WASTE RESIDUALS

- 9.0 GENERAL
- 9.1 SANITARY WASTE
- 9.2 BRINE WASTE
- 9.3 PRECIPITATIVE SOFTENING SLUDGE
- 9.4 ALUM SLUDGE
- 9.5 "RED WATER" WASTE
- 9.6 WASTE FILTER WASH WATER
- 9.7 RADIOACTIVE MATERIALS

9.0 GENERAL

All waste discharges shall be governed by regulatory agency requirements. The requirements outlined herein must, therefore, be considered minimum requirements as state water pollution control authorities may have more stringent requirements.

Provisions must be made for proper disposal of water treatment plant waste such as sanitary, laboratory, clarification sludge, softening sludge, iron sludge, filter backwash water, and brines. In locating waste disposal facilities, due consideration shall be given to preventing potential contamination of the water supply.

Alternative methods of water treatment and chemical use should be considered as a means of reducing waste volumes and the associated handling and disposal problems.

Appropriate backflow protection must be provided on waste discharge piping as needed to protect the public water supply.

9.1 SANITARY WASTE

The sanitary waste from water treatment plants, pumping stations, and other waterworks installations must receive treatment. Waste from these facilities shall be discharged directly to a sanitary sewer system, when available and feasible, or to an adequate on-site waste treatment facility approved by the appropriate reviewing authority.

9.2 BRINE WASTE

Waste from ion exchange plants, demineralization plants, or other plants which produce a brine, may be disposed of by controlled discharge to a stream if adequate dilution is available. Surface water quality requirements of the regulatory agency will control the rate of discharge. Except when discharging to large waterways, a holding tank of sufficient size should be provided to allow the brine to be discharged over a twenty-four hour period. Where discharging to a sanitary sewer, a holding tank may be required to prevent the overloading of the sewer and/or interference with the waste treatment processes. The effect of brine discharge to sewage lagoons may depend on the rate of evaporation from the lagoons.

9.3 PRECIPITATIVE SOFTENING SLUDGE

Sludge from plants using precipitative softening varies in quantity and in chemical characteristics depending on the softening process and the chemical characteristics of the water being softened. Recent studies show that the quantity of sludge produced is much larger than indicated by stoichiometric calculations. Methods of treatment and disposal are as follows:

a. Lagoons

1. Temporary storage lagoons which must be cleaned periodically should be designed on the basis of 0.7 acres per million gallons per day per 100 mg/L of hardness removed based on a usable lagoon depth of five feet. This should provide about 2 ½ years storage. At least two but preferably more lagoons must be provided in order to give flexibility in operation. An acceptable means of final sludge disposal must be provided. Provisions must be made for convenient cleaning.

2. Permanent lagoons should have a volume of at least four times that for temporary lagoons.

3. The design of both temporary lagoons and permanent lagoons should provide for

a. location free from flooding,

b. when necessary, dikes, deflecting gutters or other means of diverting surface water so that it does not flow into the lagoons,

c. a minimum usable depth of five feet,

d. adequate freeboard of at least two feet,

e. adjustable decanting device,

f. effluent sampling point,

g. adequate safety provisions,

h. parallel operation, and

i. subsurface infiltration may be acceptable if approved by the reviewing authority.

b. The application of liquid lime or dewatered sludge to farm land should be considered as a method of ultimate disposal. Prior to land application, a chemical analysis of the sludge including calcium and heavy metals shall be conducted. Approval from the appropriate reviewing authority shall be obtained. When this method is selected, the following provisions shall be made:

1. Transport of sludge by vehicle or pipeline shall incorporate a plan or design which prevents spillage or leakage during transport.

2. Interim storage areas at the application site shall be kept to a minimum and facilities shall be provided to prevent washoff of sludge or flooding.

3. Sludge shall not be applied at times when washoff of sludge from the land could be expected.

4. Sludge shall not be applied to sloping land where washoff could be expected unless provisions are made, for suitable land, to immediately incorporate the sludge into the soil.

5. Trace metals loading shall be limited to prevent significant increases in trace metals in the food chain, phytotoxicity or water pollution.

6. Each area of land to receive lime sludge shall be considered individually and a determination made as to the amount of sludge needed to raise soil pH to the optimum for the crop to be grown.

c. Discharge of lime sludge to sanitary sewers should be avoided since it may cause both liquid volume and sludge volume problems

at the sewage treatment plant. This method should be used only when the sewerage system has the capability to adequately handle the lime sludge.

d. Mixing of lime sludge with activated sludge waste may be considered as a means of co-disposal.

e. Disposal at a landfill can be done as either a solid or liquid if the landfill can accept such waste, depending on individual state requirements.

f. Mechanical dewatering of sludge may be considered. Pilot studies on a particular plant waste are required. Mechanical dewatering shall be preceded by sludge concentration and chemical pre- treatment.

g. Calcination of sludge may be considered. Pilot studies on a particular plant waste are required.

h. Lime sludge drying beds are not recommended.

9.4 ALUM SLUDGE

Lagooning may be used as a method of handling alum sludge. Lagoon size can be calculated using total chemicals used plus a factor for turbidity. Mechanical concentration may be considered. A pilot plant study is required before the design of a mechanical dewatering installation. Freezing changes the nature of alum sludge so that it can be used for fill. Acid treatment of sludge for alum recovery may be a possible alternative. Alum sludge can be discharged to a sanitary sewer. However, initiation of this practice will depend on obtaining approval from the owner of the sewerage system as well as from the regulatory agency before final designs are made.

