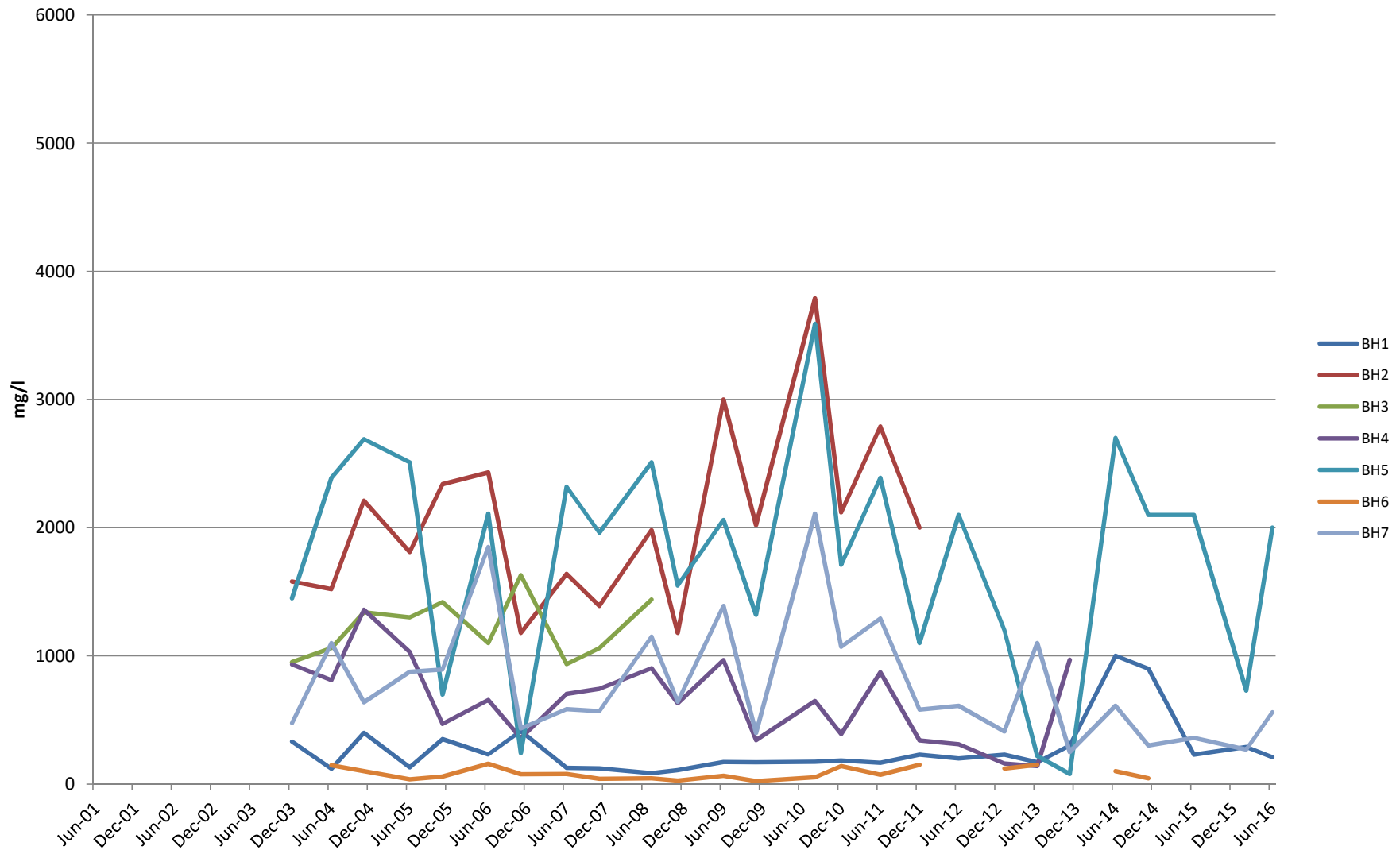
Zinc

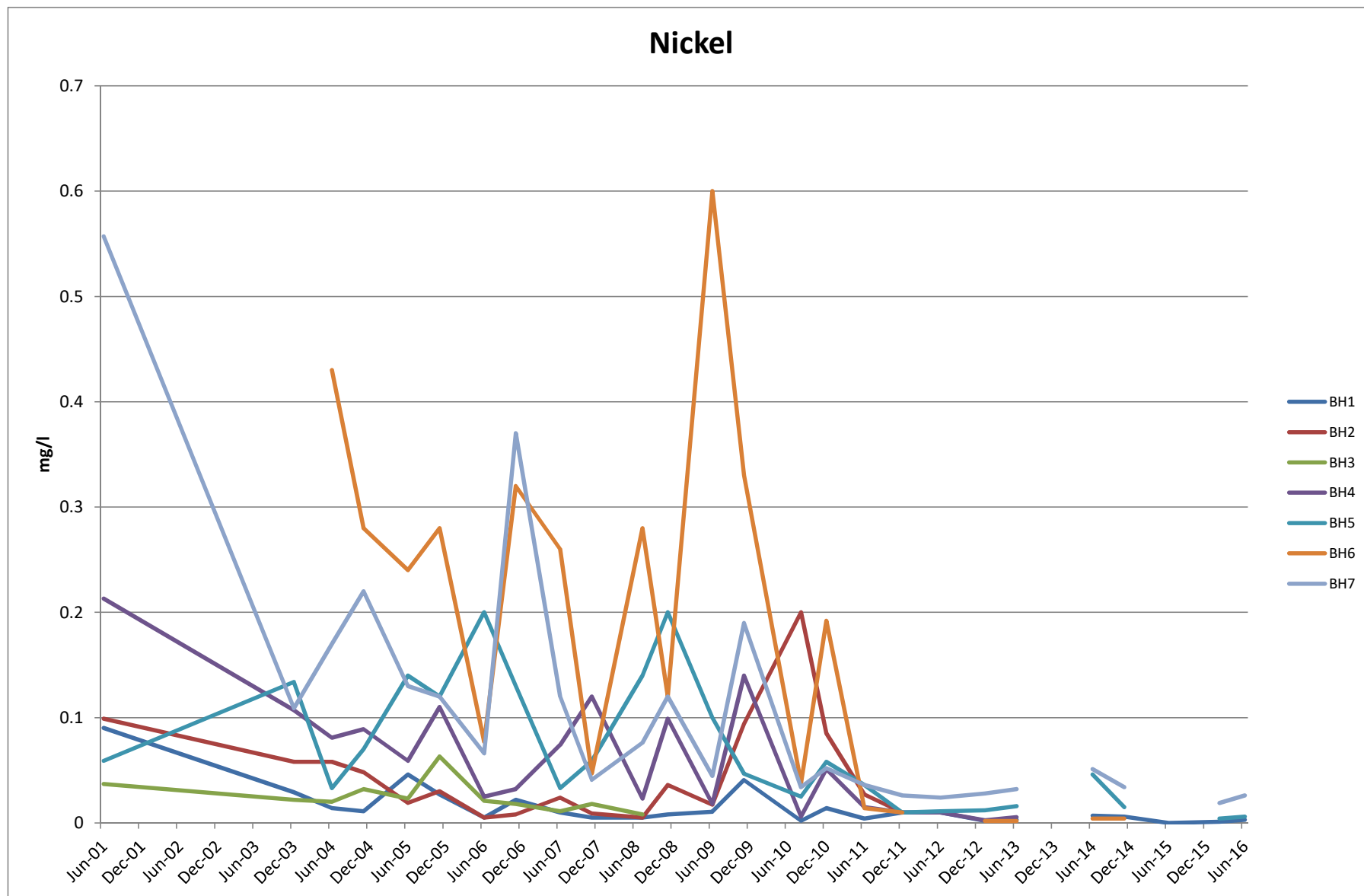


