



Memorandum

To: Stephen McCracken (DRSCW)

From: Daniel Potts and Dan Bounds, PE (CDM)

Date: August 6, 2008

Subject: Conductivity and Chloride Monitoring Summary 2007/2008

This memo summarizes conductivity and chloride monitoring conducted by the DuPage River Salt Creek Workgroup (DRSCW) pursuant to its Chloride Usage Education and Reduction Program. The objectives of the monitoring program were:

- to make continuous measurements of conductivity in DuPage River and Salt Creek;
- to establish a correlation between conductivity and chloride concentration; and thus
- to estimate chloride concentration as a continuous record over the winter deicing season.

Hourly measurements were made by conductivity sensors in five locations, and water samples were collected for chloride concentration at four of the five locations.

Conductivity Monitoring

Conductivity was monitored by in-stream probes at five locations:

- on the East Branch of DuPage River at Hobson Road in Woodridge (EBHR);
- on the East Branch of DuPage River at Army Trail Road in Bloomingdale (EBAR);
- on the West Branch of DuPage River at Arlington Drive in Hanover Park (WBAD);
- on the West Branch of DuPage River at McDowell Grove in Naperville (WBMG); and
- on Salt Creek at Wolf Road near La Grange (SCWR).

Plots of the measured conductivity at each site are attached (**Attachment A**). Monitoring began in either December 2007 or January 2008 at each site and continued until March or April 2008, except at WBMG. At EBHR and WBMG the sensors were installed for an additional two months in September and October 2007.

The sensor at EBAR is believed to have recorded erroneous data between March 10 and March 29, 2008, based on inspection of the data record.

Chloride Sampling

Grab samples for chloride analysis were collected at four of the sites above. Samples at the WBMG location could not be obtained as the river was iced over. A total of forty-four samples were collected: nine at EBHR, twelve at EBAR, twelve at WBAD and eleven at SCWR. The times at which the samples were collected are shown in the attached plots by vertical lines across the conductivity time series (**Attachment A**).

The samples were analyzed for chloride concentrations by Suburban Laboratories. The maximum chloride concentration found among the samples is 1,260 mg/L; this sample was taken at SCWR on February 15, 2008. The average chloride concentration of all the samples is 608 mg/L. The chloride concentrations in each sample are shown in **Attachment B**.

Conductivity-Chloride Correlation

Using the least-squares fit method, the chloride concentrations from the water samples were correlated with the measured conductivity readings from the sensors. Conductivity readings were matched to the samples based on the date and time each sample was taken, to the nearest hour. The four samples taken at EBAR during the period of suspect conductivity data were not included in the correlation.

The correlations are shown in the attached plots (**Attachment C**) and summarized in the table below. In the table, the regression equations are given with specific conductance (SC) in $\mu\text{S}/\text{cm}$ and chloride concentration $[\text{Cl}^-]$ in mg/L .

Site	Regression Equation	R-Squared	Number of Samples
EBHR	$[\text{Cl}^-] = 0.3007 \text{ SC} - 73.131$	0.9819	9
EBAR	$[\text{Cl}^-] = 0.3201 \text{ SC} - 89.968$	0.9444	8
WBAD	$[\text{Cl}^-] = 0.2135 \text{ SC} + 76.902$	0.8219	12
SCWR	$[\text{Cl}^-] = 0.3068 \text{ SC} - 64.443$	0.5313	11
All Sites	$[\text{Cl}^-] = 0.2858 \text{ SC} - 42.408$	0.7504	40

The correlations are quite strong at the two East Branch sites, fairly strong at the West Branch site and weaker at the Salt Creek site. Overall, specific conductance appears to be a useful

and economical surrogate for estimating chloride concentrations in the DuPage River and Salt Creek watersheds, particularly to track and observe long term trends and patterns.

