SUPPLEMENT 3
APRIL 1982

INSTRUCTIONS FOR UPDATING YOUR ER

To update your copy of the Clinton Power Station - Units 1 and 2 Environmental Report - Operating License Stage, please remove and destroy the following pages and figures and insert the Supplement 3 pages and figures as indicated.

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VOLUME 1	
General Table of Contents/1-i	General Table of Contents and page 1-i
Page 2.2-1/2.2-2	Pages 2.2-1/2.2-1a and 2.2-2
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VOLUME 2	
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Figure 3.3-1	Figure 3.3-1
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At the end of Volume 2, place the Tab, Supplement 3, the transmittal letter and this instruction sheet for Supplement 3.

CLINTON POWER STATION - UNITS 1 AND 2

ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

GENERAL TABLE OF CONTENTS

CHAPTER 1 - PURPOSE OF THE PROPOSED FACILITY AND ASSOCIATED TRANSMISSION

TABLE OF CONTENTS

2.2 ECOLOGY

Baseline ecological data were gathered in 1972-1973 and this information was presented in Section 2.7 and Appendices 2C through 2F of the Environmental Report - Construction Permit Stage (CPS-ER) (Illinois Power 1973). In order to better characterize the ecology of the Clinton site before and during construction, this section presents a summary of the four years of monitoring that were conducted from May, 1974, through April, 1978, as described in Section 6.1. This time span represents the preconstruction and construction phases and the beginning of the lake filling and development phases. All monitoring activities were conducted by Hazleton Environmental Sciences Corporation of Northbrook, Illinois (formerly NALCO Environmental Sciences) and the complete documentation is presented in the Annual Reports detailing this monitoring (Industrial Bio-Test 1975 and NALCO 1976, 1977, 1978). Construction was begun in October 1975; thus, these data represent 1-1/2 years of preconstruction data and 2-1/2 years of data taken during construction and lake filling. A discussion of the effects of construction is presented in Chapter 4. Some preconstruction monitoring locations were not exactly the same as those used in the baseline study, but the data in this section are compared to those obtained in the baseline and prior years when appropriate.

2.2.1 Terrestrial Ecology

2.2.1.1 Flora

Data from five representative vegetation cover types and habitats were comparable to the data collected during the baseline study. No habitat type was found that was considered unique to central Illinois. However, the ginseng plant which is designated as "threatened" by the Illinois Department of Conservation (IDOC) (1980) has been recorded at the site. The Illinois Endangered Species Protection Act (P.A. 77-2186, effective October 1, 1972) prohibits the possessing, selling, giving, or disposing of any animal (or animal products) which is listed as endangered. No prohibitions are associated with threatened animals or plant species. Various plant species were identified to the genus level and several of these genera are also listed by the IDOC. No federally endangered or threatened plants listed are known to occur on the site.

The ginseng plant and other plant genera listed by the IDOC occur on lands covered by the lease agreement between IDOC and IP. These lands are not planned to be developed in relation to the Clinton Power Station. Thus, little or no impact is expected to occur on these plant communities resulting from the operation of the power station. Table 2.2-67 is a listing of the common and scientific names of the plant species found at the Clinton site during the monitoring period. The five sampled habitats are described in the following subsections.

2.2.1.1.1 Abandoned Pasture (Site 1)

This pasture was last grazed in 1971, and by July, 1974, natural succession had removed many signs of former grazing. (See Chapter 6 for sampling locations and frequencies). Table 2.2-1 shows the data summary of the 12 species found in the ground layer during sampling in July, 1974. The ground layer was dominated by Kentucky bluegrass (*Poa pratensis*) and timothy (*Phleum pratense*) and supported a relatively tall canopy of grasses and a dense ground layer. The pasture represented an intermediate stage of succession and woody seedlings will eventually dominate. All dominant species found during this 1974 sampling were also found during the baseline study and differences were largely attributable to natural successional development.

In May, 1975, the abandoned pasture was found to have the composition shown in Table 2.2-2. Of the 15 taxa present, Kentucky bluegrass again dominated and was the only species with 100% frequency. Woody seedlings showed successional advancement with relative frequencies less than 2%. Major differences between 1975 data and previous data were attributable to succession and seasonal variation.

In May, 1976, the abandoned pasture was found to have the composition shown in Table 2.2-3. Sixteen taxa were found, and the results indicated a post-grazing successional advancement since grazing had stopped there. Introduced weed species had largely disappeared, and Kentucky bluegrass and timothy were again dominant. A scattered ingrowth of shrub and tree species were present. However, there was little vegetational change between May, 1975, and May, 1976.

In May, 1977, 14 taxa were recorded at the abandoned pasture site. Composition is shown in Table 2.2-4, with Kentucky bluegrass, red sorrel (Rumex acetosella), and yarrow (Achillea millefolium) commonly occurring in the ground layer. Little vegetational change occurred in the ground layer between May, 1975, and May, 1977; the diversity of species in the ground layer in 1977 was less than during the 1972 baseline data collection. The overall trend was for an increase in importance of woody species between 1972 and 1977 with the development of a well-defined upper stratum of trees and shrubs as shown in Table 2.2-5.

2.2.1.1.2 Upland White Oak Woods (Site 2)

These woods are situated on a level upland terrain and showed evidence of selective logging and grazing. The composition of the overstory and understory in May, 1974, was as shown in Tables 2.2-6 and 2.2-7. The shrub stratum and ground layer composition are shown in Tables 2.2-8 and 2.2-9. The composition of dominant tree species in 1974 was similar to that found in the baseline study, with white oak (Quercus alba) dominant in the overstory and black cherry (Prunus serotina) most important in the understory. Ground layer composition was also similar to baseline data. This was the first sampling of the shrub stratum; it thus serves as baseline data. Variation in composition between 1974 and baseline were due to statistical sampling variability and natural successional development.

In May, 1975, the understory composition was again similar to that of the overstory (see Tables 2.2-10 and 2.2-11), with white oak and black cherry dominating. The shrub stratum and ground layer composition are shown in Tables 2.2-12 and 2.2-13. As expected, there was a high similarity in overstory composition between 1974 and 1975 data. Dominant species of the understory, shrub stratum, and ground layer were also similar in 1974 and 1975. However, minor components of these strata differed markedly, with differences attributable to variation in transect placement and the dynamics of the lower strata.

2.4.1.4.2 Lake Filling Analysis

A lake filling analysis was done, assuming filling to start in the month of October with an average runoff condition on Salt Creek. Filling of the lake to the normal pool elevation of 690 feet was estimated to take 7 months. The analysis was done based on a constant reservoir release of 5 cubic feet per second and a seepage loss of 0.5% of the lake capacity per month. Using runoff values for historic drought and 100-year drought conditions, the time to fill the lake was estimated at 31 and 34 months, respectively.

The main dam was closed on October 12, 1977, and lake filling was begun. By the end of December 1977, with reservoir releases varying from 40 to 130 cubic feet per second, the lake level was observed at elevation 683 feet. This is about 7 feet higher than the water level expected in the lake with the average runoff conditions used in the lake filling analysis. The runoff on Salt Creek during the months of October, November, and December of 1977 was greater than the average flow. The lake water level reached elevation 690 feet on May 17, 1978.

2.4.1.4.3 Flooding Conditions

The flood water surface elevations in the lake were determined by routing the floods through the lake using the "SPRAT" computer program (U.S. Army Corps of Engineers 1966). The once-in-100-year flood level in the lake at the dam site is elevation 697 feet. The routed peak outflow through the service spillway is 11,610 cubic feet per second. Based on the flood frequency analysis, the once-in-100-year flood flow at the dam site is 26,400 cubic feet per second. The magnitude of the flood flows downstream from the dam is reduced due to the flood absorption effect of the lake. The probable maximum flood level with an antecedent standard project flood is elevation 708.8 feet at the dam.