Tin

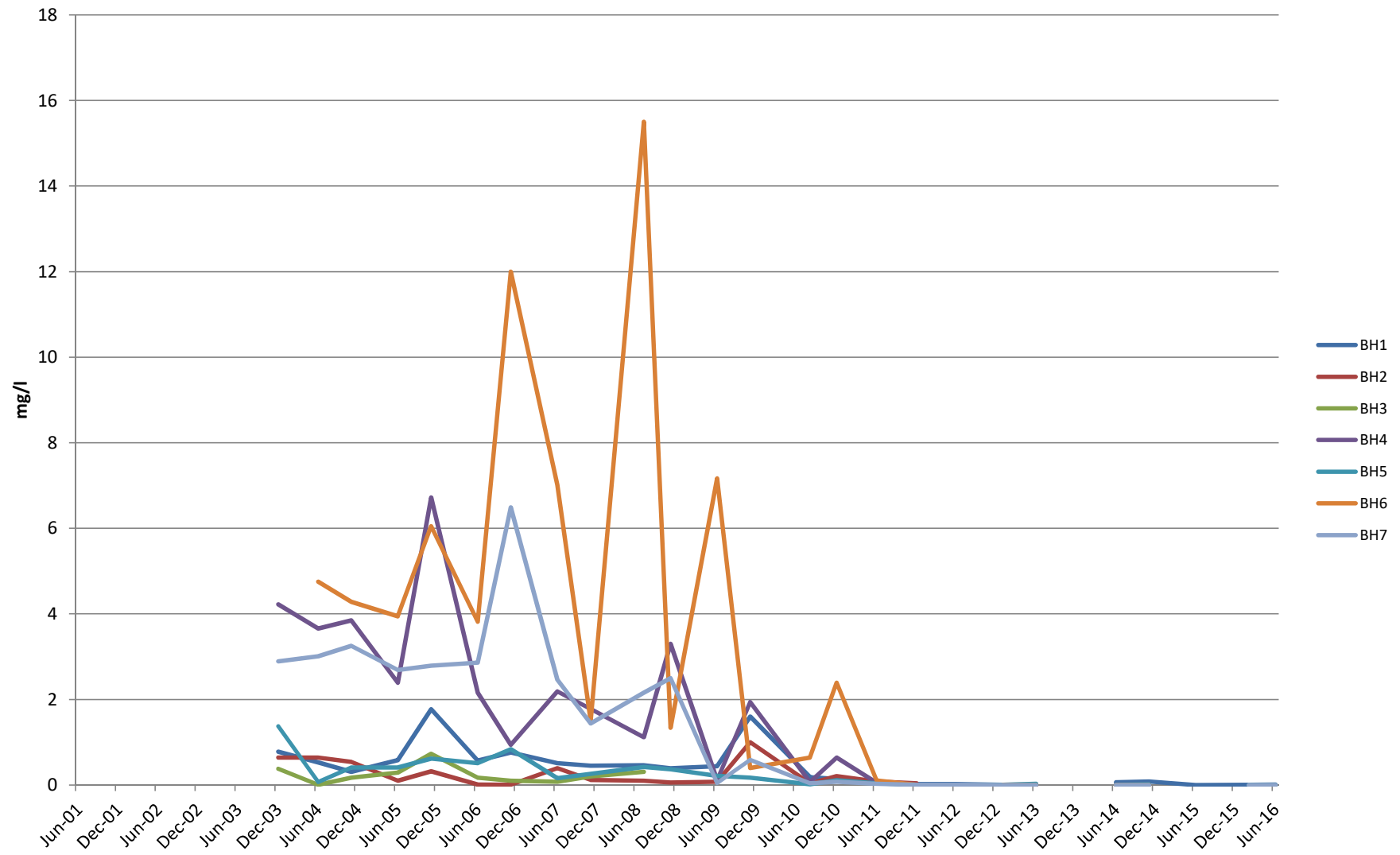


Sodium

