



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

November 10, 2010

State of Tennessee  
Department of Environment and Conservation  
Division of Water Pollution Control  
Enforcement & Compliance Section  
6<sup>th</sup> Floor, L & C Annex  
401 Church Street  
Nashville, Tennessee 37243-1534

Dear Mr. Vojin Janjić:

**TENNESSEE VALLEY AUTHORITY (TVA) – SEQUOYAH NUCLEAR (SQN) PLANT – NPDES PERMIT NO. TN0026450 – COMMENTS ON DRAFT NPDES PERMIT**

TVA has reviewed the subject draft permit that was provided to us on October 11, 2010, and offers the following comments for your consideration:

Part I Comments

1. Page 1 of 29, Outfall 101 monitoring requirements:
  - a. TVA requests that the effluent limits for Total Residual Chlorine (TRC) remain at the current NPDES Permit limit of 0.10 mg/L. Enclosed is a copy of SQN Biocide/Corrosion Treatment Plan Approval and B/CTP Request for Approval submitted to TDEC in March 2005, requesting an NPDES Permit limit of 0.10 mg/L for TRC. TVA's request was based on results from the onsite chlorine demand study which established the method of detection for TRC at 0.08 mg/ L for the SQN site. Also enclosed is a copy of TDEC July 30, 2004, approval for Watts Bar Nuclear's (WBN) Biocide/Corrosion Treatment Plan which established a 0.10 mg/L TRC permit limit for WBN. As previously discussed with your staff, a review of historical samples taken internal to the plant system and calculated for Outfall 101 since 1996 illustrates that the effluent concentrations comply with the allowable water quality based limits.
  - b. TVA request that TDEC add for clarification the following information as footnote 1 for Outfall 101.
    - <sup>1</sup> Samples taken in compliance with the monitoring requirements specified above shall be taken as follows: Flow - sampled at diffuser gate prior to entry to the Tennessee River; Ambient Temperature from Station 14 located at Tennessee River Mile 490.5 upstream of SQN; River Temperature - river temperature, temperature rise, and rate of temperature change shall be determined by numerical model.

COOL  
NRR

2. Page 3 of 29, Outfall 101 monitoring requirements: TVA requests that the last paragraph on this page be changed to read as:

Any substance, including radioactive materials, is of interest to our Agency if it has reasonable potential to exceed applicable water quality criteria. However, radioactive releases to the environment, notwithstanding point source discharges authorized via this permit, are not regulated under the Clean Water Act, but are instead **regulated under the Nuclear Regulatory Commission (NRC) by issuance of an Operating License**. Pertinent regulations are found under 10 CFR Part 20 and 10 CFR Part 50. Sequoyah Nuclear Plant effluents that may contain radioactive material are not addressed as part of the NPDES permitting process.

#### Rationale

1. Page R-5 of R-43, Outfall 101 monitoring requirements: TVA requests that the last paragraph on this page be changed to read as:

Any substance, including radioactive materials, is of interest to our Agency if it has reasonable potential to exceed applicable water quality criteria. However, radioactive releases to the environment, notwithstanding point source discharges authorized via this permit, are not regulated under the Clean Water Act, but are instead **regulated under the Nuclear Regulatory Commission (NRC) by issuance of an Operating License**. Pertinent regulations are found under 10 CFR Part 20 and 10 CFR Part 50. Sequoyah Nuclear Plant effluents that may contain radioactive material are not addressed as part of the NPDES permitting process.

2. Page R-8 of R-43, Outfall 101 monitoring requirements: TVA requests that the last sentence in Section e. on Polychlorinated Biphenyls (PCB) paragraph be changed to match the permit pages for Outfall 101 and to read as:

PCB monitoring at Outfall 101 will be deleted from the monitoring requirements.

3. Page R-8 of R-43, Outfall 101 monitoring requirements: TVA requests that the effluent limits for Total Residual Chlorine (TRC) remain at the current NPDES Permit limit of 0.10 mg/L. As stated on the Rationale page R-8 of R-43, the Lower Limit of Quantification (LLD) for the colorimetric analysis of chlorine using DPD indicator are extremely variable and dependent upon the sample matrix. TVA has performed extensive LLD studies for chlorine analysis using EPA-approved analytical methodologies and associated instrumentation. SQN has determined that the LLD for the Tennessee River in the vicinity of SQN is 0.08 mg/L. TVA had this study independently confirmed by Watts Bar Nuclear Plant. Although the 0.1 mg/L effluent limit will exceed the criterion maximum concentration (CMC), it is recognized that the reported values provided by TVA are calculated value based on TRC measurements taken within a small system prior to mixing with the total cooling water flow. TVA's calculated value only takes into account the mixing with the large volume of non-chlorinated cooling water and does not taken into account the dissipation due to elevated temperatures of the water, sunlight, or turbulence of the water prior to being discharged from Outfall 101. With all of these factors included, TVA is providing a very conservative TRC calculated value for Outfall 101. Therefore, it is anticipated that an effluent limit of 0.10 mg/L for TRC will comply with water quality criteria.

As discussed with Robert Alexander of your staff, enclosed is an updated Flow Schematic for SQN Plant.

TVA appreciates this opportunity to provide comments on the draft NPDES permit. A TVA representative will be contacting the division soon to discuss these comments and to ascertain whether a meeting would be appropriate. If you have any questions or need additional information, please contact Sam Hixson at (423)751-6705 in Chattanooga, or by email at [swhixson@tva.gov](mailto:swhixson@tva.gov).

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Sincerely,



Christopher R. Church  
Site Vice President  
Sequoyah Nuclear Plant

Enclosure

cc (Enclosure):

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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

Stéphanie 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, 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:

<b>Chemical Name:</b>	<b>Nalco PCL-401</b>
<b>Primary Ingredient:</b>	<b>Anionic Copolymer</b>
<b>CAS No.:</b>	<b>None Provided</b>

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:** Didecyldimethylammonium Chloride  
**CAS No.:** 7173-51-5

This chemical is a non-oxidizing biocide used to control mollusks. The primary ingredient, didecyldimethylammonium 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, funji, 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	
Nalco 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		12872
	7647156	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	20,800		30,400	20061
		Daphnia magna	EC50		23,000		5675
		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		2800		12872
		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	288	353	6230		
Nalco H-130 M  Active ingredient: N-Decyl-N,N'-dimethyl-1-decanaminium chloride	7173515	Ceriodaphnia 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	28	37	48	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
		Sheephead 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	20361
		Rainbow Trout	LC50	970		1240	344
Nalco 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			11951	
		Daphnia magna	NOEC	<6300			14533	
		C. daphnia dubia	LC50	7200000	8808000	12000000	212	
		Carp	LC50		8140		547	
Nalco PCL-401 Primary Active ingredient: Ingredients not provided from MSDS information submitted.	NA	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/Reprod	96-hr		
					uction			
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		
			LOEC	1,250	1,250	2,500		
			LC50			1,853		
			LC25			1,530		
			LC10			1,336		
	7778-77-0 7758-11-4	C. dubia	NOEC	625	313			
			LOEC	1,250	625			
			EC50					
			EC25					
			EC10					
						48-hr		
						1,250		
						2,500		
						1,765		
						1,397		
						1,042		
Lonza 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 27479-28-3 27479-29-4	P. promelas	EC50 <sub>48</sub>	.3295 ppm	.3694 ppm	4225 ppm		
			EC50 <sub>72</sub>	.2054 ppm	.3468 ppm	64.449 ppm		
			EC50 <sub>96</sub>	0.3003 ppm				
Nalco H150-M <sup>4</sup> (Note: this product has the same chemical characteristics as Lonza Barquat 4250-Z.)		P. promelas	LC50 <sub>96</sub>			0.283 ppm		
			NOEC	0.05 ppm				
			NOEC	0.1 ppm				
			LC50 <sub>48</sub>			0.053 ppm		
			NOEC - 3 Brood		0.02 ppm			
				0.04 ppm				

\* "Benzotriazoles Category Justification and Testing Rationale", Benzotriazoles Coalition, Synthetic Organic Chemical Manufacturers Association, December 2001

\*\* Data provided from TVA and ASCE 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. Discharge <sup>2</sup> lbs	Minimum Stream Flow <sup>9</sup> MGD	Max Conc. Active Ingre. Instream <sup>3</sup> ug/l	Active Ingre. Acute Toxicity <sup>4</sup> ug/l	Active Ingre. 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
Nalco PCL-401	Anionic Copolymer	28.50%	1480	1893	93.74	798,000		399,000	79,800
Nalco PCL-222	Anionic Copolymer	8.88%	760	1893	48.14	1,853,000		926,500	185,300
	Phosphate	32.30%	2280	1893	144.42				
Nalco 73551	Ethylene/Propylene oxide	20.00%	50	1893	3.17	200,000	28,000	100,000	28,000
Nalco Towerbrom 960	Sodium Dichloroisocyanurate	90.00%	1425	1893	90.26	150		75	15
	Sodium Bromide	10.00%	1425	1893	90.26	60,000		30,000	6,000
	TRO	54.70%	1425	1893	90.26			19	11
Barquat 4250-Z	alkyl dimethyl benzyl -ammonium chloride	25.00%	855	1893	54.16	300		150	30
	alkyl dimethylethylbenzyl - ammonium chloride	25.00%	855	1893	54.16				
Nalco H-130M	N-decyl-N, N-dimethyl-1- decanaminium chloride	50.00%	855	1893	54.16	100	104	50	10.0
Betz-Dearborn- Spectrus CT 1300	(C12-16) alkyl dimethyl benzyl ammonium chloride	50.00%	855	1893	54.16	100	104	50	10.0
Nalco Coagulant Aid 35	Aluminum	10.60%	8520	1893	540			750 <sup>8</sup>	87 <sup>8</sup>

- 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>4</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> ug/l	CMC ug/l
					Chemical ug/l	Active Ingre. ug/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	926,500
	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- decanaminium 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>5</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.



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379-2000

March 7, 2005

Ms. Pamala Myers  
Permit Section  
Tennessee Department of Environment & Conservation  
Division of Water Pollution Control  
6th Floor, L & C Annex  
401 Church Street  
Nashville, Tennessee 37243-1534

Dear Ms. Myers:

**SEQUOYAH NUCLEAR PLANT (SQN) - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT NO. TN0026450 - REQUEST BIOCIDES/CORROSION TREATMENT PLAN APPROVAL**

Sequoyah Nuclear Plant (SQN) requests permission to implement the following changes to the Biocide/Corrosion Treatment Plan. The changes are necessary for SQN to address mollusk and microbiologically induced corrosion issues in plant systems that are essential for the safe and reliable operation of the plant. These systems are designed in accordance with Nuclear Regulatory Commission requirements and must function as designed in the event plant shutdown is required. As indicated in the plan, the plant's safety related systems must be routinely chlorinated for four to twelve hours per day and occasionally must be chlorinated twenty-four hours per day. Attached please find a complete Biocide/Corrosion Treatment Plan with the following requested changes highlighted.

1. Authorization to use H-130M, Barquat 4250-Z (also known as H-150M), and/or Spectrus CT1300 for mollusk control.
2. Authorization to use the detoxifying agent bentonite clay when required. Bentonite clay will be used at a minimum ratio of 5 ppm clay to 1 ppm product.
3. SQN requests in this plan to increase the chlorine discharge limit at Outfall 101 to 0.1 mg/L for TRC. This is consistent with TDEC's comments back to WBN in the July 30, 2004 Biocide/Corrosion Treatment Plan Approval letter. (reference the plan overview). This discharge limit will be determined by mass balance calculation.

SQN plans to show compliance by use of mass balance calculations when possible. In the event detoxification with bentonite clay is required, SQN will obtain and analyze a daily confirmatory sample for the active ingredients in H-130M, Barquat 4250-Z (also known as H-150M), and/or Spectrus CT1300 during application. This analytical result may be used in conjunction with calculations to demonstrate protection of the receiving stream. These records will be maintained on site in accordance with NPDES permit requirements. Please note that SQN has conducted and passed quarterly toxicity testing in conjunction with non-oxidizing biocide treatments with H-130M during the current permit term.

Ms. Pamala Myers  
March 7, 2005  
Page 2

SQN requests written approval of this Biocide/Corrosion Treatment Plan no later than April 7, 2005 in order to facilitate more effective treatment during the spring months. SQN is also providing this request to update the NPDES permit application submitted on June 30, 2003. The attached plan reflects all the changes implemented since issuing the last NPDES permit and provides a more accurate initial reference for the Raw Cooling Water treatment chemicals and programs proposed during the NPDES permit renewal process.

SQN will request changes to this plan whenever changes in active ingredients, discharge concentrations, or maximum daily usage are necessary. Changes in the trade name of the products and minor changes in equipment or methods of application will not require additional reviews or authorization for this plan.

If you need additional copies or have comments or questions, please contact Ann Hurt (423-843-6714) or myself (423-843-6700).

*I certify under penalty of law that this document and all of its attachments were prepared under my direction or my supervisor in accordance with a system designed to assure qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Sincerely,



Stephanie A. Howard  
Principal Environmental Engineer  
Signatory Authority for  
J. Randy Douet  
Site Vice President  
Sequoyah Nuclear Plant

Enclosures  
cc (Enclosures):

Mr. Edward M. Polk, Jr., P.E.  
Manager, Permit Section  
Tennessee Department of  
Environment & Conservation  
Division of Water Pollution Control  
6th Floor, L & C Annex  
401 Church Street  
Nashville, Tennessee 37243-1534

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

## Raw Water Chemical Additives at Sequoyah Nuclear Plant

PRODUCT	PURPOSE	FREQUENCY OF DISCHARGE	ACTIVE INGREDIENTS	REPRESENTATIVE AQUATIC TOXICITY /DESCRIPTOR	DISCHARGE CONCENTRATION <sup>1</sup>
				(ppm active ingredients)	(ppm active ingredients)
PCL-401	Dispersant to facilitate iron corrosion inhibition	Continuous during cool weather months	Anionic Copolymer	48-h LC <sub>50</sub> =798 (D. magna) 96-h LC <sub>50</sub> >=2850 (bluegill sunfish)	≤ 0.2
PCL-222 <sup>2</sup>	Dispersant to facilitate iron corrosion inhibition	Continuous	Orthophosphate, Hexametaphosphate Anionic Copolymer	48-h LC <sub>50</sub> =798 (D. magna) 96-h LC <sub>50</sub> >=2850 (bluegill sunfish)	≤ 0.2
Biodetergent 73551	Surfactant to facilitate oxidizing biocides	Periodic	Ethylene Oxide – Propylene Oxide copolymer (EO/PO copolymer)	3 brood IC <sub>25</sub> =28 (C. dubia) 7-d NOEC=105.4 (P. promelas)	≤ 2.0
Towerbrom 960	Oxidizing Biocide (Chlorination)	Periodic	Sodium Bromide & Sodium Dichloroisocyanurate	48-h LC <sub>50</sub> =2.43 (D. magna) 48-h LC <sub>50</sub> =0.679 (P. promelas)	≤ 0.10 Chlorine (Total Residual)
H-130M <sup>4</sup>	Non Oxidizing Biocide (Mollusk Control)	Periodic	Didecyldimethylammonium Chloride (DDAMC)	3 brood IC <sub>25</sub> =0.139 (C. dubia) 7-d IC <sub>25</sub> =0.104 (P. promelas)	≤ 0.05
Barquat 4250-Z (also known as H-150M) <sup>4</sup>	Non Oxidizing Biocide (Mollusk Control)	Periodic	Alkyl Dimethyl Benzyl Ammonium Chloride & Alkyl Dimethyl Ethylbenzyl Ammonium Chloride	Toxicity testing of Barquat is currently underway (3/1/05) at Environmental Testing Solutions, Inc., Asheville, NC.	≤ 0.05
Spectrus CT1300 <sup>4</sup>	Non Oxidizing Biocide (Mollusk Control)	Periodic	Alkyl Dimethyl Benzyl Ammonium Chloride & Ethyl Alcohol	48-h LC <sub>50</sub> =0.18 (C. dubia) 96-h LC <sub>50</sub> =0.36 (P. promelas)	≤ 0.05
Coagulant Aid -35 <sup>3</sup>	Detoxification of non oxidizing biocides	Periodic	Sodium Silicate (Bentonite Clay)	No toxicity data is available. No treatment standards are applicable. This is an industry standard for detoxification.	≤ 10.0

1. The maximum discharge concentration is indicated EXCEPT where noted. Concentrations are achieved through dilution and/or detoxification with bentonite clay.
2. Toxicity of PCL-222 assumed to be similar to PCL-401. No actual toxicity data available for this product. Tests will be conducted at a toxicity lab under contract to the manufacturer.
3. Detoxification chemicals are applied when required.
4. SQN plans on using the non-oxidizing biocides H-130M, Barquat 4250-Z (also known as H-150M), and/or Spectrus CT 1300 for mollusk control.

# Raw Water Chemical Application Guide<sup>1</sup>

Product	Injection Points	Max Feed (ppm)	In Plant Target (ppm)	Frequency of Application	Average Duration of Application.	Estimated Max Days per Year	Maximum Daily Usage (lbs/day) <sup>2</sup>
PCL-401 <sup>3</sup>	ERCW Train A & B	2.6	2.6	Daily during cool weather months	24 hours per day	217	1480
PCL-222 Copolymer <sup>3</sup>	ERCW Train A & B and RCW	0.8	0.8	Daily	24 hours per day	365	760
PCL-222 Phosphate <sup>3</sup>	ERCW Train A & B and RCW	2.4	2.4	Daily	24 hours per day	365	2280
Biodetergent 73551	ERCW Train A & B and RCW	2.5	2.5	208 days per year	0.5 hours per day	208	50
Towerbrom 960 <sup>4</sup>	ERCW Train A & B and RCW	1.5	1.5	312 days per year	4-12 hours per day	312	1425
H-130M <sup>5</sup>	ERCW Train A & B and RCW	3.0	3.0	24 per year	3-5 days	120	855
Barquat 4250-Z (also known as H-150M) <sup>5</sup>	ERCW Train A & B and RCW	3.0	3.0	24 per year	3-5 days	120	855
Spectrus CT1300 <sup>5</sup>	ERCW Train A & B and RCW	3.0	3.0	24 per year	3-5 days	120	855
Coagulant Aid-35	ERCW Train A & B and RCW	30	30	24 per year	3.5-5.5 days	132	8520

1. Concentrations and usage are expressed for the active ingredient(s) shown on the first page of this plan.
2. Maximum Daily Usage provides an indication of loading in the receiving stream. It is the maximum amount of active ingredients for the worst case scenario of flow and feed concentration being proposed plus a 10% margin of error. SQN will request a change to this plan should an increase in maximum daily usage becomes necessary for the continued safe operation of the plant.
3. PCL-222 is a blend of copolymer, orthophosphate, and hexametaphosphate. PCL-222 is injected into the RCW system continuously, except during periods of other chemical injection due to common injection lines. PCL-222 is injected into the ERCW Train A & B system only during warm weather months. During cool weather months PCL-401 is injected.
4. Towerbrom 960 is 96% active product producing 57% free halogen (chlorine or bromine). Chlorine will be less than NPDES permit limits at NPDES discharge point (Outfall 101). Also, please note that the routine usage includes the proposed 24 hr/day chlorination activities. That is why the maximum daily usage (lbs/day) is higher than the 4-12 hours per day usage that is most typical of 'Routine Chlorination'. See the rationale documents for more information on chlorination.
5. SQN plans on using the non-oxidizing biocides H-130M, Barquat 4250-Z (also known as H-150M), and/or Spectrus CT 1300 for mollusk control.

**Calculations Showing Worst Case Scenario (final values rounded to the nearest 5 lbs)**

<b>PCL-401</b>	2.6 mg	1 lb	43,000 gal	3.785 L	60 min	24 hr	1.10	= 1480 lbs/day PCL-401
2.6 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>PCL-222</b>	0.8 mg	1 lb	71,800 gal	3.785 L	60 min	24 hr	1.10	= 760 lbs/day PCL-222 copolymer
0.8 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>PCL-222</b>	2.4 mg	1 lb	71,800 gal	3.785 L	60 min	24 hr	1.10	= 2280 lbs/day PCL-222 phosphate
2.4 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>BioDet 73551</b>	2.5 mg	1 lb	71,800 gal	3.785 L	60 min	0.5 hr	1.10	= 50 lbs/day BioDetergent 73551
2.5 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>TB-960</b>	1.5 mg	1 lb	71,800 gal	3.785 L	60 min	24 hr	1.10	= 1425 lbs/day TB-960
1.5 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>H-130M</b>	3 mg	1 lb	21,500 gal	3.785 L	60 min	24 hr	1.10	= 855 lbs/day H-130M (quat)
3 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>Barquat 4250-Z (also known as H-150M)</b>	3 mg	1 lb	21,500 gal	3.785 L	60 min	24 hr	1.10	= 855 lbs/day Barquat 4250-Z (also known as H-150M)
3 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>Spectrus CT1300</b>	3 mg	1 lb	21,500 gal	3.785 L	60 min	24 hr	1.10	= 855 lbs/day Spectrus CT1300
3 ppm active	L	454,000 mg	min	gal	1 hr	day		
<b>CA-35<sup>1</sup></b>	30 mg	1 lb	21,500 gal	3.785 L	60 min	24 hr	1.10	= 8520 lbs/day CA-35
30 ppm active	L	454,000 mg	min	gal	1 hr	day		

1. Coagulant Aid-35 is fed at 5x product dose (or 10x active dose) for quaternary amines. It may be applied to the ERCW A & B Train and RCW when required. Max ppm feed dose of 30 ppm is based on the worst case scenario of 3 ppm active H-130M, Barquat 4250-Z (also known as H-150M), and/or Spectrus CT1300 max feed dose, with a maximum ERCW/RCW flow rate of 21,500 gpm.

### Raw Water Treatment Programs

The fundamental approach and active ingredients for the various treatment programs at SQN have not changed significantly in more than seven years. Products with slightly different formulations of the same active ingredients or constituents of concern and the processes or frequencies of applying those products have changed periodically.

1. Dispersants and surfactants used year round to facilitate removal of corrosion products from carbon steel piping has changed recently with some differences in active ingredients, but all have been of low toxicity.
2. Treatment with *oxidizing* biocides has had prior approval. Based on quarterly toxicity testing, toxicity concerns are being addressed for oxidizing biocides.
3. Treatments with *non-oxidizing* biocides use quaternary amine compounds for mollusk control. Detailed calculations are performed for each treatment to ensure discharge limitations are observed.
  