The flooding effects on the headwater area of the cooling lake were determined by backwater computations using the U. S. Corps of Engineers' computer program "Water Surface Profiles" (WASP) (U.S. Army Corps of Engineers 1968). Figures 2.4-9 and 2.4-10 show the water surface profiles of the 100-year flood and probable maximum flood under natural conditions both with and without the reservoir for Salt Creek and the North Fork of Salt Creek, respectively.

The backwater effect of a once-in-100 year flood in the lake terminates at the Township Road Bridge (Iron Bridge), 76,000 feet or 14.5 miles upstream from the dam and 1.5 miles southwest of Farmer City. Flooding in the lake does not affect the residential area of Farmer City. For the North Fork of Salt Creek, the backwater effect of a once-in-100-year flood in the lake terminates at 39,000 feet or 7.5 miles upstream from the dam. There are no residential areas along the North Fork of Salt

Creek. The once-in-100-year flood level was a criterion used in the property acquisition for the lake area. The power station is at a grade elevation of 736 feet and will not be affected by floods in the lake.

The Trenkle Slough Drainage District drains into a creek that joins Salt Creek 0.5 mile upstream from the Iron Bridge. The Salt Creek channel from the Iron Bridge to the mouth of the Trenkle Slough was widened to improve the drainage conditions in the Trenkle Slough area and to avoid any adverse effect. Reported results of this channel widening were studied by M&E/Alstot, March & Guillou, Inc., 3180 Adloff Lane, Springfield, Illinois, 62703. The final report "Upper Salt Creek Drainage Program Clinton Power Station" dated July 1981, addresses the upper Salt Creek drainage concern. The following conclusion was reached in the report.

"Principal results of the five year gaging program, three years in the pre-construction phase and two years in the post-construction phase, are summarized as follows:

1. Information provided in Sections "B" and "C" contained in this report specifically shows that the channel improvements and the maintenance of reservoir levels have, for rates of stream flow which occurred in the five year period, had the following results:

   a. On Salt Creek in the vicinity of the Iron Bridge gaging station, the elevation of flood flows has been reduced from a small amount to as much as 1.2 feet. In no case is there evidence that the Clinton Reservoir has increased flood levels.

   b. On Trenkle Slough, the channel improvements completed at no expense to the Trenkle Slough Drainage District, have resulted in a general lowering of water surface elevations, and at high flows the amount of lowering of the water surface exceeds two feet.

   c. On Salt Creek, in the vicinity of Farmer City, the elevation of the flood flows has been reduced between 2.5 and 4.0 feet, with the larger number pertaining to the higher flood flows. In no case is there evidence that the Clinton Reservoir has increased flood levels.

2. The work performed under the agreement dated December 2, 1976 between Illinois Power Company and Trenkle Slough Special Drainage District has accomplished its stated objectives in improving the efficiency of the District's drainage system and offsetting any possible adverse effects of the Clinton Reservoir thereon."

Figure 2.4-10A shows the once-in-100-year flood prone area that would exist in the vicinity of Clinton Power Station without Lake Clinton in place (preconstruction flood prone area), as outlined by the US.S Geological Survey (1974). This flood prone area is along Salt Creek and the North Fork of Salt Creek. A review of maps prepared by the Federal Emergency Management Agency of the U.S. Department of Housing and Urban Development indicates that there is no flood prone area in the vicinity of the station other than that shown in Figure 2.4-10A. Figure 2.4-10B shows the property line of the Clinton Power Station site compared to the preconstruction flood prone area. As can be seen, the property line encloses the flood prone area.

Impounding Salt Creek and the North Fork of the Salt Creek to form Lake Clinton altered natural flood levels. Figure 2.4-10C shows the preconstruction flood prone area, the property line, and the once-in-100-year flooded area with Lake Clinton in place. The details of the determination of the once-in-100-year flood elevation with the lake in place are given earlier in this subsection. Figure 2.4-10C shows that the once-in-100-year flooded area with Lake Clinton in place is well within the station property line. Beyond the property line, in the upper reaches of Salt Creek and the North Fork of Salt Creek, the lake does not increase the flooded area as compared to the preconstruction once-in-100-year flood. Flood flows downstream of the Lake Clinton dam are lowered compared to preconstruction flood flows; hence, the once-in-100-year flood levels are lower.

No station structures were built in the preconstruction once-in-100-year flood prone area except for the dam that was built across Salt Creek to create Lake Clinton. Obviously, there was no alternative location for the dam outside of the flood prone area. Several structures have been built along the edges of the post-construction flood prone area (with Lake Clinton in place). These include the intake and discharge structures, modified highway bridges, a marina, and seven boat ramps. Again, there were no feasible locations for these structures outside of the flood prone area. Construction of these structures is complete, and their presence will not cause any alteration in flood levels that would extend beyond the site property lines. There will be no effect on downstream facilities of debris generated from the site during floods.

2.4.1.4.4 Effects of Drought

A design drought with a recurrence interval of 100 years was used in the determination of minimum water level in the cooling lake. The once-in-100-year drought runoff data with a duration up to 60 months are given in Table 2.4-8. Net lake evaporation values for a 100-year recurrence interval are given in Table 2.4-9. The average monthly forced evaporation data are given in Table 2.4-10.

Lake drawdown analyses were made starting at a normal pool elevation of 690 feet, using a minimum reservoir release of 5 cubic feet per second and assuming a seepage loss of 0.5% of the lake capacity per month. The minimum water level obtained for the once-in-100-year drought is elevation 681.1 feet based on forced evaporation data and load factors given in Table 2.4-10. The plant will be able to withstand the effect of the once-in-100-year drought without interruption of normal operations.

Similarly, the effect of the historic drought on the lake was analyzed using precipitation and evaporation values obtained from the U.S. Department of Commerce (U.S. Department of Commerce 1943-1977). The water level in the lake for a historic drought condition is elevation 684.1 feet.

In the event of a drought more severe than the once-in-100-year drought that will lower the lake level to elevation 677 feet, the ultimate heat sink will supply water for the emergency core cooling system.

2.4.1.4.5 Lake Sedimentation

Studies were made on sediment distribution and deposition in the lake to determine the effect on the lake capacity, depth, and shoreline area. On Salt Creek near Rowell, an average turbidity of 16 parts per million and a discharge of 0.35 cubic feet per second per square mile were observed from 1950 to 1956 (see

2.6 REGIONAL HISTORIC, ARCHAEOLOGICAL, ARCHITECTURAL, SCENIC, CULTURAL, AND NATURAL FEATURES

The history of the region that includes the Clinton Power Station (CPS) is described in Section 2.3 of the Environmental Report - Construction Permit Stage (CPS-ER).

The site is located in the south-central portion of what once was a huge prairie zone and now is the core of the midwest's agricultural heartland. The prevailing landscape is flat from horizon to horizon, punctuated only by the tree cover introduced by man or occurring naturally along stream courses and drainageways. Streams are generally small, meandering, and unnavigable except by small boat or canoe. Notwithstanding their size, these waterways provide the highest quality outdoor recreation because of the contrast they present to the dominant open, flat terrain.

The counties to the south and west of this historic prairie zone are the areas of highest recreational potential in the state because of their more varied and aesthetically pleasing landscape. To the north are the areas of highest population. This urbanized region is noticeably lacking in adequate existing recreational space, and more importantly, the potential of acquiring additional suitable land to meet the ever-increasing demand.