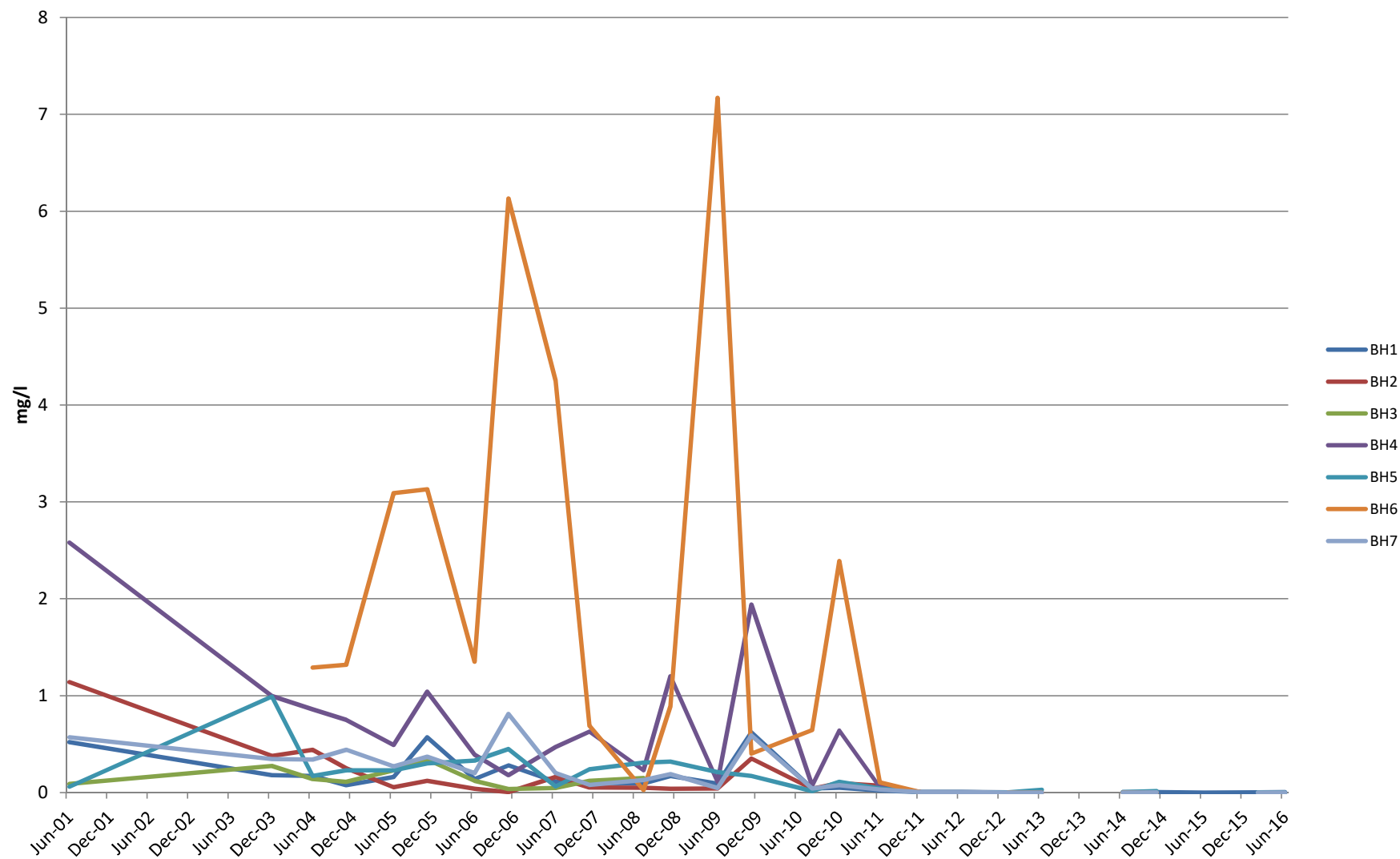




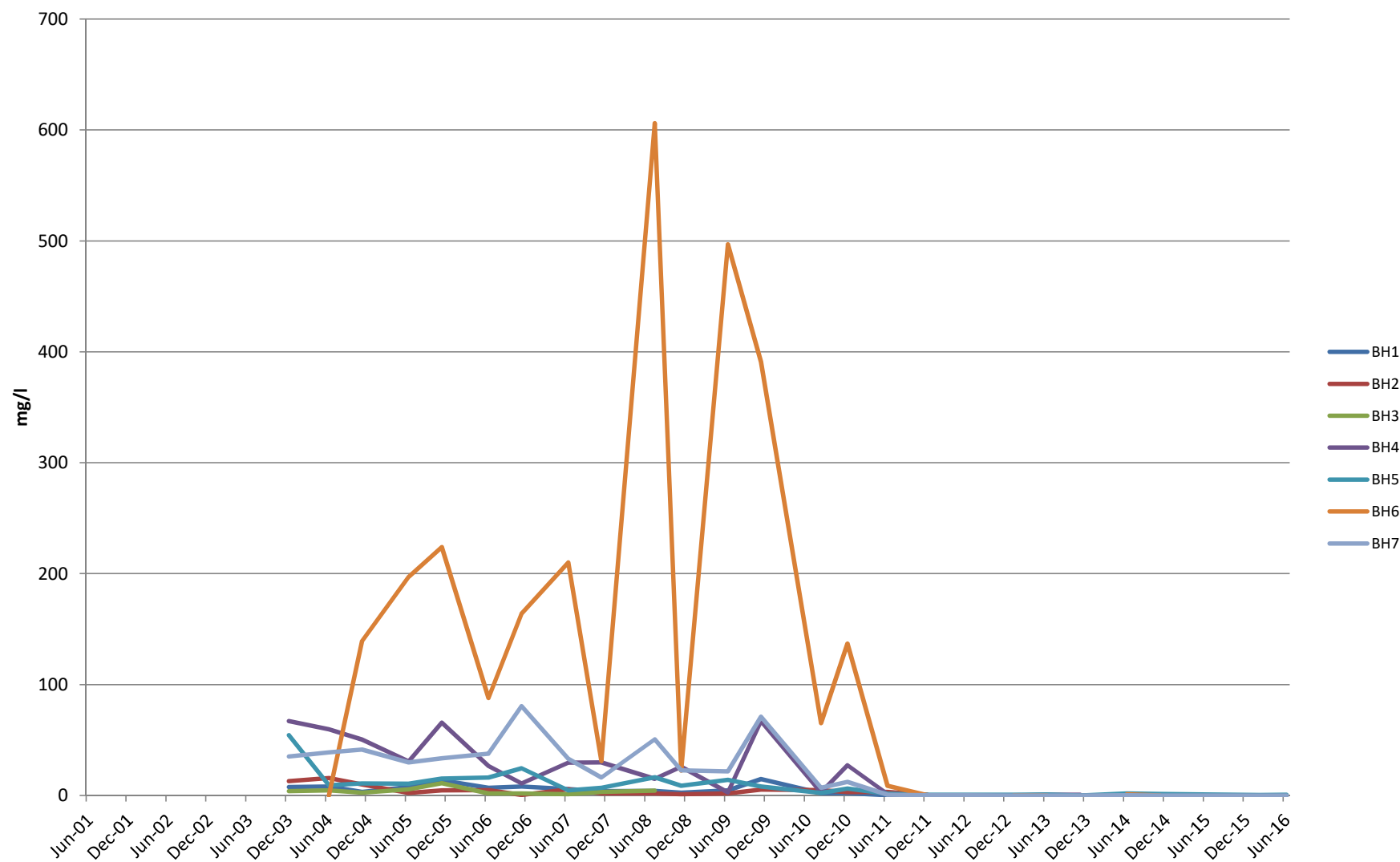
