



**NPDES PERMIT
issued to**

Location Address:

Pharmacia & Upjohn Company LLC
c/o Pfizer Inc.
100 Route 206 North, M/S 611
Peapack, New Jersey 07977

41 Stiles Lane
North Haven, Connecticut 06473

Facility ID: 101-038

Permit ID: CT0001341

Receiving Stream: Quinnipiac River (Class B)

Effective Date: October 01, 2018

Receiving Water Body ID: CT5200-00_01

Permit Expires: September 30, 2023

SECTION 1: GENERAL PROVISIONS

- (A) This permit is reissued in accordance with section 22a-430 of Chapter 446k, Connecticut General Statutes (“CGS”), the Regulations of Connecticut State Agencies (“RCSA”) adopted thereunder, as amended, and section 402(b) of the Clean Water Act (“CWA”), 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 NPDES permit program.
- (B) **PHARMACIA & UPJOHN COMPANY LLC** (“Permittee”) shall comply with all conditions of this permit including the following sections of the RCSA which have been adopted pursuant to section 22a-430 of the CGS and are hereby incorporated into this permit. Your attention is especially drawn to the notification requirements of subsections (i)(2), (i)(3), (j)(1), (j)(6), (j)(8), (j)(9)(C), (j)(10)(C), (j)(11)(C), (D), (E), and (F), (k)(3) and (4) and (l)(2) of section 22a-430-3.

Section 22a-430-3: General Conditions

- (a) Definitions
- (b) General
- (c) Inspection and Entry
- (d) Effect of a Permit
- (e) Duty
- (f) Proper Operation and Maintenance
- (g) Sludge Disposal
- (h) Duty to Mitigate
- (i) Facility Modifications; Notification
- (j) Monitoring, Records and Reporting Requirements
- (k) Bypass
- (l) Conditions Applicable to POTWs
- (m) Effluent Limitation Violations (Upsets)
- (n) Enforcement
- (o) Resource Conservation
- (p) Spill Prevention and Control
- (q) Instrumentation, Alarms, Flow Recorders
- (r) Equalization

Section 22a-430-4: Procedures and Criteria

- (a) Duty to Apply
 - (b) Duty to Reapply
 - (c) Application Requirements
 - (d) Preliminary Review
 - (e) Tentative Determination
 - (f) Draft Permits, Fact Sheets
 - (g) Public Notice, Notice of Hearing
 - (h) Public Comments
 - (i) Final Determination
 - (j) Public Hearings
 - (k) Submission of Plans and Specifications. Approval.
 - (l) Establishing Effluent Limitations and Conditions
 - (m) Case by Case Determinations
 - (n) Permit issuance or renewal
 - (o) Permit Transfer
 - (p) Permit revocation, denial or modification
 - (q) Variances
 - (r) Secondary Treatment Requirements
 - (s) Treatment Requirements for Metals and Cyanide
 - (t) Discharges to POTWs - Prohibitions
- (C) Violations of any of the terms, conditions, or limitations contained in this permit may subject the permittee to enforcement action including, but not limited to, seeking penalties, injunctions and/or forfeitures pursuant to applicable sections of the CGS and RCSA.
- (D) Any false statement in any information submitted pursuant to this permit may be punishable as a criminal offense under section 22a-438 or 22a-131a of the CGS or in accordance with section 22a-6, under section 53a-157b of the CGS. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.
- (E) The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or both.
- (F) The permittee shall allow the Commissioner of the Department of Energy and Environmental Protection ("Commissioner") or an authorized representative (including an authorized contractor acting as a representative of the Commissioner), upon presentation of credentials and other documents as may be required by law, to: a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit; b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit; c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA, any substances or parameters at any location.
- (G) The authorization to discharge under this permit may not be transferred without prior written approval of the Commissioner. To request such approval, the permittee and proposed transferee shall register such proposed transfer with the Commissioner, at least thirty days prior to the transferee becoming legally responsible for creating or maintaining any discharge which is the subject of the permit transfer. Failure, by the transferee, to obtain the Commissioner's approval prior to commencing such discharge(s) may subject the transferee to enforcement action for discharging without a permit pursuant to applicable sections of the CGS and RCSA. The Commissioner may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as maybe necessary under the CWA.

- (H) No provision of this permit and no action or inaction by the Commissioner shall be construed to constitute an assurance by the Commissioner that the actions taken by the permittee pursuant to this permit will result in compliance or prevent or abate pollution.
- (I) Nothing in this permit shall relieve the permittee of other obligations under applicable federal, state and local law.
- (J) An annual fee shall be paid for each year this permit is in effect as set forth in section 22a-430-7 of the RCSA.
- (K) This permitted discharge is consistent with the applicable goals and policies of the Connecticut Coastal Management Act (section 22a-92 of the CGS).
- (L) The permittee shall operate and maintain its collection and treatment system in accordance with the plan titled *Groundwater Treatment Plant Operation and Maintenance Manual Pharmacia & Upjohn Company LLC*, July 2017, and with any approvals issued in accordance with RCSA section 22a-430-3(i)(3).

SECTION 2: DEFINITIONS

- (A) The definitions of the terms used in this permit shall be the same as the definitions contained in section 22a-423 of the CGS and sections 22a-430-3(a) and 22a-430-6 of the RCSA.
- (B) In addition to the above, the following definitions shall apply to this permit:

“40 CFR” means Title 40 of the Code of Federal Regulations.

“Annually”, when used as a sampling frequency in Table A of this permit, means that sampling is required in the month of March.

“Average Monthly Limit” means the maximum allowable “Average Monthly Concentration” as defined in section 22a-430-3(a) of the RCSA when expressed as a concentration (e.g., mg/l); otherwise, it means “Average Monthly Discharge Limitation” as defined in section 22a-430-3(a) of the RCSA.

Connecticut Water Quality Standards means the regulations adopted under RCSA sections 22a-426-1 through 22a-426-9, as amended.

“Daily Concentration” means the concentration of a substance as measured in a daily composite sample, or, the arithmetic average of all grab sample results defining a grab sample average.

“Daily Quantity” means the quantity of waste discharged during an operating day.

“DMR” means Discharge Monitoring Report.

“Instantaneous Limit” means the highest allowable concentration of a substance as measured by a grab sample, or the highest allowable measurement of a parameter as obtained through instantaneous monitoring.

“LC” means Lethal Concentration

“LC₅₀” means the concentration lethal to 50 percent of the test organisms.

“Lowest Observed Effect Concentration” (“LOEC”) means the lowest concentration of an effluent or toxicant that results in adverse effects on the test organisms.

“Maximum Daily Limit”, means the maximum allowable “Daily Concentration” (defined above) when expressed as a concentration (e.g., mg/l); otherwise, it means the maximum allowable “Daily Quantity” as defined above, unless it is expressed as a flow quantity. If expressed as a flow quantity it means “Maximum Daily Flow” as defined in section 22a-430-3(a) of the RCSA.

“No Observed Effect Concentration” (“NOEC”) means the highest tested concentration of an effluent or toxicant at which no adverse effects are observed on the aquatic test organisms at a specific time of observation.

“Quarter” means the calendar quarter beginning at 12:00 AM on the first day of March, June, September, and December and ending at 12:00 AM on the first day of June, September, December, and March, respectively.

“Quarterly”, when used as a sampling frequency in Table A of this permit, means that sampling is required in the months of March, June, September, and December.

“Range During Sampling” (“RDS”), as a sample type, means the maximum and minimum of all values recorded as a result of analyzing each grab sample of: 1) a Composite Sample or, 2) a Grab Sample Average. For those permittees with continuous monitoring and recording pH meters, Range During Sampling means the maximum and minimum readings recorded with the continuous monitoring device during the Composite or Grab Sample Average sample collection.

“Reporting Frequency” means the frequency at which monitoring results must be provided.

“Semiannual” when used as a sampling frequency in Table A of this permit, means that sampling is required in the months of March and September.

“Twice/Month” when used as a sampling frequency in Table A of this permit, means that sampling is required twice in a calendar month, and that each sample must be collected no less than twelve days apart.

SECTION 3: COMMISSIONER'S DECISION

- (A) The Commissioner has issued a final determination and has found that with respect to DSN 001-1, modification of the existing system would protect the waters of the state from pollution. The Commissioner's decision is based on Application 201407119 for permit reissuance received on July 7, 2014, and the administrative record established in the processing of that application.
- (B) (1) From the issuance of this permit through and including the last day of the first calendar month of such issuance, the Commissioner hereby authorizes the permittee to discharge in accordance with the terms and conditions of Permit No. CT0001341, issued by the Commissioner to the permittee on January 8, 2010, the previous application submitted by the permittee on July 14, 2009, and all modifications and approvals issued by the Commissioner or the Commissioner's authorized agent for the discharge and/or activities authorized by, or associated with, Permit No. CT0001341, issued by the Commissioner to the permittee on January 8, 2010.

(2) Beginning on the first day of the month following the issuance of this permit and continuing until this permit expires or is modified or revoked, the Commissioner hereby authorizes the permittee to discharge in accordance with the terms and conditions of this permit, Application No. 201407119 received by the Department on July 7, 2014, and all modifications and approvals issued by the Commissioner or the Commissioner's authorized agent for the discharge and/or activities authorized by, or associated with this permit.
- (C) The Commissioner hereby authorizes the permittee to discharge in accordance with the provisions of this permit, the above referenced application, 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.
- (D) 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 which may be authorized under the Federal Clean Water Act or the CGS or regulations adopted thereunder, as amended. The permit as modified or renewed under this paragraph may also contain any other requirements of the Federal Clean Water Act or the CGS or regulations adopted thereunder which are then applicable.

SECTION 4: GENERAL EFFLUENT LIMITATIONS

- (A) The permittee shall assure that the surface water affected by the subject discharge shall conform to the *Connecticut Water Quality Standards*.
- (B) No discharge shall contain, or cause in the receiving stream, a visible oil sheen or floating solids, or cause visible discoloration or foaming in the receiving stream.
- (C) No discharge shall cause acute or chronic toxicity in the receiving water body beyond any zone of influence specifically allocated to that discharge in this permit.
- (D) The temperature of any discharge shall not increase the temperature of the receiving stream above 85 °F, or in any case, raise the temperature of the receiving stream by more than 4 °F.

SECTION 5: SPECIFIC EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

- (A) The discharge is restricted by, and shall be monitored in accordance with the following table in this section. The wastewater discharge shall not exceed the effluent limitations in this table and shall otherwise conform to the specific terms and conditions listed in the table. The permittee shall comply with the "Remarks" and "Footnotes" noted in the table that follows and such remarks and footnotes are enforceable like any other term or condition of this permit.
- (B) The wastewaters authorized/approved by this permit shall be collected, treated, and discharged in accordance with this permit and with any approvals issued by the Commissioner or his/her authorized agent for the discharges and activities authorized by or associated with this permit. Any wastewater discharges not expressly identified in these tables or otherwise approved to be discharged by this permit shall not be authorized to be discharged by this permit.
- (C) All samples shall be comprised of only the wastewater described in these tables. Samples shall be collected prior to combination with receiving waters or wastewater of any other type, and after all approved treatment units, if applicable. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Collection of permit required effluent samples in any location other than the authorized location noted in this permit shall be a violation of this permit.
- (D) In cases where limits and sample type are specified but sampling is not required by this permit, the limits specified shall apply to all samples which may be collected and analyzed by the Department of Energy and Environmental Protection ("Department") personnel, the permittee, or other parties.

Table A

Discharge Serial Number: 001

Monitoring Location: 1 (EXTERNAL OUTFALL)

Wastewater Comprising DSN 001-1: Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

Monitoring Location Description: Final effluent outfall chamber ("PT-4")

Receiving Water: Quinnipiac River

Dilution Factor: 16.6:1 (for 2-Chloroaniline, 3-Chloroaniline, Ammonia, Dichloran, Formaldehyde, Vanadium)

PARAMETER	NET DMR CODE	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level ²	Chemical Analysis Required With Toxicity Test	
			Average Monthly Limit	Maximum Daily Limit	Sample// Reporting Frequency ¹	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample// Reporting Frequency ¹	Sample Type or measurement to be reported			
Acute Aquatic Toxicity ³ <i>Americamysis bahia</i>	TSA3E	%	NA	LC ₅₀ ≥ 100	Semiannual	Daily Composite	LC ₅₀ ≥233.3	NR*	Grab			
Acute Aquatic Toxicity ³ <i>Cyprinodon variegatus</i>	TSA6A	%	NA	LC ₅₀ ≥ 100	Semiannual	Daily Composite	LC ₅₀ ≥233.3	NR*	Grab			
Chronic Aquatic Toxicity (Survival) ⁴ <i>Americamysis bahia</i>	TOP3E	%	NA	—	Semiannual	Daily Composite	NA	NR	NA			
Chronic Aquatic Toxicity (Growth) ⁴ <i>Americamysis bahia</i>	TPP3E	%	NA	—	Semiannual	Daily Composite	NA	NR	NA			
Chronic Aquatic Toxicity (Fecundity) ⁴ <i>Americamysis bahia</i>	TVP3E	%	NA	C-NOEC ≥ 6.0	Semiannual	Daily Composite	NA	NR	NA			
Chronic Aquatic Toxicity (Survival) ⁴ <i>Cyprinodon variegatus</i>	TOP6A	%	NA	—	Semiannual	Daily Composite	NA	NR	NA			
Chronic Aquatic Toxicity (Growth) ⁴ <i>Cyprinodon variegatus</i>	TPP6A	%	NA	C-NOEC ≥ 6.0	Semiannual	Daily Composite	NA	NR	NA			
1-Chloro-2-nitrobenzene	51649	µg/L	10.2	17.7	Twice/Month	Daily Composite	26.5	NR*	Grab	5	✓	
1-Chloro-2-nitrobenzene	51649	g/day	4.1	7.1	Twice/Month	Daily Composite	NA	NR	NA		✓	
1,1-Dichloroethane	34496	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	1	✓	
1,1-Dichloroethylene	34501	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NA		✓	
1,1,1-Trichloroethane	34506	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NA		✓	
1,2-Dichlorobenzene	34536	µg/L	---	---	Quarterly	Grab Sample Average	NA	NR	NA	1	✓	
1,2-Dichloroethane	32103	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	1	✓	
1,2-trans-Dichloroethylene	34546	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	1	✓	
1,2,4-Trichlorobenzene	34551	µg/L	---	---	Annually	Daily Composite	NA	NR	NA		✓	
1,3-Dichlorobenzene	34566	µg/L	---	---	Quarterly	Grab Sample Average	NA	NR	NA	1	✓	
1,4-Dichlorobenzene	34571	µg/L	---	---	Quarterly	Grab Sample Average	NA	NR	NA	1	✓	
INTERIM LIMITS ⁵	1,4-Dioxane	82388	µg/L	112	128	Twice/Month	Daily Composite	192	NR*	Grab	1	✓
	1,4-Dioxane	82388	g/day	45	52	Twice/Month	Daily Composite	NA	NR	NA		✓
FINAL LIMITS ⁶	1,4-Dioxane	82388	µg/L	43.3	75.0	Twice/Month	Daily Composite	113	NR*	Grab	1	✓
	1,4-Dioxane	82388	g/day	17.5	30.3	Twice/Month	Daily Composite	NA	NR	NA		✓

Table A

Discharge Serial Number: 001

Monitoring Location: 1 (EXTERNAL OUTFALL)

Wastewater Comprising DSN 001-1: Treated; Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

Monitoring Location Description: Final effluent outfall chamber ("PT-4")

Receiving Water: Quinnipiac River

Dilution Factor: 16.6:1 (for 2-Chloroaniline, 3-Chloroaniline, Ammonia, Dichloran, Formaldehyde, Vanadium)

PARAMETER	NET DMR CODE	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level ²	Chemical Analysis Required With Toxicity Test	
			Average Monthly Limit	Maximum Daily Limit	Sample// Reporting Frequency ¹	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample// Reporting Frequency ¹	Sample Type or measurement to be reported			
2-Chloroaniline	77287	µg/L	37.1	64.3	Twice/Month	Daily Composite	96.0	NR*	Grab	5	✓	
2-Chloroaniline	77287	g/day	15.0	26.0	Twice/Month	Daily Composite	NA	NR	NA		✓	
2-Chlorophenol	34586	µg/L	---	---	Quarterly	Daily Composite	NA	NR	NA	2	✓	
2-Methylphenol	78395	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	5	✓	
2,4-Dichlorophenol	34601	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	5	✓	
2,4-Dimethylphenol	34606	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	5	✓	
2,4,6-Trichlorophenol	34621	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	5	✓	
3-Chloroaniline	77286	µg/L	---	---	Monthly	Daily Composite	NA	NR	NA	10	✓	
3-Methylphenol/4-Methylphenol	82627	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	5	✓	
3,3'-Dichlorobenzidine	34631	µg/L	---	---	Monthly	Daily Composite	NA	NR	NA	2	✓	
3,3'-Dimethylbenzidine	51647	µg/L	---	---	Monthly	Daily Composite	NA	NR	NA	5	✓	
3,4-Benzofluoranthene	79531	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
4-Chloroaniline	50312	µg/L	2.83	4.90	Twice/Month	Daily Composite	7.35	NR*	Grab	5	✓	
4-Chloroaniline	50312	g/day	1.1	2.0	Twice/Month	Daily Composite	NA	NR	NA		✓	
Acenaphthene	34205	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Acenaphthylene	34200	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Aluminum, Total	01105	µg/L	83.9	136	Twice/Month	Daily Composite	204	NR*	Grab	5	✓	
Aluminum, Total	01105	g/day	33.8	54.8	Twice/Month	Daily Composite	NA	NR	NA			
INTERIM LIMITS ⁶	Ammonia (as N) <i>(from April 1st to October 31st)</i>	00610	mg/L	3.383	3.942	Twice/Month	Daily Composite	5.914	NR	Grab		✓
	Ammonia (as N) <i>(from April 1st to October 31st)</i>	00610	g/day	1366	1591	Twice/Month	Daily Composite	NA	NR	NR		✓
FINAL LIMITS ⁶	Ammonia (as N) <i>(from April 1st to October 31st)</i>	00610	mg/L	0.902	1.745	Twice/Month	Daily Composite	2.618	NR	Grab		✓
	Ammonia (as N) <i>(from April 1st to October 31st)</i>	00610	g/day	364	705	Twice/Month	Daily Composite	NA	NR	NR		✓
Ammonia (as N) <i>(from November 1st to March 31st)</i>	00610	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR		✓	
Aniline	77089	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	2	✓	
Anthracene	34220	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Antimony, Total	01268	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	1	✓	
Arsenic, Total	01252	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	2	✓	

Table A

Discharge Serial Number: 001

Monitoring Location: 1 (EXTERNAL OUTFALL)

Wastewater Comprising DSN 001-1: Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

Monitoring Location Description: Final effluent outfall chamber ("PT-4")

Receiving Water: Quinnipiac River

Dilution Factor: 16.6:1 (for 2-Chloroaniline, 3-Chloroaniline, Ammonia, Dichloran, Formaldehyde, Vanadium)

PARAMETER	NET DMR CODE	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level ²	Chemical Analysis Required With Toxicity Test	
			Average Monthly Limit	Maximum Daily Limit	Sample/Reporting Frequency ¹	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample/Reporting Frequency ¹	Sample Type or measurement to be reported			
Azobenzene	77625	µg/L	0.20 ⁵	0.35 ⁵	Twice/Month	Daily Composite	0.52 ⁵	NR*	Grab	2	✓	
Azobenzene	77625	g/day	0.08	0.14	Twice/Month	Daily Composite	NA	NR	NA		✓	
Benzene	34030	µg/L	51.0	88.4	Twice/Month	Grab Sample Average	133	NR*	Grab	0.5	✓	
Benzene	34030	g/day	20.6	35.7	Twice/Month	Grab Sample Average	NA	NR	NA		✓	
Benzidine	39120	µg/L	---	---	Monthly	Daily Composite	NA	NR	NA	5	✓	
Benzo(a)anthracene	34526	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Benzo(a)pyrene	34247	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Benzoic Acid	77247	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	50	✓	
Biochemical Oxygen Demand (BOD ₅)	85002	mg/L	20	30	Monthly	Daily Composite	45	NR*	Grab		✓	
Biochemical Oxygen Demand (BOD ₅)	85002	kg/day	8.07	12.1	Monthly	Daily Composite	NA	NR	NA		✓	
Bis(2-chloroethyl)ether	34273	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
Bis(2-ethylhexyl)phthalate	39100	µg/L	2.2 ⁵	3.8	Twice/Month	Daily Composite	5.7	NR*	Grab	3	✓	
Bis(2-ethylhexyl)phthalate	39100	g/day	0.89	1.54	Twice/Month	Daily Composite	NA	NR	NA		✓	
Cadmium, Total	01113	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	0.2	✓	
Carbazole	77571	µg/L	---	---	Monthly	Daily Composite	NA	NR	NA	2	✓	
Carbon Disulfide	77041	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	5	✓	
Chlorine, Total Residual	50060	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NA	10		
Chlorobenzene	34301	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NA	1	✓	
Chloroethane	85811	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	1	✓	
Chloroform	32106	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NA	1	✓	
Chromium, Total	01034	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	1	✓	
Chrysene	34320	µg/L	---	---	Annually	Daily Composite	NA	NR	NA	2	✓	
cis-1,2-Dichloroethene	81686	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NA	1	✓	
Compliance with 40 CFR 450	51487	Yes/No	Yes	Yes	Monthly	Compliance	NA	NR	NA			
INTERIM LIMITS ⁶	Copper, Total	01042	µg/L	14.8	17.6	Twice/Month	Daily Composite	26.4	NR*	Grab	3	✓
	Copper, Total	01042	g/day	5.9	10.3	Twice/Month	Daily Composite	NA	NR	NA		✓
FINAL LIMITS ⁶	Copper, Total	01042	µg/L	5.5	9.6	Twice/Month	Daily Composite	14.4	NR*	Grab	3	✓
	Copper, Total	01042	g/day	2.2	3.9	Twice/Month	Daily Composite	NA	NR	NA		✓
INTERIM LIMITS ⁶	Cyanide, Total	00720	µg/L	16	21	Twice/Month	Grab Sample Average	31	NR*	NA	5	✓
	Cyanide, Total	00720	g/day	6.5	8.4	Twice/Month	Grab Sample Average	NA	NR	NA		✓