Other than Weldon Springs State Park, the facilities that serve the more than 1.5 million people within a 30-minute drive of the CPS site are a handful of state parks and monuments and two small reservoirs, Lake Bloomington and Lake Decatur.

The CPS site is not visible from these facilities, nor do transmission line rights-of-way from CPS pass near them.

Also discussed in Section 2.3 of the CPS-ER were several local historic structures formerly on the CPS site. These included Valley Mill, and old grist mill, located on the North Fork of Salt Creek, and eight iron bridges (built circa 1870) that traverse Salt Creek and the North Fork of Salt Creek.

The Valley Mill, one of the few grist mills remaining in Illinois, was to have been relocated in cooperation with the DeWitt County Museum Association. Unfortunately, the mill was vandalized and burned before relocation could be accomplished.

None of the eight bridges discussed in Section 2.3 of the CPS-ER were relocated as originally considered since the Township Road Commissioners retained possession of all of these bridges. One of these bridges still remains and has a posted 3 ton weight limit. Another bridge was replaced in an action not associated with plant construction. The other six bridges were retained by the townships for salvage purposes. The initial archaeological survey of the CPS site was made in 1973 to satisfy requirements for the CPS-ER. The survey was done under the supervision of the Illinois State Museum (See Appendix 2.6A).

A total of 132 sites were located on Approximately 15,000 acres surveyed. Of these 132 sites, there were several signficant enough to require subsurface investigation. Since 10 of these more important sites were to be inundated by water, it was suggested that Illinois Power Company (IP) finance the subsurface investigation of these 10 sites.

Subsurface studies were done in a 10-week field investigation in 1974, and 9 of the 10 sites were categorized as insignificant. The tenth site, designated the Pabst site was recommended to be placed on the National Register of Historic Places and was accepted on April 30, 1975. Since this site was below the proposed level of Lake Clinton, IP financed the retrieval of any material considered important. An archaeological team consisting of one archaeologist and 10 students collected artifacts from this site.

The materials recovered are exhibited at the Illinois State Museum and are available for further study by institutions. The archaeologist's report of this investigation is included in Appendix 2.6B. There are no other sites in DeWitt County that are on either the Registry of National Landmarks or the National Register of Historic Places.

3.3 STATION WATER USE

Clinton Power Station Units 1 and 2 require water for the circulating water, service water, potable water, and make-up water treatment systems. Figure 3.3-1 shows the estimated quantities of water required for these purposes. The source of water for these systems is the cooling lake, Lake Clinton.

3.3.1 Circulating Water System

Condenser cooling water is supplied from Lake Clinton by three pumps per unit with capacities of 205,000 gal/min each (at a water elevation of 690 ft. MSL). Approximately 4 mg/liter of chlorine is injected upstream of the condenser three times per day for approximately 30-minute periods to prevent buildup of biological growths in the condenser. Heated water exiting the condenser is routed to Lake Clinton via a 3.4-mile-long open flume (see Section 3.4.3). The lake circulation pattern is clockwise from the discharge structure on the Salt Creek arm to the intake structure on the North Fork of Salt Creek branch.

Anticipated losses for the proposed circulating water system will be from evaporation, seepage, overflow, and a guaranteed downstream release of 5 cfs. These losses will be replenished by makeup from Salt Creek and the North Fork of Salt Creek and from normal runoff and precipitation from the drainage area upstream of the dam.

3.3.2 Service Water System

Certain auxiliary equipment heat exchangers, exclusive of the main condenser, require service water for cooling. Two service water systems provided for the station are the plant service water system and the essential shutdown service water system.

3.3.2.1 Essential Shutdown Service Water System

The essential service water system supplies water to cool safety-related equipment such as diesel-generator coolers, residual heat removal heat exchangers, and other equipment necessary for a safe shutdown of the reactor. Each unit has water provided by three full-size pumps, two having 16,500 gal/min capacities each and one having a 1100 gal/min capacity and are located within the circulating water screen house. The pumps take suction from the water intake area below the pump supporting floor. The source of water is the ultimate heat sink. After passing through traveling screens into the water intake area, the water is pumped through all necessary cooling heat exchangers and then discharged back to the ultimate heat sink.

3.3.2.2 Station Service Water System

The station service water system supplies water to cool equipment (such as the turbine oil coolers, generator coolers, and component cooling heat exchangers) that is not safety-related or essential for the safe shutdown of the reactor. Service water is supplied by six pumps (two pumps operational and one spare per unit) housed in the intake structure. The pumps maintain a maximum flow rate of about 44,000 gal/min to each unit. Water from the cooling lake is chlorinated before entering the service water system, with the service water system's take-off common to the water treatment system. Service water is routed back to Lake Clinton via the circulating water discharge flume.

3.3.3 Potable Water System

The station potable water treating system supplies water for drinking and sanitary purposes. Potable water requirements are provided by prechlorinated and pretreated lake water stored in the filtered water storage tank. The effluent from the potable water system is routed to the sewage treatment system and returned to Lake Clinton via the circulating water discharge flume.

3.3.4 Water Treatment System

High-quality water is required for the steam-cycle makeup. The water treatment system consists of pretreatment, demineralization and condensate polishing equipment. Makeup water is provided by Lake Clinton, and all regenerative wastes are routed back to the lake via the waste treatment system.

3.3.4.1 Steam Cycle Makeup System

The steam cycle makeup system pretreats and demineralizes cooling lake water for the supply of feedwater makeup. During pretreatment, raw water from Lake Clinton is prechlorinated, retained in a retention tank (for chemical reaction), and premixed with alum or sodium aluminate, and coagulant aid in a premix tank before being routed through lime softening equipment. Lime is added to the water in two parallel lime softening units (each normally operating at 50% capacity) and allowed to interact in the clearwell. Water is then pumped through three parallel pressure sand filters to a filtered water storage tank. This pretreatment system handles a flow of about 500 gpm, of which 150 gpm is available for the potable water system. The rest of the water flows through three parallel carbon filters to the demineralizer.

During demineralization, pretreated water passes through two parallel demineralizer trains, each consisting of the following four vessels (in order): one strong acid cation vessel, one weak base anion vessel, one strong base anion vessel and one mixed bed vessel. Each makeup demineralizer train has an average daily capacity of 165 gpm or a minimum net capacity of 237,600 gal/day.

3.3.4.2 Condensate Polishing System

Circulating water leakages can alter the chemistry of the water entering the reactor to a point that is unacceptable. To maintain acceptable water quality, each unit has eight condensate polishing (mixed bed) vessels operating continuously, and one spare vessel. During normal operation, the condensate polishing system will handle a flow rate of 26,000 gpm per unit.

3.3.4.3 Wastewater Treatment System

The wastewater treatment system receives and processes wastes from the pretreatment and demineralization equipment that result from backwashing, rinsing, blowdown, and resin regeneration.

