



NPDES PERMIT MODIFICATION

issued to

King Industries, Inc.
Science Road
Norwalk, CT 06852

Location Address:

Science Road
Norwalk, CT 06852

Attention: Dennis Rayburn

Facility ID: 103-070

Permit ID: CT0000841

Receiving Stream: Norwalk River

Permit Expires: May 5, 2015

This permit modification is issued in accordance with section 22a-430 of Chapter 446k, Connecticut General Statutes ("CGS"), section 22a-430-4(p)(5) of the Regulations of Connecticut State Agencies ("RCSA") adopted thereunder, as amended, and Section 402(b) of the Clean Water Act, as amended 33 USC 1251, et. seq., and pursuant to an approval dated September 26, 1973, by the Administrator of the United States Environmental Protection Agency for the State of Connecticut to administer a N.P.D.E.S. permit program.

The Commissioner of Energy and Environmental Protection ("the Commissioner") has made a final determination on this permit modification and found that the continuance of the existing system to treat the discharge will protect the waters of the state from pollution. The Commissioner's decision is based on Application No. 201403609 for permit modification received on April 17, 2014 and the administrative record established in the processing of that application.

King Industries, Inc., ("Permittee"), shall comply with all other conditions of Permit No. CT0000841 issued on May 6, 2010 and modified on February 16, 2012 with the following modifications:

- 1) Section 5, Table A of the modified permit is hereby replaced and superseded with Table A attached hereto. Specifically the following change was made:
 - a) The "Temperature, Continuous" was changed from 83⁰F to 95⁰F.
- 2) The compliance schedule in Section 10 of the modified permit issued on February 16, 2012 is hereby replaced and superseded with section 10 attached hereto.

The Commissioner hereby authorizes the Permittee to discharge in accordance with the provisions of this permit modification, Permit No. CT0000841, the above referenced correspondence, and all approvals issued by the Commissioner or the Commissioner's authorized agent for the discharges and/or activities authorized by, or associated with, this permit.

The Commissioner reserves the right to make appropriate revisions to the permit in order to establish any appropriate effluent limitations, schedules of compliance, or other provisions that may be authorized under the Clean Water Act or the Connecticut General Statutes or regulations adopted thereunder, as amended. The permit as modified under this paragraph may also contain any other requirements of the Clean Water Act or Connecticut General Statutes or regulations adopted thereunder which are then applicable.

All other terms and conditions of Permit No. CT0000841 issued on May 6, 2010 and modified on February 16, 2012 shall continue in full force and effect.

This modification is hereby issued on

Macky McCleary
Deputy Commissioner

DRAFT

Table A

Discharge Serial Number: DSN 001 - D						Monitoring Location: 1			
Wastewater Description: Cooling tower blowdown, steam condensate from boiler operations, fire response testing and maintenance wastewaters									
Monitoring Location Description: Sedimentation basin outlet (Dry weather discharge sampling)									
Allocated Zone of Influence (ZOI): 104,166 gph						In-stream Waste Concentration (IWC): 1.0%			
PARAMETER	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level Test ³
		Average Monthly Limit	Maximum Daily Limit	Sample//Reporting Frequency ²	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample//Reporting Frequency ²	Sample Type or measurement to be reported	
Aluminum, Total	mg/l	NA	----	Quarterly	Daily Composite	NA	NR	NA	*
Aquatic Toxicity, Daphnia Pulex ⁵ LC 50	%	NA	LC 50> 20%	Semi-Annual ⁴	Daily Composite	LC 50> 6.7	NR	NA	
Aquatic Toxicity, Pimephales promelas ⁵ LC 50	%	NA	LC 50> 20%	Semi-Annual ⁴	Daily Composite	LC 50> 6.7	NR	NA	
Biological Oxygen Demand,5-day (BOD ₅)	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Chemical Oxygen Demand (COD)	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Chlorine, Total Residual	mg/l	NA	NA	NR	NA	0.05	Quarterly ⁴	Grab	*
Chronic Toxicity (See Section 6(c) below)	%	NA	----	Annual	Daily Composite	NA	NR	NA	
Copper, Total	mg/l	0.116	0.146	Quarterly ⁴	Daily Composite	0.219	NR	NA	*
Fecal coliform	#/100ml	NA	NA	NR	NA	----	Quarterly ⁴	Grab	
Flow, Average Daily ¹ (Dry Weather)	Gpd	25,000	NA	Continuous// Quarterly	Daily Flow	NA	NR	NA	
Flow, Maximum Daily ¹ (Dry Weather)	Gpd	NA	47,000	Continuous// Quarterly	Daily Flow	NA	NR	NA	
Flow, Day of Sampling (Dry Weather)	Gpd	NA	47,000	Quarterly	Daily Flow	NA	NR	NA	
Iron, Total	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Lead, Total	mg/l	0.090	0.206	Quarterly ⁴	Daily Composite	0.309	NR	NA	*
MBAS	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Nitrogen, Ammonia (Total as N)	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Oil petroleum, total recoverable	mg/l	----	----	Quarterly ⁴	Grab Sample Average	NA	NR	NA	
pH, Continuous	S.U.	NA	NA	NR	NA	6.0 – 9.0	Continuous// Quarterly	RDM	
pH, Day of Sampling	S.U.	NA	NA	NR	NA	6.0 – 9.0	Quarterly	RDS	
Phosphorous, Total	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Temperature, Continuous	°F	NA	NA	NR	NA	95.0	Continuous// Quarterly	Grab	
Total Dissolved Solids	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Total Organic Carbon	mg/l	NA	----	Quarterly ⁴	Daily Composite	NA	NR	NA	
Total Suspended Solids	mg/l	NA	30.0	Quarterly ⁴	Daily Composite	45.0	NR	NA	
Zinc, Total	mg/l	----	----	Quarterly ⁴	Daily Composite	NA	NR	NA	

Table Foot notes and Remarks

Footnotes:

¹ For this parameter, the Permittee shall maintain at the facility a record of the total flow for each day of dry weather and wet weather discharge and shall report the Average Daily Flow and the Maximum Daily Flow for dry and wet weather discharges for each sampling month.

² The first entry in this column is the 'Sample Frequency'. If a 'Reporting Frequency' does not follow this entry and the 'Sample Frequency' is more frequent than monthly then the 'Reporting Frequency' is monthly. If the 'Sample frequency' is specified as monthly, or less frequent, then the 'Reporting Frequency' is the same as the 'Sample Frequency'.

³ Minimum Level Test refers to Section 6, Paragraph (A)(3) of Permit No. CT0000841 issued on May 6, 2010.

⁴ Dry weather discharge sampling shall be taken after two days (48 hours) of antecedent dry weather and not within 48 hours of a tank farm pump out to assure a negligible presence of stormwater within the basin. Aquatic toxicity testing as specified in Table A above shall be performed during dry weather discharge only. Sampling shall be conducted according to the requirements above unless climatic conditions preclude, in which case the sample shall be taken at a time as closely approximating to the conditions as possible.

⁵ The results of the toxicity test shall be reported on the DMR as the % effluent associated with 50% mortality. Aquatic toxicity testing specified in Table A above shall be performed during dry weather sampling only.

Remarks:

- a. Refer to Section 6(C) of Permit No. CT0000841 issued on May 6, 2010 for chronic toxicity requirements.

SECTION 10: COMPLIANCE SCHEDULE

- (A) In July or August of 2014, the Permittee shall conduct a field verification study of the thermal discharge impact to the Norwalk River and submit the report describing the results of this study for the Commissioner's review and written approval. The study shall include but not be limited to thermal plume mapping reflecting the current outfall release cross-sectional area. The thermal plume mapping shall include, at a minimum:
- (1) a map of the nearfield area, circumscribed by a radial distance extending outward from the location of the discharge (DSN001-1) into the receiving water body, at a scale of no greater than 100 feet per inch. Such map shall also delineate the location of any watercourses, discharges, designated tidal wetlands, and structural features such as bridges and culverts. The cross sectional bathymetry of the Norwalk River shall be plotted;
 - (2) thermal isotherms delineating the areal extent of the plume equivalent to a delta T of 1.5°F and a maximum temperature of 83°F. Isotherms shall be labeled for both maximum temperature and maximum temperature increase beginning at the outfall and at delta 1.5 °F intervals. Isotherms should be labeled from point of discharge until the thermal component of that plume has been reduced to ambient temperatures. Nearfield temperature increases should be well documented to determine the localized effect of high temperature discharges; and
 - (3) measurements shall be taken during July or August on a normal operating day at high tide, low tide, and at two mid tides (ebb tide and flood tide).
- (B) The Permittee shall use best efforts to submit to the Commissioner all documents required by Section 10 of this permit modification in a complete and approvable form. If the Commissioner notifies the Permittee that any document or other action is deficient, and does not approve it with conditions or modifications, it is deemed disapproved, and the Permittee shall correct the deficiencies and resubmit it within the time specified by the Commissioner or, if no time is specified by the Commissioner, within thirty days of the Commissioner's notice of deficiencies. In approving any document or other action under this Compliance Schedule, the Commissioner may approve the document or other action as submitted or performed or with such conditions or modifications as the Commissioner deems necessary to carry out the purposes of this section of the permit modification. Nothing in this paragraph shall excuse noncompliance or delay.
- (C) Dates. The date of submission to the Commissioner of any document required by this section of the permit modification shall be the date such document is received by the Commissioner. The date of any notice by the Commissioner under this section of the permit, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the Commissioner, whichever is earlier. Except as otherwise specified in this permit, the word "day" as used in this section of the permit means calendar day. Any document or action which is required by this section only of the permit modification, to be submitted, or performed, by a date which falls on, Saturday, Sunday, or a Connecticut or federal holiday, shall be submitted or performed on or before the next day which is not a Saturday, Sunday, or Connecticut or federal holiday.
- (D) Notification of noncompliance. Except as otherwise provided in this permit modification, in the event that the Permittee becomes aware that it did not or may not comply, or did not or may not comply on time, with any requirement of this section of the permit modification or of any document required hereunder, the Permittee shall immediately notify the Commissioner and shall take all reasonable steps to ensure that any noncompliance or delay is avoided or, if unavoidable, is minimized to the greatest extent possible. In so notifying the Commissioner, the Permittee shall state in writing the reasons for the noncompliance or delay and propose, for the review and written approval of the Commissioner, dates by which compliance will be achieved, and the Permittee shall comply with any dates that may be approved in writing by the Commissioner. Notification by the Permittee shall not excuse noncompliance or delay, and the Commissioner's approval of any compliance dates proposed shall not excuse noncompliance or delay unless specifically so stated by the Commissioner in writing.
- (E) Notice to Commissioner of changes. Within fifteen days of the date the Permittee becomes aware of a change in any information submitted to the Commissioner under this section of the permit modification, or that any such information was inaccurate or misleading or that any relevant information was omitted, the Permittee shall submit the correct or omitted information to the Commissioner.