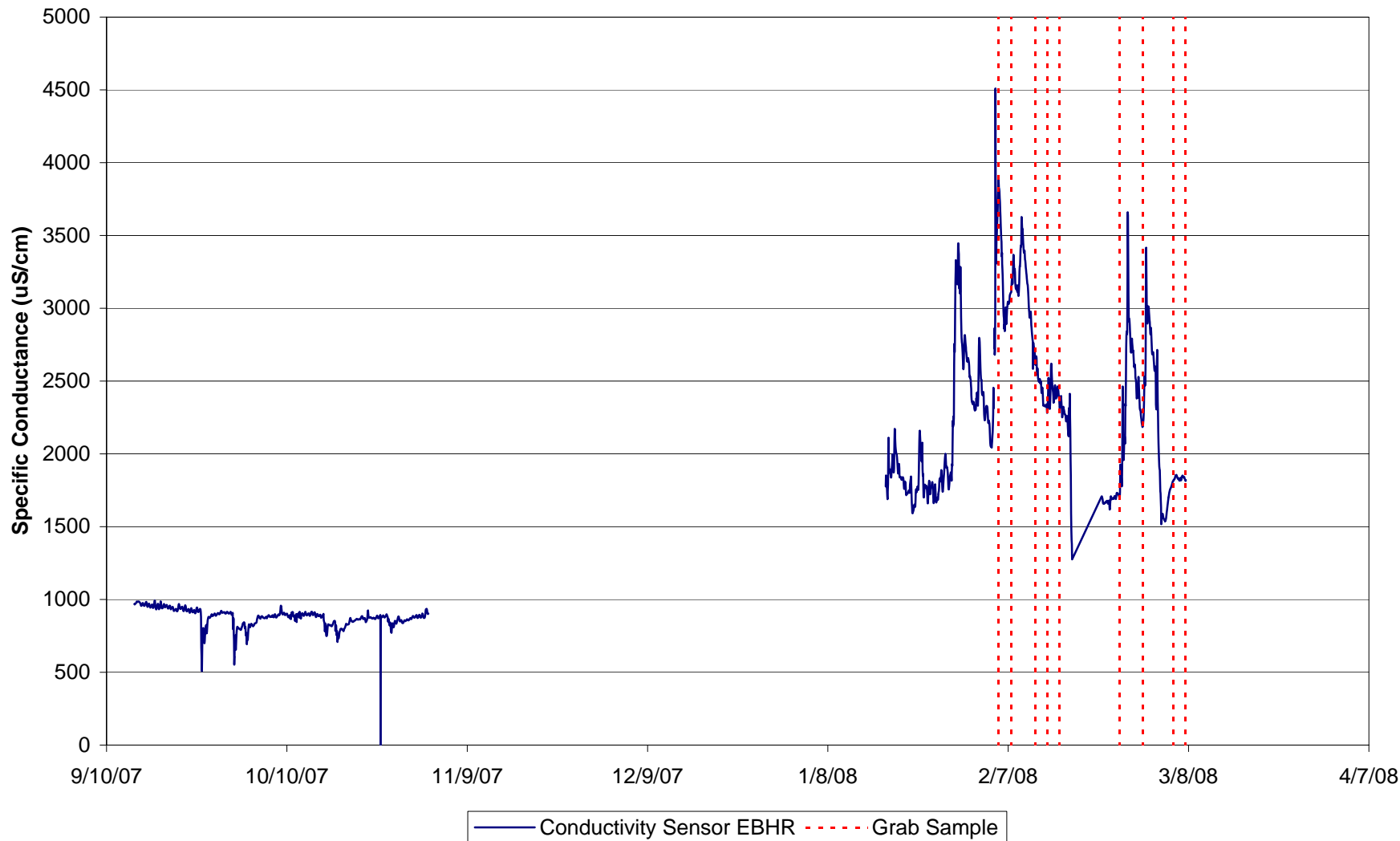
Chloride Concentration Estimates

Using the correlations reported above, chloride concentrations were estimated from the measured conductivity readings for the period of record. The chloride concentration for each site was estimated from the site-specific regression equation. At WBMG, the chloride concentration was estimated using an overall regression equation developed from data from all sites.

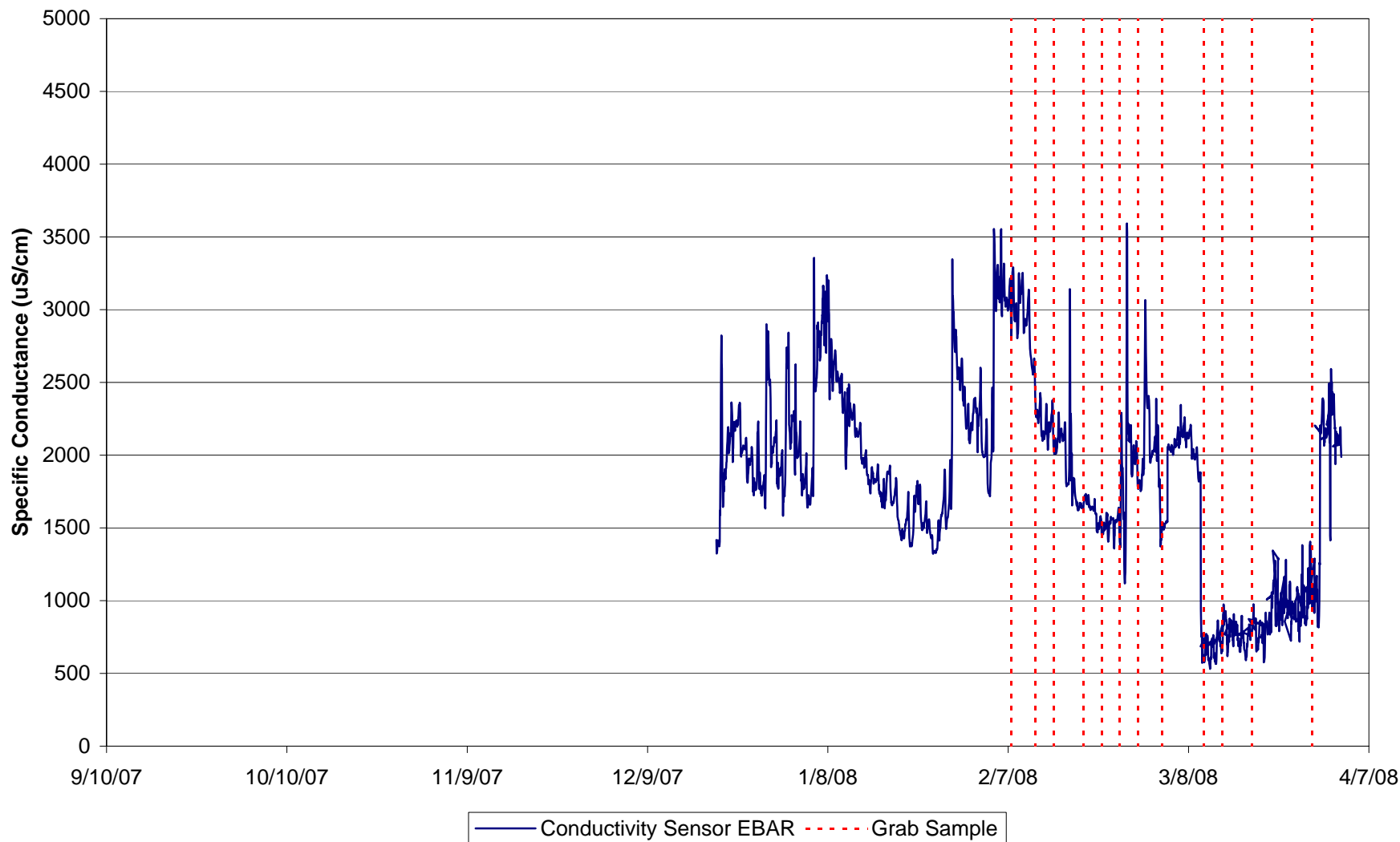
The estimated chloride concentrations are shown in the attached plot (**Attachment D**). During September and October, the estimated chloride concentrations at EBHR and WBMG were approximately 200 mg/L. The maximum of the estimated chloride concentrations is 1,357 mg/L, appearing at SCWR on December 11, 2007. The estimated chloride concentrations exceed 500 mg/L for considerable periods at each site. (The Illinois Pollution Control Board has specified 500 mg/L as the water quality standard for chloride.)