4. **The most significant changes in this proposal are:**
  - The addition of continuous (24hr/day) oxidizing biocide treatments for mollusk control.
  - SQN plans to increase the number of non-oxidizing biocide treatments from four to eight for mollusk control. One treatment is defined as injections into three systems RCW, ERCW-A train and ERCW-B train.
  - Detoxify non-oxidizing biocides using bentonite clay when required.
  - SQN requests in this plan to increase the chlorine discharge limit at Outfall 101 to 0.1 mg/L for TRC this is consistent with TDEC's comments back to WBN in the July 30, 2004 Biocide/Corrosion Treatment Plan Approval letter. (reference the plan overview). This discharge limit will be determined by mass balance calculation.

Treatment Plan Overview and Toxicity Summaries	
Document	Summary
 Plan Overview	An overview of the proposed raw water treatment programs at SQN.
 Detoxification	This document describes the process for detoxifying SQN's effluents from the application of quaternary amines as a molluscicide. The process references H-130M but is applicable to Barquat 4250-Z (also known as H-150M) and Spectrus CT1300 as well.
 Toxicity Assessment Summary	Several bench top toxicity studies on individual products and the synergistic effects of the various treatment programs have been conducted for TVA nuclear facilities. The simulated effluents tested included the molluscicide H-130M contained in this treatment plan. Results from these studies are incorporated into the attached summary of toxicity endpoints compared with projected instream product concentrations. Reports are available upon request. Ongoing documentation for protection against synergistic and/or chronic impacts by SQN's treatment programs is provided by routine 7-day toxicity testing at Outfall 101 (diffuser discharge). SQN has not failed a toxicity test at Outfall 101 during quarterly testing under the current chemical additive plan.
 Quaternary Amines	A short summary prepared by Calgon with information on how quaternary amines work.

<b>PCL-401 (Anionic Copolymer)</b>	
A dispersant commonly used in water treatment programs. PCL-401 is a copolymer-dispersant used to minimize fouling and under-deposit corrosion in the ERCW system. This product makes carbon piping corrosion inhibitors more effective. PCL-401 is not considered hazardous per OSHA regulations and appears to be of very low toxicity according to the MSDS and bench top studies conducted by TVA.	
Document	Summary
 PCL-401 MSDS.pdf	Material Safety Data Sheet.
 PCL401 PB.pdf	Product Bulletin

<b>PCL-222 (Anionic Copolymer/Phosphate)</b>	
A dispersant commonly used in water treatment programs. PCL-222 is a copolymer-phosphate dispersant used to minimize fouling and under-deposit corrosion in the ERCW and RCW systems. This product makes carbon piping corrosion inhibitors more effective. PCL-222 is not considered hazardous per OSHA regulations and appears to be of very low toxicity according to the MSDS and compliance with WET limits during on-going quarterly testing.	
Document	Summary
 PCL-222 MSDS	Material Safety Data Sheet.
 PCL-222 PB	Product Bulletin

<b>Biodetergent 73551 (Ethylene Oxide/Propylene Oxide Copolymer)</b>	
Biodetergent 73551 is a surfactant commonly used in water treatment programs to remove and disperse "soft foulant" (biofilm-enmeshed mud, silt and clay) from piping systems. When Towerbrom 960 is used for routine chlorination treatments, this product is added into the ERCW and RCW systems for approximately 30 minutes prior to initiating treatment to enhance the effectiveness of chlorination. This product has a low toxicity and will be discharged at low concentrations.	
Document	Summary
 Biodetergent 73551 MSDS.pdf	Material Safety Data Sheet.
 73551 PB.pdf	Product Bulletin

<b>Towerbrom 960 (Sodium Bromide &amp; Sodium Dichloroisocyanurate)</b>	
<p>Towerbrom 960 is an oxidizing biocide generating bromine and chlorine solutions when dissolved in water. Chlorine is monitored to ensure discharge limitations are met when this product is used in the ERCW and RCW systems. In system samples are collected during the treatment and analyzed according to NPDES permit requirements and used in a mass balance calculation to derive the discharge concentration to ensure discharge limitations are met.</p>	
<b>Document</b>	<b>Summary</b>
 Towerbrom 960 MSDS.pdf	Material Safety Data Sheet.
 Towerbrom 960 PB.pdf	Product Bulletin

<b>H-130M (Didecyldimethylammonium Chloride)</b>	
<p>H-130M is a quaternary amine used for mollusk control. Actual discharges are based on calculations that assume no demand in the system, therefore increasing the safety margin for instream protection. SQN is requesting with this application that the number of injections and durations be adjusted, but that the current maximum allowable discharge concentration of 0.05 ppm remains unchanged. SQN plans to ensure water quality is not threatened by adding bentonite clay to detoxify the active ingredient when required. TVA's own studies as well as those of the manufacturer of this product indicate that bentonite clay will be effective at detoxifying this product.</p>	
<b>Document</b>	<b>Summary</b>
 H-130M MSDS.pdf	Material Safety Data Sheet.
 H-130m PB.pdf	Product Bulletin

<b>Barquat 4250-Z (also known as H-150M)</b>	
<p>Barquat 4250-Z (also known as H-150M) is a quaternary amine used for mollusk control. Actual discharges are based on calculations that assume no demand in the system, therefore increasing the safety margin for instream protection. SQN is requesting with this application that the number of injections and durations be adjusted, but that the current maximum allowable discharge concentration of 0.05 ppm remains unchanged. SQN plans to ensure water quality is not threatened by adding bentonite clay to detoxify the active ingredient when required. The manufacturer of this product indicates that bentonite clay will be effective at detoxifying this product.</p>	
<b>Document</b>	<b>Summary</b>
 Barquat 4250-Z MSDS	Material Safety Data Sheet.
 Barquat 4250-Z PB	Product Bulletin

<b>Spectrus CT1300</b>	
<p>Spectrus CT1300 is a quaternary amine used for mollusk control. Actual discharges are based on calculations that assume no demand in the system, therefore increasing the safety margin for instream protection. SQN is requesting with this application that the number of injections and durations be adjusted, but that the current maximum allowable discharge concentration of 0.05 ppm remains unchanged. SQN plans to ensure water quality is not threatened by adding bentonite clay to detoxify the active ingredient when required. The manufacturer of this product indicates that bentonite clay will be effective at detoxifying this product.</p>	
<b>Document</b>	<b>Summary</b>
 Spectrus CT1300 MSDS	Material Safety Data Sheet.
 Spectrus CT1300 PB	Product Bulletin

<b>Coagulant Aid-35 (Sodium Silicate)</b>	
<p>Bentonite Clay. An industry standard for detoxifying effluents and water treatment. No toxicity data is available for this product. Wide spread use as a flocculant and as a detoxifying agent for organics. TVA and manufacturer studies indicated bentonite clay is very effective at removing the constituents of concern of the non-oxidizing biocides proposed in this treatment plan. The primary end product following absorption of the constituents is carbon dioxide from degradation of the complex organic molecules. Compliance with TSS limitations will be met during use of this product.</p>	
<b>Document</b>	<b>Summary</b>
 CA-35 MSDS.pdf	Material Safety Data Sheet.
 CA-35 PB.pdf	Product Bulletin

## **AN OVERVIEW OF RAW WATER CHEMICAL ADDITIVES**

Inspection and chemical treatment programs have been implemented at Sequoyah Nuclear Plant (SQN) to control fouling, plugging, and pipe wall thinning of the raw water systems. Most of the chemicals used in these treatment programs are added at three locations Essential Raw Cooling Water (ERCW) intake for ERCW A train and ERCW B train and Raw Cooling Water (RCW) pump suction header for RCW to ensure these raw water systems are protected. These systems, the ERCW and RCW, are essential for the safe and reliable operation of the plant. SQN plans to show compliance with the treatment plans below using mass balance calculations where possible.

### **CARBON STEEL CORROSION INHIBITION**

SQN currently uses a combination of three chemicals to provide corrosion protection for carbon steel piping in the plant: a biodegradable ethylene glycol oxide/propylene glycol oxide copolymer, a dispersant copolymer PCL-401 and a dispersant copolymer with a phosphate additive PCL-222. SQN recently received approval for use of the biodegradable 73551 and it is injected into ERCW and RCW. SQN has used the dispersants PCL-401 and PCL-222 for seven years. PCL-401 contains a copolymer with no phosphorous. PCL-401 is only injected into the ERCW system during months when the average ambient temperatures are below 35 degrees Fahrenheit. PCL-222 is injected into the RCW system year round and is injected into the ERCW system when the average ambient temperature is above 35 degrees Fahrenheit. The concentration of ethylene glycol oxide/propylene glycol oxide copolymer in the plant effluents will not exceed 2.0 ppm, and copolymer and phosphorous in the plant effluents will not exceed 0.2 ppm. It will continue to be necessary to apply these chemicals year round.

### **RAW COOLING WATER BIOCIDES TREATMENTS**

Protection of the raw cooling water systems from macro-invertebrates (mollusks) requires oxidizing and non-oxidizing biocide treatments. Oxidizing biocide treatments are aimed at both macro-invertebrate and microbiologically induced corrosion (MIC) control. Non-oxidizing biocides are aimed at macro-invertebrate control. SQN plans to continue treating plant systems for mollusk control with a non-oxidizing biocide, H-130M, previously approved by the Division of Water Pollution Control. SQN also requests authorization to use additional quaternary amines to supplement the treatment program when needed. SQN plans to detoxify non-oxidizing effluents when required.

### **ROUTINE RAW WATER TREATMENT WITH OXIDIZING BIOCIDES (CHLORINATION)**

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.

The active ingredients in Towerbrom 960 produce 57% free halogen (chlorine and bromine) in solution. TVA plans 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 Total Residual Chlorine (TRC) test). Water quality criteria for TRC are 0.019 mg/L as the Criteria Maximum Concentrations ((CMC) are water quality criteria for acute exposures) and 0.011 mg/L as the Criteria Continuous Concentrations ((CCC) are water quality criteria for chronic exposure). 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 0.1 mg/L for TRC will comply with water quality criteria. SQN requests in this plan to increase the chlorine discharge limit at Outfall 101 to 0.1 mg/L for TRC this is consistent with TDEC's comments back to WBN in the July 30, 2004 Biocide/Corrosion Treatment Plan Approval letter. This discharge limit will be determined by mass balance calculation.

#### **NON OXIDIZING BIOCIDES TREATMENT (MOLLUSK CONTROL)**

Due to an increase in the clam infestations seen in the plant piping necessary for safe shutdown of the plant, SQN plans to use the non-oxidizing biocides H-130M, Barquat 4250-Z (also known as H-150M) and/or Spectrus CT1300 for 24-120 hours, 4-8 times per raw water system (RCW, ERCW-A, and ERCW-B) per year. SQN will show by mass balance calculation that the required concentrations are being met for each application. SQN plans to detoxify the effluent by treatment with bentonite clay when required and confirm the effectiveness of detoxification with daily sampling for the active ingredient in the effluent during the treatment period. For additional information refer to the detoxification document in the rationale for this treatment plan.

## Detoxification Plan

**Note:** This document describes the process for detoxifying SQN's effluents when required from the application of quaternary amines as a molluscicide. The process references H-130M but is applicable to Barquat 4250-Z (also known as H-150M) and Spectrus CT1300 as well.

### Background

H-130M is a non-oxidizing liquid organic molluscicide containing a quaternary amine (quat) compound. H-130M effectively controls the zebra mussel and Asiatic clam in their veliger, juvenile, and adult forms. Due to the toxicity of H-130M to non-target organisms, a plant's discharge may need to be treated with CA-35, bentonite clay. CA-35 complexes with quaternary amines. The combined complex is not harmful to aquatic species or benthic organisms.

Effective dosage of H-130M is a function of water temperature. As water temperature decreases, the amount of H-130M required or the length of treatment is greater for the same mortality rate. Below 60 °F, the effectiveness of H-130M drops off quickly and dramatically due to lower mollusk metabolism rates and slower chemical reactions. Generally, 70-72 °F is considered to be ideal, providing highest mortality for lowest chemical dosage and duration. At very high temperatures (low to mid 80s), mollusk metabolism is also known to decrease and therefore filter-feeding rate may decrease. Therefore, the vendor does not recommend applications at very high temperatures.

Table 1 illustrates recommended treatment dosages and durations for mollusk control at SQN. This information is based on seminar literature and flow-through R&D data. Treatments must be maintained at the target active residuals as measured (using a mass balance calculation) at the system outlet, for the entire duration.

System	Treatment	Temp (°F)	Product Dose (ppm)	Target Active Residual (ppm)	Duration (hrs)
ERCW/ RCW	H-130M with CA-35 clay detox at 5:1 ratio to H-130M product	60-85	6.0	3.0	24-120

*Table 1: Recommended H-130M Treatment Dosage and Duration*

### H-130M Injection Plan

SQN plans on injecting H-130M to obtain 3.0 ppm active residual at the ERCW/RCW system outlet during treatment of RCW and each train of ERCW for a minimum of 24 hours. Based on the time required to rotate system equipment, to meet system demand and to see acceptable concentrations in low flow areas and components during the treatment, the typical treatment will most likely last 48 hours and, potentially, as long as 120 hours. The ERCW system chemical injection will occur in the respective ERCW pump pit of the ERCW train being treated. For example, if treating the ERCW A train, H-130M will be injected to the ERCW A pump pit. The RCW system injection will occur in the suction header feeding the RCW pumps.

## Detoxification Plan

Increased consumption of H-130M may occur due to higher system demand in all treatments. Therefore, the H-130M injection dose may need to increase to 6.0 ppm as product or higher to achieve 3.0 ppm active residual at the system's low flow components. Clay detoxification feed rate will increase in proportion prior to raising the H-130M injection rate. If clay detoxification is halted to a discharge path due to malfunctions of any type, injection of H-130M will immediately stop.

### **Application/Equipment Description**

One clay detoxification feeder is required to feed CA-35 at the discharge point. A clay feeder consists of a feed augur, hopper, eductor, pump, and piping enclosed in a small trailer. Clay is unloaded in the hopper and transferred to the eductor by the feed augur. Clay mixes with the drive water creating clay slurry which is then injected into the selected discharge point by a pump. Clay feed rate is controlled by the feed augur. The augur has two settings: low (154 lbs clay/hr max) and high (617 lbs clay/hr max). Based on anticipated system flow rates, the maximum total anticipated clay feed rate is 355 lbs/hr during a typical treatment, which is easily within the capacity of the feed augur system. The hopper can hold as much as 150 pounds of clay, maximizing the time of unloading clay. Equipment set-up and components may vary slightly depending on vendor used for detoxification. Bentonite clay will be used at a minimum ratio of 5 ppm clay to 1 ppm product.

A technician will be responsible for proper and continuous operation of the trailer. Due to the critical nature of detoxification during the molluscicide treatment, the technician will be under the close supervision of an experienced vendor representative. If any problem is observed to be preventing clay feed, H-130M injection will be immediately terminated, the discharge paths will be isolated, and SQN staff notified.

### **Sampling**

To confirm effective detoxification for NPDES discharge purposes, daily samples will be collected at the NPDES discharge point (Outfall 101) for each day of treatment and during the treatment process and will be either analyzed on site or will be shipped to an analytical laboratory and analyzed using a methylene chloride extraction method with a MDL of 0.02 ppm quaternary amine.

### **Tentative Treatment Schedule**

In accordance with TVAN procedures, a minimum number of molluscicide treatments are established to exceed no more than eight treatments per year. A treatment is defined as injection of H-130M into each ERCW train A & B and the RCW system. Injections of H-130M are not conducted concurrently as only one train or system has injection occurring at any time.

**Estimated Chemical Usage**

Table 2 lists the expected H-130M chemical use and feed rates during typical molluscicide treatments of RCW and each train of ERCW. Table 3 lists the expected CA-35 chemical use.

**Table 2: Expected H-130M Chemical Usage**

Treatment	System Flowrate (gpm)	Treatment Duration (hrs)	H-130M Injection Dose (ppm)	H-130M Injection Rate (lbs/hr)	H-130M used during treatment (lbs)
Spring Treatment	21,500	288	6.0	35	10,080
1 <sup>st</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
2 <sup>nd</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
3 <sup>rd</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
4 <sup>th</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
5 <sup>th</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
6 <sup>th</sup> Veliger Peak Treatment	21,500	90	6.0	35	3,150
Fall Treatment	21,500	288	6.0	35	10,080
<b>Total Annual Usage (lbs)</b>					<b>39,060</b>

**Table 3: Expected CA-35 Chemical Usage**

Treatment	System Flowrate (gpm)	Treatment Duration (hrs)	CA-35 Feed Rate (lbs/hr)	CA-35 used during treatment (lbs)
Spring Treatment	21,500	292	180	52,560
1 <sup>st</sup> Veliger Peak Treatment	21,500	94	180	16,920
2 <sup>nd</sup> Veliger Peak Treatment	21,500	94	180	16,920
3 <sup>rd</sup> Veliger Peak Treatment	21,500	94	180	16,920
4 <sup>th</sup> Veliger Peak Treatment	21,500	94	180	16,920
5 <sup>th</sup> Veliger Peak Treatment	21,500	94	180	16,920
6 <sup>th</sup> Veliger Peak Treatment	21,500	94	180	16,920
Fall Treatment	21,500	292	180	52,560
<b>Total Annual Usage (lbs)</b>				<b>206,640</b>

**Product Toxicity Data Summary and Comparison with Maximum Instream Wastewater Concentrations (IWC)**

Chemical	Organism <sup>1</sup>	Acute Endpoints (ppm as active)		Chronic Endpoints (ppm as active)		Maximum Discharge Conc. (< Acute endpoints)  (ppm as active)	Conc. @ 101 Instream Waste Conc. 1Q10 ~3491 MGD 101 ~1532 MGD (< Chronic endpoints))  (ppm as active)
		48-h LC <sub>50</sub>	96-h LC <sub>50</sub>	NOEC	IC <sub>25</sub>		
PCL-401	D. magna	798	-	-	-	0.2	0.088
	Bluegill	-	>2,850	-	-		
	Rainbow Trout	-	>1,397	-	-		
PCL-222 <sup>2</sup>	D. magna	798	-	-	-	0.2	0.088
	Bluegill	-	>2,850	-	-		
	Rainbow Trout	-	>1,397	-	-		
Biodetergent 73551	D. magna	>200	-	-	-	2.0	0.88
	C. dubia	-	-	-	28		
	P. promelas	-	-	-	105.4		
	Bluegill	-	>200	-	-		
	Rainbow Trout	-	>200	-	-		
Towerbrom 960	D. magna	2.43	-	-	-	0.1	0.044
	P. promelas	0.679	-	-	-		
	Blue Gill	-	0.417	-	-		
	Rainbow Trout	-	0.359	-	-		
H-130M	C. dubia <sup>3</sup>	-	0.172	-	0.139	0.05	0.022
	D. magna	0.094	-	-	-		
	P. promelas <sup>3</sup>	-	0.172	-	0.104		
	Bluegill	-	0.46	-	-		
	Rainbow Trout	-	1.10	-	-		
	H. azteca <sup>3</sup>	-	-	-	0.144		
	C. tentans <sup>3</sup>	-	-	-	>1.50		
	U. imbecillis <sup>3</sup>	-	0.159 w/o silt; w/silt >0.300	-	9-day LC <sub>50</sub> w/o silt=0.047; w/silt>1.50		

**Product Toxicity Data Summary and Comparison with Maximum Instream Wastewater Concentrations (IWC), continued**

Chemical	Organism <sup>1</sup>	Acute Endpoints (ppm as active)		Chronic Endpoints (ppm as active)		Maximum Discharge Conc. (< Acute endpoints)	Conc. @ 101 Instream Waste Conc. 1Q10 ~3491 MGD 101 ~1532 MGD (< Chronic endpoints)
		48-h LC <sub>50</sub>	96-h LC <sub>50</sub>	NOEC	IC <sub>25</sub>	(ppm as active)	(ppm as active)
Barquat 4250-Z (also known as H-150M) <sup>4</sup>	C. dubia			-	-	0.05	0.022
	P. promelas			-	-		
Spectrus CT1300	C. dubia	0.18 NOEC 0.08	-	-	-	0.05	0.022
	D. magna	0.06 NOEC 0.03	--	-	-		
	P. promelas	-	0.36 NOEC 0.20	-	-		
	Rainbow Trout	-	1.0 NOEC 0.6	-	-		
	L. variegatus	-	0.74	-	-		
	C. tentans	-	0.25 NOEC 0.07	-	-		
	G. pseutilimnaeus	-	0.04	-	-		

**Notes:**

1. Data Source: Manufacturer unless otherwise noted.
2. Toxicity of PCL-222 assumed to be similar to PCL-401. No actual toxicity data available for this product. Tests will be conducted at a toxicity lab under contract to the manufacturer.
3. Data Source: TVA/Contractor
4. Toxicity testing of Barquat 4250-Z (also known as H-150M) is currently underway (3/1/05) at Environmental Testing Solutions, Inc., Asheville, NC.

## Lessons learned in over 100 Zebra Mussel Control Applications at Industrial Facilities

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### Abstract

Since their introduction into US waterways, Zebra Mussels (*Dreissena polymorphae*) have spread rapidly throughout the Great Lakes and Mississippi regions. These mussels have continued to colonize the intake pipes of industrial water supplies and water distribution systems throughout the affected areas. Their colonization has compromised plant safety and production efficiency, and steadily increased costs to water users.

The design of each industrial plant water distribution system is unique. A comprehensive zebra mussel control strategy using the best available options must be considered in each specific situation. This paper discusses the successful use of one strategy (a quaternary ammonium-based molluscicide) in the battle against zebra mussels. The commercial life cycle of an industrial molluscicide began with initial toxicity screening in the laboratory. The evaluation continued at plant sites through field trials and applications. Lessons learned from these experiences helped direct our efforts toward the development of a second generation program.

Keywords: Zebra mussel, molluscicide, intake structure, macrofouling, amine salt of endothal and quaternary ammonium compounds

### INTRODUCTION

Zebra mussels have been found as far south as New Orleans, LA and as far west as Oklahoma (Figure 1).<sup>1</sup> Additional infestation of this organism is expected to continue at a very slow rate. As an example, *Corbiculae* (Asian Clams) were first found in the state of Washington and can now be found in most fresh water systems in the US. The spread of Asian clams took nearly twenty years from the time of their introduction.