- (F) Submission of documents. Any document, other than a discharge monitoring report, required to be submitted to the Commissioner under this section of the permit modification shall, unless otherwise specified in writing by the Commissioner, be directed to:

Oluwatoyin Fakilede
Department of Environmental Protection
Bureau of Materials Management and Compliance Assurance
Water Permitting and Enforcement Division
79 Elm Street
Hartford, CT06106-5127

DRAFT

WASTEWATER DISCHARGE PERMIT: DATA TRACKING AND TECHNICAL FACT SHEET

Permittee: King Industries, Inc.

PERMIT, ADDRESS, AND FACILITY DATA

PERMIT #: CT0000841

APPLICATION #: 201403609

FACILITY ID. 103-070

<u>Mailing Address:</u>						<u>Location Address:</u>					
Street:	Science Road					Street:	Science Road				
City:	Norwalk	ST:	CT	Zip:	06852	City:	Norwalk	ST:	CT	Zip:	06852
Contact Name:	Dennis Rayburn					DMR Contact:	Dennis Rayburn				
Phone No.:	(203) 866-5551					Phone No.:	(203) 866-5551				

PERMIT INFORMATION

DURATION 5 YEAR X 10 YEAR ___ 30 YEAR _____

TYPE New ___ Reissuance ___ Modification X___

CATEGORIZATION POINT (X) NON-POINT () GIS # ___

NPDES (X) PRETREAT () GROUND WATER (UIC) () GROUND WATER (OTHER) ()

NPDES MAJOR (MA) _____

NPDES SIGNIFICANT MINOR or PRETREAT SIU (SI) _____

NPDES or PRETREATMENT MINOR (MI) X_____

PRETREAT SIGNIFICANT INDUS USER (SIU) _____

PRETREAT CATEGORICAL (CIU) _____

POLLUTION PREVENTION MANDATE ___ ENVIRONMENTAL EQUITY ISSUE _____

SIC CODE: 2869

COMPLIANCE ISSUES

COMPLIANCE SCHEDULE YES X NO ___

POLLUTION PREVENTION___ **TREATMENT REQUIREMENT**___ **WATER CONSERVATION**

WATER QUALITY REQUIREMENT X **REMEDIATION** ___ **OTHER** _____

RECENT ENFORCEMENT HISTORY

IS THE PERMITTEE SUBJECT TO A PENDING ENFORCEMENT ACTION? YES ___ NO X

OWNERSHIP CODE

Private X Federal ___ State ___ Municipal (town only) ___ Other public ___

DEEP STAFF ENGINEER: Oluwatoyin Fakiled

PERMIT FEES

<i>Discharge Code</i>	<i>DSN</i>	<i>Annual Fee</i>
102000b	001-1	\$656.25
1080000	001-1	\$2,912.50

A permit modification fee of \$940.00 was charged.

The fees assigned to DSN 001-1 for cooling water and storm water discharges are consistent with section 22a-430-7, Schedule B (II.) of RCSA.

FOR NPDES DISCHARGES

Drainage basin Code: 7300

Present/Future Water Quality Standard: SC/SB

NATURE OF BUSINESS GENERATING DISCHARGE

King Industries, Inc. manufactures organic chemicals such as corrosion inhibitors, coating catalysts, coating additives, and plasticizers.

PROCESS AND TREATMENT DESCRIPTION (by DSN)

DSN 001-1: This discharge is comprised of 47,000 gallons per day of residual storm water that has accumulated in the basin from tank farm pump out, cooling tower blowdown, steam condensate from boilers, fire response system test wastewater and maintenance wastewaters during dry weather (Table A). Treatment consists of pH adjustment (as necessary), oil-water separation, and gravity settling within a 28,000-gallon in-ground sedimentation basin. During wet weather (Table B), the composition of water within the basin is expected to be mostly storm water from the facility's loading/unloading dock, paved parking and materials transfer areas, and tank farm containment areas.

RESOURCES USED TO DRAFT PERMIT

- Federal Effluent Limitation Guideline
- Performance Standards
- Federal Development Document
- Treatability Manual
- Department File Information
- Connecticut Water Quality Standards
- Anti-degradation Policy
- Coastal Management Consistency Review Form
- Other - Explain

BASIS FOR LIMITATIONS, STANDARDS OR CONDITIONS

- Case-by-Case determination using Best Professional Judgment (See Other Comments)

Ammonia-N, BOD (5-day), Iron, MBAS, Oil petroleum, total recoverable, Phosphorous, TOC, Toxic Pollutants, COD, TSS, TDS

X *In order to meet in-stream water quality (See General Comments and Other Comments) Copper, Lead, pH, Aquatic Toxicity, Temperature, Total Residual Chlorine, Zinc*

GENERAL COMMENTS

The need for inclusion of water quality based discharge limitations in this permit was evaluated consistent with Connecticut Water Quality Standards and criteria, pursuant to 40 CFR 122.44(d). Each parameter was evaluated for consistency with the available aquatic life criteria (acute and chronic) and human health (fish consumption only) criteria, considering the zone of influence allocated to the facility where appropriate. The statistical procedures outlined in the EPA Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001) were employed to calculate the need for such limits. The most restrictive of the water quality limitations, aquatic life acute, aquatic life chronic, and human health were chosen and included in the permit for copper, lead, and total residual chlorine. Monitoring only is proposed for zinc. Comparison of monitoring data and its inherent variability with these calculated water quality based limits indicates a low statistical probability of exceeding such limits.

OTHER COMMENTS (PERTAIN TO PERMIT MODIFICATION OF FEBRUARY 16, 2012)

The Permittee submitted Application No. 201103338 requesting to reduce the temperature of discharge DSN001-1 rather than conduct a thermal verification study as specified under Section 10 of NPDES Permit No. CT0000841 issued on May 6, 2010. After a review of this proposal, the Department has decided that if the Permittee can meet a maximum instantaneous temperature limitation of 83°F at the discharge outfall, then a thermal verification study would not be necessary and the discharge will be consistent with the Water Quality Standards. The Permittee originally agreed with this temperature limitation. Therefore, the thermal verification requirement was removed from the permit and a temperature limit of 83°F was added.

The tentative determination for this permit modification was originally published in the Norwalk Hour on September 24, 2011. On October 12, 2011, the Permittee submitted written comments on the draft permit modification requesting a twelve month schedule to allow the Permittee to implement changes in order to comply with the maximum instantaneous temperature limitation of 83°F. The Permittee had previously provided additional thermal data collected after permit issuance. DEEP staff reviewed this thermal data and conducted an assessment using a thermal zone of influence of a depth of 3 feet and radial distance of 120 feet extending outward from the location of the discharge into the receiving water body and actual highest recorded temperature of Norwalk River from data between May 2010 to September 2010 in a report titled "Water Quality Data Report For The Norwalk River Watershed" (See Attachment A). The Department has decided to re-notice the permit modification, include an interim maximum instantaneous temperature limitation of 95°F and allow the temperature limit of 83°F to become effective 365 days after issuance of this permit modification. The attached temperature calculations support the issuance of the permit modification interim temperature limit of 95°F.

The permit modification also included a revised Section 7. The revised section reflects the Department's new requirement for Permittees to submit data using NETDMR, a web-based tool that allows Permittees to electronically submit discharge monitoring reports (DMRs) and other required reports through a secure internet connection.

The fecal coliform sample type was inadvertently included as daily composite in Table A of NPDES Permit No. CT0000841 issued on May 6, 2010. The sample type has been changed to grab sample to be consistent with approved testing protocols.

During the 2010 chronic toxicity testing, the Permittee discovered that the salinities of the Norwalk River samples taken were 26 ppt, 21 ppt and 19 ppt, which are much higher than the salinities of typical freshwaters. Therefore, the laboratory conducting the analyses requested authorization to use lab water as the dilution water and run a screening test on the river. To prevent future occurrences, the test organisms were changed from freshwater species, Cerio daphnia and Fathead Minnow to salt water species, Mysidopsis bahia and Menidia beryllina respectively.

OTHER COMMENTS (PERTAIN TO THIS PERMIT MODIFICATION)

Section 10 of NPDES Permit No. CT0000841 (“the permit”) issued on May 6, 2010 required the Permittee to perform a thermal verification study. The Permittee raised concerns about the costs to conduct this study and asked the Department of Energy and Environmental Protection (DEEP) for an alternative to doing this detailed evaluation. The Permittee submitted Application No. 201103338 requesting to reduce the temperature of discharge DSN001-1 rather than conduct a thermal verification study as specified under Section 10 of the permit. After a review of the permit modification application, the permit was modified to include an interim temperature limit of 95 °F and a final temperature limit of 83 °F. Section 10 of the February 2012 modified permit included a compliance schedule that required the Permittee to submit a comprehensive and thorough report which describes and evaluates alternative actions which may be taken by the Permittee to achieve compliance with the temperature limitation of 83°F.