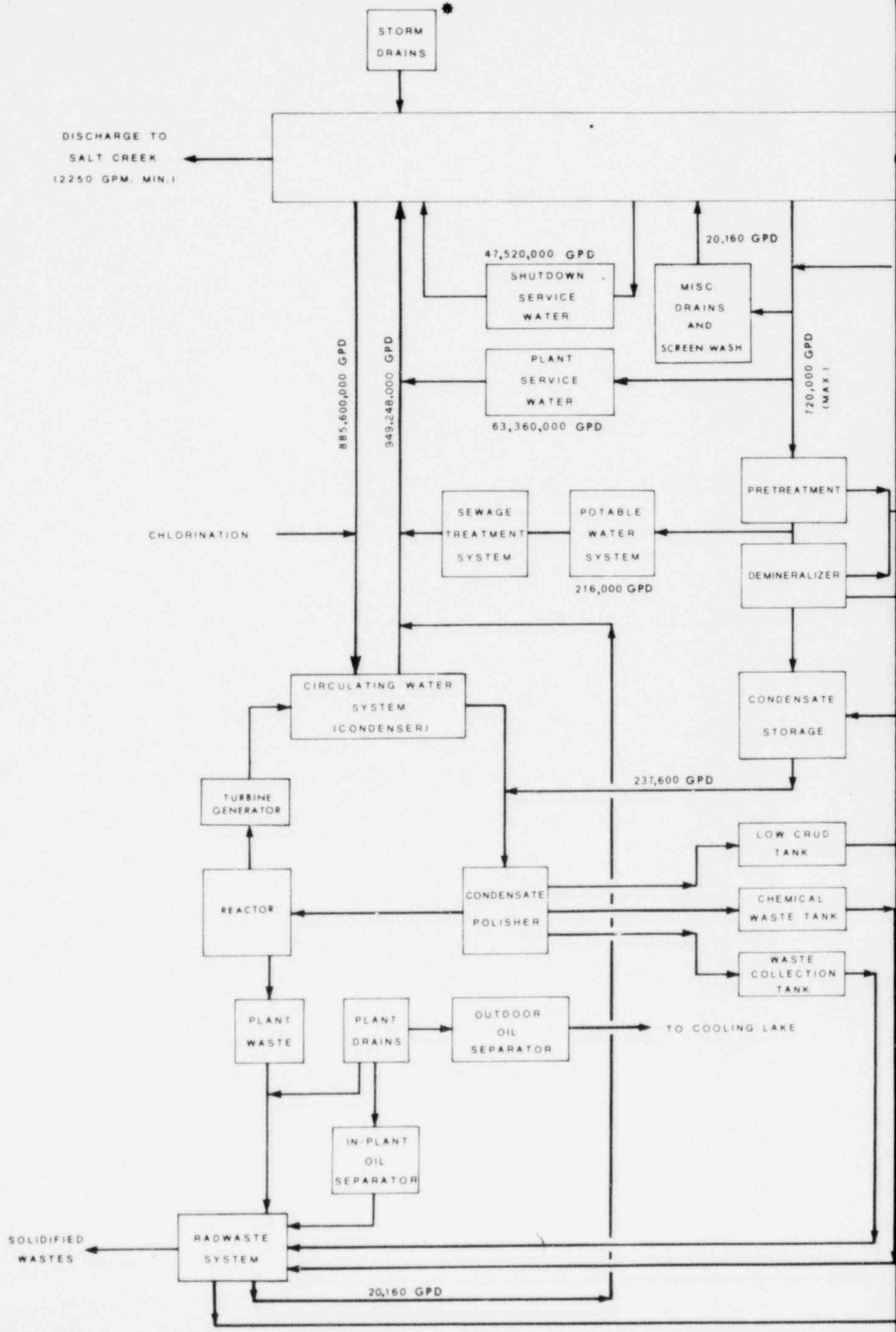
Sand and carbon filters (pretreatment equipment) require backwashing once per day with filtered water from the filtered water storage tank. The sand filters are backwashed for 10 minutes per day at a flow rate of 550 gpm. The carbon filters are backwashed for 10 minutes per day at a flow rate of 300 gpm.

Lime softening units (two per unit) require intermittent sludge blowdown for 4 minutes every 20 minutes of operation at 50 gpm.

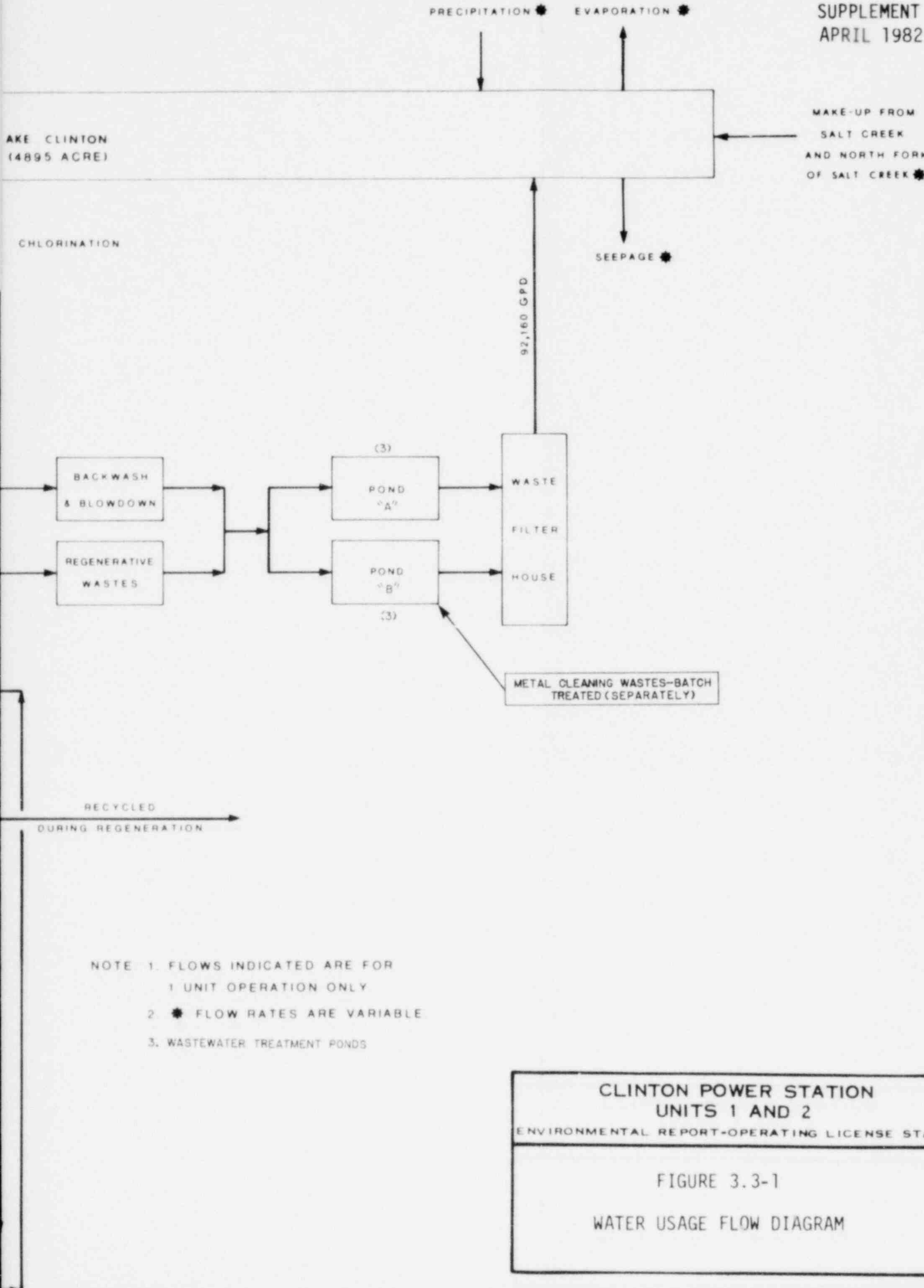
Demineralization exhausts the capability of the ion exchange resins to remove anions and cations. After an estimated 238,000 gallons of water have passed through each demineralizer train, the resins require regeneration. Regeneration of the primary train (cation and anion vessels) occurs once daily, and regeneration of the mixed bed vessel occurs once every 2 weeks. Regenerative wastes total 850 lbs of 98% H_2SO_4 and 413 pounds of 100% NaOH per unit, with a maximum possible wastewater flow rate of 205 gpm from each primary train and 100 gpm from the mixed bed units. A total of 39,930 gallons (per train including the mixed bed) of wastewater results from each regeneration.

