

Method for Analysis of Environmental Lead Contamination in Soils

Supporting Information

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Number of Pages: 15

Number of Figures: 25

Optimization of SWASV Method

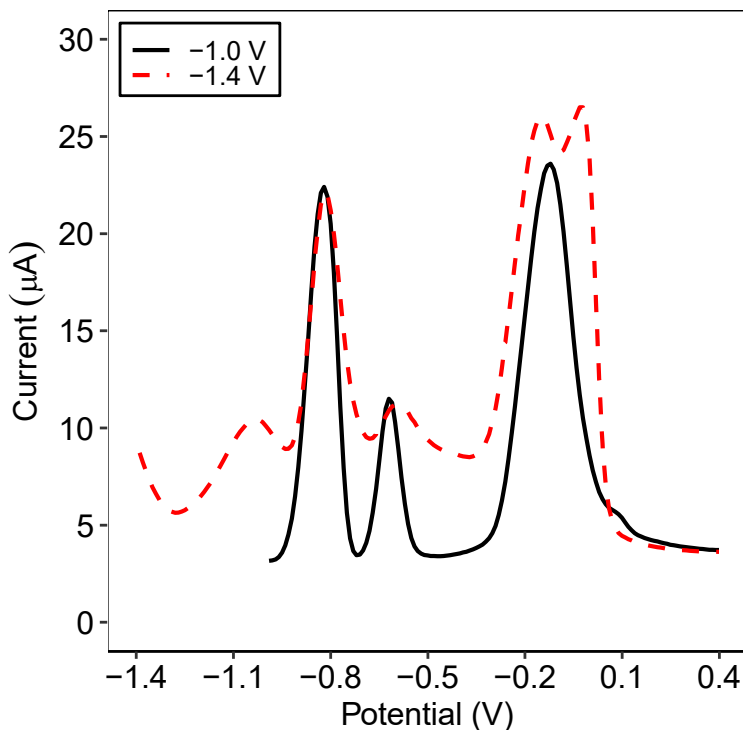


Figure S1. Anodic stripping voltammogram of extracted certified reference material soil. A 360 s deposition at -1.4 V (red dashed) and at -1.0 V (black solid) was performed prior to square wave voltammetry. The -1.0 V deposition lowered the background current and improved resolution of the lead (Pb, -0.6 V peak potential) and cadmium stripping peaks. The -1.0 V deposition retained some sensitivity for cadmium (-0.8 V peak potential) but removed the ability to detect zinc (-1.0 V peak potential).

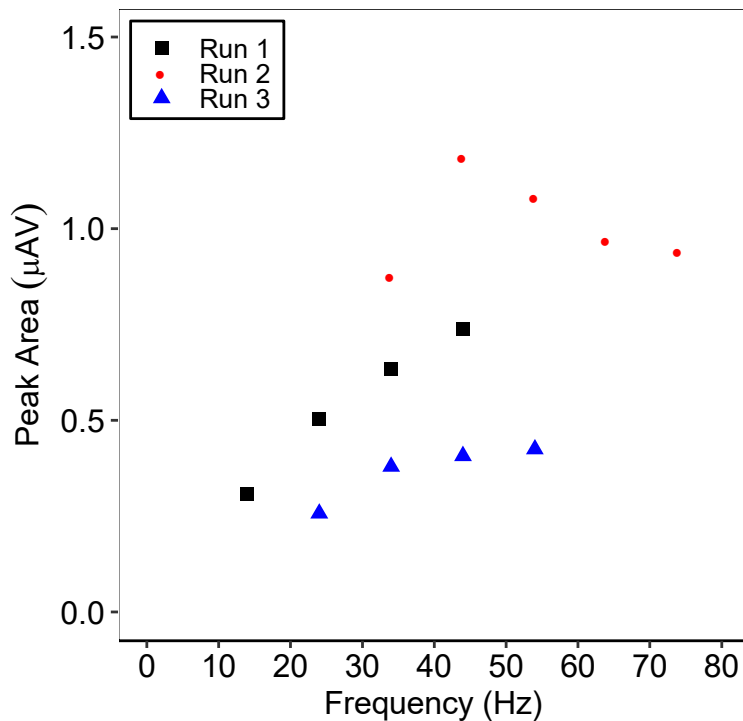


Figure S2. Multiple measurements of 100 ppb Pb with varying square wave frequencies. Runs 1–3 were performed on different electrodes with varying frequency windows investigated. Run 1 ranged from 14–44 Hz, run 2 ranged from 34–74 Hz, and run 3 ranged from 24–54 Hz. 44 Hz gave the largest and second largest peak areas between the runs, so it was selected as the optimized value for this method. The other square wave voltammetry settings were held constant at: deposition potential: -1.0 V; deposition time: 360 s; equilibration time: 10 s; step increment: 10 mV; amplitude: 20 mV; Frequency: 44 Hz.

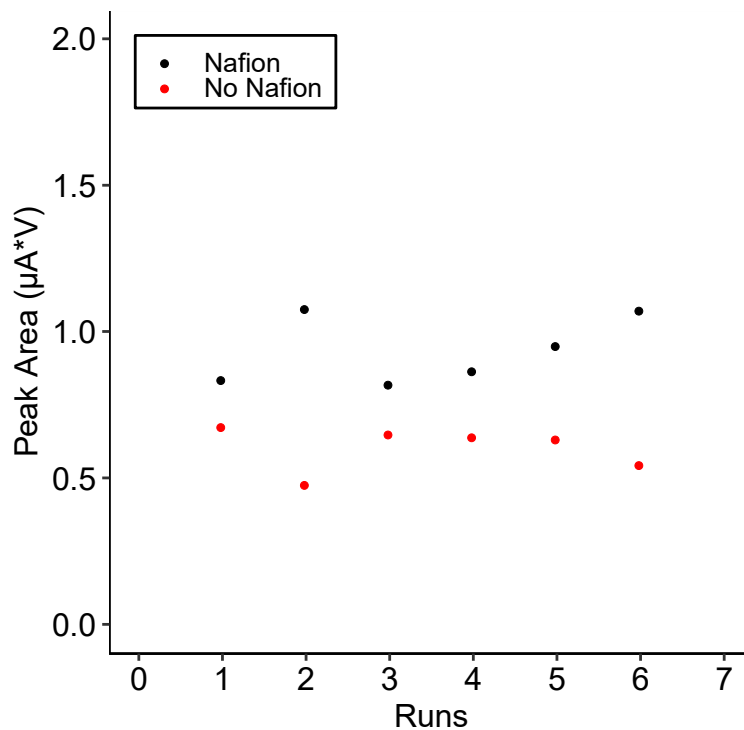


Figure S3. Multiple measurements of 100 ppb Pb performed on two electrodes with a cleaning performed between measurements. One electrode was coated in a Nafion film while the other was left bare. Nafion coated electrode observed larger Pb stripping peaks, which support previous work done with Nafion coated electrodes. (Wang et al., 2014)

