GEOCHEMICAL CHARACTERIZATION IN SUPPORT OF A PROPOSED EXPLORATION DRIFT, PALMER PROJECT

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Palmer Project, Alaska

Report prepared for:

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EXECUTIVE SUMMARY

This report provides the results to date for an on-going geochemical characterization program for the Palmer Volcanogenic Massive Sulfide (VMS) Project located in Southeast Alaska, USA. Constantine Metal Resources Ltd. (Constantine) initiated geochemical sampling and testing programs at the project in 2014 as part of the company's baseline environmental program and in support of a conceptual exploration drift at the Palmer Project. The objective of the characterization program is to assess, to the extent possible, the acid rock drainage (ARD) and metal leaching (ML) potential of waste rock that would be generated as part of the exploration drift development.

The proposed underground exploration drift, identified as Option 7, would allow Constantine to continue exploration of massive sulfide mineralization in the South Wall Zone in the Glacier Creek prospect area. The access ramp would pass through hanging wall basalts and subordinate intercalated limey sediments in the Jasper Mountain Area for most of its length, before passing through limey argillites near the Kudo Fault area, and then back into hanging wall basalts of the South Wall area (Core Geoscience, 2018). The proposed exploration drift is designed to stay entirely within the hanging wall sequence of rock units and will not come in contact with VMS mineralization or the footwall sequence.

A total of 142 samples were collected by Constantine from 2014 through 2017and tested as part of the ARD/ML characterization program. However, only 101 samples geologically representative of the Option 7 exploration drift (as determined by Constantine) have been included in the waste rock analysis provided this report. These samples, including 17 surface outcrop samples and 84 diamond drill core samples, comprise the three main rock types that will be intersected along the access ramp: Jasper Mountain basalt (most volumetrically significant), limey argillite, and hanging wall basalt in the South Wall area, as well as minor units such as mafic dykes, gabbro, faults etc.

Laboratory static tests included acid-base accounting, total inorganic carbon and trace element analyses on all samples. In addition, field barrel kinetic tests and parallel laboratory humidity cell leach tests have been initiated, and are currently in progress, on three composite samples representing the three main rock types expected in drift development. Additional analyses on the three composite samples has included particle size analyses and mineralogical analysis via QEMSCAN.

Results indicate that rock expected to be encountered in exploration drift development has abundant neutralization potential and thus buffering capacity, primarily in the form of calcite. Sulfur content was generally low and typical of trace to minor amounts of sulfide mineralization in the rock, primarily as pyrite. However, sulfur content was typically higher in the limey argillite unit than the Jasper Mountain basalt and hanging wall basalt units.

All rock samples of relevance to the proposed exploration drift classified as non-potentially acid generating (non-PAG). Thus, waste rock encountered during underground drift development is not expected to generate acid rock drainage

Kinetic testing of drill core in the three field barrels and lab-based humidity cells is on-going. Results to date have yielded leachates with alkaline pH and are not expected to generate acid. The potential for metal leaching from the Jasper Mountain and hanging wall basalts is likely to be low. Leach tests on limey argillite have indicated an initial flush of soluble selenium from the rock at neutral pH. However, selenium in the humidity cell test has steadily declined to lower levels as testing has progressed.

The field barrel and humidity cell tests are still in early stages and results should be viewed as preliminary.

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LISTS OF ACRONYMS

ABA	Acid-Base Accounting
AP	Acid Potential
ARD	Acid Rock Drainage
CO_3 NP	Carbonate Neutralization Potential
ICP-MS	Inductively Coupled Plasma Mass Spectroscopy
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectroscopy
ML	Metal Leaching
MPA	Maximum Potential Acidity
Non-PAG	Non-Potentially Acid Generating
NP	Neutralization Potential
NPR	Neutralization Potential Ratio
PAG	Potentially Acid Generating
PMA	Particle Mineral Analysis
QEMSCAN	Quantitative Evaluation of Minerals by Scanning Electron Microscopy
TIC	Total Inorganic Carbon
VMS	Volcanogenic Massive Sulfide
XRF	X-Ray Fluorescence

GEOCHEMICAL CHARACTERIZATION IN SUPPORT OF A PROPOSED EXPLORATION DRIFT, PALMER PROJECT

PALMER PROJECT, ALASKA

1.0 INTRODUCTION

The Palmer Volcanogenic Massive Sulfide (VMS) Project is a copper-zinc-gold-silver project located 55 km northwest of the town of Haines in Southeast Alaska, USA. The project is being advanced as a joint venture partnership between Constantine North Inc. (Constantine) incorporated in Alaska (a wholly owned subsidiary of Constantine Metal Resources Ltd.) and Dowa Metals & Mining Alaska Ltd. (Dowa) incorporated in Alaska (a wholly owned subsidiary of Dowa Metals and Mining Co. Ltd. of Japan) with Constantine as operator.

pHase Geochemistry Inc. (pHase) has been retained by Constantine to review and interpret the results of geochemical sampling and testing programs conducted by Constantine from 2014 through 2017 as part of the company's baseline environmental program and in support of a conceptual exploration drift at the Palmer Project. The objective of the characterization program is to assess, to the extent possible, the acid rock drainage (ARD) and metal leaching (ML) potential of waste rock that would be generated as part of the exploration drift development. The results from the programs will be used as a basis for waste rock management planning and ARD monitoring during exploration drift development such that problematic waste rock, should it be encountered, can be properly identified, handled and disposed of.

This report documents the methods and summarizes the results of the waste rock geochemical characterization program. The report is structured as follows:

Section 2 – **Background** presents geological information relevant to the characterization program.

Section 3 – **Methods** provides a summary of sampling and analytical methods.

Section 4 – **Results** provides a compilation and discussion of results.

Section 5 – **Summary** provides the key findings of the geochemical characterization program.

2.0 BACKGROUND

2.1 Geology

The following geology is summarized from excerpts out of the 2015 43-101 Technical Report (Gray and Cunningham-Dunlop, 2015).

The Palmer property lies within a mafic-dominated, bimodal sequence of submarine volcanic and sedimentary rocks belonging to the Alexander Terrane. The Alexander Terrane hosts numerous VMS occurrences throughout Southeast Alaska and northwest B.C. including the Greens Creek and Windy Craggy deposits. The Property is underlain by Paleozoic and lower Mesozoic metasedimentary and metavolcanic rocks that have been intruded locally by Cretaceous and Tertiary granitic plutons.

The Project hosts several mineralized prospects with the Glacier Creek VMS prospect the focus of the majority of exploration. The Glacier Creek deposit consists of seven distinctive zones (lenses) of stratiform massive sulfide-sulphate. These zones of mineralization occur on both limbs of a large-scale, south-overturned anticline that is disrupted by significant faulting and modest offset. Three separate, stratigraphically stacked VMS horizons named South Wall Zones I, II and III, and a zone identified as the South Wall EM Zone, are located on the steeply dipping, south-facing limb of the fold and referred to as the 'South Wall'. The RW Zones, which includes RW East, RW West, and RW Oxide, are located on the north-facing, gently dipping upper limb of the anticline. A geological map of the Glacier Creek prospect is provided in Figure 1 with the principal mineralized zones (RW and South Wall Zones) shown in Figure 2.

Detailed geology and mineralization of all the zones is discussed in greater detail in the 2015 43-101 Technical Report. A simplified account of the South Wall geology is presented here as that is where the proposed exploration drilling will be conducted.

The general stratigraphic package in the South Wall consists of a hanging wall sequence of sulfide poor, carbonate-rich unaltered basalt, and a footwall sequence of moderately to strongly pyrite-quartz-sericite altered volcaniclastic rocks and basalt. A calcareous siltstone/argillite unit a few meters thick commonly separates the hanging wall/footwall sequences, with massive sulfide located at multiple horizons (SW I, II and III) in the footwall sequence, including immediately below the calcareous siltite/argillite unit. The rhyolite unit associated with RW Zone mineralization in the upper limb is absent in the South Wall limb.

VMS mineralization of the South Wall Zones consists of barite, sphalerite, pyrite, chalcopyrite, quartz, and galena, with lesser calcite, magnetite, pyrrhotite, arsenopyrite, chalcocite, tetrahedrite and tenantite. Typical zoning consists of copper-rich massive pyrite-chalcopyrite mineralization grading laterally and vertically outwards into zinc dominant barite-sphalerite-pyrite +/- chalcopyrite mineralization. Further outward, mineralization locally grades into massive carbonate-sphalerite or variably precious-metal enriched low sulfide chert-barite mineralization. Other types of mineralization include copper-rich pyrite and/or pyrrhotite stockwork, and massive pyrrhotite-chalcopyrite.

The proposed exploration drift discussed in this report is designed to stay entirely within the hanging wall sequence of rock units and will not come in contact with VMS mineralization or the footwall sequence. The discussion on VMS mineralization and footwall alteration herein is for information purposes only.

2.2 Proposed Exploration Drift

Constantine is evaluating continued exploration of the South Wall Zone in the Glacier Creek prospect area via an underground drift for the purpose of resource definition and exploration drilling. The development would consist of a portal and ramp to access a drilling drift as shown in Figure 3. The portal would be located in the area immediately southeast of the terminus of the Saksaia Glacier, referred to as the Terminus Area. From the portal, the proposed access ramp would pass under the Saksaia Glacier before turning to the northeast and extending to the South Wall area, where an exploration drift would extend away from the access ramp to serve as a platform for drilling (Core Geoscience, 2018). This proposed drift has been identified as Option 7 and is referred to as such herein. Previous evaluations had focused on different portal location options.

The access ramp would pass through hanging wall basalts (and subordinate intercalated limey sediments) in the Jasper Mountain Area for most of its length, before passing through limey argillites near the Kudo Fault area and then back into hanging wall basalts of the South Wall area near the intersection of the access ramp and exploration drift (Core Geoscience, 2018). A geological cross-section in the area of the proposed exploration drift development is shown in Figure 4. These design plans restrict all development to be entirely within the hanging wall stratigraphy, with no development in the ore horizon, sediments/tuff immediately above the ore horizon, or the footwall rock units.

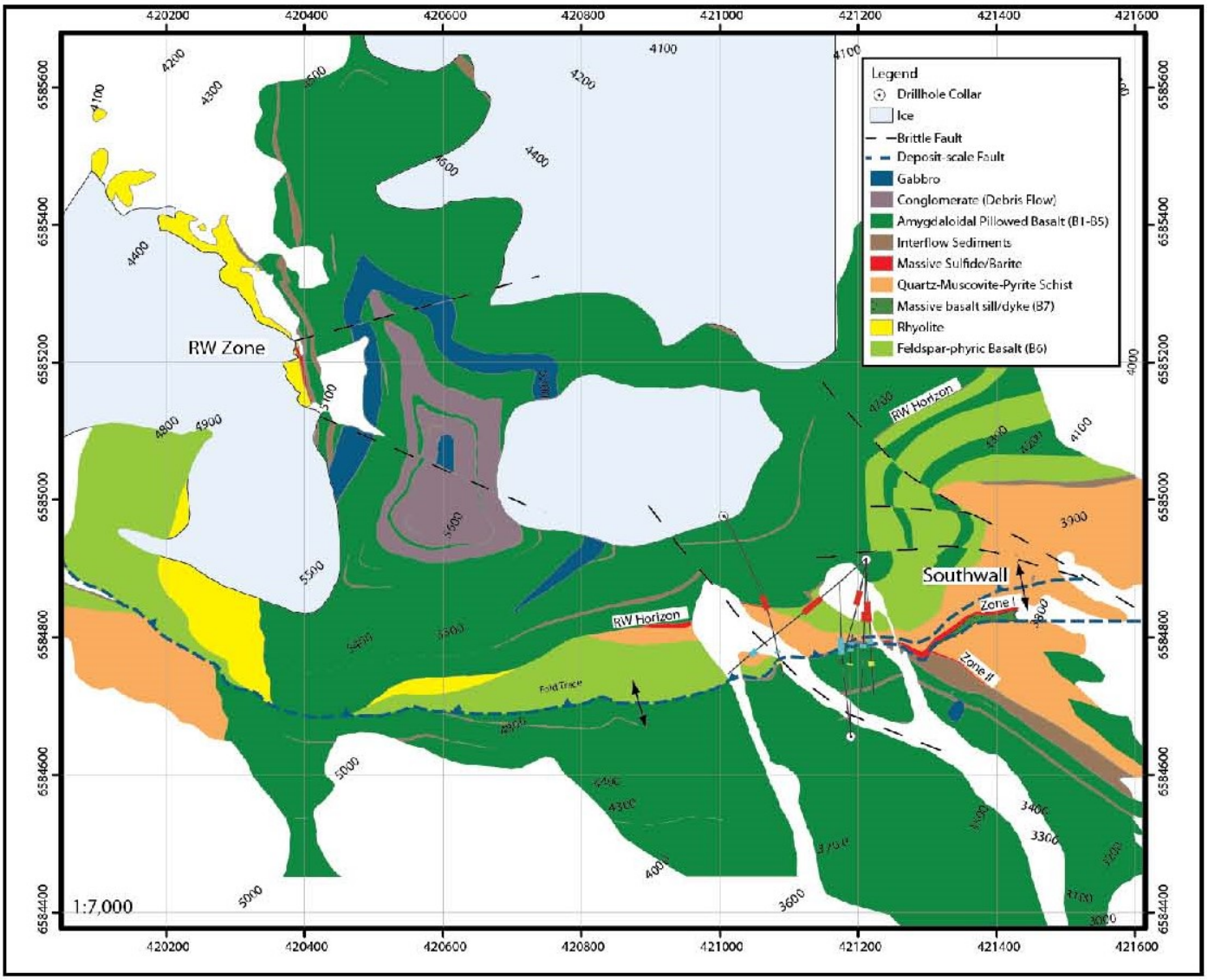


FIGURE 1. GEOLOGICAL MAP OF THE GLACIER CREEK PROSPECT (GRAY AND CUNNINGHAM-DUNLOP, 2015).

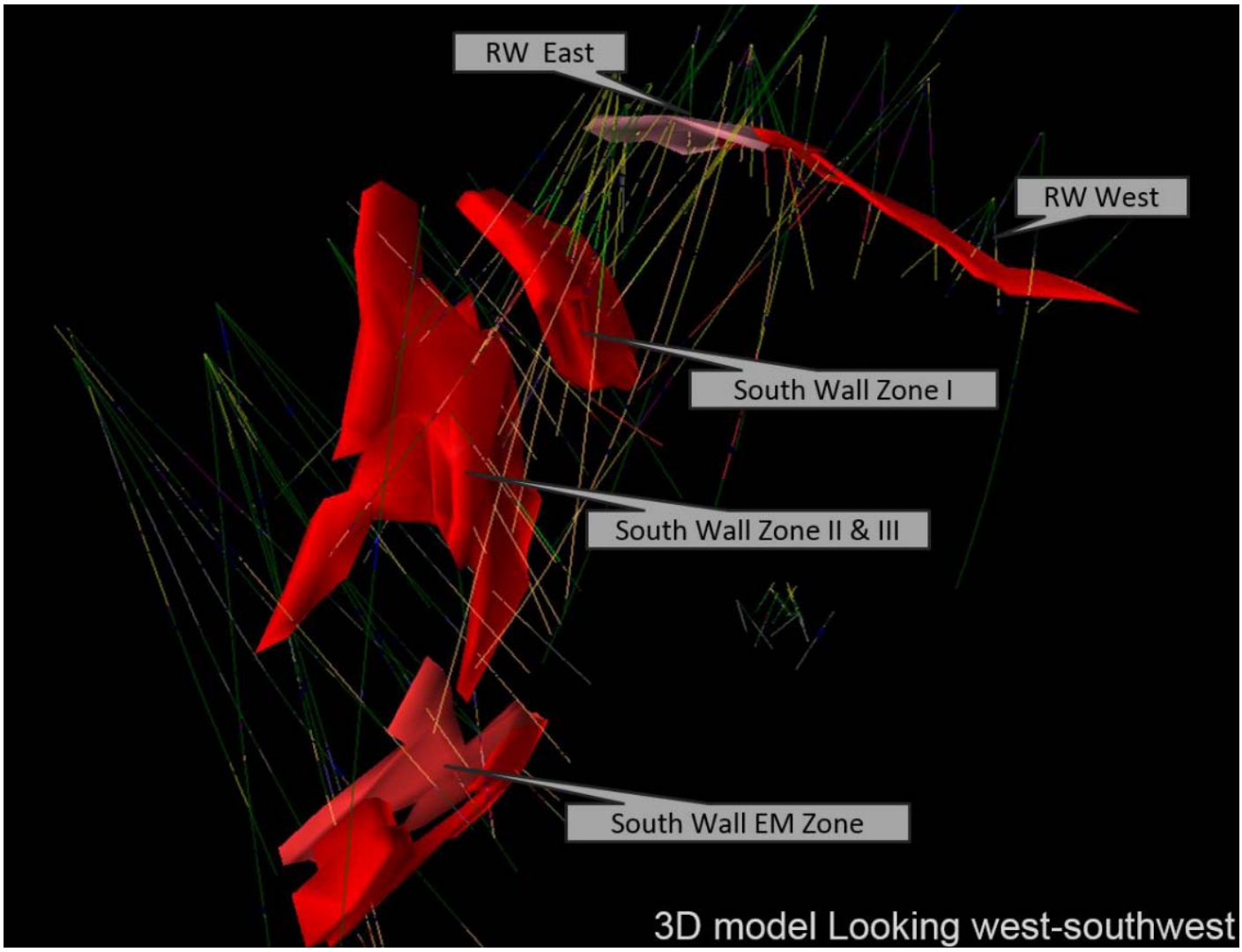


FIGURE 2. PRINCIPAL MINERALIZED ZONES – LOOKING WEST-SOUTHWEST (GRAY AND CUNNINGHAM-DUNLOP, 2015).

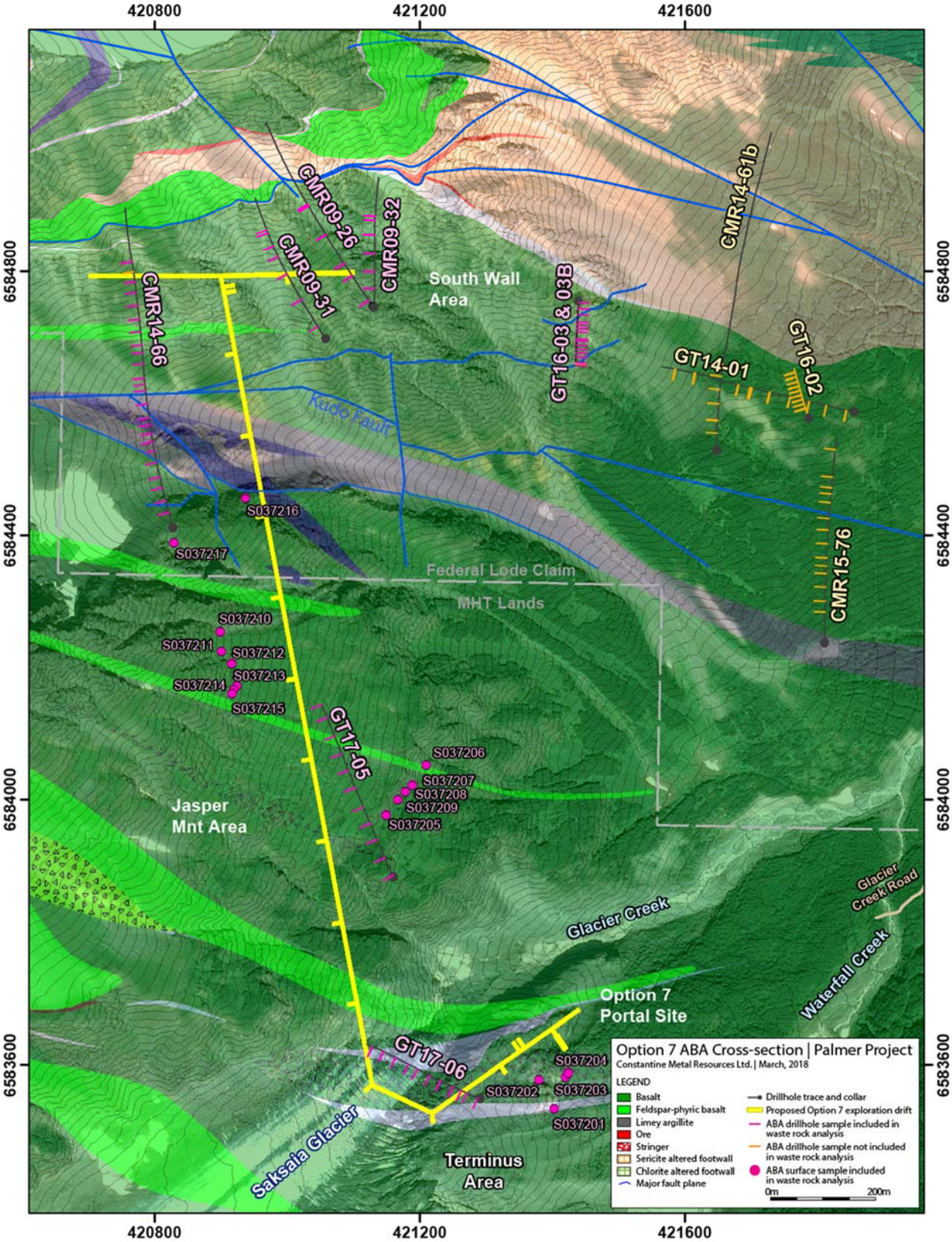


FIGURE 3. PROPOSED EXPLORATION DRIFT AND SAMPLE LOCATIONS.

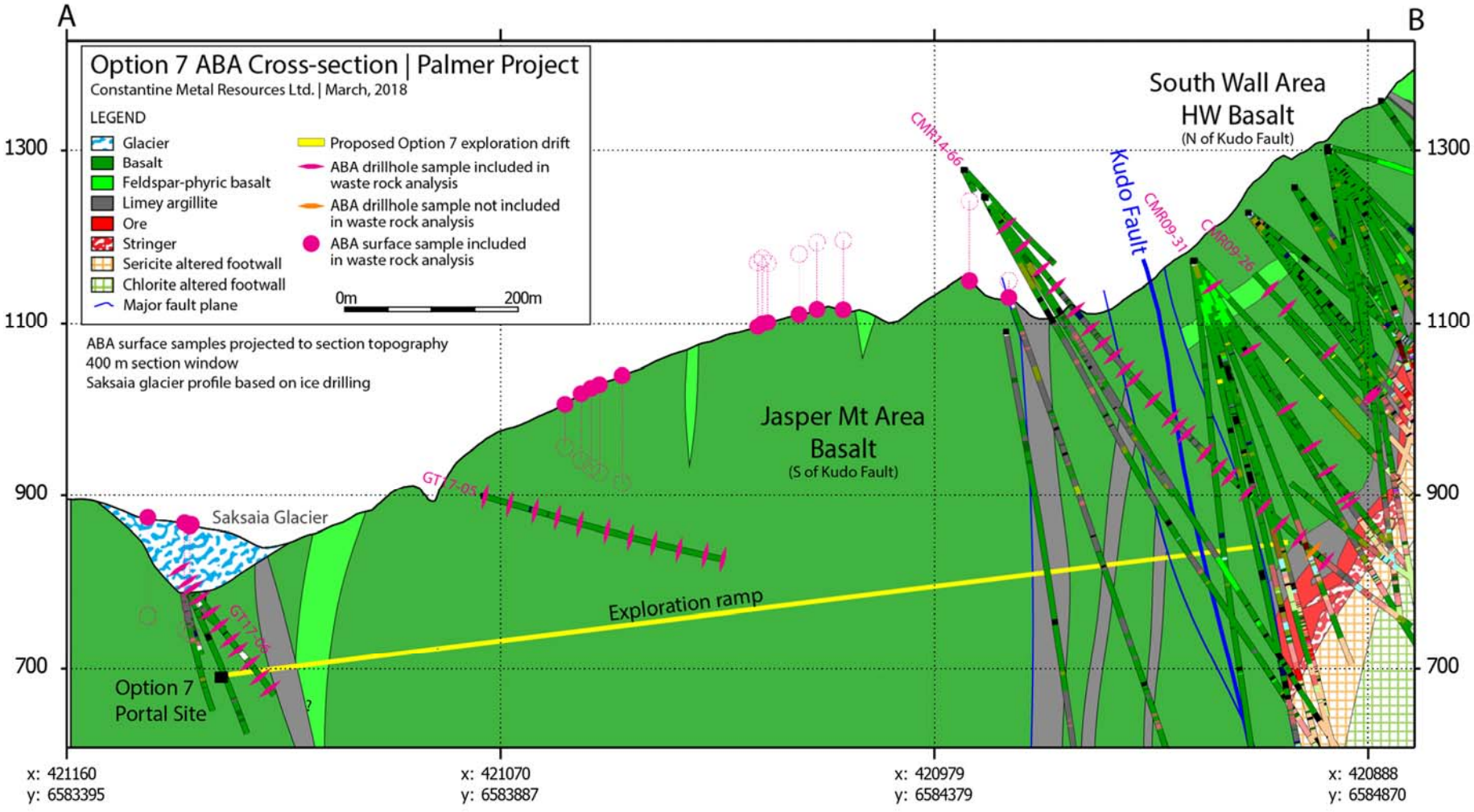


FIGURE 4. CROSS-SECTION IN THE AREA OF PROPOSED EXPLORATION DRIFT DEVELOPMENT.

3.0 METHODS

3.1 Sampling

Geochemical sampling for the Palmer Project has been conducted from 2014 through 2017. Sample selection and collection for both programs were conducted by Constantine under the direction of Darwin Green following consultation with various ARD specialists. Cumulatively, this sampling is considered by pHase to provide good property-scale characterization of the hanging wall sequence and be representative of the rocks expected to be encountered in the proposed exploration drift.

Details of the sampling programs are provided in the following sections.

3.1.1 Pre-2017 Static Sample Set

A total of 82 samples were selected from 10 drill holes located within the hanging wall stratigraphy of the South Wall Zone. These drill holes were selected to provide geochemical information as part of an evaluation of underground access options which contemplated collaring a portal on the lower slopes of the South Wall. These access options are no longer being considered by Constantine. Many of the samples collected during that program however are considered geologically analogous to rock expected to be intersected by the new access location and are therefore included in this summary.

Hanging wall rock in the South Wall was sampled over a broad area with core samples sourced from exploration drill holes and several holes that were specifically drilled for obtaining geotechnical and environmental geochemical data. Samples are distributed across a distance of 1100 meters laterally along strike, and across a vertical elevation range (down dip depth extent) of approximately 900 meters. The unit has similarly been sampled perpendicular to bedding across a stratigraphic thickness in excess of 600 meters.

Plans, long sections and cross sections showing the location of ABA samples are provided in Appendix A.

Rock types in the sample set included hanging wall basalt (64 samples), limey argillite (7 samples), mafic dykes (3 samples), gabbro (1 sample), tuff (3 samples), and faults (4 samples). Geological descriptions of the rock samples including carbonate and sulfide estimates are provided in Appendix B, as well as graphic geologic logs for each of the ARD sampled drill holes in Appendix C.

Sample lengths typically varied from a minimum 0.2 meter interval to a maximum 3.5 meter interval, with most samples ranging from 0.4 meters to 1.5 meters in sample length.

3.1.2 2017 Static Sample Set

Geochemical sampling in 2017 focused on the area of the proposed Option 7 underground access and included surface rock samples and drill core samples. Extensive details on the collection of these samples is provided in a report by Core Geoscience (2018) with a summary provided here. Sampling locations relative to the proposed exploration drift are shown in cross-section in Figure 4.

Seventeen surface rock samples from bedrock exposures in the Terminus Area and Jasper Mountain Area south of the Kudo Fault were collected to represent the Jasper Mountain basalt that will be intersected along most of the length of the access ramp. Samples typically weighed approximately 5-kilograms each and comprised rock chips collected along the outcrop exposures. The samples were generally collected randomly along bands of outcrops so that they represented the general rock mass, rather than any single outcrop.

In addition, 39 samples of drill core from three drill holes were collected in the 2017 sampling program (Figure 4). Drill hole GT17-06 (11 samples) is representative of rock in the Terminus Area that would be encountered in the portal area and where the ramp is proposed to cross under the Saksaia Glacier. Drill hole GT17-05 (11 samples)

is representative of hanging wall Jasper Mountain basalt that will be intersected along most of the length of the access ramp. Drill hole CRM14-66 (17 samples) represents Jasper Mountain basalt, the limey argillite unit near the Kudo Fault, and hanging wall basalts of the South Wall (north of the Kudo Fault) at the far (upper) end of the ramp system. Drill core samples were typically 0.5 meters in length.

Overall, rock types in the 2017 sample set included Jasper Mountain basalt (37 samples), limey argillite (8 samples), hanging wall basalt (4 samples), mafic dykes (6 samples), gabbro (1 sample), and cap intrusive (1 sample). Geological descriptions of the rock samples including carbonate and sulfide estimates are provided in Appendix B, as well as graphic geologic logs for each of the ARD sampled drill holes in Appendix C.

3.1.3 Field Barrels

Three waste rock field barrel tests and one reference field barrel (rain water) were installed at the Palmer Project as part of the 2017 geochemical characterization program. The objective of the field barrel kinetic tests is to provide an assessment of waste rock pore water quality leachate under site specific conditions. The barrel tests were installed by Constantine following consultation with pHase in August 2017 at a location next to the meteorological station on the Glacier Creek access road.

The field barrels are representative of the three main rock types expected to be encountered in the Option 7 access ramp: Jasper Mountain basalt (Barrel 1), limey argillite from near the Kudo Fault (Barrel 2) and hanging wall basalt of the South Wall (Barrel 3). A fourth, empty barrel, was also included to serve as a reference by providing leachate data for rainwater passing through an empty barrel.

Extensive detail on material selection and preparation of the field barrel composite samples and set up of the field barrel tests is provided by Core Geoscience (2018), with a summary provided here. A list of the drill hole intervals used to generate the three field barrel composite samples is provided in Appendix B.

Sample material used for the barrel tests comprises drill core sourced from four drill holes. Barrel 1 comprises core from drill holes CMR14-66, GT-17-05 and GT17-07. Barrel 2 is comprised of core from drill hole CMR14-66 and is from an interval consisting of argillite (76%) cut by carbonate-altered mafic dikes (24%). Barrel 3 material is from drill hole CMR09-31 in an interval below the Kudo Fault (or "beyond" the fault relative to the ramp alignment) but still above the mineralization in the Main Zone area.

Preparation of the composite samples included crushing of the core to approximately minus1.5 inch (3.8 cm) at ALS's prep facility in Whitehorse, and homogenization via a modified cone and quarter method prior to loading in the barrel (Core Geoscience, 2018). A 10 kg split was collected for static test characterization and lab-based humidity cell testwork, prior to loading of the material into the barrels.

Once loaded into the barrels, the barrel materials were immersed in distilled water and drained to collect a sample of leachate as a "first flush" and sent to ALS Environmental in Burnaby, B.C. for analyses.

All four barrels are open to the environment and will be monitored monthly during the frost-free seasons.

3.2 Analytical Program

3.2.1 Static Tests

Waste rock samples from both sampling campaigns were sent to ALS Minerals in North Vancouver, B.C., for static testing under the direction of pHase.

All samples were analyzed for Modified acid-base accounting (ABA) including paste pH, total sulfur (Leco), sulfate sulfur by Na_2CO_3 and HCl leach, Modified Neutralization Potential (NP) by the MEND (1991) procedure and total inorganic carbon (TIC) with calculations of the maximum potential acidity (MPA), net neutralizing potential (NNP) and NP/MPA ratio (ALS code OA-VOL08m). These results quantify the potential total acidity by sulfide oxidation

and potential neutralization capacity and allow for the classification of the acid generating potential of the samples.

To quantify the metal content in the rock, solid phase trace element analyses for the Palmer samples were completed using what ALS refers to as a complete characterization package (ALS Method: CCP-PKG03) consisting of XRF, ICP-MS and ICP-AES as well as Leco furnace analyses of 62 elements and oxides. Individual methods in the characterization package are summarized in Table 1.

TABLE 1. SUMMARY OF ALS CHARACTERIZATION PACKAGE.

ALS Method Code	Description	Analytes
ME-XRF26	Lithium borate fusion into a fused disc where it is then analyzed by XRF spectrometry.	13 element oxide package: Al_2O, BaO, CaO, Cr_2O_3, Fe_2O_3, K_2O, MgO, MnO, Na_2O, P_2O_5, SO_3, SiO_2, and TiO_2
ME-MS81	Lithium borate fusion technique followed by acid dissolution and ICP-MS analysis	31 element package: Ba, Ce, Cr, Cs, Dy, Er, Eu, Ga, Gd, Hf, Ho, La, Lu, Nb, Nd, Pr, Rb Sm, Sn, Sr, Ta, Tb, Th, Tm, U, V, W, Y, Yb, Zr
ME-4ACD81	Four acid digestion and ICP-AES method	10 elements: Ag, Cd, Co, Cu, Li, Mo, Ni, Pb, Sc, Zn
ME-MS42	aqua regia digestion and ICP-MS method	Elements: As, Bi, Hg, In, Re, Sb, Se, Te and Tl
ME-IR08	Leco furnace combustion	Total carbon and sulfur

It is noted that the complete characterization package was not conducted on 8 samples, mostly from drill hole GT16-02, with sample IDs as follows: S038822, S038883 to S038888 and S038891. However, results from the standard four-acid digestion with ICP-AES for analysis of 33 elements (Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, K, La, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sc, Sr, Th, Ti, Tl, U, V, W, and Zn) that is conducted on all Palmer samples was utilized for interpretation for these 8 samples.

3.2.2 Kinetic Tests

FIELD BARRELS

A 10 kg split was obtained from each of the three field barrel samples and sent to ALS Minerals in North Vancouver, B.C. for static test characterization and trace element analyses. The field barrel splits were analyzed for Standard ABA including paste pH, total sulfur (Leco), sulfate sulfur by Na_2CO_3 and HCl leach, Sobek NP and TIC (ALS code OA-VOL08). Trace element analyses were analyzed for the complete characterization package as outlined in the section above.

Mineralogical analyses on each of the field barrel splits included Quantitative Evaluation of Minerals by Scanning Electron Microscopy (QEMSCAN®) using Particle Mineral Analysis (PMA) protocol to identify and quantify mineral phases in the rock samples with emphasis on carbonate and sulfide minerals, the primary sources of buffering and acidity. The QEMSCAN analyses were conducted by ALS Kamloops.

Particle size distribution analyses were also conducted on the field barrel splits to provide an indication of the reactive surface area of the sample solids. These analyses were conducted by ALS Saskatoon.

Two field barrel leachate sampling events were conducted in 2017 (September and October) prior to the onset of frozen conditions at site. Leachates from each event were measured for in-situ water quality parameters (pH, temp, conductivity, dissolved oxygen, turbidity – Measured with YSI Pro and LaMott Turbidity Meter). In addition, total precipitation from the nearby weathering station and volume of leachate measured via graduated cylinder are recorded.

Leachate samples were submitted to ALS Environmental in Burnaby, B.C. for analytical water quality. The field barrel leachates were analyzed for general parameters (pH, conductivity, hardness, total suspended solids, total dissolved solids), anions (alkalinity, acidity, chloride, fluoride, bromide and sulphate), nutrients (ammonia, nitrate, nitrite, phosphorus) cyanide (weak acid dissociable), and dissolved metals by ICP-MS.

HUMIDITY CELLS

Laboratory humidity cell tests were initiated in November 2017 on a sample split from each of the three field barrels. The humidity cell tests are being conducted at ALS Environmental using the MEND (2009) procedure whereby the waste rock is flushed once per week with deionized water and the leachate is analyzed to assess oxidations rates (i.e. sulphate production) and element leaching.

Weekly humidity cell leachates are analyzed for general parameters (pH, conductivity, turbidity), anions (alkalinity, acidity chloride, fluoride, bromide and sulphate), nutrients (ammonia, nitrate, nitrite, phosphorus) cyanide (weak acid dissociable), and total and dissolved metals by ICP-MS.

A summary of the humidity cell program is provided in Table 2. Testing is currently in progress, and 10 weeks of data had been received from the laboratory at the time of this report.

TABLE 2. SUMMARY OF PALMER HUMIDITY CELL TEST PROGRAM.

HCT ID	Test Type	Rock Type	Weeks Tested	Test Status
ABA Barrel 1	Waste Rock	Jasper Mountain Basalt	10	Test continuing
ABA Barrel 2	Waste Rock	Limey Argillite & Carbonate Alt'd Mafic Dikes	10	Test continuing
ABA Barrel 3	Waste Rock	Hanging Wall Basalt	10	Test continuing

4.0 RESULTS

Only those drill holes and samples that are geologically representative (as determined by Constantine) of the currently proposed exploration drift (i.e. Option 7 drift) (Figure 3) are discussed in the results section. This includes the three principal units that will be intersected along the access ramp: Jasper Mountain basalt, limey argillite (those interstitial to basalts, and from the unit near the Kudo Fault), and hanging wall basalt in the South Wall area within the vicinity of the access ramp and exploration drift, as well as minor units such as mafic dykes, gabbro, fault etc.

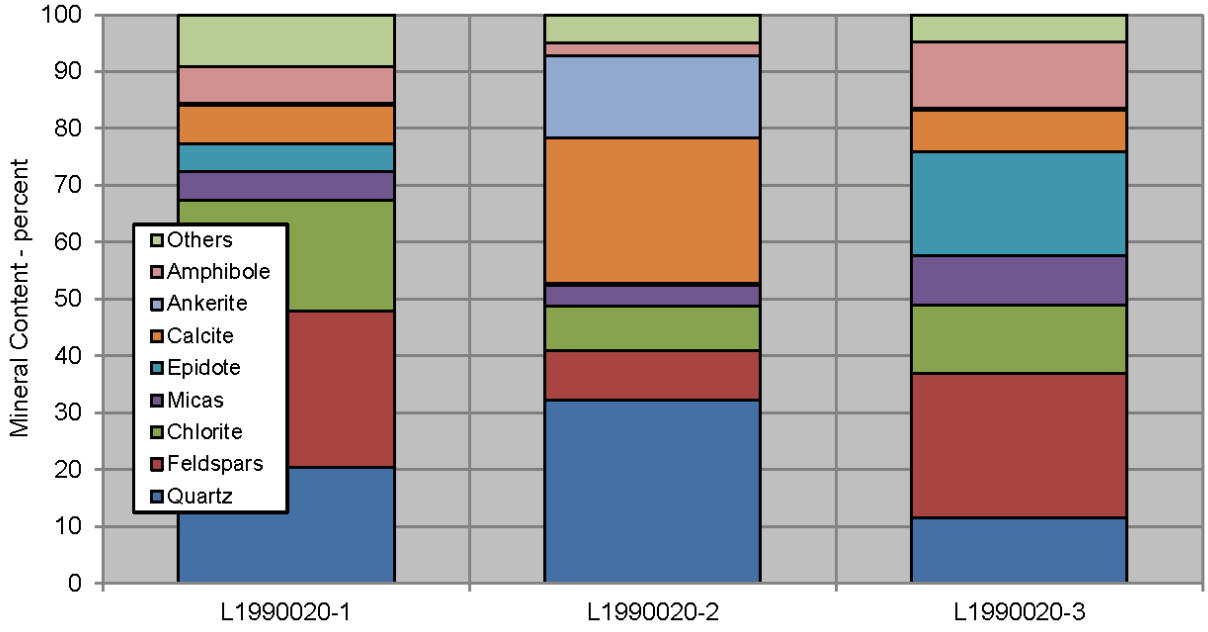
Results from geochemical testing on all samples in the Palmer database (pre-2017and 2017 programs) are however provided in Appendices D and E.

4.2 Mineralogy

Mineralogical analysis by QEMSCAN was conducted on three samples representing the three main rock types expected to be encountered in the proposed exploration drift: Jasper Mountain basalt, hanging wall basalt and limey argillite with lesser carbonate altered mafic dike. All three samples were representative splits from the field barrel tests. The complete QEMSCAN report is provided in Appendix F and summarized below.

Predominant minerals in all three samples were quartz, feldspars, chlorite and calcite (Figure 5). Minor amounts of kaolinite, apatite, iron oxides, pyrite and titanium minerals were also identified in all the samples. Calcite, the predominant carbonate mineral in all three samples, ranged from ~7% to 26%. In addition to calcite, the iron

carbonate mineral ankerite (~14%) was also reported in the limey argillite sample. Pyrite, in minor amounts, was the predominant sulfur-bearing mineral identified in the samples, with negligible copper sulphides, galena and sphalerite.



Notes:
a) L1990020-1 = Jasper Mountain Basalt; L1990020-2 = Limey Argillite and Carbonate Altd'd Mafic Dikes; L1990020-3 = Hanging Wall Basalt.
b) Ankerite includes trace amounts of Dolomite.
c) Other includes iron oxides, Pyrite, Apatite, Titanium Minerals, Kaolinite (clay), and trace amounts of Copper Sulphides, Galena, Sphalerite and Unresolved mineral species
d) Detailed mineralogical data is located in Appendix F.

FIGURE 5. MINERALOGICAL COMPOSITION OF THREE MAIN ROCK TYPES.

4.2 Acid-Base Accounting

Results of ABA testing on samples geologically representative of the proposed drift are summarized in Table 3 and shown graphically in Figures 6 to 11. Full results are provided in Appendix D.

Paste pH values were circum-neutral to alkaline with values ranging from 7.5 to 9.8.

The sample set was typically characterized by low total-sulfur content with a median of 0.13% (range from 0.01% to 1.09%). Nearly 90% of samples had total-sulfur levels less than 0.5%, and 67% of samples had levels less than 0.2%. Total-sulfur was notably higher in limey argillite (median ~0.6%) compared to the Jasper Mountain basalt (median 0.12%) and hanging wall basalt in the South Wall (median 0.05%) (Figure 6). Total-sulfur content in the mafic dykes (median ~0.3%) was also slightly higher than the basalts. The number of samples available for gabbro, fault and cap intrusive were limited but also indicated low sulfur content (<0.2%).

Sulfur speciation indicates that a large proportion of total-sulfur in the samples is attributed to sulfide minerals, typically the active sulfur species for acid generation (Figure 6). Trace amounts of pyrite were reported in some of the samples, as identified in mineralogical analysis and visual logging (Appendix C). Sulfate-sulfur was low to

negligible in most samples with a median of 0.01% by Na_2CO_3 leach and 0.01% by HCl leach. Due to the presence of acid-insoluble sulfate (i.e. barite or $BaSO_4$) in the deposit, % barite-sulfur was back calculated from solid-phase barium to determine if barite was a significant sulfur species in the waste rock samples. Calculated barite-sulfur was low and ranged from 0.002% to 0.01% with a median of 0.006% (Appendix D). Overall, total-sulfur provides a good approximation of the sulfide-sulfur content in the waste rock samples due to typically low acid soluble sulfate-sulfur and acid insoluble sulfate-sulfur values.

Maximum potential acidity (MPA) calculated from total-sulfur content ranged from 0.3 to 34 kg $CaCO_3$/t equivalent with a median of 4 kg $CaCO_3$/t.

Buffering capacity, or neutralization potential, in the samples as represented by modified NP was variable but generally high with a range from 6 to 651 kg $CaCO_3$/t and median of 100 kg $CaCO_3$/t. Notably higher NP was reported in the limey argillites (median ~400 kg $CaCO_3$/t) compared to the other rock types (Figure 8). The Jasper Mountain basalt and hanging wall basalts in the South Wall had median NP levels of ~100 kg $CaCO_3$/t. The cap intrusive sample had the lowest NP at 6 kg $CaCO_3$/t (Table 3).

Nearly all the NP is contributed by carbonate minerals as indicated by a strong correlation between Modified NP and carbonate NP, or CO_3 NP (Figure 9). Carbonate content, as identified by QEMSCAN (Appendix F) and visual logging (Appendix C), is dominated by the reactive mineral calcite in the sample set. Trace amounts of iron carbonate ($FeCO_3$) were visually logged in the rare sample (Appendix B and C) and a minor amount of ankerite (14%) was identified by QEMSCAN in the limey argillite field barrel sample (Appendix F). Iron carbonate minerals are not net neutralizing under oxygenated conditions. However, calcite is predominant in those samples and contributes to the overall NP.

Rhodochrosite ($MnCO_3$) amygdules were also reported in a few of the sample descriptions (Appendix B and C). Similar to iron carbonates, manganese carbonate minerals do not provide effective buffering at neutral pH. To determine if rhodochrosite was a significant carbon species in the samples, back-calculation of solid-phase manganese, assuming all manganese occurs as $MnCO_3$, to %C as rhodochrosite indicated that 0.01% to 0.04% carbon (<5 kg $CaCO_3$/t) occurs as rhodochrosite, a negligible amount compared to total inorganic carbon % in the samples and thus an insignificant proportion of the carbonate NP contribution.

As shown in Figure 9, Modified NP was greater than carbonate NP (CO_3 NP) for several basalt and dyke samples typically below 75 kg $CaCO_3$/t suggesting some NP contribution from slower-reacting alumino-silicate minerals (i.e. epidote, chlorite etc.) could be occurring within the NP titration.

TABLE 3. SUMMARY OF ACID-BASE ACCOUNTING RESULTS BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRESENTATIVE OF THE PROPOSED DRIFT.

Rock Type	Statistic	Paste pH	Total S	Sulfate S	Sulfide S	MPA	Modified NP	CO_3 NP	NNP	NPR
			wt. %			kg$CaCO_3$/t				
All Rock (n = 101)	Min	7.5	0.01	0.01	0.01	0.3	6	4	5	2.5
	Median	8.8	0.13	0.01	0.12	4	100	89	96	33
	Max	9.8	1.09	0.19	1.05	34	651	647	634	381
Jasper Mtn Basalt (n=38)	Min	8.1	0.01	0.01	0.01	0.3	17	4	10	2.5
	Median	8.8	0.12	0.01	0.11	4	93	78	88	31
	Max	9.2	0.32	0.19	0.26	10	617	622	607	219
Limey Argillite (n = 14)	Min	7.5	0.04	0.01	0.03	1	114	110	96	6.3
	Median	8.6	0.57	0.02	0.55	18	435	457	414	27
	Max	8.9	1.09	0.04	1.05	34	651	647	634	235
HW Basalt (n=37)	Min	8.0	0.01	0.01	0.01	0.3	28	13	28	7.9
	Median	8.8	0.05	0.01	0.04	2	91	82	89	80
	Max	9.7	0.44	0.03	0.41	14	381	381	379	381
Mafic Dyke (n = 8)	Min	8.2	0.13	0.01	0.12	4	46	37	40	4.9
	Median	9.0	0.28	0.01	0.28	9	74	62	61	7.0
	Max	9.8	1.06	0.01	1.05	33	201	211	196	43
Gabbro (n = 2)	Min	8.8	0.03	0.01	0.03	1	40	26	39	13
	Max	9.0	0.22	0.01	0.21	7	88	74	81	43
Fault (n = 1)		8.4	0.23	0.01	0.23	7	245	237	238	34
Cap Intrusive (n=1)		8.9	0.03	0.02	0.01	1	6	4	5	6

Notes:
Full ABA results provided in Appendix D.
Sulfate-sulfur (by Na_2CO_3 leach)
Sulfide-Sulfur: Total-Sulfur - Sulfate-Sulfur
MPA (Maximum Potential Acidity): Total-Sulfur x 31.25
CO_3 NP (Carbonate NP): Equivalents: based on CO_2 (Carbonate Carbon)
NNP (Net Neutralization Potential): Calculated as Mod. NP - MPA
NPR (Neutralization to Acid Potential Ratio): Calculated as Mod.NP / MPA

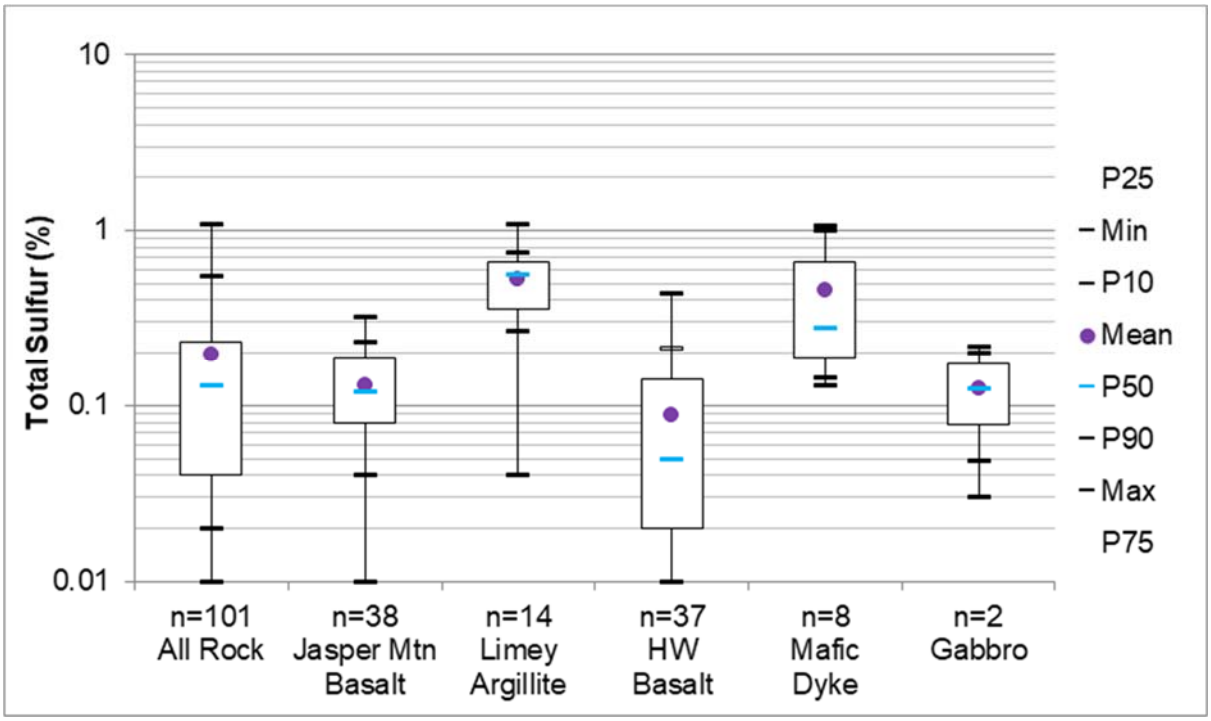


FIGURE 6. PERCENTILE DISTRIBUTION OF SULFUR BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRESENTATIVE OF THE PROPOSED DRIFT.

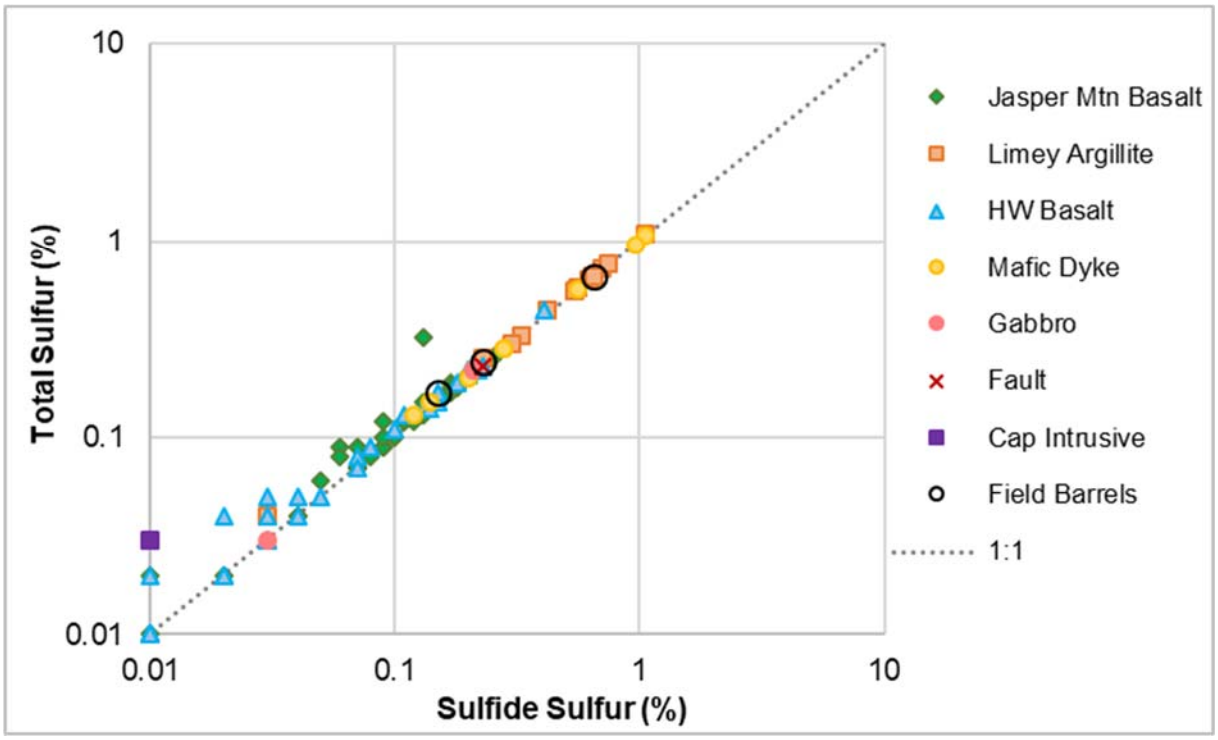


FIGURE 7. COMPARISON OF TOTAL-SULFUR VERSUS SULFIDE-SULFUR.

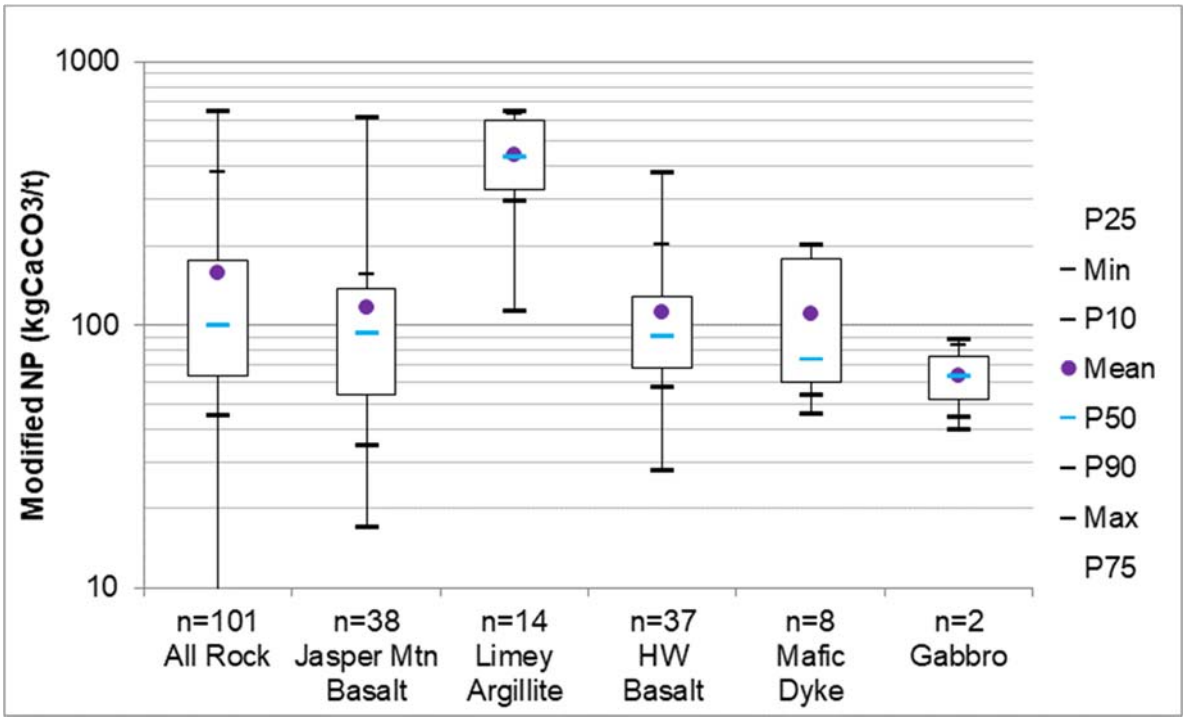


FIGURE 8. PERCENTILE DISTRIBUTION OF MODIFIED NP BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRESENTATIVE OF THE PROPOSED DRIFT.

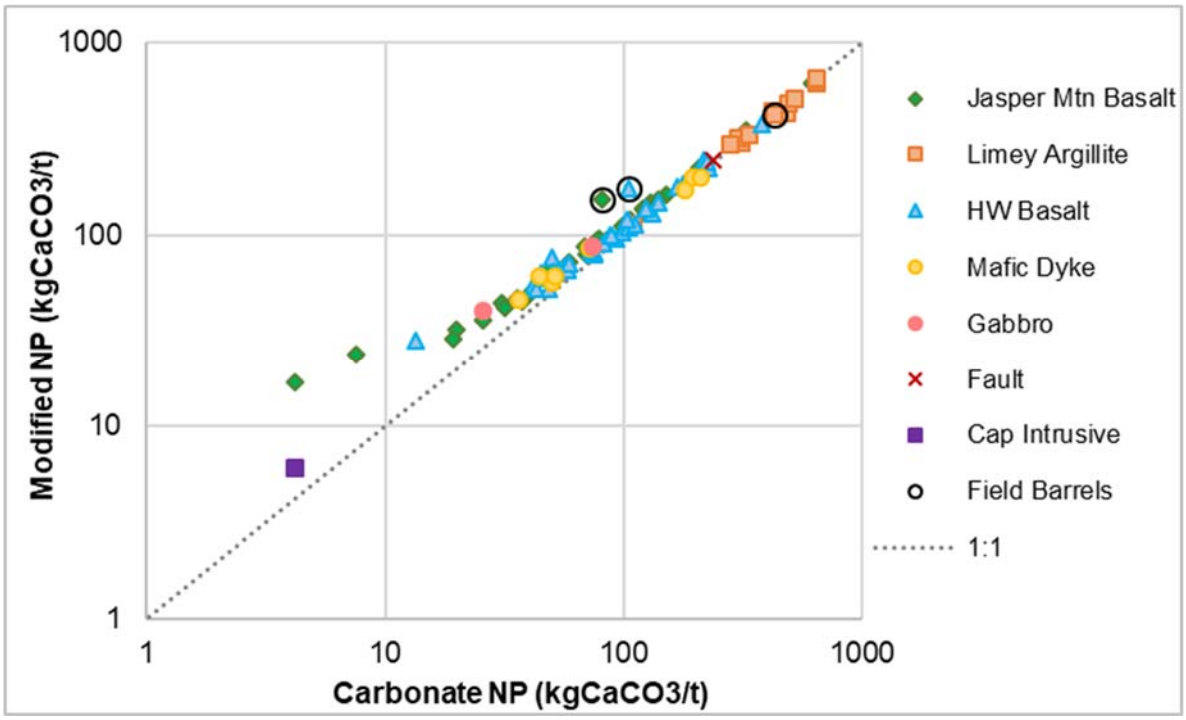


FIGURE 9. COMPARISON OF MODIFIED NP VERSUS CARBONATE NP.

Classification based on the ABA results as either potentially acid generating (PAG) or non-potentially acid generating (non-PAG) is done using the neutralization potential to acid potential ratio, or NPR. Screening criteria as provided by the MEND (2009) guidelines and the Global Acid Rock Drainage (GARD) Guide (INAP, 2009) have been adopted in this assessment whereby a sample is considered:

- Potentially acid generating (PAG) if NPR < 1,
- Non-potentially acid generating (non-PAG) if NPR > 2, and
- Uncertain (UC) if NPR is between 1 and 2.

In practice, samples considered uncertain are generally managed as PAG rock unless a site-specific ratio can be demonstrated i.e. PAG if NPR<2.

For this study, the MPA and Modified NP values have been used for the NPR calculation. The use of MPA is considered a more conservative approach, however due to negligible sulfate-sulfur and barite-sulfur in the samples, the NPR values are similar whether the MPA (calculated from total-sulfur) or AP (calculated from sulfide-sulfur) values are used in the NPR calculation. The use of Modified NP versus carbonate NP is typically non-conservative, however due to similar values the use of Modified NP versus carbonate NP resulted in the same classification for all samples.

ABA results, as illustrated in Figure 10 and Figure 11, indicate that all samples classified as non-potentially acid generating (non-PAG). NPR ratios ranged from 2.5 to 380 with a median of 33, an indication of the excess neutralizing capacity in the samples. Overall, the results indicate that rock units that are expected to be intersected during drift development should be non-PAG with sufficient NP to neutralize any acidity generated by sulfide oxidation.

Based on the trend of NP/MPA to total sulfur (%) for the basalt units (Figure 11), the potential for local acidity may occur along the drift if sulfur content were to exceed >1%. For the limey argillite units, the threshold for potential acidity is higher at >5% sulfur. These thresholds could be used for visual monitoring of waste rock during development to safeguard against the unlikely event of encountering unanticipated PAG material.

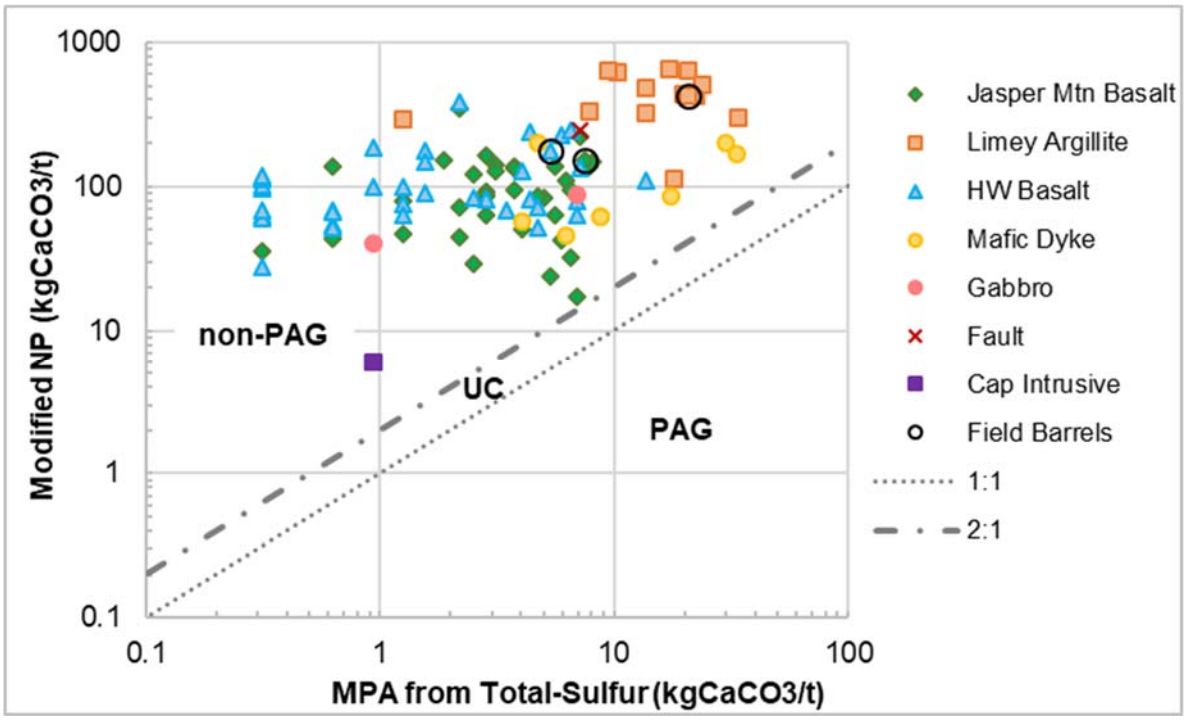


FIGURE 10. ARD CLASSIFICATION BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRESENTATIVE OF THE PROPOSED DRIFT.

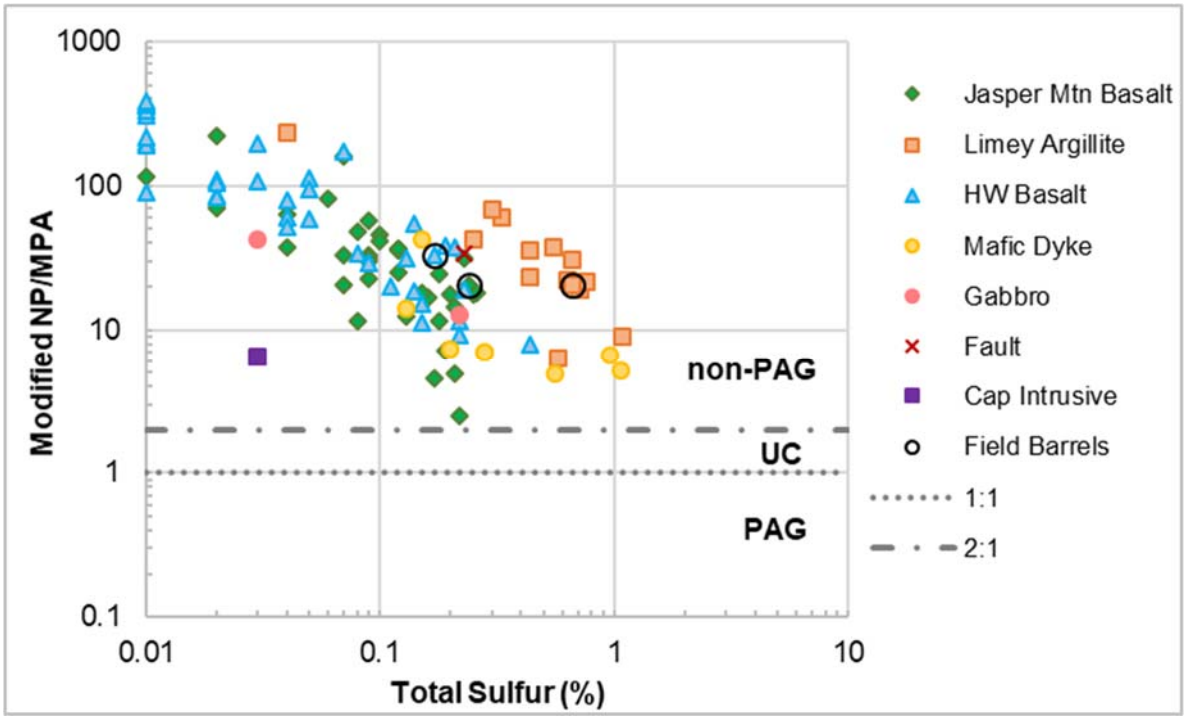


FIGURE 11. MODIFIED NP/MPA RATIO VERSUS TOTAL-SULFUR.

4.3 Metal Content

A summary of select trace elements i.e. those of potential interest associated with or in proximity to VMS type mineralization, for samples geologically representative of the proposed exploration drift are provided in Table 4 and Figure 12 and Figure 13. Complete results are provided in Appendix E.

Also shown in Table 4, is the average distribution of elements in the earth's crust for basalt and shale, as sourced from Price (1997). These average crustal abundances have been used to screen and identify trace element values that occur at elevated or anomalous concentrations in the sample set. A calculated threshold of 10 times the average crustal abundances has been used to define significant concentrations for environmental purposes, as suggested by Price (1997). On this basis, those metals that would be considered elevated (highlighted and bolded in Appendix E) in the sample solids included:

- Selenium in many of the Jasper Mountain basalt, hanging wall basalt and fault samples,
- Barium in one Jasper Mountain basalt sample,
- Bismuth in a few of the hanging wall basalt samples, and
- Calcium in two limey argillite samples.

Other metals such as cadmium, copper, lead, zinc, arsenic and antimony were at low levels relative to crustal abundances in the samples geologically representative of the proposed drift development.

Overall, while the comparison to crustal abundances allows for the identification of elements that are considered elevated, it does not necessarily indicate a potential for metal leaching. Ten times the crustal abundance for selenium in basalt is 0.5 ppm, which is equivalent to 0.00005%. Despite such low concentration, the potential for selenium leaching under neutral pH conditions coupled with the very low water quality guidelines for selenium, supports the need for leach tests or kinetic testing to evaluate and quantify the metal leaching potential of these rocks.

TABLE 4. SUMMARY OF SELECT TRACE ELEMENTS BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRESENTATIVE OF THE PROPOSED DRIFT.

Rock Type	Statistic	As	Ba	Bi	Cd	Cu	Mo	Mn	Ni	Pb	Sb	Se	Zn
		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
All rock (n = 100)	Min	0.1	90	0.01	*0.5*	3	*1*	542	1	*2*	*0.05*	*0.2*	20
	Median	0.6	269	0.02	0.5	36	1	1394	32	3	0.12	0.4	118
	Max	28.3	8506	2.0	2.1	295	3	2168	291	29	5	4.7	293
Jasper Mtn. Basalt (n = 38)	Min	0.2	90	0.01	*0.5*	11	*1*	929	1	*2*	*0.05*	*0.2*	20
	Median	0.8	134	0.02	0.5	29	1	1549	21	3	0.11	0.4	128
	Max	2.0	8506	0.06	1.0	295	3	2168	102	6	0.23	1.4	198
Limey Argillite (n = 13)	Min	0.1	179	0.02	*0.5*	18	*1*	542	13	*2*	0.05	0.5	29
	Median	0.6	448	0.07	0.5	38	2	1316	30	7	0.23	2.8	86
	Max	28.3	1433	0.26	0.9	88	3	1626	67	29	1.06	4.7	236
HW Basalt (n=37)	Min	0.1	90	0.01	*0.5*	9	*1*	757	22	*2*	*0.05*	*0.2*	49
	Median	0.6	358	0.02	0.5	39	1	1394	77	3	0.13	0.5	122
	Max	5.7	985	2.0	2.1	90	3	2013	159	13	5	3.7	293
Mafic Dyke (n=8)	Min	0.2	90	0.01	*0.5*	10	*1*	774	1	*2*	0.05	0.2	75
	Median	0.4	358	0.03	0.5	43	1	1278	27	3	0.14	0.4	101
	Max	0.6	1253	0.05	0.6	71	2	1859	155	5	0.41	2.5	157
Gabbro (n=2)	Min	0.5	269	0.01	0.5	11	*1*	1239	258	*2*	0.06	0.2	77
	Max	0.6	358	0.05	0.6	80	1	1549	291	4	0.23	0.5	224
Fault (n=1)		14.7	269	0.06	1.1	46	1	3	95	3	0.07	1.1	115
Cap Intrusive (n=1)		0.7	1074	0.01	*0.5*	3	*1*	4	4	4	0.07	*0.2*	54
Crustal Abundance (basalt)		2	330	0.007	0.22	87	1.5	1500	130	6	0.2	0.05	105
Crustal Abundance (shale)		13	580	-	0.3	45	2.6	850	68	20	1.5	0.6	95

Notes:

Full Trace Element Results provided in Appendix E.

Red italics – value reported as less than laboratory detection limit. Detection limit shown.

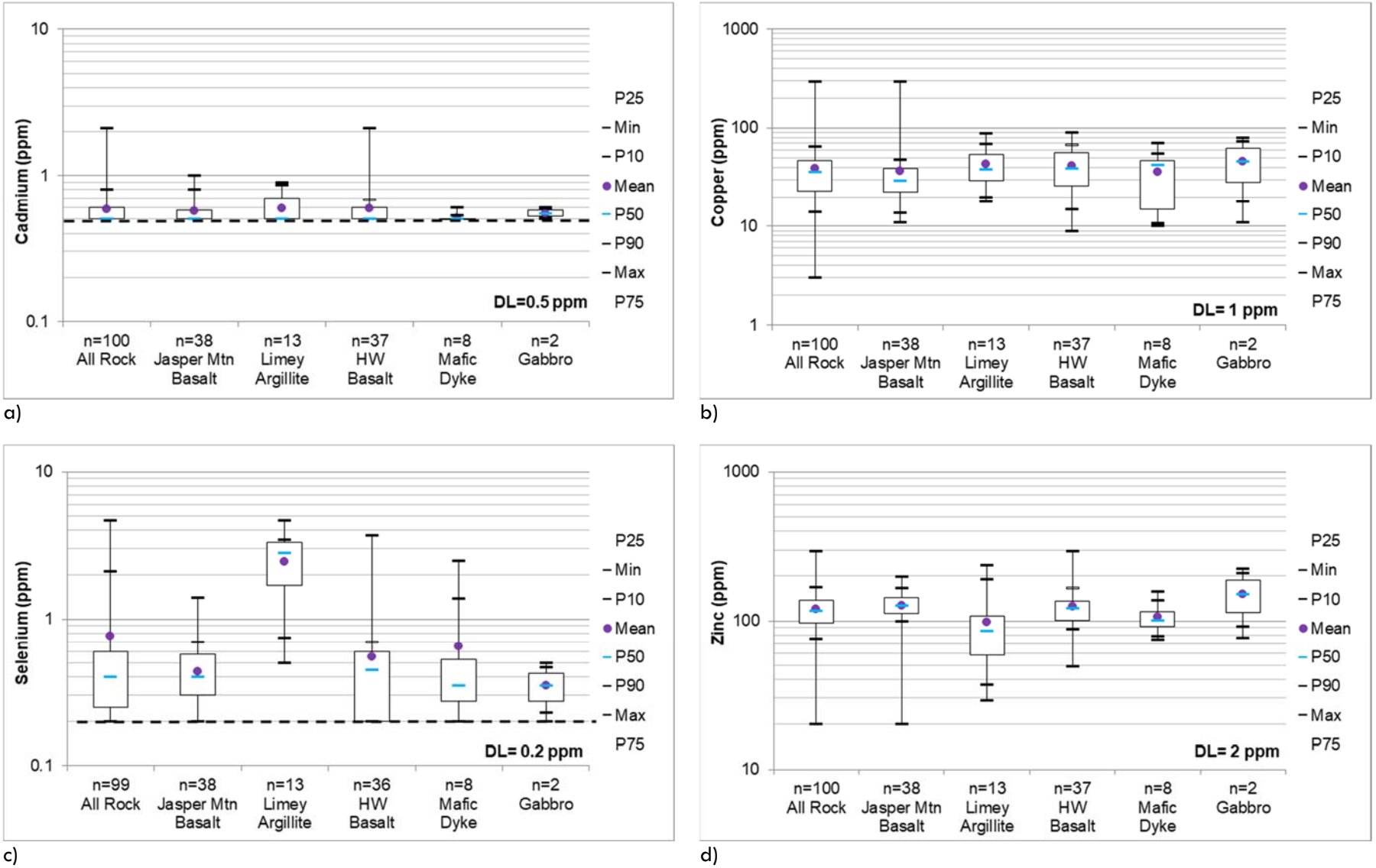


FIGURE 12. BOX AND WHISKER DIAGRAM FOR A) CADMIUM, B) COPPER, C) SELENIUM, AND D) ZINC BY ROCK TYPE FOR SAMPLES GEOLOGICALLY REPRSENTATIVE OF THE PROPOSED DRIFT.

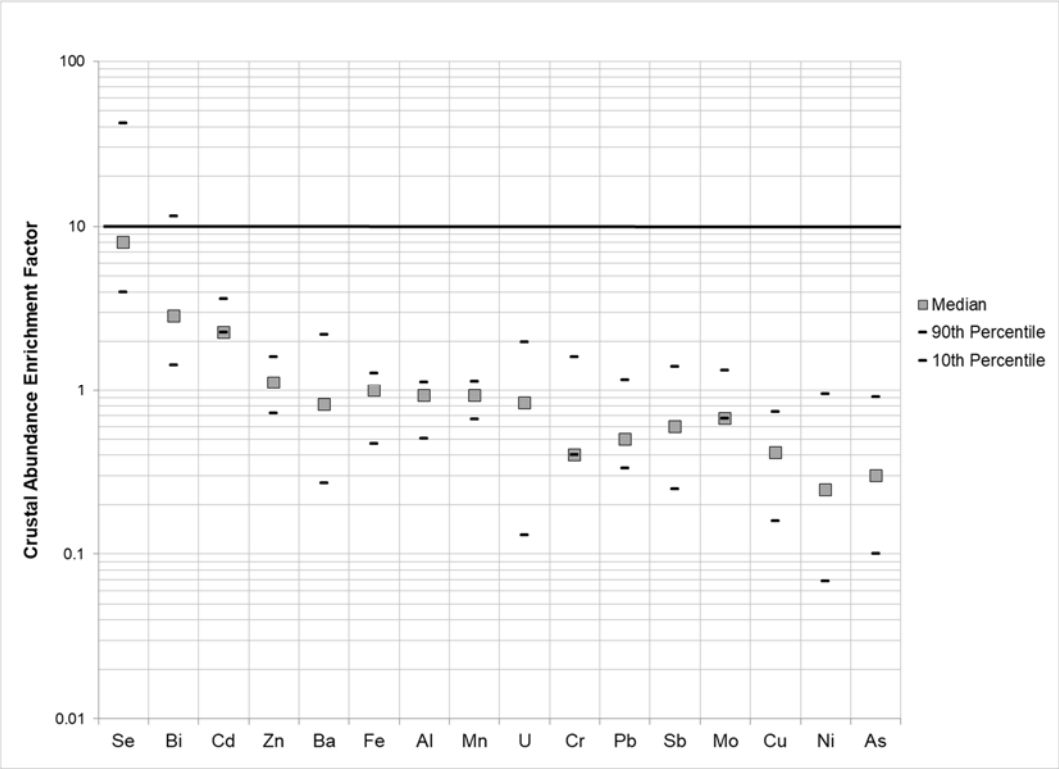


FIGURE 13. CRUSTAL ABUNDANCE ENRICHMENT FACTOR FOR SELECT TRACE ELEMENTS.

4.4 Field Barrels

As noted in Section 3.2.2, four field barrels have been in operation at the Palmer Project since August 2017, three rock barrels and one empty control barrel for precipitation. Static test characterization on the field barrel splits is summarized in Table 5 with complete results in Appendices D and E. Mineralogy of the field barrel samples was discussed in Section 4.1 and attached in Appendix F.

TABLE 5. SUMMARY OF STATIC TEST CHARACTERIZATION ON FIELD BARREL SPLITS.

Parameter	Units	ABA Barrel 1 - Jasper Mtn Basalt	ABA Barrel 2 - Limey Argillite/ Mafic Dyke	ABA Barrel 3 - HW Basalt
Paste pH	pH units	8.9	8.5	9.2
Total-S	%	0.24	0.66	0.17
SO_4-S (CO3-leach)	%	0.01	0.01	0.02
MPA	kg $CaCO_3$/t	7.5	20.6	5.3
Sobek NP	kg $CaCO_3$/t	153	423	175
Carb-NP	kg $CaCO_3$/t	81	429	106
NPR		20	21	33
ABA Classification		non-PAG	non-PAG	non-PAG
Cd	ppm	0.7	0.8	0.7
Cu	ppm	32	40	54
Pb	ppm	2	13	3
Se	ppm	0.5	2	0.6
Zn	ppm	138	101	108

All samples classified as non-PAG by ABA classification with generally low metals. One exception was selenium that reported slightly elevated levels relative to ten times crustal abundance for the basalt samples (ten times crustal abundance for basalt = 0.5 ppm).

Results of particle size distribution analyses on a split of the field barrel composite samples (crushed drill core) is provided in Appendix G. Results indicated fairly consistent particle size between the two basalt barrels (Barrels 1 and 3) with roughly 45% of rock greater than 25 mm and 37% greater between 9.5 and 25 mm. Barrel 2 (limey argillite) indicated slightly finer rock with 33% greater than 25 mm and 45% between 9.5 and 25 mm.

Sampling of the barrel leachates occurred in September and October 2017 prior to the onset of frozen conditions. Complete field barrel leachate results are provided in Appendix H with select parameters summarized in Table 6.

Leachate from the basalt samples (Barrels 1 and 3) have been characterized by alkaline pH, low sulphate (<20 mg/L) and low dissolved metals. The limey argillite (Barrel 2) was characterized by alkaline pH and slightly higher sulphate (range of ~40 to 200 mg/L), consistent with higher sulfur content in the sample. Dissolved metals were typically slightly higher in the limey argillite compared to the basalts, albeit at generally low concentrations. The exception is soluble selenium in the limey argillite, ranging from 0.004 to 0.013 mg/L, and though not necessarily considered an appropriate comparison because barrel contact water is not representative of the receiving environment, these concentrations are at or slightly above the Alaskan water quality guidelines. Note that these samples represent initial barrel leach results, and as shown in the humidity cell data below, may not be representative of longer term trends which often show a reduction in soluble metals as testing progresses and oxidation products that accumulated prior to testing are flushed from the test.

TABLE 6. FIELD BARREL LEACHATAE RESULTS.

Parameter	Units	ABA Barrel 1 - Jasper Mtn Basalt		ABA Barrel 2 - Limey Argillite/Mafic Dyke		ABA Barrel 3 - HW Basalt	
		13-Sep-17	16-Oct-17	13-Sep-17	16-Oct-17	13-Sep-17	16-Oct-17
pH	pH units	8.2	8.1	8.4	8.2	8.6	8.2
Cond.	uS/cm	89	217	178	559	82	209
TSS	mg/L	70	3.3	164	3.3	155	11.5
TDS	mg/L	71	120	135	365	99	118
Alkalinity	mgCaCO3/L	40.6	93.8	51.2	99.9	49.3	96
F	mg/L	0.052	0.115	0.074	0.125	0.027	0.044
SO4	mg/L	2.58	17.2	41.6	204	4.66	13.1
D. Al	mg/L	0.14	0.040	0.064	0.014	0.20	0.042
D. Sb	mg/L	0.00027	0.00052	0.0011	0.0020	0.00014	0.00031
D. As	mg/L	0.00011	0.00096	0.0047	0.0034	0.00011	0.0011
D. Cd	mg/L	*0.000005*	0.0000088	*0.000005*	0.000026	*0.000005*	*0.000005*
D. Cu	mg/L	0.00032	0.00032	0.00023	0.00026	0.0014	0.0013
D. Fe	mg/L	*0.01*	*0.01*	*0.01*	*0.01*	0.032	*0.01*
D. Pb	mg/L	*0.00005*	*0.00005*	*0.00005*	0.000052	*0.00005*	*0.00005*
D. Mn	mg/L	0.0060	0.016	0.0066	0.018	0.0047	0.010
D. Mo	mg/L	0.0021	0.0062	0.0039	0.017	0.0014	0.0048
D. Ni	mg/L	*0.0005*	*0.0005*	0.0012	0.0059	*0.0005*	*0.0005*
D. Se	mg/L	0.00038	0.00059	0.0037	0.013	0.00079	0.0012
D. Zn	mg/L	*0.001*	*0.001*	*0.001*	0.0032	*0.001*	*0.001*

Notes:

Full Results provided in Appendix H.

Blue italics – value reported as less than laboratory detection limit. Detection limit shown.

4.4 Humidity Cells

All humidity cell test results including data tables and time trend graphs are provided in Appendices I and J, respectively. Time trend graphs for parameters discussed below are pulled forward into Figure 14. The humidity cells are identified as HC – ABA Barrel 1, HC – ABA Barrel 2 and HC – ABA Barrel 3 reflecting the fact that the samples were sourced from the field barrel sample set.

Steady state conditions within a humidity cell test represent the average concentrations or rates for the period of time following the initial flush for each individual sample. The initial flush is determined from inspection of sulfate trends on a sample specific basis, and a preliminary assessment indicates that the initial flush appears to be within the first six or seven weeks of testing for the Palmer samples. The release rates were determined from the steady state concentrations converted to units of mg/kg/wk. A summary of the humidity cell test leachate results to date are provided in Table 7 as steady state concentrations and release rates for key parameters. It is noted that the test duration is still in early stage and as such what is assumed here to be steady state should be viewed as preliminary. Rates will be verified as the test program continues.

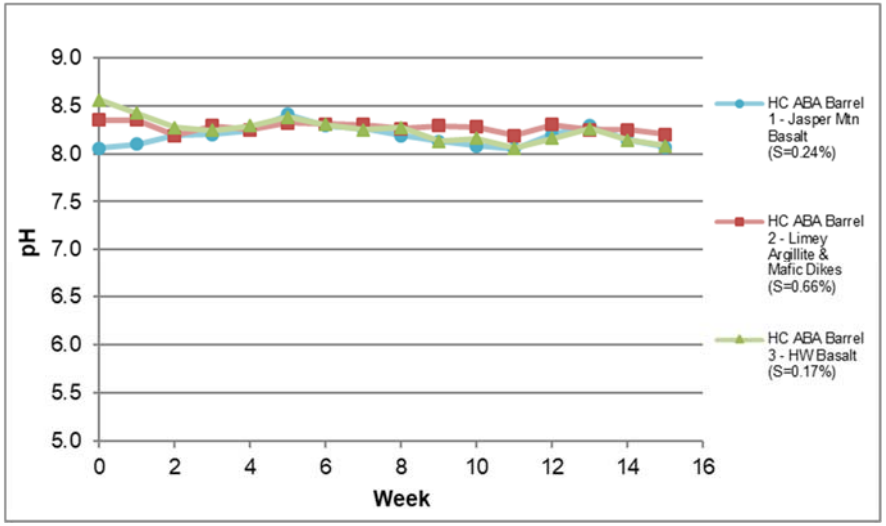
Leachate pHs have been alkaline and stable, typically ranging from 8.0 to 8.5 (Figure 14).

