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RECIP.NAME RECIPIENT AFFILIATION
SWERDON,P. Pennsylvania, Commonwealth of,

SUBJECT: Outlines water treatment program which util intends to use & anticipated effects on cooling tower blowdown (Outfall 071) water quality. Contributing waste stream not identified in NPDES permit application also provided.

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July 19, 1984

Mr. Paul Swerdon
Chief, Facilities Section
Department of Environmental Resources
90 East Union Street, Second Floor
Wilkes-Barre, PA 18701

SUSQUEHANNA STEAM ELECTRIC STATION
NPDES PERMIT APPLICATION
PERMIT NO. PA 0047325-SUPPLEMENTAL INFORMATION
CCN 741326 FILE 012
PLE- 5362

Dear Mr. Swerdon:

The Pennsylvania Power and Light Company (PP&L) submitted a revised NPDES permit application for the Susquehanna Steam Electric Station (Susquehanna SES) to the Pennsylvania Department of Environmental Resources (Pa. DER) on April 6, 1984. As stated in the permit application in the Supplement to Item VI.C. of Form 2C, Expected Levels of Pollutants, PP&L intends to use a dispersant in the service water system. At the time the NPDES permit application was submitted, no specific treatment program was selected. This letter outlines the treatment program which PP&L intends to use and its anticipated effects on cooling tower blowdown (outfall 071) water quality. In addition, a contributing waste stream not identified in the permit application is now provided for Pa. DER review.

Water Treatment Program

The Susquehanna SES contains two (2) identical 1050 Mw(e) boiling water reactors. Each unit is equipped with its own circulating water system for rejecting heat from the main condenser. Each circulating water system consists of one natural draft cooling tower and basin, four (4) circulating water pumps, main condenser, and associated piping. Water is drawn from the cooling tower basin, passed through the main condenser and returned to the cooling tower where the heat is dissipated to the atmosphere. Makeup to the cooling tower basins is provided by a common intake structure located on the west bank of the Susquehanna River. Blowdown from the basins flows into a common line for discharge to the Susquehanna.

Each unit is also provided with a service water system which is used to remove heat from various auxiliary systems and components. This system draws water from the inlet line of the circulating water pumps, passes it through various heat exchangers, and returns the water the circulating water system . Figure 1 is a schematic of the circulating and service water systems.

High iron levels in the makeup water from the river have resulted in iron oxide sludge filling and fouling service water heat exchangers. Additionally, localized corrosion is occurring in the main condensers of the circulating water system and in service water heat exchangers.

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In order to eliminate fouling of the service water heat exchangers and reduce corrosion in both the circulating and service water systems, PP&L plans to implement a chemical treatment program. This program is scheduled to begin in late August or September 1984. The treatment includes continuous injection of a dispersant and two corrosion inhibitors into the service water pumps' discharge to maintain the levels listed below. The range of concentrations indicated are the initial concentrations planned for the treatment program. Operating experience may dictate treatment with higher or lower levels, up to the maximum concentrations listed.

Chemical	Use	Concentration in Circulating Water (cooling tower blowdown-outfall 071)	
		Range	Maximum
Sodium Polyacrylate (1000 M.W. polymer)	dispersant	4-6 ppm active acrylate	10 ppm
Sodium Toly-triazole	copper corrosion inhibitor	1.2-1.8 ppm, active Tolytriazole	2 ppm
Zinc (added as zinc chloride or zinc sulfate)	carbon steel corrosion inhibitor	0.5-0.8 ppm active zinc	1.0 ppm

PP&L expects much higher than normal iron concentrations in outfall 071 when this treatment program is begun, due to resuspension of iron which has settled and accumulated throughout the service and circulating water systems. Expected iron concentrations in outfall 071 are difficult to predict since it is unknown to what extent this resuspension of iron will occur. However, during this initial "flushing" of the system, iron concentrations are expected to exceed the present 7 mg/l daily maximum limit.

After this initial "flushing" of the system, which may last up to four weeks, iron concentrations are expected to decline. However, long-term blowdown iron concentrations are also difficult to predict. Prior to initiating this treatment program, settling of suspended iron occurred in both the circulating and service water systems as well as in the cooling tower basins. (In the March 1984 NPDES Permit Application PP&L used a settling rate of 75% for iron). The use of a dispersant will reduce the settling rate; thus, a long-term increase in iron levels in outfall 071 may occur.