Table A

Discharge Serial Number: 001

Monitoring Location: 1 (EXTERNAL OUTFALL)

Wastewater Comprising DSN 001-1: Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

Monitoring Location Description: Final effluent outfall chamber ("PT-4")

Receiving Water: Quinnipiac River

Dilution Factor: 16.6:1 (for 2-Chloroaniline, 3-Chloroaniline, Ammonia, Dichloran, Formaldehyde, Vanadium)

PARAMETER	NET DMR CODE	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level ²	Chemical Analysis Required With Toxicity Test
			Average Monthly Limit	Maximum Daily Limit	Sample// Reporting Frequency ¹	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample// Reporting Frequency ¹	Sample Type or measurement to be reported		
FINAL LIMITS ⁶ Cyanide, Total	00720	µg/L	0.58 ⁵	1.0 ⁵	Twice/Month	Grab Sample Average	1.5 ⁵	NR*	NA	5	✓
	00720	g/day	0.23	0.40	Twice/Month	Grab Sample Average	NA	NR	NA		✓
Dibenzofuran	81302	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	2	✓
Dichloran	38446	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	5	✓
Diphenamid	78004	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	5	✓
Ethylbenzene	34371	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Flow, Average ⁷	00056	gpd	106,560	NA	Continuous	Total Daily Flow	NA	NR	NR		✓
Flow, Maximum ⁷	50047	gpd	NA	252,000	Continuous	Total Daily Flow	NA	NR	NR		✓
Flow, Day of Sampling	74076	gpd	NA	252,000	Twice/Month	Total Daily Flow	NA	NR	NR		✓
Fluoranthene	34376	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Fluorene	34381	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Formaldehyde	71880	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	50	✓
Iron, Total	01045	µg/L	---	---	Quarterly	Daily Composite	NA	NR	NR	10	✓
Lead, Total	01051	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	0.4	✓
m-Toluidine	51648	µg/L	---	---	Monthly	Daily Composite	NA	NR	NR	10	✓
Mercury, Total	50092	ng/L	---	---	Monthly	Daily Composite	NA	NR	NR	0.5	✓
Methylbromide	34413	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Methylene chloride	34423	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Methyl tert butyl ether	22417	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	1	✓
Naphthalene	34696	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Nickel, Total	01067	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2.5	✓
Nitrate (as N)	00620	mg/L	---	---	Monthly	Daily Composite	NA	NR	NR		✓
Nitrite (as N)	00615	mg/L	---	---	Monthly	Daily Composite	NA	NR	NR		✓
Nitrobenzene	34447	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Nitrogen, Total	00600	lbs/day	75.0	NA	Monthly	Daily Composite	NA	NR	NR		✓
Organic Nitrogen (as N)	00605	mg/L	---	---	Monthly	Daily Composite	NA	NR	NR		✓
Oxygen, Dissolved (Minimum)	00300	mg/L	---	---	Monthly	Daily Composite	---	Monthly	Grab		✓
PCBs, Total Aroclors ⁸	51867	µg/L	0.000064 ⁵	0.000111 ⁵	Twice/Month	Daily Composite	0.000166 ⁵	NR*	Grab	0.05	✓
PCBs, Total Aroclors ⁸	51867	g/day	0.000026	0.000045	Twice/Month	Daily Composite	NA	NR	NR		✓
pH, Minimum	61942	SU	NA	NA	NR	NA	6.5	Continuous	Continuous		✓

Table A

Discharge Serial Number: 001

Monitoring Location: 1 (EXTERNAL OUTFALL)

Wastewater Comprising DSN 001-1: Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

Monitoring Location Description: Final effluent outfall chamber ("PT-4")

Receiving Water: Quinnipiac River Dilution Factor: 16.6:1 (for 2-Chloroaniline, 3-Chloroaniline, Ammonia, Dichloran, Formaldehyde, Vanadium)

PARAMETER	NET DMR CODE	UNITS	FLOW/TIME BASED MONITORING				INSTANTANEOUS MONITORING			Minimum Level ²	Chemical Analysis Required With Toxicity Test
			Average Monthly Limit	Maximum Daily Limit	Sample// Reporting Frequency ¹	Sample Type or Measurement to be reported	Instantaneous limit or required range	Sample// Reporting Frequency ¹	Sample Type or measurement to be reported		
pH, Maximum	61941	SU	NA	NA	NR	NA	8.0	Continuous	Continuous		
pH, Day of Sampling	00400	SU	NA	NA	NR	NA	6.5-8.0	Twice/Month	RDS		✓
Phenanthrene	34461	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Phenol	34694	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	5	✓
Phosphorus, Total	00665	mg/L	---	---	Monthly	Daily Composite	NA	NR	NR		✓
Pyrene	34469	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	2	✓
Silver, Total	01077	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	0.2	✓
Sulfide	00745	mg/L	---	---	Monthly	Daily Composite	NA	NR	NA	50	✓
Tetrachloroethylene	34475	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Toluene	34010	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NR	0.5	✓
Total Suspended Solids (TSS)	00530	mg/L	30	60	Monthly	Daily Composite	90	NR*	Grab		✓
Total Suspended Solids (TSS)	00530	kg/day	12.1	24.2	Monthly	Daily Composite	NA	NR	NR		✓
Trichloroethylene	39180	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Xylene, Total (ortho, meta, and para)	81551	µg/L	---	---	Annually	Grab Sample Average	NA	NR	NR	0.5	✓
Vanadium, Total	01128	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	5	✓
Vinyl chloride	39175	µg/L	---	---	Monthly	Grab Sample Average	NA	NR	NR	0.5	✓
Zinc, Total	01092	µg/L	---	---	Annually	Daily Composite	NA	NR	NR	10	✓

TABLE A FOOTNOTES & REMARKS

Footnotes:

¹ The first entry in this column is the "Sample Frequency". If a "Reporting Frequency" does not follow this entry, then the "Reporting Frequency" is Monthly.

² Minimum Level (ML) is described in Paragraph (6)(D) of this permit. The MLs identified in the table above represent the highest acceptable MLs. Actual MLs reported by the laboratory must be reported on the DMR. Detected concentrations less than the noted ML shall be reported on the DMR as the concentration reported by the laboratory.

³ Acute Aquatic Toxicity testing shall be conducted in accordance with Section 7(B) of this permit. The LC₅₀ results for the Acute Aquatic Toxicity testing shall be reported on the DMR. Aquatic toxicity testing for purposes of determining compliance with instantaneous limits shall be performed in accordance with Section 7(A) of this permit.

CONTINUED ON THE NEXT PAGE

TABLE A FOOTNOTES & REMARKS (CONTINUED FROM THE PREVIOUS PAGE)

⁴ Chronic Aquatic Toxicity testing shall be conducted in accordance with Section 7(B) of this permit. The C-NOEC (Chronic No-Observed-Effect Concentration) results for the specified conditions noted in this table shall be reported on the DMR. Supplemental data shall be collected as required and reported consistent with Section 8(A) of this permit. The supplemental data can be provided in any acceptable format as long as it contains the information identified on Attachment A.

⁵ The noted permit limit is below the Minimum Level (ML). Therefore, compliance with this limit shall be determined based on the ML. If the measured value is less than the ML, the results shall be reported in accordance with Section 6F of this permit and Footnote 2, above, and the results will be considered to be in compliance with the permit limit. If the measured value is greater or equal to the ML, the actual results obtained shall be reported on the DMR and these results will be considered a violation of the permit limit.

⁶ The interim limits shall take effect upon issuance of this permit. The final limits shall take effect on the final compliance date approved in accordance with Section 10(D) of this permit.

⁷ For this parameter, the permittee shall maintain at the facility a record of the Total Daily Flow for each day. The permittee shall report on its DMR the "Average Daily Flow" and the "Maximum Daily Flow" for each month and shall provide the record of the Total Daily Flow as an attachment to the DMR.

⁸ For this parameter, the permittee shall analyze Aroclor 1060, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260 and shall sum the results and report the result on the DMR as "PCBs, Total Aroclors".

Remarks:

1. Abbreviations used for units are as follows: gpd means gallons per day; mg/L means milligrams per liter; µg/L means micrograms per liter; SU means Standard Units; ng/L means nanograms per liter; g/day means grams per day; kg/day means kilograms per day; lbs/day means pounds per day. Other abbreviations are as follows: RDS means Range During Sampling; NA means Not Applicable; NR means Not Reportable; NR* means Not Reportable, unless a sample is collected and analyzed per Section 5D of this permit

2. If "---" is noted in the limits column in the table, this means that a limit is not specified but a value must be reported on the DMR.

3. Flow shall be reported to 1 gpd. pH shall be reported to 0.1 SU. Total Nitrogen shall be reported to 0.1 lb/day. All other values shall be reported to the level of precision/accuracy reported by the laboratory.

4. In calculating average concentrations, use zeros for values reported as less than the ML.

5. "Continuous", used in this table as a "Sample" or "Sample Type", means monitoring that produces one or more data points in fifteen minutes or less.

6. Total Nitrogen means the sum of the concentrations of: Ammonia Nitrogen + Organic Nitrogen + Nitrate Nitrogen + Nitrite Nitrogen. The concentration-based value shall be converted to lbs/day and reported on the DMR.

7. To the extent that any portion of the discharge is subject to 40 CFR 450, the permittee shall comply with the applicable provisions of 40 CFR 450. All records shall be maintained on-site. On a monthly basis, the permittee shall report compliance with the requirements of 40 CFR 450 under reporting code 51487. If the requirements of 40 CFR 450 are not applicable in any portion of a calendar month because the discharge is not subject to 40 CFR 450 in that month, then the permittee shall use the appropriate NODI (No Data Indicator) code for 51487.

8. Supplemental data shall be provided as required and shall be reported consistent with Section 8(A) of this permit. The supplemental data can be provided in any acceptable format as long as it contains the information identified on Attachment B.

SECTION 6: SAMPLE COLLECTION, HANDLING AND ANALYTICAL TECHNIQUES

- (A) All samples shall be collected, handled, and analyzed in accordance with the methods approved under 40 CFR 136, unless another method is required under 40 CFR subchapter N or unless an alternative method has been approved in writing pursuant to 40 CFR 136.5. To determine compliance with limits and conditions established in this permit, monitoring must be performed using sufficiently-sensitive methods approved pursuant to 40 CFR 136 for the analysis of pollutants having approved methods under that part, unless a method is required under 40 CFR subchapter N or unless an alternative method has been approved in writing pursuant to 40 CFR 136.5. Monitoring parameters which do not have approved methods of analysis defined in 40 CFR 136 shall be collected, handled, and analyzed in accordance with the methods in Section 6(B), below.
- (B) The latest, most up-to-date, of the following test method(s) as well as the following container, preservation, and hold time requirements, shall be used to analyze the parameters identified below:

PARAMETER	METHOD OF ANALYSIS	CONTAINER/PRESERVATION/MAXIMUM HOLDING TIME
1-Chloro-2-nitrobenzene	EPA 625	Per 40 CFR 136 (Table II)
1,4-Dioxane	EPA 625	Per 40 CFR 136 (Table II)
2-Chloroaniline	EPA 625	Per 40 CFR 136 (Table II)
2-Methylphenol	EPA 625	Per 40 CFR 136 (Table II)
2,4-Dinitrophenol	EPA 625	Per 40 CFR 136 (Table II)
3-Chloroaniline	EPA 625	Per 40 CFR 136 (Table II)
3-Methylphenol/4-Methylphenol	EPA 625	Per 40 CFR 136 (Table II)
3,3'-Dimethylbenzidine	EPA 625	Per 40 CFR 136 (Table II)
4-Chloroaniline	EPA 625	Per 40 CFR 136 (Table II)
Aniline	EPA 625	Per 40 CFR 136 (Table II)
Azobenzene	EPA 625	Per 40 CFR 136 (Table II)
Benzoic Acid	EPA 625	Per 40 CFR 136 (Table II)
Carbazole	EPA 625	Per 40 CFR 136 (Table II)
Carbon disulfide	EPA 624	Per 40 CFR 136 (Table II)
cis-1,3-Dichloroethene	EPA 624	Per 40 CFR 136 (Table II)
Dibenzofuran	EPA 625	Per 40 CFR 136 (Table II)
Dichloran	EPA 625	Per 40 CFR 136 (Table II)
Diphenamid	EPA 625	Per 40 CFR 136 (Table II)
Formaldehyde	EPA 1667	Per Method 1667
Methyl tert butyl ether	EPA 624	Per 40 CFR 136 (Table II)
Xylenes, Total	EPA 624	Per 40 CFR 136 (Table II)

- (C) All metals analyses identified in this permit shall refer to analyses for Total Recoverable Metal as defined in 40 CFR 136, unless otherwise specified.
- (D) The term Minimum Level (ML) refers to either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the method detection limit (MDL). MLs may be obtained in several ways: They may be published in a method; they may be sample concentrations equivalent to the lowest acceptable calibration point used by the laboratory; or they may be calculated by multiplying the MDL in a method, or the MDL determined by a lab, by a factor. The Minimum Levels specified in the Section 5 table represent the maximum concentrations at which quantification must be achieved and verified during the chemical analyses for those noted parameters. Analyses for these parameters must include check standards within ten percent of the specified Minimum Level or calibration points equal to or less than the specified Minimum Level.
- (E) The value of each parameter for which monitoring is required under this permit shall be reported to the maximum level of accuracy and precision possible, consistent with the requirements of this section of the permit.
- (F) Analyses for which quantification was verified to be at or below an ML, and which indicate that a parameter was not detected, shall be reported as "less than x" where 'x' is the numerical value equivalent to the ML for that analysis. If the permittee is required to submit its DMRs through the NetDMR system, the permittee shall report the non-detect value consistent with the reporting requirements for NetDMR.
- (G) Results of analyses which indicate that a parameter was not present at a concentration greater than or equal to the ML specified for that analysis shall be considered equivalent to zero for purposes of determining compliance with effluent limitations or conditions specified in this permit.

- (H) It is a violation of this permit for a permittee or his/her designated agent, to manipulate test samples in any manner, to delay sample shipment, or to terminate or to cause to terminate a toxicity test. Once initiated, all toxicity tests must be completed.
- (I) Analyses required under this permit shall be performed in accordance with CGS section 19a-29a. An "environmental laboratory", as that term is defined in the referenced section, that is performing analyses required by this permit, shall be registered and have certification acceptable to the Commissioner, as such registration and certification is necessary.

SECTION 7: TOXICITY MONITORING

(A) **ACUTE TESTING REQUIREMENTS (*Grab Samples Only*):** The permittee shall conduct acute aquatic toxicity testing for DSN 001-1 for Instantaneous Monitoring requirements as follows:

- (1) **TEST METHOD:** Acute Aquatic Toxicity monitoring shall be performed as prescribed in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA-821-R-02-012), or the most current version, with any exceptions or clarifications noted below.
- (2) **SAMPLE COLLECTION & HANDLING:**
 - (a) Grab samples shall be chilled immediately following collection. Samples shall be held at 0-6 °C until acute aquatic toxicity testing is initiated.
 - (b) Effluent samples shall not be dechlorinated, filtered, or, modified in any way, prior to testing for aquatic toxicity unless specifically approved in writing by the Commissioner for monitoring at this facility.
 - (c) Tests for acute aquatic toxicity shall be initiated within 36 hours of sample collection.
- (3) **TEST DURATION & TEST SPECIES:**
 - (a) For 48-hours utilizing neonatal *Americamysis bahia* (1-5 days old with no more than 24-hours range in age).
 - (b) For 48-hours utilizing larval *Cyprinodon variegatus* (1-14 days old with no more than 24-hours range in age).
- (4) **ACUTE ENDPOINT:** Survival at 48 hours measured by LC₅₀.
- (5) **TEST CONDITIONS:**
 - (a) Tests for acute aquatic toxicity shall be conducted as prescribed for static non-renewal tests.
 - (b) Multi-concentration (definitive) testing shall be conducted. The following effluent dilution series concentrations shall be used: 100%, 75%, 50%, 25%, 12.5% and 6.25%.
 - (c) Synthetic seawater for use as dilution water or controls shall be prepared with deionized water and commercial sea salts as described in EPA-821-R-02-012.
 - (d) All effluent concentrations and the control(s) used in the test shall have the same salinity. If the effluent requires salinity adjustment to a standard salinity, this shall be accomplished by adding a minimum amount of commercial sea salts as described in EPA-821-R-02-012.
 - (e) If the test organisms have been cultured in water which is different (\pm 5ppt) from the test dilution water, a second set of controls matching the salinity of the culture water should be included in the test. Test validity shall be determined using the controls adjusted to match the source water salinity.

- (f) The feeding regime shall be that specified in EPA-821-R-02-012.
 - (g) Sodium lauryl sulfate or sodium dodecyl sulfate shall be used as the reference toxicant.
 - (h) Dissolved oxygen, pH, and temperature shall be measured in the control and in all test concentrations at the beginning of the test, daily thereafter, and at test termination. Salinity shall be measured in each test concentration at the beginning of the test and at test termination.
 - (i) Salinity, pH, specific conductance, total alkalinity, total hardness, and total residual chlorine shall be measured in the undiluted effluent sample and in the dilution (control) water at the beginning of the test and at test termination. If total residual chlorine is not detected at test initiation, it does not need to be measured at test termination.
 - (j) The actual effluent concentrations in definitive tests with saltwater organisms shall be used in calculating test results.
- (5) **CHEMICAL ANALYSIS:** Chemical analyses of the parameters identified in the Section 5 tables under "Monitoring Required With Toxicity Test" shall be conducted on an aliquot of the same sample tested for aquatic toxicity. For tests that require salinity adjustment of the effluent, chemical analyses shall be conducted on an aliquot of the effluent sample collected for acute aquatic toxicity testing and on the undiluted aliquot of the effluent following salinity adjustment. Both sets of results shall be reported.
 - (6) **TEST ACCEPTABILITY CRITERIA:** For the test results to be acceptable, control survival must equal or exceed 90%. If the laboratory control fails to meet test acceptability criteria for either of the test organisms at the end of the respective test period, then the test is considered invalid and the test must be repeated with a newly collected sample.
 - (7) **REPORTING:** In addition to reporting the percent survival on the DMR, the permittee must provide a report of toxicity results that includes the items identified in Section 8(B) of this permit.

(B) CHRONIC AND MODIFIED ACUTE TESTING REQUIREMENTS. The permittee shall conduct chronic and modified acute aquatic toxicity testing for DSN 001-1 as follows:

- (1) **TEST METHOD:** Chronic toxicity monitoring shall be performed as prescribed in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, EPA 821-R-02-014, or the most current version, with any exceptions or clarifications noted below:
- (2) **SAMPLE COLLECTION & HANDLING:**
 - (a) Composite samples shall be chilled as they are collected. Samples shall be held at 4 °C until aquatic toxicity testing is initiated.
 - (b) Effluent samples shall not be dechlorinated, filtered, or modified in any way, prior to testing for aquatic toxicity unless specifically approved in writing by the Commissioner for monitoring at this facility.
 - (c) Tests for aquatic toxicity shall be initiated within 36 hours of sample collection.
- (3) **TEST SPECIES & TEST DURATION:**
 - (a) For seven days utilizing neonatal *Americamysis bahia* (7 days old).
 - (b) For seven days utilizing larval *Cyprinodon variegatus* (less than 24 hours).

Survival results of the first 48 hours for *Americamysis bahia* and for *Cyprinodon variegatus* shall be used for determining compliance with acute toxicity limits.

(4) **CHRONIC ENDPOINTS:**

- (a) *Americamysis bahia*: Survival, growth, and egg development (fecundity)
- (b) *Cyprinodon variegatus*: Larval survival and growth

- (5) **DILUTION WATER:** Quinnipiac River water collected immediately upstream of the area influenced by the discharge shall be used as site water control (0% effluent) and dilution water in the toxicity tests. The permittee shall document the dilution water sampling location by providing coordinates and/or a map of the location.

If the Quinnipiac River dilution water is found or is suspected to be toxic or unreliable, an alternative dilution water standard shall be used in the toxicity test. The use of an alternative dilution water standard is species-specific and shall be conditionally allowed in either of the following two instances:

- (a) Instance 1: *When an invalid toxicity test is repeated.* In this instance, the permittee shall implement the use of an alternative dilution water sample without the approval of the Department if the following conditions are met: 1) the test is repeated during the required time frame; 2) the alternative dilution water is of known quality with hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids, similar to that of the Quinnipiac River and the alternative dilution water does not produce a toxic response; 3) receiving water controls are run during the alternative dilution water tests; 4) a complete toxicity test report is submitted by the permittee and it shall clearly document: that site water toxicity rendered the first test invalid; that a re-test was conducted using an alternative dilution water that matched the characteristics of the site water; that site water controls were included in the re-test; and that the site water controls of the re-test met the minimum acceptability criteria. However, if the re-test documented that the site water controls met the minimum test acceptability criteria, site water must be used as the diluent in future toxicity tests. If the site water controls of the re-test failed to meet test acceptability criteria, an alternative dilution water may be used in future toxicity tests using the affected test organism after submitting written documentation to the Department.
- (b) Instance 2: *In future toxicity tests, where there are at least two documented incidents where use of the Quinnipiac River as the dilution water was found to be unreliable.* In this instance, the permittee must receive written approval from the Commissioner prior to using an alternative dilution water. The documentation submitted to the Department in support of the use of alternative dilution water in this instance must include the following: Documentation of site water toxicity including all supporting documentation as well an identification of the affected test organism and an identification of the affected test period; a description of the alternative dilution water proposed; and a description of the controls that will be used in future toxicity tests. Upon approval, the permittee shall implement the use of the alternative dilution water testing for the term of the permit.