Manganese



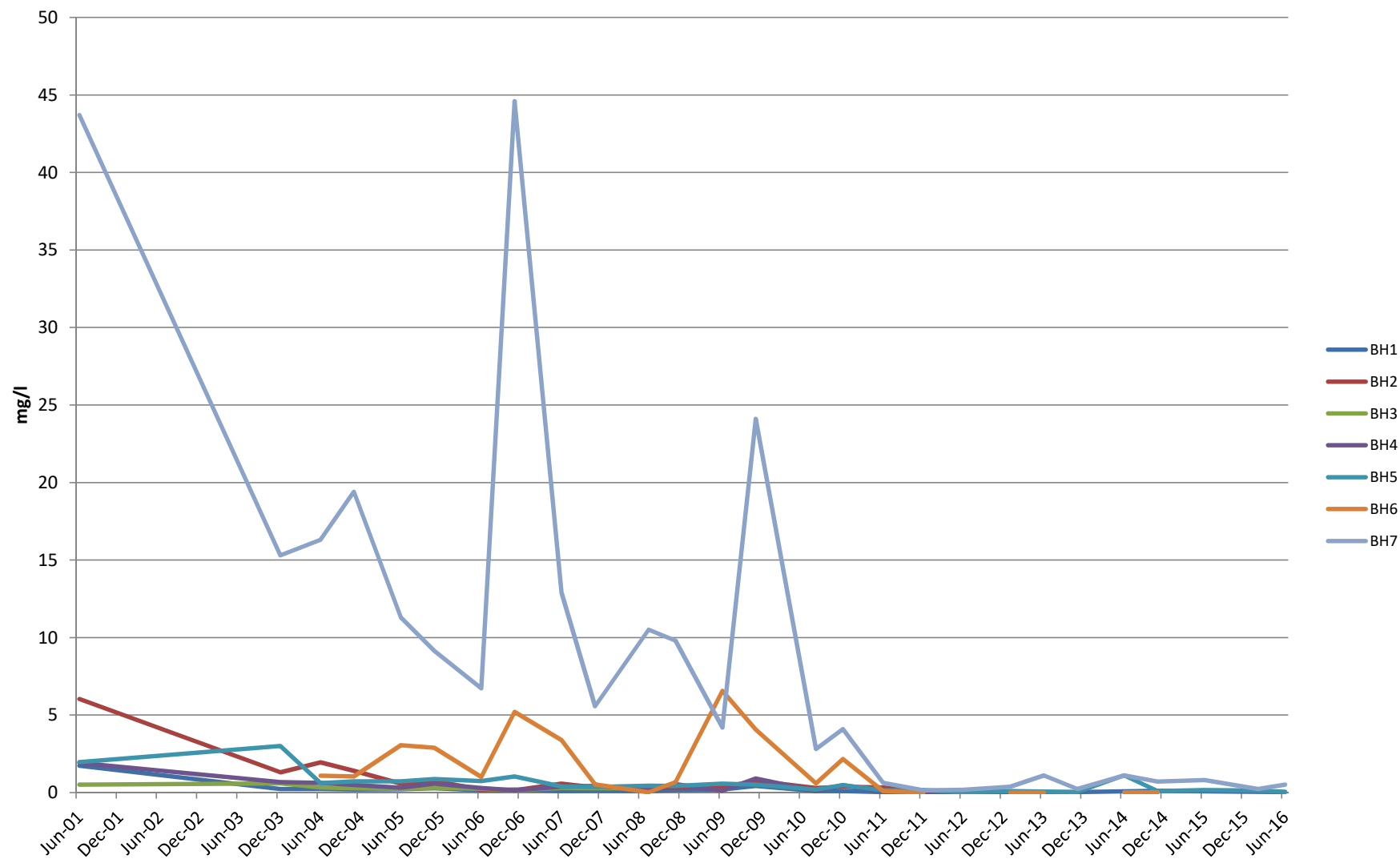
Lead