The extent of this increase is difficult to determine because the settling rate of suspended iron with the use of a dispersant is unknown. Assuming

worst-case, no settling of the iron will occur at all. Blowdown iron concentrations could then be expected to reach 3.7 times that of the raw river water under maximum design conditions due to the cycles of concentration in the station's circulating water system. Data presented in the March NPDES permit application show average iron levels in the river to be 2.63 mg/l total iron (from 1968-1983 data). Average iron concentrations in the blowdown would then be expected to be 2.63 x 3.7 or 9.7 mg/l. The maximum iron concentration found in the river during this same time period was 17.3 mg/l, indicating that maximum blowdown iron concentrations of up to 64 mg/l could be possible.

Fluctuations of iron concentrations in the river have resulted in variability of blowdown iron concentrations. Because of this variability, PP&L suggested in the March 1984 NPDES permit application that a monthly average limit on blow- down iron concentrations may be a more appropriate means of monitoring this parameter than the existing daily maximum limit of 7 mg/l.

PP&L further requests that the final permit limit for iron in outfall 071 be established after an initial trial stage is completed and the long-term treatment program is implemented. PP&L will monitor cooling tower blowdown iron levels during the trial stage in order to characterize blowdown iron concentrations and to provide the Pa. DER with more realistic information regarding this parameter. Such an analysis would enable a more realistic and workable permit limit for iron to be established.

Regardless of the iron concentrations found in Susquehanna's discharge, PP&L wants to emphasize that no net addition of iron to the river is occurring. The only iron present in the discharge, other than some insignificant quantities due to corrosion, is that which is present in the intake water and concentrated approximately 2-4 times in the station's circulating water system due to evaporation from the cooling towers.

Standby Liquid Control Waste Stream

PP&L would also like to notify the Pa. DER of an intermittent low volume waste stream which was not identified in the March 1984 NPDES permit reapplication. Twice per quarter, up to 1,000 gallons of a sodium pentaborate ($Na_2B_{10}O_{16}$) solution will be discharged from the standby liquid control system. This discharge will be directed to either the cooling tower basin (outfall 071), or to Unit 1 or 2 turbine building drains (outfalls 073 and 074).

The standby liquid control system provides an emergency reactor shutdown mechanism which floods the reactor with a solution containing neutron-absorbing boron. It is tested and flushed periodically, resulting in this discharge. Previously, this discharge was directed to the S-2 sedimentation pond, after receiving Pa. DER approval for discharge of plant test flushings.

The sodium pentaborate solution contains 15,000-35,000 mg/l of boron, with total quantities of boron to be discharged of up to 100-300 lbs. boron per discharge. The discharge is between 6-9 pH and contains no radioactivity and negligible amounts of other suspended or dissolved material. If directed to the cooling tower basin, the maximum boron increase predicted in the blowdown following each discharge would be less than 10 ppm boron.

I will be contacting you in the near future to discuss Pa. DER's permitting strategy regarding Susquehanna SES's iron levels in outfall 071. If you have any comments or concerns regarding this additional information, please contact me at (215) 770-7889.

Respectfully yours,

Jerome S. Fields
Sr. Environmental Scientist-Nuclear

DAS/dml

daslte001179a

cc: [A. Schwencer=NRC]