The report entitled, “Basin Discharge Cooling Study” dated August 3, 2012 and addendum dated June 25, 2013 were submitted by the Permittee. In the report, the Permittee had proposed to increase condensate recovery and install a spray cooling system at the lower basin of the discharge system.

At the time the permit was being modified in 2012, the Permittee had provided additional thermal data collected after permit issuance. DEEP staff had reviewed this additional thermal data and conducted an assessment using a thermal zone of influence of a depth of 3 feet and radial distance of 120 feet extending outward from the location of the discharge into the receiving water body and actual highest recorded temperature of Norwalk River from data between May 2010 to September 2010 in a report titled “Water Quality Data Report For The Norwalk River Watershed”. The Department then concluded that the thermal effects of the discharge are consistent with the water quality standards as long as the Permittee meets a maximum instantaneous temperature of 95°F (see Attachment A).

On April 17, 2014, King Industries, Inc. submitted another permit modification application. In the permit modification application, the Permittee solicited to have its permit modified to include the initial thermal verification study requirement and a temperature limit of 110°F, as were the requirements in the permit issued on May 6, 2010. The Permittee claims to have implemented certain changes at the facility such as increasing condensate recovery and installation of a spray cooling system at the lower basin of the discharge system. Despite these changes, the Permittee claims to have been unable to consistently achieve the 83°F limit in its permit. The Permittee resorted to discharging to the sanitary sewer under a “Non Contact Cooling Water and Heat Pump Wastewater General Permit”, in order to avoid violating its NPDES permit. The Permittee claims that the discharge to sanitary sewer is done using hoses which requires careful supervision and management because of safety issues.

Since the Permittee has now agreed to perform a thermal verification study, this permit modification includes a temperature limit of 95°F and a requirement to perform a thermal verification study in July or August of 2014. The justification for this modification is as follows:

- 1) Although 95°F is less stringent than 83°F, which was in the permit modification of February 16, 2012, the proposed change does not contravene the anti-backsliding rule of Section 22a-430-4(1)(4)9A)(xxiii) of the Regulations of Connecticut State Agencies. This is because the circumstance on which the previous permit was based has changed, since the Permittee is now willing to perform the thermal verification study immediately.
- 2) The Permittee claims to have modified the facility and installed certain treatment systems required to assist in meeting the temperature limitation but has nevertheless been unable to achieve the previous temperature limit under certain summer conditions.
- 3) Based on mathematical calculations, the Department believes that 95°F will be protective of the waters of the state. However, the Department needs physical data to verify/confirm the mathematical calculations. The thermal verification study will provide the needed data.
- 4) Since the current permit will expire on May 5, 2015, this study will provide information that will assist in the next renewal of the permit.

ATTACHMENT A: THERMAL CALCULATIONS FOR KING INDUSTRIES

Section 4(c) of Permit No. CT0000841 requires that:

- 1) The temperature of the discharge shall not increase the temperature of the receiving stream above 83°F.
- 2) The temperature of the discharge shall not raise the temperature of the receiving stream by more than 4 °F.
- 3) During the period including July, August, and September, the temperature of the discharge shall not raise the temperature of the receiving water by more than 1.5 °F unless it can be shown that spawning and growth indigenous organisms will not be significantly affected.

Based on actual Norwalk River monitoring data, maximum temperature of receiving stream (May 2010 – September 2010) = 25°C on July 7, 2010 = 77°F (See Appendix B)

Based on USGS data, the drainage area of the receiving stream (Norwalk River at Science Road in Norwalk) = 61 mi² (USGS data, See Appendix A)

Closest gage station to the discharge location is Gage no. 01209700 (Norwalk River at Wilton)

7Q10 for Norwalk River at gage station 01209700 is 1.6 cfs (See Appendix C)

Drainage area = 30 mi² (USGS data, See Appendix C)

$$ZOI \text{ at } 01209700 = \frac{1.6 \times 61}{30} = 3.253 \text{ cfs}$$

7Q10 of the receiving stream = 3.253 cfs

Connecticut surface water quality standards allow a maximum of 25% of the 7Q10 as the thermal zone of influence (ZOI). (Surface water quality standards, item 10)

Therefore, ZOI = 25% of 3.253 cfs = 0.813 cfs.

Discharge at King Industries = 47,000 gpd

Maximum discharge (Table A of the permit) = 47,000 gpd / 646,316.883 (1 cfs = 646,316.883 gpd)
= 0.0727 cfs

Mixing equation

$$QT = Q_1T_1 + Q_2T_2$$

Where Q is the new river flow rate, (Q= Q₁+Q₂)

T is the new river temperature,

Q₁ is the effluent flowrate,

T₁ is the effluent temperature,

Q₂ is the 25% of the river 7Q10 and

T₂ is the background river temperature

1st thermal requirement in the permit

- The temperature of the discharge shall not increase the temperature of the receiving stream above 83°F.

$$\text{Effluent temperature } T_1 = \frac{QT - Q_2T_2}{Q_1}$$

$$\begin{aligned}\text{Effluent temperature } T_1 &= \frac{(.8857)(83) - (.813)(77)}{.0727} \\ &= \frac{73.513 - 62.601}{.0727} \\ &= 150.09^\circ\text{F} \approx 150^\circ\text{F}\end{aligned}$$

2nd thermal requirement in the permit

- The temperature of the discharge shall not raise the temperature of the receiving stream by more than 4 °F.

$$\text{Effluent temperature } T_1 = \frac{QT - Q_2T_2}{Q_1}$$

$$\begin{aligned}\text{Effluent temperature } T_1 &= \frac{(.8857)(81) - (.813)(77)}{.0727} \\ &= \frac{71.742 - 62.601}{.0727} \\ &= 125.73^\circ\text{F} \approx 125^\circ\text{F}\end{aligned}$$

3rd thermal requirement in the permit

- During the period including July, August, and September, the temperature of the discharge shall not raise the temperature of the receiving water by more than 1.5 °F.

$$\text{Effluent temperature } T_1 = \frac{QT - Q_2T_2}{Q_1}$$

$$\begin{aligned}\text{Effluent temperature } T_1 &= \frac{(.8857)(78.5) - (.813)(77)}{.0727} \\ &= \frac{69.528 - 62.601}{.0727} \\ &= 95.28^\circ\text{F} \approx 95^\circ\text{F}\end{aligned}$$

If the most stringent of the three temperatures is incorporated, the discharge temperature will be protective of the waters of the State.

Therefore, a permit limit of 95°F is recommended.

Translate the ZOI to dimension

Convert the ZOI from cfs to cubic feet per day

$$0.813 \text{ cfs} \times 60 \times 60 \times 24 = 70243$$

$$\text{Volume } V = \pi r^2 h$$

Assume that the thermal discharge impacts the receiving stream to a depth of 3 feet.

Volume of the receiving stream = $\frac{1}{2}$ volume of a cylinder

$$\text{Volume } V = \frac{1}{2} \pi r^2 h$$

$$70243 = \frac{1}{2} \pi r^2 \times 3$$

$$r^2 = \frac{70243}{\frac{1}{2} \pi}$$

$$r^2 = 14900$$

$$r = 122 \text{ feet} \approx 120 \text{ feet}$$

Dimension of allowed ZOI is 120 feet radially and 3 feet deep.



Streamstats Ungaged Site Report

Appendix A

Date: Mon Apr 4 2011 14:29:23 Mountain Daylight Time
 Site Location: Connecticut
 NAD27 Latitude: 41.1093 (41 06 33)
 NAD27 Longitude: -73.4119 (-73 24 43)
 NAD83 Latitude: 41.1094 (41 06 34)
 NAD83 Longitude: -73.4114 (-73 24 41)
 Drainage Area: 61 mi²

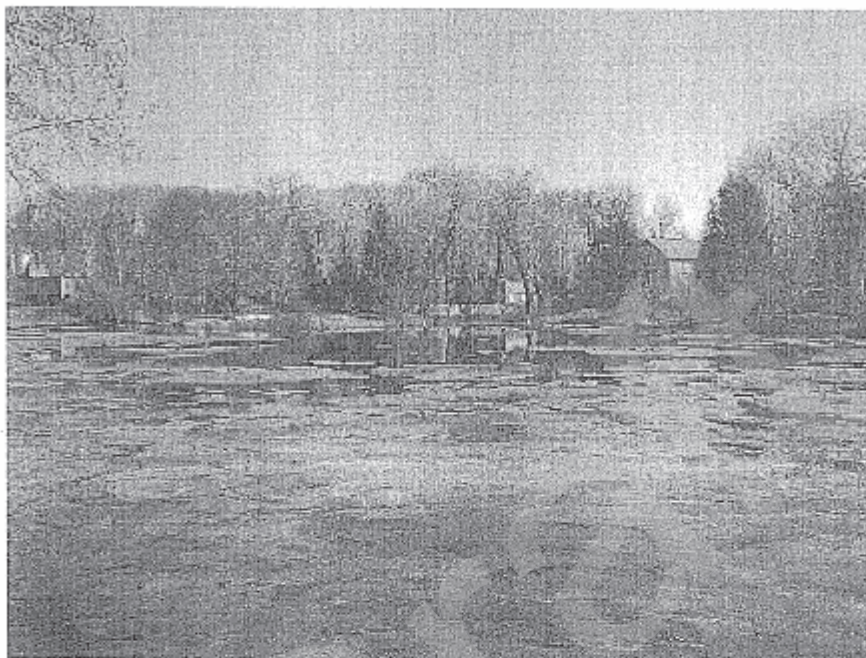
Peak Flows Region Grid Basin Characteristics			
100% Statewide Multiparameter (61 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	61	1.69	715
24 Hour 2 Year Precipitation (inches)	3.7	2.95	3.82
24 Hour 10 Year Precipitation (inches)	5.2	4.15	5.53
24 Hour 25 Year Precipitation (inches)	6.4	4.93	7
24 Hour 50 Year Precipitation (inches)	7.5	5.62	8.36
24 Hour 100 Year Precipitation (inches)	8.7	6.41	9.99
Mean Basin Elevation (feet)	421.09	169	1310