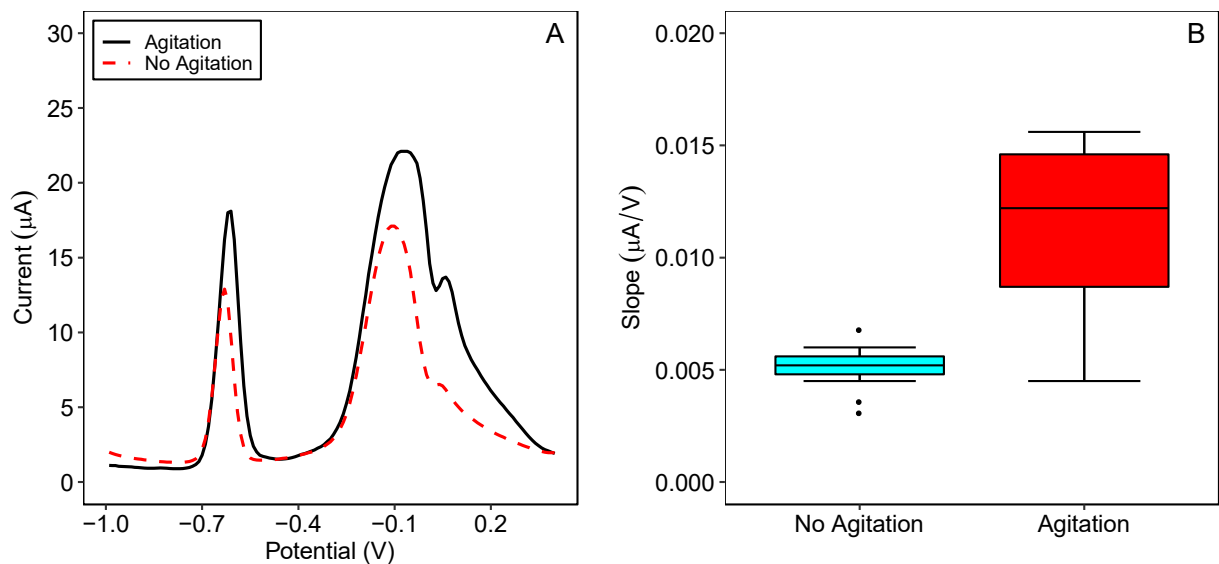


Figure S4. (A) Voltammogram of soil #11 with a 100 ppb Pb addition. Agitation provided larger Pb stripping peaks than the peaks without applied agitation. (B) A box and whiskers plot of the slopes of the regression lines obtained during the standard addition method for all samples tested. Samples that were tested with agitation led to much more variability between slopes, and this was the reason agitation was removed from the optimized protocol.

Analysis of the Soil Samples Without Agitation

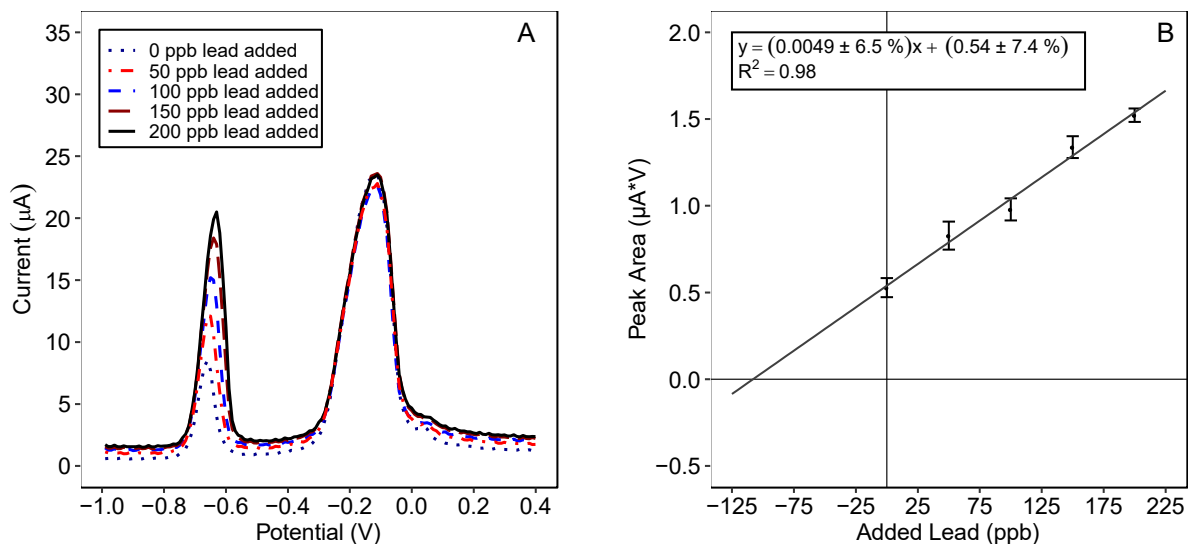


Figure S5. (A) Example voltammograms for soil sample #2 (B) Plot for the standard addition analysis of soil sample #2.