Attachment A
Measured Conductivity Plots with Grab Sample Times

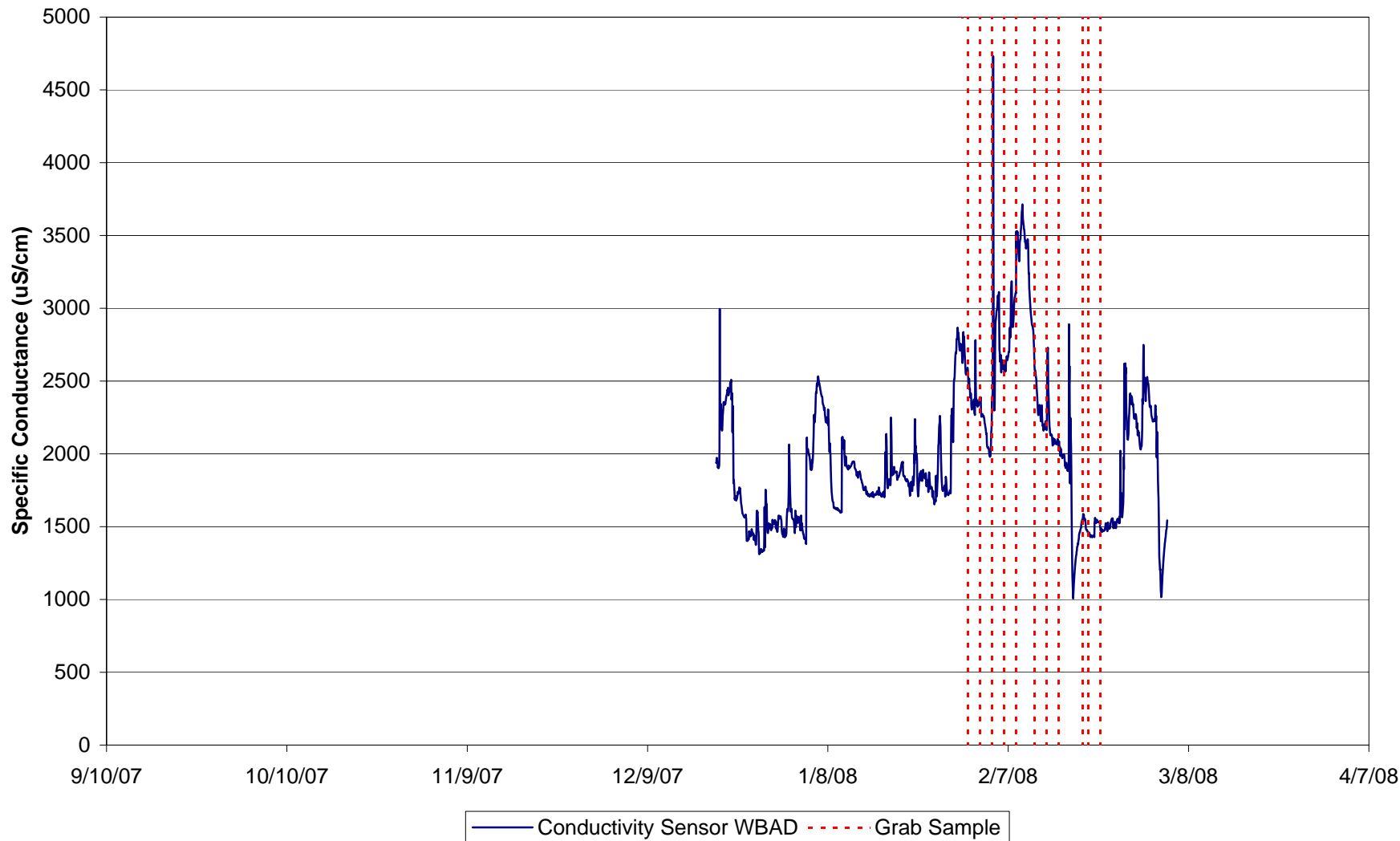
Measured Specific Conductance at East Branch: Hobson Road (EBHR)