Sulphate loadings for all humidity cells were highest during the initial weeks of operation (Figure 14), which is typical of humidity cell tests flushing oxidation products that accumulated prior to testing. Sulphate concentrations then declined and started to stabilize by week 6 with concentrations typically <10 mg/L for the two basalt samples and 30 to 40 mg/L for the limey argillite sample. The maximum sulphate concentration reported in the week one initial flush was approximately 180 mg/L from the Jasper Mountain basalt in Barrel 1, while the lowest concentration (17 mg/L) was from the hanging wall basalt in Barrel 3.

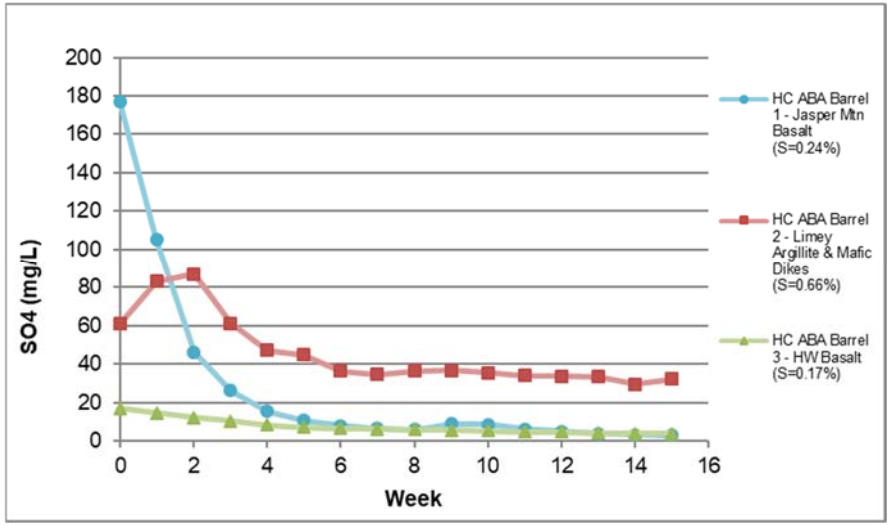
Trace element concentrations were generally low after the initial flush in all the tests, including cadmium, copper, lead and zinc with concentrations typically less than laboratory detection limits. Selenium in the limey argillite (HC – ABA Barrel 2) reported concentrations between 0.01 and 0.02 mg/L in the initial flush, however, concentrations have steadily declined to a more stable level of 0.003 mg/L in week 15 as testing has progressed (Figure 13). In comparison, steady state selenium concentrations in the basalt (HC – ABA Barrel 1 and HC – ABA Barrel 3) are nearly an order of magnitude lower at approximately 0.0003 mg/L and 0.0005 mg/L, respectively. An initial flush of soluble arsenic was also reported in the limey argillite compared to the basalt samples (three times higher) albeit still at low concentrations (Figure 14).

Humidity cell steady state concentrations were typically within an order of magnitude of corresponding field barrel leachate concentrations.

Preliminary calculations of carbonate neutralization and sulfur depletion times as defined in Price (1997), indicate that the Jasper Mountain basalt, hanging wall basalt and limey argillite samples are expected to remain non-PAG.



a)



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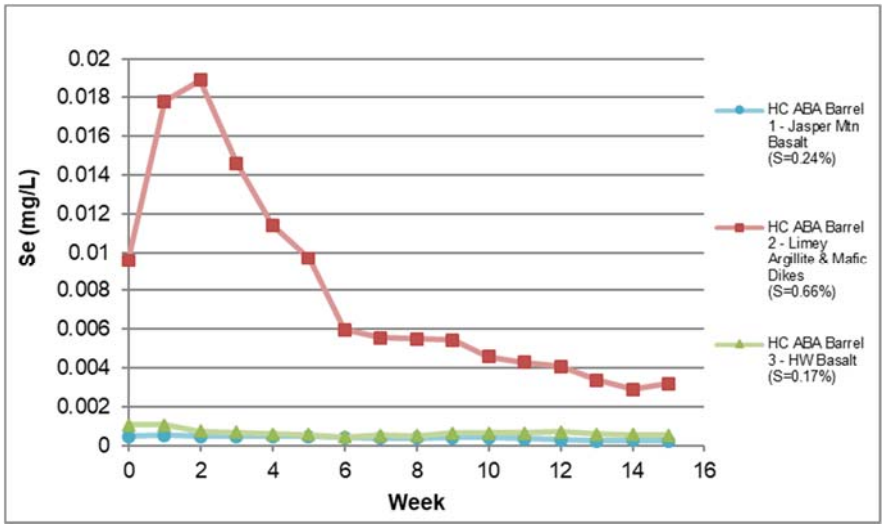

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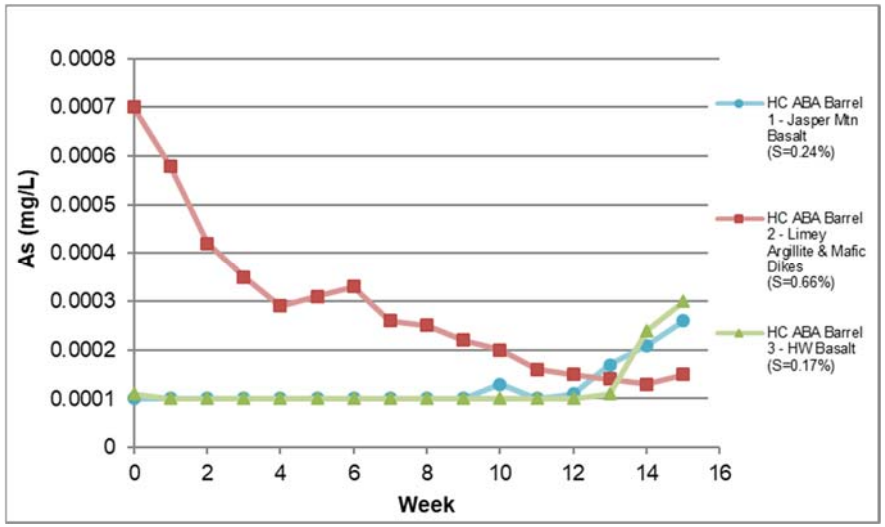

d)

FIGURE 14. HUMIDITY CELL LEACHATE TIME TRENDS FOR A) PH, B) SULFATE, C) SELENIUM AND D) ARSENIC.

TABLE 7. SUMMARY OF HUMIDITY CELL LEACHATE RESULTS.

Parameter	Steady State Concentrations (mg/L)			Steady State Rates (mg/kg/week)		
	HC - ABA Barrel 1 Jasper Mtn Basalt	HC - ABA Barrel 2 Limey Argillite/ Carb. Altd Mafic Dikes	HC - ABA Barrel 3 HW Basalt	HC - ABA Barrel 1 Jasper Mtn Basalt	HC - ABA Barrel 2 Limey Argillite/ Carb. Altd Mafic Dikes	HC - ABA Barrel 3 HW Basalt
Alk	54	81	54			
SO4	5.9	34	4.9	2.6	16	2.3
Al	0.33	0.09	0.19	0.15	0.042	0.092
Sb	0.00042	0.00040	0.00018	0.00019	0.00018	0.000083
As	0.00014	0.00020	0.00014	0.000066	0.000087	0.000069
Cd	0.00001	0.00001	0.00001	0.0000046	0.0000048	0.0000048
Cu	0.0005	0.0005	0.0005	0.00023	0.00024	0.00024
Fe	0.03	0.03	0.03	0.014	0.014	0.014
Pb	0.00005	0.00005	0.00005	0.000023	0.000024	0.000024
Mn	0.017	0.012	0.011	0.0078	0.0059	0.0051
Mo	0.00062	0.0028	0.00021	0.00026	0.0013	0.00010
Ni	0.0005	0.0005	0.0005	0.00023	0.00024	0.00024
Se	0.00034	0.0045	0.00060	0.00015	0.0020	0.00029
Zn	0.003	0.003	0.0031	0.0014	0.0014	0.0015

Note:

The humidity cell tests are still in early stage and thus what is assumed here to be steady state should be viewed as preliminary.

Full results are provided in Appendix I.

5.0 SUMMARY

The results of the geochemical characterization program conducted on samples of hanging wall rock associated with a proposed exploration drift at the Palmer Project, Alaska can be summarized as follows:

- Jasper Mountain basalt is expected to comprise the most volumetrically significant rock type encountered in proposed exploration drift development, followed by the hanging wall basalt in the South Wall area. Less volumetrically significant rock types characterized included limey argillite, mafic dykes and faults.
- Total-sulfur content was a good approximation of sulfide-sulfur in the samples. Total-sulfur content in 90% of samples was <0.5%. The Jasper Mountain basalt and hanging wall basalt units reported lower sulfur than the limey argillite and mafic dyke units.
- Neutralization potential was high in the basalts (median ~100 kg $CaCO_3$/t) and limey argillites (~400 kg $CaCO_3$/t) and is dominated by calcite.
- All rock samples of relevance to the proposed exploration drift classified as non-potentially acid generating (non-PAG), an indication that the proposed drift development is not expected to intersect PAG rock.
- Selenium was elevated relative to ten times crustal abundances in many of the Jasper Mountain basalt and hanging wall basalt samples.
- Field barrel and humidity cell tests have yielded leachates with alkaline pH and are not expected to generate acid.
- Metal leaching potential of the Jasper Mountain and hanging wall basalts is likely to be low based on leach tests to date.
- Leach tests on limey argillite have indicated an initial flush of soluble selenium at neutral pH. However, selenium in the humidity cell test has steadily declined to lower levels as testing has progressed.

The field barrel and humidity cell tests are still in early stages and results should be viewed as preliminary.

This report titled "**Geochemical Characterization in Support of a Proposed Exploration Drift, Palmer Project**" was prepared by pHase Geochemistry Inc. for Constantine and provides the results of the geochemical sampling and testing program on potential waste rock that would be produced from underground drift development.

Report written by:

Original Signed by

Andrea Samuels, P.Geo (BC)

Original Signed by

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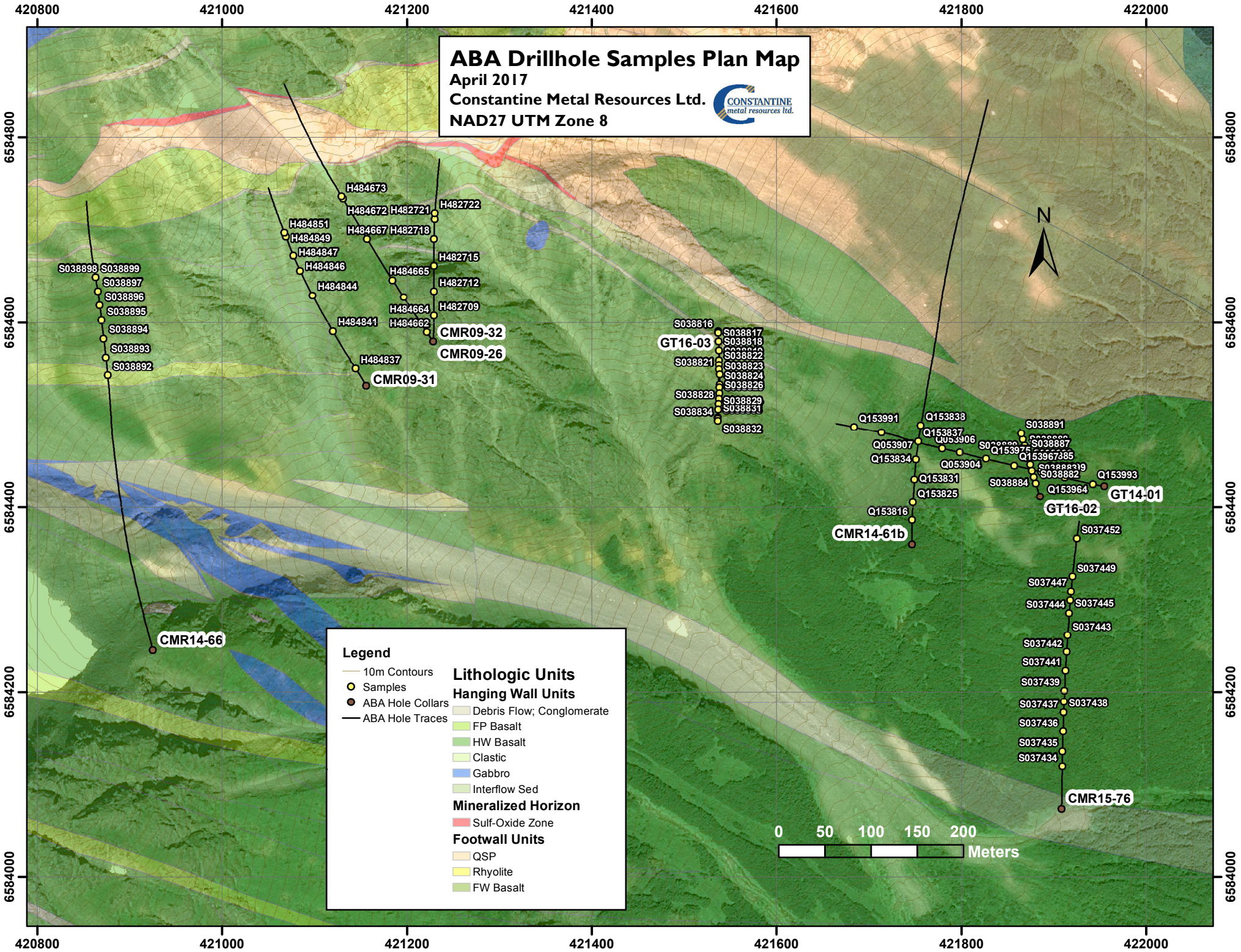
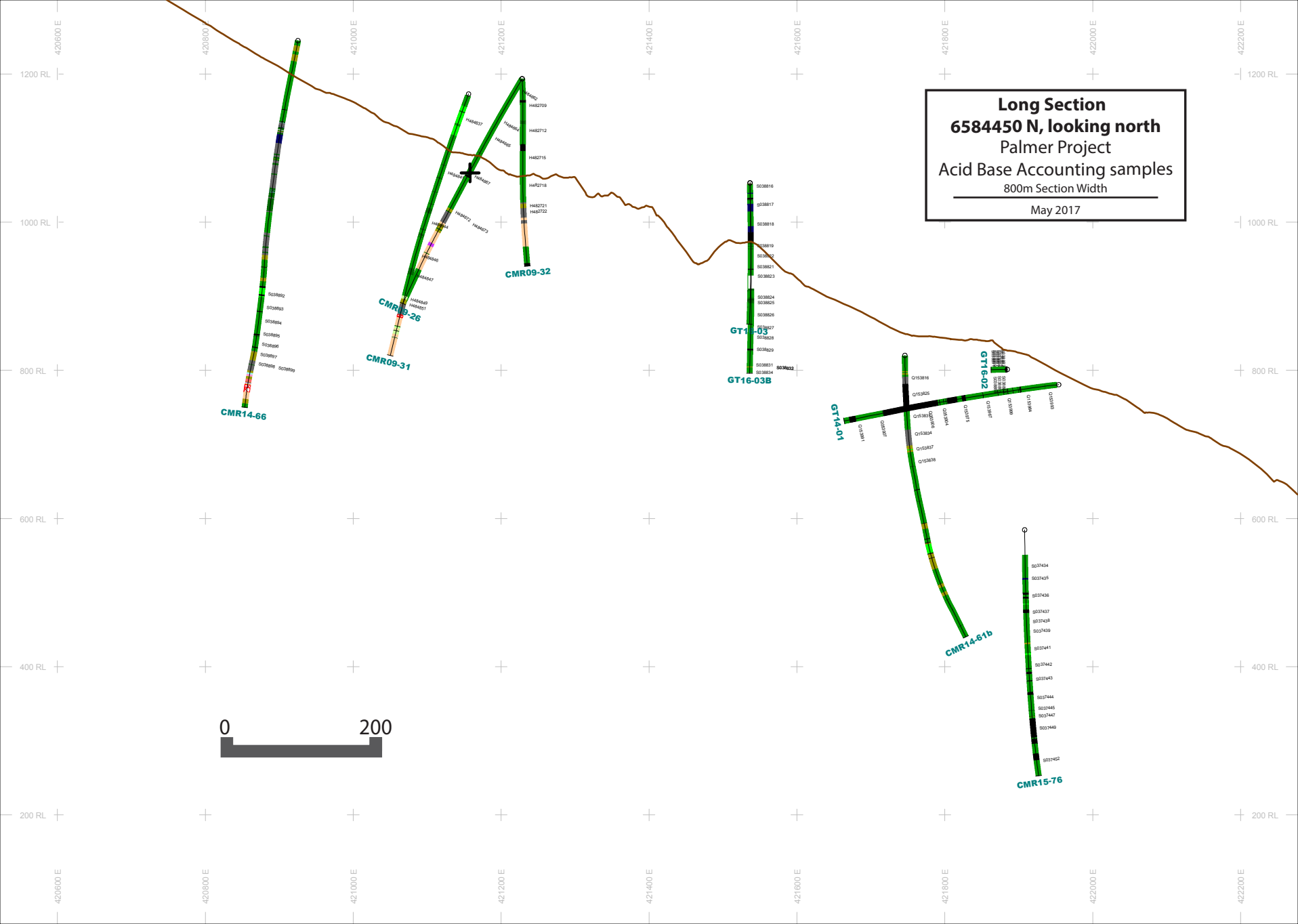
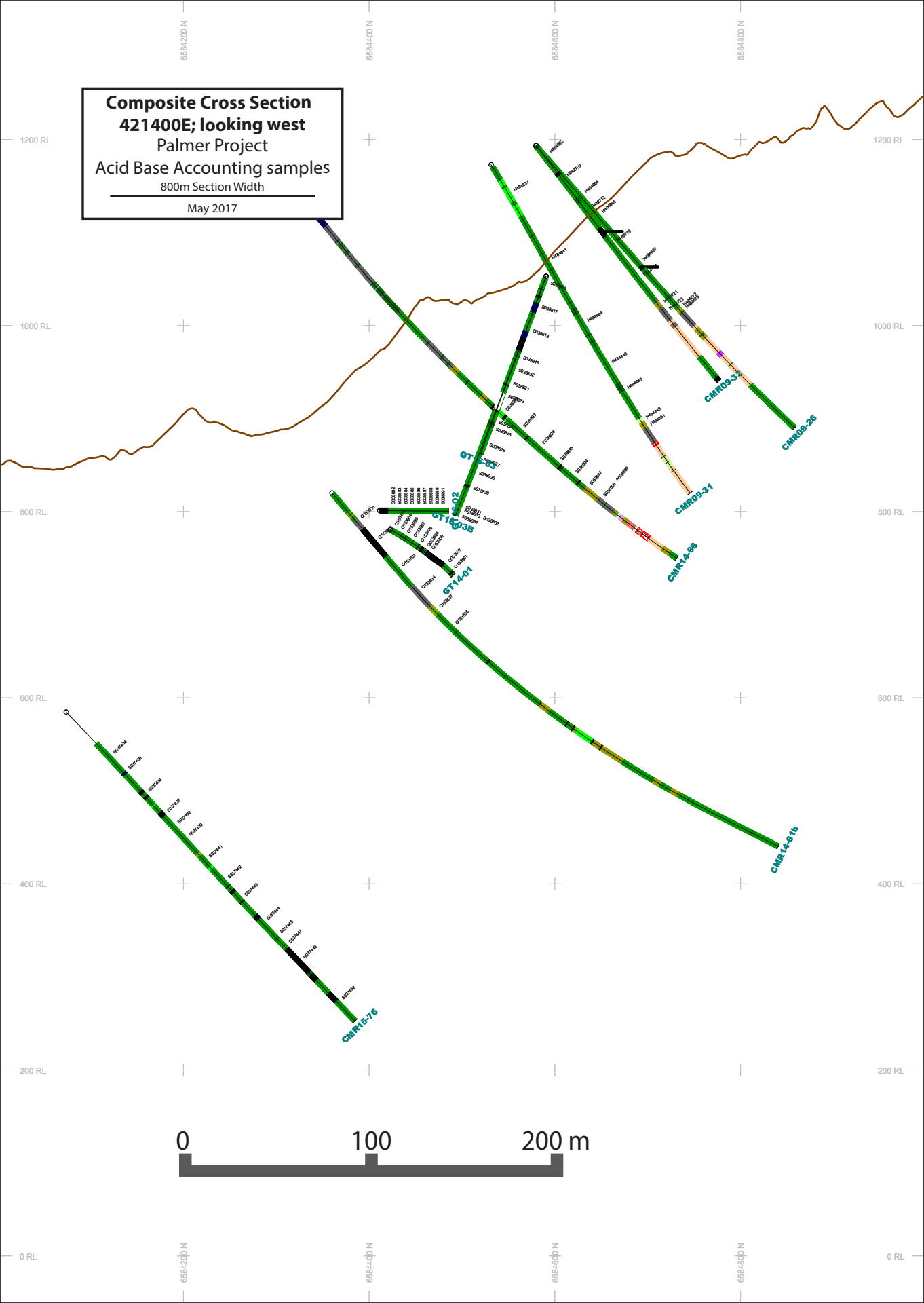
APPENDIX A: LOCATION OF PRE-2017 ABA SAMPLES ON PLANS MAPS, LONG- AND CROSS-SECTIONS


ABA Drillhole Samples Plan Map
April 2017
Constantine Metal Resources Ltd.
NAD27 UTM Zone 8
CONSTANTINE metal resources ltd.
420800
421000
421200
421400
421600
421800
422000
6584800
6584600
6584400
6584200
6584000
N
H484673
H484672
H482721
H482722
H484851
H484849
H484667
H482718
H484847
H484846
H482715
H484665
H484844
H482712
H484664
H482709
H484841
H484662
CMR09-32
CMR09-26
H484837
CMR09-31
S038898
S038899
S038897
S038896
S038895
S038894
S038893
S038892
CMR14-66
S038816
S038817
GT16-03
S038818
S038822
S038821
S038823
S038824
S038826
S038828
S038829
S038834
S038832
Q153991
Q153838
Q153837
Q053906
Q053907
Q153834
Q053904
Q153831
Q153825
Q153816
CMR14-61b
S038891
S038887
Q153967385
S038882
S038884
Q153993
Q153964
GT14-01
GT16-02
S037452
S037449
S037447
S037444
S037445
S037443
S037442
S037441
S037439
S037437
S037438
S037436
S037435
S037434
CMR15-76
Legend
10m Contours
Samples
ABA Hole Collars
ABA Hole Traces
Lithologic Units
Hanging Wall Units
Debris Flow; Conglomerate
FP Basalt
HW Basalt
Clastic
Gabbro
Interflow Sed
Mineralized Horizon
Sulf-Oxide Zone
Footwall Units
QSP
Rhyolite
FW Basalt
0
50
100
150
200
Meters


Long Section
6584450 N, looking north
Palmer Project
Acid Base Accounting samples
800m Section Width
May 2017
420600 E
420800 E
421000 E
421200 E
421400 E
421600 E
421800 E
422000 E
422200 E
1200 RL
1000 RL
800 RL
600 RL
400 RL
200 RL
CMR14-66
CMR09-31
CMR09-26
CMR09-32
GT16-03B
GT14-01
GT16-02
CMR14-61b
CMR15-76
0
200


Composite Cross Section
421400E; looking west
Palmer Project
Acid Base Accounting samples
800m Section Width
May 2017
6584200 N
6584400 N
6584600 N
6584800 N
1200 RL
1000 RL
800 RL
600 RL
400 RL
200 RL
0 RL
CMR09-26
CMR09-31
CMR14-66
CMR14-61b
CMR15-76
GT14-01
0
100
200 m

LEGEND FOR DRILL LOGS

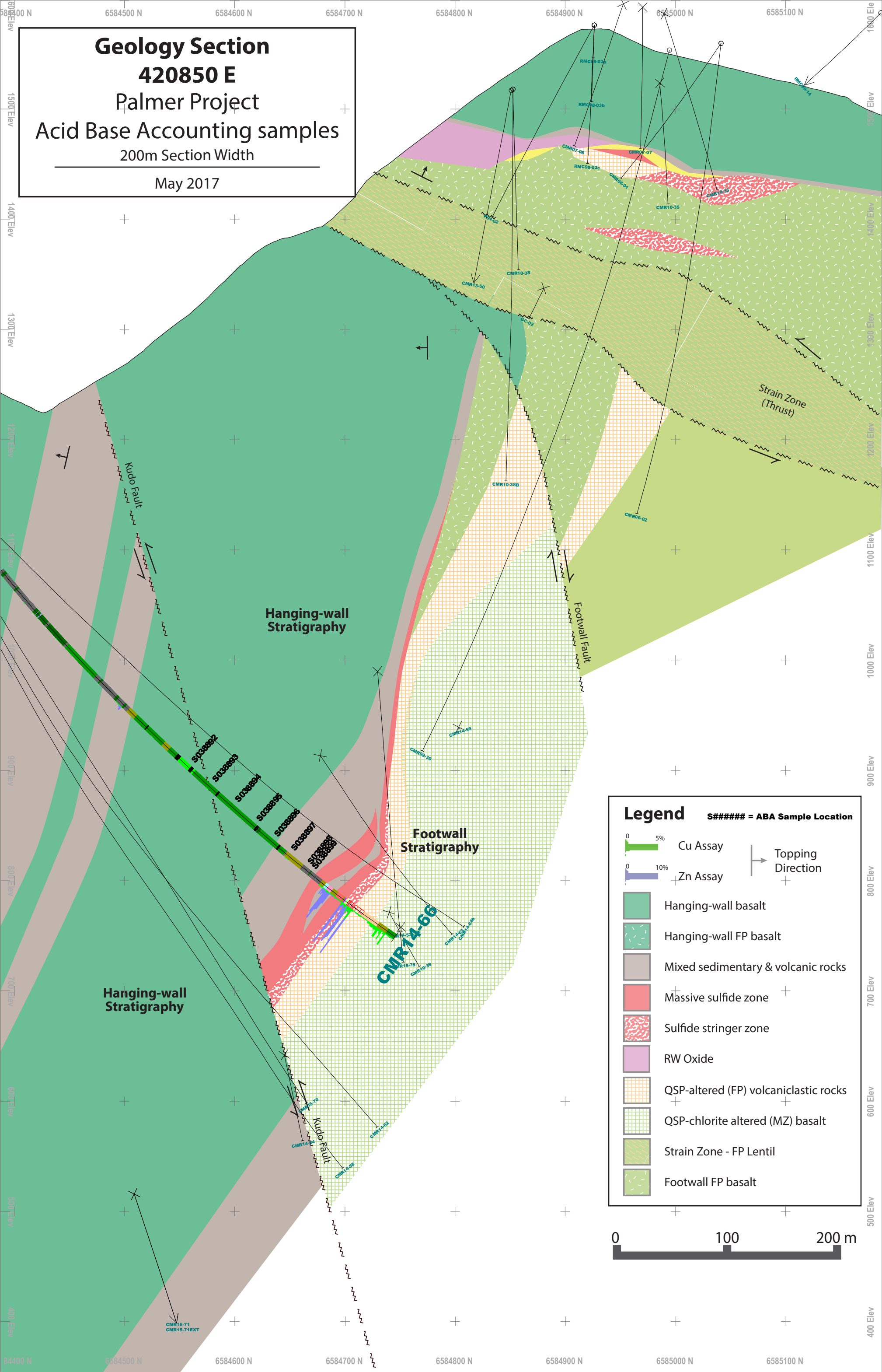
LEGEND

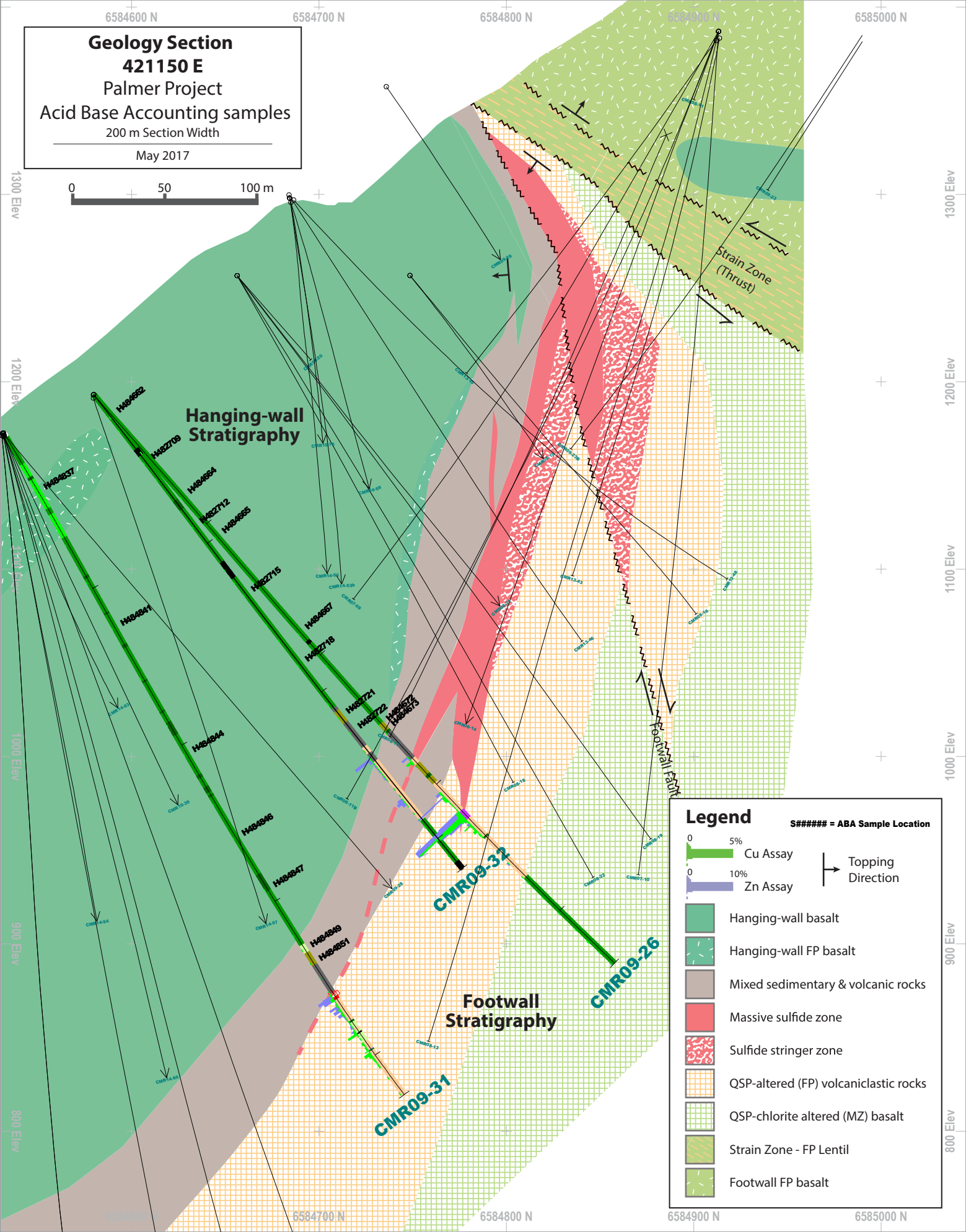
- Semi Massive Sulphide
- MIN Heavy Sulphide/Sulphate
- QSP
- QSP-chl
- Chert
- Argillite
- Argillite Cherty
- Argillite Limey
- Tuffaceous Limestone or Sed/Tuff
- Undifferentiated Seds
- Basalt Massive
- Basalt Amyg
- Basalt Pillow
- Basalt Flow Breccia
- Basalt T
- Basalt LT
- Basalt ALT
- Basalt FP Pillow
- Basalt FP Lentil
- P&G Basalt
- Casing
- Vein
- Fault
- Mafic Dyke
- Diorite
- Gabbro

2016 PALMER PROJECT

Geology Section
420850 E
Palmer Project
Acid Base Accounting samples
200m Section Width

May 2017




Geology Section
421150 E
Palmer Project
Acid Base Accounting samples
200 m Section Width
May 2017
0
50
100 m
6584600 N
6584700 N
6584800 N
6584900 N
6585000 N
1300 Elev
1200 Elev
1100 Elev
1000 Elev
900 Elev
800 Elev
Hanging-wall Stratigraphy
Footwall Stratigraphy
Strain Zone (Thrust)
Footwall Fault
CMR09-31
CMR09-26
CMR09-31
H484652
H482709
H484637
H484654
H482712
H484655
H482715
H484657
H482718
H484841
H482721
H482722
H484672
H484673
H484844
H484846
H484847
H484849
H484851
Legend
S###### = ABA Sample Location
0
5%
Cu Assay
0
10%
Zn Assay
Topping Direction
Hanging-wall basalt
Hanging-wall FP basalt
Mixed sedimentary & volcanic rocks
Massive sulfide zone
Sulfide stringer zone
QSP-altered (FP) volcaniclastic rocks
QSP-chlorite altered (MZ) basalt
Strain Zone - FP Lentil
Footwall FP basalt

APPENDIX B: SAMPLE DESCRIPTIONS

APPENDIX B.1: PRE-2017 SAMPLE DESCRIPTIONS

Appendix B.1. Pre-2017 Samples - Hanging Wall Sample Descriptions, Palmer Project

hole_id	from_m	to_m	length	sample ID	rocktype[1]	rcolor[2]	Ca-Vns (%)	Ca-amygs (%)	Ca-perv (%)	Carb %	Py (%)	Po (%)	Sph (%)	Cpy (%)	Other (%)	Total Sx %
CMR14-66	456	456.8	0.8	S038892	BFP (Pill-Amyg?) (ser)	47	1	2	5	12	0.01					0.01
CMR14-66	482	483	1.0	S038893	B Pill (ep) ((mt,MnCarb))	32	5	0	0.5	5.5	0.01					0.01
CMR14-66	509.8	510.8	1.0	S038894	B Pill ep ((mt,piedm))	32	0.5	0	1	1.5	0.1					0.1
CMR14-66	536.1	537.1	1.0	S038895	B Pill ep ((mt,piedm))	32	1	0	1	2	0.1					0.1
CMR14-66	557.6	558.7	1.1	S038896	B Pill-Amyg (ep) (mag)	33	1	0	0.5	1.5	0.1					0.1
CMR14-66	577.7	578.7	1.0	S038897	Sed/Tuff bio chl (polylith ALT)	65	0.1	0	0	0.1	0.1	1				1.1
CMR14-66	597.4	598.2	0.8	S038898	Arg Limy ((sed/tuff))	64	0	0	10	10	1	0.1				1.1
CMR09-31	37.1	38.4	1.3	H484837	Ep/Rhod pill-amyg Chunky FP	47	1		10	11	0.01					0.01
CMR09-31	124.3	125.2	0.9	H484841	Mag,Ep/Rhod/Chl, pill-(amy) Bas	33	3			3	0.1					0.1
CMR09-31	204.8	206.2	1.4	H484844	Mag,Ep/Rhod/Chl, pill-(amy) Bas	33	5		10	15	0.01					0.01
CMR09-31	258.5	259.6	1.1	H484846	Mag,Ep/Chl, pill-(amy) Bas (Bx)	33	15			15	0.1					0.1
CMR09-31	291.3	292.6	1.3	H484847	Dyke mafic (bc)	80	2			2	0.1					0.1
CMR09-31	330.1	331.3	1.2	H484849	Basalt amyg (MZ?)	42	1	10	10	21	0.1					0.1
CMR09-31	338.9	339.8	0.9	H484851	Limey Tuff, Bas ALT	65	1		15	16						0
CMR09-26	15.8	17.3	1.5	H484662	Ep, Rhod mag Bas pill ((amyg))	32	1			1	0.1					0.1
CMR09-26	78.3	79.8	1.5	H484664	Ep, Rhod mag pill-amyg Bas	33	5	5	2	12	0.05					0.05
CMR09-26	108.8	110.3	1.5	H484665	Ep, Rhod mag pill-amyg Bas	33	2	2		4	0.01					0.01
CMR09-26	182	183.4	1.4	H484667	Ep Rhod mag Pill Bas ((amyg))	32	1			1	0.1					0.1
CMR09-26	252.6	253.5	0.9	H484672	Tuffaceous Limestone	65			>50	>50						0
CMR09-26	256.6	257.7	1.1	H484673	Layered amyg Bas LTA	37	1	1	3	5	0.01					0.01
CMR09-32	45.1	46.3	1.2	H482709	brkn Ep Rhodo Basalt pill	32	5			5						0
CMR09-32	87.7	89.3	1.6	H482712	(ep rhodo) Basalt pill-amyg	33	1	5	10	16						0
CMR09-32	133.5	134.7	1.2	H482715	Basalt pill (jsp mt ep rhodo)	32	1		2	3	0.5					0.5
CMR09-32	180.4	181.9	1.5	H482718	fg Basalt msv w Min QVs	30	1		1	2	0.1	0.1				0.2
CMR09-32	216.1	217.6	1.5	H482721	Basalt (amyg) AT	37			3	3		1				1
CMR09-32	226.1	227.6	1.5	H482722	Argillite limey w tr sx	64	1		>70	>70	2	3				5
GT16-03	4.6	5.1	0.5	S038816	B Amyg (FeCarb)	31	1	1	15	17	0.01					0.01
GT16-03	31.7	32.2	0.5	S038817	Gabbro dyke ep	83	1		1	2	0.01					0.01
GT16-03	59.2	59.7	0.5	S038818	B Pill cave (ep hem)	32	1		1	2	0.01					0.01
GT16-03	90	90.5	0.5	S038819	B Pill (bleach) ((hem))	32	1.25		0.5	1.75	0.07					0.07
GT16-03	120	120.5	0.5	S038821	B Pill bleach ep (hem)	32	0.5		0.5	1	0.01					0.01
GT16-03B	134.2	134.8	0.6	S038823	B Pill (chl>ep)	32	1.5	0.02	1.5	3.02	0.01					0.01
GT16-03B	164	164.5	0.5	S038824	B Pill (chl>ep)	32	2.5		2	4.5	0.03					0.03
GT16-03B	172.3	172.8	0.5	S038825	Dyke Maf	80	1.5		3	4.5	0.3					0.3
GT16-03B	190.4	190.9	0.5	S038826	B Pill (chl>ep) (rhodo)	32	2		2.25	4.25	0.5					0.5
GT16-03B	207.7	208.2	0.5	S038827	B Pill-Amyg (Tuff limy)	33	0.5		50	50.5	0.05					0.05
GT16-03B	222.5	223	0.5	S038828	B Pill-Amyg ((Ep/FeCarb))	33	4	10	2	16	0.05					0.05
GT16-03B	239.5	240.7	1.2	S038829	Fault blch stg Ca/FeCarb	7	10		50	60	0.01					0.01
GT16-03B	262	262.5	0.5	S038831	B Pill-Amyg (cal)	33	1.5	0.5	1	3	0.01					0.01
GT16-03B	266	266.5	0.5	S038832	Tuff Limstn (mag) ((po))	65	1	0.5	55	56.5	0.05	0.5				0.55
GT16-03B	273.2	273.8	0.6	S038834	B Pill (mag)	32	0.5		2		0.03					0.03
CMR14-61b	40	40.5	0.5	Q153816	Arg Limy	64										
CMR14-61b	68.8	70.1	1.3	Q153825	Faulted limey BT (po) (bio)	7										
CMR14-61b	108.3	108.8	0.5	Q153831	B Pill-Amyg sil (ep) (mt)	33										
CMR14-61b	140.8	141.3	0.5	Q153834	Arg Limy+bio-tuff beds/sills?	64										
CMR14-61b	169.3	169.8	0.5	Q153837	BFP amyg amph dyke? bio?	43										
CMR14-61b	193.9	194.9	1	Q153838	B Pill-Amyg	33										
GT16-02	15	16	1.0	S038882	B Pill-Amyg (chl, carb)	33	0	1	2	3	0.1					0.1
GT16-02	64	65	1.0	S038889	B Pill-Amyg (chl, carb)	33	1	5	1	7	0.1					0.1
CMR15-76	66.7	67	0.3	S037434	B Msv-FLTd ((amyg))	30										
CMR15-76	90.3	90.5	0.2	S037435	Dyke FHP	83										
CMR15-76	122	122.4	0.4	S037436	B Msv FLTd mag	30										
CMR15-76	152	152.4	0.4	S037437	FLT/Bx/gg (mag) (B Msv?)	7										
CMR15-76	169	169.4	0.4	S037438	B Msv-FLTd mag ((ep))	30										
CMR15-76	187.1	187.5	0.4	S037439	B Msv + Maf Dykes 50%	30										
CMR15-76	218.9	219.3	0.4	S037441	B Amyg ((rho))	31										
CMR15-76	249.2	249.6	0.4	S037442	B Pill ((amyg)) ep rho pied	32										
CMR15-76	275.2	275.7	0.5	S037443	B Amyg	31										
CMR15-76	310.4	310.8	0.4	S037444	B Amyg	31										

Appendix B.1. Pre-2017 Samples - Hanging Wall Sample Descriptions, Palmer Project

hole_id	from_m	to_m	length	sample ID	rocktype[1]	rcolor[2]	Ca-Vns (%)	Ca-amygs (%)	Ca-perv (%)	Carb %	Py (%)	Po (%)	Sph (%)	Cpy (%)	Other (%)	Total Sx %
CMR15-76	330.9	331.3	0.4	S037445	B Amyg (hem fracs (py))	31										
CMR15-76	344.7	345	0.3	S037447	B (Amyg) (sph?)	31										
CMR15-76	367.7	368.2	0.5	S037449	Fault-Bleached ((fuch)) SH 30°	7										
CMR15-76	428.3	428.7	0.4	S037452	B Amyg ((py po))	31										
GT14-01	160.2	163.7	3.5	Q053904	Fault (B Pill)	7										
GT14-01	181.1	182.6	1.5	Q053906	Fault (B Pill Amyg)	7										
GT14-01	250.1	251.5	1.4	Q053907	B Pill-Amyg (maf-dyke)	33										
GT14-01	43.6	44.3	0.7	Q153964	B Amyg (pill) vuggy	31										
GT14-01	100.1	101.1	1	Q153967	B Pill-(Amyg) brkn (flt'd)	33										
GT14-01	131.7	133.2	1.5	Q153975	Fault (B Amyg) ZnOx	7										
GT14-01	281.3	282.4	1.1	Q153991	B Pill (3% slvdg:ep,hem)((rhodo))	32										
GT14-01	12.1	13.1	1	Q153993	B Amyg (pill)	31										
GT14-01	70	71	1	Q153999	B Amyg (pill) (brkn)	31										

Notes:

[1]Rocktype populated from D_GEOL

[2]Color code populated from D_GEOL (see rcolor legend next page)

Appendix B. Hanging Wall Sample Descriptions, Palmer Project

rcolor legend

rocktype	rcolor
Casing/EOH	0
Vein	4
Fault/Lost Core	7
MS	10
SMS	11
Sx Stringer Zone	12
MBa	15
Oxide Zone	18
QSP altered	20
QSP-chl altered	21
QSP-barite altered	22
Basalt massive	30
Basalt amygdaloidal	31
Basalt pillowed	32
Basalt pill-amyg	33
Basalt flow bx	34
Basalt T	35
Basalt LT	36
Basalt ALT	37
Basalt spherulitic	40
Basalt P&G	41
Basalt MZ	42
Basalt FP massive	43
Basalt FP pillowed	44
Basalt FP flow bx	45
Basalt FP lentil	46
Basalt FP pill-amyg	47
Basalt FP T to ALT	48
Rhyolite	50
Rhyolite amygdaloidal	51
Rhyolite T	52
Rhyolite LT	53
Rhyolite ALT	54
Chert	60
Chert MIN	61
Argillite	62
Argillite cherty	63
Argillite limey	64
Tuffaceous Limestone	65
Conglomerage/debris flow	66
Dyke mafic	80
Dyke rhyolite	81
Dyke fg Diorite	82
Gabbro	83

Color code populated from D_GEOL

APPENDIX B.2: 2017 SAMPLE DESCRIPTIONS

Appendix B.2

2017 ABA Surface Sample Descriptions (Core Geoscience, 2018)

Waypoint Name	Datum	lat (dd.ddddd)	lon (dd.ddddd)	elevation (m)	Comments
S037201	NAD83	59.38307301	-136.383864	777	ABA sample of limey seds. composite rock chip sample from outcrops
S037202	NAD83	59.38346998	-136.383558	750	ABA Sample of limey sed unit. Composite grab from surface outcrops.
S037203	NAD83	59.38362203	-136.383169	740	ABA Sample of limey seds. Outcrop composite rock grab sample. 10 meter wide outcrop exposure up to contact with basalt.
S037204	NAD83	59.38362203	-136.383169	740	ABA Sample of amygdaloidal basalt. Outcrop composite rock grab sample at one of preferred locations for upper laydown/portal Sample collected of 10 meter wide face just downslope from limy seds in sample S037203.
S037205	NAD83	59.38703396	-136.388258	952	Chip composite basalt south of dike
S037206	NAD83	59.38766495	-136.3871743	912	Chip composite basalt going south from cliffed out spot...pillow basalts, effervescent
S037207	NAD83	59.38743596	-136.387552	920	Aba basalt
S037208	NAD83	59.387356	-136.387825	931	Aba dike
S037209	NAD83	59.38734401	-136.387813	932	Grab chip basalt for ABA
S037210	NAD83	59.38949271	-136.3926545	1041	basalt for ABA
S037211	NAD83	59.38929498	-136.392664		basalt for ABA
S037212	NAD83	59.38914503	-136.3924113		basalt, effervesces in hcl, amygdaloidal, for ABA
S037213	NAD83	59.38883289	-136.3922049		o/c basalt grab chip for ABA
S037214	NAD83	59.38872401	-136.392306		o/c coarse quartz-bearing dike cutting basalt flows. trends 245/90. Potentially q-diorite or q-monzonite. Atypical for dikes seen in hw basalt to date. Collected for ABA, Specimen given to Nathan for thin section.
S037215	NAD83	59.38872401	-136.392306		o/c basalt - pillowed south from contact with the q-bearing coarse grained dike of S037214
end of S037216	NAD83	59.39121796	-136.392155	1151	Uphill north end of sample S037216
S037216	NAD83	59.39146397	-136.391968	1128	ABA basalt sample near green pad
S037217	NAD83	59.390808	-136.394179	1243	ABA basalt sample near green pad

Appendix B.2

2017 ABA Core Sample Descriptions (Core Geoscience, 2018)

Sample #	Hole ID	Rock Type	from (m)	to (m)	Ca-vns (%)	Ca-amygs (%)	Ca-perv (%)	Carb %	Py (%)	Total Sx %	Comments
S037977	GT17-05	HWBasalt	2	2.5	3.00	2.00	9.00	14.00	0.25	0.25	Perv carb in groundmass (mod/3), Ca-carb vns+amygs, tr.diss.py grains,wk-mod FeOx stains on fracts. Unit also contains zones of chlorite enrichment, none of which included within this sample.
S037978	GT17-05	HWGabbro Dyke	32	32.6	6.00	0.00	22.00	28.00	0.50	0.50	Ca-carb constitutes ~22% of groundmass between abundant pyroxenes and remainder of chlorite-rich groundmass. 1x calcite vein from 1-11mm thick, which stretches across nearly entire length of sample.
S037979	GT17-05	HWBasalt	63.3	63.8	4.00	1.00	3.00	8.00	0.10	0.10	Representative sample, except for zones of chlorite enrichment which exist throughout unit. Groundmass lightly Ca-carb rich locally, v.thin calcite veins+few amygs.
S037981	GT17-05	HWBasalt	90.8	91.3	1.00	6.00	2.00	9.00	0.10	0.10	Amygdaloidal basalt with w/small amygs+few thin CaCarb veins. Very trace disseminated pyrite.
S037982	GT17-05	HWBasalt	118.5	119	3.00	4.00	1.00	8.00	0.25	0.25	Amygdaloidal basalt with w/small amygs+few thin CaCarb veins. Very trace disseminated pyrite.
S037983	GT17-05	HWBasalt	151.5	152	0.00	0.50	0.50	1.00	0.10	0.10	Chlorite-rich basalt with few, extremely thin CaCarb veins, and v.lightly CaCarb-rich groundmass,patchy. Very trace pyrite.
S037984	GT17-05	HWBasalt	180.3	180.8	1.50	0.00	0.00	1.50	0.75	0.75	Chlorite and epidote-rich basalt, with minor CaCarb veins
S037985	GT17-05	HWBasalt	208.3	208.8	3.00	0.00	30.00	33.00	0.10	0.10	Moderate CaCarb rich groundmass, few veins, no amygs. Trace amounts of disseminated pyrite.
S037986	GT17-05	HWBasalt	238.8	239.3	1.50	1.50	10.00	13.00	0.10	0.10	Spotty zones of CaCarb rich groundmass, few v.small CaCarb amygs and veins. Tr pyrite.
S037987	GT17-05	HWBasalt	270	270.5	4.00	0.00	45.00	49.00	0.10	0.10	Strongly CaCarb rich groundmass, significant Ca Carb veins, v.trace pyrite.
S037988	GT17-05	HWBasalt	291.6	292.1	1.00	0.00	35.00	36.00	0.10	0.10	Strongly CaCarb rich groundmass, few CaCarb veins, tr. Pyrite.
S037989	GT17-06	HWBasalt	5.9	6.4	5.00	0.50	3.00	8.50	0.30	0.30	Weakly amygdaloidal basalt crosscut by sporadic 0.2-14mm CV's
S037991	GT17-06	HWBasalt	28.9	29.4	6.00	0.50	1.00	7.50	0.50	0.30	Weakly amygdaloidal basalt w/weak-mod chlorite alt+abundant webby CV's, and finely dissem. pyrite.
S037992	GT17-06	HWBasalt	40.8	41.3	55.00	0.80	5.00	60.00	0.30	0.30	Intensely rhodocrosite veined amygdaloidal basalt with 4% void space. Rhod veining present from 40.6-43.6m. Sample includes 60% rhod and 36% b amyg wallrock.
S037993	GT17-06	HWBasalt	59.4	59.9	0.80	5.00	3.00	8.50	0.30	0.30	Weak-moderately chlorite altered frothy amygdaloidal basalt with occasional 0.1-5mm QCV's and fine-medium grained weakly dissem. Pyrite
S037994	GT17-06	HWBasalt	85.3	85.8	1.50	5.00	3.00	9.50	0.10	0.10	Weak-moderately chlorite altered frothy amygdaloidal basalt with occasional 0.1-5mm QCV's and trace fine grained dissem. Pyrite
S037995	GT17-06	HWMafic Dyke	108.9	109.4	1.00	0.00	50.00	51.00	1.50	1.50	Strongly CaCarb altered weakly faulted mafic dyke or alt'd B amyg with frac fil FeCarb and vfg-fg dissem. Pyrite.
S037996	GT17-06	HWBasalt	135.3	135.8	6.00	3.00	2.00	11.00	0.10	0.10	Very weakly foliated chloritic amygdaloidal basalt crosscut by qtz+calcite veins with trace vfg dissem. Pyrite.
S037997	GT17-06	HWMafic Dyke	154.3	154.8	0.80	0.00	18.00	18.80	0.50	0.50	Massive fine grained moderately carbonate altered mafic-dyke crosscut by 0.5-2mm quartz-carbonate-pyrite veins with weakly disseminated fg pyrite.

Appendix B.2

2017 ABA Core Sample Descriptions (Core Geoscience, 2018)

Sample #	Hole ID	Rock Type	from (m)	to (m)	Ca-vns (%)	Ca-amygs (%)	Ca-perv (%)	Carb %	Py (%)	Total Sx %	Comments
S037998	GT17-06	HWBasalt	181.3	181.8	0.50	10.00	18.00	28.50	0.10	0.10	Very weakly foliated frothy amygdaloidal basalt with pervasive mod cacarb alt and weak chlorite alt. Contains fg dissem. Magnetite and trace dissem. Pyrite.
S037999	GT17-06	HWBasalt	206	206.5	1.00	8.00	4.00	13.00	0.80	0.80	Weakly foliated frothy chloritic amygdaloidal basalt with weak pervasive cacarb alt. Containsfg dissem. Pyrite.
S038000	GT17-06	HWBasalt	230.5	231	2.00	3.50	7.00	12.50	0.10	0.10	Weakly foliated chloritic variably amygdaloidal basalt crosscut by calcite veinlets with weak perv CaCarb alt. Trace dissem. Pyrite.
W422041	CMR14-66	HWBasalt	40.5	41	1.00	4.00	0.00	5.00	0.25	0.25	Only rxn to HCl from vns+amygs; representative
W422042	CMR14-66	HWBasalt	70	70.5	2.00	0.00	6.00	8.00	0.10	0.10	Patchy rxn to HCl via alt of select grains,few v.thin veinlets,ep alt of groundmass
W422043	CMR14-66	HWBasalt	104.2	104.7	1.50	0.00	20.00	21.50	0.10	0.10	Same as 042 except for lesser ep alt
W422044	CMR14-66	HWBasalt	130	130.5	2.00	0.00	15.00	17.00	0.10	0.10	Faulted/broken sample,mod-str rxn to HCl
W422045	CMR14-66	HWBasalt	165.5	166	0.25	0.00	0.00	0.25	0.00	0.00	Faulted/broken sample,no rxn to HCl
W422046	CMR14-66	HWArgillite	193	193.5	2.00	0.00	40.00	42.00	2.00	2.00	Perv mod-str rxn in argillite+v.thin veinlets;cubic pyrite
W422047	CMR14-66	HWBasalt	215	215.5	3.00	0.00	6.00	9.00	1.00	1.00	Weak rxn to HCl via v.thin veinlets
W422048	CMR14-66	HWArgillite	235	235.5	4.00	0.00	20.00	24.00	2.00	2.00	Same as 046 except for more veins
W422049	CMR14-66	HWArgillite	255	255.5	2.00	0.00	20.00	22.00	0.50	0.50	Same as 046
W422051	CMR14-66	HWBasalt	270.5	271	4.00	4.00	35.00	43.00	0.10	0.10	Mod-str rxn to HCl via abund v.thin veinlets; also 1x large cal vein
W422052	CMR14-66	HWBasalt	303	303.5	2.00	6.00	25.00	33.00	0.10	0.10	Str rxn to HCl in groundmass w/apparent amygs
W422053	CMR14-66	HWBasalt	332.5	333	1.00	1.00	15.00	17.00	0.10	0.10	mod rxn, thin veinlets
W422054	CMR14-66	HWBasalt	345.5	346	1.00	0.00	15.00	16.00	0.10	0.10	wk rxn, abun v.thin veinlets
W422055	CMR14-66	HWArgillite	358.5	359	2.00	0.00	30.00	32.00	1.00	1.00	representative argillite w/ mod-str rxn to HCl perv
W422056	CMR14-66	HWBasalt	389	389.5	8.00	0.00	20.00	28.00	0.50	0.50	abund cal veins thin+thick, mod rxn within groundmass
W422057	CMR14-66	HWBasalt	412	412.5	3.00	0.00	0.00	3.00	2.00	2.00	only rxn to HCl from vns; representative; cubic pyrite
W422058	CMR14-66	HWArgillite	428.5	429	15.00	0.00	40.00	55.00	0.50	0.50	very thick cal veins
wk	weak										
rxn	reaction										
Ca	carbonate										
HW	hangingwall										
HCL	hydrochloric acid										
amygs	amygdules										
vns	veins										
perv	pervasive										
Sx	sulfide										
str	strong										
abun	abundant										
ep	epidote										

APPENDIX B.3: FIELD BARREL SAMPLE COMPOSITE MAKEUP

Appendix B.3

DESCRIPTIVE DATA FOR 2017 FIELD KINETIC (BARREL) TEST SAMPLES (CORE GEOSCIENCE, 2018)

Barrel 1					
Hole ID	from	to	Hole ID	from	to
Hole GT17-05 (meters)			Hole GT17-07 (meters)		
HQ	3.4	4.4	HQ	0.7	1.7
HQ	18.8	19.8	HQ	17.1	18.1
HQ	34.9	35.9	HQ	33.9	34.9
HQ	51.4	52.4	HQ	50.5	51.5
HQ	67.2	68.2	HQ	66.3	67.3
HQ	83.3	84.3	HQ	83.0	84.0
HQ	100.3	101.3	HQ	99.9	100.9
HQ	115.5	116.5	HQ	116.0	117.0
HQ	132.7	133.7	HQ	133.1	134.1
HQ	149.0	150.0	HQ	149.0	150.0
HQ	166.5	167.5	HQ	164.7	165.7
HQ	183.1	184.1	HQ	182.0	183.0
HQ	200.9	201.9	HQ	200.9	201.9
HQ	215.6	216.6	HQ	217.3	218.3
HQ	231.6	232.6	HQ	231.4	232.4
HQ	247.2	248.2	HQ	250.0	251.0
HQ	263.8	264.8			
HQ	279.6	280.6	Hole 14-66 (m)		
			HQ	17.4	18.4
			HQ	33.0	34.0
			HQ	49.0	50.0
			HQ	66.8	67.8
			HQ	82.0	83.0
			HQ	98.3	99.3

Barrel 2					
Hole ID	from	to		from	to
Hole 14-66 (meters)					
HQ	181.5	182.5	HQ	229.8	230.8
HQ	184.6	185.6	HQ	234.3	235.3
HQ	187.5	188.5	HQ	237.1	238.1
HQ	190.2	191.2	HQ	239.5	240.5
HQ	193.5	194.5	HQ	242.5	243.5
HQ	196.0	197.0	HQ	243.5	251.2
HQ	199.0	200.0	HQ	252.7	257.3
HQ	202.4	203.4	HQ	258.8	259.8
HQ	205.4	206.4	HQ	266.0	267.0
HQ	208.5	209.5	HQ	268.5	269.5
HQ	211.5	212.5	HQ	274.2	276.2
HQ	214.6	215.8	HQ	279.0	280.0
HQ	217.6	219.2	HQ	281.6	282.6
HQ	220.7	221.7	HQ	287.4	288.4
HQ	223.7	224.7	HQ	294.6	295.6
HQ	226.8	227.8			

Barrel 3					
Hole ID	from	to		from	to
Hole 09-31 (feet)					
HQ	32.0	35.0	NQ	469.0	473.5
HQ	55.0	58.0	NQ	492.0	496.5
HQ	78.0	81.0	NQ	519.5	524.0
HQ	101.0	104.0	NQ	547.0	551.5
HQ	124.0	127.0	NQ	574.0	578.5
HQ	147.0	150.0	NQ	601.5	606.0
HQ	170.0	173.0	NQ	628.0	632.5
HQ	193.0	196.0	NQ	651.0	655.5
HQ	216.0	219.0	NQ	674.0	679.5
HQ	240.0	243.0	NQ	697.0	701.5
HQ	263.0	266.0	NQ	720.0	724.5
HQ	286.0	289.0	NQ	743.0	747.5
NQ	309.0	313.5	NQ	766.0	770.5
NQ	331.0	335.5	NQ	789.0	793.5
NQ	345.1	348.1	NQ	812.0	816.5
NQ	355.9	357.4	NQ	835.0	839.5
NQ	379.0	383.5	NQ	858.0	862.5
NQ	405.0	409.5	NQ	881.0	885.5
NQ	423.0	427.5	NQ	904.0	908.5
NQ	446.0	450.5			

APPENDIX C: GRAPHIC GEOLOGICAL LOGS

LEGEND FOR DRILL LOGS

LEGEND

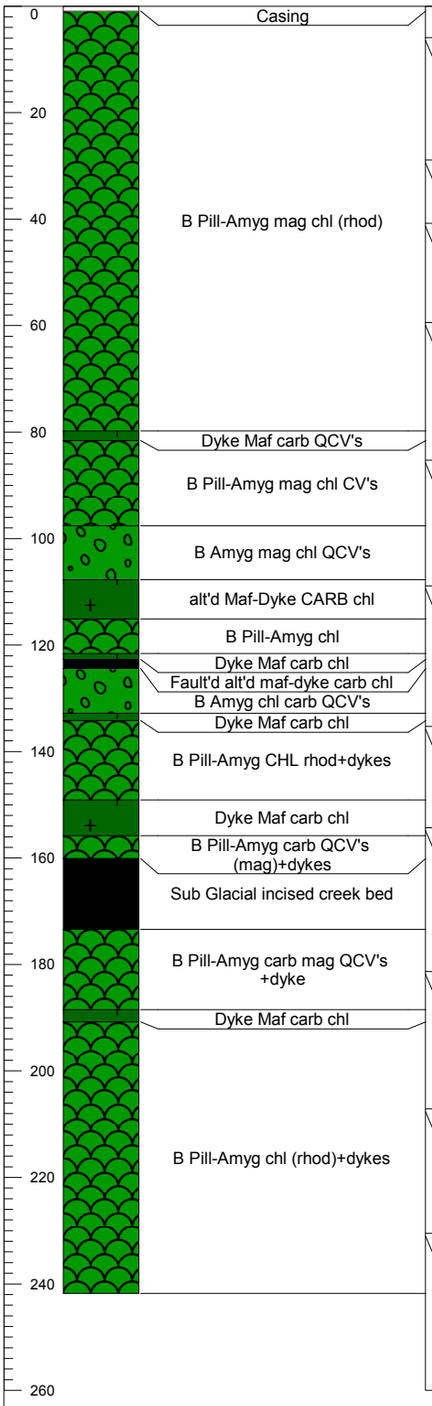
- Semi Massive Sulphide
- MIN Heavy Sulphide/Sulphate
- QSP
- QSP-chl
- Chert
- Argillite
- Argillite Cherty
- Argillite Limey
- Tuffaceous Limestone or Sed/Tuff
- Undifferentiated Seds
- Basalt Massive
- Basalt Amyg
- Basalt Pillow
- Basalt Flow Breccia
- Basalt T
- Basalt LT
- Basalt ALT
- Basalt FP Pillow
- Basalt FP Lentil
- P&G Basalt
- Casing
- Vein
- Fault
- Mafic Dyke
- Diorite
- Gabbro

2016 PALMER PROJECT

GT17-06

Lithology, Carbonates, Sulphides & ABA Assay Values

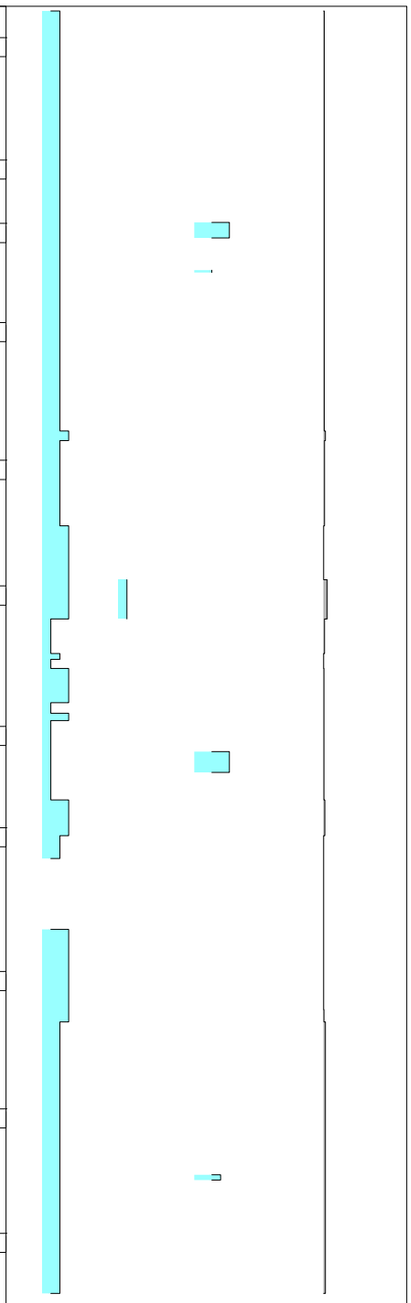
EOH (m): 291.96	Area: Glacier Creek	Easting NAD27: 421390.726	Drilled by: Hy-Tech	Logged by: Owen Brown
Property: Palmer	Elevation (m): 819.087	Northing NAD27: 6583383.197	Dates: 8jul17 to 13jul17	



Rocktype
Casing
B Pill-Amyg mag chl (rhod)
Dyke Maf carb QCV's
B Pill-Amyg mag chl CV's
B Amyg mag chl QCV's
alt'd Maf-Dyke CARB chl
B Pill-Amyg chl
Dyke Maf carb chl
Fault'd alt'd maf-dyke carb chl
B Amyg chl carb QCV's
Dyke Maf carb chl
B Pill-Amyg CHL rhod+dykes
Dyke Maf carb chl
B Pill-Amyg carb QCV's (mag)+dykes
Sub Glacial incised creek bed
B Pill-Amyg carb mag QCV's +dyke
Dyke Maf carb chl
B Pill-Amyg chl (rhod)+dykes

ABA Assay Values

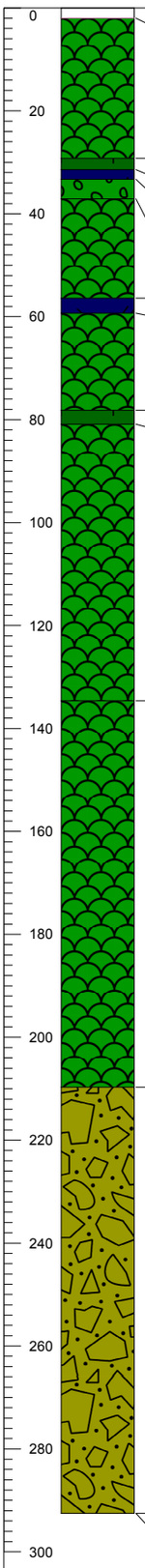
Sample ID	From	To	NP	MPA	NNP	NP/ MPA
S037989	5.90	6.40	137.00	5.60	131.00	24.36
S037991	28.90	29.40	135.00	3.80	131.00	36.00
S037992	40.80	41.30	617.00	10.00	607.00	61.70
S037993	59.40	59.90	137.00	0.60	136.00	219.20
S037994	85.30	85.80	163.00	2.80	160.00	57.96
S037995	108.90	109.40	61.00	8.80	52.00	6.97
S037996	135.30	135.80	153.00	1.90	151.00	81.60
S037997	154.30	154.80	86.00	17.50	69.00	4.91
S037998	181.30	181.80	350.00	2.20	348.00	160.00
S037999	207.10	207.60	223.00	7.20	216.00	31.03
S038000	230.50	231.00	121.00	2.50	119.00	48.40



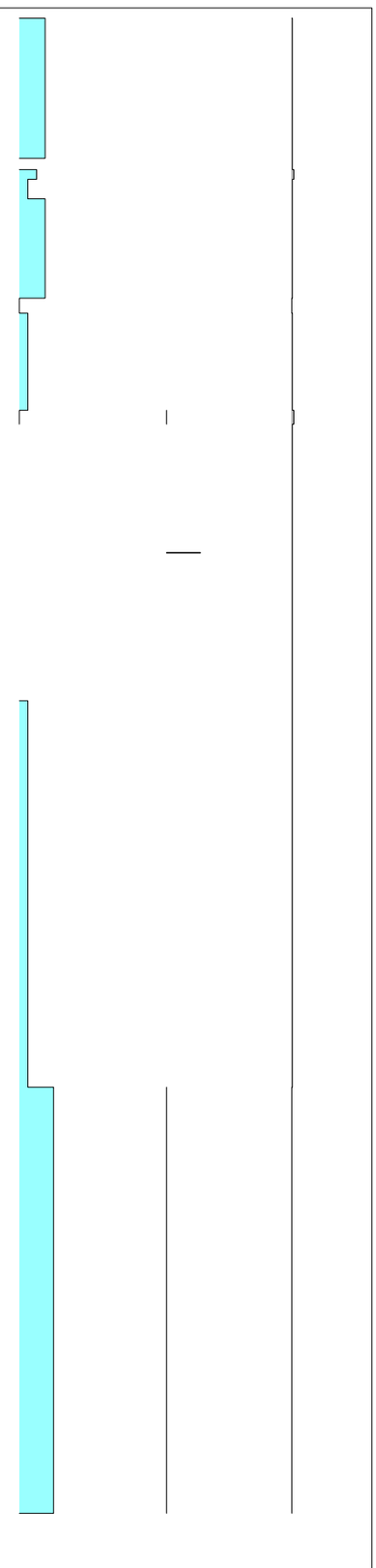
GT17-05

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 334.13	Area: Glacier Creek	Easting NAD27: 421259.286	Drilled by: Hy-Tech	Logged by: Owen Brown
Property: Palmer	Elevation (m): 899.253	Northing NAD27: 6583718.003	Dates: 23jun17 to 8jul16	



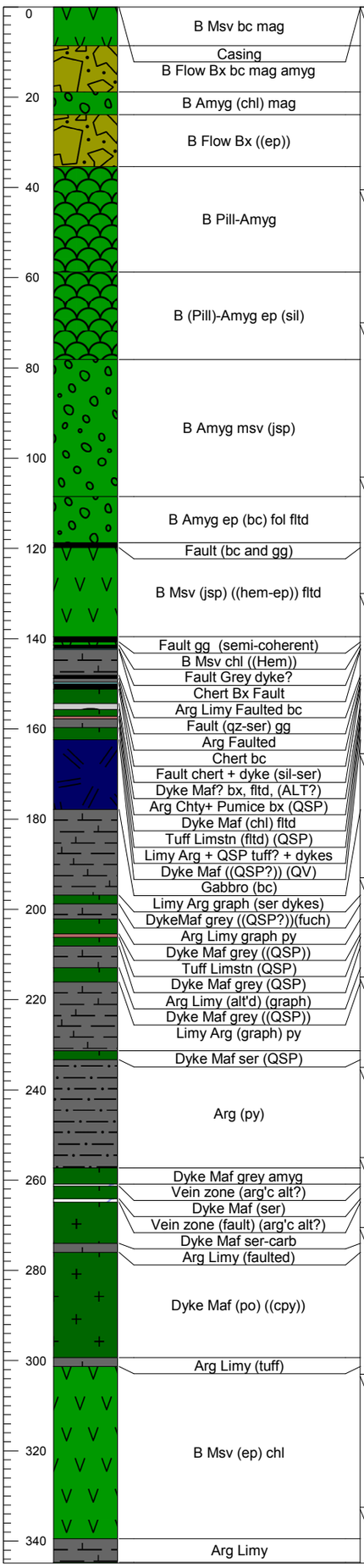
Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA
Casing	S037977	2.00	2.50	92.00	2.80	89.00	32.71
B Pill-Amyg mag chl (ep)							
Dyke Maf chl ep							
Gabbro px (dyke?)	S037978	32.00	32.60	88.00	6.90	81.00	12.80
B Amyg mag ep (horblende-dyke)							
B Pill-Amyg mag chl (ep)							
Dyke FHP Faulted							
B Pill-Amyg mag chl (ep)	S037979	63.30	63.80	88.00	2.80	85.00	31.29
Dyke Maf chl (ep)							
B Pill-Amyg mag chl ep	S037981	90.80	91.30	44.00	0.60	43.00	70.40
	S037982	118.50	119.00	36.00	0.30	36.00	230.40
B Pill?-Amyg Ep mag (chl)	S037983	151.50	152.00	24.00	5.30	19.00	4.52
	S037984	180.30	180.80	42.00	5.90	36.00	7.07
B ALT chl (ep)	S037985	208.30	208.80	111.00	6.30	105.00	17.76
	S037986	238.80	239.30	84.00	5.00	79.00	16.80
	S037987	270.00	270.50	142.00	3.10	139.00	45.44
EOH	S037988	291.60	292.10	95.00	3.80	91.00	25.33



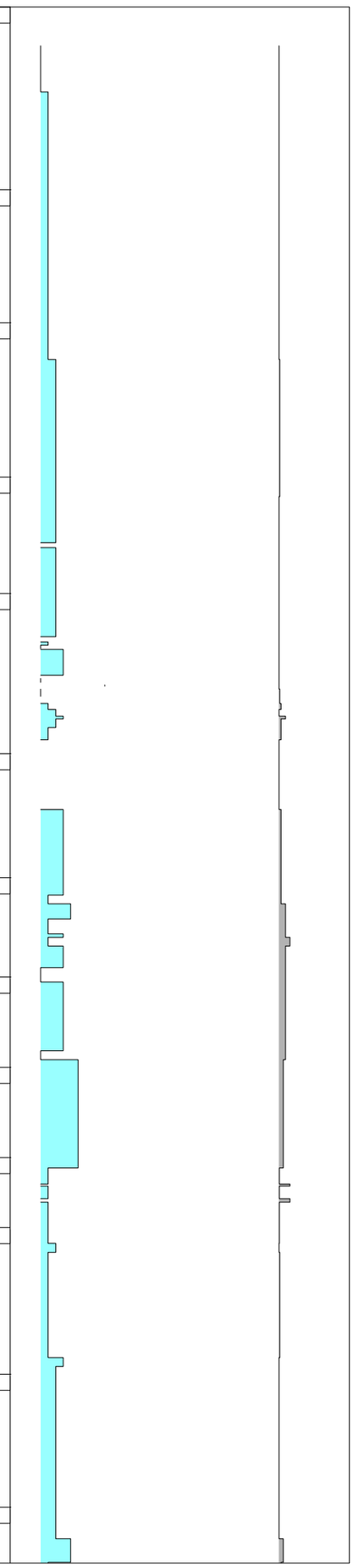
CMR14-66

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 346.92	Area: Glacier Creek	Easting NAD27: 420926.62	Drilled by: First Drilling	Logged by: Nathan Steeves and Conor McKinley
Property: Palmer	Elevation (m): 1244.49	Northing NAD27: 6584244.98	Dates: 04sept2014 to 30sept2014	



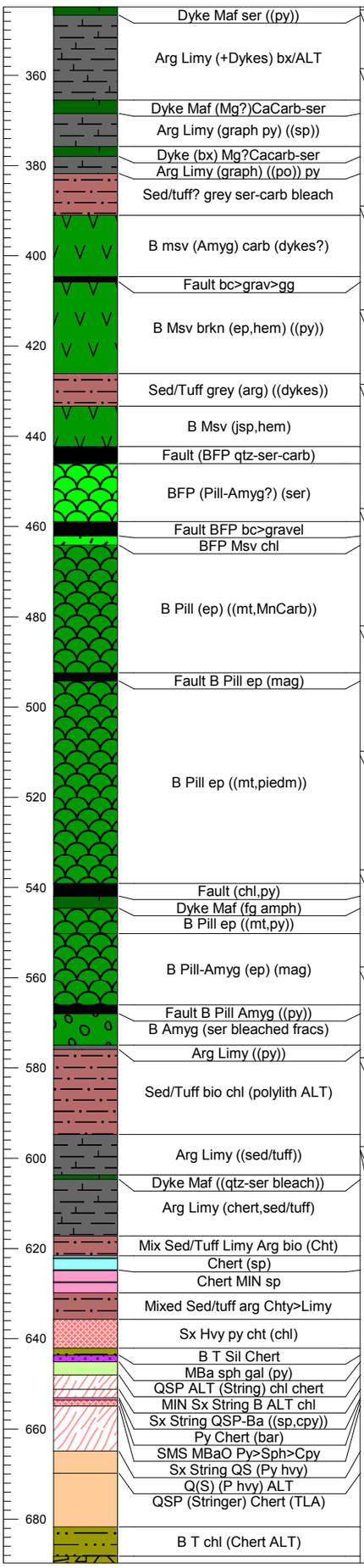
Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA
B Msv bc mag	W422050	0.00	0.00	6.00	0.90	5.00	6.40
Casing							
B Flow Bx bc mag amyg							
B Amyg (chl) mag							
B Flow Bx ((ep))							
B Pill-Amyg	W422041	40.50	41.00	94.00	6.60	87.00	14.32
B (Pill)-Amyg ep (sil)	W422042	70.00	70.50	85.00	4.70	80.00	18.13
B Amyg msv (jsp)	W422043	104.20	104.70	136.00	3.80	132.00	36.27
B Amyg ep (bc) fol fltd							
Fault (bc and gg)							
B Msv (jsp) ((hem-ep)) fltd	W422044	130.00	130.50	129.00	3.10	126.00	41.28
Fault gg (semi-coherent)							
B Msv chl ((Hem))							
Fault Grey dyke?							
Chert Bx Fault							
Arg Limy Faulted bc							
Fault (qz-ser) gg							
Arg Faulted							
Chert bc	W422045	165.50	166.00	29.00	2.50	27.00	11.60
Fault chert + dyke (sil-ser)							
Dyke Maf? bx, fltd, (ALT?)							
Arg Chty+ Pumice bx (QSP)							
Dyke Maf (chl) fltd							
Tuff Limstn (fltd) (QSP)							
Limy Arg + QSP tuff? + dykes							
Dyke Maf ((QSP?)) (QV)							
Gabbro (bc)	W422046	193.00	193.50	486.00	13.80	472.00	35.35
Limy Arg graph (ser dykes)							
DykeMaf grey ((QSP?))(fuch)							
Arg Limy graph py							
Dyke Maf grey ((QSP))							
Tuff Limstn (QSP)							
Dyke Maf grey (QSP)	W422047	215.00	215.50	170.00	33.10	137.00	5.13
Arg Limy (alt'd) (graph)							
Dyke Maf grey ((QSP))							
Limy Arg (graph) py							
Dyke Maf ser (QSP)							
Arg (py)	W422048	235.00	235.50	631.00	20.60	610.00	30.59
Dyke Maf grey amyg	W422049	255.00	255.50	651.00	17.20	634.00	37.88
Vein zone (arg'c alt?)							
Dyke Maf (ser)							
Vein zone (fault) (arg'c alt?)							
Dyke Maf ser-carb	W422051	270.50	271.00	201.00	4.70	196.00	42.88
Arg Limy (faulted)							
Dyke Maf (po) ((cpy))							
Arg Limy (tuff)							
B Msv (ep) chl	W422052	303.00	303.50	244.00	6.60	237.00	37.18
	W422053	332.50	333.00	147.00	1.60	145.00	94.08
Arg Limy							



CMR14-66

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 346.92	Area: Glacier Creek	Easting NAD27: 420926.62	Drilled by: First Drilling	Logged by: Nathan Steeves and Conor McKinley
Property: Palmer	Elevation (m): 1244.49	Northing NAD27: 6584244.98	Dates: 04sept2014 to 30sept2014	

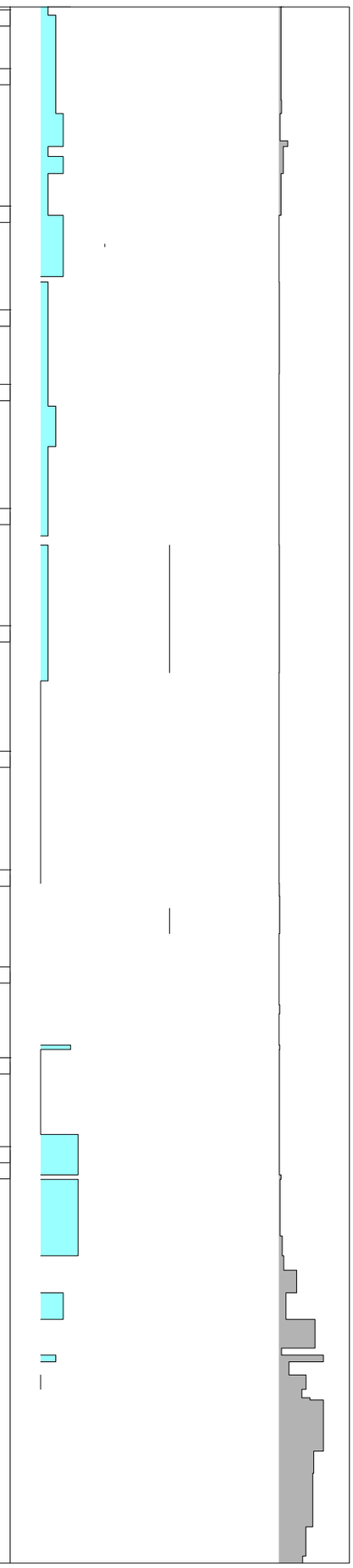


Rocktype

Dyke Maf ser ((py))
Arg Limy (+Dykes) bx/ALT
Dyke Maf (Mg?)CaCarb-ser
Arg Limy (graph py) ((sp))
Dyke (bx) Mg?Cacarb-ser
Arg Limy (graph) ((po)) py
Sed/tuff? grey ser-carb bleach
B msv (Amyg) carb (dykes?)
Fault bc>grav>gg
B Msv brkn (ep,hem) ((py))
Sed/Tuff grey (arg) ((dykes))
B Msv (jsp,hem)
Fault (BFP qtz-ser-carb)
BFP (Pill-Amyg?) (ser)
Fault BFP bc>gravel
BFP Msv chl
B Pill (ep) ((mt,MnCarb))
Fault B Pill ep (mag)
B Pill ep ((mt,piedm))
Fault (chl,py)
Dyke Maf (fg amph)
B Pill ep ((mt,py))
B Pill-Amyg (ep) (mag)
Fault B Pill Amyg ((py))
B Amyg (ser bleached fracs)
Arg Limy ((py))
Sed/Tuff bio chl (polylith ALT)
Arg Limy ((sed/tuff))
Dyke Maf ((qtz-ser bleach))
Arg Limy (chert,sed/tuff)
Mix Sed/Tuff Limy Arg bio (Cht)
Chert (sp)
Chert MIN sp
Mixed Sed/tuff arg Chty>Limy
Sx Hvy py cht (chl)
B T Sil Chert
MBa sph gal (py)
QSP ALT (String) chl chert
MIN Sx String B ALT chl
Sx String QSP-Ba ((sp,cpy))
Py Chert (bar)
SMS MBaO Py>Sph>Cpy
Sx String QS (Py hvy)
Q(S) (P hvy) ALT
QSP (Stringer) Chert (TLA)
B T chl (Chert ALT)

ABA Assay Values

Sample ID	From	To	NP	MPA	NNP	NP/ MPA
W422054	345.50	346.00	200.00	30.00	170.00	6.67
W422055	358.50	359.00	508.00	23.80	484.00	21.39
W422056	389.00	389.50	239.00	4.40	235.00	54.63
W422057	412.00	412.50	136.00	7.20	129.00	18.92
W422058	428.50	429.00	439.00	20.00	419.00	21.95
S038892	456.00	456.80	178.00	1.60	176.00	113.92
S038893	482.00	483.00	119.00	0.30	119.00	761.60
S038894	509.80	510.80	71.00	4.70	66.00	15.15
S038895	536.10	537.10	100.00	0.90	99.00	106.67
S038896	557.60	558.70	63.00	6.90	56.00	9.16
S038897	577.70	578.70	77.00	98.80	22.00	0.78
S038898	597.40	598.20	622.00	10.30	612.00	60.32
S038899	597.40	598.20	637.00	9.40	628.00	67.95



CMR14-66

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 346.92	Area: Glacier Creek	Easting NAD27: 420926.62	Drilled by: First Drilling	Logged by: Nathan Steeves and Conor McKinley
Property: Palmer	Elevation (m): 1244.49	Northing NAD27: 6584244.98	Dates: 04sept2014 to 30sept2014	

Depth (m)	Lithology	Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA	CaCarb (2 4 6)	FeCarb (2 4 6)	MnCarb (2 4 6)	Total Sulphide % (0 10 20)
		B (AL)T py (cpy) Chl mt											
700		B Msv (ALT) (string)											
		EOH											
720													

ABA Assay Values

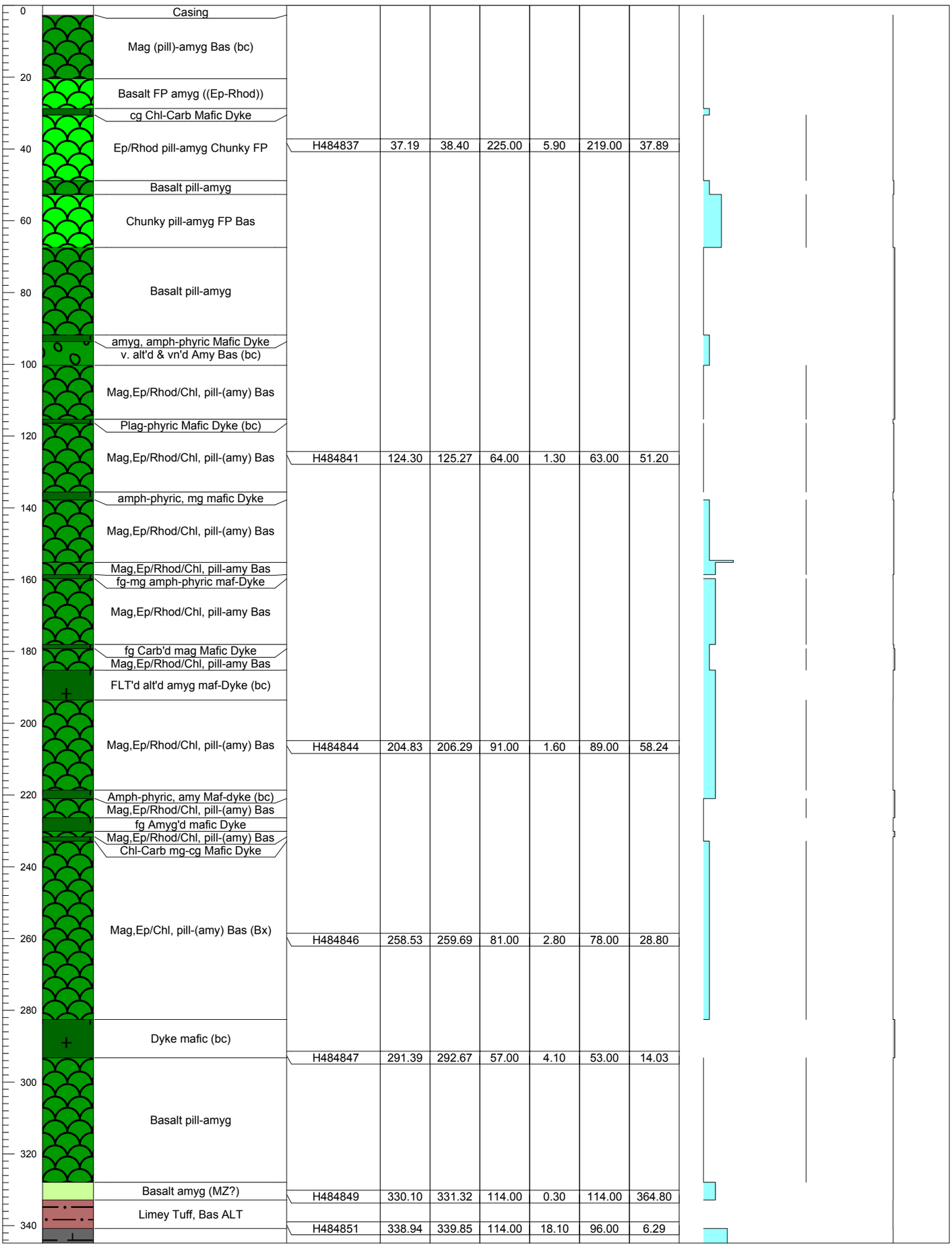
Carbonate Alteration/Abundance
Strength scale: 1 = weak, 6 = intense