(6) **TEST CONDITIONS:**

- (a) Tests for aquatic toxicity shall be conducted as prescribed in the referenced test manual for static with daily renewal. Samples of the discharge and grab samples of the Quinnipiac River for use as site water control and dilution water shall be collected on: Day 1 of the test (for test initiation and test solution renewal on Day 2 of the test); Day 3 of the test (for test solution renewal on Day 3 and Day 4 of the test); and Day 5 of the test (for test solution renewal on Days 5, 6, and 7 of the test). Samples shall not be dechlorinated, pH or hardness adjusted, or chemically altered in any way, except as may be necessary for salinity adjustment.
- (b) Tests concentrations shall be comprised of: 100% effluent, 50% effluent, 25% effluent, 12.5% effluent, 6.25% effluent, laboratory water control, and dilution site water.

- (7) **CHEMICAL ANALYSIS:** The 100% effluent sample and the Quinnipiac River water used in the chronic toxicity test, shall, at a minimum, be analyzed for those parameters identified in Section 5, Table A under "Monitoring Required With Toxicity Test" and shall be analyzed for the following

additional parameters: specific conductance, alkalinity, hardness, chloride, and salinity. The salinity-adjusted sample shall be analyzed for: BOD₅, TSS, ammonia (as N), nitrate (as N), nitrite (as N), total cyanide, total iron, total aluminum, total residual chlorine, and pH. Analysis of the effluent shall be the same sample as the sample tested for aquatic toxicity.

- (8) **TEST ACCEPTABILITY CRITERIA:** Test acceptability criteria is identified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*. If the laboratory fails to meet test acceptability criteria for either of the test organisms at the end of the respective test periods, the test is considered invalid, and the test must be repeated.
- (9) **REPORTING:** A report detailing the result of the chronic and modified acute toxicity monitoring shall be submitted no later than 60 days following the day sampling was concluded for that test. The report shall include the items identified in Section 8(B) of this permit and the following: a summary of the test results which includes, at a minimum, percent survival in each replicate test chamber and all supporting chemical/physical measurements performed in association with the toxicity test. Endpoints to be reported are: 48-hour LC₅₀, 7-day LC₅₀ (survival), 7-day C-NOEC (survival), 7-day C-LOEC (survival), 7-day C-NOEC (growth), 7-day C-LOEC (growth), 7 day C-NOEC (fecundity), 7-day C-LOEC (fecundity).

SECTION 8: REPORTING REQUIREMENTS

- (A) The results of chemical analyses and any aquatic toxicity test required by this permit shall be entered on the Discharge Monitoring Report (DMR), provided by this office, and reported to the Bureau of Materials Management and Compliance Assurance (Attn: DMR Processing) at the following address or submitted electronically using NetDMR. Monitoring results shall be reported at the monitoring frequency specified in this permit. Any monitoring required more frequently than monthly shall be reported on an attachment to the DMR, and any additional monitoring conducted in accordance with 40 CFR 136, or another method required for an industry-specific waste stream under 40 CFR subchapter N, or other methods approved by the Commissioner, shall also be included on the DMR, or as an attachment, if necessary, and the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Commissioner in the permit. All aquatic toxicity reports shall also be included as an attachment to the DMR. A report shall also be included with the DMR which includes a detailed explanation of any violations of the limitations specified. DMRs, attachments, and reports, shall continue to be submitted electronically in accordance with Section 8(D)(2) below. However, if the DMRs, attachments, and reports are required to be submitted in hard copy form, they shall be received at this address by the last day of the month following the month in which samples are collected:

Bureau of Materials Management and Compliance Assurance
Water Permitting and Enforcement Division (Attn: DMR Processing)
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

- (B) The Aquatic Toxicity Monitoring Report (ATMR) shall include all applicable items identified in Section 12 of EPA-821-R-02-012 and in Section 10 of EPA-821-R-02-014, including complete and accurate aquatic toxicity test data, including percent survival of test organisms in each replicate test chamber, LC₅₀ values and 95% confidence intervals for definitive test protocols, and all supporting chemical/physical measurements performed in association with any aquatic toxicity test, including measured daily flow and hours of operation for the 30 consecutive operating days prior to sample collection. The ATMR shall be submitted electronically and a hard copy shall be sent to the Bureau of Water Protection and Land Reuse at the address below. The ATMR required by Section 7(A) and 7(B) shall be received at this address by the last day of the month following the month in which the samples are collected. The ATMR required by Section 7(B) shall be provided in accordance with the timeframe identified in Section 7(B)(9) above to:

Bureau of Water Protection and Land Reuse (Attn: Aquatic Toxicity)
Connecticut Department of Energy and Environmental Protection
79 Elm St.
Hartford, CT 06106-5127

- (C) If this permit requires monitoring of a discharge on a calendar basis (e.g., monthly, quarterly, etc.), but a discharge has not occurred within the frequency of sampling specified in the permit, the permittee must submit the DMR and ATMR, as scheduled, indicating "NO DISCHARGE". For those permittees whose required monitoring is discharge dependent (e.g., per batch), the minimum reporting frequency is monthly. Therefore, if there is no discharge during a calendar month for a batch discharge, a DMR must be submitted indicating such by the end of the following month.
- (D) *NetDMR Reporting Requirements:* The permittee shall continue reporting electronically using NetDMR, a web-based tool that allows permittees to electronically submit Discharge Monitoring Reports and other required reports through a secure internet connection. Specific requirements regarding NetDMR, submittal of reports using NetDMR, and submittal of reports in hard copy form, are described below:

- (1) *Submittal of NetDMR Subscriber Agreement:* The permittee has submitted a signed and notarized copy of the *Connecticut DEEP NetDMR Subscriber Agreement* to the Department.
- (2) *Submittal of Reports Using NetDMR:* The permittee and/or the signatory authority shall continue to electronically submit DMRs and reports required under this permit to the Department using NetDMR in satisfaction of the DMR submission requirement of Section 8(A) of this permit.

DMRs shall be submitted electronically to the Department no later than the last day of the month following the completed reporting period. All reports required under the permit, including any monitoring conducted more frequently than monthly or any additional monitoring shall be submitted to the Department as an electronic attachment to the DMR in NetDMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to the Department. The permittee shall also electronically file any written report of noncompliance described in Section 9 of this permit as an attachment in NetDMR. NetDMR is accessed from: <http://www.epa.gov/netdmr>.

- (3) *Submittal of NetDMR Opt-Out Requests:* If the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for electronically submitting DMRs and reports, the Commissioner may approve the submission of DMRs and other required reports in hard copy form ("opt-out request"). Opt-out requests must be submitted in writing to the Department for written approval on or before fifteen (15) days prior to the date a permittee would be required under this permit to begin filing DMRs and other reports using NetDMR. This demonstration shall be valid for twelve (12) months from the date of the Department's approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to the Department using NetDMR unless the permittee submits a renewed opt-out request and such request is approved by the Department.
- (4) All opt-out requests and requests for the NetDMR subscriber form should be sent to the following address or by email at: deep.netdmr@ct.gov

Attn: NetDMR Coordinator
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

SECTION 9: RECORDING AND REPORTING OF VIOLATIONS, ADDITIONAL TESTING AND REPORTING REQUIREMENTS

- (A) In addition to any other written reporting requirements, the permittee shall report any instances of noncompliance with this permit with its DMR. Such reporting shall be due no later than the last day of the month following the reporting period in which the noncompliant event occurred. The information provided in the DMR shall include, at a minimum: the type of violation, the duration of the violation, the cause of the violation, and any corrective action(s) or preventative measure(s) taken to address the violation.
- (B) The permittee shall notify the Bureau of Materials Management and Compliance Assurance, Water Permitting and Enforcement Division, within 72 hours and in writing within thirty days of the discharge of

any substance listed in the application, but not listed in the permit, if the concentration or quantity of that substance exceeds two times the level listed in the application.

- (C) If any sample analysis indicates that an aquatic toxicity effluent limitation in Section 5 of this permit has been exceeded, or that the test was invalid, another sample of the effluent shall be collected and tested for aquatic toxicity and associated chemical parameters, as described above in Section 7, and the results reported to the Bureau of Materials Management and Compliance Assurance (Attn: DMR Processing), at the address listed above, within 30 days of the exceedance or invalid test. Results of all tests, whether valid or invalid, shall be reported.
- (D) If any two consecutive test results or any three test results in a twelve-month period indicate that an aquatic toxicity limit has been exceeded, the permittee shall immediately take all reasonable steps to eliminate toxicity wherever possible and shall also submit a report, for the review and written approval of the Commissioner, which describes in detail the steps taken or that shall be taken to eliminate the toxic impacts of the discharge on the receiving water and it shall also include a proposed schedule for implementation. Such report shall be submitted in accordance with the timeframe set forth in section 22a-430-3(j)(10)(C) of the RCSA. The permittee shall implement all actions in accordance with the approved report and schedule.

SECTION 10: SPECIAL CONDITIONS/COMPLIANCE SCHEDULE

- (A) The permittee shall undertake a study designed to collect data for the purpose of determining a site-specific metal translator value. The study shall be undertaken as set forth in the EPA document titled *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From A Dissolved Criterion*, June 1996 (EPA 823-B-96-007). Within ninety days of issuance of this permit, the permittee shall submit a scope of study describing the study design. Upon approval, the permittee shall implement the plan.
- (B) The permittee shall make best efforts to find a laboratory that can perform EPA Method 605 and EPA Method 617. Every six months following issuance of this permit, the permittee shall submit documentation to the Department describing the efforts taken.
- (C) For the duration that this permit is in effect, the permittee shall make an assessment to the Department that its discharge does not cause pollution to the waters of the state. Such assessment shall be made by analyzing the DSN 001-1 discharge using analytical methods that can quantify all pollutants that may be in the discharge at levels at or below the applicable or derived water quality criteria, to the extent that such methods are available. Such assessment shall be made on a monthly basis or at another appropriate frequency, such as quarterly. At a minimum, EPA Method 1668 must be used for PCB analysis. The results of the assessment must be submitted with the DMR. Within sixty days of the issuance of this permit, the permittee shall provide the Department with a plan to undertake the assessment. Upon approval, the permittee shall maintain the plan in full effect.
- (D) The permittee shall achieve compliance with the final effluent limitations for DSN 001-1 (Section 5, Table A) of this permit in accordance with the following:
 - (1) On or before thirty (30) days after the date of issuance of this permit, the permittee shall retain one or more qualified consultants acceptable to the Commissioner to prepare the documents and implement or oversee the actions required by this section of the permit and shall, by that date, notify the Commissioner in writing of the identity of such consultants. The permittee shall retain one or more qualified consultants acceptable to the Commissioner until the actions required by this section of the permit have been completed, and within ten days after retaining any consultant other than one originally identified under this paragraph, the permittee shall notify the Commissioner in writing of the identity of such other consultant. The consultant retained to perform the studies and/or oversee any remedial measures required to achieve compliance with the noted permit limitations shall be a qualified professional engineer licensed to practice in Connecticut and acceptable to the Commissioner. The permittee shall submit to the Commissioner a description of a consultant's education, experience and training that is relevant to the work required by this permit within ten days after a request for such a description. Nothing in this paragraph shall preclude the Commissioner from finding a previously acceptable consultant unacceptable.
 - (2) On or before ninety (90) days after the date of issuance of this permit, the permittee shall submit for the Commissioner's review and written approval a comprehensive and thorough report which

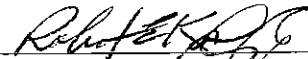
describes and evaluates alternative actions which may be taken by the permittee to achieve compliance with the effluent limitations in Section 5, Table A of this permit. Such report shall:

- (a) include a thorough evaluation of all alternative actions to achieve compliance with the effluent limitations in Section 5, Table A including, but not limited to, pollutant source reduction, process changes/innovations, chemical substitutions, recycle and zero discharge systems, water conservation measures, and other internal and/or end-of-pipe treatment technologies. Such evaluation shall also consider any adverse environmental impacts that may occur with each alternative and quantify that impact;
 - (b) state in detail the most expeditious schedule for performing each alternative;
 - (c) list all permits and approvals required for each alternative, including but not limited to any permits required under sections 22a-32, 22a-42a, 22a-342, 22a-361, 22a-368 or 22a-430 of the Connecticut General Statutes;
 - (d) propose a preferred alternative or combination of alternatives with supporting justification; and,
 - (e) propose a detailed program and schedule to perform all actions required by the preferred alternative including, but not limited to, a schedule for submission of engineering plans and specifications on any internal and/or end of pipe treatment facilities, start and completion of any construction activities related to any treatment facilities, operation and maintenance plans, and applying for and obtaining all permits and approvals required for such actions.
- (3) The permittee shall implement all actions required by this section of the permit in accordance with the approved plans and specifications and approved schedule as soon as possible.
- (4) Within fifteen days after achieving compliance, the permittee shall certify to the Commissioner in writing that it has achieved compliance with the final effluent limitations in Section 5, Table A of the permit.
- (E) Until the project described in Section 10(D) is completed as approved, the permittee shall submit to the Commissioner quarterly status reports on March 1st, June 1st, September 1st, and December 1st. Status reports shall include, but not be limited to, a detailed description of progress made by the permittee in performing actions required by this section of the permit in accordance with the approved schedule including, but not limited to, development of engineering plans and specifications, construction activity, contract bidding, operational changes, preparation and submittal of permit applications, and any other actions specified per the applicable sections.
- (F) The permittee shall use best efforts to submit to the Commissioner all documents required by this section of the permit 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 re-submit 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. Nothing in this paragraph shall excuse noncompliance or delay.
- (G) **Dates.** The date of submission to the Commissioner of any document required by this section of the permit 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, to be submitted, or performed, by a date which falls on, Saturday, Sunday, or, a legal Connecticut or federal holiday, shall be submitted or performed on or before the next day which is not a Saturday, Sunday, or legal Connecticut or federal holiday.

- (H) **Notification of noncompliance.** 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, except for final compliance dates, 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.
- (I) **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, 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.
- (J) **Signature and certification of documents.** Any document, other than a discharge monitoring report, required to be submitted to the Commissioner under this section of the permit shall, unless otherwise specified in writing, be submitted in accordance with RCSA section 22a-430-3(b)(2)(B).
- (K) **Submission of documents.** Any document, other than a discharge monitoring report, required to be submitted to the Commissioner under this section of the permit shall, unless otherwise specified in writing by the Commissioner, be directed to:

Christine Gleason, Sanitary Engineer
Department of Energy and Environmental Protection
Bureau of Materials Management and Compliance Assurance
Water Permitting and Enforcement Division
79 Elm Street
Hartford, CT 06106-5127

This permit is hereby issued on *September 25, 2018.*



ROBERT E. KALISZEWSKI
Deputy Commissioner

REK/CMG

ATTACHMENT A

Supplemental Monitoring Data for Chronic Toxicity Testing for DSN 001-1

PARAMETER	UNITS	EFFLUENT SAMPLE RESULTS			SALINITY-ADJUSTED SAMPLE RESULTS			QUINNIPIAC RIVER SAMPLE RESULTS		
		DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	
1-Chloro-2-nitrobenzene	µg/L									
1,1-Dichloroethane	µg/L									
1,1-Dichloroethylene	µg/L									
1,1,1-Trichloroethane	µg/L									
1,2-Dichlorobenzene	µg/L									
1,2-Dichloroethane	µg/L									
1,2-trans-Dichloroethylene	µg/L									
1,2,4-Trichlorobenzene	µg/L									
1,3-Dichlorobenzene	µg/L									
1,4-Dichlorobenzene	µg/L									
1,4-Dioxane	µg/L									
2-Chloroaniline	µg/L									
2-Chlorophenol	µg/L									
2-Methylphenol	µg/L									
2,4-Dichlorophenol	µg/L									
2,4-Dimethylphenol	µg/L									
3-Chloroaniline	µg/L									
3&4-Methylphenol	µg/L									
3,3'-Dichlorobenzidine	µg/L									
3,3'-Dimethylbenzidine	µg/L									
3,4-Benzofluoranthene	µg/L									
4-Chloroaniline	µg/L									
Acenaphthene	µg/L									
Acenaphthylene	µg/L									
Anthracene	µg/L									
Alkalinity	mg/L									
Aluminum	µg/L									
Ammonia	mg/L									
Aniline	µg/L									
Arsenic, Total	µg/L									
Azobenzene	µg/L									
Benzene	µg/L									
Benzidine	µg/L									
Benzo(a)anthracene	µg/L									
Benzo(a)pyrene	µg/L									
BOD ₅	mg/L									
Bis(2-chloroethyl)ether	µg/L									
Bis(2-ethylhexyl)phthalate	µg/L									
Cadmium	µg/L									
Carbazole	µg/L									
Carbon Disulfide	µg/L									
Chloride	mg/L									
Chlorine, Total Residual	µg/L									
Chlorobenzene	µg/L									
Chloroethane	µg/L									
Chloroform	µg/L									
Chromium, Total	µg/L									
Chrysene	µg/L									
cis-1,2-Dichloroethene	µg/L									
Copper, Total	µg/L									
Cyanide, Total	µg/L									
Dibenzofuran	µg/L									
Dichloran	µg/L									

PARAMETER	UNITS	EFFLUENT SAMPLE RESULTS			SALINITY-ADJUSTED SAMPLE RESULTS			QUINNIPIAC RIVER SAMPLE RESULTS		
		DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED	DATE SAMPLED
Diphenamid	µg/L									
Ethylbenzene	µg/L									
Fluoranthene	µg/L									
Fluorene	µg/L									
Formaldehyde	µg/L									
Hardness	mg/L									
Iron, Total	µg/L									
Lead, Total	µg/L									
m-Toluidine	µg/L									
Mercury, Total	µg/L									
Methylbromide	µg/L									
Methylene chloride	µg/L									
Methyl tert butyl ether	µg/L									
Naphthalene	µg/L									
Nickel, Total	µg/L									
Nitrate	mg/L									
Nitrite	mg/L									
Nitrobenzene	µg/L									
Nitrogen, Total	mg/L									
Organic Nitrogen	mg/L									
PCB – Aroclor 1016	µg/L									
PCB – Aroclor 1221	µg/L									
PCB – Aroclor 1232	µg/L									
PCB – Aroclor 1242	µg/L									
PCB – Aroclor 1248	µg/L									
PCB – Aroclor 1254	µg/L									
PCB – Aroclor 1260	µg/L									
pH	SU									
Phenanthrene	µg/L									
Phenol	µg/L									
Phosphorus, Total	mg/L									
Pyrene	µg/L									
Salinity	ppt									
Silver, Total	µg/L									
Specific Conductance	µS/cm									
Sulfide	mg/L									
Temperature	°F									
Tetrachloroethylene	µg/L									
Toluene	µg/L									
Total Suspended Solids	mg/L									
Trichloroethylene	µg/L									
Xylene, Total	µg/L									
Vanadium	µg/L									
Vinyl chloride	µg/L									
Zinc, Total	µg/L									

Indicate the location where the Quinnipiac River sample was collected: (coordinates): _____

Temperature and Total Residual Chlorine shall be analyzed upon collection.

ATTACHMENT B

Attachment Sheet for Supplemental Monitoring Data for DSN 001-1

PARAMETER	UNITS	DATE SAMPLED WEEK 1						DATE SAMPLED WEEK 2														
		FLOW DAY OF SAMPLING						FLOW DAY OF SAMPLING														
		HOURS OF DISCHARGE						HOURS OF DISCHARGE														
		GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6									
		TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME									
1-Chloro-2-nitrobenzene	µg/L																					
1,1-Dichloroethane	µg/L																					
1,1-Dichloroethylene	µg/L																					
1,1,1-Trichloroethane	µg/L																					
1,2-Dichlorobenzene	µg/L																					
1,2-Dichloroethane	µg/L																					
1,2-trans-Dichloroethylene	µg/L																					
1,2,4-Trichlorobenzene	µg/L																					
1,3-Dichlorobenzene	µg/L																					
1,4-Dichlorobenzene	µg/L																					
1,4-Dioxane	µg/L																					
2-Chloroaniline	µg/L																					
2-Chlorophenol	µg/L																					
2-Methylphenol	µg/L																					
2,4-Dichlorophenol	µg/L																					
2,4-Dimethylphenol	µg/L																					
3-Chloroaniline	µg/L																					
3,4-Benzofluoranthene	µg/L																					
3&4-Methylphenol	µg/L																					
3,3'-Dichlorobenzidine	µg/L																					
3,3'-Dimethylbenzidine	µg/L																					
4-Chloroaniline	µg/L																					
Acenaphthene	µg/L																					
Acenaphthylene	µg/L																					
Anthracene	µg/L																					

PARAMETER	UNITS	DATE SAMPLED WEEK 1						DATE SAMPLED WEEK 2						
		FLOW DAY OF SAMPLING						FLOW DAY OF SAMPLING						
		HOURS OF DISCHARGE						HOURS OF DISCHARGE						
		GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	
		TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	
Aluminum	µg/L													
Ammonia	mg/L													
Aniline	µg/L													
Arsenic, Total	µg/L													
Azobenzene	µg/L													
Benzene	µg/L													
Benzidine	µg/L													
Benzo(a)anthracene	µg/L													
Benzo(a)pyrene	µg/L													
BOD ₅	mg/L													
Bis(2-chloroethyl)ether	µg/L													
Bis(2-ethylhexyl)phthalate	µg/L													
Cadmium	µg/L													
Carbazole	µg/L													
Carbon Disulfide	µg/L													
Chlorine, Total Residual	µg/L													
Chlorobenzene	µg/L													
Chloroethane	µg/L													
Chloroform	µg/L													
Chromium, Total	µg/L													
Chrysene	µg/L													
cis-1,2-Dichloroethene	µg/L													
Copper, Total	µg/L													
Cyanide, Total	µg/L													
Dibenzofuran	µg/L													
Dichloran	µg/L													
Diphenamid	µg/L													
Ethylbenzene	µg/L													

PARAMETER	UNITS	DATE SAMPLED WEEK 1						DATE SAMPLED WEEK 2						
		FLOW DAY OF SAMPLING						FLOW DAY OF SAMPLING						
		HOURS OF DISCHARGE						HOURS OF DISCHARGE						
		GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	
		TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	
Fluoranthene	µg/L													
Fluorene	µg/L													
Formaldehyde	µg/L													
Iron, Total	µg/L													
Lead, Total	µg/L													
m-Toluidine	µg/L													
Mercury, Total	µg/L													
Methylbromide	µg/L													
Methylene chloride	µg/L													
Methyl tert butyl ether	µg/L													
Naphthalene	µg/L													
Nickel, Total	µg/L													
Nitrate	mg/L													
Nitrite	mg/L													
Nitrobenzene	µg/L													
Nitrogen, Total	mg/L													
Organic Nitrogen	mg/L													
PCB -- Aroclor 1016	µg/L													
PCB -- Aroclor 1221	µg/L													
PCB -- Aroclor 1232	µg/L													
PCB -- Aroclor 1242	µg/L													
PCB -- Aroclor 1248	µg/L													
PCB -- Aroclor 1254	µg/L													
PCB -- Aroclor 1260	µg/L													
pH	SU													
Phenanthrene	µg/L													
Phenol	µg/L													

PARAMETER	UNITS	DATE SAMPLED WEEK 1						DATE SAMPLED WEEK 2						
		FLOW DAY OF SAMPLING						FLOW DAY OF SAMPLING						
		HOURS OF DISCHARGE						HOURS OF DISCHARGE						
		GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	GRAB SAMPLE 1	GRAB SAMPLE 2	GRAB SAMPLE 3	GRAB SAMPLE 4	GRAB SAMPLE 5	GRAB SAMPLE 6	
		TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	
Phosphorus, Total	µg/L													
Pyrene	µg/L													
Salinity	ppt													
Silver, Total	µg/L													
Sulfide	µg/L													
Temperature	°F													
Tetrachloroethylene	µg/L													
Toluene	µg/L													
Total Suspended Solids	µg/L													
Trichloroethylene	µg/L													
Xylene, Total	µg/L													
Vanadium	µg/L													
Vinyl chloride	µg/L													
Zinc, Total	µg/L													

If values are non-detect, they must be reported on this attachment sheet as "<ML", where the ML is value reported by the lab.

