



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

May 26, 2005

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Gentlemen:

In the Matter of ) Docket Nos. 50-327  
Tennessee Valley Authority ) 50-328

**SEQUOYAH NUCLEAR PLANT - NPDES PERMIT NO. TN00226450  
BIOCIDES/CORROSION TREATMENT PLAN CHANGE**

The enclosure provides the changes to SQN NPDES Permit No. TN00226450 Biocide/Corrosion Treatment Plan as required by SQN Environmental Technical Specification Section 5.5.2, Changes in Permits and Certifications.

If you have any questions concerning this matter, please call me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

P. L. Pace  
Manager, Site Licensing and  
Industry Affairs

Enclosure

IE25

ENCLOSURE

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT (SQN)

NPDES PERMIT NO. TN00226450 BIOCIDES/CORROSION  
TREATMENT PLAN CHANGE



STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
401 CHURCH STREET  
L & C ANNEX 6<sup>TH</sup> FLOOR  
NASHVILLE, TN 37243-1534

April 27, 2005

Stephanie A. Howard  
Principal Environmental Engineer  
Tennessee Valley Authority,  
Sequoyah Nuclear Plant  
P.O. Box 2000  
Soddy-Daisy, TN 37379-2000

**Re: TVA-Sequoyah Nuclear Plant  
NPDES Permit No. TN0026450  
Biocide/Corrosion Treatment Plan Approval**

Dear Ms Howard:

The Division of Water Pollution Control (Division) has received and reviewed your letter of March 7, 2005 requesting authorization to implement changes to the raw water treatment plan at the Sequoyah Nuclear Plant (SQN). The revised plan, which you submitted with the letter, included four parts, (1) a copy of the plan in tabular format with accompanying rationale, (2) a plan overview and supporting documentation, and (3) a copy of MSDS sheets and product bulletins for the chemicals to be used, and (4) additional information describing how treatment would be carried out. The format for the plan was discussed at a meeting between SQN and WPC staff in Chattanooga in June 2004. It should also be noted that TVA Watts Bar Nuclear (WBN) Plant is situated upstream of SQN on the same waterway and that some [same] products were previously approved for use at WBN. Some products may have already been approved for use at the SQN facility, but this approval is an update on the use and properties of those [chemical] products. The Division appreciates the effort made by TVA to update the format and expand the information in the plan, which makes review much easier.

The SQN raw water treatment plan involves the use of eight (8) chemicals, applied to treat piping systems essential to safety in the event of a shutdown. The chemicals, following treatment under appropriate circumstances, will be discharged to the Tennessee River through the NPDES permitted Outfall 101 (ERCW Train A & B and the RCW) and Outfall 110 (supplemental condenser cooling water line when in closed mode). The chemicals include two corrosion inhibitors, one biodegradable detergent, one oxidizing biocide (chlorination/bromination), three non-oxidizing biocides (quaternary ammonium compounds for mollusk control), and sodium silicate (detoxification). The use of some of these chemicals was approved by the Division in the past based on specific discharge conditions. Other chemicals are new to the plan.

There are certain basic criteria that the Division is following in reviewing this plan to assure that the effluent quality is protective of receiving stream quality. Based on data

provided by TVA and/or the chemical vendor we have calculated maximum concentrations of the active ingredient(s) in the discharge in order to compare those values with acute and chronic criteria for the ingredients. The objective is to assure that the discharge concentration does not exceed the acute toxicity criteria for each ingredient. The maximum concentration of each active ingredient for Outfalls 101 and 110 - combined has been calculated to compare to the chronic toxicity criteria for [each active ingredient] at the end of the mixing zones. Based on those calculations, some values could exceed CCC criteria, however, TVA has committed not to exceed specific effluent concentrations and it is anticipated that the reactive properties of those chemicals should reduce the concentrations after mixing to acceptable levels. Because there are no federal or state criteria developed for most of the active ingredients in these chemicals, criteria have been derived based on data from the EPA EcoTox database (See Table 1 attached), from TVA, and from the chemical vendors. These derived criteria are compared to the maximum anticipated chemical ingredient instream concentration in Table 2 and discharge concentration in Table 3. Where TVA has committed not to exceed a specific effluent concentration and daily mass loading, those values have been made a condition of the plan approval, provided that water quality criteria are met.

For purposes of this plan evaluation, reference to chemical means the vendor chemical -name including all active constituents. Where concentration limits have been established, we have specified whether that concentration limit applies to a specific ingredient, to the whole chemical, or to an indicator element for which analytical procedures are available. Unless otherwise specified, where mass limits are applied, they refer to the active ingredient(s) based on maximum daily feed rate.