Because of zebra mussels recent introduction into the North American waterways (within the last ten years), plants and industrial facilities were not prepared to handle the problems associated with their infestation. In Europe, industries have adopted modified design that minimizes the colonization problems of zebra mussel. Due to the capital expenditure involved, most North American companies are not able to modify existing intake structures at all plant facilities.

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Generally, such design changes are most cost efficiently implemented during new construction. This is a real dilemma for facilities.

As reported in a survey conducted by the New York Sea Grant publication Dreissena<sup>2</sup>, Zebra Mussel Information Clearinghouse, expenses related to zebra mussels at 339 facilities totaled \$69,070,780. In addition to the millions of dollars spent on minimizing zebra mussel infestation, plants shouldered the additional risk of plugged safety related equipment, valve seats, and fire water systems. The mean expenditure per facility was \$205,570. In some cases, they also incurred the additional expenses related to lost production due to plugged screens and heat exchanger equipment. Zebra mussel infestations also have caused municipal water suppliers great difficulties in maintaining sufficient water supplies to their customers.

Chemical control of mollusk colonization has become the most accepted method of treatment. Of these chlorine is the most commonly used molluscicide. However, regulatory agencies and companies have expressed increased concerns over chlorinated organic compounds, free oxidants and indirect trihaloamines.<sup>3</sup> These chemicals can persist in the environment. Storage and handling of large quantities of chlorine are regulated under SARA Title III. Detoxification of chlorine is needed prior to discharge. Chlorination can also increase the corrosion potential. All of these factors could lead to the eventual abandonment of chlorine as an option.

A class of chemical known as quaternary ammonium compounds (Quats) is now being used as an alternative to chlorine for control of macrofouling. Quats function by interfering with oxygen transfer across the gill membrane of the zebra mussel.<sup>4</sup> Normally an 8-24 hour continuous application of Quats is used to disinfect distribution system piping several times during the mollusk breeding season. Control is maintained by keeping the size of the zebra mussel population such that they will not interfere with the heat exchange equipment. Quats may need to be deactivated prior to discharge, particularly in once through cooling systems.

#### LABORATORY VERIFICATION OF QUATS AS A MOLLUSCIDICIDE

In 1989, a comprehensive research project was begun to develop a molluscicide for industrial use. A literature search of the physiology and biological cycles of *Dreissena polymorpha* was initiated. A zebra mussel farm was developed, to observe mussel specimens and test various potential molluscicides on them. (See Figure 2)<sup>5</sup>.

Screening of quaternary ammonium compounds and other possible chemicals by Static Renewal Studies was the first step in the verification process. Because of the success of quaternary ammonium compounds against Asian clams, *Corbicula*, a quaternary ammonium compound was evaluated at an industrial facility along Lake Erie. A field trial determined that the quaternary ammonium compounds were effective at the tested concentration range (0.50 - 2.50 mg/l active) achieving 100% mortality. Bioboxes were utilized at this facility with zebra mussels acclimated to the plant intake water. The water temperature during these series of tests was 22°C. A second series of tests were performed in the late fall when the water temperature had dropped. During this series of tests, more chemical was needed to kill the mussels than in the first series of tests.<sup>6</sup> Due to the varying results in the field, it was decided to verify and attempt to duplicate these results under controlled laboratory conditions. This decision was made with the intention of registering the quaternary ammonium compound as a molluscicide.

The laboratory phases involved the construction of the flow-through test chambers (Figure 3).<sup>7</sup> Testing of mussels in a dynamic system like flow through test chambers helps stimulate biological activities in the mussels. In studies performed both in laboratory and field applications, a constant flow of fresh water over the mussels encouraged active filtration.

The testing of the mussels at various concentrations and temperature helps optimize the treatment strategies and minimizes the amount of product used in the application. Quat dosage for zebra mussel control is a function of water temperature. As the water temperature decreases,

the amount of Quats required to control the zebra mussels is higher. At 22°C, 0.25 mg/L active concentration of didecyl dimethyl ammonium chloride achieved 100% mortality in 120 hours. While at 18 °C, the same dose achieved 100% mortality in 240 hours. By increasing the concentration to 0.50 mg/L active concentration of didecyl dimethyl ammonium chloride, the time required to achieve 100% mortality at 22°C was 72 hours. Using the same dose and lowering the water temperature to 18°C, resulted in an increase from 72 hours to 120 hours in order to achieve 100% mortality (Figure 4).<sup>8</sup>

Before the product could be used in the field, an effective means of deactivating the product had to be addressed. The use of bentonite clay had demonstrated its ability to deactivate the quaternary ammonium compound. In studies performed in laboratory using deionized water, 9 mg/l of bentonite clay was needed to deactivate 5 mg/l of the Quats product (Figure 5).<sup>9</sup> In the field, where the system water has varying concentration of cationic charge particles, amounts of bentonite clay needed to deactivate the Quats is lower.

A Zebra Mussel Detoxification Trailer was constructed (Figure 6).<sup>10</sup> The trailer was designed to be portable and self contained. The trailer operates at remote sites using energy from an attached electrical generator unit. Bentonite clay is delivered through a hopper to auger which the clay disperses into an eductor that utilizes 273 m<sup>3</sup>/day water flow. The clay slurry is then introduced to the discharge at this point.

After investigating several different scenarios in the laboratory, the product was taken to the field for efficacy studies at industrial sites.

### LESSONS LEARNED

No two industrial water distribution systems are alike. It is critical to investigate the entire system. Input should be gathered by all operating groups involved. Mollusk control issues commonly involve maintenance, operations, safety, environmental, and management personnel. Each group needs to be consulted and be in agreement on the resulting plan. Many factors are involved in the decision to use a chemical for mollusk control. The four main factors are the physical characteristics of the plant, the nature of the chemical to be applied, economics and the frequency of application.<sup>11</sup>

After these criteria for zebra mussel control strategy had been considered, the molluscicide was applied at several industrial facilities. At each facility treated, more accurate knowledge of existing intake structures, as well as an increased understanding of biology of the zebra mussels as it has adapted to the North America, were acquired. The strategy was modified accordingly at each site.

#### Chemical Application and Plant Distribution System Consideration

As previously mentioned, it is important to thoroughly understand the system to be treated. A study of distribution system diagrams will help determine where the greatest threat of mollusk infestation exists. But do not rely on plant blueprints for the whole picture. Updates and modification to existing intake structures are not always depicted on the blueprint. Operators and maintenance personnel may have the best knowledge of cross connections or deviations from the original system.

Potable water systems, eye wash stations, and showers should be circumvented during application of a chemical mollusk treatment. In some cases it is necessary to either time the treatment with outages, weekends, or during evening hours to avoid conflicts with the operation or availability of other systems in the plant.

It has also been observed that mollusk infestation within a distribution system primarily affects the first one-third length of piping. In our experience, we have never seen or heard of a discharge system had a plugging problems due to mollusks.

Where cooling towers are integral to the operation of an industrial water distribution system, it is a good practice to blow down the tower and minimize cycles of concentration the day prior to application of a mollusk control program. When treatment is started, the cooling tower blowdown should be shut off and the system dosed with the Quats at the desired concentration based on system volume. Natural deactivation will occur due to solids in the system and contact with distribution system surfaces. When chemical levels meet discharge levels, the blowdown valve is opened and normal operation is resumed. Some Quats tend to cause foam in cooling towers. It is important to choose a dosage rate that will be effective yet minimize the amount of foam generated. It may be necessary to have antifoam available at least the first time a cooling tower is treated in case excessive amounts of foam are generated.

Firewater systems had been treated using a treat and soak method. The farthest end of the system was flushed while Quats was being added to the service water system. A residual of Quats was measured using an Colorimetric Determination of Didecyldimethylammonium Chloride method.<sup>12</sup> When a residual was found, the hydrant is shut off and different laterals were operated. This continued until the entire fire water systems contained treated water. The system is then allowed to sit for twenty-four hours and then flushed.

The key to effective treatment is to maintain an active residual of Quats during the prescribed treatment period while achieving the desired contact time. In the case of flowing water, the chemical must be continually added to keep the residual at the desired level. In the case of the firewater system, once the residual level is reached, the system is simply bottled up and maintained without the need for additional chemical.

Another lesson learned was how to start up a treatment to get quick results with the optimum amount of chemical. Many plants have surge tanks or storage tanks in various parts of the system. If these tanks contain amounts of water that will turn over slowly, it is important to dose these areas with chemical on the day of treatment as the rest of the system is treated. In this manner the entire distribution is treated at the same time. Although it may sound insignificant, success or failure of an application depends on reaching the effective residual as quickly as possible.

### Monitoring

A treatment schedule is subject to preferences and the potential risk that the plant is willing to endure. Some facilities choose to treat once per year at the end of the breeding season, which is normally in September. Others skip the spring treatment, but treat twice later in the year. First treatment is right after the peak veliger releases during the summer, and the second treatment is in the fall after veliger numbers diminish.

It is important to monitor both the adult and veliger population in the source water. This should be done continuously when water temperature is above 13°C. The presence of either settling adults or a high density of veligers will indicate the need for a treatment. Current industry procedures outline both monitoring protocols and sampling protocol. Monitoring for juvenile or adult mussels on artificial substrates (concrete blocks, PVC) should be located at critical intake structures. More than one monitoring site is recommended due to the variability of settling mussels. Monitoring for veligers in the source water consists of passing a known amount of plant water through at least a 40 micron plankton net with a specimen cup on the end. Microscopic observation of the residual material will allow determination of the number of veligers per unit volume of water. Tracking this data will reveal the trends in breeding activity that will be useful in timing zebra mussel treatment applications.<sup>13</sup>

In one plant, zebra mussel shells were found in heat exchanger tubes when maintenance personnel were working on the exchangers. Maintenance personnel flushed the shells out of the system. When the appearance of zebra mussel shells began to increase at this plant, the plant personnel decided to dose a molluscicide. One day after the treatment was applied, the plant personnel were surprised when a slug of zebra mussel tissue clogged up critical heat exchangers in the plant and forced an emergency outage. The material was cleaned up and the plant was put back on line. Within another 24-hour period, the heat exchangers were once again fouled, but this time by zebra mussel shells. The two outages caused the plant to lose approximately one million dollars in lost production time and associated clean up costs.

The theory behind effective periodic Quat treatments is that once a distribution system is disinfected or mussel free, it is kept clean by killing off mollusk colonies before they grow to proportions that would plug critical equipment in a water distribution system. Once a system is clean, only veligers are introduced into the plant on a continual basis during the breeding season. Well-timed treatments will kill the veligers and insure a clean system.

Monitoring the zebra mussel population is the key for the initial treatment. Immediate reactions to the presence of the organism can help eliminate infestation problems.

### Temperature

As a part of the monitoring protocol, a log of the current source water temperature should be maintained. It has been our experience that water temperature is an important criterion for efficacy of a chemical treatment program. Zebra mussels must be actively siphoning in order for the chemical to do its job. At water temperatures below 16 °C, the activity of zebra mussels slows dramatically.<sup>14</sup> Although chemical treatment can still accomplish the desired effect, zebra mussel control will require more chemical and/or longer treatment.

The same application that would take 24 hours at temperatures above 16 °C might take as long as 3 days to yield the same results below 16 °C water temperature.<sup>15</sup> This extended treatment time will increase the cost of treatment.

### Water Velocity

In addition to temperature, water velocity affects zebra mussel colonization. Zebra mussels prefer water flow rate of 1.5 m/sec or less. Colonization of water systems with a water velocity over 1.5 m/sec are rare.

Intake forebay areas and systems with water velocities less than 1.5 m/sec are high risk areas.<sup>16</sup> It has been observed that zebra mussels often tend to colonize distribution systems to a greater degree than the surrounding area streams, rivers, and lakes. A constant water flow along with heavy nutrient load concentrated in a small area provide the zebra mussel with a perfect breeding ground.<sup>17</sup>

The main circulating water in some cases is not a concern because the water velocity is high enough to discourage zebra mussel attachment. For example, consider a water flow rate in the plant service water loop at 109,020 m<sup>3</sup>/day while the main circulating water flow rate is 2,725,500 m<sup>3</sup>/day. In this situation, an adequate service water treatment might be Quats continuously applied at 1.5 mg/l active for 24 hours. No deactivation of the chemical was needed due to the sufficient dilution with the main circulating water stream. The residual value of the Quat in the discharge was well below water quality effluent standards.

### Environmental Fate and Deactivation

Since Quats have a cationic charge, it is generally accepted that their molluscidal mode of action involves coagulation of mucous on the zebra mussel gill. The binding of the Quats to the

gill will shut down certain biochemical reaction in the zebra mussel (external membrane bound co-enzymes and respiration).

\* The affinity for Quats to adhere to the surfaces of gills is the primary concern in effluent waters. In order to prevent this mode of action in non-targeted organisms, bentonite clay is added to the discharge water. The clay has a slightly anionic charge on the surface and tends to swell when added to water. The clay acts like a sponge and adsorbs any remaining Quats. The adsorption onto the clay makes the Quats unavailable to attach to the gills of non-targeted organisms.

\* Extensive studies were conducted on the clay and Quats complex. Adsorption and desorption studies showed that the Quats remained complexed to the clay after dispersal into the benthic environment. Bioavailability and degradation with acclimated and nonacclimated bacteria have shown that the Quats were still available for biodegradation but at a reduced level.<sup>18</sup> Other studies including dispersal system evaluation, risk assessment and degradation using natural sediment concluded that the clay-Quats complex was stable and had no adverse effect on the environment.

\* In addition to these tests, acute toxicity work was taken during treatment application. Results from all facilities tested showed no residual toxicity on daphnia and fathead minnows in either acute or chronic tests.

\* Deactivation of the chemical is a major part of the treatment. Specialized clay feed equipment is used to deliver a prescribed amount of clay slurry to the discharge stream. Constant monitoring of the clay feed is needed to insure continuous feed of the clay to the discharge system. Clay feeders are at each outfall and, combined with the current analytical procedures, make the Quats treatment program equipment and labor intensive.

In addition to the cost related to deactivation of the Quats, companies are still uncomfortable with the idea of adding clay to deactivate the chemical. In order to eliminate the use of clay in the process, a search for an alternative treatment was instituted.

## A SECOND GENERATION CHEMICAL APPROACH

Quats were first used to control Asian clams (*Corbiculae*) and microorganisms within cooling tower systems.<sup>19</sup> It was logical that the use of Quats could be extended to control of the zebra mussels. Even though Quat chemistry has been shown to biodegrade in the environment and not accumulate, many users would like to avoid the use of bentonite clay for deactivation. Industry has called for a more proactive treatment protocol for veliger control than the current periodic treatment process. Continuing research into alternate chemistries has resulted in the development of a new chemical approach. With a much larger need for zebra mussel control and the desire for alternate approaches for control, the search began for a second generation molluscicide.

A combination of endothall and filming amine commercially known as EVAC<sup>TM</sup>(<sup>21</sup>) (amine salt of endothall) was identified as an alternative to existing chemistries. The amine salt of endothall has several advantages that position it as a second generation approach to mollusk control. Listed below are the major differences between the amine salt of endothall and Quat chemistry:

- The amine salt of endothall can be applied without the need for deactivation with bentonite clay
- Periodic treatments of only 8 hours for the amine salt of endothall compare well with 10- to 24-hour applications for Quats

<sup>(21)</sup> Registered Trademark of Elf Atochem North America, Inc. EVAC<sup>TM</sup> is Mono(N,N-dimethylalkylamine<sup>22</sup>) salt of endothall<sup>23</sup>

<sup>23</sup> 7-cis-butyl-2,2,1) heptane-2,3-dicarboxylic Acid

<sup>22</sup> Alkyl as in fatty acids of coconut oil

- The amine salt of endothall can be applied on a routine schedule throughout the breeding season for control of veligers.  
The environmental fate of the amine salt of endothall is better than Quats, since its half-life is only 24 hours, while the half-life of Quats is 28 days.

In recent field applications, the amine salt of endothall performed effectively against zebra mussels. Three concentration levels were tested. Efficacy results are shown in Figure 7. In the first series of tests, 1 mg/l active amine salt of endothall effectively killed all the mussels in a 24-hour exposure. The next tests were performed using 2 mg/l active amine salt of endothall. Within 8 hours of chemical feed, 90% of the mussels were dead or not responding. The chemical feed was discontinued. A constant flow of service water was maintained over the tested mussels without Endothall. After 10 hours, all mussels were either dead or not responsive.

The last series of tests were done at 5 mg/l active amine salt of endothall. Within 4 hours the start of chemical feed, 85% of the mussels were dead or not responding. Chemical feed continued until all mussels were dead or not responding (Figure 8).<sup>20</sup>

The amine salt of endothall chemistry represents the first FIFRA approved product to take mollusk control to the next level. The molluscidal mode of action of this product is not completely understood. The product seems to coat the gill membranes of the mollusks which interferes with oxygen transfer. The amine salt also has a high affinity with surfaces. It adheres to piping walls and suspended solids in water distribution systems. At normal use concentrations, the product does not exist in discharge water in significant amounts.

Control of veligers is possible without the use of oxidizing molluscicides and the hazards associated with oxidants. In a study conducted by a power generating company, settlement of veligers decreased by 66%.<sup>21</sup> The elimination of the need for detoxification by bentonite clay simplifies the application of the amine salt of endothall. This is a step in the right direction and builds on lessons learned from experiences gained with Quat applications.

## CONCLUSION

Zebra mussel control considerations are here to stay. New construction will have to take mollusk fouling into account in the design of water distribution systems. Existing systems will continue to require mollusk abatement methods, particularly as the zebra mussel range expands. A comprehensive control strategy must be developed that meets the operation and safety goals of plant owners and operators. The search for alternative control methods continues. While current treatment involves Quats and chlorine, a new molluscicide has been developed. The development of this new molluscicide was based on field experiences and specific needs unique to zebra mussel control in industrial applications.

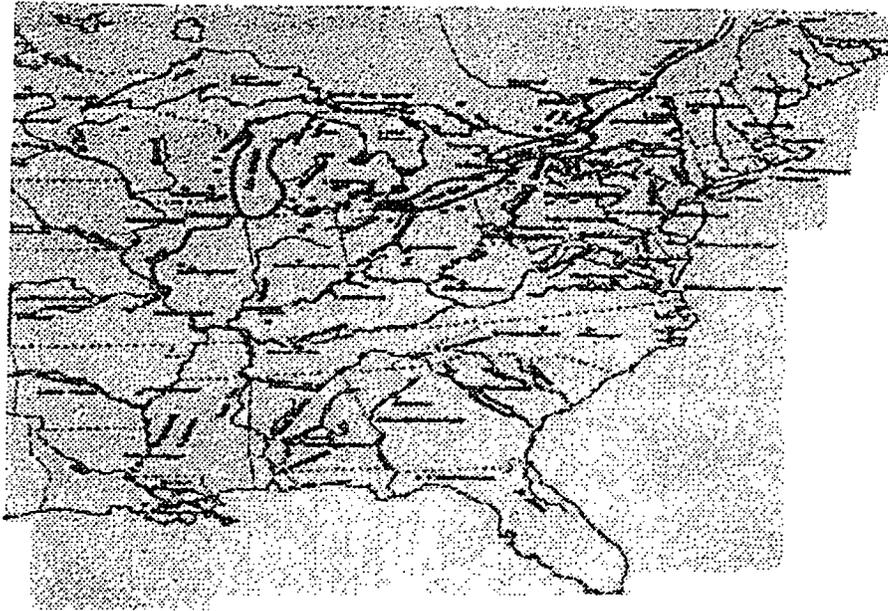


Figure 1 - Distribution map of zebra mussel colonization

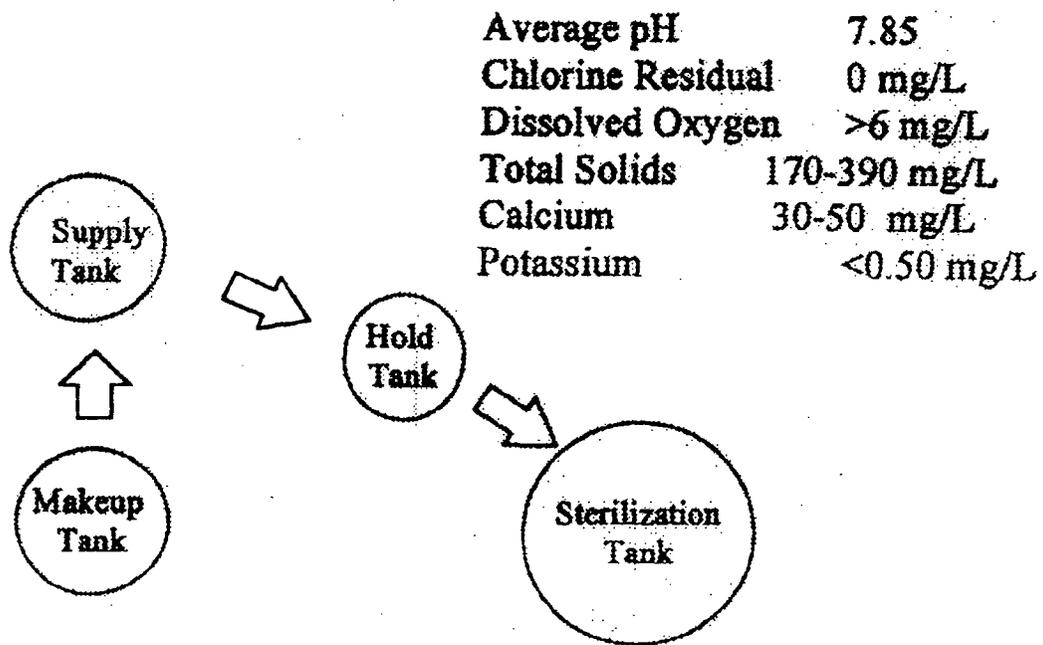


Figure 2 - Zebra Mussel Holding Tank

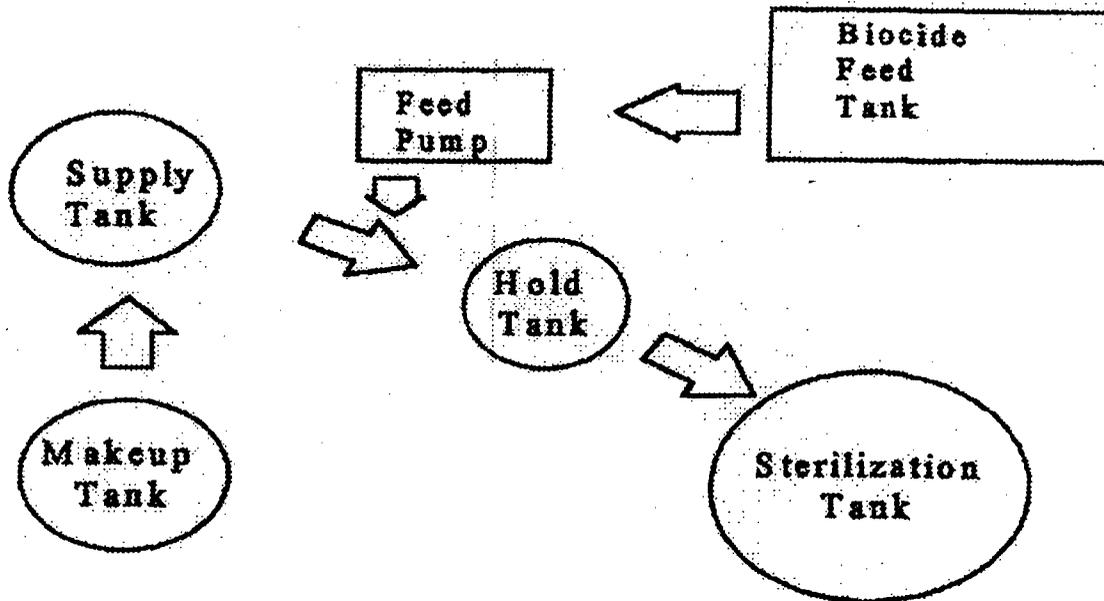


Figure 3- Flow-through Test Chamber

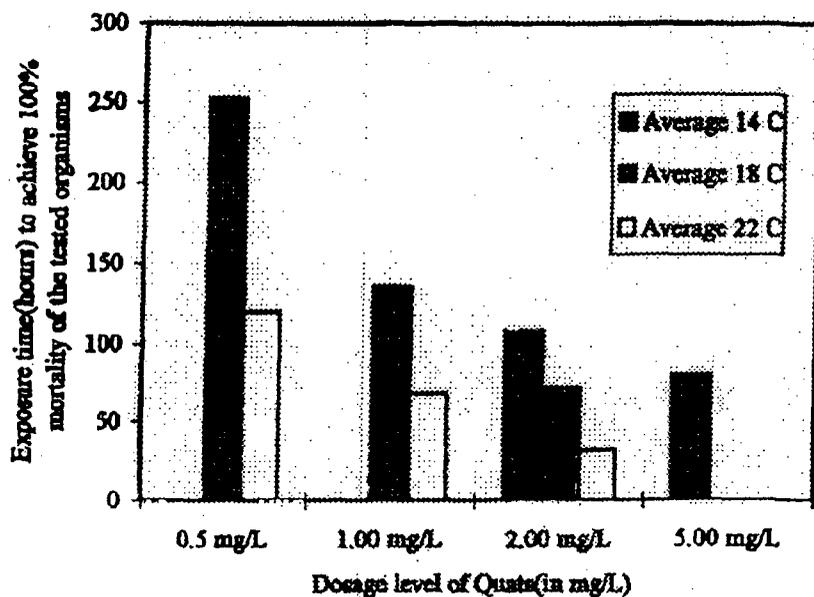


Figure 4 -Dosage levels of Quats used to obtain 100% mortality at various temperatures