SALMONID SPAWNING Basin Characteristics			
100% Duration Flow 2010 5052 (61 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	61	0.92	150
Mean November Precipitation (inches)	4.5	3.48	4.93
Percent Coarse Stratified Drift (percent)	9.5	0.1	55.1
Mean Annual Winter Precipitation (inches)	3.8	3.19	4.4
Percent Wetlands (percent)	0.8	0.3	18.1
Mean Basin Elevation (feet)	420.83	168	1287

OVERWINTER Basin Characteristics			
100% Duration Flow 2010 5052 (61 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	61	0.92	150
Mean November Precipitation (inches)	4.5	3.48	4.93
Percent Coarse Stratified Drift (percent)	9.5	0.1	55.1
Mean Annual Winter Precipitation (inches)	3.8	3.19	4.4
Percent Wetlands (percent)	0.8	0.3	18.1
Mean Basin Elevation (feet)	420.83	168	1287

HABITAT FORMING Basin Characteristics			
100% Duration Flow 2010 5052 (61 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	61	0.92	150
Mean November Precipitation (inches)	4.5	3.48	4.93

**Water Quality Data Report
For
The Norwalk River Watershed
May 2010 through September 2010**



Excessive nutrients cause unwanted algal growth on impoundments such as Factory Pond

Submitted by:

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Long Island Sound Futures Fund, Connecticut Light and Power, The Norwalk Mayor's Water Quality Committee, The Wilton Inland Wetlands Commission, King Industries, Norwalk River Watershed Association, Inc., NRG-Manresa, Town of Ridgefield, Norm Bloom, Leslie Miklovich, and Trout Unlimited

Appendix B

Table B1 Sampling site, date, time, air & water temperature, dissolved oxygen, conductivity, fecal coliform bacteria, *E. coli* bacteria, rainfall, days prior to sampling, and QA/QC activity for monitoring events in the Norwalk River Watershed May 2010 through September 2010 (plus one sampling date in October)

Site	Date	Time	Air Temp. °C	Water Temp. °C	D.O. mg/L	COND. umho/cm	Fecal Coliform. CFU/100 mL	<i>E. coli</i> CFU/100 mL	Amount of rain (in)	Days prior to sampling	QA/QC	Fecal Coliform. CFU/100 mL
NR 23	5/8/2010	1042	24.0	14.2	9.5	745	24	24	0.98	3	Duplicate	34
NR 22	5/8/2010	1055	25.0	15.3	10.6	600	0	1	0.98	3	Field Blank	0
NR 21	5/8/2010	1101	28.0	16.2	5.2	529	120	120	0.98	3	Replicate	128
NR 20	5/8/2010	1108	27.0	16.1	7.7	573	240	240	0.98	3		
NR 15	5/8/2010	1118	25.0	17.5	9.3	486	80	80	0.98	3		
NR 13	5/8/2010	1130	26.0	17.7	9.0	347	60	60	0.98	3		
NR 9.5	5/8/2010	1145	22.0	18.0	9.2	390	30	30	0.98	3		
NR 9	5/8/2010	1129	22.0	16.7	9.3	359	66	66	0.98	3		
NR 6	5/8/2010	1114	21.0	16.3	9.7	336	160	140	0.98	3	Field Blank	0
NR 4	5/8/2010	1055	21.0	6.4	9.7	353	110	110	0.98	3		
SM 3	5/8/2010	1040	21.0	16.8	9.2	235	60	60	0.98	3	Replicate	80
NR 1	5/8/2010	1028	22.0	17.0 *	9.5	326	80	80	0.98	3	Duplicate	80
NR 23	5/12/2010	1052	8.0	8.9	11.2	385	1740	1380	0.38	0		
NR 22	5/12/2010	1102	9.0	13.2	10.7	779	1	1	0.38	0		
NR 21	5/12/2010	1110	7.0	8.6	8.5	581	1500	1160	0.38	0	Duplicate	1116
NR 20	5/12/2010	1124	7.0	9.7	9.2	618	420	360	0.38	0	Replicate	468
NR 15	5/12/2010	1134	8.0	10.6	10.7	607	360	340	0.38	0	Field Blank	0
NR 13	5/12/2010	1029	8.0	10.8	10.5	379	160	120	0.38	0		
NR 9.5	5/12/2010	1207	11.0	11.5	10.6	367	140	60	0.38	0		
NR 9	5/12/2010	1146	11.0	10.7	10.1	331	160	140	0.38	0	Field Blank	0
NR 6	5/12/2010	1130	11.0	10.6	10.6	322	700	680	0.38	0		
NR 4	5/12/2010	1113	10.0	10.7	9.2	345	620	460	0.38	0	Replicate	640
SM 3	5/12/2010	1055	12.0	11.0	10.3	266	440	340	0.38	0	Duplicate	520
NR 1	5/12/2010	1036	12.0	11.3 *	10.4	339	860	600	0.38	0		
NR 23	5/20/2010	1040	24.0	13.7	10.3	886	100	100	0.95	2		
NR 22	5/20/2010	1050	24.0	15.4	10.3	749	1	1	0.95	2	Field Blank	0
NR 21	5/20/2010	1100	24.0	15.5	7.0	648	260	212	0.95	2		
NR 20	5/20/2010	1115	23.5	16.2	8.7	608	216	188	0.95	2		
NR 15	5/20/2010	1125	24.5	15.1	9.6	545	148	148	0.95	2	Duplicate	108
NR 13	5/20/2010	1140	26.0	15.5	9.7	449	124	108	0.95	2	Replicate	152
NR 9.5	5/20/2010	1137	23.0	15.0	9.4	385	150	148	0.95	2	Duplicate	180
NR 9	5/20/2010	1120	23.0	14.4	9.7	344	154	154	0.95	2	Replicate	180
NR 6	5/20/2010	1105	22.0	14.5	10.2	340	228	228	0.95	2		
NR 4	5/20/2010	1055	26.0	15.2	10.7	353	600	600	0.95	2	Field Blank	0
SM 3	5/20/2010	1037	21.0	13.8	9.7	240	172	168	0.95	2		
NR 1	5/20/2010	1021	22.0	15.0 *	9.8	352	204	152	0.95	2		
NR 23	5/27/2010	1054	28.0	18.2	9.0	1070	96	96	0.08	3		
NR 22	5/27/2010	1104	28.0	18.4	9.6	822	0	1	0.08	3	Field Blank	0
NR 21	5/27/2010	1130	29.0	21.4	6.3	821	212	136	0.08	3		
NR 20	5/27/2010	1116	28.0	22.2	8.4	775	272	228	0.08	3		
NR 15	5/27/2010	1023	26.0	19.4	8.4	659	140	132	0.08	3	Replicate	124
NR 13	5/27/2010	1149	26.0	20.7	9.0	430	820	400	0.08	3	Duplicate	n/g
NR 9.5	5/27/2010	1005	28.0	19.9	8.3	427	260	260	0.08	3		
NR 9	5/27/2010	1026	28.0	17.9	9.4	372	280	180	0.08	3		
NR 6	5/27/2010	1037	28.5	18.6	9.1	380	240	228	0.08	3	Duplicate	248
NR 4	5/27/2010	1064	29.0	20.3	11.3	402	204	196	0.08	3	Replicate	176
SM 3	5/27/2010	1107	27.5	18.4	9.1	272	152	152	0.08	3	Field Blank	0
NR 1	5/27/2010	1127	32.5	21.8 *	8.9	385	172	144	0.08	3		
NR 23	6/3/2010	1040	29.0	19.5	9.5	1032	132	132	0.38	2		
NR 22	6/3/2010	1059	29.0	19.5	9.8	848	0	1	0.38	2	Field Blank	0
NR 21	6/3/2010	1100	29.0	21.0	6.8	814	204	204	0.38	2		
NR 20	6/3/2010	1108	28.0	22.5	9.4	796	720	720	0.38	2	Duplicate	440
NR 15	6/3/2010	1124	26.0	21.8	8.4	706	184	184	0.38	2	Replicate	172
NR 13	6/3/2010	1137	25.0	21.9	8.8	488	272	272	0.38	2		
NR 9.5	6/3/2010	1110	25.0	22.0	7.2	440	64	64	0.38	2		
NR 9	6/3/2010	1057	25.0	19.3	8.6	388	440	420	0.38	2	Field Blank	0
NR 6	6/3/2010	1045	25.0	19.9	8.4	371	196	144	0.38	2	Duplicate	220
NR 4	6/3/2010	1027	24.0	20.4	9.8	386	292	272	0.38	2	Replicate	284
SM 3	6/3/2010	1011	23.5	20.2	8.2	174	220	156	0.38	2		
NR 1	6/3/2010	955	27.0									

B1.

