HECLA GREENS CREEK MINING COMPANY

FRESH WATER MONITORING PROGRAM
ANNUAL REPORT

WATER YEAR 2010

(October 1, 2009 through September 30, 2010)

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EXECUTIVE SUMMARY

This annual report has been prepared by Hecla Greens Creek Mining Company (HGCMC) in accordance with the mine's General Plan of Operations Appendix 1: Fresh Water Monitoring Program (FWMP). Monitoring data interpretative reports are presented for eight surface water and eight groundwater monitoring sites.

Each site's interpretative report summarizes the annual dataset with respect to several goals and objectives outlined in the FWMP. Each report contains a list of any exceptions, omissions or errors that occurred during data collection. The report lists a comparison of each site's annual dataset to all appropriate applicable Alaska Water Quality Standards (AWQS). Finally, a series of summary tables and X-Y graphs have been generated to meet the specific statistical goals for each site.

During the Water Year 2010 a transition was made from the previous FWMP sampling schedule to the recently approved new FWMP sampling schedule. This changed occurred over the January and February 2009 sampling events, and because the water year started in October 2009 the overall sampling schedule for the Water Year 2010 was a hybrid of both schedules. With that in mind all required sampling was accomplished as specified in the monitoring schedule, except for the November sampling of Site 13 (inaccessible) , the February sampling of Site 56 and Site 57 (transitional period), and the May sampling of Site 60 (no flow). For each site the specified analytic suite (P or Q) was performed on the collected samples, however there was some confusion between Battelle Marine Science and HGCMC as to which suites to run during the transitional period. A few sites (6, 48, and 54) were run as Suite Q and not Suite P. Fortunately, Suite Q encompasses all of the same analytes as a Suite P and a few others. Applicable holding times were achieved for all analytes, except pH, which for one of the twelve sample events was not within the applicable hold time. Furthermore, no data points were qualified as outlying.

Several exceedances of Alaska Water Quality Standards (AWQS) occurred in the 920 Area at Site 13, Site 48, Site 54, and Site 6. The two exceedances at Site 13 were for total sulfate which had values of 265 mg/L and 271 mg/L. These values were slightly above the AWQS limit of 250 mg/L, and comparable to data seen in previous water years. It is HGCMC intention to remove approximately 20,000 cubic yards of waste rock from the 1350 area during the 2011 summer season. Though much material has already been removed from this site in the past it was not located in the drainage that affects Site 13. The other exceedances were recorded at Site 48, Site 6, and Site 54 for low pH values. Of these values only one was not a laboratory pH value. Frequently laboratory pH values differ from the field pH values. In general much consideration has not been give to this fact because both values are normally above the lower limit. However, as the overall pH of the stream decreases these small discrepancies can mean the difference between being in or out of compliance. HGCMC plans to investigate this discrepancy.

Exceedances in the tailings area were noted for low pH, low alkalinity, and elevated levels of arsenic, and lead. The shallow wells (sites 58, 27, 29, and 32) continued to display a long history of exceedances due to the low pH, low alkalinity water that characterize these sites. Four exceedances for dissolved lead occurred at two of the three down gradient shallow wells (sites 29 and 32). These exceedances continue the recent history of low to moderate levels of lead that may in part be due to minor amounts of tailings escaping the containment controls around the impoundment due to fugitive dust or tracking. The single deep, downgradient well, Site 28, had three exceedances for arsenic. This is a continuation of the trends established in prior years with elevated arsenic levels that are naturally associated with the marine unit that the well is completed in. Of the remaining two sites, Site 60 had exceedances for low alkalinity, low pH, and elevated mercury. This site's watershed was disturbed with the construction of Pond 7; as the area recovers the water is returning to the naturally low pH and low alkalinity characteristic of the area. It has been theorized that the disturbance resulted in the watershed going from being naturally acidic to alkaline. This change in fundamental chemistry is thought to have caused the naturally occurring, low level, dissolved mercury to adsorb onto soil particles. Now as the area reverts to the natural state of low pH and low alkalinity, this abundance of adsorbed mercury may be dissolving back into solution, resulting in the temporary mercury increase. After this disturbance mercury concentrations had continued to increase yearly until WY09, which had shown a decrease in concentration. Unfortunately, this trend did not continue in the current water year, with the highest measurement recorded occurring in September 2010. However, the first sampling (November 2010) of this site during the current water year (WY2011) had a measured value half of the AWQS. The next sampling is expected to occur in May 2011.

The final site, Site 9, had exceedances for low alkalinity and low pH. The alkalinity values appear to be characteristic of the site since monitoring restarted in WY2006, whereas the lower pH values have been recorded in the most recent two water years (WY2009 & WY2010). The low alkalinity values are expected given the naturally occurring acidic muskeg conditions in the headwaters near Site 27 and Site 28.

Graphical and non-parametric analyses for trends in the data were performed for all sites monitored. Statistically significant trends were identified for twelve sites: Site 48, downward trends in pH and total alkalinity, and an upward trend in dissolved zinc; Site 6, downward trends in pH and total alkalinity, and an upward trend in dissolved zinc; Site 54, a downward trend in total alkalinity, and an upward trend in dissolved zinc; Site 49, downward trend in total alkalinity, and an upward trend in total sulfate; Site 46, a downward trend in total alkalinity; Site 57, downward trends in dissolved zinc, total alkalinity, total sulfate, and upward trends in conductivity and pH; Site 56, downward trend in total alkalinity; Site 13, downward trend in total alkalinity, and an upward trend in pH; Site 27, an upward trend in conductivity and total sulfate; Site 29, a downward trend in total alkalinity; Site 59, an upward trend in conductivity and total sulfate; and Site 28, an upward trend in conductivity.

Site 48, Site 49, Site 57, Site 58, and Site 59 are considered upgradient control sites and thus the trends are likely due to natural variation. The decreasing trend in pH for Site 6 is not expected to be caused by our activities in the area. Site 54 is downstream from Site 6 and thus is expected to exhibit similar trends. Both the down gradient sites (6 and 54) had similar seasonal lower pH values such as the upgradient site 48. Also, all three Greens Creek sites show a similar low magnitude increasing trend in dissolved zinc. The magnitude of the alkalinity trend for Site 46 is low. The trend in pH for Site 13 was in a favorable decreasing direction; though total alkalinity is trending down. Changes in alkalinity at Site 29 continue a long-term trend of slowly decreasing alkalinity established since 1990. The increasing sulfate values measured at Sites 27 and 59 are of low magnitude, along with the increasing trends in conductivity. The decreasing trends in total alkalinity and total sulfate at Site 60 were expected to occur as the site returned to pre-disturbance conditions.

A non-parametric comparison of medians was performed for all the appropriately paired surface (48-6, 6-54, and 49-46) and groundwater (57-56) sites around the 920 area. Significant differences were noted for the paired datasets from Greens Creek (48-6) for conductivity, pH, sulfate, and dissolved zinc. These differences have all been noted in previous annual reports and do not appear to be increasing in magnitude. Also, there were significant differences for the paired dataset (6-54) from Greens Creek for conductivity, and pH. The was no trend for the alkalinity and sulfate data. However the dissolved zinc values trended in a favorable direction, and may reflect the work that has been done in the area in recent years (*i.e.* B pond and C pond). The Bruin Creek sites (49 and 46) had significant differences in pH values. Though this is not in a favorable direction a comparison of the other analytes (alkalinity, conductivity, sulfate, and zinc) indicates that these sites are still relatively similar to each other. If HGCMC activities at the 920 Mill site and Site23/D were having a negative impact on the Bruin Creek watershed, trends would be expected in the other analytes as well.

INTRODUCTION

This annual report for Water Year 2010 (October 1, 2009 through September 30, 2010) provides the information required by the Fresh Water Monitoring Program (FWMP) for the Hecla Greens Creek Mining Company (HGCMC). It is separated into several sections, the first of which provides general information applicable to the entire program, followed by a comprehensive analysis of the data for each specific site.

To avoid confusion data values reported by the laboratory as being below the Method Detection Limit (MDL) are assigned a value of zero for plotting purposes. This is done so that the values below MDL are visually distinct and thus can be properly interpreted. On several of the graphs presented, changes have occurred in MDL over the period shown. This leads to the visual impression that an upward trend exists when in fact the older analysis had MDL greater than ambient background levels. For the current Water Year's data the actual MDLs for non-detect values are listed in each site's table of results in the interpretative discussion of this report. For prior Water Year's historic MDLs please refer to GPO Appendix 1, Table 8-2.

The monitoring schedule varies from site to site and a request for modification was made with the 2008 FWMP report. These modifications were approved and implemented during January and February of the Water Year 2010. Different sites are monitored for different analytes on different months of the year. Occasionally, sites scheduled for sampling may not be available due to weather or more rarely operational reasons. Copies of the Water Year 2010 sampling log are included on page 6 of this section and any variations from scheduled sampling events are noted on each site's table of results presented in the interpretive section.

The adjacent table outlines the requested Statistical Information Goals (SIGs) for each site sampled during the Water Year 2010. A comparison to Alaska Water Quality Standards (AWQS) is required for all sites. In Appendix A the specific water quality criteria used for each comparison are summarized. Trend analysis is carried out by two different methods. The first method is a visual trend analysis for each analyte. For each site sampled a series of time-concentration graphs are constructed for the previous five years of data collected. The second method is a non-parametric statistical method, Kendall seasonal trend analysis that is

Site	Description	AWQS Comparison	Trend Visual	Trend Calc	Calculate Median	Median Comparison
48	Upper GC	X	X	+	X	
6	Middle GC	X	X	+	X	48 vs 6
54	Lower GC	X	X	+	X	6 vs 54
49	Upper Bruin Crk	X	X	+	X	
46	Lower Bruin Crk	X	X	+	X	49 vs 46
13	1350 Audit	X	X	+	X	
57	MW-23-00-03	X	X	+	X	
56	MW-D-00-01	X	X	+	X	57 vs 56
58	MW-T-00-01C	X	X	+	X	
27	MW-2S	X	X	+	X	**
29	MW-3S	X	X	+	X	**
32	MW-5S	X	X	+	X	**
59	MW-T-00-1A	X	X	+	X	
28	MW-2D	X	X	+	X	**
9	Tributary Crk	X				**
60	Althea Crk Lower	X				**

+: Addional statitical trend analysis done for conductivity, pH, alkalinity, dissolved zinc.

**: Insufficient Data for a robust statistical evaluation routinely done for conductivity, pH, alkalinity, and dissolved zinc. These are the key parameters along with sulfate that can be strongly affected by Acid Mine Drainage (AMD). Sulfate was added back into the required list of analytes in the 2002 Water Year. Median calculation is shown in the annual table of results for each site. Finally, for all down gradient sites that are paired with an upgradient reference site, which are monitored with a frequency greater than 4 times per year, a comparison of medians is presented for each specific site. These down gradient sites (upgradient site in parenthesis) include Site 6 (Site 48), Site 54 (Site 6), Site 46 (Site 49), and Site 56 (Site 57). For each of these sites, the statistical information goals requested a comparison of medians for total alkalinity, pH, conductivity, total sulfate and dissolved zinc. The statistical test utilized is a non-parametric, Wilcoxon signed-rank test. A brief summary of the two main statistical procedures, the Wilcoxon-Mann-Whitney rank sum test and the Mann-Kendall seasonal trend are given below.

Statistical Tests

The Mann-Kendall seasonal trend test is a non-parametric test for zero slope of a linear regression of time-ordered data verse time. Briefly the test consists of tabulating the Mann-Kendall statistic S_k (k=1 to 12, for each month) and its variance VAR(S) for data from each season (month). The S_k statistic is simply the sum of the number of positive differences minus the number of negative differences for time ordered data pairs. Any seasonal trend is removed by only considering data pairs taken within the same month. The individual monthly Mann-Kendall statistics (S_k) are tested for homogeneity of trend which is used to determine if it is reasonable to combine the monthly S_k statistics into an overall annual statistic (ΣS_k). If the test for monthly homogeneity is rejected the annualize statistic is not meaningful. However, the individual monthly Mann-Kendall statistics can still be tested for trend and a Sen's slope estimator can be calculated for each month (noted as Q_m in the interpretive section) with a significant trend.

The advantages of the Seasonal Kendall trend test is that it is a rank-based procedure especially suitable for non-normally distributed data, censored data, data containing outliers and non-linear trends. The null hypothesis (H_0) states that the data(x_1, ., x_n) are a sample of n independent and identically distributed random variables. The trend test statistic Z is used as a measure of trend magnitude, or of its significance. A positive Z value indicates an upward trend while a negative value indicates a downward trend. However, the Z statistic is not a direct quantification of trend magnitude. For trend of significant magnitude a separate statistic, Sen's slope estimator, is calculated by computing the seasonally adjusted (monthly) median value for the slope. For datasets which fail the homogeneity test, individual monthly S_k statistics are compared to a theoretical probability distribution of S derived by Mann and Kendall (Table A18 in Gilbert, 1987). Further guidance and background on these statistical methods can be found in Gilbert (1987) or Helsel and Hirsch (1992).

The Wilcoxon signed-rank test is used to determine if the median difference between paired data points is equal to zero. In general terms the signed-rank is used to determine if a set of paired data observations, x's and y's, come from the same population (i.e. have the same median) or as the alternative hypothesis differ only in the location of the central value (median). If the data are from the same population then the differences of the paired data should be equally distributed around 0, or about half the differences should be greater than 0 and half should be less than 0. Computationally the test is straight forward. First the differences $D_i=x_i-y_i$,i=1…N are computed for each pair. The absolute values of the differences $|D_i|$, i=1…N are ranked from smallest to largest and data pairs that are tied, thus having differences of zero, are ignored. The ranks of the absolute differences are assigned the sign of the actual differences. For example, negative differences have negative-signed ranks and positive differences have positive-signed ranks thus the term "signed-rank" in the method name. The test statistic W^+ is the sum of all positively signed ranks. The statistic W^+ is then compared to tabled values that vary based on N. The one-tailed version of the signed-rank test has been applied to the key indicator analytes of conductivity, pH, total alkalinity, sulfate, and dissolved zinc as listed in the table below.

Analyte	**Rationale**	**median |D|**	**Tail**	**Reject H_0 if:**
Specific Conductance	Conductivity, as a proxy for total dissolved solids, **increases** due to sulfide oxidation.	<0	X's **<** Y's	$W^+(calc) < W(table)_{\alpha,n}$
Lab-pH	pH **decreases** though the addition of H^+ generated by pyrite oxidation.	>0	X's **>** Y's	$W^+(calc) > W(table)_{\alpha,n}$
Total Alkalinity	Total alkalinity **decreases** by consumption of buffing capacity due to H^+ produced by pyrite oxidation.	>0	X's **>** Y's	$W^+(calc) > W(table)_{\alpha,n}$
Total Sulfate	Total sulfate **increases** due to oxidation of sulfides	<0	X's **<** Y's	$W^+(calc) < W(table)_{\alpha,n}$
Dissolved Zinc	Dissolved zinc **increases** due to sulfide oxidation and is more readily soluble at neutral pH than other metals.	<0	X's **<** Y's	$W^+(calc) < W(table)_{\alpha,n}$

X: Upgradient Site

Y: Downgradient Site

Further guidance and background on the statistical methods utilized in this report can be found in one of the following references: Helsel and Hirsch (1992), Gilbert (1987), or Section 3.3.3.1 of the EPA document "Guidance for Data Quality Assessment" EPA/600/R-96/084.

Qualified Data by QA Reviewer - Reports provide a summary for each site section of data limitations found in the monthly QA reviews. They list all data for that site that was qualified by the QA Reviewer for Water Year 2010 along with the reason for qualification. These data are all included in the data analyses, unless also identified as an outlier in the Qualified Data Summary.

INTERVENTIONS

This section identifies below any procedural changes, natural phenomena, mine operational changes, or other interventions that could possibly have affected data during Water Year 2010. Results of any visual data analyses to detect evident effects of these interventions are so indicated.

Prior interventions (and negotiated mid-year program modifications such as changes to laboratories, methods, detection limits, and reporting limits), and anything else which may affect data comparability and quality which occurred during previous Water Years, are documented in the “General History” section of the FWMP and in previous annual reports.

There has been an error in the graphical labeling found in the 2004-2009 annual reports. It was recently noticed that on most of the graphs, the line indicating the AQWS is labeled as ‘total’. Most of the analytes in this report are dissolved and HGCMC is held to the dissolved AQWS. All analyses have been dissolved during this timeframe, so the graphs were mislabeled and should read ‘dissolved’. After reviewing the yearly files it appears that HGCMC was using total standards prior to 2003 when the change was made to using the dissolved standards. This change resulted in modifying the limits and also the graph labels, both of which were correctly done in 2003. Unfortunately, in 2004-2009 both of these modifications were not carried over. This error in the labeling has been corrected in the current 2010 FWMP report.

All required sampling was accomplished as specified in the monitoring schedule, except for the November sampling of Site 13 (inaccessible), the February sampling of Site 56 and Site 57 (transitional period), and the May sampling of Site 60 (no flow).

MID-YEAR MODIFICATIONS

Hecla Greens Creek Mining Company modified the Fresh Water Monitoring Program sample schedule during the months of January and February 2010. These changes were made in accordance with the changes proposed in the 2008 FWMP report: approval to implement these changes came in January 2010. As a result of the mid-year modification the sampling schedule for the 2009 FWMP was a hybrid of the previous schedule and the proposed new schedule. There were a few glitches during the transition and not all of the proposed sampling was carried out in February (Site 56 and Site 57 were not sampled). Furthermore, the January sampling events were sampled as Suite Q and not as Suite P. After this transitional period there were no more errors with the sampling events and the new schedule was fully in place by March 2011.

FWMP SAMPLE LOG

Water Year October 2009 Through September 20010

Annual Water Quality Monitoring Schedule-Laboratory Samples

Site	Site Name	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
6	Middle Greens Creek	10-20 P	11-17 P	12-08 Q	01-12 Q	02-16 Q	03-16 P	04-06 P	05-11 P	06-15 P	07-13 P	08-03 P	09-14 P
9	Tributary Creek-Lower								05-11 Q		07-13 P,R		09-14 Q
13	Mine Adit Discharge East	10-20 Q	Q						05-11 Q			08-03 Q	
27	Monitoring Well 2S								05-11 Q		07-15 Q		09-21 Q
28	Monitoring Well 2D								05-11 Q		07-15 Q		09-21 Q
29	Monitoring Well 3S								05-11 Q		07-15 Q		09-21 Q
32	Monitoring Well 5S								05-11 Q		07-15 Q		09-21 Q
46	Lower Bruin Creek	10-20 P	11-17 P	12-08 Q		02-16 Q			05-11 P			08-03 P	
48	Upper Greens Creek	10-20 P	11-17 P	12-08 Q	01-12 Q	02-16 Q	03-16 P	04-06 P	05-11 P	06-15 P	07-13 P,R	08-03 P	09-14 P
49	Control Site Upper Bruin Creek	10-20 P	11-17 P	12-08 Q		02-16 Q			05-11 P			08-03 P	
54	Greens Creek below D-Pond	10-20 P	11-17 P	12-08 Q	01-12 Q	02-16 Q	03-16 P	04-06 P	05-11 P	06-15 P	07-13 P,R	08-03 P	09-14 P
56	Monitoring Well-D-00-01	10-20 Q	11-17 Q			Q			05-11 Q			08-03 Q	
57	Monitoring Well-23-00-03	10-20 Q	11-17 Q			Q			05-11 Q			08-03 Q	
58	Monitoring Well-T-00-01C								05-11 Q		07-13 Q		09-21 Q
59	Monitoring Well-T-00-01A								05-11 Q		07-13 Q		09-21 Q
60	Althea Creek Lower								05-11 Q		07-13 P		09-14 P
	Field Blank @ Site	56	46	6	48	49	54	56	59	13	9	57	32

Date / Suite	Regular monthly sample
Date / Suite (blue)	No Sample taken due to ice
Date / Suite (yellow)	Wrong Suite sampled
(hatched)	Transitional period
Date / Suite (orange)	No Sample taken due to lack of access (snow).
Date / Suite (pink)	No Sample taken due to lack of flow
Date / Suite (green)	Accidentally not sampled (transitional period)

SAMPLE SUITES

Suite P
(Surface water only)

Conductivity
pH
Temperature
Hardness
Sulfate
Total Alkalinity
Dissolved Arsenic
Dissolved Cadmium
Dissolved Copper
Dissolved Lead
Dissolved Mercury
Dissolved Zinc

Suite Q
(Groundwater and surface water)

Conductivity
pH
Temperature
Hardness
Sulfate
Total Alkalinity
Dissolved Arsenic
Dissolved Barium
Dissolved Cadmium
Dissolved Chromium
Dissolved Copper
Dissolved Lead
Dissolved Mercury
Dissolved Nickel
Dissolved Selenium
Dissolved Silver
Dissolved Zinc

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PROPOSED PROGRAM MODIFICATIONS

Hecla Greens Creek Mining Company proposes to change the Fresh Water Monitoring Program sampling suite for Site 60 'Lower Althea'. It is common to have limited/no water flow at Site 60 throughout the sampling season. Currently, the May FWMP sampling event calls for a Suite Q and the rest of the sampling events are Suite P. Unfortunately, when there is no water flow in May the more extensive Suite Q is not collected, as happened during the 2010 FWMP program. To prevent this loss of data HGCMC is proposing to change the July and September samplings from Suite P to Suite Q. A review of the sampling schedule shows that the only other site (Site 13) at risk for being dry is already only sampled for Suite Q.

With the expansion of the tailings facility to the east of its current position, the two upgradient monitoring wells Site 58 and Site 59 are now within the new tailings boundary. During the 2010 summer drill program two new upgradient wells (MW-T-10-08A, MW-T-10-08B) were installed approximately 400 feet upslope and to the north. These wells were installed under consultation with EDE Consultants as replacements for Site 58 and Site 59. HGCMC proposes to develop these wells during the 2011 sampling season and sample them for Suite Q during the months of May, July, September, and November. Results of these sampling events will be presented in the following year's FWMP report. It is HGCMC's intention to monitor both the current wells and the new wells for the next two years. Next year, based on the sampling results, a proposal will be made to change the regulatory monitoring to these two new wells.

These proposed modifications will allow HGCMC to maintain their commitment to the continued success of the Fresh Water Monitoring Program. Once comments are received from the agencies on these proposed changes, HGCMC will initiate the formal process of requesting the changes as per GPO Appendix 1, FWMP, Section 13.

BIBLIOGRAPHY

Environmental Protection Agency (1998). *EPA Guidance for Data Quality Assessment.* EPA QA/G-9, EPA/600-R-96/084. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C. 219 pp.

Gilbert, Richard O. (1987). *Statistical Methods for Environmental Pollution Monitoring.* Van Nostrand Reinhold, New York. 320 pp.

Helsel, D.R., and Hirsch, R.M. (1992). *Statistical methods in water resource.* Elsevier Publishers, Amsterdam. 510 pp.

INTERPRETIVE REPORT
SITE 46 "LOWER BRUIN CREEK"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 20010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. No results exceeding these criteria have been identified as listed in the table below.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
No exceedances have been identified by HGCMC for the period of Oct-09 though Sept-10.					

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There was an identifiable trend in dissolved chromium. Between Water Year 2009 and Water Year 2010 there was roughly an order of magnitude increase in the dissolved chromium concentration. A similar increase was also noted for Site 6, Site 13, Site 46, Site 48, Site 49, and Site 54; all sites that are located in the 920 area.

A non-parametric statistical analysis for trend was performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented on the pages following this interpretive section. The following table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). Datasets with a statistically significant trend ($\alpha/2$=2.5%) a

Site 46-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.44	0		
pH, Lab	6	0.27	0		
Alkalinity, Total	6	**0.01**	-	-1.44	-2.4
Sulfate, Total	6	0.78	0		
Zinc, Dissolved	6	0.91	0		

(1): Number of years (2):Significance level

Seasonal-Sen's Slope estimate statistic has also been calculated.

The dataset for total alkalinity has a statistically significant ($p = 0.01$) negative trend with a slope estimate of -1.44 mg/L/yr or a -2.4% decrease over the period. This trend is similar in magnitude and direction as noted for the upgradient control Site 49 and therefore is interpreted as natural variation.

A comparison of median values for alkalinity, laboratory pH, laboratory conductivity, sulfate, and dissolved zinc between Site 49 and Site 46 has been conducted as specified in the Statistical Information Goals for Site 46. Additionally, X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 46 and Site 49, the upstream control site, to aid in the comparison between those sites. Calculation details of the non-parametric signed-rank tests are presented in detail on the pages following this interpretive section. The below table summarizes the results of the signed-rank test as performed on the Water Year 2010 data set. For all of the analytes, except pH, there were no statistically significant differences between the measured median values at a significance level of α=0.05 for a one-tailed test.

Site 46 vs Site 49 - WY2010, summary statistics for median analysis.

Parameter	Signed Ranks p-value	Site 49 median	Site 46 median	Median of Differences
Conductivity, Lab	0.16	152	154	-1.0
pH, Lab	**0.97**	7.74	7.58	0.21
Alkalinity, Total	0.00	59.8	61.4	-1.0
Sulfate, Total	1.00	12.9	12.6	0.3
Zinc, Dissolved	0.95	2.21	2.00	0.37

The median values for pH for Site 46 and Site 49 are 7.74 su and 7.58 su respectively and the median of differences, Site 49 minus Site 46, is 0.21 su. This pattern has occurred in 5 of the last 6 FWMP reports (WY 2004 – WY 2010) and has been consistent in the difference between the sites. Given the low magnitude of the difference and the yearly consistency in the difference, this variation is considered a part of the natural variation that can be expected for this type of monitoring.

Table of Results for Water Year 2010

Site48 "Upper Greens Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	12/8/2009	1/12/2010	2/16/2010	3/16/2010	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	3.6	0.9	0.2	0.7	1.6	0.6	0.9	4.1	4.6	6.7	9.7	6.8	2.6
Conductivity-Field(µmho)	129	111	146	93	124	141	127	107	85	92	100	125	118
Conductivity-Lab (µmho)	119	124 J	137	104	115	129	129	103	87	95	105	130	117
pH Lab (standard units)	7.82	7.52 J	7.64	7.54	6.87	7.14	6.83	7.95	6.87	6.45	7.70	6.72	7.33
pH Field (standard units)	7.41	7.24	7.17	6.63	7.20	7.29	7.01	7.67	7.08	6.95	7.08	6.72	7.13
Total Alkalinity (mg/L)	42.2	45.6 J	48.4	41.4	41.0	45.7	43.3	36.5	32.5	34.1	39.3	48.9	41.8
Total Sulfate (mg/L)	13.8	16.1	17.0	13.4	13.0 J	15.4	15.5 J	10.0	8.7	9.2 J	10.8 J	14.5	13.6
Hardness (mg/L)	61.8	60.8	65.5	51.1	58.5	63.7	63.1	47.4	40.6	46.7	50.8	62.9	59.7
Dissolved As (ug/L)	0.242	0.209	0.205	0.187	0.185	0.234	0.202	0.202	0.216	0.242	0.265	0.234	0.213
Dissolved Ba (ug/L)			28.7	22.2	24.6								24.6
Dissolved Cd (ug/L)	0.0412	0.0418	0.0397	0.0362	0.0340	0.0388	0.0367	0.0307	0.0323	0.0342	0.0356	0.0411	0.0365
Dissolved Cr (ug/L)			1.850	1.890	2.420								1.890
Dissolved Cu (ug/L)	0.418	0.451	0.403	0.536 U	0.652 U	0.601	0.570	0.322	0.215 U	0.272	0.275	0.328	0.411
Dissolved Pb (ug/L)	<0.0030	0.0032 U	0.0030 U	0.0070 U	0.0060 U	0.0040	0.0086 U	<0.0030	0.0071 U	0.0030 J	0.0169 U	<0.0060	0.0036
Dissolved Ni (ug/L)			1.060	0.685	1.090								1.060
Dissolved Ag (ug/L)			<0.003	<0.003	<0.003								0.002
Dissolved Zn (ug/L)	3.40	3.87 U	3.73	3.39 U	4.02 U	3.51	3.12	2.80	2.60 U	2.69	2.40 U	2.75	3.26
Dissolved Se (ug/L)			1.290	0.735	0.864 J								0.864
Dissolved Hg (ug/L)	0.000667	0.000669	0.000607	0.001210	0.001180	0.001000	0.001200 U	0.000761	0.001200 U	0.000797 U	0.000608 U	0.000586 U	0.000779

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
48	11/17/2009	12:00 AM				
			Alk Tot,mg/l	45.6	J	Temperature Exceedance
			Cond, µs/cm	124	J	Temperature Exceedance
			Pb diss, µg/l	0.00323	U	Field Blank Contamination
			Zn diss, µg/l	3.87	U	Field Blank Contamination
			pH Lab, su	7.52	J	Hold Time Violation
48	12/8/2009	12:00 AM				
			Pb diss, µg/l	0.00302	U	Field Blank Contamination
48	1/12/2010	12:00 AM				
			Cu diss, µg/l	0.53	U	Field Blank Contamination
			Pb diss, µg/l	0.00695	U	Field Blank Contamination
			Zn diss, µg/l	3.39	U	Field Blank Contamination
48	2/16/2010	12:00 AM				
			Cu diss, µg/l	0.652	U	Field Blank Contamination
			Pb diss, µg/l	0.00595	U	Field Blank Contamination
			Se diss, µg/l	0.864	J	LCS Recovery
			Cu diss, µg/l	0.601	U	Field Blank Contamination
			Pb diss, µg/l	0.00396	U	Field Blank Contamination
			Zn diss, µg/l	3.51	U	Field Blank Contamination
			SO4 Tot, mg/l	15.4	J	Sample Receipt Temperature
48	4/6/2010	2:33 PM				
			Hg diss, µg/l	0.0012	U	Field Blank Contamination
			Pb diss, µg/l	0.00856	U	Field Blank Contamination
			Hg diss, µg/l	0.000761	U	Field Blank Contamination
			Pb diss, µg/l	-0.003	U	Field Blank Contamination
			SO4 Tot, mg/l	10	J	Sample Temperature
48	6/15/2010	12:00 AM				
			Cu diss, µg/l	0.215	U	Field Blank Contamination
			Hg diss, µg/l	0.0012	U	Field Blank Contamination
			Pb diss, µg/l	0.0071	U	Field Blank Contamination
			Zn diss, µg/l	2.6	U	Field Blank Contamination
48	7/13/2010	9:48 AM				
			Hg diss, µg/l	0.000797	U	Field Blank Contamination
			Pb diss, µg/l	0.00301	J	Below Quantitative Range
			SO4 Tot, mg/l	9.2	J	Sample Reciept Temperature

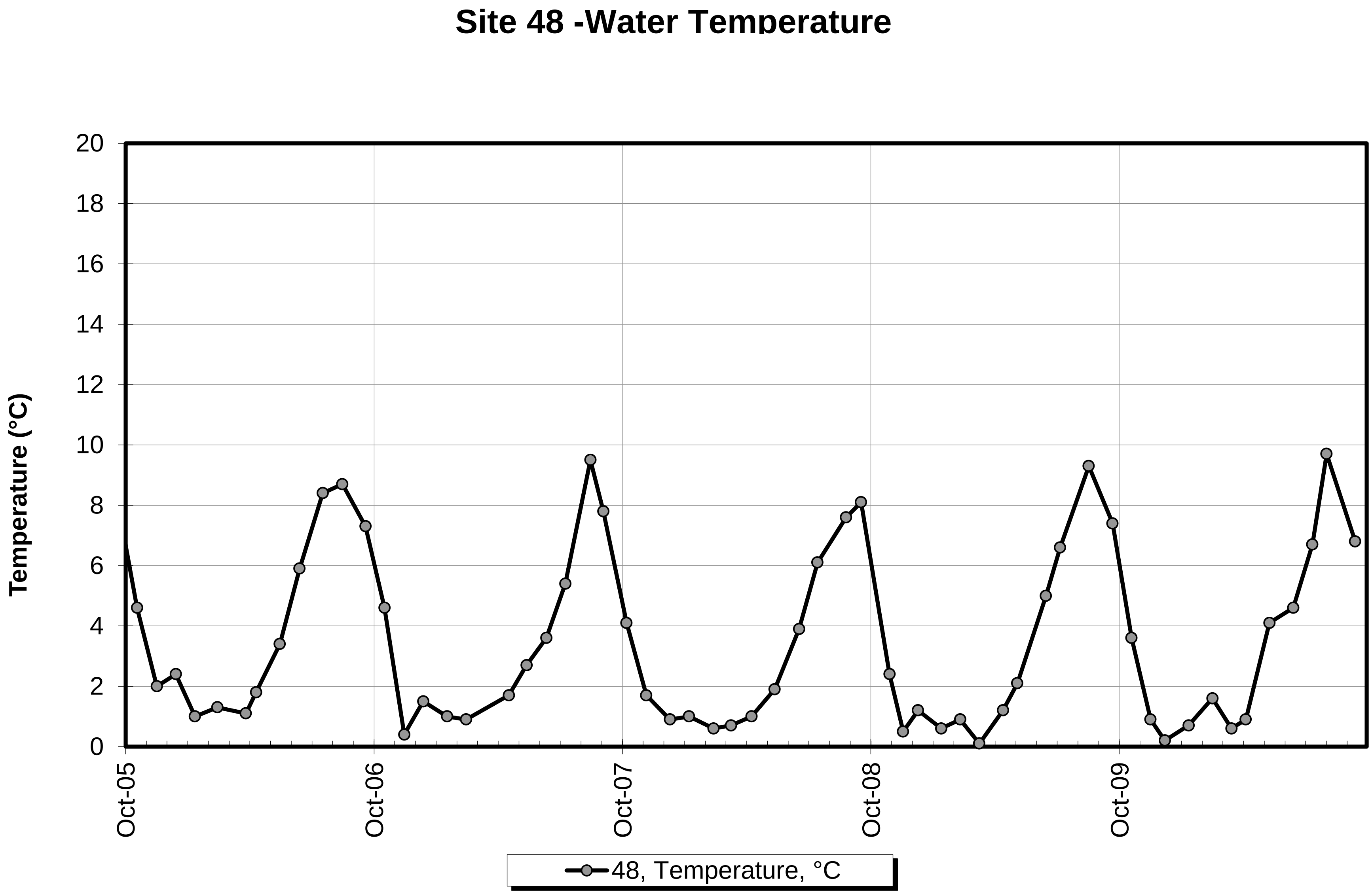
Qualifier	**Description**
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

Qualified Data by QA Reviewer

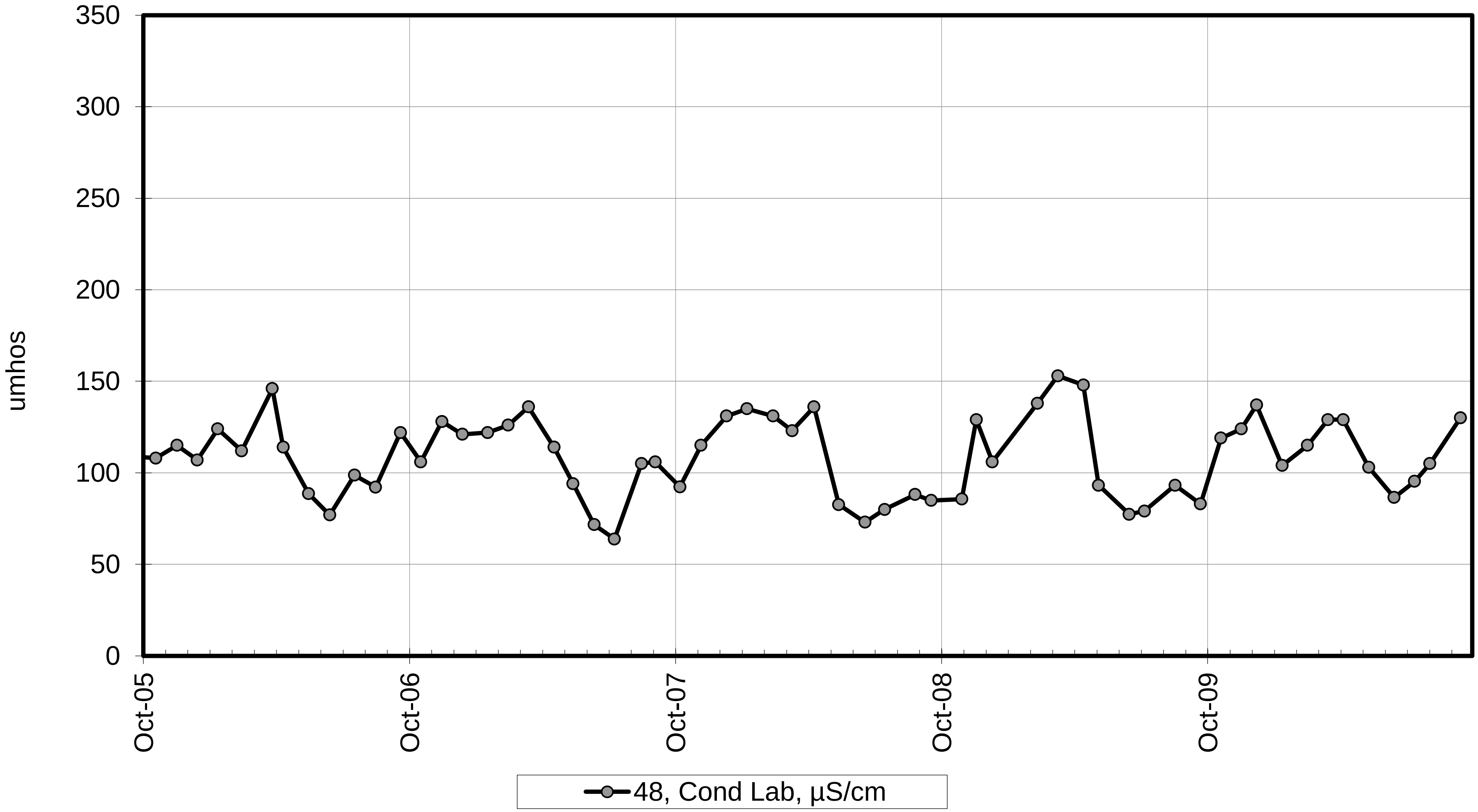
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
48	8/3/2010	12:12 PM				
			Hg diss, µg/l	0.000608	U	Field Blank Contamination
			Pb diss, µg/l	0.0169	U	Field Blank Contamination
			Zn diss, µg/l	2.4	U	Field Blank Contamination
			SO4 Tot, mg/l	10.8	J	Sample Temperature
48	9/14/2010	12:00 AM				
			Hg diss, µg/l	0.000586	U	Trip Blank Contamination

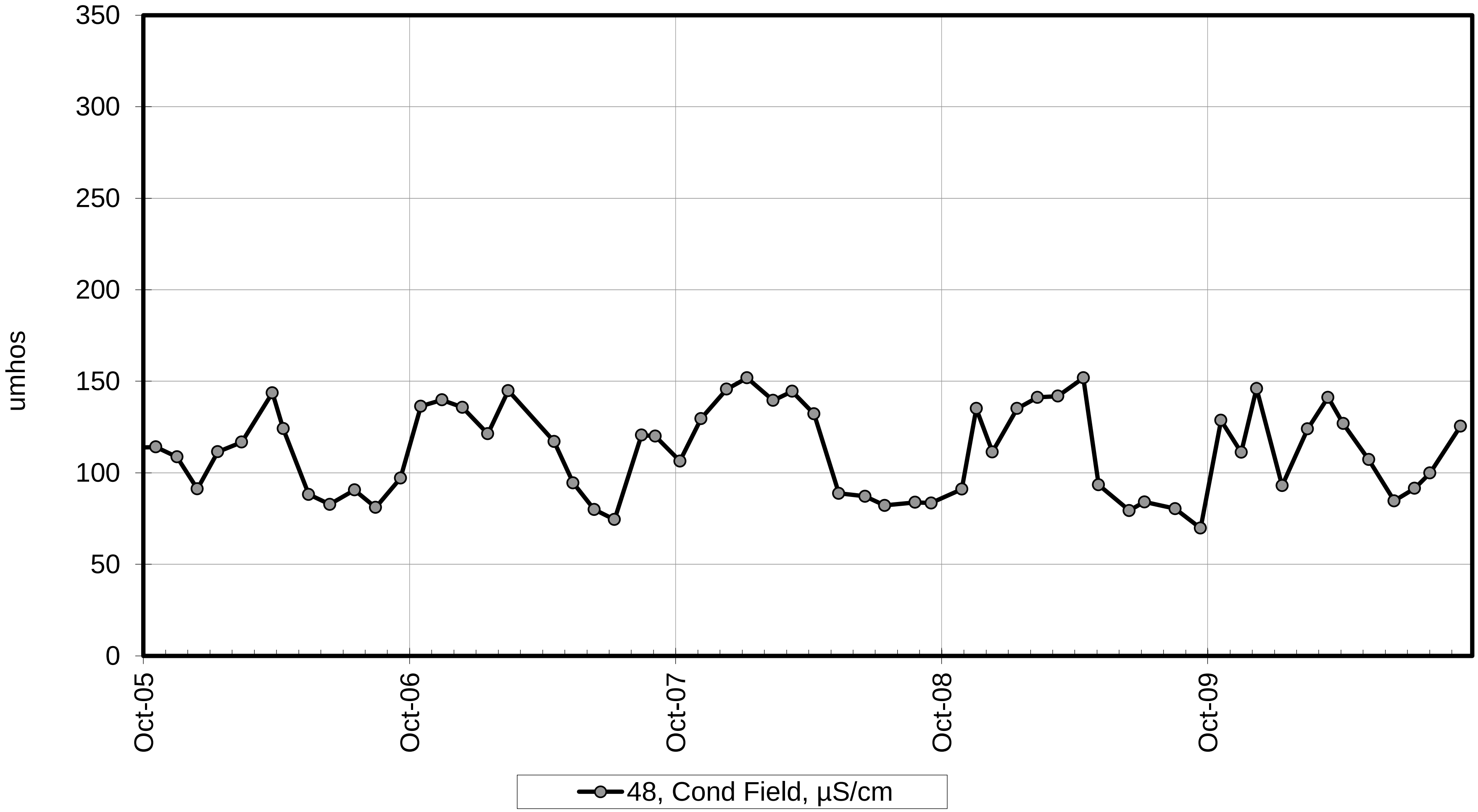
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

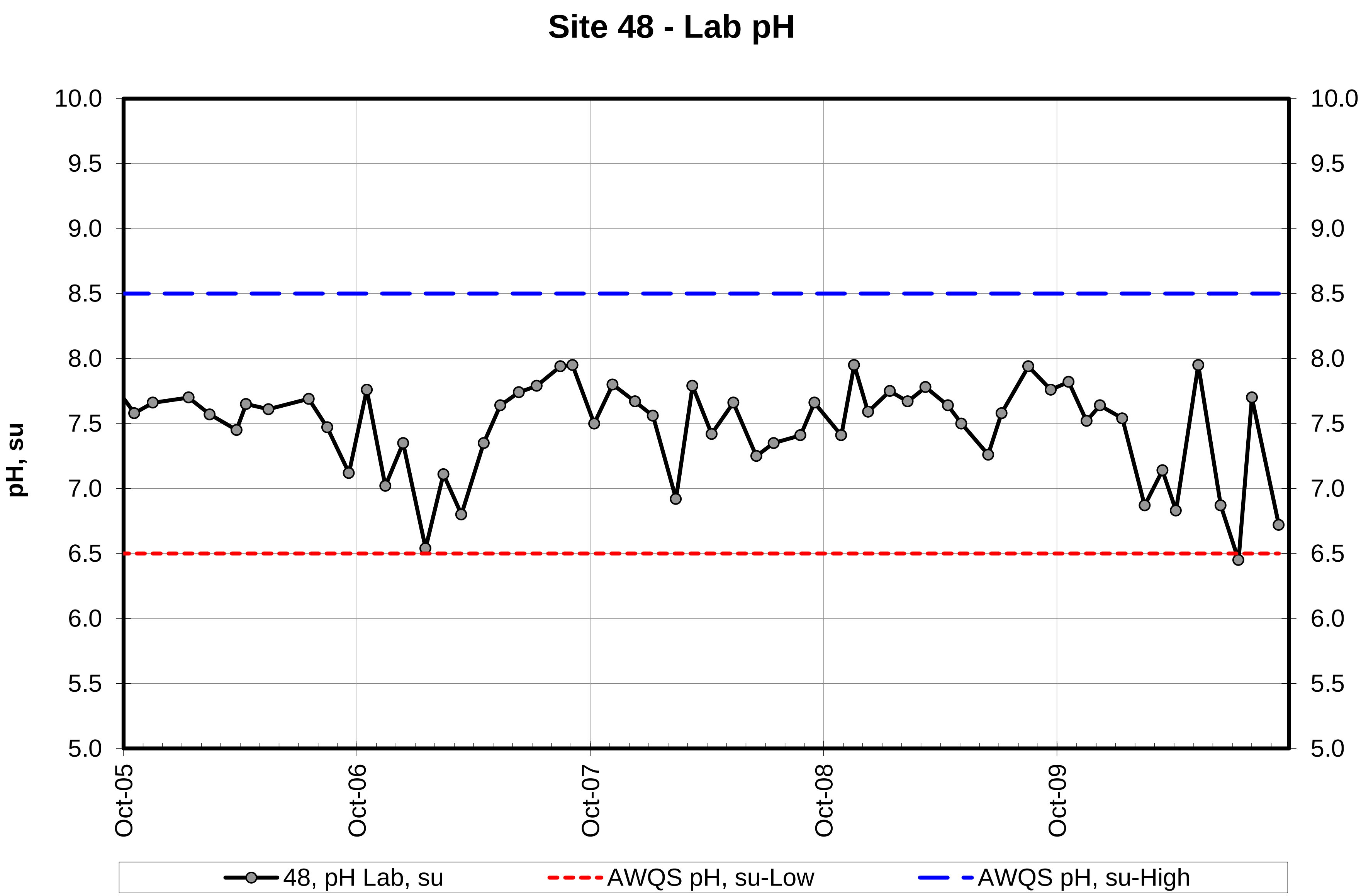

Site 48 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Temperature, °C

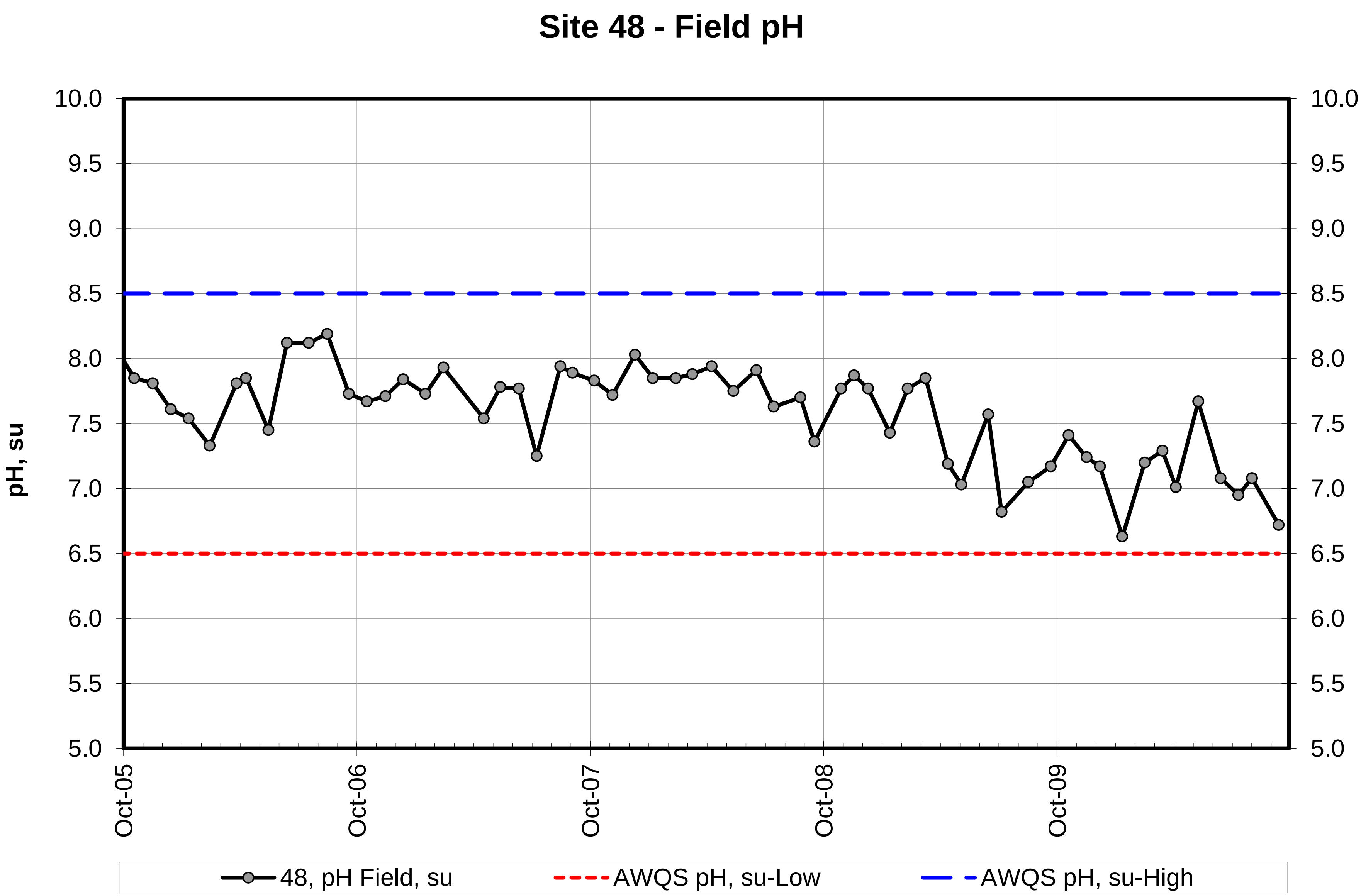
Site 48 - Conductivity-Lab



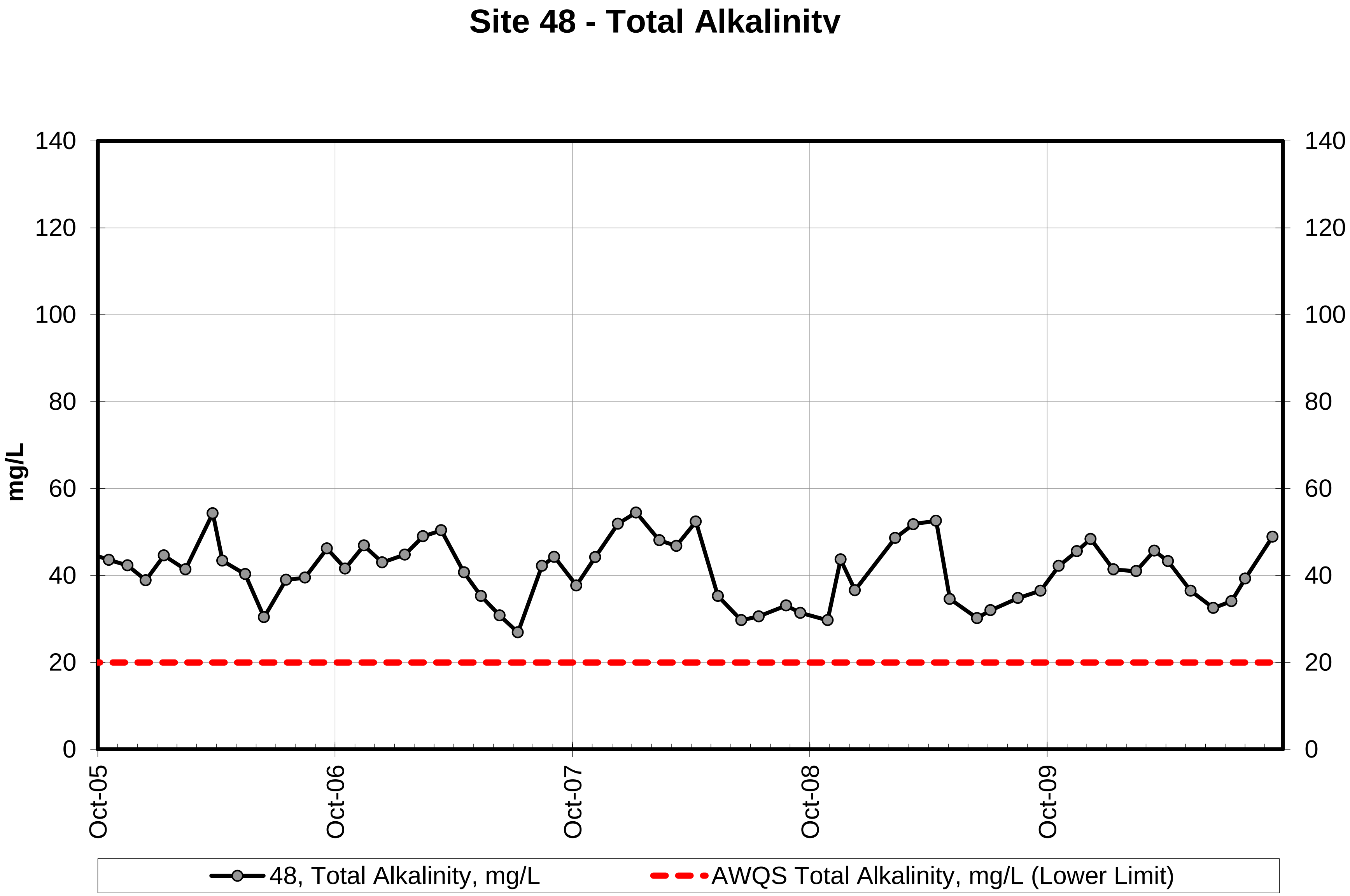
Site 48 - Conductivity-Field




Site 48 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

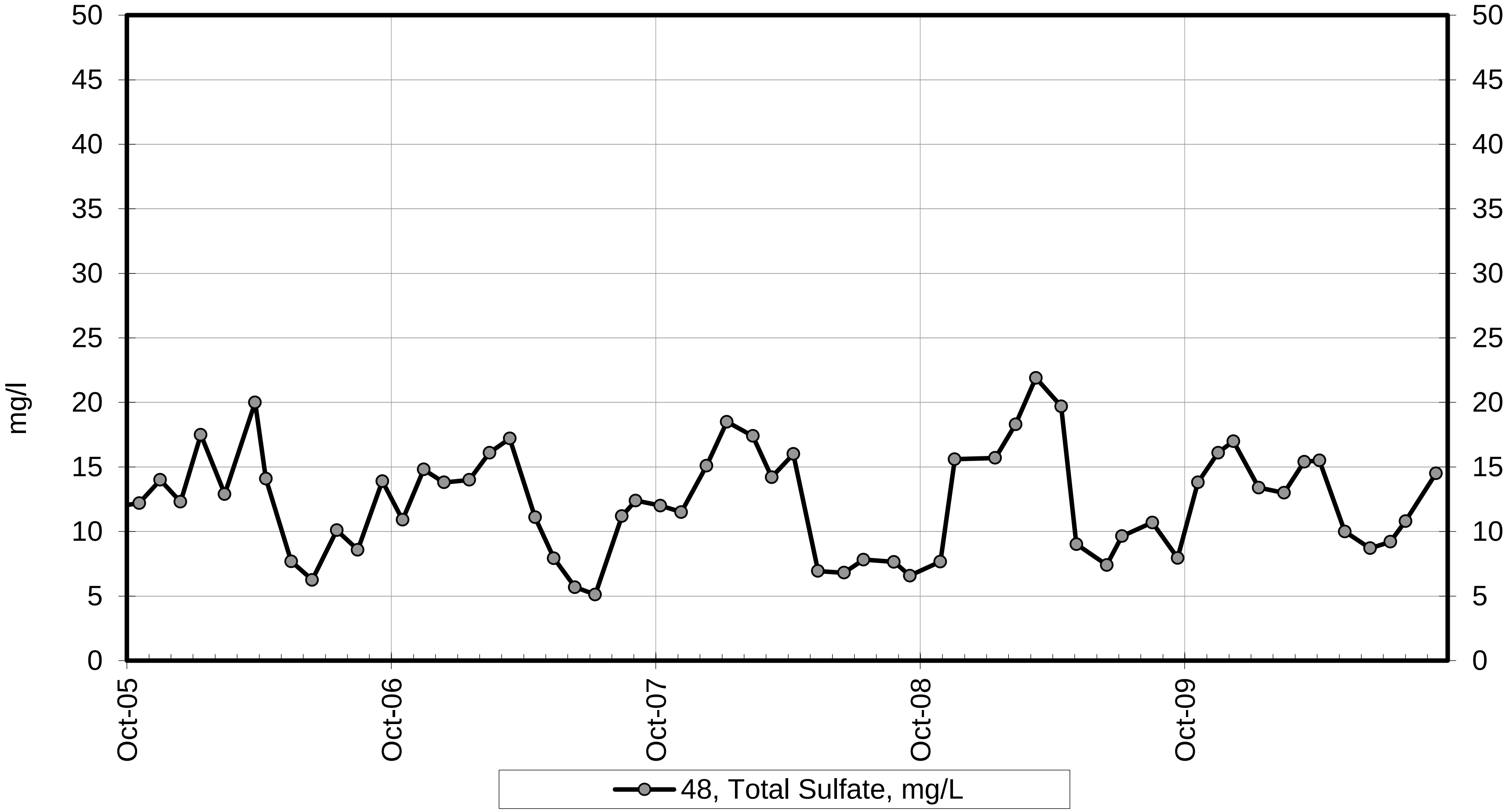


Site 48 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High



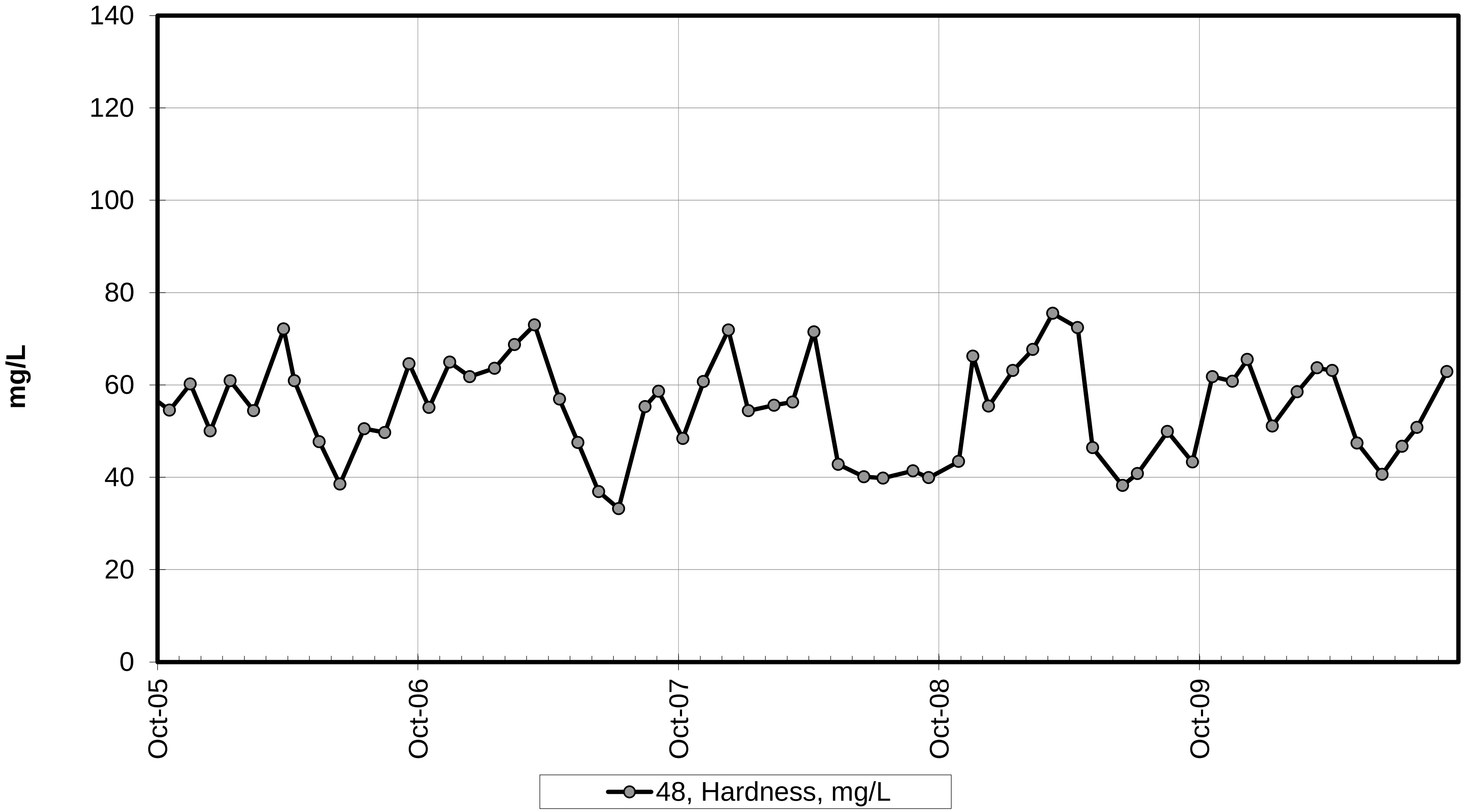
Site 48 - Total Alkalinity
mg/L
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

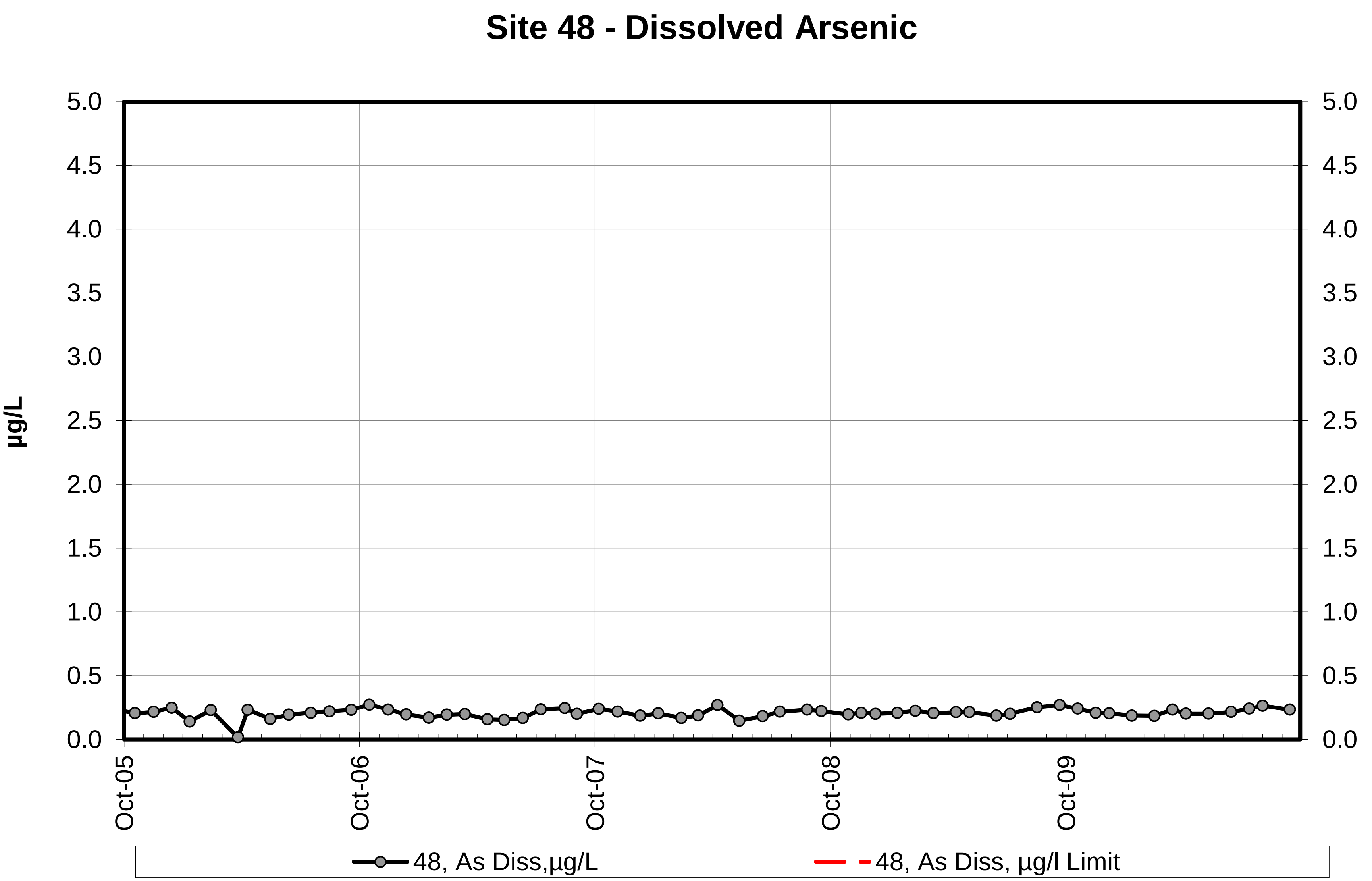
Site 48 - Total Sulfate



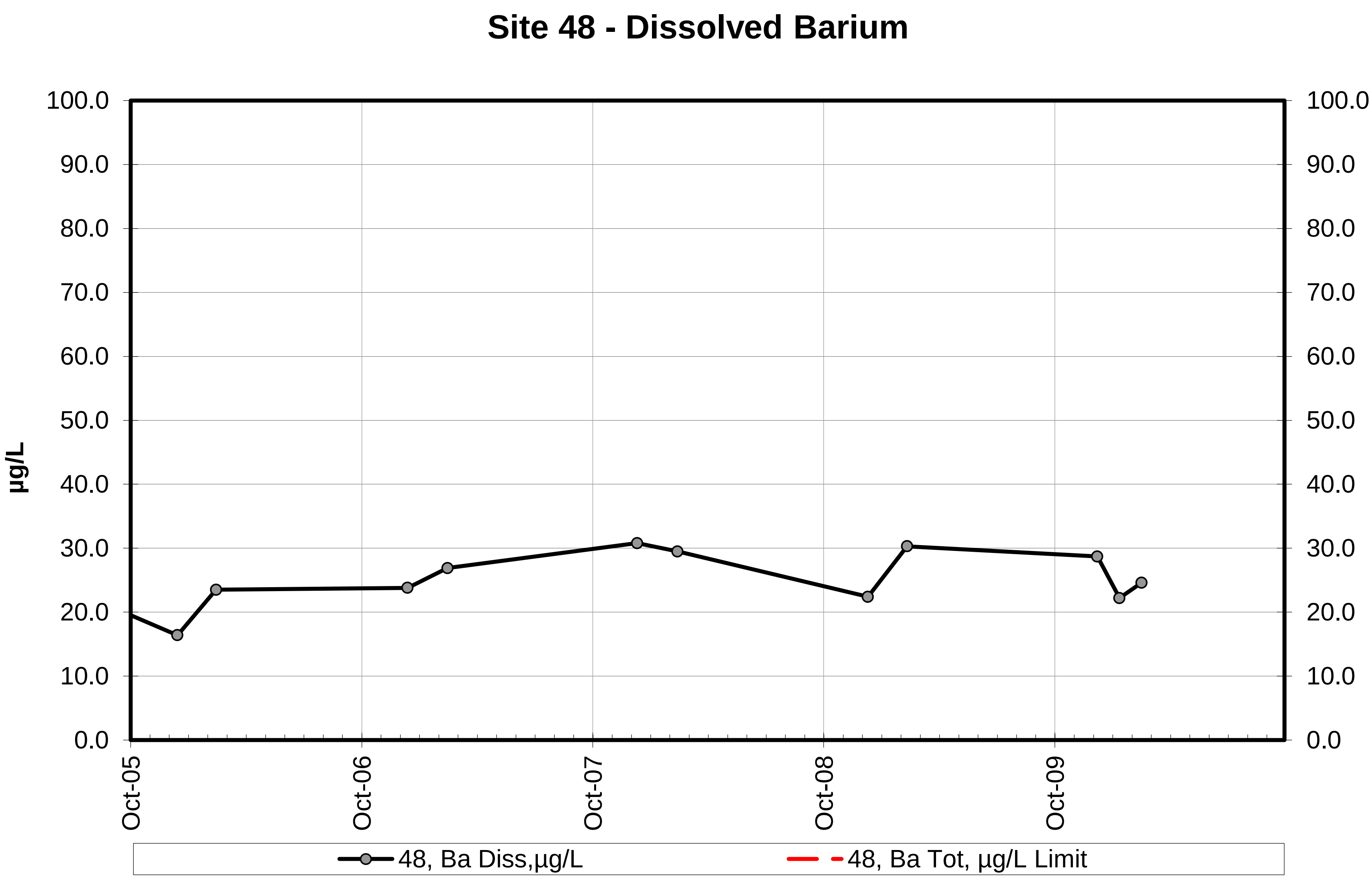
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

Site 48 - Hardness

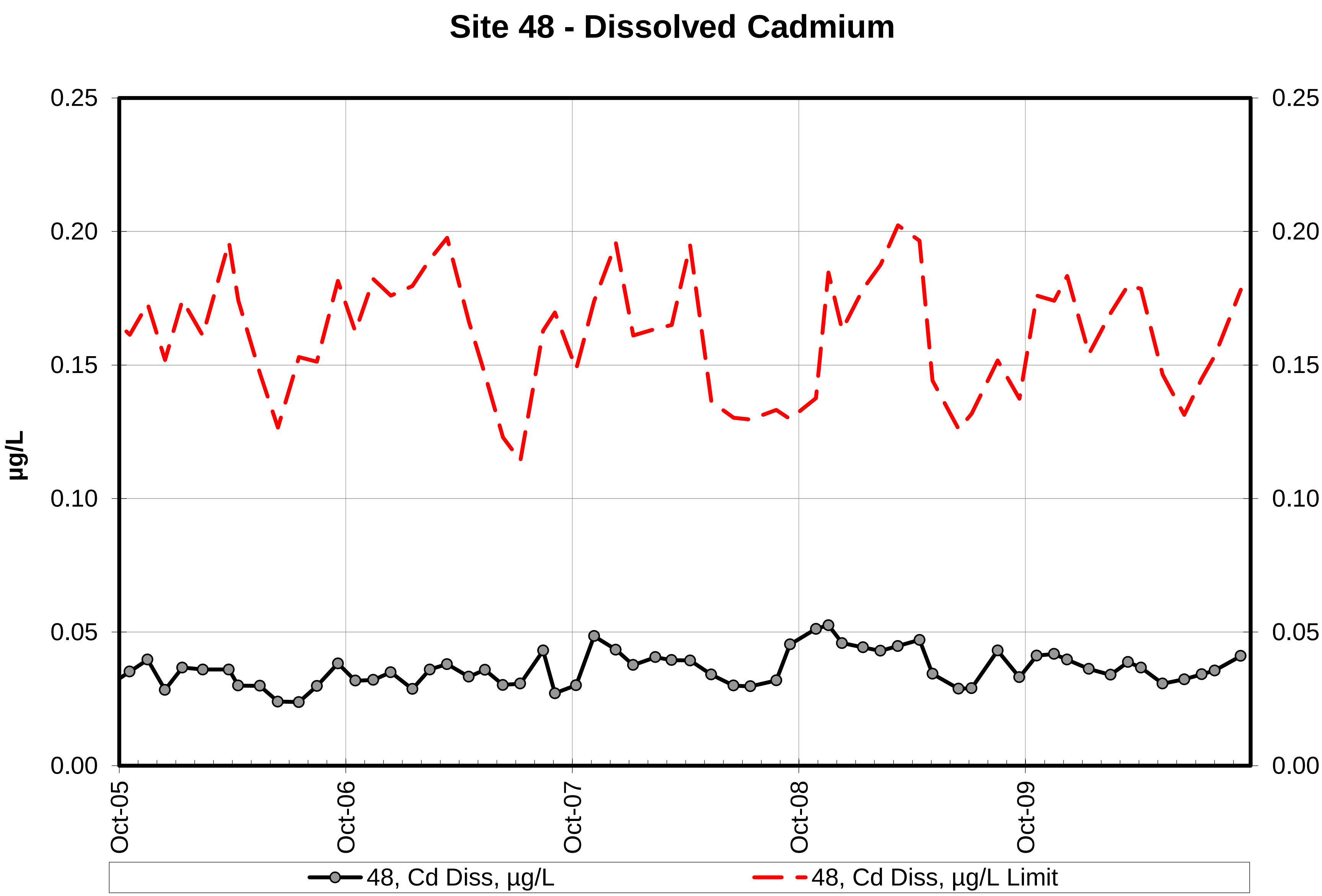




Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

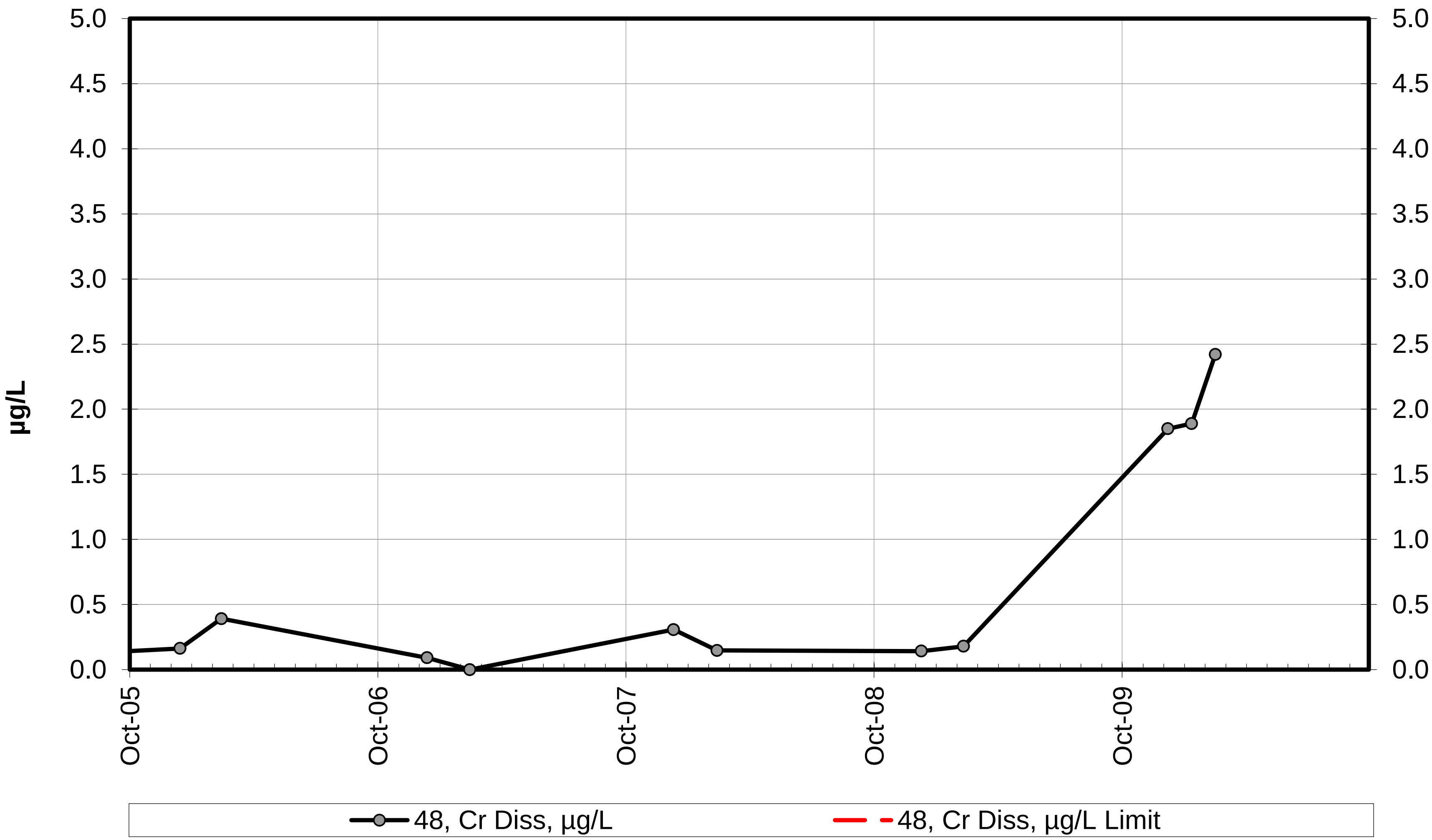


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



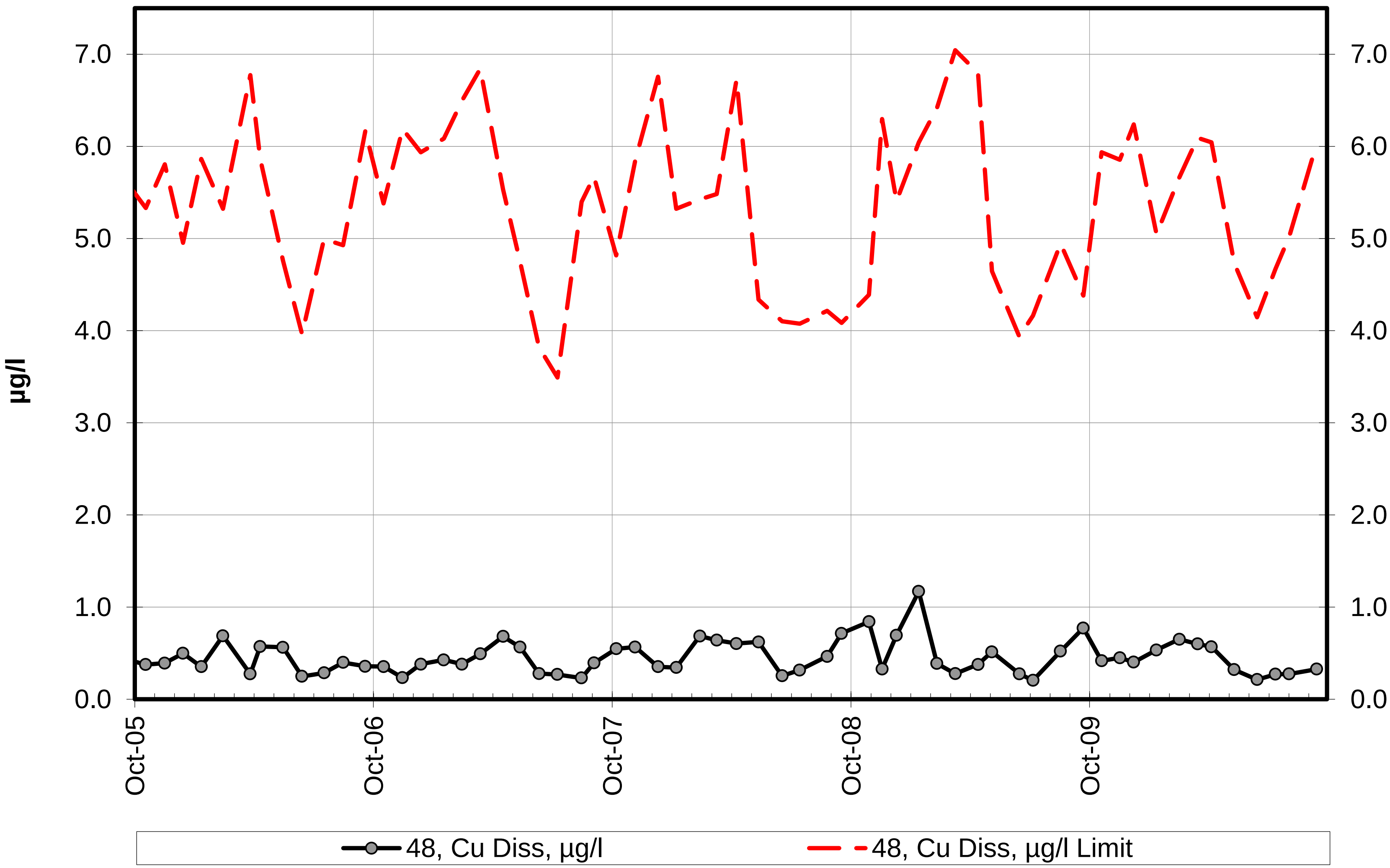
Site 48 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Cd Diss, µg/L
48, Cd Diss, µg/L Limit

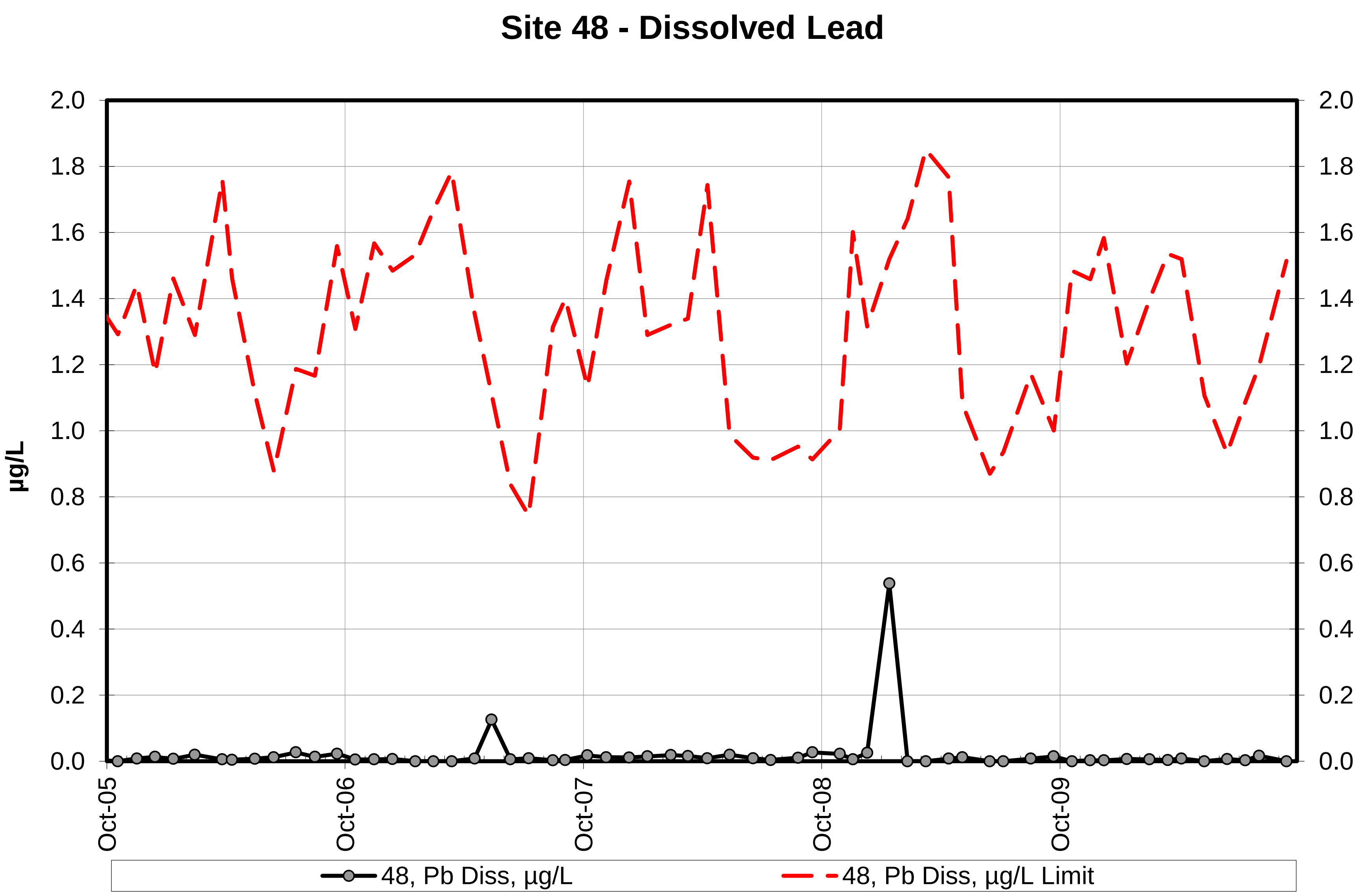
Site 48 - Dissolved Chromium



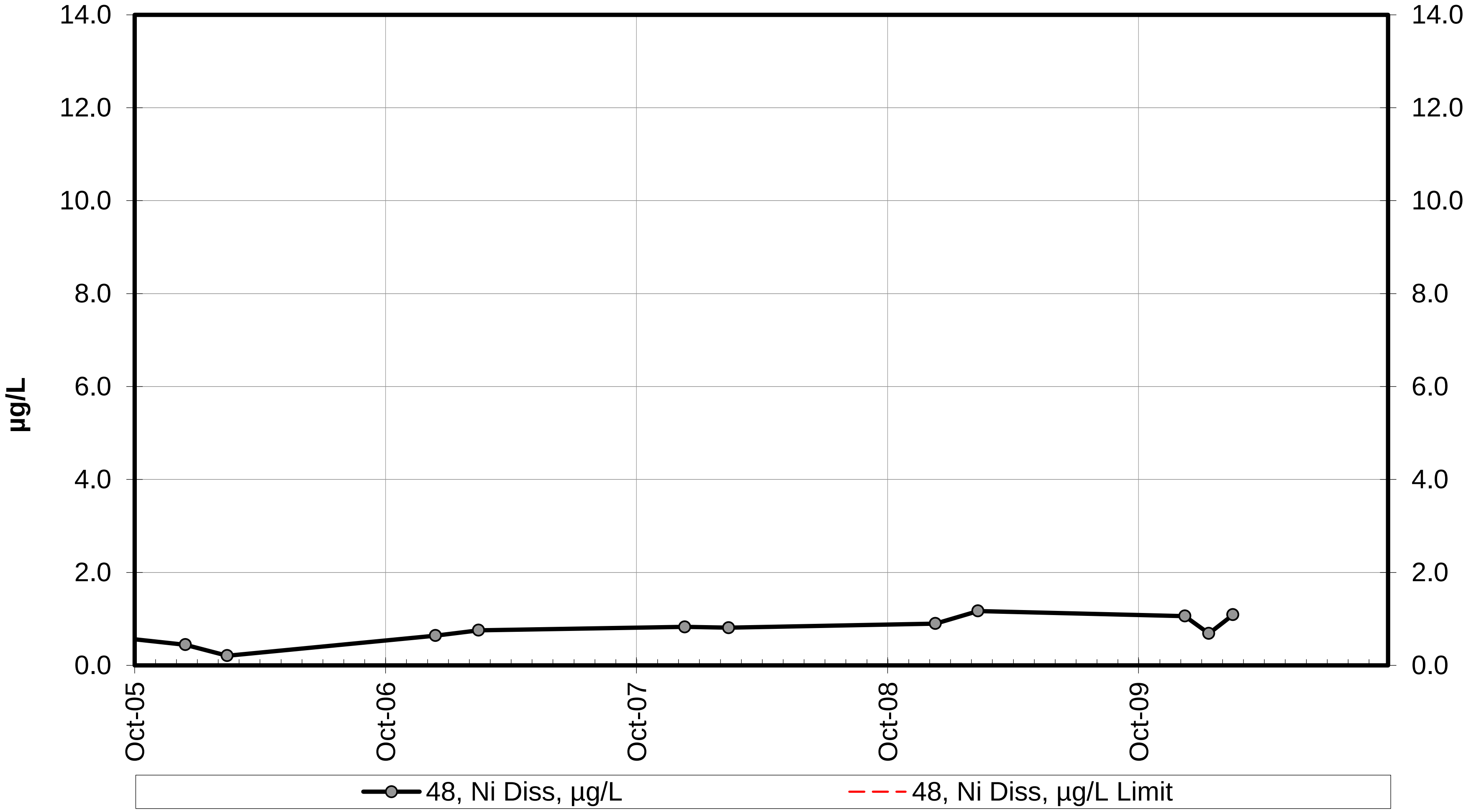
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

Site 48 - Dissolved Copper



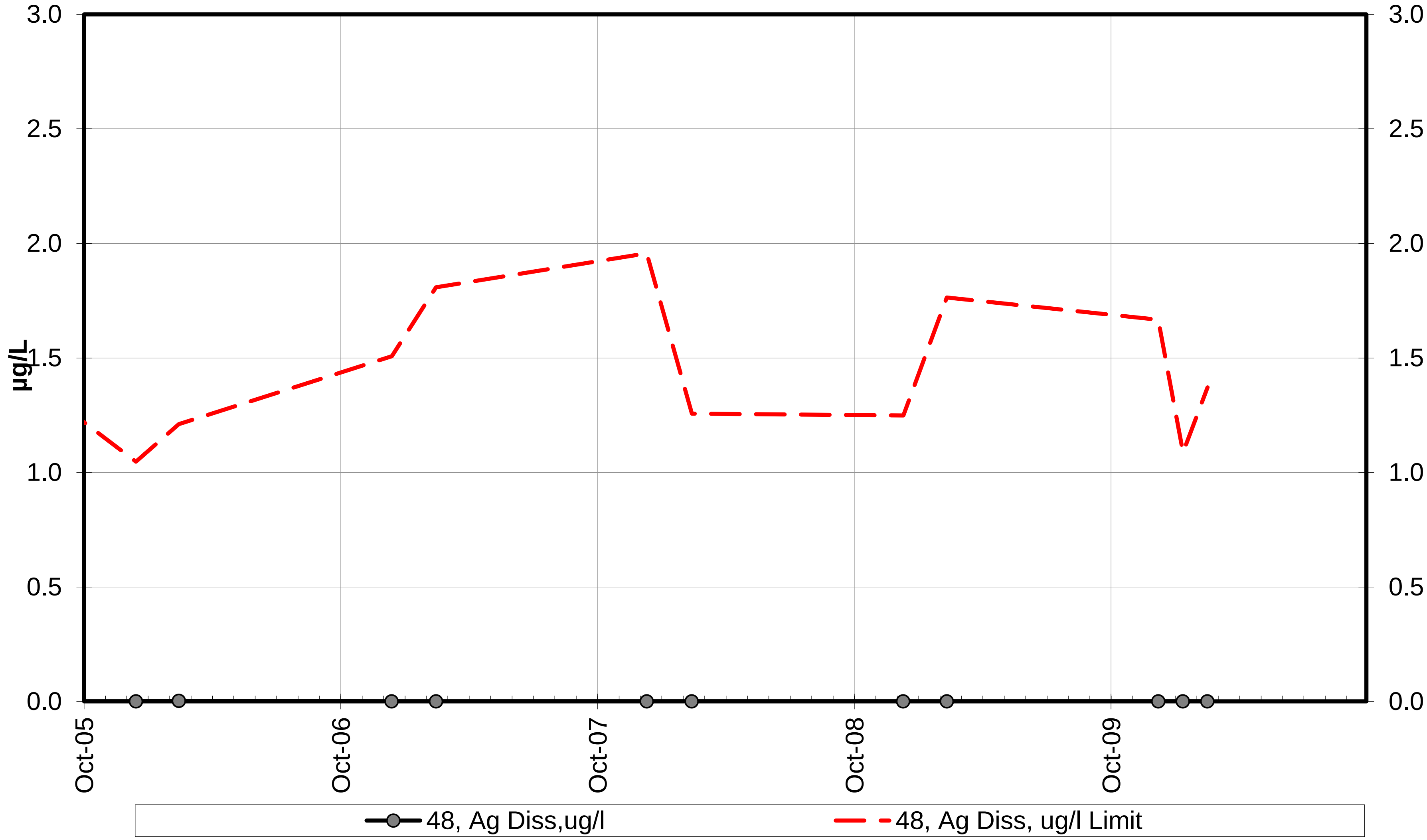

Site 48 - Dissolved Lead
µg/L
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Pb Diss, µg/L
48, Pb Diss, µg/L Limit

Site 48 - Dissolved Nickel

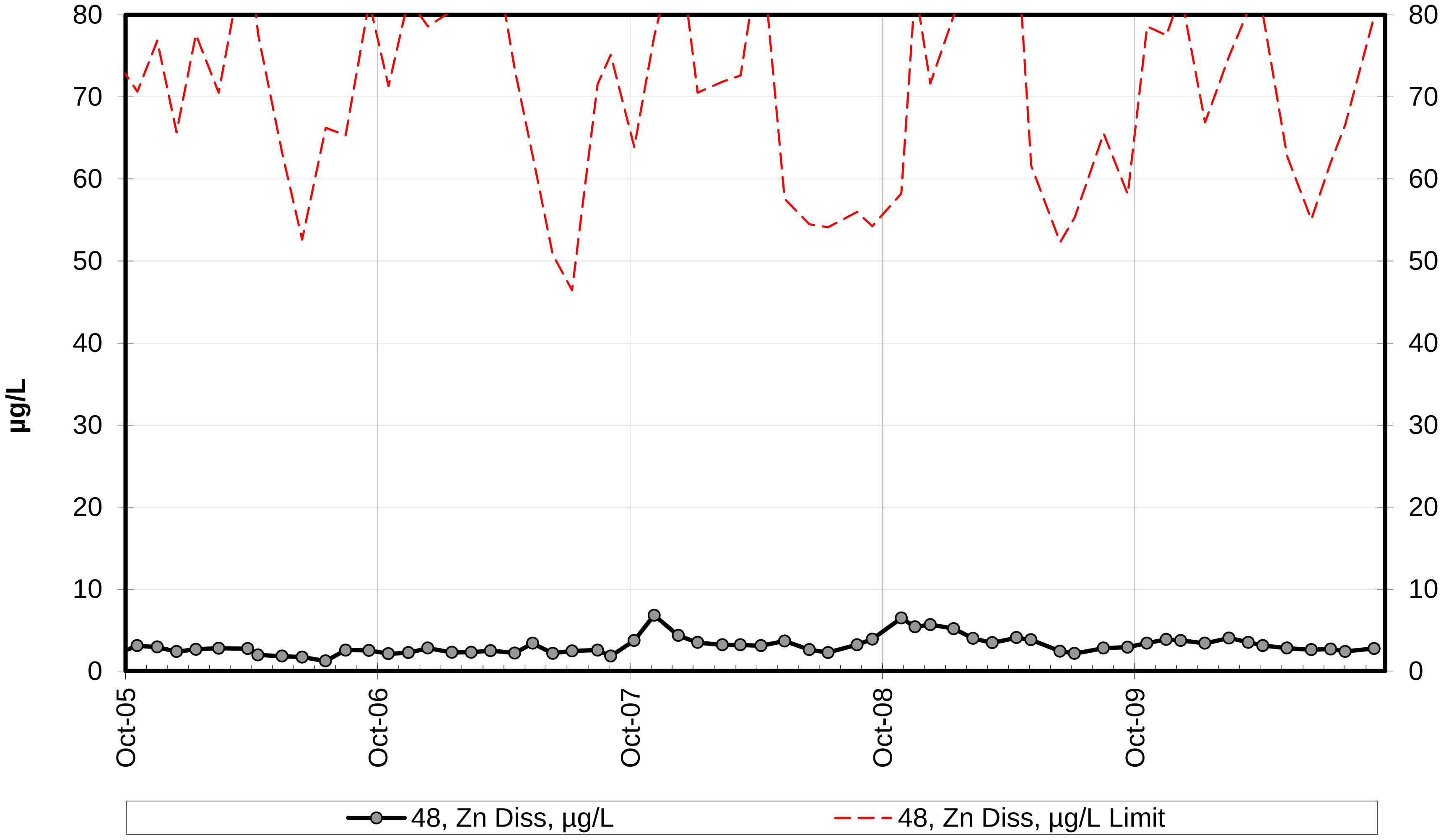


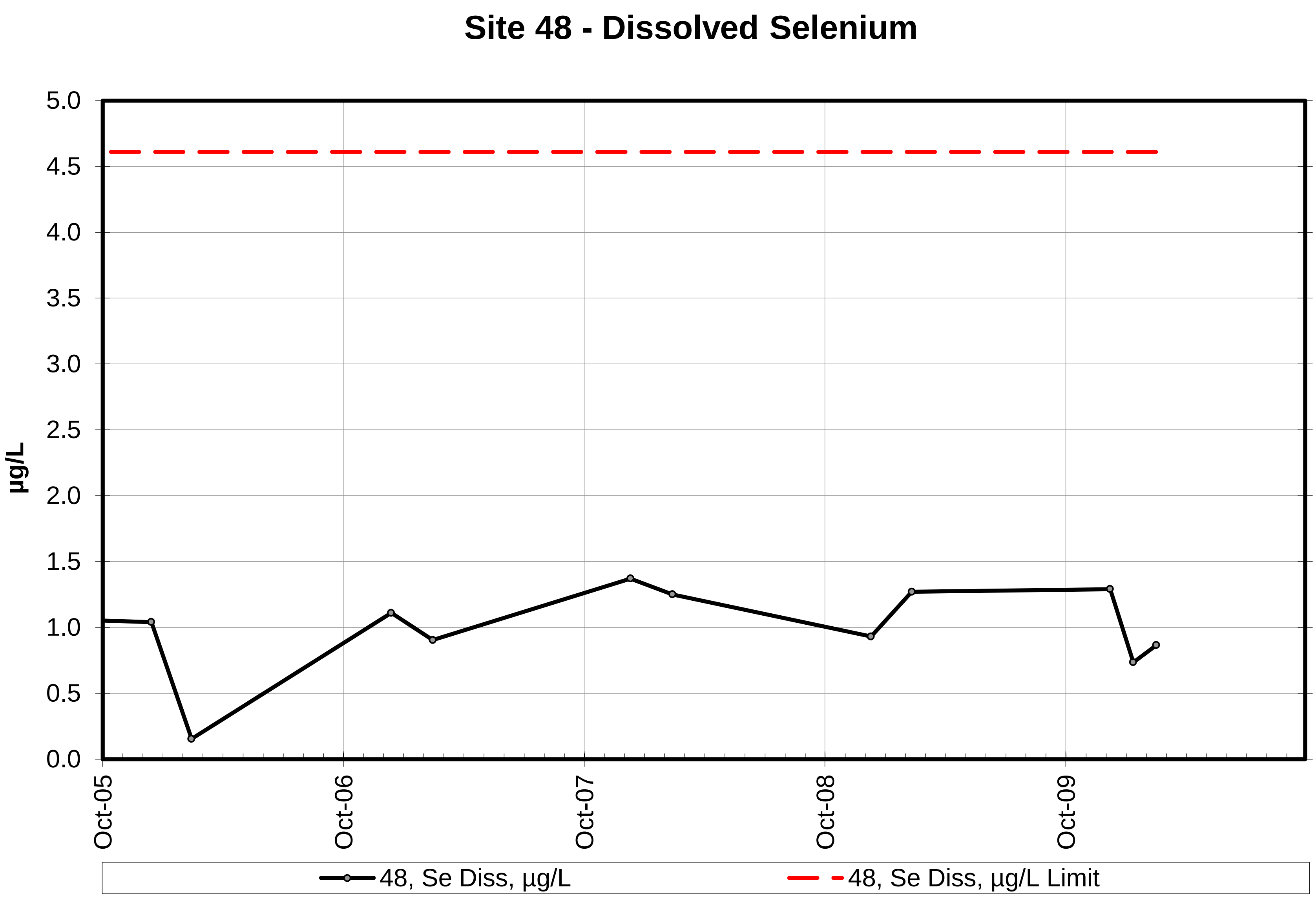
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

Site 48 - Dissolved Silver

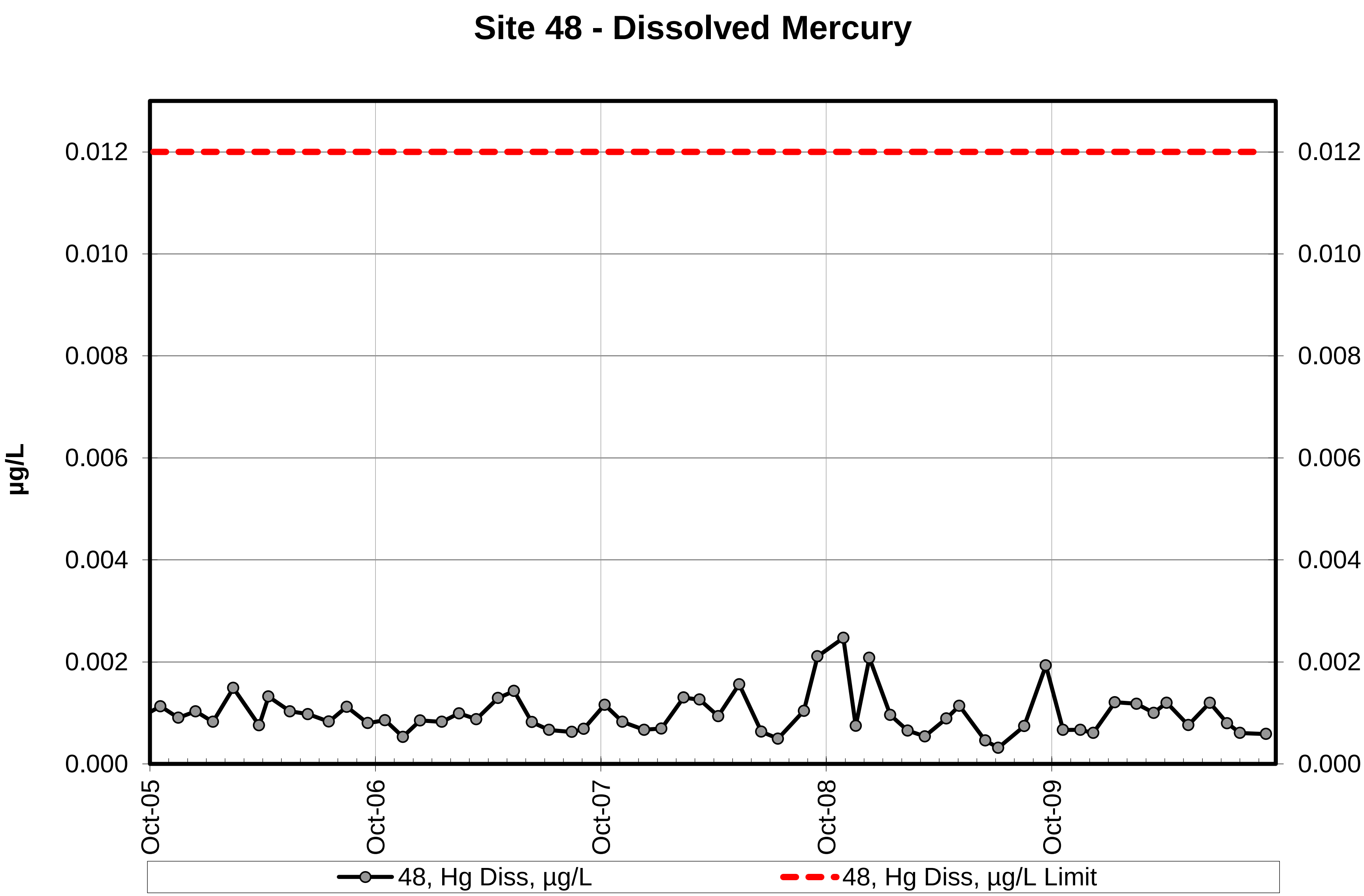


Site 48 - Dissolved Zinc





Site 48 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Se Diss, µg/L
48, Se Diss, µg/L Limit



Site 48 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Hg Diss, µg/L
48, Hg Diss, µg/L Limit

Site **#48** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	134	88.4	126	132	135	108	116.4	79.6	81.9	98	131	109
b	**WY2006**	108	115	107	124	112	146	114	88.6	77	98.7	92.2	122
c	**WY2007**	106	128	121	122	126	136	114	94.1	71.7	63.8	105	106
d	**WY2008**	92.3	115	131	135	131	123	136	82.6	73	80	88.1	84.9
e	**WY2009**	85.6	129	106		138	153	148	93.2	77.3	79.1	93.2	83
f	**WY2010**	119	124	137	104	115	129	129	103	86.5	95.3	105	130
	n	6	6	6	5	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	5	5	5	3	5	5	5	3	5
t_2	0	1	0	0	0	0	1	0	0	0	1	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	-1	1	-1	1	-1	1
c-a	-1	1	-1	-1	-1	1	-1	1	-1	-1	-1	-1
d-a	-1	1	1	1	-1	1	1	1	-1	-1	-1	-1
e-a	-1	1	-1		1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1	-1	-1	1	1	1	1	-1	-1	1
c-b	-1	1	1	-1	1	-1	0	1	-1	-1	1	-1
d-b	-1	0	1	1	1	-1	1	-1	-1	-1	-1	-1
e-b	-1	1	-1		1	1	1	1	1	-1	1	-1
f-b	1	1	1	-1	1	-1	1	1	1	-1	1	1
d-c	-1	-1	1	1	1	-1	1	-1	1	1	-1	-1
e-c	-1	1	-1		1	1	1	-1	1	1	-1	-1
f-c	1	-1	1	-1	-1	-1	1	1	1	1	0	1
e-d	-1	1	-1		1	1	1	1	1	-1	1	-1
f-d	1	1	1	-1	-1	1	-1	1	1	1	1	1
f-e	1	-1	1		-1	-1	-1	1	1	1	1	1
S_k	-7	8	3	-4	1	3	6	9	3	-3	-2	-3

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	21.67	28.33	16.67	28.33	28.33	27.33	28.33	28.33	28.33	27.33	28.33
$Z_k = S_k/\sigma_S$	-1.32	1.72	0.56	-0.98	0.19	0.56	1.15	1.69	0.56	-0.56	-0.38	-0.56
Z^2_k	1.73	2.95	0.32	0.96	0.04	0.32	1.32	2.86	0.32	0.32	0.15	0.32

ΣZ_k= 2.63

ΣZ^2_k= 11.59

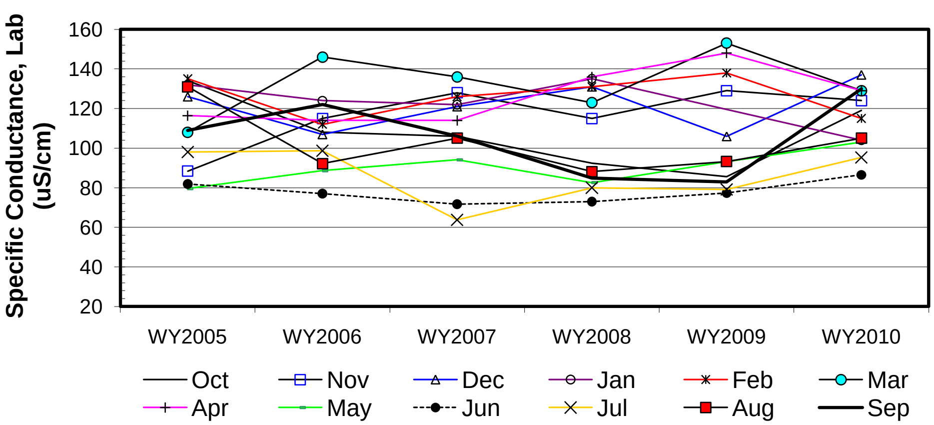
Z-bar=$\Sigma Z_k/K$= 0.22

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	54	3	0	0	0

Σn 71

ΣS_k 14

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	11.01	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.442**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.73	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
319.67	**p** **0.766**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.00		3.64
0.050	-1.23	**0.75**	2.83
0.100	-0.84		2.37
0.200	-0.01		2.00

Site **#48** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	8.0	7.6	7.9	7.9	7.6	8.0	7.9	8.0	8.1	7.2	7.9	7.8
b	**WY2006**	7.6	7.7		7.7	7.6	7.5	7.7	7.6		7.7	7.5	7.1
c	**WY2007**	7.8	7.0	7.4	6.5	7.1	6.8	7.4	7.6	7.7	7.8	7.9	8.0
d	**WY2008**	7.5	7.8	7.7	7.6	6.9	7.8	7.4	7.7	7.3	7.4	7.4	7.7
e	**WY2009**	7.4	8.0	7.6	7.8	7.7	7.8	7.6	7.5	7.3	7.6	7.9	7.8
f	**WY2010**	7.8	7.5	7.6	7.5	6.9	7.1	6.8	8.0	6.9	6.5	7.7	6.7
	n	6	6	5	6	6	6	6	6	5	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	3	5
t_2	0	0	0	0	0	0	0	0	0	0	1	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1		-1	-1	-1	-1	-1		1	-1	-1
c-a	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1
d-a	-1	1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1
e-a	-1	1	-1	-1	1	-1	-1	-1	-1	1	1	-1
f-a	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
c-b	1	-1		-1	-1	-1	-1	1		1	1	1
d-b	-1	1		-1	-1	1	-1	1		-1	-1	1
e-b	-1	1		1	1	1	-1	-1		-1	1	1
f-b	1	-1		-1	-1	-1	-1	1		-1	1	-1
d-c	-1	1	1	1	-1	1	1	1	-1	-1	-1	-1
e-c	-1	1	1	1	1	1	1	-1	-1	-1	0	-1
f-c	1	1	1	1	-1	1	-1	1	-1	-1	-1	-1
e-d	-1	1	-1	1	1	-1	1	-1	1	1	1	1
f-d	1	-1	-1	-1	-1	-1	-1	1	-1	-1	1	-1
f-e	1	-1	1	-1	-1	-1	-1	1	-1	-1	-1	-1
S_k	-5	3	-2	-5	-7	-5	-9	-1	-8	-3	0	-5

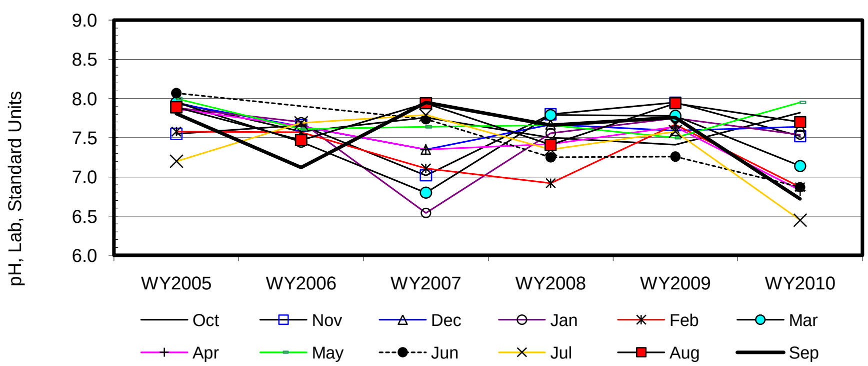
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	28.33	28.33	28.33	28.33	28.33	16.67	28.33	27.33	28.33
$Z_k = S_k/\sigma_S$	-0.94	0.62	-0.49	-0.94	-1.32	-0.94	-1.69	-0.19	-1.96	-0.56	0.00	-0.94
Z^2_k	0.88	0.39	0.24	0.88	1.73	0.88	2.86	0.04	3.84	0.32	0.00	0.88

ΣZ_k= -9.34
ΣZ^2_k= 12.94
Z-bar=$\Sigma Z_k/K$= -0.78

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 70
ΣS_k -47

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$=	5.66	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.895**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -2.61	@$\alpha/2$=2.5% Z= 1.96	**H_0** (No trend)	REJECT
310.67	**p** **0.005**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.14		-0.01
0.050	-0.11	**-0.06**	-0.03
0.100	-0.10		-0.03
0.200	-0.08		-0.04
		-0.8%	

Site **#48** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	55.2	39.7	51.3	57.2	61.2	50.1	53.8	39.8	37.8	42.2	50.4	45.3
b	**WY2006**	43.6	42.3	38.9	44.6	41.4	54.3	43.4	40.3	30.4	39.0	39.5	46.2
c	**WY2007**	41.6	46.9	43.0	44.8	49.0	50.4	40.7	35.3	30.8	26.9	42.2	44.3
d	**WY2008**	37.7	44.2	51.9	54.5	48.1	46.8	52.4	35.3	29.7	30.6	33.1	31.4
e	**WY2009**	29.7	43.7	36.6		48.6	51.8	52.6	34.6	30.2	32.0	34.8	36.5
f	**WY2010**	42.2	45.6	48.4	41.4	41.0	45.7	43.3	36.5	32.5	34.1	39.3	48.9
	n	6	6	6	5	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	-1	1	-1	-1	-1	1
c-a	-1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1
d-a	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1
e-a	-1	1	-1		-1	1	-1	-1	-1	-1	-1	-1
f-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
c-b	-1	1	1	1	1	-1	-1	-1	1	-1	1	-1
d-b	-1	1	1	1	1	-1	1	-1	-1	-1	-1	-1
e-b	-1	1	-1		1	-1	1	-1	-1	-1	-1	-1
f-b	-1	1	1	-1	-1	-1	-1	-1	1	-1	-1	1
d-c	-1	-1	1	1	-1	-1	1	0	-1	1	-1	-1
e-c	-1	-1	-1		-1	1	1	-1	-1	1	-1	-1
f-c	1	-1	1	-1	-1	-1	1	1	1	1	-1	1
e-d	-1	-1	-1		1	1	1	-1	1	1	1	1
f-d	1	1	-1	-1	-1	-1	-1	1	1	1	1	1
f-e	1	1	1		-1	-1	-1	1	1	1	1	1
S_k	-9	7	-1	-4	-7	-5	-3	-6	-3	-3	-7	-1

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	16.67	28.33	28.33	28.33	27.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-1.69	1.45	-0.19	-0.98	-1.32	-0.94	-0.56	-1.15	-0.56	-0.56	-1.32	-0.19
Z^2_k	2.86	2.10	0.04	0.96	1.73	0.88	0.32	1.32	0.32	0.32	1.73	0.04

ΣZ_k= -8.01

ΣZ^2_k= 12.60

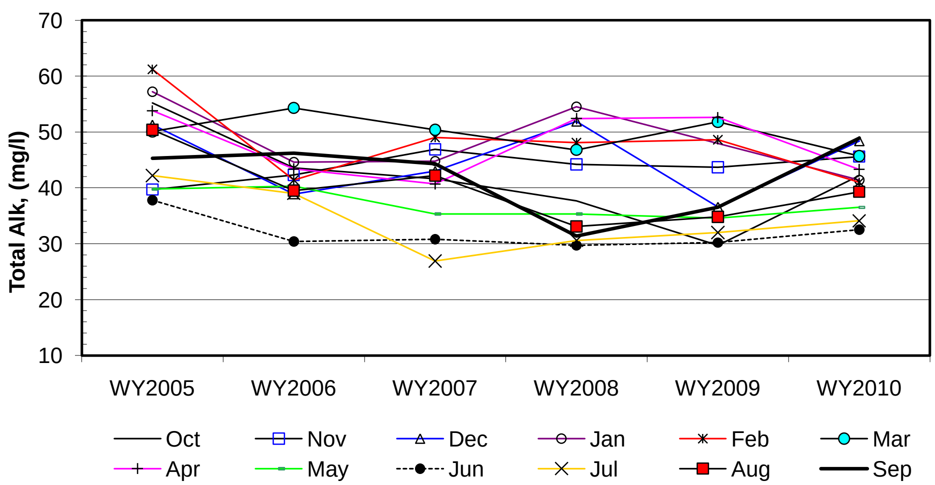
Z-bar=$\Sigma Z_k/K$= -0.67

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 71

ΣS_k -42

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	7.26	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.778**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -2.28	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
322.33	p **0.011**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.04		-0.02
0.050	-1.61	**-0.83**	-0.30
0.100	-1.50		-0.35
0.200	-1.10		-0.50

-2.0%

Site **#48** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	14.1	7.8	13.5	15.9	19.1	11.7	15.0	7.4	8.8	9.9	16.8	11.9
b	**WY2006**	12.2	14.0	12.3	17.5	12.9	20.0	14.1	7.7	6.3	10.1	8.6	13.9
c	**WY2007**	10.9	14.8	13.8	14.0	16.1	17.2	11.1	7.9	5.7	5.1	11.2	12.4
d	**WY2008**	12.0	11.5	15.1	18.5	17.4	14.2	16.0	6.9	6.8	7.8	7.6	6.6
e	**WY2009**	7.7	15.6	14.3	15.7	18.3	21.9	19.7	9.0	7.4	9.6	10.7	8.0
f	**WY2010**	13.8	16.1	17.0	13.4	13.0	15.4	15.5	10.0	8.7	9.2	10.8	14.5
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1
c-a	-1	1	1	-1	-1	1	-1	1	-1	-1	-1	1
d-a	-1	1	1	1	-1	1	1	-1	-1	-1	-1	-1
e-a	-1	1	1	-1	-1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1	-1	-1	1	1	1	-1	-1	-1	1
c-b	-1	1	1	-1	1	-1	-1	1	-1	-1	1	-1
d-b	-1	-1	1	1	1	-1	1	-1	1	-1	-1	-1
e-b	-1	1	1	-1	1	1	1	1	1	-1	1	-1
f-b	1	1	1	-1	1	-1	1	1	1	-1	1	1
d-c	1	-1	1	1	1	-1	1	-1	1	1	-1	-1
e-c	-1	1	1	1	1	1	1	1	1	1	-1	-1
f-c	1	1	1	-1	-1	-1	1	1	1	1	-1	1
e-d	-1	1	-1	-1	1	1	1	1	1	1	1	1
f-d	1	1	1	-1	-1	1	-1	1	1	1	1	1
f-e	1	1	1	-1	-1	-1	-1	1	1	-1	1	1
S_k	-5	11	11	-5	-1	3	5	9	3	-3	-3	1

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-0.94	2.28	2.07	-0.94	-0.19	0.56	0.94	1.69	0.56	-0.56	-0.56	0.19
Z^2_k	0.88	5.19	4.27	0.88	0.04	0.32	0.88	2.86	0.32	0.32	0.32	0.04

ΣZ_k= 5.10

ΣZ^2_k= 16.30

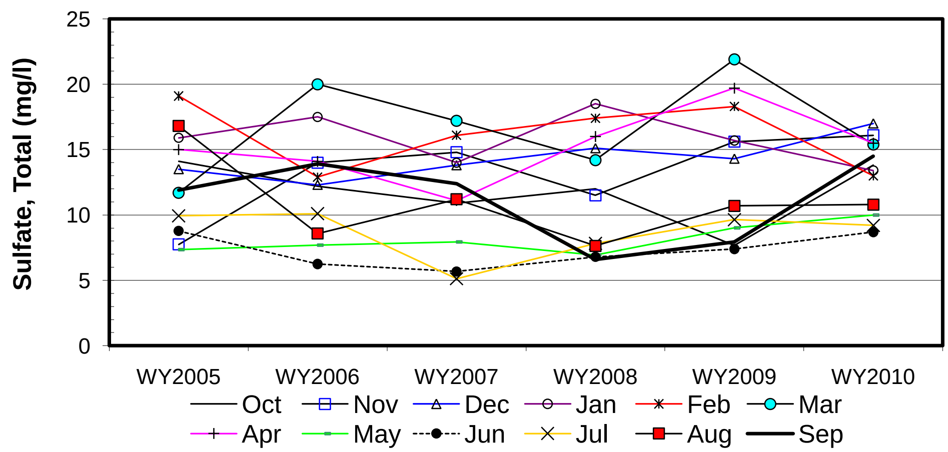
Z-bar=$\Sigma Z_k/K$= 0.42

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 72

ΣS_k 26

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	14.14	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity	
p	**0.225**			$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} 1.37	@α=5% Z=	1.64	**H_0** (No trend)	ACCEPT
335.00	**p** **0.914**			**H_A** ($\pm$ trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	**Lower Limit**	**Sen's Slope**	**Upper Limit**
0.010	-0.17		0.62
0.050	-0.06	**0.33**	0.53
0.100	0.05		0.52
0.200	0.15		0.44

Site **#48** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	2.5	3.0	3.8	3.0	2.9	3.9	2.4	2.8	2.2	2.0	1.6	2.0
b	**WY2006**	3.1	2.9	2.4	2.7	2.8	2.7	2.0	1.8	1.7	1.2	2.6	2.5
c	**WY2007**	2.1	2.2	2.8	2.3	2.3	2.5	2.2	3.4	2.2	2.5	2.6	1.8
d	**WY2008**	3.7	6.8	4.3	3.5	3.2	3.2	3.1	3.7	2.6	2.3	3.2	3.9
e	**WY2009**	6.5	5.4	5.7	5.2	4.0	3.5	4.1	3.8	2.4	2.1	2.8	2.9
f	**WY2010**	3.4	3.9	3.7	3.4	4.0	3.5	3.1	2.8	2.6	2.7	2.4	2.8
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	3	5	5	5
t_2	0	0	0	0	0	0	0	0	1	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1
c-a	-1	-1	-1	-1	-1	-1	-1	1	0	1	1	-1
d-a	1	1	1	1	1	-1	1	1	1	1	1	1
e-a	1	1	1	1	1	-1	1	1	1	1	1	1
f-a	1	1	-1	1	1	-1	1	1	1	1	1	1
c-b	-1	-1	1	-1	-1	-1	1	1	1	1	-1	-1
d-b	1	1	1	1	1	1	1	1	1	1	1	1
e-b	1	1	1	1	1	1	1	1	1	1	1	1
f-b	1	1	1	1	1	1	1	1	1	1	-1	1
d-c	1	1	1	1	1	1	1	1	1	-1	1	1
e-c	1	1	1	1	1	1	1	1	1	-1	1	1
f-c	1	1	1	1	1	1	1	-1	1	1	-1	1
e-d	1	-1	1	1	1	1	1	1	-1	-1	-1	-1
f-d	-1	-1	-1	-1	1	1	1	-1	-1	1	-1	-1
f-e	-1	-1	-1	-1	1	1	-1	-1	1	1	-1	-1
S_k	7	3	5	5	9	3	9	7	8	7	3	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	27.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	1.32	0.62	0.94	0.94	1.69	0.56	1.69	1.32	1.53	1.32	0.56	0.94
Z^2_k	1.73	0.39	0.88	0.88	2.86	0.32	2.86	1.73	2.34	1.73	0.32	0.88

ΣZ_k= 13.42

ΣZ^2_k= 16.92

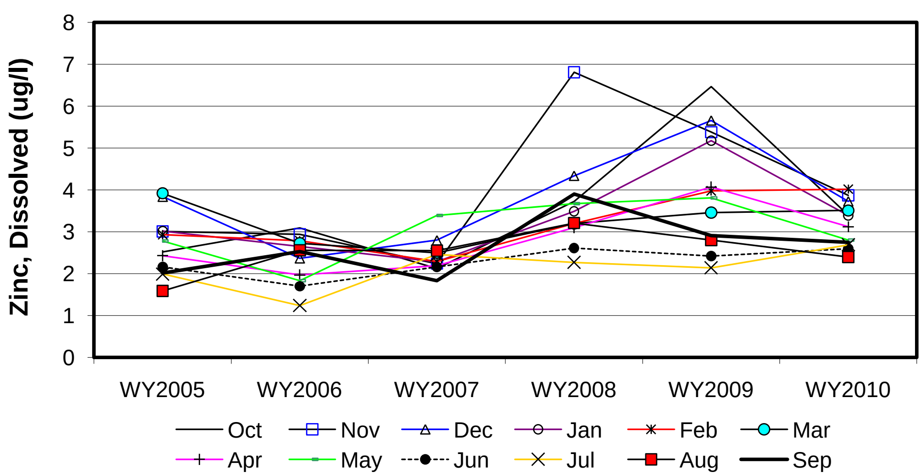
Z-bar=$\Sigma Z_k/K$= 1.12

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 72

ΣS_k 71

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	1.90	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.999**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} 3.83	@$\alpha/2$=2.5% Z= 1.96	**H_0** (No trend)	REJECT
334.00	**p** **1.000**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.09		0.31
0.050	0.14	**0.21**	0.28
0.100	0.15		0.25
0.200	0.17		0.24
		7.6%	

INTERPRETIVE REPORT
SITE 6 "MIDDLE GREENS CREEK"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses with the exception of one outlier shown on the table below. During the current year no new data points were flagged as outliers after review by HGCMC.

Sample Date	Parameter	Value	Qualifier	Notes
12/14/2005	pH Lab, su	8.23	RR	Holding time violation

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Five results exceeding these criteria have been identified as listed in the table below. All of the exceedances were for pH values less than the lower limit of 6.5 su. Four laboratory pH values all had acceptable field pH values ranging from 6.92 su to 7.61 su. One field pH value was less than the 6.5 su limit; however, the corresponding laboratory value was within range.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
12-Jan-10	pH Field, su	6.46		6.5	Aquatic Life, chronic
16-Feb-10	pH Lab, su	6.4		6.5	Aquatic Life, chronic
6-Apr-10	pH Lab, su	6.48		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	6.32		6.5	Aquatic Life, chronic
14-Sep-10	pH Lab, su	6.37		6.5	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There was an identifiable trend in dissolved chromium. Between Water Year 2009 and Water Year 2010 there was roughly an order of magnitude increase in the dissolved chromium concentration. A similar increase was also noted for Site 6, Site 13, Site 46, Site 48, Site 49, and Site 54; all sites that are located in the 920 area.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The following table summarizes the results of the data collected between Oct-04 and Sep-10 (WY2005-WY2010). Two of the analytes had statistically significant negative slopes.

Site 6-WY2010, summary statistics for trend analysis.					
		Mann-Kendall test statistics		Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.57	0		
pH, Lab	6	<0.01	-	-0.07	-0.9
Alkalinity, Total	6	<0.01	-	-1.05	-2.4
Sulfate, Total	6	0.79	0		
Zinc, Dissolved	6	1.00	+	0.39	6.2

(1): Number of years (2):Significance level

Laboratory pH had a slope estimate of -0.07 su/yr, and total alkalinity had a slope estimate of -1.05 mg/L/yr. Given the low magnitude, HGCMC does not feel that these decreasing trends are a significant indication of changes in water chemistry at Site 6.. Dissolved zinc has a statistically significant positive slope of 0.39 µg/L/yr. This trend appears driven by the water years 2009 and 2008 in which there was an increase in the March, April, and May values; along with an increase in the August, September, and October values. Though these values are increasing they are still approximately 1/8th of the AWQS for dissolved zinc. Currently, HGCMC does not feel that this increasing trend is a significant indication of changes in water chemistry.

A comparison of median values for alkalinity, laboratory pH, lab conductivity, sulfate, and dissolved zinc between Site 6 and Site 48 has been conducted as specified in the Statistical Information Goals for Site 6. Additionally, X-Y plots have been generated for alkalinity, pH (field and laboratory), conductance, sulfate, and dissolved zinc that co-plot data from Site 6 and Site 48, the upstream control site, to aid in the comparison between those sites. Calculation details of the non-parametric signed-rank tests are presented in detail on the pages following this interpretive section. The table below summarizes the results of the signed-rank test as performed on the Water Year 2010 data set.

Site 6 vs Site 48 - WY2010, summary statistics for median analysis.

Parameter	Signed Ranks p-value	Site 48 median	Site 6 median	Median of Differences
Conductivity, Lab	**<0.01**	117	126	-6.0
pH, Lab	**1.00**	7.33	6.92	0.22
Alkalinity, Total	0.04	41.8	44.5	-0.9
Sulfate, Total	**<0.01**	13.6	15.7	-1.6
Zinc, Dissolved	**<0.01**	3.26	6.18	-2.79

Alkalinity does not show a statistically significant difference between the measured median values at a significance level of α=0.05 for a one-tailed test. The laboratory conductivity, laboratory pH, total sulfate, and dissolved zinc concentrations are statistically different. The median values for laboratory conductivity for Site 48 and Site 6 are 117 µS/cm and 126 µS/cm respectively and the median of differences, Site 48 minus Site 6, is -6.0 µS/cm. The median values for laboratory pH for Site 48 and Site 6 are 7.33 su and 6.92 su respectively and the median of the differences, Site 48 minus Site 6, is 0.22 su. A comparison of the X-Y co-plots for laboratory and field pH shows that there is a general trend for Site 6 field pH to be less. Currently, HGCMC interprets the lower pH at Site 6 as due to natural variation. The median values for total sulfate for Site 48 and Site 6 are 13.6 mg/L and 15.7 mg/L respectively and the median of the differences, Site 48 minus Site 6, is -1.6 mg/L total sulfate. Prior Water Year's datasets from 2003-2009 have yielded similar differences ranging for -1.7 mg/L to -2.5 mg/L.

Dissolved zinc results follow along in a similar manner where the median values for Site 48 and Site 6 are 3.26 µg/L and 6.18 µg/L respectively while the median difference is -2.79 µg/L. Similar signed-rank test results for prior datasets for Water Years 2000 – 2009 show similar statistically significant differences with a median difference ranging from -1.7 µg/L to -4.17 µg/L dissolved zinc. The magnitudes of these differences appear to have been relatively consistent over the past several years and do not appear to be increasing. Also, the magnitude of the relative differences is small with respect to laboratory conductivity and well below the applicable AWQS in the case of sulfate and dissolved zinc. HGCMC believes that no additional monitoring is warranted at this time due to the consistent differences in the measured analytes between the two sites. Taking into consideration the small magnitude of the differences that are measurable between the two sites, the current FWMP program is sufficient to monitor any future increases at Site 6. Thus, if an upward trend in conductivity, total sulfate, or dissolved zinc at Site 6 is occurring, the current program is sufficient for identifying the change before any water quality values are impaired.

Table of Results for Water Year 2010

Site 6 "Middle Greens Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	12/8/2009	1/12/2010	2/16/2010	3/16/2010	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	3.6	1.0	0.2	0.7	1.7	0.6	0.8	3.9	4.6	6.7	9.0	6.8	2.7
Conductivity-Field(µmho)	133.8	117.1	154.8	98.4	136.6	151.2	139.8	110.1	87.8	94.8	103.8	128.2	122.7
Conductivity-Lab (µmho)	125	131 J	146	109	126	141	140	106	87	99	109	136	126
pH Lab (standard units)	7.46	7.65 J	7.51	7.56	6.40	6.95	6.48	7.69	6.88	6.32	6.56	6.37	6.92
pH Field (standard units)	7.68	7.12	7.55	6.46	7.38	7.48	6.92	7.61	7.02	6.99	7.02	7.59	7.25
Total Alkalinity (mg/L)	45.0	46.4 J	52.2	39.7	45.6	46.7	44.0	36.2	32.9	35.9	41.1	46.5	44.5
Total Sulfate (mg/L)	15.3	18.7	19.9	15.0	16.4	19.0 J	19.4	10.7	9.4	9.9 J	11.8 J	16.0	15.7
Hardness (mg/L)	63.9	62.4	69.8	52.9	64.0	68.5	68.4	48.1	42.1	48.9	52.3	63.5	63.0
Dissolved As (ug/L)	0.232	0.198	0.185	0.190	0.199	0.214	0.192	0.200	0.226	0.210	0.237	0.209	0.205
Dissolved Ba (ug/L)			28.5	22.9	25.0								25.0
Dissolved Cd (ug/L)	0.0514	0.0665	0.0574	0.0435	0.0538	0.0536	0.0695	0.0362	0.0339	0.0361	0.0382	0.0459	0.0487
Dissolved Cr (ug/L)			1.080	2.560	2.710								2.560
Dissolved Cu (ug/L)	0.463	0.540	0.462	0.582 U	0.692 U	0.692 U	0.631	0.364	0.242 U	0.298	0.315	0.375	0.463
Dissolved Pb (ug/L)	0.0091 U	0.0240 U	0.0273	0.0186 U	0.0467 U	0.0320 U	0.0458 U	0.0089 U	0.0100 U	0.0095	0.0089 U	0.0100 J	0.0143
Dissolved Ni (ug/L)			1.130	0.747	1.120								1.120
Dissolved Ag (ug/L)			<0.003	<0.003	<0.003								0.002
Dissolved Zn (ug/L)	6.36	9.97	8.98	6.00 U	8.38	9.36 U	11.70	4.25	3.95 U	3.61	3.45	4.42	6.18
Dissolved Se (ug/L)			1.390	1.010	1.070 J								1.070
Dissolved Hg (ug/L)	0.000649	0.000763	0.000654	0.001240	0.001180	0.000999	0.001190 U	0.000670 U	0.001190 U	0.000552	0.000571 U	0.000764	0.000764

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
6	10/20/2009	12:00 AM				
			Pb diss, µg/l	0.00912	U	Field Blank Contamination
6	11/17/2009	12:00 AM				
			Alk Tot,mg/l	46.4	J	Temperature Exceedance
			Cond, µs/cm	131	J	Temperature Exceedance
			Pb diss, µg/l	0.02	U	Field Blank Contamination
			pH Lab, su	7.65	J	Hold Time Violation
6	1/12/2010	12:00 AM				
			Cu diss, µg/l	0.58	U	Field Blank Contamination
			Pb diss, µg/l	0.01	U	Field Blank Contamination
			Zn diss, µg/l	6	U	Field Blank Contamination
6	2/16/2010	12:00 AM				
			Cu diss, µg/l	0.692	U	Field Blank Contamination
			Pb diss, µg/l	0.0467	U	Field Blank Contamination
			Se diss, µg/l	1.07	J	LCS Recovery
6	3/16/2010	12:00 AM				
			Cu diss, µg/l	0.692	U	Field Blank Contamination
			Pb diss, µg/l	0.032	U	Field Blank Contamination
			Zn diss, µg/l	9.36	U	Field Blank Contamination
			SO4 Tot, mg/l	19	J	Sample Receipt Temperature
6	4/6/2010	12:00 AM				
			Hg diss, µg/l	0.00119	U	Field Blank Contamination
			Pb diss, µg/l	0.0458	U	Field Blank Contamination
6	5/11/2010	12:00 AM				
			Hg diss, µg/l	0.00067	U	Field Blank Contamination
			Pb diss, µg/l	0.00893	U	Field Blank Contamination
			SO4 Tot, mg/l	10.7	v	Sample Temperature
6	6/15/2010	12:00 AM				
			Cu diss, µg/l	0.242	U	Field Blank Contamination
			Hg diss, µg/l	0.00119	U	Field Blank Contamination
			Pb diss, µg/l	0.01	U	Field Blank Contamination
			Zn diss, µg/l	3.95	U	Field Blank Contamination

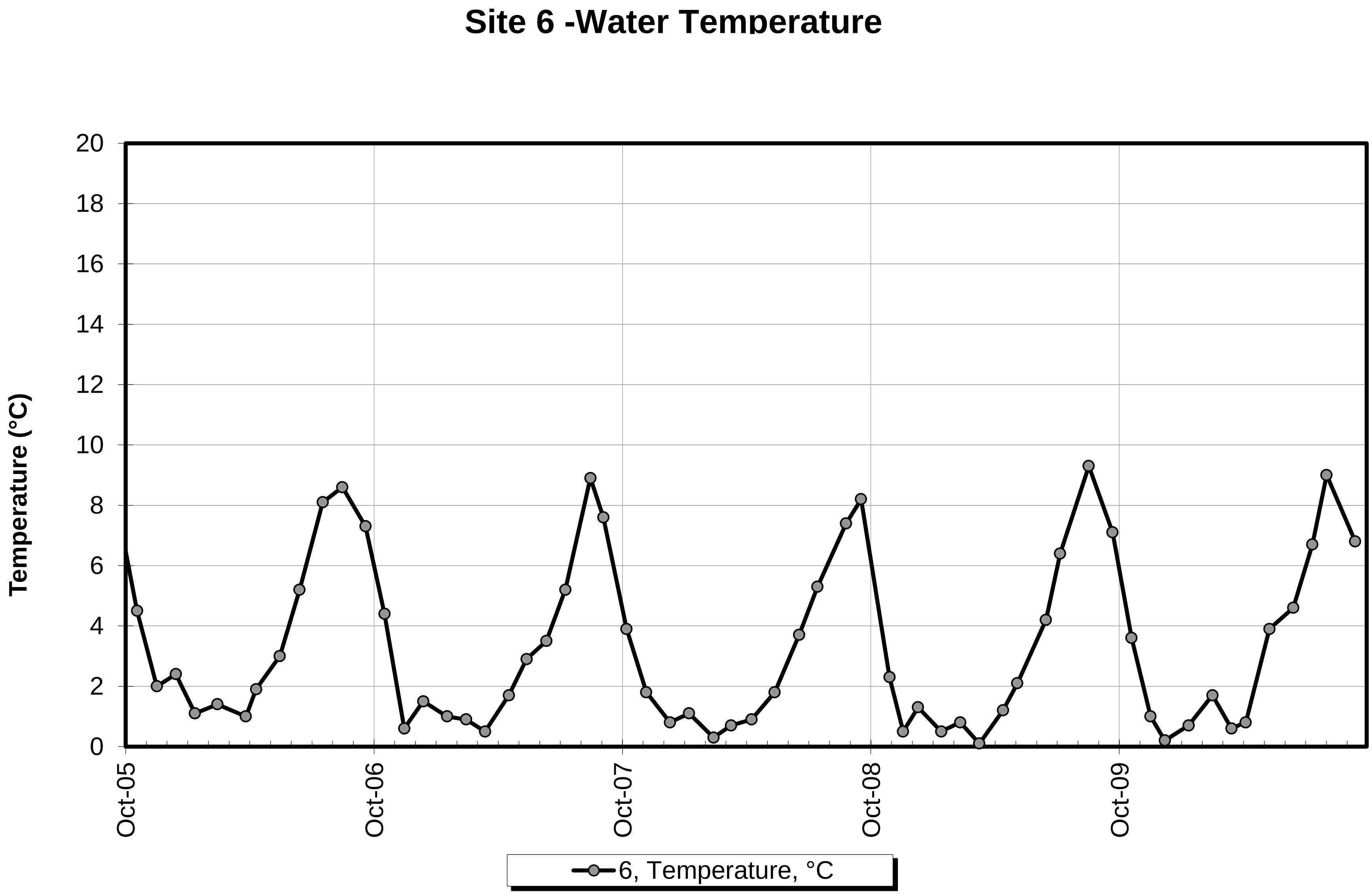
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

Qualified Data by QA Reviewer

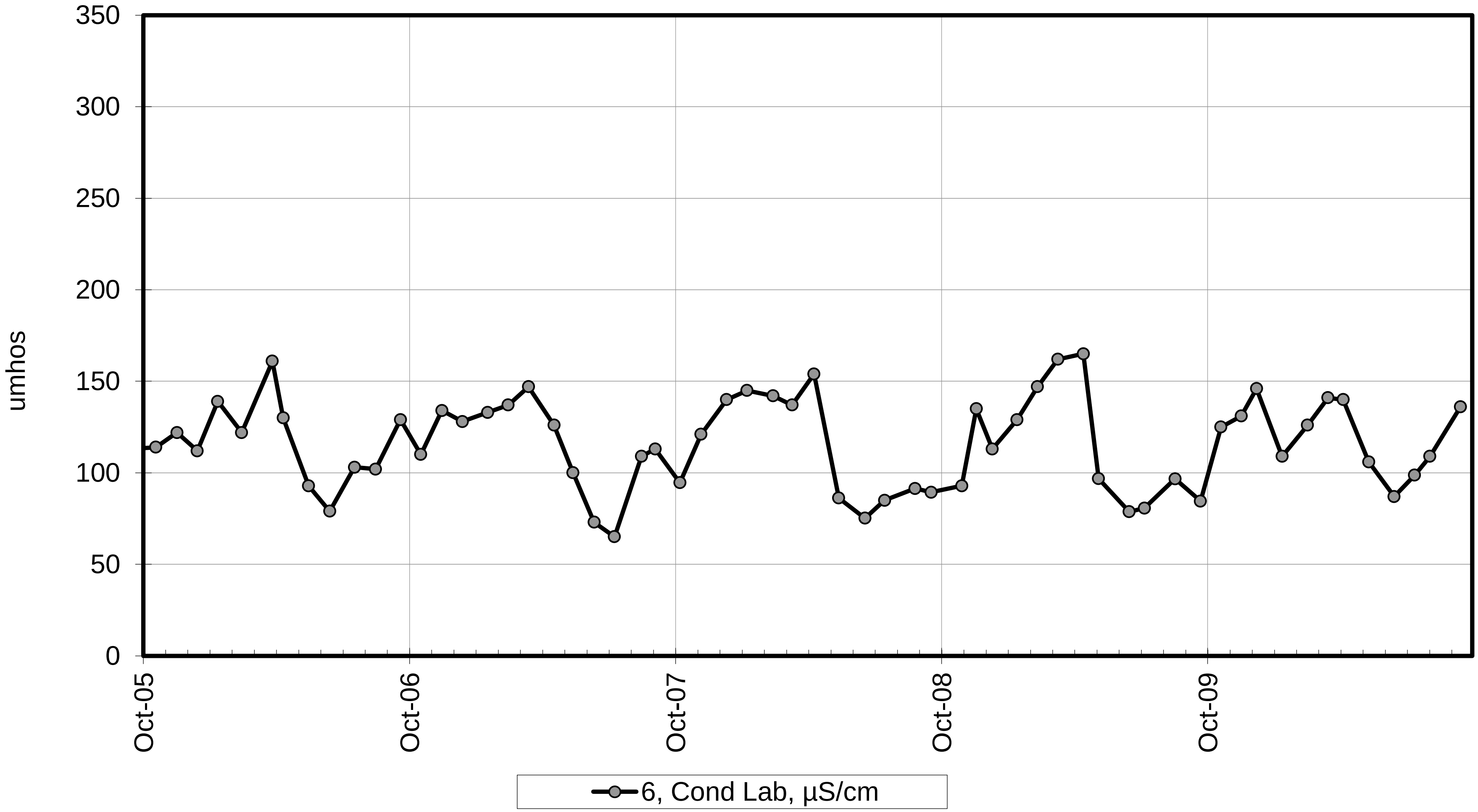
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
6	7/13/2010	9:03 AM	Hg diss, µg/l	0.000552	U	Field Blank Contamination
			SO4 Tot, mg/l	9.9	J	Sample Reciept Temperature
6	8/3/2010	12:00 AM				
			Hg diss, µg/l	0.000571	U	Field Blank Contamination
			Pb diss, µg/l	0.00893	U	Field Blank Contamination
			SO4 Tot, mg/l	11.8	J	Sample Temperature
6	9/14/2010	12:00 AM				
			Pb diss, µg/l	0.01	J	Below Quantitative Range

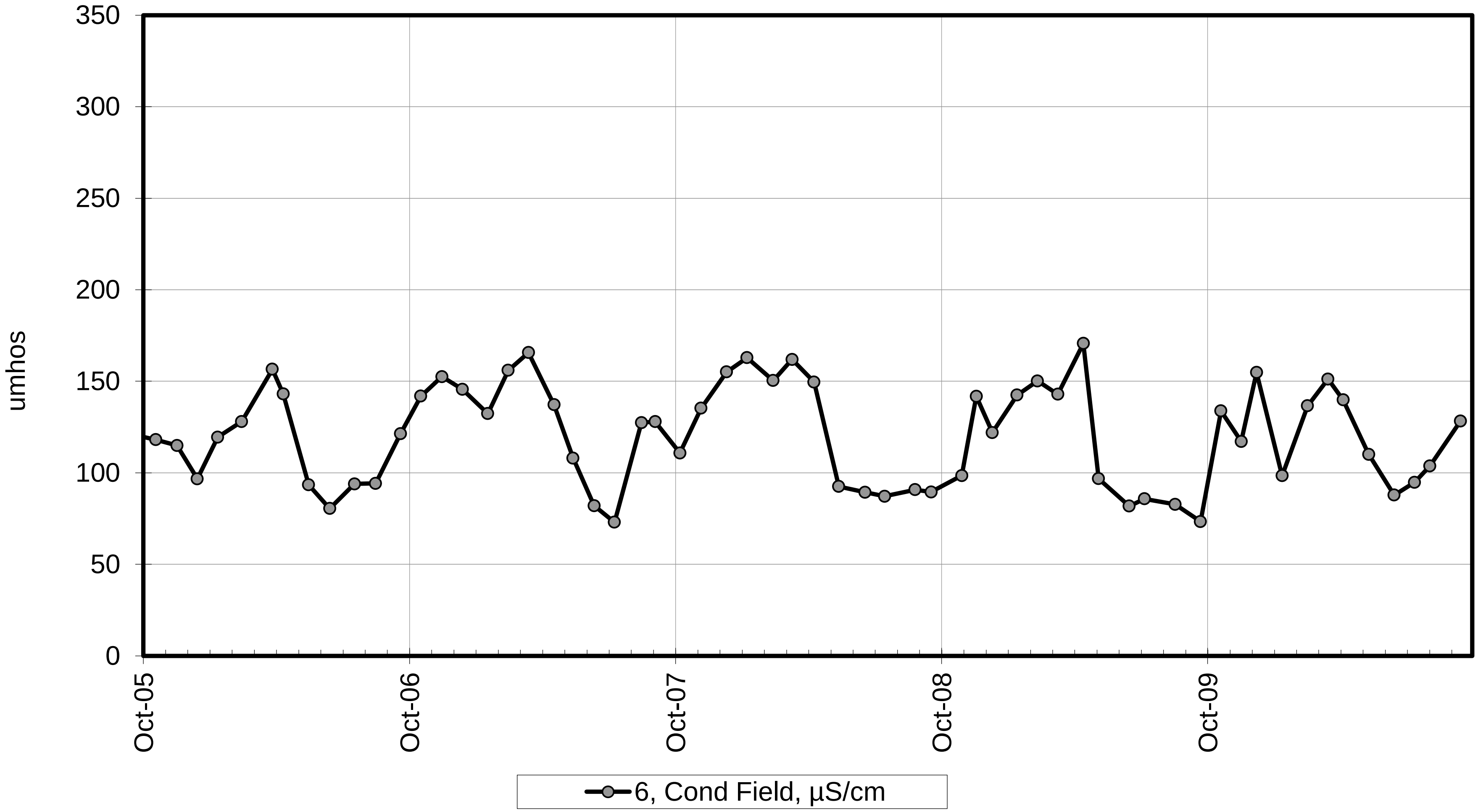
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

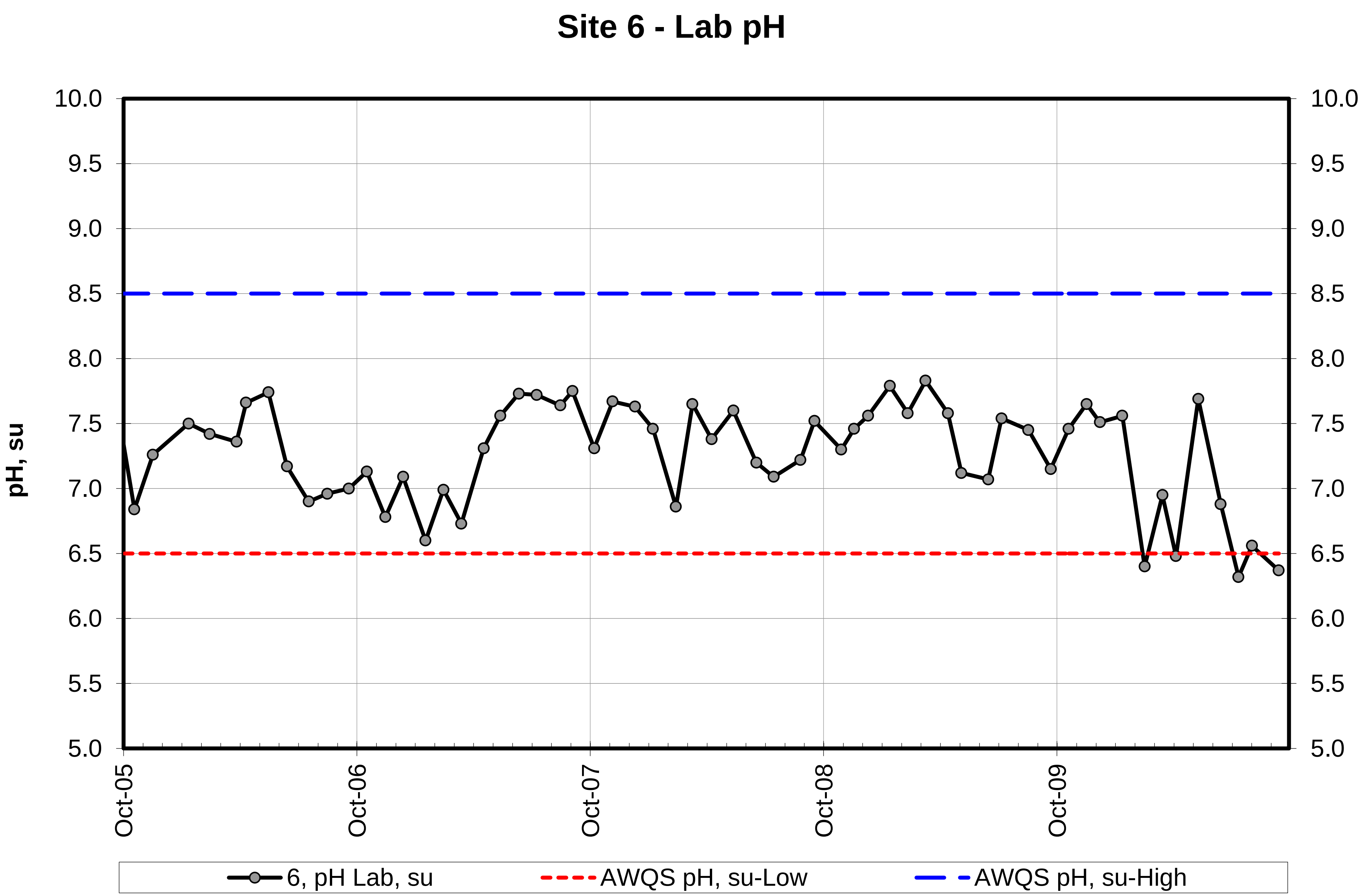

Site 6 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, Temperature, °C

Site 6 - Conductivity-Lab

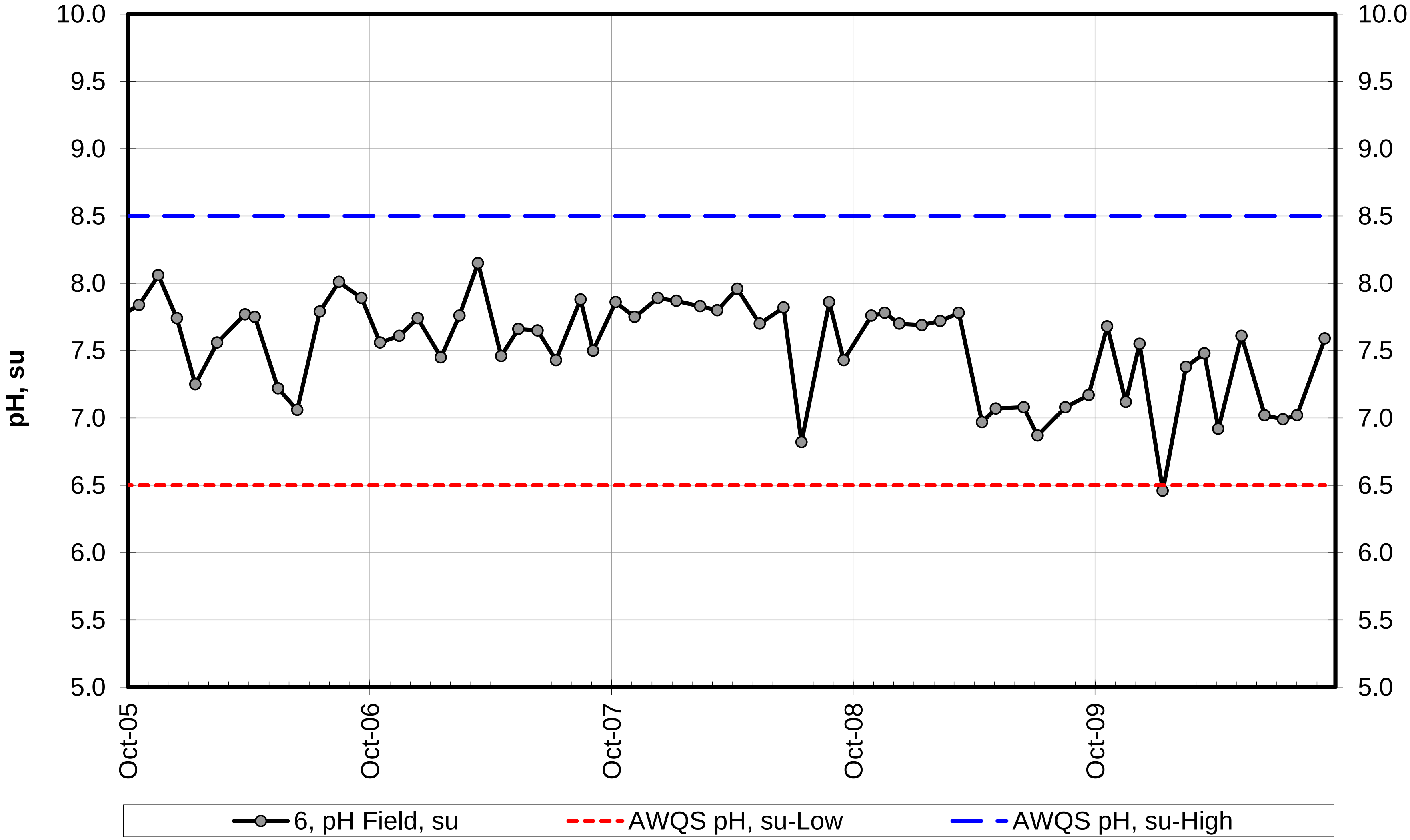


Site 6 - Conductivity-Field

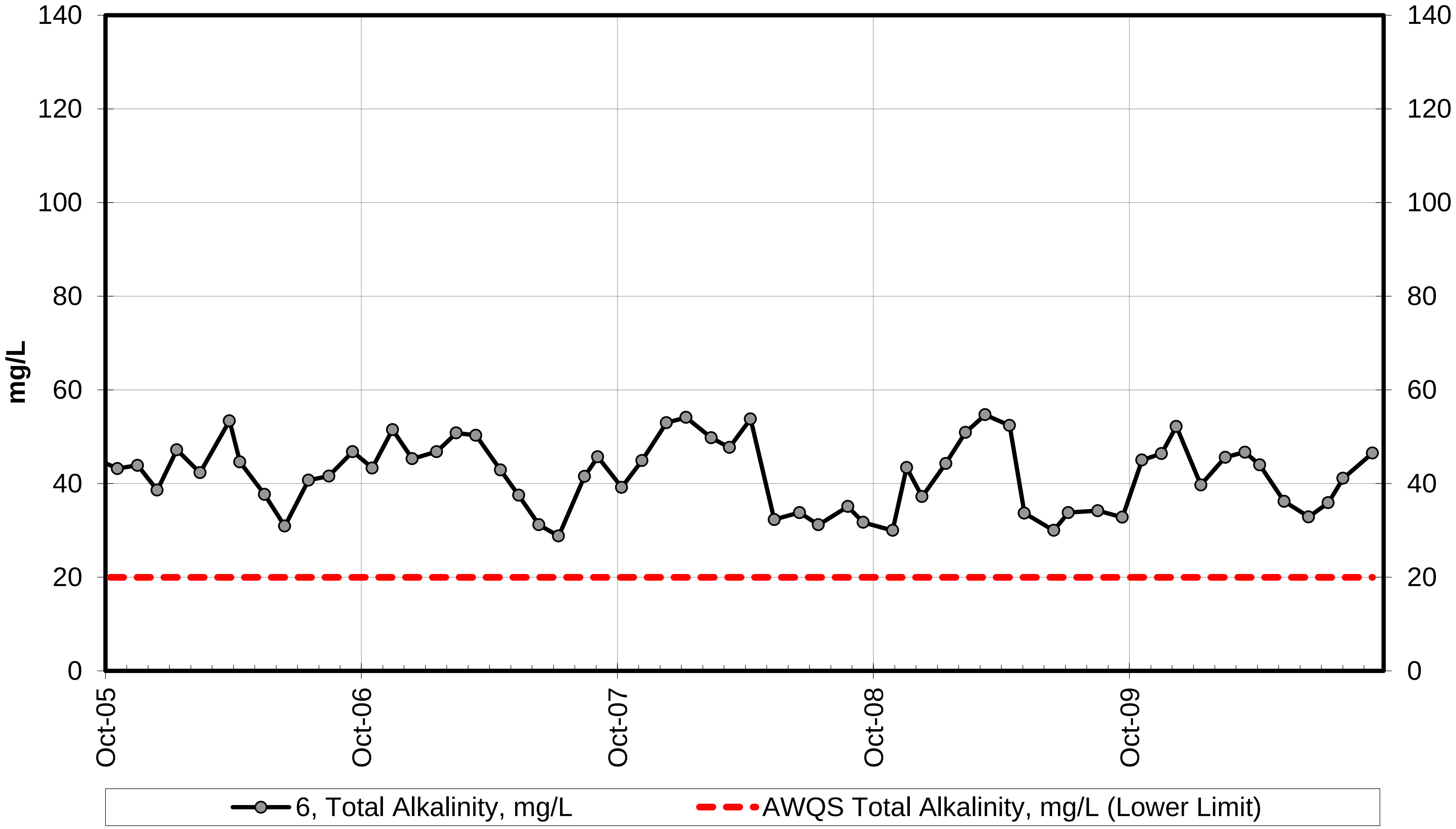



Site 6 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

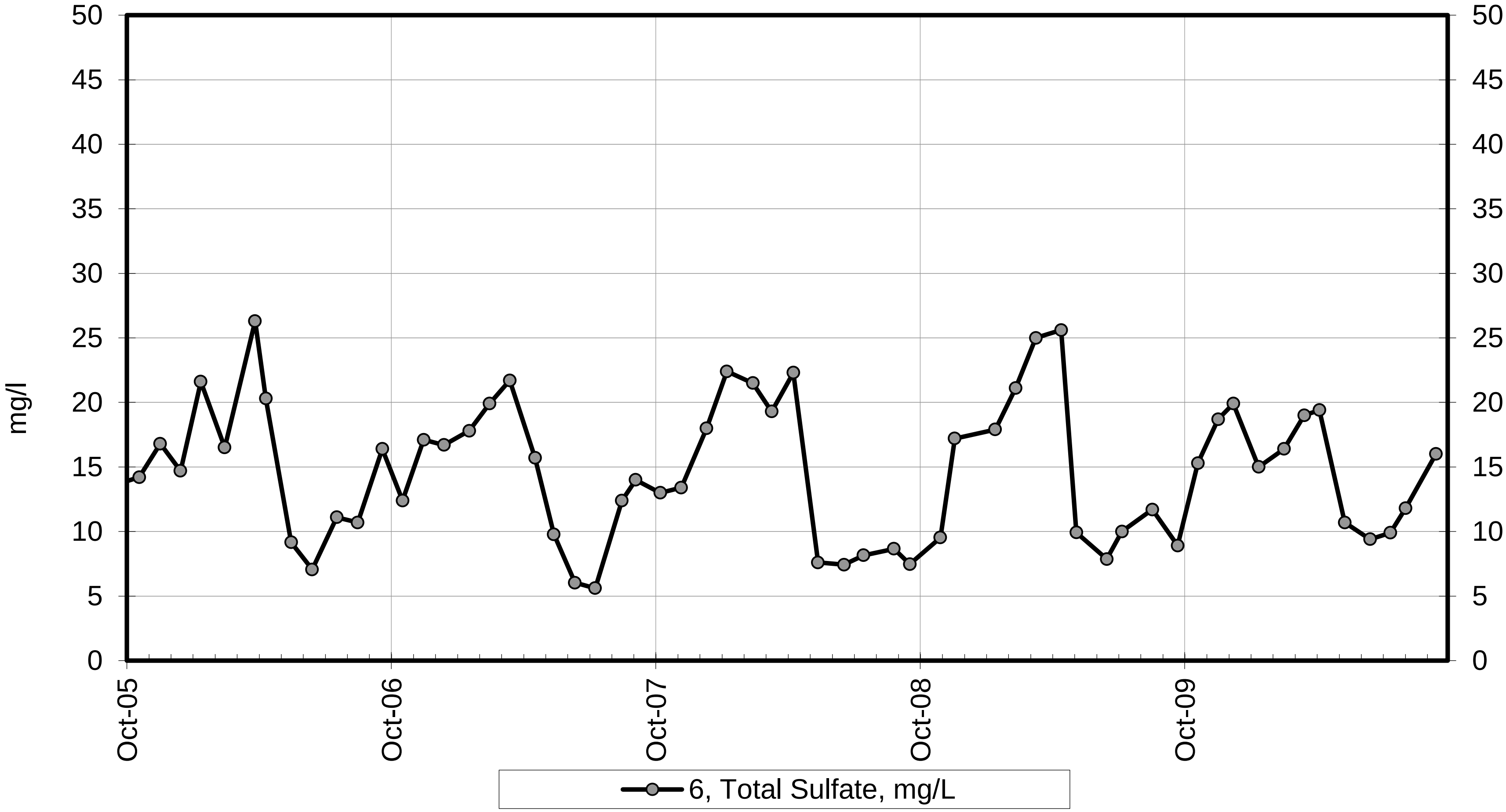
Site 6 - Field pH



Site 6 - Total Alkalinity

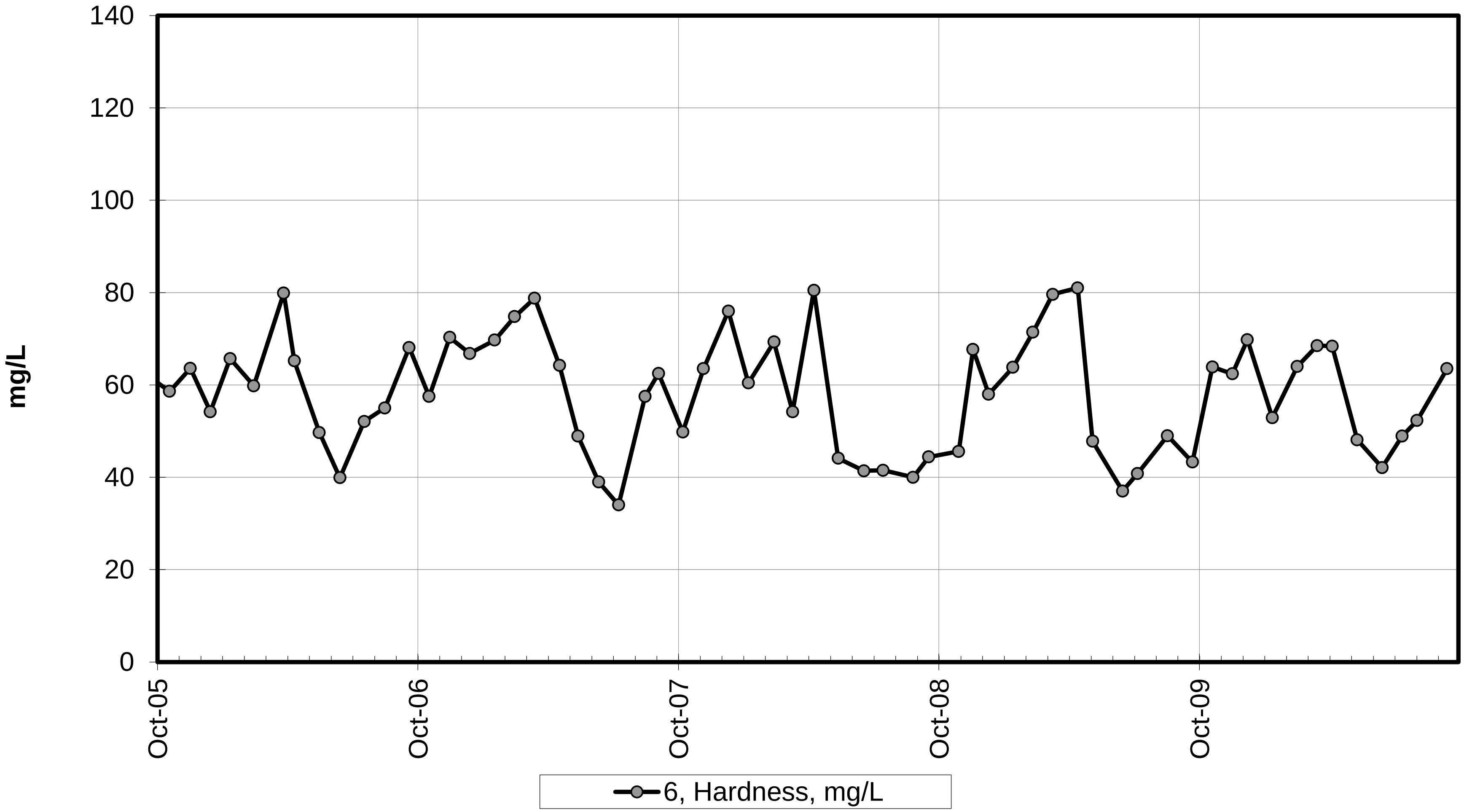


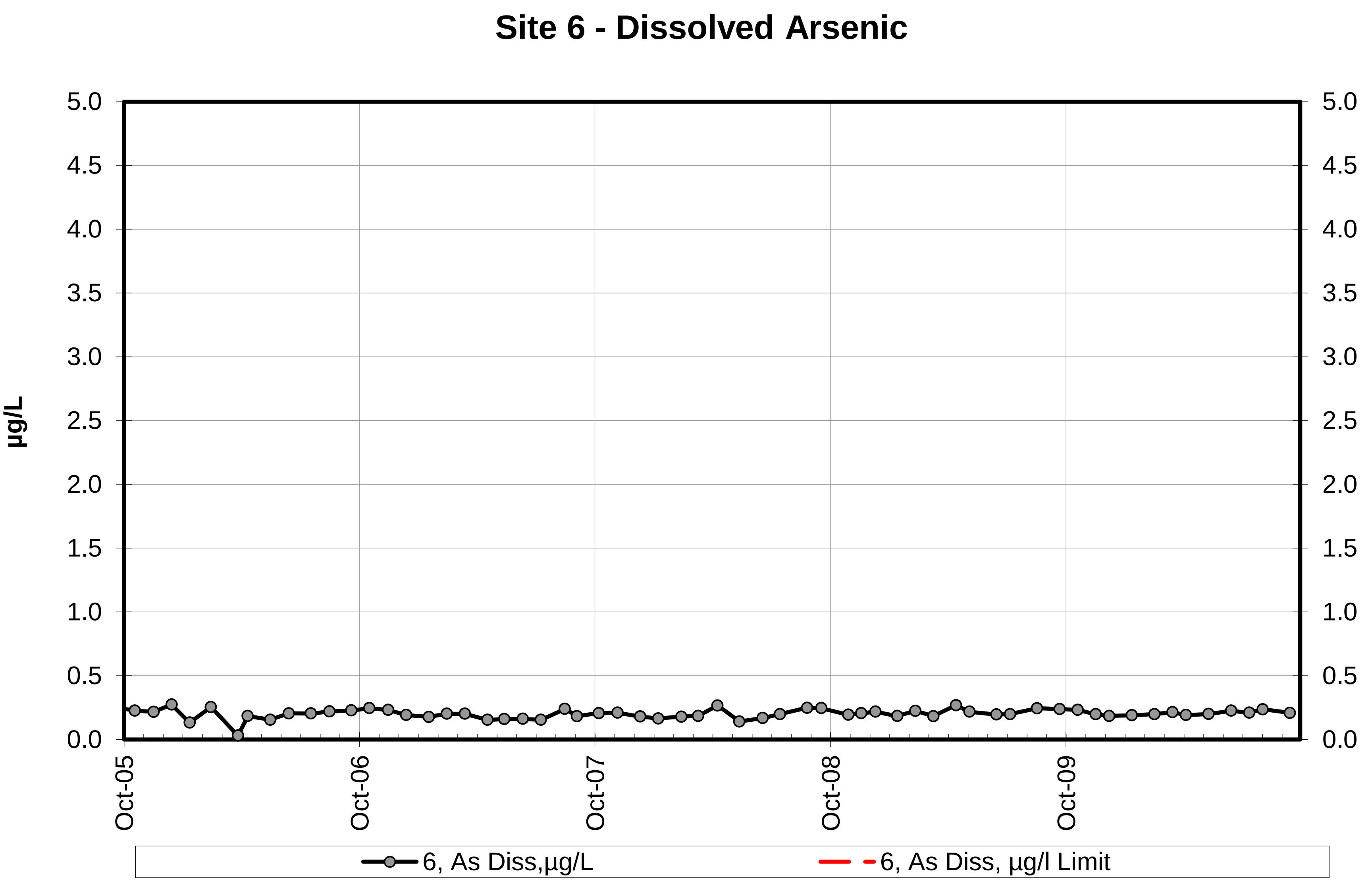
Site 6 - Total Sulfate



Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

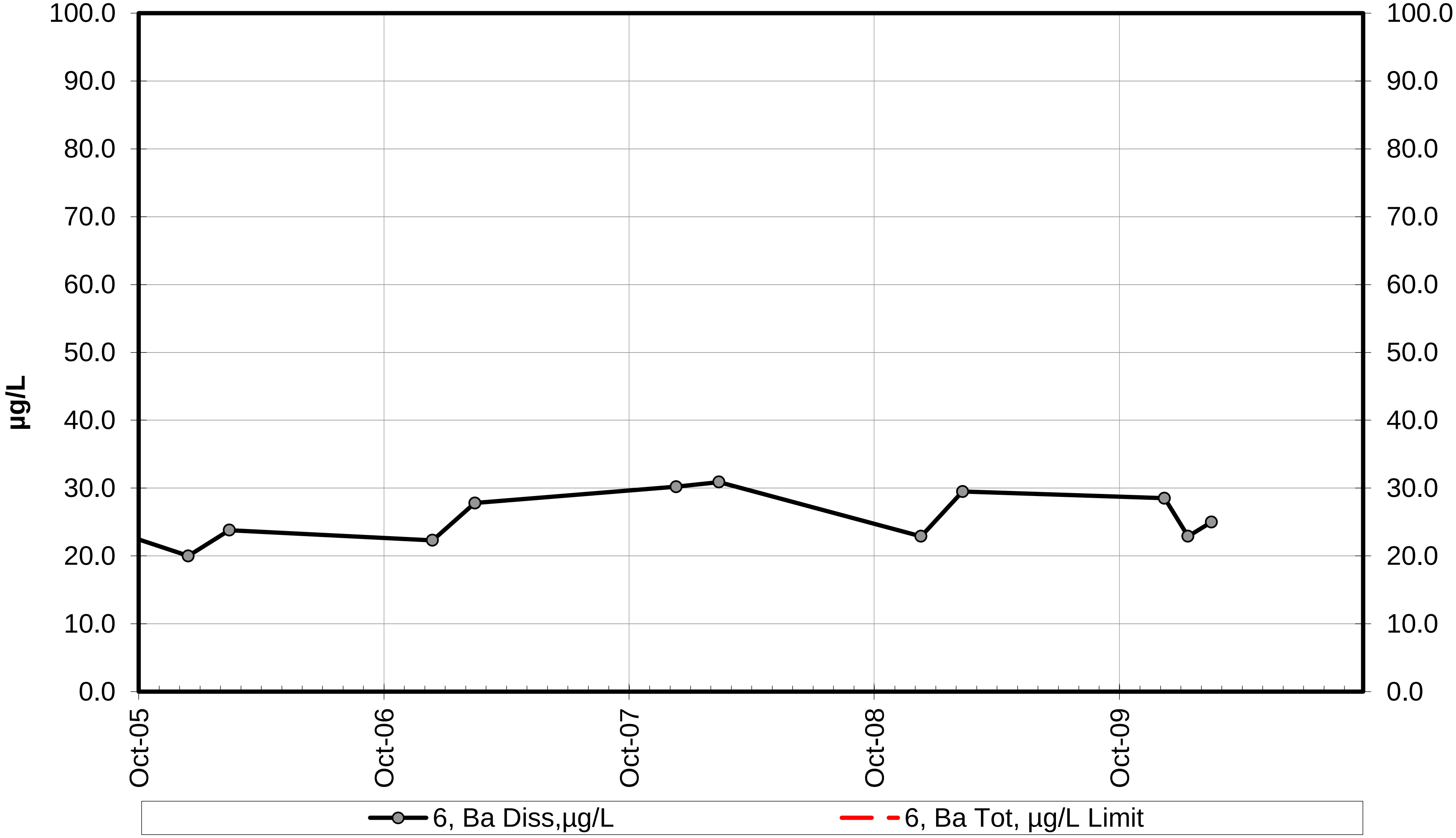
Site 6 - Hardness



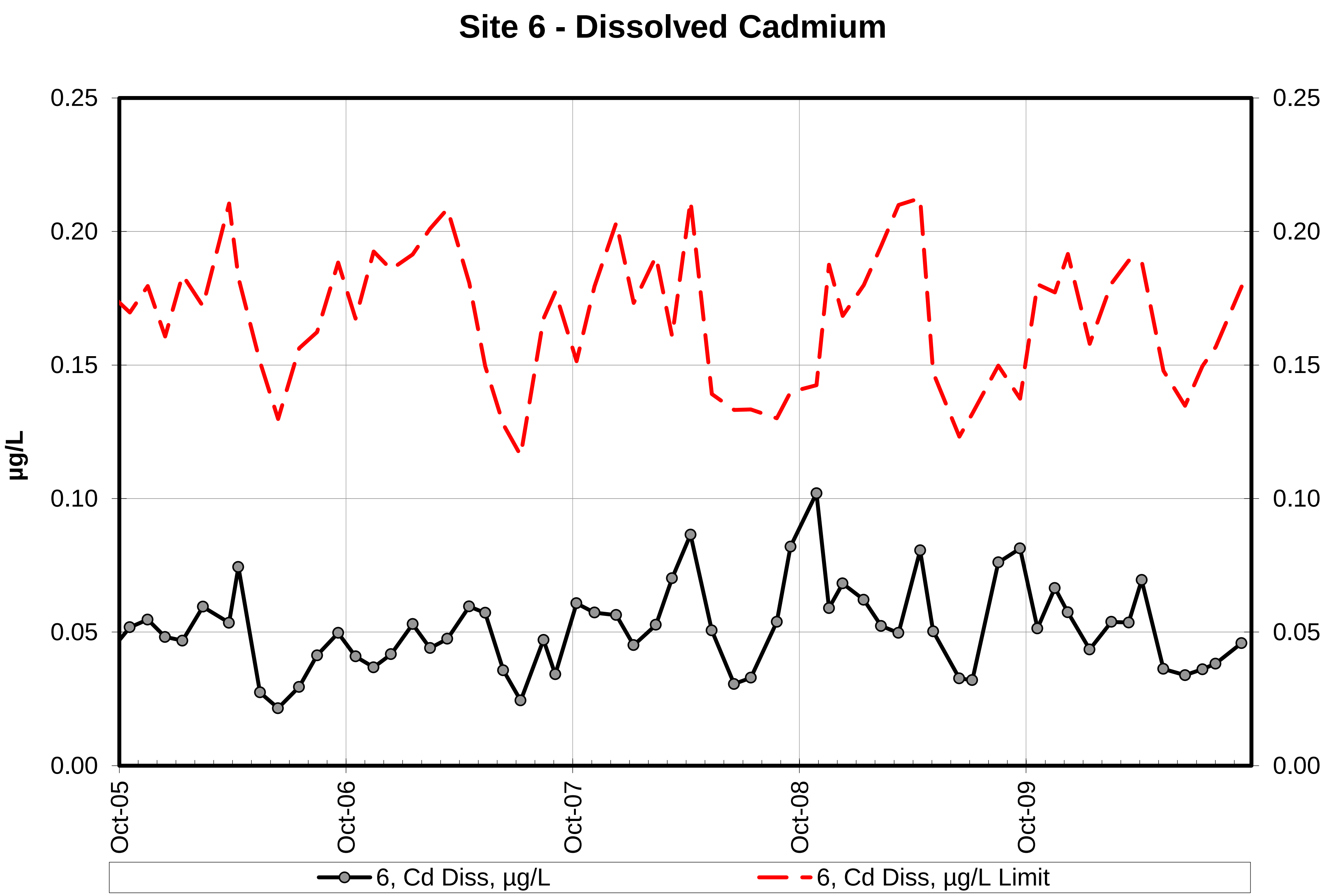


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

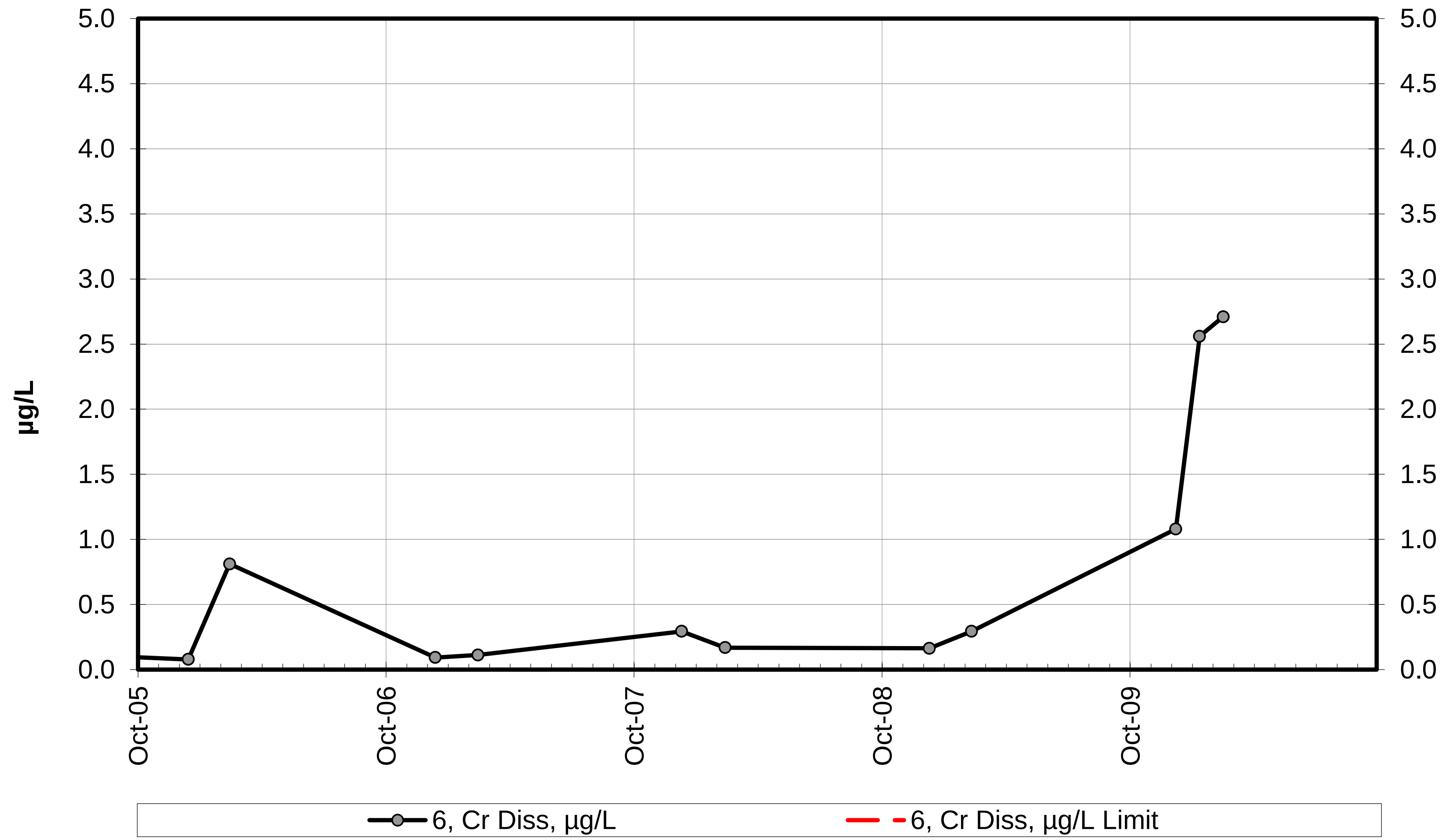
Site 6 - Dissolved Barium



Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

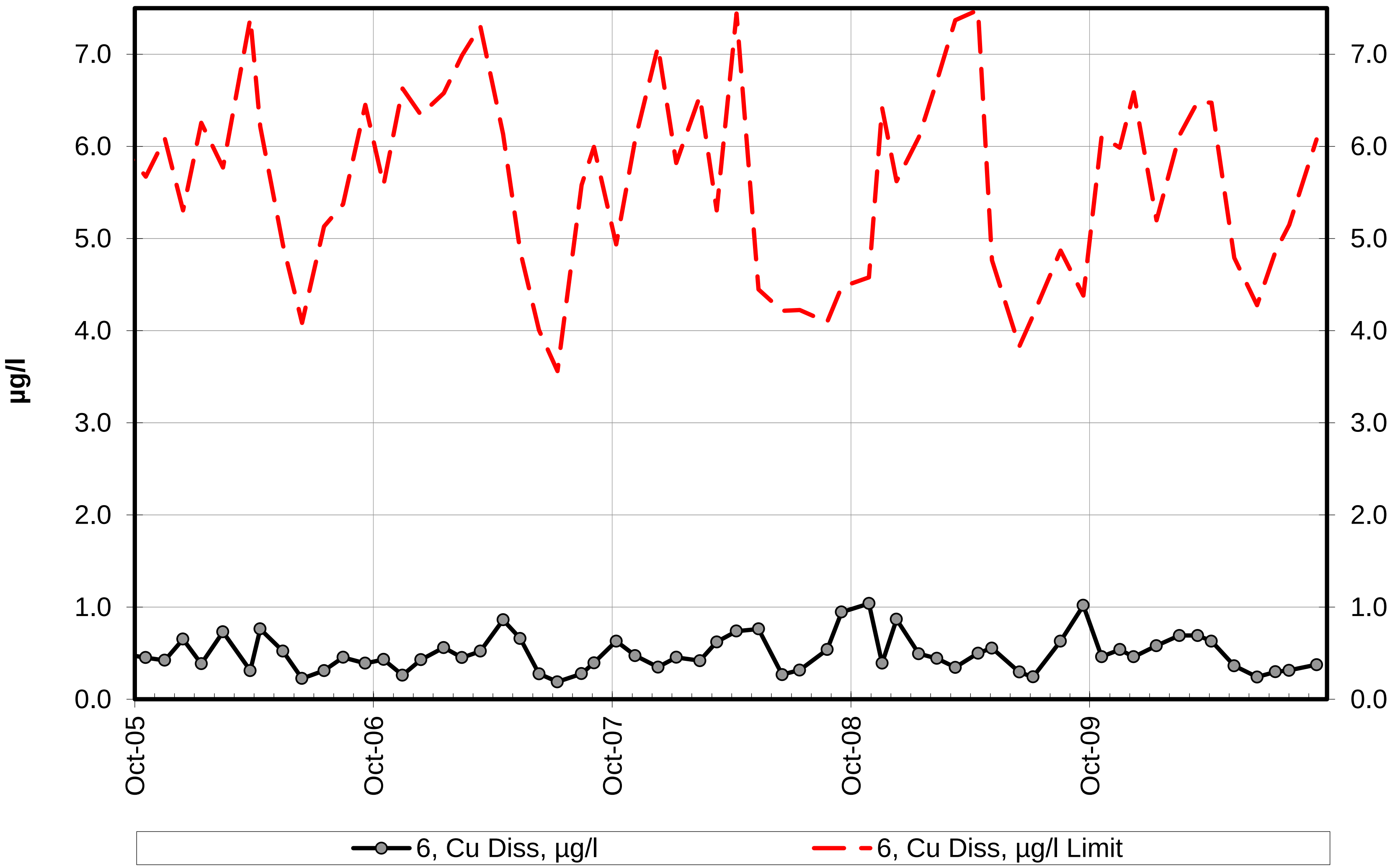

Site 6 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, Cd Diss, µg/L
6, Cd Diss, µg/L Limit

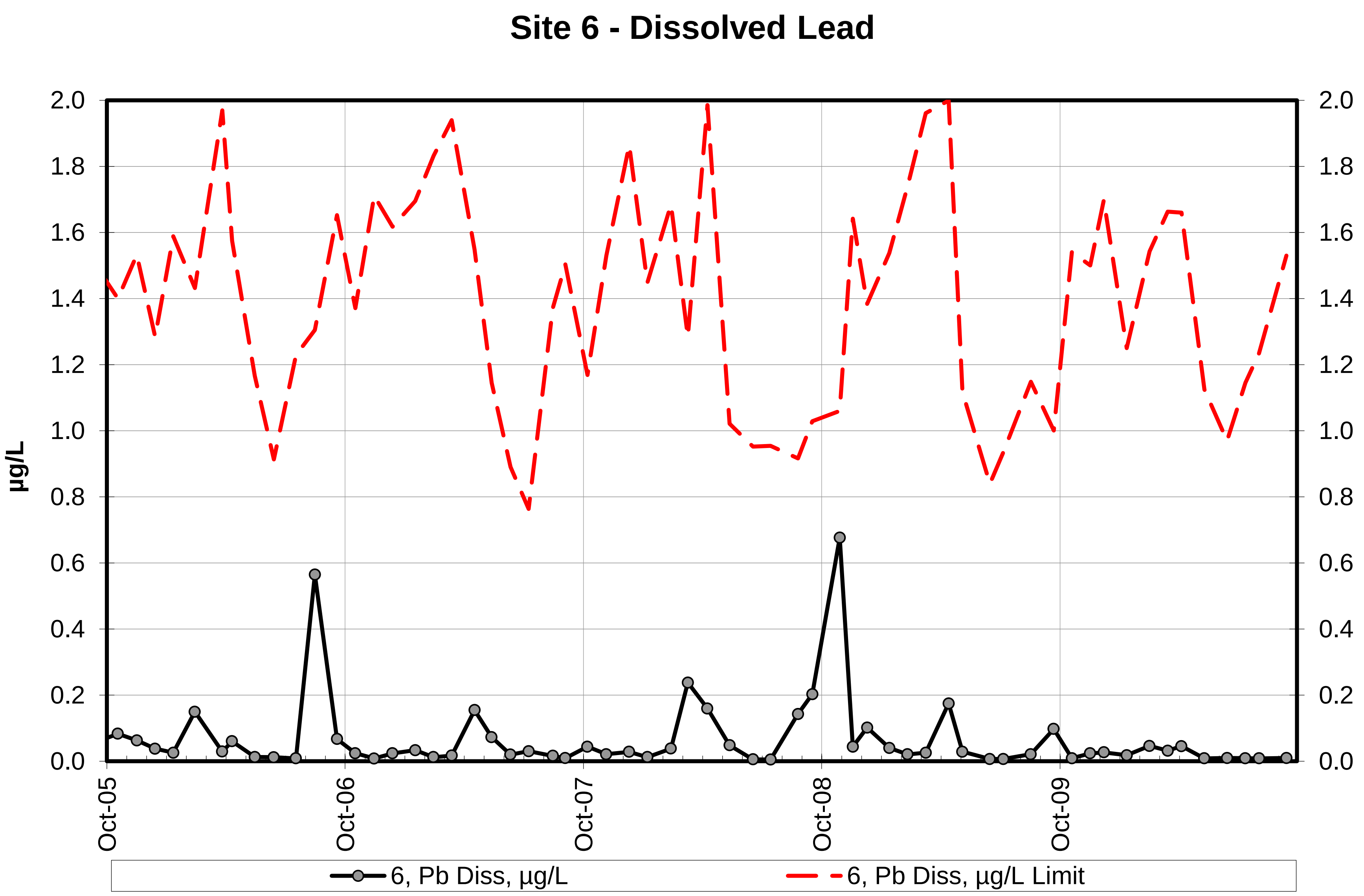
Site 6 - Dissolved Chromium

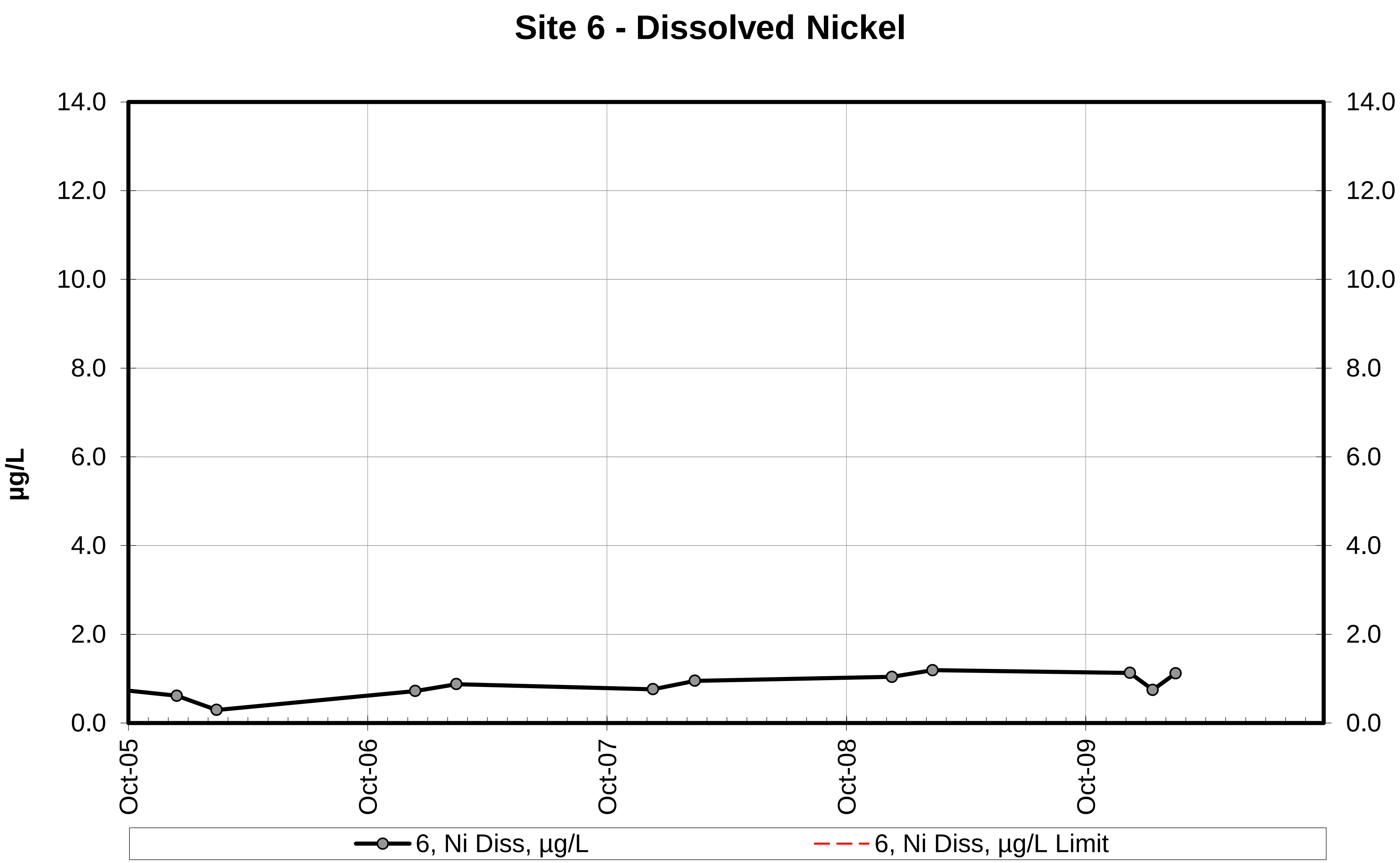


Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

Site 6 - Dissolved Copper

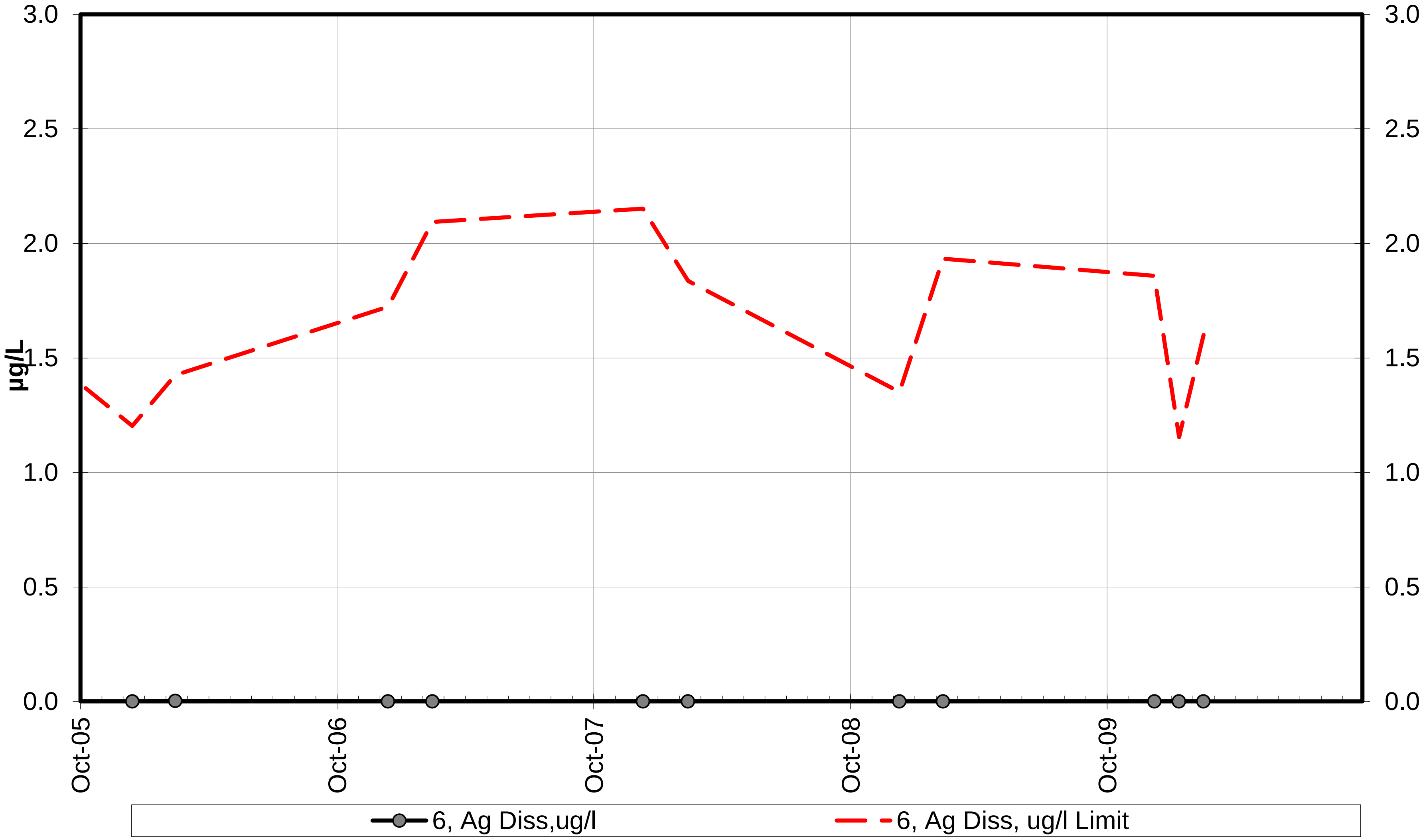



Site 6 - Dissolved Lead
µg/L
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, Pb Diss, µg/L
6, Pb Diss, µg/L Limit

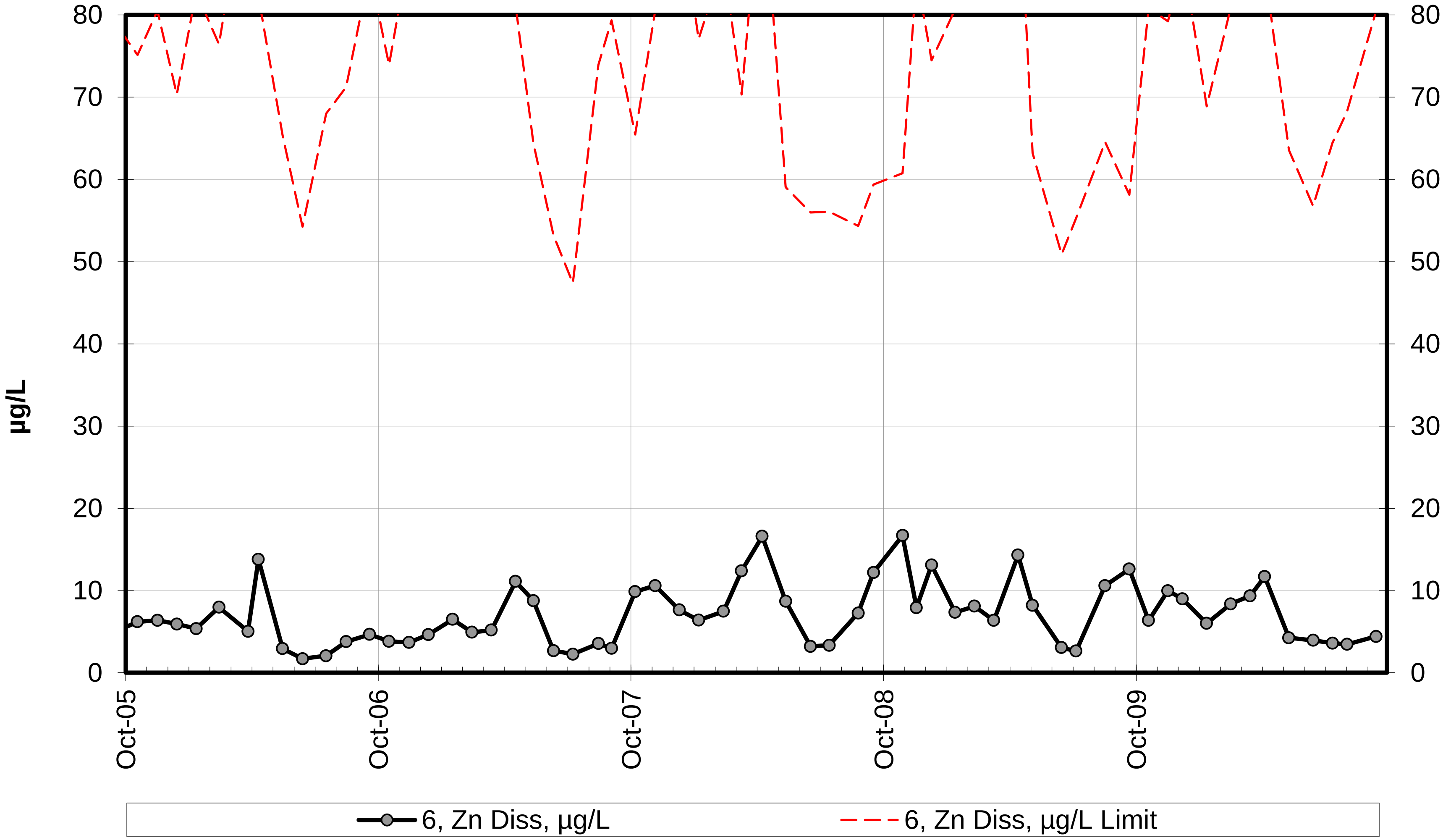


Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

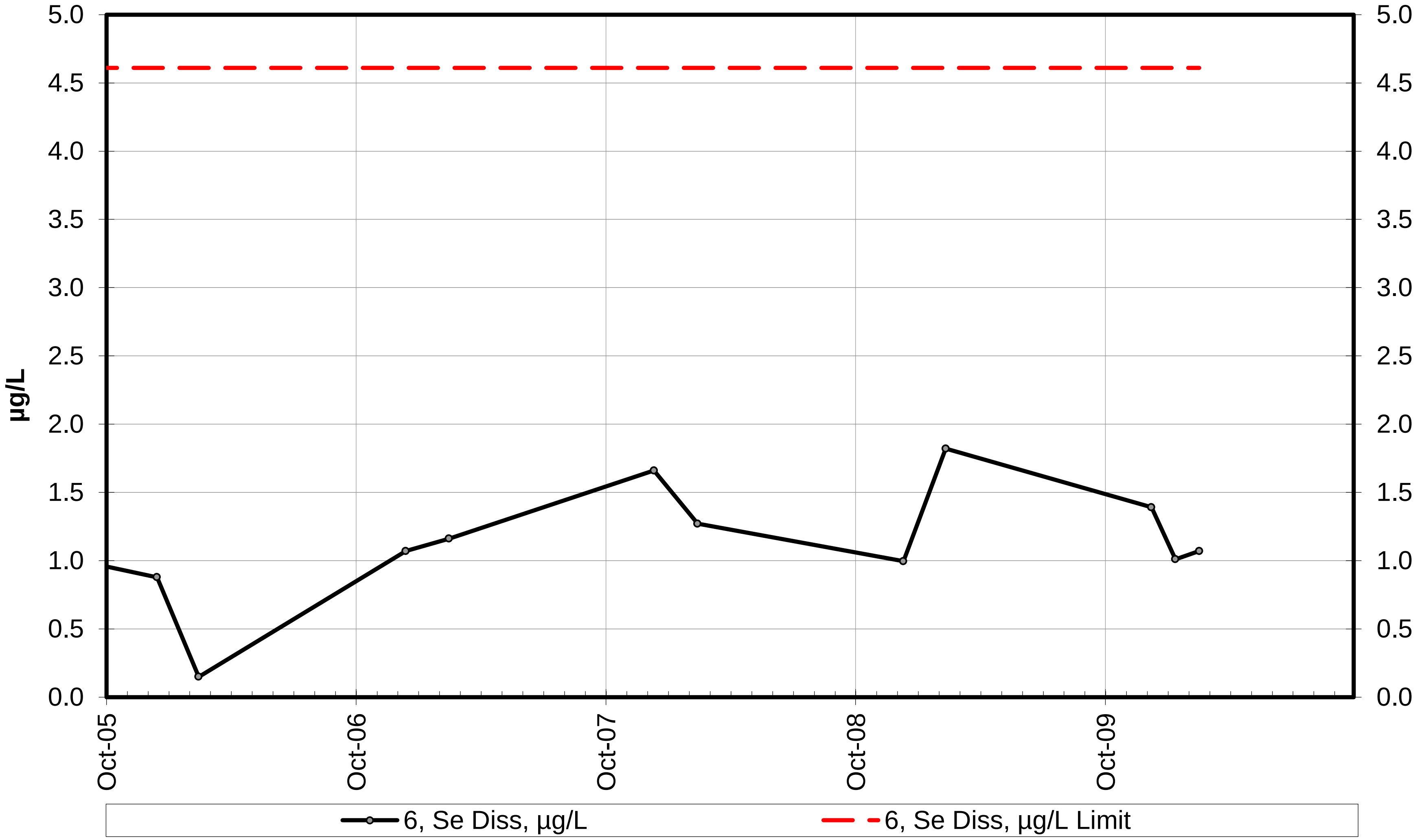
Site 6 - Dissolved Silver

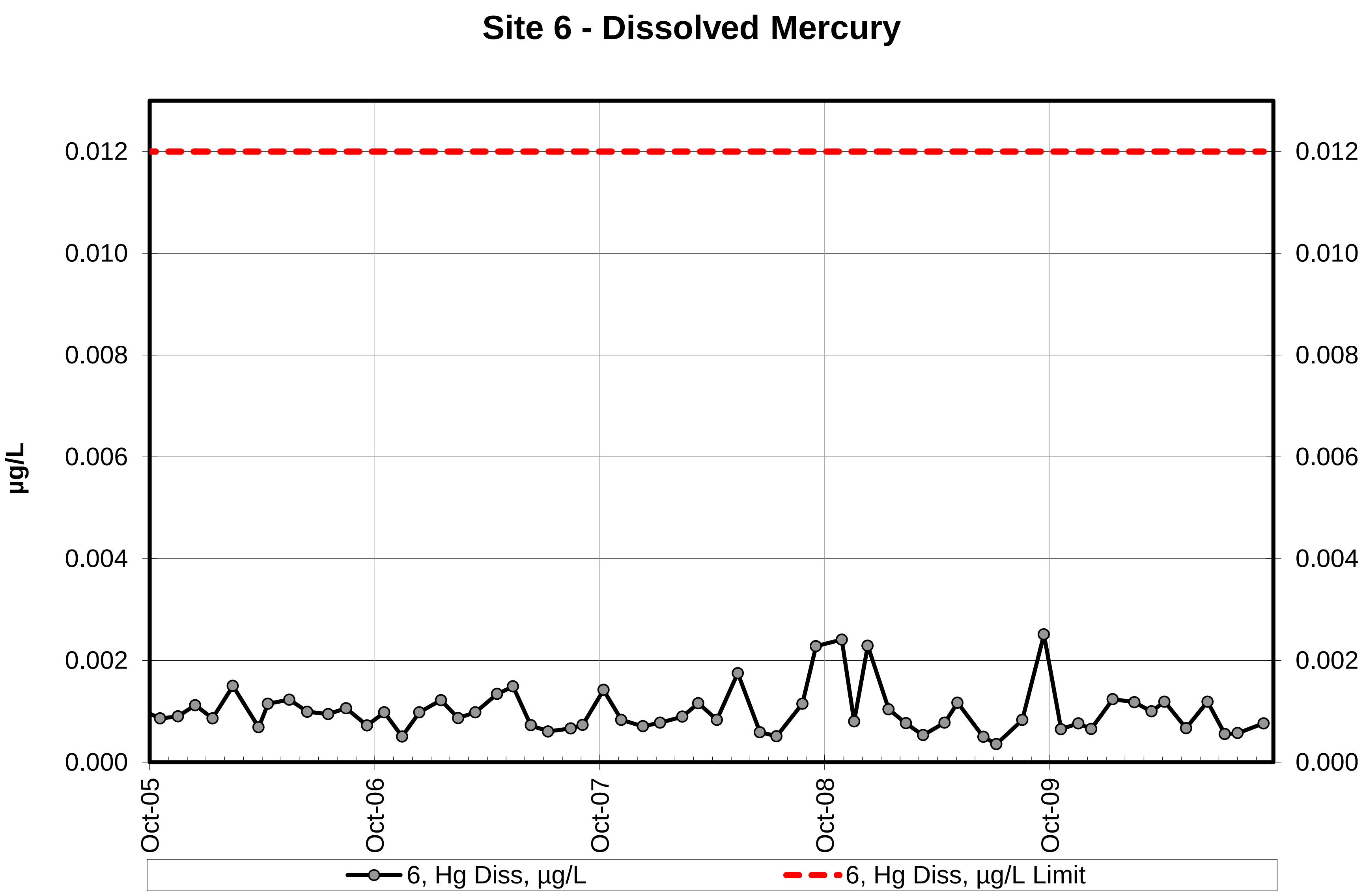


Site 6 - Dissolved Zinc



Site 6 - Dissolved Selenium





Site 6 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, Hg Diss, µg/L
6, Hg Diss, µg/L Limit

Site **#6** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	140	95.9	131	140	145	117	145	83.9	85.9	101	137	113
b	**WY2006**	114	122	112	139	122	161	130	92.8	79	103	102	129
c	**WY2007**	110	134	128	133	137	147	126	100	73	65.1	109	113
d	**WY2008**	94.6	121	140	145	142	137	154	86.2	75.2	85	91.4	89.4
e	**WY2009**	92.9	135	113	129	147	162	165	96.8	78.7	80.7	96.7	84.5
f	**WY2010**	125	131	146	109	126	141	140	106	87	98.7	109	136
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	3	3
t_2	0	0	0	0	0	0	0	0	0	0	1	1
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	-1	1	-1	1	-1	1
c-a	-1	1	-1	-1	-1	1	-1	1	-1	-1	-1	0
d-a	-1	1	1	1	-1	1	1	1	-1	-1	-1	-1
e-a	-1	1	-1	-1	1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1	-1	-1	1	-1	1	1	-1	-1	1
c-b	-1	1	1	-1	1	-1	-1	1	-1	-1	1	-1
d-b	-1	-1	1	1	1	-1	1	-1	-1	-1	-1	-1
e-b	-1	1	1	-1	1	1	1	1	-1	-1	-1	-1
f-b	1	1	1	-1	1	-1	1	1	1	-1	1	1
d-c	-1	-1	1	1	1	-1	1	-1	1	1	-1	-1
e-c	-1	1	-1	-1	1	1	1	-1	1	1	-1	-1
f-c	1	-1	1	-1	-1	-1	1	1	1	1	0	1
e-d	-1	1	-1	-1	1	1	1	1	1	-1	1	-1
f-d	1	1	1	-1	-1	1	-1	1	1	1	1	1
f-e	1	-1	1	-1	-1	-1	-1	1	1	1	1	1
S_k	-7	7	5	-9	1	3	3	9	1	-3	-4	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	27.33	27.33
$Z_k = S_k/\sigma_S$	-1.32	1.45	0.94	-1.69	0.19	0.56	0.56	1.69	0.19	-0.56	-0.77	-0.38
Z^2_k	1.73	2.10	0.88	2.86	0.04	0.32	0.32	2.86	0.04	0.32	0.59	0.15

ΣZ_k= 0.87

ΣZ^2_k= 12.18

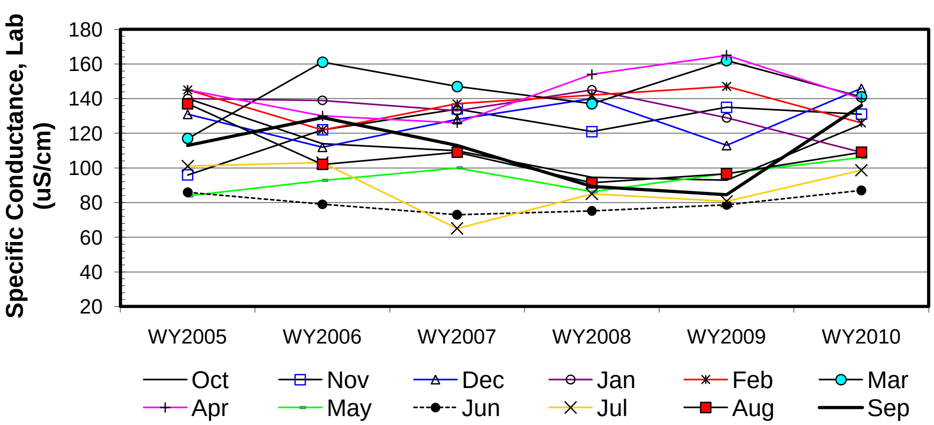
Z-bar=ΣZ_k/K= 0.07

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 72

ΣS_k 4

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		12.12	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
	p	**0.355**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.16	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
333.00	p	**0.565**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.31		3.00
0.050	-1.80	0.28	2.20
0.100	-1.57		2.00
0.200	-1.00		1.56

Site **#6** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	8.1	7.5	7.7	7.9	7.8	7.8	7.9	7.6	8.2	7.6	6.9	7.8
b	**WY2006**	6.8	7.3	7.7	7.5	7.4	7.4	7.7	7.7	7.2	6.9	7.0	7.0
c	**WY2007**	7.1	6.8	7.1	6.6	7.0	6.7	7.3	7.6	7.7	7.7	7.6	7.8
d	**WY2008**	7.3	7.7	7.6	7.5	6.9	7.7	7.4	7.6	7.2	7.1	7.2	7.5
e	**WY2009**	7.3	7.5	7.6	7.8	7.6	7.8	7.6	7.1	7.1	7.5	7.5	7.2
f	**WY2010**	7.5	7.7	7.5	7.6	6.4	7.0	6.5	7.7	6.9	6.3	6.6	6.4
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	1	-1
c-a	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	-1
d-a	-1	1	-1	-1	-1	-1	-1	0	-1	-1	1	-1
e-a	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	1	-1
f-a	-1	1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1
c-b	1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1
d-b	1	1	-1	-1	-1	1	-1	-1	1	1	1	1
e-b	1	1	-1	1	1	1	-1	-1	-1	1	1	1
f-b	1	1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1
d-c	1	1	1	1	-1	1	1	1	-1	-1	-1	-1
e-c	1	1	1	1	1	1	1	-1	-1	-1	-1	-1
f-c	1	1	1	1	-1	1	-1	1	-1	-1	-1	-1
e-d	-1	-1	-1	1	1	1	1	-1	-1	1	1	-1
f-d	1	-1	-1	1	-1	-1	-1	1	-1	-1	-1	-1
f-e	1	1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1
S_k	3	3	-9	-1	-9	-1	-9	-2	-11	-5	1	-9

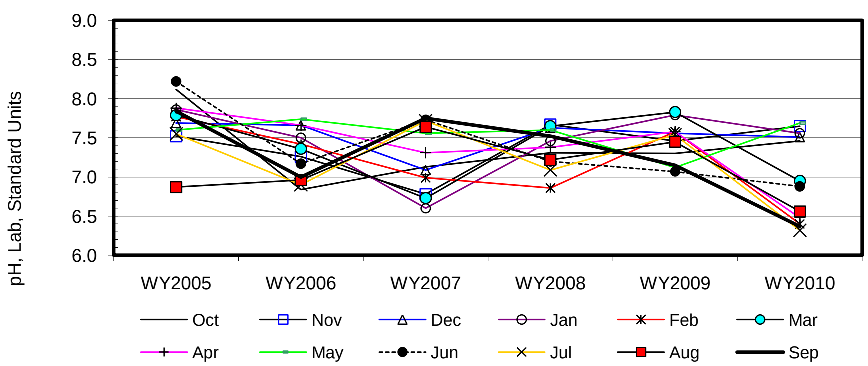
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	27.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	0.56	0.62	-1.69	-0.19	-1.69	-0.19	-1.69	-0.38	-2.07	-0.94	0.19	-1.69
Z^2_k	0.32	0.39	2.86	0.04	2.86	0.04	2.86	0.15	4.27	0.88	0.04	2.86

ΣZ_k= -9.15
ΣZ^2_k= 17.54
Z-bar=ΣZ_k/K= -0.76

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 72
ΣS_k -49

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	10.56	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.481**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -2.63	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
334.00	**p** **0.004**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.17		-0.01
0.050	-0.15	**-0.07**	-0.02
0.100	-0.13		-0.03
0.200	-0.11		-0.04
		-0.9%	

Site **#6** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	54.8	40.4	53.2	59.1	62.1	51.1	76.7	39.4	36.5	42.5	50.0	45.5
b	**WY2006**	43.2	43.9	38.6	47.2	42.3	53.4	44.6	37.7	30.9	40.7	41.6	46.8
c	**WY2007**	43.3	51.5	45.3	46.8	50.8	50.3	42.9	37.5	31.2	28.8	41.5	45.7
d	**WY2008**	39.2	44.9	53.0	54.1	49.8	47.7	53.8	32.3	33.8	31.2	35.1	31.7
e	**WY2009**	30.0	43.4	37.2	44.3	50.9	54.7	52.4	33.7	30.0	33.8	34.2	32.8
f	**WY2010**	45.0	46.4	52.2	39.7	45.6	46.7	44.0	36.2	32.9	35.9	41.1	46.5
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	1
c-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
d-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
e-a	-1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1
f-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
c-b	1	1	1	-1	1	-1	-1	-1	1	-1	-1	-1
d-b	-1	1	1	1	1	-1	1	-1	1	-1	-1	-1
e-b	-1	-1	-1	-1	1	1	1	-1	-1	-1	-1	-1
f-b	1	1	1	-1	1	-1	-1	-1	1	-1	-1	-1
d-c	-1	-1	1	1	-1	-1	1	-1	1	1	-1	-1
e-c	-1	-1	-1	-1	1	1	1	-1	-1	1	-1	-1
f-c	1	-1	1	-1	-1	-1	1	-1	1	1	-1	1
e-d	-1	-1	-1	-1	1	1	-1	1	-1	1	-1	1
f-d	1	1	-1	-1	-1	-1	-1	1	-1	1	1	1
f-e	1	1	1	-1	-1	-1	-1	1	1	1	1	1
S_k	-5	5	-3	-11	-3	-5	-5	-9	-3	-3	-11	-1

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-0.94	1.04	-0.56	-2.07	-0.56	-0.94	-0.94	-1.69	-0.56	-0.56	-2.07	-0.19
Z^2_k	0.88	1.07	0.32	4.27	0.32	0.88	0.88	2.86	0.32	0.32	4.27	0.04

ΣZ_k= -10.05

ΣZ^2_k= 16.42

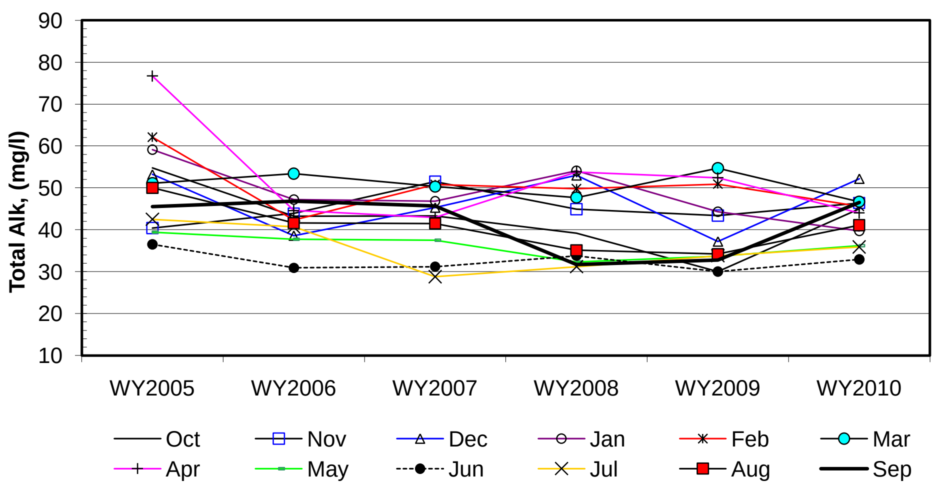
Z-bar=ΣZ_k/K= -0.84

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 72

ΣS_k -54

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$=	8.01	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.712**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	-2.90	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
335.00 **p**	**0.002**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-1.97		-0.16
0.050	-1.70	**-1.05**	-0.40
0.100	-1.67		-0.45
0.200	-1.42		-0.66

-2.4%

Site **#6**

Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	16.5	10.1	16.1	19.5	23.6	14.9	12.5	7.9	9.5	11.0	18.9	13.6
b	**WY2006**	14.2	16.8	14.7	21.6	16.5	26.3	20.3	9.2	7.1	11.1	10.7	16.4
c	**WY2007**	12.4	17.1	16.7	17.8	19.9	21.7	15.7	9.8	6.0	5.6	12.4	14.0
d	**WY2008**	13.0	13.4	18.0	22.4	21.5	19.3	22.3	7.6	7.4	8.2	8.7	7.5
e	**WY2009**	9.5	17.2	16.5	17.9	21.1	25.0	25.6	9.9	7.9	10.0	11.7	8.9
f	**WY2010**	15.3	18.7	19.9	15.0	16.4	19.0	19.4	10.7	9.4	9.9	11.8	16.0
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	1	-1	1	1	1	-1	1	-1	1
c-a	-1	1	1	-1	-1	1	1	1	-1	-1	-1	1
d-a	-1	1	1	1	-1	1	1	-1	-1	-1	-1	-1
e-a	-1	1	1	-1	-1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1	-1	-1	1	1	1	-1	-1	-1	1
c-b	-1	1	1	-1	1	-1	-1	1	-1	-1	1	-1
d-b	-1	-1	1	1	1	-1	1	-1	1	-1	-1	-1
e-b	-1	1	1	-1	1	-1	1	1	1	-1	1	-1
f-b	1	1	1	-1	-1	-1	-1	1	1	-1	1	-1
d-c	1	-1	1	1	1	-1	1	-1	1	1	-1	-1
e-c	-1	1	-1	1	1	1	1	1	1	1	-1	-1
f-c	1	1	1	-1	-1	-1	1	1	1	1	-1	1
e-d	-1	1	-1	-1	-1	1	1	1	1	1	1	1
f-d	1	1	1	-1	-1	-1	-1	1	1	1	1	1
f-e	1	1	1	-1	-1	-1	-1	1	1	-1	1	1
S_k	-5	11	9	-5	-5	-1	7	9	3	-3	-3	-1

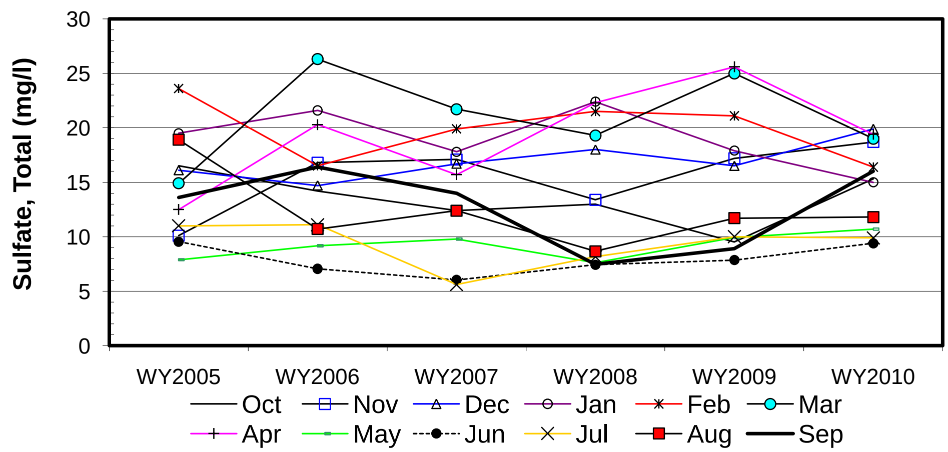
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-0.94	2.28	1.69	-0.94	-0.94	-0.19	1.32	1.69	0.56	-0.56	-0.56	-0.19
Z^2_k	0.88	5.19	2.86	0.88	0.88	0.04	1.73	2.86	0.32	0.32	0.32	0.04

ΣZ_k= 3.22
ΣZ^2_k= 16.30
Z-bar=$\Sigma Z_k/K$= 0.27

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 72
ΣS_k 16

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	15.44	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.163**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.82	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
335.00	p **0.794**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.35		0.61
0.050	-0.20	**0.19**	0.51
0.100	-0.10		0.42
0.200	0.00		0.30

Site #6

Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	4.9	9.4	7.9	5.7	6.7	10.6	1.6	2.5	2.8	2.3	2.6	4.9
b	**WY2006**	6.2	6.4	5.9	5.4	8.0	5.0	13.8	2.9	1.7	2.1	3.8	4.7
c	**WY2007**	3.8	3.7	4.7	6.5	4.9	5.2	11.1	8.8	2.7	2.3	3.6	3.0
d	**WY2008**	9.9	10.6	7.6	6.4	7.5	12.4	16.6	8.7	3.2	3.3	7.3	12.2
e	**WY2009**	16.7	7.9	13.1	7.3	8.1	6.4	14.3	8.2	3.1	2.6	10.6	12.6
f	**WY2010**	6.4	10.0	9.0	6.0	8.4	9.4	11.7	4.3	4.0	3.6	3.5	4.4
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	1	-1	-1	-1	1	-1	1	1	-1	-1	1	-1
c-a	-1	-1	-1	1	-1	-1	1	1	-1	-1	1	-1
d-a	1	1	-1	1	1	1	1	1	1	1	1	1
e-a	1	-1	1	1	1	-1	1	1	1	1	1	1
f-a	1	1	1	1	1	-1	1	1	1	1	1	-1
c-b	-1	-1	-1	1	-1	1	-1	1	1	1	-1	-1
d-b	1	1	1	1	-1	1	1	1	1	1	1	1
e-b	1	1	1	1	1	1	1	1	1	1	1	1
f-b	1	1	1	1	1	1	-1	1	1	1	-1	-1
d-c	1	1	1	-1	1	1	1	-1	1	1	1	1
e-c	1	1	1	1	1	1	1	-1	1	1	1	1
f-c	1	1	1	-1	1	1	1	-1	1	1	-1	1
e-d	1	-1	1	1	1	-1	-1	-1	-1	-1	1	1
f-d	-1	-1	1	-1	1	-1	-1	-1	1	1	-1	-1
f-e	-1	1	-1	-1	1	1	-1	-1	1	1	-1	-1
S_k	7	3	5	5	9	3	5	3	9	9	5	1