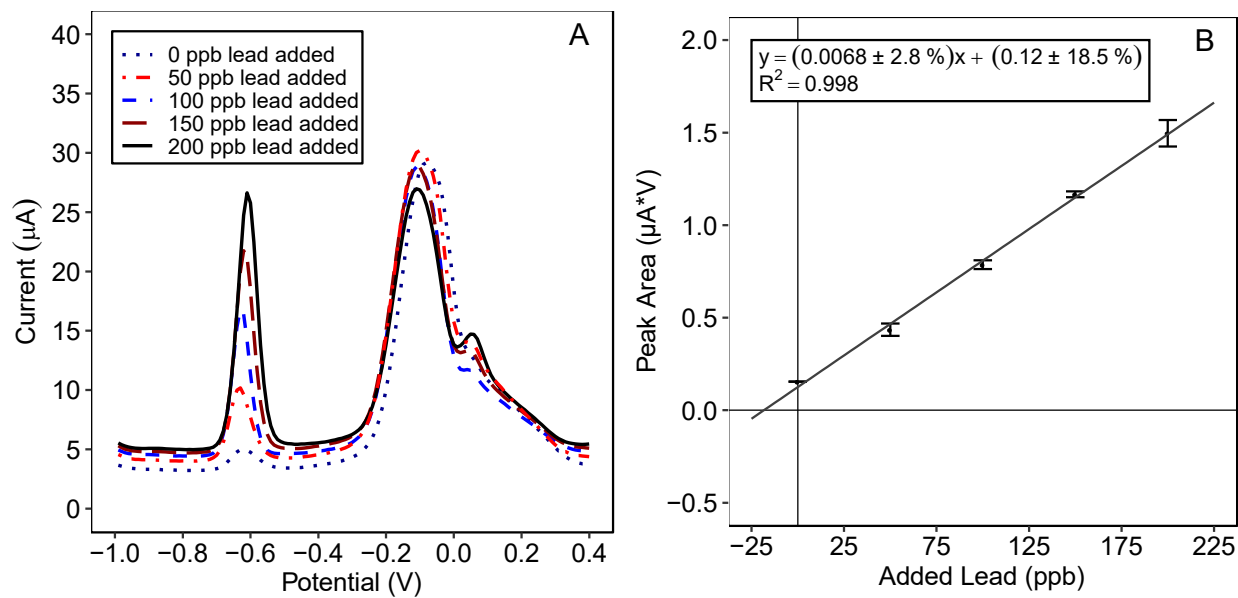


Figure S6. (A) Example voltammograms for soil sample #3 (B) Plot for the standard addition analysis of soil sample #3.

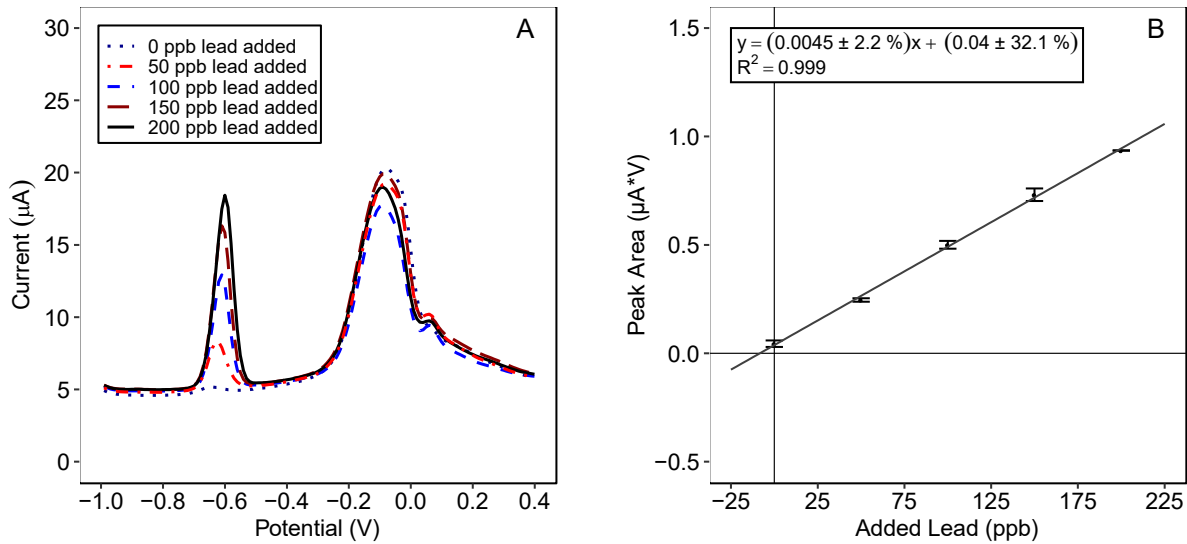


Figure S7. (A) Example voltammograms for soil sample #4 (B) Plot for the standard addition analysis of soil sample #4.

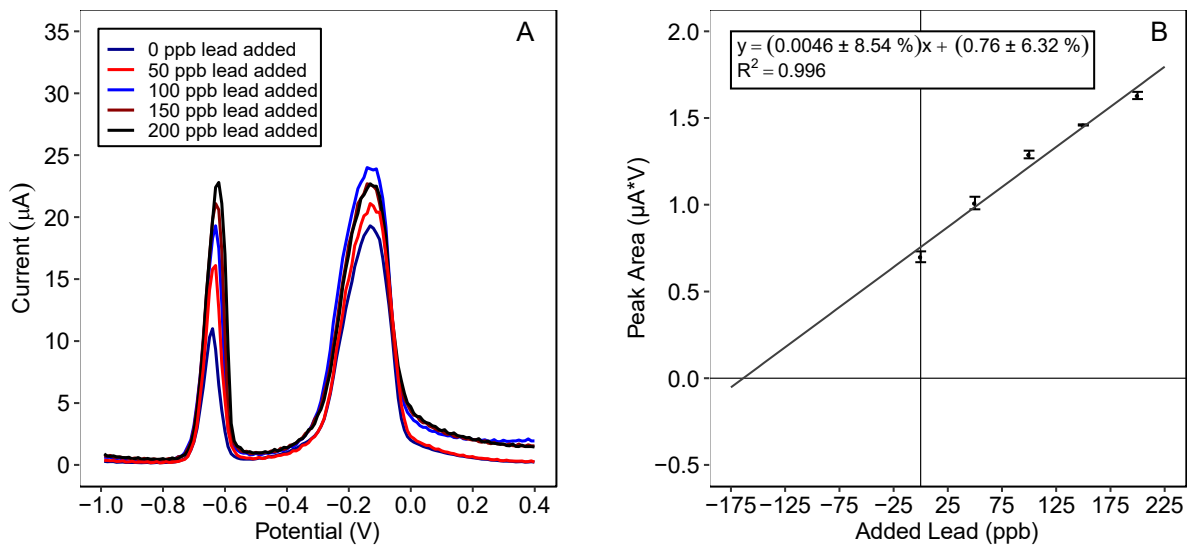


Figure S8. (A) Example voltammograms for soil sample #5 (B) Plot for the standard addition analysis of soil sample #5.