Visual Estimate

CMR09-31

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 426.72	Area: Glacier Creek	Easting NAD27: 421156.74	Drilled by: Peak Exploration	Logged by: Nathan
Property: Palmer	Elevation (m): 1172.03	Northing NAD27: 6584532.34	Dates: 28aug09 to 12sept09	



ABA Assay Values

Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA
Ep/Rhod pill-amyg Chunky FP	H484837	37.19	38.40	225.00	5.90	219.00	37.89
Mag,Ep/Rhod/Chl, pill-(amy) Bas	H484841	124.30	125.27	64.00	1.30	63.00	51.20
Mag,Ep/Rhod/Chl, pill-(amy) Bas	H484844	204.83	206.29	91.00	1.60	89.00	58.24
Mag,Ep/Chl, pill-(amy) Bas (Bx)	H484846	258.53	259.69	81.00	2.80	78.00	28.80
Dyke mafic (bc)	H484847	291.39	292.67	57.00	4.10	53.00	14.03
Basalt amyg (MZ?)	H484849	330.10	331.32	114.00	0.30	114.00	364.80
Limey Tuff, Bas ALT	H484851	338.94	339.85	114.00	18.10	96.00	6.29

CMR09-31

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 426.72	Area: Glacier Creek	Easting NAD27: 421156.74	Drilled by: Peak Exploration	Logged by: Nathan
Property: Palmer	Elevation (m): 1172.03	Northing NAD27: 6584532.34	Dates: 28aug09 to 12sept09	

Depth (m)	Lithology	Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA
		Argillite limey							
360		Cherty Sx Stringer Zone							
		MS/SMS							
		QSP altered Argillite							
		MIN QSP, Cherty Frags (AT)							
		MIN QSP Schist							
380		light grn, sil'd, mafic Dyke							
		QSP-chl Amyg Bas ALT (MIN)							
		QSP Schist (LT)							
		QSP-chl-Bio, (bc) (MIN)							
		MIN Fault/QSP-schist (bc)							
		QSP-chl altered amyg bas							
400		QSP schist							
		MIN Qz Vein							
		QSP-Carb maf-sill (bc) (Fault)							
		(MIN) QSP Schist - ALT Frag							
420									
		EOH							

ABA Assay Values

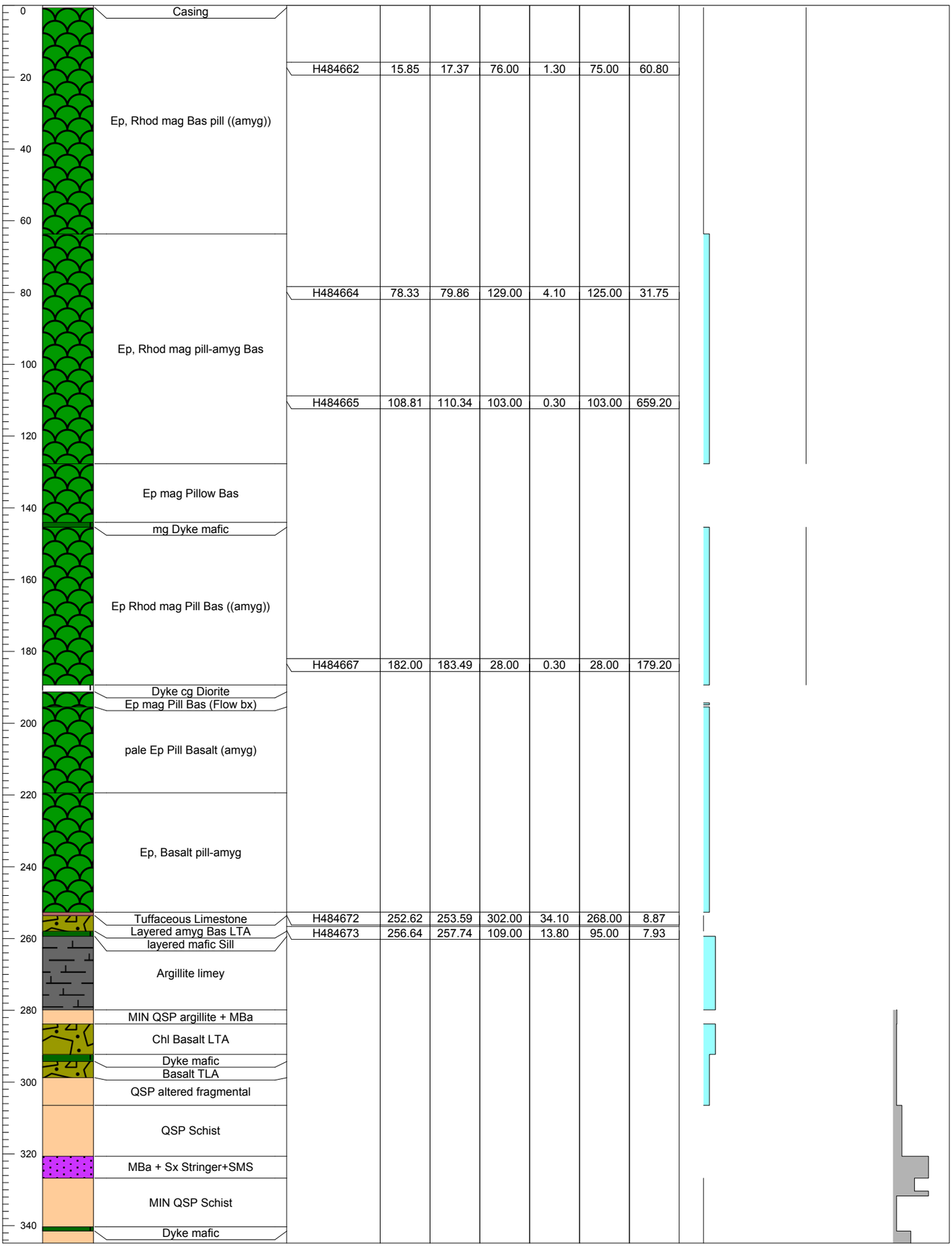
Carbonate Alteration/Abundance
Strength scale: 1 = weak, 6 = intense

Visual Estimate

CMR09-26

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 442.57	Area: Glacier Creek	Easting NAD27: 421228.81	Drilled by: Peak Exploration	Logged by: Nathan/Darwin/Liz
Property: Palmer	Elevation (m): 1193.27	Northing NAD27: 6584580.23	Dates: 02aug09 to 09aug09	



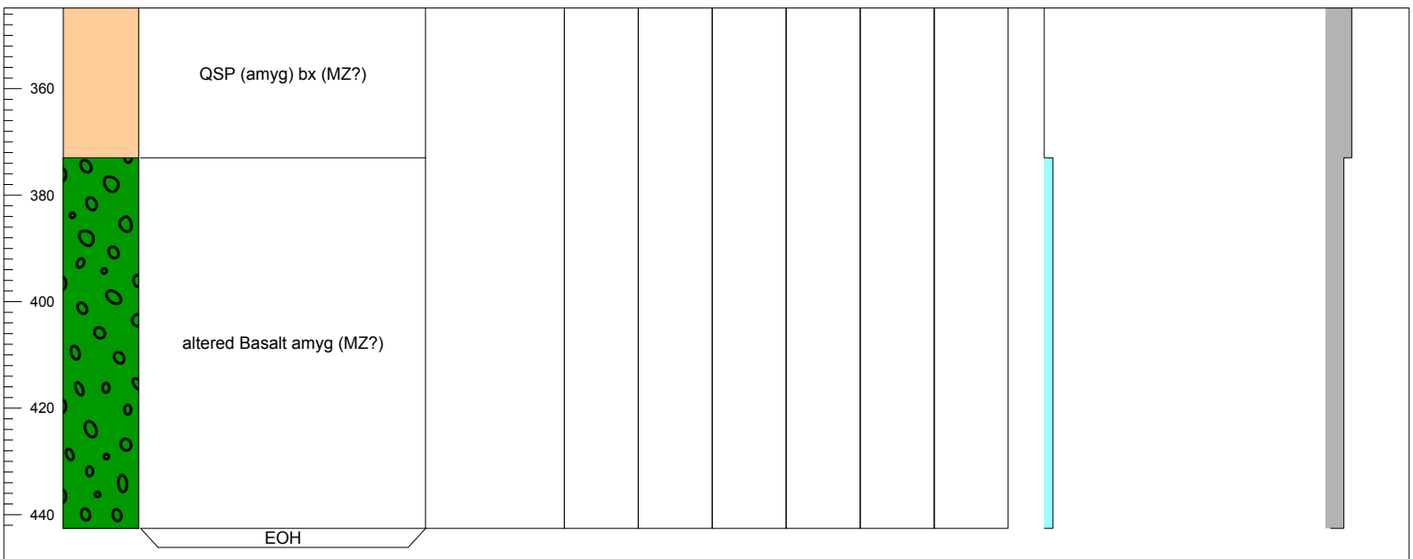
ABA Assay Values

Sample ID	From	To	NP	MPA	NNP	NP/ MPA
H484662	15.85	17.37	76.00	1.30	75.00	60.80
H484664	78.33	79.86	129.00	4.10	125.00	31.75
H484665	108.81	110.34	103.00	0.30	103.00	659.20
H484667	182.00	183.49	28.00	0.30	28.00	179.20
H484672	252.62	253.59	302.00	34.10	268.00	8.87
H484673	256.64	257.74	109.00	13.80	95.00	7.93

CMR09-26

Lithology, Carbonates, Sulphides & ABA Assay Values

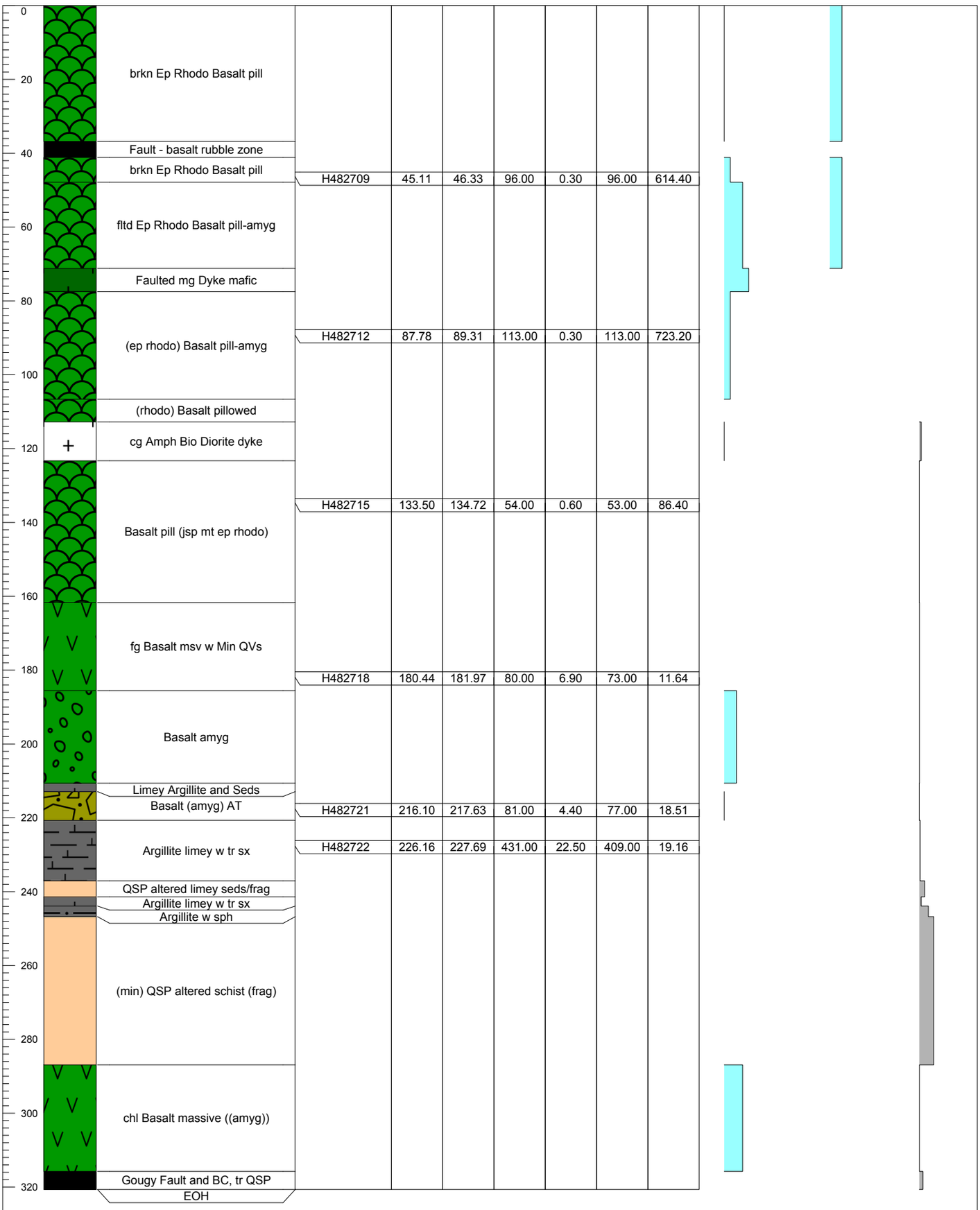
EOH (m): 442.57	Area: Glacier Creek	Easting NAD27: 421228.81	Drilled by: Peak Exploration	Logged by: Nathan/Darwin/Liz
Property: Palmer	Elevation (m): 1193.27	Northing NAD27: 6584580.23	Dates: 02aug09 to 09aug09	



CMR09-32

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 320.65	Area: Glacier Creek	Easting NAD27: 421229.91	Drilled by: Peak Exploration	Logged by: Liz
Property: Palmer	Elevation (m): 1193.08	Northing NAD27: 6584580.16	Dates: 02sept09 to 09sept09	



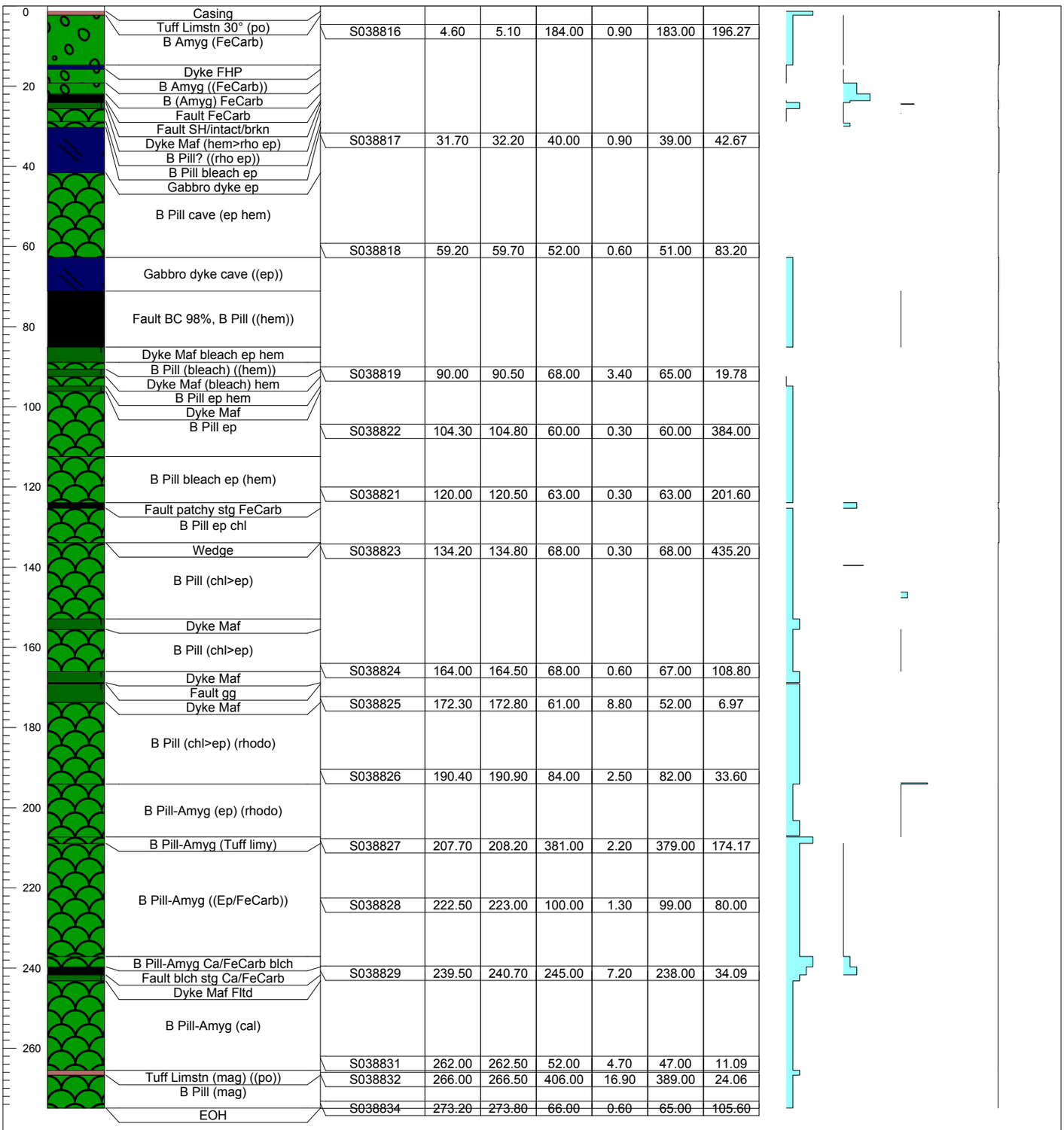
ABA Assay Values

Sample ID	From	To	NP	MPA	NNP	NP/ MPA
H482709	45.11	46.33	96.00	0.30	96.00	614.40
H482712	87.78	89.31	113.00	0.30	113.00	723.20
H482715	133.50	134.72	54.00	0.60	53.00	86.40
H482718	180.44	181.97	80.00	6.90	73.00	11.64
H482721	216.10	217.63	81.00	4.40	77.00	18.51
H482722	226.16	227.69	431.00	22.50	409.00	19.16

GT16-03 & 03B

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 274.9	Area: Glacier Creek	Easting NAD27: 421538.68	Drilled by: Hy-Tech	Logged by: Varina Zinno & Mac Kester
Property: Palmer	Elevation (m): 1046.58	Northing NAD27: 6584588.92	Dates: 21jul2016 to 28jul2016	

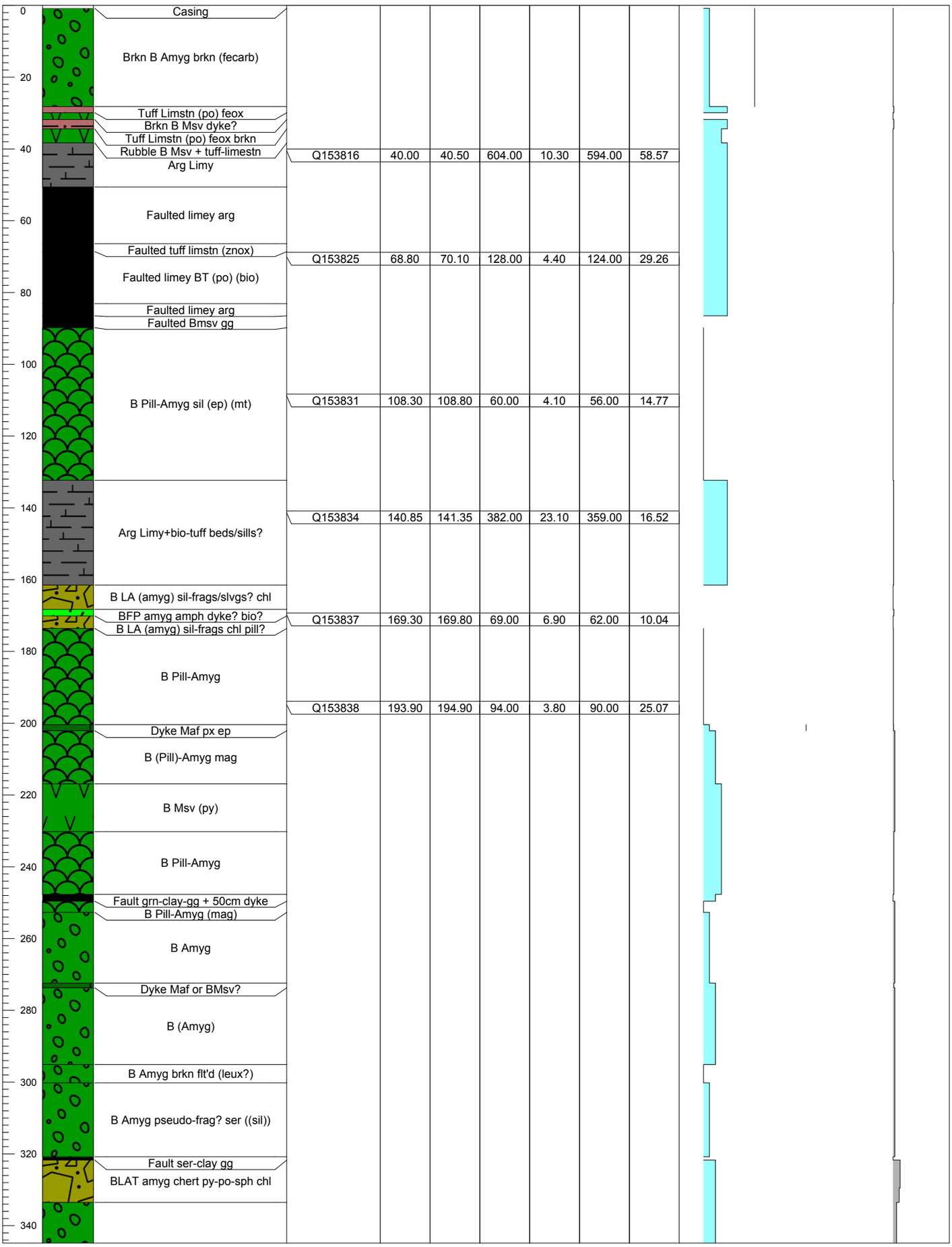


Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA
Tuff Limstn 30° (po) B Amyg (FeCarb)	S038816	4.60	5.10	184.00	0.90	183.00	196.27
Dyke Maf (hem>rho ep)	S038817	31.70	32.20	40.00	0.90	39.00	42.67
B Pill cave (ep hem)	S038818	59.20	59.70	52.00	0.60	51.00	83.20
B Pill (bleach) ((hem))	S038819	90.00	90.50	68.00	3.40	65.00	19.78
B Pill ep	S038822	104.30	104.80	60.00	0.30	60.00	384.00
B Pill bleach ep (hem)	S038821	120.00	120.50	63.00	0.30	63.00	201.60
Wedge	S038823	134.20	134.80	68.00	0.30	68.00	435.20
B Pill (chl>ep)	S038824	164.00	164.50	68.00	0.60	67.00	108.80
Dyke Maf	S038825	172.30	172.80	61.00	8.80	52.00	6.97
B Pill (chl>ep) (rhodo)	S038826	190.40	190.90	84.00	2.50	82.00	33.60
B Pill-Amyg (Tuff limy)	S038827	207.70	208.20	381.00	2.20	379.00	174.17
B Pill-Amyg ((Ep/FeCarb))	S038828	222.50	223.00	100.00	1.30	99.00	80.00
Fault blch stg Ca/FeCarb	S038829	239.50	240.70	245.00	7.20	238.00	34.09
B Pill-Amyg (cal)	S038831	262.00	262.50	52.00	4.70	47.00	11.09
Tuff Limstn (mag) ((po))	S038832	266.00	266.50	406.00	16.90	389.00	24.06
EOH	S038834	273.20	273.80	66.00	0.60	65.00	105.60

CMR14-61b

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 625.8	Area: Glacier Creek	Easting NAD27: 421747.34	Drilled by: First Drilling	Logged by: Kei Quinn
Property: Palmer	Elevation (m): 814.7	Northing NAD27: 6584364.29	Dates: 29july2014 to 20aug2014	



Sample ID	From	To	NP	MPA	NNP	NP/ MPA
Q153816	40.00	40.50	604.00	10.30	594.00	58.57
Q153825	68.80	70.10	128.00	4.40	124.00	29.26
Q153831	108.30	108.80	60.00	4.10	56.00	14.77
Q153834	140.85	141.35	382.00	23.10	359.00	16.52
Q153837	169.30	169.80	69.00	6.90	62.00	10.04
Q153838	193.90	194.90	94.00	3.80	90.00	25.07

CMR14-61b

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 625.8	Area: Glacier Creek	Easting NAD27: 421747.34	Drilled by: First Drilling	Logged by: Kei Quinn
Property: Palmer	Elevation (m): 814.7	Northing NAD27: 6584364.29	Dates: 29july2014 to 20aug2014	

Depth (m)	Lithology	Rocktype	Sample ID	From	To	NP	MPA	NNP	NP/ MPA	CaCarb (2 4 6)	FeCarb (2 4 6)	MnCarb (2 4 6)	Total Sulphide % (0 10 20)
		B Amyg											
360		Lost Core											
		Fault bamyg gravel rubble											
		B (amyg) (brkn) (leux)?											
		Fault											
		Faulted BTLA ((jsp)) (sil) (leux)?											
		Faulted BFP? Lent LTA (jsp)											
380		BFP? Lentil TLA amyg chl-Q(S)P											
		Fault + Bleached dyke											
		Bkn B TLA amyg chl-QSP (fplent)											
400		Fault gg rubble + QCV											
420		B TLA chl-QS(P) bio sil ((jsp))											
440		B Amyg + BTLA											
460		B Pill-Amyg bio py ((mt))											
		Dyke Maf py bio											
		B TLA cherty py-po bio											
480		Limey (lam) Sed/Tuff ((sph)) bio											
		B Pill-Amyg bio po-py ((sph))											
		Mixed Sed/Tuff + Bamyg py-po											
500		B Pill-Amyg bio chl											
		B Msv Ep-qcvs (bio)											
		B Pill-(Amyg) chl mag											
		Dyke Maf											
520		Brkn+flt'd B Pill-((Amyg)) + dykes											
540		B Pill-(Amyg) (mt) mag											
560		B (Amyg) (sil) + dykes mag											
580		B Pill-Amyg (rhod) (ep) (bio)											
		Dyke Maf											
600		B Pill-Amyg											
620		EOH											

ABA Assay Values

Carbonate Alteration/Abundance
Strength scale: 1 = weak, 6 = intense

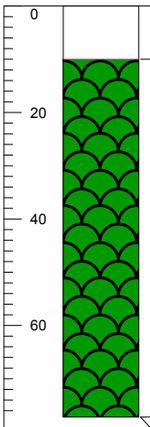
Visual Estimate

GT16-02

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 77.2	Area: Glacier Creek	Easting NAD27: 421885.91	Drilled by: Hy-Tech	Logged by: Varina Zinno & Mac Kester
Property: Palmer	Elevation (m): 799.37	Northing NAD27: 6584412.9	Dates: 18jul2016 to 21jul2016	

Depth (m) | Lithology | Rocktype | ABA Assay Values | Carbonate Alteration/Abundance (Strength scale: 1 = weak, 6 = intense) | Visual Estimate



Rocktype: Casing; B Pill-Amyg (chl, carb); EOH

Sample ID	From	To	NP	MPA	NNP	NP/ MPA
S038882	15.00	16.00	90.00	2.50	88.00	36.00
S038883	22.00	23.00	143.00	8.40	135.00	16.95
S038884	29.00	30.00	88.00	7.20	81.00	12.24
S038885	36.00	37.00	66.00	3.10	63.00	21.12
S038886	43.00	44.00	85.00	1.60	83.00	54.40
S038887	50.00	51.00	109.00	6.30	103.00	17.44
S038888	57.00	58.00	150.00	24.70	125.00	6.08
S038889	64.00	65.00	127.00	8.40	119.00	15.05
S038891	71.00	72.00	120.00	11.60	108.00	10.38

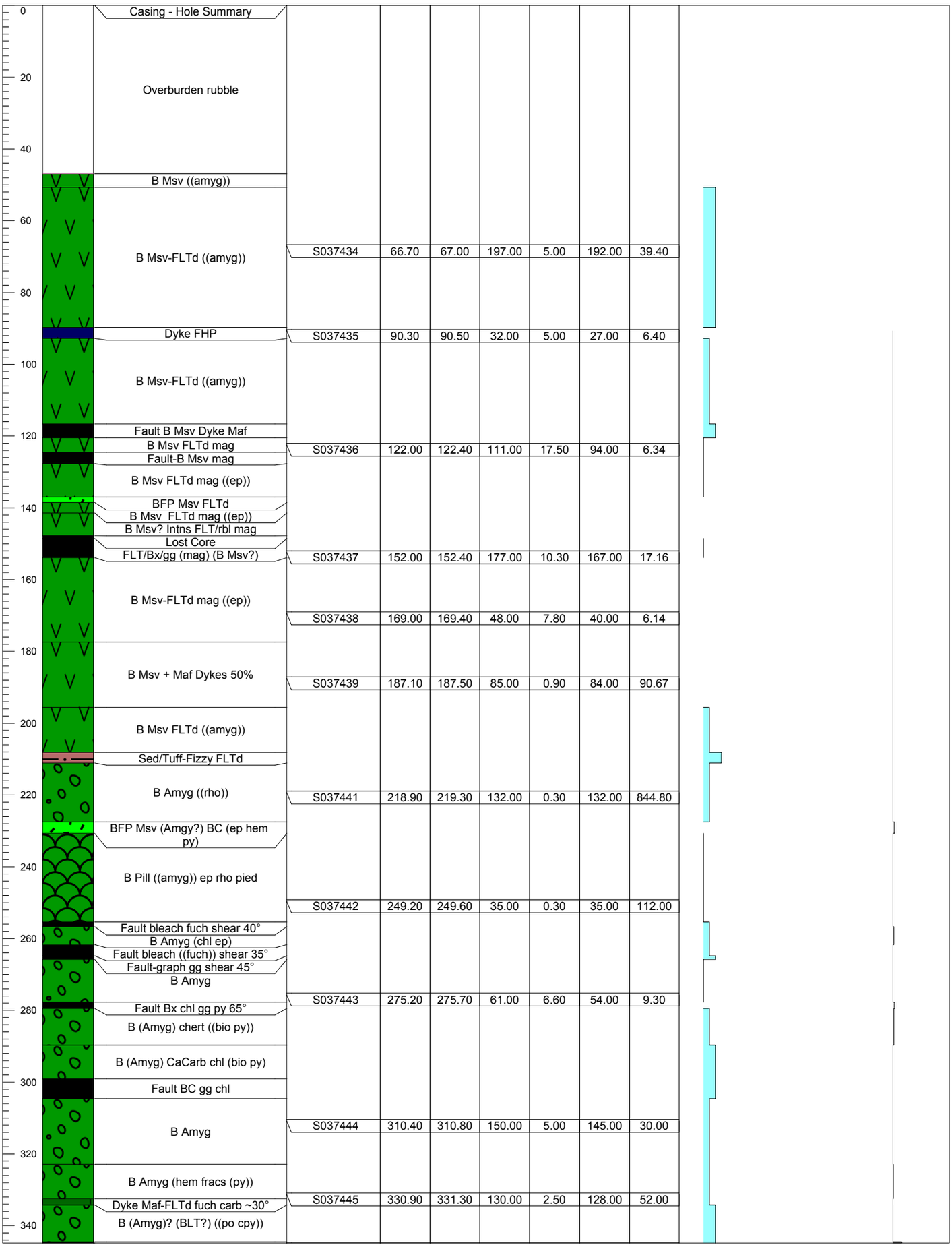
Carbonate Alteration/Abundance (Strength scale: 1 = weak, 6 = intense): CaCarb, FeCarb, MnCarb (2 4 6)

Visual Estimate: Total Sulphide % (0 10 20)

CMR15-76

Lithology, Carbonates, Sulphides & ABA Assay Values

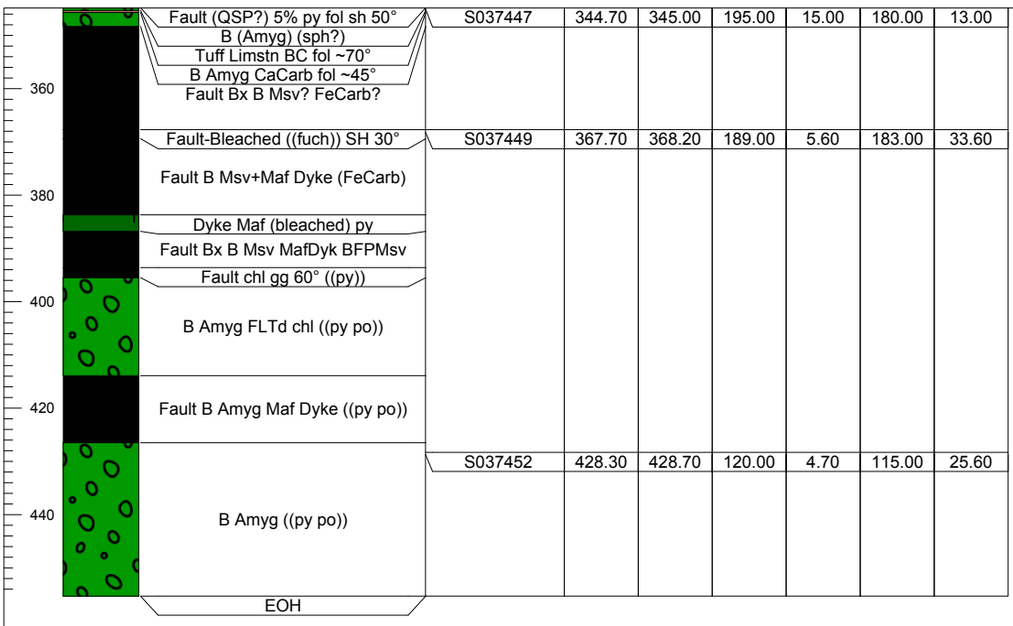
EOH (m): 455.3	Area: Glacier Creek	Easting NAD27: 421909.99	Drilled by: Hy-Tech	Logged by: Varina Zinno
Property: Palmer	Elevation (m): 587.3	Northing NAD27: 6584072.53	Dates: 31july2015 to 11aug2015	



CMR15-76

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 455.3	Area: Glacier Creek	Easting NAD27: 421909.99	Drilled by: Hy-Tech	Logged by: Varina Zinno
Property: Palmer	Elevation (m): 587.3	Northing NAD27: 6584072.53	Dates: 31july2015 to 11aug2015	



Sample ID	From	To	NP	MPA	NNP	NP/ MPA
S037447	344.70	345.00	195.00	15.00	180.00	13.00
S037449	367.70	368.20	189.00	5.60	183.00	33.60
S037452	428.30	428.70	120.00	4.70	115.00	25.60

ABA Assay Values

Carbonate Alteration/Abundance
Strength scale: 1 = weak, 6 = intense

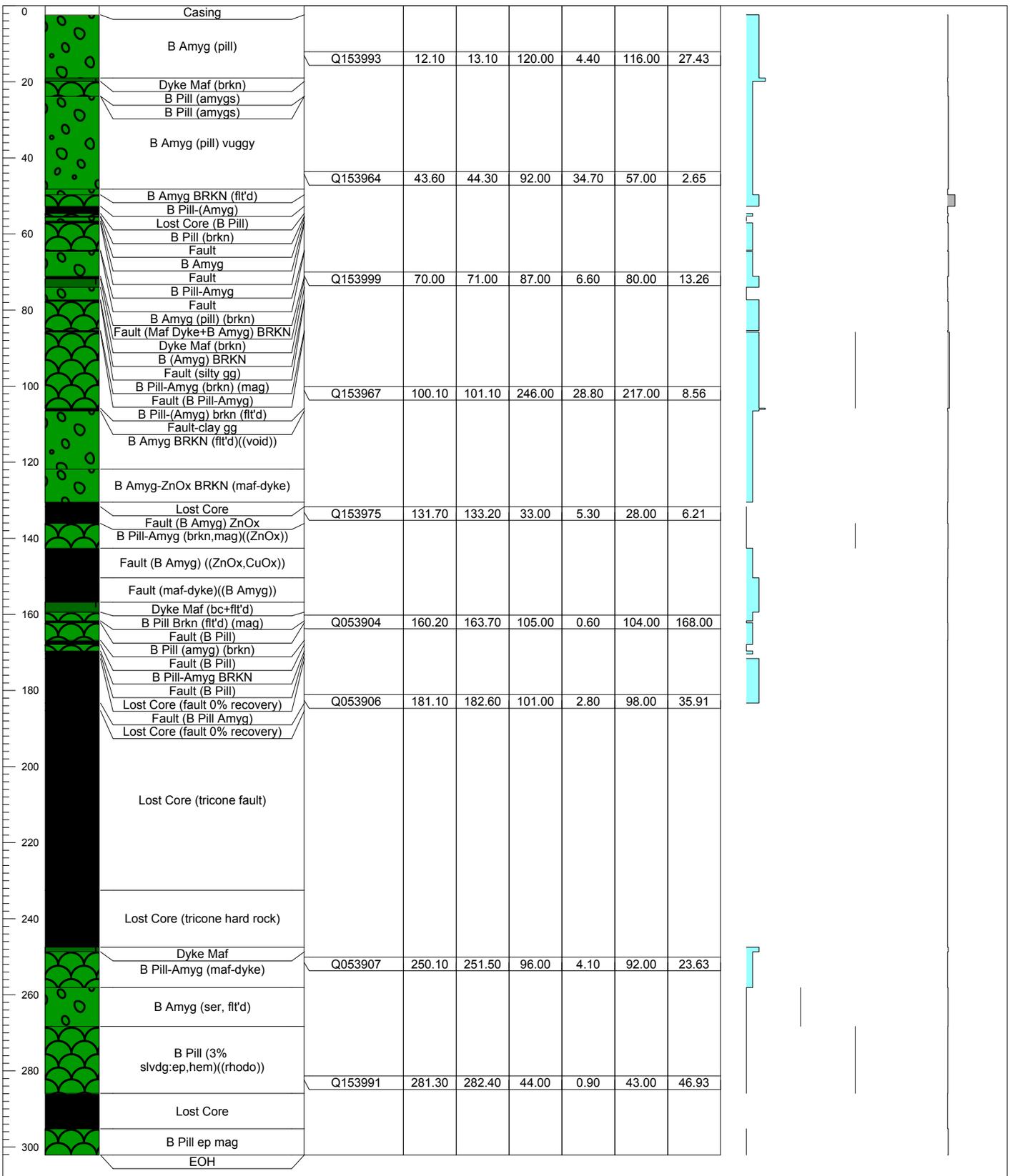
CaCarb FeCarb MnCarb

Visual Estimate
Total Sulphide %

GT14-01

Lithology, Carbonates, Sulphides & ABA Assay Values

EOH (m): 302.1	Area: Glacier Creek	Easting NAD27: 421955.04	Drilled by: First Drilling	Logged by: Mark Neuroth and Conor/Kei
Property: Palmer	Elevation (m): 780.74	Northing NAD27: 6584422.34	Dates: 09aug2014 to 13sept2014	



ABA Assay Values

Sample ID	From	To	NP	MPA	NNP	NP/ MPA
Q153993	12.10	13.10	120.00	4.40	116.00	27.43
Q153964	43.60	44.30	92.00	34.70	57.00	2.65
Q153999	70.00	71.00	87.00	6.60	80.00	13.26
Q153967	100.10	101.10	246.00	28.80	217.00	8.56
Q153975	131.70	133.20	33.00	5.30	28.00	6.21
Q053904	160.20	163.70	105.00	0.60	104.00	168.00
Q053906	181.10	182.60	101.00	2.80	98.00	35.91
Q053907	250.10	251.50	96.00	4.10	92.00	23.63
Q153991	281.30	282.40	44.00	0.90	43.00	46.93

APPENDIX D: ACID-BASE ACCOUNTING RESULTS

Appendix D. Acid-Base Accounting Results, Palmer Project

Geol. Rep. of Current Drift	Sample Year	Rocktype	Hole or Surface ID*	From (m)	To (m)	Sample ID	Certificate	Paste pH	Total-S	Sulfate-S Na2CO3	Sulfate-S HCl	Sulfide-S	Sulfide-S adj. for Barite-S	MPA	AP adj.	FIZZ RATING	Modified NP[1]	CO2	TIC	TIC adj. for rhod-%C	CO3 NP	NNP (Mod. NP-MPA)	NPR (Mod. NP/ MPA)
Y (yes) or N (no)									%	%	%	%	%	kgCaCO3/t	kgCaCO3/t		kgCaCO3/t	%	%		kgCaCO3/t	kgCaCO3/t	
									S_pct_IR08	S_pct_GRA06	S_pct_GRA06a	S_pct_CAL06	calc	calc	calc			GAS05	GAS05		calc.	calc.	calc.
Y	2015	HW Basalt	CMR09-32	45.11	46.33	H482709	VA15001994	9.4	0.01	0.01	0.02	0.01	0.01	0.3	0.3	3	96	4.1	1.12	1.09	93	96	307
Y	2015	HW Basalt	CMR09-32	87.78	89.31	H482712	VA15001994	8.7	0.01	0.01	0.01	0.01	0.01	0.3	0.3	3	113	4.6	1.26	1.23	105	113	362
Y	2015	HW Basalt	CMR09-32	133.5	134.72	H482715	VA15001994	8.7	0.02	0.01	0.01	0.01	0.01	0.6	0.3	2	54	1.8	0.50	0.47	42	53	86
Y	2015	HW Basalt	CMR09-32	180.44	181.97	H482718	VA15001994	8.2	0.22	0.02	0.01	0.2	0.19	6.9	5.9	3	80	3.3	0.90	0.87	75	73	12
Y	2015	HW Basalt	CMR09-32	216.1	217.63	H482721	VA15001994	8.2	0.14	0.01	0.01	0.13	0.11	4.4	3.3	3	81	3.3	0.90	0.87	75	77	19
Y	2015	HW Basalt	CMR09-26	15.85	17.37	H484662	VA15001994	8.8	0.04	0.01	0.01	0.03	0.02	1.3	0.6	2	76	2.2	0.60	0.57	50	75	61
Y	2015	HW Basalt	CMR09-26	78.33	79.86	H484664	VA15001994	8.1	0.13	0.02	0.02	0.11	0.09	4.1	2.8	3	129	5.8	1.58	1.56	132	125	32
Y	2015	HW Basalt	CMR09-26	108.81	110.34	H484665	VA15001994	8.6	0.01	0.01	0.02	0.01	0.01	0.3	0.3	3	103	4.3	1.18	1.16	98	103	330
Y	2015	HW Basalt	CMR09-26	182	183.49	H484667	VA15001994	8.6	0.01	0.01	0.02	0.01	0.01	0.3	0.3	2	28	0.6	0.16	0.14	13	28	90
Y	2015	HW Basalt	CMR09-26	256.64	257.74	H484673	VA15001994	8	0.44	0.03	0.03	0.41	0.39	13.8	12.2	3	109	4.7	1.27	1.24	106	95	7.9
Y	2015	HW Basalt	CMR09-31	37.19	38.4	H484837	VA15001994	8.4	0.19	0.01	0.03	0.18	0.18	5.9	5.6	4	225	10	2.74	2.71	228	219	38
Y	2015	HW Basalt	CMR09-31	124.3	125.27	H484841	VA15001994	8	0.04	0.02	0.03	0.02	0.01	1.3	0.31	2	64	2.2	0.61	0.58	51	63	51
Y	2015	HW Basalt	CMR09-31	204.83	206.29	H484844	VA15001994	8	0.05	0.01	0.05	0.04	0.03	1.6	1.1	3	91	3.6	0.99	0.95	82	89	58
Y	2015	HW Basalt	CMR09-31	258.53	259.69	H484846	VA15001994	8.4	0.09	0.01	0.03	0.08	0.07	2.8	2.2	3	81	3.3	0.89	0.86	74	78	29
Y	2015	HW Basalt	CMR09-31	330.1	331.32	H484849	VA15001994	8.2	0.01	0.01	0.01	0.01	0.01	0.3	0.3	4	114	4.9	1.33	1.29	111	114	365
Y	2015	HW Basalt	GT16-03	4.6	5.1	S038816	VA16144763	8.6	0.03	0.01	0.03	0.03	0.03	0.9	0.8	3	184	7.8	2.14	2.11	178	183	196
Y	2015	HW Basalt	GT16-03	59.2	59.7	S038818	VA16144763	9	0.02	0.01	0.02	0.02	0.01	0.6	0.4	2	52	1.9	0.52	0.48	43	51	83
Y	2015	HW Basalt	GT16-03	90	90.5	S038819	VA16144763	9.1	0.11	0.01	0.03	0.1	0.09	3.4	2.9	3	68	2.5	0.68	0.66	57	65	20
Y	2015	HW Basalt	GT16-03	120	120.5	S038821	VA16144763	9.2	0.01	0.01	0.02	0.01	0.01	0.3	0.3	2	63	2.3	0.62	0.58	52	63	202
Y	2015	HW Basalt	GT16-03	104.3	104.8	S038822	VA16144763	9.4	0.01	0.01	0.02	0.01	0.01	0.3	0.3	2	60	2	0.55	0.55	46	60	192
Y	2015	HW Basalt	GT16-03B	134.2	134.8	S038823	VA16144763	9.5	0.01	0.01	0.01	0.01	0.01	0.3	0.3	3	68	2.5	0.69	0.67	57	68	218
Y	2015	HW Basalt	GT16-03B	164	165	S038824	VA16144763	9.7	0.02	0.01	0.04	0.02	0.01	0.6	0.4	3	68	2.5	0.69	0.67	57	67	109
Y	2015	HW Basalt	GT16-03B	190.4	190.9	S038826	VA16144763	9.6	0.08	0.01	0.03	0.07	0.06	2.5	1.9	3	84	3.2	0.88	0.85	73	82	34
Y	2015	HW Basalt	GT16-03B	207.7	208.2	S038827	VA16144763	8.7	0.07	0.01	0.05	0.07	0.07	2.2	2.1	3	381	16.8	4.57	4.53	381	379	174
Y	2015	HW Basalt	GT16-03B	222.5	223	S038828	VA16144763	9.5	0.04	0.01	0.03	0.04	0.03	1.3	0.9	3	100	3.9	1.05	1.02	87	99	80
Y	2015	HW Basalt	GT16-03B	262	262.5	S038831	VA16144763	9	0.15	0.01	0.02	0.15	0.15	4.7	4.7	2	52	2.1	0.58	0.55	48	47	11
Y	2015	HW Basalt	GT16-03B	273.2	273.8	S038834	VA16144763	8.8	0.02	0.01	0.04	0.02	0.02	0.6	0.6	2	66	2.6	0.70	0.67	58	65	106
Y	2015	HW Basalt	CMR14-66	456	456.8	S038892	VA16144766	8.8	0.05	0.01	0.03	0.05	0.03	1.6	1.0	3	178	7.4	2.02	2.00	168	176	114
Y	2015	HW Basalt	CMR14-66	482	483	S038893	VA16144766	9.4	0.01	0.01	0.02	0.01	0.01	0.3	0.3	3	119	4.6	1.24	1.21	103	119	381
Y	2015	HW Basalt	CMR14-66	509.8	510.8	S038894	VA16144766	9.1	0.15	0.01	0.08	0.15	0.13	4.7	4.2	3	71	2.6	0.71	0.68	59	66	15
Y	2015	HW Basalt	CMR14-66	536.1	537.1	S038895	VA16144766	9.3	0.03	0.01	0.03	0.03	0.02	0.9	0.7	3	100	3.9	1.07	1.04	89	99	107
Y	2015	HW Basalt	CMR14-66	557.6	558.7	S038896	VA16144766	9.4	0.22	0.01	0.03	0.22	0.21	6.9	6.5	2	63	2	0.54	0.51	45	56	9.2
Y	2017	HW Basalt	CMR14-66_2017-ABA	303	303.5	W422052	VA17194435	8.8	0.21	0.01	0.01	0.2	0.19	6.6	5.8	3	244	9.6	2.62	2.59	218	237	37
Y	2017	HW Basalt	CMR14-66_2017-ABA	332.5	333	W422053	VA17194435	8.9	0.05	0.02	0.04	0.03	0.03	1.6	0.9	3	147	6.1	1.67	1.64	139	145	94
Y	2017	HW Basalt	CMR14-66_2017-ABA	389	389.5	W422056	VA17194435	8.7	0.14	0.01	0.01	0.14	0.13	4.4	4.2	3	239	9.9	2.69	2.66	224	235	55
Y	2017	HW Basalt	CMR14-66_2017-ABA	412	412.5	W422057	VA17194435	8.7	0.23	0.01	0.01	0.23	0.23	7.2	7.1	3	136	5.4	1.48	1.44	123	129	19
Y	2017	HW Basalt	ABA Barrel 3					9.2	0.17	0.02	0.01	0.15	0.14	5.3	4.4	3	175	4.7	1.27	1.24	106	170	33
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037204	VA17194447	8.8	0.12	0.01	0.02	0.11	0.11	3.8	3.3	3	137	5.3	1.45	1.41	121	133	37
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037205	VA17194447	8.9	0.07	0.01	0.02	0.07	0.07	2.2	2.1	3	72	2.6	0.71	0.68	59	70	33
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037206	VA17194447	8.8	0.09	0.01	0.01	0.09	0.09	2.8	2.7	2	63	2.2	0.61	0.58	51	60	22
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037207	VA17194447	8.8	0.21	0.01	0.02	0.21	0.21	6.6	6.4	2	32	0.9	0.24	0.21	20	25	4.9
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037209	VA17194447	8.8	0.18	0.01	0.01	0.18	0.18	5.6	5.6	2	64	2.1	0.57	0.53	47	58	11
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037210	VA17194447	8.8	0.04	0.01	0.02	0.04	0.04	1.3	1.2	2	47	1.6	0.43	0.39	36	46	38
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037211	VA17194447	8.7	0.13	0.01	0.04	0.13	0.13	4.1	3.9	2	51	1.8	0.49	0.46	41	47	13
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037212	VA17194447	8.8	0.09	0.01	0.04	0.09	0.09	2.8	2.7	3	85	3.2	0.87	0.83	72	82	30
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037213	VA17194447	8.1	0.22	0.01	0.02	0.22	0.22	6.9	6.8	2	17	0.2	0.05	0.01	4	10	2.5
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037214	VA17194447	8.8	0.25	0.01	0.02	0.25	0.23	7.8	7.3	3	139	5.6	1.53	1.50	127	131	18
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037215	VA17194447	9	0.04	0.01	0.03	0.04	0.03	1.3	0.9	3	80	3.1	0.84	0.81	70	79	64
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037216	VA17194447	8.7	0.26	0.01	0.01	0.26	0.26	8.1	8.0	4	147	5.7	1.56	1.52	130	139	18
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037217	VA17194447	9	0.07	0.01	0.02	0.07	0.07	2.2	2.1	2	45	1.7	0.45	0.42	37	43	21
Y	2017	Jasper Mtn Basalt	GT17-05	2	2.5	S037977	VA17154263	9.1	0.09	0.03	0.02	0.06	0.06	2.8	1.7	3	92	3.4	0.92	0.89	77	89	33
Y	2017	Jasper Mtn Basalt	GT17-05	63.3	63.8	S037979	VA17154263	8.9	0.09	0.01	0.01	0.09	0.09	2.8	2.7	3	88	3	0.83	0.80	69	85	31
Y	2017	Jasper Mtn Basalt	GT17-05	90.8	91.3	S037981	VA17154263	8.8	0.02	0.01	0.01	0.01	0.01	0.6	0.2	2	44	1.4	0.37	0.34	31	43	70
Y	2017	Jasper Mtn Basalt	GT17-05	118.5	119	S037982	VA17154263	9.2	0.01	0.01	0.01	0.01	0.01	0.3	0.2	2	36	1.1	0.31	0.28	26	36	115
Y	2017	Jasper Mtn Basalt	GT17-05	151.5	152	S037983	VA17154263	8.9	0.17	0.01	0.01	0.17	0.16	5.3	5.1	2	24	0.3	0.09	0.06	7	19	4.5
Y	2017	Jasper Mtn Basalt	GT17-05	180.3	180.8	S037984	VA17154263	8.8	0.19	0.02	0.01	0.17	0.17	5.9	5.2	2	42	1.4	0.38	0.34	32	36	7.1
Y	2017	Jasper Mtn Basalt	GT17-05	208.3	208.8	S037985	VA17154263	8.8	0.2	0.01	0.01	0.2	0.20	6.3	6.2	3	111	4.3	1.18	1.14	98	105	18
Y	2017	Jasper Mtn Basalt	GT17-05	238.8	239.3	S037986	VA17154263	8.9	0.16	0.01	0.01	0.16	0.16	5.0	4.9	3	84	3.2	0.87	0.84	72	79	17
Y	2017	Jasper Mtn Basalt	GT17-05	270	270.5	S037987	VA17154263	8.7	0.1	0.01	0.01	0.1	0.10	3.1	3.0	3	142	5.8	1.57	1.53	131	139	45
Y	2017	Jasper Mtn Basalt	GT17-05	291.6	292.1	S037988	VA17154263	9	0.12	0.01	0.01	0.12	0.12	3.8	3.6	3	95	3.5	0.95	0.92	79	91	25
Y	2017	Jasper Mtn Basalt	GT17-06	5.9	6.4	S037989	VA17154273	8.9	0.18	0.01	0.01	0.17	0.17	5.6	5.2	3	137	5.7	1.56	1.54	130	131	24
Y	2017	Jasper Mtn Basalt	GT17-06	28.9	29.4	S037991	VA17154273	9	0.12	0.01	0.01	0.11	0.11	3.8	3.4	3	135	5.4	1.47	1.44	122	131	36
Y	2017	Jasper Mtn Basalt	GT17-06	40.8	41.3	S037992	VA17154273	8.4	0.32	0.19	0.23	0.13	0.01	10.0	0.3	4	617	27.3	7.46	7.41	622	607	62
Y	2017	Jasper Mtn Basalt	GT17-06	59.4	59.9	S037993	VA17154273	8.8	0.02	0.01	0.01	0.02	0.02	0.6	0.6	3	137	5.7	1.54	1.51	128	136	219
Y	2017	Jasper Mtn Basalt	GT17-06	85.3	85.8	S037994	VA17154273	9.1	0.09	0.02	0.01	0.07	0.07	2.8	2.1	3	163	6.6	1.81	1.78	151	160	58

Appendix D. Acid-Base Accounting Results, Palmer Project

Geol. Rep. of Current Drift	Sample Year	Rocktype	Hole or Surface ID*	From (m)	To (m)	Sample ID	Certificate	Paste pH	Total-S	Sulfate-S Na2CO3	Sulfate-S HCl	Sulfide-S	Sulfide-S adj. for Barite-S	MPA	AP adj.	FIZZ RATING	Modified NP[1]	CO2	TIC	TIC adj. for rhod-%C	CO3 NP	NNP (Mod. NP-MPA)	NPR (Mod. NP/ MPA)
Y (yes) or N (no)									%	%	%	%	%	kgCaCO3/t	kgCaCO3/t		kgCaCO3/t	%	%		kgCaCO3/t	kgCaCO3/t	
									S_pct_IR08	S_pct_GRA06	S_pct_GRA06a	S_pct_CAL06	calc	calc	calc			GAS05	GAS05		calc.	calc.	calc.
Y	2017	Jasper Mtn Basalt	GT17-06	135.3	135.8	S037996	VA17154273	8.7	0.06	0.01	0.01	0.05	0.04	1.9	1.3	3	153	6.1	1.67	1.64	139	151	82
Y	2017	Jasper Mtn Basalt	GT17-06	181.3	181.8	S037998	VA17154273	8.8	0.07	0.01	0.02	0.07	0.06	2.2	2.0	4	350	14.3	3.91	3.87	326	348	160
Y	2017	Jasper Mtn Basalt	GT17-06	207.1	207.6	S037999	VA17154273	8.6	0.23	0.01	0.01	0.22	0.22	7.2	6.8	4	223	9.2	2.50	2.47	208	216	31
Y	2017	Jasper Mtn Basalt	GT17-06	230.5	231	S038000	VA17154273	8.6	0.08	0.02	0.01	0.06	0.06	2.5	1.8	3	121	4.7	1.28	1.25	107	119	48
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	40.5	41	W422041	VA17194435	9.1	0.21	0.01	0.01	0.2	0.20	6.6	6.2	3	94	3.7	1.02	0.99	85	87	14
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	70	70.5	W422042	VA17194435	8.9	0.15	0.02	0.01	0.13	0.13	4.7	4.0	3	85	3.3	0.89	0.86	74	80	18
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	104.2	104.7	W422043	VA17194435	8.8	0.12	0.03	0.01	0.09	0.09	3.8	2.7	3	136	5.7	1.56	1.52	130	132	36
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	130	130.5	W422044	VA17194435	8.8	0.1	0.01	0.01	0.09	0.09	3.1	2.7	3	129	5.4	1.48	1.44	123	126	41
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	165.5	166	W422045	VA17194435	9	0.08	0.01	0.01	0.08	0.08	2.5	2.4	2	29	0.9	0.23	0.20	19	27	12
Y	2017	Jasper Mtn Basalt	ABA Barrel 1					8.9	0.24	0.01	0.01	0.23	0.23	7.5	7.1	3	153	3.6	0.97	0.94	81	146	20
N	2015	HW Basalt	GT14-01	250.1	251.5	Q053907	VA14139914	9	0.13	0.01	0.01	0.13	0.13	4.1	3.9	3	96	4	1.10	1.07	92	92	24
N	2015	HW Basalt	CMR14-61b	108.3	108.8	Q153831	VA14144162	9	0.13	0.01	0.01	0.13	0.11	4.1	3.4	2	60	2.2	0.60	0.56	50	56	15
N	2015	HW Basalt	CMR14-61b	169.3	169.8	Q153837	VA14144162	9.1	0.22	0.01	0.01	0.21	0.19	6.9	6.0	2	69	2.7	0.75	0.73	62	62	10
N	2015	HW Basalt	CMR14-61b	193.9	194.9	Q153838	VA14144162	8.6	0.12	0.01	0.01	0.11	0.11	3.8	3.3	3	94	3.7	1.01	0.99	84	90	25
N	2015	HW Basalt	GT14-01	43.6	44.3	Q153964	VA14139914	9	1.11	0.01	0.01	1.11	1.05	34.7	32.9	3	92	4	1.10	1.07	92	57	2.7
N	2015	HW Basalt	GT14-01	100.1	101.1	Q153967	VA14139914	8.7	0.92	0.01	0.02	0.92	0.90	28.8	28.0	3	246	11.2	3.06	3.00	255	217	8.6
N	2015	HW Basalt	GT14-01	281.3	282.4	Q153991	VA14139914	9.3	0.03	0.01	0.01	0.03	0.03	0.9	0.8	2	44	1.5	0.40	0.37	33	43	47
N	2015	HW Basalt	GT14-01	12.1	13.1	Q153993	VA14139914	8.8	0.14	0.01	0.01	0.14	0.14	4.4	4.2	3	120	5.1	1.38	1.33	115	116	27
N	2015	HW Basalt	GT14-01	70	71	Q153999	VA14139914	8.9	0.21	0.01	0.01	0.21	0.21	6.6	6.6	3	87	3.4	0.94	0.91	78	80	13
N	2015	HW Basalt	CMR15-76	122	122.4	S037436	VA15151635	9.4	0.56	0.01	0.02	0.55	0.54	17.5	16.7	3	111	4.5	1.22	1.20	102	94	6.3
N	2015	HW Basalt	CMR15-76	169	169.4	S037438	VA15151635	9.4	0.25	0.01	0.03	0.25	0.24	7.8	7.6	2	48	1.7	0.45	0.43	37	40	6.1
N	2015	HW Basalt	CMR15-76	187.1	187.5	S037439	VA15151635	9.5	0.03	0.01	0.01	0.03	0.02	0.9	0.7	3	85	3.2	0.89	0.87	74	84	91
N	2015	HW Basalt	CMR15-76	218.9	219.3	S037441	VA15151635	9.5	0.01	0.01	0.01	0.01	0.01	0.3	0.3	3	132	5.5	1.49	1.46	124	132	422
N	2015	HW Basalt	CMR15-76	249.2	249.6	S037442	VA15151635	9.1	0.01	0.01	0.01	0.01	0.01	0.3	0.3	2	35	1.1	0.30	0.26	25	35	112
N	2015	HW Basalt	CMR15-76	275.2	275.7	S037443	VA15151635	9.2	0.21	0.01	0.02	0.21	0.21	6.6	6.4	2	61	2.3	0.62	0.59	52	54	9.3
N	2015	HW Basalt	CMR15-76	310.4	310.8	S037444	VA15151635	8.8	0.16	0.01	0.03	0.16	0.15	5.0	4.7	3	150	6.4	1.74	1.70	145	145	30
N	2015	HW Basalt	CMR15-76	330.9	331.3	S037445	VA15151635	8.8	0.08	0.01	0.01	0.08	0.08	2.5	2.4	3	130	5.2	1.42	1.38	118	128	52
N	2015	HW Basalt	CMR15-76	344.7	345	S037447	VA15151635	8.7	0.48	0.01	0.01	0.48	0.47	15.0	14.8	3	195	11.3	3.07	3.05	256	180	13
N	2015	HW Basalt	CMR15-76	428.3	428.7	S037452	VA15151635	8.6	0.15	0.01	0.03	0.15	0.14	4.7	4.4	3	120	5.2	1.42	1.38	118	115	26
N	2015	HW Basalt	GT16-02	15	16	S038882	VA16144761	8.8	0.08	0.01	0.02	0.08	0.07	2.5	2.2	3	90	3.5	0.95	0.92	79	88	36
N	2015	HW Basalt	GT16-02	22	23	S038883	VA16144761	8.6	0.27	0.01	0.04	0.27	0.24	8.4	7.5	3	143	6	1.65	1.65	137	135	17
N	2015	HW Basalt	GT16-02	29	30	S038884	VA16144761	8.7	0.23	0.01	0.01	0.23	0.22	7.2	6.9	3	88	3.6	0.98	0.98	82	81	12
N	2015	HW Basalt	GT16-02	36	37	S038885	VA16144761	8.9	0.1	0.01	0.01	0.1	0.09	3.1	2.9	2	66	2.3	0.63	0.63	52	63	21
N	2015	HW Basalt	GT16-02	43	44	S038886	VA16144761	8.9	0.05	0.01	0.06	0.05	0.04	1.6	1.1	3	85	3.3	0.91	0.91	76	83	54
N	2015	HW Basalt	GT16-02	50	51	S038887	VA16144761	8.9	0.2	0.01	0.04	0.2	0.18	6.3	5.6	3	109	4.2	1.16	1.16	97	103	17
N	2015	HW Basalt	GT16-02	57	58	S038888	VA16144761	8.8	0.79	0.01	0.02	0.79	0.77	24.7	24.2	3	150	6.3	1.71	1.71	142	125	6.1
N	2015	HW Basalt	GT16-02	64	65	S038889	VA16144761	9	0.27	0.01	0.02	0.27	0.26	8.4	8.0	3	127	5.2	1.42	1.39	118	119	15
N	2015	HW Basalt	GT16-02	71	72	S038891	VA16144761	8.8	0.37	0.01	0.04	0.37	0.35	11.6	10.9	3	120	4.9	1.34	1.34	112	108	10
N	2015	HW Basalt/Fault	GT14-01	160.2	163.7	Q053904	VA14139914	8.8	0.02	0.01	0.01	0.02	0.02	0.6	0.6	3	105	4.2	1.15	1.12	96	104	168
N	2015	HW Basalt/Fault	GT14-01	181.1	182.6	Q053906	VA14139914	8.7	0.09	0.01	0.02	0.08	0.06	2.8	1.9	3	101	3.9	1.05	1.02	87	98	36
N	2015	HW Basalt Tuff/Fault	CMR14-61b	68.8	70.1	Q153825	VA14144162	8.1	0.14	0.01	0.01	0.13	0.12	4.4	3.7	3	128	5.1	1.38	1.35	115	124	29
N	2015	HW Basalt/Fault	CMR15-76	66.7	67	S037434	VA15151635	8.5	0.16	0.01	0.03	0.16	0.16	5.0	4.9	3	197	9	2.46	2.43	205	192	39
Y	2015	Argillite	CMR09-32	226.16	227.69	H482722	VA15001994	7.8	0.72	0.02	0.01	0.7	0.67	22.5	20.8	4	431	21.4	5.83	5.79	486	409	19
Y	2015	Argillite	CMR09-26	252.62	253.59	H484672	VA15001994	7.5	1.09	0.04	0.02	1.05	1.04	34.1	32.4	4	302	13.7	3.73	3.70	311	268	8.9
Y	2015	Argillite	CMR09-31	338.94	339.85	H484851	VA15001994	7.8	0.58	0.02	0.02	0.56	0.53	18.1	16.5	4	114	4.9	1.32	1.29	110	96	6.3
N	2015	Argillite (limey)	CMR14-61b	40	40.5	Q153816	VA14144162	8.3	0.33	0.01	0.01	0.32	0.31	10.3	9.5	4	604	28.1	7.66	7.63	638	594	59
N	2015	Argillite (limey)	CMR14-61b	140.85	141.35	Q153834	VA14144162	8.8	0.74	0.01	0.01	0.73	0.71	23.1	22.3	4	382	18.2	4.96	4.94	413	359	17
Y	2015	Argillite w/ tr dykes	CMR14-66	597.4	598.2	S038898	VA16144766	8.6	0.33	0.01	0.01	0.33	0.31	10.3	9.8	4	622	28.3	7.72	7.68	643	612	60
Y	2015	*Duplicate of S038898*	CMR14-66	597.4	598.2	S038899	VA16144766	8.6	0.3	0.01	0.01	0.3	0.30	9.4	9.4	4	637	28.4	7.74	7.74	645	628	68
Y	2017	Argillite	SS17-ABA			S037201	VA17194447	8.1	0.44	0.02	0.01	0.42	0.41	13.8	12.9	4	321	13.4	3.65	3.62	304	307	23
Y	2017	Argillite	SS17-ABA			S037202	VA17194447	8.2	0.25	0.02	0.01	0.23	0.22	7.8	7.0	4	334	14.8	4.03	4.01	336	326	43
Y	2017	Argillite	SS17-ABA			S037203	VA17194447	8.7	0.04	0.01	0.01	0.03	0.02	1.3	0.7	4	294	12.3	3.36	3.33	280	293	235
Y	2017	Argillite	CMR14-66_2017-ABA	193	193.5	W422046	VA17194435	8.6	0.44	0.02	0.01	0.42	0.41	13.8	12.8	4	486	21.7	5.91	5.88	492	472	35
Y	2017	Argillite	CMR14-66_2017-ABA	235	235.5	W422048	VA17194435	8.9	0.66	0.02	0.01	0.64	0.63	20.6	19.6	4	631	28.3	7.73	7.70	644	610	31
Y	2017	Argillite	CMR14-66_2017-ABA	255	255.5	W422049	VA17194435	8.9	0.55	0.01	0.01	0.54	0.54	17.2	16.7	4	651	28.5	7.76	7.72	647	634	38
Y	2017	Argillite	CMR14-66_2017-ABA	358.5	359	W422055	VA17194435	8.6	0.76	0.01	0.01	0.75	0.74	23.8	23.2	4	508	22.9	6.25	6.24	521	484	21
Y	2017	Argillite	CMR14-66_2017-ABA	428.5	429	W422058	VA17194435	8.5	0.63	0.01	0.01	0.62	0.61	19.7	19.2	4	439	18.5	5.04	5.02	420	419	22
Y	2017	Argillite w Mafic Dykes	ABA Barrel 2					8.5	0.66	0.01	0.01	0.65	0.64	20.6	19.9	3	423	18.9	5.15	5.12	429	402	21
N	2015	Dyke	CMR15-76	90.3	90.5	S037435	VA15151635	9.2	0.16	0.01	0.01	0.16	0.15	5.0	4.8	2	32	1.2	0.32	0.30	27	27	6.4
Y	2015	Dyke	CMR09-31	291.39	292.67	H484847	VA15001994	8.2	0.13	0.01	0.03	0.12	0.09	4.1	2.8	2	57	2.2	0.60	0.56	50	53	14
Y	2015	Mafic Dyke	GT16-03B	172.3	172.8	S038825	VA16144763	9.8	0.28	0.01	0.05	0.28	0.27	8.8	8.4	2	61	2	0.53	0.50	44	52	7.0
Y	2017	Mafic Dyke	SS17-ABA			S037208	VA17194447	9.2	0.20	0.01	0.01	0.2	0.19	6.3	6.0	2	46	1.6	0.44	0.42	37	40	7.4
Y	2017	Mafic Dyke	GT17-06	108.9	109.4	S037995	VA17154273	9.4	0.28	0.01	0.02	0.28	0.27	8.8	8.5	2	61	2.3	0.62	0.59	52	52	7.0
Y	2017	Mafic Dyke	GT17-06	154.3	154.8	S037997	VA17154273	9.6	0.56	0.01	0.01	0.56	0.55	17.5	17.3	3	86	3.2	0.86	0.83	72	69	4.9
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	215	215.5	W422047	VA17194435	8.7	1.06	0.01	0.01	1.05	1.03	33.1	32.3	3	170	7.9	2.16	2.14	180	137	5.1

Appendix D. Acid-Base Accounting Results, Palmer Project

Geol. Rep. of Current Drift	Sample Year	Rocktype	Hole or Surface ID*	From (m)	To (m)	Sample ID	Certificate	Paste pH	Total-S	Sulfate-S Na2CO3	Sulfate-S HCl	Sulfide-S	Sulfide-S adj. for Barite-S	MPA	AP adj.	FIZZ RATING	Modified NP[1]	CO2	TIC	TIC adj. for rhod-%C	CO3 NP	NNP (Mod. NP-MPA)	NPR (Mod. NP/ MPA)
Y (yes) or N (no)									%	%	%	%	%	kgCaCO3/t	kgCaCO3/t		kgCaCO3/t	%	%		kgCaCO3/t	kgCaCO3/t	
									S_pct_IR08	S_pct_GRA06	S_pct_GRA06a	S_pct_CAL06	calc	calc	calc			GAS05	GAS05		calc.	calc.	calc.
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	270.5	271	W422051	VA17194435	8.7	0.15	0.01	0.03	0.14	0.14	4.7	4.3	3	201	8.6	2.34	2.31	195	196	43
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	345.5	346	W422054	VA17194435	8.6	0.96	0.01	0.02	0.96	0.96	30.0	29.9	3	200	9.3	2.53	2.51	211	170	6.7
Y	2015	Gabbro Dyke	GT16-03	31.7	32.2	S038817	VA16144763	9.0	0.03	0.01	0.02	0.03	0.02	0.9	0.7	2	40	1.1	0.31	0.28	26	39	43
Y	2017	Gabbro (Dyke?)	GT17-05	32	32.6	S037978	VA17154263	8.8	0.22	0.01	0.01	0.21	0.20	6.9	6.3	3	88	3.3	0.89	0.86	74	81	13
N	2015	Tuff/Limestone	GT16-03B	266	266.5	S038832	VA16144763	8.4	0.54	0.01	0.01	0.54	0.54	16.9	16.9	3	406	18	4.91	4.88	409	389	24
N	2015	*Duplicate of S038832*	GT16-03B	266	266.5	S038833	VA16144763	8.5	0.51	0.01	0.04	0.51	0.51	15.9	15.9	3	397	17.5	4.77	4.77	397	381	25
N	2015	Tuff?	CMR14-66	577.7	578.7	S038897	VA16144766	9.2	3.16	0.01	0.05	3.16	2.50	98.8	78.1	3	77	3.1	0.84	0.81	70	-22	0.8
N	2015	Fault	GT14-01	131.7	133.2	Q153975	VA14139914	8.1	0.17	0.01	0.02	0.17	0.16	5.3	5.0	2	33	1.2	0.33	0.28	27	28	6.2
N	2015	Fault	CMR15-76	152	152.4	S037437	VA15151635	8.6	0.33	0.01	0.02	0.33	0.33	10.3	10.2	3	177	8.2	2.23	2.20	186	167	17
N	2015	Fault	CMR15-76	367.7	368.2	S037449	VA15151635	9.3	0.18	0.03	0.01	0.15	0.14	5.6	4.5	3	189	13.7	3.73	3.70	311	183	34
Y	2015	Seds in Fault	GT16-03B	239.5	240.7	S038829	VA16144763	8.4	0.23	0.01	0.03	0.23	0.22	7.2	7.0	3	245	10.4	2.84	2.81	237	238	34
Y	2017	C (Cap Intrusive)	CMR14-66_2017-ABA			W422050	VA17194435	8.9	0.03	0.02	0.01	0.01	0.01	0.9	0.3	1	6	0.2	0.05	0.03	4	5	6.4

Notes:

[1] NP - All samples analyzed by Modified NP except for 3 field barrel sample splits (Sobek NP).

* ID with SS17-ABA refers to surface samples

red italics - total sulfur reported as less than detection limit. Detection limit shown.