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S. H. Cantone	A2-4, w/o	D. G. Ortz	S&A, w/a
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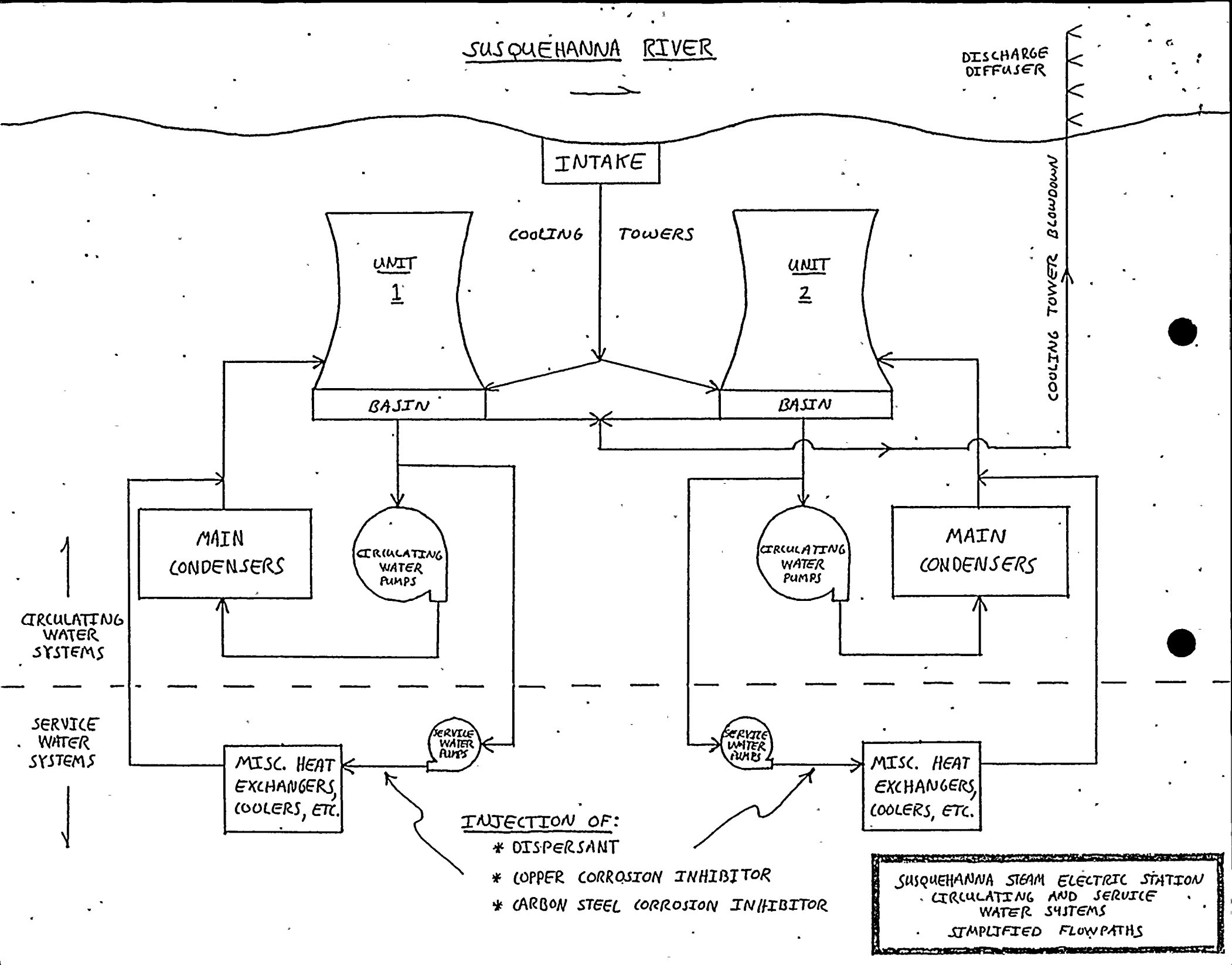
A. M. Ehritz	TW-2, w/a	D. A. Stoner	A2-4, w/a
J. S. Fields	A2-4, w/a	R. S. Tombaugh	A6-3, w/a
J. B. Hansell	A2-4, w/a	H. D. Woodeshick	Spec. Off., w/a
H. W. Keiser	S&A, w/a	SRMS Corresp. File	A6-2, w/a
		SRMS Letter File	A6-2, w/o


SUSQUEHANNA RIVER
DISCHARGE DIFFUSER
INTAKE
COOLING TOWERS
UNIT 1
UNIT 2
COOLING TOWER BLOWDOWN
BASIN
BASIN
MAIN CONDENSERS
CIRCULATING WATER PUMPS
CIRCULATING WATER PUMPS
MAIN CONDENSERS
CIRCULATING WATER SYSTEMS
SERVICE WATER SYSTEMS
SERVICE WATER PUMPS
SERVICE WATER PUMPS
MISC. HEAT EXCHANGERS, COOLERS, ETC.
MISC. HEAT EXCHANGERS, COOLERS, ETC.
INJECTION OF:
* DISPERSANT
* COPPER CORROSION INHIBITOR
* CARBON STEEL CORROSION INHIBITOR
SUSQUEHANNA STEAM ELECTRIC STATION
CIRCULATING AND SERVICE WATER SYSTEMS
SIMPLIFIED FLOWPATHS