The eight chemicals are discussed individually below and the conditions for their use are specified. Each chemical is approved for use effective April 27, 2005, subject to these specific conditions:

**Chemical Name:** Nalco PCL-401  
**Primary Ingredient:** Anionic Copolymer  
**CAS No.:** None Provided

This chemical is a dispersant designed to prevent the formation of scale in the system. The chemical contains an anionic copolymer that is proprietary in makeup. Division records show this chemical was included in the submittal as part of the raw water treatment plan for WBN in August 1996 (see letter from Odis E. Hickman, Jr. to Paul Davis). Acute aquatic toxicity data has been presented in the plan from the NALCO MSDS and from TVA data. Based on this data a 48 hr LC50 for *Daphnia magna* of 798 mg/l has been utilized to derive a criterion maximum concentration (CMC) of 399 mg/l and a criterion continuous concentration (CCC) of 79.8 mg/l. TVA has agreed to keep concentrations of the active ingredient at or below 0.2 mg/L in the effluent. Conditions for approval of PCL-401 are (1) that the concentration of the chemical shall not exceed 0.2 mg/l in the plant effluents based on mass balance calculations, and (2) that the total quantity of chemical discharged shall not exceed 1,480 lbs per day.

**Chemical Name:** Nalco PCL-222  
**Primary Ingredient:** Copolymer-Phosphate blend  
**CAS No.:** (Individual Component CAS numbers available from the  
Manufacturer)

This chemical contains a copolymer-phosphate blend and is used as a dispersant designed to prevent the formation of scale in the system. Acute aquatic toxicity data was not initially available from NALCO MSDS. However, TVA stated in their B/CTP that "toxicity of PCL-222 is assumed to be similar to PCL-401"; and that "tests will be conducted at a toxicity lab under contract to the manufacturer". Tests were performed March 5-12, 2005, and ASci® Corporation, Environmental Testing Laboratory provided TVA with data for test endpoints as NOEC and LOEC, which were forwarded to the division on or about March 30, 2005. Division records show this chemical was included in a submittal as part of the raw water treatment plan for WBN in August 1996 (see letter from Odis E. Hickman, Jr. to Paul Davis).

TVA proposes to keep concentrations for each active ingredient (copolymer and phosphate) at or below 0.2 mg/l in the effluent. Conditions for approval of PCL-222 are (1) PCL-222 is injected into the ERCW Train A & B system only during warm weather months, (2) PCL-222 is injected into the RCW system continuously, except during periods of other chemical injection, (3) that the concentration of each active ingredient of PCL-222 shall not exceed 0.2 mg/l in the plant effluents based on mass balance calculations, and (4) that the total quantity of chemical discharged shall not exceed 760 lbs per day for the copolymer, and 2280 lbs per day for the phosphate as detailed in the SQN Raw Water Chemical Application Guide.

**Chemical Name:** NALCO Biodetergent 73551  
**Primary ingredient:** Ethylene oxide-Propylene oxide copolymer  
**CAS No.** None Provided

This chemical is a non-ionic copolymer used in advance of non-oxidizing biocide applications to remove and disperse soft foulant deposits in cooling water systems. This chemical was previously approved for use in a July 16, 2004 letter to TVA from Ed Polk. Nalco Biodetergent 73551 replaced the surfactant, DMAD (CL363 dimethylamide), which was phased out of production in June 2004. Frequency of use would be approximately 208 days per year and duration of use would be about 0.5 hours per day with a maximum daily usage of 50 lbs/day for all three-injection points.

Data from the EPA EcoTox database shows that the chemical ethylene oxide exhibits acute toxicity to *D. magna* at 83 to 300 mg/l and to *P. promelas* at 63 mg/l to 150 mg/l. Data from the Nalco MSDS shows acute toxicity of the chemical to *D. magna* with a reported LC50 of >1000 mg/l. The MSDS also shows chronic toxicity to *P. promelas* at an IC25 of 527 mg/l and for *Ceriodaphnia dubia* at an IC25 of 141 mg/l. Data presented by TVA for the active ingredient show chronic toxicity (IC25) to *P. promelas* of 105.4 mg/l and to *C. dubia* of 28 mg/l. TVA has agreed to keep the effluent concentration of the active ingredients at or below 2.0 mg/l. Based on these data, conditions for approval of this chemical are (1) the plant effluent concentration of the active ingredients in Nalco

Biodetergent 73551 shall not exceed 2.0 mg/l at any time based on mass balance calculations, (2) the maximum quantity of the active ingredients used shall not exceed 50 lbs per day for all three injection points, and (3) treatment durations shall not exceed 30 minutes at 2-3 times per week into ERCW Train A, ERCW Train B and RCW systems.

**Chemical Name:** NALCO Towerbrom 960  
**Primary Ingredient:** Sodium Dichloroisocyanurate  
**CAS Nos.** 2893-78-9  
**Secondary Ingredient:** Sodium Bromide  
**CAS Nos.** 7647-15-6

This chemical mixture is an oxidizing (chlorinating/brominating) biocide used for control of slime producing organisms, i.e., Asiatic clams and zebra mussels. The chemical mixture contains 85% to 95% sodium dichloroisocyanurate and 5% to 10% sodium bromide. This chemical was previously approved by the Division, at WBN for non-discharge use in biological control of the cooling towers (see Thomas E. Roehm letter to Odis E. Hickman of September 6, 1996).

TVA is requesting to be allowed to increase the chlorine discharge limit at Outfall 101 when using Towerbrom 960 to a maximum discharge concentration of TRO of 0.10 mg/L from the current maximum of 0.058 mg/L. The increase in the maximum limit is based on the following statement from TVA.