Sulfide-S = Total-S - Sulfate-S (Na2CO3)

Sulfide-S adj for Barite-S = Total-S - Sulfate-S (Na2CO3) - Barite-S, where % barite-S calculated from Ba% (XRF assay)

MPA (Maximum Potential Acidity): Total-Sulfur x 31.25

AP adj (Acid Potential adjusted) = Sulfide-S (adj for Barite-S) x 31.25

TIC - total inorganic carbon

TIC adj. - total inorganic carbon % - rhodochrosite-carbon %

CO_3 NP: Carbonate NP equivalents based on CO_2 (Carbonate Carbon)

NNP (Net Neutralization Potential): Calculated as Mod. NP - MPA

NPR (Neutralization to Acid Potential Ratio): Calculated as Mod.NP / MPA

APPENDIX E: TRACE ELEMENT ANALYSES

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Certificate	Al2O3	Al	BaO	Ba	CaO	Ca	Cr2O3	Cr	Fe2O3	Fe	K2O	K	MgO	Mg	MnO	Mn	Na2O	Na	P2O5	P
Y (yes) or N (no)								%	%	%	ppm	%	%	%	ppm	%	%	%	%	%	%	%	ppm	%	%	%	ppm
								ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc
	Crustal Abundance for Basalt (Price, 1997)								7.8		330		7.6		170		8.65		0.83		4.6		1500		1.8		1100
	Crustal abundance x10								78		3300		76		1700		86.5		8.3		46		15000		18		11000
Y	2015	HW Basalt	CMR09-32	45.11	46.33	H482709	VA15001994	13.7	7.25	0.04	358	9.26	6.62	0.02	137	15.86	11.1	2	1.66	3.26	1.97	0.15	1162	3.79	2.81	0.34	1484
Y	2015	HW Basalt	CMR09-32	87.78	89.31	H482712	VA15001994	14.3	7.57	0.05	448	8.62	6.16	0.03	205	11.72	8.2	2.05	1.70	4.73	2.85	0.15	1162	4.37	3.24	0.21	916
Y	2015	HW Basalt	CMR09-32	133.5	134.72	H482715	VA15001994	16.55	8.76	0.03	269	9.72	6.95	0.04	274	14.06	9.8	1.47	1.22	5.31	3.20	0.18	1394	3.25	2.41	0.07	305
Y	2015	HW Basalt	CMR09-32	180.44	181.97	H482718	VA15001994	14.2	7.52	0.06	537	12	8.58	0.04	274	12.5	8.7	1.08	0.90	7.94	4.79	0.2	1549	1.72	1.28	0.1	436
Y	2015	HW Basalt	CMR09-32	216.1	217.63	H482721	VA15001994	16.55	8.76	0.11	985	6.04	4.32	0.01	68	12.97	9.1	1.73	1.44	7.28	4.39	0.18	1394	1.52	1.13	0.26	1135
Y	2015	HW Basalt	CMR09-26	15.85	17.37	H484662	VA15001994	14.8	7.83	0.05	448	11.55	8.25	0.03	205	14.98	10.5	1.1	0.91	4.42	2.67	0.15	1162	1.8	1.34	0.28	1222
Y	2015	HW Basalt	CMR09-26	78.33	79.86	H484664	VA15001994	13.85	7.33	0.1	895	8.49	6.07	0.01	68	10.88	7.6	1.86	1.54	4.29	2.59	0.14	1084	3.95	2.93	0.5	2182
Y	2015	HW Basalt	CMR09-26	108.81	110.34	H484665	VA15001994	15	7.94	0.05	448	9.67	6.91	0.03	205	11.66	8.2	2.41	2.00	4.86	2.93	0.13	1007	3.74	2.77	0.14	611
Y	2015	HW Basalt	CMR09-26	182	183.49	H484667	VA15001994	16.9	8.94	0.03	269	6.44	4.60	0.05	342	14.96	10.5	1.5	1.25	4.96	2.99	0.11	852	4.13	3.06	0.1	436
Y	2015	HW Basalt	CMR09-26	256.64	257.74	H484673	VA15001994	14.5	7.67	0.1	895	7.45	5.32	0.02	137	10.44	7.3	1.79	1.49	6.45	3.89	0.18	1394	2.11	1.57	0.16	698
Y	2015	HW Basalt	CMR09-31	37.19	38.4	H484837	VA15001994	14.3	7.57	0.01	90	15.15	10.83	0.04	274	6.93	4.8	0.16	0.13	6.67	4.02	0.2	1549	3.19	2.37	0.1	436
Y	2015	HW Basalt	CMR09-31	124.3	125.27	H484841	VA15001994	14.7	7.78	0.09	806	9.72	6.95	0.02	137	14.51	10.1	2.31	1.92	4.34	2.62	0.16	1239	2.22	1.65	0.32	1397
Y	2015	HW Basalt	CMR09-31	204.83	206.29	H484844	VA15001994	15.25	8.07	0.03	269	13.9	9.93	0.04	274	13.83	9.7	2.18	1.81	4.75	2.86	0.22	1704	1.72	1.28	0.08	349
Y	2015	HW Basalt	CMR09-31	258.53	259.69	H484846	VA15001994	16.45	8.71	0.05	448	13	9.29	0.04	274	14.57	10.2	0.95	0.79	4.74	2.86	0.2	1549	2.32	1.72	0.09	393
Y	2015	HW Basalt	CMR09-31	330.1	331.32	H484849	VA15001994	14.25	7.54	0.02	179	6.84	4.89	0.06	411	11.29	7.9	0.19	0.16	9.67	5.83	0.24	1859	2.51	1.86	0.18	786
Y	2015	HW Basalt	GT16-03	4.6	5.1	S038816	VA16144763	13.26	7.02	0.02	179	9.88	7.06	0.04	274	10.88	7.6	0.23	0.19	6.85	4.13	0.19	1471	3.15	2.34	0.2	873
Y	2015	HW Basalt	GT16-03	59.2	59.7	S038818	VA16144763	15.1	7.99	0.03	269	10.55	7.54	0.04	274	12.48	8.7	1.06	0.88	9.57	5.77	0.21	1626	1.23	0.91	0.04	175
Y	2015	HW Basalt	GT16-03	90	90.5	S038819	VA16144763	16.96	8.98	0.03	269	4.74	3.39	0.04	274	13.69	9.6	1.16	0.96	5.66	3.41	0.13	1007	5.67	4.21	0.04	175
Y	2015	HW Basalt	GT16-03	120	120.5	S038821	VA16144763	14.99	7.93	0.02	179	13	9.29	0.03	205	11.89	8.3	1.21	1.00	8.13	4.90	0.21	1626	1.32	0.98	0.03	131
Y	2015	HW Basalt	GT16-03	104.3	104.8	S038822	VA16144763		8.6		160		6.49		200		10.2		0.96		2.91		757		2.73		330
Y	2015	HW Basalt	GT16-03B	134.2	134.8	S038823	VA16144763	16.54	8.75	0.05	448	8.05	5.75	0.04	274	14.72	10.3	2.16	1.79	5.12	3.09	0.12	929	3.87	2.87	0.09	393
Y	2015	HW Basalt	GT16-03B	164	165	S038824	VA16144763	16.48	8.72	0.03	269	8.38	5.99	0.04	274	14.76	10.3	2.06	1.71	5.2	3.14	0.14	1084	3.61	2.68	0.09	393
Y	2015	HW Basalt	GT16-03B	190.4	190.9	S038826	VA16144763	16.14	8.54	0.05	448	9.69	6.93	0.04	274	13.83	9.7	3.19	2.65	4.64	2.80	0.15	1162	3.13	2.32	0.07	305
Y	2015	HW Basalt	GT16-03B	207.7	208.2	S038827	VA16144763	8.65	4.58	0.02	179	22.4	16.01	0.01	68	7.04	4.9	0.47	0.39	5.2	3.14	0.26	2013	1.66	1.23	0.21	916
Y	2015	HW Basalt	GT16-03B	222.5	223	S038828	VA16144763	13.67	7.23	0.05	448	9.56	6.83	0.01	68	10.18	7.1	1.27	1.05	5.36	3.23	0.18	1394	4.7	3.49	0.4	1746
Y	2015	HW Basalt	GT16-03B	262	262.5	S038831	VA16144763	13.56	7.18	0.01	90	8.25	5.90	0.01	68	15.8	11.1	0.14	0.12	6.48	3.91	0.2	1549	3.77	2.80	0.43	1877
Y	2015	HW Basalt	GT16-03B	273.2	273.8	S038834	VA16144763	16.78	8.88	0.01	90	4.41	3.15	0.04	274	11.82	8.3	0.21	0.17	7.31	4.41	0.15	1162	4.31	3.20	0.02	87
Y	2015	HW Basalt	CMR14-66	456	456.8	S038892	VA16144766	16.04	8.49	0.09	806	10.4	7.43	0.04	274	6.88	4.8	1.52	1.26	5.4	3.26	0.12	929	3.72	2.76	0.12	524
Y	2015	HW Basalt	CMR14-66	482	483	S038893	VA16144766	15.52	8.21	0.02	179	13.15	9.40	0.03	205	13.64	9.5	1.4	1.16	4.58	2.76	0.19	1471	3.24	2.40	0.07	305
Y	2015	HW Basalt	CMR14-66	509.8	510.8	S038894	VA16144766	15.56	8.24	0.08	716	11.45	8.18	0.03	205	14.5	10.1	1.74	1.44	4.73	2.85	0.17	1316	1.73	1.28	0.15	655
Y	2015	HW Basalt	CMR14-66	536.1	537.1	S038895	VA16144766	15.1	7.99	0.04	358	10.85	7.75	0.03	205	13.25	9.3	1.48	1.23	5.81	3.50	0.19	1471	2.12	1.57	0.11	480
Y	2015	HW Basalt	CMR14-66	557.6	558.7	S038896	VA16144766	14.7	7.78	0.06	537	7.6	5.43	0.04	274	12.37	8.7	1.54	1.28	5.43	3.27	0.15	1162	4.54	3.37	0.28	1222
Y	2017	HW Basalt	CMR14-66_2017-ABA	303	303.5	W422052	VA17194435	13.12	6.94	0.07	627	13.65	9.76	0.01	68	11.1	7.8	1.42	1.18	3.51	2.12	0.18	1394	0.98	0.73	0.09	393
Y	2017	HW Basalt	CMR14-66_2017-ABA	332.5	333	W422053	VA17194435	14.64	7.75	0.01	90	8.31	5.94	0.03	205	9.73	6.8	0.06	0.05	6.49	3.91	0.16	1239	3.78	2.80	0.13	567
Y	2017	HW Basalt	CMR14-66_2017-ABA	389	389.5	W422056	VA17194435	12.18	6.45	0.03	269	12.65	9.04	*0.01*	68	11.46	8.0	1.06	0.88	4.53	2.73	0.17	1316	0.15	0.11	0.19	829
Y	2017	HW Basalt	CMR14-66_2017-ABA	412	412.5	W422057	VA17194435	13.31	7.04	*0.01*	90	9.72	6.95	*0.01*	68	14.06	9.8	0.04	0.03	6.3	3.80	0.21	1626	2.18	1.62	0.21	916
Y	2017	HW Basalt	ABA Barrel 3					7.19	3.81	0.05	448	20.1	14.37	0.01	68	6.04	4.2	0.71	0.59	4.57	2.76	0.18	1394	0.84	0.62	0.15	655
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037204	VA17194447	13.9	7.36	0.02	179	8.57	6.12	*0.01*	68	13.96	9.8	0.59	0.49	5.18	3.12	0.22	1704	2.39	1.77	0.3	1309
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037205	VA17194447	10.57	5.59	*0.01*	90	6.23	4.45	*0.01*	68	16.58	11.6	0.24	0.20	3.12	1.88	0.2	1549	2.47	1.83	0.33	1440
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037206	VA17194447	12.9	6.83	*0.01*	90	5.87	4.20	0.01	68	15.55	10.9	0.26	0.22	5.6	3.38	0.2	1549	2.9	2.15	0.32	1397
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037207	VA17194447	14.72	7.79	0.02	179	3.18	2.27	*0.01*	68	19.19	13.4	0.77	0.64	7.61	4.59	0.19	1471	2.46	1.82	0.34	1484
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037209	VA17194447	14.3	7.57	0.01	90	7.31	5.22	*0.01*	68	16	11.2	0.28	0.23	5.4	3.26	0.21	1626	2.8	2.08	0.39	1702
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037210	VA17194447	12.64	6.69	0.01	90	6.83	4.88	*0.01*	68	16.76	11.7	0.47	0.39	4.19	2.53	0.23	1781	2.21	1.64	0.31	1353
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037211	VA17194447	12.62	6.68	0.02	179	4.61	3.29	0.01	68	14.48	10.1	0.63	0.52	4.81	2.90	0.18	1394	2.44	1.81	0.25	1091
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037212	VA17194447	11.38	6.02	0.01	90	6.26	4.47	0.01	68	13.25	9.3	0.44	0.37	4.72	2.85	0.25	1936	2.4	1.78	0.37	1615
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037213	VA17194447	13	6.88	0.01	90	3.88	2.77	*0.01*	68	19.62	13.7	0.36	0.30	5.16	3.11	0.21	1626	2.53	1.88	0.51	2226
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037214	VA17194447	15.86	8.39	0.08	716	8.1	5.79	*0.01*	68	9.85	6.9	1.34	1.11	6.11	3.68	0.2	1549	2.89	2.14	0.17	742
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037215	VA17194447	17.04	9.02	0.05	448	5.79	4.14	*0.01*	68	11.42	8.0	1.18	0.98	5.51	3.32	0.17	1316	3.91	2.90	0.28	1222
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037216	VA17194447	12	6.35	0.02	179	8.01	5.72	0.05	342	12.06	8.4	0.78	0.65	6.96	4.20	0.22	1704	1.53	1.14	0.24	1047
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037217	VA17194447	12.5	6.62	0.01	90	4.7	3.36	*0.01*	68	12.67	8.9	0.15	0.12	3.67	2.21	0.16	1239	3.71	2.75	0.51	2226
Y	2017	Jasper Mtn Basalt	GT17-05	2	2.5	S037977	VA17154263	11.48	6.08	0.02	179	6.75	4.82	*0.01*	68	8.67	6.1	0.49	0.41	2.59	1.56	0.19	1471	4.5	3.34	0.4	1746
Y	2017	Jasper Mtn Basalt	GT17-05	63.3	63.8	S037979	VA17154263	12.32	6.52	0.02	179	6.82	4.87	*0.01*	68	14.04	9.8	0.37	0.31	4	2.41	0.2	1549	3.83	2.84	0.36	1571
Y	2017	Jasper Mtn Basalt	GT17-05	90.8	91.3	S037981	VA17154263	14.04	7.43	0.01	90	4.62	3.30	*0.01*	68	17.4	12.2	0.27	0.22	5.88	3.55	0.19	1471	3.87	2.87	0.41	1789
Y	2017	Jasper Mtn Basalt	GT17-05	118.5	119	S037982	VA17154263	12.4	6.56	0.02	179	3.87	2.77	*0.01*	68	17.67	12.4	0.71	0.59	3.6	2.17	0.15	1162	4.11	3.05	0.43	1877
Y	2017	Jasper Mtn Basalt	GT17-05	151.5	152	S037983	VA17154263	13.88	7.35	0.03	269	5.14	3.67	0.01	68	20.32	14.2	1.72	1.43	8.86	5.34	0.2	1549	0.19	0.14	0.28	1222
Y	2017	Jasper Mtn Basalt	GT17-05	180.3	180.8	S037984	VA17154263	12.89	6.82	0.02	179	9.4	6.72	0.01	68	16.3	11.4	0.35	0.29	4.76	2.87	0.23	1781	1.79	1.33	0.26	1135
Y	2017	Jasper Mtn Basalt	GT17-05	208.3	208.8	S037985	VA17154263	10.62	5.62	0.01	90	7.87	5.62	0.01	68	11.44	8.0	0.18	0.15	3.26	1.97	0.24	1859	2.92	2.17	0.25	1091
Y	2017	Jasper Mtn Basalt	GT17-05	238.8	239.3	S037986	VA17154263	12.7	6.72	0.02	179	7.44	5.32	0.01	68	13.52	9.5	0.44	0.37	4.01	2.42	0.2	1549	3.29	2.44	0.28	1222
Y	2017	Jasper Mtn Basalt	GT17-05	270	270.5	S037987	VA17154263	12.94	6.85	0.02	179	9.62	6.88	0.01	68	13.34	9.3	0.3	0.25	4.6	2.77	0.23	1781	3.4	2.52	0.25	1091
Y	2017	Jasper Mtn Basalt	GT17-05	291.6	292.1	S037988	VA17154263	13.8	7.30	0.02	179	6.88	4.92	0.01	68	12.26	8.6	0.42	0.35	5.48	3.30	0.15	1162	4.15	3.08	0.24	1047
Y	2017	Jasper Mtn Basalt	GT17-06	5.9	6.4	S037989	VA17154273	13.43	7.11	0.01	90	8.94	6.39	0.01	68	11.13	7.8	0.14	0.12	4.46	2.69	0.12	929	5.08	3.77	0.28	1222
Y	2017	Jasper Mtn Basalt	GT17-06	28.9	29.4	S037991	VA17154273	13.19	6.98	*0.01*	90	8.71	6.23	0.01	68	11.1	7.8	0.23	0.19	4.41	2.66	0.15	1162	5.16	3.83	0.25	1091
Y	2017	Jasper Mtn Basalt	GT17-06	40.8	41.3	S037992	VA17154273	3.79	2.01	0.95	**8506**	37	26.44	0.01	68	3.88	2.7	0.15	0.12	0.66	0.40	0.28	2168	1.76	1.31	0.11	480

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Certificate	Al2O3	Al	BaO	Ba	CaO	Ca	Cr2O3	Cr	Fe2O3	Fe	K2O	K	MgO	Mg	MnO	Mn	Na2O	Na	P2O5	P
Y (yes) or N (no)								%	%	%	ppm	%	%	%	ppm	%	%	%	%	%	%	%	ppm	%	%	%	ppm
								ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc
	Crustal Abundance for Basalt (Price, 1997)								7.8		330		7.6		170		8.65		0.83		4.6		1500		1.8		1100
	Crustal abundance x10								78		3300		76		1700		86.5		8.3		46		15000		18		11000
Y	2017	Jasper Mtn Basalt	GT17-06	59.4	59.9	S037993	VA17154273	13.62	7.21	*0.01*	90	9.24	6.60	0.01	68	13.64	9.5	0.11	0.09	5.01	3.02	0.17	1316	4.84	3.59	0.35	1527
Y	2017	Jasper Mtn Basalt	GT17-06	85.3	85.8	S037994	VA17154273	13.04	6.90	0.02	179	9.31	6.65	0.01	68	12.27	8.6	1.16	0.96	4.51	2.72	0.19	1471	4.35	3.23	0.29	1266
Y	2017	Jasper Mtn Basalt	GT17-06	135.3	135.8	S037996	VA17154273	14.06	7.44	0.04	358	9.78	6.99	0.01	68	12.5	8.7	1.2	1.00	5.51	3.32	0.17	1316	1.69	1.25	0.3	1309
Y	2017	Jasper Mtn Basalt	GT17-06	181.3	181.8	S037998	VA17154273	9.59	5.08	0.03	269	20.7	14.79	0.01	68	12.52	8.8	1.34	1.11	3.76	2.27	0.26	2013	0.12	0.09	0.24	1047
Y	2017	Jasper Mtn Basalt	GT17-06	207.1	207.6	S037999	VA17154273	12.58	6.66	0.01	90	13.05	9.33	0.01	68	12.46	8.7	0.11	0.09	6.17	3.72	0.2	1549	2.72	2.02	0.27	1178
Y	2017	Jasper Mtn Basalt	GT17-06	230.5	231	S038000	VA17154273	14.17	7.50	*0.01*	90	7.89	5.64	0.01	68	13.5	9.4	0.09	0.07	6.86	4.14	0.15	1162	2.89	2.14	0.3	1309
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	40.5	41	W422041	VA17194435	11.43	6.05	0.01	90	6.55	4.68	*0.01*	68	10.84	7.6	0.15	0.12	3.32	2.00	0.2	1549	3.9	2.89	0.32	1397
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	70	70.5	W422042	VA17194435	13.3	7.04	*0.01*	90	8.85	6.33	0.01	68	13	9.1	0.02	0.02	5.11	3.08	0.2	1549	2.26	1.68	0.26	1135
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	104.2	104.7	W422043	VA17194435	13.94	7.38	0.01	90	8.78	6.28	*0.01*	68	13.35	9.3	0.15	0.12	5	3.02	0.21	1626	3.97	2.95	0.22	960
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	130	130.5	W422044	VA17194435	14.17	7.50	*0.01*	90	7.34	5.25	*0.01*	68	14.48	10.1	0.66	0.55	5.15	3.11	0.21	1626	2.52	1.87	0.24	1047
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	165.5	166	W422045	VA17194435	13.65	7.22	0.01	90	8.98	6.42	*0.01*	68	13.92	9.7	0.1	0.08	7.52	4.54	0.2	1549	2.14	1.59	0.21	916
Y	2017	Jasper Mtn Basalt	ABA Barrel 1					12.98	6.87	0.02	179	7.45	5.32	*0.01*	68	14.75	10.3	0.59	0.49	5.35	3.23	0.19	1471	2.94	2.18	0.31	1353
N	2015	HW Basalt	GT14-01	250.1	251.5	Q053907	VA14139914	14.05	7.44	0.02	179	8.36	5.97	0.05	342	12.89	9.0	0.41	0.34	6.71	4.05	0.17	1316	3.98	2.95	0.18	786
N	2015	HW Basalt	CMR14-61b	108.3	108.8	Q153831	VA14144162	14.05	7.44	0.1	895	7.89	5.64	0.05	342	13.32	9.3	2.57	2.13	8.36	5.04	0.24	1859	2.26	1.68	0.13	567
N	2015	HW Basalt	CMR14-61b	169.3	169.8	Q153837	VA14144162	16	8.47	0.08	716	7.99	5.71	0.02	137	6.76	4.7	1.32	1.10	4.31	2.60	0.13	1007	4.01	2.97	0.1	436
N	2015	HW Basalt	CMR14-61b	193.9	194.9	Q153838	VA14144162	13.5	7.14	0.02	179	5.84	4.17	0.01	68	12.78	8.9	0.3	0.25	6.15	3.71	0.14	1084	3.34	2.48	0.35	1527
N	2015	HW Basalt	GT14-01	43.6	44.3	Q153964	VA14139914	14.1	7.46	0.27	2417	5.47	3.91	0.01	68	12.08	8.4	1.2	1.00	2.9	1.75	0.15	1162	3.65	2.71	0.37	1615
N	2015	HW Basalt	GT14-01	100.1	101.1	Q153967	VA14139914	12.95	6.85	0.11	985	13.6	9.72	0.01	68	8.9	6.2	0.44	0.37	6.9	4.16	0.34	2633	3.76	2.79	0.12	524
N	2015	HW Basalt	GT14-01	281.3	282.4	Q153991	VA14139914	14.55	7.70	0.02	179	9.1	6.50	0.03	205	14.31	10.0	0.97	0.81	5.44	3.28	0.18	1394	3.39	2.51	0.12	524
N	2015	HW Basalt	GT14-01	12.1	13.1	Q153993	VA14139914	14.45	7.65	0.02	179	6.56	4.69	0.01	68	11.8	8.3	0.28	0.23	6.03	3.64	0.31	2401	3.83	2.84	0.14	611
N	2015	HW Basalt	GT14-01	70	71	Q153999	VA14139914	13.7	7.25	0.01	90	4.9	3.50	0.01	68	10.21	7.1	0.1	0.08	5.03	3.03	0.19	1471	4.18	3.10	0.32	1397
N	2015	HW Basalt	CMR15-76	122	122.4	S037436	VA15151635	13.92	7.37	0.07	627	9.61	6.87	0.02	137	14.14	9.9	3.71	3.08	4.44	2.68	0.12	929	0.8	0.59	0.24	1047
N	2015	HW Basalt	CMR15-76	169	169.4	S037438	VA15151635	15.97	8.45	0.03	269	5.75	4.11	0.02	137	13.4	9.4	1.51	1.25	4.34	2.62	0.11	852	4.71	3.49	0.41	1789
N	2015	HW Basalt	CMR15-76	187.1	187.5	S037439	VA15151635	13.56	7.18	0.03	269	7.37	5.27	0.03	205	15.84	11.1	1.7	1.41	4.13	2.49	0.11	852	3.43	2.54	0.31	1353
N	2015	HW Basalt	CMR15-76	218.9	219.3	S037441	VA15151635	13.16	6.96	0.03	269	11.75	8.40	0.03	205	9.54	6.7	0.49	0.41	4.11	2.48	0.16	1239	4.63	3.43	0.18	786
N	2015	HW Basalt	CMR15-76	249.2	249.6	S037442	VA15151635	15.92	8.43	0.03	269	8.47	6.05	0.04	274	14.02	9.8	0.85	0.71	7.44	4.49	0.22	1704	2.3	1.71	0.1	436
N	2015	HW Basalt	CMR15-76	275.2	275.7	S037443	VA15151635	15.55	8.23	0.02	179	5.31	3.80	0.01	68	16.15	11.3	0.28	0.23	9.8	5.91	0.18	1394	2.44	1.81	0.34	1484
N	2015	HW Basalt	CMR15-76	310.4	310.8	S037444	VA15151635	13.25	7.01	0.04	358	8.84	6.32	0.01	68	13.4	9.4	0.71	0.59	4.11	2.48	0.23	1781	2.66	1.97	0.32	1397
N	2015	HW Basalt	CMR15-76	330.9	331.3	S037445	VA15151635	14.01	7.41	0.02	179	7.85	5.61	0.01	68	11.48	8.0	0.36	0.30	5.73	3.46	0.21	1626	3.34	2.48	0.2	873
N	2015	HW Basalt	CMR15-76	344.7	345	S037447	VA15151635	8.75	4.63	0.03	269	14	10.01	0.01	68	8.16	5.7	0.88	0.73	3.16	1.91	0.14	1084	0.99	0.73	0.22	960
N	2015	HW Basalt	CMR15-76	428.3	428.7	S037452	VA15151635	12.97	6.86	0.04	358	7.52	5.37	0.01	68	15.87	11.1	0.8	0.66	3.92	2.36	0.22	1704	1.27	0.94	0.27	1178
N	2015	HW Basalt	GT16-02	15	16	S038882	VA16144761	15.01	7.94	0.05	448	5.23	3.74	0.01	68	13.61	9.5	0.74	0.61	4.53	2.73	0.2	1549	3.76	2.79	0.36	1571
N	2015	HW Basalt	GT16-02	22	23	S038883	VA16144761		8.5		1310		6.33		7		10.45		1.67		3.44		1770		1.22		1550
N	2015	HW Basalt	GT16-02	29	30	S038884	VA16144761		7.58		330		4.09		12		9.16		0.53		3.5		1310		2		1660
N	2015	HW Basalt	GT16-02	36	37	S038885	VA16144761		8.06		240		4.3		31		7.77		0.46		2.98		1205		2.79		1520
N	2015	HW Basalt	GT16-02	43	44	S038886	VA16144761		7.32		580		3.75		11		8.18		0.64		2.81		1375		2.29		1610
N	2015	HW Basalt	GT16-02	50	51	S038887	VA16144761		7.63		890		4.51		5		9.08		0.87		2.77		1415		2.27		1650
N	2015	HW Basalt	GT16-02	57	58	S038888	VA16144761		8.14		730		6.53		10		8.99		0.94		2.18		1660		2.52		1790
N	2015	HW Basalt	GT16-02	64	65	S038889	VA16144761	13	6.88	0.06	537	7.51	5.37	0.01	68	10.83	7.6	1.5	1.25	2.81	1.69	0.19	1471	2.06	1.53	0.34	1484
N	2015	HW Basalt	GT16-02	71	72	S038891	VA16144761		7.62		880		5.25		12		9.45		1.22		2.36		1885		1.3		1530
N	2015	HW Basalt/Fault	GT14-01	160.2	163.7	Q053904	VA14139914	12.75	6.75	0.01	90	6.52	4.66	0.01	68	12.12	8.5	0.14	0.12	6.37	3.84	0.18	1394	3.03	2.25	0.32	1397
N	2015	HW Basalt/Fault	GT14-01	181.1	182.6	Q053906	VA14139914	13.85	7.33	0.09	806	5.98	4.27	0.01	68	12.61	8.8	0.7	0.58	4.6	2.77	0.2	1549	3.42	2.54	0.3	1309
N	2015	HW Basalt Tuff/Fault	CMR14-61b	68.8	70.1	Q153825	VA14144162	13.1	6.93	0.06	537	9.08	6.49	0.02	137	11.83	8.3	0.25	0.21	7.65	4.61	0.2	1549	2.36	1.75	1.01	4408
N	2015	HW Basalt/Fault	CMR15-76	66.7	67	S037434	VA15151635	12.1	6.40	0.01	90	11.9	8.50	0.01	68	13.04	9.1	1.22	1.01	3.67	2.21	0.2	1549	1.24	0.92	0.27	1178
Y	2015	Dyke	CMR09-31	291.39	292.67	H484847	VA15001994	14.7	7.78	0.14	1253	10.05	7.18	0.04	274	12.78	8.9	2.14	1.78	7.59	4.58	0.24	1859	1.64	1.22	0.1	436
Y	2015	Mafic Dyke	GT16-03B	172.3	172.8	S038825	VA16144763	17.84	9.44	0.05	448	9.39	6.71	0.01	68	11.66	8.2	3.65	3.03	5.79	3.49	0.18	1394	2.7	2.00	0.19	829
Y	2017	Mafic Dyke	SS17-ABA			S037208	VA17194447	16.58	8.77	0.04	358	6.27	4.48	0.01	68	6.88	4.8	0.59	0.49	4.39	2.65	0.12	929	5.72	4.24	0.13	567
Y	2017	Mafic Dyke	GT17-06	108.9	109.4	S037995	VA17154273	17.99	9.52	0.04	358	8.67	6.20	*0.01*	68	9.8	6.9	0.91	0.76	3.39	2.04	0.16	1239	5.09	3.78	0.29	1266
Y	2017	Mafic Dyke	GT17-06	154.3	154.8	S037997	VA17154273	17.22	9.11	0.03	269	9.88	7.06	*0.01*	68	9.75	6.8	1.41	1.17	3.53	2.13	0.17	1316	4.07	3.02	0.27	1178
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	215	215.5	W422047	VA17194435	14.24	7.54	0.08	716	7.93	5.67	0.02	137	6.63	4.6	1	0.83	5.24	3.16	0.1	774	3.01	2.23	0.12	524
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	270.5	271	W422051	VA17194435	12.85	6.80	*0.01*	90	10.85	7.75	0.01	68	11.28	7.9	0.02	0.02	5.05	3.05	0.18	1394	2.64	1.96	0.16	698
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	345.5	346	W422054	VA17194435	13.3	7.04	*0.01*	90	9.99	7.14	0.08	547	9.5	6.6	0.1	0.08	9.44	5.69	0.13	1007	1.94	1.44	0.13	567
N	2015	Dyke	CMR15-76	90.3	90.5	S037435	VA15151635	16.69	8.83	0.03	269	7.77	5.55	0.01	68	7.6	5.3	1.58	1.31	3.83	2.31	0.11	852	3.73	2.77	0.18	786
Y	2015	Gabbro Dyke	GT16-03	31.7	32.2	S038817	VA16144763	11.89	6.29	0.03	269	10.45	7.47	0.13	889	11.08	7.7	0.58	0.48	13.7	8.26	0.2	1549	1.53	1.14	0.12	524
Y	2017	Gabbro (Dyke?)	GT17-05	32	32.6	S037978	VA17154263	10.95	5.80	0.04	358	11.85	8.47	0.18	1232	8.99	6.3	0.57	0.47	13.65	8.23	0.16	1239	2.14	1.59	0.19	829
N	2015	Tuff/Limestone	GT16-03B	266	266.5	S038832	VA16144763	4.17	2.21	0.01	90	23.4	16.72	0.01	68	4.07	2.8	0.04	0.03	1.8	1.09	0.2	1549	1.14	0.85	0.18	786
N	2015	*Duplicate of S038832*	GT16-03B	266	266.5	S038833	VA16144763																				
N	2015	Tuff?	CMR14-66	577.7	578.7	S038897	VA16144766	13.2	6.99	3.16	**28293**	4.19	2.99	0.01	68	15.38	10.8	5.75	4.77	7.48	4.51	0.15	1162	0.41	0.30	0.46	2008
Y	2015	Fault (seds)	GT16-03B	239.5	240.7	S038829	VA16144763	9.4	4.97	0.03	269	14.6	10.43	0.05	342	6.46	4.5	0.53	0.44	5.82	3.51	0.15	1162	1.43	1.06	0.12	524
Y	2017	C (Cap Intrusive)	CMR14-66_2017-ABA			W422050	VA17194435	15.72	8.32	0.12	1074	4.86	3.47	*0.01*	68	3.85	2.7	1.38	1.15	1.82	1.10	0.1	774	4.17	3.09	0.09	393
N	2015	Fault	GT14-01	131.7	133.2	Q153975	VA14139914	17.75	9.39	0.05	448	2.49	1.78	0.01	68	12.84	9.0	0.82	0.68	5.03	3.03	0.28	2168	3.15	2.34	0.34	1484
N	2015	Fault	CMR15-76	152	152.4	S037437	VA15151635	11.94	6.32	0.02	179	11.55	8.25	0.04	274	9.46	6.6	0.51	0.42	6.89	4.16	0.16	1239	2.57	1.91	0.21	916
N	2015	Fault	CMR15-76	367.7	368.2	S037449	VA15151635	12.64	6.69	0.03	269	10.3	7.36	0.01	68	9.2	6.4	1.92	1.59	4.86	2.93	0.17	1316	1.8	1.34	0.17	742

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Certificate	Al2O3	Al	BaO	Ba	CaO	Ca	Cr2O3	Cr	Fe2O3	Fe	K2O	K	MgO	Mg	MnO	Mn	Na2O	Na	P2O5	P
Y (yes) or								%	%	%	ppm	%	%	%	ppm	%	%	%	%	%	%	%	ppm	%	%	%	ppm
N (no)								ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc
	Crustal Abundance for Basalt (Price, 1997)								7.8		330		7.6		170		8.65		0.83		4.6		1500		1.8		1100
	Crustal abundance x10								78		3300		76		1700		86.5		8.3		46		15000		18		11000
	Crustal Abundance for Shales (Price, 1997)								8.0		580		2.21		90		4.72		2.66		1.5		850		0.96		700
	Crustal abundance x10								80		5800		22.1		900		47.2		26.6		15		8500		9.6		7000
Y	2015	Argillite	CMR09-32	226.16	227.69	H482722	VA15001994	5.39	2.85	0.16	1433	25.4	18.15	0.01	68	3.27	2.3	1.32	1.10	1.4	0.84	0.21	1626	0.13	0.10	0.1	436
Y	2015	Argillite	CMR09-26	252.62	253.59	H484672	VA15001994	6.81	3.60	0.07	627	18.15	12.97	0.02	137	5.67	4.0	0.81	0.67	3.25	1.96	0.19	1471	1.74	1.29	0.21	916
Y	2015	Argillite	CMR09-31	338.94	339.85	H484851	VA15001994	12.3	6.51	0.16	1433	7.53	5.38	0.02	137	9.64	6.7	2.48	2.06	5.66	3.41	0.17	1316	0.77	0.57	0.16	698
Y	2015	Argillite w/ tr dykes	CMR14-66	597.4	598.2	S038898	VA16144766	2.69	1.42	0.08	716	36.4	**26.02**	0.01	68	1.57	1.1	0.81	0.67	0.78	0.47	0.21	1626	0.01	0.01	0.09	393
Y	2015	*Duplicate of S038898*	CMR14-66	597.4	598.2	S038899	VA16144766																				
Y	2017	Argillite	SS17-ABA			S037201	VA17194447	8.49	4.49	0.03	269	16.9	12.08	0.02	137	6.67	4.7	0.56	0.46	5.04	3.04	0.2	1549	0.72	0.53	0.14	611
Y	2017	Argillite	SS17-ABA			S037202	VA17194447	7.51	3.97	0.03	269	17.45	12.47	0.01	68	5.84	4.1	0.69	0.57	3.67	2.21	0.14	1084	0.71	0.53	0.18	786
Y	2017	Argillite	SS17-ABA			S037203	VA17194447	9.3	4.92	0.04	358	15.1	10.79	0.01	68	8.08	5.7	0.95	0.79	4.96	2.99	0.17	1316	0.24	0.18	0.13	567
Y	2017	Argillite	CMR14-66_2017-ABA	193	193.5	W422046	VA17194435	4.09	2.16	0.05	448	25.5	18.22	0.01	68	2.69	1.9	1.17	0.97	1.76	1.06	0.16	1239	0.06	0.04	0.15	655
Y	2017	Argillite	CMR14-66_2017-ABA	235	235.5	W422048	VA17194435	3.75	1.98	0.06	537	22.7	16.22	*0.01*	68	5.01	3.5	0.69	0.57	8.79	5.30	0.18	1394	0.23	0.17	0.1	436
Y	2017	Argillite	CMR14-66_2017-ABA	255	255.5	W422049	VA17194435	2.55	1.35	0.02	179	24.3	17.37	*0.01*	68	4.69	3.3	0.43	0.36	8.24	4.97	0.21	1626	0.2	0.15	0.09	393
Y	2017	Argillite	CMR14-66_2017-ABA	358.5	359	W422055	VA17194435	4.35	2.30	0.03	269	26.5	18.94	0.01	68	2.7	1.9	0.64	0.53	1.77	1.07	0.07	542	0.34	0.25	0.17	742
Y	2017	Argillite	CMR14-66_2017-ABA	428.5	429	W422058	VA17194435	5.1	2.70	0.03	269	24.3	17.37	0.01	68	3.92	2.7	0.66	0.55	1.36	0.82	0.11	852	0.21	0.16	0.22	960
Y	2017	Argillite w Mafic Dykes	ABA Barrel 2					14.59	7.72	0.06	537	11.55	8.25	0.03	205	11.2	7.8	1.25	1.04	5.36	3.23	0.17	1316	2.83	2.10	0.17	742
N	2015	Argillite (limey)	CMR14-61b	40	40.5	Q153816	VA14144162	3.3	1.75	0.07	627	35.9	**25.66**	0.01	68	1.97	1.4	0.9	0.75	0.95	0.57	0.19	1471	0.05	0.04	0.08	349
N	2015	Argillite (limey)	CMR14-61b	140.85	141.35	Q153834	VA14144162	5.56	2.94	0.08	716	23.6	16.87	0.01	68	3.09	2.2	1.48	1.23	1.83	1.10	0.14	1084	0.22	0.16	0.09	393

Notes:

Yellow highlight denotes samples NOT analyzed for ALS characterization pkg (CCP-PKG03); these samples only submitted for 4-acid ICP

MEXRF26 - Lithitum borate fusion decomposition with XRF Sprectroscopy analysis (part of ALS CCP-PKG03)

ME-MS81 - Lithitum borate fusion decomposition with ICP-MS analysis (part of ALS CCP-PKG03)

ME-4ACD81 - Four Acid digestion with ICP-AES analysis (part of CCP-PKG03)

ME-MS42 - Aqua Regia digestion with ICP-MS analysis (part of ALS CCP-PKG03)

Number - value greater than ten times crustal abundance for basalt or shale

D=The data for these elements are missing or unreliable.

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	SiO2	Si	SrO	Sr	TiO2	Ti	LOI	Total	Ce	Cs	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho	La	Lu	Nb
Y (yes) or N (no)							%	ppm	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
							ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	ME-XRF26	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81
	Crustal Abundance for Basalt (Price, 1997)							230000		465		1.38			48	1.1	3.8	2.1	0.8	17	5.3	1.3	2	1.1	15	0.6	19
	Crustal abundance x10							2300000		4650		13.8			480	11	38	21	8	170	53	13	20	11	150	6	190
Y	2015	HW Basalt	CMR09-32	45.11	46.33	H482709	45.2	211283	0.02	169	1.16	0.70	4.94	99.86	22.4	4.36	4.67	3.03	1.19	16.7	4.1		2.1	1.06	11.8	0.45	10.5
Y	2015	HW Basalt	CMR09-32	87.78	89.31	H482712	46.1	215490	0.02	169	0.73	0.44	6.08	99.24	19.3	4.25	4.61	3.05	0.83	15.8	3.62		2	0.98	9.2	0.46	8.7
Y	2015	HW Basalt	CMR09-32	133.5	134.72	H482715	44.6	208478	0.03	254	0.65	0.39	3.98	100.1	3.3	3.38	2.73	2.03	0.51	15.5	1.9		0.7	0.67	1.6	0.29	1.5
Y	2015	HW Basalt	CMR09-32	180.44	181.97	H482718	43.2	201934	0.02	169	0.84	0.50	5.43	100.1	8.5	2.37	3.05	2.13	0.67	14.6	2.48		1	0.7	3.7	0.32	3.3
Y	2015	HW Basalt	CMR09-32	216.1	217.63	H482721	44.6	208478	0.01	85	1.16	0.70	6.98	99.88	24.7	1.79	4.47	2.75	1.14	18.7	4.09		2.4	0.95	11.3	0.4	14
Y	2015	HW Basalt	CMR09-26	15.85	17.37	H484662	45.3	211750	0.03	254	1.18	0.71	4.1	99.98	21.9	2.79	4.36	3.08	1.09	17.8	3.94		2.1	1.01	10.8	0.43	10.2
Y	2015	HW Basalt	CMR09-26	78.33	79.86	H484664	46.6	217827	0.02	169	1.16	0.70	7.5	99.78	47.7	2.07	5.03	3.14	1.36	16.7	5.04		3.6	1.08	22.5	0.48	20.9
Y	2015	HW Basalt	CMR09-26	108.81	110.34	H484665	45.2	211283	0.02	169	0.72	0.43	5.73	99.46	17.9	5.2	4.21	3	0.88	21	3.51		1.9	0.92	9.5	0.45	9.1
Y	2015	HW Basalt	CMR09-26	182	183.49	H484667	48.1	224839	0.02	169	0.7	0.42	2.54	100.65	4.3	3.62	3.23	2.25	0.57	16.1	2.22		0.7	0.78	2.3	0.38	2.1
Y	2015	HW Basalt	CMR09-26	256.64	257.74	H484673	47.2	220632	0.02	169	0.88	0.53	6.62	99.25	23.7	3.65	4.75	3.14	0.91	15.6	3.86		2.2	1.06	12.4	0.48	9
Y	2015	HW Basalt	CMR09-31	37.19	38.4	H484837	38.8	181367	0.03	254	0.61	0.37	12.91	99.71	8.1	0.47	2.6	1.59	0.65	12.3	2.09		1.1	0.57	3.3	0.24	3.4
Y	2015	HW Basalt	CMR09-31	124.3	125.27	H484841	46.1	215490	0.04	338	1.18	0.71	3.78	99.69	20.8	3.34	4.23	2.59	1.11	18	3.77		2	0.91	9.2	0.4	10.1
Y	2015	HW Basalt	CMR09-31	204.83	206.29	H484844	41.4	193520	0.03	254	0.64	0.38	5.15	99.46	4.2	3.12	3.11	2.29	0.56	15.9	2.05		0.7	0.76	2.1	0.35	1.8
Y	2015	HW Basalt	CMR09-31	258.53	259.69	H484846	41	191650	0.04	338	0.68	0.41	5.55	100	4.6	1.57	3.22	2.29	0.53	17.6	2.26		0.8	0.77	2.3	0.36	2.1
Y	2015	HW Basalt	CMR09-31	330.1	331.32	H484849	44.1	206141	0.02	169	0.91	0.55	9.45	99.89	21.6	0.76	4.56	3.12	1.04	16.6	3.89		2	1.04	9.1	0.46	11.8
Y	2015	HW Basalt	GT16-03	4.6	5.1	S038816	42.5	198662	0.02	169	0.96	0.58	11.74	100.2	19.3	0.95	3.99	2.56	1.16	17.1	3.44	5	1.9	0.89	9.2	0.4	10.3
Y	2015	HW Basalt	GT16-03	59.2	59.7	S038818	43.46	203149	0.02	169	0.6	0.36	5.38	100	3.8	0.93	2.89	2.03	0.53	15.8	1.98	5	0.6	0.65	1.7	0.3	1.5
Y	2015	HW Basalt	GT16-03	90	90.5	S038819	45.83	214228	0.01	85	0.7	0.42	4.85	99.99	2.9	1.65	2.66	1.8	0.46	12.2	1.97	5	0.6	0.63	1.3	0.3	1.6
Y	2015	HW Basalt	GT16-03	120	120.5	S038821	43.34	202588	0.03	254	0.6	0.36	4.97	99.97	3.7	0.72	2.75	1.96	0.53	15.9	1.96	5	0.5	0.68	1.6	0.3	1.4
Y	2015	HW Basalt	GT16-03	104.3	104.8	S038822				141		0.37								20					10		
Y	2015	HW Basalt	GT16-03B	134.2	134.8	S038823	44.33	207216	0.02	169	0.72	0.43	4.48	100.5	3.7	3.53	2.8	1.94	0.51	17.5	2.07	5	0.6	0.7	1.8	0.35	1.6
Y	2015	HW Basalt	GT16-03B	164	165	S038824	43.76	204552	0.02	169	0.64	0.38	4.48	99.89	3.7	3.68	2.77	2.04	0.46	16.9	2.03	5	0.6	0.66	2	0.34	1.7
Y	2015	HW Basalt	GT16-03B	190.4	190.9	S038826	43.45	203103	0.03	254	0.66	0.40	4.5	99.96	3.7	5.56	3.01	1.99	0.53	15.6	1.96	5	0.5	0.68	1.9	0.33	1.4
Y	2015	HW Basalt	GT16-03B	207.7	208.2	S038827	33.25	155424	0.02	169	0.63	0.38	19.75	99.9	34.1	0.47	5.02	3.09	0.99	11.9	4.99	5	2.8	1.08	24.4	0.48	12.9
Y	2015	HW Basalt	GT16-03B	222.5	223	S038828	48.43	226381	0.02	169	1.24	0.74	4.95	100.3	50.5	2.15	5.41	3.27	1.44	15.3	5.51	5	4	1.16	24.4	0.49	23.9
Y	2015	HW Basalt	GT16-03B	262	262.5	S038831	44.71	208992	0.01	85	2.25	1.35	3.68	99.89	26.1	0.1	5.48	3.36	1.52	22.9	4.87	5	2.4	1.17	11.5	0.54	13.3
Y	2015	HW Basalt	GT16-03B	273.2	273.8	S038834	46.87	219089	0.01	85	0.76	0.46	6.59	99.51	5.3	0.21	2.71	1.65	0.44	17.4	2.28	5	0.6	0.55	4.3	0.24	1.6
Y	2015	HW Basalt	CMR14-66	456	456.8	S038892	44.17	206468	0.03	254	0.68	0.41	10.57	100	12.3	3.61	3.11	1.77	0.72	13.6	2.67	5	1.4	0.62	5.6	0.26	7.3
Y	2015	HW Basalt	CMR14-66	482	483	S038893	41.24	192772	0.03	254	0.62	0.37	6.03	99.9	3.9	4.16	2.88	1.91	0.56	14.5	2.09	5	0.6	0.72	1.9	0.3	2.2
Y	2015	HW Basalt	CMR14-66	509.8	510.8	S038894	44.26	206889	0.03	254	0.95	0.57	4.65	100.55	11.7	5.69	3.52	2.4	0.87	17.9	3.21	5	1.2	0.88	5.5	0.4	4.8
Y	2015	HW Basalt	CMR14-66	536.1	537.1	S038895	43.24	202121	0.06	507	0.88	0.53	6.5	99.88	10.7	3.19	3.04	2.32	0.73	16.5	2.62	5	1	0.72	5	0.33	4.4
Y	2015	HW Basalt	CMR14-66	557.6	558.7	S038896	48.11	224885	0.02	169	0.91	0.55	3.22	99.65	24.3	3.7	4.52	3.28	1	15	4.17	5	2	1.02	11.5	0.45	12.3
Y	2017	HW Basalt	CMR14-66_2017-ABA	303	303.5	W422052	40.84	190902	0.03	254	0.86	0.52	13.4	99.94	7.6	0.43	2.85	1.92	0.58	14.9	2.5	5	0.9	0.67	3.2	0.3	2.8
Y	2017	HW Basalt	CMR14-66_2017-ABA	332.5	333	W422053	45.67	213480	0.04	338	0.83	0.50	9.51	99.66	16.6	0.08	2.98	1.61	0.84	16.4	2.84	5	1.9	0.65	7.8	0.28	5
Y	2017	HW Basalt	CMR14-66_2017-ABA	389	389.5	W422056	41.67	194782	0.03	254	1	0.60	13.28	98.87	17	0.44	4.28	2.94	0.88	15.1	3.43	5	1.7	0.94	8.3	0.45	8.5
Y	2017	HW Basalt	CMR14-66_2017-ABA	412	412.5	W422057	43.32	202495	0.03	254	1.12	0.67	9.01	100.15	25.8	0.24	4.65	2.9	1.27	18	3.92	5	1.9	0.99	12	0.52	13.1
Y	2017	HW Basalt	ABA Barrel 3				38.54	180151	0.05	423	0.44	0.26	19.59	100.2	14.6	0.38	3.14	1.96	0.77	8.1	3.03	5	1.3	0.65	12.7	0.3	3.9
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037204	44	205674	0.02	169	1.64	0.98	8.6	99.84	30.5	0.53	4.77	2.98	1.33	18.8	4.43	5	2.7	1.11	13.9	0.46	15.4
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037205	53.03	247883	0.02	169	1.6	0.96	4.48	99.18	36.2	0.32	7.89	5.39	1.63	19.5	6.74	5	3.8	1.83	17.1	0.91	14.1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037206	48.28	225680	0.02	169	1.76	1.06	5.23	99.25	32.5	0.36	7.47	5.2	1.5	19.4	5.99	5	3.7	1.65	15.1	0.79	12.4
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037207	44.75	209179	0.02	169	1.8	1.08	4.73	100.5	40.9	1.04	9.05	5.81	1.81	24.9	7.61	5	4.5	2	19.5	0.82	14.8
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037209	44.44	207730	0.04	338	1.75	1.05	5.45	99.02	36.9	0.31	6.93	4.81	1.72	21.1	6.82	5	3.7	1.56	16.8	0.73	10.8
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037210	48.93	228718	0.04	338	1.91	1.15	4	98.79	35.5	0.68	7.5	4.84	1.64	21	6.44	5	4.3	1.63	16.7	0.75	17.4
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037211	52.37	244798	0.02	169	1.36	0.82	4.68	98.96	31.7	0.67	6.8	4.36	1.44	19.5	5.59	5	3.2	1.51	14.8	0.67	12.1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037212	52.5	245406	0.02	169	1.68	1.01	5.79	99.4	33.3	0.59	7.43	4.78	1.58	17.6	6.54	5	3.7	1.65	15.3	0.76	12.5
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037213	47.16	220445	0.02	169	2.51	1.50	3.77	99.42	43.2	0.55	9.89	6.18	2.34	23.3	8.72	5	5.3	2.11	19.3	0.98	19.1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037214	42.81	200111	0.03	254	1.03	0.62	9.27	98.51	17.6	0.37	3.3	1.85	0.97	16.5	3.27	5	1.6	0.65	7.8	0.27	5.3
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037215	45.69	213573	0.03	254	1.14	0.68	6.65	99.08	30	0.23	4.01	2.39	1.24	19.7	4.24	5	2.8	0.86	13.7	0.37	6.7
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037216	45.56	212966	0.03	254	1.34	0.80	9.51	99.12	29.8	0.18	5.19	3.52	1.3	18	4.3	5	3	1.15	14.6	0.46	9.6
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037217	56.33	263309	0.03	254	2.01	1.21	3.47	100.2	44.7	0.25	8.79	5.85	2.09	20.8	8.19	5	4.9	1.99	20.1	0.86	17.5
Y	2017	Jasper Mtn Basalt	GT17-05	2	2.5	S037977	58.38	272891	0.03	254	1.83	1.10	4.34	100.05	38.2	0.43	7.67	4.97	1.64	16.1	6.94	5	3.8	1.71	18	0.77	14.5
Y	2017	Jasper Mtn Basalt	GT17-05	63.3	63.8	S037979	50.36	235403	0.02	169	2.12	1.27	5.41	100.2	28.8	0.58	6.13	4.11	1.47	15.9	5.83	5	3.3	1.36	13.2	0.57	11.2
Y	2017	Jasper Mtn Basalt	GT17-05	90.8	91.3	S037981	46.85	218996	0.01	85	2.11	1.26	4.28	100.1	37.1	0.41	8.65	5.64	1.64	25.1	7.4	5	4.5	1.8	16.4	0.78	17.3
Y	2017	Jasper Mtn Basalt	GT17-05	118.5	119	S037982	51.37	240124	0.01	85	2.21	1.32	2.45	99.15	36.6	0.81	8.44	5.68	1.81	19.3	7.62	5	4.3	1.78	17.4	0.92	15.2
Y	2017	Jasper Mtn Basalt	GT17-05	151.5	152	S037983	42.39	198148	0.01	85	2.01	1.21	4.39	99.99	26.7	1.89	6.57	4.48	1.39	21	5.69	5	3.5	1.49	11.7	0.66	11.7
Y	2017	Jasper Mtn Basalt	GT17-05	180.3	180.8	S037984	48.67	227503	0.05	423	1.67	1.00	2.99	100.05	23.5	0.4	6.14	4.1	1.19	18.6	5.25	5	3	1.27	10.6	0.59	9.2
Y	2017	Jasper Mtn Basalt	GT17-05	208.3	208.8	S037985	55.35	258728	0.02	169	1.37	0.82	5.21	99.38	26.6	0.21	6.18	4.23	1.22	15.7	5.6	5	2.8	1.4	13	0.61	9.9
Y	2017	Jasper Mtn Basalt	GT17-05	238.8	239.3	S037986	51.34	239984	0.03	254	1.48	0.89	5.02	100.4	26.4	0.65	5.26	3.63	1.31	17.3	5.12	5	3	1.22	12	0.5	11.2
Y	2017	Jasper Mtn Basalt	GT17-05	270	270.5	S037987	45.31	211797	0.02	169	1.45	0.87	8.48	100.4	22.4	0.4	5.51	3.66	1.21	16.7	4.86	5	2.2	1.21	10.3	0.54	8.1
Y	2017	Jasper Mtn Basalt	GT17-05	291.6	292.1	S037988	49.21	230027	0.02	169	1.32	0.79	6.2	100.55	18.9	0.66	4.66	3.22	1.07	15.3	4.3	5	1.9	1.06	9	0.46	7.8
Y	2017	Jasper Mtn Basalt	GT17-06	5.9	6.4	S037989	47.35	221333	0.03	254	1.48	0.89	7.54	100.65	22.7	0.46	4.25	2.96	1.04	15.8	4.03	5	1.8	0.95	9.8	0.37	11.6
Y	2017	Jasper Mtn Basalt	GT17-06	28.9	29.4	S037991	47.36	221380	0.03	254	1.44	0.86	7.33	99.76	22.7	1.01	4.22	2.94	1.03	15.9	3.89	5	2	0.92	10.5	0.41	11.6
Y	2017	Jasper Mtn Basalt	GT17-06	40.8	41.3	S037992	20.74	96947	0.11	930	0.43	0.26	28.66	99.44	11.5	0.53	2.2	1.54	0.46	4.4	1.86	5	0.5	0.45	5.8	0.22	3.6

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	SiO2	Si	SrO	Sr	TiO2	Ti	LOI	Total	Ce	Cs	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho	La	Lu	Nb
Y (yes) or N (no)							%	ppm	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
							ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	ME-XRF26	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81
	Crustal Abundance for Basalt (Price, 1997)							230000		465		1.38			48	1.1	3.8	2.1	0.8	17	5.3	1.3	2	1.1	15	0.6	19
	Crustal abundance x10							2300000		4650		13.8			480	11	38	21	8	170	53	13	20	11	150	6	190
Y	2017	Jasper Mtn Basalt	GT17-06	59.4	59.9	S037993	43.26	202215	0.02	169	1.65	0.99	7.47	99.61	31.3	0.48	5.45	3.43	1.2	16.7	5.21	5	2.1	1.11	15	0.53	13
Y	2017	Jasper Mtn Basalt	GT17-06	85.3	85.8	S037994	44.74	209133	0.03	254	1.64	0.98	8.38	100.3	23.7	3.78	4.69	3.03	1.14	16	4.22	5	2.2	0.99	10.1	0.4	12.9
Y	2017	Jasper Mtn Basalt	GT17-06	135.3	135.8	S037996	42.27	197587	0.02	169	1.7	1.02	10.11	99.62	26.6	0.27	4.69	2.82	1.18	17.8	4.29	5	2.3	0.99	12	0.41	13.8
Y	2017	Jasper Mtn Basalt	GT17-06	181.3	181.8	S037998	32.03	149721	0.03	254	1.22	0.73	17.66	99.78	19.9	1.01	3.76	2.14	0.92	14	3.38	5	1.8	0.74	9.1	0.29	9.3
Y	2017	Jasper Mtn Basalt	GT17-06	207.1	207.6	S037999	37.98	177534	0.03	254	1.49	0.89	12.49	100.25	26.3	0.32	4.44	2.59	1.07	16.7	3.84	5	2.1	0.86	12.1	0.41	12.1
Y	2017	Jasper Mtn Basalt	GT17-06	230.5	231	S038000	44.17	206468	0.02	169	1.7	1.02	8.54	100.6	25.6	0.33	4.71	2.99	1.12	17.6	4.73	5	2.4	1.01	12	0.4	13.2
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	40.5	41	W422041	56.07	262094	0.02	169	1.52	0.91	4.7	99.72	41.4	0.09	8.26	5.3	1.6	17.1	7.06	5	3.8	1.8	20.6	0.76	12
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	70	70.5	W422042	49.05	229279	0.04	338	1.4	0.84	5.77	99.75	24.3	0.05	5.36	3.52	1.22	16.5	4.54	5	2.3	1.17	11.1	0.46	7.9
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	104.2	104.7	W422043	44.38	207450	0.03	254	1.31	0.79	8.23	100.05	20.5	0.06	5.04	3.29	1.23	16.9	4.08	5	2.2	1.08	9.3	0.51	9
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	130	130.5	W422044	43.97	205533	0.02	169	1.36	0.82	8.49	99.01	19.5	0.94	5.03	3.18	1.11	18.5	4.08	5	2.4	1.1	8.7	0.5	9.8
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	165.5	166	W422045	47.76	223249	0.03	254	1.16	0.70	3.2	99.21	19.4	0.12	4.7	2.87	1.08	16.8	3.64	5	1.9	1.01	9.1	0.42	9.5
Y	2017	Jasper Mtn Basalt	ABA Barrel 1				46.66	218108	0.03	254	1.55	0.93	5.99	99.56	29.2	0.7	5.32	3.66	1.33	17.2	5.31	5	3.5	1.12	13.3	0.5	11.4
N	2015	HW Basalt	GT14-01	250.1	251.5	Q053907	46.9	219229	0.02	169	0.89	0.53	3.51	98.6	22.4	1.36	4.46	2.79	0.96	16.4	3.71		2.1	0.92	10	0.4	11.1
N	2015	HW Basalt	CMR14-61b	108.3	108.8	Q153831	44.1	206141	0.03	254	0.91	0.55	4.33	98.78	13.2	1.77	3.49	2.08	0.73	15.5	2.87		1.4	0.75	6	0.3	5.4
N	2015	HW Basalt	CMR14-61b	169.3	169.8	Q153837	53.5	250080	0.07	592	0.6	0.36	4.13	99.63	17.4	1.51	2.39	1.41	0.71	19.2	2.3		2.4	0.48	8.7	0.21	4.1
N	2015	HW Basalt	CMR14-61b	193.9	194.9	Q153838	48.4	226241	0.01	85	1.28	0.77	6.91	99.36	40.9	0.85	6.82	4.31	1.47	19.5	5.52		3.4	1.37	19	0.67	18.4
N	2015	HW Basalt	GT14-01	43.6	44.3	Q153964	50.9	237927	0.01	85	1.38	0.83	5.66	101.05	45.2	0.52	6.54	4.4	1.38	18.4	5.59		3.9	1.46	21.7	0.67	18.3
N	2015	HW Basalt	GT14-01	100.1	101.1	Q153967	37.5	175290	0.04	338	0.67	0.40	13.9	101.75	18.3	0.55	3.89	2.71	0.74	12.2	3.05		1.5	0.89	9.8	0.45	5.3
N	2015	HW Basalt	GT14-01	281.3	282.4	Q153991	46.8	218762	0.02	169	0.93	0.56	3.27	99.36	10	0.92	3.56	2.34	0.73	12.3	2.86		1.1	0.81	4.5	0.34	3.8
N	2015	HW Basalt	GT14-01	12.1	13.1	Q153993	46.3	216425	0.01	85	0.79	0.47	7.37	99.18	19.7	0.47	4.04	2.72	0.85	14.4	3.41		1.7	0.9	10.3	0.41	6.8
N	2015	HW Basalt	GT14-01	70	71	Q153999	53.4	249613	0.01	85	1.26	0.76	5.07	99.18	37.5	0.13	5.66	3.64	1.15	16.2	4.73		3.2	1.25	18.2	0.53	16.8
N	2015	HW Basalt	CMR15-76	122	122.4	S037436	45	210348	0.02	169	1.18	0.71	6.29	101.2	19.3	3.44	4.23	2.6	0.99	17.2	3.43	5	1.7	0.88	8.7	0.37	8.8
N	2015	HW Basalt	CMR15-76	169	169.4	S037438	47.71	223016	0.04	338	1.14	0.68	3.16	99.03	28.5	1.78	4.83	3.13	1.37	17.8	4.44	5	2.3	1.03	14	0.41	9
N	2015	HW Basalt	CMR15-76	187.1	187.5	S037439	46.87	219089	0.03	254	1.16	0.70	4.7	99.47	22.4	2.94	4.2	2.64	1.1	16.6	3.9	5	2	0.89	10.8	0.41	9.5
N	2015	HW Basalt	CMR15-76	218.9	219.3	S037441	48.48	226615	0.02	169	0.7	0.42	6.61	99.98	15.7	0.34	3.72	2.54	0.7	12.8	3.02	5	1.7	0.85	7.2	0.38	7.8
N	2015	HW Basalt	CMR15-76	249.2	249.6	S037442	44.78	209320	0.03	254	0.96	0.58	4.36	99.69	8.2	0.76	3.31	2.15	0.72	16.3	2.69	5	0.9	0.74	3.5	0.32	3.2
N	2015	HW Basalt	CMR15-76	275.2	275.7	S037443	40.65	190014	0.01	85	1.24	0.74	6.9	99.65	33.3	1.19	6.32	4.39	1.47	20.2	5.36	5	3	1.4	16.1	0.68	12.8
N	2015	HW Basalt	CMR15-76	310.4	310.8	S037444	46.35	216658	0.01	85	1.25	0.75	8.82	100.6	36.2	0.56	6.03	3.94	1.36	19.2	5.27	5	2.9	1.28	17.9	0.56	15.3
N	2015	HW Basalt	CMR15-76	330.9	331.3	S037445	47.4	221567	0.02	169	0.91	0.55	8.49	100.35	18.8	0.35	3.88	2.54	0.8	16.1	3.56	5	1.9	0.91	8.6	0.39	8.6
N	2015	HW Basalt	CMR15-76	344.7	345	S037447	48.13	224979	0.02	169	0.66	0.40	12.89	99.38	18.3	0.63	4.04	2.69	0.89	10.7	3.8	5	2	0.92	12.6	0.37	6.2
N	2015	HW Basalt	CMR15-76	428.3	428.7	S037452	46.26	216238	0.02	169	1.64	0.98	8.08	99.41	24.4	0.15	6.58	4.55	1.16	19	5.22	5	3.3	1.49	11.8	0.7	10.4
N	2015	HW Basalt	GT16-02	15	16	S038882	48.63	227316	0.01	85	1.42	0.85	6.3	100.4	41.3	0.3	5.8	4.03	1.49	18.5	5.29	5	4	1.38	19.9	0.57	17.8
N	2015	HW Basalt	GT16-02	22	23	S038883				108		1.09								20					30		
N	2015	HW Basalt	GT16-02	29	30	S038884				98		0.8								20					20		
N	2015	HW Basalt	GT16-02	36	37	S038885				261		0.8								20					10		
N	2015	HW Basalt	GT16-02	43	44	S038886				113		0.79								20					20		
N	2015	HW Basalt	GT16-02	50	51	S038887				109		0.88								20					20		
N	2015	HW Basalt	GT16-02	57	58	S038888				136		0.9								20					20		
N	2015	HW Basalt	GT16-02	64	65	S038889	51.67	241526	0.01	85	1.2	0.72	7.73	99.82	39.4	0.41	5.9	3.95	1.43	17.3	5.05	5	3.5	1.36	19.4	0.62	15.5
N	2015	HW Basalt	GT16-02	71	72	S038891				95		0.8								20					20		
N	2015	HW Basalt/Fault	GT14-01	160.2	163.7	Q053904	50.1	234187	0.01	85	1.17	0.70	7.38	100.25	34.7	0.24	5.75	3.91	1.21	15.9	4.94		3.1	1.25	16.8	0.56	15.8
N	2015	HW Basalt/Fault	GT14-01	181.1	182.6	Q053906	49.9	233253	0.01	85	1.18	0.71	6	99.2	35.3	0.76	5.46	3.6	1.18	16.9	4.63		3.2	1.21	17	0.54	15.3
N	2015	HW Basalt Tuff/Fault	CMR14-61b	68.8	70.1	Q153825	44.1	206141	0.02	169	1.4	0.84	8.83	100.3	59	0.45	6.47	3.59	2.76	15.8	8.76		3.3	1.29	25.9	0.47	10.6
N	2015	HW Basalt/Fault	CMR15-76	66.7	67	S037434	42.02	196418	0.02	169	1.72	1.03	12.01	100	21.8	2.38	7.84	5.34	1.82	18.6	6.23	5	3.1	1.72	9.2	0.74	7.1
Y	2015	Dyke	CMR09-31	291.39	292.67	H484847	45.5	212685	0.04	338	0.9	0.54	4.26	100.6	8.6	3.26	3.1	2.09	0.66	15.4	2.41		1	0.71	3.7	0.33	3.4
Y	2015	Mafic Dyke	GT16-03B	172.3	172.8	S038825	43.28	202308	0.06	507	1.02	0.61	3.47	100.15	27.6	7.03	3.67	1.96	1.27	20.6	4.25	5	2.2	0.75	13	0.29	4.8
Y	2017	Mafic Dyke	SS17-ABA			S037208	55.33	258635	0.07	592	0.52	0.31	3.09	100.35	23.4	0.14	2.08	1.16	0.88	18.4	2.37	5	2.2	0.44	11.6	0.19	5.9
Y	2017	Mafic Dyke	GT17-06	108.9	109.4	S037995	48.13	224979	0.10	846	0.83	0.50	4.33	100.65	35.4	1.15	3.64	2.27	1.24	18.8	4.16	5	2.3	0.73	16.7	0.33	6.9
Y	2017	Mafic Dyke	GT17-06	154.3	154.8	S037997	47.44	221754	0.07	592	0.81	0.49	5.08	101.35	36	1.87	3.5	2.05	1.16	17.7	4.05	5	2.3	0.71	18.2	0.3	6.6
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	215	215.5	W422047	49.43	231056	0.05	423	0.53	0.32	9.04	100.1	30.9	0.97	2.17	1.36	0.98	15	2.71	5	1.7	0.43	15.9	0.18	3.7
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	270.5	271	W422051	43.55	203570	0.04	338	0.95	0.57	11.51	99.52	14.8	0.03	3.62	2.26	0.88	14.7	2.96	5	1.5	0.82	6.7	0.36	6.2
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	345.5	346	W422054	39.96	186789	0.04	338	0.66	0.40	12.4	99.97	13.9	0.52	2.22	1.11	0.5	14.3	2.39	5	1.2	0.47	6.4	0.18	2
N	2015	Dyke	CMR15-76	90.3	90.5	S037435	55.38	258868	0.06	507	0.71	0.43	2.71	100.9	25.5	0.61	2.81	1.71	0.99	18.6	3.12	5	2.3	0.62	12.8	0.26	5.1
Y	2015	Gabbro Dyke	GT16-03	31.7	32.2	S038817	45.21	211330	0.03	254	0.81	0.49	3.99	100	18.6	0.25	2.77	1.57	0.99	15.2	3.12	5	1.7	0.58	9	0.23	3
Y	2017	Gabbro (Dyke?)	GT17-05	32	32.6	S037978	44.28	206982	0.03	254	0.65	0.39	5.61	99.96	23	0.13	3.05	1.63	1.23	11.7	4.18	5	1.4	0.58	10.3	0.18	1.7
N	2015	Tuff/Limestone	GT16-03B	266	266.5	S038832	45.56	212966	0.02	169	0.19	0.11	17.91	100.05	17	0.07	3.24	2.09	0.68	5.8	3.37	5	1.1	0.73	19.8	0.33	3.7
N	2015	*Duplicate of S038832*	GT16-03B	266	266.5	S038833																					
N	2015	Tuff?	CMR14-66	577.7	578.7	S038897	41.66	194736	0.02	169	1.84	1.10	5.77	105.65	55.3	9.77	5.87	3.79	1.29	22.9	6.41	5	4.4	1.29	26.8	0.59	22.4
Y	2015	Fault (seds)	GT16-03B	239.5	240.7	S038829	46.99	219650	0.02	169	0.44	0.26	13.12	99.87	21.1	0.81	2.77	1.64	0.75	10.8	2.7	5	1.6	0.57	14.3	0.26	4.6
Y	2017	C (Cap Intrusive)	CMR14-66_2017-ABA			W422050	65.97	308370	0.09	761	0.34	0.20	0.94	99.55	33	0.22	1.72	0.97	0.73	17.3	1.76	5	2.6	0.33	18.5	0.2	8.2
N	2015	Fault	GT14-01	131.7	133.2	Q153975	48.9	228578	0.01	85	1.36	0.82	5.38	99.32	42	0.48	8.15	5.2	1.8	18.5	7.16		3.6	1.75	21.4	0.77	17.1
N	2015	Fault	CMR15-76	152	152.4	S037437	43.91	205253	0.04	338	0.87	0.52	11.14	100.25	20.7	0.46	2.82	1.71	0.92	13.5	2.99	5	1.5	0.56	10	0.23	5.6
N	2015	Fault	CMR15-76	367.7	368.2	S037449	42.58	199036	0.02	169	0.86	0.52	15.24	100.45	19	4.95	4.12	2.85	0.91	14.7	3.48	5	2.2	0.85	9.2	0.41	6.4

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	SiO2	Si	SrO	Sr	TiO2	Ti	LOI	Total	Ce	Cs	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho	La	Lu	Nb
Y (yes) or N (no)							%	ppm	%	ppm	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
							ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	calc	ME-XRF26	ME-XRF26	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81	ME-MS81
	Crustal Abundance for Basalt (Price, 1997)							230000		465		1.38			48	1.1	3.8	2.1	0.8	17	5.3	1.3	2	1.1	15	0.6	19
	Crustal abundance x10							2300000		4650		13.8			480	11	38	21	8	170	53	13	20	11	150	6	190
	Crustal Abundance for Shales (Price, 1997)							73000		300		0.46			59	5	4.6	2.5	1	19	6.4	1.6	2.8	1.2	92	0.7	11
	Crustal abundance x10							730000		3000		4.6			590	50	46	25	10	190	64	16	28	12	920	7	110
Y	2015	Argillite	CMR09-32	226.16	227.69	H482722	39.4	184171	0.03	254	0.23	0.14	20.96	100.05	26.4	1.03	4.33	2.8	0.87	7.9	4.3		2.2	0.97	22.3	0.42	7.6
Y	2015	Argillite	CMR09-26	252.62	253.59	H484672	47.6	222501	0.03	254	0.32	0.19	13.01	100.95	20.9	2.14	3.62	2.29	0.85	9.7	3.39		1.7	0.79	17	0.33	4.7
Y	2015	Argillite	CMR09-31	338.94	339.85	H484851	52.1	243536	0.01	85	0.84	0.50	6.19	99.68	36.6	3.05	5.88	4	1	16.2	4.84		3.4	1.33	19.8	0.66	16.1
Y	2015	Argillite w/ tr dykes	CMR14-66	597.4	598.2	S038898	27.09	126629	0.03	254	0.15	0.09	28.95	99.77	17.8	0.44	2.97	1.65	0.75	3.6	3.41	5	0.7	0.63	22.3	0.24	2.4
Y	2015	*Duplicate of S038898*	CMR14-66	597.4	598.2	S038899																					
Y	2017	Argillite	SS17-ABA			S037201	42.69	199550	0.03	254	0.39	0.23	15.99	99.04	16.6	0.18	2.53	1.68	0.64	9.8	2.54	*5*	1.5	0.55	13.1	0.25	3.6
Y	2017	Argillite	SS17-ABA			S037202	44.72	209039	0.03	254	0.52	0.31	16.66	98.85	13.6	0.22	2.78	1.73	0.64	8.9	2.46	*5*	1.2	0.57	10.9	0.27	5.1
Y	2017	Argillite	SS17-ABA			S037203	44.3	207076	0.02	169	0.62	0.37	15.71	99.83	17.5	0.22	3.04	1.74	0.65	11.3	2.69	*5*	1.4	0.65	13.1	0.27	5.5
Y	2017	Argillite	CMR14-66_2017-ABA	193	193.5	W422046	40.15	187677	0.07	592	0.22	0.13	23.45	100.65	14.5	0.44	3.17	2.23	0.8	5.1	3.27	*5*	1.1	0.68	15.7	0.28	3.6
Y	2017	Argillite	CMR14-66_2017-ABA	235	235.5	W422048	27.01	126256	0.04	338	0.24	0.14	30.11	100.65	10.4	0.56	3.05	1.87	0.65	4.9	2.98	*5*	0.9	0.65	11.3	0.29	3.4
Y	2017	Argillite	CMR14-66_2017-ABA	255	255.5	W422049	27.07	126536	0.04	338	0.15	0.09	29.81	99.29	10.7	0.24	2.55	1.73	0.67	3.7	2.69	*5*	0.7	0.57	12.3	0.22	2.5
Y	2017	Argillite	CMR14-66_2017-ABA	358.5	359	W422055	38.03	177767	0.04	338	0.25	0.15	23.22	99.86	14.1	0.35	2.61	1.65	0.74	5.4	2.77	*5*	1	0.58	14.7	0.29	3.9
Y	2017	Argillite	CMR14-66_2017-ABA	428.5	429	W422058	41.75	195156	0.04	338	0.28	0.17	19.8	99.52	22.4	0.31	2.92	1.75	1.03	6.2	3.17	*5*	1	0.59	18.1	0.26	3.8
Y	2017	Argillite w Mafic Dykes	ABA Barrel 2				45.16	211096	0.03	254	0.85	0.51	6.81	100.6	14.6	1.53	3.17	2.29	0.84	14.4	3.31	*5*	1.5	0.72	7.3	0.32	5.3
N	2015	Argillite (limey)	CMR14-61b	40	40.5	Q153816	27.6	129013	0.03	254	0.18	0.11	28.51	100.6	19.9	0.35	3.47	2.13	0.85	4.2	3.89		0.8	0.73	23.8	0.29	2.7
N	2015	Argillite (limey)	CMR14-61b	140.85	141.35	Q153834	43.8	204739	0.02	169	0.28	0.17	18.34	100.3	18.9	0.65	3.87	2.52	0.74	7.7	4.16		1.4	0.79	20.4	0.33	4.1

Notes:

Yellow highlight denotes samples NOT analyzed for ALS characterization pkg (CCP-PKG03); these samples only submitted for 4-acid ICP

MEXRF26 - Lithitum borate fusion decomposition with XRF Sprectroscopy analysis (part of ALS CCP-PKG03)

ME-MS81 - Lithitum borate fusion decomposition with ICP-MS analysis (part of ALS CCP-PKG03)

ME-4ACD81 - Four Acid digestion with ICP-AES analysis (part of CCP-PKG03)

ME-MS42 - Aqua Regia digestion with ICP-MS analysis (part of ALS CCP-PKG03)

Number - value greater than ten times crustal abundance for basalt or shale

D=The data for these elements are missing or unreliable.

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Nd	Pr	Rb	Sm	Sn	Ta	Tb	Th	Tm	U	V	W	Y	Yb	Zr	Ag	Cd	Co	Cu	Li	Mo
Y (yes) or N (no)							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
							ME-MS82	ME-MS83	ME-MS84	ME-MS85	ME-MS86	ME-MS87	ME-MS88	ME-MS89	ME-MS90	ME-MS91	ME-MS92	ME-MS93	ME-MS94	ME-MS95	ME-MS96						
	Crustal Abundance for Basalt (Price, 1997)						20	4.6	30	5.3	1.5	1.1	0.8	4	0.2	1	250	0.7	21	2.1		0.11	0.22	48	87	17	1.5
	Crustal abundance x10						200	46	300	53	15	11	8	40	2	10	2500	7	210	21		1.1	2.2	480	870	170	15
Y	2015	HW Basalt	CMR09-32	45.11	46.33	H482709	14.1	3.11	59.6	3.46	1	0.6	0.71	0.75	0.43	0.39	295	1	29.5	2.93	89	0.5	0.5	27	9	10	1
Y	2015	HW Basalt	CMR09-32	87.78	89.31	H482712	11.3	2.54	47.2	3.05	1	0.5	0.7	1.37	0.44	0.19	228	1	27.7	3.26	63	0.5	0.5	30	28	10	1
Y	2015	HW Basalt	CMR09-32	133.5	134.72	H482715	2.6	0.53	40	1.2	1	0.1	0.38	0.14	0.31	0.07	381	1	15.9	1.94	26	0.5	0.6	45	32	10	1
Y	2015	HW Basalt	CMR09-32	180.44	181.97	H482718	5.6	1.19	37.9	1.88	1	0.2	0.43	0.35	0.32	0.65	320	1	17.5	2.04	34	0.5	0.5	46	86	10	1
Y	2015	HW Basalt	CMR09-32	216.1	217.63	H482721	13.7	3.25	39.3	3.73	1	0.5	0.67	1.41	0.4	0.83	258	1	25.2	2.66	89	0.5	0.5	41	36	20	1
Y	2015	HW Basalt	CMR09-26	15.85	17.37	H484662	12.9	2.85	32.9	3.29	1	0.5	0.67	0.76	0.42	0.3	311	1	27.1	2.8	78	0.5	0.6	38	49	10	1
Y	2015	HW Basalt	CMR09-26	78.33	79.86	H484664	23.3	5.78	49.6	5.22	1	1.1	0.78	2.74	0.47	0.79	163	1	28.3	2.86	148	0.5	0.5	24	29	20	1
Y	2015	HW Basalt	CMR09-26	108.81	110.34	H484665	10.6	2.52	49.3	2.7	1	0.5	0.59	1.34	0.44	0.19	230	1	26.8	2.74	65	0.5	0.5	33	36	10	1
Y	2015	HW Basalt	CMR09-26	182	183.49	H484667	3.6	0.66	34.4	1.4	1	0.1	0.43	0.16	0.35	0.06	369	1	17.4	2.24	31	0.5	0.5	33	21	10	1
Y	2015	HW Basalt	CMR09-26	256.64	257.74	H484673	13.2	3.1	67.1	3.55	1	0.5	0.72	1.24	0.45	0.52	229	1	27.2	2.97	73	0.5	0.5	32	81	20	1
Y	2015	HW Basalt	CMR09-31	37.19	38.4	H484837	5.4	1.07	2.9	1.5	1	0.2	0.38	0.27	0.25	1.87	194	1	14.4	1.61	38	0.5	0.5	41	42	10	1
Y	2015	HW Basalt	CMR09-31	124.3	125.27	H484841	12.5	2.71	66.1	3.03	1	0.6	0.62	0.73	0.41	0.32	305	1	23.7	2.66	80	0.5	0.5	42	28	10	1
Y	2015	HW Basalt	CMR09-31	204.83	206.29	H484844	3.5	0.67	46.2	1.25	1	0.1	0.41	0.17	0.32	0.13	381	1	18.6	2.25	21	0.5	0.6	39	39	10	1
Y	2015	HW Basalt	CMR09-31	258.53	259.69	H484846	3.5	0.7	22.8	1.25	1	0.1	0.43	0.18	0.35	0.07	395	4	19.5	2.47	27	0.5	0.5	38	43	10	1
Y	2015	HW Basalt	CMR09-31	330.1	331.32	H484849	12.5	2.98	4.7	3.26	1	0.7	0.69	1.41	0.45	0.64	237	1	26.5	2.89	61	0.5	0.5	54	51	20	1
Y	2015	HW Basalt	GT16-03	4.6	5.1	S038816	11.2	2.57	5.3	2.84	1	0.5	0.64	1.29	0.39	1.27	290	1	25.7	2.76	71	0.5	0.6	53	47	10	1
Y	2015	HW Basalt	GT16-03	59.2	59.7	S038818	2.7	0.54	25	1.12	1	0.1	0.4	0.17	0.29	0.09	356	1	17.9	1.99	18	0.5	1.1	53	70	20	1
Y	2015	HW Basalt	GT16-03	90	90.5	S038819	2.3	0.49	36.1	1.15	1	0.2	0.38	0.19	0.27	0.13	359	1	15.6	1.8	20	0.5	0.5	65	26	10	1
Y	2015	HW Basalt	GT16-03	120	120.5	S038821	2.8	0.54	26.4	1.06	1	0.1	0.39	0.18	0.28	0.13	360	1	18.2	2.14	19	0.5	0.6	46	67	10	1
Y	2015	HW Basalt	GT16-03	104.3	104.8	S038822								20		10	377	10				0.5	0.5	39	18		1
Y	2015	HW Basalt	GT16-03B	134.2	134.8	S038823	3	0.6	55.2	1.29	1	0.1	0.42	0.14	0.32	0.07	436	1	17.8	2.19	24	0.5	0.5	40	25	10	1
Y	2015	HW Basalt	GT16-03B	164	165	S038824	3.1	0.58	60.4	1.17	1	0.1	0.41	0.15	0.29	0.07	406	1	16.3	2.01	28	0.5	0.6	39	38	10	1
Y	2015	HW Basalt	GT16-03B	190.4	190.9	S038826	3	0.53	95.4	1.17	1	0.1	0.4	0.14	0.32	0.09	427	1	18.6	1.97	21	0.5	0.8	39	12	10	1
Y	2015	HW Basalt	GT16-03B	207.7	208.2	S038827	22.5	5.74	8.6	4.9	1	0.7	0.81	3.41	0.47	4.38	164	1	37.5	3.14	117	0.5	2.1	21	26	10	3
Y	2015	HW Basalt	GT16-03B	222.5	223	S038828	24.6	6.37	29.2	5.72	2	1.3	0.87	3.35	0.42	1.6	163	1	32.3	3.06	185	0.5	0.5	33	14	10	1
Y	2015	HW Basalt	GT16-03B	262	262.5	S038831	15.1	3.55	1.3	3.95	1	0.7	0.86	1.17	0.49	0.84	511	1	34	3.19	99	0.5	0.5	49	40	10	1
Y	2015	HW Basalt	GT16-03B	273.2	273.8	S038834	4.5	0.99	4.8	1.49	1	0.1	0.38	0.18	0.22	0.97	372	1	16.4	1.71	20	0.5	0.5	57	58	20	1
Y	2015	HW Basalt	CMR14-66	456	456.8	S038892	7.4	1.69	85.3	2.31	1	0.1	0.45	0.44	0.23	1.26	232	1	16.6	1.82	49	0.5	0.5	25	15	20	1
Y	2015	HW Basalt	CMR14-66	482	483	S038893	3	0.58	46	1.46	1	0.1	0.43	0.12	0.26	0.09	382	1	17.8	2.21	19	0.5	0.5	35	43	10	1
Y	2015	HW Basalt	CMR14-66	509.8	510.8	S038894	7.9	1.7	70.4	2.25	1	0.2	0.56	0.42	0.38	0.18	403	1	22.9	2.57	47	0.5	0.5	37	24	10	1
Y	2015	HW Basalt	CMR14-66	536.1	537.1	S038895	6.3	1.44	43.2	2.25	1	0.2	0.5	0.36	0.31	0.21	375	1	19.8	2.05	44	0.5	0.5	40	62	10	1
Y	2015	HW Basalt	CMR14-66	557.6	558.7	S038896	13.8	3.25	46.1	3.92	1	0.5	0.74	1.59	0.49	0.43	227	1	28.8	2.97	68	0.5	0.5	34	56	10	1
Y	2017	HW Basalt	CMR14-66_2017-ABA	303	303.5	W422052	5.3	1.06	22.5	1.66	*1*	0.2	0.46	0.22	0.32	0.1	290	*1*	17	2.06	30	*0.5*	*0.5*	49	90	10	1
Y	2017	HW Basalt	CMR14-66_2017-ABA	332.5	333	W422053	9.8	2.23	0.9	2.7	1	0.3	0.52	0.84	0.27	0.45	261	1	16.3	1.74	64	*0.5*	*0.5*	33	15	10	*1*
Y	2017	HW Basalt	CMR14-66_2017-ABA	389	389.5	W422056	9.4	2.17	17.6	2.55	1	0.4	0.58	0.85	0.46	0.28	307	1	23.5	2.76	65	*0.5*	*0.5*	47	63	20	*1*
Y	2017	HW Basalt	CMR14-66_2017-ABA	412	412.5	W422057	14.4	3.38	0.7	3.87	1	0.4	0.62	1.17	0.5	0.31	336	1	27.2	2.93	79	*0.5*	0.6	45	60	10	*1*
Y	2017	HW Basalt	ABA Barrel 3				12.3	2.7	14.3	2.53	1	0.2	0.47	1.29	0.28	1.56	172	*1*	20.8	1.68	50	*0.5*	0.8	16	40	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037204	17.2	3.71	12.4	4.11	1	0.9	0.79	1.28	0.46	0.59	397	2	27.4	3.1	107	*0.5*	*0.5*	49	27	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037205	20.8	4.68	5.2	5.31	2	0.7	1.19	1.92	0.85	1.35	304	1	46.5	5.59	159	*0.5*	0.5	29	15	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037206	19.3	4.11	5.1	4.93	2	0.7	1.11	1.86	0.77	1.1	406	1	42.7	5.02	135	*0.5*	*0.5*	47	22	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037207	24.5	5.2	16.4	6.37	2	0.8	1.33	2.38	0.86	1.34	417	1	51.1	5.74	169	*0.5*	*0.5*	44	25	20	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037209	23	4.9	5	5.98	1	0.6	1.15	2.17	0.68	1.47	409	1	40.7	4.25	132	*0.5*	*0.5*	42	42	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037210	21.1	4.45	8.6	5.33	2	0.8	1.12	2.34	0.72	1.03	441	1	43.5	4.85	154	*0.5*	0.5	43	14	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037211	18.2	4.05	12.9	4.96	2	0.6	0.98	1.9	0.66	1.32	343	1	39.3	4.12	123	*0.5*	*0.5*	35	29	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037212	20.6	4.47	9.5	5.23	1	0.7	1.14	2.01	0.71	1.48	298	1	41.5	4.65	140	*0.5*	*0.5*	38	27	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037213	26.4	5.66	8.6	6.86	2	1	1.45	2.4	0.99	1.72	353	1	55	5.74	209	*0.5*	*0.5*	51	19	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037214	11.9	2.55	22.3	3.19	1	0.3	0.52	1.04	0.25	0.43	299	1	17.7	1.86	59	*0.5*	0.5	31	295	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037215	17.8	3.93	18.6	4.1	1	0.3	0.67	2.16	0.38	0.95	260	1	21.6	2.45	106	*0.5*	*0.5*	29	11	10	*1*
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037216	17.1	3.81	10.6	4.02	1	0.5	0.74	1.83	0.48	0.88	319	1	29.4	3.31	109	*0.5*	0.5	49	38	10	1
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037217	28	5.91	2.8	6.73	2	1	1.5	2.46	0.81	1.54	233	1	50.5	5.41	188	*0.5*	*0.5*	47	13	10	*1*
Y	2017	Jasper Mtn Basalt	GT17-05	2	2.5	S037977	22.8	5.23	9.3	5.7	2	0.8	1.24	2.3	0.72	2.07	338	1	43.4	4.76	167	*0.5*	0.5	64	23	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	63.3	63.8	S037979	17.9	4.06	7.5	4.45	1	0.7	1	1.49	0.6	1.68	406	2	33.5	3.69	140	*0.5*	0.5	63	31	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	90.8	91.3	S037981	23.1	5.25	5.7	5.94	2	0.9	1.28	2.56	0.81	1.72	354	2	47.7	4.95	200	*0.5*	0.5	45	15	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	118.5	119	S037982	23.2	5.07	15.3	6.14	2	0.8	1.3	2.45	0.84	1.49	390	1	47.3	5.7	182	*0.5*	0.5	27	13	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	151.5	152	S037983	17.7	3.9	37.4	4.57	2	0.6	1.04	1.82	0.65	0.79	410	1	36.3	3.85	149	*0.5*	0.5	49	29	20	*1*
Y	2017	Jasper Mtn Basalt	GT17-05	180.3	180.8	S037984	14.6	3.32	5.2	3.95	2	0.5	0.92	1.5	0.6	0.69	365	5	34.3	3.92	126	*0.5*	0.5	49	38	10	3
Y	2017	Jasper Mtn Basalt	GT17-05	208.3	208.8	S037985	16.2	3.86	2.9	3.91	1	0.5	0.95	1.88	0.63	1.78	294	1	35.5	4.24	118	*0.5*	*0.5*	34	25	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	238.8	239.3	S037986	16.7	3.69	7.9	4.22	1	0.6	0.92	1.52	0.5	0.84	322	1	29.8	3.52	132	*0.5*	0.5	40	37	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	270	270.5	S037987	14	3.08	4.6	3.54	1	0.4	0.83	1.05	0.53	0.64	332	1	31.4	3.49	95	*0.5*	0.7	45	39	10	1
Y	2017	Jasper Mtn Basalt	GT17-05	291.6	292.1	S037988	11.9	2.64	7	2.98	1	0.4	0.76	0.82	0.48	0.65	318	1	26	2.86	79	*0.5*	*0.5*	57	50	10	*1*
Y	2017	Jasper Mtn Basalt	GT17-06	5.9	6.4	S037989	13.6	3.14	4.3	3.17	1	0.6	0.64	0.95	0.4	0.58	316	1	23.7	2.87	89	*0.5*	*0.5*	56	41	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	28.9	29.4	S037991	13.7	3.04	8.7	2.99	1	0.7	0.66	1.04	0.45	0.86	335	1	23	2.72	90	*0.5*	0.6	51	42	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	40.8	41.3	S037992	6.5	1.6	5.6	1.55	*1*	0.2	0.34	0.3	0.21	0.17	109	1	12.8	1.45	25	*0.5*	0.7	9	19	*10*	*1*