Two existing wastewater treatment ponds, which are divided by a dike, are provided for the removal of suspended solids in the waste streams. These ponds accept clarifier underflow and makeup demineralizer ion exchange system regenerant waste. Filtration is provided in the filter house, and the effluent is discharged to Lake Clinton. Backwash water from these filters is routed back to the wastewater treatment ponds.

Regeneration of the mixed bed condensate polisher vessels is required approximately once every 7 days based on normal operation. Regeneration requires the use of 1300 pounds of 93% H_2SO_4, 715 pounds of 100% NaOH, and 34,200 gallons of demineralized water and produces 29,725 gallons of low-conductivity, high-crud waste; 11,800 gallons of low conductivity, low-crud waste; and 10,725 gallons of high conductivity wastes. These wastes are neutralized and then processed by the radwaste system for the removal of solid wastes. The low-crud, low conductivity waste water is recoverable and is intended for reuse during subsequent regenerations.



STORM DRAINS
DISCHARGE TO SALT CREEK (2250 GPM. MIN.)
47,520,000 GPD
SHUTDOWN SERVICE WATER
20,160 GPD
MISC. DRAINS AND SCREEN WASH
885,600,000 GPD
949,248,000 GPD
PLANT SERVICE WATER
63,360,000 GPD
720,000 GPD (MAX.)
PRETREATMENT
CHLORINATION
SEWAGE TREATMENT SYSTEM
POTABLE WATER SYSTEM
216,000 GPD
DEMINERALIZER
CIRCULATING WATER SYSTEM (CONDENSER)
CONDENSATE STORAGE
237,600 GPD
TURBINE GENERATOR
LOW CRUD TANK
REACTOR
CONDENSATE POLISHER
CHEMICAL WASTE TANK
WASTE COLLECTION TANK
PLANT WASTE
PLANT DRAINS
OUTDOOR OIL SEPARATOR
TO COOLING LAKE
IN-PLANT OIL SEPARATOR
SOLIDIFIED WASTES
RADWASTE SYSTEM
20,160 GPD



CLINTON POWER STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT-OPERATING LICENSE STAGE

FIGURE 3.3-1

WATER USAGE FLOW DIAGRAM

3.6 CHEMICAL AND BIOCIDE WASTES

The source of makeup water for the Clinton Power Station Units 1 and 2 is the cooling lake (Lake Clinton). A flow diagram illustrating station water use is shown in Figure 3.3-1. A list of chemicals used at the station is given in Table 3.6-1. The chemical additions to the cooling lake resulting from station operation will be the waste solution resulting from regeneration of the makeup demineralizers and any remaining traces of free or combined chlorine resulting from its use as a biocide to control slime formation in the condensers, service water system, and sewage treatment system (see Section 3.3). All chemical and biocide discharges to Lake Clinton will meet the requirements set forth in 40 CFR 423. Any excess water discharged from the liquid radwaste system will be of high chemical purity. Laundry waste water is recovered and recycled through the laundry filters and then to the chemical waste collecting tanks. From there the waste water is processed by evaporation in one of the radwaste evaporators.

3.6.1 Cooling Water Systems

3.6.1.1 Circulating Water System

Condenser cooling water is supplied by the cooling lake. The chemical composition of the intake water is described in Section 2.2. Biological growths and slime buildup in the main condensers will be chemically controlled by periodic treatment of the intake water with chlorine. Chlorine gas will be dissolved in water and injected into the cooling water stream ahead of each condenser. Each condenser will receive a 20- to 30-minute treatment two to three times daily. The chlorination schedule will be staggered so that the two condensers are not treated simultaneously.

In order to be effective, the free chlorine concentration in the condenser during treatment will be in the range of 0.5 to 1.0 mg/liter. The addition of chlorine at an average rate of about 4 mg/liter (5.3 mg/liter maximum) will be required (due to rapid reaction of free chlorine with reducing substances in the water) to leave a biocidally effective concentration at the inlet to the condensers. Transit time through the condensers is approximately 10.8 seconds. The free chlorine residual will be reduced to approximately 0.1 mg/liter at the condenser outlet. Free chlorine residual will be monitored during chlorination and the rate of chlorine addition will be controlled manually to maintain the required level.

Water from the condenser will be mixed during treatment in the discharge flume with untreated circulating water from the other unit. The chlorine demand of the untreated water will reduce the free chlorine content to an undectable level during the 3.9 hour travel time to the cooling lake. Total residual chlorine (free chlc ine plus combined chlorine) will be monitored at the discharge to Lake Clinton during chlorination to comply with the proposed conditions of the NPDES permit.

A shutdown of one unit will not significantly affect the total chlorine residual entering the ooling lake. Aeration from the supplemental cooling system during the summer months, the 3.9 hour transit time, and aeration over the two drop structures (see Section 3.4) will limit the concentration of free chlorine and should ensure that the total chlorine residual will be within limits to be prescribed in the National Pollutant Discharge Elimination System (NPDES) permit.

3.6.1.2 <u>Service Water System</u>

Service water (shutdown and plant service water) will also be chlorinated for slime control in the same manner as condenser cooling water in order to limit the free residual chlorine level to a maximum of 0.1 mg/liter at the discharge and comply with the proposed conditions of the NPDES permit. After mixing with the condenser discharge, the contribution of residual chlorine will be in trace amounts and will be further reduced in the discharge flume.

3.6.2 <u>Makeup Water Treatment System</u>

The makeup water supply for the steam cycle and for other station uses requirng high purity water will be independent of the cooling water system, but the makeup water will be obtained from the cooling lake. The makeup water will be purified by chlorination, lime softening, filtration, and demineralization (see Section3.3).

The makeup filter subsystem consists of three fine-sand filteres and three carbon filters. All filters are backwashed once a day with water from the filtered water storage tank. The sand filters are backwashed for 10 minutes at 550 gallons per minute. The carbon filters are backwashed for 10 minutes at 300 gallons per minute.

The discharge from the backwashing operations is routed to one of two wastewater treatment ponds.

The two redundant filter trains have a total of 8 demineralizers. Each train has a strong acid cation, weak base anion, strong base anion, and a mixed bed demineralizer.

During the water treatment processes, chemical regeneration of the ion exchange resins will be necessary. Sulfuric acid (66°Be H_2SO_4) and caustic soda (NaOH) will be used to regenerate these resins.

Regenerative wastes, clarifier underflow, and filter backwash water will be routed to one of the two wastewater treatment ponds.

The regeneration frequency and amount of wastewater per regeneration of the makeup demineralizers is shown on Table 3.6-2. The amount of chemicals discharged to waste per regeneration is shown on Table 3.6-3.

Chemical regeneration of the condensate polishing system will be required every 7 days during normal operation. The regeneration process will use 1300 pounds of 93% H_2SO_4 and 715 pounds of 100% NaOH and produce 29,725 gallons of low-conductivity, high-crud waste, 11,800 gallons of low conductivity, low-crud waste, and 10,725 gallons of high conductivity wastes. Condensate polishing system regeneration wastes will be neutralized and processed by the radwaste system for the removal of solid wastes. The low-crud, low-conductivity wastewater will be recoverable for reuse during subsequent regenerations. High-conductivity wastes containing approximately 5% total dissolved solids by weight will be transferred to the chemical waste storage tank before being evaporated, solidified, and sent to offsite burial.