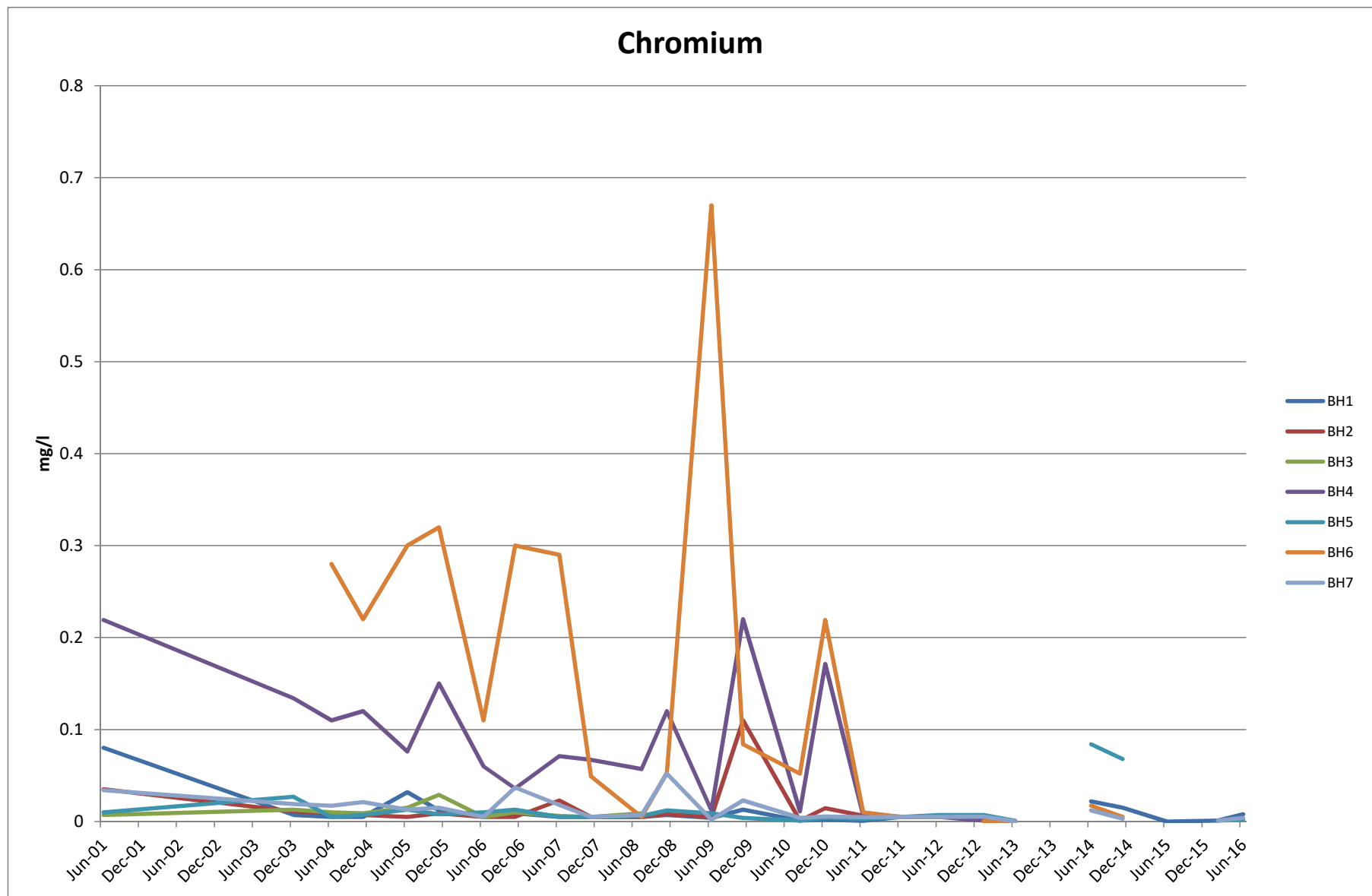


Iron

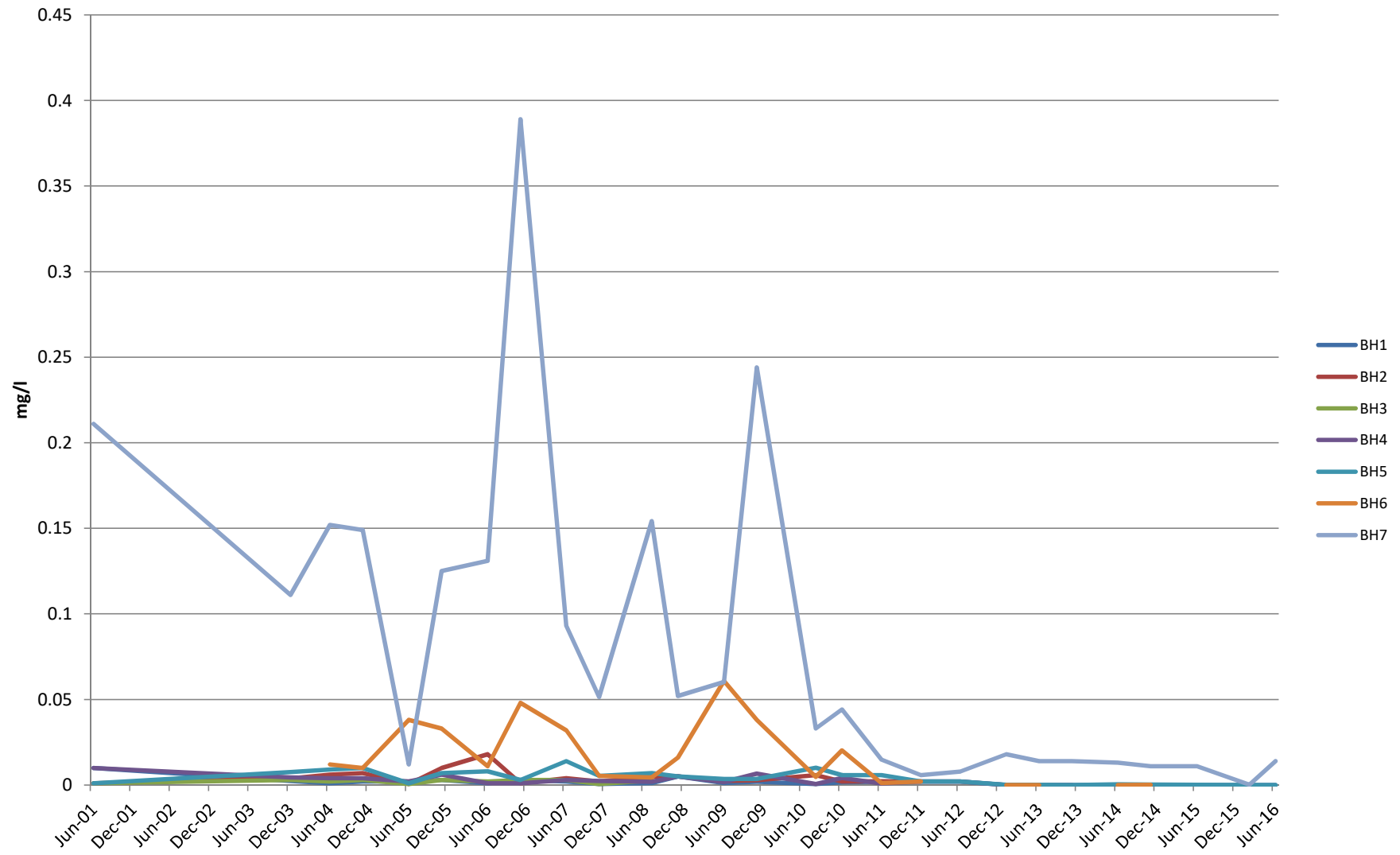