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Nd	Pr	Rb	Sm	Sn	Ta	Tb	Th	Tm	U	V	W	Y	Yb	Zr	Ag	Cd	Co	Cu	Li	Mo
Y (yes) or							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
N (no)							ME-MS82	ME-MS83	ME-MS84	ME-MS85	ME-MS86	ME-MS87	ME-MS88	ME-MS89	ME-MS90	ME-MS91	ME-MS92	ME-MS93	ME-MS94	ME-MS95	ME-MS96						
	Crustal Abundance for Basalt (Price, 1997)						20	4.6	30	5.3	1.5	1.1	0.8	4	0.2	1	250	0.7	21	2.1		0.11	0.22	48	87	17	1.5
	Crustal abundance x10						200	46	300	53	15	11	8	40	2	10	2500	7	210	21		1.1	2.2	480	870	170	15
Y	2017	Jasper Mtn Basalt	GT17-06	59.4	59.9	S037993	18.6	4.21	3.3	3.86	1	0.7	0.84	1.17	0.48	0.8	353	1	28.5	3.18	101	*0.5*	1.0	32	56	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	85.3	85.8	S037994	15.4	3.45	41.3	3.52	1	0.7	0.71	1.2	0.42	0.73	354	1	25.5	2.77	101	*0.5*	0.9	48	37	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	135.3	135.8	S037996	15.9	3.72	20.3	4.04	1	0.8	0.73	1.22	0.42	1.09	372	2	24.5	2.45	103	*0.5*	0.8	47	29	20	1
Y	2017	Jasper Mtn Basalt	GT17-06	181.3	181.8	S037998	11.4	2.75	33.6	2.9	1	0.6	0.55	0.9	0.28	0.74	282	1	19.9	1.9	75	*0.5*	0.9	40	37	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	207.1	207.6	S037999	15.7	3.45	3.1	3.77	1	0.7	0.72	1.03	0.42	1.58	329	1	24.5	2.91	92	*0.5*	0.8	38	23	10	1
Y	2017	Jasper Mtn Basalt	GT17-06	230.5	231	S038000	16.2	3.39	3.2	3.98	1	0.8	0.76	1.23	0.43	0.57	361	1	25.3	2.89	103	*0.5*	0.6	44	24	10	*1*
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	40.5	41	W422041	23.6	5.09	2.7	5.71	2	0.7	1.24	2.32	0.77	1.39	319	1	47.3	4.86	136	*0.5*	*0.5*	35	12	10	1
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	70	70.5	W422042	13.8	3.05	*0.2*	4	1	0.4	0.84	1.37	0.52	0.81	335	1	32.6	3.24	86	*0.5*	*0.5*	46	33	10	1
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	104.2	104.7	W422043	12	2.66	2	3.4	1	0.5	0.76	0.94	0.5	0.39	343	1	28.3	3.13	83	*0.5*	*0.5*	51	48	10	*1*
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	130	130.5	W422044	12.2	2.6	14.8	3.45	1	0.5	0.76	0.99	0.53	0.68	367	*1*	28.6	3.36	89	*0.5*	*0.5*	55	48	10	1
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	165.5	166	W422045	11	2.53	0.9	2.78	1	0.4	0.67	0.91	0.49	0.33	346	*1*	26.6	2.94	74	*0.5*	*0.5*	47	42	10	1
Y	2017	Jasper Mtn Basalt	ABA Barrel 1				17.3	3.69	14.4	4.54	1	0.6	0.81	1.67	0.59	1.05	373	1	34	3.67	127	*0.5*	0.7	43	32	10	2
N	2015	HW Basalt	GT14-01	250.1	251.5	Q053907	12.5	2.95	7.6	3.26	1	0.6	0.65	1.47	0.41	0.53	269	2	25.3	2.61	72	0.5	0.6	37	68	20	1
N	2015	HW Basalt	CMR14-61b	108.3	108.8	Q153831	7.8	1.71	35.7	2.15	1	0.3	0.49	0.56	0.34	0.32	298	2	19.5	1.95	53	0.5	0.5	60	77	20	1
N	2015	HW Basalt	CMR14-61b	169.3	169.8	Q153837	9.6	2.3	33.1	2.25	1	0.2	0.39	1.4	0.21	0.73	210	1	13.1	1.22	91	0.5	0.5	22	52	20	1
N	2015	HW Basalt	CMR14-61b	193.9	194.9	Q153838	20.9	5.07	7.7	4.64	1	0.8	0.99	2.82	0.62	2.03	355	1	39.4	4.26	151	0.5	0.5	39	22	20	1
N	2015	HW Basalt	GT14-01	43.6	44.3	Q153964	21.5	5.41	24.4	5.28	2	0.9	0.99	2.98	0.67	4.3	367	1	38.7	4.13	150	0.5	0.5	44	36	10	1
N	2015	HW Basalt	GT14-01	100.1	101.1	Q153967	9.1	2.15	10	2.35	1	0.3	0.55	0.84	0.42	1.51	261	1	24.8	2.83	54	0.5	0.7	54	224	20	4
N	2015	HW Basalt	GT14-01	281.3	282.4	Q153991	6.6	1.37	20.1	2.18	1	0.2	0.49	0.46	0.34	0.16	407	1	20.5	2.21	39	0.5	0.5	46	80	10	1
N	2015	HW Basalt	GT14-01	12.1	13.1	Q153993	10.4	2.52	7.7	2.8	1	0.4	0.57	1.05	0.4	1.21	298	6	25.3	2.64	64	0.5	**32**	58	647	20	1
N	2015	HW Basalt	GT14-01	70	71	Q153999	18	4.42	2.2	4.19	1	0.8	0.82	2.6	0.55	3.16	343	1	34.5	3.51	131	0.5	**17.3**	40	88	10	1
N	2015	HW Basalt	CMR15-76	122	122.4	S037436	11.1	2.44	115	3.15	1	0.5	0.64	0.67	0.36	0.22	310	1	21.6	2.48	69	0.5	0.5	41	85	20	1
N	2015	HW Basalt	CMR15-76	169	169.4	S037438	16.6	3.71	43.7	4.17	1	0.5	0.74	1.17	0.46	0.53	295	1	26.6	2.91	95	0.5	0.5	24	21	10	1
N	2015	HW Basalt	CMR15-76	187.1	187.5	S037439	12.4	2.78	54.7	3.17	1	0.6	0.64	0.75	0.37	0.22	310	1	22.9	2.53	81	0.5	0.5	28	35	10	1
N	2015	HW Basalt	CMR15-76	218.9	219.3	S037441	8.9	1.95	4.9	2.46	1	0.5	0.55	1.22	0.35	0.35	192	1	20.6	2.45	58	0.5	0.6	29	47	10	1
N	2015	HW Basalt	CMR15-76	249.2	249.6	S037442	5.5	1.12	16.1	1.74	1	0.2	0.45	0.35	0.32	0.15	367	1	17.5	2.22	34	0.5	0.5	52	91	10	1
N	2015	HW Basalt	CMR15-76	275.2	275.7	S037443	17.1	4.02	7.5	4.39	1	0.7	0.88	1.73	0.63	1.84	346	1	36.6	4.54	126	0.5	0.7	60	118	10	1
N	2015	HW Basalt	CMR15-76	310.4	310.8	S037444	17.3	4.22	12.9	4.12	1	0.7	0.87	2.53	0.57	2.13	335	1	32.4	3.92	130	0.5	0.7	35	31	10	1
N	2015	HW Basalt	CMR15-76	330.9	331.3	S037445	9.5	2.22	6.1	2.71	1	0.4	0.55	1.41	0.38	0.63	282	2	21.9	2.57	77	0.5	0.5	50	46	20	1
N	2015	HW Basalt	CMR15-76	344.7	345	S037447	12.1	2.84	12.8	2.88	1	0.4	0.61	1.73	0.38	1.58	188	1	23.6	2.5	84	0.5	0.5	26	49	10	7
N	2015	HW Basalt	CMR15-76	428.3	428.7	S037452	13.6	2.99	10.5	3.86	1	0.6	0.94	1.67	0.61	0.76	444	1	36.3	4.29	129	0.5	0.5	44	44	10	1
N	2015	HW Basalt	GT16-02	15	16	S038882	19.5	4.86	13.6	4.76	2	0.8	0.9	3.03	0.6	1.63	371	1	34.8	3.84	145	0.5	**8.9**	39	129	10	1
N	2015	HW Basalt	GT16-02	22	23	S038883								20		10	482	10				0.5	**8.3**	56	175		1
N	2015	HW Basalt	GT16-02	29	30	S038884								20		10	311	10				0.5	1.3	52	79		1
N	2015	HW Basalt	GT16-02	36	37	S038885								20		10	285	10				0.5	**10**	43	115		1
N	2015	HW Basalt	GT16-02	43	44	S038886								20		10	310	10				0.5	**5.5**	47	177		1
N	2015	HW Basalt	GT16-02	50	51	S038887								20		10	352	10				0.5	**2.1**	47	34		1
N	2015	HW Basalt	GT16-02	57	58	S038888								20		10	349	10				0.5	0.8	59	53		1
N	2015	HW Basalt	GT16-02	64	65	S038889	18.2	4.58	28.1	4.95	2	0.7	0.92	2.96	0.61	3.19	336	2	35.8	3.96	141	0.5	**3.4**	40	25	10	1
N	2015	HW Basalt	GT16-02	71	72	S038891								20		10	321	10				0.5	**14.6**	48	259		1
N	2015	HW Basalt/Fault	GT14-01	160.2	163.7	Q053904	17.4	4.16	3.7	4.23	1	0.8	0.86	2.46	0.57	1.91	336	1	34.9	3.65	120	0.5	**3.7**	32	43	20	1
N	2015	HW Basalt/Fault	GT14-01	181.1	182.6	Q053906	16.9	4.21	15.2	4.17	1	0.7	0.82	2.37	0.52	1.7	340	1	32.4	3.57	129	0.5	0.6	41	36	10	1
N	2015	HW Basalt Tuff/Fault	CMR14-61b	68.8	70.1	Q153825	38.7	8.5	4.8	9.36	2	0.5	1.24	3.64	0.48	2.27	344	2	32.1	2.99	128	0.5	0.5	39	110	10	1
N	2015	HW Basalt/Fault	CMR15-76	66.7	67	S037434	14.8	2.97	37.1	4.79	1	0.4	1.14	1.35	0.74	3.33	421	1	39.9	4.96	110	0.5	0.6	61	72	20	1
Y	2015	Dyke	CMR09-31	291.39	292.67	H484847	5.7	1.16	57.6	1.84	1	0.2	0.47	0.36	0.33	0.17	332	1	17.6	1.98	40	0.5	0.5	47	48	20	1
Y	2015	Mafic Dyke	GT16-03B	172.3	172.8	S038825	16.9	3.88	118.5	3.94	1	0.2	0.64	1.37	0.28	0.57	359	1	21.8	1.96	84	0.5	0.6	34	47	20	2
Y	2017	Mafic Dyke	SS17-ABA			S037208	12.9	2.89	7.3	2.83	1	0.4	0.38	2.08	0.18	0.93	162	*1*	11.3	1.13	84	*0.5*	*0.5*	21	16	10	*1*
Y	2017	Mafic Dyke	GT17-06	108.9	109.4	S037995	20.5	4.78	20.8	4.18	1	0.4	0.66	2.57	0.32	1.12	210	1	19.7	2.08	102	*0.5*	0.5	20	10	10	1
Y	2017	Mafic Dyke	GT17-06	154.3	154.8	S037997	20.6	4.75	36.9	4	1	0.3	0.62	2.52	0.28	1.12	210	1	18	1.9	98	*0.5*	0.5	22	11	10	*1*
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	215	215.5	W422047	16	3.78	19.7	3.08	1	0.3	0.36	3.37	0.19	1.27	218	1	11.5	1.22	65	*0.5*	*0.5*	24	71	20	*1*
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	270.5	271	W422051	9	1.97	0.3	2.27	1	0.4	0.57	0.65	0.39	0.29	268	1	20.8	2.32	60	*0.5*	*0.5*	45	45	20	1
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	345.5	346	W422054	9.5	2.04	1.6	2.51	1	0.1	0.36	0.73	0.21	0.39	223	1	11.8	1.24	44	*0.5*	*0.5*	44	40	30	*1*
N	2015	Dyke	CMR15-76	90.3	90.5	S037435	12.8	3.16	40.2	3.07	1	0.3	0.46	2.1	0.25	1.22	180	1	14.6	1.7	93	0.5	0.5	16	37	10	1
Y	2015	Gabbro Dyke	GT16-03	31.7	32.2	S038817	10.7	2.56	12.5	2.82	1	0.2	0.48	1.51	0.21	0.71	252	1	16.1	1.42	61	0.5	0.6	57	11	10	1
Y	2017	Gabbro (Dyke?)	GT17-05	32	32.6	S037978	16.9	3.49	5.5	3.87	1	0.1	0.53	1.25	0.22	0.66	223	2	14.2	1.32	61	*0.5*	0.5	51	80	10	*1*
N	2015	Tuff/Limestone	GT16-03B	266	266.5	S038832	16.7	4.14	1	3.01	1	0.2	0.56	1.66	0.31	3.17	70	1	26.6	2.09	45	0.5	0.9	3	36	10	2
N	2015	*Duplicate of S038832*	GT16-03B	266	266.5	S038833																					
N	2015	Tuff?	CMR14-66	577.7	578.7	S038897	27.9	7.01	211	6.94	4	1.1	1.03	3.6	0.56	1.66	225	1	38.2	4.1	203	0.5	0.5	41	382	20	1
Y	2015	Fault (seds)	GT16-03B	239.5	240.7	S038829	13	3.23	10.6	2.68	1	0.2	0.44	1.89	0.23	1.96	186	1	18.3	1.58	66	0.5	1.1	20	46	10	1
Y	2017	C (Cap Intrusive)	CMR14-66_2017-ABA			W422050	12.5	3.51	21	2.54	1	0.6	0.26	4.74	0.19	2.39	89	1	10.1	1.16	101	*0.5*	*0.5*	8	3	*10*	*1*
N	2015	Fault	GT14-01	131.7	133.2	Q153975	24.2	5.72	17.2	6.14	2	0.8	1.24	3.06	0.77	3.3	367	1	50	4.78	137	0.5	**15.7**	68	378	20	2
N	2015	Fault	CMR15-76	152	152.4	S037437	11.1	2.56	10.8	2.59	1	0.3	0.45	1.24	0.21	0.66	222	1	13.9	1.67	56	0.5	0.6	35	51	30	1
N	2015	Fault	CMR15-76	367.7	368.2	S037449	10	2.21	42.8	2.77	1	0.4	0.56	1.56	0.38	0.92	254	1	22.4	2.83	90	0.5	0.5	35	57	10	1

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Nd	Pr	Rb	Sm	Sn	Ta	Tb	Th	Tm	U	V	W	Y	Yb	Zr	Ag	Cd	Co	Cu	Li	Mo
Y (yes) or							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
N (no)							ME-MS82	ME-MS83	ME-MS84	ME-MS85	ME-MS86	ME-MS87	ME-MS88	ME-MS89	ME-MS90	ME-MS91	ME-MS92	ME-MS93	ME-MS94	ME-MS95	ME-MS96						
	Crustal Abundance for Basalt (Price, 1997)						20	4.6	30	5.3	1.5	1.1	0.8	4	0.2	1	250	0.7	21	2.1		0.11	0.22	48	87	17	1.5
	Crustal abundance x10						200	46	300	53	15	11	8	40	2	10	2500	7	210	21		1.1	2.2	480	870	170	15
	Crustal Abundance for Shales (Price, 1997)						24	5.6	140	6.4	6	0.8	1	12	0.2	3.7	130	1.8	26	2.6		0.07	0.3	19	45	66	2.6
	Crustal abundance x10						240	56	1400	64	60	8	10	120	2	37	1300	18	260	26		0.7	3	190	450	660	26
Y	2015	Argillite	CMR09-32	226.16	227.69	H482722	19.9	4.67	27.9	3.94	1	0.4	0.68	2.48	0.38	2.33	63	1	30.1	2.43	83	0.5	0.9	3	36	10	2
Y	2015	Argillite	CMR09-26	252.62	253.59	H484672	15.7	3.76	23.2	3.39	1	0.3	0.56	1.99	0.31	3.7	124	1	25	2.1	60	0.5	0.9	15	70	10	3
Y	2015	Argillite	CMR09-31	338.94	339.85	H484851	19	4.59	87.3	4.19	1	0.9	0.87	2.38	0.64	1.17	192	1	34.4	4.15	110	0.5	0.5	30	64	20	1
Y	2015	Argillite w/ tr dykes	CMR14-66	597.4	598.2	S038898	16.1	3.9	21.2	3.32	1	0.1	0.51	0.9	0.21	1.52	46	1	24.4	1.54	30	0.5	0.5	1	19	10	2
Y	2015	*Duplicate of S038898*	CMR14-66	597.4	598.2	S038899																					
Y	2017	Argillite	SS17-ABA			S037201	12.1	2.72	10	2.28	1	0.2	0.4	1.54	0.23	1.66	154	1	17.2	1.6	54	*0.5*	0.5	20	43	10	1
Y	2017	Argillite	SS17-ABA			S037202	10.1	2.51	12	2.31	1	0.3	0.43	1.13	0.25	2.18	166	1	18	1.72	47	*0.5*	*0.5*	18	41	10	2
Y	2017	Argillite	SS17-ABA			S037203	12.6	2.91	13.6	2.48	1	0.3	0.47	1.17	0.28	1.11	244	1	18.6	1.8	52	*0.5*	*0.5*	24	18	10	*1*
Y	2017	Argillite	CMR14-66_2017-ABA	193	193.5	W422046	14.7	3.4	22.1	3.28	*1*	0.2	0.51	1.41	0.28	2.21	83	1	22	1.63	43	*0.5*	0.7	4	38	*10*	2
Y	2017	Argillite	CMR14-66_2017-ABA	235	235.5	W422048	10.3	2.43	14	2.2	1	0.2	0.43	1.01	0.25	1.57	118	1	20.9	1.9	37	*0.5*	0.5	9	29	*10*	2
Y	2017	Argillite	CMR14-66_2017-ABA	255	255.5	W422049	10.9	2.43	8.1	2.36	*1*	0.1	0.4	0.97	0.24	1.53	64	1	19.5	1.52	29	*0.5*	0.5	3	24	*10*	1
Y	2017	Argillite	CMR14-66_2017-ABA	358.5	359	W422055	12.1	2.94	12.4	2.15	*1*	0.3	0.4	1.48	0.24	2.35	96	1	19.1	1.56	43	*0.5*	0.5	4	31	*10*	3
Y	2017	Argillite	CMR14-66_2017-ABA	428.5	429	W422058	16.6	3.96	11	3.5	*1*	0.2	0.53	1.42	0.28	5.04	145	3	20.9	1.74	46	*0.5*	*0.5*	22	88	10	3
Y	2017	Argillite w Mafic Dykes	ABA Barrel 2				8.8	1.98	32.4	2.81	1	0.3	0.48	1	0.37	1.14	333	1	21.2	2.18	62	*0.5*	0.7	37	54	10	*1*
N	2015	Argillite (limey)	CMR14-61b	40	40.5	Q153816	18.2	4.27	19.8	3.65	1	0.1	0.55	1.01	0.28	1.8	50	1	27	1.93	33	0.5	0.8	2	24	10	1
N	2015	Argillite (limey)	CMR14-61b	140.85	141.35	Q153834	17.9	4.34	36.6	3.89	1	0.2	0.62	1.83	0.36	2.23	79	1	29	2.1	59	0.5	0.8	5	38	10	1

Notes:

Yellow highlight denotes samples NOT analyzed for ALS characterization pkg (CCP-PKG03); these samples only submitted for 4-acid ICP

MEXRF26 - Lithitum borate fusion decomposition with XRF Sprectroscopy analysis (part of ALS CCP-PKG03)

ME-MS81 - Lithitum borate fusion decomposition with ICP-MS analysis (part of ALS CCP-PKG03)

ME-4ACD81 - Four Acid digestion with ICP-AES analysis (part of CCP-PKG03)

ME-MS42 - Aqua Regia digestion with ICP-MS analysis (part of ALS CCP-PKG03)

Number - value greater than ten times crustal abundance for basalt or shale

D=The data for these elements are missing or unreliable.

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Ni	Pb	Sc	Zn	As	Bi	Hg	In	Re	Sb	Se	Te	Tl	S	C
Y (yes) or N (no)							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%
	Crustal Abundance for Basalt (Price, 1997)						130	6	30	105	2	0.007	0.09		D	0.2	0.05	D	0.21	0.03	
	Crustal abundance x10						1300	60	300	1050	20	0.07	0.9			2	0.5		2.1	0.3	
Y	2015	HW Basalt	CMR09-32	45.11	46.33	H482709	52	5	36	143	2.9	**0.40**	0.005			0.26	0.4	0.01	0.25	0.01	1.08
Y	2015	HW Basalt	CMR09-32	87.78	89.31	H482712	57	5	33	114	1.1	**0.09**	0.019			0.20	0.3	0.02	0.26	0.01	1.28
Y	2015	HW Basalt	CMR09-32	133.5	134.72	H482715	113	4	52	166	1.2	**0.09**	0.01			0.16	0.2	0.02	0.33	0.03	0.51
Y	2015	HW Basalt	CMR09-32	180.44	181.97	H482718	127	6	45	133	0.9	**0.08**	0.015			0.14	**0.6**	0.03	0.47	0.25	0.9
Y	2015	HW Basalt	CMR09-32	216.1	217.63	H482721	32	9	32	195	0.7	**0.07**	0.012			0.08	0.4	0.02	0.63	0.15	0.9
Y	2015	HW Basalt	CMR09-26	15.85	17.37	H484662	66	6	39	130	0.6	0.01	0.005			0.15	**0.6**	0.02	0.19	0.04	0.58
Y	2015	HW Basalt	CMR09-26	78.33	79.86	H484664	24	10	28	169	0.7	0.05	0.005			0.09	**0.6**	0.02	0.13	0.14	1.57
Y	2015	HW Basalt	CMR09-26	108.81	110.34	H484665	62	5	34	122	0.7	0.02	0.01			0.13	**0.5**	0.02	0.26	0.01	1.2
Y	2015	HW Basalt	CMR09-26	182	183.49	H484667	83	5	47	132	0.6	0.01	0.01			0.17	0.4	0.01	0.32	0.01	0.18
Y	2015	HW Basalt	CMR09-26	256.64	257.74	H484673	32	6	27	293	0.3	0.04	0.013			0.11	**0.7**	0.06	1.27	**0.53**	1.31
Y	2015	HW Basalt	CMR09-31	37.19	38.4	H484837	69	4	33	49	1.8	0.03	0.005			0.35	**3.7**	0.01	0.02	0.19	2.8
Y	2015	HW Basalt	CMR09-31	124.3	125.27	H484841	71	4	38	127	0.7	0.03	0.006			0.27	0.4	0.01	0.37	0.04	0.63
Y	2015	HW Basalt	CMR09-31	204.83	206.29	H484844	90	2	52	96	1.5	**0.09**	0.006			0.22	0.2	0.03	0.32	0.04	0.98
Y	2015	HW Basalt	CMR09-31	258.53	259.69	H484846	94	7	52	133	0.6	0.04	0.005			0.28	0.2	0.02	0.21	0.09	0.93
Y	2015	HW Basalt	CMR09-31	330.1	331.32	H484849	148	3	29	109	0.4	0.04	0.005			0.19	0.5	0.01	0.11	0.02	1.33
Y	2015	HW Basalt	GT16-03	4.6	5.1	S038816	135	2	33	123	0.4	0.01	0.021	0.055	0.001	0.08	0.2	0.01	0.05	0.03	2.3
Y	2015	HW Basalt	GT16-03	59.2	59.7	S038818	138	2	38	221	0.4	0.01	0.014	0.008	0.001	0.18	0.2	0.01	0.16	0.01	0.58
Y	2015	HW Basalt	GT16-03	90	90.5	S038819	159	2	48	137	0.2	0.01	0.01	0.009	0.001	0.11	0.2	0.03	0.18	0.14	0.73
Y	2015	HW Basalt	GT16-03	120	120.5	S038821	129	3	45	70	0.2	0.01	0.006	0.005	0.001	0.13	0.2	0.01	0.13	0.01	0.61
Y	2015	HW Basalt	GT16-03	104.3	104.8	S038822	95	2	50	97	5	2				5			10	0.01	
Y	2015	HW Basalt	GT16-03B	134.2	134.8	S038823	102	2	53	108	0.2	0.01	0.007	0.006	0.001	0.09	0.2	0.01	0.37	0.01	0.74
Y	2015	HW Basalt	GT16-03B	164	165	S038824	89	2	48	120	0.3	0.01	0.005	0.005	0.001	0.1	0.2	0.01	0.43	0.01	0.77
Y	2015	HW Basalt	GT16-03B	190.4	190.9	S038826	83	2	50	103	0.4	0.02	0.009	0.006	0.001	0.09	0.2	0.02	0.64	0.07	0.94
Y	2015	HW Basalt	GT16-03B	207.7	208.2	S038827	34	3	15	92	0.3	0.03	0.006	0.021	0.02	0.06	**0.7**	0.02	0.11	0.06	4.92
Y	2015	HW Basalt	GT16-03B	222.5	223	S038828	28	3	28	135	0.4	0.01	0.005	0.01	0.001	0.11	0.2	0.01	0.4	0.03	1.12
Y	2015	HW Basalt	GT16-03B	262	262.5	S038831	41	5	43	147	0.4	0.01	0.005	0.02	0.003	0.06	**0.6**	0.01	0.02	0.14	0.62
Y	2015	HW Basalt	GT16-03B	273.2	273.8	S038834	157	2	49	127	0.4	0.01	0.005	0.017	0.005	0.05	0.2	0.02	0.03	0.01	0.77
Y	2015	HW Basalt	CMR14-66	456	456.8	S038892	55	2	31	103	0.1	0.02	0.007	0.019	0.001	0.13	**0.5**	0.02	0.17	0.05	2.21
Y	2015	HW Basalt	CMR14-66	482	483	S038893	95	4	50	76	0.2	0.01	0.01	0.006	0.001	0.1	**0.6**	0.02	0.38	0.01	1.35
Y	2015	HW Basalt	CMR14-66	509.8	510.8	S038894	81	4	48	165	0.6	0.05	0.011	0.012	0.001	0.35	**0.8**	0.02	0.73	0.17	0.79
Y	2015	HW Basalt	CMR14-66	536.1	537.1	S038895	86	4	45	94	0.3	0.01	0.013	0.013	0.001	0.21	**0.6**	0.01	0.64	0.02	1.17
Y	2015	HW Basalt	CMR14-66	557.6	558.7	S038896	77	2	30	130	0.7	0.03	0.014	0.011	0.001	0.15	**0.5**	0.03	0.61	0.20	0.6
Y	2017	HW Basalt	CMR14-66_2017-ABA	303	303.5	W422052	49	*2*	41	84	5.7	0.01	*0.005*	0.03	0.001	0.07	**0.6**	*0.01*	*0.02*	0.19	3.19
Y	2017	HW Basalt	CMR14-66_2017-ABA	332.5	333	W422053	70	3	26	107	0.2	0.01	*0.005*	0.05	*0.001*	*0.05*	*0.2*	*0.01*	*0.02*	0.06	1.81
Y	2017	HW Basalt	CMR14-66_2017-ABA	389	389.5	W422056	22	*2*	36	91	2.3	0.01	*0.005*	0.045	0.002	0.05	**0.6**	*0.01*	*0.02*	0.14	2.97
Y	2017	HW Basalt	CMR14-66_2017-ABA	412	412.5	W422057	24	*2*	36	107	1.5	0.01	*0.005*	0.028	0.001	0.15	**0.6**	*0.01*	*0.02*	0.22	1.68
Y	2017	HW Basalt	ABA Barrel 3				39	13	15	101	1.3	0.05	0.009	0.029	0.005	0.26	**2**	0.03	0.03	**0.68**	5.54
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037204	37	*2*	40	137	0.5	0.03	*0.005*	0.039	0.002	0.05	0.4	0.02	0.05	0.12	1.6
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037205	2	4	26	149	0.6	0.02	*0.005*	0.025	0.001	0.12	**0.7**	*0.01*	0.04	0.08	0.86
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037206	32	*2*	36	142	0.7	0.01	*0.005*	0.04	0.001	0.11	0.4	*0.01*	0.05	0.09	0.72
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037207	16	2	33	174	1.2	0.06	0.005	0.05	*0.001*	0.12	0.3	0.01	0.13	0.22	0.29
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037209	17	*2*	38	146	0.8	0.02	*0.005*	0.023	0.001	0.08	0.3	*0.01*	0.05	0.21	0.73
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037210	10	3	33	170	0.5	0.01	*0.005*	0.016	*0.001*	0.11	0.4	*0.01*	0.1	0.06	0.52
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037211	23	*2*	34	135	1.1	0.02	0.006	0.033	0.003	0.11	**0.8**	0.01	0.15	0.15	0.61
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037212	33	3	29	143	0.6	0.01	*0.005*	0.026	*0.001*	0.08	**0.5**	*0.01*	0.11	0.09	0.99
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037213	6	2	41	198	1.1	0.03	0.005	0.027	0.001	0.12	0.4	0.02	0.12	0.20	0.13
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037214	22	5	30	117	0.2	0.02	*0.005*	0.061	*0.001*	0.05	**0.7**	0.02	*0.02*	**0.30**	1.72
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037215	19	*2*	24	119	0.4	0.01	*0.005*	0.022	*0.001*	0.12	*0.2*	*0.01*	*0.02*	0.05	0.96
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037216	102	3	34	134	1	0.03	0.007	0.046	0.001	*0.05*	0.4	0.03	*0.02*	0.27	1.79
Y	2017	Jasper Mtn Basalt	SS17-ABA			S037217	8	*2*	30	137	2	0.01	*0.005*	0.075	0.003	0.19	0.2	*0.01*	0.03	0.06	0.49
Y	2017	Jasper Mtn Basalt	GT17-05	2	2.5	S037977	10	3	29	105	1.8	0.04	*0.005*	0.029	0.001	0.17	**1.4**	0.01	0.09	0.10	1
Y	2017	Jasper Mtn Basalt	GT17-05	63.3	63.8	S037979	12	3	38	138	0.9	0.02	0.007	0.047	0.002	0.15	0.3	*0.01*	0.06	0.09	0.96
Y	2017	Jasper Mtn Basalt	GT17-05	90.8	91.3	S037981	7	3	35	166	0.7	0.02	*0.005*	0.051	0.002	0.14	*0.2*	0.01	0.04	0.02	0.42
Y	2017	Jasper Mtn Basalt	GT17-05	118.5	119	S037982	1	6	31	156	0.5	0.02	0.005	0.037	0.002	0.15	0.2	*0.01*	0.09	0.02	0.31
Y	2017	Jasper Mtn Basalt	GT17-05	151.5	152	S037983	15	3	36	170	0.7	0.01	0.008	0.009	0.001	0.12	**0.7**	*0.01*	0.27	0.16	0.08
Y	2017	Jasper Mtn Basalt	GT17-05	180.3	180.8	S037984	14	5	37	155	1	0.01	*0.005*	0.009	0.002	0.1	**0.6**	*0.01*	0.06	0.21	0.45
Y	2017	Jasper Mtn Basalt	GT17-05	208.3	208.8	S037985	9	4	27	111	0.8	0.03	*0.005*	0.026	0.002	0.09	0.2	*0.01*	0.03	0.21	1.34
Y	2017	Jasper Mtn Basalt	GT17-05	238.8	239.3	S037986	14	4	33	112	0.9	0.02	*0.005*	0.02	0.001	0.15	0.3	0.01	0.1	0.15	0.97
Y	2017	Jasper Mtn Basalt	GT17-05	270	270.5	S037987	23	*2*	37	118	0.8	0.01	*0.005*	0.031	0.002	0.08	0.3	*0.01*	0.05	0.13	1.76
Y	2017	Jasper Mtn Basalt	GT17-05	291.6	292.1	S037988	21	*2*	40	84	0.8	0.02	*0.005*	0.035	0.002	0.09	0.4	0.01	0.09	0.13	1.05
Y	2017	Jasper Mtn Basalt	GT17-06	5.9	6.4	S037989	38	4	34	94	0.8	0.02	*0.005*	0.055	0.005	0.11	**0.6**	0.01	0.05	0.20	1.67
Y	2017	Jasper Mtn Basalt	GT17-06	28.9	29.4	S037991	40	2	33	88	0.6	0.03	*0.005*	0.067	0.004	0.1	**0.6**	0.01	0.08	0.11	1.66
Y	2017	Jasper Mtn Basalt	GT17-06	40.8	41.3	S037992	5	5	12	20	0.2	0.03	*0.005*	0.027	0.001	0.06	0.4	0.01	0.05	**0.32**	7.92

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Ni	Pb	Sc	Zn	As	Bi	Hg	In	Re	Sb	Se	Te	Tl	S	C
Y (yes) or N (no)							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%
	Crustal Abundance for Basalt (Price, 1997)						130	6	30	105	2	0.007	0.09		D	0.2	0.05	D	0.21	0.03	
	Crustal abundance x10						1300	60	300	1050	20	0.07	0.9			2	0.5		2.1	0.3	
Y	2017	Jasper Mtn Basalt	GT17-06	59.4	59.9	S037993	30	3	37	118	0.5	0.02	0.005	0.049	0.003	0.13	0.4	0.01	0.03	0.03	1.66
Y	2017	Jasper Mtn Basalt	GT17-06	85.3	85.8	S037994	32	3	35	102	0.5	0.02	0.005	0.054	0.001	0.05	0.3	0.01	0.37	0.09	1.97
Y	2017	Jasper Mtn Basalt	GT17-06	135.3	135.8	S037996	37	2	39	126	0.3	0.05	0.005	0.025	0.006	0.05	0.2	0.03	0.02	0.06	1.92
Y	2017	Jasper Mtn Basalt	GT17-06	181.3	181.8	S037998	26	3	26	129	0.2	0.01	0.005	0.015	0.003	0.05	0.4	0.01	0.14	0.08	4.31
Y	2017	Jasper Mtn Basalt	GT17-06	207.1	207.6	S037999	32	2	31	110	0.6	0.01	0.005	0.056	0.008	0.05	0.4	0.01	0.02	0.23	2.81
Y	2017	Jasper Mtn Basalt	GT17-06	230.5	231	S038000	33	2	36	124	0.3	0.02	0.005	0.061	0.001	0.05	0.2	0.01	0.02	0.07	1.42
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	40.5	41	W422041	8	4	24	123	1.8	0.04	0.005	0.056	0.002	0.14	**0.6**	0.01	0.02	0.21	1.15
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	70	70.5	W422042	19	2	38	116	1	0.01	0.005	0.021	0.002	0.15	0.4	0.02	0.02	0.17	1
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	104.2	104.7	W422043	24	2	40	113	1	0.02	0.005	0.063	0.001	0.14	**0.5**	0.01	0.02	0.12	1.67
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	130	130.5	W422044	23	2	41	130	1.1	0.01	0.005	0.037	0.004	0.07	**0.6**	0.01	0.04	0.10	1.58
Y	2017	Jasper Mtn Basalt	CMR14-66_2017-ABA	165.5	166	W422045	23	2	41	106	0.6	0.01	0.005	0.011	0.001	0.23	0.2	0.01	0.02	0.07	0.28
Y	2017	Jasper Mtn Basalt	ABA Barrel 1				21	2	33	138	0.8	0.04	0.005	0.036	0.002	0.11	**0.5**	0.02	0.1	0.26	1.07
N	2015	HW Basalt	GT14-01	250.1	251.5	Q053907	112	2	31	145	0.5	0.02	0.005			0.13	**0.8**	0.02	0.14	0.13	1.12
N	2015	HW Basalt	CMR14-61b	108.3	108.8	Q153831	204	2	40	100	0.5	0.01	0.012			0.15	**0.5**	0.01	0.77	0.12	0.62
N	2015	HW Basalt	CMR14-61b	169.3	169.8	Q153837	23	8	21	68	0.8	0.02	0.007			0.15	0.2	0.01	0.35	0.21	0.79
N	2015	HW Basalt	CMR14-61b	193.9	194.9	Q153838	7	2	34	145	0.4	0.02	0.008			0.09	**0.6**	0.01	0.11	0.1	1.02
N	2015	HW Basalt	GT14-01	43.6	44.3	Q153964	14	14	35	215	3.1	**0.07**	0.007			0.09	**0.8**	0.01	0.29	**1.1**	1.09
N	2015	HW Basalt	GT14-01	100.1	101.1	Q153967	38	25	37	182	16.8	0.03	0.033			1.33	**1**	0.02	1.83	**0.89**	3.1
N	2015	HW Basalt	GT14-01	281.3	282.4	Q153991	86	6	48	142	0.4	0.01	0.005			0.25	0.2	0.01	0.24	0.04	0.41
N	2015	HW Basalt	GT14-01	12.1	13.1	Q153993	42	8	41	**5970**	1.5	0.05	0.005			0.11	**1.1**	0.02	0.29	0.15	1.41
N	2015	HW Basalt	GT14-01	70	71	Q153999	16	5	32	**2080**	2.3	**0.10**	0.006			0.1	**0.9**	0.01	0.12	0.22	0.95
N	2015	HW Basalt	CMR15-76	122	122.4	S037436	74	2	39	98	0.7	0.05	0.005	0.016	0.001	0.15	**0.5**	0.08	0.54	**0.59**	1.24
N	2015	HW Basalt	CMR15-76	169	169.4	S037438	33	2	30	113	0.6	0.02	0.005	0.025	0.001	0.25	0.3	0.02	0.17	0.25	0.45
N	2015	HW Basalt	CMR15-76	187.1	187.5	S037439	50	2	34	112	0.4	0.01	0.005	0.019	0.001	0.21	0.3	0.01	0.37	0.03	0.92
N	2015	HW Basalt	CMR15-76	218.9	219.3	S037441	67	2	30	79	0.4	0.01	0.005	0.011	0.001	0.23	0.3	0.01	0.04	0.01	1.54
N	2015	HW Basalt	CMR15-76	249.2	249.6	S037442	122	2	49	86	0.2	0.01	0.005	0.01	0.001	0.27	0.4	0.01	0.18	0.01	0.35
N	2015	HW Basalt	CMR15-76	275.2	275.7	S037443	27	8	42	188	0.5	0.03	0.005	0.042	0.006	0.14	**1.4**	0.01	0.26	0.22	0.68
N	2015	HW Basalt	CMR15-76	310.4	310.8	S037444	8	3	36	176	0.3	0.01	0.005	0.025	0.001	0.05	**0.6**	0.01	0.1	0.16	1.78
N	2015	HW Basalt	CMR15-76	330.9	331.3	S037445	22	5	38	121	0.2	0.02	0.005	0.037	0.003	0.08	0.4	0.02	0.08	0.08	1.51
N	2015	HW Basalt	CMR15-76	344.7	345	S037447	28	9	21	93	6.4	**0.07**	0.005	0.033	0.003	0.76	**1.5**	0.06	0.05	**0.51**	3.26
N	2015	HW Basalt	CMR15-76	428.3	428.7	S037452	19	2	43	199	0.6	0.01	0.005	0.011	0.003	0.05	**0.5**	0.01	0.02	0.14	1.47
N	2015	HW Basalt	GT16-02	15	16	S038882	11	11	37	**1420**	0.9	0.01	0.013	0.046	0.001	0.05	**0.7**	0.01	0.26	0.07	1.04
N	2015	HW Basalt	GT16-02	22	23	S038883	14	16	48	**1725**	5	2				5			10	**0.32**	
N	2015	HW Basalt	GT16-02	29	30	S038884	15	8	36	613	5	2				5			10	**0.36**	
N	2015	HW Basalt	GT16-02	36	37	S038885	20	16	32	**1505**	5	2				5			10	0.12	
N	2015	HW Basalt	GT16-02	43	44	S038886	14	8	35	**1385**	5	2				5			10	0.07	
N	2015	HW Basalt	GT16-02	50	51	S038887	16	16	37	671	5	2				5			10	0.23	
N	2015	HW Basalt	GT16-02	57	58	S038888	20	12	40	396	5	2				5			10	**0.90**	
N	2015	HW Basalt	GT16-02	64	65	S038889	13	12	33	477	1	0.02	0.012	0.026	0.003	0.05	**0.6**	0.01	0.34	0.27	1.55
N	2015	HW Basalt	GT16-02	71	72	S038891	14	16	37	**1800**	5	2				5			10	**0.42**	
N	2015	HW Basalt/Fault	GT14-01	160.2	163.7	Q053904	9	2	33	726	0.6	0.02	0.005			0.15	**0.6**	0.01	0.08	0.02	1.14
N	2015	HW Basalt/Fault	GT14-01	181.1	182.6	Q053906	17	8	34	646	0.6	0.03	0.005			0.09	**0.5**	0.01	0.16	0.09	1.17
N	2015	HW Basalt Tuff/Fault	CMR14-61b	68.8	70.1	Q153825	35	4	39	82	0.4	0.05	0.005			0.14	**1.1**	0.02	0.18	0.11	1.49
N	2015	HW Basalt/Fault	CMR15-76	66.7	67	S037434	20	2	43	115	0.7	**0.07**	0.011	0.056	0.001	0.11	**3.2**	0.02	0.08	0.17	2.57
Y	2015	Dyke	CMR09-31	291.39	292.67	H484847	122	5	47	157	0.6	0.05	0.005			0.17	0.3	0.03	0.94	0.13	0.58
Y	2015	Mafic Dyke	GT16-03B	172.3	172.8	S038825	11	2	22	98	0.5	0.01	0.006	0.009	0.001	0.08	0.2	0.02	0.85	0.26	0.6
Y	2017	Mafic Dyke	SS17-ABA			S037208	25	3	17	80	0.3	0.03	0.008	0.016	0.001	0.05	0.2	0.01	0.02	0.20	0.57
Y	2017	Mafic Dyke	GT17-06	108.9	109.4	S037995	2	3	15	75	0.5	0.03	0.005	0.018	0.001	0.13	0.3	0.01	0.14	**0.31**	0.69
Y	2017	Mafic Dyke	GT17-06	154.3	154.8	S037997	1	5	17	103	0.3	0.03	0.005	0.013	0.001	0.09	0.4	0.01	0.25	**0.57**	0.96
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	215	215.5	W422047	28	2	23	110	0.6	0.04	0.007	0.021	0.001	0.41	**2.5**	0.02	0.02	**1.05**	2.27
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	270.5	271	W422051	30	2	36	95	0.2	0.01	0.005	0.058	0.001	0.14	0.4	0.01	0.02	0.12	2.55
Y	2017	Mafic Dyke	CMR14-66_2017-ABA	345.5	346	W422054	155	3	30	130	0.2	0.04	0.005	0.043	0.001	0.2	**0.9**	0.03	0.02	**0.91**	2.63
N	2015	Dyke	CMR15-76	90.3	90.5	S037435	20	5	19	52	1.2	0.02	0.005	0.01	0.001	0.24	0.3	0.01	0.03	0.18	0.34
Y	2015	Gabbro Dyke	GT16-03	31.7	32.2	S038817	291	4	33	224	0.5	0.01	0.008	0.01	0.001	0.23	0.2	0.01	0.02	0.01	0.37
Y	2017	Gabbro (Dyke?)	GT17-05	32	32.6	S037978	258	2	44	77	0.6	0.05	0.005	0.011	0.001	0.06	0.5	0.02	0.02	0.23	0.97
N	2015	Tuff/Limestone	GT16-03B	266	266.5	S038832	22	4	5	50	0.2	0.04	0.005	0.022	0.011	0.05	**1.3**	0.04	0.02	**0.56**	5.04
N	2015	*Duplicate of S038832*	GT16-03B	266	266.5	S038833															
N	2015	Tuff?	CMR14-66	577.7	578.7	S038897	27	5	13	267	0.4	**0.26**	0.022	0.031	0.001	0.72	**1.6**	0.23	**2.59**	**3.15**	0.93
Y	2015	Fault (seds)	GT16-03B	239.5	240.7	S038829	95	3	17	115	14.7	0.06	0.005	0.031	0.01	0.07	**1.1**	0.1	0.19	0.24	3.13
Y	2017	C (Cap Intrusive)	CMR14-66_2017-ABA			W422050	4	4	8	54	0.7	0.01	0.005	0.005	0.001	0.07	0.2	0.01	0.03	0.01	0.05
N	2015	Fault	GT14-01	131.7	133.2	Q153975	40	12	33	**2440**	1	0.04	0.005			0.1	**1.1**	0.01	0.37	0.18	0.34
N	2015	Fault	CMR15-76	152	152.4	S037437	102	2	27	102	0.4	0.04	0.007	0.039	0.001	0.19	0.4	0.01	0.02	**0.35**	2.31
N	2015	Fault	CMR15-76	367.7	368.2	S037449	30	4	38	85	1.4	0.04	0.005	0.051	0.002	0.59	**0.7**	0.01	0.18	0.19	3.85

Appendix E. Trace Element Analyses, Palmer Project

Geol. Rep. of Current Drift Development	Year	Rocktype	Hole or Surface ID	From (m)	To (m)	Sample ID	Ni	Pb	Sc	Zn	As	Bi	Hg	In	Re	Sb	Se	Te	Tl	S	C
Y (yes) or N (no)							ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%
	Crustal Abundance for Basalt (Price, 1997)						130	6	30	105	2	0.007	0.09		D	0.2	0.05	D	0.21	0.03	
	Crustal abundance x10						1300	60	300	1050	20	0.07	0.9			2	0.5		2.1	0.3	
	Crustal Abundance for Shales (Price, 1997)						68	20	13	95	13	D	0.4		D	1.5	0.6	D	1.4	0.24	
	Crustal abundance x10						680	200	130	950	130		4			15	6		14	2.4	
Y	2015	Argillite	CMR09-32	226.16	227.69	H482722	23	14	6	211	8.8	0.14	0.025			0.28	3.3	0.03	0.17	0.75	6.1
Y	2015	Argillite	CMR09-26	252.62	253.59	H484672	52	7	10	113	1.5	0.11	0.018			0.14	4.7	0.17	0.45	1.19	3.78
Y	2015	Argillite	CMR09-31	338.94	339.85	H484851	30	11	24	236	0.1	0.08	0.011			0.18	1.3	0.08	1.37	0.60	1.29
Y	2015	Argillite w/ tr dykes	CMR14-66	597.4	598.2	S038898	13	10	4	29	0.2	0.03	0.013	0.014	0.002	0.61	2	0.02	0.13	0.37	8.2
Y	2015	*Duplicate of S038898*	CMR14-66	597.4	598.2	S038899															
Y	2017	Argillite	SS17-ABA			S037201	67	2	18	79	0.3	0.26	*0.005*	0.016	0.006	0.08	2.6	0.07	*0.02*	0.46	4.07
Y	2017	Argillite	SS17-ABA			S037202	45	2	18	59	0.3	0.22	0.007	0.018	0.004	0.06	1.7	0.06	*0.02*	0.27	4.42
Y	2017	Argillite	SS17-ABA			S037203	65	*2*	25	90	0.2	0.09	0.007	0.025	0.002	0.05	0.5	0.03	*0.02*	0.06	3.67
Y	2017	Argillite	CMR14-66_2017-ABA	193	193.5	W422046	28	29	5	106	16.2	0.07	0.017	0.021	0.007	0.75	2.8	0.03	0.02	0.43	6.92
Y	2017	Argillite	CMR14-66_2017-ABA	235	235.5	W422048	23	6	8	86	28.3	0.05	0.007	0.022	0.007	1.06	3.0	0.01	0.03	0.68	8.95
Y	2017	Argillite	CMR14-66_2017-ABA	255	255.5	W422049	21	14	4	70	0.6	0.05	0.006	0.011	0.004	0.44	2.8	0.02	*0.02*	0.58	9.02
Y	2017	Argillite	CMR14-66_2017-ABA	358.5	359	W422055	30	8	6	50	0.4	0.04	*0.005*	0.022	0.009	0.50	3.5	0.01	*0.02*	0.74	7.09
Y	2017	Argillite	CMR14-66_2017-ABA	428.5	429	W422058	32	3	8	34	2.8	0.07	0.005	0.023	0.021	0.23	3.3	0.02	0.02	0.68	5.54
Y	2017	Argillite w Mafic Dykes	ABA Barrel 2				66	3	39	108	0.7	0.02	0.005	0.014	0.001	0.16	**0.6**	0.02	0.27	0.19	1.37
N	2015	Argillite (limey)	CMR14-61b	40	40.5	Q153816	10	9	5	69	0.1	0.05	0.013			0.12	2.3	0.03	0.11	0.34	8.04
N	2015	Argillite (limey)	CMR14-61b	140.85	141.35	Q153834	27	6	8	98	0.1	0.07	0.016			0.39	3.2	0.05	0.33	0.72	5.14

Notes:

Yellow highlight denotes samples NOT analyzed for ALS characterization pkg (CCP-PKG03); these samples only submitted for 4-acid ICP

MEXRF26 - Lithitum borate fusion decomposition with XRF Sprectroscopy analysis (part of ALS CCP-PKG03)

ME-MS81 - Lithitum borate fusion decomposition with ICP-MS analysis (part of ALS CCP-PKG03)

ME-4ACD81 - Four Acid digestion with ICP-AES analysis (part of CCP-PKG03)

ME-MS42 - Aqua Regia digestion with ICP-MS analysis (part of ALS CCP-PKG03)

Number - value greater than ten times crustal abundance for basalt or shale

D=The data for these elements are missing or unreliable.

APPENDIX F: MINERALOGICAL REPORT (FIELD BARRELS)

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December 6, 2017

Ms. Maria Egerton
Constantine Metal Resources Ltd
Suite 320 – 800 West Pender St.
Vancouver, British Columbia
V6C 2V6

Dear Ms. Egerton;

Re: Mineralogical Assessment of Palmer Project Samples – KM5527

We are pleased to report that we have now completed the mineralogical analyses on three samples from the Palmer Project. The samples were received on November 22, 2017 and weighed between 80 and 100 grams. A detailed list of samples received is located in Appendix I – Sample Origin. The objective of the mineralogical assessment was to determine the mineralogical composition, specifically the quantity of carbonate minerals.

Upon receiving the samples, sample puck block mounts were prepared for each sample and analyzed by the QEMSCAN using Particle Mineral Analysis (PMA) protocol. Assay results were provided by ALS Minerals North Vancouver and can be found in Appendix 1 – Sample Origin.

A summary of the mineral content and calcium deportment for each sample is presented in Figure 1. Detailed mineralogical results are located in Appendix II – Mineralogical Data.

The predominant carbonate mineral in all three samples was identified as Calcite and ranged from approximately seven to twenty-six percent. Ankerite was detected as the second most abundant carbonate and measured as the highest in sample L1990020-2, fourteen percent. Dolomite was present in trace amounts in sample L1990020-2.

The predominant minerals present in all three samples were quartz, feldspars, chlorite and calcite. Minor amounts of kaolinite, apatite, iron oxides, pyrite, and titanium minerals were observed in all the samples.

The main calcium bearing mineral present for sample L1990020-1 and L1990020-3 was calcite and epidote, while sample L1990020-2 was calcite and ankerite. The prime sulphur bearing mineral in all of the samples was pyrite.

Thank you for the opportunity to participate in your mineralogical studies. If you have any questions regarding this report, or the results generated by this program, please contact us directly.

Regards,

Ryan Wilds
Mineralogy Lab Manager

Peter Mehrfert, P. Eng.
Operations Manager
ALS Metallurgy - Kamloops

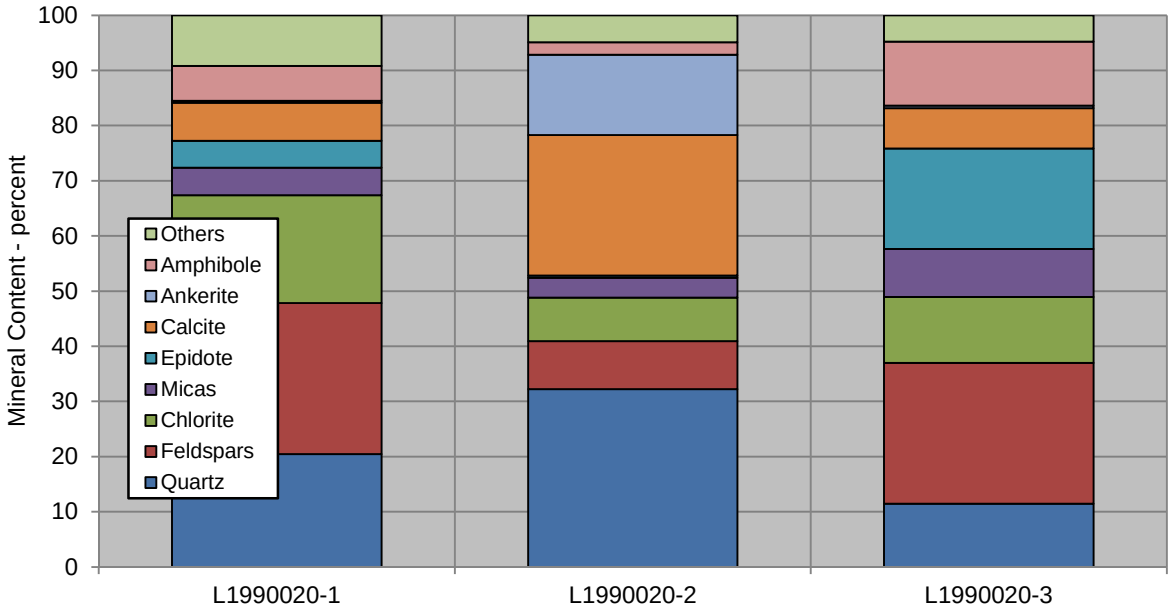
PROFESSIONAL
PROVINCE OF
P. J. MEHRFERT
24527
BRITISH COLUMBIA
ENGINEER

Dec. 6, 2017

December 6, 2017
KM5527

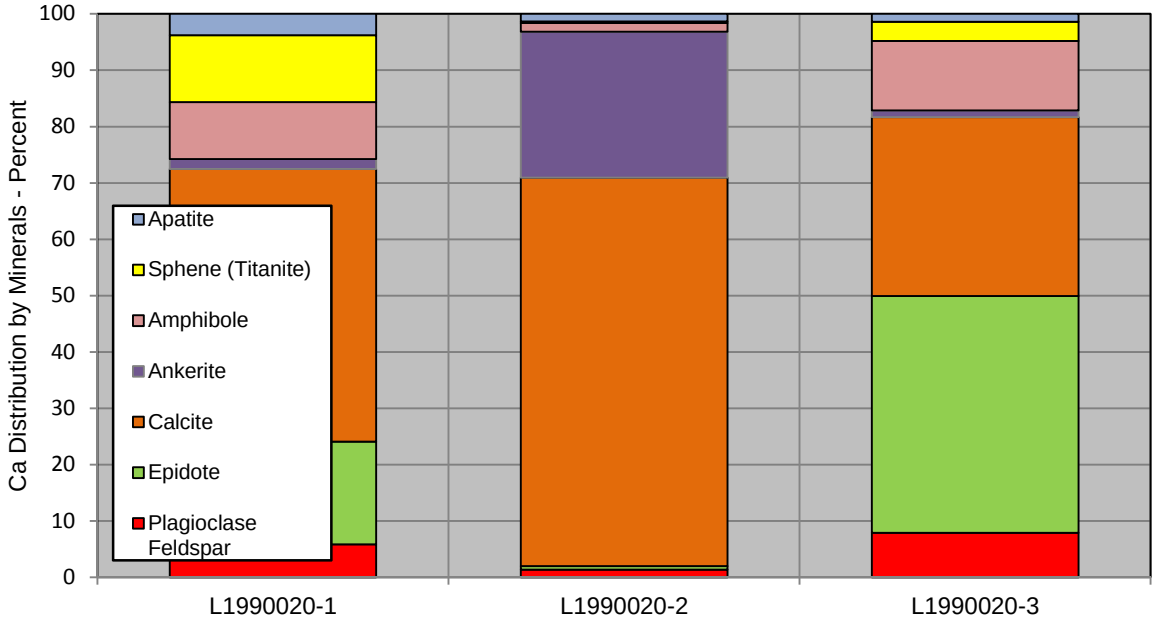
Electronic Distribution:
Maria Egerton, Allegra Cairns, Darwin Green and Shannon Shaw

FIGURE 1A
MINERALOGICAL COMPOSITION



Notes: a) Ankerite includes trace amounts of Dolomite.
b) Others includes Iron Oxides, Pyrite, Apatite, Titanium Minerals, Kaolinite (clay) and trace amounts of Copper Sulphides, Galena, Sphalerite and unresolved mineral species.
c) Detailed mineralogical data is located in Appendix II.

FIGURE 1B
CALCIUM DEPORTMENT



Notes: a) Ankerite includes trace amounts of Dolomite.
b) Detailed mineralogical data is located in Appendix II.

APPENDIX I – KM5527

SAMPLE ORIGIN

1.0 Sample Origin

A shipment of three pulverized samples was received at ALS Metallurgy Kamloops on November 22, 2017 from ALS Minerals Vancouver. The samples originated from the Palmer Project and are listed in Table I-1.

Chemical analyses of the samples were performed by ALS Minerals North Vancouver. A summary of the assay data is located in Table I-2.

The samples are currently in storage at ALS Metallurgy Kamloops.

TABLE I-1
MASS AND IDENTIFICATION OF PALMER PROJECT SAMPLES RECEIVED

Sample ID	Weight grams
L1990020-1	90
L1990020-2	80
L1990020-3	100

Note: All samples received were in pulverized form.

TABLE I-2
CHEMICAL ANALYSIS OF SELECTED SAMPLES

Sample	Assay – percent							
	Al_2O_3	CaO	Fe_2O_3	K_2O	MgO	S	SiO_2	TiO_2
L1990020-1	13.0	7.45	14.8	0.59	5.35	0.26	46.7	1.55
L1990020-2	7.19	20.1	6.04	0.71	4.57	0.68	38.5	0.44
L1990020-3	14.6	11.6	11.2	1.25	5.36	0.19	45.2	0.85

Note: Chemical data provided by ALS Minerals Vancouver.

APPENDIX II – KM5527

MINERALOGICAL DATA

TABLE 1A
MINERAL COMPOSITION OF PALMER PROJECT SAMPLES
KM5527

Minerals	L1990020-1	L1990020-2	L1990020-3
Copper Sulphides	<0.1	<0.1	<0.1
Pyrite	0.5	1.3	0.4
Iron Oxides	3.7	0.3	1.6
Quartz	20.5	32.2	11.4
Feldspars	27.4	8.7	25.5
Chlorite	19.6	7.9	12.0
Micas	4.9	3.6	8.7
Epidote	4.9	0.4	18.2
Calcite	6.9	25.5	7.3
Ankerite	0.4	14.2	0.4
Dolomite	0.0	0.3	0.0
Amphibole	6.3	2.3	11.7
Titanium Minerals	4.0	0.6	1.9
Apatite	0.5	0.5	0.3
Kaolinite (clay)	<0.1	0.2	<0.1
Others	0.4	2.0	0.5
Total	100	100	100

Notes: 1) Copper Sulphides includes Chalcopyrite and Chalcocite/Covellite.
2) Pyrite includes trace amounts of Pyrrhotite.
3) Iron Oxides includes Magnetite, Hematite and Goethite/Limonite.
4) Feldspars includes Feldspar Albite, Plagioclase Feldspar and K-Feldspar.
5) Micas includes Muscovite and Biotite/Phlogopite.
6) Titanium Minerals includes Sphene (Titanite) and trace amounts of Rutile/Anatase and Ilmenite.
7) Others includes trace amounts of Galena, Sphalerite and unresolved mineral species.
8) A Particle Measurement Analysis was used for all measurements.

TABLE 1B
% CALCIUM BEARING MINERAL OF TOTAL CALCIUM
KM5527

Minerals	L1990020-1	L1990020-2	L1990020-3
Plagioclase Feldspar	5.9	1.4	7.9
Epidote	18.2	0.6	42.0
Calcite	48.4	68.9	31.8
Ankerite	1.8	25.5	1.2
Dolomite	0.0	0.4	0.0
Amphibole	10.1	1.5	12.3
Sphene (Titanite)	11.9	0.3	3.4
Apatite	3.8	1.4	1.4
Total	100	100	100

TABLE 1C
% SULPHUR BEARING MINERAL OF TOTAL SULPHUR
KM5527

Minerals	L1990020-1	L1990020-2	L1990020-3
Copper Sulphides	1.1	0.2	1.3
Pyrite	98.5	99.6	98.5
Other Sulphide Minerals	0.3	0.2	0.2
Total	100	100	100

1) Copper Sulphides includes Chalcopyrite and trace amounts of Chalcocite/Covellite.

2) Other Sulphide Minerals includes Galena and Sphalerite.

TABLE 1D
CHEMICAL COMPOSITION OF PALMER PROJECT SAMPLES
KM5527

Element	Assay Methods	L1990020-1	L1990020-2	L1990020-3
Al	QEMSCAN	6.81	2.89	8.35
	Chemical	6.87	3.81	7.72
Ca	QEMSCAN	5.68	14.7	9.20
	Chemical	5.32	14.4	8.25
Fe	QEMSCAN	8.39	3.72	7.56
	Chemical	10.3	4.22	7.83
Mg	QEMSCAN	3.09	2.16	3.10
	Chemical	3.23	2.76	3.23
K	QEMSCAN	0.52	0.40	0.90
	Chemical	0.49	0.59	1.04
Si	QEMSCAN	22.7	19.9	20.8
	Chemical	21.8	18.0	21.1
S	QEMSCAN	0.26	0.67	0.22
	Chemical	0.26	0.68	0.19
Ti	QEMSCAN	0.92	0.26	0.45
	Chemical	0.93	0.26	0.51

Note: Assays were conducted by ALS Geochemistry Vancouver.

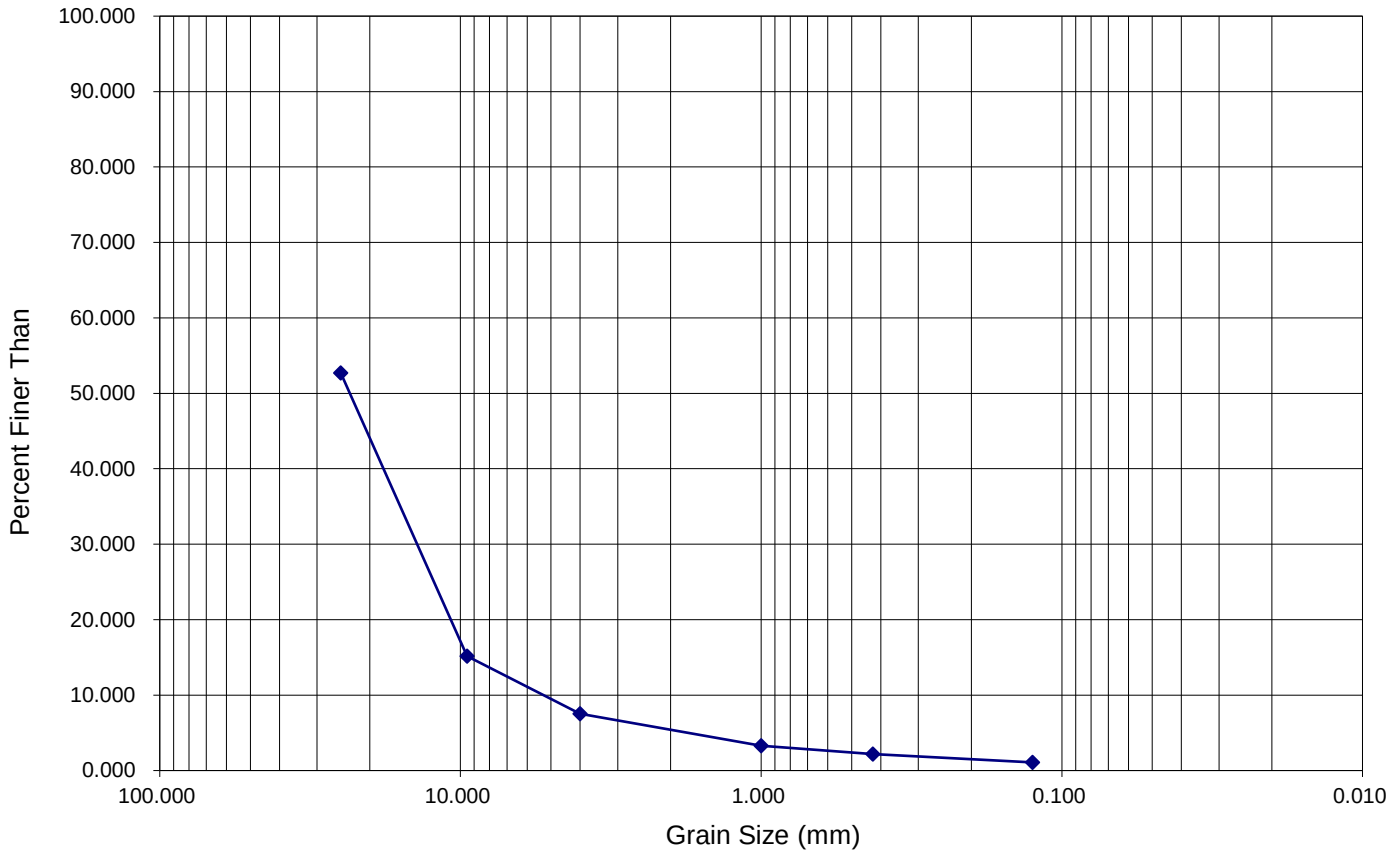
APPENDIX G: PARTICLE SIZE DISTRIBUTION ANALYSES

ALS Laboratory Group

819-58th Street, Saskatoon,SK

Client Name: Constantine North Inc.
Project Number:
Client Sample ID #1
Lab Sample ID L1990020-1
Date Sample Received 12-Sep-17
Test Completion Date: 25-Sep-17
Analyst: SHC

PARTICLE SIZE DISTRIBUTION CURVE



PARTICLE SIZE DISTRIBUTION

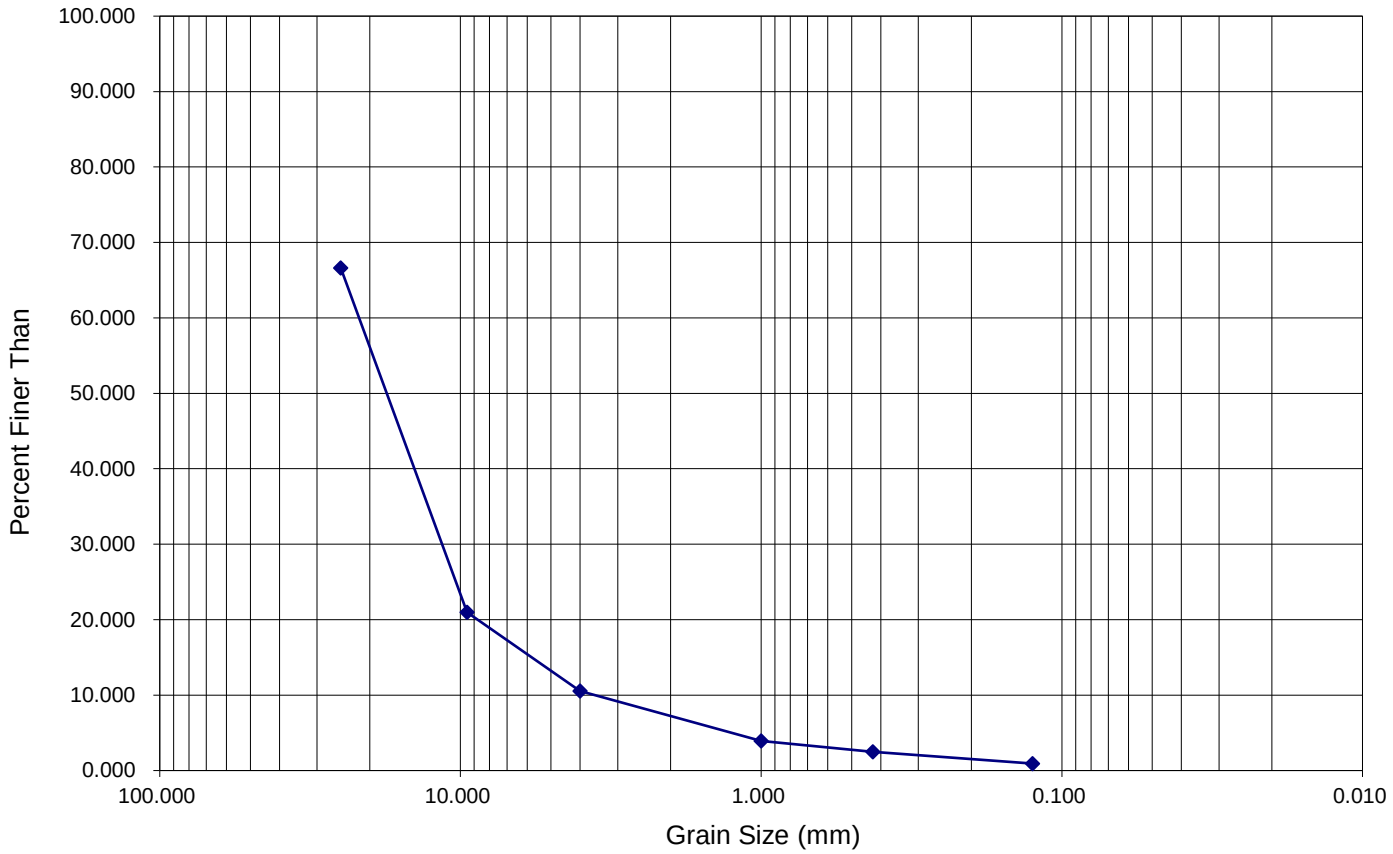
Particle Range (mm)	Weight (%)	Particle Range (mm)	% Passing
> 25 mm	47.3	25	53
25 - 9.5 mm	37.5	9.5	15
9.5 - 4 mm	7.7	4	8
4 - 1 mm	4.2	1	3
1 - 0.425 mm	1.1	0.425	2
0.425 - 0.125 mm	1.1	0.125	1
< 0.125 mm	1.1	0	0
	100.0		
		0	0

ALS Laboratory Group

819-58th Street, Saskatoon,SK

Client Name:	Constantine North Inc.
Project Number:	
Client Sample ID	#2
Lab Sample ID	L1990020-2
Date Sample Received	12-Sep-17
Test Completion Date:	25-Sep-17
Analyst:	SHC

PARTICLE SIZE DISTRIBUTION CURVE



PARTICLE SIZE DISTRIBUTION

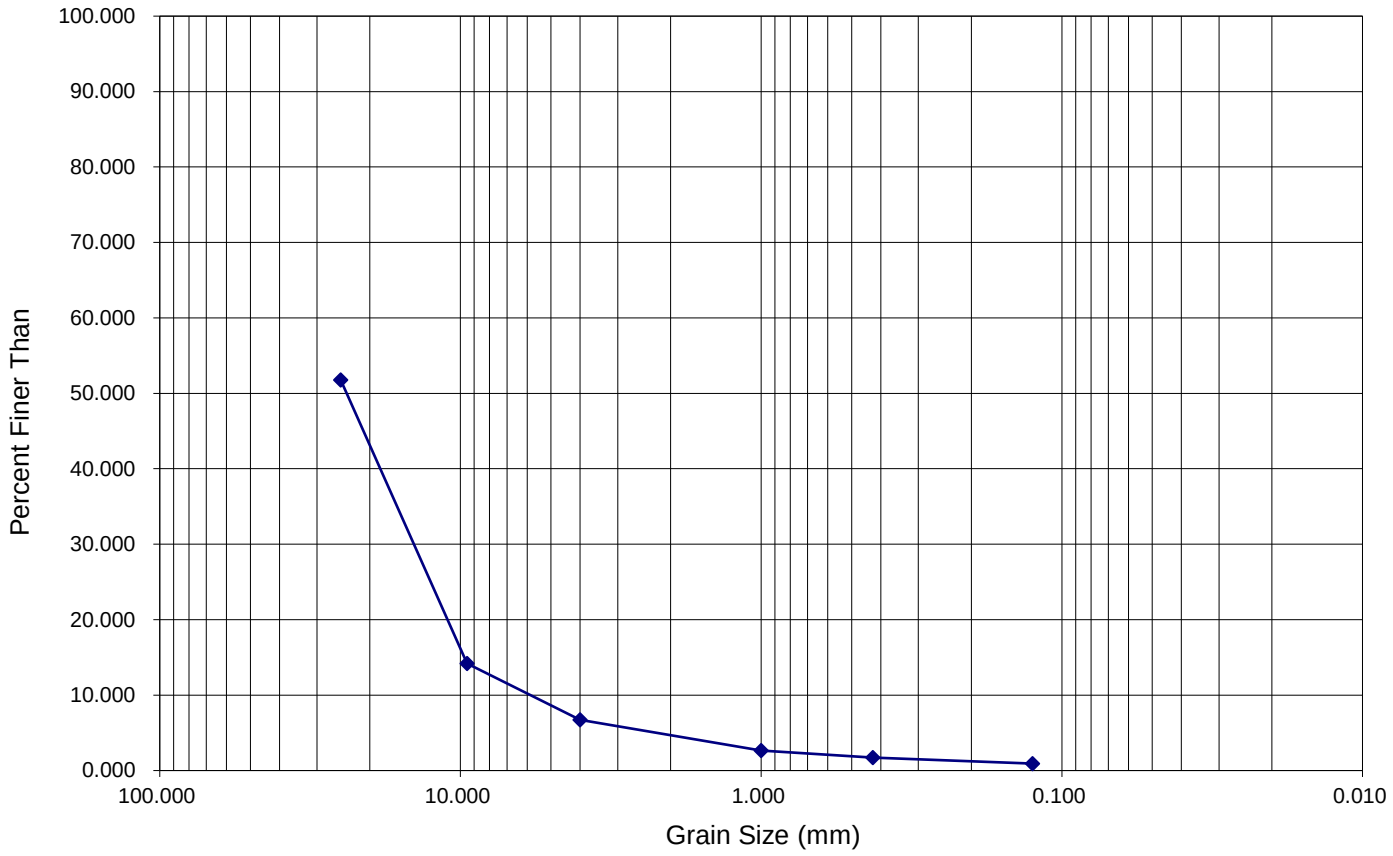
Particle Range (mm)	Weight (%)	Particle Range (mm)	% Passing
> 25 mm	33.4	25	67
25 - 9.5 mm	45.6	9.5	21
9.5 - 4 mm	10.4	4	11
4 - 1 mm	6.6	1	4
1 - 0.425 mm	1.5	0.425	2
0.425 - 0.125 mm	1.5	0.125	1
< 0.125 mm	0.9	0	0
	100.0		
		0	0

ALS Laboratory Group

819-58th Street, Saskatoon,SK

Client Name: Constantine North Inc.
Project Number:
Client Sample ID #3
Lab Sample ID L1990020-3
Date Sample Received 12-Sep-17
Test Completion Date: 25-Sep-17
Analyst: SHC

PARTICLE SIZE DISTRIBUTION CURVE



PARTICLE SIZE DISTRIBUTION

Particle Range (mm)	Weight (%)	Particle Range (mm)	% Passing
> 25 mm	48.2	25	52
25 - 9.5 mm	37.6	9.5	14
9.5 - 4 mm	7.5	4	7
4 - 1 mm	4.1	1	3
1 - 0.425 mm	0.9	0.425	2
0.425 - 0.125 mm	0.8	0.125	1
< 0.125 mm	0.9	0	0
	100.0		
		0	0

APPENDIX H: FIELD BARREL LEACHATE RESULTS

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 1 (Hangingwall Basalt)**

			In-Situ Parameters									Physical Tests					Anions and Nutrients														
Sample ID	**Sample Date**	**ALS Sample ID**	**Temp**	**BP**	**DO**	**DO**	**SPC**	**pH**	**pH**	**Turbidity**	**Total Volume**	**Cond.**	**Hardness**	**pH**	**TSS**	**TDS**	**Acidity**	**Alkalinity**	**NH3-Total**	**Br**	**Cl**	**F**	**NO3+NO2**	**NO3**	**NO2**	**P-Total**	**P-Diss**	**SO4**	**Anion Sum**	**Cation Sum**	**Cation - Anion Balance**
			°C	mm/Hg	%	mg/L	uS/cm		mV	NTU	L	uS/cm	mg CaCO3/L	units	mg/L	mg/L	mg CaCO3/L	mg CaCO3/L	as N mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L			
Minimum			4.6	710	67.3	#N/A	87	8.10	-69.8	1.64		89	28.5	8.12	3.3	71	1.0	41	0.0256	0.05	1.86	0.052	0.005	0.005	0.0010	0.0035	0.002	3			
Maximum			11	729	79.5	#N/A	222	8.15	-63	55.50		217	79.8	8.15	69.7	120	1.2	94	0.0257	0.05	2.32	0.115	0.049	0.048	0.0014	0.0412	0.005	17			
Average			7.8	719	73.4	#N/A	154	8.13	-66.4	28.57		153	54.2	8.14	36.5	96	1.1	67	0.0257	0.05	2.09	0.084	0.027	0.026	0.0012	0.0224	0.003	10			
1	13-Sep-17	L1991787-1	11	729	79.5	8.54	86.5	8.15	-69.8	55.5	75.25	89.1	28.5	8.15	69.7	71	*1*	40.6	0.0256	*0.05*	2.32	0.052	0.049	0.0476	0.0014	0.0412	0.0046	2.58			
1	16-Oct-17	L2009472-1	4.6	709.9	67.3	#N/A	222.3	8.1	-63	1.64	42	217	79.8	8.12	3.3	120	1.2	93.8	0.0257	*0.05*	1.86	0.115	*0.0051*	0.005	0.001	0.0035	*0.002*	17.2	2.29	2.13	-3.6

Notes:
red italics = value reported as less than laboratory detection limit; detection limit shown

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 1 (Hangingwall Basalt)

			Cyanides	Total Metals																														
Sample ID	**Sample Date**	**ALS Sample ID**	**CN (WAD)**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**	**Sr**	**S**	**Tl**	**Sn**
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.005	0.13	0.0003	0.0003	0.025	0.00002	0.00005	0.014	0.000005	11.3	0.0006	0.0001	0.0005	0.19	0.00005	0.001	5.1	0.02	0.000005	0.00228	0.00050	0.05	4.8	0.0003	1.82	0.00001	3.77	0.138	5.77	0.000021	0.00013
Maximum			0.005	5.02	0.0006	0.0011	0.038	0.00005	0.00005	0.034	0.000030	24.3	0.0099	0.0038	0.0027	9.08	0.00034	0.002	5.8	0.15	0.000005	0.00659	0.00396	0.05	9.8	0.0006	7.15	0.00001	6.71	0.362	5.77	0.000027	0.00032
Average			0.005	2.58	0.0005	0.0007	0.032	0.00004	0.00005	0.024	0.000018	17.8	0.0052	0.0020	0.0016	4.63	0.00019	0.002	5.5	0.09	0.000005	0.00444	0.00223	0.05	7.3	0.0005	4.49	0.00001	5.24	0.250	5.77	0.000024	0.00023
1	13-Sep-17	L1991787-1	0.005	5.02	0.00032	0.00026	0.0253	0.000054	*0.00005*	0.014	0.0000297	11.3	0.00985	0.0038	0.0027	9.08	0.000335	0.0021	5.1	0.15	0.000005	0.00228	0.00396		4.76	0.000321	7.15	*0.00001*	3.77	0.138		0.000027	0.00013
1	16-Oct-17	L2009472-1	0.005	0.131	0.00061	0.00111	0.0384	*0.00002*	*0.00005*	0.034	0.0000054	24.3	0.00055	*0.0001*	*0.0005*	0.189	*0.00005*	0.001	5.8	0.02	0.000005	0.00659	*0.0005*	*0.05*	9.79	0.0006	1.82	*0.00001*	6.71	0.362	5.77	0.000021	0.00032

Notes:
red italics = value reported as less than laboratory detec

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 1 (Hangingwall Basalt)

			Dissolved Metals																															
Sample ID	**Sample Date**	**ALS Sample ID**	**Ti**	**U**	**V**	**Zn**	**Zr**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.003	0.000023	0.0018	0.006	0.0003	0.04	0.00027	0.00011	0.011	0.00002	0.00005	0.012	0.00001	9.3	0.0001	0.0001	0.0003	0.01	0.00005	0.001	1.26	0.0060	0.000005	0.00207	0.0005	0.05	4.42	0.00038	0.85	0.00001	3.83
Maximum			0.241	0.000028	0.0284	0.018	0.0003	0.14	0.00052	0.00096	0.037	0.00002	0.00005	0.030	0.00001	22.8	0.0007	0.0001	0.0003	0.01	0.00005	0.001	5.55	0.0159	0.000005	0.00624	0.0005	0.05	9.53	0.00059	1.69	0.00001	6.61
Average			0.122	0.000026	0.0151	0.012	0.0003	0.09	0.00040	0.00054	0.024	0.00002	0.00005	0.021	0.00001	16.1	0.0004	0.0001	0.0003	0.01	0.00005	0.001	3.41	0.0109	0.000005	0.00416	0.0005	0.05	6.98	0.00049	1.27	0.00001	5.22
1	13-Sep-17	L1991787-1	0.241	0.000023	0.0284	*0.018*		0.137	0.00027	0.00011	0.0109	*0.00002*	*0.00005*	0.012	*0.000005*	9.33	0.00012	*0.0001*	0.00032	*0.01*	*0.00005*	*0.001*	1.26	0.00597	*0.000005*	0.00207	*0.0005*		4.42	0.00038	0.846	*0.00001*	3.83
1	16-Oct-17	L2009472-1	0.00326	0.000028	0.00177	0.0057	*0.0003*	0.04	0.00052	0.00096	0.0368	*0.00002*	*0.00005*	0.03	0.0000088	22.8	0.0007	*0.0001*	0.00032	*0.01*	*0.00005*	*0.001*	5.55	0.0159	*0.000005*	0.00624	*0.0005*	*0.05*	9.53	0.00059	1.69	*0.00001*	6.61

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 1 (Hangingwall Basalt)**

Sample ID	Sample Date	ALS	Sr	S	Tl	Sn	Ti	U	V	Zn	Zr
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.13	5.14	0.000012	0.00010	0.0003	0.00001	0.0011	0.001	0.0003
Maximum			0.34	5.14	0.000045	0.00079	0.0003	0.00003	0.0012	0.001	0.0003
Average			0.23	5.14	0.000029	0.00045	0.0003	0.00002	0.0012	0.001	0.0003
1	13-Sep-17	L1991787-1	0.127		0.000012	*0.0001*	*0.0003*	*0.00001*	0.00124	*0.001*	
1	16-Oct-17	L2009472-1	0.341	5.14	0.000045	0.00079	*0.0003*	0.000026	0.0011	*0.001*	*0.0003*

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 2**
(Argillite & Mafic Dikes)

			In-Situ Parameters									Physical Tests					Anions and Nutrients														
Sample ID	**Sample Date**	**ALS**	**Temp**	**BP**	**DO**	**DO**	**SPC**	**pH**	**pH**	**Turbidity**	**Total Volume**	**Cond.**	**Hardness**	**pH**	**TSS**	**TDS**	**Acidity**	**Alkalinity**	**NH3-Total**	**Br**	**Cl**	**F**	**NO3+NO2**	**NO3**	**NO2**	**P-Total**	**P-Diss**	**SO4**	**Anion Sum**	**Cation Sum**	**Cation - Anion Balance**
		Sample ID	°C	mm/Hg	%	mg/L	uS/cm		mV	NTU	L	uS/cm	mg CaCO3/L	units	mg/L	mg/L	mg CaCO3/L	mg CaCO3/L	as N mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L			
Minimum			2.9	709.9	70.4	9.15	174	8.22	-93.3	0.57		178	68	8.15	3.3	135	1.0	51	0.091	0.05	0.76	0.074	0.052	0.049	0.003	0.004	0.004	42			
Maximum			11.2	729.1	84.7	9.20	561	8.62	-69.3	115		559	265	8.37	164	365	1.2	100	0.125	0.05	0.82	0.125	0.120	0.084	0.035	0.004	0.156	204			
Average			7.05	719.5	77.6	9.18	367	8.42	-81.3	57.8		369	167	8.26	83.7	250	1.1	76	0.108	0.05	0.79	0.100	0.086	0.067	0.019	0.004	0.080	123			
2	13-Sep-17	L1991787-2	11.2	729.1	84.7	9.15	173.5	8.62	-93.3	115	82	178	68	8.37	164	135	*1*	51.2	0.091	*0.05*	0.82	0.074	0.0518	0.049	0.0029	*0.004*	0.156	41.6			
2	16-Oct-17	L2009472-2	2.9	709.9	70.4	9.2	561	8.22	-69.3	0.57	43.7	559	265	8.15	3.3	365	1.2	99.9	0.125	*0.05*	0.76	0.125	0.12	0.0843	0.0353	0.0039	0.0041	204	6.28	5.81	-3.9

Notes:
red italics = value reported as less than laboratory detection limit; detection limit shown

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 2
(Argillite & Mafic Dikes)

			Cyanides	Total Metals																														
Sample ID	**Sample Date**	**ALS**	**CN (WAD)**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**	**Sr**	**S**	**Tl**	**Sn**
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.005	0.03	0.00105	0.0035	0.038	0.00002	0.00005	0.021	0.00002	20.4	0.0009	0.00119	0.0005	0.028	0.00005	0.002	9.72	0.0199	0.000005	0.005	0.0062	0.05	4.3	0.003	1.71	0.00001	3.8	0.81	69.6	0.000011	0.00013
Maximum			0.005	3.70	0.00216	0.0079	0.038	0.00016	0.00005	0.044	0.00009	51.2	0.0155	0.00448	0.0046	5.170	0.00345	0.004	35.8	0.0870	0.000005	0.018	0.0159	0.05	7.9	0.013	4.65	0.00008	7.88	2.99	69.6	0.000026	0.00052
Average			0.005	1.86	0.00161	0.0057	0.038	0.00009	0.00005	0.033	0.00005	35.8	0.0082	0.00284	0.0025	2.599	0.00175	0.003	22.76	0.0535	0.000005	0.011	0.0111	0.05	6.1	0.008	3.18	0.00004	5.8	1.90	69.6	0.000019	0.00333
2	13-Sep-17	L1991787-2	*0.005*	3.7	0.00105	0.00794	0.0379	0.000163	*0.00005*	0.021	0.0000851	20.4	0.0155	0.00448	0.00457	5.17	0.00345	0.0038	9.72	0.087	*0.000005*	0.00504	0.0159		4.3	0.00335	4.65	0.000079	3.8	0.809		0.000026	0.00013
2	16-Oct-17	L2009472-2	*0.005*	0.0272	0.00216	0.00352	0.0375	*0.00002*	*0.00005*	0.044	0.0000217	51.2	0.00086	0.00119	*0.0005*	0.028	*0.00005*	0.0022	35.8	0.0199	*0.000005*	0.0177	0.00622	*0.05*	7.9	0.0131	1.71	*0.00001*	7.88	2.99	69.6	0.000011	0.00052

Notes:
red italics = value reported as less than laboratory detec

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 2
(Argillite & Mafic Dikes)

Sample ID	Sample Date	ALS Sample ID	Ti	U	V	Zn	Zr	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na
			Dissolved Metals																														
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.0003	0.0012	0.0005	0.007	0.0003	0.01	0.00107	0.00335	0.013	0.00002	0.00005	0.017	0.00001	14.7	0.0004	0.00016	0.0002	0.01	0.00005	0.001	7.61	0.0066	0.000005	0.004	0.0012	0.05	4.2	0.004	0.80	0.00001	4.1
Maximum			0.0072	0.0063	0.0157	0.029	0.0003	0.06	0.00203	0.00469	0.036	0.00002	0.00005	0.039	0.00003	49.9	0.0007	0.00114	0.0003	0.01	0.00005	0.002	34	0.0184	0.000005	0.017	0.0059	0.05	7.5	0.013	1.71	0.00001	7.48
Average			0.0038	0.0038	0.0081	0.018	0.0003	0.04	0.00155	0.00402	0.024	0.00002	0.00005	0.028	0.00002	32.3	0.0005	0.00065	0.0002	0.01	0.00005	0.002	20.81	0.0125	0.000005	0.010	0.0036	0.05	5.9	0.008	1.25	0.00001	5.8
2	13-Sep-17	L1991787-2	*0.0072*	0.00118	0.0157	0.0287		0.0638	0.00107	0.00469	0.0126	*0.00002*	*0.00005*	0.017	*0.000005*	14.7	0.00037	0.00016	0.00023	*0.01*	*0.00005*	*0.001*	7.61	0.00662	*0.000005*	0.00391	0.00117		4.17	0.00367	0.797	*0.00001*	4.08
2	16-Oct-17	L2009472-2	*0.0003*	0.00632	*0.0005*	0.007	*0.0003*	0.0141	0.00203	0.00335	0.036	*0.00002*	*0.00005*	0.039	0.0000263	49.9	0.00068	0.00114	0.00026	*0.01*	0.000052	0.0022	34	0.0184	*0.000005*	0.017	0.00593	*0.05*	7.53	0.0126	1.71	*0.00001*	7.48

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 2**
(Argillite & Mafic Dikes)

Sample ID	Sample Date	ALS	Sr	S	Tl	Sn	Ti	U	V	Zn	Zr
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.75	66.1	0.000010	0.00010	0.0003	0.0007	0.0005	0.001	0.0003
Maximum			2.84	66.1	0.000044	0.00114	0.0003	0.0059	0.0005	0.003	0.0003
Average			1.80	66.1	0.000027	0.00062	0.0003	0.0033	0.0005	0.002	0.0003
2	13-Sep-17	L1991787-2	0.754		*0.00001*	0.0001	*0.0003*	0.000694	*0.0005*	*0.001*	
2	16-Oct-17	L2009472-2	2.84	66.1	0.000044	0.00114	*0.0003*	0.00586	*0.0005*	0.0032	*0.0003*

Notes:
red italics = value reported as less than laboratory detec

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 3 (Hangingwall Basalt)

			In-Situ Parameters									Physical Tests					Anions and Nutrients														
Sample ID	Sample Date	ALS Sample ID	Temp	BP	DO	DO	SPC	pH	pH	Turbidity	Total Volume	Cond.	Hardness	pH	TSS	TDS	Acidity	Alkalinity	NH3-Total	Br	Cl	F	NO3+NO2	NO3	NO2	P-Total	P-Diss	SO4	Anion Sum	Cation Sum	Cation - Anion Balance
			°C	mm/Hg	%	mg/L	uS/cm		mV	NTU	L	uS/cm	mg CaCO3/L	units	mg/L	mg/L	mg CaCO3/L	mg CaCO3/L	as N mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L			
Minimum			3.1	709.8	69.5	7.3	75.4	8.31	-136.2	6		82	19.3	8.17	12	99	1	49	0.018	0.05	0.77	0.027	0.0051	0.005	0.001	0.011	0.004	5			
Maximum			13	728.9	72.0	9.7	213.4	9.42	-73.7	369		209	66.7	8.62	155	118	1	96	0.019	0.05	0.86	0.044	0.0299	0.030	0.001	0.196	0.005	13			
Average			8.1	719.35	70.8	8.5	144.4	8.87	-105.0	188		145	43.0	8.40	83	109	1	73	0.019	0.05	0.82	0.036	0.0175	0.017	0.001	0.104	0.004	9			
3	13-Sep-17	L1991787-3	13	728.9	69.5	7.3	75.4	9.42	-136.2	369	62.5	81.5	19.3	8.62	155	99	*1*	49.3	0.019	*0.05*	0.86	0.027	0.0299	0.0299	*0.001*	0.196	0.0035	4.66			
3	16-Oct-17	L2009472-3	3.1	709.8	72	9.69	213.4	8.31	-73.7	6	42	209	66.7	8.17	11.5	118	*1*	96	0.018	*0.05*	0.77	0.044	*0.0051*	*0.005*	*0.001*	0.0112	0.0046	13.1	2.22	2.16	-1.2

Notes:
red italics = value reported as less than laboratory detection limit; detection limit shown

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 3 (Hangingwall Basalt)

			Cyanides	Total Metals																														
Sample ID	**Sample Date**	**ALS**	**CN (WAD)**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**	**Sr**	**S**	**Tl**	**Sn**
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.005	0.56	0.00032	0.0006	0.092	0.00002	0.00005	0.01	0.00001	18.1	0.0025	0.00057	0.0028	0.85	0.00007	0.001	4.32	0.027	0.000005	0.0017	0.0011	0.05	6.7	0.001	2.60	0.00001	6.2	0.06	4.34	0.00001	0.00024
Maximum			0.005	15.3	0.00033	0.0011	0.220	0.00016	0.00005	0.01	0.00012	21.4	0.0696	0.01540	0.0614	21.70	0.00217	0.008	13	0.444	0.000009	0.0050	0.0276	0.05	8.2	0.001	23.5	0.00010	13.7	0.13	4.34	0.00015	0.00044
Average			0.005	7.93	0.00033	0.0008	0.156	0.00009	0.00005	0.01	0.00006	19.8	0.0361	0.00799	0.0321	11.27	0.00112	0.005	8.66	0.235	0.000007	0.0033	0.0144	0.05	7.5	0.001	13.05	0.00005	10.0	0.10	4.34	0.00008	0.00034
3	13-Sep-17	L1991787-3	*0.005*	15.3	0.00033	0.00055	0.22	0.000158	*0.00005*	*0.01*	0.000115	18.1	0.0696	0.0154	0.0614	21.7	0.00217	0.0083	13	0.444	0.0000092	0.00169	0.0276		6.73	0.000843	23.5	0.000095	6.24	0.057		0.000152	0.00024
3	16-Oct-17	L2009472-3	*0.005*	0.558	0.00032	0.00106	0.0924	*0.00002*	*0.00005*	*0.01*	*0.000005*	21.4	0.0025	0.00057	0.00284	0.845	0.000065	*0.001*	4.32	0.0267	*0.000005*	0.00498	0.00112	*0.05*	8.21	0.00119	2.6	*0.00001*	13.7	0.133	4.34	*0.00001*	0.00044

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 3 (Hangingwall Basalt)**

			Dissolved Metals																															
Sample ID	**Sample Date**	**ALS**	**Ti**	**U**	**V**	**Zn**	**Zr**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.03	0.0001	0.0042	0.004	0.0003	0.04	0.0001	0.0001	0.025	0.00002	0.00005	0.01	0.00001	6.6	0.0003	0.0001	0.0013	0.010	0.00005	0.001	0.70	0.0047	0.000005	0.0014	0.0005	0.05	3.56	0.00079	0.89	0.00001	5.8
Maximum			1.08	0.0002	0.0745	0.057	0.0003	0.195	0.00031	0.0011	0.084	0.00002	0.00005	0.01	0.00001	20.4	0.0005	0.0001	0.0014	0.032	0.00005	0.001	3.84	0.010	0.000005	0.0048	0.0005	0.05	8.74	0.00116	1.95	0.00001	13.8
Average			0.56	0.0002	0.0394	0.030	0.0003	0.12	0.0002	0.0006	0.054	0.00002	0.00005	0.01	0.00001	13.5	0.0004	0.0001	0.0014	0.021	0.00005	0.001	2.27	0.007	0.000005	0.0031	0.0005	0.05	6.15	0.00097	1.42	0.00001	9.8
3	13-Sep-17	L1991787-3	1.08	0.000192	0.0745	0.0566		0.195	0.00014	0.00011	0.025	*0.00002*	*0.00005*	*0.01*	*0.000005*	6.58	0.00028	*0.0001*	0.00139	0.032	*0.00005*	*0.001*	0.7	0.00472	*0.000005*	0.00135	*0.0005*		3.56	0.000788	0.892	*0.00001*	5.78
3	16-Oct-17	L2009472-3	*0.03*	0.00011	0.00423	0.0036	*0.0003*	0.042	0.00031	0.00105	0.0838	*0.00002*	*0.00005*	*0.01*	*0.000005*	20.4	0.00049	*0.0001*	0.00131	*0.01*	*0.00005*	*0.001*	3.84	0.0102	*0.000005*	0.0048	*0.0005*	*0.05*	8.74	0.00116	1.95	*0.00001*	13.8

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 3 (Hangingwall Basalt)**

Sample ID	Sample Date	ALS	Sr	S	Tl	Sn	Ti	U	V	Zn	Zr
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.029	4.48	0.00001	0.00011	0.0003	0.00002	0.0015	0.001	0.0003
Maximum			0.127	4.48	0.00001	0.00065	0.0011	0.00010	0.0026	0.001	0.0003
Average			0.078	4.48	0.00001	0.00038	0.0007	0.00006	0.0021	0.001	0.0003
3	13-Sep-17	L1991787-3	0.0292		*0.00001*	0.00011	0.00108	0.000021	0.0026	*0.001*	
3	16-Oct-17	L2009472-3	0.127	4.48	*0.00001*	0.00065	*0.0003*	0.000103	0.00153	*0.001*	*0.0003*

Notes:
red italics = value reported as less than laboratory detec

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 4
(Rain Water - Blank)

			In-Situ Parameters									Physical Tests					Anions and Nutrients														
Sample ID	Sample Date	ALS Sample ID	Temp	BP	DO	DO	SPC	pH	pH	Turbidity	Total Volume	Cond.	Hardness	pH	TSS	TDS	Acidity	Alkalinity	NH3-Total	Br	Cl	F	NO3+NO2	NO3	NO2	P-Total	P-Diss	SO4	Anion Sum	Cation Sum	Cation - Anion Balance
			°C	mm/Hg	%	mg/L	uS/cm		mV	NTU	L	uS/cm	mg CaCO3/L	units	mg/L	mg/L	mg CaCO3/L	mg CaCO3/L	as N mg/L	mg/L	mg/L	mg/L	as N mg/L	as N mg/L	as N mg/L	mg/L	mg/L	mg/L			
Minimum			2.7	709.8	70.5	7.3	5.4	5.78	-83.1	0.33		5	1	6.31	3	2.4	2	2	0.0113	0.05	0.2	0.02	0.02	0.015	0.001	0.002	0.003	0.3			
Maximum			13	729.1	73.0	9.9	7.2	8.47	-61.1	1.45		5	1	6.59	3	20.0	2	2	0.0263	0.05	0.5	0.02	0.0436	0.044	0.001	0.013	0.004	5.0			
Average			7.9	719.5	71.8	8.6	6.3	7.13	-72.1	0.89		5	1	6.45	3	11.2	2	2	0.0188	0.05	0.3	0.02	0.03	0.029	0.001	0.008	0.003	2.7			
4	13-Sep-17	L1991787-4	13	729.1	70.5	7.3	7.2	5.78	-61.1	0.33	7.5	4.6	*0.5*	6.59	*3*	*20*	2.2	2.3	0.0263	*0.05*	*0.5*	*0.02*	0.0436	0.0436	*0.001*	*0.002*	*0.004*	*0.3*			
4	16-Oct-17	L2009472-4	2.7	709.8	73	9.91	5.4	8.47	-83.1	1.45	39.6	5.1	1.23	6.31	*3*	2.4	2.3	1.9	0.0113	*0.05*	0.17	*0.02*	0.0153	0.0153	*0.001*	0.0131	0.0029	*5*	*0.1*	*0.1*	-3.2

Notes:
red italics = value reported as less than laboratory detection limit; detection limit shown

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 4
(Rain Water - Blank)

			Cyanides	Total Metals																														
Sample ID	**Sample Date**	**ALS**	**CN (WAD)**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**	**Sr**	**S**	**Tl**	**Sn**
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.005	0.0032	0.0001	0.00064	0.003	0.00002	0.00005	0.01	0.00001	0.1	0.0003	0.0001	0.0005	0.010	0.00226	0.001	0.1	0.00043	0.000005	0.00005	0.0005	0.05	0.1	0.00005	0.11	0.00001	0.1	0.0002	0.5	0.00001	0.00010
Maximum			0.005	0.0061	0.00011	0.00118	0.020	0.00002	0.00005	0.01	0.00001	0.5	0.0006	0.0001	0.0005	0.011	0.00389	0.001	0.1	0.00651	0.000005	0.00005	0.0005	0.05	0.3	0.00005	0.4	0.00001	0.912	0.0011	0.5	0.00001	0.00117
Average			0.005	0.0047	0.0001	0.00091	0.011	0.00002	0.00005	0.01	0.00001	0.3	0.0004	0.0001	0.0005	0.011	0.00308	0.001	0.1	0.00347	0.000005	0.00005	0.0005	0.05	0.2	0.00005	0.26	0.00001	0.5	0.0007	0.5	0.00001	0.00064
4	13-Sep-17	L1991787-4	*0.005*	0.0032	*0.0001*	0.00064	0.00304	*0.00002*	*0.00005*	*0.01*	*0.000005*	*0.05*	0.00025	*0.0001*	*0.0005*	*0.01*	0.00226	*0.001*	*0.1*	0.00043	*0.000005*	*0.00005*	*0.0005*		*0.1*	*0.00005*	0.4	*0.00001*	0.912	*0.0002*		*0.00001*	*0.0001*
4	16-Oct-17	L2009472-4	*0.005*	0.0061	0.00011	0.00118	0.0197	*0.00002*	*0.00005*	*0.01*	0.0000135	0.477	0.00062	*0.0001*	*0.0005*	0.011	0.00389	*0.001*	*0.1*	0.00651	*0.000005*	*0.00005*	*0.0005*	*0.05*	0.3	*0.00005*	0.11	*0.00001*	0.114	0.00111	*0.5*	*0.00001*	0.00117

Notes:
red italics = value reported as less than laboratory detec

Project: Palmer Project
Client: Constantine Metal Resources Ltd.

