APPENDIX A

QUALITY CONTROL/QUALITY ASSURANCE PROGRAM FOR WATER SAMPLING AND ANALYSIS

An extensive Quality Assurance and Quality Control (QA/QC) program was instituted at the Sacramento Constructed Wetlands (SCW) during the 1996 project year. The program was designed to include several methods of managing QA/QC both internally and externally. Field blanks, duplicate sampling, blind spikes, and parallel samples made up the external portion of the program. Internal laboratory QA/QC procedures were specified by the SCW program.

There were a few data exclusions and no data qualifications required by the SCW QA/QC program in 1996. Data were excluded due to unexplainable and *unqualifiable* results in 1996 on the following; all nitrogen data for the January monthly water quality sampling event, and all total mercury data for the November quarterly water quality sampling event. Metals analysis were canceled due to a high presence of organic matter in the July monthly water quality sampling event. A schedule of QA/QC events performed during 1996 is presented in Appendix A.

External - Field Quality Control Samples. The field QA/QC samples submitted to the SRWTP and contract laboratories consisted of field blanks and blind parallel spikes. This portion of the QA/QC program was implemented to assess potential impacts of sampling procedures and equipment on the precision and accuracy of lab results.

Field blanks were used to evaluate potential contamination of water quality samples caused by sampling procedures and equipment. Field blanks were prepared by the SRWTP and Frontier Geosciences laboratory to be used with their respective analyses. SRWTP field blanks contained de-ionized, "metal-free" (nano-pure) water. Frontier Geosciences field blanks contained "mercury-free" (nano-pure) water. Field blanks were performed by a sample transfer from the field blank container to a sample container at the sampling site and under the same sampling conditions as all standard samples.

Parallel samples were used to evaluate potential contamination and comparative relations of sampling locations, procedures, and equipment. Parallel samples were performed on several aspects of sampling procedures, including: field ammonia analysis vs. laboratory analysis, dissolved oxygen meter vs. winkler titration's, influent diffusers vs. influent containment in standpipe, and effluent immediately upstream of overflow weir vs. effluent overflowing the weir.

External - Laboratory Quality Control Samples. External laboratory QC samples consisted of duplicate field samples and blind spike samples. External QC samples were submitted to assess the quality of resulting SRWTP, A & L Western Agricultural, and CalTest laboratory data.

Duplicate field samples were used to measure the precision of constituent concentrations in field water quality, vegetation, and sediment samples. Duplicate field samples were performed by taking two samples simultaneously from the same sampling location and under the same sampling conditions.

The blind spike sample was used as an external measure of the analytical accuracy of the resulting data. A standard reference material obtained from the Environmental Resource Associates was submitted as a blind sample spiked with known concentrations of all metals analyzed in the water quality monitoring program at SCW.

Internal - Laboratory Quality Control Procedures. Internal laboratory QC was performed to assure quality data were produced by the SRWTP, Frontier Geosciences, A & L Western Agricultural, and CalTest laboratories. Internal laboratory QC samples were analyzed at a rate of one sample per every ten samples submitted, and on a sample from a treatment cell other than the groundwater cell. Internal laboratory QC was performed on water quality, vegetation, sediment, and fish tissue samples.

Analytical laboratory precision was evaluated by the laboratory through the calculation of the relative percent differences between: (1) analyte concentrations in duplicate samples split from a single sample by the laboratory, and (2) matrix spike duplicates analysis. Sample duplicates and matrix spike duplicate analyses were each conducted at a rate of one in ten samples or at least one per analytical batch and on a sample taken from a cell other than the groundwater cell. Laboratory control standard and matrix spike recovery acceptance ranges were 80 - 120 percent. Acceptable precision of laboratory split samples and matrix spike duplicates were defined as relative percent differences of up to 20 percent.

QA/QC Data Analysis Methods. SCW project data analyst methods investigate the following: holding time compliance, batch QC adequacy, lab duplicate relative percent differences, lab matrix spike results and trends, lab control standards results and trends, standard reference material results and trends, field blank results and trends, duplicate sample results, and parallel sample results. Upon review of the QA/QC data, the analyst determines whether or not laboratory results are acceptable, and whether or not data qualifications or exclusions are warranted.