FACT SHEET

NPDES PERMIT REISSUANCE

DRAFT PERMIT PUBLIC NOTICED: AUGUST 16, 2018 to SEPTEMBER 14, 2018

APPLICANT	<i>PHARMACIA & UPJOHN COMPANY LLC (c/o Pfizer Inc.)</i>
NPDES PERMIT NO.	<i>CT0001341 (existing term: January 8, 2010 to January 7, 2015)</i>
NPDES APPLICATION NO.	<i>201407119</i>
DATE APPLICATION RECEIVED	<i>July 7, 2014</i>
FACILITY IDENTIFICATION	<i>101-038</i>
LOCATION	<i>41 Stiles Lane North Haven, Connecticut 06473</i>
MAILING ADDRESS	<i>Pfizer Inc. 100 Route 206 North, MS 4LLA-401 Peapack, New Jersey 07977</i>
FACILITY CONTACT (OWNER)	<i>Russell Downey Director – Environmental Engineering, Remediation, and Transactions Pfizer Inc. Office: (908) 901-6079 russell.g.downey@pfizer.com</i>
FACILITY CONTACT (OPERATOR)	<i>Michael Fiedler Woodard & Curran, Inc. Office: (203) 230-2072 mfiedler@woodardcurran.com</i>
DMR CONTACT	<i>Russell Downey</i>
SECRETARY OF STATE BUSINESS ID	<i>#0799035 (Pharmacia & Upjohn Company LLC) #0088341 (Pfizer Inc.) #0256450 (Woodard & Curran, Inc.)</i>
PERMIT TERM	<i>5 years</i>
PERMIT CATEGORY	<i>NPDES: <input type="checkbox"/> Major <input checked="" type="checkbox"/> Discretionary Major <input type="checkbox"/> Minor [Score: 548, May 2018]</i>
SIC CODE	<i>9999 (Nonclassifiable Establishments)¹</i>
APPLICABLE EFFLUENT GUIDELINE(S)	<i>40 CFR 450 (Construction and Development Point Source Category)</i>
PERMIT TYPE	<i>Reissuance</i>
OWNERSHIP	<i><input type="checkbox"/> Federal <input type="checkbox"/> State <input checked="" type="checkbox"/> Private <input type="checkbox"/> Public <input type="checkbox"/> Other: _____</i>
RECEIVING WATER	<i>Quinnipiac River</i>
WATER BODY SEGMENT ID	<i>CT5200-00_01</i>
SURFACE WATERBODY CLASSIFICATION	<i>B</i>
DISCHARGE LOCATION	<i>DSN 001-1: Latitude (41° 22' 24") Longitude (72° 52' 25")</i>
DEEP STAFF ENGINEER	<i>Christine Gleason (860/424-3278) christine.gleason@ct.gov</i>

¹ The applicant indicates that NAICS Code 562910 (Remediation and Site Cleanup of Contaminated Buildings, Mine Sites, Soil, or Groundwater) applies to its operations

I. FEES

Application Fees (RCSA 22a-430-6):

Application Filing Fee: \$1,300. Paid on July 3, 2014.

Application Processing Fee: \$13,100.00 (Invoice 284925). Paid on May 17, 2017.

Annual Permit Fee (RCSA 22a-430-7):

DISCHARGE CODE	WASTEWATER CATEGORY	MAXIMUM GPD or CATEGORY	DSN	ANNUAL FEE
1090000	<i>Groundwater Contamination Recovery Systems (Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater)</i>	---	001-1	4,337.50
1080000	<i>Stormwater (Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater)</i>	---	001-1	2,912.50
1230000	<i>Building Floor Drain Wastewaters (Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash)</i>	---	001-1	0
TOTAL				\$7,250.00

II. APPLICATION

On July 7, 2014, the Department of Energy and Environmental Protection (“Department”) received an application (Application 201407119) from Pfizer Inc. on behalf of Pharmacia & Upjohn Company LLC (“Permittee”, “Applicant”) for the renewal of its NPDES permit, CT0001341, expiring on January 7, 2015. Consistent with the requirements of Section 22a-6g of the Connecticut General Statutes (“CGS”), the Applicant caused a “Notice of Permit Application” to be published in the *New Haven Register* on June 11, 2014; a copy of the notice was provided to the chief elected official of North Haven. On July 15, 2014, the application was determined to be timely and administratively sufficient. Additional information relative to Application 201407719 was submitted subsequent to the original July 2014 submittal, including a supplemental application provided in July 2017.

The permittee seeks authorization for the following in Application 201407719:

DISCHARGE SERIAL NUMBER (DSN)	PROPOSED AVERAGE MONTHLY FLOW (gpd)	PROPOSED MAXIMUM DAILY FLOW (gpd)	WASTESTREAMS PROPOSED TO BE DISCHARGED	WASTEWATER TREATMENT OPERATIONS	RECEIVING WATER
001-1	106,560	252,000	<i>Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash</i>	Equalization; Biological Treatment; Metals Precipitation; Organics Oxidation; Carbon Adsorption	Quinnipiac River (5200-00_01)

The primary wastewater generating activity continues to be the treatment of contaminated groundwater at the site. However, a number of remedial activities have occurred since the issuance of the existing NPDES permit in January 2010 that have resulted in both a reduction of groundwater flow into treatment system and the elimination of certain wastestreams. Due to these changes, the permittee intends to modify certain portions of its wastewater treatment system.

III. GENERAL ISSUES RELATED TO THE APPLICATION

A. FEDERALLY-RECOGNIZED INDIAN LAND

As provided in the permit application, the site is not located on federally-recognized Indian land.

B. COASTAL AREA/COASTAL BOUNDARY

The site is located within the coastal area/boundary as defined in CGS 22a-94(b). However, the application is not for a new activity or a modification of an existing activity that will change the footprint of the site.

C. ENDANGERED SPECIES

The December 2016 Natural Diversity Database Areas map indicates that there are areas of "State and Federal Listed Species & Significant Natural Communities" at the site. However, the application is not for a new activity or a modification of an existing activity that will change the footprint of the site.

D. AQUIFER PROTECTION AREAS

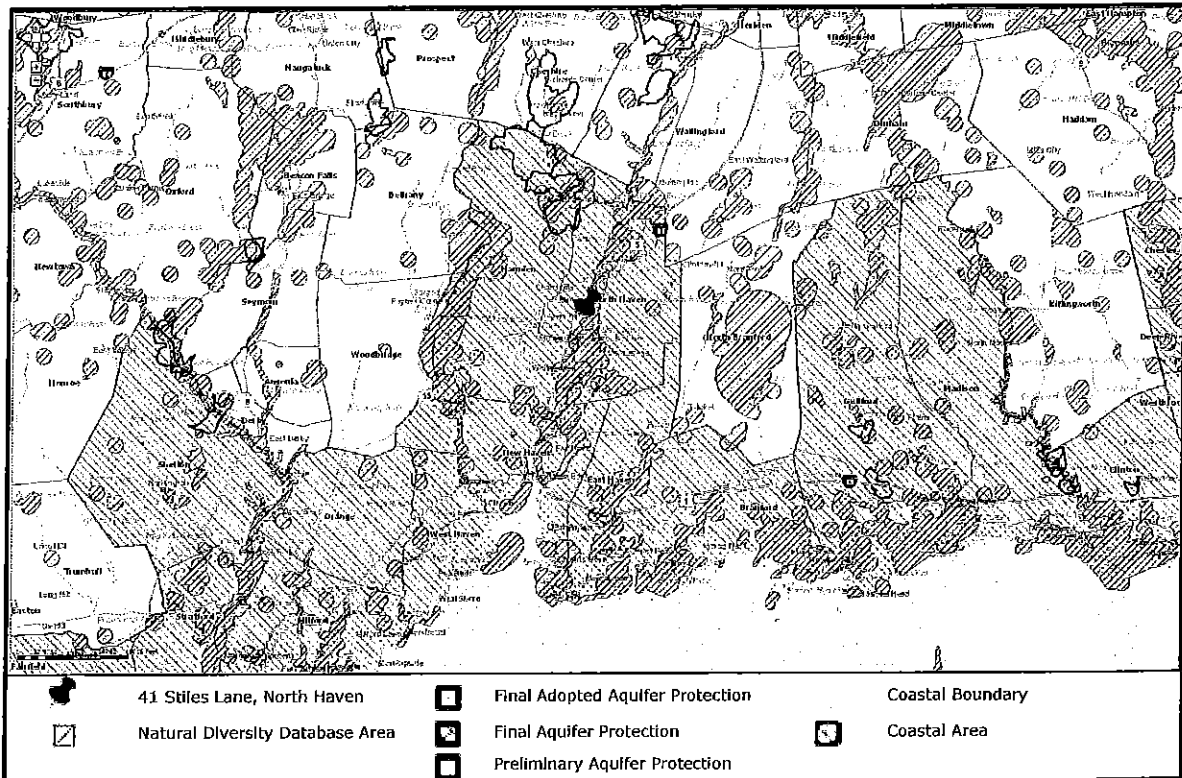
The project site is located in a town required to establish Aquifer Protection Areas. However, the boundaries of the site are not in Level A/B mapping areas.

E. CONSERVATION OR PRESERVATION RESTRICTION

As provided in the permit application, the property is not subject to a conservation or preservation restriction.

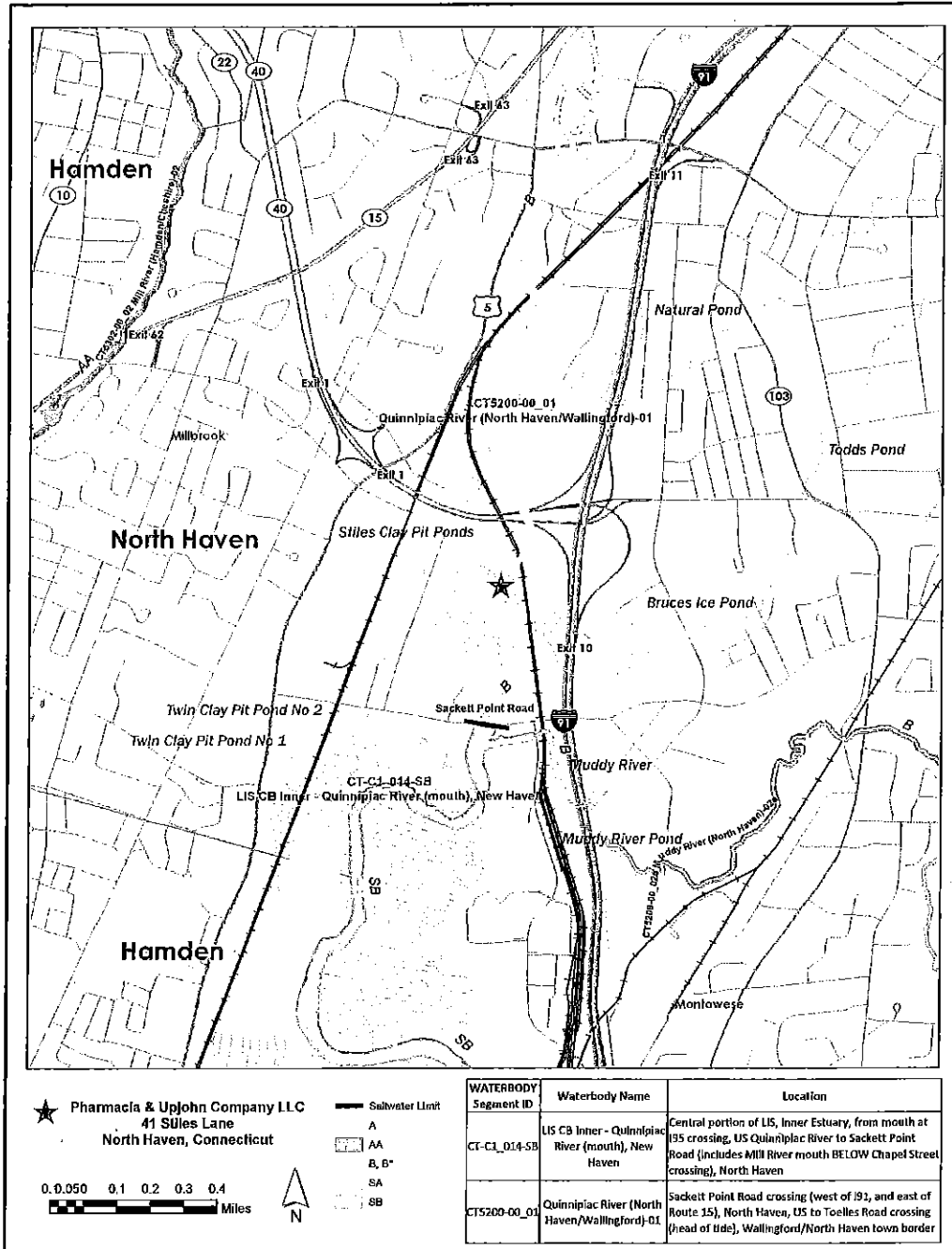
F. PUBLIC WATER SUPPLY WATERSHED

According to the applicant, the site is not located within a public water supply watershed.



IV. RECEIVING WATER INFORMATION

The permittee discharges into the section of the Quinnipiac River identified as Waterbody Segment ID CT5200-00_01. This section of the river is classified as "B". Class B waters are designated for: habitat for fish and other aquatic life and wildlife; recreation; and industrial and agricultural water supply. This waterbody segment is identified on the 2016 *Integrated Water Quality Report* as an impaired waterbody. There is one impaired designated use associated with this waterbody: an impairment to the habitat for fish, other aquatic life and wildlife due to "unknown" causes. A TMDL (Total Maximum Daily Load) has been developed for *E. coli* for this section of the Quinnipiac River (*A Total Maximum Daily Load Analysis for the Quinnipiac River Regional Basin*, June 4, 2008). This TMDL does not include an allocation for the permittee's discharge. In addition, *A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound*, December 2000 also applies to this watershed. The permittee's discharge has been assigned a wasteload allocation for total nitrogen as part of this TMDL.



V. NATURE OF BUSINESS GENERATING THE DISCHARGE

The permittee is primarily engaged in remediation activities at the site. The SIC code for this activity, as provided by the applicant, is: 9999 (Nonclassifiable Establishments). The NAICS Code provided is 562910 (Remediation and Site Cleanup of Contaminated Buildings, Mine Sites, Soil, or Groundwater).

VI. FACILITY DESCRIPTION

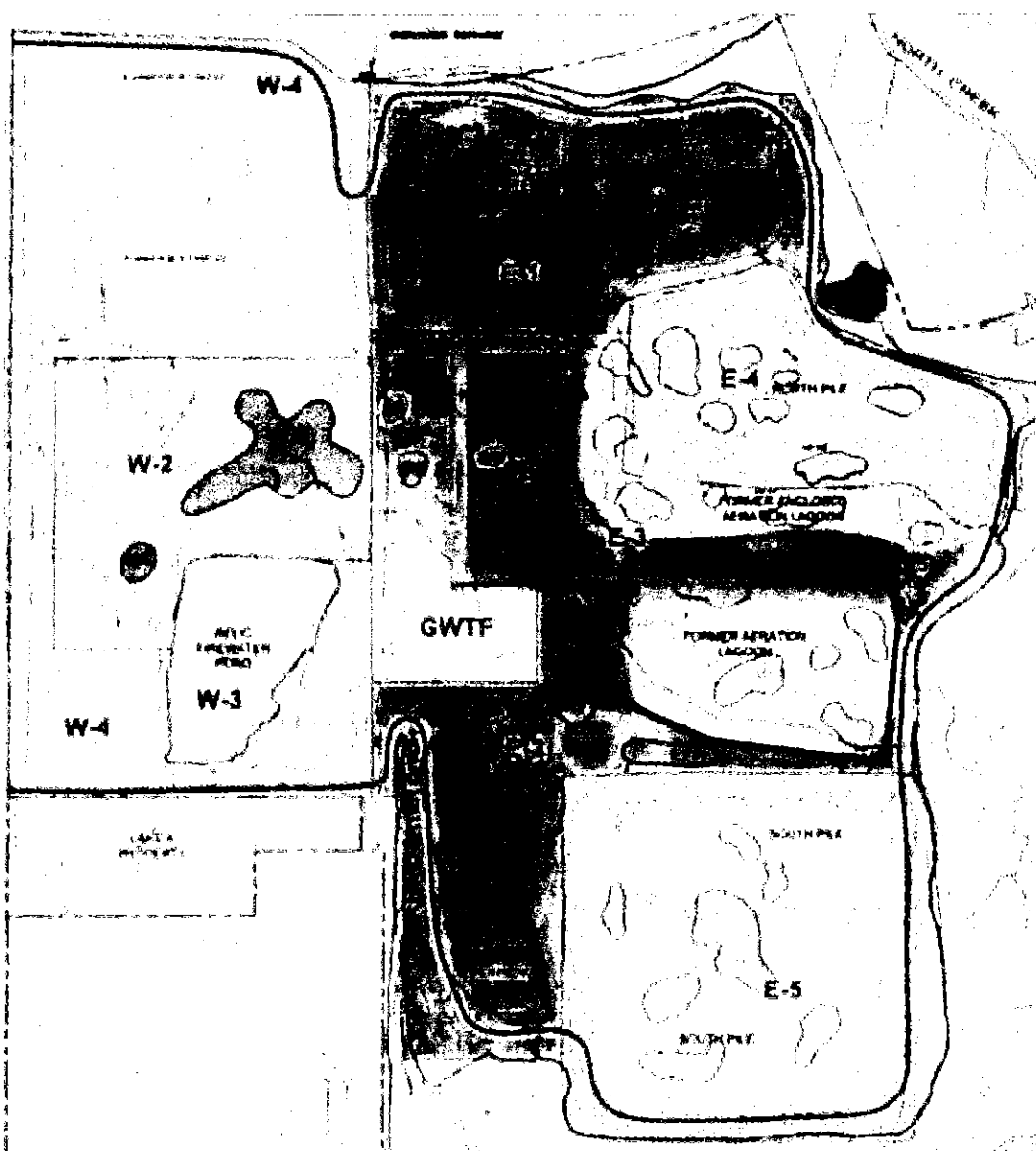
Pharmacia & Upjohn Company LLC ("Pharmacia & Upjohn") is engaged in remediation activities at the site. The site was the former location of The Upjohn Company, ("Upjohn") Fine Chemicals Division. When in operation, Upjohn was in the business of researching and manufacturing numerous types of chemicals, including: intermediates used in the dye, pigment, perfume, cosmetic, agriculture, and pharmaceutical industries; UV coatings; polyurethane elastomers; agricultural fungicides; photodeveloping chemicals; and liquid sunscreen agents. Operations ceased at the site in 1993 and in 1995, Upjohn was acquired by Pharmacia Corporation. In 2003, Pfizer Inc. ("Pfizer") acquired Pharmacia Corporation. In 2012, Pharmacia Corporation was converted to a limited liability corporation, known as Pharmacia LLC. Pharmacia & Upjohn Company LLC, which owns the site, is a subsidiary of Pharmacia LLC, and both entities are indirectly wholly-owned subsidiaries of Pfizer. For approximately the last twenty years, the property has been subject to extensive remedial and restoration work, including, among other things, the operation of a groundwater extraction system and groundwater treatment facility. The discharge from this system is the subject of NPDES permit CT0001341.

The former Upjohn site consisted of approximately 80 acres located along the Quinnipiac River in North Haven. When operational, the site address was 410 Sackett Point Road; the address now used is 41 Stiles Lane. Since the mid-1800s, the site has been occupied by various industries including, a clay mine and brick yard, a chemical manufacturer, and an electrical components manufacturer. In 1962, Upjohn began operating at the site manufacturing specialty and industrial chemicals. Wastewater from Upjohn's operations was treated on-site, using land-based treatment units, including aeration lagoons and a polishing lagoon. The treated wastewater from this system was discharged to the Quinnipiac River as authorized by NPDES Permit CT0001341. Wastewater treatment sludges from the system and other wastes were disposed of on-site in areas known as the North Pile and the South Pile. Upjohn also operated as an interim status hazardous waste facility under RCRA (CTD001168533), storing, treating, and disposing of hazardous wastes that it generated from its operations in numerous other areas around the site. Over time, the facility became contaminated through releases from these areas.