Barrel ID: ABA Barrel 4
(Rain Water - Blank)

			Dissolved Metals																															
Sample ID	**Sample Date**	**ALS**	**Ti**	**U**	**V**	**Zn**	**Zr**	**Al**	**Sb**	**As**	**Ba**	**Be**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Fe**	**Pb**	**Li**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**	**P**	**K**	**Se**	**Si**	**Ag**	**Na**
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.0003	0.00001	0.0005	0.005	0.0003	0.001	0.0001	0.0006	0.003	0.00002	0.00005	0.01	0.00001	0.1	0.0002	0.0001	0.0002	0.010	0.00108	0.001	0.1	0.00044	0.000005	0.00005	0.0005	0.05	0.1	0.00005	0.10	0.00001	0.114
Maximum			0.0003	0.00001	0.0005	0.005	0.0003	0.007	0.00018	0.0012	0.020	0.00002	0.00005	0.01	0.00001	0.5	0.0006	0.0001	0.0006	0.016	0.00545	0.001	0.1	0.00645	0.000005	0.00005	0.0005	0.05	0.3	0.00005	0.36	0.00001	0.879
Average			0.0003	0.00001	0.0005	0.005	0.0003	0.004	0.0001	0.0009	0.012	0.00002	0.00005	0.01	0.00001	0.3	0.0004	0.0001	0.0004	0.013	0.00327	0.001	0.1	0.00345	0.000005	0.00005	0.0005	0.05	0.2	0.00005	0.23	0.00001	0.497
4	13-Sep-17	L1991787-4	*0.0003*	*0.00001*	*0.0005*	0.0047		*0.001*	*0.0001*	0.0006	0.00332	*0.00002*	*0.00005*	*0.01*	*0.000005*	*0.05*	0.00023	*0.0001*	*0.0002*	*0.01*	0.00108	*0.001*	*0.1*	0.00044	*0.000005*	*0.00005*	*0.0005*		*0.1*	*0.00005*	0.357	*0.00001*	0.879
4	16-Oct-17	L2009472-4	*0.0003*	*0.00001*	*0.0005*	0.0049	*0.0003*	0.0065	0.00018	0.0012	0.0202	*0.00002*	*0.00005*	*0.01*	0.0000137	0.491	0.00063	*0.0001*	0.0006	0.016	0.00545	*0.001*	*0.1*	0.00645	*0.000005*	*0.00005*	*0.0005*	*0.05*	0.32	*0.00005*	0.098	*0.00001*	0.114

Notes:
red italics = value reported as less than laboratory detec

Project: **Palmer Project**
Client: **Constantine Metal Resources Ltd.**

Barrel ID: **ABA Barrel 4**
(Rain Water - Blank)

Sample ID	Sample Date	ALS	Sr	S	Tl	Sn	Ti	U	V	Zn	Zr
		Sample ID	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum			0.0002	0.5	0.00001	0.00018	0.0003	0.00001	0.0005	0.0017	0.0003
Maximum			0.0011	0.5	0.00001	0.00157	0.0003	0.00001	0.0005	0.0061	0.0003
Average			0.0007	0.5	0.00001	0.00088	0.0003	0.00001	0.0005	0.0039	0.0003
4	13-Sep-17	L1991787-4	*0.0002*		*0.00001*	0.00018	*0.0003*	*0.00001*	*0.0005*	0.0017	
4	16-Oct-17	L2009472-4	0.00114	*0.5*	*0.00001*	0.00157	*0.0003*	*0.00001*	*0.0005*	0.0061	*0.0003*

Notes:
red italics = value reported as less than laboratory detec

APPENDIX I: HUMIDITY CELL LEACHATE RESULTS

HC ABA Barrel_1
Sample = Jasper Mountain Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL Input	Volume mL Output	Cond. umhos/cm	pH	Turbidity NTU	Concentrations Acidity mgCaCO3/L	Alkalinity mgCaCO3/L	NH3-Total mg/L	Br mg/L	Cl mg/L	F mg/L	NO3 (as N) mg/L	NO2 (as N) mg/L	P-Total mg/L	SO4 mg/L	CN (WAD) mg/L	Dissolved Metals: Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L
0	24-Nov-17	750	550	521	8.06	0.1	1	38.6	0.0483	0.05	13.5	0.169	0.0711	0.0456	0.002	177	0.005	0.21	0.00077	0.0001	0.028	0.0001	0.0005	0.026	0.00001	47.6	0.0005
1	1-Dec-17	500	500	332	8.10	0.1	1	46.0	0.005	0.05	4.7	0.158	0.005	0.001	0.002	105	0.005	0.26	0.00077	0.0001	0.0164	0.0001	0.0005	0.023	0.00001	27.8	0.0005
2	8-Dec-17	500	450	220	8.19	0.12	1	55.6	0.005	0.05	1.24	0.141	0.005	0.001	0.002	46.3	0.005	0.304	0.00068	0.0001	0.0105	0.0001	0.0005	0.017	0.00001	17.6	0.0005
3	15-Dec-17	500	475	183	8.20	0.15	1	63.7	0.005	0.05	0.5	0.126	0.005	0.001	0.002	26.1	0.005	0.293	0.0007	0.0001	0.0116	0.0001	0.0005	0.015	0.00001	15.9	0.0005
4	22-Dec-17	500	475	146	8.24	0.1	1	57.2	0.005	0.05	0.5	0.095	0.005	0.001	0.002	15.6	0.005	0.322	0.00064	0.0001	0.0101	0.0001	0.0005	0.011	0.00001	13.8	0.0005
5	29-Dec-17	500	530	135	8.41	0.2	1	57.1	0.005	0.05	0.5	0.085	0.005	0.001	0.0025	10.8	0.005	0.328	0.00053	0.0001	0.0105	0.0001	0.0005	0.01	0.00001	13.5	0.0005
6	5-Jan-18	500	530	125	8.29	0.2	1	58.3	0.005	0.05	0.5	0.074	0.005	0.002	0.002	8.03	0.005	0.326	0.00049	0.0001	0.0104	0.0001	0.0005	0.01	0.00001	12.9	0.0005
7	12-Jan-18	500	380	130	8.26	0	1	62.3	0.0	0.05	0.5	0.07	0.0078	0.001	0.002	6.46	0.005	0.359	0.00048	0.0001	0.0111	0.0001	0.0005	0.01	0.00001	14	0.0005
8	19-Jan-18	500	400	125	8.19	0	1	59.8	0.0	0.05	0.5	0.051	0.0063	0.0037	0.002	6.04	0.005	0.318	0.00045	0.0001	0.0106	0.0001	0.0005	0.01	0.00001	13.9	0.0005
9	26-Jan-18	500	500	121	8.13	0	2.8	53.4	0.0	0.05	0.5	0.046	0.005	0.001	0.002	8.84	0.005	0.328	0.00056	0.0001	0.0114	0.0001	0.0005	0.01	0.00001	13.5	0.0005
10	2-Feb-18	500	510	121	8.08	0	1.1	48.2	0.0	0.05	0.9	0.045	0.005	0.001	0.002	8.54	0.005	0.313	0.00045	0.00013	0.0107	0.0001	0.0005	0.01	0.00001	13.5	0.0005
11	9-Feb-18	500	430	122	8.05	0	1	55.8	0.0	0.05	0.98	0.044	0.005	0.001	0.002	6.3	0.005	0.32	0.00042	0.0001	0.0116	0.0001	0.0005	0.01	0.00001	14.9	0.0005
12	16-Feb-18	500	500	111	8.20	0	1	51.1	0.0	0.05	0.88	0.035	0.005	0.0011	0.002	4.89	0.005	0.323	0.00034	0.00011	0.0104	0.0001	0.0005	0.01	0.00001	12.6	0.0005
13	23-Feb-18	500	450	108	8.29	1	1	50.5	0.0	0.05	0.82	0.032	0.005	0.002	0.0025	3.95	0.005	0.348	0.00038	0.00017	0.0101	0.0001	0.0005	0.01	0.00001	14	0.0005
14	2-Mar-18	500	520	109	8.14	0	1	45.9	0.0	0.05	0.73	0.027	0.0051	0.0026	0.002	3.24	0.005	0.336	0.00031	0.00021	0.00996	0.0001	0.0005	0.01	0.00001	12.9	0.0005
15	9-Mar-18	500	450	109	8.07	0	1.5	55.1	0.0	0.05	0.84	0.025	0.005	0.001	0.002	3.06	0.005	0.323	0.00029	0.00026	0.0102	0.0001	0.0005	0.01	0.00001	14.3	0.0005

HC ABA Barrel_1
Sample = Jasper Mountain Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	24-Nov-17	750	550	0.0001	0.0005	0.03	0.00005	0.001	9.78	0.0202	0.000005	0.00528	0.0005	0.3	24.7	0.00047	1.24	0.00001	21.6	0.506	62.8	0.000024	0.0001	0.01	0.00006	0.0017	0.003
1	1-Dec-17	500	500	0.0001	0.0005	0.03	0.00005	0.001	9.23	0.0183	0.000005	0.0145	0.0005	0.3	15.6	0.00054	1.48	0.00001	13.7	0.295	34.9	0.000016	0.0001	0.01	0.000046	0.0031	0.003
2	8-Dec-17	500	450	0.0001	0.0005	0.03	0.00005	0.001	6.24	0.0212	0.000005	0.00712	0.0005	0.3	10.7	0.00047	1.47	0.00001	7.28	0.174	16	0.00001	0.0001	0.01	0.00002	0.0039	0.003
3	15-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	6.39	0.0238	0.000005	0.00426	0.0005	0.3	9.53	0.00046	1.51	0.00001	5.27	0.163	9.02	0.00001	0.0001	0.01	0.000014	0.0043	0.003
4	22-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	4.73	0.0203	0.000005	0.00248	0.0005	0.3	7.4	0.00047	1.48	0.00001	3.28	0.123	5.5	0.00001	0.00026	0.01	0.00001	0.005	0.003
5	29-Dec-17	500	530	0.0001	0.0005	0.03	0.00005	0.001	4.86	0.0106	0.000005	0.00152	0.0005	0.3	7.38	0.00046	1.48	0.00001	2.59	0.112	3.79	0.00001	0.0001	0.01	0.00001	0.0053	0.003
6	5-Jan-18	500	530	0.0001	0.0005	0.03	0.00005	0.001	4.4	0.0111	0.000005	0.00103	0.0005	0.3	6.8	0.00041	1.42	0.00001	2.05	0.108	2.48	0.00001	0.0001	0.01	0.00001	0.0053	0.003
7	12-Jan-18	500	380	0.0001	0.0005	0.03	0.00005	0.001	4.41	0.0252	0.000005	0.000929	0.0005	0.3	6.58	0.00037	1.58	0.00001	1.8	0.108	1.95	0.00001	0.0001	0.01	0.000011	0.0059	0.003
8	19-Jan-18	500	400	0.0001	0.0005	0.03	0.00005	0.001	4.14	0.0212	0.000005	0.000849	0.0005	0.3	6.71	0.00039	1.49	0.00001	1.63	0.105	1.86	0.00001	0.0001	0.01	0.000016	0.0057	0.003
9	26-Jan-18	500	500	0.0001	0.0005	0.03	0.00005	0.001	4.22	0.0129	0.000005	0.000772	0.0005	0.3	6	0.00042	1.55	0.00001	1.52	0.106	2.89	0.00001	0.0001	0.01	0.000027	0.0064	0.003
10	2-Feb-18	500	510	0.0001	0.0005	0.03	0.00005	0.001	3.83	0.0143	0.000005	0.000635	0.0005	0.3	5.6	0.00041	1.35	0.00001	1.3	0.101	2.55	0.00001	0.0001	0.01	0.000025	0.0065	0.003
11	9-Feb-18	500	430	0.0001	0.0005	0.03	0.00005	0.001	3.45	0.0219	0.000005	0.000563	0.0005	0.3	5.75	0.00034	1.53	0.00001	1.15	0.1	1.92	0.00001	0.0001	0.01	0.000024	0.007	0.003
12	16-Feb-18	500	500	0.0001	0.0005	0.03	0.00005	0.001	3.42	0.0131	0.000005	0.000398	0.0005	0.3	5.51	0.0003	1.44	0.00001	1.07	0.0873	1.69	0.00001	0.0001	0.01	0.000028	0.0072	0.003
13	23-Feb-18	500	450	0.0001	0.0005	0.03	0.00005	0.001	3.15	0.0156	0.000005	0.000396	0.0005	0.3	5.37	0.00024	1.63	0.00001	1.04	0.0919	1.29	0.00001	0.0001	0.01	0.000028	0.0075	0.003
14	2-Mar-18	500	520	0.0001	0.0005	0.03	0.00005	0.001	2.95	0.011	0.000005	0.000307	0.0005	0.3	5.1	0.00025	1.53	0.00001	0.846	0.0926	1.05	0.00001	0.0001	0.01	0.000025	0.0075	0.003
15	9-Mar-18	500	450	0.0001	0.0005	0.03	0.00005	0.001	2.99	0.0206	0.000005	0.000319	0.0005	0.3	5.16	0.00022	1.51	0.00001	0.812	0.0878	1	0.00001	0.0001	0.01	0.000025	0.0072	0.003

HC ABA Barrel_1
Sample = Jasper Mountain Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Loadings																						
		Input	Output	Acidity	Alkalinity	NH3	Br	Cl	F	NO3	NO2	P	SO4	CN (WAD)	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu
				mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	550	0.550	21.23	0.02657	0.0275	7.43	0.0930	0.03911	0.02508	0.0011	97.4	0.0028	0.116	0.000424	0.000055	0.0154	0.000055	0.00028	0.0143	0.0000055	26.2	0.00028	0.000055	0.00028
1	1-Dec-17	500	500	0.500	23.00	0.00250	0.0250	2.35	0.0790	0.00250	0.00050	0.0010	52.5	0.0025	0.130	0.000385	0.000050	0.0082	0.000050	0.00025	0.0115	0.0000050	13.9	0.00025	0.000050	0.00025
2	8-Dec-17	500	450	0.450	25.02	0.00225	0.0225	0.56	0.0635	0.00225	0.00045	0.0009	20.8	0.0023	0.137	0.000306	0.000045	0.0047	0.000045	0.00023	0.0077	0.0000045	7.9	0.00023	0.000045	0.00023
3	15-Dec-17	500	475	0.475	30.26	0.00238	0.0238	0.24	0.0599	0.00238	0.00048	0.0010	12.4	0.0024	0.139	0.000333	0.000048	0.0055	0.000048	0.00024	0.0071	0.0000048	7.6	0.00024	0.000048	0.00024
4	22-Dec-17	500	475	0.475	27.17	0.00238	0.0238	0.24	0.0451	0.00238	0.00048	0.0010	7.4	0.0024	0.153	0.000304	0.000048	0.0048	0.000048	0.00024	0.0052	0.0000048	6.6	0.00024	0.000048	0.00024
5	29-Dec-17	500	530	0.530	30.26	0.00265	0.0265	0.27	0.0451	0.00265	0.00053	0.0013	5.7	0.0027	0.174	0.000281	0.000053	0.0056	0.000053	0.00027	0.0053	0.0000053	7.2	0.00027	0.000053	0.00027
6	5-Jan-18	500	530	0.530	30.90	0.00265	0.0265	0.27	0.0392	0.00265	0.00106	0.0011	4.3	0.0027	0.173	0.000260	0.000053	0.0055	0.000053	0.00027	0.0053	0.0000053	6.8	0.00027	0.000053	0.00027
7	12-Jan-18	500	380	0.380	23.67	0.00190	0.0190	0.19	0.0266	0.00296	0.00038	0.0008	2.5	0.0019	0.136	0.000182	0.000038	0.0042	0.000038	0.00019	0.0038	0.0000038	5.3	0.00019	0.000038	0.00019
8	19-Jan-18	500	400	0.400	23.92	0.00264	0.0200	0.20	0.0204	0.00252	0.00148	0.0008	2.4	0.0020	0.127	0.000180	0.000040	0.0042	0.000040	0.00020	0.0040	0.0000040	5.6	0.00020	0.000040	0.00020
9	26-Jan-18	500	500	1.400	26.70	0.00250	0.0250	0.25	0.0230	0.00250	0.00050	0.0010	4.4	0.0025	0.164	0.000280	0.000050	0.0057	0.000050	0.00025	0.0050	0.0000050	6.8	0.00025	0.000050	0.00025
10	2-Feb-18	500	510	0.561	24.58	0.00255	0.0255	0.46	0.0230	0.00255	0.00051	0.0010	4.4	0.0026	0.160	0.000230	0.000066	0.0055	0.000051	0.00026	0.0051	0.0000051	6.9	0.00026	0.000051	0.00026
11	9-Feb-18	500	430	0.430	23.99	0.00215	0.0215	0.42	0.0189	0.00215	0.00043	0.0009	2.7	0.0022	0.138	0.000181	0.000043	0.0050	0.000043	0.00022	0.0043	0.0000043	6.4	0.00022	0.000043	0.00022
12	16-Feb-18	500	500	0.500	25.55	0.00250	0.0250	0.44	0.0175	0.00250	0.00055	0.0010	2.4	0.0025	0.162	0.000170	0.000055	0.0052	0.000050	0.00025	0.0050	0.0000050	6.3	0.00025	0.000050	0.00025
13	23-Feb-18	500	450	0.450	22.73	0.00225	0.0225	0.37	0.0144	0.00225	0.00090	0.0011	1.8	0.0023	0.157	0.000171	0.000077	0.0045	0.000045	0.00023	0.0045	0.0000045	6.3	0.00023	0.000045	0.00023
14	2-Mar-18	500	520	0.520	23.87	0.00390	0.0260	0.38	0.0140	0.00265	0.00135	0.0010	1.7	0.0026	0.175	0.000161	0.000109	0.0052	0.000052	0.00026	0.0052	0.0000052	6.7	0.00026	0.000052	0.00026
15	9-Mar-18	500	450	0.675	24.80	0.00225	0.0225	0.38	0.0113	0.00225	0.00045	0.0009	1.4	0.0023	0.145	0.000131	0.000117	0.0046	0.000045	0.00023	0.0045	0.0000045	6.4	0.00023	0.000045	0.00023

HC ABA Barrel_1
Sample = Jasper Mountain Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	550	0.0165	0.000028	0.00055	5.38	0.0111	0.0000028	0.00290	0.00028	0.165	13.59	0.00026	0.68	0.0000055	11.88	0.278	34.54	0.0000132	0.000055	0.0055	0.000033	0.00094	0.00165
1	1-Dec-17	500	500	0.0150	0.000025	0.00050	4.62	0.0092	0.0000025	0.00725	0.00025	0.150	7.80	0.00027	0.74	0.0000050	6.85	0.148	17.45	0.0000080	0.000050	0.0050	0.000023	0.00155	0.00150
2	8-Dec-17	500	450	0.0135	0.000023	0.00045	2.81	0.0095	0.0000023	0.00320	0.00023	0.135	4.82	0.00021	0.66	0.0000045	3.28	0.078	7.20	0.0000045	0.000045	0.0045	0.000009	0.00176	0.00135
3	15-Dec-17	500	475	0.0143	0.000024	0.00048	3.04	0.0113	0.0000024	0.00202	0.00024	0.143	4.53	0.00022	0.72	0.0000048	2.50	0.077	4.28	0.0000048	0.000048	0.0048	0.000007	0.00204	0.00143
4	22-Dec-17	500	475	0.0143	0.000024	0.00048	2.25	0.0096	0.0000024	0.00118	0.00024	0.143	3.52	0.00022	0.70	0.0000048	1.56	0.058	2.61	0.0000048	0.000124	0.0048	0.000005	0.00238	0.00143
5	29-Dec-17	500	530	0.0159	0.000027	0.00053	2.58	0.0056	0.0000027	0.00081	0.00027	0.159	3.91	0.00024	0.78	0.0000053	1.37	0.059	2.01	0.0000053	0.000053	0.0053	0.000005	0.00281	0.00159
6	5-Jan-18	500	530	0.0159	0.000027	0.00053	2.33	0.0059	0.0000027	0.00055	0.00027	0.159	3.60	0.00022	0.75	0.0000053	1.09	0.057	1.31	0.0000053	0.000053	0.0053	0.000005	0.00281	0.00159
7	12-Jan-18	500	380	0.0114	0.000019	0.00038	1.68	0.0096	0.0000019	0.00035	0.00019	0.114	2.50	0.00014	0.60	0.0000038	0.68	0.041	0.74	0.0000038	0.000038	0.0038	0.000004	0.00224	0.00114
8	19-Jan-18	500	400	0.0120	0.000020	0.00040	1.66	0.0085	0.0000020	0.00034	0.00020	0.120	2.68	0.00016	0.60	0.0000040	0.65	0.042	0.74	0.0000040	0.000040	0.0040	0.000006	0.00228	0.00120
9	26-Jan-18	500	500	0.0150	0.000025	0.00050	2.11	0.0065	0.0000025	0.00039	0.00025	0.150	3.00	0.00021	0.78	0.0000050	0.76	0.053	1.45	0.0000050	0.000050	0.0050	0.000014	0.00320	0.00150
10	2-Feb-18	500	510	0.0153	0.000026	0.00051	1.95	0.0073	0.0000026	0.00032	0.00026	0.153	2.86	0.00021	0.69	0.0000051	0.66	0.052	1.30	0.0000051	0.000051	0.0051	0.000013	0.00332	0.00153
11	9-Feb-18	500	430	0.0129	0.000022	0.00043	1.48	0.0094	0.0000022	0.00024	0.00022	0.129	2.47	0.00015	0.66	0.0000043	0.49	0.043	0.83	0.0000043	0.000043	0.0043	0.000010	0.00301	0.00129
12	16-Feb-18	500	500	0.0150	0.000025	0.00050	1.71	0.0066	0.0000025	0.00020	0.00025	0.150	2.76	0.00015	0.72	0.0000050	0.54	0.044	0.85	0.0000050	0.000050	0.0050	0.000014	0.00360	0.00150
13	23-Feb-18	500	450	0.0135	0.000023	0.00045	1.42	0.0070	0.0000023	0.00018	0.00023	0.135	2.42	0.00011	0.73	0.0000045	0.47	0.041	0.58	0.0000045	0.000045	0.0045	0.000013	0.00338	0.00135
14	2-Mar-18	500	520	0.0156	0.000026	0.00052	1.53	0.0057	0.0000026	0.00016	0.00026	0.156	2.65	0.00013	0.80	0.0000052	0.44	0.048	0.55	0.0000052	0.000052	0.0052	0.000013	0.00390	0.00156
15	9-Mar-18	500	450	0.0135	0.000023	0.00045	1.35	0.0093	0.0000023	0.00014	0.00023	0.135	2.32	0.00010	0.68	0.0000045	0.37	0.040	0.45	0.0000045	0.000045	0.0045	0.000011	0.00324	0.00135

HC ABA Barrel_2
Sample = Limey Argillite & Limey Dikes
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL Input	Volume mL Output	Cond. umhos/cm	pH	Turbidity NTU	Concentrations Acidity mgCaCO3/L	Alkalinity mgCaCO3/L	NH3-Total mg/L	Br mg/L	Cl mg/L	F mg/L	NO3 (as N) mg/L	NO2 (as N) mg/L	P-Total mg/L	SO4 mg/L	CN (WAD) mg/L	Dissolved Metals: Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L
0	24-Nov-17	750	550	279	8.35	0.1	1	66.2	0.461	0.05	1.18	0.138	0.0819	0.0215	0.002	60.9	0.005	0.139	0.00115	0.0007	0.0145	0.0001	0.0005	0.025	0.00001	15.8	0.0005
1	1-Dec-17	500	475	361	8.35	0.1	1	107	0.223	0.05	0.56	0.137	0.0481	0.0202	0.002	83	0.005	0.112	0.00153	0.00058	0.0244	0.0001	0.0005	0.045	0.00001	22.8	0.0005
2	8-Dec-17	500	475	361	8.19	0.1	1.2	99.6	0.005	0.05	0.5	0.1	0.005	0.001	0.002	86.9	0.005	0.103	0.00117	0.00042	0.0226	0.0001	0.0005	0.036	0.00001	26	0.0005
3	15-Dec-17	500	475	303	8.29	0.1	1	95.9	0.0068	0.05	0.5	0.081	0.005	0.0017	0.002	61.1	0.005	0.121	0.0009	0.00035	0.0209	0.0001	0.0005	0.025	0.00001	23.3	0.0005
4	22-Dec-17	500	475	259	8.25	0.1	1	86.5	0.005	0.05	0.5	0.063	0.005	0.001	0.002	47.2	0.005	0.116	0.00087	0.00029	0.0176	0.0001	0.0005	0.018	0.00001	20.1	0.0005
5	29-Dec-17	500	560	275	8.32	0.1	1	95.1	0.005	0.05	0.5	0.055	0.005	0.001	0.002	44.8	0.005	0.109	0.00073	0.00031	0.021	0.0001	0.0005	0.015	0.00001	23.3	0.0005
6	5-Jan-18	500	375	222	8.31	0.1	1	82.1	0.005	0.05	0.5	0.049	0.005	0.001	0.002	36.4	0.005	0.113	0.00055	0.00033	0.0164	0.0001	0.0005	0.011	0.00001	19.8	0.0005
7	12-Jan-18	500	450	223	8.30	0.1	1	80.7	0.005	0.05	0.5	0.044	0.0068	0.0015	0.002	34.6	0.005	0.117	0.00052	0.00026	0.0172	0.0001	0.0005	0.01	0.00001	19.3	0.0005
8	19-Jan-18	500	475	226	8.26	0.1	1	83.8	0.0061	0.05	0.5	0.032	0.0058	0.001	0.002	36.5	0.005	0.101	0.00047	0.00025	0.0176	0.0001	0.0005	0.01	0.00001	21.3	0.0005
9	26-Jan-18	500	500	226	8.29	0.1	2.4	83.7	0.005	0.05	0.5	0.03	0.005	0.001	0.002	36.7	0.005	0.102	0.00046	0.00022	0.0187	0.0001	0.0005	0.01	0.00001	21.5	0.0005
10	2-Feb-18	500	490	225	8.28	0.1	1	80.8	0.005	0.05	0.5	0.028	0.005	0.001	0.002	35.6	0.005	0.092	0.00039	0.0002	0.0173	0.0001	0.0005	0.01	0.00001	20.3	0.0005
11	9-Feb-18	500	425	221	8.19	0.1	1	82.2	0.0056	0.05	0.5	0.028	0.005	0.0017	0.002	34	0.005	0.0874	0.00038	0.00016	0.0188	0.0001	0.0005	0.01	0.00001	21.4	0.0005
12	16-Feb-18	500	485	218	8.30	0.2	1	77.1	0.005	0.05	0.5	0.023	0.005	0.001	0.002	33.7	0.005	0.0782	0.0003	0.00015	0.0165	0.0001	0.0005	0.01	0.00001	21.2	0.0005
13	23-Feb-18	500	475	211	8.25	0.1	1	78.6	0.005	0.05	0.5	0.022	0.005	0.001	0.002	33.3	0.005	0.0817	0.00035	0.00014	0.0158	0.0001	0.0005	0.01	0.00001	20	0.0005
14	2-Mar-18	500	500	208	8.25	0.1	1	77.9	0.0067	0.05	0.5	0.02	0.005	0.001	0.002	29.4	0.005	0.0757	0.00029	0.00013	0.0151	0.0001	0.0005	0.01	0.00001	20.1	0.0005
15	9-Mar-18	500	475	212	8.20	0.1	1	82.1	0.005	0.05	0.5	0.02	0.005	0.001	0.002	32.3	0.005	0.0691	0.00028	0.00015	0.0153	0.0001	0.0005	0.01	0.00001	20.8	0.0005

HC ABA Barrel_2
Sample = Limey Argillite & Limey Dikes
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	24-Nov-17	750	550	0.0001	0.0005	0.03	0.00005	0.001	11.7	0.00813	0.000005	0.00951	0.0005	0.3	12.4	0.00957	1.13	0.00001	11.3	0.423	24.2	0.00001	0.0001	0.01	0.000447	0.001	0.003
1	1-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.0024	23.5	0.00924	0.000005	0.0111	0.00052	0.3	13.3	0.0178	1.8	0.00001	9.37	0.646	27.6	0.00001	0.0001	0.01	0.000869	0.001	0.003
2	8-Dec-17	500	475	0.00012	0.0005	0.03	0.00005	0.0024	24.2	0.0102	0.000005	0.0065	0.0005	0.3	9.22	0.0189	1.83	0.00001	4.18	0.626	30.8	0.00001	0.0001	0.01	0.00098	0.001	0.003
3	15-Dec-17	500	475	0.00011	0.0005	0.03	0.00005	0.0017	21.5	0.0106	0.000005	0.0051	0.0005	0.3	6.61	0.0146	1.6	0.00001	2.27	0.531	21.5	0.00001	0.0001	0.01	0.000776	0.001	0.003
4	22-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.002	17	0.0104	0.000005	0.00454	0.0005	0.3	5	0.0114	1.6	0.00001	1.35	0.441	16.9	0.00001	0.0001	0.01	0.000629	0.001	0.003
5	29-Dec-17	500	560	0.0001	0.0005	0.03	0.00005	0.0018	18.4	0.00948	0.000005	0.00424	0.0005	0.3	4.44	0.0097	1.56	0.00001	1.12	0.442	16.4	0.00001	0.0001	0.01	0.000689	0.001	0.003
6	5-Jan-18	500	375	0.0001	0.0005	0.03	0.00005	0.0013	13.6	0.0114	0.000005	0.00315	0.0005	0.3	3.2	0.00596	1.26	0.00001	0.618	0.347	11.6	0.00001	0.0001	0.01	0.000503	0.001	0.003
7	12-Jan-18	500	450	0.0001	0.0005	0.03	0.00005	0.0012	14.5	0.0111	0.000005	0.00298	0.0005	0.3	2.83	0.00555	1.34	0.00001	0.548	0.345	11.9	0.00001	0.0001	0.01	0.000439	0.001	0.003
8	19-Jan-18	500	475	0.0001	0.0005	0.03	0.00005	0.0013	14.6	0.0123	0.000005	0.00331	0.0005	0.3	2.83	0.00549	1.22	0.00001	0.53	0.346	12.5	0.00001	0.0001	0.01	0.000524	0.001	0.003
9	26-Jan-18	500	500	0.0001	0.0005	0.03	0.00005	0.0014	14.8	0.0121	0.000005	0.0033	0.0005	0.3	2.34	0.00545	1.22	0.00001	0.493	0.335	12.3	0.00001	0.0001	0.01	0.00055	0.001	0.003
10	2-Feb-18	500	490	0.0001	0.0005	0.03	0.00005	0.001	14.3	0.0136	0.000005	0.00294	0.0005	0.3	2.1	0.00458	0.991	0.00001	0.414	0.333	11.7	0.00001	0.0001	0.01	0.000444	0.001	0.003
11	9-Feb-18	500	425	0.0001	0.0005	0.03	0.00005	0.001	13.5	0.0124	0.000005	0.00289	0.0005	0.3	1.9	0.00427	1.07	0.00001	0.369	0.318	10.9	0.00001	0.0001	0.01	0.000418	0.001	0.003
12	16-Feb-18	500	485	0.0001	0.0005	0.03	0.00005	0.001	13.9	0.0124	0.000005	0.00262	0.0005	0.3	1.7	0.00409	0.994	0.00001	0.346	0.286	12	0.00001	0.0001	0.01	0.00044	0.001	0.003
13	23-Feb-18	500	475	0.0001	0.0005	0.03	0.00005	0.0015	14	0.0133	0.000005	0.00248	0.0005	0.3	1.7	0.00338	1.01	0.00001	0.322	0.303	10.9	0.00001	0.0001	0.01	0.0004	0.001	0.003
14	2-Mar-18	500	500	0.0001	0.0005	0.03	0.00005	0.0011	13	0.0107	0.000005	0.00238	0.0005	0.3	1.4	0.00289	0.941	0.00001	0.26	0.303	9.8	0.00001	0.0001	0.01	0.000329	0.001	0.003
15	9-Mar-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	15	0.0143	0.000005	0.00211	0.0005	0.3	1.35	0.0032	0.936	0.00001	0.266	0.273	10.7	0.00001	0.0001	0.01	0.000344	0.001	0.003

HC ABA Barrel_2
Sample = Limey Argillite & Limey Dikes
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Loadings																						
		Input	Output	Acidity	Alkalinity	NH3	Br	Cl	F	NO3	NO2	P	SO4	CN (WAD)	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu
				mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	550	0.55	36.41	0.2536	0.0275	0.649	0.076	0.04505	0.01183	0.0011	33.50	0.00275	0.0765	0.000633	0.00039	0.0080	0.000055	0.000275	0.0138	0.0000055	8.69	0.000275	0.000055	0.000275
1	1-Dec-17	500	475	0.48	50.83	0.1059	0.0238	0.266	0.065	0.02285	0.00960	0.0010	39.43	0.00238	0.0532	0.000727	0.00028	0.0116	0.000048	0.000238	0.0214	0.0000048	10.83	0.000238	0.000048	0.000238
2	8-Dec-17	500	475	0.57	47.31	0.0024	0.0238	0.238	0.048	0.00238	0.00048	0.0010	41.28	0.00238	0.0489	0.000556	0.00020	0.0107	0.000048	0.000238	0.0171	0.0000048	12.35	0.000238	0.000057	0.000238
3	15-Dec-17	500	475	0.48	45.55	0.0032	0.0238	0.238	0.038	0.00238	0.00081	0.0010	29.02	0.00238	0.0575	0.000428	0.00017	0.0099	0.000048	0.000238	0.0119	0.0000048	11.07	0.000238	0.000052	0.000238
4	22-Dec-17	500	475	0.48	41.09	0.0024	0.0238	0.238	0.030	0.00238	0.00048	0.0010	22.42	0.00238	0.0551	0.000413	0.00014	0.0084	0.000048	0.000238	0.0086	0.0000048	9.55	0.000238	0.000048	0.000238
5	29-Dec-17	500	560	0.56	53.26	0.0028	0.0280	0.280	0.031	0.00280	0.00056	0.0011	25.09	0.00280	0.0610	0.000409	0.00017	0.0118	0.000056	0.000280	0.0084	0.0000056	13.05	0.000280	0.000056	0.000280
6	5-Jan-18	500	375	0.38	30.79	0.0019	0.0188	0.188	0.018	0.00188	0.00038	0.0008	13.65	0.00188	0.0424	0.000206	0.00012	0.0062	0.000038	0.000188	0.0041	0.0000038	7.43	0.000188	0.000038	0.000188
7	12-Jan-18	500	450	0.45	36.32	0.0023	0.0225	0.225	0.020	0.00306	0.00068	0.0009	15.57	0.00225	0.0527	0.000234	0.00012	0.0077	0.000045	0.000225	0.0045	0.0000045	8.69	0.000225	0.000045	0.000225
8	19-Jan-18	500	475	0.48	39.81	0.0029	0.0238	0.238	0.015	0.00276	0.00048	0.0010	17.34	0.00238	0.0480	0.000223	0.00012	0.0084	0.000048	0.000238	0.0048	0.0000048	10.12	0.000238	0.000048	0.000238
9	26-Jan-18	500	500	1.20	41.85	0.0025	0.0250	0.250	0.015	0.00250	0.00050	0.0010	18.35	0.00250	0.0510	0.000230	0.00011	0.0094	0.000050	0.000250	0.0050	0.0000050	10.75	0.000250	0.000050	0.000250
10	2-Feb-18	500	490	0.49	39.59	0.0025	0.0245	0.245	0.014	0.00245	0.00049	0.0010	17.44	0.00245	0.0451	0.000191	0.00010	0.0085	0.000049	0.000245	0.0049	0.0000049	9.95	0.000245	0.000049	0.000245
11	9-Feb-18	500	425	0.43	34.94	0.0024	0.0213	0.213	0.012	0.00213	0.00072	0.0009	14.45	0.00213	0.0371	0.000162	0.00007	0.0080	0.000043	0.000213	0.0043	0.0000043	9.10	0.000213	0.000043	0.000213
12	16-Feb-18	500	485	0.49	37.39	0.0024	0.0243	0.243	0.011	0.00243	0.00049	0.0010	16.34	0.00243	0.0379	0.000146	0.00007	0.0080	0.000049	0.000243	0.0049	0.0000049	10.28	0.000243	0.000049	0.000243
13	23-Feb-18	500	475	0.48	37.34	0.0024	0.0238	0.238	0.010	0.00238	0.00048	0.0010	15.82	0.00238	0.0388	0.000166	0.00007	0.0075	0.000048	0.000238	0.0048	0.0000048	9.50	0.000238	0.000048	0.000238
14	2-Mar-18	500	500	0.50	38.95	0.0034	0.0250	0.250	0.010	0.00250	0.00050	0.0010	14.70	0.00250	0.0379	0.000145	0.00007	0.0076	0.000050	0.000250	0.0050	0.0000050	10.05	0.000250	0.000050	0.000250
15	9-Mar-18	500	475	0.48	39.00	0.0024	0.0238	0.238	0.010	0.00238	0.00048	0.0010	15.34	0.00238	0.0328	0.000133	0.00007	0.0073	0.000048	0.000238	0.0048	0.0000048	9.88	0.000238	0.000048	0.000238

HC ABA Barrel_2
Sample = Limey Argillite & Limey Dikes
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	550	0.0165	0.0000275	0.0006	6.44	0.00447	0.0000028	0.00523	0.00028	0.165	6.82	0.00526	0.622	0.0000055	6.22	0.233	13.31	0.0000055	0.000055	0.0055	0.00025	0.00055	0.00165
1	1-Dec-17	500	475	0.0143	0.0000238	0.0011	11.16	0.00439	0.0000024	0.00527	0.00025	0.143	6.32	0.00846	0.855	0.0000048	4.45	0.307	13.11	0.0000048	0.000048	0.0048	0.00041	0.00048	0.00143
2	8-Dec-17	500	475	0.0143	0.0000238	0.0011	11.50	0.00485	0.0000024	0.00309	0.00024	0.143	4.38	0.00898	0.869	0.0000048	1.99	0.297	14.63	0.0000048	0.000048	0.0048	0.00047	0.00048	0.00143
3	15-Dec-17	500	475	0.0143	0.0000238	0.0008	10.21	0.00504	0.0000024	0.00242	0.00024	0.143	3.14	0.00694	0.760	0.0000048	1.08	0.252	10.21	0.0000048	0.000048	0.0048	0.00037	0.00048	0.00143
4	22-Dec-17	500	475	0.0143	0.0000238	0.0010	8.08	0.00494	0.0000024	0.00216	0.00024	0.143	2.38	0.00542	0.760	0.0000048	0.64	0.209	8.03	0.0000048	0.000048	0.0048	0.00030	0.00048	0.00143
5	29-Dec-17	500	560	0.0168	0.0000280	0.0010	10.30	0.00531	0.0000028	0.00237	0.00028	0.168	2.49	0.00543	0.874	0.0000056	0.63	0.248	9.18	0.0000056	0.000056	0.0056	0.00039	0.00056	0.00168
6	5-Jan-18	500	375	0.0113	0.0000188	0.0005	5.10	0.00428	0.0000019	0.00118	0.00019	0.113	1.20	0.00224	0.473	0.0000038	0.23	0.130	4.35	0.0000038	0.000038	0.0038	0.00019	0.00038	0.00113
7	12-Jan-18	500	450	0.0135	0.0000225	0.0005	6.53	0.00500	0.0000023	0.00134	0.00023	0.135	1.27	0.00250	0.603	0.0000045	0.25	0.155	5.36	0.0000045	0.000045	0.0045	0.00020	0.00045	0.00135
8	19-Jan-18	500	475	0.0143	0.0000238	0.0006	6.94	0.00584	0.0000024	0.00157	0.00024	0.143	1.34	0.00261	0.580	0.0000048	0.25	0.164	5.94	0.0000048	0.000048	0.0048	0.00025	0.00048	0.00143
9	26-Jan-18	500	500	0.0150	0.0000250	0.0007	7.40	0.00605	0.0000025	0.00165	0.00025	0.150	1.17	0.00273	0.610	0.0000050	0.25	0.168	6.15	0.0000050	0.000050	0.0050	0.00028	0.00050	0.00150
10	2-Feb-18	500	490	0.0147	0.0000245	0.0005	7.01	0.00666	0.0000025	0.00144	0.00025	0.147	1.03	0.00224	0.486	0.0000049	0.20	0.163	5.73	0.0000049	0.000049	0.0049	0.00022	0.00049	0.00147
11	9-Feb-18	500	425	0.0128	0.0000213	0.0004	5.74	0.00527	0.0000021	0.00123	0.00021	0.128	0.81	0.00181	0.455	0.0000043	0.16	0.135	4.63	0.0000043	0.000043	0.0043	0.00018	0.00043	0.00128
12	16-Feb-18	500	485	0.0146	0.0000243	0.0005	6.74	0.00601	0.0000024	0.00127	0.00024	0.146	0.82	0.00198	0.482	0.0000049	0.17	0.139	5.82	0.0000049	0.000049	0.0049	0.00021	0.00049	0.00146
13	23-Feb-18	500	475	0.0143	0.0000238	0.0007	6.65	0.00632	0.0000024	0.00118	0.00024	0.143	0.81	0.00161	0.480	0.0000048	0.15	0.144	5.18	0.0000048	0.000048	0.0048	0.00019	0.00048	0.00143
14	2-Mar-18	500	500	0.0150	0.0000250	0.0006	6.50	0.00535	0.0000025	0.00119	0.00025	0.150	0.70	0.00145	0.471	0.0000050	0.13	0.152	4.90	0.0000050	0.000050	0.0050	0.00016	0.00050	0.00150
15	9-Mar-18	500	475	0.0143	0.0000238	0.0005	7.13	0.00679	0.0000024	0.00100	0.00024	0.143	0.64	0.00152	0.445	0.0000048	0.13	0.130	5.08	0.0000048	0.000048	0.0048	0.00016	0.00048	0.00143

HC ABA Barrel_3
Sample = HW Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL Input	Volume mL Output	Cond. umhos/cm	pH	Turbidity NTU	Concentrations Acidity mgCaCO3/L	Alkalinity mgCaCO3/L	NH3-Total mg/L	Br mg/L	Cl mg/L	F mg/L	NO3 (as N) mg/L	NO2 (as N) mg/L	P-Total mg/L	SO4 mg/L	CN (WAD) mg/L	Dissolved Metals: Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L
0	24-Nov-17	750	520	184	8.56	0.2	1	67.6	0.0196	0.05	2	0.136	0.0655	0.029	0.0064	17	0.005	0.29	0.0005	0.00011	0.0456	0.0001	0.0005	0.017	0.00001	5.66	0.0005
1	1-Dec-17	500	475	167	8.42	0.1	1	67.2	0.005	0.05	0.75	0.082	0.0057	0.001	0.002	14.7	0.005	0.231	0.00051	0.0001	0.0708	0.0001	0.0005	0.016	0.00001	7.91	0.0005
2	8-Dec-17	500	475	156	8.27	0.1	1	65.7	0.005	0.05	0.5	0.061	0.005	0.001	0.002	12.3	0.005	0.211	0.0004	0.0001	0.0798	0.0001	0.0005	0.013	0.00001	9.63	0.0005
3	15-Dec-17	500	475	150	8.24	0.1	1	63.2	0.005	0.05	0.5	0.055	0.005	0.0011	0.002	10.4	0.005	0.196	0.00034	0.0001	0.0981	0.0001	0.0005	0.01	0.00001	11.5	0.0005
4	22-Dec-17	500	475	136	8.29	0.1	1	59.7	0.005	0.05	0.5	0.037	0.005	0.001	0.002	8.27	0.005	0.199	0.0003	0.0001	0.102	0.0001	0.0005	0.01	0.00001	12.9	0.0005
5	29-Dec-17	500	550	132	8.38	0.2	1	58.8	0.005	0.05	0.5	0.032	0.005	0.001	0.002	7.13	0.005	0.182	0.0003	0.0001	0.12	0.0001	0.0005	0.01	0.00001	13.5	0.0005
6	5-Jan-18	500	475	124	8.30	0.2	1	58.1	0.005	0.05	0.5	0.029	0.005	0.001	0.002	6.4	0.005	0.188	0.00022	0.0001	0.119	0.0001	0.0005	0.01	0.00001	12.6	0.0005
7	12-Jan-18	500	380	134	8.25	0.2	1	60.7	0.005	0.05	0.5	0.031	0.0079	0.001	0.002	6.24	0.005	0.194	0.00023	0.0001	0.136	0.0001	0.0005	0.01	0.00001	14	0.0005
8	19-Jan-18	500	475	119	8.27	0.2	1	56.9	0.005	0.05	0.5	0.024	0.006	0.001	0.002	5.85	0.005	0.192	0.00021	0.0001	0.141	0.0001	0.0005	0.01	0.00001	13.6	0.0005
9	26-Jan-18	500	500	118	8.13	0.2	2.2	56.1	0.005	0.05	0.5	0.021	0.005	0.001	0.002	5.6	0.005	0.189	0.00021	0.0001	0.154	0.0001	0.0005	0.01	0.00001	13.6	0.0005
10	2-Feb-18	500	475	117	8.16	0.2	1	53.7	0.005	0.05	0.5	0.02	0.005	0.001	0.002	5.35	0.005	0.178	0.00018	0.0001	0.146	0.0001	0.0005	0.01	0.00001	13.1	0.0005
11	9-Feb-18	500	475	120	8.06	0.2	1.3	55.5	0.005	0.05	0.5	0.02	0.005	0.001	0.002	4.73	0.005	0.186	0.00017	0.0001	0.175	0.0001	0.0005	0.01	0.00001	14.8	0.0005
12	16-Feb-18	500	475	112	8.16	0.2	1	50.7	0.005	0.05	0.5	0.02	0.005	0.001	0.002	4.58	0.005	0.177	0.00013	0.0001	0.163	0.0001	0.0005	0.01	0.00001	13.2	0.0005
13	23-Feb-18	500	490	108	8.26	0.2	1.1	50.3	0.005	0.05	0.5	0.02	0.005	0.001	0.002	4.18	0.005	0.206	0.0002	0.00011	0.156	0.0001	0.0005	0.01	0.00001	13.7	0.0005
14	2-Mar-18	500	500	111	8.14	0.1	1	51.5	0.005	0.05	0.5	0.02	0.005	0.001	0.002	3.81	0.005	0.191	0.00013	0.00024	0.17	0.0001	0.0005	0.01	0.00001	13.9	0.0005
15	9-Mar-18	500	470	110	8.08	0.1	1	54.8	0.005	0.05	0.5	0.02	0.005	0.001	0.002	3.71	0.005	0.198	0.00014	0.0003	0.179	0.0001	0.0005	0.01	0.00001	14.5	0.0005

HC ABA Barrel_3
Sample = HW Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	24-Nov-17	750	520	0.0001	0.00075	0.03	0.00005	0.001	1.46	0.00404	0.000005	0.00445	0.0005	0.3	18.5	0.00106	1.9	0.00001	18.9	0.036	6.47	0.000015	0.0001	0.01	0.00001	0.0097	0.003
1	1-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.54	0.0052	0.000005	0.00501	0.0005	0.3	17.2	0.00105	2.01	0.00001	13.4	0.0585	4.68	0.000017	0.0001	0.01	0.000016	0.0074	0.003
2	8-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.97	0.00781	0.000005	0.00253	0.0005	0.3	14.7	0.00072	2.08	0.00001	8.68	0.0678	4.27	0.000011	0.0001	0.01	0.000022	0.0068	0.003
3	15-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	3.55	0.0125	0.000005	0.0015	0.0005	0.3	13.5	0.00068	2.1	0.00001	5.48	0.0774	3.65	0.000013	0.0001	0.01	0.000025	0.0066	0.003
4	22-Dec-17	500	475	0.0001	0.0005	0.03	0.00005	0.001	3.21	0.0135	0.000005	0.000802	0.0005	0.3	10.7	0.00059	2.12	0.00001	3.35	0.0793	2.81	0.00001	0.0001	0.01	0.00003	0.0069	0.003
5	29-Dec-17	500	550	0.0001	0.0005	0.03	0.00005	0.001	3.46	0.00839	0.000005	0.000528	0.0005	0.3	10.7	0.00057	2.12	0.00001	2.57	0.0828	2.5	0.00001	0.0001	0.01	0.000034	0.0063	0.003
6	5-Jan-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	3.32	0.00836	0.000005	0.000341	0.0005	0.3	9.74	0.00045	1.98	0.00001	2.11	0.0822	1.84	0.00001	0.0001	0.01	0.000037	0.0064	0.003
7	12-Jan-18	500	380	0.0001	0.0005	0.03	0.00005	0.001	3.04	0.0177	0.000005	0.00028	0.0005	0.3	9.92	0.00052	2.37	0.00001	1.71	0.0824	2.05	0.00001	0.0001	0.01	0.000037	0.0072	0.003
8	19-Jan-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.97	0.0117	0.000005	0.000275	0.0005	0.3	8.86	0.00051	2.17	0.00001	1.55	0.0864	2.05	0.000011	0.0001	0.01	0.000047	0.007	0.003
9	26-Jan-18	500	500	0.0001	0.0005	0.03	0.00005	0.001	2.89	0.00913	0.000005	0.000251	0.0005	0.3	8.23	0.00066	2.31	0.00001	1.48	0.0855	2	0.000011	0.0001	0.01	0.000056	0.0075	0.003
10	2-Feb-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.69	0.00824	0.000005	0.000326	0.0005	0.3	7.62	0.00064	1.99	0.00001	1.22	0.0847	1.55	0.00001	0.0001	0.01	0.000053	0.0069	0.003
11	9-Feb-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.5	0.0135	0.000005	0.00025	0.0005	0.3	7.77	0.00065	2.24	0.00001	1.07	0.0888	1.6	0.00001	0.0001	0.01	0.000055	0.0076	0.003
12	16-Feb-18	500	475	0.0001	0.0005	0.03	0.00005	0.001	2.56	0.00962	0.000005	0.000184	0.0005	0.3	7.42	0.00071	2.11	0.00001	1	0.0777	1.66	0.00001	0.0001	0.01	0.000056	0.0072	0.003
13	23-Feb-18	500	490	0.0001	0.0005	0.03	0.00005	0.001	2.37	0.0102	0.000005	0.000148	0.0005	0.3	7.66	0.0006	2.32	0.00001	0.96	0.0843	1.31	0.000012	0.0001	0.01	0.000056	0.0076	0.0037
14	2-Mar-18	500	500	0.0001	0.0005	0.03	0.00005	0.001	2.19	0.00791	0.000005	0.000097	0.0005	0.3	7.31	0.00057	2.11	0.00001	0.783	0.0838	1.2	0.00001	0.0001	0.01	0.000054	0.0071	0.003
15	9-Mar-18	500	470	0.0001	0.0005	0.03	0.00005	0.001	2.32	0.0147	0.000005	0.00012	0.0005	0.3	7.27	0.00052	2.13	0.00001	0.752	0.0817	1.2	0.000011	0.0001	0.01	0.000047	0.007	0.003

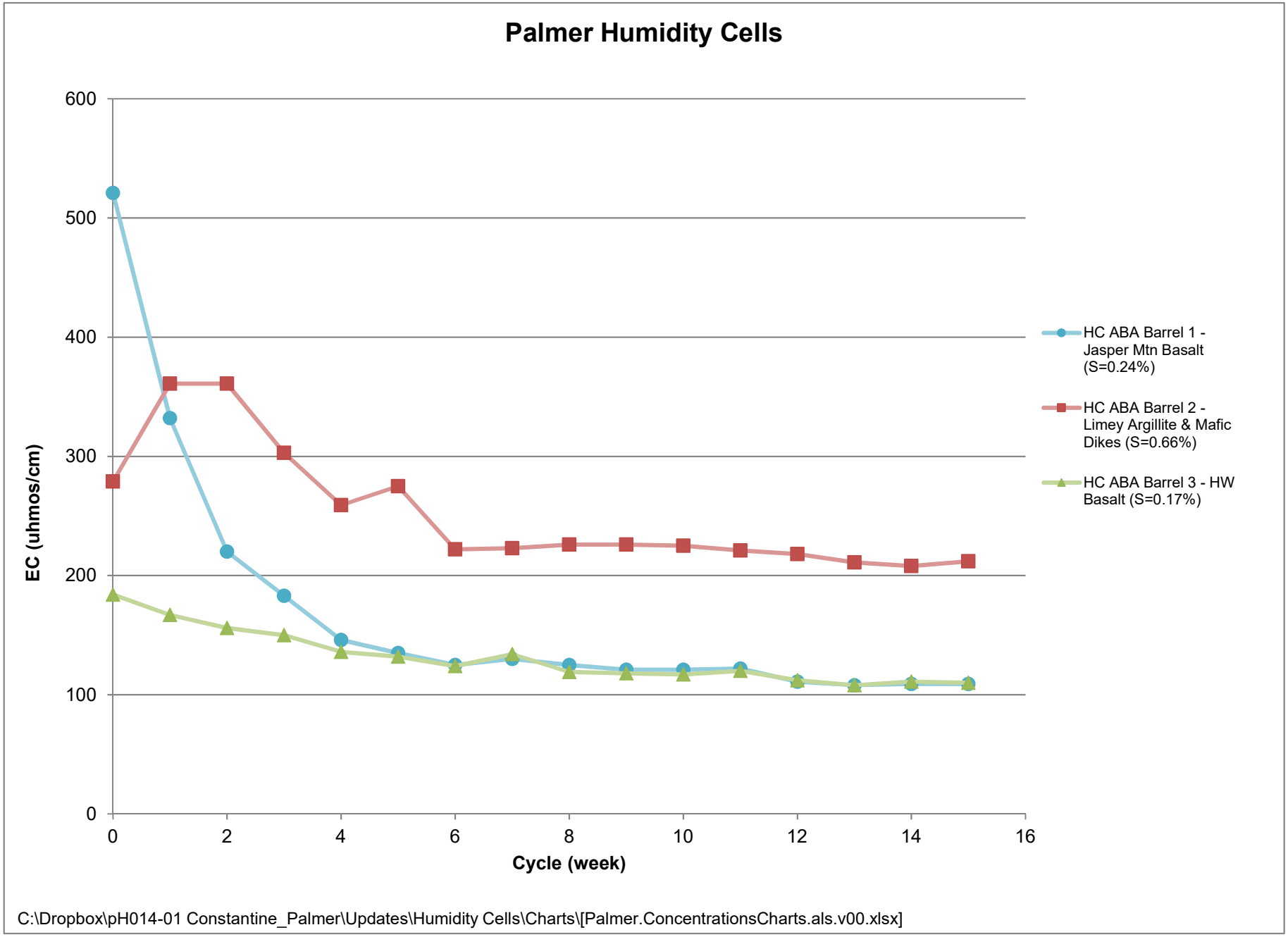
HC ABA Barrel_3
Sample = HW Basalt
Sample Wt. (kg) 1.00

Cycle	Date	Volume mL		Loadings																						
		Input	Output	Acidity	Alkalinity	NH3	Br	Cl	F	NO3	NO2	P	SO4	CN (WAD)	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu
				mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	520	0.52	35.15	0.0102	0.0260	1.04	0.0707	0.0341	0.01508	0.00333	8.84	0.0026	0.151	0.00026	5.72E-05	0.0237	0.000052	0.00026	0.0088	0.0000052	2.94	0.00026	0.000052	0.00039
1	1-Dec-17	500	475	0.48	31.92	0.0024	0.0238	0.36	0.0390	0.0027	0.00048	0.00095	6.98	0.0024	0.110	0.00024	4.75E-05	0.0336	0.000048	0.00024	0.0076	0.0000048	3.76	0.00024	0.000048	0.00024
2	8-Dec-17	500	475	0.48	31.21	0.0024	0.0238	0.24	0.0290	0.0024	0.00048	0.00095	5.84	0.0024	0.100	0.00019	4.75E-05	0.0379	0.000048	0.00024	0.0062	0.0000048	4.57	0.00024	0.000048	0.00024
3	15-Dec-17	500	475	0.48	30.02	0.0024	0.0238	0.24	0.0261	0.0024	0.00052	0.00095	4.94	0.0024	0.093	0.00016	4.75E-05	0.0466	0.000048	0.00024	0.0048	0.0000048	5.46	0.00024	0.000048	0.00024
4	22-Dec-17	500	475	0.48	28.36	0.0024	0.0238	0.24	0.0176	0.0024	0.00048	0.00095	3.93	0.0024	0.095	0.00014	4.75E-05	0.0485	0.000048	0.00024	0.0048	0.0000048	6.13	0.00024	0.000048	0.00024
5	29-Dec-17	500	550	0.55	32.34	0.0028	0.0275	0.28	0.0176	0.0028	0.00055	0.00110	3.92	0.0028	0.100	0.00017	0.000055	0.0660	0.000055	0.00028	0.0055	0.0000055	7.43	0.00028	0.000055	0.00028
6	5-Jan-18	500	475	0.48	27.60	0.0024	0.0238	0.24	0.0138	0.0024	0.00048	0.00095	3.04	0.0024	0.089	0.00010	4.75E-05	0.0565	0.000048	0.00024	0.0048	0.0000048	5.99	0.00024	0.000048	0.00024
7	12-Jan-18	500	380	0.38	23.07	0.0019	0.0190	0.19	0.0118	0.0030	0.00038	0.00076	2.37	0.0019	0.074	0.00009	0.000038	0.0517	0.000038	0.00019	0.0038	0.0000038	5.32	0.00019	0.000038	0.00019
8	19-Jan-18	500	475	0.48	27.03	0.0024	0.0238	0.24	0.0114	0.0029	0.00048	0.00095	2.78	0.0024	0.091	0.00010	4.75E-05	0.0670	0.000048	0.00024	0.0048	0.0000048	6.46	0.00024	0.000048	0.00024
9	26-Jan-18	500	500	1.10	28.05	0.0025	0.0250	0.25	0.0105	0.0025	0.00050	0.00100	2.80	0.0025	0.095	0.00011	0.00005	0.0770	0.000050	0.00025	0.0050	0.0000050	6.80	0.00025	0.000050	0.00025
10	2-Feb-18	500	475	0.48	25.51	0.0024	0.0238	0.24	0.0095	0.0024	0.00048	0.00095	2.54	0.0024	0.085	0.00009	4.75E-05	0.0694	0.000048	0.00024	0.0048	0.0000048	6.22	0.00024	0.000048	0.00024
11	9-Feb-18	500	475	0.62	26.36	0.0024	0.0238	0.24	0.0095	0.0024	0.00048	0.00095	2.25	0.0024	0.088	0.00008	4.75E-05	0.0831	0.000048	0.00024	0.0048	0.0000048	7.03	0.00024	0.000048	0.00024
12	16-Feb-18	500	475	0.48	24.08	0.0024	0.0238	0.24	0.0095	0.0024	0.00048	0.00095	2.18	0.0024	0.084	0.00006	4.75E-05	0.0774	0.000048	0.00024	0.0048	0.0000048	6.27	0.00024	0.000048	0.00024
13	23-Feb-18	500	490	0.54	24.65	0.0025	0.0245	0.25	0.0098	0.0025	0.00049	0.00098	2.05	0.0025	0.101	0.00010	5.39E-05	0.0764	0.000049	0.00025	0.0049	0.0000049	6.71	0.00025	0.000049	0.00025
14	2-Mar-18	500	500	0.50	25.75	0.0025	0.0250	0.25	0.0100	0.0025	0.00050	0.00100	1.91	0.0025	0.096	0.00007	0.00012	0.0850	0.000050	0.00025	0.0050	0.0000050	6.95	0.00025	0.000050	0.00025
15	9-Mar-18	500	470	0.47	25.76	0.0024	0.0235	0.24	0.0094	0.0024	0.00047	0.00094	1.74	0.0024	0.093	0.00007	0.000141	0.0841	0.000047	0.00024	0.0047	0.0000047	6.82	0.00024	0.000047	0.00024

HC ABA Barrel_3
Sample = HW Basalt
Sample Wt. (kg) 1.00

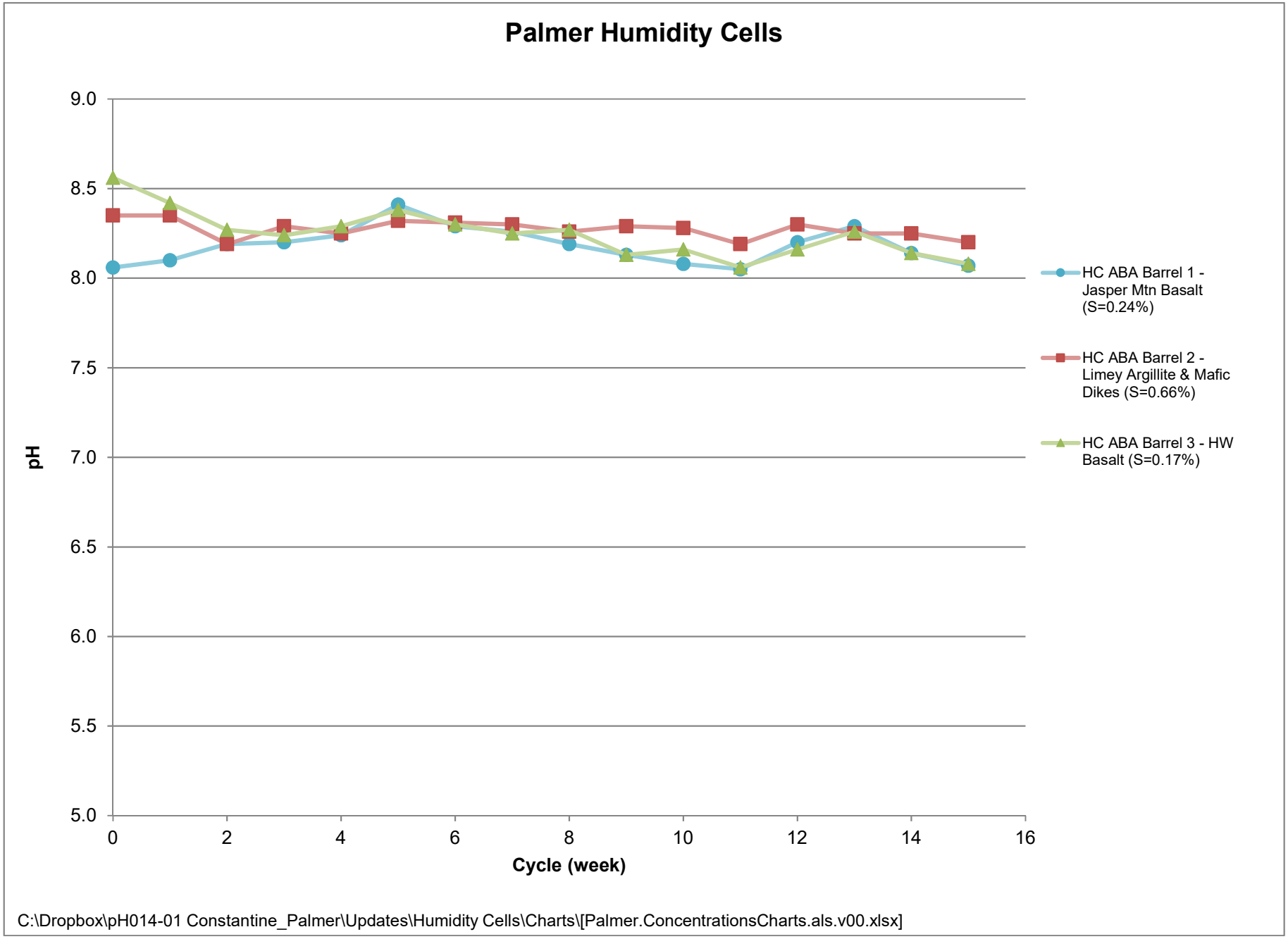
Cycle	Date	Volume mL		Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	S	Tl	Sn	Ti	U	V	Zn
		Input	Output	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk
0	24-Nov-17	750	520	0.0156	0.000026	0.00052	0.76	0.00210	0.0000026	0.00231	0.00026	0.156	9.62	0.000551	0.99	0.0000052	9.83	0.0187	3.36	0.0000078	0.000052	0.0052	0.0000052	0.0050	0.00156
1	1-Dec-17	500	475	0.0143	0.000024	0.00048	1.21	0.00247	0.0000024	0.00238	0.00024	0.143	8.17	0.000499	0.95	0.0000048	6.37	0.0278	2.22	0.0000081	0.000048	0.0048	0.0000076	0.0035	0.00143
2	8-Dec-17	500	475	0.0143	0.000024	0.00048	1.41	0.00371	0.0000024	0.00120	0.00024	0.143	6.98	0.000342	0.99	0.0000048	4.12	0.0322	2.03	0.0000052	0.000048	0.0048	0.0000105	0.0032	0.00143
3	15-Dec-17	500	475	0.0143	0.000024	0.00048	1.69	0.00594	0.0000024	0.00071	0.00024	0.143	6.41	0.000323	1.00	0.0000048	2.60	0.0368	1.73	0.0000062	0.000048	0.0048	0.0000119	0.0031	0.00143
4	22-Dec-17	500	475	0.0143	0.000024	0.00048	1.52	0.00641	0.0000024	0.00038	0.00024	0.143	5.08	0.000280	1.01	0.0000048	1.59	0.0377	1.33	0.0000048	0.000048	0.0048	0.0000143	0.0033	0.00143
5	29-Dec-17	500	550	0.0165	0.000028	0.00055	1.90	0.00461	0.0000028	0.00029	0.00028	0.165	5.89	0.000314	1.17	0.0000055	1.41	0.0455	1.38	0.0000055	0.000055	0.0055	0.0000187	0.0035	0.00165
6	5-Jan-18	500	475	0.0143	0.000024	0.00048	1.58	0.00397	0.0000024	0.00016	0.00024	0.143	4.63	0.000214	0.94	0.0000048	1.00	0.0390	0.87	0.0000048	0.000048	0.0048	0.0000176	0.0030	0.00143
7	12-Jan-18	500	380	0.0114	0.000019	0.00038	1.16	0.00673	0.0000019	0.00011	0.00019	0.114	3.77	0.000198	0.90	0.0000038	0.65	0.0313	0.78	0.0000038	0.000038	0.0038	0.0000141	0.0027	0.00114
8	19-Jan-18	500	475	0.0143	0.000024	0.00048	1.41	0.00556	0.0000024	0.00013	0.00024	0.143	4.21	0.000242	1.03	0.0000048	0.74	0.0410	0.97	0.0000052	0.000048	0.0048	0.0000223	0.0033	0.00143
9	26-Jan-18	500	500	0.0150	0.000025	0.00050	1.45	0.00457	0.0000025	0.00013	0.00025	0.150	4.12	0.000330	1.16	0.0000050	0.74	0.0428	1.00	0.0000055	0.000050	0.0050	0.0000280	0.0038	0.00150
10	2-Feb-18	500	475	0.0143	0.000024	0.00048	1.28	0.00391	0.0000024	0.00015	0.00024	0.143	3.62	0.000304	0.95	0.0000048	0.58	0.0402	0.74	0.0000048	0.000048	0.0048	0.0000252	0.0033	0.00143
11	9-Feb-18	500	475	0.0143	0.000024	0.00048	1.19	0.00641	0.0000024	0.00012	0.00024	0.143	3.69	0.000309	1.06	0.0000048	0.51	0.0422	0.76	0.0000048	0.000048	0.0048	0.0000261	0.0036	0.00143
12	16-Feb-18	500	475	0.0143	0.000024	0.00048	1.22	0.00457	0.0000024	0.00009	0.00024	0.143	3.52	0.000337	1.00	0.0000048	0.48	0.0369	0.79	0.0000048	0.000048	0.0048	0.0000266	0.0034	0.00143
13	23-Feb-18	500	490	0.0147	0.000025	0.00049	1.16	0.00500	0.0000025	0.00007	0.00025	0.147	3.75	0.000294	1.14	0.0000049	0.47	0.0413	0.64	0.0000059	0.000049	0.0049	0.0000274	0.0037	0.00181
14	2-Mar-18	500	500	0.0150	0.000025	0.00050	1.10	0.00396	0.0000025	0.00005	0.00025	0.150	3.66	0.000285	1.06	0.0000050	0.39	0.0419	0.60	0.0000050	0.000050	0.0050	0.0000270	0.0036	0.00150
15	9-Mar-18	500	470	0.0141	0.000024	0.00047	1.09	0.00691	0.0000024	0.00006	0.00024	0.141	3.42	0.000244	1.00	0.0000047	0.35	0.0384	0.56	0.0000052	0.000047	0.0047	0.0000221	0.0033	0.00141

APPENDIX J: HUMIDITY CELL TIME TREND GRAPHS



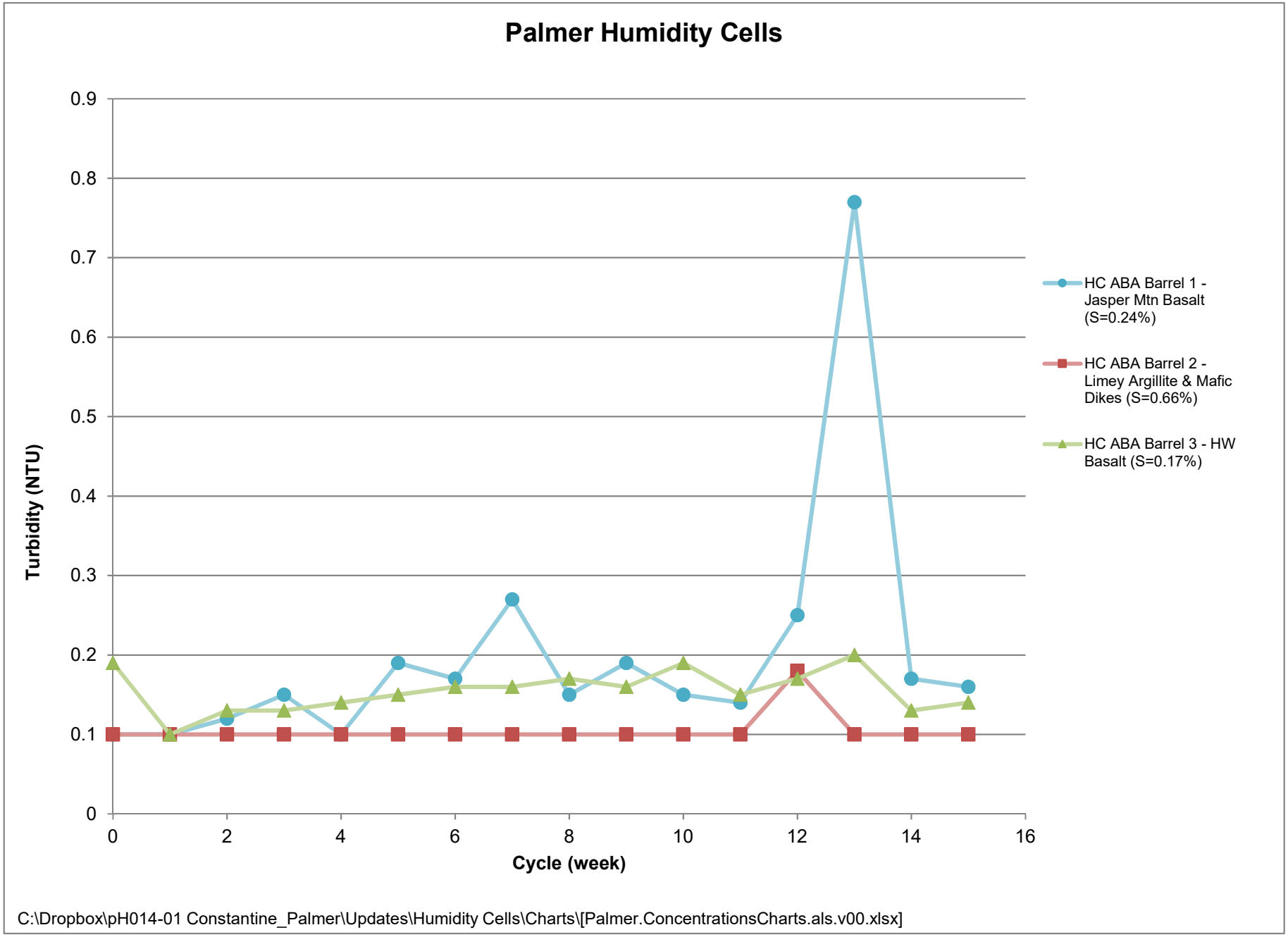
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



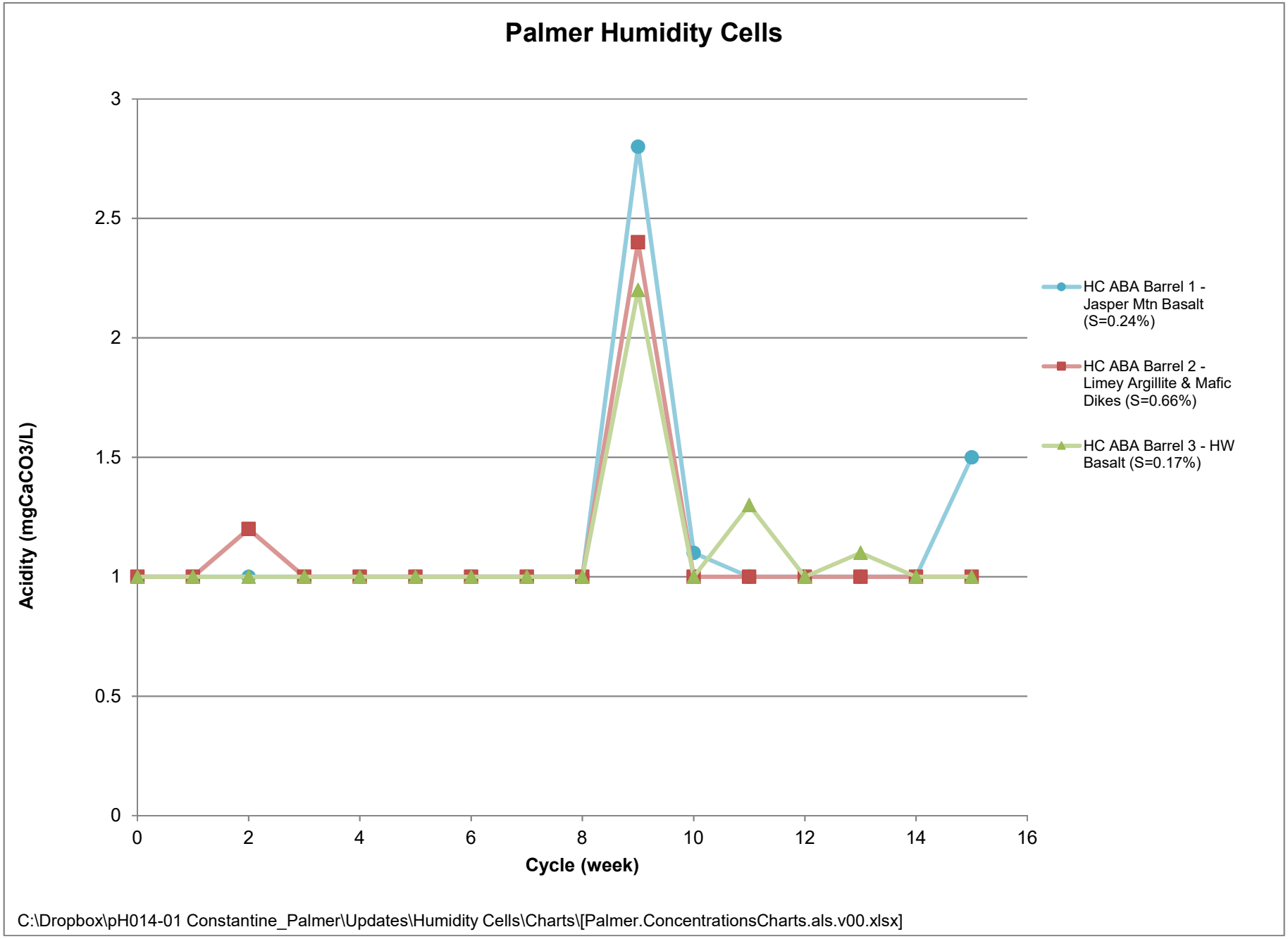
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