3.6.3 Potable Water System

The volume of water used for drinking and sanitary purposes will be small in comparison with that used for other station water purposes. All potable water system wastes will be treated by the sewage treatment system described in Section 3.7. The effluent will be continuously chlorinated and the amount of chlorine will be controlled and monitored according to the limitations set forth in the NPDES permit.

3.6.4 Wastewater Effleunt Treatment Facility

The filter house and pH treatment facility contains the equipment shown in Figure 3.6-1. Figure 3.6-2 provides a flow diagram of the entire wastewater effluent treatment facility.

Wastewater from the makeup water pretreatment and demineralizer systems, specifically lime softener sludge blowdowns, filter backwashes, and demineralizer regenerant wastes, will flow to one of the two wastewater treatment ponds. Effluent from the wastewater treatment ponds will be pumped to the filter treatment house where the wastewater will be chemically neutralized, if required to meet applicable standards, by addition of acid or caustic through respective feed systems. The neutralized wastewater will flow through two sand filters arranged in parallel and then into Lake Clinton. If needed, a coagulant aid will be added to the wastewater upstream of the sand filters to improve filtration of the suspended solids.

A portion of the sand filter effluent will be drawn off to provide dilution water for the acid and caustic feed systems, and to fill a backwash water storage tank. The water from this storage tank will be used to backwash the sand filters. The sand filters are interlocked to prevent simultaneous backwashing of the filters. During the backwashing sequence compressed air will be used for scouring the filters.

If the quality of the wastewater does not meet effleunt limitations for pH, provisions have been made for routing the sand filter effluent back to a wastewater treatment pond.

When the sludge layer in one wastewater treatment pond builds up to a maximum allowable level, the wastewater from the pretreatment and demineralizer systems will be directed to the other pond. The sludge layer in the full pond will then be dredged and disposed of in an acceptable manner.

The wastewater treatment ponds will normally be utilized on an individual basis. If the need arises to operate with both ponds, they will be utilized in parallel or in series depending on circumstances. Temporarily, while the plant is under construction, the wastewater treatment ponds are being utilized as separate units. The hydrolazer preoperational pipe joint rinse waters are routed to pond B and batch treated as shown in Figure 3.6-2. The other wastewaters are routed to pond A and treated as specified. Following the completion of construction, the wastewater treatment ponds will revert to the original procedure. Intermittently, at approximate 5 to 7 year intervals, pond B will be used to treat operational metal cleaning wastewater resulting from the acid-cleansing of the condenser tubes. Nevertheless, at all times, the ponds and filter house equipment will be operated as required to meet the metal cleaning waste limitations contained within the extended NPDES permit. These requirements are indicated below:

Preoperational Metal Cleaning Wastes

Characteristic	Monitor	NPDES Max. Limits
Flow (MGD)	Daily	No Limit
Total suspended solids	Daily	15 PPM
Total iron	Daily	1 PPM
Total copper	Daily	1 PPM
Total zinc	Daily	1 PPM
*Total phosphorous (as P)	Daily	1 PPM
*Ammonia (as N)	Daily	0.02 PPM
Oil and grease	Daily	15 PPM
*BOD (5)	Daily	4 PPM
pH (separate discharge only)	Daily	9 (6-minimum)

*not included in the new proposed NPDES permit

Each batch of metal cleaning wastewater must be sampled prior to mixing. Therefore, the sampling occurs before it mixes with the other wastewater or discharges to Lake Clinton. The pH limit would not apply when all the streams mix since the aggregate effluent would have to meet the limits for the Treatment Works presented in this subsection. There shall be no discharge of floating solids or visible foam in other than trace amounts.

An estimate of the sludge rate (excluding preoperational metal cleaning wastes) entering one of the wastewater treatment ponds is shown in Table 3.6-4. The estimated chemical composition of the wastewater treatment pond effluent is shown in Table 3.6-5, along with the applicable NPDES effluent limitations (for low-volume wastes) and state effluent and water quality standards. Wastewater processed through this wastewater treatment system will meet the NPDES permit effluent limitations and monitoring requirements. The effluent standards in the existing NPDES permit are the following:

Effluent From Treatment Works
(includes all waste streams)

Characteristic	Monitor	NPDES Max. Limits
Flow (MGD)	Weekly	No limit
Total suspended solids	Weekly	15 PPM
Oil and grease	Monthly	15 PPM
pH	Weekly	9 (6-minimum)

There shall be no floating solids or visible foam in other than trace amounts.

3.6.5 Total Dissolved Solids in the cooling Lake

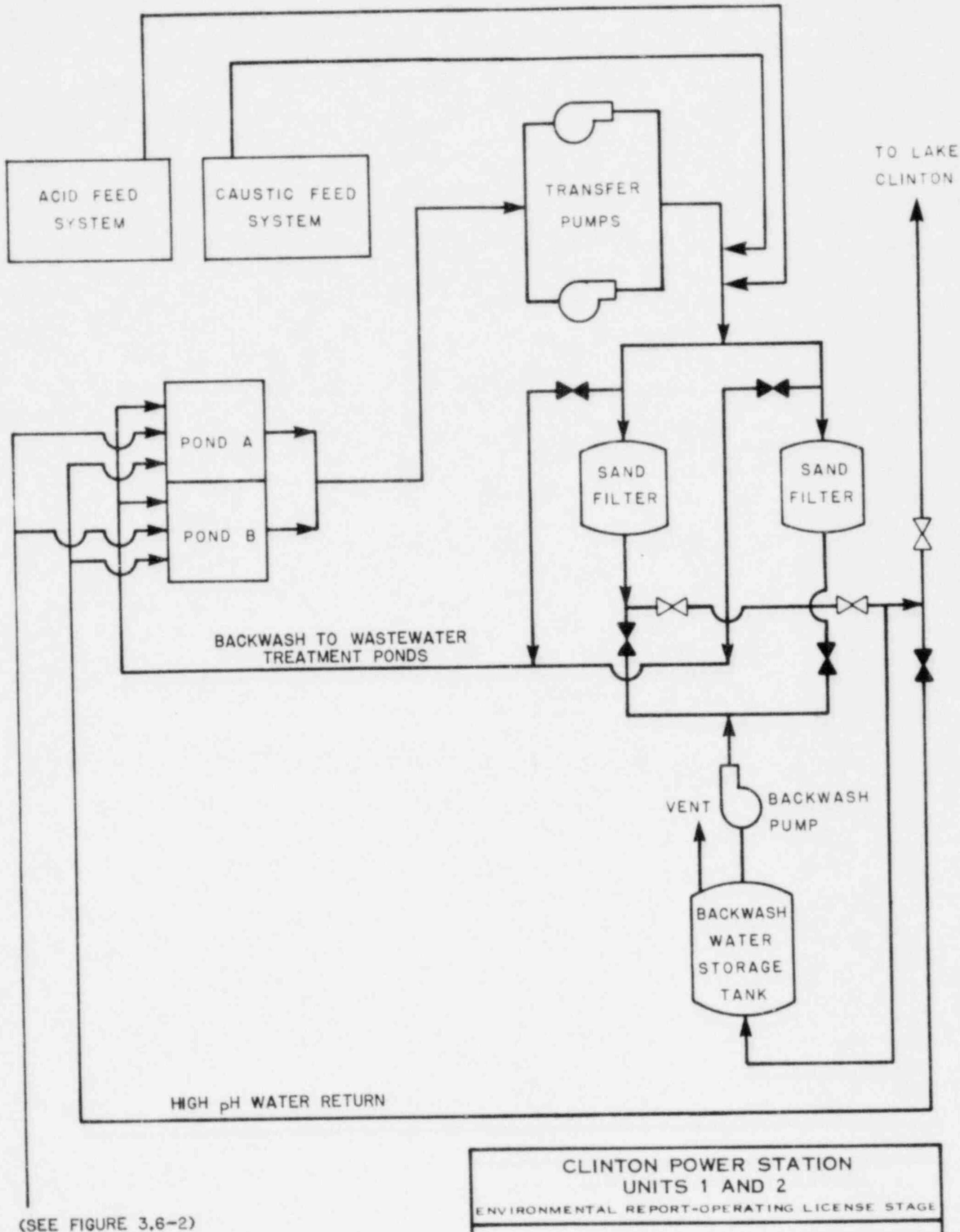
The evaporation of water from the surface of the cooling lake will lead to an increased concentration of total dissolved solids (TDS). The buildup of TDS in the cooling lake was discussed in Subsection 5.1.7.2 of the Environmetnal Report - Construction Permit Stage, and the effects of this buildup are discussed in Subsection 5.1.2 of this report.