In 1989, EPA issued a RCRA Section 3013 order (RCRA Docket No. I-89-1101) to Upjohn finding that it had released hazardous waste from the site to the environment. The order required Upjohn to assess the nature and extent of contamination at the site. Under this order, site investigations were conducted and several interim remedial measures (IRMs) were undertaken including removing debris, decontaminating and removing structures, and pumping and treating contaminated groundwater. This order has now been closed. In 1994, EPA entered into a RCRA Section 3008(h) consent order (RCRA Docket No. I-94-1055) with Upjohn requiring it to continue to enhance IRMs, to further assess site risk, and to evaluate remedial alternatives. Pharmacia & Upjohn continued the work under this consent order that was begun by Upjohn and in 2010, it submitted a Corrective Measures Study (CMS) to EPA analyzing the clean-up options for the property. Among other things, the CMS evaluated remediation technologies and alternatives for the impacted groundwater at the site. The CMS alternatives combined all of the Areas of Concern (AECs) at the site into nine areas: four on the western side of the property (W-1, W-2, W-3, W-4) and five on the eastern side (E-1, E-2, E-3, E-4, E-5). The alternative selected as the final remedy provided for the following principal components: installation of a hydraulic control system; continued groundwater extraction, treatment, and monitoring; treatment of Dense Non-Aqueous Phase Liquid (DNAPL) using In-Situ Thermal Recovery (ISTR); removal of impacted soils from the site and impacted sediments from tidal flats; stabilization of the North and South piles; and enhancements to both the east and west sides of the site. In March 2011, Pharmacia & Upjohn entered into an updated RCRA Section 3008(h) consent order (RCRA Docket No.-01-2011-0027) with EPA requiring it to undertake Corrective Measures Implementation (CMI) consistent with the CMS option selected.

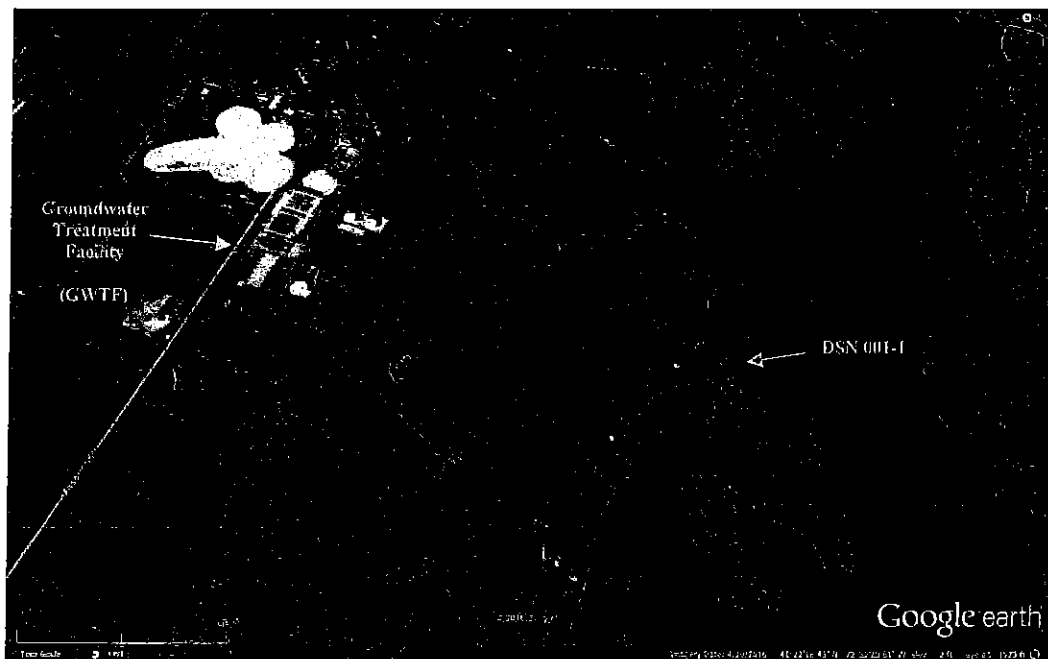
The remedial work performed to date under the 2011 consent order has resulted in changes to the sources, flows, and pollutant concentrations of the influent sent to the on-site Groundwater Treatment Facility (GWTF). A summary of the work is as follows:

- **Relic Firewater Pond (W-3):** In 2009/2010, the IRM associated with the Relic Firewater Pond was completed. When this project was underway, it generated "Fire Pond Water" (i.e., excess water that had accumulated in the pond), and "Fire Pond Consolidation Water" (i.e., pore water generated from consolidating the sediments in the pond). Since the project is now completed, both wastestreams can be removed from the permit.
- **Hydraulic Barrier Wall (HBW):** In 2013, a vertical hydraulic barrier wall was installed around the perimeter of the northern, eastern, and southern sections of the property. The wall confines the migration of impacted groundwater into the Quinnipiac River and into the North and South Creeks. The HBW has also cut off river water that contributed to groundwater flows during high tide. Since completion of the wall, the groundwater extraction system has been modified to maintain an inward hydraulic gradient, resulting in reduced groundwater flows to the GWTF.



- In-Situ Thermal Recovery (W-1): The highest concentration of contamination on-site was in an area known as the "Former Production Area" (AEC #28). The groundwater in this area was treated using In-Situ Thermal Recovery (ISTR), a process where thermal energy was used to volatilize organic contaminants in the groundwater. An ISTR pilot study was conducted for approximately seven months in 2012 followed by full-scale ISTR operations from May 2015 to February 2016. As a result of this project, loading into the GWTF has been reduced.
- East Side Remedial Actions (E-1, E-2, E-3, E-4 E-5): Remedial work on the east side included: installing a new cover system on the North Pile, consolidating and capping the South Pile and the Former Aeration Lagoon, constructing wetlands, installing a soil barrier cover in the E-1, E-2, and E-3 areas, and excavating sediment from the mudflats bordering the Quinnipiac River and from the South Creek. Completion of these projects has resulted in the elimination of some wastewaters that had been directed into the GWTF (e.g., South Pile consolidation water) and caused the redirection of others (i.e., stormwater runoff from the South Pile). Much of the site stormwater that had been directed into the GWTF is now directed to on-site wetlands. Additionally, the cover system installed on the East Side has reduced stormwater infiltration resulting in less wastewater being directed into the GWTF. East Side remedial actions were completed in 2014.
- West Side Remedial Actions (W-2 & W-4): The primary west side action was the ISTR project already noted. However, additional west side work consisted of the installation of a protective barrier cover system in the area, reducing infiltration. Completion of West Side work is expected in the next couple of years.

Groundwater at the site continues to be extracted and treated in the GWTF. Unit 1 wells, those wells that are located in historic fill and shallow sand, continue to be the main source of groundwater extracted; Unit 3 wells are expected to contribute much smaller flows than Unit 1 wells. Implementation of the CMIs have resulted in a reduction in the rate and loading of the influent into the GWTF and a corresponding reduction in effluent flow discharged into the Quinnipiac River via DSN 001-1. The number of extraction wells on-site has now been reduced from nineteen to seven. Currently, the groundwater is extracted from seven wells installed along the northern and eastern property boundary (PW-1R, PW-2RA, PW-4R, PW-9, PW-10, PW-16A, TPW-1N) and four extraction sumps associated within the groundwater collection trenches located on the southwestern and northwestern property boundaries (S1N, S2N, S2S, S1S). [See Attachment 1 for the site map.] Pollutant concentrations are highest at extraction wells in the southeastern portion of the site. Wastewater discharge flow rates have been reduced from 180,000 gallons per day (in 2010) to approximately 100,000 gallons per day, now. Due to the lower flows and loads, the permittee is proposing to redesign the GWTF.



As noted above, the majority of the wastewater that is treated in the on-site GWTF consists of extracted groundwater. Other wastestreams consist of those ancillary to the extraction and treatment operations, including sidestreams to the wastewater treatment system. A description of the wastewaters that comprise the DSN 001-1 effluent is as follows:

WASTESTREAM	DESCRIPTION
Contaminated Groundwater	Extracted groundwater from the Unit 1 and Unit 3 wells and from the site-wide groundwater collection trenches. Phosphoric acid may be added into the groundwater during well re-development operations.
Decontamination Station Wastewater	Municipal water used for decontamination of the drill rigs and other heavy equipment that comes into contact with contaminated soils at the site.
Excavation Dewatering Wastewater	Groundwater and stormwater collected from excavation trenches or from dewatering activities associated with remediation, construction, or maintenance activities.
Stormwater from Site Remediation and Maintenance Activities	Stormwater that comes into contact with impacted soil from activities associated with site remediation and maintenance.
Containment System Stormwater	Stormwater that collects in the secondary containment system associated with the WST and the Equalization Tanks. The stormwater collected is pumped directly into WST.
Floorwash Water	Wastewater generated from cleaning the floors of the GWTF.
Lab Sink Wastewaters	Wastewater generated from laboratory and sampling activities, including autosampler and grab sampler wastewater, spent wet chemistry wastewater, etc. These wastewaters are discharged into the lab sink which recycles into the FBR sump.
Air Compressor/Dryer Condensate	Condensate from the UV/Ox and the FBR air compressors and associated dryers are periodically blowdown and recycled into the FBR sump.
Pump Seal Water	Leaks of potable water used to seal the pumps are directed into the FBR sump for treatment
Tank Cleaning Wastewater	Municipal water used for cleaning and rinsing tanks as part of maintenance and repair activities within the GWTF.
Filter Backwash	The sand filters used in the wastewater treatment system (F228 or F238) are backwashed with city water.

Uncontaminated stormwater continues to be covered under the *General Permit for the Discharge of Stormwater Associated with Industrial Activity* (Registration GSI000143) with discharges to North Creek and South Creek. [See Attachment 2 for the site map].

VII. THE ON-SITE WASTEWATER COLLECTION/TREATMENT SYSTEM

As noted above, the permittee proposes to modify its wastewater collection/treatment system. The existing system is configured and operates as follows:

EXISTING SYSTEM: Groundwater from the site-wide extraction system is collected in a 207,000 gallon well surge tank (WST) for equalization. If necessary, equalization can also be provided by two additional tanks (T-101 and T-102), each with a nominal capacity of 115,000 gallons; wastewater from T-101 and T-102 is either directed to the WST or is routed directly into the treatment system. Wastewater is transferred from the WST via two influent pumps (P-103 and P-104) or from T-101 and T-102 via two influent pumps (P-101 and P-201) to a Fluidized Bed Reactor (FBR). The FBR is an attached-growth biological treatment system that uses granular activated carbon (GAC) as support media for the biomass. Flow to the FBR consists of a combination of influent wastewater, combined with recirculated/recycled effluent generated from the FBR; oxygen is fed up through the bottom of the reactor in order to keep the GAC fluidized. One FBR reactor is used; another serves as a standby. Wastewater treated in the FBR discharges either to the suspended solids removal system or alternatively to the UV/Ox (ultraviolet light/oxidation) treatment system. In the primary flow path, the FBR effluent is directed to a coagulation tank (T-202) where the wastewater is treated with polyaluminum chloride (PAC). Treated water from T-202 is then directed into a rapid mix chamber (T-203) where sodium hydroxide can be added, if necessary, to settle solids. Effluent from the rapid mix chamber discharges to the Inclined Plate Clarifier (IPC) by way of a flash mix tank (T-204) where flocculant (an anionic polymer) is added, then to the floc mix tank (T-205), and then to the settler (T-206), for gravity

settling of flocculated particles. [Solids generated from the IPC are periodically pumped into a sludge thickening tank. The resulting slurry (approximately 3%-7% solids) is periodically shipped off-site for disposal. A plate and frame filter press also exists on-site and can alternatively be used to dewater the sludge.] Clarified effluent from the IPC is conveyed by gravity to an upflow sand filter (F-228) for further particle removal and then discharges by gravity to a holding tank. A second parallel train, consisting of a flash mix tank, floc mix tank, IPC, and sand filter serves as backup. Wastewater from the sand filter flows to the UVOx system for treatment of organics. The wastewater is first dosed with hydrogen peroxide and then pumped into the UV/Ox reactor where the ultraviolet light in the reactor reacts with the hydrogen peroxide in the wastewater forming hydroxyl radicals that oxidize the organics in the wastewater. Each reactor train consists of four reactors in series, each containing a UV lamp with the number of lamps used proportional to the influent flow to the system. A second UV/Ox reactor train serves as a standby. Effluent from the UVOx reactor is then treated through a peroxide destruction unit (PDU), which consists of catalytically activated carbon that destroys the residual peroxide. Following treatment in the PDU, the effluent is sampled (at sample location "PT-4") and is then conveyed into the Quininiac River via a single 8-inch diameter side-wall pipe. This discharge is identified as DSN 001-1 in the permit. DSN 001-1 is a continuous discharge (24 hours per day, 7 days a week) with an average discharge flow of approximately 106,560 gallons per day (74 gpm). Design capacity is reported to be 252,000 gpd (175 gpm). The GWTF is staffed by Woodard & Curran 24 hours per day, 7 days per week, with an overall staff of six. One operator is a Class III and one is a Class I. Since the GWTF uses biological processes to treat its wastewater, the permittee is subject to the regulations at RCSA section 22a-416 concerning Wastewater Treatment Facility Operator Certification. The facility's existing rating is a Class II.

[See Attachment 3 for a schematic of the existing wastewater treatment system].

PROPOSED SYSTEM: The permittee intends to modify its existing wastewater collection/treatment system in this permit term. The modifications are to address the reduction in inflows to the GWTF brought about by recent site modifications, including the HBW and the East Side Remedial Actions, and to address the compliance schedule in the reissued permit. The details of the proposed system will be submitted in accordance with Section 10D of the permit.

VIII. EFFLUENT QUALITY DATA

See Attachment 4 for a summary of the influent (PT-3) data and Attachment 5 for a summary of the effluent (PT-4) data from November 2012 to November 2017.

IX. MONITORING/EFFLUENT VIOLATIONS

Based on a review of Pharmacia & Upjohn's DMRs from November 2012 to November 2017, the following violations of effluent limitations were noted:

MONTH/YEAR	DSN	PARAMETER VIOLATED	TYPE OF LIMIT	PERMITTED LIMIT	REPORTED VALUE
July 2014	001-1	2-Chloroaniline	Average Monthly	103 µg/L	130 µg/L
REASON: <input type="checkbox"/> Equipment Related <input type="checkbox"/> Operator Error <input checked="" type="checkbox"/> Other <input type="checkbox"/> Unknown					
The permittee indicated that there appeared to be a mix up with the sample bottles for the influent sample and the effluent sample. The sample thought to be the effluent sample was reanalyzed out of hold time and found to be within the permit limits.					

MONTH/YEAR	DSN	PARAMETER VIOLATED	TYPE OF LIMIT	PERMITTED LIMIT	REPORTED VALUE
June 2015	001-1	Bis(2-ethylhexyl)phthalate	Maximum Daily	11.8 µg/L	14 µg/L
REASON: <input type="checkbox"/> Equipment Related <input type="checkbox"/> Operator Error <input checked="" type="checkbox"/> Other <input type="checkbox"/> Unknown					
The lab results for bis(2-ethylhexyl)phthalate were reported as 14 µg/L. The sample was reextracted and reanalyzed out of hold time and results were non-detect for bis(2-ethylhexyl)phthalate.					

MONTH/YEAR	DSN	PARAMETER VIOLATED	TYPE OF LIMIT	PERMITTED LIMIT	REPORTED VALUE
March 2017	001-1	BOD ₅	Maximum Daily	30 mg/L	31 mg/L
REASON: <input type="checkbox"/> Equipment Related <input type="checkbox"/> Operator Error <input type="checkbox"/> Other <input checked="" type="checkbox"/> Unknown					
Unknown.					

MONTH/YEAR	DSN	PARAMETER VIOLATED	TYPE OF LIMIT	PERMITTED LIMIT	REPORTED VALUE
May 2017	001-1	2-Chloroaniline	Average Monthly Maximum Daily	103 µg/L 207 µg/L	382 µg/L 1900 µg/L
		Chlorobenzene	Maximum Daily	20 µg/L	51 µg/L
REASON: <input type="checkbox"/> Equipment Related <input type="checkbox"/> Operator Error <input checked="" type="checkbox"/> Other <input type="checkbox"/> Unknown					
An upset condition occurred in the GWTF's FBR. The upset reportedly occurred as a result of GWTF maintenance activities that occurred in April 2017, involving the emptying and cleaning of the PAC tank. The addition of the PAC-cleaning wastewaters to the FBR caused a phosphate deficiency in the wastewater, resulting in an inadequate food supply to the microorganisms in the FBR, impacting their performance. Phosphoric acid and additional GAC was added to the system. On May 20, 2017, the system was brought back into compliance.					

Based on a review of Pharmacia & Upjohn's DMRs from November 2012 to November 2017, the following monitoring/reporting violations were noted:

- **December 2012:** Failed to report weekly BOD₅ results for DSN 001-1. The samples were collected and sent to the lab, but the lab was unable to report the results for the BOD₅ sample due to the failure to add polyseed to the blank.
- **December 2013:** Quantification was not verified at or below the minimum level of 10 µg/L for total cyanide as required by Section 6(A)(4) of NPDES Permit CT0001341. Three values for December 10 and 11 were reported at 20 µg/L.
- **November 2015:** Failed to report weekly BOD₅ results for DSN 001-1. Specifically, no BOD₅ result was provided for one week of the month. The sample was collected and sent to the lab, but the lab was unable to report the results for the BOD₅ due to multiple QC failures associated with the sample batch.
- **September 2017:** Failed to report quantitation limit for total cyanide as required by Section 6(A)(6) of NPDES Permit CT0001341.

X. ENFORCEMENT (RELATED TO WASTEWATER DISCHARGES):

NOV WRIN17016 was issued to the permittee on July 31, 2017 for the March 2017 BOD₅ permit limit violation and the May 2017 Chlorobenzene and 2-Chloroaniline permit limit violations. The NOV was closed on August 24, 2017.

XI. SPILL HISTORY:

In March 2012, approximately 1,000 gallons of impacted groundwater was released from the collection system due to a loose pipe fitting. The spilled material emptied into a spill retention basin on-site. The contents of the spill retention basin were transferred into the GWTF for treatment authorized through an approval under RCSA section 22a-430-3(i).

XII. EFFLUENT GUIDELINES

Pharmacia & Upjohn is engaged in remediation activities at the site. These operations involve the following:

- Groundwater extraction activities generate contaminated groundwater. The contaminated groundwater at the site is a result of releases associated with Upjohn's operations. When Upjohn

was in operation, the discharge from its manufacturing operations was subject to: 40 CFR 455 (Pesticide Chemicals), 40 CFR 414 (Organic Chemicals, Plastics, and Synthetic Fibers), and 40 CFR 439 (Pharmaceutical Manufacturing). The provisions of these regulations are applicable to process wastewater discharges. Contaminated groundwater is not a process wastewater per 40 CFR 122.2 or 40 CFR 439.1(m). Manufacturing operations ceased in 1993 and presently none of the subject categoricals apply.

- Construction activities associated with the ongoing remediation operations can generate stormwater (e.g., excavation dewatering wastewater). These discharges have occurred intermittently beginning on or about 1993. Section 40 CFR 450 (Construction and Development Point Source Category) applies to discharges associated with construction activity required to obtain NPDES permit coverage pursuant to 40 CFR 122.26(b)(14)(x) and (b)(15)² (i.e., sites with one or more acres of land disturbance). The regulations at 40 CFR 450 were promulgated in 2009. To the extent that the permittee continues to engage in construction activities at the site that generate a discharge subject to 40 CFR 450, it shall comply with the applicable requirements for existing sources of this subpart.
- The North Pile and the South Pile were used for storage/treatment/disposal of wastes. These units were reportedly used for wastes associated with on-site operations only (i.e., they were operated as “captive” units). Closure of the North Pile and South Pile is now completed; the units were closed with waste in place. The wastewaters associated with these units no longer discharge into the GWTF as they have either been redirected (e.g., stormwater runoff) or have ceased being generated (e.g., South Pile pore consolidation water). Contaminated groundwater in the area of the North and South piles continues to be treated and discharged. Section 40 CFR 445 (Landfills) covers discharges of “landfill wastewater” to surface waters. It does not apply to waste piles or captive landfills. Therefore, 40 CFR 445 does not apply.

XIII. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. WASTESTREAMS AUTHORIZED FOR DISCHARGE UNDER DSN 001-1:

Treated: Contaminated Groundwater; Decontamination Station Wastewater; Excavation Dewatering Wastewater; Stormwater from Site Remediation and Maintenance Activities; Containment System Stormwater; Floorwash Wastewater; Laboratory Sink Wastewaters; Air Compressor/Dryer Condensate; Pump Seal Water; Tank Cleaning Wastewater; Filter Backwash

B. POLLUTANTS OF CONCERN FOR DSN 001-1:

The applicant has provided analyses on the influent to the groundwater treatment system from sampling point “PT-3” with its last three NPDES renewal applications. The PT-3 results are as follows:

PARAMETER	PT-3 RESULTS			
	DEC 2005/ FEB 2006 (µg/L)	MAR 2009 (µg/L)	DEC 2013/ JAN 2014 (µg/L)	JUNE 2017 (µg/L)
Aluminum, Total	14B	<88	872	11
Ammonia (Total as N)	3200			3240
Antimony, Total	<0.084		0.91J	0.7
Arsenic, Total	0.55B	2.0J	1.21	<1; <2
Cadmium, Total	<0.074		0.16J	0.2
Chloride	479000	339000		
Chlorine, Total Residual	28B			<20
Chromium, Total	9.1		2.88	5.8
Copper, Total	5.6		7.29	9
Cyanide, Total	<1	<5	7.5	5
Iron, Total	5300		6600	2910
Lead, Total	0.87B	<2.2	22.23	<0.4
Mercury, Total	<0.049	0.081J	<0.2	0.44B

² 40 CFR 122.26(b)(14)(x): Construction activity including clearing, grading and excavation, except operations that result in the disturbance of less than five acres of total land area. Construction activity also includes the disturbance of less than five acres of total land area that is a part of a larger common plan of development or sale if the larger common plan will ultimately disturb five acres or more; 40 CFR 122.26(b)(15): Storm water discharge associated with small construction activity.