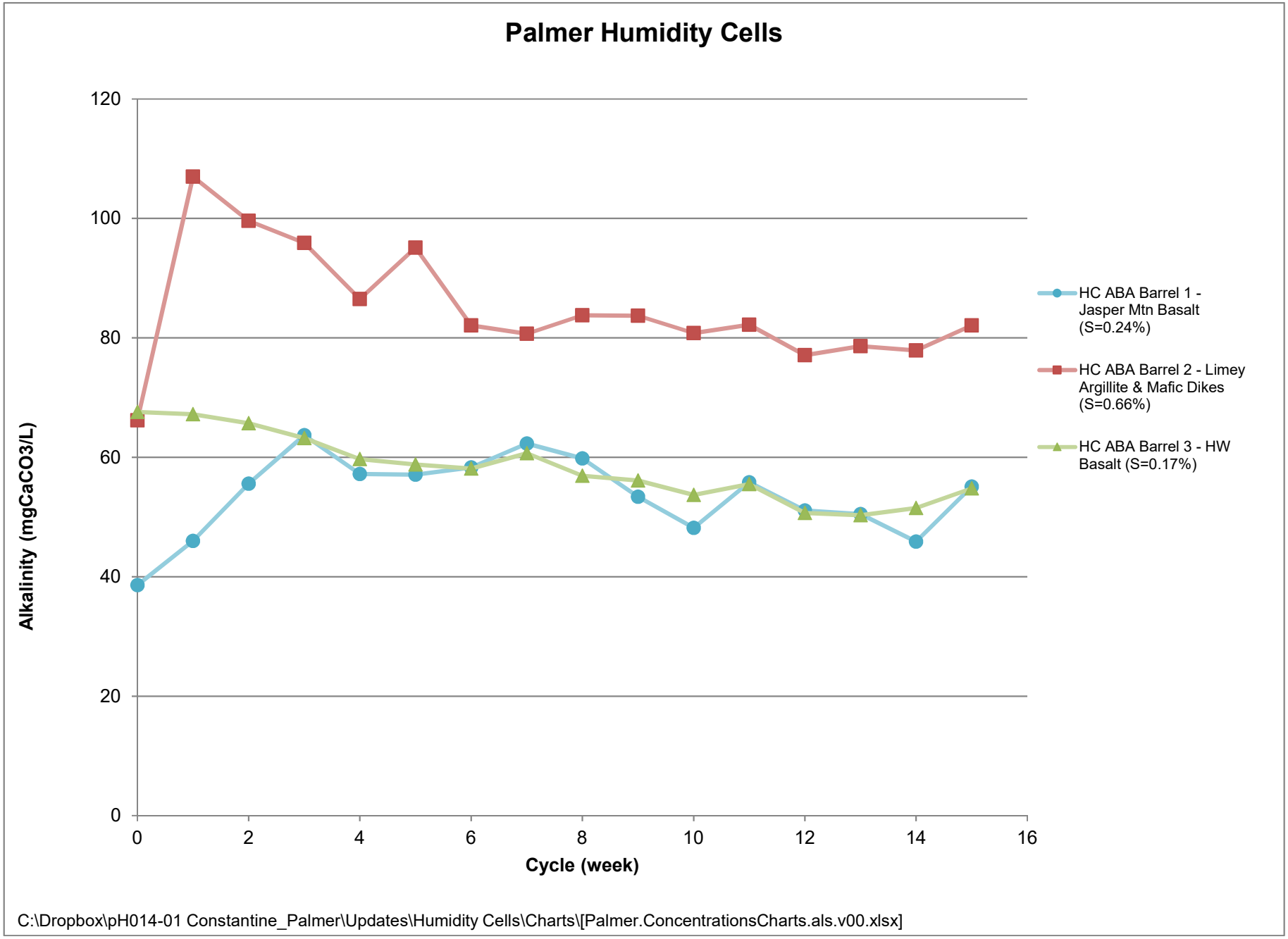
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



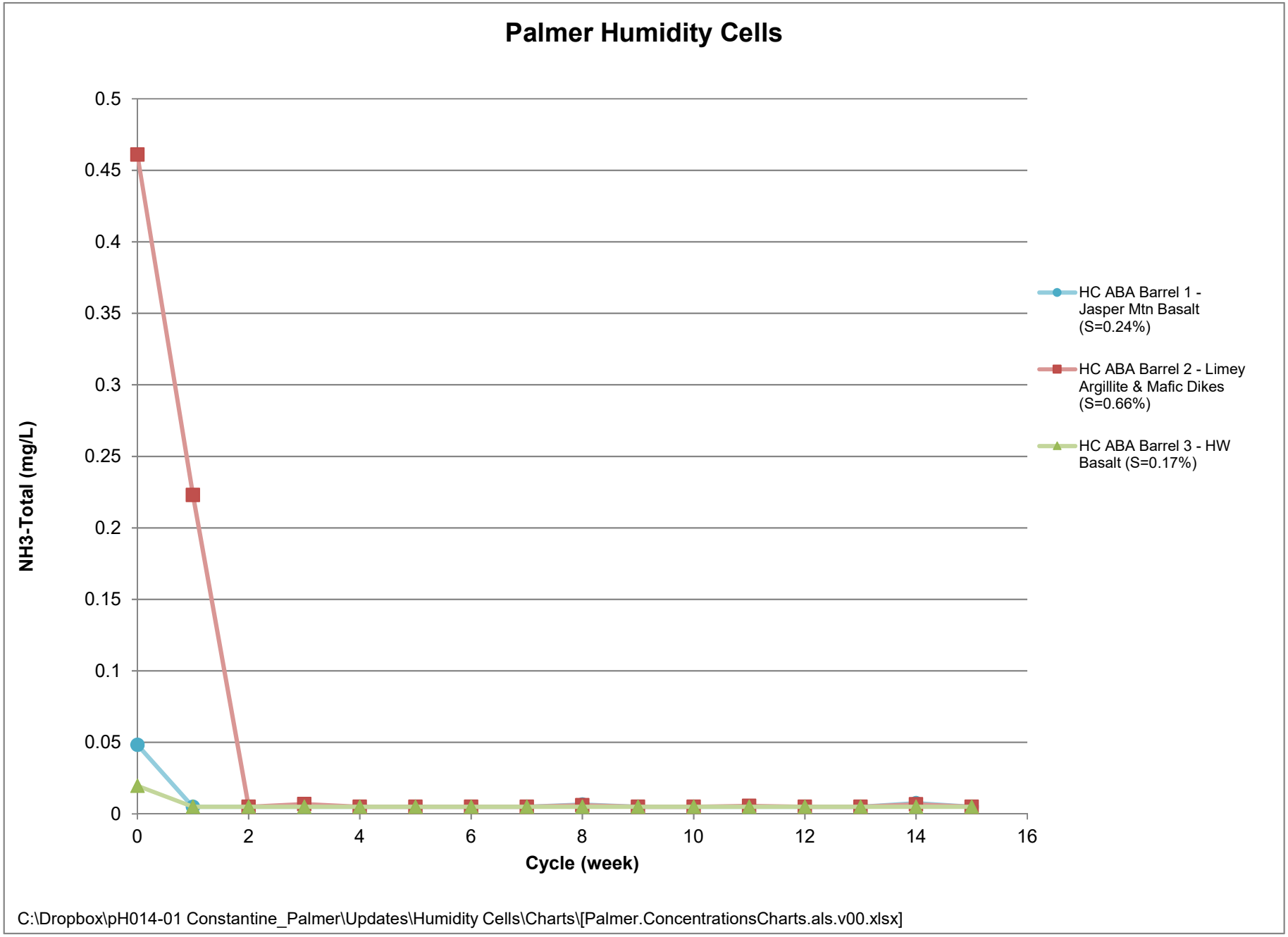
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



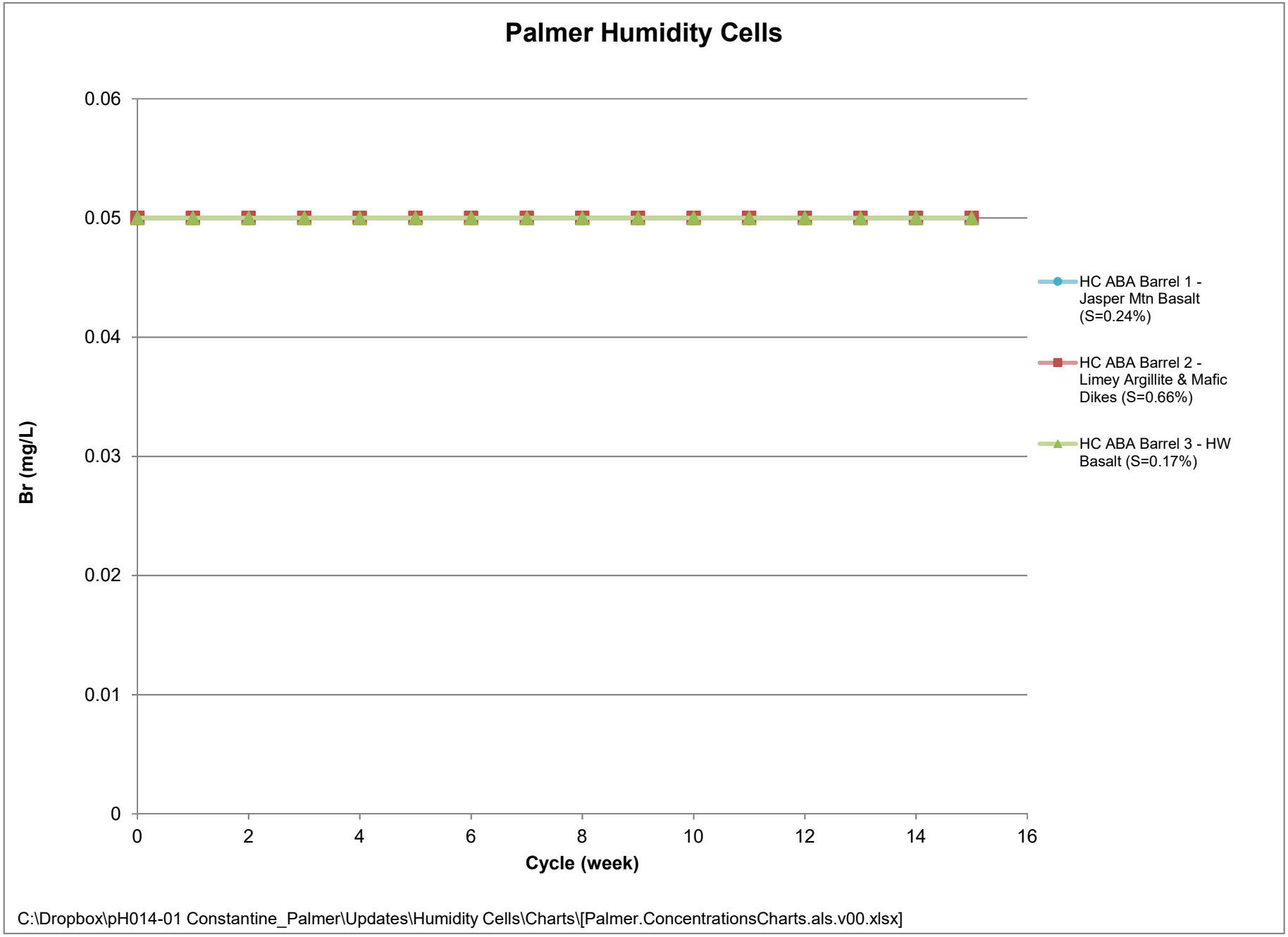
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



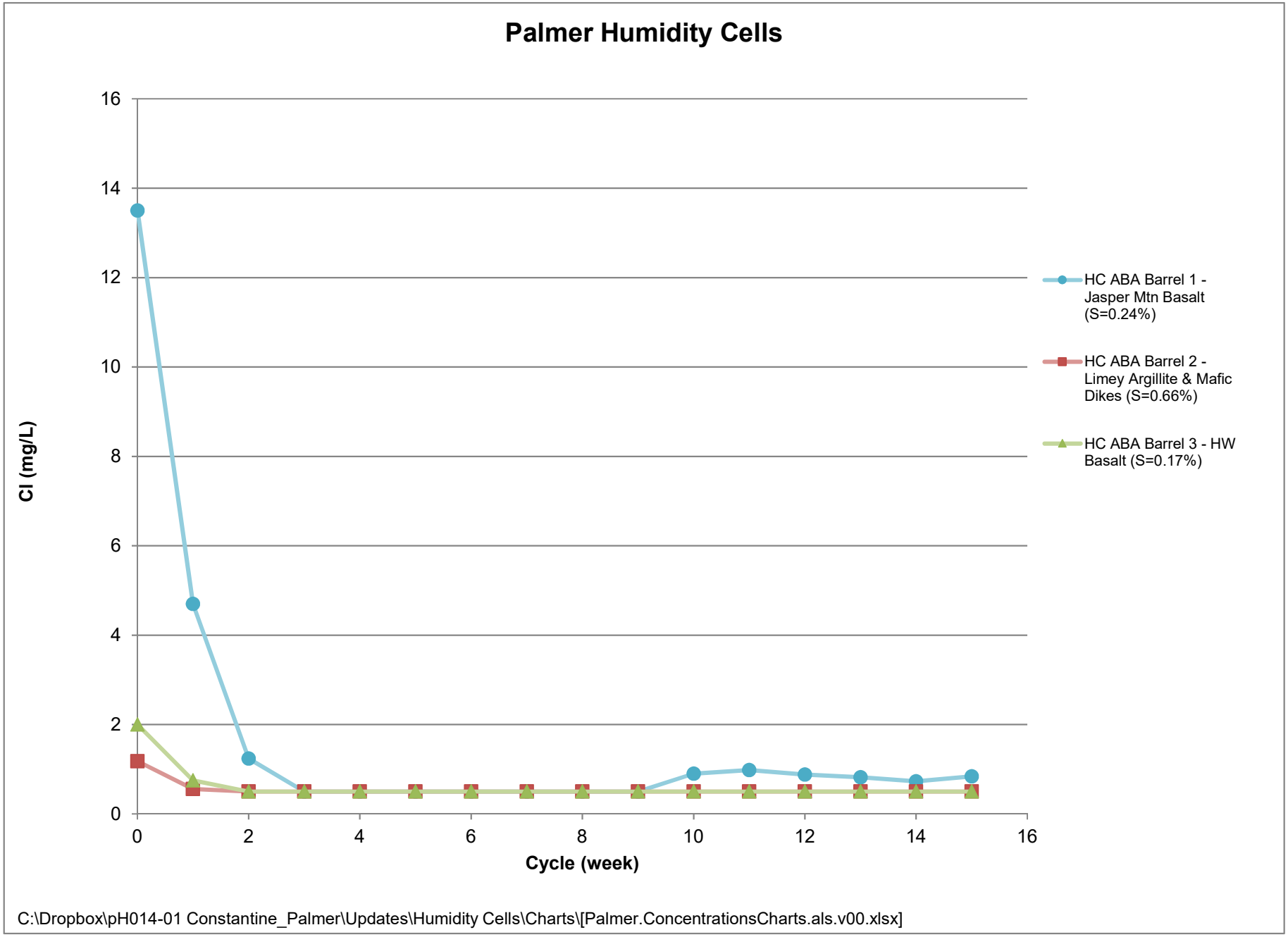
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



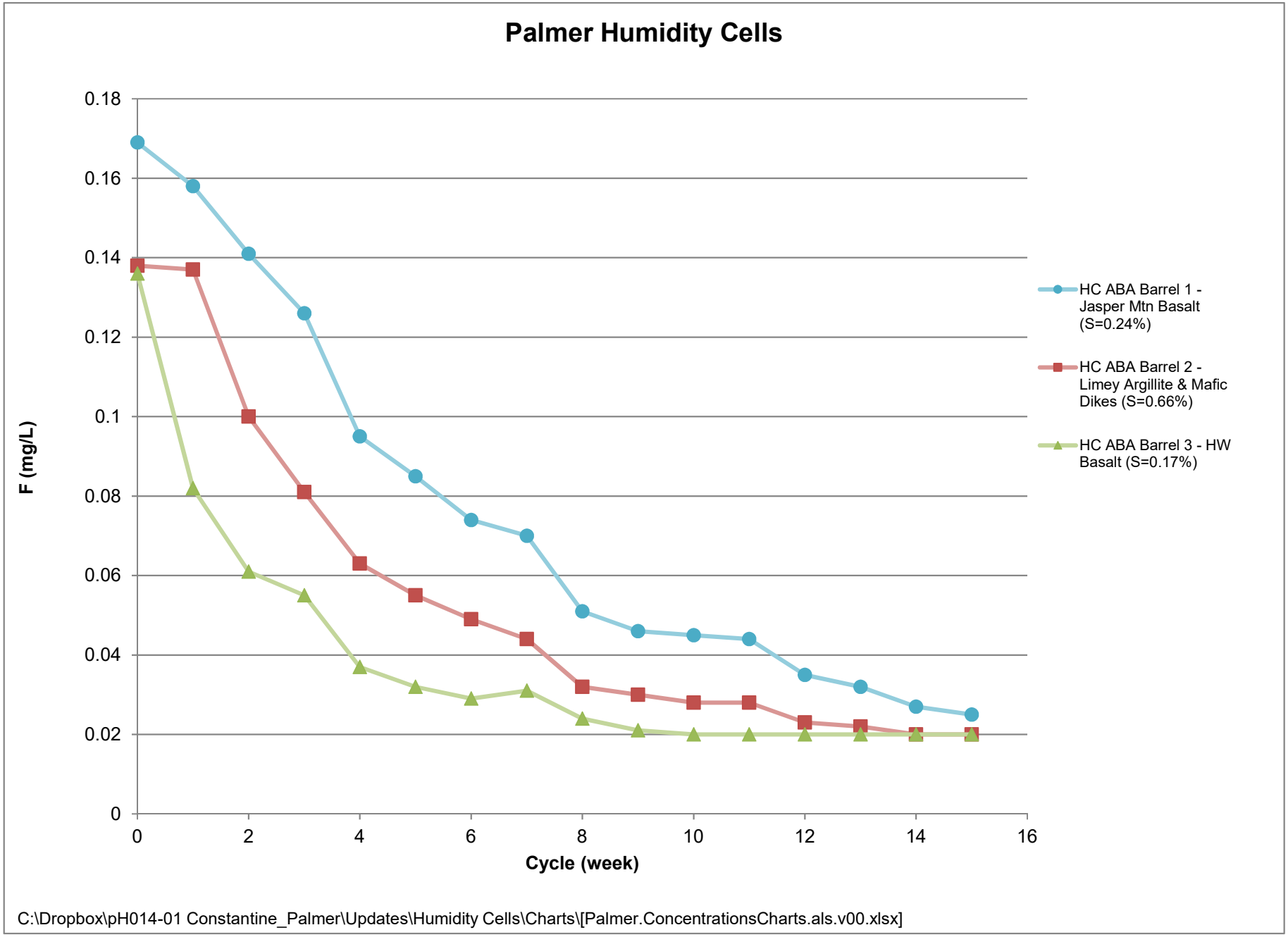
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



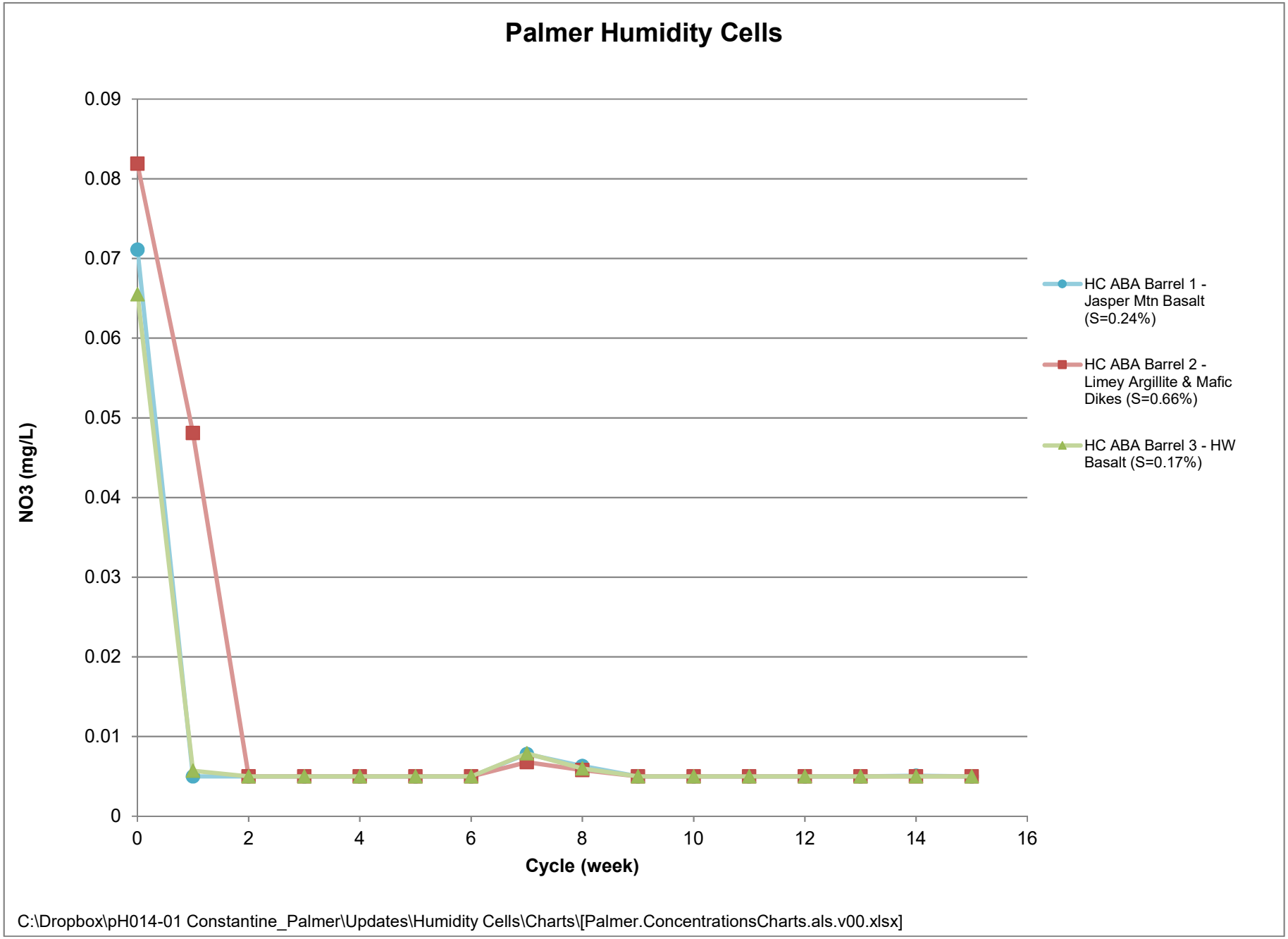
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



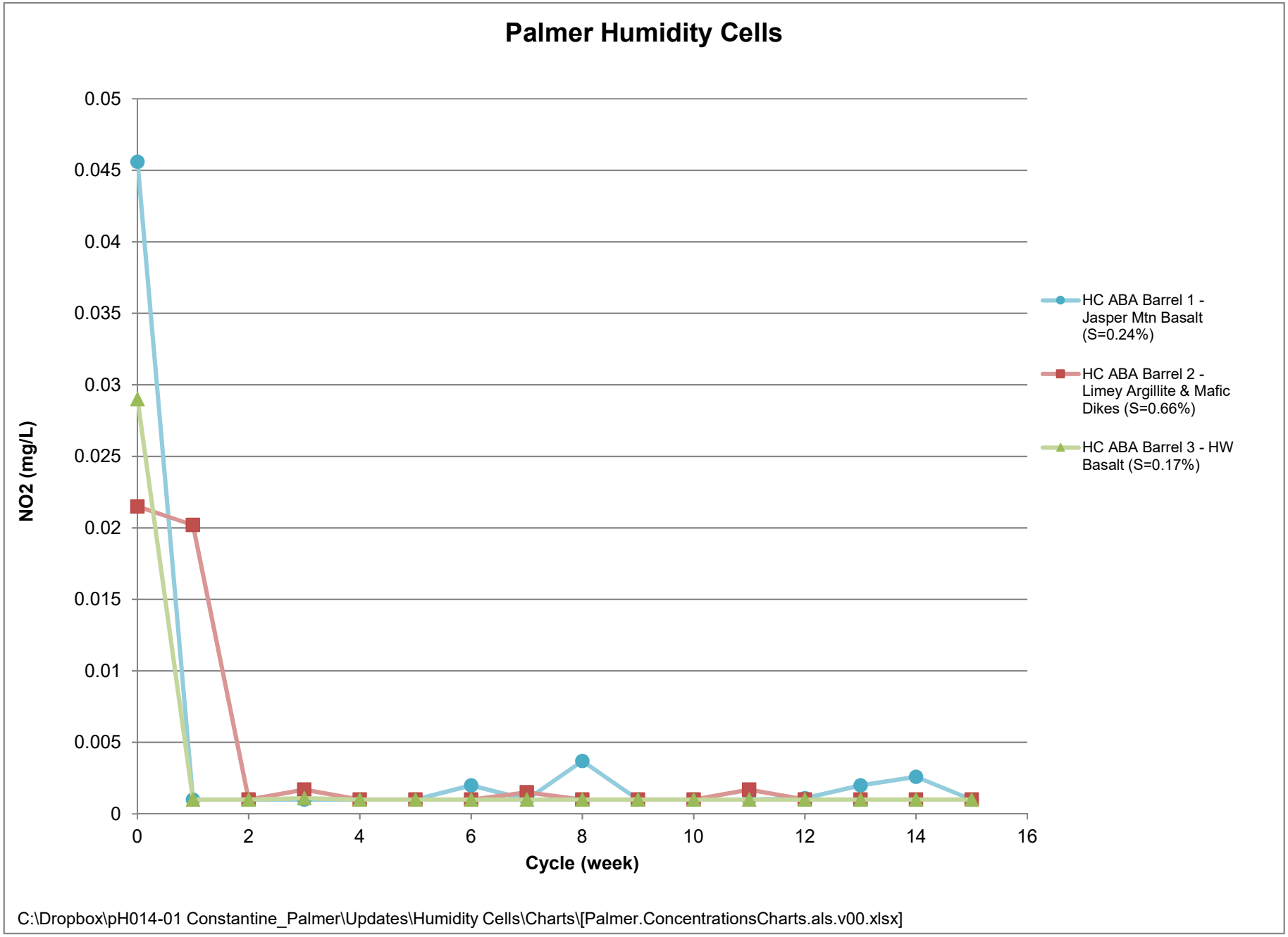
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



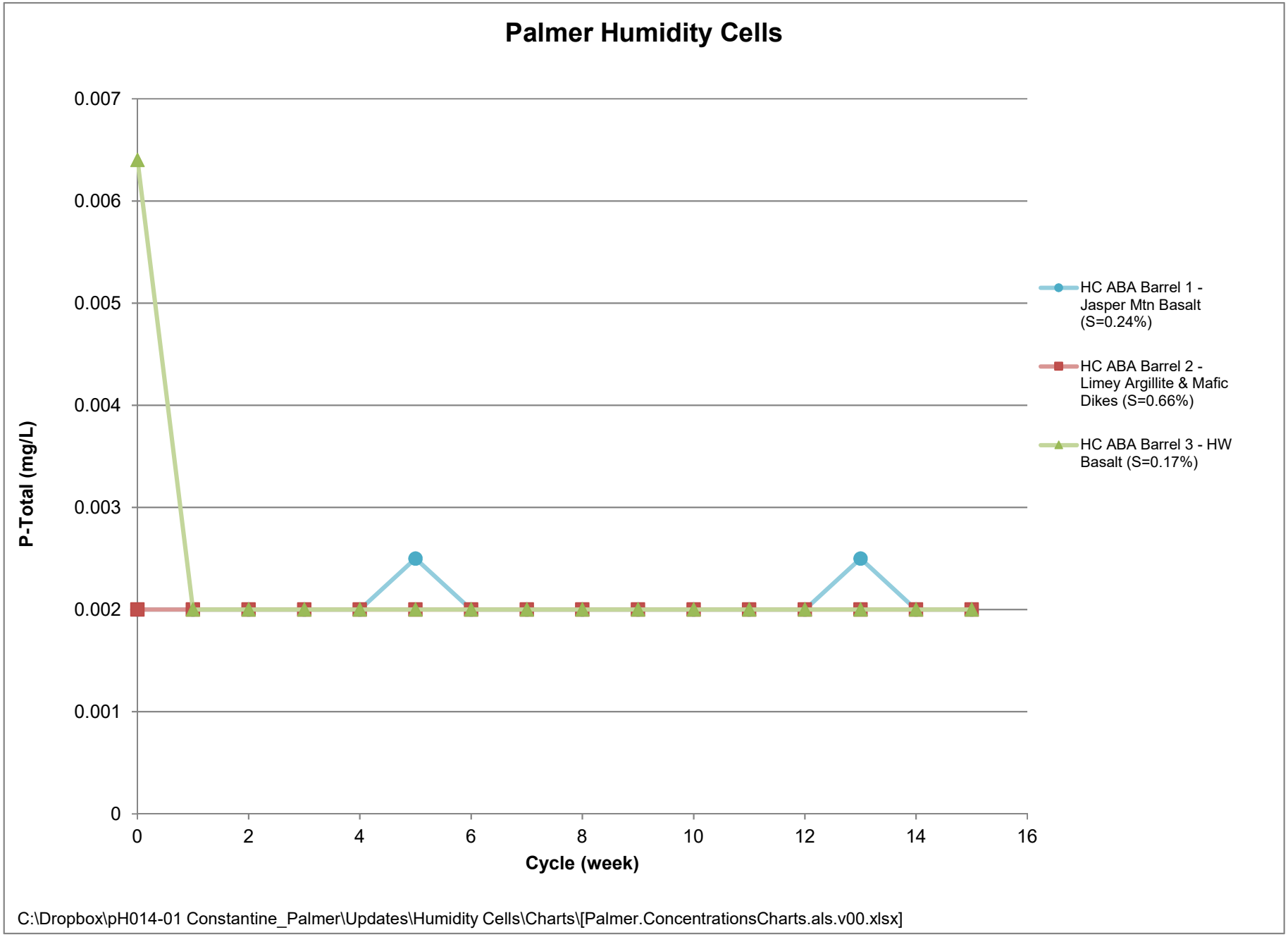
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



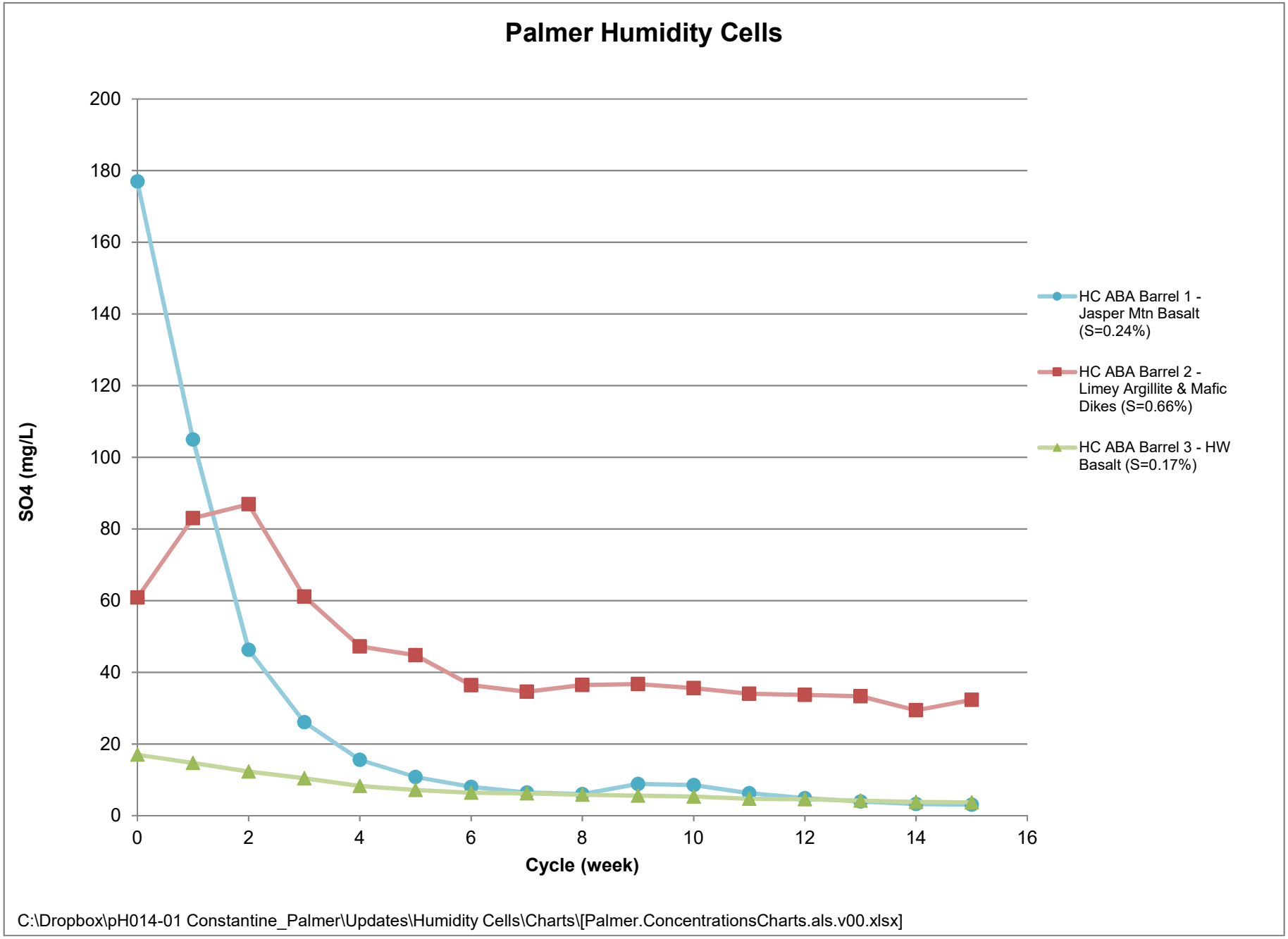
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



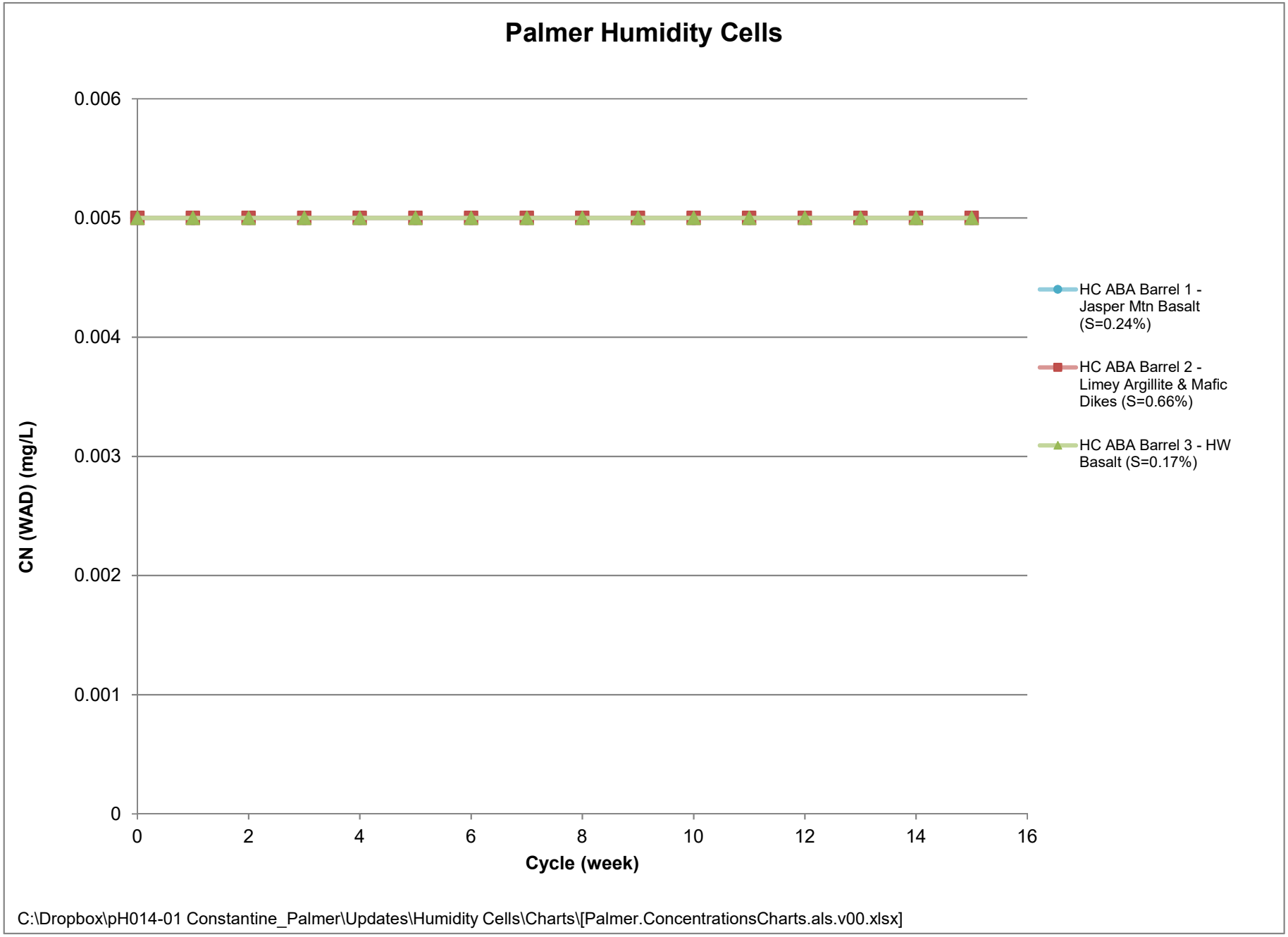
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



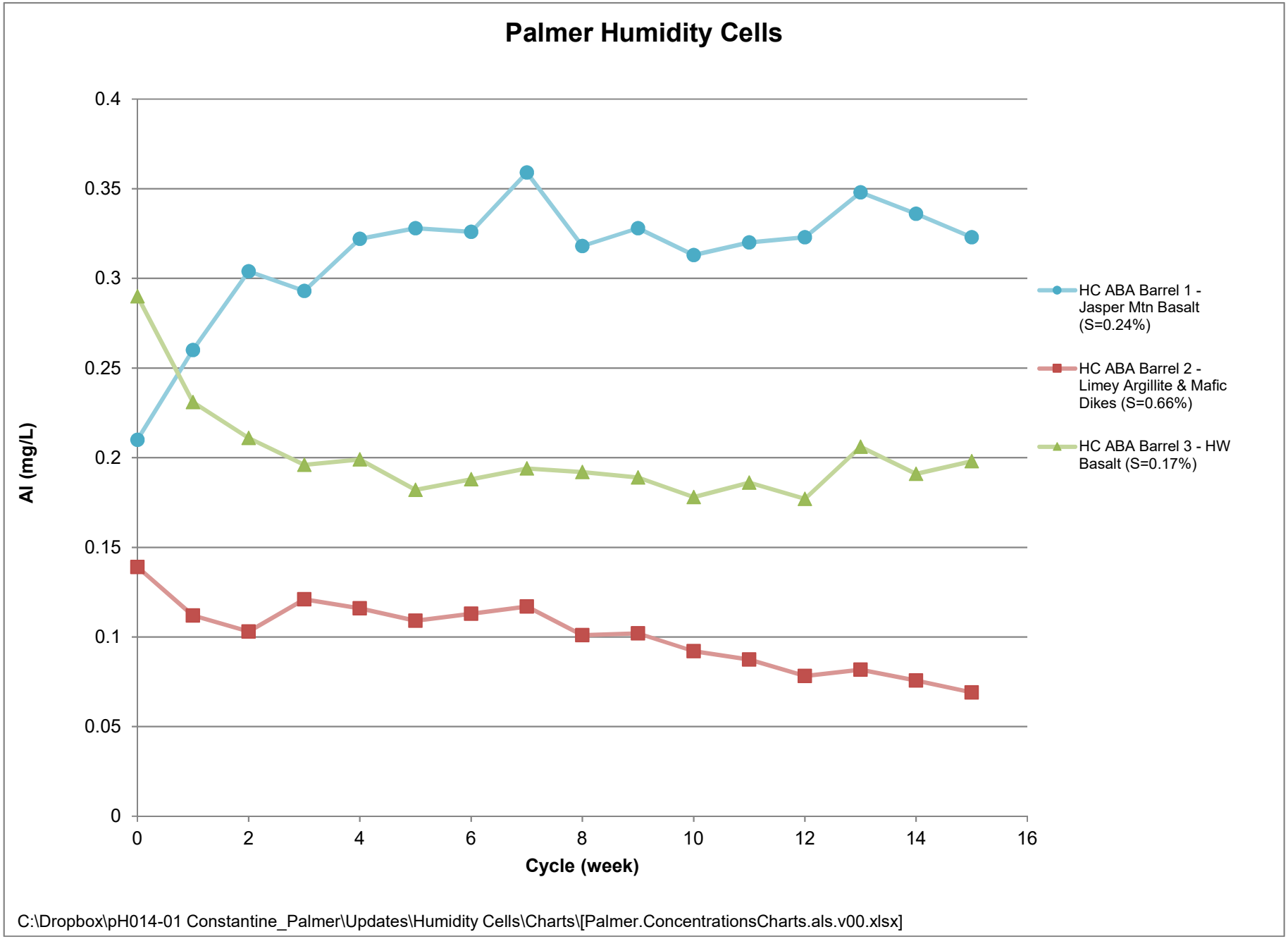
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



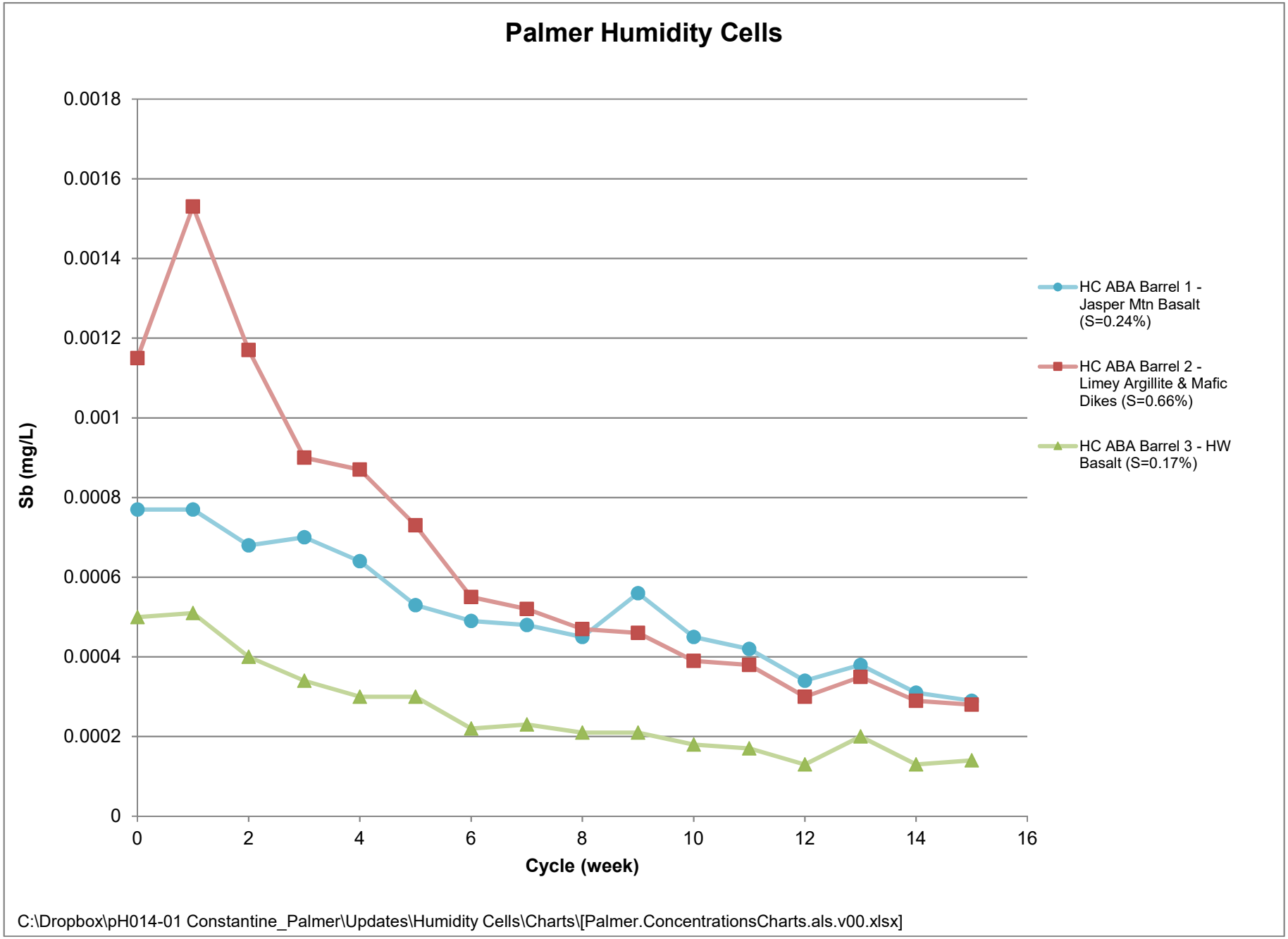
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



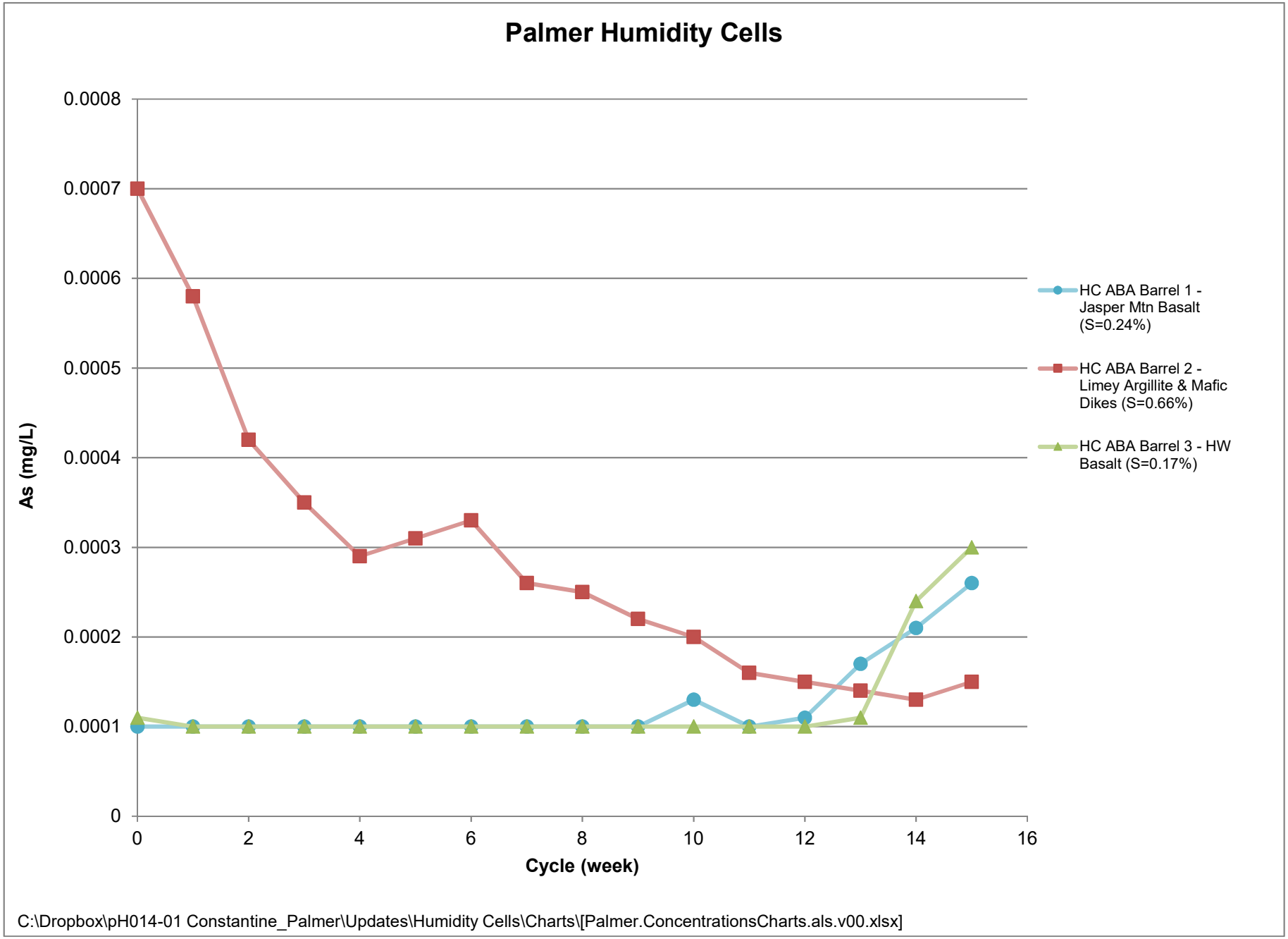
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



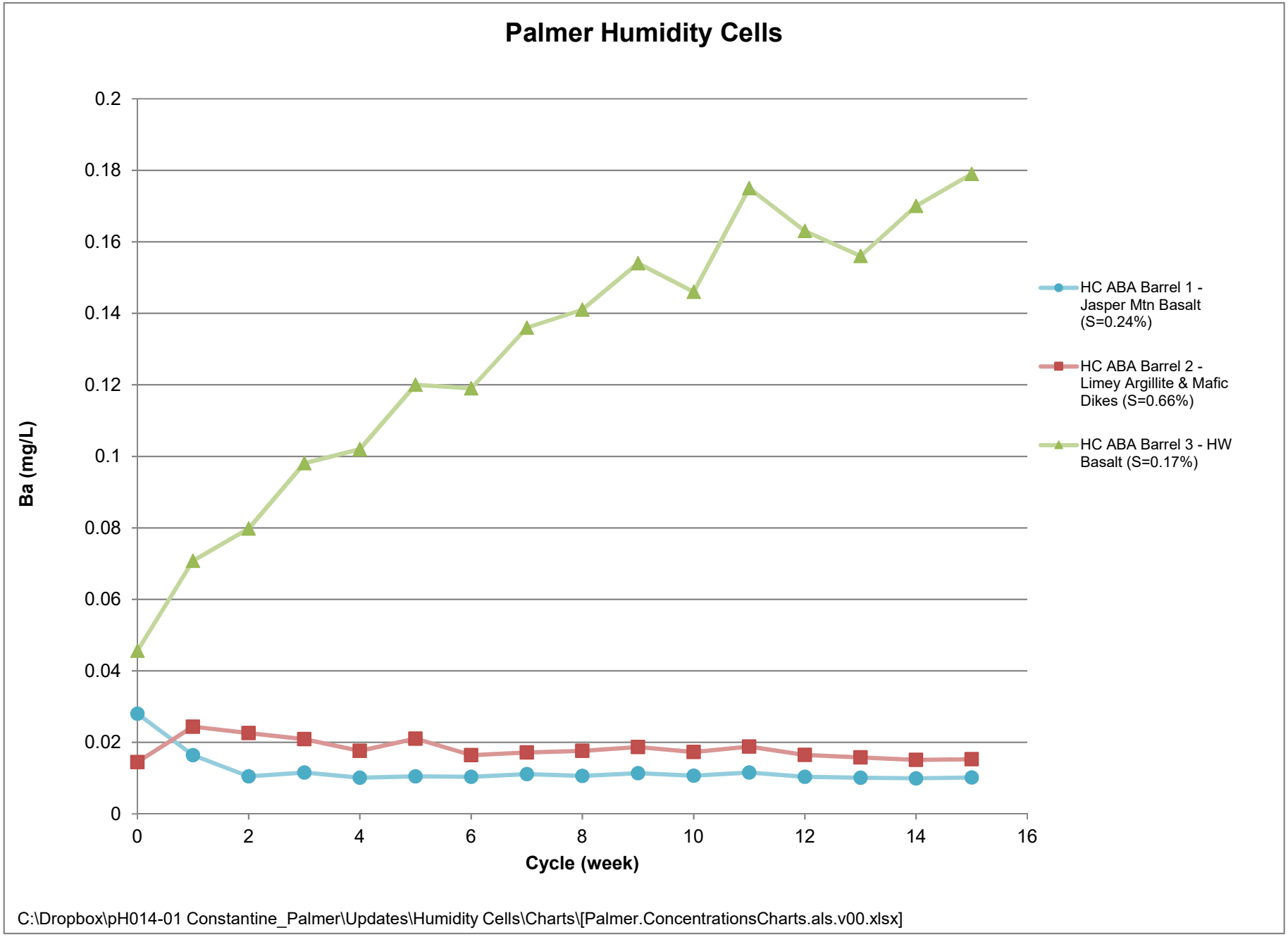
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



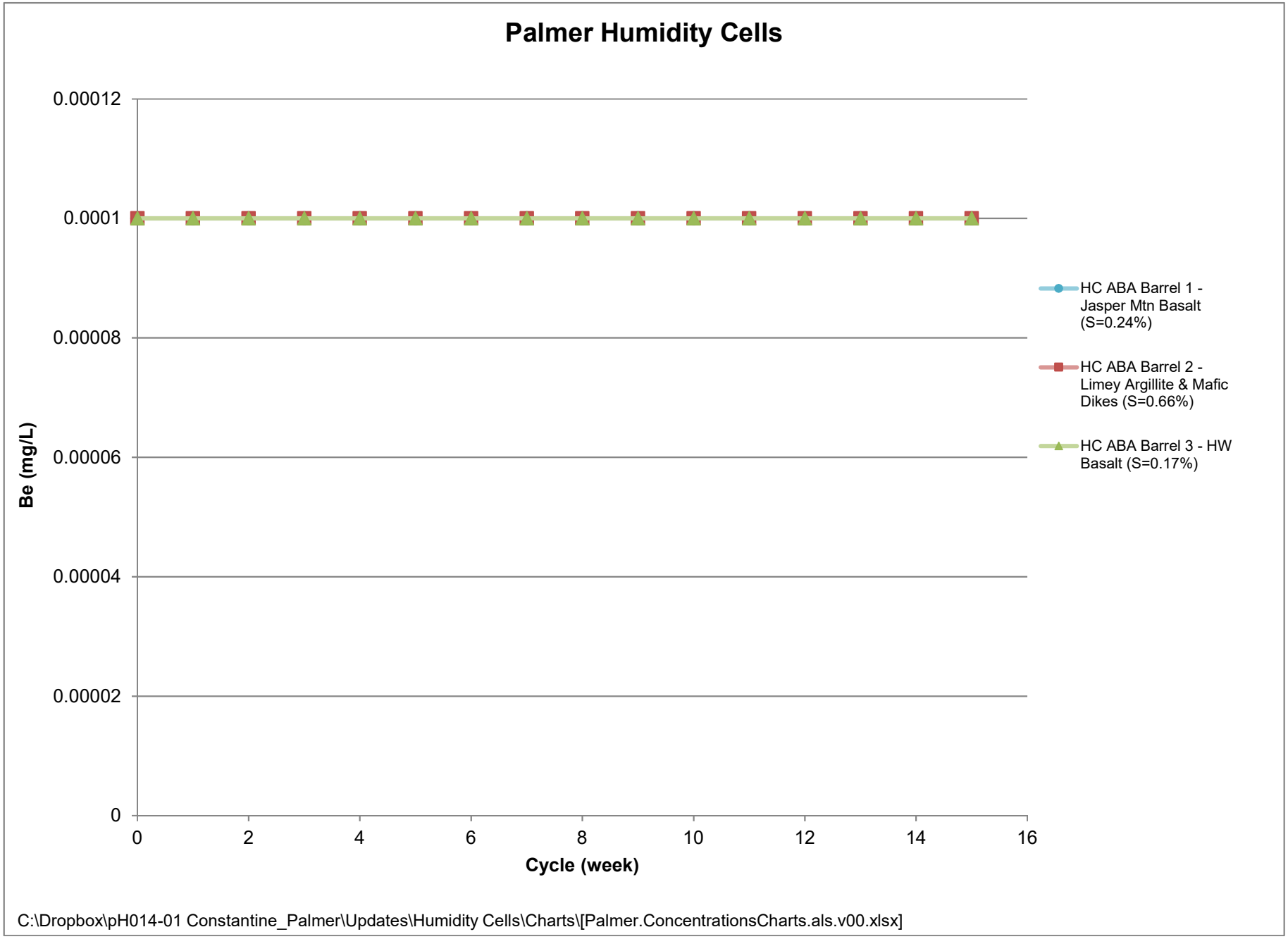
Palmer Waste Rock Humidity Cell Results

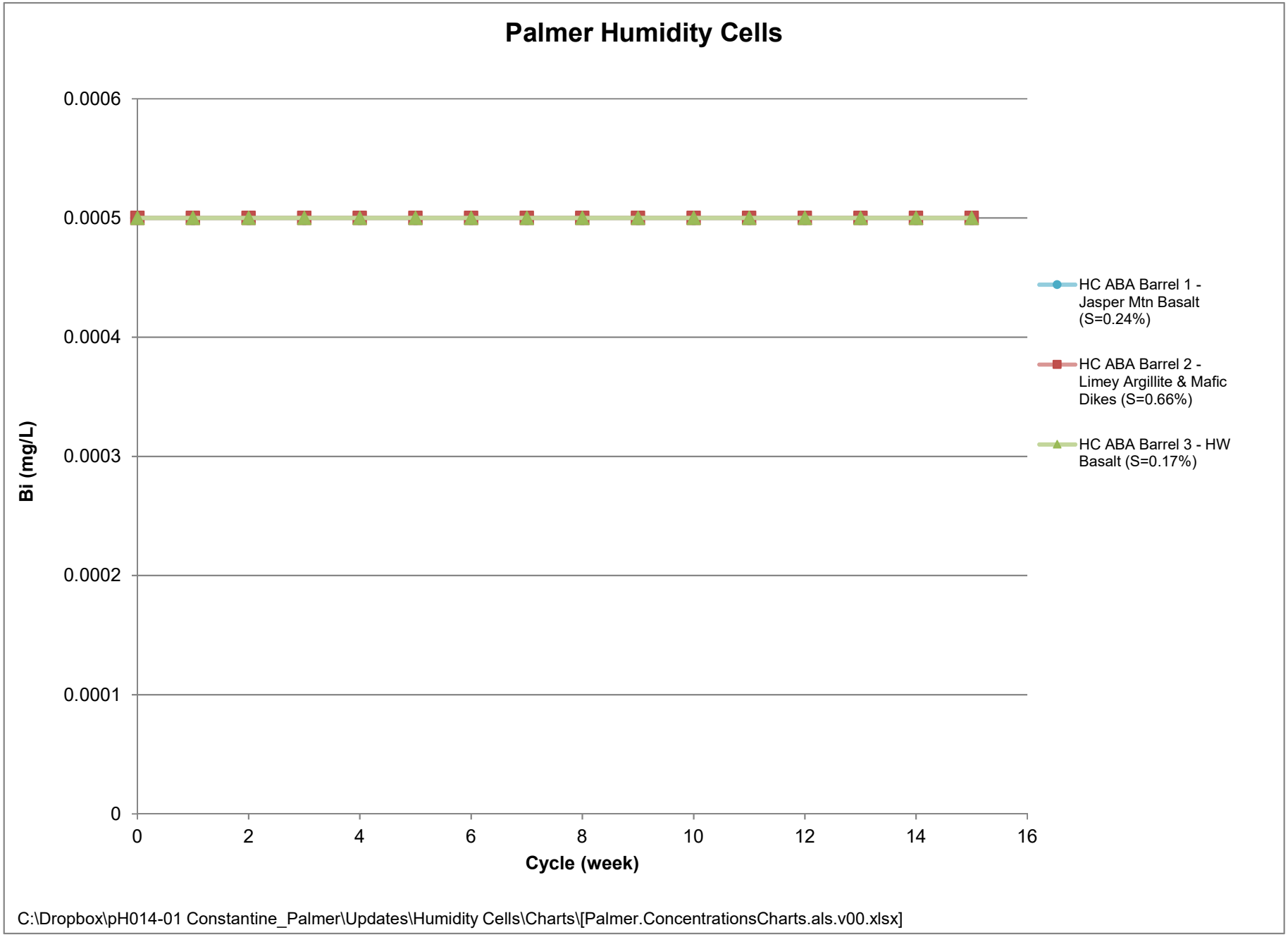
pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

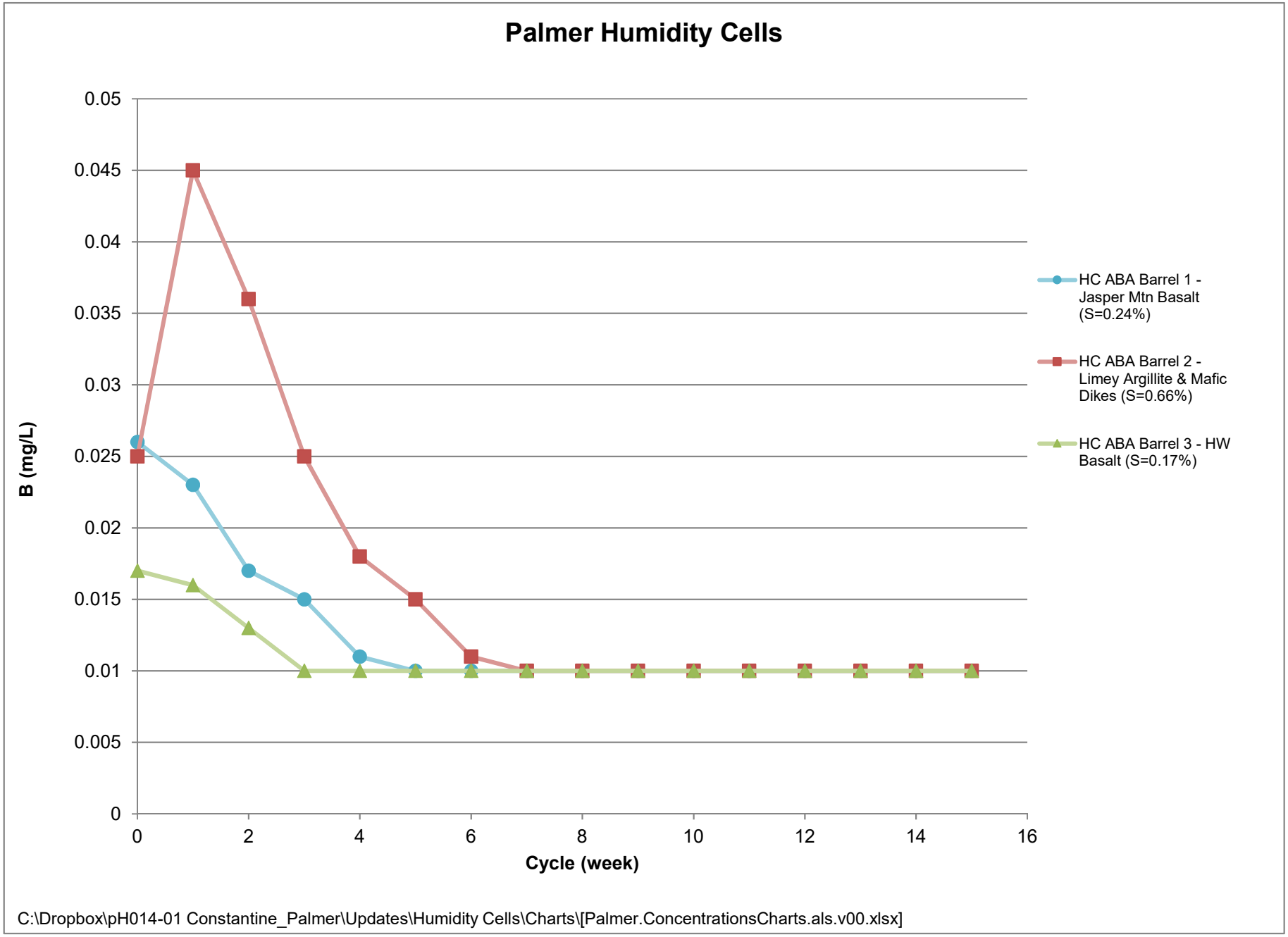
pHase Geochemistry Inc.
4/4/2018


Palmer Humidity Cells
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
Be (mg/L)
0
2
4
6
8
10
12
14
16
Cycle (week)
HC ABA Barrel 1 - Jasper Mtn Basalt (S=0.24%)
HC ABA Barrel 2 - Limey Argillite & Mafic Dikes (S=0.66%)
HC ABA Barrel 3 - HW Basalt (S=0.17%)
C:\Dropbox\pH014-01 Constantine_Palmer\Updates\Humidity Cells\Charts\[Palmer.ConcentrationsCharts.als.v00.xlsx]



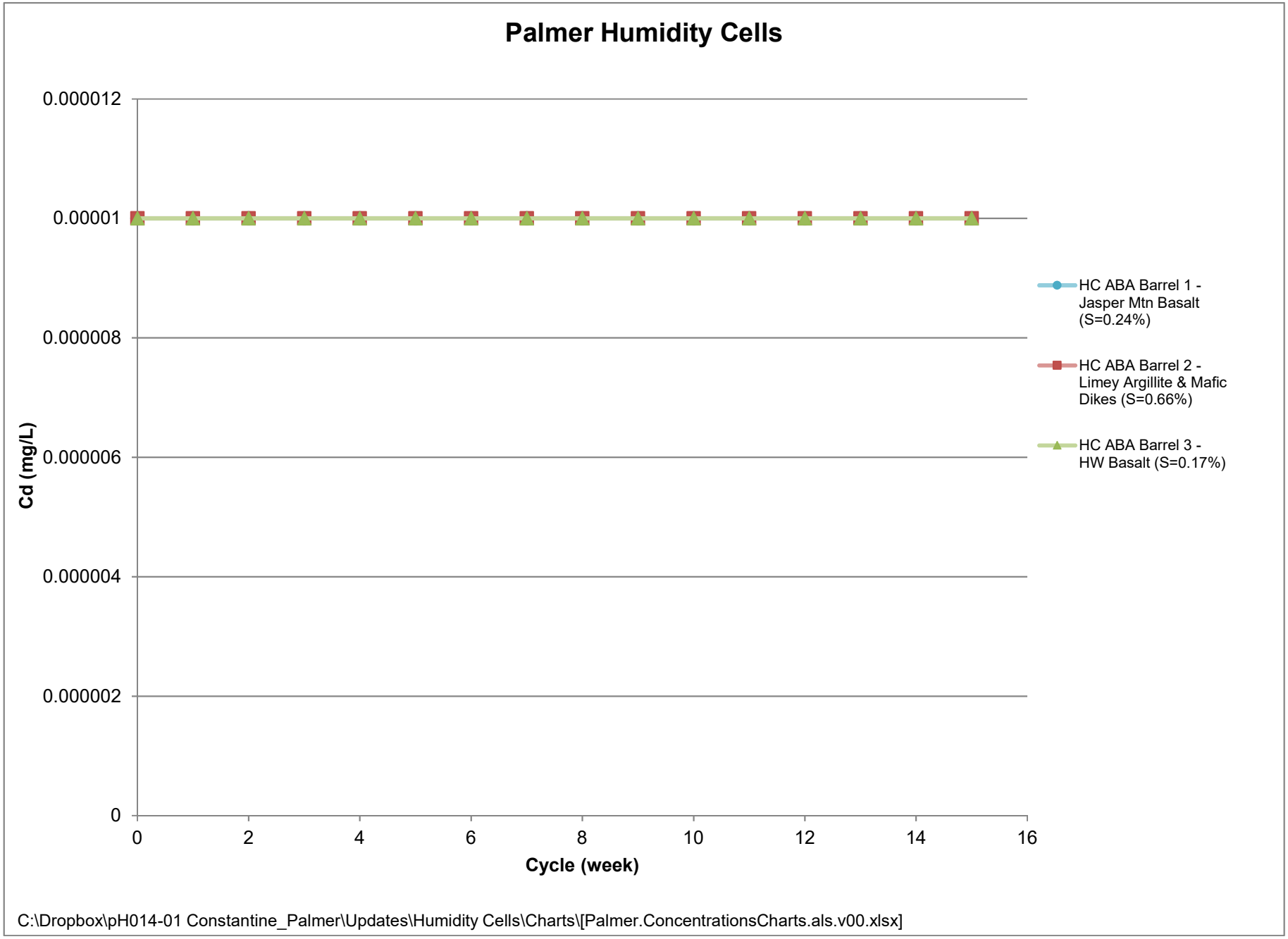
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



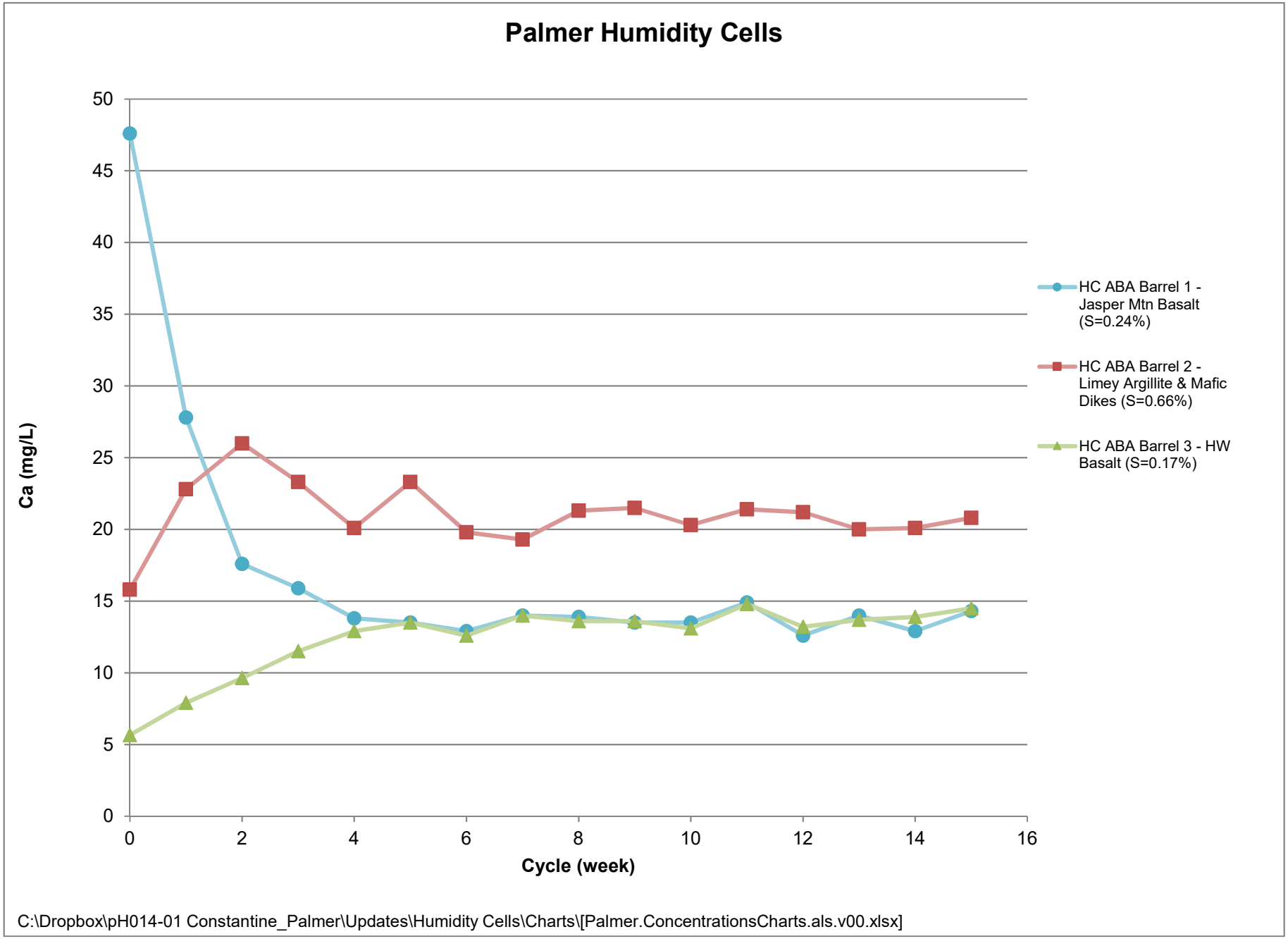
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



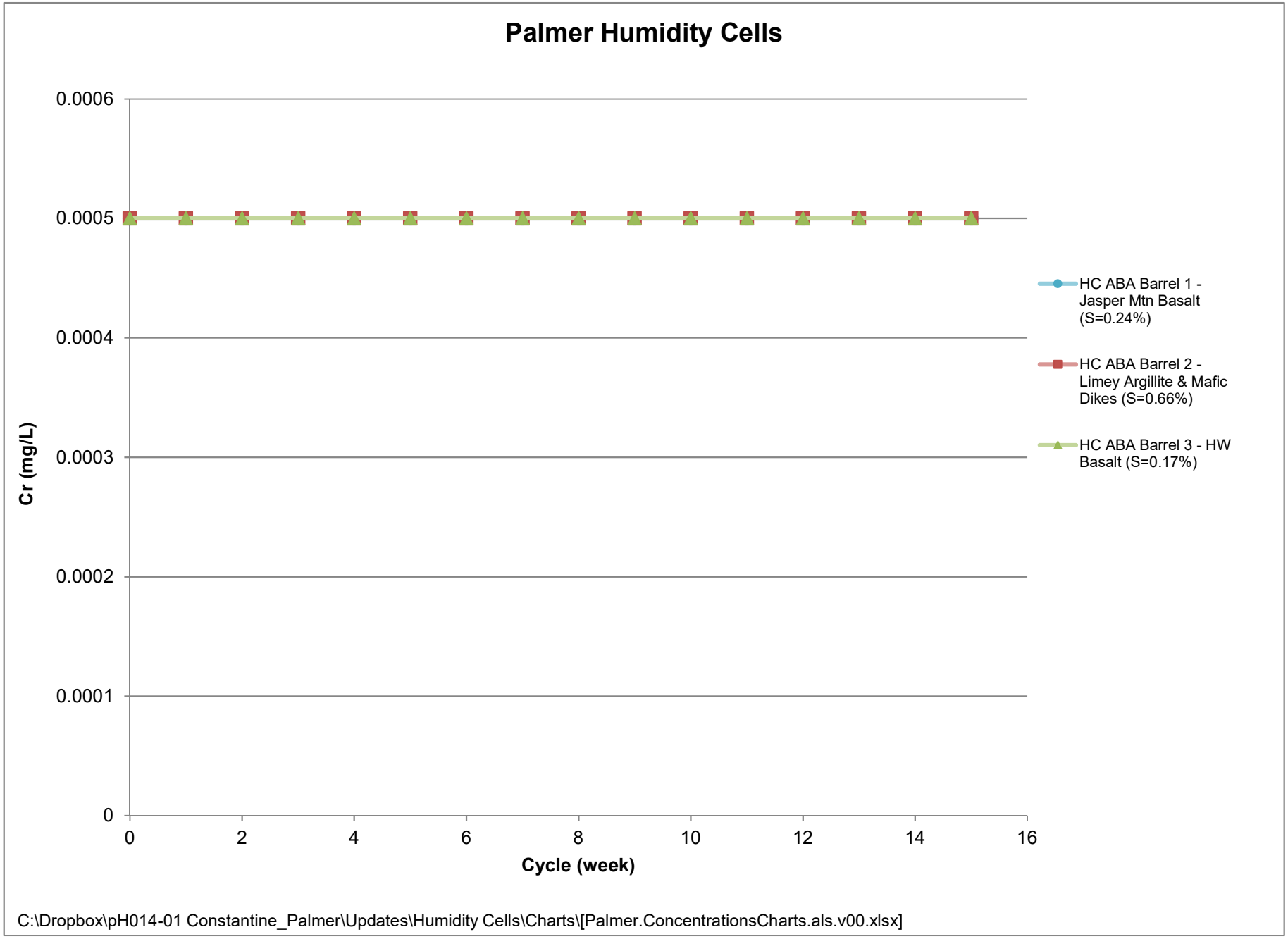
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



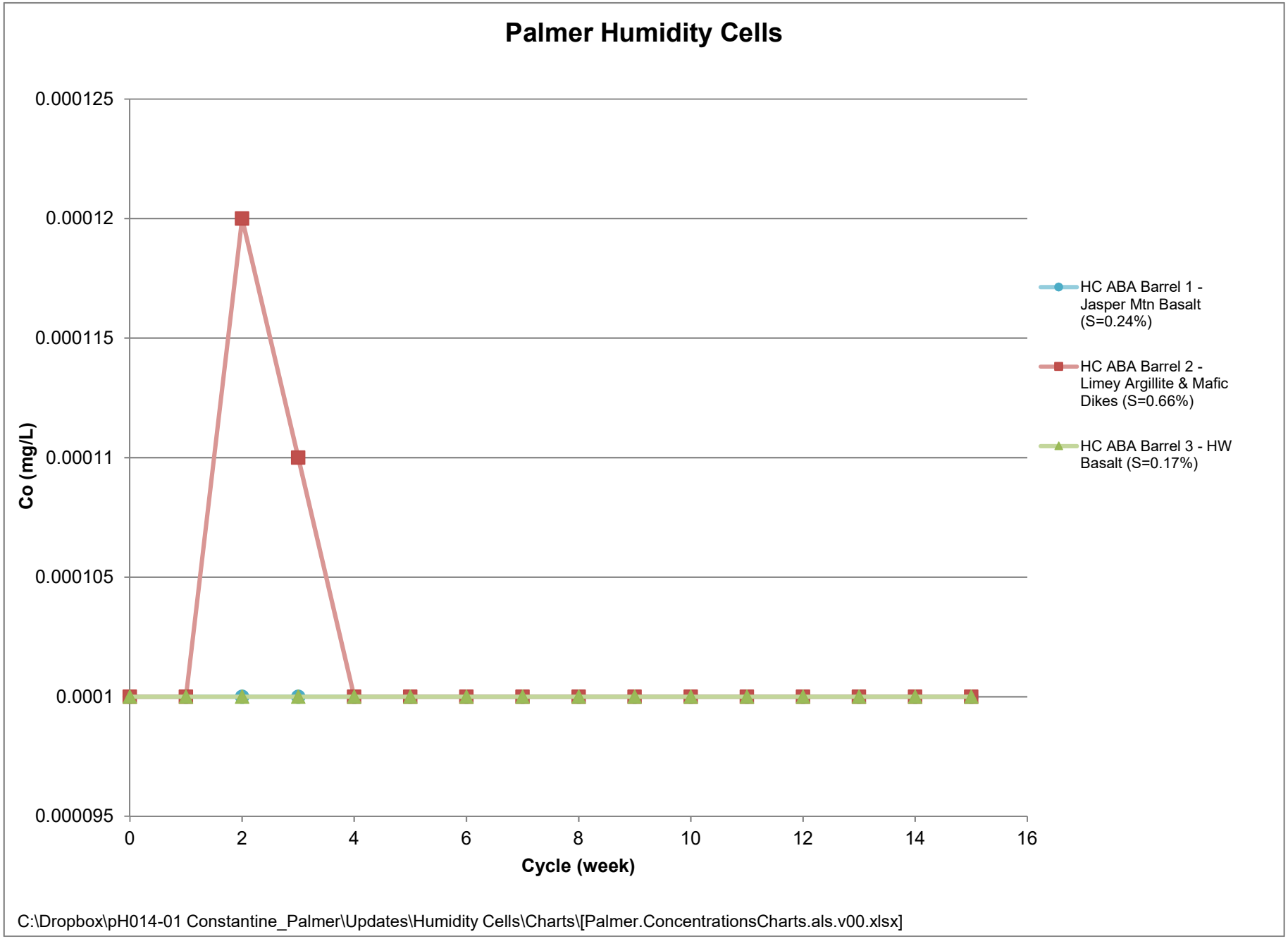
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



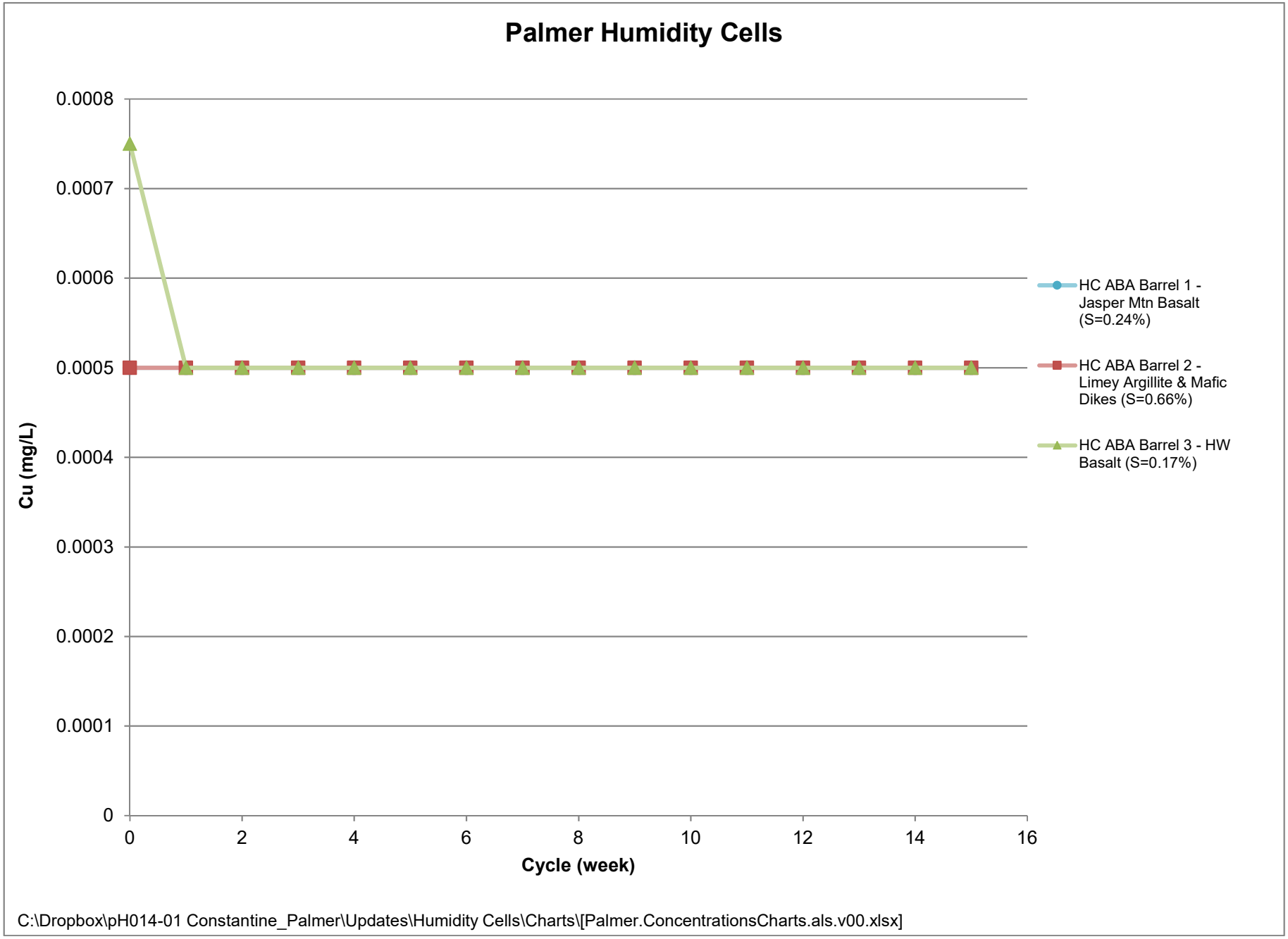
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