"The application period of Towerbrom must be increased in order to ensure growth of Asiatic clams and zebra mussels entering the plant system is limited to a size that will not restrict flow to equipment essential for the safe shutdown of the nuclear plant. During spring of 2004, SQN's ability to safely shutdown was threatened due to infestation of Asiatic clams with sizes up to 3/8" inch. The non-oxidizing biocide kills Asiatic clams and zebra mussels only when the river temperature is above 60 degrees F. TVAN monitoring has shown that veligers are present at river temperatures as low as 46 degrees F. Previously, spawning was believed to stop at 55 degrees F. For that reason, the 2003 request to TDEC, asked for continuous Towerbrom treatment when the river temperature was >55 degrees F until such time as non-oxidizing biocide was administered. With current data proving present of veligers at river temperatures as low as 45 degrees F, the ability to use continuous Towerbrom for a period long enough to protect the system from infestation whenever veligers are detected is necessary. The 24-hour application of continuous Towerbrom treatment following nonoxidizing biocide treatments is necessary to have a synergistic effect for mollusk eradication in the systems. Likewise the number of treatments must be increased in order to limit the size of clams to 1/8 inch. Shells larger than 1/8 inch could cause failure of critical components required for safe shutdown. Growth data obtained indicates that a clam can reach 1/4 inch in 8 to 12 weeks. Again, the ability to control the size of these mollusks is necessary to ensure safe shutdown capability. The same treatment program is also being used at TVAN's Watts Bar plant in order to ensure safe shutdown capability."

From "An Overview of Raw Water Chemical Additives", included in the letter of March 7, 2005 requesting authorization to implement changes to the raw water treatment plan at the Sequoyah Nuclear Plant (SQN):

"To control macro invertebrates and microbiologically induced corrosion, routine raw water treatments with oxidizing biocide (chlorination) are necessary for:

1. SQN plans to treat two to five days per week during cool weather periods and five to seven days per week during warm weather periods for four to twelve hours per day.
2. SQN plans to treat twenty-four hours per day for approximately 90 days per year and/or when veligers are present.
3. Shorter (24-72 hour) periods of continuous oxidizing biocide treatment will also be required following treatments with the non-oxidizing biocide."

Sodium dichloroisocyanurate is acutely toxic to *D. magna* with reported EC50 in the range of 0.093 mg/l to 0.36 mg/l and LC50 of 0.15 mg/l. The sodium bromide is less toxic with *D. magna* LC50s in the range of 1.3 to 20,000 mg/l. TVA reported data for the Towerbrom 960 mixture, which shows *D. magna* 48 hr LC50 of 2.43 mg/l and *P. promelas* 48 hr LC50 of 0.679 mg/l.

The active ingredients in Towerbrom 960 produce 57% free halogen (chlorine and bromine) in solution. TVA is proposing to control the effluent concentration of Towerbrom-960 by controlling effluent Total Residual Oxidants to 0.10 mg/l in the plant effluent (TROs is defined for purposes of this plan to include residual chlorine and bromine and is to be quantified using the Total Residual Chlorine [TRC] test). Water quality criteria for TRC are 0.019 mg/l as the CMC and 0.011 mg/l as the CCC. Although the 0.1 mg/l effluent limit will exceed the CMC, it is recognized that TRC reacts and dissipates rapidly between the point of measurement and the point of discharge at the receiving stream. Therefore it is anticipated that an effluent limit of 0.10 mg/l for TRC will comply with water quality criteria.

Based on the data available, the conditions for approval of use of this chemical shall be strictly adhered to and are: (1) the maximum concentration of TROs (including chlorine and bromine) shall not exceed 0.10 mg/l in Outfall 101, (2) the total quantity of active ingredient use shall not exceed 1425 lbs/day, (3) discharge limits compliance will be determined by mass balance calculation, (4) increased periods of application is approved based on described items 1. through 3. above (from the March 7, 2005 request letter's "An Overview of Raw Water Chemical Additives"), (5) oxidizing biocide treatments using Towerbrom 960 shall not be conducted simultaneous per system train with non-oxidizing biocide chemical treatments.

**Chemical Name:** NALCO H-130M  
**Primary Ingredient:** Didecyltrimethylammonium Chloride  
**CAS No.:** 7173-51-5

This chemical is a non-oxidizing biocide used to control mollusks. The primary ingredient, didecyltrimethylammonium chloride, is a specific biocide in the family of quaternary ammonium compounds. These compounds are generally structured to contain four organic radicals attached to a nitrogen molecule. Ethanol may be added to enhance solubility.

TVA is proposing to increase the use of H-130M and to provide detoxification treatment using Nalco Coagulant Aid 35 active ingredient: Quartz, crystalline silica. (See separate discussion below).

Nalco H-130M is acutely toxic to *D.magna* in the range of 0.019 mg/l to >1.0 mg/l based on data from the EPA EcoTox database. The Nalco MSDS reports *D.magna* acute toxicity at 0.19 mg/l and TVA reports chronic toxicity for *C. dubia* at 0.139 mg/l and for *P. promelas* at 0.104 mg/l. Based on these data, an acute criteria (CMC) of 0.05 mg/l and a chronic criteria (CCC) of 0.01 mg/l are established for this compound.