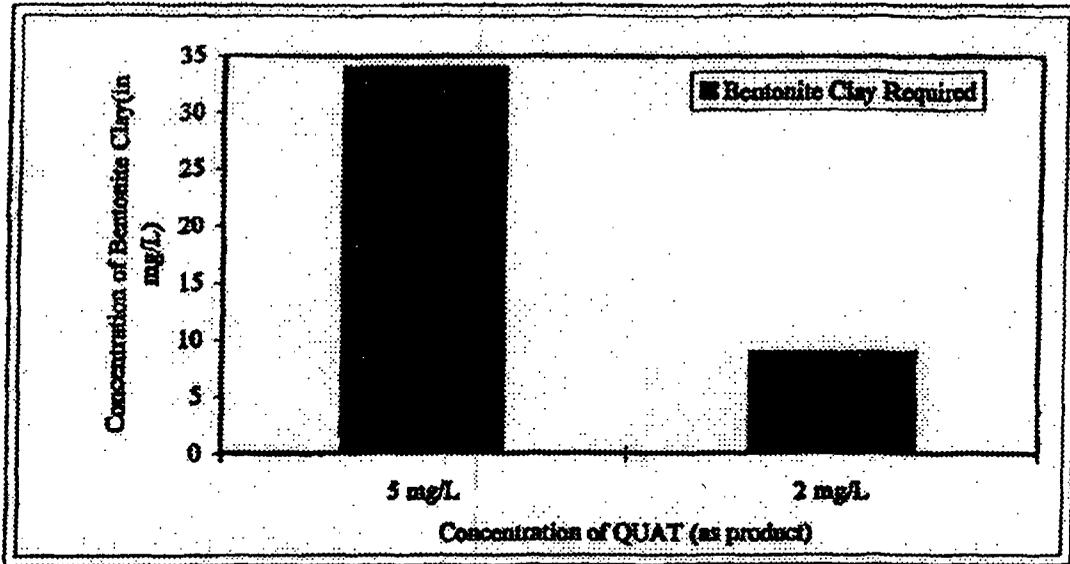


Figure 5- Amount of Bentonite clay used to deactivate solutions of Quats prepared in deionized water

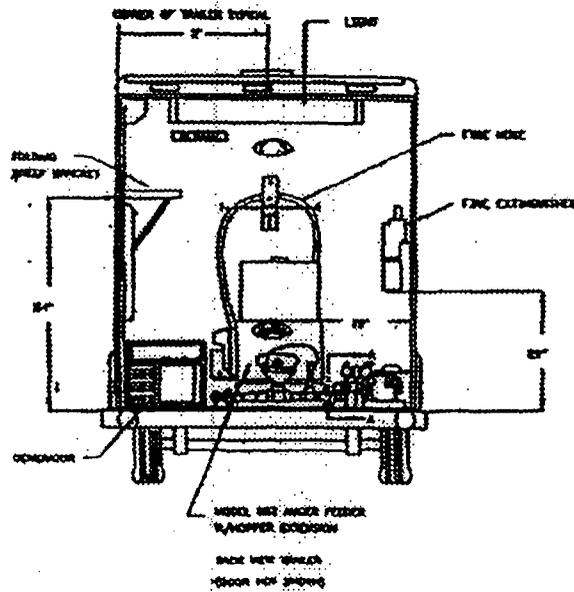


Figure 6 - Deactivation Trailer for the Quats

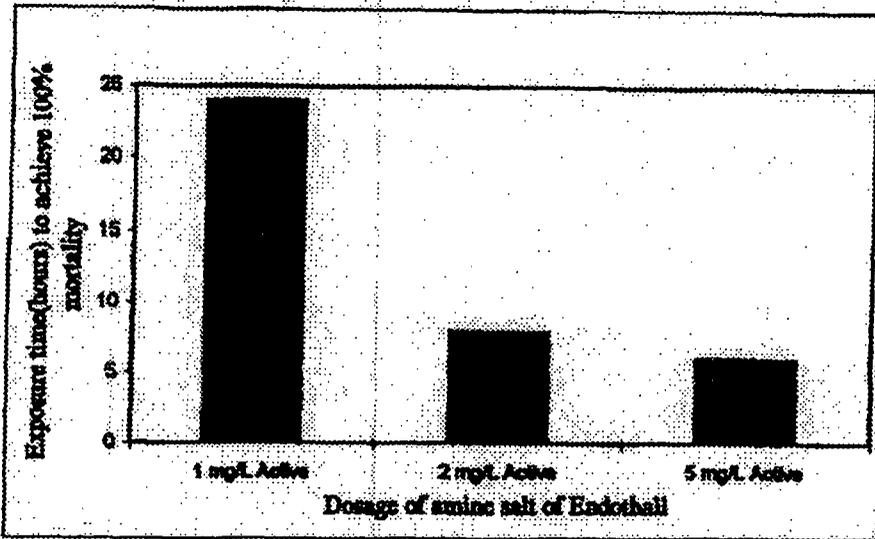
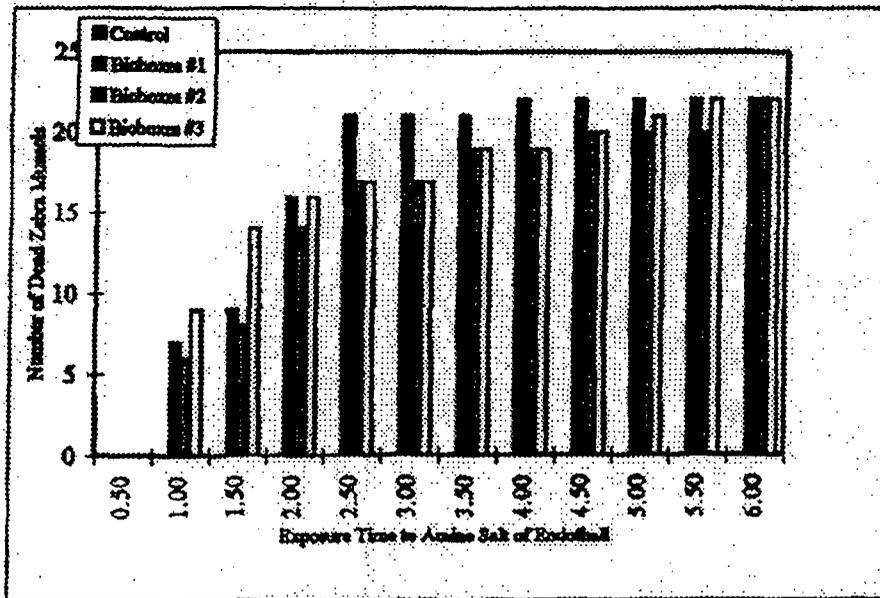


Figure 7 - Results of Flow-through studies performed in the field



Mussel



# MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-401**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : PCL-401

APPLICATION : WATER TREATMENT

COMPANY IDENTIFICATION :  
Nalco Company  
1601 W. Diehl Road  
Naperville, Illinois  
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH: 0/1 FLAMMABILITY: 1/1 INSTABILITY: 0/0 OTHER:

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Based on our hazard evaluation, none of the substances in this product are hazardous.

## 3. HAZARDS IDENTIFICATION

### \*\*EMERGENCY OVERVIEW\*\*

#### CAUTION

May cause irritation with prolonged contact.

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear suitable protective clothing.

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :

May cause irritation with prolonged contact.

SKIN CONTACT :

May cause irritation with prolonged contact.

INGESTION :

Not a likely route of exposure. No adverse effects expected.



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### INHALATION :

Not a likely route of exposure. No adverse effects expected.

### SYMPTOMS OF EXPOSURE :

#### Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

#### Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

### AGGRAVATION OF EXISTING CONDITIONS :

A review of available data does not identify any worsening of existing conditions.

## 4. FIRST AID MEASURES

### EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

### SKIN CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

### INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

### INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

### NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

### EXTINGUISHING MEDIA :

This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

### FIRE AND EXPLOSION HAZARD :

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

### SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



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### 6. ACCIDENTAL RELEASE MEASURES

**PERSONAL PRECAUTIONS :**

Do not touch spilled material. Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Ventilate spill area if possible.

**METHODS FOR CLEANING UP :**

**SMALL SPILLS:** Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

**ENVIRONMENTAL PRECAUTIONS :**

Do not contaminate surface water.

### 7. HANDLING AND STORAGE

**HANDLING :**

Avoid eye and skin contact. Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use.

**STORAGE CONDITIONS :**

Store the containers tightly closed.

**SUITABLE CONSTRUCTION MATERIAL :**

PVC, Buna-N, HDPE (high density polyethylene), Polyurethane, Polypropylene, Polyethylene, Stainless Steel 304, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

**UNSUITABLE CONSTRUCTION MATERIAL :**

Brass, Hypalon, Viton, Neoprene, EPDM

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**OCCUPATIONAL EXPOSURE LIMITS :**

This product does not contain any substance that has an established exposure limit.

**ENGINEERING MEASURES :**

General ventilation is recommended.

**RESPIRATORY PROTECTION :**

Respiratory protection is not normally needed.

**HAND PROTECTION :**

Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****SKIN PROTECTION :**

Wear standard protective clothing.

**EYE PROTECTION :**

Wear chemical splash goggles. Wear chemical splash goggles.

**HYGIENE RECOMMENDATIONS :**

Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE	Liquid
APPEARANCE	Light yellow
ODOR	None
SPECIFIC GRAVITY	1.16 - 1.20
SOLUBILITY IN WATER	Complete
pH ( )	4.2 - 5.0
VISCOSITY	20 - 160 cps
FREEZING POINT	25 °F /
VAPOR PRESSURE	Same as water
VOC CONTENT	0.00 % EPA Method 24

Note: These physical properties are typical values for this product and are subject to change.

**10. STABILITY AND REACTIVITY****STABILITY :**

Stable under normal conditions.

**HAZARDOUS POLYMERIZATION :**

Hazardous polymerization will not occur.

**CONDITIONS TO AVOID :**

Freezing temperatures.

**MATERIALS TO AVOID :**

Strong oxidizing agents

**HAZARDOUS DECOMPOSITION PRODUCTS :**

Under fire conditions: Oxides of carbon, Oxides of nitrogen, Oxides of sulfur

**11. TOXICOLOGICAL INFORMATION**

The following results are for the product.

**MATERIAL SAFETY DATA SHEET****PRODUCT****PCL-401****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****ACUTE ORAL TOXICITY :**Species LD50  
Rat 5 g/kg  
Rating : Non-HazardousTest Descriptor  
Product**ACUTE DERMAL TOXICITY :**Species LD50  
Rabbit 2 g/kg  
Rating : Non-HazardousTest Descriptor  
Product**SENSITIZATION :**

This product is not expected to be a sensitizer.

**CARCINOGENICITY :**

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

**12. ECOLOGICAL INFORMATION****ECOTOXICOLOGICAL EFFECTS :**

The following results are for the product.

**ACUTE FISH RESULTS :**

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	4,900 mg/l	Product
Bluegill Sunfish	96 hrs	> 5,000 mg/l	Product

Rating : Essentially non-toxic

**ACUTE INVERTEBRATE RESULTS :**

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	2,800 mg/l		Product

Rating : Essentially non-toxic

**MOBILITY :**

The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	30 - 50%	50 - 70%

The portion in water is expected to be soluble or dispersible.



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**(800) 424-9300 (24 Hours) CHEMTREC**

**BIOACCUMULATION POTENTIAL**

This preparation or material is not expected to bioaccumulate.

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

**14. TRANSPORT INFORMATION**

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

**LAND TRANSPORT :**

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

**AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

**MARINE TRANSPORT (IMDG/IMO) :**

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

**15. REGULATORY INFORMATION**

**NATIONAL REGULATIONS, USA :**

**OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :**

Based on our hazard evaluation, none of the substances in this product are hazardous.

**CERCLA/SUPERFUND, 40 CFR 117, 302 :**

Notification of spills of this product is not required.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-401**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :

None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-401**

EMERGENCY TELEPHONE NUMBER(S)

**(800) 424-9300 (24 Hours) CHEMTREC**

### CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

### INTERNATIONAL CHEMICAL CONTROL LAWS

#### AUSTRALIA

All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS) and are listed on the Australian Inventory of Chemical Substances (AICS).

#### EUROPE

The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

#### THE PHILIPPINES

All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

## 16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

### REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-401**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 02/26/2004

Version Number : 1.4

**PRODUCT BULLETIN****PCL-401***Scale Inhibitor***PRODUCT BENEFITS**

- **Prevents the Formation of Calcium Phosphate** — Scale inhibition under severe conditions of calcium phosphate supersaturation is cost-effectively attainable with TRC-233®. The deposition of calcium phosphate scale from orthophosphate present in the cooling water system, either as the result of the inorganic phosphate corrosion control practice or from orthophosphate in the make-up, is effectively controlled by a threshold mechanism. Control of calcium phosphate is achieved without the need for costly pretreatment, undesirable pH depression and excessive blowdown.
- **Inhibits Scale Formation in High pH/Alkalinity Water** — Formulated to control potential scaling problems with calcium phosphate and low to moderate degrees of calcium carbonate supersaturation scaling. Typical acid feed rates are greatly reduced, and in many systems, acid feed may be eliminated entirely.
- **Complements Good Corrosion and Biological Control** — For systems in which zinc is still permissible for use as a corrosion inhibitor, PCL-401 can be used to complement heavy metal corrosion control programs without pH control.  
  
Deposits provide media for the propagation of biological growth and cause localized corrosion of metal surfaces. PCL-401 prevents the formation of deposits and disperses suspended solids. Cleaner surfaces deter further biological growth and assure better performance of corrosion inhibitors.
- **Iron Oxide Deposit Control** — Functions as a dispersant keeping metal oxides and silts fluidized, minimizing deposition in equipment and on heat exchanger surfaces.

- **Stable In Chlorinated Water** — There is no need to increase dosage during periods of chlorination.
- **Contains No Heavy Metals** — Contains no zinc or chromate. It can be used in systems where current discharge regulations prohibit the use of heavy metals.
- **Convenient to Use** — Supplied as a liquid and can be fed directly from the shipping container or bulk storage tank. The need and associated costs for premixing chemicals is eliminated.

C-PCL-401

**GENERAL DESCRIPTION**

PCL-401, based on pHreeGUARD® technology, is a liquid product formulated to control the deposition of calcium scales in once-through and recirculating cooling water systems. The product contains the copolymer TRC-233. It is particularly effective for controlling the precipitation of calcium phosphate. PCL-401 is a dispersant for suspended material such as silt and metal oxides. This dispersant action maintains the insoluble material in suspension, facilitating its removal from the system. For a general description of the typical chemical and physical properties, see the PCL-401 Material Safety Data Sheet.

**PATENTS**

These products are covered under U.S. Patents 4,552,665 and 3,709,816.

*(Continued on Reverse Side)*

**NALCO CHEMICAL COMPANY** · One Nalco Center · Naperville, Illinois 60563-1198



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pHreeGUARD and TRC-233 are Registered Trademarks of Calgon Corporation Printed in U.S.A. 11-00





## MATERIALS COMPATIBILITY

Compatible materials of construction for bulk storage tanks include high density, low density, or cross-linked polyethylene, fiberglass with isophthalic or bisphenol resins, epoxy phenolic or vinylester lined steel, 304 or 316 stainless steel. Compatible materials for pump "liquid ends" and piping include polyethylene, polypropylene, PVC, 304 or 316 SS, Viton, Buna-N, Teflon, neoprene, Hypalon, Kynar.

## CONTROL TESTING

In recirculating waters, product performance is ultimately confirmed by equipment inspection and/or by monitoring heat transfer. In once-through waters, product dosages are generally below detectable limits. Product feed rates are adjusted based on water quality and system flow.

## FEEDING AND DOSAGE

PCL-401 should be fed at a point in the system where turbulent flow will assure good mixing. The product may be fed either neat or diluted and must not be mixed with other water treatment chemicals prior to feeding. Dosage rates will vary depending upon system parameters and water quality. Your Nalco representative will assist you in establishing a treatment program to fit your specific cost performance criteria.

## STORAGE AND HANDLING

The recommended minimum storage temperature for PCL-401 is within the range of 15-20°F. Best if used within 12 months from the time of receipt. If product freezes, it does not lose its integrity. Restore for use by warming slowly until product thaws; agitate.

## SHIPPING

PCL-401 is shipped to on-site storage facilities via bulk.

DOT Hazardous Class	Not Restricted
DOT Proper Shipping Name	Not Restricted
UN Number	Not Applicable

## REMARKS

If you need assistance or information, please call your nearest Nalco representative, or our Naperville office at 630-305-1000. For more news about Nalco, visit our website at [www.nalco.com](http://www.nalco.com).

**For Medical and Transportation Emergencies involving Nalco products, call (24 hour response): (800) I-M- ALERT (800-462-5378).**



**MATERIAL SAFETY DATA SHEET**

PRODUCT

**PCL-222**

EMERGENCY TELEPHONE NUMBER

(800) 424-9300 (24 Hours) CHEMTREC

**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : PCL-222  
APPLICATION : SCALE INHIBITOR  
COMPANY IDENTIFICATION : ONDEO Nalco Company  
ONDEO Nalco Center  
Naperville, Illinois  
60563-1198  
EMERGENCY TELEPHONE NUMBER : (800) 424-9300 (24 Hours) CHEMTREC

**NFPA 704M/HMIS RATING**

HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 REACTIVITY : 0 / 0 OTHER :  
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Based on our hazard evaluation, none of the substances in this product are hazardous.

**3. HAZARDS IDENTIFICATION**

**\*\*EMERGENCY OVERVIEW\*\***

**CAUTION**

May cause irritation with prolonged contact.  
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. Flush affected area with water.  
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of phosphorus (POx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :  
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :  
May cause irritation with prolonged contact.

SKIN CONTACT :  
May cause irritation with prolonged contact.

INGESTION :  
Not a likely route of exposure. No adverse effects expected.



**MATERIAL SAFETY DATA SHEET**

**PRODUCT**

**PCL-222**

**EMERGENCY TELEPHONE NUMBER**

**(800) 424-9300 (24 Hours) CHEMTREC**

**INHALATION :**

Not a likely route of exposure. No adverse effects expected.

**SYMPTOMS OF EXPOSURE :**

**Acute :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

**Chronic :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

**AGGRAVATION OF EXISTING CONDITIONS :**

A review of available data does not identify any worsening of existing conditions.

**4. FIRST AID MEASURES**

**EYE CONTACT :**

Flush affected area with water. If symptoms develop, seek medical advice.

**SKIN CONTACT :**

Flush affected area with water. If symptoms develop, seek medical advice.

**INGESTION :**

If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice. Do not induce vomiting without medical advice.

**INHALATION :**

If symptoms develop, seek medical advice. Remove to fresh air, treat symptomatically.

**NOTE TO PHYSICIAN :**

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

**5. FIRE FIGHTING MEASURES**

**FLASH POINT :** > 200 °F / > 93 °C ( )

**EXTINGUISHING MEDIA :**

Use extinguishing media appropriate for surrounding fire. This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.