Table B1 (continued)

Site	Date	Time	Air Temp. ° C	Water Temp. ° C	D.O. mg/L	COND. µmho/cm	Fecal Coliform. CFU/100 mL	E. coli CFU/100 mL	Amount of rain (in)	Days prior to sampling	QA/QC	Fecal Coliform. CFU/100 mL
NR 23	6/10/2010	1004	18.5	15.0	9.7	625	550	550	0.53	1	Duplicate	420
NR 22	6/10/2010	1014	19.0	17.4	9.5	829	0	0	0.53	1		
NR 21	6/10/2010	1031	20.5	15.0	6.1	608	680	680	0.53	1	Field Blank	0
NR 20	6/10/2010	1020	19.0	15.5	7.7	571	400	400	0.53	1		
NR 15	6/10/2010	952	20.0	16.2	9.4	663	770	770	0.53	1	Replicate	700
NR 13	6/10/2010	1043	19.0	16.1	9.1	453	250	250	0.53	1		
NR 9.5	6/10/2010	1118	19.0	17.7	9.0	n/a	20	20	0.53	1		
NR 9	6/10/2010	1104	18.0	16.6	9.4	n/a	2100	2100	0.53	1	Duplicate	1600
NR 6	6/10/2010	1050	20.0	16.7	9.8	n/a	410	350	0.53	1		
NR 4	6/10/2010	1034	22.0	17.2	10.5	n/a	460	380	0.53	1	Field Blank	0
SM 3	6/10/2010	1024	22.0	16.8	9.6	n/a	240	240	0.53	1		
NR 1	6/10/2010	1010	23.0	18.0	10.3	n/a	170	160	0.53	1	Replicate	170
NR 23	6/17/2010	1010		17.5	8.7	1102	100	100	0.01	3		
NR 22	6/17/2010	1020		19.1	9.2	865	0	1	0.01	3	Duplicate	4
NR 21	6/17/2010	1042		19.3	6.3	838	420	400	0.01	3	Field Blank	0
NR 20	6/17/2010	1032		19.9	9.0	845	192	192	0.01	3		
NR 15	6/17/2010	955		18.6	8.2	682	212	188	0.01	3	Replicate	208
NR 13	6/17/2010	1056		19.2	8.2	507	288	256	0.01	3		
NR 9.5	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
NR 9	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
NR 6	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
NR 4	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
SM 3	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
NR 1	6/17/2010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.01	3		
NR 23	6/24/2010	1053	26.0	20.7	8.7	651	3500	2800	0.77	2		
NR 22	6/24/2010	1105	28.0	20.8	9.1	818	200	170	0.77	2	Field Blank	0
NR 21	6/24/2010	1129	29.0	21.3	3.4	512	5900	4100	0.77	2		
NR 20	6/24/2010	1114	27.0	22.2	6.8	522	6400	5900	0.77	2	Duplicate	6100
NR 16	6/24/2010							8	0.77	2		
NR 15	6/24/2010	1039	25.0	21.8	8.4	683	1300	1300	0.77	2		
NR 13	6/24/2010	1146	27.0	22.1	8.3	491	3100	2600	0.77	2		
NR 9.5	6/25/2010	1111	25.0	23.4	7.6	463	260 (pink)	260	0.77	2	Duplicate	360
NR 9	6/25/2010	1057	26.0	21.7	8.5	418	980	920	0.77	2		
NR 6	6/25/2010	1045	25.0	22.1	8.0	398	480	440	0.77	2		
NR 4	6/25/2010	1029	30.0	23.6	7.5	407	680	500	0.77	2		
SM 3.1 P	6/25/2010							4	0.77	2	Field Blank	0
SM 3	6/25/2010	1016	25.5	22.2	7.0	275	188	156	0.77	2		
NR 1	6/25/2010	1000	24.5	23.2	8.3	356	480	380	0.77	2		
NR 23	7/1/2010	1052	21.0	17.1	9.1	1009	76	10	0.37	3		
NR 22	7/1/2010	1106	20.5	19.9	8.8	809	0	n/a	0.37	3	Replicate	0
NR 21	7/1/2010	1115	22.0	19.3	6.7	846	184	140	0.37	3	Field Blank	0
NR 20	7/1/2010	1123	22.5	19.2	10.0	812	52	44	0.37	3		
NR 15	7/1/2010	1134	22.0	17.7	8.5	662	60	60	0.37	3		
NR 13	7/1/2010	1145	22.0	19.8	8.0	516	180	168	0.37	3	Duplicate	NG
NR 9.5	7/1/2010	1100	19.0	19.7	7.6	903	84	84	0.37	3	Duplicate	96
NR 9	7/1/2010	1050	22.0	17.0	9.1	431	240	240	0.37	3		
NR 6	7/1/2010	1040	22.0	17.7	8.7	432	132	120	0.37	3		
NR 4	7/1/2010	1020	24.5	20.0	11.2	439	200	156	0.37	3	Replicate	228
SM 3	7/1/2010	1000	19.5	20.3	7.8	285	132	132	0.37	3	Field Blank	0
NR 1	7/1/2010	1010	23.0	20.6	8.8	427	260	228	0.37	3		
NR 23	7/7/2010	1035	33.0	23.3	7.8	1187	140	130	0.00	7		
NR 22	7/7/2010	1046	34.0	22.4	8.8	820	0	n/a	0.00	7		
NR 21	7/7/2010	1108	33.0	22.9	5.9	915	400	400	0.00	7	Field Blank	0
NR 20	7/7/2010	1057	32.0	24.9	6.3	864	340	340	0.00	7	Duplicate	280
NR 15	7/7/2010	1020	33.0	23.7	7.1	730	210	200	0.00	7		
NR 13	7/7/2010	1138	36.0	24.8	7.2	494	820	740	0.00	7	Replicate	700
NR 9.5	7/7/2010	1100	31.0	24.9	7.1	511	132	124	0.00	7	Replicate	152
NR 9	7/7/2010	1045	32.0	22.2	8.3	400	380	380	0.00	7	Duplicate	436
NR 6	7/7/2010	1035	32.0	24.3	7.6	416	420	400	0.00	7		
NR 4	7/7/2010	1025	35.0	24.9	12.8	446	256	228	0.00	7	Field Blank	0
SM 3	7/7/2010	1010	31.0	24.4	7.1	299	80	80	0.00	7		
NR 1	7/7/2010	955	32.0	25.0	8.4	469	240	240	0.00	7		

B2.

Table B1 (continued)

Site	Date	Time	Air Temp. °C	Water Temp. °C	D.O. mg/L	COND. µmho/cm	Fecal Coliform. CFU/100 mL	E. coli CFU/100 mL	Amount of rain (in)	Days prior to sampling	QA/QC	Fecal Coliform. CFU/100 mL
NR 23	7/15/2010	1028	23.0	21.1	8.3	520	300	300	1.62	1*		
NR 22	7/15/2010	1040	24.0	22.4	8.8	740	0	n/a	1.62	1*	Field Blank	0
NR 21	7/15/2010	1050	26.0	22.0	3.5	675	370	370	1.62	1*		
NR 20	7/15/2010	1058	24.0	22.6	4.6	516	290	290	1.62	1*		
NR 15	7/15/2010	1107	25.5	23.0	8.0	410	308	308	1.62	1*		
NR 13	7/15/2010	1120	25.0	23.2	7.8	405	820	820	1.62	1*	Replicate	1020
NR 9.5	7/15/2010	1110	23.6	23.7	7.4	408	330	330	1.62	1*		
NR 9	7/15/2010	100	23.1	23.2	7.8	407	400	400	1.62	1*		
NR 6	7/15/2010	1045	22.4	23.3	8.0	411	670	670	1.62	1*		
NR 4	7/15/2010	1030	22.5	23.6	5.8	400	14000	14000	1.62	1*	Field Blank	0
SM 3	7/15/2010	1000	25.0	23.8	7.4	241	580	580	1.62	1*	Replicate	550
NR 1	7/15/2010	1015	24.5	23.5	7.9	379	770	770	1.62	1*		
NR 23	7/22/2010	1045	25.0	21.2	8.7	505	900	700	1.16	1		
NR 22	7/22/2010	1055	28.0	22.4	9.1	774	3	3	1.16	1	Field Blank	0
NR 21	7/22/2010	1105	26.0	21.6	3.6	650	450	450	1.16	1		
NR 20	7/22/2010	1115	26.0	22.6	5.8	451	300	300	1.16	1	Duplicate	250
NR 15	7/22/2010	1132	26.0	23.4	8.7	528	210	210	1.16	1	Replicate	180
NR 13	7/22/2010	1145	28.0	23.7	7.6	428	460	390	1.16	1		
NR 9.5	7/22/2010	1100	25.5	23.7	7.2	383	80	70	1.16	1		
NR 9	7/22/2010	1045	25.0	22.5	7.9	322	530	470	1.16	1		
NR 6	7/22/2010	1035	24.0	22.5	7.8	289	1500	800	1.16	1	Field Blank	0
NR 4	7/22/2010	1025	31.0	23.1	9.2	283	3600	2400	1.16	1	Replicate	3800
SM 3	7/22/2010	1010	25.0	22.4	8.3	214	1900	1400	1.16	1	Duplicate	1200
NR 1	7/22/2010	955	25.0	23.1	7.9	250	1700	800	1.16	1		
NR 23	7/28/2010	1038	28.0	20.8	8.4	1022	80	56	0.11	3		
NR 22	7/28/2010	1047	28.0	21.6	8.9	841	0	0	0.11	3	Field Blank	0
NR 21	7/28/2010	1109	32.0	21.6	4.4	862	240	240	0.11	3	Duplicate	360
NR 20	7/28/2010	1056	30.0	22.5	8.2	796	84	80	0.11	3		
NR 15	7/28/2010	1024	26.0	21.0	7.4	632	165	120	0.11	3	Replicate	160
NR 13	7/28/2010	1127	30.0	22.6	7.7	476	380	380	0.11	3		
NR 9.5	7/28/2010	1105	28.0	23.3	7.0	444	56	52	0.11	3	Field Blank	0
NR 9	7/28/2010	1055	27.0	20.5	8.3	376	480	420	0.11	3	Replicate	440
NR 6	7/28/2010	1040	27.0	20.8	8.6	388	164	156	0.11	3	Duplicate	144
NR 4	7/28/2010	1025	30.0	22.7	10.9	425	248	212	0.11	3		
SM 3	7/28/2010	1015	27.0	22.1	7.9	238	108	96	0.11	3		
NR 1	7/28/2010	1005	26.0	23.0	8.5	364	144	120	0.11	3		
NR 23	8/5/2010	1020	28.0	22.6	8.5	1100	264	204	0.02	7	Field Blank	0
NR 22	8/5/2010	1052	31.0	23.0	9.3	928	0	0	0.02	7		
NR 21	8/5/2010	1105	28.0	24.0	5.8	947	360	360	0.02	7	Duplicate	336
NR 20	8/5/2010	1121	30.0	24.7	9.0	906	168	168	0.02	7		
NR 15	8/5/2010	1132	29.0	23.4	11.7	723	64	64	0.02	7		
NR 13	8/5/2010	1145	29.5	23.4	7.7	505	620	620	0.02	7	Replicate	600
NR 9.5	8/5/2010	1100	28.0	23.9	6.6	467	420	420	0.02	7		
NR 9	8/5/2010	1050	27.0	21.2	8.4	355	600	600	0.02	7		
NR 6	8/5/2010	1043	28.0	22.6	7.3	390	260	260	0.02	7	Field Blank	0
NR 4	8/5/2010	1030	28.5	23.6	12.0	430	440	440	0.02	7	Duplicate	660
SM 3	8/5/2010	950	26.0	23.2	8.0	279	116	116	0.02	7	Replicate	88
NR 1	8/5/2010	1010	27.0	23.7	8.2	441	240	240	0.02	7		
NR 23	8/11/2010	1034	27.0	22.2	8.2	1245	420	420	0.00	7		
NR 22	8/11/2010	1043	26.0	23.1	8.8	527	0	1	0.00	7	Field Blank	0
NR 21	8/11/2010	1102	30.0	23.5	6.0	900	248	176	0.00	7		
NR 20	8/11/2010	1051	28.0	23.3	8.2	872	104	104	0.00	7		
NR 15	8/11/2010	1015	27.0	22.5	7.5	680	248	244	0.00	7	Duplicate	216
NR 13	8/11/2010	1117	28.0	23.2	6.7	505	440	400	0.00	7	Duplicate	460
NR 9.5	8/11/2010	1111	24.5	23.1	meter bad	450	232	204	0.00	7	Duplicate	260
NR 9	8/11/2010	1059	24.0	20.0	meter bad	344	1060	880	0.00	7		
NR 6	8/11/2010	1049	25.0	22.4	meter bad	399	232	168	0.00	7		
NR 4	8/11/2010	1032	29.0	23.4	meter bad	233	188	172	0.00	7	Field Blank	0
SM 3	8/11/2010	1022	26.0	23.5	meter bad	292	44	44	0.00	7		
NR 1	8/11/2010	1005	27.0	22.8	meter bad	478	212	200	0.00	7		

