APPENDIX D

Best Management Practice (BMP) for Silver-Rich Solutions

All facilities generating silver-rich solutions must comply with the BMP Requirements shown below. Silver-rich solutions contain sufficient silver for cost-effective recovery, either on-site or off-site. These solutions include used fix and bleach-fix solutions, low replenished (low-flow) washes following a fix or bleach-fix solution, and stabilizers for the washless minilab film and paper processes.

I. SILVER-RICH SOLUTION MANAGEMENT REQUIREMENTS:
A. Either: (1) Haul silver-rich spent film processing solutions off-site for recovery or disposal, or (2) Using technology that is equivalent to or exceeds the equipment listed below, based on the volume of silver-rich solutions generated by each piece of equipment per day, pretreat all silver-rich spent film processing solutions to remove silver prior to discharge of the solutions to sewer; operate and maintain silver recovery equipment so that it provides the percent recovery for which it was designed.
   (a) If the equipment generates an average of less than 0.5 gallons/day of silver-rich solutions: treat silver-rich solutions using a single chemical recovery cartridge (CRC) with manufacturer specified flow control, or alternative technology providing at least 90% silver recovery or management.
   (b) If the equipment generates an average of 0.5 to 20 gallons/day silver-rich solutions: treat silver-rich solutions using two chemical recovery cartridges in series with manufacturer-specified flow control, or an electrolytic unit followed by a chemical recovery cartridge with manufacturer-specified flow control, or alternative technology providing at least 95% silver recovery or management.
   (c) If the equipment generates an average of more than 20 gallons/day silver-rich solutions: treat silver-rich solutions using an electrolytic unit plus two or more CRCs with manufacturer specified flow control or an electrolytic unit plus a precipitation unit, or alternative technology providing at least 99% silver recovery or management.

Note: recovery systems serving more than 1 processor must be designed to meet removal requirements for the combined flow.

II. SELF-MONITORING AND RECORD-KEEPING REQUIREMENTS:
A. For each silver recovery system in operation:
   1. Test the silver concentration in the recovery system effluent at least once every three months, using silver test paper. If the paper turns black, the recovery system is not operating properly and needs immediate attention. Cease discharge and take all measures necessary to restore recovery system efficiency prior to re-initiating discharge. (Facilities whose silver recovery systems are serviced by a contract maintenance service at a frequency of at least once every three months are exempt from this requirement.)
   2. Maintain a silver recovery log to record flow through the silver recovery system and test results resulting from (1) above, if applicable.
B. If more than one silver recovery system is used:
   Develop and maintain a list of silver recovery systems in use and their location, and document which processors each recovery system serves. Maintain the list on-site and make it available to Wastewater Pretreatment Inspectors upon request.

III. REPORTING REQUIREMENTS: (Facilities generating less than .5 gallons/day silver-rich solution are exempt)
A. Twice a year, by the due dates specified in Attachment B of your permit, submit a statement to this office certifying that, during the previous six months, all silver-rich solutions generated at your facility have been either: (1) treated on-site to remove no less than the percentage of silver required by the BMP, prior to disposal to sewer, or; (2) hauled off-site for treatment and disposal. A Certification Form will be mailed to your facility for signature approximately five weeks prior to the due date.

IV. DEFINITIONS:
1. % silver recovery: The percent of silver recovered from the silver-rich solutions by the silver recovery treatment system, calculated as follows: % recovery = 1 - concentration (in mg/l) silver in effluent / concentration (in mg/l) silver in influent
2. CRC: A chemical recovery cartridge which recovers silver through a process known as metallic replacement.
3. Electrolytic Silver Recovery: A method of recovering silver in which a direct current is applied across two electrodes immersed in a silver-rich solution.
4. Metallic Replacement: A method of recovering silver from silver-rich solutions by an oxidation-reduction reaction with elemental iron and silver thiosulfate to produce ferrous iron in solution and metallic silver sludge. The device used is commonly called a chemical recovery cartridge (CRC).
5. Silver Recovery System: One or more silver recovery treatment units which, alone or in combination, are used to treat a given silver-rich solution to remove silver prior to discharge of the solution to the sanitary sewer.