Treatment of Outfalls 101 and 110 with sodium bentonite shall be undertaken any time mass balance calculations indicate that an exceedance of the effluent concentration limits for H-130M will occur. TVA-SQN will also use grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may use a colorimetric method for detection of quaternary ammonium compounds suitable for field use to a detectable limit (MDL) of 0.05 mg/l for operational use. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

The conditions for approval of the use of this compound are (1) the concentration of the active ingredients in the plant effluents shall not exceed 0.05 mg/l, (2) when treatment is underway, routine sampling of the effluents shall be undertaken once each four hours during daylight hours and once during nighttime hours, (or a composite sampler may be used), and the grab samples shall be analyzed for quaternary ammonium compounds using methylene chloride extraction, and (3) the total use of Nalco H-130M shall not exceed 855 lbs/day of active ingredients, and (4) treatment using sodium bentonite shall be applied to Outfalls 101 and 110 any time that calculations show that an exceedance of condition (1) or (3) may occur. TVA-SQN will use grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

<b>Chemical Name:</b>	<b>Lonza Barquat 4250-Z, a.k.a. Nalco H-150M</b>
<b>Primary Ingredient:</b>	<b>N-alkyl (C<sub>14</sub> 60%, C<sub>16</sub> 30%, C<sub>12</sub> 5%, C<sub>18</sub> 5%)-N, N-dimethyl-N-Benzylammonium Chloride</b>
<b>CAS No.:</b>	<b>68391-01-5</b>
<b>Secondary Ingredient:</b>	<b>N-Dodecyl-N,N-dimethyl-N-ethylbenzylammonium</b>
<b>CAS No.:</b>	<b>27479-28-3</b>
	<b>Chloride</b>

This chemical is a "second" generation quaternary ammonium compound used as a hard surface disinfectant and/or water treatment to provide biocidal action against a broad



spectrum of microbial organisms such as: bacteria, fungi, viruses, and algae. This product is new to this program and has not been previously approved for use. TVA stated in their request for approval to use that "Toxicity testing of Barquat is (was) currently underway (3/1/05) at Environmental Testing Solutions, Inc., Asheville, NC." Testing was completed on, or about March 15 2005. Completed test results were presented in a report to the division March 30, 2005.

Barquat 4250-Z is acutely toxic to *C. dubia* in the range of 48-hour LC<sub>50</sub> of 0.053 mg/l to 24-hour LC<sub>50</sub> of 0.083 mg/l based on data from the recently completed toxicity testing. The toxicity tests also reports acute toxicity for *P. promelas* between 0.283 mg/l for a 96-hour LC<sub>50</sub> to 0.386 mg/l for a 24-hour LC<sub>50</sub>. Based on these data, an acute criteria (CMC) of 0.05 mg/l and a chronic criteria (CCC) of 0.01 mg/l are established for this compound.

Treatment of Outfalls 101 and 110 with sodium bentonite shall be undertaken any time mass balance calculations indicate that an exceedance of the effluent concentration limits for Lonza Barquat 4250-Z, a.k.a. Nalco H-150M will occur. TVA-SQN will also use grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may use a colorimetric method for detection of quaternary ammonium compounds suitable for field use to a detectable limit (MDL) of 0.05 mg/l for operational use. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

The conditions for approval of the use of this compound are (1) the concentration of the active ingredients in the plant effluents shall not exceed 0.05 mg/l, (2) the effluents shall be sampled and analyzed for quaternary ammonium compounds once each 4 hours during daylight hours and once per nighttime hours, (or a composite sampler may be used), in periods when treatment is underway, (3) the total use of Barquat 4250-Z (or Nalco H-150M) shall not exceed 855 lbs/day of active ingredients, and (4) treatment using sodium bentonite shall be applied to Outfalls 101 and 110 any time that calculations show that an exceedance of condition (1) or (3) may occur, (5) TVA-SQN will also use grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

**Chemical Name:** Betz Dearborn Spectrus CT1300  
**Primary Ingredient:** (C12-C16) Dimethylbenzylammonium Chloride  
**CAS No.:** 68424-85-1  
**Secondary Ingredient:** Ethyl Alcohol  
**CAS No.:** 64-17-5

This chemical is a non-oxidizing biocide used for mollusk control. It contains a primary ingredient, (C12-C16) dimethylbenzylammonium chloride (50%), which is a quaternary ammonium compound. A secondary ingredient is ethyl alcohol. This product is approved by the Division with the condition that the concentration of the active ingredients does not exceed 0.05 mg/l in the plant effluents. TVA is requesting that the number of injections and durations be adjusted, but that the current maximum allowable discharge concentration of 0.05 mg/L remains unchanged. Under these conditions, detoxification of the chemicals will be undertaken using sodium bentonite (see discussion below).

Dimethylbenzyl ammonium chloride has been found to be acutely toxic to *D. magna* at concentrations ranging from .00028 to .09 mg/l and to *P. promelas* in concentrations ranging from 0.23 to 1.8 mg/l based on limited data in the EPA EcoTox database. The Betz Dearborn MSDS reports acute toxicity for *D. magna* of 0.16 mg/l and *P. promelas* of 2.9 mg/l. TVA reports chronic toxicity to *C. dubia* of 0.18 mg/l and to *P. promelas* of 0.36 mg/l. Based on these data, a CMC of 0.050 mg/l and a CCC of 0.010 mg/l are selected to protect the stream.