B3.

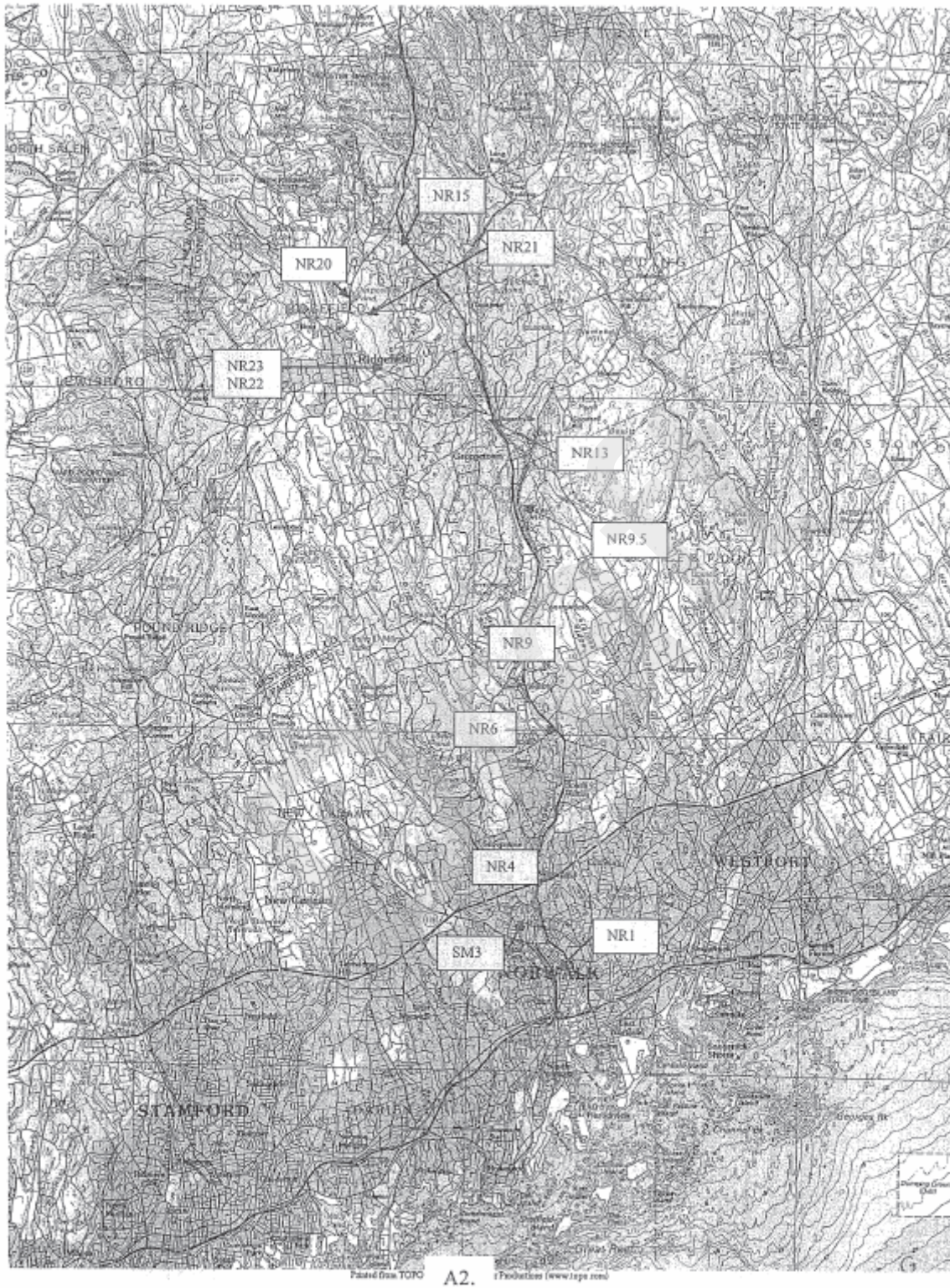
Table B1 (continued)