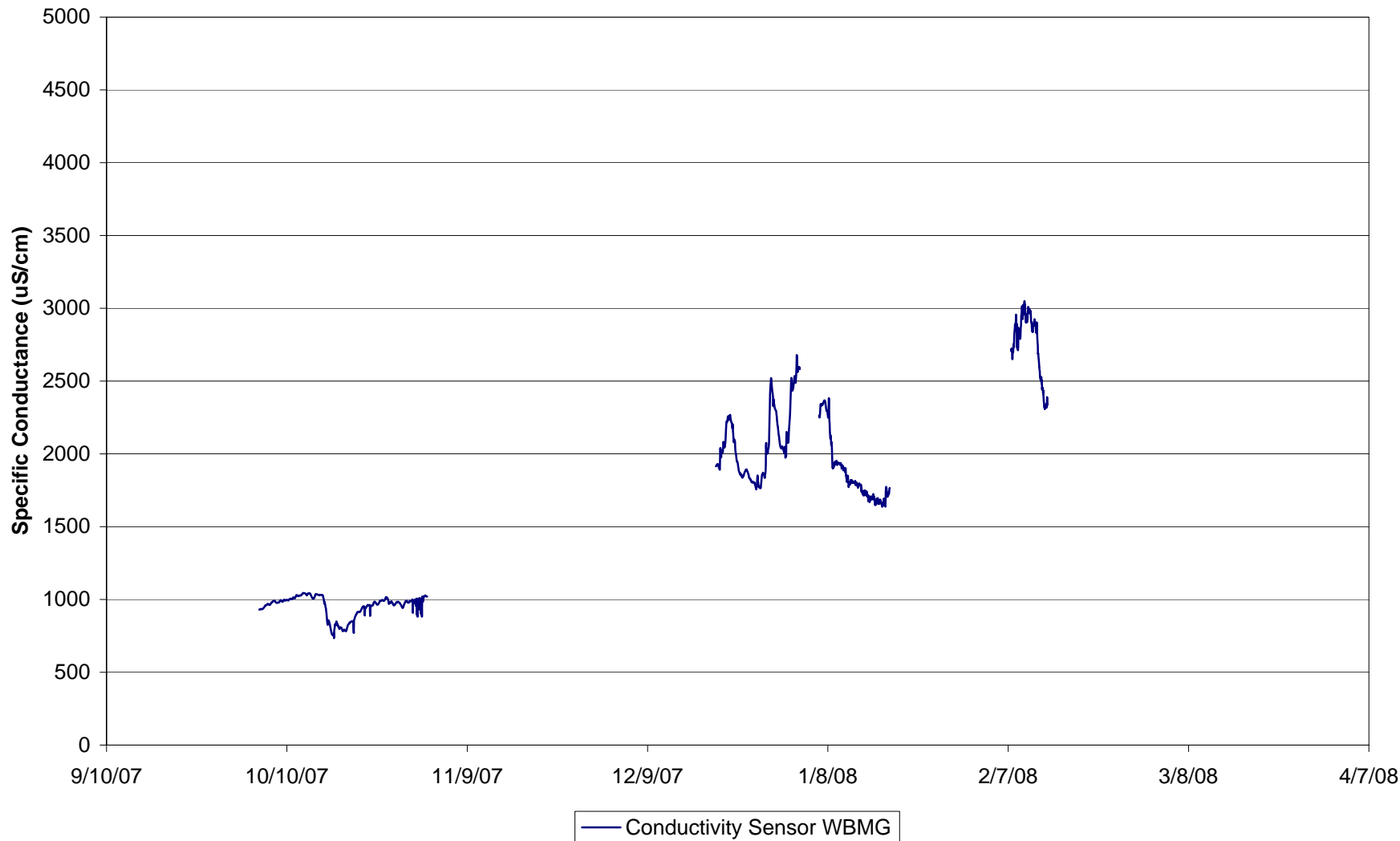
Measured Specific Conductance at East Branch: Army Trail Road (EBAR)



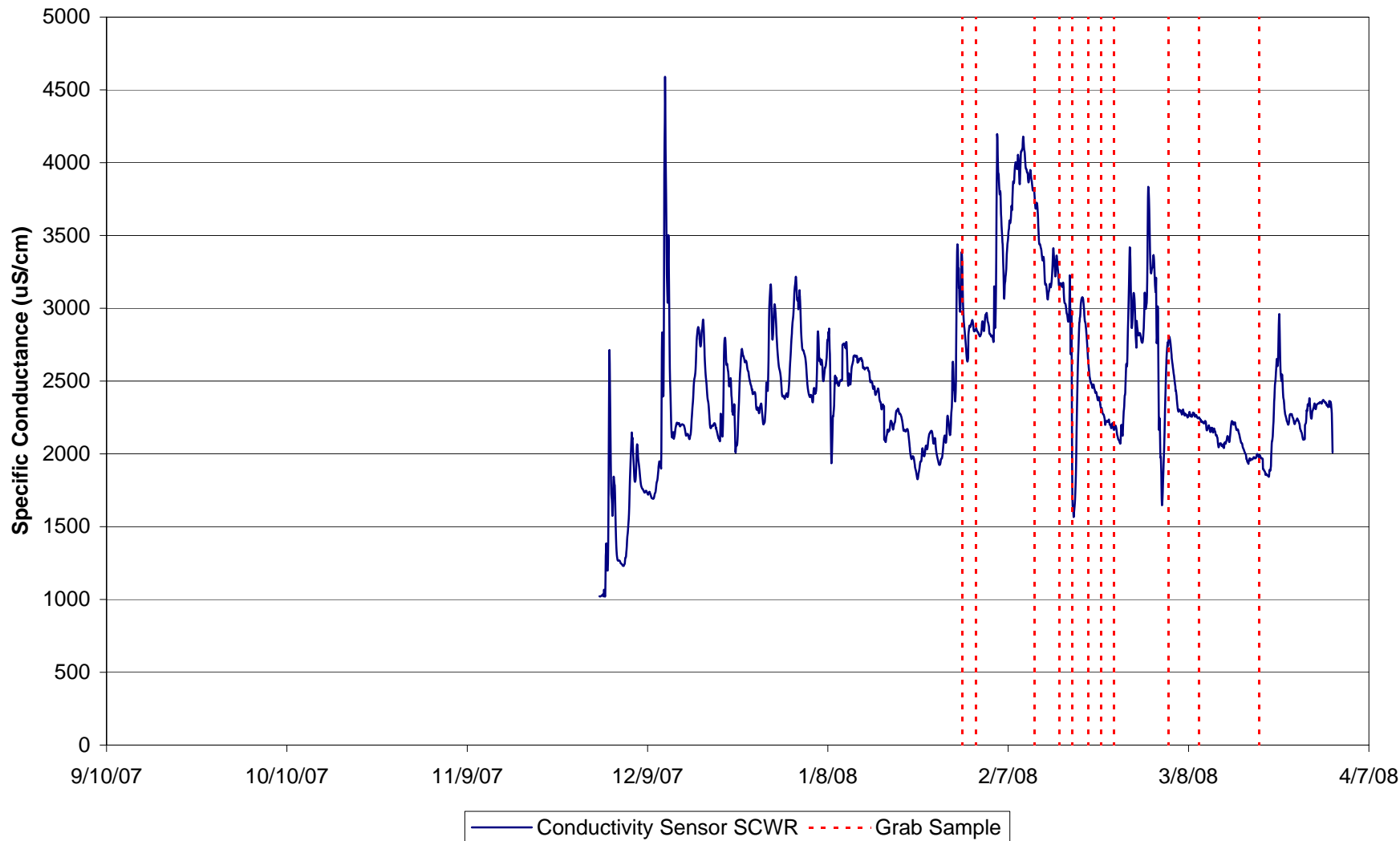
Measured Specific Conductance at West Branch: Arlington Drive (WBAD)