Treatment of Outfalls 101 and 110 with sodium bentonite shall be undertaken any time mass balance calculations indicate that an exceedance of the effluent concentration limits for Betz Dearborn Spectrus CT1300 will occur. TVA-SQN will also use grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may use a colorimetric method for detection of quaternary ammonium compounds suitable for field use to a detectable limit (MDL) of 0.05 mg/l for operational use. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

The use of Betz Dearborn Spectrus CT1300 is approved for use with the following conditions (1) the concentration of the quaternary ammonium compounds in the chemical shall not exceed 0.05 mg/l, (2) the total use of all active ingredients in Spectrus CT1300 shall not exceed 855 lbs/day, (3) treatment of Outfalls 101 and 110 with sodium bentonite shall be undertaken any time mass balance calculations indicate that an exceedance of condition (1) and (2) may occur, (4) when treatment is underway, routine sampling of the effluents shall be undertaken once each four hours during daylight hours and once during nighttime hours, (or a composite sampler may be used), and the grab samples shall be analyzed for quaternary ammonium compounds with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream. TVA may send samples to Nalco or other qualified laboratories for comparative sample analysis.

**Chemical Name:** Nalco Coagulant Aid-35  
**Active Ingredient:** Quartz, crystalline silica (aluminum silicate)  
**CAS No.:** 14808-60-7

This chemical is sodium bentonite clay, which is composed primarily of sodium and aluminum silicates. The clay is used to detoxify (adsorb and bind) the toxic constituents in H-130M, Barquat 4250-Z, (also known as H-150M), and Spectrus CT1300. This treatment proposal is new and has not been approved in the past. Treatment is to occur approximately 24 times per year for about a 3.5-5.5-day period, for a maximum period of 132 days per year. Special trailers have been constructed to house the chemical feed equipment to be used during the treatment operation. Both Outfalls 101 and 110 will be treated as needed. Proposed feed rate is up to 8,520 lbs/day and proposed maximum concentration in the effluents is 10 mg/l.

The sodium and aluminum silicate clays are generally non-toxic and should not pose a problem for the receiving stream. Nalco Coagulant Aid-35 is approved for use with the conditions (1) the maximum concentration in the effluents is less than 10 mg/l based on mass balance calculations, (2) the total use of sodium bentonite shall not exceed 8,520 lbs/day, and (3) treatment of Outfalls 101 and 110 with sodium bentonite shall be undertaken any time mass balance calculations indicate that an exceedance of the effluent concentration limits for Nalco H-130M, Barquat 4250-Z, or Betz Dearborn Spectrus CT1300 will occur. TVA-SQN will also use daily grab samples analyzed with a low-level detection test method (using methylene chloride extraction), which has an MDL of 0.02 mg/l, in conjunction with those calculations to demonstrate protection of the receiving stream.

### **General Requirements**

In addition to the chemical specific requirements above, the approval of the use of these chemicals is also conditioned upon the following:

1. Oxidizing and non-oxidizing biocides are not to be used at the same time, in each system Train, (e.g., ERCW Train A, Train B, or RCW),
2. Whole effluent toxicity testing (biomonitoring) of Outfall 101 shall be undertaken once per year when oxidizing biocides are being used and once per year when non-oxidizing biocides are being used,
3. Whole effluent toxicity testing (biomonitoring) of Outfall 110 shall be undertaken once per year when oxidizing biocides are being used and once per year when non-oxidizing biocides are being used,
4. Whole effluent toxicity testing performed under requirements of the NPDES permit may be coordinated with the requirements of (2) and (3) above.
5. The sampling and test procedures used for biomonitoring shall be the same as those described in the NPDES permit, analysis of the samples shall be performed the same regardless of how the sample is collected, e.g., if composite sample collection is used the test method for the sample shall be the same as if the sample was collected by grab sample.
6. The acceptable methods for detection of TRO shall be the same as those specified in the NPDES permit for TRC,

7. Annually, a report shall be submitted to the Division presenting the biomonitoring data for tests conducted during treatments, a summary of all analytical results (daily maximum, daily average, number of samples), the approximate duration in hours of each chemical used, quantity in pounds of each chemical used, and any minor changes that have occurred to the plan. The report shall be submitted to the Enforcement and Compliance Section in Nashville and to the Chattanooga field office by February 15 of the year following the reporting year. Significant changes to the plan must be submitted for Division for approval prior to their initiation. Minor changes (e.g. chemical names or vendor changes of essentially the same chemical) do not require pre-approval, but shall be indicated in the annual report or when the plan is revised,

8. In order to compare reliability of the mass-balance calculations with the methylene chloride extraction method, SQN shall compare both methods used for the analyses of the effluent and report to the Division. This is especially important during the first six treatments using detoxification. When the division includes "...other qualified laboratories..." the intent is that a laboratory will be selected based on its ability to accurately run the specified test. TVA should base their selection of the laboratory on the highest of industry standards. The results of these comparisons will be submitted in the first annual report to TDEC on February 15, 2006, and

9. TVA-SQN is required to maintain all records on file of sampling and analytical data, toxicity test results, records of quantities fed per day of each chemical, and mass balance calculations. These records shall be maintained on site for a period of at least three years.