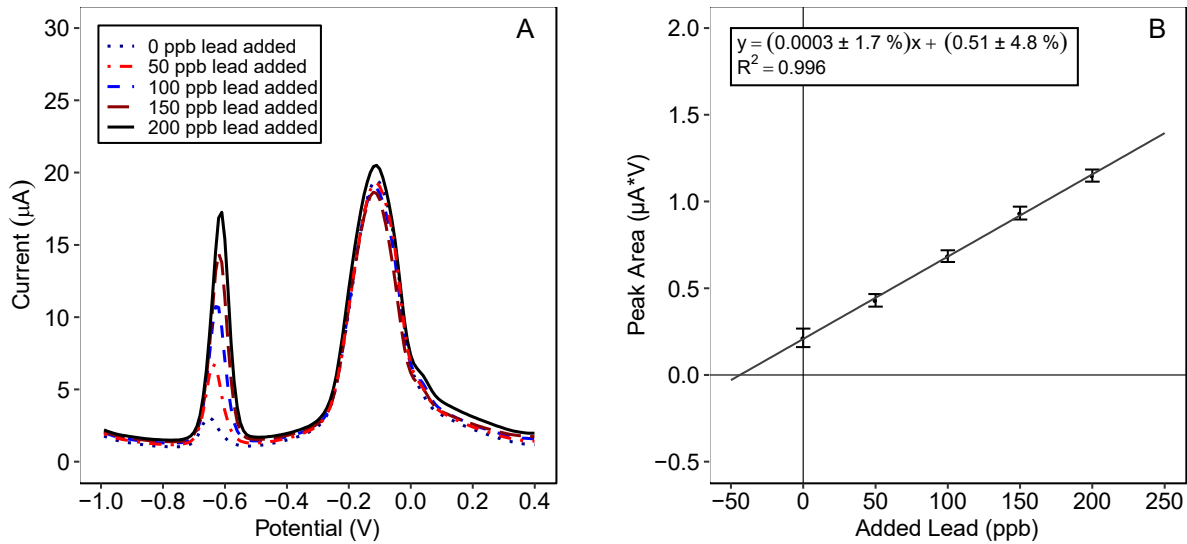


Figure S9. (A) Example voltammograms for soil sample #6 (B) Plot for the standard addition analysis of soil sample #6.

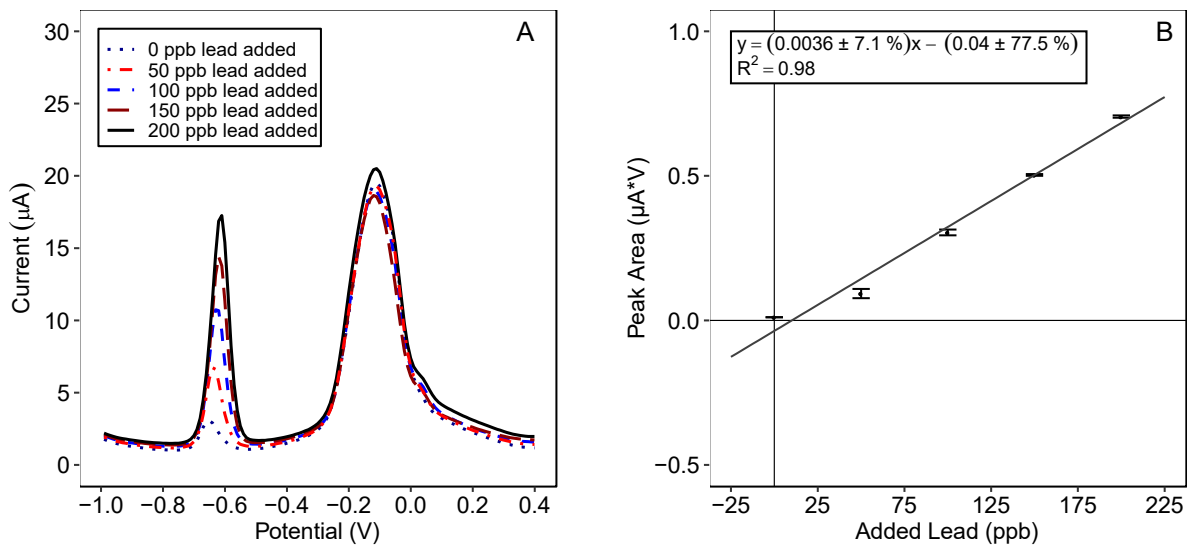


Figure S10. (A) Example voltammograms for soil sample #7 (B) Plot for the standard addition analysis of soil sample #7.

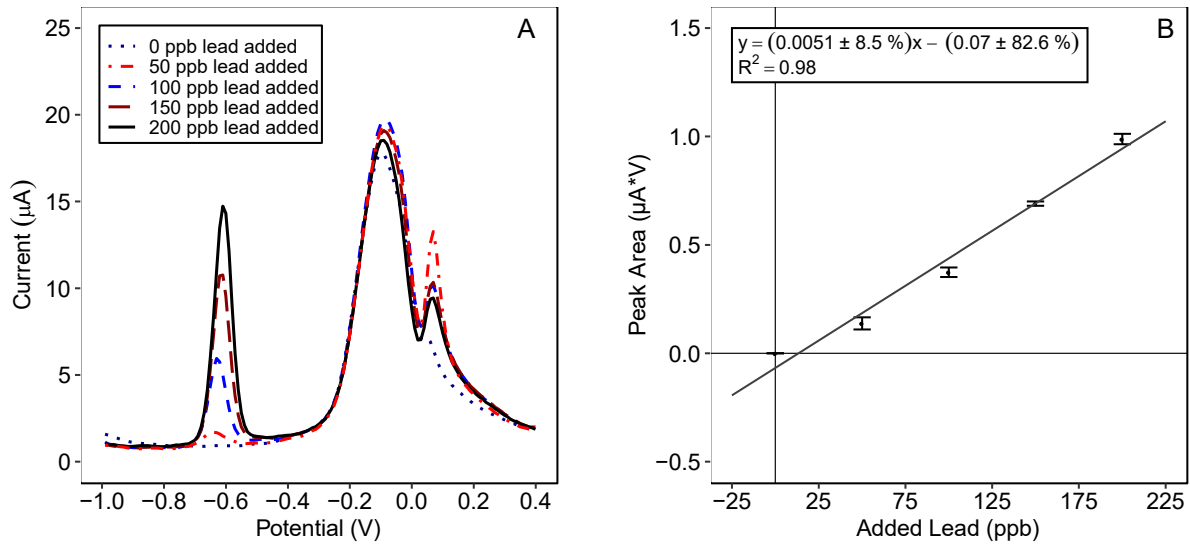


Figure S11. (A) Example voltammograms for soil sample #8 (B) Plot for the standard addition analysis of soil sample #8.