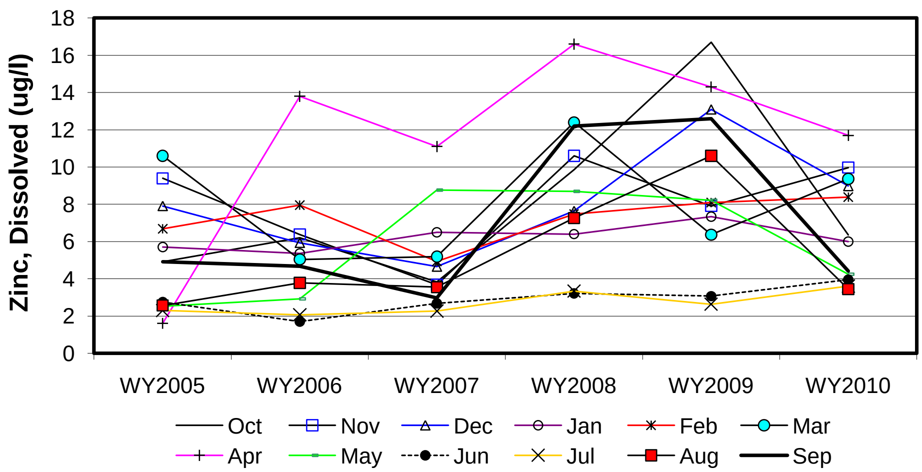
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	1.32	0.62	0.94	0.94	1.69	0.56	0.94	0.56	1.69	1.69	0.94	0.19
Z^2_k	1.73	0.39	0.88	0.88	2.86	0.32	0.88	0.32	2.86	2.86	0.88	0.04

ΣZ_k= 12.08
ΣZ^2_k= 14.89
Z-bar=$\Sigma Z_k/K$= 1.01

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 72
ΣS_k 64

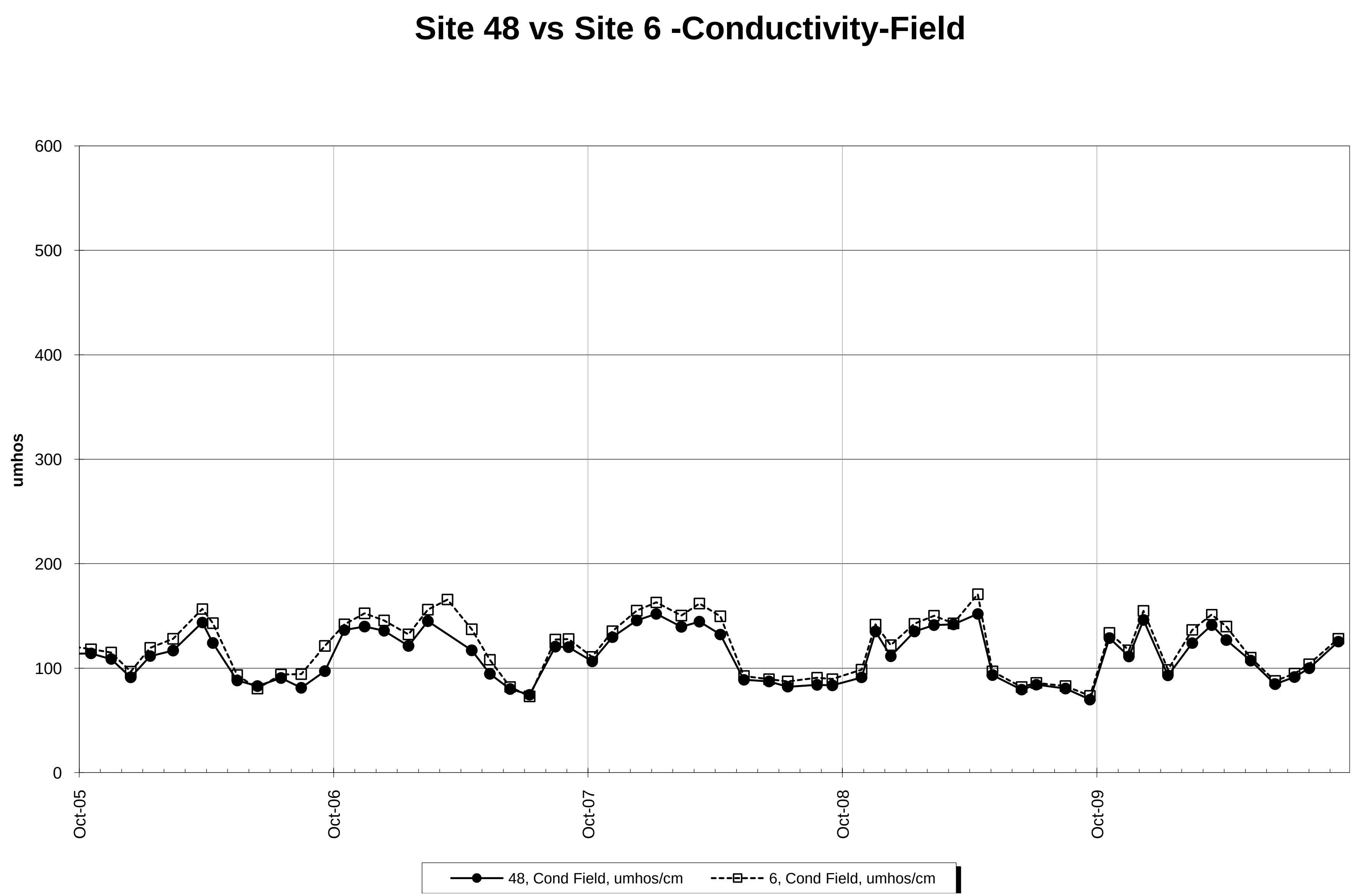
$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$= 2.73	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p **0.994**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc} 3.44	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
335.00 **p** **1.000**		H_A (± trend)	ACCEPT



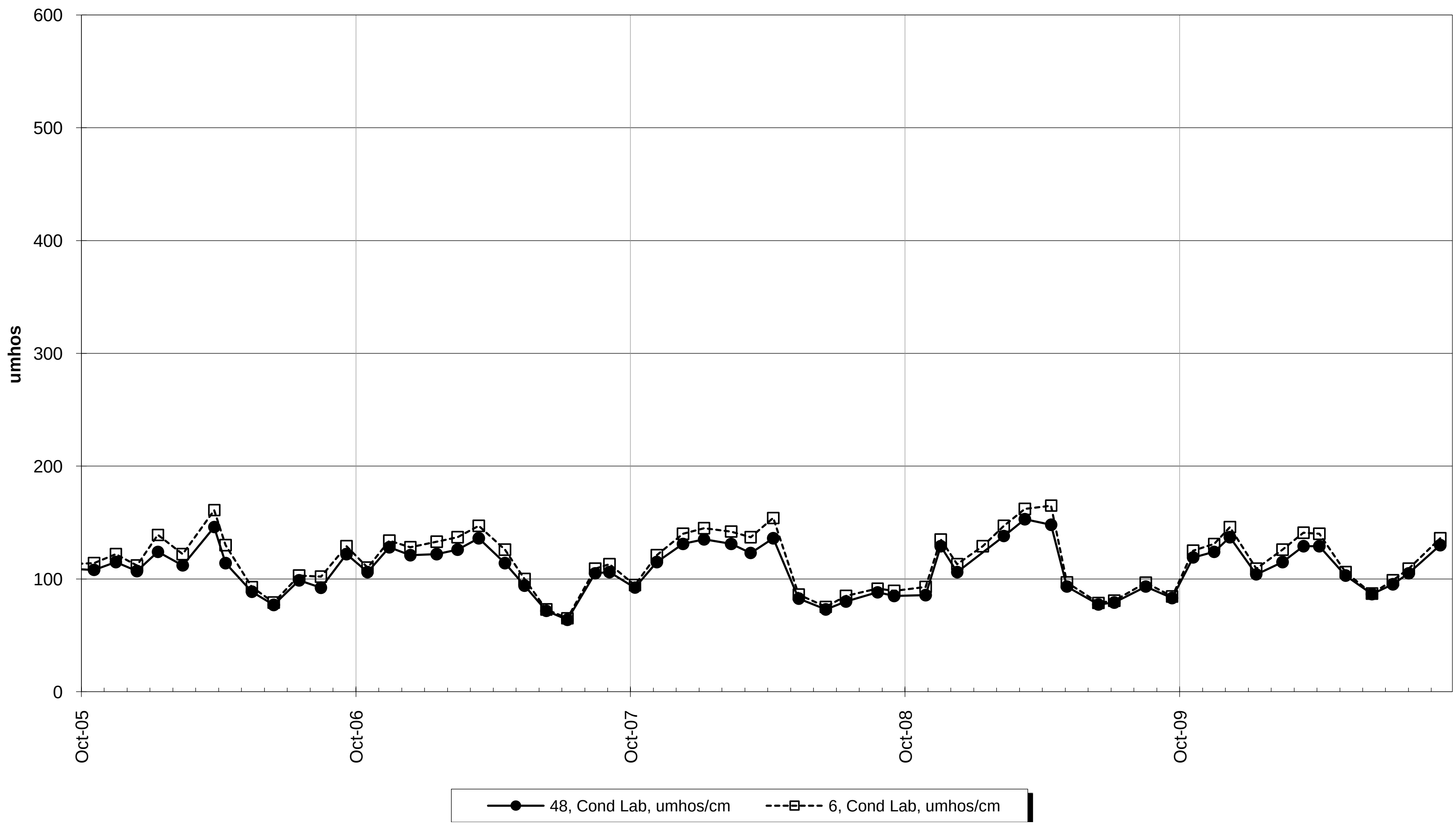
Seasonal-Kendall Slope Confidence Intervals

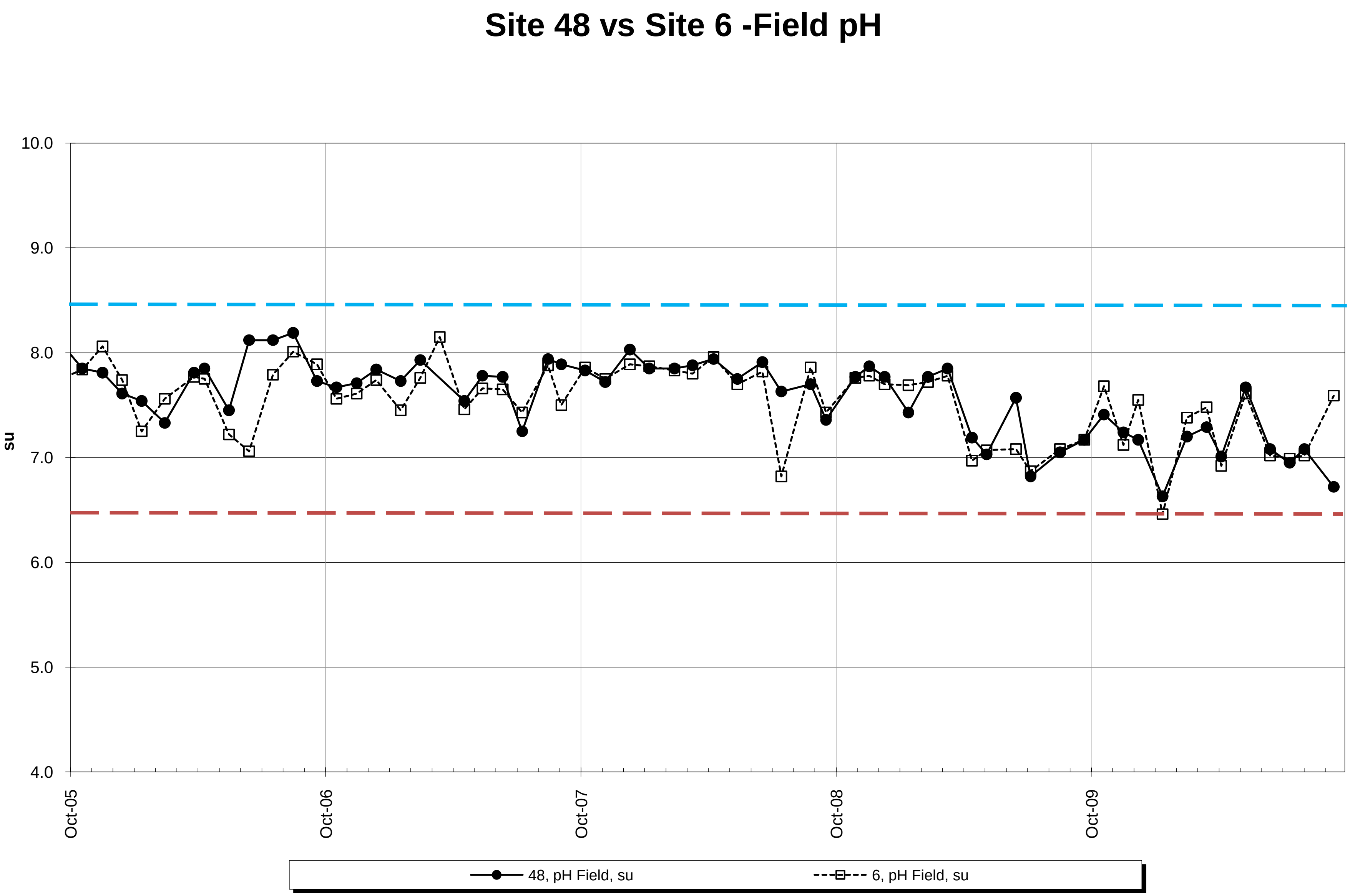
α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.16		0.64
0.050	0.20	**0.39**	0.52
0.100	0.24		0.48
0.200	0.29		0.44

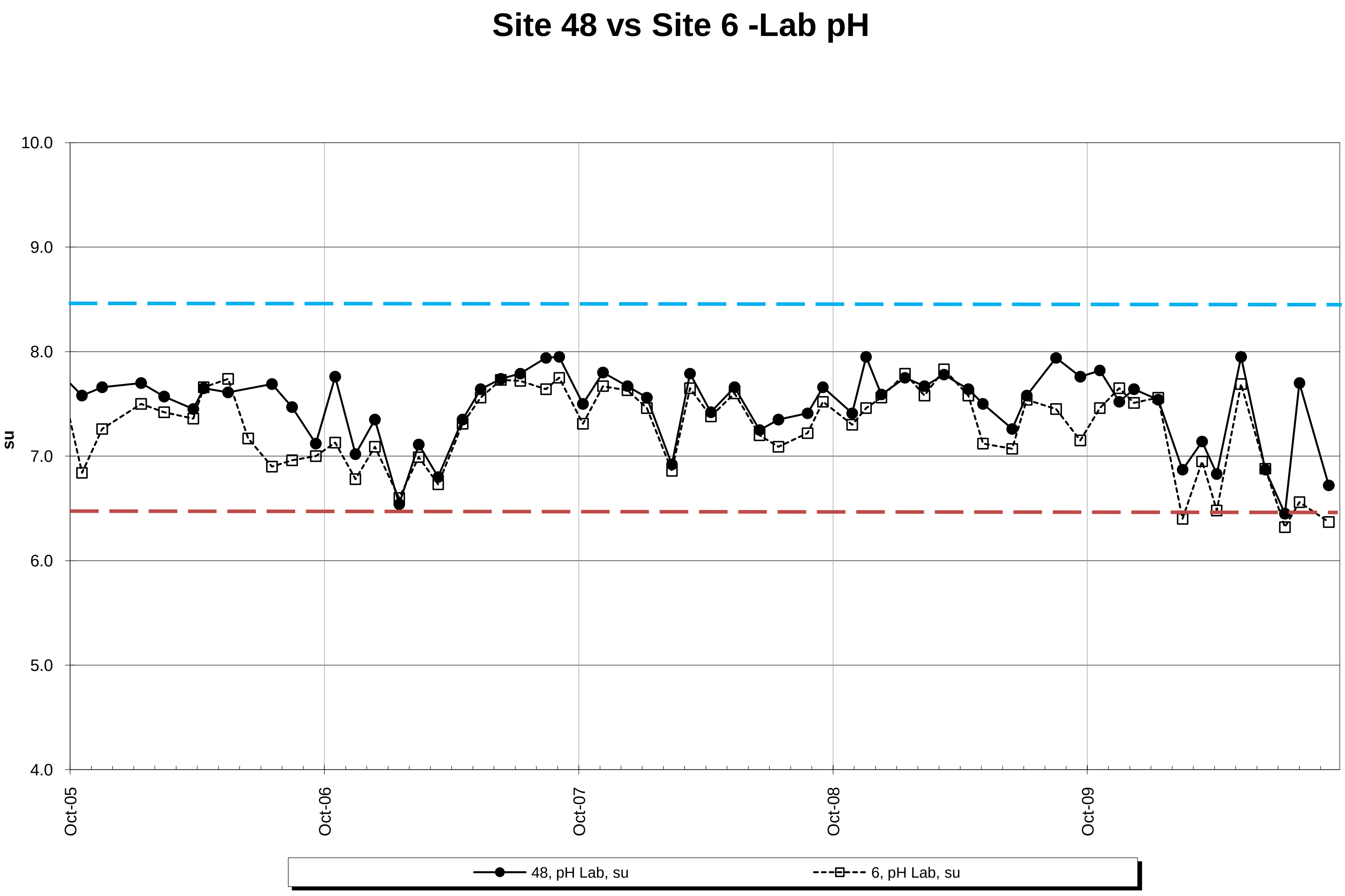
6.2%


Site 48 vs Site 6 -Conductivity-Field
umhos
600
500
400
300
200
100
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, Cond Field, umhos/cm
6, Cond Field, umhos/cm

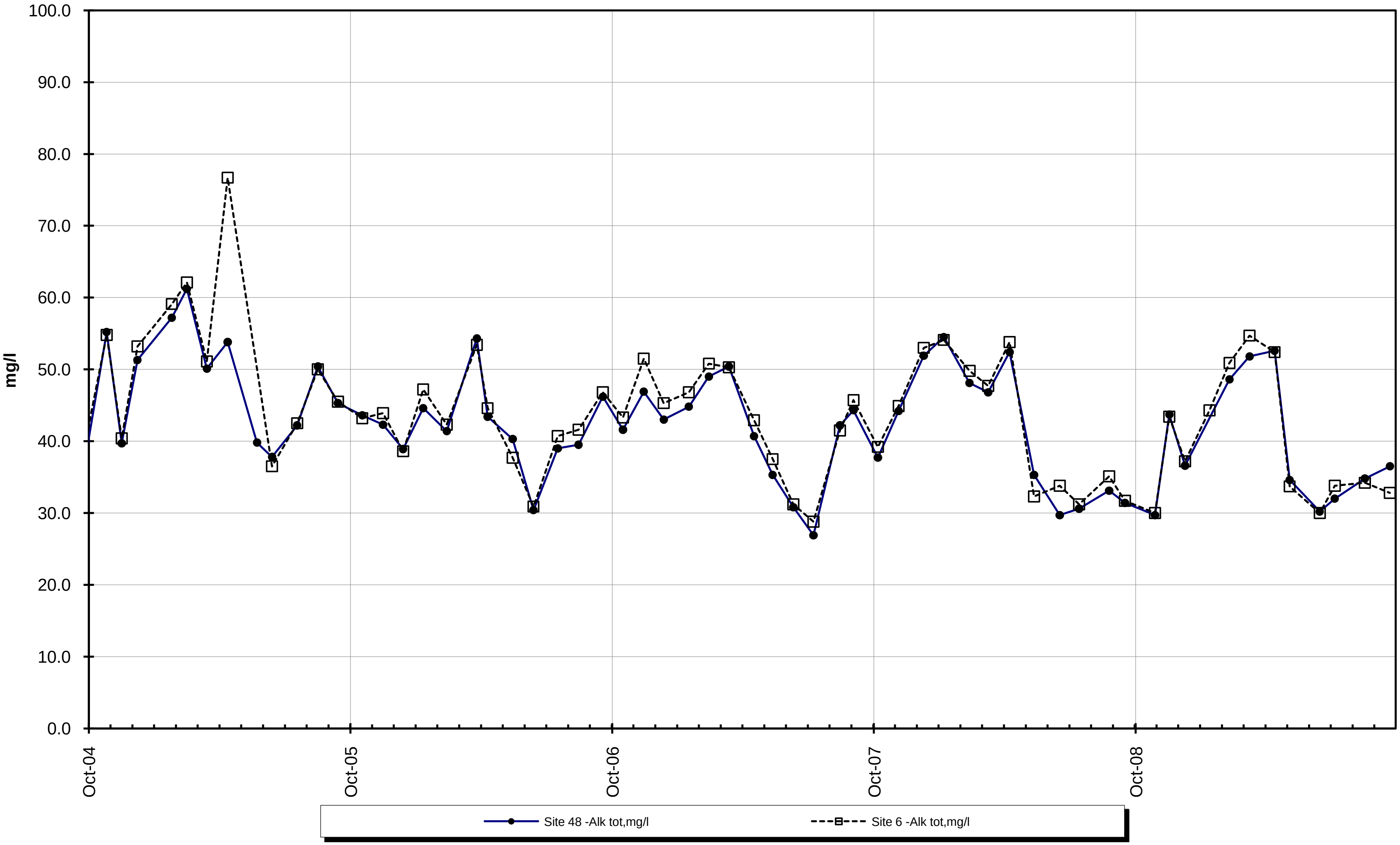
Site 48 vs Site 6 -Conductivity



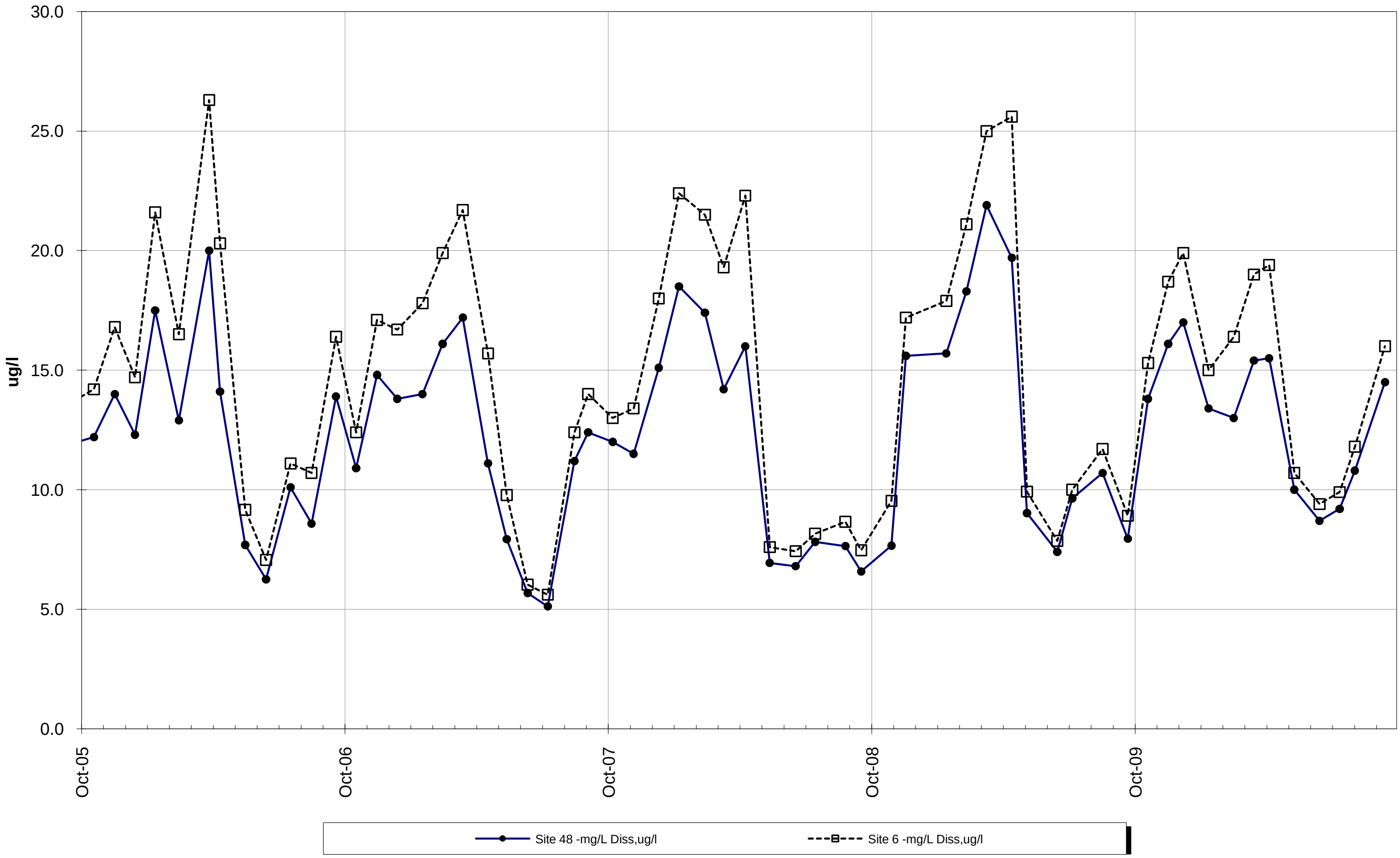

Site 48 vs Site 6 -Field pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
su
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, pH Field, su
6, pH Field, su


Site 48 vs Site 6 -Lab pH
su
10.0
9.0
8.0
7.0
6.0
5.0
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
48, pH Lab, su
6, pH Lab, su

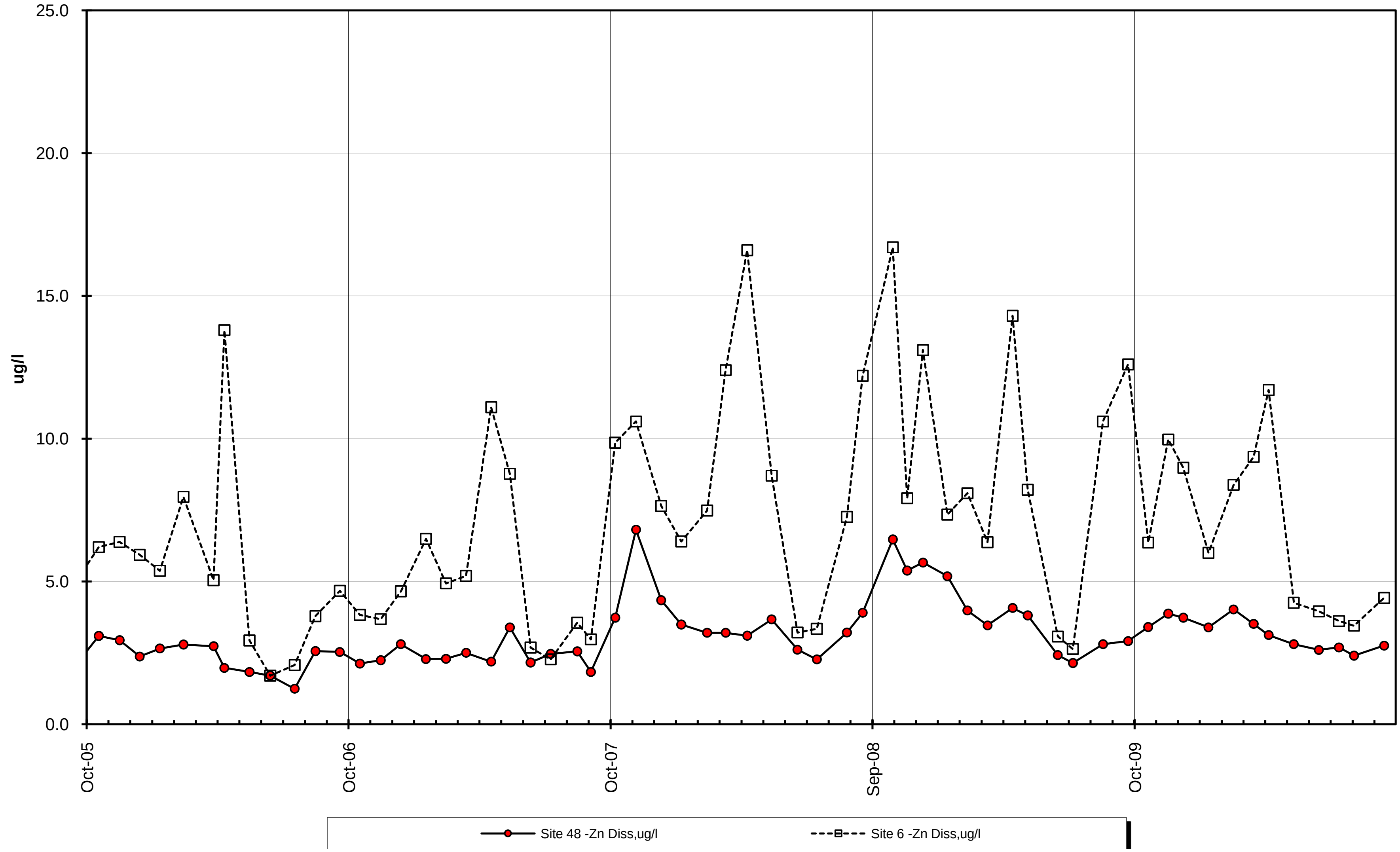
Site 48 vs. Site 6 -Total Alkalinity



Site 48 vs. Site 6 -Total Sulfate



Site 48 vs. Site 6 -Dissolved Zinc



Wilcoxon-signed-ranks test

Exact Form

Variable: **Specific Conductance, Lab (uS/cm)**

	X	**Y**			
Site	#48	#6	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	119.0	125.0	-6.0	6.0	-6.5
Nov	124.0	131.0	-7.0	7.0	-8
Dec	137.0	146.0	-9.0	9.0	-9
Jan	104.0	109.0	-5.0	5.0	-5
Feb	115.0	126.0	-11.0	11.0	-10.5
Mar	129.0	141.0	-12.0	12.0	-12
Apr	129.0	140.0	-11.0	11.0	-10.5
May	103.0	106.0	-3.0	3.0	-2
Jun	86.5	87.0	-0.5	0.5	-1
Jul	95.3	98.7	-3.4	3.4	-3
Aug	105.0	109.0	-4.0	4.0	-4
Sep	130.0	136.0	-6.0	6.0	-6.5
Median	117.0	125.5	-6.0	6.0	

n	**m**
12	12

N= 12

ΣR= -78

α
5.0%
W'α,n
17

W^{+}=
0
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **pH, Lab, Standard Units**

	X	**Y**	Differences		
Site	#48	#6			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	7.82	7.46	0.36	0.36	10
Nov	7.52	7.65	-0.13	0.13	-5
Dec	7.64	7.51	0.13	0.13	3.5
Jan	7.54	7.56	-0.02	0.02	-2
Feb	6.87	6.40	0.47	0.47	11
Mar	7.14	6.95	0.19	0.19	6
Apr	6.83	6.48	0.35	0.35	8.5
May	7.95	7.69	0.26	0.26	7
Jun	6.87	6.88	-0.01	0.01	-1
Jul	6.45	6.32	0.13	0.13	3.5
Aug	7.70	6.56	1.14	1.14	12
Sep	6.72	6.37	0.35	0.35	8.5
Median	7.33	6.92	0.22	0.22	

n	**m**
12	12

N= 12

$\Sigma R=$ 62

α
95.0%
W'$_{\alpha,n}$
59

$W^{+}=$
70
p-test
0.995

H_0	median [D]=0	**REJECT**
H_1	median [D]>0	**ACCEPT**

Wilcoxon-signed-ranks test
Exact Form

Variable: **Total Alk, (mg/l)**

	X	**Y**	Differences		
Site	#48	#6			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	42.2	45.0	-2.8	2.8	-10
Nov	45.6	46.4	-0.8	0.8	-4
Dec	48.4	52.2	-3.8	3.8	-11
Jan	41.4	39.7	1.7	1.7	6
Feb	41.0	45.6	-4.6	4.6	-12
Mar	45.7	46.7	-1.0	1.0	-5
Apr	43.3	44.0	-0.7	0.7	-3
May	36.5	36.2	0.3	0.3	1
Jun	32.5	32.9	-0.4	0.4	-2
Jul	34.1	35.9	-1.8	1.8	-7.5
Aug	39.3	41.1	-1.8	1.8	-7.5
Sep	48.9	46.5	2.4	2.4	9
Median	41.8	44.5	-0.9	1.8	

n	**m**
12	12

N= 12

$\Sigma R=$ -46

α
95.0%
W'α,n
59

$W^{+}=$
16
p-test
0.039

H_0	median [D]=0	ACCEPT
H_1	median [D]>0	

Wilcoxon-signed-ranks test

Exact Form

Variable: **Sulfate, Total (mg/l)**

	X	**Y**	Differences		
Site	#48	#6			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	13.8	15.3	-1.5	1.5	-5.5
Nov	16.1	18.7	-2.6	2.6	-8
Dec	17.0	19.9	-2.9	2.9	-9
Jan	13.4	15.0	-1.6	1.6	-7
Feb	13.0	16.4	-3.4	3.4	-10
Mar	15.4	19.0	-3.6	3.6	-11
Apr	15.5	19.4	-3.9	3.9	-12
May	10.0	10.7	-0.7	0.7	-1
Jun	8.7	9.4	-0.7	0.7	-2.5
Jul	9.2	9.9	-0.7	0.7	-2.5
Aug	10.8	11.8	-1.0	1.0	-4
Sep	14.5	16.0	-1.5	1.5	-5.5
Median	13.6	15.7	-1.6	1.6	

n	**m**
12	12

N= 12

$\Sigma R =$ -78

α
5.0%
W'$_{\alpha,n}$
17

$W^+=$
0
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **Zinc, Dissolved (ug/l)**

	X	**Y**			
Site	#48	#6	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	3.40	6.36	-2.96	2.96	-7
Nov	3.87	9.97	-6.10	6.10	-11
Dec	3.73	8.98	-5.25	5.25	-9
Jan	3.39	6.00	-2.61	2.61	-6
Feb	4.02	8.38	-4.36	4.36	-8
Mar	3.51	9.36	-5.85	5.85	-10
Apr	3.12	11.70	-8.58	8.58	-12
May	2.80	4.25	-1.45	1.45	-4
Jun	2.60	3.95	-1.35	1.35	-3
Jul	2.69	3.61	-0.92	0.92	-1
Aug	2.40	3.45	-1.05	1.05	-2
Sep	2.75	4.42	-1.67	1.67	-5
Median	3.26	6.18	-2.79	2.79	

n	**m**
12	12

N= 12

ΣR= -78

α
5.0%
W'$_{\alpha,n}$
17

W^+=
0
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

INTERPRETIVE REPORT
SITE 54 "LOWER GREENS CREEK"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses with the exception of one outlier shown on the table below. During the current year no new data points were flagged as outliers, after review by HGCMC.

Sample Date	Parameter	Value	Qualifier	Notes
12/14/2005	pH Lab, su	8.23	RR	Holding time exceeded, field-lab not comparable

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Five results exceeding these criteria have been identified as listed in the table below. All of the exceedances were for laboratory pH values less than the lower limit of 6.5 su. Each of these laboratory pH values had a corresponding field pH value that was above this lower limit. These are similar to the values measured for Site 6, which is immediately up stream.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
16-Feb-10	pH Lab, su	5.94		6.5	Aquatic Life, chronic
6-Apr-10	pH Lab, su	6.23		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	5.51		6.5	Aquatic Life, chronic
3-Aug-10	pH Lab, su	6.25		6.5	Aquatic Life, chronic
14-Sep-10	pH Lab, su	6.05		6.5	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There are identifiable trends in dissolved chromium and field pH. Between Water Year 2009 and Water Year 2010 there was an order of magnitude increase in the dissolved chromium concentration. A similar increase was also noted for Site 6, Site 13, Site 46, Site 48, Site 49, and Site 54; all sites that are located in the 920 area. The other trend noticed is a decrease in the mean field pH starting in the winter/spring of 2009.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The table below summarizes the results on the data collected between Oct-04 and Sep-10

(WY2005-WY2010). Dissolved zinc has a statistically significant (p=1.00) trend with a slope estimate of 0.32 µg/L/yr or a 5.5% increase. Furthermore, total alkalinity has a statistically significant (p<0.01) trend with a slope estimate of -0.91 µg/L/yr or 2.0% decrease. Given the low magnitude and similar trend noted at Site 6, HGCMC does not feel that this decreasing trend is a significant indication of changes in water chemistry at Site 54.

Site 54-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.67	0		
pH, Lab	6	0.20	0		
Alkalinity, Total	6	**<0.01**	-	-0.91	-2
Sulfate, Total	6	0.71	0		
Zinc, Dissolved	6	**1.00**	+	0.32	5.5

(1): Number of years (2):Significance level

A comparison of median values for alkalinity, laboratory pH, laboratory conductivity, sulfate, and dissolved zinc between Site 54 and Site 6 has been conducted as specified in the Statistical Information Goals for Site 54. Additionally, X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 54 and Site 6, the upstream control site, to aid in the comparison between those sites. Calculation details of the non-parametric signed-rank tests are presented in detail on the pages following this interpretive section. The table below summarizes the results of the signed-rank test as performed on the Water Year 2010 data set.

Site 54 vs Site 6 - WY2010, summary statistics for median analysis.

Parameter	Signed Ranks p-value	Site 6 median	Site 54 median	Median of Differences
Conductivity, Lab	**<0.01**	125.5	128	-1.2
pH, Lab	**1.00**	6.92	6.67	0.28
Alkalinity, Total	0.31	44.5	44.3	-0.4
Sulfate, Total	0.95	15.7	15.6	0
Zinc, Dissolved	1.00	6.18	6.06	0.28

The median values for pH for Site 6 and Site 54 are 6.92 su and 6.67 su respectively and the median of differences, Site 6 minus Site 54, is 0.28 su. Site 54 has intermittently (5 out of 7) shown statistically significantly lower pH reading for the prior seven water years (WY2002 and WY2009). This difference may in part be due to inflow of Bruin Creek which typically has a slightly lower pH than Greens Creek. The median values for alkalinity are 44.5 mg/L and 44.3 mg/L. The median values for total sulfate for Site 6 and Site 54 are 0.95 mg/L and 15.7 mg/L respectively. The median of the differences, Site 6 minus Site 54, is 0.0 mg/L total sulfate. Again similar results are obtained using the signed-rank test on the WY2004 - WY2009 total sulfate datasets. The median values for dissolved zinc for Site 6 and Site 54 are 6.18 µg/L and 6.06 µg/L, respectively.

Laboratory conductivity showed a statistically significant difference between the measured median values at a significance level of α=0.05 for a one-tailed test. The median values for conductivity for Site 6 and Site 54 are 125.5 µS/cm and 128 µS/cm respectively and the median of the differences, Site 6 minus Site 54, is -1.2 µS/cm. Datasets from WY2002 – WY2009 yield similar significant results with similar magnitudes. In general, the trend in conductivity is similar to differences measured between Site 48 and Site 6, although of a smaller magnitude. HGCMC feels that given the small magnitude of the differences and the consistency of the variations over the past several years, that the current FWMP program is adequate to measure and quantify any future changes that may occur due to the influence of Waste Rock Site 23/D that occur between Site 6 and Site 54.

Table of Results for Water Year 2010

Site 54 "Lower Greens Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	12/8/2009	1/12/2010	2/16/2010	3/16/2010	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	3.6	1.0	0.2	0.6	1.7	0.6	0.7	3.7	4.6	6.6	8.9	6.8	2.7
Conductivity-Field(µmho)	136	119	157	100	140	153	142	111	88	96	105	131	125
Conductivity-Lab (µmho)	129	132 J	148	110	127	142	143	107	91	100	110	138	128
pH Lab (standard units)	7.49	7.58 J	7.17	7.58	5.94	6.81	6.23	7.67	6.52	5.51	6.25	6.05	6.67
pH Field (standard units)	7.68	7.11	7.24	6.71	7.34	7.75	6.95	7.58	7.01	7.00	7.02	7.54	7.18
Total Alkalinity (mg/L)	45.9	45.7 J	52.0	41.3	43.1	47.2	45.5	37.8	33.2	34.7	39.1	49.2	44.3
Total Sulfate (mg/L)	15.2	18.7	19.9	15.0	16.4	19.1 J	19.7	10.7	9.6	10.1 J	11.9 J	16.0	15.6
Hardness (mg/L)	64.6	64.8	70.6	53.8	63.3	70.6	69.3	49.9	42.0	47.8	52.9	64.8	64.0
Dissolved As (ug/L)	0.241	0.198	0.186	0.204	0.225	0.200	0.180	0.205	0.213	0.220	0.266	0.245	0.209
Dissolved Ba (ug/L)			28.4	22.1	25.5								25.5
Dissolved Cd (ug/L)	0.052	0.057	0.055	0.041	0.047	0.056	0.062	0.036	0.033	0.038	0.041	0.048	0.047
Dissolved Cr (ug/L)			0.635	2.950	3.780								2.950
Dissolved Cu (ug/L)	0.461	0.522	0.474	0.632 U	0.744 U	0.676 U	0.664	0.368	0.233 U	0.295	0.304	0.364	0.468
Dissolved Pb (ug/L)	0.0134 U	0.0309 U	0.0299	0.0182 U	0.0302 U	0.0207 U	0.0276 U	0.0200 U	0.0552 U	0.0043 J	0.0154 U	0.0159 J	0.0204
Dissolved Ni (ug/L)			1.140	0.723	1.140								1.140
Dissolved Ag (ug/L)			<0.003	<0.003	<0.003								0.002
Dissolved Zn (ug/L)	6.24	9.20	8.40	5.88 U	7.87	8.54 U	10.60	4.13	3.55 U	3.96	3.56	4.27	6.06
Dissolved Se (ug/L)			1.230	1.020	1.040 J								1.040
Dissolved Hg (ug/L)	0.000643	0.000758	0.000632	0.001280	0.001170	0.001020	0.001850 U	0.000868	0.000916 U	0.000597 U	0.000605 U	0.000790	0.000829

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
54	10/20/2009	12:00 AM				
			Pb diss, µg/l	0.01	U	Field Blank Contamination
54	11/17/2009	12:00 AM				
			Alk Tot,mg/l	45.7	J	Temperature Exceedance
			Cond, µs/cm	132	J	Temperature Exceedance
			Pb diss, µg/l	0.03	U	Field Blank Contamination
			pH Lab, su	7.58	J	Hold Time Violation
54	1/12/2010	12:00 AM				
			Cu diss, µg/l	0.63	U	Field Blank Contamination
			Pb diss, µg/l	0.01	U	Field Blank Contamination
			Zn diss, µg/l	5.88	U	Field Blank Contamination
54	2/16/2010	12:00 AM				
			Cu diss, µg/l	0.744	U	Field Blank Contamination
			Pb diss, µg/l	0.0302	U	Field Blank Contamination
			Se diss, µg/l	1.04	J	LCS Recovery
54	3/16/2010	12:00 AM				
			Cu diss, µg/l	0.676	U	Field Blank Contamination
			Pb diss, µg/l	0.0207	U	Field Blank Contamination
			Zn diss, µg/l	8.54	U	Field Blank Contamination
			SO4 Tot, mg/l	19.1	J	Sample Receipt Temperature
54	4/6/2010	12:00 AM				
			Hg diss, µg/l	0.00185	U	Field Blank Contamination
			Pb diss, µg/l	0.0276	U	Field Blank Contamination
54	5/11/2010	11:26 AM				
			Pb diss, µg/l	0.02	U	Field Blank Contamination
			SO4 Tot, mg/l	10.7	J	Sample Temperature
54	6/15/2010	12:00 AM				
			Cu diss, µg/l	0.233	U	Field Blank Contamination
			Hg diss, µg/l	0.000916	U	Field Blank Contamination
			Pb diss, µg/l	0.0552	U	Field Blank Contamination
			Zn diss, µg/l	3.55	U	Field Blank Contamination

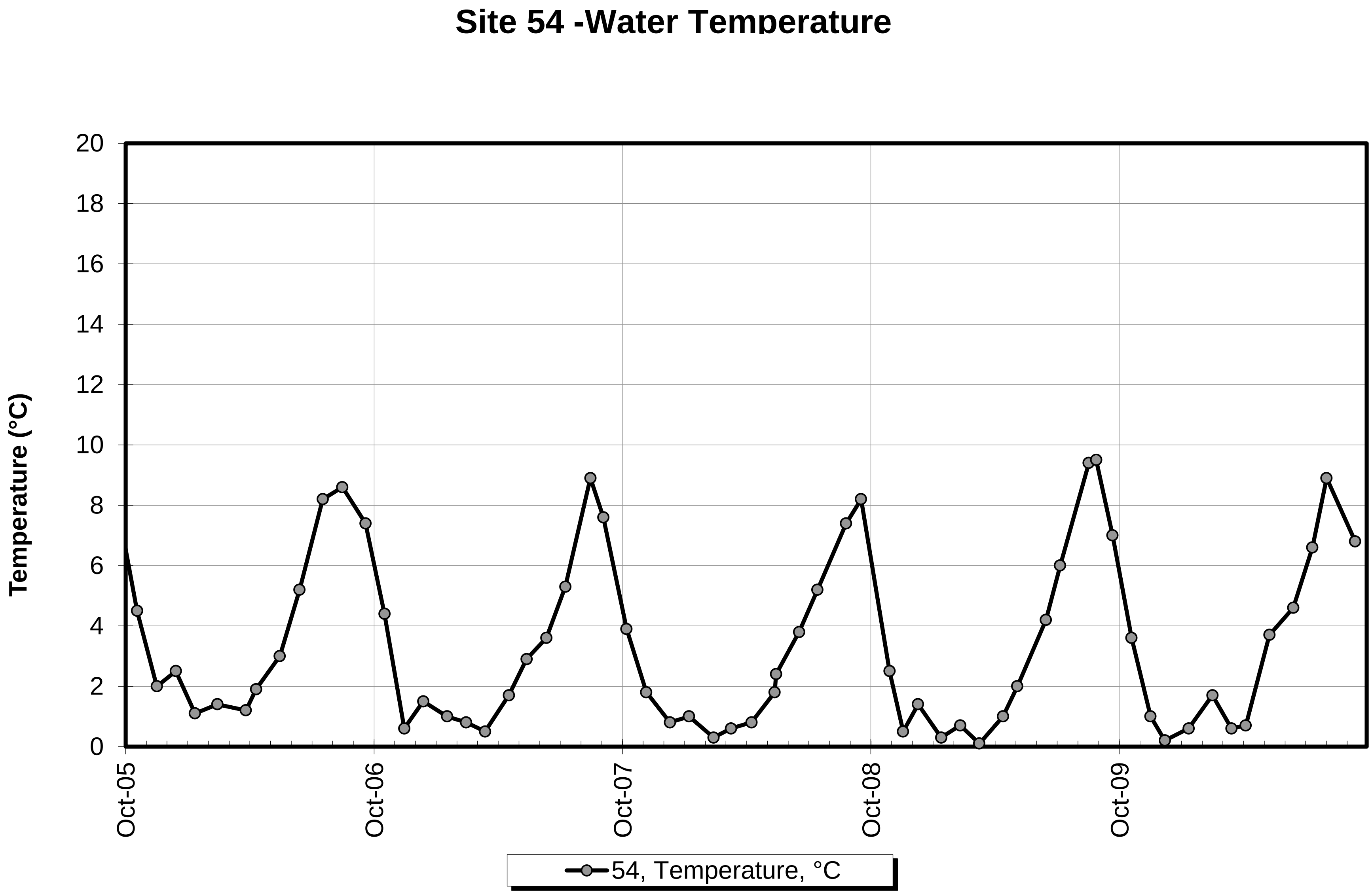
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

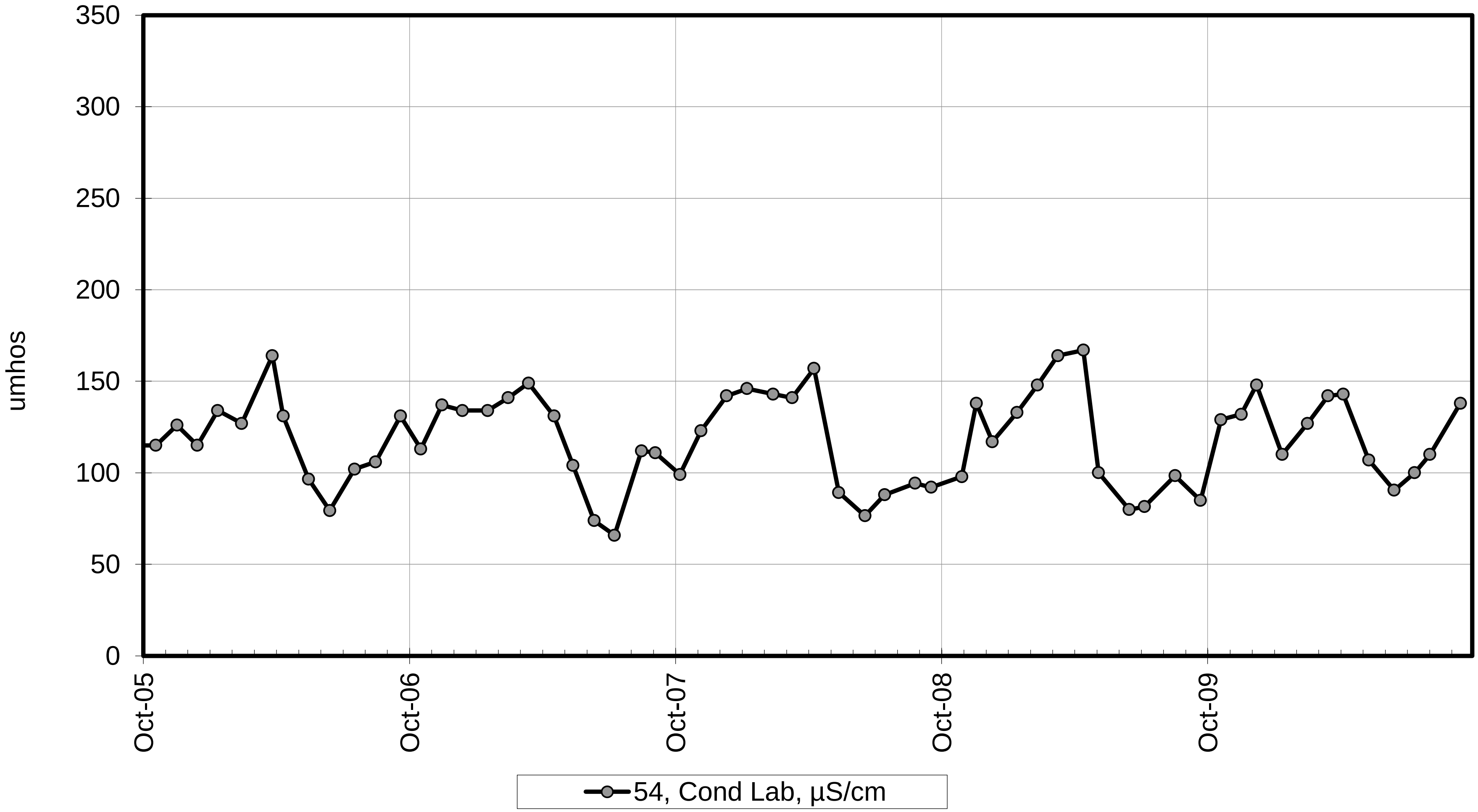
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
UJ	Not Detected Above Approximate Quantitation Limit					
54	7/13/2010	8:38 AM				
			Hg diss, µg/l	0.000597	U	Field Blank Contamination
			Pb diss, µg/l	0.00433	J	Below Quantitative Range
			SO4 Tot, mg/l	10.1	J	Sample Reciept Temperature
54	8/3/2010	10:05 AM				
			Hg diss, µg/l	0.000605	U	Field Blank Contamination
			Pb diss, µg/l	0.0154	U	Field Blank Contamination
			SO4 Tot, mg/l	11.9	J	Sample Temperature
54	9/14/2010	12:00 AM				
			Pb diss, µg/l	0.0159	J	Below Quantitative Range

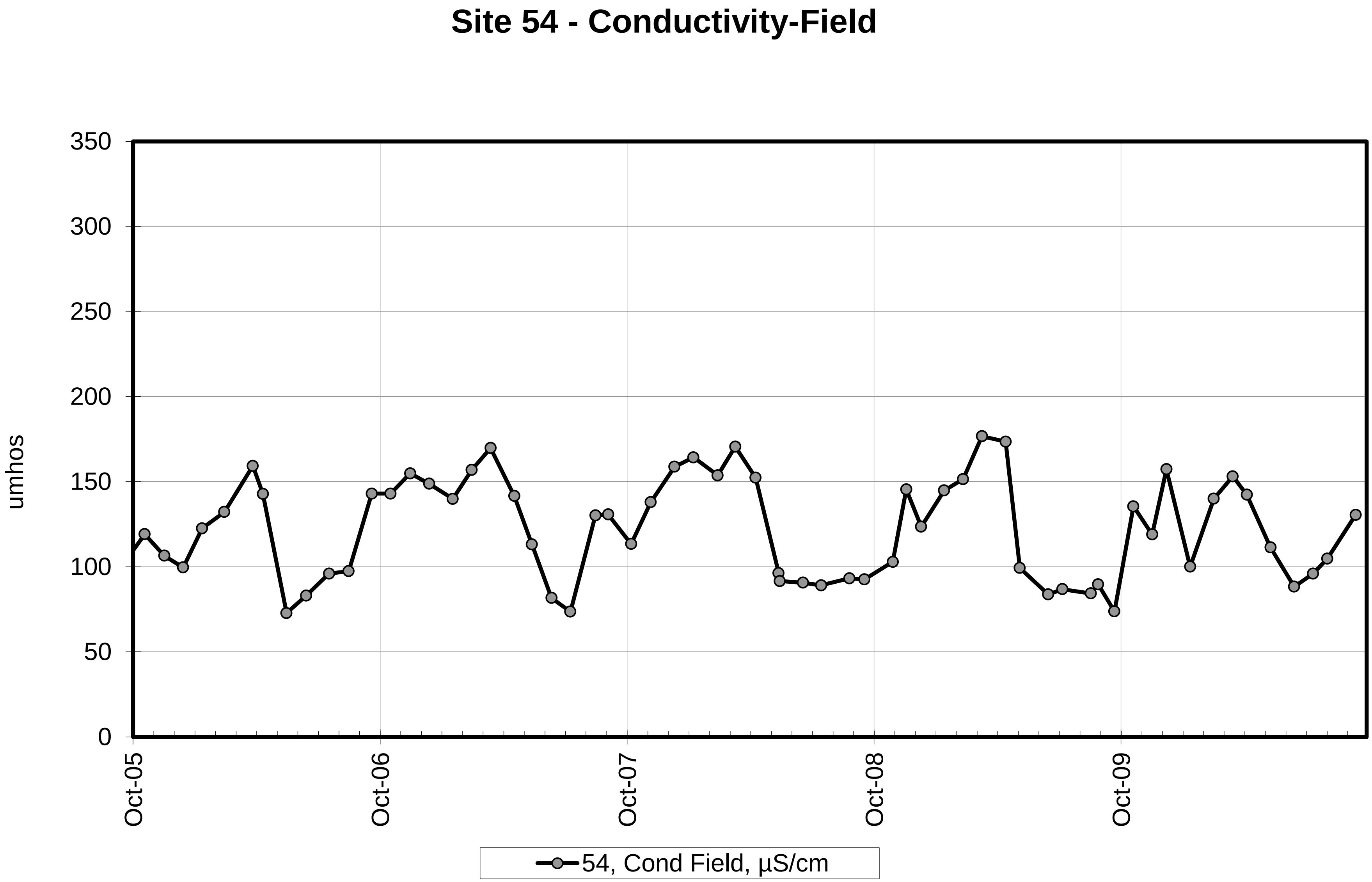
Qualifier	**Description**
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

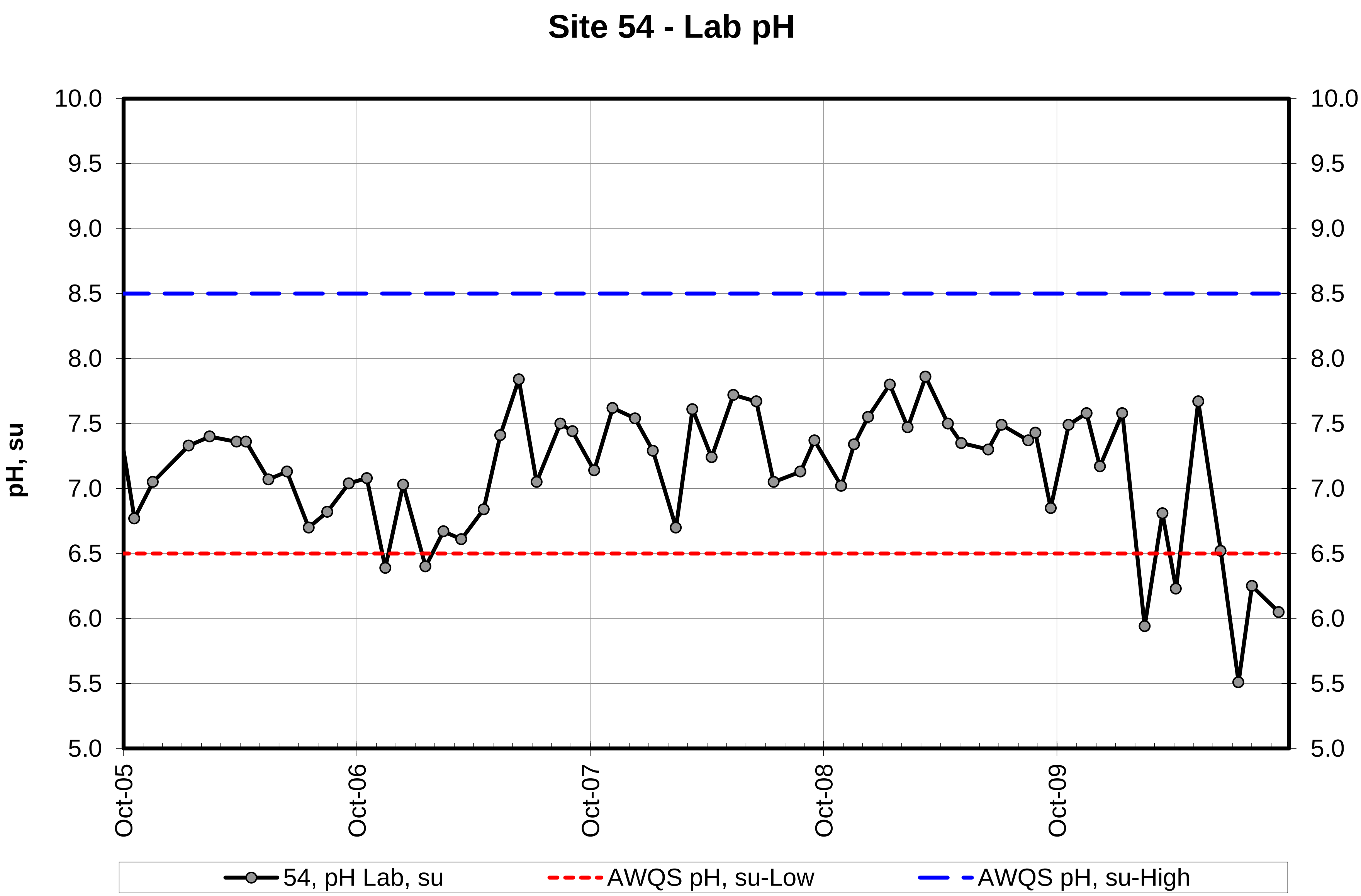


Site 54 -Water Temperature
Temperature (°C)
0
2
4
6
8
10
12
14
16
18
20
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Temperature, °C

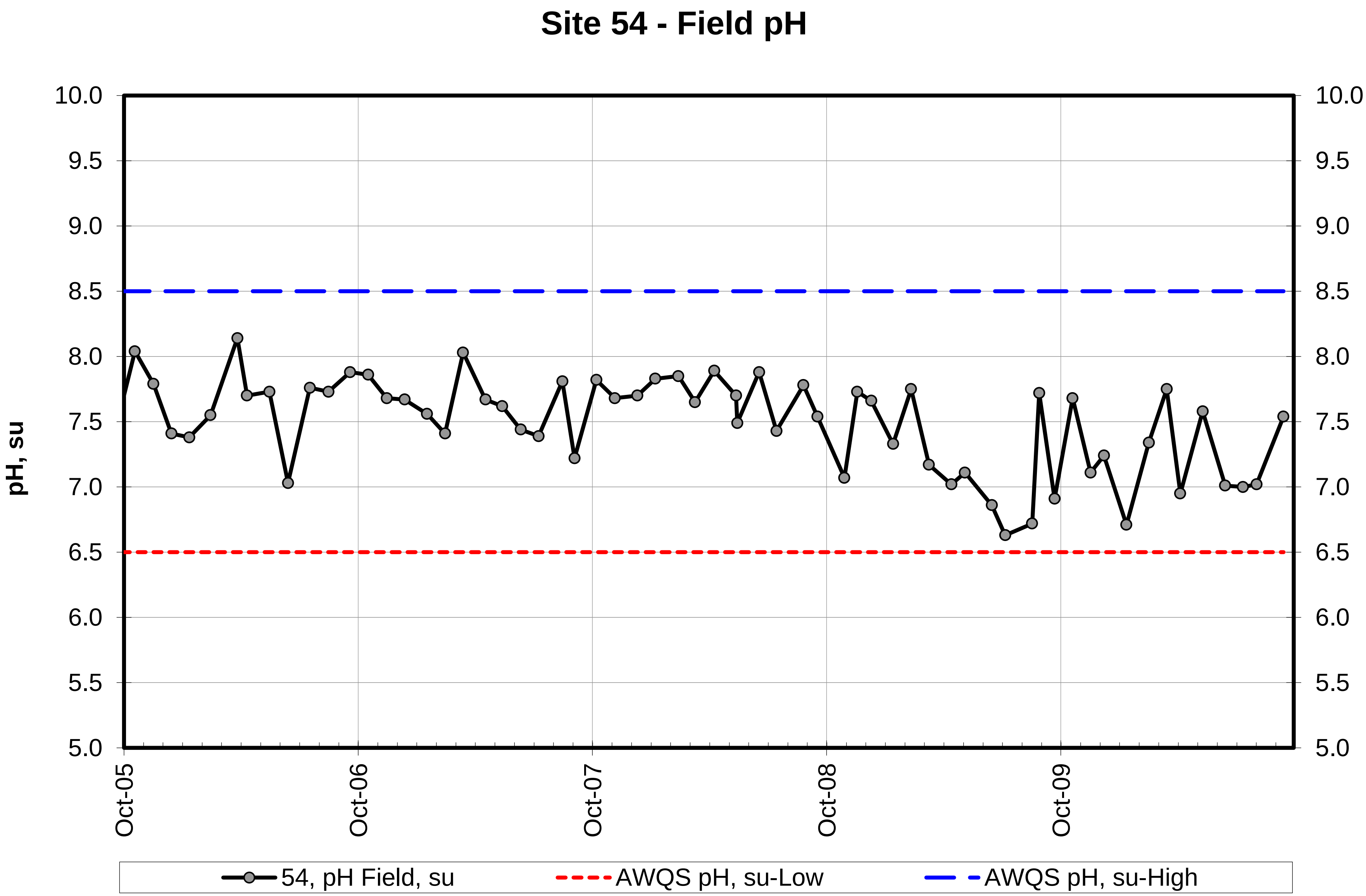
Site 54 - Conductivity-Lab



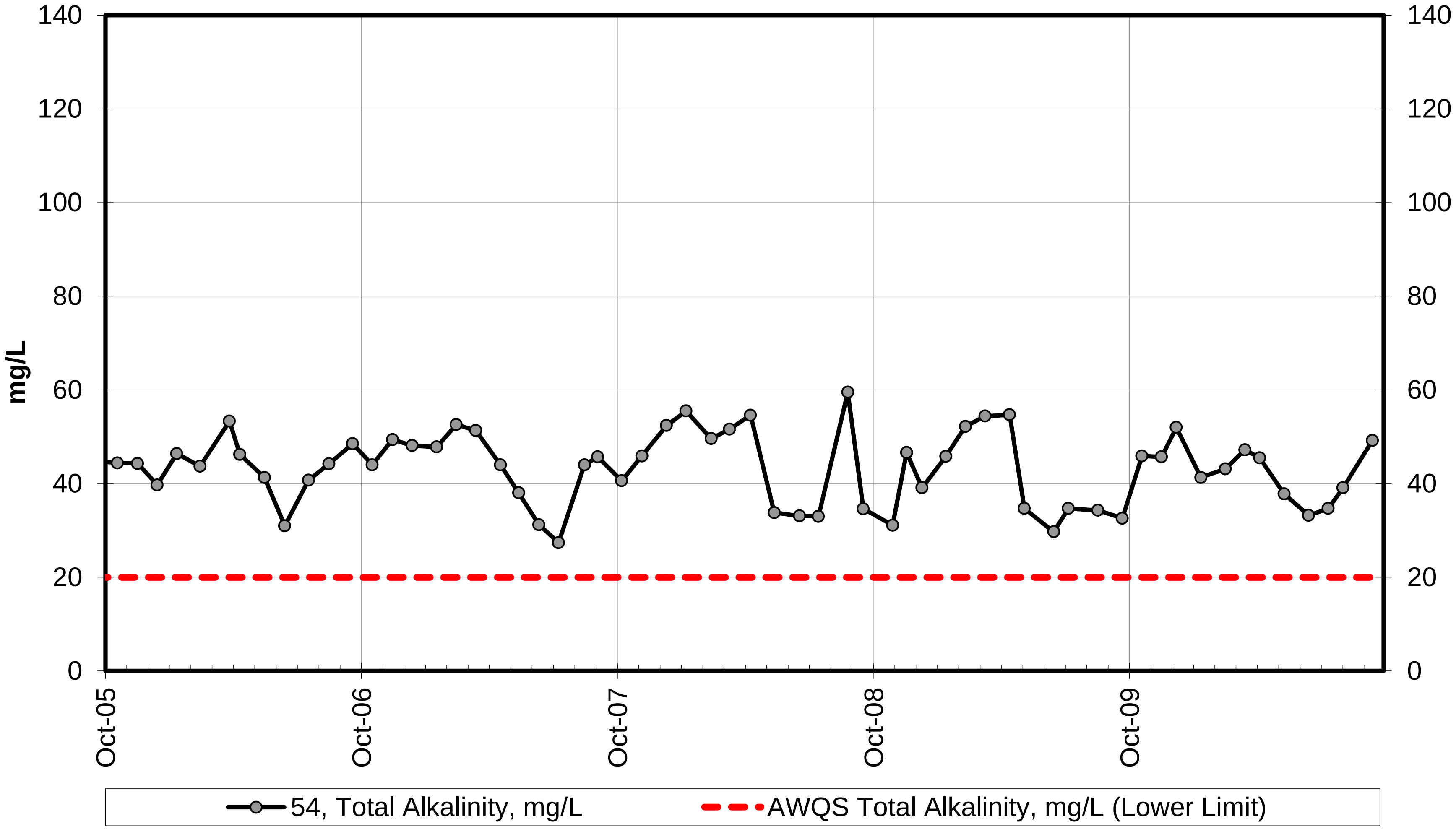

Site 54 - Conductivity-Field
umhos
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Cond Field, µS/cm

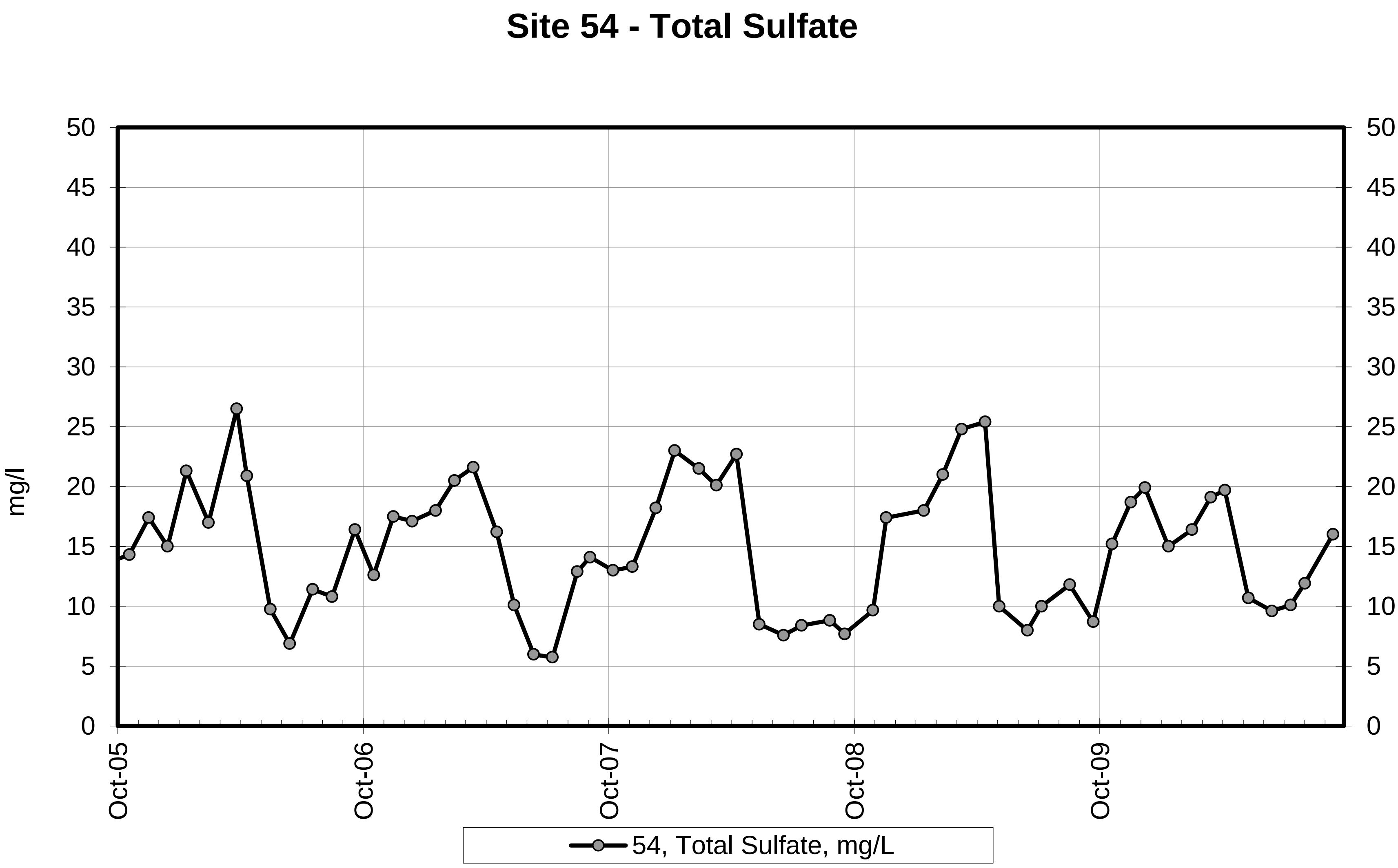


Site 54 - Lab pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
pH, su
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

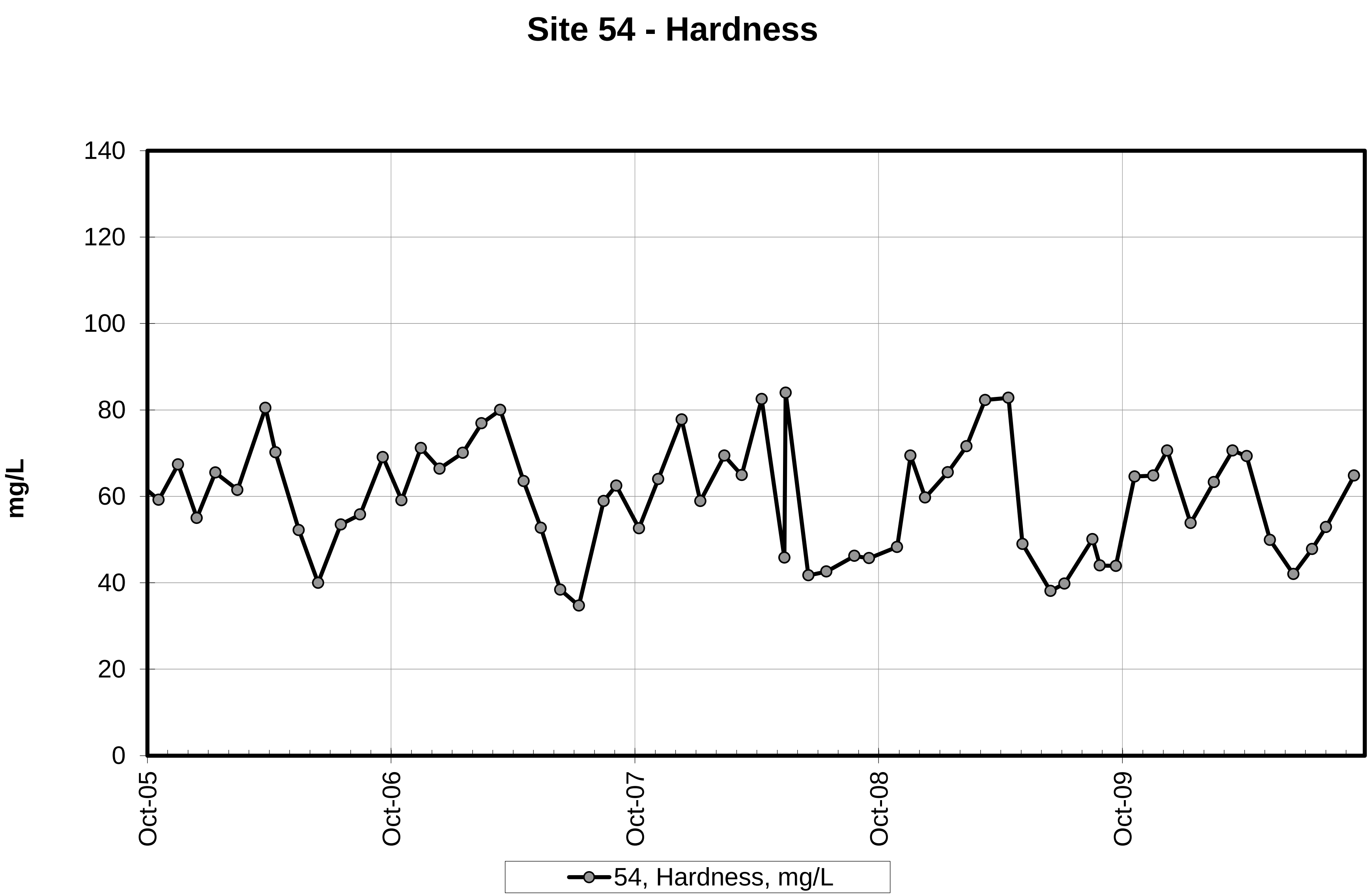

Site 54 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

Site 54 - Total Alkalinity



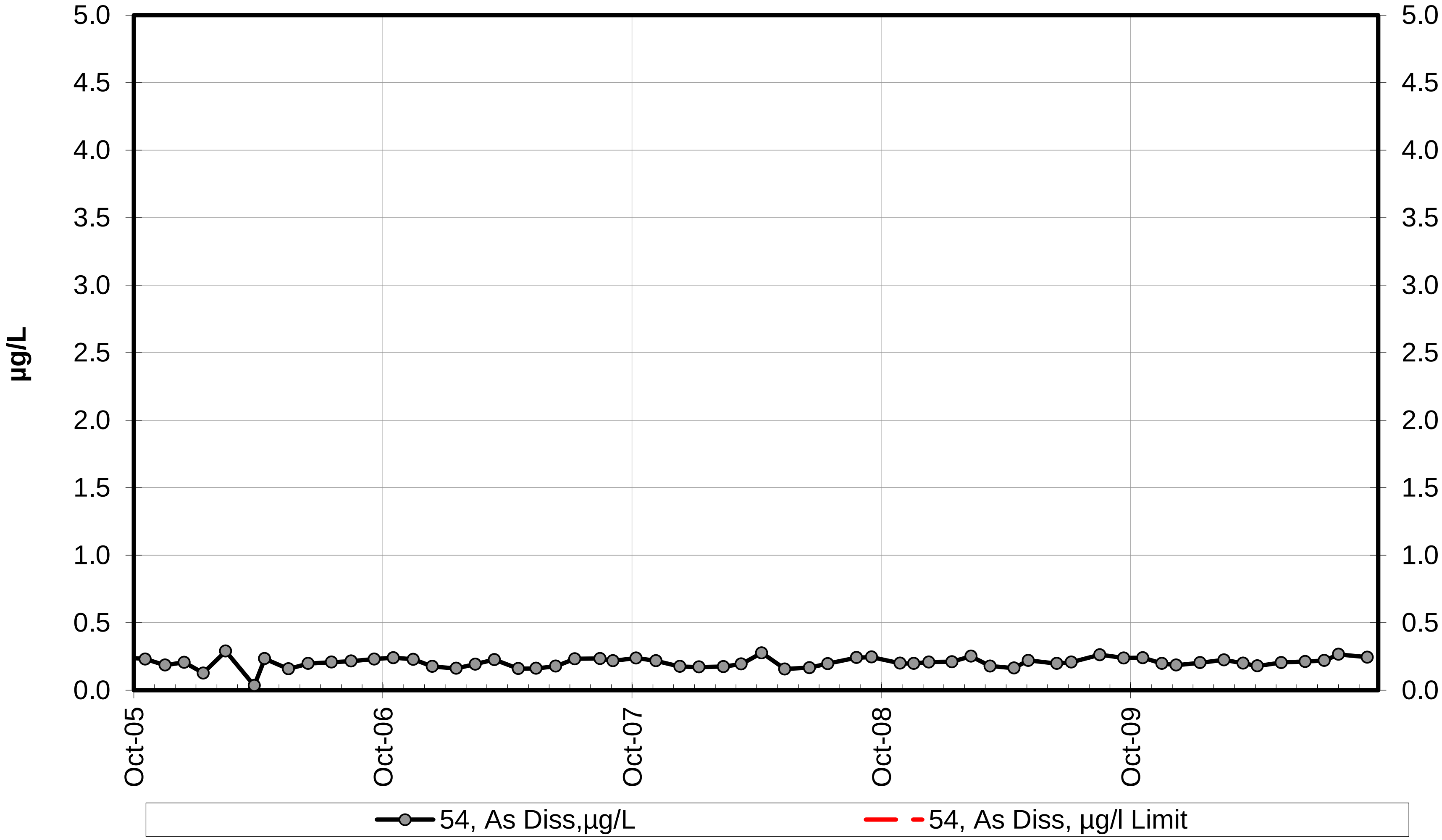


Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

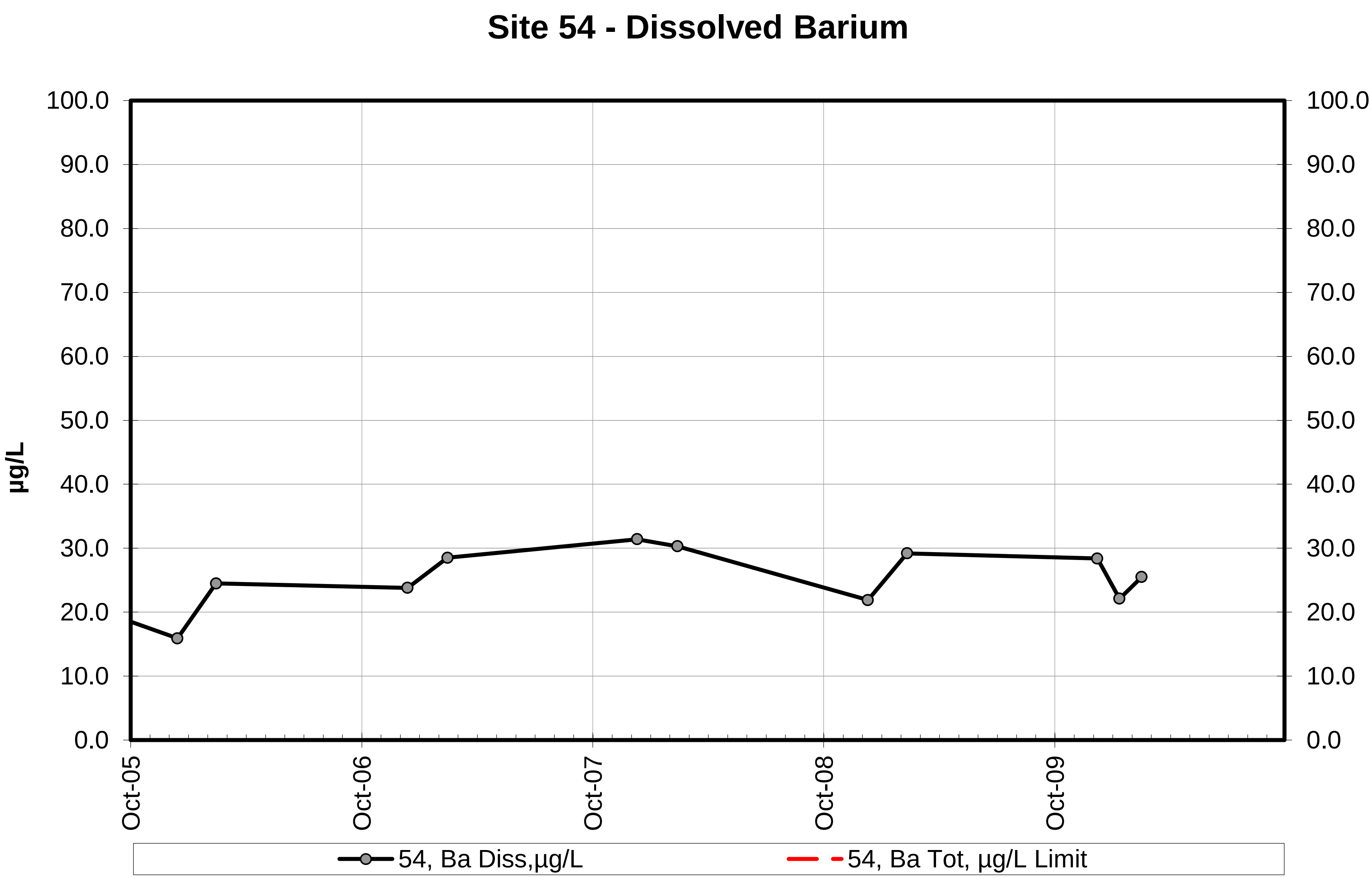


Site 54 - Hardness
mg/L
0
20
40
60
80
100
120
140
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Hardness, mg/L

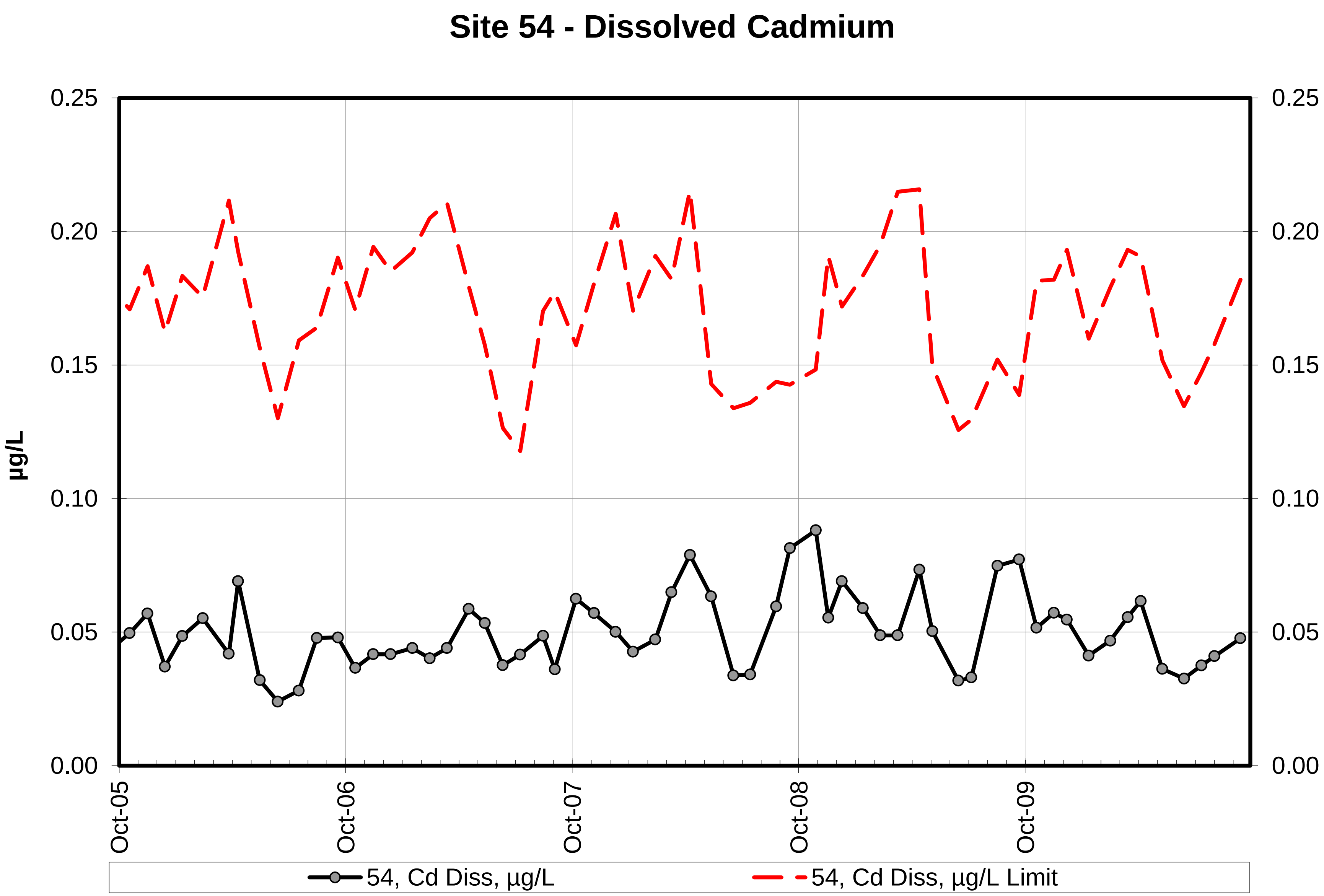
Site 54 - Dissolved Arsenic



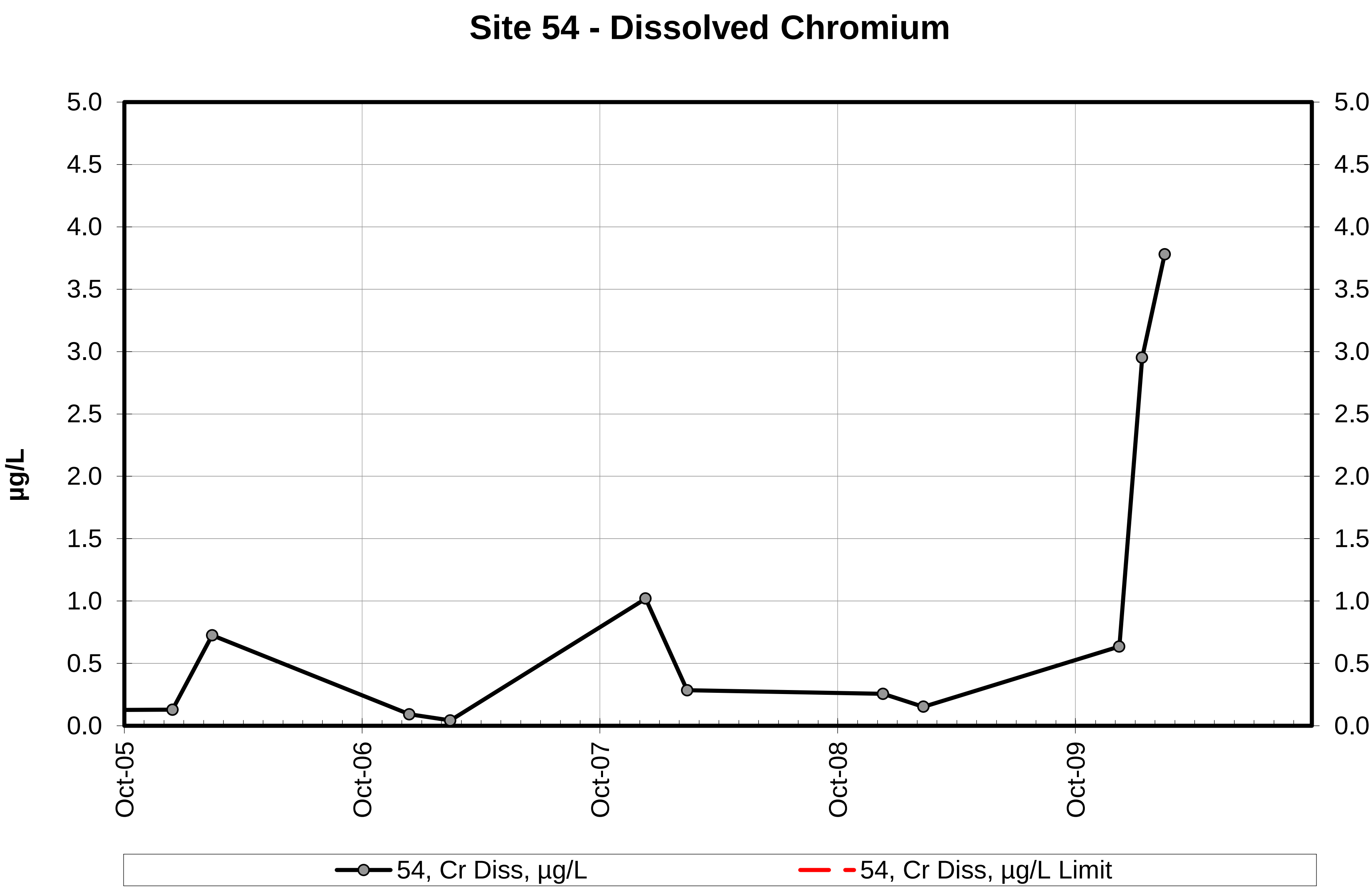
Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination



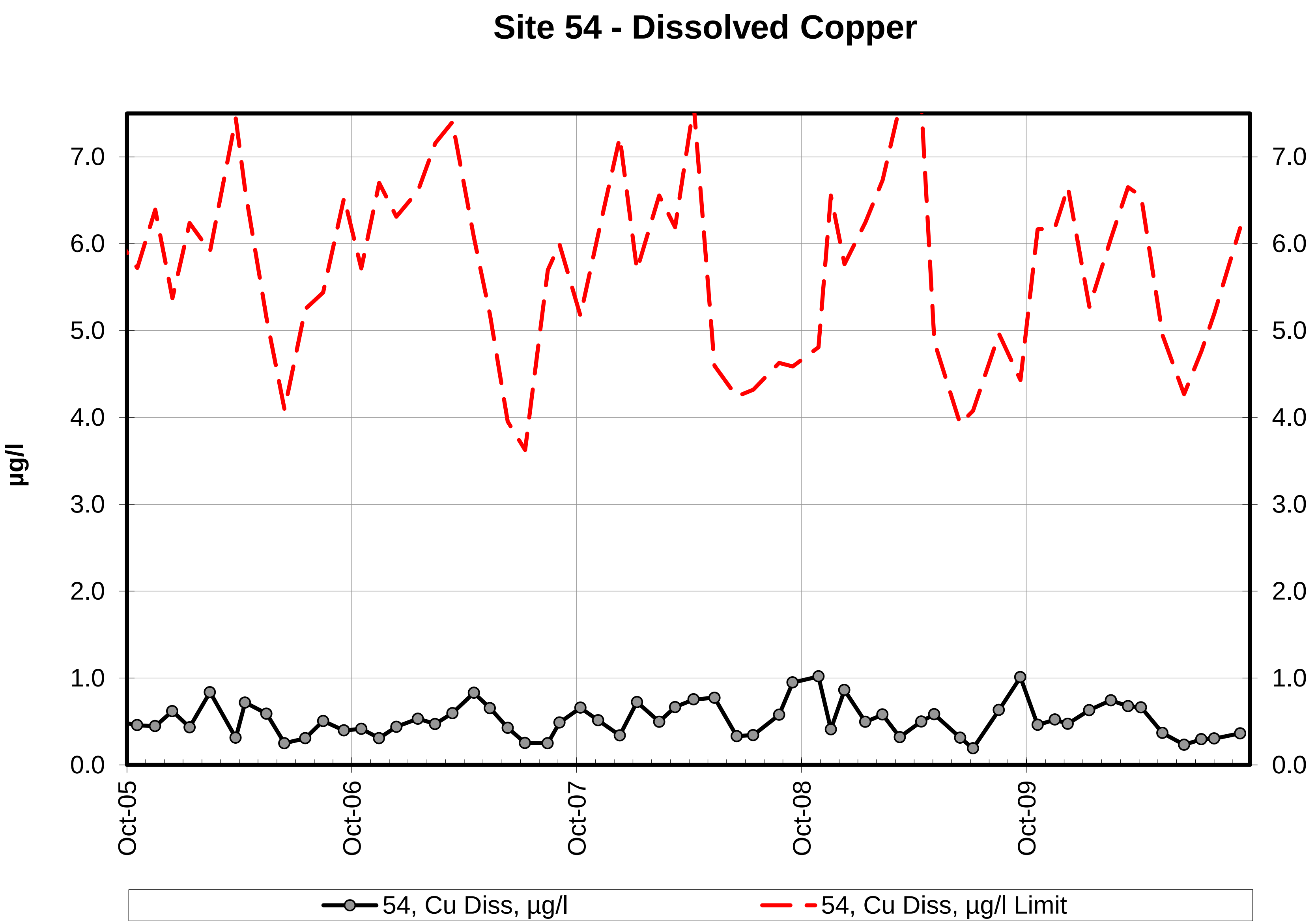
Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



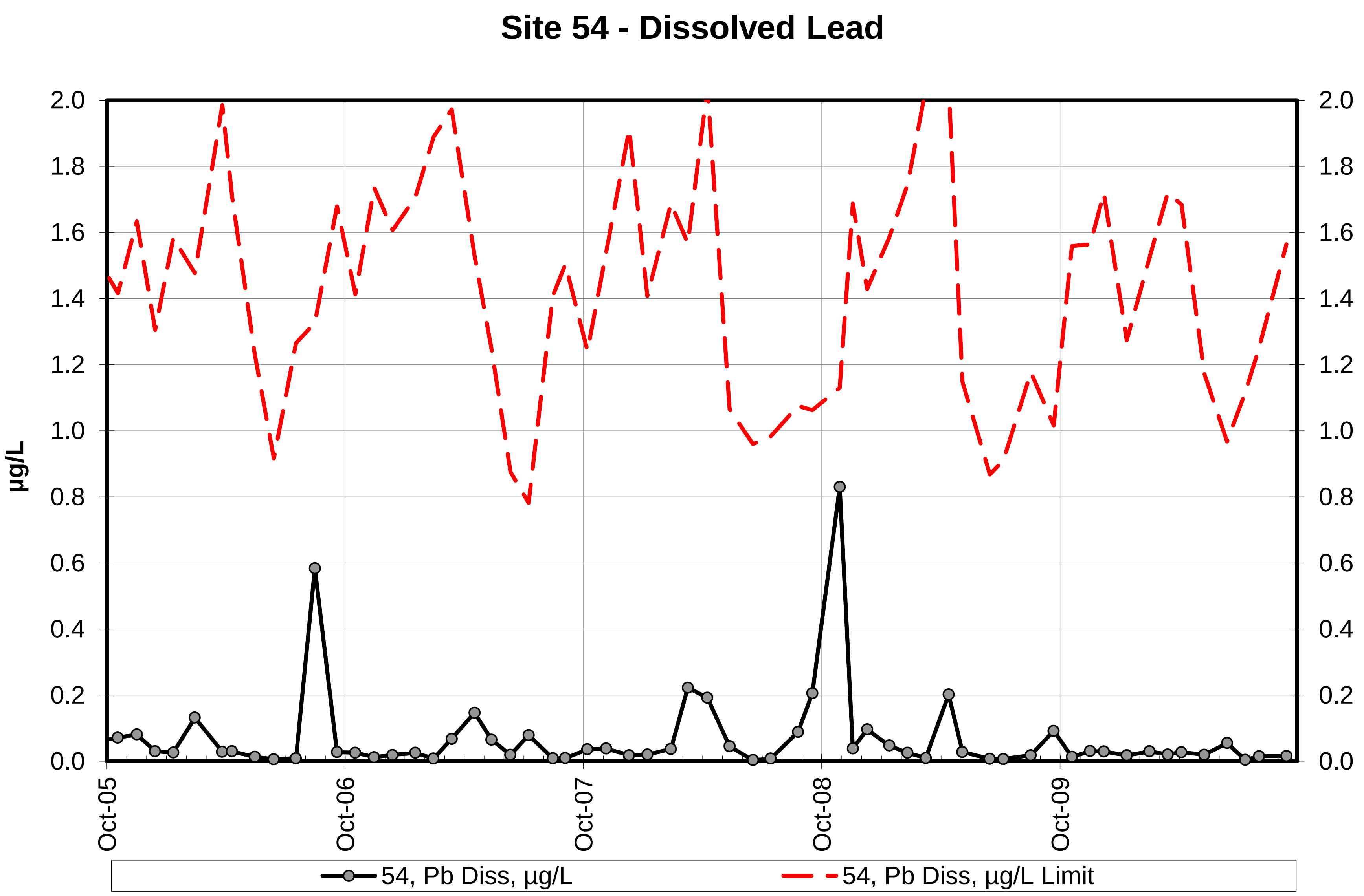
Site 54 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Cd Diss, µg/L
54, Cd Diss, µg/L Limit



Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

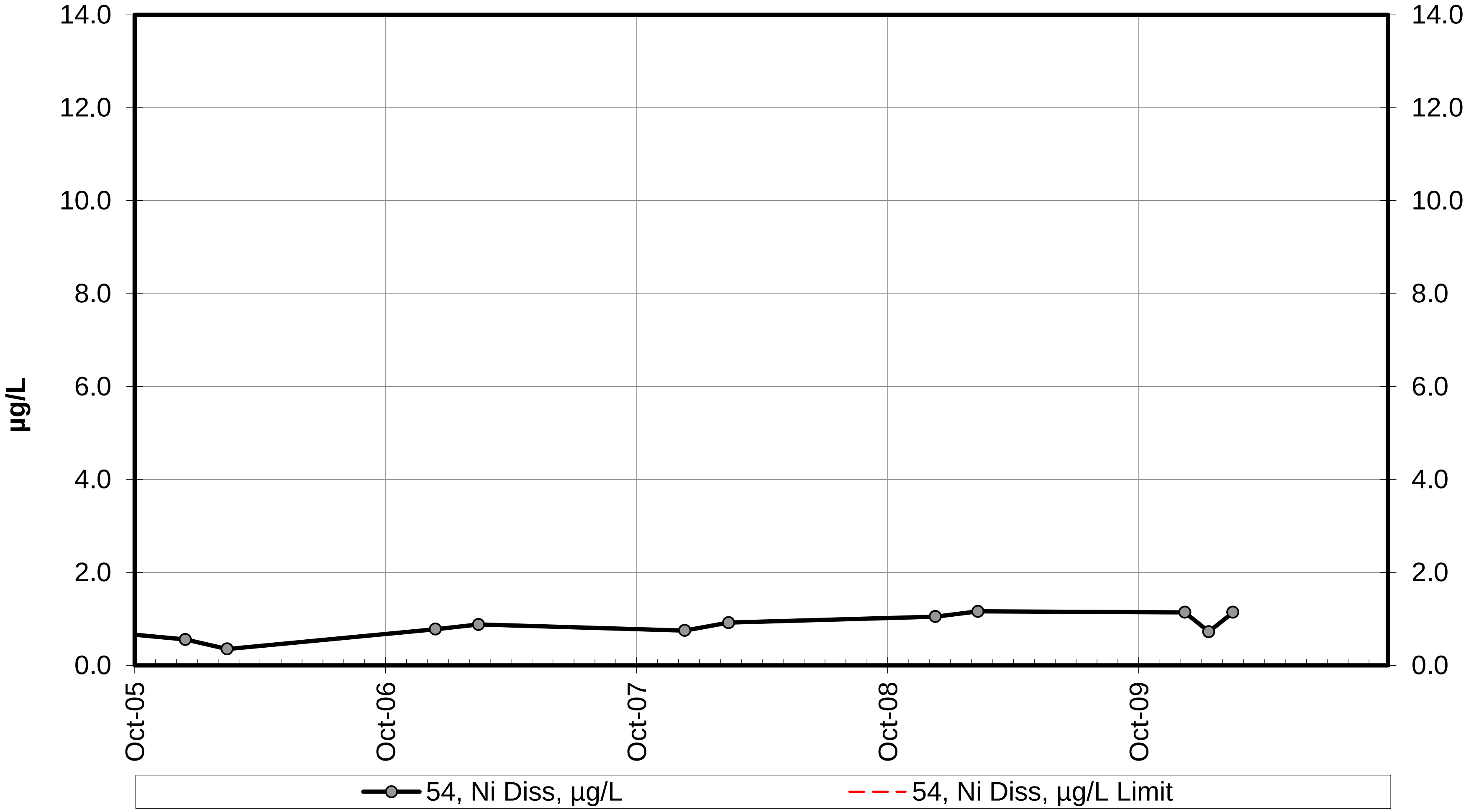


Site 54 - Dissolved Copper
µg/l
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Cu Diss, µg/l
54, Cu Diss, µg/l Limit

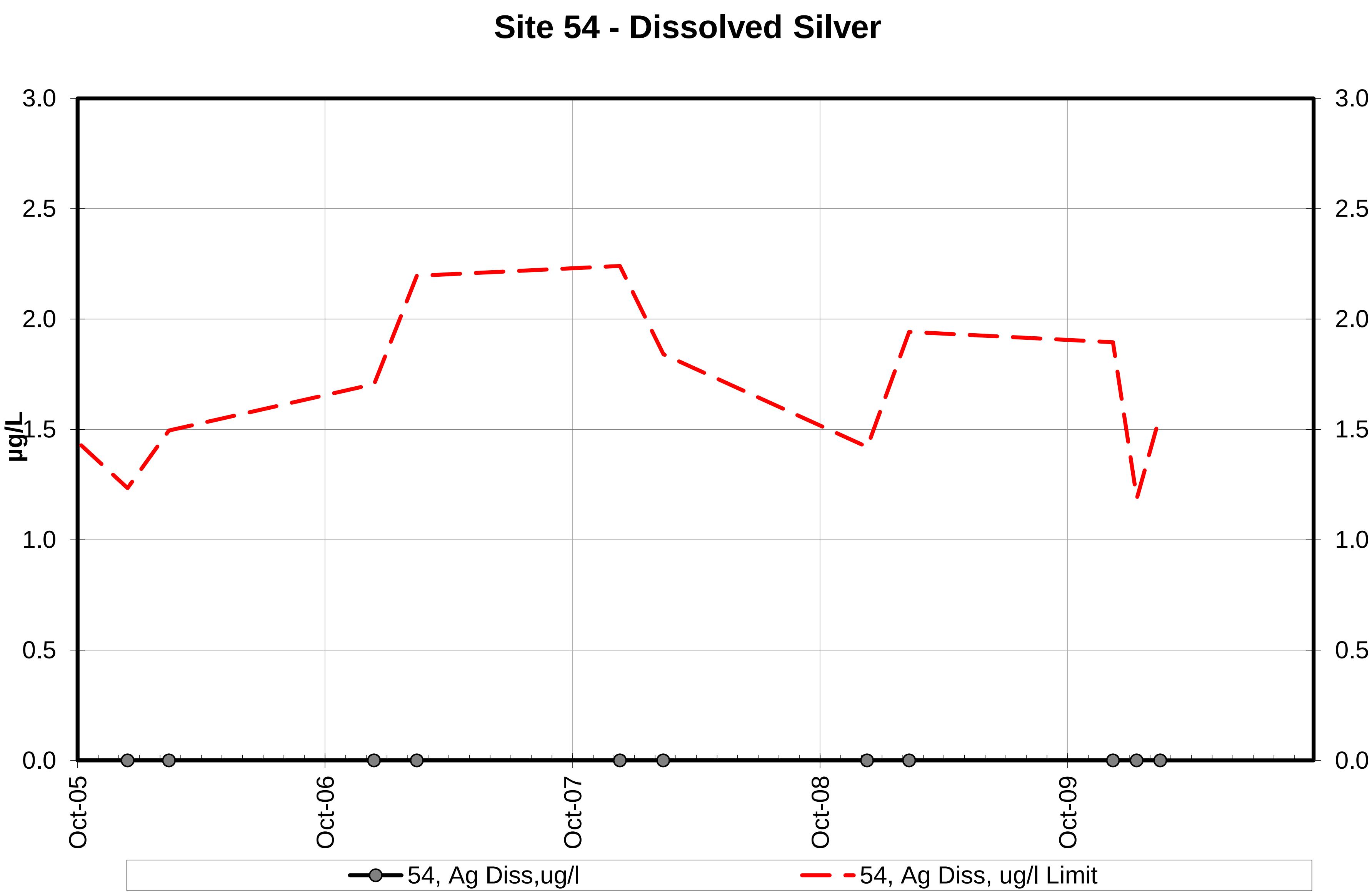


Site 54 - Dissolved Lead
µg/L
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Pb Diss, µg/L
54, Pb Diss, µg/L Limit

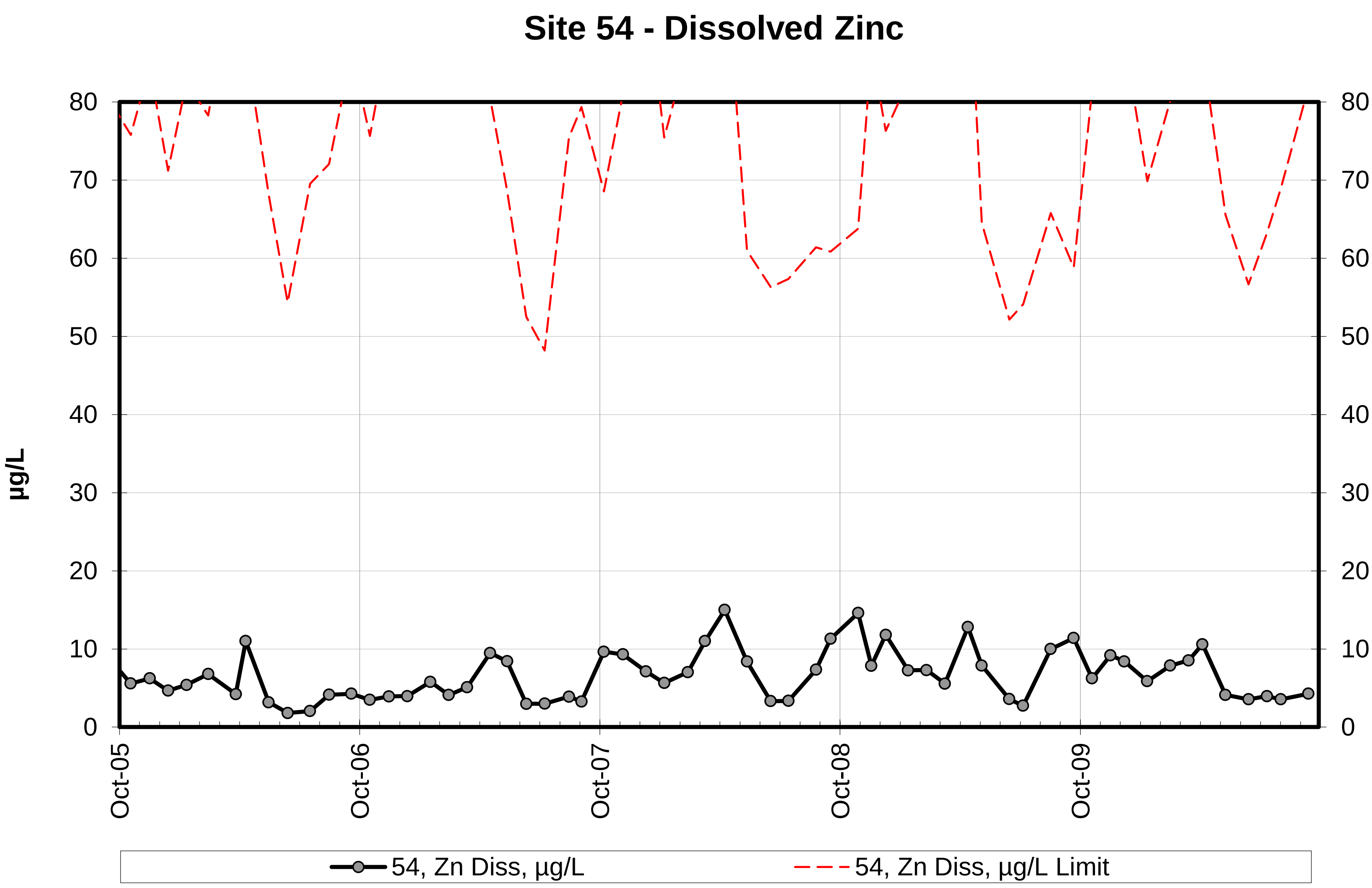
Site 54 - Dissolved Nickel



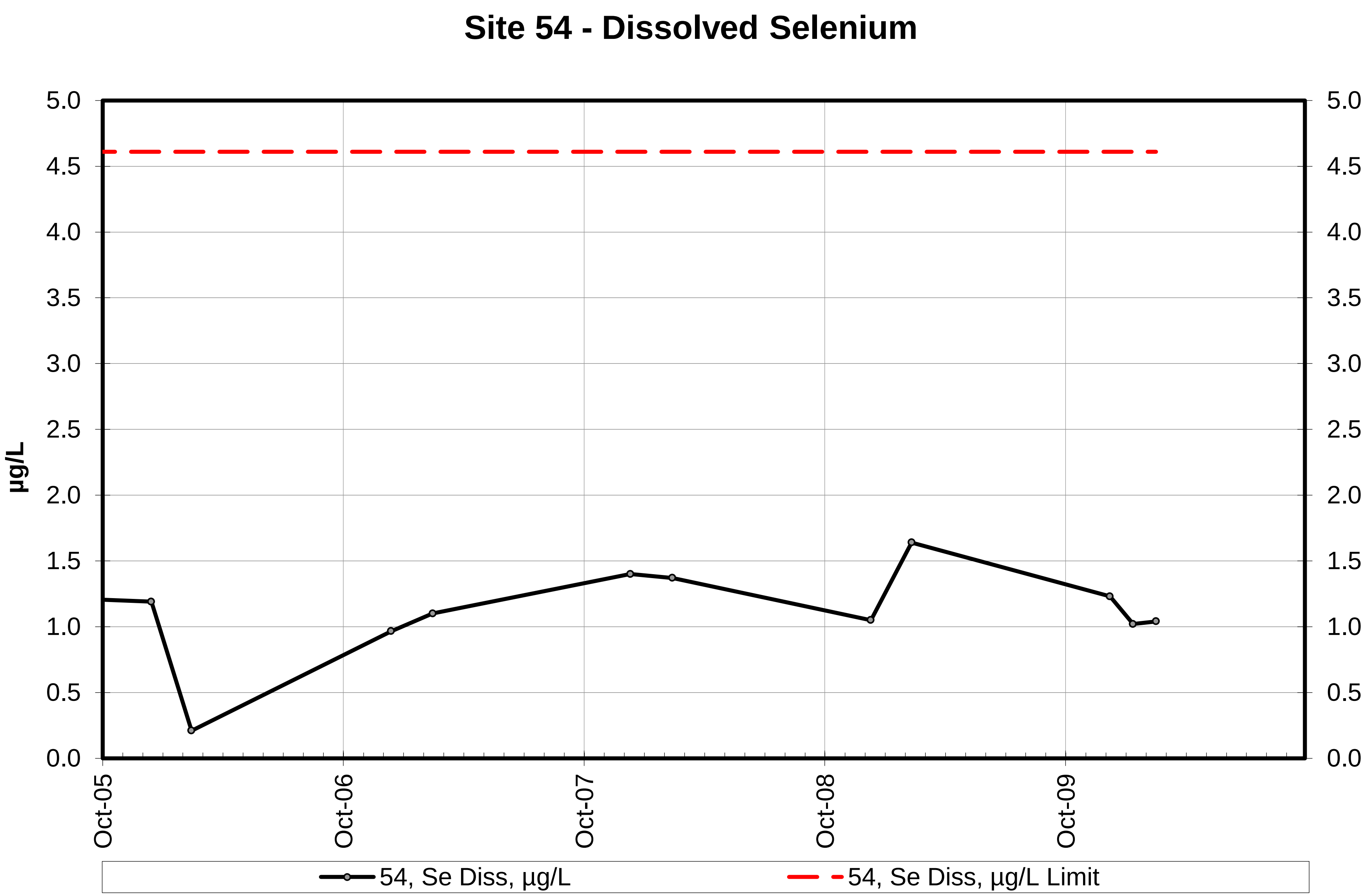
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.



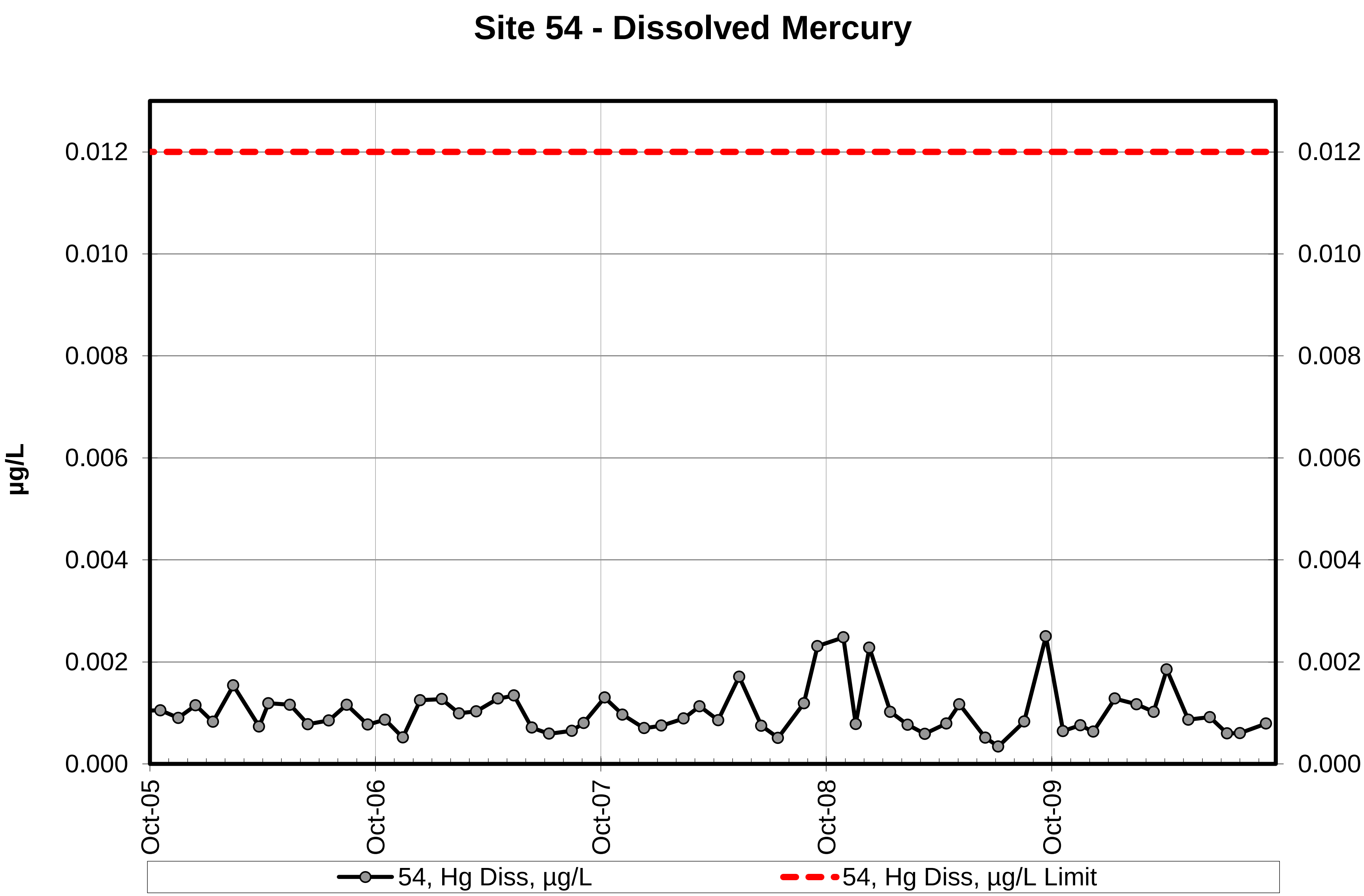
Site 54 - Dissolved Silver
µg/L
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Ag Diss,ug/l
54, Ag Diss, ug/l Limit



Site 54 - Dissolved Zinc
µg/L
0
10
20
30
40
50
60
70
80
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Zn Diss, µg/L
54, Zn Diss, µg/L Limit



Site 54 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Se Diss, µg/L
54, Se Diss, µg/L Limit



Site 54 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
54, Hg Diss, µg/L
54, Hg Diss, µg/L Limit

Site **#54** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

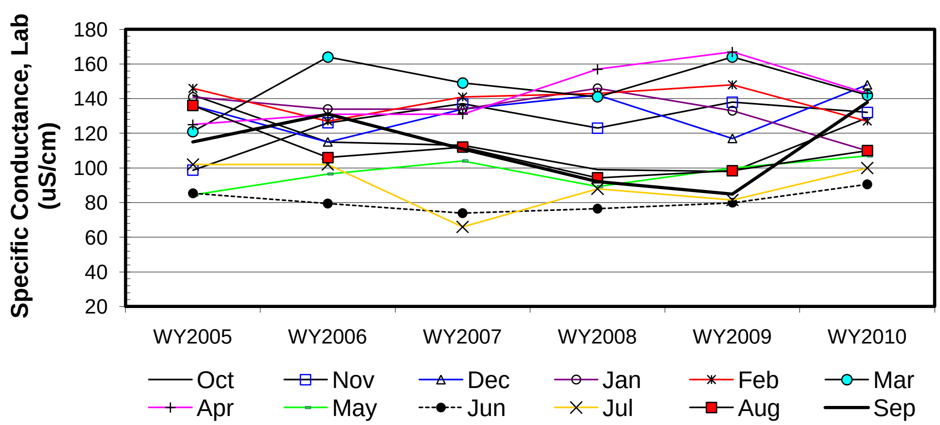
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	142	98.7	136	141	146	121	125	84.4	85.4	102	136	115
b	**WY2006**	115	126	115	134	127	164	131	96.5	79.4	102	106	131
c	**WY2007**	113	137	134	134	141	149	131	104	73.9	65.9	112	111
d	**WY2008**	99.1	123	142	146	143	141	157	89.2	76.5	88	94.3	92.1
e	**WY2009**	97.9	138	117	133	148	164	167	100	79.9	81.5	98.4	84.9
f	**WY2010**	129	132	148	110	127	142	143	107	90.5	100	110	138
	n	6	6	6	6	6	6	6	6	6	6	6	6
	t_1	5	5	5	3	3	3	3	5	5	3	5	5
	t_2	0	0	0	1	1	1	1	0	0	1	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a	-1	1	-1	-1	-1	1	1	1	-1	0	-1	1
	c-a	-1	1	-1	-1	-1	1	1	1	-1	-1	-1	-1
	d-a	-1	1	1	1	-1	1	1	1	-1	-1	-1	-1
	e-a	-1	1	-1	-1	1	1	1	1	-1	-1	-1	-1
	f-a	-1	1	1	-1	-1	1	1	1	1	-1	-1	1
	c-b	-1	1	1	0	1	-1	0	1	-1	-1	1	-1
	d-b	-1	-1	1	1	1	-1	1	-1	-1	-1	-1	-1
	e-b	-1	1	1	-1	1	0	1	1	1	-1	-1	-1
	f-b	1	1	1	-1	0	-1	1	1	1	-1	1	1
	d-c	-1	-1	1	1	1	-1	1	-1	1	1	-1	-1
	e-c	-1	1	-1	-1	1	1	1	-1	1	1	-1	-1
	f-c	1	-1	1	-1	-1	-1	1	1	1	1	-1	1
	e-d	-1	1	-1	-1	1	1	1	1	1	-1	1	-1
	f-d	1	1	1	-1	-1	1	-1	1	1	1	1	1
	f-e	1	-1	1	-1	-1	-1	-1	1	1	1	1	1
	S_k	-7	7	5	-8	0	2	10	9	3	-4	-5	-3
	σ^2_S=	28.33	23.33	28.33	27.33	27.33	27.33	27.33	28.33	28.33	27.33	28.33	28.33
	$Z_k = S_k/\sigma_S$	-1.32	1.45	0.94	-1.53	0.00	0.38	1.91	1.69	0.56	-0.77	-0.94	-0.56
	Z^2_k	1.73	2.10	0.88	2.34	0.00	0.15	3.66	2.86	0.32	0.59	0.88	0.32

ΣZ_k=	1.82
ΣZ^2_k=	15.82
Z-bar=ΣZ_k/K=	0.15

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	50	5	0	0	0

Σn	72
ΣS_k	9

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		15.54	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
	p	**0.159**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.44	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
330.00	p	**0.670**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.00		3.05
0.050	-1.36	**0.50**	2.59
0.100	-0.88		1.91
0.200	-0.38		1.38

Site **#54** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	8.1	7.5	7.8	8.0	7.8	7.9	7.7	7.3	6.9	7.0	6.8	7.2
b	**WY2006**	6.8	7.1		7.3	7.4	7.4	7.4	7.1	7.1	6.7	6.8	7.0
c	**WY2007**	7.1	6.4	7.0	6.4	6.7	6.6	7.3	7.4	7.8	7.1	7.5	7.5
d	**WY2008**	7.1	7.6	7.5	7.3	6.7	7.6	7.2	7.7	7.7	7.1	7.1	7.4
e	**WY2009**	7.0	7.3	7.6	7.8	7.5	7.9	7.5	7.4	7.3	7.5	7.4	6.9
f	**WY2010**	7.5	7.6	7.2	7.6	5.9	6.8	6.2	7.7	6.5	5.5	6.3	6.1
	n	6	6	5	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	3	5	5
t_2	0	0	0	0	0	0	0	0	0	1	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1		-1	-1	-1	-1	-1	1	-1	1	-1
c-a	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	1
d-a	-1	1	-1	-1	-1	-1	-1	1	1	1	1	1
e-a	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	-1
f-a	-1	1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1
c-b	1	-1		-1	-1	-1	-1	1	1	1	1	1
d-b	1	1		-1	-1	1	-1	1	1	1	1	1
e-b	1	1		1	1	1	1	1	1	1	1	-1
f-b	1	1		1	-1	-1	-1	1	-1	-1	-1	-1
d-c	1	1	1	1	1	1	-1	1	-1	0	-1	-1
e-c	-1	1	1	1	1	1	1	-1	-1	1	-1	-1
f-c	1	1	1	1	-1	1	-1	1	-1	-1	-1	-1
e-d	-1	-1	1	1	1	1	1	-1	-1	1	1	-1
f-d	1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1
f-e	1	1	-1	-1	-1	-1	-1	1	-1	-1	-1	-1
S_k	1	3	-2	-1	-7	-3	-9	7	-1	2	1	-7

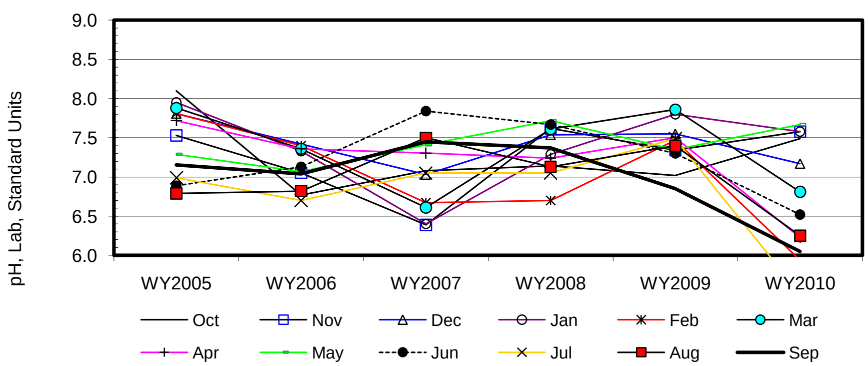
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	28.33	28.33	28.33	28.33	28.33	28.33	27.33	28.33	28.33
$Z_k = S_k/\sigma_S$	0.19	0.62	-0.49	-0.19	-1.32	-0.56	-1.69	1.32	-0.19	0.38	0.19	-1.32
Z^2_k	0.04	0.39	0.24	0.04	1.73	0.32	2.86	1.73	0.04	0.15	0.04	1.73

ΣZ_k=	-3.06
ΣZ^2_k=	9.28
Z-bar=ΣZ_k/K=	-0.25

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn	71
ΣS_k	-16

$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	8.50	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity	
p	**0.668**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -0.84	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
322.33	**p** **0.202**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.15		0.06
0.050	-0.11	**-0.05**	0.03
0.100	-0.09		0.02
0.200	-0.07		0.00

Site #54 — Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	58.9	42.4	54.2	59.2	64.1	51.8	56.7	40.3	39.5	41.4	51.0	44.8
b	**WY2006**	44.4	44.3	39.7	46.4	43.7	53.3	46.2	41.3	31.0	40.7	44.2	48.5
c	**WY2007**	44.0	49.4	48.1	47.8	52.6	51.3	44.0	38.0	31.2	27.4	44.0	45.7
d	**WY2008**	40.6	45.9	52.4	55.5	49.6	51.6	54.6	33.8	33.1	33.0	59.5	34.6
e	**WY2009**	31.1	46.6	39.1	45.8	52.2	54.4	54.7	34.7	29.7	34.7	34.3	32.6
f	**WY2010**	45.9	45.7	52.0	41.3	43.1	47.2	45.5	37.8	33.2	34.7	39.1	49.2
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	3	5	5
t_2	0	0	0	0	0	0	0	0	0	1	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	-1	1	-1	-1	-1	1
c-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
d-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1
e-a	-1	1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1
f-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1
c-b	-1	1	1	1	1	-1	-1	-1	1	-1	-1	-1
d-b	-1	1	1	1	1	-1	1	-1	1	-1	1	-1
e-b	-1	1	-1	-1	1	1	1	-1	-1	-1	-1	-1
f-b	1	1	1	-1	-1	-1	-1	-1	1	-1	-1	1
d-c	-1	-1	1	1	-1	1	1	-1	1	1	1	-1
e-c	-1	-1	-1	-1	-1	1	1	-1	-1	1	-1	-1
f-c	1	-1	1	-1	-1	-1	1	-1	1	1	-1	1
e-d	-1	1	-1	-1	1	1	1	1	-1	1	-1	-1
f-d	1	-1	-1	-1	-1	-1	-1	1	1	1	-1	1
f-e	1	-1	1	-1	-1	-1	-1	1	1	0	1	1
S_k	-7	5	-3	-9	-7	-3	-3	-7	-1	-4	-7	-1

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	27.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-1.32	1.04	-0.56	-1.69	-1.32	-0.56	-0.56	-1.32	-0.19	-0.77	-1.32	-0.19
Z^2_k	1.73	1.07	0.32	2.86	1.73	0.32	0.32	1.73	0.04	0.59	1.73	0.04

ΣZ_k= -8.75

ΣZ^2_k= 12.46

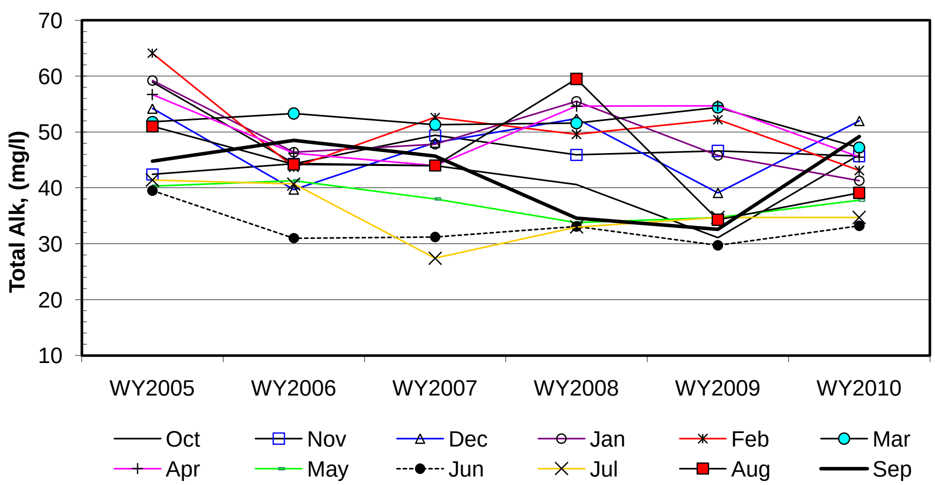
Z-bar=ΣZ_k/K= -0.73

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 72

ΣS_k -47

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$= 6.08	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p **0.868**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 334.00	Z_{calc} -2.52 **p** **0.006**	@α/2=2.5% Z= 1.96	**H_0** (No trend) REJECT
			H_A (± trend) ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.14		-0.09
0.050	-1.65	**-0.91**	-0.20
0.100	-1.47		-0.41
0.200	-1.32		-0.53
		-2.0%	

Site #54

Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	16.6	10.3	16.4	18.9	23.8	16.2	19.4	7.9	9.6	11.2	19.0	13.6
b	**WY2006**	14.3	17.4	15.0	21.3	17.0	26.5	20.9	9.8	6.9	11.4	10.8	16.4
c	**WY2007**	12.6	17.5	17.1	18.0	20.5	21.6	16.2	10.1	6.0	5.7	12.9	14.1
d	**WY2008**	13.0	13.3	18.2	23.0	21.5	20.1	22.7	8.5	7.6	8.4	8.8	7.7
e	**WY2009**	9.7	17.4	16.3	18.0	21.0	24.8	25.4	10.0	8.0	10.0	11.8	8.7
f	**WY2010**	15.2	18.7	19.9	15.0	16.4	19.1	19.7	10.7	9.6	10.1	11.9	16.0
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	3	5	5	5	5	3	5	5	5
t_2	0	1	0	1	0	0	0	0	1	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	1	-1	1	1	1	-1	1	-1	1
c-a	-1	1	1	-1	-1	1	-1	1	-1	-1	-1	1
d-a	-1	1	1	1	-1	1	1	1	-1	-1	-1	-1
e-a	-1	1	-1	-1	-1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1	-1	-1	1	1	1	0	-1	-1	1
c-b	-1	1	1	-1	1	-1	-1	1	-1	-1	1	-1
d-b	-1	-1	1	1	1	-1	1	-1	1	-1	-1	-1
e-b	-1	0	1	-1	1	-1	1	1	1	-1	1	-1
f-b	1	1	1	-1	-1	-1	-1	1	1	-1	1	-1
d-c	1	-1	1	1	1	-1	1	-1	1	1	-1	-1
e-c	-1	-1	-1	0	1	1	1	-1	1	1	-1	-1
f-c	1	1	1	-1	-1	-1	1	1	1	1	-1	1
e-d	-1	1	-1	-1	-1	1	1	1	1	1	1	1
f-d	1	1	1	-1	-1	-1	-1	1	1	1	1	1
f-e	1	1	1	-1	-1	-1	-1	1	1	1	1	1
S_k	-5	8	7	-6	-5	-1	5	9	4	-1	-3	-1

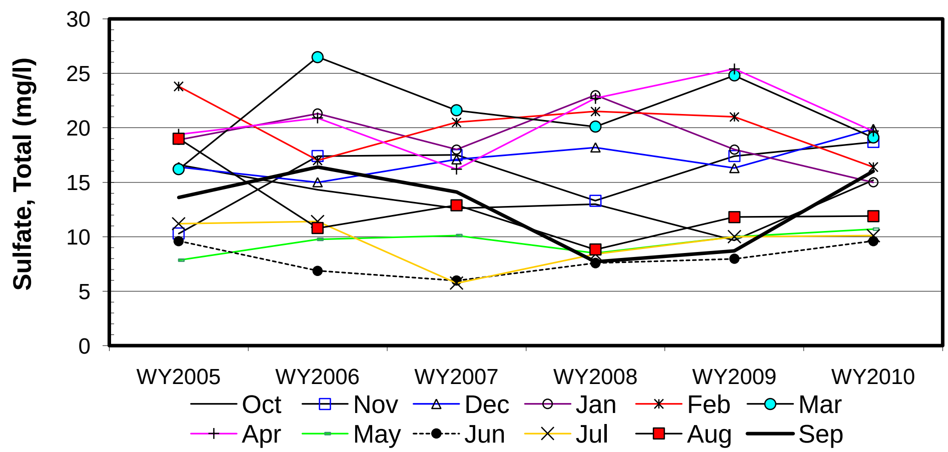
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2{}_S=$	28.33	21.67	28.33	27.33	28.33	28.33	28.33	28.33	27.33	28.33	28.33	28.33
$Z_k = S_k/\sigma_S$	-0.94	1.72	1.32	-1.15	-0.94	-0.19	0.94	1.69	0.77	-0.19	-0.56	-0.19
$Z^2{}_k$	0.88	2.95	1.73	1.32	0.88	0.04	0.88	2.86	0.59	0.04	0.32	0.04

$\Sigma Z_k=$ 2.28
$\Sigma Z^2{}_k=$ 12.52
Z-bar=$\Sigma Z_k/K=$ 0.19

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	54	3	0	0	0

Σn 72
ΣS_k 11

$\chi^2{}_h=\Sigma Z^2{}_k-K(\text{Z-bar})^2=$ 12.08	@α=5% $\chi^2{}_{(K-1)}=$ 19.68	Test for station homogeneity	
p **0.357**		$\chi^2{}_h<\chi^2{}_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$ 331.33	Z_{calc} 0.55	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
p **0.709**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.45		0.54
0.050	-0.30	**0.10**	0.37
0.100	-0.20		0.34
0.200	-0.04		0.25

Site **#54** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	4.9	9.2	8.3	6.5	5.6	9.6	8.2	2.5	2.7	2.8	2.7	8.9
b	**WY2006**	5.6	6.2	4.7	5.4	6.8	4.2	11.0	3.2	1.8	2.1	4.1	4.3
c	**WY2007**	3.5	3.9	4.0	5.8	4.1	5.1	9.5	8.4	3.0	3.0	3.9	3.3
d	**WY2008**	9.7	9.3	7.1	5.7	7.0	11.0	15.0	8.4	3.3	3.4	7.3	11.3
e	**WY2009**	14.6	7.9	11.8	7.3	7.3	5.6	12.8	7.9	3.6	2.7	10.0	11.4
f	**WY2010**	6.2	9.2	8.4	5.9	7.9	8.5	10.6	4.1	3.6	4.0	3.6	4.3
	n	6	6	6	6	6	6	6	6	6	6	6	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	3
t_2	0	0	0	0	0	0	0	0	0	0	0	1
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	1	-1	-1	-1	1	-1	1	1	-1	-1	1	-1
c-a	-1	-1	-1	-1	-1	-1	1	1	1	1	1	-1
d-a	1	1	-1	-1	1	1	1	1	1	1	1	1
e-a	1	-1	1	1	1	-1	1	1	1	-1	1	1
f-a	1	-1	1	-1	1	-1	1	1	1	1	1	-1
c-b	-1	-1	-1	1	-1	1	-1	1	1	1	-1	-1
d-b	1	1	1	1	1	1	1	1	1	1	1	1
e-b	1	1	1	1	1	1	1	1	1	1	1	1
f-b	1	1	1	1	1	1	-1	1	1	1	-1	0
d-c	1	1	1	-1	1	1	1	-1	1	1	1	1
e-c	1	1	1	1	1	1	1	-1	1	-1	1	1
f-c	1	1	1	1	1	1	1	-1	1	1	-1	1
e-d	1	-1	1	1	1	-1	-1	-1	1	-1	1	1
f-d	-1	-1	1	1	1	-1	-1	-1	1	1	-1	-1
f-e	-1	1	-1	-1	1	1	-1	-1	-1	1	-1	-1
S_k	7	1	5	3	11	3	5	3	11	7	5	2

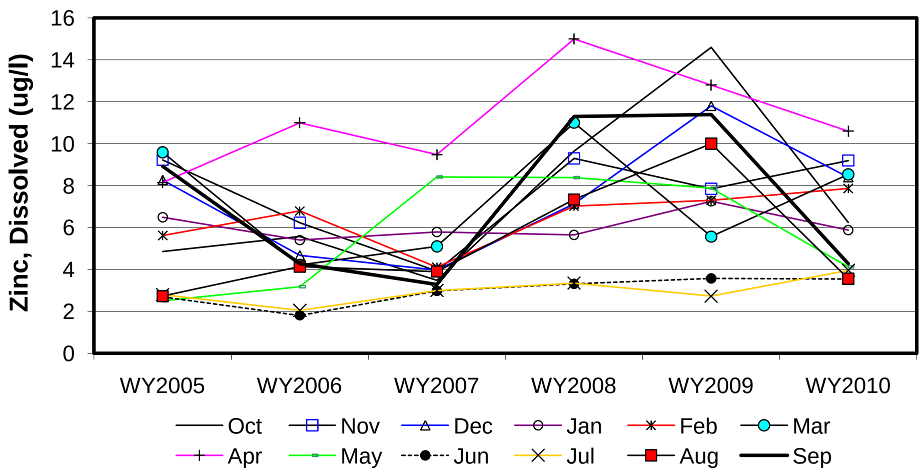
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	28.33	27.33
$Z_k = S_k/\sigma_S$	1.32	0.21	0.94	0.56	2.07	0.56	0.94	0.56	2.07	1.32	0.94	0.38
Z^2_k	1.73	0.04	0.88	0.32	4.27	0.32	0.88	0.32	4.27	1.73	0.88	0.15

ΣZ_k= 11.86
ΣZ^2_k= 15.79
Z-bar=ΣZ_k/K= 0.99

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 72
ΣS_k 63

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	4.06	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.968**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 3.39	@α/2=2.5% Z= 1.96	**H_0** (No trend)	REJECT
334.00	p **1.000**		**H_A** (± trend)	ACCEPT

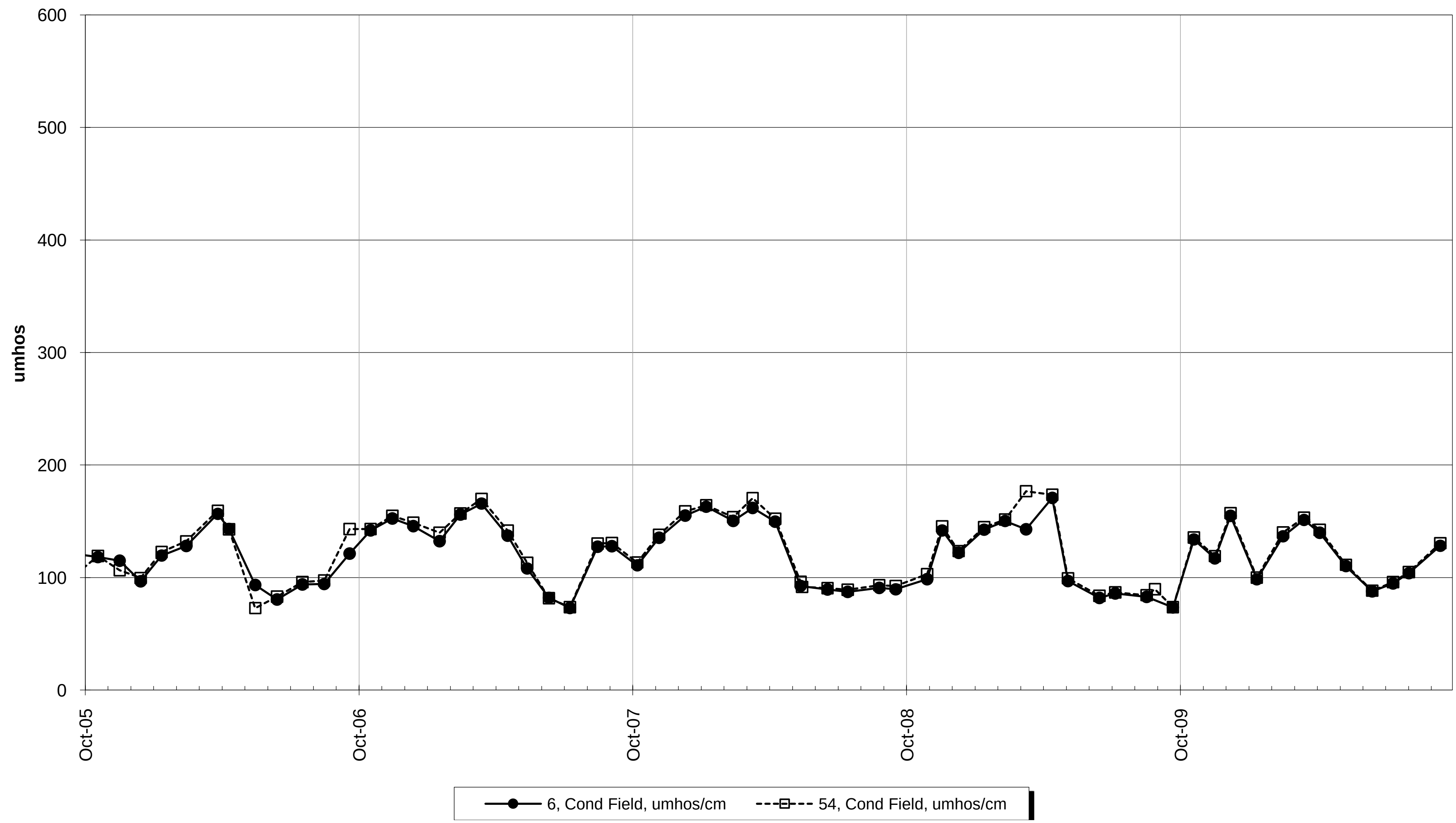


Seasonal-Kendall Slope Confidence Intervals

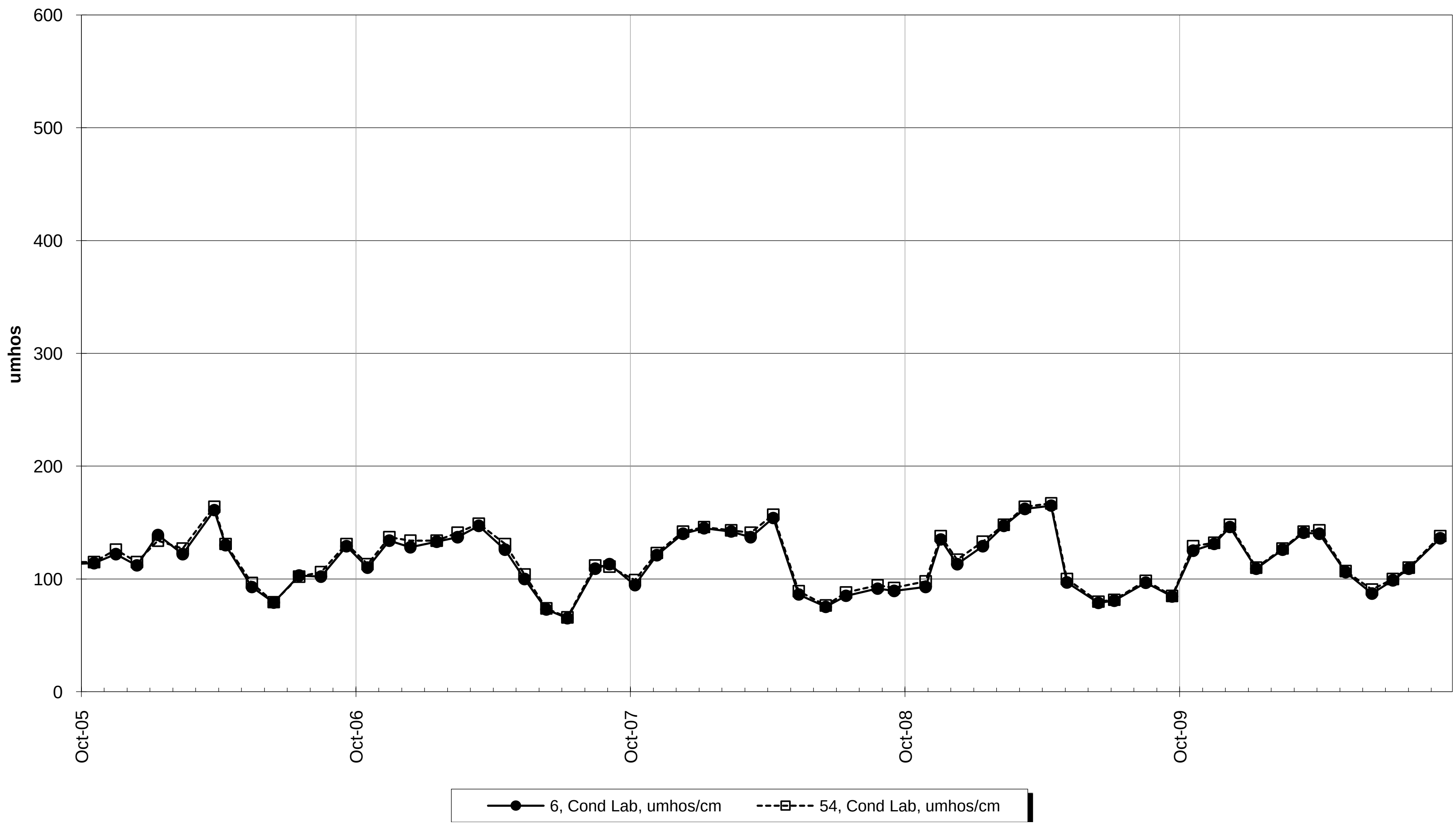
α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.12		0.62
0.050	0.18	**0.32**	0.49
0.100	0.21		0.46
0.200	0.24		0.42

5.5%

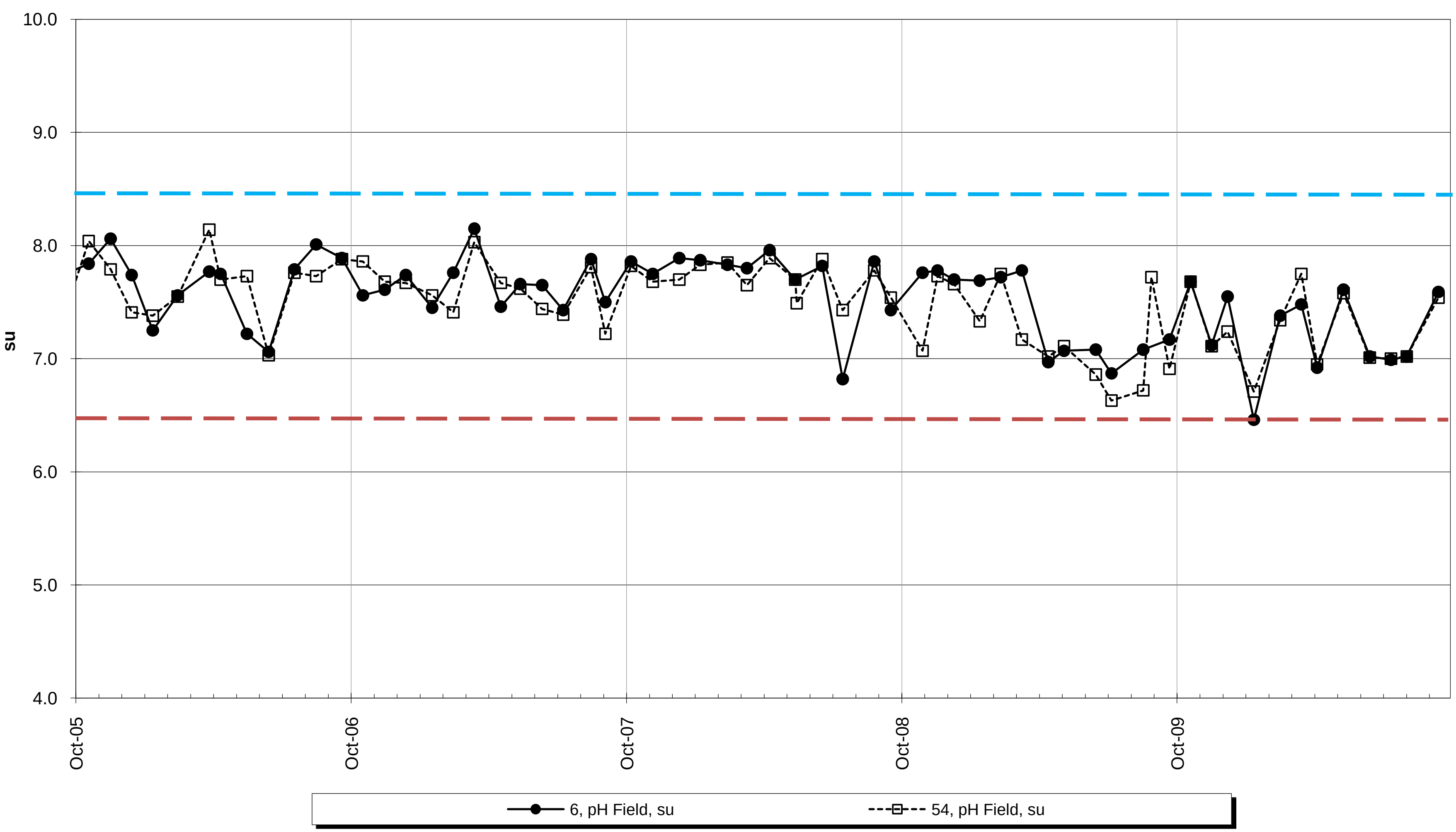
Site 6 vs Site 54 -Conductivity-Field

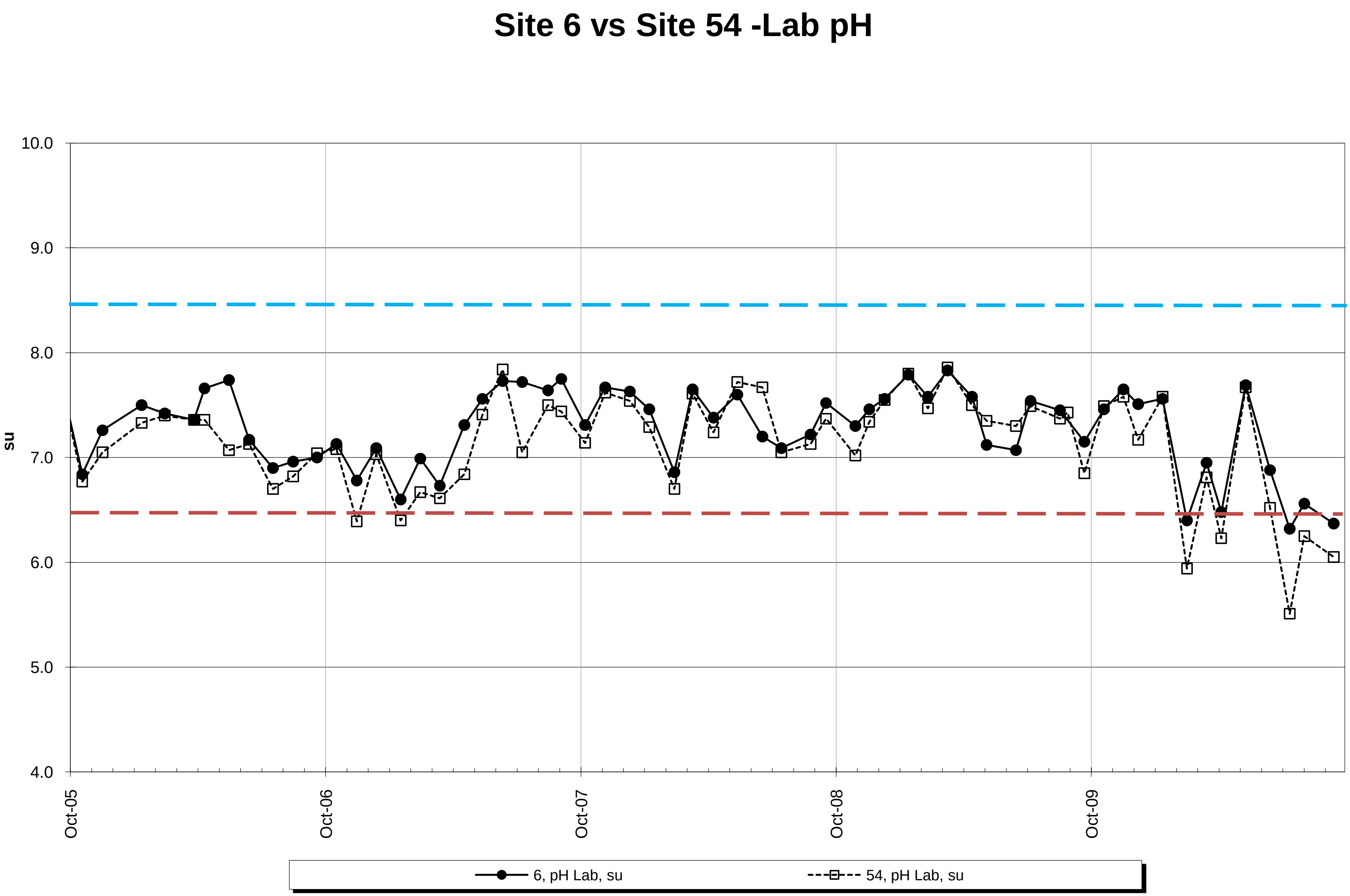


Site 6 vs Site 54 -Conductivity



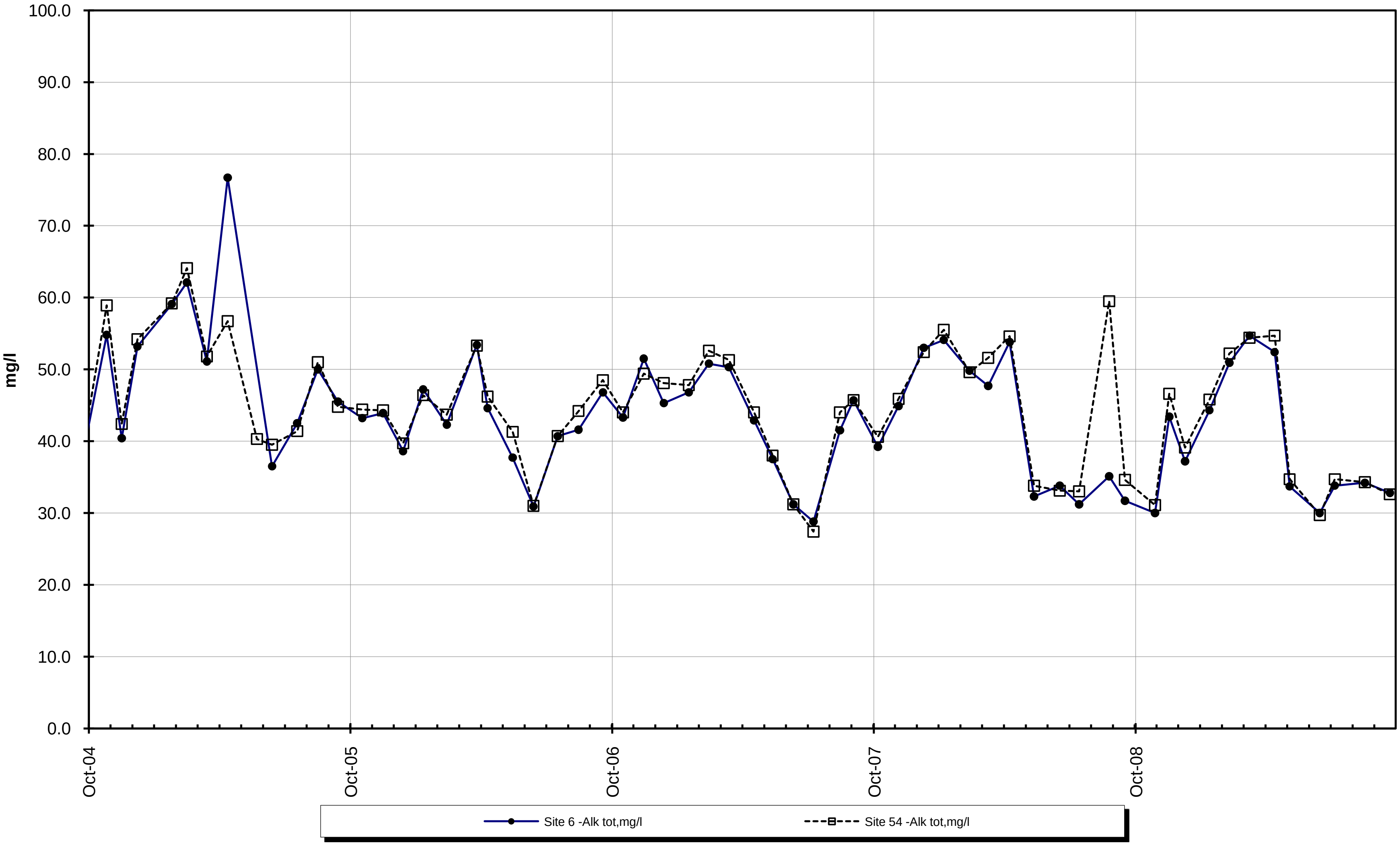
Site 6 vs Site 54 -Field pH

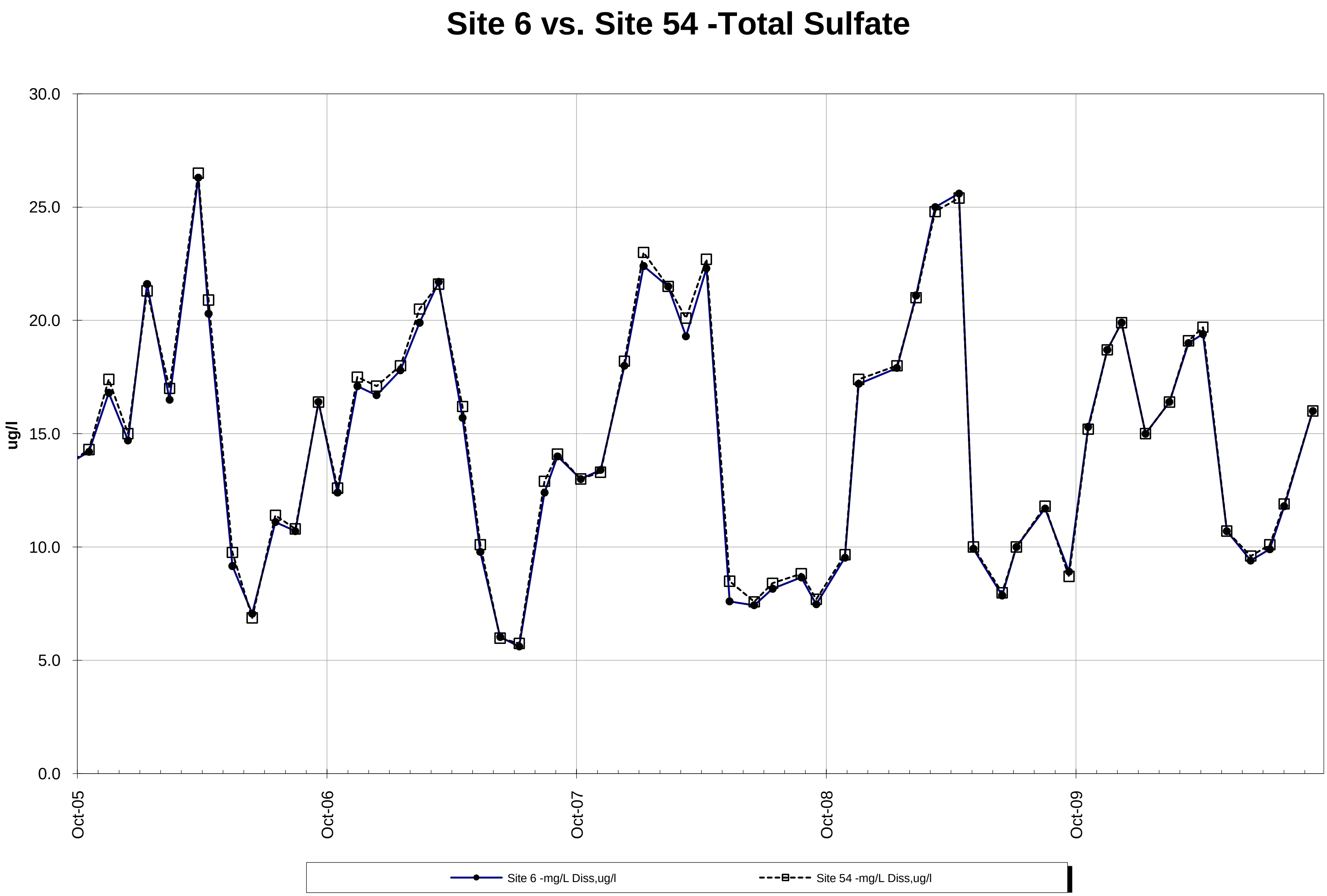




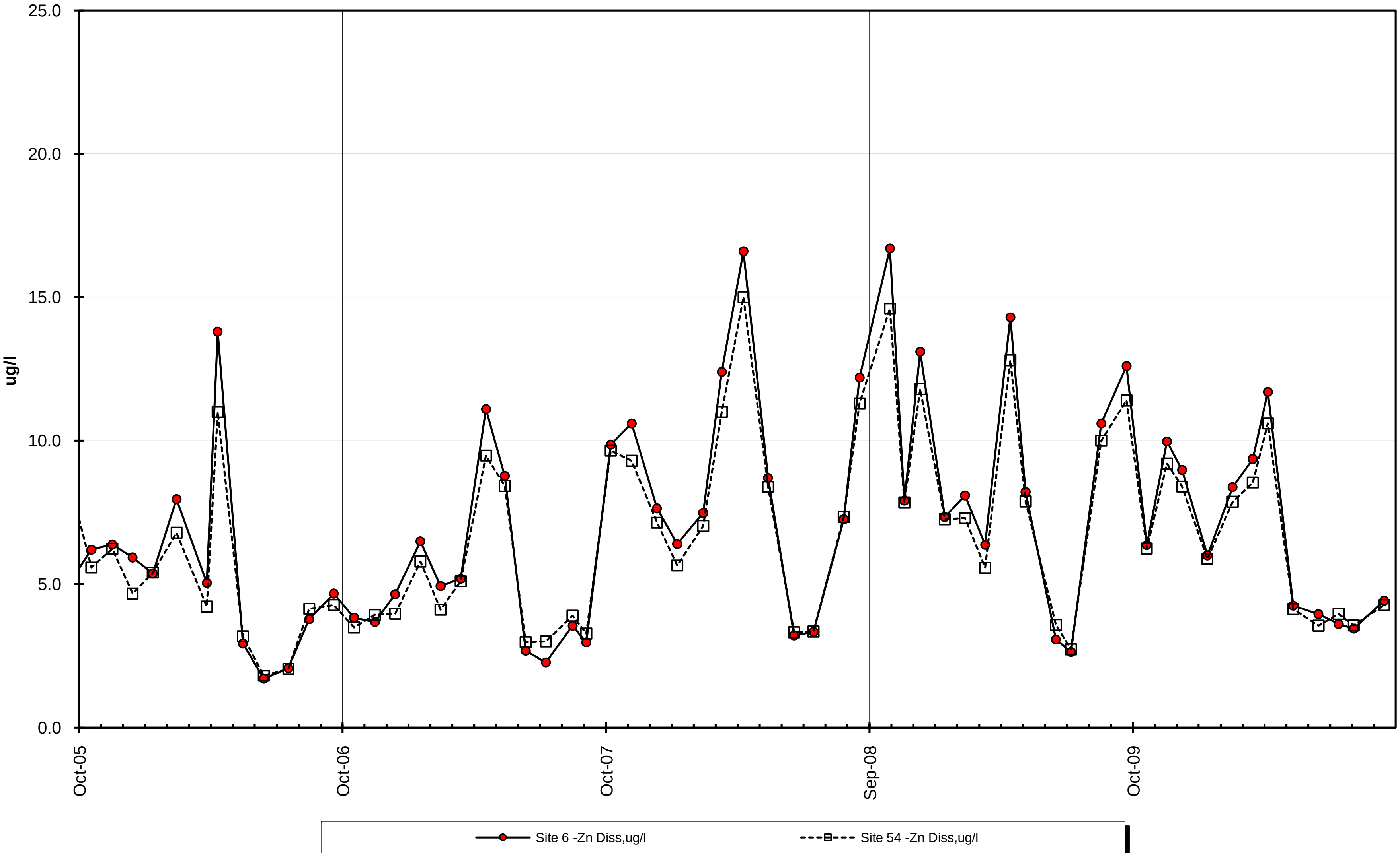
Site 6 vs Site 54 -Lab pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
su
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
6, pH Lab, su
54, pH Lab, su

Site 6 vs. Site 54 -Total Alkalinity




Site 6 vs. Site 54 -Total Sulfate
ug/l
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Site 6 -mg/L Diss,ug/l
Site 54 -mg/L Diss,ug/l

Site 6 vs. Site 54 -Dissolved Zinc



Wilcoxon-signed-ranks test

Exact Form

Variable: **Specific Conductance, Lab (uS/cm)**

	X	**Y**			
Site	#6	#54	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	125.0	129.0	-4.0	4.0	-12
Nov	131.0	132.0	-1.0	1.0	-3.5
Dec	146.0	148.0	-2.0	2.0	-8.5
Jan	109.0	110.0	-1.0	1.0	-3.5
Feb	126.0	127.0	-1.0	1.0	-3.5
Mar	141.0	142.0	-1.0	1.0	-3.5
Apr	140.0	143.0	-3.0	3.0	-10
May	106.0	107.0	-1.0	1.0	-3.5
Jun	87.0	90.5	-3.5	3.5	-11
Jul	98.7	100.0	-1.3	1.3	-7
Aug	109.0	110.0	-1.0	1.0	-3.5
Sep	136.0	138.0	-2.0	2.0	-8.5
Median	125.5	128.0	-1.2	1.2	

n	**m**
12	12

N= 12

$\Sigma R=$ -78

α
5.0%
W'$_{\alpha,n}$
17

$W^{+}=$
0
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **pH, Lab, Standard Units**

	X	**Y**			
Site	#6	#54	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	7.46	7.49	-0.03	0.03	-3
Nov	7.65	7.58	0.07	0.07	4
Dec	7.51	7.17	0.34	0.34	9
Jan	7.56	7.58	-0.02	0.02	-2
Feb	6.40	5.94	0.46	0.46	11
Mar	6.95	6.81	0.14	0.14	5
Apr	6.48	6.23	0.25	0.25	6
May	7.69	7.67	0.02	0.02	1
Jun	6.88	6.52	0.36	0.36	10
Jul	6.32	5.51	0.81	0.81	12
Aug	6.56	6.25	0.31	0.31	7
Sep	6.37	6.05	0.32	0.32	8
Median	6.92	6.67	0.28	0.28	

n	**m**
12	12

N= 12

$\Sigma R=$ 68

α
95.0%
W'$_{\alpha,n}$
59

$W^+=$
73
p-test
0.998

H_0	median [D]=0	**REJECT**
H_1	median [D]>0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **Total Alk, (mg/l)**

	X	**Y**			
Site	#6	#54	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	45.0	45.9	-0.9	0.9	-5
Nov	46.4	45.7	0.7	0.7	4
Dec	52.2	52.0	0.2	0.2	1
Jan	39.7	41.3	-1.6	1.6	-8.5
Feb	45.6	43.1	2.5	2.5	11
Mar	46.7	47.2	-0.5	0.5	-3
Apr	44.0	45.5	-1.5	1.5	-7
May	36.2	37.8	-1.6	1.6	-8.5
Jun	32.9	33.2	-0.3	0.3	-2
Jul	35.9	34.7	1.2	1.2	6
Aug	41.1	39.1	2.0	2.0	10
Sep	46.5	49.2	-2.7	2.7	-12
Median	44.5	44.3	-0.4	1.4	

n	**m**
12	12

N= 12

$\Sigma R =$ -14

α
95.0%
W'$_{\alpha,n}$
59

$W^{+}=$
32
p-test
0.311

H_0	median [D]=0	ACCEPT
H_1	median [D]>0	

Wilcoxon-signed-ranks test
Exact Form

Variable: **Sulfate, Total (mg/l)**

	X	**Y**	Differences		
Site	#6	#54			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	15.3	15.2	0.1	0.1	1.5
Nov	18.7	18.7	0.0		
Dec	19.9	19.9	0.0		
Jan	15.0	15.0	0.0		
Feb	16.4	16.4	0.0		
Mar	19.0	19.1	-0.1	0.1	-3
Apr	19.4	19.7	-0.3	0.3	-6
May	10.7	10.7	0.0		
Jun	9.4	9.6	-0.2	0.2	-4.5
Jul	9.9	10.1	-0.2	0.2	-4.5
Aug	11.8	11.9	-0.1	0.1	-1.5
Sep	16.0	16.0	0.0		
Median	15.7	15.6	0.0	0.2	

n	**m**
12	6

N= 6
ΣR= -18

α
5.0%
W'α,n
2

W^+=
1.5
p-test
0.031

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **Zinc, Dissolved (ug/l)**

	X	**Y**			
Site	#6	#54	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	6.36	6.24	0.12	0.12	3
Nov	9.97	9.20	0.77	0.77	10
Dec	8.98	8.40	0.58	0.58	9
Jan	6.00	5.88	0.12	0.12	3
Feb	8.38	7.87	0.51	0.51	8
Mar	9.36	8.54	0.82	0.82	11
Apr	11.70	10.60	1.10	1.10	12
May	4.25	4.13	0.12	0.12	3
Jun	3.95	3.55	0.40	0.40	7
Jul	3.61	3.96	-0.35	0.35	-6
Aug	3.45	3.56	-0.11	0.11	-1
Sep	4.42	4.27	0.15	0.15	5
Median	6.18	6.06	0.28	0.38	

n	**m**
12	12

N= 12

$\Sigma R=$ 64

α
5.0%
W'α,n
17

$W^{+}=$
71
p-test
0.997

H_0	median [D]=0	ACCEPT
H_1	median [D]<0	

INTERPRETIVE REPORT
SITE 49 "UPPER BRUIN CREEK"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. No results exceeding these criteria have been identified as listed in the table below.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
No exceedances have been identified by HGCMC for the period of Oct-09 though Sept-10.					

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There was an identifiable trend in dissolved chromium. Between Water Year 2009 and Water Year 2010 there was roughly an order of magnitude increase in the dissolved chromium concentration. A similar increase was also noted for Site 6, Site 13, Site 46, Site 48, Site 49, and Site 54; all sites that are located in the 920 area.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). For datasets with a statistically significant trend ($\alpha/2=2.5\%$) a Seasonal-Sen's Slope estimate statistic has also been calculated. The dataset for total alkalinity has a statistically

Site 49-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.71	0		
pH, Lab	6	0.18	0		
Alkalinity, Total	6	**<0.01**	-	-2.07	-3.5
Sulfate, Total	6	**0.99**	+	0.42	3.6
Zinc, Dissolved	6	0.93	0		

(1): Number of years (2):Significance level

significant ($p<0.01$) negative trend with a slope estimate of -2.07 mg/L/yr or a -3.5% decrease over the period. Also, there is a statistically significant increasing trend in total sulfate, with a slope estimate of 0.42 mg/L/yr or a 3.6% increase over the period. Given the low magnitude of the change, the fact that Site 49 is an upgradient background site, these variations are considered a part of the natural variation that can be expected for this type of monitoring.

Table of Results for Water Year 2010

Site 49 "Upper Bruin Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	12/8/2009	1/12/2010	2/16/2010	3/16/2010	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	4.6	1.3	0.4	NOT SCHEDULED FOR SAMPLING	1.7	NOT SCHEDULED FOR SAMPLING		4.4	NOT SCHEDULED FOR SAMPLING		10.6	NOT SCHEDULED FOR SAMPLING	3.1
Conductivity-Field(µmho)	154	113	176		179			122			147		151
Conductivity-Lab (µmho)	145	148 J	167		165			119			156		152
pH Lab (standard units)	7.82	7.57 J	7.76		7.54			7.91			7.72		7.74
pH Field (standard units)	7.97	7.43	7.65		7.61			7.76			7.38		7.63
Total Alkalinity (mg/L)	58.4	61.6 J	71.5		56.9			46.6			61.1		59.8
Total Sulfate (mg/L)	11.7	13.3	14.7		16.2			7.8 J			12.4 J		12.9
Hardness (mg/L)	77.7	75.7	82.4		89.2			57.1			81.8		79.8
Dissolved As (ug/L)	0.207	0.172	0.186		0.165			0.147			0.207		0.179
Dissolved Ba (ug/L)			10.5		11.1								10.8
Dissolved Cd (ug/L)	0.033	0.031	0.029		0.022			0.025			0.027		0.028
Dissolved Cr (ug/L)			0.798		2.400								1.599
Dissolved Cu (ug/L)	0.546	0.501	0.440		0.553 U			0.347			0.527		0.514
Dissolved Pb (ug/L)	0.0035 U	0.0042 U	0.0076 U		0.0767 U			0.0033 U			0.0042 U		0.0042
Dissolved Ni (ug/L)			1.250		1.430								1.340
Dissolved Ag (ug/L)			<0.003		<0.003								0.002
Dissolved Zn (ug/L)	2.20 U	2.57 U	2.22		2.53			2.02			1.79 U		2.21
Dissolved Se (ug/L)			0.791		1.090 J								0.941
Dissolved Hg (ug/L)	0.001280	0.001290	0.001000		0.001320			0.001160			0.001520		0.001285

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

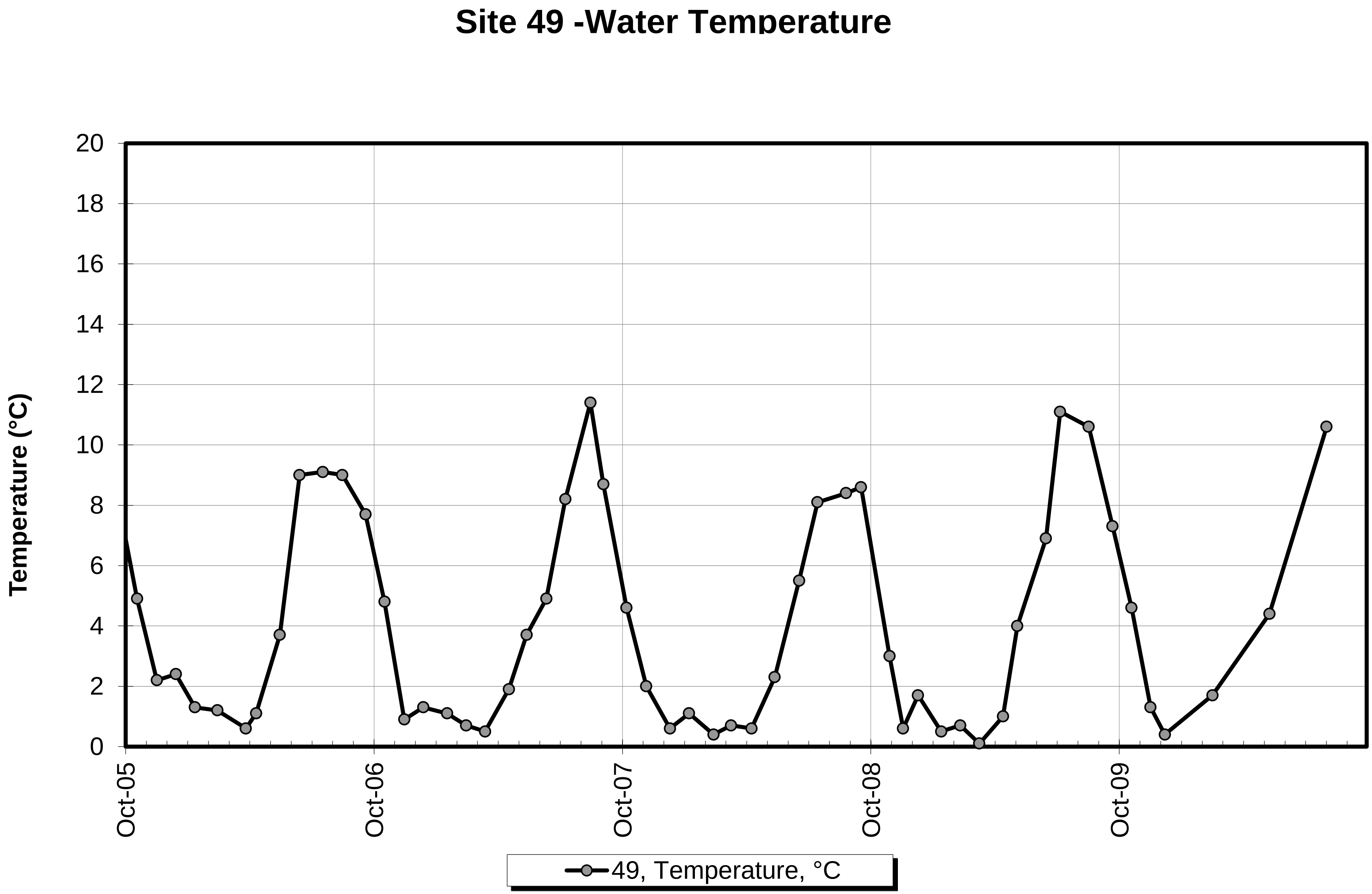
Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

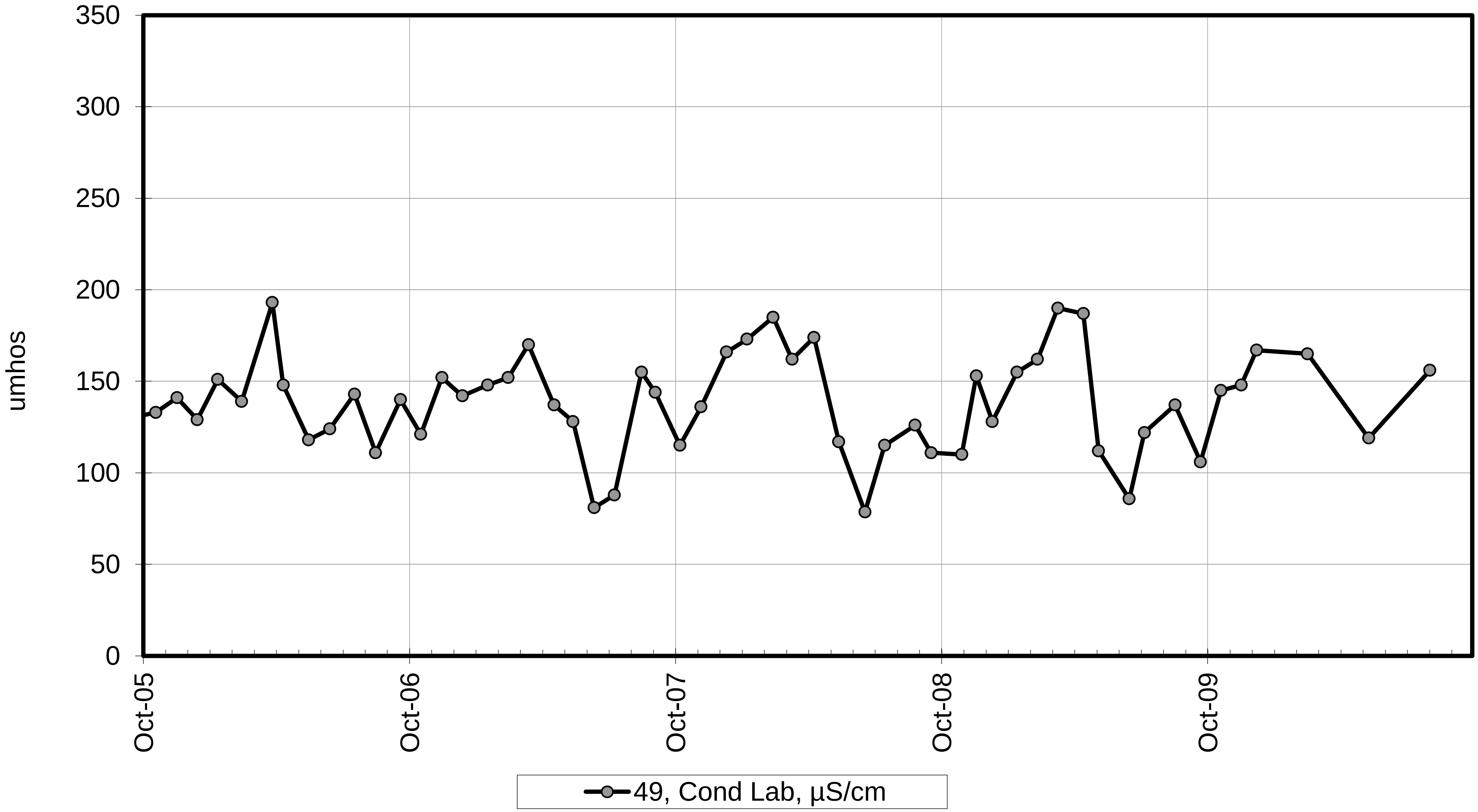
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
49	10/20/2009	12:00 AM				
			Pb diss, µg/l	0.00346	U	Field Blank Contamination
			Zn diss, µg/l	2.2	U	Field Blank Contamination
49	11/17/2009	12:00 AM				
			Alk Tot,mg/l	61.6	J	Temperature Exceedance
			Cond, µs/cm	148	J	Temperature Exceedance
			Pb diss, µg/l	0.00419	U	Field Blank Contamination
			Zn diss, µg/l	2.57	U	Field Blank Contamination
			pH Lab, su	7.57	J	Hold Time Violation
49	12/8/2009	12:00 AM				
			Pb diss, µg/l	0.00763	U	Field Blank Contamination
49	2/16/2010	12:00 AM				
			Cu diss, µg/l	0.553	U	Field Blank Contamination
			Pb diss, µg/l	0.0767	U	Field Blank Contamination
			Se diss, µg/l	1.09	J	LCS Recovery
49	5/11/2010	3:47 PM				
			Pb diss, µg/l	0.0033	U	Field Blank Contamination
			SO4 Tot, mg/l	7.8	J	Sample Temperature
49	8/3/2010	12:48 PM				
			Pb diss, µg/l	0.00422	U	Field Blank Contamination
			Zn diss, µg/l	1.79	U	Field Blank Contamination
			SO4 Tot, mg/l	12.4	J	Sample Temperature

Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

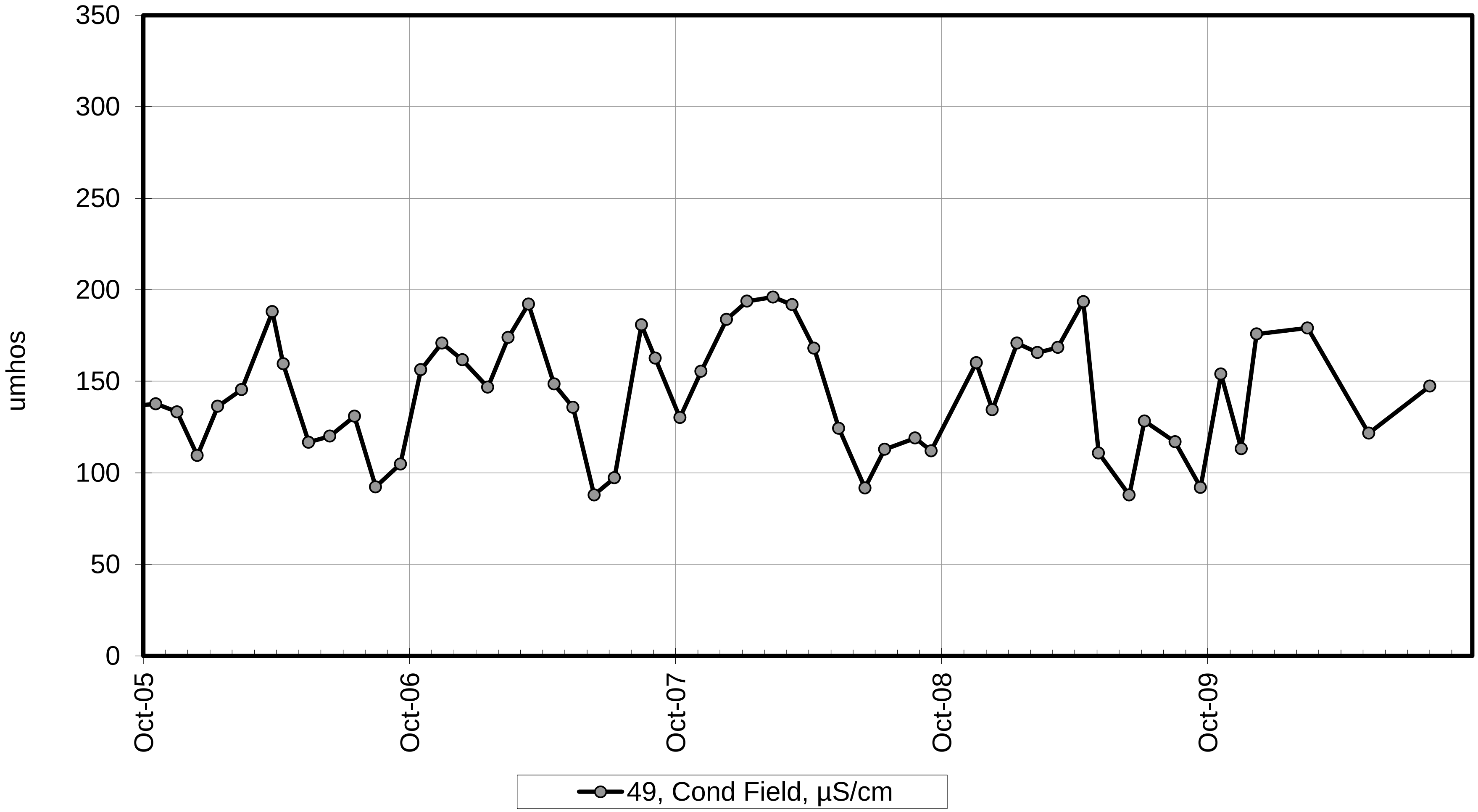


Site 49 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Temperature, °C

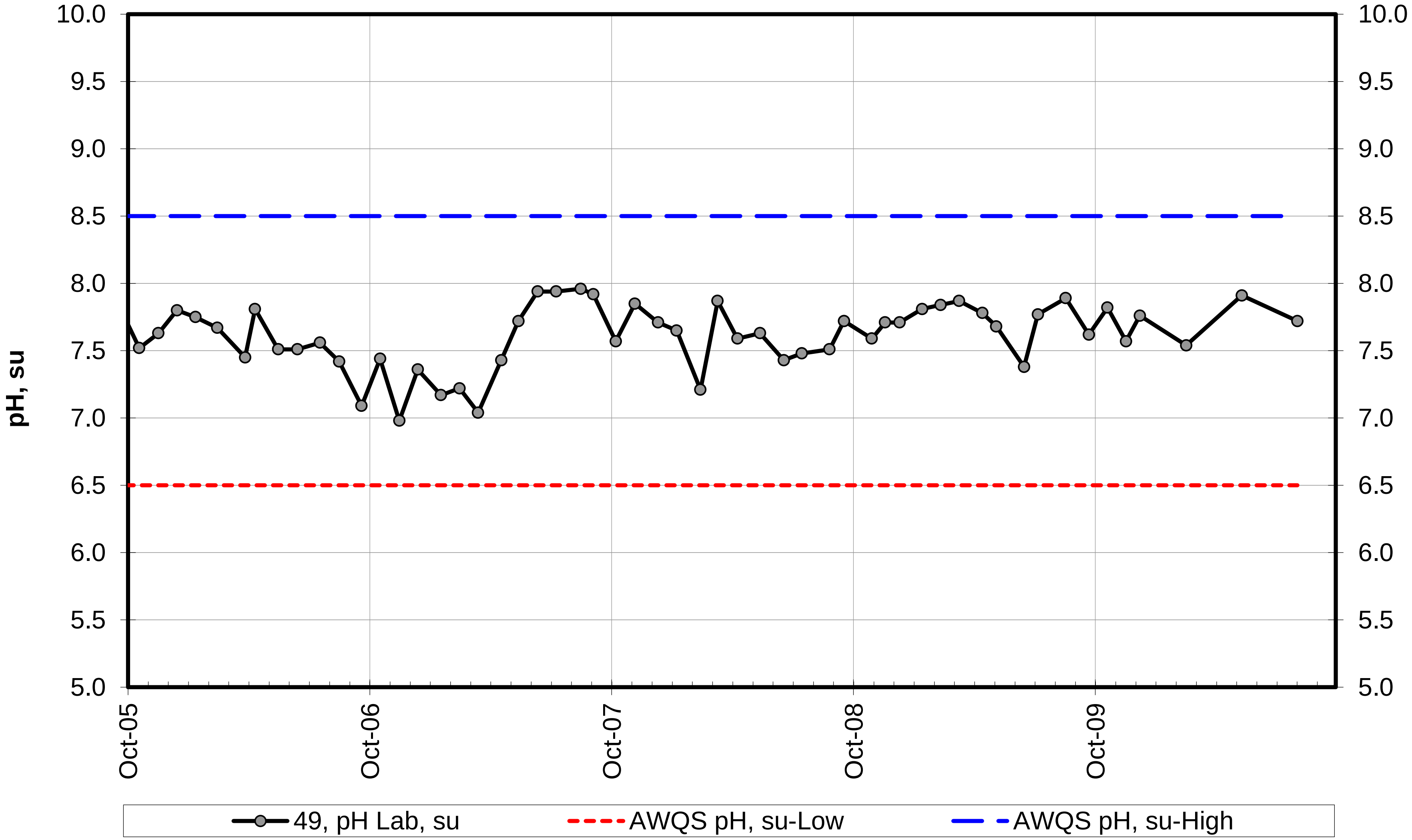
Site 49 - Conductivity-Lab

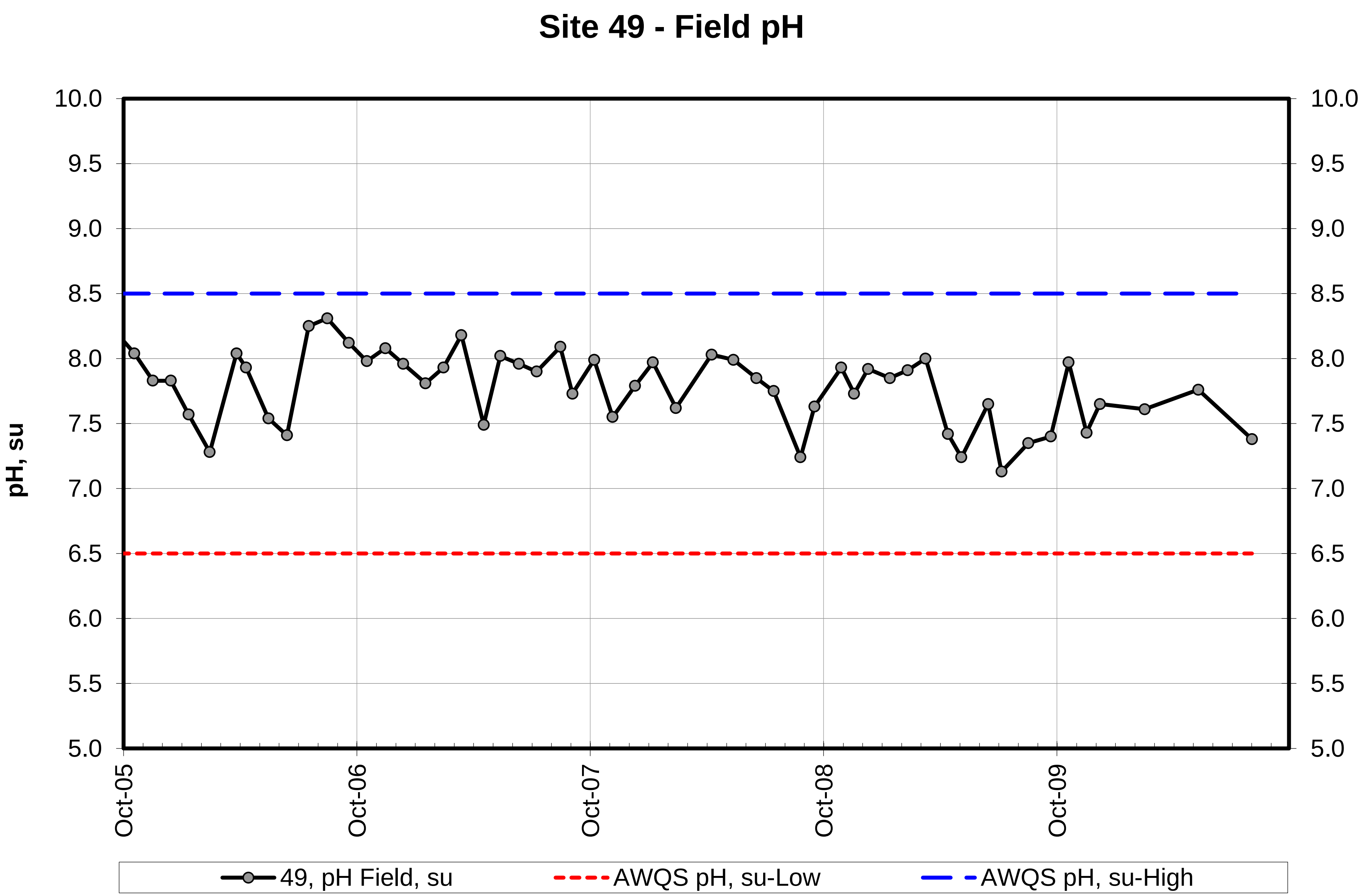


Site 49 - Conductivity-Field



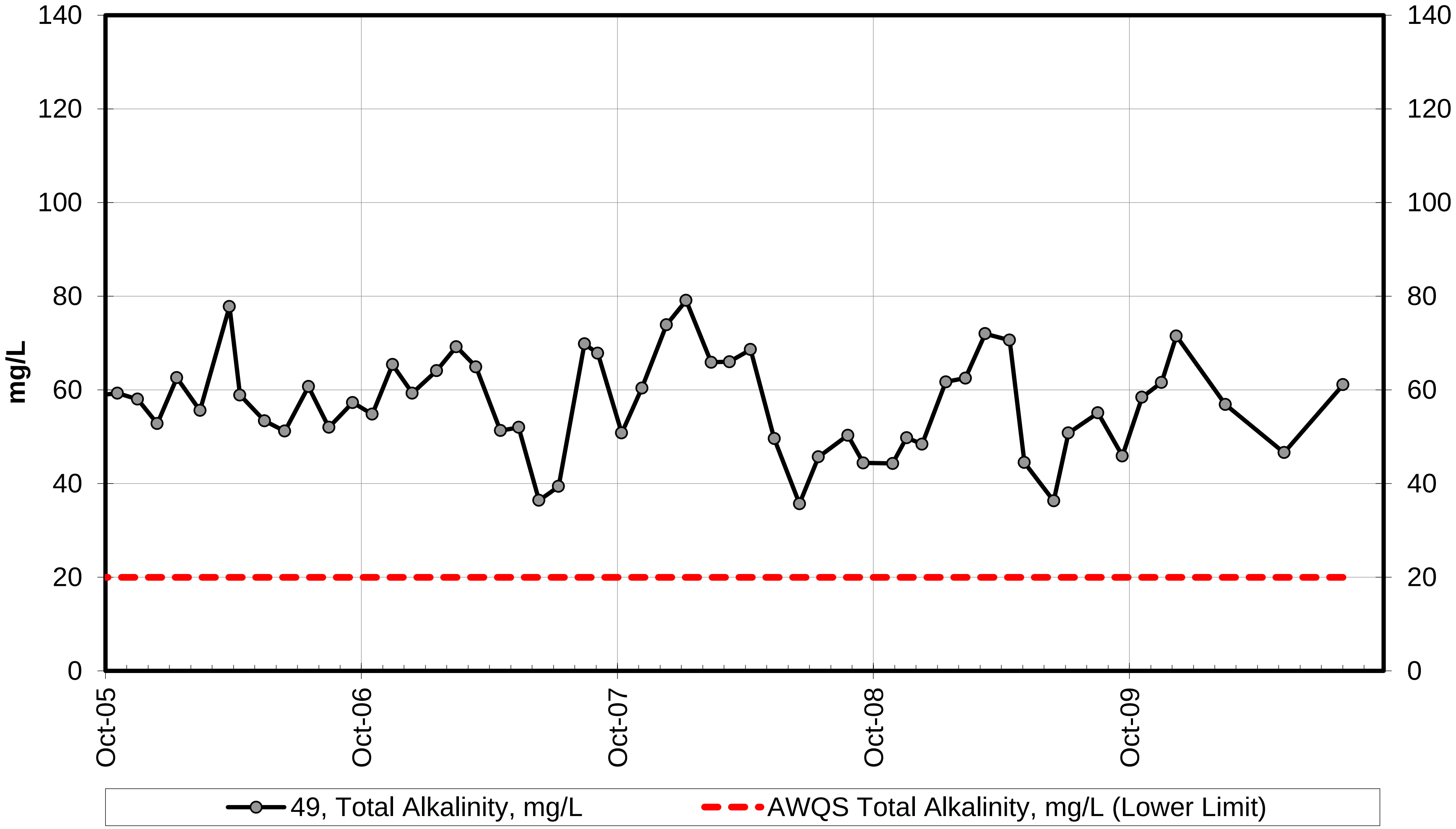
Site 49 - Lab pH

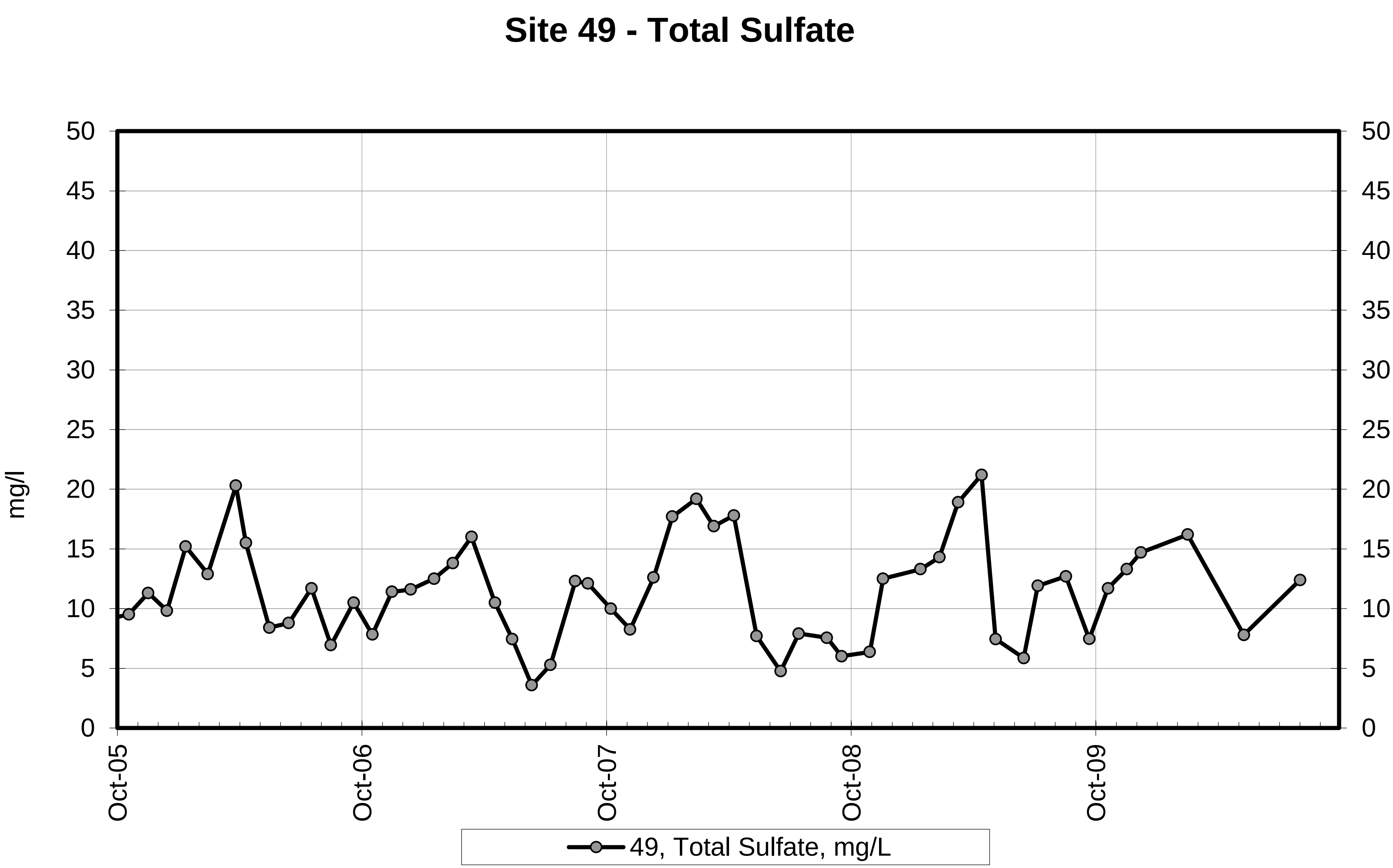




Site 49 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

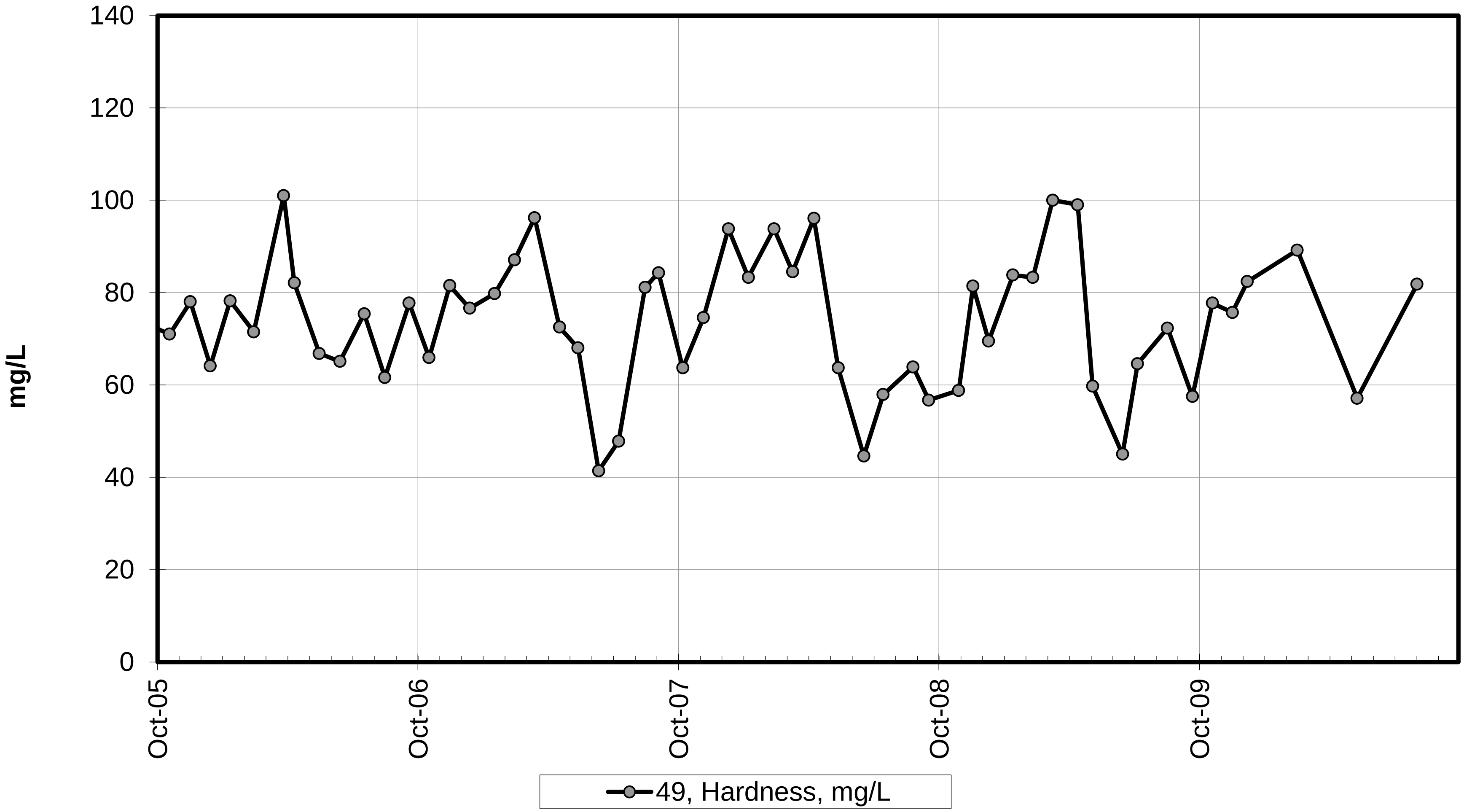
Site 49 - Total Alkalinity

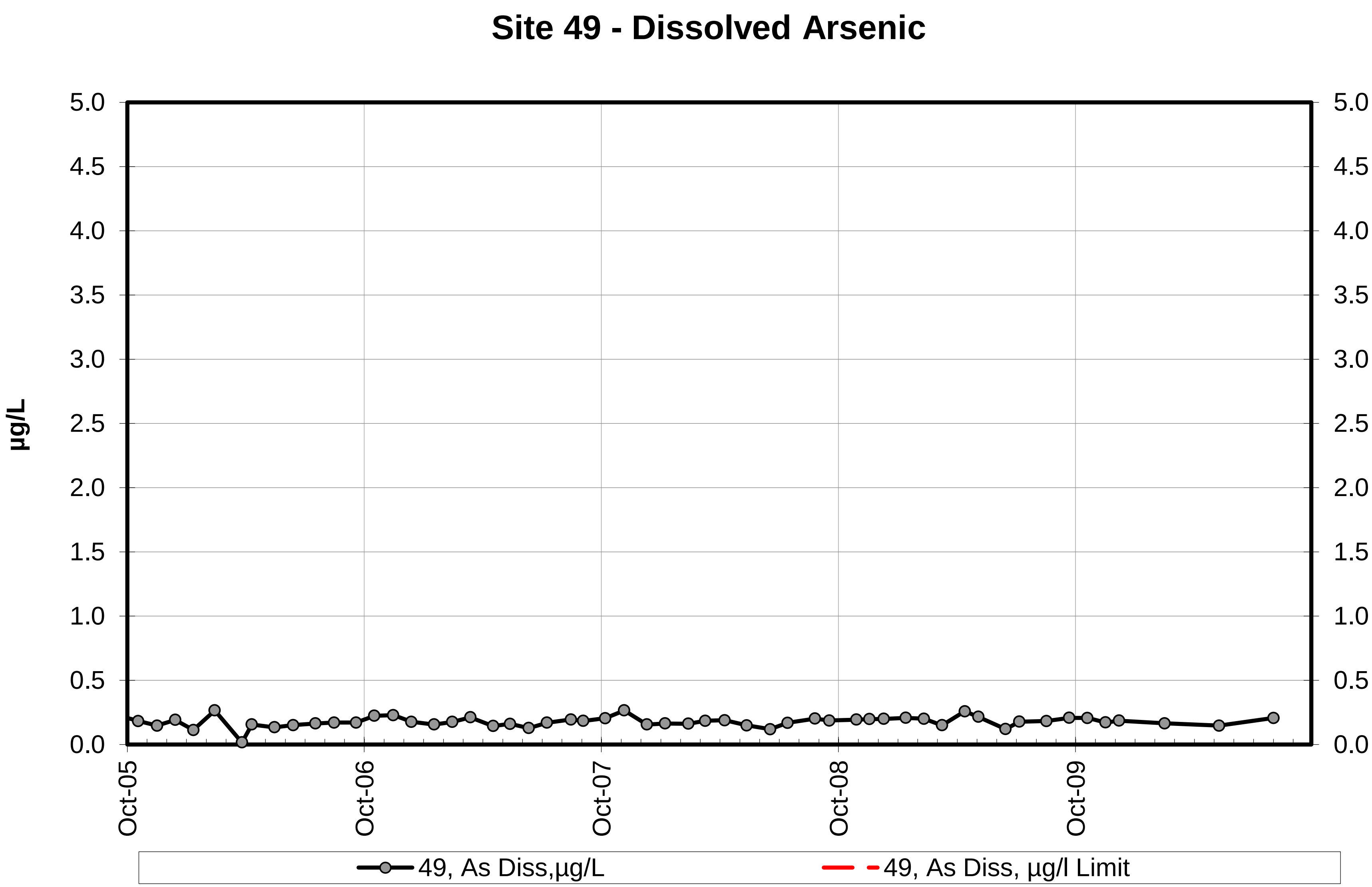




Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

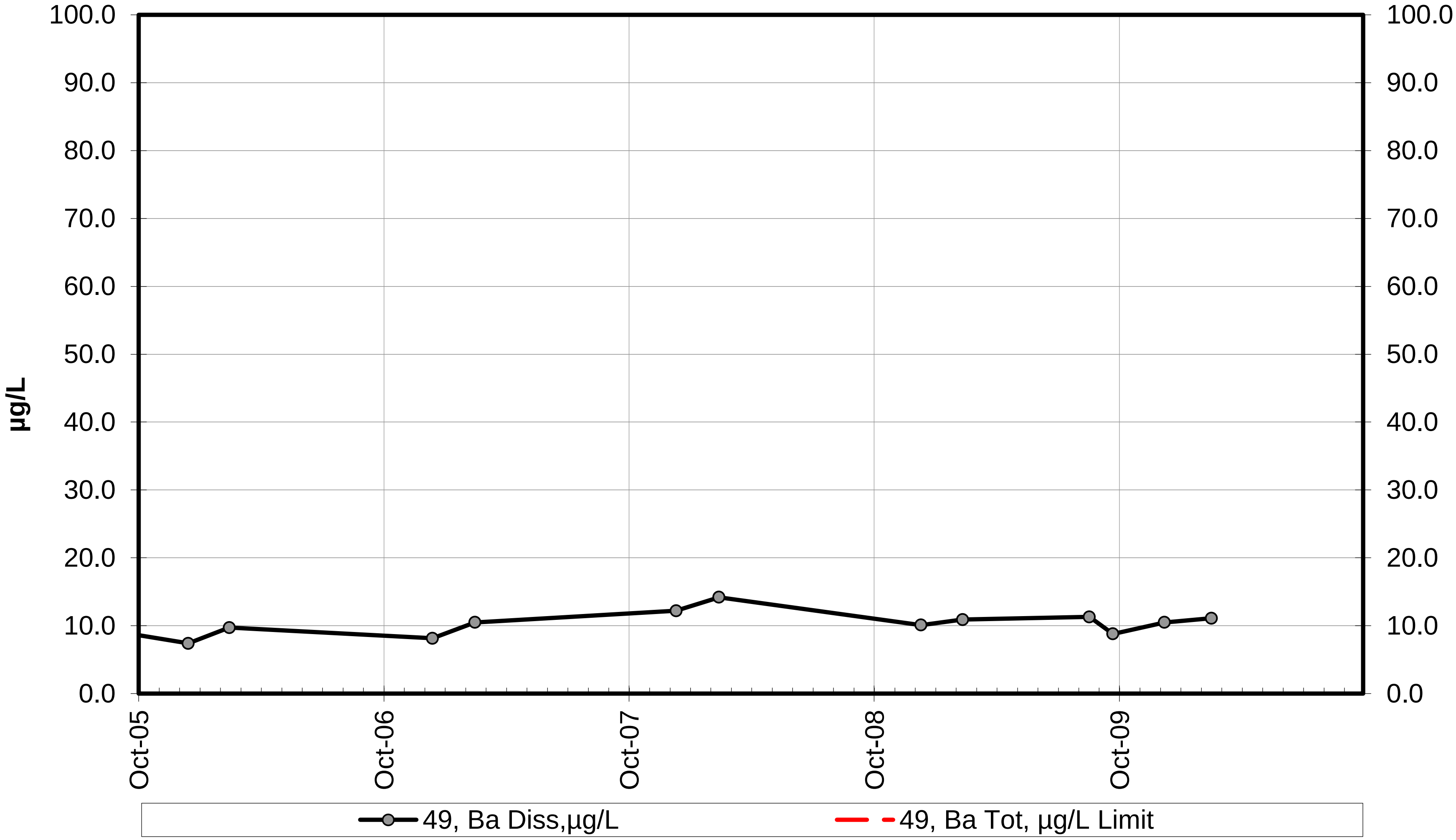
Site 49 - Hardness



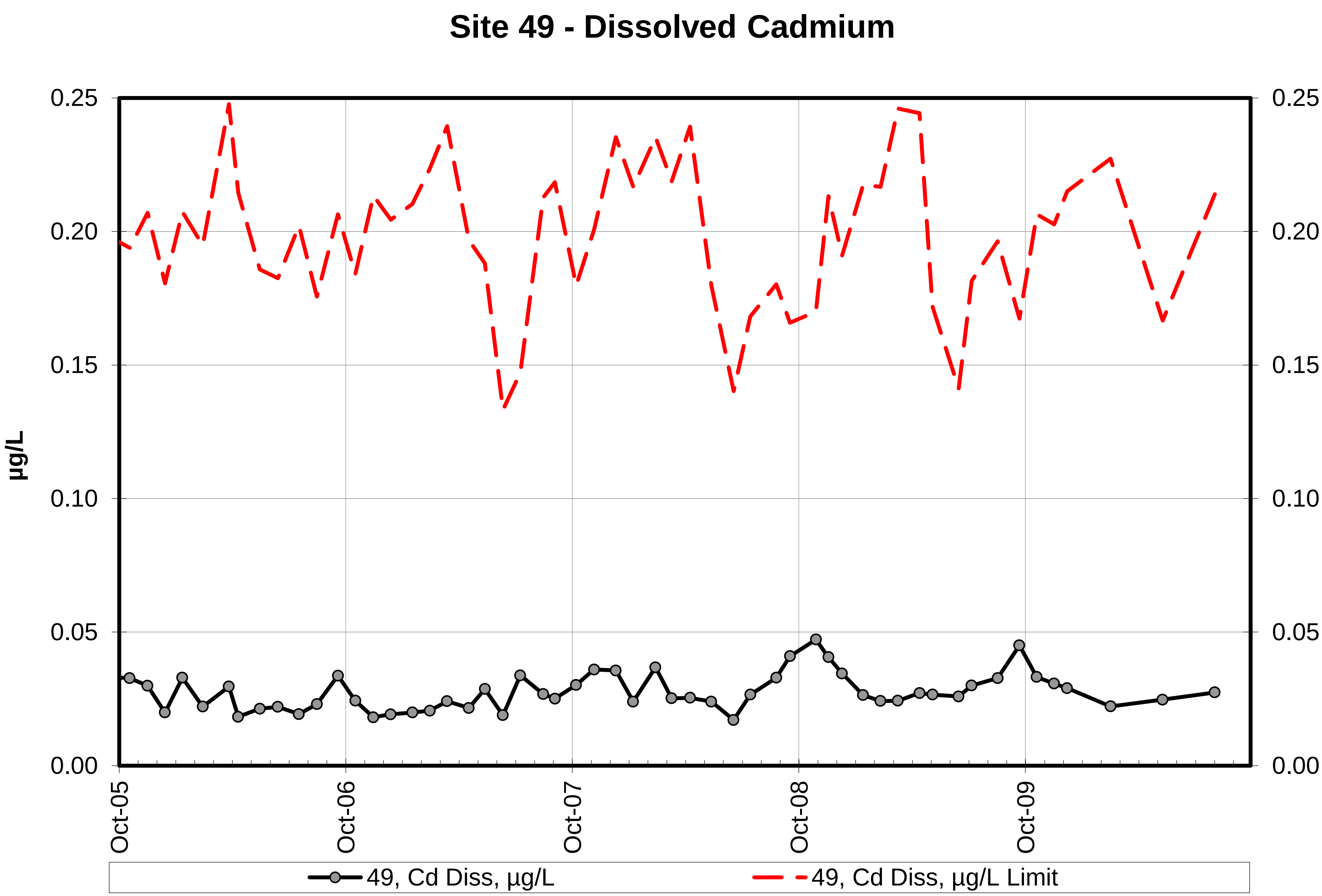


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

Site 49 - Dissolved Barium

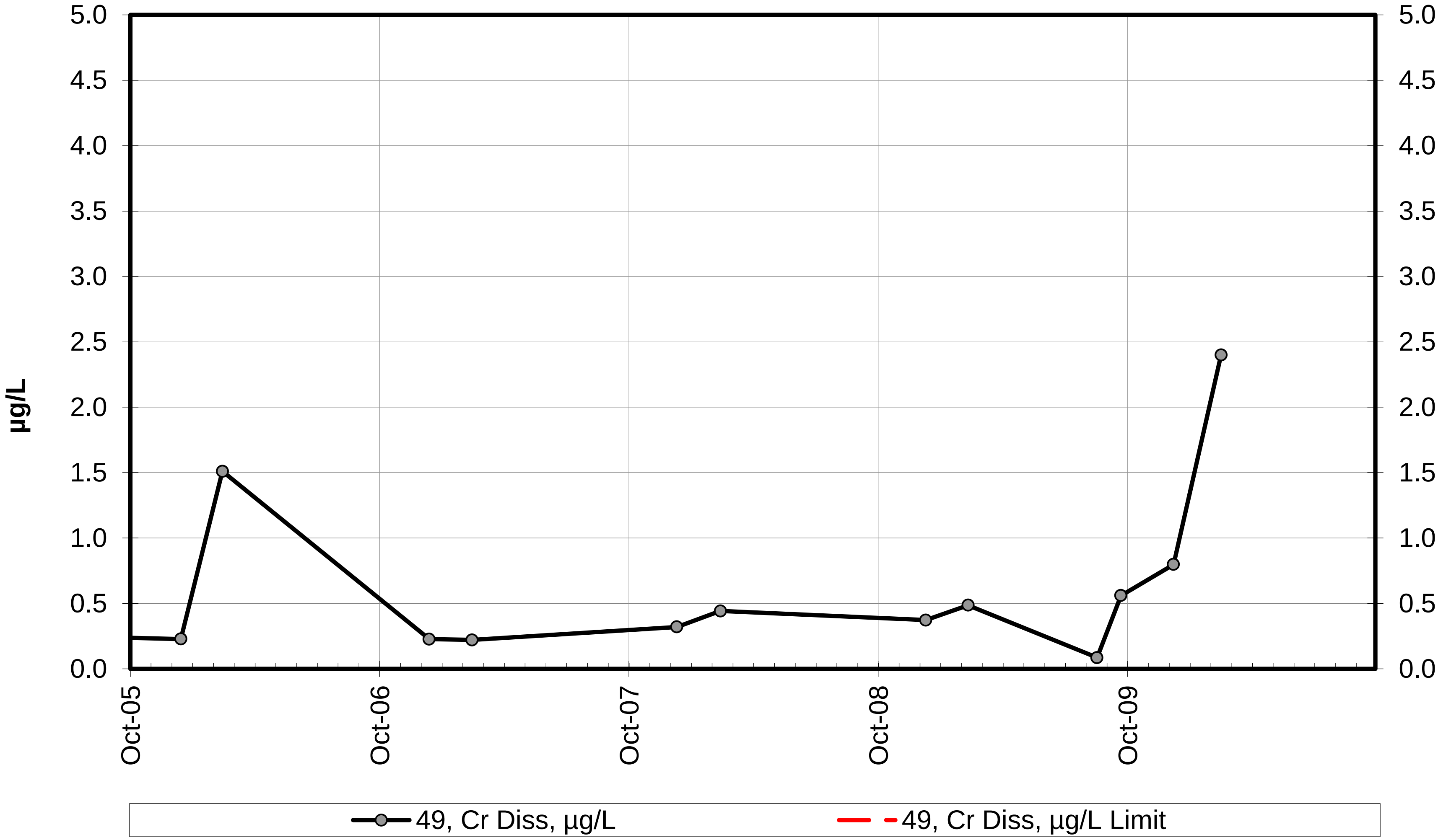


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

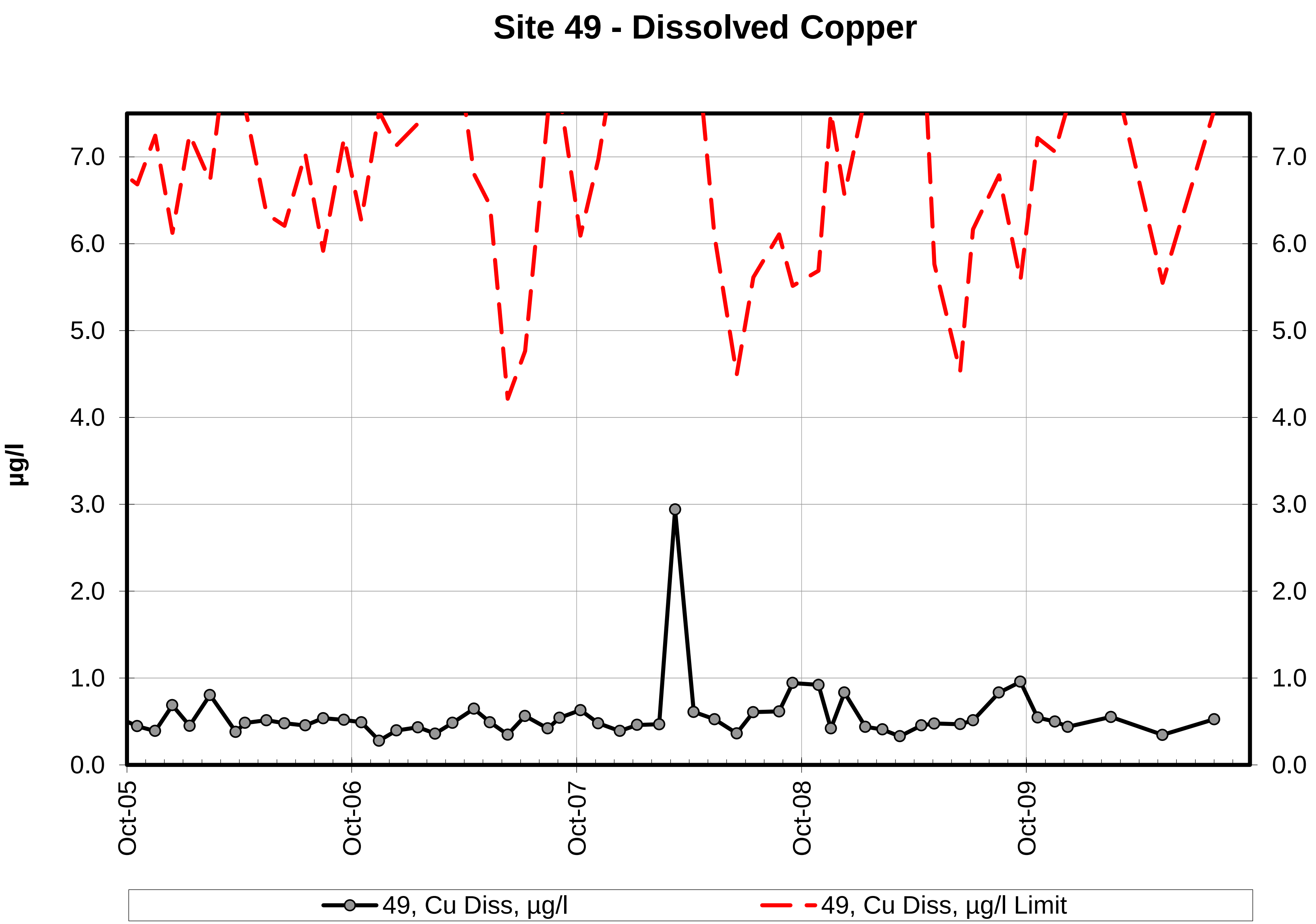


Site 49 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Cd Diss, µg/L
49, Cd Diss, µg/L Limit