Site	Date	Time	Air Temp. ° C	Water Temp. ° C	D.O. mg/L	COND. umho/cm	Fecal Coliform. CFU/100 mL	E. coli CFU/100 mL	Amount of rain (in)	Days prior to sampling	QA/QC	Fecal Coliform. CFU/100 mL
NR 23	8/19/2010	1025	28.0	19.5	7.8	1083	188	188	0.47	3	Duplicate	120
NR 22	8/19/2010	1038	28.0	21.8	9.0	838	0	1	0.47	3		
NR 21	8/19/2010	1046	28.0	21.0	6.1	886	320	220	0.47	3	Field Blank	0
NR 20	8/19/2010	1051	28.0	20.7	8.7	814	112	112	0.47	3		
NR 15	8/19/2010	1107	26.5	19.8	7.8	711	96	88	0.47	3		
NR 13	8/19/2010	1120	28.0	20.9	7.8	581	740	600	0.47	3	Replicate	560
NR 9.5	8/19/2010	1220	29.0	21.8	7.5	416	108	104	0.47	3	Replicate	112
NR 9	8/19/2010	1210	29.0	19.7	8.9	357	820	720	0.47	3		
NR 6	8/19/2010	1240	30.0	21.4	8.1	388	300	300	0.47	3		
NR 4	8/19/2010	1145	30.0	22.0	5.4	395	120	88	0.47	3	Duplicate	160
SM 3	8/19/2010	1133	27.0	21.7	7.3	279	440	440	0.47	3	Field Blank	0
NR 1	8/19/2010	1115	27.0	21.2	7.7	551	280	220	0.47	3		
NR 23	8/25/2010	1038	22.0	17.7	8.7	520	660	460	1.91	2*		
NR 22	8/25/2010	1048	22.0	20.5	9.2	778	0	1	1.91	2*		
NR 21	8/25/2010	1057	22.0	18.5	4.4	590	272	272	1.91	2*	Field Blank	0
NR 20	8/25/2010	1111	22.0	18.3	4.0	477	128	104	1.91	2*	Replicate	112
NR 15	8/25/2010	1124	22.0	18.7	8.7	443	228	164	1.91	2*	Duplicate	216
NR 13	8/25/2010	1140	23.0	18.8	8.6	371	380	240	1.91	2*		
NR 9.5	8/25/2010	1106	23.0	17.2	8.7	334	460	260	1.91	2*		
NR 9	8/25/2010	1054	22.0	19.0	8.9	332	600	400	1.91	2*		
NR 6	8/25/2010	1043	22.0	18.9	9.2	323	840	720	1.91	2*	Replicate	980
NR 4	8/25/2010	1029	23.0	19.2	9.6	329	780	560	1.91	2*	Field Blank	0
SM 3	8/25/2010	1013	18.5	19.1	8.7	224	256	236	1.91	2*	Duplicate	280
NR 1	8/25/2010	956	18.0	19.3	5.1	310	540	340	1.91	2*		
NR 23	9/2/2010	1043	30.0	22.1	8.3	1207	216	208	0.02	7		
NR 22	9/2/2010	1056	32.0	22.8	9.2	881	0	1	0.02	7	Field Blank	0
NR 21	9/2/2010	1105	34.0	23.3	6.7	933	380	380	0.02	7	Replicate	360
NR 20	9/2/2010	1115	30.0	23.6	8.5	885	112	80	0.02	7	Duplicate	80
NR 15	9/2/2010	1125	28.0	22.5	7.3	648	252	116	0.02	7		
NR 13	9/2/2010	1139	30.0	22.6	7.8	367	148	136	0.02	7		
NR 9.5	9/2/2010	1139	29.0	23.6	7.1	453	88	60	0.02	7		
NR 9	9/2/2010	1123	27.0	21.0	8.3	389	540	340	0.02	7	Replicate	472
NR 6	9/2/2010	1106	27.0	21.5	8.1	400	172	152	0.02	7	Duplicate	204
NR 4	9/2/2010	1047	30.0	22.5	9.6	425	400	320	0.02	7	Field Blank	0
SM 3	9/2/2010	1036	27.0	22.0	8.1	269	108	72	0.02	7		
NR 1	9/2/2010	1021	29.0	23.1	9.0	420	112	72	0.02	7		
NR 23	9/8/2010	1159	30.0	20.8	8.8	1330	480	340	0.01	5		
NR 22	9/8/2010	1207	28.0	21.4	9.1	880	0	1	0.01	5	Replicate	0
NR 21	9/8/2010	1215	30.0	23.1	6.8	937	252	195	0.01	5	Field Blank	0
NR 20	9/8/2010	1228	29.0	22.9	8.9	898	104	84	0.01	5	Duplicate	116
NR 15	9/8/2010	1238	27.0	20.7	8.1	742	120	96	0.01	5		
NR 13	9/8/2010	1254	27.0	21.9	8.8	476	1400	1240	0.01	5		
NR 9.5	9/8/2010	1200	27.0	20.9	8.3	483	180	156	0.01	5	Replicate	172
NR 9	9/8/2010	1130	26.0	19.0	9.2	380	340	300	0.01	5	Duplicate	360
NR 6	9/8/2010	1114	27.0	20.4	8.0	403	156	144	0.01	5		
NR 4	9/8/2010	1048	28.0	21.5	9.8	436	340	300	0.01	5	Field Blank	0
SM 3	9/8/2010	1035	27.0	20.3	8.1	286	60	48	0.01	5		
NR 1	9/8/2010	1015	28.0	21.4	9.5	480	172	132	0.01	5		
NR 23	9/22/2010	1145	26.0	16.6	9.6	1284	168	144	0.79	6	Replicate	120
NR 22	9/22/2010	1154	25.0	19.1	9.6	883	0	1	0.79	6	Field Blank	0
NR 21	9/22/2010	1204	27.0	19.9	8.0	924	240	152	0.79	6	Duplicate	200
NR 20	9/22/2010	1216	25.0	18.5	10.1	890	48	36	0.79	6		
NR 15	9/22/2010	1227	25.0	15.9	9.2	756	88	44	0.79	6		
NR 13	9/22/2010	1242	27.0	17.2	10.6	581	112	108	0.79	6		
NR 9.5	9/22/2010	1206	25.0	17.0	8.5	470	84	68	0.79	6	Duplicate	76
NR 9	9/22/2010	1149	24.0	16.0	9.8	390	204	180	0.79	6		
NR 6	9/22/2010	1132	26.0	16.0	8.3	412	124	100	0.79	6		
NR 4	9/22/2010	1100	25.0	17.4	7.4	402	328	280	0.79	6	Field Blank	0
SM 3	9/22/2010	1039	23.0	16.8	8.3	295	140	124	0.79	6		
NR 1	9/22/2010	1017	23.0	17.2	9.4	431	248	140	0.79	6	Replicate	192
NR 23	10/7/2010	1040	17.0	13.5	11.0	877	56	56	0.04	2		
NR 22	10/7/2010	1046	17.0	17.7	8.7	800	0	1	0.04	2		
NR 21	10/7/2010	1057	17.0	14.5	7.0	775	120	104	0.04	2		
NR 20	10/7/2010	1105	18.0	13.7	8.0	628	60	52	0.04	2		
NR 15	10/7/2010	1113	17.0	13.9	9.8	449	156	140	0.04	2	Duplicate	
NR 13	10/7/2010	1129	17.0	14.2	10.1	360	112	88	0.04	2	Replicate	188
NR 9.5	10/7/2010	1142	19.0	14.3	9.2	330	224	204	0.04	2		
NR 9	10/7/2010	1127	20.0	13.9	9.2	328	208	188	0.04	2		
NR 6	10/7/2010	1113	18.0	14.2	9.3	331	108	108	0.04	2		
NR 4	10/7/2010	1053	19.0	14.4	10.2	343	204	204	0.04	2		
SM 3	10/7/2010	1044	18.0	14.2	9.0	264	124	88	0.04	2	Replicate	84
NR 1	10/7/2010	1023	19.0	14.6	9.8	335	140	104	0.04	2	Duplicate	

8/20/10 Air Temp 82.4°F Water Temp 70.5°F
 11/22/2010 73.4°F 63°F

B4.

Figure A2 Location of sampling sites located in the Norwalk River Watershed



Flow Durations, Low-Flow Frequencies, and Monthly Median Flows for Selected Streams in Connecticut through 2005

By Elizabeth A. Ahearn

Prepared in cooperation with the
Connecticut Department of Environmental Protection and
New England Water Pollution Control Commission

Scientific Investigations Report 2007–5270

**U.S. Department of the Interior
U.S. Geological Survey**

Table 3. Low-flow frequency statistics for 91 streamgaging stations with 10 or more years of record in Connecticut.—Continued

[Low-flow frequency statistics are based on the climatic year, which begins on April 1 and ends on March 31, and on flow record through March 31, 2003. USGS, U.S. Geological Survey; mi², square miles; ft³/s, cubic feet per second; --, no data; **bold** indicates Index Station]

Map reference number (fig. 1)	USGS station number	River name	Town	Years of record	Drainage area (mi ²)	Low-flow frequency statistic			
						7Q ₁₀ (ft ³ /s)	7Q ₂ (ft ³ /s)	30Q ₂ (ft ³ /s)	Number of days and dates of zero flow
108	01196620	Mill River	Hamden	29	24.5	1.37	5.34	6.93	--
109	01198500	Blackberry River	North Canaan	22	45.9	2.99	6.66	9.79	--
114	01199000	Housatonic River	Salisbury	93	634	110	189	238	--
115	01199050	Salmon Creek	Salisbury	44	29.4	3.22	6.60	9.05	--
116	01199200	Guinea Brook	Sharon	21	3.5	0.00	0.16	0.19	(141 total)—(5) 1962, (30) 1964, (38) 1965, (28) 1966, (8) 1968, (7) 1970, (1) 1974, (24) 1980
117	01200000	Tenmile River	Wingdale, NY	72	203	12.7	27.8	35.8	--
118	01200500	Housatonic River	New Milford	65	996	158	263	336	--
119	01201190	West Aspetuck River	New Milford	10	23.8	0.77	1.59	2.54	--
120	01201500	Still River	New Milford	35	67.5	14.4	20.7	26.0	--
122	01201930	Marshepaug River	Goshen	14	9.24	0.44	1.27	2.05	--
124	01203000	Shepaug River	Roxbury	41	132	6.23	11.5	16.5	--
126	01203600	Nonewaug River	Woodbury	19	17.7	0.65	1.70	2.80	--
129	01204000	Pomperaug River	Southbury	73	75.1	6.16	11.3	15.7	--
130	01204800	Copper Mill Brook	Monroe	18	2.45	0.08	0.19	0.35	--
131	01205500	Housatonic River	Oxford	77	1,544	128	307	479	(1) 10/12/1930
132	01205600	West Branch Naugatuck River	Torrington	40	33.8	1.33	4.04	6.11	--
133	01205700	East Branch Naugatuck River	Torrington	41	13.6	1.53	2.40	3.73	--
134	01206000	Naugatuck River	Thomaston	29	71	15.6	21.8	25.4	--
135	01206400	Leadmine Brook	Harwinton	13	19.6	0.41	1.15	2.26	--
136	01206500	Leadmine Brook	Thomaston	29	24.3	0.36	1.18	2.18	--
137	01206900	Naugatuck River	Thomaston	45	99.8	11.6	18.5	26.5	--
138	01208013	Branch Brook	Watertown	15	20.8	0.45	2.14	3.88	--
139	01208420	Hop Brook	Naugatuck	20	16.5	0.44	1.28	2.61	--
140	01208500	Naugatuck River	Beacon Falls	83	260	61.7	89.1	110	--
141	01208873	Rooster River	Trumbull	28	10.6	1.00	1.92	3.07	--
143	01208925	Mill River	Fairfield	33	28.6	1.14	2.67	4.50	(1) 11/1/1979
144	01208950	Sasco Brook	Fairfield	41	7.38	0.04	0.32	0.76	--
145	01208990	Saugatuck River	Redding	41	21	0.27	1.27	2.44	--
147	01209500	Saugatuck River	Westport	35	79.8	2.25	7.81	10.7	--
148	01209700	Norwalk River	Wilton	43	30	1.60	3.72	5.43	--

* Post-reservoir record 1940–1987.