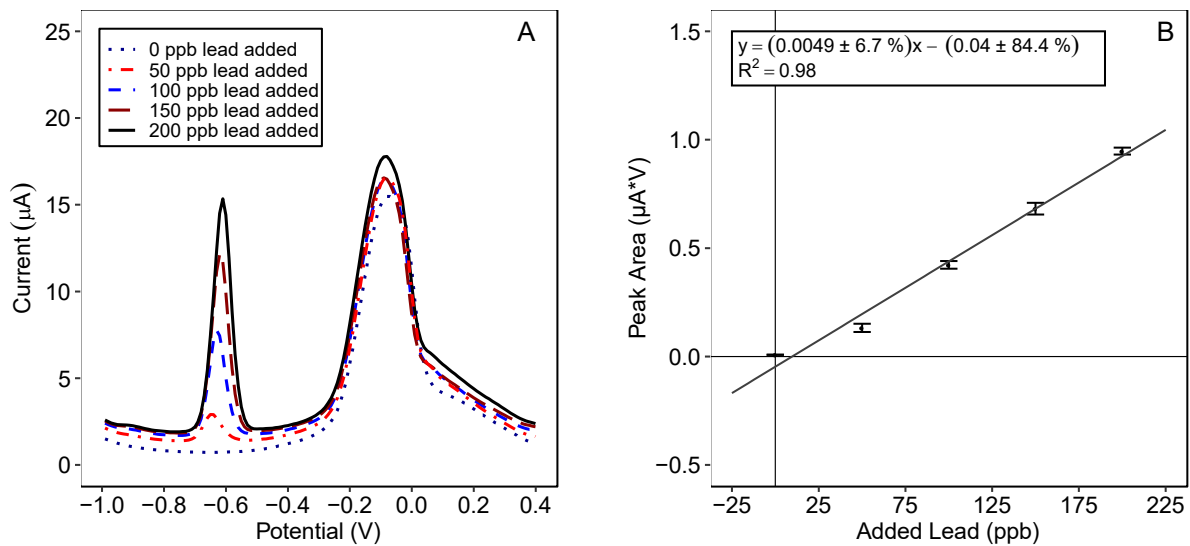


Figure S12. (A) Example voltammograms for soil sample #9 (B) Plot for the standard addition analysis of soil sample #9.

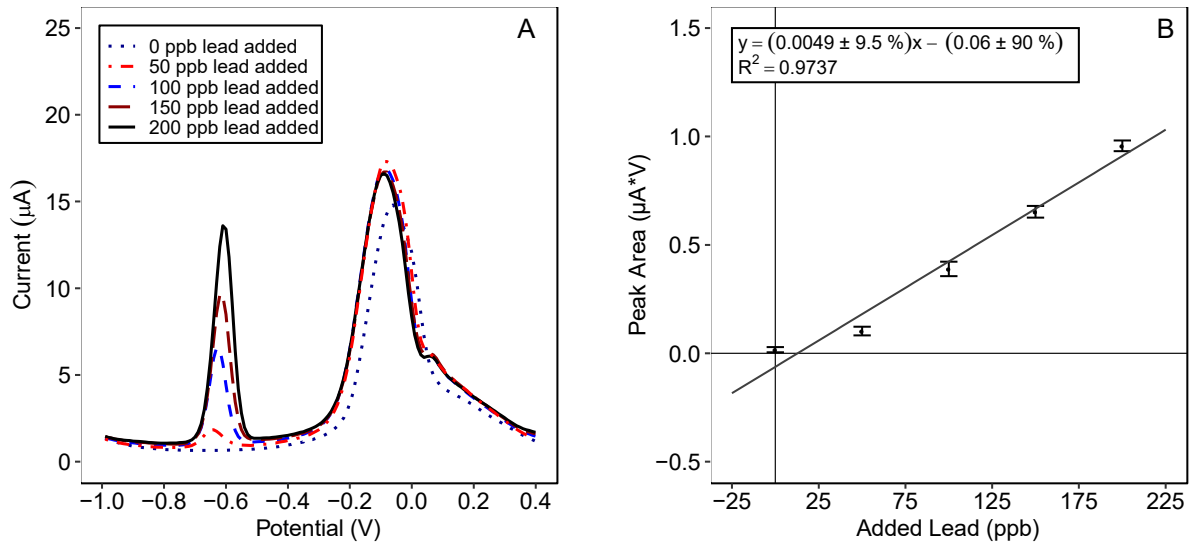


Figure S13. (A) Example voltammograms for soil sample #10 (B) Plot for the standard addition analysis of soil sample #10.