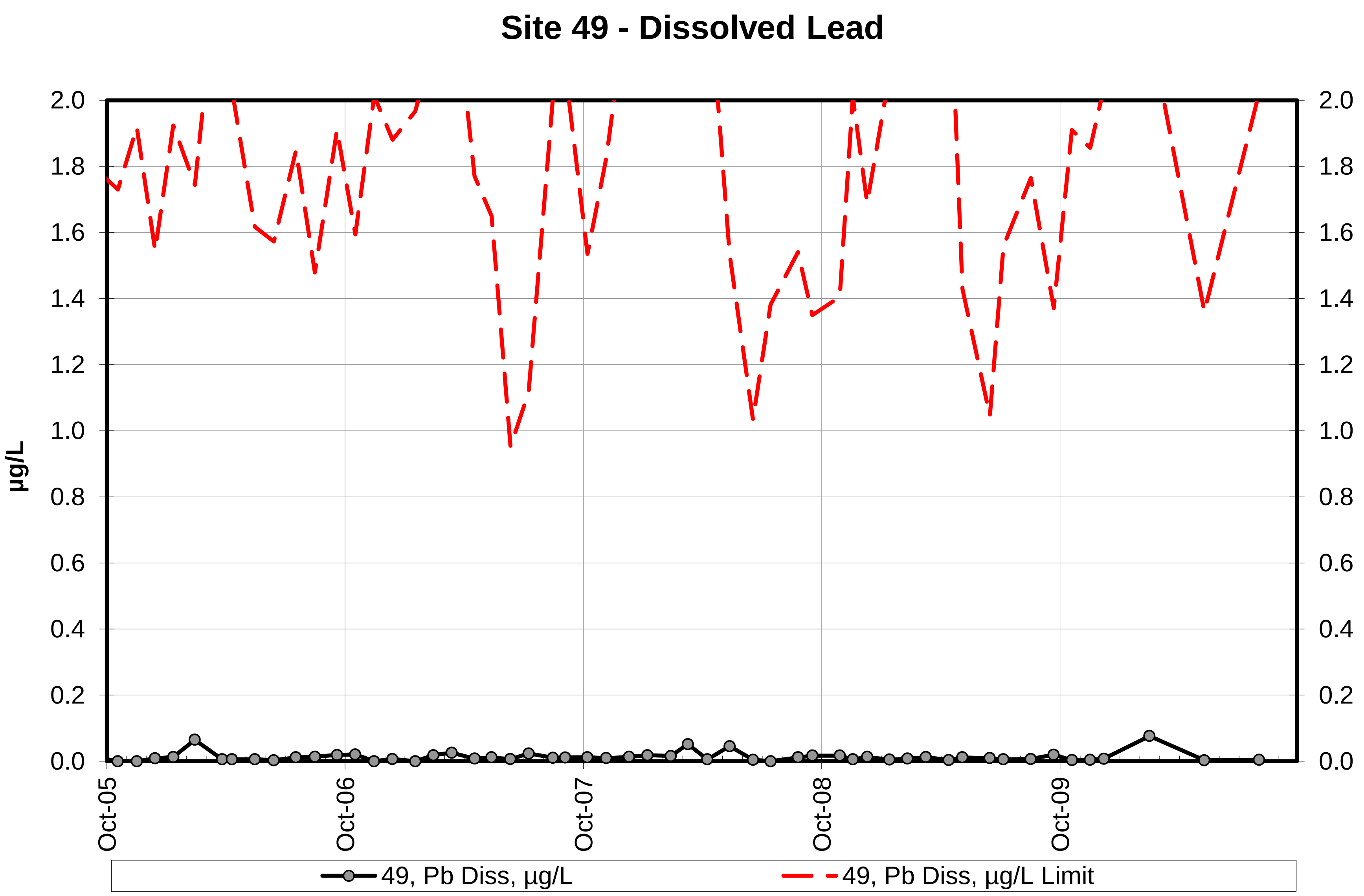
Site 49 - Dissolved Chromium



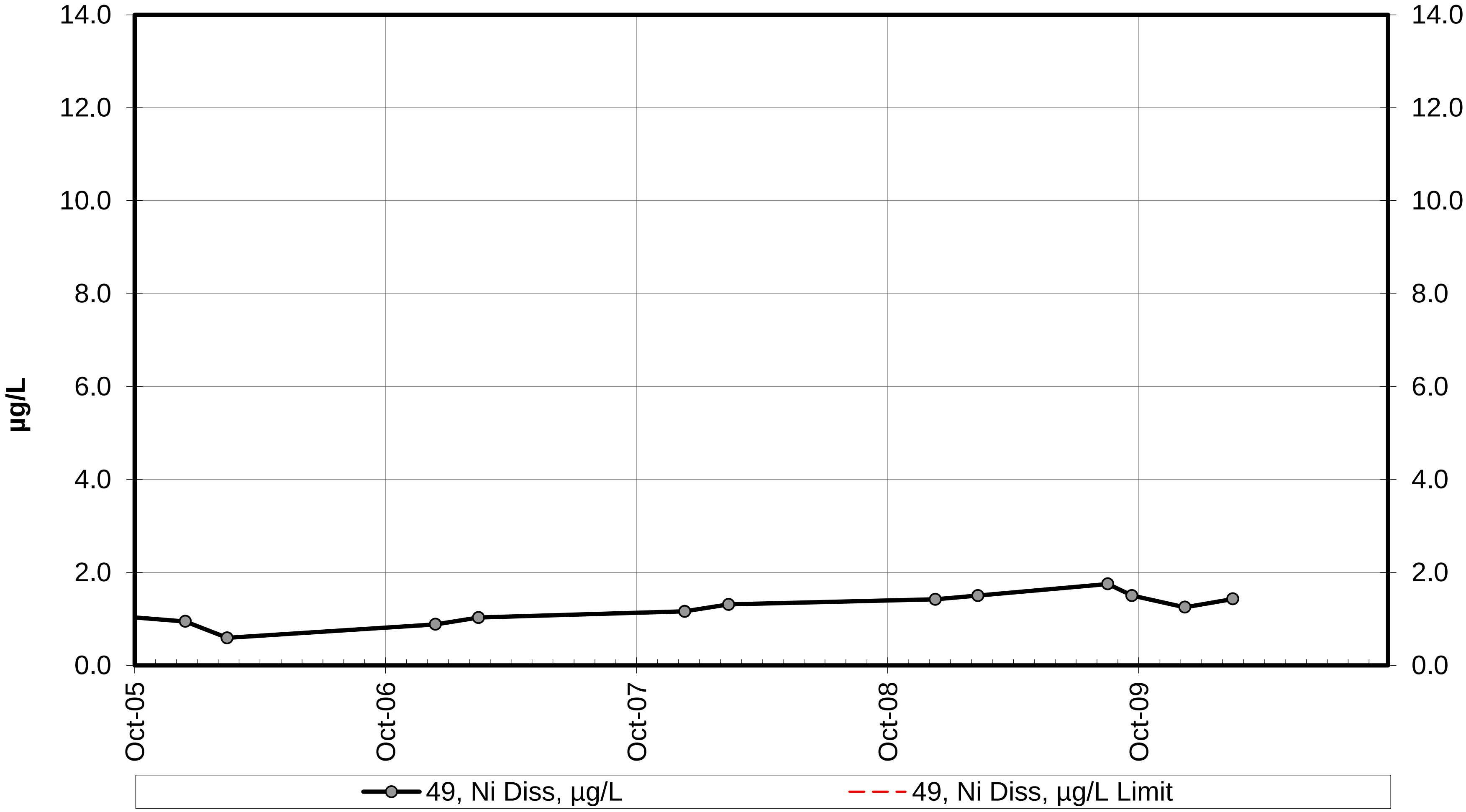
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



Site 49 - Dissolved Copper
µg/l
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Cu Diss, µg/l
49, Cu Diss, µg/l Limit

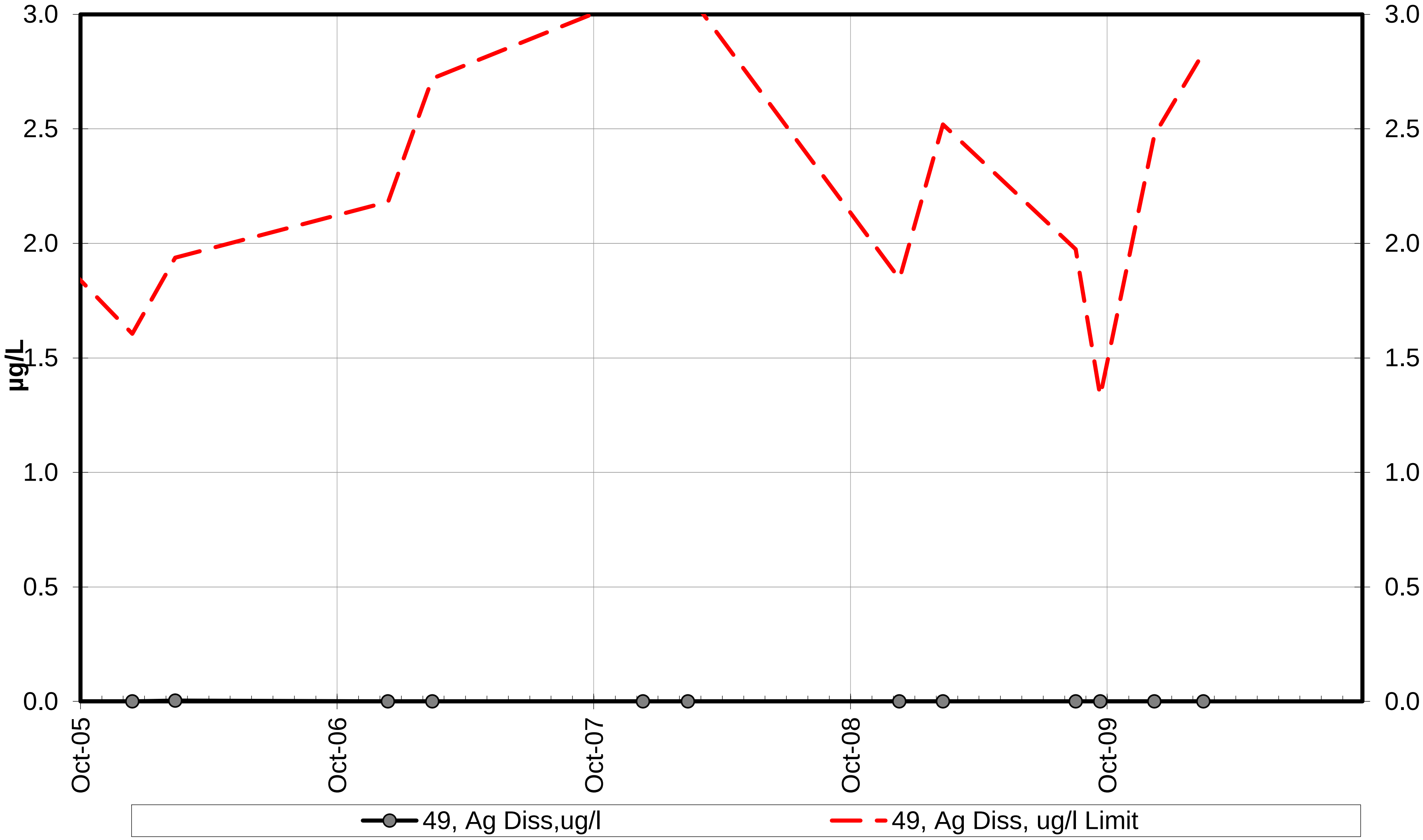

Site 49 - Dissolved Lead
µg/L
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Pb Diss, µg/L
49, Pb Diss, µg/L Limit

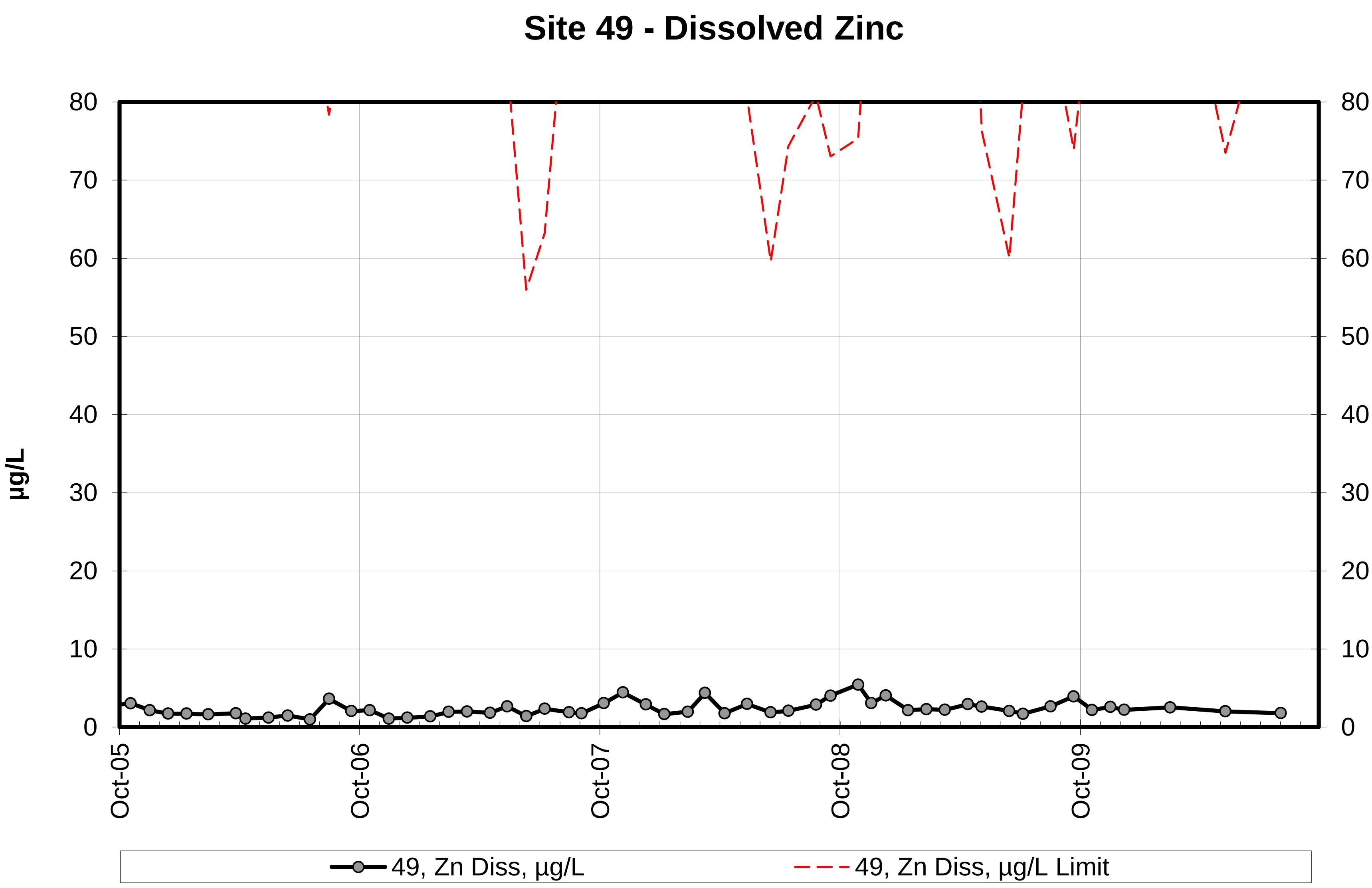
Site 49 - Dissolved Nickel



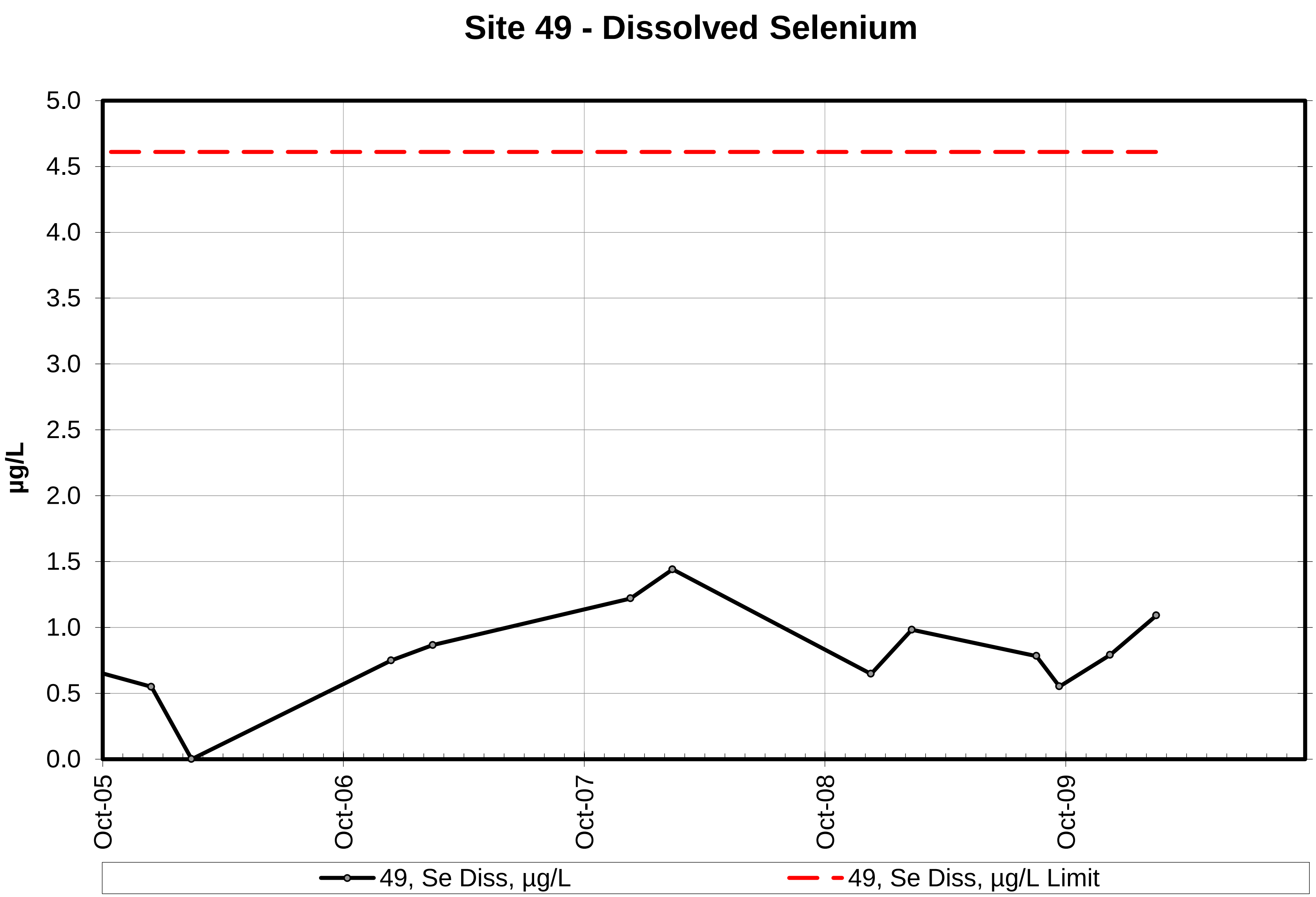
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

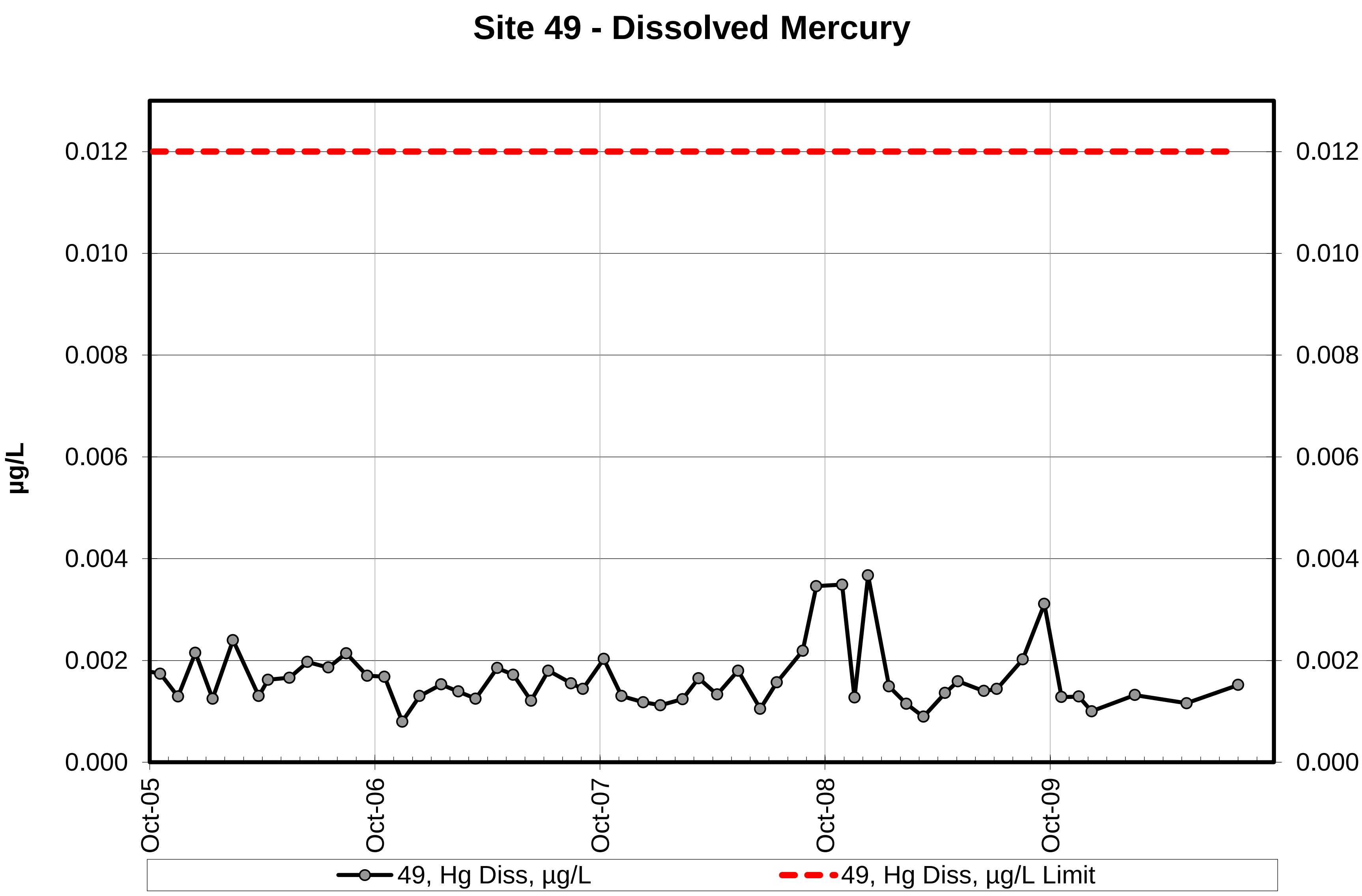
Site 49 - Dissolved Silver





Site 49 - Dissolved Zinc
µg/L
80
70
60
50
40
30
20
10
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Zn Diss, µg/L
49, Zn Diss, µg/L Limit


Site 49 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Se Diss, µg/L
49, Se Diss, µg/L Limit


Site 49 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
49, Hg Diss, µg/L
49, Hg Diss, µg/L Limit

Site #49 — Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	164	127	147	157	160	139	142	92.2	130	142	169	130
b	**WY2006**	133	141	129	151	139	193	148	118	124	143	111	140
c	**WY2007**	121	152	142	148	152	170	137	128	80.9	87.9	155	144
d	**WY2008**	115	136	166	173	185	162	174	117	78.6	115	126	111
e	**WY2009**	110	153	128	155	162	190	187	112	85.8	122	137	106
f	**WY2010**	145	148	167		165			119			156	
	n	6	6	6	5	6	5	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	1	1	-1	1	-1	1
c-a	-1	1	-1	-1	-1	1	-1	1	-1	-1	-1	1
d-a	-1	1	1	1	1	1	1	1	-1	-1	-1	-1
e-a	-1	1	-1	-1	1	1	1	1	-1	-1	-1	-1
f-a	-1	1	1		1			1			-1	
c-b	-1	1	1	-1	1	-1	-1	1	-1	-1	1	1
d-b	-1	-1	1	1	1	-1	1	-1	-1	-1	1	-1
e-b	-1	1	-1	1	1	-1	1	-1	-1	-1	1	-1
f-b	1	1	1		1			1			1	
d-c	-1	-1	1	1	1	-1	1	-1	-1	1	-1	-1
e-c	-1	1	-1	1	1	1	1	-1	1	1	-1	-1
f-c	1	-1	1		1			-1			1	
e-d	-1	1	-1	-1	-1	1	1	-1	1	1	1	-1
f-d	1	1	1		-1			1			1	
f-e	1	-1	1		1			1			1	
S_k	-7	7	3	0	7	2	6	3	-6	-2	1	-4

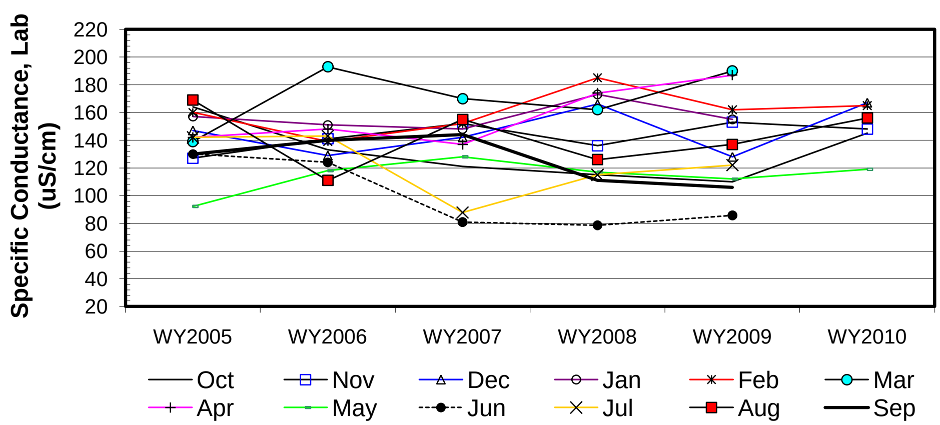
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	16.67	28.33	16.67	16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-1.32	1.45	0.56	0.00	1.32	0.49	1.47	0.56	-1.47	-0.49	0.19	-0.98
Z^2_k	1.73	2.10	0.32	0.00	1.73	0.24	2.16	0.32	2.16	0.24	0.04	0.96

ΣZ_k=	1.78
ΣZ^2_k=	11.99
Z-bar=$\Sigma Z_k/K$=	0.15

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	66
ΣS_k	10

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		11.72	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity	
	p	**0.385**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.55	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
265.00	p	**0.710**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.99		5.36
0.050	-2.50	0.75	4.08
0.100	-2.13		3.72
0.200	-0.50		2.92

Site **#49** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	8.1	7.8	8.0	8.0	7.9	8.1	7.9	7.9	7.5	7.5	7.6	7.9
b	**WY2006**	7.5	7.6	7.8	7.8	7.7	7.5	7.8	7.5	7.5	7.6	7.4	7.1
c	**WY2007**	7.4	7.0	7.4	7.2	7.2	7.0	7.4	7.7	7.9	7.9	8.0	7.9
d	**WY2008**	7.6	7.9	7.7	7.7	7.2	7.9	7.6	7.6	7.4	7.5	7.5	7.7
e	**WY2009**	7.6	7.7	7.7	7.8	7.8	7.9	7.8	7.7	7.4	7.8	7.9	7.6
f	**WY2010**	7.8	7.6	7.8		7.5			7.9			7.7	
	n	6	6	6	5	6	5	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	3	5	5	3	5	5	5	5	5	5
t_2	0	0	1	0	0	1	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1
c-a	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1
d-a	-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
e-a	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	-1
f-a	-1	-1	-1		-1			1			1	
c-b	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	1
d-b	1	1	-1	-1	-1	1	-1	1	-1	-1	1	1
e-b	1	1	-1	1	1	1	-1	1	-1	1	1	1
f-b	1	-1	-1		-1			1			1	
d-c	1	1	1	1	-1	1	1	-1	-1	-1	-1	-1
e-c	1	1	1	1	1	1	1	-1	-1	-1	-1	-1
f-c	1	1	1		1			1			-1	
e-d	1	-1	0	1	1	0	1	1	-1	1	1	-1
f-d	1	-1	1		1			1			1	
f-e	1	-1	1		-1			1			-1	
S_k	3	-3	-4	-2	-5	-1	-4	3	-6	2	3	-2

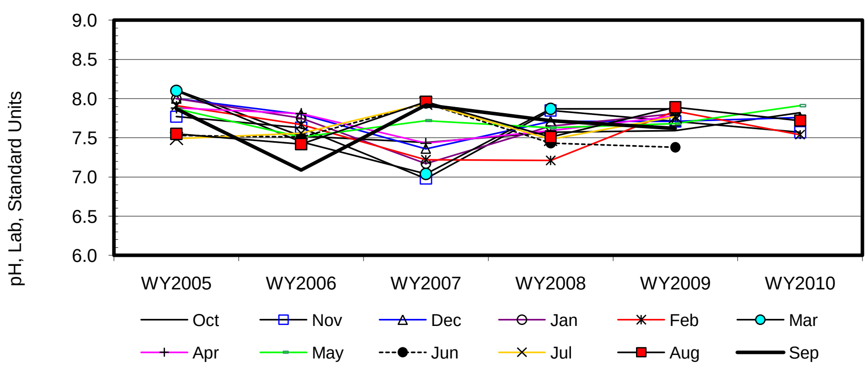
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	27.33	16.67	28.33	15.67	16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.56	-0.62	-0.77	-0.49	-0.94	-0.25	-0.98	0.56	-1.47	0.49	0.56	-0.49
Z^2_k	0.32	0.39	0.59	0.24	0.88	0.06	0.96	0.32	2.16	0.24	0.32	0.24

ΣZ_k= -3.83
ΣZ^2_k= 6.71
Z-bar=$\Sigma Z_k/K$= -0.32

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 66
ΣS_k -16

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	5.49	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.905**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -0.92	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
263.00	**p** **0.177**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.05		0.03
0.050	-0.05	**-0.02**	0.02
0.100	-0.04		0.01
0.200	-0.03		0.00

Site **#49** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	77.5	60.6	70.4	78.3	83.7	70.4	74.4	48.8	63.8	64.6	74.2	58.7
b	**WY2006**	59.3	58.0	52.8	62.6	55.6	77.8	58.9	53.4	51.2	60.7	52.0	57.3
c	**WY2007**	54.8	65.4	59.3	64.1	69.2	64.9	51.3	52.0	36.4	39.4	69.8	67.8
d	**WY2008**	50.8	60.4	73.9	79.1	65.9	66.0	68.6	49.6	35.7	45.7	50.3	44.4
e	**WY2009**	44.3	49.8	48.4	61.7	62.5	72.0	70.6	44.5	36.3	50.8	55.1	45.9
f	**WY2010**	58.4	61.6	71.5		56.9			46.6			61.1	
	n	6	6	6	5	6	5	5	6	5	5	6	5

t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

b-a	-1	-1	-1	-1	-1	1	-1	1	-1	-1	-1	-1
c-a	-1	1	-1	-1	-1	-1	-1	1	-1	-1	-1	1
d-a	-1	-1	1	1	-1	-1	-1	1	-1	-1	-1	-1
e-a	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1
f-a	-1	1	1		-1			-1			-1	
c-b	-1	1	1	1	1	-1	-1	-1	-1	-1	1	1
d-b	-1	1	1	1	1	-1	1	-1	-1	-1	-1	-1
e-b	-1	-1	-1	-1	1	-1	1	-1	-1	-1	1	-1
f-b	-1	1	1		1			-1			1	
d-c	-1	-1	1	1	-1	1	1	-1	-1	1	-1	-1
e-c	-1	-1	-1	-1	-1	1	1	-1	-1	1	-1	-1
f-c	1	-1	1		-1			-1			-1	
e-d	-1	-1	-1	-1	-1	1	1	-1	1	1	1	1
f-d	1	1	-1		-1			-1			1	
f-e	1	1	1		-1			1			1	
S_k	-9	-1	1	-2	-7	0	0	-7	-8	-4	-3	-4

σ^2_S=	28.33	23.33	28.33	16.67	28.33	16.67	16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-1.69	-0.21	0.19	-0.49	-1.32	0.00	0.00	-1.32	-1.96	-0.98	-0.56	-0.98
Z^2_k	2.86	0.04	0.04	0.24	1.73	0.00	0.00	1.73	3.84	0.96	0.32	0.96

ΣZ_k= -9.31

ΣZ^2_k= 12.71

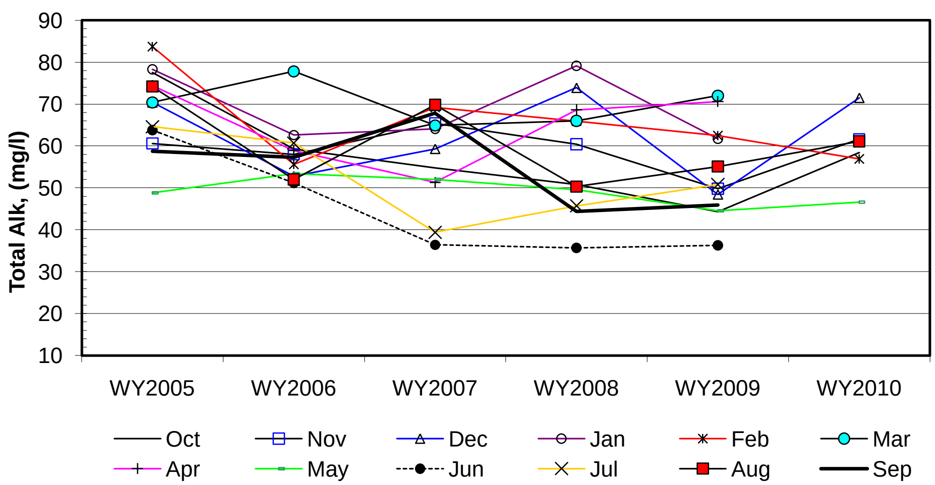
Z-bar=$\Sigma Z_k/K$= -0.78

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 66

ΣS_k -44

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	5.49	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.905**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	-2.64	@α/2=2.5% Z= 1.96	**H_0** (No trend)	REJECT
265.00 p	**0.004**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.99		-0.31
0.050	-3.42	**-2.07**	-1.15
0.100	-3.30		-1.34
0.200	-2.88		-1.47

-3.5%

Site **#49** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	12.0	9.0	9.8	12.2	15.2	10.3	12.4	5.6	10.8	10.6	15.2	9.1
b	**WY2006**	9.5	11.3	9.8	15.2	12.9	20.3	15.5	8.4	8.8	11.7	6.9	10.5
c	**WY2007**	7.8	11.4	11.6	12.5	13.8	16.0	10.5	7.5	3.6	5.3	12.3	12.1
d	**WY2008**	10.0	8.3	12.6	17.7	19.2	16.9	17.8	7.7	4.8	7.9	7.6	6.0
e	**WY2009**	6.4	12.5	12.1	13.3	14.3	18.9	21.2	7.5	5.9	11.9	12.7	7.5
f	**WY2010**	11.7	13.3	14.7		16.2			7.8			12.4	
	n	6	6	6	5	6	5	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	1	1	-1	1	1	1	-1	1	-1	1
c-a	-1	1	1	1	-1	1	-1	1	-1	-1	-1	1
d-a	-1	-1	1	1	1	1	1	1	-1	-1	-1	-1
e-a	-1	1	1	1	-1	1	1	1	-1	1	-1	-1
f-a	-1	1	1		1			1			-1	
c-b	-1	1	1	-1	1	-1	-1	-1	-1	-1	1	1
d-b	1	-1	1	1	1	-1	1	-1	-1	-1	1	-1
e-b	-1	1	1	-1	1	-1	1	-1	-1	1	1	-1
f-b	1	1	1		1			-1			1	
d-c	1	-1	1	1	1	1	1	1	1	1	-1	-1
e-c	-1	1	1	1	1	1	1	0	1	1	1	-1
f-c	1	1	1		1			1			1	
e-d	-1	1	-1	-1	-1	1	1	-1	1	1	1	1
f-d	1	1	1		-1			1			1	
f-e	1	1	1		1			1			-1	
S_k	-3	9	13	4	5	4	6	4	-4	2	1	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	16.67	28.33	16.67	16.67	27.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.56	1.86	2.44	0.98	0.94	0.98	1.47	0.77	-0.98	0.49	0.19	-0.49
Z^2_k	0.32	3.47	5.96	0.96	0.88	0.96	2.16	0.59	0.96	0.24	0.04	0.24

ΣZ_k= 8.08

ΣZ^2_k= 16.78

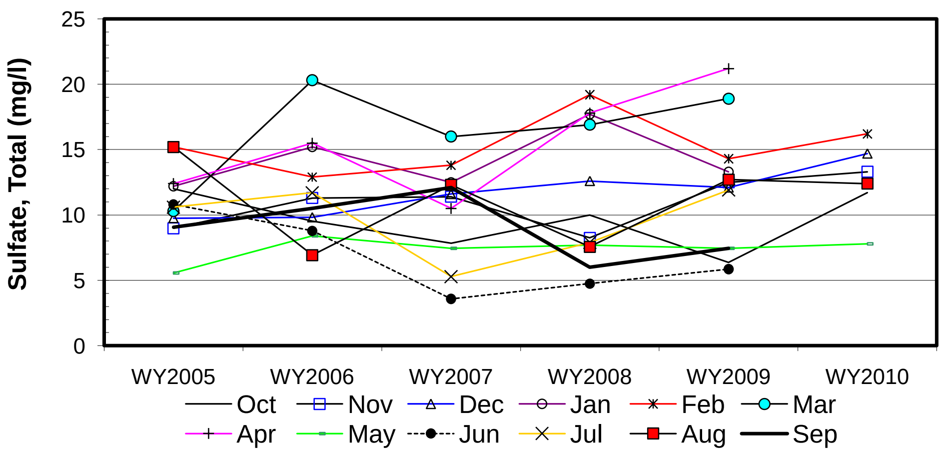
Z-bar=$\Sigma Z_k/K$= 0.67

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 66

ΣS_k 39

$\chi^2_h=\Sigma Z^2_k\text{-}K(\text{Z-bar})^2$=	11.33	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity	
p	**0.416**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 2.34	@α=5% Z=	1.64	H_0 (No trend)	REJECT
264.00	p **0.990**			H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.00		0.92
0.050	0.11	0.42	0.83
0.100	0.20		0.78
0.200	0.25		0.58

3.6%

Site #49 — Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	2.3	2.9	3.2	1.8	2.0	3.0	1.8	2.2	2.3	2.0	1.3	2.7
b	**WY2006**	3.0	2.2	1.7	1.7	1.6	1.8	1.1	1.2	1.5	1.0	3.6	2.1
c	**WY2007**	2.2	1.1	1.2	1.4	2.0	2.0	1.8	2.7	1.4	2.4	1.9	1.8
d	**WY2008**	3.1	4.4	2.9	1.7	2.0	4.4	1.8	3.0	1.9	2.1	2.9	4.0
e	**WY2009**	5.4	3.1	4.1	2.2	2.3	2.2	2.9	2.6	2.1	1.7	2.7	3.9
f	**WY2010**	2.2	2.6	2.2		2.5			2.0			1.8	
	n	6	6	6	5	6	5	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	3	5	5	5	5	5	5	5
t_2	0	0	0	0	1	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1
c-a	-1	-1	-1	-1	-1	-1	1	1	-1	1	1	-1
d-a	1	1	-1	-1	0	1	1	1	-1	1	1	1
e-a	1	1	1	1	1	-1	1	1	-1	-1	1	1
f-a	-1	-1	-1		1			-1			1	
c-b	-1	-1	-1	-1	1	1	1	1	-1	1	-1	-1
d-b	1	1	1	-1	1	1	1	1	1	1	-1	1
e-b	1	1	1	1	1	1	1	1	1	1	-1	1
f-b	-1	1	1		1			1			-1	
d-c	1	1	1	1	1	1	-1	1	1	-1	1	1
e-c	1	1	1	1	1	1	1	-1	1	-1	1	1
f-c	1	1	1		1			-1			-1	
e-d	1	-1	1	1	1	-1	1	-1	1	-1	-1	-1
f-d	-1	-1	-1		1			-1			-1	
f-e	-1	-1	-1		1			-1			-1	
S_k	3	1	1	0	10	2	6	1	0	0	-1	2

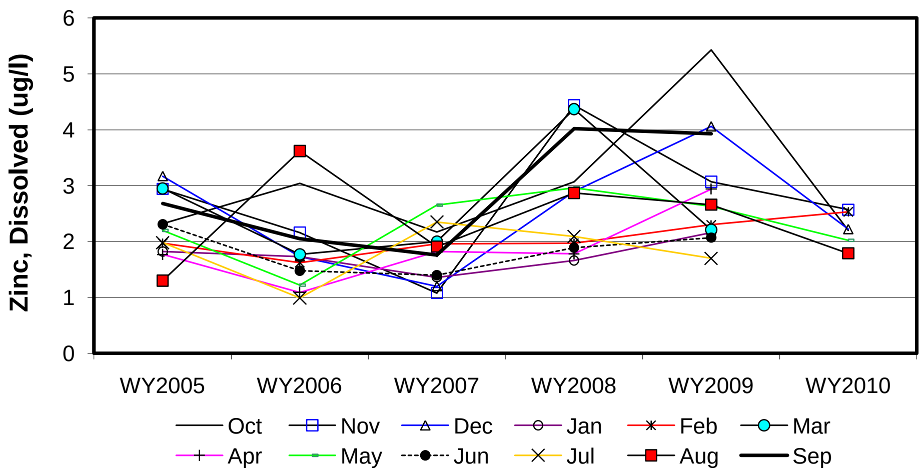
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	28.33	16.67	27.33	16.67	16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.56	0.21	0.19	0.00	1.91	0.49	1.47	0.19	0.00	0.00	-0.19	0.49
Z^2_k	0.32	0.04	0.04	0.00	3.66	0.24	2.16	0.04	0.00	0.00	0.04	0.24

ΣZ_k= 5.32
ΣZ^2_k= 6.76
Z-bar=ΣZ_k/K= 0.44

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 66
ΣS_k 25

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	4.41	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.957**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 1.48	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
264.00	**p** **0.930**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.04		0.23
0.050	-0.01	**0.11**	0.21
0.100	0.01		0.19
0.200	0.03		0.17

INTERPRETIVE REPORT
SITE 46 "LOWER BRUIN CREEK"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 20010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. No results exceeding these criteria have been identified as listed in the table below.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
No exceedances have been identified by HGCMC for the period of Oct-09 though Sept-10.					

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There was an identifiable trend in dissolved chromium. Between Water Year 2009 and Water Year 2010 there was roughly an order of magnitude increase in the dissolved chromium concentration. A similar increase was also noted for Site 6, Site 13, Site 46, Site 48, Site 49, and Site 54; all sites that are located in the 920 area.

A non-parametric statistical analysis for trend was performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented on the pages following this interpretive section. The following table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). Datasets with a statistically significant trend ($\alpha/2=2.5\%$) a

Site 46-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.44	0		
pH, Lab	6	0.27	0		
Alkalinity, Total	6	**0.01**	-	-1.44	-2.4
Sulfate, Total	6	0.78	0		
Zinc, Dissolved	6	0.91	0		

(1): Number of years (2):Significance level

Seasonal-Sen's Slope estimate statistic has also been calculated.

The dataset for total alkalinity has a statistically significant (p= 0.01) negative trend with a slope estimate of -1.44 mg/L/yr or a -2.4% decrease over the period. This trend is similar in magnitude and direction as noted for the upgradient control Site 49 and therefore is interpreted as natural variation.

A comparison of median values for alkalinity, laboratory pH, laboratory conductivity, sulfate, and dissolved zinc between Site 49 and Site 46 has been conducted as specified in the Statistical Information Goals for Site 46. Additionally, X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 46 and Site 49, the upstream control site, to aid in the comparison between those sites. Calculation details of the non-parametric signed-rank tests are presented in detail on the pages following this interpretive section. The below table summarizes the results of the signed-rank test as performed on the Water Year 2010 data set. For all of the analytes, except pH, there were no statistically significant differences between the measured median values at a significance level of α=0.05 for a one-tailed test.

Site 46 vs Site 49 - WY2010, summary statistics for median analysis.

Parameter	Signed Ranks p-value	Site 49 median	Site 46 median	Median of Differences
Conductivity, Lab	0.16	152	154	-1.0
pH, Lab	**0.97**	7.74	7.58	0.21
Alkalinity, Total	0.00	59.8	61.4	-1.0
Sulfate, Total	1.00	12.9	12.6	0.3
Zinc, Dissolved	0.95	2.21	2.00	0.37

The median values for pH for Site 46 and Site 49 are 7.74 su and 7.58 su respectively and the median of differences, Site 49 minus Site 46, is 0.21 su. This pattern has occurred in 5 of the last 6 FWMP reports (WY 2004 – WY 2010) and has been consistent in the difference between the sites. Given the low magnitude of the difference and the yearly consistency in the difference, this variation is considered a part of the natural variation that can be expected for this type of monitoring.

Table of Results for Water Year 2010

Site 46 "Lower Bruin Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	12/8/2009	1/12/2010	2/16/2010	3/16/2010	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	4.3	1.2	1.0	NOT SCHEDULED FOR SAMPLING	1.4	NOT SCHEDULED FOR SAMPLING		4.3	NOT SCHEDULED FOR SAMPLING		10.3	NOT SCHEDULED FOR SAMPLING	2.9
Conductivity-Field(µmho)	157	134	174		176			124			147		152
Conductivity-Lab (µmho)	148	150 J	167		163			120			157		154
pH Lab (standard units)	7.66	7.71 J	7.50		6.51			7.80			7.03		7.58
pH Field (standard units)	7.89	7.37	7.22		6.99			7.74			6.87		7.30
Total Alkalinity (mg/L)	59.5	62.7 J	68.7		61.4			47.4			61.3		61.4
Total Sulfate (mg/L)	11.6	13.0	14.1		15.1			7.8 J			12.2 J		12.6
Hardness (mg/L)	78.9	77.9	83.1		87.5			57.7			78.9		78.9
Dissolved As (ug/L)	0.263	0.299	0.164		0.128			0.190			0.198		0.194
Dissolved Ba (ug/L)			11.7		13.0								12.4
Dissolved Cd (ug/L)	0.025	0.025	0.022		0.029			0.020			0.033		0.025
Dissolved Cr (ug/L)			0.993		4.070								2.532
Dissolved Cu (ug/L)	0.547	0.538	0.493		0.486 U			0.382			1.560		0.516
Dissolved Pb (ug/L)	0.0098 U	0.0401	0.0033 U		0.0314 U			0.0093 U			0.0488		0.0206
Dissolved Ni (ug/L)			1.150		1.230								1.190
Dissolved Ag (ug/L)			<0.003		<0.003								0.002
Dissolved Zn (ug/L)	2.29 U	2.16 U	1.83		2.18			1.61			1.83 U		2.00
Dissolved Se (ug/L)			0.931		0.932 J								0.932
Dissolved Hg (ug/L)	0.001360	0.001300	0.001220		0.001130			0.001230			0.001590		0.001265

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

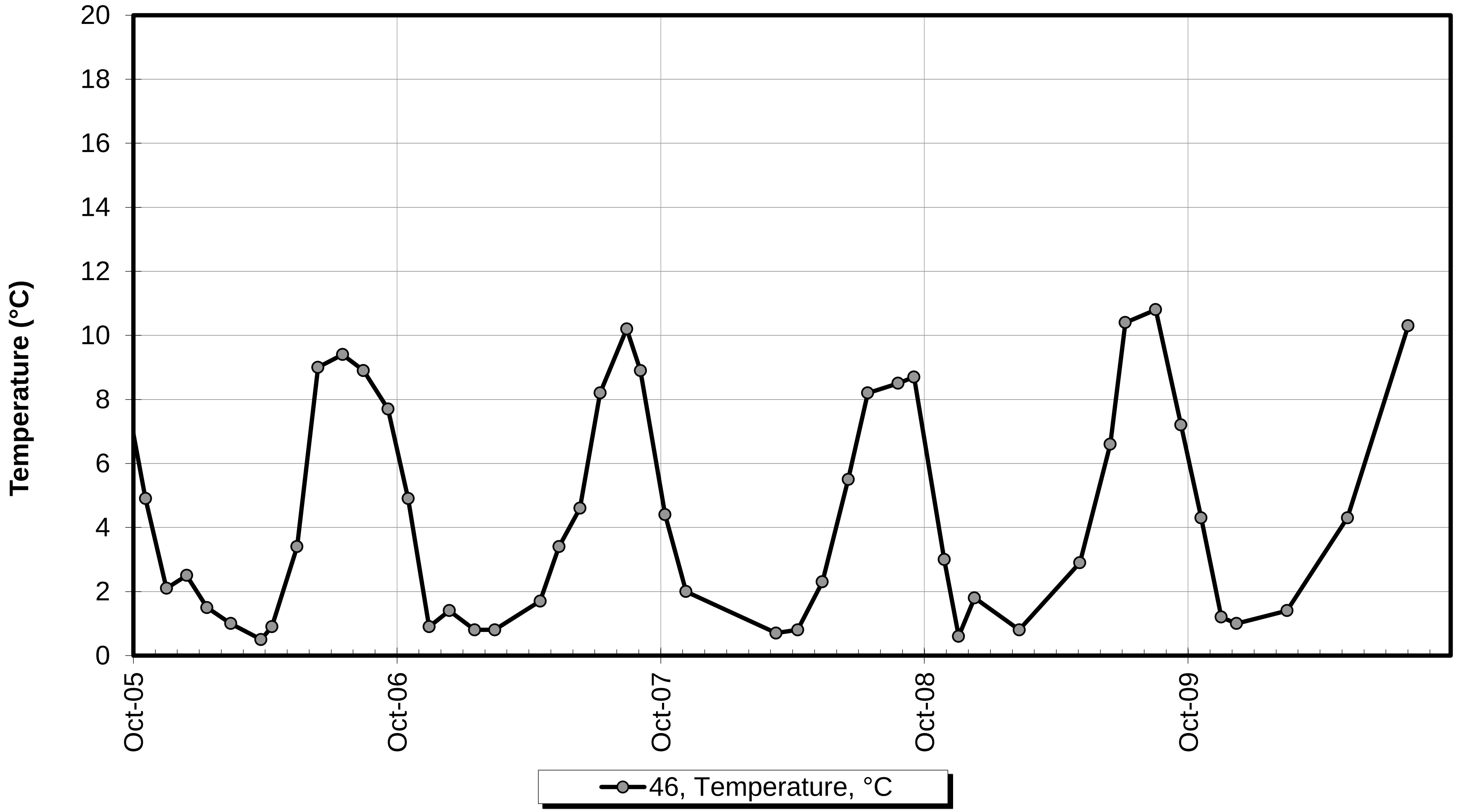
Qualified Data by QA Reviewer

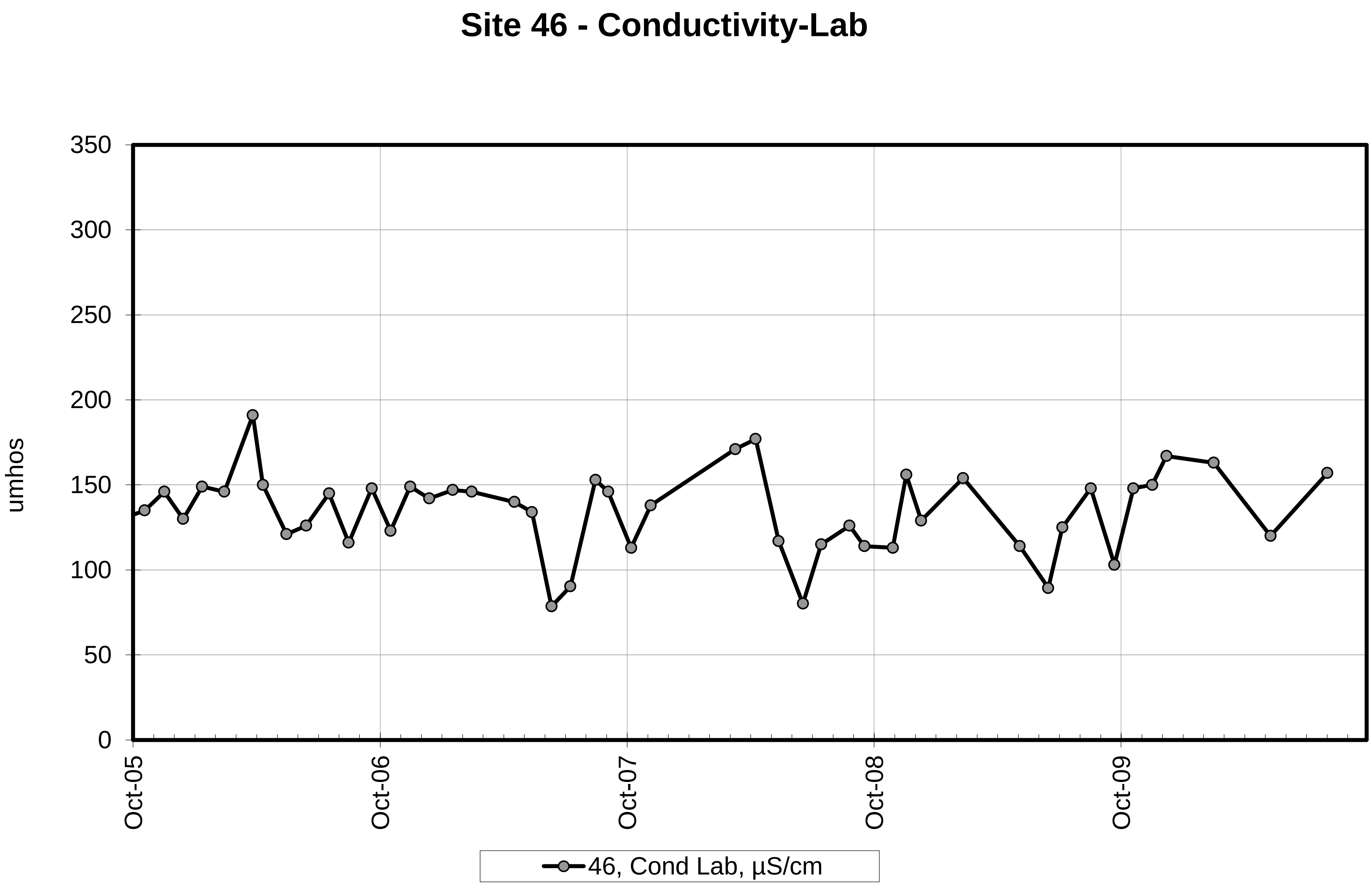
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
46	10/20/2009	12:00 AM				
			Pb diss, µg/l	0.0098	U	Field Blank Contamination
			Zn diss, µg/l	2.29	U	Field Blank Contamination
46	11/17/2009	12:00 AM				
			Alk Tot,mg/l	62.7	J	Temperature Exceedance
			Cond, µs/cm	150	J	Temperature Exceedance
			Zn diss, µg/l	2.16	U	Field Blank Contamination
			pH Lab, su	7.71	J	Hold Time Violation
46	12/8/2009	12:00 AM				
			Pb diss, µg/l	0.00333	U	Field Blank Contamination
46	2/16/2010	12:00 AM				
			Cu diss, µg/l	0.486	U	Field Blank Contamination
			Pb diss, µg/l	0.0314	U	Field Blank Contamination
			Se diss, µg/l	0.932	J	LCS Recovery
46	5/11/2010	12:27 PM				
			Pb diss, µg/l	0.00934	U	Field Blank Contamination
			SO4 Tot, mg/l	7.8	J	Sample Temperature
46	8/3/2010	10:40 AM				
			Zn diss, µg/l	1.83	U	Field Blank Contamination
			SO4 Tot, mg/l	12.2	J	Sample Temperature

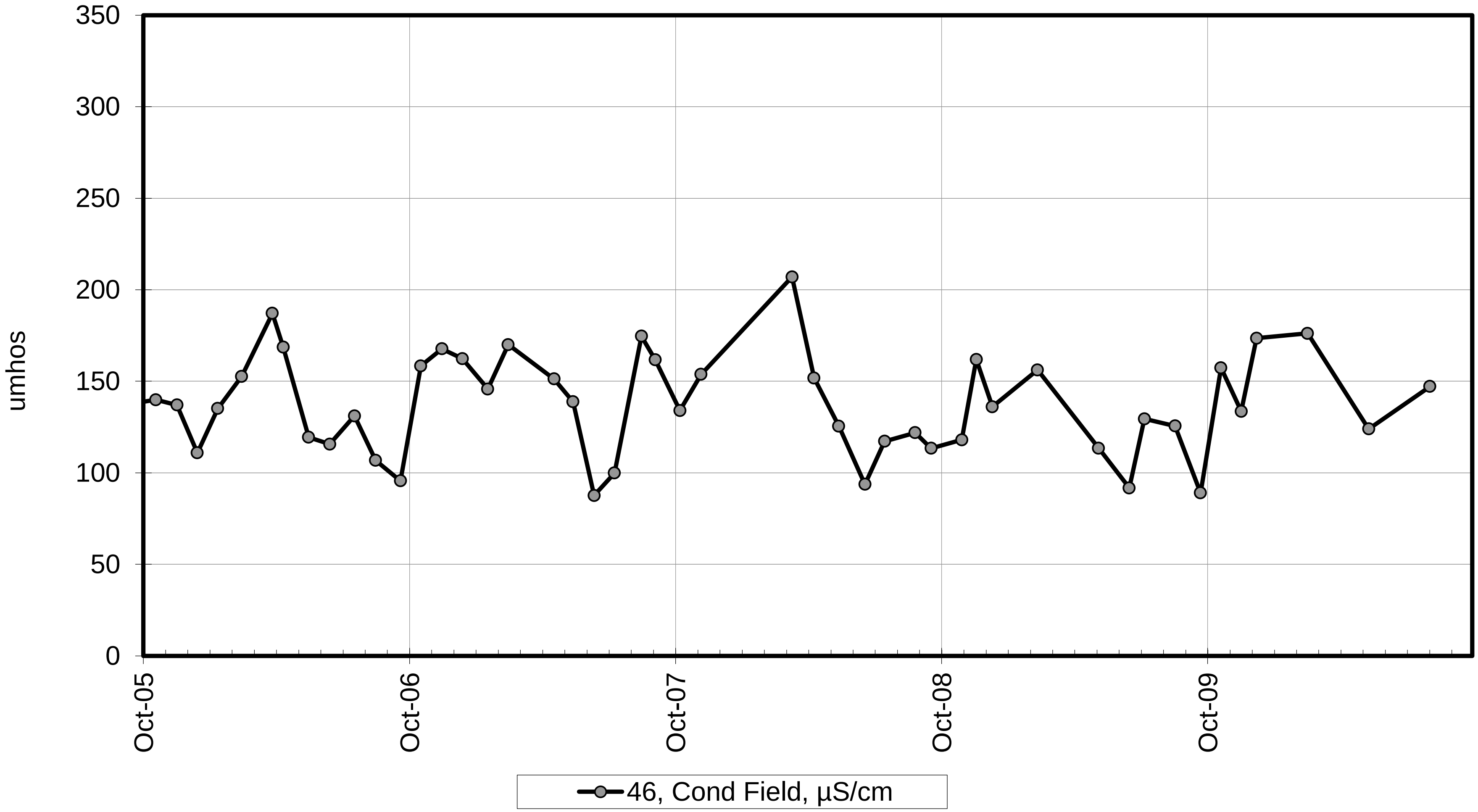
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

Site 46 -Water Temperature

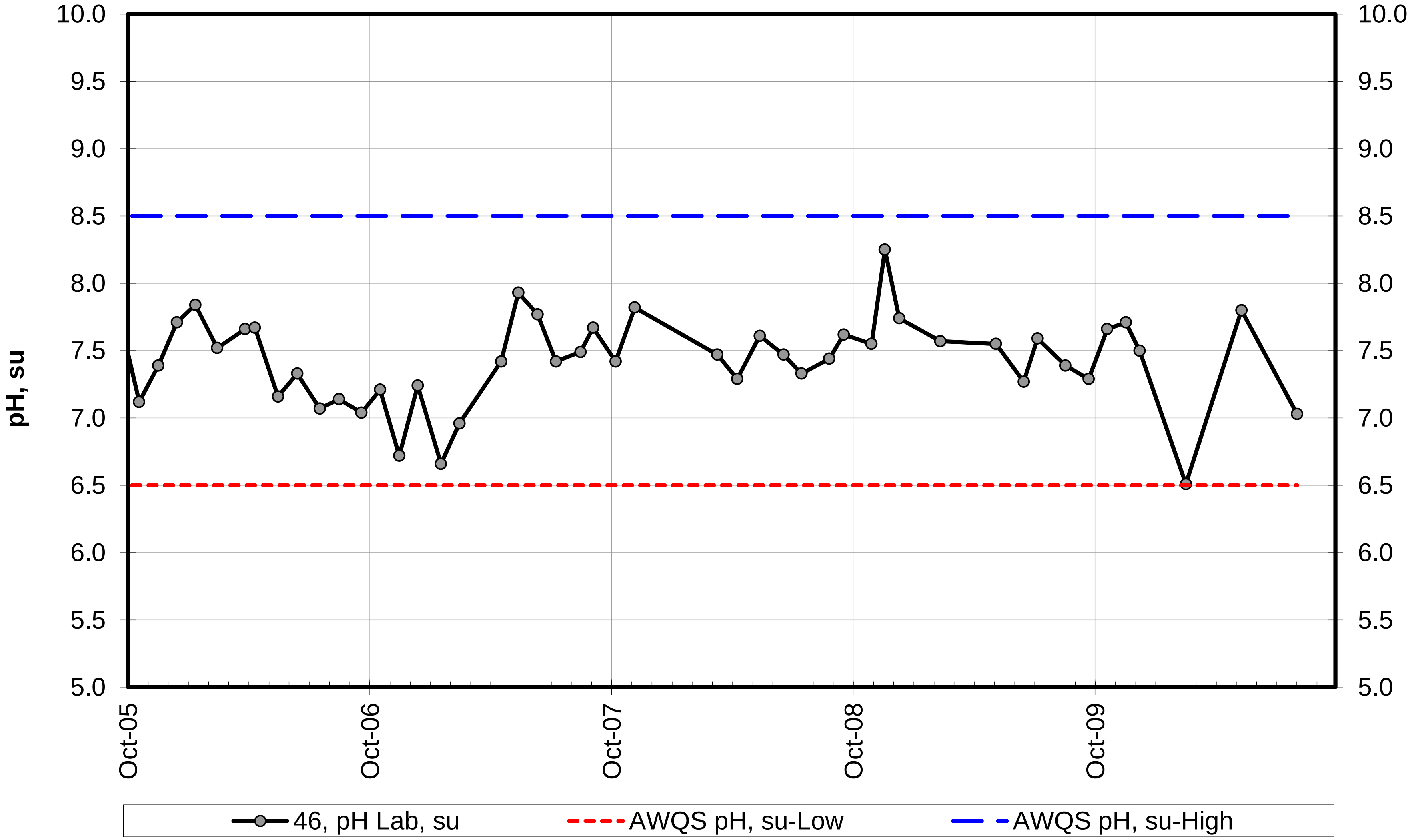


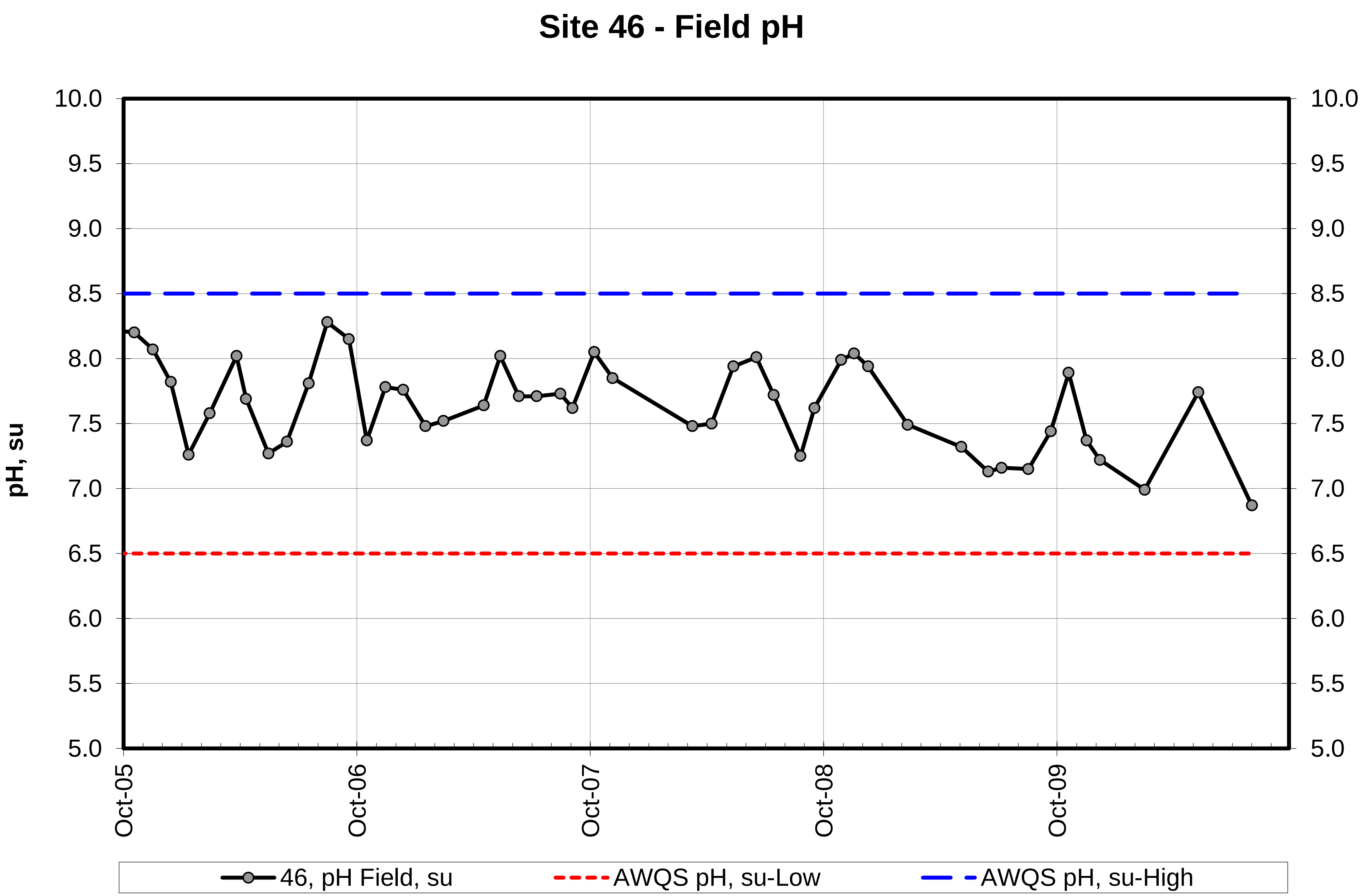

Site 46 - Conductivity-Lab
umhos
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Cond Lab, µS/cm

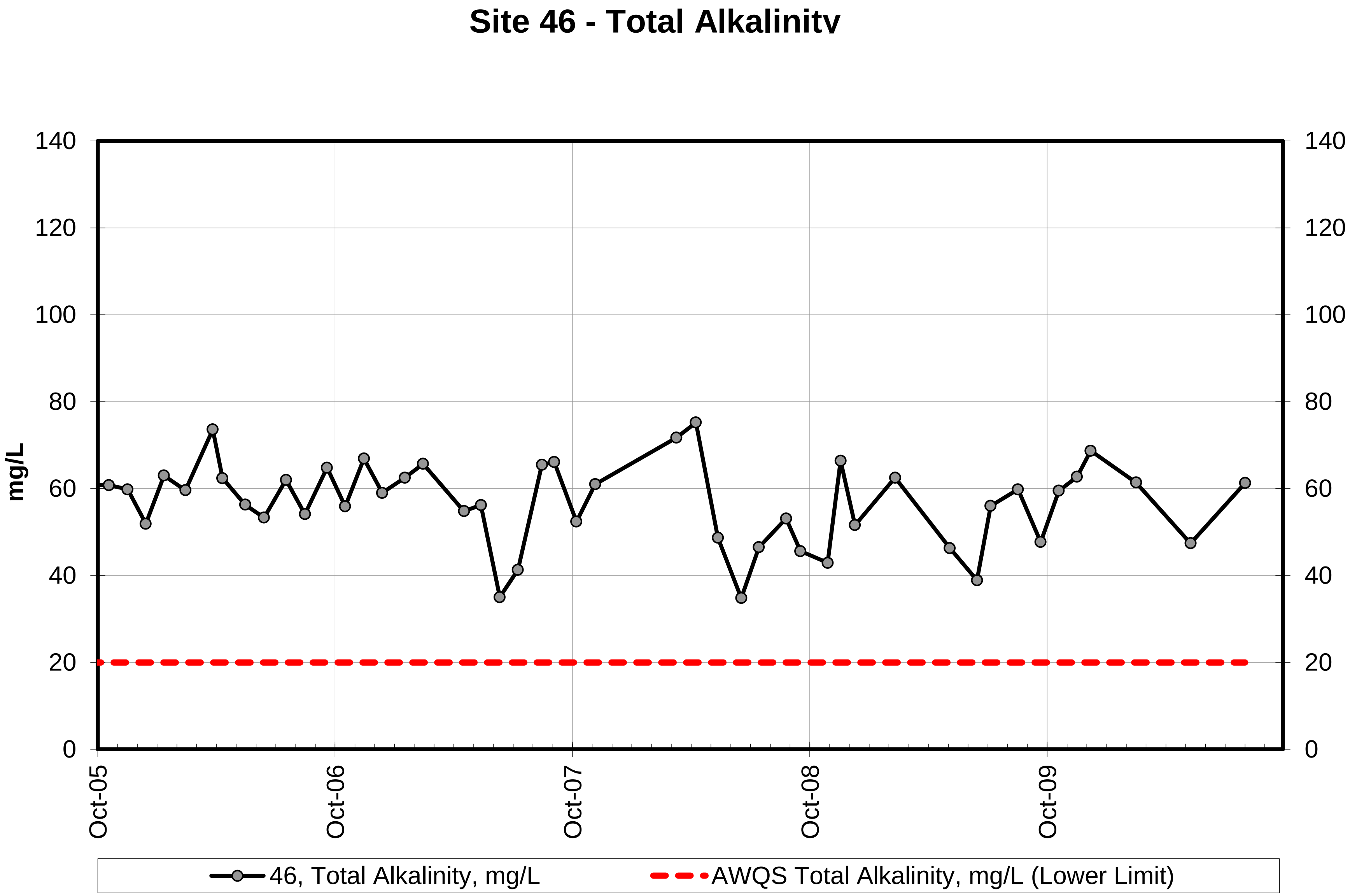
Site 46 - Conductivity-Field



Site 46 - Lab pH

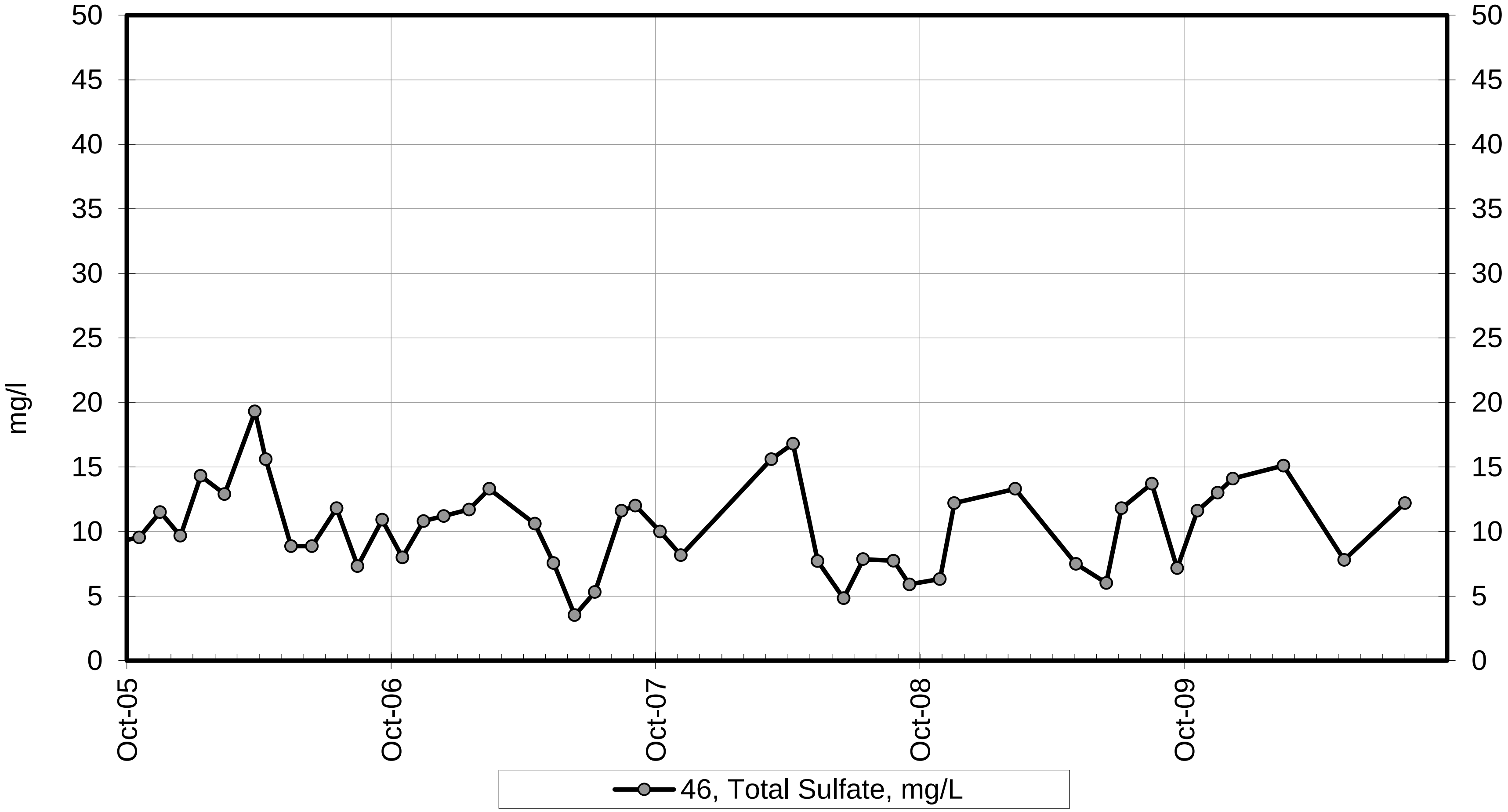



Site 46 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

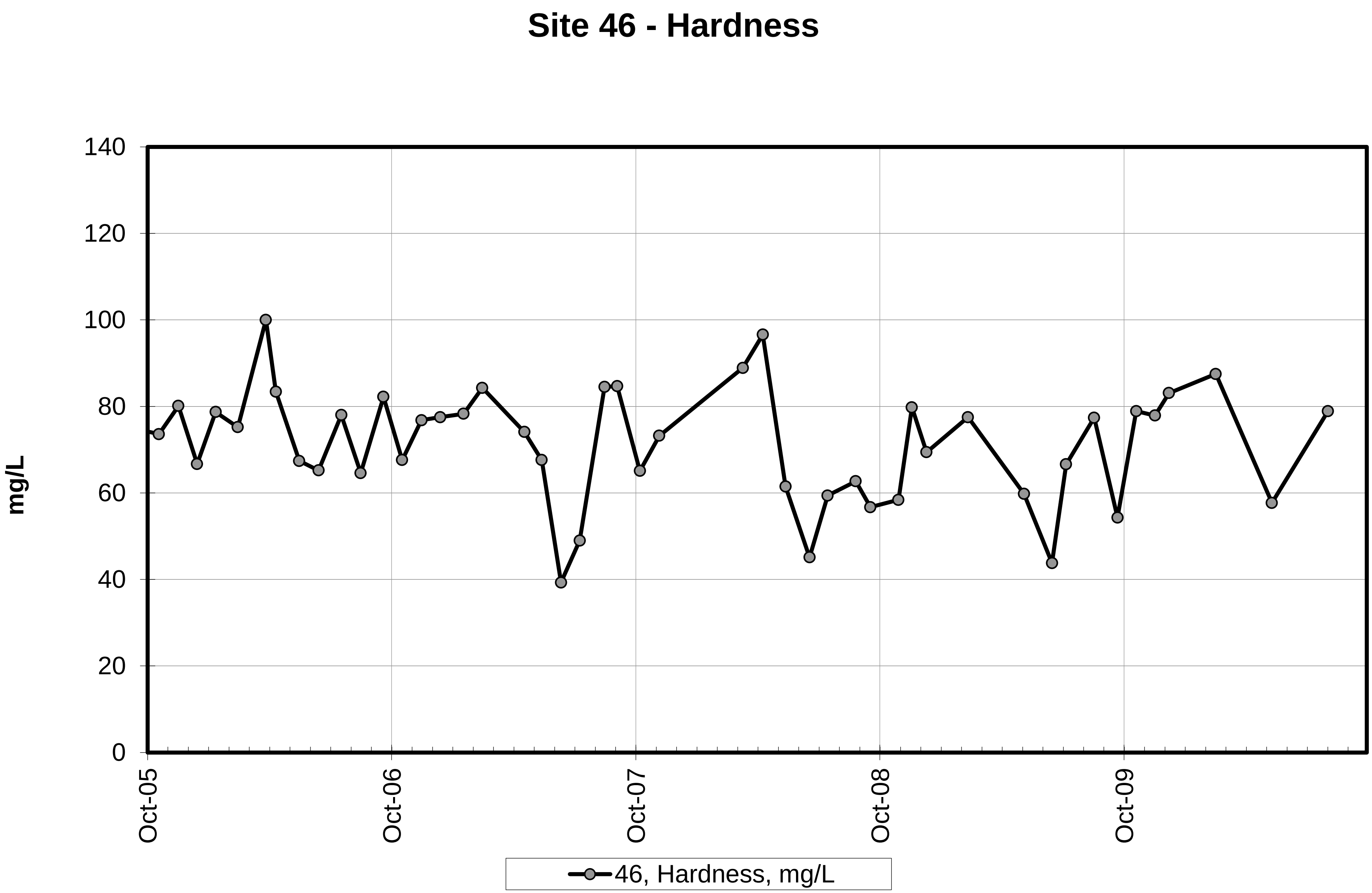


Site 46 - Total Alkalinity
mg/L
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

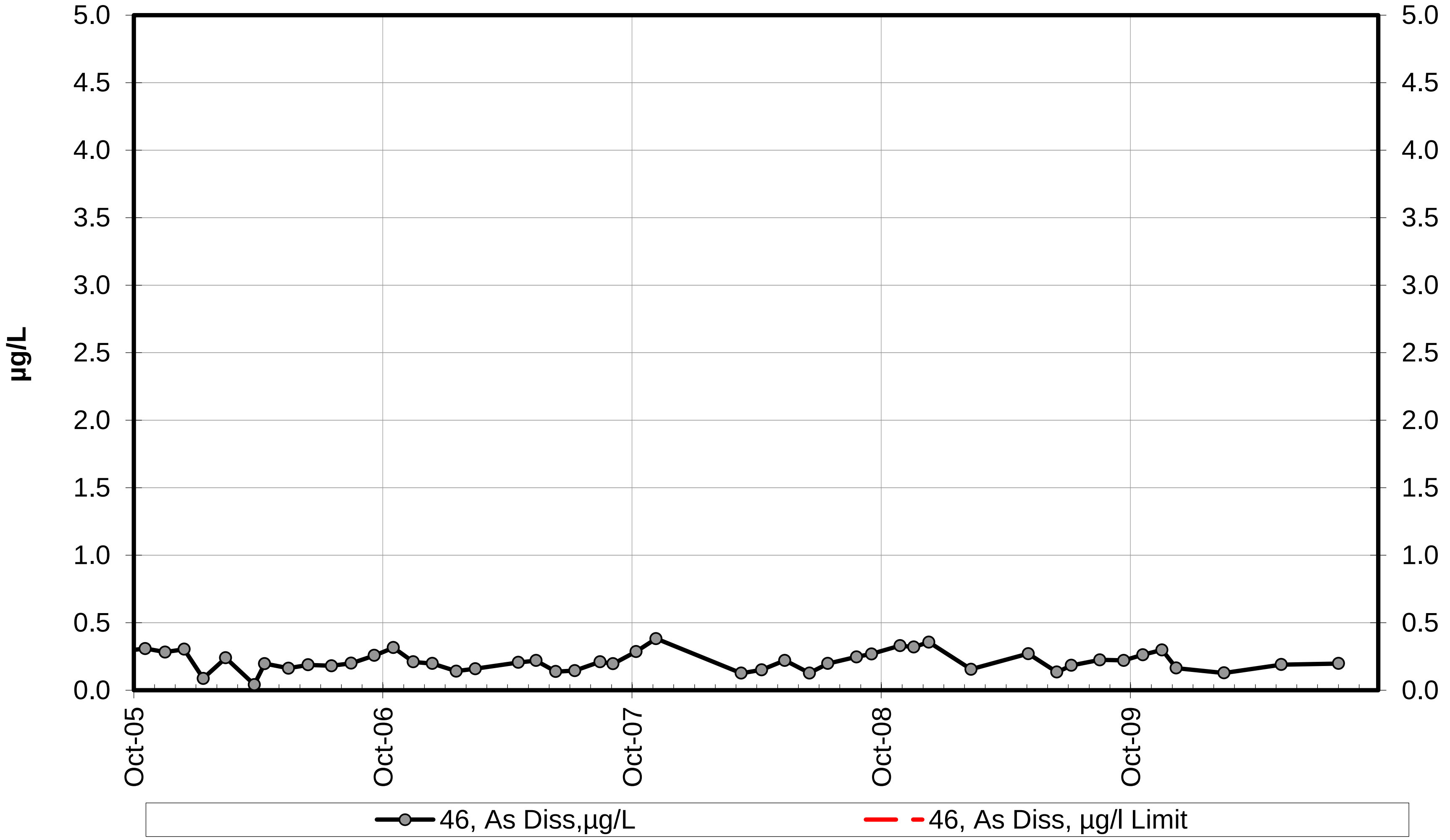
Site 46 - Total Sulfate



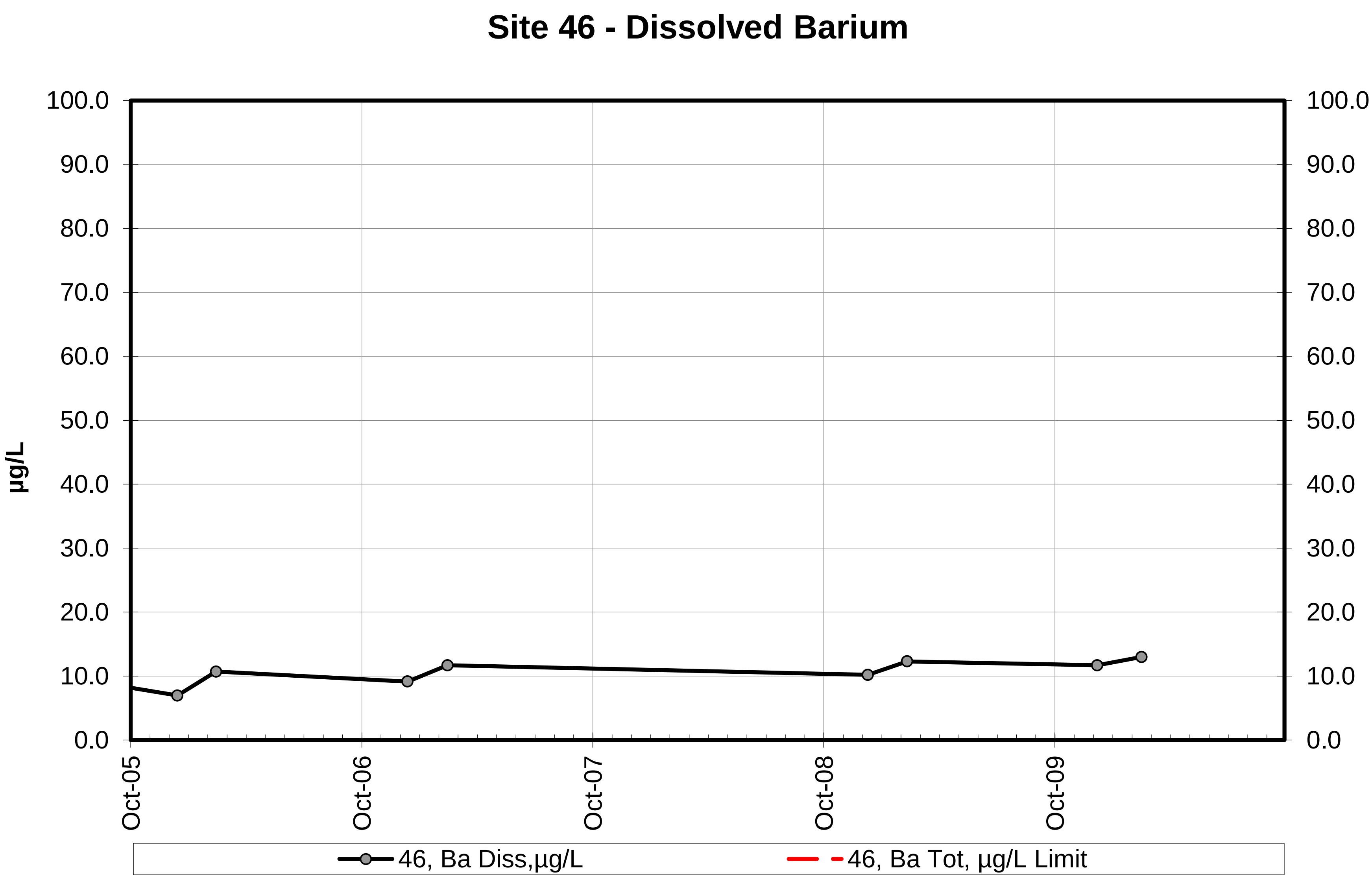
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.


Site 46 - Hardness
mg/L
0
20
40
60
80
100
120
140
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Hardness, mg/L

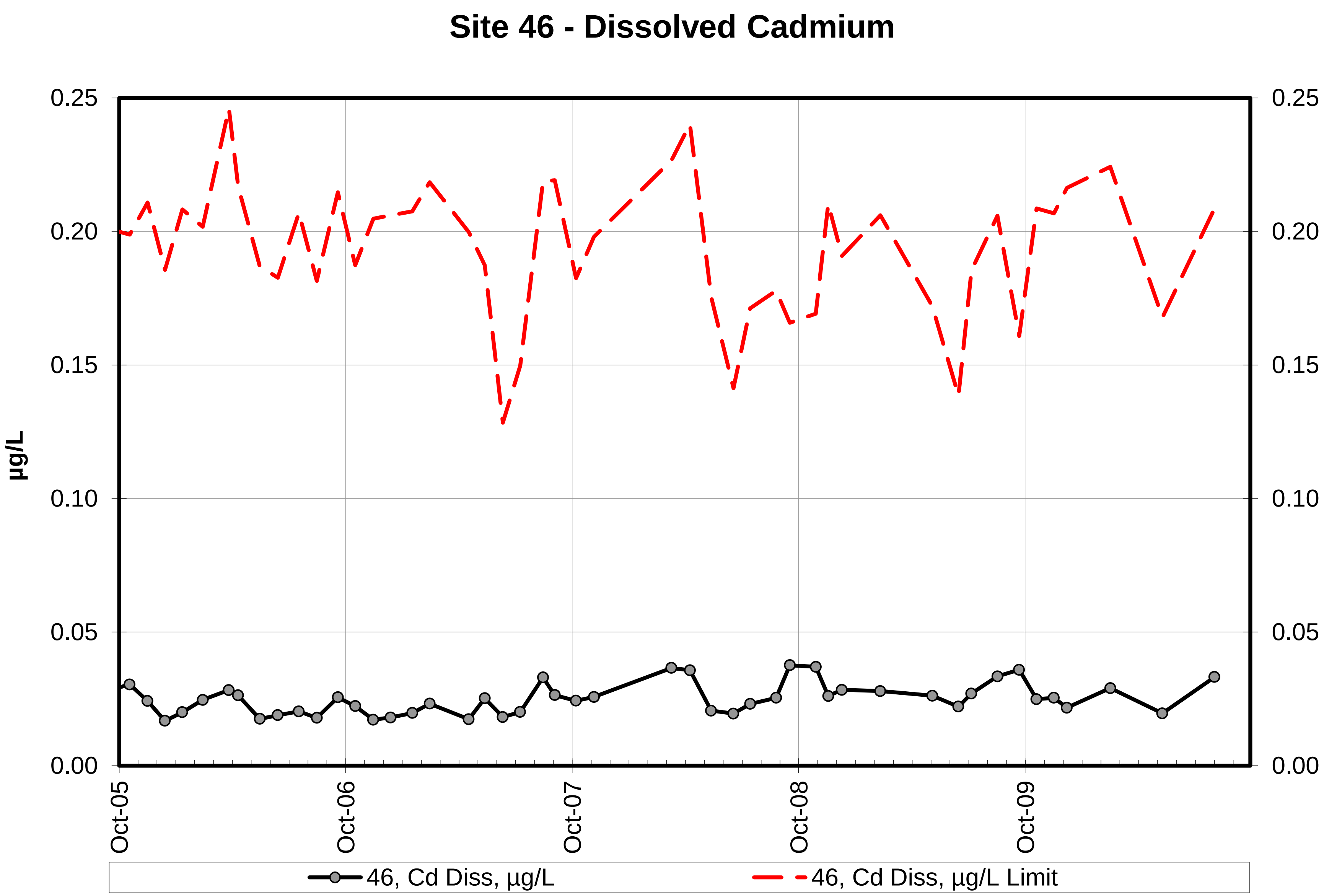
Site 46 - Dissolved Arsenic



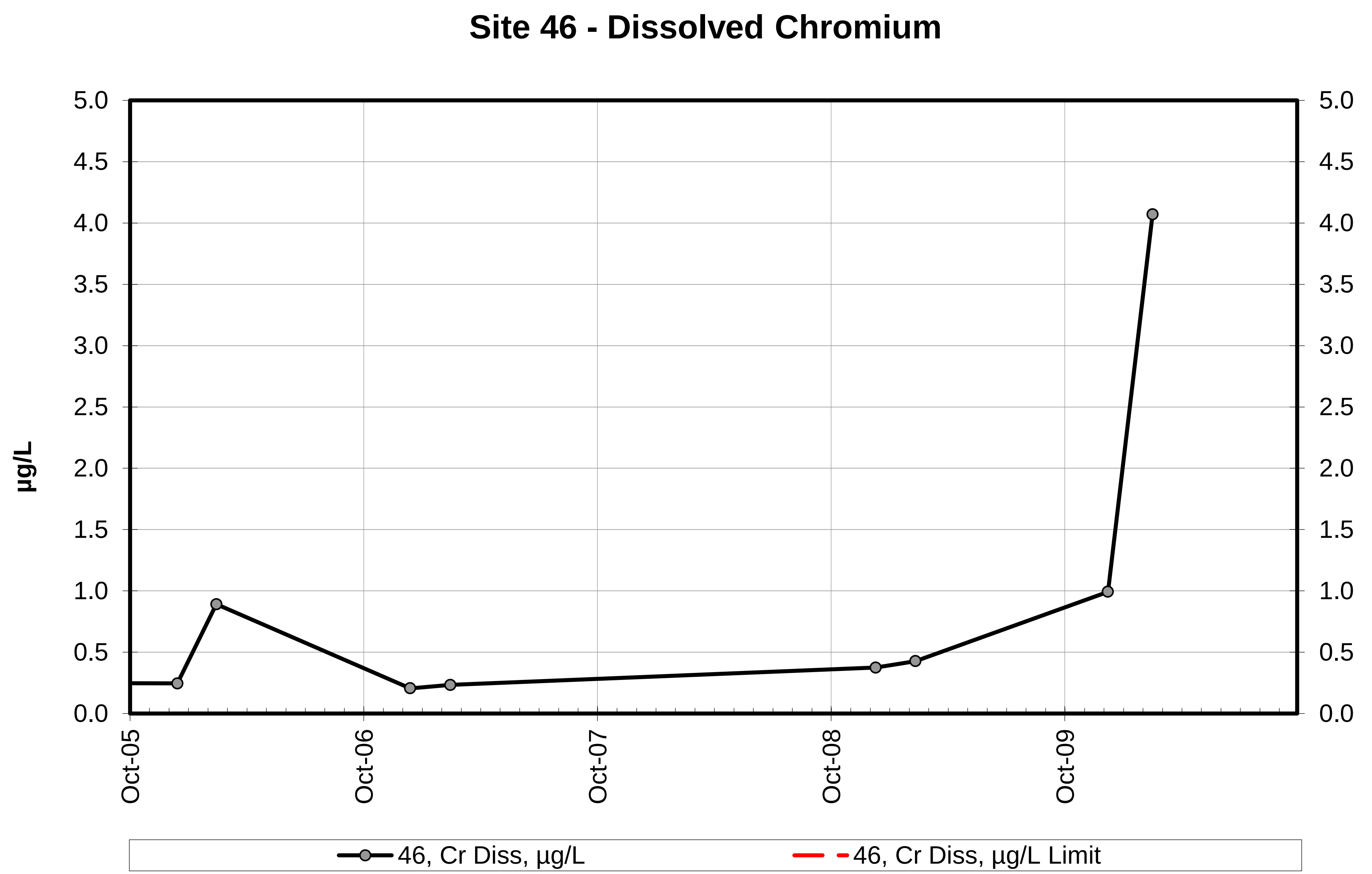
Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination



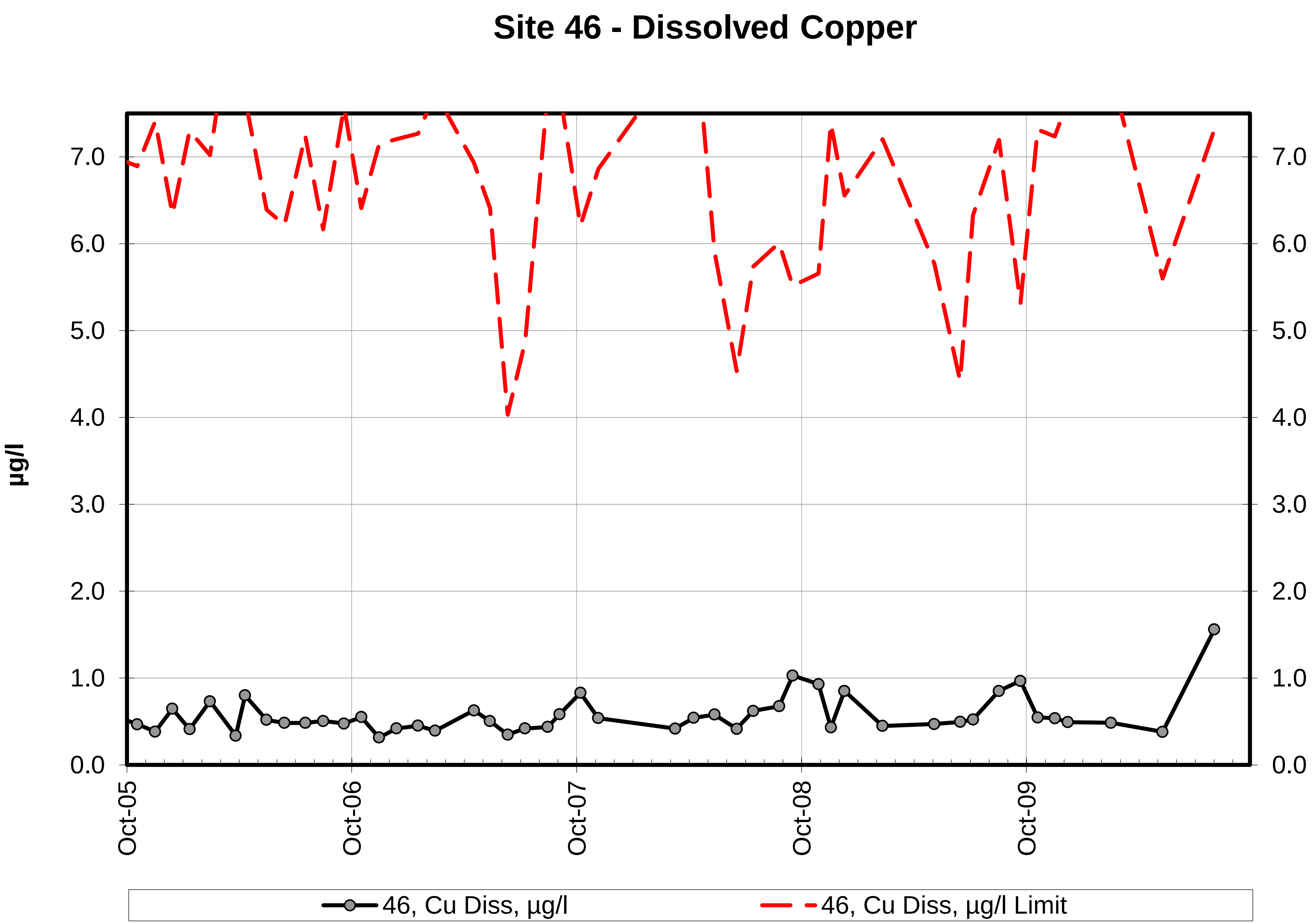
Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



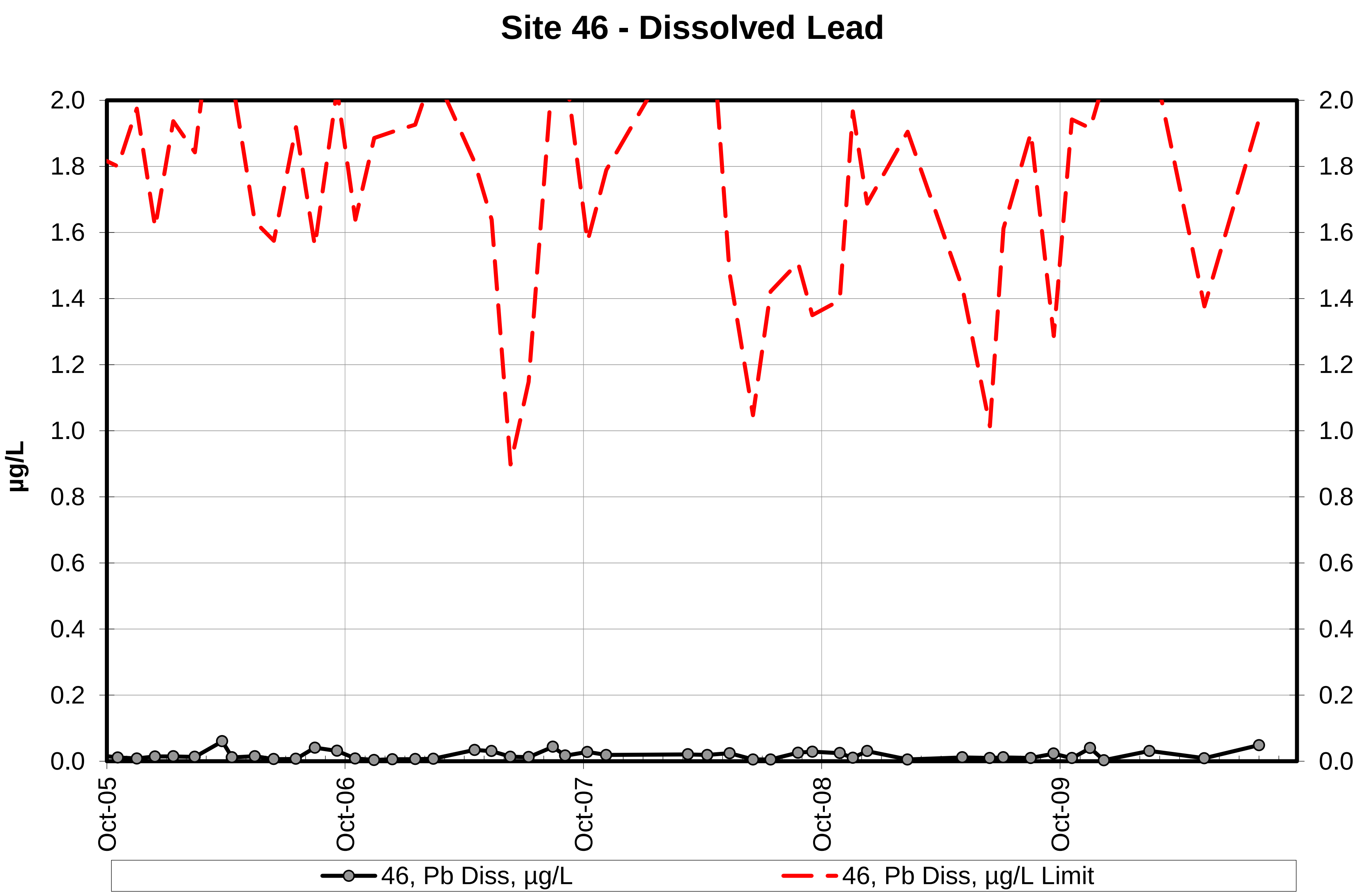
Site 46 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Cd Diss, µg/L
46, Cd Diss, µg/L Limit



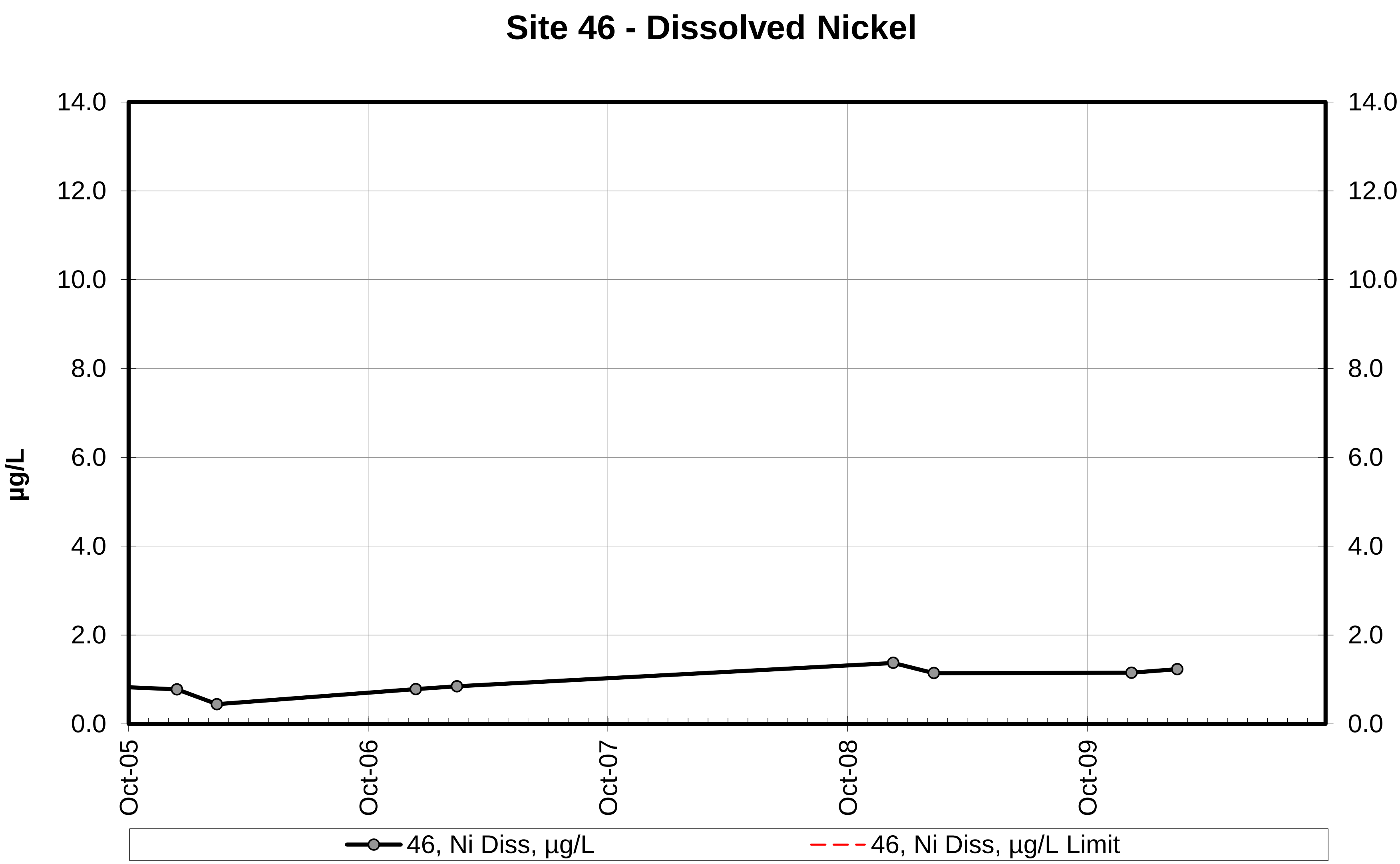
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



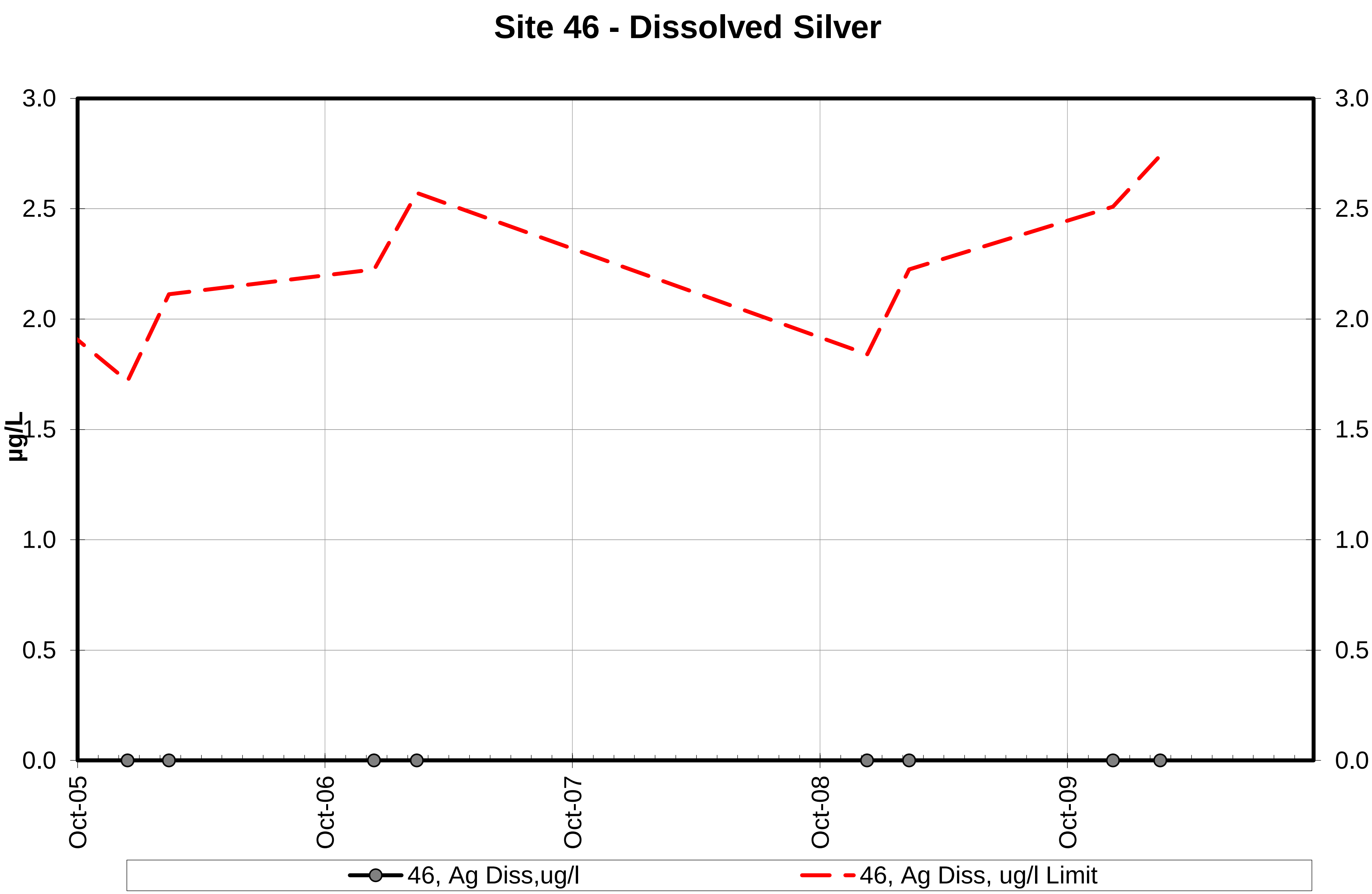
Site 46 - Dissolved Copper
µg/l
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Cu Diss, µg/l
46, Cu Diss, µg/l Limit

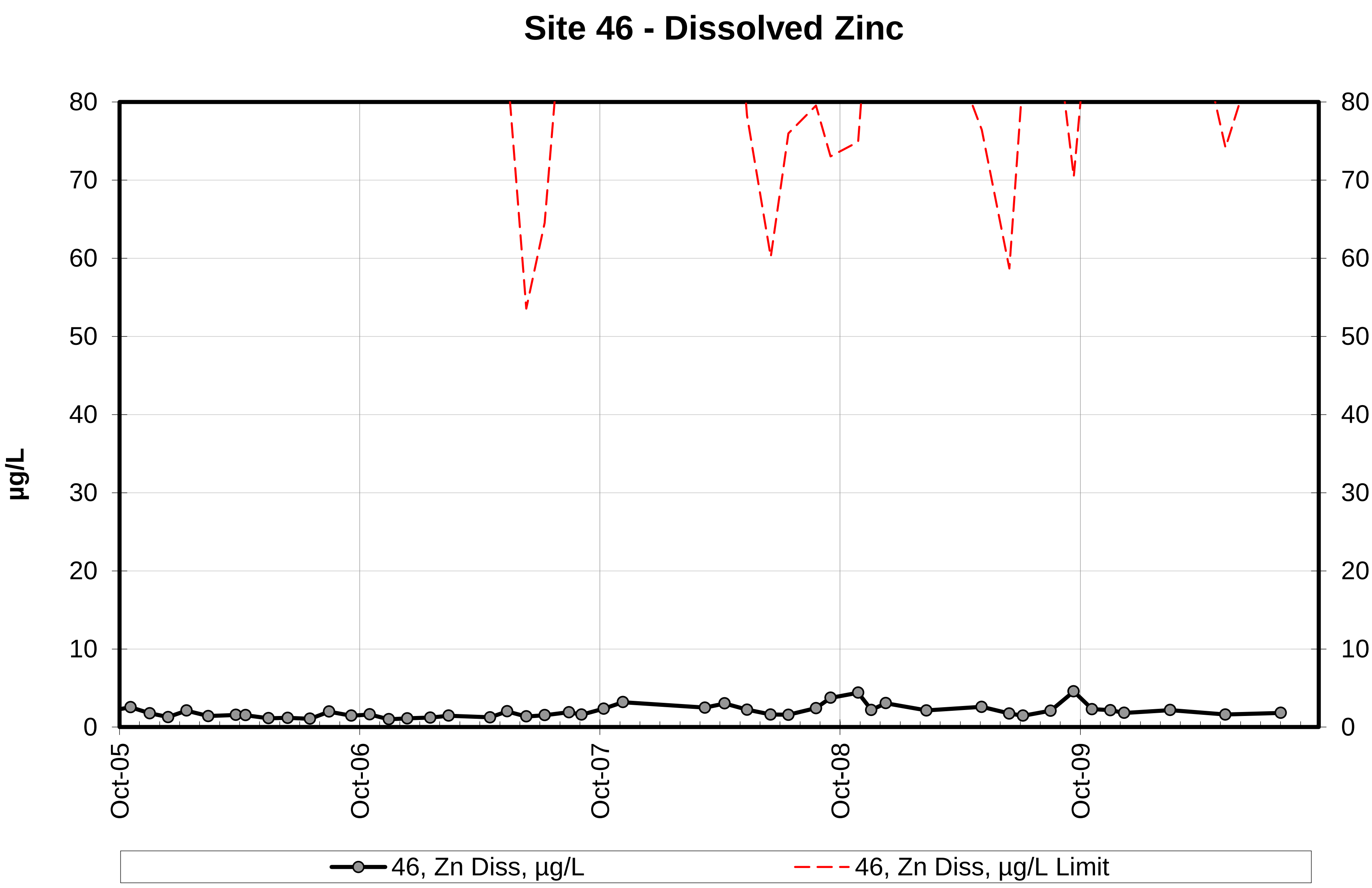


Site 46 - Dissolved Lead
µg/L
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Pb Diss, µg/L
46, Pb Diss, µg/L Limit

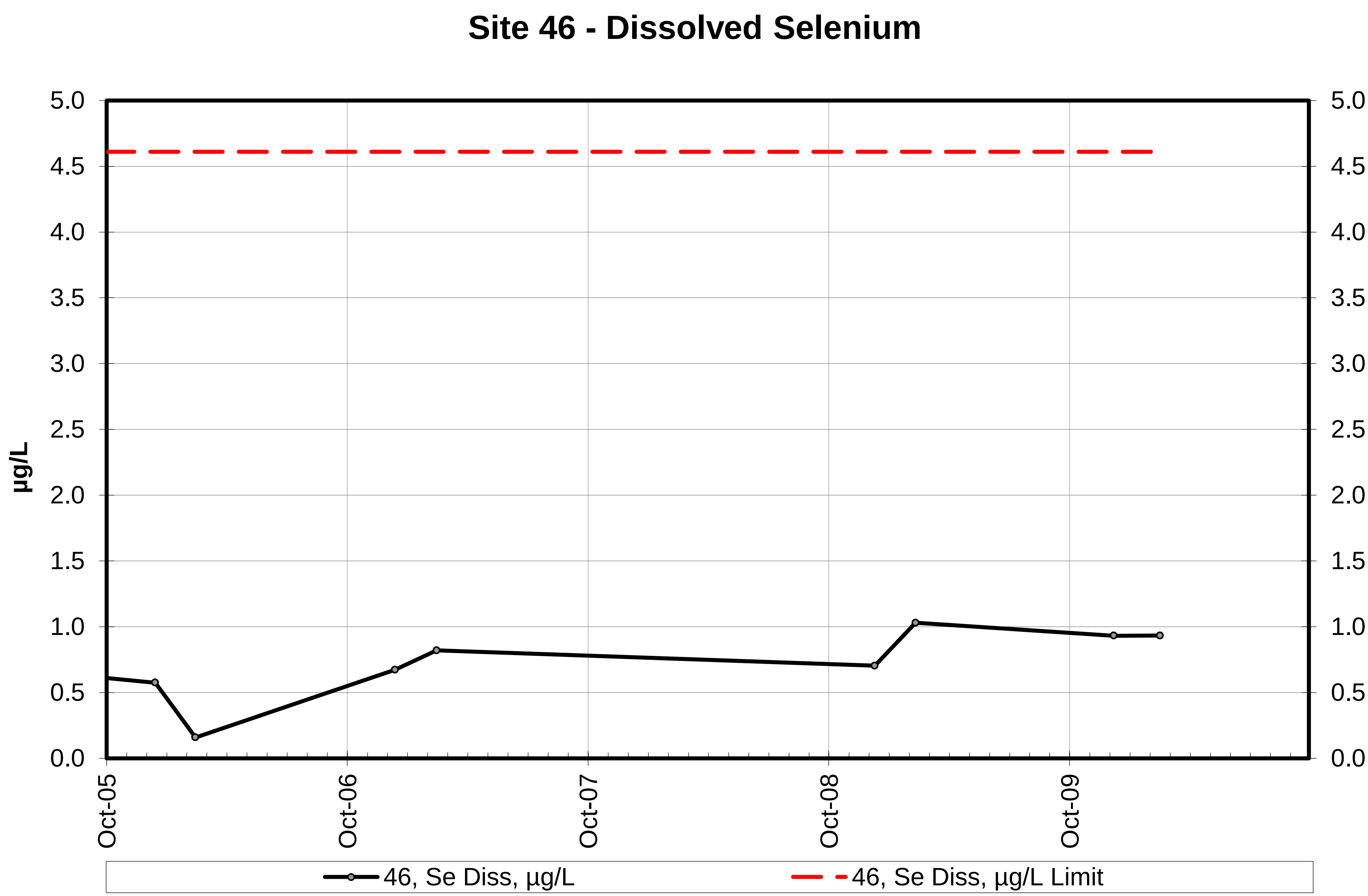


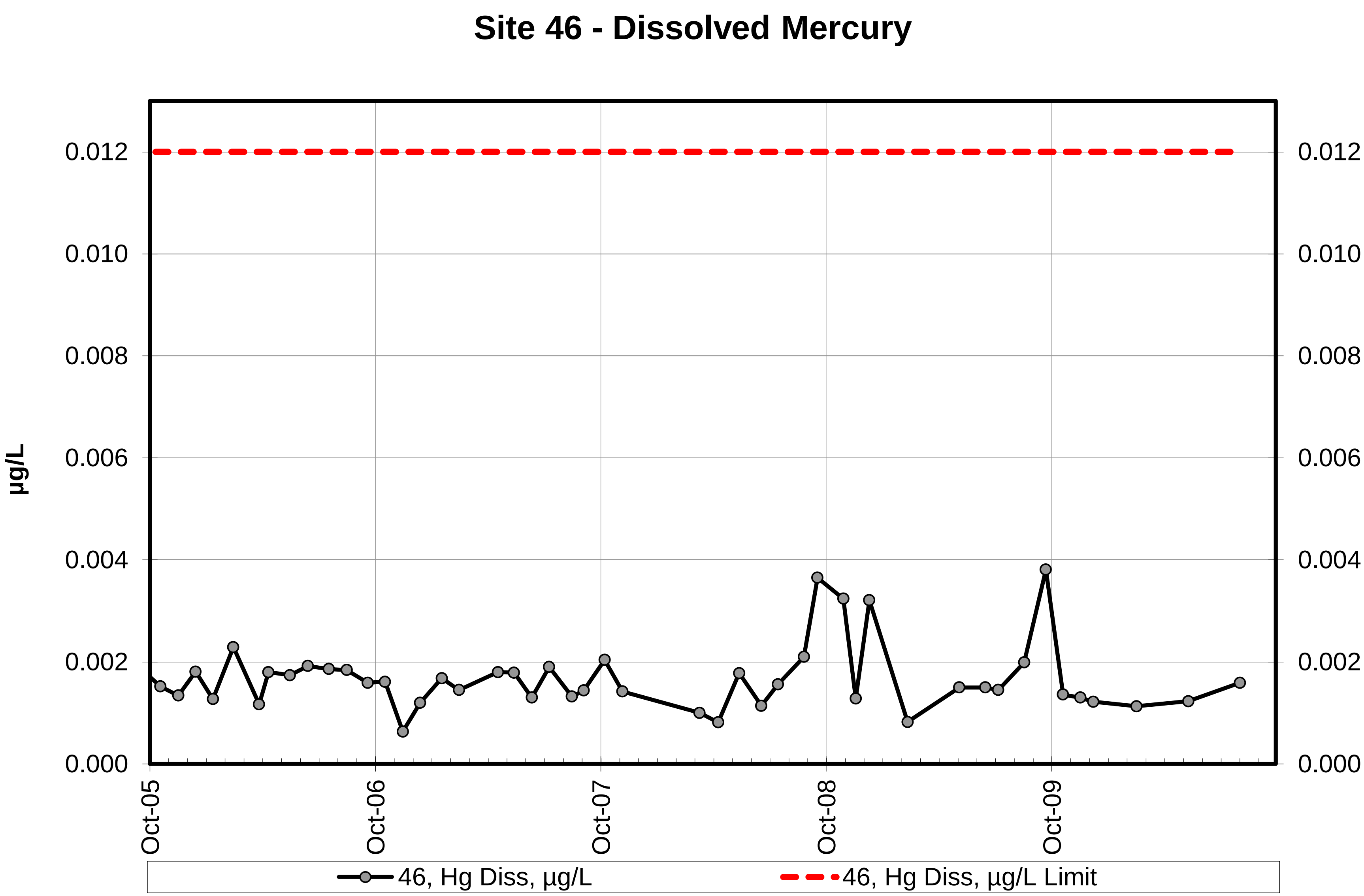
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.


Site 46 - Dissolved Silver
µg/L
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Ag Diss,ug/l
46, Ag Diss, ug/l Limit



Site 46 - Dissolved Zinc
µg/L
80
70
60
50
40
30
20
10
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Zn Diss, µg/L
46, Zn Diss, µg/L Limit


Site 46 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Se Diss, µg/L
46, Se Diss, µg/L Limit


Site 46 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
46, Hg Diss, µg/L
46, Hg Diss, µg/L Limit

Site #46 — Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	165	128	148	159	157	140	127	94.1	130	145	169	130
b	**WY2006**	135	146	130	149	146	191	150	121	126	145	116	148
c	**WY2007**	123	149	142	147	146		140	134	78.6	90.3	153	146
d	**WY2008**	113	138				171	177	117	80.2	115	126	114
e	**WY2009**	113	156	129		154			114	89.4	125	148	103
f	**WY2010**	148	150	167		163			120			157	
	n	6	6	5	3	5	3	4	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	3	5	5	5	3	5	5	5	5	3	5	5
t_2	1	0	0	0	1	0	0	0	0	1	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	-1	-1	1	1	1	-1	0	-1	1
c-a	-1	1	-1	-1	-1		1	1	-1	-1	-1	1
d-a	-1	1				1	1	1	-1	-1	-1	-1
e-a	-1	1	-1		-1			1	-1	-1	-1	-1
f-a	-1	1	1		1			1			-1	
c-b	-1	1	1	-1	0		-1	1	-1	-1	1	-1
d-b	-1	-1				-1	1	-1	-1	-1	1	-1
e-b	-1	1	-1		1			-1	-1	-1	1	-1
f-b	1	1	1		1			-1			1	
d-c	-1	-1					1	-1	1	1	-1	-1
e-c	-1	1	-1		1			-1	1	1	-1	-1
f-c	1	1	1		1			-1			1	
e-d	0	1						-1	1	1	1	-1
f-d	1	1						1			1	
f-e	1	-1	1		1			1			1	
S_k	-6	9	0	-3	3	1	4	1	-4	-3	1	-6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	27.33	23.33	16.67	3.67	15.67	3.67	8.67	28.33	16.67	15.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-1.15	1.86	0.00	-1.57	0.76	0.52	1.36	0.19	-0.98	-0.76	0.19	-1.47
Z^2_k	1.32	3.47	0.00	2.45	0.57	0.27	1.85	0.04	0.96	0.57	0.04	2.16

ΣZ_k= -1.04

ΣZ^2_k= 13.70

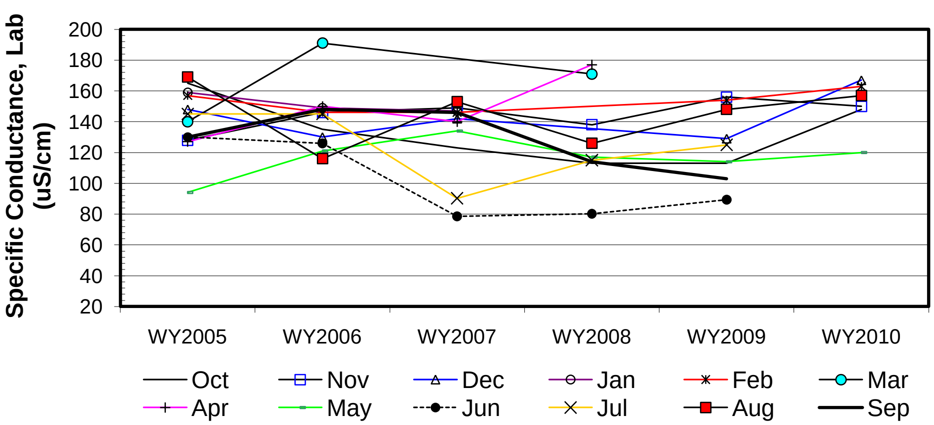
Z-bar=$\Sigma Z_k/K$= -0.09

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	54	3	0	0	0

Σn 59

ΣS_k -3

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	13.61	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity	
p	**0.255**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -0.14	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
204.67	p **0.444**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-5.00		3.93
0.050	-3.86	**-0.13**	3.19
0.100	-3.00		1.78
0.200	-2.33		1.20

Site **#46** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	8.0	7.7	8.0	7.9	7.8	7.7	7.9	7.7	7.1	7.4	6.8	7.8
b	**WY2006**	7.1	7.4	7.7	7.8	7.5	7.7	7.7	7.2	7.3	7.1	7.1	7.0
c	**WY2007**	7.2	6.7	7.2	6.7	7.0		7.4	7.9	7.8	7.4	7.5	7.7
d	**WY2008**	7.4	7.8				7.5	7.3	7.6	7.5	7.3	7.4	7.6
e	**WY2009**	7.6	8.3	7.7		7.6			7.6	7.3	7.6	7.4	7.3
f	**WY2010**	7.7	7.7	7.5		6.5			7.8			7.0	
	n	6	6	5	3	5	3	4	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	1	-1
c-a	-1	-1	-1	-1	-1		-1	1	1	-1	1	-1
d-a	-1	1				-1	-1	-1	1	-1	1	-1
e-a	-1	1	-1		-1			-1	1	1	1	-1
f-a	-1	1	-1		-1			1			1	
c-b	1	-1	-1	-1	-1		-1	1	1	1	1	1
d-b	1	1				-1	-1	1	1	1	1	1
e-b	1	1	1		1			1	-1	1	1	1
f-b	1	1	-1		-1			1			-1	
d-c	1	1					-1	-1	-1	-1	-1	-1
e-c	1	1	1		1			-1	-1	1	-1	-1
f-c	1	1	1		-1			-1			-1	
e-d	1	1						-1	-1	1	-1	-1
f-d	1	-1						1			-1	
f-e	1	-1	-1		-1			1			-1	
S_k	5	5	-4	-3	-6	-3	-6	1	2	2	1	-4

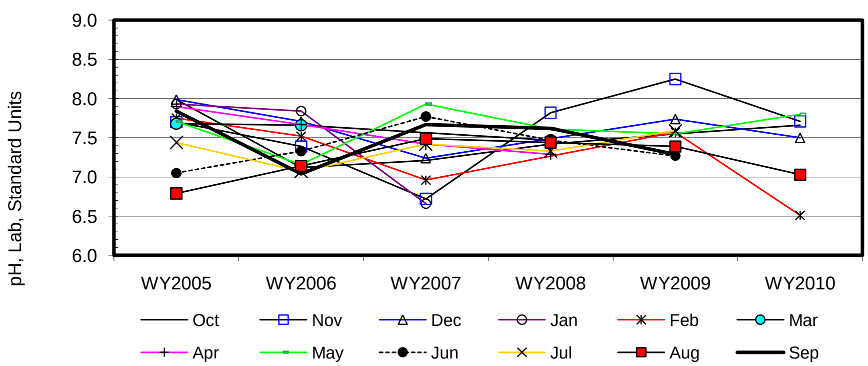
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	3.67	16.67	3.67	8.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.94	1.04	-0.98	-1.57	-1.47	-1.57	-2.04	0.19	0.49	0.49	0.19	-0.98
Z^2_k	0.88	1.07	0.96	2.45	2.16	2.45	4.15	0.04	0.24	0.24	0.04	0.96

ΣZ_k=	-5.27
ΣZ^2_k=	15.65
Z-bar=ΣZ_k/K=	-0.44

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	59
ΣS_k	-10

$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	13.33	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.272**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -0.62	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
207.67	**p** **0.266**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.09		0.08
0.050	-0.07	**-0.04**	0.05
0.100	-0.06		0.02
0.200	-0.05		0.00

Site #46

Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	79.4	63.5	70.2	78.6	81.1	71.6	57.7	51.4	64.2	67.7	73.6	60.9
b	**WY2006**	60.8	59.8	51.9	63.0	59.6	73.6	62.4	56.3	53.3	62.0	54.1	64.8
c	**WY2007**	55.9	66.9	59.0	62.5	65.7		54.8	56.2	35.0	41.3	65.5	66.1
d	**WY2008**	52.4	61.0				71.7	75.2	48.7	34.8	46.5	53.1	45.6
e	**WY2009**	42.9	66.4	51.6		62.5			46.3	38.9	56.0	59.8	47.7
f	**WY2010**	59.5	62.7	68.7		61.4			47.4			61.3	
	n	6	6	5	3	5	3	4	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1	-1	-1	-1	1	1	1	-1	-1	-1	1
c-a	-1	1	-1	-1	-1		-1	1	-1	-1	-1	1
d-a	-1	-1				1	1	-1	-1	-1	-1	-1
e-a	-1	1	-1		-1			-1	-1	-1	-1	-1
f-a	-1	-1	-1		-1			-1			-1	
c-b	-1	1	1	-1	1		-1	-1	-1	-1	1	1
d-b	-1	1				-1	1	-1	-1	-1	-1	-1
e-b	-1	1	-1		1			-1	-1	-1	1	-1
f-b	-1	1	1		1			-1			1	
d-c	-1	-1					1	-1	-1	1	-1	-1
e-c	-1	-1	-1		-1			-1	1	1	-1	-1
f-c	1	-1	1		-1			-1			-1	
e-d	-1	1						-1	1	1	1	1
f-d	1	1						-1			1	
f-e	1	-1	1		-1			1			1	
S_k	-9	1	-2	-3	-4	1	2	-9	-6	-4	-3	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	3.67	16.67	3.67	8.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-1.69	0.21	-0.49	-1.57	-0.98	0.52	0.68	-1.69	-1.47	-0.98	-0.56	-0.49
Z^2_k	2.86	0.04	0.24	2.45	0.96	0.27	0.46	2.86	2.16	0.96	0.32	0.24

ΣZ_k= -8.51

ΣZ^2_k= 13.83

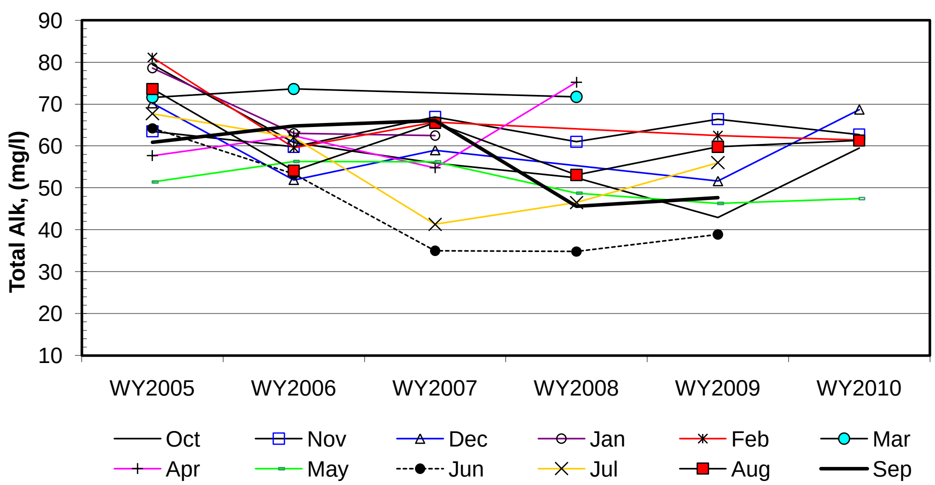
Z-bar=ΣZ_k/K= -0.71

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 59

ΣS_k -38

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	7.79	@α=5% $\chi^2_{(K-1)}$=	19.68	Test for station homogeneity
p	**0.732**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -2.57	@α/2=2.5% Z=	1.96	H_0 (No trend) REJECT
207.67	**p** **0.005**			H_A (± trend) ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.91		-0.17
0.050	-3.49	**-1.44**	-0.50
0.100	-3.31		-0.76
0.200	-2.85		-0.95

-2.4%

Site **#46** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	11.9	9.0	9.7	12.0	14.3	10.1	19.5	5.7	10.5	10.8	13.9	9.2
b	**WY2006**	9.5	11.5	9.7	14.3	12.9	19.3	15.6	8.9	8.9	11.8	7.3	10.9
c	**WY2007**	8.0	10.8	11.2	11.7	13.3		10.6	7.6	3.5	5.3	11.6	12.0
d	**WY2008**	10.0	8.2				15.6	16.8	7.7	4.8	7.9	7.7	5.9
e	**WY2009**	6.3	12.2	12.0		13.3			7.5	6.0	11.8	13.7	7.2
f	**WY2010**	11.6	13.0	14.1		15.1			7.8			12.2	
	n	6	6	5	3	5	3	4	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	3	5	5	5	5	3	5	5
t_2	0	0	0	0	1	0	0	0	0	1	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1	-1	1	-1	1	-1	1	-1	1	-1	1
c-a	-1	1	1	-1	-1		-1	1	-1	-1	-1	1
d-a	-1	-1				1	-1	1	-1	-1	-1	-1
e-a	-1	1	1		-1			1	-1	1	-1	-1
f-a	-1	1	1		1			1			-1	
c-b	-1	-1	1	-1	1		-1	-1	-1	-1	1	1
d-b	1	-1				-1	1	-1	-1	-1	1	-1
e-b	-1	1	1		1			-1	-1	0	1	-1
f-b	1	1	1		1			-1			1	
d-c	1	-1					1	1	1	1	-1	-1
e-c	-1	1	1		0			-1	1	1	1	-1
f-c	1	1	1		1			1			1	
e-d	-1	1						-1	1	1	1	1
f-d	1	1						1			1	
f-e	1	1	1		1			1			-1	
S_k	-3	7	8	-1	3	1	-2	3	-4	1	1	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	3.67	15.67	3.67	8.67	28.33	16.67	15.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.56	1.45	1.96	-0.52	0.76	0.52	-0.68	0.56	-0.98	0.25	0.19	-0.49
Z^2_k	0.32	2.10	3.84	0.27	0.57	0.27	0.46	0.32	0.96	0.06	0.04	0.24

ΣZ_k= 2.46

ΣZ^2_k= 9.46

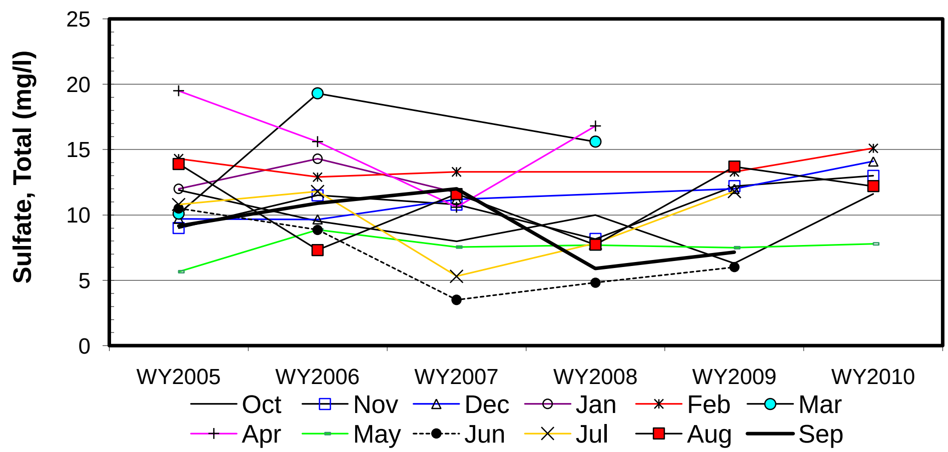
Z-bar=$\Sigma Z_k/K$= 0.20

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 59

ΣS_k 12

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	8.95	@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.626**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 205.67	Z_{calc} 0.77	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
	p **0.778**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.42		0.65
0.050	-0.20	**0.18**	0.50
0.100	-0.05		0.41
0.200	0.00		0.31

Site #46

Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	2.9	2.4	2.0	1.4	1.4	2.5	9.1	1.9	1.8	1.6	1.2	2.1
b	**WY2006**	2.5	1.8	1.3	2.1	1.4	1.6	1.5	1.1	1.2	1.1	2.0	1.5
c	**WY2007**	1.6	1.0	1.1	1.2	1.5		1.3	2.0	1.4	1.5	1.9	1.6
d	**WY2008**	2.4	3.2				2.5	3.0	2.2	1.6	1.6	2.4	3.8
e	**WY2009**	4.4	2.2	3.1		2.1			2.6	1.7	1.5	2.1	4.6
f	**WY2010**	2.3	2.2	1.8		2.2			1.6			1.8	
	n	6	6	5	3	5	3	4	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1	-1	1	1	-1	-1	-1	-1	-1	1	-1
c-a	-1	-1	-1	-1	1		-1	1	-1	-1	1	-1
d-a	-1	1				1	-1	1	-1	1	1	1
e-a	1	-1	1		1			1	-1	-1	1	1
f-a	-1	-1	-1		1			-1			1	
c-b	-1	-1	-1	-1	1		-1	1	1	1	-1	1
d-b	-1	1				1	1	1	1	1	1	1
e-b	1	1	1		1			1	1	1	1	1
f-b	-1	1	1		1			1			-1	
d-c	1	1					1	1	1	1	1	1
e-c	1	1	1		1			1	1	-1	1	1
f-c	1	1	1		1			-1			-1	
e-d	1	-1						1	1	-1	-1	1
f-d	-1	-1						-1			-1	
f-e	-1	-1	-1		1			-1			-1	
S_k	-3	-1	0	-1	10	1	-2	5	2	0	3	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33	16.67	3.67	16.67	3.67	8.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.56	-0.21	0.00	-0.52	2.45	0.52	-0.68	0.94	0.49	0.00	0.56	1.47
Z^2_k	0.32	0.04	0.00	0.27	6.00	0.27	0.46	0.88	0.24	0.00	0.32	2.16

ΣZ_k= 4.46

ΣZ^2_k= 10.97

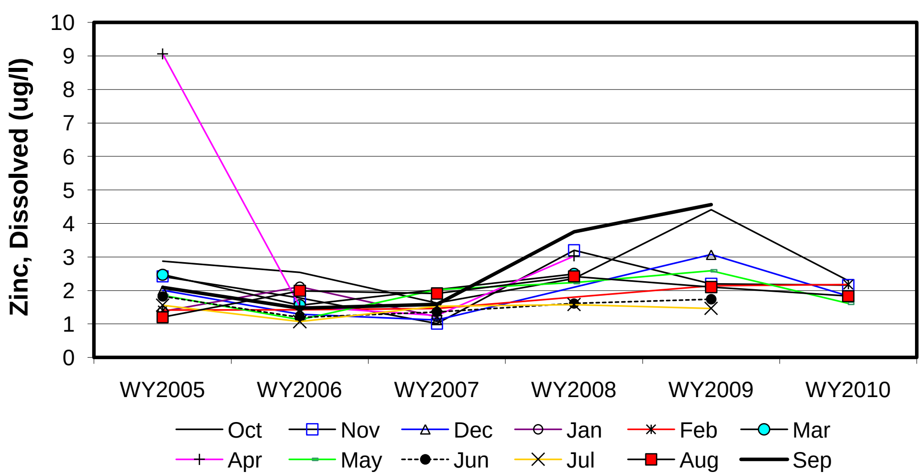
Z-bar=ΣZ_k/K= 0.37

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 59

ΣS_k 20

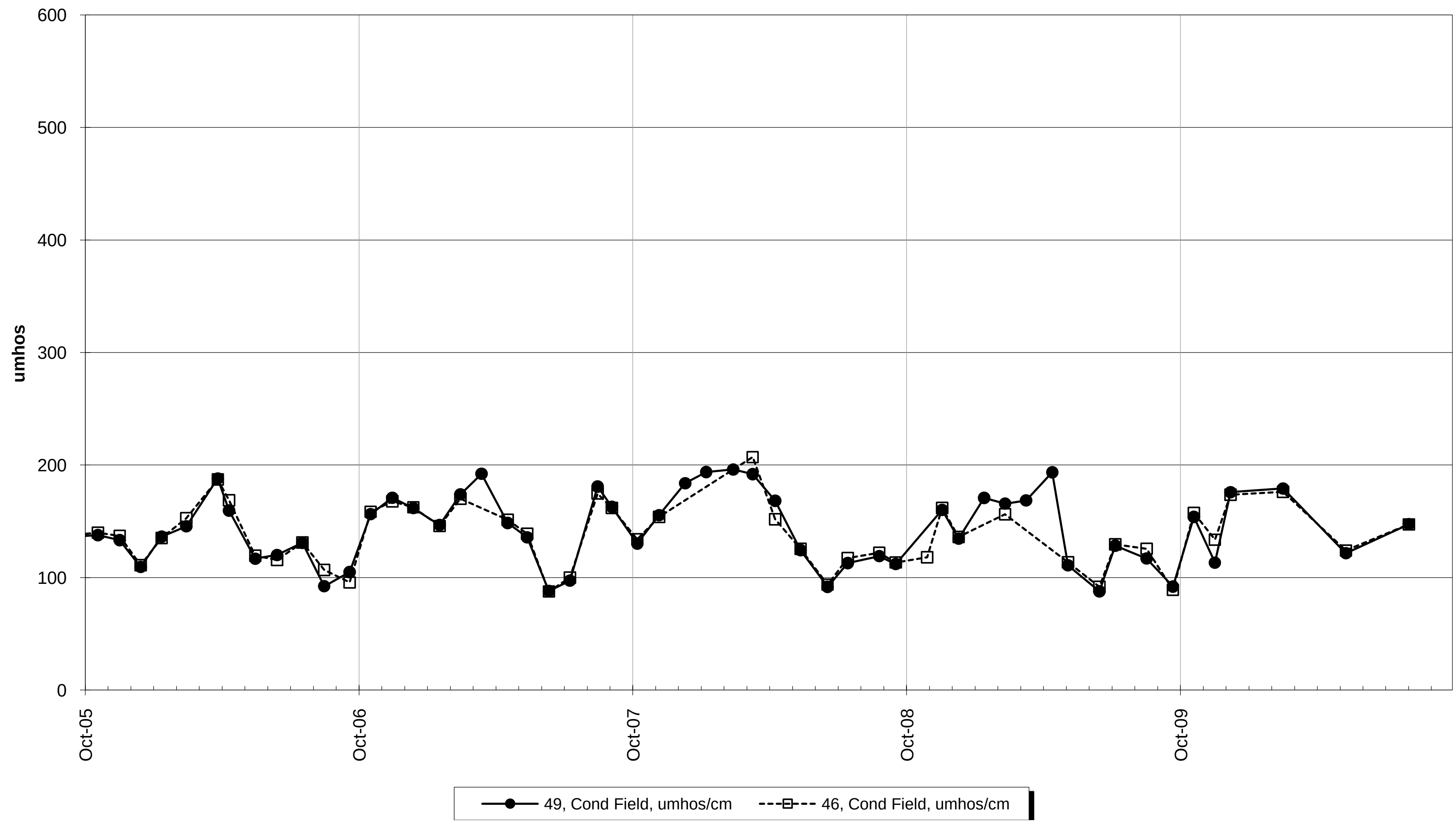
$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$= 9.31		@α=5% $\chi^2_{(K-1)}$= 19.68	Test for station homogeneity	
p	**0.593**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 1.32	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
207.67	**p** **0.906**		H_A (± trend)	REJECT



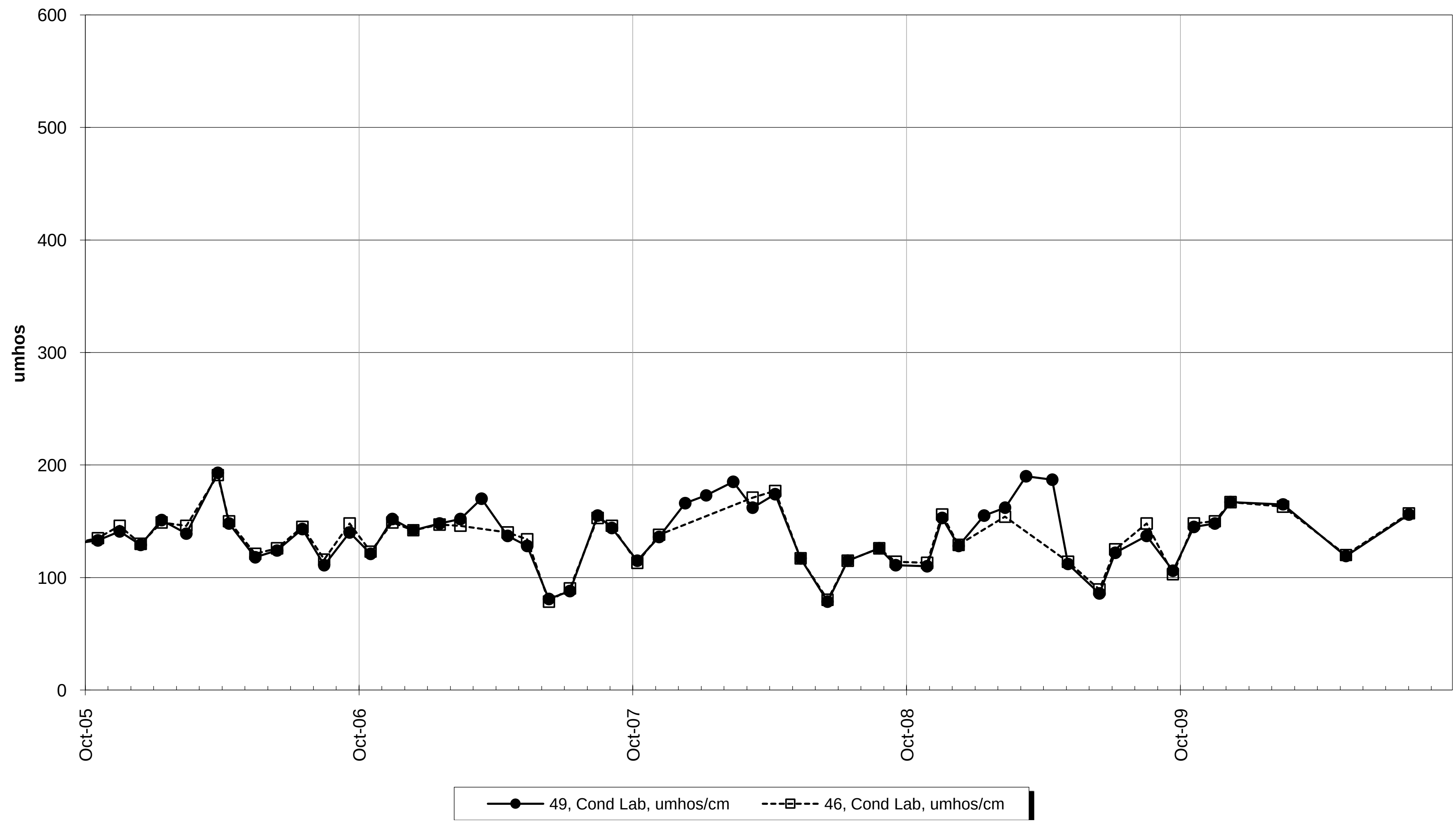
Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.04		0.21
0.050	-0.02	**0.10**	0.18
0.100	0.00		0.14
0.200	0.02		0.13

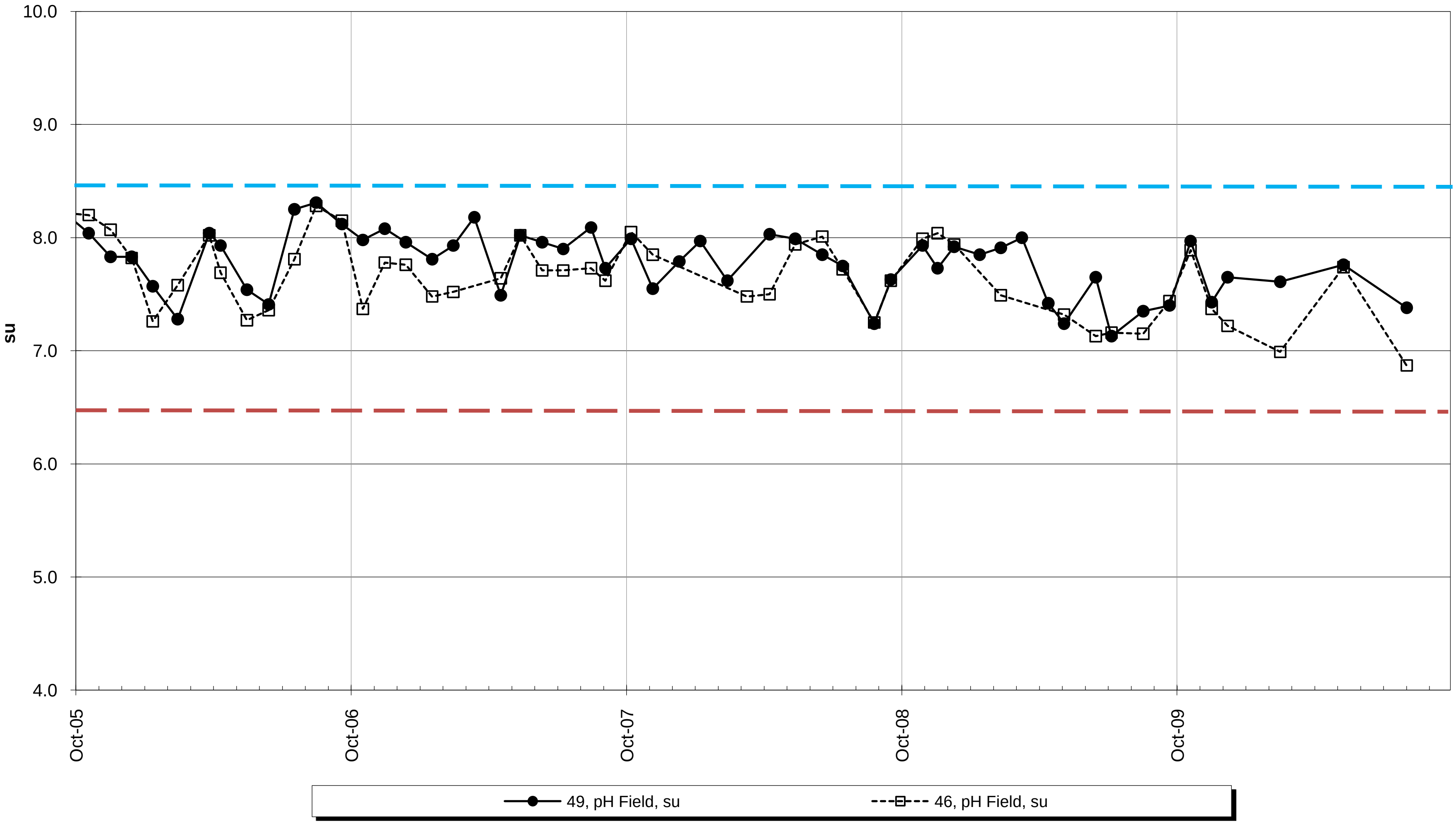
Site 49 vs Site 46 -Conductivity-Field



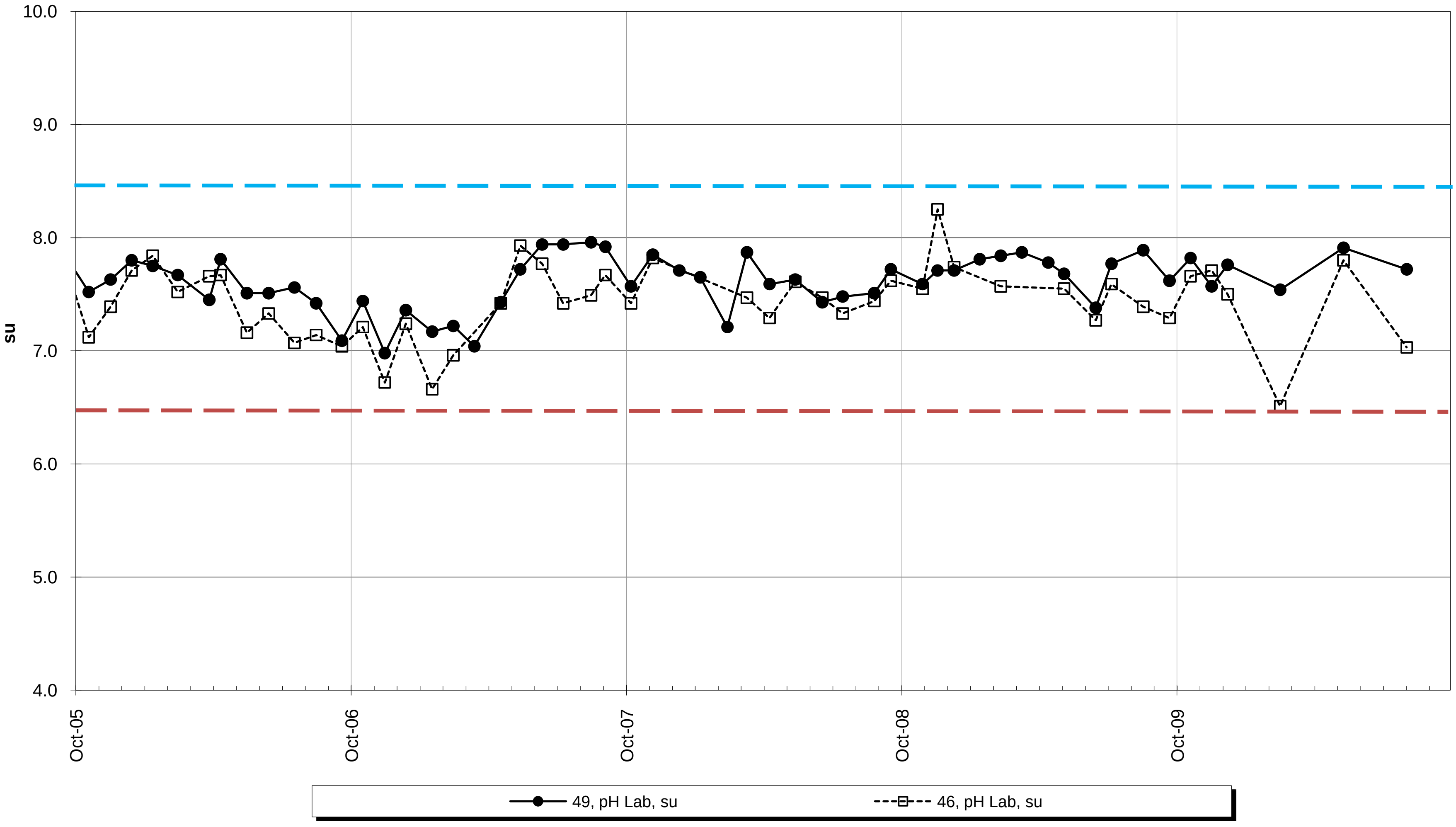
Site 49 vs Site 46 -Conductivity



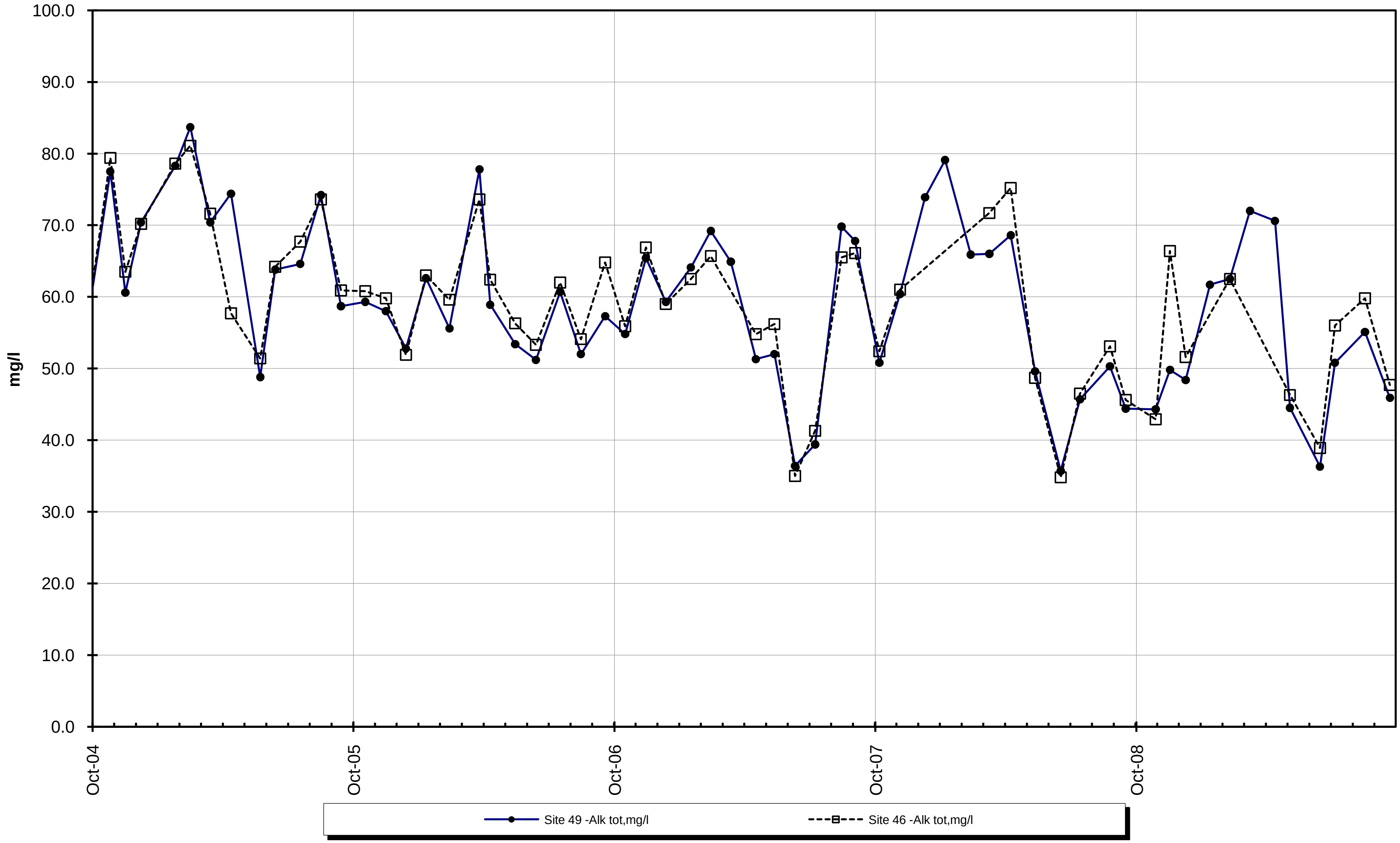
Site 49 vs Site 46 -Field pH



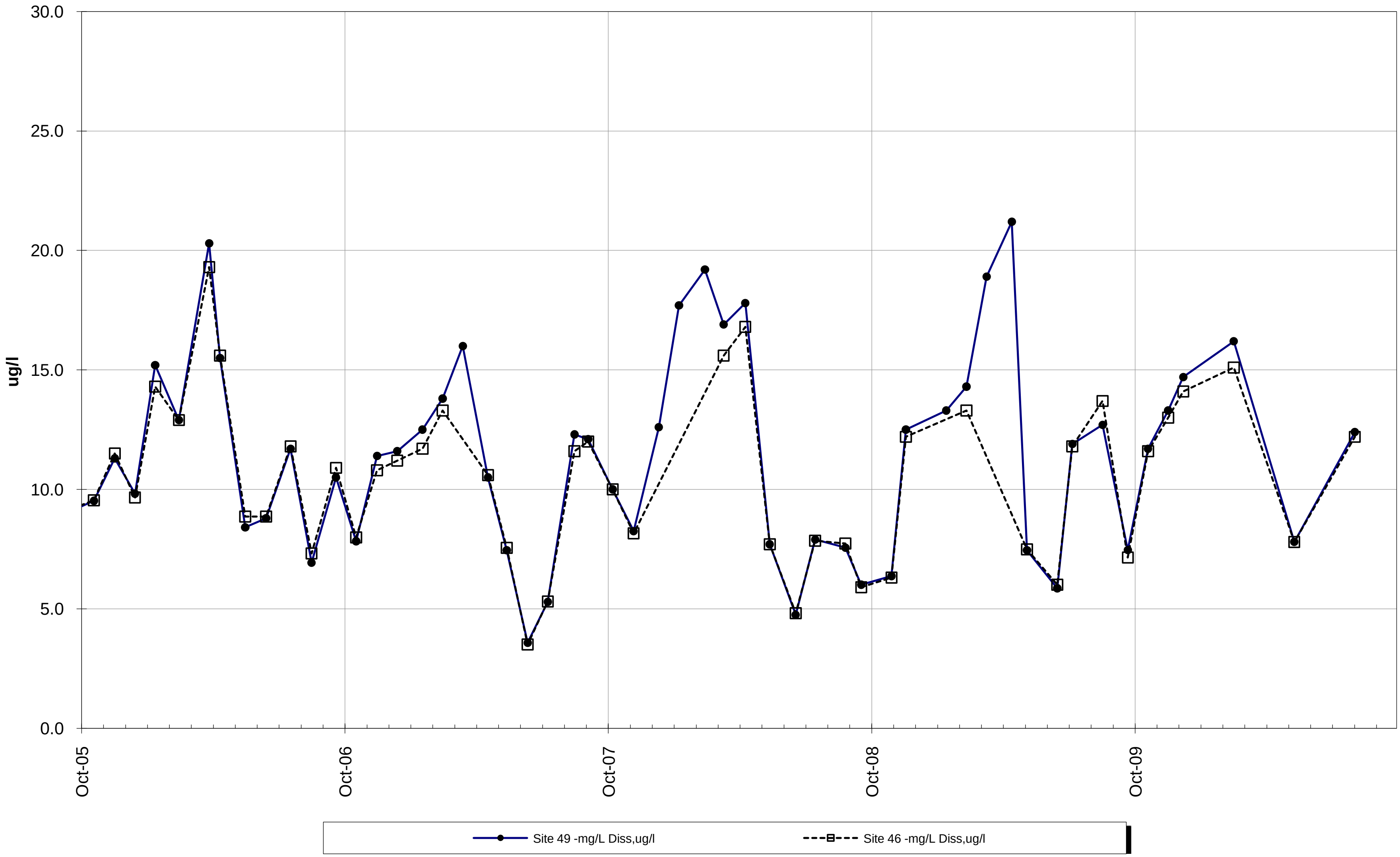
Site 49 vs Site 46 -Lab pH

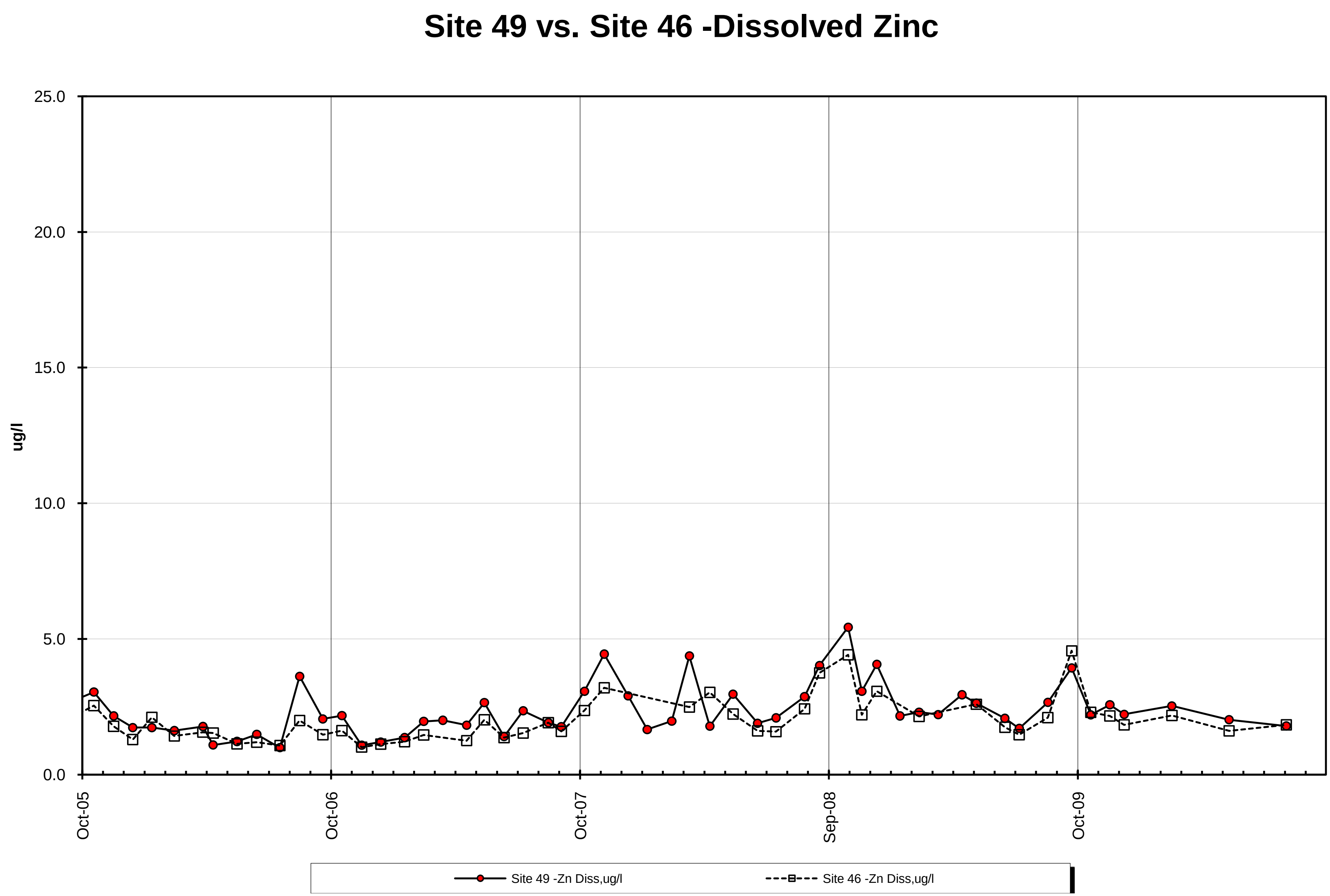


Site 49 vs. Site 46 -Total Alkalinity



Site 49 vs. Site 46 -Total Sulfate





Site 49 vs. Site 46 -Dissolved Zinc
25.0
20.0
15.0
10.0
5.0
0.0
ug/l
Oct-05
Oct-06
Oct-07
Sep-08
Oct-09
Site 49 -Zn Diss,ug/l
Site 46 -Zn Diss,ug/l

Wilcoxon-signed-ranks test

Exact Form

Variable: **Specific Conductance, Lab (uS/cm)**

	X	**Y**			
Site	#49	#46	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	145.0	148.0	-3.0	3.0	-5
Nov	148.0	150.0	-2.0	2.0	-3.5
Dec	167.0	167.0	0.0		
Jan					
Feb	165.0	163.0	2.0	2.0	3.5
Mar					
Apr					
May	119.0	120.0	-1.0	1.0	-1.5
Jun					
Jul					
Aug	156.0	157.0	-1.0	1.0	-1.5
Sep					
Median	152.0	153.5	-1.0	2.0	

n	**m**
6	5

N= 5

$\Sigma R =$ -8

α
5.0%
W'α,n
#N/A

$W^{+}=$
3.5
p-test
0.156

H_0	median [D]=0	ACCEPT
H_1	median [D]<0	

Wilcoxon-signed-ranks test

Exact Form

Variable: **pH, Lab, Standard Units**

	X	**Y**	Differences		
Site	#49	#46			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	7.82	7.66	0.16	0.16	3
Nov	7.57	7.71	-0.14	0.14	-2
Dec	7.76	7.50	0.26	0.26	4
Jan					
Feb	7.54	6.51	1.03	1.03	6
Mar					
Apr					
May	7.91	7.80	0.11	0.11	1
Jun					
Jul					
Aug	7.72	7.03	0.69	0.69	5
Sep					
Median	7.74	7.58	0.21	0.21	

n	**m**
6	6

N= 6

ΣR= 17

α
95.0%
W'$_{\alpha,n}$
17

W^{+}=
19
p-test
0.969

H_0	median [D]=0	**REJECT**
H_1	median [D]>0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **Total Alk, (mg/l)**

	X	**Y**			
Site	#49	#46	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	58.4	59.5	-1.1	1.1	-3.5
Nov	61.6	62.7	-1.1	1.1	-3.5
Dec	71.5	68.7	2.8	2.8	5
Jan					
Feb	56.9	61.4	-4.5	4.5	-6
Mar					
Apr					
May	46.6	47.4	-0.8	0.8	-2
Jun					
Jul					
Aug	61.1	61.3	-0.2	0.2	-1
Sep					
Median	59.8	61.4	-1.0	1.1	

n	**m**
6	6

N= 6

$\Sigma R =$ -11

α
95.0%
W'α,n
#N/A

$W^{+}=$
5
p-test
0.000

H_0	median [D]=0	ACCEPT
H_1	median [D]>0	

Wilcoxon-signed-ranks test
Exact Form

Variable: **Sulfate, Total (mg/l)**

	X	**Y**			
Site	#49	#46	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	11.7	11.6	0.1	0.1	1
Nov	13.3	13.0	0.3	0.3	3
Dec	14.7	14.1	0.6	0.6	4
Jan					
Feb	16.2	15.1	1.1	1.1	5
Mar					
Apr					
May	7.8	7.8	0.0		
Jun					
Jul					
Aug	12.4	12.2	0.2	0.2	2
Sep					
Median	12.9	12.6	0.3	0.3	

n	**m**
6	5

N= 5
ΣR= 15

α
5.0%
W'α,n
#N/A

W^+=
15
p-test
1.000

H_0	median [D]=0	ACCEPT
H_1	median [D]<0	

Wilcoxon-signed-ranks test

Exact Form

Variable: **Zinc, Dissolved (ug/l)**

	X	**Y**			
Site	#49	#46	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	2.20	2.29	-0.09	0.09	-2
Nov	2.57	2.16	0.41	0.41	5.5
Dec	2.22	1.83	0.39	0.39	4
Jan					
Feb	2.53	2.18	0.35	0.35	3
Mar					
Apr					
May	2.02	1.61	0.41	0.41	5.5
Jun					
Jul					
Aug	1.79	1.83	-0.04	0.04	-1
Sep					
Median	2.21	2.00	0.37	0.37	

n	**m**
6	6

N= 6

$\Sigma R =$ 15

α
5.0%
W'$_{\alpha,n}$
2

$W^{+}=$
18
p-test
0.953

H_0	median [D]=0	ACCEPT
H_1	median [D]<0	

INTERPRETIVE REPORT
SITE 57 "MONITORING WELL 23-00-03"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. No results exceeding these criteria have been identified as listed in the table below.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
No exceedances have been identified by HGCMC for the period of October 2009 through September 2010.					

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. Though values for dissolved cadmium, lead, and dissolved zinc had shown large variation in the past, the current water year's data continues the trend from WY2009 of these analytes leveling out. Also, as with the increase in chromium seen at the other sites (site 48, site 6, site 54, site 49, site 46, and site 13), chromium was seen to increase at this site. However, the increased values were similar to those recorded in WY 2006 and WY 2007. The dataset for total alkalinity shows a statistically significant (p<0.01) trend with a slope estimate of -4.88mg/L/yr or a -3.5%, similar to the value obtained in WY2009 of -4.17 mg/L/yr. Dissolved zinc has a statistically significant (p<0.01) trend with a slope estimate of -2.27 mg/L/yr or a -23.5%. Total sulfate was statistically significant with a decreasing slope of -1.61 mg/L/yr. Both laboratory conductivity and laboratory pH had increasing statistically significant trends,

Site 57-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.98	+	5	1.3
pH, Lab	6	0.99	+	0.06	0.8
Alkalinity, Total	6	<0.01	-	-4.88	-3.5
Sulfate, Total	6	0.04	-	-1.61	-3
Zinc, Dissolved	6	<0.01	-	-2.27	-23.5

(1): Number of years (2):Significance level

with estimated slopes of 5 μs/yr and 0.06 su/yr respectively. Given that Site 57 is an upgradient reference site, these trends are interpreted by HGCMC to be part of the natural variation that characterizes this site.

Table of Results for Water Year 2010

Site 57 "MW-23-00-03"

Sample Date/Parameter	10/20/2009	11/17/2009	Dec-09	Jan-10	Feb-10	Mar-10	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	5.9	4.0	NOT SCHEDULED FOR SAMPLING		Transition Period	NOT SCHEDULED FOR SAMPLING		5.6	NOT SCHEDULED FOR SAMPLING		15.1	NOT SCHEDULED FOR SAMPLING	5.8
Conductivity-Field(µmho)	440	423						431			475		436
Conductivity-Lab (µmho)	386	385 J						393			421		390
pH Lab (standard units)	7.69	7.55 J						7.57			7.44		7.56
pH Field (standard units)	7.55	7.34						7.47			7.18		7.41
Total Alkalinity (mg/L)	137.0	140.0 J						133.0			143.0		138.5
Total Sulfate (mg/L)	51.7	57.5						44.3 J			60.5 J		54.6
Hardness (mg/L)	201.0	207.0						193.0			217.0		204.0
Dissolved As (ug/L)	0.574	0.483						0.464			0.526		0.505
Dissolved Ba (ug/L)	27.3	28.9						28.4			30.9		28.7
Dissolved Cd (ug/L)	0.172	0.166						0.178			0.218		0.175
Dissolved Cr (ug/L)	1.700	0.508						3.920			4.590		2.810
Dissolved Cu (ug/L)	0.730	0.537						0.896			0.679		0.705
Dissolved Pb (ug/L)	0.22	0.17						0.23			0.38		0.23
Dissolved Ni (ug/L)	2.58	2.27						2.90			2.53		2.56
Dissolved Ag (ug/L)	<0.003	<0.003						<0.004			<0.004		0.002
Dissolved Zn (ug/L)	4.92	5.81 U						23.50			6.87		6.34
Dissolved Se (ug/L)	1.120 J	0.937						0.883			1.220		1.029
Dissolved Hg (ug/L)	0.000204 U	0.000162 J						0.000991			0.000277 U		0.000241

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

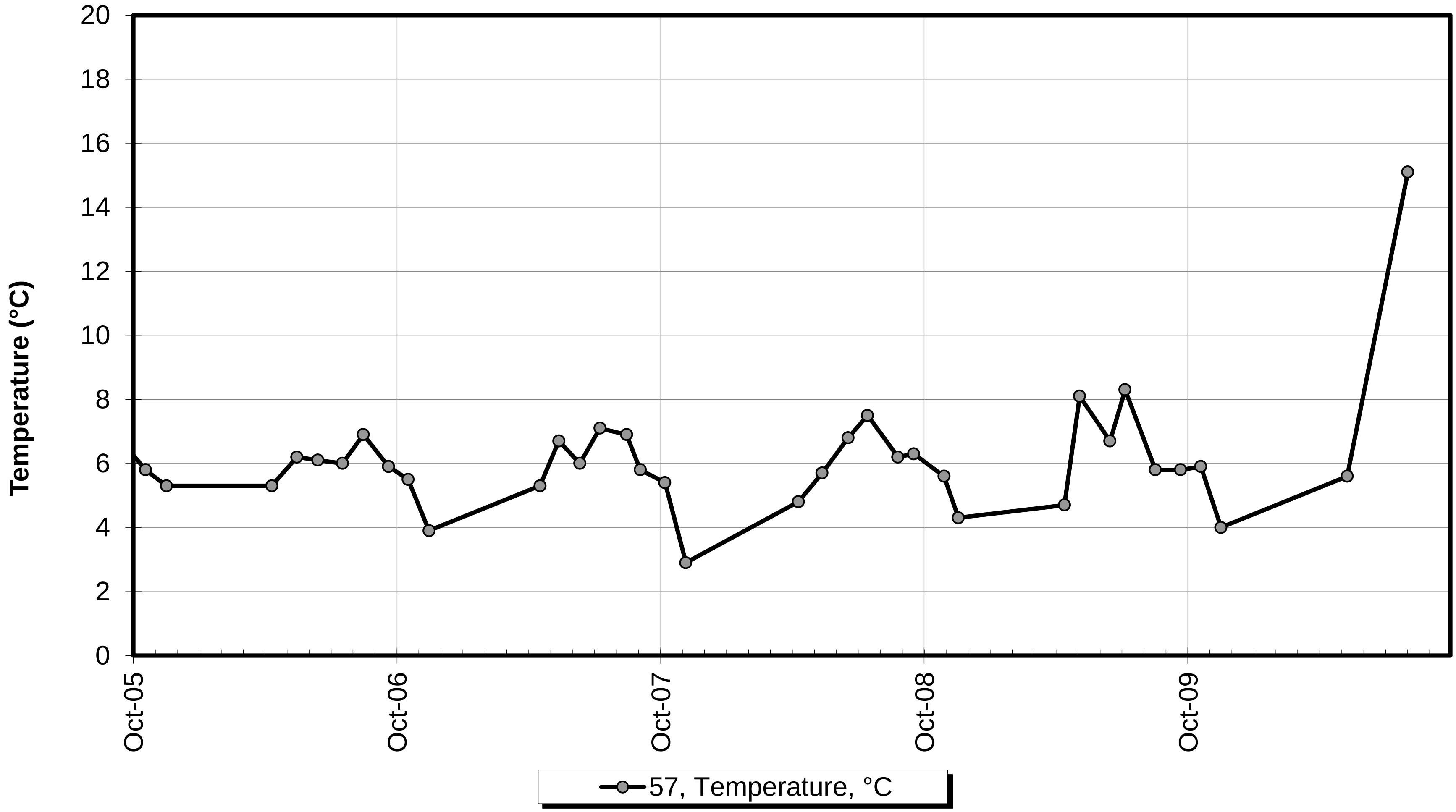
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

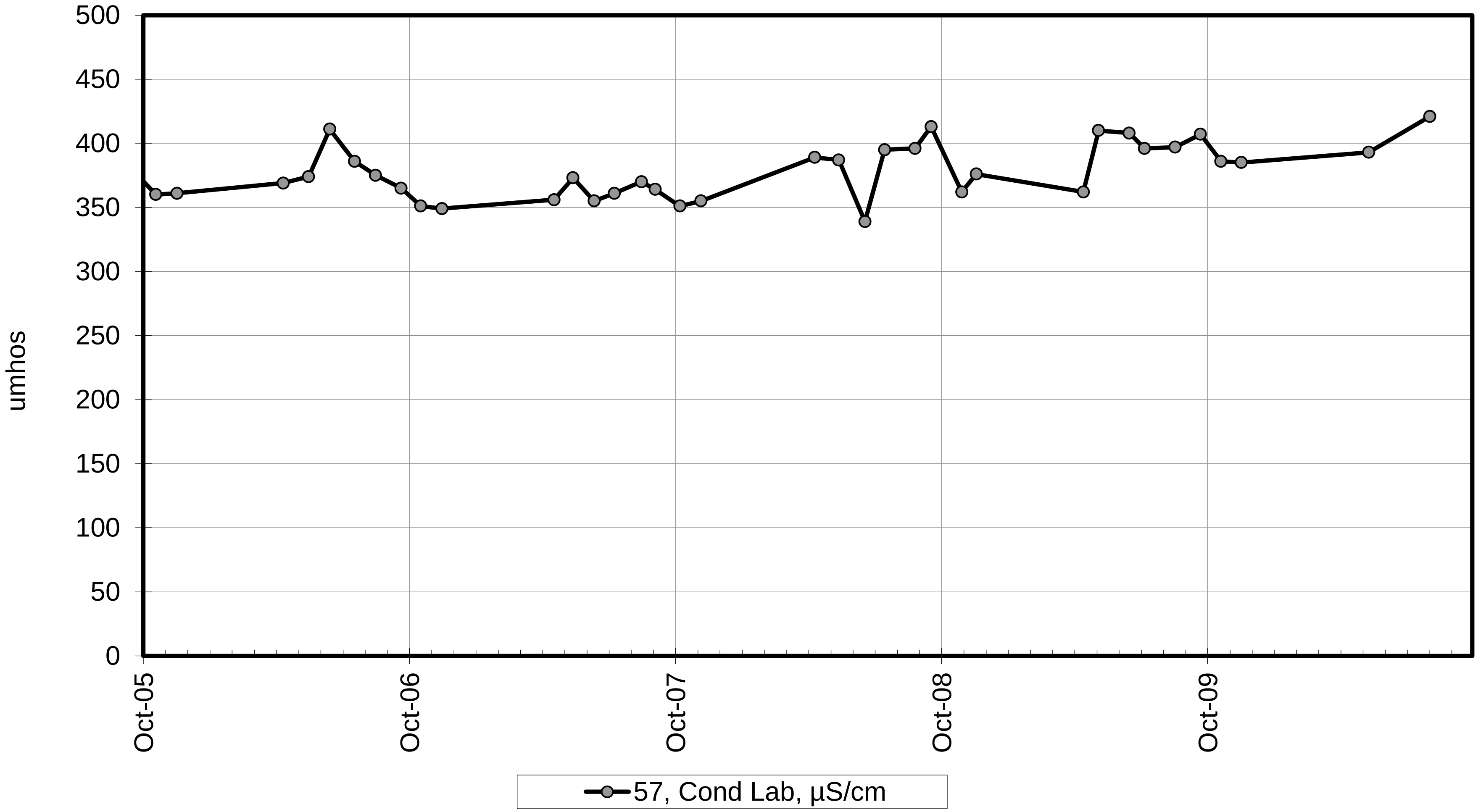
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
57	10/20/2009	12:00 AM				
			Hg diss, µg/l	0.000204	U	Field Blank Contamination
			Se diss, µg/l	1.12	J	Matrix Spike Recovery
57	11/17/2009	12:00 AM				
			Alk Tot,mg/l	140	J	Temperature Exceedance
			Cond, µs/cm	385	J	Temperature Exceedance
			Hg diss, µg/l	0.000162	J	Below Quantitative Range
			Zn diss, µg/l	5.81	U	Field Blank Contamination
			pH Lab, su	7.55	J	Hold Time Violation
57	5/11/2010	3:24 PM				
			SO4 Tot, mg/l	44.3	J	Sample Temperature
57	8/3/2010	2:05 PM				
			Hg diss, µg/l	0.000277	U	Field Blank Contamination
			SO4 Tot, mg/l	60.5	J	Sample Temperature

Qualifier	**Description**
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

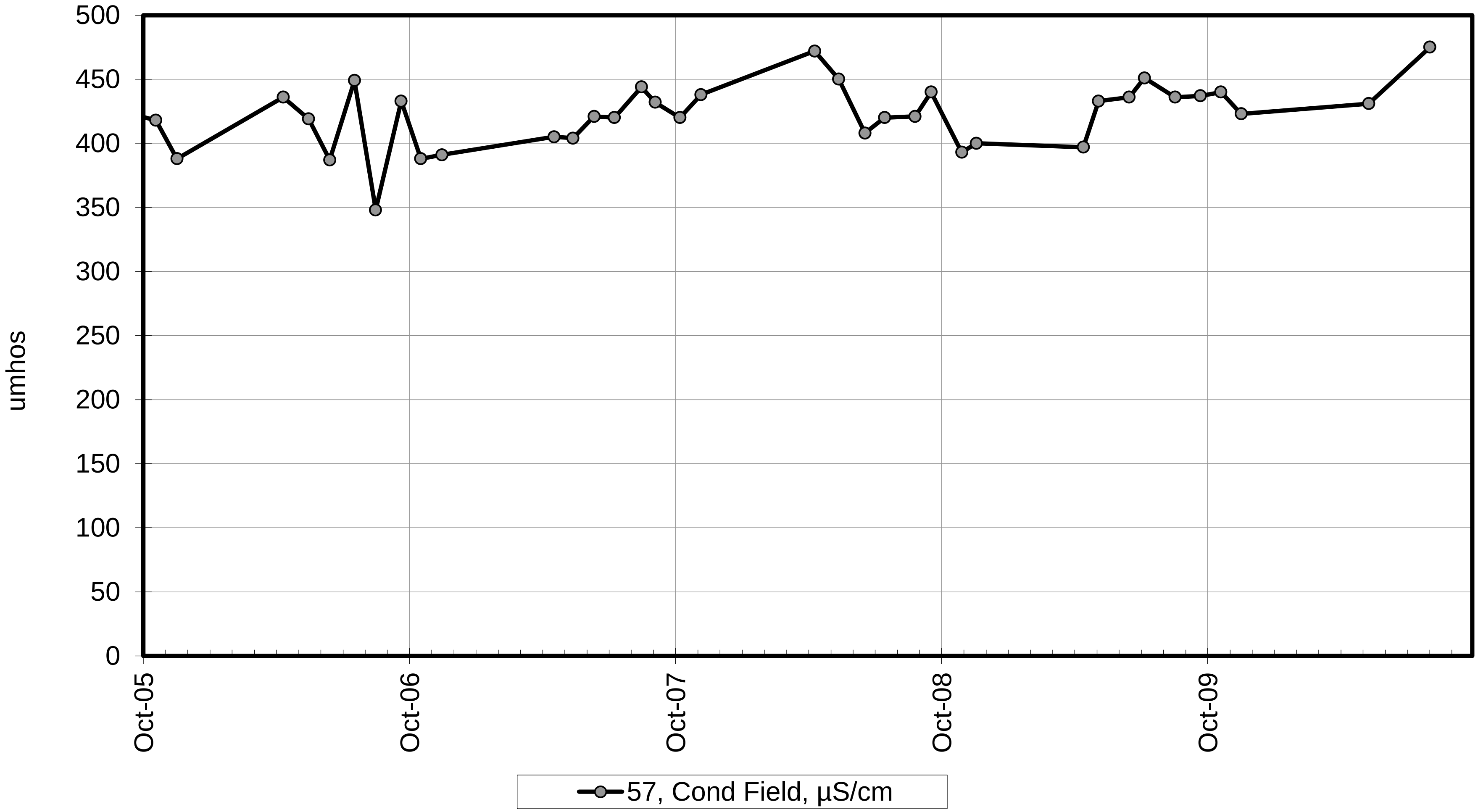
Site 57 -Water Temperature

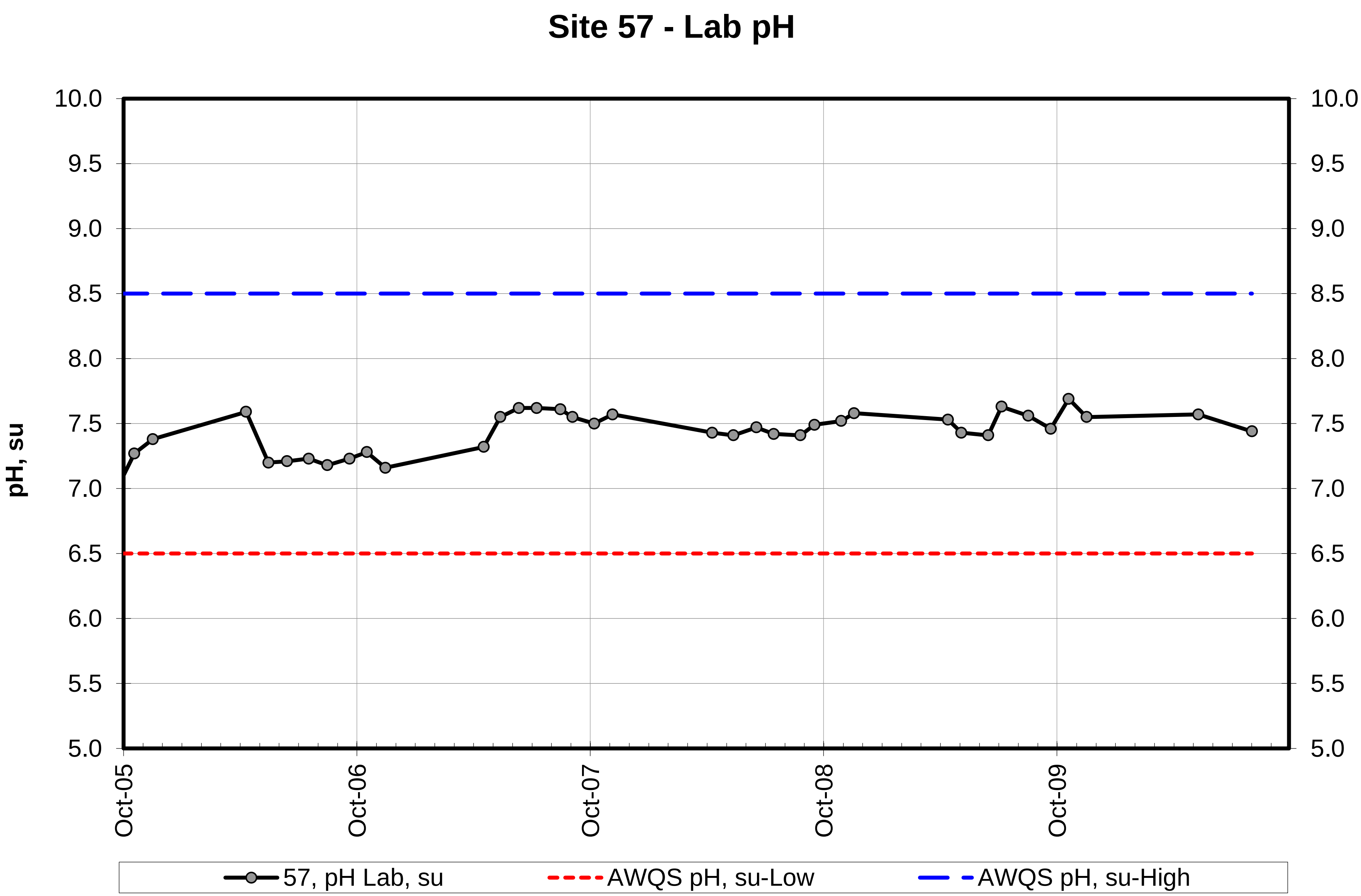


Site 57 - Conductivity-Lab

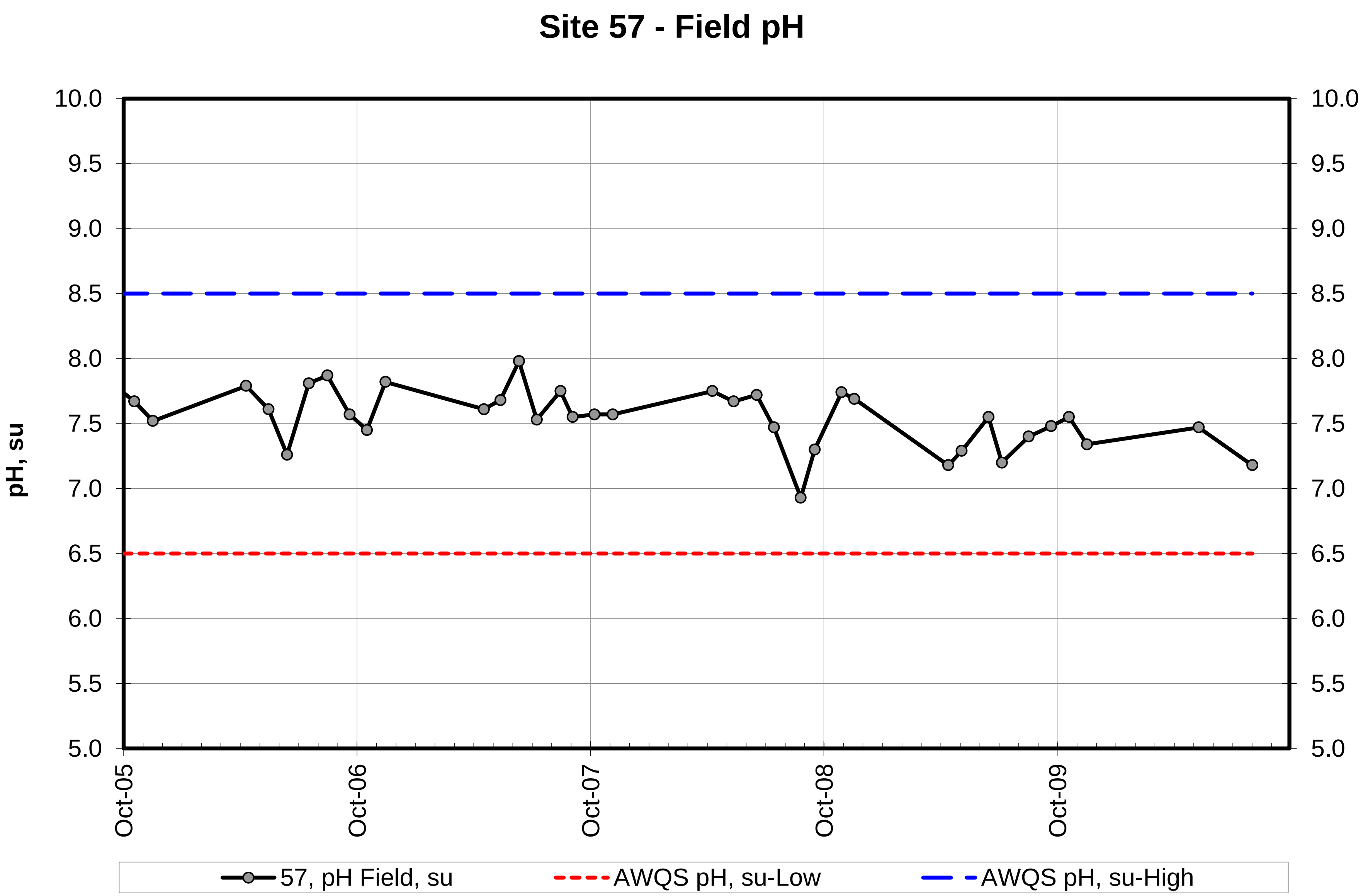


Site 57 - Conductivity-Field

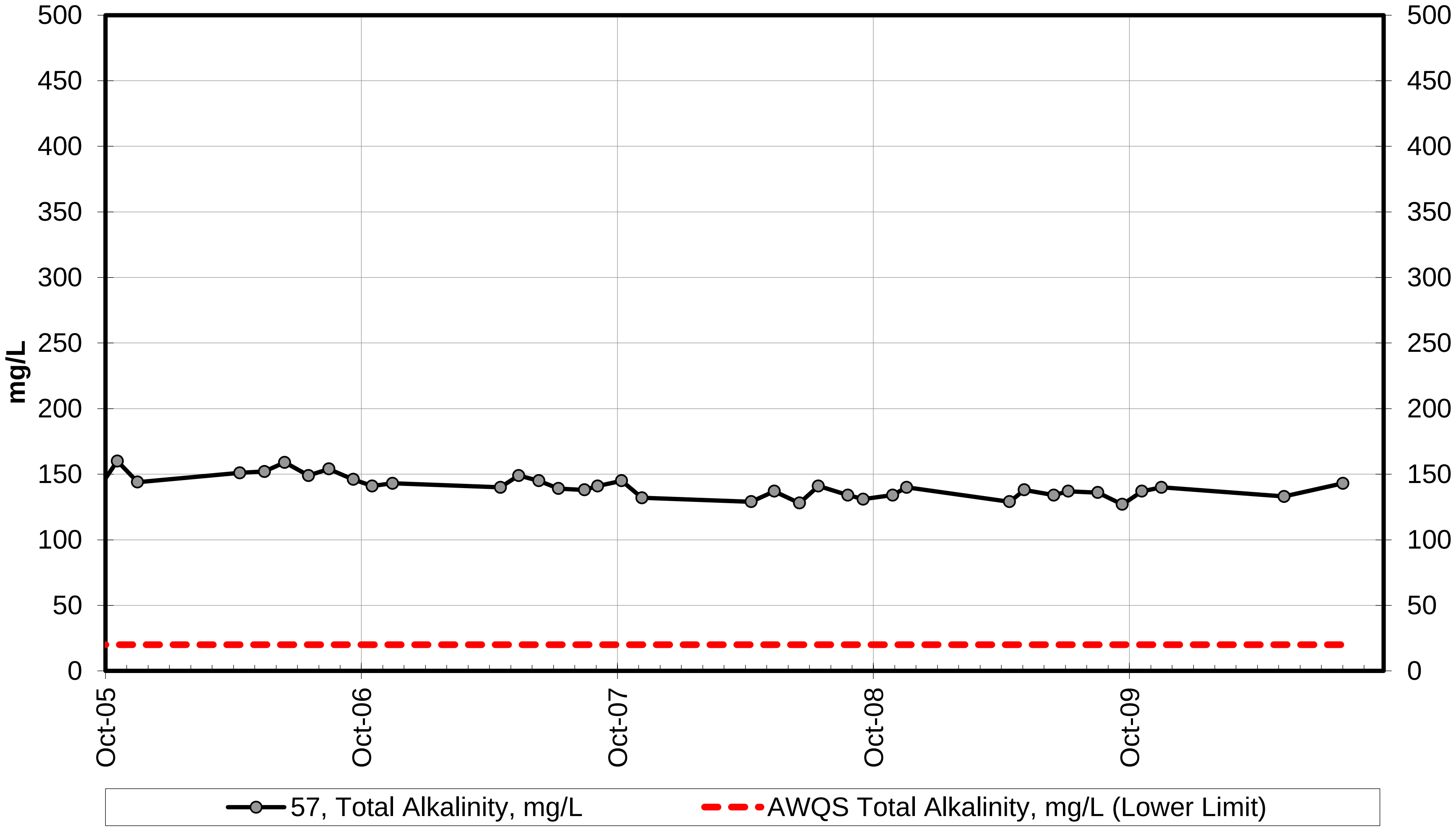




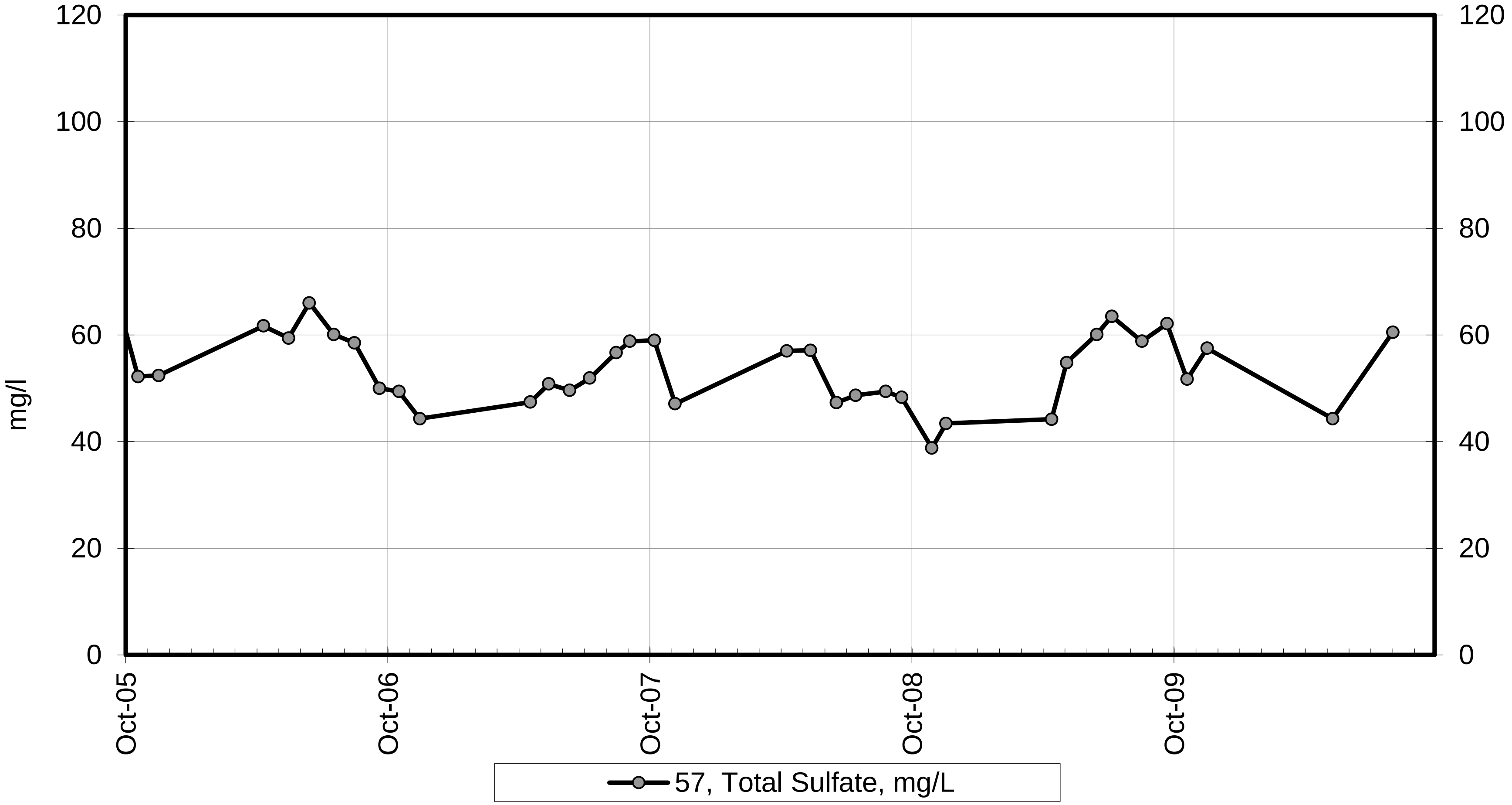
Site 57 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High


Site 57 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

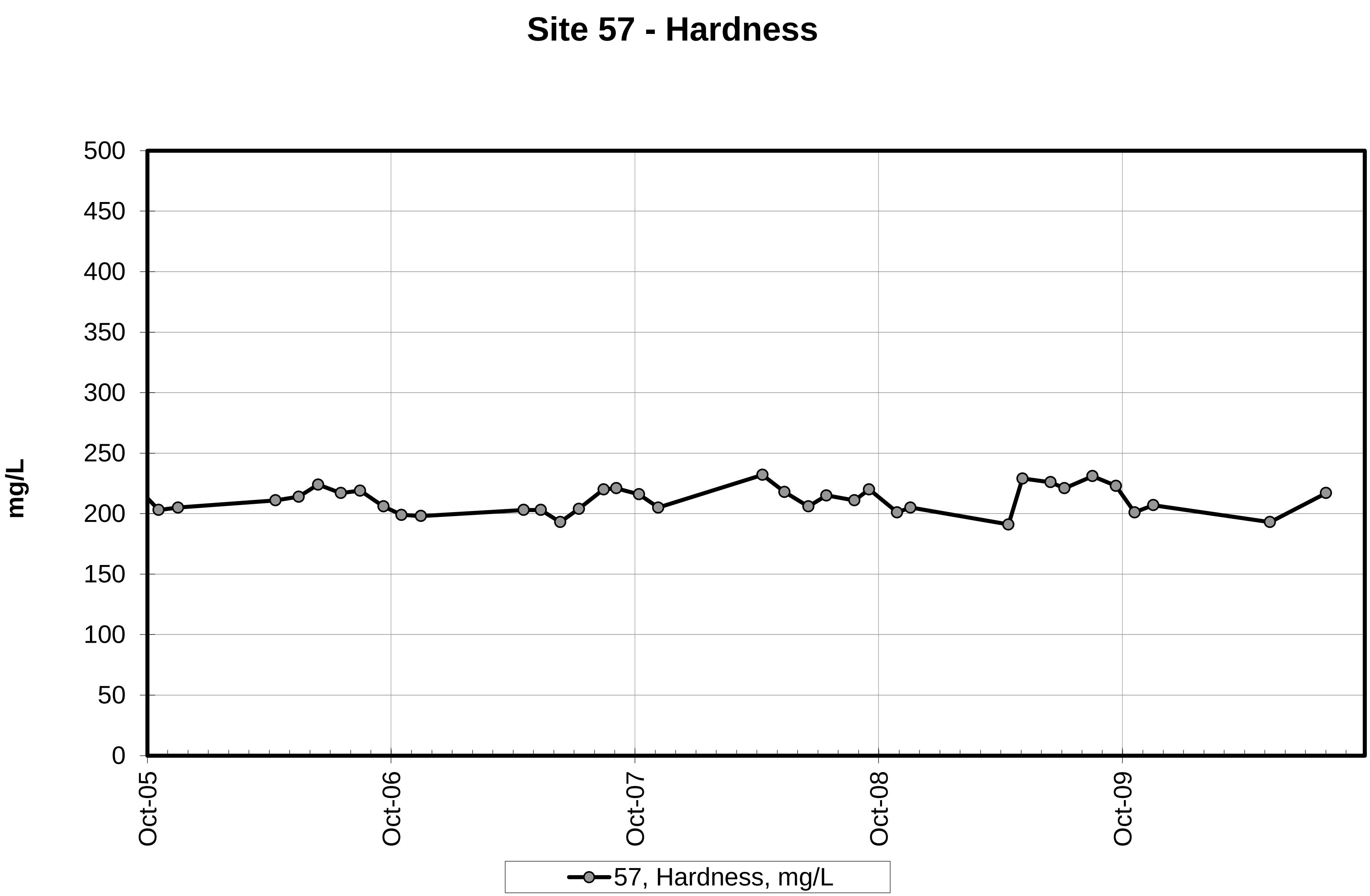
Site 57 - Total Alkalinity

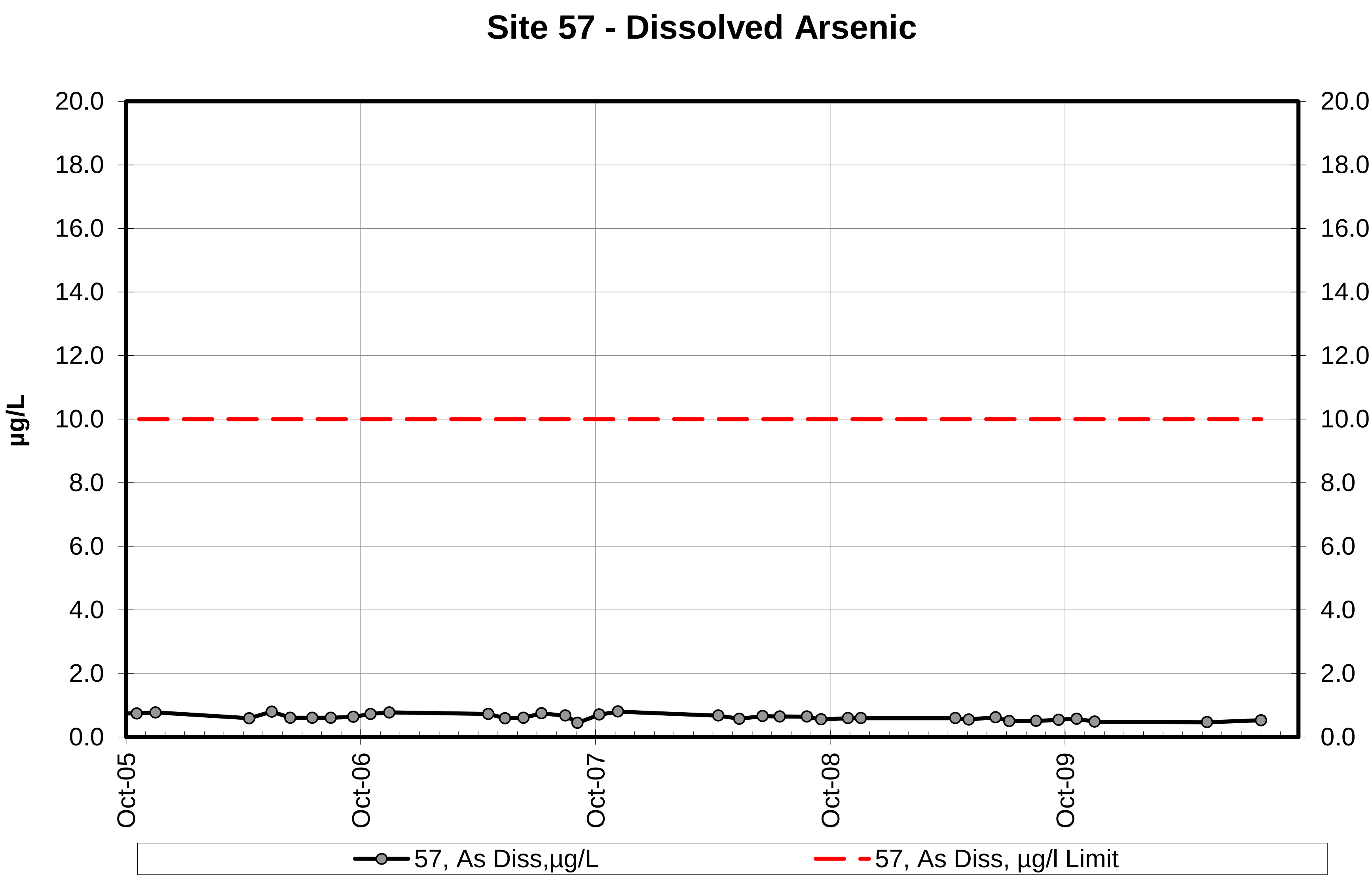


Site 57 - Total Sulfate



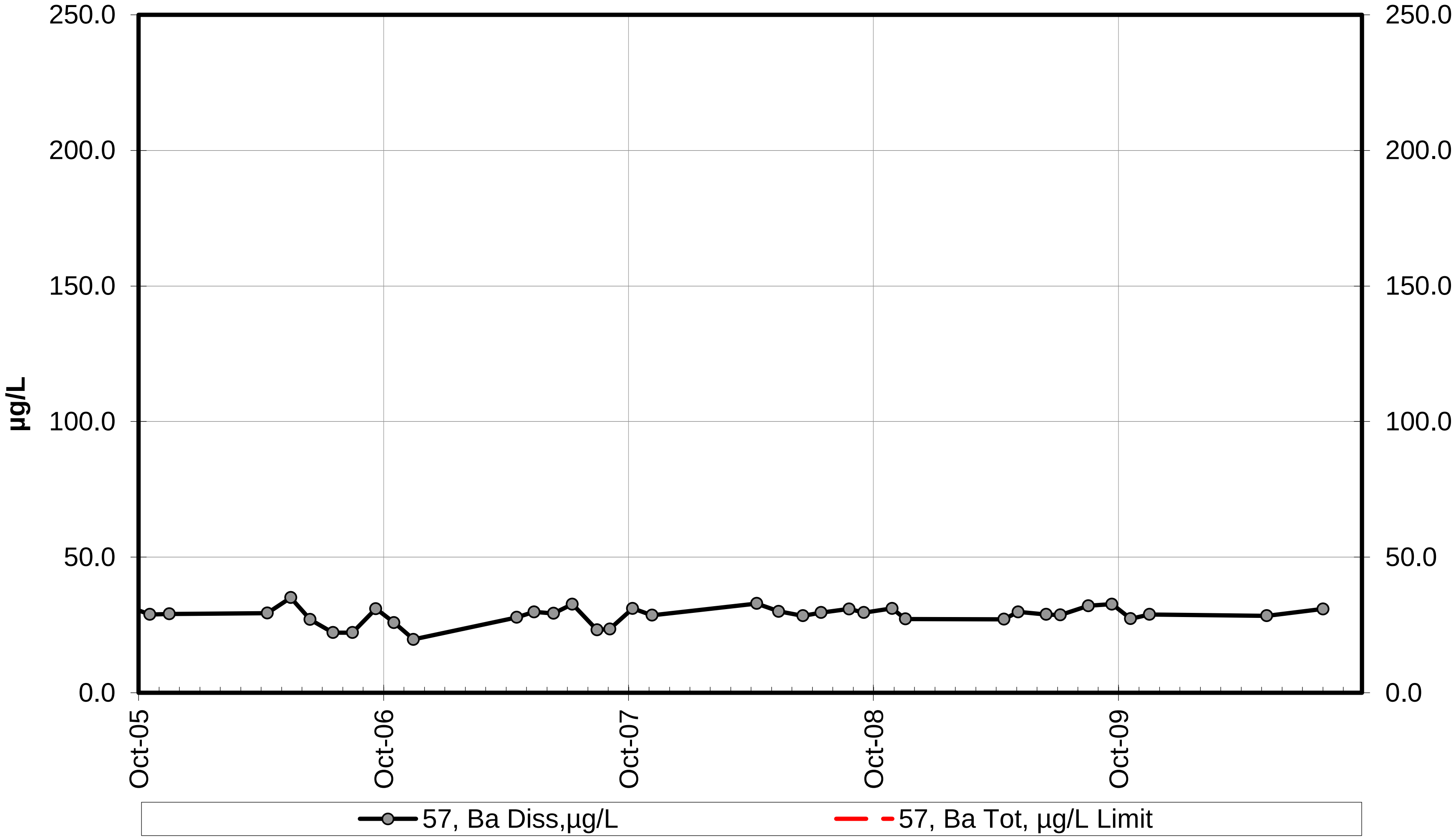
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.