9.4.1 Lagoons

Lagoons should be designed to produce an effluent satisfactory to the regulatory agency and should provide for:

a. location free from flooding,

b. where necessary, dikes, deflecting gutters or other means of diverting surface water so that it does not flow into the lagoon,

c. a minimum usable depth of five feet,

d. adequate freeboard of at least two feet,

e. adjustable decanting device,

f. effluent sampling point,

g. adequate safety provisions, and

h. a minimum of two cells, each with appropriate inlet/outlet structures to facilitate independent filling/dewatering operations.

9.4.2 Mechanical dewatering

a. The successful use of mechanical dewatering depends on the characteristics of the alum sludge produced, as determined by site specific studies.

b. Mechanical dewatering shall be preceded by sludge concentration and chemical pre- treatment.

9.4.3 Land application

Alum sludge may be disposed of by land application either alone, or in combination with other wastes where an agronomic value has been determined and disposal has been approved by the reviewing authority.

9.5 "RED WATER" WASTE

Waste filter wash water from iron and manganese removal plants can be disposed of as follows:

9.5.1 Sand filters

Sand filters should have the following features:

a. Total filter area shall be sufficient to adequately dewater applied solids. Unless the filter is small enough to be cleaned and returned to service in one day, two or more cells are required.

b. The "red water" filter shall have sufficient capacity to contain, above the level of the sand, the entire volume of wash water produced by washing all of the production filters in the plant, unless the production filters are washed on a rotating schedule and the flow through the production filters is regulated by true rate of flow

controllers. Then sufficient volume shall be provided to properly dispose of the wash water involved.

c. Sufficient filter surface area should be provided so that, during any one filtration cycle, no more than two feet of backwash water will accumulate over the sand surface.

d. The filter shall not be subject to flooding by surface runoff or flood waters. Finished grade elevation shall be established to facilitate maintenance, cleaning and removal of surface sand as required. Flash boards or other non-watertight devices shall not be used in the construction of filter side walls.

e. The filter media should consist of a minimum of twelve inches of sand, three to four inches of supporting small gravel or torpedo sand, and nine inches of gravel in graded layers. All sand and gravel should be washed to remove fines.

f. Filter sand should have an effective size of 0.3 to 0.5 mm and a uniformity coefficient not to exceed 3.5. The use of larger sized sands shall be justified by the designing engineer to the satisfaction of the reviewing authority.

g. The filter should be provided with an adequate under-drainage collection system to permit satisfactory discharge of filtrate.

h. Provision shall be made for the sampling of the filter effluent.

i. Overflow devices from "red water" filters shall not be permitted.

j. Where freezing is a problem, provisions should be made for covering the filters during the winter months.

k. "Red water" filters shall comply with the common wall provisions contained in Sections 7.1.3 and 8.10.1, which pertain to the possibility of contaminating treated water with an unsafe water.

The reviewing authority must be contacted for approval of any arrangement where a separate structure is not provided.

9.5.2 Lagoons

Lagoons shall have the following features:

a. be designed with a volume 10 times the total quantity of wash water discharged during any 24-hour period,

b. a minimum usable depth of three feet,

c. length four times width, and the width at least three times the depth, as measured at the operating water level,

d. outlet to be at the end opposite the inlet,

e. a weir overflow device at the outlet end with weir length equal to or greater than depth,

f. velocity to be dissipated at the inlet end.

g. subsurface infiltration lagoons may be acceptable if approved by the reviewing authority.

9.5.3 Discharge to community sanitary sewer

Red water can be discharged to a community sewer. However, approval of this method will depend on obtaining approval from the owner of the sewerage system as well as from the regulatory agency before final designs are made. A holding tank is recommended to prevent overloading the sewers. Design shall prevent cross connections and there shall be no common walls between potable and non-potable water.

9.5.4 Recycling "red water" wastes

Recycling of supernatant or filtrate from "red water" waste treatment facilities to the head end of an iron removal plant shall not be allowed except as approved by the reviewing authority.

9.6 WASTE FILTER WASH WATER

Waste filter wash water from surface water treatment or lime softening plants should have suspended solids reduced to a level acceptable to the regulatory agency before being discharged. Many plants have constructed holding tanks and returned this water to the inlet end of the plant. The holding tank shall be of such a size that it will contain the anticipated volume of waste wash water produced by the plant when operating at design capacity. A plant that has two filters should have a holding tank that will contain the total waste wash water from both filters calculated by using a 15 minute wash at 20 gallons per minute per square foot. In plants with more filters, the size of the holding tank will depend on the anticipated hours of operation. It is recommended that waste filter wash water be returned at a rate of less than 10 percent of the instantaneous raw water flow rate entering the plant. Filter

backwash water should not be recycled when the raw water contains excessive algae, when finished water taste and odor problems are encountered, or when disinfection byproduct levels in the distribution system may exceed allowable levels. Particular attention must be given to the presence of protozoans such as *Giardia* and *Cryptosporidium* concentrating in the waste water stream. Water utilities may need to treat filter waste water prior to recycling or avoid reclaiming filter wash water given the increased risk to treated water quality.

9.7 RADIOACTIVE MATERIALS

Radioactive materials include, but are not limited to, granulated activated carbon (GAC) used for radon removal; ion-exchange regeneration waste from radium removal; and manganese greensand backwash solids from manganese removal systems, precipitative softening sludges, and reverse osmosis concentrates where radiological constituents are present. The buildup of radioactive decay products of radon shall be considered, and adequate shielding and safeguards shall be provided for operators and visitors. These materials may require disposal as radioactive waste in accordance with Nuclear Regulatory Commission regulations. Approval shall be obtained from the responsible regulatory agencies prior to disposal of all wastes.