If you have any questions or comments, please don't hesitate to contact me at (615) 532-1178, or at [edward.polk@state.tn.us](mailto:edward.polk@state.tn.us).

Sincerely,

 4/27/05

Edward M. Polk, Jr., P.E.  
Manager, Permit Section  
Water Pollution Control

EMP/prm

#### Attachments

Cc: Saya A. Qualls, P.E., WPC-Chief Engineer  
Pamala Myers, Permit Section  
Terry Whalen, Chattanooga EFO

**Table 1**  
**TVA Sequoyah Nuclear Plant**  
**Raw Water Treatment Plant Chemicals**  
**Toxicity Data from EPA EcoTox Database**

Supplier Name and Chemical Name	CAS No.	Aquatic Species	EndPoint <sup>1</sup>	Concentration, ug/l			Reference No.
				Min	Average	Max	
Naico Towerbrom 960 Primary active ingredient: 1,3-Dichloro-1,3,5-triazine-2,4,6 (1H,3H,5H)-trione, Sodium salt. 90% active ingredient in Towerbrom 960  Secondary active ingredient: Sodium bromide 10% active ingredient in Towerbrom 960	2893789	Corbicula	EC50		600		14413
		Daphnia magna	EC50	93		360	344
		Daphnia magna	EC50		150		14413
		Bluegill	LC50	250		3200	344
		Rainbow trout	LC50		290		14413
		Rainbow trout	LC50	130		900	344
	Daphnia magna	EC0		5,171,000		6628	
	Daphnia magna	EC50		7,219,000		6628	
	Daphnia magna	NOEC		91,000		6628	
	Daphnia magna	EC10		43,000		12972	
	Daphnia magna	EC50		6,820,000		10203	
	Daphnia magna	EC50		7,219,000		847	
	Daphnia magna	EC50	1300	1400	1600	7054	
	Daphnia magna	EC50	6,700,000		9,300,000	2493	
	Daphnia magna	EC50	5,700,000		10,800,000	6556	
	Daphnia magna	EC50		>1,000,000		344	
	Daphnia magna	EC50		5,800,000		1060	
	Daphnia magna	EC50	20,900		30,400	20061	
	Daphnia magna	EC50		23,000		5875	
	Daphnia magna	EC50		23,000		10600	
	Daphnia magna	EC50	5870		14,170	3949	
	Daphnia magna	LC50		500,000		5718	
	Daphnia magna	LC50		11,000,000		10600	
	Daphnia magna	LC50				49794	
	Daphnia magna	LC50		10,500,000		5675	
	Daphnia magna	LC50	10,000,000		20,000,000	7054	
	Daphnia magna	LC50		8,900,000		10203	
	Daphnia magna	LC50	<38		76	6320	
	Daphnia magna	LC50	7394		7508	49794	
	Daphnia magna	LOEC		19,000		20061	
	Daphnia magna	LOEC		19,000		4484	
	Daphnia magna	LOEC	3000		47,000	5857	
	Daphnia magna	NOEC		2900		12972	
	Daphnia magna	NOEC	3,100,000		7,800,000	10600	
	Daphnia magna	NOEC		7500		20061	
	Daphnia magna	NOEC		91,000		847	
	Daphnia magna	NOEC	7800		16,000	10600	
	Daphnia magna	NOEC	<3000		19,000	5857	
Scud	LC50	<32	333	407	6320		
Bluegill	LC50		>1,000,000		344		
Inland silverside	LC50	50		410	6230		
Golden shiner	LC50	236	298	353	6230		
Naico H-130 M  Active ingredient: N-Decyl-N,N-Dimethyl-1-decanaminium chloride	7173515	Genodaphnia dubia	LC50	69	76	82	17880
		Daphnia magna	EC50	59		>1000	5333
		Daphnia magna	EC50	14		120	344
		Daphnia magna	LC50	64		>1000	5333
		Daphnia magna	LC50	29	37	43	18386
		P. promelas	LC50	450	470	500	17880
		P. promelas	LC50	200	330	500	18386
		White sturgeon	LC50	0.006		10	20400
		Opossum shrimp	LC50	39		1100	18386
		Opossum shrimp	LC50	52	69	84	344
		Virginia oyster	LC50	17	94	210	344
		Sheepshead minnow	LC50	770	960	1170	344
		Zebra mussel	LC50	30		>10,000	14064
		Mayfly	LC50	4200		6900	17880
		Scud	LC50	90	110	120	18386
		Channel Catfish	LC50	690	710	730	344
		Bluegill	LC50	350	590	830	344
		3-Horned Wartyback	LC50	4850	6120	7730	4175
		Rainbow Trout	LC50	373		773	20381
		Rainbow Trout	LC50	970		1240	344
Naico Biodetergent 73551 Ethylene Oxide	75218	Daphnia magna	LC50	83,000		300,000	10117
		P. promelas	LC50	63,000		150,000	10117
Propylene oxide	75569	Goldfish	LC50		170,000		623
		W. mosquitofish	LC50		141,000		840
		Bluegill	LC50		215,000		