Site 57 - Hardness
mg/L
500
450
400
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, Hardness, mg/L

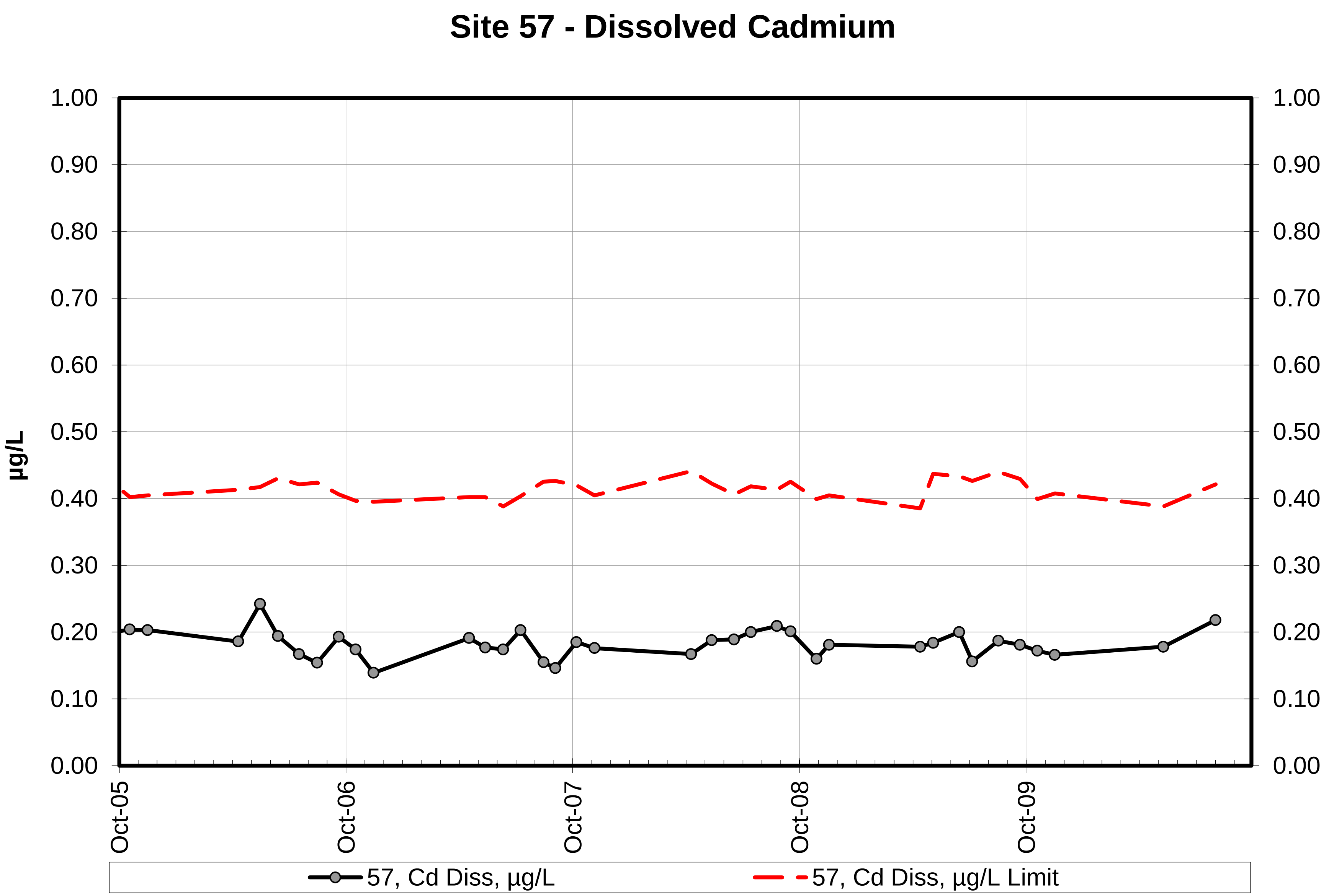


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

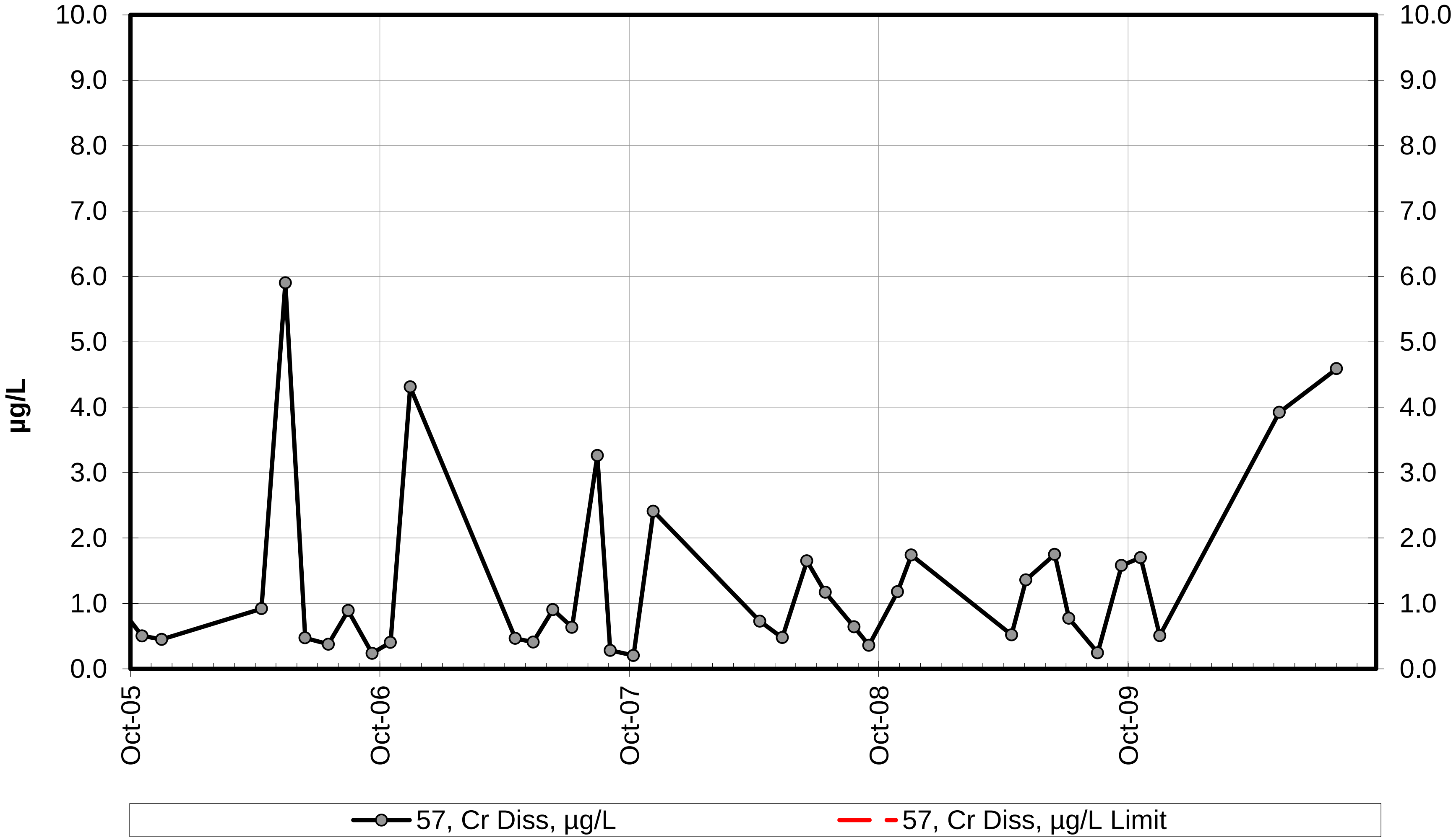
Site 57 - Dissolved Barium



Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

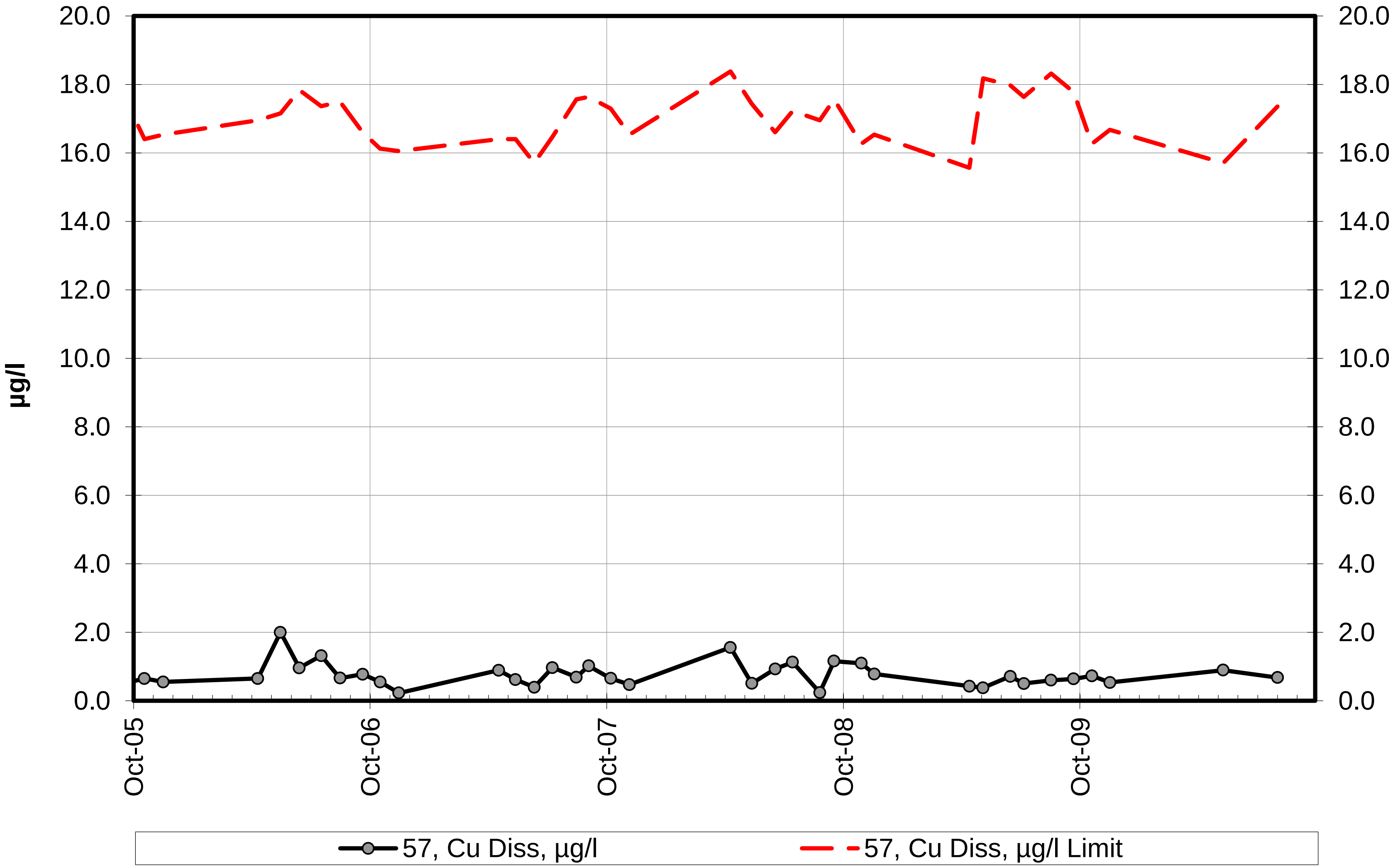

Site 57 - Dissolved Cadmium
µg/L
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, Cd Diss, µg/L
57, Cd Diss, µg/L Limit

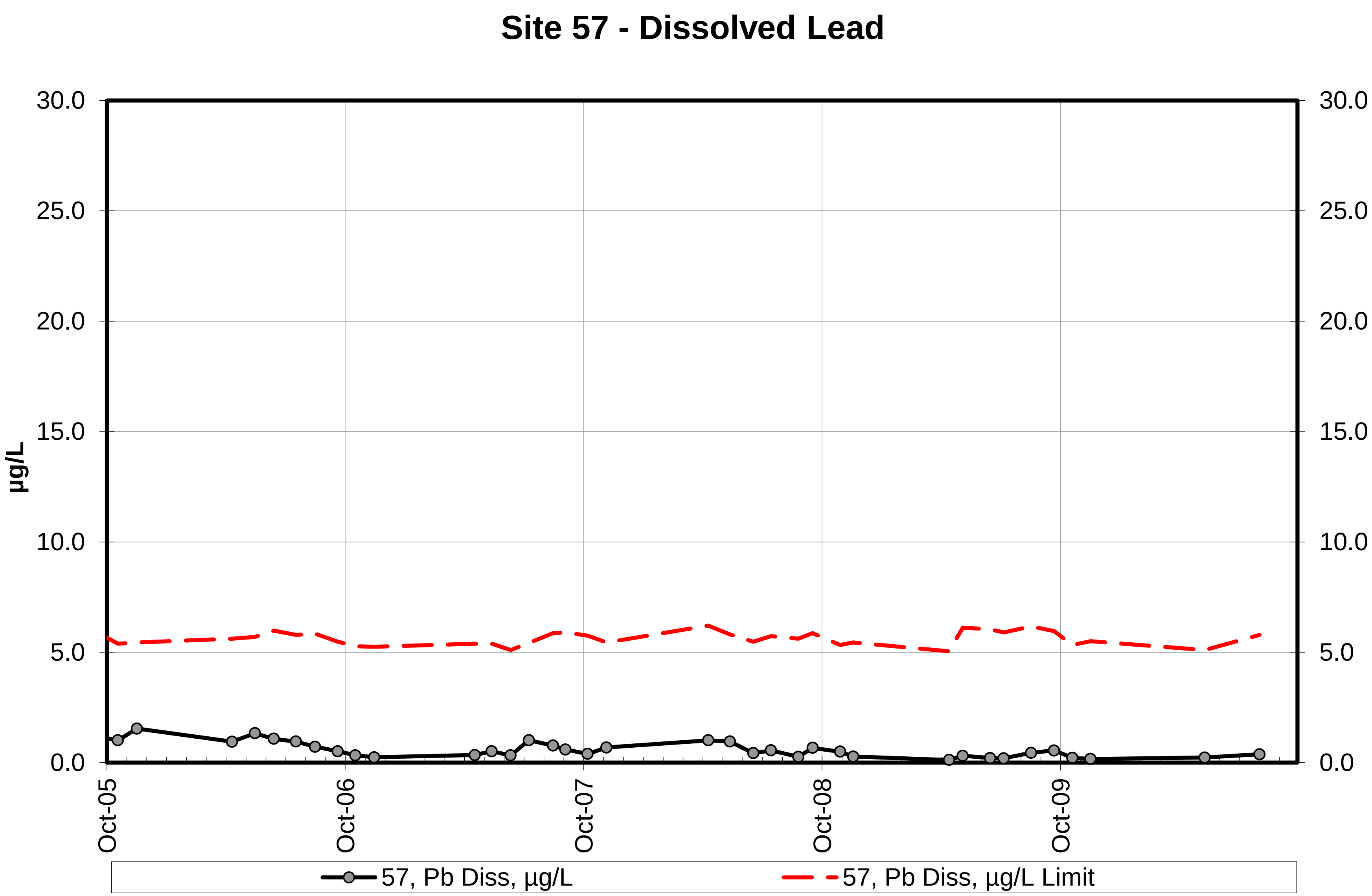
Site 57 - Dissolved Chromium

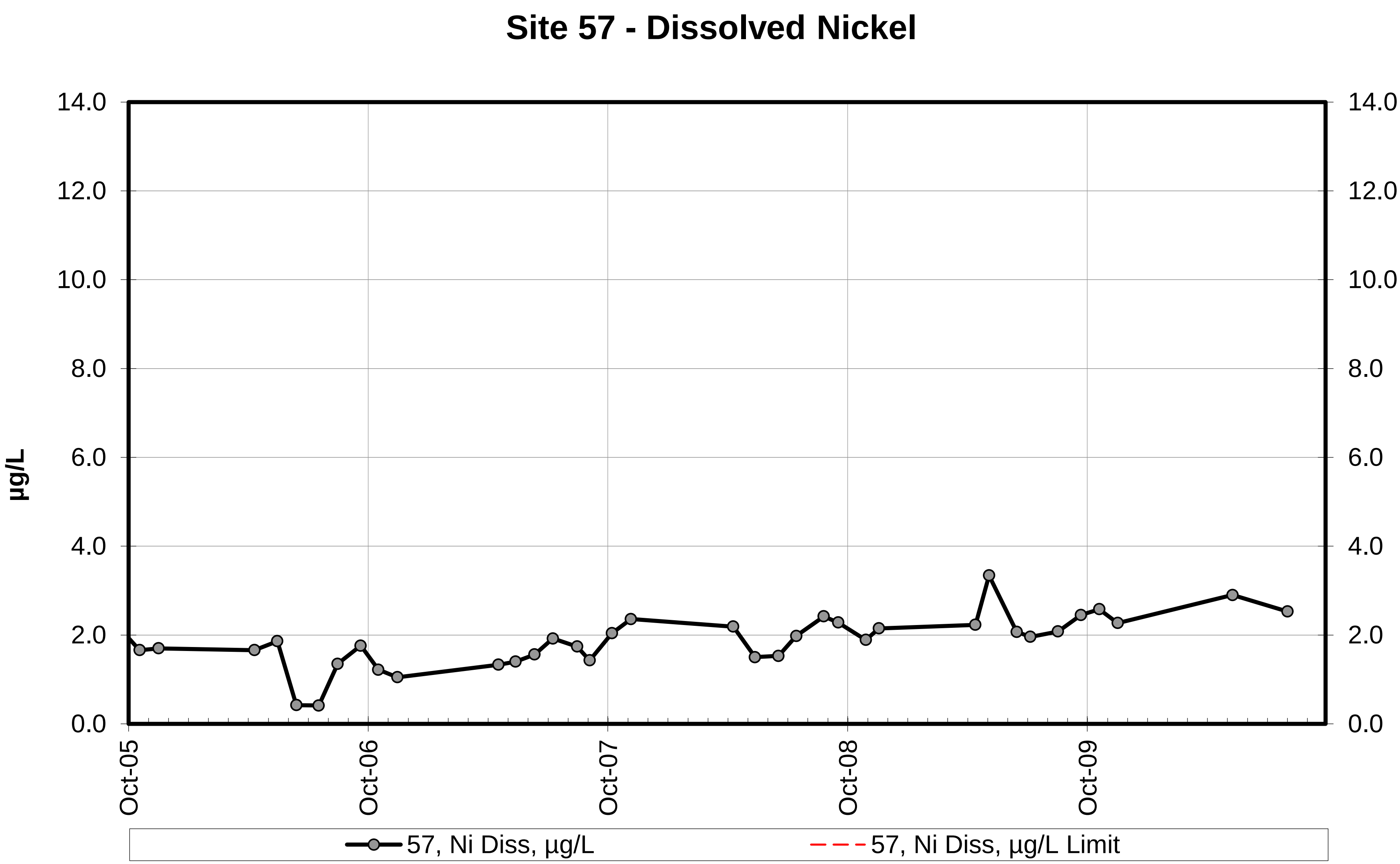


Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

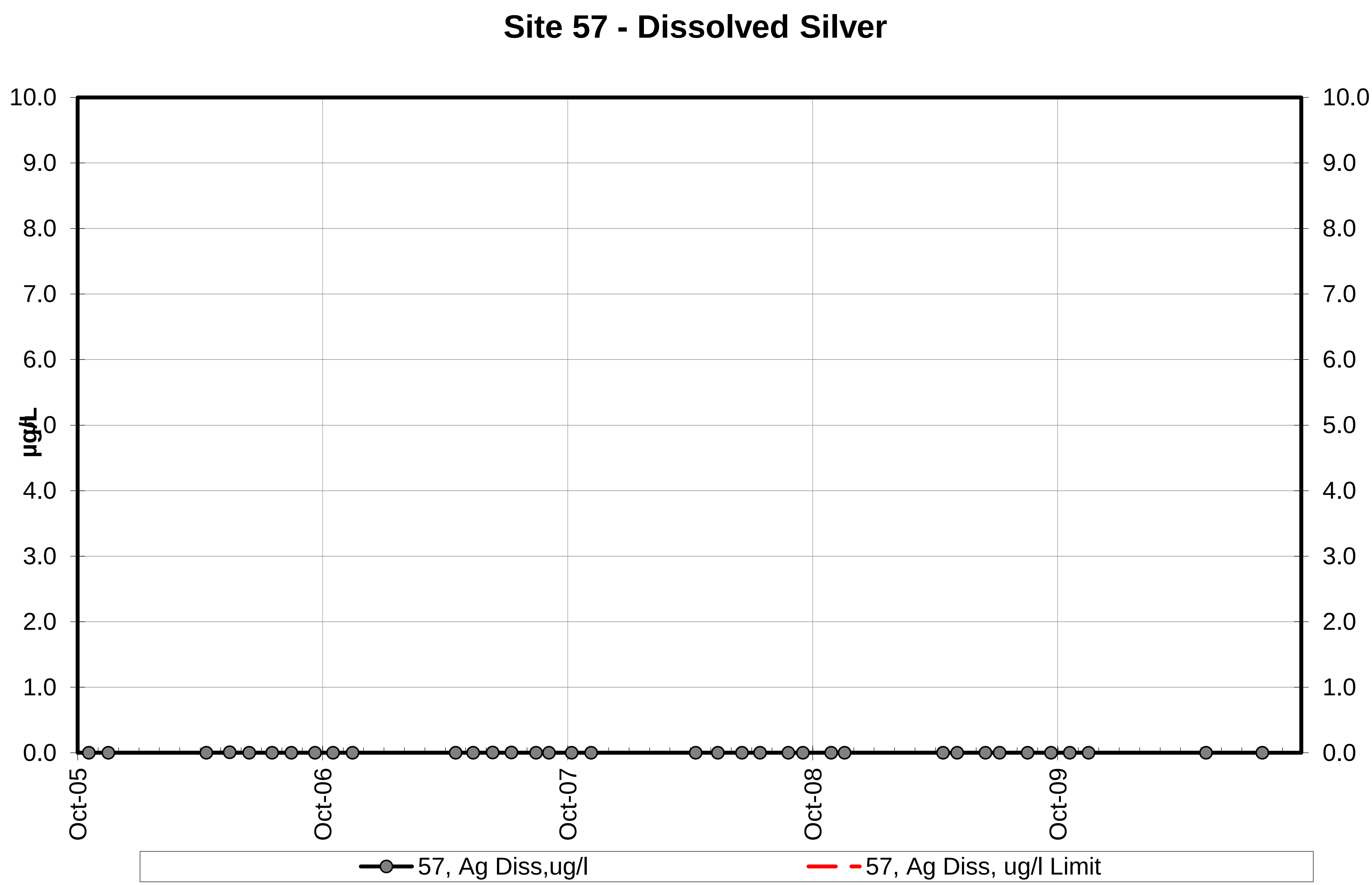
Site 57 - Dissolved Copper




Site 57 - Dissolved Lead
µg/L
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, Pb Diss, µg/L
57, Pb Diss, µg/L Limit

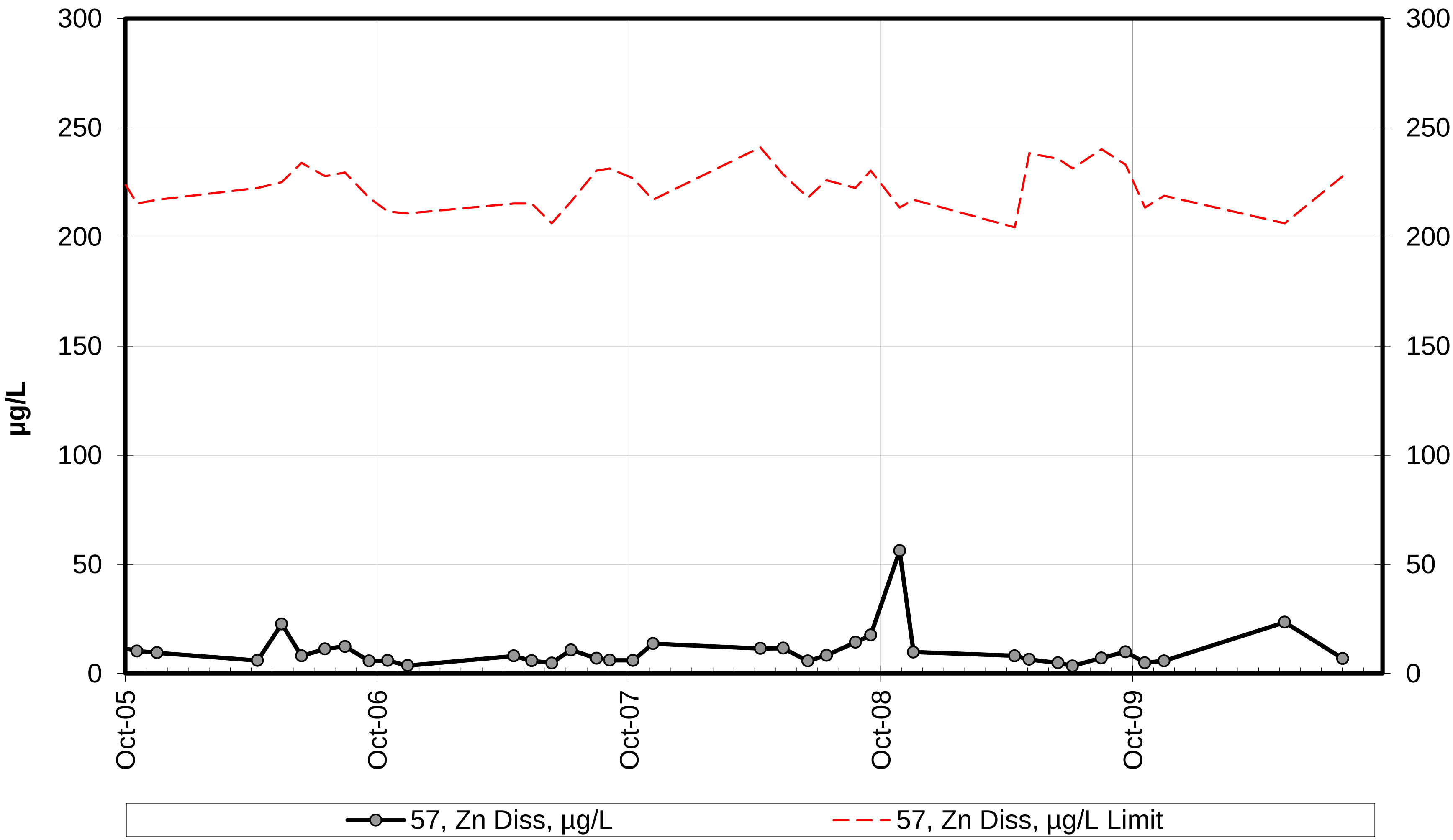


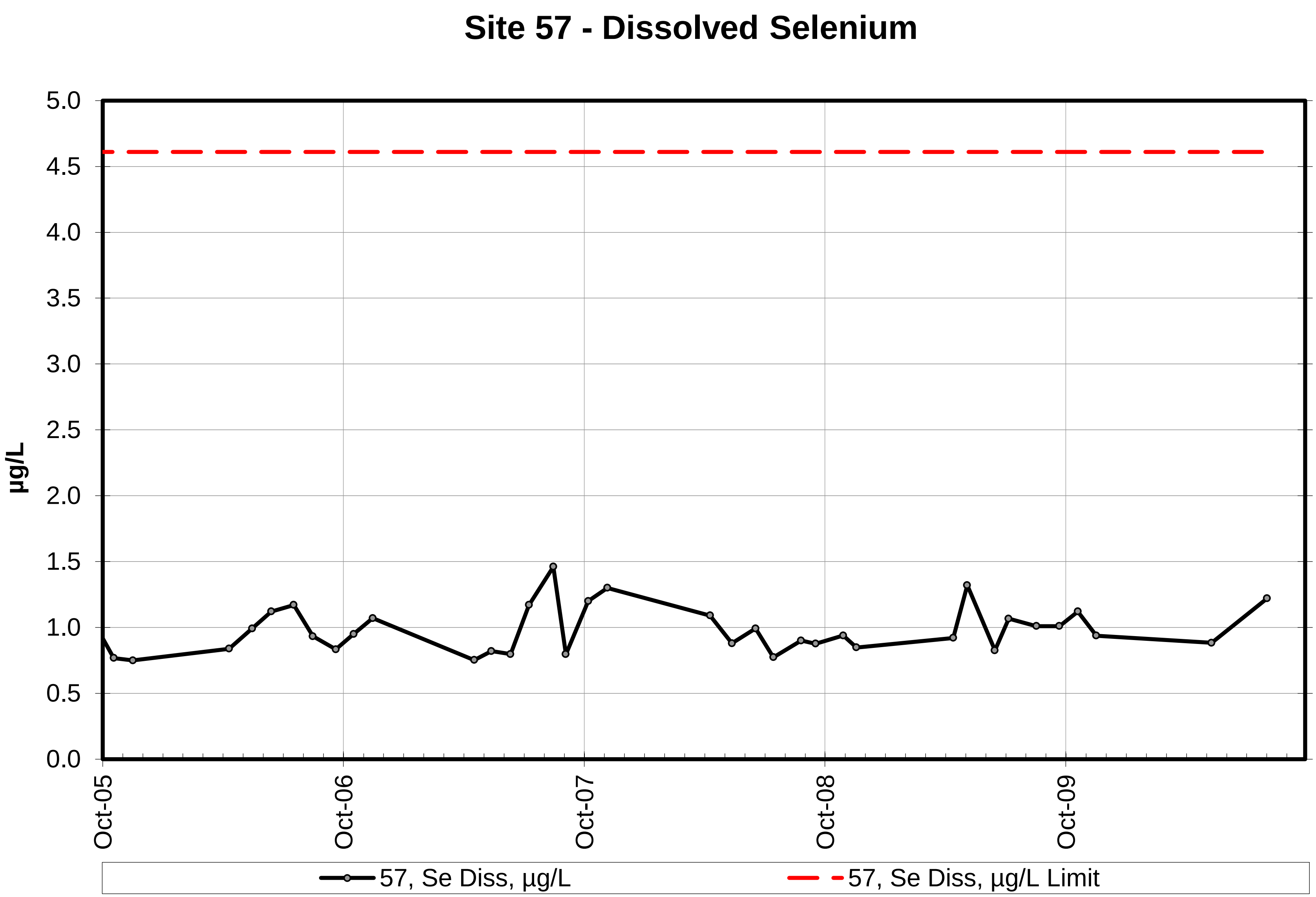
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.



Site 57 - Dissolved Silver
µg/L
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, Ag Diss,ug/l
57, Ag Diss, ug/l Limit

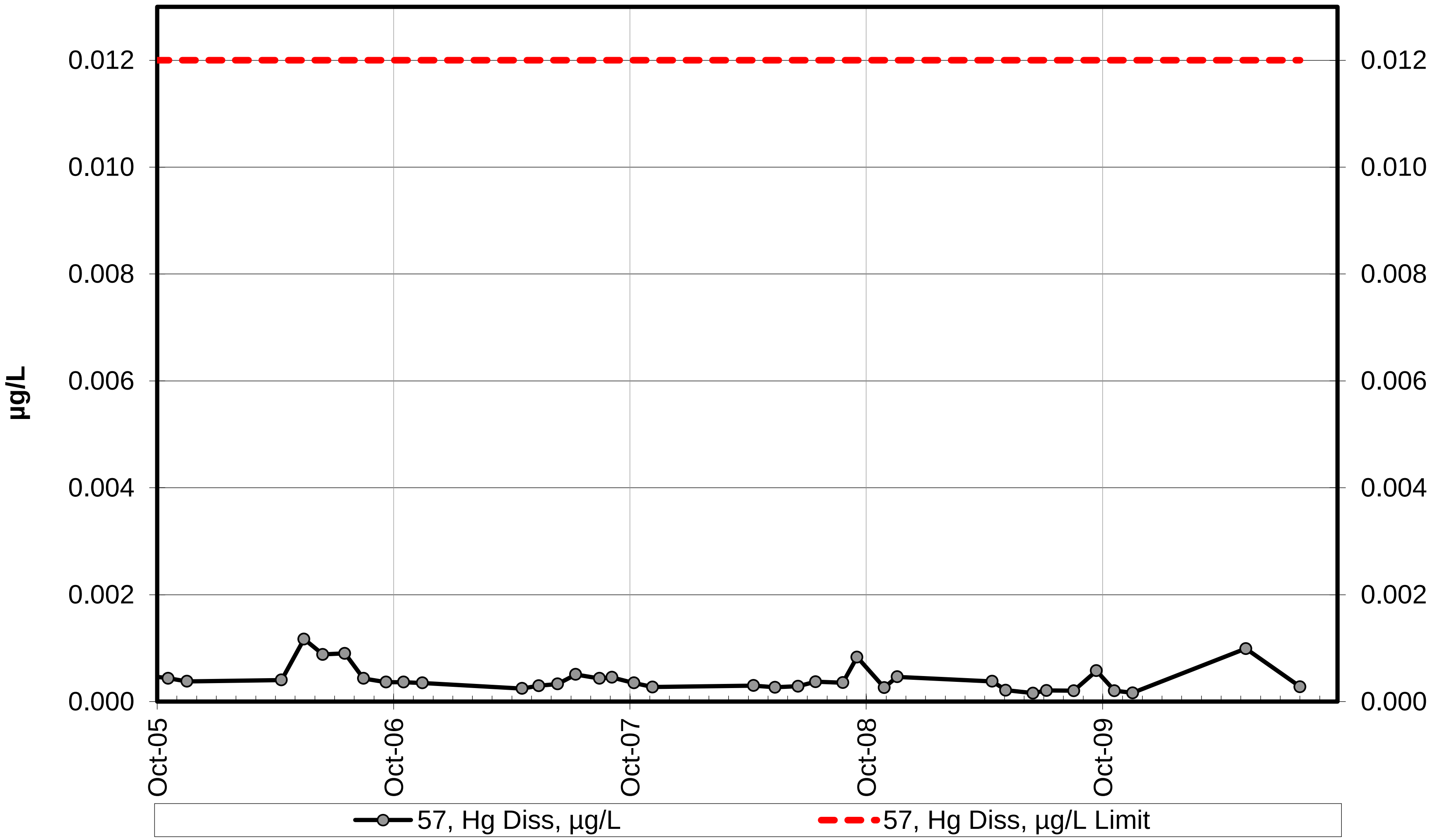
Site 57 - Dissolved Zinc





Site 57 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
57, Se Diss, µg/L
57, Se Diss, µg/L Limit

Site 57 - Dissolved Mercury

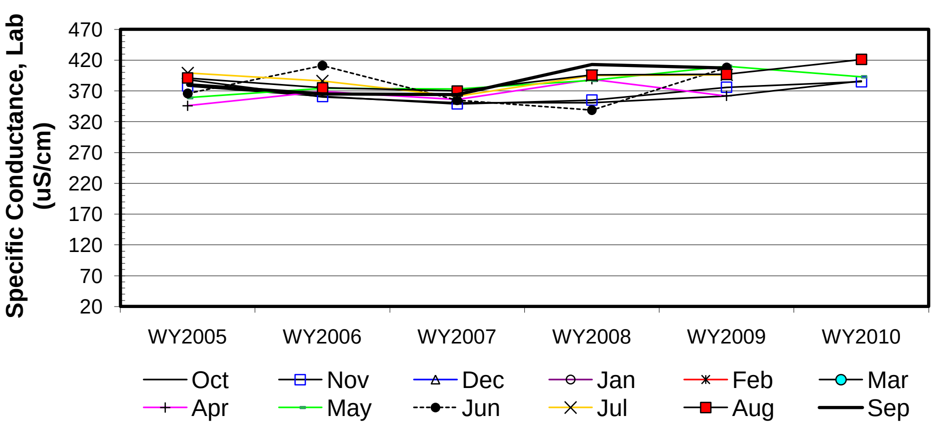


Site **#57** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	388	378					346	359	366	399	391	380
b	**WY2006**	360	361					369	374	411	386	375	365
c	**WY2007**	351	349					356	373	355	361	370	364
d	**WY2008**	351	355					389	387	339	395	396	413
e	**WY2009**	362	376					362	410	408	396	397	407
f	**WY2010**	386	385						393			421	
	n	6	6	0	0	0	0	5	6	5	5	6	5
	t_1	3	5	5	5	5	5	5	5	5	5	5	5
	t_2	1	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a	-1	-1					1	1	1	-1	-1	-1
	c-a	-1	-1					1	1	-1	-1	-1	-1
	d-a	-1	-1					1	1	-1	-1	1	1
	e-a	-1	-1					1	1	1	-1	1	1
	f-a	-1	1						1			1	
	c-b	-1	-1					-1	-1	-1	-1	-1	-1
	d-b	-1	-1					1	1	-1	1	1	1
	e-b	1	1					-1	1	-1	1	1	1
	f-b	1	1						1			1	
	d-c	0	1					1	1	-1	1	1	1
	e-c	1	1					1	1	1	1	1	1
	f-c	1	1						1			1	
	e-d	1	1					-1	1	1	1	1	-1
	f-d	1	1						1			1	
	f-e	1	1						-1			1	
	S_k	0	3	0	0	0	0	4	11	-2	0	9	2
	σ^2_S=	27.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
	$Z_k = S_k/\sigma_S$	0.00	0.62					0.98	2.07	-0.49	0.00	1.69	0.49
	Z^2_k	0.00	0.39					0.96	4.27	0.24	0.00	2.86	0.24

ΣZ_k=	5.36	Tie Extent	t_1	t_2	t_3	t_4	t_5	Σn 44
ΣZ^2_k=	8.96	Count	58	1	0	0	0	ΣS_k 27
Z-bar=$\Sigma Z_k/K$=	0.67							

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	5.37	@α=5% $\chi^2_{(K-1)}$=	14.07	Test for station homogeneity	
p	**0.615**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) / 174.00	Z_{calc} 1.97	@α/2=2.5% Z=	1.96	**H_0** (No trend)	REJECT
p	**0.976**			**H_A** ($\pm$ trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.59		10.17
0.050	1.00	**5.00**	6.97
0.100	1.45		6.70
0.200	3.00		6.28
		1.3%	

Site **#57** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	7.5	7.4					7.7	7.6	7.3	7.3	7.1	6.9
b	**WY2006**	7.3	7.4					7.6	7.2	7.2	7.2	7.2	7.2
c	**WY2007**	7.3	7.2					7.3	7.6	7.6	7.6	7.6	7.6
d	**WY2008**	7.5	7.6					7.4	7.4	7.5	7.4	7.4	7.5
e	**WY2009**	7.5	7.6					7.5	7.4	7.4	7.6	7.6	7.5
f	**WY2010**	7.7	7.6						7.6			7.4	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1					-1	-1	-1	-1	1	1
c-a	-1	-1					-1	-1	1	1	1	1
d-a	-1	1					-1	-1	1	1	1	1
e-a	1	1					-1	-1	1	1	1	1
f-a	1	1						1			1	
c-b	1	-1					-1	1	1	1	1	1
d-b	1	1					-1	1	1	1	1	1
e-b	1	1					-1	1	1	1	1	1
f-b	1	1						1			1	
d-c	1	1					1	-1	-1	-1	-1	-1
e-c	1	1					1	-1	-1	1	-1	-1
f-c	1	1						1			-1	
e-d	1	1					1	1	-1	1	1	-1
f-d	1	-1						1			1	
f-e	1	-1						1			-1	
S_k	9	7	0	0	0	0	-4	3	2	6	7	4

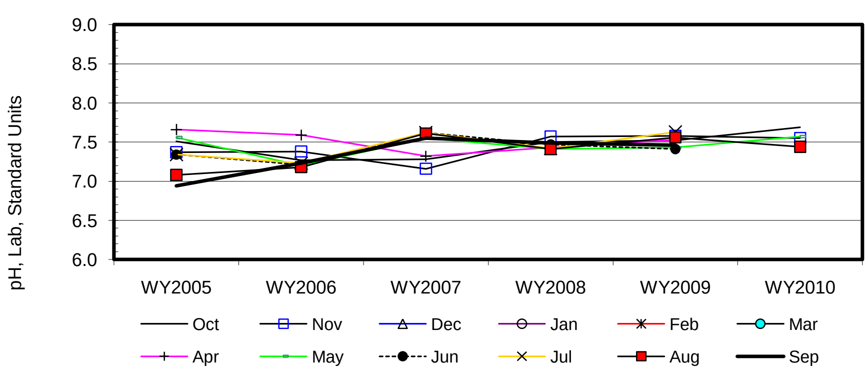
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	1.69	1.45					-0.98	0.56	0.49	1.47	1.32	0.98
Z^2_k	2.86	2.10					0.96	0.32	0.24	2.16	1.73	0.96

ΣZ_k=	6.98
ΣZ^2_k=	11.33
Z-bar=ΣZ_k/K=	0.87

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	44
ΣS_k	34

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	5.24	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.631**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} 2.49	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
175.00	**p** **0.994**		H_A ($\pm$ trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.00		0.10
0.050	0.01	**0.06**	0.09
0.100	0.02		0.08
0.200	0.02		0.07
		0.8%	

Site **#57** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	166.0	33.9					153.0	156.0	161.0	159.0	158.0	134.0
b	**WY2006**	160.0	144.0					151.0	152.0	159.0	149.0	154.0	146.0
c	**WY2007**	141.0	143.0					140.0	149.0	145.0	139.0	138.0	141.0
d	**WY2008**	145.0	132.0					129.0	137.0	128.0	141.0	134.0	131.0
e	**WY2009**	134.0	140.0					129.0	138.0	134.0	137.0	136.0	127.0
f	**WY2010**	137.0	140.0						133.0			143.0	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	5	5	5	3	5	5	5	5	5
t_2	0	1	0	0	0	0	1	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1					-1	-1	-1	-1	-1	1
c-a	-1	1					-1	-1	-1	-1	-1	1
d-a	-1	1					-1	-1	-1	-1	-1	-1
e-a	-1	1					-1	-1	-1	-1	-1	-1
f-a	-1	1						-1			-1	
c-b	-1	-1					-1	-1	-1	-1	-1	-1
d-b	-1	-1					-1	-1	-1	-1	-1	-1
e-b	-1	-1					-1	-1	-1	-1	-1	-1
f-b	-1	-1						-1			-1	
d-c	1	-1					-1	-1	-1	1	-1	-1
e-c	-1	-1					-1	-1	-1	-1	-1	-1
f-c	-1	-1						-1			1	
e-d	-1	1					0	1	1	-1	1	-1
f-d	-1	1						-1			1	
f-e	1	0						-1			1	
S_k	-11	0	0	0	0	0	-9	-13	-8	-8	-7	-6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	21.67					15.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-2.07	0.00					-2.27	-2.44	-1.96	-1.96	-1.32	-1.47
Z^2_k	4.27	0.00					5.17	5.96	3.84	3.84	1.73	2.16

ΣZ_k= -13.49

ΣZ^2_k= 26.97

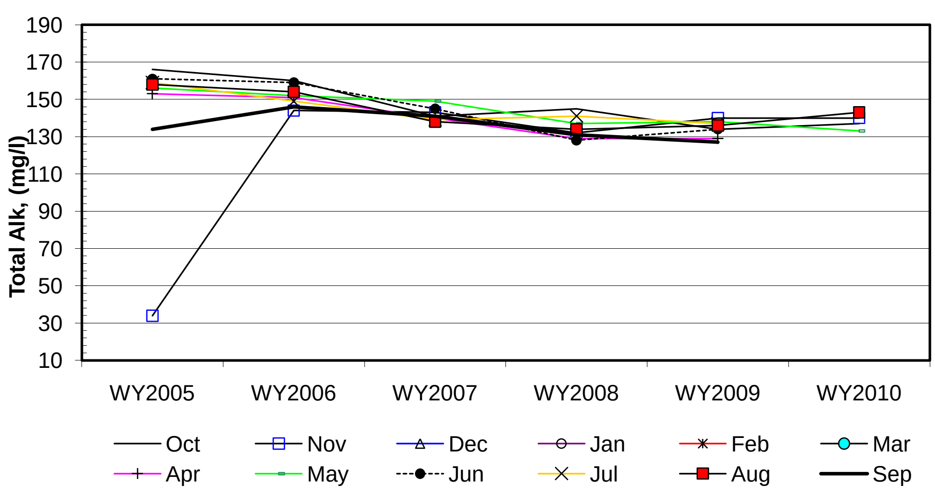
Z-bar=$\Sigma Z_k/K$= -1.69

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 44

ΣS_k -62

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	4.24	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	0.752		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$ 172.33	Z_{calc} -4.65	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
	p 0.000		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-6.33		-3.00
0.050	-6.00	**-4.88**	-4.00
0.100	-5.77		-4.00
0.200	-5.50		-4.00

-3.5%

Site **#57** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	50.8	56.5					51.3	52.0	62.7	66.2	68.2	68.6
b	**WY2006**	52.2	52.4					61.7	59.4	66.0	60.1	58.5	50.0
c	**WY2007**	49.4	44.3					47.4	50.8	49.6	51.9	56.7	58.8
d	**WY2008**	59.0	47.1					57.0	57.1	47.3	48.7	49.4	48.3
e	**WY2009**	38.8	43.4					44.2	54.8	60.1	63.5	58.8	62.1
f	**WY2010**	51.7	57.5						44.3			60.5	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	1	-1					1	1	1	-1	-1	-1
c-a	-1	-1					-1	-1	-1	-1	-1	-1
d-a	1	-1					1	1	-1	-1	-1	-1
e-a	-1	-1					-1	1	-1	-1	-1	-1
f-a	1	1						-1			-1	
c-b	-1	-1					-1	-1	-1	-1	-1	1
d-b	1	-1					-1	-1	-1	-1	-1	-1
e-b	-1	-1					-1	-1	-1	1	1	1
f-b	-1	1						-1			1	
d-c	1	1					1	1	-1	-1	-1	-1
e-c	-1	-1					-1	1	1	1	1	1
f-c	1	1						-1			1	
e-d	-1	-1					-1	-1	1	1	1	1
f-d	-1	1						-1			1	
f-e	1	1						-1			1	
S_k	-1	-3	0	0	0	0	-4	-5	-4	-4	-1	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.19	-0.62					-0.98	-0.94	-0.98	-0.98	-0.19	-0.49
Z^2_k	0.04	0.39					0.96	0.88	0.96	0.96	0.04	0.24

ΣZ_k= -5.37

ΣZ^2_k= 4.46

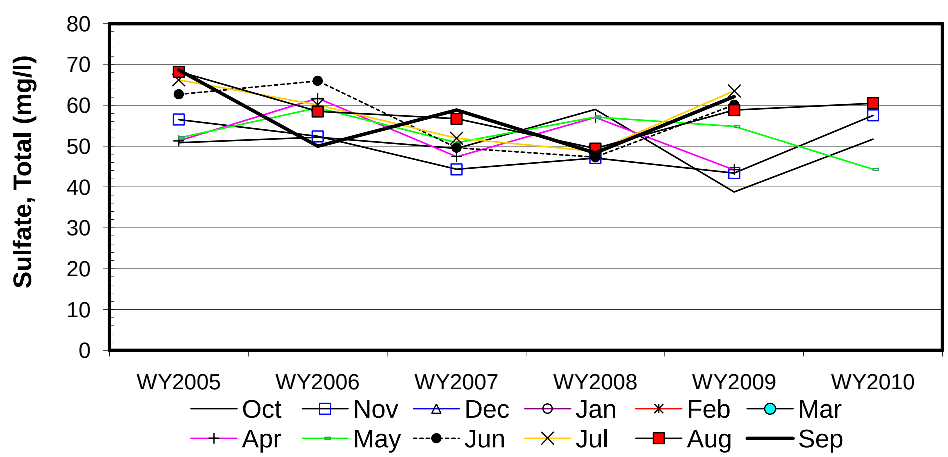
Z-bar=ΣZ_k/K= -0.67

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 44

ΣS_k -24

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	0.86	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.997**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 175.00	Z_{calc} -1.74	@α=5% Z= 1.64	H_0 (No trend)	REJECT
	p **0.041**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.23		0.32
0.050	-2.78	**-1.61**	-0.47
0.100	-2.35		-0.66
0.200	-2.24		-0.98
		-3.0%	

Site **#57** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	91.3	69.7					14.7	21.8	19.4	31.3	23.9	12.4
b	**WY2006**	10.3	9.5					6.0	22.7	8.1	11.3	12.4	5.8
c	**WY2007**	6.0	3.7					8.1	5.9	4.8	10.8	7.0	6.1
d	**WY2008**	6.0	13.7					11.5	11.6	5.7	8.4	14.3	17.6
e	**WY2009**	56.2	9.8					8.1	6.5	4.9	3.5	7.1	10.0
f	**WY2010**	4.9	5.8						23.5			6.9	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1					-1	1	-1	-1	-1	-1
c-a	-1	-1					-1	-1	-1	-1	-1	-1
d-a	-1	-1					-1	-1	-1	-1	-1	1
e-a	-1	-1					-1	-1	-1	-1	-1	-1
f-a	-1	-1						1			-1	
c-b	-1	-1					1	-1	-1	-1	-1	1
d-b	-1	1					1	-1	-1	-1	1	1
e-b	1	1					1	-1	-1	-1	-1	1
f-b	-1	-1						1			-1	
d-c	1	1					1	1	1	-1	1	1
e-c	1	1					1	1	1	-1	1	1
f-c	-1	1						1			-1	
e-d	1	-1					-1	-1	-1	-1	-1	-1
f-d	-1	-1						1			-1	
f-e	-1	-1						1			-1	
S_k	-7	-5	0	0	0	0	0	1	-6	-10	-9	2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-1.32	-1.04					0.00	0.19	-1.47	-2.45	-1.69	0.49
Z^2_k	1.73	1.07					0.00	0.04	2.16	6.00	2.86	0.24

$\Sigma Z_k=$ -7.28

$\Sigma Z^2_k=$ 14.09

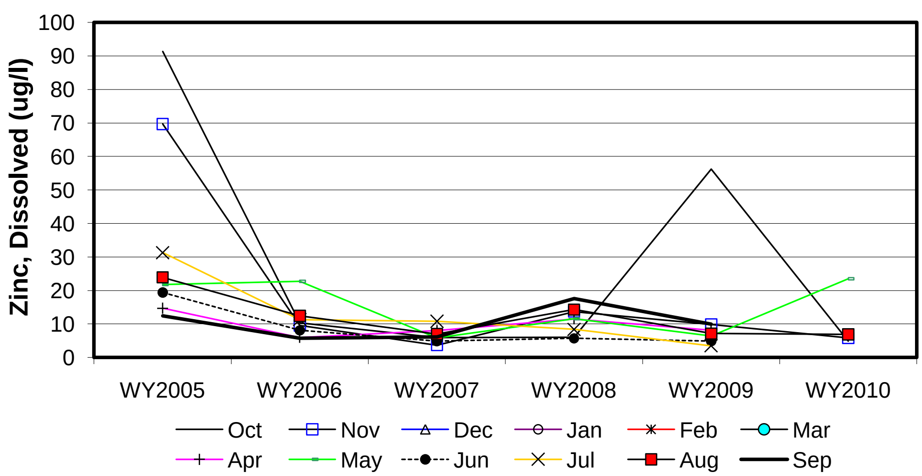
Z-bar=$\Sigma Z_k/K=$ -0.91

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 44

ΣS_k -34

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$ 7.47	@α=5% $\chi^2_{(K-1)}=$ 14.07	Test for station homogeneity	
p **0.382**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 175.00 / Z_{calc} -2.49	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
p **0.006**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-4.09		-0.32
0.050	-3.71	**-2.27**	-0.83
0.100	-3.51		-1.07
0.200	-3.37		-1.36

-23.5%

INTERPRETIVE REPORT
SITE 56 “MONITORING WELL D-00-01”

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

Sampling at this site was added to the FWMP in October-2001. All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. No results exceeding these criteria have been identified as listed in the table below.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
No exceedances have been identified by HGCMC for the period of Oct-09 though Sept-10.					

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. No visually obvious trends were apparent. As with the increase in chromium seen at the other sites (site 48, site 6, site 54, site 49, site 46, and site 13), chromium was seen to increase at this site also. However, the increased values were similar to those recorded in previous water years and to a lesser extent.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table summarizes the results on the data collected between May-04 and Sep-10 (WY2005-WY2010). There was one statistically significant ($\alpha/2$=2.5%) trend identified for

Site 56-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.32	0		
pH, Lab	6	0.53	0		
Alkalinity, Total	6	**<0.01**	-	-1.79	-3.1
Sulfate, Total	6	0.80	0		
Zinc, Dissolved	6	0.35	0		

(1): Number of years (2):Significance level

the current water year. Total alkalinity (p=0.01) has an estimated slope of -1.79 mg/L/yr or a slope of -3.1%. This trend is similar to those calculated for the previous two water years and is similar in direction and magnitude to that seen at Site 6 (Middle Greens Creek). Dissolved zinc failed the test for homogeneity that is required for the Mann-Kendall calculations.

A comparison of median values for total alkalinity, laboratory pH, laboratory conductivity, total sulfate, and dissolved zinc between Site 56 and Site 57 has been conducted as specified in the Statistical Information Goals for Site 56. Additional X-Y plots have been generated for alkalinity, pH, conductivity, sulfate, and dissolved zinc that co-plot data from Site 56 and Site 57, the up-gradient control site, to aid in the comparison between those two sites. Calculation details of the non-parametric signed-rank tests are presented in detail on the pages following this interpretive section. The table below summarizes the results of the signed-rank test as performed on the Water Year 2010 data set.

Site 56 vs Site 57 - WY2010, summary statistics for median analysis.

Parameter	Signed Ranks p-value	Site 57 median	Site 56 median	Median of Differences
Conductivity, Lab	1.00	389.5	144	252.0
pH, Lab	1.00	7.6	7.6	0.1
Alkalinity, Total	**1.00**	138.5	59.3	79.3
Sulfate, Total	1.00	54.6	11.7	42.7
Zinc, Dissolved	1.00	6.34	0.45	5.89

The only significant difference identified by the typical one-tailed test was for total alkalinity. Median values for alkalinity for Site 49 and Site 46 are 138.5 mg/L and 59.3 mg/L respectively. The median difference, Site 49 minus Site 46, is 79.3 mg/L. It should be noted that if a two-tailed signed-rank test was applied to the dataset for these sites a very significant (p=1.00) difference would exist with respect to the other parameters included in the signed-ranks analysis. Specifically, conductivity, sulfate, and dissolved zinc fail to meet the null hypothesis of no significant difference between medians when the alternative hypothesis is cast in terms without regard to the direction of the difference (H_a: median [D]$\neq$0). The obvious differences of the major water-quality parameters at these sites are likely the result of several inherent hydrological/geological differences between the two sites.

The two major differences between the sites are the unit of completion and the hydrological setting. The up-gradient control site, Site 57, is in an area away from the influence of any major surface flow. The screened interval is in the colluvial unit that underlies most of Site 23 production rock area and samples 63 to 68 feet below the surface. The aquifer sampled by the screened interval may be one of multiple perched aquifers located below Site 23 as noted in the "Site 23/D Hydrogeology and Geochemistry Analysis" report (EDE, 2004). The down-gradient well, Site 56, is to the southeast of the Site 23/D production rock areas and is located approximately 40 feet west of the lower reaches of Bruin Creek. The screened interval was originally interpreted as the same colluvial unit as Site 57, but recent drilling information suggests the completion is in the alluvial sands which underlie most of Site D. The sampled interval is at a depth of 14 to 19 feet. The difference in the unit of completion may have an effect on the resulting water quality. The colluvium is characterized as a fine to coarse sand with angular to sub-rounded, partially weathered chloritic rock with localized residual pyrite. The alluvial sand is characterized as a fine to coarse sand with subangular to rounded gravel and is composed of well-weathered clasts with a more stable mineral assemblage. Thus the colluvial material, being less deeply weathered, would typically generate a higher leachable load of dissolved salts that would be reflected in the chemistry of the associated ground water. Additionally, the proximity of Site 56 to Bruin Creek and Greens Creek and its shallow completion depth suggest there would be a much greater influence of a surface water component relative to Site 57. The water temperature data for Site 56 reflects this by showing a very strong seasonal variation that is very similar to the data collected at the nearby surface sites 46 and 6. In contrast the Site 57 water temperature data shows a much lower variation that is indicative of groundwater with a minor seasonal surface component. The surface water recharge to the local aquifer would tend to act as a diluent with respect to the more concentrated dissolved fraction of groundwater. Finally, if Site 57 does sample a localized, perched aquifer it would probably be more strongly influenced by seasonal and/or annual variations in recharge rate since the area of capture would be more limited than for Site 56. In summary, the combined effects of the difference in completion units and the different hydrological regimes likely explain the disparity in analyte concentrations found at the two sites.

Because of the differences in the completions of these well the statistical analysis of the inter-comparison is prone to failure if not misinterpretation. An attempt was made this season to analyze this well data on an intra-well comparison basis using the combined Shewhart-CUSUM control chart approach. This method was first referenced by Westgard et al. 1977 then further developed by Lucas (1982). This form of analysis has been recommended for use in intra-well monitoring by the U.S. Environmental Protection Agency (EPA) (EPA 1989, 1992).

The Shewhart-CUSUM is a sequential analysis technique to determine changes in a variable. The methodology involves the calculation of a standardized difference z_i for each measurement at time t_i as x_i:

$$Z_i = (x_i - x) / s$$

At each time t_i, the cumulative sum is computed as:

$$S_0 = 0$$
$$S_i = \max[0,(z_i - d) + (S_i - 1)]$$

Setting $S_0 = 0$ ensures that only cumulative increase over background are monitor. When the value of S exceeds a certain threshold value, a change in value has been found. The above formula only detects changes in the positive direction. Plot the values S_i (y-axis) versus t_i (x-axis) on time plot for visual purposes. A process (analyte) is considered ‘out of control’ when the cumulative increase in the parameter over background $S_i >= h$ (e.g.

h=5) or a standardized increase z_i >= SCL (e.g. SCL = 4.5 standard deviations units over background).

For this year's FWMP report the combined Shewhart-CUSUM control chart statistical analysis was carried out on the specific conductance, dissolved zinc, and total sulfate data from Site 56 starting from October 2001. In order to use the analysis background values were calculated for each of the analytes. Without a true background record the first year of sampling was chosen for this calculation. Results of these calculations are summarized in the Table 1.

The visual representations of these calculations are graphed in the Figures 1 – 3. All three of the analytes reached the lowest control limit (SCL=2) and only total sulfate reached the control limit of SCL=4. Each of the sites were below the EPA recommend control limit of SCL=4.5. Values for the CUMSUM statistic ranged from a low of 0, observed in each analysis to a high of 3.3 recorded for total sulfate. None of the analysis exceed the established limit of h=5. In order for a process to be considered 'out of control' both metrics (Shewhart & CUMSUM) need to be 'out of control'. With these analyses the only analyte that neared both these limits was total sulfate.

Once a background value is established the proceeding years are not 'out of control' the data for those years can be used to recalculate the background values. It is suggested that these calculations be carried out every two years. In order to prevent the incorporation of a gradual trend into the background data, it is important to test for background trends on a routine basis. Currently, HGCMC is using the Mann-Kendall test for seasonal trends for trend analysis. Of the three analytes used, for the combined Shewhart-CUSUM control charts, none of them had a significant seasonal trend. Therefore, it should be possible to incorporate more of the measurements into the calculation of the baseline statistics.

With this being the initial investigation into intra-well monitoring using the combined Shewhart-CUSUM control charts the results of these analyses need to be considered carefully. From the seasonal trend analyses, the similarity to Site 46 analytes, and the Shewhart-CUSUM results; it is concluded that the impact HGCMC has had on the groundwater at Site 56 is negligible or currently undetectable.

Table 1. Specific Conductance, Dissolved Zinc, and Total Sulfate Baseline Periods, Summary Statistics and Various Control Limits

	Site 56 Conductivity (µS/cm)	Site 56 Diss. Zinc (µg/L)	Site 56 Total Sulfate (mg/L)
Baseline Statistics			
Baseline Period	10/25/01 - 11/12/02	10/25/01 - 11/12/02	10/25/01 - 11/12/02
Number of Samples	9	9	9
Mean (x)	137.20	1.07	9.47
Standard Deviation	26.20	1.02	2.33
Shewhart-CUSUM Control Limits (SCL)			
Control Limit (mean x+ 2s)	190	3	14
Control Limit (mean x + 3s)	216	4	16
Control Limit (mean x + 4s)	242	5	19
Control Limit (mean x + 4.5s)	255	6	20
CUSUM Control Limits			
Cumulative increase – h	5	5	5

Figure 1. **Observed Specific Conductance Measurements from Site 56 Compared to the Combined Shewhart-Cusum Control Limits From Table 1**

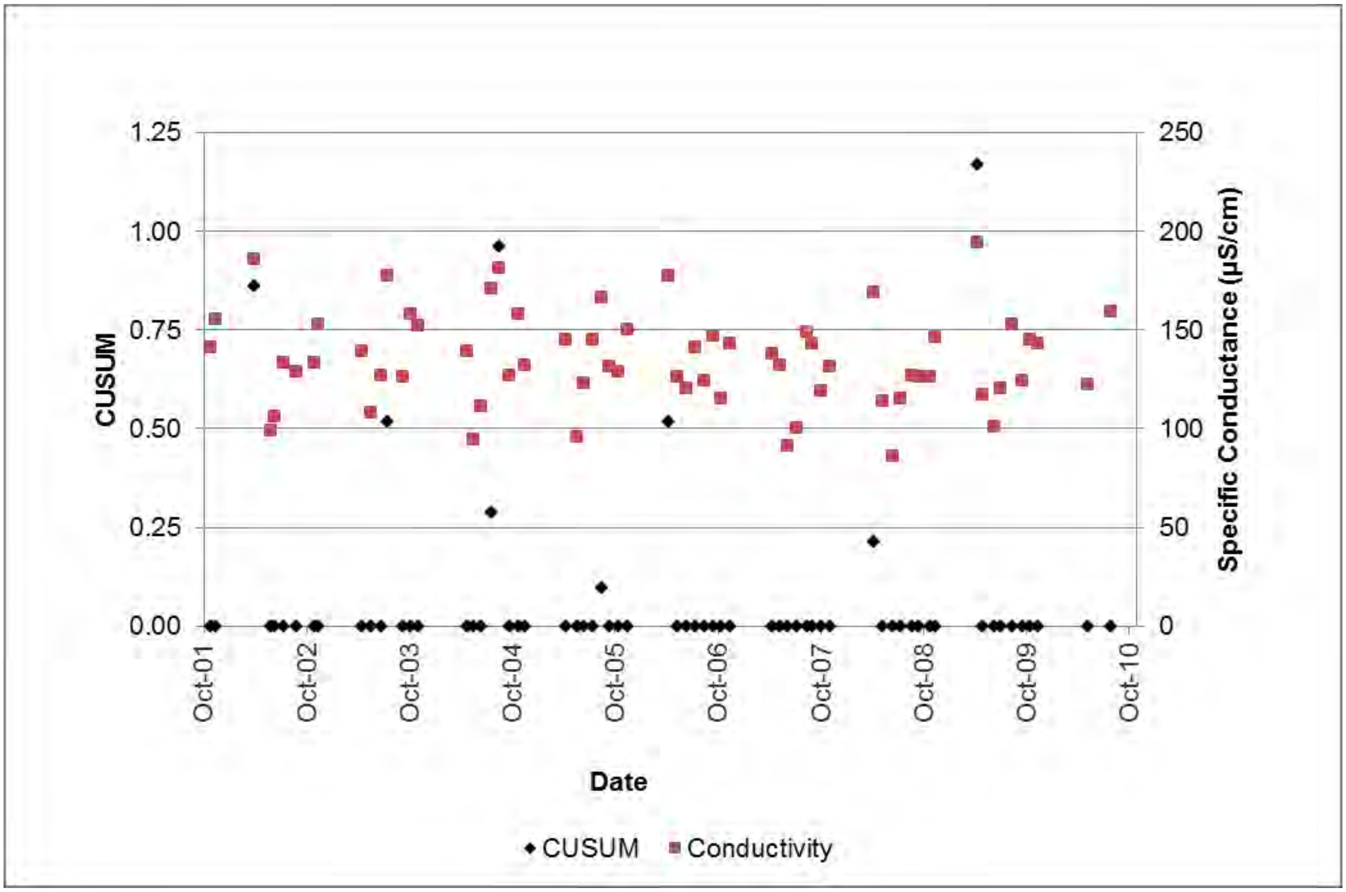


Figure 2. **Observed Dissolved Zinc Measurements from Site 56 Compared to the Combined Shewhart-Cusum Control Limits From Table 1**

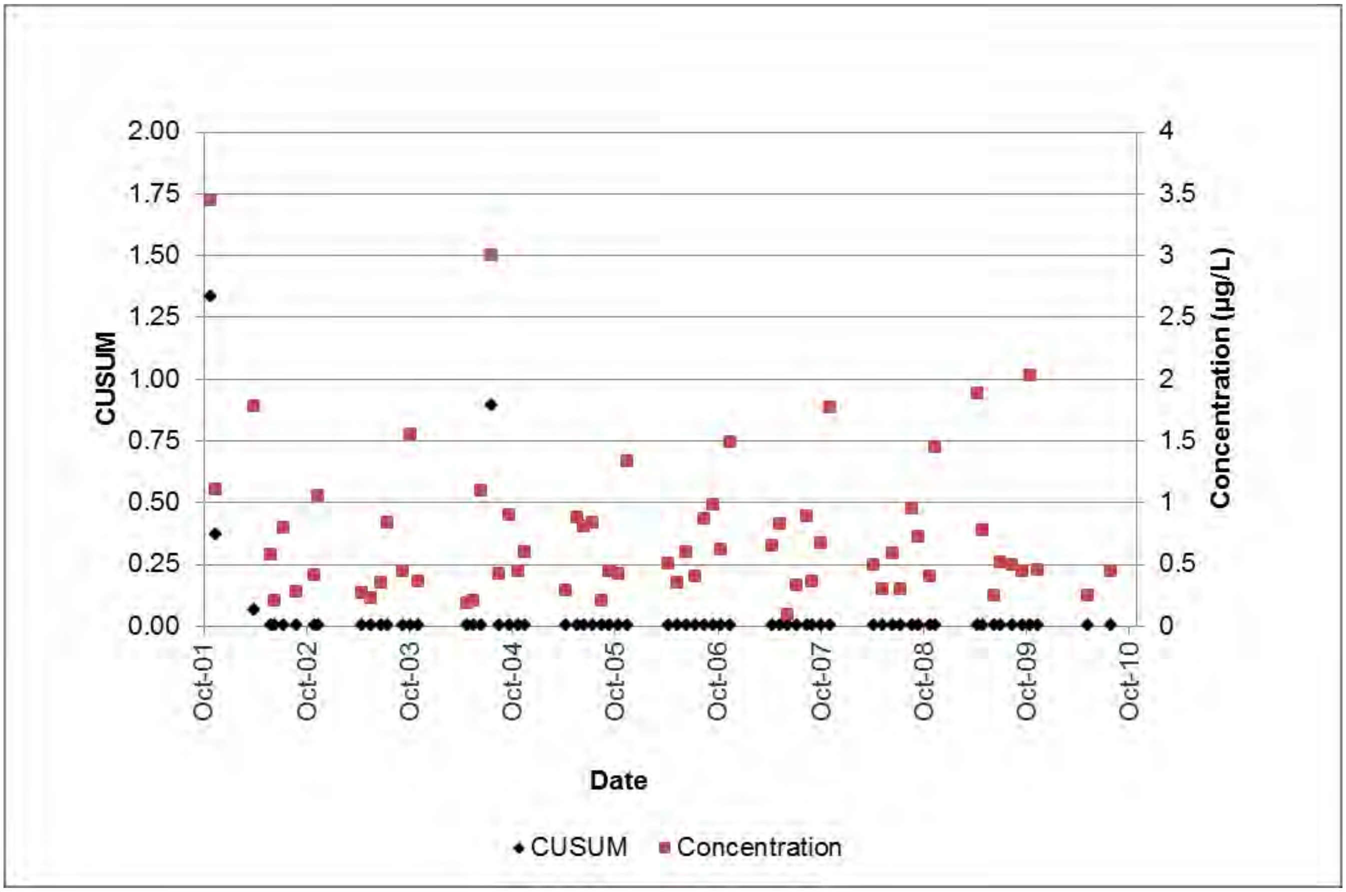


Figure 3. **Observed Total Sulfate Measurements from Site 56 Compared to the Combined Shewhart-Cusum Control Limits From Table 1**

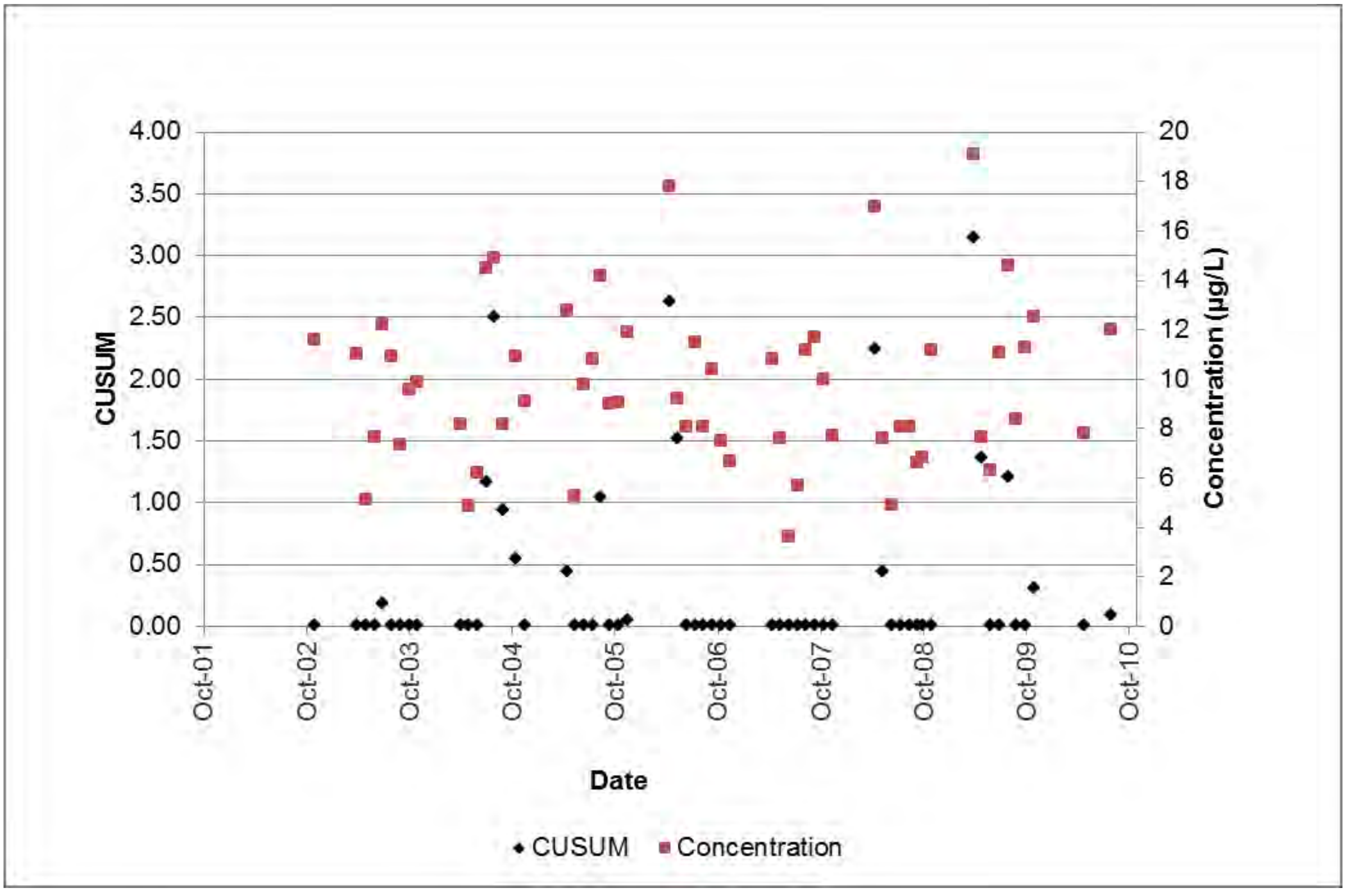


Table of Results for Water Year 2010

Site 56 "MW-D-00-01"

Sample Date/Parameter	10/20/2009	11/17/2009	Dec-09	Jan-10	Feb-10	Mar-10	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	5.5	1.3	NOT SCHEDULED FOR SAMPLING		Transition Period	NOT SCHEDULED FOR SAMPLING		4.1	NOT SCHEDULED FOR SAMPLING		10.6	NOT SCHEDULED FOR SAMPLING	4.8
Conductivity-Field(µmho)	158	127						131			155		143
Conductivity-Lab (µmho)	145	143 J						122			159		144
pH Lab (standard units)	7.54	7.59 J						7.66			7.00		7.57
pH Field (standard units)	7.05	6.85						7.73			6.80		6.95
Total Alkalinity (mg/L)	58.6	59.9 J						46.3			66.1		59.3
Total Sulfate (mg/L)	11.3	12.5						7.8 v			12.0 J		11.7
Hardness (mg/L)	78.3	73.4						59.7			79.5		75.9
Dissolved As (ug/L)	0.135	0.119						0.133			0.163		0.134
Dissolved Ba (ug/L)	11.6	10.5						7.4			12.8		11.1
Dissolved Cd (ug/L)	0.018	0.015 J						0.009 J			0.017		0.016
Dissolved Cr (ug/L)	0.186 U	0.200 U						1.940			1.970		1.070
Dissolved Cu (ug/L)	0.602	0.563						0.471			0.615		0.583
Dissolved Pb (ug/L)	0.0044 U	<0.0030						<0.0030 U			<0.0030 U		0.0015
Dissolved Ni (ug/L)	1.020	0.823						0.824			0.915 U		0.870
Dissolved Ag (ug/L)	<0.003	<0.003						<0.004			<0.004		0.002
Dissolved Zn (ug/L)	2.03 U	0.45 U						0.25			0.44 U		0.45
Dissolved Se (ug/L)	0.992 J	0.761						0.385			0.740		0.751
Dissolved Hg (ug/L)	0.001660	0.000934						0.001320			0.001590		0.001455

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

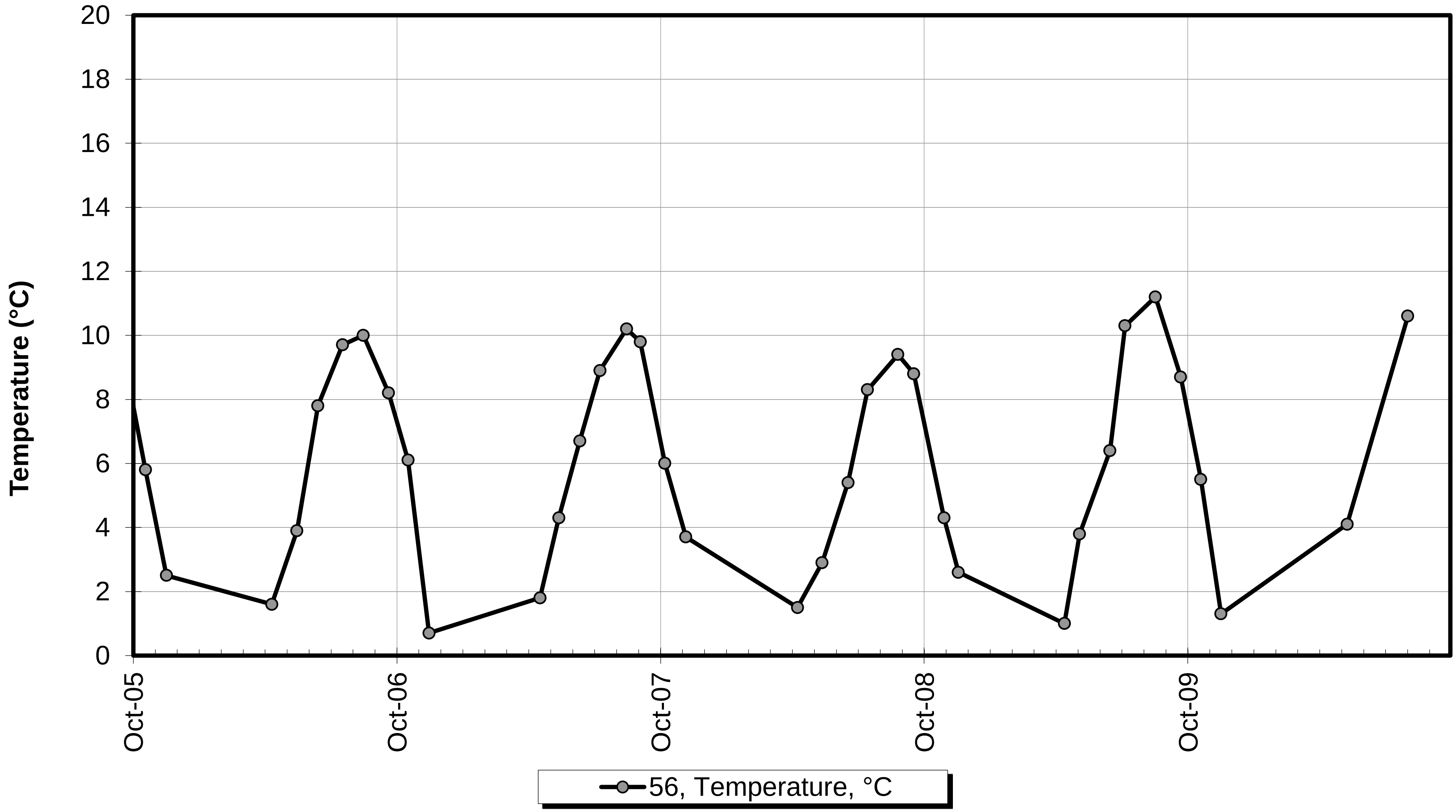
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

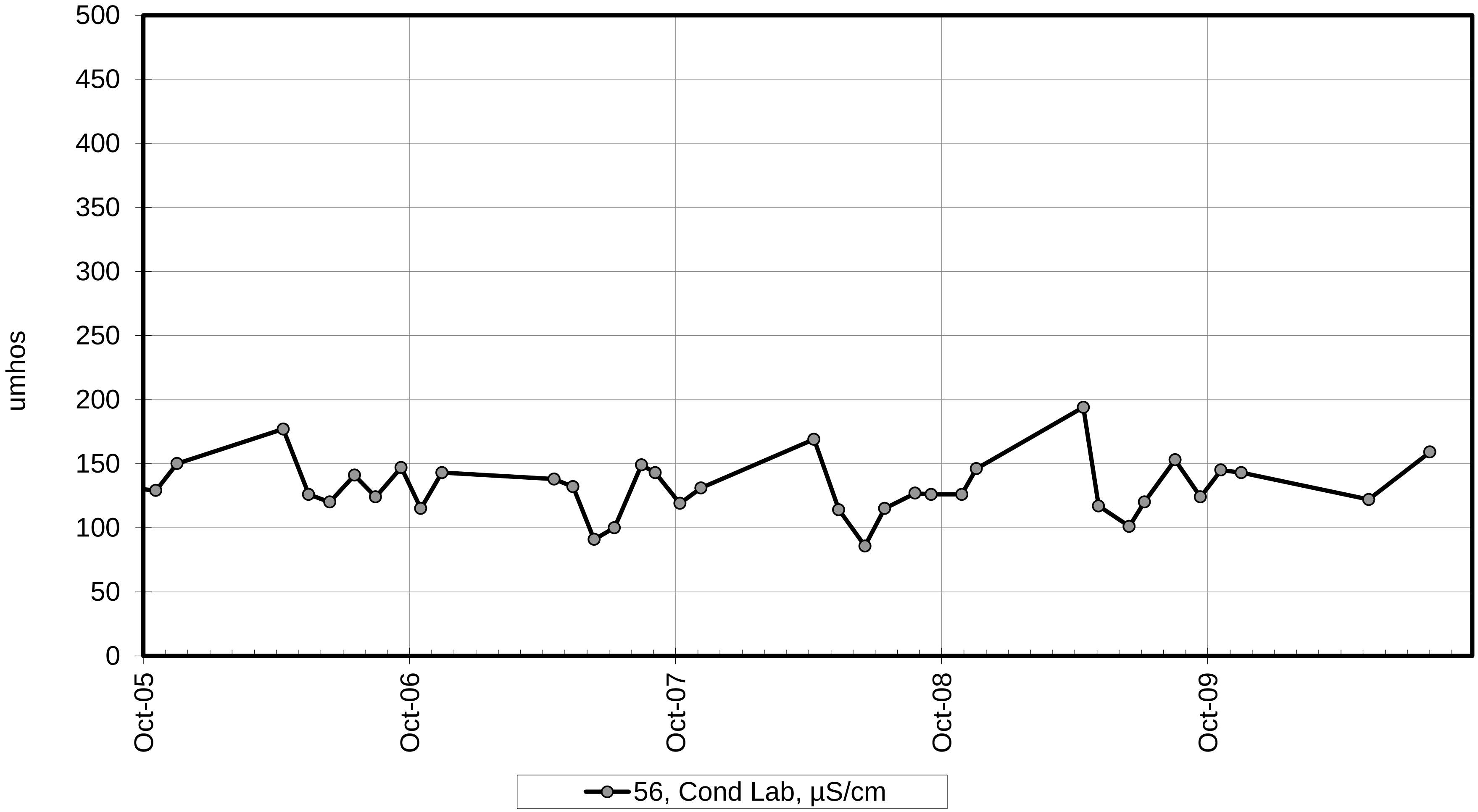
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
56	10/20/2009	12:00 AM				
			Cr diss, µg/l	0.18	U	Method Blank Contamination
			Pb diss, µg/l	0.00438	U	Field Blank Contamination
			Se diss, µg/l	0.99	J	Matrix Spike Recovery
			Zn diss, µg/l	2.03	U	Field Blank Contamination
56	11/17/2009	12:00 AM				
			Alk Tot,mg/l	59.9	J	Temperature Exceedance
			Cond, µs/cm	143	J	Temperature Exceedance
			Cd diss, µg/l	0.01	J	Below Quantitative Range
			Cr diss, µg/l	0.2	U	Field Blank Contamination
			Zn diss, µg/l	0.45	U	Field Blank Contamination
			pH Lab, su	7.59	J	Hold Time Violation
56	5/11/2010	12:52 PM				
			Cd diss, µg/l	0.00891	J	Below Quantitative Range
			Pb diss, µg/l	-0.003	U	Field Blank Contamination
			SO4 Tot, mg/l	7.8	J	Sample Temperature
56	8/3/2010	10:58 AM				
			Ni diss, µg/l	0.915	U	Field Blank Contamination
			Pb diss, µg/l	-0.003	U	Field Blank Contamination
			Zn diss, µg/l	0.444	U	Field Blank Contamination
			SO4 Tot, mg/l	12	J	Sample Temperature

Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

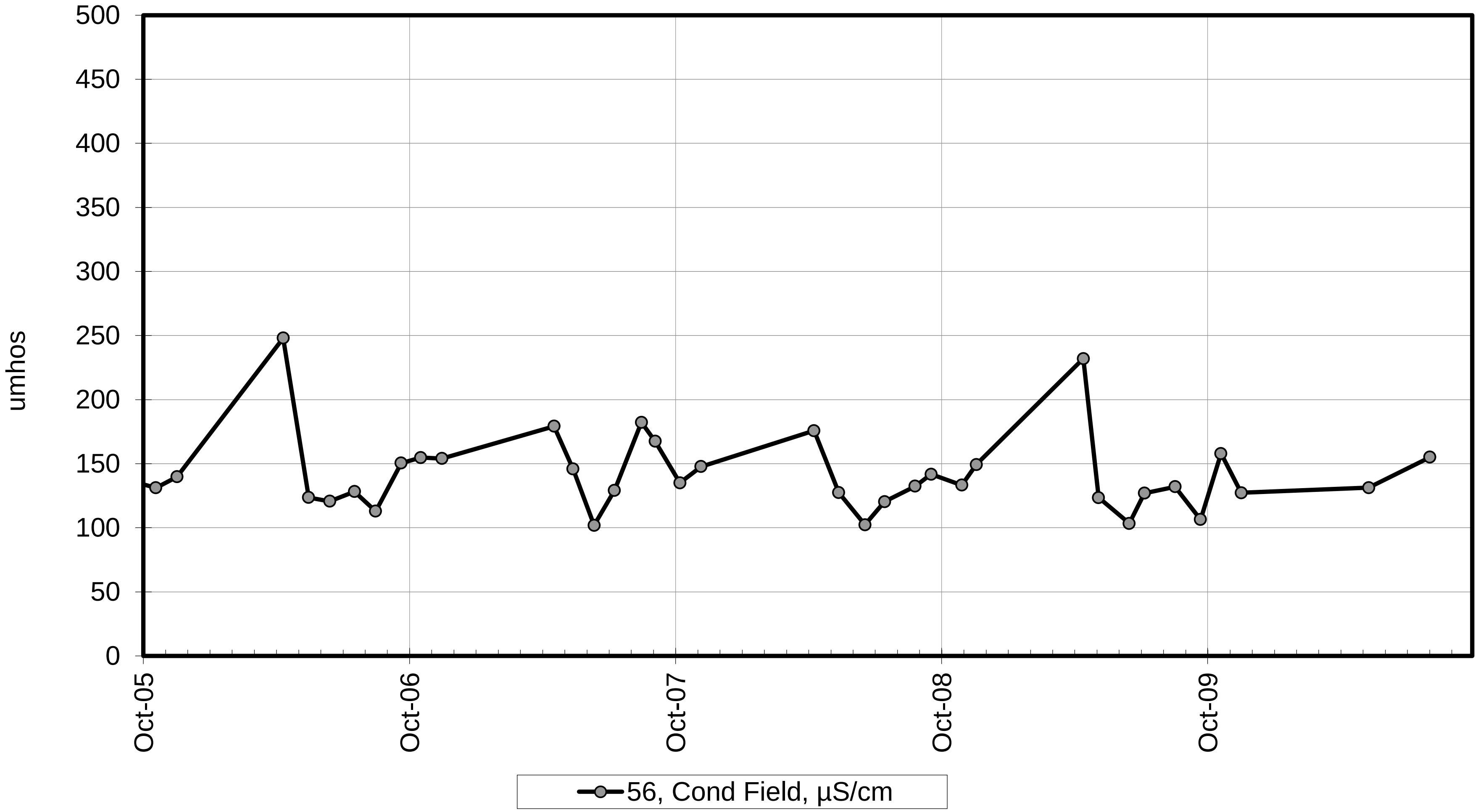
Site 56 -Water Temperature

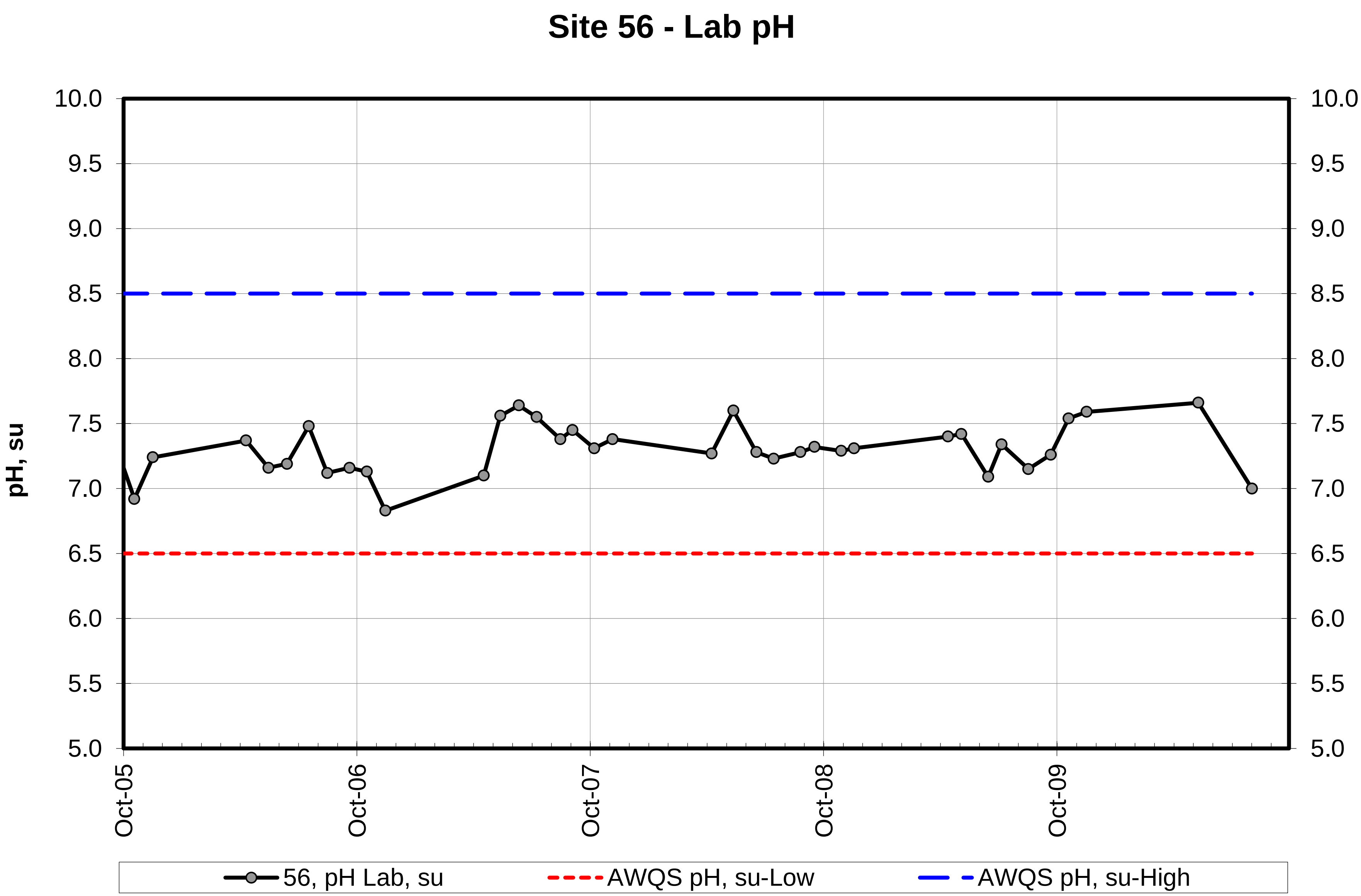


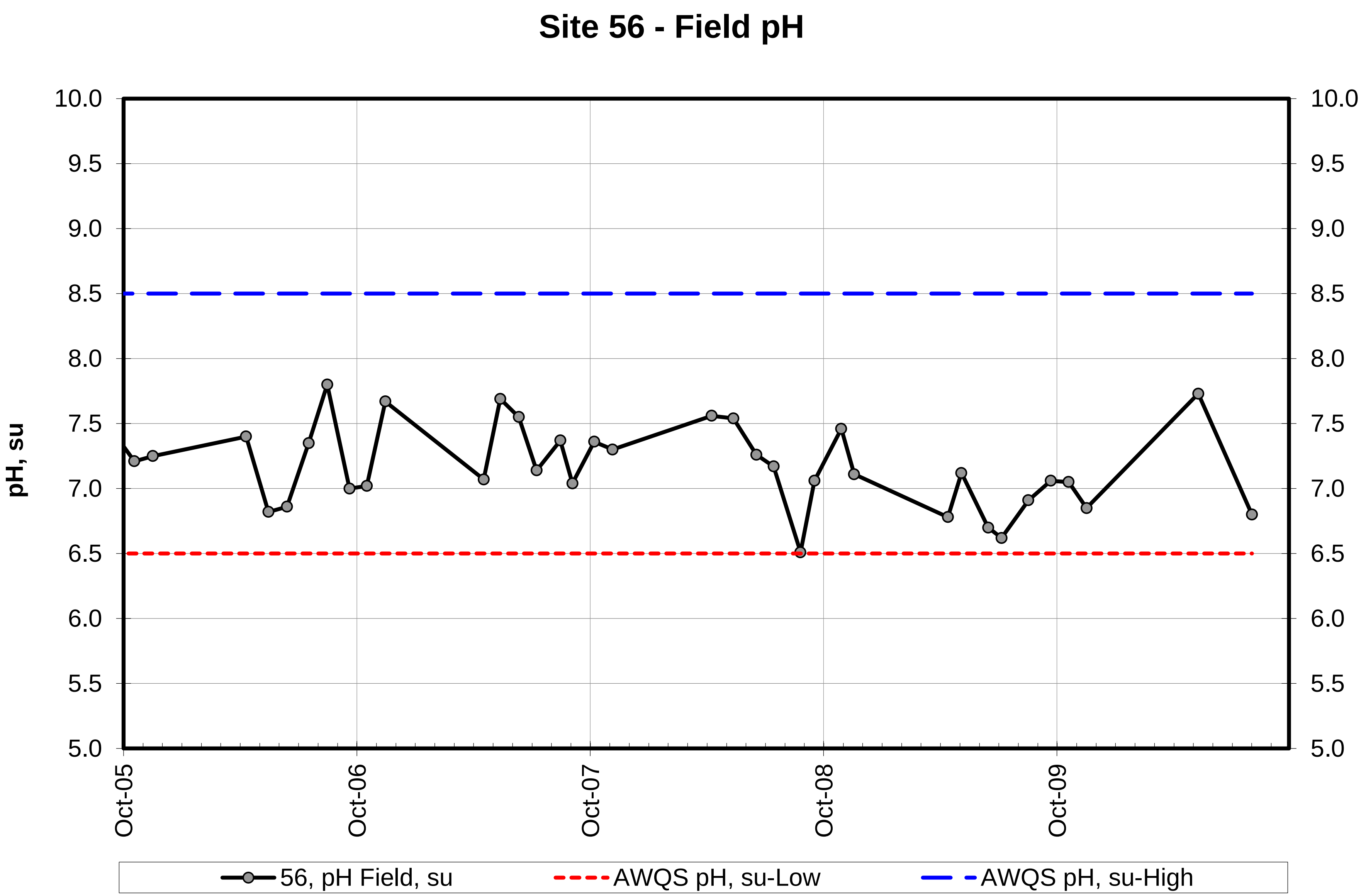
Site 56 - Conductivity-Lab



Site 56 - Conductivity-Field

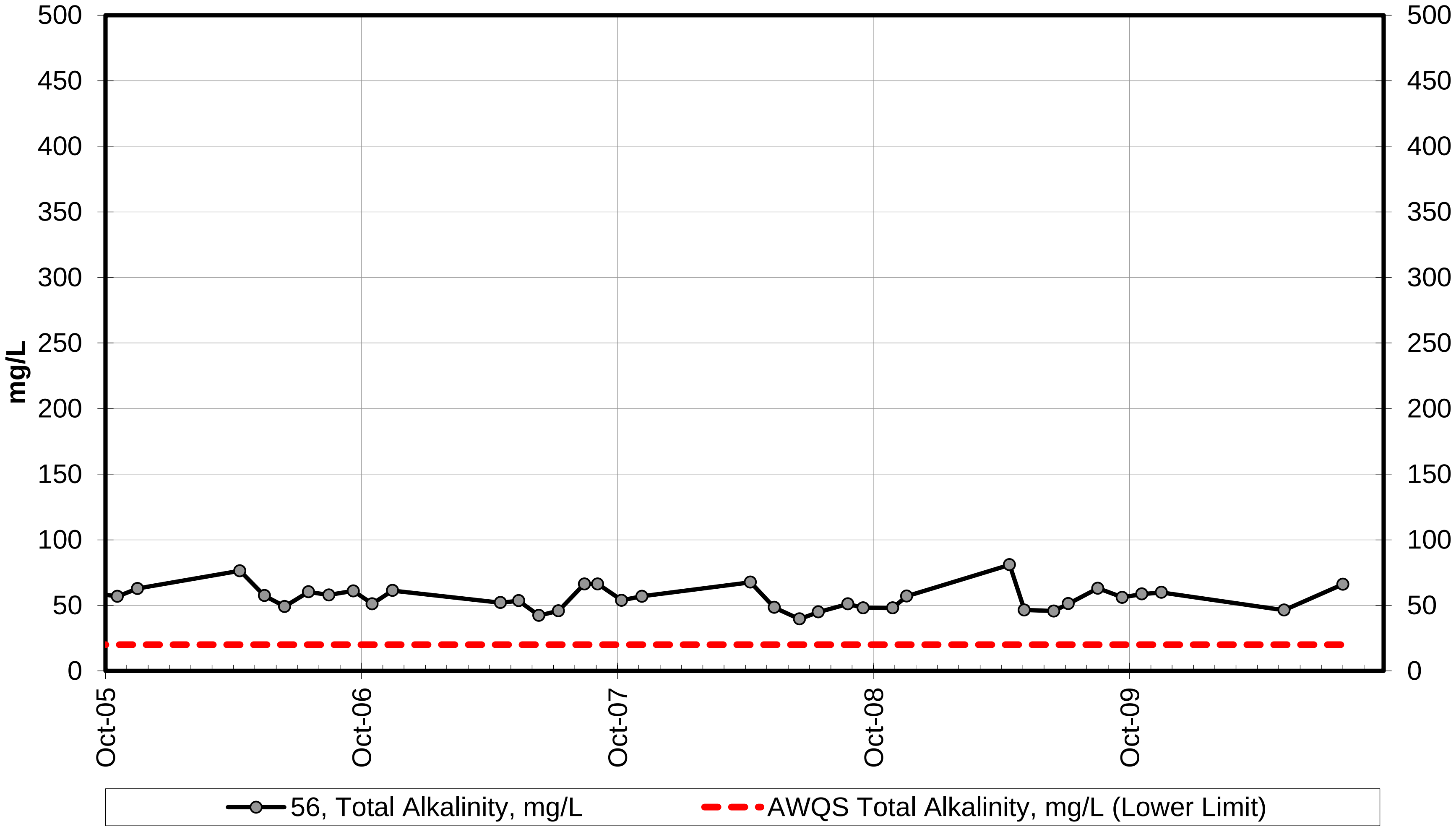


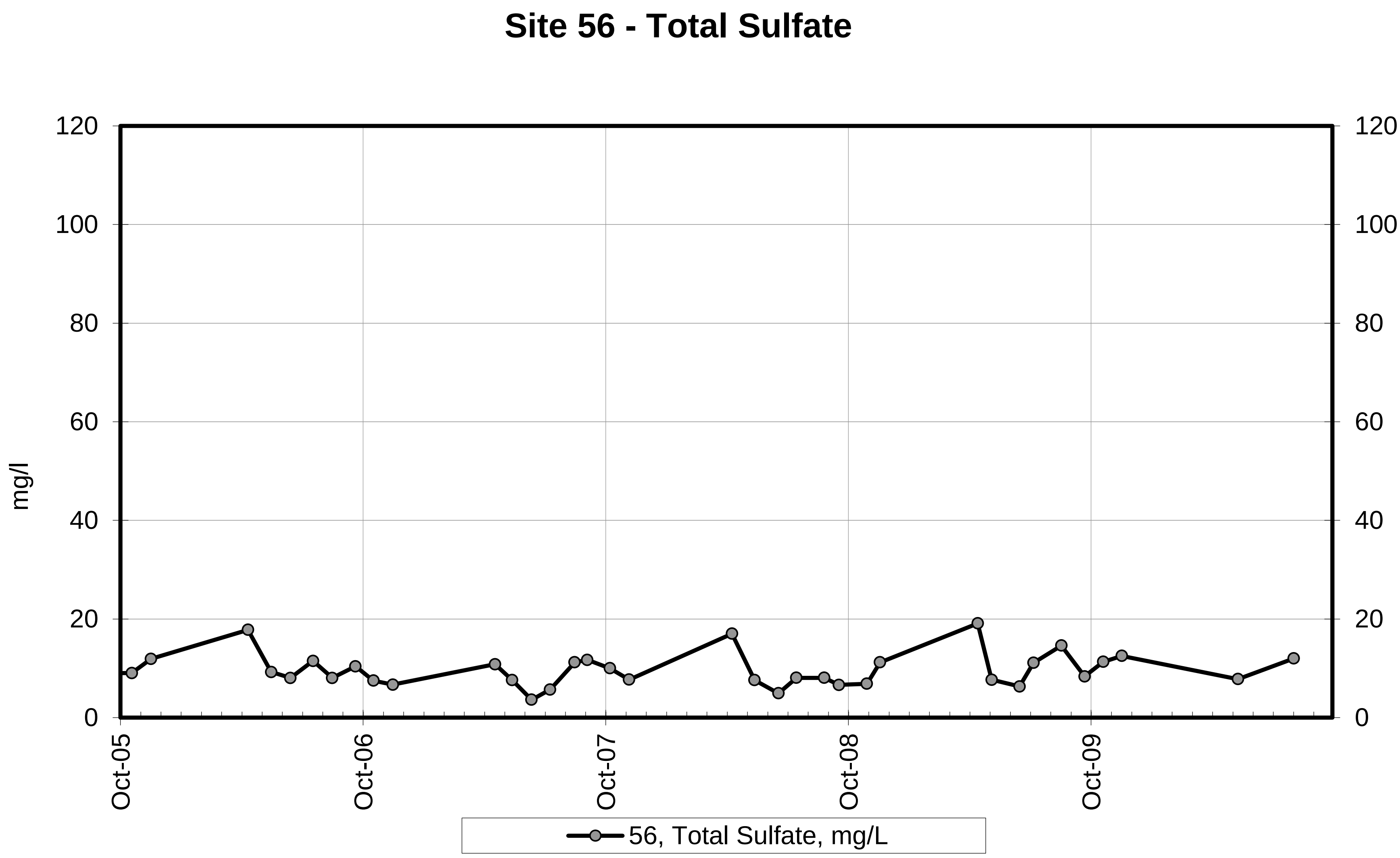

Site 56 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High



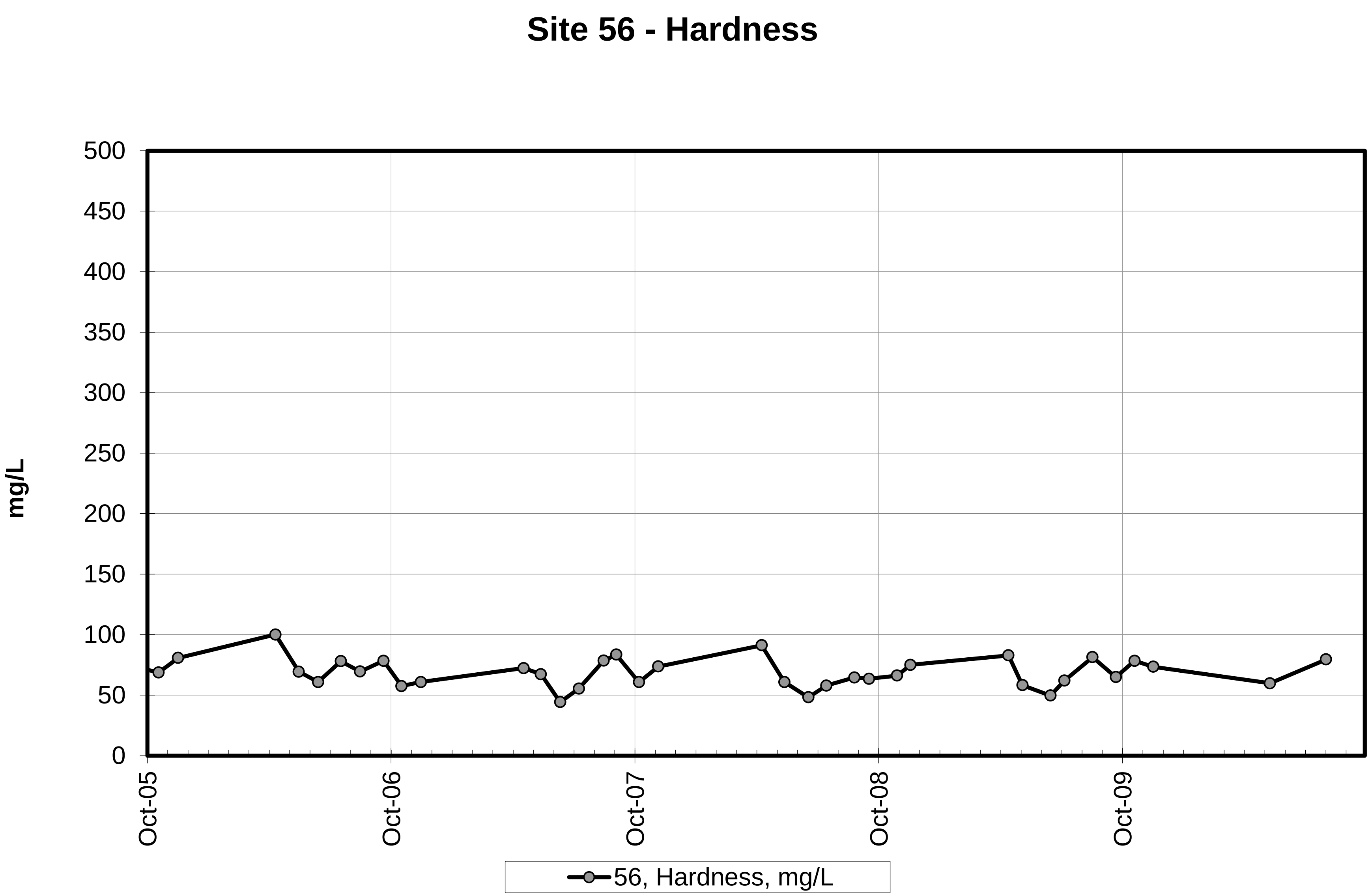
Site 56 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

Site 56 - Total Alkalinity



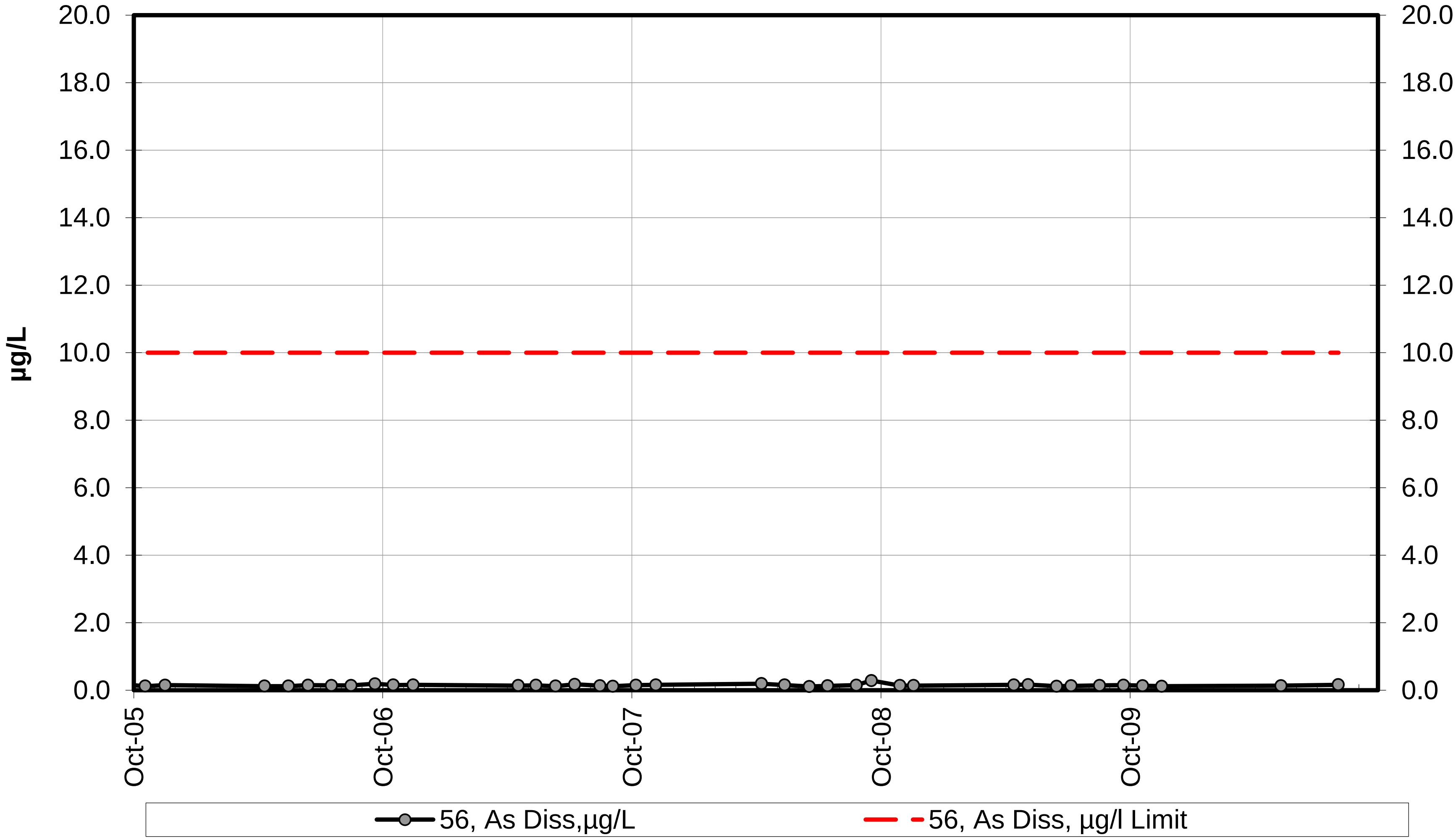


Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.



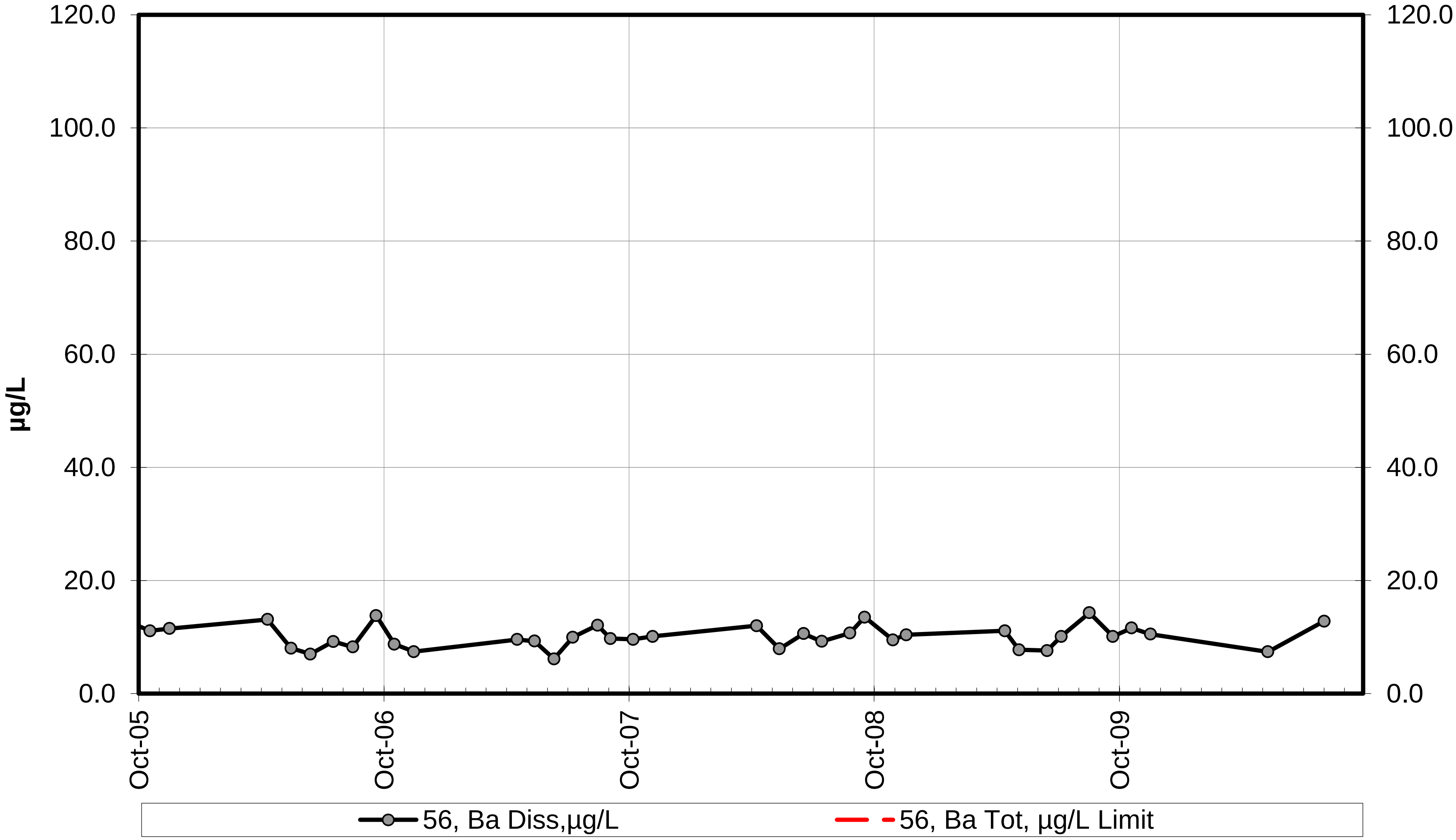
Site 56 - Hardness
mg/L
500
450
400
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, Hardness, mg/L

Site 56 - Dissolved Arsenic

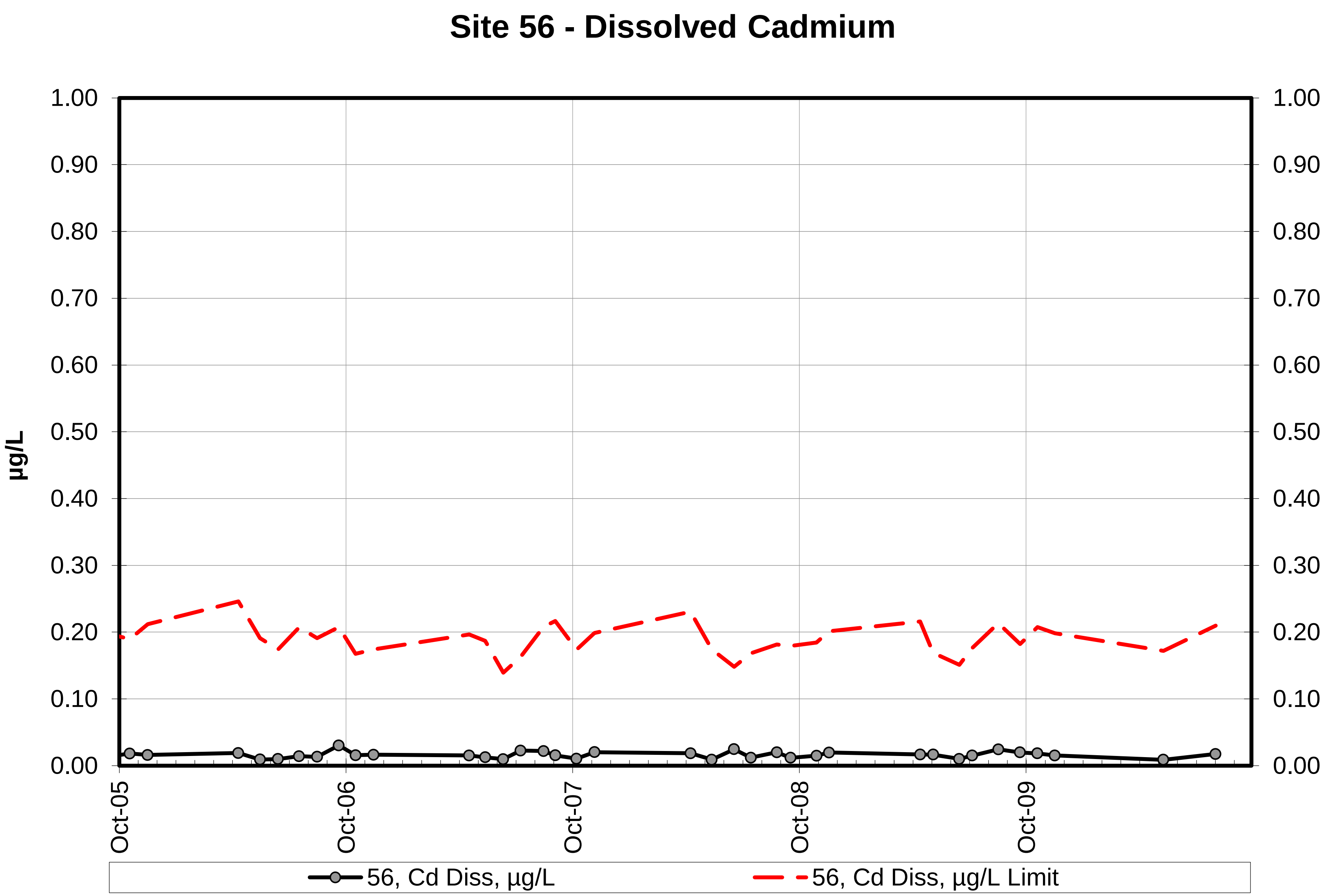


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

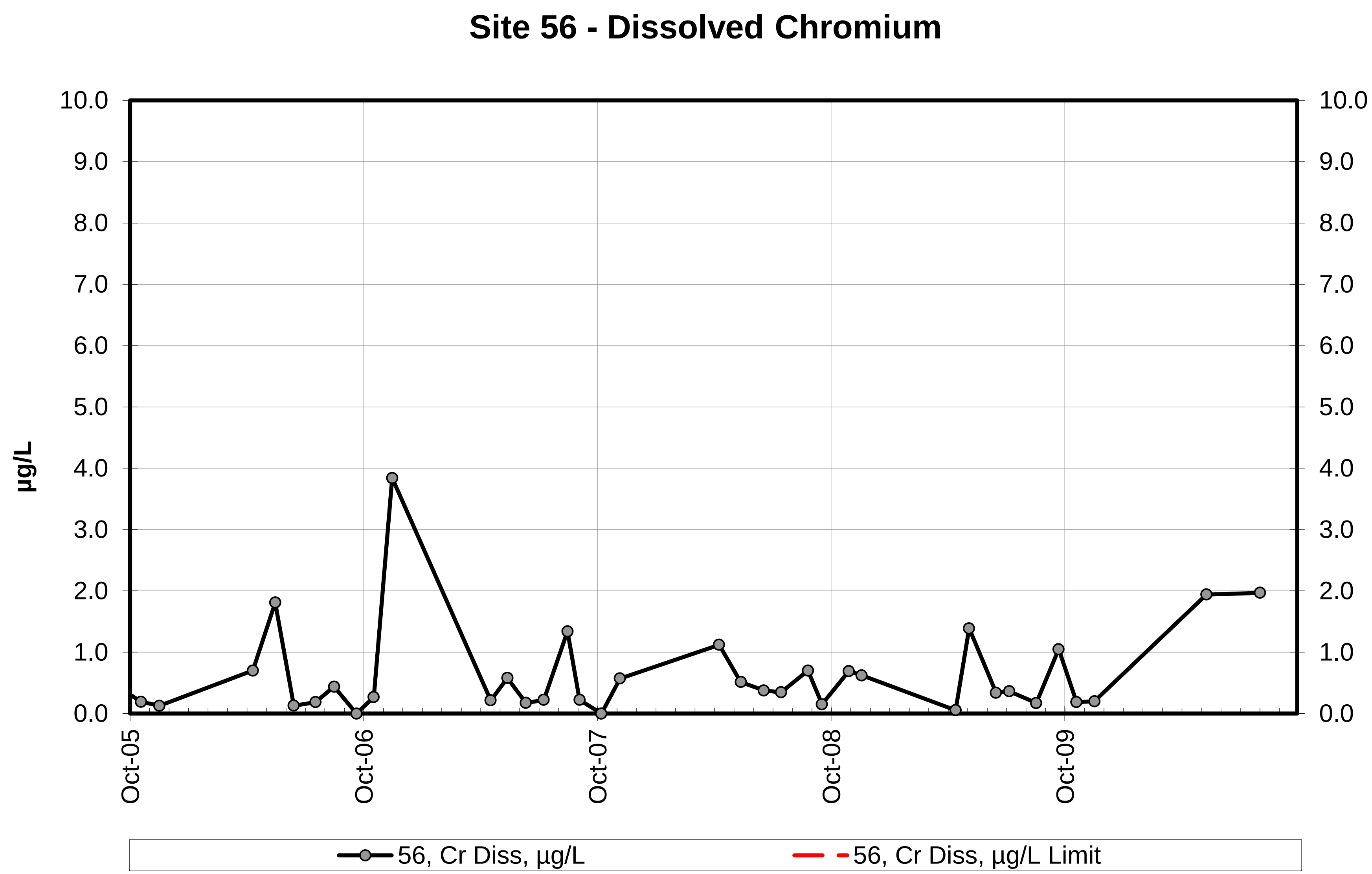
Site 56 - Dissolved Barium



Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

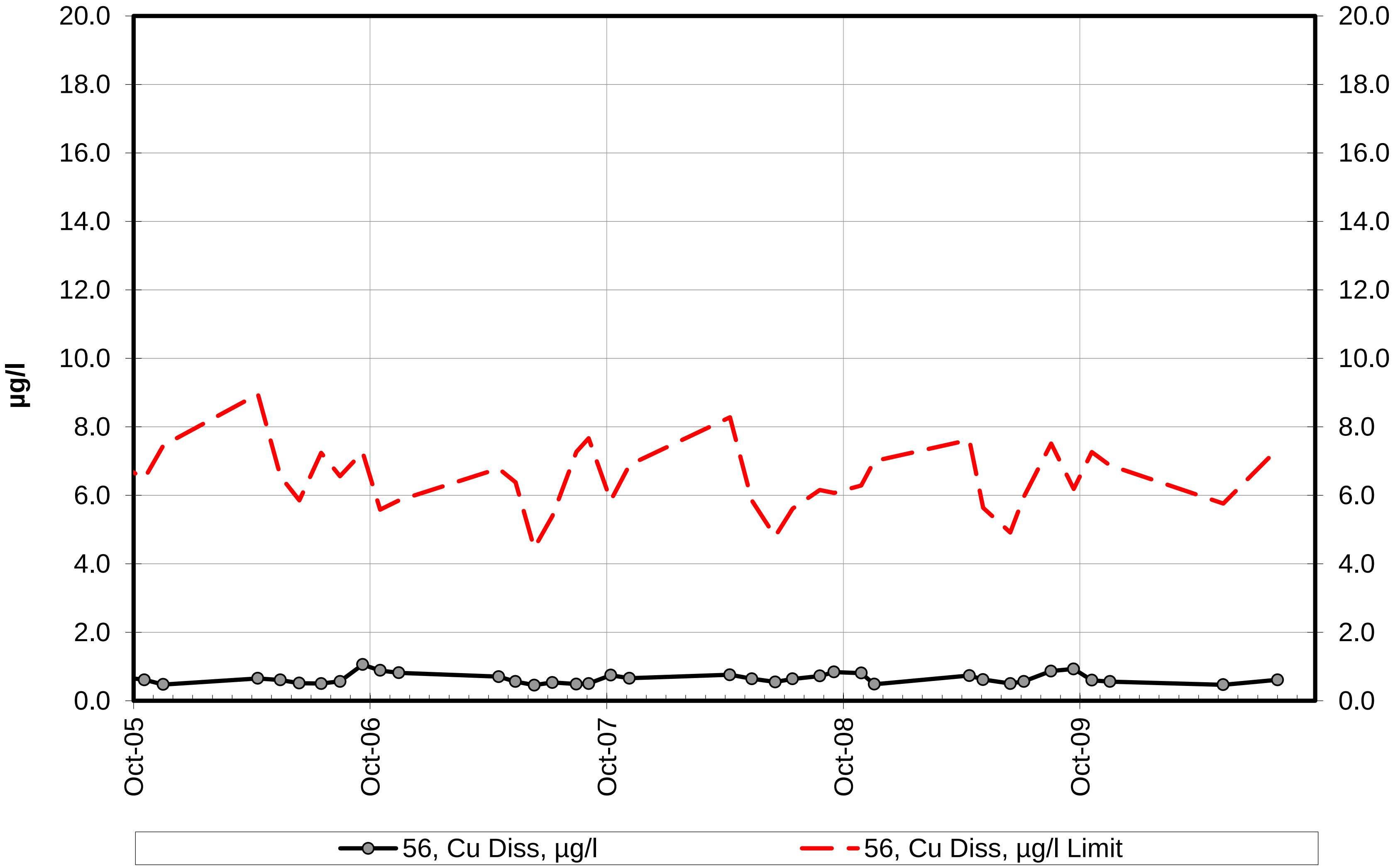


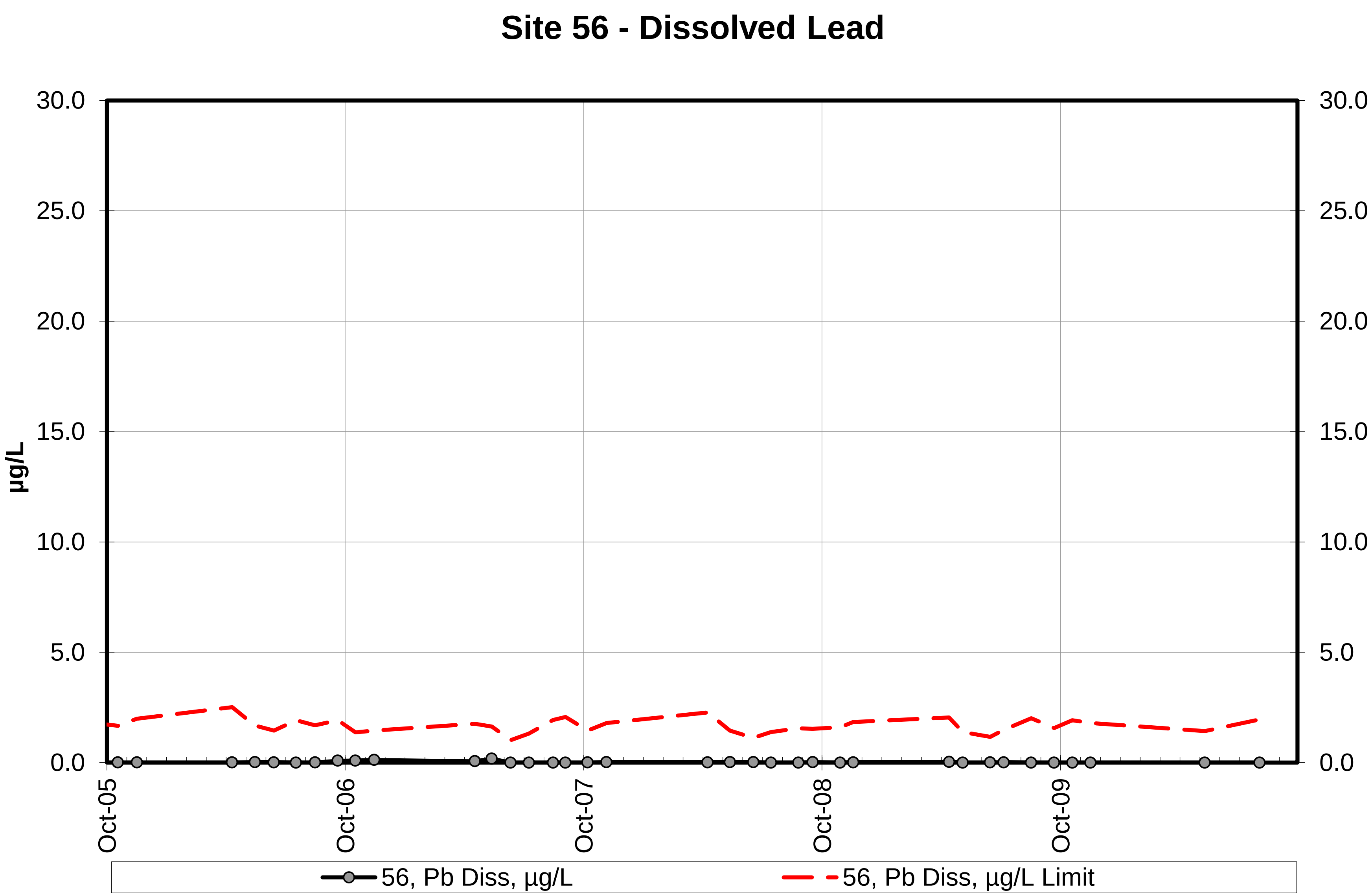
Site 56 - Dissolved Cadmium
µg/L
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, Cd Diss, µg/L
56, Cd Diss, µg/L Limit



Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

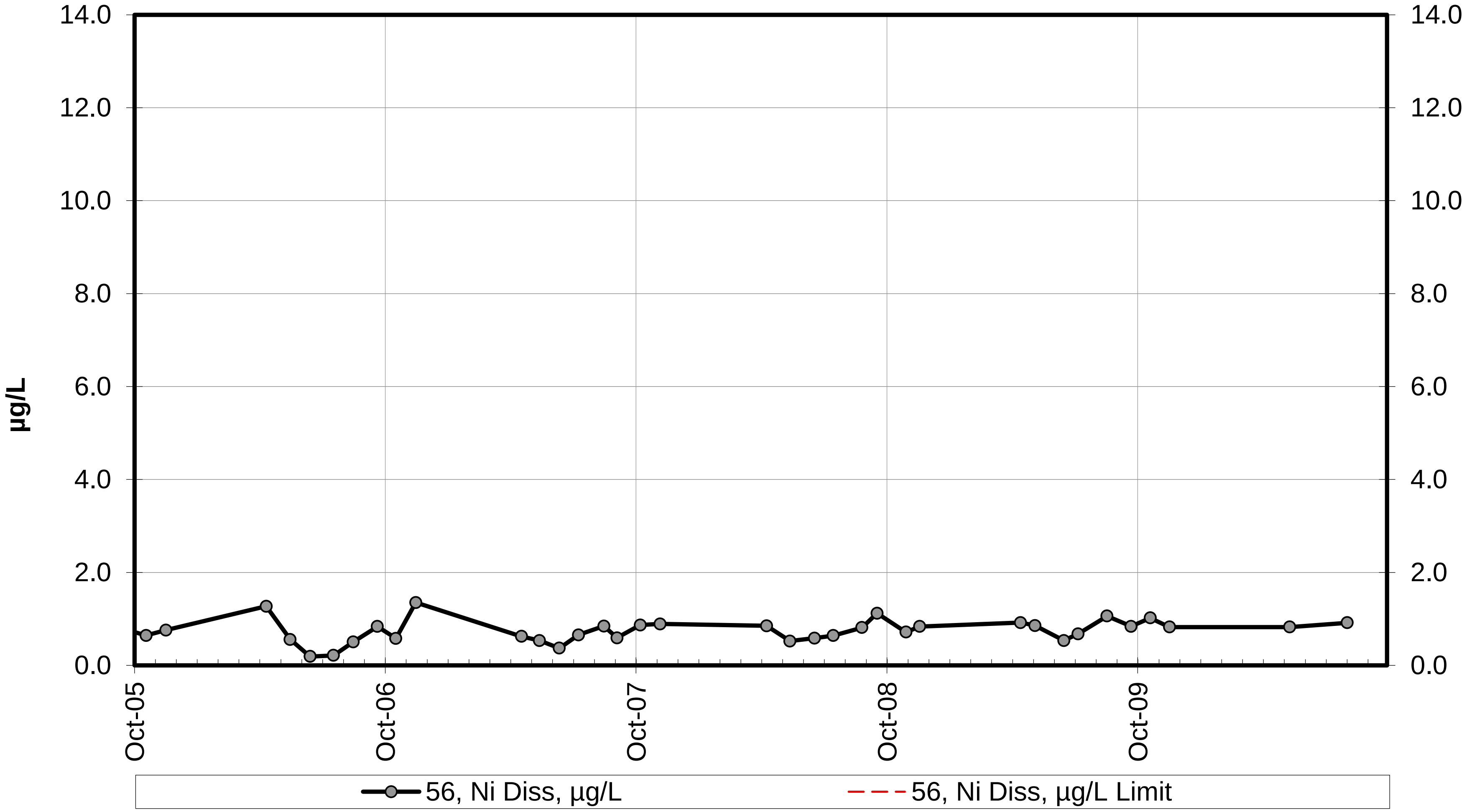
Site 56 - Dissolved Copper





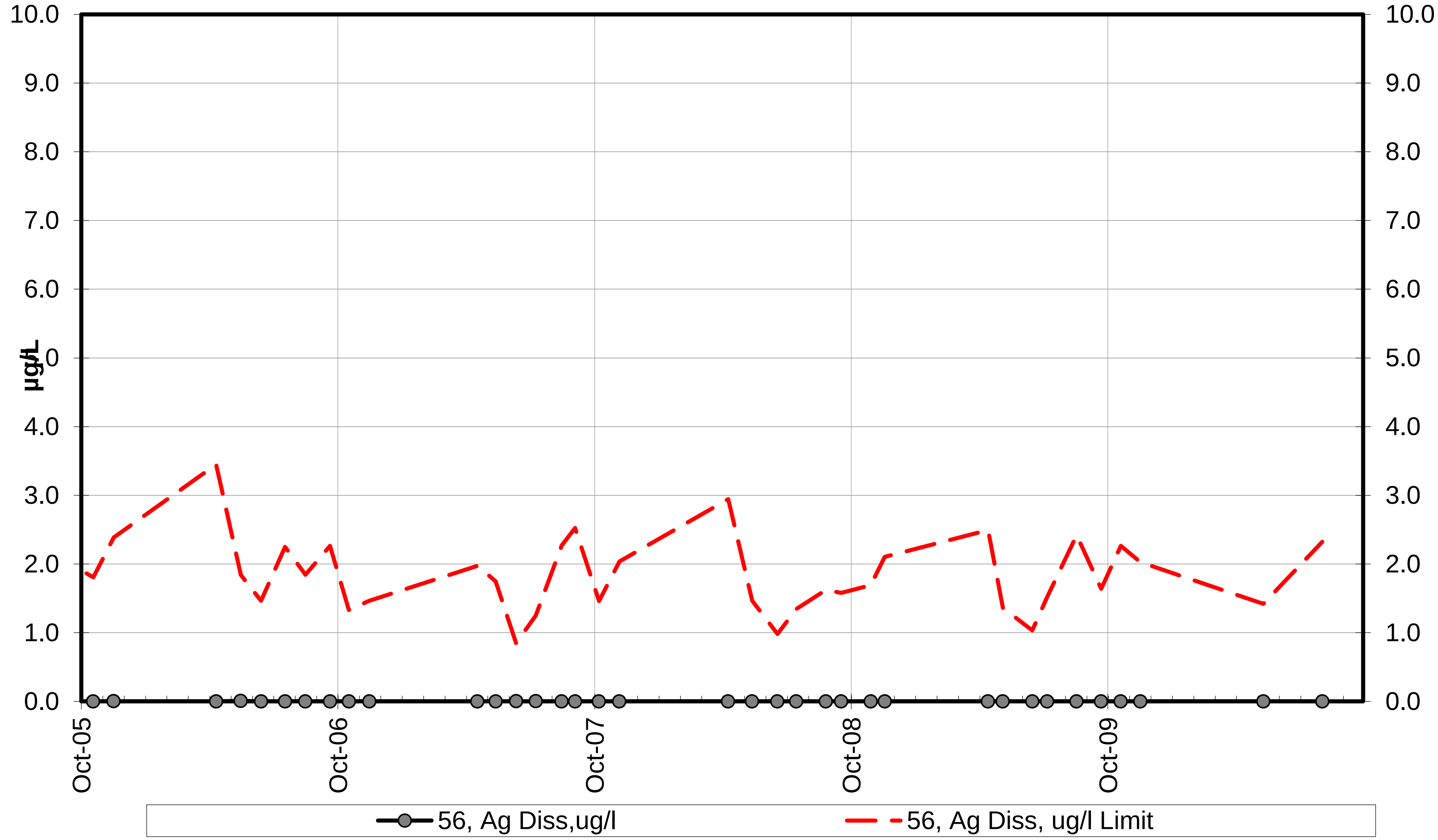
Site 56 - Dissolved Lead
µg/L
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, Pb Diss, µg/L
56, Pb Diss, µg/L Limit

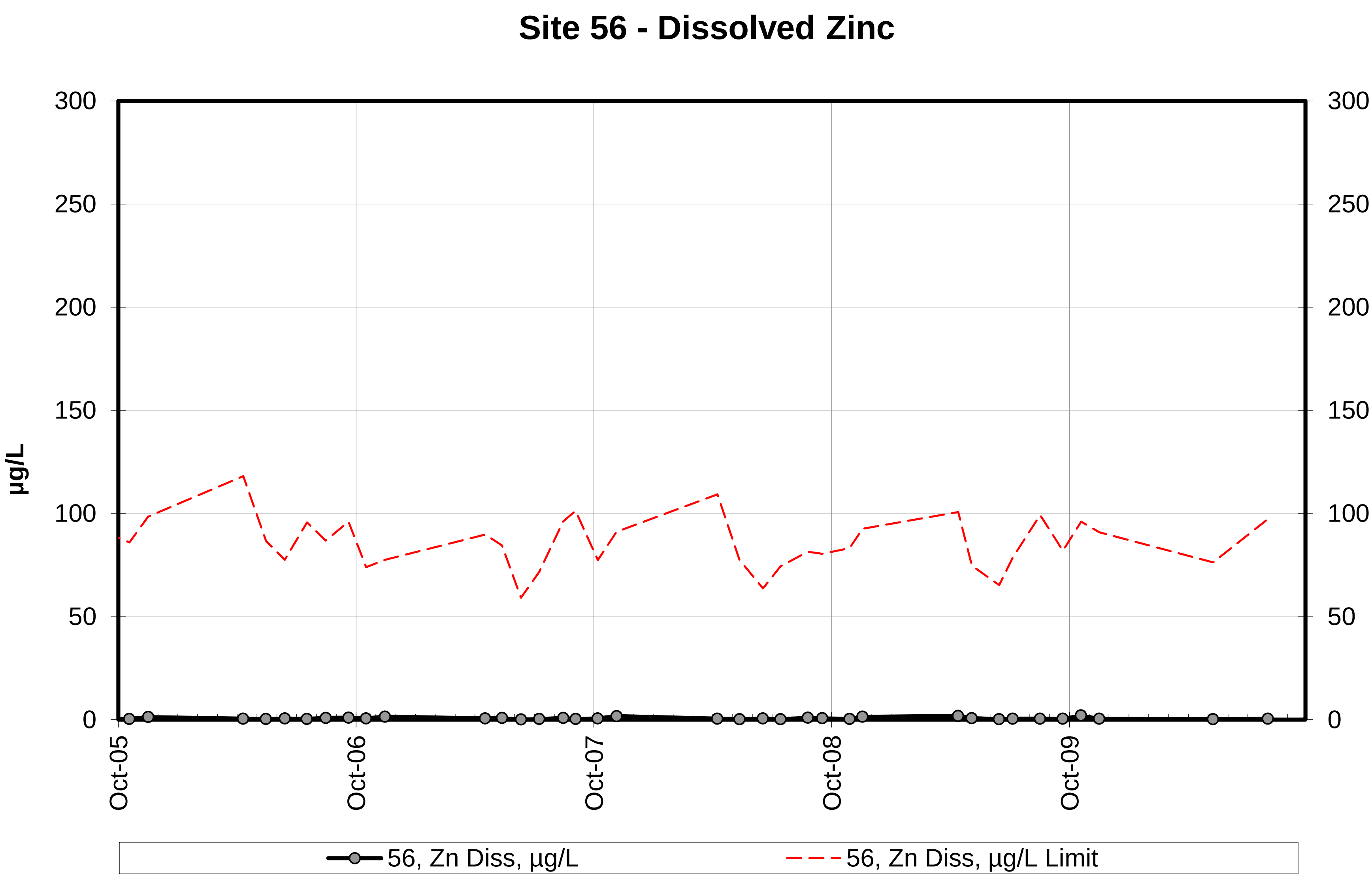
Site 56 - Dissolved Nickel



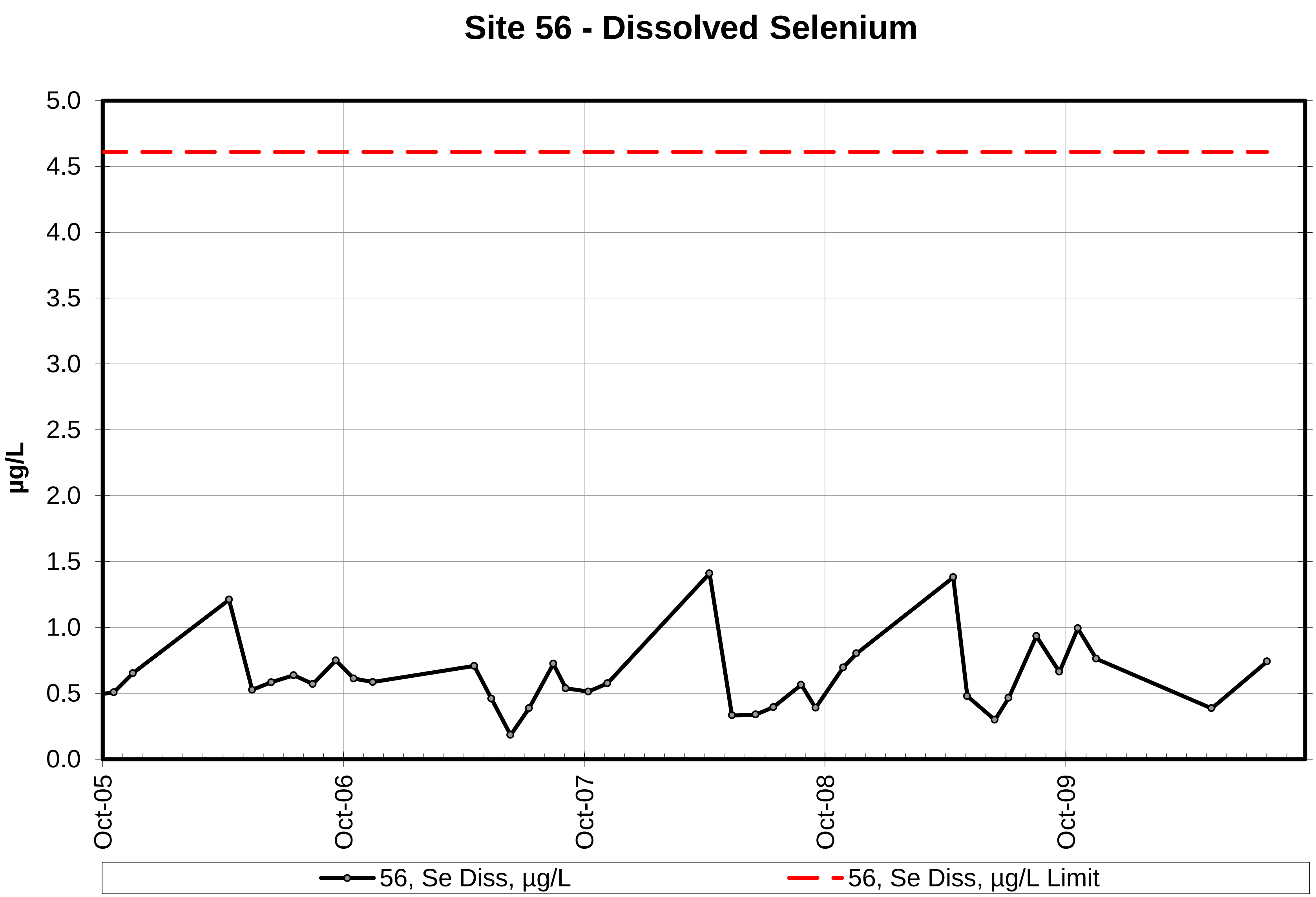
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

Site 56 - Dissolved Silver



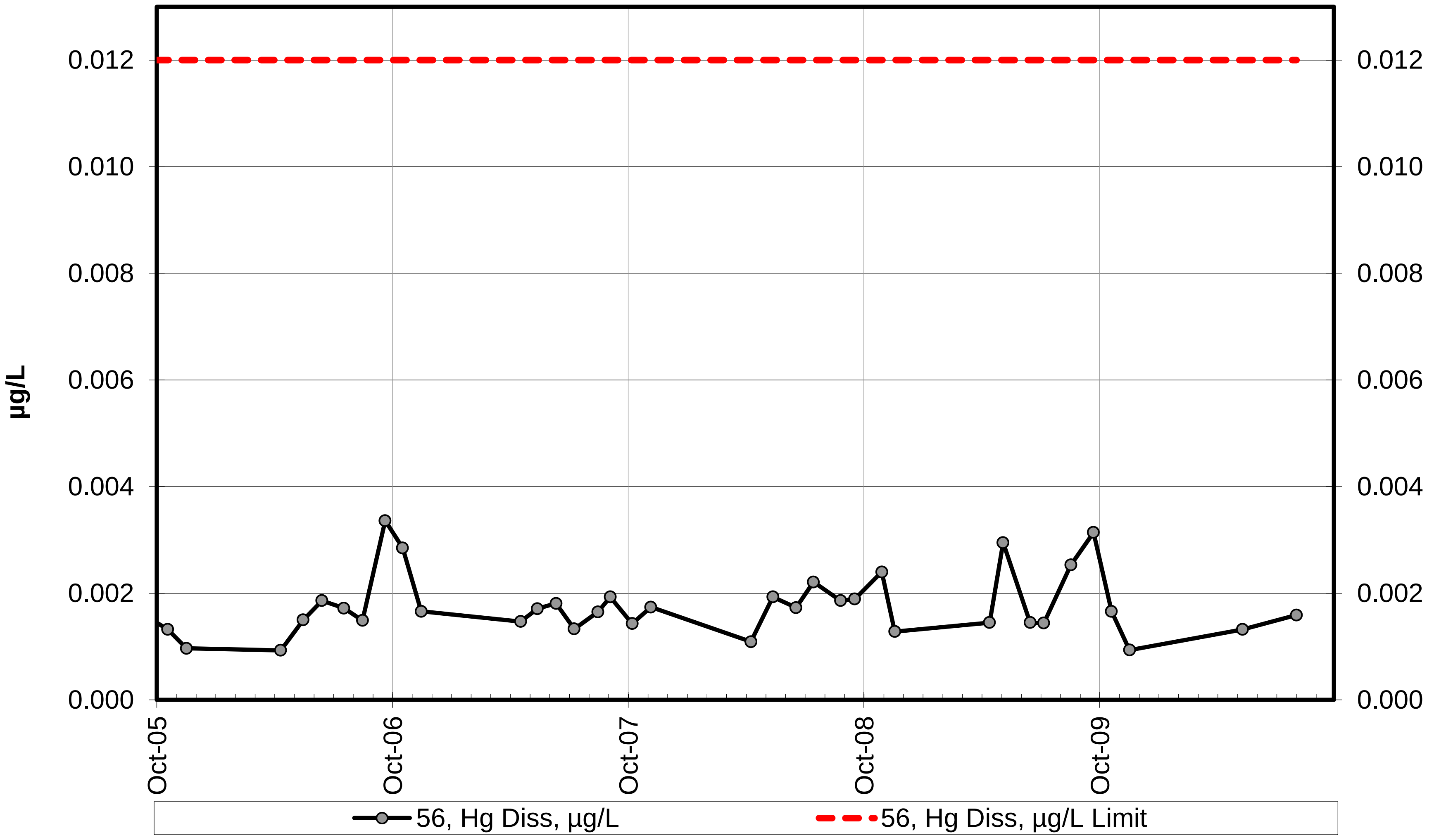


Site 56 - Dissolved Zinc
µg/L
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, Zn Diss, µg/L
56, Zn Diss, µg/L Limit



Site 56 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
56, Se Diss, µg/L
56, Se Diss, µg/L Limit

Site 56 - Dissolved Mercury



Site **#56** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	158	132					145	96	123	145	166	131
b	**WY2006**	129	150					177	126	120	141	124	147
c	**WY2007**	115	143					138	132	90.9	100	149	143
d	**WY2008**	119	131					169	114	85.7	115	127	126
e	**WY2009**	126	146					194	117	101	120	153	124
f	**WY2010**	145	143						122			159	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	5	5	5	5	5	5	5	5	5
t_2	0	1	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1					1	1	-1	-1	-1	1
c-a	-1	1					-1	1	-1	-1	-1	1
d-a	-1	-1					1	1	-1	-1	-1	-1
e-a	-1	1					1	1	-1	-1	-1	-1
f-a	-1	1						1			-1	
c-b	-1	-1					-1	1	-1	-1	1	-1
d-b	-1	-1					-1	-1	-1	-1	1	-1
e-b	-1	-1					1	-1	-1	-1	1	-1
f-b	1	-1						-1			1	
d-c	1	-1					1	-1	-1	1	-1	-1
e-c	1	1					1	-1	1	1	1	-1
f-c	1	0						-1			1	
e-d	1	1					1	1	1	1	1	-1
f-d	1	1						1			1	
f-e	1	-1						1			1	
S_k	-1	0	0	0	0	0	4	3	-6	-4	3	-6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	21.67					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.19	0.00					0.98	0.56	-1.47	-0.98	0.56	-1.47
Z^2_k	0.04	0.00					0.96	0.32	2.16	0.96	0.32	2.16

ΣZ_k= -2.00

ΣZ^2_k= 6.91

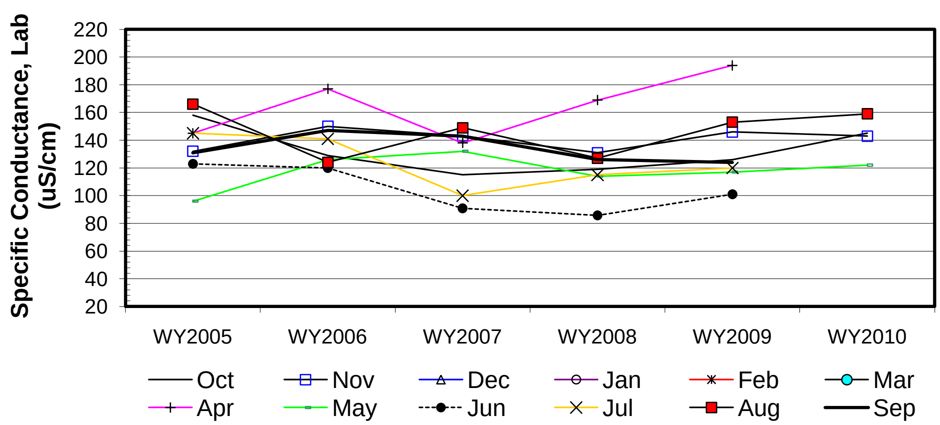
Z-bar=$\Sigma Z_k/K$= -0.25

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 44

ΣS_k -7

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	6.41	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.493**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -0.46	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
173.33	p **0.324**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-4.31		5.00
0.050	-3.32	**-1.17**	3.47
0.100	-3.00		2.55
0.200	-2.32		1.50

Site **#56** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	7.8	7.4					7.7	7.5	7.1	7.4	7.3	7.4
b	**WY2006**	6.9	7.2					7.4	7.2	7.2	7.5	7.1	7.2
c	**WY2007**	7.1	6.8					7.1	7.6	7.6	7.6	7.4	7.5
d	**WY2008**	7.3	7.4					7.3	7.6	7.3	7.2	7.3	7.3
e	**WY2009**	7.3	7.3					7.4	7.4	7.1	7.3	7.2	7.3
f	**WY2010**	7.5	7.6						7.7			7.0	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	-1					-1	-1	1	1	-1	-1
c-a	-1	-1					-1	1	1	1	1	1
d-a	-1	-1					-1	1	1	-1	1	-1
e-a	-1	-1					-1	-1	-1	-1	-1	-1
f-a	-1	1						1			-1	
c-b	1	-1					-1	1	1	1	1	1
d-b	1	1					-1	1	1	-1	1	1
e-b	1	1					1	1	-1	-1	1	1
f-b	1	1						1			-1	
d-c	1	1					1	1	-1	-1	-1	-1
e-c	1	1					1	-1	-1	-1	-1	-1
f-c	1	1						1			-1	
e-d	-1	-1					1	-1	-1	1	-1	-1
f-d	1	1						1			-1	
f-e	1	1						1			-1	
S_k	3	3	0	0	0	0	-2	7	0	-2	-5	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.56	0.62					-0.49	1.32	0.00	-0.49	-0.94	-0.49
Z^2_k	0.32	0.39					0.24	1.73	0.00	0.24	0.88	0.24

ΣZ_k= 0.09

ΣZ^2_k= 4.04

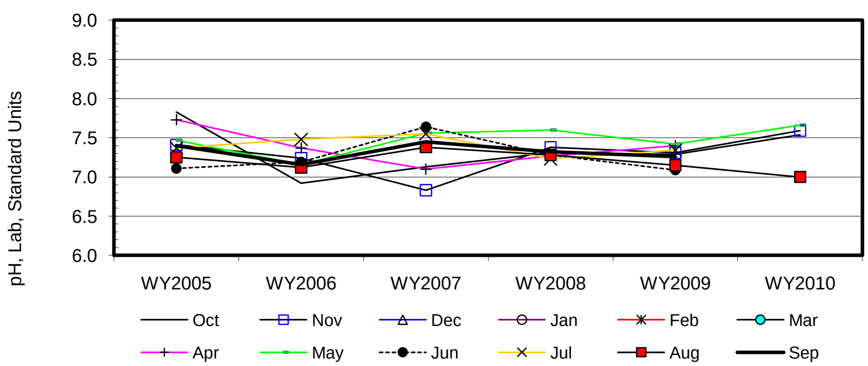
Z-bar=$\Sigma Z_k/K$= 0.01

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 44

ΣS_k 2

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	4.03	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.776**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	0.08	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
175.00 **p**	**0.530**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.05		0.07
0.050	-0.03	**0.01**	0.04
0.100	-0.03		0.04
0.200	-0.02		0.03

Site **#56** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	74.2	62.8					80.0	52.9	62.3	66.8	72.3	59.5
b	**WY2006**	56.8	62.8					76.3	57.4	49.1	60.3	57.9	61.0
c	**WY2007**	51.2	61.3					52.1	53.5	42.3	45.8	66.3	66.3
d	**WY2008**	53.8	56.9					67.6	48.4	39.6	44.9	51.1	48.1
e	**WY2009**	48.0	57.0					80.9	46.4	45.6	51.3	63.0	56.1
f	**WY2010**	58.6	59.9						46.3			66.1	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	5	5	5	5	5	5	5	5	5
t_2	0	1	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	0					-1	1	-1	-1	-1	1
c-a	-1	-1					-1	1	-1	-1	-1	1
d-a	-1	-1					-1	-1	-1	-1	-1	-1
e-a	-1	-1					1	-1	-1	-1	-1	-1
f-a	-1	-1						-1			-1	
c-b	-1	-1					-1	-1	-1	-1	1	1
d-b	-1	-1					-1	-1	-1	-1	-1	-1
e-b	-1	-1					1	-1	-1	-1	1	-1
f-b	1	-1						-1			1	
d-c	1	-1					1	-1	-1	-1	-1	-1
e-c	-1	-1					1	-1	1	1	-1	-1
f-c	1	-1						-1			-1	
e-d	-1	1					1	-1	1	1	1	1
f-d	1	1						-1			1	
f-e	1	1						-1			1	
S_k	-5	-8	0	0	0	0	0	-11	-6	-6	-3	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	21.67					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.94	-1.72					0.00	-2.07	-1.47	-1.47	-0.56	-0.49
Z^2_k	0.88	2.95					0.00	4.27	2.16	2.16	0.32	0.24

ΣZ_k= -8.72

ΣZ^2_k= 12.98

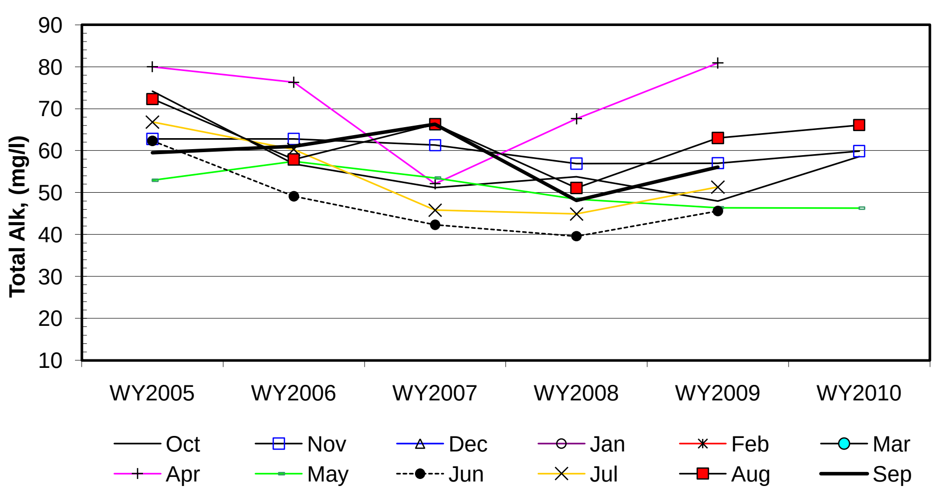
Z-bar=$\Sigma Z_k/K$= -1.09

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 44

ΣS_k -41

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	3.49	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.837**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$ 173.33	Z_{calc} -3.04	@$\alpha/2$=2.5% Z= 1.96	**H_0** (No trend)	REJECT
	p **0.001**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.68		-0.74
0.050	-3.00	**-1.79**	-1.18
0.100	-2.94		-1.39
0.200	-2.56		-1.50
		-3.1%	

Site #56 Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	10.9	9.1					12.8	5.3	9.8	10.8	14.2	9.0
b	**WY2006**	9.0	11.9					17.8	9.2	8.1	11.5	8.1	10.4
c	**WY2007**	7.5	6.7					10.8	7.6	3.6	5.7	11.2	11.7
d	**WY2008**	10.0	7.7					17.0	7.6	4.9	8.1	8.1	6.6
e	**WY2009**	6.9	11.2					19.1	7.7	6.3	11.1	14.6	8.4
f	**WY2010**	11.3	12.5						7.8			12.0	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1					1	1	-1	1	-1	1
c-a	-1	-1					-1	1	-1	-1	-1	1
d-a	-1	-1					1	1	-1	-1	-1	-1
e-a	-1	1					1	1	-1	1	1	-1
f-a	1	1						1			-1	
c-b	-1	-1					-1	-1	-1	-1	1	1
d-b	1	-1					-1	-1	-1	-1	1	-1
e-b	-1	-1					1	-1	-1	-1	1	-1
f-b	1	1						-1			1	
d-c	1	1					1	1	1	1	-1	-1
e-c	-1	1					1	1	1	1	1	-1
f-c	1	1						1			1	
e-d	-1	1					1	1	1	1	1	1
f-d	1	1						1			1	
f-e	1	1						1			-1	
S_k	-1	5	0	0	0	0	4	7	-4	0	3	-2

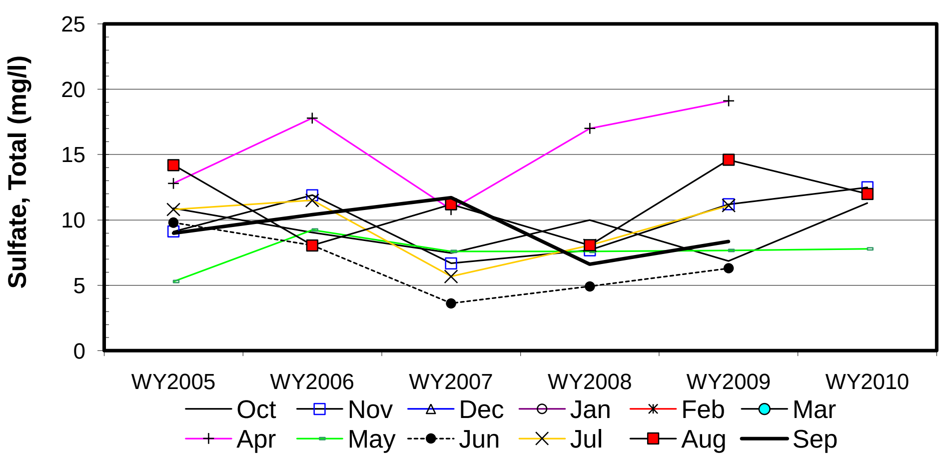
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	-0.19	1.04					0.98	1.32	-0.98	0.00	0.56	-0.49
Z^2_k	0.04	1.07					0.96	1.73	0.96	0.00	0.32	0.24

ΣZ_k= 2.24
ΣZ^2_k= 5.31
Z-bar=$\Sigma Z_k/K$= 0.28

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 44
ΣS_k 12

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	4.69	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity	
p	**0.698**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 175.00	Z_{calc} 0.83	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
	p **0.797**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.55		0.73
0.050	-0.35	**0.08**	0.56
0.100	-0.27		0.49
0.200	-0.07		0.22

Site **#56** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**	0.4	0.6					0.3	0.9	0.8	0.8	0.2	0.4
b	**WY2006**	0.4	1.3					0.5	0.4	0.6	0.4	0.9	1.0
c	**WY2007**	0.6	1.5					0.7	0.8	0.1	0.3	0.9	0.4
d	**WY2008**	0.7	1.8					0.5	0.3	0.6	0.3	1.0	0.7
e	**WY2009**	0.4	1.5					1.9	0.8	0.2	0.5	0.5	0.4
f	**WY2010**	2.0	0.5						0.2			0.4	
	n	6	6	0	0	0	0	5	6	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a	-1	1					1	-1	-1	-1	1	1
c-a	1	1					1	-1	-1	-1	1	-1
d-a	1	1					1	-1	-1	-1	1	1
e-a	-1	1					1	-1	-1	-1	1	1
f-a	1	-1						-1			1	
c-b	1	1					1	1	-1	-1	1	-1
d-b	1	1					-1	-1	-1	-1	1	-1
e-b	-1	1					1	1	-1	1	-1	-1
f-b	1	-1						-1			-1	
d-c	1	1					-1	-1	1	-1	1	1
e-c	-1	-1					1	-1	1	1	-1	1
f-c	1	-1						-1			-1	
e-d	-1	-1					1	1	-1	1	-1	-1
f-d	1	-1						-1			-1	
f-e	1	-1						-1			-1	
S_k	5	1	0	0	0	0	6	-9	-6	-4	1	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	28.33	23.33					16.67	28.33	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.94	0.21					1.47	-1.69	-1.47	-0.98	0.19	0.00
Z^2_k	0.88	0.04					2.16	2.86	2.16	0.96	0.04	0.00

ΣZ_k= -1.34

ΣZ^2_k= 9.10

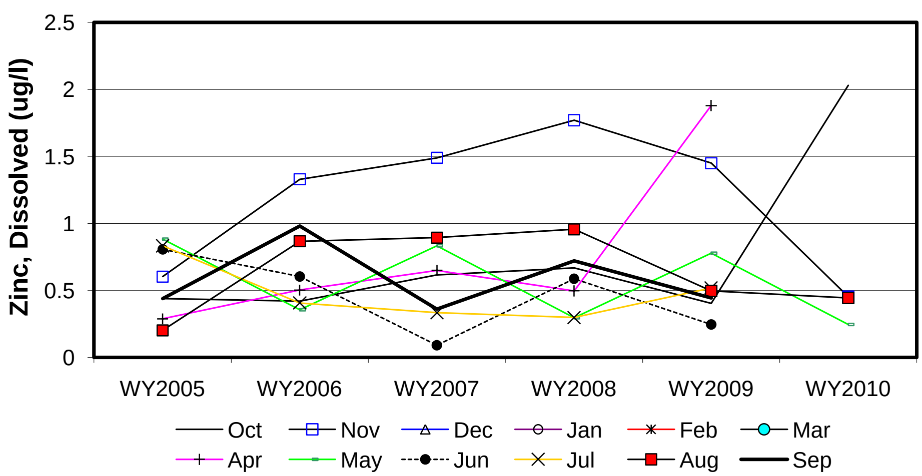
Z-bar=$\Sigma Z_k/K$= -0.17

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 44

ΣS_k -6

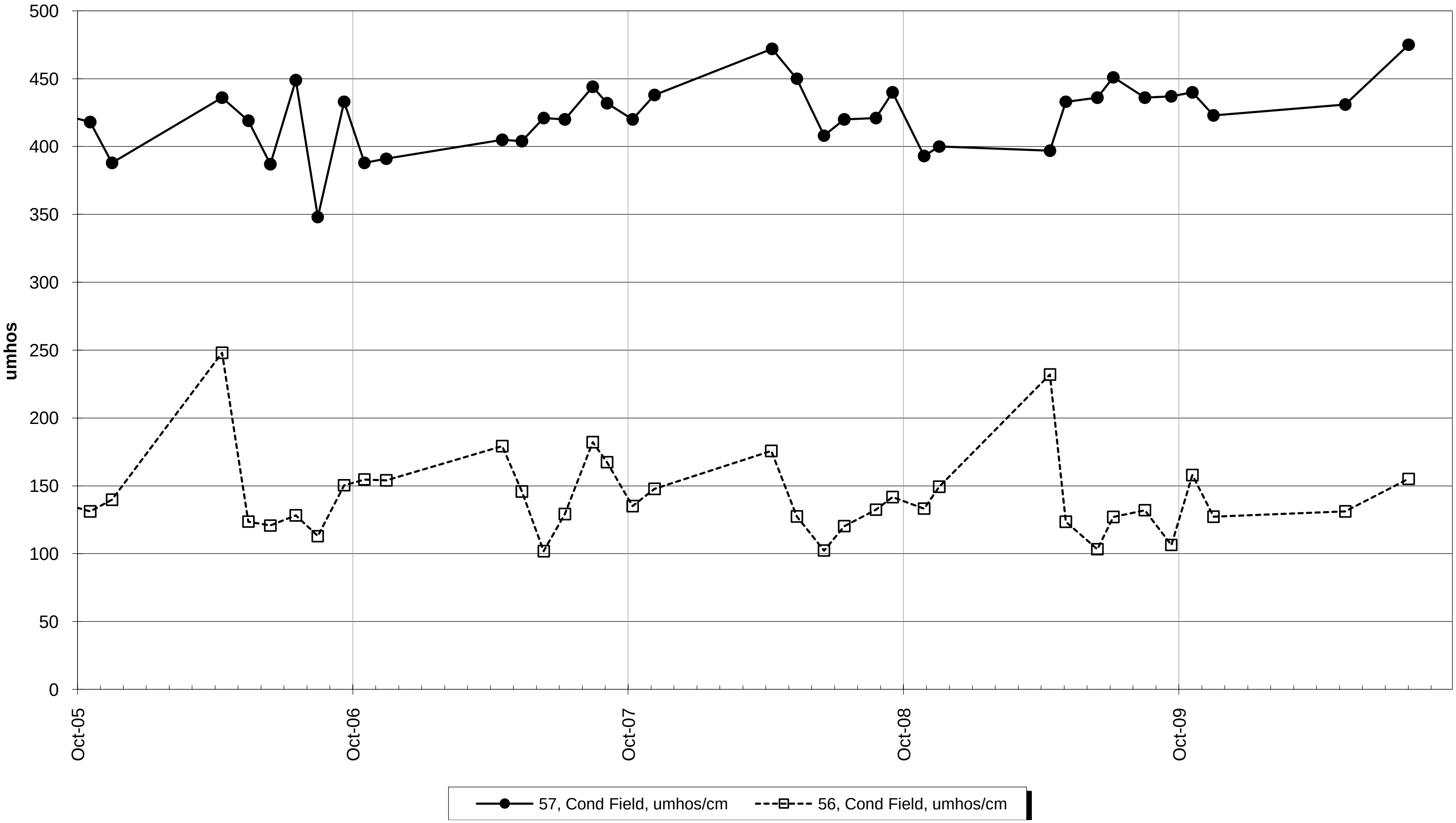
$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	8.88	@α=5% $\chi^2_{(K-1)}$= 14.07	Test for station homogeneity
p	**0.262**		$\chi^2_h<\chi^2_{(K-1)}$ ACCEPT
$\Sigma VAR(S_k)$ / 175.00	Z_{calc} -0.38	@$\alpha/2$=2.5% Z= 1.96	**H_0** (No trend) ACCEPT
	p **0.353**		**H_A** (± trend) REJECT



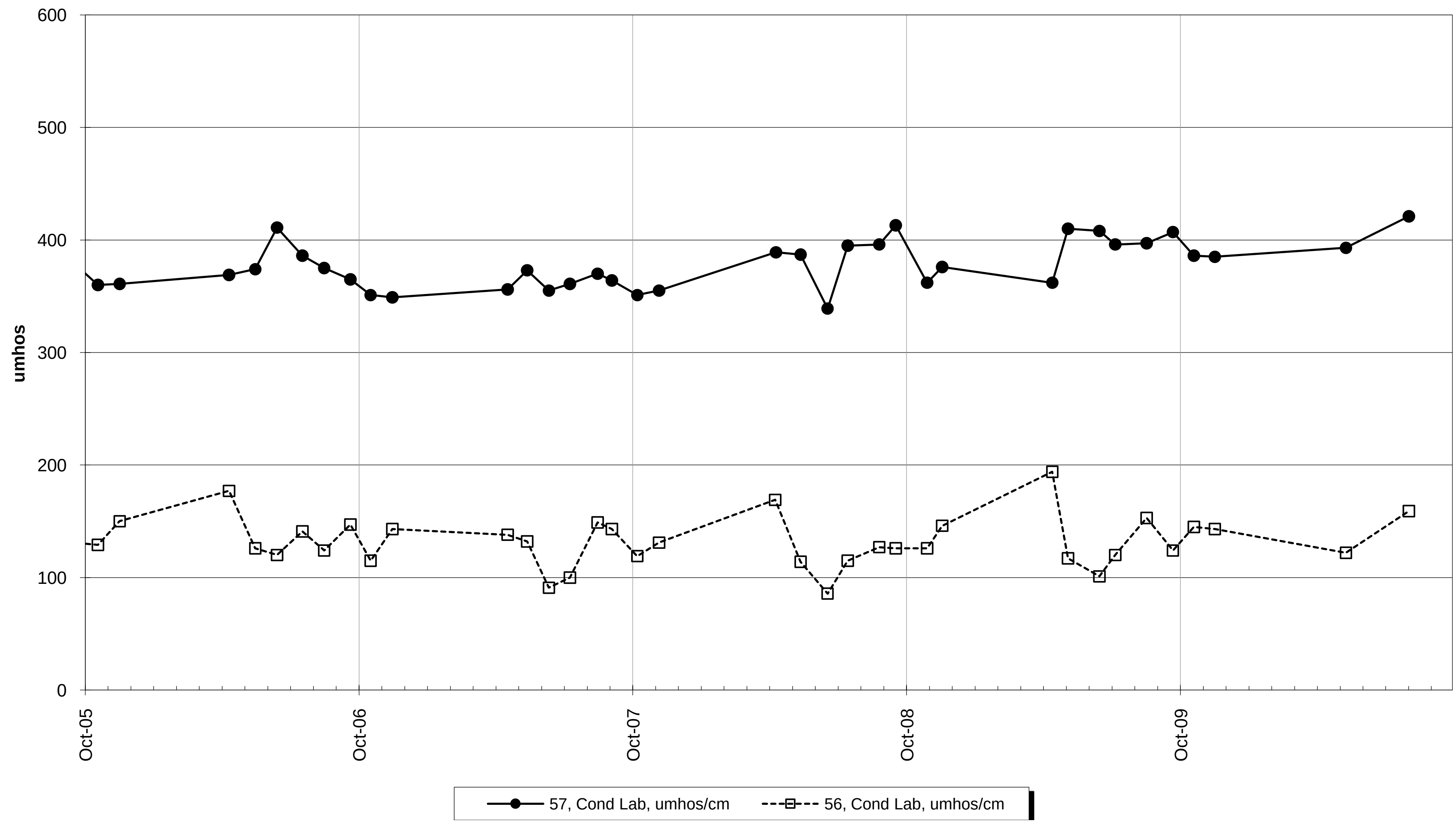
Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.08		0.08
0.050	-0.04	**-0.01**	0.05
0.100	-0.03		0.04
0.200	-0.03		0.03

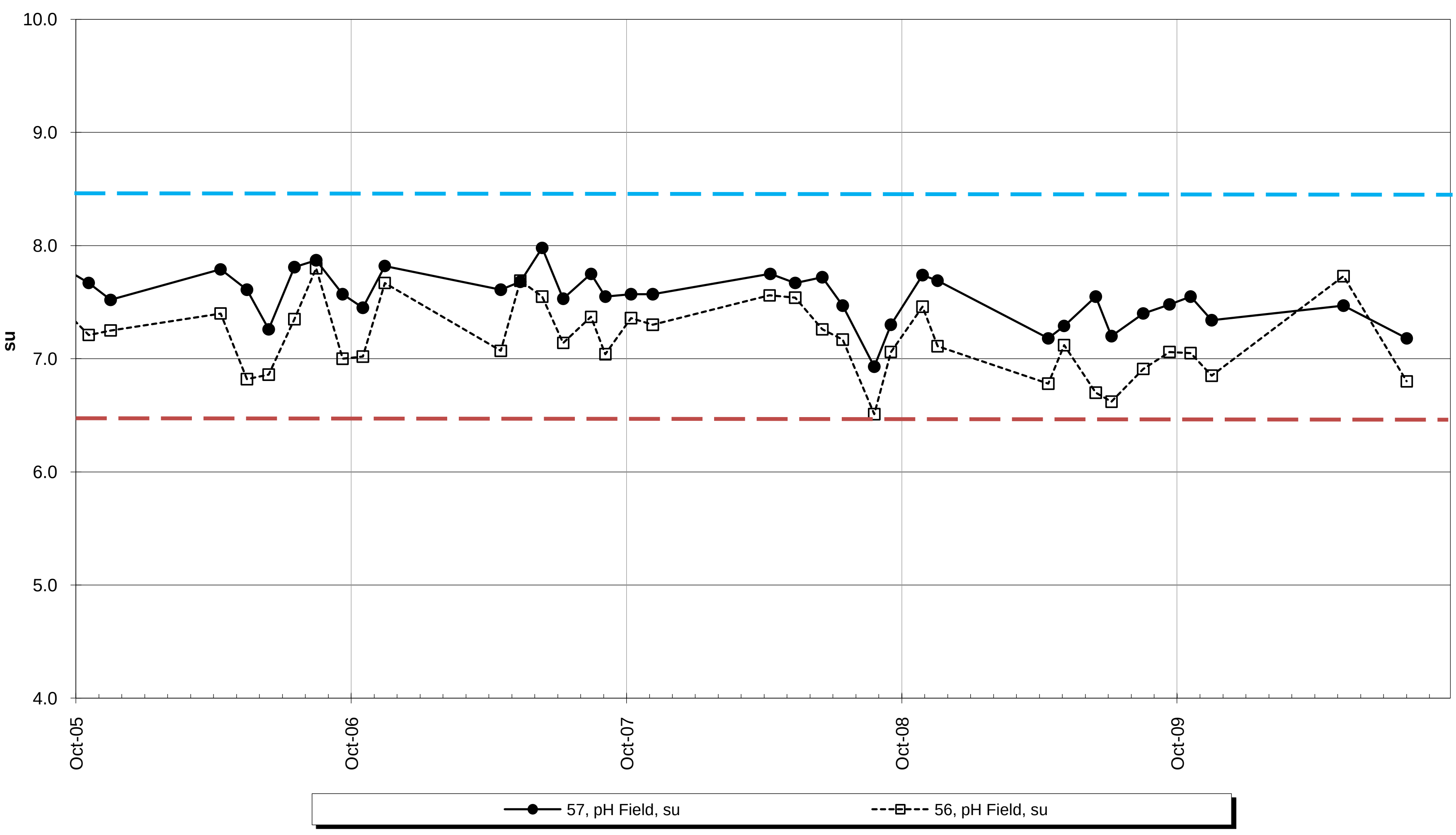
Site 57 vs Site 56 -Conductivity-Field



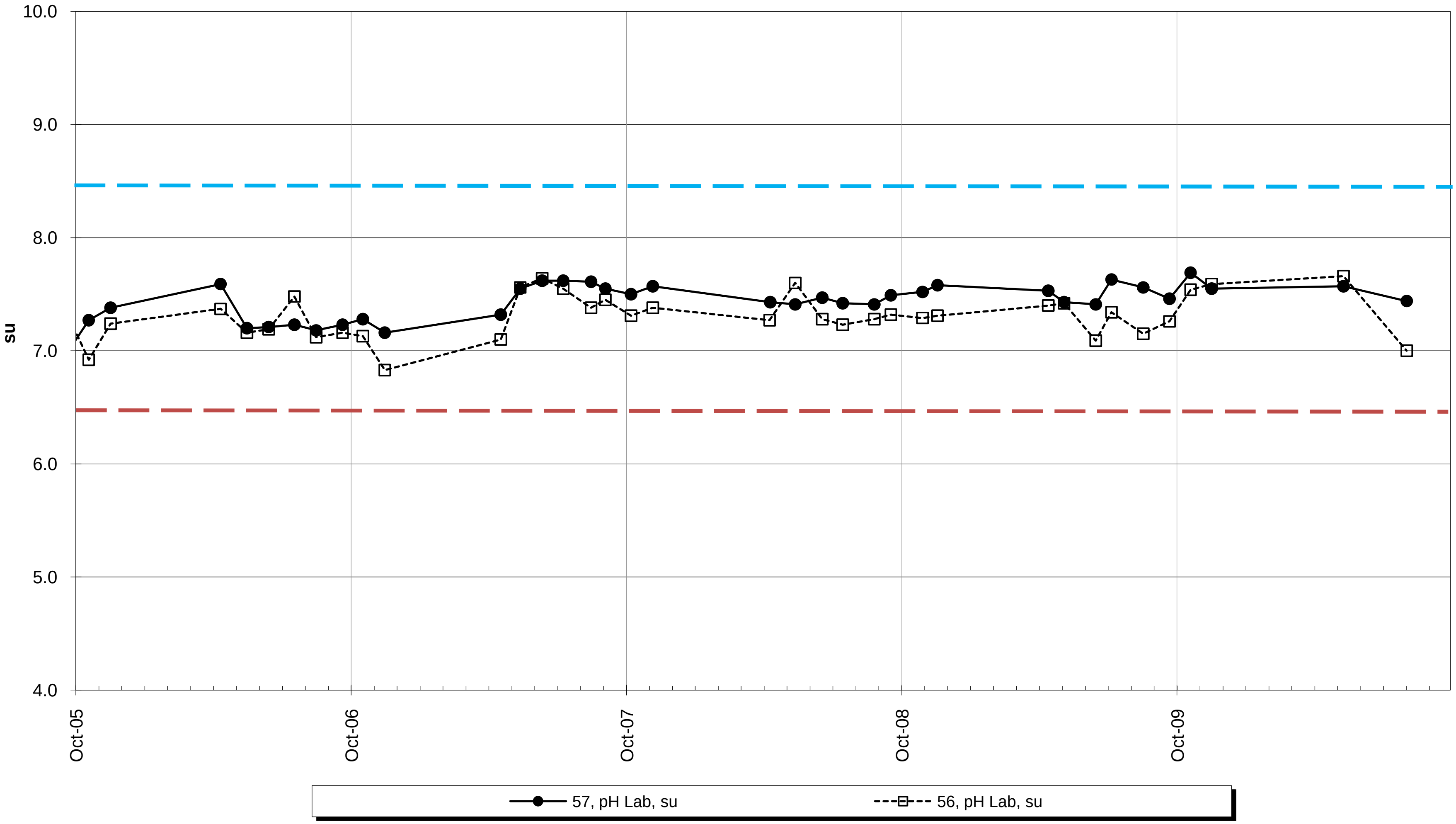
Site 57 vs Site 56 -Conductivity



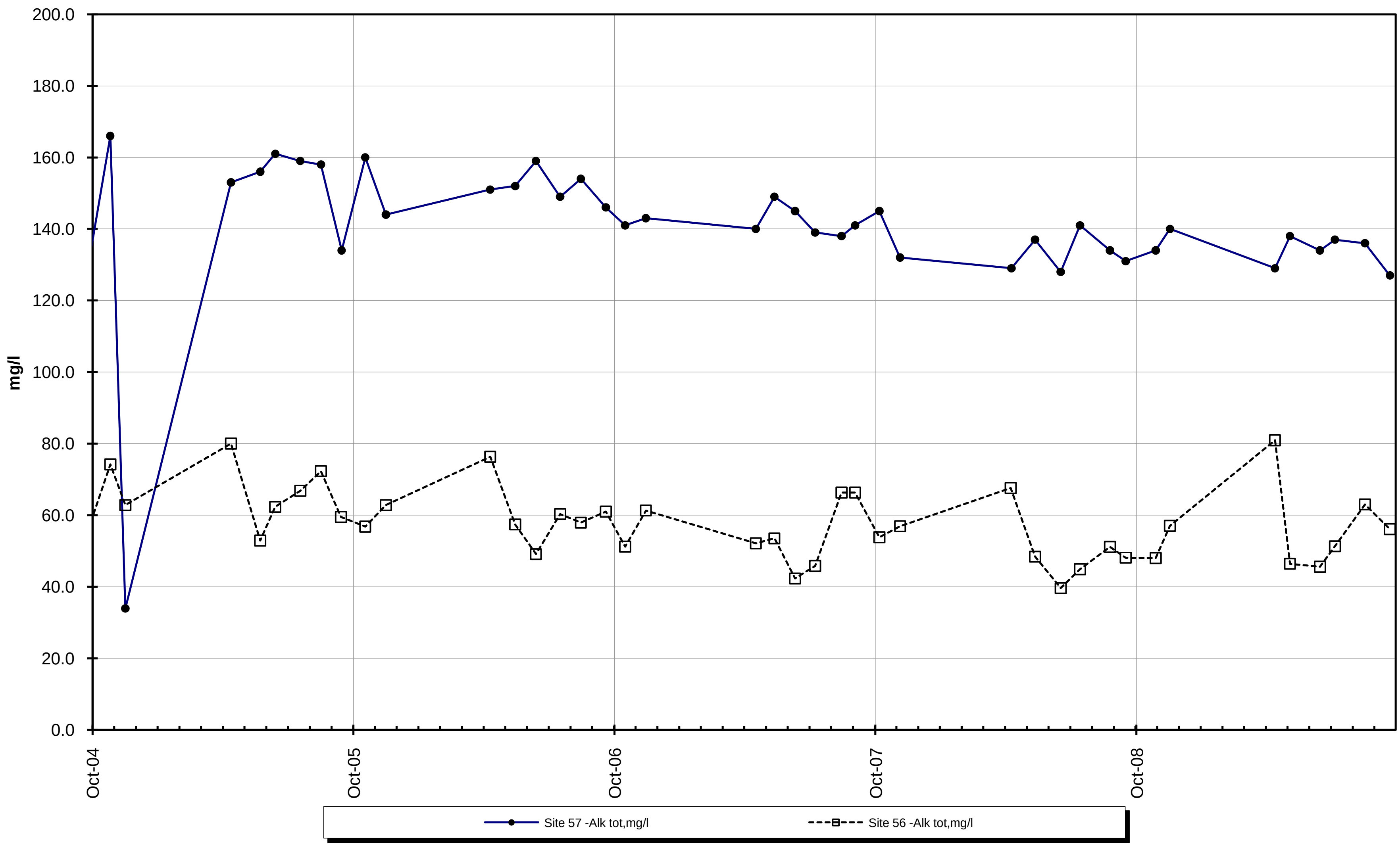
Site 57 vs Site 56 -Field pH



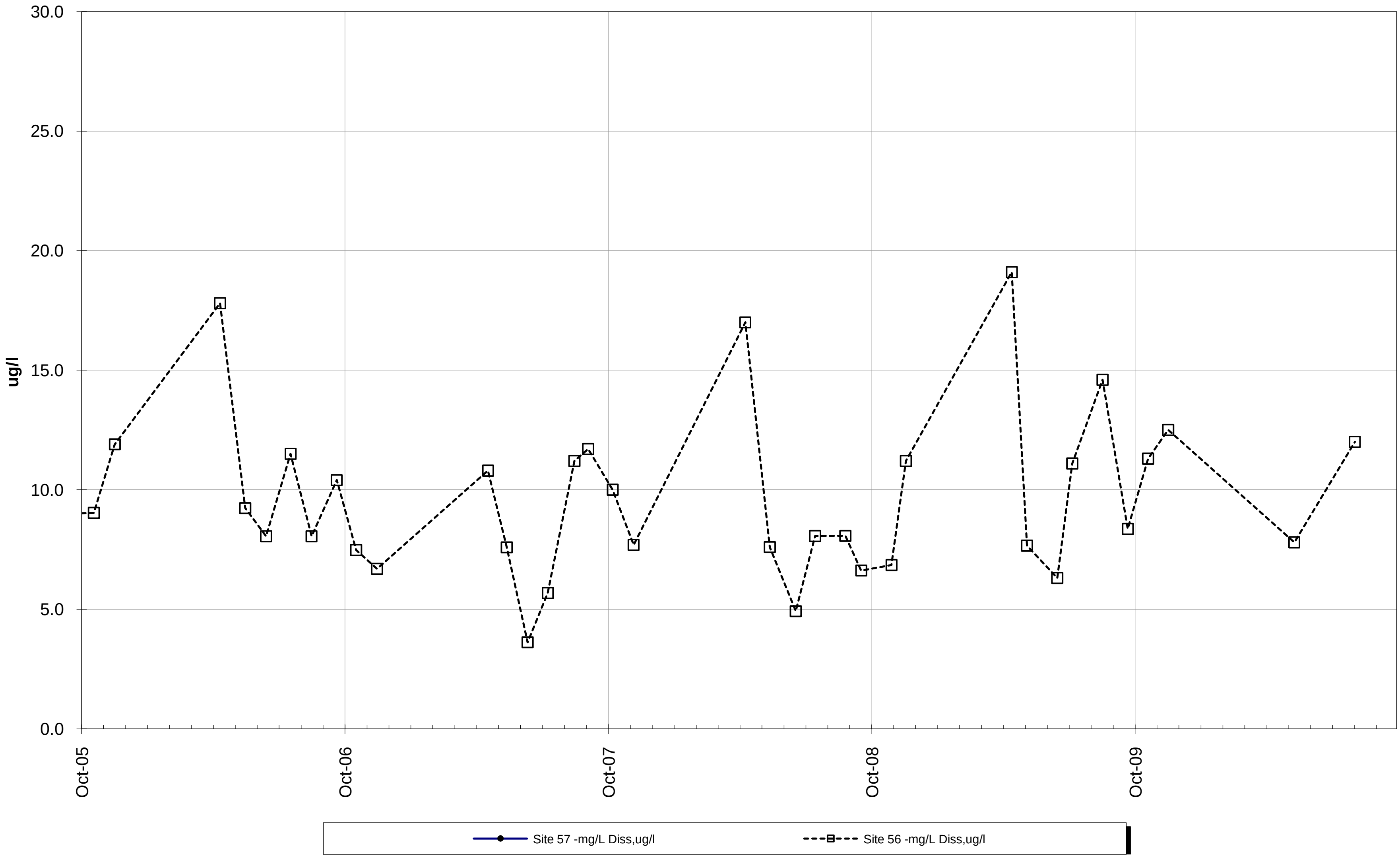
Site 57 vs Site 56 -Lab pH



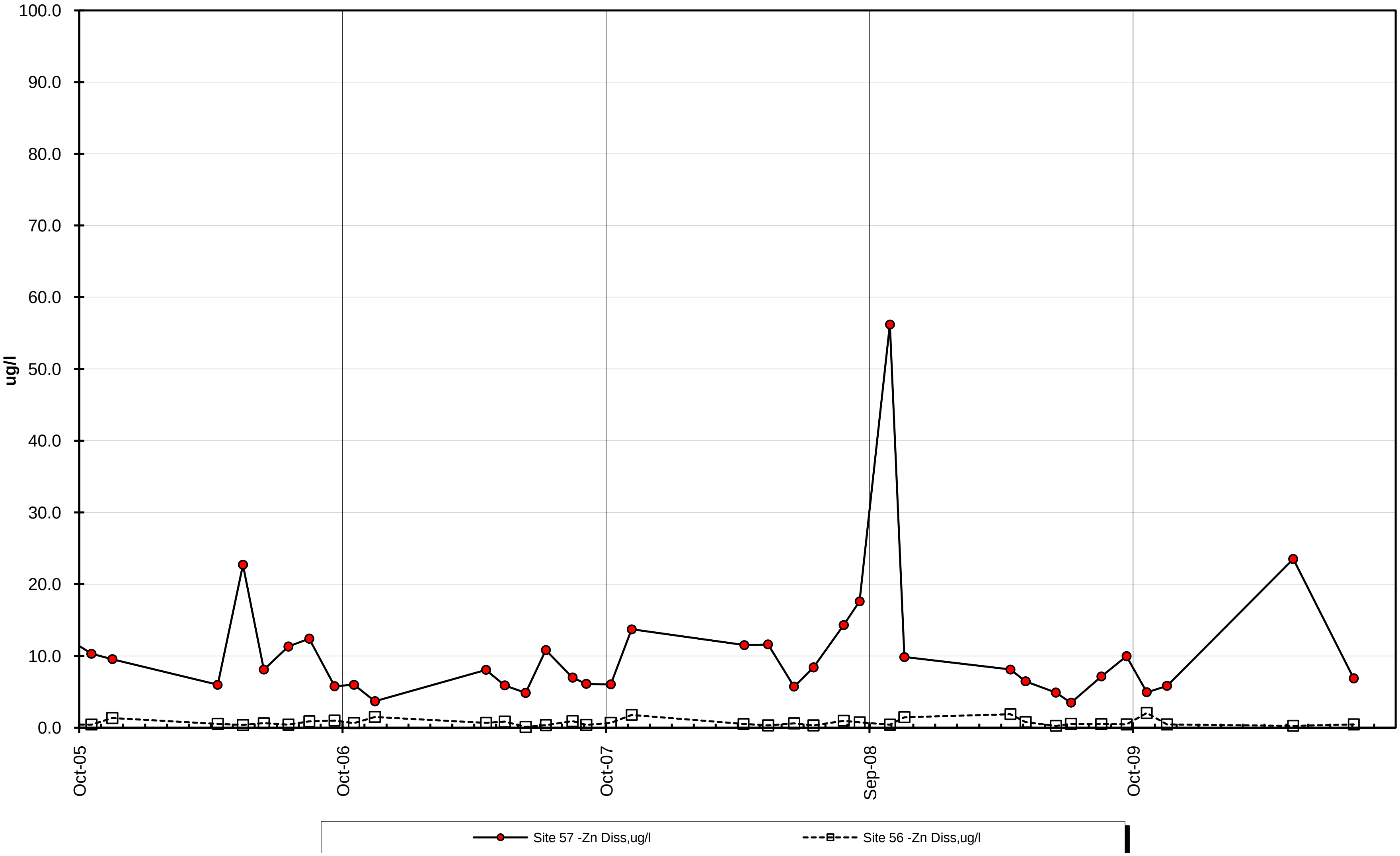
Site 57 vs. Site 56 -Total Alkalinity



Site 57 vs. Site 56 -Total Sulfate



Site 57 vs. Site 56 -Dissolved Zinc



Wilcoxon-signed-ranks test

Exact Form

Variable: **Specific Conductance, Lab (uS/cm)**

	X	**Y**			
Site	#57	#56	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	386.0	145.0	241.0	241.0	1
Nov	385.0	143.0	242.0	242.0	2
Dec					
Jan					
Feb					
Mar					
Apr					
May	393.0	122.0	271.0	271.0	4
Jun					
Jul					
Aug	421.0	159.0	262.0	262.0	3
Sep					
Median	389.5	144.0	252.0	252.0	

n	**m**
4	4

N= 4

$\Sigma R =$ 10

α
5.0%
W'$_{\alpha,n}$
#N/A

$W^+=$
10
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **pH, Lab, Standard Units**

	X	**Y**			
Site	#57	#56	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	7.69	7.54	0.15	0.15	3
Nov	7.55	7.59	-0.04	0.04	-1
Dec					
Jan					
Feb					
Mar					
Apr					
May	7.57	7.66	-0.09	0.09	-2
Jun					
Jul					
Aug	7.44	7.00	0.44	0.44	4
Sep					
Median	7.56	7.57	0.06	0.12	

n	**m**
4	4

N= 4

$\Sigma R=$ 4

α
95.0%
W'α,n
#N/A

$W^+=$
7
p-test
0.000

H_0	median [D]=0	ACCEPT
H_1	median [D]>0	

Wilcoxon-signed-ranks test

Exact Form

Variable: **Total Alk, (mg/l)**

	X	**Y**			
Site	#57	#56	Differences		
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	137.0	58.6	78.4	78.4	2
Nov	140.0	59.9	80.1	80.1	3
Dec					
Jan					
Feb					
Mar					
Apr					
May	133.0	46.3	86.7	86.7	4
Jun					
Jul					
Aug	143.0	66.1	76.9	76.9	1
Sep					
Median	138.5	59.3	79.3	79.3	

n	**m**
4	4

N= 4

ΣR= 10

α
95.0%
W'α,n
#N/A

W^+=
10
p-test
0.000

H_0	median [D]=0	ACCEPT
H_1	median [D]>0	

Wilcoxon-signed-ranks test

Exact Form

Variable: **Sulfate, Total (mg/l)**

	X	Y	Differences		
Site	#57	#56			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	51.7	11.3	40.4	40.4	2
Nov	57.5	12.5	45.0	45.0	3
Dec					
Jan					
Feb					
Mar					
Apr					
May	44.3	7.8	36.5	36.5	1
Jun					
Jul					
Aug	60.5	12.0	48.5	48.5	4
Sep					
Median	54.6	11.7	42.7	42.7	

n	**m**
4	4

N= 4

ΣR= 10

α
5.0%
W'$_{\alpha,n}$
#N/A

W^+=
10
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

Wilcoxon-signed-ranks test

Exact Form

Variable: **Zinc, Dissolved (ug/l)**

	X	**Y**	Differences		
Site	#57	#56			
Year	WY2010	WY2010	**D**	**|D|**	**Rank**
Oct	4.92	2.03	2.89	2.89	1
Nov	5.81	0.45	5.36	5.36	2
Dec					
Jan					
Feb					
Mar					
Apr					
May	23.50	0.25	23.25	23.25	4
Jun					
Jul					
Aug	6.87	0.44	6.43	6.43	3
Sep					
Median	6.34	0.45	5.89	5.89	

n	**m**
4	4

N= 4

$\Sigma R =$ 10

α
5.0%
W' α,n
#N/A

$W^+ =$
10
p-test
0.000

H_0	median [D]=0	**REJECT**
H_1	median [D]<0	**ACCEPT**

SITE 13 “MINE ADIT DISCHARGE EAST”

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Two results exceeding these criteria have been identified, as listed in the table below. The data are for total sulfate from the Oct-2009 and Aug-2010 samplings with values of 265 mg/L and 271 mg/L respectively. This year’s data breaks from the trend of decreasing sulfate trending towards the historic (1985 – 1990) mean of 160 mg/L. over the past few years the waste rock material has been being removed from the 1350 Area. Most if not all of this removal has not been in the drainage that passes through Site 13. It is expected that during the 2011 construction season that the majority of the remaining material (East Lobe) will be removed. When this removal is completed, water quality at this site is expected to improve.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
20-Oct-09	SO4 Tot, mg/l	265		6.5	Aquatic Life, chronic
3-Aug-10	SO4 Tot, mg/l	271		6.5	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. As with the other sites in the 920 Area, there was a substantial increase in the dissolved chromium concentration at site 13.

A non-parametric statistical analysis for trend was performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages

Site 13-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.35	0		
pH, Lab	6	**0.98**	+	0.06	0.8
Alkalinity, Total	6	**<0.01**	-	-8.80	-6.20
Sulfate, Total	5	0.16	0		
Zinc, Dissolved	6	0.42	0		

(1): Number of years (2):Significance level

following this interpretive section. The following table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). For datasets with a statistically significant trend a Seasonal-Sen's Slope estimate statistic has also been calculated. Statistically significant (a/2=2.5%) trends are present in the datasets for conductivity, alkalinity, total sulfate, and dissolved zinc.

As hypothesized for several years, the drier summers of WY2003 and WY2004 lead to an increase in pyrite oxidation, resulting in an increase in alkalinity from carbonate mineral dissolution. As climatic conditions 'normalized' in the following years, this increasing alkalinity trend reversed and is now a significant ($p<0.01$) decreasing trend with an estimated slope of -8.80 mg/L/yr or a -6.20% decrease. However, there is still ample buffering capacity contained in the waste rock at this site, as evidenced by the slightly increasing trend in pH. .Laboratory pH exhibits a significant ($p=0.98$) increasing trend with an estimated slope of 0.06 su/yr or a 0.8% increase. Though this trend is increasing the values are well within the AWQS. Furthermore, HGCMC feels the current FWMP program is sufficient to monitor any future increases at Site 13 before any water quality values are impaired. The overall constituent loading for this site is within the range expected from exposed waste rock.

Table of Results for Water Year 2010

Site 13 "Mine Adit Discharge Creek"

Sample Date/Parameter	10/20/2009	11/17/2009	Dec-09	Jan-10	Jan-10	Mar-10	4/6/2010	5/11/2010	6/15/2010	7/13/2010	8/3/2010	9/14/2010	**Median**
Water Temp (℃)	4.8	No Access			NOT SCHEDULED FOR SAMPLING			5.2	NOT SCHEDULED FOR SAMPLING		10.7	NOT SCHEDULED FOR SAMPLING	5.2
Conductivity-Field(µmho)	842							812			895		842
Conductivity-Lab (µmho)	746							768			846		768
pH Lab (standard units)	7.84							7.91			7.84		7.84
pH Field (standard units)	7.86							7.95			7.47		7.86
Total Alkalinity (mg/L)	134.0							141.0			181.0		141.0
Total Sulfate (mg/L)	265.0							439.0			271.0 J		265.0
Hardness (mg/L)	469.0							241.0 J			512.0		469.0
Dissolved As (ug/L)	0.193							0.115			0.146		0.146
Dissolved Ba (ug/L)	24.7							17.3			22.7		22.7
Dissolved Cd (ug/L)	0.020							0.012 J			0.011 J		0.012
Dissolved Cr (ug/L)	0.395							7.340			8.330		7.340
Dissolved Cu (ug/L)	1.170							0.404			0.483		0.483
Dissolved Pb (ug/L)	0.0068 U							0.0046 U			0.0169 U		0.0068
Dissolved Ni (ug/L)	2.960							2.980			2.550		2.960
Dissolved Ag (ug/L)	<0.003							<0.004			<0.004		0.002
Dissolved Zn (ug/L)	12.60							8.38			5.94		8.38
Dissolved Se (ug/L)	0.404 J							0.426			0.443		0.426
Dissolved Hg (ug/L)	0.000641							0.000749 U			0.000815 U		0.000749

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

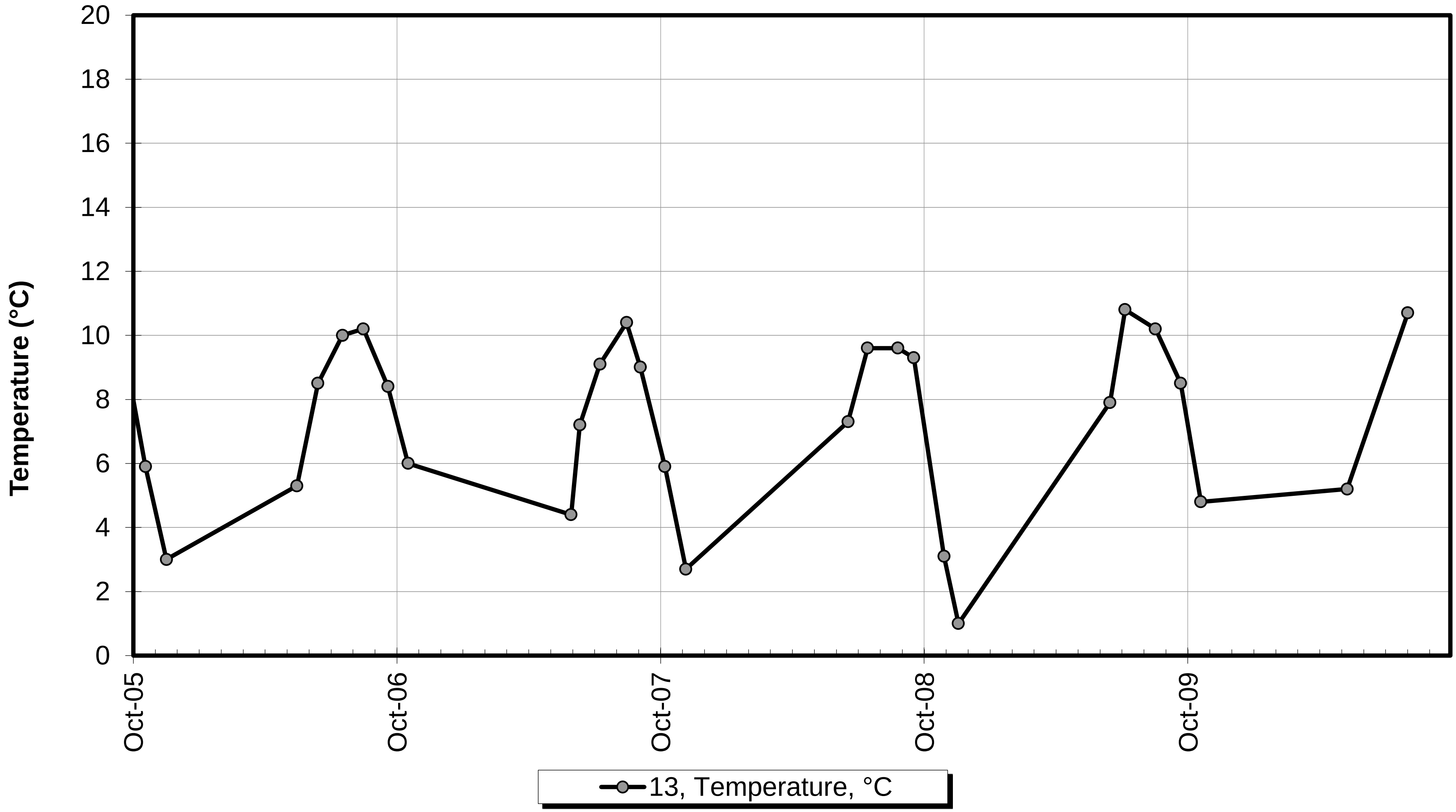
Qualified Data by QA Reviewer

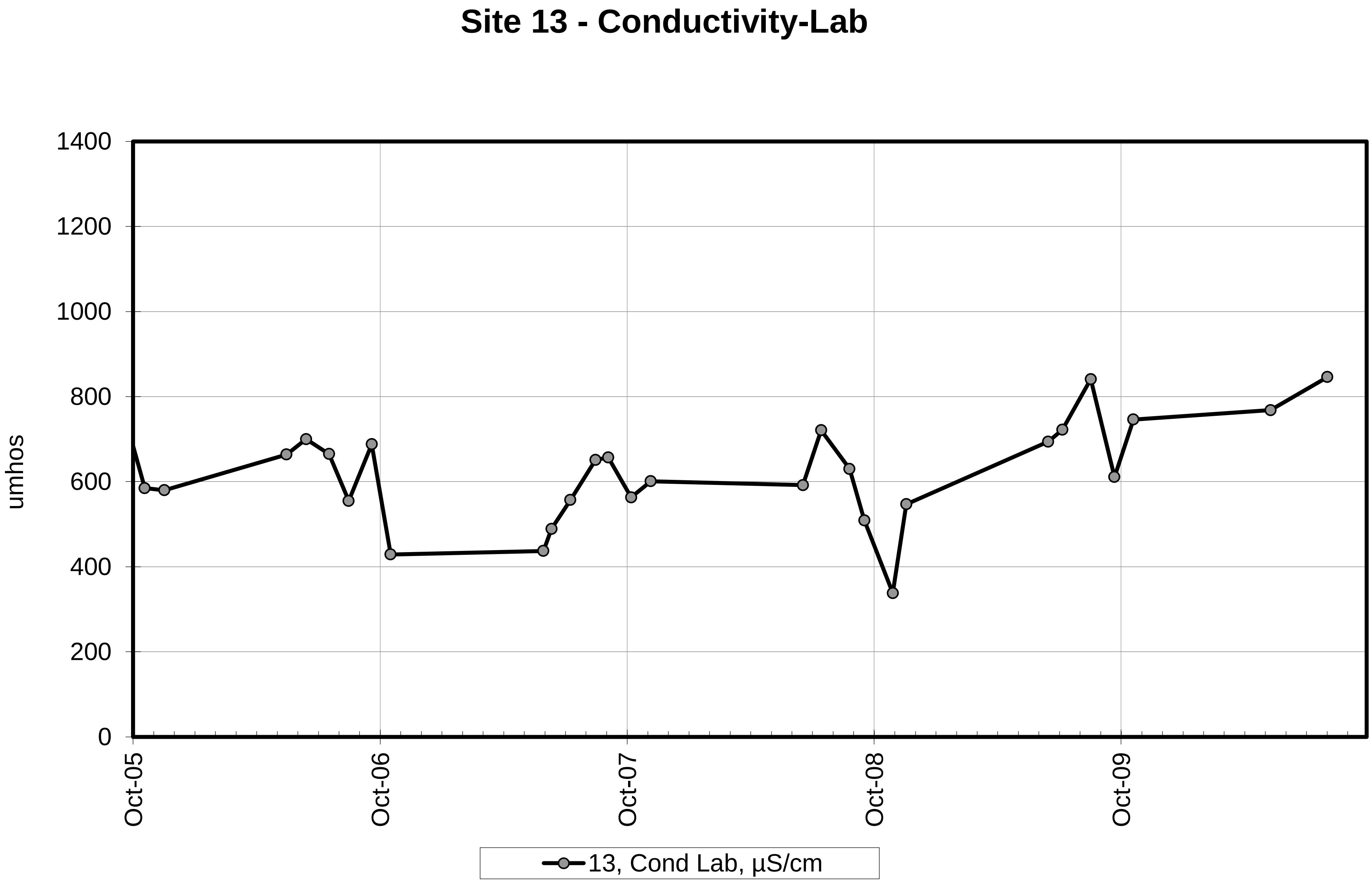
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
13	10/20/2009	12:00 AM				
			Pb diss, µg/l	0.00681	U	Field Blank Contamination
			Se diss, µg/l	0.4	J	Matrix Spike Recovery
13	5/11/2010	1:31 PM				
			Cd diss, µg/l	0.0117	J	Below Quantitative Range
			Hg diss, µg/l	0.000749	U	Field Blank Contamination
			Pb diss, µg/l	0.00455	U	Field Blank Contamination
			SO4 Tot, mg/l	241	J	Sample Temperature
13	8/3/2010	11:39 AM				
			Cd diss, µg/l	0.0111	J	Below Quantitative Range
			Hg diss, µg/l	0.000815	U	Field Blank Contamination
			Pb diss, µg/l	0.0169	U	Field Blank Contamination
			SO4 Tot, mg/l	271	J	Sample Temperature

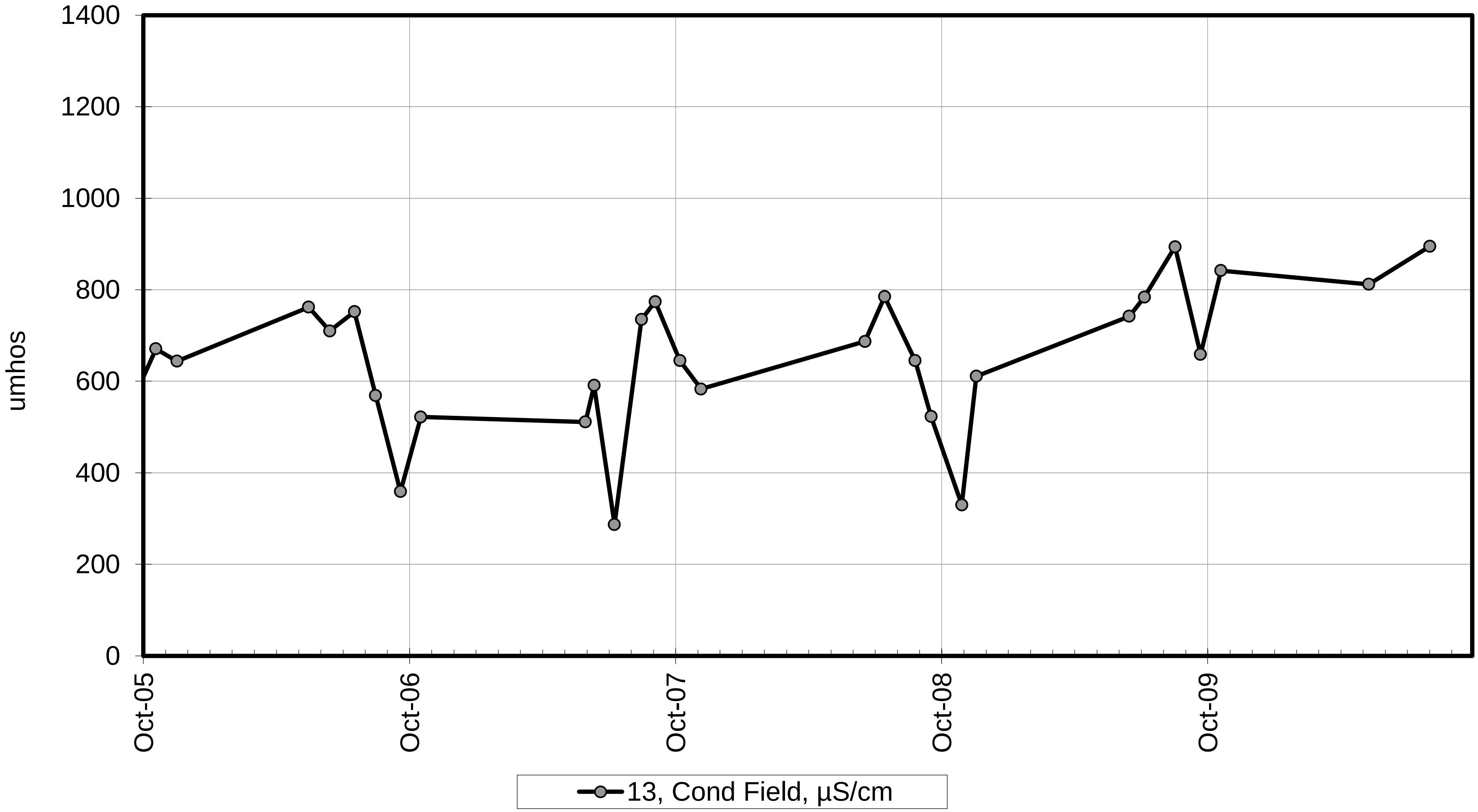
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

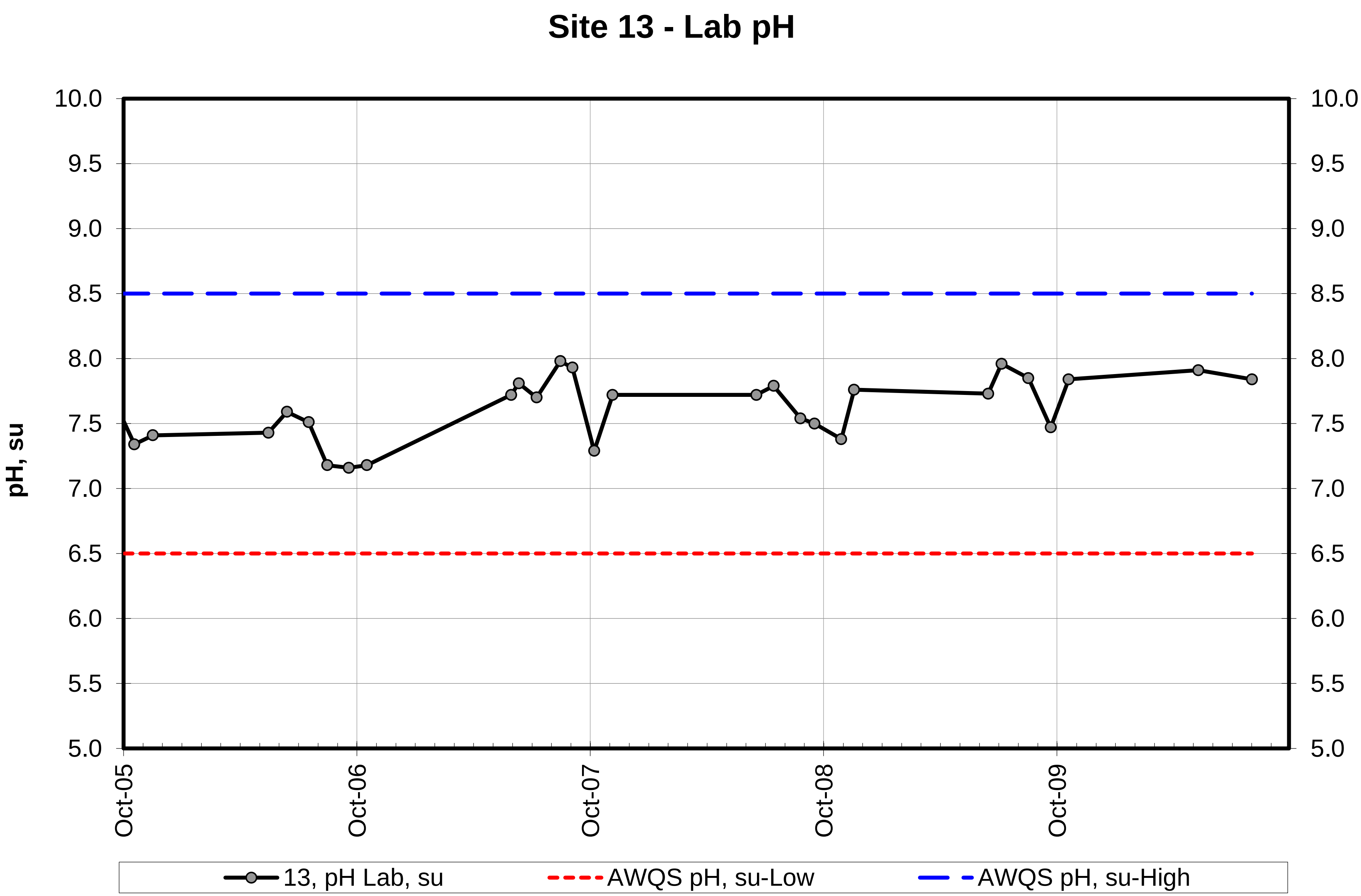
Site 13 -Water Temperature




Site 13 - Conductivity-Lab
umhos
1400
1200
1000
800
600
400
200
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, Cond Lab, µS/cm

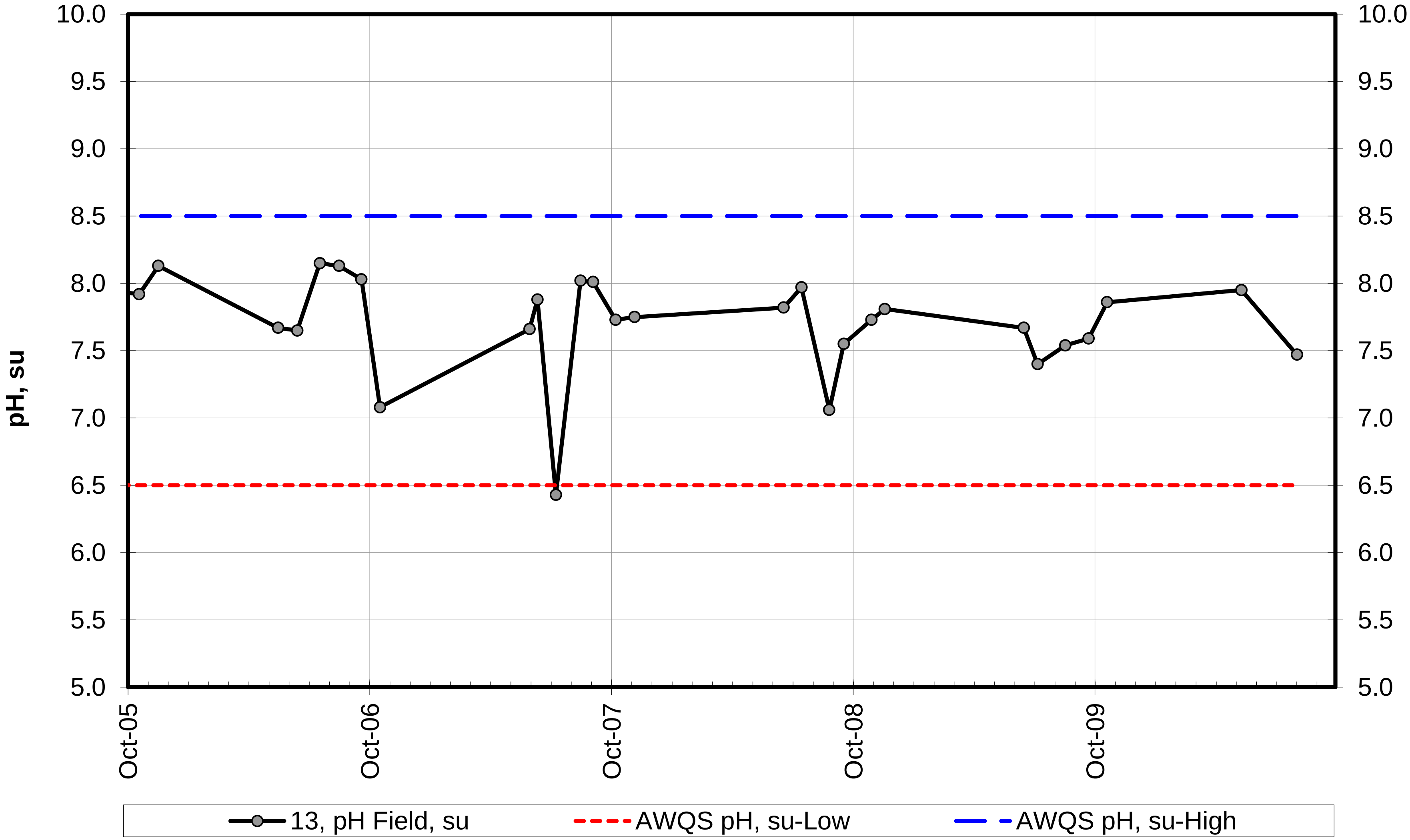
Site 13 - Conductivity-Field



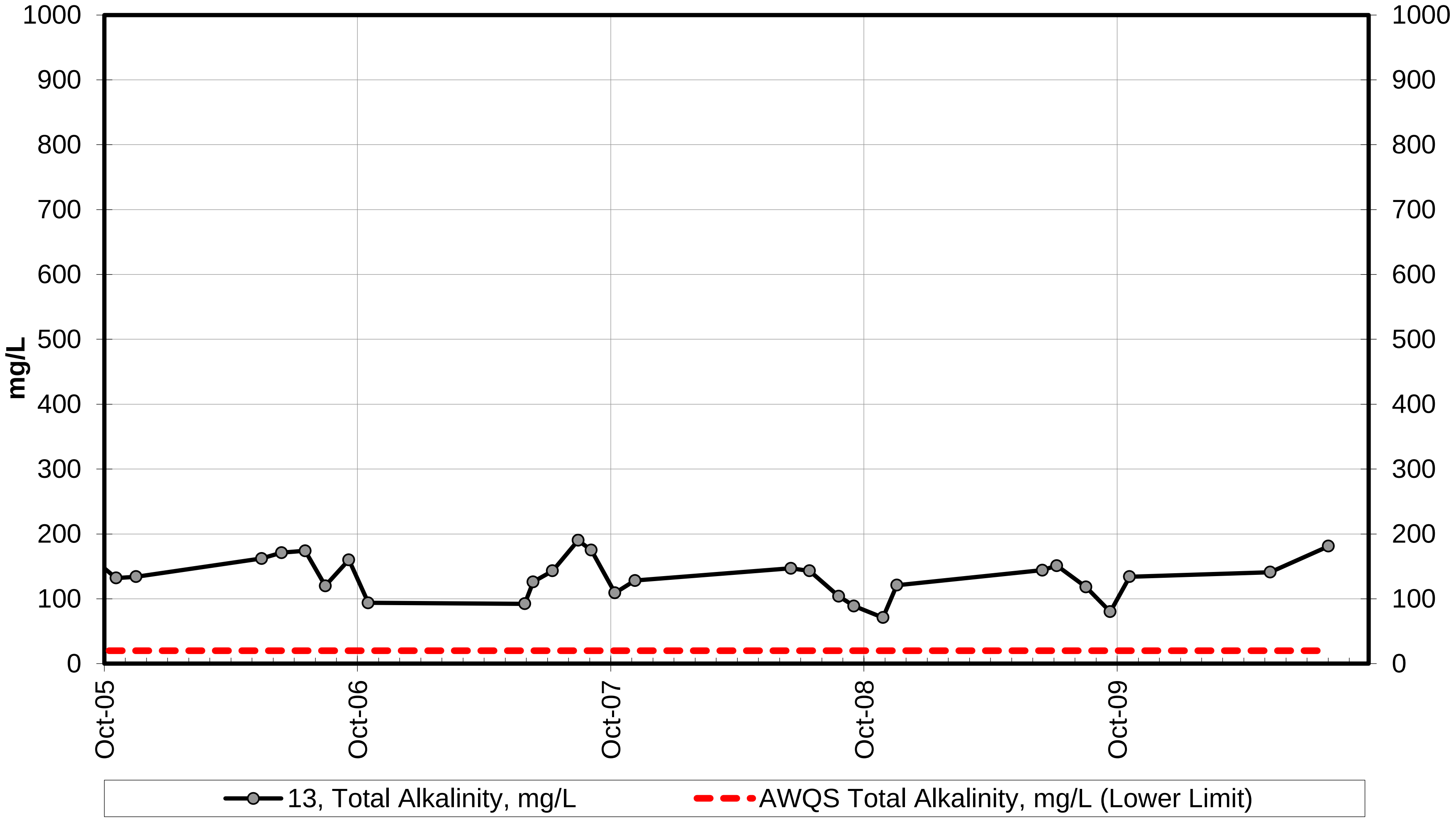


Site 13 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

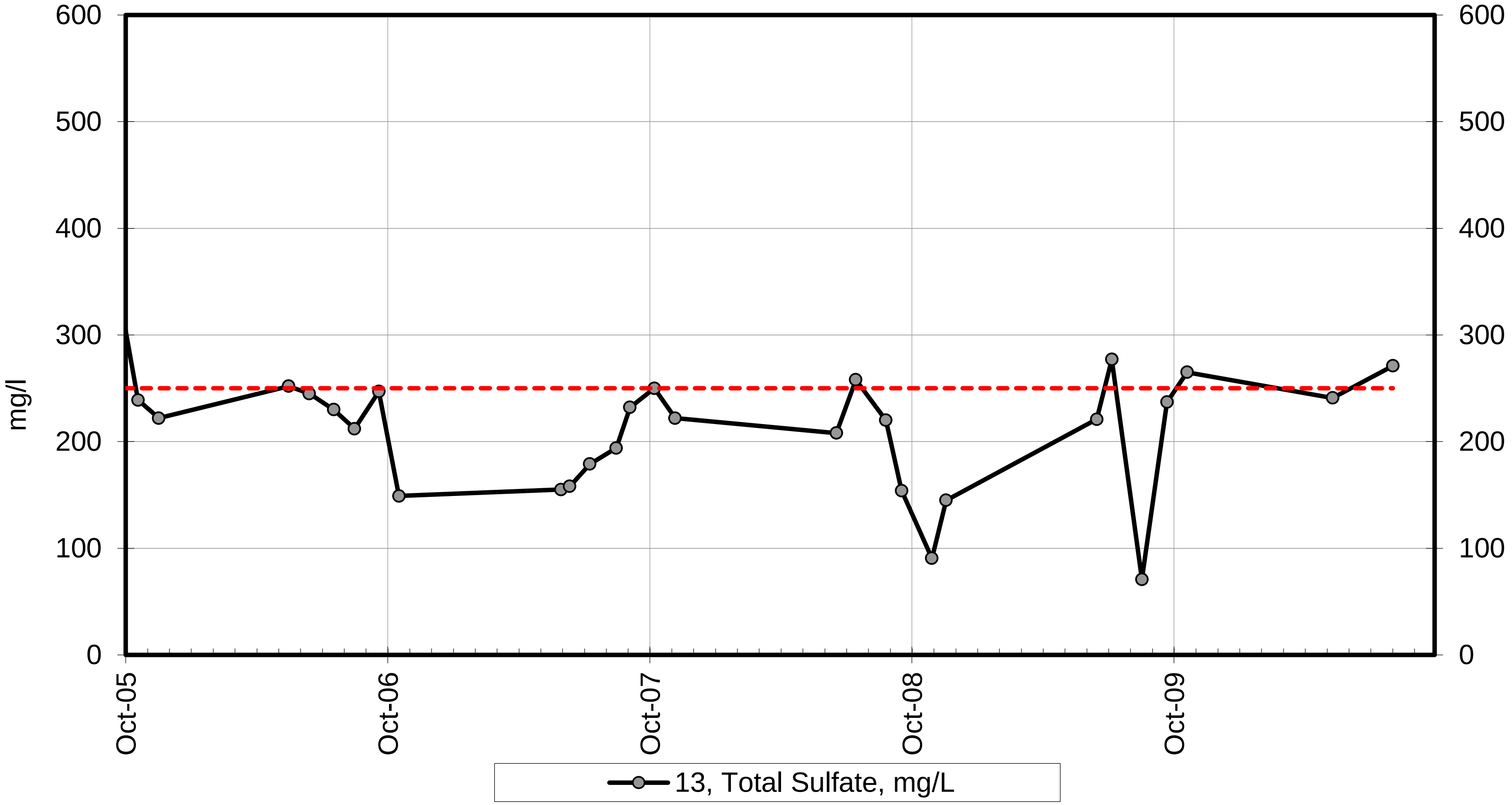
Site 13 - Field pH



Site 13 - Total Alkalinity

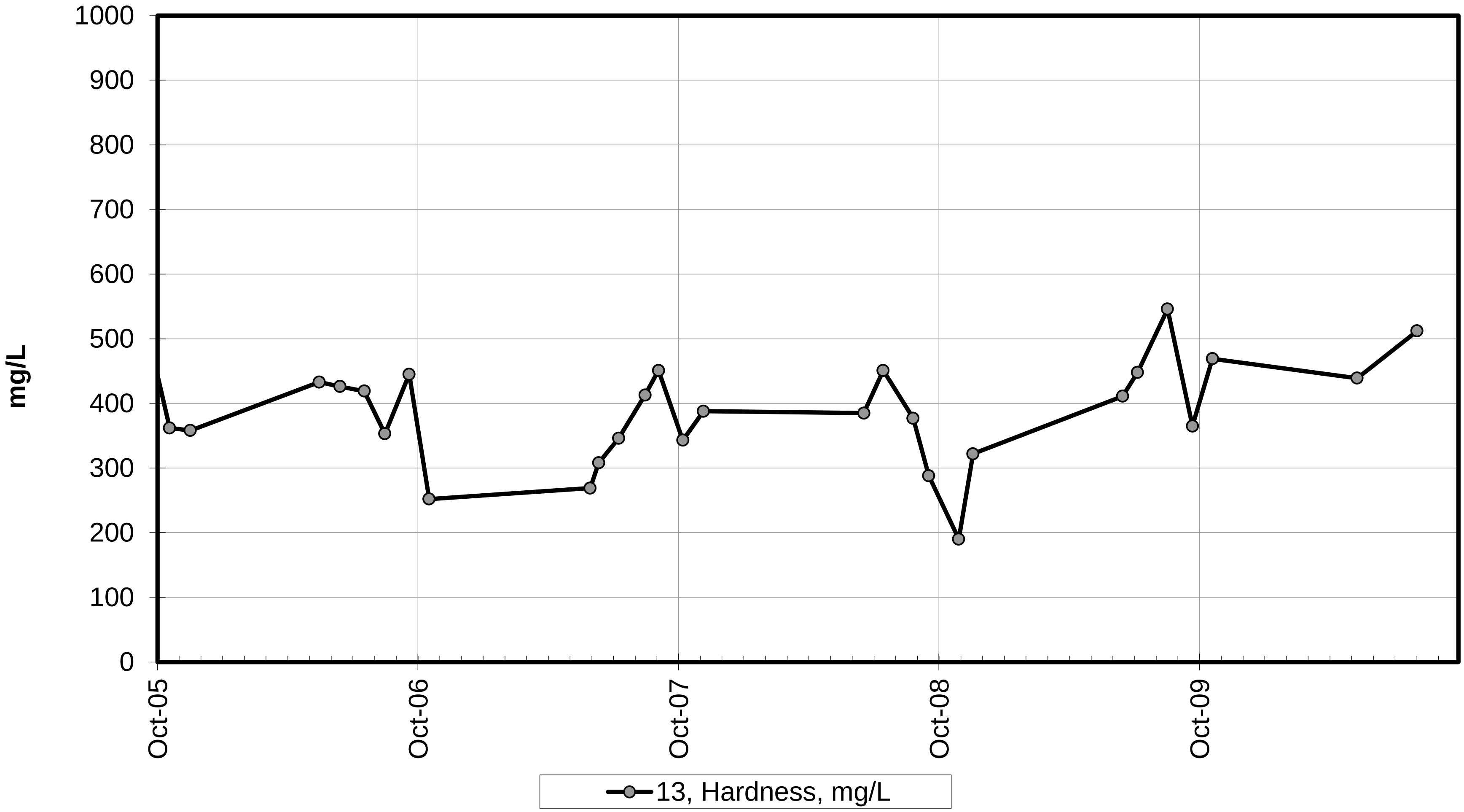


Site 13 - Total Sulfate

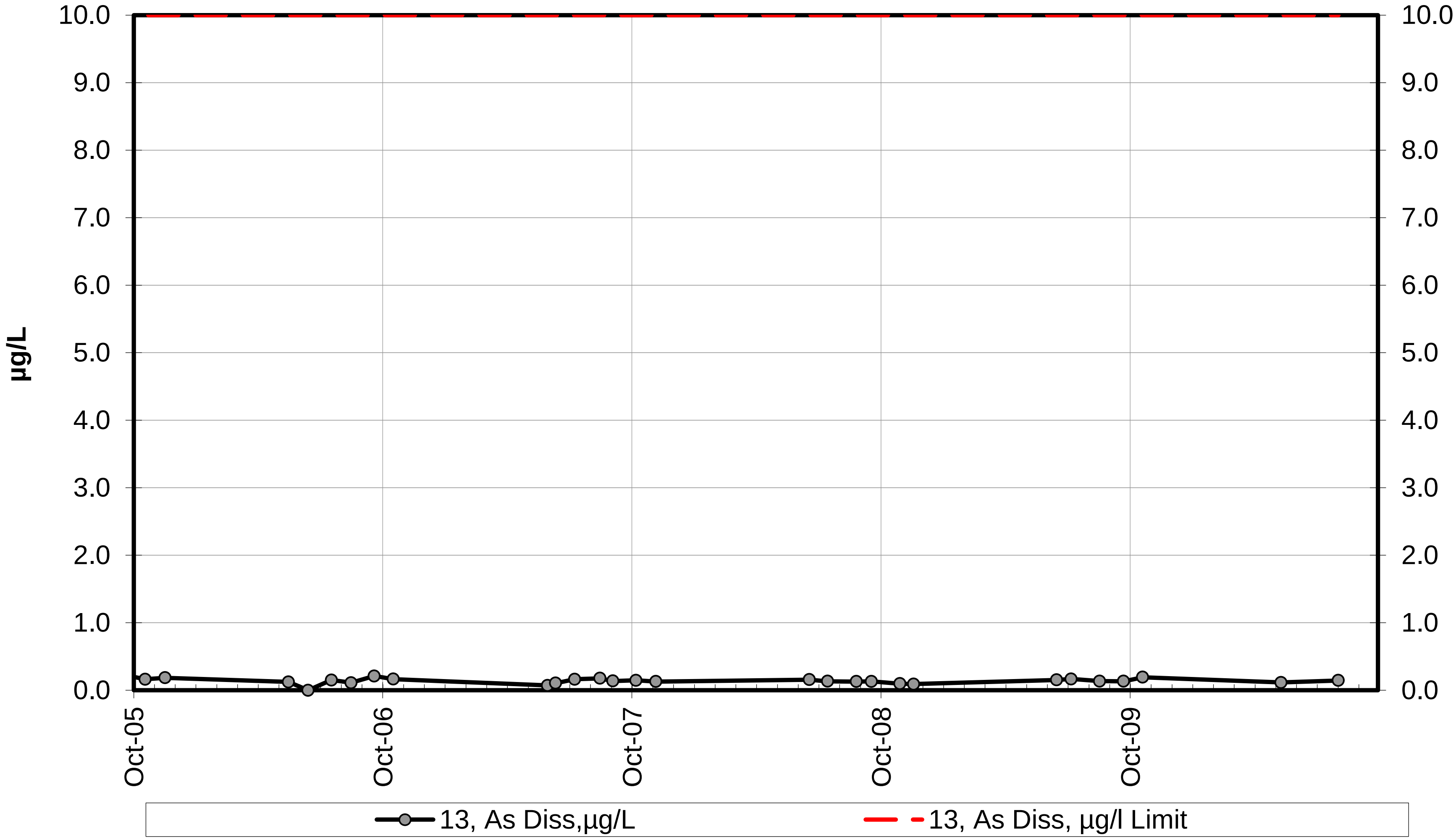


Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

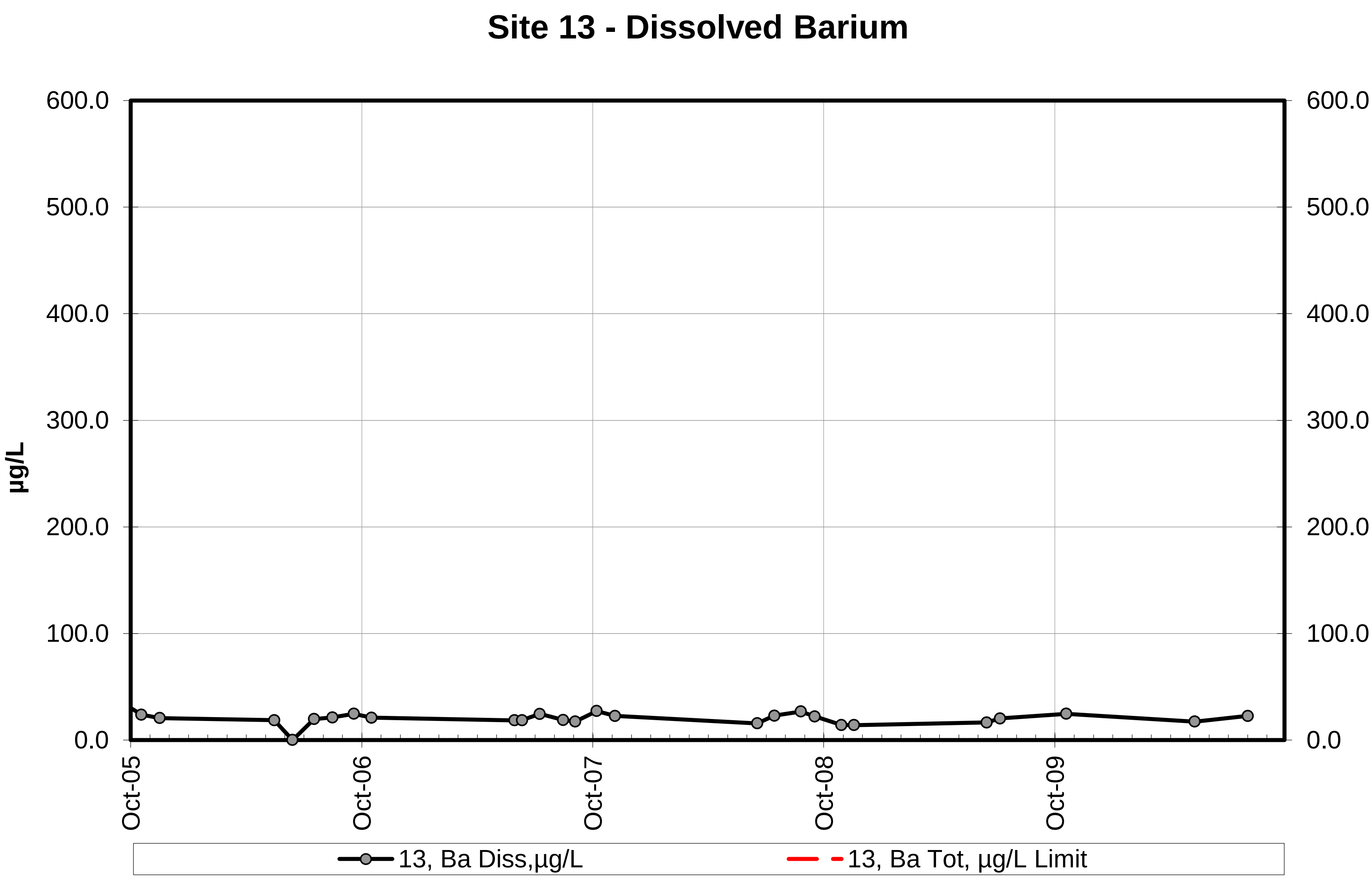
Site 13 - Hardness



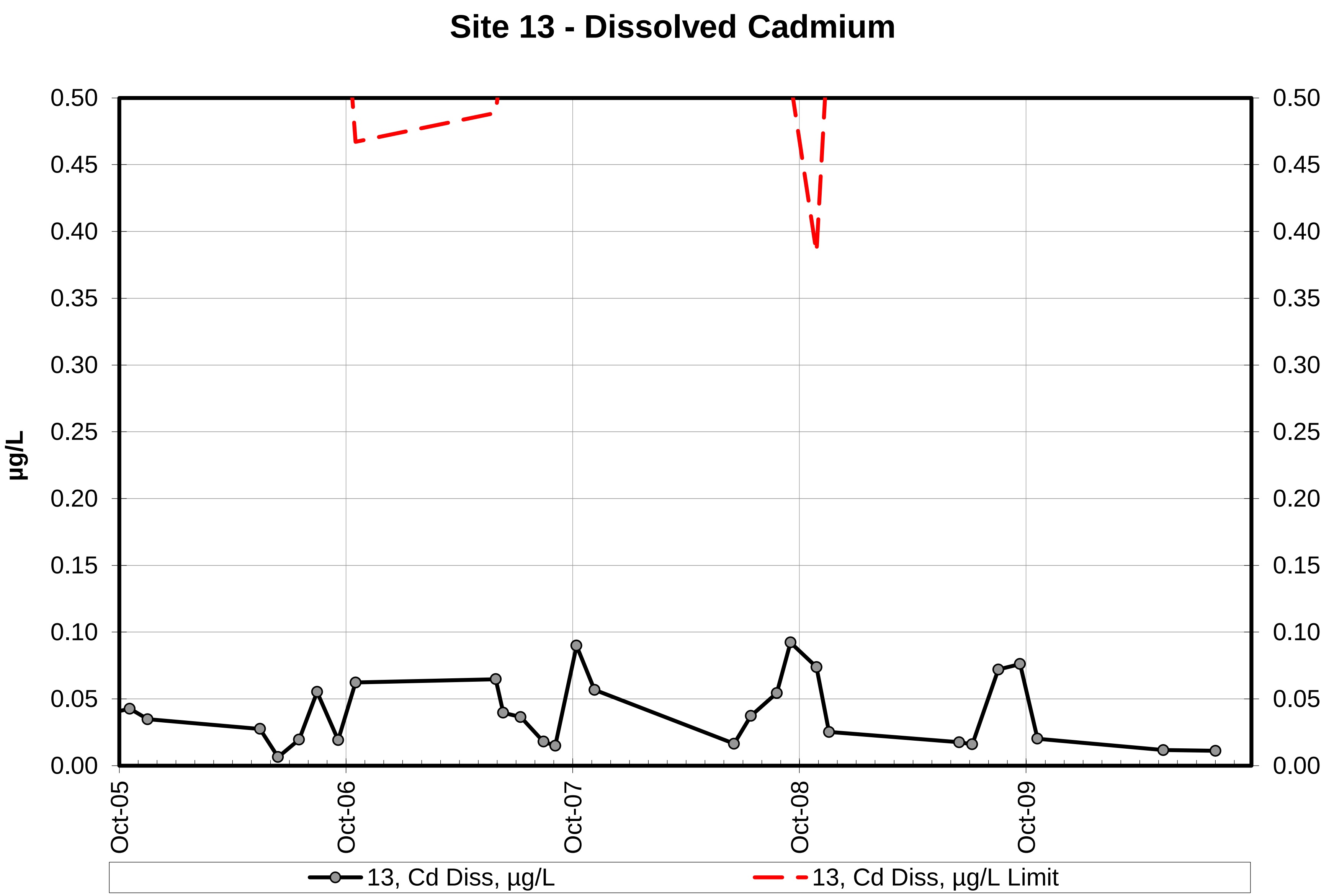
Site 13 - Dissolved Arsenic



Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

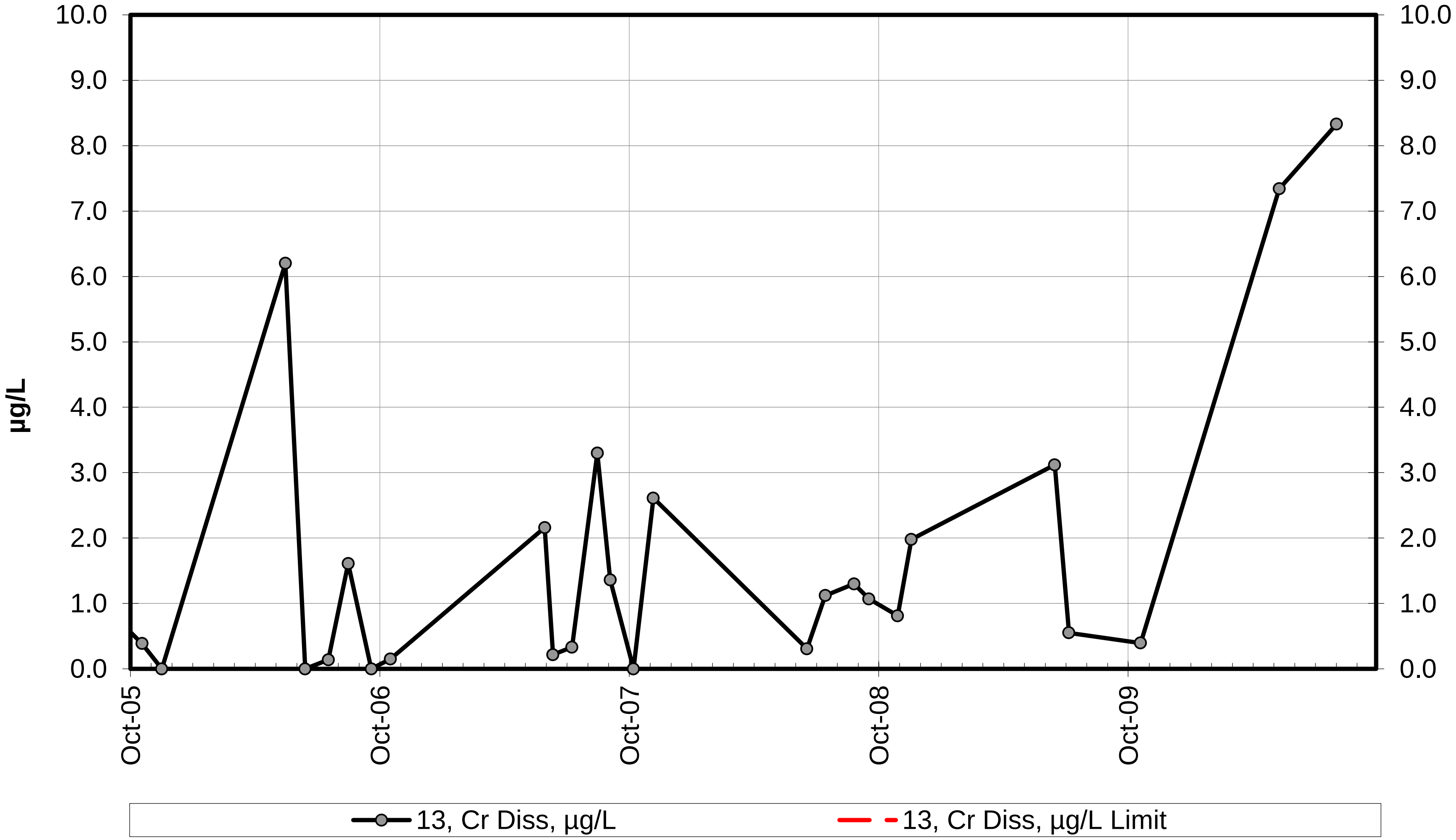


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



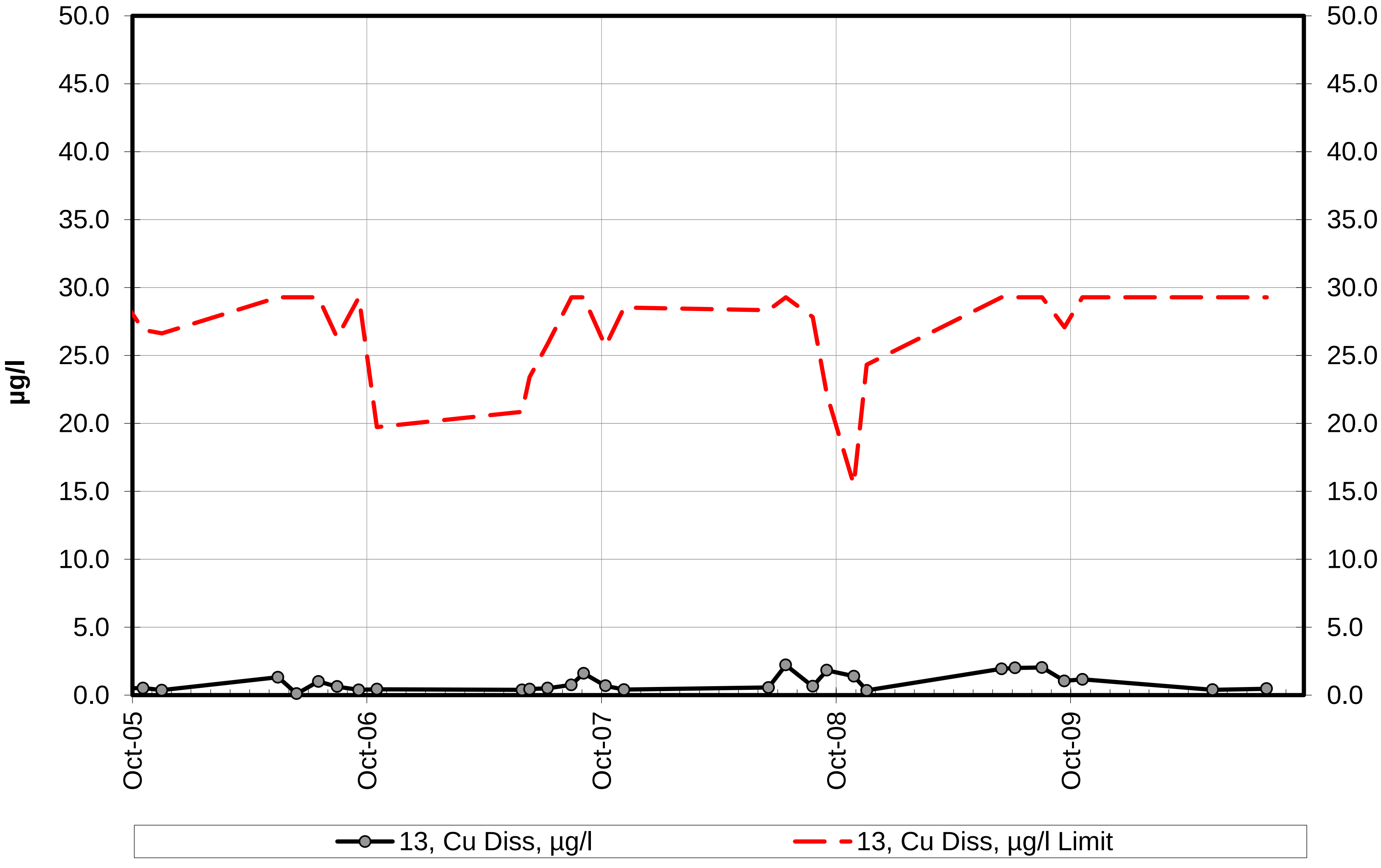
Site 13 - Dissolved Cadmium
µg/L
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, Cd Diss, µg/L
13, Cd Diss, µg/L Limit