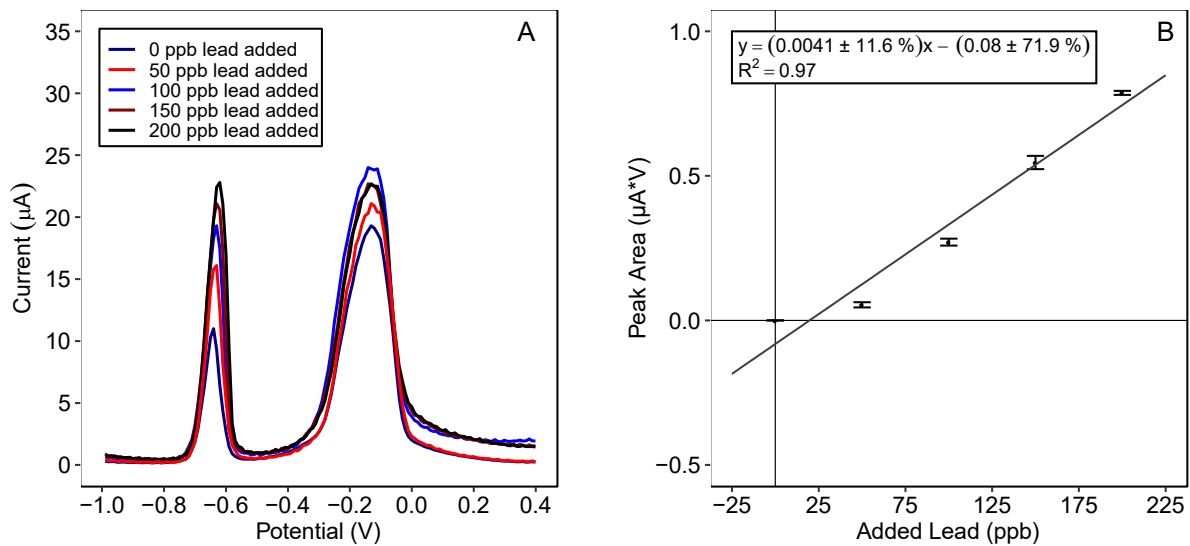


Figure S14. (A) Example voltammograms for soil sample #11 (B) Plot for the standard addition analysis of soil sample #11.

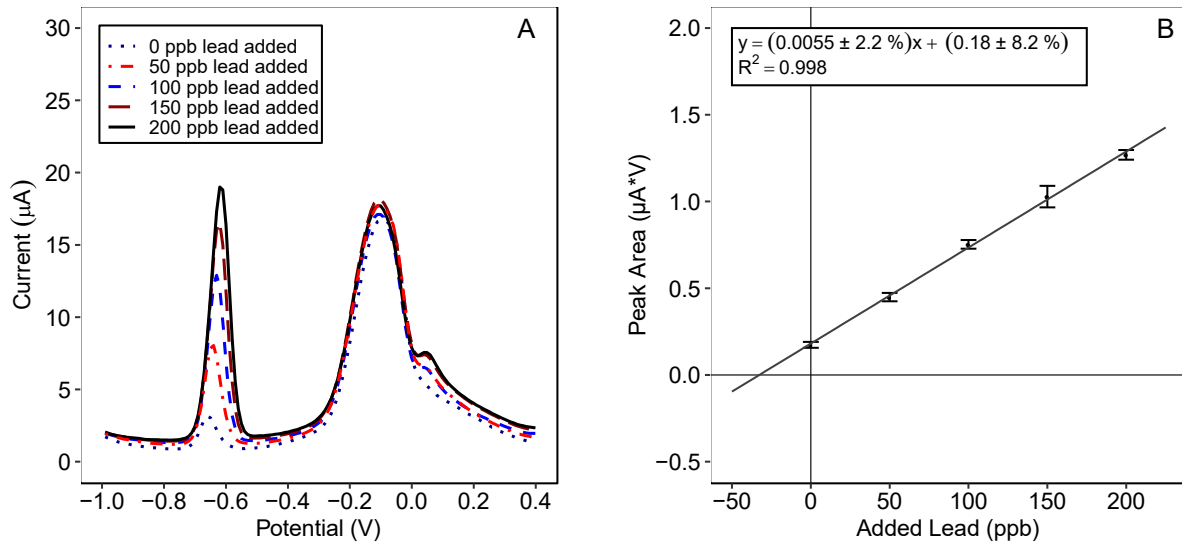


Figure S15. (A) Example voltammograms for soil sample #12 (B) Plot for the standard addition analysis of soil sample #12.

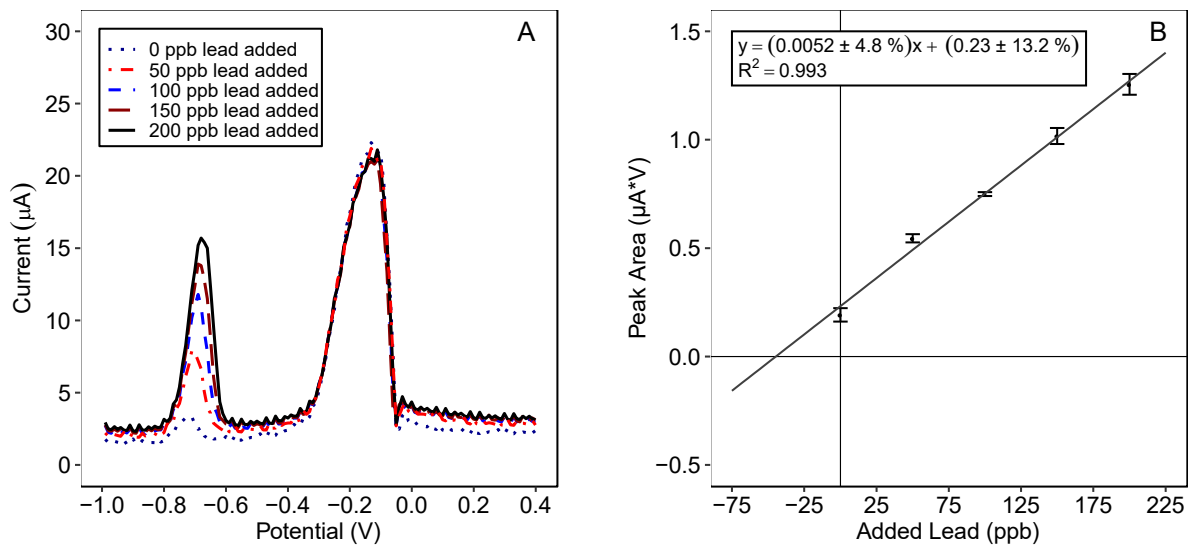


Figure S16. (A) Example voltammograms for soil sample #13 (B) Plot for the standard addition analysis of soil sample #13.