**FIRE AND EXPLOSION HAZARD :**

May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of phosphorus (POx) under fire conditions. May evolve oxides of nitrogen (NOx) and sulfur (SOx) under fire conditions.

**SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :**

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



## MATERIAL SAFETY DATA SHEET

PRODUCT

PCL-222

EMERGENCY TELEPHONE NUMBER

(800) 424-9300 (24 Hours) CHEMTREC

### 6. ACCIDENTAL RELEASE MEASURES

#### PERSONAL PRECAUTIONS :

Restrict access to area as appropriate until clean-up operations are complete. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Do not touch spilled material. Ventilate spill area if possible.

#### METHODS FOR CLEANING UP :

Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact an approved waste hauler for disposal of contaminated recovered material. **SMALL SPILLS:** Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

#### ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

### 7. HANDLING AND STORAGE

#### HANDLING :

Do not take internally. Ensure all containers are labelled. Keep the containers closed when not in use. Avoid eye and skin contact.

#### STORAGE CONDITIONS :

Store the containers tightly closed.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### OCCUPATIONAL EXPOSURE LIMITS :

This product does not contain any substance that has an established exposure limit.

#### ENGINEERING MEASURES :

General ventilation is recommended.

#### RESPIRATORY PROTECTION :

Respiratory protection is not normally needed.

#### HAND PROTECTION :

Nitrile gloves, Butyl gloves, PVC gloves, Neoprene gloves

#### SKIN PROTECTION :

Wear standard protective clothing.

#### EYE PROTECTION :

Wear chemical splash goggles.

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**PCL-222**

EMERGENCY TELEPHONE NUMBER

**(800) 424-9300 (24 Hours) CHEMTREC****HYGIENE RECOMMENDATIONS :**

Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE            Liquid

APPEARANCE                Clear

ODOR                         Sharp

SPECIFIC GRAVITY	1.3 @ 77 °F / 25 °C
DENSITY	10.8 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	4 - 5
VAPOR PRESSURE	Same as water
EVAPORATION RATE	Same as water

**10. STABILITY AND REACTIVITY****STABILITY :**

Stable under normal conditions.

**HAZARDOUS POLYMERIZATION :**

Hazardous polymerization will not occur.

**CONDITIONS TO AVOID :**

Freezing temperatures.

**MATERIALS TO AVOID :**

Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with strong alkalis (e.g. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium hydroxide, calcium hydroxide (lime), cyanide, sulfide, hypochlorites, chlorites) may generate heat, splattering or boiling and toxic vapors.

**HAZARDOUS DECOMPOSITION PRODUCTS :**

Under fire conditions:            Oxides of carbon, Oxides of phosphorus, Oxides of nitrogen, Oxides of sulfur

**11. TOXICOLOGICAL INFORMATION**

No toxicity studies have been conducted on this product.

**CARCINOGENICITY :**

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).



**MATERIAL SAFETY DATA SHEET**

**PRODUCT**

**PCL-222**

**EMERGENCY TELEPHONE NUMBER**

**(800) 424-9300 (24 Hours) CHEMTREC**

**12. ECOLOGICAL INFORMATION**

**ECOTOXICOLOGICAL EFFECTS :**

No toxicity studies have been conducted on this product.

**MOBILITY AND BIOACCUMULATION POTENTIAL**

High phosphate levels in surface water can cause eutrophication with subsequent algal blooms and oxygen depletion.

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

**14. TRANSPORT INFORMATION**

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are:

**LAND TRANSPORT :**

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID; N.O.S.
Technical Name(s) :	SODIUM PHOSPHATE, TRIBASIC
UN/ID No :	UN 3082
Hazard Class - Primary :	9
Packing Group :	III
Flash Point :	> 93 °C / > 200 °F
DOT Reportable Quantity (per package) :	40,000 lbs
DOT RQ Component :	SODIUM PHOSPHATE, TRIBASIC

**AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name :	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name(s) :	SODIUM PHOSPHATE, TRIBASIC
UN/ID No :	UN 3082
Hazard Class - Primary :	9



# MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-222**

EMERGENCY TELEPHONE NUMBER

**(800) 424-9300 (24 Hours) CHEMTREC**

Packing Group : III  
IATA Cargo Packing Instructions : 914  
IATA Cargo Aircraft Limit : NO LIMIT (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

## 15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :  
Based on our hazard evaluation, none of the substances in this product are hazardous.

CERCLA/SUPERFUND, 40 CFR 117, 302 :  
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

<u>RQ Substance</u>	<u>RQ</u>
Sodium Phosphate, Tribasic	40,000 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :  
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :  
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :  
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :  
The chemical substances in this product are on the TSCA 8(b) Inventory (40 CFR 710).

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR / formerly Sec. 311 :  
This product contains the following substances listed in the regulation:

<u>Substance(s)</u>	<u>Citations</u>
Sodium Phosphate, Tribasic :	Sec. 311

ONDEO Nalco Company ONDEO Nalco Center • Naperville, Illinois 60563-1198

(630)305-1000

6 / 8



## MATERIAL SAFETY DATA SHEET

PRODUCT

PCL-222

EMERGENCY TELEPHONE NUMBER

(800) 424-9300 (24 Hours) CHEMTREC

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :  
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

None of the substances are specifically listed in the regulation.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

Not considered a WHMIS controlled product.

### 16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

#### REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, Co.

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Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**PCL-222**

EMERGENCY TELEPHONE NUMBER

**(800) 424-9300 (24 Hours) CHEMTREC**

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Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO

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Prepared By : Product Safety Department  
Date issued : 06/05/2000  
Replaces : 04/12/1999



Nalco Company  
(630) 305-1000

1601 W. Diehl Rd.  
Naperville, Illinois 60563-1198  
U.S.A.

18 January 2005

To Whom It May Concern :

Thank you for your interest in PCL-222. This product contains the following components:

<b>Substance Name</b>	<b>CAS Number</b>	<b>Percent (wt)</b>
Sodium bisulfite	7631-90-5	0.2649
Sodium polyphosphate	68915-31-1	13.88
Sodium sulfate	7757-82-6	0.042
Water	7732-18-5	58.502
Monopotassium phosphate	7778-77-0	15.57
Dipotassium phosphate	7758-11-4	2.857
Acrylic acid, polymer with sodium amps, sodium salt	37350-42-8	8.8842

This compositional information for PCL-222 is considered proprietary by our company. It is being released with the expectation that it will be viewed only by those employees of your Company that have a need to know.

If you have any further questions about PCL-222 or other Nalco products, please call me at 630-305-2578.

Sincerely,

Kevin M Cheatham  
Marketing Development Manager

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**H-130M**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : H-130M

APPLICATION : BIOCIDES

COMPANY IDENTIFICATION :  
Nalco Company  
1601 W. Diehl Road  
Naperville, Illinois  
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

## NFPA 704M/HMIS RATING

HEALTH: 3 / 3 FLAMMABILITY: 2 / 2 INSTABILITY: 0 / 0 OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Didecyl-Dimethyl-Ammonium chloride	7173-51-5	50.0
Ethanol	64-17-5	5 - 10

**3. HAZARDS IDENTIFICATION****\*\*EMERGENCY OVERVIEW\*\*****DANGER**

**CORROSIVE.** Causes severe eye and skin damage. Harmful or fatal if swallowed. Do not get in eyes, on skin, or on clothing. Wears goggles or face shield and rubber gloves when handling. Avoid contamination of food. Remove contaminated clothing and wash before reuse.

Do not get in eyes, on skin, on clothing. Do not take internally. Keep away from heat. Keep away from sources of ignition - No smoking. Use with adequate ventilation. Keep container tightly closed and in a well-ventilated place.

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.

Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.

Combustible Liquid; may form combustible mixtures at or above the flash point. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve HCl under fire conditions. May evolve ammonia (NH4) under fire conditions.

PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

**MATERIAL SAFETY DATA SHEET****PRODUCT****H-130M****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC****HUMAN HEALTH HAZARDS - ACUTE :****EYE CONTACT :**

May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

**SKIN CONTACT :**

May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered.

**INGESTION :**

May cause burns to mouth and gastro-intestinal tract.

**INHALATION :**

Repeated or prolonged exposure may irritate the respiratory tract. Can cause central nervous system depression.

**SYMPTOMS OF EXPOSURE :****Acute :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

**Chronic :**

A review of available data does not identify any symptoms from exposure not previously mentioned.

**AGGRAVATION OF EXISTING CONDITIONS :**

A review of available data does not identify any worsening of existing conditions.

**4. FIRST AID MEASURES**

For Eyes and Skin: Flush with plenty of water for at least 15 minutes. (Eyelids must be held open). Call a physician immediately. Remove contaminated clothing and wash before reuse.

If swallowed: Immediately give 3-4 glasses of milk; if unavailable, give water. Do not induce vomiting. Call a physician.

**NOTE TO PHYSICIAN:** Probable mucosal damage may contraindicate the use of gastric lavage.

**NOTE TO PHYSICIAN :**

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

**5. FIRE FIGHTING MEASURES**

**FLASH POINT :** 109 °F / 43 °C ( SETAFLASH )

**EXTINGUISHING MEDIA :**

Foam, Carbon dioxide, Dry powder, Other extinguishing agent suitable for Class B fires, For large fires, use water spray or fog, thoroughly drenching the burning material.

Water mist may be used to cool closed containers.



# MATERIAL SAFETY DATA SHEET

PRODUCT

H-130M

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

## FIRE AND EXPLOSION HAZARD :

Combustible Liquid; may form combustible mixtures at or above the flash point. Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, or expose containers to flame or other sources of ignition. May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. May evolve HCl under fire conditions. May evolve ammonia (NH<sub>4</sub>) under fire conditions.

## SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

### PERSONAL PRECAUTIONS :

Notify appropriate government, occupational health and safety and environmental authorities. Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Eliminate ignition sources. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

### METHODS FOR CLEANING UP :

**SMALL SPILLS:** Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. **LARGE SPILLS:** Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

### ENVIRONMENTAL PRECAUTIONS :

This product is toxic to fish and other water organisms. Do not discharge directly into lakes, ponds, streams, waterways or public water supplies.

## 7. HANDLING AND STORAGE

### HANDLING :

Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Avoid release of vapors or mists into workplace air. Keep the containers closed when not in use. Do not use in locations where vapor is likely to travel to welding flames or arcs or to other hot surfaces. Vapors are much heavier than air, this can result in uneven distribution. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

### STORAGE CONDITIONS :

Store away from heat and sources of ignition. Connections must be grounded to avoid electrical charges. Store the containers tightly closed. Store separately from oxidizers. Store in suitable labelled containers.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

### ACGIH/TLV :



**MATERIAL SAFETY DATA SHEET**

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**EMERGENCY TELEPHONE NUMBER(S)**

**(800) 424-9300 (24 Hours) CHEMTREC**

**Substance(s)**  
Ethanol

TWA: 1,000 ppm , 1,880 mg/m3

**OSHA/PEL :**  
**Substance(s)**  
Ethanol

TWA: 1,000 ppm , 1,900 mg/m3

**ENGINEERING MEASURES :**

Use general ventilation with local exhaust ventilation.

**RESPIRATORY PROTECTION :**

If significant mists, vapors or aerosols are generated an approved respirator is recommended. An organic vapor cartridge with dust/mist prefilter may be used. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

**HAND PROTECTION :**

Neoprene gloves, Viton# gloves

**SKIN PROTECTION :**

Wear impervious apron and boots. A full slicker suit is recommended if gross exposure is possible.

**EYE PROTECTION :**

Wear chemical splash goggles.

**HYGIENE RECOMMENDATIONS :**

Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Use good work and personal hygiene practices to avoid exposure.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

PHYSICAL STATE	Liquid
APPEARANCE	Light yellow
ODOR	Alcoholic
SPECIFIC GRAVITY	0.93 @ 77 °F / 25 °C
DENSITY	7.7 lb/gal
SOLUBILITY IN WATER	Complete
pH (1 %)	7.0 - 8.0
VISCOSITY	< 100 cps @ 77 °F / 25 °C
FREEZING POINT	12 °F /
VOC CONTENT	10 %

Note: These physical properties are typical values for this product and are subject to change.

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**H-130M**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

**10. STABILITY AND REACTIVITY**

## STABILITY :

Stable under normal conditions.

## HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

## CONDITIONS TO AVOID :

Heat and sources of ignition including static discharges.

## MATERIALS TO AVOID :

Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Contact with reducing agents (e.g. hydrazine, sulfites, sulfide, aluminum or magnesium dust) may generate heat, fires, explosions and toxic vapors.

## HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: Oxides of carbon, Oxides of nitrogen, HCl

**11. TOXICOLOGICAL INFORMATION**

The following results are for the product.

## ACUTE DERMAL TOXICITY :

Species	LD50	Test Descriptor
Rabbit	> 4 g/kg	Product
Rating :	Non-Hazardous	

## SENSITIZATION :

This product is not expected to be a sensitizer.

## CARCINOGENICITY :

None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

**12. ECOLOGICAL INFORMATION**

## ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

## ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	2.2 mg/l	
Bluegill Sunfish	96 hrs	0.92 mg/l	

Rating : Very toxic

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**ACUTE INVERTEBRATE RESULTS :**

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	0.19 mg/l		
Mysid Shrimp (Mysidopsis bahia)	96 hrs	0.14 mg/l		

Rating : Very toxic

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D001

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.

**14. TRANSPORT INFORMATION**

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

**LAND TRANSPORT :**

Proper Shipping Name : CORROSIVE LIQUID, FLAMMABLE, N.O.S.  
Technical Name(s) : DIDECYLDIMETHYLAMMONIUM CHLORIDE, ETHANOL  
UN/ID No : UN 2920  
Hazard Class - Primary : 8  
Hazard Class - Secondary : 3  
Packing Group : II

Flash Point : 43 °C / 109 °F

**AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name : CORROSIVE LIQUID, FLAMMABLE, N.O.S.  
Technical Name(s) : DIDECYLDIMETHYLAMMONIUM CHLORIDE, ETHANOL  
UN/ID No : UN 2920  
Hazard Class - Primary : 8  
Hazard Class - Secondary : 3  
Packing Group : II  
IATA Cargo Packing Instructions :

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**H-130M**

EMERGENCY TELEPHONE NUMBER(S)

**(800) 424-9300 (24 Hours) CHEMTREC**

IATA Cargo Aircraft Limit :

(Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :

CORROSIVE LIQUID, FLAMMABLE, N.O.S.

Technical Name(s) :

DIDECYLDIMETHYLAMMONIUM CHLORIDE, ETHANOL

UN/ID No :

UN 2920

Hazard Class - Primary :

8

Hazard Class - Secondary :

3

Packing Group :

II

**15. REGULATORY INFORMATION**

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Didecyl-Dimethyl-Ammonium chloride : Corrosive

Ethanol : Flammable

RCRA/SUPERFUND, 40 CFR 117, 302 :

This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

RQ Substance

Ethanol

RQ

1,000 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

- X Immediate (Acute) Health Hazard
- Delayed (Chronic) Health Hazard
- X Fire Hazard
- Sudden Release of Pressure Hazard
- Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

**Nalco Company 1601 W. Diehl Road • Naperville, Illinois 60563-1198****(630)305-1000**

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**MATERIAL SAFETY DATA SHEET**

**PRODUCT**

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**EMERGENCY TELEPHONE NUMBER(S)**

**(800) 424-9300 (24 Hours) CHEMTREC**

**SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :**

This product does not contain substances on the List of Toxic Chemicals.

**TOXIC SUBSTANCES CONTROL ACT (TSCA) :**

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

**FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT (FIFRA) :**

EPA Reg. No. 6836-203-1706

In all cases follow instructions on the product label.

**FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :**

None of the substances are specifically listed in the regulation.

**CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :**

This product contains the following substances listed in the regulation:

Substance(s)	Citations
• Ethanol	Sec. 111

**CALIFORNIA PROPOSITION 65 :**

This product does not contain substances which require warning under California Proposition 65.

**MICHIGAN CRITICAL MATERIALS :**

None of the substances are specifically listed in the regulation.

**STATE RIGHT TO KNOW LAWS :**

This product is a registered biocide and is exempt from State Right to Know Labelling Laws.

**NATIONAL REGULATIONS, CANADA :**

**WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**WHMIS CLASSIFICATION :**

Pesticide controlled products are not regulated under WHMIS.

**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :**

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

**16. OTHER INFORMATION**

**MATERIAL SAFETY DATA SHEET****PRODUCT****H-130M****EMERGENCY TELEPHONE NUMBER(S)****(800) 424-9300 (24 Hours) CHEMTREC**

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

**REFERENCES**

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department  
Date issued : 03/04/2004  
Version Number : 1.5

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**PRODUCT BULLETIN**

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**H-130M<sup>®</sup>***Molluscicide***PRODUCT BENEFITS**

- Achieves a 100% kill rate of adult, juvenile, and veliger forms of zebra mussels and Asiatic clams usually within 24 hours of the start of a treatment program.
- One to three 24-hour treatments per year are usually sufficient to avoid the problems associated with an uncontrolled mollusk infestation.
- Treatment of a plant's discharge with CA-35, a bentonite clay, effectively complexes with H-130M to eliminate toxicity to non-target organisms. The combined complex is not harmful to aquatic species or benthic organisms.
- Biodegradable at use concentrations, providing an environmentally acceptable treatment.
- Treatment dosages as low as 0.5-2.0 ppm of H-130M are sufficient for an effective treatment.
- H-130M is a non-oxidizing molluscicide meaning that H-130M is available for mollusk control rather than being consumed by organic or inorganic reducing substances in the cooling water.
- Addition to the cooling water does not depress the pH of the bulk water and does not form corrosive by-products as found with chlorination or bromination.
- Corrosion of metal surfaces is not accelerated by biocide treatment.

**EPA REGISTRATION**

Molluscicide H-130M is registered by the Environmental Protection Agency (EPA Registration No. 6836-203-1706) as a slug feed molluscicide for industrial cooling water systems.

**DIRECTIONS FOR USE**

H-130M molluscicide is only sold as part of a complete Nalco mollusk treatment application service. This product is safe to the aquatic environment only if the treated water is properly deactivated prior to discharge. The method for using this product is restricted by environmental regulations. This product is not to be used without supervision from a Nalco representative.

**MATERIALS COMPATIBILITY**

Compatible materials of construction for pump and piping include polypropylene, polyethylene, Hypalon, stainless steel, epoxy phenolic-lined steel, or isophthalic polyester resins.

**CONTROL TESTING AND EFFLUENT TOXICITY TESTING**

H-130M residual is monitored throughout a plant system and prior to discharge using a test procedure sensitive down to 20 ppb. The biological toxicity of the effluent water generated during the treatment is verified to be safe through a composite water sample sent to an outside laboratory. Results of this testing are provided to the customer.

*(Continued on Reverse Side)*

C-H-130M





## FEEDING AND DOSAGE

H-130M is fed as close to the raw water inlet as possible without risking the release of the chemical into the environment. Treatment of a system with H-130M molluscicide typically includes a 24-hour feed period at 1.5 ppm to the inlet of the plant, maintaining a residual at the discharge of 0.5 ppm. The rate of adsorption of the biocide on the target mollusks and thus, the kill rate, is temperature-dependent. Actual treatment durations may vary from site to site dependent on water temperature and other site specific conditions.

## DEACTIVATION REQUIREMENTS

CA-35 is used to deactivate H-130M molluscicide in the plant water prior to discharge to the environment. The feed rate of the CA-35 is typically 5 ppm of CA-35 for every 1 ppm of H-130M molluscicide fed to the inlet water. CA-35 feed continues for at least 2 hours past the time when the H-130M molluscicide feed is discontinued to assure complete deactivation of biocide remaining in the system.

## HANDLING AND STORAGE

Do not use or store near heat sources or open flame. H-130M is stable at room temperature. A slight haziness occurs as the product approaches its freezing point. Warming will return it to original condition with molluscicidal properties unimpaired.

Best if used within six months from the time of receipt.

## SHIPPING

H-130M molluscicide is shipped in 5 gal pails and 55 gal drums.

DOT Hazard Class	Combustible liquid
DOT Proper Shipping Name	Combustible liquid, N.O.S. (isopropanol)
UN#	1993

## DISPOSAL

**Prohibitions** — Do not contaminate water, food or feed by storage or disposal.

**Pesticide Control** — Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

**Metal Containers** — Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, by incineration or as allowed by state and local procedures.

**Plastic Containers** — Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, by incineration or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

**Tank Cleaning** — Transport tanks and equipment should be thoroughly drained and flushed with water to properly remove all traces of product. Dispose of washings as indicated above. Liquid and solid residues are hazardous.

## REMARKS

If you need assistance or information, please call your nearest Nalco representative, or our Naperville office at 630-305-1000. For more news about Nalco, visit our website at [www.nalco.com](http://www.nalco.com).

**For Medical and Transportation Emergencies** involving Nalco products, call (24 hour response): (800) I-M- ALERT or (800) 462-5378.

## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtrec)

Health : 3  
Flammability : 1  
Reactivity : 0

Lonza Inc.  
90 Bondline Road Allendale, NJ 07401  
800-777-1875 (9am - 5pm) 309-697-7200 (After 5pm)

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95309 Barquat 4250-2

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<b>MATERIAL</b>	<b>DATE ISSUED</b>	<b>DOT HAZARD CLASSIFICATION</b>
Barquat 4250-2	11/23/2004 - Revision 4	PG II
<b>CAS NO. Mixture</b>	<b>SUPERSEDES</b>	<b>DOT SHIPPING NAME</b>
	09/11/1995	Disinfectant liquid, corrosive n.o.s.
<b>FORMULA Mixture</b>		<b>DOT LABEL Class 8</b>
		<b>IMDG Classification</b>
		Corrosive liquid n.o.s.
		Marine pollutant

**CHEMICAL NAME (Active):** Mixture of Alkyl dimethylbenzylammonium chloride and Alkyl dimethylstyrylbenzyl-ammonium chloride

\*\*\*\*\* I - INGREDIENTS \*\*\*\*\*

	APPROXIMATE WEIGHT %	TWA/TLV
N-alkyl (C <sub>12-18</sub> )-N,N-dimethyl-N-benzylammonium Chloride (CAS No. 68391-01-5)	25	None established
N-Dodecyl-N,N-dimethyl-N-ethylbenzylammonium Chloride (CAS No. 27479-28-3)	17	None established
N-Tetradecyl-N,N-dimethyl-N-ethylbenzylammonium Chloride (CAS No. 27479-28-3)	2	None established
Water (CAS No. 7732-18-5)	53	None established

\*\*\*\*\* II - PHYSICAL AND CHEMICAL PROPERTIES \*\*\*\*\*

<b>APPEARANCE</b> Clear, pale yellow liquid	<b>pH</b> 6.5 - 8.2 at 10%
<b>VISCOSITY</b> <100 cPs @ 25°C	<b>ODOR</b> Benzaldehyde-like
<b>BOILING POINT</b> Not known	<b>MELTING OR FREEZING POINT</b> -10 °C
<b>VAPOR DENSITY (Air=1)</b> Not applicable	<b>VAPOR PRESSURE (mm Hg)</b> Not known
<b>PERCENT VOLATILE (by weight)</b> 50 %	<b>DENSITY</b> 0.96 @ 25°C
<b>EVAPORATION RATE (Butyl Acetate=1)</b> <1	<b>SOLUBILITY IN WATER</b> Soluble

\*\*\*\*\* III - FIRE AND EXPLOSION INFORMATION \*\*\*\*\*

**FLASH POINT** >200 F (Setaflash Closed Tester) **AUTO IGNITION TEMPERATURE** Not known  
**LOWER EXPLOSION LIMIT (%)** Not applicable **UPPER EXPLOSION LIMIT (%)** Not applicable  
**EXTINGUISHING MEDIA** FOAM X ALCOHOL FOAM X CO<sub>2</sub> X  
DRY CHEMICAL X WATER X OTHER

The information provided herein is compiled from internal reports and data from professional publications. IT IS FURNISHED WITHOUT WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED. It is intended to assist in evaluating the suitability and proper use of the material in manufacturing and in the development and implementation of safety precautions and procedures.



## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtree)

Lonza Inc.  
90 Boroline Road Allendale, NJ 07401  
800-777-1875 (Dun - Spin) 309-687-7200 (After Spin)

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55303 Marquat 4250-Z

\*\*\*\*\* IV - HEALTH EFFECTS INFORMATION \*\*\*\*\*

### CHEMICALS LISTED AS CARCINOGEN BY:

NATIONAL TOXICOLOGY PROGRAM - No  
I.A.R.C. MONOGRAPHS - No  
OSHA - No

### NOTE TO PHYSICIAN:

Probable mucosal damage may contraindicate the use of gastric lavage. Take measures against circulatory shock. Breathing may need support, either through use of manually or mechanically measures. Administer oxygen if having difficulty with breathing.

\*\*\*\*\* V - REACTIVITY INFORMATION \*\*\*\*\*

STABILITY: STABLE  CONDITIONS TO AVOID None known  
UNSTABLE

### HAZARDOUS DECOMPOSITION PRODUCTS

Thermal decomposition may produce toxic organic and amine vapors/fumes, hydrogen chloride and oxides of carbon and nitrogen.

HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID  
MAY WILL NOT  None known  
OCCUR OCCUR

### INCOMPATIBILITY (MATERIALS TO AVOID)

WATER: OTHER  Strong oxidizing or reducing agents

\*\*\*\*\* VI - SPILL AND DISPOSAL INFORMATION \*\*\*\*\*

### STEPS TO BE TAKEN IN CASE OF MATERIAL SPILL OR RELEASE

DANGER! Corrosive, liquid. Floors may become slippery. Wear appropriate protective equipment and NIOSH approved respirator where mists or vapors of unknown concentrations may be generated (self-contained breathing apparatus preferred).

Dike and contain spill with inert material (sand, earth, etc.) and transfer the liquid and solid separately to containers for recovery or disposal. Keep spill out of sewers and open bodies of water.

### WASTE DISPOSAL METHOD

Dispose of in compliance with all Federal, state and local laws and regulations. Incineration is the preferred method. If incinerated avoid smoke.

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## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9308 (Chemtree)

Lonza Inc.  
90 Baroline Road Allendale, NJ 07401  
800-777-1873 (Days - 5pm) 309-697-7200 (After 5pm)

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95309 Barquat 4250-Z

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\*\*\*\*\* VI - SPILL AND DISPOSAL INFORMATION \*\*\*\*\*

### PACKAGING DISPOSAL METHOD

Triple rinse (or equivalent). Then offer for recycle or reconditioning, or puncture and dispose of in a sanitary landfill or by incineration, if permitted by state and local authorities. If incinerated avoid smoke.

\*\*\*\*\* VII - PERSONAL PROTECTION INFORMATION \*\*\*\*\*

### ENGINEERING CONTROLS

In processes where mists or vapors may be generated, proper ventilation must be provided in accordance with good ventilation practices.

### RESPIRATORY PROTECTION

In processes where mists or vapors may be generated, a NIOSH/MSHA jointly approved respirator is advised in the absence of proper environmental controls.

### PROTECTIVE GLOVES

Rubber or neoprene, when needed, to prevent skin contact.

### EYE PROTECTION

Wear chemical splash goggles where there is a potential for eye contact. Use safety glasses with side shields under normal use conditions.

### OTHER PROTECTIVE EQUIPMENT

Eye wash; safety shower; protective clothing (long sleeves, coveralls or other, as appropriate), when needed, to prevent skin contact.

\*\*\*\*\* VIII - STORAGE AND HANDLING \*\*\*\*\*

### PRECAUTIONS FOR STORAGE AND HANDLING:

Store at or near room temperature. Keep containers tightly closed when not in use. Do not store above 140 °C.

\*\*\*\*\* IX - TOXICOLOGY & ECOTOXICOLOGY INFORMATION \*\*\*\*\*

The toxicity information provided below is for this material and component(s) of this material.

### ACUTE

- Oral LD<sub>50</sub> (rat): 250 mg/kg
- Dermal LD<sub>50</sub> (rabbit): 3400 mg/kg
- Inhalation LC<sub>50</sub>: 86 mg/L
- Eye irritation (rabbit): Severe irritant.
- Dermal irritation (rabbit): Severe irritant.
- Dermal corrosivity (rabbit - DOT): Corrosive.

The information provided herein is compiled from internal reports and data from professional publications. IT IS FURNISHED WITHOUT WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED. It is intended to assist in evaluating the suitability and proper use of the material in manufacturing and in the development and implementation of safety precautions and procedures.

## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtrec)

Lonza Inc.  
90 Boroline Road Allendale, NJ 07401  
800-777-1875 (9am - 5pm) 309-697-7200 (After 5pm)

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\*\*\*\*\* IX - TOXICOLOGY & ECOTOXICOLOGY INFORMATION \*\*\*\*\*

For N-Alkyl (C<sub>12-18</sub>)-N,N-dimethyl-N-benzylammonium chloride:

- Photosensitization (guinea pig): Not a contact sensitizer or photosensitizer.
- rat: non-irritant N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component repeat exposure at 0.01% for two weeks
- rat: mild to moderate N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component repeat exposure at 3% for two weeks
- rat: not teratogenic Doses 10 to 50 mg/kg on days 6 to 15 of gestation
- rat: no neonatal effects for N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component at 1000 ppm, observed at 2000 ppm

For N-Alkyl (C<sub>12-18</sub>)-N,N-dimethyl-N-benzylammonium chloride:

- Photosensitization (guinea pig): Not a contact sensitizer or photosensitizer.

Sub-chronic

Rat dermal: 20 mg/kg/day for 90 days

Mild irritation for N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component no systemic toxic effects.

Rabbit dermal: 20 days 1:500, 1:1000, 1:4000 of 100% active produced mild redness and swelling for N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component.

Rat dietary: 90 days

Definitive effects at 4000 ppm, possible 1000 ppm and none at 500 ppm for N-Alkyl-N,N-dimethyl-N-benzylammonium chloride component.

\*\*\*\*\* X - MISCELLANEOUS AND REGULATORY INFORMATION \*\*\*\*\*

U.S. FEDERAL LEVEL REGULATIONS:

TOXIC SUBSTANCES CONTROL ACT (TSCA INVENTORY) STATUS:

The components in this product are currently listed on the EPA TSCA 8(b) inventory.

TSCA Section 12(b) Export Notification

Components present in this product which, if exported, could require either annual or one-time reporting under this regulation are as follows:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
None known		

EPA REGULATION ON PESTICIDES

This product is an EPA FIFRA registered pesticide, EPA Registration No. 6936-26. It can only be used commercially in the United States for EPA registered application(s) listed on the product label.

## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtree)

Lonza Inc.  
90 Boroline Road Allendale, NJ 07401  
800-777-1875 (9am - 5pm) 309-697-7300 (After 5pm)

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\*\*\*\*\* X - MISCELLANEOUS AND REGULATORY INFORMATION \*\*\*\*\*

CERCLA (Comprehensive Environmental Response, Compensation and Liability Act of 1980) requires notification of the National Response Center (Telephone 800-424-8802) in the event of a release of quantities of the following hazardous materials contained in this product, if the release is equal to or greater than the Reportable Quantities (RQs) listed in 40 CFR 302.4:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
None known		

SARA Title III, Sections 302/304 (Superfund Amendments and Reauthorization act of 1986) - This act requires emergency planning, including agency notification, for possible release of the following components of this material, based upon the Threshold Planning Quantities (TPQs) and release Reportable Quantities (RQs) listed for the Components in 40 CFR 355:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
None known		

SARA Title III Sections 311/312 - This act requires reporting under the Community Right-to-Know provisions due to the inclusion of the following components of this material in one or more of the five hazard categories listed in 40 CFR 370:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Hazard *) Categories</u>
N-alkyl (C <sub>12-14</sub> )-N,N-dimethyl-N-Benzylammonium	68391-01-5	A
N-Dodecyl-N,N-dimethyl-N-ethylbenzylammonium	27479-28-3	A
N-Tetradecyl-N,N-dimethyl-N-ethylbenzylammonium	27479-28-3	A

\*) The five hazard categories are as follows: F= FIRE HAZARD; S= SUDDEN RELEASE OF PRESSURE; R= REACTIVE; A= IMMEDIATE (ACUTE) HEALTH HAZARD; C= DELAYED (CHRONIC) HEALTH HAZARD

SARA Title III Section 313 - This act requires submission of annual reports of the releases of the following components of this material if the threshold reporting quantities as listed in 40 CFR 372, are met or exceeded:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
None known		

## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtree)

Lonza Inc.  
99 Boroline Road Allendale, NJ 07401  
800-777-1875 (9am - 5pm) 309-697-7200 (After 5pm)

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95309 Barquat 4250-Z

\*\*\*\*\* X - MISCELLANEOUS AND REGULATORY INFORMATION (continued) \*\*\*\*\*  
STATE RIGHT-TO-KNOW REGULATIONS:

**CALIFORNIA PROPOSITION 65** - Components present in this material which the State of California has found to cause cancer, birth defects or other reproductive harm are as follows:

**AS A CANCER HAZARD:**

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
Benzene	71-43-2	200 ppm
Benzyl chloride	100-44-7	100 ppm
N-Nitrosodimethylamine	62-75-9	1 ppm
Propylene oxide	75-56-9	10 ppm

**AS A REPRODUCTIVE HAZARD**

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
Benzene	71-43-2	200 ppm
Toluene	108-88-3	300 ppm

**MASSACHUSETTS Right-to-Know** - The following components of this material are included in the Massachusetts Substance List and are present at or above reportable levels:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
Benzene	71-43-2	200 ppm
Benzyl chloride	100-44-7	100 ppm
N-Nitrosodimethylamine	62-75-9	1 ppm
Propylene oxide	75-56-9	10 ppm

**MICHIGAN Critical Materials** - The following components of this material are included in the Michigan Critical Materials List:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
None known		

**NEW JERSEY Right-to-Know** - The following components of this material are included in the New Jersey Hazardous Substance List and are present at or above reportable levels:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
N-alkyl (C <sub>12-18</sub> )-N,N-dimethyl-N-Benzylammonium	68391-01-5	25%
N-Dodecyl-N,N-dimethyl-N-ethylbenzylammonium	27479-28-3	17%
N-Tetradecyl-N,N-dimethyl-N-ethylbenzylammonium	27479-38-3	8%

## MATERIAL SAFETY DATA SHEET

EMERGENCY TELEPHONE: 800-424-9300 (Chemtree)

Lonza Inc.  
90 Boroline Road Allendale, NJ 07401  
800-777-1875 (9am - 5pm) 309-697-7200 (After 5pm)

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\*\*\*\*\* Z - MISCELLANEOUS AND REGULATORY INFORMATION (continued) \*\*\*\*\*

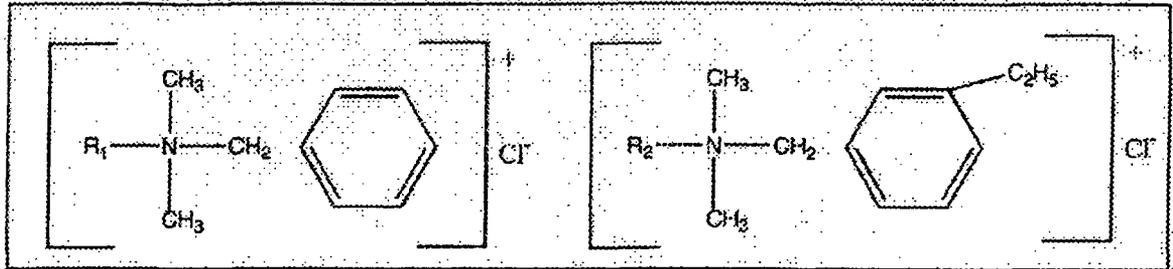
PENNSYLVANIA Right-to-Know - The following components of this material are included in the Pennsylvania Hazardous Substance List and are present at or above reportable levels:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Typical Maximum Concentration</u>
Benzene	71-43-2	200 ppm

The information provided herein is compiled from internal reports and data from professional publications. IT IS FURNISHED WITHOUT WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED. It is intended to assist in evaluating the suitability and proper use of the material in manufacturing and in the development and implementation of safety precautions and procedures.

## BARQUAT<sup>®</sup> 4250Z BARQUAT<sup>®</sup> 4280Z

Quaternary Ammonium Compounds  
EPA Registered



Barquat 4250Z and Barquat 4280Z are blends of alkyl dimethyl benzyl ammonium chlorides and alkyl dimethyl ethylbenzyl ammonium chlorides. When used as an active ingredient in FIFRA<sup>1</sup> registered formulations such as hard surface disinfectants, sanitizers and/or certain types of water treatment formulations, these products have been found to provide superior biocidal action against a broad spectrum of microbial organisms such as: bacteria, fungi, viruses, and algae. This "second" generation quaternary ammonium compound delivers potent germicidal action even in heavy organic soil loads.

### Typical Chemical Composition

	Barquat 4250Z	Barquat 4280Z
<b>Active Ingredients</b>		
Alkyl (C <sub>12</sub> 60%, C <sub>16</sub> 30%, C <sub>12</sub> 5%, C <sub>16</sub> 5%)		
Dimethyl Benzyl Ammonium Chloride	25%	40%
Alkyl (C <sub>12</sub> 68%, C <sub>14</sub> 32%)		
Dimethyl Ethylbenzyl Ammonium Chloride	25%	40%
<b>Inert Ingredients</b>		
Ethyl alcohol	—	10%
Water	50%	10%

<sup>1</sup> FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

The seller makes no warranty, expressed or implied, concerning the accuracy of any results to be obtained from the use of this information and no warranty is expressed or implied concerning the use of these products other than indicated within. The buyer assumes all risks of use and/or handling. No statement is intended or should be construed as a recommendation to infringe any patent. Printed in the USA

## Typical Properties

	<u>Barquat 4250Z</u>	<u>Barquat 4280Z</u>
Appearance	Clear, pale yellow to straw liquid	Clear, pale yellow to straw liquid
Color, (APHA)	125 Max.	200 Max.
pH, (10% active solution)	6.5-8.3	6.5-8.3
Flash Point, (Setefast, °F)	200	117
Average Molecular Weight	377	377
Specific Gravity @ 25°C	0.96	0.94
Density in lbs./gal.	8.00	7.84
Freezing Point, °F	14	14

## Physical State

Clear, pale yellow to straw liquid with a mild odor. Congealing may occur during prolonged storage at low temperatures; this is a reversible on warming with mixing.

## Solubility

Freely Soluble in water, lower alcohols, ketones and glycols.

## Safety & Toxicology

Refer to Lonza Material Safety Data Sheet for this product.

	<u>Barquat 4250Z</u>	<u>Barquat 4280Z</u>
<b>Regulatory</b>		
EPA Registration No.:	6836-26	6836-23
Canadian Pesticide Control No.:	21904	21901
CAS No.:	68391-01-5 & 27479-28-3 & 27479-29-4	68391-01-5 & 27479-28-3 & 27479-29-4
California Registered:	Yes	Yes

Barquat 4250Z and Barquat 4280Z are permitted by the FDA for use as no rinse, food contact sanitizers at no more than 200 ppm active, as noted in 21 CFR part 178.1010.

The components of Barquat 4250Z and Barquat 4280Z are listed in the United States Environmental Protection Agency TSCA Chemical Inventory list.

## Application

Barquat 4250Z and Barquat 4280Z have been incorporated into a substantial number of Lonza EPA registered formulations. These formulations include but are not limited to: disinfectants, sanitizers, and industrial water treatment. For more information on Lonza's extensive portfolio of EPA registered formulations and our Supplemental Registration Program please call our Technical Service Hotline at (800) 365-TECH (2324).



## Spectrus™ CT1300 Mollusk Control Agent

- Controls common fouling mollusks at all life stages using brief (6 to 24 hr) seasonal applications
- Effective on all types of fresh and salt water clams, mussels, and oysters
- Certified by the National Sanitation Foundation (NSF) for use in potable water systems, including influent water systems and desalination systems
- Can be rapidly detoxified and is readily biodegradable
- Field test methods available for determining product concentrations

### DESCRIPTION AND USE

Spectrus™ CT1300 is an environmentally friendly, bio-control agent that can be used to control mollusks in a variety of industrial, water-based systems. Spectrus CT1300 can also be used for control of algae, bacteria, and fungal slimes in these same water systems. Spectrus CT1300 is concentrated. It contains 50% of quaternary ammonium hydrochloride (Quat) as active ingredient.

Spectrus CT1300, applied in brief (6 to 24 hr) seasonal applications, is effective against all mollusks at all life stages. Spectrus CT1300 is effective against adult organisms and will prevent immature forms from growing to a fouling size.

Spectrus CT1300 is EPA-approved for use in recirculating cooling systems, heat exchange systems, and evaporative condensers. This product is also approved for use in once-through cooling systems, service water, auxiliary water, and fire protection systems, as well as influent and wastewater systems. See the Spectrus CT1300 product label for a complete listing of approved end-uses.

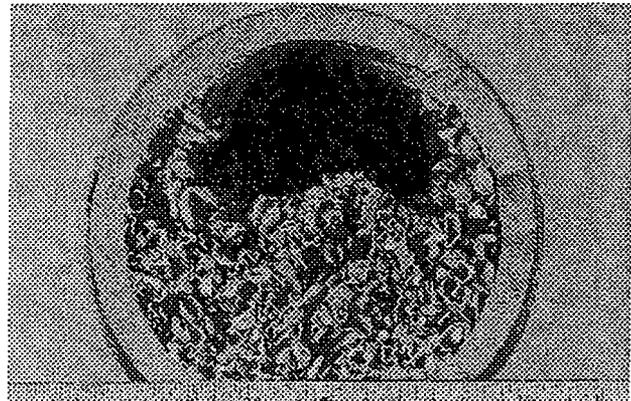


Figure 1: Zebra Mussel Accumulation after 3 Months in a 6-in. (15.2 cm) Diameter Discharge Line.

Control of macrofouling organisms such as mollusks is needed to prevent blocked water lines and damaged equipment. Uncontrolled growth of macrofouling organisms can lead to higher maintenance and production costs, reduced plant safety, and even plant outages. Therefore, an effective macrofouling control is necessary for operating units to achieve profitability goals. More importantly, effective macrofouling control is essential to ensure availability of fire protection systems and other safety-related equipment.

### POTABLE APPLICATIONS

When used in desalination systems producing potable water, the NSF has certified Spectrus CT1300 based on a maximum dosage of 10 ppm (mg/L). When used in general influent systems producing potable water, NSF has certified Spectrus CT1300 at a maximum dosage of 3.5 ppm (mg/L).

## ENVIRONMENTAL BENEFITS

The active ingredient in Spectrus CT1300 (Quat) is short-lived in the environment. Quats are cationic and rapidly adsorbed by natural, anionic substrates and sediments. Adsorption effectively detoxifies Quats and renders them harmless to aquatic and benthic organisms as well as microbes.

Spectrus CT1300 can be deliberately detoxified by use of highly adsorbent, anionic materials such as those found in Spectrus DT1400 or DT1401. These products may be used where natural adsorption is not adequate to comply with water quality criteria. Once adsorbed, Quats are readily biodegraded to carbon dioxide and water.

Because Spectrus CT1300 provides macrofouling control in just a few hours, it reduces chemical consumption, environmental impact and treatment costs compared to halogen-based macrofouling treatments. When halogens are used for mollusk control, they must be applied continuously for several weeks if they are to be effective, and they must be dehalogenated. In addition, continuous feed of halogens promotes formation of undesirable byproducts such as trihalomethanes (THMs), total organic halides (TOX), and adsorbable halogenated organics (AOX). Since Spectrus CT1300 is not an oxidizer, it does not produce these compounds.

## TREATMENT AND FEEDING REQUIREMENTS

Correct treatment levels and frequency of Spectrus CT1300 addition depend on many factors. These include, but are not limited to, degree of infestation, type of mollusk, temperature, system retention time, and discharge environment. Heavy infestations of mollusks should be physically removed by vacuuming, dredging, or scraping prior to treatment. Consult your GE Betz representative for technical advice on your specific application.

**Feed point** - Apply Spectrus CT1300 to a point in the system where turbulence and flow patterns assure good mixing with the water being treated.

**Dilution** - This product is best fed neat (undiluted) from the storage container.

**Feed Equipment** - Spectrus CT1300 is compatible with the following materials of construction: Hastalloy 825; High Density Cross-linked Polyethylene; Teflon; PVC; Neoprene; Buna N; Buna S; Litharge Viton; Ethylene Propylene Resin; Hypalon.

*Avoid use of:* 304 and 316 Stainless Steels (especially in thin walled feed lines); High Density Polypropylene; Linear High Density Polyethylene; Nylon.

This product may be fed using the PaceSetter™ control system.