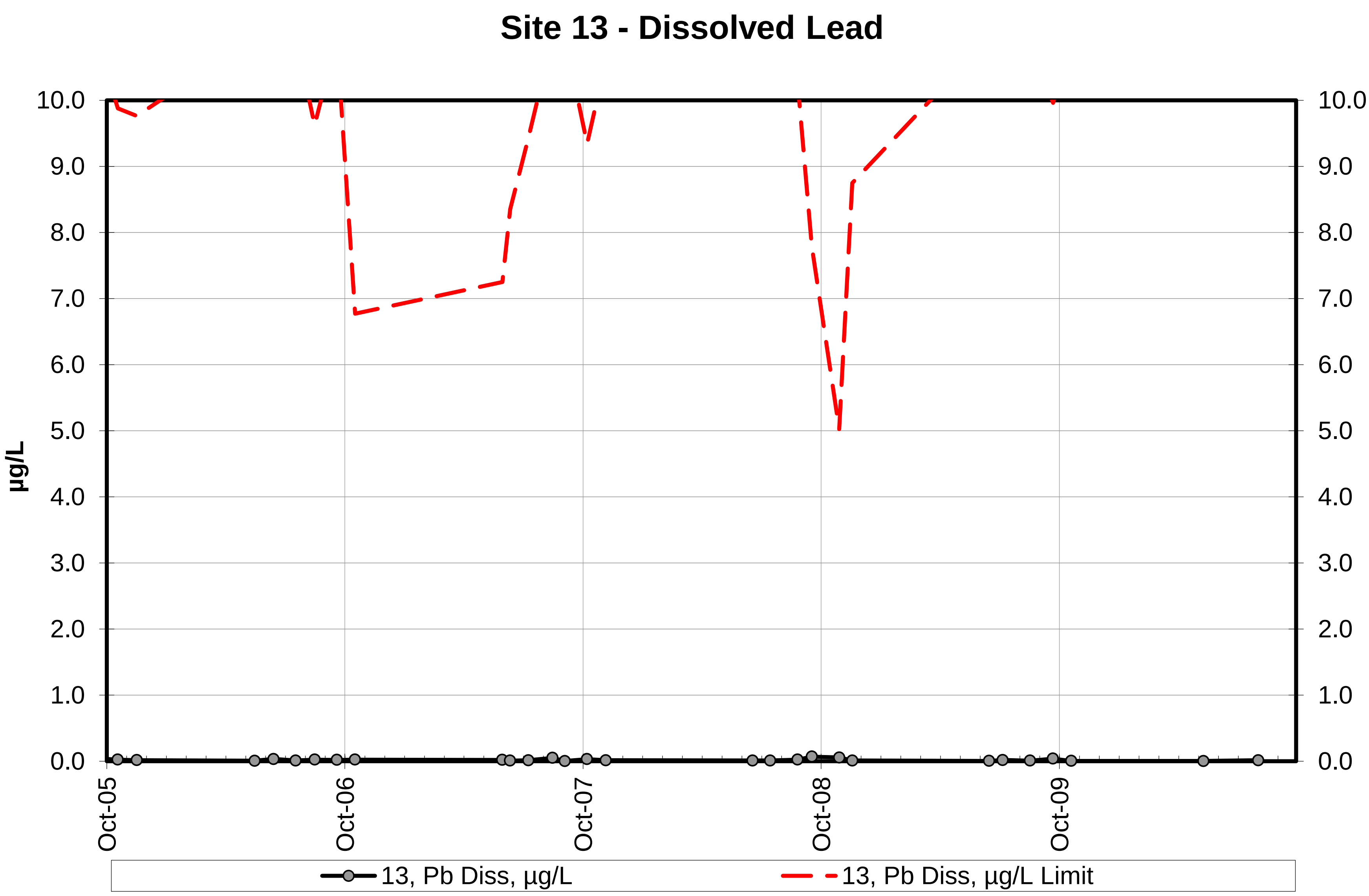
Site 13 - Dissolved Chromium

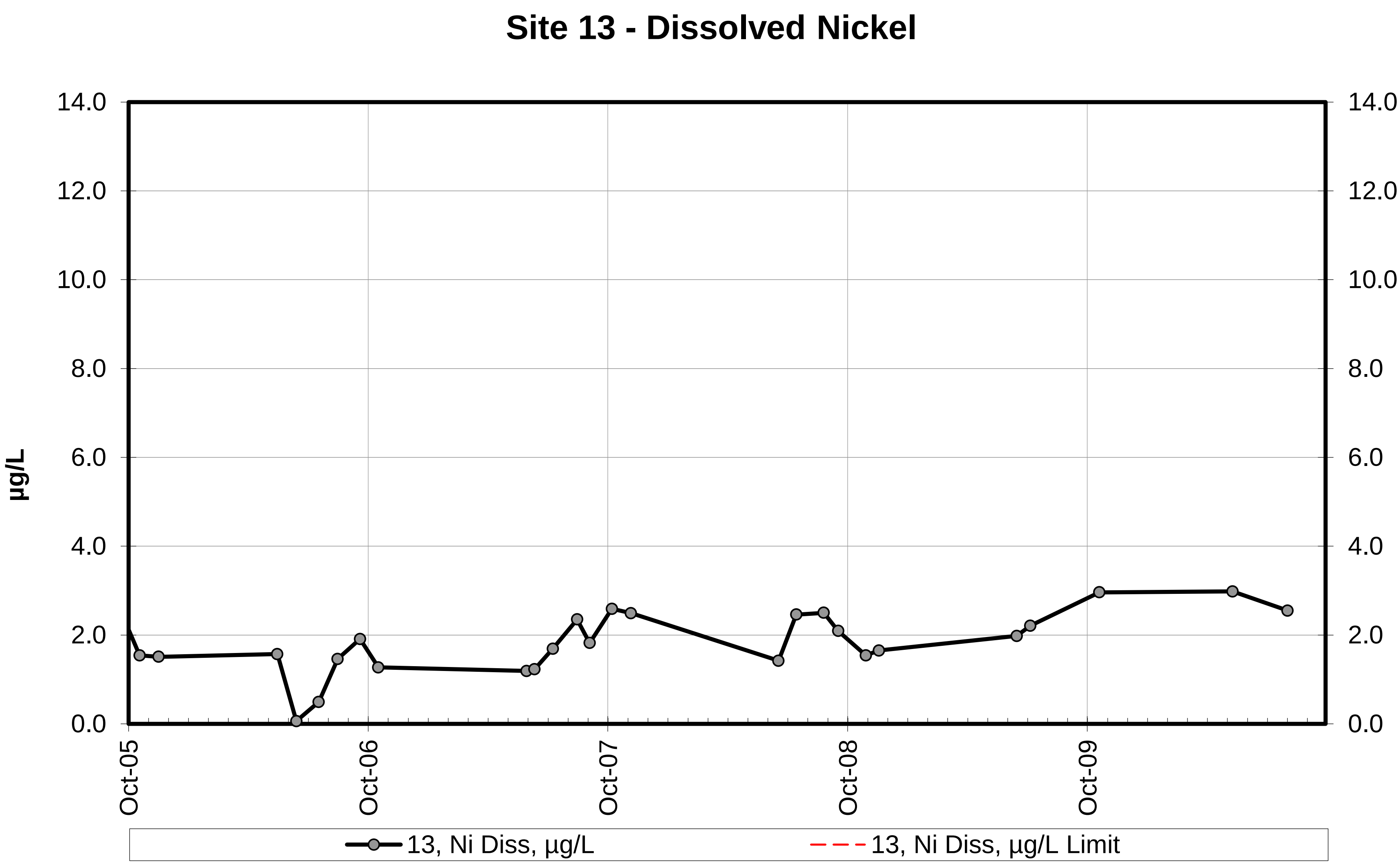


Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

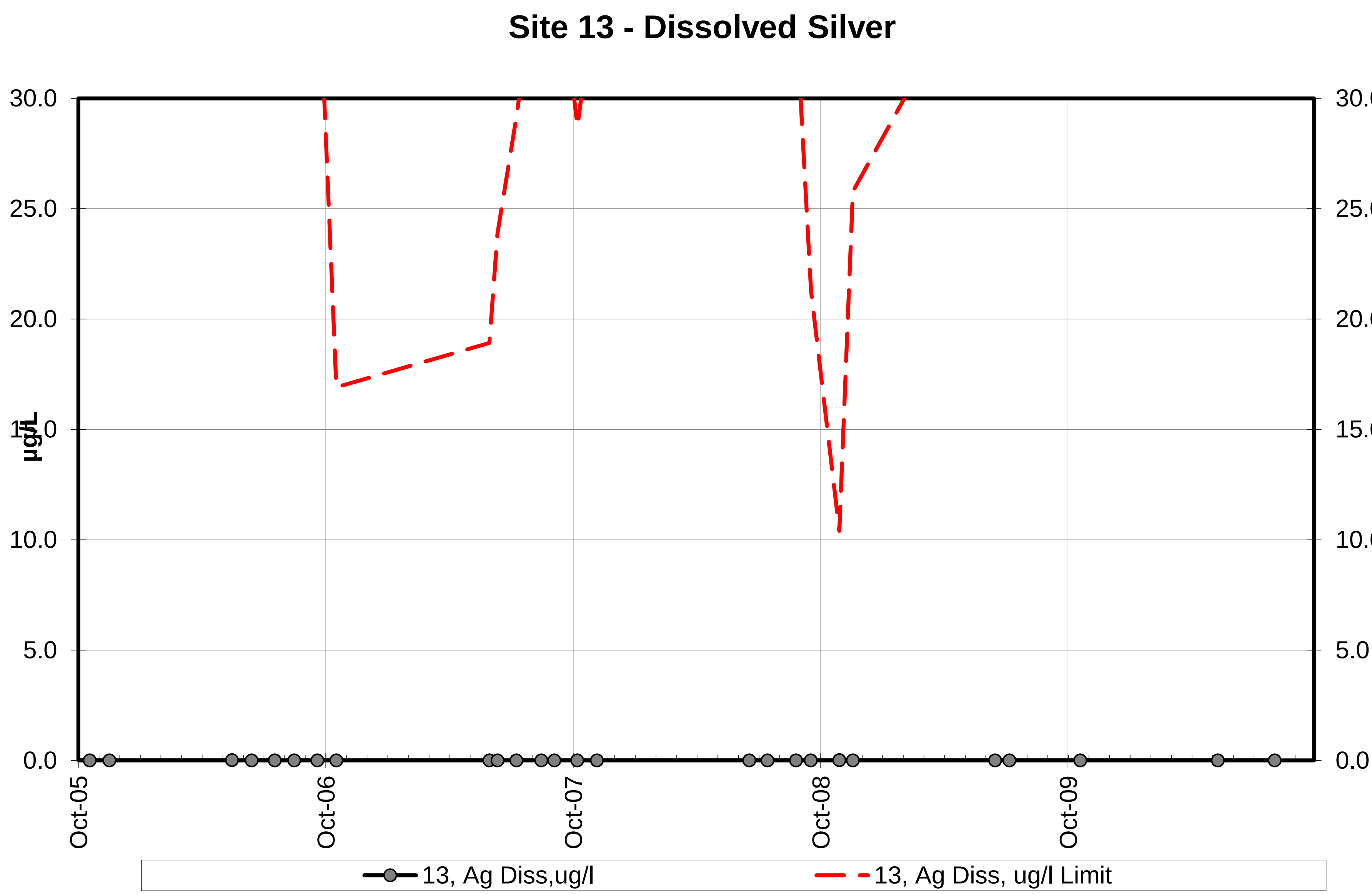
Site 13 - Dissolved Copper




Site 13 - Dissolved Lead
µg/L
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, Pb Diss, µg/L
13, Pb Diss, µg/L Limit

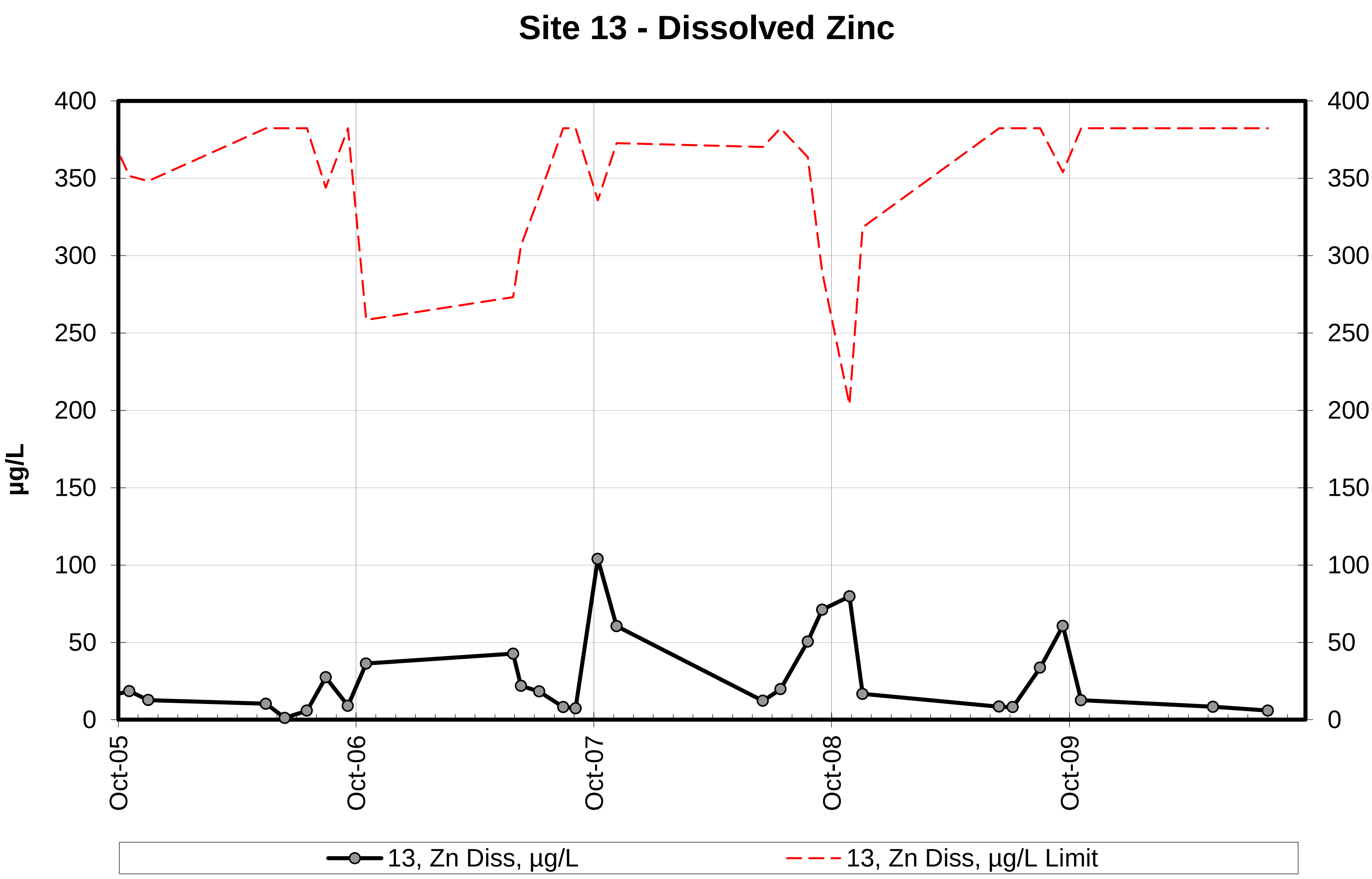


Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

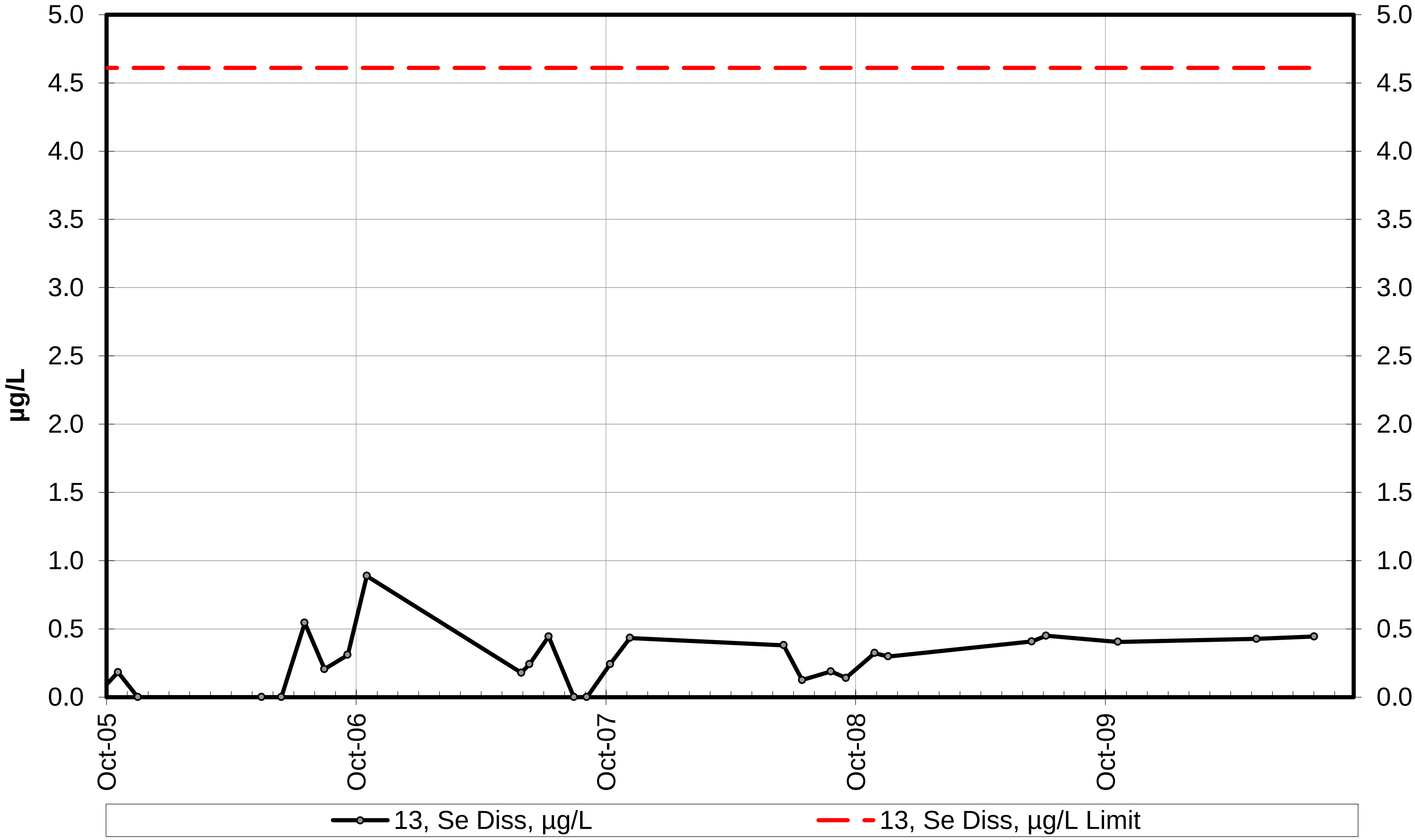


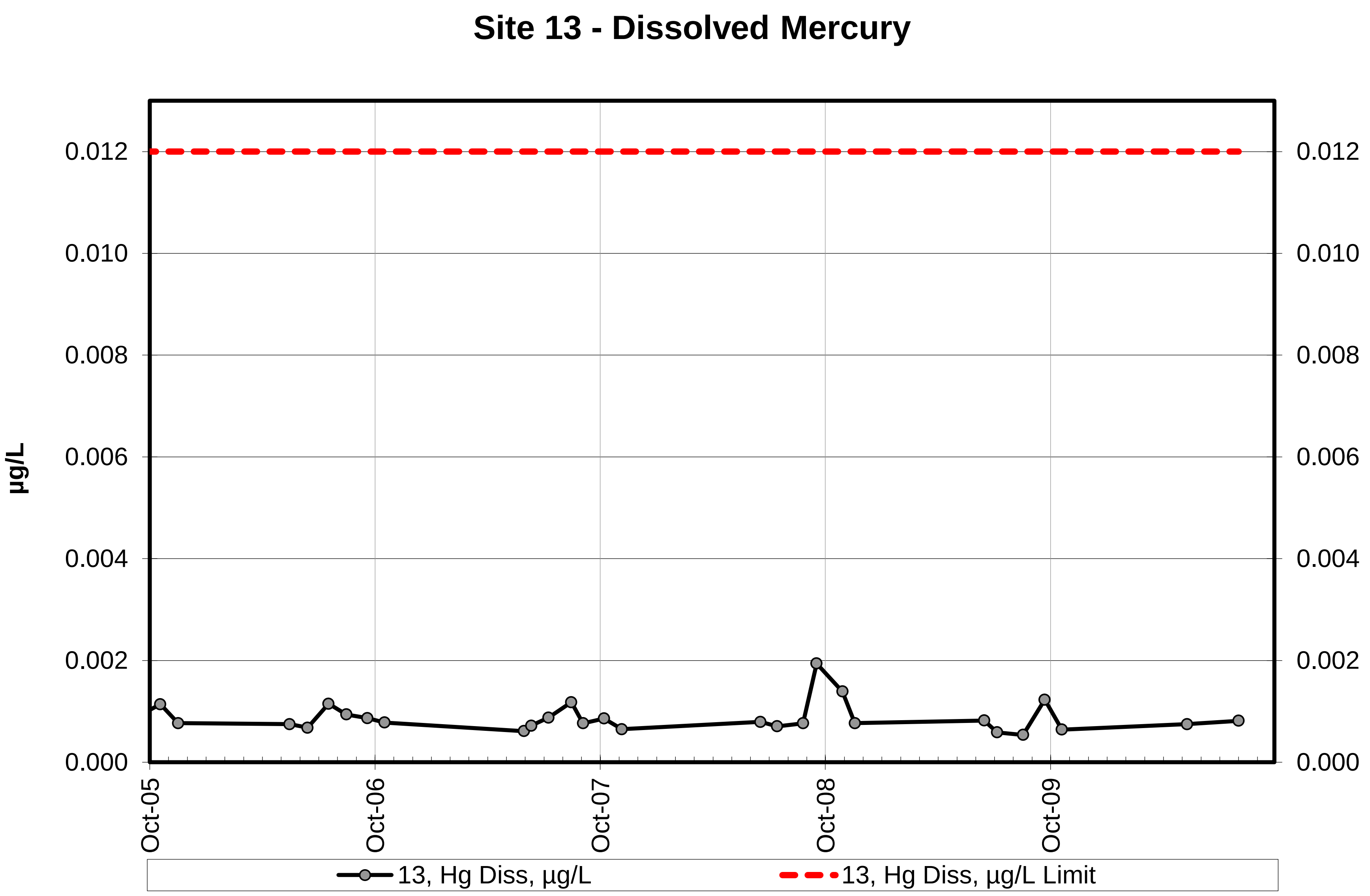
Site 13 - Dissolved Silver
µg/L
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, Ag Diss,ug/l
13, Ag Diss, ug/l Limit

Site 13 - Dissolved Zinc



Site 13 - Dissolved Selenium





Site 13 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
13, Hg Diss, µg/L
13, Hg Diss, µg/L Limit

Site **#13** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

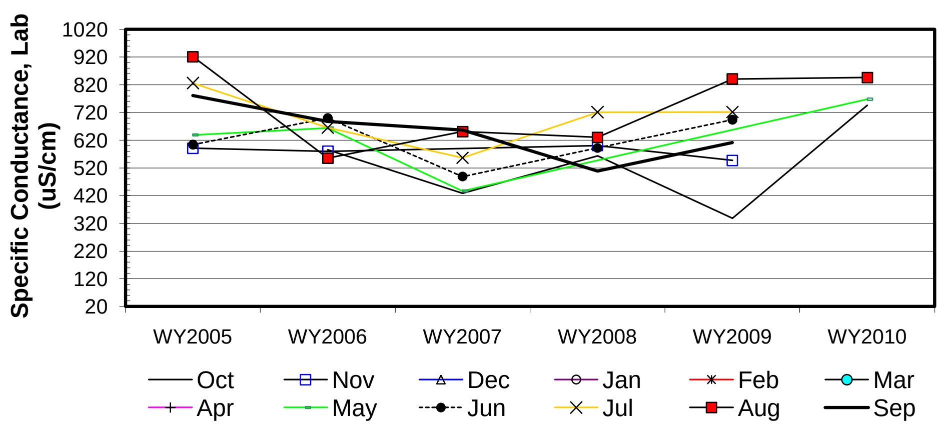
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**		591						639	604	826	921	781
b	**WY2006**	585	580						664	700	665	555	688
c	**WY2007**	429							437	489	557	651	657
d	**WY2008**	563	601							592	721	630	509
e	**WY2009**	338	547							694	722	841	611
f	**WY2010**	746							768			846	
	n	5	4	0	0	0	0	0	4	5	5	6	5
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a		-1						1	1	-1	-1	-1
	c-a								-1	-1	-1	-1	-1
	d-a		1							-1	-1	-1	-1
	e-a		-1							1	-1	-1	-1
	f-a								1			-1	
	c-b	-1							-1	-1	-1	1	-1
	d-b	-1	1							-1	1	1	-1
	e-b	-1	-1							-1	1	1	-1
	f-b	1							1			1	
	d-c	1								1	1	-1	-1
	e-c	-1								1	1	1	-1
	f-c	1							1			1	
	e-d	-1	-1							1	1	1	1
	f-d	1										1	
	f-e	1										1	
	S_k	0	-2	0	0	0	0	0	2	0	0	3	-8
	σ^2_S=	16.67	3.67						8.67	16.67	16.67	28.33	16.67
	$Z_k = S_k/\sigma_S$	0.00	-1.04						0.68	0.00	0.00	0.56	-1.96
	Z^2_k	0.00	1.09						0.46	0.00	0.00	0.32	3.84

ΣZ_k=	-1.76
ΣZ^2_k=	5.71
Z-bar=$\Sigma Z_k/K$=	-0.25

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	34
ΣS_k	-5

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		5.27	@α=5% $\chi^2_{(K-1)}$=	12.59	Test for station homogeneity	
	p	**0.510**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	-0.39	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
107.33	p	**0.350**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-44.15		27.10
0.050	-26.10	**-11.00**	22.55
0.100	-23.37		11.68
0.200	-19.30		3.01

Site **#13** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**		7.4						7.7	7.8	7.7	7.6	7.7
b	**WY2006**	7.3	7.4						7.4	7.6	7.5	7.2	7.2
c	**WY2007**	7.2							7.7	7.8	7.7	8.0	7.9
d	**WY2008**	7.3	7.7							7.7	7.8	7.5	7.5
e	**WY2009**	7.4	7.8							7.7	8.0	7.9	7.5
f	**WY2010**	7.8							7.9			7.8	
	n	5	4	0	0	0	0	0	4	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a		1						-1	-1	-1	-1	-1
c-a								1	1	-1	1	1
d-a		1							-1	1	-1	-1
e-a		1							-1	1	1	-1
f-a								1			1	
c-b	-1							1	1	1	1	1
d-b	-1	1							1	1	1	1
e-b	1	1							1	1	1	1
f-b	1							1			1	
d-c	1								-1	1	-1	-1
e-c	1								-1	1	-1	-1
f-c	1							1			-1	
e-d	1	1							1	1	1	-1
f-d	1										1	
f-e	1										-1	
S_k	6	6	0	0	0	0	0	4	0	6	3	-2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	16.67	3.67						8.67	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	1.47	3.13						1.36	0.00	1.47	0.56	-0.49
Z^2_k	2.16	9.82						1.85	0.00	2.16	0.32	0.24

ΣZ_k= 7.51

ΣZ^2_k= 16.54

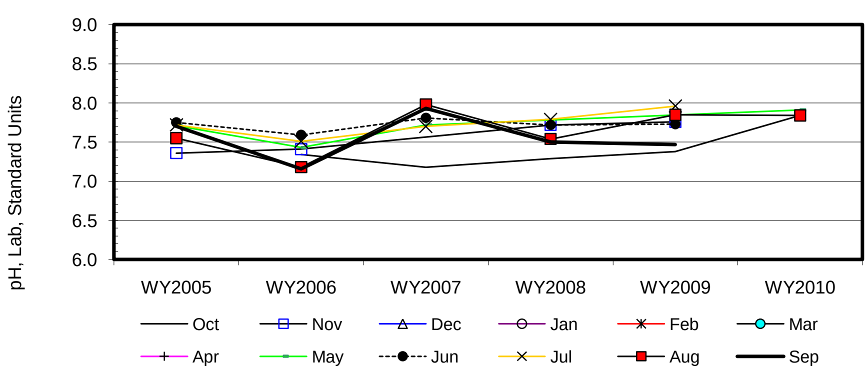
Z-bar=$\Sigma Z_k/K$= 1.07

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 34

ΣS_k 23

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$= 8.50		@α=5% $\chi^2_{(K-1)}$= 12.59	Test for station homogeneity
p	**0.204**		$\chi^2_h<\chi^2_{(K-1)}$ ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} 2.12	@α/2=2.5% Z= 1.96	**H_0** (No trend) REJECT
107.33	**p** **0.983**		**H_A** (± trend) ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.00		0.12
0.050	0.01	**0.06**	0.11
0.100	0.03		0.10
0.200	0.04		0.09

0.8%

Site **#13** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**		120.0						186.0	201.0	188.0	207.0	162.0
b	**WY2006**	132.0	134.0						162.0	171.0	174.0	120.0	160.0
c	**WY2007**	93.8							92.3	126.0	143.0	190.0	175.0
d	**WY2008**	109.0	128.0							147.0	143.0	104.0	88.8
e	**WY2009**	70.9	121.0							144.0	151.0	118.0	80.0
f	**WY2010**	134.0							141.0			181.0	
	n	5	4	0	0	0	0	0	4	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	3	5	5
t_2	0	0	0	0	0	0	0	0	0	1	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a		1						-1	-1	-1	-1	-1
c-a								-1	-1	-1	-1	1
d-a		1							-1	-1	-1	-1
e-a		1							-1	-1	-1	-1
f-a								-1			-1	
c-b	-1							-1	-1	-1	1	1
d-b	-1	-1							-1	-1	-1	-1
e-b	-1	-1							-1	-1	-1	-1
f-b	1							-1			1	
d-c	1								1	0	-1	-1
e-c	-1								1	1	-1	-1
f-c	1							1			-1	
e-d	-1	-1							-1	1	1	-1
f-d	1										1	
f-e	1										1	
S_k	0	0	0	0	0	0	0	-4	-6	-5	-5	-6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	16.67	3.67						8.67	16.67	15.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.00	0.00						-1.36	-1.47	-1.26	-0.94	-1.47
Z^2_k	0.00	0.00						1.85	2.16	1.60	0.88	2.16

ΣZ_k= -6.50

ΣZ^2_k= 8.64

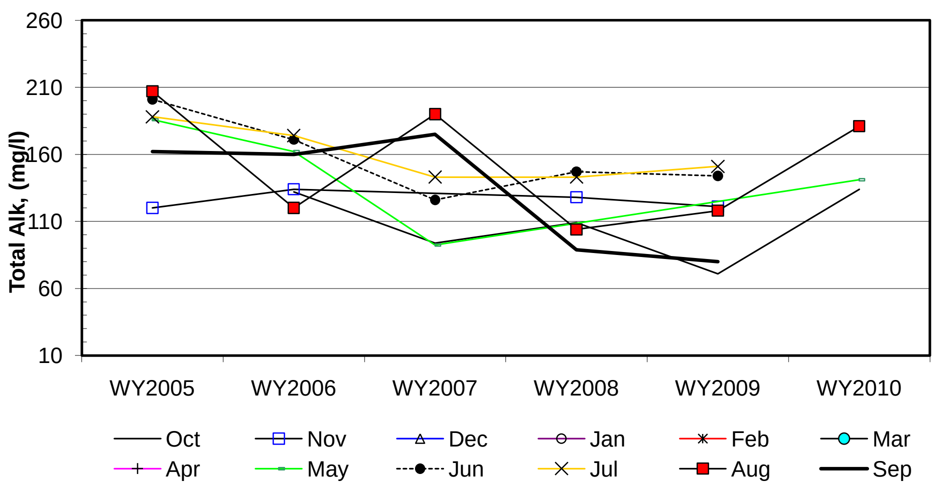
Z-bar=ΣZ_k/K= -0.93

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 34

ΣS_k -26

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	2.61	@α=5% $\chi^2_{(K-1)}$= 12.59	Test for station homogeneity	
p	**0.856**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -2.42	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
106.33	**p** **0.008**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-20.43		-1.34
0.050	-14.99	**-8.80**	-3.03
0.100	-14.03		-5.11
0.200	-11.49		-7.11

-6.2%

Site **#13** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**		241.0						217.0	208.0	358.0	337.0	367.0
b	**WY2006**	239.0	222.0						252.0	245.0	230.0	212.0	247.0
c	**WY2007**	149.0							155.0	158.0	179.0	194.0	232.0
d	**WY2008**	250.0	222.0							208.0	258.0	220.0	154.0
e	**WY2009**	90.6	145.0							221.0	277.0	70.8	237.0
f	**WY2010**	265.0							241.0			271.0	
	n	5	4	0	0	0	0	0	4	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	3	5	5	5	5	5	5	3	5	5	5
t_2	0	1	0	0	0	0	0	0	1	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a		-1						1	1	-1	-1	-1
c-a								-1	-1	-1	-1	-1
d-a		-1							0	-1	-1	-1
e-a		-1							1	-1	-1	-1
f-a								1			-1	
c-b	-1							-1	-1	-1	-1	-1
d-b	1	0							-1	1	1	-1
e-b	-1	-1							-1	1	-1	-1
f-b	1							-1			1	
d-c	1								1	1	1	-1
e-c	-1								1	1	-1	1
f-c	1							1			1	
e-d	-1	-1							1	1	-1	1
f-d	1										1	
f-e	1										1	
S_k	2	-5	0	0	0	0	0	0	1	0	-3	-6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	16.67	2.00						8.67	15.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.49	-3.54						0.00	0.25	0.00	-0.56	-1.47
Z^2_k	0.24	12.50						0.00	0.06	0.00	0.32	2.16

ΣZ_k= -4.83

ΣZ^2_k= 15.28

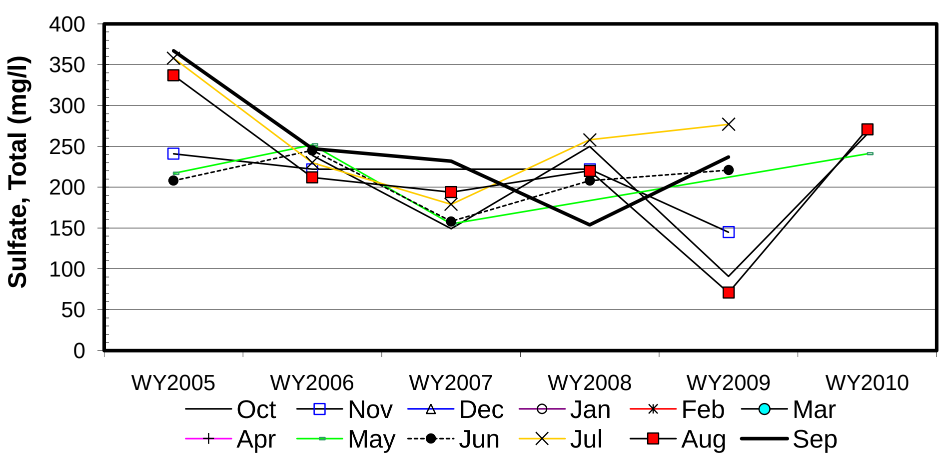
Z-bar=$\Sigma Z_k/K$= -0.69

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 34

ΣS_k -11

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		11.95	@α=5% $\chi^2_{(K-1)}$= 12.59	Test for station homogeneity	
	p	**0.063**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-0.98	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
104.67	p	**0.164**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-35.60		5.90
0.050	-28.90	**-13.20**	3.19
0.100	-25.04		0.14
0.200	-20.01		-2.86

Site **#13** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**		40.5						11.3	13.5	20.3	6.0	15.0
b	**WY2006**	18.5	12.7						10.3	1.2	5.8	27.4	9.0
c	**WY2007**	36.3							42.7	21.9	18.3	8.2	7.4
d	**WY2008**	104.0	60.5							12.2	19.7	50.5	71.1
e	**WY2009**	79.7	16.7							8.5	8.1	33.6	60.7
f	**WY2010**	12.6							8.4			5.9	
	n	5	4	0	0	0	0	0	4	5	5	6	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a		-1						-1	-1	-1	1	-1
c-a								1	1	-1	1	-1
d-a		1							-1	-1	1	1
e-a		-1							-1	-1	1	1
f-a								-1			-1	
c-b	1							1	1	1	-1	-1
d-b	1	1							1	1	1	1
e-b	1	1							1	1	1	1
f-b	-1							-1			-1	
d-c	1								-1	1	1	1
e-c	1								-1	-1	1	1
f-c	-1							-1			-1	
e-d	-1	-1							-1	-1	-1	-1
f-d	-1										-1	
f-e	-1										-1	
S_k	0	0	0	0	0	0	0	-2	-2	-2	1	2

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=	16.67	3.67						8.67	16.67	16.67	28.33	16.67
$Z_k = S_k/\sigma_S$	0.00	0.00						-0.68	-0.49	-0.49	0.19	0.49
Z^2_k	0.00	0.00						0.46	0.24	0.24	0.04	0.24

ΣZ_k= -0.98

ΣZ^2_k= 1.22

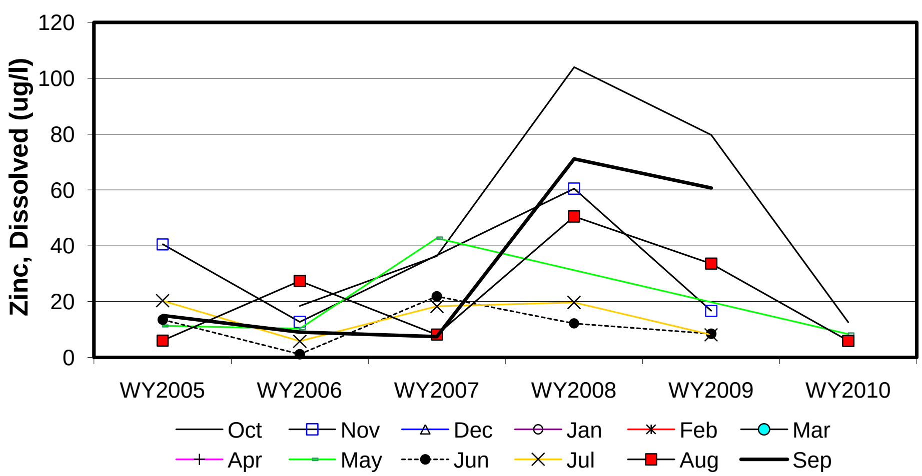
Z-bar=ΣZ_k/K= -0.14

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 34

ΣS_k -3

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	1.08	@α=5% $\chi^2_{(K-1)}$= 12.59	Test for station homogeneity	
p	**0.982**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -0.19	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
107.33	**p** **0.423**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-4.51		6.91
0.050	-1.63	**-0.20**	4.23
0.100	-1.28		2.12
0.200	-0.96		1.30

INTERPRETIVE REPORT
SITE 58 “MONITORING WELL T-00-01C”

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

Sampling at this site was added to the FWMP in May-2002. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Seven values exceeding these criteria have been identified, as listed in the table below. Five of these values were for field and laboratory pH. Values for field and laboratory pH from other wells completed into organic rich peat sediments similar to Site 58 have historically resulted in pH values ranging from 5 to 6 su (*e.g.* Sites 27, 29, and 32). Likewise, total alkalinity for organic, peat rich completions are typically at or below the 20 mg/L AWQS.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	5.12		6.5	Aquatic Life, chronic
11-May-10	pH Lab, su	6.04		6.5	Aquatic Life, chronic
13-Jul-10	pH Field, su	5.33		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	5.3		6.5	Aquatic Life, chronic
21-Sep-10	pH Field, su	6.18		6.5	Aquatic Life, chronic
21-Sep-10	pH Lab, su	5.41		6.5	Aquatic Life, chronic
11-May-10	Alkalinity Total, mg/L	16.9		20	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. Visually dissolved manganese appears to be increasing over the past few years. Though it appears to be increasing the values are still ~1/3 the AWQS (200 µg/L). Also, another trend noticed is a moderate increase in the dissolved mercury concentration measured at the end of the water year. This increase has also been noted for other sites in the tailings area. One plausible explanation for this is that preparatory work for the East Ridge expansion is driving this increase. During the spring of 2010 HGCMC dropped the tree cover over the area for the East Ridge expansion. This removal of the canopy, along with the disturbance to the substrate by the heavy equipment, may have impacted the natural processes in this region. Even though the value has increased, it is well within the AWQS. HGCMC accepts that with the changes made to the FWMP schedule in 2010, the program is sufficient to monitor any future increases.

A non-parametric statistical analysis for trend was performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). There were no statistically significant ($\alpha/2$=2.5%) trends identified for the current water year.

Site 58-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.04	0		
pH, Lab	6	0.15	0		
Alkalinity, Total	6	0.07	0		
Sulfate, Total	6	0.12	0		
Zinc, Dissolved	6	0.93	0		

(1): Number of years (2):Significance level

Table of Results for Water Year 2010

Site 58 "MW-T-00-01C"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)								7.5	NOT SCHEDULED FOR SAMPLING	10.0	NOT SCHEDULED FOR SAMPLING	10.6	10.0
Conductivity-Field(µmho)								58		7		76	58
Conductivity-Lab (µmho)								54		70		69	69
pH Lab (standard units)								6.04		5.30		5.41	5.41
pH Field (standard units)								5.12		5.33		6.18	5.33
Total Alkalinity (mg/L)								16.9		24.8		22.9	22.9
Total Sulfate (mg/L)								1.1 J		<0.5 UJ		0.9 J	0.9
Hardness (mg/L)								19.7		29.0		30.0	29.0
Dissolved As (ug/L)								0.229		0.235		0.305	0.235
Dissolved Ba (ug/L)				NOT SCHEDULED FOR SAMPLING				14.5		19.8		23.5	19.8
Dissolved Cd (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Cr (ug/L)								1.720		1.200		0.614	1.200
Dissolved Cu (ug/L)								0.100 U		0.116		0.192	0.116
Dissolved Pb (ug/L)								0.0342 U		0.0302		0.0911	0.0342
Dissolved Ni (ug/L)								0.413		0.423		0.686	0.423
Dissolved Ag (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Zn (ug/L)								0.28		0.92		0.81	0.81
Dissolved Se (ug/L)								0.261 J		0.944		0.243 J	0.261
Dissolved Hg (ug/L)								0.000881		0.000979 U		0.003570	0.000979

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

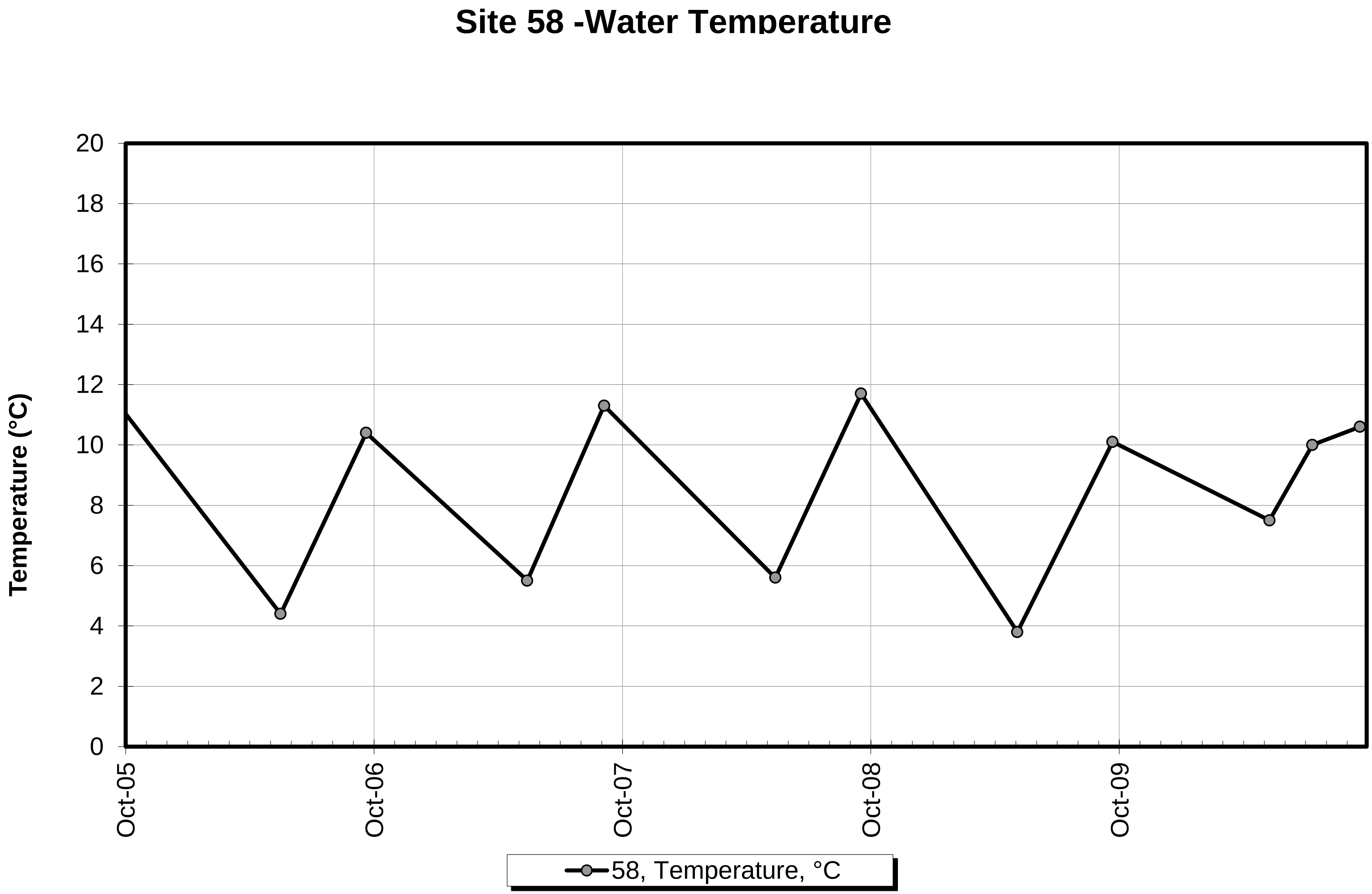
Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

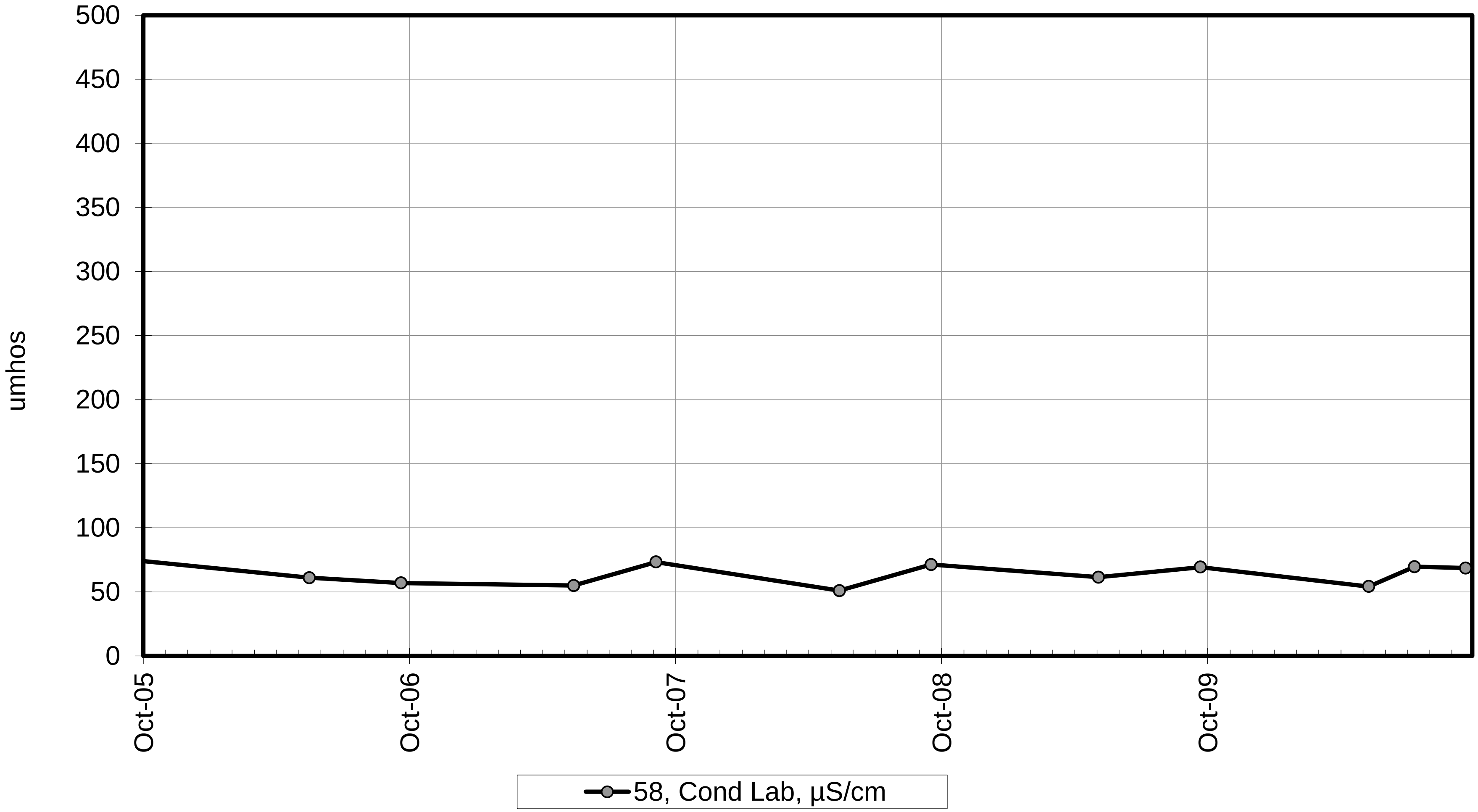
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
58	5/11/2010	9:56 AM				
			Cu diss, µg/l	0.1	U	Field Blank Contamination
			Pb diss, µg/l	0.0342	U	Field Blank Contamination
			Se diss, µg/l	0.261	J	Below Quantitative Range
			SO4 Tot, mg/l	1.1	J	Sample Temperature
58	7/13/2010	2:25 PM				
			Hg diss, µg/l	0.000979	U	Field Blank Contamination
			SO4 Tot, mg/l	0	UJ	Sample Reciept Temperature
58	9/21/2010	9:43 AM				
			Se diss, µg/l	0.243	J	Below Quantitative Range
			SO4 Tot, mg/l	0.9	J	Below Quantitative Range

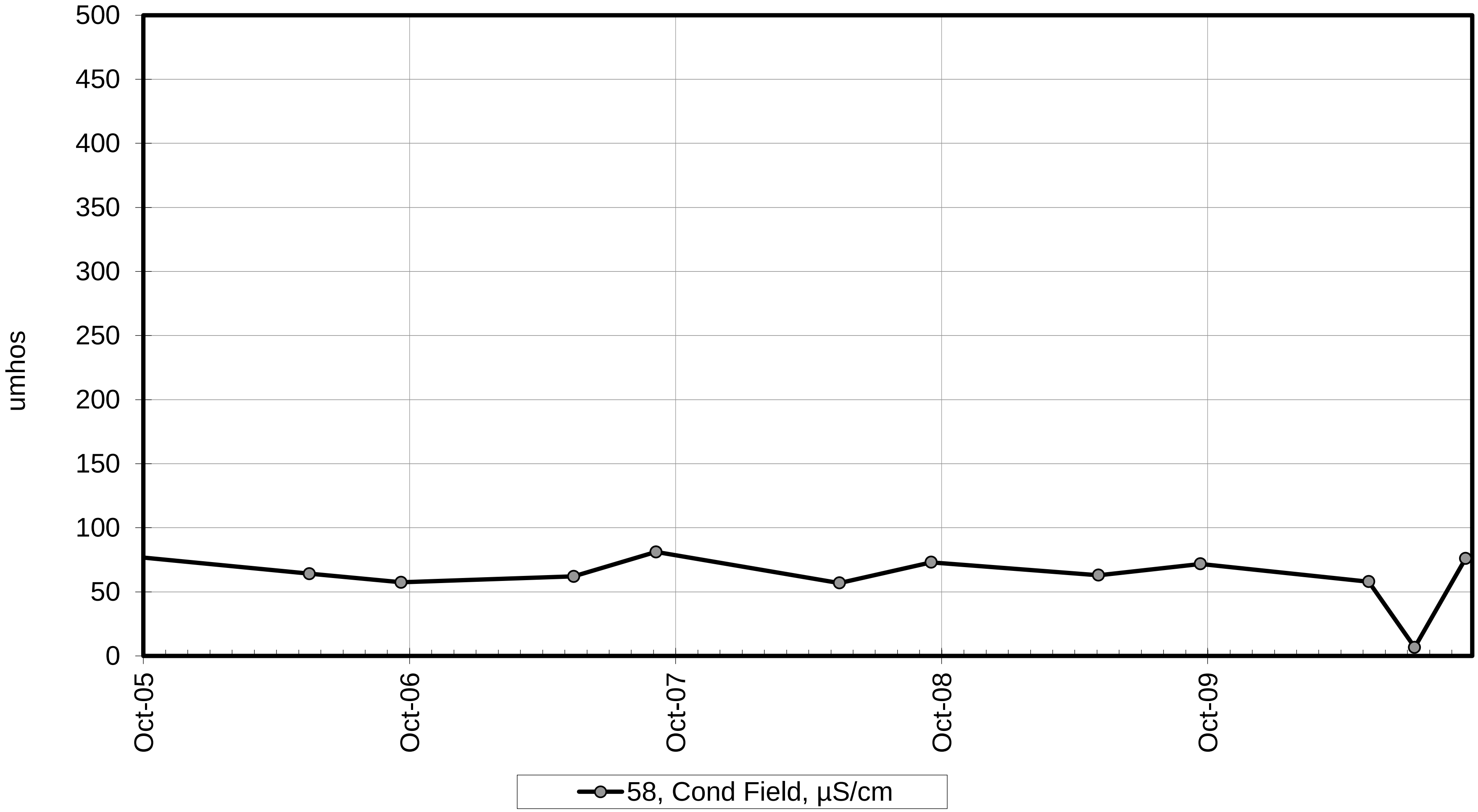
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit


Site 58 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Temperature, °C

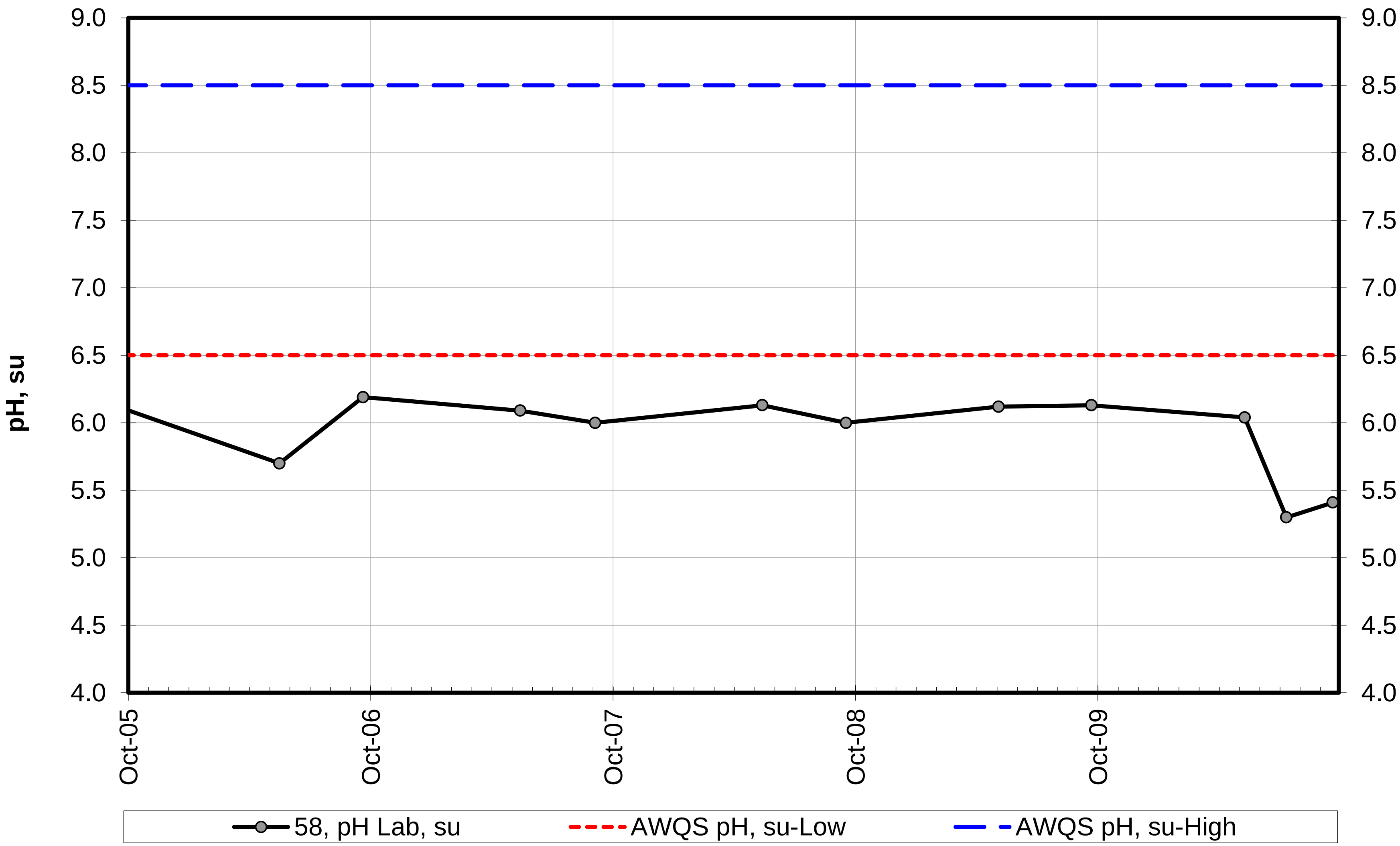
Site 58 - Conductivity-Lab

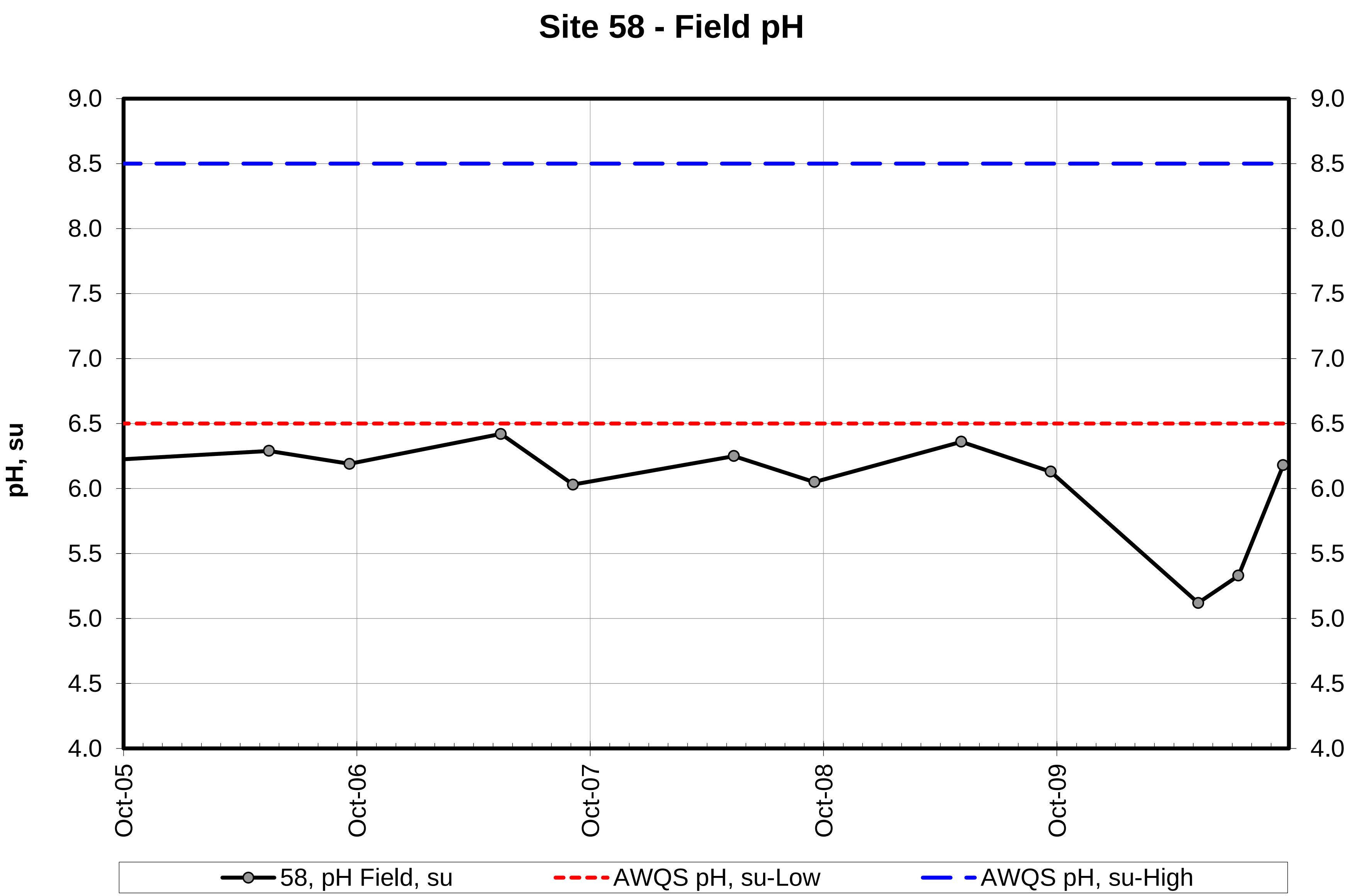


Site 58 - Conductivity-Field

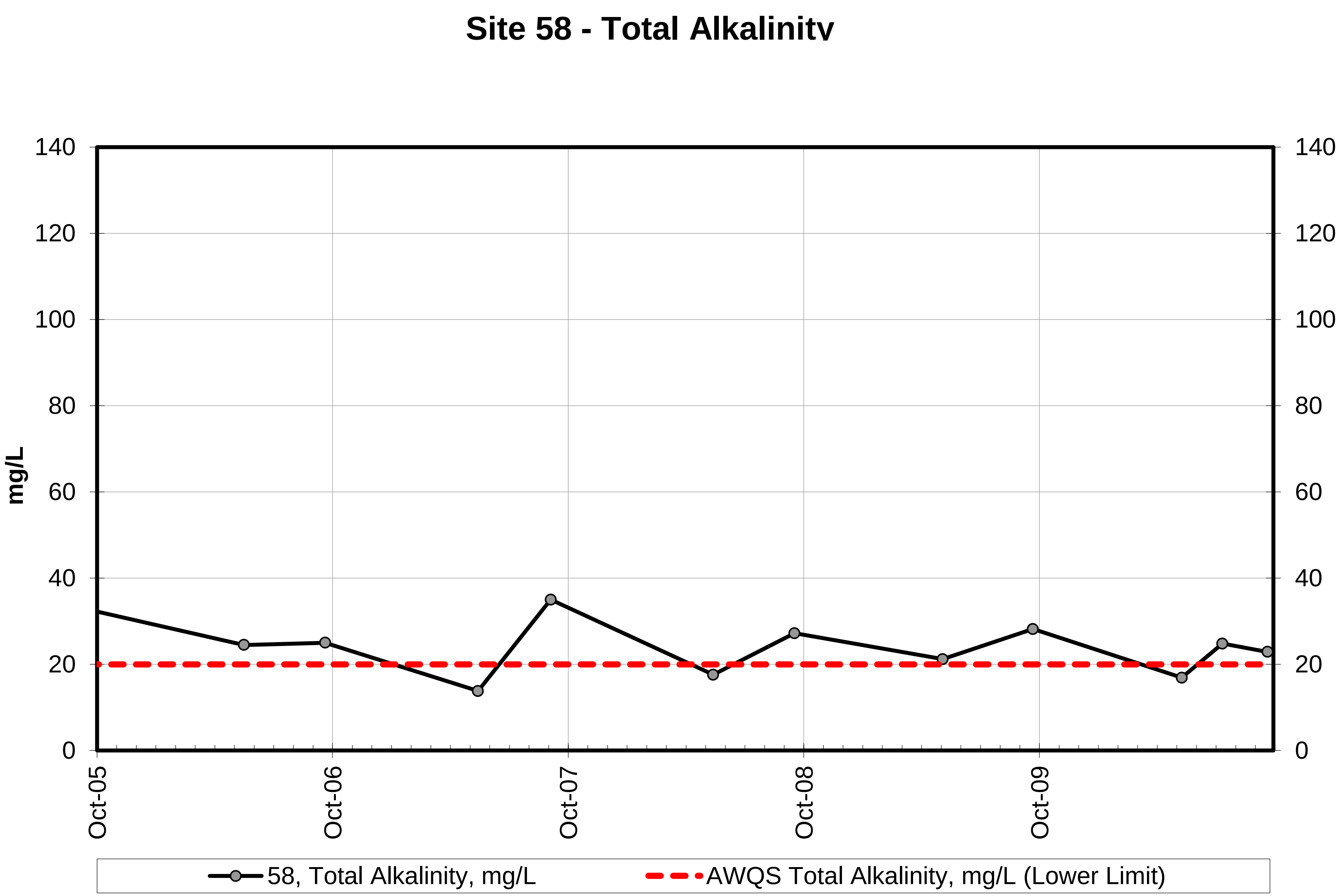


Site 58 - Lab pH

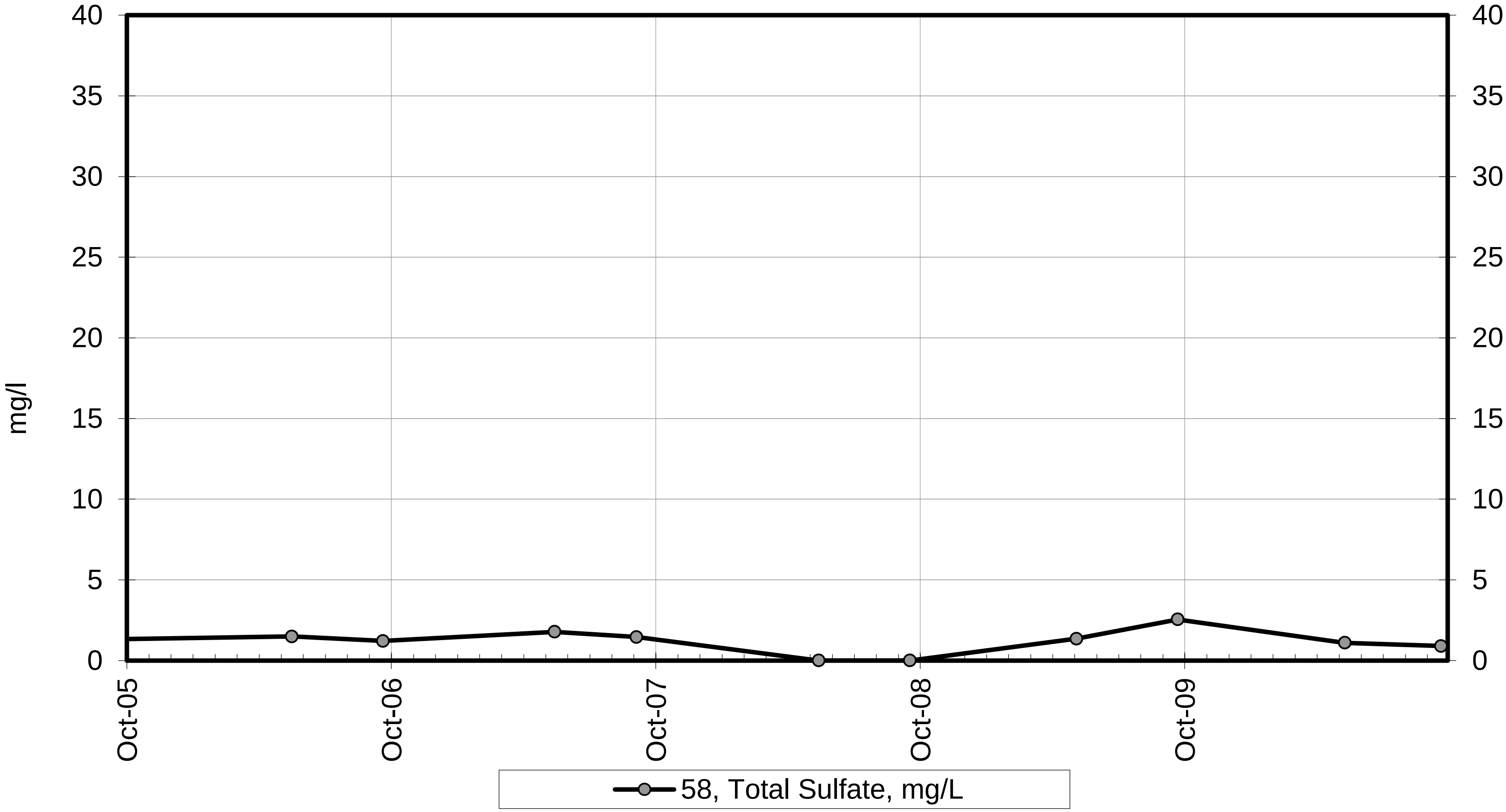




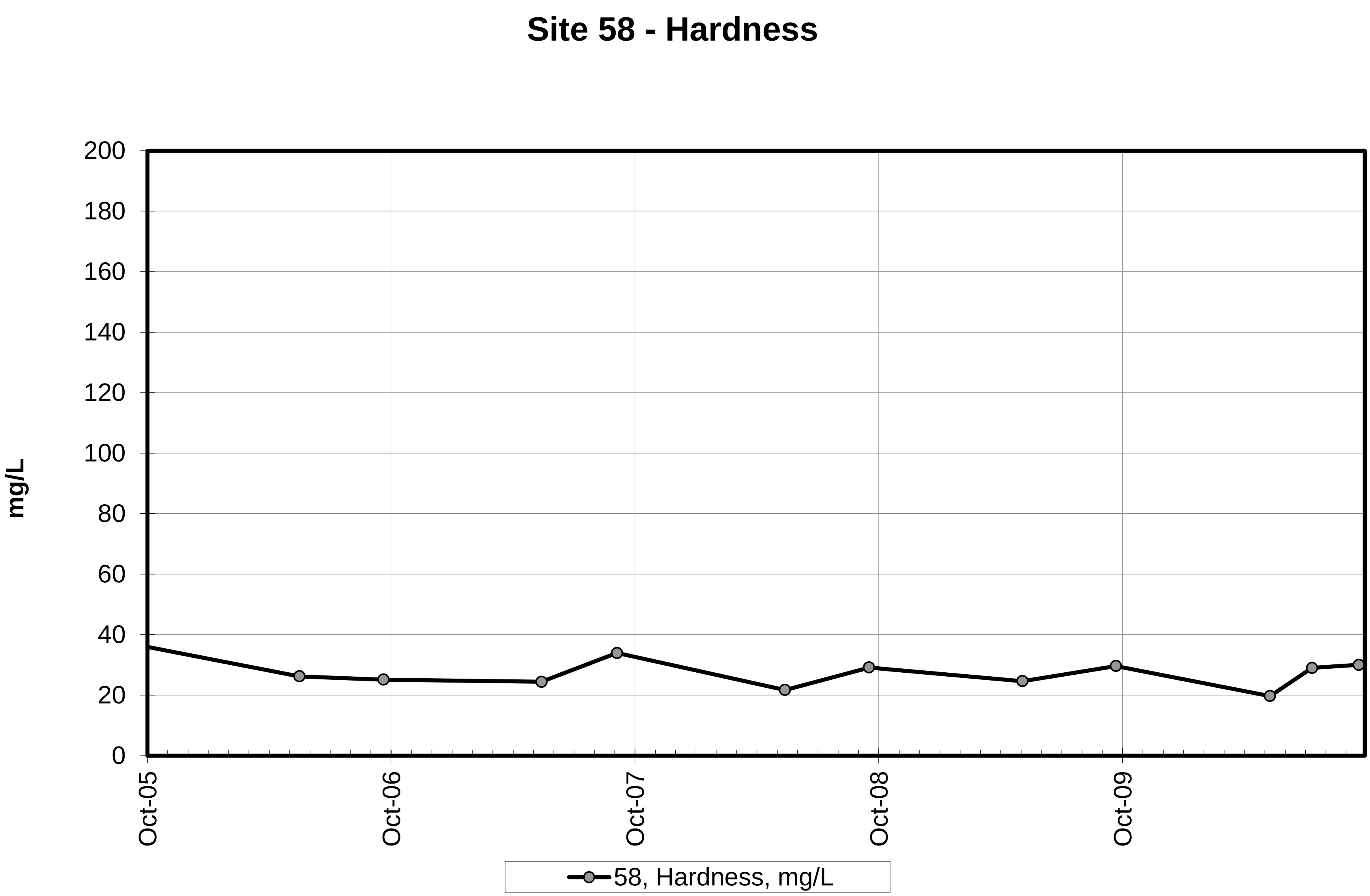
Site 58 - Field pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High


Site 58 - Total Alkalinity
mg/L
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

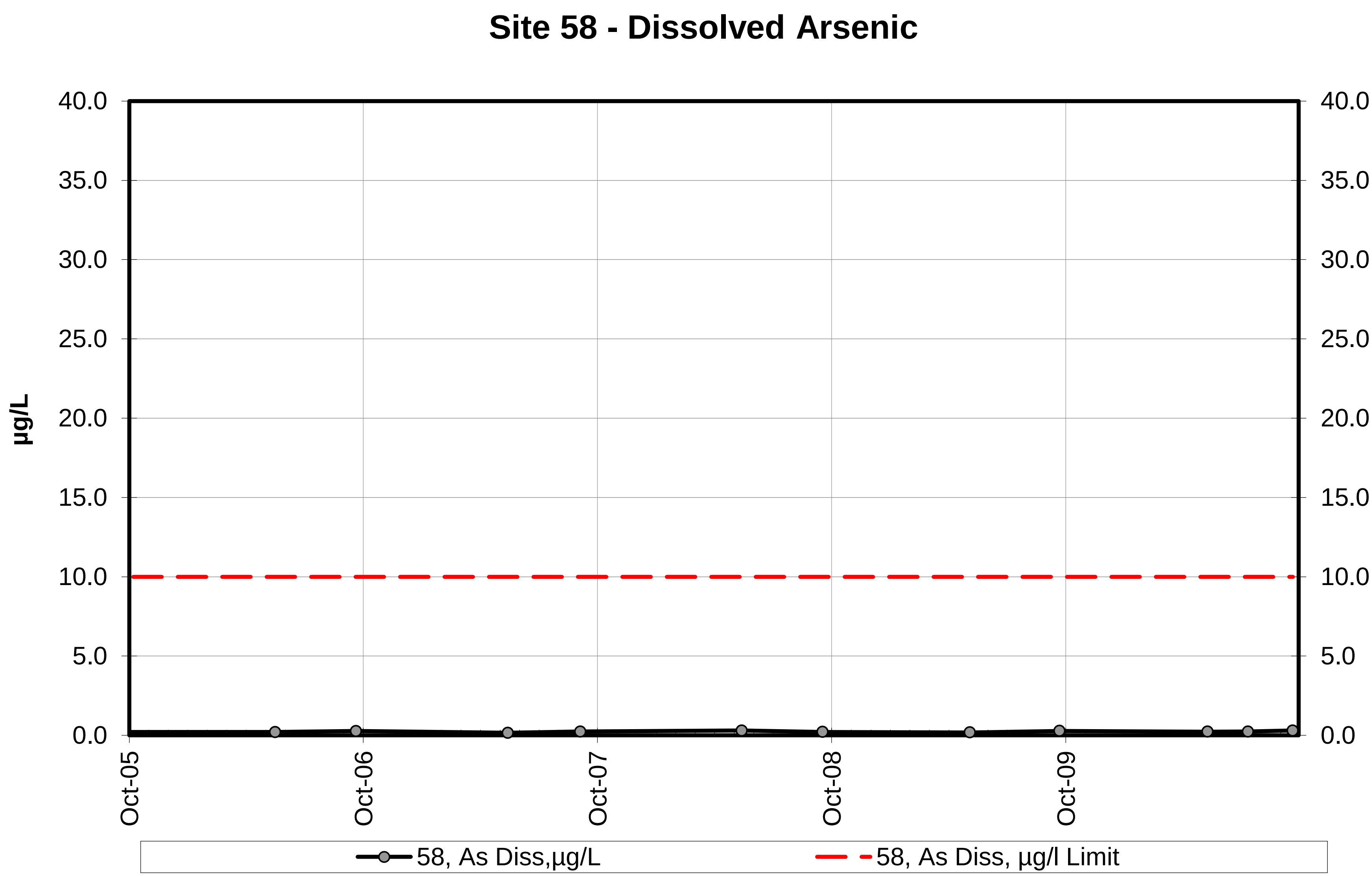
Site 58 - Total Sulfate



Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

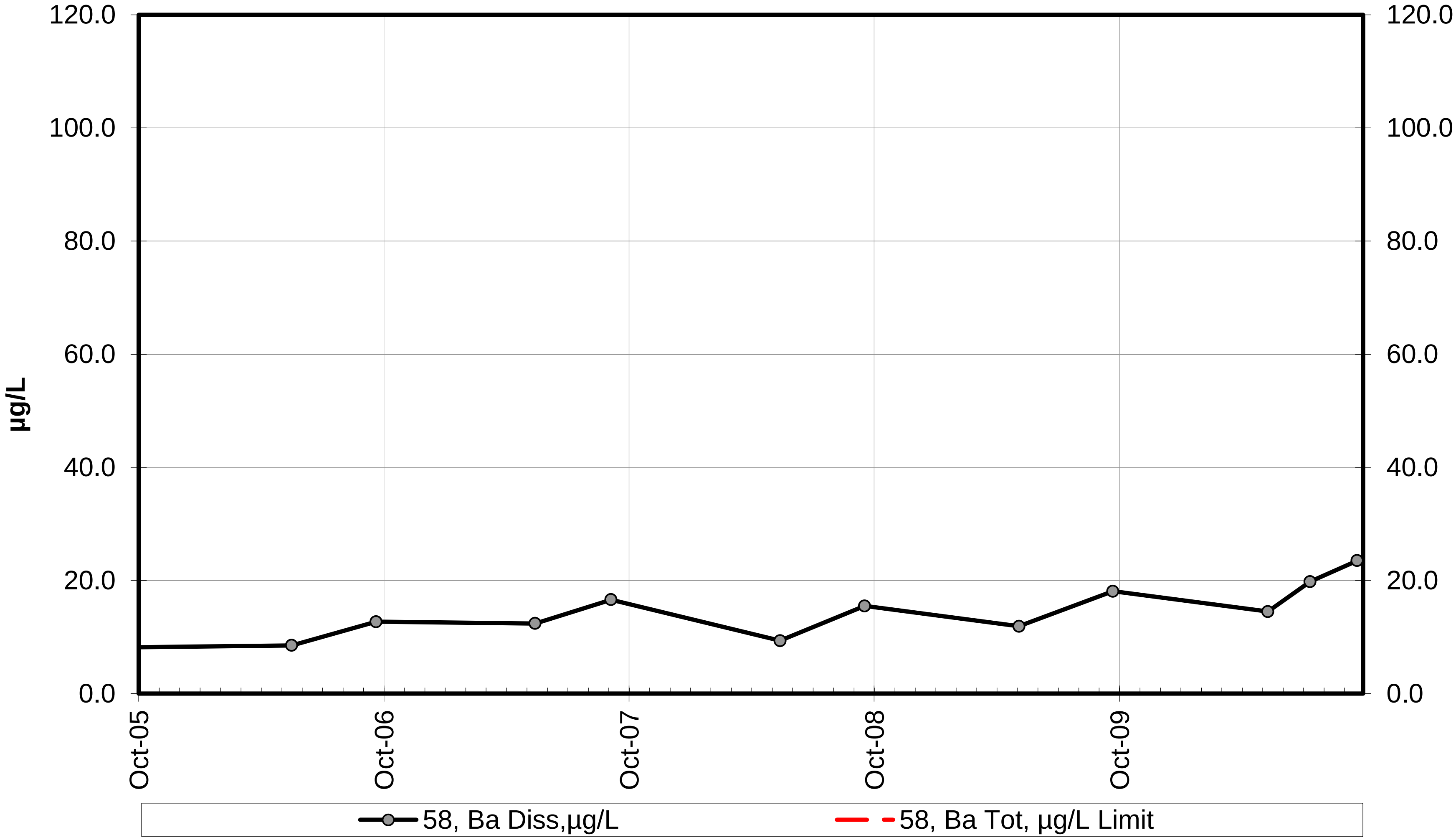


Site 58 - Hardness
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Hardness, mg/L

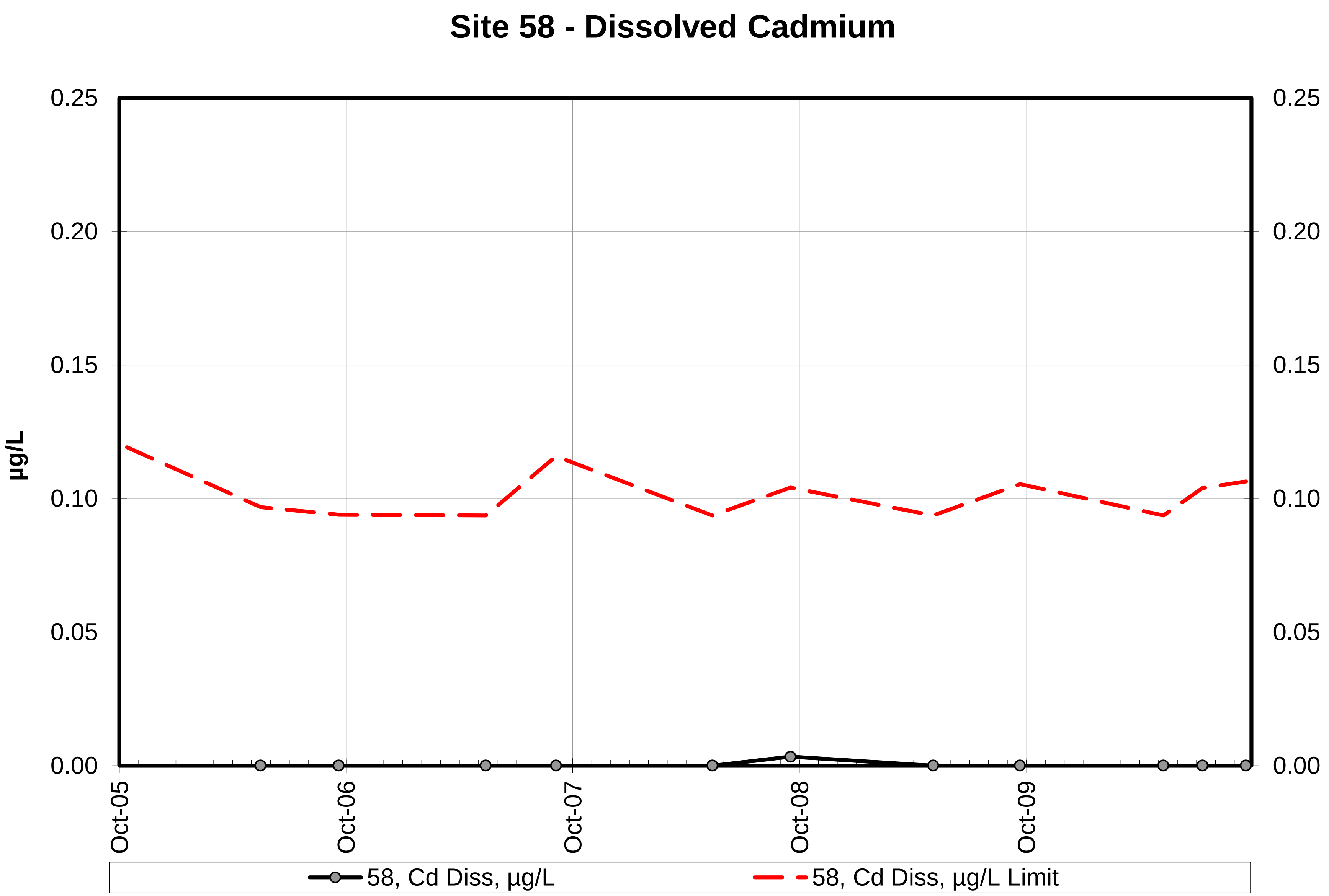


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

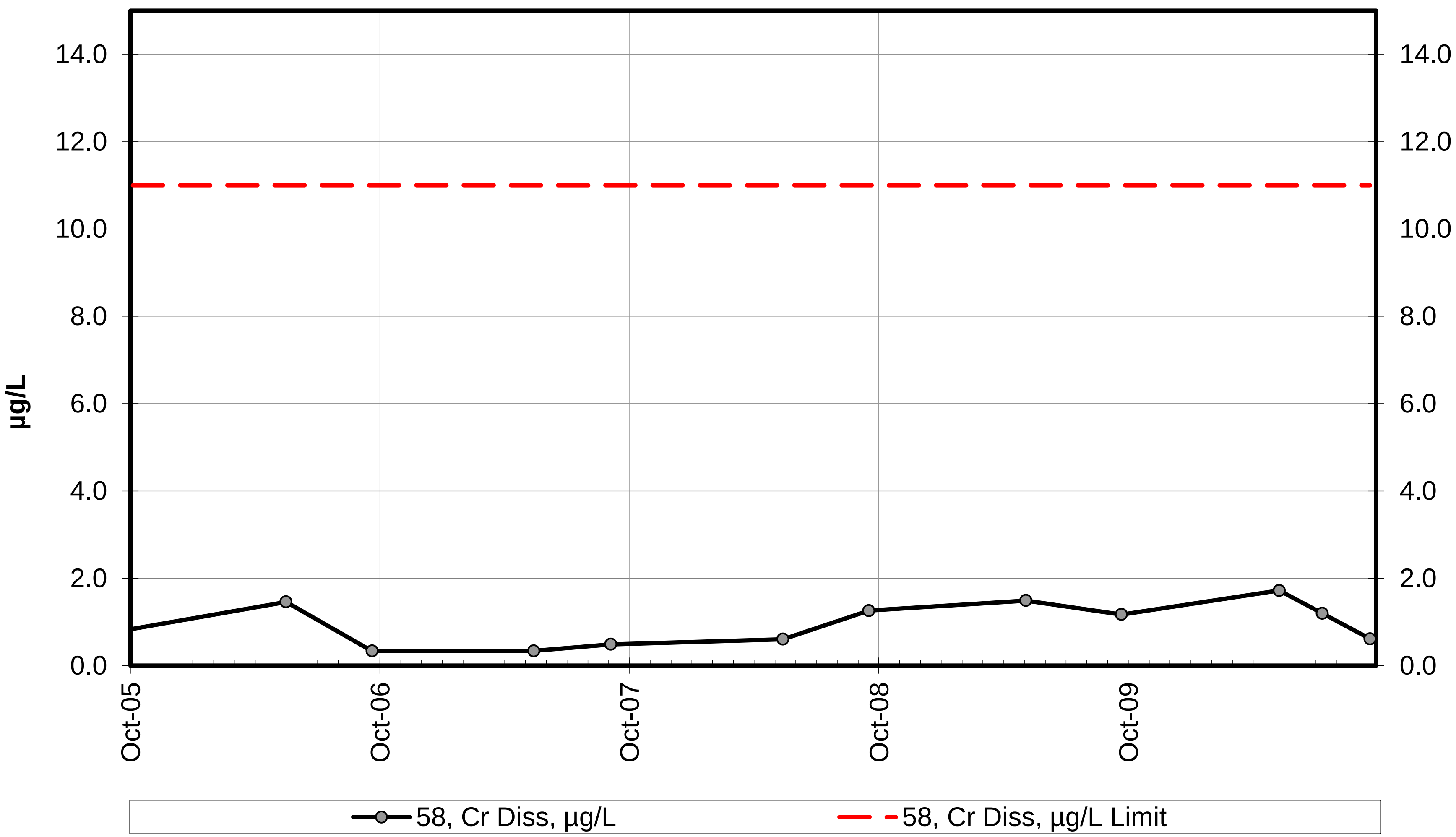
Site 58 - Dissolved Barium



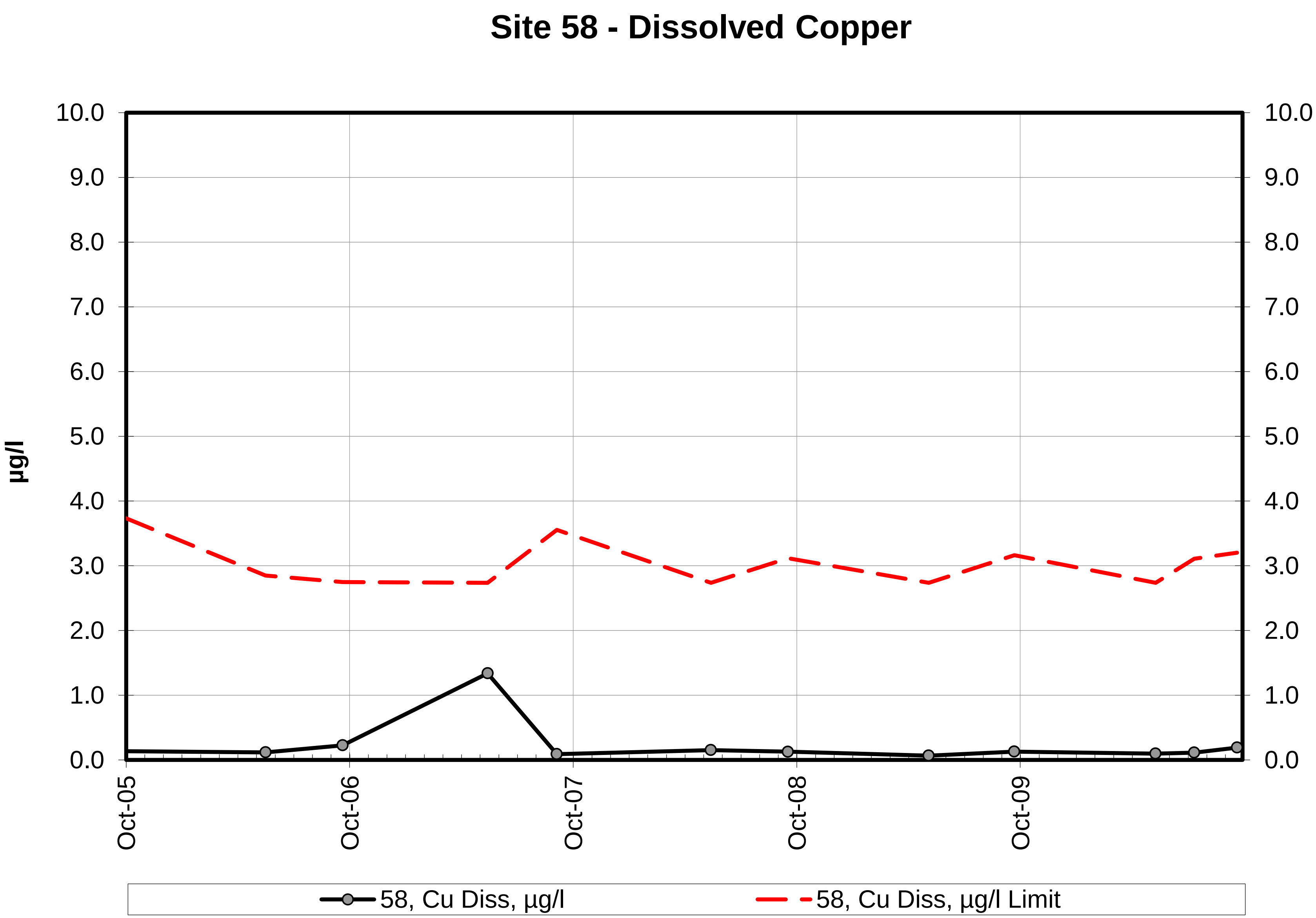
Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination


Site 58 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Cd Diss, µg/L
58, Cd Diss, µg/L Limit

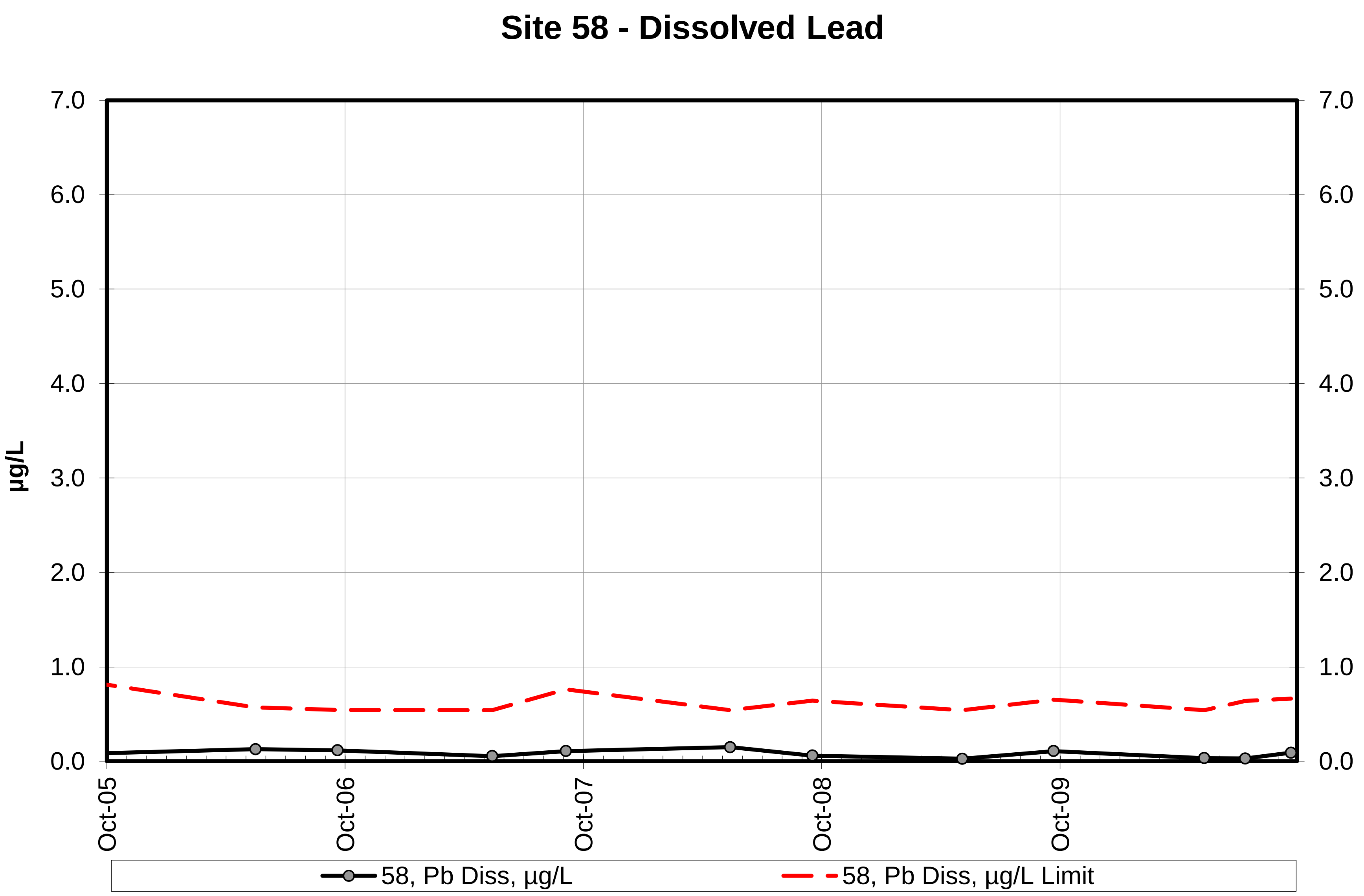
Site 58 - Dissolved Chromium



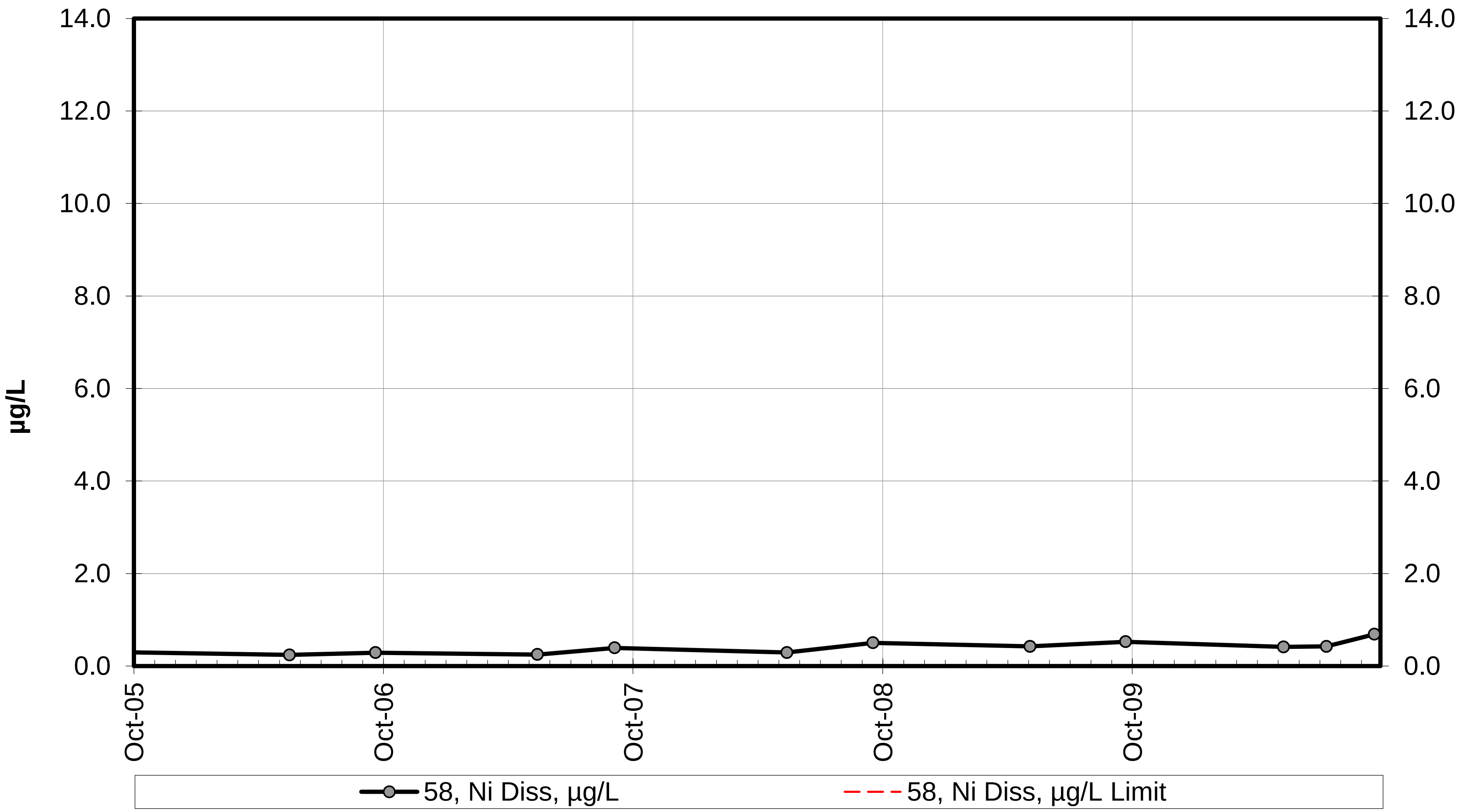
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



Site 58 - Dissolved Copper
µg/l
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Cu Diss, µg/l
58, Cu Diss, µg/l Limit

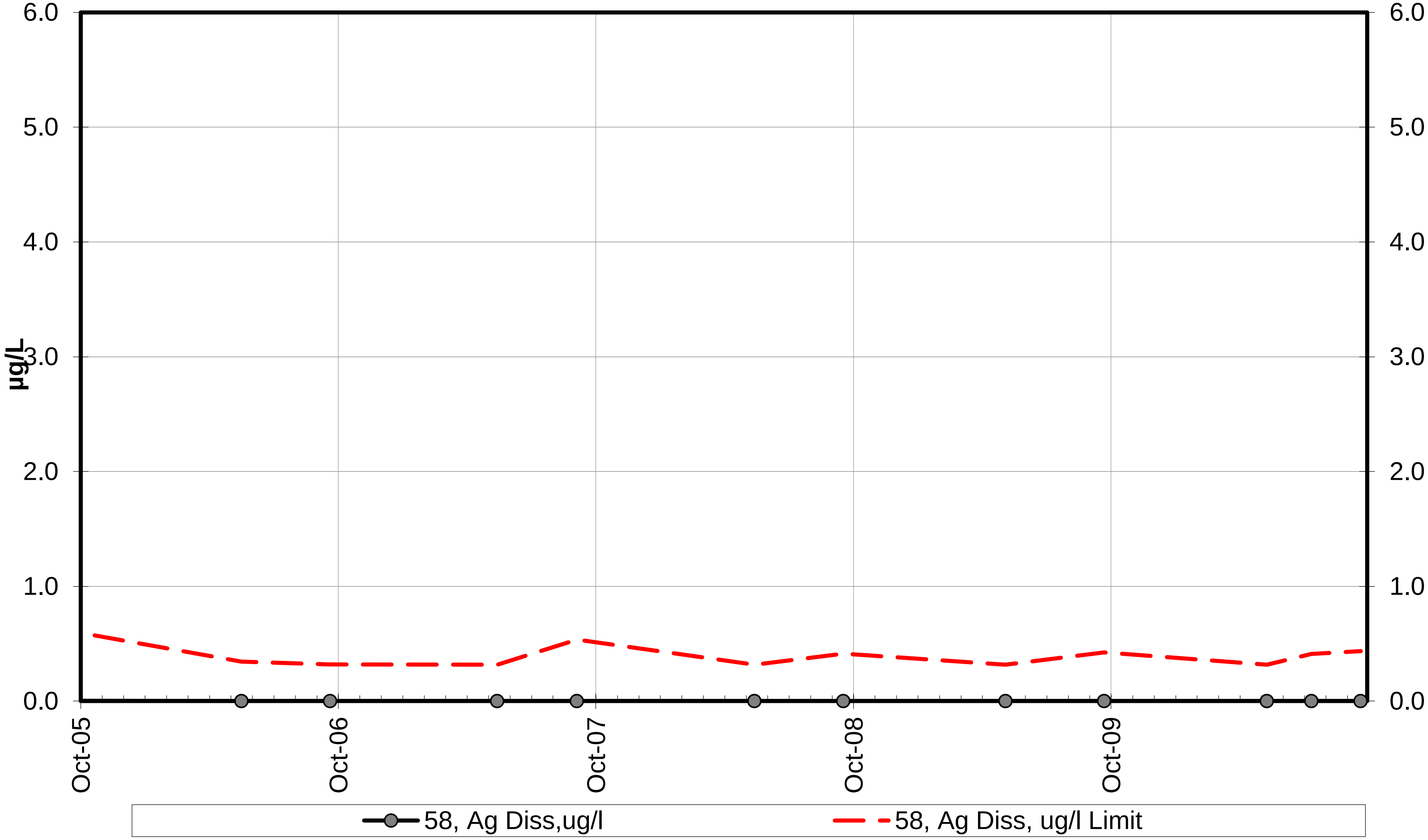

Site 58 - Dissolved Lead
µg/L
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Pb Diss, µg/L
58, Pb Diss, µg/L Limit

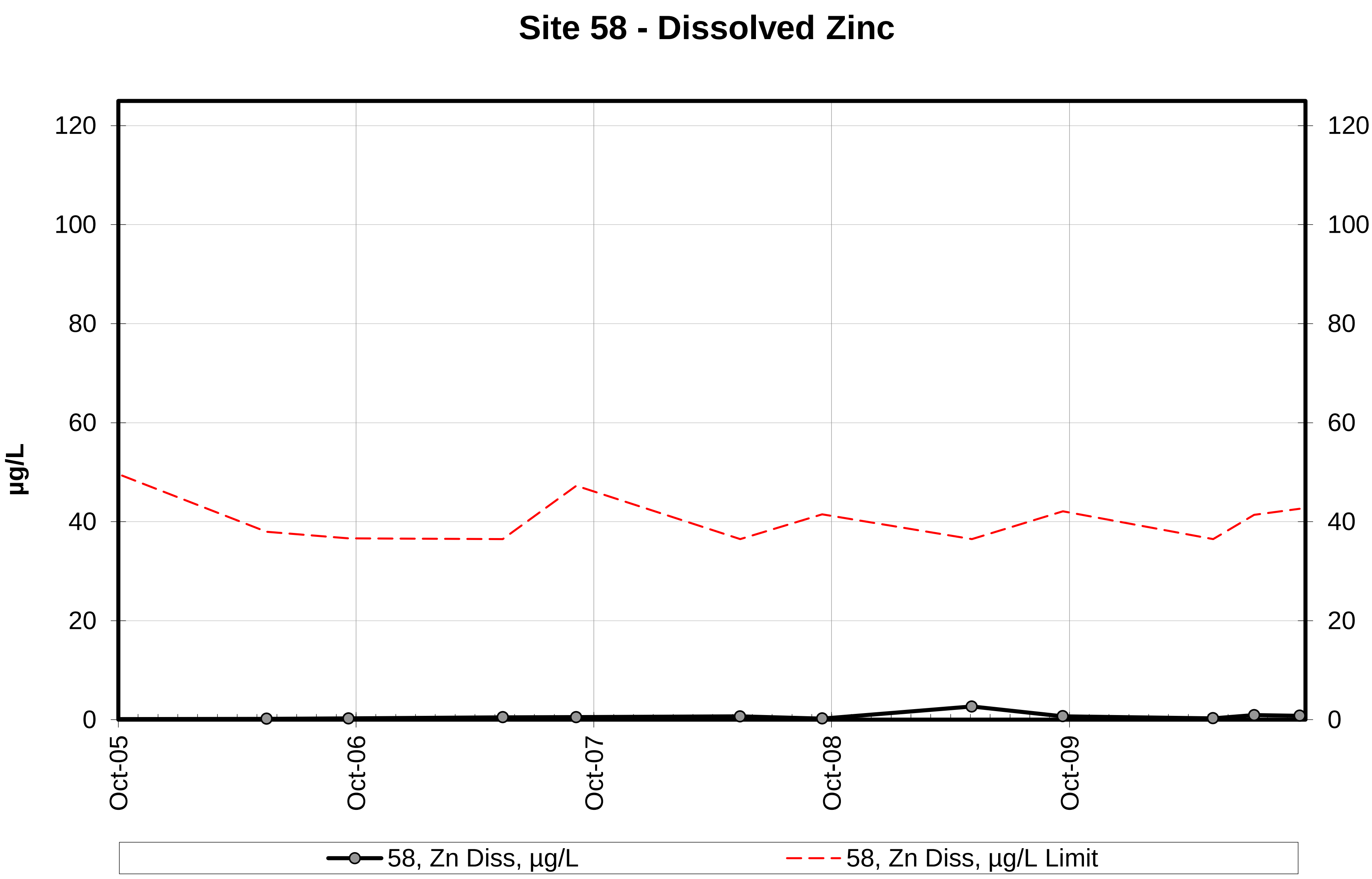
Site 58 - Dissolved Nickel



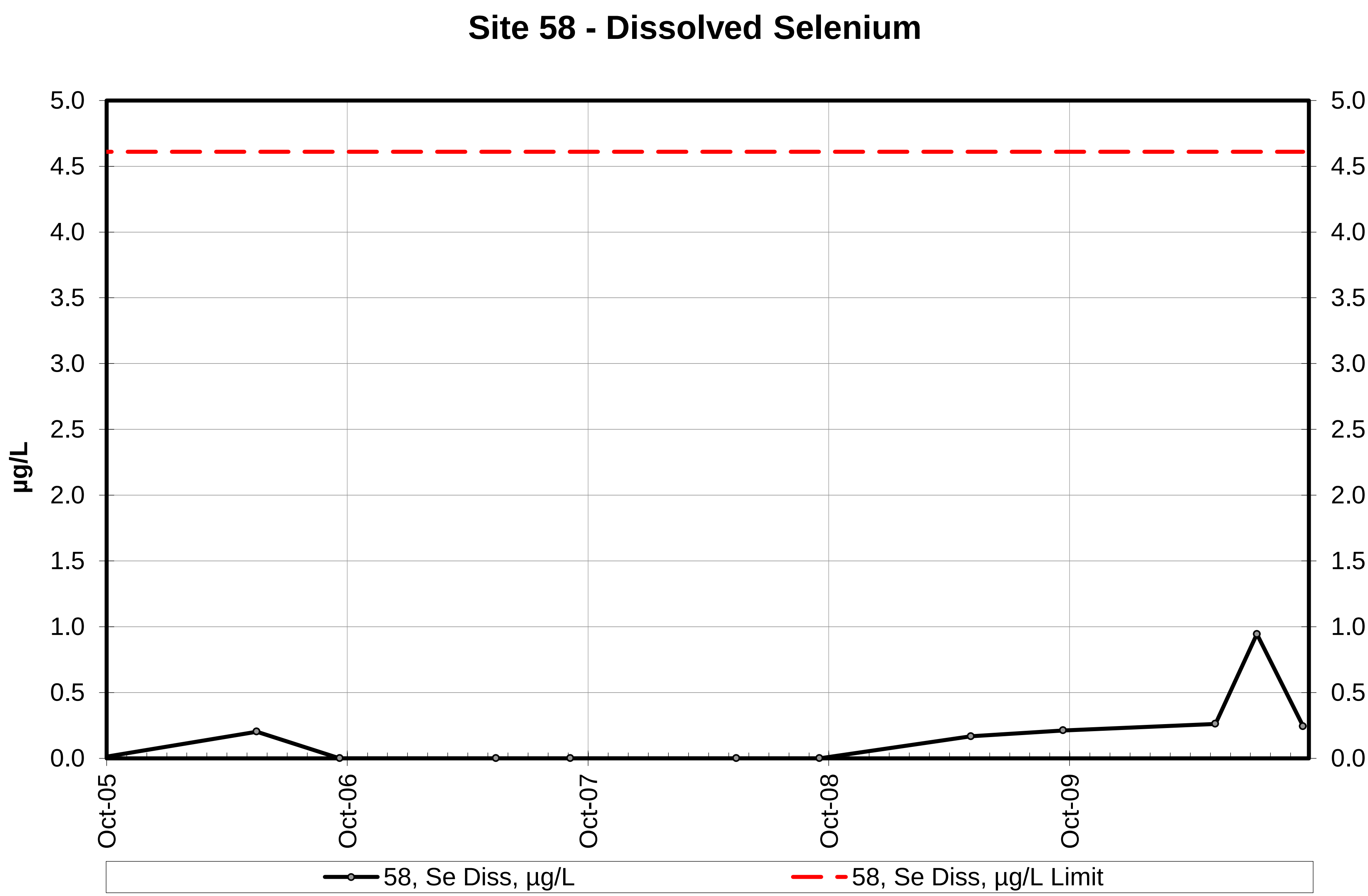
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

Site 58 - Dissolved Silver

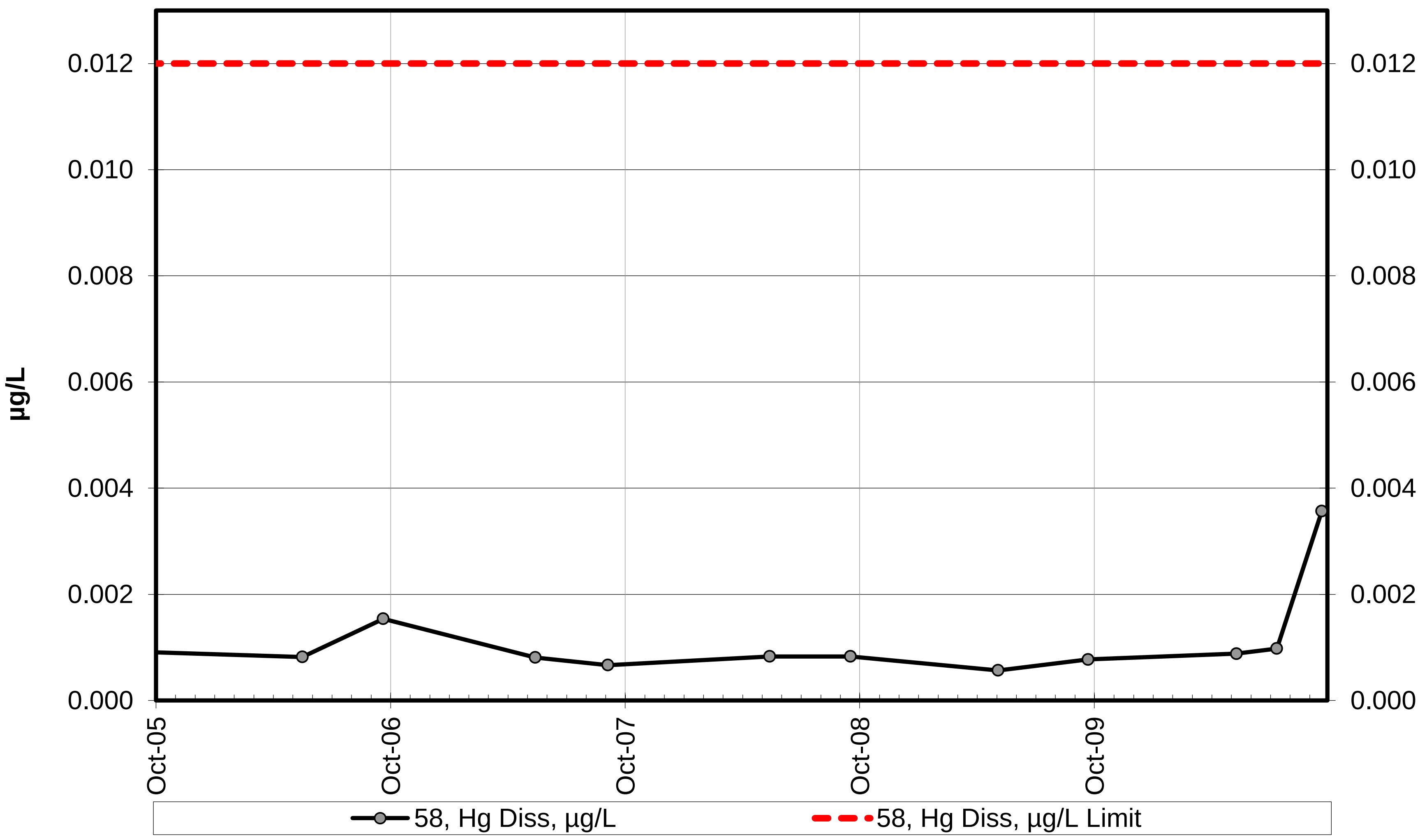




Site 58 - Dissolved Zinc
µg/L
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Zn Diss, µg/L
58, Zn Diss, µg/L Limit


Site 58 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Se Diss, µg/L
58, Se Diss, µg/L Limit

Site 58 - Dissolved Mercury

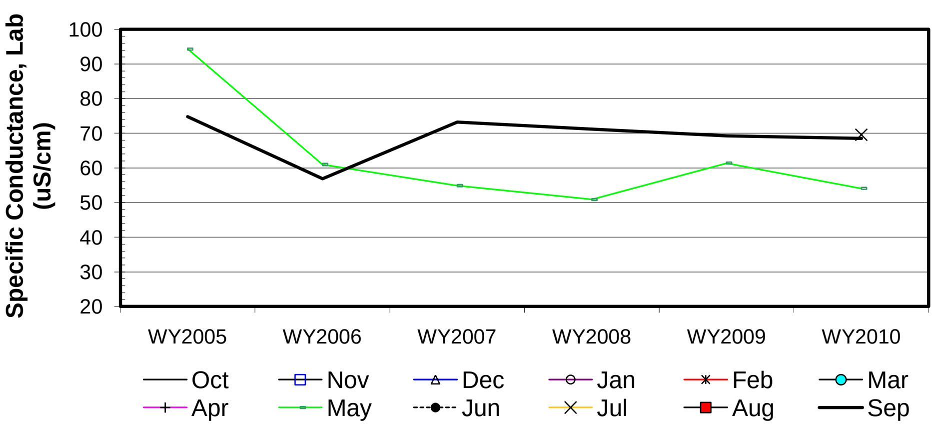


Site **#58** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								94.3				74.8
b	**WY2006**								61				56.9
c	**WY2007**								54.9				73.2
d	**WY2008**								50.9				71.2
e	**WY2009**								61.4				69.3
f	**WY2010**								54.1		69.6		68.5
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				-1
	c-a								-1				-1
	d-a								-1				-1
	e-a								-1				-1
	f-a								-1				-1
	c-b								-1				1
	d-b								-1				1
	e-b								1				1
	f-b								-1				1
	d-c								-1				-1
	e-c								1				-1
	f-c								-1				-1
	e-d								1				-1
	f-d								1				-1
	f-e								-1				-1
	S_k	0	0	0	0	0	0	0	-7	0	0	0	-7
	σ^2_S=								28.33				28.33
	$Z_k = S_k/\sigma_S$								-1.32				-1.32
	Z^2_k								1.73				1.73

ΣZ_k=	-2.63	Tie Extent	t_1	t_2	t_3	t_4	t_5	Σn	13
ΣZ^2_k=	3.46	Count	60	0	0	0	0	ΣS_k	-14
Z-bar=$\Sigma Z_k/K$=	-1.32								

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.00	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity	
	p	**1.000**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	-1.73	@α/2=2.5% Z=	1.96	H_0 (No trend)	ACCEPT
56.67	**p**	**0.042**			H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-7.86		1.24
0.050	-5.25	**-1.47**	-0.70
0.100	-3.65		-0.87
0.200	-1.96		-1.25

Site **#58** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								6.3				6.1
b	**WY2006**								5.7				6.2
c	**WY2007**								6.1				6.0
d	**WY2008**								6.1				6.0
e	**WY2009**								6.1				6.1
f	**WY2010**								6.0		5.3		5.4
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	3
t_2	0	0	0	0	0	0	0	0	0	0	0	1
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								-1				-1
d-a								-1				-1
e-a								-1				1
f-a								-1				-1
c-b								1				-1
d-b								1				-1
e-b								1				-1
f-b								1				-1
d-c								1				0
e-c								1				1
f-c								-1				-1
e-d								-1				1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-3	0	0	0	-6

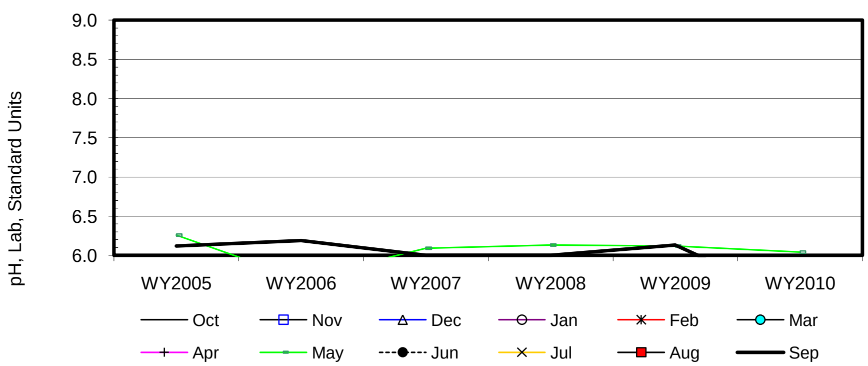
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				27.33
$Z_k = S_k/\sigma_S$								-0.56				-1.15
Z^2_k								0.32				1.32

ΣZ_k= -1.71
ΣZ^2_k= 1.63
Z-bar=$\Sigma Z_k/K$= -0.86

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 13
ΣS_k -9

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$=	0.17	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity
p	**0.680**		$\chi^2_h<\chi^2_{(K-1)}$ ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -1.07	@α/2=2.5% Z= 1.96	**H_0** (No trend) ACCEPT
55.67	**p** **0.142**		**H_A** (± trend) REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.17		0.06
0.050	-0.09	**-0.04**	0.00
0.100	-0.08		0.00
0.200	-0.05		-0.02

Site #58 — Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								47.0				32.8
b	**WY2006**								24.5				25.0
c	**WY2007**								13.8				35.0
d	**WY2008**								17.6				27.2
e	**WY2009**								21.2				28.2
f	**WY2010**								16.9		24.8		22.9
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				1
d-a								-1				-1
e-a								-1				-1
f-a								-1				-1
c-b								-1				1
d-b								-1				1
e-b								-1				1
f-b								-1				-1
d-c								1				-1
e-c								1				-1
f-c								1				-1
e-d								1				1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-7	0	0	0	-5

	May	Sep
$\sigma^2_S=$	28.33	28.33
$Z_k = S_k/\sigma_S$	-1.32	-0.94
Z^2_k	1.73	0.88

$\Sigma Z_k=$ -2.25

$\Sigma Z^2_k=$ 2.61

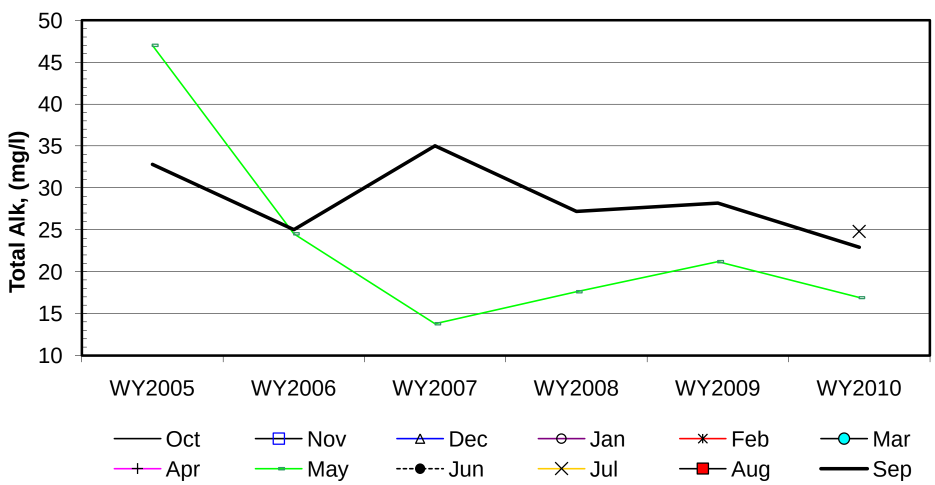
$\text{Z-bar}=\Sigma Z_k/K=$ -1.13

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13

ΣS_k -12

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$ 0.07		@α=5% $\chi^2_{(K-1)}=$ 3.84	Test for station homogeneity	
p	**0.790**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -1.46	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
56.67	**p** **0.072**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-7.47		1.06
0.050	-5.44	**-1.94**	-0.09
0.100	-4.25		-0.63
0.200	-3.55		-1.14

Site **#58** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								3.9				1.3
b	**WY2006**								1.5				1.2
c	**WY2007**								1.8				1.5
d	**WY2008**								-3.8				-7.5
e	**WY2009**								1.4				2.6
f	**WY2010**								1.1		0.0		0.9
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				1
d-a								-1				-1
e-a								-1				1
f-a								-1				-1
c-b								1				1
d-b								-1				-1
e-b								-1				1
f-b								-1				-1
d-c								-1				-1
e-c								-1				1
f-c								-1				-1
e-d								1				1
f-d								1				1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-9	0	0	0	-1

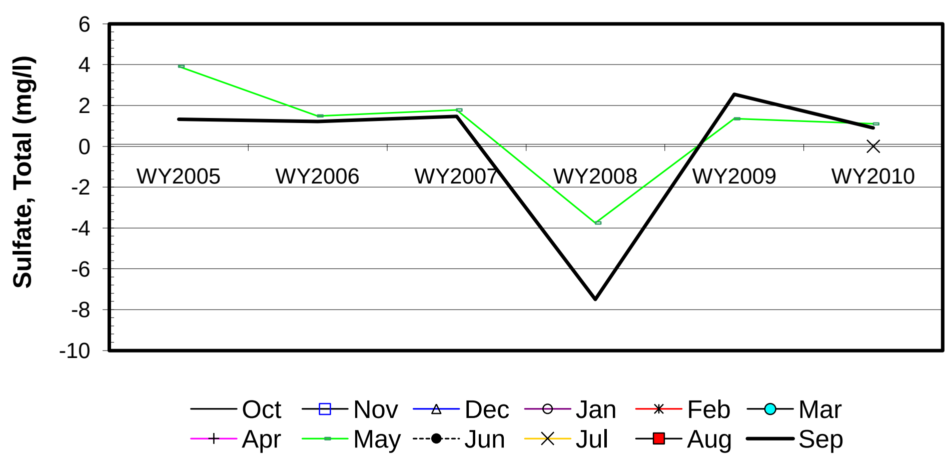
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-1.69				-0.19
Z^2_k								2.86				0.04

ΣZ_k=	-1.88
ΣZ^2_k=	2.89
Z-bar=ΣZ_k/K=	-0.94

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-10

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	1.13	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.288**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -1.20	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
56.67	**p** **0.116**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.53		0.30
0.050	-1.18	**-0.15**	0.10
0.100	-0.63		-0.05
0.200	-0.30		-0.08

Site **#58** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.9				0.1
b	**WY2006**								0.2				0.3
c	**WY2007**								0.5				0.5
d	**WY2008**								0.7				0.2
e	**WY2009**								2.7				0.7
f	**WY2010**								0.3		0.9		0.8
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								-1				1
d-a								-1				1
e-a								1				1
f-a								-1				1
c-b								1				1
d-b								1				-1
e-b								1				1
f-b								1				1
d-c								1				-1
e-c								1				1
f-c								-1				1
e-d								1				1
f-d								-1				1
f-e								-1				1
S_k	0	0	0	0	0	0	0	1	0	0	0	11

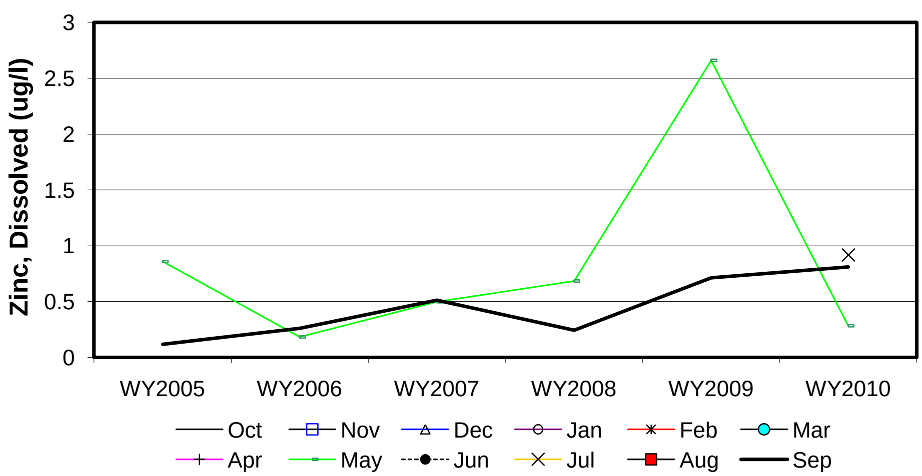
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								0.19				2.07
Z^2_k								0.04				4.27

ΣZ_k= 2.25
ΣZ^2_k= 4.31
Z-bar=ΣZ_k/K= 1.13

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13
ΣS_k 12

$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	1.76	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.184**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	1.46	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
56.67 **p**	**0.928**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.10		0.28
0.050	-0.02	**0.14**	0.21
0.100	0.03		0.18
0.200	0.09		0.15

INTERPRETIVE REPORT
SITE 27 "MONITORING WELL 2S"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Six samples exceeding these criteria have been identified, as listed in the table below. These exceedances are for pH values, both field and laboratory, which are below the lower limit of 6.5 su listed in the AWQS. Values for field and laboratory pH from other wells completed into organic rich peat sediments similar to Site 27 have historically resulted in pH values ranging from 5 to 6 su (*e.g.* Sites 58, 29, and 32). All of the other analytes were within AWQS for the current water year.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	5.57		6.5	Aquatic Life, chronic
11-May-10	pH Lab, su	5.97		6.5	Aquatic Life, chronic
13-Jul-10	pH Field, su	5.5		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	5.14		6.5	Aquatic Life, chronic
21-Sep-10	pH Field, su	6.18		6.5	Aquatic Life, chronic
21-Sep-10	pH Lab, su	5.48		6.5	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. Visually the increasing trend seen in sulfate values for the last two water years is now a downward trend. Also, the decreasing trend in alkalinity noted in the 2009 FWMP has now slightly begun to increase. These trends are supported by the non-parametric statistical analysis that were performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc.

Site 27-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	**0.98**	+	9.1	10.2
pH, Lab	6	0.82	0		
Alkalinity, Total	6	0.18	0		
Sulfate, Total	6	**1.00**	+	3.52	35.2
Zinc, Dissolved	6	0.45	0		

(1): Number of years (2):Significance level

Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The above table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010).

For datasets with a statistically significant trend ($\alpha/2=2.5\%$) a Seasonal-Sen's Slope estimate statistic has also been calculated. The dataset for laboratory conductivity has a statistically significant (p=0.98) trend and a slope estimate of 9.1 µs/yr or a 10.2% increase over the past 6 years. Also, total sulfate has a statistically significant (p=1.00) trend with a slope estimate of 3.52 mg/L/yr or a 35.2% increase over the last 6 years. Sulfate results at this site prior to 1996 are highly variable and typically ranged between 1 to 10 mg/L. The sulfate trend that was identified over the previous five years was of very low magnitude. WY2009 results indicate a substantial increase in sulfate concentration at Site 27, however by the end of WY 2010 sulfate values were <1/2 the maximum concentration seen in the previous WY. With the changes that were made to the FWMP monitoring schedule (*i.e.* increase sampling frequency), HGCMC feels that the program is sufficient to monitor any further increases, before the AWQS are exceeded.

Additional X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 27 and Site 58, the upgradient control site, to aid in the comparison between those two sites. Total alkalinity, laboratory conductivity, and pH are all approximately within the same range for both sites. Total sulfate currently and has been higher at the down gradient site for the last three years.

In general the waters for these two different sites are characterized by significantly different hydrological and geological conditions. Site 58 is located in close proximity to the large bedrock ridge, which defines the eastern geologic and hydrologic boundary of the tails area. The upslope portion of the ridge acts as the major recharge zone to the area aquifer. Along this ridge it is likely that groundwater flow is dominated by shallow or near surface flows due to the steep gradient and thin mineral soil. Thus, the groundwater at Site 58 is typically a mixture of surficial recharge from the immediate area with a component of relatively juvenile groundwater originating from the ridge to the east. In contrast, Site 27 is located in an area of gently sloping muskeg that forms part of the upper Tributary Creek drainage area. The area's groundwater is characterized by diffuse flow through the peat/sand strata that make up the upper portion of the unconsolidated sediment fill in the Tributary Creek valley. Additionally, Site 27 is located in an area identified as a groundwater discharge site into Tributary Creek. Thus, Site 27 samples groundwater that is relatively mature in comparison to Site 58 and may have a higher component of groundwater that has been in contact with a larger variety of strata for a longer period of time. Therefore, the groundwater would be expected to have a higher dissolved load. The lower pH would be due to the greater interaction with organic matter in the muskeg and would promote greater solubility for naturally occurring dissolved metals sampled at this site.

Table of Results for Water Year 2010

Site 27 "MW-2S"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							5.8	NOT SCHEDULED FOR SAMPLING	9.0	NOT SCHEDULED FOR SAMPLING	9.5	9.0
Conductivity-Field(µmho)								107		110		127	110
Conductivity-Lab (µmho)								110		105		121	110
pH Lab (standard units)								5.97		5.14		5.48	5.48
pH Field (standard units)								5.57		5.50		6.18	5.57
Total Alkalinity (mg/L)								22.0		22.6		31.7	22.6
Total Sulfate (mg/L)								18.0 J		10.0 J		13.7 J	13.7
Hardness (mg/L)								36.2		38.2		43.5	38.2
Dissolved As (ug/L)								4.900		3.830		3.960	3.960
Dissolved Ba (ug/L)								42.1		44.9		51.6	44.9
Dissolved Cd (ug/L)								0.008 J		0.010 J		<0.008	0.008
Dissolved Cr (ug/L)								3.320		0.729		0.840	0.840
Dissolved Cu (ug/L)								0.330		0.251		0.240	0.251
Dissolved Pb (ug/L)								0.7130		0.7930		0.4760	0.7130
Dissolved Ni (ug/L)								1.750		1.530		1.660	1.660
Dissolved Ag (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Zn (ug/L)								20.90		7.74		1.26	7.74
Dissolved Se (ug/L)								<0.114		<0.114		<0.228	0.057
Dissolved Hg (ug/L)								0.000587 U		0.001130 U		0.003090	0.001130

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

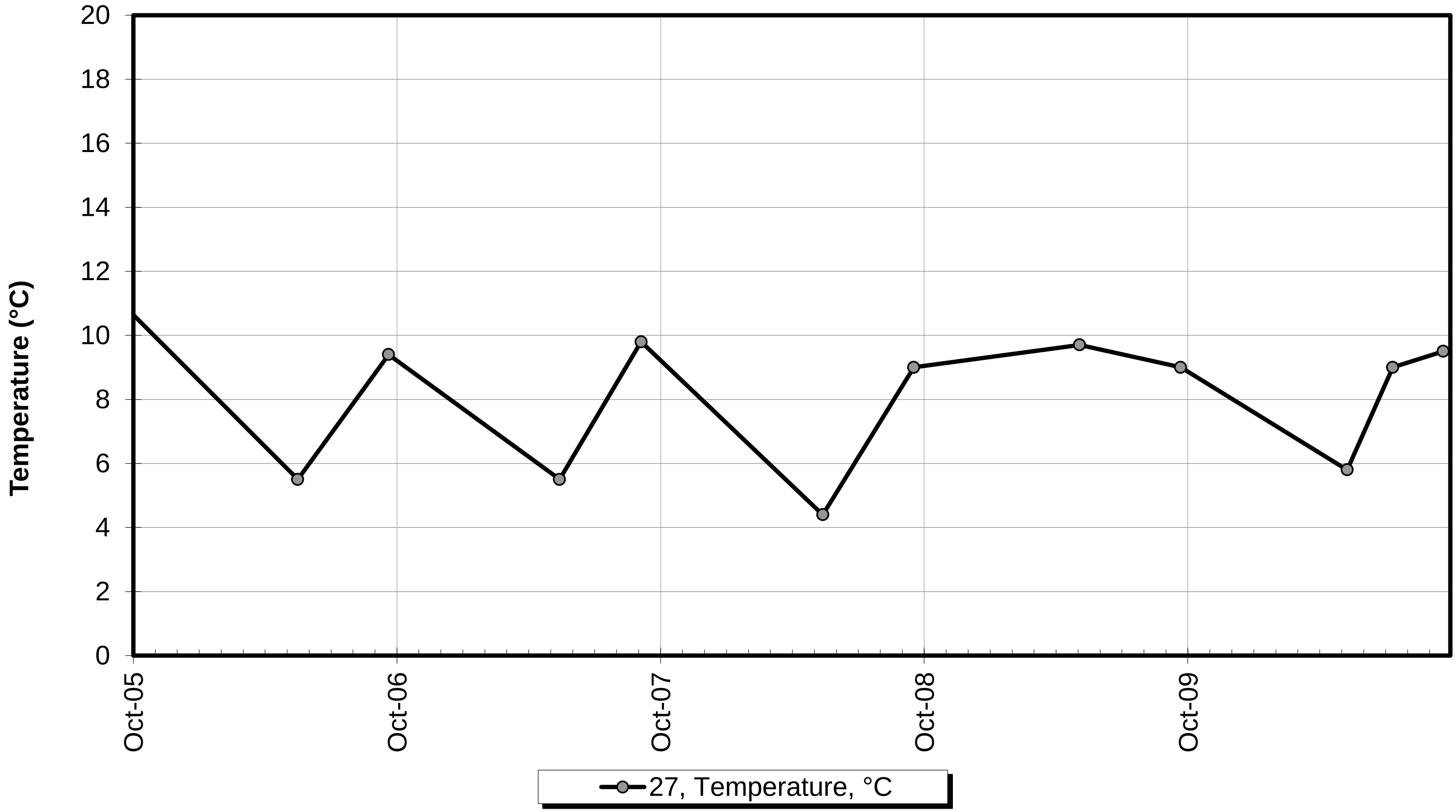
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

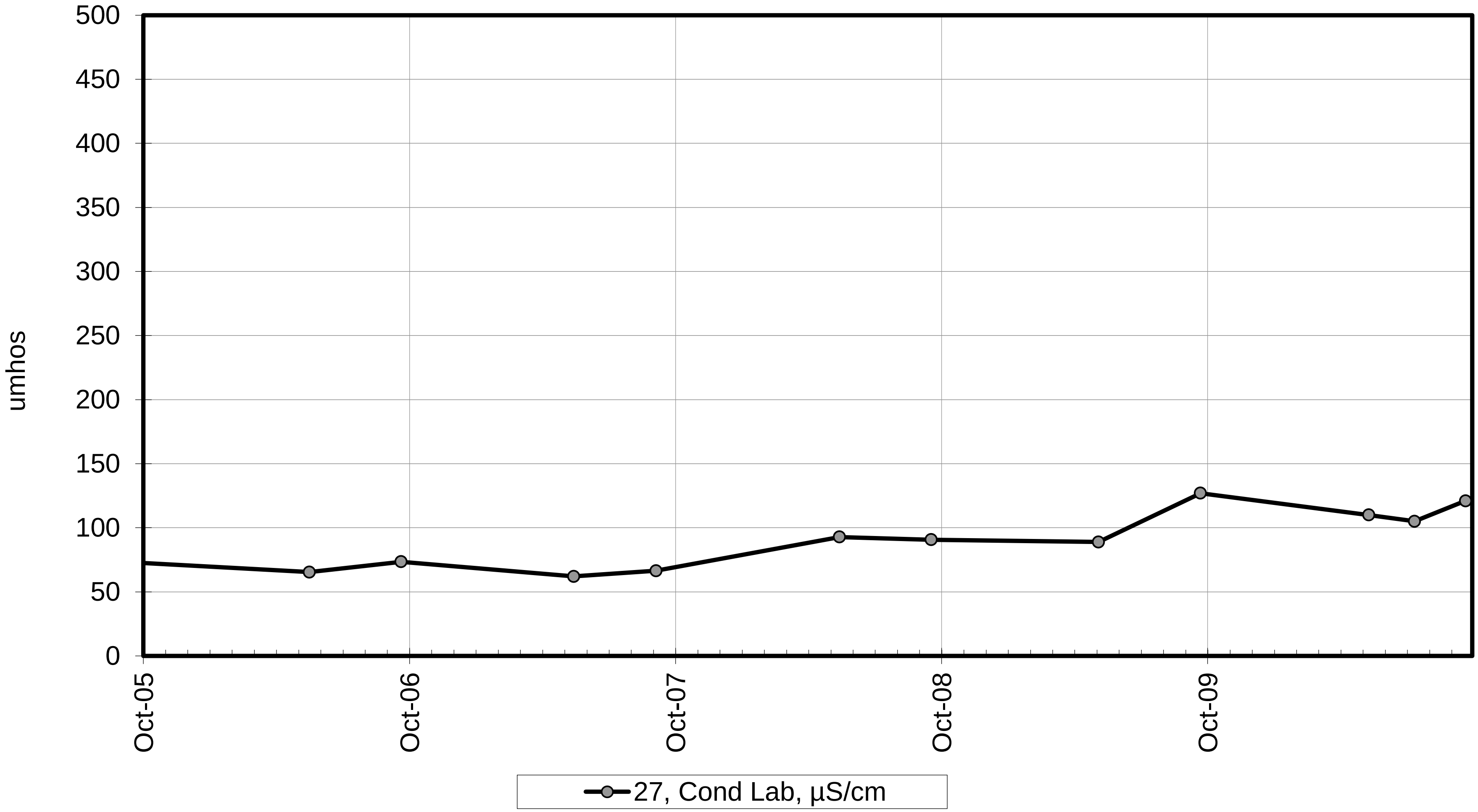
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
27	5/11/2010	1:05 PM				
			Cd diss, µg/l	0.00762	J	Below Quantitative Range
			Hg diss, µg/l	0.000587	U	Field Blank Contamination
			SO4 Tot, mg/l	18	J	Sample Temperature
27	7/13/2010	12:27 PM				
			Cd diss, µg/l	0.0095	J	Below Quantitative Range
			Hg diss, µg/l	0.00113	U	Field Blank Contamination
			SO4 Tot, mg/l	10	J	Sample Reciept Temperature
27	9/21/2010	11:41 AM				
			SO4 Tot, mg/l	13.7	J	Sample Receipt Temperature

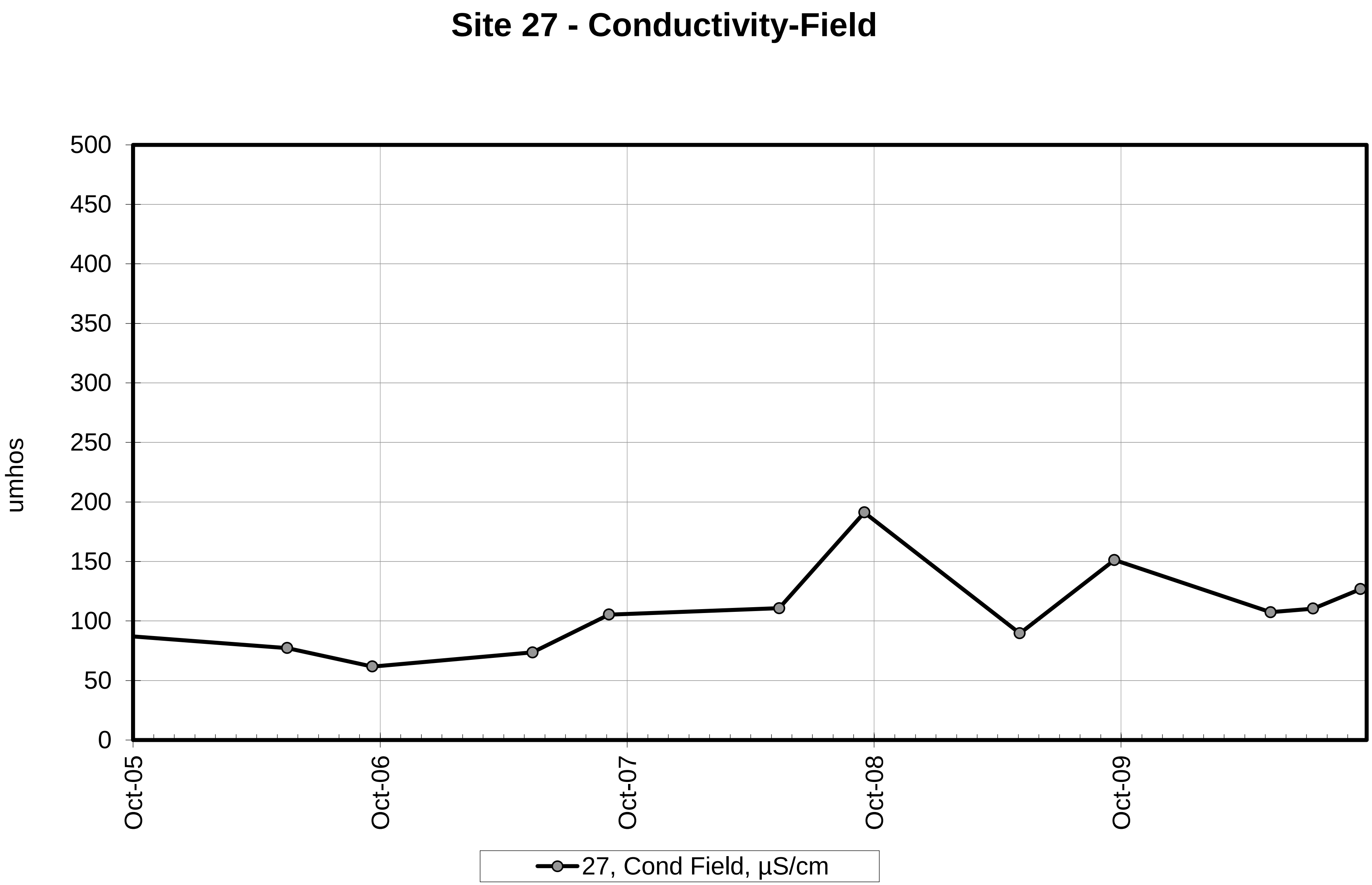
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

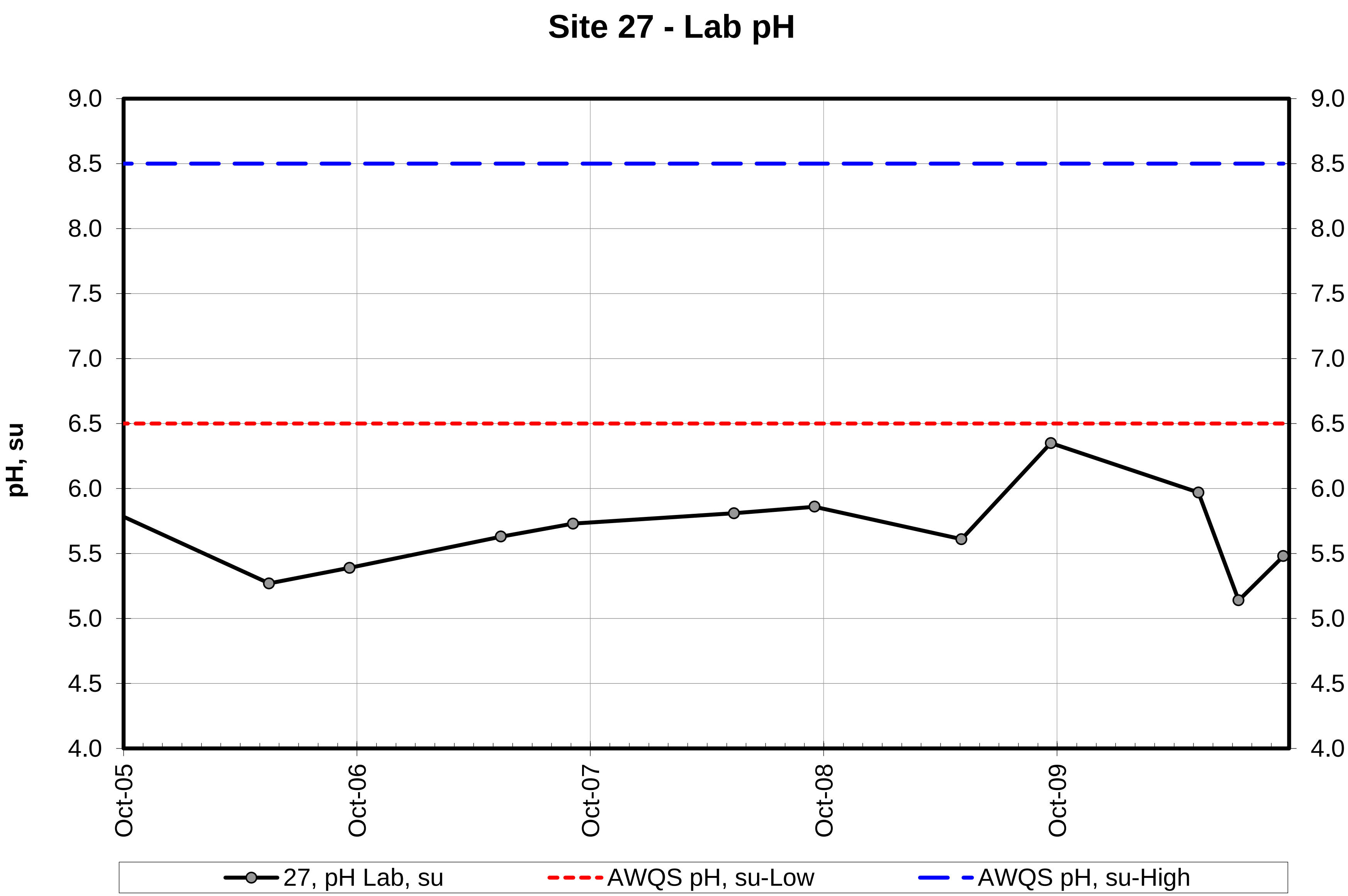
Site 27 -Water Temperature



Site 27 - Conductivity-Lab

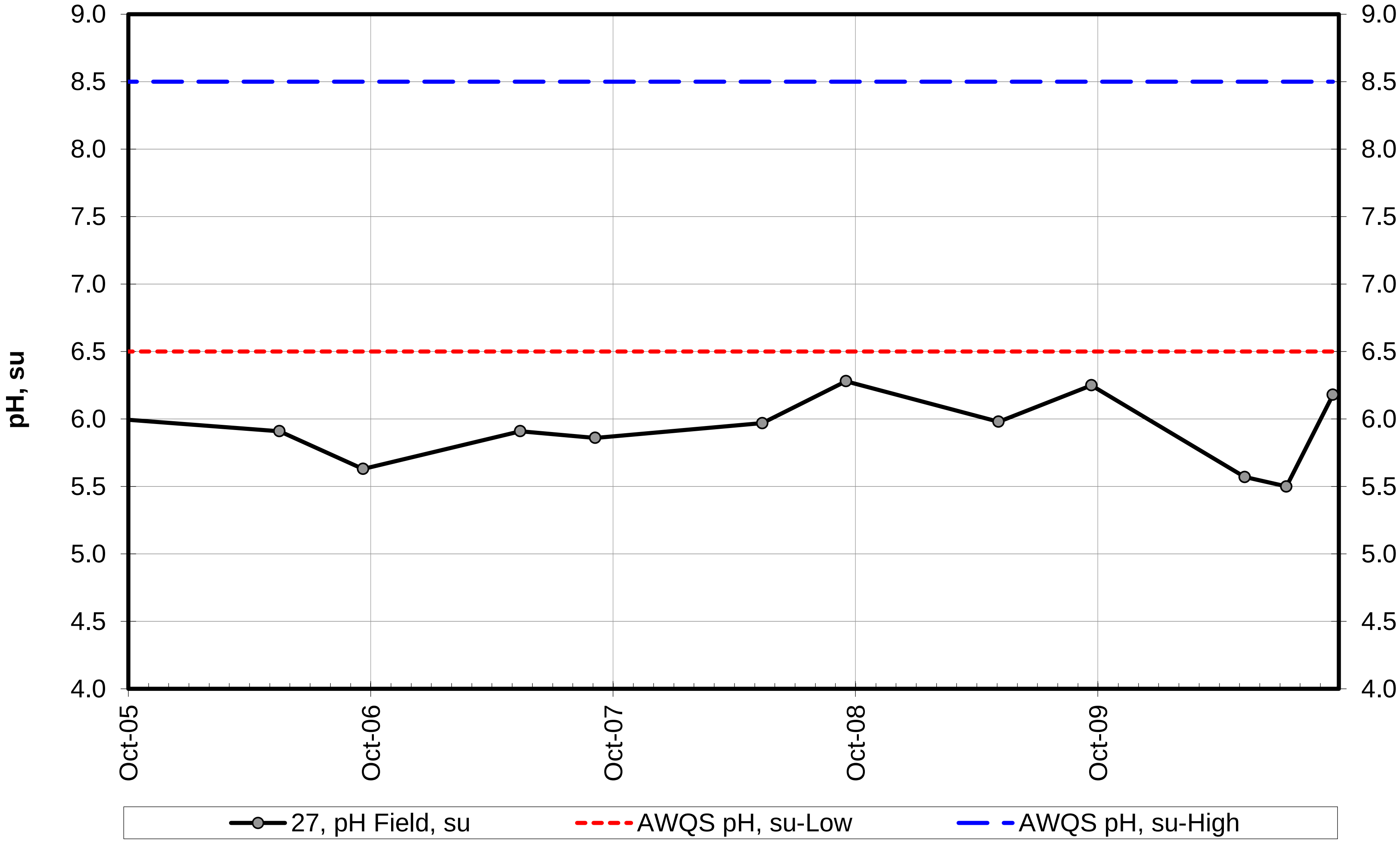


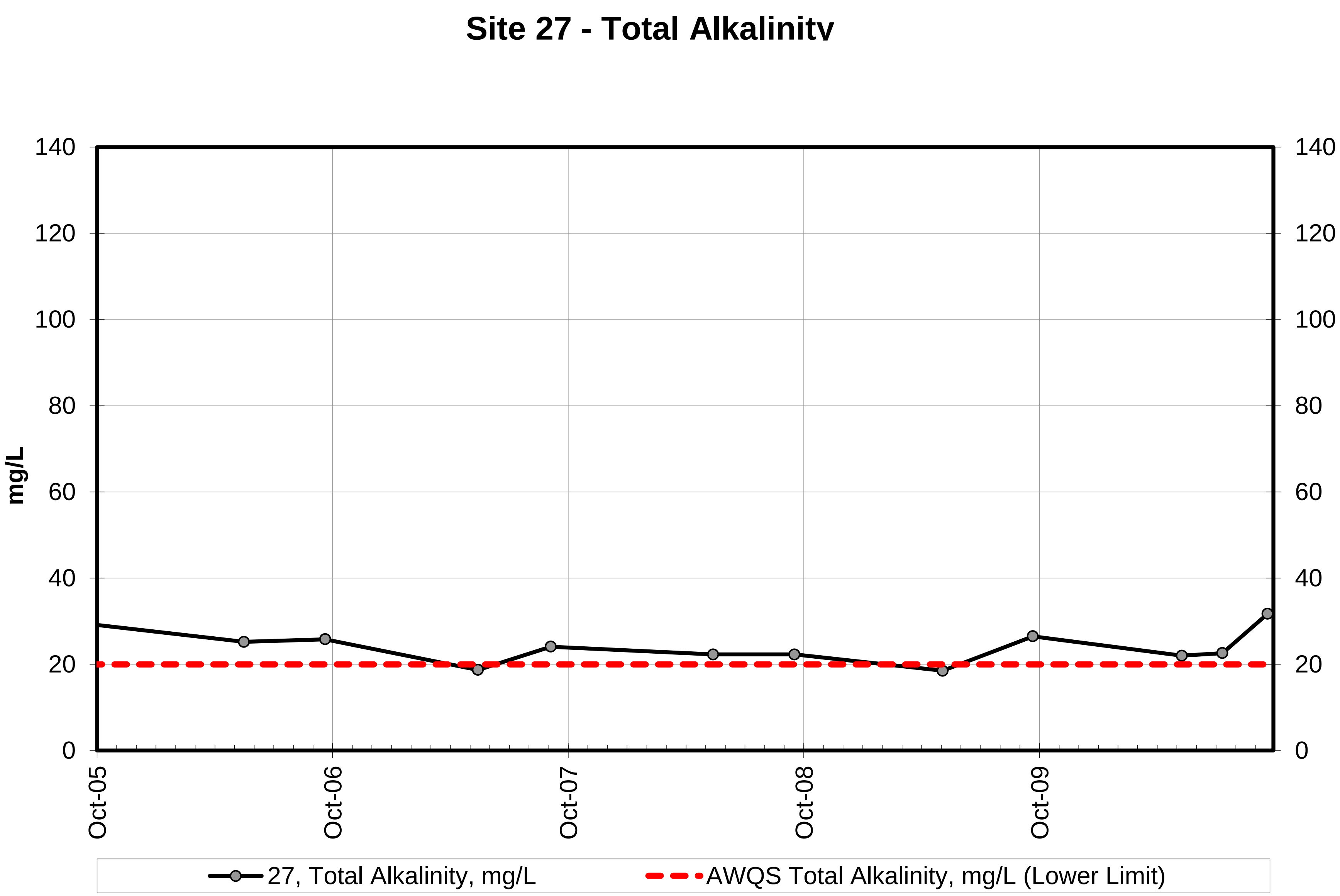

Site 27 - Conductivity-Field
umhos
500
450
400
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Cond Field, µS/cm

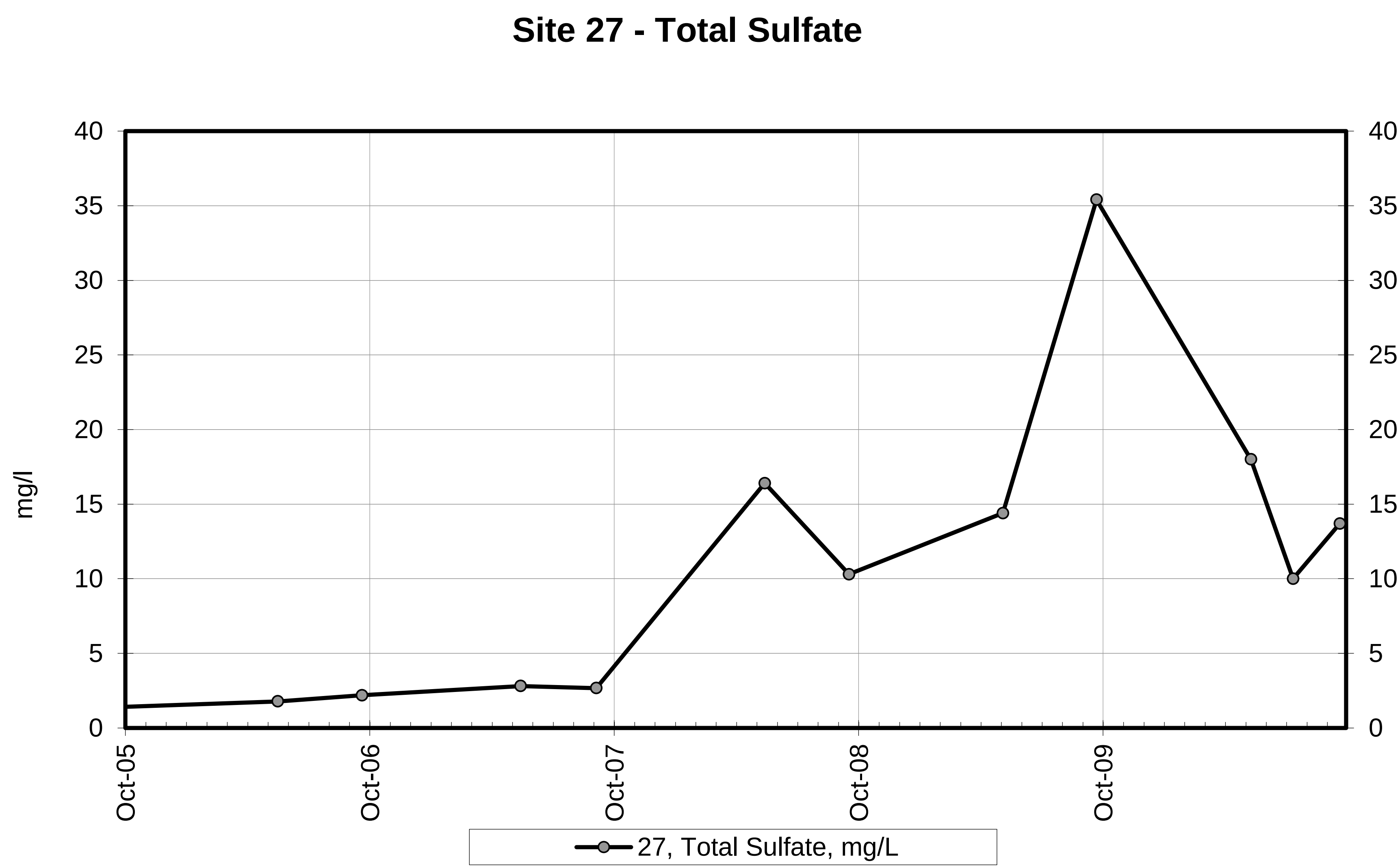


Site 27 - Lab pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

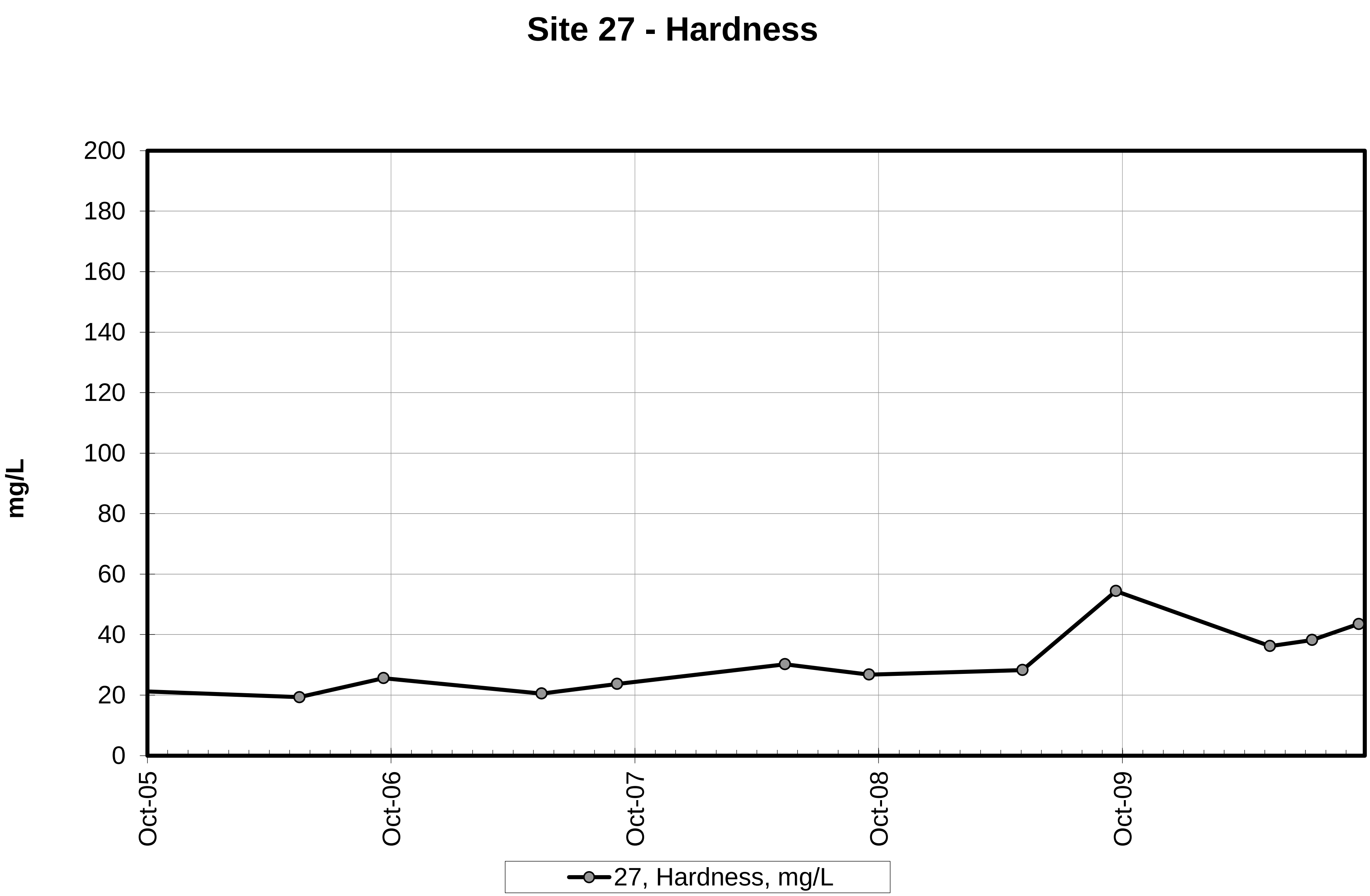
Site 27 - Field pH

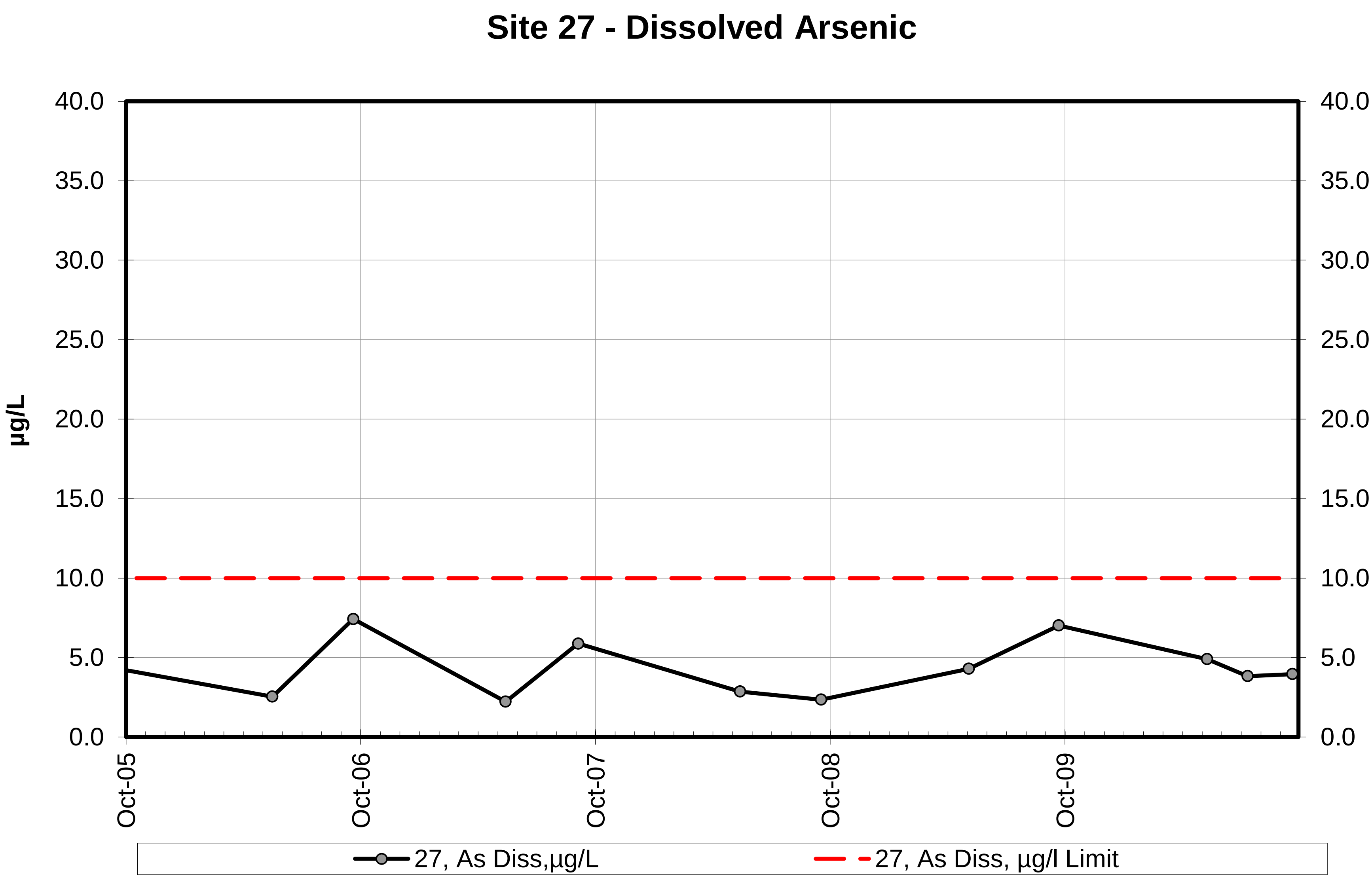



Site 27 - Total Alkalinity
mg/L
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

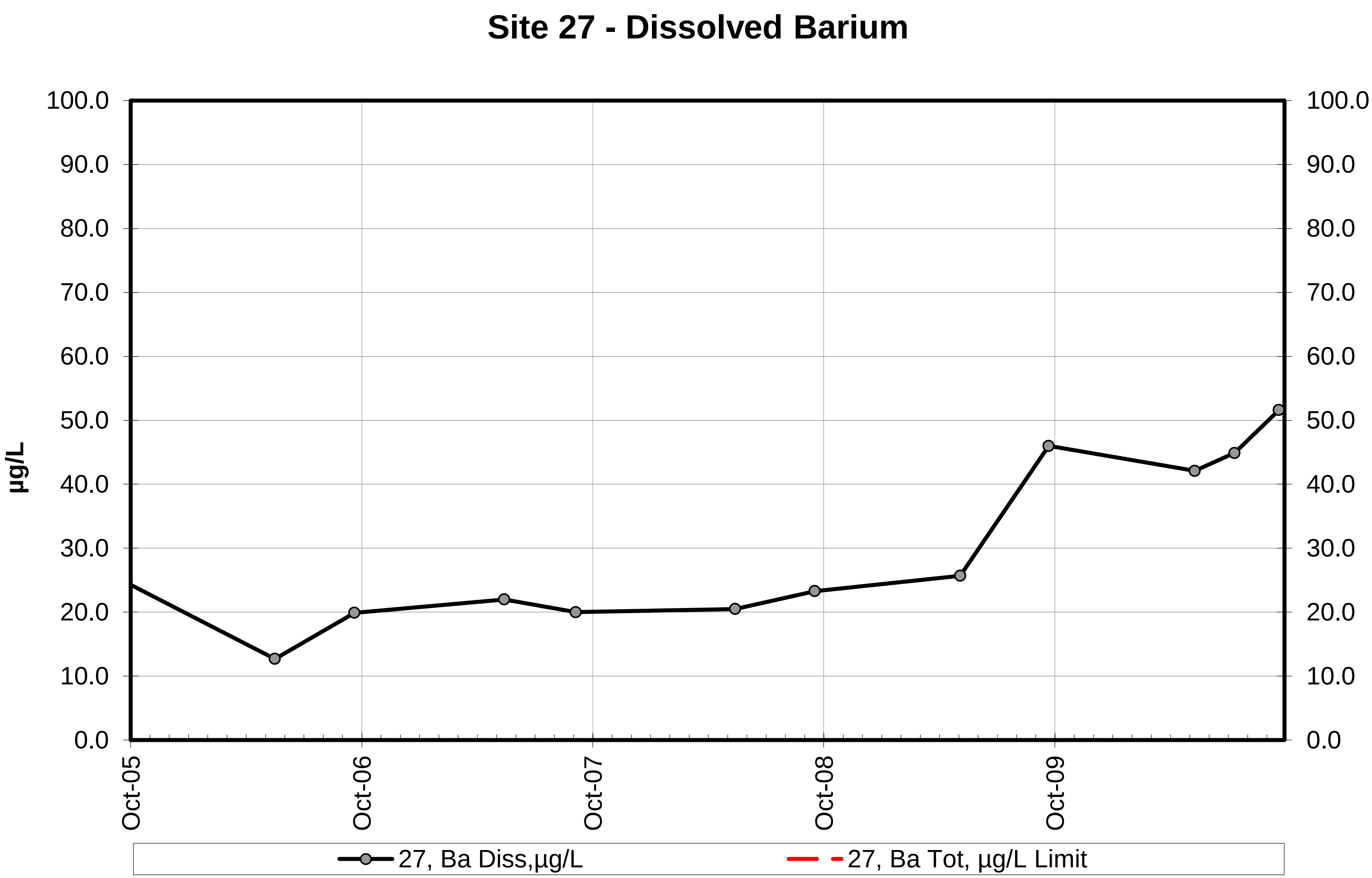


Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

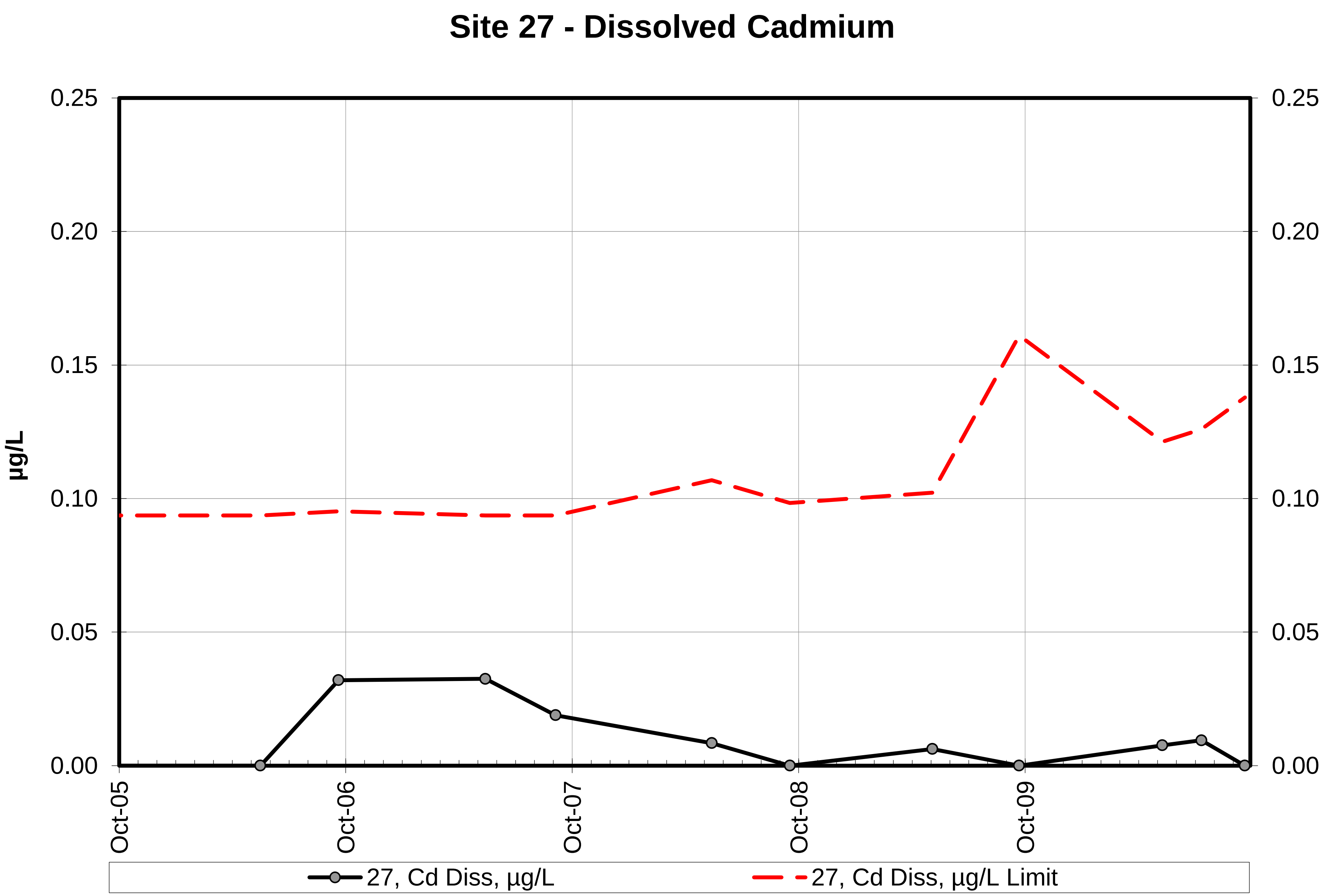

Site 27 - Hardness
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Hardness, mg/L



Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

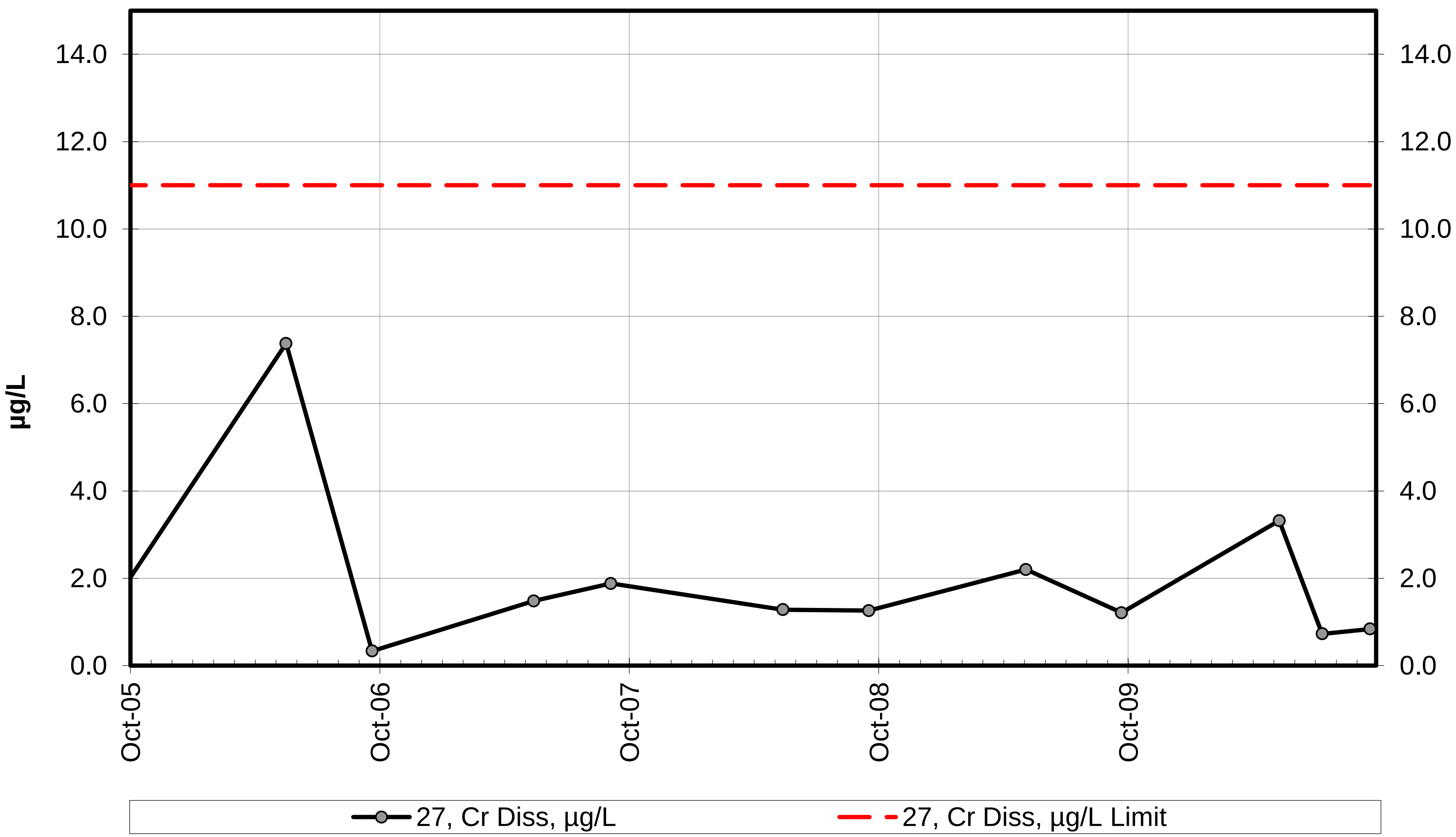


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

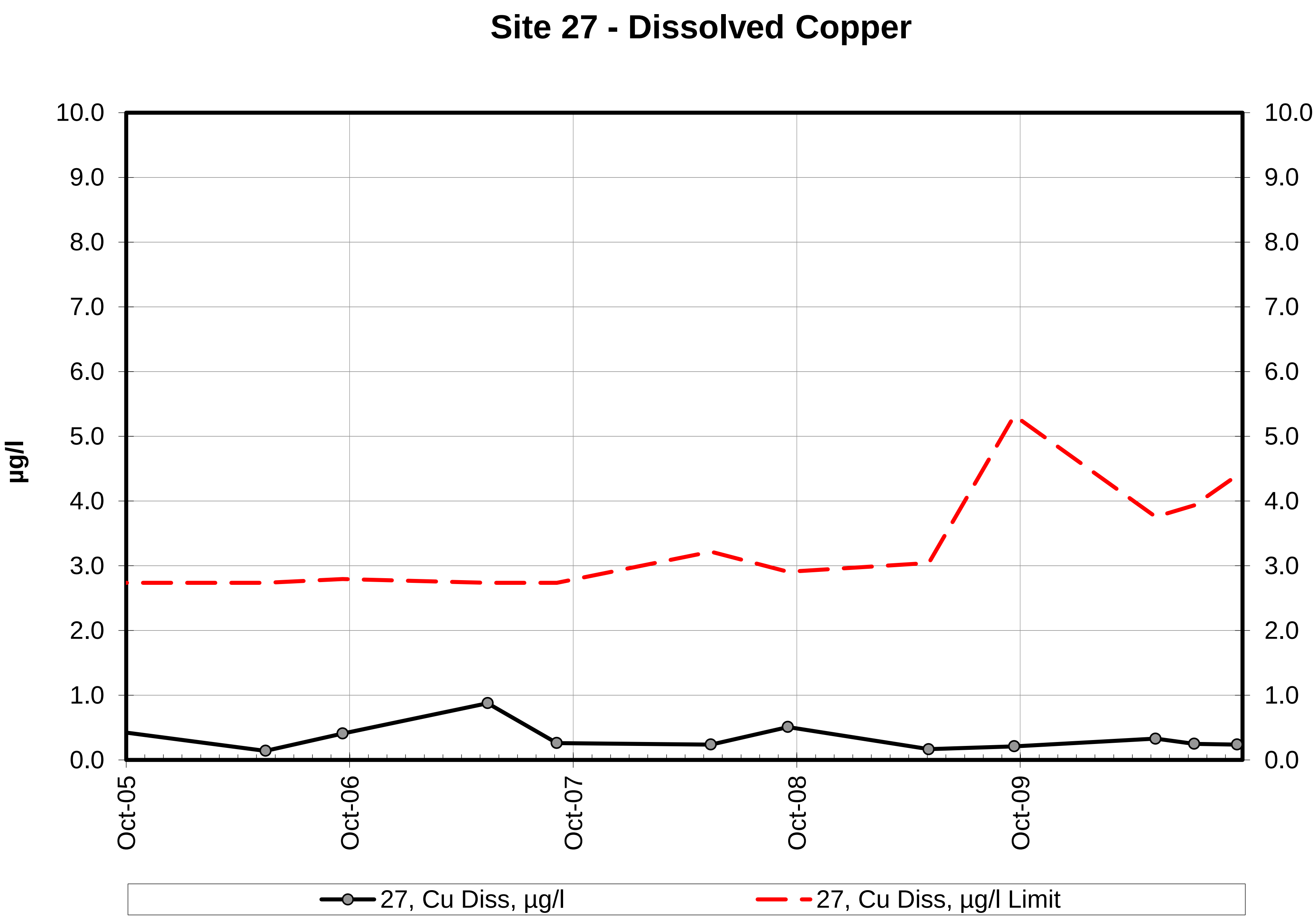


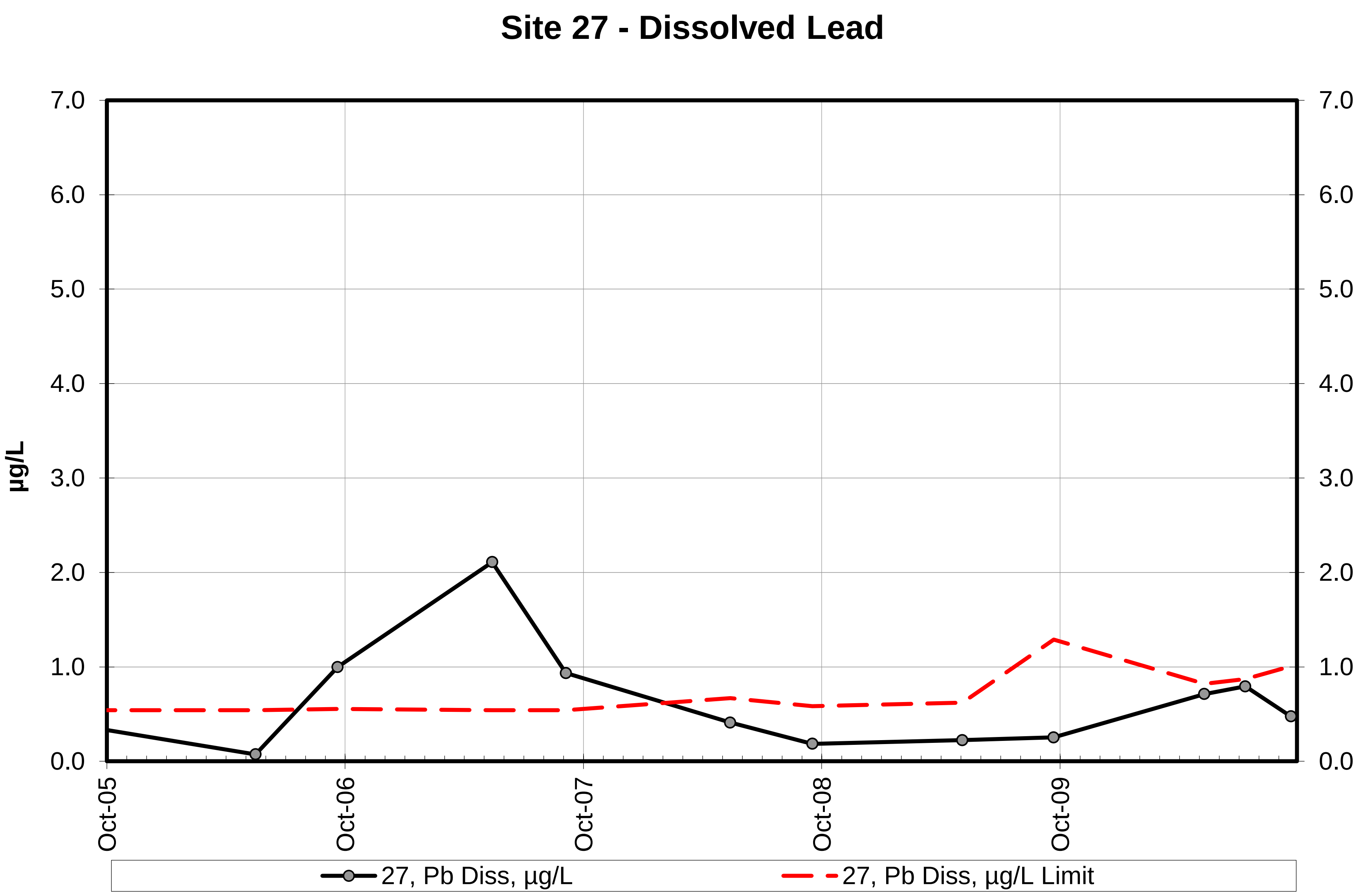
Site 27 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Cd Diss, µg/L
27, Cd Diss, µg/L Limit

Site 27 - Dissolved Chromium



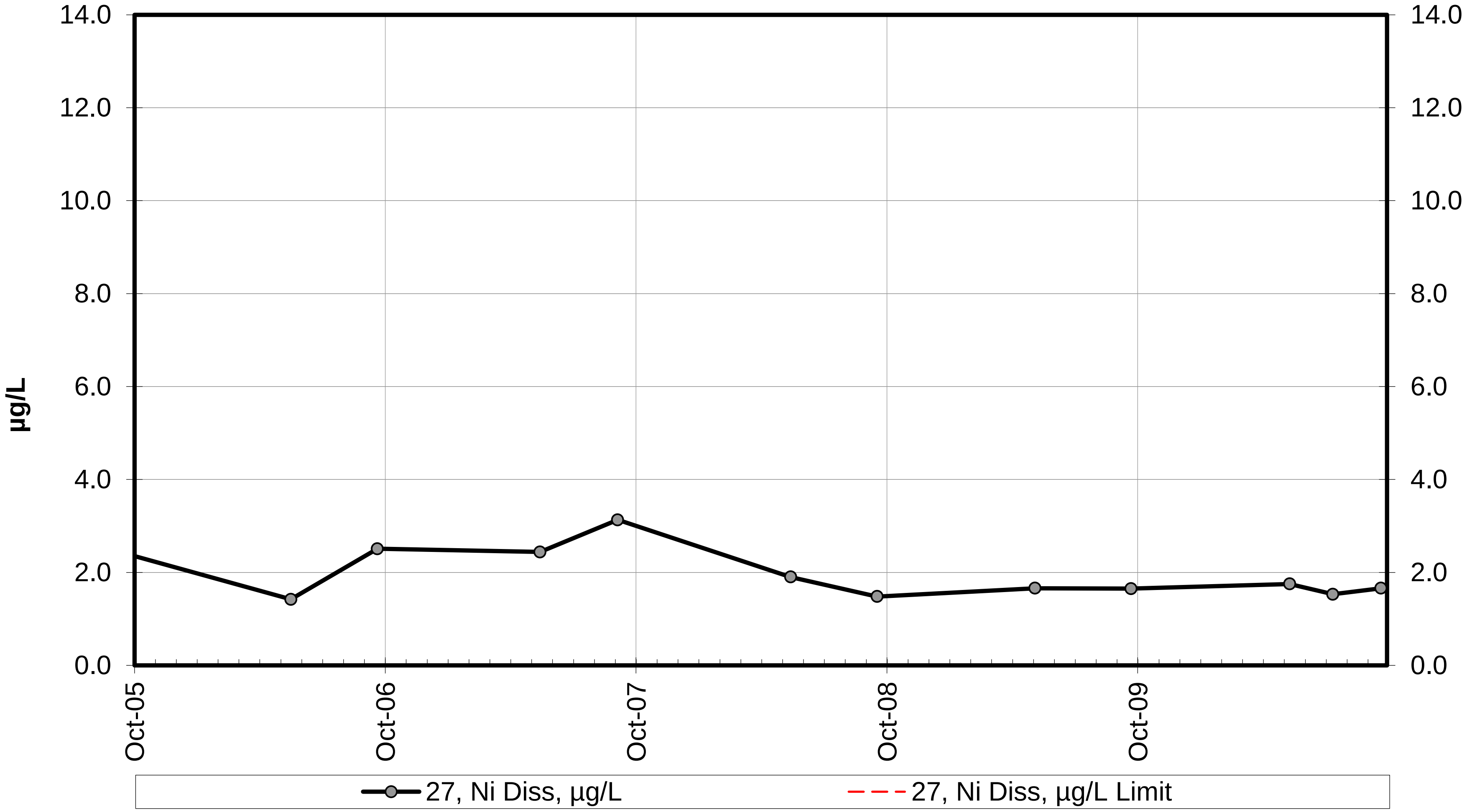
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination


Site 27 - Dissolved Copper
µg/l
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Cu Diss, µg/l
27, Cu Diss, µg/l Limit

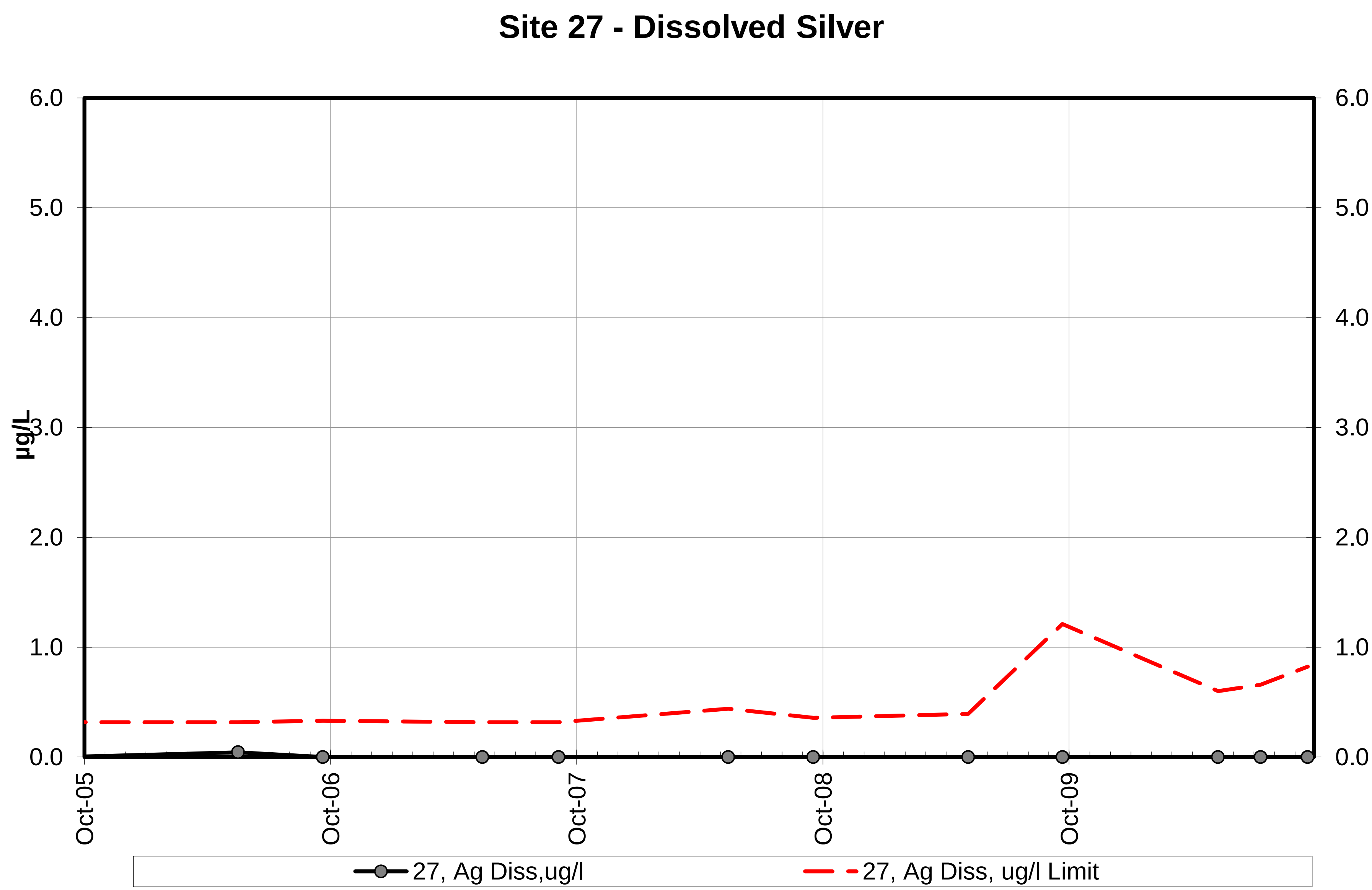


Site 27 - Dissolved Lead
µg/L
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Pb Diss, µg/L
27, Pb Diss, µg/L Limit

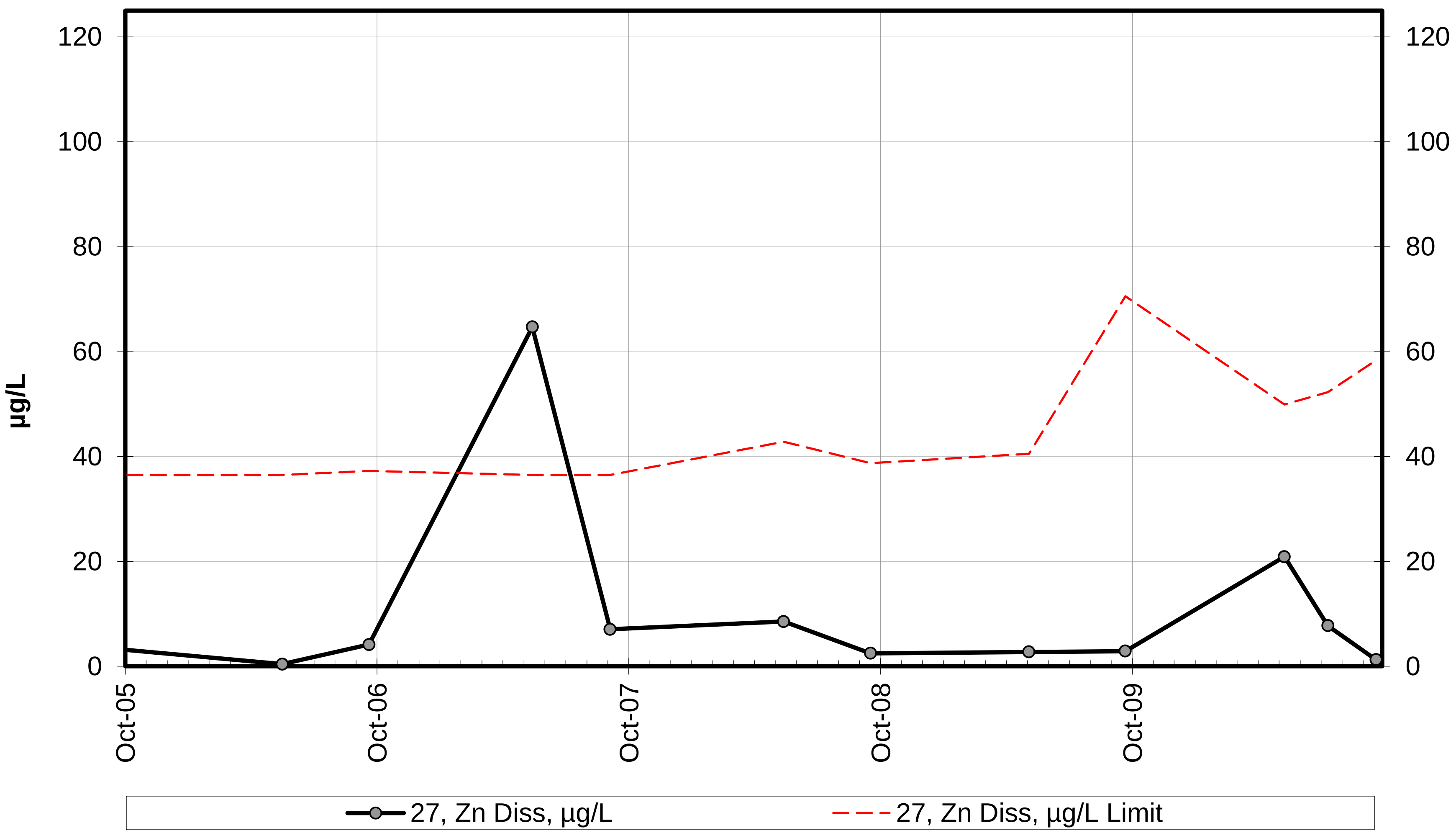
Site 27 - Dissolved Nickel



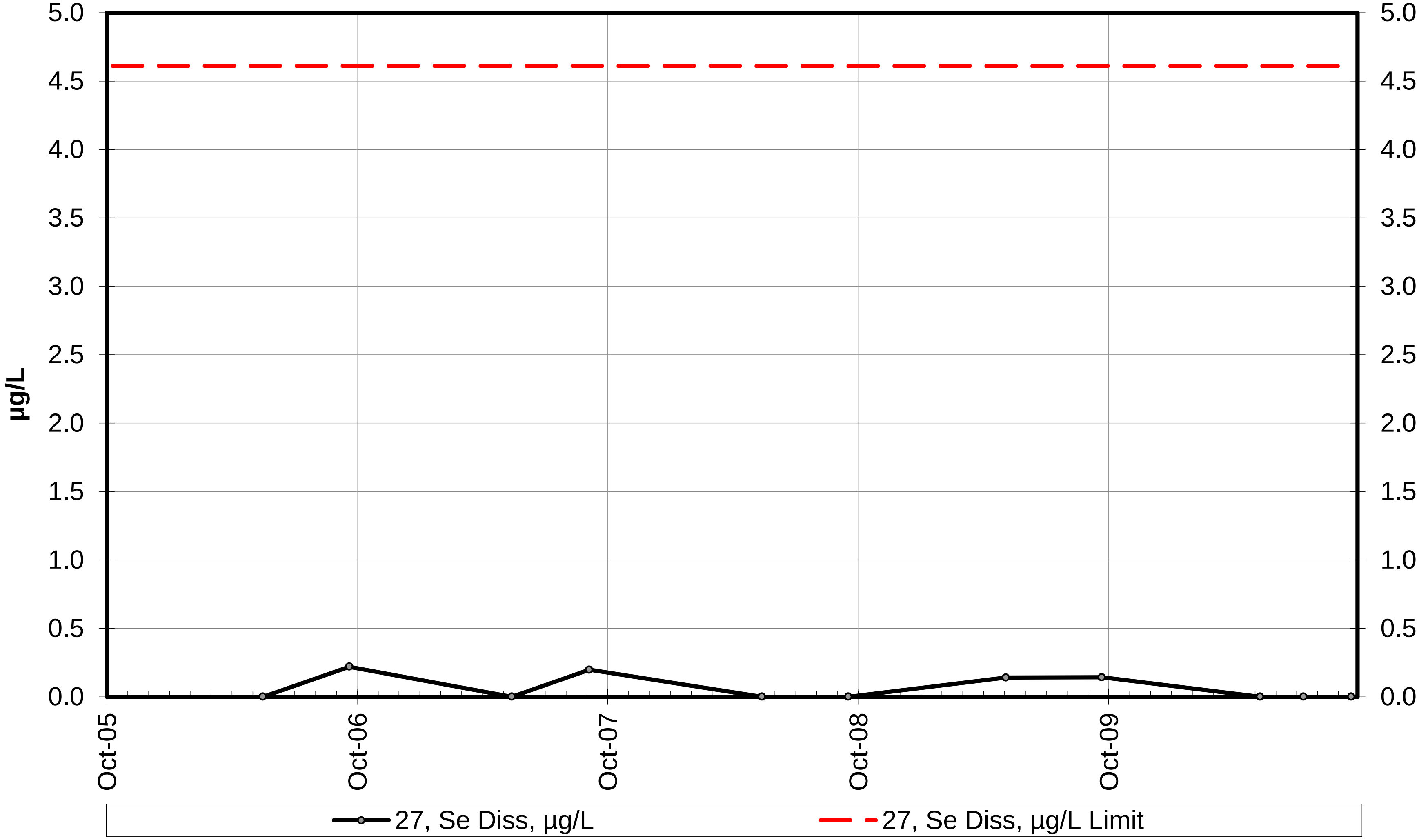
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

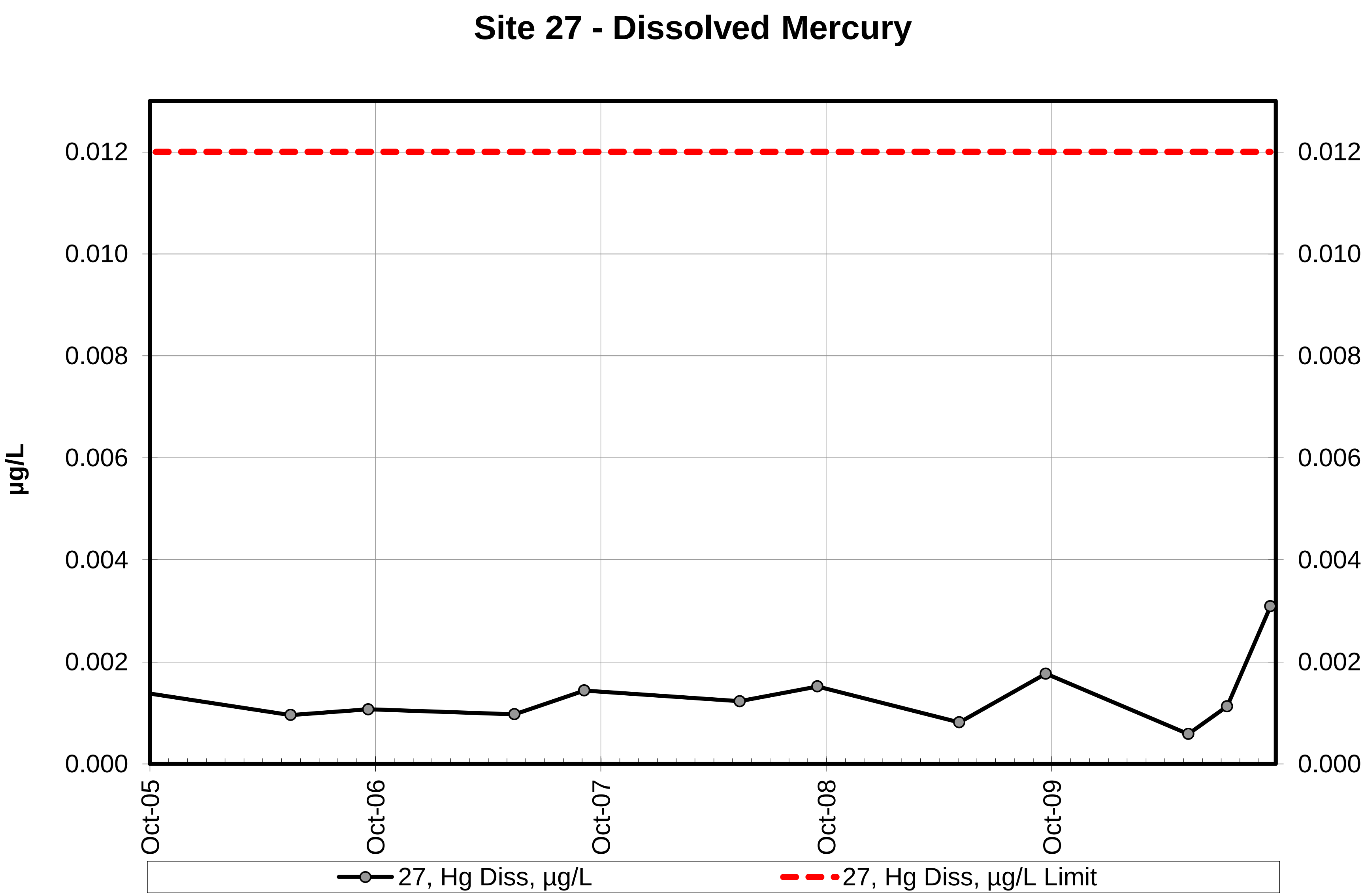

Site 27 - Dissolved Silver
µg/L
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Ag Diss,ug/l
27, Ag Diss, ug/l Limit

Site 27 - Dissolved Zinc



Site 27 - Dissolved Selenium





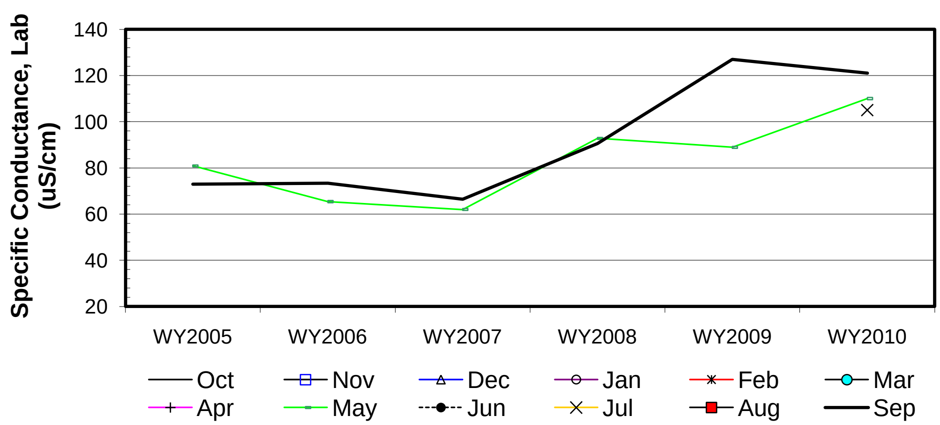
Site 27 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
27, Hg Diss, µg/L
27, Hg Diss, µg/L Limit

Site **#27** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								80.9				73
b	**WY2006**								65.4				73.4
c	**WY2007**								62				66.4
d	**WY2008**								92.8				90.6
e	**WY2009**								88.9				127
f	**WY2010**								110		105		121
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				1
	c-a								-1				-1
	d-a								1				1
	e-a								1				1
	f-a								1				1
	c-b								-1				-1
	d-b								1				1
	e-b								1				1
	f-b								1				1
	d-c								1				1
	e-c								1				1
	f-c								1				1
	e-d								-1				1
	f-d								1				1
	f-e								1				-1
	S_k	0	0	0	0	0	0	0	7	0	0	0	9
	σ^2_S=								28.33				28.33
	$Z_k = S_k/\sigma_S$								1.32				1.69
	Z^2_k								1.73				2.86

ΣZ_k=	3.01	Tie Extent	t_1	t_2	t_3	t_4	t_5	Σn	13
ΣZ^2_k=	4.59	Count	60	0	0	0	0	ΣS_k	16
Z-bar=ΣZ_k/K=	1.50								

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.07	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.790**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	1.99	@α/2=2.5% Z= 1.96	H_0 (No trend)	REJECT
56.67	p	**0.977**		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.38		17.41
0.050	1.69	**9.10**	13.99
0.100	4.29		13.49
0.200	5.86		12.16
		10.2%	

Site **#27** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								5.7				5.8
b	**WY2006**								5.3				5.4
c	**WY2007**								5.6				5.7
d	**WY2008**								5.8				5.9
e	**WY2009**								5.6				6.4
f	**WY2010**								6.0		5.1		5.5
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				-1
d-a								1				1
e-a								-1				1
f-a								1				-1
c-b								1				1
d-b								1				1
e-b								1				1
f-b								1				1
d-c								1				1
e-c								-1				1
f-c								1				-1
e-d								-1				1
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	5	0	0	0	3

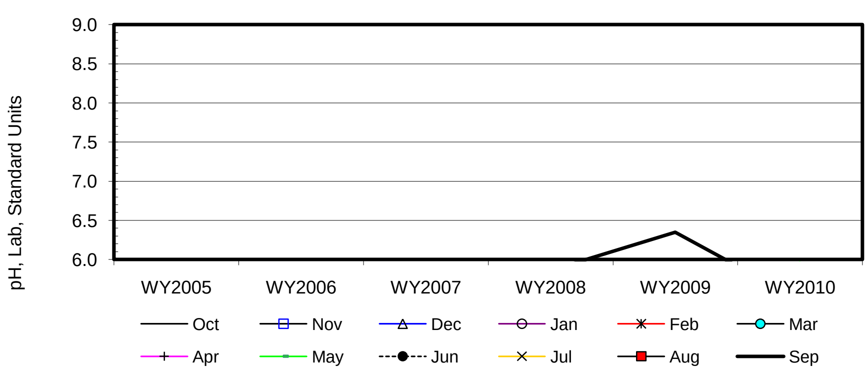
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								0.94				0.56
Z^2_k								0.88				0.32

ΣZ_k= 1.50
ΣZ^2_k= 1.20
Z-bar=ΣZ_k/K= 0.75

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13
ΣS_k 8

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	0.07	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.790**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.93	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
56.67	**p** **0.824**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.08		0.26
0.050	-0.05	**0.06**	0.18
0.100	-0.03		0.13
0.200	0.01		0.12

Site **#27** Seasonal Kendall analysis for Total Alk, (mg/l)