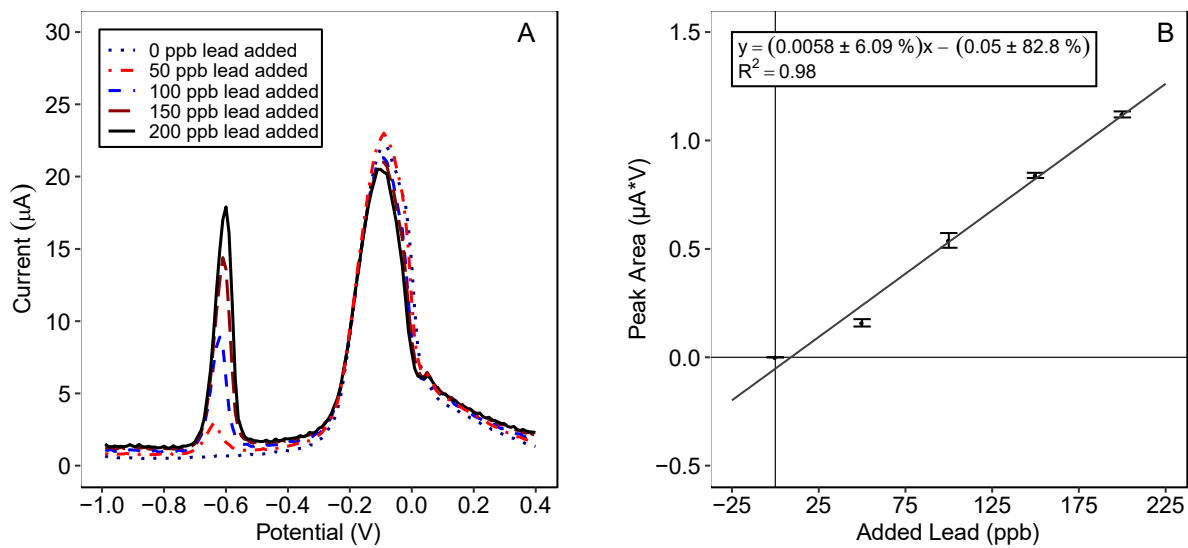


Figure S17. (A) Example voltammograms for soil sample #14 (B) Plot for the standard addition analysis of soil sample #14.

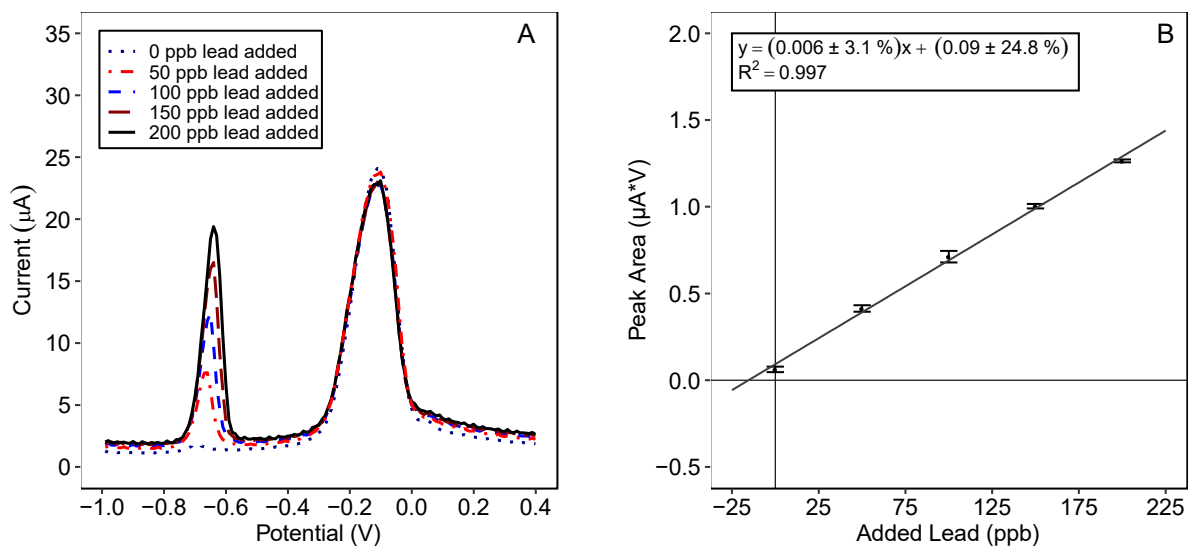


Figure S18. (A) Example voltammograms for soil sample #15 (B) Plot for the standard addition analysis of soil sample #15.

Analysis of the Soil Samples With Agitation

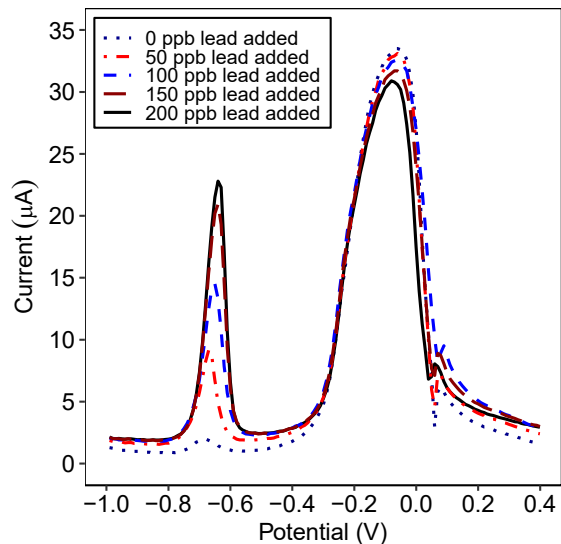


Figure S19. Voltammograms for sample #16. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

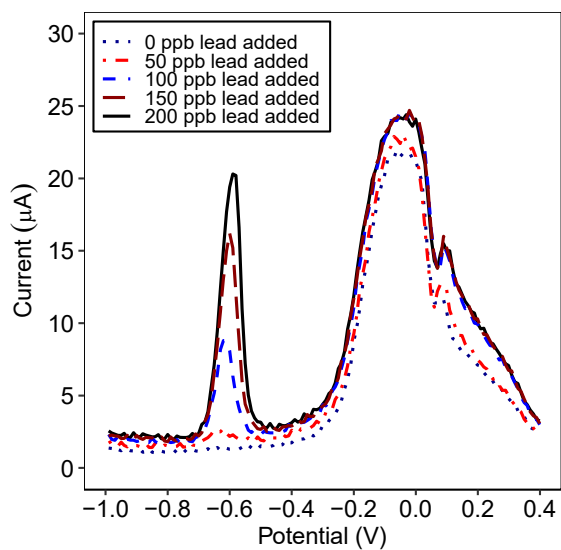


Figure S19. Voltammograms for sample #17. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