Measured Specific Conductance at West Branch: McDowell Grove (WBMG)

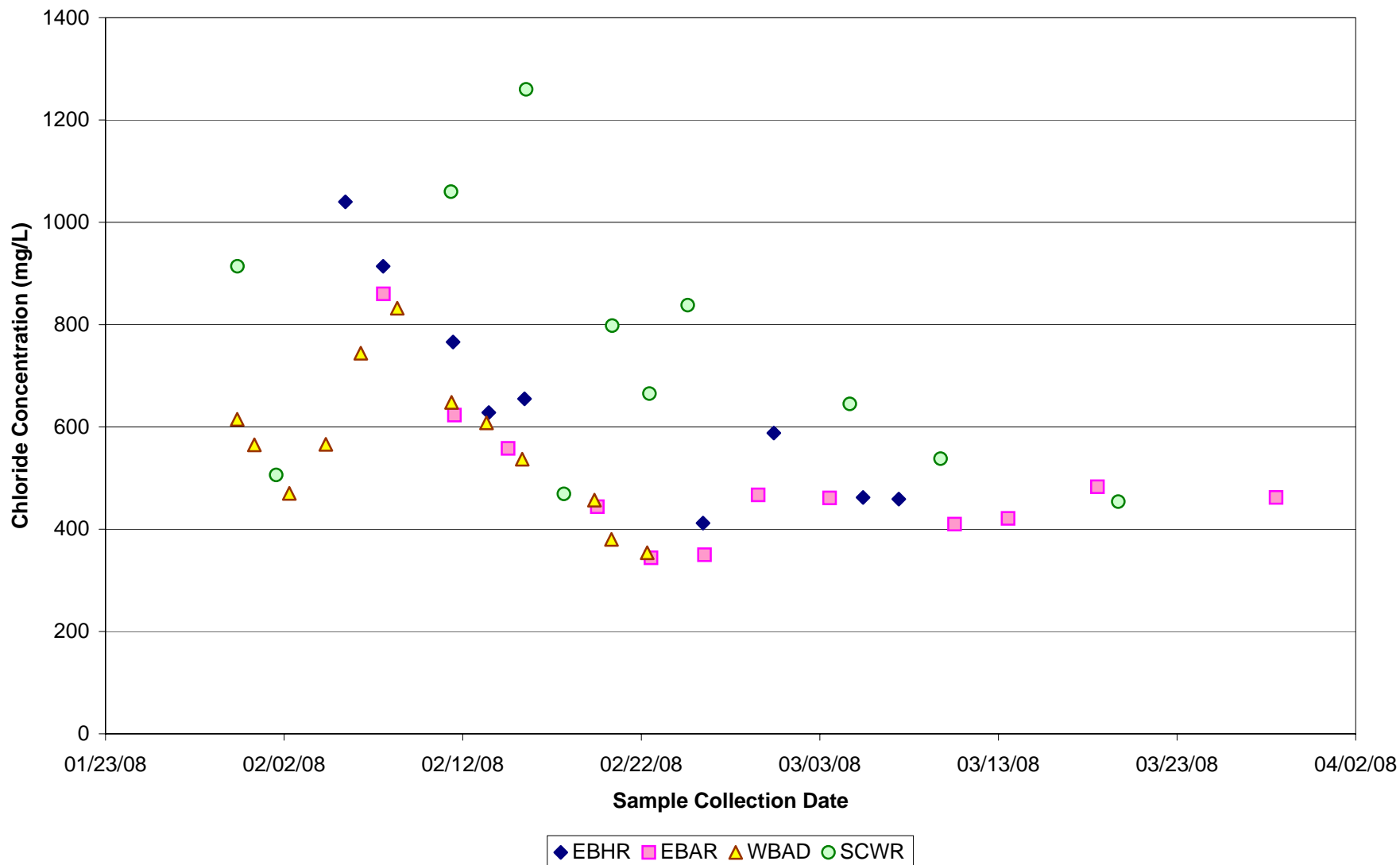


Measured Specific Conductance at Salt Creek: Wolf Road (SCWR)