## GENERAL PROPERTIES

Physical properties of Spectrus CT1300 are shown on the Material Safety Data Sheet, a copy of which is available on request.

## PACKAGING INFORMATION

Spectrus CT1300 is a liquid and is available in a wide variety of containers and delivery methods, including GE Betz's ChemSure™ Drumless Delivery Services.

## STORAGE

Protect from extreme temperatures. Protect from freezing. Keep containers closed when not in use. Keep away from flames or sparks.

## SAFETY PRECAUTIONS

Use of eye protection (goggles and face shield) and gauntlet-type neoprene gloves is required when handling this product. See section 7 of the MSDS for additional information on recommended personal protective equipment.

## GENERAL INFORMATION

EPA Registration Number.....3876-149

Purchase of Spectrus CT1300 from GE Betz includes a license to practice the process covered by U.S. Patent 4,857,209.

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**PRODUCT NAME : **COAGULANT AID 35**COMPANY IDENTIFICATION :  
Nalco Company  
1601 W. Diehl Road  
Naperville, Illinois  
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING

HEALTH : 0/1 FLAMMABILITY : 1/1 INSTABILITY : 0/0 OTHER :

0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Quartz, crystalline silica	14808-60-7	1.0 - 5.0

**3. HAZARDS IDENTIFICATION****\*\*EMERGENCY OVERVIEW\*\*****CAUTION**

May cause irritation with prolonged contact. Inhalation of crystalline silica can cause silicosis. Do not get in eyes, on skin, on clothing. Do not take internally. Do not breathe dust. Wear suitable protective clothing. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap and water.  
Not flammable or combustible. Water in contact with the product will cause slippery floor conditions.

## PRIMARY ROUTES OF EXPOSURE :

Eye, Skin

## HUMAN HEALTH HAZARDS - ACUTE :

## EYE CONTACT :

Particles may scratch eye surfaces or cause mechanical irritation.

## SKIN CONTACT :

May cause irritation with prolonged contact.

## INGESTION :

Not a likely route of exposure. No adverse effects expected.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

### INHALATION :

Repeated or prolonged exposure may irritate the respiratory tract. May cause irritation of mucous membranes.

### SYMPTOMS OF EXPOSURE :

#### Acute :

A review of available data does not identify any symptoms from exposure not previously mentioned.

#### Chronic :

A review of available data does not identify any symptoms from exposure not previously mentioned.

### AGGRAVATION OF EXISTING CONDITIONS :

Prolonged inhalation of product can increase lung injury in persons with emphysema, asthma, or other lung disorders.

## 4. FIRST AID MEASURES

### EYE CONTACT :

Flush affected area with water. If symptoms develop, seek medical advice.

### SKIN CONTACT :

First aid is normally not required. If symptoms develop, seek medical advice.

### INGESTION :

Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

### INHALATION :

Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

### NOTE TO PHYSICIAN :

Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition.

## 5. FIRE FIGHTING MEASURES

FLASH POINT : None

### EXTINGUISHING MEDIA :

Not expected to burn. Use extinguishing media appropriate for surrounding fire.

### FIRE AND EXPLOSION HAZARD :

Not flammable or combustible. Water in contact with the product will cause slippery floor conditions.

### SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :

In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.



# MATERIAL SAFETY DATA SHEET

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

## 6. ACCIDENTAL RELEASE MEASURES

### PERSONAL PRECAUTIONS :

Notify appropriate government, occupational health and safety and environmental authorities. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

### METHODS FOR CLEANING UP :

Sweep up and shovel. Reclaim into recovery or salvage drums. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations). Water in contact with the product will cause slippery floor conditions.

### ENVIRONMENTAL PRECAUTIONS :

Do not contaminate surface water.

## 7. HANDLING AND STORAGE

### HANDLING :

Do not take internally. Ensure all containers are labelled. Avoid eye and skin contact. Avoid generating dusts.

### STORAGE CONDITIONS :

Keep in dry place.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### OCCUPATIONAL EXPOSURE LIMITS :

Exposure guidelines have not been established for this product. Available exposure limits for the substance(s) are shown below.

#### ACGIH/TLV :

##### Substance(s)

Respirable Nuisance TWA: 3 mg/m3

##### Particulates

Inhalable (Total) Nuisance TWA: 10 mg/m3

##### Particulates

Quartz, crystalline silica TWA: 0.1 mg/m3 0.1 mg/m3

#### OSHA/PEL :

##### Substance(s)

Respirable Nuisance TWA: 5 mg/m3

##### Particulates

Inhalable (Total) TWA: 15 mg/m3 (total dust)

##### Nuisance Particulates

Quartz, crystalline silica TWA: 0.1 mg/m3

### ENGINEERING MEASURES :

General ventilation is recommended. Local exhaust ventilation may be necessary when dusts or mists are generated.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

### RESPIRATORY PROTECTION :

An approved respirator must be worn if the occupational exposure limit is likely to be exceeded. If dusts are generated, use an approved air-purifying respirator. A dust, mist, fume cartridge may be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

### HAND PROTECTION :

Nitrile gloves, PVC gloves, Neoprene gloves, Rubber gloves, Butyl gloves, Cloth gloves

### SKIN PROTECTION :

Wear standard protective clothing.

### EYE PROTECTION :

Wear safety glasses with side-shields.

### HYGIENE RECOMMENDATIONS :

Keep an eye wash fountain available. Keep a safety shower available.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Powder
APPEARANCE	Light grey
ODOR	None
SOLUBILITY IN WATER	Insoluble
pH (5 %)	8.5 - 10.5

Note: These physical properties are typical values for this product and are subject to change.

## 10. STABILITY AND REACTIVITY

### STABILITY :

Stable under normal conditions.

### HAZARDOUS POLYMERIZATION :

Hazardous polymerization will not occur.

### CONDITIONS TO AVOID :

Moisture

### MATERIALS TO AVOID :

None known

### HAZARDOUS DECOMPOSITION PRODUCTS :

Under fire conditions: None known

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

**11. TOXICOLOGICAL INFORMATION**

No toxicity studies have been conducted on this product.

**CARCINOGENICITY :**

Contains crystalline silica (quartz or cristobalite). The International Agency for Research on Cancer (IARC) has evaluated crystalline silica (inhaled in the form of quartz or cristobalite from occupational sources) and found it to be a human carcinogen (Group 1) based on sufficient animal data and sufficient human evidence. The National Toxicology Program (NTP) has evaluated crystalline silica and found it may be reasonably anticipated to be a human carcinogen. Overexposure to the respirable dust (less than or equal to 5 microns in size) may lead to silicosis, which is a progressive and irreversible lung disease.

**12. ECOLOGICAL INFORMATION****ECOTOXICOLOGICAL EFFECTS :**

No toxicity studies have been conducted on this product.

If released into the environment, see CERCLA/SUPERFUND in Section 15.

**13. DISPOSAL CONSIDERATIONS**

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

**14. TRANSPORT INFORMATION**

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

**LAND TRANSPORT :**

Proper Shipping Name :

PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION**AIR TRANSPORT (ICAO/IATA) :**

Proper Shipping Name :

PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION**MARINE TRANSPORT (IMDG/IMO) :**

**MATERIAL SAFETY DATA SHEET**

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

(800) 424-9300 (24 Hours) CHEMTREC

Proper Shipping Name :

PRODUCT IS NOT REGULATED DURING  
TRANSPORTATION**15. REGULATORY INFORMATION**

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :

Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Quartz, crystalline silica : Cancer suspect agent (refer to Section 3)

CERCLA/SUPERFUND, 40 CFR 117, 302 :

Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :

This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

- |   |                                   |
|---|-----------------------------------|
| X | Immediate (Acute) Health Hazard   |
| X | Delayed (Chronic) Health Hazard   |
|   | Fire Hazard                       |
|   | Sudden Release of Pressure Hazard |
|   | Reactive Hazard                   |

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :

This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :

The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :

When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 173.310 Boiler Water Additives, 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :

None of the substances are specifically listed in the regulation.

Nalco Company 1601 W. Diehl Road • Naperville, Illinois 60563-1198

(630)305-1000

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# MATERIAL SAFETY DATA SHEET

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

**(800) 424-9300 (24 Hours) CHEMTREC**

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :  
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :

This product contains the following substances which require warning under California Proposition 65.

Substance(s)	Concentration	EFFECTS
• Quartz, crystalline silica	5 %	Causes Cancer

MICHIGAN CRITICAL MATERIALS :

None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :

The following substances are disclosed for compliance with State Right to Know Laws:

Quartz, crystalline silica

14808-60-7

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :

D2A - Materials Causing Other Toxic Effects - Very Toxic Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :

The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

## 16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

### REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.



## MATERIAL SAFETY DATA SHEET

PRODUCT

**COAGULANT AID 35**

EMERGENCY TELEPHONE NUMBER(S)

**(800) 424-9300 (24 Hours) CHEMTREC**

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department

Date issued : 02/21/2004

Version Number : 1.6

## PRODUCT NAME

# COAGULANT AID 35

## *Coagulant*

## PRODUCT DESCRIPTION AND APPLICATION

COAGULANT AID 35 is a specially selected, off-white pulverized clay.

COAGULANT AID 35 is used in clarification of municipal and industrial water supplies. COAGULANT AID 35 helps produce a heavier, faster settling floc. The clarity of the finished water is also improved. Usually this product is used in combination with cationic coagulants, such as NALCOLYTE® 8103 Plus.

## ADVANTAGES

- Heavier, faster settling floc; especially where raw water turbidity is low
- Improved clarity
- Economical treatment costs

## PHYSICAL & CHEMICAL PROPERTIES

These properties are typical. Refer to the Material Safety Data Sheet (MSDS) for the most current data.

Form	Powder
Appearance	Pale grey to buff powder granules
Odor	None
Specific Gravity	1.0 - 1.5 (1% aqueous suspension)
pH (5% aqueous suspension)	8.5 - 10.5
Freeze Point	Not applicable
Boiling Point	Not applicable
% Volatile by Weight	Not applicable
Solubility in Water	Negligible
Vapor Density (air = 1)	Not applicable
Vapor Pressure	Not applicable

## ACTIVE CONSTITUENTS

Please refer to the Material Safety Data Sheet (MSDS) for the most recent information.

Bentonite Clay

## REGULATORY APPROVALS

Please refer to the Material Safety Data Sheet (MSDS) for the most recent approval information.

## MATERIALS OF COMPATIBILITY

### Compatible

Buna N  
Carbon Steel  
CPVC  
EPDM  
FRP  
Hypalon  
Kynar  
Neoprene  
Plasite 7122 (Epoxy)  
Plasite 4100 (Vinyl Ester)  
Polyethylene  
Polypropylene  
PVC  
304 and 316 Stainless Steel  
Viton

### Not Compatible

Aluminum  
Silicone 65

## ENVIRONMENTAL AND TOXICITY DATA

Please refer to the Material Safety Data Sheet (MSDS), SECTIONS 11 and 12, for all aquatic and mammalian information.

## SAFETY AND HANDLING

Read the label and Material Safety Data Sheet for complete handling information before using this product.

**EYE/FACE PROTECTION:** Chemical splash goggles

**HANDLING:** Avoid breathing dust.  
Avoid contact with eyes.  
Use with adequate ventilation.  
Wash thoroughly after handling.

Keep container closed when not in use.

## **STORAGE**

Please read the MSDS before storing this product.

Keep container sealed properly to avoid moisture pickup. The product should be acceptable for use for 1 year of storage if kept in a dry, sealed container.

## **REMARKS**

If you need assistance or more information on this product, please call your nearest Nalco Representative. For more news about Nalco Company, visit our website at [www.nalco.com](http://www.nalco.com).

For **Medical and Transportation Emergencies** involving Nalco products, please see the Material Safety Data Sheet for the phone number.

## **ADDITIONAL INFORMATION**

NALCOLYTE and NALCO are registered trademarks of Ondeo Nalco Company (8-03)

**FREIGHT CLASSIFICATION:** Clay or sand, N.O.I., granulated or pulverized with not over 3.5% other ingredients, admixed but not processed for decolorizing, filtering or water softening.



## STATE OF TENNESSEE

## FAX TRANSMITTAL

TO: Mr. Robert J. Crawford, Environmental Supervisor	FROM: Mr. Edward M. Polk, Jr., P.E., Manager, Permit Section
AGENCY/COMPANY: TVA -WBN	DATE: 7/29/2004
FAX NUMBER: 423/365-1854	TOTAL NUMBER OF PAGES INCLUDING COVER: 14
PHONE NUMBER: 423/365-8767	SENDER'S PHONE NUMBER: 615/532-1178
SUBJECT: WBN B/C Treat. Plan Approval	SENDER'S FAX NO.: 615/532-0686

X URGENT     FOR REVIEW     PLEASE REPLY

## MESSAGE:

Final approval of plan for WBN.
Thank You!

The information contained in this message is confidential and is intended solely for the use of the person or entity named above. This message may contain individual identifiable information that must remain confidential and is protected by state and federal law. If the reader of this message is not the intended recipient, the reader is hereby notified that any dissemination, distribution or reproduction of this message is strictly prohibited. If you have received this message in error, please immediately notify the sender by telephone and destroy the original message. We regret any inconvenience and appreciate your cooperation.



STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
401 CHURCH STREET  
L & C ANNEX 6<sup>TH</sup> FLOOR  
NASHVILLE, TN 37243-1534  
July 30, 2004

Robert J. Crawford  
Environmental Supervisor  
Tennessee Valley Authority,  
Watts Bar Nuclear Plant  
P.O. Box 2000  
Spring City, TN 37381-2000

**Re: TVA-Watts Bar Nuclear Plant  
NPDES Permit No. TN0020168  
Biocide/Corrosion Treatment Plan Approval**

Dear Mr. Crawford:

The Division of Water Pollution Control has received and reviewed your letter of June 15, 2004 requesting authorization to implement changes to the raw water treatment plan at the Watts Bar Nuclear Plant (WBN). 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 WBN and WPC staff in Chattanooga in May 2004. 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 WBN raw water treatment plan involves the use of ten (10) 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 Outfalls 101 (cooling tower blowdown line) and 113 (supplemental condenser cooling water line). The chemicals include three corrosion inhibitors, one biodegradable detergent, one of two oxidizing biocides (chlorination/bromination), sodium bisulfite (dechlorination), one of two non-oxidizing biocides (quaternary ammonium compounds for mollusk control), and sodium bentonite (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. However, all ten chemicals have been assessed (or reassessed) as part of the review process for the current 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

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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. Also, the concentration of each active ingredient at the end of the mixing zones for Outfalls 101 and 113 combined has been calculated to assure that it is below the chronic toxicity criteria for each ingredient. 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 including all active and inactive 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 ten chemicals are discussed individually below and the conditions for their use are specified. Each chemical is approved for use effective August 2, 2004 subject to the specified conditions:

**Chemical Name:** Nalco MSW-109  
**Primary Ingredient:** Zinc Chloride  
**CAS No.** 7646857  
**Secondary Ingredient:** Phosphoric Acid  
**CAS No.** 7664382

This chemical is a corrosion inhibitor used continuously for raw water treatment. Its use was approved by the Division on December 13, 2002. No change in the use of this chemical is being requested by TVA. The primary constituents of concern are zinc and phosphorus. The acute criterion for zinc is 0.291 mg/l and the chronic criterion is 0.319 mg/l. TVA has agreed in the plan not to exceed 0.2 mg/l for both zinc and phosphorus in the discharge. This concentration will be protective of both the acute and chronic criteria in the receiving stream. The conditions for approval of MSW-109 use are that (1) the concentration of zinc or phosphorus shall not exceed 0.2 mg/l in the plant effluents at any time based on mass balance calculations, and (2) the total chemical use shall be such that the quantity of zinc and phosphorus shall each not exceed 200 lbs per day.

**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 in August 1996 (see letter from Odie 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

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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 chemical 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 200 lbs per day.

**Chemical Name:** NALCO 1336  
**Primary Ingredient:** Sodium Tolytriazole, (1-H-benzotriazole, 4 (or 5) methyl, sodium salt)  
**CAS No.** 64665-57-2

This chemical is an antirust and corrosion inhibitor used to inhibit copper corrosion in the plant. The primary ingredient is of the chemical family of benzotriazoles which are compounds composed of a benzene ring attached to three linked nitrogen atoms. This chemical was in the plan submittal of August 20, 1996, but was listed as a CALGON product called Cuprostat PF. No reference was found to a request or approval of the change to the NALCO 1336.

The benzotriazoles have been found to exhibit acute toxicity to *D. magna* in the range of 35 mg/l to 280 mg/l (48 hr LC50). One study of 1-H-Benzotriazole, 4 (or 5)-methyl indicated acute toxicity to *Pimaphales promelas* of 25.5 mg/l (96 hr LC50). TVA has agreed to keep effluent concentration of the active ingredients at or below 0.25 mg/l. Based on these data, the conditions for approval of this chemical are (1) the plant effluent concentration of the active ingredients in Nalco 1336 shall not exceed 0.25 mg/l based on mass balance calculations, and (2) the maximum quantity of active ingredients discharged shall not exceed 2200 lbs per day.

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

This chemical is a non-ionic copolymer used to remove and disperse soft foulant deposits in cooling water systems. It is a new chemical being proposed by TVA for use in advance of non-oxidizing biocide application. Frequency of use would be approximately 26 times per year and duration of use would be about 0.25 hours per day.

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 141 mg/l and for *Ceriodaphnia dubia* at an IC25 of 527 mg/l. Data presented by TVA for the active ingredient show chronic toxicity (IC25) to *P. promelas* of 104.5 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, and (2) the maximum quantity of the active ingredients used shall not exceed 485 lbs per day.

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**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. The chemical mixture contains 85% to 95% sodium dichloroisocyanurate and 5% to 10% sodium bromide. This chemical was previously approved by the Division 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 expand the use of Towerbrom 960 in two ways. First it is proposing to apply Towerbrom 960 to the raw water treatment system, potentially replacing NALCO H-901G. The frequency of use would be increased to approximately 260 days per year and average duration would be for approximately 10 hours per day; however, during certain periods TVA would feed 24 hours per day. Secondly, TVA proposes to continue the use of Towerbrom 960 in the cooling towers, with the option to discharge to the diffusers (Outfall 101) or the SCCW (Outfall 113). The frequency of cooling tower treatment is approximately 26 days per year and the duration of the treatment is up to 4 hours per day. To assure that the total residual oxidants (TROs) in the effluent does not exceed 0.1 mg/l, TVA proposes to treat the effluent using sodium bisulfite (NALCO 7408, see separate discussion below).

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.

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 0.1 mg/l for TRC will comply with water quality criteria.

Based on the data available, the conditions for approval of this chemical are (1) the maximum concentration of TROs (including chlorine and bromine) shall not exceed 0.10 mg/l in Outfalls 101 and 113, (2) the total quantity of active ingredient use shall not exceed 4575 lbs/day, (3) whenever Towerbrom 960 is in use, treatment of the effluent using sodium bisulfite shall be undertaken, as necessary to meet the 0.10 mg/l TRO condition (or such other TRC limit as specified in the NPDES permit) for Outfalls 101 and 113 respectively, and (4) oxidizing biocide treatments using Towerbrom 960 will not be conducted simultaneous with non-oxidizing biocide chemical treatments.

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**Chemical Name:** NALCO H-901G  
**Primary Ingredient:** 1-Bromo-3-Chloro-5, 5-Dimethyl-Hydantoin  
**CAS No.:** 16079-88-2

This chemical is an oxidizing organic microcide that puts 57% of its active ingredient into solution as chlorine and bromine. TVA uses H-901G for routine treatment of internal piping via the raw water treatment system. It was included in the TVA plan submittal of August 20, 1996 where it was projected for periodic use at 4 hours per day. The current plan indicates that this chemical is to be used for raw water treatment at an approximate frequency of 260 days per year with an average duration of about 10 hours per day; however, during certain periods, TVA may feed 24 hours per day.

Toxicity data reported from the Nalco MSDS sheet indicates that H-901G is toxic to the *P. promelas* with a 96 hr LC50 of 0.71 mg/l and to *D. magna* with a 48 hr LC50 of 0.4 mg/l. Data from EPA EcoTox database provide one study of toxicity to *D. magna* with an EC50 ranging from 0.3 mg/l to 6765 mg/l and to *P. promelas* with an EC50 range from >1085 to 14,990 mg/l. TVA proposes to limit toxicity by controlling the Total Residual Oxidants (TROs) to 0.1 mg/l in Outfalls 101 and 113. The 0.1 mg/l TRC effluent limit is considered to be protective of water quality (see discussion for Towerbrom 960 above).

Based on the data presented, this chemical is approved for use with the conditions that (1) the concentration of Total Residual Oxidants (TROs including chlorine and bromine) after treatment shall not exceed 0.10 mg/l (or other such concentration as specified in the NPDES permit) in Outfall 101 and 113, (2) the total active ingredient use shall not exceed 2375 lbs/day, (3) treatment of the effluent using sodium bisulfite shall be undertaken whenever necessary to comply with the above effluent concentration limits, and (4) oxidizing biocide treatments using H-901G will not be conducted simultaneously with non-oxidizing biocide chemical treatments.

**Chemical Name:** NALCO 7408  
**Primary Ingredient:** Sodium Bisulfite (Sodium Hydrogen Sulfite)  
**CAS No.:** 7631-90-5

Sodium bisulfite is used as a treatment method to destroy residual chlorine. It also reacts with dissolved oxygen in water. TVA proposes to use Nalco 7408 for conditions where effluent chlorine residual is projected to exceed the effluent limits imposed by the NPDES permit and/or the raw water treatment plan. This generally is projected to occur during periodic biocide treatments.

The product toxicity data from the Nalco MSDS sheet indicates *D. magna* toxicity with a 48 hr LC50 ranging from 275 mg/l to 728 mg/l (the Nalco product contains only 30% to 60% NaHSO<sub>3</sub>). The EPA EcoTox database provides toxicity for sodium bisulfite with *D. magna* LC50s varying from 81 to 179 mg/l. Since the maximum feed rate of sodium bisulfite is 10 mg/l and the chemical will react rapidly with residual oxidants toxicity is not anticipated to be a problem.

Sodium bisulfite is an oxygen scavenger and can reduce the dissolved oxygen in the WBN effluent if over fed. Thus feed rates should be carefully controlled to match what is just necessary to react with residual chlorine. To assure that over feeding is not occurring, dissolved oxygen levels in the system and the effluent should be measured routinely when this chemical is being used.