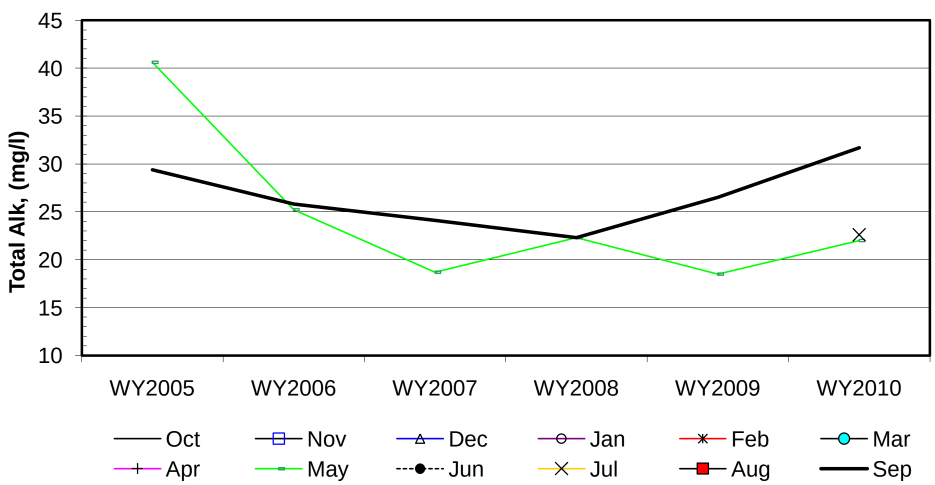
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								40.6				29.4
b	**WY2006**								25.2				25.8
c	**WY2007**								18.7				24.1
d	**WY2008**								22.3				22.3
e	**WY2009**								18.5				26.5
f	**WY2010**								22.0		22.6		31.7
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				-1
	c-a								-1				-1
	d-a								-1				-1
	e-a								-1				-1
	f-a								-1				1
	c-b								-1				-1
	d-b								-1				-1
	e-b								-1				1
	f-b								-1				1
	d-c								1				-1
	e-c								-1				1
	f-c								1				1
	e-d								-1				1
	f-d								-1				1
	f-e								1				1
	S_k	0	0	0	0	0	0	0	-9	0	0	0	1
σ^2_S=									28.33				28.33
$Z_k = S_k/\sigma_S$									-1.69				0.19
Z^2_k									2.86				0.04

ΣZ_k=	-1.50
ΣZ^2_k=	2.89
Z-bar=ΣZ_k/K=	-0.75

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-8

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		1.76	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity	
	p	**0.184**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-0.93	@α/2=2.5% Z=	1.96	H_0 (No trend)	ACCEPT
56.67	**p**	**0.176**			H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.78		1.41
0.050	-2.83	**-1.13**	0.58
0.100	-2.34		0.17
0.200	-1.87		-0.14

Site **#27** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.8				1.4
b	**WY2006**								1.8				2.2
c	**WY2007**								2.8				2.7
d	**WY2008**								16.4				10.3
e	**WY2009**								14.4				35.4
f	**WY2010**								18.0		10.0		13.7
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				1
c-a								1				1
d-a								1				1
e-a								1				1
f-a								1				1
c-b								1				1
d-b								1				1
e-b								1				1
f-b								1				1
d-c								1				1
e-c								1				1
f-c								1				1
e-d								-1				1
f-d								1				1
f-e								1				-1
S_k	0	0	0	0	0	0	0	13	0	0	0	13

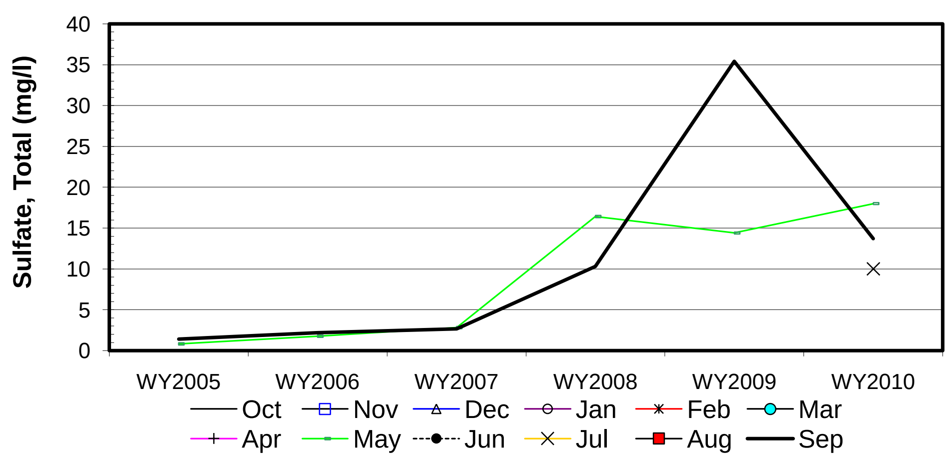
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								2.44				2.44
Z^2_k								5.96				5.96

ΣZ_k=	4.88
ΣZ^2_k=	11.93
Z-bar=ΣZ_k/K=	2.44

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	26

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=		0.00	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**1.000**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	3.32	@α=5% Z= 1.64	**H_0** (No trend)	REJECT
56.67	p	**1.000**		**H_A** ($\pm$ trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.84		6.94
0.050	1.02	**3.52**	5.09
0.100	1.83		4.18
0.200	2.81		4.06

35.2%

Site **#27** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	WY2005								0.5				3.3
b	WY2006								0.4				4.1
c	WY2007								64.7				7.1
d	WY2008								8.5				2.5
e	WY2009								2.7				2.9
f	WY2010								20.9		7.7		1.3
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								1				1
d-a								1				-1
e-a								1				-1
f-a								1				-1
c-b								1				1
d-b								1				-1
e-b								1				-1
f-b								1				-1
d-c								-1				-1
e-c								-1				-1
f-c								-1				-1
e-d								-1				1
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	5	0	0	0	-7

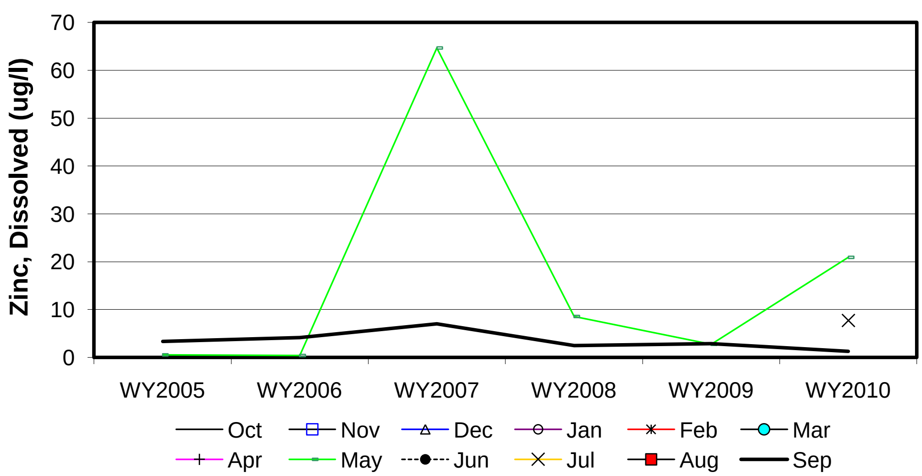
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								0.94				-1.32
Z^2_k								0.88				1.73

ΣZ_k= -0.38
ΣZ^2_k= 2.61
Z-bar=$\Sigma Z_k/K$= -0.19

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13
ΣS_k -2

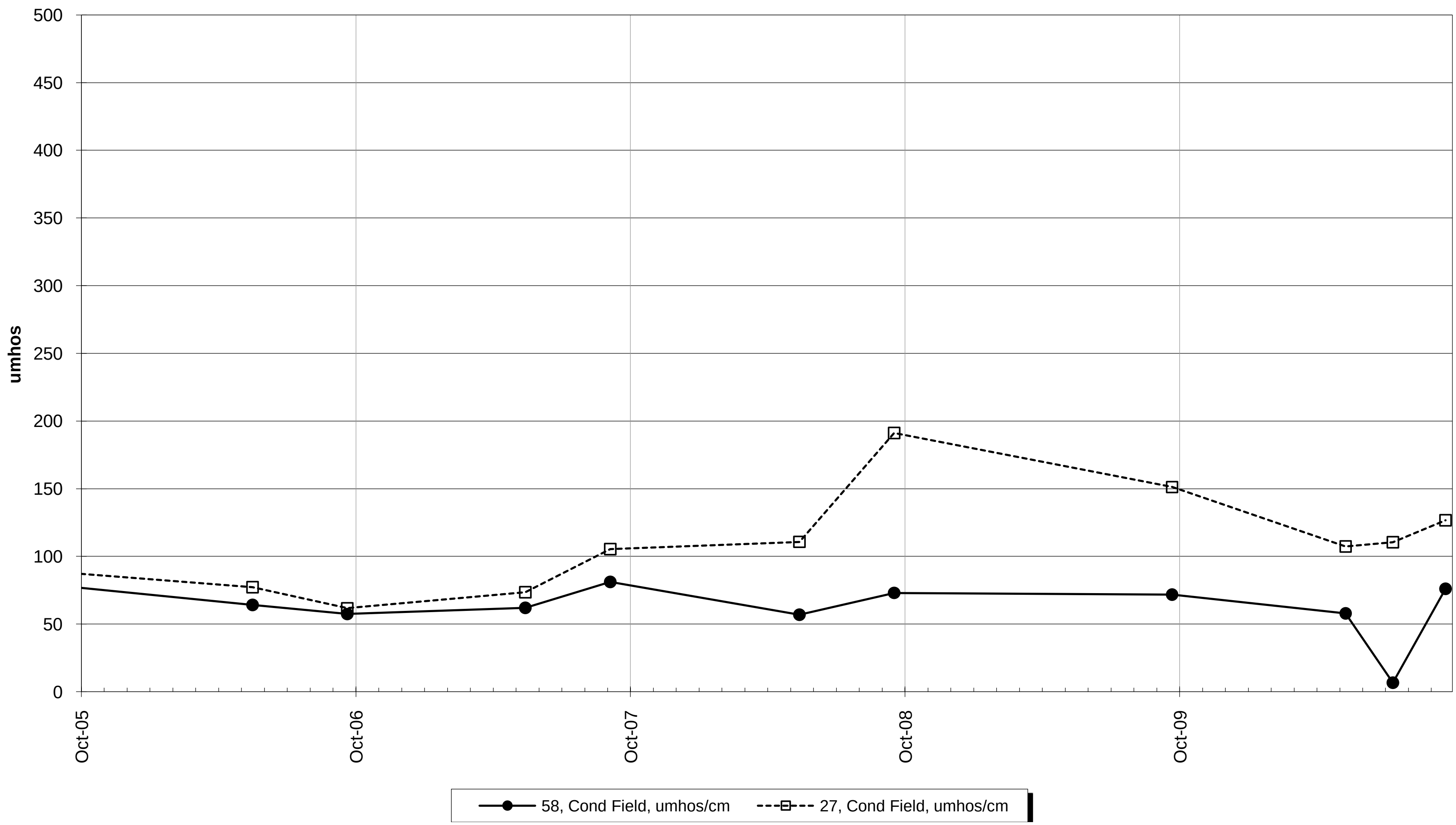
$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	2.54	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.111**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$ Z_{calc}	-0.13	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
56.67 **p**	**0.447**		H_A (± trend)	REJECT



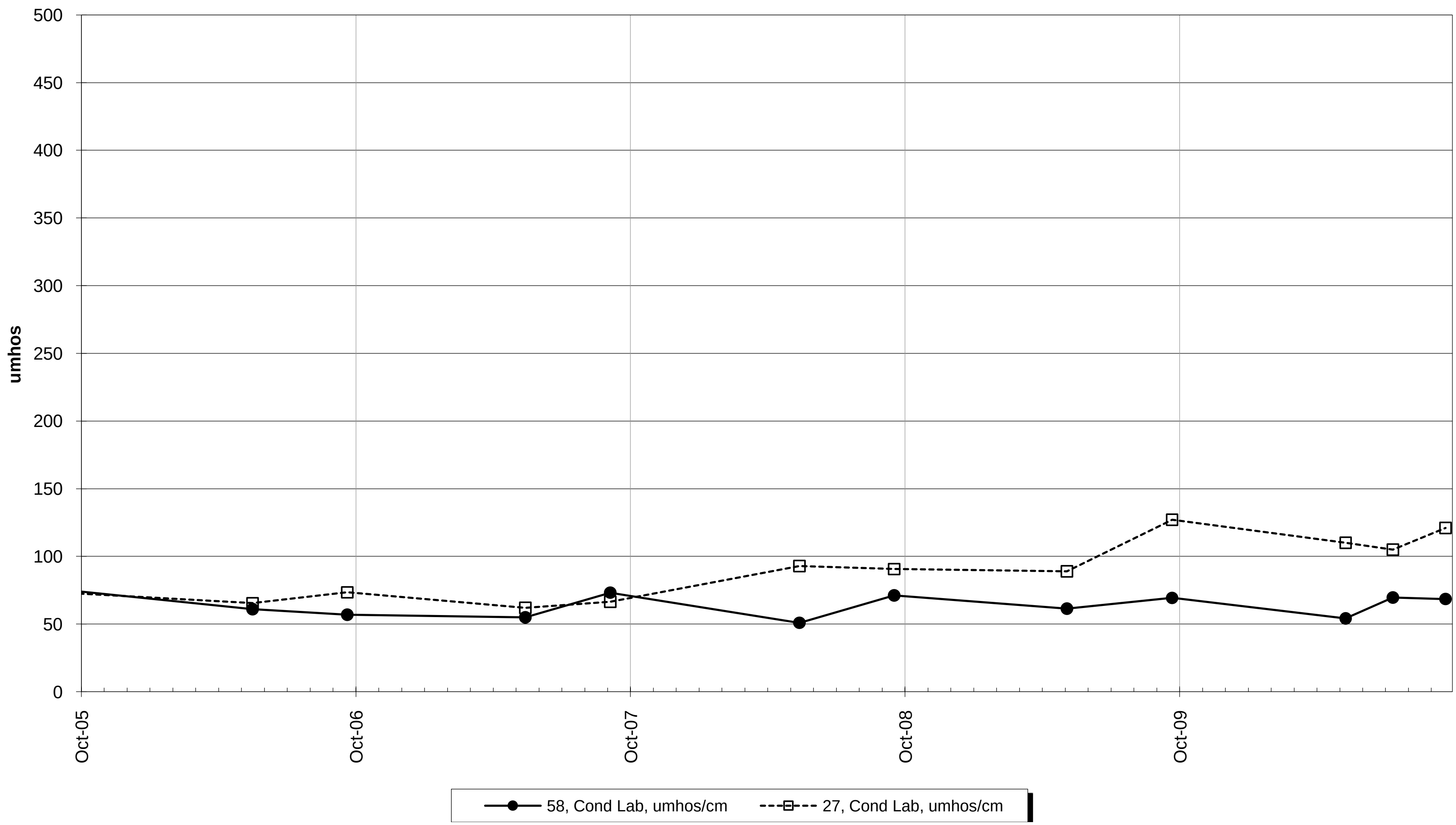
Seasonal-Kendall Slope Confidence Intervals

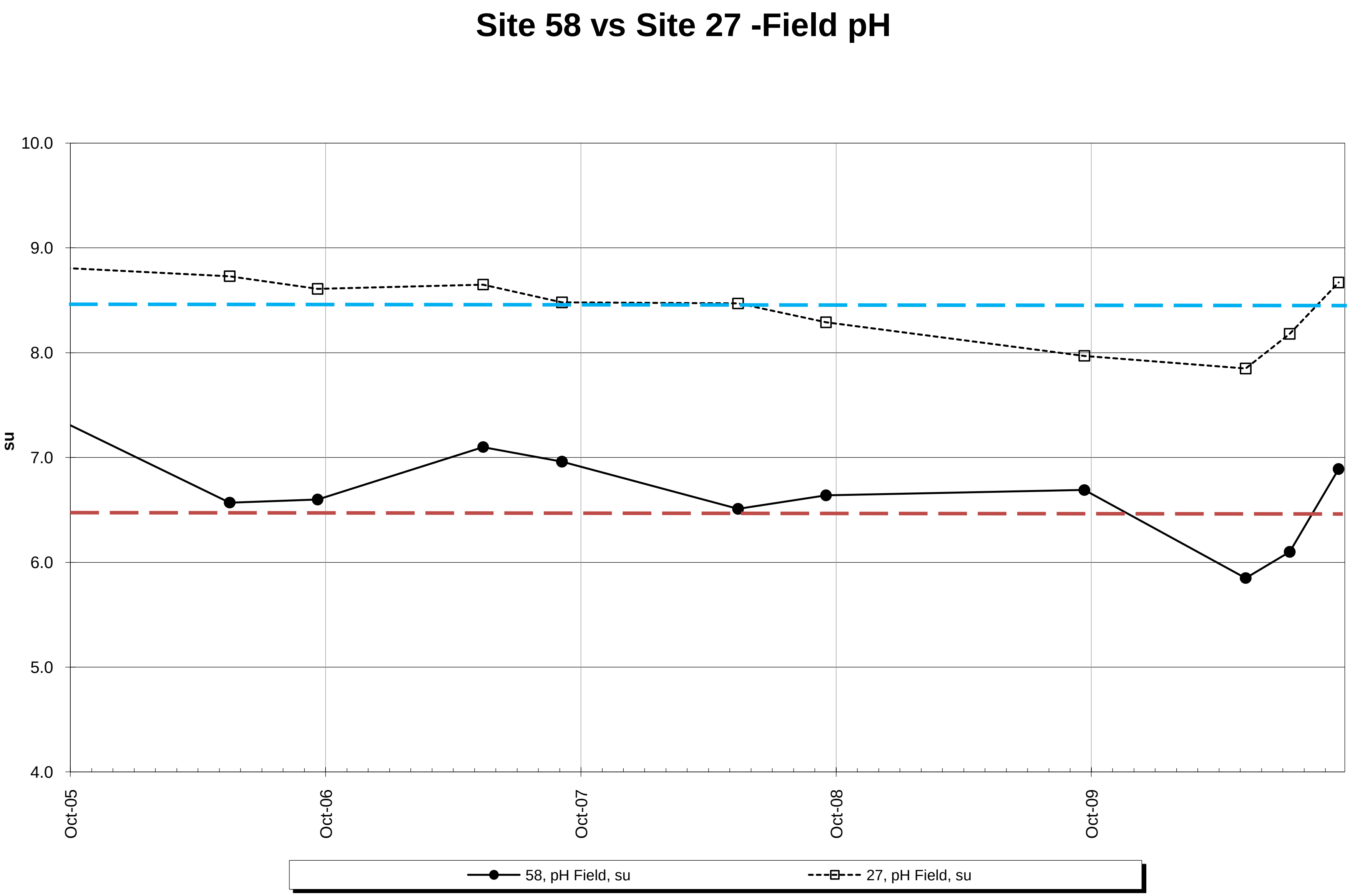
α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.04		3.77
0.050	-0.97	**-0.11**	2.02
0.100	-0.70		0.81
0.200	-0.45		0.59

Site 58 vs Site 27 -Conductivity-Field

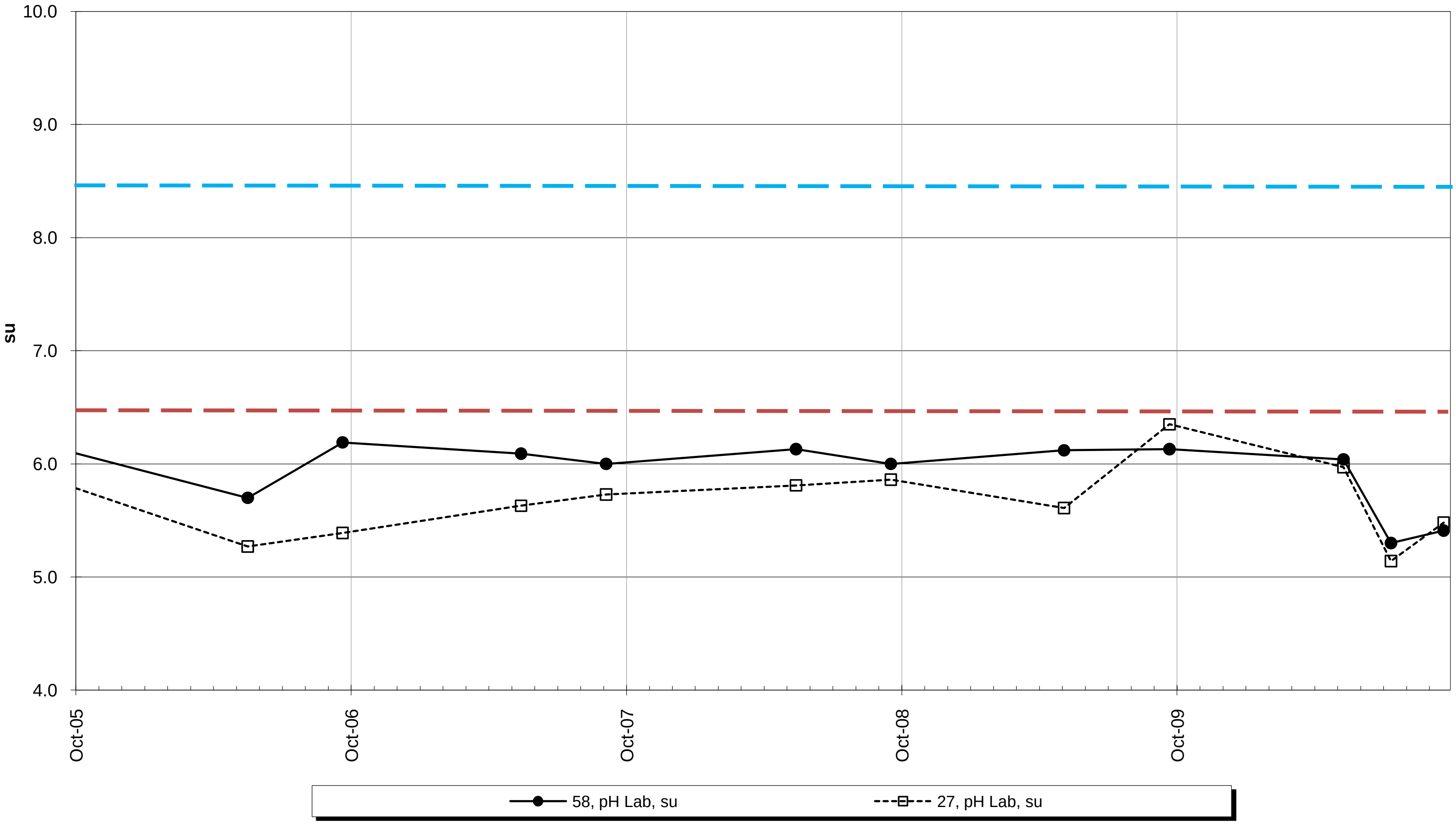


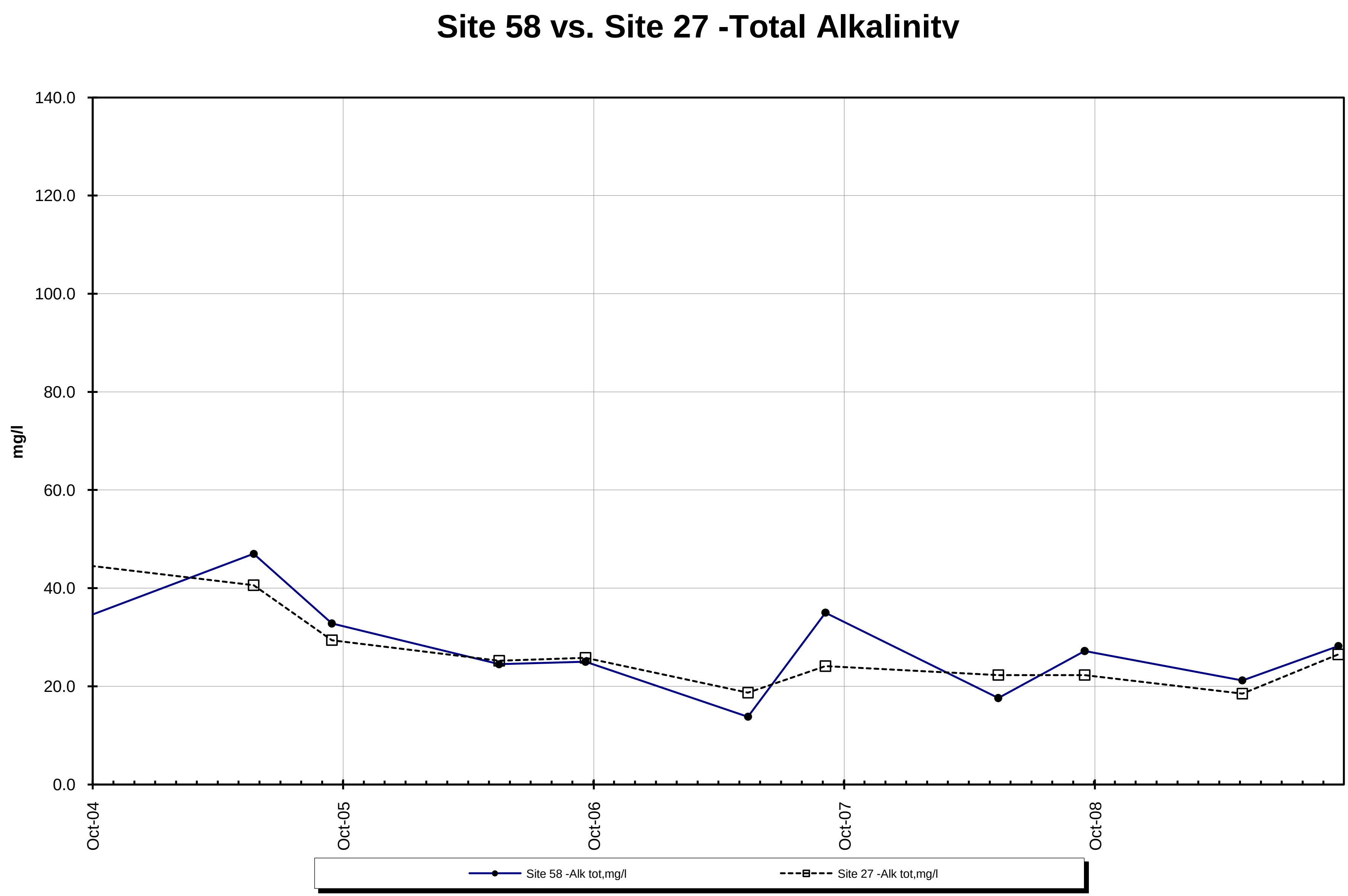
Site 58 vs Site 27 -Conductivity




Site 58 vs Site 27 -Field pH
su
10.0
9.0
8.0
7.0
6.0
5.0
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, pH Field, su
27, pH Field, su

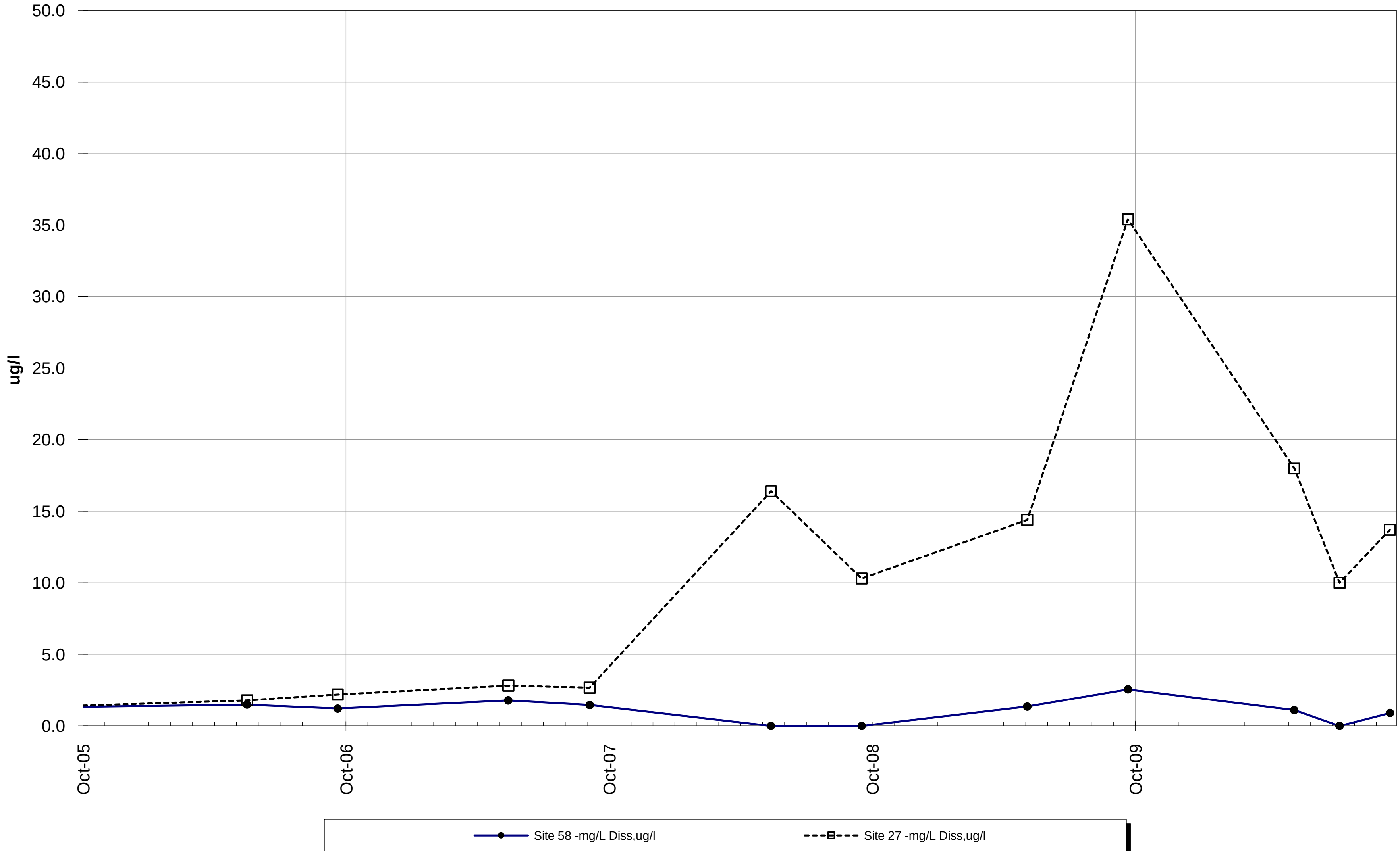
Site 58 vs Site 27 -Lab pH



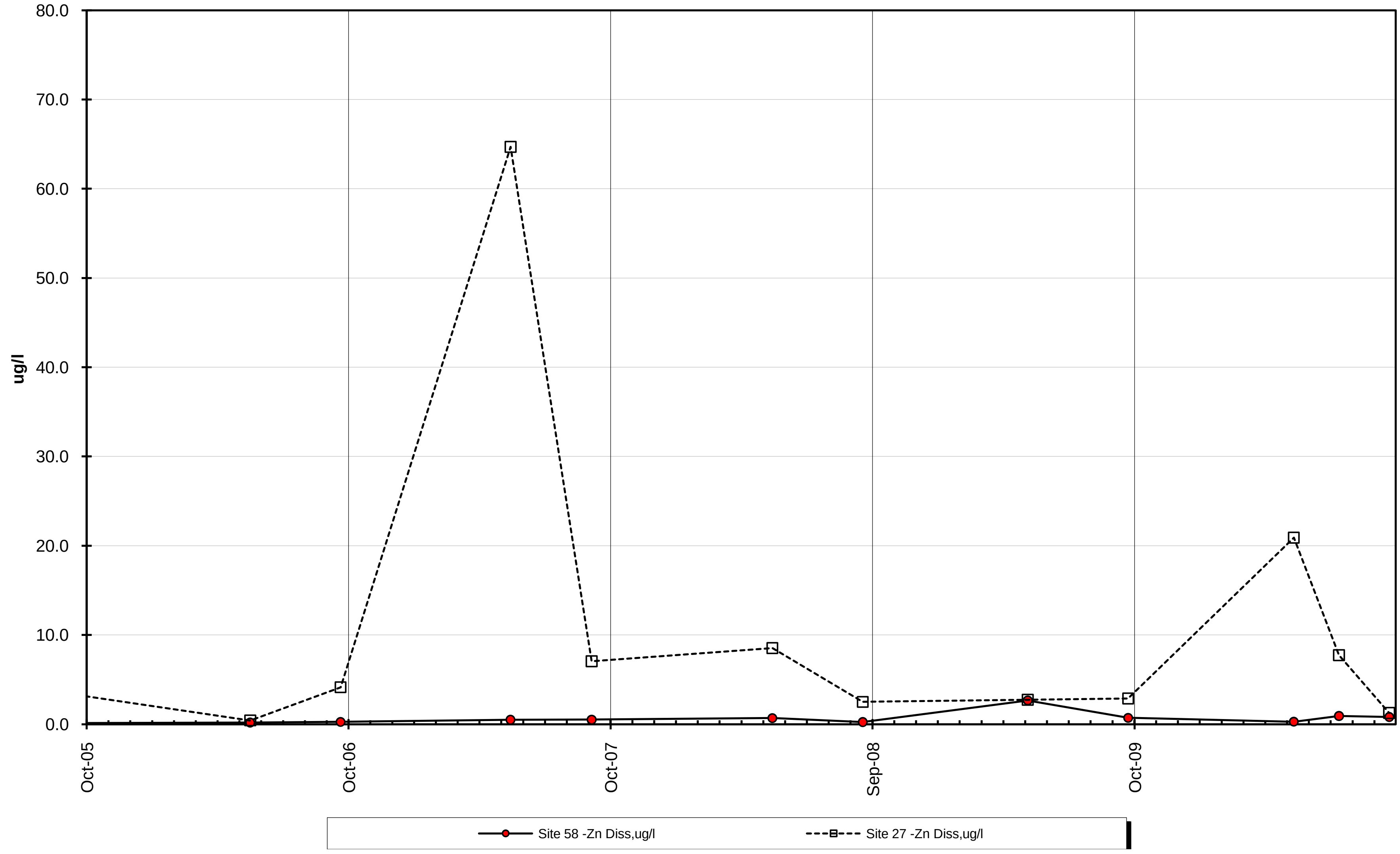


Site 58 vs. Site 27 -Total Alkalinity
mg/l
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Site 58 -Alk tot,mg/l
Site 27 -Alk tot,mg/l

Site 58 vs. Site 27 -Total Sulfate



Site 58 vs. Site 27 -Dissolved Zinc



INTERPRETIVE REPORT
SITE 29 "MONITORING WELL 3S"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Ten results exceeding these criteria have been identified, as listed in the table below. Six of these records are for pH, both for field and laboratory, values below the lower limit of 6.5 su listed in AWQS. Field and laboratory pH from other wells completed into organic rich peat sediments similar to Site 29 have historically resulted in pH values ranging from 5 to 6 su (*e.g.* Sites 58, 27, and 32). The other exceedances are for dissolved lead (0.679 µg/L), and all three samplings for total alkalinity.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	4.47		6.5	Aquatic Life, chronic
11-May-10	pH Lab, su	5.27		6.5	Aquatic Life, chronic
13-Jul-10	pH Field, su	4.76		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	4.6		6.5	Aquatic Life, chronic
21-Sep-10	pH Field, su	4.93		6.5	Aquatic Life, chronic
21-Sep-10	pH Lab, su	4.32		6.5	Aquatic Life, chronic
13-Jul-10	Lead, Dissolved ug/L	0.679	21.9	0.54	Aquatic Life, chronic
11-May-10	Alkalinity Total, mg/L	8.7		20	Aquatic Life, chronic
13-Jul-10	Alkalinity Total, mg/L	10.5		20	Aquatic Life, chronic
21-Sep-10	Alkalinity Total, mg/L	-1		20	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. There is a visually apparent downward trend in total alkalinity values across the last five water years. The same trend is apparent in the dissolved arsenic, dissolved barium, dissolved manganese, hardness, and conductivity data. Currently, HGCMC does not have explanation for the mechanism that is in operation causing the visual decrease in these values.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The following table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). One significant trend was identified with this analysis. Total alkalinity (p=0.02) was negatively trending with an estimated slope of -6.07 µg/L/yr or a 23.0% increase. This apparent decrease in total alkalinity is an artifact of the sampling and analysis procedure. When comparing the laboratory and field pH for the three sampling events for WY 2010 it was noticed that these values have opposite trends. The field pH increases across the season where as the laboratory pH decreases in time. There is frequently a decrease in the sample pH after the samples have been shipped to the laboratory. Standard method recommends the titration pH end point for a low alkalinity sample (~30 mg $CaCO_3$/L) to be a pH of 4.9 su. Based on the standard method (2320B) the starting pH for the last sample was below the standard titration end point, which would account for the sample having no alkalinity at the laboratory.

Site 29-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.04	0		
pH, Lab	6	0.18	0		
Alkalinity, Total	6	**0.02**	-	-6.07	-23
Sulfate, Total	6	Discontinuation in the continuity of the MD			
Zinc, Dissolved	6	0.55	0		

(1): Number of years (2):Significance level

Trend analysis was not performed on the total sulfate dataset because of a change in the method detection limit used by Analytica Laboratories. A primary assumption of the Mann-Kendall test is "… only one censoring threshold exists. When more than one detection limit exists, the Mann-Kendall test cannot be performed without further censoring the data." In order to prevent this from occurring HGCMC has worked to establish a consistent MDL for sulfate from the laboratory.

Additional X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 29 and Site 58, the up-gradient control site, to aid in the comparison between those two sites. Laboratory conductivity and total alkalinity are within similar ranges at both sites. Laboratory pH is slightly lower at Site 29 than Site 58, while total sulfate is slightly higher at Site 58 (note Site 29 typically returns sulfate values that are below the 0.1 mg/L SO_4 MDL). Site 29 routinely has dissolved zinc values that are ~5 µg/L higher than values found at Site 58. These results are similar in magnitude and range to what was noted previously for Site 27 with respect to the comparison with Site 58. The hydrogeologic conditions that exist at Site 29 are similar to Site 27 with the exception that Site 29 is not typically in an active surface discharge zone. However, the area around Site 29 is located in an area of gently sloping muskeg that is part of the upper headwater region of Further Creek, which drains westward into Hawk Inlet. The site's groundwater is characterized by diffuse flow through the peat/sand strata. Thus the lower pH would be due to the greater interaction with organic matter in the muskeg. The lower pH would also promote greater solubility for dissolved metals sampled at this site.

Table of Results for Water Year 2010

Site 29 "MW-3S"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							7.6	NOT SCHEDULED FOR SAMPLING	8.7	NOT SCHEDULED FOR SAMPLING	8.3	8.3
Conductivity-Field(µmho)								62		62		49	62
Conductivity-Lab (µmho)								53		54		38	53
pH Lab (standard units)								5.27		4.60		4.32	4.60
pH Field (standard units)								4.47		4.76		4.93	4.76
Total Alkalinity (mg/L)								8.7		10.5		<1.0	8.7
Total Sulfate (mg/L)								<10.0 UJ		<10.0 UJ		<10.0 J	5.0
Hardness (mg/L)								20.8		21.9		10.8	20.8
Dissolved As (ug/L)								8.68		7.75		3.67	7.75
Dissolved Ba (ug/L)								8.4		9.3		6.7	8.4
Dissolved Cd (ug/L)								0.006 J		0.004 J		<0.008	0.004
Dissolved Cr (ug/L)								10.400		1.830		0.925	1.830
Dissolved Cu (ug/L)								0.309		0.360		0.182	0.309
Dissolved Pb (ug/L)								0.4090		0.6790		0.3750	0.4090
Dissolved Ni (ug/L)								1.260		1.290		1.130	1.260
Dissolved Ag (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Zn (ug/L)								3.67		3.42		2.80	3.42
Dissolved Se (ug/L)								0.356		<0.114		<0.228	0.114
Dissolved Hg (ug/L)								0.000666 U		0.001670		0.001090	0.001090

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

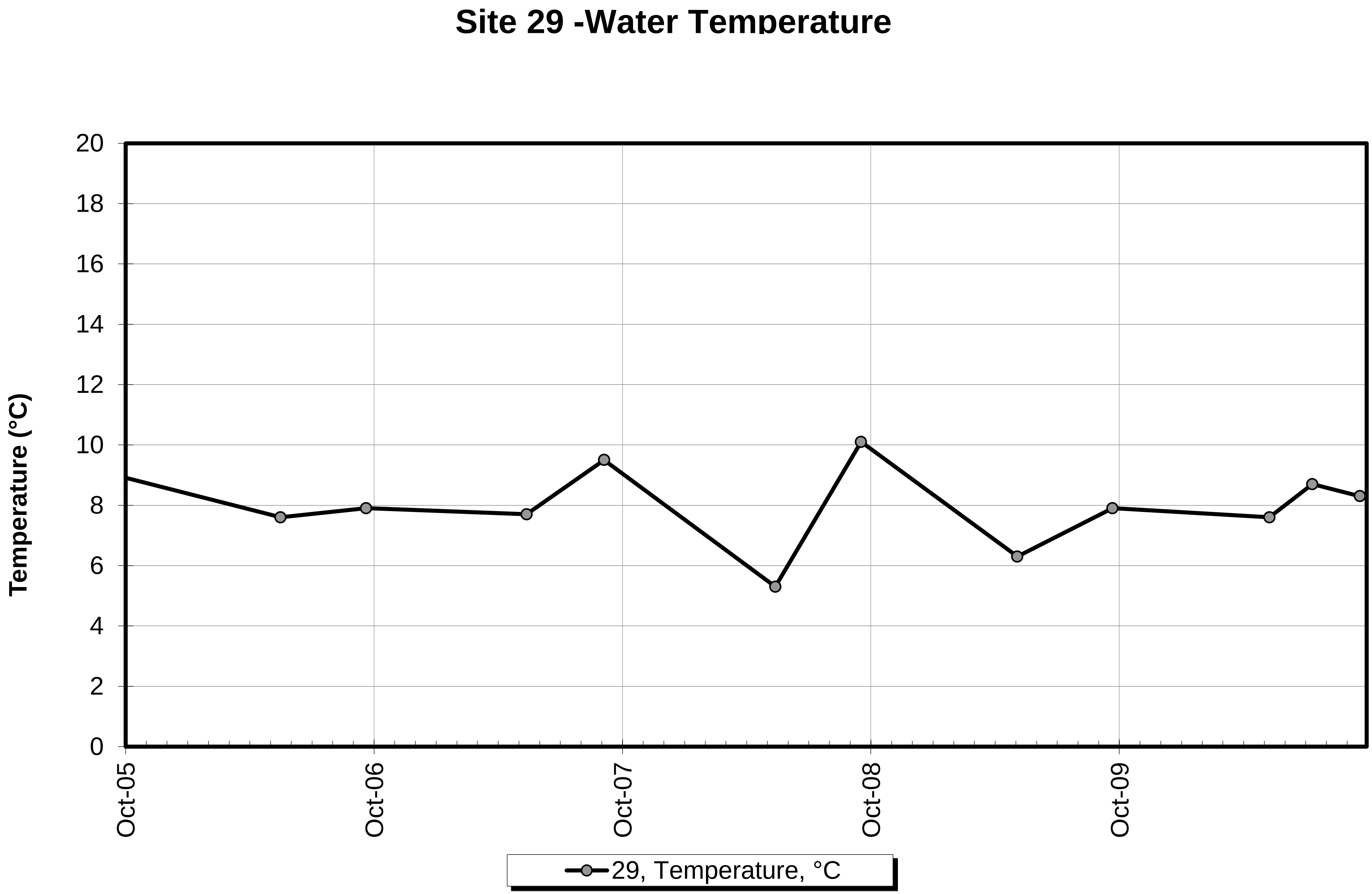
Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

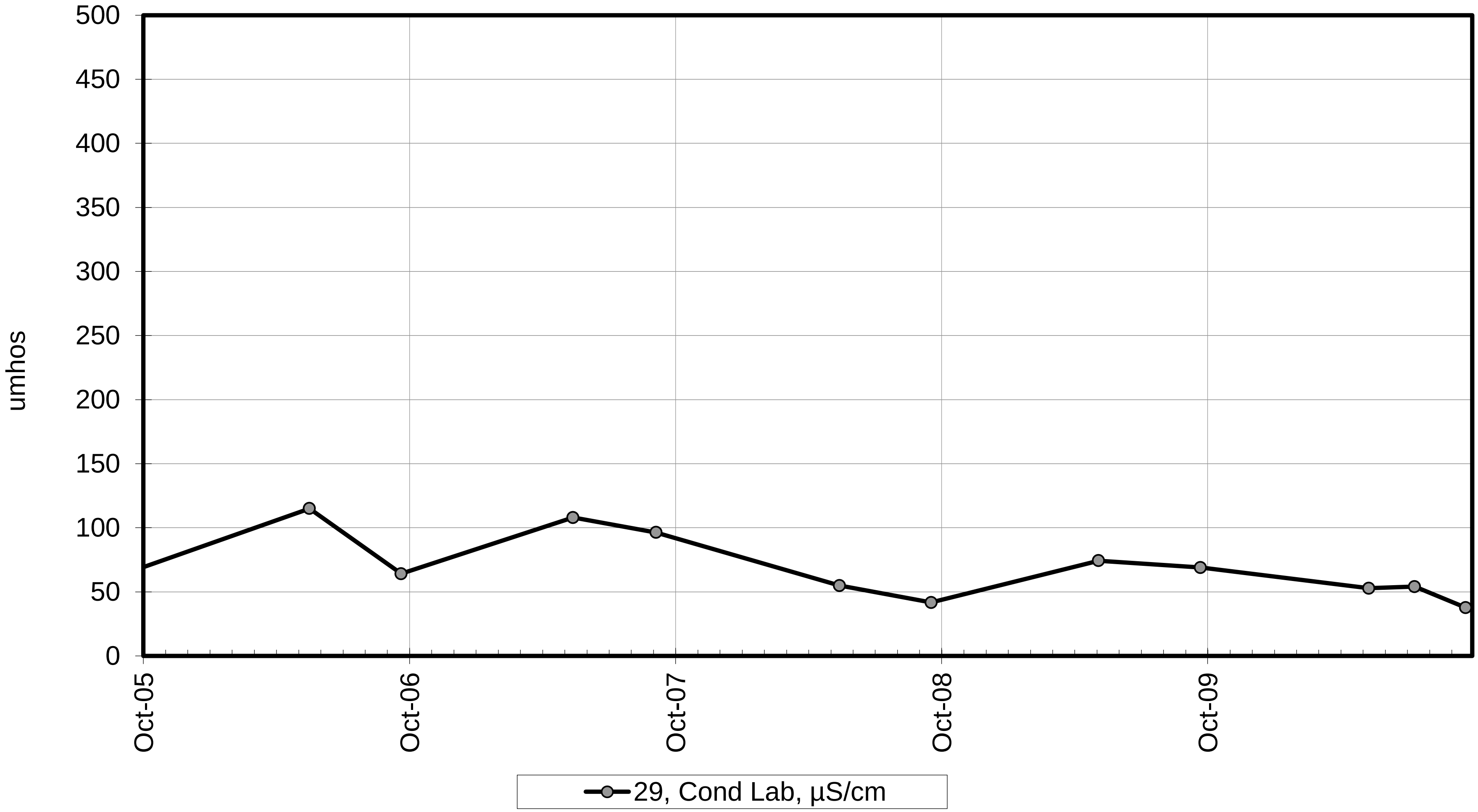
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
28	5/11/2010	12:53 PM				
			Pb diss, µg/l	-0.003	U	Field Blank Contamination
			Se diss, µg/l	0.241	J	Below Quantitative Range
			Zn diss, µg/l	0.0964	U	Field Blank Contamination
			SO4 Tot, mg/l	11.3	J	Sample Temperature
28	7/13/2010	12:17 PM				
			Hg diss, µg/l	0.000156	U	Field Blank Contamination
			SO4 Tot, mg/l	10.4	J	Sample Reciept Temperature
28	9/21/2010	11:29 AM				
			Cr diss, µg/l	0.171	J	Below Quantitative Range
			Zn diss, µg/l	0.0783	J	Below Quantitative Range
			SO4 Tot, mg/l	11	J	Sample Receipt Temperature

Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

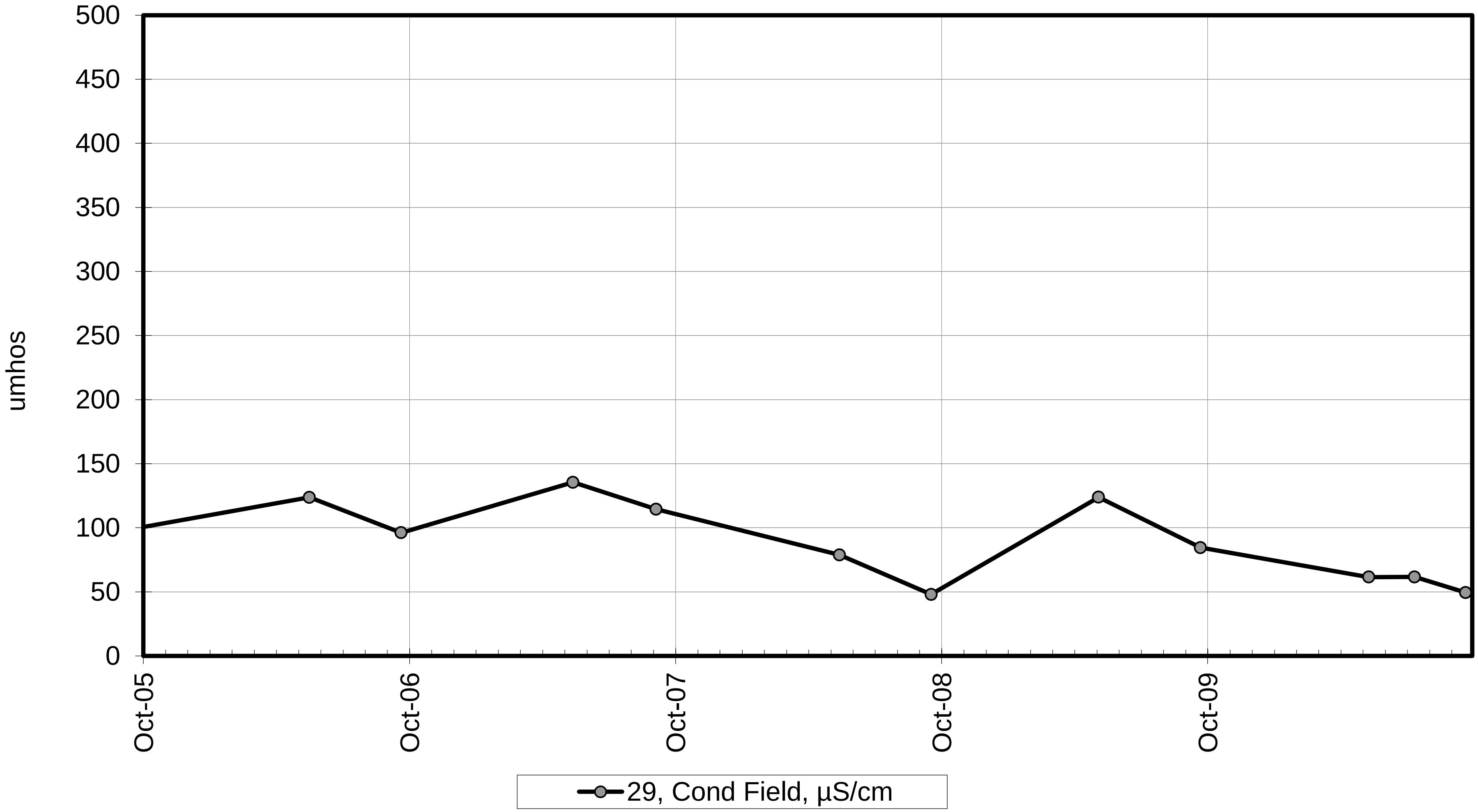


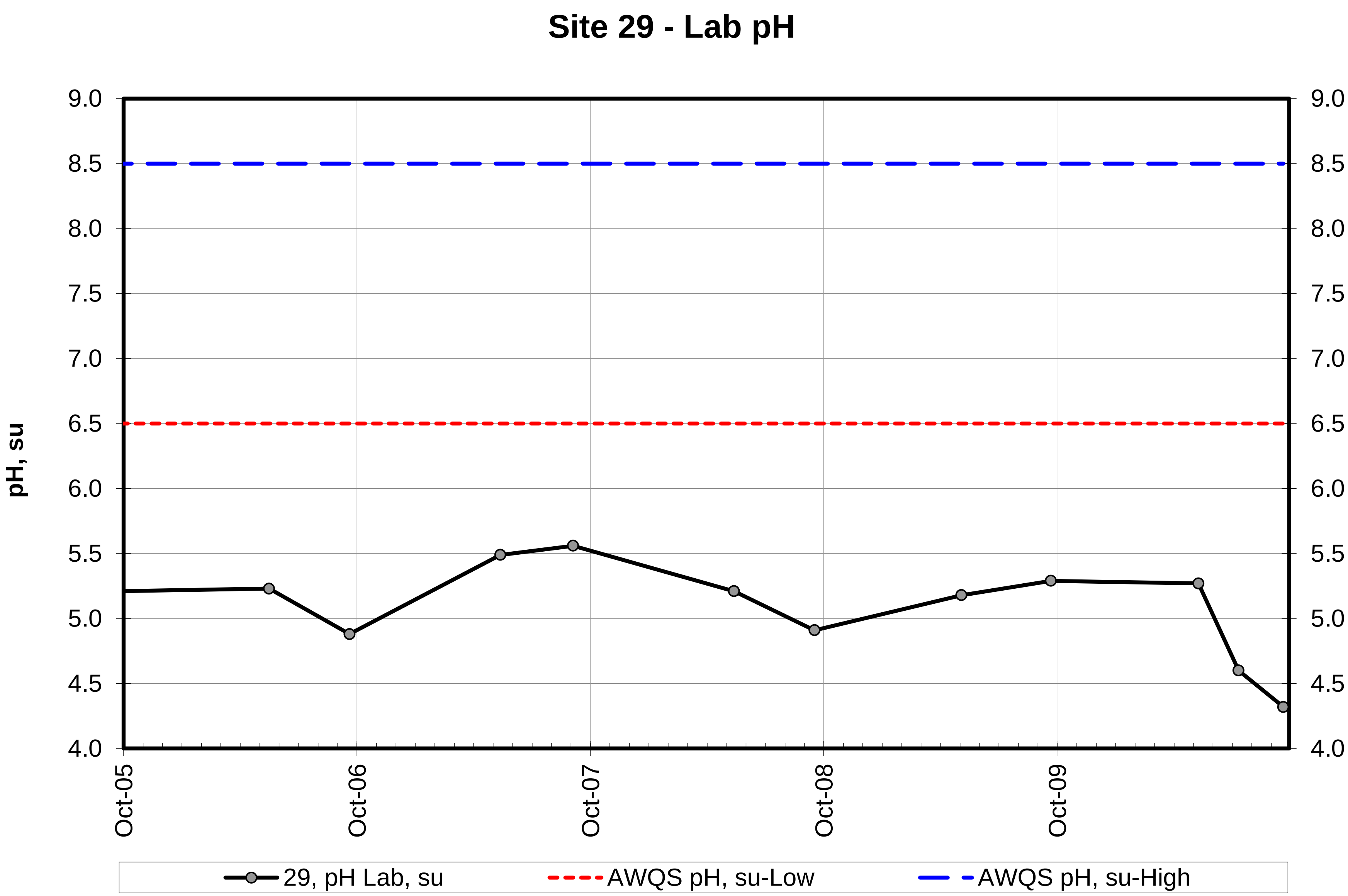
Site 29 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
29, Temperature, °C

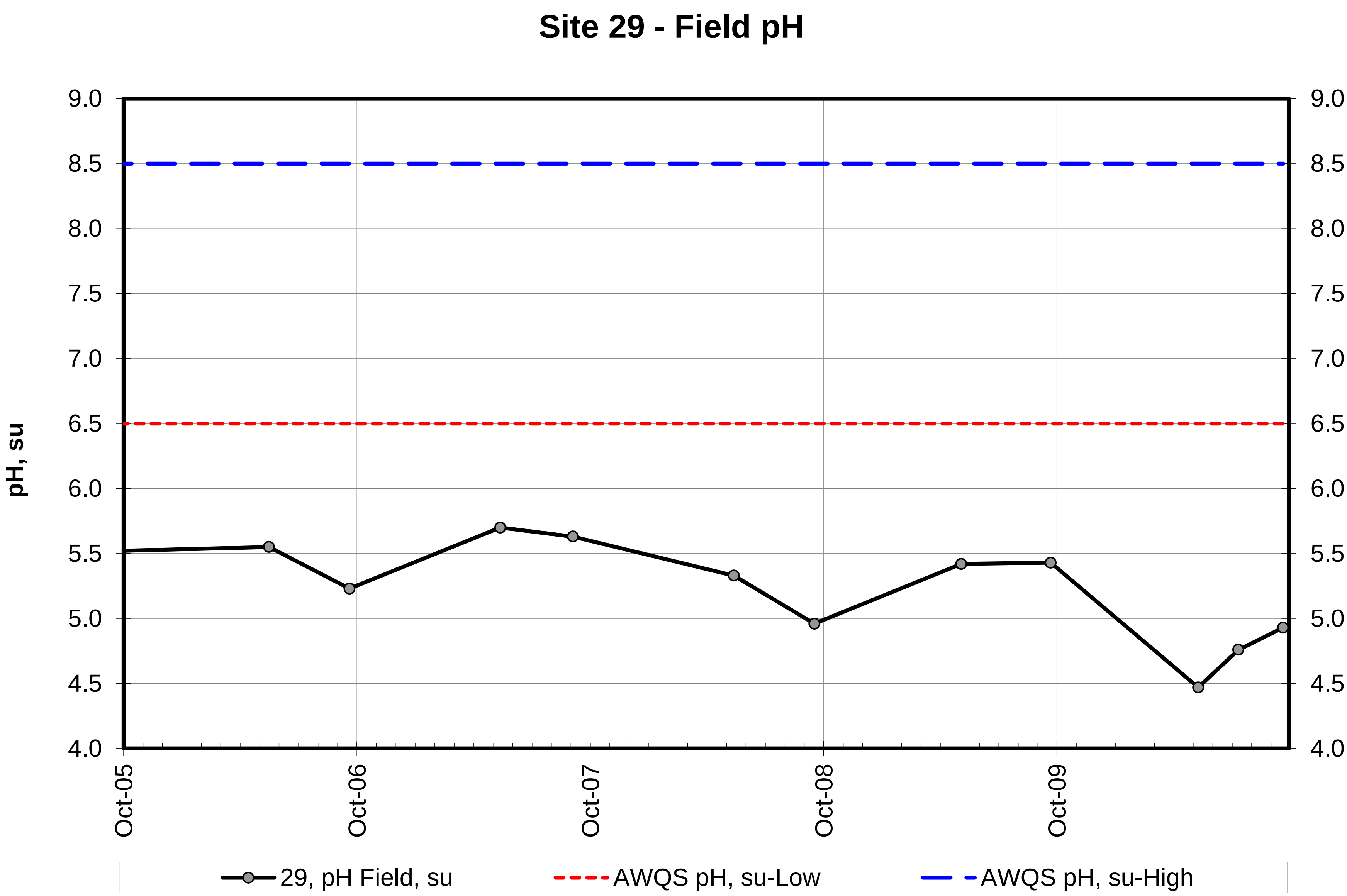
Site 29 - Conductivity-Lab



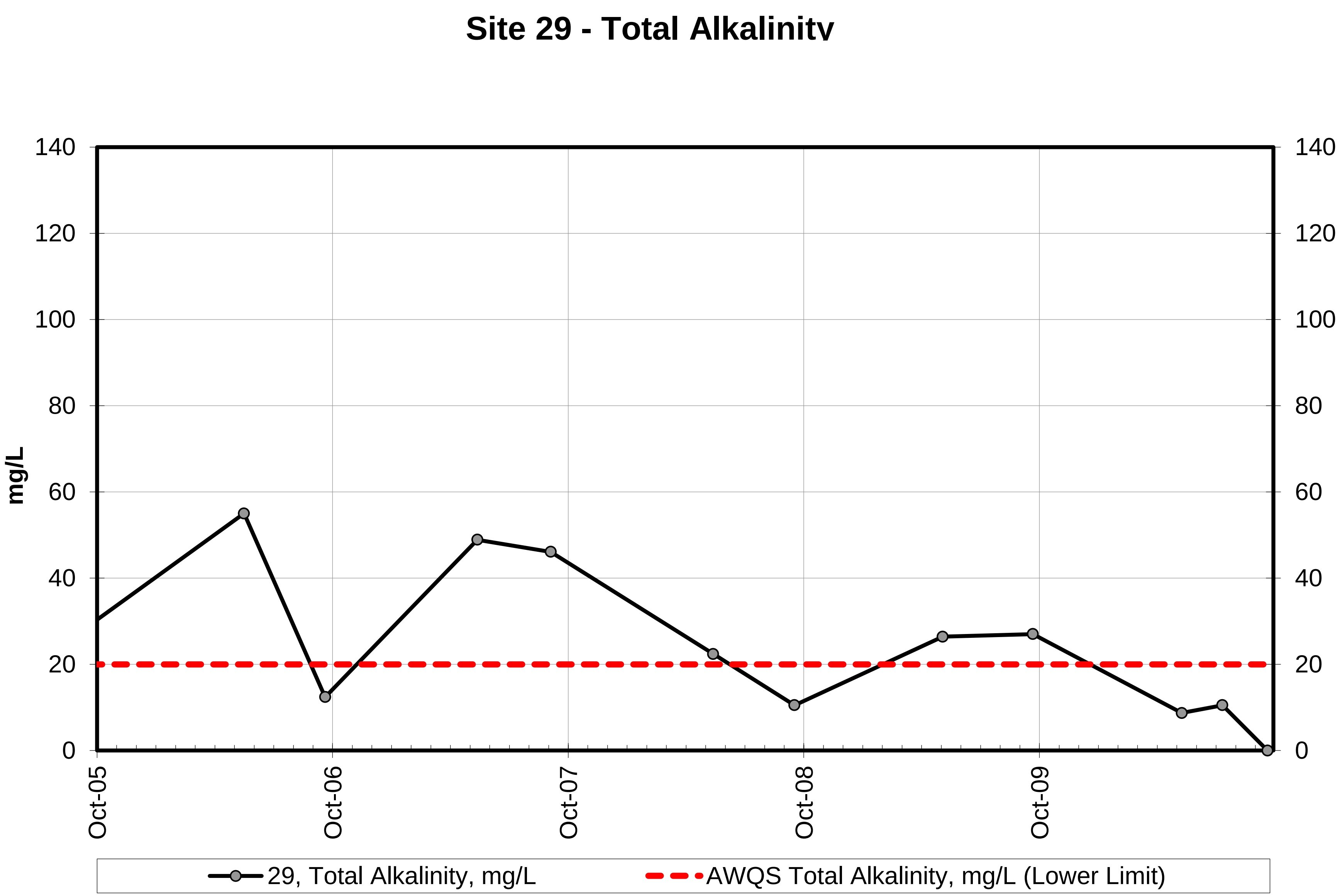
Site 29 - Conductivity-Field



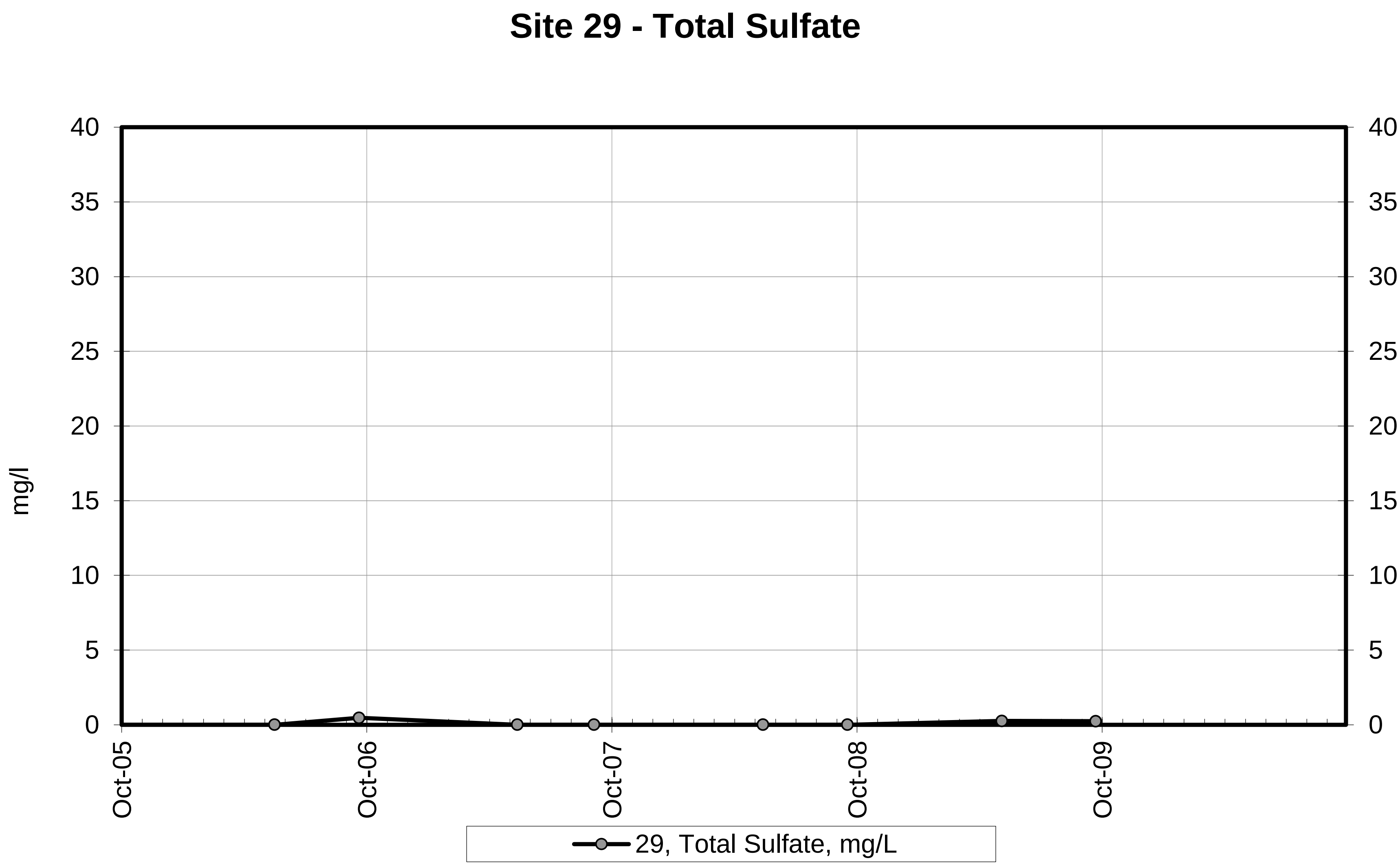

Site 29 - Lab pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
29, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High



Site 29 - Field pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
29, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

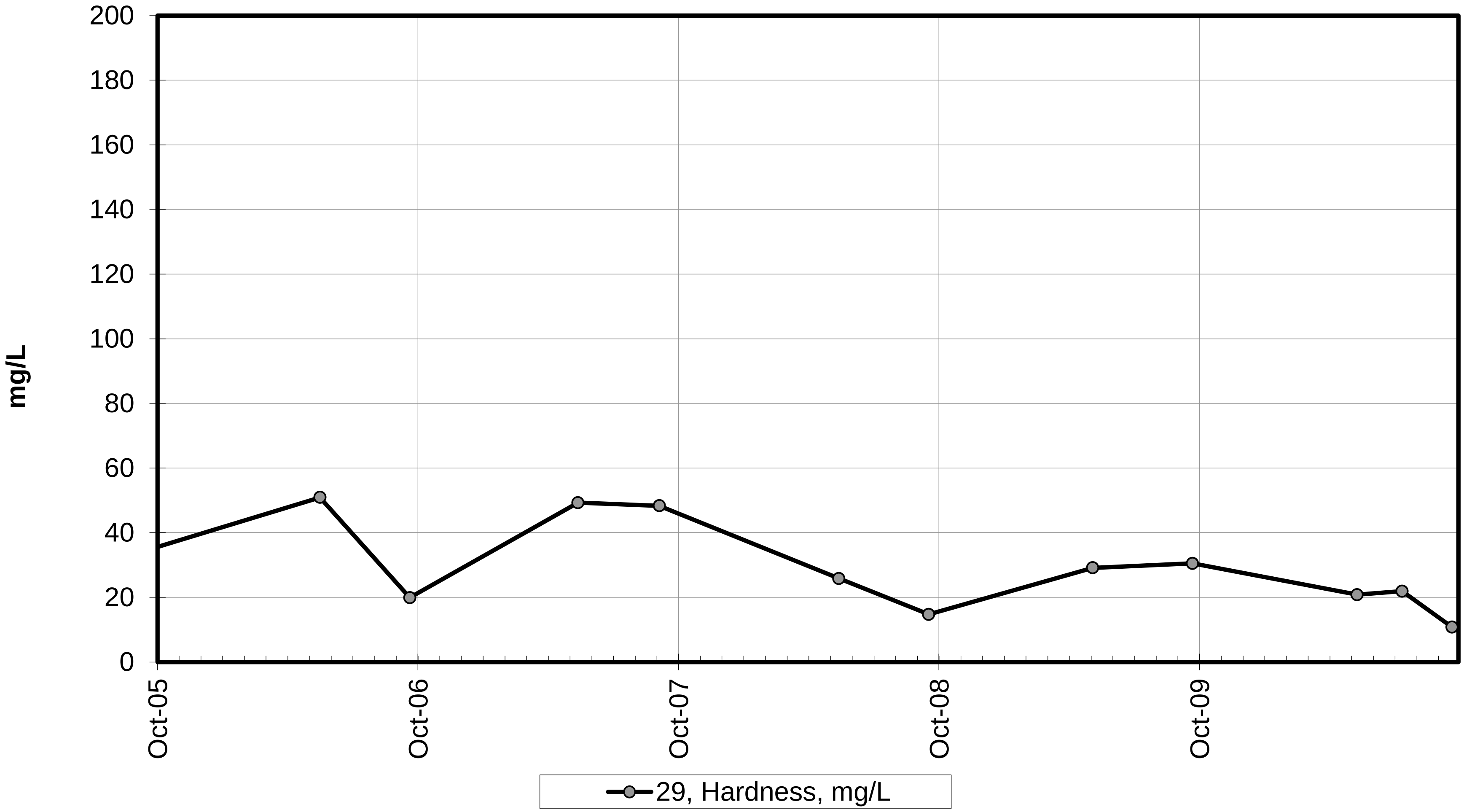


Site 29 - Total Alkalinity
mg/L
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
29, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

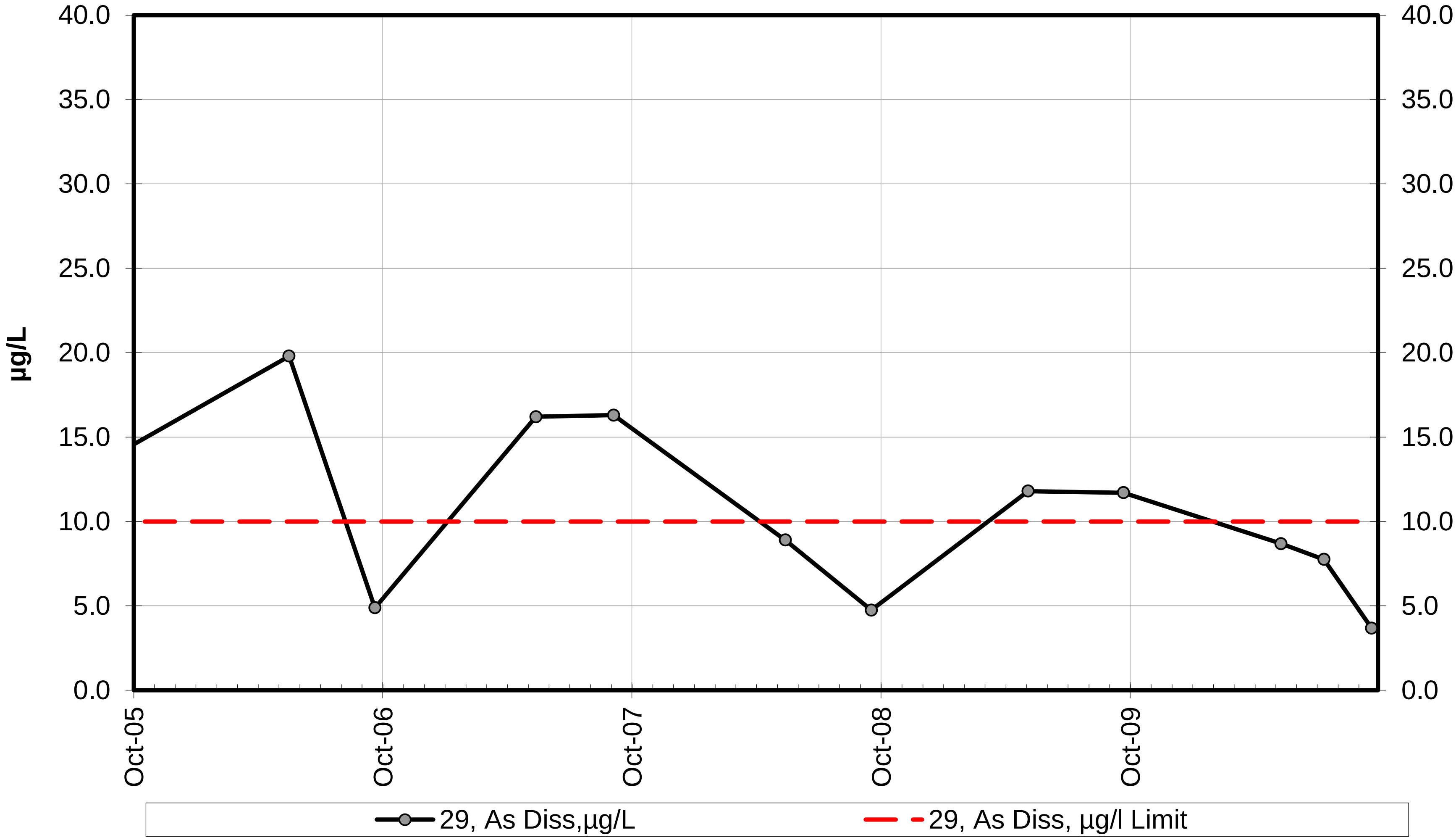


Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

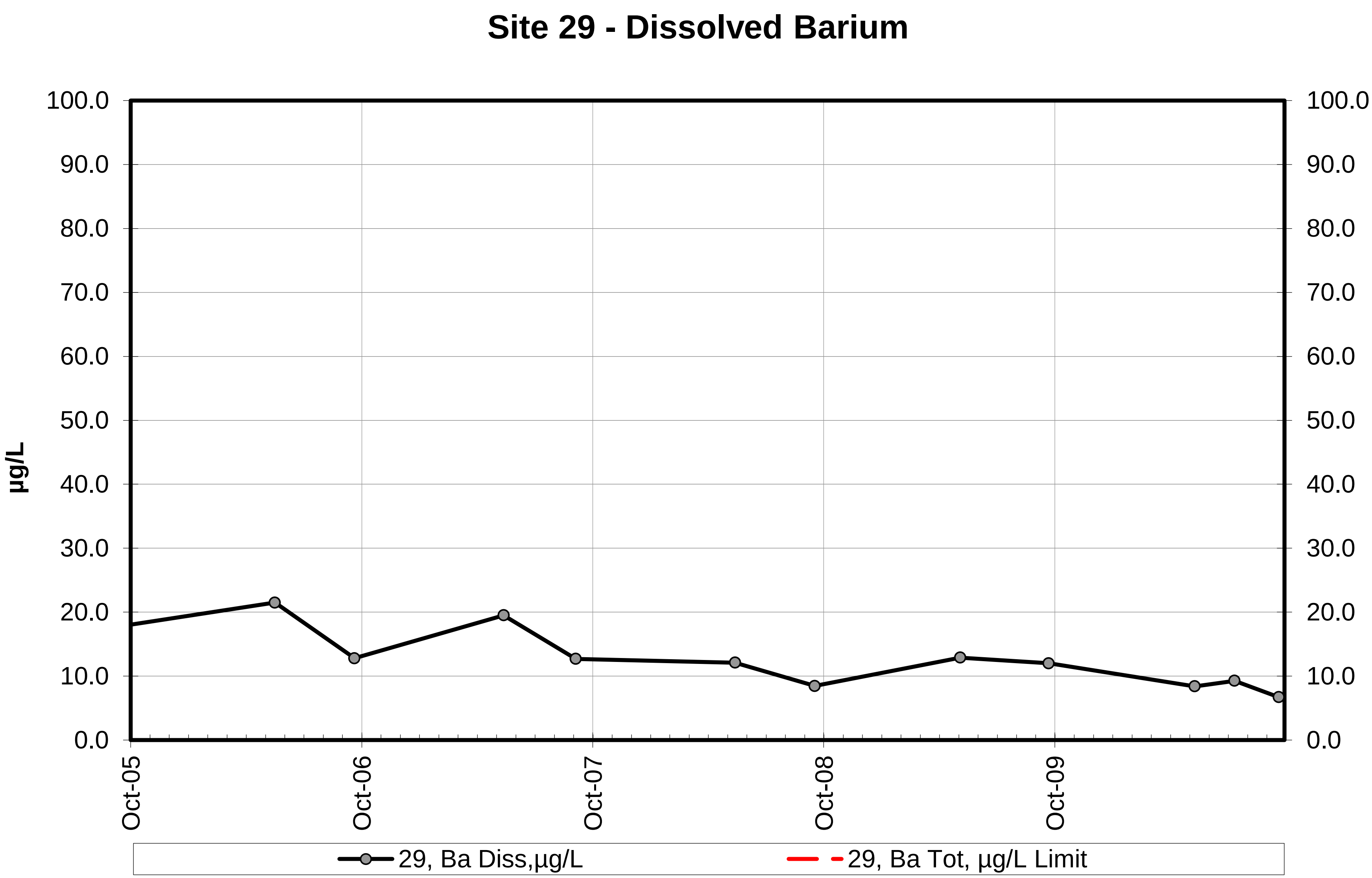
Site 29 - Hardness



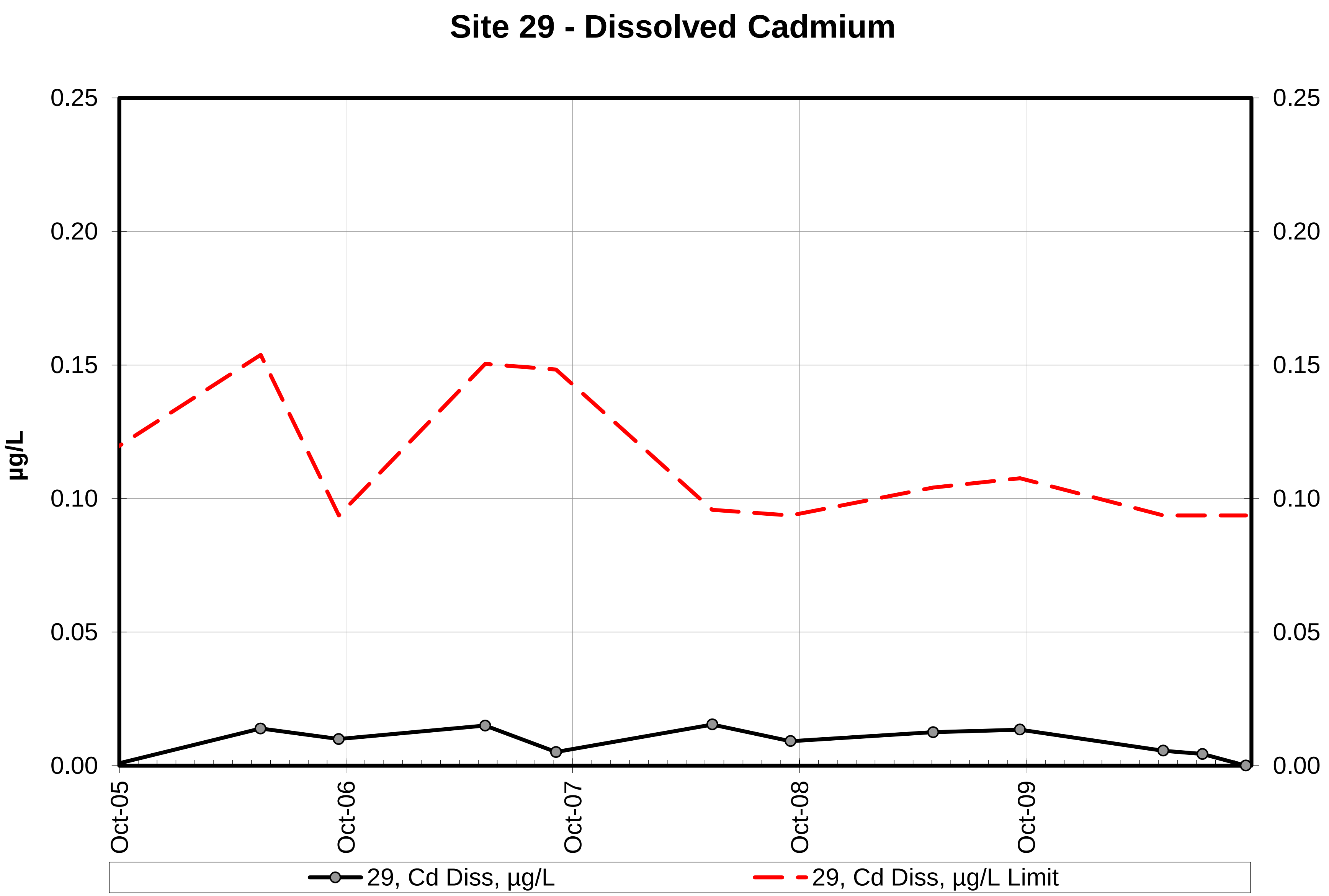
Site 29 - Dissolved Arsenic



Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

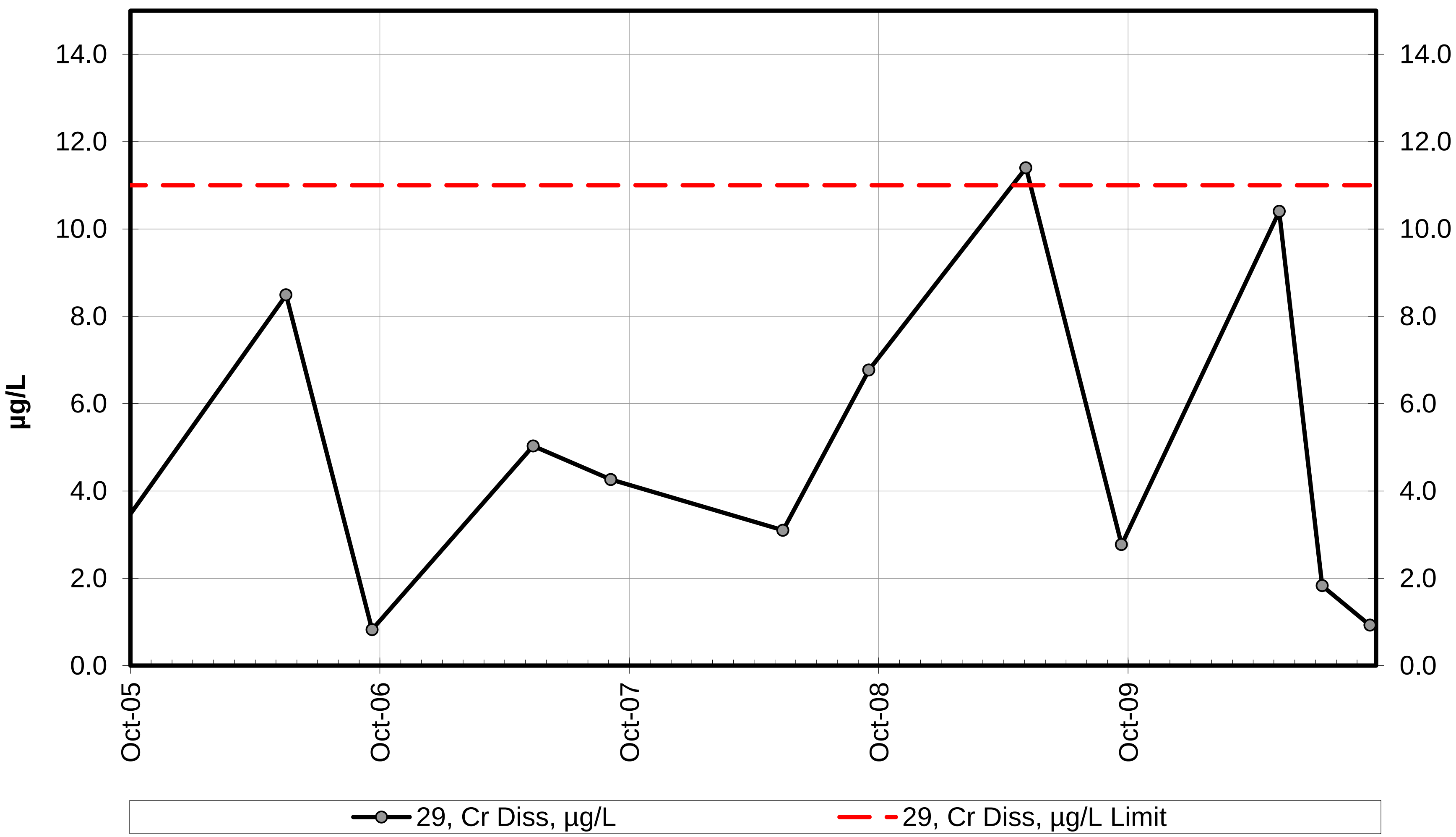


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



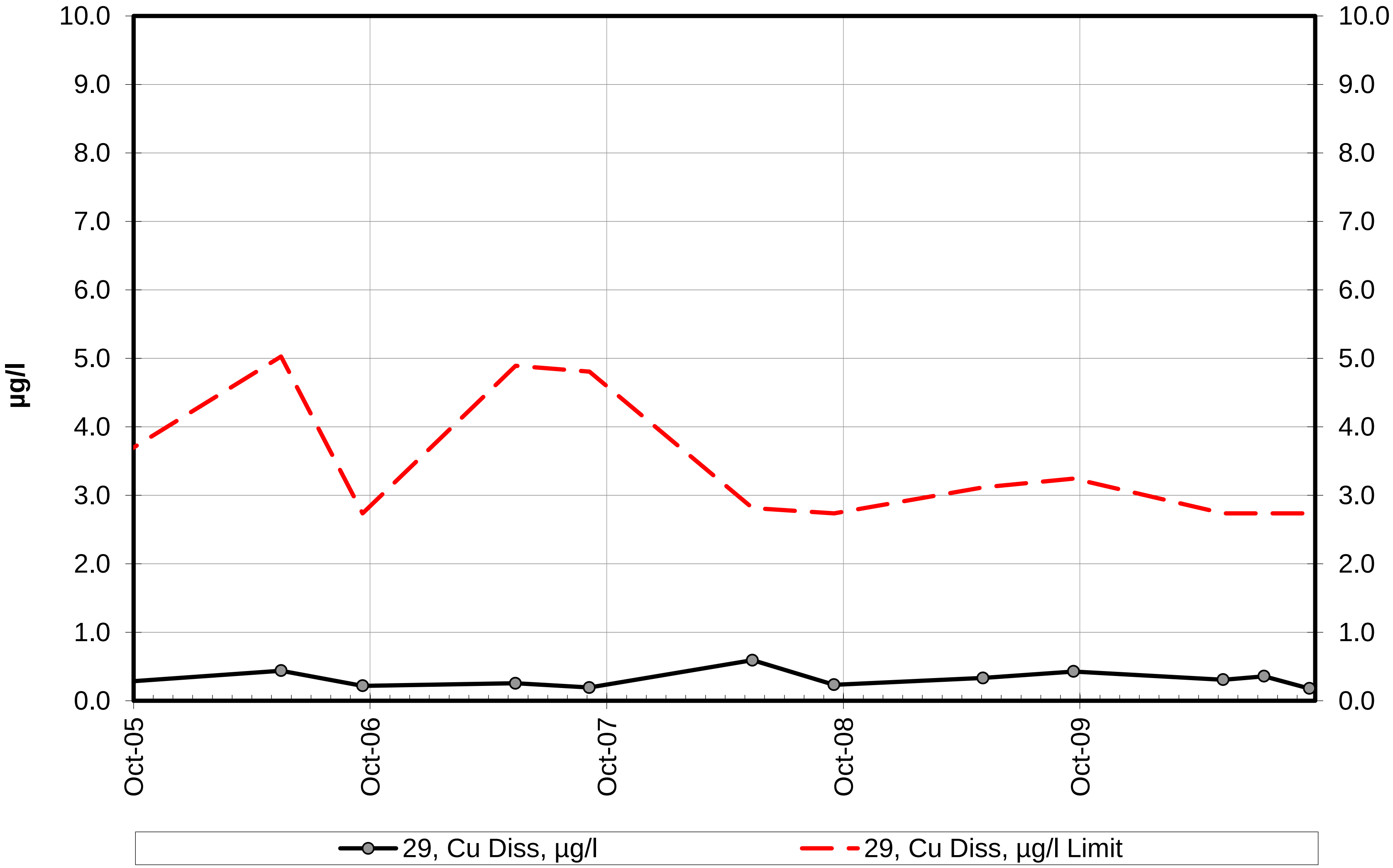
Site 29 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
29, Cd Diss, µg/L
29, Cd Diss, µg/L Limit

Site 29 - Dissolved Chromium

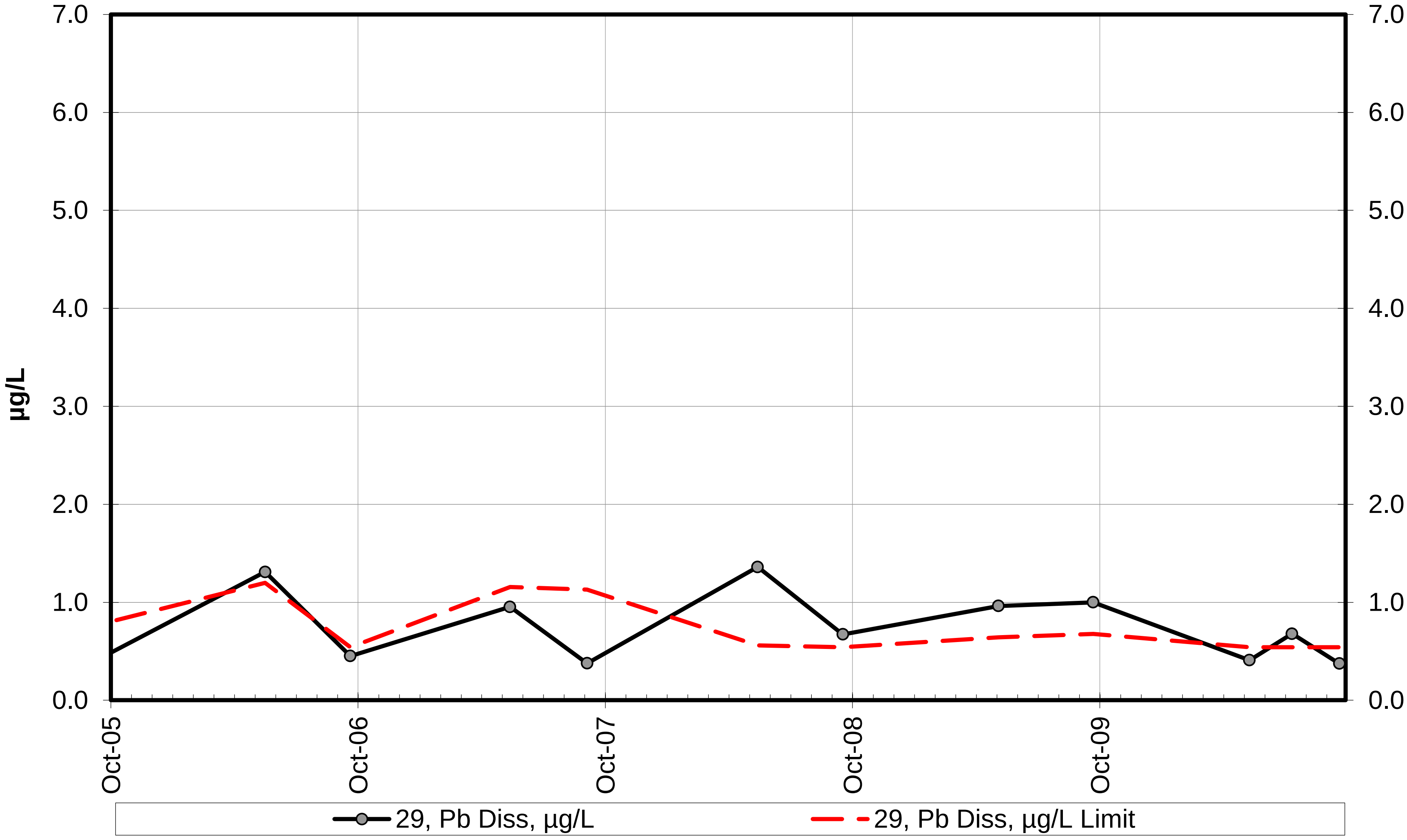


Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

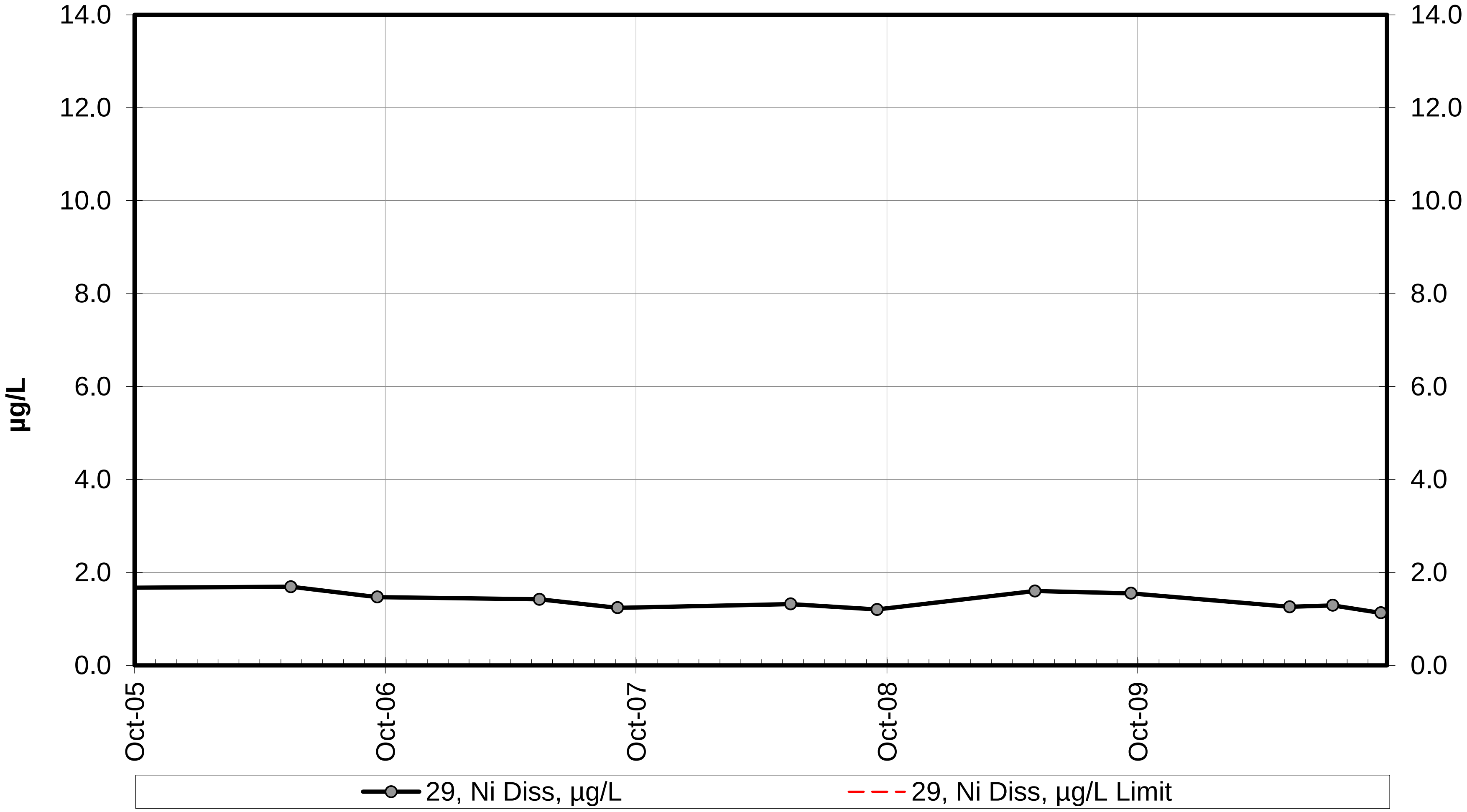
Site 29 - Dissolved Copper



Site 29 - Dissolved Lead

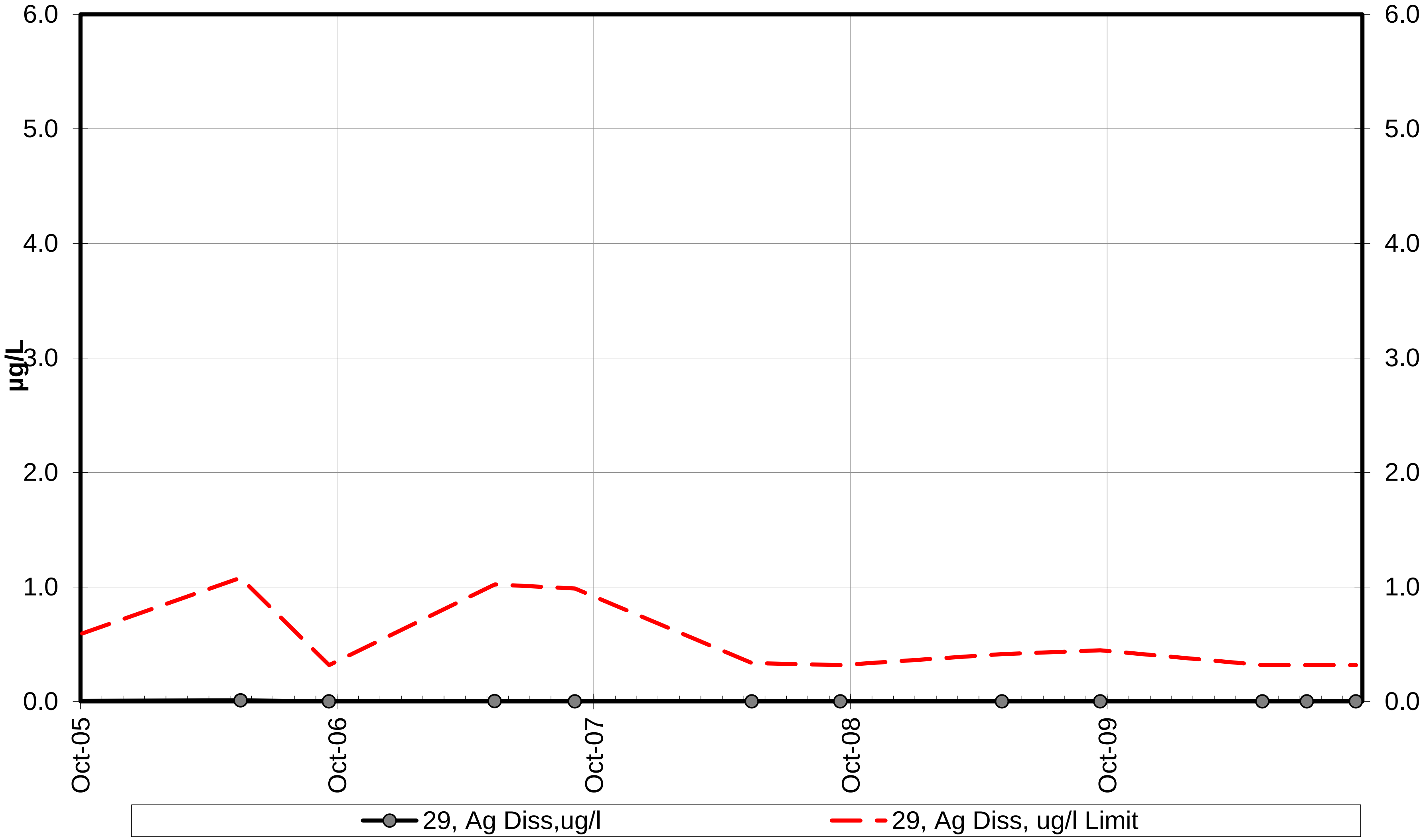


Site 29 - Dissolved Nickel

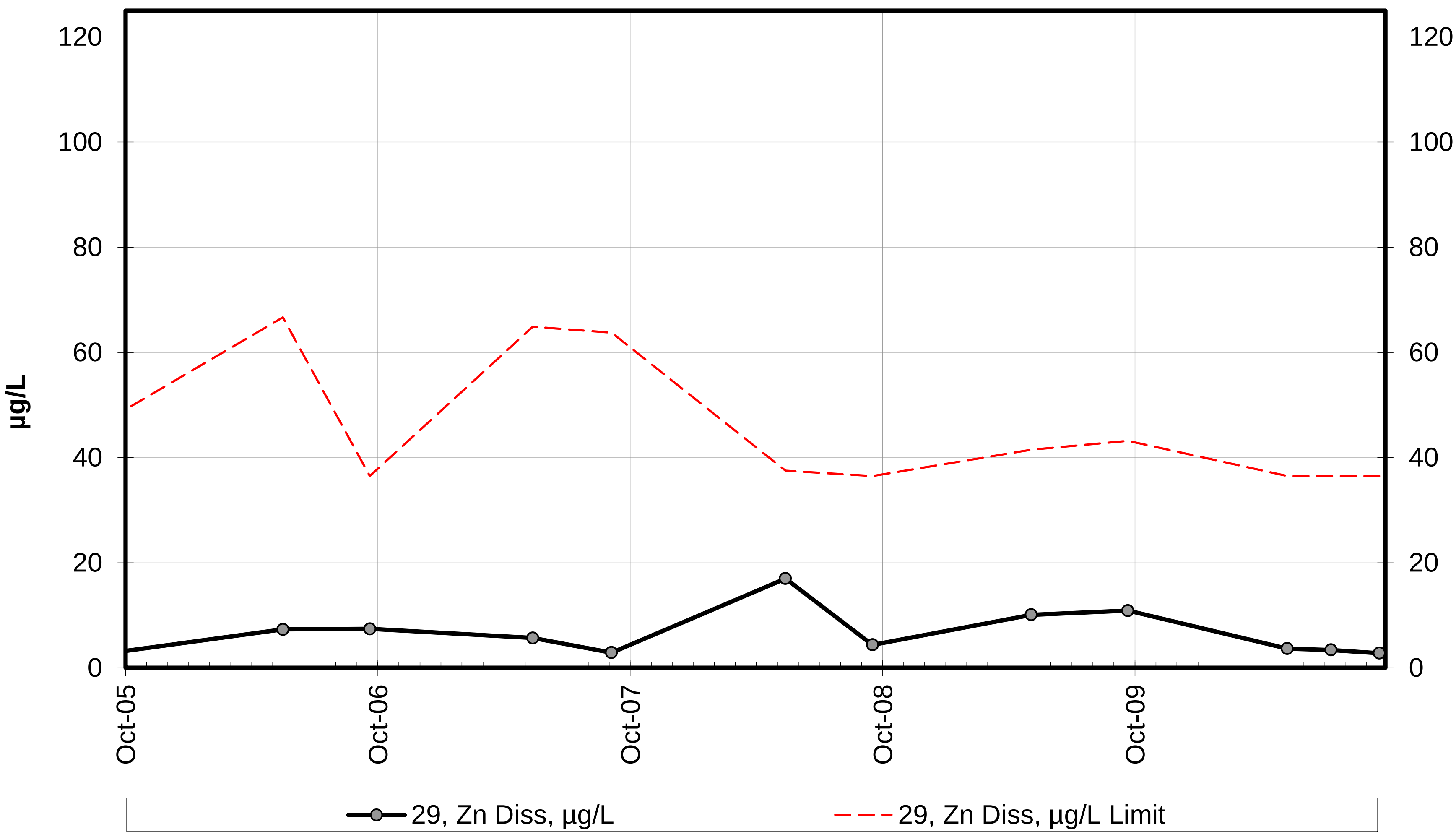


Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

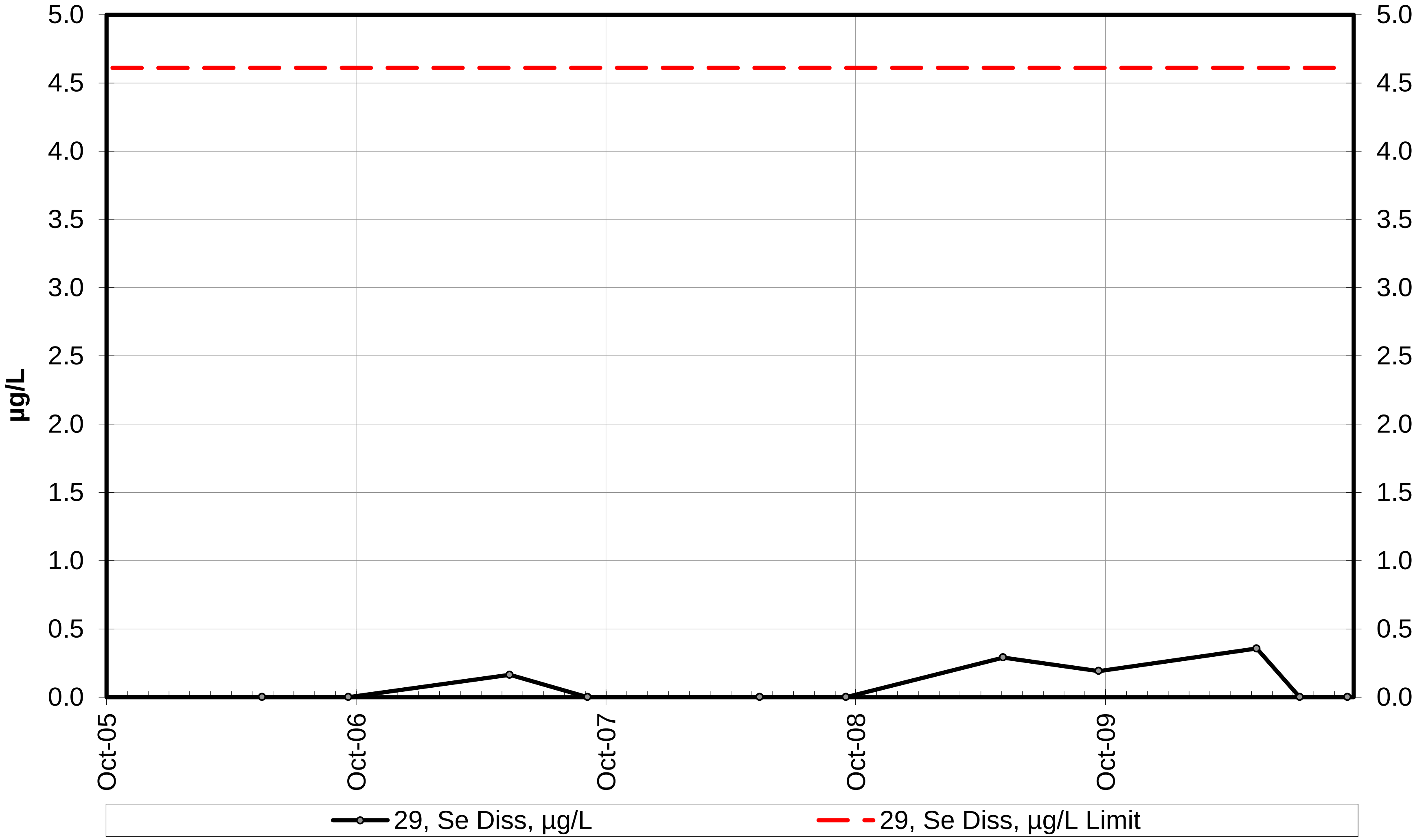
Site 29 - Dissolved Silver



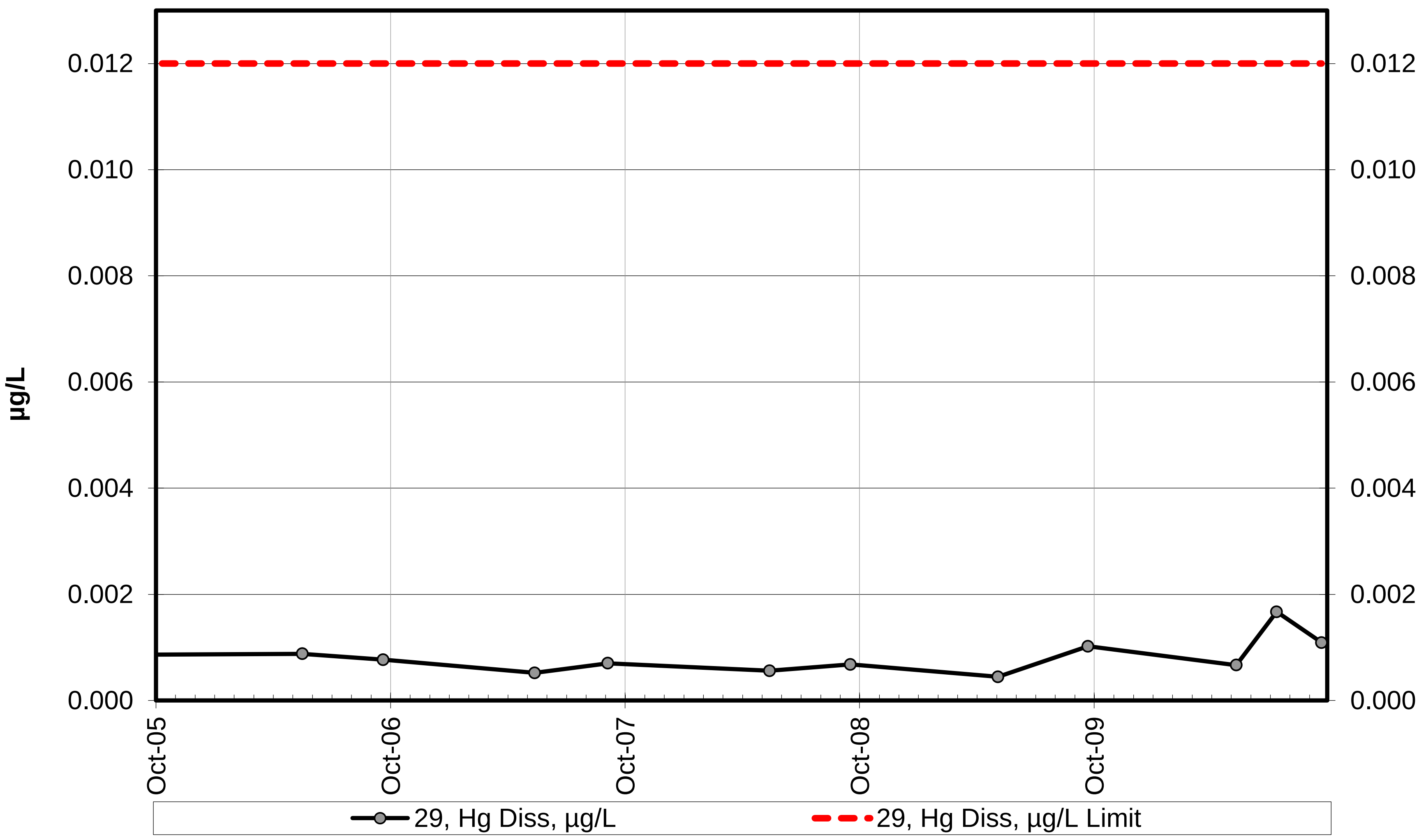
Site 29 - Dissolved Zinc



Site 29 - Dissolved Selenium



Site 29 - Dissolved Mercury



Site **#29** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								77.3				66.1
b	**WY2006**								115				64.1
c	**WY2007**								108				96.3
d	**WY2008**								54.9				41.7
e	**WY2009**								74.3				68.9
f	**WY2010**								52.8		54		37.7
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				-1
c-a								1				1
d-a								-1				-1
e-a								-1				1
f-a								-1				-1
c-b								-1				1
d-b								-1				-1
e-b								-1				1
f-b								-1				-1
d-c								-1				-1
e-c								-1				-1
f-c								-1				-1
e-d								1				1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-9	0	0	0	-5

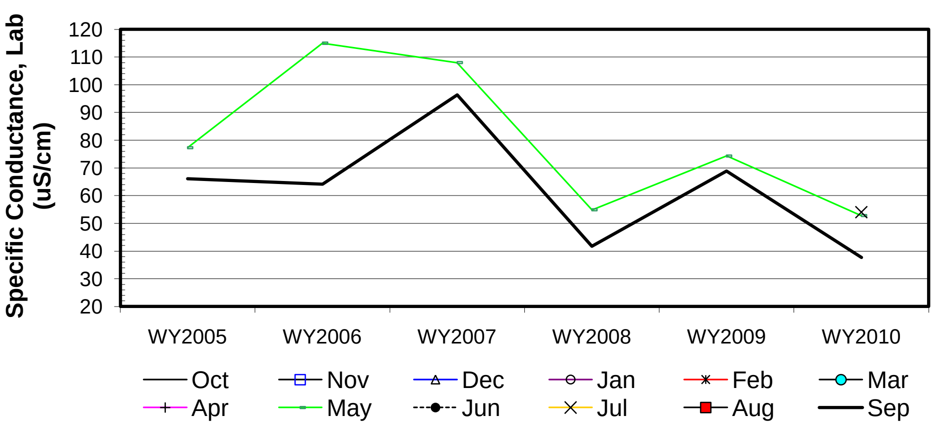
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-1.69				-0.94
Z^2_k								2.86				0.88

ΣZ_k=	-2.63
ΣZ^2_k=	3.74
Z-bar=ΣZ_k/K=	-1.32

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-14

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.28	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.595**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-1.73	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
56.67	**p**	**0.042**		**H_A** ($\pm$ trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-19.26		1.38
0.050	-15.80	**-6.80**	-0.99
0.100	-13.68		-2.00
0.200	-11.60		-4.41

Site **#29** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								5.3				5.2
b	**WY2006**								5.2				4.9
c	**WY2007**								5.5				5.6
d	**WY2008**								5.2				4.9
e	**WY2009**								5.2				5.3
f	**WY2010**								5.3		4.6		4.3
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								1				1
d-a								-1				-1
e-a								-1				1
f-a								-1				-1
c-b								1				1
d-b								-1				1
e-b								-1				1
f-b								1				-1
d-c								-1				-1
e-c								-1				-1
f-c								-1				-1
e-d								-1				1
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	-5	0	0	0	-3

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-0.94				-0.56
Z^2_k								0.88				0.32

ΣZ_k= -1.50

ΣZ^2_k= 1.20

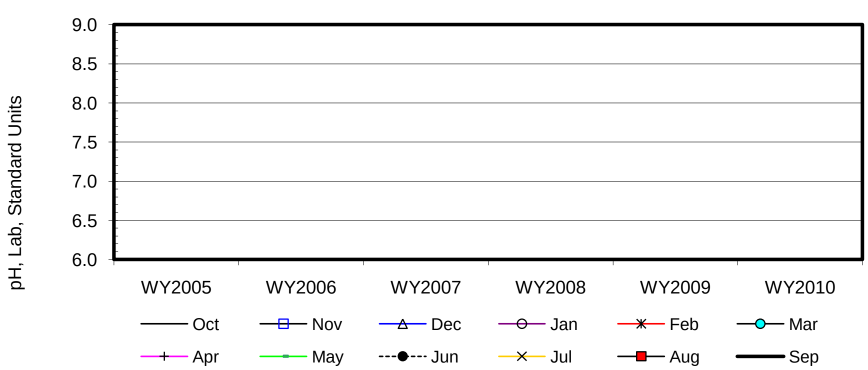
Z-bar=$\Sigma Z_k/K$= -0.75

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13

ΣS_k -8

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	0.07	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity	
p	**0.790**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -0.93	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
56.67	**p** **0.176**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.26		0.08
0.050	-0.14	**-0.02**	0.02
0.100	-0.13		0.01
0.200	-0.08		-0.01

Site #29 — Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								39.5				28.6
b	**WY2006**								55.0				12.4
c	**WY2007**								48.9				46.1
d	**WY2008**								22.4				10.5
e	**WY2009**								26.4				27.0
f	**WY2010**								8.7		10.5		0.0
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				-1
c-a								1				1
d-a								-1				-1
e-a								-1				-1
f-a								-1				-1
c-b								-1				1
d-b								-1				-1
e-b								-1				1
f-b								-1				-1
d-c								-1				-1
e-c								-1				-1
f-c								-1				-1
e-d								1				1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-9	0	0	0	-7

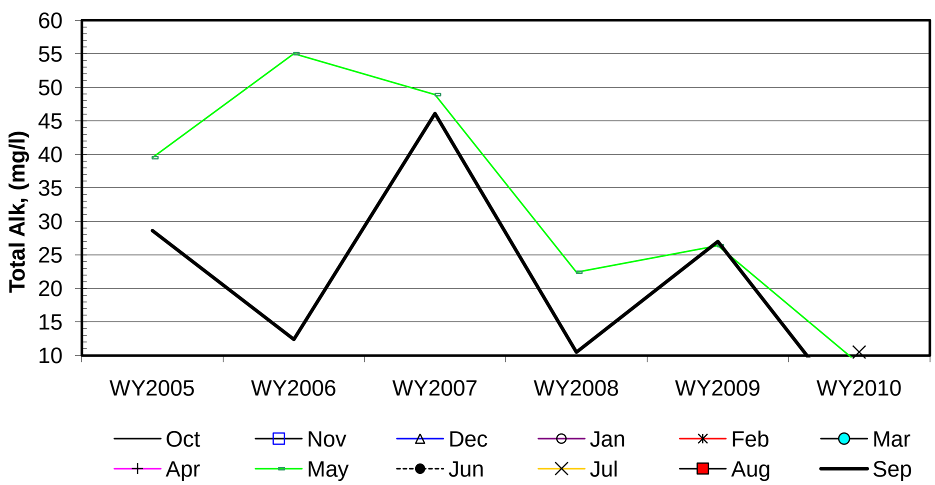
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-1.69				-1.32
Z^2_k								2.86				1.73

ΣZ_k=	-3.01
ΣZ^2_k=	4.59
Z-bar=ΣZ_k/K=	-1.50

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-16

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$=		0.07	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity
	p	**0.790**			$\chi^2_h<\chi^2_{(K-1)}$ ACCEPT
ΣVAR(S_k)	Z_{calc}	-1.99	@α/2=2.5% Z=	1.96	H_0 (No trend) REJECT
56.67	**p**	**0.023**			H_A (± trend) ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-16.00		2.93
0.050	-11.92	**-6.07**	-2.69
0.100	-10.95		-3.62
0.200	-9.54		-5.62

-23.0%

Site **#29** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.0				0.0
b	**WY2006**								0.0				0.5
c	**WY2007**								0.0				0.0
d	**WY2008**								0.0				0.0
e	**WY2009**								0.3				0.2
f	**WY2010**								0.0		0.0		0.0
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	0	0	0	0	0	0	0	1	0	1	0	2
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	1
	t_5	0	0	0	0	0	0	0	1	0	0	0	0
	b-a								0				1
	c-a								0				0
	d-a								0				0
	e-a								1				1
	f-a								0				0
	c-b								0				-1
	d-b								0				-1
	e-b								1				-1
	f-b								0				-1
	d-c								0				0
	e-c								1				1
	f-c								0				0
	e-d								1				1
	f-d								0				0
	f-e								-1				-1
	S_k	0	0	0	0	0	0	0	3	0	0	0	-1
	σ^2_S=								11.67				19.67
	$Z_k = S_k/\sigma_S$								0.88				-0.23
	Z^2_k								0.77				0.05

ΣZ_k= 0.65

ΣZ^2_k= 0.82

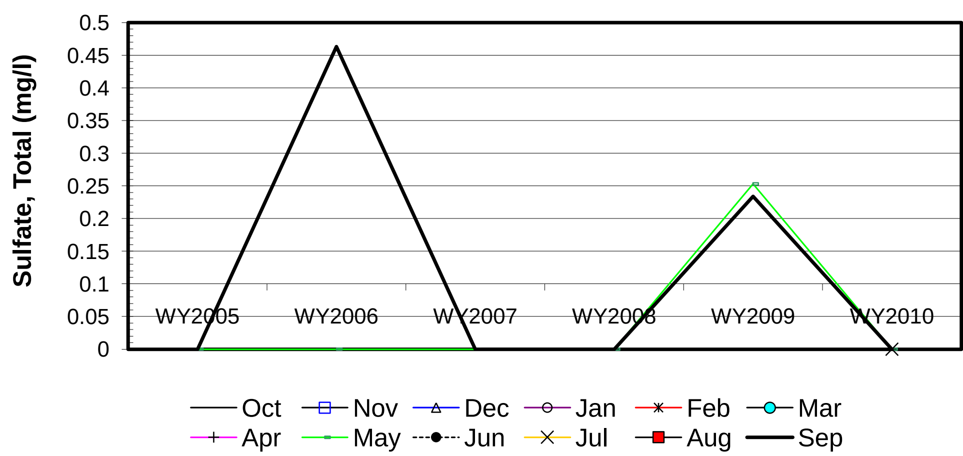
Z-bar=$\Sigma Z_k/K$= 0.33

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	4	0	0	1	1

Σn 13

ΣS_k 2

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$=		0.61	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.435**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.18	@α=5% Z= 1.64	H_0 (No trend)	ACCEPT
31.33	p	**0.571**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.00		0.00
0.050	0.00	**0.00**	0.00
0.100	0.00		0.00
0.200	0.00		0.00

Site **#29** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								2.9				2.9
b	**WY2006**								7.3				7.4
c	**WY2007**								5.7				2.9
d	**WY2008**								17.0				4.4
e	**WY2009**								10.1				10.9
f	**WY2010**								3.7		3.4		2.8
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				1
c-a								1				-1
d-a								1				1
e-a								1				1
f-a								1				-1
c-b								-1				-1
d-b								1				-1
e-b								1				1
f-b								-1				-1
d-c								1				1
e-c								1				1
f-c								-1				-1
e-d								-1				1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	3	0	0	0	-1

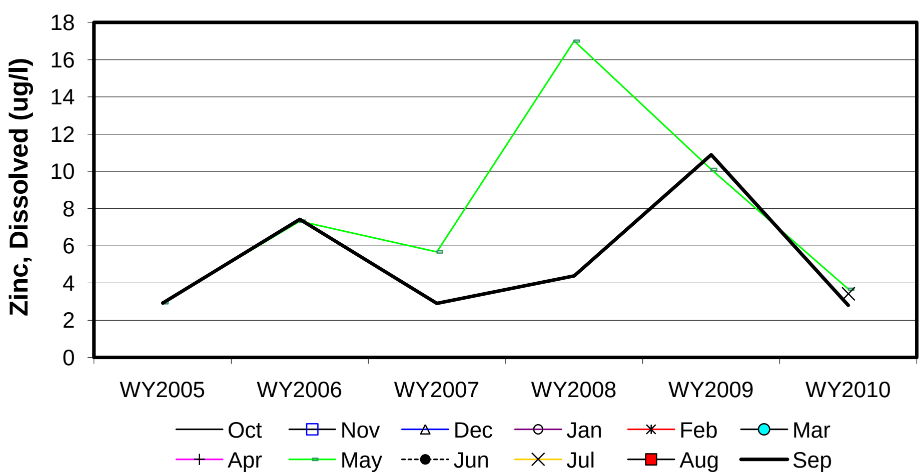
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$								28.33				28.33
$Z_k = S_k/\sigma_S$								0.56				-0.19
Z^2_k								0.32				0.04

$\Sigma Z_k=$	0.38
$\Sigma Z^2_k=$	0.35
Z-bar=ΣZ_k/K=	0.19

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	2

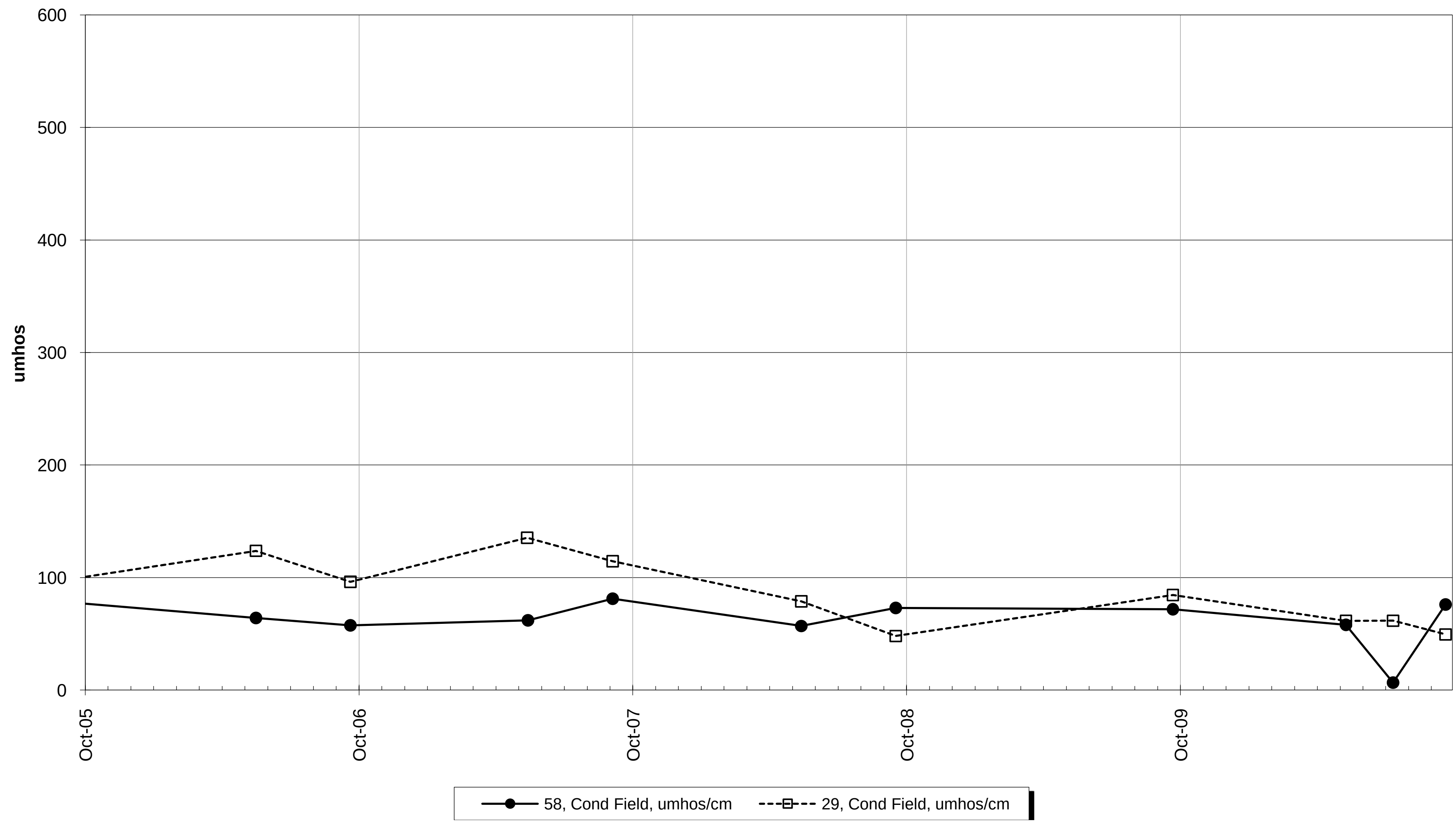
$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	0.28	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.595**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.13	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
56.67	**p** **0.553**		**H_A** (± trend)	REJECT

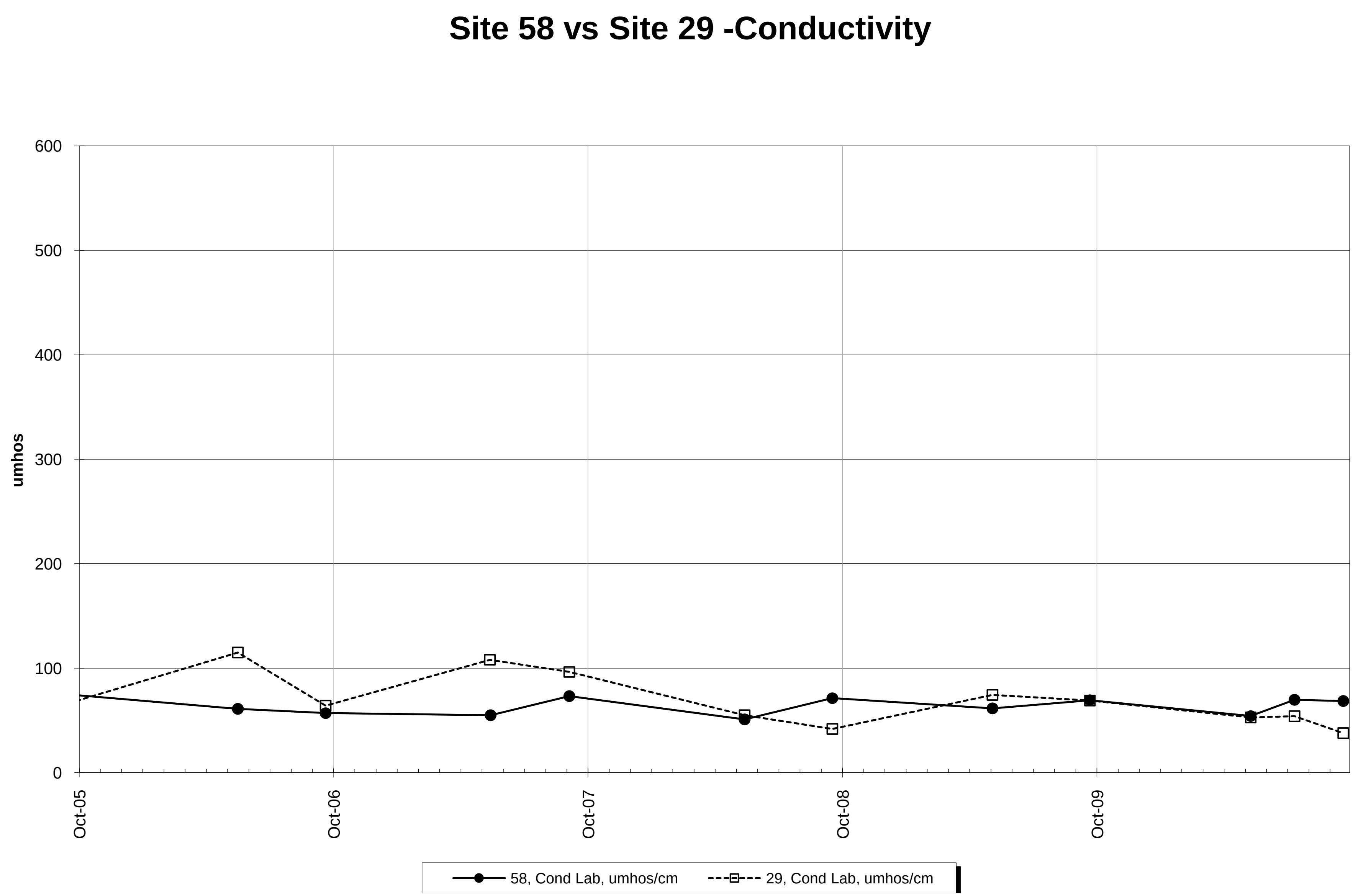


Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-1.62		3.56
0.050	-0.96	**0.32**	1.83
0.100	-0.77		1.47
0.200	-0.14		1.19

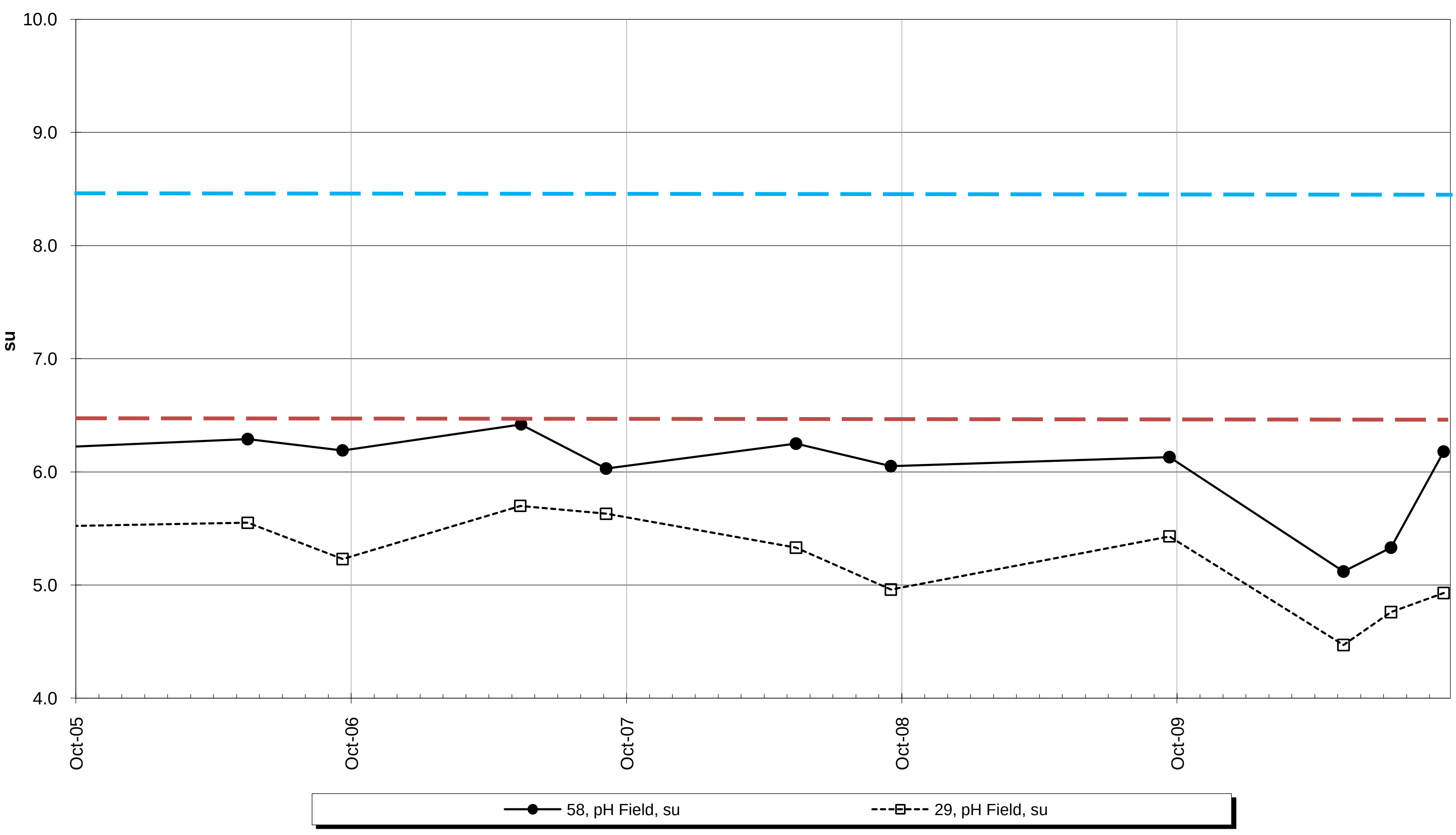
Site 58 vs Site 29 -Conductivity-Field



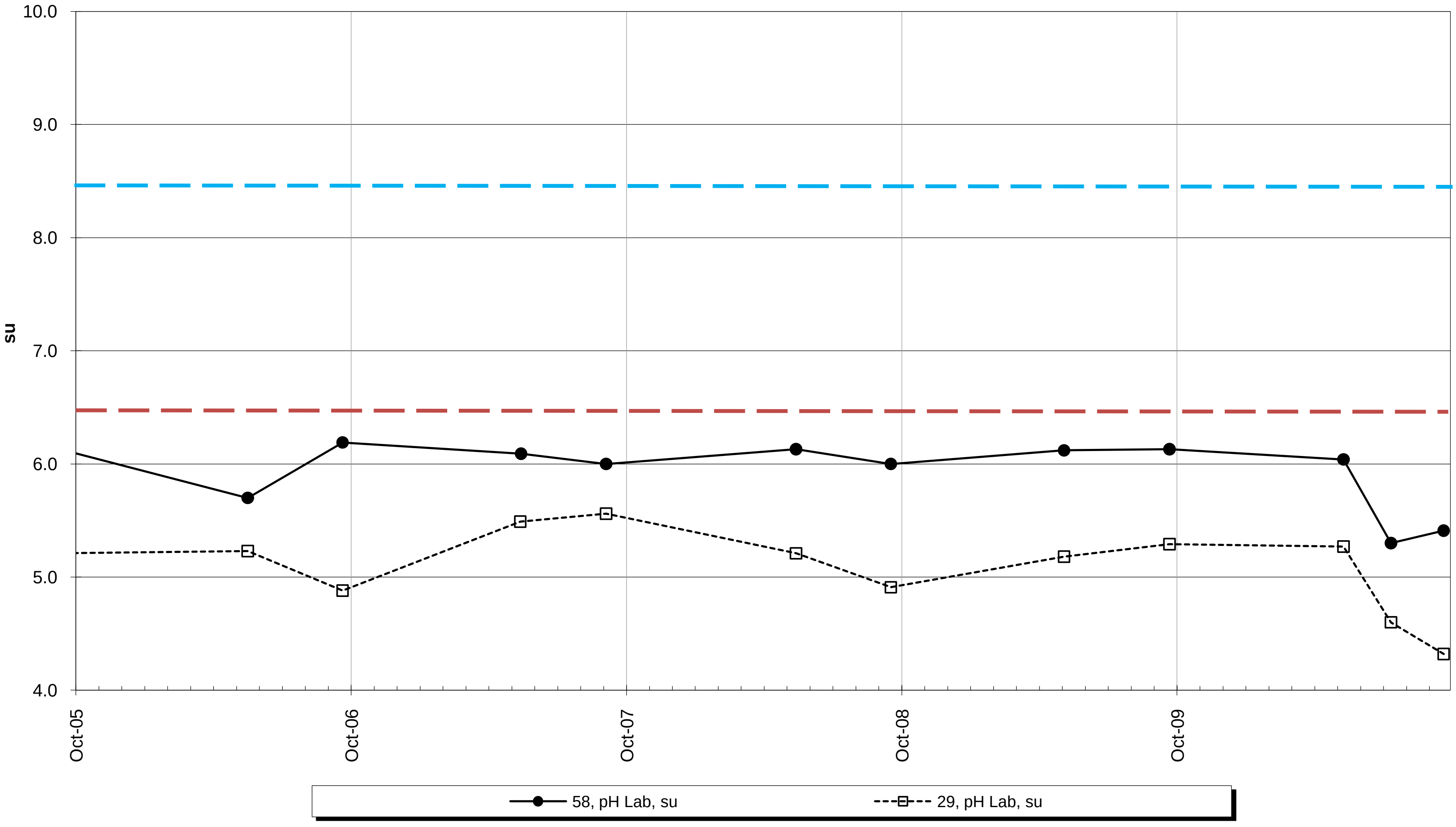


Site 58 vs Site 29 -Conductivity
umhos
600
500
400
300
200
100
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, Cond Lab, umhos/cm
29, Cond Lab, umhos/cm

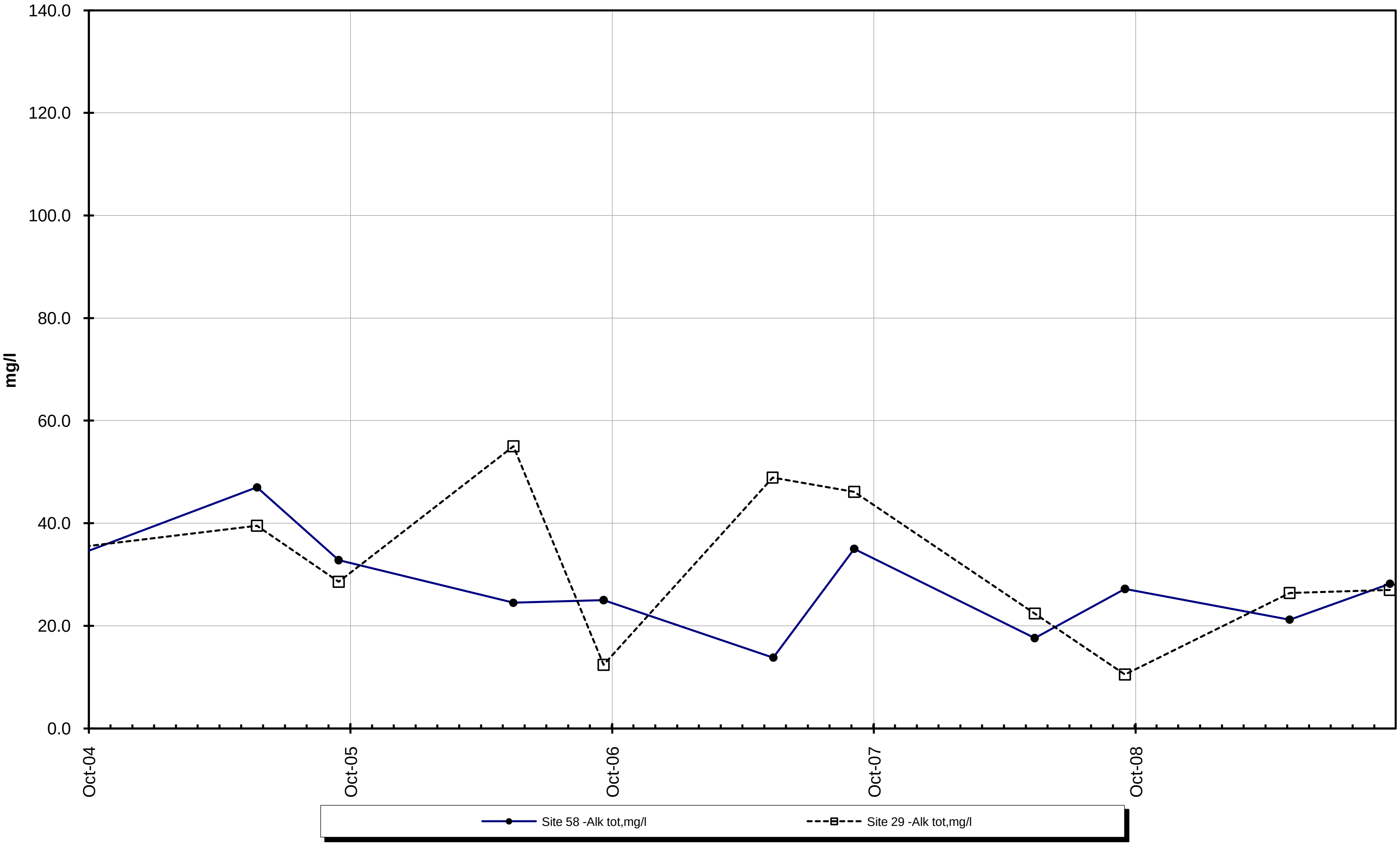
Site 58 vs Site 29 -Field pH



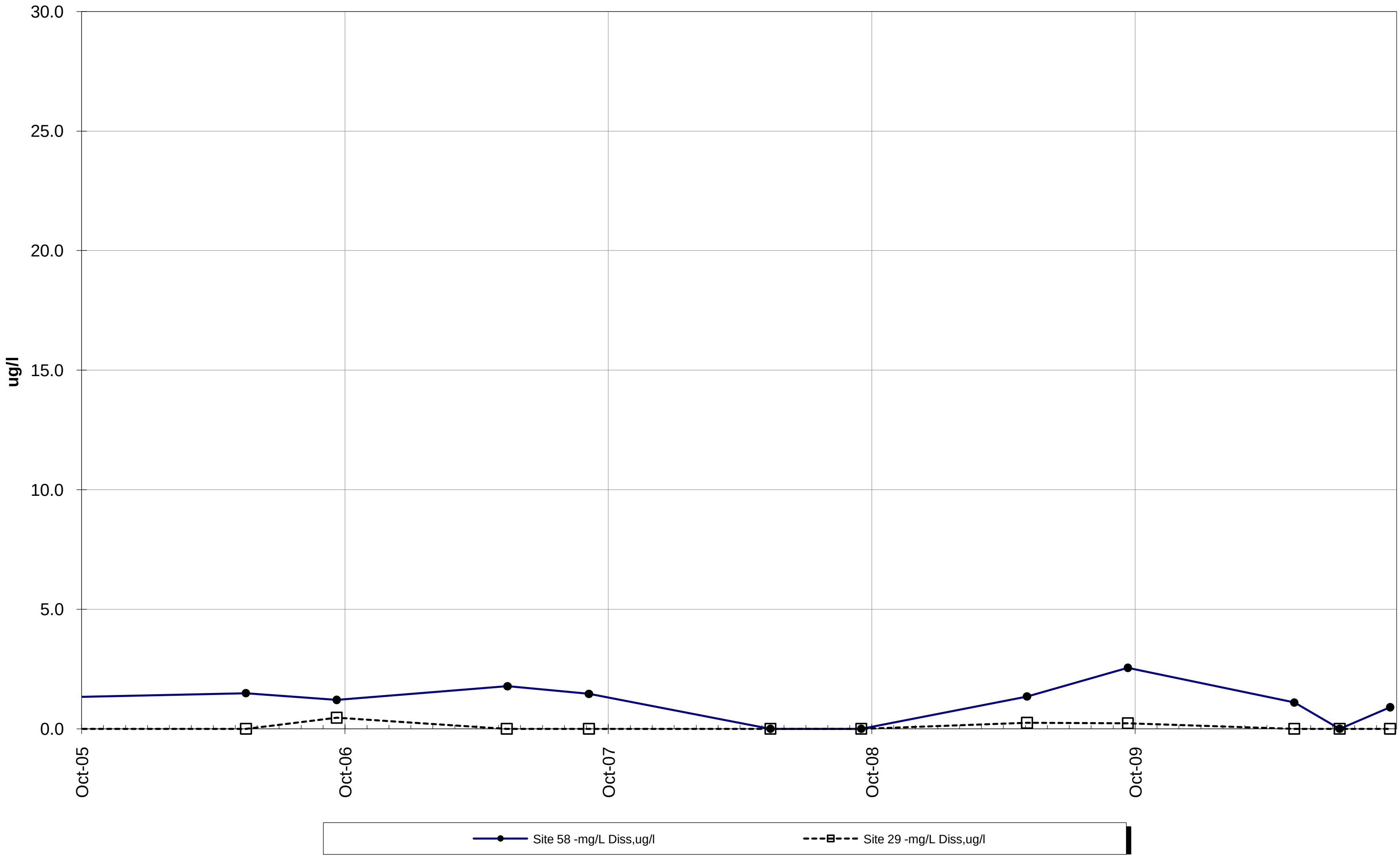
Site 58 vs Site 29 -Lab pH



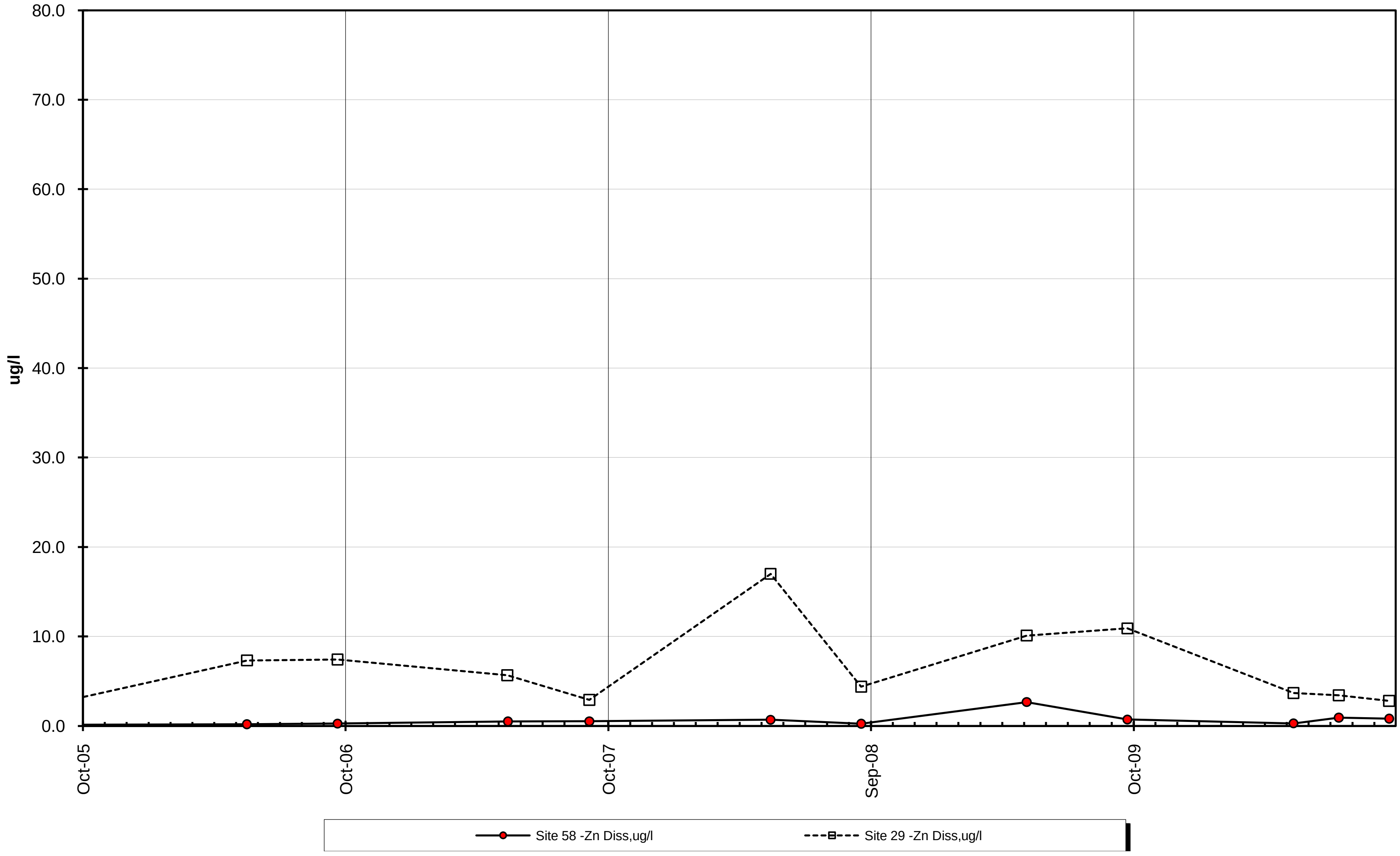
Site 58 vs. Site 29 -Total Alkalinity



Site 58 vs. Site 29 -Total Sulfate



Site 58 vs. Site 29 -Dissolved Zinc



INTERPRETIVE REPORT
SITE 32 “MONITORING WELL 5S”

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2001.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Thirteen results exceeding these criteria have been identified, as listed in the table below. Six of these data points are for pH, both field and laboratory, showing values below the lower limit of 6.5 su listed in AWQS. Field and laboratory pH for Site 32 has historically resulted in values ranging from a pH of 4.5 to 5.5 su which are characteristic for wells completed in organic rich peat sediments. Three exceedances are for total alkalinity samples taken during the WY 2010. Another, three exceedances are for dissolved lead concentrations during the season. Due to the low hardness for this site, 30 of the past 31 samples have returned lead values higher than the AWQS. As noted in previous reports, fugitive tailings dust may be contributing to the elevated lead levels monitored at Site 32. Though the values exceed the AWQS the general trend over the past four years has been a decrease in the concentration. The final exceedance was for dissolved chromium (11.7 µg/L) in the May 2010 sampling. This

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	4.64		6.5	Aquatic Life, chronic
13-Jul-10	pH Field, su	4.75		6.5	Aquatic Life, chronic
21-Sep-10	pH Field, su	5.15		6.5	Aquatic Life, chronic
11-May-10	pH Lab, su	5.23		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	4.48		6.5	Aquatic Life, chronic
21-Sep-10	pH Lab, su	4.5		6.5	Aquatic Life, chronic
11-May-10	Lead, Dissolved ug/L	1.79	9.64	0.54	Aquatic Life, chronic
13-Jul-10	Lead, Dissolved ug/L	2.34	9.17	0.54	Aquatic Life, chronic
21-Sep-10	Lead, Dissolved ug/L	1.84	8.05	0.54	Aquatic Life, chronic
11-May-10	Alkalinity Total, mg/L	6.4		20	Aquatic Life, chronic
13-Jul-10	Alkalinity Total, mg/L	-1		20	Aquatic Life, chronic
21-Sep-10	Alkalinity Total, mg/L	-1		20	Aquatic Life, chronic
11-May-10	Chromium, Dissolved µg/L	11.7		11.00	Aquatic Life, chronic

concentration is similar to the concentration (11.6 µg/L) recorded the previous year in May. By the July sampling the concentration was below the AWQS limit and in a range that appears to be normal for the site. Furthermore, the AWQS is for Cr(VI) and the analysis is for unspeciated dissolved chromium. Speciation of the sample at the current pH level would results in Cr existing as Cr(III). Following along this reasoning, the AWQS for Cr(III) is hardness dependent. A hardness of 9.6 mg/L (May 2010) would result in an upper chronic limit of 12µg/L. Because Cr(III) is a hardness based criteria a slight decrease in the hardness can have a significant impact on the AWQS. It is HGCMC intention to request Batelle Marine Science run the May 2011 sample for the various chromium species, if possible.

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. No obvious trends are apparent except for dissolved lead which has decreased the last four water years from a peak in WY2006. A non-parametric statistical analysis for trend was performed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). No significant trends were identified with this analysis. Trend analysis was not performed on the total sulfate dataset because of a change in the method detection limit used by Analytica Laboratories. A primary assumption of the Mann-Kendall test is "… only one censoring threshold exists. When more than one detection limit exists, the Mann-Kendall test cannot be performed without further censoring the data." In order to prevent this from occurring HGCMC has worked to establish a consistent MDL for sulfate from the laboratory.

Site 32-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	0.91	0		
pH, Lab	6	0.30	0		
Alkalinity, Total	6	0.04	0		
Sulfate, Total	6	Discontinuation in the continuity of the MD			
Zinc, Dissolved	6	0.55	0		

(1): Number of years (2):Significance level

Additional X-Y plots have been generated for alkalinity, pH, conductance, sulfate, and dissolved zinc that co-plot data from Site 32 and Site 58, the upgradient control site, to aid in comparison between those two sites. Typically, laboratory conductivity, total sulfate, and total alkalinity are slightly higher at Site 58 while laboratory pH is more basic at Site 58 than at Site 32. Dissolved zinc levels are higher at Site 32 than at Site 58. The long-term median value for dissolved zinc since June 1998 is 9.72 µg/L, which is elevated with respect to Site 58 and the other shallow wells completed into peat (*e.g.* Site 27 and Site 29). The previously discussed mechanisms (fugitive dust) that may be elevating the dissolved lead levels would also be expected to increase dissolved zinc. In addition the lower pH at Site 32 with respect to the other shallow wells may exacerbate the elevated zinc concentration found there due to higher zinc solubility at a lower pH.

Table of Results for Water Year 2010

Site 32 "MW-5S"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							6.8	NOT SCHEDULED FOR SAMPLING	9.6	NOT SCHEDULED FOR SAMPLING	9.8	9.6
Conductivity-Field(µmho)								72		67		67	67
Conductivity-Lab (µmho)								55		57		61	57
pH Lab (standard units)								5.23		4.48		4.50	4.50
pH Field (standard units)								4.64		4.75		5.15	4.75
Total Alkalinity (mg/L)								6.4		<1.0		<1.0	0.5
Total Sulfate (mg/L)								<10.0		<10.0 UJ		<30.0 J	5.0
Hardness (mg/L)								9.6		9.2		8.1	9.2
Dissolved As (ug/L)								5.880		5.510		4.200	5.510
Dissolved Ba (ug/L)								15.6		16.3		14.7	15.6
Dissolved Cd (ug/L)								0.020		0.024		0.019 J	0.020
Dissolved Cr (ug/L)								11.700		2.860		1.660	2.860
Dissolved Cu (ug/L)								1.080		1.150		0.883	1.080
Dissolved Pb (ug/L)								1.790		2.340		1.840	1.840
Dissolved Ni (ug/L)								3.640		3.770		3.260	3.640
Dissolved Ag (ug/L)								0.004		<0.004		<0.008	0.004
Dissolved Zn (ug/L)								11.90		9.88		8.50	9.88
Dissolved Se (ug/L)								0.505		<0.114		0.347 J	0.347
Dissolved Hg (ug/L)								0.002310		0.001870		0.003470	0.002310

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

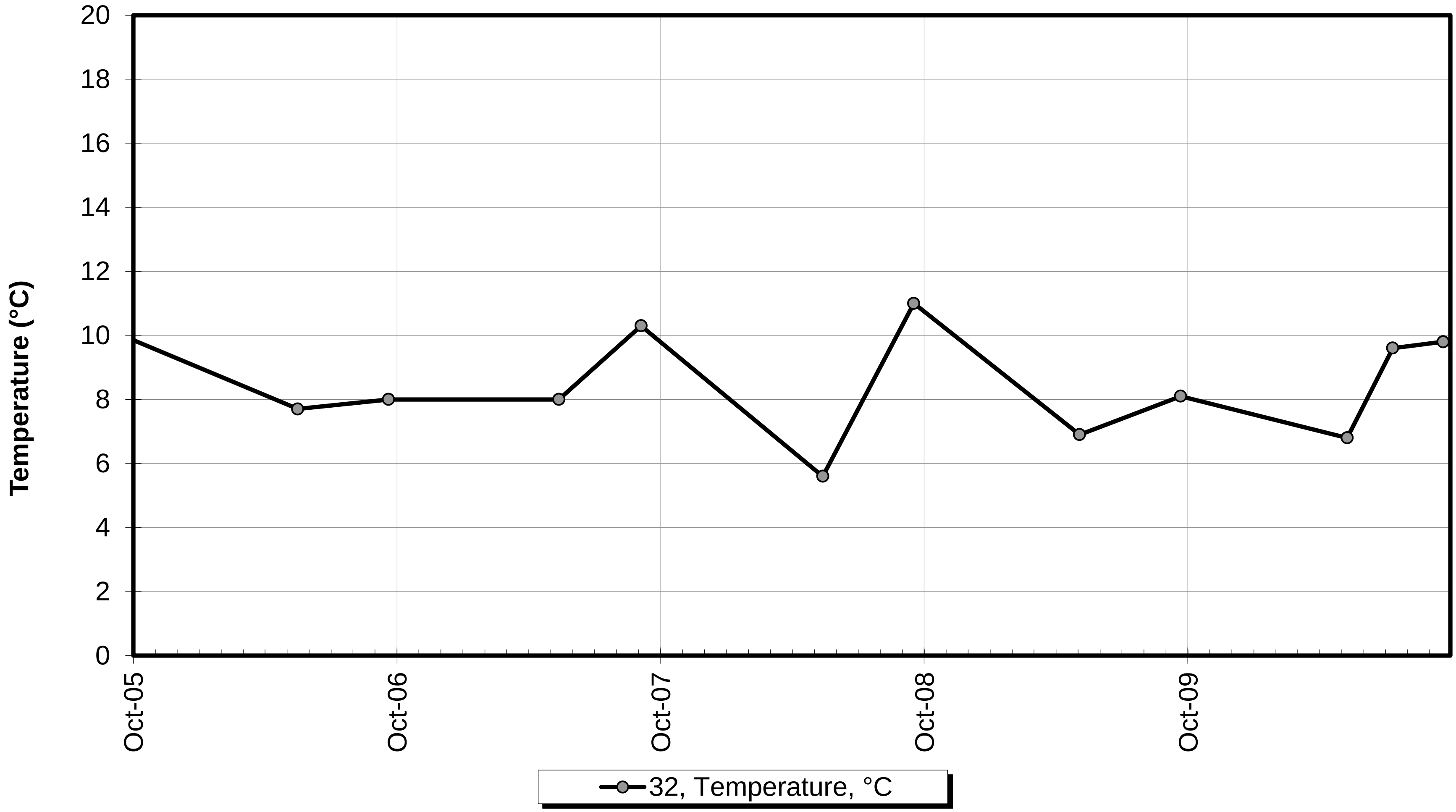
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

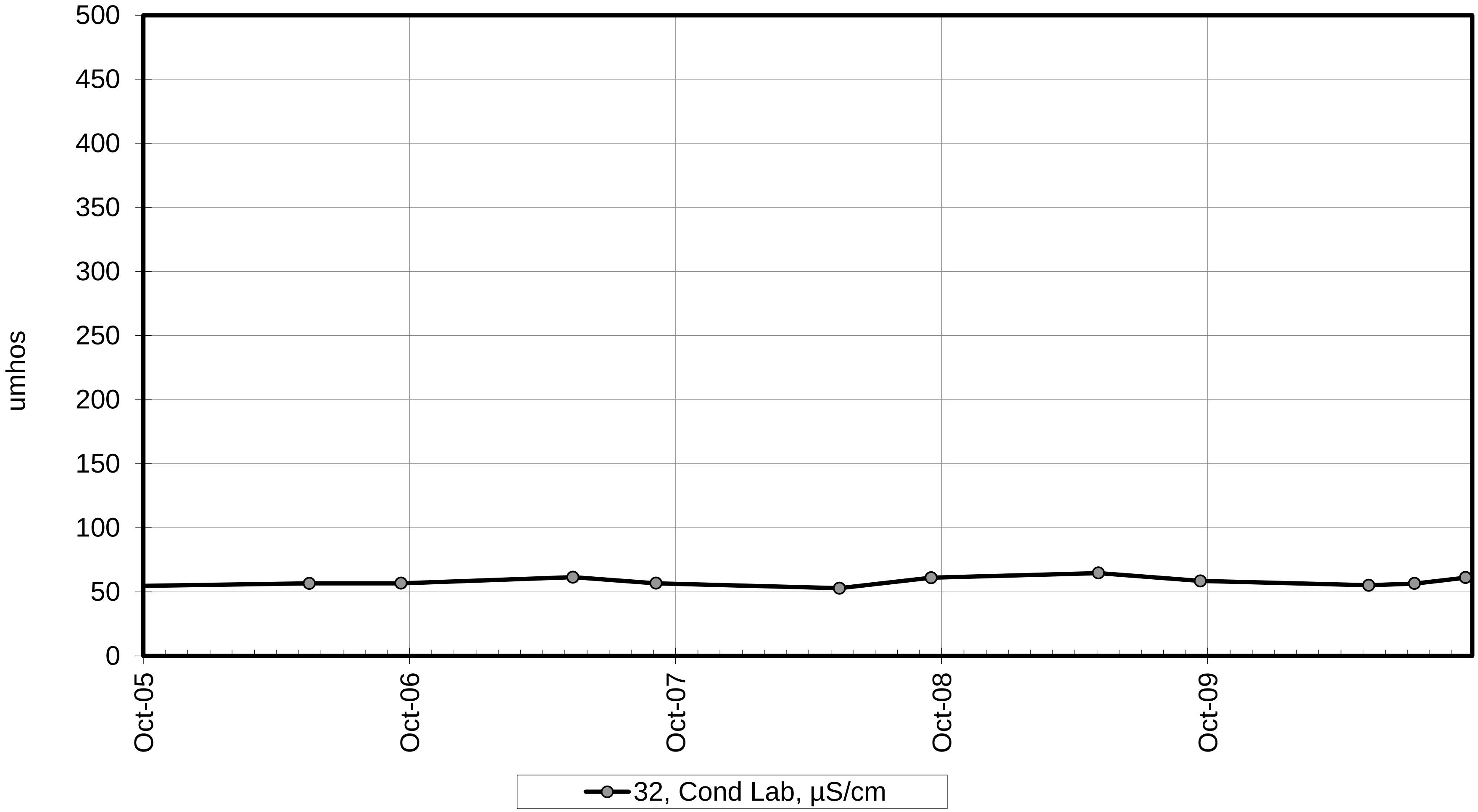
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
32	5/11/2010	10:47 AM				
			Ag diss, µg/l	0.00403	J	Below Quantitative Range
			SO4 Tot, mg/l	0	UJ	Sample Temperature
32	7/13/2010	1:22 PM				
			SO4 Tot, mg/l	0	UJ	Sample Reciept Temperature
32	9/21/2010	10:32 AM				
			Cd diss, µg/l	0.0191	J	Below Quantitative Range
			Se diss, µg/l	0.347	J	Below Quantitative Range
			SO4 Tot, mg/l	0	J	Sample Receipt Temperature

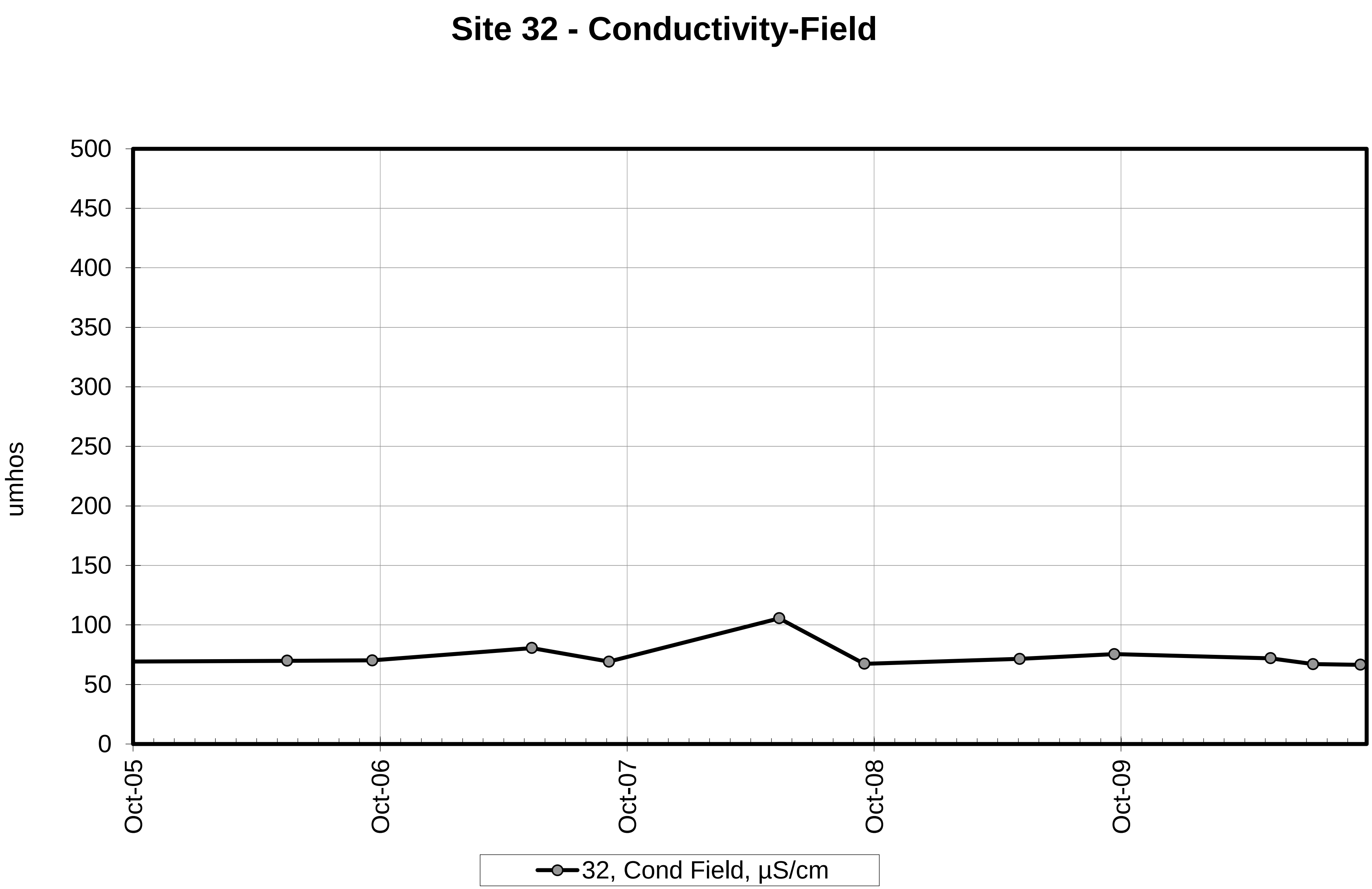
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

Site 32 -Water Temperature

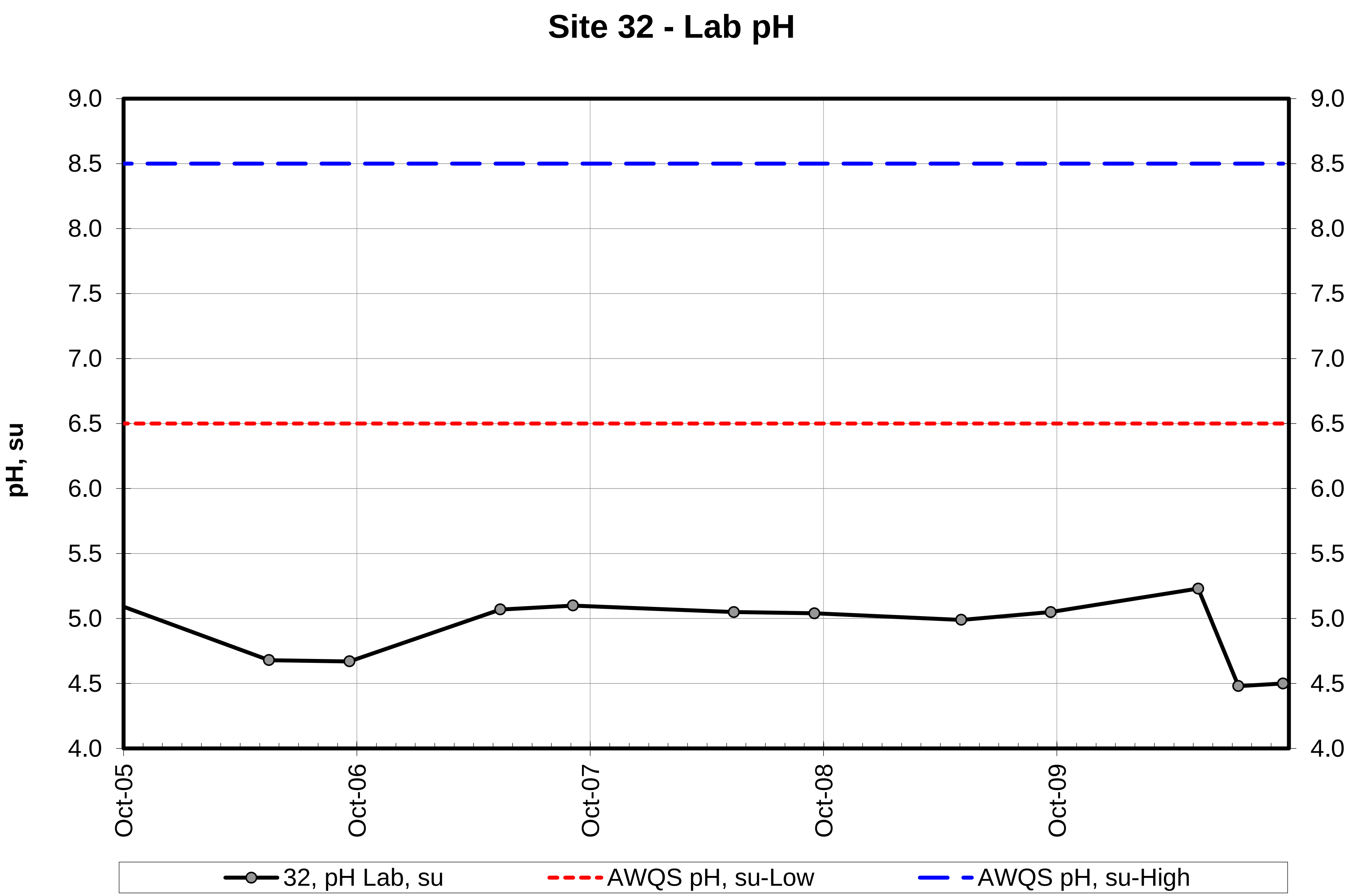


Site 32 - Conductivity-Lab

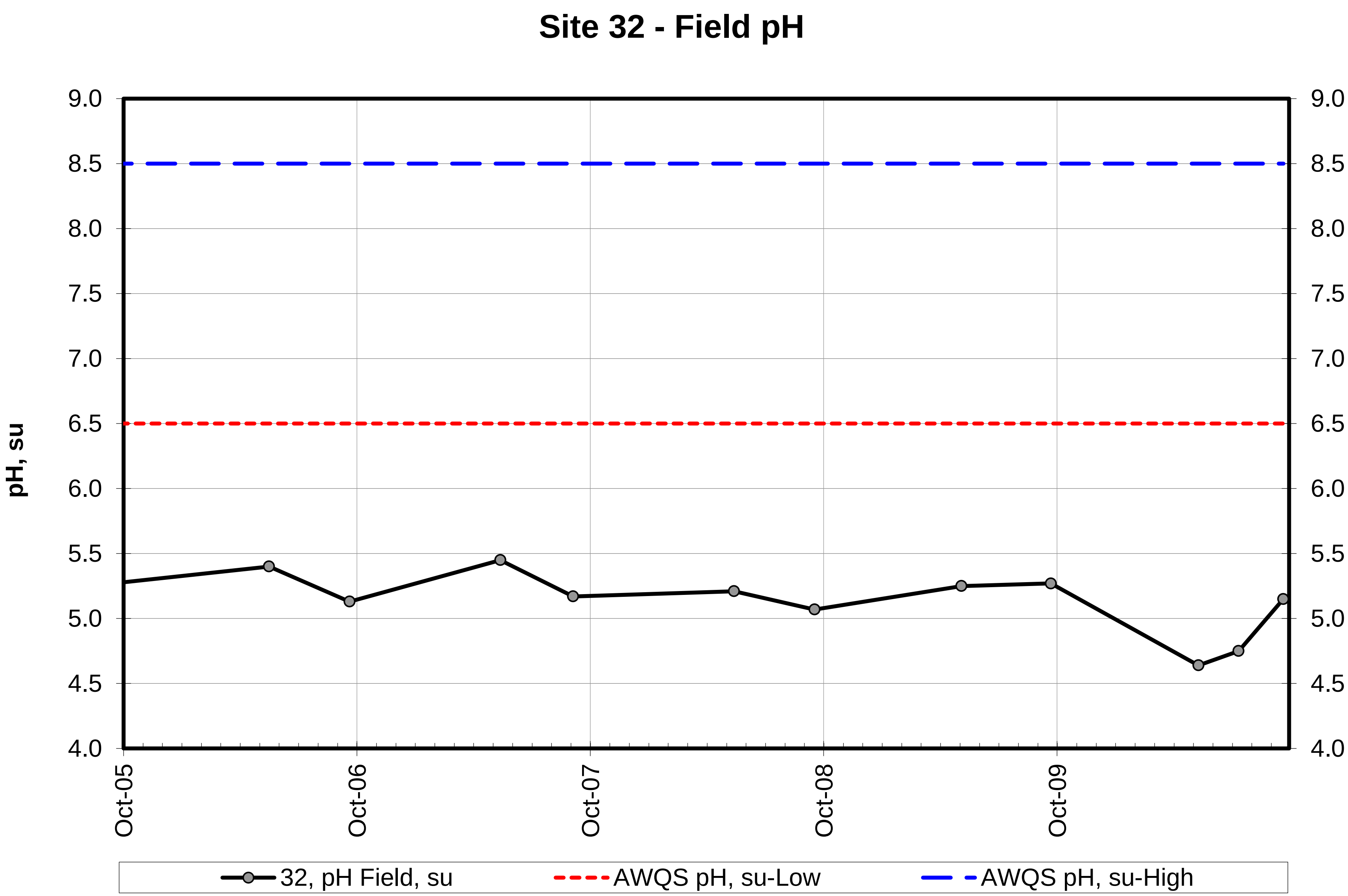


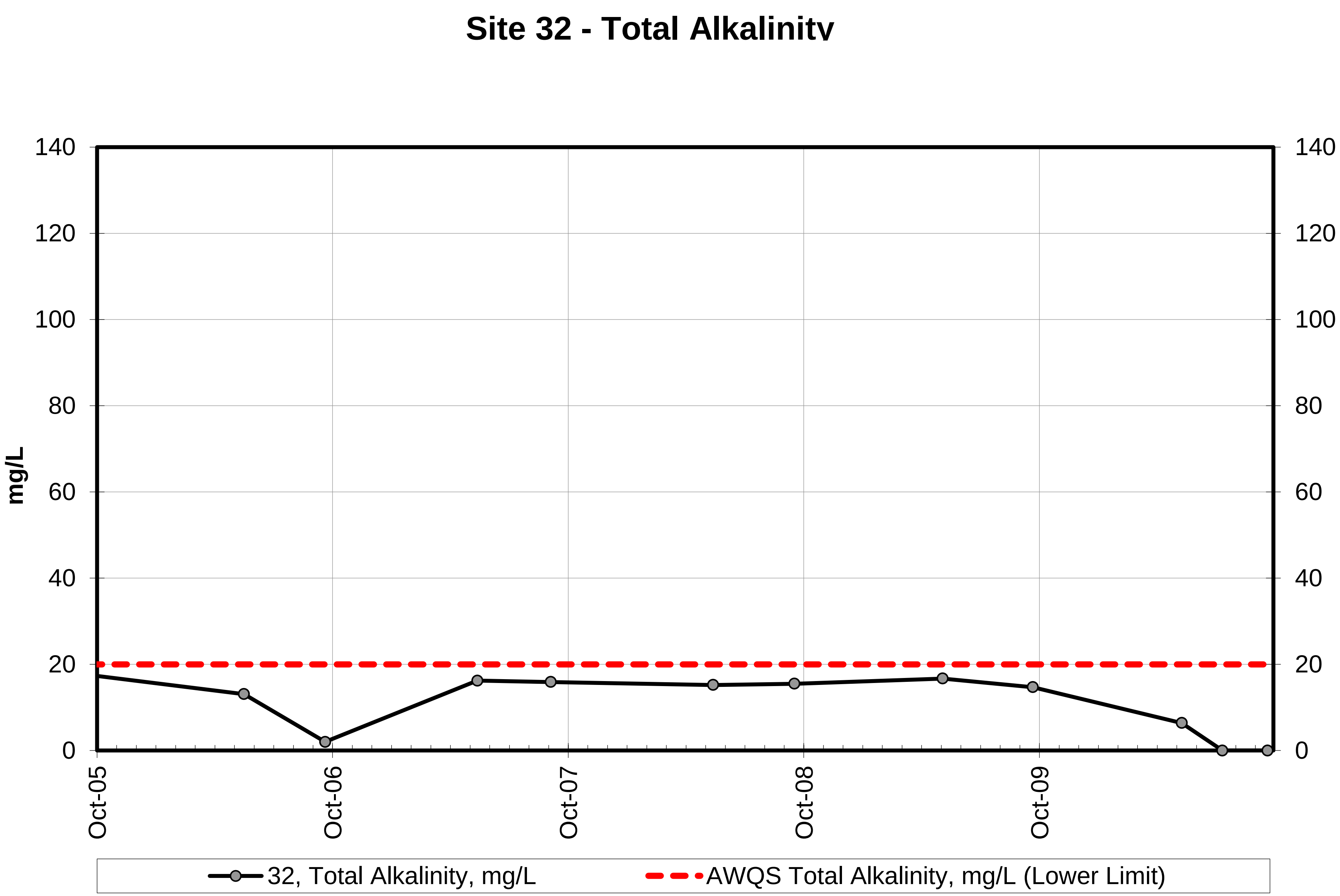


Site 32 - Conductivity-Field
umhos
500
450
400
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Cond Field, µS/cm



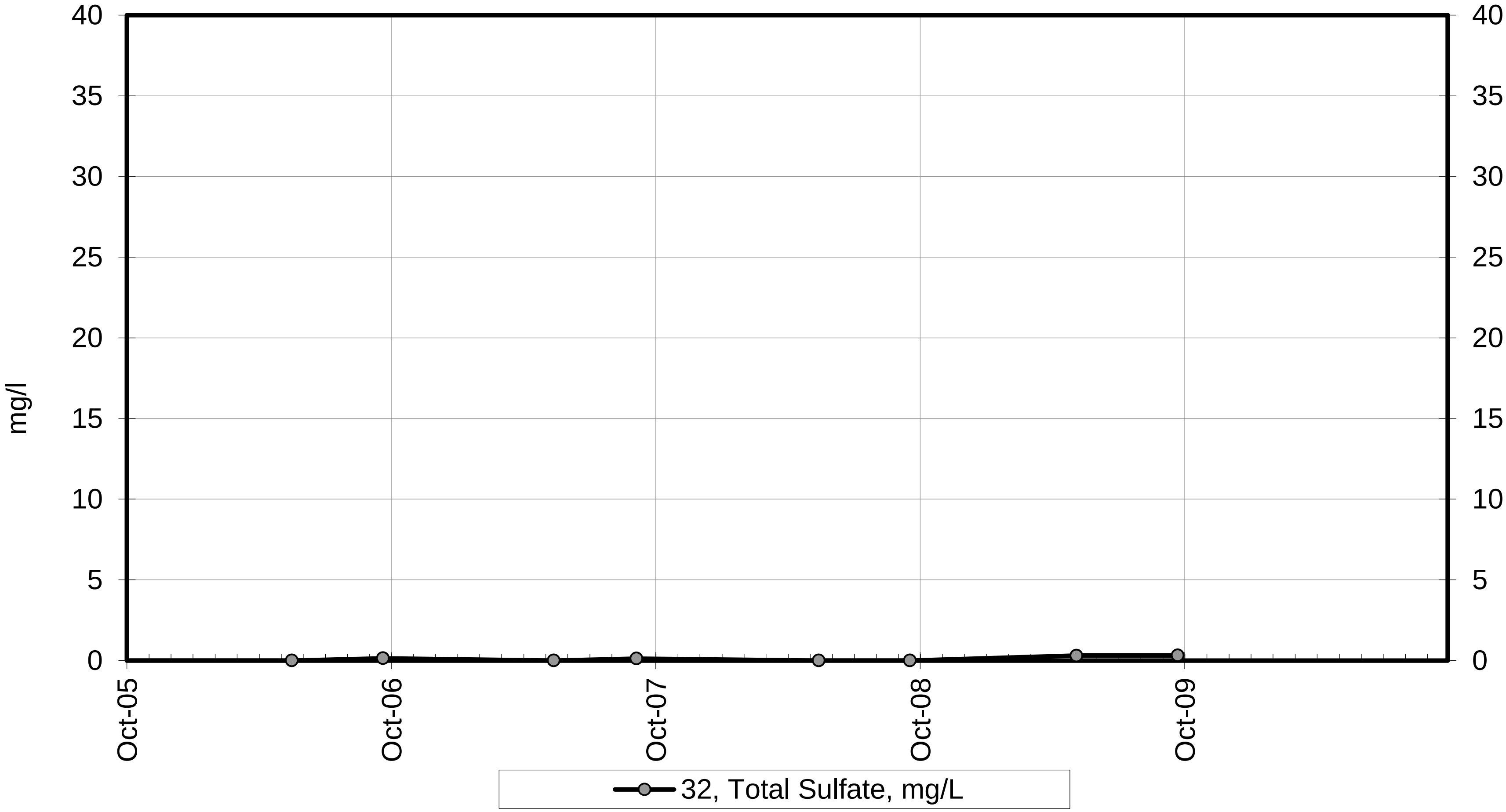
Site 32 - Lab pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High


Site 32 - Field pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High



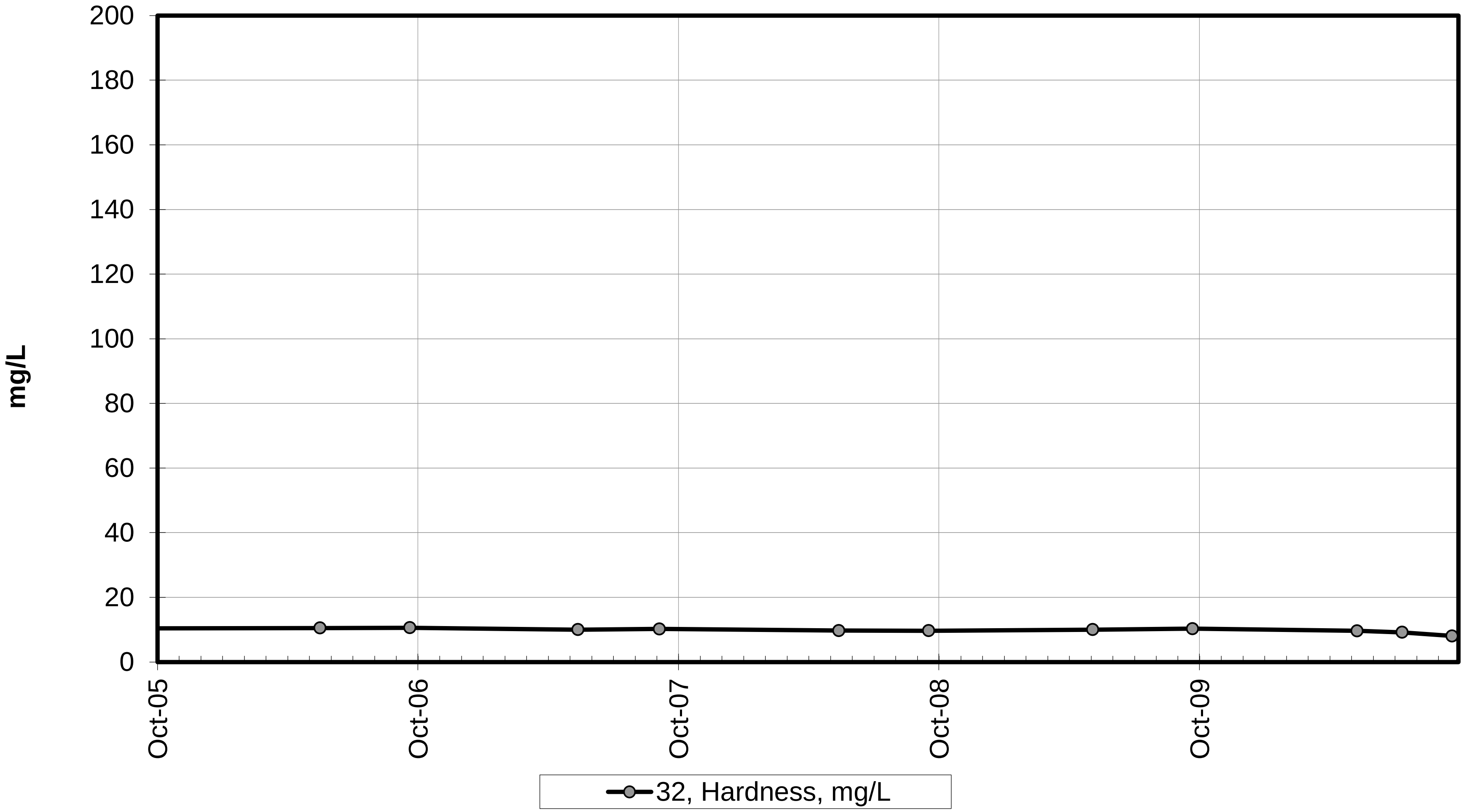
Site 32 - Total Alkalinity
mg/L
0
20
40
60
80
100
120
140
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

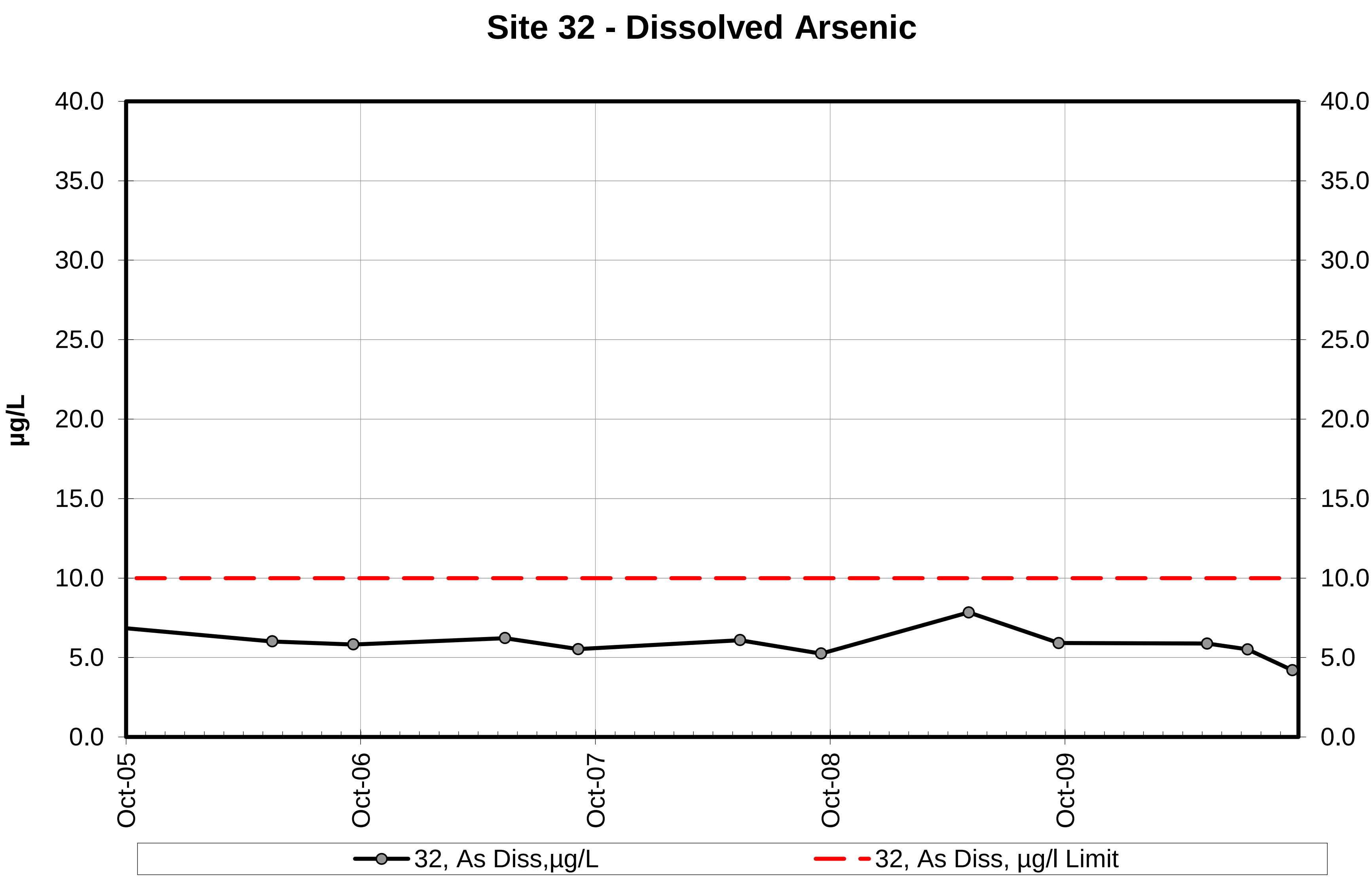
Site 32 - Total Sulfate



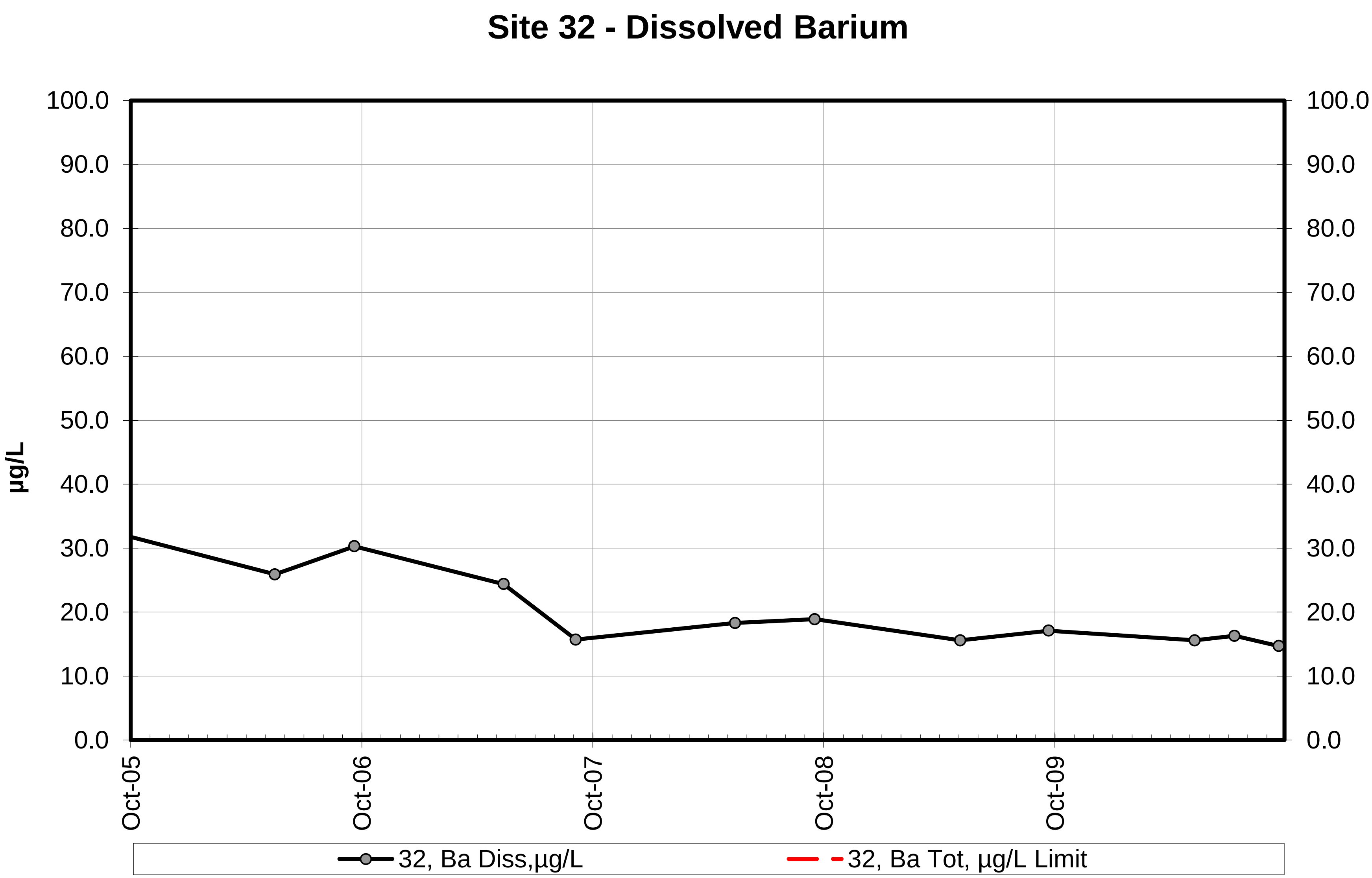
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

Site 32 - Hardness

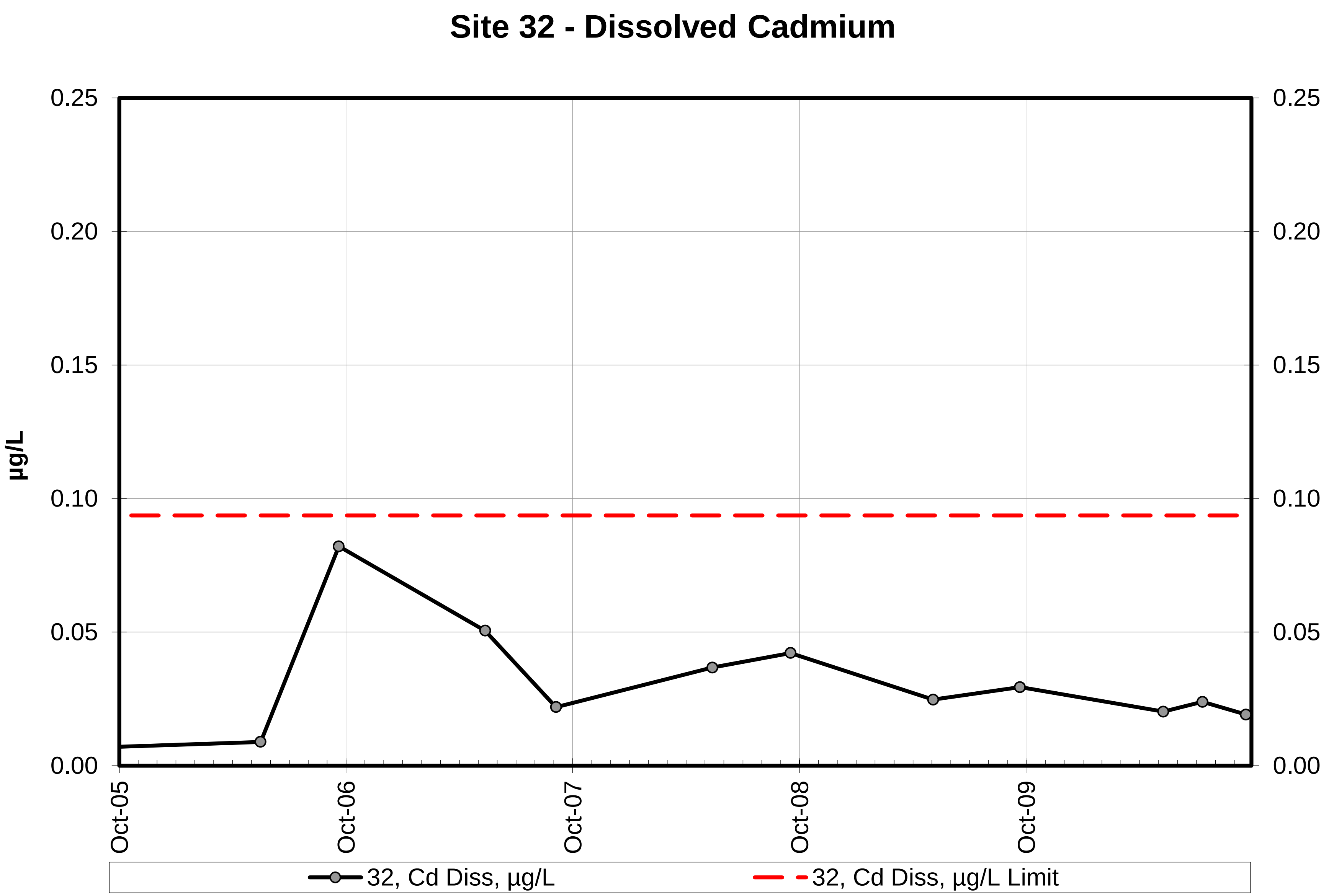


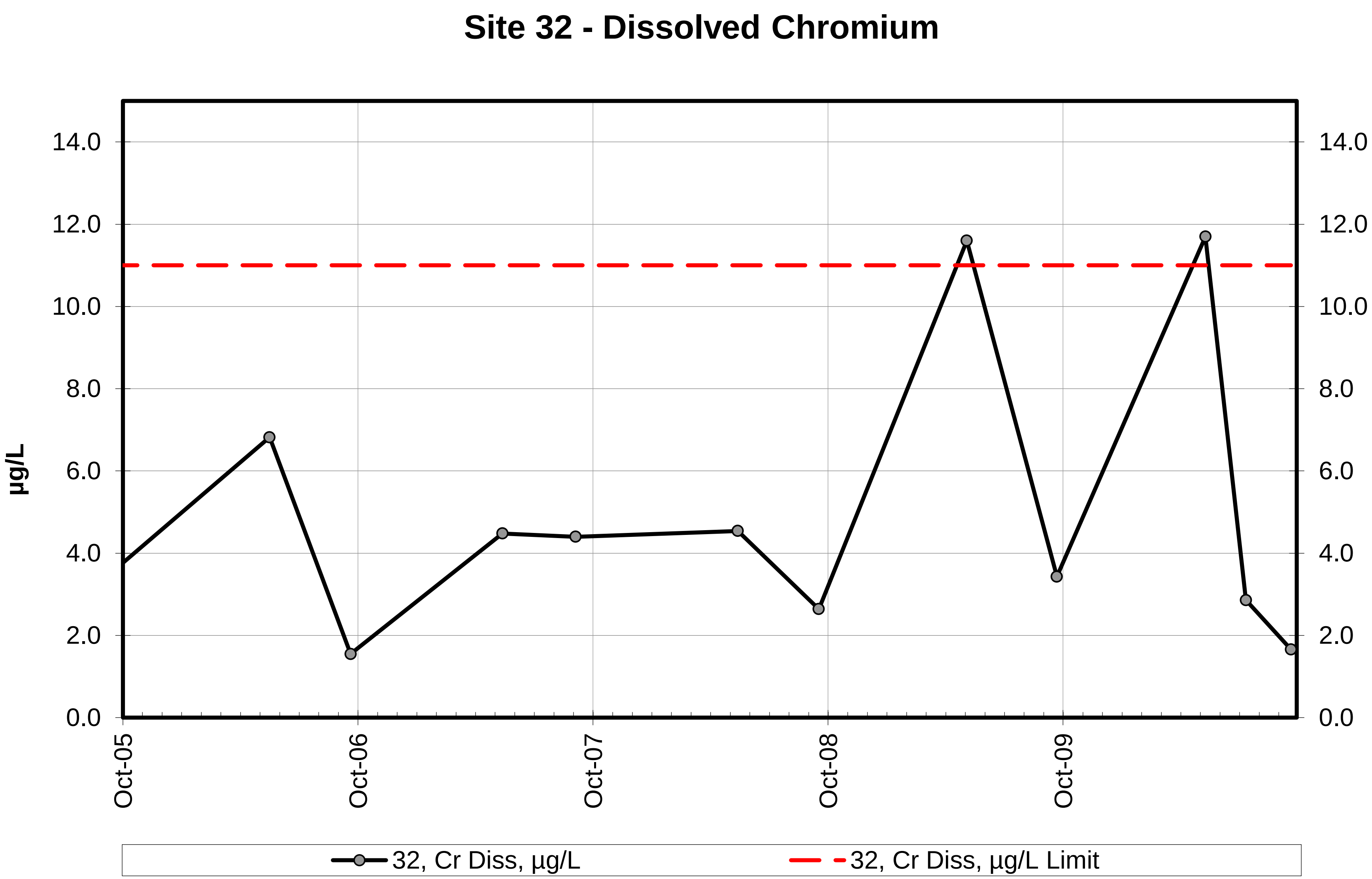


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

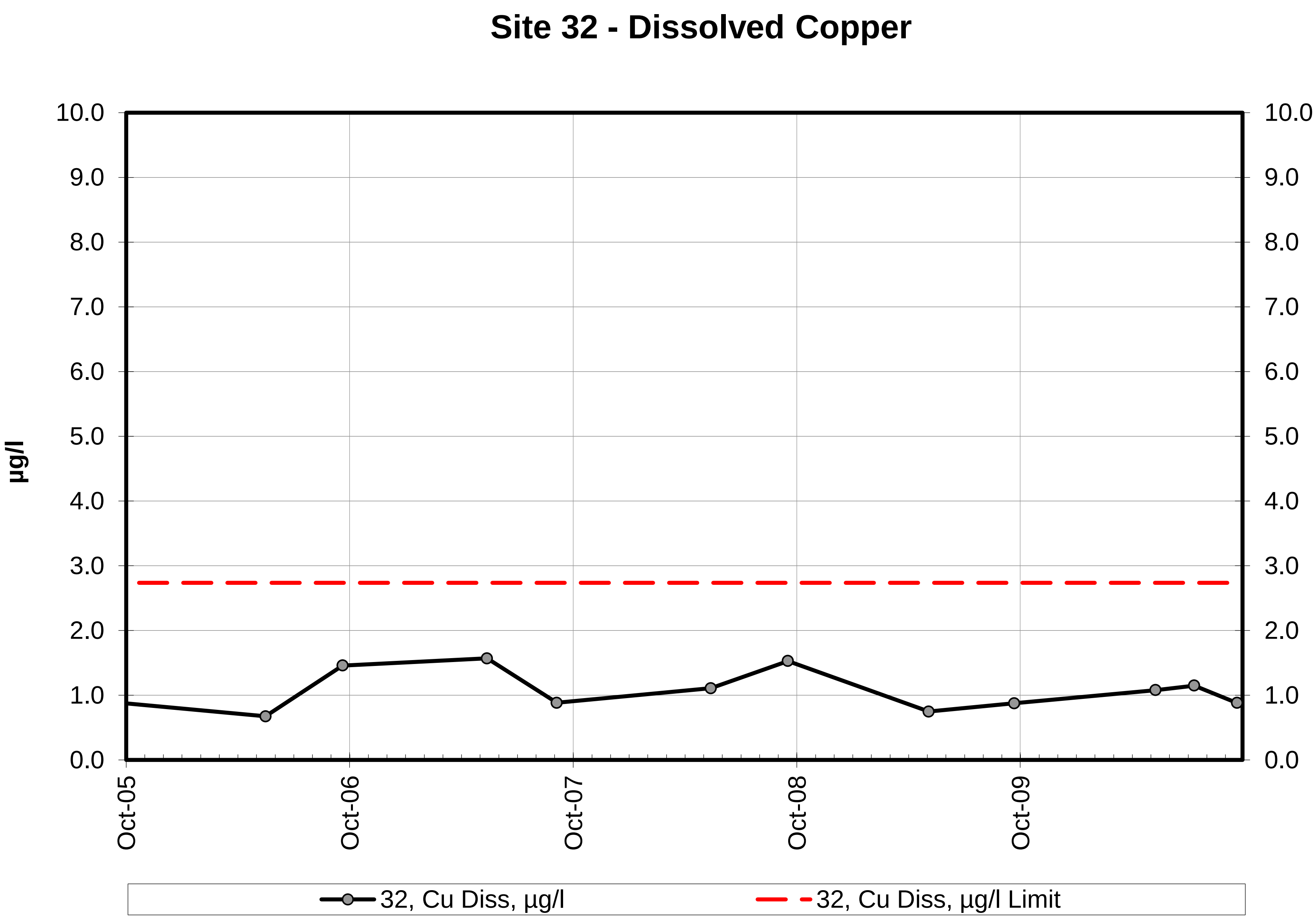


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination


Site 32 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Cd Diss, µg/L
32, Cd Diss, µg/L Limit

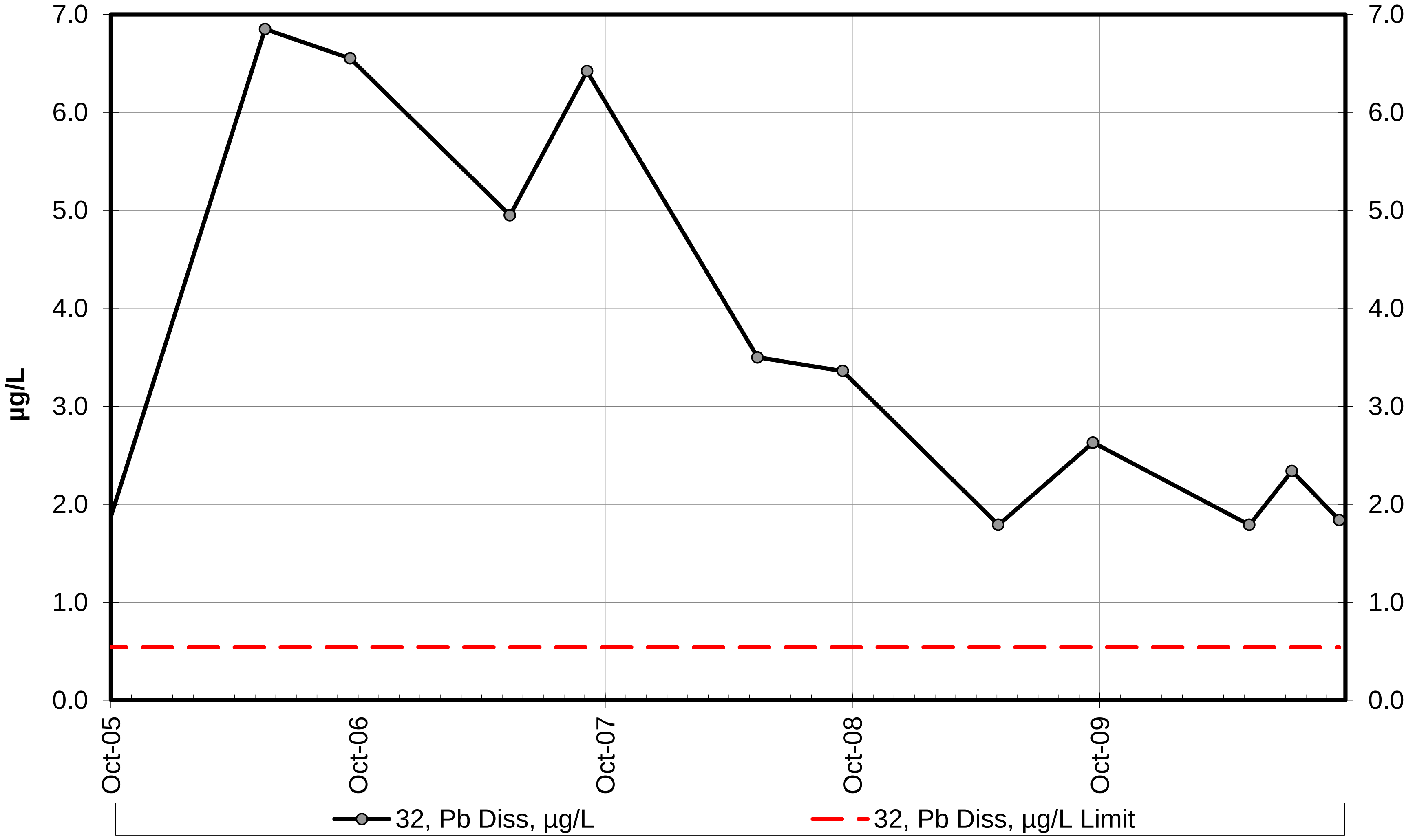


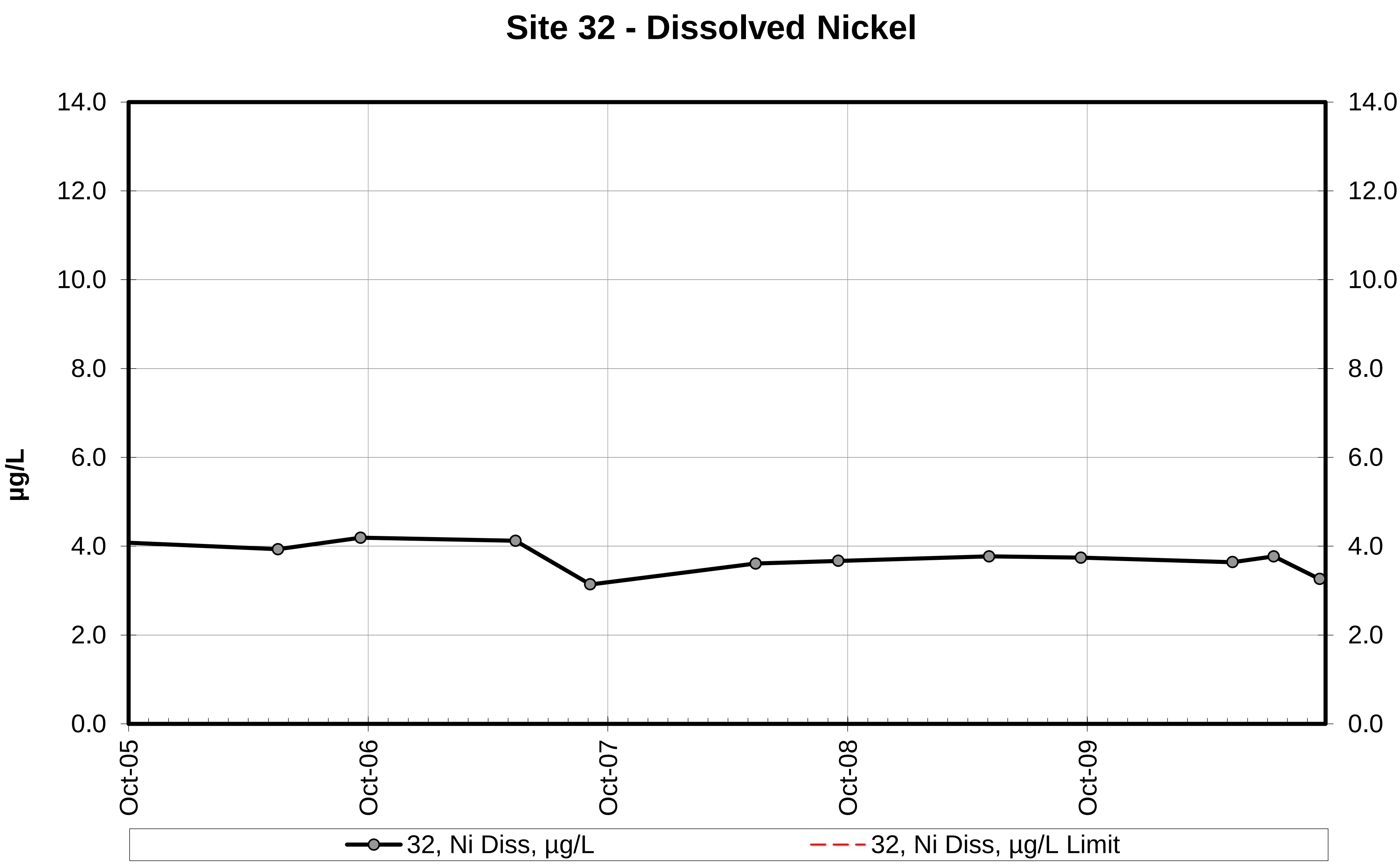
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



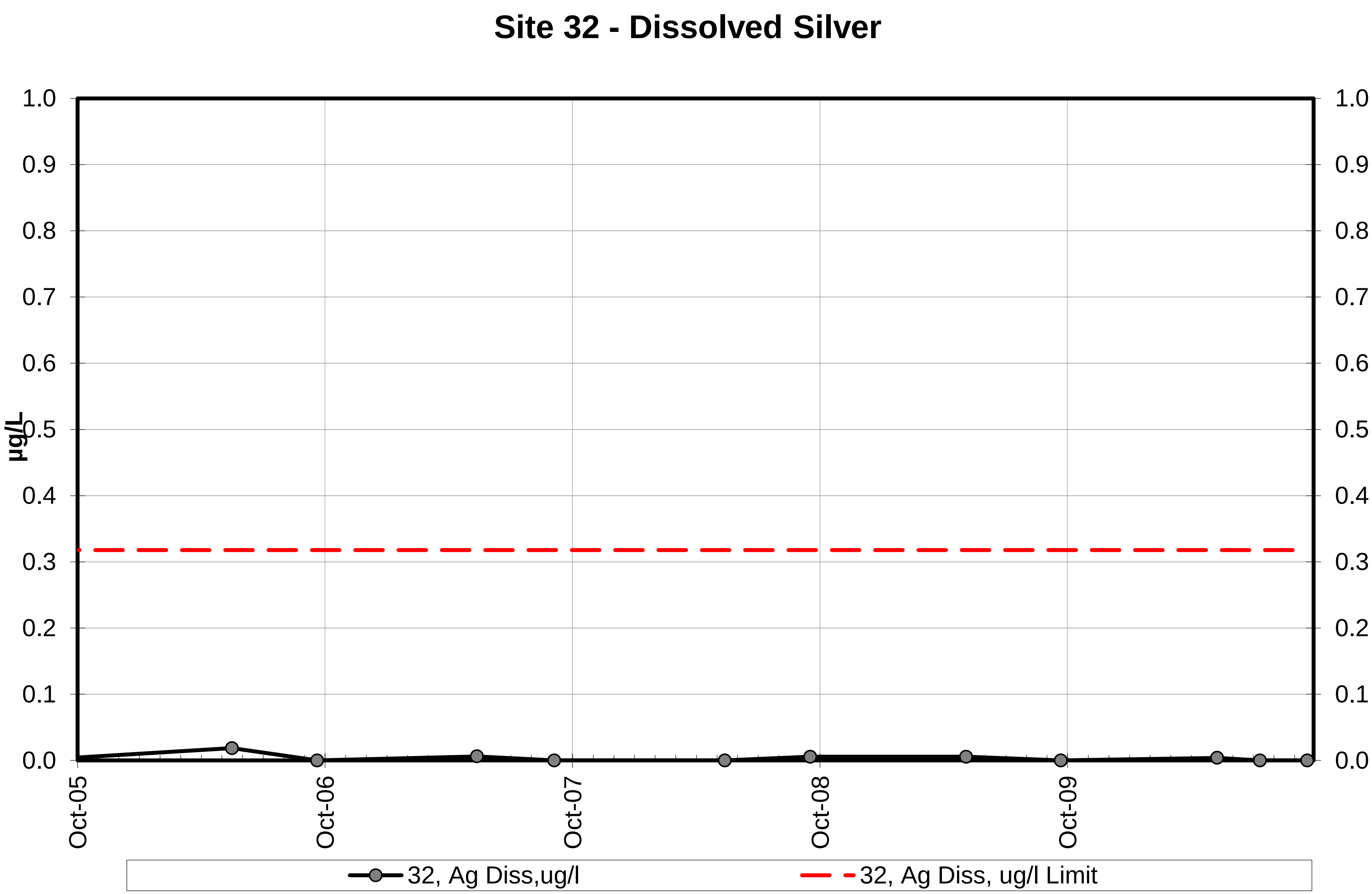
Site 32 - Dissolved Copper
µg/l
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Cu Diss, µg/l
32, Cu Diss, µg/l Limit

Site 32 - Dissolved Lead

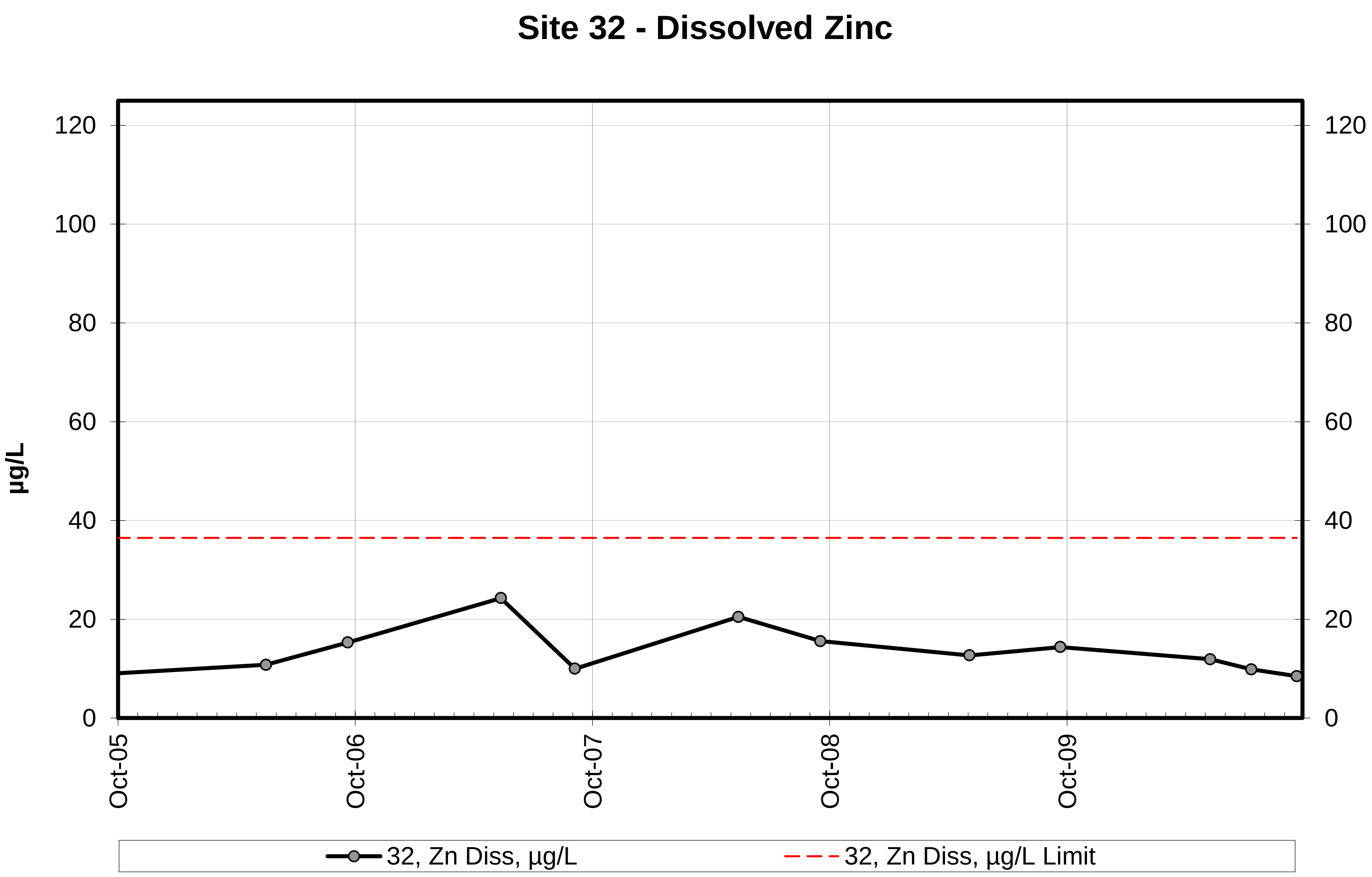




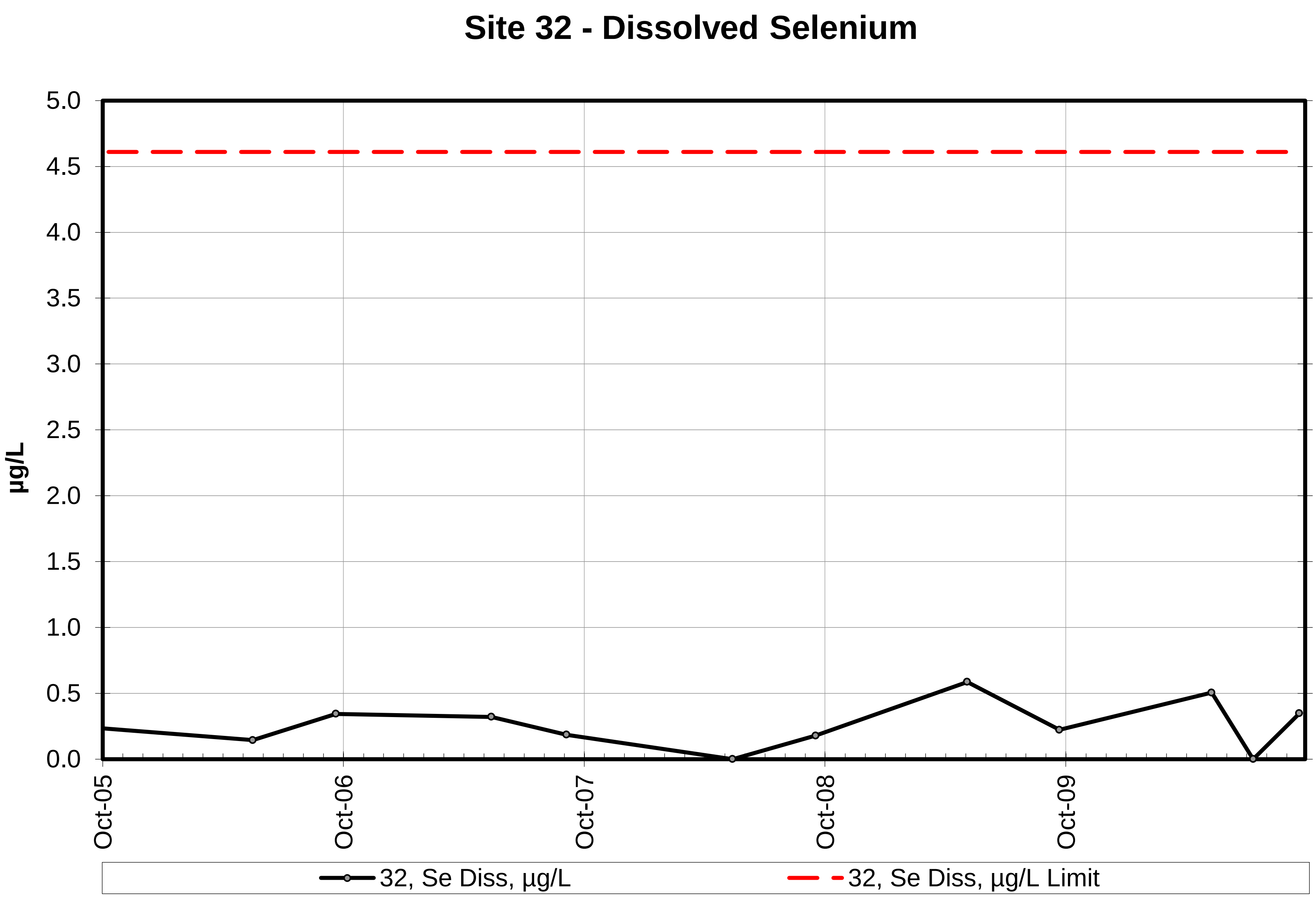
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.