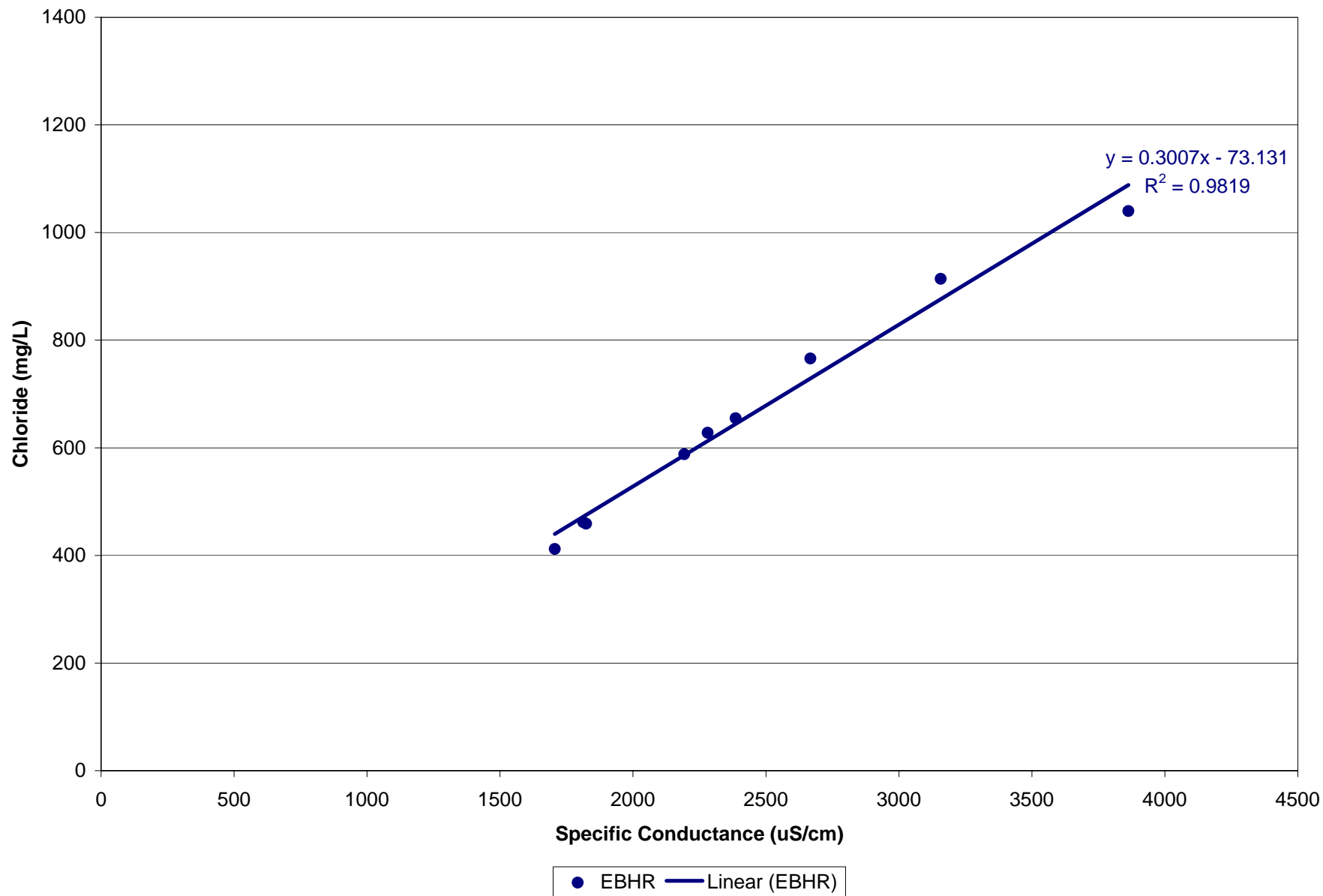


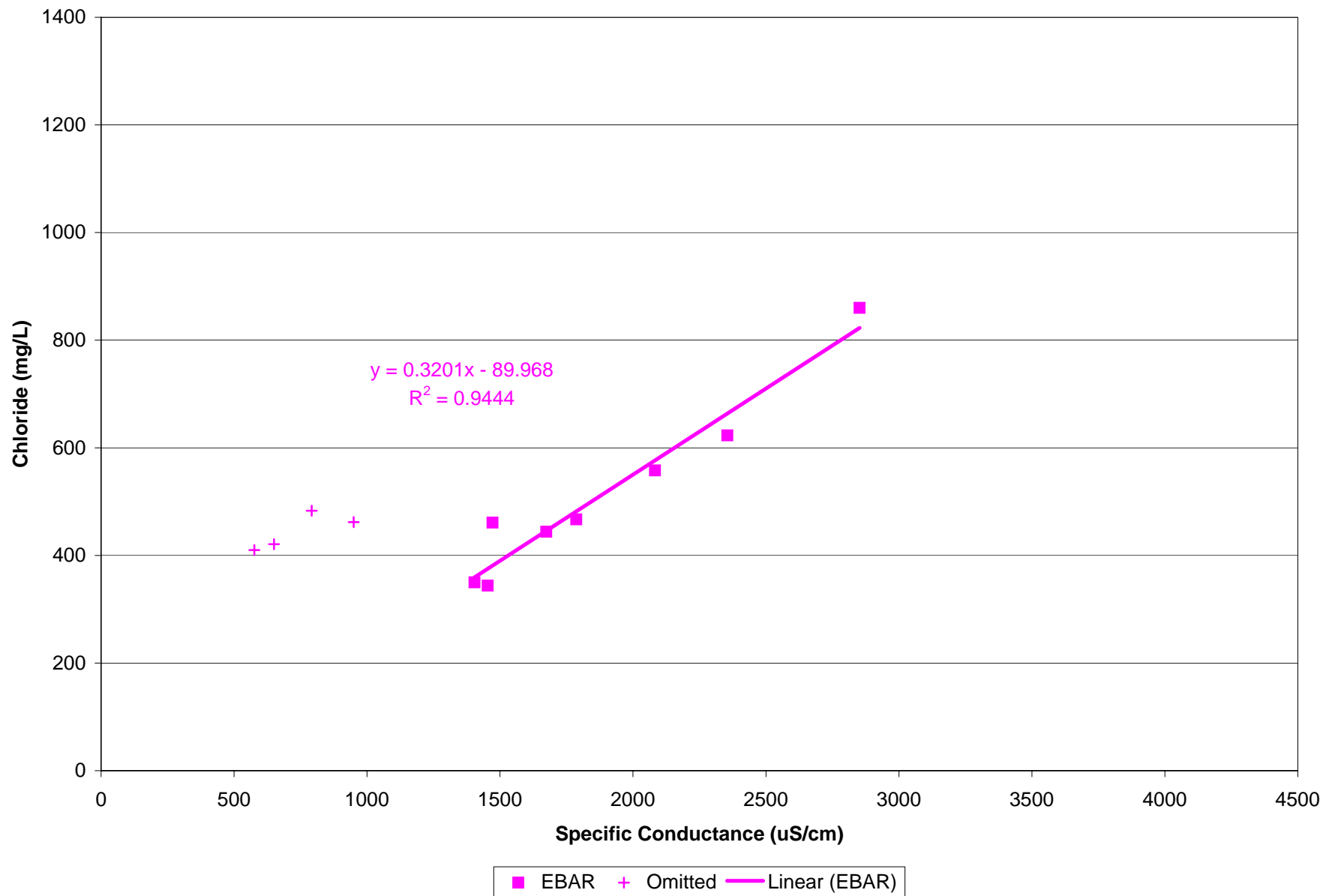
Attachment B
Chloride Sampling Data