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Based on the data provided in the plan, the use of Nalco 7408 is approved based on the following conditions: (1) maximum concentration of active ingredients near the point(s) of injection(s) shall not exceed 10 mg/l based on calculations, (2) the maximum quantity of active ingredients used shall not exceed 5615 lbs/day, (3) the dissolved oxygen (DO) concentration in the effluents during treatment will be monitored routinely (once each 4 hours during daylight hours and once during nighttime on the first day of treatment and a minimum of twice daily for all subsequent days of treatment period), and (5) if levels of DO in the effluent fall below 4.0 mg/l, the EAC shall be notified within 24 hours and corrective actions shall be undertaken to prevent recurrence.

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

This chemical is a non-oxidizing biocide used to control mollusks. The primary ingredient, didecyldimethylammonium 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.

Nalco H-130M was previously approved by the Division for use at the Watts Bar Nuclear Plant with the condition that the effluent concentration does not exceed the field detection level, 0.05 mg/l, in the diffuser discharge (Outfall 101) (see Thomas E. Roehm letter to Odie E. Hickman of September 6, 1996). TVA is proposing to increase the use of H-130M and to provide detoxification treatment using sodium bentonite (primary ingredients sodium and aluminum silicate, see separate discussion below).

Nalco H-130M is acutely toxic to *D. magna* in the range of 0.014 mg/l to >1.0 mg/l based on data from the EPA EcoTox database. The Nalco MSDS reports *D. magna* acute toxicity at 0.14 mg/l and TVA reports chronic toxicity for *D. magna* 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 is established for this compound. Nalco proposes to 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. A laboratory method using methylene chloride extraction is also available with an MDL of 0.02 mg/l. Testing of the effluents will be required using the methylene chloride extraction method.

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 used) in periods when treatment is underway, (3) the total use of Nalco H-130M shall not exceed 1,190 lbs/day of active ingredients, and (4) treatment using sodium bentonite shall be applied to Outfalls 101 and 113 any time that calculations show that an exceedance of condition (1) or (3) may occur, (5) if TVA demonstrates no exceedances of the 0.05 mg/l discharge limitation after 6 applications, then the frequency of monitoring may be reduced to twice per day, and (6) the use of Nalco H-130M shall only occur when flow in the Tennessee River is equal to or greater than 2,262 MGD.

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**Chemical Name:** Betz Dearborn Spectrus NX 1104  
**Primary Ingredient:** (C12-C16) Dimethylbenzylammonium Chloride  
**CAS No.:** 68424-85-1  
**Secondary Ingredient:** Dodecylguanidine Hydrochloride  
**CAS No.** 13590-97-1

This chemical is a non-oxidizing biocide used for mollusk control. It contains a primary ingredient, (C12-C16) dimethylbenzylammonium chloride (8%), which is a quaternary ammonium compound. A secondary ingredient, is dodecylguanidine hydrochloride (5%), an ammonium based cationic surfactant. Spectrus NX-1104 replaces an earlier product, Clamtrol CT-1. This change was approved by the Division with the condition that the concentration of the active ingredients not exceed 0.05 mg/l in the plant effluents (see S. Qualls letter of June 25, 2002 to R. Crawford). TVA plans to increase the use of Spectrus NX-1104 such that projected concentrations in the outfall may exceed 0.05. 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. Dodecylguanidine monohydrochloride has been found to be acutely toxic to *D. magna* in the range of .077 to 1.0 mg/l from this same database. The Betz Dearborn MSDS (for the chemical mixture) reports acute toxicity for *D. magna* of 0.16 mg/l and *P. promelas* of 2.9 mg/l. TVA reports chronic toxicity (for the chemical mixture) to *C. dubia* of 0.004 mg/l and to *P. promelas* of 0.048 mg/l. Based on these data, a CMC of 0.050 mg/l and a CCC of 0.004 mg/l are selected to protect the stream.

Nalco proposes to use a colorimetric field method for detection of quaternary ammonium compounds suitable for field use to a detectable limit (MDL) of 0.05 mg/l for operational use. A methylene chloride extraction laboratory method is also proposed by Nalco with a MDL of 0.02 mg/l. Spectrus NX 1104 has two active ingredients, with 61.5 % of the active ingredients being a quaternary ammonium compound and 38.1% of the active ingredients being an anionic surfactant. Thus to meet a 0.05 mg/l limit for the combined ingredients, the quaternary ammonium ingredient concentration must not exceed 0.031 mg/l. Because the colorimetric test will not measure this concentration, laboratory analysis using methylene chloride extraction must be employed as a test method for effluents.

The use of Betz Dearborn Spectrus NX-1104 is approved for use with the following conditions (1) the concentration of the quaternary ammonium compounds in the chemical shall not exceed 0.031 mg/l, (2) the total use of all active ingredients in Spectrus NX-1104 shall not exceed 1,190 lbs/day, (3) treatment of Outfalls 101 and 113 with sodium bentonite shall be undertaken any time calculations indicate that an exceedance of condition (1) 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 used) and the samples shall be analyzed for quaternary ammonium compounds using methylene chloride extraction, and (5) if TVA demonstrates no exceedances of the 0.031 mg/l discharge limitation after 6 applications, then the frequency of monitoring may be reduced to twice per day.

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**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 and Spectrus NX-1104. This treatment proposal is new and has not been approved in the past. Treatment is to occur approximately 26 times per year for about a two-day period. Special trailers have been constructed to house the chemical feed equipment to be used during the treatment operation. Both Outfall 101 and 113 will be treated. Proposed feed rate is up to 11,990 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, (3) the total use of sodium bentonite shall not exceed 11,990 lbs/day, and (4) treatment of Outfalls 101 and 113 with sodium bentonite shall be undertaken any time calculations indicate that an exceedance of the effluent concentration limits for Nalco H-130M or Betz Dearborn Spectrus NX 1104 will occur.

#### 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,
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 113 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,
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 office by February 15 of the year following the reporting year. Significant changes to the plan must be submitted for Division 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 colorimetric instrumentation and method with the methylene chloride extraction method, WBN shall conduct side-by-side colorimetric and methylene chloride extraction analyses of the effluent

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during the first six treatments using detoxification. Additionally, WBN will conduct a bench top study comparing the analytical results of spiked samples analyzed by both methods. The results of these comparisons will be submitted in the first annual report to TDEC on February 15, 2005, and

9. TVA-WBN 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,



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

EMP/prm

Enclosures

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

**TABLE 1**  
**TVA Watts Bar Nuclear Plant**  
**Raw Water Treatment Plant Chemicals**  
**Toxicity Data from EPA EcoTox Database**

Supplier Name and Chemical Name	CAS No	Aquatic Species	EndPoint	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		500		14413	
		Daphnia magna	EC50	93		360	344	
		Daphnia magna	EC50		150		14413	
		Bluegill	LC50	260		3200	344	
		Rainbow trout	LC50		290		14413	
		Rainbow trout	LC50	130		900	344	
		Daphnia magna	EC0		6 171,000		6623	
		Daphnia magna	EC50		7 219,000		6623	
		Daphnia magna	NOEC		91,000		6623	
		Daphnia magna	EC10		43,000		12372	
	Daphnia magna	EC50		6,820,000		10203		
	Daphnia magna	EC50		7,219,000		847		
	Daphnia magna	EC50	1300	1400	1800	7054		
	Daphnia magna	EC50	6 700,000		9,300,000	2493		
	Daphnia magna	EC50	5,700,000		10,800,000	6558		
	Daphnia magna	EC50		>1,000,000		344		
	Daphnia magna	EC50		5,800,000		1060		
	Daphnia magna	EC50	20,800		30,100	20061		
	Daphnia magna	EC50		23,000		5875		
	Daphnia magna	EC50		23,000		10600		
	Daphnia magna	EC50	5870		14,170	2949		
	Daphnia magna	LC50		500,000		5713		
	Daphnia magna	LC50		11,000,000		10800		
	Daphnia magna	LC50				40784		
	Daphnia magna	LC50		10,500,000		5675		
	Daphnia magna	LC50	10,200,000		20,000,000	7054		
	Daphnia magna	LC50		8,900,000		10203		
	Daphnia magna	LC50	<38		78	6320		
	Daphnia magna	LC50	7394		7503	29794		
	Daphnia magna	LOEC		19,000		20061		
	Daphnia magna	LOEC		18,000		4484		
	Daphnia magna	LOEC	3000		47,000	5857		
	Daphnia magna	NOEC		2800		12372		
	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		18,000	10600		
	Daphnia magna	NOEC	<3000		18,000	5857		
	Scud	LC50	<92		233	6320		
	Bluegill	LC50			>1,000,000	344		
	Inland silverside	LC50	50		410	6230		
	Golden shiner	LC50	238		288	6230		
	Naico H-130 M  Active Ingredients N-Decyl-N,N'-dimethyl-1-decanaminium chloride	7173516	Chironomid	LC50	69	75	82	17880
			Daphnia magna	EC50	93		>1000	5353
			Daphnia magna	EC50	14		120	344
Daphnia magna			LC50	64		>1000	5386	
Daphnia magna			LC50	28		37	18386	
P. promelas			LC50	450		470	17880	
P. promelas			LC50	200		300	18386	
White sturgeon			LC50	0.006		10	20400	
Opossum shrimp			LC50	99		1100	18386	
Copepod shrimp			LC50	52		69	344	
Virginia oyster			LC50	17		94	344	
Shoghead minnow			LC50	770		960	344	
Zebra mussel			LC50	30		>10,000	14064	
Mayfly			LC50	4200		6800	17880	
Scud			LC50	90		110	18386	
Channel Catfish			LC50	690		710	344	
Bluegill			LC50	380		580	344	
3-Horned Waterbug			LC50	4850		8120	4175	
Rainbow Trout			LC50	373		773	20361	
Rainbow Trout			LC50	970		1240	344	

TABLE 1 (continued)  
 TVA Watts Bar Nuclear Plant  
 Raw Water Treatment Plant Chemicals  
 Toxicity Data from EPA EcoTox Database

Supplier Name and Chemical Name	CAS No.	Aquatic Species	EndPoint	Concentration, ug/l			Reference No.
				Min	Average	Max	
Baird Desbourn Spectrus NX1104  Primary Active ingredient (C12-18 alkyl dimethyl benzyl ammonium chloride (listed in EcoTox as Hyamine 3300))	69424051	Daphnia magna	EC50	0.28		90	344
		P. promelas		230		1800	344
		Brown Bullhead	LC50	1480	1590	1700	344
		Opaeum shrimp	LC50	81	920	130	344
		Goldfish	LC50	1160	1490	1910	344
		Virginia oyster	LC50	52.1	55.2	58.3	344
		Shapthead minnow	LC50	680	880	1100	344
		Channel catfish	LC50	880	980	1090	344
		Green sunfish	LC50	2040	2250	2480	344
		Bluegill	LC50	220		3030	344
		Redear sunfish	LC50	560	740	980	344
		Smallmouth bass	LC50	1290	1370	1450	344
		Largemouth bass	LC50	1070	1130	1200	344
		Striped bass	LC50	3500		17600	2468
		Rainbow trout	LC50	870		2740	344
		Rainbow trout	LC50	1300	1800	2200	344
		Brown trout	LC50	1030	1950	2000	344
Lake trout	LC50	310	420	590	344		
Secondary Active ingredient: Decylpyridinium monohydrochloride	13590-97-1	Daphnia magna	EC50	77	88	1000	344
Nalco 1336 Active ingredient: Sodium Tolytrazole	64665872	Bluegill	LC50		>175,000		
		Daphnia magna	LC50		260,000		
Nalco Biogardant 73551 Ethylene Oxide	75218	Daphnia magna	LC50	83,000		300,000	10117
		P. promelas	LC50	69,000		150,000	10117
Propylene oxide	75569	Goldfish	LC50		170,000		623
		W. mosquitofish	LC50		141,000		840
		Bluegill	LC50		215,000		
Nalco 7409 Sodium Bisulfite	763905	Daphnia magna	EC50		102,000		2462
		Daphnia magna	LC50	81,000		171,000	915
		Daphnia magna	LC50	119,000		179,000	2466
		Daphnia magna	LETG		<145000		2130
		Pond Snail	LC50	59,000		179,000	915
Nalco H-801 G 1-Bromo-3-Chloro-5,5-Dimethyl-Hydantoin	16079282	Opaeum Shrimp	LC50	700		1,400	344
		Shapthead minnow	LC50	1,200		10,000,000	344
		Daphnia magna	EC50	300		8,765,000	344
		Bluegill	LC50	180		>1,017,000	344
		P. promelas	LC50	>1,085,000		14,890,000	344

\* Benzotriazoles Category Justification and Testing Rationale, Benzotriazoles Coalition, Synthetic Organic Chemical Manufacturers Association, December 2001

† Test durations vary from 12 hours to 96 hours

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

Chemical	Active Ingredient (or Ingredient of Concern)	% Active Ingredient in Chemical <sup>1</sup>	Max Daily Active Ingre. Discharge <sup>2</sup> lbs	Minimum Stream Flow <sup>2</sup> MGD	Max Conc Active Ingre. Instream <sup>3</sup> ug/l	Active Ingre. Acute Toxicity <sup>4</sup> ug/l	Active Ingre. 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
Nalco MSW-108	Zinc	12.60%	200	2062	11.62			318.2	291.4
Nalco PCL-401	Anionic Copolymer	28.50%	200	2062	3.31	798,000		399,000	79,800
Nalco 1336	Sodium Tolytriazole	42.80%	2200	2026	130.20	25,500		12,750	2,550
Nalco 73551	Ethylene/Propylene oxide	20.00%	415	2026	4.61	200,000	29,000	100,000	29,000
Nalco Towerbrom 990	Sodium Dichlorocephaluronate	90.00%	4575	2026	243.7	150		75	15
	Sodium Bromide	10.00%	4575	2026	27.1	60,000		30,000	6,000
	TRO	54.70%	4575	2026	148.1			19	11
Nalco H-901G	1-Bromo-3-Chloro-5,5-Dimethyl-Hydantoin	96.00%	2375	2026	141	384		192	39
	TRO	54.70%	2375	2026	77			19	11
Nalco 7408	Sodium Bisulfite	40.00%	5615	2026	332	80,000		40,000	8,000
Nalco H-130M	N-decyl-N,N-dimethyl-1-decanaminium chloride	50.00%	1190	2262	63.08	100	104	50	10.0
Betz-Deaerben-Spectrum NX 1104	(C12-16) alkyl dimethyl benzyl ammonium chloride	8.00%	1190	2262	38.8	100	104.0	50.0	10.0
	dodecylguanidine hydrochloride	5.00%	1180	2262	24.3	25		44	8.8
Nalco Coagulant Aid 35	Aluminum	10.60%	11900	2066	75			750 <sup>8</sup>	87 <sup>9</sup>

1 Data obtained from MSDS, chemical vendor, or TVA

2 TVA data from Raw Water Treatment Plan, 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 TVA

5 Chronic toxicity data from MSDS or TVA data

6 CMC is published criteria for zinc, 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 2026 MGD except for non-emulsifying biocides which are restricted in use to periods when stream flow is 2262 MGD or greater.

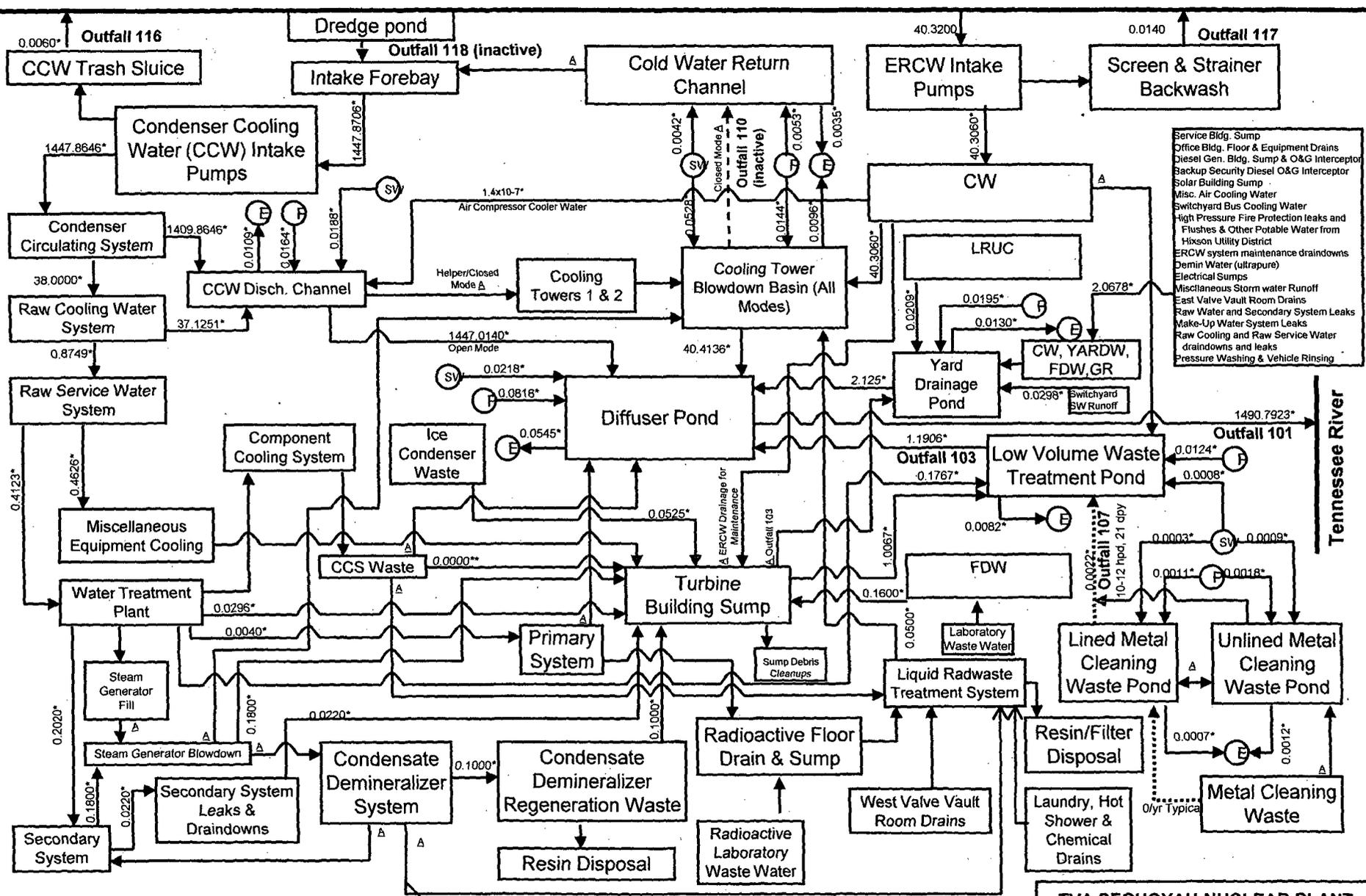
Table 3  
 Maximum Anticipated Discharge Concentrations Versus CMC

Chemical	Active Ingredient (or Ingredient of Concern)	% Active Ingredient	Max Daily Active Ingre. Discharge <sup>1</sup> lbs	Avg. Plant Discharge 10 <sup>1</sup> ± 113 <sup>1</sup> MGD	Calc. Max. Discharge Concentration <sup>2</sup>		TVA Max Act. Ingre. Disch. Conc. <sup>3</sup> ug/l	CMC ug/l
					Chemical ug/l	Active Ingre. ug/l		
Nalco MSW-109	Zinc	12.60%	200	163	147	19	200	319.2
Nalco PCL-401	Anionic Copolymer	100.00%	200	163	147	147	200	399,000
Nalco 1236	Sodium Polytriazole	42.30%	2200	163	1618	685	250	40,500
Nalco 73551	Ethylene/Propylene oxide	100.00%	416	163	305	305	200	0
Nalco Towerbrom 960	Sodium Dichloroisocyanurate	96.00%	4575	163	3365	3231	100 TRC	75
	Sodium Bromide	10.00%	4575	163	3365	337	100 TRC	30,000
	TRO	54.70%	4575	163	3365	1841	100 TRC	19
Nalco H-901G	1-Bromo-3-Chloro-5, 5-Dimethyl -Hydantoin	96.00%	2375	163	1747	1677	100 TRC	192
	TRO	54.70%	2375	163	1747	956	100 TRC	19
Nalco 740E	Sodium Bisulfite	60.00%	5615	163	4120	2476	<10,000	40,000
Nalco H-130M	N-decyl-N, N-dimethyl-1- dodecylammonium chloride	50.00%	1190	163	675	438	14.3, instream	50
Betz-Dearborn- Spectrus NX 1104	(C12-16) alkyl dimethyl benzyl ammonium chloride	8.00%	1190	163	875	70	4.0, instream	50
	dodecylguanidine hydrochloride	5.00%	1190	163	875	44	5.0	44
Nalco Coagulant Aid 95	Aluminum	10.60%	11990	163	8820	935	1010	750

1 Average flow reported in April 2001 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 Treatment Plan, Tables 2 and 3.

Tennessee River

Tennessee River



- Service Bldg. Sump
- Office Bldg. Floor & Equipment Drains
- Diesel Gen. Bldg. Sump & O&G Interceptor
- Backup Security Diesel O&G Interceptor
- Solar Building Sump
- Misc. Air Cooling Water
- Switchyard Bus Cooling Water
- High Pressure Fire Protection leaks and Flushes & Other Potable Water from Hixson Utility District
- ERCW system maintenance draindowns
- Demin Water (ultrapure)
- Electrical Sumps
- Miscellaneous Storm water Runoff
- East Valve Vault Room Drains
- Raw Water and Secondary System Leaks
- Make-Up Water System Leaks
- Raw Cooling and Raw Service Water draindowns and leaks
- Pressure Washing & Vehicle Rinsing

\* Multiply value by 10<sup>6</sup> for GPD  
 \*\*\* Represents intermittent flow  
 (P) Represents precipitation  
 (E) Represents evaporation  
 (SV) Represents Storm Water  
 A - denotes alternate flow path to be used by authority of plant management  
 \*\* Flow is 200 gal/yr  
 \*\* Flow is 0 gal/yr

**TVA SEQUOYAH NUCLEAR PLANT**  
 NPDES FLOW SCHEMATIC  
 NPDES Permit No. TN0026450  
 11/05/10

TVA Sequoyah Nuclear Plant Water Treatment Plant  
 Water Balance Diagram #2 of 2  
 Plant ID # 03578