Table 1 continued

Supplier Name and Chemical Name	CAS No.	Aquatic Species	EndPoint <sup>1</sup>	Concentration, ug/l			Reference No.	
				Min	Average	Max		
Betz Dearborn Spectrus CT1300 Primary Active Ingredient: (12-16) Alkyl dimethyl benzyl ammonium chloride	68424851	Daphnia magna	EC50	3.6 ppm	5.9 ppm	7.5 ppm	344	
		P. promelas	LC50	.77 ppm	.83 ppm	.90 ppm	344	
		Brown Bullhead	LC50	1.48 ppm	1.59 ppm	1.70 ppm	344	
		Goldfish	LC50	1.16 ppm	1.49 ppm	1.91 ppm	344	
		Smallmouth bass	LC50	1.29 ppm	1.37 ppm	1.45 ppm	344	
		Channel catfish	LC50	.88 ppm	.98 ppm	1.09 ppm	344	
		Green sunfish	LC50	2.04 ppm	2.25 ppm	2.48 ppm	344	
		Bluegill	LC50	2.36 ppm	2.71 ppm	3.03 ppm	344	
		Redear sunfish	LC50	0.56 ppm	.74 ppm	.98 ppm	344	
		Largemouth bass	LC50	1.07 ppm	1.13 ppm	1.20 ppm	344	
		Striped bass	LC50	10400	14100	19100	2468	
		Rainbow trout	LC50	2.19 ppm	2.45 ppm	2.74 ppm	344	
		ethyl alcohol (Ethanol)	64175	Daphnia magna	LC50	>100000		
Daphnia magna	NOEC			<6300			14533	
C. dubia	LC50			7200000	8808000	12000000	212	
Carp	LC50				8140		547	
Nalco PCL-401 Primary Active Ingredient: Ingredients not provided from MSDS information submitted.	N/A	Rainbow trout	LC50			4900 ppm		
		Daphnia magna	LC50			2800 ppm		
		Bluegill	LC50			>5000 ppm		
Nalco Coagulant Aid 35 Primary Active Ingredient: Quartz, crystalline silica	14808607	Rainbow trout	LC50			120	14405	
		Ridged-beak pea clam	LC50			>0.40 ppm	19974	
	CAS No.	Aquatic Species	EndPoint <sup>1</sup>	Concentration, mg/l		Concentration, mg/l		
				7-day	Growth Reproduction	96-hr		
Nalco PCL-222** Primary Active Ingredient: Sodium bisulfate Sodium polyphosphate  Monopotassium phosphate Dipotassium phosphate	7631-90-5 68915-31-1	P. promelas	NOEC	625	625	1,250		
			LC50	1,250	1,250	2,500		
			LC25			1,853		
			LC10			1,530		
			LC10			1,336		
	7778-77-0 7758-11-4	C. dubia	NOEC	625	313			
			LC50	1,250	625			
			EC50					
			EC25					
			EC10					
Loraz Barquat 4250-Z *** Primary Active Ingredient: N-Alkyl (C12-18) -N, N-dimethyl-N-benzylammonium chloride N-Dodecyl -N, N-dimethyl-N-ethylbenzylammonium chloride N-Tetradecyl-N, N-dimethyl-N-ethylbenzylammonium chloride	68391-01-5	P. promelas	EC50 <sub>96</sub>	.3295 ppm	.3694 ppm	.4225 ppm		
	27479-28-3	P. promelas	EC50 <sub>72</sub>	.2054 ppm	.3468 ppm	64.449 ppm		
	27479-29-4	P. promelas	EC50 <sub>96</sub>	0.3003 ppm				
Nalco H150-M* (Note: this product has the same chemical characteristics as Loraz Barquat 4250-Z.)		P. promelas	LC50 <sub>96</sub>			0.283 ppm		
		P. promelas	NOEC	0.05 ppm				
		P. promelas	NOEC	0.1 ppm				
		C. dubia	LC50 <sub>96</sub>			0.053 ppm		
		C. dubia	NOEC - 3 Brood		0.02 ppm			
		C. dubia	LOEC - 3 Brood		0.04 ppm			

\* "Benzotriazoles Category Justification and Testing Rationale", Benzotriazoles Coalition, Synthetic Organic Chemical Manufacturers Association, December 2001  
 \*\* Data provided from TVA and ASCI® testing performed March 5-12, 2005.  
 \*\*\* Data provided from TVA and Environmental Testing Solutions, Inc. laboratory report.  
<sup>1</sup> Test durations vary from 12 hours to 96 hours  
<sup>2</sup> Data source is TVA or Manufacturer.  
 Subscripts for end points for Barquat 4250-Z are for test data at 72-hr, 48-hr, and 96-hr test at 95% Fiducial Limits.  
 Some data duplicated from TVA WBN raw water treatment plan.