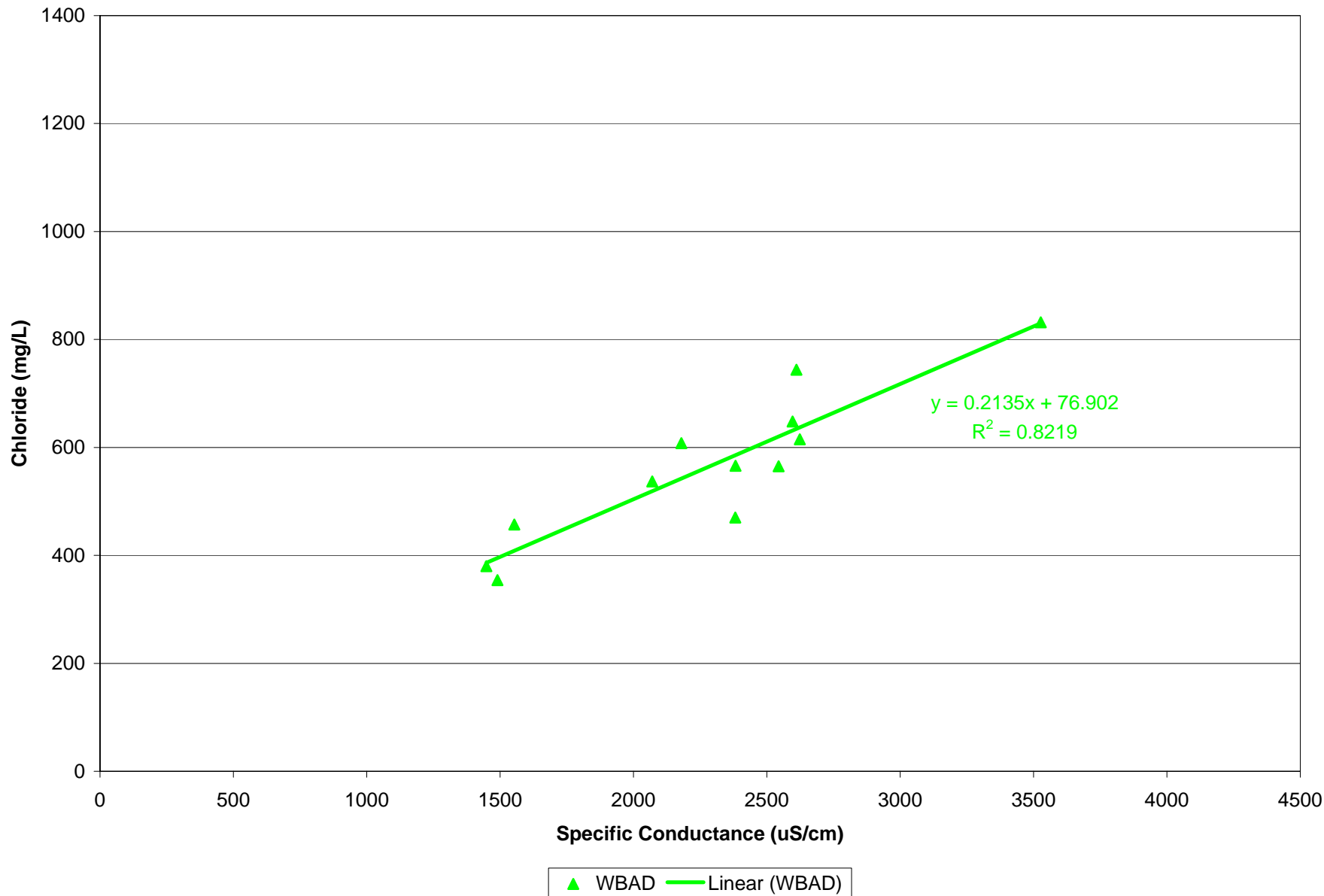
Water Sample Analysis Results

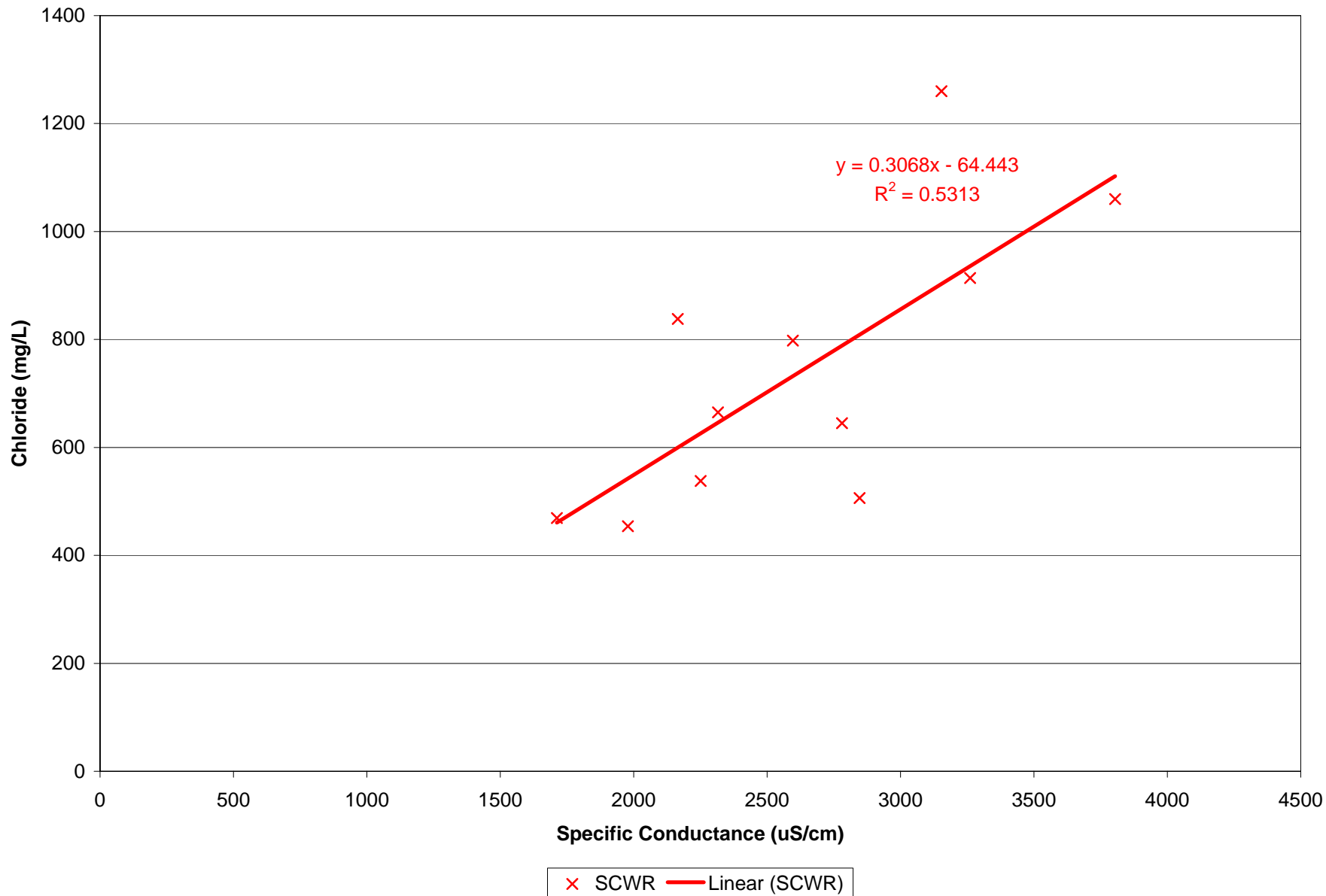


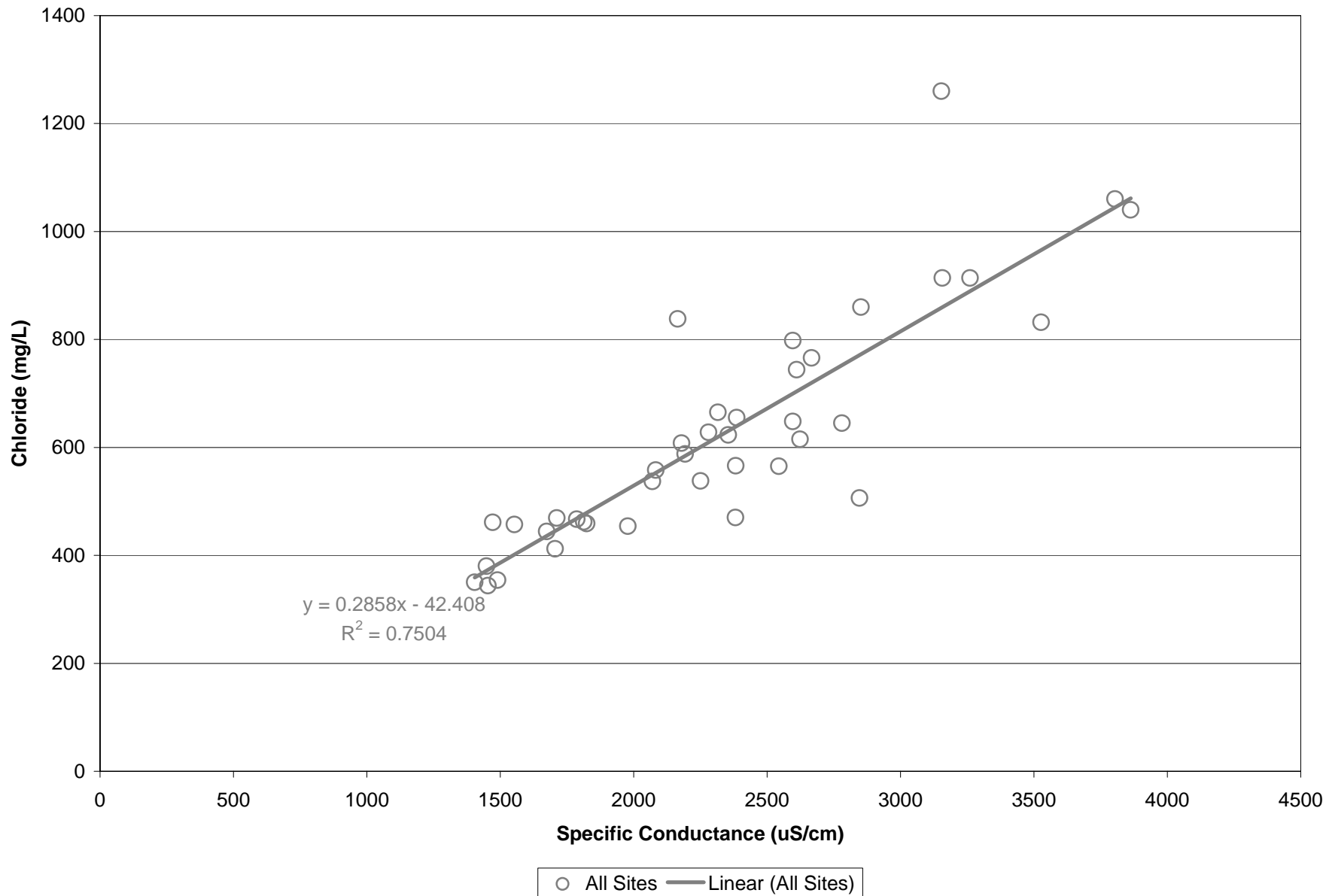
Attachment C
Conductivity-Chloride Correlation Plots











Attachment D
Estimated Chloride Concentrations