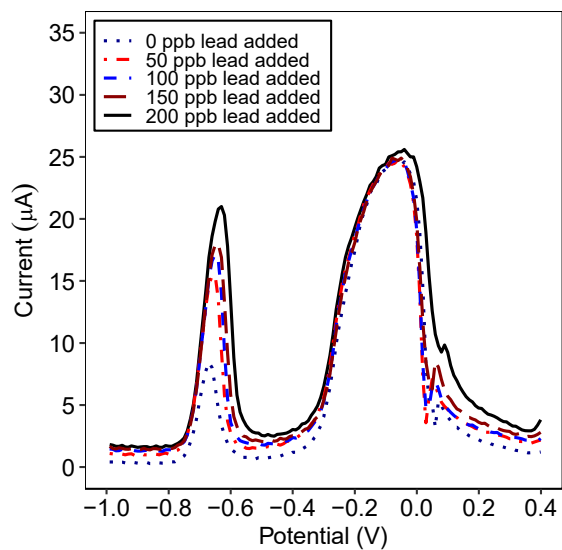


Figure S20. Voltammograms for sample #18. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

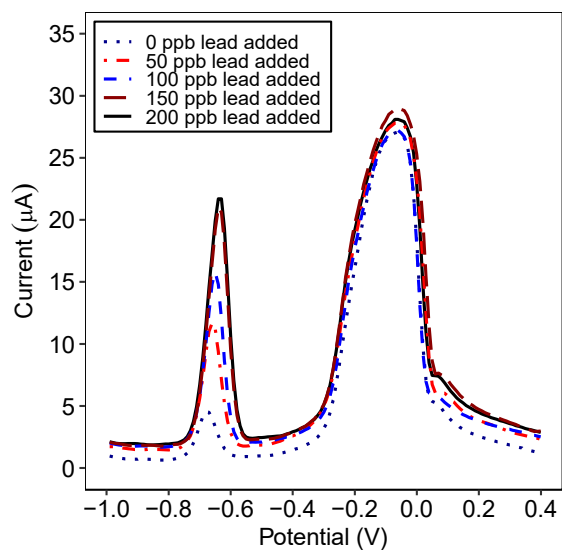


Figure S21. Voltammograms for sample #19. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

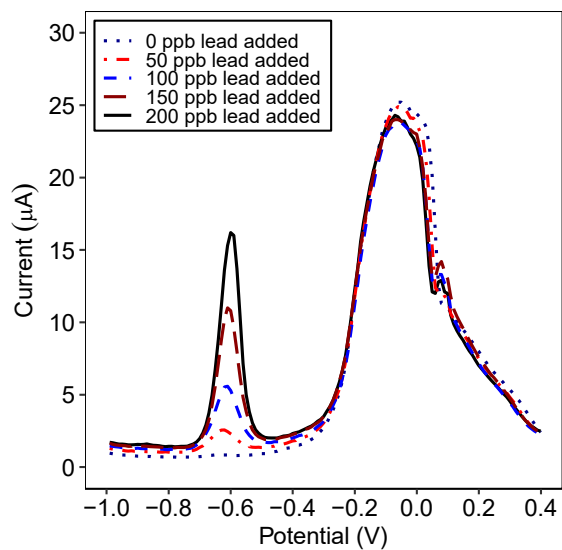


Figure S22. Voltammograms for sample #20. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

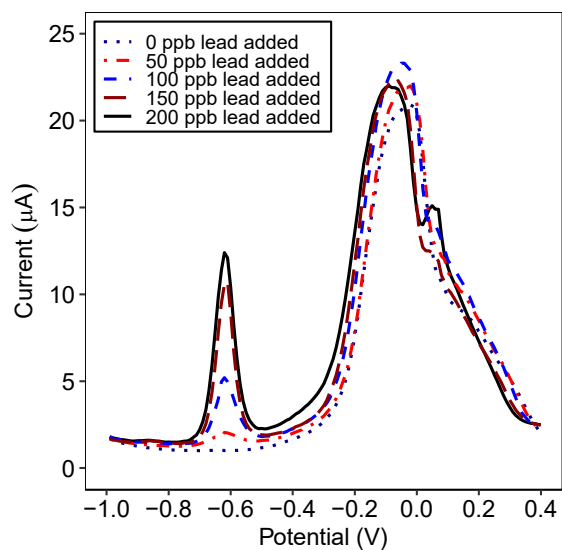


Figure S23. Voltammograms for sample #21. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

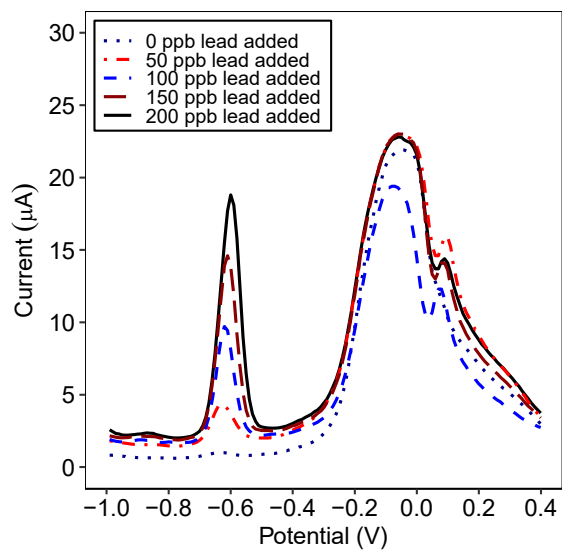


Figure S24. Voltammograms for sample #22. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.

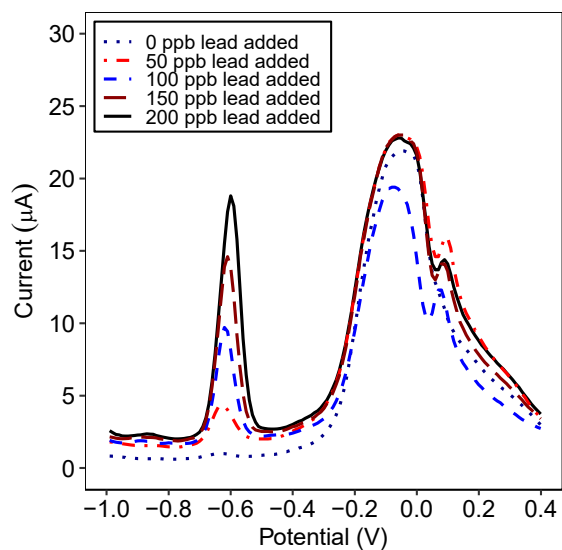


Figure S25. Voltammograms for sample #23. Agitation was applied during this deposition; therefore, this data was not included in the final analysis.