TABLE 3.6-1

CHEMICALS STORED ON SITE

CHEMICAL	QUANTITY	LOCATION OF POTENTIALLY HAZARDOUS CHEMICALS[a]
Caustic (Sodium Hydroxide) (50% Solution)	10,000 gal	Radwaste Bldg. El. 702 feet
Sulfuric Acid (96% Solution)	10,000 gal	Radwaste Bldg. El. 702 feet
Chlorine	32 tons (two tank cars)	Yard
Alum (aluminum sulfate)	5,000 gal	
Polyelectrolite (Proprietary)	165 gal	
Lime, (Calcium Hydroxide)	2,600 ft^3	
Calcium Hypochlorite	500 lb	
Trisodium Phosphate	1,000 lb	
Disodium Phosphate	1,000 lb	
Sodium Nitrate	500 lb	
Hydrazine	110 gal	
Fuel Oil	136,800 gal	Diesel Generator Bldg.
Lubrication Oil	42,000 gal	{Radwaste Bldg. El. 737 feet, 30,000 gal {Turbine Bldg. El. 762 feet, 12,000 gal
Glycol (ethylene glycol)	1,000 gal	
Hydrogen	73,000 ft^3	Yard
Carbon Dioxide	20,000 lb (two tanks)	
Acetylene	3,000 ft^3 (20 tanks)	Radwaste Bldg. El. 737 feet
Oxygen	6,000 ft^3 (20 tanks)	
Nitrogen	11,300 ft^3 (50 tanks)	
Argon	9,000 ft^3 (30 tanks)	

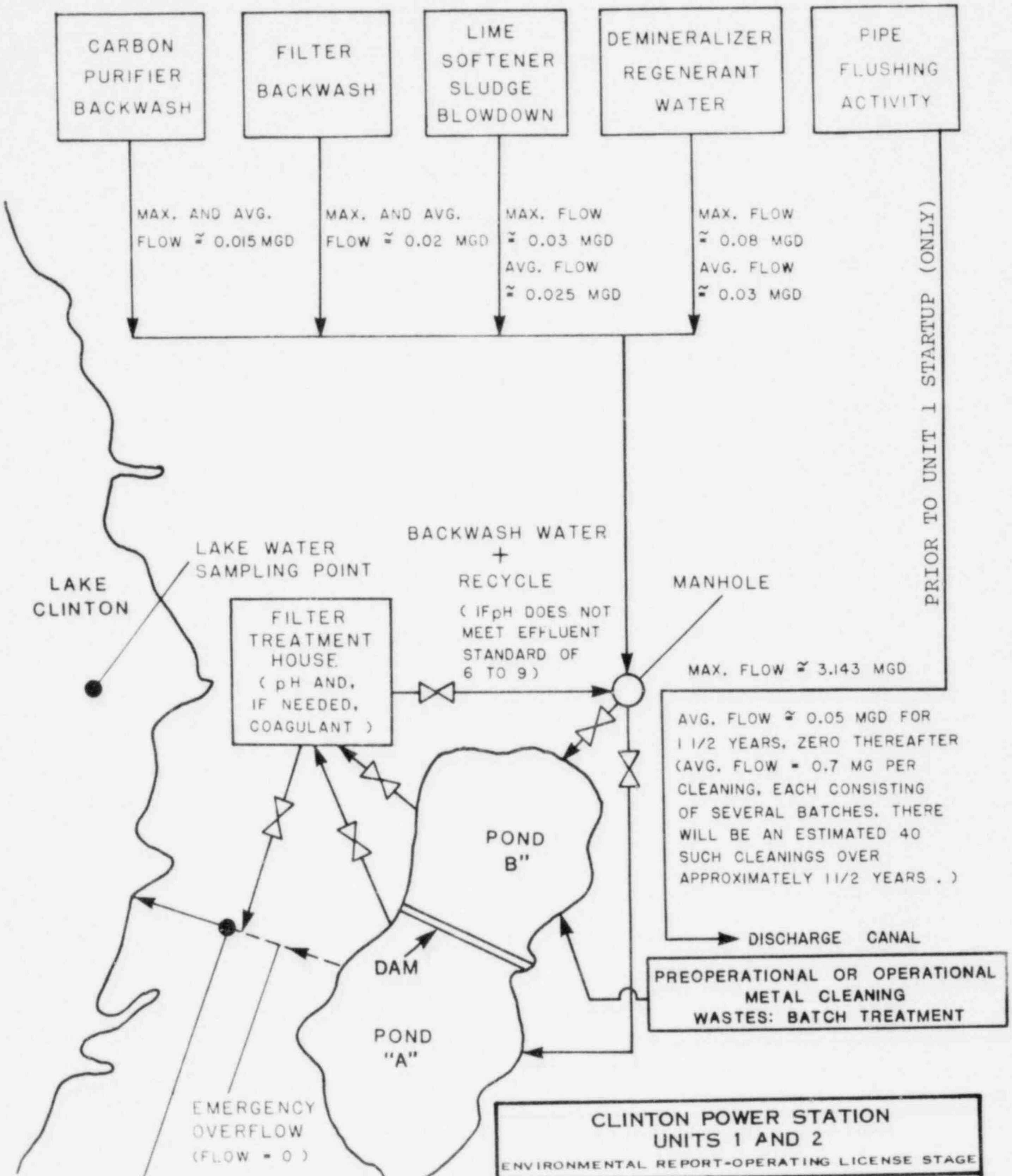
[a] No location indicates that the chemical is not considered hazardous.



CLINTON POWER STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT-OPERATING LICENSE STAGE

FIGURE 3.6-1

WASTEWATER TREATMENT EQUIPMENT



CLINTON POWER STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT-OPERATING LICENSE STAGE

FIGURE 3.6-2

FLOW DIAGRAM OF WASTEWATER EFFLUENT TREATMENT FACILITY FOR ONE UNIT ONLY

3.7 SANITARY AND OTHER WASTE SYSTEMS

3.7.1 Sanitary Waste System

The sanitary wastes are collected by conventional means and discharged into a sewage treatment plant located on the Clinton Power Station (CPS) site. The treatment plant is capable of two modes of operation: a temporary mode for the construction stage and a permanent mode for use when the station becomes operational.

During the early stages of the CPS construction effort, the sewage treatment plant was operated as a contact stabilization unit capable of treating a maximum waste flow of 37,500 gallons per day. When the inlet flow was not high enough for this mode of operation, extended aeration was used. The treated effluent was indirectly discharged into Lake Clinton via a small retention pond and drainage through a ravine to the lake.