Memorandum

To: File
From: Art Mauger *Art Mauger*
Date: 7/23/11
Re: KING INDUSTRIES - NORWALK - THERMAL IMPACT - CT0000841

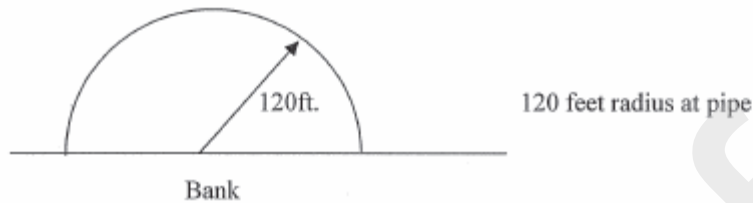
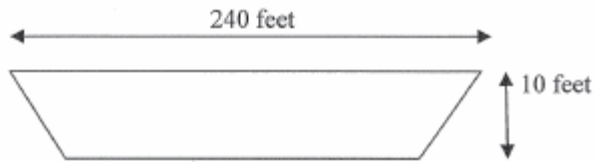
I have evaluated the thermal plume from King Industries to determine a zone of influence, and to establish a maximum temperature limit for the discharge. I used the information recently submitted by King Industries to come to the assumptions. I made the following assumptions: a zone of influence 3 feet deep with a circular radius of 120 feet around the outfall. Using these dimensions, and mixing in the entire daily flow of 47,000 gallons per day, the final effluent temperature should be **less than 95 degrees F.** in order to limit the temperature increase in the mixing zone to less than 1.5 degrees F. This is a conservative analysis that does not take into account the tidal exchange which would increase the amount of dilution.

The Connecticut Water Quality Standards for Class SB waters for allowable temperature increase (outside of a mixing zone) is "in no case exceed 83 degrees F, or in any case raise the temperature of the receiving water more than 4 degrees F.. During the period including July, August, and September, the temperature of the receiving water shall not be raised more than 1.5 degrees F. unless it can be shown the spawning and growth of indigenous organisms will not be significantly affected." The limited temperature data available shows a plume approximately 60 feet wide which is less than 25% of the river width. A thermal plume typically floats in the top of the water column, so I would conclude that this thermal plume would be less than 25% of the cross sectional area of the river as referenced in the WQS. In terms of the 1.5 degrees summer limitation, the spawning and growth of organisms for most species is on the river bottom. Also, this thermal plume will shift with each tide, so that the same zone is not steadily affected. With a floating thermal plume, I would conclude that the spawning and growth of indigenous organisms would not be significantly affected.

King Industries – Thermal Plume

Zone of Influence

Norwalk River: 240 feet wide
10 feet deep in channel



Assume zone of influence of 120 feet radius, 3 feet deep. This is less than 25% of the cross sectional area allowed in the WQS.

$$\text{Volume } V = \frac{1}{2}\pi r^2 \times \text{depth}$$

$$\frac{1}{2}\pi \times 120^2 \times 3 = 67,885 \text{ ft}^3 \times 7.48 \frac{\text{gal}}{\text{ft}^3} = 507,785 \text{ gals}$$

Discharge = 47,000 gpd

$507,785 / 47,000 = 10.8: 1$ dilution

Using a mixing equation:

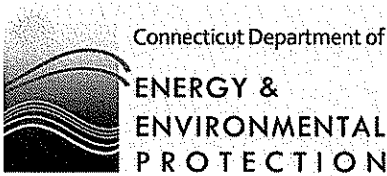
$$\frac{T_R Q_R - T_F Q_F}{Q_R + Q_F} = T_{final}$$

Using a high summer river temperature of 77°F and allowing a 1.5°F change in temperature

$$= \frac{77(10.8) + T(1)}{10.8 + 1} = 78.5$$

$$926.3 - 831.6 = 94.7^\circ\text{F}$$

$$T \approx 95^\circ\text{F}$$



**NOTICE OF TENTATIVE DECISION
INTENT TO MODIFY A NATIONAL POLLUTANT DISCHARGE ELIMINATION
SYSTEM PERMIT FOR THE FOLLOWING DISCHARGE INTO
THE WATERS OF THE STATE OF CONNECTICUT**

TENTATIVE DECISION

The Commissioner of Energy and Environmental Protection hereby gives notice of a tentative decision to modify a permit based on an application submitted by **King Industries, Inc.** ("the applicant") under section 22a-430 of the Connecticut General Statutes for a permit to discharge into the waters of the state.

In accordance with applicable federal and state law, the Commissioner has made a tentative decision on this permit modification and found that the continuance of the existing system to treat the discharge will protect the waters of the state from pollution and the Commissioner proposes to modify a permit for the discharge to the Norwalk River.

The proposed permit modification, if issued by the Commissioner, will require that all wastewater be treated to meet the applicable effluent limitations.

APPLICANT'S PROPOSAL

The permit modification proposes to revise the temperature limit from 83^oF to 95^oF and replace the compliance schedule in section 10 of the permit modification with a new compliance schedule for conducting a thermal verification study in July or August of 2014.

Dry Weather Condition

King Industries, Inc. is presently permitted to discharge a maximum of 47,000 gallons per day of tank farm storm water, cooling tower blowdown, steam condensate from boilers and fire sprinkler testing wastewaters to the Norwalk River from operations at an organic chemical manufacturing facility.

Wet Weather Condition

King Industries, Inc. contributes a maximum flow of 160,000 gallons of pretreated storm water to the Norwalk River per inch of rain received during a storm event. This is based on the NPDES drainage area of the facility.

The name and mailing address of the permit applicant are: King Industries, Inc., Science Road, Norwalk, CT 06852.

The activity takes place at: Science Road, Norwalk, CT 06852.

The proposed activity is within the coastal area as defined in C.G.S. Section 22a-94. Pursuant to C.G.S. Section 22a-98, the applicant must demonstrate that the activities are consistent with all applicable goals and policies in C.G.S. Section 22a-92, and that such activities incorporate all reasonable measures mitigating any adverse impacts on coastal resources and future water-dependent development activities.

REGULATORY CONDITIONS

Type of Treatment

Sedimentation, oil-water separation and pH adjustment (when necessary)

Effluent Limitations

This permit contains effluent limitations consistent with Best Available Technology based on a case by case determination using the criteria of Best Professional Judgment and which will meet Water Quality Standards when the Permittee complies with all permit requirements.

In accordance with section 22a-430-4(l) of the Regulations of Connecticut State Agencies the permit modification contains effluent limitations for the following types of toxic substances: heavy metals.

Compliance Schedule

This permit contains an enforceable compliance schedule which requires the applicant to perform a thermal verification study.

COMMISSIONER'S AUTHORITY

The Commissioner of Energy and Environmental Protection is authorized to approve or deny such permits pursuant to section 402(b) of the Federal Water Pollution Control Act, as amended, 33 USC 1251, *et. seq.* and section 22a-430 of the Connecticut General Statutes and the Water Discharge Permit Regulations (section 22a-430-3 and 4 of the Regulations of Connecticut State Agencies).

INFORMATION REQUESTS

The application has been assigned the following numbers by the Department of Energy and Environmental Protection. Please use these numbers when corresponding with this office regarding this application.

APPLICATION NO. 201403609 PERMIT ID NO. CT0000841 FACILITY ID NO. 103-070

Interested persons may obtain copies of the application from Dennis Rayburn, King Industries, Inc., Science Road, Norwalk, CT 06852, (203) 866-5551.

The application is available for inspection by contacting Oluwatoyin Fakiledede on (860) 424-3018, at the Department of Energy and Environmental Protection, Bureau of Materials Management and Compliance Assurance, 79 Elm Street, Hartford, CT, 06106-5127 from 8:30 - 4:30, Monday through Friday.

Any interested person may request in writing that his or her name be put on a mailing list to receive notice of intent to issue any permit to discharge to the surface waters of the state. Such request may be for the entire state or any geographic area of the state and shall clearly state in writing the name and mailing address of the interested person and the area for which notices are requested.

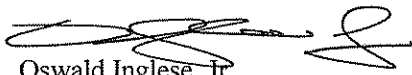
PUBLIC COMMENT

Prior to making a final determination to approve or deny any application, the Commissioner shall consider written comments on the application from interested persons that are received within 30 days of this public notice. Written comments should be directed to Oluwatoyin Fakiledede, Bureau of Materials Management and Compliance

Assurance, Department of Energy and Environmental Protection, 79 Elm Street, Hartford, CT 06106-5127. The Commissioner may hold a public hearing prior to approving or denying an application if in the Commissioner's discretion the public interest will be best served thereby, and shall hold a hearing upon receipt of a petition signed by at least twenty-five persons. Notice of any public hearing shall be published at least 30 days prior to the hearing.

Petitions for a hearing should include the application number noted above and also identify a contact person to receive notifications. Petitions may also identify a person who is authorized to engage in discussions regarding the application and, if resolution is reached, withdraw the petition. Original petitions must be *mailed or delivered* to: DEEP Office of Adjudications, 79 Elm Street, 3rd floor, Hartford, CT 06106-5127. Petitions cannot be sent by fax or email. Additional information can be found at www.ct.gov/deep/adjudications.

The Connecticut Department of Energy and Environmental Protection is an Affirmative Action and Equal Opportunity Employer that is committed to complying with the Americans with Disabilities Act. To request an accommodation contact us at (860) 418-5910 or deep.accommodations@ct.gov.



Oswald Inglese, Jr.

Director

Water Permitting and Enforcement Division

Bureau of Materials Management and Compliance Assurance

Dated:

JUL 01 2014