PARAMETER	PT-3 RESULTS			
	DEC 2005/ FEB 2006 (µg/L)	MAR 2009 (µg/L)	DEC 2013/ JAN 2014 (µg/L)	JUNE 2017 (µg/L)
Nickel, Total	41.2		4.19	4.9
Selenium, Total	2B		1.49J	<0.2;<0.4
Silver	<0.31	<2.2	<1	0.1
Zinc, Total	17	<5.5	26.96	1.5
Benzene	900	890	2100	820
Chlorobenzene	180	223	480	350
Chloroethane	<0.80	1.6	<40	0.37
Chloroform	<0.7	<1	<30	<0.50
1,1-Dichloroethane	<0.60	0.57J	<30	1.5
1,2-Dichloroethane	<0.60	<1	<20	<0.50
1,1-Dichloroethylene	<0.7	<1	<20	0.56
Ethylbenzene	3.1J	5.8	12J	3.5
Methylbromide	<1.2	<1	<40	<0.5
Methylene chloride	<0.4	6.1	<120	<0.50
Tetrachloroethylene	<0.5	<1	<20	3.5
Toluene	97	24.6	670	3.4
1,2-trans-Dichloroethylene	<0.5	<1	<30	0.41
1,1,1-Trichloroethane	<0.4	<1	<20	0.37
Trichloroethylene	8.5J	0.55J	<20	4.3
Vinyl chloride	1.9J	0.53J	<40	4.7
2-Chlorophenol	9J	8.2	40J	<10;<20;<80
2,4-Dinitrophenol	<8	1.2J	<300	<100;<200<800
Pentachlorophenol	<50	<7.5	<150	<25;<50<200
Phenol	<4	7.0J	17J	<25;<50;<200
2,4,6-Trichlorophenol	<8	<7.5	<50	<25;<50;<200
Acenaphthene	<8	<0.094	<50	<10;<20;<80
Acenaphthylene	<8	<0.094	<50	<10;<20;<80
Anthracene	<10	<0.094	<50	<10;<20;<80
Benidine	<22	<24.5	99	<2;<10
Benzo(a)anthracene	<12	<0.094	<50	<10;<20;<80
3,4-Benzofluoranthene	<15	<0.094	<50	<10;<20;<80
Bis(2-Chloroethyl)ether	<6	1.0J	<50	<10;<20;<80
Bis(2-ethylhexyl)phthalate	<13	4.5	<50	<15;<30<120
Butylbenzyl phthalate	<10	<2.8	<50	<25;<50;<200
1,2-Dichlorobenzene	<7	3.1	30J	89
1,3-Dichlorobenzene	<7	<2.8	<50	4.2
1,4-Dichlorobenzene	<5	0.30J	<50	10
3,3'-Dichlorobenzidine	12J	7.7	46	13
Di-n-octyl phthalate	<13	<7.5	<50	<25;<50;<200
Fluoranthene	<11	<0.094	<50	<10;<20;<80
Fluorene	<8	<0.094	<50	<10;<20;<80
Naphthalene	<7	2.1	<50	<10;<20;<80
Phenanthrene	<7	<0.094	<50	<10;<20;<80
Pyrene	<10	<0.094	<50	<10;<20;<80
1,2,4-Trichlorobenzene	<7	<2.8	<50	<25;<50;<200
Aroclor 1016	<0.057	<0.94		<0.047
Aroclor 1221	<0.11	<0.94		<0.047
Aroclor 1232	<0.081	<0.94		<0.047
Aroclor 1242	<0.072	<0.94		<0.047
Aroclor 1248	<0.060	<0.94		<0.047
Aroclor 1254	<0.094	<0.94		0.18
Aroclor 1260	<0.082	<0.94		<0.047
1-Chloro-2-nitrobenzene	<21	<7.5	<50	<25;<50;<200
1-Methylnaphthalene	<31	<1.4	<20	<10;<20;<80
1,4-Dioxane	930	409	1260	328
2-Chloroaniline	6800	5260	24000	6300
3-Chloroaniline	26J	14	55J	13J
4-Chloroaniline	66J	49.7	180	63
3,3'-Dimethylbenzidine	39J	6.2J	120	6.9J
Aniline	23J	27	120	41
Azobenzene	<8	<2.8	<50	8.2J
Benzoic Acid	<59R	<28.3	<500	<250;<500;<2000
Carbazole	<11	150	<50	570
Carbon disulfide	<0.9	<1	31J	<5
cis-1,2-Dichloroethene	3.6J	0.80J	<20	13
m,p-Cresol	<3	<7.5	13J	<25;<50;<200
o-Cresol	<6	0.69J	10J	<25;<50;<200

PARAMETER	PT-3 RESULTS			
	DEC 2005/ FEB 2006 (µg/L)	MAR 2009 (µg/L)	DEC 2013/ JAN 2014 (µg/L)	JUNE 2017 (µg/L)
Cyclohexane	<0.3	<1	<400	
Dibenzofuran	<8	<2.8	<50	<10;<20;<80
Dichloran	<12	<8.5	<70	<25;<50;<200
Dinitrobenzene (1,3)	<33		<20	<10;<20;<80
Diphenamid	300	231	920	350
Formaldehyde	19J	0.86J		25
m-Toluidine	37J	30.9	190	<50;<100;<400
Methyl tert butyl ether	2.2J	1.6J	<50	0.96
Xylene (Total)	4.6J	4.1	17J	1 (o-); 1.5 (m;-p-)

NOTES:

J= Estimated value.

B=A result greater than or equal to the MDL, but less than the RL

R= Rejected

Several pollutants have been identified as "Known or Suspected Present" in the permit application. Sources used to identify these pollutants include: the DMR data, PT-3 data, groundwater monitoring data from the individual wells, as well as an evaluation of whether any Technology-Based Effluent Limits (TBEL) in an Effluent Limitation Guideline (ELG) or whether a wasteload allocation in a Total Maximum Daily Load (TMDL) would apply to the discharge. A summary of these pollutants is as follows:

POLLUTANT	REASON FOR INCLUSION			
	POLLUTANT WITH AN APPLICABLE TBEL	POLLUTANT WITH AN APPLICABLE TMDL	POLLUTANT IDENTIFIED AS PRESENT IN THE EFFLUENT THROUGH SAMPLING	POLLUTANT OTHERWISE EXPECTED TO BE PRESENT IN THE EFFLUENT
1-Chloro-2-nitrobenzene			✓	
1,1-Dichloroethane			✓	
1,1-Dichloroethylene				✓
1,1,1-Trichloroethane				✓
1,2-Dichlorobenzene			✓	
1,2-Dichloroethane			✓	
1,2-trans-Dichloroethylene				✓
1,2,4-Trichlorobenzene				
1,3-Dichlorobenzene				✓
1,4-Dichlorobenzene			✓	
1,4-Dioxane			✓	
2-Chloroaniline			✓	
2-Chlorophenol			✓	
2-Methylphenol				✓
2,4-Dichlorophenol				✓
2,4-Dimethylphenol				✓
2,4,6-Trichlorophenol				✓
3-Chloroaniline			✓	
3,4-Benzofluoranthene				✓
3&4-Methylphenol				✓
3,3'-Dichlorobenzidine				✓
3,3'-Dimethylbenzidine				✓
4-Chloroaniline			✓	
Acenaphthene				✓
Acenaphthylene				✓
Anthracene				✓
Aluminum, Total			✓	
Ammonia (as N)			✓	
Aniline				✓
Antimony, Total				✓
Arsenic, Total				✓
Azobenzene			✓	
Benzene			✓	
Benzidine				✓
Benzo(a)anthracene				✓
Benzo(a)pyrene				✓
Benzoic Acid				✓
Bis(2-chloroethyl)ether				✓
Bis(2-ethylhexyl)phthalate			✓	

POLLUTANT	REASON FOR INCLUSION			
	POLLUTANT WITH AN APPLICABLE TBEL	POLLUTANT WITH AN APPLICABLE TMDL	POLLUTANT IDENTIFIED AS PRESENT IN THE EFFLUENT THROUGH SAMPLING	POLLUTANT OTHERWISE EXPECTED TO BE PRESENT IN THE EFFLUENT
Biochemical Oxygen Demand, 5 Day (BOD ₅)			✓	
Cadmium, Total				✓
Carbazole				✓
Carbon Disulfide				✓
Chloride				✓
Chlorine, Total Residual				✓
Chlorobenzene			✓	
Chloroethane				✓
Chloroform			✓	
Chromium, Total			✓	
Chrysene				✓
cis-1,2-Dichloroethene			✓	
Copper, Total			✓	
Cyanide, Total			✓	
Dibenzofuran				✓
Dichloran			✓	
Diphenamid				✓
Ethylbenzene				✓
Fluoranthene				✓
Fluorene				✓
Formaldehyde			✓	
Iron, Total			✓	
Kjeldahl Nitrogen, Total			✓	
Lead, Total				✓
m-Toluidine				✓
Mercury, Total			✓	
Methyl bromide			✓	
Methylene chloride				✓
Methyl tert butyl ether				✓
Naphthalene				✓
Nickel, Total			✓	
Nitrate (as N)			✓	
Nitrite (as N)			✓	
Nitrobenzene			✓	
Nitrogen, Total		✓	✓	
Organic Nitrogen			✓	
Oxygen, Dissolved			✓	
PCBs			✓	
pH			✓	
Phenanthrene				✓
Phenol			✓	
Phosphorus, Total			✓	
Pyrene				✓
Silver, Total				✓
Sulfide			✓	
Tetrachloroethylene				✓
Toluene			✓	
Trichloroethylene				✓
Total Suspended Solids (TSS)			✓	
Xylenes, Total				✓
Vanadium, Total			✓	
Vinyl chloride				✓
Zinc, Total			✓	

C. BASIS FOR DSN 001-1 LIMITS:

Technology and water-quality based requirements are considered when developing permit limitations. Technology-based treatment requirements represent the minimum level of control that must be imposed under CWA. Technology-based effluent limitation guidelines (ELGs) are found at 40 CFR 405-471. Water-quality based limits are required when any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) is or may be discharged at a level that causes, has reasonable potential to cause, or contributes to an excursion

above any water quality criteria. The excursion occurs if the projected/actual in-stream concentrations exceed the applicable criteria. State numeric criteria is found in the *Connecticut Water Quality Standards (WQS)*, at RCSA sections 22a-426-1 to 22a-426-9, effective October 10, 2013.

i. TECHNOLOGY-BASED LIMITS FOR DSN 001-1:

The requirements at 40 CFR 450 are narrative, not numeric. These are included in the permit.

ii. MIXING ZONE FOR DSN 001-1:

A mixing zone was allocated and used, where applicable, to determine water-quality based limits. See Attachment 6 for details on the mixing zone.

iii. WATER QUALITY-BASED LIMITS FOR DSN 001-1:

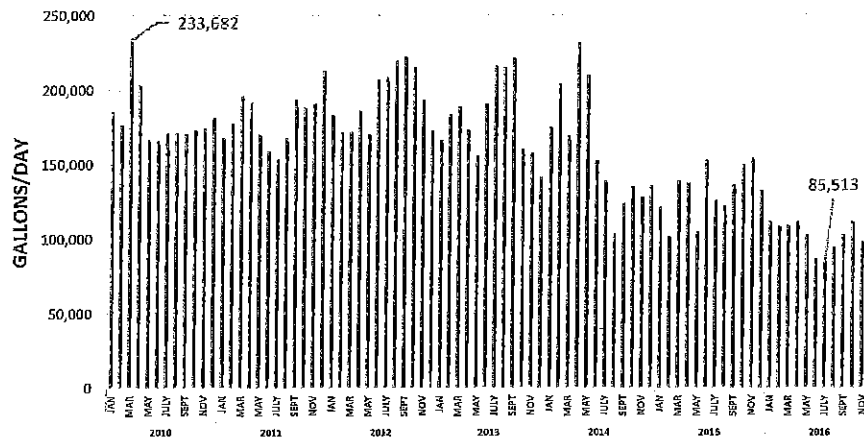
A reasonable potential analysis was conducted for the parameters known or suspected to be present in the discharge and which were detected in the effluent based on the last five years of DMR data. See Attachment 7 for information on the reasonable potential analysis. Attachment 7 contains the following information: the results of the reasonable potential analysis (page 1-2); permit limits for those pollutants that have reasonable potential (pages 3-4); data sets used in the analysis (pages 5-19); additional criteria (pages 20-38); metals translator information for copper (pages 39-40); background receiving water information (pages 41-42); and a summary of the equations used in the calculations (pages 43-44).

The analysis conducted indicates that reasonable potential exists for: 1-chloro-2-nitrobenzene, 1,4-dioxane, 2-chloroaniline, 4-chloroaniline, aluminum, ammonia, azobenzene, benzene, bis(2-ethylhexyl)phthalate, copper, cyanide, and PCBs to exceed the applicable water quality criteria. Therefore, the permit will include water quality-based limits for these parameters.

iv. OTHER DSN 001-1 PARAMETERS:

FLOW: DSN 001-1 is a continuous discharge. From 2010 to 2016, the long-term average flow for DSN 001-1 was 188,646 gpd. However, the flow has been reduced during the term of this permit. Proposed flows during this permit term are: 106,560 gpd (average monthly) and 252,000 gpd (maximum daily), based on the design flow of the treatment system. A summary of the flows from 2010 to 2016 is as follows:

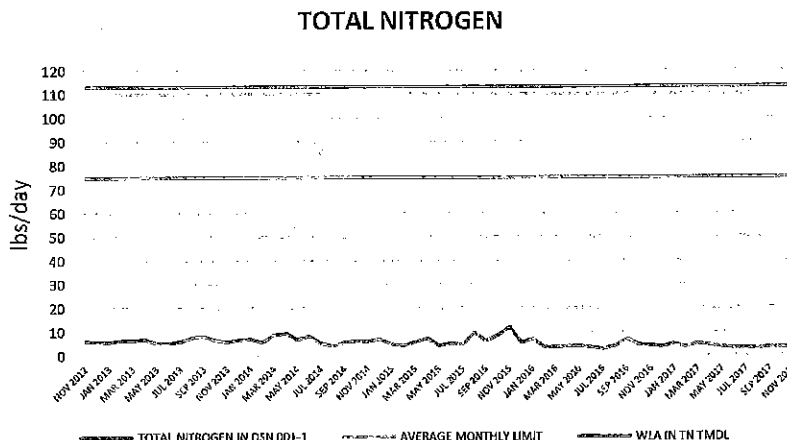
**DSN 001-1 AVERAGE MONTHLY FLOWS
(2010-2016)**



TOTAL NITROGEN: The TMDL *A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound*, December 2000 ("TN

TMDL”) addresses hypoxia conditions in Long Island Sound by assigning total nitrogen wasteload allocations to various POTWs and industries located in Connecticut and New York. In that TMDL, Upjohn is identified as a Zone 3 facility with a total nitrogen wasteload allocation of 113 lbs/day. Converting the single wasteload allocation (WLA) into a longterm average (LTA), and then into an average monthly limit (AML) is as follows:

$LTA_n = WLA * e^{[0.5\sigma_n^2 - z\sigma_n]}$ $LTA = 113 * 0.527$ $LTA = 59.55 \text{ lbs/day}$	$AML = LTA * e^{[z\sigma_n - 0.5\sigma_n^2]}$ $AML = 59.55 * 1.26$ $AML = 75.0 \text{ lbs/day}$
[The value for the WLA multiplier ($e^{[0.5\sigma_n^2 - z\sigma_n]}$) was determined from Table 5-1 in the TSD. A coefficient of variance (CV) of 0.3 was determined from the dataset; the 99 th percentile occurrence probability is recommended for the LTA. This results in a WLA multiplier of 0.527.]	[The value for the LTA multiplier ($e^{[z\sigma_n - 0.5\sigma_n^2]}$) was determined from Table 5-2 in the TSD. A CV of 0.3 and n=4 was used; the 95 th percentile occurrence probability was used for the AML. This results in a LTA multiplier of 1.26.]



TOTAL PHOSPHORUS: The Department currently has an interim strategy to manage total phosphorus until final numeric criteria is developed. This interim strategy is for freshwater non-tidal streams. DSN 001-1 does not discharge into a non-tidal stream and therefore no interim criteria is applicable.

BOD₅ & TSS: BOD₅ and TSS have been included in the permit with BPJ limits since 2007. These limits will continue to be: BOD₅: 20 mg/L and 8.07 kg/day (average monthly); 30 mg/L and 12.1 kg/day (maximum daily); 45 mg/L (instantaneous); and TSS: 30 mg/L and 12.1 kg/day (average monthly) 60 mg/L and 24.2 kg/day (maximum daily), and 90 mg/L (instantaneous).

pH: The WQS specify that for Class B waters the pH criteria is in the range of 6.5 to 8.0 SU.

D. SUMMARY OF LIMITS FOR DSN 001-1:

Below is a summary of the applicable limits for each of the subject parameters. If more than one limit applies to a parameter, the most stringent limit is included in the permit.

PARAMETER	UNITS	LIMITS					
		TECHNOLOGY		WATER QUALITY		BPJ	
		RCSA 22a-430-4(f)(4)(A)(i)-(iv) 40 CFR 122.44(a)(1) 40 CFR 450, July 1, 2017		RCSA 22a-430(f)(4)(A)(s) 40 CFR 122.44(f)(1)(ii) <i>(Water Quality Standards, October 10, 2013)</i> RCSA 22a-426-1 to 22a-426-9		RCSA 22a-130-4(f)(4)(A)(ii) RCSA 22a-130-4(m)	
		AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum
1-Chloro-2-nitrobenzene	µg/L	---	---	10.2	17.7	---	---
1-Chloro-2-nitrobenzene	g/day	---	---	4.1	7.1	---	---
1,1-Dichloroethane	µg/L	---	---	---	---	---	---

PARAMETER	UNITS	LIMITS					
		TECHNOLOGY		WATER QUALITY		BPJ	
		RCSA 22a-430-4(f)(4)(A)(i)-(vii) 40 CFR 122.44(a)(1)		RCSA 22a-430(f)(4)(A)(v) 40 CFR 122.44(a)(1)(ii) <i>(Water Quality Standards, October 10, 2013)</i> RCSA 22a-426-1 to 22a-426-9		RCSA 22a-430-4(f)(4)(A)(ii) RCSA 22a-430-4(m)	
		AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum
1,1-Dichloroethylene	µg/L	---	---	---	---	---	---
1,1,1-Trichloroethane	µg/L	---	---	---	---	---	---
1,2-Dichlorobenzene	µg/L	---	---	---	---	---	---
1,2-Dichloroethane	µg/L	---	---	---	---	---	---
1,2,-trans-Dichloroethylene	µg/L	---	---	---	---	---	---
1,2,4-Trichlorobenzene	µg/L	---	---	---	---	---	---
1,3-Dichlorobenzene	µg/L	---	---	---	---	---	---
1,4-Dichlorobenzene	µg/L	---	---	---	---	---	---
1,4-Dioxane	µg/L	---	---	43.3	75.0	---	---
1,4-Dioxane	g/day	---	---	17.5	30.3	---	---
2-Chloroaniline	µg/L	---	---	37.1	64.3	---	---
2-Chloroaniline	g/day	---	---	15.0	26.0	---	---
2-Chlorophenol	µg/L	---	---	---	---	---	---
2-Methylphenol	µg/L	---	---	---	---	---	---
2,4-Dichlorophenol	µg/L	---	---	---	---	---	---
2,4-Dimethylphenol	µg/L	---	---	---	---	---	---
2,4,6-Trichlorophenol	µg/L	---	---	---	---	---	---
3-Chloroaniline	µg/L	---	---	---	---	---	---
3,4-Benzofluoranthene	µg/L	---	---	---	---	---	---
3-Methylphenol/4-Methylphenol	µg/L	---	---	---	---	---	---
3,3'-Dichlorobenzidine	µg/L	---	---	---	---	---	---
3,3'-Dimethylbenzidine	µg/L	---	---	---	---	---	---
4-Chloroaniline	µg/L	---	---	2.83	4.90	---	---
4-Chloroaniline	g/day	---	---	1.1	2.0	---	---
Acenaphthene	µg/L	---	---	---	---	---	---
Acenaphthylene	µg/L	---	---	---	---	---	---
Anthracene	µg/L	---	---	---	---	---	---
Aluminum, Total	µg/L	---	---	83.9	136	---	---
Aluminum, Total	g/day	---	---	33.8	54.8	---	---
Ammonia (as N) [Apr 1 - Oct 31]	mg/L	---	---	0.902	1.745	---	---
Ammonia (as N) [Apr 1 - Oct 31]	g/day	---	---	364	705	---	---
Ammonia (as N) [Nov 1 - Mar 31]	mg/L	---	---	---	---	---	---
Aniline	µg/L	---	---	---	---	---	---
Antimony, Total	µg/L	---	---	---	---	---	---
Arsenic, Total	µg/L	---	---	---	---	---	---
Azobenzene	µg/L	---	---	0.20	0.35	---	---
Azobenzene	g/day	---	---	0.08	0.14	---	---
Benzene	µg/L	---	---	51	88.4	---	---
Benzene	g/day	---	---	20.6	35.7	---	---
Benzidine	µg/L	---	---	---	---	---	---
Benzo(a)anthracene	µg/L	---	---	---	---	---	---
Benzo(a)pyrene	µg/L	---	---	---	---	---	---
Benzoic Acid	µg/L	---	---	---	---	---	---
Biochemical Oxygen Demand	mg/L	---	---	---	---	20	30
Biochemical Oxygen Demand	g/day	---	---	---	---	8.07	12.1
Bis(2-chloroethyl)ether	µg/L	---	---	---	---	---	---
Bis(2-ethylhexyl)phthalate	µg/L	---	---	2.2	3.8	---	---
Bis(2-ethylhexyl)phthalate	g/day	---	---	0.89	1.54	---	---
Cadmium, Total	µg/L	---	---	---	---	---	---
Carbazole	µg/L	---	---	---	---	---	---
Carbon Disulfide	µg/L	---	---	---	---	---	---
Chlorine, Total Residual	µg/L	---	---	---	---	---	---
Chlorobenzene	µg/L	---	---	---	---	---	---
Chloroethane	µg/L	---	---	---	---	---	---
Chloroform	µg/L	---	---	---	---	---	---
Chloride	mg/L	---	---	---	---	---	---
Chromium, Total	µg/L	---	---	---	---	---	---
Chrysene	µg/L	---	---	---	---	---	---
cis-1,2-Dichloroethene	µg/L	---	---	---	---	---	---
Copper, Total	µg/L	---	---	5.5	9.6	---	---