The sewage treatment plant is now capable of treating a maximum flow of 42,500 gallons per day. The increased capacity is due to the 1981 installation of two equalization tanks and four blowers and the conversion of the original equalization tank into an aeration tank. The sewage treatment plant, which is in its permanent mode of operation, is an extended aeration plant. In this mode, the design capacity can adequately treat the expected waste flow from the permanent station personnel for one-unit operation, which is 12,500 gallons per day. The effluent will continue to be indirectly discharged into Lake Clinton via the circulating water discharge flume.

The effluent from both modes of operation receives tertiary treatment consisting of presettling, filtration, and chlorination. Chlorination of the tertiary effluent is done for purposes of disinfection. Gaseous chlorine is injected intermittently by means of a timed chlorination to maintain a proper chlorine residual. This amount is carefully measured, controlled, and monitored.

Following some erratic operating problems associated with the installation of the facility, the sanitary waste stream was stabilized. An extensive sewer pipe lining program was completed to minimize storm water infiltration. An issued Illinois EPA construction permit allowed the modifications made to the sanitary plant in 1981, thus enabling compliance with the National Pollutant Discharge Elimination System (NPDES) Permit No. IL0036919 requirements. Although the NPDES permit was scheduled for expiration on July 31, 1980, it has been extended until the new draft permit is approved. The final effluent from the sanitary treatment plant must meet a daily average of 10 mg/l BOD_5 (the 5 day biochemical oxygen demand) and 12 mg/l of TSS (total suspended solids). The daily maximum allowed for each parameter is 45 mg/l. The total residual chlorine is maintained as low as practical to keep the fecal coliforms below the 400 counts per 100 ml maximum concentration limit specified in the extended permit.

When the permit is revised, which is expected by January 1983, the limits for TSS and BOD(5) will be raised to 30 mg/l due to mixing and dilution provided in the flume. Adherence to the effluent limitations and monitoring requirements of the Federal Water Pollution Control Act of 1972, the Clean Water Act of 1977, and the Illinois Pollution Control Board's Chapter 3 rules and regulations for water pollution control will continue.

3.7.2 Waste Water Treatment Facility

For a description of the Waste Water Treatment Facility, see 3.6.4.

3.7.3 Gaseous Effluents

There are 6 diesel engines, 3 per reactor unit, in three separation divisions. These engines are run only in an emergency or for surveillance testing. Operating time for all engines is expected to total 120 hours per year based on testing requirements and expected emergency conditions. The exhausts from these engines are discharged out the roof of the diesel generator and HVAC building with no treatment except noise muffling. Total annual discharged quantities of SO_2 and NO_x pollutants are estimated at between 740 to 1209 lbs. and between 459 to 749 lbs., respectively, considering that some are 3070 HP units and some are 5375 HP units.

The auxiliary steam supply, required to furnish steam for various station operations when steam is not available by extraction from the turbine-generator system, is electrically produced.

c. The percentage light penetration shall be determined and primary productivity shall be determined by oxygen production in light and dark bottles.

6.1.6.8.5 Zooplankton

a. Quarterly samples shall be collected from the following locations: 1, 2, 3, 4, 4.5, 5, 7, 8, and 16.

b. Analysis shall be for density and identification.

6.1.6.8.6 Fisheries

a. Quarterly samples shall be taken from Locations 1, 2, 4, 4.5, 5, 7, 8, 16, and 17.

b. The method of collection shall be as follows:

1) At lake locations (2, 4, 4.5, 8, 16, and 17), four 15-minute electrofishing samples; 24-hour winged hoop net or trap net samples; and experimental gill net samples (used only if additional fish are needed for a representative sample) will be collected. At Location 5 seine hauls are made rather than gill netting because it is located in a stream lake interface area.

2) At stream locations 24-hour winged hoop net or trap net samples and seine haul are made.

c. Analysis of samples shall be as follows:

1) catch per unit effort;

2) species;

3) lengths;

4) weights of representative fish;

5) condition factors for representative game fish;

6) annual scale samples from representative game fish; and

7) food preference for 3 species of game fish on a quarterly basis from two areas of lake representing different habitats. Food items shall be identified from the stomachs of a minimum of 6 fish of each species; the game species sampled each quarter may vary, but at least one species sampled in the previous quarter will be included in the current quarter.

6.1.6.8.7 Sediments

a. Sediment measuring stations shall be established on Parnell Road Bridge and DeWitt County Highway 14 Bridge to determine sedimentation rates.

b. Measurements shall be taken annually.

TABLE 6.1-8 (Cont'd)

SAMPLE LOCATION NUMBER	LOCATION RELATIVE TO STATION-DIRECTION/DISTANCE (feet)	ANALYSIS TO BE PERFORMED ON EACH SAMPLE	GENERAL TYPE OF COLLECTION EQUIPMENT	COLLECTION FREQUENCY/ANALYSIS FREQUENCY	STARTING DATE	APPROX. DURATION (MONTHS)	SAMPLE TYPE
10	ENE/26,250	γ isotopic tritium	Grab Samples	31 days/31 days 31 days/92 days	7/81 7/81	18 18	Surface Water
		γ isotopic	Grab Samples	182 days/182 days	4/80	33	Slime
		γ isotopic	Grab Samples	182 days/182 days	4/80	33	Shoreline Sediment
		γ isotopic	Grab Samples	182 days/182 days	4/80	33	Bottom Sediment
11	S/approx-imately 16 mi.	I-131 Gross β γ isotopic	Air Particulate Monitors	7 days/7 days 7 days/7 days 7 days/92 days	10/81 7/81 7/81	15 18 18	Airborne
		γ dose	TLD	92 days	4/80	33	Direct Radiation
		I-131 γ isotopic	2 gallons per Location	14 days/14 days on pasture 31 days/31 days other	10/81	15	Milk
12	S/5,250	I-131 Gross β γ isotopic tritium	Grab Samples	14 days/14 days 31 days/31 days 31 days/31 days 31 days/92 days	7/81 7/81 7/81 7/81	18 18 18 18	Well Water
13	SW/20,000	γ isotopic tritium	Grab Samples	31 days/31 days 31 days/92 days	7/81 7/81	18 18	Surface Water
14	WNW/1,000	I-131 Gross β γ isotopic tritium	Composite Water Samples	14 days/14 days 31 days/31 days 31 days/31 days 31 days/92 days	7/81 7/81 7/81 7/81	18 18 18 18	Surface Drinking Water
15 16 17	To be determined on the basis of census results	I-131 γ isotopic	2 gallons per Location	14 days/14 days animals on pasture 31 days/31 days other	10/81 7/81	15 18	Milk
18	To be determined on the basis of census results	γ isotopic	Grab Samples	365 days/365 days	7/81	18	Green Leafy Vegetables and Tuberous Veg.
19	Discharge flume area	γ isotopic	Net/Electro-shocker	182 days/182 days	4/80	33	Fish
21-52	16 sectors in an inner ring near site boundary 16 sectors in an outer ring 4-5 miles range from site	γ dose	TLD	92 days	4/80	33	Direct Radiation

TABLE 6.1-9

LOWER LIMITS OF DETECTION FOR ENVIRONMENTAL SAMPLE ANALYSIS

ANALYSIS	WATER (pCi/liter)	AIRBORNE PARTICULATE OR GAS (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/liter)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	2	1×10^{-2}				
H-3	330					
Mn-54	15		130			
Fe-59	30		260			
Co-58; Co-60	15		130			
Zn-65	30		260			
Zr-95; Nb-95	10					
I-131	0.5	7×10^{-2}		8.8		
Cs-134; Cs-137	15	1×10^{-2}	130	15		150
Ba-140; La-140	15			15		

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