Site 32 - Dissolved Silver
µg/L
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Ag Diss,ug/l
32, Ag Diss, ug/l Limit

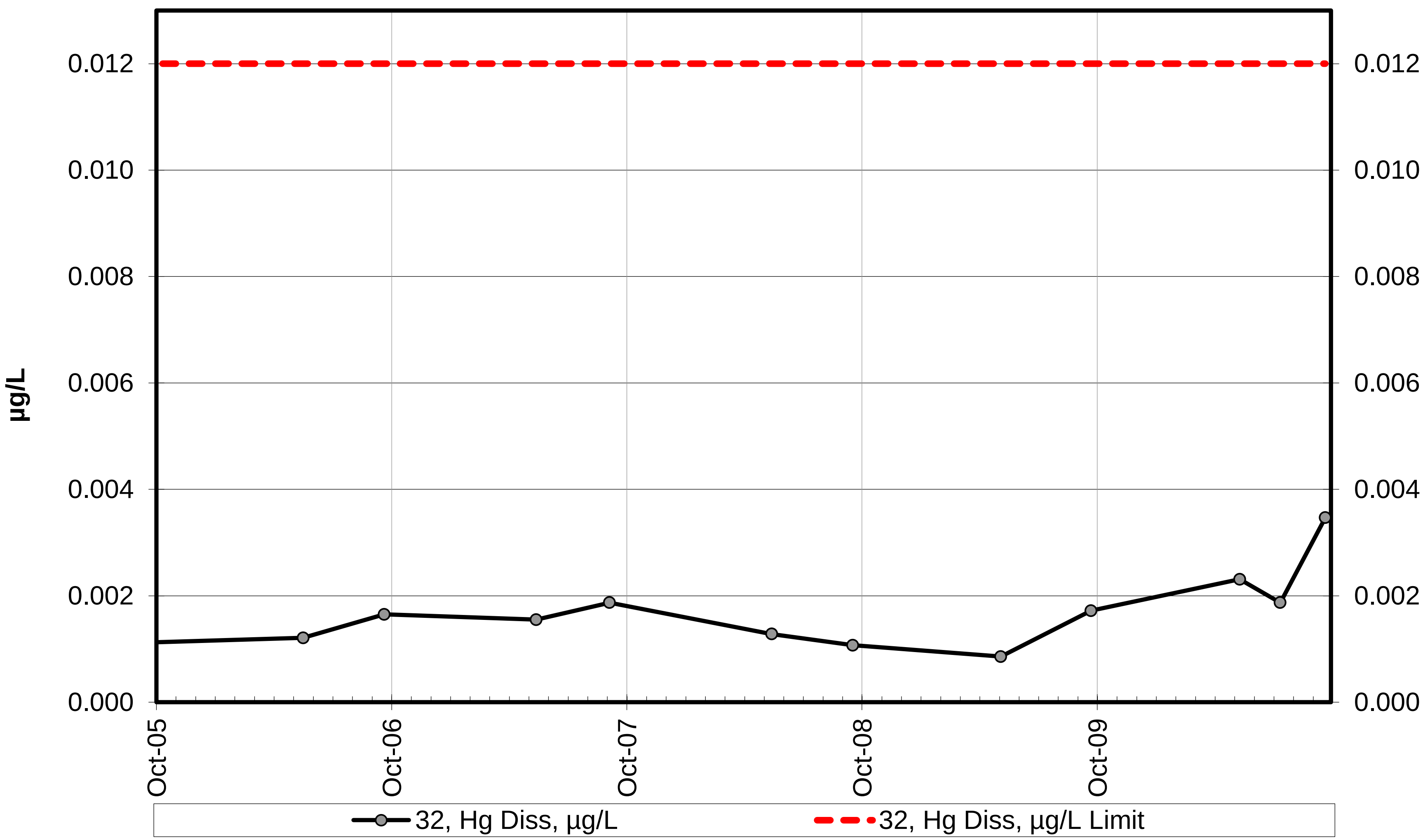


Site 32 - Dissolved Zinc
µg/L
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Zn Diss, µg/L
32, Zn Diss, µg/L Limit



Site 32 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
32, Se Diss, µg/L
32, Se Diss, µg/L Limit

Site 32 - Dissolved Mercury



Site **#32** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								58.3				54.6
b	**WY2006**								56.6				56.7
c	**WY2007**	61.5							61.4				56.7
d	**WY2008**								52.8				61
e	**WY2009**								64.6				58.4
f	**WY2010**								55.1		56.5		61.1
	n	1	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	3
t_2	0	0	0	0	0	0	0	0	0	0	0	1
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								1				1
d-a								-1				1
e-a								1				1
f-a								-1				1
c-b								1				0
d-b								-1				1
e-b								1				1
f-b								-1				1
d-c								-1				1
e-c								1				1
f-c								-1				1
e-d								1				-1
f-d								1				1
f-e								-1				1
S_k	0	0	0	0	0	0	0	-1	0	0	0	12

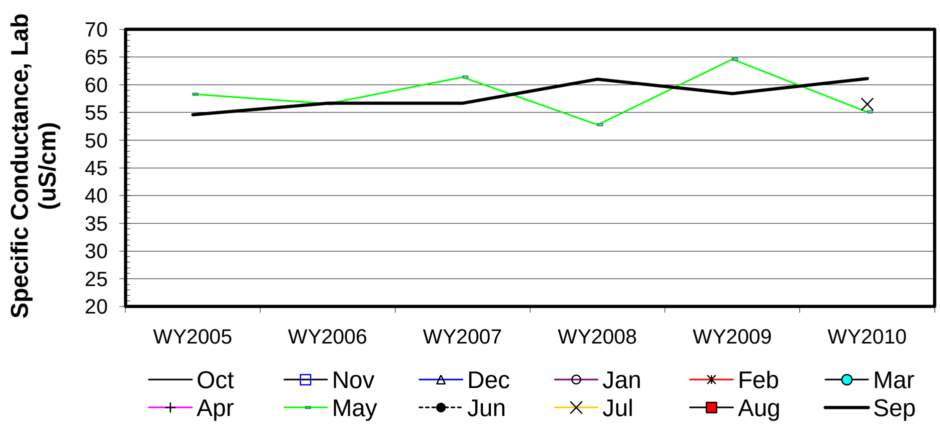
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				27.33
$Z_k = S_k/\sigma_S$								-0.19				2.30
Z^2_k								0.04				5.27

ΣZ_k=	2.11
ΣZ^2_k=	5.30
Z-bar=$\Sigma Z_k/K$=	1.05

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn	14
ΣS_k	11

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		3.08	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity
	p	**0.079**			$\chi^2_h<\chi^2_{(K-1)}$ ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	1.34	@α/2=2.5% Z=	1.96	**H_0** (No trend) ACCEPT
55.67	p	**0.910**			**H_A** (± trend) REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-1.79		2.12
0.050	-0.41	**1.08**	1.58
0.100	0.01		1.53
0.200	0.49		1.32

Site **#32** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								5.1				5.1
b	**WY2006**								4.7				4.7
c	**WY2007**								5.1				5.1
d	**WY2008**								5.1				5.0
e	**WY2009**								5.0				5.1
f	**WY2010**								5.2		4.5		4.5
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								0				-1
d-a								-1				-1
e-a								-1				-1
f-a								1				-1
c-b								1				1
d-b								1				1
e-b								1				1
f-b								1				-1
d-c								-1				-1
e-c								-1				-1
f-c								1				-1
e-d								-1				1
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	2	0	0	0	-7

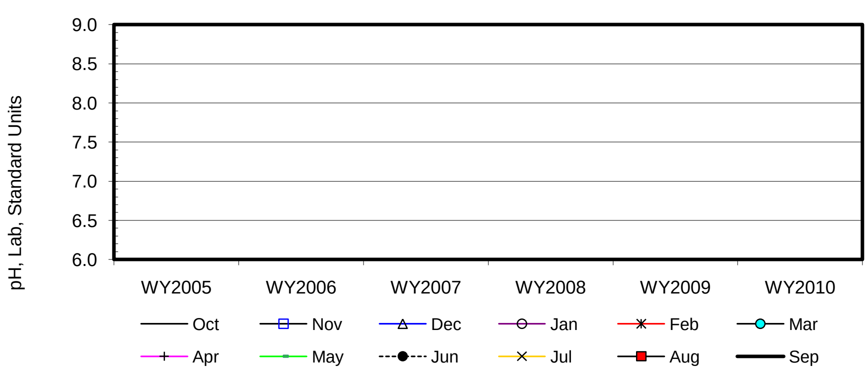
	May	Sep
σ^2_S=	27.33	28.33
$Z_k = S_k/\sigma_S$	0.38	-1.32
Z^2_k	0.15	1.73

ΣZ_k= -0.93
ΣZ^2_k= 1.88
Z-bar=ΣZ_k/K= -0.47

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 13
ΣS_k -5

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	1.44	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.230**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	-0.54	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
55.67 **p**	**0.296**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.10		0.12
0.050	-0.04	**-0.01**	0.06
0.100	-0.04		0.03
0.200	-0.03		0.00

Site **#32** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								21.4				17.6
b	**WY2006**								13.1				2.0
c	**WY2007**								16.2				15.9
d	**WY2008**								15.2				15.5
e	**WY2009**								16.7				14.7
f	**WY2010**								6.4		0.0		0.0
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				-1
d-a								-1				-1
e-a								-1				-1
f-a								-1				-1
c-b								1				1
d-b								1				1
e-b								1				1
f-b								-1				-1
d-c								-1				-1
e-c								1				-1
f-c								-1				-1
e-d								1				-1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-5	0	0	0	-9

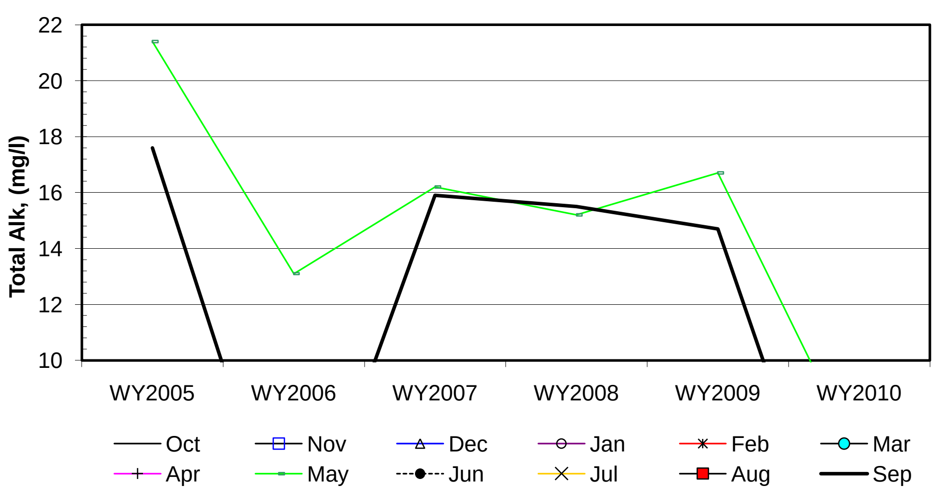
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-0.94				-1.69
Z^2_k								0.88				2.86

ΣZ_k=	-2.63
ΣZ^2_k=	3.74
Z-bar=$\Sigma Z_k/K$=	-1.32

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-14

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.28	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity	
	p	**0.595**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	-1.73	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
56.67	p	**0.042**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-5.08		0.85
0.050	-3.32	**-0.93**	-0.48
0.100	-2.93		-0.62
0.200	-2.16		-0.72

Site **#32** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.1				-0.1
b	**WY2006**								0.0				0.1
c	**WY2007**								0.0				0.1
d	**WY2008**								0.0				0.0
e	**WY2009**								0.3				0.3
f	**WY2010**								0.0		0.0		0.0
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	0	0	0	0	0	0	0	2	0	1	0	4
t_2	0	0	0	0	0	0	0	0	0	0	0	1
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	1	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								-1				1
d-a								-1				1
e-a								1				1
f-a								-1				1
c-b								0				-1
d-b								0				-1
e-b								1				1
f-b								0				-1
d-c								0				-1
e-c								1				1
f-c								0				-1
e-d								1				1
f-d								0				0
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-1	0	0	0	2

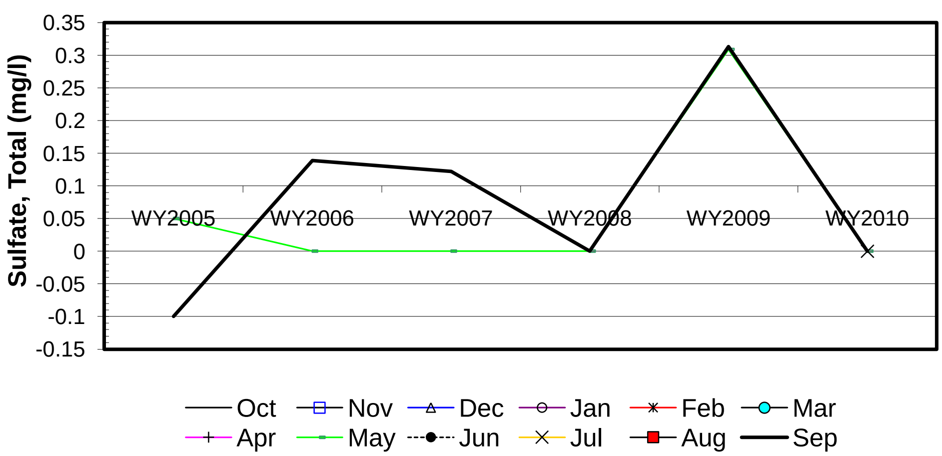
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								19.67				27.33
$Z_k = S_k/\sigma_S$								-0.23				0.38
Z^2_k								0.05				0.15

ΣZ_k= 0.16
ΣZ^2_k= 0.20
Z-bar=ΣZ_k/K= 0.08

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	7	1	0	1	0

Σn 13
ΣS_k 1

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.18	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.667**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.00	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
47.00	**p**	**0.500**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.03		0.09
0.050	-0.02	0.00	0.05
0.100	-0.01		0.03
0.200	0.00		0.00

Site **#32** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								6.5				9.0
b	**WY2006**								10.8				15.3
c	**WY2007**								24.3				10.0
d	**WY2008**								20.5				15.6
e	**WY2009**								12.7				14.4
f	**WY2010**								11.9		9.9		8.5
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				1
c-a								1				1
d-a								1				1
e-a								1				1
f-a								1				-1
c-b								1				-1
d-b								1				1
e-b								1				-1
f-b								1				-1
d-c								-1				1
e-c								-1				1
f-c								-1				-1
e-d								-1				-1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	3	0	0	0	-1

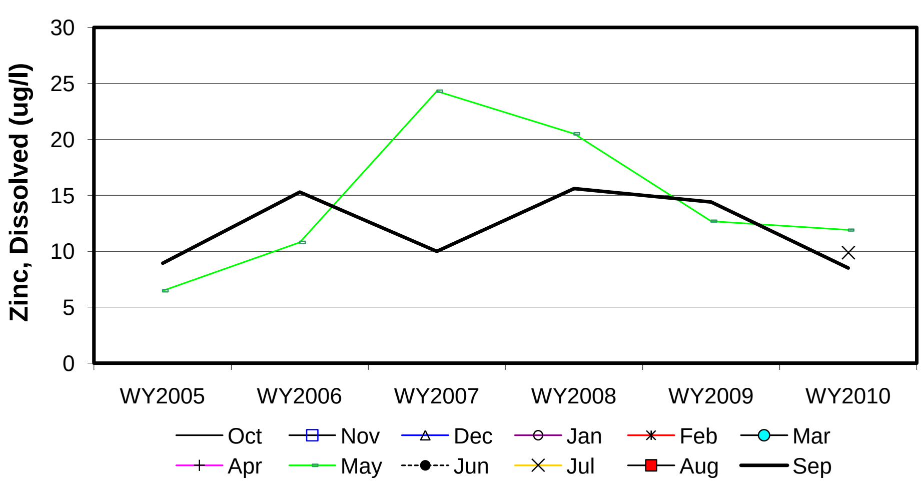
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								0.56				-0.19
Z^2_k								0.32				0.04

ΣZ_k=	0.38
ΣZ^2_k=	0.35
Z-bar=ΣZ_k/K=	0.19

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	2

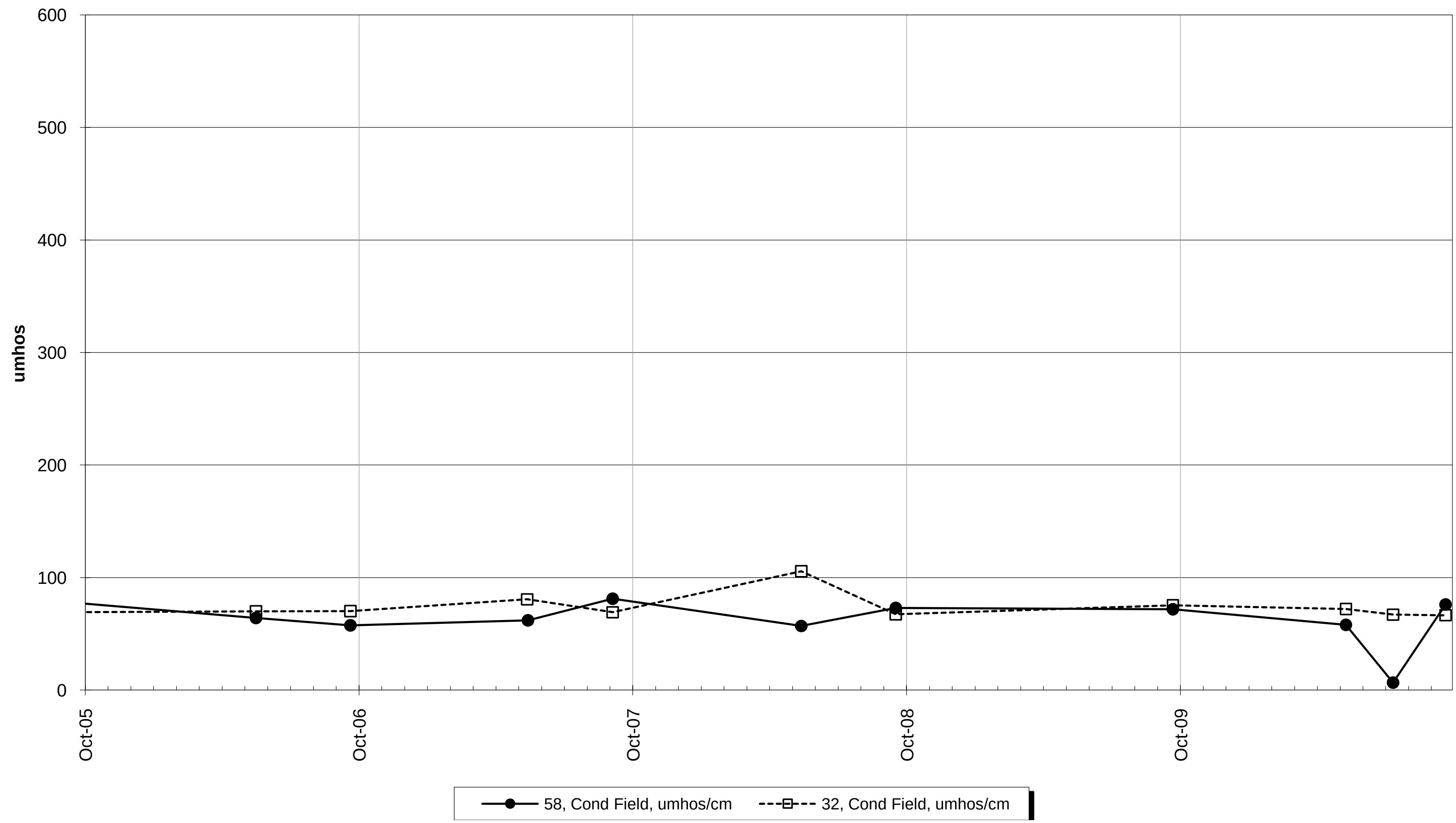
$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	0.28	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.595**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.13	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
56.67	**p** **0.553**		H_A (± trend)	REJECT



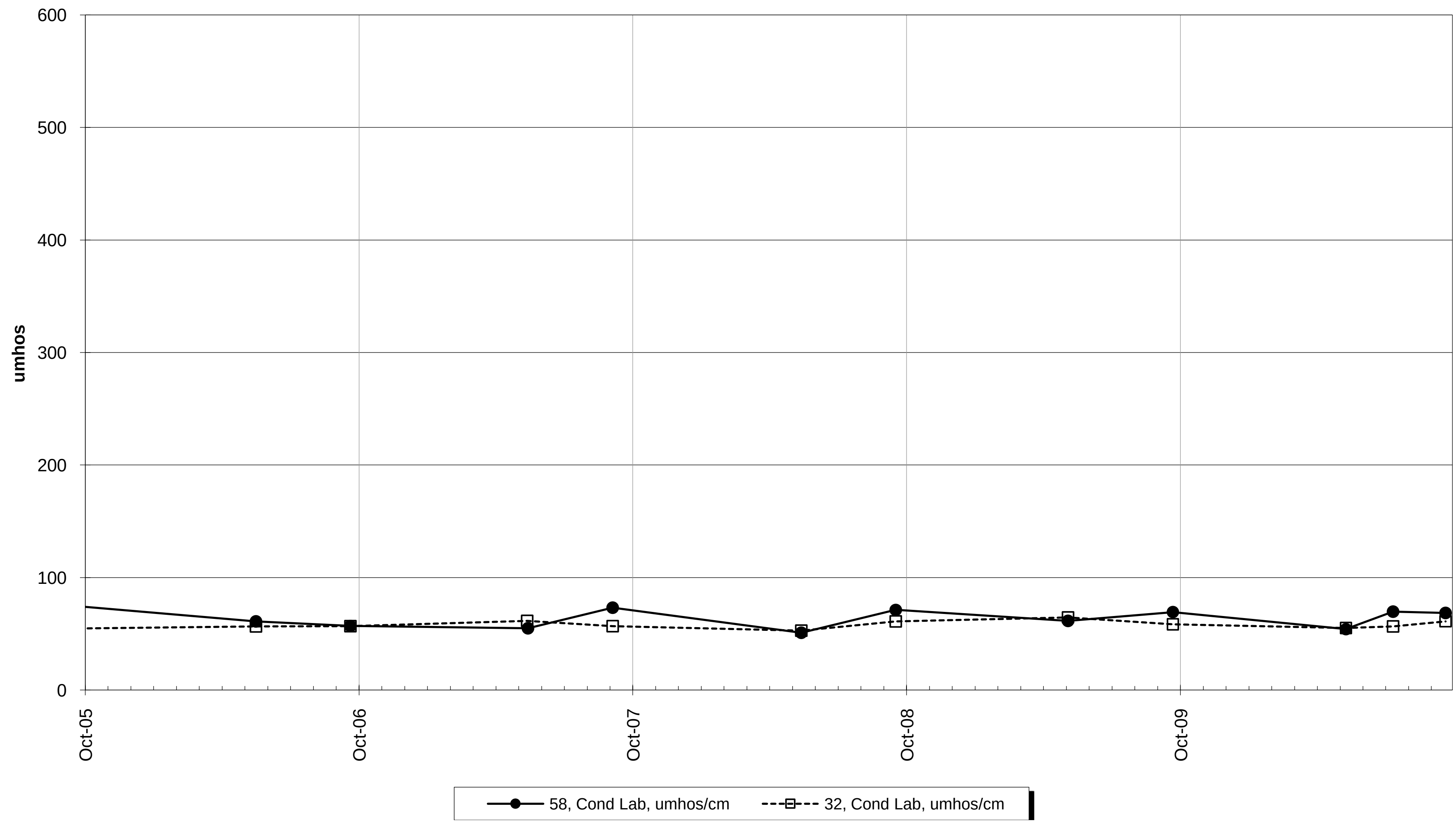
Seasonal-Kendall Slope Confidence Intervals

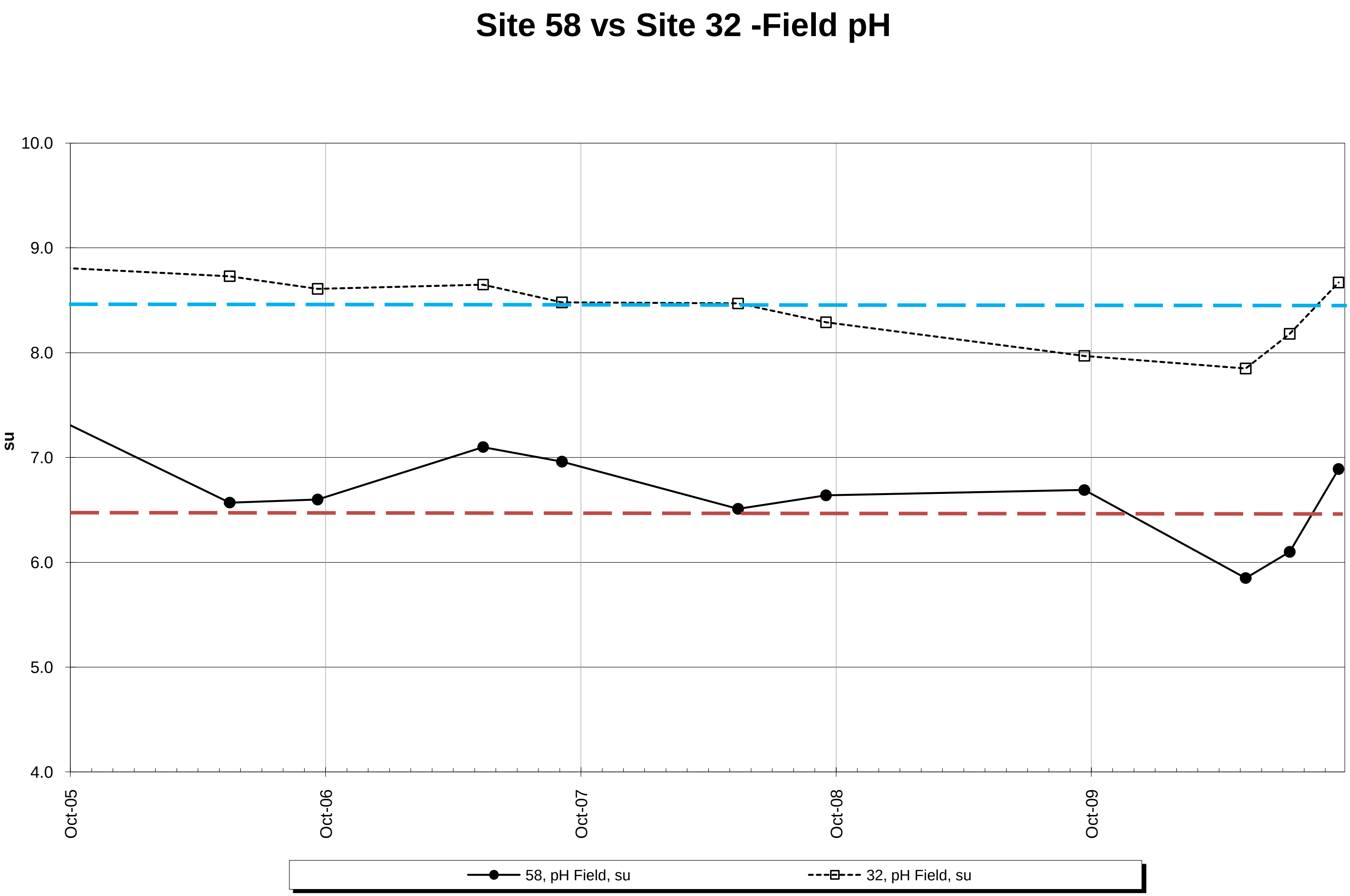
α	Lower Limit	Sen's Slope	Upper Limit
0.010	-4.05		3.81
0.050	-2.05	**0.21**	1.68
0.100	-1.13		1.31
0.200	-0.55		0.71

Site 58 vs Site 32 -Conductivity-Field

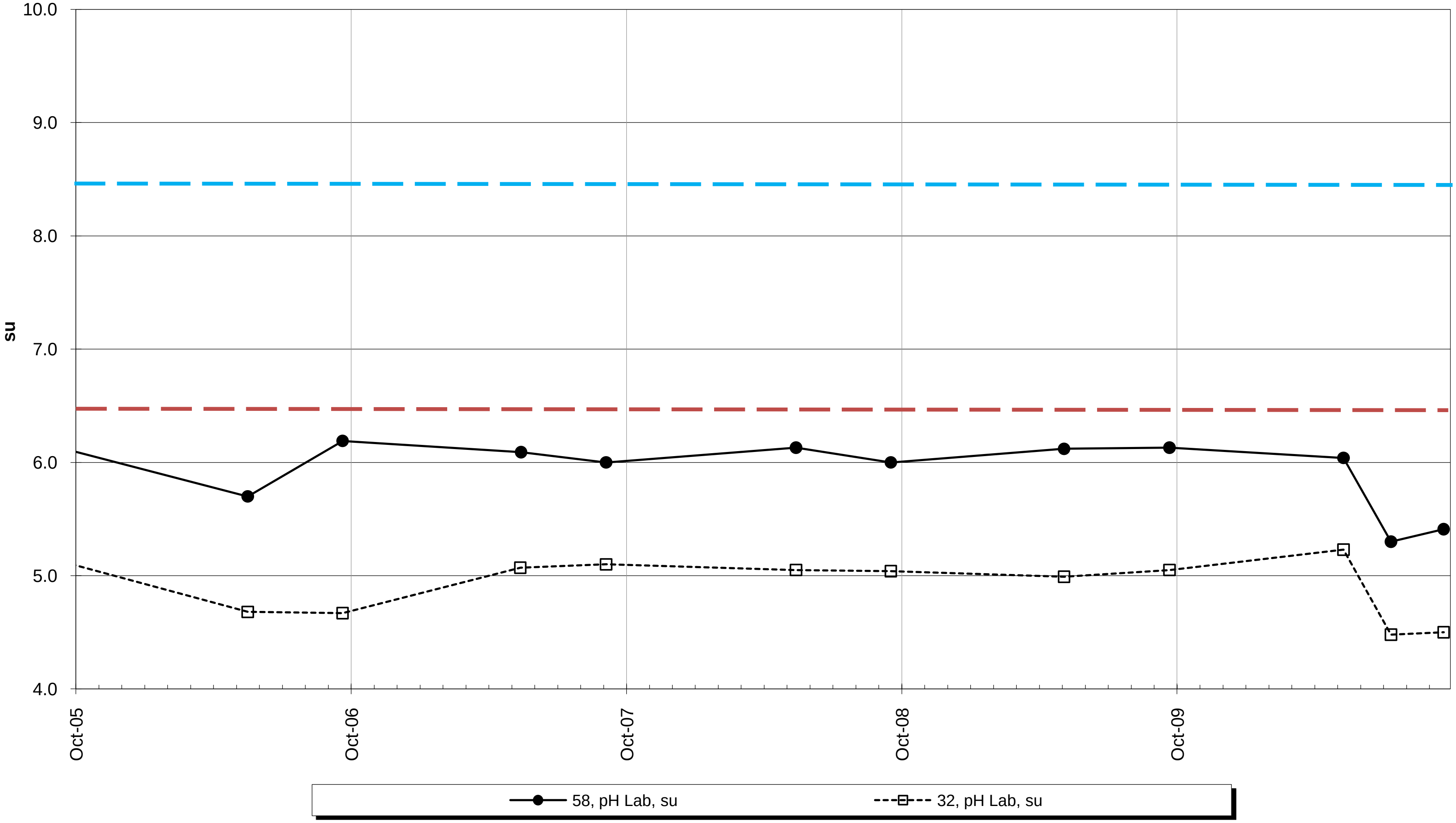


Site 58 vs Site 32 -Conductivity

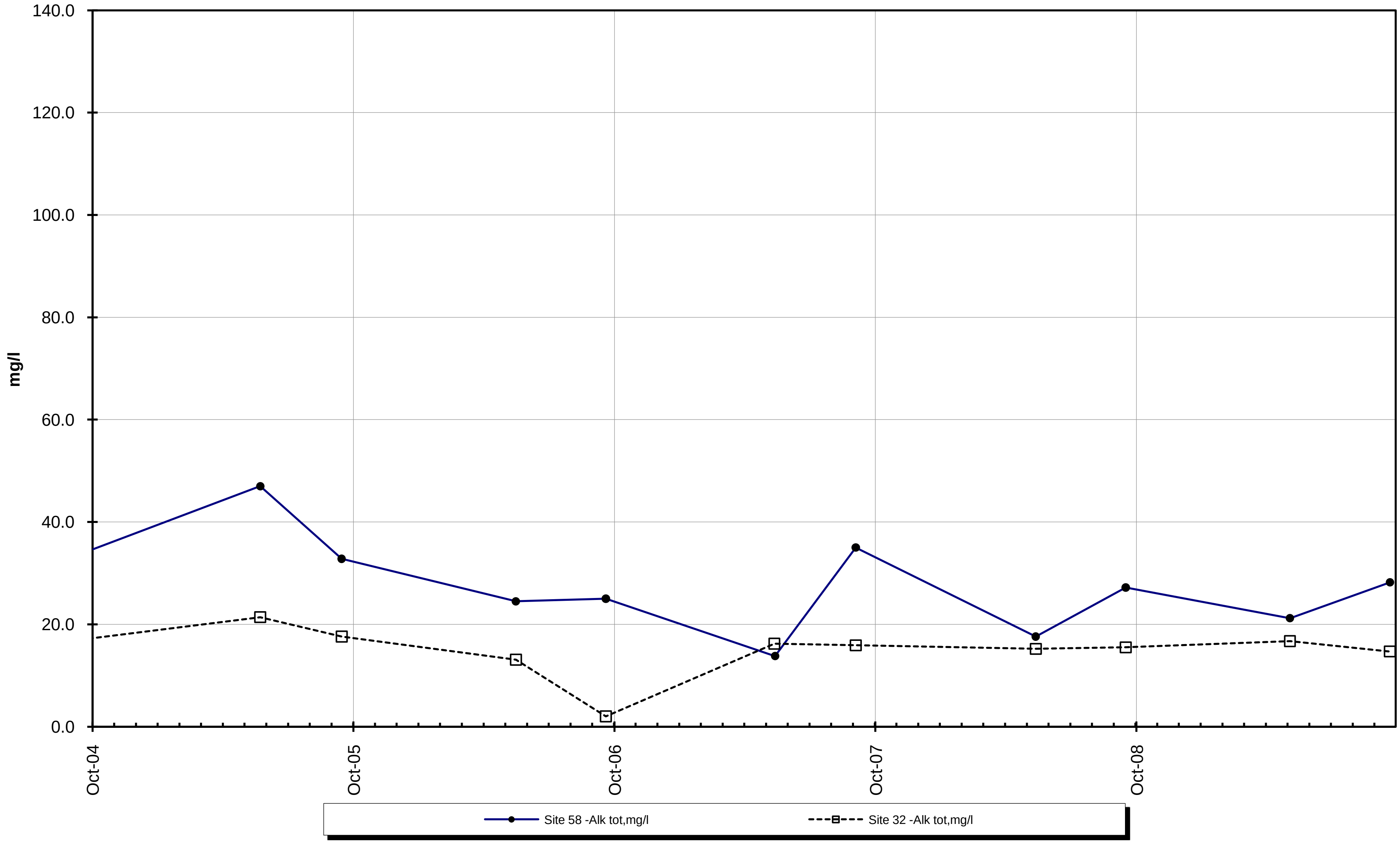


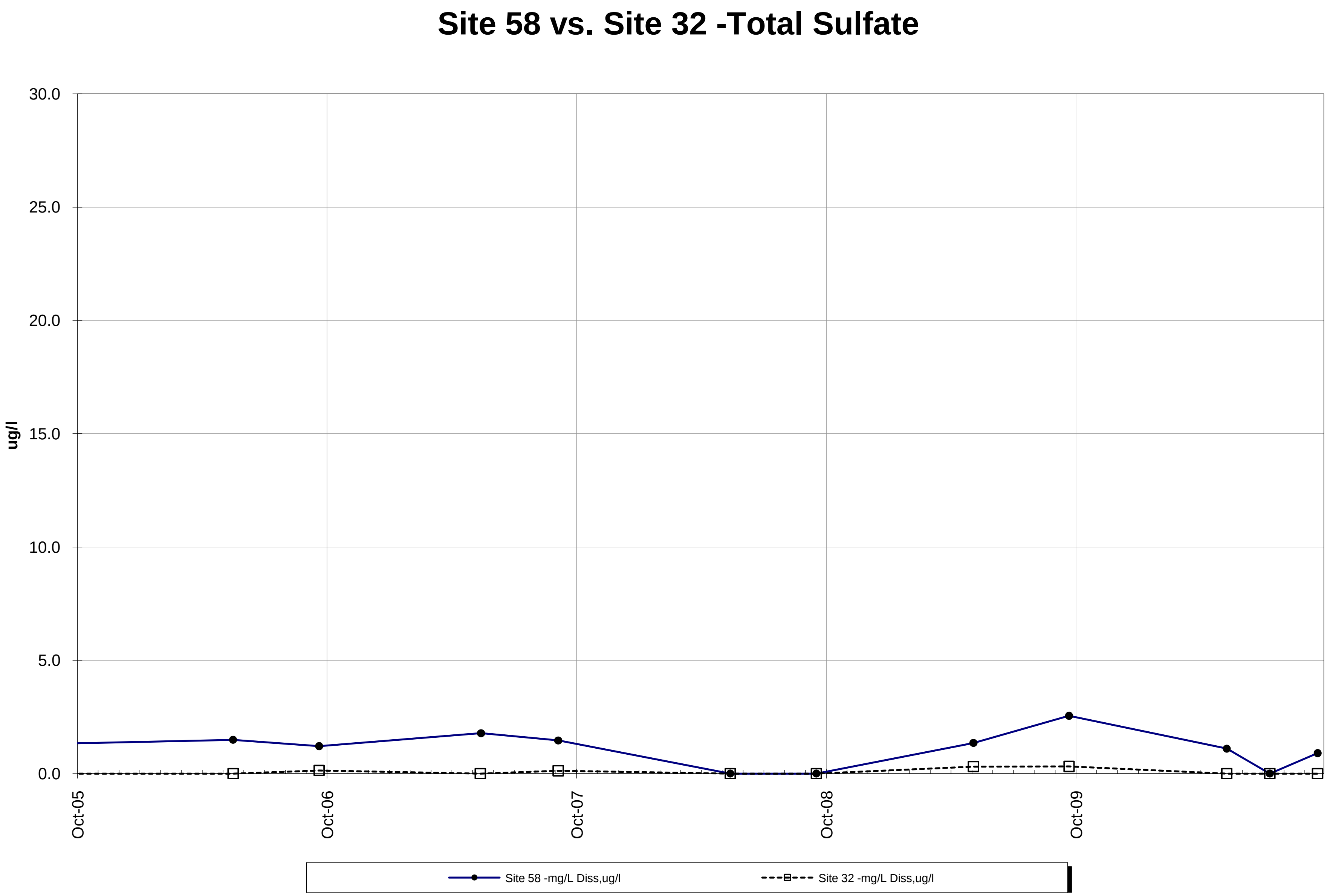

Site 58 vs Site 32 -Field pH
10.0
9.0
8.0
7.0
6.0
5.0
4.0
su
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
58, pH Field, su
32, pH Field, su

Site 58 vs Site 32 -Lab pH

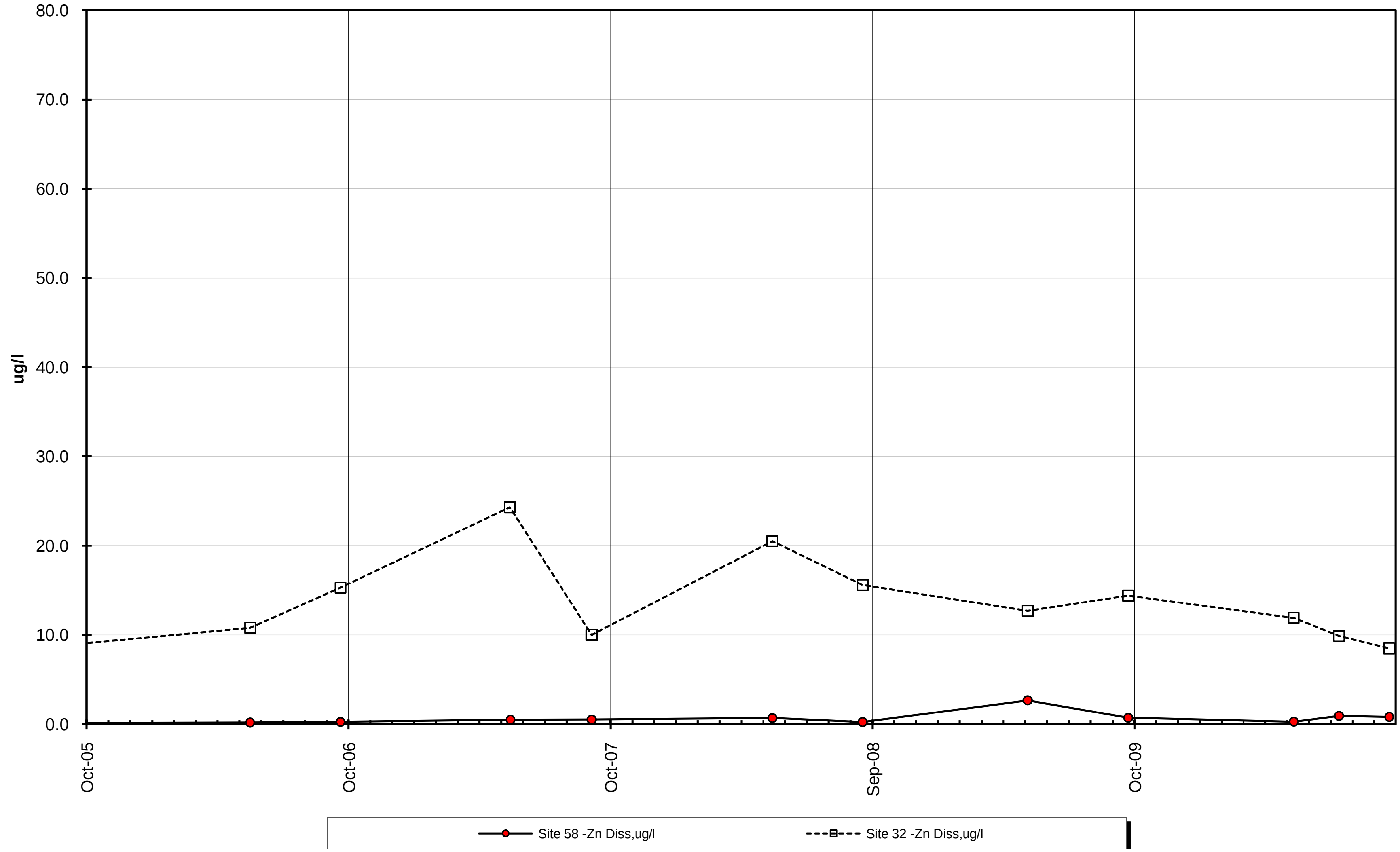


Site 58 vs. Site 32 -Total Alkalinity




Site 58 vs. Site 32 -Total Sulfate
ug/l
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Site 58 -mg/L Diss,ug/l
Site 32 -mg/L Diss,ug/l

Site 58 vs. Site 32 -Dissolved Zinc



INTERPRETIVE REPORT
SITE 59 “MONITORING WELL T-00-01A”

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

Sampling at this site was added to the FWMP in May-2002. All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Out of the three sampling events, two were in exceedance for laboratory pH and the other was in exceedance for the field pH.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	5.85		6.5	Aquatic Life, chronic
13-Jul-10	pH Field, su	6.1		6.5	Aquatic Life, chronic
13-Jul-10	pH Lab, su	6.38		6.5	Aquatic Life, chronic
21-Sep-10	pH Lab, su	6.11		6.5	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. One visual trend in dissolved mercury concentration has been identified. There was a moderate increase in the dissolved mercury concentration measured at Site 59 by the end of the water year. This increase has also been noted for the other upgradient well Site 58 and is thought to be a result of the preparatory work for the East Ridge expansion.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-

Site 59-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	**1.00**	+	3.33	3.2
pH, Lab	6	0.45	0		
Alkalinity, Total	6	0.35	0		
Sulfate, Total	6	**0.98**	+	0.29	6.4
Zinc, Dissolved	6	0.18	0		

(1): Number of years (2):Significance level

WY2010). Two statistically significant ($\alpha/2=2.5\%$) trends were identified. Laboratory conductivity ($p=1.00$) with an estimated slope of 3.33 µS/cm/yr or a 3.2% increase, and total sulfate ($p=0.99$) with an estimated slope of 0.29 mg/L/yr or a 6.4% increase. The small magnitude of change and limited dataset (started 2002) makes drawing definitive conclusions difficult. Currently without further information and with the site being upgradient, this variation is considered natural.

Table of Results for Water Year 2010

Site 59 "MW-T-00-01A"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							8.3	NOT SCHEDULED FOR SAMPLING	9.4	NOT SCHEDULED FOR SAMPLING	7.0	8.3
Conductivity-Field(µmho)								107		117		121	117
Conductivity-Lab (µmho)								112		115		115	115
pH Lab (standard units)								6.80		6.38		6.11	6.38
pH Field (standard units)								5.85		6.10		6.89	6.10
Total Alkalinity (mg/L)								40.5		41.0		42.1	41.0
Total Sulfate (mg/L)								5.3 J		4.7 J		5.5 J	5.3
Hardness (mg/L)								46.1		49.7		48.0	48.0
Dissolved As (ug/L)								0.141		0.177		0.161	0.161
Dissolved Ba (ug/L)								6.7		7.4		7.9	7.4
Dissolved Cd (ug/L)								0.011 J		0.011 J		0.012 J	0.011
Dissolved Cr (ug/L)								6.910		4.740		4.070	4.740
Dissolved Cu (ug/L)								0.080 U		0.116		0.168	0.116
Dissolved Pb (ug/L)								0.0481		0.0044 J		0.0076 J	0.0076
Dissolved Ni (ug/L)								1.010		0.864		1.130	1.010
Dissolved Ag (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Zn (ug/L)								0.35		0.87		0.45	0.45
Dissolved Se (ug/L)								0.319 J		0.503		<0.228	0.319
Dissolved Hg (ug/L)								0.002010		0.000194 U		0.003820	0.002010

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

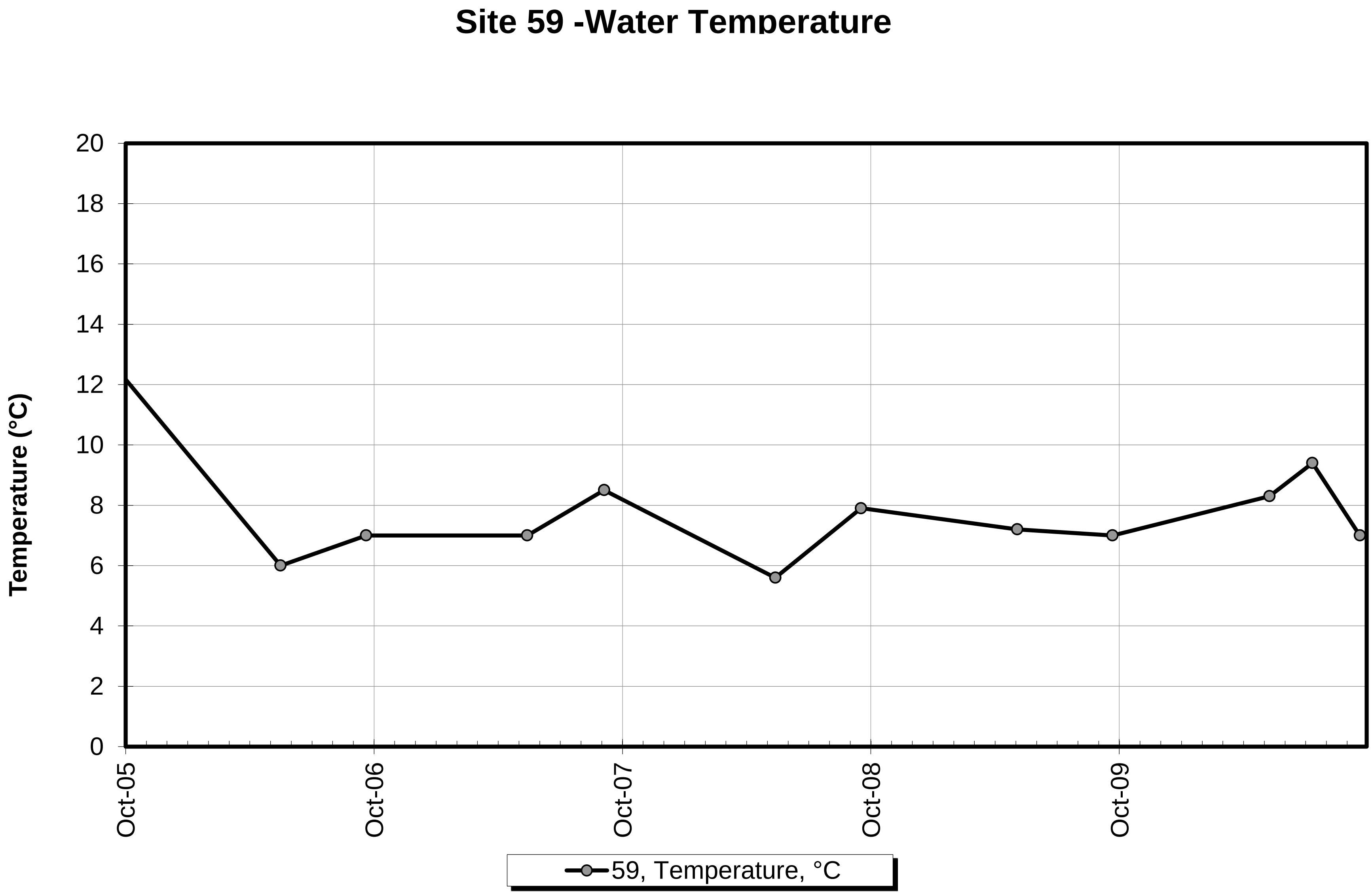
Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

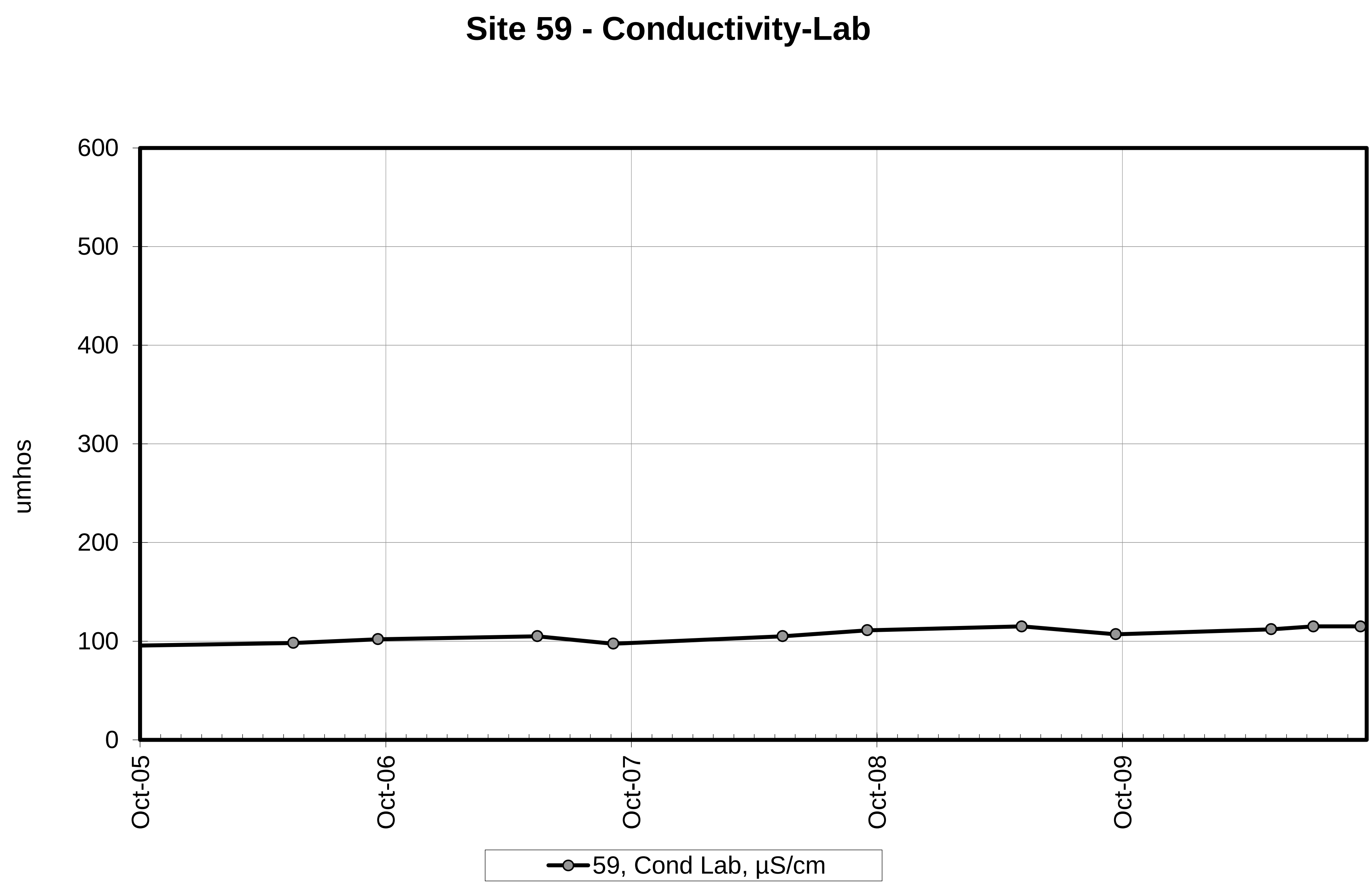
Date Range: 10/01/2009 to 09/30/2010

Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
59	5/11/2010	10:18 AM				
			Cd diss, µg/l	0.0112	J	Below Quantitative Range
			Cu diss, µg/l	0.0798	U	Field Blank Contamination
			Se diss, µg/l	0.319	J	Below Quantitative Range
			SO4 Tot, mg/l	5.3	J	Sample Temperature
59	7/13/2010	2:12 PM				
			Cd diss, µg/l	0.0114	J	Below Quantitative Range
			Hg diss, µg/l	0.000194	U	Field Blank Contamination
			Pb diss, µg/l	0.00443	J	Below Quantitative Range
			SO4 Tot, mg/l	4.7	J	Sample Reciept Temperature
59	9/21/2010	9:28 AM				
			Cd diss, µg/l	0.0116	J	Below Quantitative Range
			Pb diss, µg/l	0.00763	J	Below Quantitative Range
			SO4 Tot, mg/l	5.5	J	Sample Receipt Temperature

Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

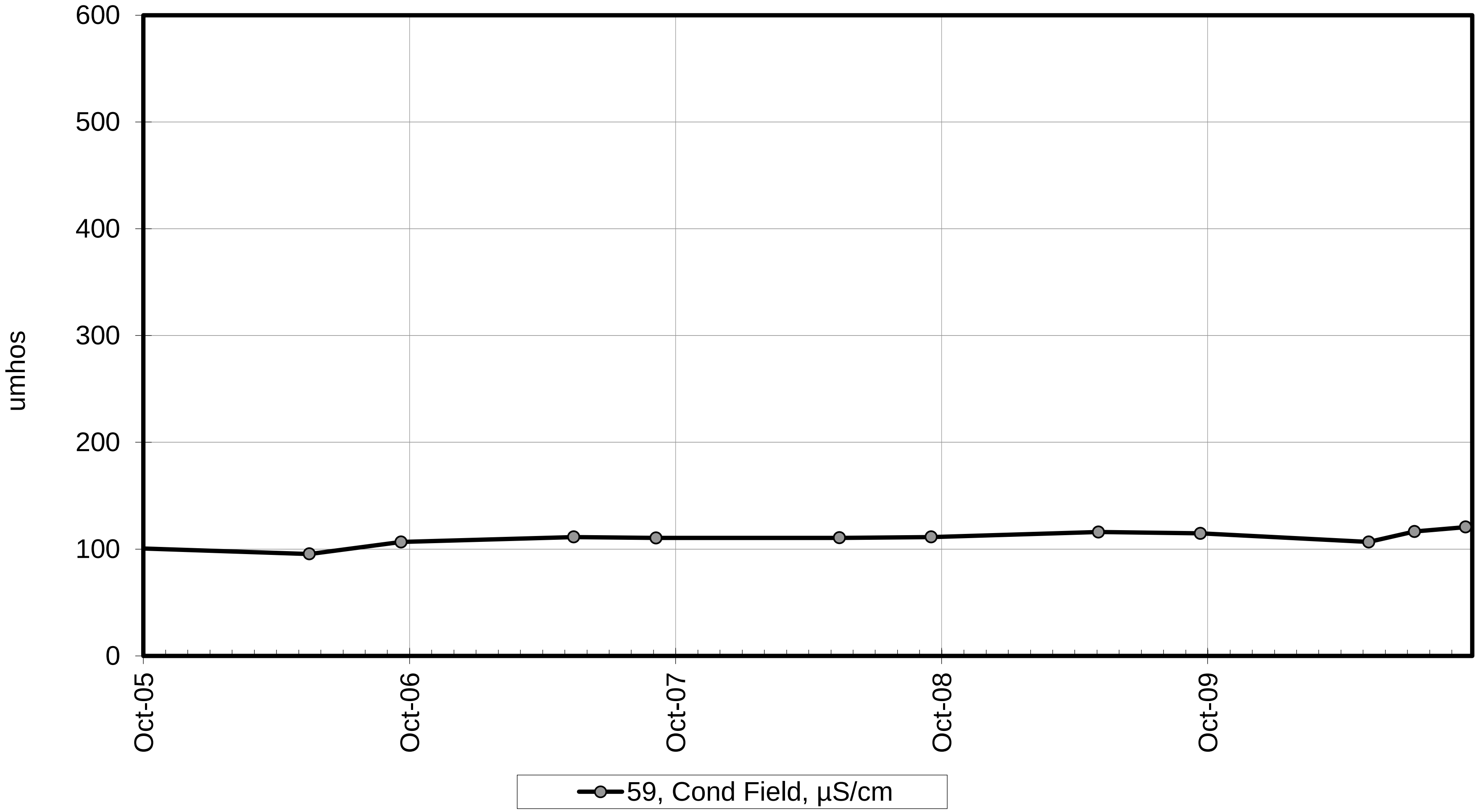


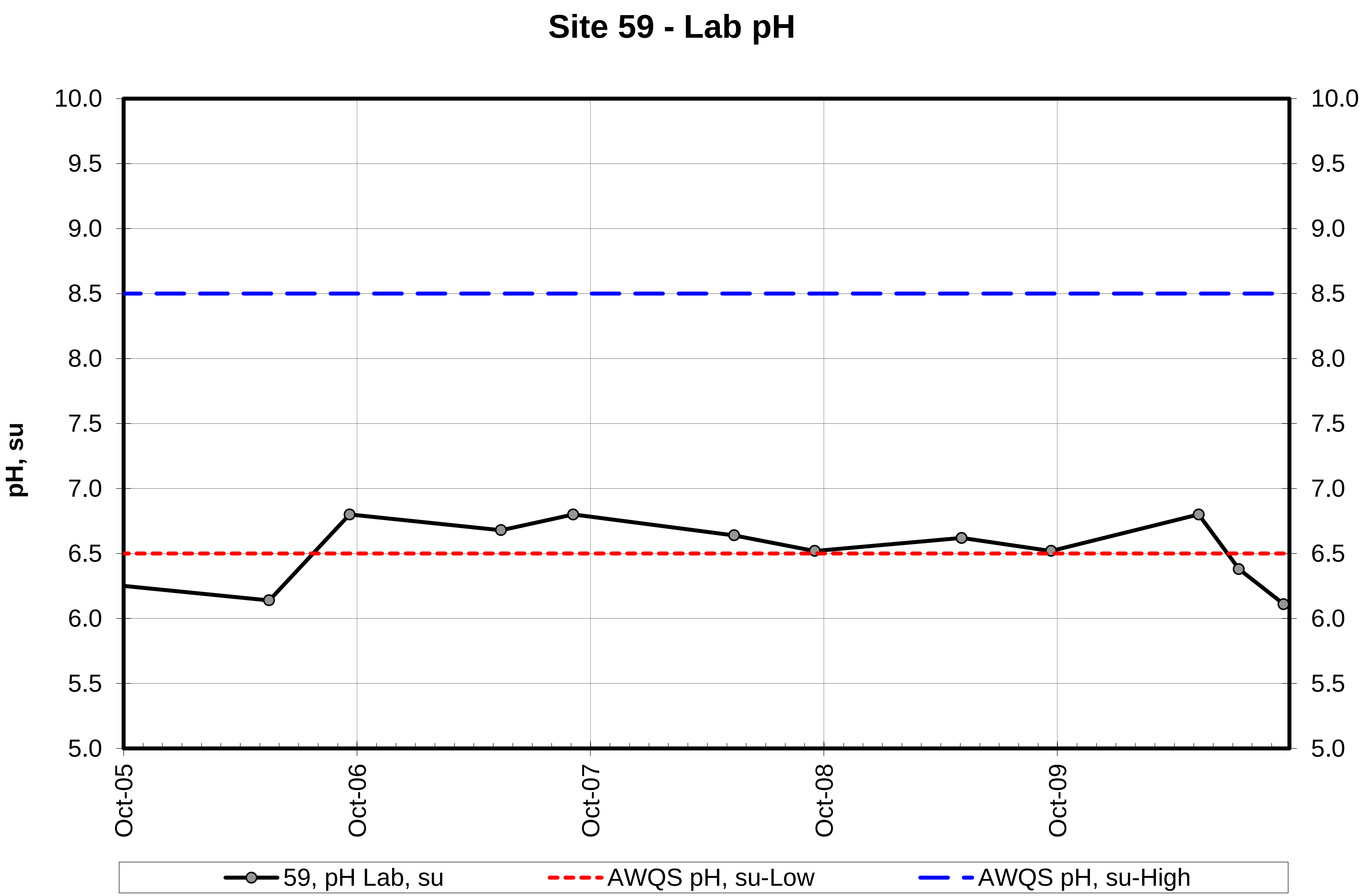
Site 59 -Water Temperature
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Temperature, °C



Site 59 - Conductivity-Lab
umhos
600
500
400
300
200
100
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Cond Lab, µS/cm

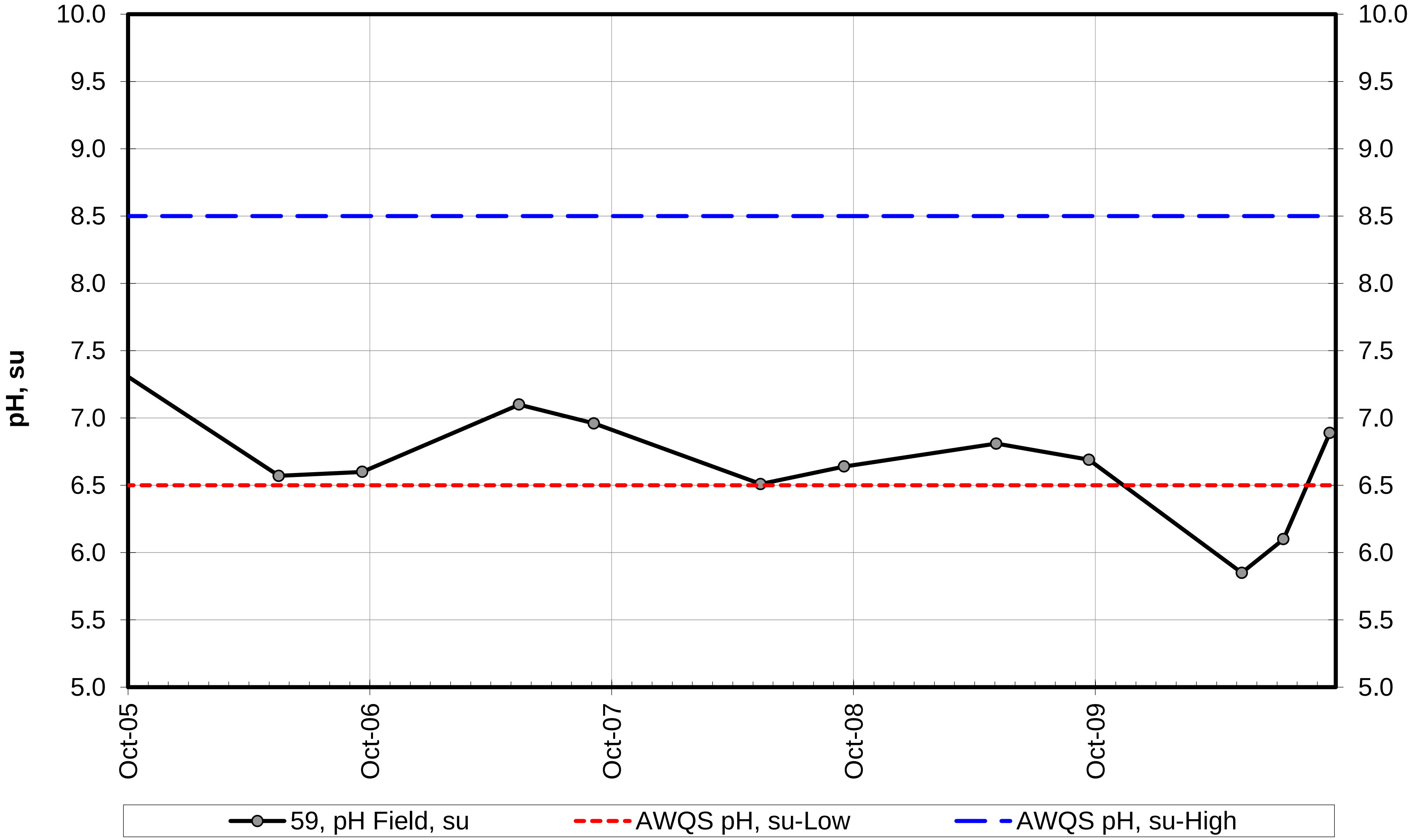
Site 59 - Conductivity-Field

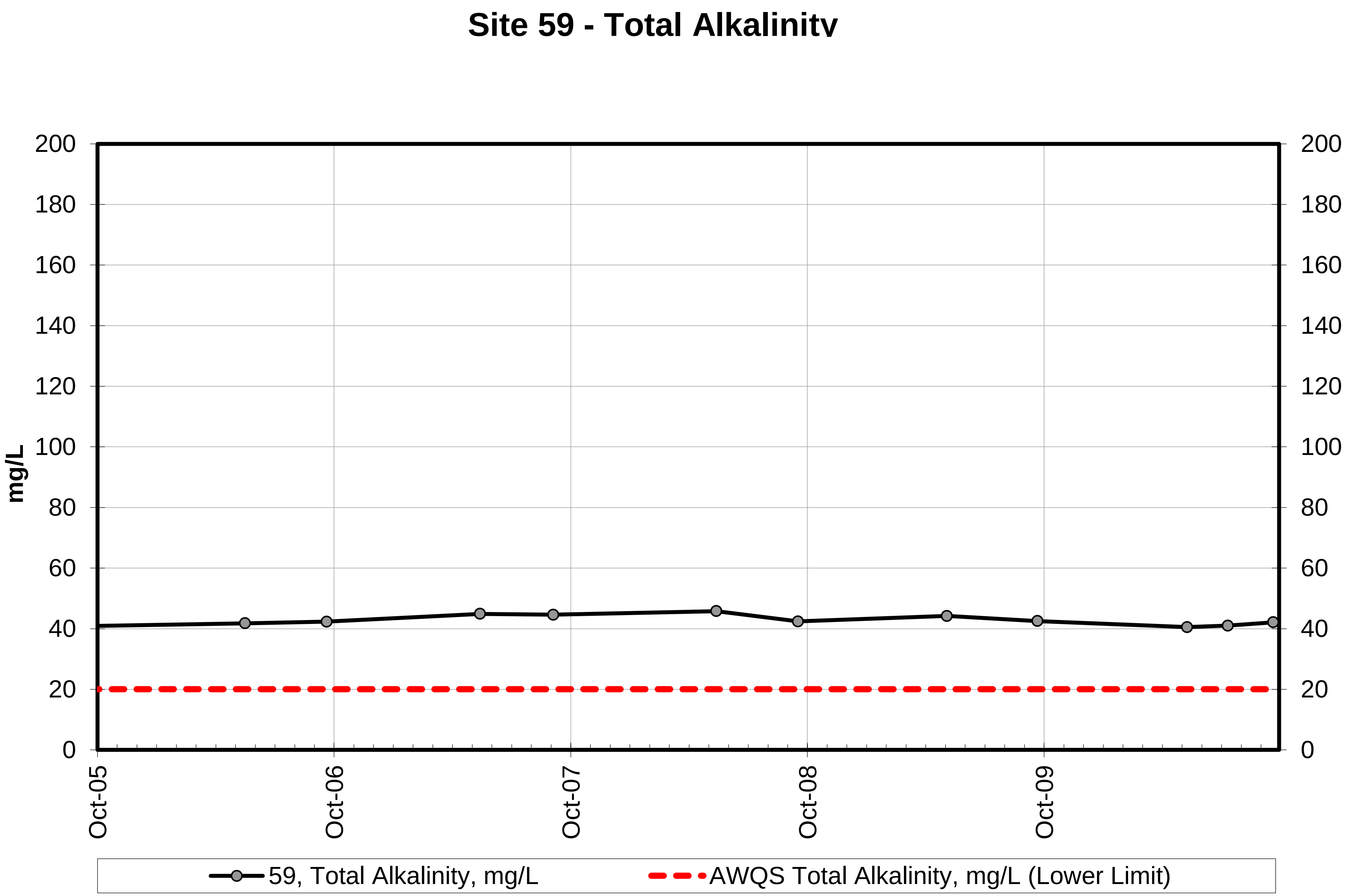


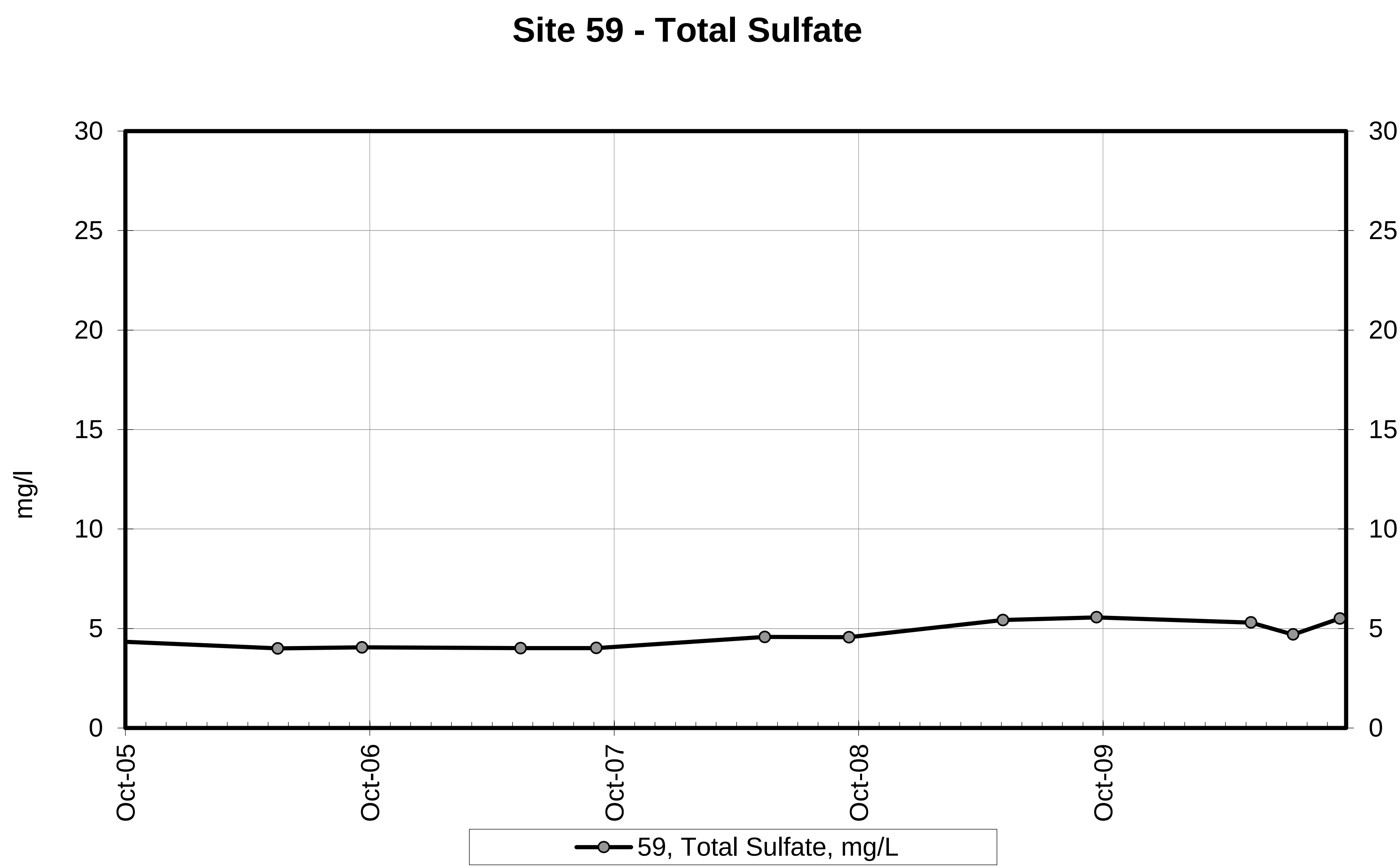


Site 59 - Lab pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

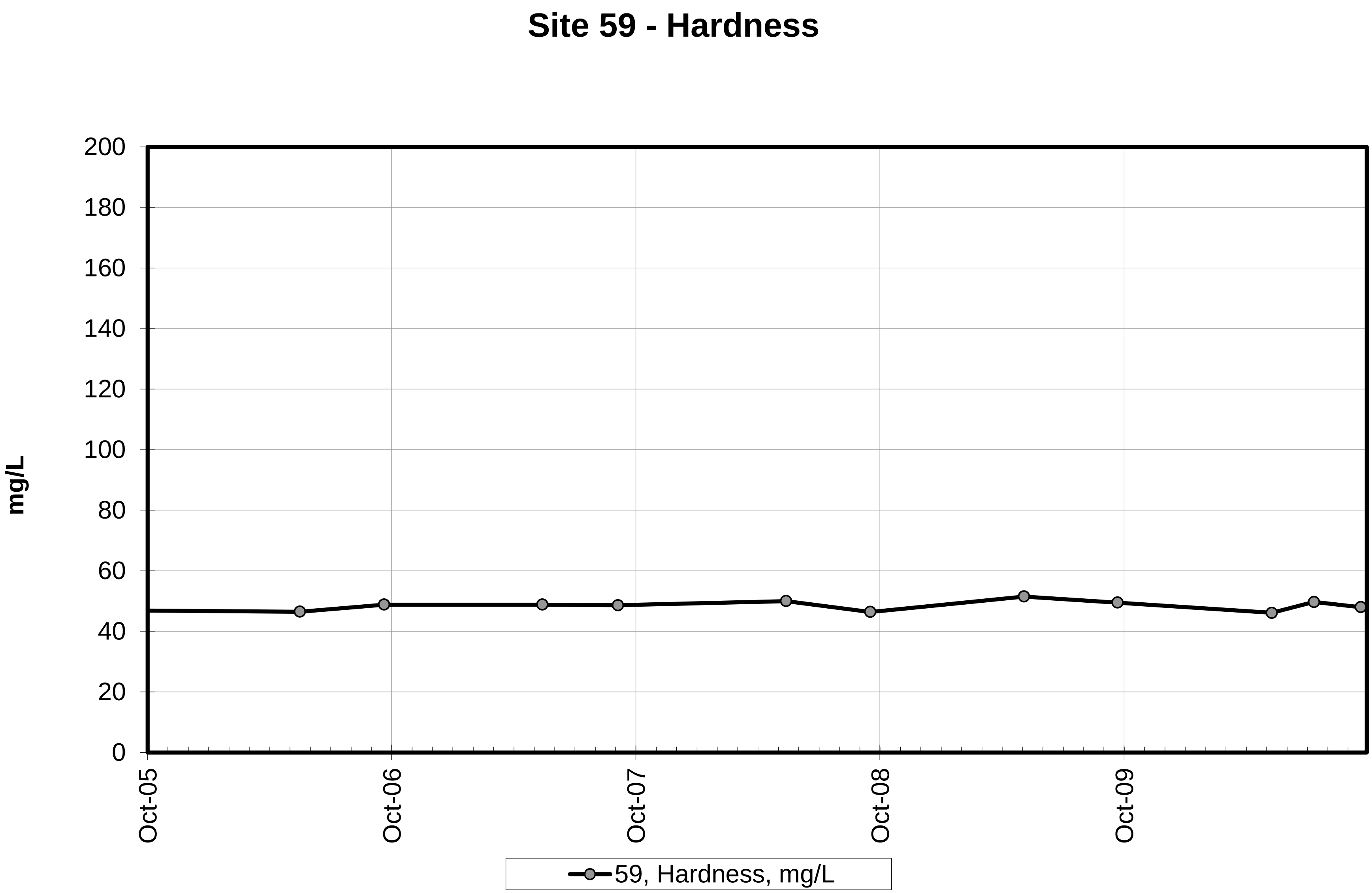
Site 59 - Field pH



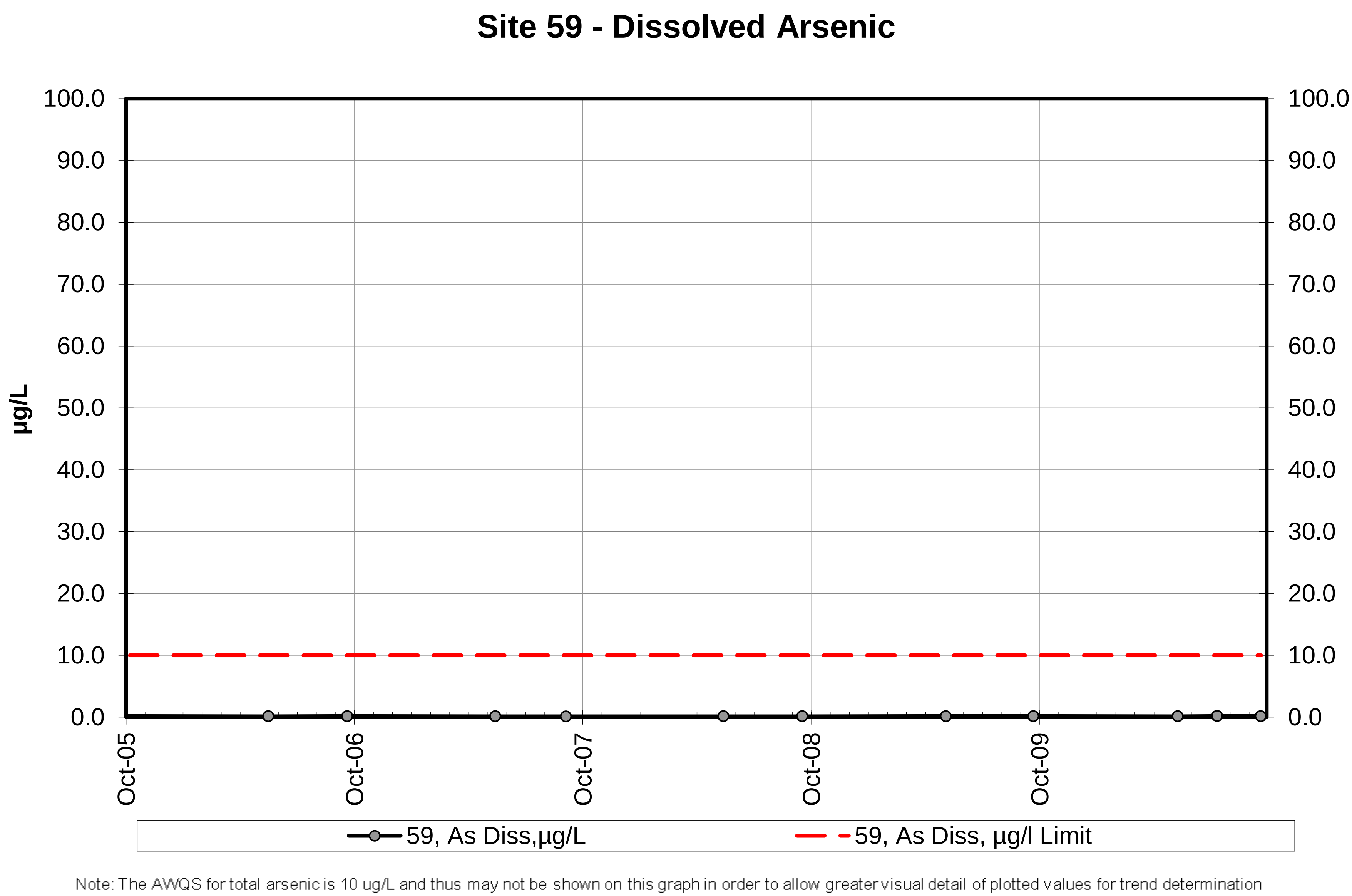

Site 59 - Total Alkalinity
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)



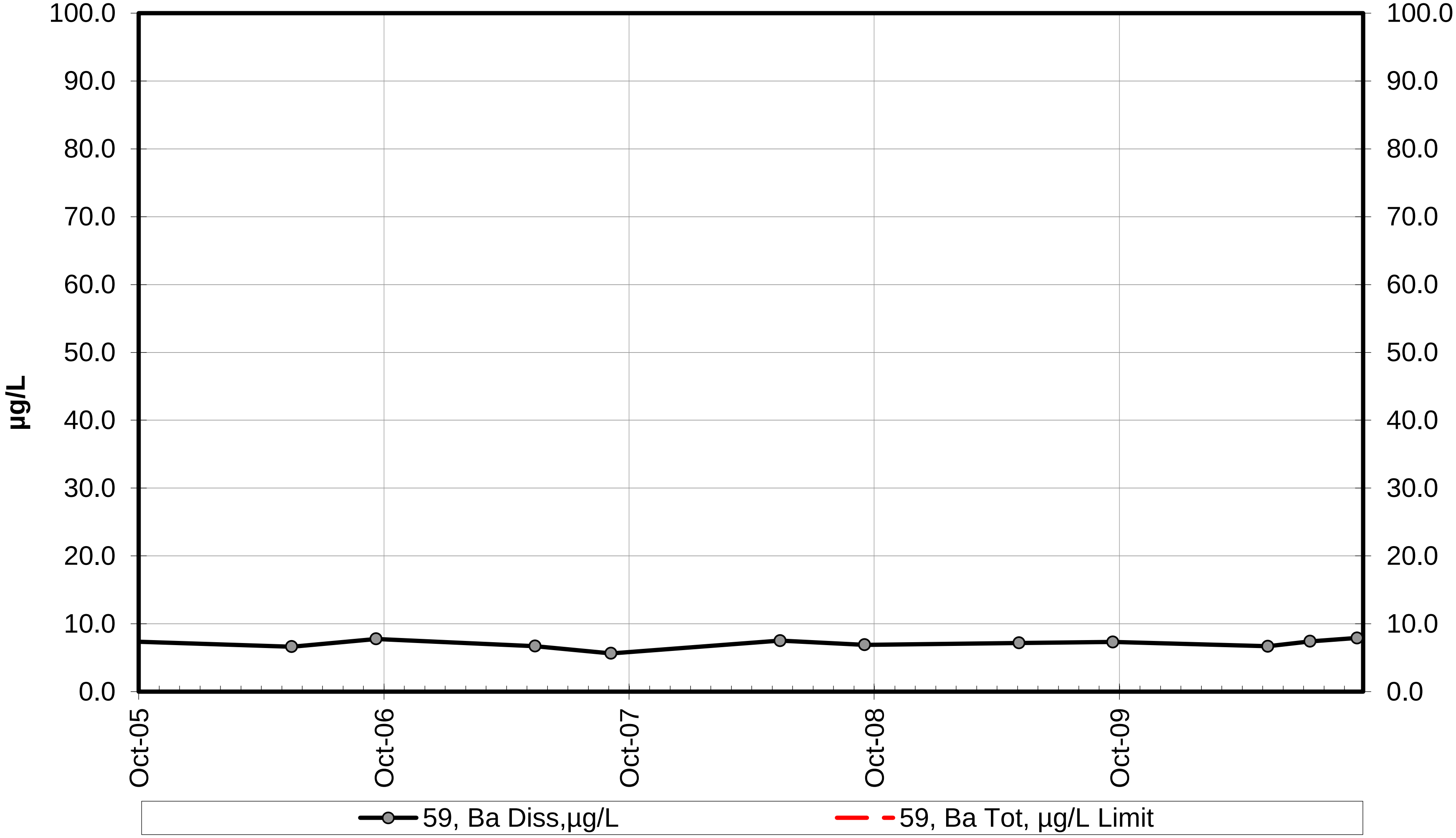
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.



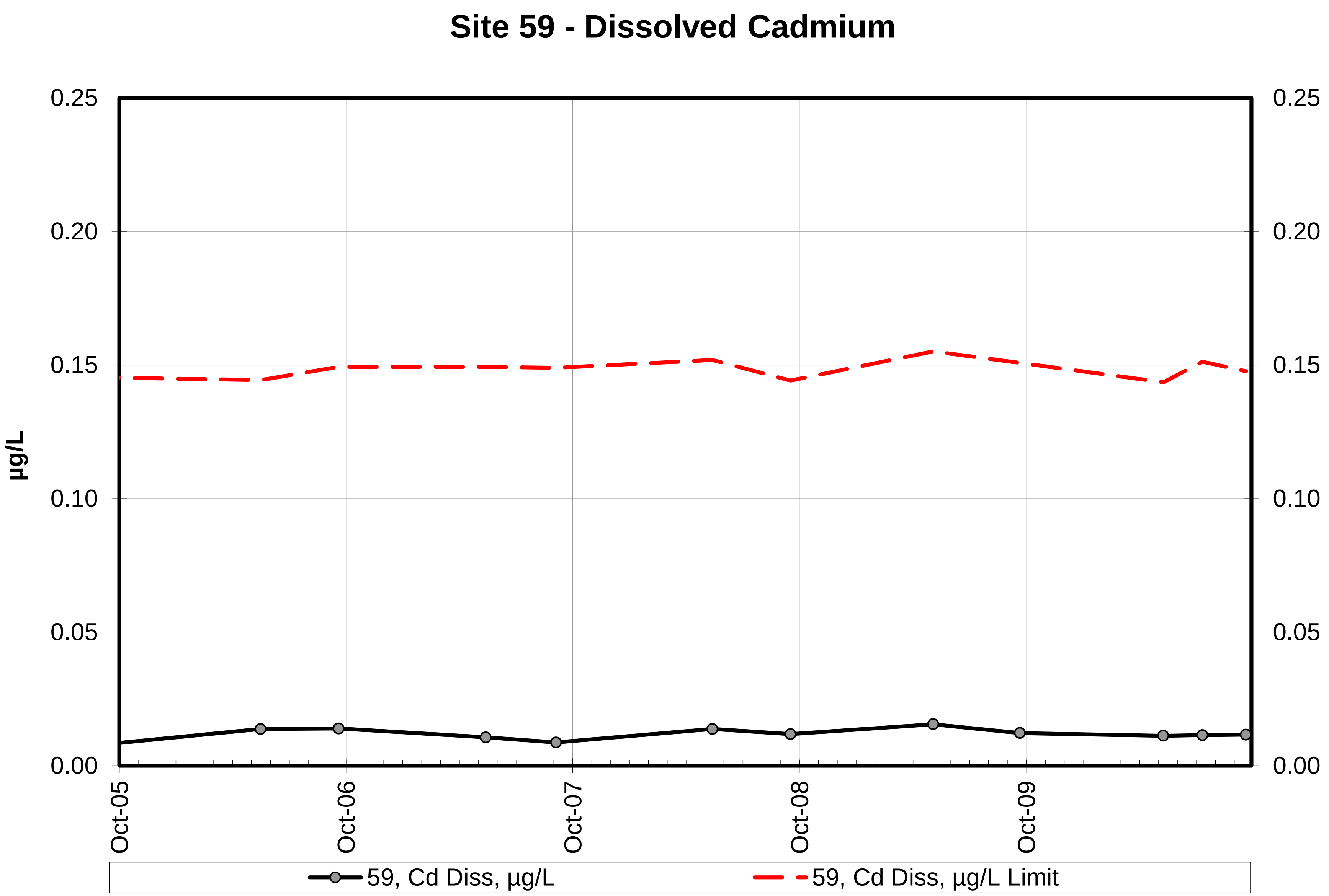
Site 59 - Hardness
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Hardness, mg/L


Site 59 - Dissolved Arsenic
µg/L
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, As Diss,µg/L
59, As Diss, µg/l Limit
Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

Site 59 - Dissolved Barium

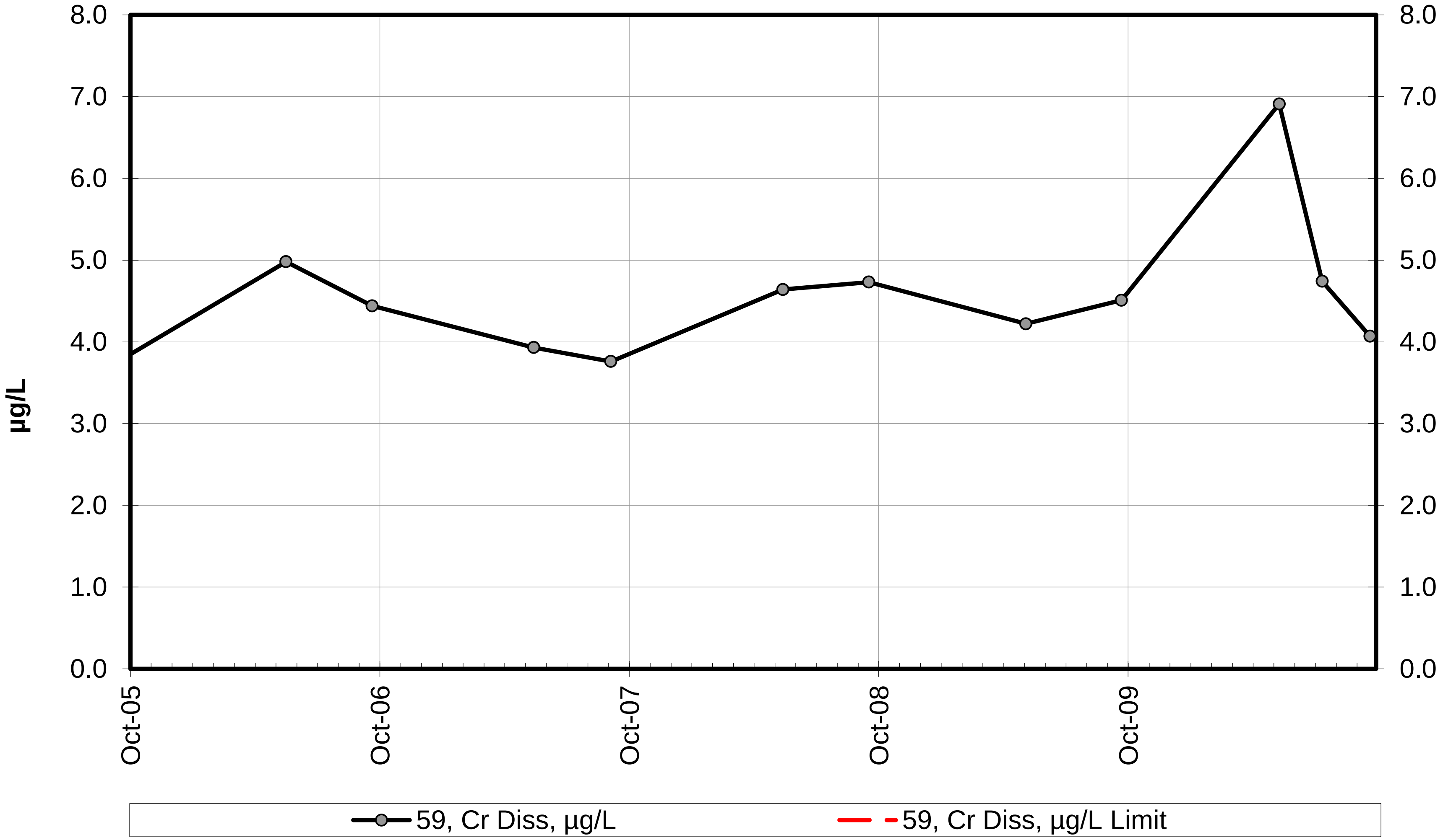


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



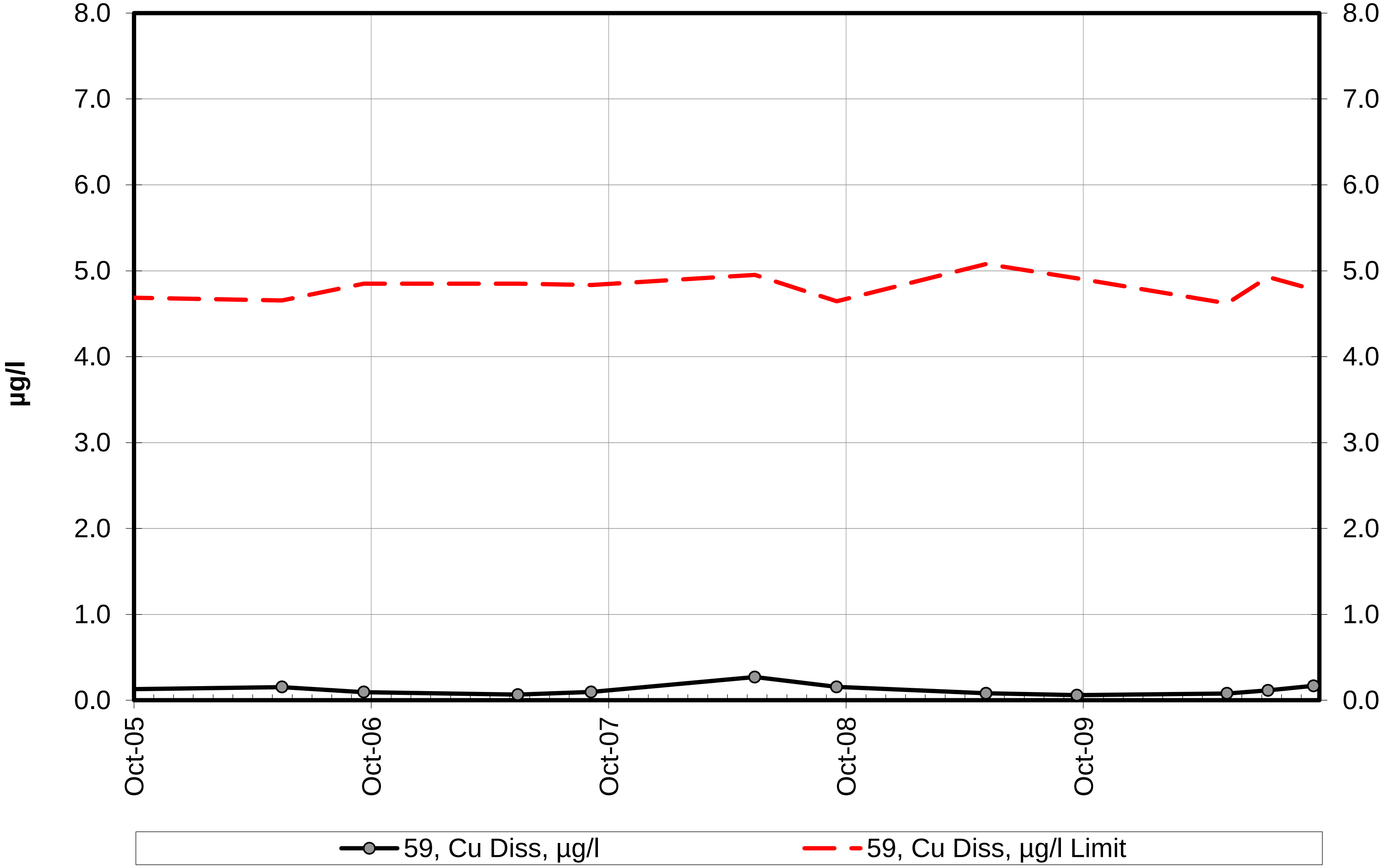
Site 59 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Cd Diss, µg/L
59, Cd Diss, µg/L Limit

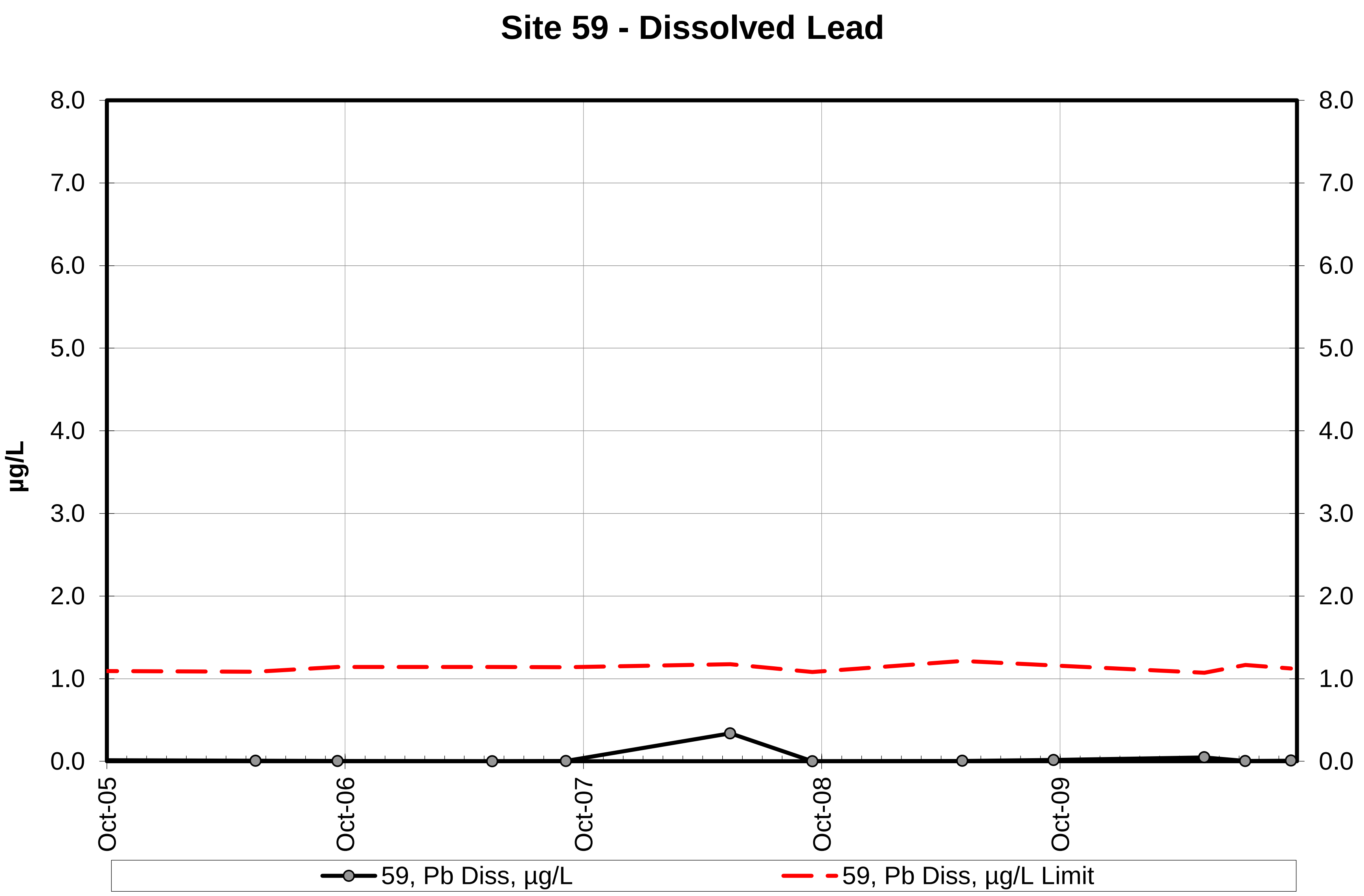
Site 59 - Dissolved Chromium



Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

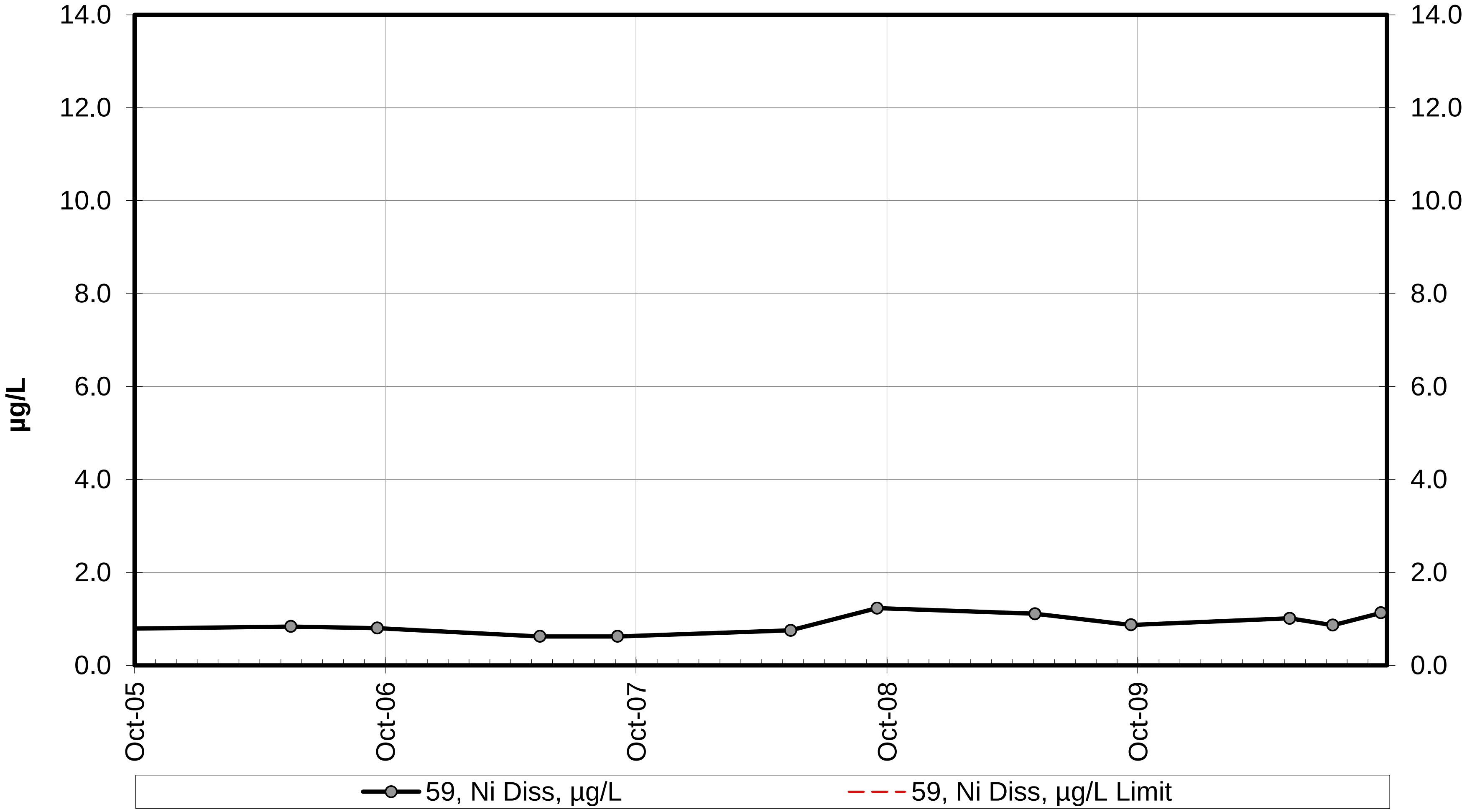
Site 59 - Dissolved Copper





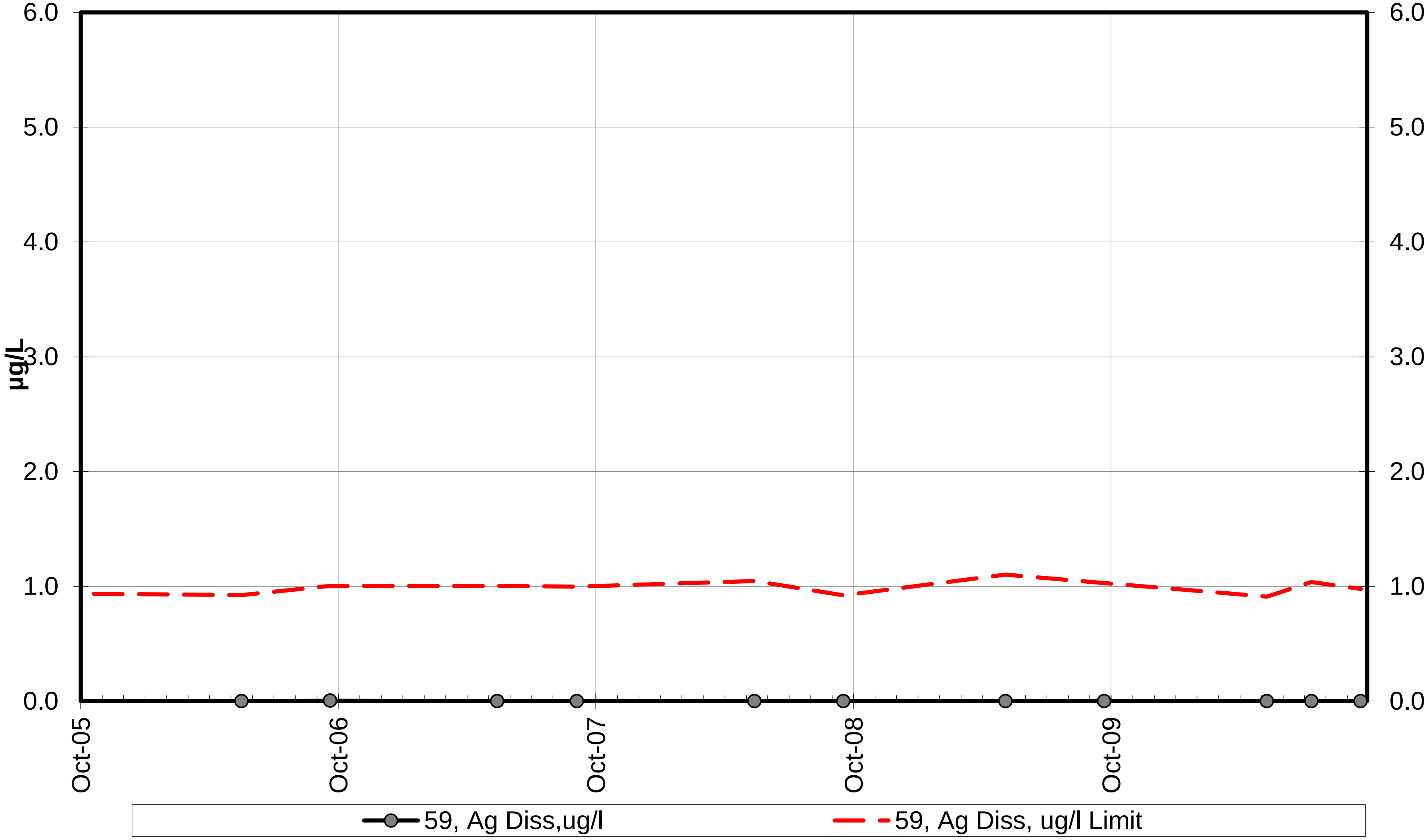
Site 59 - Dissolved Lead
µg/L
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Pb Diss, µg/L
59, Pb Diss, µg/L Limit

Site 59 - Dissolved Nickel

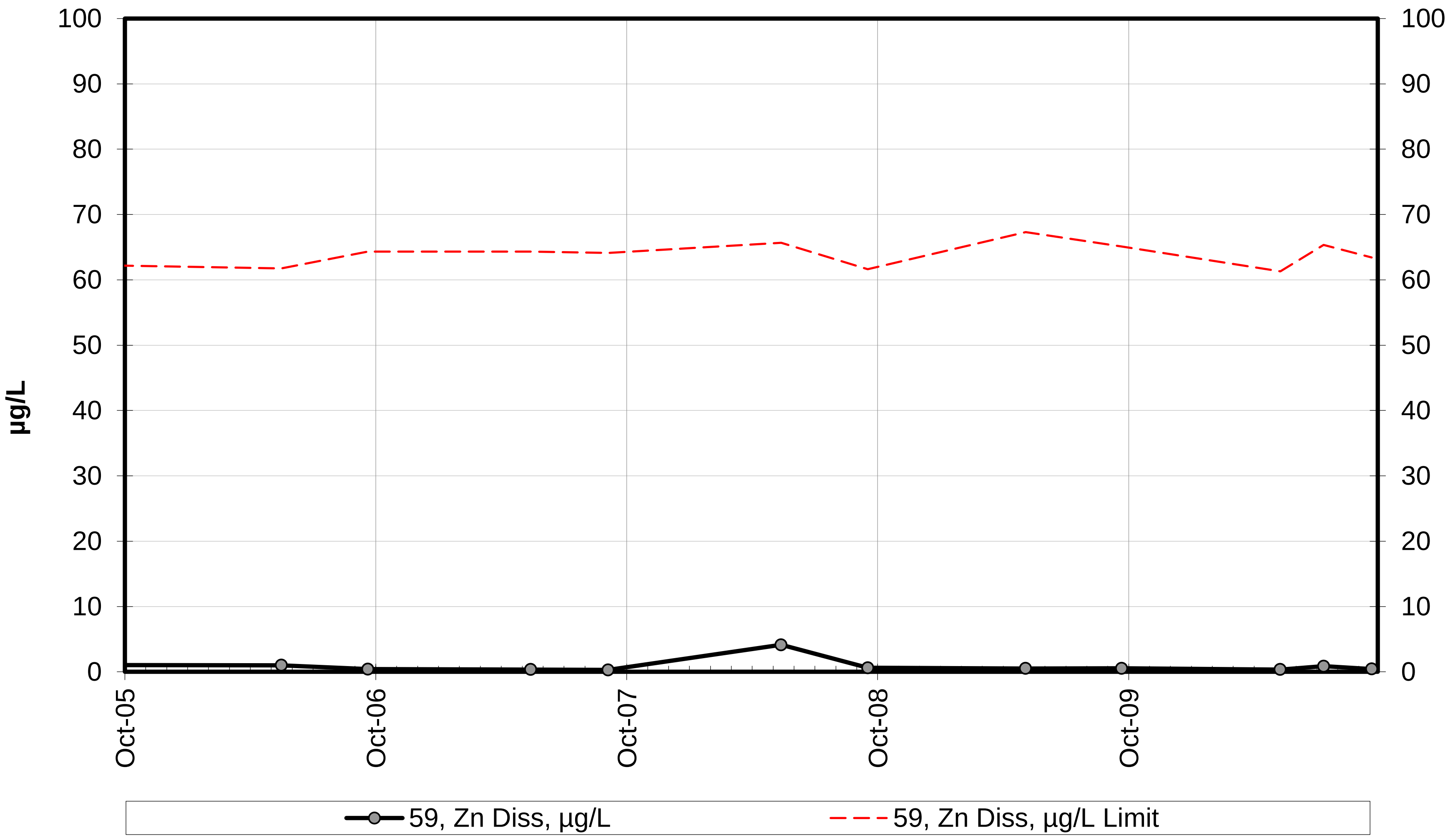


Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.

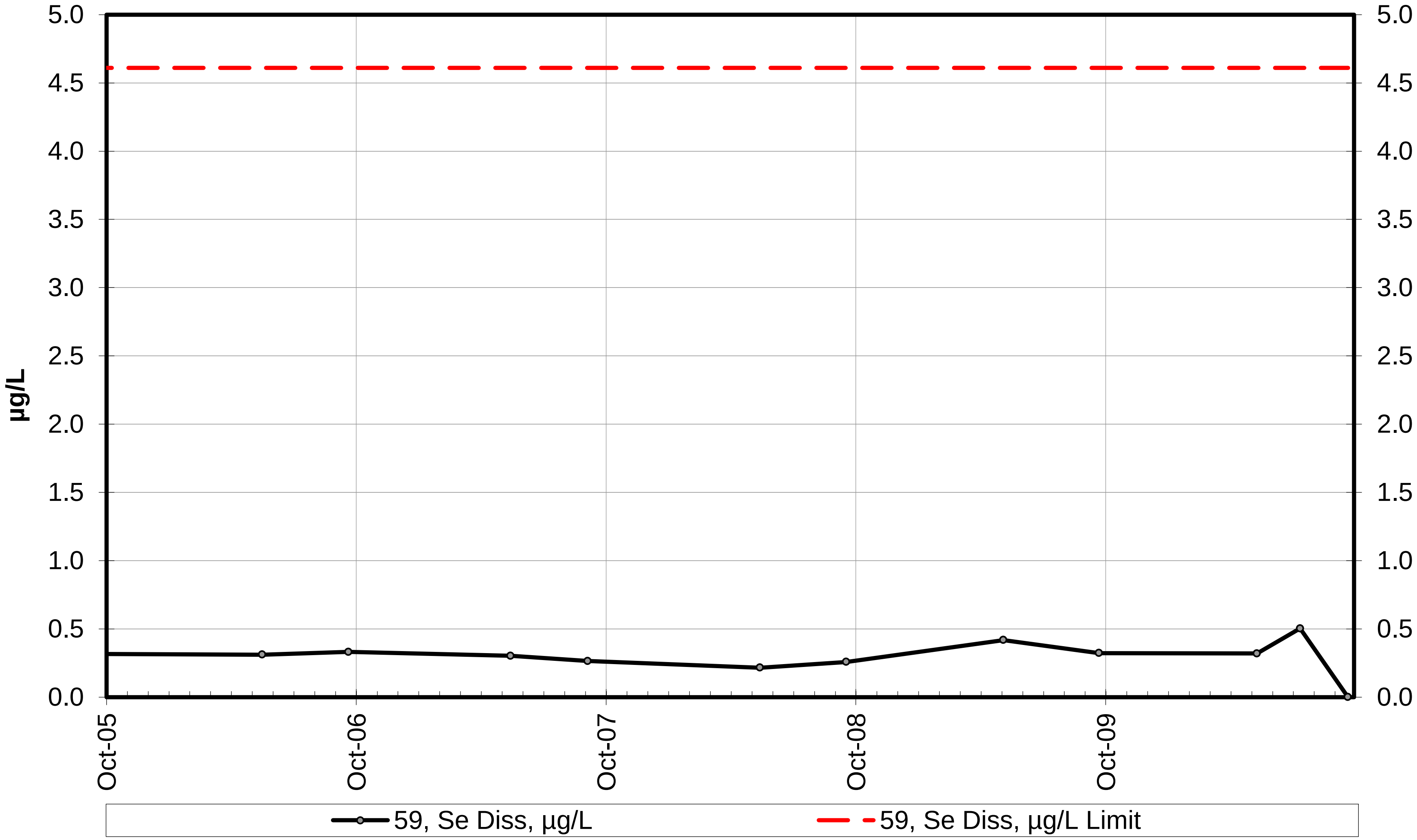
Site 59 - Dissolved Silver



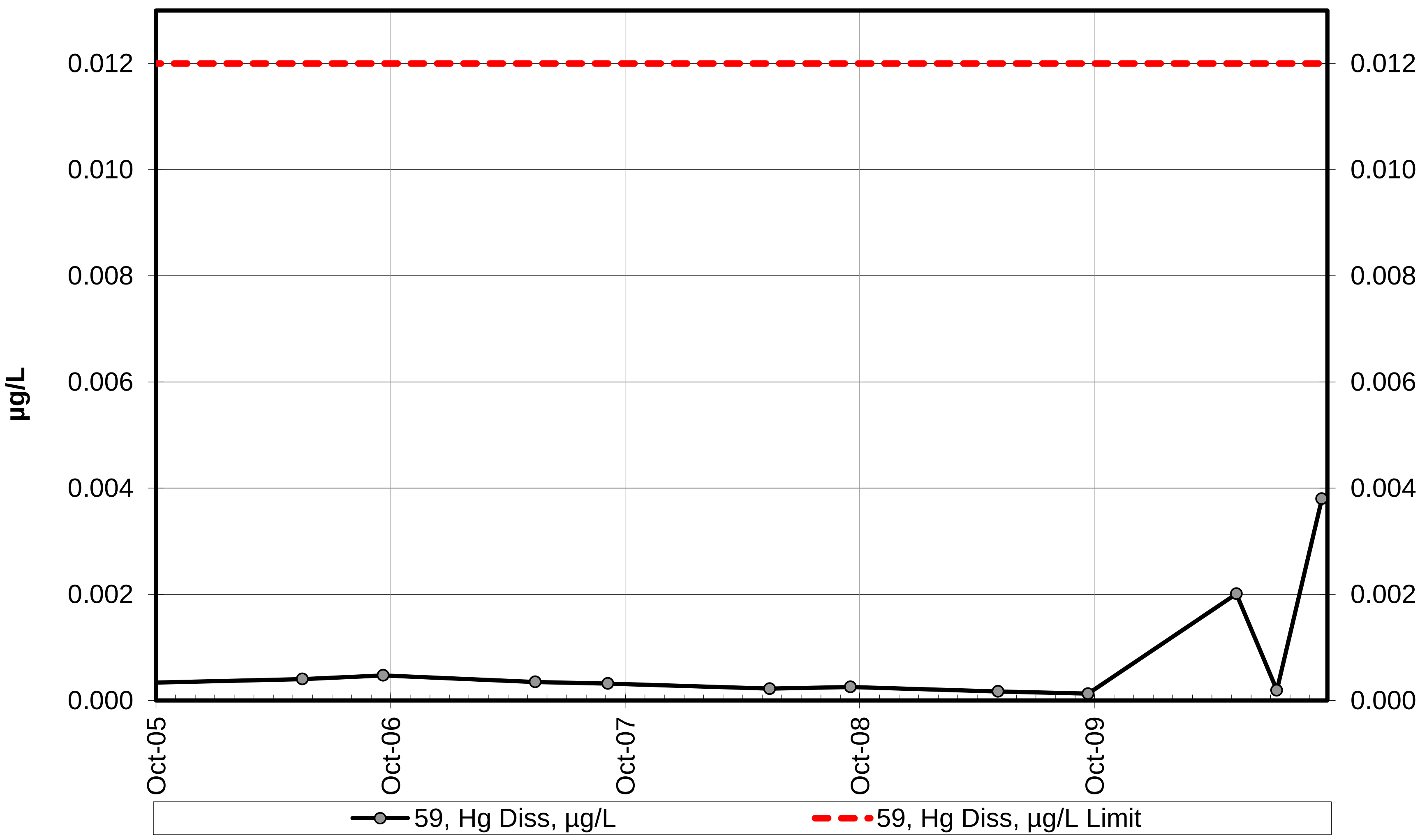
Site 59 - Dissolved Zinc



Site 59 - Dissolved Selenium



Site 59 - Dissolved Mercury



Site **#59** Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								103				95.4
b	**WY2006**								98.2				102
c	**WY2007**								105				97.4
d	**WY2008**								105				111
e	**WY2009**								115				107
f	**WY2010**								112		115		115
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								1				1
d-a								1				1
e-a								1				1
f-a								1				1
c-b								1				-1
d-b								1				1
e-b								1				1
f-b								1				1
d-c								0				1
e-c								1				1
f-c								1				1
e-d								1				-1
f-d								1				1
f-e								-1				1
S_k	0	0	0	0	0	0	0	10	0	0	0	11

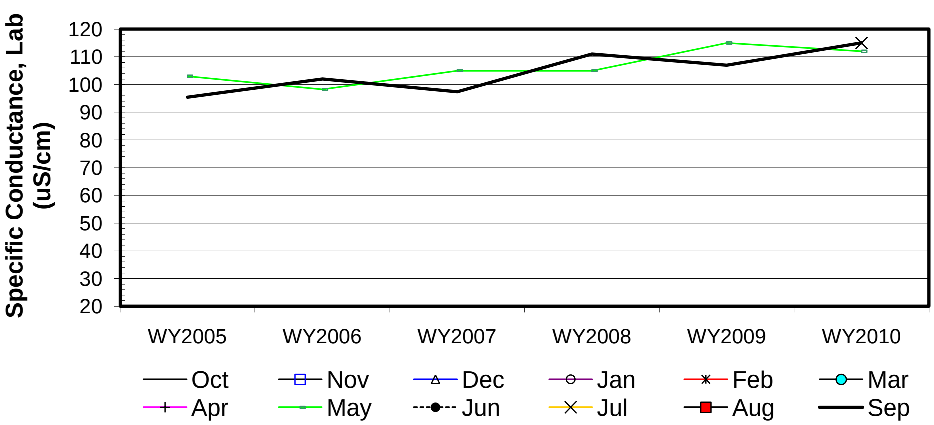
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								27.33				28.33
$Z_k = S_k/\sigma_S$								1.91				2.07
Z^2_k								3.66				4.27

ΣZ_k=	3.98
ΣZ^2_k=	7.93
Z-bar=$\Sigma Z_k/K$=	1.99

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn	13
ΣS_k	21

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.01	@α=5% $\chi^2_{(K-1)}$=	3.84	Test for station homogeneity	
	p	**0.913**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	2.68	@α/2=2.5% Z=	1.96	**H_0** (No trend)	REJECT
55.67	p	**0.996**			**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	0.77		5.47
0.050	1.58	**3.33**	4.83
0.100	1.84		4.37
0.200	2.29		3.56
		3.2%	

Site **#59** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								6.7				6.3
b	**WY2006**								6.1				6.8
c	**WY2007**								6.7				6.8
d	**WY2008**								6.6				6.5
e	**WY2009**								6.6				6.5
f	**WY2010**								6.8		6.4		6.1
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	1
t_2	0	0	0	0	0	0	0	0	0	0	0	2
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				1
c-a								1				1
d-a								-1				1
e-a								-1				1
f-a								1				-1
c-b								1				0
d-b								1				-1
e-b								1				-1
f-b								1				-1
d-c								-1				-1
e-c								-1				-1
f-c								1				-1
e-d								-1				0
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	3	0	0	0	-5

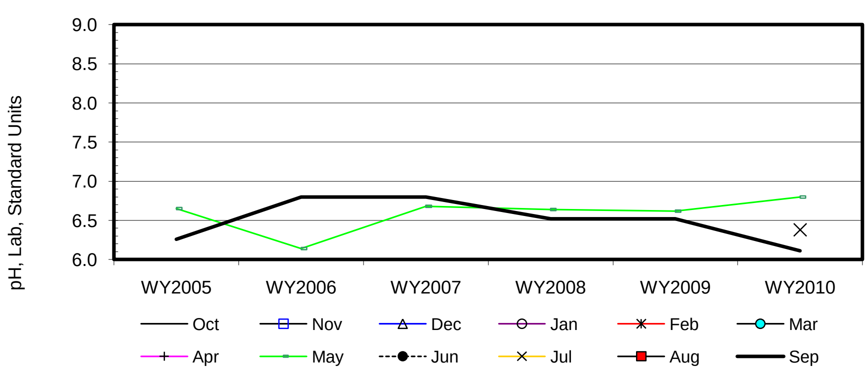
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				26.33
$Z_k = S_k/\sigma_S$								0.56				-0.97
Z^2_k								0.32				0.95

ΣZ_k= -0.41
ΣZ^2_k= 1.27
Z-bar=$\Sigma Z_k/K$= -0.21

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	56	2	0	0	0

Σn 13
ΣS_k -2

$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	1.18	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.277**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) Z_{calc}	-0.14	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
54.67 **p**	**0.446**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.16		0.13
0.050	-0.10	**0.00**	0.07
0.100	-0.04		0.04
0.200	-0.03		0.02

Site **#59** Seasonal Kendall analysis for Total Alk, (mg/l)

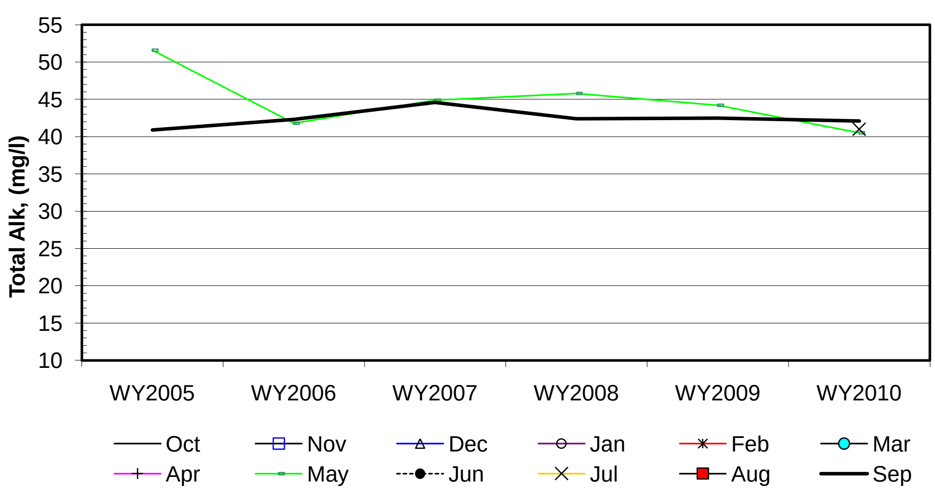
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								51.6				40.9
b	**WY2006**								41.8				42.3
c	**WY2007**								44.9				44.6
d	**WY2008**								45.8				42.4
e	**WY2009**								44.2				42.5
f	**WY2010**								40.5		41.0		42.1
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				1
	c-a								-1				1
	d-a								-1				1
	e-a								-1				1
	f-a								-1				1
	c-b								1				1
	d-b								1				1
	e-b								1				1
	f-b								-1				-1
	d-c								1				-1
	e-c								-1				-1
	f-c								-1				-1
	e-d								-1				1
	f-d								-1				-1
	f-e								-1				-1
	S_k	0	0	0	0	0	0	0	-7	0	0	0	3
σ^2_S=									28.33				28.33
$Z_k = S_k/\sigma_S$									-1.32				0.56
Z^2_k									1.73				0.32

ΣZ_k= -0.75
ΣZ^2_k= 2.05
Z-bar=ΣZ_k/K= -0.38

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13
ΣS_k -4

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		1.76	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.184**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-0.40	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
56.67	**p**	**0.345**		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.13		0.73
0.050	-1.65	**-0.24**	0.27
0.100	-1.39		0.09
0.200	-0.87		0.05

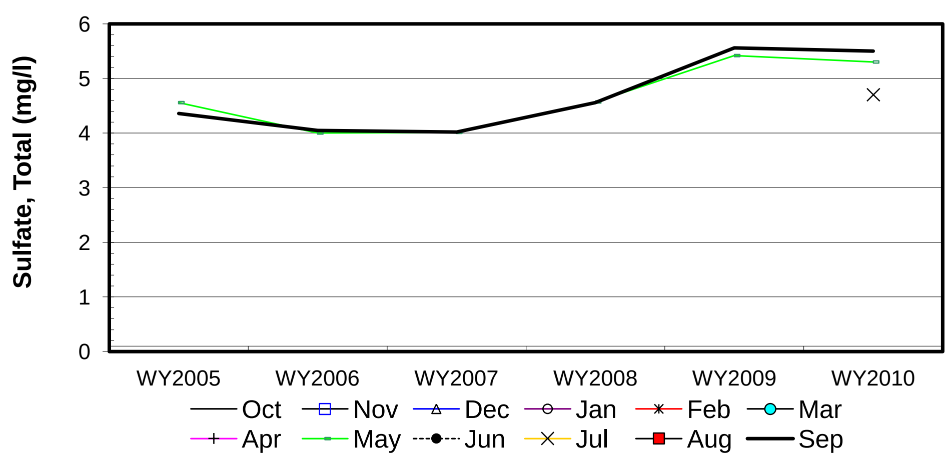
Site	#59	Seasonal Kendall analysis for Sulfate, Total (mg/l)											
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	WY2005								4.6				4.4
b	WY2006								4.0				4.1
c	WY2007								4.0				4.0
d	WY2008								4.6				4.6
e	WY2009								5.4				5.6
f	WY2010								5.3		4.7		5.5
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				-1
	c-a								-1				-1
	d-a								1				1
	e-a								1				1
	f-a								1				1
	c-b								1				-1
	d-b								1				1
	e-b								1				1
	f-b								1				1
	d-c								1				1
	e-c								1				1
	f-c								1				1
	e-d								1				1
	f-d								1				1
	f-e								-1				-1
	S_k	0	0	0	0	0	0	0	9	0	0	0	7
	σ^2_S=								28.33				28.33
	$Z_k = S_k/\sigma_S$								1.69				1.32
	Z^2_k								2.86				1.73

ΣZ_k=	3.01
ΣZ^2_k=	4.59
Z-bar=ΣZ_k/K=	1.50

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	16

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.07	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	0.790		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc}	1.99	@α=5% Z= 1.64	H_0 (No trend)	REJECT
56.67	p	0.977		H_A (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.05		0.50
0.050	0.01	0.29	0.47
0.100	0.08		0.42
0.200	0.20		0.36

6.4%

Site #59 — Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.7				1.0
b	**WY2006**								1.0				0.4
c	**WY2007**								0.4				0.3
d	**WY2008**								4.1				0.6
e	**WY2009**								0.5				0.5
f	**WY2010**								0.4		0.9		0.4
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				-1
c-a								-1				-1
d-a								1				-1
e-a								-1				-1
f-a								-1				-1
c-b								-1				-1
d-b								1				1
e-b								-1				1
f-b								-1				1
d-c								1				1
e-c								1				1
f-c								-1				1
e-d								-1				-1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-5	0	0	0	-3

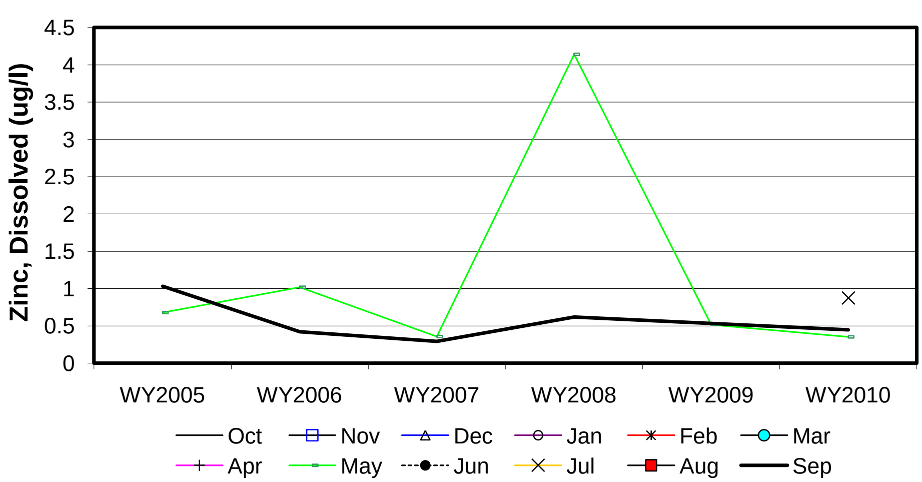
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$								28.33				28.33
$Z_k = S_k/\sigma_S$								-0.94				-0.56
Z^2_k								0.88				0.32

$\Sigma Z_k=$	-1.50
$\Sigma Z^2_k=$	1.20
Z-bar=$\Sigma Z_k/K=$	-0.75

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	-8

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$	0.07	@α=5% $\chi^2_{(K-1)}=$	3.84	Test for station homogeneity	
p	**0.790**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 56.67	Z_{calc} -0.93	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
	p **0.176**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.17		0.09
0.050	-0.16	**-0.08**	0.04
0.100	-0.14		0.00
0.200	-0.12		-0.03

INTERPRETIVE REPORT
SITE 28 "MONITORING WELL 2D"

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

All data collected at this site for the past six years are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Four results exceeding these criteria have been identified, as listed in the table below. Dissolved arsenic was in exceedance for all three monthly FWMP sampling events. This site has routinely returned arsenic values above the AWQS and has a mean value of 72 µg/L based on sampling since October-1988. The other exceedance was for the field pH taken during the September sampling event.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
21-Sep-10	pH Field, su	8.67		8.5	Aquatic Life, chronic
11-May-10	Arsenic Dissolved ug/L	75.1		10	Aquatic Life, chronic
13-Jul-10	Arsenic Dissolved ug/L	72.8		10	Aquatic Life, chronic
21-Sep-10	Arsenic Dissolved ug/L	68.5		10	Aquatic Life, chronic

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. These plots have been visually analyzed for the appearance of any trend in concentration. No obvious trends were apparent.

A non-parametric statistical analysis for trend was preformed for conductivity, pH, alkalinity, sulfate, and dissolved zinc. Calculation details of the Seasonal Kendall analyses are presented in detail on the pages following this interpretive section. The adjacent table

Site 28-WY2010, summary statistics for trend analysis.

	Mann-Kendall test statistics			Sen's slope estimate	
Parameter	n(1)	p(2)	Trend	Q	Q(%)
Conductivity, Lab	6	**0.98**	+	5.75	2.8
pH, Lab	6	0.82	0		
Alkalinity, Total	6	0.07	0		
Sulfate, Total	6	0.67	0		
Zinc, Dissolved	6	0.04	0		

(1): Number of years (2):Significance level

summarizes the results on the data collected between Oct-04 and Sep-10 (WY2005-WY2010). There was one significant trend identified in laboratory conductivity (p=0.98) with an estimated slope of 5.75 µS/cm/yr or a 2.8% increase, during the 2010 water year.

Additional X-Y plots have been generated for alkalinity, pH, sulfate, conductance, and dissolved zinc that co-plot data from Site 28 and Site 59, the up-gradient control site, to aid in comparison between those two sites. Laboratory conductivity, laboratory pH, total alkalinity, and sulfate are all higher at Site 28 than at Site 59 while the dissolved zinc concentrations are generally similar except for the 2006 water year which shows a pronounced spike of moderate amplitude. By the end of the 2007 water year dissolved zinc was again at a typical value for Site 28. Site 59 and Site 28 are deep completion wells that are each respectively co-located with Site 58 and Site 27. A similar line of reasoning discussed in the section for Site 28 can be applied to explaining the differences in water chemistry between Site 59 and Site 28. Thus, the generally higher concentrations at Site 28 reflect the more mature nature of the groundwater sampled at this site.

Table of Results for Water Year 2010

Site 28 "MW-2D"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	Jul-10	Aug-10	9/21/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							6.1	NOT SCHEDULED FOR SAMPLING	11.0	NOT SCHEDULED FOR SAMPLING	10.2	10.2
Conductivity-Field(µmho)								243		199		216	216
Conductivity-Lab (µmho)								218		208		209	209
pH Lab (standard units)								8.32		7.80		7.83	7.83
pH Field (standard units)								7.85		8.18		8.67	8.18
Total Alkalinity (mg/L)								86.5		79.0		89.5	86.5
Total Sulfate (mg/L)								11.3 J		10.4 J		11.0 J	11.0
Hardness (mg/L)								71.4		77.9		77.1	77.1
Dissolved As (ug/L)								75.10		72.80		68.50	72.80
Dissolved Ba (ug/L)								6.0		6.3		6.3	6.3
Dissolved Cd (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Cr (ug/L)								1.290		0.799		0.171 J	0.799
Dissolved Cu (ug/L)								0.160		0.049		0.188	0.160
Dissolved Pb (ug/L)								<0.0030 U		<0.0030		<0.0060	0.0015
Dissolved Ni (ug/L)								0.719		0.547		0.805	0.719
Dissolved Ag (ug/L)								<0.004		<0.004		<0.008	0.002
Dissolved Zn (ug/L)								0.10 U		0.47		0.08 J	0.10
Dissolved Se (ug/L)								0.241 J		<0.114		<0.228	0.114
Dissolved Hg (ug/L)								0.001170		0.000156 U		0.000515	0.000515

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

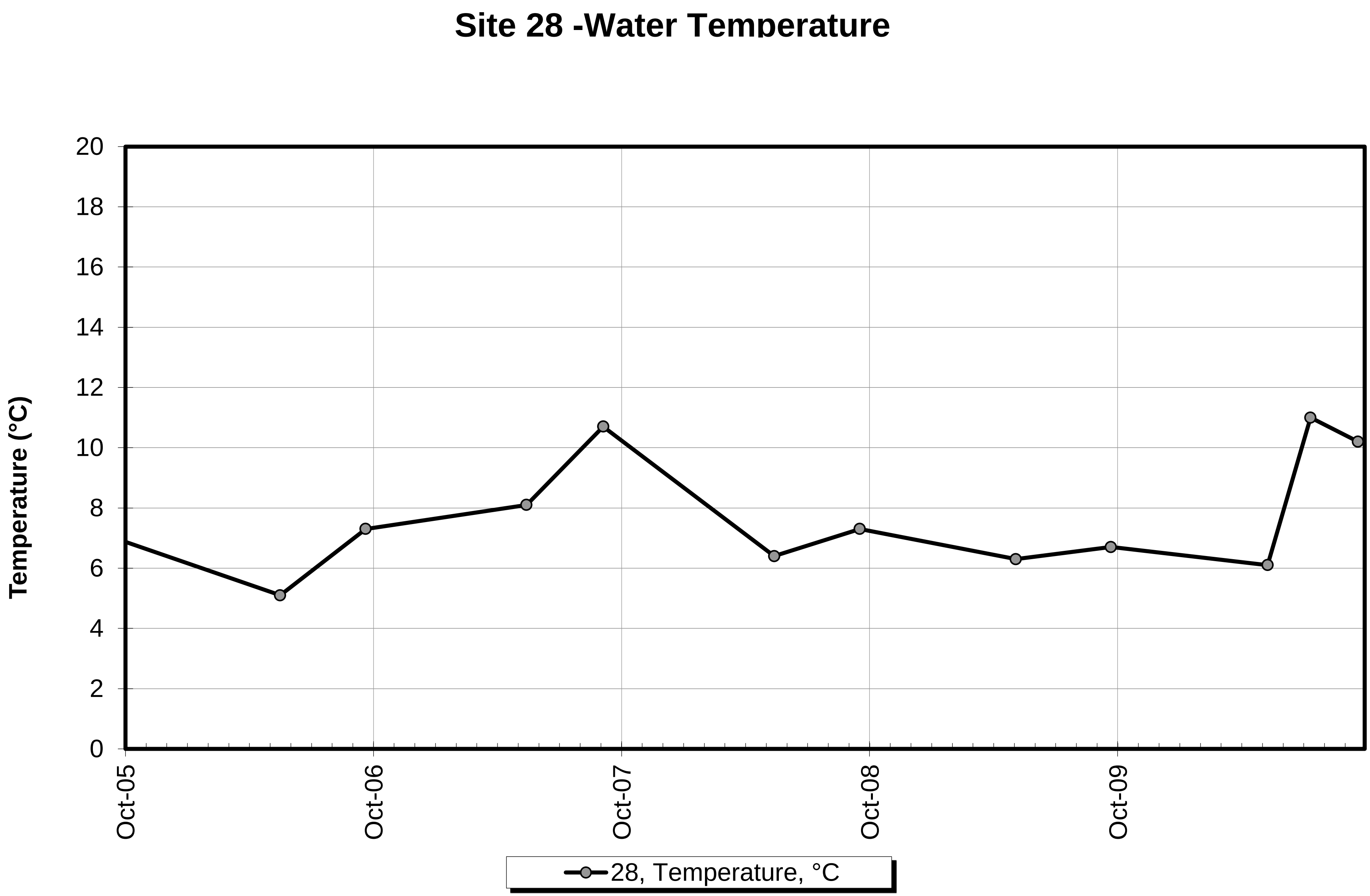
Shaded data has been qualified as an outlier by HGCMC and removed from any further analysis and is not included into the calculation of the median

Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

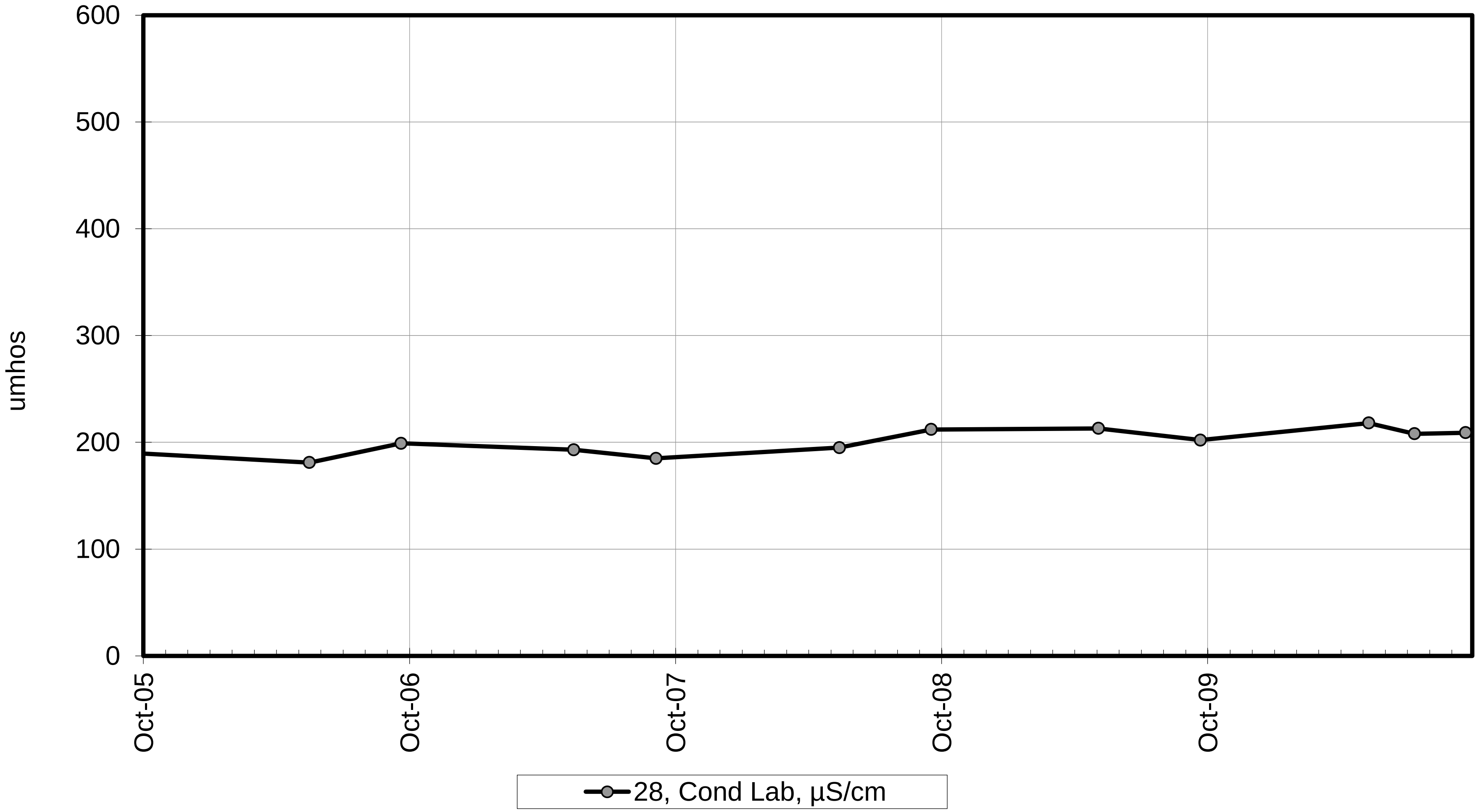
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
28	5/11/2010	12:53 PM				
			Pb diss, µg/l	-0.003	U	Field Blank Contamination
			Se diss, µg/l	0.241	J	Below Quantitative Range
			Zn diss, µg/l	0.0964	U	Field Blank Contamination
			SO4 Tot, mg/l	11.3	J	Sample Temperature
28	7/13/2010	12:17 PM				
			Hg diss, µg/l	0.000156	U	Field Blank Contamination
			SO4 Tot, mg/l	10.4	J	Sample Reciept Temperature
28	9/21/2010	11:29 AM				
			Cr diss, µg/l	0.171	J	Below Quantitative Range
			Zn diss, µg/l	0.0783	J	Below Quantitative Range
			SO4 Tot, mg/l	11	J	Sample Receipt Temperature

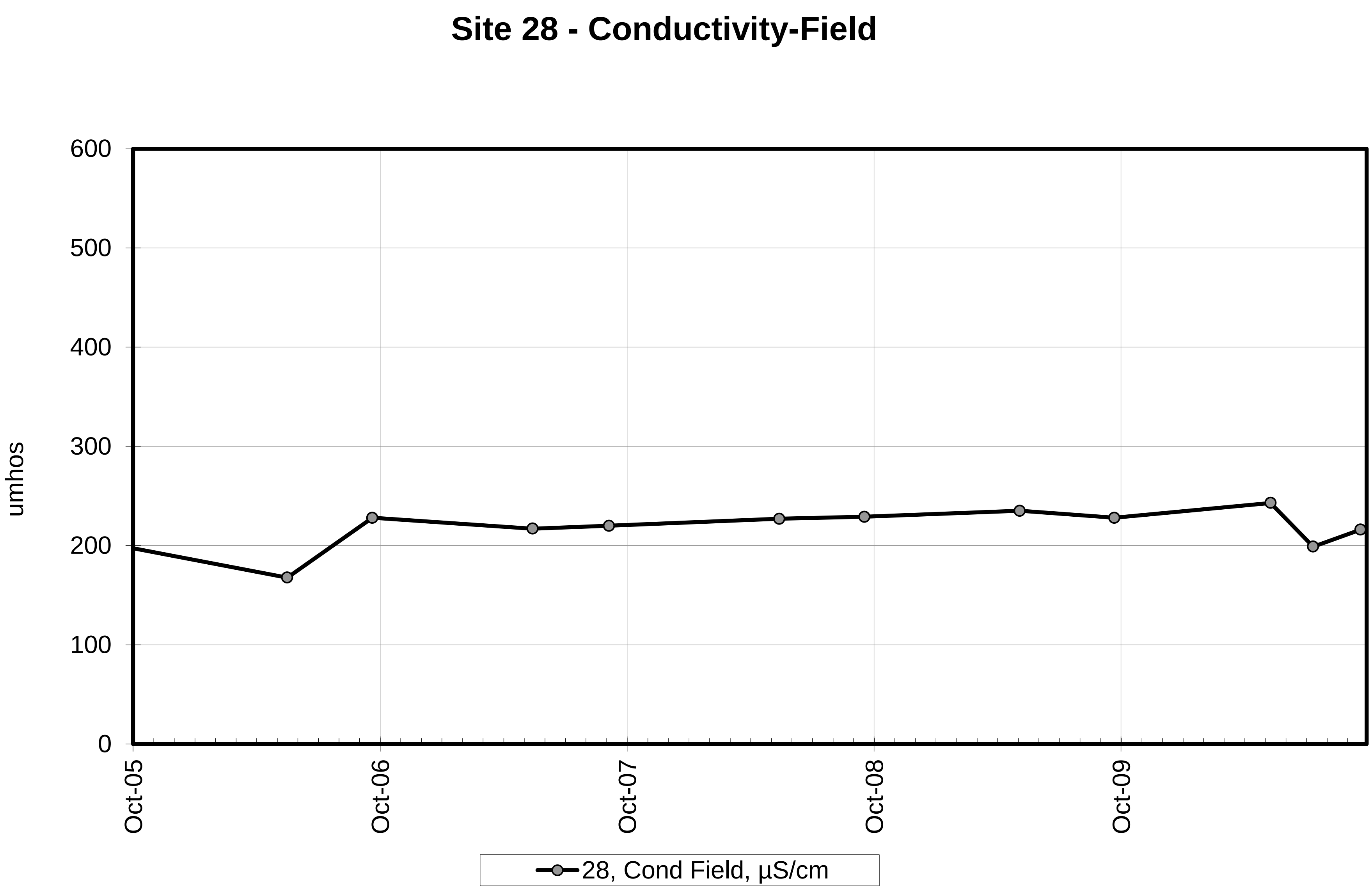
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit



Site 28 -Water Temperature
Temperature (°C)
0
2
4
6
8
10
12
14
16
18
20
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Temperature, °C

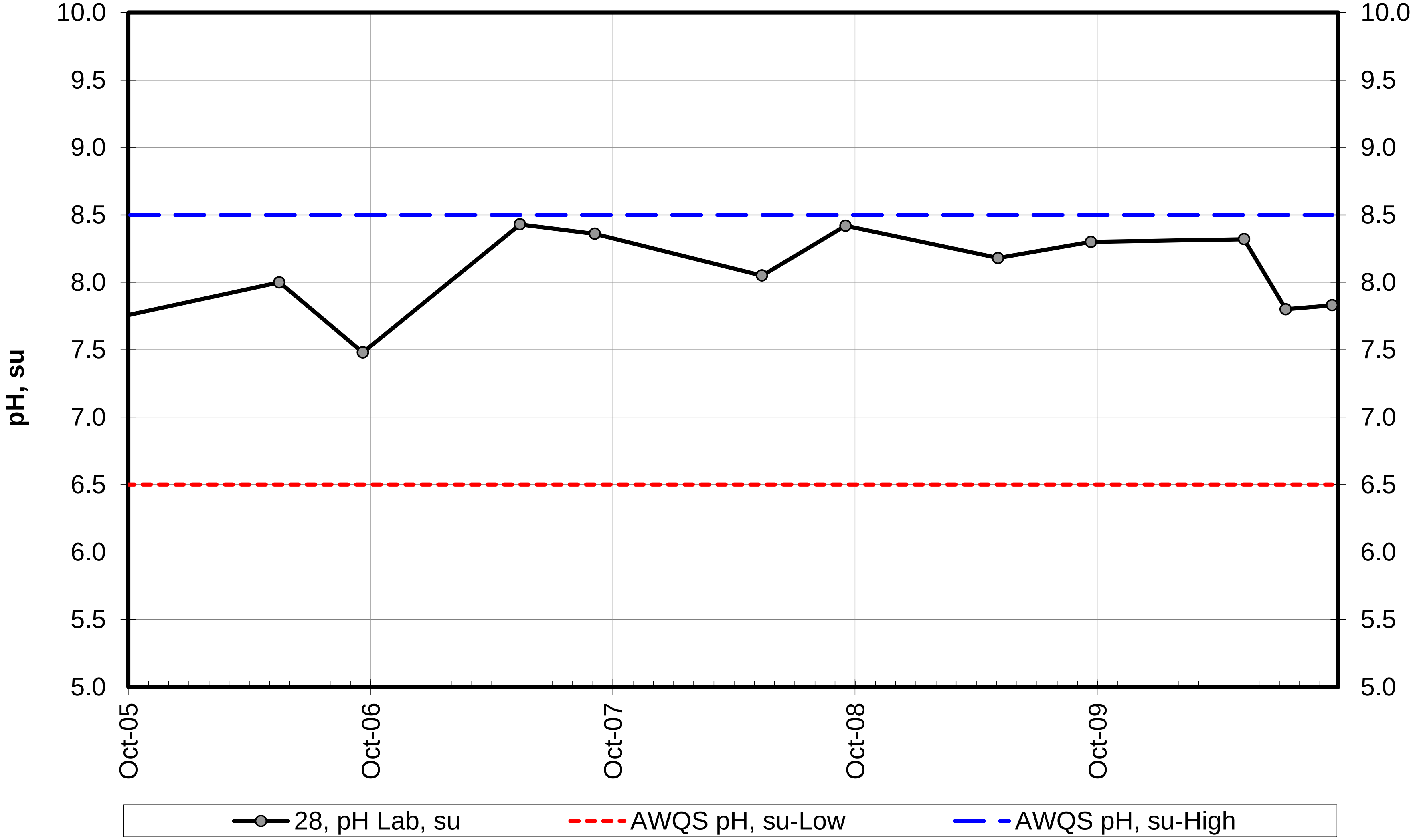
Site 28 - Conductivity-Lab

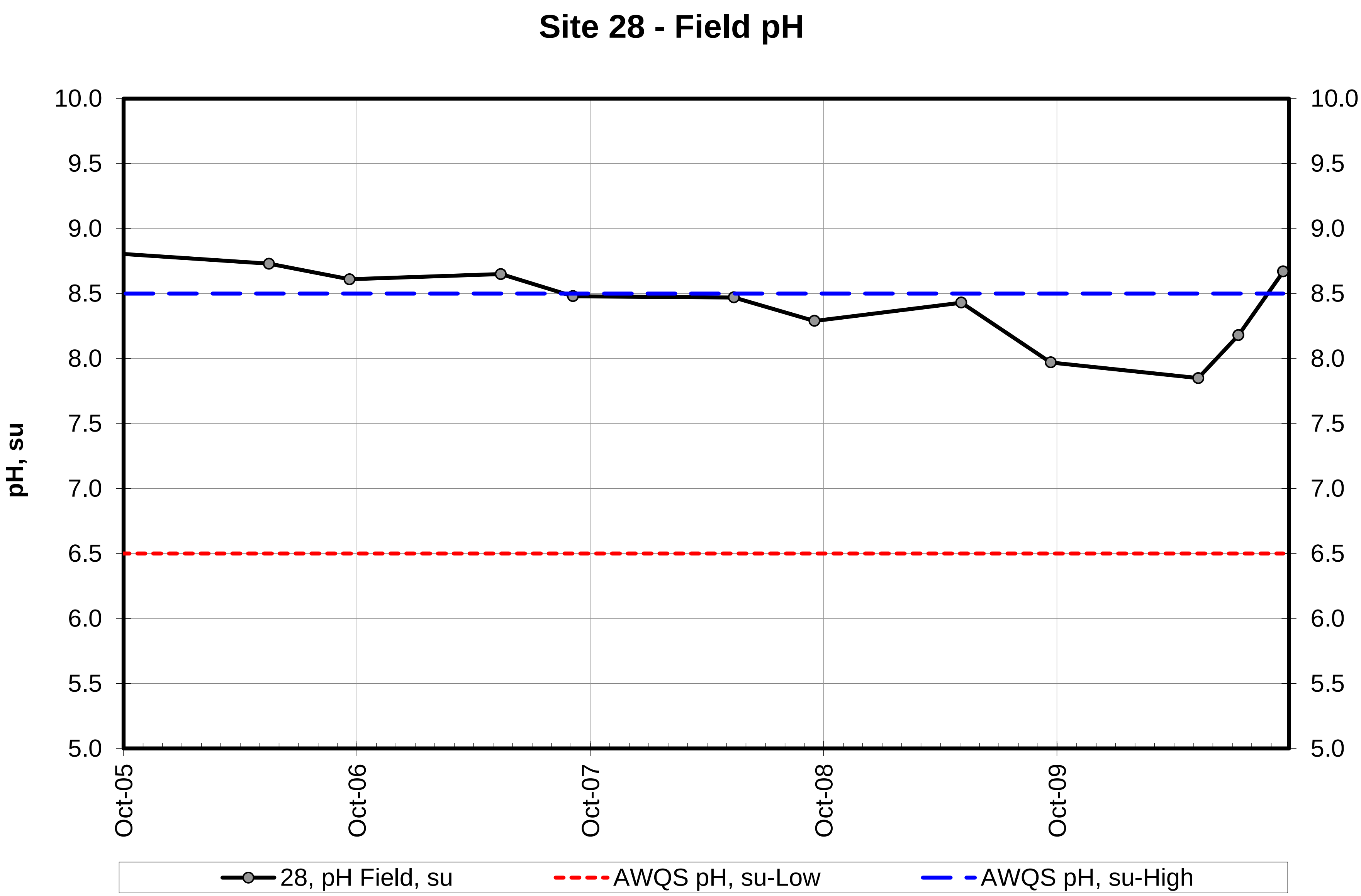




Site 28 - Conductivity-Field
umhos
600
500
400
300
200
100
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Cond Field, µS/cm

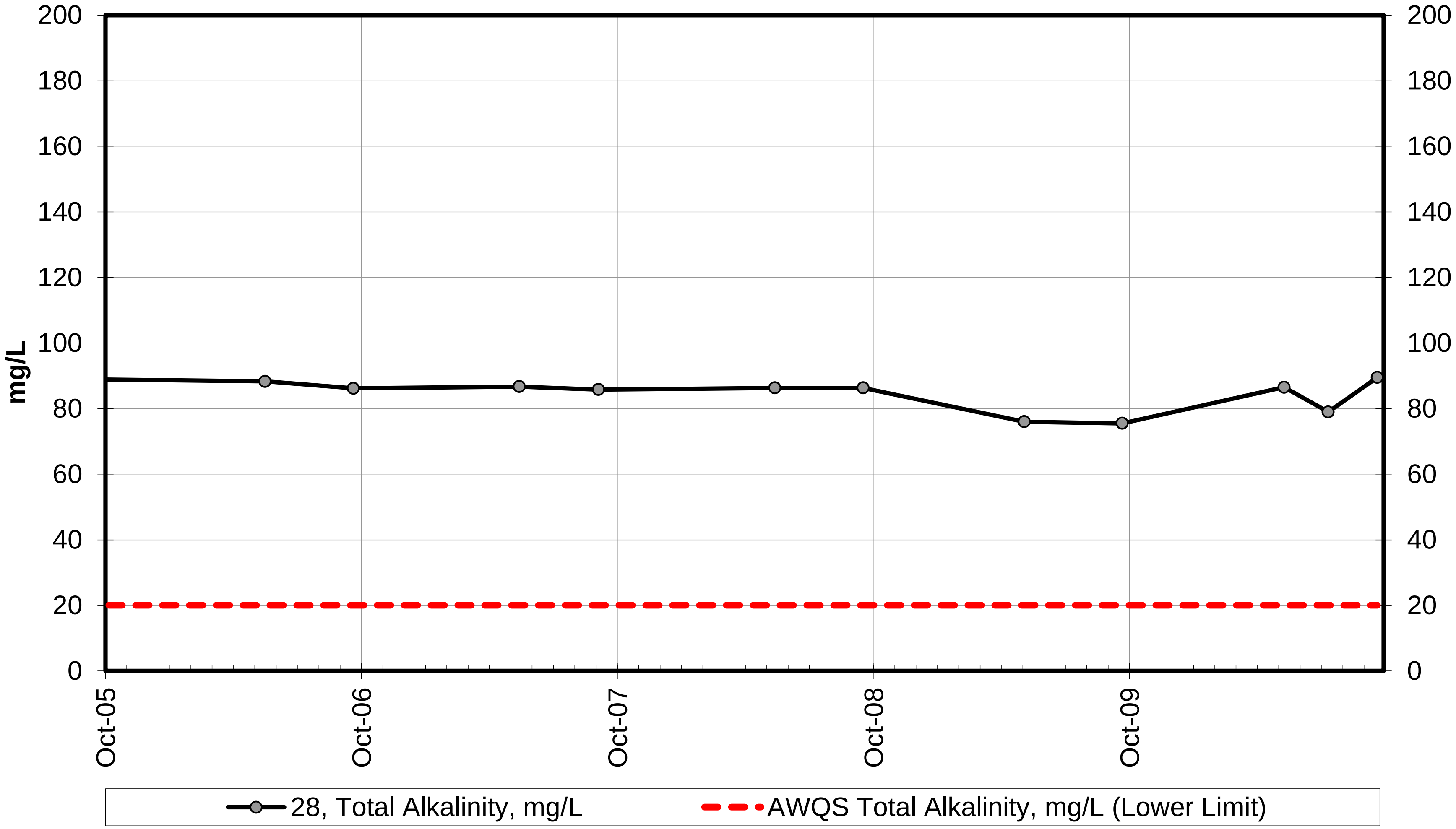
Site 28 - Lab pH



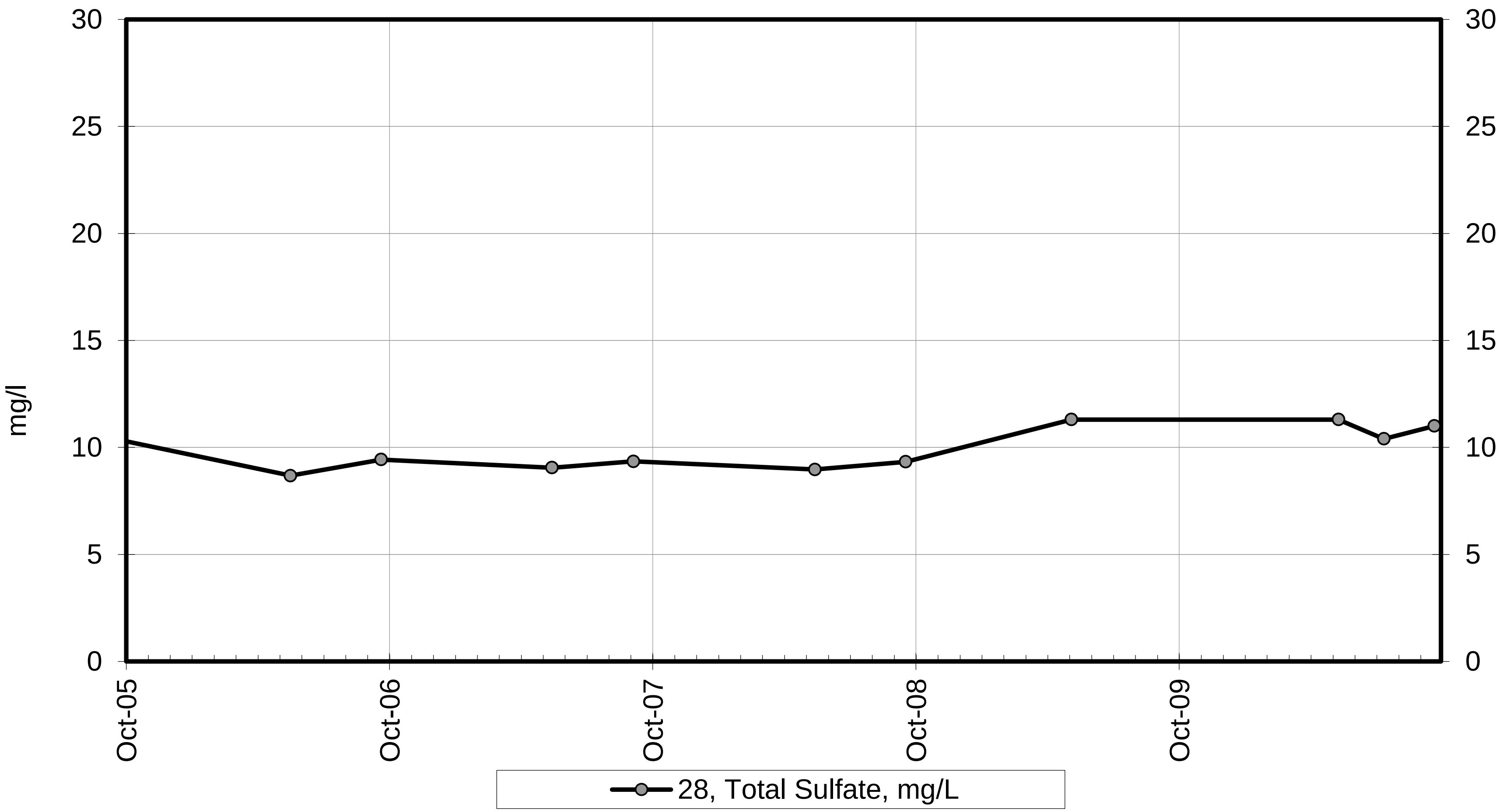


Site 28 - Field pH
pH, su
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

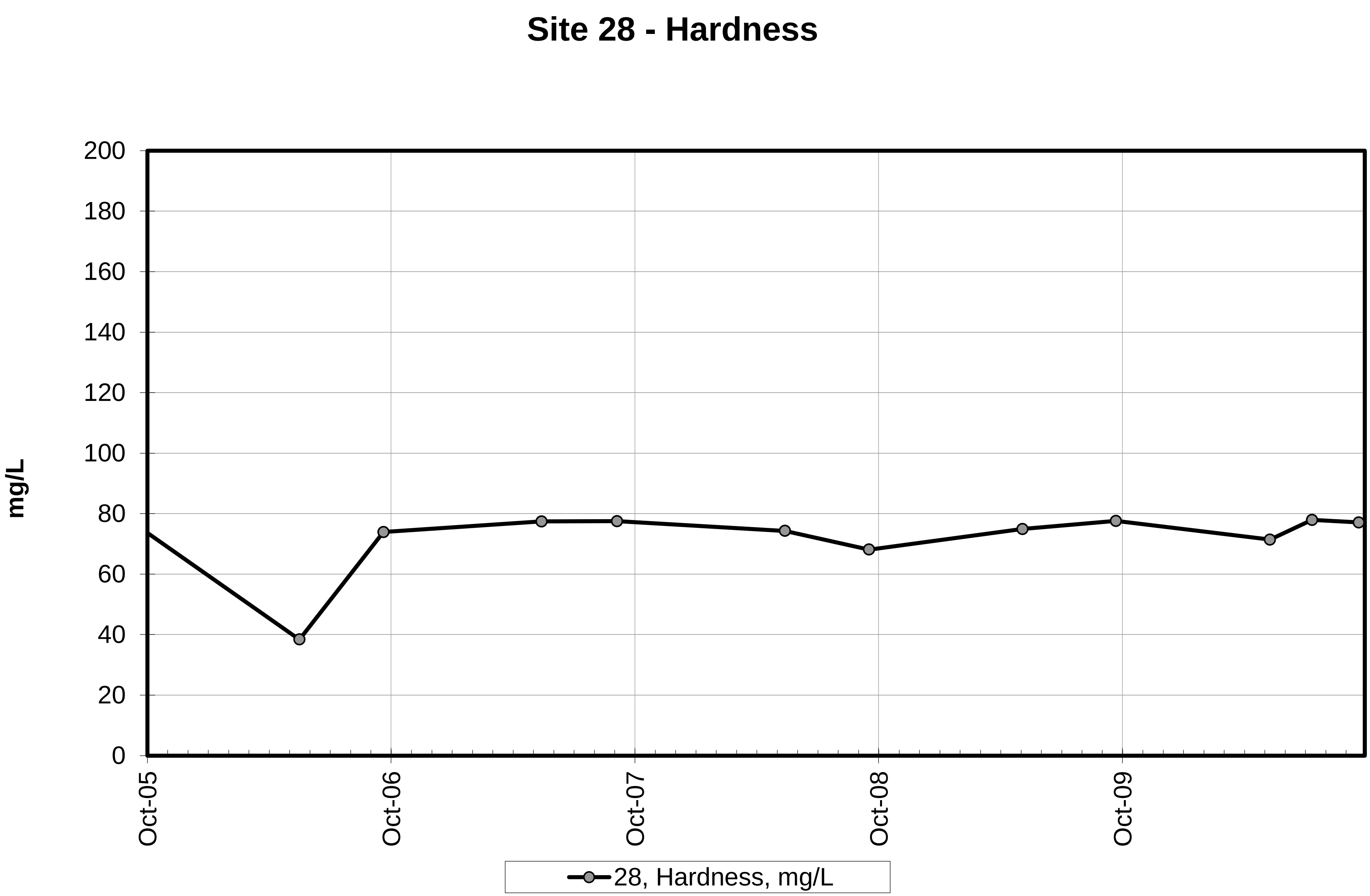
Site 28 - Total Alkalinity

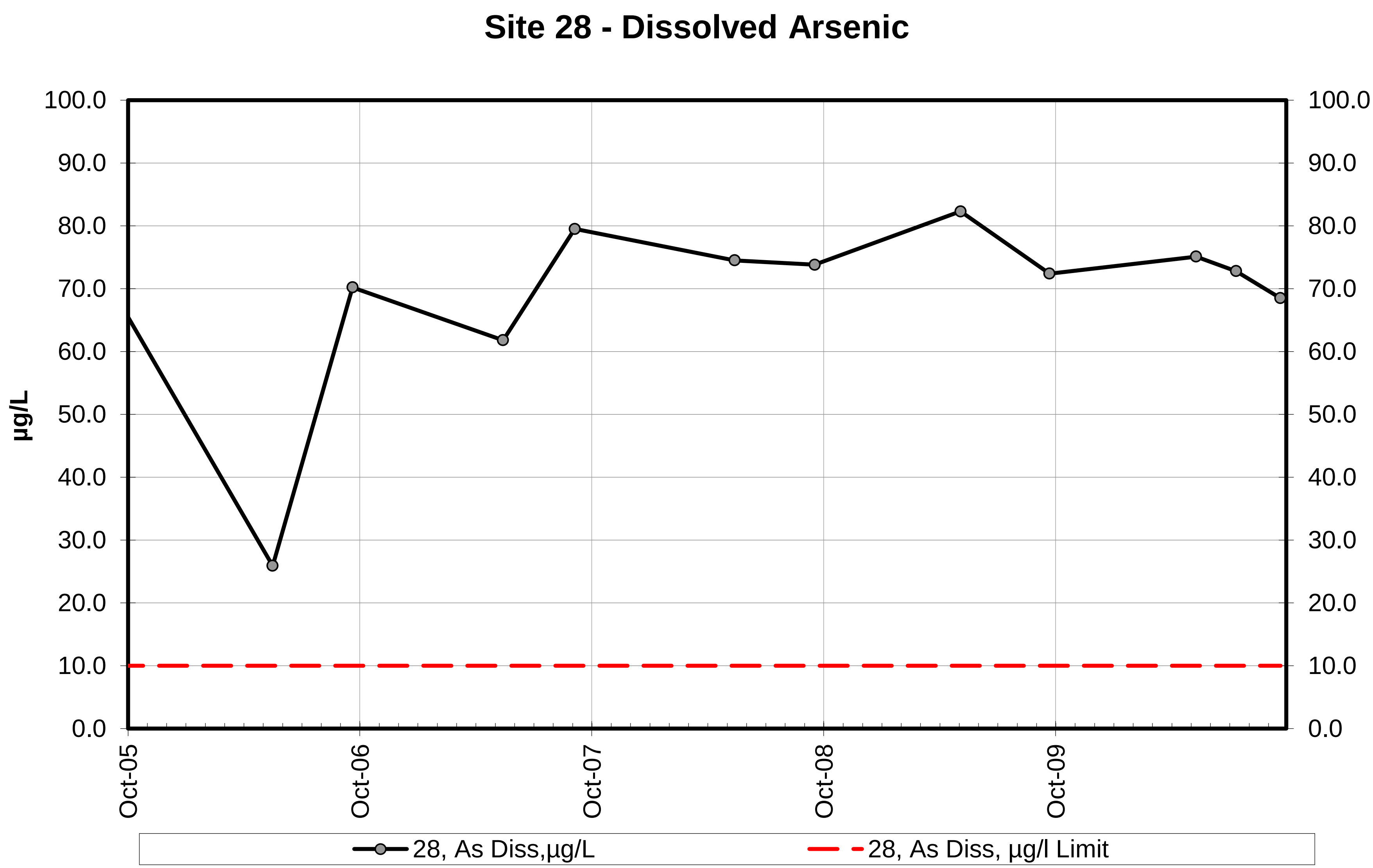


Site 28 - Total Sulfate



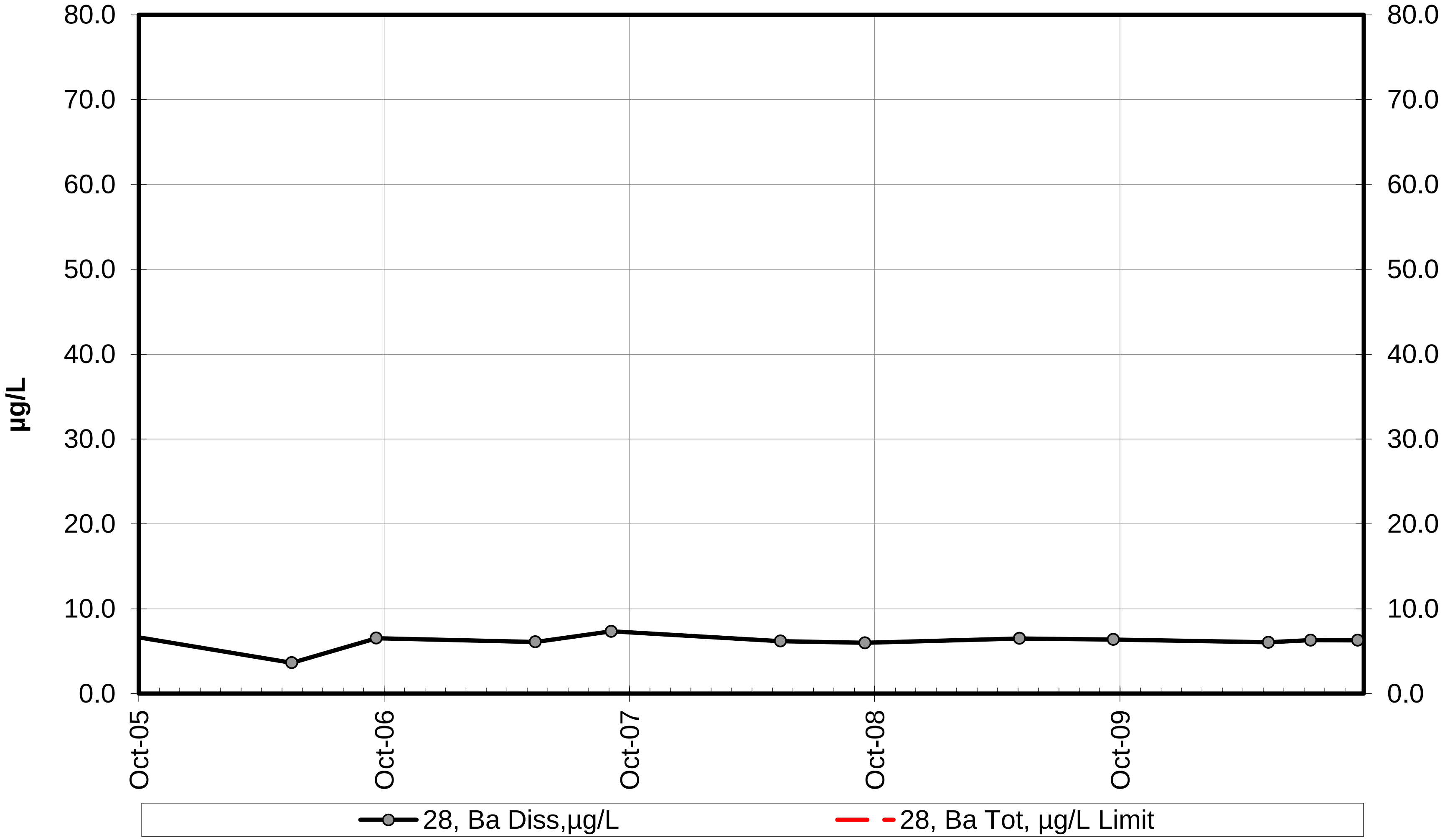
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.


Site 28 - Hardness
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Hardness, mg/L

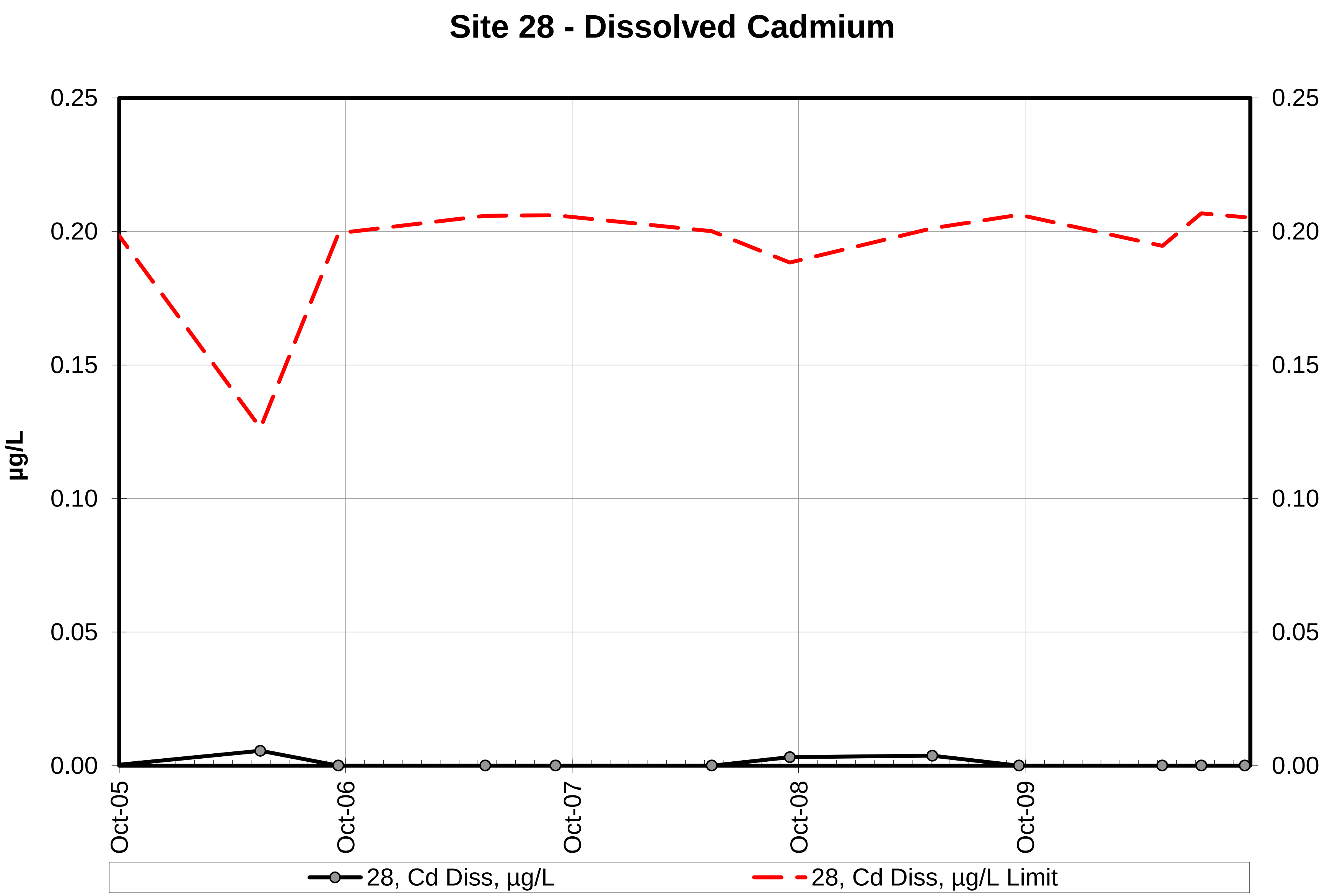


Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

Site 28 - Dissolved Barium

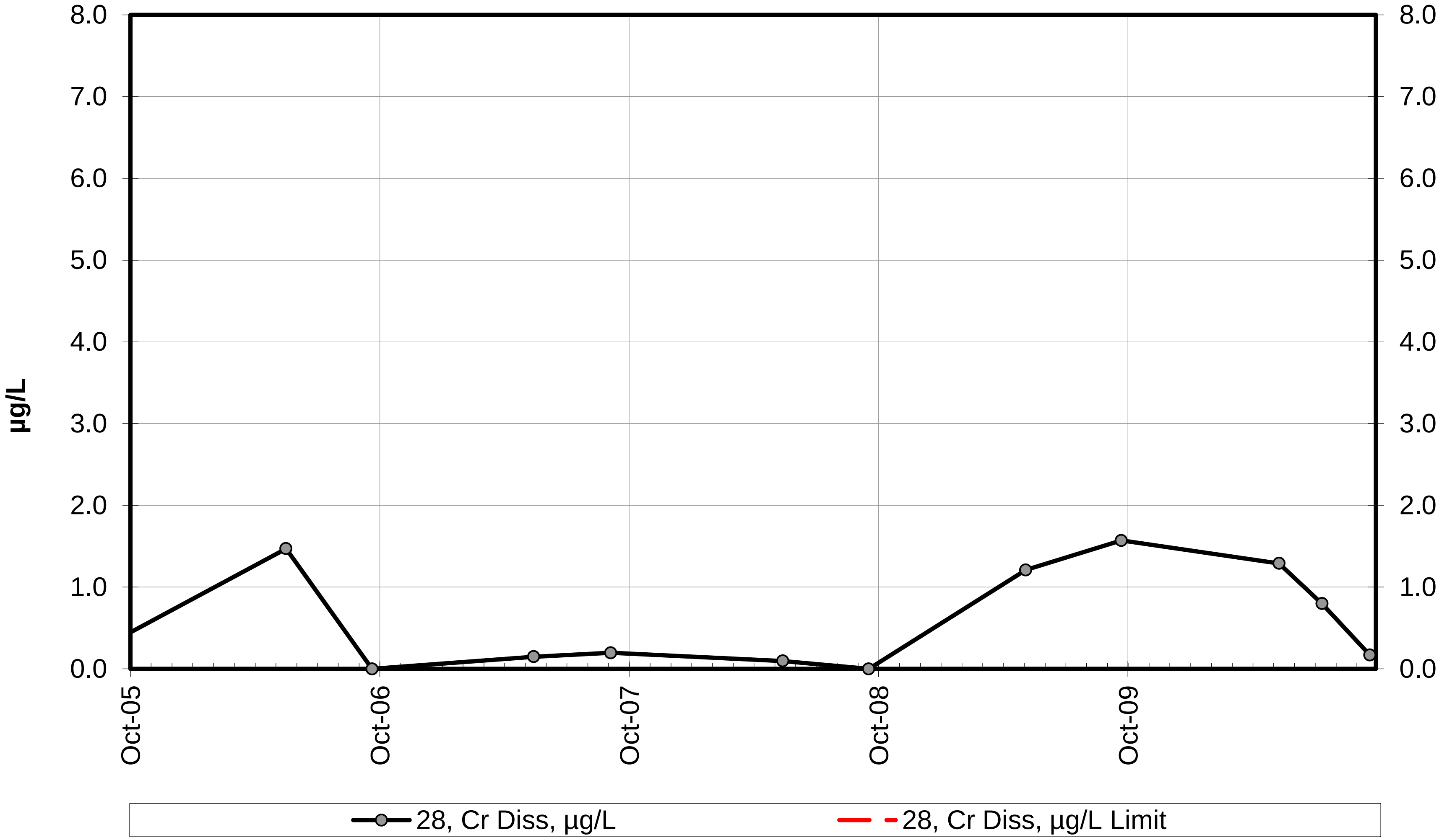


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination



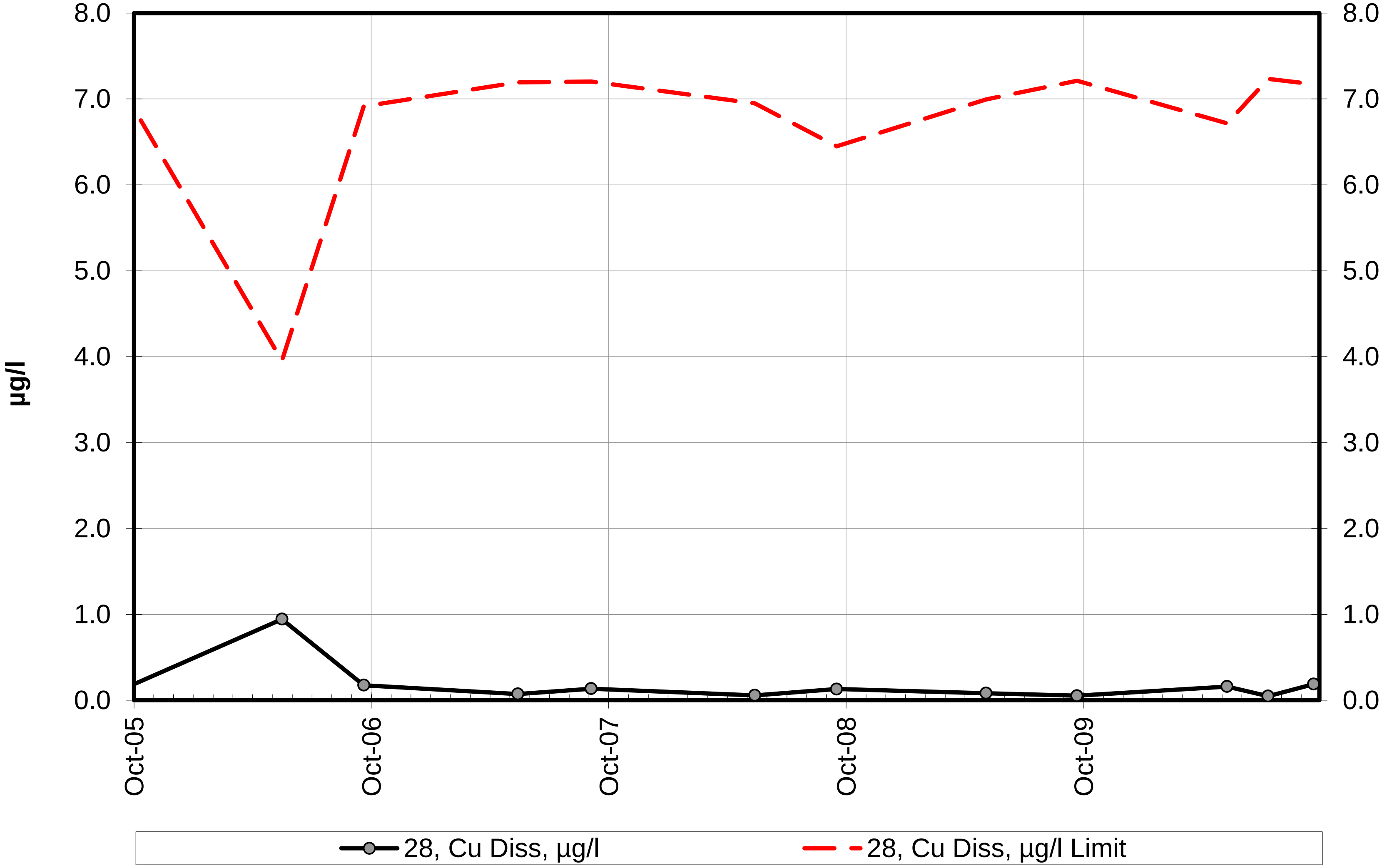
Site 28 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Cd Diss, µg/L
28, Cd Diss, µg/L Limit

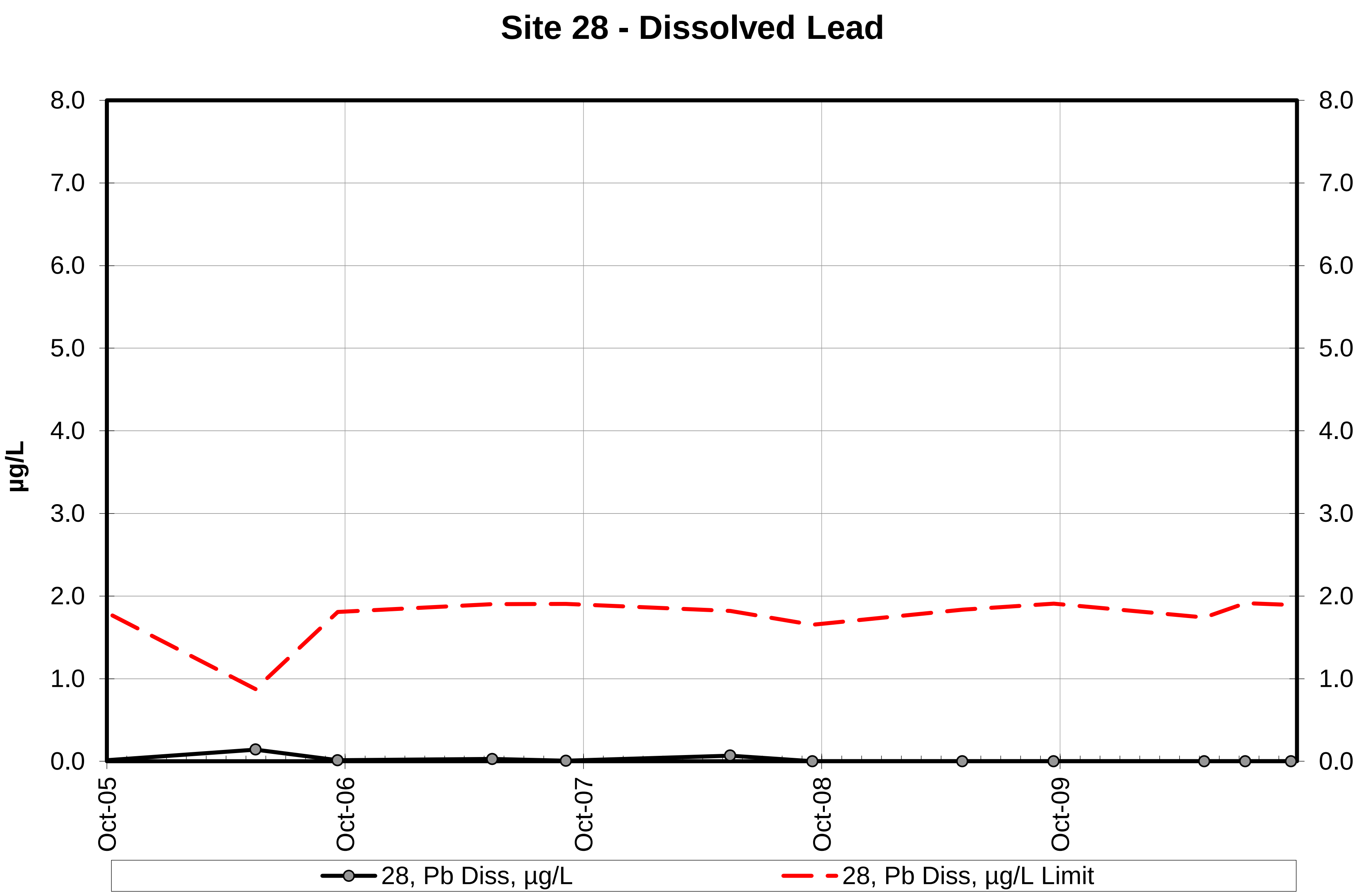
Site 28 - Dissolved Chromium



Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

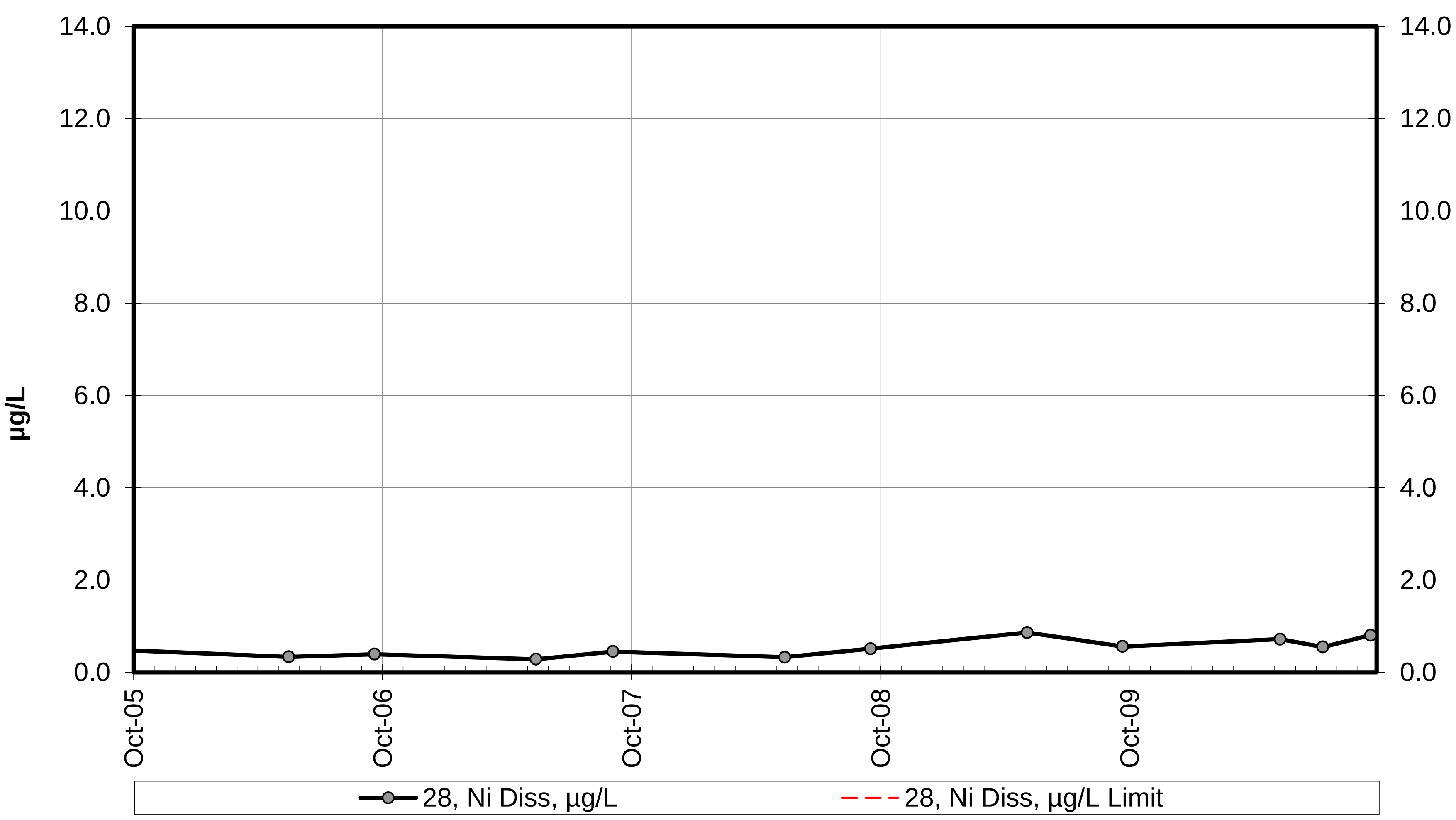
Site 28 - Dissolved Copper



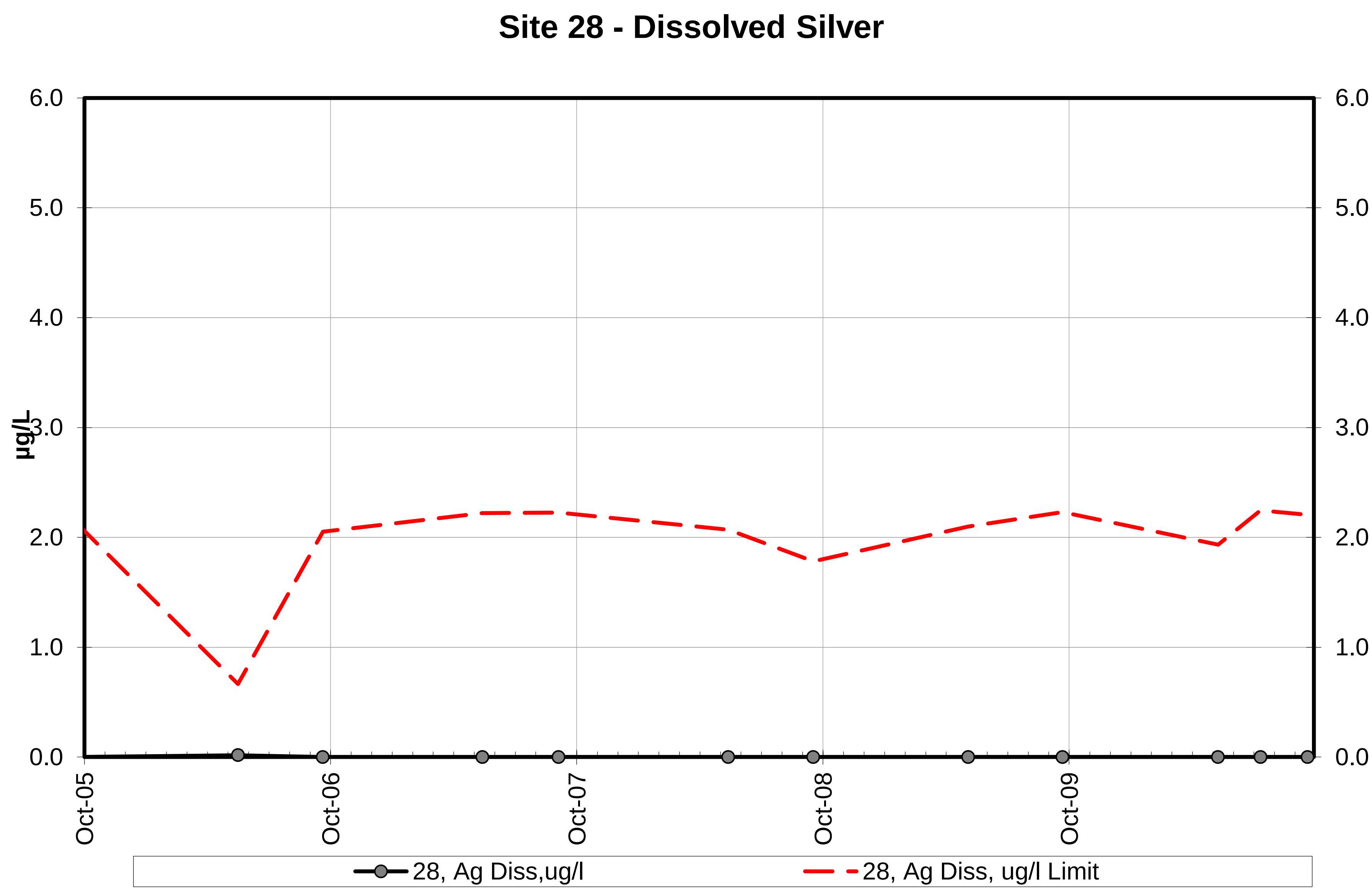


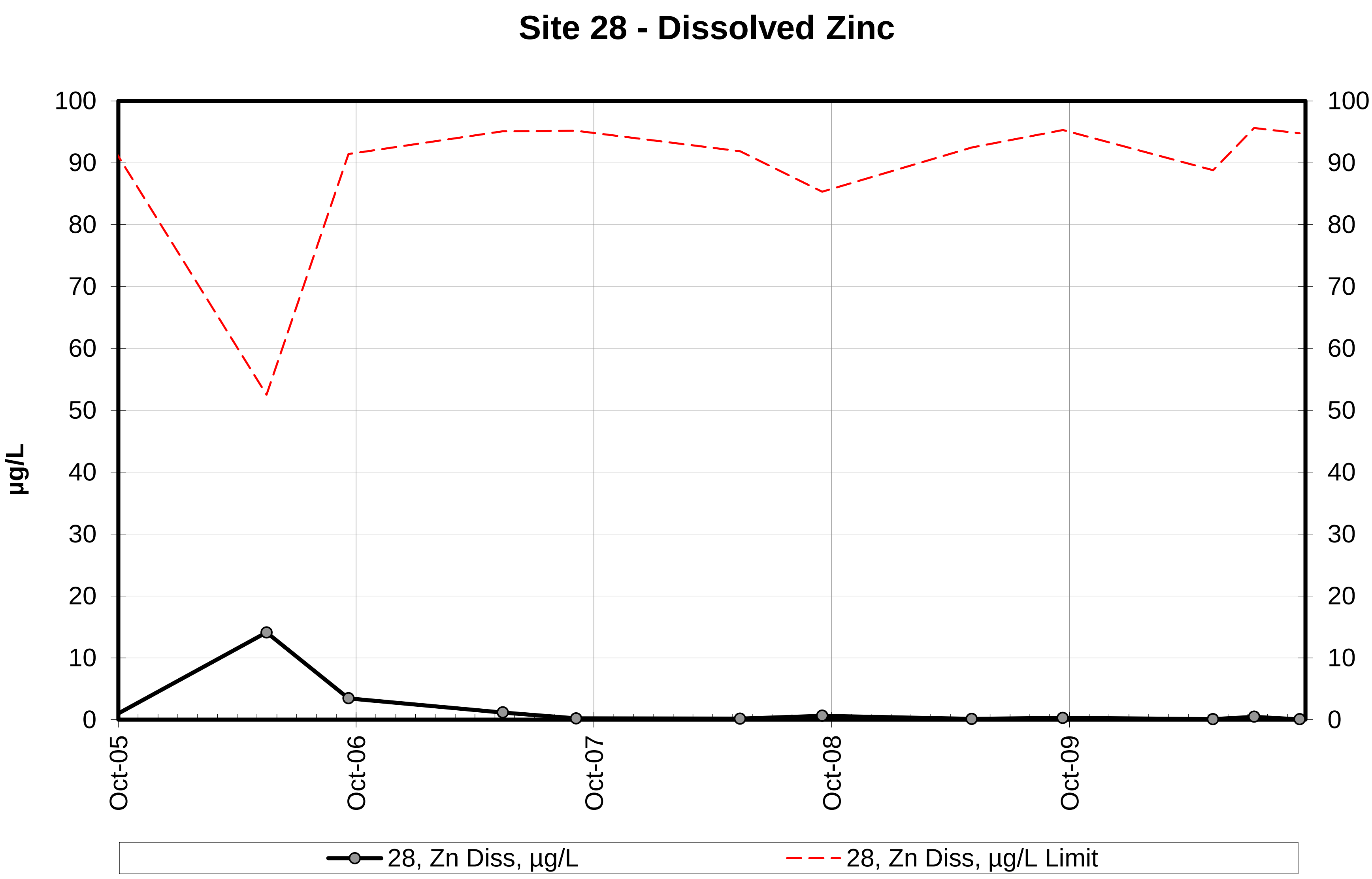
Site 28 - Dissolved Lead
µg/L
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Pb Diss, µg/L
28, Pb Diss, µg/L Limit

Site 28 - Dissolved Nickel

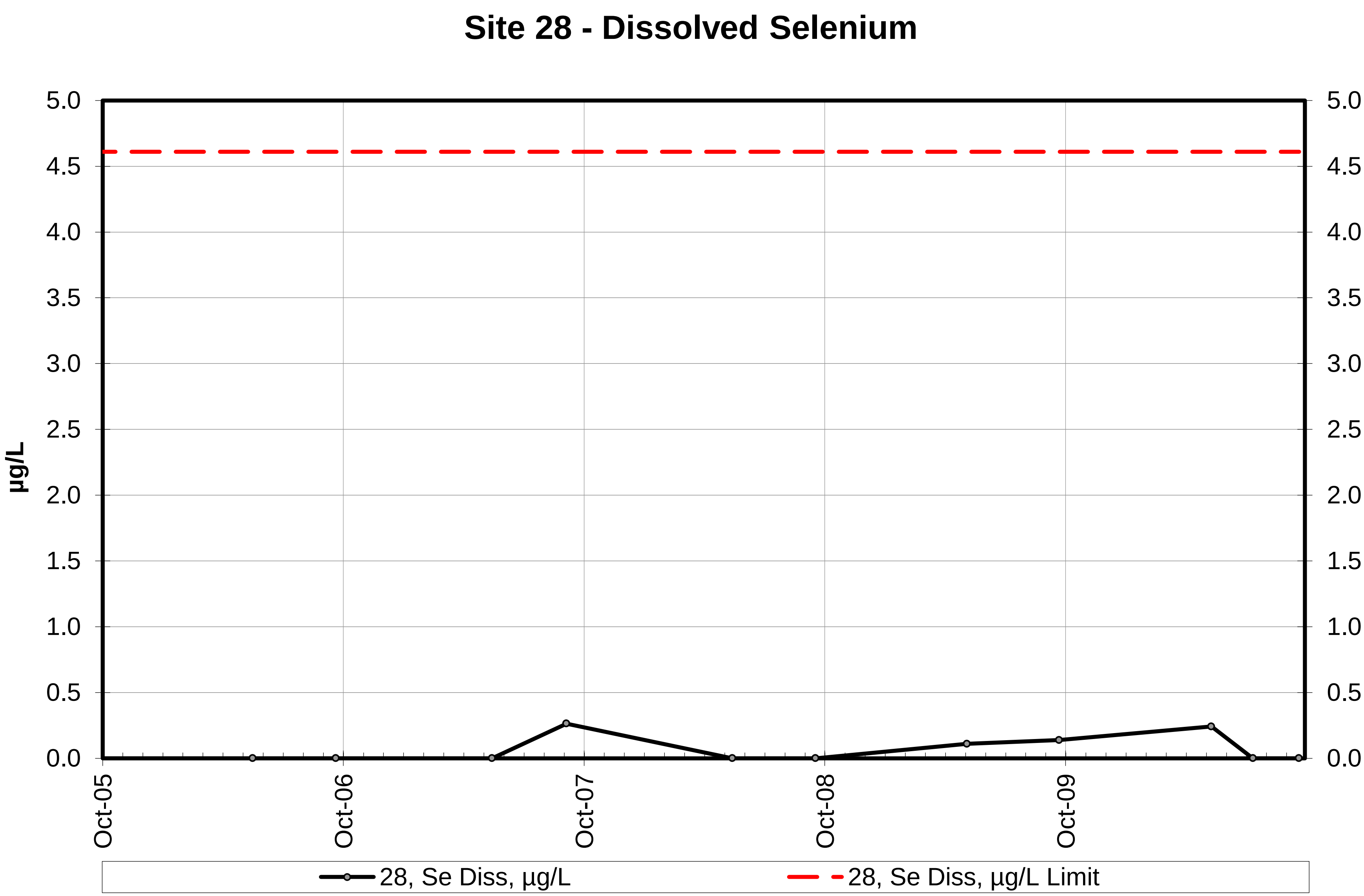


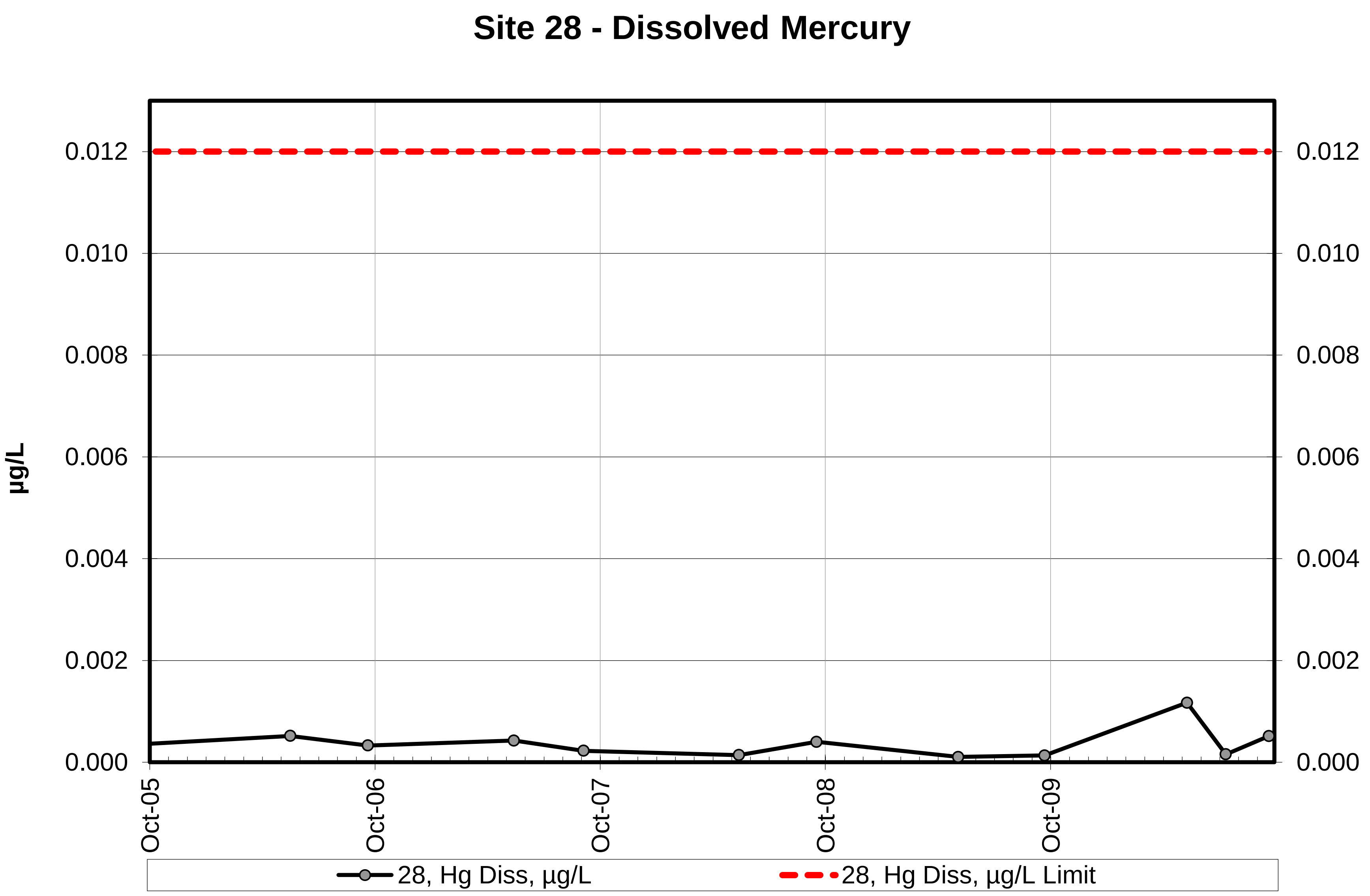
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.