PARAMETER	UNITS	LIMITS					
		TECHNOLOGY		WATER QUALITY		BPJ	
		RCSA 22a-430-4(j)(4)(A)(i)-(vii) 40 CFR 122.44(a)(1)		RCSA 22a-430(j)(4)(A)(x) 40 CFR 122.44(d)(1)(ii) <i>(Water Quality Standards, October 10, 2013)</i> RCSA 22a-426-1 to 22a-426-9		RCSA 22a-430-4(j)(4)(A)(x) RCSA 22a-430-4(m)	
		AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum	AVERAGE MONTHLY LIMIT OR pH Minimum	MAXIMUM DAILY LIMIT OR pH Maximum
Copper, Total	g/day	---	---	2.2	3.9	---	---
Cyanide, Total	µg/L	---	---	0.58	1.0	---	---
Cyanide, Total	g/day	---	---	0.23	0.40	---	---
Dibenzofuran	µg/L	---	---	---	---	---	---
Dichloran	µg/L	---	---	---	---	---	---
Diphenamid	µg/L	---	---	---	---	---	---
Ethylbenzene	µg/L	---	---	---	---	---	---
Fluoranthene	µg/L	---	---	---	---	---	---
Fluorene	µg/L	---	---	---	---	---	---
Formaldehyde	µg/L	---	---	---	---	---	---
Iron, Total	µg/L	---	---	---	---	---	---
Kjeldahl Nitrogen, Total (as N)	mg/L	---	---	---	---	---	---
Lead, Total	µg/L	---	---	---	---	---	---
m-Toluidine	µg/L	---	---	---	---	---	---
Mercury, Total	µg/L	---	---	---	---	---	---
Methyl bromide	µg/L	---	---	---	---	---	---
Methylene chloride	µg/L	---	---	---	---	---	---
Methyl tert butyl ether	µg/L	---	---	---	---	---	---
Naphthalene	µg/L	---	---	---	---	---	---
Nickel, Total	µg/L	---	---	---	---	---	---
Nitrate (as N)	mg/L	---	---	---	---	---	---
Nitrite (as N)	mg/L	---	---	---	---	---	---
Nitrobenzene	µg/L	---	---	---	---	---	---
Nitrogen, Total	lbs/day	---	---	75.0	---	---	---
Organic Nitrogen (as N)	mg/L	---	---	---	---	---	---
Oxygen, Dissolved	mg/L	---	---	---	---	---	---
PCB – Total Aroclors	µg/L	---	---	0.000064	0.000111	---	---
PCB – Total Aroclors	g/day	---	---	0.000026	0.000045	---	---
pH	SU	---	---	6.5	8.0	---	---
Phenanthrene	µg/L	---	---	---	---	---	---
Phenol	µg/L	---	---	---	---	---	---
Phosphorus, Total	mg/L	---	---	---	---	---	---
Pyrene	µg/L	---	---	---	---	---	---
Silver, Total	µg/L	---	---	---	---	---	---
Sulfide	mg/L	---	---	---	---	---	---
Tetrachloroethylene	µg/L	---	---	---	---	---	---
Toluene	µg/L	---	---	---	---	---	---
Total Suspended Solids	mg/L	---	---	---	---	30	60
Total Suspended Solids	g/day	---	---	---	---	12.1	24.2
Trichloroethylene	µg/L	---	---	---	---	---	---
Xylenes, Total	µg/L	---	---	---	---	---	---
Vanadium, Total	µg/L	---	---	---	---	---	---
Vinyl chloride	µg/L	---	---	---	---	---	---
Zinc, Total	µg/L	---	---	---	---	---	---

NOTES:

1) The TBELs for 40 CFR 450 are narrative.

2) As applicable, instantaneous limits are also included in the permit. These limits are 1.5 times the maximum daily limit.

E. WHOLE EFFLUENT TOXICITY:

Pharmacia's existing permit requires quarterly acute and chronic toxicity testing of DSN 001-1 using *Mysidopsis bahia*, now known as *Americamysis bahia*, and *Cyprinodon variegatus*. Results of the toxicity testing conducted from March 2012 to June 2017 are as follows:

	ACUTE (48 HOURS)		CHRONIC (Laboratory water used for dilution) (7 DAYS)						
	<i>Mysidopsis bahia</i>	<i>Cyprinodon variegatus</i>	<i>Mysidopsis bahia</i>				<i>Cyprinodon variegatus</i>		
	LC ₅₀	LC ₅₀	SURVIVAL LC ₅₀	SURVIVAL C-NOEC	GROWTH C-NOEC	REPRODUCTION C-NOEC	SURVIVAL LC ₅₀	SURVIVAL C-NOEC	GROWTH C-NOEC
	%	%	%	%	%	%	%	%	%
MAR 2012	>100	>100	>100	100	100	100	>100	100	100
JUN 2012	>100	>100	>100	100	100	10	>100	100	100
SEP 2012	>100	>100	>100	100	100	100	>100	100	100
DEC 2012	>100	>100	>100	100	100	100	>100	100	100
MAR 2013	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
JUN 2013	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
SEP 2013	>100	>100	>100	100	100	100	>100	100	100
DEC 2013	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
MAR 2014	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
JUN 2014	>100	>100	>100	100	20	NOT ESTIMATED ¹	>100	100	100
SEP 2014	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
DEC 2014	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
MAR 2015	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
JUN 2015	>100	>100	>100	100	100	100	>100	100	100
SEP 2015	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
DEC 2015	>100	>100	>100	100	100	100	>100	100	10
MAR 2016	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
JUN 2016	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
SEP 2016	>100	>100	>100	100	100	100	>100	100	80
DEC 2016	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
MAR 2017	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100
JUN 2017	>100	>100	>100	100	100	NOT ESTIMATED ¹	>100	100	100

¹ Control did not meet test criteria of ≥ 50% fecundity rate.

Based on the toxicity testing performed from March 2012 until June 2017, there is reasonable potential that the discharge could contribute to an excursion beyond that described in RCSA section 22a-426-4(a)(5) of the WQS. [See Attachment 8 for the reasonable potential analysis.] Therefore, consistent with 40 CFR 122.44(d)(1)(iv), a limitation on chronic toxicity for those conditions where reasonable potential exists (i.e., growth for *Cyprinodon variegatus* and reproduction for *Americamysis bahia*) is included in the permit.

RCRA Section 22a-430-3(j)(7)(A)(iii) states that: Test species to be used to determine the (acute) toxicity of a discharge shall be determined according to the following:

- (a) For discharges to fresh receiving waters exhibiting a normal salinity of 1 ppt or less, *Pimephales promelas* and *Daphnia pulex* shall be used;
- (b) For discharges to estuarine waters exhibiting a normal salinity of between 1 ppt and 20 ppt, species selection shall be determined by the commissioner on a case-by-case basis;
- (c) For discharges to marine waters exhibiting a normal salinity greater than 20 ppt, *Cyprinodon variegatus* and *Mysidopsis bahia* shall be used.

Additionally, the *Technical Support Document For Water Quality-based Toxics Control* (“TSD”) recommends that freshwater organisms be used when the receiving water salinity is less than 1,000 mg/l, and that marine organisms be used when the receiving water salinity equals or exceeds 1,000 mg/l. Limited data exists regarding the salinity of the receiving stream in the vicinity of the discharge. However, this data indicates that the salinity range is from 1 ppt to 5 ppt. Given this, the existing test species will continue to be used. Quinnipiac River water will be used as the dilution water.

F. MONITORING FREQUENCY

RCSA section 22a-430-3(j) states that the minimum frequency to determine compliance with effluent limits is specified in the *Monitoring Schedule* set forth in RCSA section 22a-430-3, unless

a more frequent monitoring schedule is warranted. The *Monitoring Schedule* prescribes a frequency of monthly for DSN 001-1 based on the category of discharge (“Groundwater Contamination Recovery Systems”). There have been some changes/new information provided in the permit application (e.g., sufficiently sensitive analytical data, background receiving water data) that have resulted in permit limits on certain parameters that have not previously been limited. Compliance with these limits for the most part is not clear. Therefore, these pollutants shall be monitored on a twice/monthly basis to ensure the ability to consistently comply with the limits. Monitoring for other parameters is based on the frequency that the pollutant is expected to be in the discharge. Sampling frequency for aquatic toxicity is found at RCSA sections 22a-430-3(j)(3) and (4). Subsection 4 of that section permits a frequency other than quarterly if the toxicity is relatively consistent. The toxicity of the effluent is generally consistent; the frequency of monitoring for toxicity will now be semi-annual.

G. EXPRESSION OF EFFLUENT LIMITATIONS

DSN 001-1 is a continuous discharge. Therefore, the permit limits are expressed as average monthly and maximum daily (per RCSA section 22a-430-4(l)(4)(A)(xiii)). Limits based on water quality are expressed as both mass and concentration, where appropriate, consistent with 40 CFR 122.45(f)(1) and the TSD (Section 5.7.1). Total nitrogen is expressed only in the units of measure that its WLA is expressed in.

XIV. SUFFICIENTLY SENSITIVE METHODS

The regulations at 40 CFR 122.44(i)(1)(iv)(A) now require that monitoring requirements under a permit must be performed using sufficiently-sensitive test methods approved under 40 CFR part 136 for those monitoring parameters that have approved test methods or those parameters that are required under 40 CFR chapter I, subchapter N or O. As noted in the regulation, “sufficiently sensitive” means when: (1) The method minimum level (ML) is at or below the level of the effluent limit established in the permit for the measured pollutant or pollutant parameter; or (2) The method has the lowest ML of the analytical methods approved under 40 CFR part 136 or required under 40 CFR chapter I, subchapter N or O for the measured pollutant or pollutant parameter. For those pollutants that do not have any approved methods under 40 CFR 136, 40 CFR 122.44(i)(1)(iv)(B) now states that monitoring shall be conducted according to a test procedure specified in the permit for such pollutants or pollutant parameters.

- For those pollutants in the permit that have 40 CFR 136-approved methods, the permittee provided sufficiently-sensitive test data with its application (per 40 CFR 122.21(e)(3)(i)). The MLs reported with this application data have been incorporated into the permit.
- For those pollutants in the permit that do not have 40 CFR 136-approved methods, the permittee provided test data with its application as specified in 40 CFR 122.21(e)(3)(ii). Section 6B of the permit includes those test procedures; Table A of the permit includes the corresponding MLs.
 - The majority of the non-approved pollutants will be analyzed by modifying either EPA Method 624 or 625 to include analysis of the subject pollutant.
 - Formaldehyde has no approved method(s) in 40 CFR 136. Table I-F in 40 CFR 136 allows the use of EPA Method 1667 for certain pharmaceutical pollutants. EPA Method 1667 can be used to analyze formaldehyde. EPA’s website indicates that industry-specific methods that are approved for compliance monitoring in the industry for which they are designated may be used for general use, if the same method is listed in Tables I-A to I-E, or I-H at 40 CFR 136.3. <https://www.epa.gov/cwa-methods/approved-industry-specific-cwa-test-methods>. Method 1667 is not listed in the referenced tables. There appear to be no other CWA test methods suitable for formaldehyde. Therefore, formaldehyde will be analyzed by Method 1667.
 - Dichloran has approved methods under 40 CFR 136, (i.e., Method 608.2, Method 617, Method 6630 B, etc.). However, the permittee indicates that it cannot locate a lab that can perform these methods. Therefore, dichloran is included in the list of non-approved pollutants in Section 6B.

- Benzidine and 3,3'-dichlorobenzidine were analyzed for application completeness using EPA Method 605. However, the permittee now indicates that the only laboratory that it was able to locate which could conduct Method 605 no longer performs this analysis. Therefore, these two pollutants will be analyzed in the permit using EPA Method 625.

XV. ANTI-BACKSLIDING

An anti-backsliding analysis was conducted on the final effluent limitations in the proposed permit and compared to the existing permit. See Attachment 9.

XVI. ANTIDegradation

The renewed permit does not include any new or expanded discharges.

XVII. SPECIAL CONDITIONS/COMPLIANCE SCHEDULE

1. Instream data is required in order to convert dissolved metals to the total form. Some instream data exists, but it needs to be updated. The permittee will undertake a study to collect updated data in order to develop the metals translator necessary to convert the dissolved metals. RCSA section 22a-430-4(D)(4)(F) allows the commissioner to include any condition in a permit which he or she deems reasonably necessary to ensure compliance with chapter 446k of the Connecticut General Statutes and regulations adopted thereunder as amended, to ensure that his or her actions are consistent with the CWA and to ensure proper operation of a treatment facility or any other part thereof. This condition is added in accordance with that provision. This requirement is included in Section 10A of the permit.

2. The permittee indicates that it cannot locate a laboratory that performs EPA Method 605 or EPA Method 617. For the term of this permit, the permittee shall make best efforts every six months to locate a laboratory that can perform these methods. RCSA section 22a-430-4(D)(4)(F) allows the commissioner to include any condition in a permit which he or she deems reasonably necessary to ensure compliance with chapter 446k of the Connecticut General Statutes and regulations adopted thereunder as amended, to ensure that his or her actions are consistent with the CWA and to ensure proper operation of a treatment facility or any other part thereof. This condition is added in accordance with that provision. This requirement is included in Section 10B of the permit.

3. Due to the analytical limitations of many of the 40 CFR 136 approved test methods, the permittee cannot demonstrate whether the discharge is causing pollution to the waters of the state for a number of pollutants. As it relates to those pollutants in the DSN 001-1 discharge which have numeric criteria lower than the MLs of the test data provided, the permittee shall investigate any test method that may or could be available for analyzing these pollutants and it shall analyze the discharge using these test methods. Such demonstration shall be made on a monthly basis. RCSA section 22a-430-4(D)(4)(F) allows the commissioner to include any condition in a permit which he or she deems reasonably necessary to ensure compliance with chapter 446k of the Connecticut General Statutes and regulations adopted thereunder as amended, to ensure that his or her actions are consistent with the CWA and to ensure proper operation of a treatment facility or any other part thereof. This condition is added in accordance with that provision. This requirement is included in Section 10C of the permit.

4. The permittee will not be able to comply with the new water-quality based limits for 1,4-dioxane, ammonia, and cyanide at permit issuance. Therefore, interim limits will apply until the permittee can take steps to comply with the final limits. These interim limits are based on a statistical evaluation of the permittee's effluent data results using the methods in Appendix E of the TSD. For ammonia and cyanide, the average monthly and maximum daily limits were determined from the 95th percentile of the 2016 and 2017 effluent results. For 1,4-dioxane only three sufficiently sensitive data points were provided by the permittee, less than the recommended amount of data, so the interim limits for 1,4-dioxane were based only on these three points. [See Attachment 10]. In addition, interim limits were developed for copper. However, there is an inadequate amount of effluent data for copper and the receiving water data for copper is also limited. Given the proximity of the discharge point to the section of Quinnipiac River with site-specific copper requirements, the interim limits for copper were developed using the site-specific copper criteria in the WQS (25.7 µg/L

acute; 18.1 µg/L chronic). Assuming no dilution, a frequency of twice/month, and a 95th probability basis, the resulting limits are: 14.8 µg/L (average monthly) and 17.6 µg/L (maximum daily). Section 10D of the permit includes a compliance schedule which requires the Permittee to undertake remedial actions leading to compliance with all final limits which are included in Table A of Section 5 of the permit. These remedial actions must be accomplished as soon as possible. Until the remedial actions have been fully implemented to the satisfaction of the Commissioner, the permittee shall provide the Department with quarterly status reports describing the efforts that it has taken to implement the remedial actions and meet its final permit limits.

XVIII. REFERENCES

Administrative Order, In the Matter of The Upjohn Company, North Haven Connecticut Respondent. EPA RCRA Docket No. I-89-1101 – CTD001168533

Administrative Order on Consent, In the Matter of The Upjohn Company, North Haven Connecticut Respondent. EPA Docket No. RCRA-I-94-1055 – CTD001168533

Administrative Order on Consent, In the Matter of Pharmacia & Upjohn Company LLC, North Haven Connecticut Respondent. EPA Docket No. RCRA-01-2011-0027 – CTD001168533

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Construction and Development Point Source Category, 40 C.F.R. §450 (2017)

EPA Administered Permit Programs: The National Pollutant Discharge Elimination System, 40 C.F.R. §122 (2017)

Golder Associates Inc. (2017) *2016 Annual Progress Report Corrective Measures Implementation at the Pharmacia & Upjohn Company LLC Site North Haven, Connecticut RCRA I.D. No. CTD001168533*

Landfills Point Source Category, 40 C.F.R. §445 (2017)

New England Bioassay. 2013 through 2017. *Pharmacia & Upjohn Chronic Toxicity Test Report*.

Organic Chemicals, Plastics, and Synthetic Fibers, 40 C.F.R. § 414 (2017)

Pesticide Chemicals, 40 C.F.R. §455 (2017)

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Pfizer Inc. on behalf of Pharmacia & Upjohn Company LLC, 2012 through 2017, *Discharge Monitoring Reports*

Regulations of Connecticut State Agencies, Title 22a, Environmental Protection. *Water Pollution Control*, Sections 22a-430-1 to 22a-430-8

Regulations of Connecticut State Agencies, Title 22a, Environmental Protection. *Wastewater Treatment Facility Operator Certification*, Sections 22a-416-1 to 22a-416-10

Regulations of Connecticut State Agencies, Title 22a, Environmental Protection. *Connecticut Water Quality Standards*, Sections 22a-426-1 to 22a-426-9 (2013).

U.S. EPA. (n.d). *National Recommended Water Quality Criteria - Aquatic Life Criteria Table*. Retrieved from <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>

U.S. EPA. 1985. *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses*. (PB85-227049)

U.S. EPA. 1991. *Technical Support Document For Water Quality-based Toxics Control*. (EPA/505/2-90-001)

U.S. EPA. 1996. *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From A Dissolved Criterion*. (EPA 823-B-96-007)

U.S. EPA. 2000. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health*. (EPA-822-B-00-004)

U.S. EPA. 2002. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA-821-R-02-012)

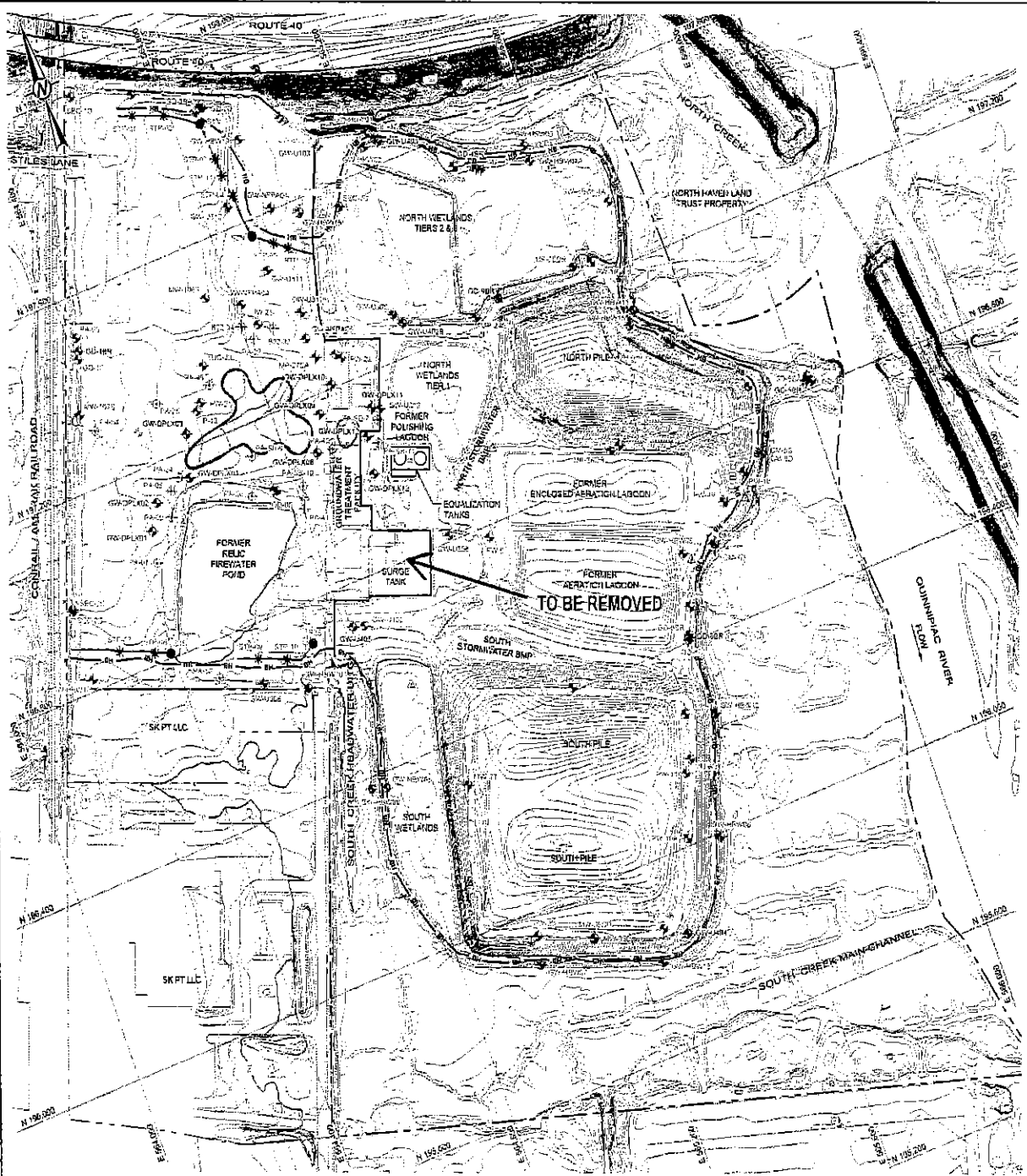
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U.S. EPA Region 1. 2010. *Final Decision and Response to Comments For Pharmacia & Upjohn Company LLC Site North Haven, Connecticut*