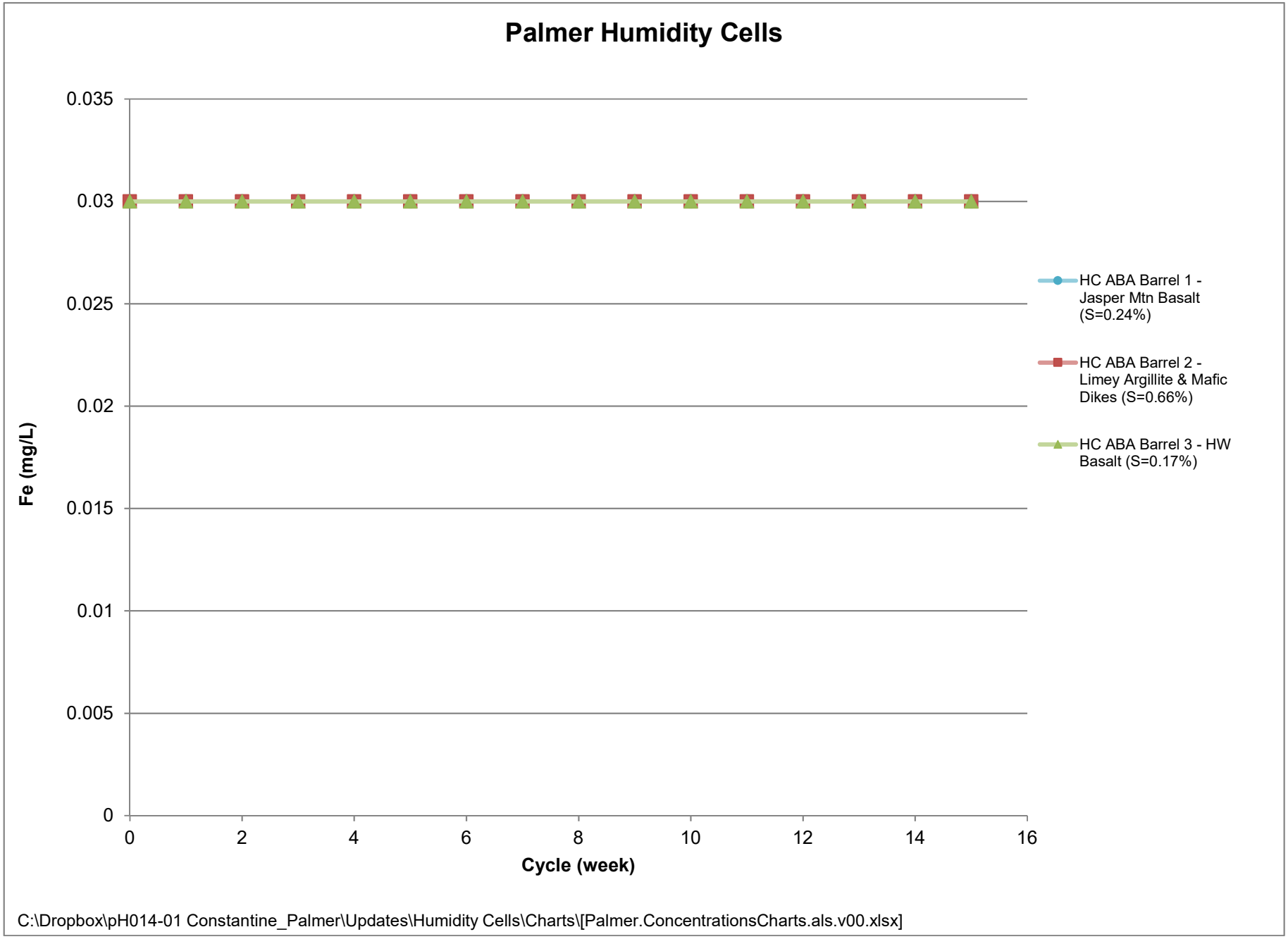
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



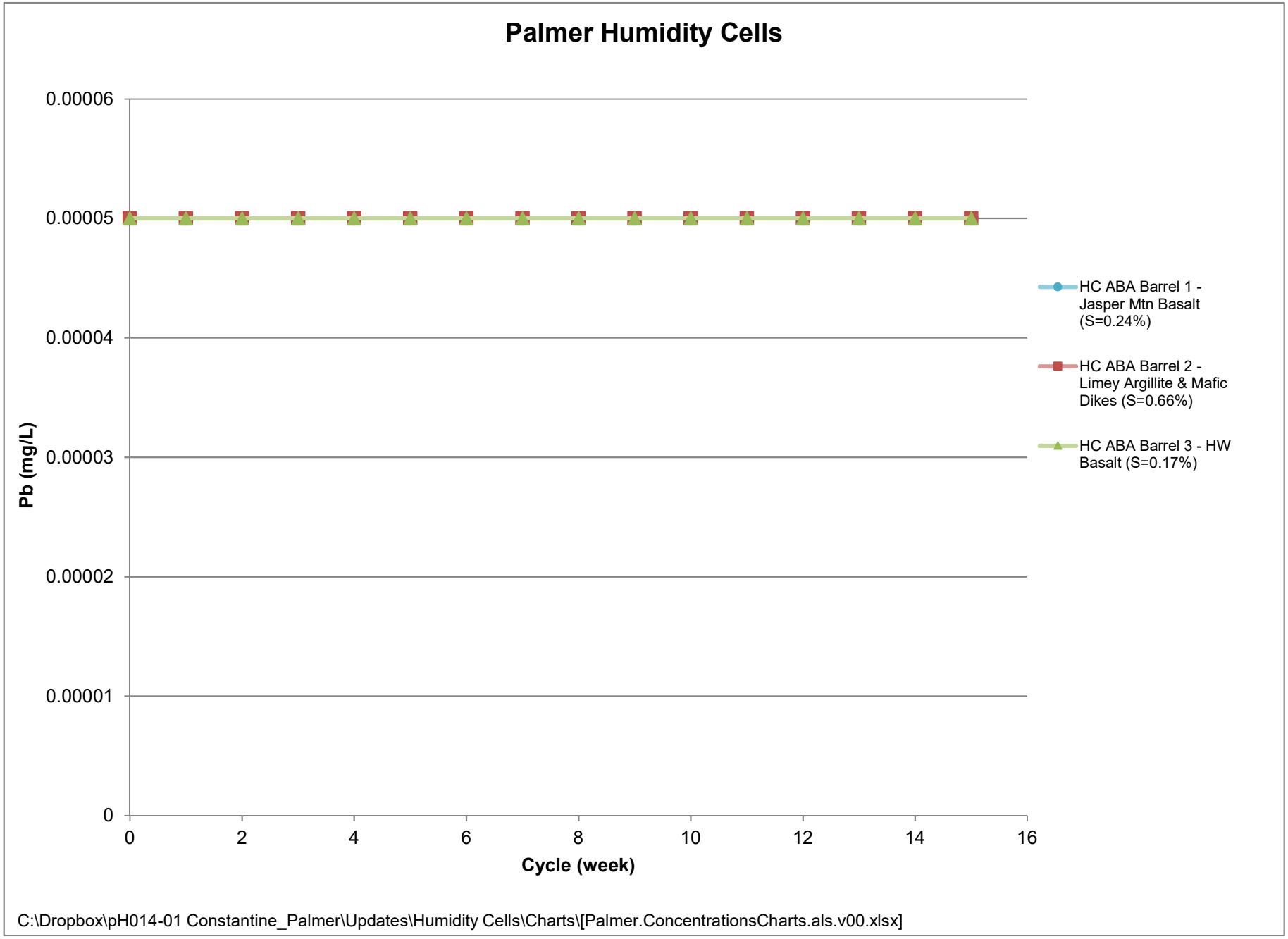
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



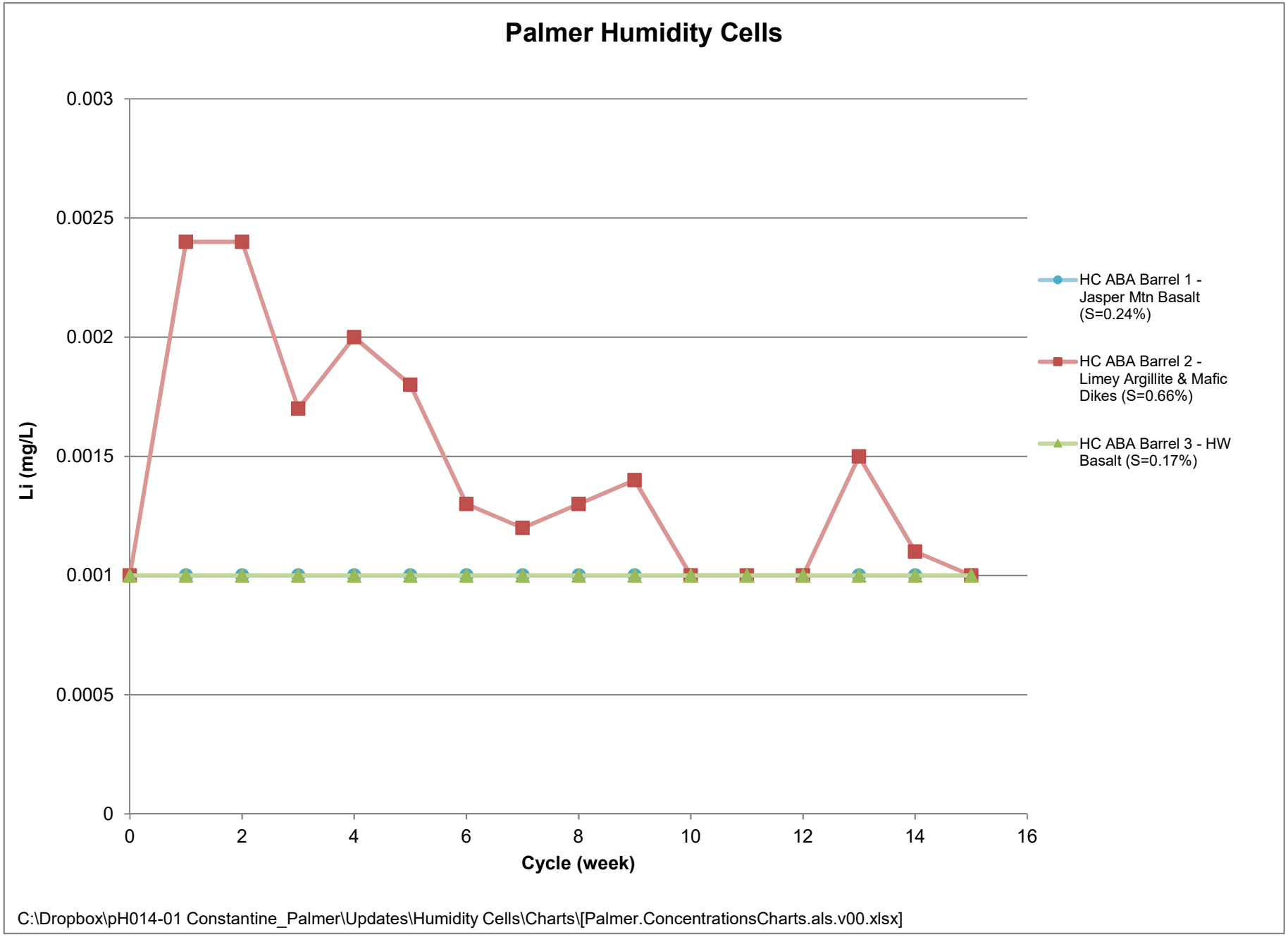
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

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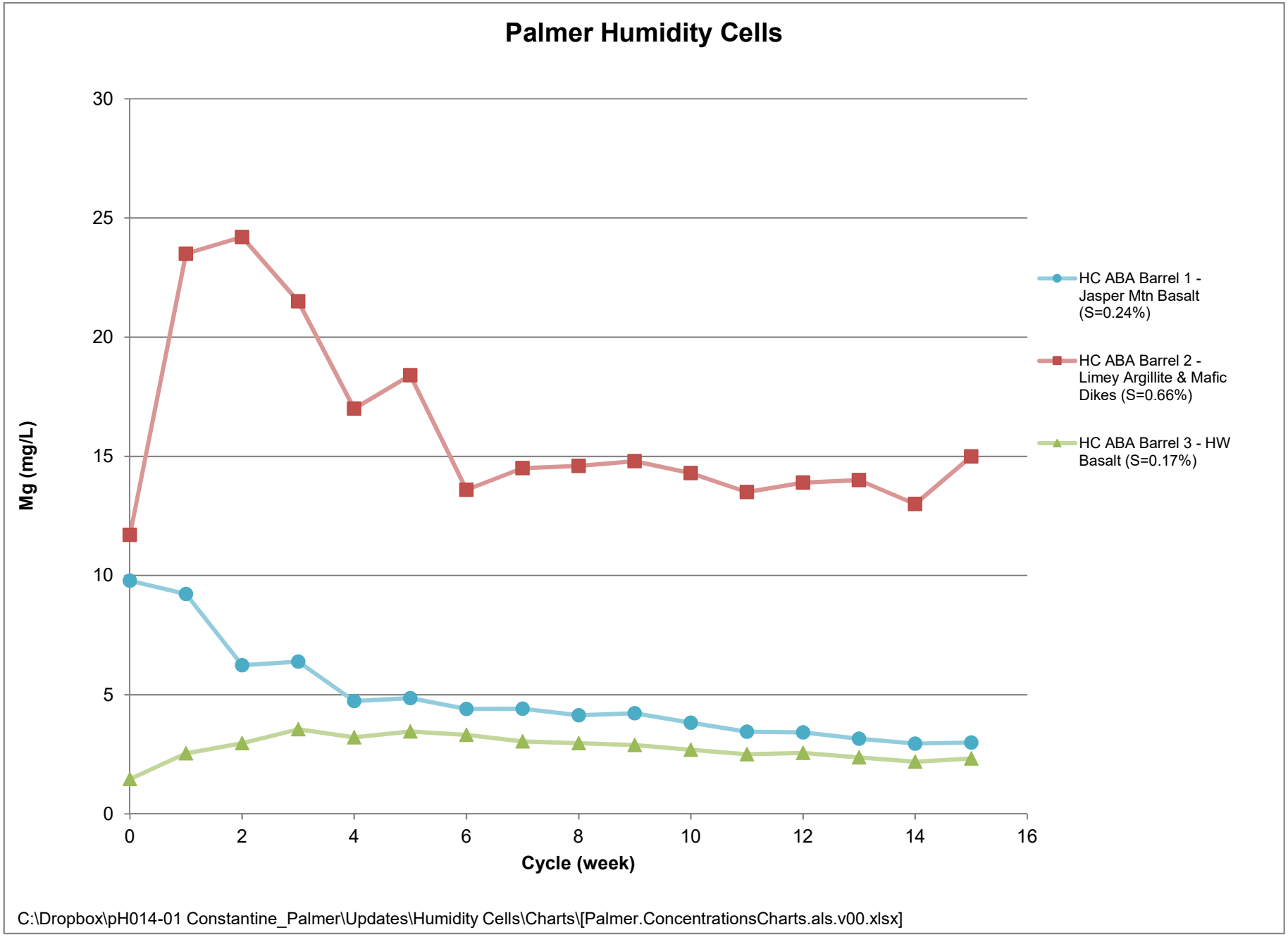
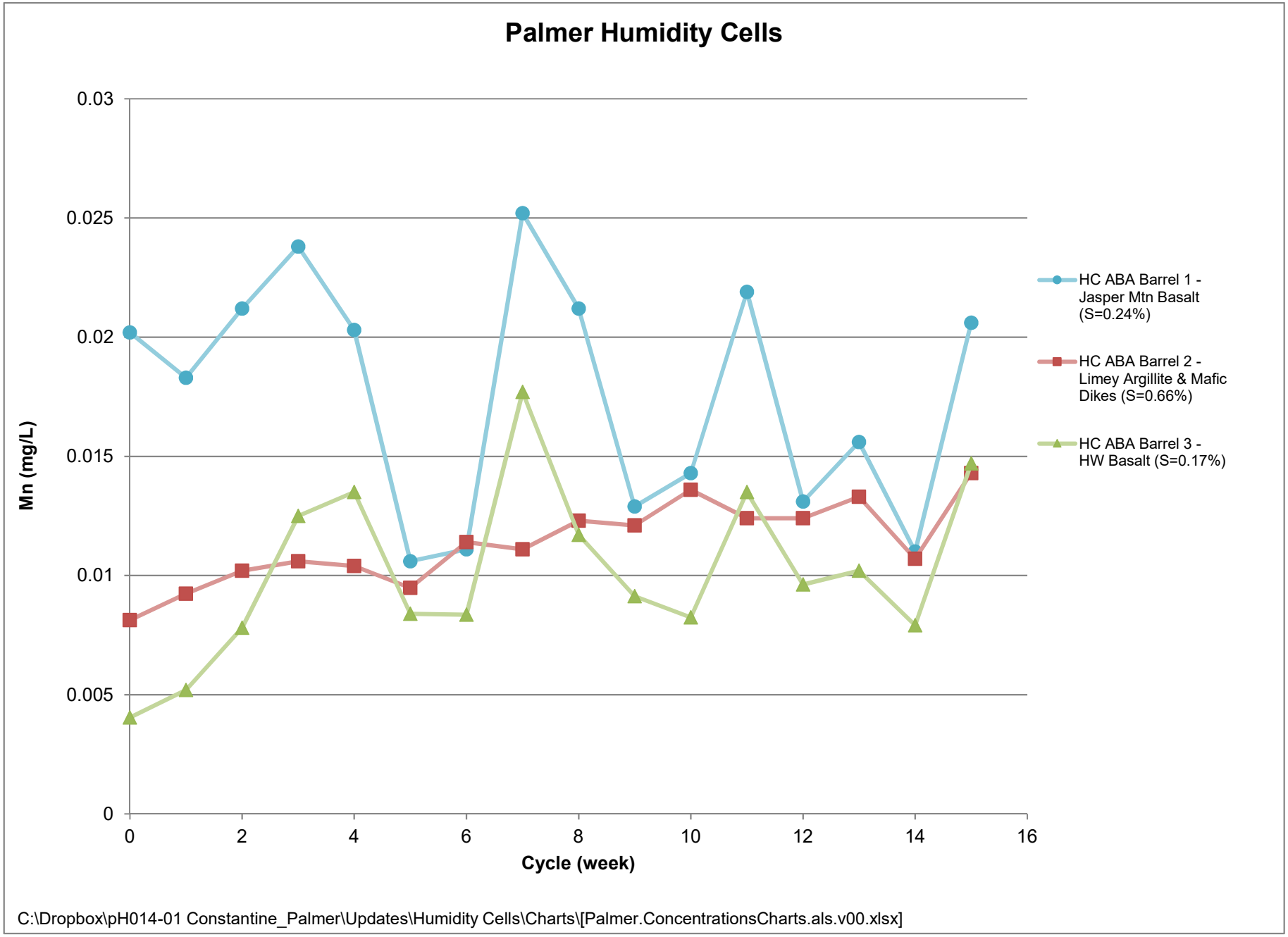
4/4/2018



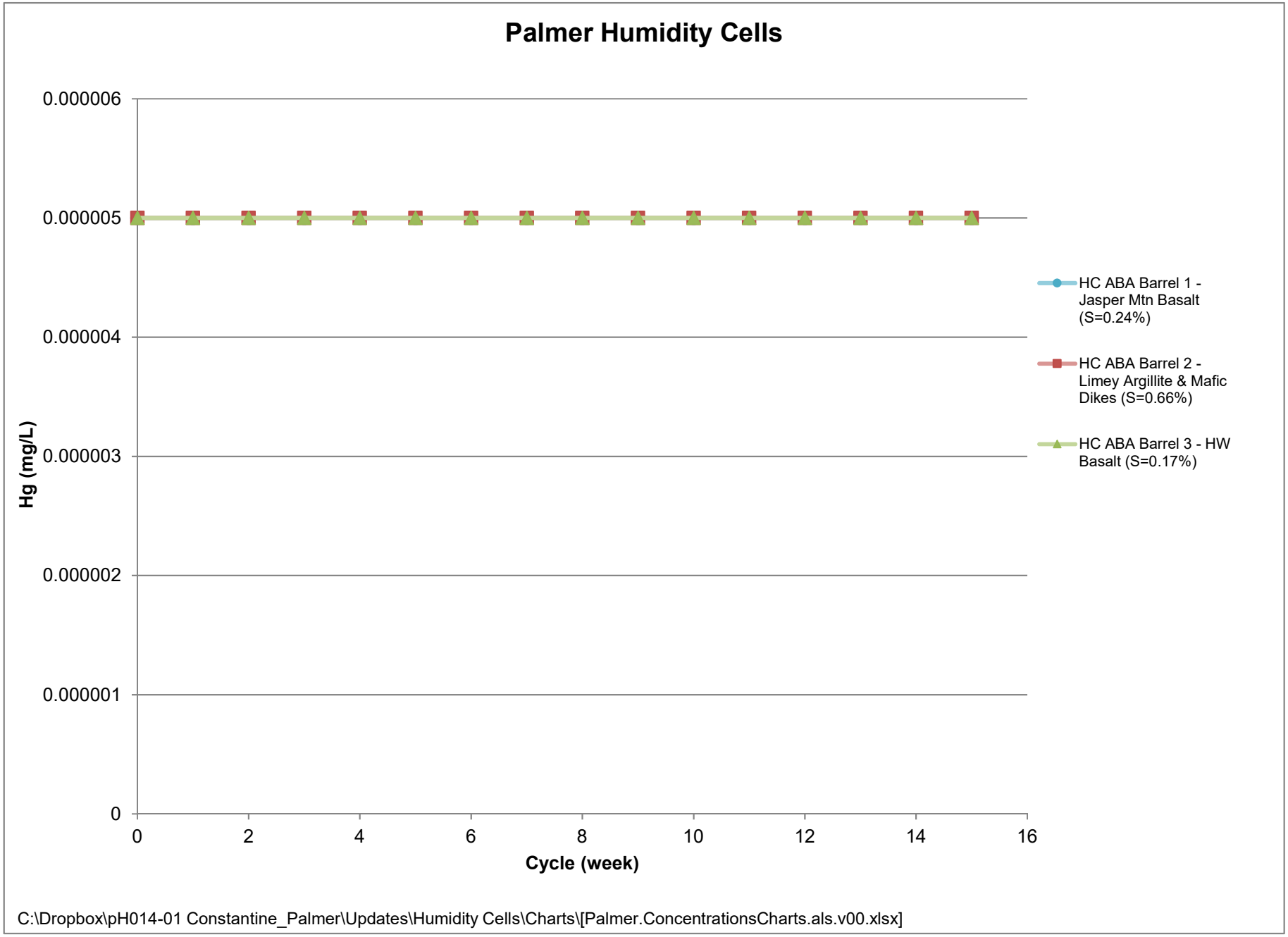
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



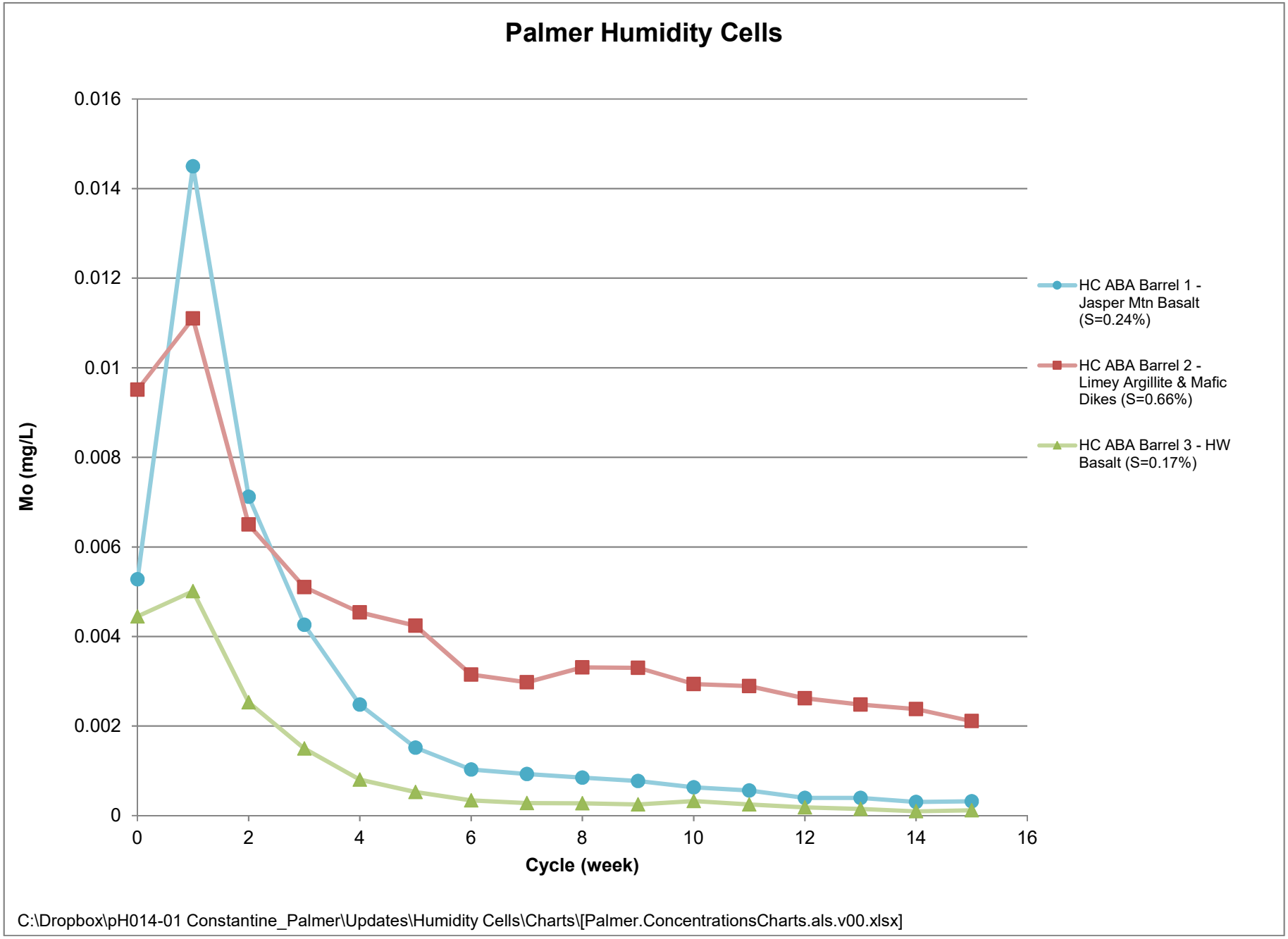
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



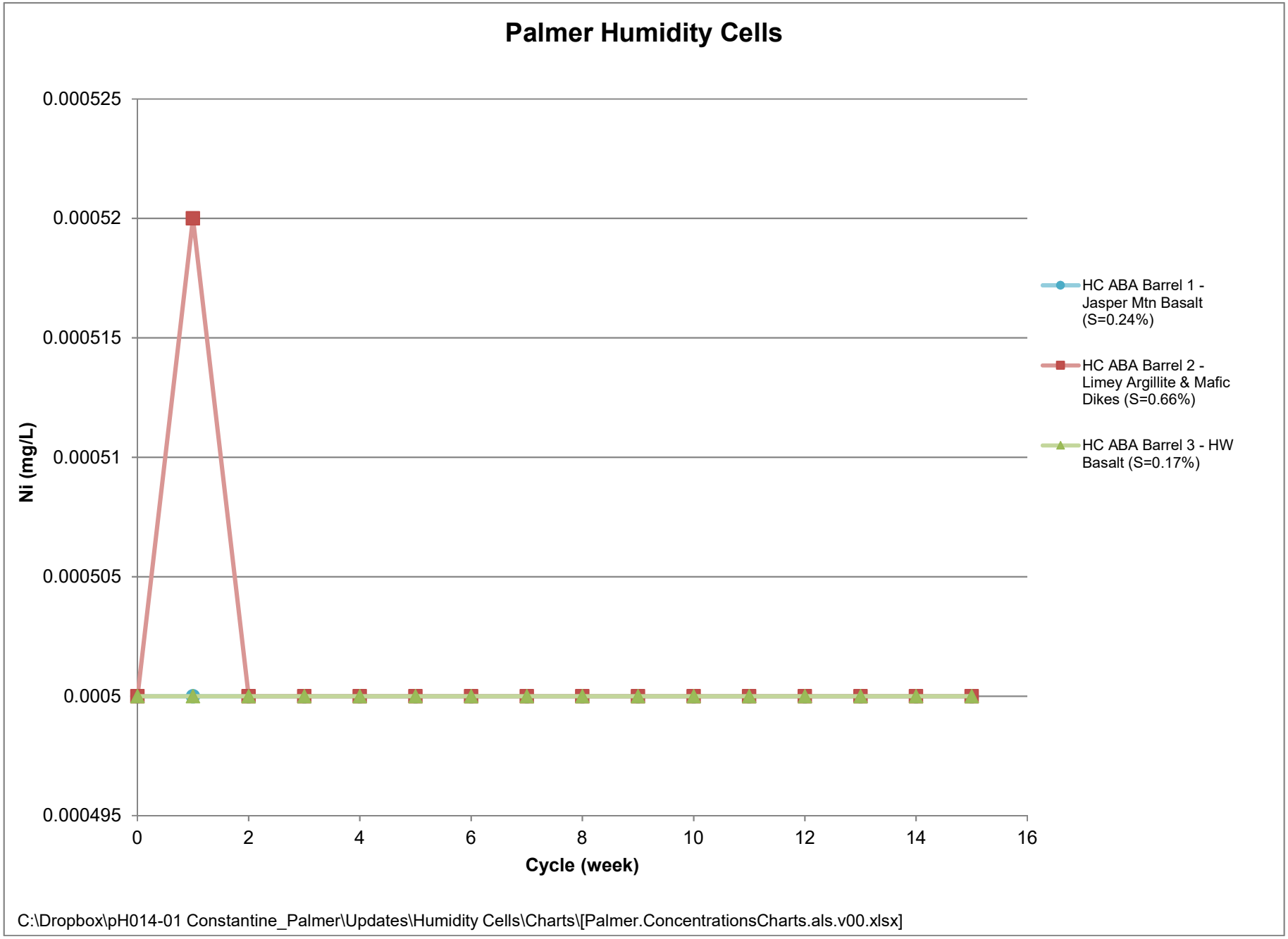
Palmer Waste Rock Humidity Cell Results

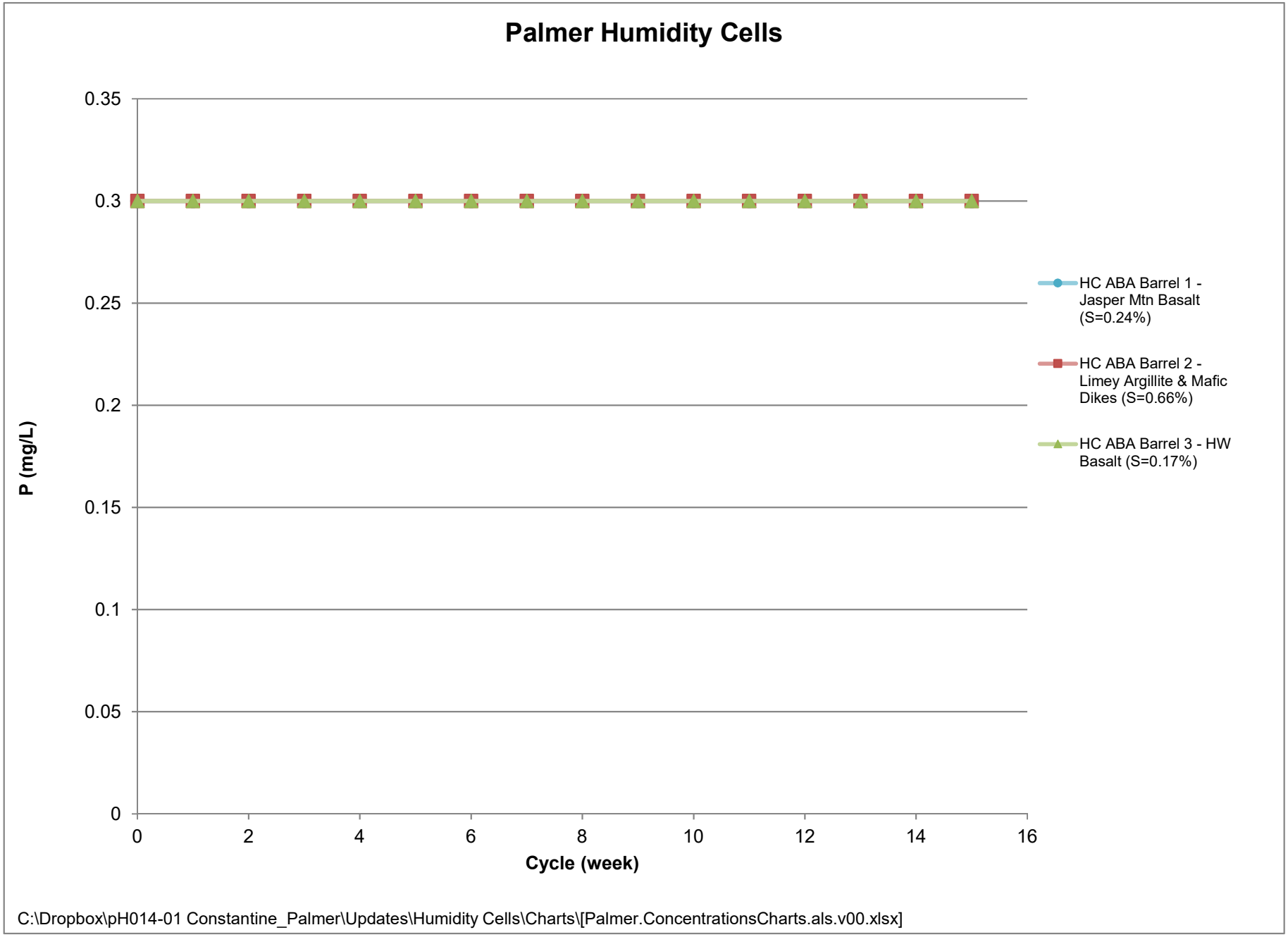
pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

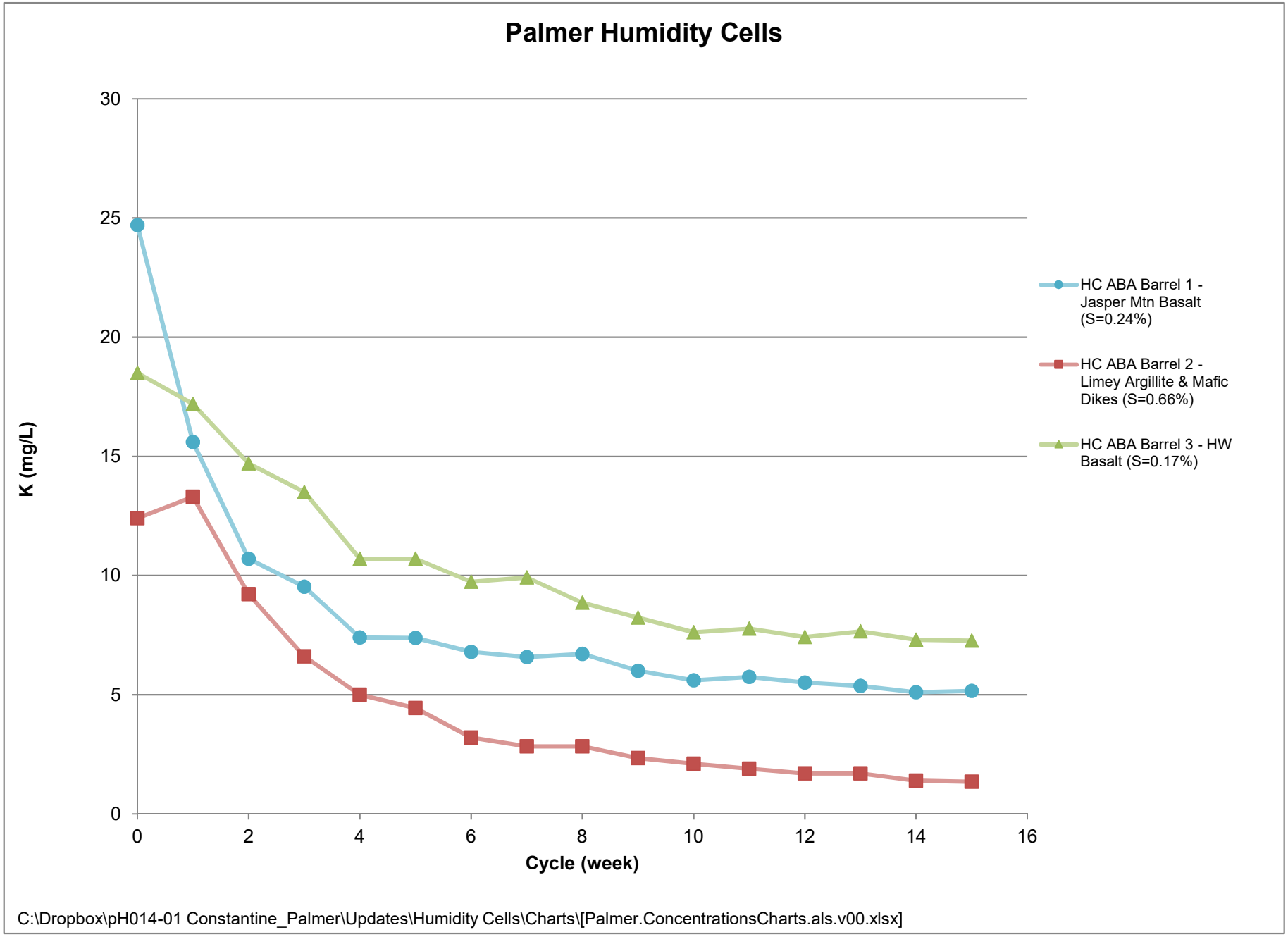
pHase Geochemistry Inc.
4/4/2018


Palmer Humidity Cells
0.000525
0.00052
0.000515
0.00051
0.000505
0.0005
0.000495
Ni (mg/L)
0
2
4
6
8
10
12
14
16
Cycle (week)
HC ABA Barrel 1 - Jasper Mtn Basalt (S=0.24%)
HC ABA Barrel 2 - Limey Argillite & Mafic Dikes (S=0.66%)
HC ABA Barrel 3 - HW Basalt (S=0.17%)
C:\Dropbox\pH014-01 Constantine_Palmer\Updates\Humidity Cells\Charts\[Palmer.ConcentrationsCharts.als.v00.xlsx]



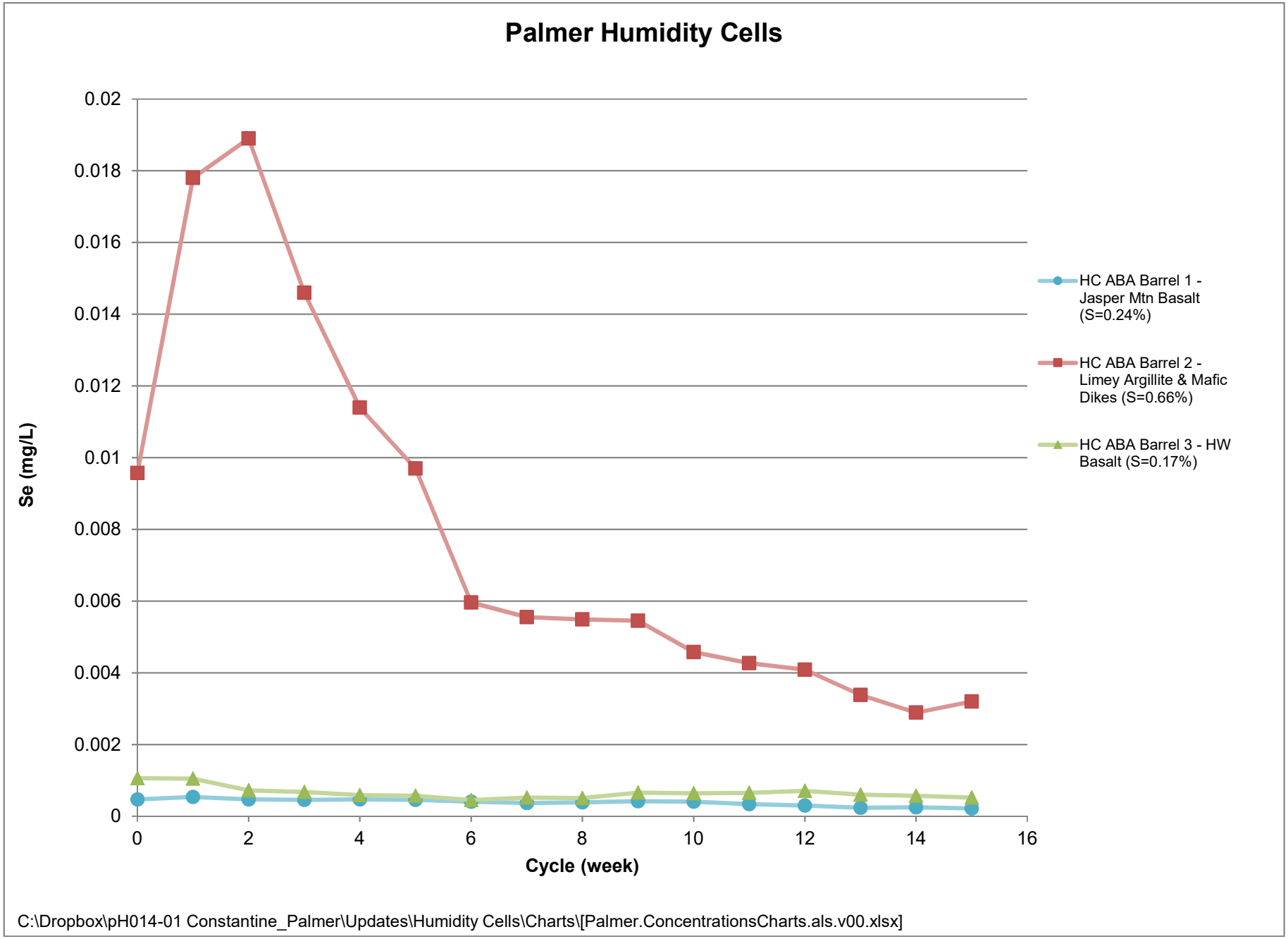
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



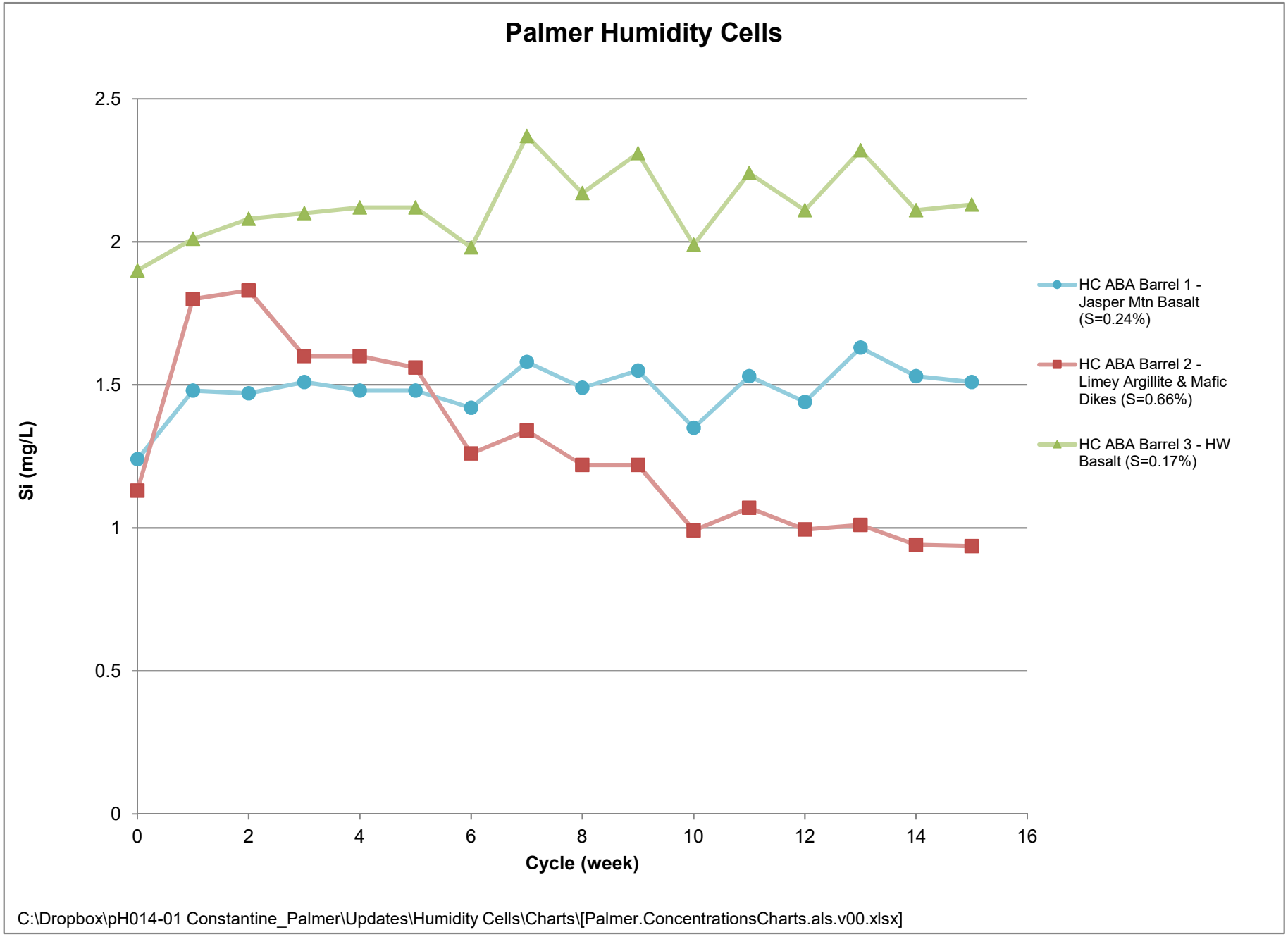
Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

pHase Geochemistry Inc.
4/4/2018



Palmer Waste Rock Humidity Cell Results

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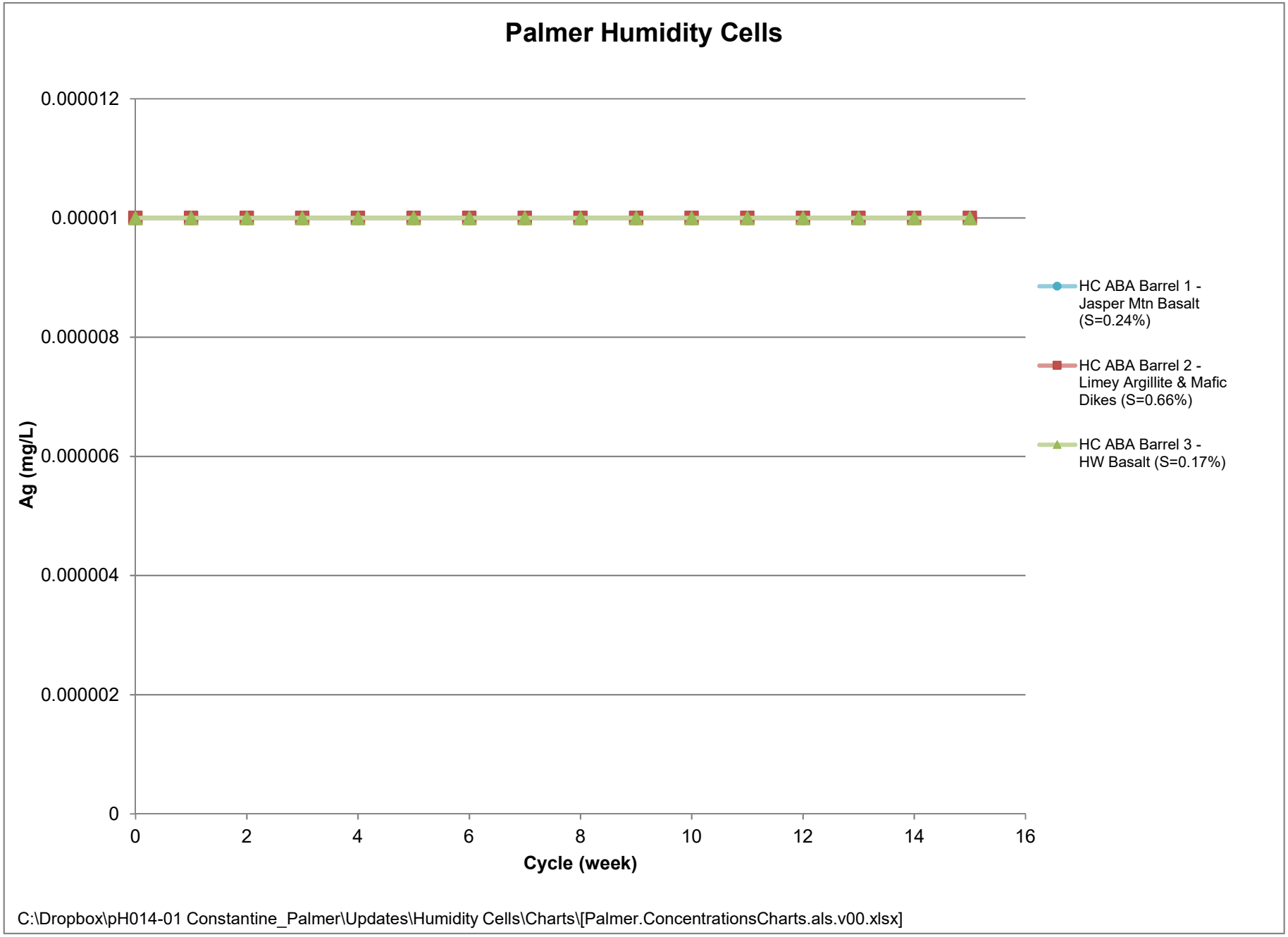

Palmer Waste Rock Humidity Cell Results

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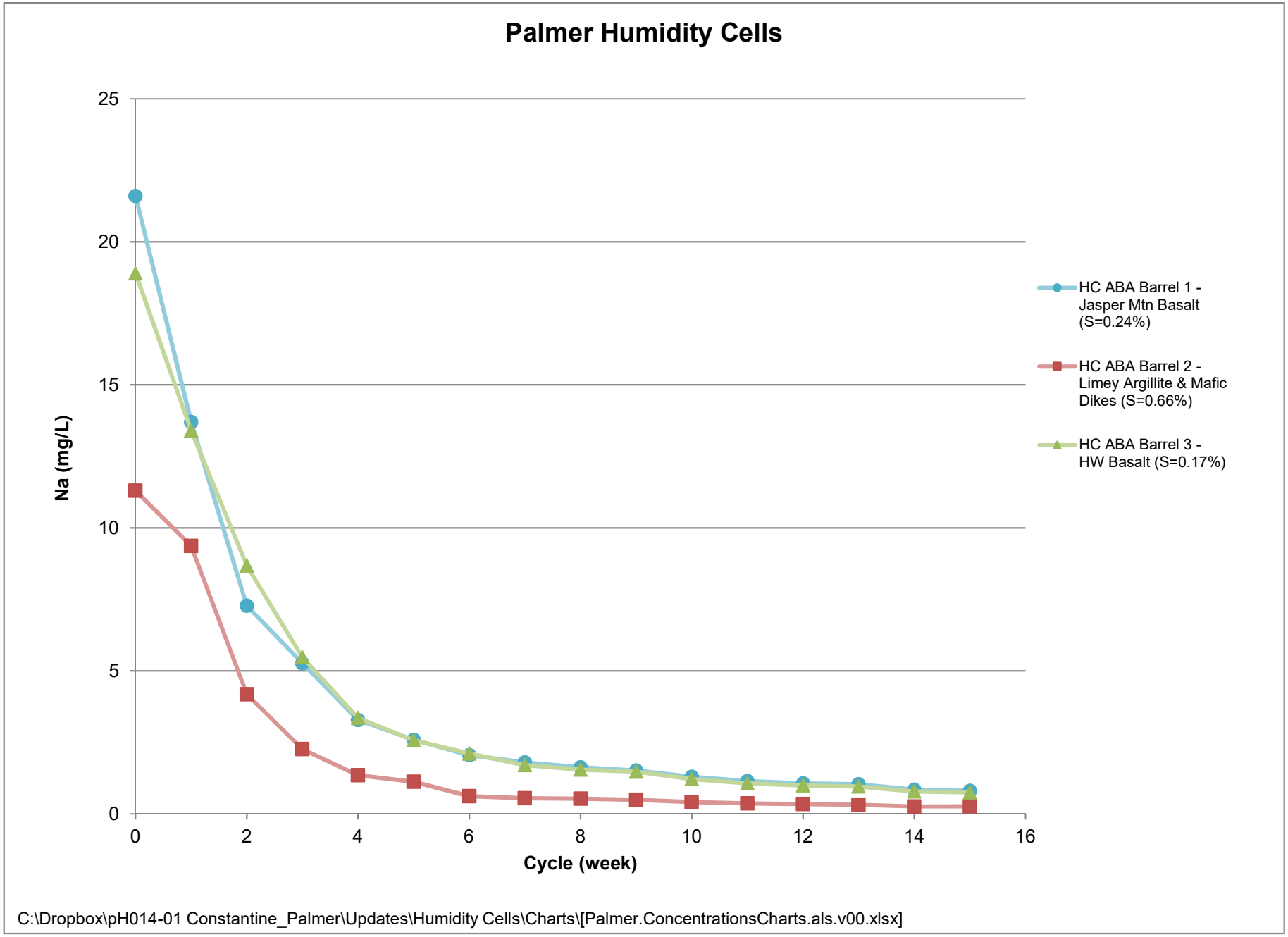

Palmer Waste Rock Humidity Cell Results

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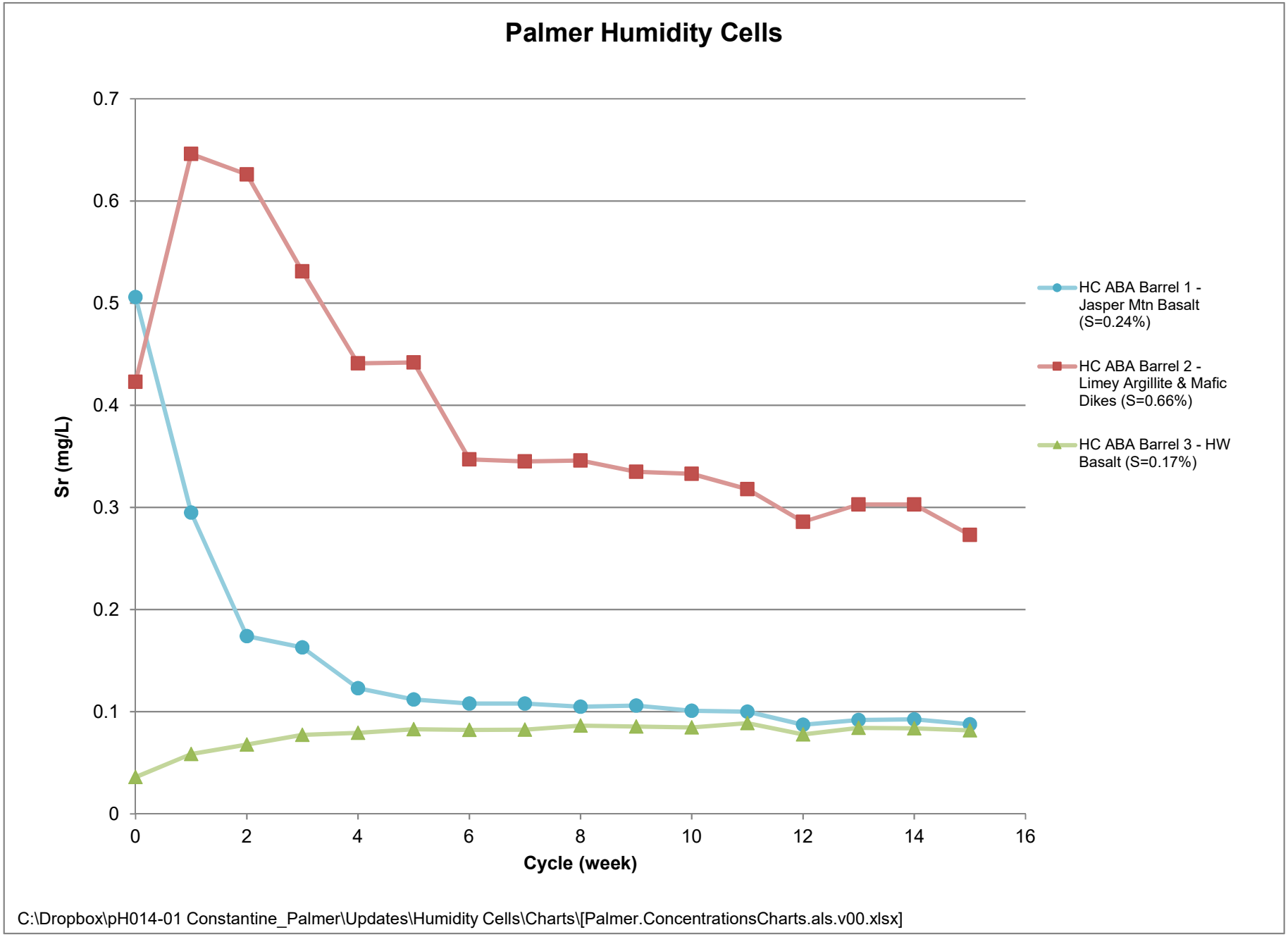

Palmer Waste Rock Humidity Cell Results

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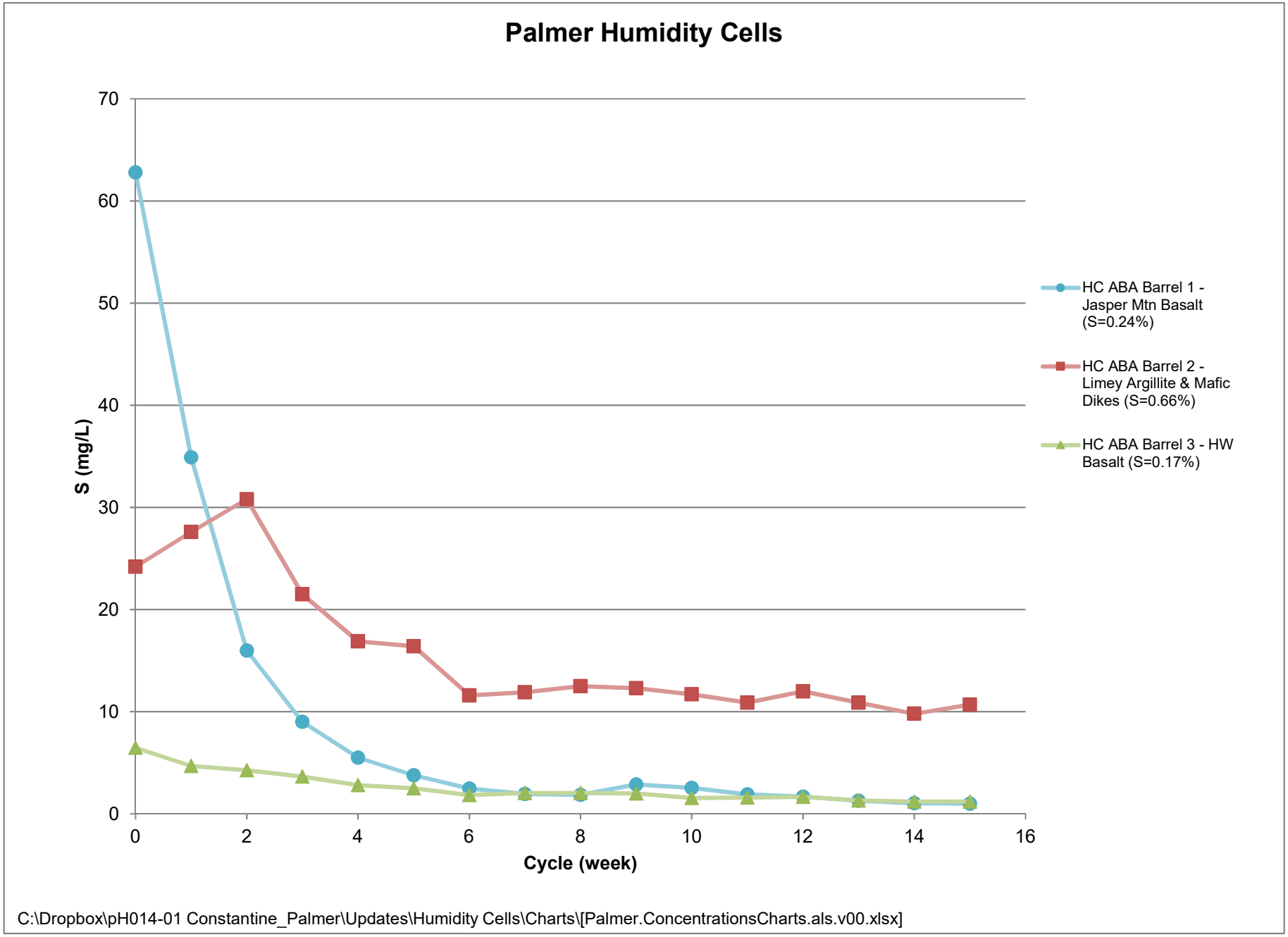

Palmer Waste Rock Humidity Cell Results

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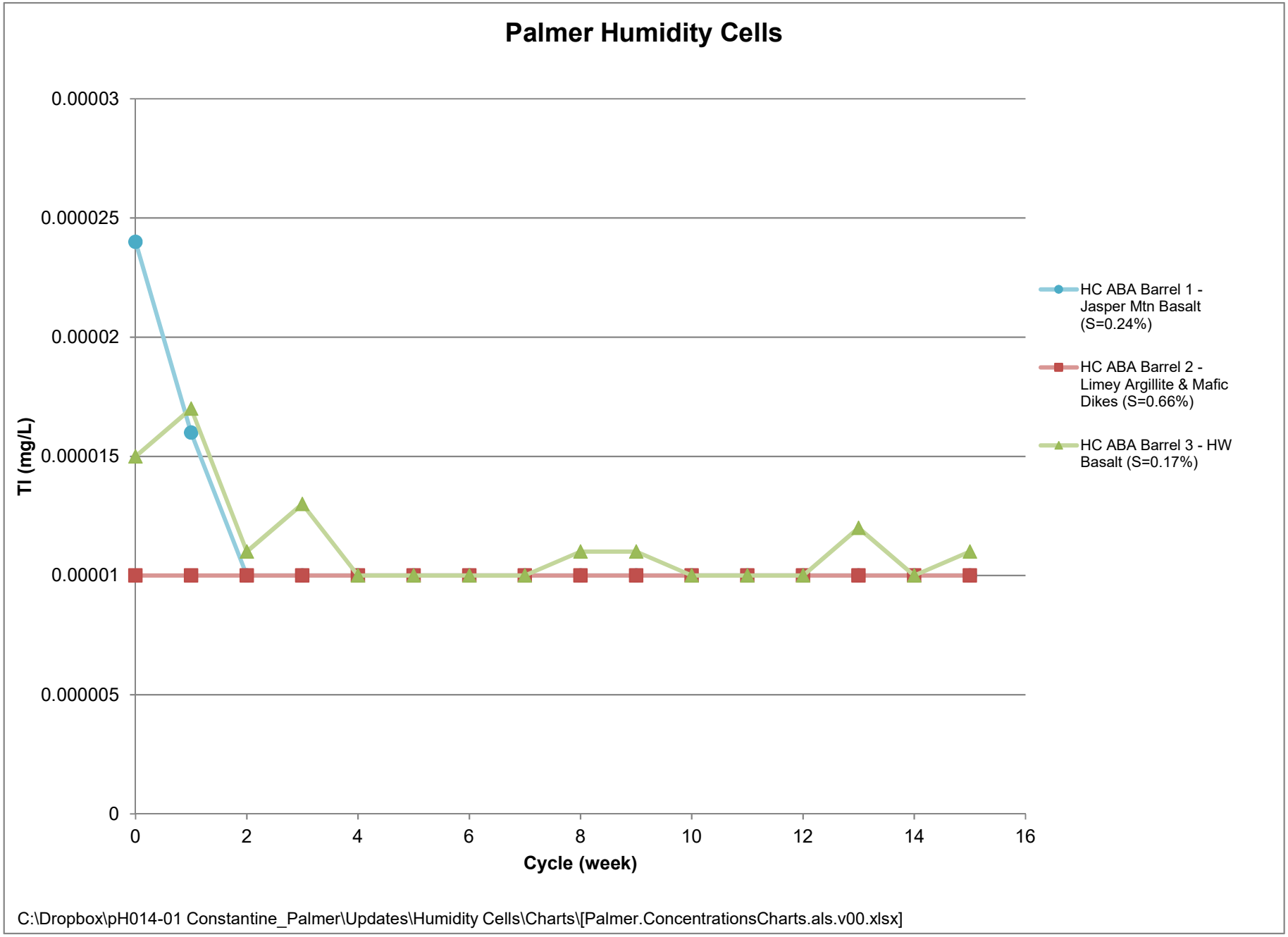
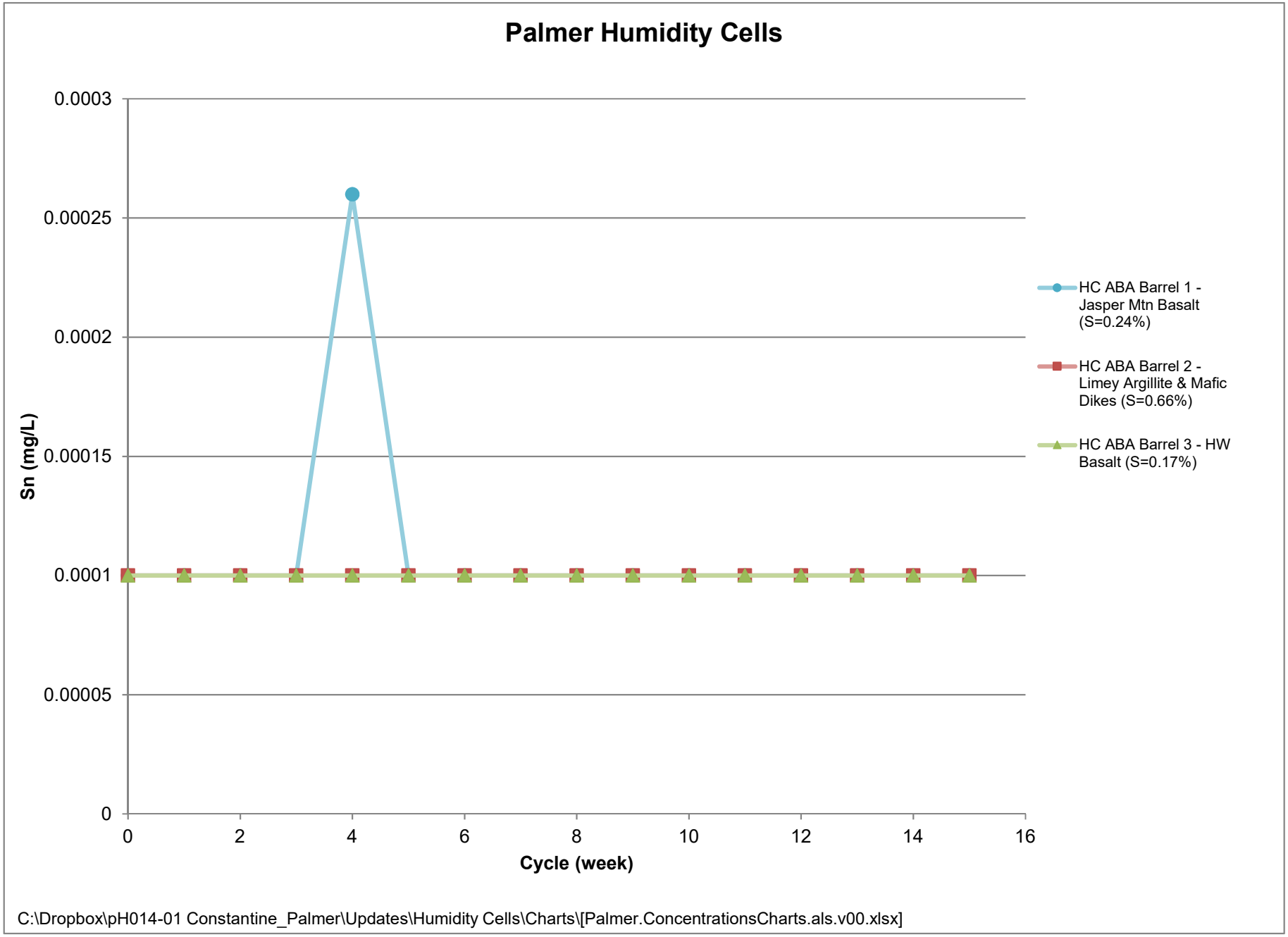

Palmer Humidity Cells
0.00003
0.000025
0.00002
0.000015
0.00001
0.000005
0
Tl (mg/L)
0
2
4
6
8
10
12
14
16
Cycle (week)
HC ABA Barrel 1 - Jasper Mtn Basalt (S=0.24%)
HC ABA Barrel 2 - Limey Argillite & Mafic Dikes (S=0.66%)
HC ABA Barrel 3 - HW Basalt (S=0.17%)
C:\Dropbox\pH014-01 Constantine_Palmer\Updates\Humidity Cells\Charts\[Palmer.ConcentrationsCharts.als.v00.xlsx]



Palmer Waste Rock Humidity Cell Results

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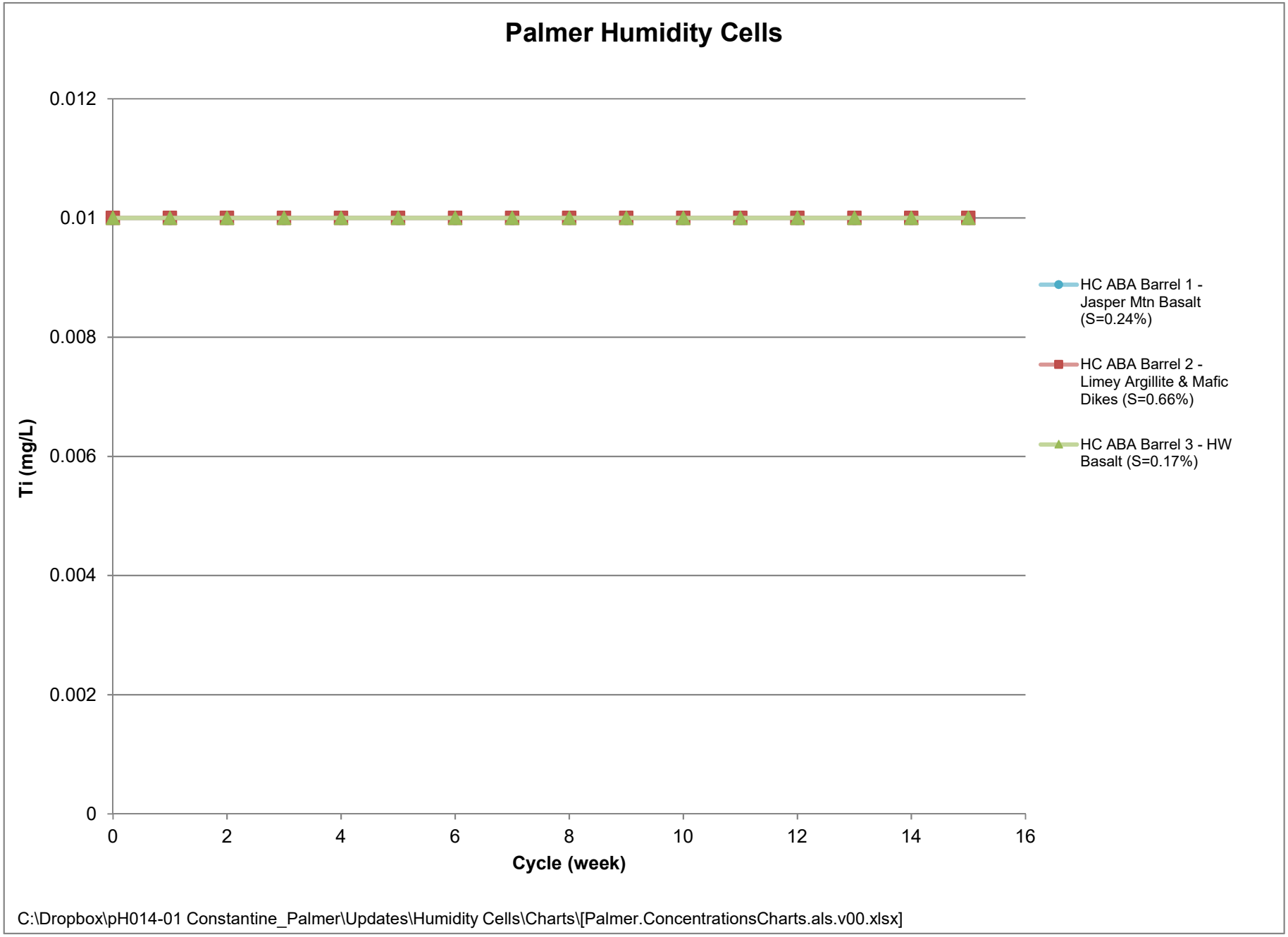
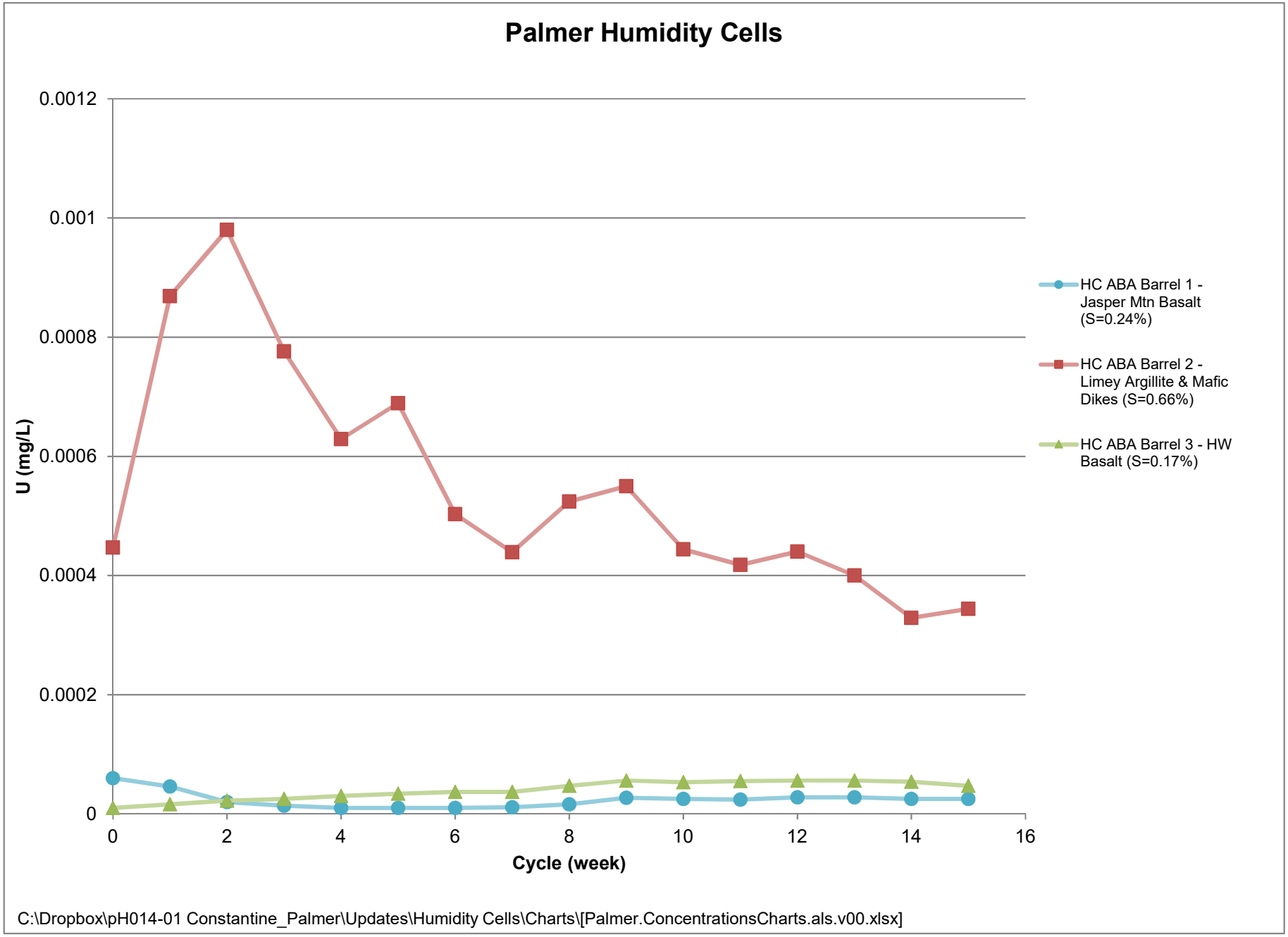

Palmer Humidity Cells
0.012
0.01
0.008
0.006
0.004
0.002
0
Ti (mg/L)
0
2
4
6
8
10
12
14
16
Cycle (week)
HC ABA Barrel 1 - Jasper Mtn Basalt (S=0.24%)
HC ABA Barrel 2 - Limey Argillite & Mafic Dikes (S=0.66%)
HC ABA Barrel 3 - HW Basalt (S=0.17%)
C:\Dropbox\pH014-01 Constantine_Palmer\Updates\Humidity Cells\Charts\[Palmer.ConcentrationsCharts.als.v00.xlsx]



Palmer Waste Rock Humidity Cell Results

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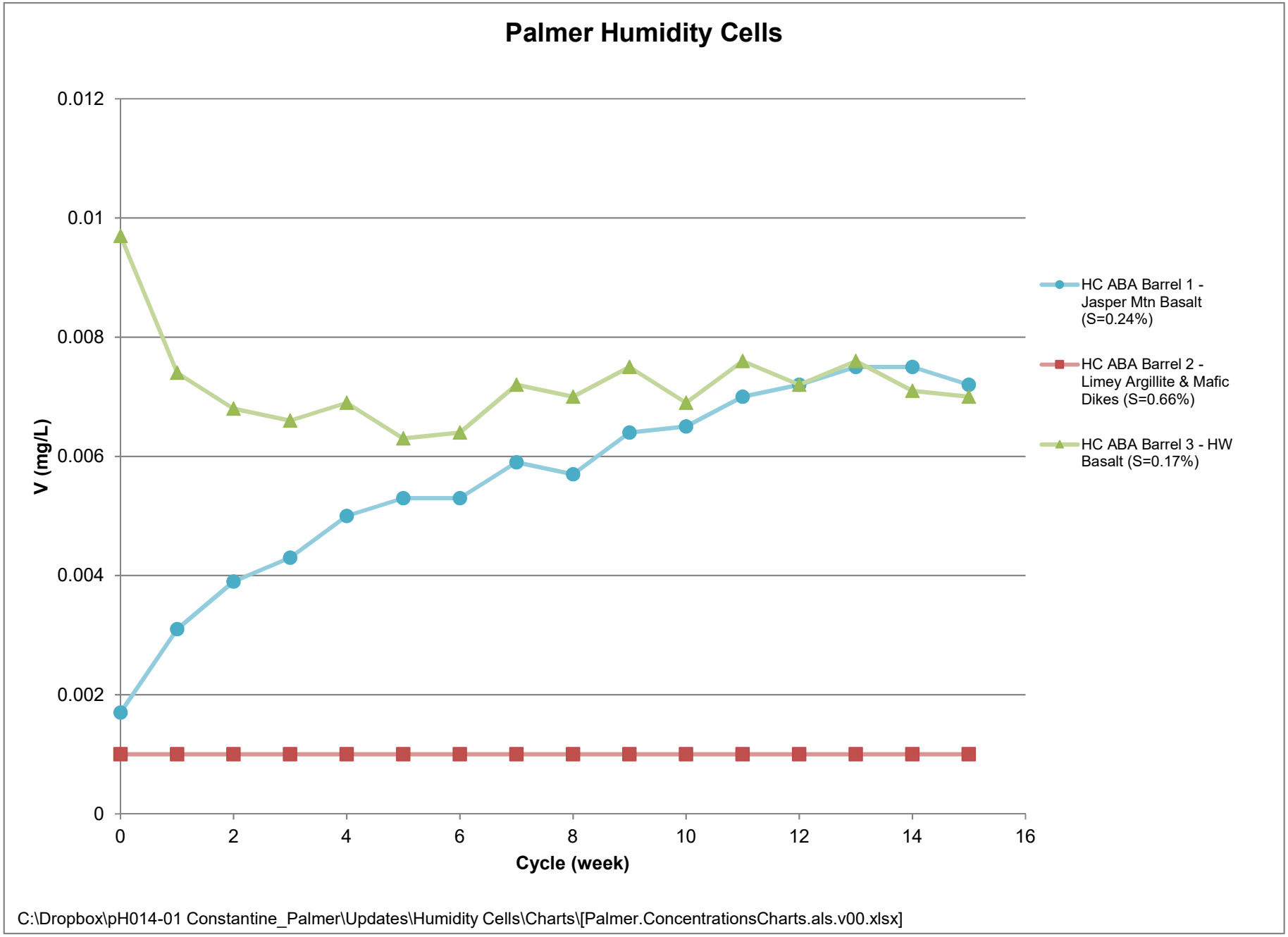

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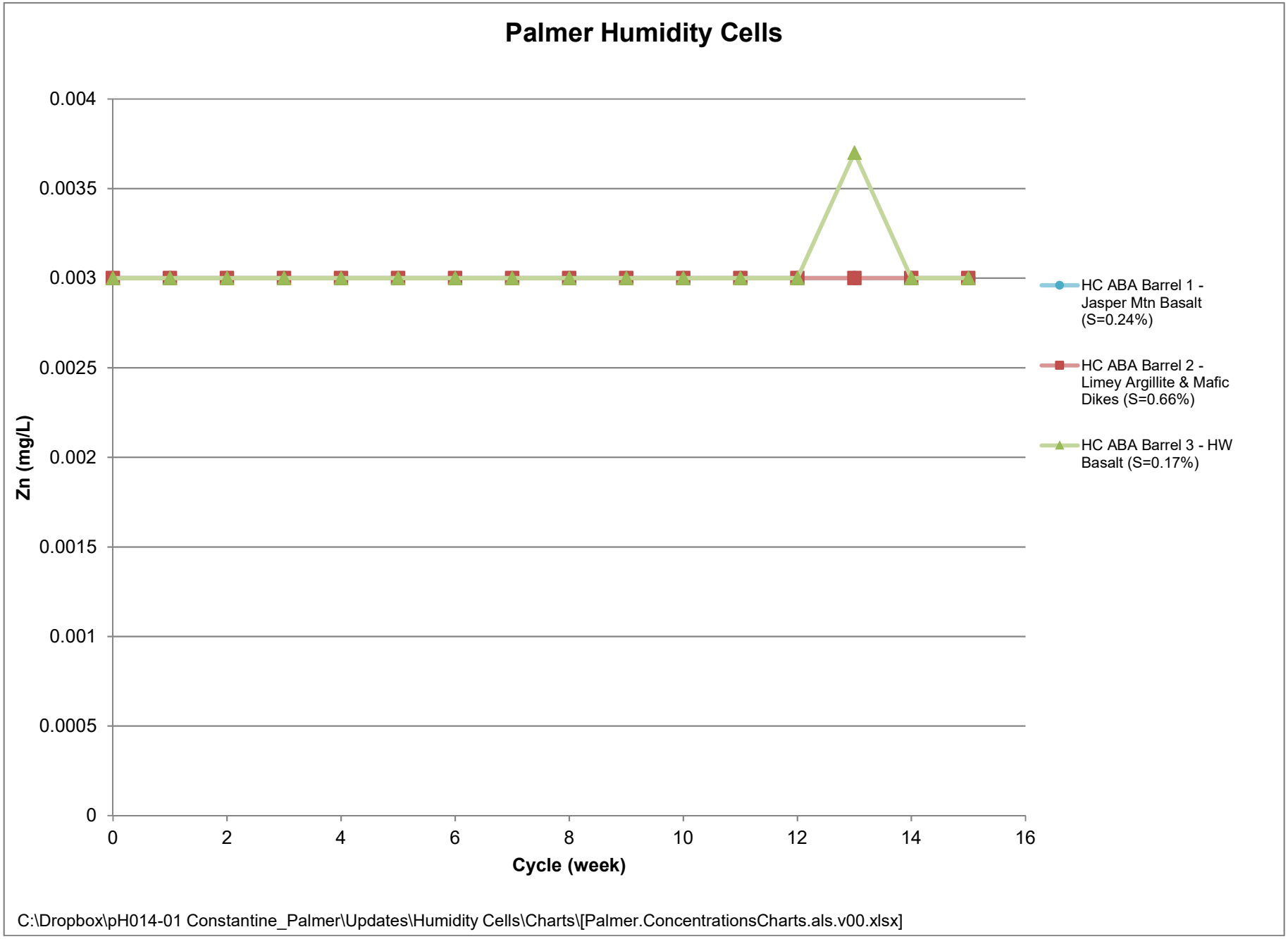

Palmer Waste Rock Humidity Cell Results

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