Copper

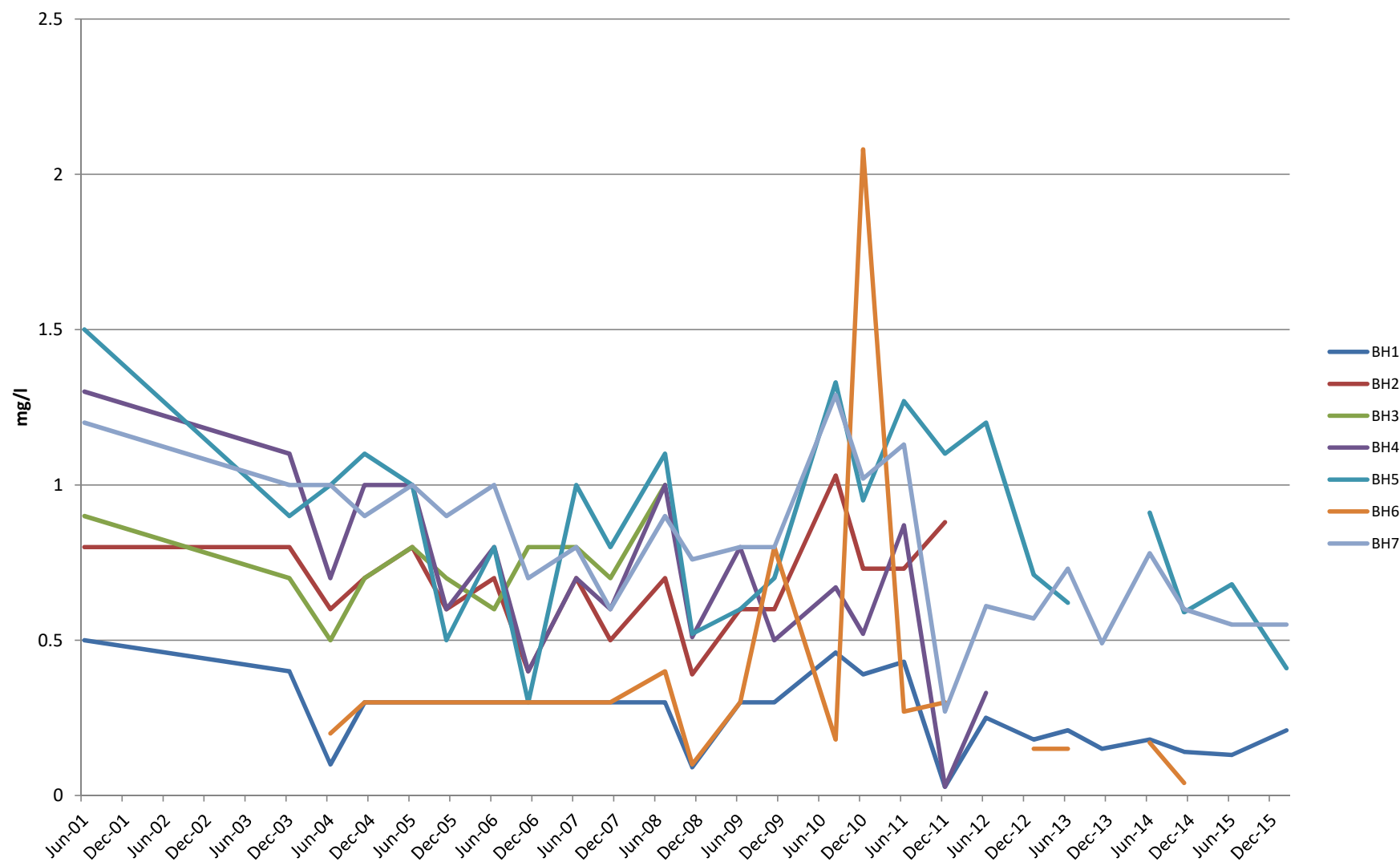