Site 28 - Dissolved Silver
µg/L
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Ag Diss,ug/l
28, Ag Diss, ug/l Limit



Site 28 - Dissolved Zinc
µg/L
100
90
80
70
60
50
40
30
20
10
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Zn Diss, µg/L
28, Zn Diss, µg/L Limit


Site 28 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Se Diss, µg/L
28, Se Diss, µg/L Limit



Site 28 - Dissolved Mercury
µg/L
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
28, Hg Diss, µg/L
28, Hg Diss, µg/L Limit

Site #28

Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

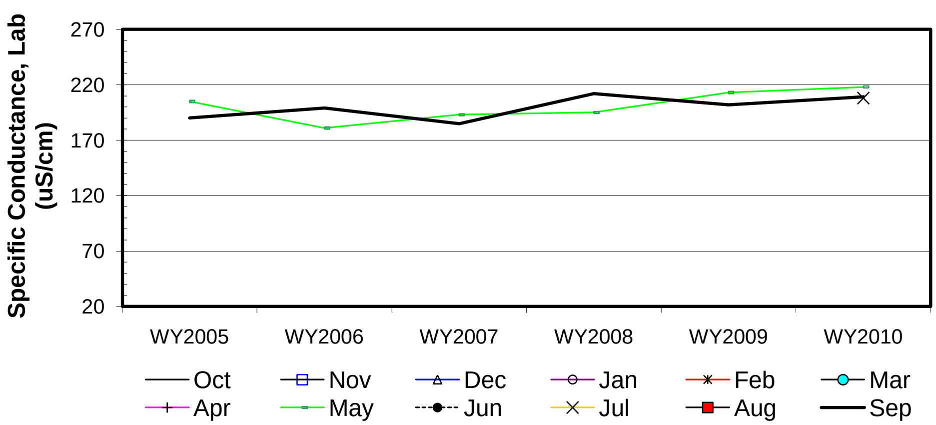
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								205				190
b	**WY2006**								181				199
c	**WY2007**								193				185
d	**WY2008**								195				212
e	**WY2009**								213				202
f	**WY2010**								218		208		209
	n	0	0	0	0	0	0	0	6	0	1	0	6
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a								-1				1
	c-a								-1				-1
	d-a								-1				1
	e-a								1				1
	f-a								1				1
	c-b								1				-1
	d-b								1				1
	e-b								1				1
	f-b								1				1
	d-c								1				1
	e-c								1				1
	f-c								1				1
	e-d								1				-1
	f-d								1				-1
	f-e								1				1
	S_k	0	0	0	0	0	0	0	9	0	0	0	7
	σ^2_S=								28.33				28.33
	$Z_k = S_k/\sigma_S$								1.69				1.32
	Z^2_k								2.86				1.73

ΣZ_k=	3.01
ΣZ^2_k=	4.59
Z-bar=$\Sigma Z_k/K$=	1.50

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	16

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.07	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.790**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	1.99	@α/2=2.5% Z= 1.96	**H_0** (No trend)	REJECT
56.67	p	**0.977**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.26		9.19
0.050	1.81	**5.75**	8.37
0.100	2.09		7.88
0.200	2.58		7.06
		2.8%	

Site **#28** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								8.1				7.7
b	**WY2006**								8.0				7.5
c	**WY2007**								8.4				8.4
d	**WY2008**								8.1				8.4
e	**WY2009**								8.2				8.3
f	**WY2010**								8.3		7.8		7.8
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								1				1
d-a								-1				1
e-a								1				1
f-a								1				1
c-b								1				1
d-b								1				1
e-b								1				1
f-b								1				1
d-c								-1				1
e-c								-1				-1
f-c								-1				-1
e-d								1				-1
f-d								1				-1
f-e								1				-1
S_k	0	0	0	0	0	0	0	5	0	0	0	3

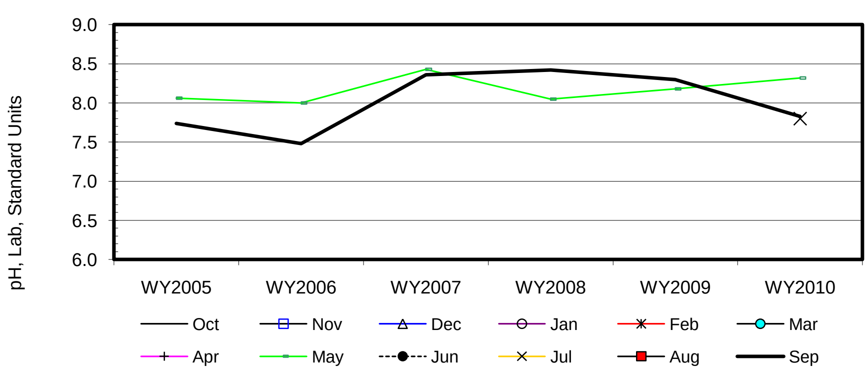
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$								28.33				28.33
$Z_k = S_k/\sigma_S$								0.94				0.56
Z^2_k								0.88				0.32

$\Sigma Z_k=$	1.50
$\Sigma Z^2_k=$	1.20
Z-bar$=\Sigma Z_k/K=$	0.75

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	13
ΣS_k	8

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$		0.07	@α=5% $\chi^2_{(K-1)}=$	3.84	Test for station homogeneity	
	p	**0.790**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.93	@α/2=2.5% $Z=$	1.96	$\mathbf{H_0}$ (No trend)	ACCEPT
56.67	**p**	**0.824**			$\mathbf{H_A}$ ($\pm$ trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.12		0.17
0.050	-0.04	**0.06**	0.14
0.100	-0.03		0.12
0.200	0.01		0.08

Site **#28** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								100.0				88.9
b	**WY2006**								88.3				86.2
c	**WY2007**								8.7				85.8
d	**WY2008**								86.3				86.3
e	**WY2009**								76.0				75.5
f	**WY2010**								86.5		79.0		89.5
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				-1
d-a								-1				-1
e-a								-1				-1
f-a								-1				1
c-b								-1				-1
d-b								-1				1
e-b								-1				-1
f-b								-1				1
d-c								1				1
e-c								1				-1
f-c								1				1
e-d								-1				-1
f-d								1				1
f-e								1				1
S_k	0	0	0	0	0	0	0	-5	0	0	0	-1

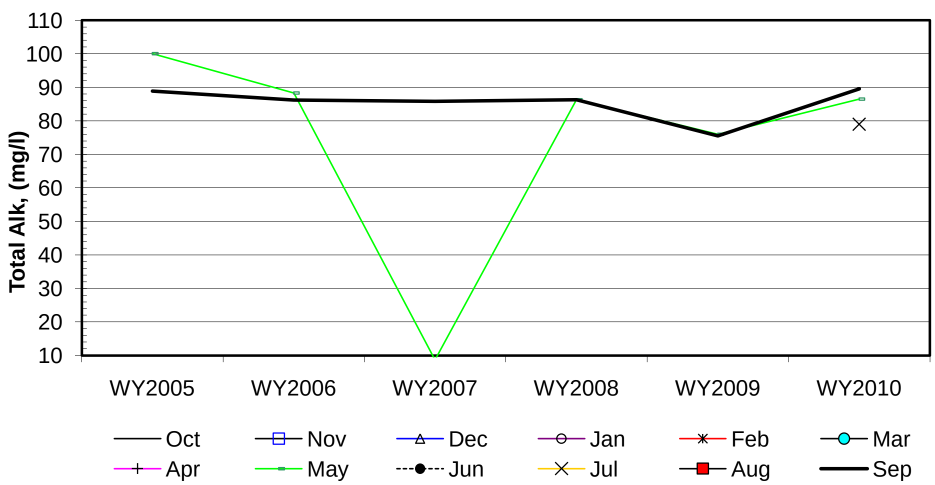
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								28.33				28.33
$Z_k = S_k/\sigma_S$								-0.94				-0.19
Z^2_k								0.88				0.04

ΣZ_k= -1.13
ΣZ^2_k= 0.92
Z-bar=ΣZ_k/K= -0.56

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 13
ΣS_k -6

$\chi^2_h=\Sigma Z^2_k - K(\text{Z-bar})^2$= 0.28	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p **0.595**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 56.67	Z_{calc} -0.66 **p** **0.253**	@α/2=2.5% Z= 1.96	**H_0** (No trend) ACCEPT
			H_A (± trend) REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-5.79		1.13
0.050	-4.19	**-0.93**	0.19
0.100	-3.53		0.09
0.200	-2.81		-0.32

Site #28 — Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								10.1				10.4
b	**WY2006**								8.7				9.4
c	**WY2007**								9.1				9.4
d	**WY2008**								9.0				9.3
e	**WY2009**								11.3				
f	**WY2010**								11.3		10.4		11.0
	n	0	0	0	0	0	0	0	6	0	1	0	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	3	5	5	5	5
t_2	0	0	0	0	0	0	0	1	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								-1				-1
c-a								-1				-1
d-a								-1				-1
e-a								1				
f-a								1				1
c-b								1				-1
d-b								1				-1
e-b								1				
f-b								1				1
d-c								-1				-1
e-c								1				
f-c								1				1
e-d								1				
f-d								1				1
f-e								0				
S_k	0	0	0	0	0	0	0	6	0	0	0	-2

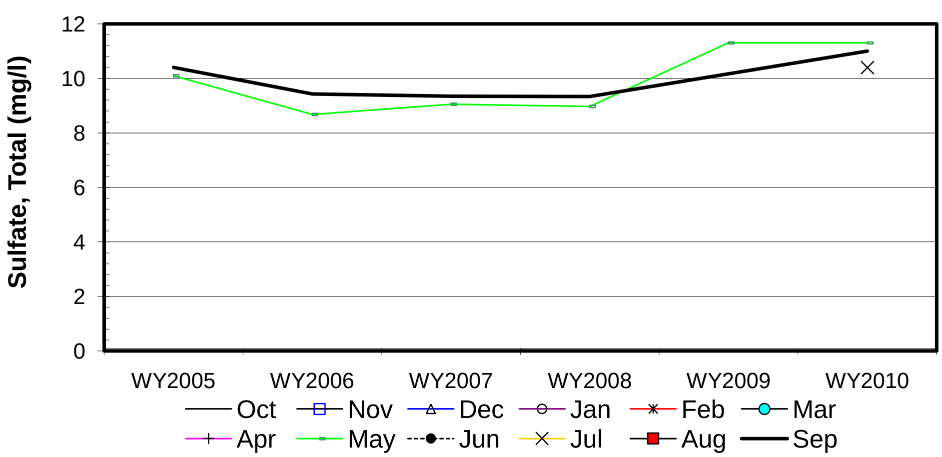
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								27.33				16.67
$Z_k = S_k/\sigma_S$								1.15				-0.49
Z^2_k								1.32				0.24

ΣZ_k= 0.66
ΣZ^2_k= 1.56
Z-bar=ΣZ_k/K= 0.33

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	58	1	0	0	0

Σn 12
ΣS_k 4

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	1.34	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
p	**0.247**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k) 44.00	Z_{calc} 0.45	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
p	**0.674**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.41		0.77
0.050	-0.08	**0.15**	0.54
0.100	-0.07		0.39
0.200	-0.03		0.32

Site **#28** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**								0.8				0.1
b	**WY2006**								14.1				3.5
c	**WY2007**								1.2				0.2
d	**WY2008**								0.2				0.6
e	**WY2009**								0.1				0.3
f	**WY2010**								0.1		0.5		0.1
	n	0	0	0	0	0	0	0	6	0	1	0	6

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a								1				1
c-a								1				1
d-a								-1				1
e-a								-1				1
f-a								-1				-1
c-b								-1				-1
d-b								-1				-1
e-b								-1				-1
f-b								-1				-1
d-c								-1				1
e-c								-1				1
f-c								-1				-1
e-d								-1				-1
f-d								-1				-1
f-e								-1				-1
S_k	0	0	0	0	0	0	0	-11	0	0	0	-3

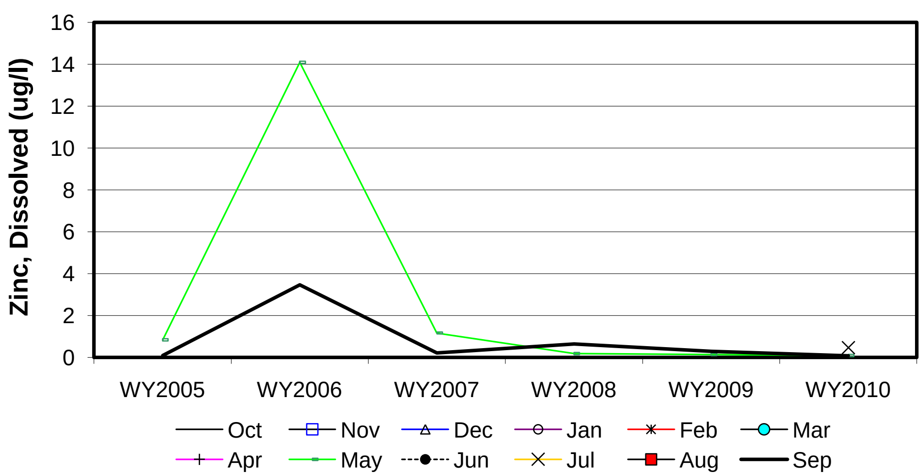
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$								28.33				28.33
$Z_k = S_k/\sigma_S$								-2.07				-0.56
Z^2_k								4.27				0.32

$\Sigma Z_k=$ -2.63
$\Sigma Z^2_k=$ 4.59
Z-bar=$\Sigma Z_k/K=$ -1.32

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

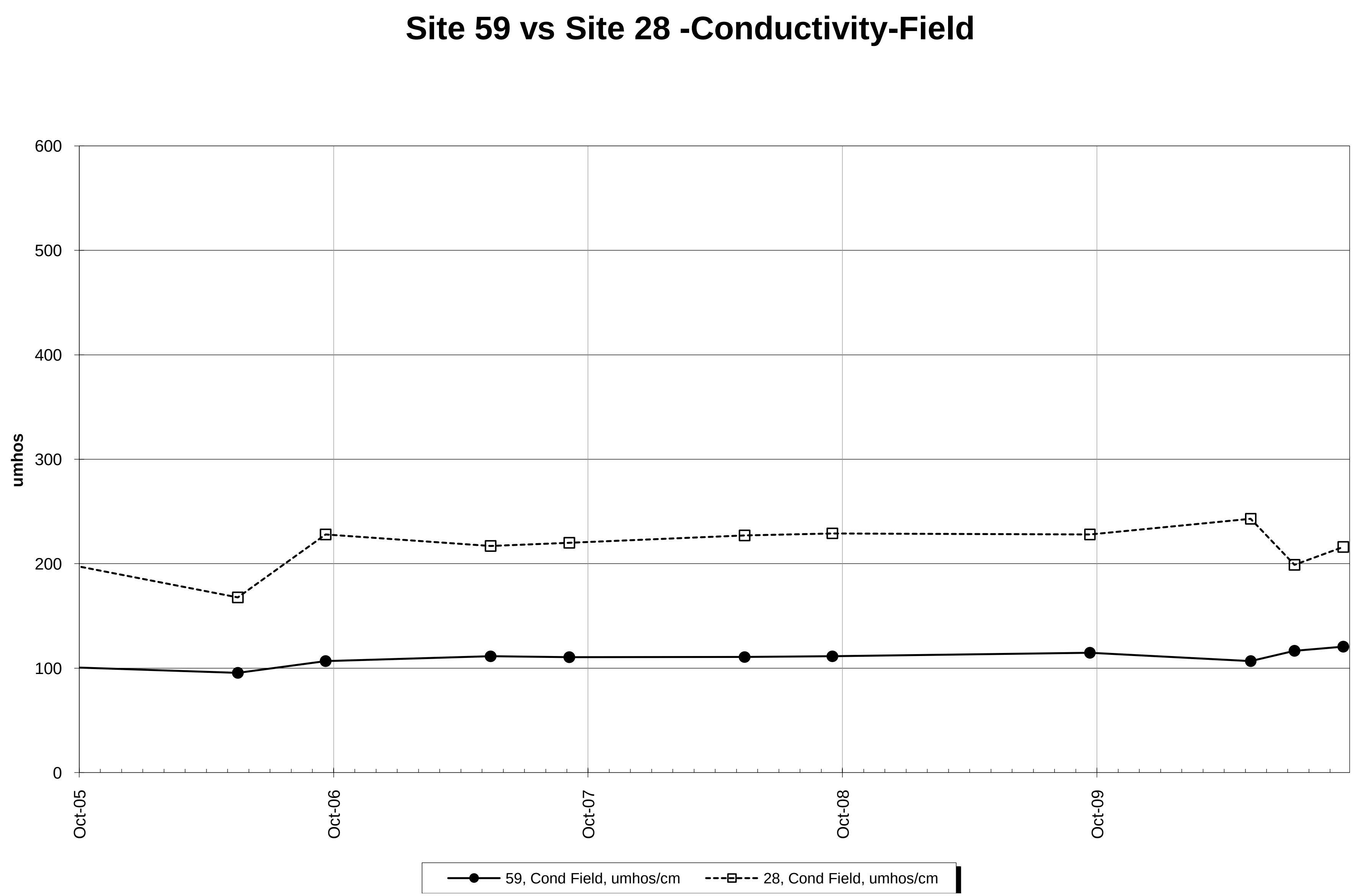
Σn 13
ΣS_k -14

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$ 1.13	@α=5% $\chi^2_{(K-1)}=$ 3.84	Test for station homogeneity	
p **0.288**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} -1.73	@$\alpha/2$=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
56.67	**p** **0.042**		**H_A** (± trend)	REJECT



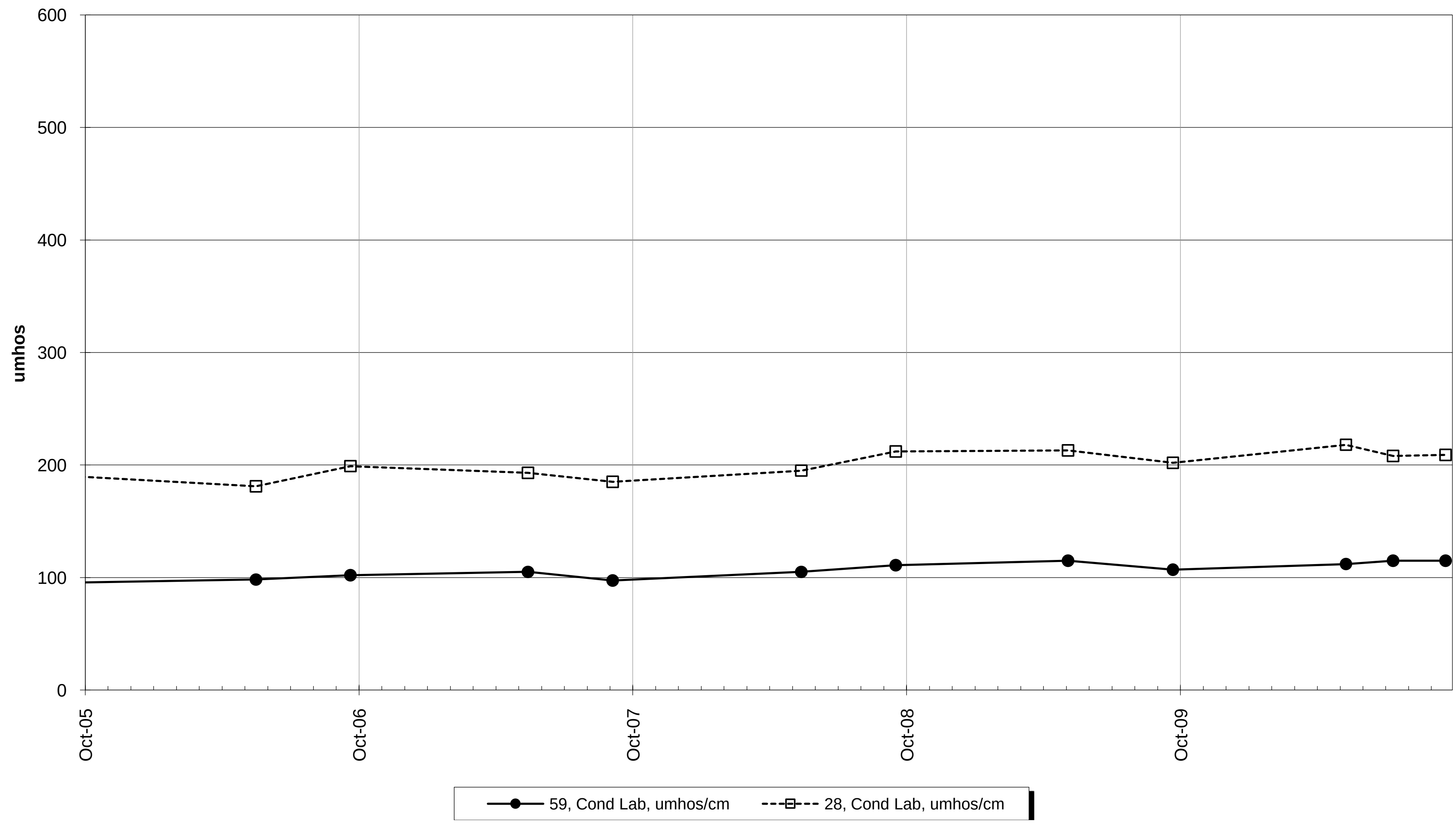
Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-1.33		0.04
0.050	-0.88	**-0.19**	-0.03
0.100	-0.49		-0.04
0.200	-0.36		-0.05

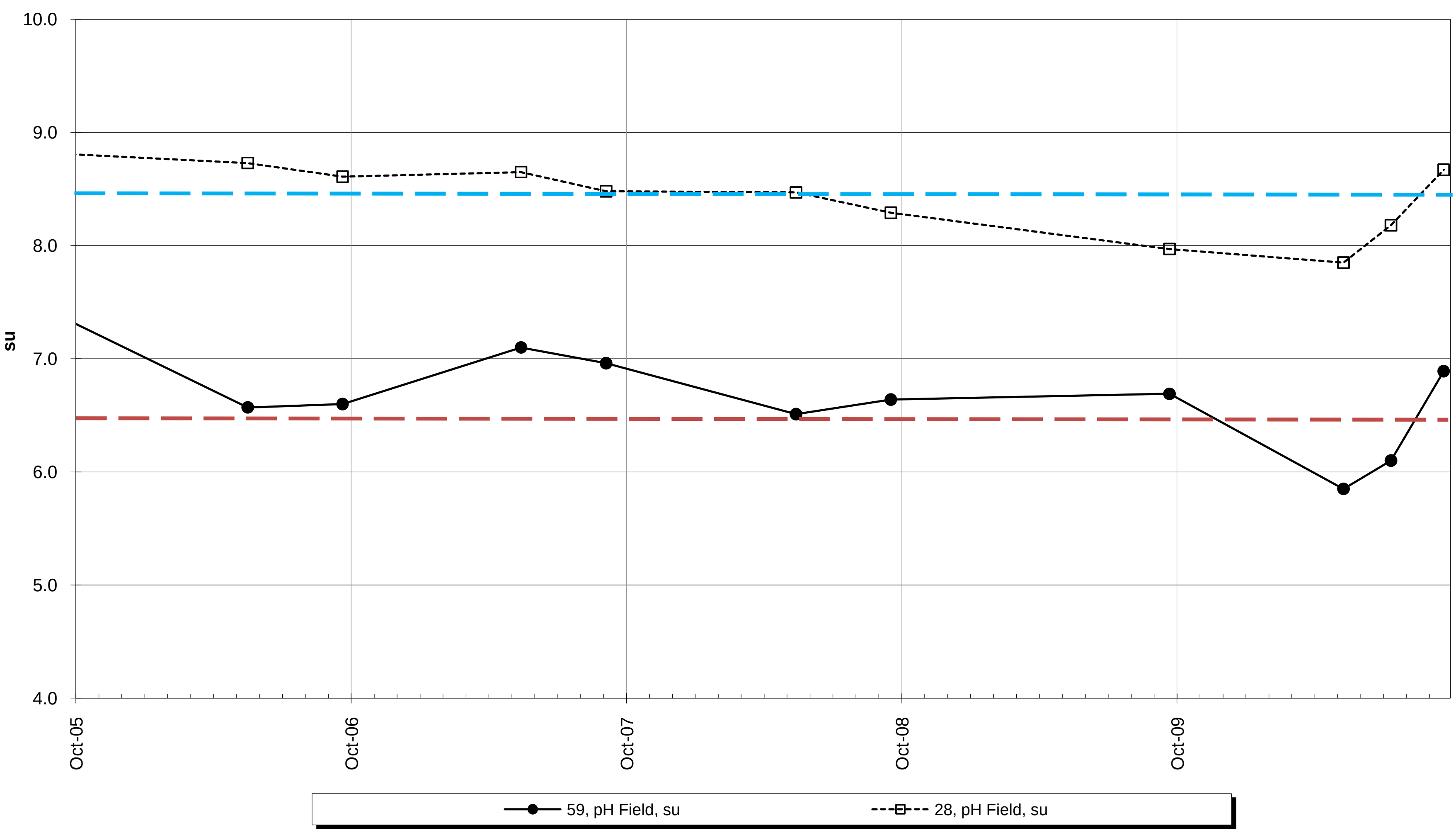


Site 59 vs Site 28 -Conductivity-Field
umhos
600
500
400
300
200
100
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
59, Cond Field, umhos/cm
28, Cond Field, umhos/cm

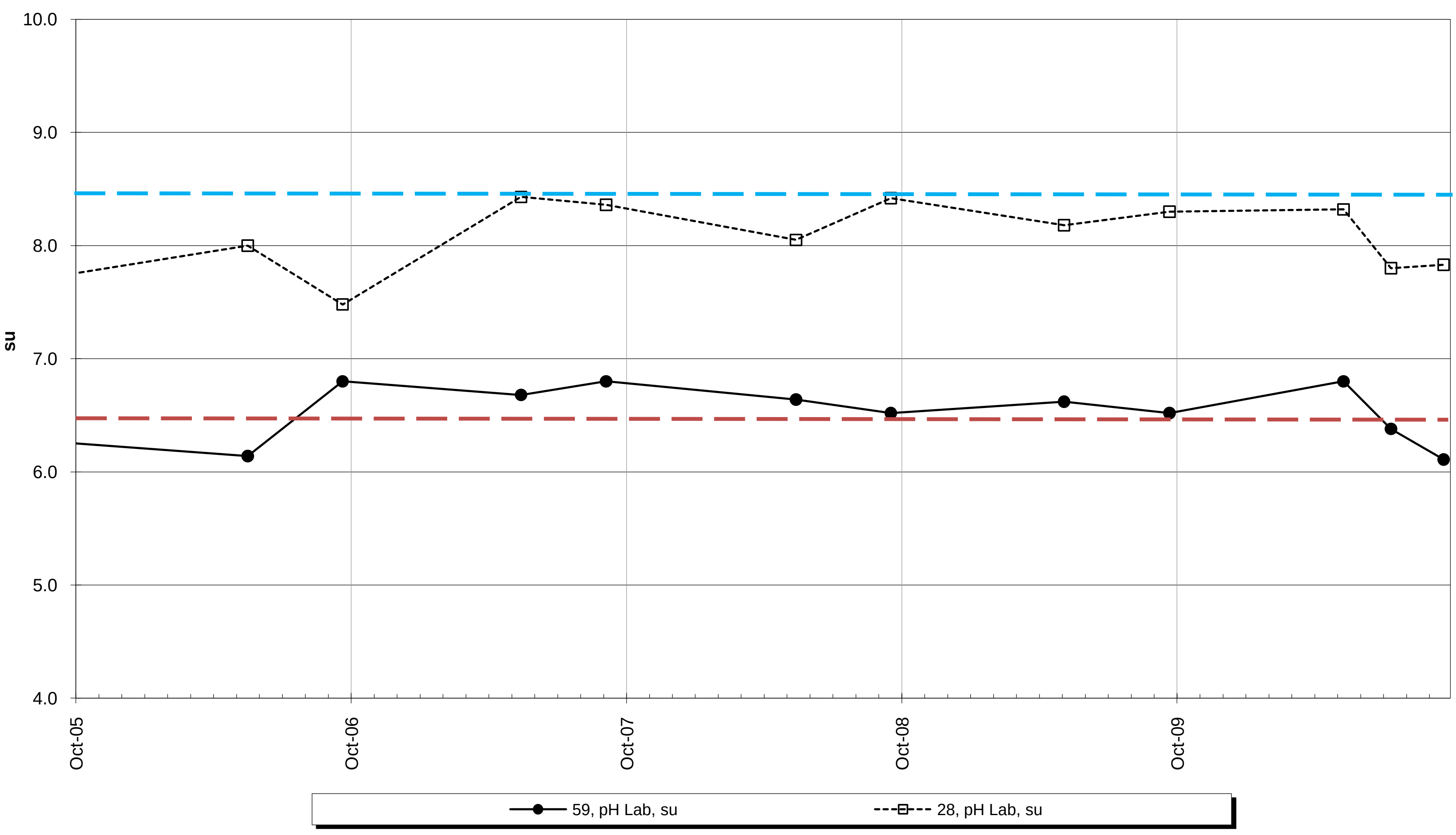
Site 59 vs Site 28 -Conductivity

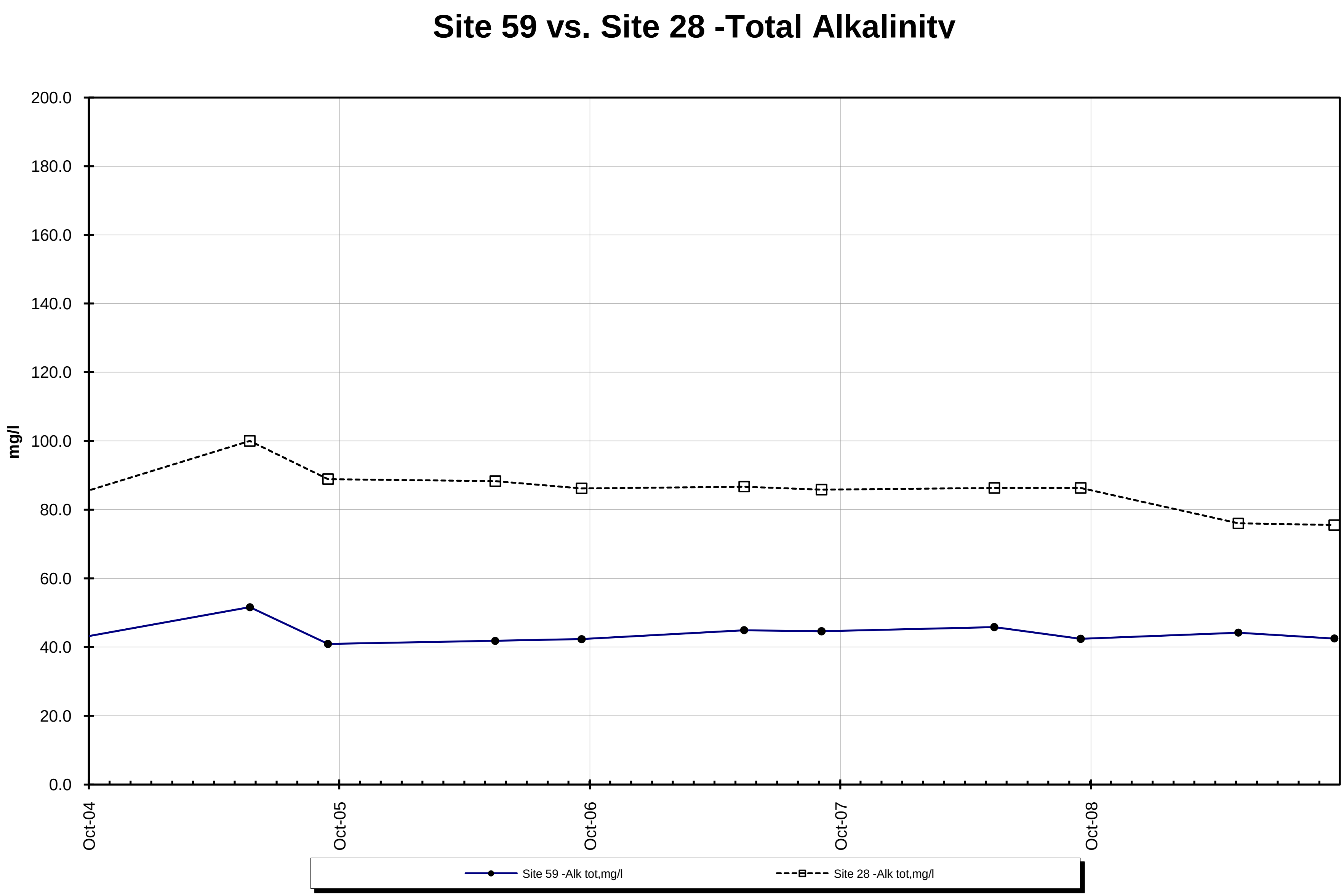


Site 59 vs Site 28 -Field pH

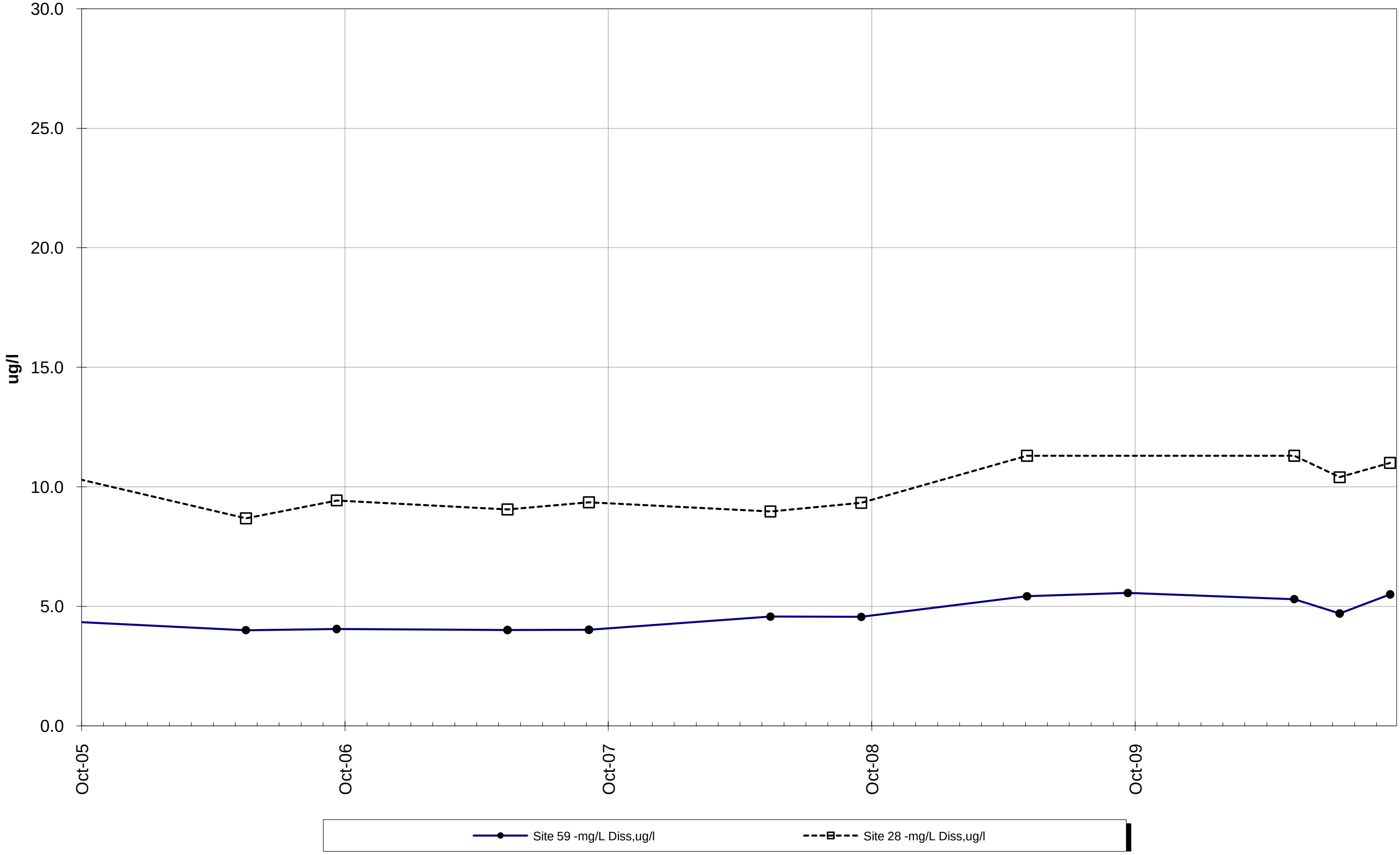


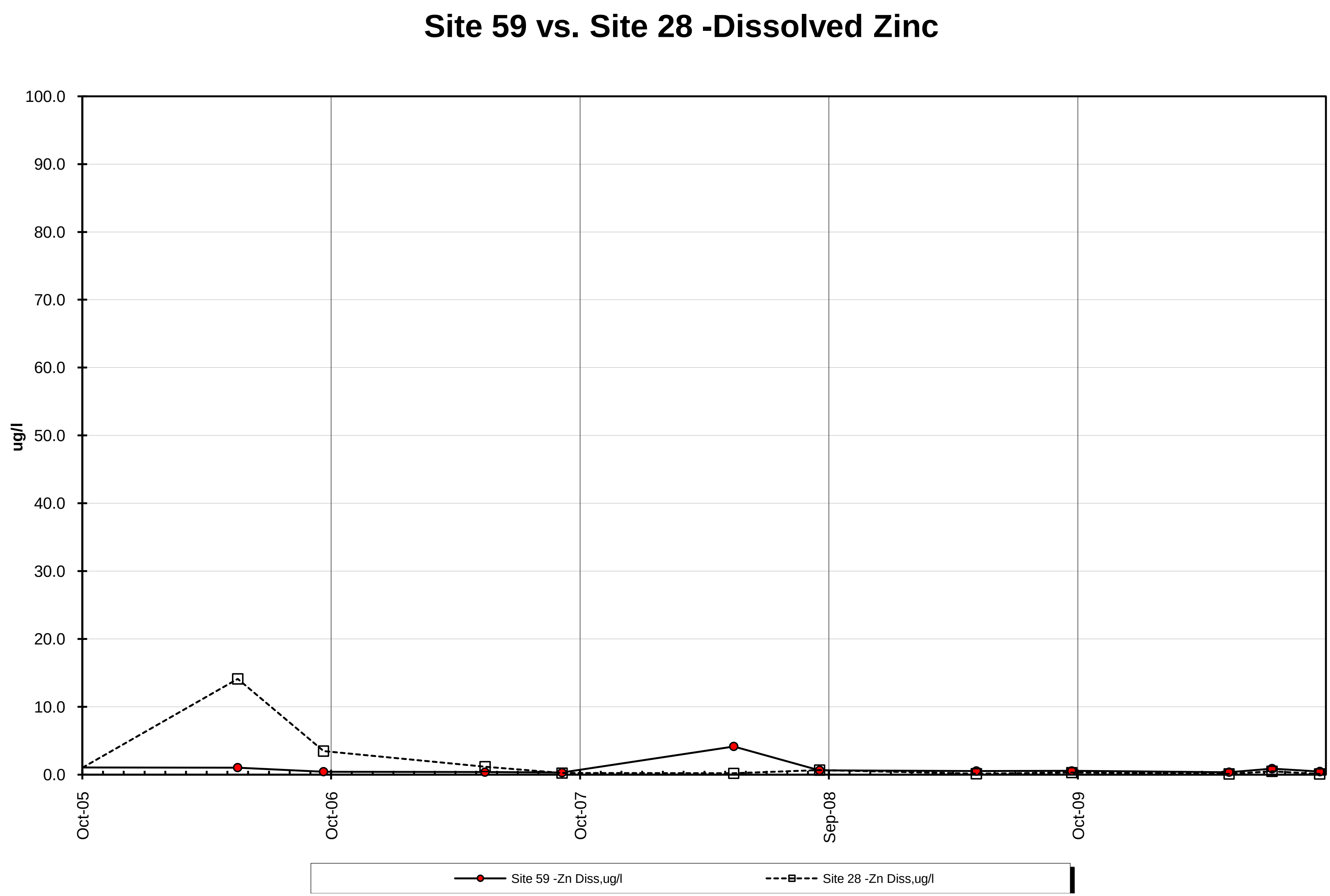
Site 59 vs Site 28 -Lab pH




Site 59 vs. Site 28 -Total Alkalinity
mg/l
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Site 59 -Alk tot,mg/l
Site 28 -Alk tot,mg/l

Site 59 vs. Site 28 -Total Sulfate




Site 59 vs. Site 28 -Dissolved Zinc
ug/l
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Oct-05
Oct-06
Oct-07
Sep-08
Oct-09
Site 59 -Zn Diss,ug/l
Site 28 -Zn Diss,ug/l

INTERPRETIVE REPORT
SITE 9 “TRIBUTARY CREEK”

The Tributary Creek site was initially located to monitor the effects on water quality caused by the originally planned, larger slurry tailings impoundment. It is approximately one mile downstream from the present dry stack tailings site. The site was monitored from 1981 – 1993 when it was temporarily suspended by administrative agreement with the USFS. The site was re-activated in 2001 as a biological monitoring site for the Tailings Pile. HGCMC recommenced collection of water chemistry samples after receiving a suggestion to do so from ADNR-Office of Habitat Management and Permitting personnel. It was noted that should the required annual biomonitoring show significant changes, an understanding of any related water chemistry variations would enhance the interpretation of those results. During the 2010 water year, samples were collected in conjunction with the normal monthly FWMP sampling run during the months of May, July, and September and analyzed for Suite Q analytes.

The data collected during the current water year are listed in the following “Table of Results for Water Year 2010” report. The table includes all the FWMP analyte data (field and laboratory) collected for the current water year and a series of flags keyed to the summary report “Qualified Data by QA Reviewer”. The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

Routine water chemistry data collection was reinstated May 2006. All data collected at the site since then are included in the data analyses. As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2006 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Four results exceeding these criteria have been identified, and listed in the table below. Two data points are for the total alkalinity values of 18.2 mg/L and 18.7 mg/L for the May 2010 and September 2010 sampling events respectively, which exceeds the AWQS lower limit of 20 mg/L. Also, the May field pH value was 6.2 su and the September laboratory pH was 6.15 su. However, the reciprocal pH reading (laboratory / field) for both of these events were within AWQS.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
11-May-10	pH Field, su	6.2		6.5	Aquatic Life, chronic
14-Sep-10	pH Lab, su	6.15		6.5	Aquatic Life, chronic
11-May-10	Alkalinity Total, mg/L	18.2		20	Aquatic Life, chronic
14-Sep-10	Alkalinity Total, mg/L	18.7		20	Aquatic Life, chronic

As stated in past reports, HGCMC feels that the current limited dataset for this site makes definitive interpretation of these exceedances difficult at this time. Site 29 (MW-3S), located in the headwaters of Tributary Creek, also had exceedances for these two analytes. In the previous four water years there have been dissolved lead exceedances recorded in each year. This water year all of the dissolved lead values were approximately half the AWQS, which was around one. As additional data are collected, it may be possible to make a determination whether the lead values represent natural background concentrations, or result from HGCMC activities.

X-Y plots have been generated to graphically present the data for each of the analytes that are listed in Suite Q. Given the short record, no clear determination can be made as to if any trends are present. Comparisons made between the current dataset and an analysis of data from the prior monitoring period from 1981 to 1993, indicates that no major changes in water chemistry for the listed analytes appear to have occurred in the in-between years.

HGCMC will continue to monitor Site 9 during May, July, September, and November for the Suite Q analytes. This sampling is in addition to the already scheduled July biomonitoring. HGCMC feels that this schedule will adequately characterize the water quality parameters while addressing safety concerns associated with winter access down the steep slope that leads to the site and the increased potential for bear encounters during salmon spawning season.

Table of Results for Water Year 2010

Site 9 "Tributary Creek"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Jan-10	Mar-10	Apr-10	5/11/2010	Jun-10	7/13/2010	Aug-10	9/14/2010	**Median**
Water Temp (℃)								8.0	NOT SCHEDULED FOR SAMPLING	11.6	NOT SCHEDULED FOR SAMPLING		9.8
Conductivity-Field(µmho)								89.5		91.7		91.5	91.5
Conductivity-Lab (µmho)								94		96		102	96
pH Lab (standard units)								6.95		5.98		6.15	6.15
pH Field (standard units)								6.20		6.52		7.19	6.52
Total Alkalinity (mg/L)								18.2		18.7		21.3	18.7
Total Sulfate (mg/L)								18.0 J		12.0 J		18.3	18.0
Hardness (mg/L)								39.7		43.6		45.9	43.6
Dissolved As (ug/L)								0.867		1.050		1.150	1.050
Dissolved Ba (ug/L)				NOT SCHEDULED FOR SAMPLING				36.1					36.1
Dissolved Cd (ug/L)								0.0226		0.0326		0.0425	0.0326
Dissolved Cr (ug/L)								1.330					1.330
Dissolved Cu (ug/L)								1.600		1.980		1.920	1.920
Dissolved Pb (ug/L)								0.3250		0.4360		0.5090	0.4360
Dissolved Ni (ug/L)								2.680					2.680
Dissolved Ag (ug/L)								0.008 J					0.008
Dissolved Zn (ug/L)								5.22		6.68		6.04	6.04
Dissolved Se (ug/L)								0.221 J					0.221
Dissolved Hg (ug/L)								0.002210		0.003770		0.003430	0.003430

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by KGCMC and removed from any further analysis and is not included into the calculation of the median

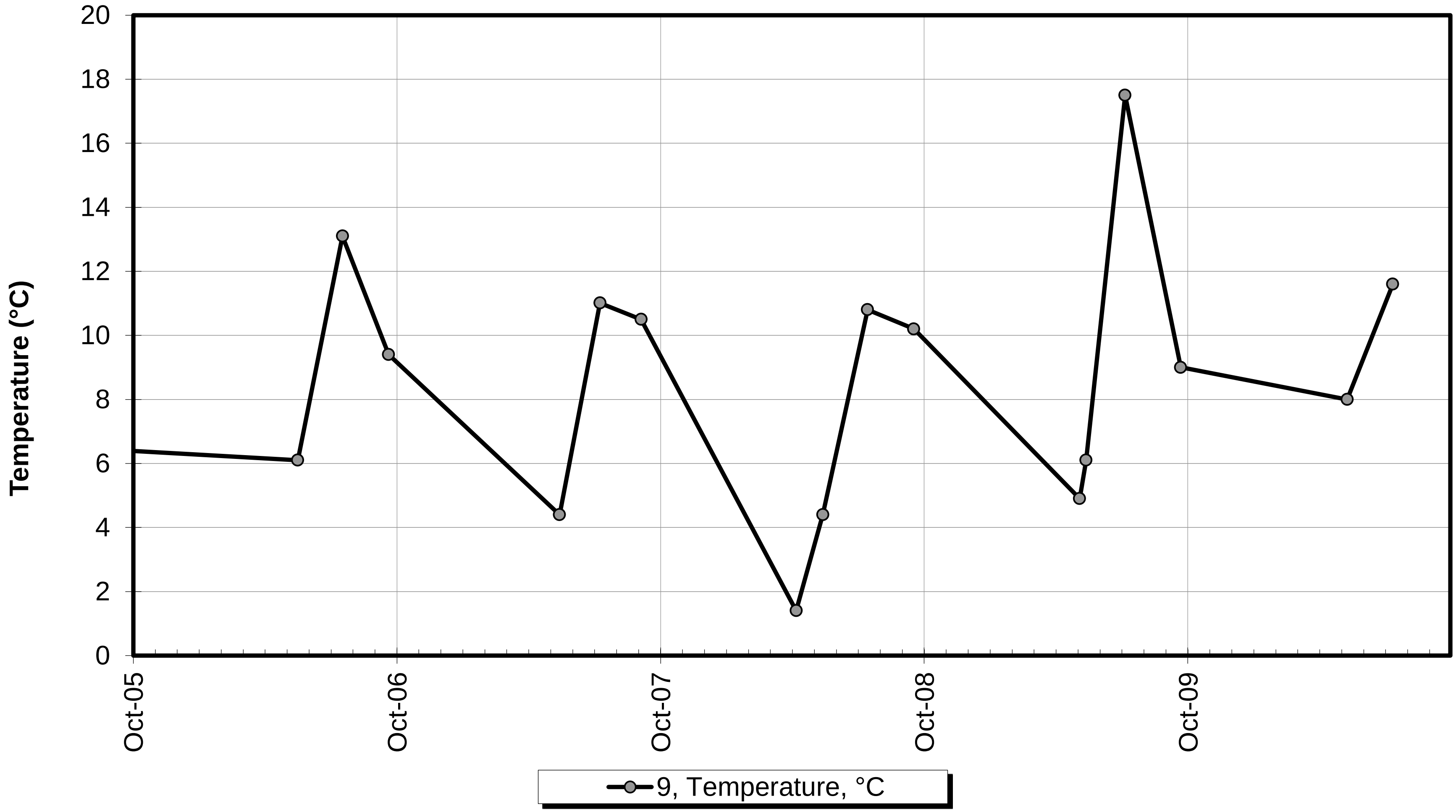
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

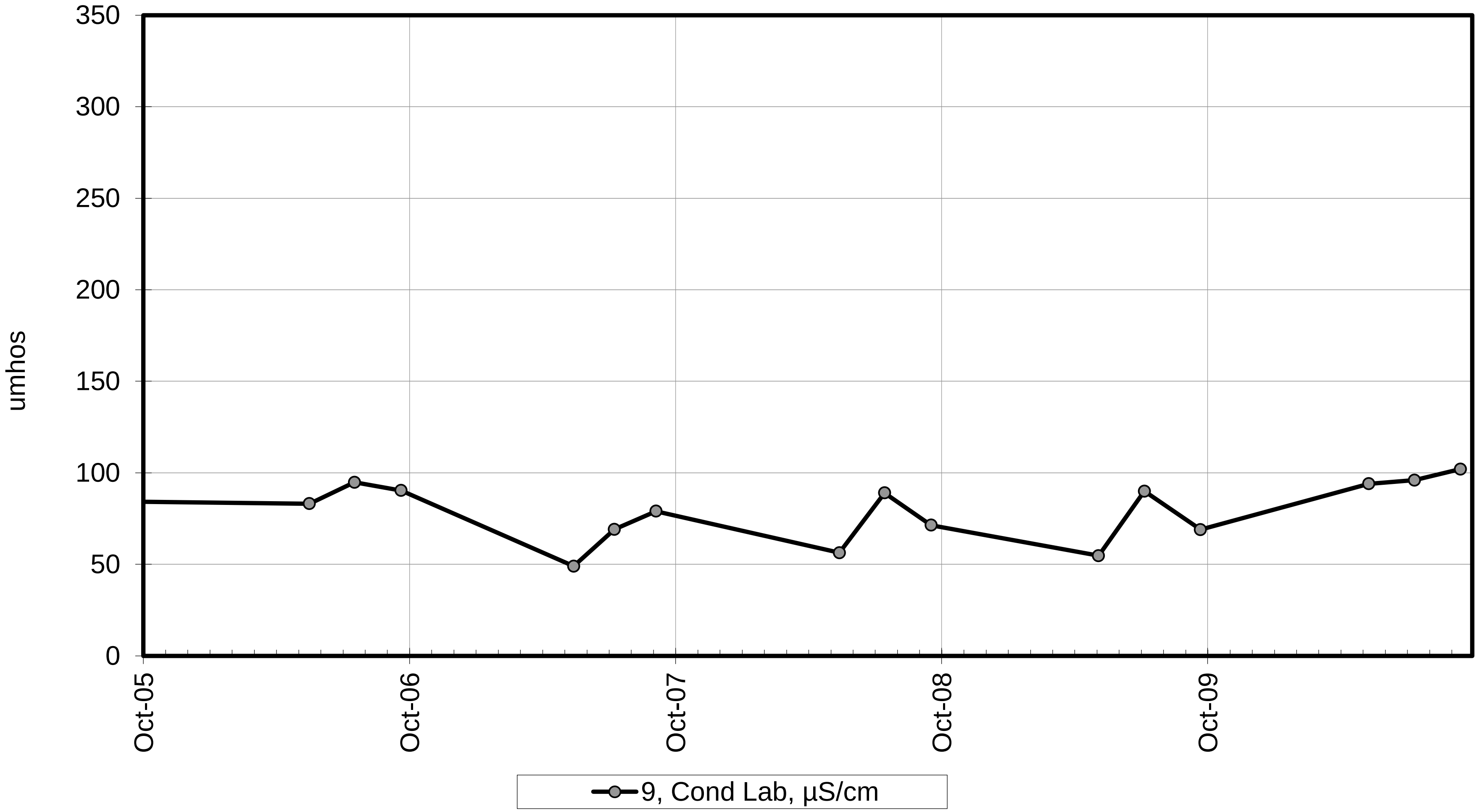
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
9	5/11/2010	12:00 AM				
			Ag diss, µg/l	0.00769	J	Below Quantitative Range
			Se diss, µg/l	0.221	J	Below Quantitative Range
			SO4 Tot, mg/l	18	J	Sample Temperature
9	7/13/2010	11:15 AM				
			SO4 Tot, mg/l	12	J	Sample Reciept Temperature

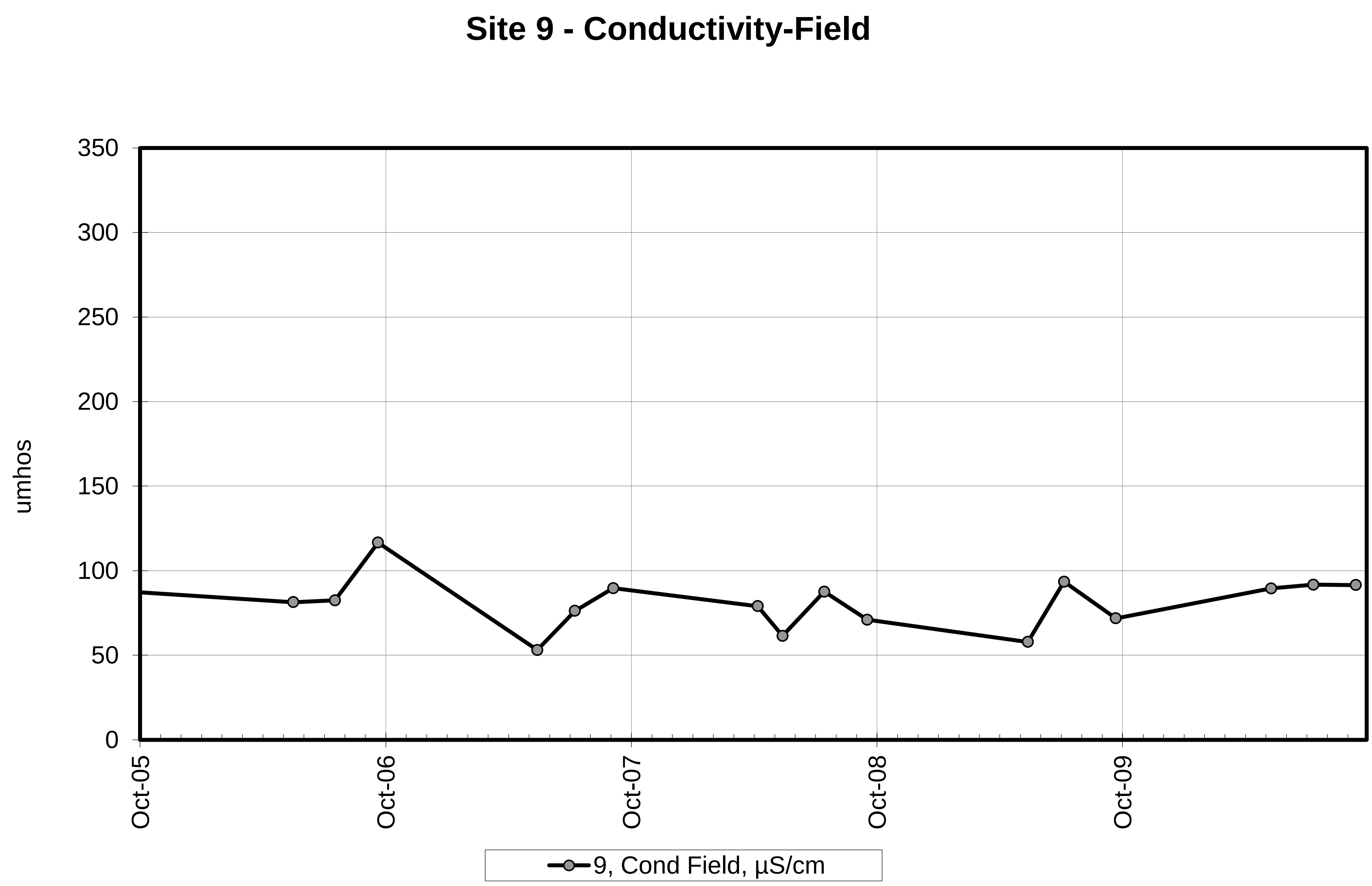
Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

Site 9 -Water Temperature



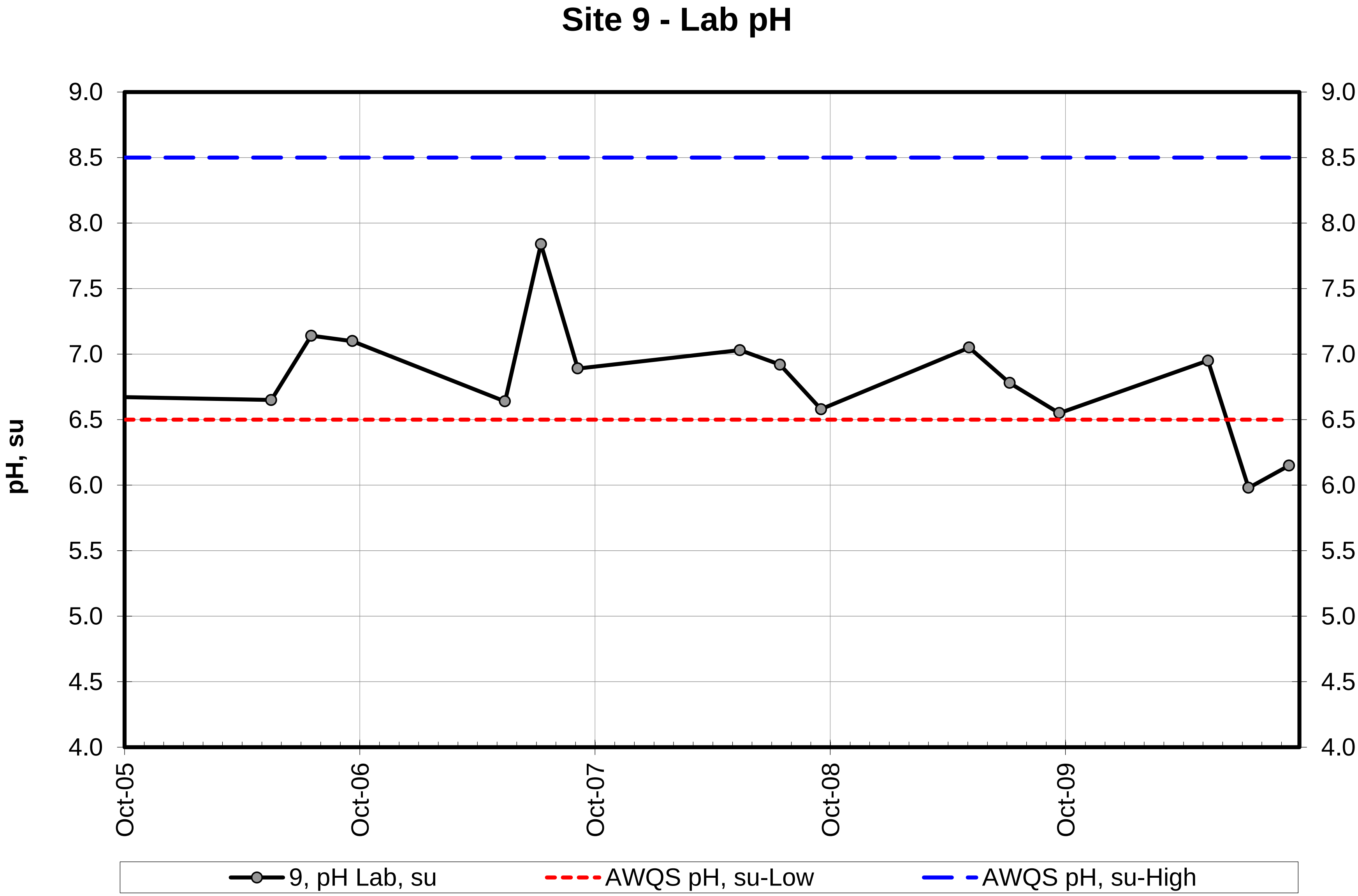
Site 9 - Conductivity-Lab



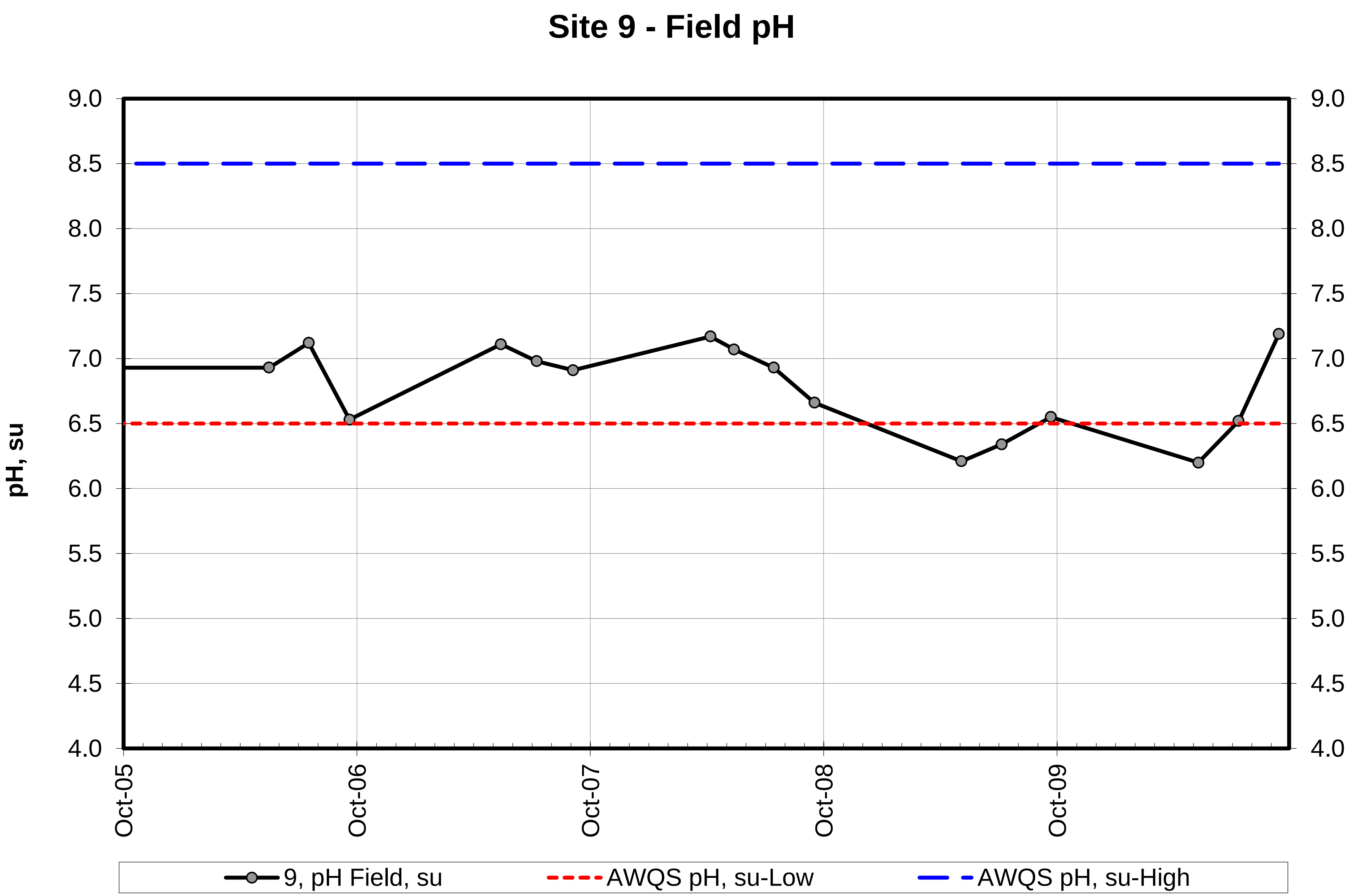


Site 9 - Conductivity-Field
umhos
350
300
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Cond Field, µS/cm

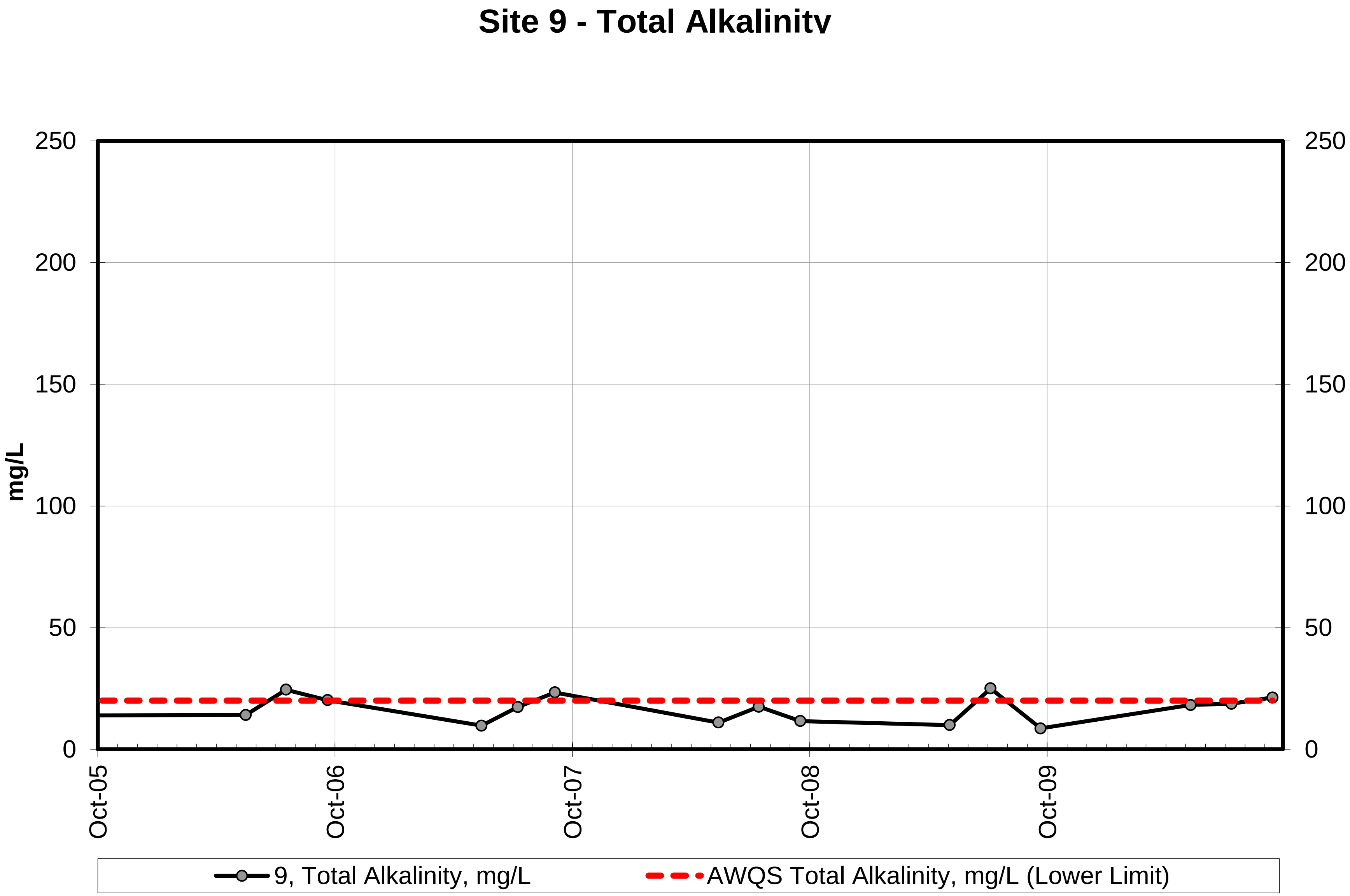
Site 9 - Lab pH



Site 9 - Lab pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High

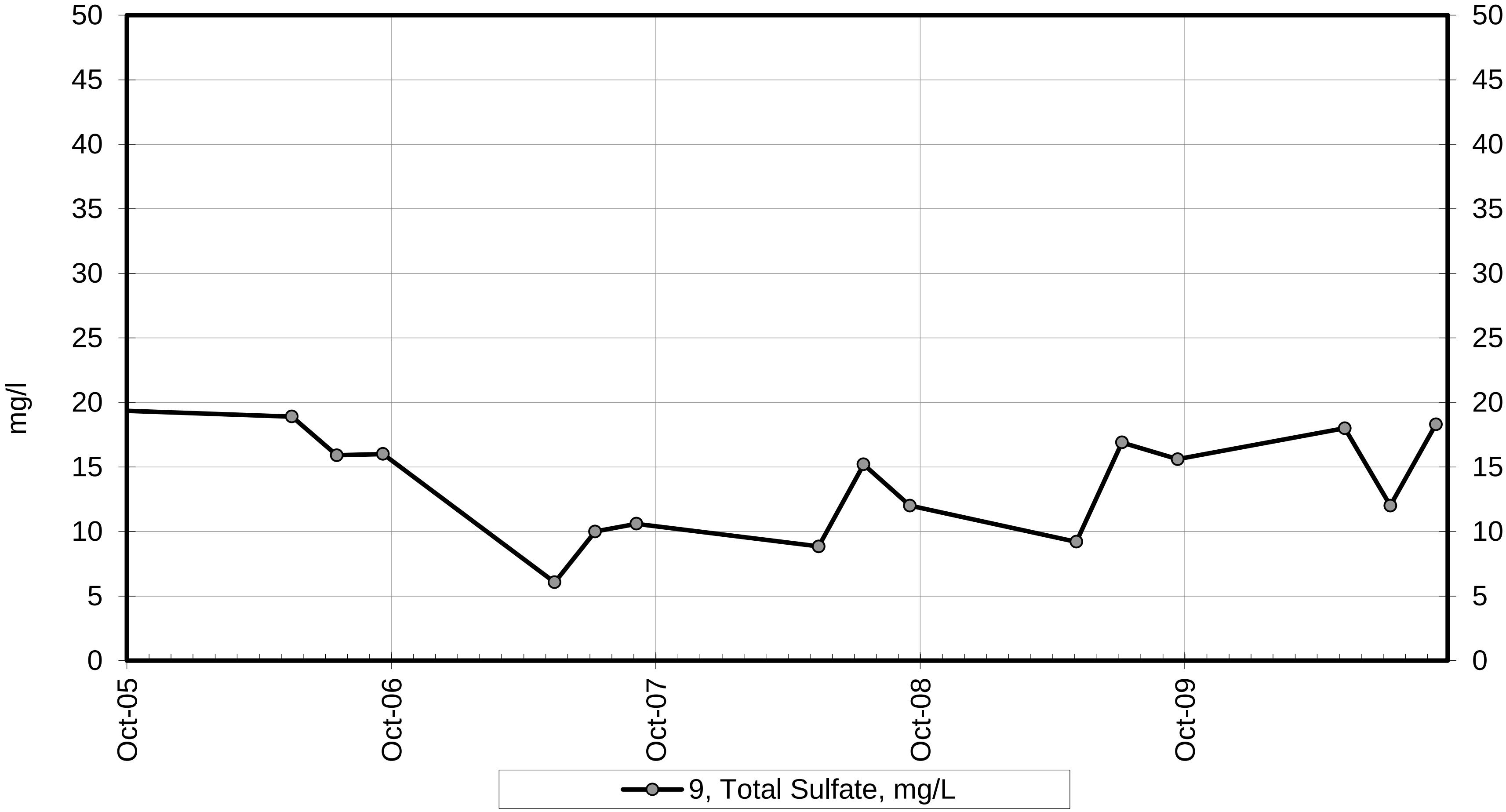


Site 9 - Field pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

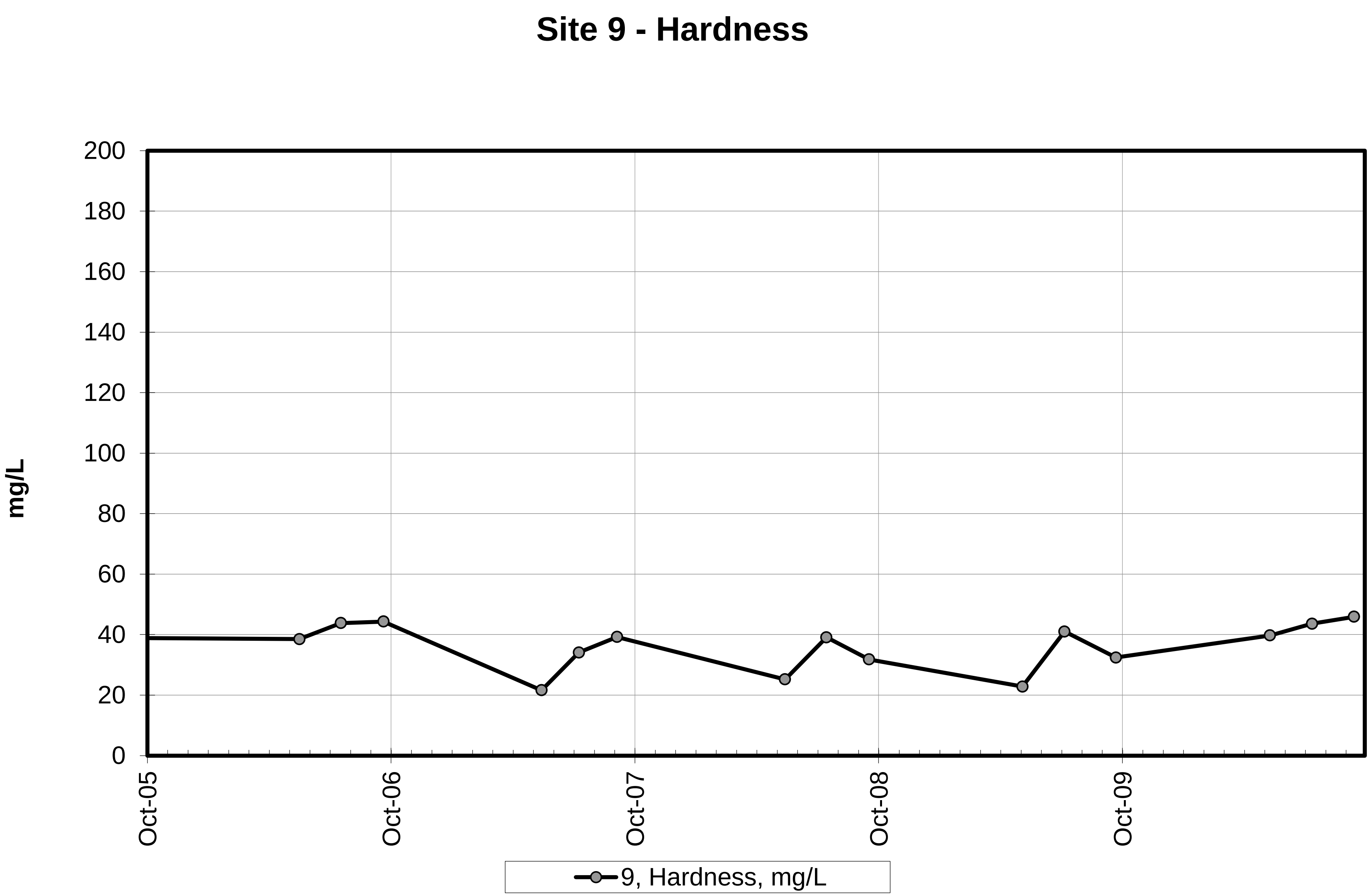


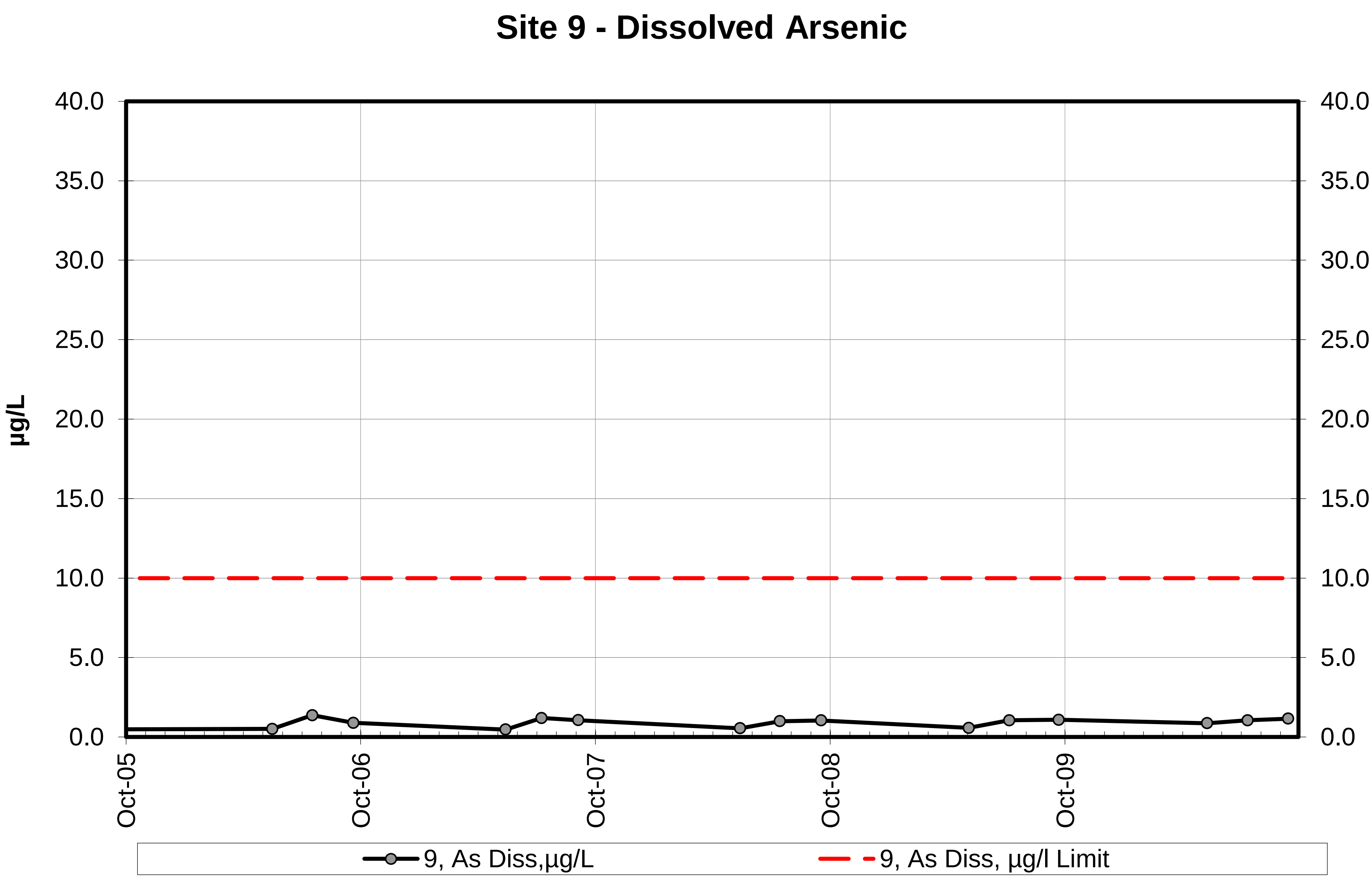
Site 9 - Total Alkalinity
mg/L
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)

Site 9 - Total Sulfate



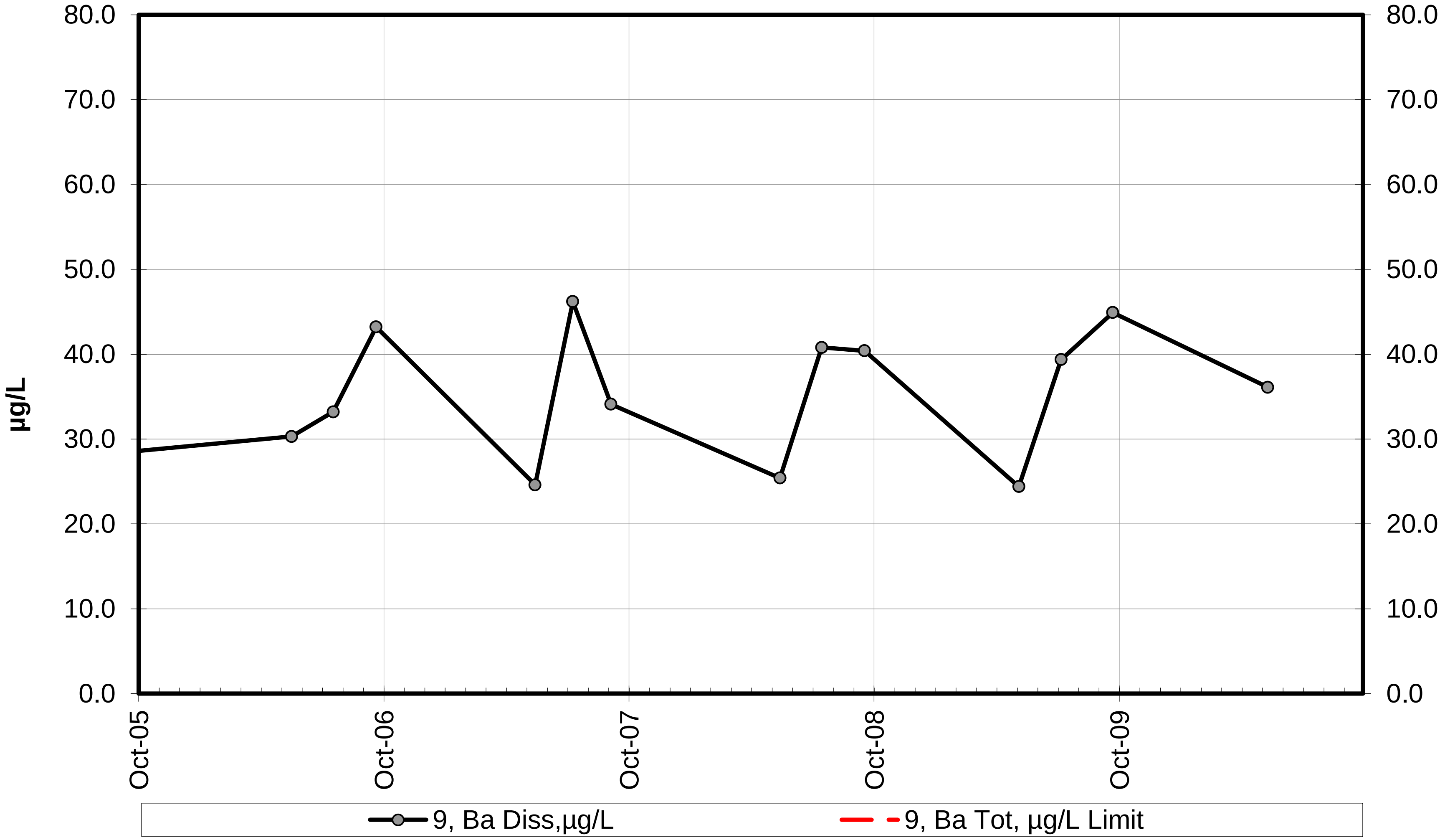
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.


Site 9 - Hardness
mg/L
200
180
160
140
120
100
80
60
40
20
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Hardness, mg/L

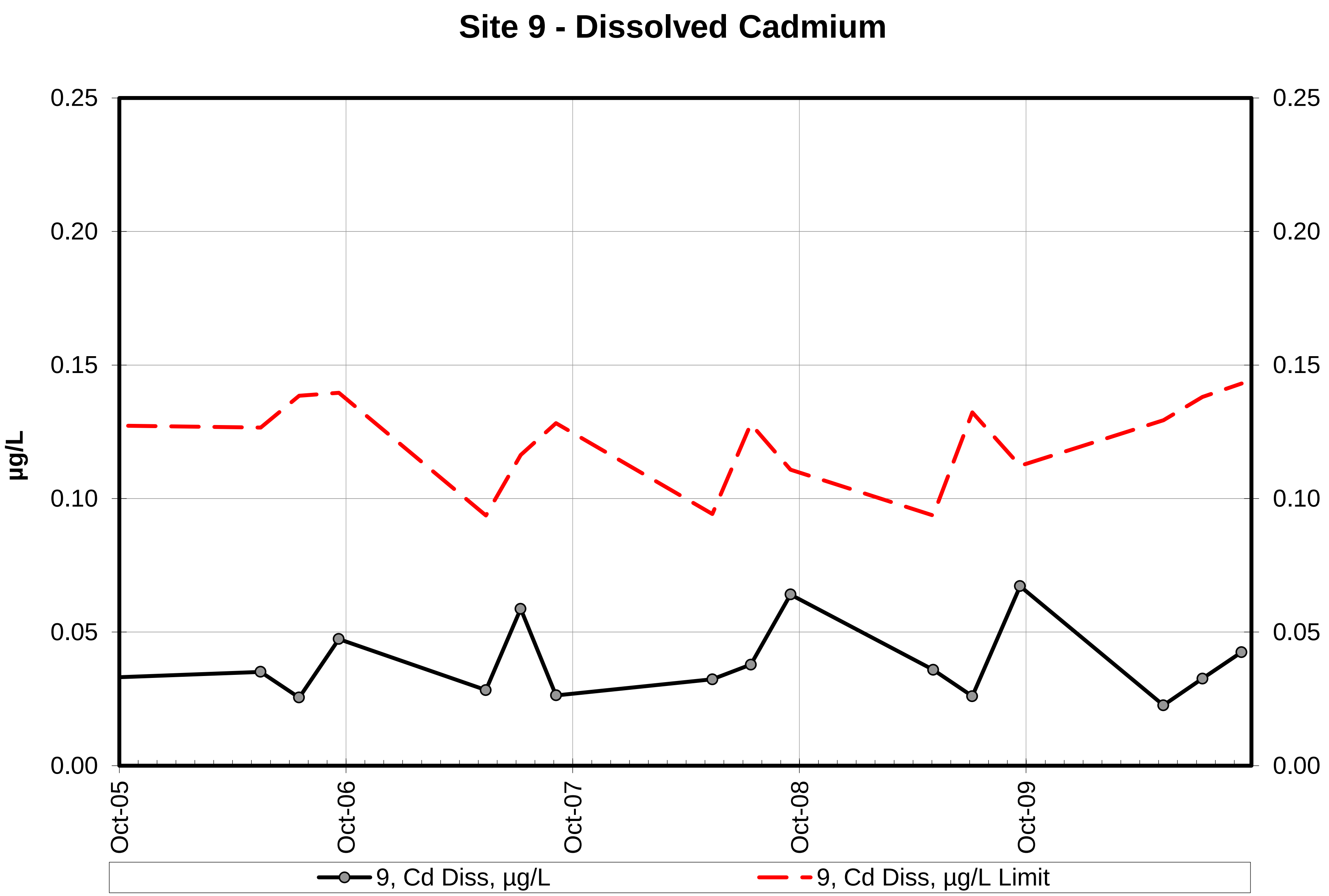


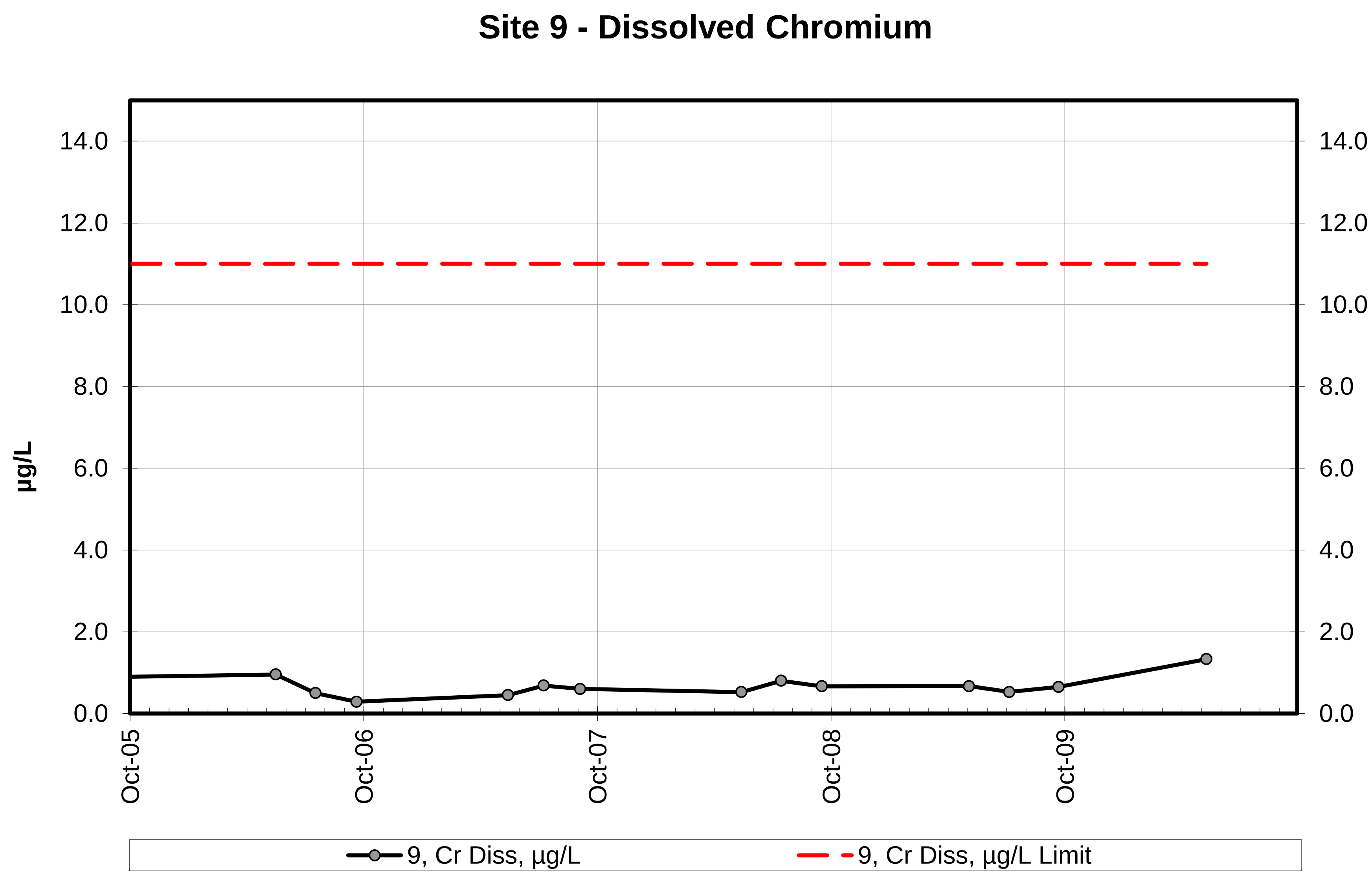
Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination

Site 9 - Dissolved Barium

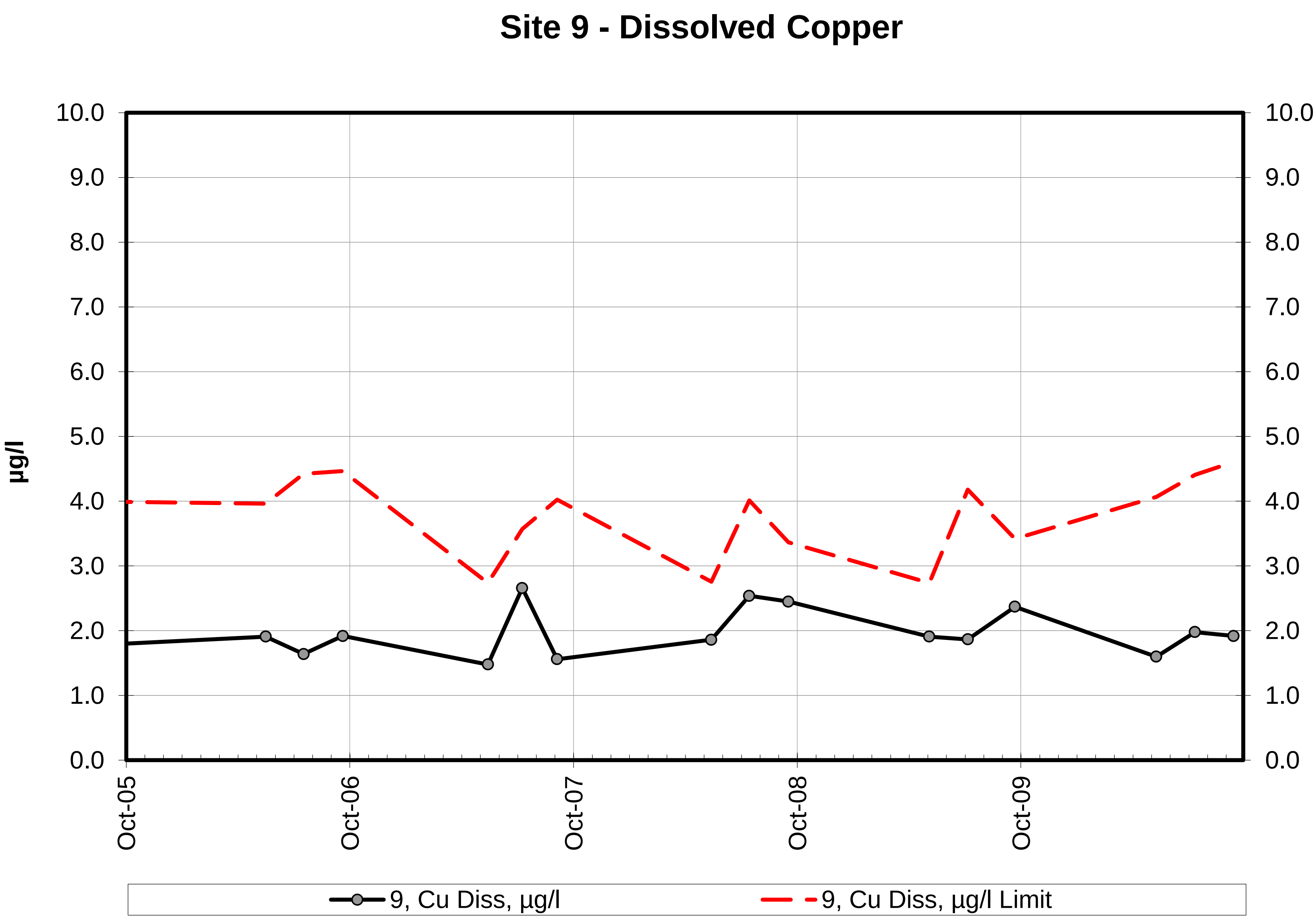


Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

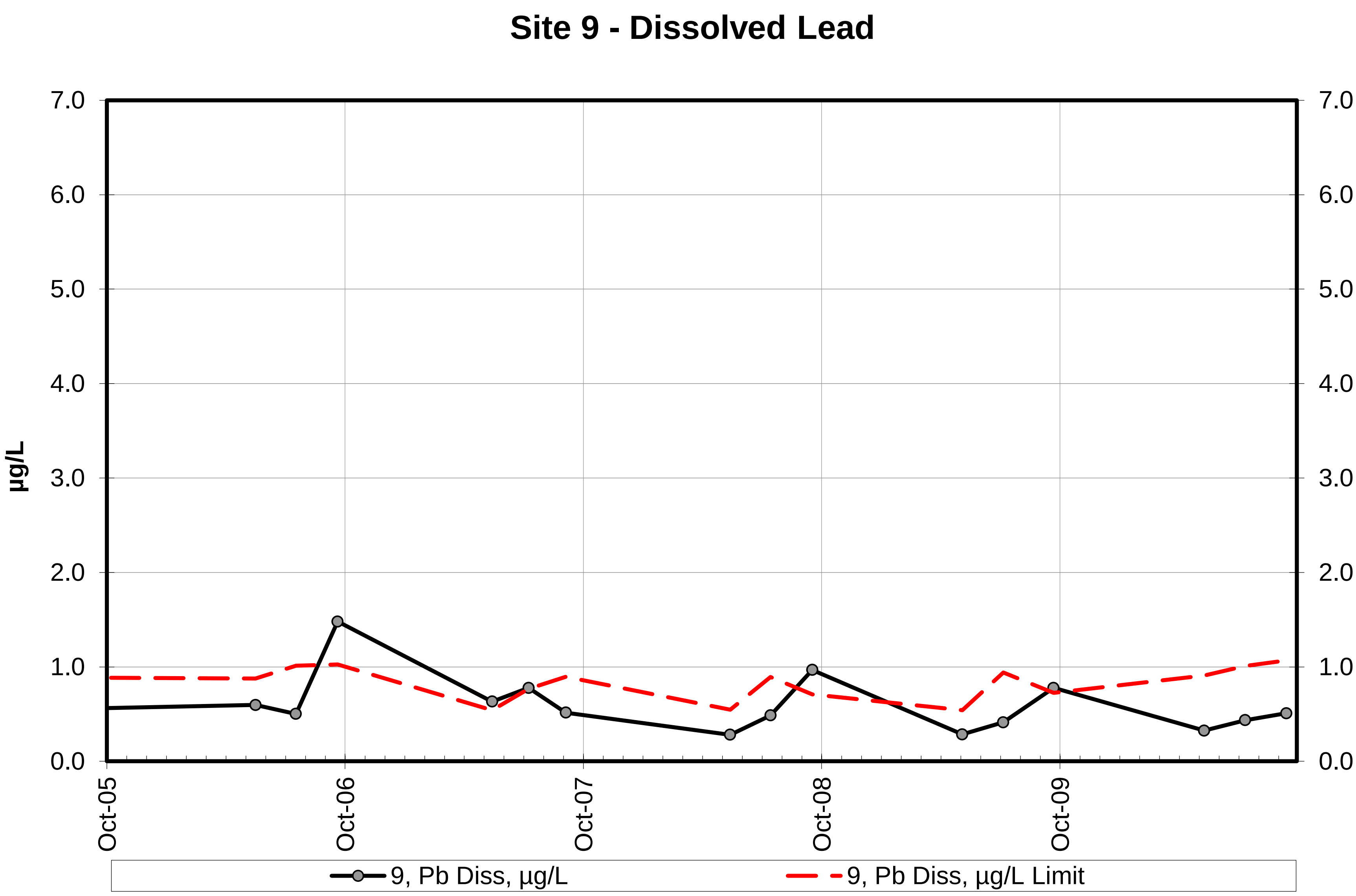

Site 9 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Cd Diss, µg/L
9, Cd Diss, µg/L Limit



Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

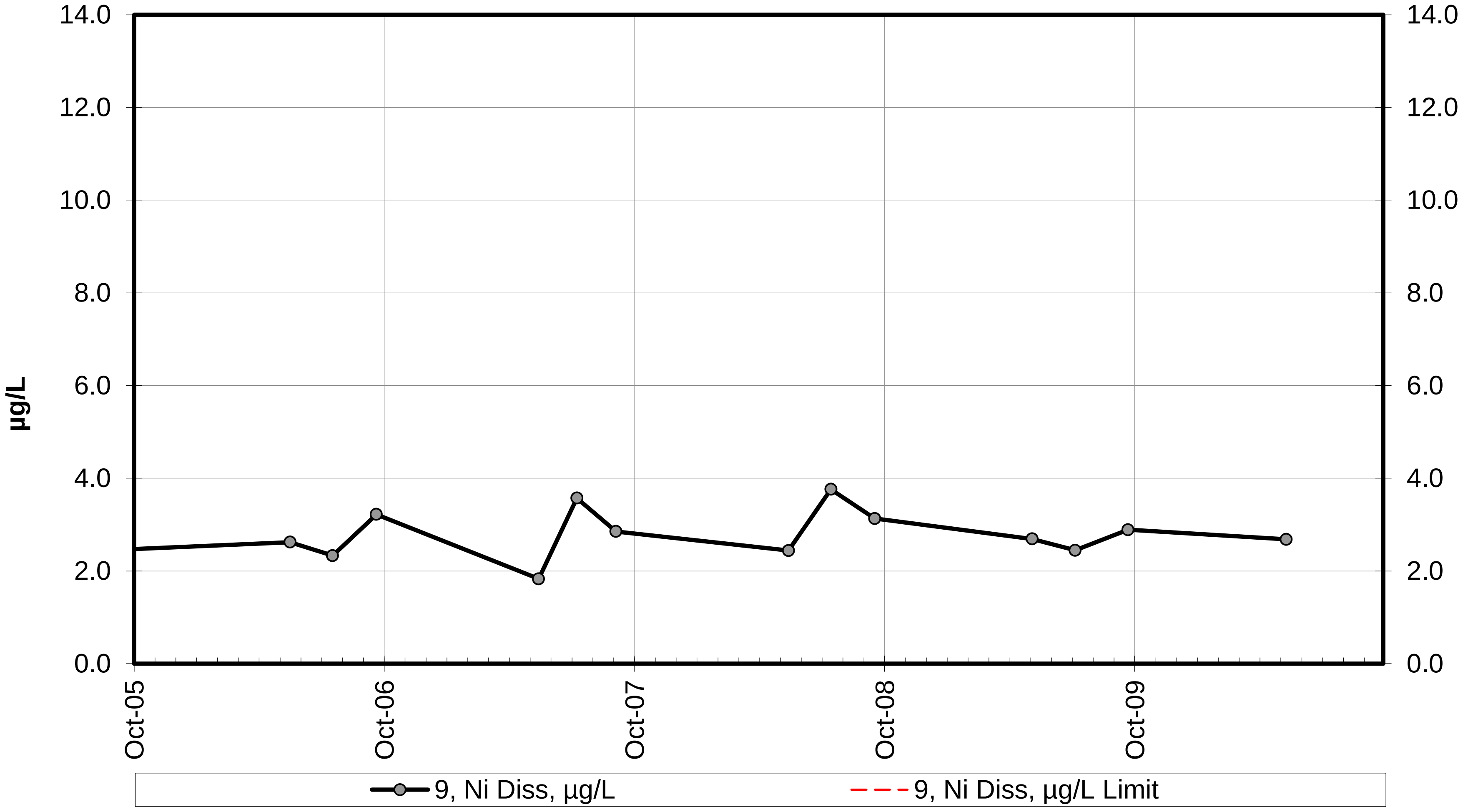


Site 9 - Dissolved Copper
µg/l
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Cu Diss, µg/l
9, Cu Diss, µg/l Limit

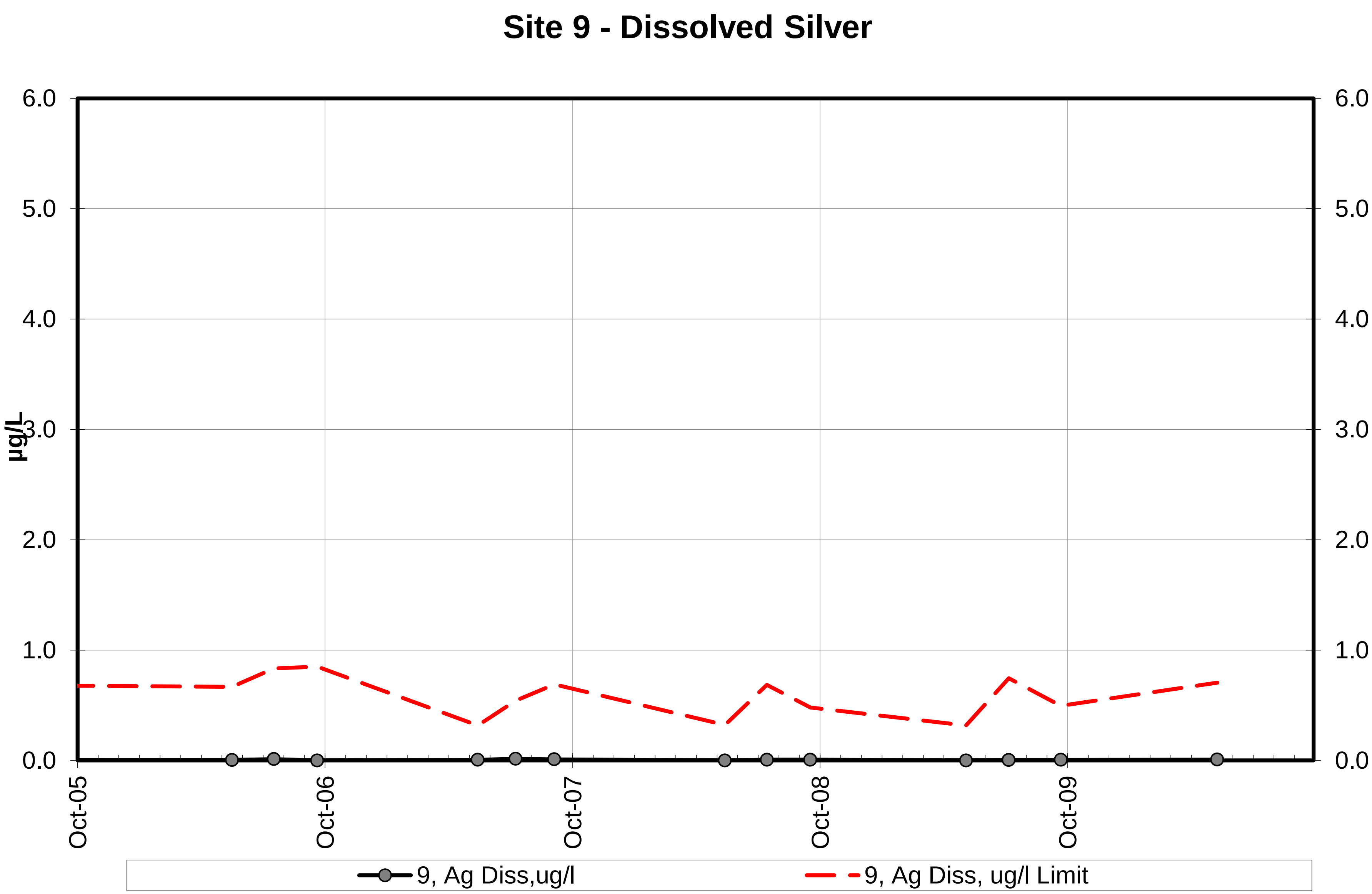


Site 9 - Dissolved Lead
µg/L
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Pb Diss, µg/L
9, Pb Diss, µg/L Limit

Site 9 - Dissolved Nickel

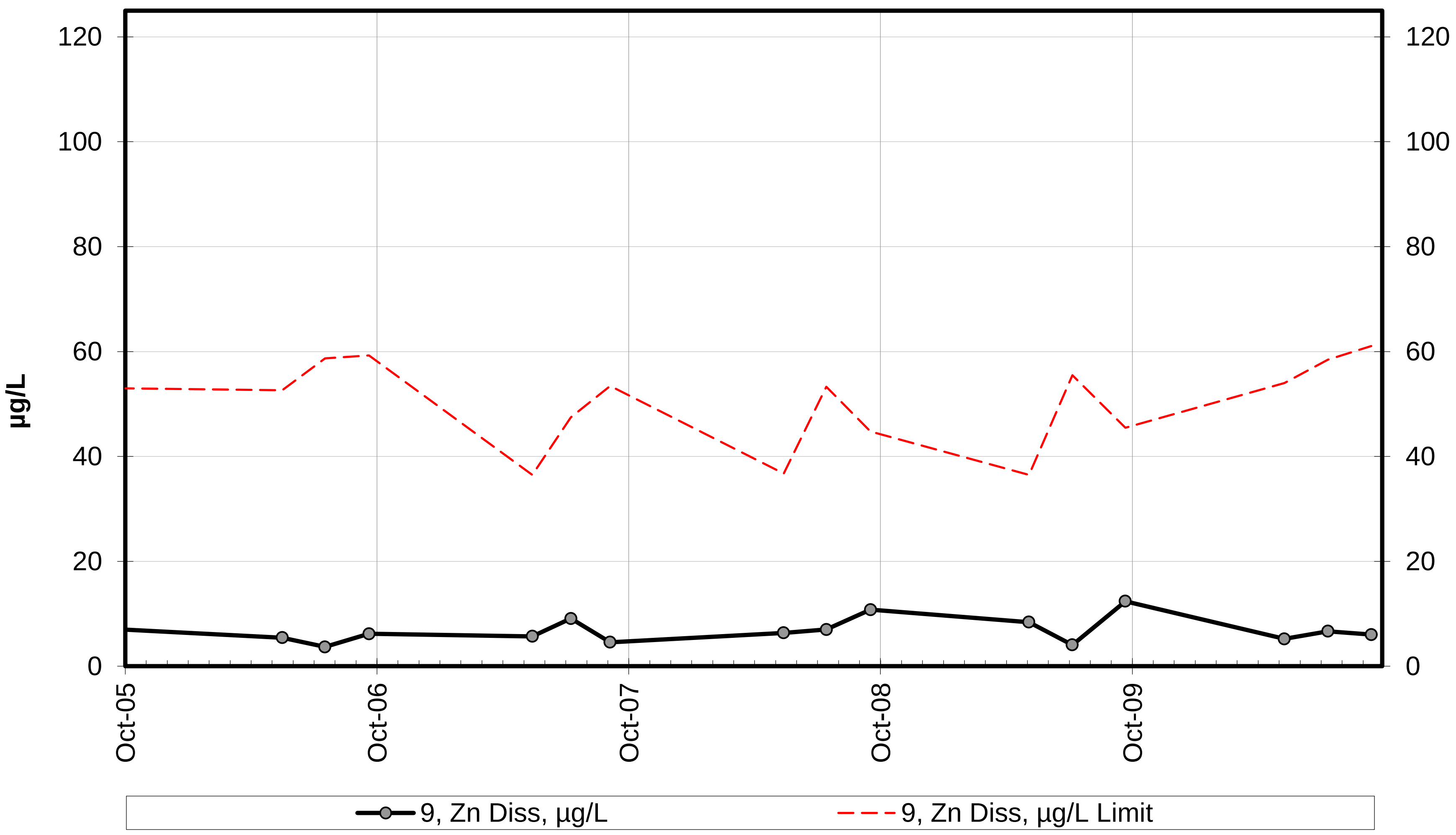


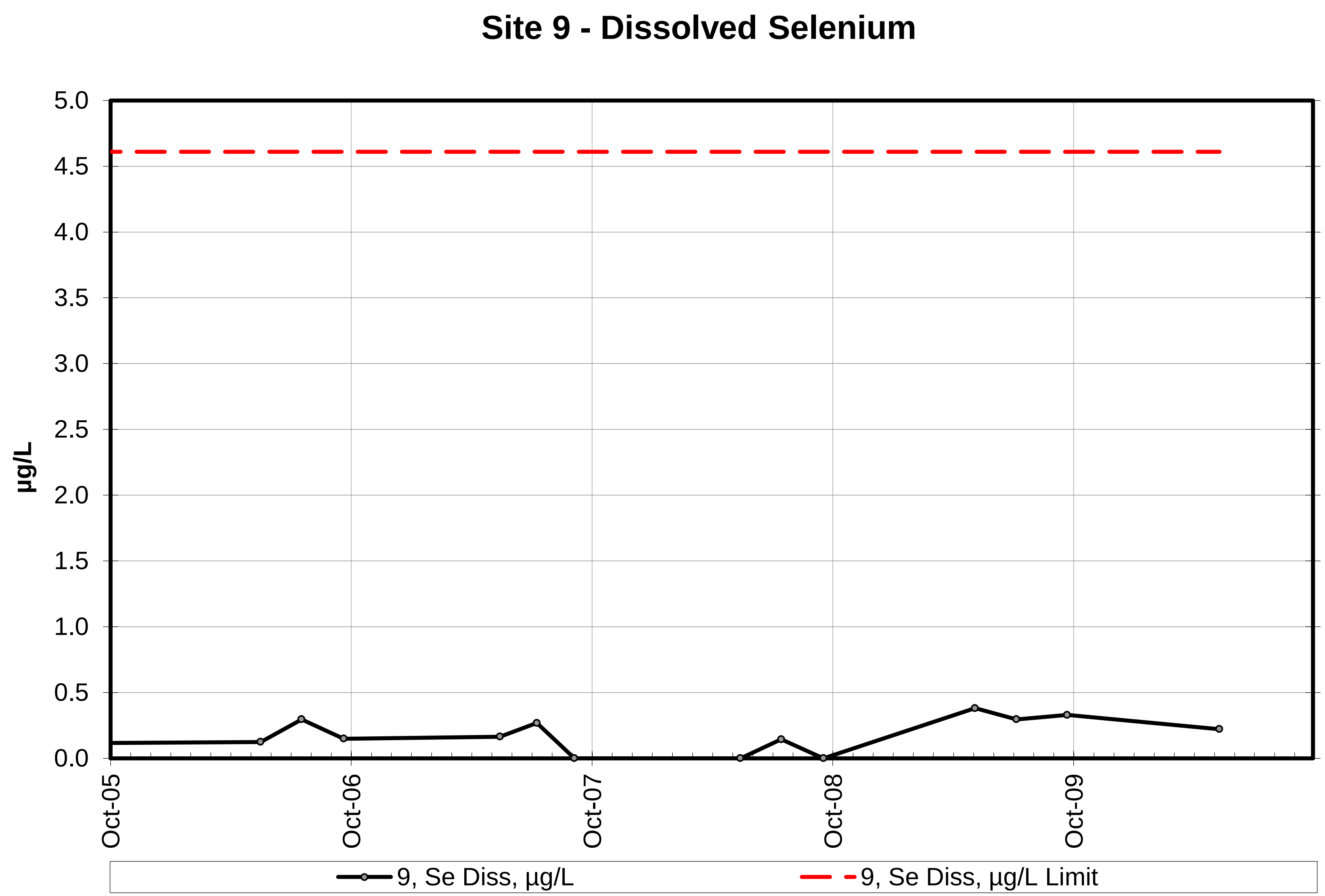
Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.



Site 9 - Dissolved Silver
µg/L
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Ag Diss,ug/l
9, Ag Diss, ug/l Limit

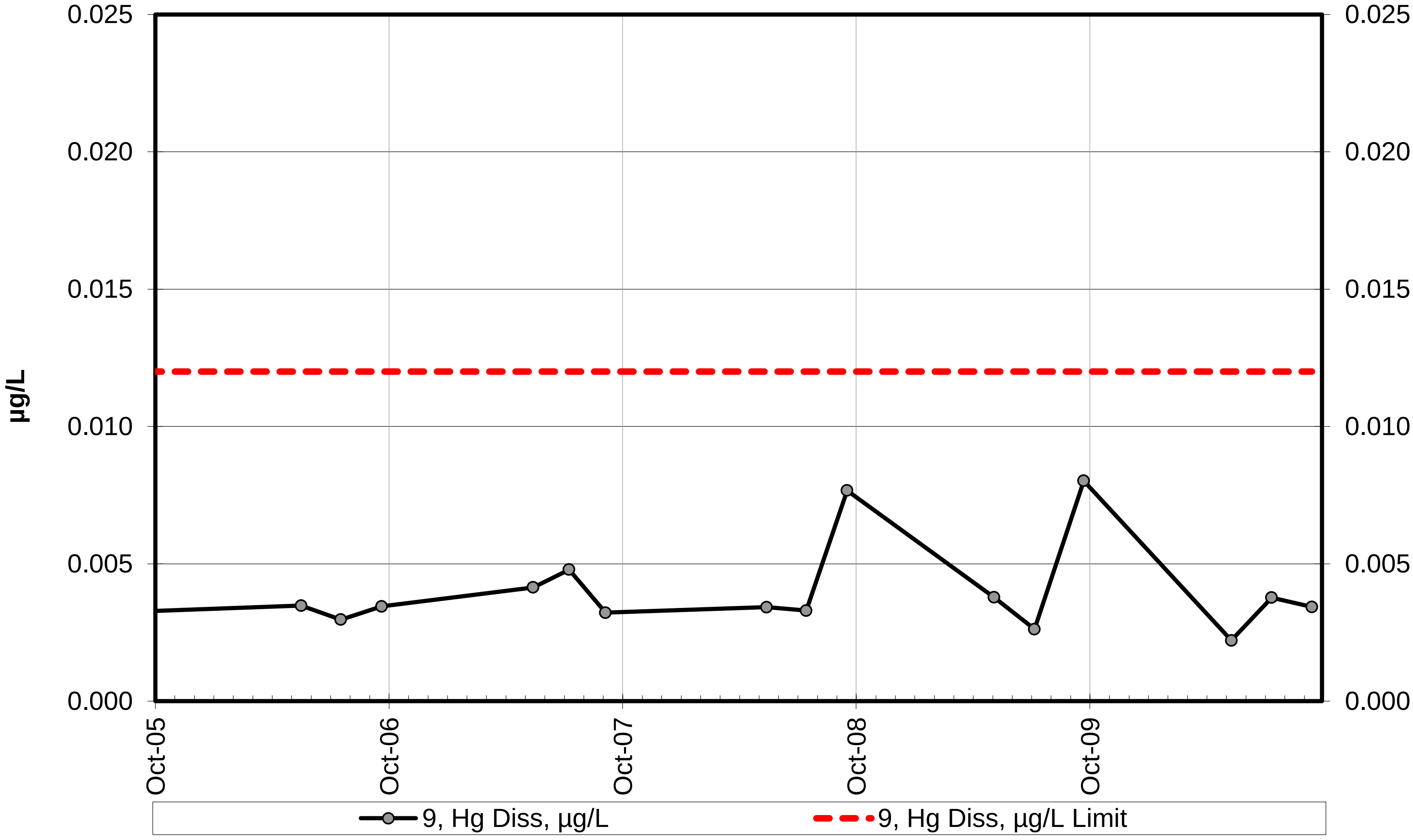
Site 9 - Dissolved Zinc





Site 9 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
9, Se Diss, µg/L
9, Se Diss, µg/L Limit

Site 9 - Dissolved Mercury



Site #9 Seasonal Kendall analysis for Specific Conductance, Lab (uS/cm)

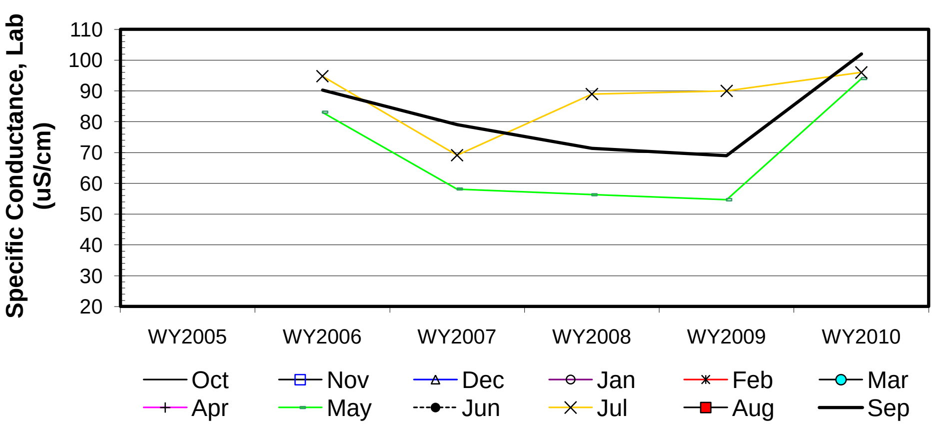
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	WY2005												
b	WY2006								83.1		94.8		90.3
c	WY2007								58.15		69.1		79
d	WY2008								56.3		89		71.4
e	WY2009								54.7		90		69
f	WY2010								94		96		102
	n	0	0	0	0	0	0	0	5	0	5	0	5
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a												
	c-a												
	d-a												
	e-a												
	f-a												
	c-b								-1		-1		-1
	d-b								-1		-1		-1
	e-b								-1		-1		-1
	f-b								1		1		1
	d-c								-1		1		-1
	e-c								-1		1		-1
	f-c								1		1		1
	e-d								-1		1		-1
	f-d								1		1		1
	f-e								1		1		1
	S_k	0	0	0	0	0	0	0	-2	0	4	0	-2
	σ^2_S=								16.67		16.67		16.67
	$Z_k = S_k/\sigma_S$								-0.49		0.98		-0.49
	Z^2_k								0.24		0.96		0.24

ΣZ_k= 0.00
ΣZ^2_k= 1.44
Z-bar=ΣZ_k/K= 0.00

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 15
ΣS_k 0

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		1.44	@α=5% $\chi^2_{(K-1)}$= 5.99	Test for station homogeneity	
	p	0.487		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.00	@α/2=2.5% Z= 1.96	H_0 (No trend)	ACCEPT
50.00	p	0.500		H_A (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-8.02		9.30
0.050	-4.61	-0.65	5.54
0.100	-2.67		3.23
0.200	-1.85		2.68

Site **#9** Seasonal Kendall analysis for pH, Lab, Standard Units

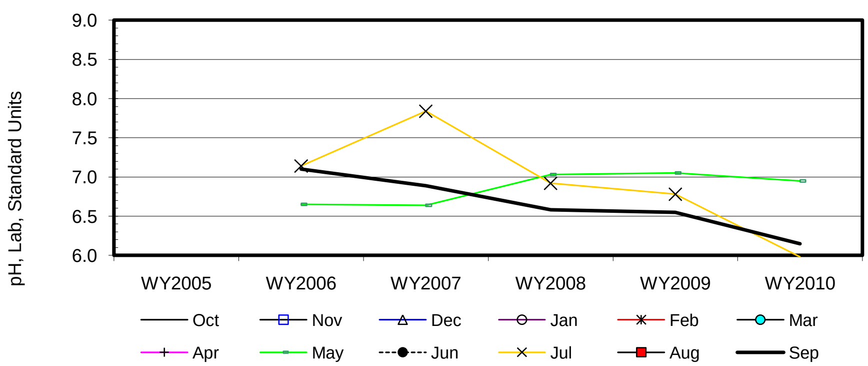
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**								6.7		7.1		7.1
c	**WY2007**								6.6		7.8		6.9
d	**WY2008**								7.0		6.9		6.6
e	**WY2009**								7.1		6.8		6.6
f	**WY2010**								7.0		6.0		6.2
	n	0	0	0	0	0	0	0	5	0	5	0	5
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a												
	c-a												
	d-a												
	e-a												
	f-a												
	c-b								-1		1		-1
	d-b								1		-1		-1
	e-b								1		-1		-1
	f-b								1		-1		-1
	d-c								1		-1		-1
	e-c								1		-1		-1
	f-c								1		-1		-1
	e-d								1		-1		-1
	f-d								-1		-1		-1
	f-e								-1		-1		-1
S_k		0	0	0	0	0	0	0	4	0	-8	0	-10
Qm													
σ^2_S=									16.67		16.67		16.67
$Z_k = S_k/\sigma_S$									0.98		-1.96		-2.45
Z^2_k									0.96		3.84		6.00

ΣZ_k=	-3.43
ΣZ^2_k=	10.80
Z-bar=ΣZ_k/K=	-1.14

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	15
ΣS_k	-14

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=	6.88	@α=5% $\chi^2_{(K-1)}$=	5.99	Test for station homogeneity	
p	**0.032**			$\chi^2_h < \chi^2_{(K-1)}$	**REJECT**
ΣVAR(S_k)	Z_{calc} -1.84	@α/2=2.5% Z=	1.96	H_0 (No trend)	NA
50.00	**p** **0.033**			H_A ($\pm$ trend)	NA



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-0.33		0.03
0.050	-0.26	**-0.16**	-0.03
0.100	-0.24		-0.07
0.200	-0.21		-0.11

Site	#9	Seasonal Kendall analysis for Total Alk, (mg/l)											
Row label	**Water Year**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
a	**WY2005**												
b	**WY2006**								14.1		24.5		20.2
c	**WY2007**								9.7		17.4		23.4
d	**WY2008**								11.0		17.5		11.6
e	**WY2009**								10.0		25.0		8.6
f	**WY2010**								18.2		18.7		21.3
	n	0	0	0	0	0	0	0	5	0	5	0	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a												
c-a												
d-a												
e-a												
f-a												
c-b								-1		-1		1
d-b								-1		-1		-1
e-b								-1		1		-1
f-b								1		-1		1
d-c								1		1		-1
e-c								1		1		-1
f-c								1		1		-1
e-d								-1		1		-1
f-d								1		1		1
f-e								1		-1		1
S_k	0	0	0	0	0	0	0	2	0	2	0	-2

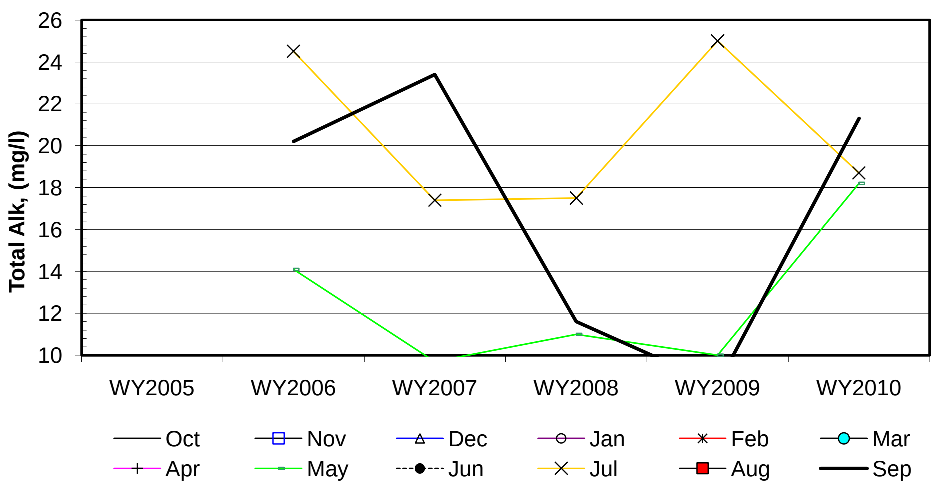
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								16.67		16.67		16.67
$Z_k = S_k/\sigma_S$								0.49		0.49		-0.49
Z^2_k								0.24		0.24		0.24

ΣZ_k=	0.49
ΣZ^2_k=	0.72
Z-bar=$\Sigma Z_k/K$=	0.16

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	15
ΣS_k	2

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=	0.64	@α=5% $\chi^2_{(K-1)}$=	5.99	Test for station homogeneity	
p	**0.726**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
$\Sigma VAR(S_k)$	Z_{calc} 0.14	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
50.00	**p** **0.556**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-3.96		2.92
0.050	-2.73	**0.13**	0.95
0.100	-1.50		0.52
0.200	-1.36		0.27

Site **#9** Seasonal Kendall analysis for Sulfate, Total (mg/l)

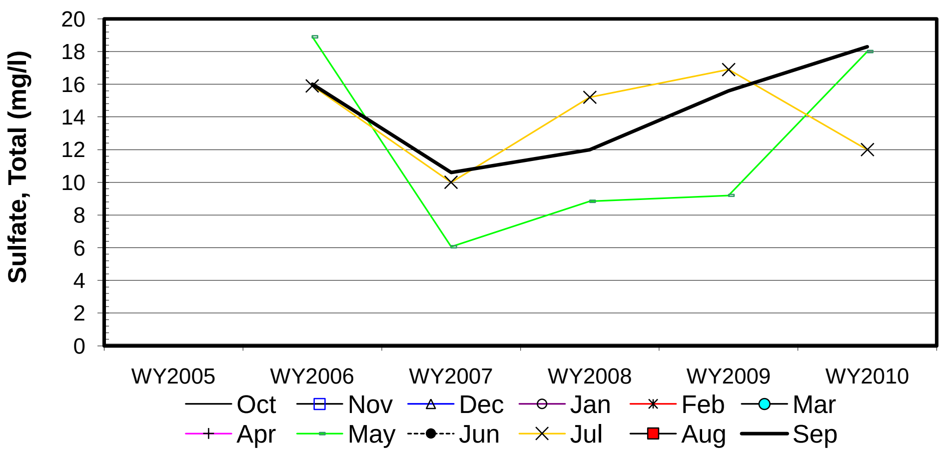
Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**								18.9		15.9		16.0
c	**WY2007**								6.1		10.0		10.6
d	**WY2008**								8.8		15.2		12.0
e	**WY2009**								9.2		16.9		15.6
f	**WY2010**								18.0		12.0		18.3
	n	0	0	0	0	0	0	0	5	0	5	0	5
	t_1	5	5	5	5	5	5	5	5	5	5	5	5
	t_2	0	0	0	0	0	0	0	0	0	0	0	0
	t_3	0	0	0	0	0	0	0	0	0	0	0	0
	t_4	0	0	0	0	0	0	0	0	0	0	0	0
	t_5	0	0	0	0	0	0	0	0	0	0	0	0
	b-a												
	c-a												
	d-a												
	e-a												
	f-a												
	c-b								-1		-1		-1
	d-b								-1		-1		-1
	e-b								-1		1		-1
	f-b								-1		-1		1
	d-c								1		1		1
	e-c								1		1		1
	f-c								1		1		1
	e-d								1		1		1
	f-d								1		-1		1
	f-e								1		-1		1
	S_k	0	0	0	0	0	0	0	2	0	0	0	4
	σ^2_S=								16.67		16.67		16.67
	$Z_k = S_k/\sigma_S$								0.49		0.00		0.98
	Z^2_k								0.24		0.00		0.96

ΣZ_k=	1.47
ΣZ^2_k=	1.20
Z-bar=ΣZ_k/K=	0.49

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	15
ΣS_k	6

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2$=		0.48	@α=5% $\chi^2_{(K-1)}$= 5.99	Test for station homogeneity	
	p	**0.787**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	0.71	@α=5% Z= 1.64	**H_0** (No trend)	ACCEPT
50.00	p	**0.760**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-2.28		2.86
0.050	-0.86	**0.62**	2.55
0.100	-0.29		2.12
0.200	-0.12		1.57

Site **#9** Seasonal Kendall analysis for Zinc, Dissolved (ug/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**								5.5		3.7		6.2
c	**WY2007**								5.7		9.1		4.6
d	**WY2008**								6.4		7.0		10.8
e	**WY2009**								8.4		4.1		12.4
f	**WY2010**								5.2		6.7		6.0
	n	0	0	0	0	0	0	0	5	0	5	0	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a												
c-a												
d-a												
e-a												
f-a												
c-b								1		1		-1
d-b								1		1		1
e-b								1		1		1
f-b								-1		1		-1
d-c								1		-1		1
e-c								1		-1		1
f-c								-1		-1		1
e-d								1		-1		1
f-d								-1		-1		-1
f-e								-1		1		-1
S_k	0	0	0	0	0	0	0	2	0	0	0	2

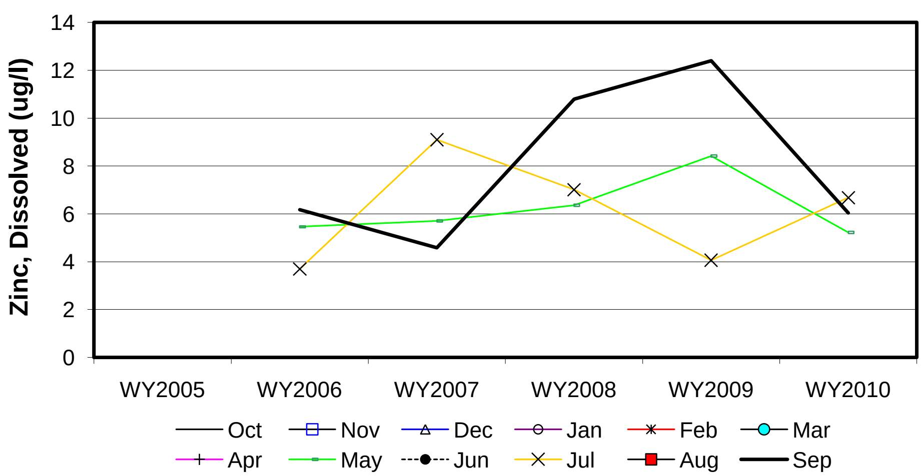
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								16.67		16.67		16.67
$Z_k = S_k/\sigma_S$								0.49		0.00		0.49
Z^2_k								0.24		0.00		0.24

ΣZ_k= 0.98
ΣZ^2_k= 0.48
Z-bar=ΣZ_k/K= 0.33

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 15
ΣS_k 4

$\chi^2_h=\Sigma Z^2_k$-K(Z-bar)^2=	0.16	@α=5% $\chi^2_{(K-1)}$=	5.99	Test for station homogeneity	
p	**0.923**			$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} 0.42	@α/2=2.5% Z=	1.96	**H_0** (No trend)	ACCEPT
50.00	**p** **0.664**			**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-1.70		1.75
0.050	-0.50	**0.35**	1.29
0.100	-0.16		0.87
0.200	-0.06		0.65

INTERPRETIVE REPORT
SITE 60 "–LOWER ALTHEA CREEK"

Sampling at this site was initiated during background investigations conducted by HGCMC for the Stage II Tailings EIS. The two sampling events that occurred in 2003 were submitted to Analytica Alaska Laboratories for analysis and subject to standard QAQC procedures. The detection limits achieved during this analysis were slightly higher for some analytes than are currently achieved under FWMP sampling protocols. The two sample events that occurred in the 2006 water year were analyzed in parallel with standard FWMP samples and thus subject to the same analytical procedures.

The data collected during the current water year are listed in the following "Table of Results for Water Year 2010" report. The table includes all the required FWMP analyte data (field and lab) collected for the current water year and a series of flags keyed to the summary report "Qualified Data by QA Reviewer". The QA report lists any associated data limitations found during the monthly QA reviews of laboratory data for this site. Median values for all analytes have been calculated and are shown in the right-most column of the table of results. Any value reported as less than MDL has been replaced with a value of ½ MDL for the purpose of median calculation.

Both ADEC and the USFS requested during the WY2006 annual meeting that an additional monitoring point be added to monitor the impact from Pond 7 on the western, downgradient drainage. Greens Creek proposed the current site on lower Althea, and after review by ADEC and USFS during a site visit (June 2, 2007 – USFS Inspection #259) the new site was added to the routine monitoring schedule.

As shown in the table below, there were no data outliers.

Sample Date	Parameter	Value	Qualifier	Notes
No outliers have been identified by HGCMC for the period of October 2005 through September 2010.				

The data for Water Year 2010 have been compared to the strictest fresh water quality criterion for each applicable analyte. Eight results exceeding these criteria have been identified, as listed in the table below. Four of the datum are for pH; two laboratory pH values of 5.45 su (July) and 6.01 su (September), and two field pHs with values of 5.5 su (July) and 6.47 su (September), all of which are below the AWQS limit of 6.50 su. Historical sampling for this site in 2003, prior to any disturbance that would directly impact Althea Creek, indicates that the natural background pH ranged from 4.1 to 4.8 su for both field and laboratory analyses. For both the July and September sampling events total alkalinity was in exceedance at Site 60, with the respective values of 11.3 mg/L and 10.7 mg/L. However, this is a continuation of the visual trend of decreasing alkalinity, towards pre-disturbance values.

Sample Date	Parameter	Value	Hardness (mg/L)	Standard	Standard Type
13-Jul-10	pH Field, su	5.5			Aquatic Life, chronic
14-Sep-10	pH Field, su	6.47			Aquatic Life, chronic
13-Jul-10	pH Lab, su	5.45			Aquatic Life, chronic
14-Sep-10	pH Lab, su	6.01			Aquatic Life, chronic
13-Jul-10	Alkalinity Total, mg/L	11.3		20	Aquatic Life, chronic
14-Sep-10	Alkalinity Total, mg/L	10.7		20	Aquatic Life, chronic
13-Jul-10	Mercury, Dissolved µg/L	0.0156		0.012	
14-Sep-10	Mercury, Dissolved µg/L	0.0227		0.012	

X-Y plots have been generated to graphically present the data for each of the analytes requested in the Statistical Information Goals for this site. Because of the limited amount of sampling for this site, non-parametric statistical analyses for trend were not performed. Site 60 was added to the FWMP as a monitoring point for impacts from Pond 7. Some analytes (*e.g.* sulfate, barium) and measurements (*e.g.* pH, conductivity, hardness, and alkalinity) have similar decreasing visual trends over water years 2007 – 2009. Initially, after the construction of Pond 7 there was a spike in these analytes and measurements. With the completion of the Pond 7 under drain caisson pump back system, these values have begun to decrease and normalize.

The notable exception to this is the current elevated dissolved mercury levels in the past few years. It is theorized that this too is an artifact from the construction of Pond 7. When the natural waters shifted to a more alkaline state after the disturbance caused by Pond 7 construction, this caused dissolved mercury that naturally existed at a low level to adsorb on to other particles and come out of solution. With the success of the pump back system the area is beginning to returning to its natural state as previously mentioned. Because there is this fundamental chemistry shift in the pH the adsorbed mercury is now going back into solution causing the increased values. As the ‘pool’ of adsorbed mercury is depleted, mercury levels should return to levels recorded in 2006 (mean = .00395µg/L). Though the data last year suggested that dissolved mercury levels were starting to decrease, the September 2010 sample was the highest level (0.227 µg/L) recorded. Additional sampling in adjacent drainages during WY2009 showed that this issue was isolated to only the Althea watershed. As a final note, the November 2011 dissolved mercury sample was 0.00622 µg/L, which is below the AWQS limit.

Table of Results for Water Year 2010

Site 60 "ALTHEA CREEK - LOWER"

Sample Date/Parameter	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	5/11/2010	Jun-10	7/13/2010	Aug-10	9/14/2010	**Median**
Water Temp (℃)	NOT SCHEDULED FOR SAMPLING							No Flow	NOT SCHEDULED FOR SAMPLING	10.8	NOT SCHEDULED FOR SAMPLING		10.8
Conductivity-Field(µmho)										54.7		51.6	53.2
Conductivity-Lab (µmho)										60		55	57
pH Lab (standard units)										5.45		6.01	5.73
pH Field (standard units)										5.50		6.47	5.99
Total Alkalinity (mg/L)										11.3		10.7	11.0
Total Sulfate (mg/L)										<5.0 UJ		<5.0	2.5
Hardness (mg/L)										29.7		29.0	29.4
Dissolved As (ug/L)										2.160		2.620	2.390
Dissolved Ba (ug/L)													
Dissolved Cd (ug/L)										0.0206		0.0267	0.0237
Dissolved Cr (ug/L)													
Dissolved Cu (ug/L)										1.060		1.160	1.110
Dissolved Pb (ug/L)										0.1640		0.2420	0.2030
Dissolved Ni (ug/L)													
Dissolved Ag (ug/L)													
Dissolved Zn (ug/L)										5.23		5.29	5.26
Dissolved Se (ug/L)													
Dissolved Hg (ug/L)										0.015600 U		0.022700	0.019150

For individual sample/analyte qualifier descriptions see "Qualified Data by QA Reviewer" table.

Values reported as less than MDL are replaced by 1/2 MDL for median calculation purposes.

Shaded data has been qualified as an outlier by KGCMC and removed from any further analysis and is not included into the calculation of the median

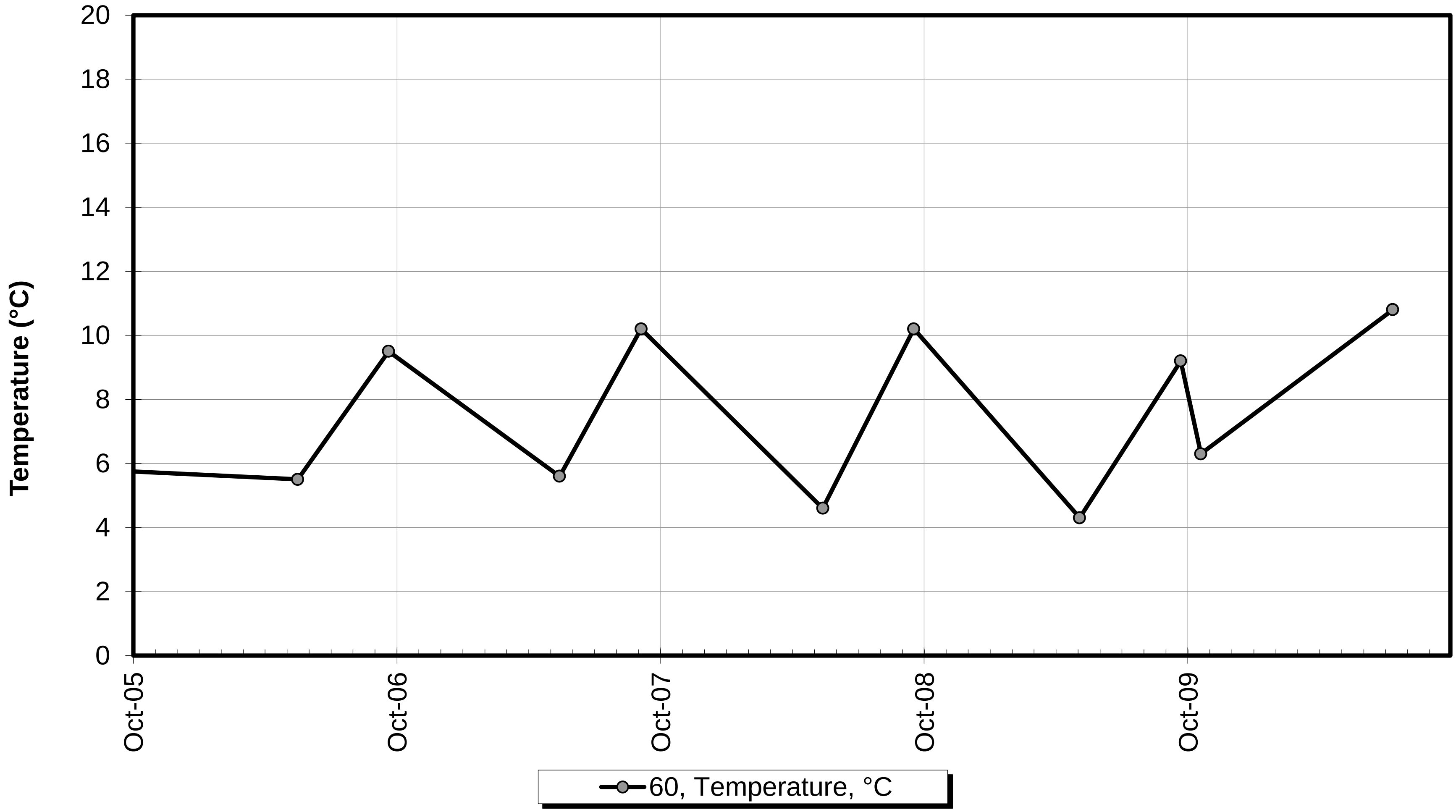
Qualified Data by QA Reviewer

Date Range: 10/01/2009 to 09/30/2010

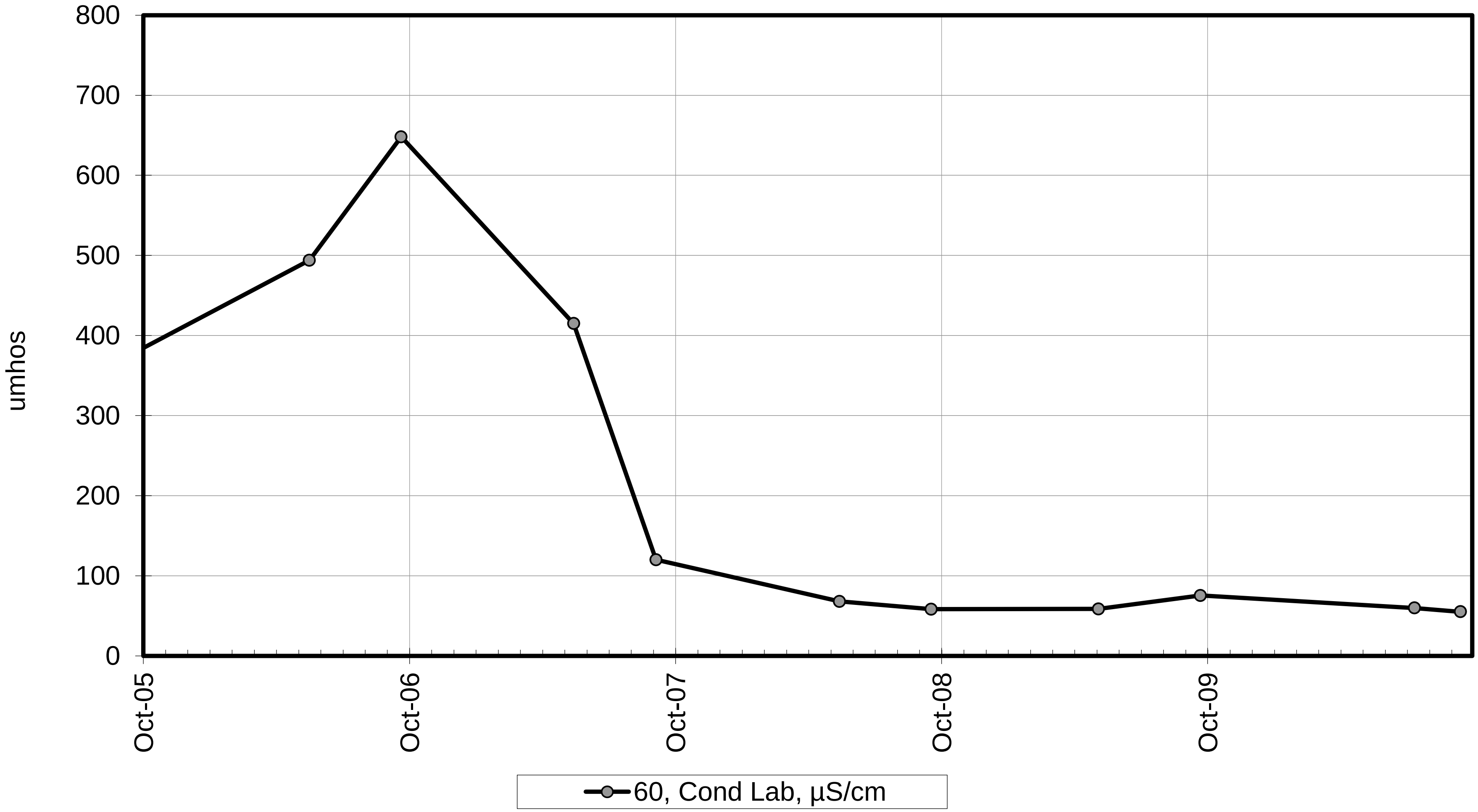
Site No.	Sample Date	Sample Time	Parameter	Value	Qualifier	Reason for Qualifier
60	7/13/2010	1:07 PM				
			SO4 Tot, mg/l	0	UJ	Sample Reciept Temperature

Qualifier	Description
J	Positively Identified - Approximate Concentration
N	Presumptive Evidence For Tentative Identification
NJ	Tentatively Identified - Approximate Concentration
R	Rejected - Cannot be Verified
U	Not Detected Above Quantitation Limit
UJ	Not Detected Above Approximate Quantitation Limit

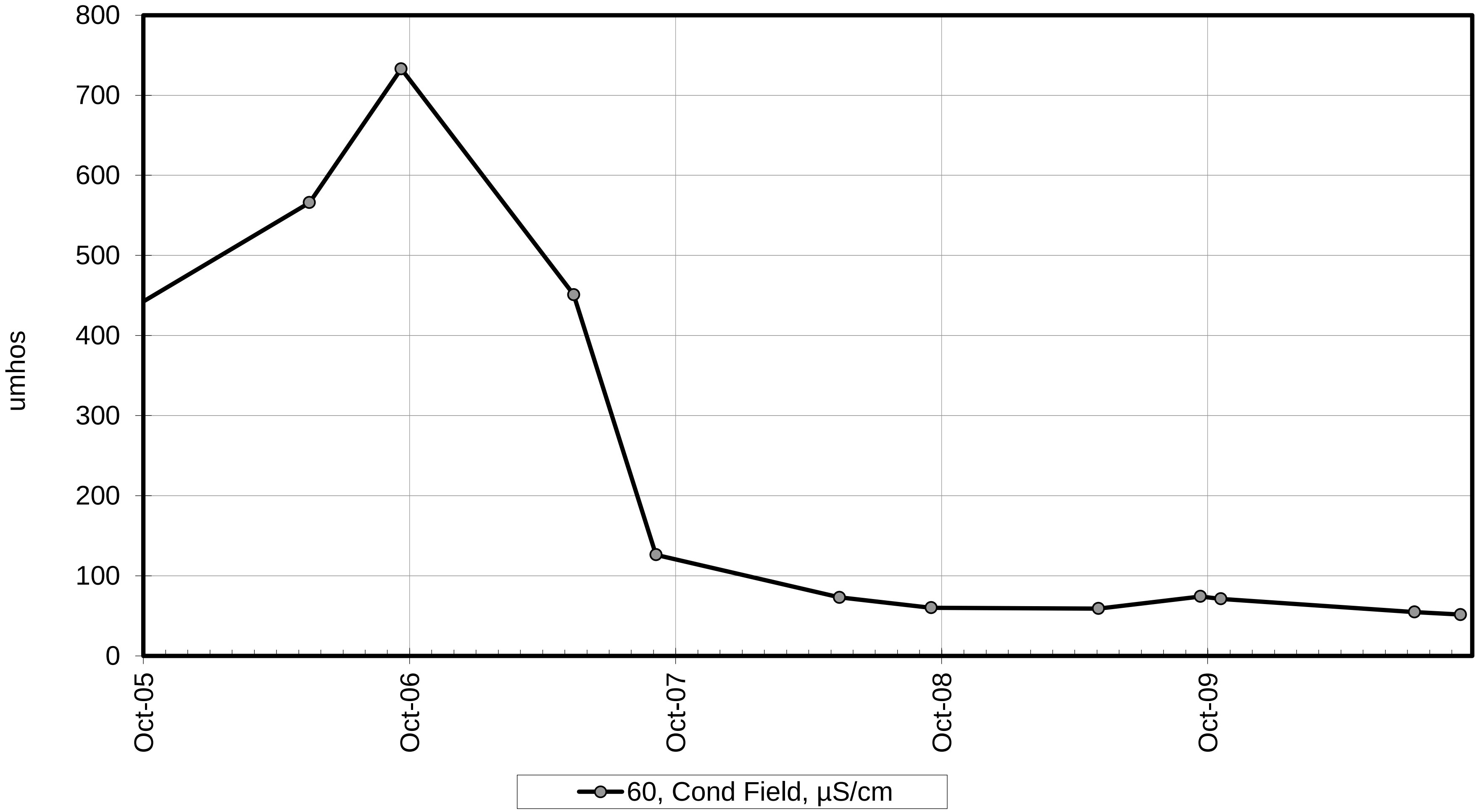
Site 60 -Water Temperature

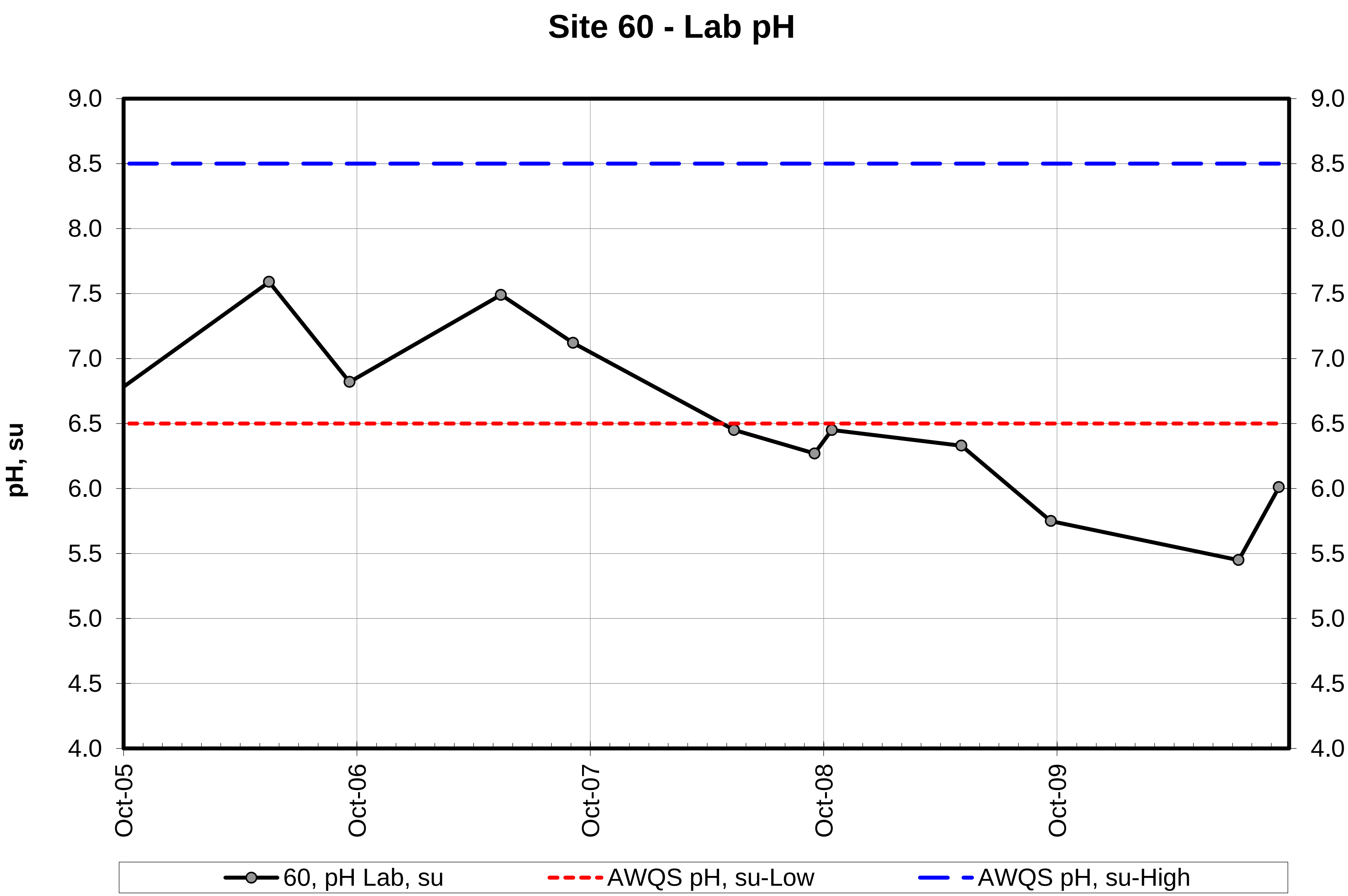


Site 60 - Conductivity-Lab

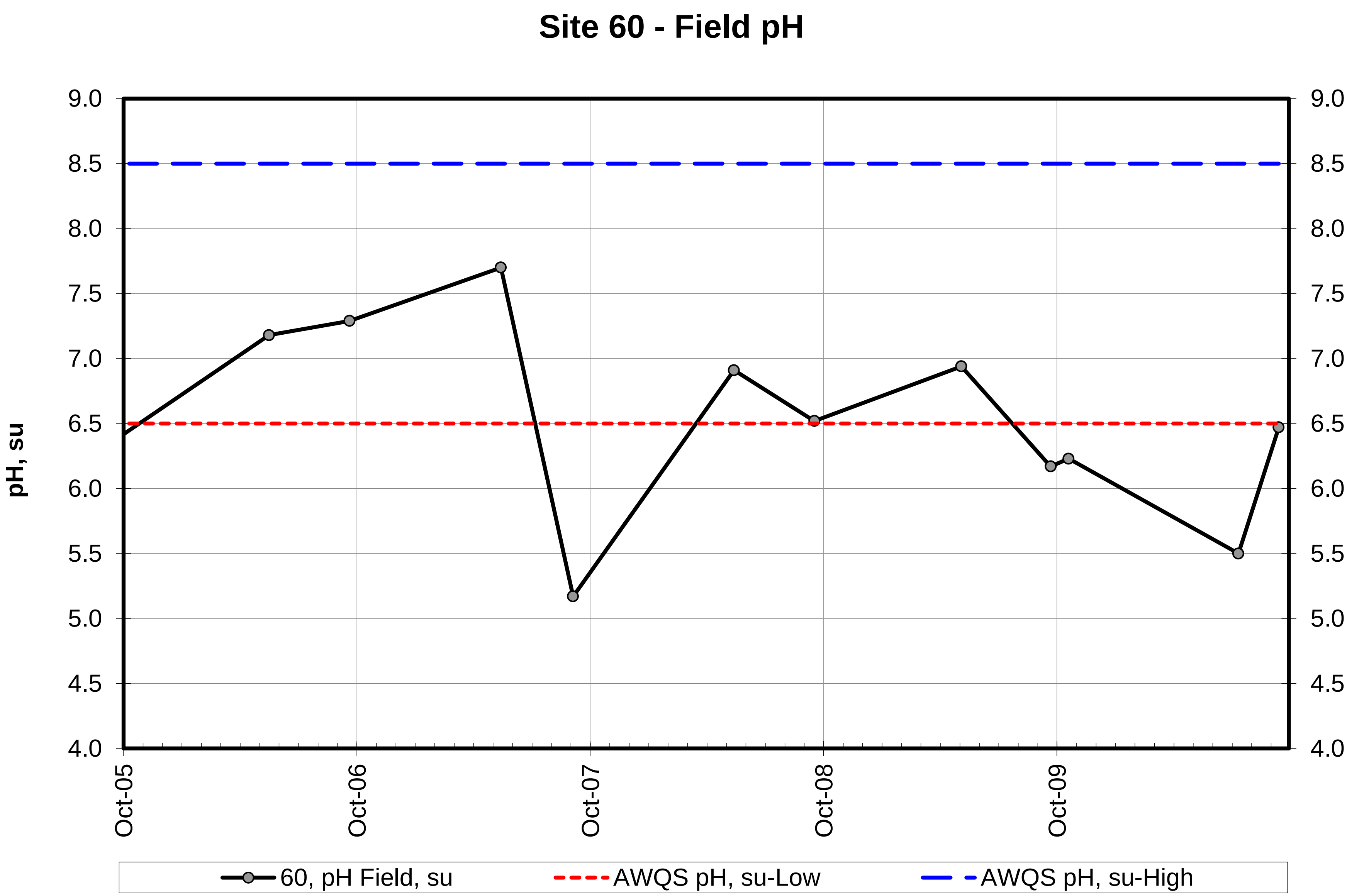


Site 60 - Conductivity-Field

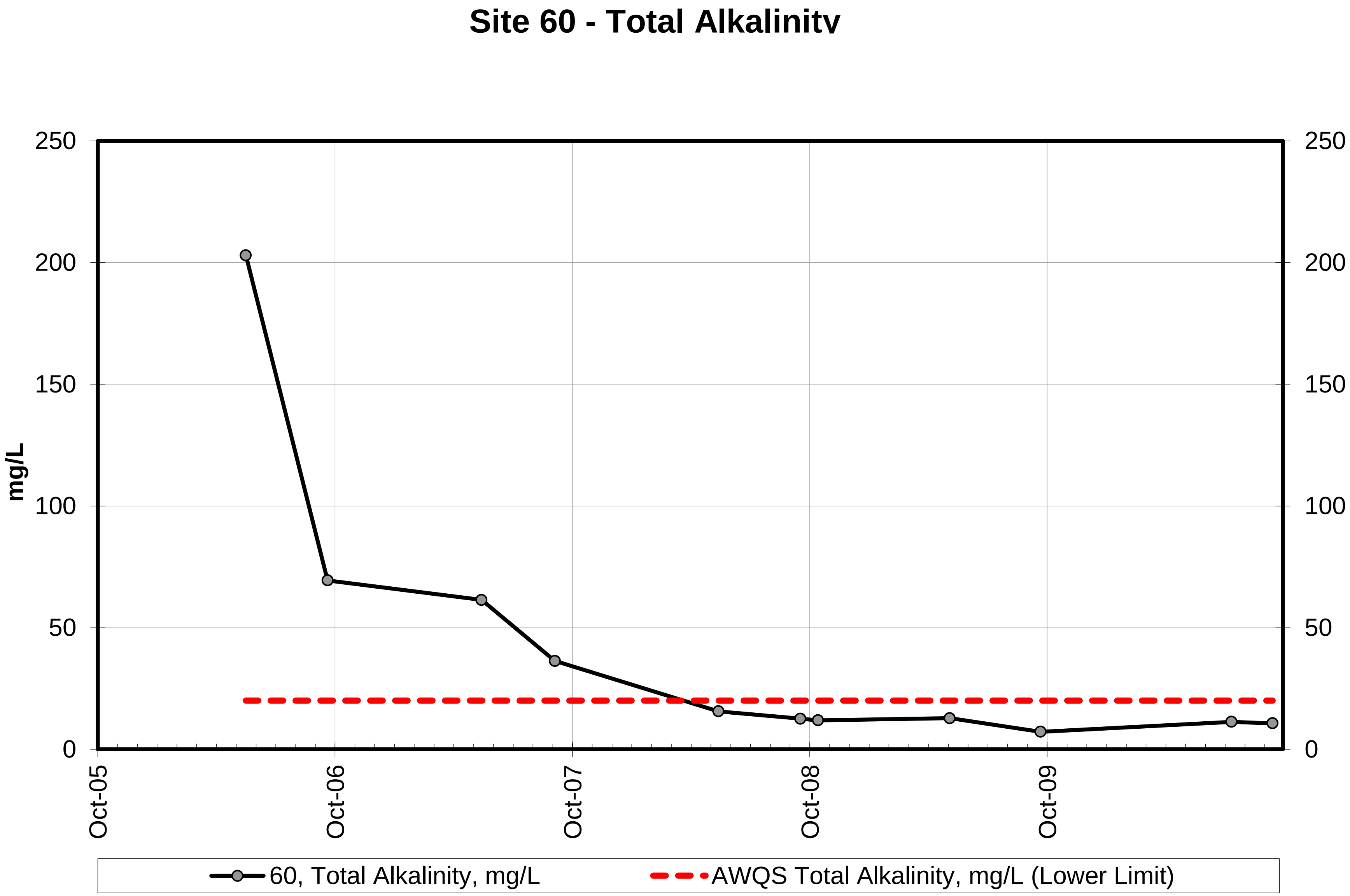




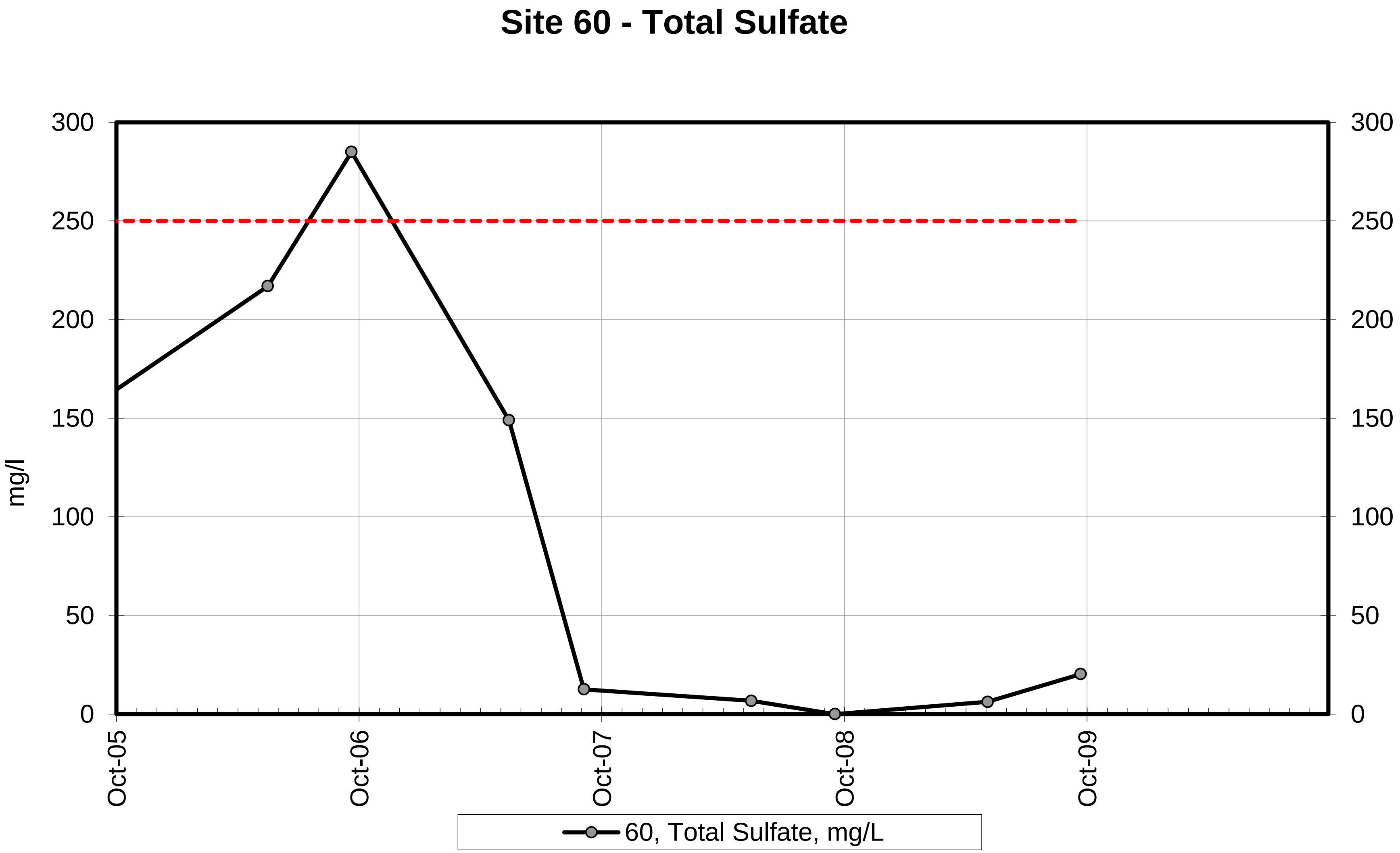
Site 60 - Lab pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, pH Lab, su
AWQS pH, su-Low
AWQS pH, su-High



Site 60 - Field pH
pH, su
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, pH Field, su
AWQS pH, su-Low
AWQS pH, su-High

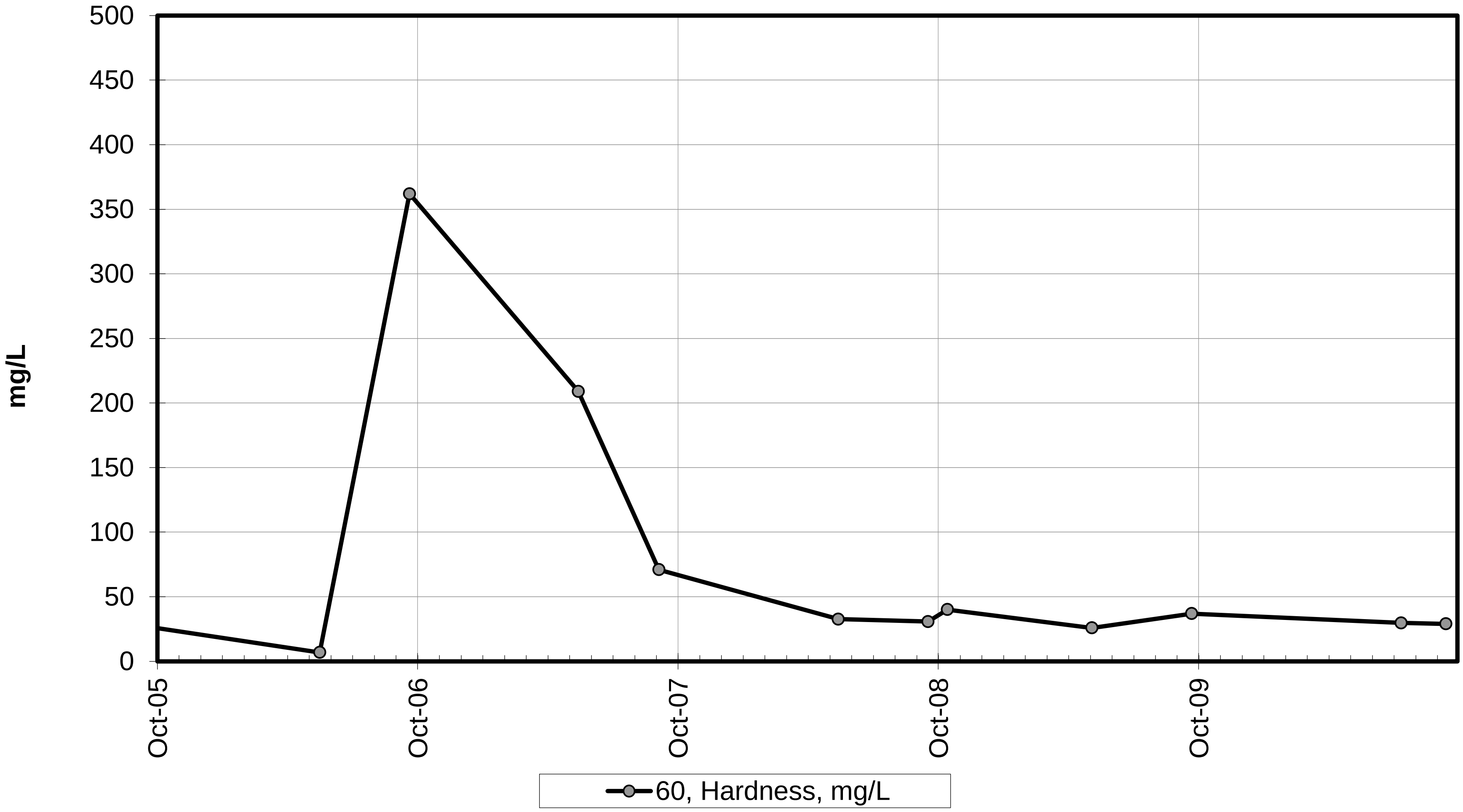


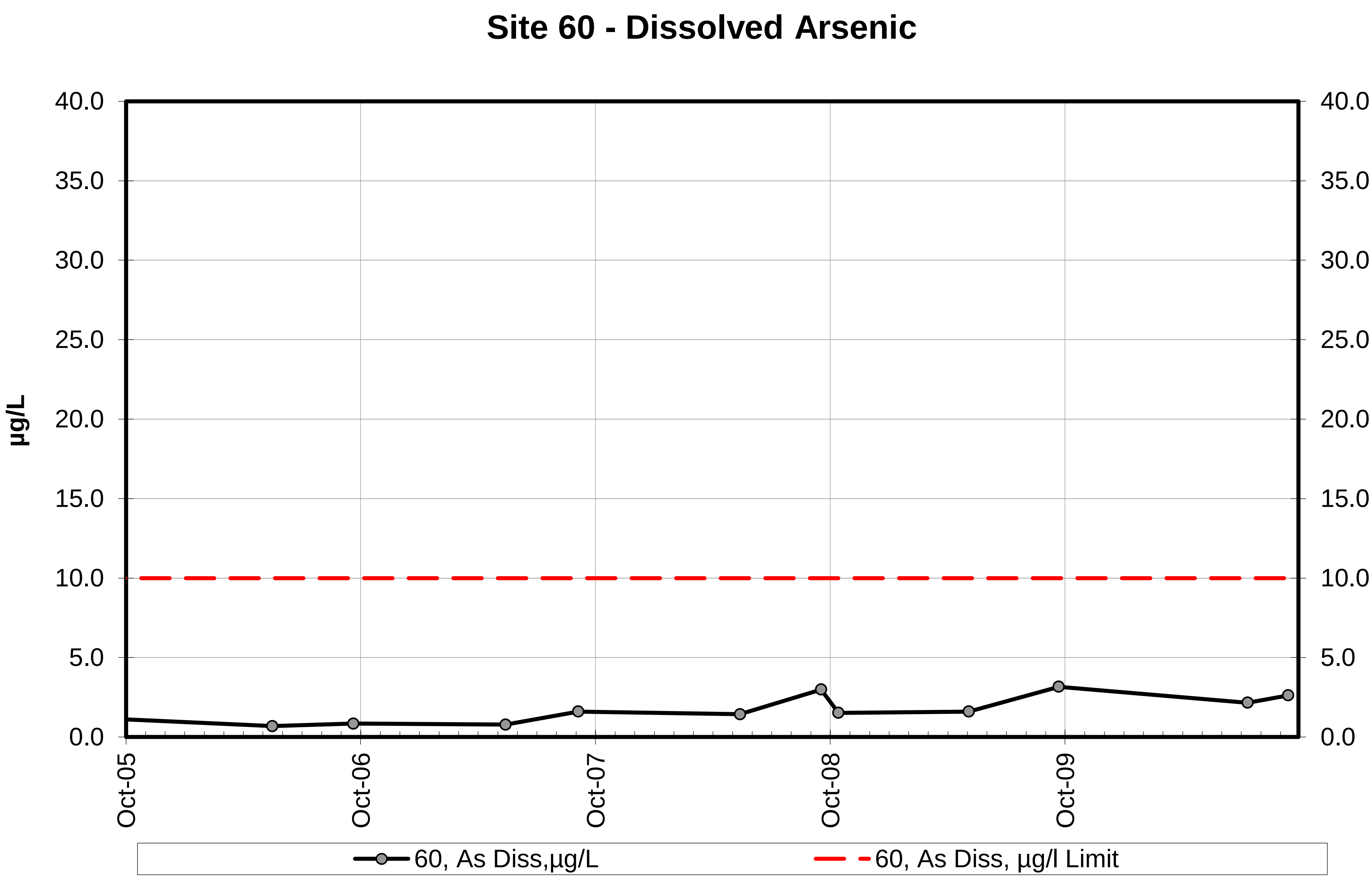
Site 60 - Total Alkalinity
mg/L
250
200
150
100
50
0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, Total Alkalinity, mg/L
AWQS Total Alkalinity, mg/L (Lower Limit)



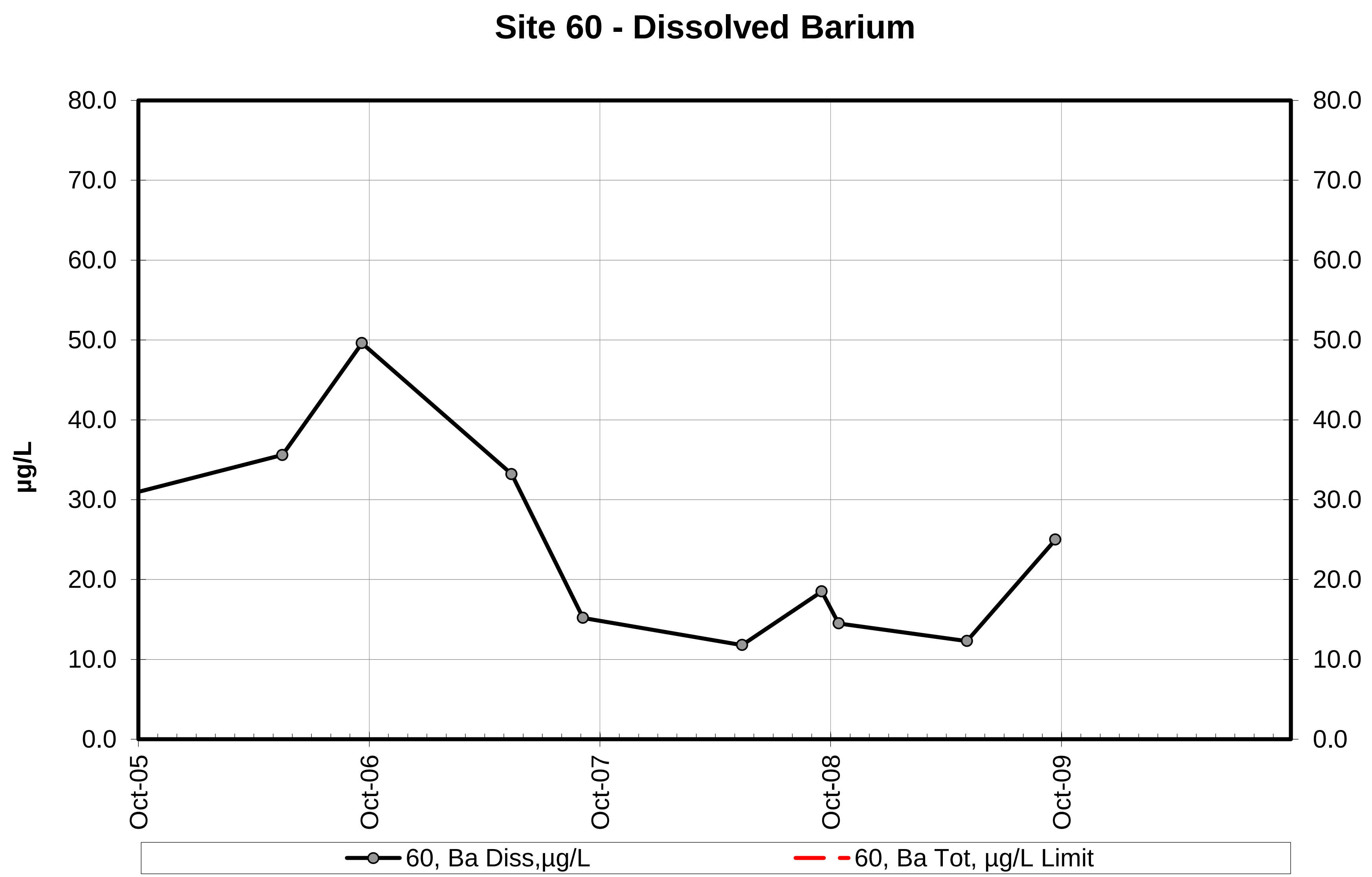
Note: The AWQS for Total Sulfate is 250 mg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination.

Site 60 - Hardness

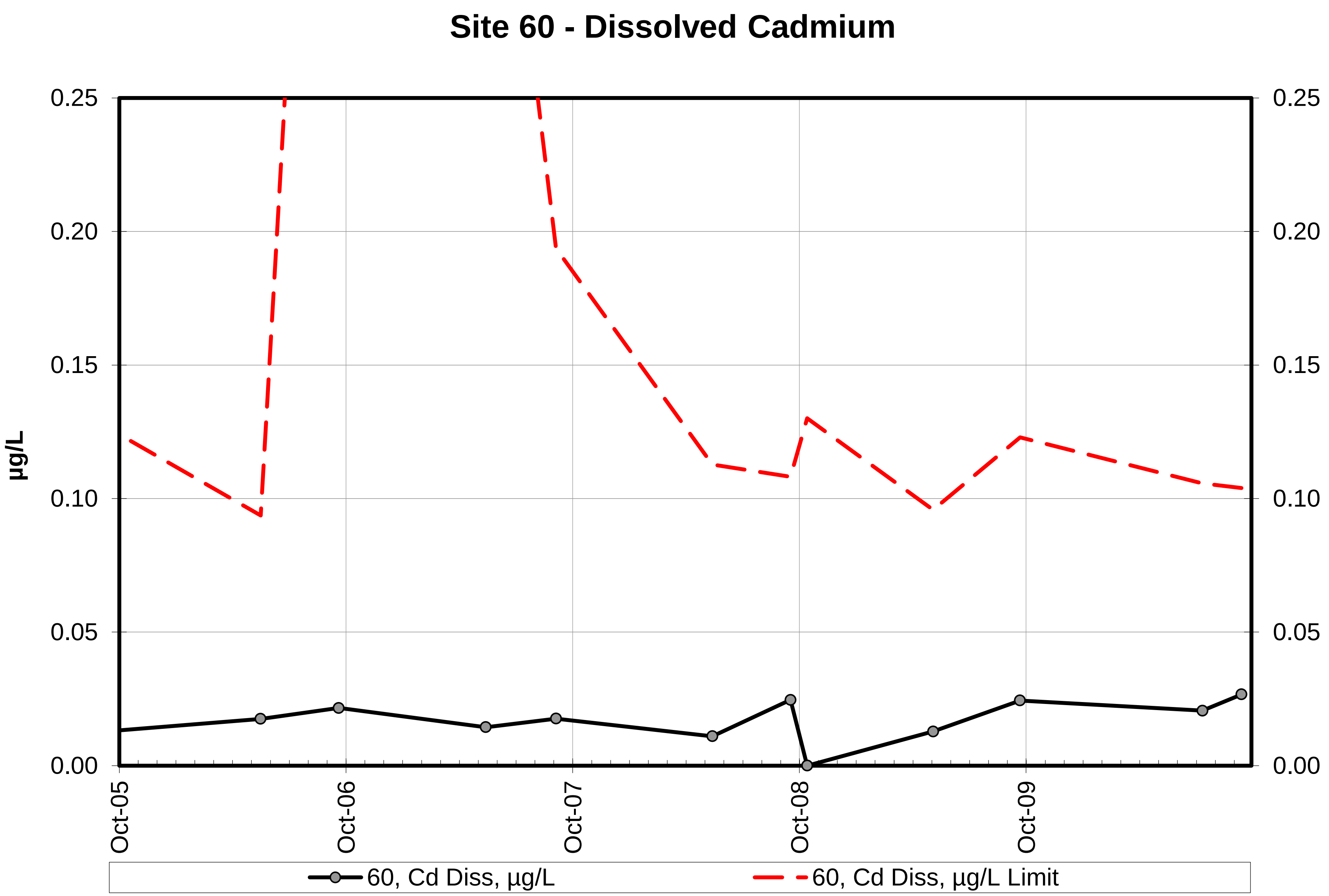




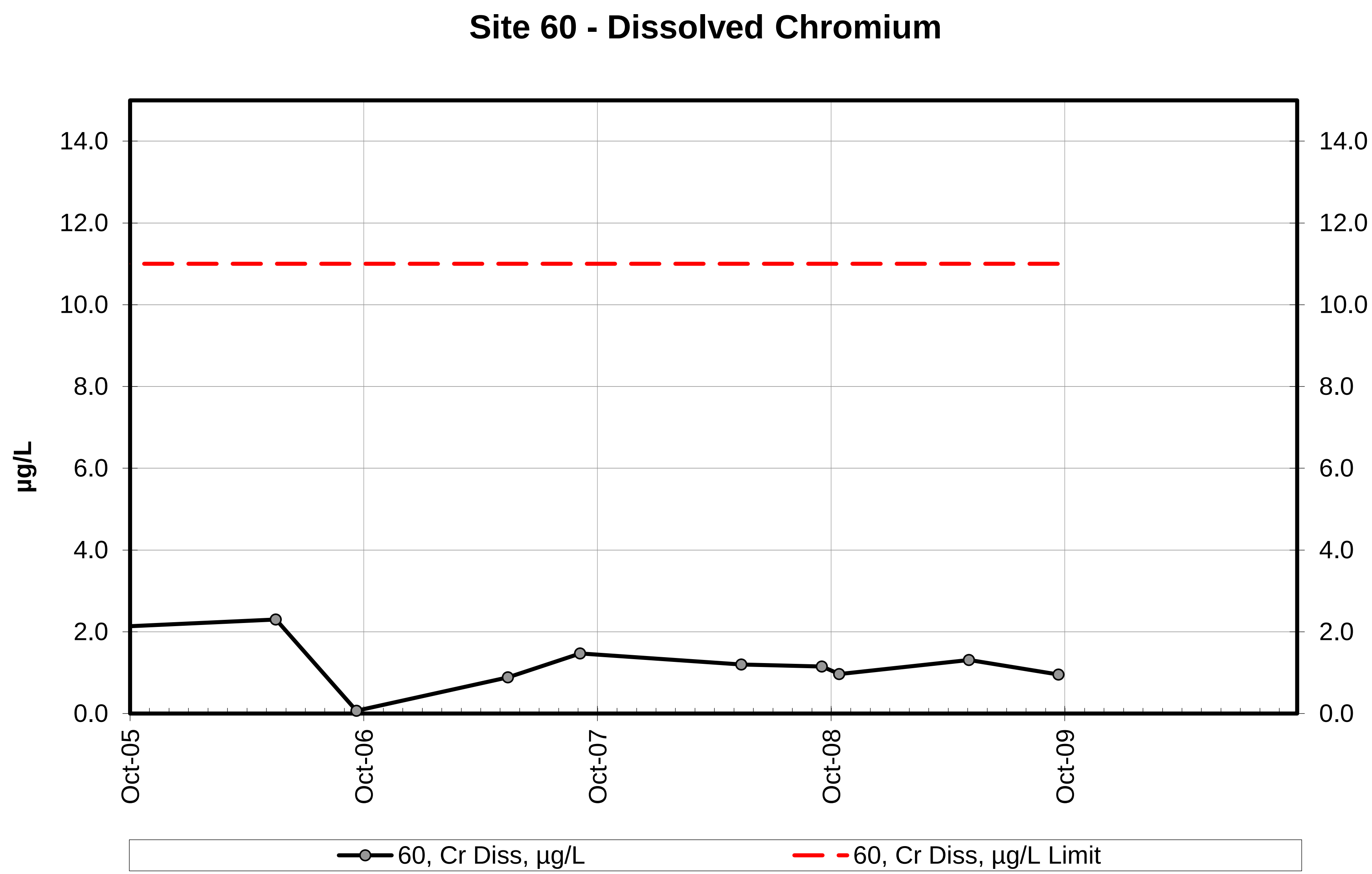
Note: The AWQS for total arsenic is 10 ug/L and thus may not be shown on this graph in order to allow greater visual detail of plotted values for trend determination



Note: the AWQS for Total Barium is 1000 ug/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

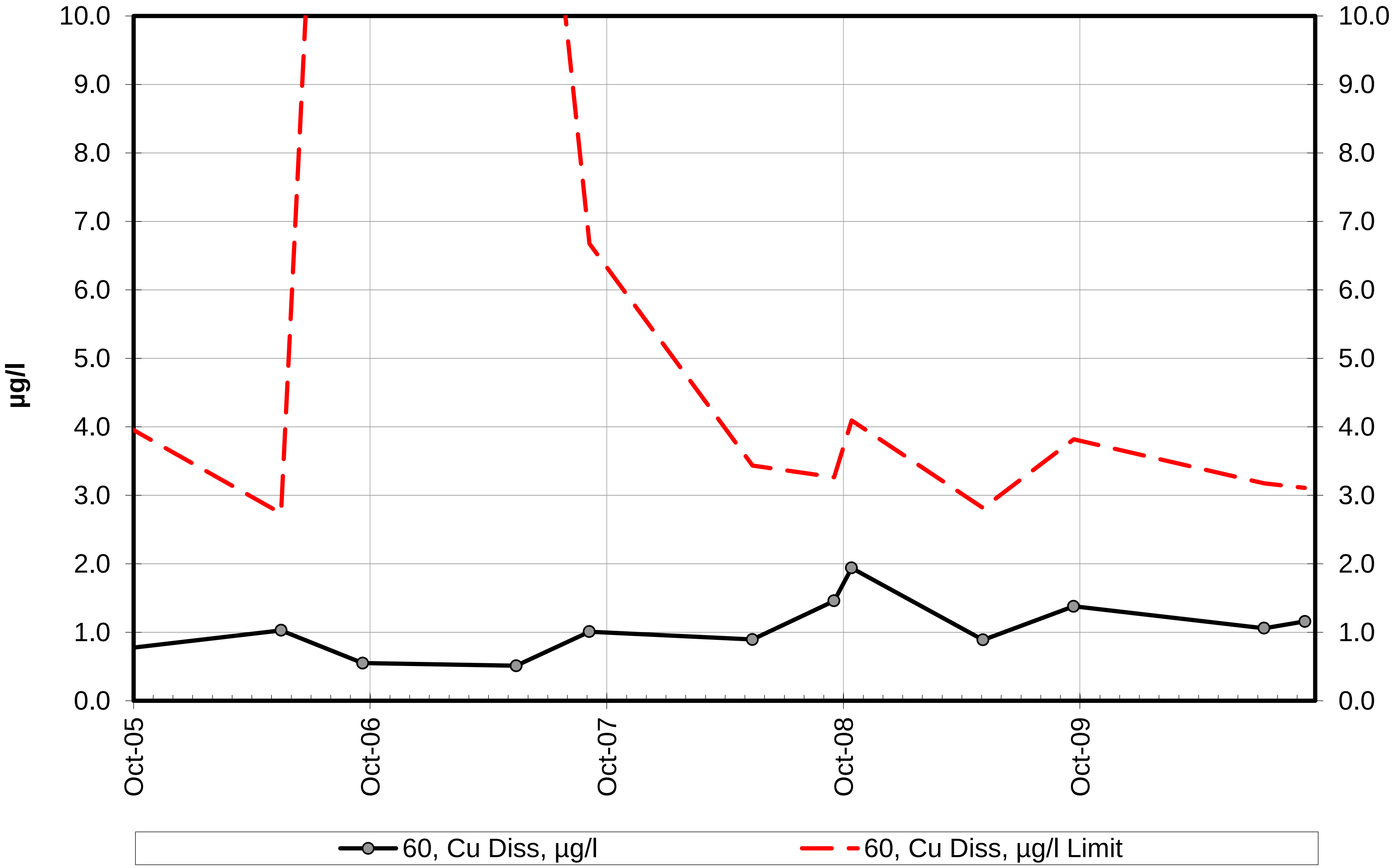


Site 60 - Dissolved Cadmium
µg/L
0.25
0.20
0.15
0.10
0.05
0.00
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, Cd Diss, µg/L
60, Cd Diss, µg/L Limit

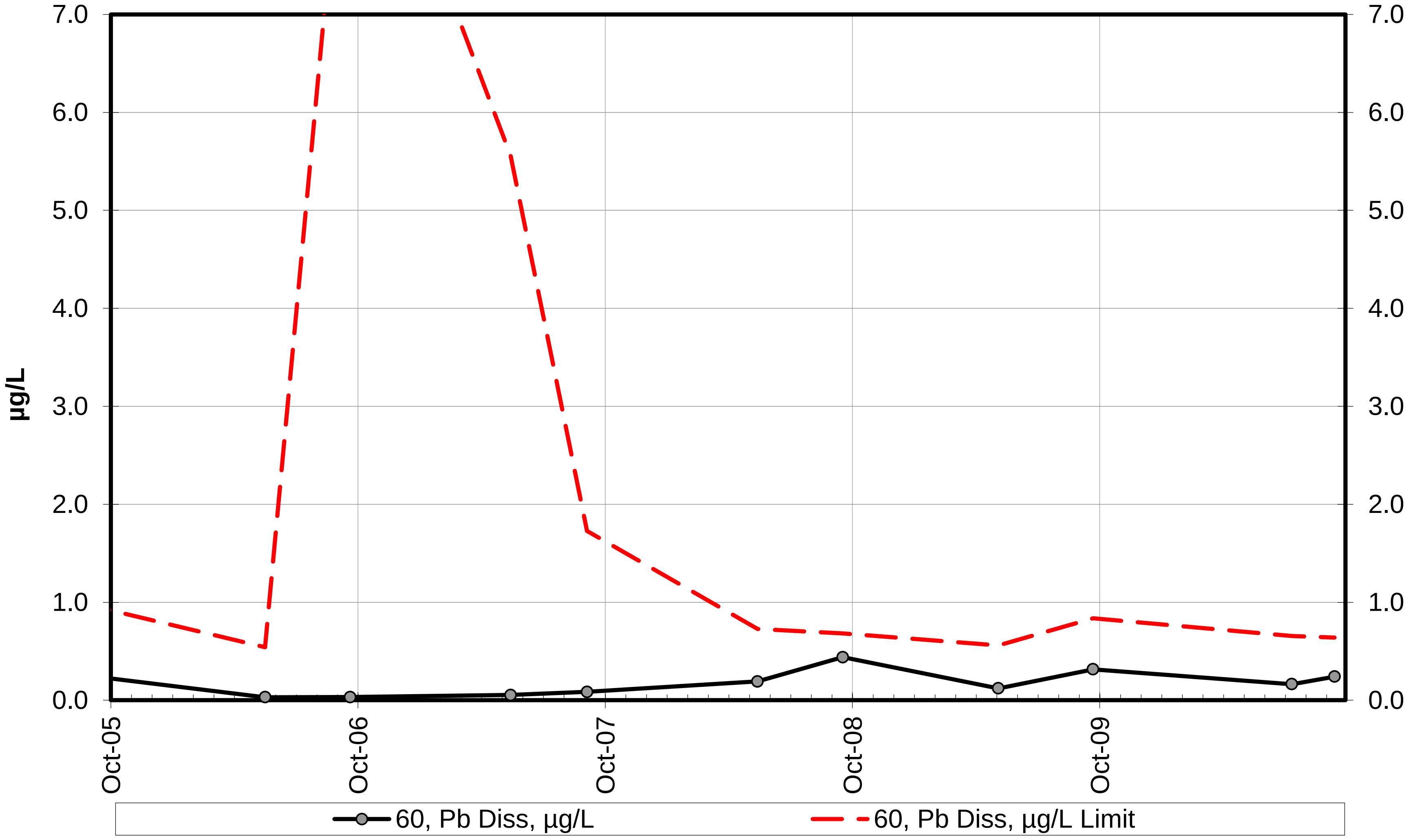


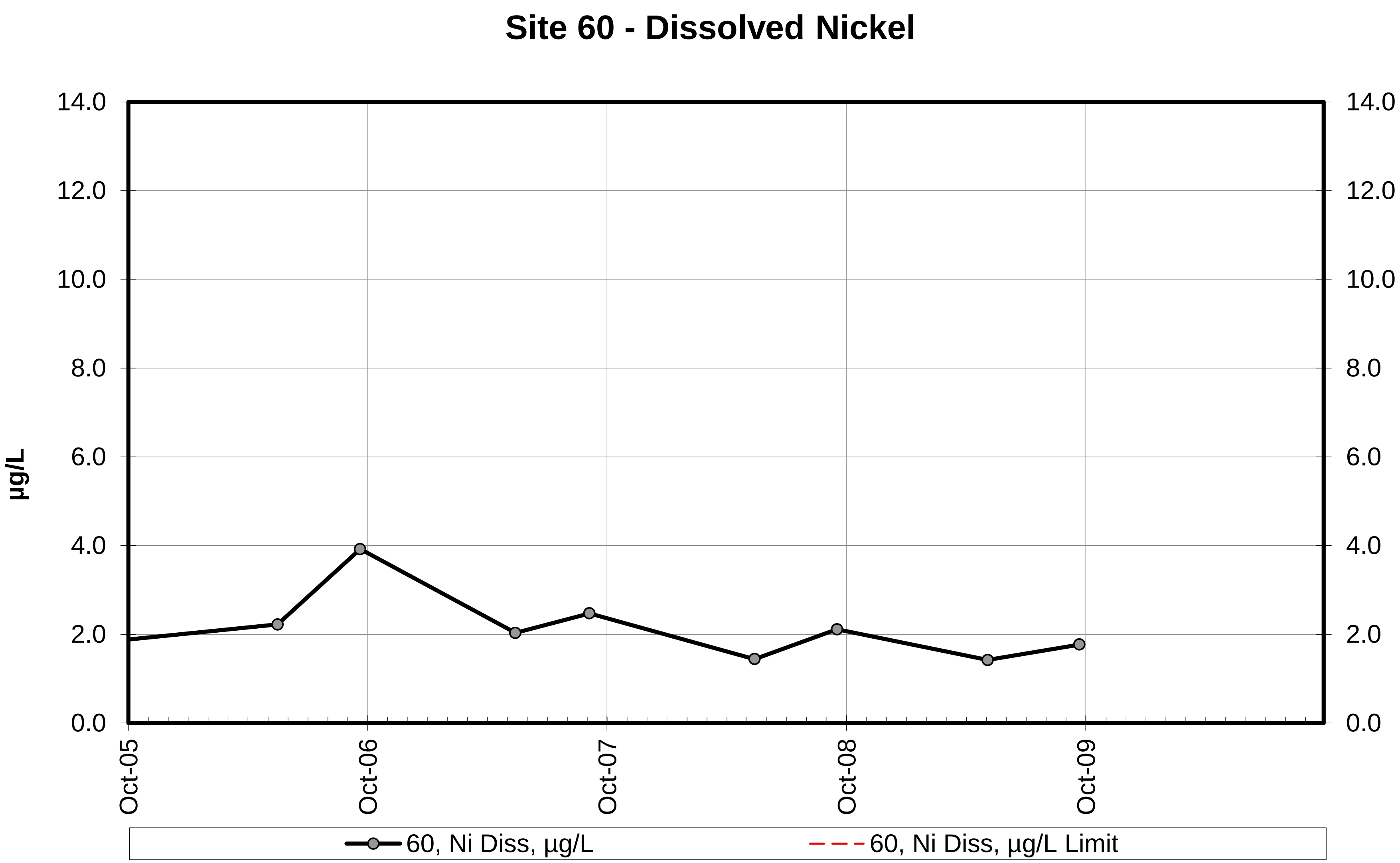
Note: the AWQS for Dissolved Chromium is 11 µg/L and thus may not be shown on this graph in order to allow greater visual detail of measured values for trend determination

Site 60 - Dissolved Copper

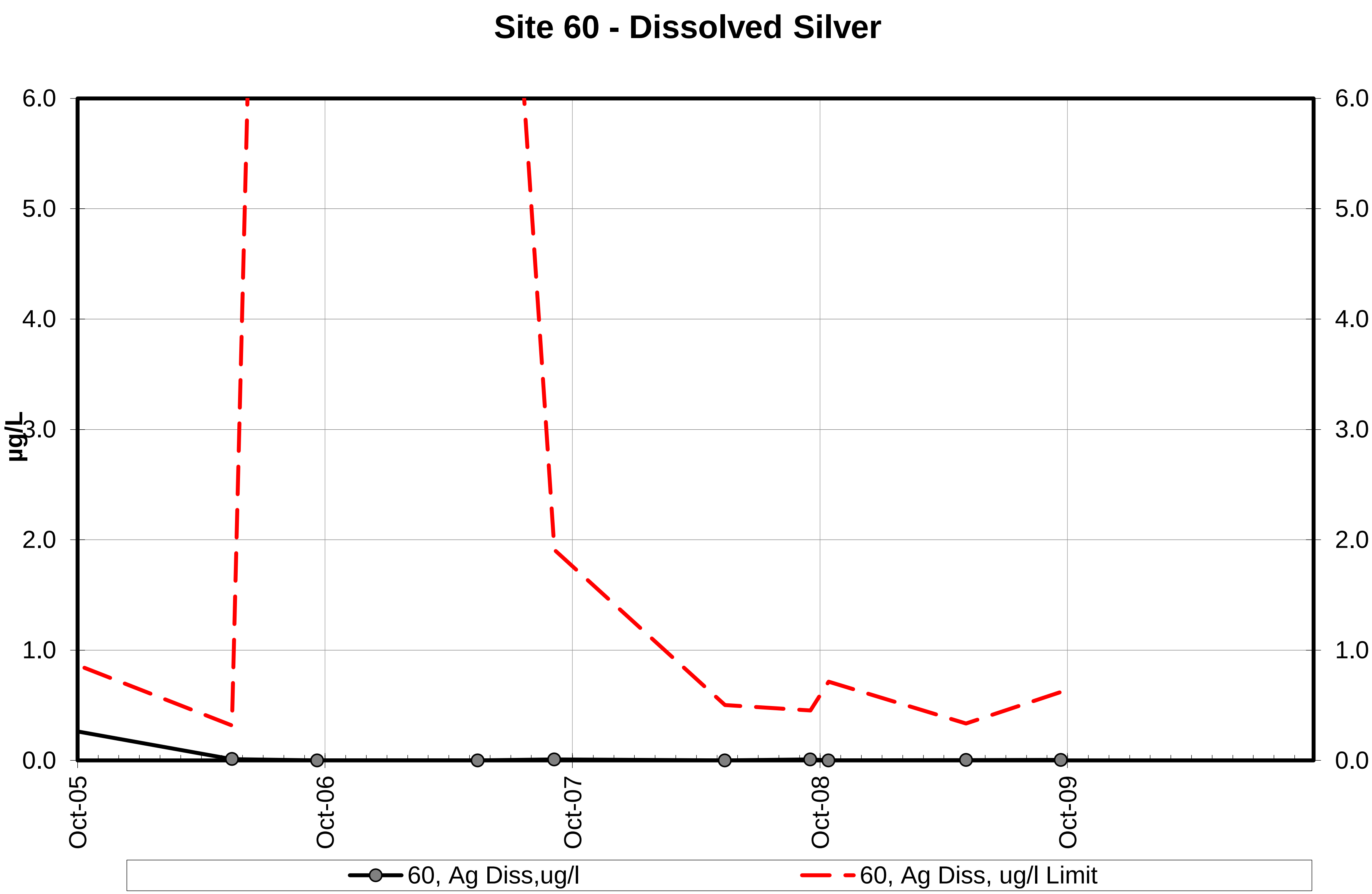


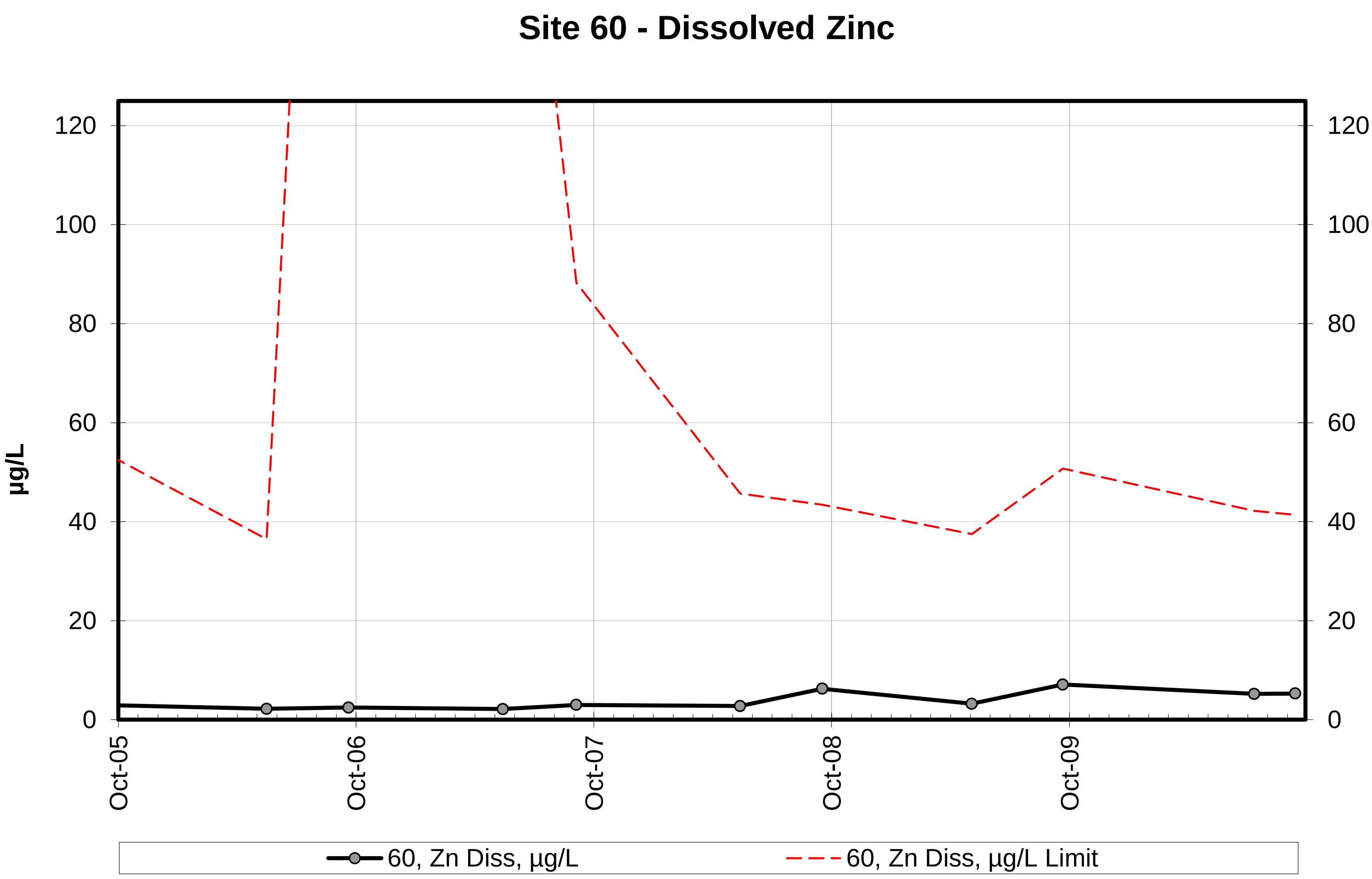
Site 60 - Dissolved Lead



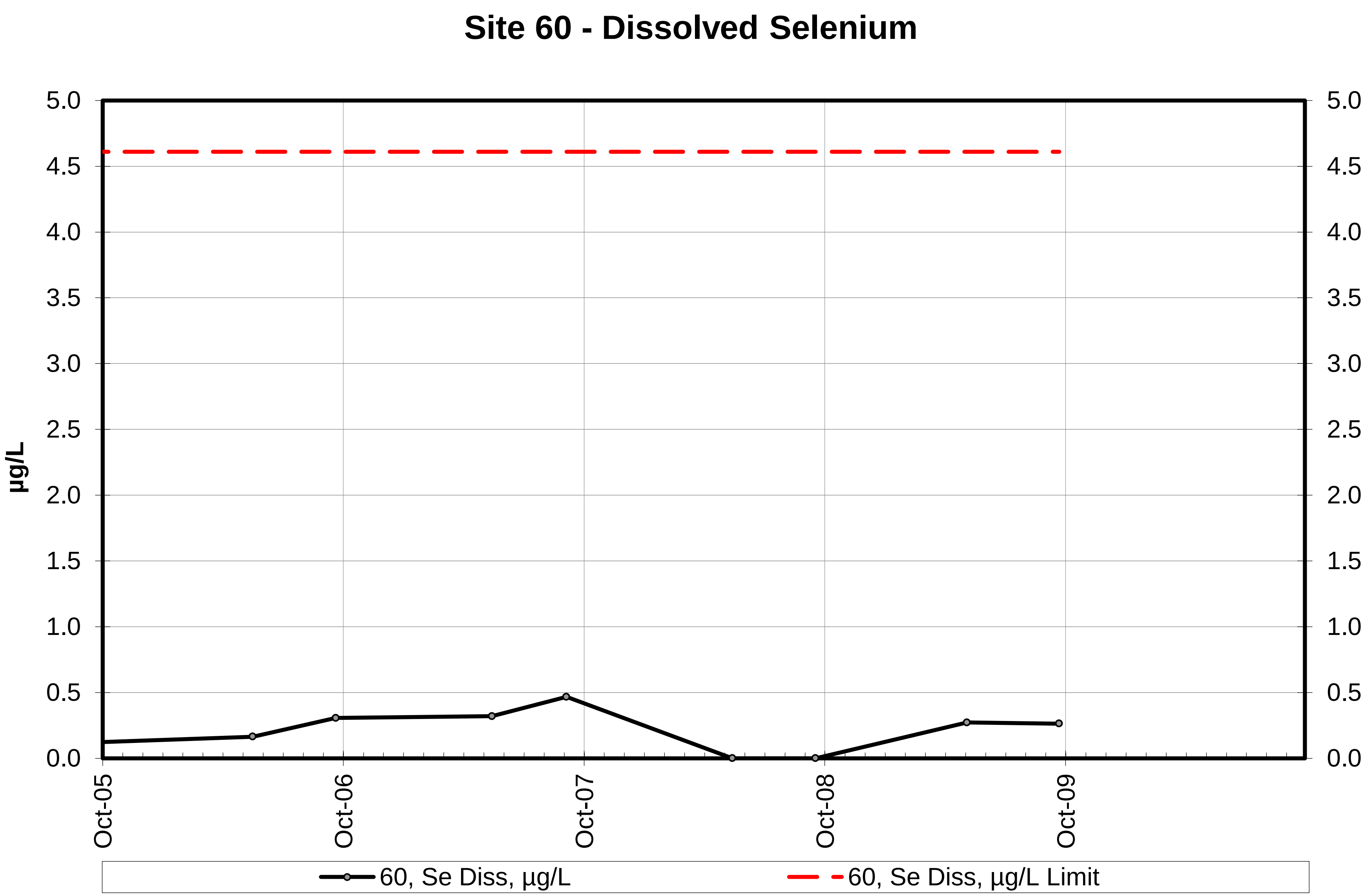


Note: The AWQS for dissolved nickel is hardness dependant and varies between 16 ug/L and 128 ug/L for waters with hardness values of 25 mg/L and 400 mg/L respectively. The AWQS, which would plot above the upper value on the Y-axis, are not shown on this graph to allow for greater visual detail of the plotted values.


Site 60 - Dissolved Silver
µg/L
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, Ag Diss,ug/l
60, Ag Diss, ug/l Limit

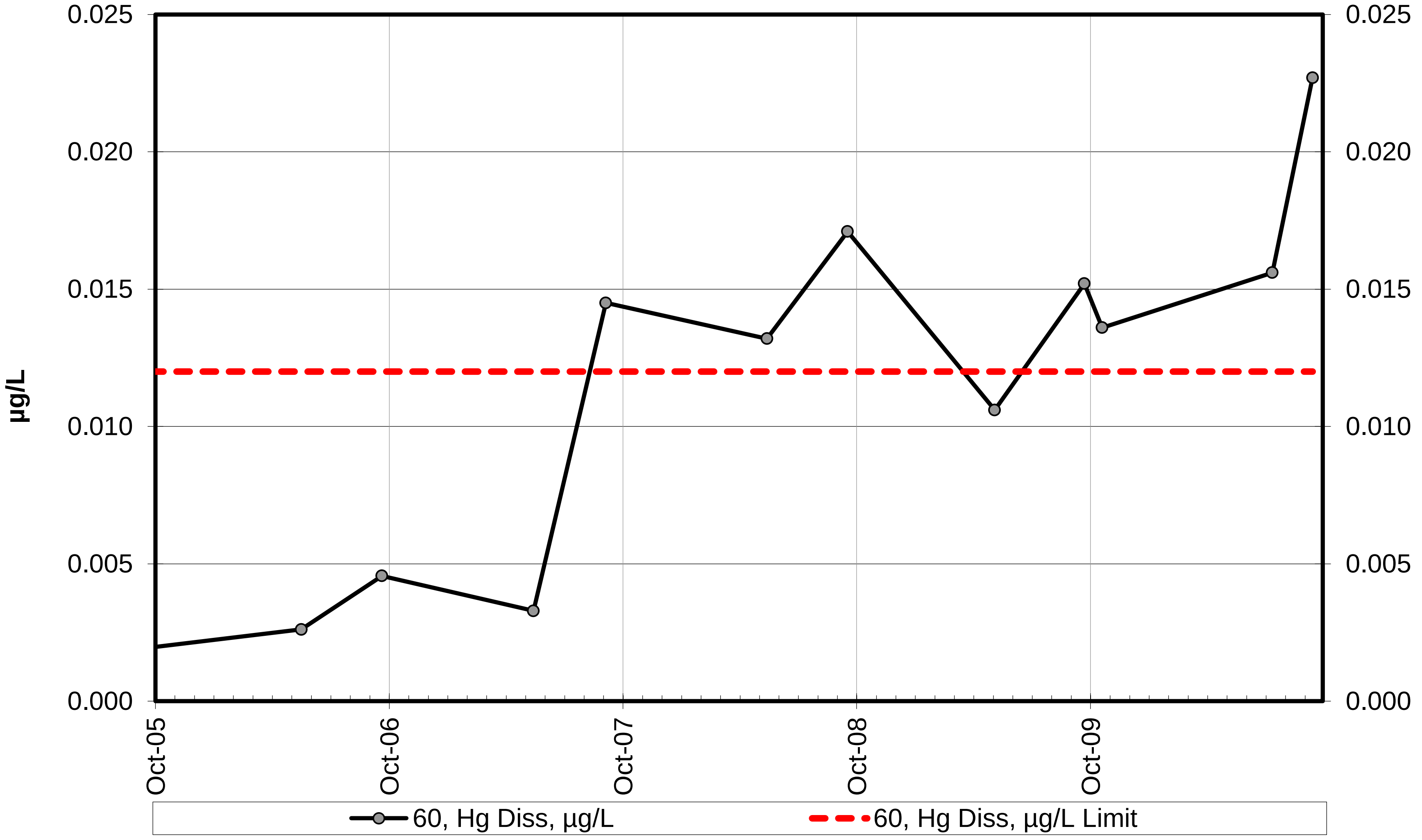


Site 60 - Dissolved Zinc
µg/L
0
20
40
60
80
100
120
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, Zn Diss, µg/L
60, Zn Diss, µg/L Limit



Site 60 - Dissolved Selenium
µg/L
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
60, Se Diss, µg/L
60, Se Diss, µg/L Limit

Site 60 - Dissolved Mercury



Site **#60** Seasonal Kendall analysis for pH, Lab, Standard Units

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**												
c	**WY2007**												
d	**WY2008**								6.5				6.3
e	**WY2009**								6.3				5.8
f	**WY2010**										5.5		6.0
	n	0	0	0	0	0	0	0	2	0	1	0	3

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a												
c-a												
d-a												
e-a												
f-a												
c-b												
d-b												
e-b												
f-b												
d-c												
e-c												
f-c												
e-d								-1				-1
f-d												-1
f-e												1
S_k	0	0	0	0	0	0	0	-1	0	0	0	-1

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
σ^2_S=								1.00				3.67
$Z_k = S_k/\sigma_S$								-1.00				-0.52
Z^2_k								1.00				0.27

ΣZ_k= -1.52

ΣZ^2_k= 1.27

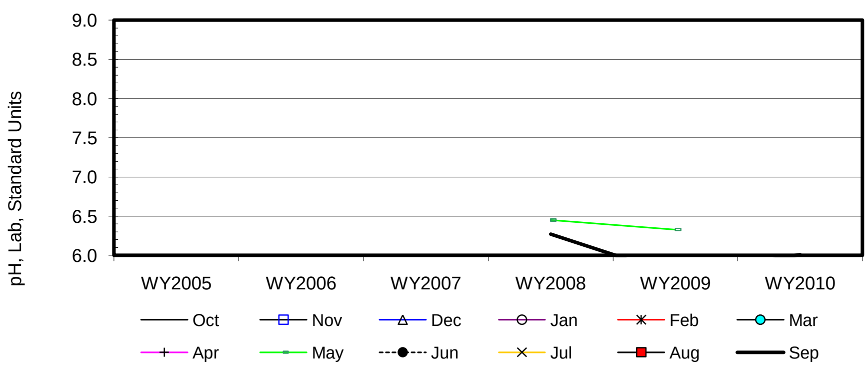
Z-bar=ΣZ_k/K= -0.76

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 6

ΣS_k -2

$\chi^2_h = \Sigma Z^2_k - K(\text{Z-bar})^2$=		0.11	@α=5% $\chi^2_{(K-1)}$= 3.84	Test for station homogeneity	
	p	**0.735**		$\chi^2_h < \chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-0.46	@α/2=2.5% Z= 1.96	**H_0** (No trend)	ACCEPT
4.67	p	**0.322**		**H_A** (± trend)	REJECT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	#NUM!		#NUM!
0.050	#NUM!	**-0.13**	0.18
0.100	#NUM!		0.03
0.200	-0.48		-0.12

Site **#60** Seasonal Kendall analysis for Total Alk, (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**								203.0				69.4
c	**WY2007**								61.4				36.3
d	**WY2008**								15.6				12.6
e	**WY2009**								12.8				7.2
f	**WY2010**										11.3		10.7
	n	0	0	0	0	0	0	0	4	0	1	0	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a												
c-a												
d-a												
e-a												
f-a												
c-b								-1				-1
d-b								-1				-1
e-b								-1				-1
f-b												-1
d-c								-1				-1
e-c								-1				-1
f-c												-1
e-d								-1				-1
f-d												-1
f-e												1
S_k	0	0	0	0	0	0	0	-6	0	0	0	-8

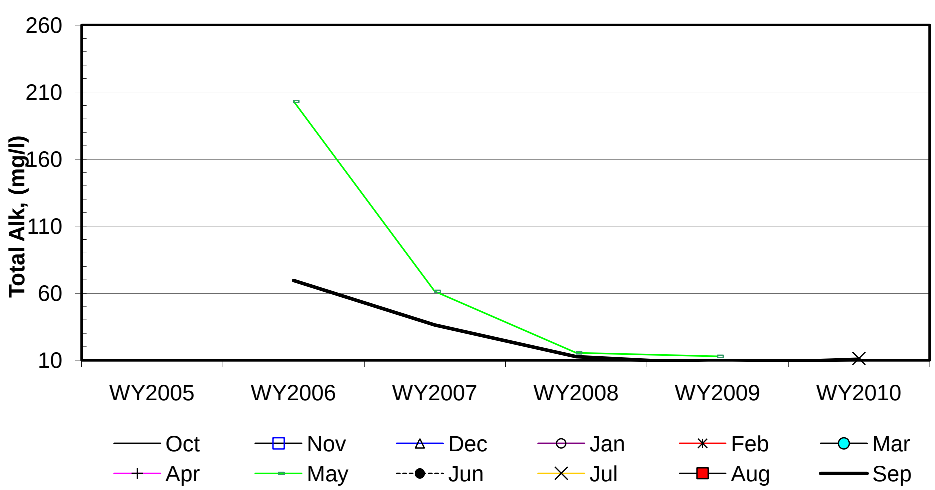
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2_S=$								8.67				16.67
$Z_k = S_k/\sigma_S$								-2.04				-1.96
Z^2_k								4.15				3.84

$\Sigma Z_k=$	-4.00
$\Sigma Z^2_k=$	7.99
Z-bar=$\Sigma Z_k/K=$	-2.00

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn	10
ΣS_k	-14

$\chi^2_h=\Sigma Z^2_k-K(\text{Z-bar})^2=$		0.00	@α=5% $\chi^2_{(K-1)}=$ 3.84	Test for station homogeneity	
	p	**0.956**		$\chi^2_h<\chi^2_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc}	-2.58	@α/2=2.5% Z= 1.96	**H_0** (No trend)	REJECT
25.33	p	**0.005**		**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-89.29		-3.18
0.050	-48.25	**-22.22**	-8.10
0.100	-35.96		-13.20
0.200	-28.95		-14.66

-156.5%

Site **#60** Seasonal Kendall analysis for Sulfate, Total (mg/l)

Row label	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
a	**WY2005**												
b	**WY2006**								217.0				285.0
c	**WY2007**								149.0				12.6
d	**WY2008**								6.7				-7.5
e	**WY2009**								6.2				20.3
f	**WY2010**										0.0		0.0
	n	0	0	0	0	0	0	0	4	0	1	0	5

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
t_1	5	5	5	5	5	5	5	5	5	5	5	5
t_2	0	0	0	0	0	0	0	0	0	0	0	0
t_3	0	0	0	0	0	0	0	0	0	0	0	0
t_4	0	0	0	0	0	0	0	0	0	0	0	0
t_5	0	0	0	0	0	0	0	0	0	0	0	0

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
b-a												
c-a												
d-a												
e-a												
f-a												
c-b								-1				-1
d-b								-1				-1
e-b								-1				-1
f-b												-1
d-c								-1				-1
e-c								-1				1
f-c												-1
e-d								-1				1
f-d												1
f-e												-1
S_k	0	0	0	0	0	0	0	-6	0	0	0	-4

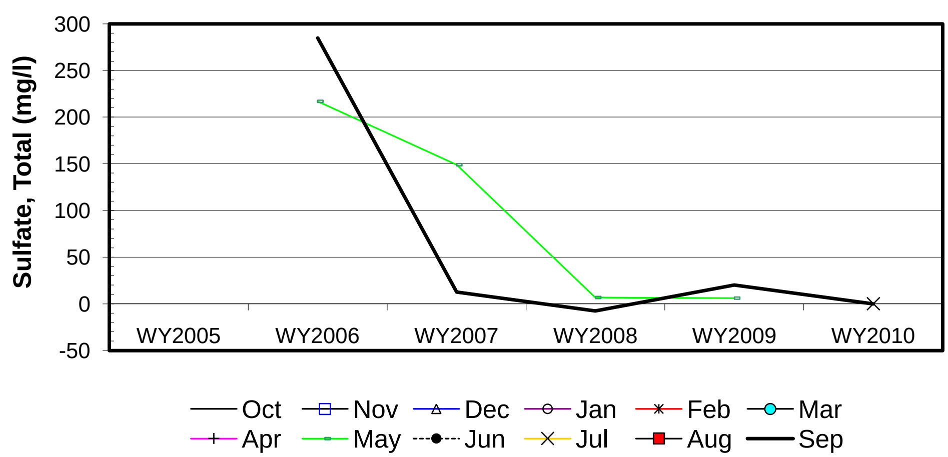
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
$\sigma^2{}_S$=								8.67				16.67
$Z_k = S_k/\sigma_S$								-2.04				-0.98
$Z^2{}_k$								4.15				0.96

ΣZ_k= -3.02
$\Sigma Z^2{}_k$= 5.11
Z-bar=ΣZ_k/K= -1.51

Tie Extent	t_1	t_2	t_3	t_4	t_5
Count	60	0	0	0	0

Σn 10
ΣS_k -10

$\chi^2{}_h=\Sigma Z^2{}_k$-K(Z-bar)^2=	0.56	@α=5% $\chi^2{}_{(K-1)}$=	3.84	Test for station homogeneity	
p	**0.454**			$\chi^2{}_h<\chi^2{}_{(K-1)}$	ACCEPT
ΣVAR(S_k)	Z_{calc} -1.79	@α=5% Z=	1.64	**H_0** (No trend)	REJECT
25.33	**p** **0.037**			**H_A** (± trend)	ACCEPT



Seasonal-Kendall Slope Confidence Intervals

α	Lower Limit	Sen's Slope	Upper Limit
0.010	-145.67		3.13
0.050	-110.31	**-69.13**	-3.69
0.100	-92.04		-16.52
0.200	-73.38		-20.28

-715.3%

APPENDIX A

Parameter	Drinking Water	Stockwater	Irrigation Water	Aquatic Life-Fresh Water								Human Health Criteria for NonCarcinogens	
				Acute				Chronic					
				criteria	as	multilply by conversion factor	to convert to	criteria	as	multiply by conversion factor	to convert to	Water + Aquatic Organisms	Aquatic Organisms Only
alkalinity								20,000 minimum					
As	10	50	100	340	TR	1	D	150	TR	1	D		
Ba	2,000												
Cd	5	10	10	e^1.0166(ln hardness)-3.924	TR	1.136672-[(ln hardness)(0.041838)]	D	e^0.7409(ln hardness)-4.719	TR	1.101672-[(ln hardness)(0.041838)]	D		
Cr	100												
Cr(total)			100										
Cr(III)				e^0.819(ln hardness)+3.7256	TR	0.316	D	e^0.819(ln hardness)+0.6848	TR	0.860	D		
Cr(VI)		50		16	D			11	D				
Cu			200	e^0.9422(ln hardness)-1.700	TR	0.960	D	e^0.8545(ln hardness)-1.702	TR	0.960	D	1,300	
Pb		50	5,000	e^1.273(ln hardness)-1.460	TR	1.46203-[(ln hardness)(0.145712)]	D	e^1.273(ln hardness)-4.705	TR	1.46203-[(ln hardness)(0.145712)]	D		
Hg	2			1.4	D			0.012	TR			0.05	0.051
Ni	100		200	e^0.846(ln hardness)+2.255	TR	0.998	D	e^0.846(ln hardness)+0.0584	TR	0.997	D	610	4,600
Se	50	10	20	1/[([selenite]/185.9)+([selenate]/12.83)]	TR	0.922	D	5	TR	0.922	D	170	11,000
Ag				e^1.72(ln hardness)-6.52	TR	0.850	D						
Zn			2,000	e^0.8473(ln hardness)+0.884	TR	0.978	D	e^0.8473(ln hardness)+0.884	TR	0.986	D	9,100	69,000

all units in micrograms per liter (ug/L)

DENOTES STRICTEST CRITERIA

TR total recoverable
D dissolved
H some of the criteria for this parameter are hardness dependant
FWA Fresh Water Acute
FWC Fresh Water Chronic

Source: http://www.dec.state.ak.us/water/wqsar/wqs/toxicsbook.xls
Table formatting was modified by HGCMC to include only parameters include in Suite P and Q and to highlight the strictest standard.

- APPENDIX B

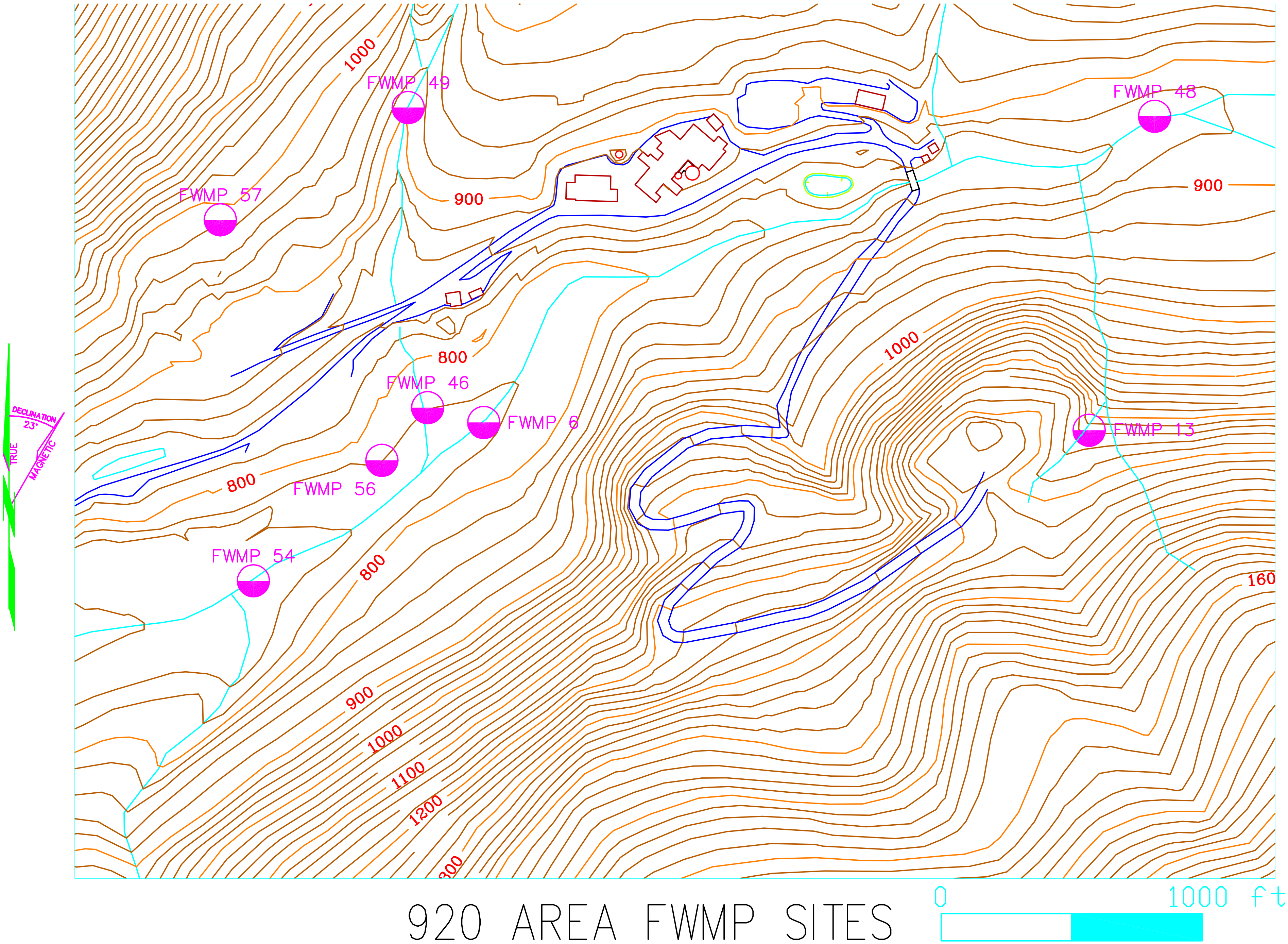
Map Sheets

C1-920 Area FWMP Sites

C2-Tailings Area FWMP Sites

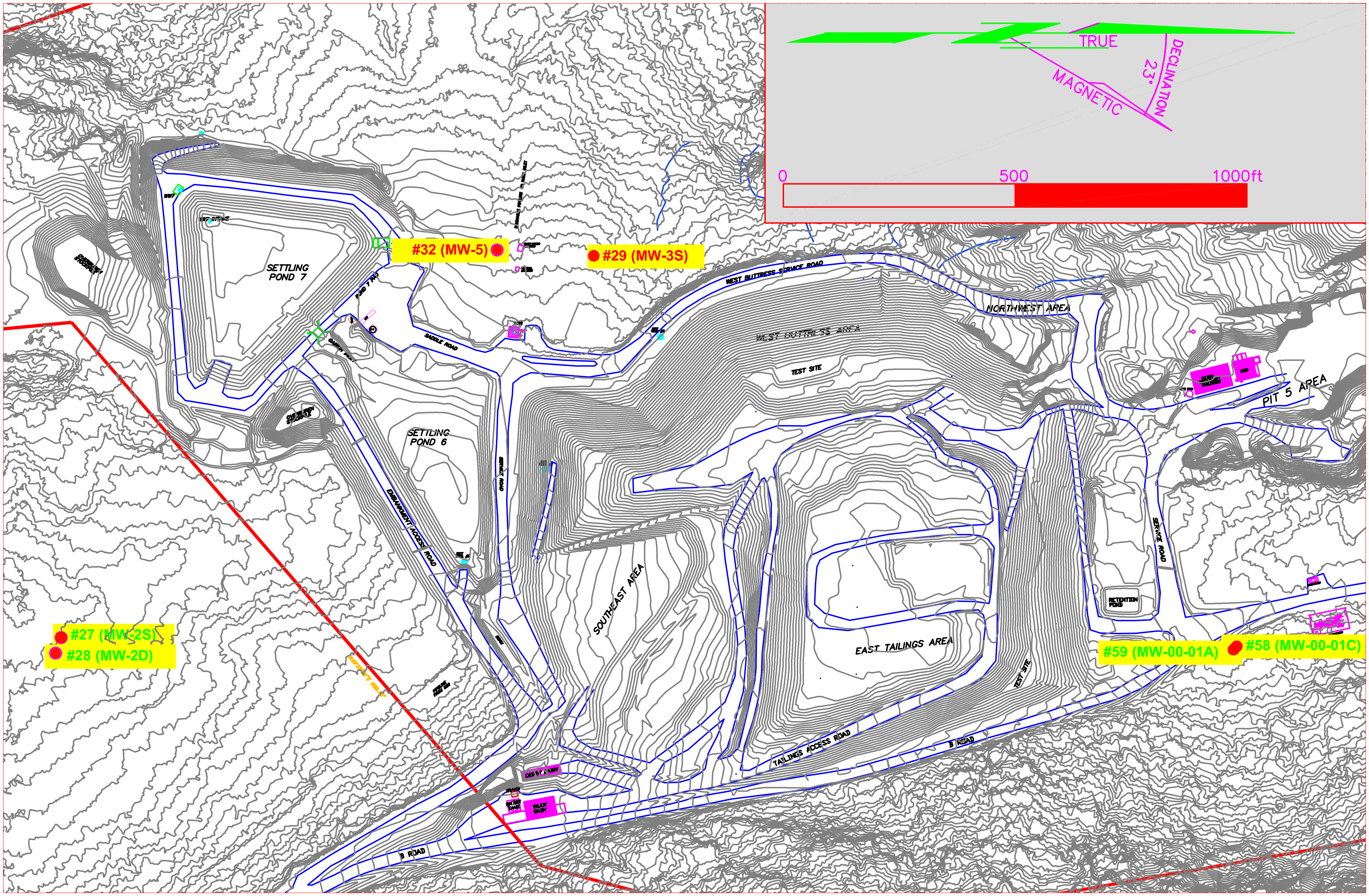
C3-Site 60, Lower Althea Creek

HECLA GREENS CREEK MINING COMPANY

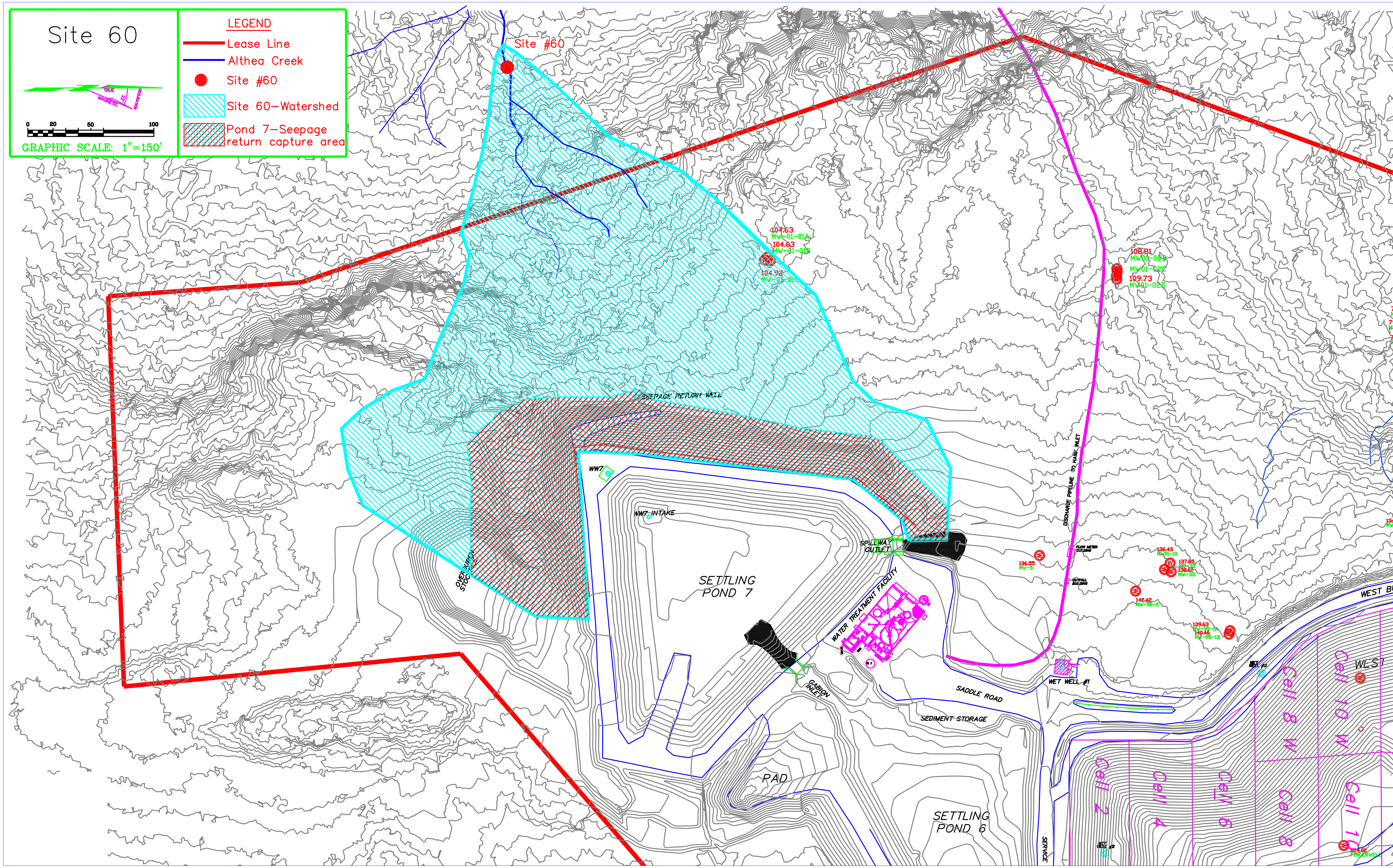


920 AREA FWMP SITES

HECLA GREENS CREEK MINING COMPANY



TAILS AREA FWMP SITES


Site 60
GRAPHIC SCALE: 1"=150'
0
20
50
100
LEGEND
Lease Line
Althea Creek
Site #60
Site 60–Watershed
Pond 7–Seepage return capture area
Site #60
SEEPAGE RETURN WELL
WW7
WW7 INTAKE
SETTLING POND 7
SPILLWAY OUTLET
WATER TREATMENT FACILITY
GABION INLET
PAD
SADDLE ROAD
SEDIMENT STORAGE
SETTLING POND 6
SERVICE
WET WELL #1
DISCHARGE PIPELINE TO HAWK INLET
WEST BUTT
Cell 2
Cell 4
Cell 6
Cell 8
Cell 8 W
Cell 10 W
104.63
MW-01-01A
104.63
MW-01-01B
108.81
MW01-02A
MW01-02C
109.73
MW01-02D
136.55
MW-5
146.42
MW-96-2