**TABLE 2**  
**Maximum Instream Concentration of Raw Water Treatment Chemical versus Calculated Water Quality Criteria**  
**TVA Sequoyah Nuclear Plant**

Chemical	Active Ingredient (or Ingredient of Concern)	% Active Ingredient in Chemical <sup>1</sup>	Max Daily Active Ingre <sup>d</sup> . Discharge <sup>2</sup> lbs	Minimum Stream Flow <sup>9</sup> MGD	Max Conc. Active Ingre <sup>d</sup> . Instream <sup>3</sup> ug/l	Active Ingre <sup>d</sup> . Acute Toxicity <sup>4</sup> ug/l	Active Ingre <sup>d</sup> . Chronic Toxicity <sup>5</sup> ug/l	CMC <sup>6</sup> (1/2 Acute) ug/l	CCC <sup>7</sup> (1/10 Acute) ug/l
Naico PCL-401	Anionic Copolymer	28.50%	1480	1890	93.74	798,000		399,000	79,800
Naico PCL-222	Anionic Copolymer	8.88%	760	1890	48.14	1,853,000		926,500	185,300
	Phosphate	32.30%	2280	1890	144.42				
Naico 73551	Ethylene/Propylene oxide	20.00%	50	1890	3.17	200,000	29,000	100,000	29,000
Naico Towerbrom 960	Sodium Dichloroacrylate	80.00%	1425	1890	90.25	150		75	15
	Sodium Bromide	10.00%	1425	1890	90.26	60,000		30,000	6,000
	TPO	54.70%	1425	1890	90.26			19	11
Barquat 4250-Z	alkyl dimethyl benzyl ammonium chloride	25.00%	855	1890	54.16	300		150	30
	alkyl dimethylethybenzyl ammonium chloride	25.00%	855	1890	54.16				
Naico H-130M	N-decyl-N, N-dimethyl-1-decanaminium chloride	50.00%	855	1890	54.16	100	104	50	10.0
Betz-Dearborn-Spectrus CT 1300	(C12-18) alkyl dimethyl benzyl ammonium chloride	50.00%	855	1890	54.16	100	104	50	10.0
Naico Coagulant Aid 35	Aluminum	10.60%	8520	1890	540			750	87

- 1 Data obtained from MSDS, chemical vendor, or TVA.
- 2 TVA data from Raw Water Chemical Application Guide, Tables 2 and 3.
- 3 Concentration calculated based on mass balance using minimum stream flow and assuming zero background concentration in stream. Values shown in bold have the potential to exceed the CMC and/or the CCC.
- 4 Concentration selected based on best professional judgement using data from the EPA ECOTOX database, toxicity information from the MSDS for the chemical, or data presented by
- 5 Chronic toxicity data from MSDS or TVA data
- 6 CMC is published criteria for TRC and aluminum. For other active ingredients, CMC calculated to be 1/2 of the acute toxicity in accordance with EPA procedures.
- 7 CCC value is equal to the measured chronic toxicity value or 1/10 of acute toxicity value (where measured chronic toxicity data is absent.)
- 8 Because the source of the aluminum is clay, a naturally occurring material in the Tennessee Valley, and because the aluminum silicate is not soluble, the CMC and CCC are not considered applicable to this material.
- 9 Minimum stream flow is the 1 Q10 of 3491 MGD minus the discharge flow (which accounts as the intake volume).

**Table 3**  
**Maximum Anticipated Discharge Concentrations Versus CMC**

Chemical	Active Ingredient (or Ingredient of Concern)	% Active Ingredient	Max Daily Active Ingre. Discharge <sup>1</sup> lbs	Avg. Plant Discharge 101 + 110 <sup>1</sup> MGD	Calc. Max. Discharge Concentration <sup>2</sup>		A Max Anticipated Act. Ingre. Disch. Conc. <sup>3</sup> uc/l	CMC uc/l
					Chemical uc/l	Active Ingre. uc/l		
Nalco PCL-401	Anionic Copolymer	100.00%	1480	1598	111	111	200	399,000
Nalco PCL-222	Anionic Copolymer	50.00%	760	1598	57	29	200	925,500
	Phosphate	50.00%	2280	1598	171	86		
Nalco 73551	Ethylene/Propylene oxide	100.00%	50	1598	4	4	2000	100,000
Nalco Towerbrom 960	Sodium Dichloroisocyanurate	96.00%	1425	1598	107	103	100 TRC	75
	Sodium Bromide	10.00%		1598			100 TRC	30,000
	TRO	54.70%	1425	1598	107		100 TRC	19
Barquat 4250-Z	alkyl dimethyl benzyl -ammonium chloride	25.00%	855	1598	64	16	50	150
	alkyl dimethylethylbenzyl - ammonium chloride	25.00%	855	1598	64	16		
Nalco H-130M	N-decyl-N, N-dimethyl-1- decylammonium chloride	50.00%	855	1598	64	32	50	50
Betz-Dearborn- Spectrus CT 1300	(C12-16) alkyl dimethyl benzyl ammonium chloride	50.00%	855	1598	64	32	50	50
Nalco Coagulant Aid 35	Aluminum	10.60%	8520	1598	639	68	10600	750 <sup>3</sup>

- 1 Average flow reported in June 2003 NPDES permit application
- 2 Concentration value assumes no treatment for TRO or detoxification of quaternary ammonium compounds
- 3 The maximum anticipated concentration presented by TVA in the Raw Water Chemical Additives table in the Raw Water Treatment Plan
- 4 TVA data from Raw Water Chemical Application Guide, Tables 2 and 3.