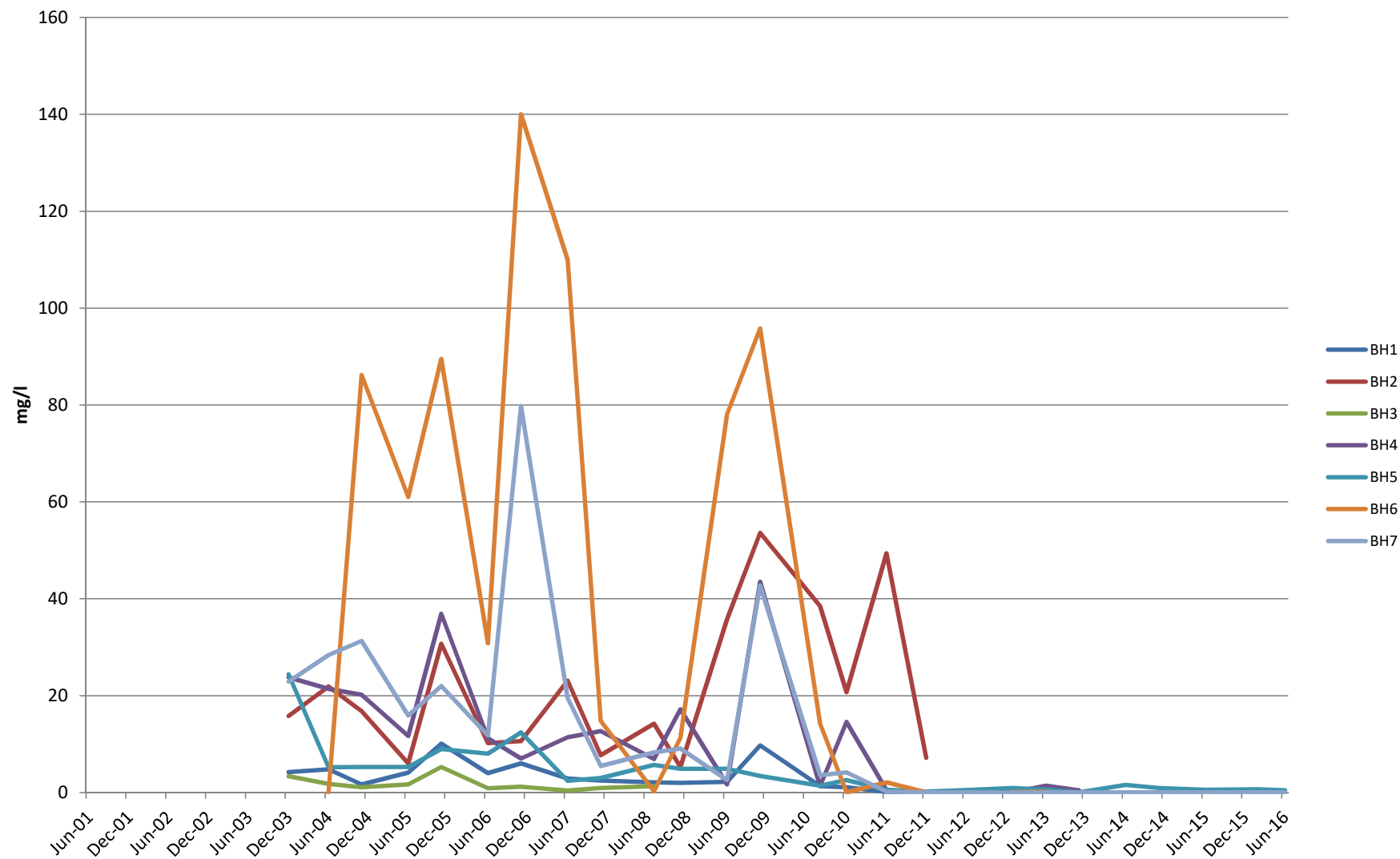
Cadmium



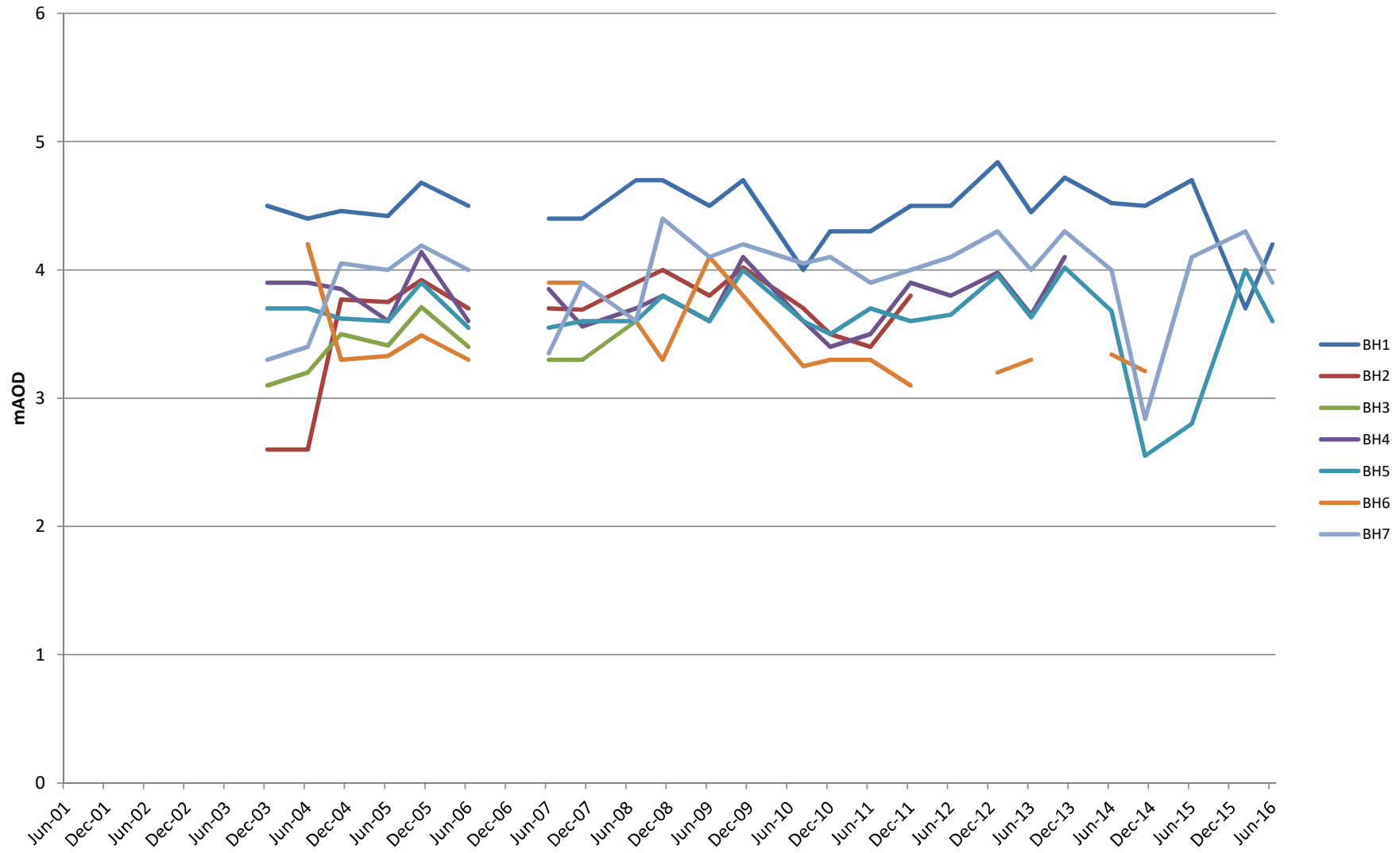
Boron



Aluminium



Groundwater Level



Depth to Groundwater