U.S. EPA Region 1. 2010. *Statement of Basis for Pharmacia & Upjohn Company LLC Site North Haven, Connecticut*



LEGEND - MONITORING POINTS (AS OF DECEMBER 31, 2016)

- UNIT 1 GROUNDWATER MONITORING WELL
- TEMPORARY UNIT 1 GROUNDWATER MONITORING WELL
- UNIT 1 STANDPIPE WELLS
- UNIT 1 GROUNDWATER EXTRACTION WELL
- UNIT 1 TEMPORARY EXTRACTION WELL
- UNIT 1 GROUNDWATER COLLECTION SUMPS
- UNIT 1 DNAPL MONITORING WELL
- UNIT 1 LNAPL MONITORING WELL
- UNIT 3 GROUNDWATER MONITORING WELL
- DEEP MONITORING WELL - UNCONFINED MATERIALS WITHIN AREA OF THIN/EDISABSENT UNIT 2
- UNIT 4 GROUNDWATER MONITORING WELL
- SURVEY CONTROL POINTS

LEGEND - SITE FEATURES

- PROPERTY LINE (APPROXIMATE)
- HYDRAULIC BARRIER WALL
- BOUNDARY BETWEEN ESRC AND WSRC
- GROUNDWATER COLLECTION TRENCH
- TIDAL SURFACE WATER - LOW TIDE
- FORMER RELIC FIREWATER POND (FILLED AS PART OF AGENCY APPROVED IRM)
- FULL-SCALE IN-SITU THERMAL REMEDIATION AREA (DNAPL REMEDIATION AREA)
- SITE ROADS AND TRAILS
- FEMA 100 YEAR FLOODPLAIN BOUNDARY

NOTE(S)

1. THE PRIMARY PURPOSE OF THIS FIGURE IS TO SHOW ENVIRONMENTAL MONITORING POINT LOCATIONS. OTHER FEATURES SUCH AS TOPOGRAPHIC CONTOURS, BUILDINGS, FOUNDATIONS, UTILITIES, WETLANDS ETC. ARE SHOWN FOR GENERAL REFERENCE ONLY AND MAY HAVE BEEN ALTERED BY THE ONGOING CORRECTIVE MEASURES IMPLEMENTATION.
2. MONITORING POINTS CATEGORIZED AS "TEMPORARY" ARE TYPICALLY ONE-INCH DIAMETER PVC WELL POINTS CONSTRUCTED WITHOUT A PERMANENT PROTECTIVE SURFACE FEATURE, SUCH AS A PROTECTIVE FLUSHMOUNT MAINHOLE OR STICK-UP ABOVEGROUND OUTER STEEL CASING. THESE LOCATIONS, INSTALLED PRIMARILY ON THE WEST SIDE OF SITE, ARE PROPOSED FOR EITHER ABANDONMENT OR CONVERSION TO A PERMANENT MONITORING POINT DURING WSRC IMPLEMENTATION.

REFERENCE(S)

1. TOPOGRAPHIC CONTOURS AND OTHER SITE FEATURES WITHIN THE ESRC AND THE HYDRAULIC BARRIER WALL ALIGNMENT FROM BASE MAP DWG ST-02, TITLED "FINAL GRADE PLAN VIEW," OF THE ESRC CORRECTIVE MEASURES CONSTRUCTION RECORD DRAWINGS FINAL PLAN SET, PREPARED BY FJSS & OTHIEL, DATED SEPTEMBER 14, 2016.
2. TOPOGRAPHIC CONTOURS AND OTHER SITE FEATURES ON THE REMAINDER OF THE SITE SHOWN FROM DIGITAL CAD FILE "XYS116061.DWG," PREPARED BY BL COMPANIES. MAP BASED ON CONNECTICUT STATE PLAN COORDINATE SYSTEM OF 1927 (NAD 29) AND ELEVATIONS REFER TO NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NOVD 29). DATE OF AERIAL PHOTOGRAPHY WAS APRIL 5, 2009.
3. PROPERTY LINE TAKEN FROM DIGITAL FILES UPJOHN.DWG AND UPJOHN.DWG, ENTITLED "PROPERTY BOUNDARY MAP," SHEETS 1 AND 2, PROVIDED BY UNITED INTERNATIONAL CORPORATION, DATED JULY 20, 1998.
4. SURVEY CONTROL POINTS TAKEN FROM ELECTRONIC CAD FILE G0LTS101.DWG, TITLED "WELL ELEVATION PLAN," PROVIDED BY F.A. HESKETH & ASSOCIATES, INC.
5. EQUILIZATION TANK LAYOUT FROM DIGITAL CAD FILE 2247800-ZKR_SITE_PLAN-A2 ASBUILT.DWG, PREPARED BY A2 CONSTRUCTION.
6. WELL LOCATIONS HAVE BEEN TAKEN FROM NUMEROUS SOURCES INCLUDING ESRC CORRECTIVE MEASURES CONSTRUCTION RECORD DRAWINGS FINAL PLAN SET, PREPARED BY FJSS & OTHIEL DATED SEPTEMBER 14, 2016; EXCEL FILE "G0LDERWELLS-08-05-REV3.XLS" AND FILE G0LDR1.DWG PROVIDED BY F.A. HESKETH & ASSOCIATES, INC. RECEIVED JANUARY 12, 2006; "MASTER-SITE-PLAN.DWG" DATED JANUARY 11, 2003 AND THE MASTER BORING SUMMARY TABLE, SUPPLIED BY GEODESIGN INCORPORATED, MIDDLEBURY, CONNECTICUT, AND FSR, 18TH IBER, IGDR AND CSOSI) REPORTS PROVIDED BY EARTH TECH IN 2009.
7. THE APPROXIMATE FEMA 100-YEAR FLOOD BOUNDARY IS BASED ON FEMA FIRM(S) DATED JULY 8, 2013. THIS APPROXIMATE BOUNDARY IS SHOWN ALONG AN INTERPOLATED CONTOUR ELEVATION OF 10.0 FT (NOVD 29), WHICH IS THE BASE FLOOD ELEVATION OF 9 FT (MSL (NOVD 88) SHOWN ON THE FIRMS, CONVERTED TO THE VERTICAL DATUM OF THE SITE BASE MAP (NOVD 29).

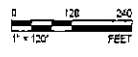
CLIENT
PHARMACIA & UPJOHN COMPANY LLC SITE
NORTH HAVEN, CT

PROJECT
SUPPLEMENTAL PERMIT RENEWAL APPLICATION

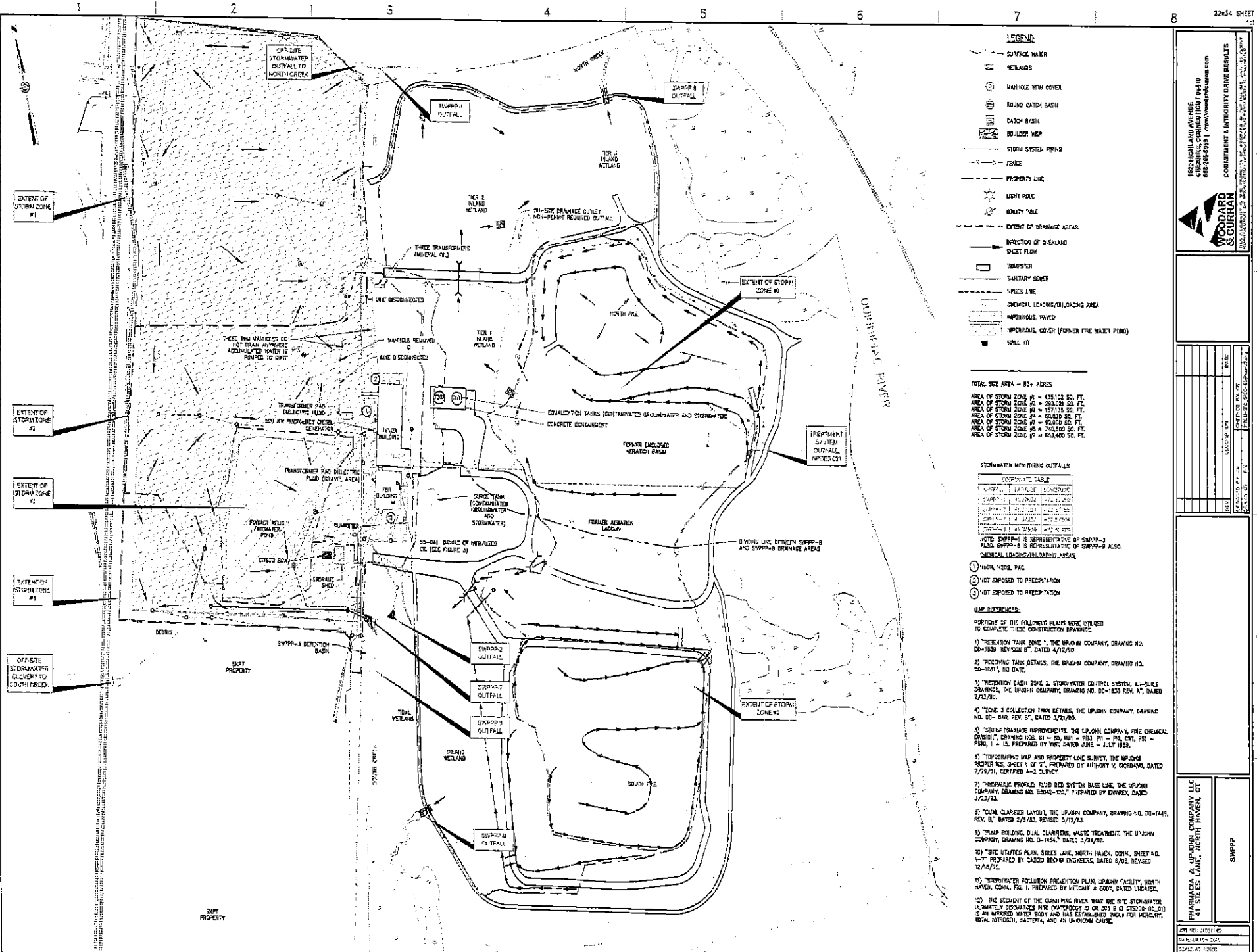
TITLE
BASE MAP

SOURCE: 2016 ANNUAL REPORT

CONSULTANT	XXXX-NH-00	2017-01-30
DRAWN/ISSUED	JSL	
PREPARED	AM	
REVIEWED	JSL	
APPROVED	GPH	



PROJECT NO	CONTROL	REV	FIGURE
033-6231.004	A001	0	1



LEGEND

- SURFACE WATER
- WETLANDS
- MANHOLE WITH COVER
- ROUND CATCH BASIN
- CATCH BASIN
- BOULDER WDF
- STORM SYSTEM PIPING
- FENCE
- PROPERTY LINE
- LIGHT POLE
- UTILITY POLE
- EXTENT OF OVERLAND SHEET FLOW
- DIRECTION OF DRAINAGE SHEET FLOW
- SANITARY SEWER
- RIMPLE LINE
- CIRCULAR LOADING/UNLOADING AREA
- IMPERVIOUS PAVED
- IMPERVIOUS COVER (FORMER FIRE WATER POND)
- SPILL KIT

TOTAL SITE AREA = 83+ ACRES

- AREA OF STORM ZONE #1 = 435,100 SQ. FT.
- AREA OF STORM ZONE #2 = 283,000 SQ. FT.
- AREA OF STORM ZONE #3 = 187,135 SQ. FT.
- AREA OF STORM ZONE #4 = 62,000 SQ. FT.
- AREA OF STORM ZONE #5 = 34,800 SQ. FT.
- AREA OF STORM ZONE #6 = 62,800 SQ. FT.
- AREA OF STORM ZONE #7 = 62,800 SQ. FT.
- AREA OF STORM ZONE #8 = 62,800 SQ. FT.

STORMWATER MONITORING OUTFALLS

NO.	DATE	LOCATION
1	1/15/02	SWPPP-1
2	1/15/02	SWPPP-2
3	1/15/02	SWPPP-3
4	1/15/02	SWPPP-4
5	1/15/02	SWPPP-5
6	1/15/02	SWPPP-6
7	1/15/02	SWPPP-7
8	1/15/02	SWPPP-8

NOTE: SWPPP-1 IS REPRESENTATIVE OF SWPPP-3 ALSO. SWPPP-8 IS REPRESENTATIVE OF SWPPP-9 ALSO.

CIRCULAR LOADING/UNLOADING AREAS

- 1) HIGH, WOOD PILE
- 2) NOT EXPOSED TO PRECIPITATION
- 3) NOT EXPOSED TO PRECIPITATION

MAP REFERENCES:

PORTIONS OF THE FOLLOWING PLANS WERE UTILIZED TO COMPLETE THESE CONSTRUCTION DRAWINGS:

- 1) "RETENTION TANK ZONE 1, THE UPJOHN COMPANY, DRAWING NO. 00-1839, REVISED BY, DATED 4/12/80
- 2) "RECYCLING TANK DETAILS, THE UPJOHN COMPANY, DRAWING NO. 00-1887, NO DATE.
- 3) "RETENTION BASIN ZONE 2, STORMWATER CONTROL SYSTEM, AS-BUILT DRAWING, THE UPJOHN COMPANY, DRAWING NO. 00-1830 REV. A, DATED 3/12/80.
- 4) "ZONE 3 COLLECTION TANK DETAILS, THE UPJOHN COMPANY, DRAWING NO. 00-1840, REV. B, DATED 3/29/80.
- 5) "STORM DRAINAGE IMPROVEMENTS, THE UPJOHN COMPANY, FINE CHEMICAL GROUP, DRAWING NO. 01-85, REV. 1 = 03, REV. 2 = 02, REV. 3 = 01 = 12, PREPARED BY THE, DATED JUNE - JULY 1988.
- 6) "TOPOGRAPHIC MAP AND PROPERTY LINE SURVEY, THE UPJOHN COMPANY, SHEET 1 OF 2, PREPARED BY AUTHORITY V. GOGGARD, DATED 7/8/71, CONFIRMED A-1 SURVEY.
- 7) "MECHANICAL FLUID BED SYSTEM BASE LINE, THE UPJOHN COMPANY, DRAWING NO. 00-1840-100" PREPARED BY DORRIS, DATED 3/22/83.
- 8) "TOTAL CLARIFIER LAYOUT, THE UPJOHN COMPANY, DRAWING NO. 00-1441, REV. B," DATED 2/8/83, REVISED 3/11/83.
- 9) "TRAP BUILDING, DUAL CLARIFIERS, WASTE TREATMENT, THE UPJOHN COMPANY, DRAWING NO. 0-1454," DATED 3/24/82.
- 10) "SITE UTILITIES PLAN, STILES LAKE, NORTH HAVEN, CONN., SHEET NO. 1-77 PREPARED BY CALICO DESIGN ENGINEERS, DATED 8/86, REVISED 12/8/96.
- 11) "STORMWATER POLLUTION PREVENTION PLAN, UPJOHN FACILITY, NORTH HAVEN, CONN., FIG. A, PREPARED BY METCALF & EDDY, DATED UNDATED.
- 12) "THE STORMWATER OF THE CROMBACH RIVER THAT THE SITE STORMWATER ULTIMATELY DISCHARGES INTO (WATERBODY ID OR JCS ID 028200-06_01) IS AN IMPERVIOUS WATER BODY AND HAS ESTABLISHED THREAT FOR MERCURY, BETA, INTRICID, BACTERIA, AND AN UNKNOWN CANCER.

DRAWINGS SOURCE: GEORGEON INCORPORATED, 801 SOUTHFORD ROAD, HADDONFIELD, CONNECTICUT 06430-1500-BUSINESS FOR PHARMACIA & UPJOHN COMPANY LLC, 41 STILES LAKE NORTH HAVEN, CT, DRAWING NAME: "SITE PLAN" STORMWATER POLLUTION PREVENTION, DATED 01/02/2008, FILE NO. 107/24.2 PLAN 2A.

1500 HIGHLAND AVENUE
SHELTON, CONNECTICUT 06484
603.875.4941 | www.woodwardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

WOODWARD & CURRAN
A DIVISION OF WOODWARD-CLARK GROUP

NO.	DATE	BY	CHECKED BY	SCALE	SHEET NO.	TOTAL SHEETS

PHARMACIA & UPJOHN COMPANY LLC
41 STILES LAKE, NORTH HAVEN, CT

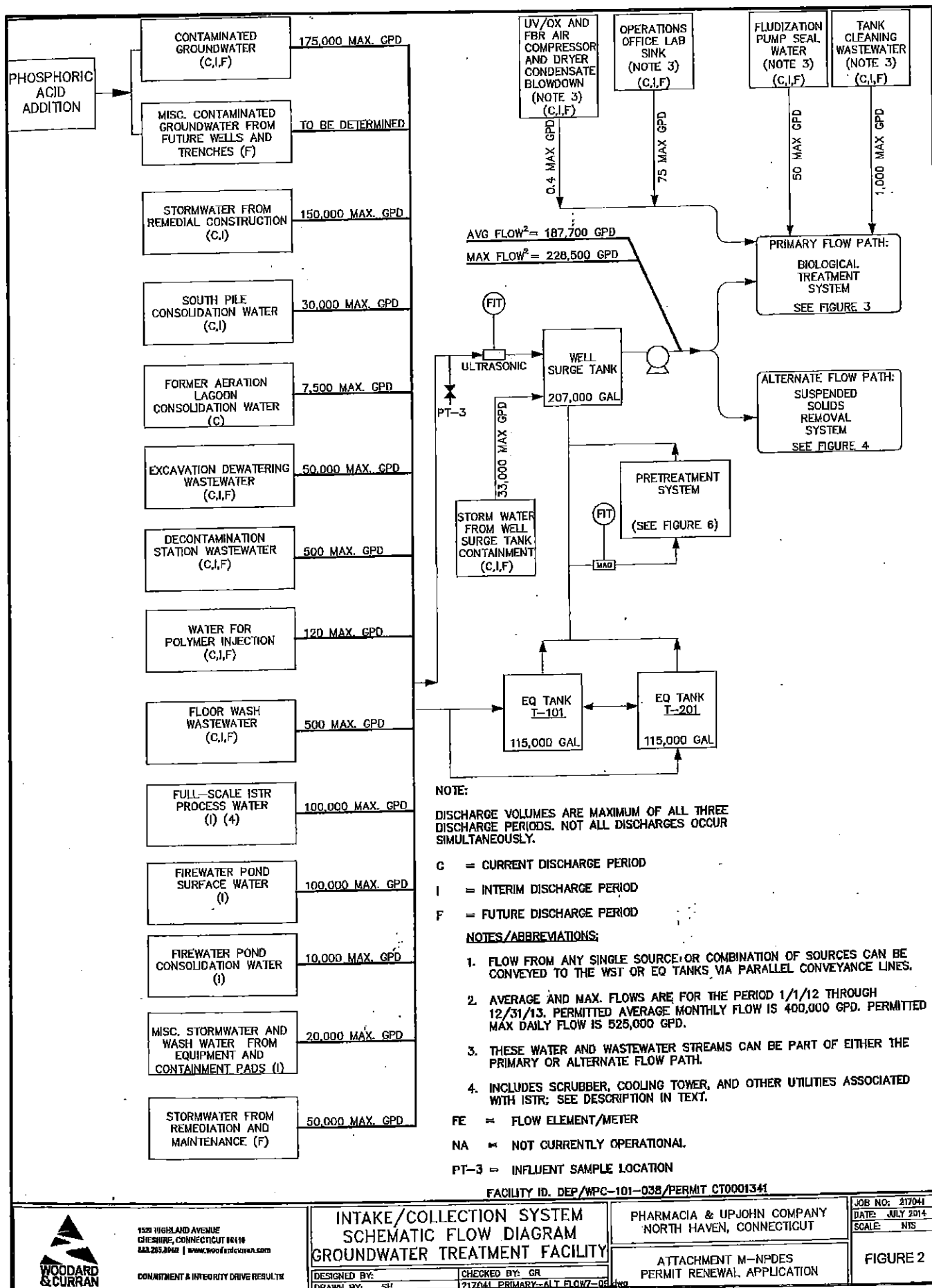
SWPPP

JOB NO. 107/24.2	DATE: MARCH 2008	SCALE: AS SHOWN	SHEET: 1 OF 1
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FIGURE 2

ATTACHMENT 2

ATTACHMENT 3



1520 HIGHLAND AVENUE
 CHESHIRE, CONNECTICUT 06416
 484.265.3052 | www.woodardcurran.com
 COMMITMENT & INTEGRITY DRIVE RESULTS

**INTAKE/COLLECTION SYSTEM
 SCHEMATIC FLOW DIAGRAM
 GROUNDWATER TREATMENT FACILITY**

DESIGNED BY: _____ CHECKED BY: GR
 DRAWN BY: SH 217041 PRIMARY-ALT FLOW-02

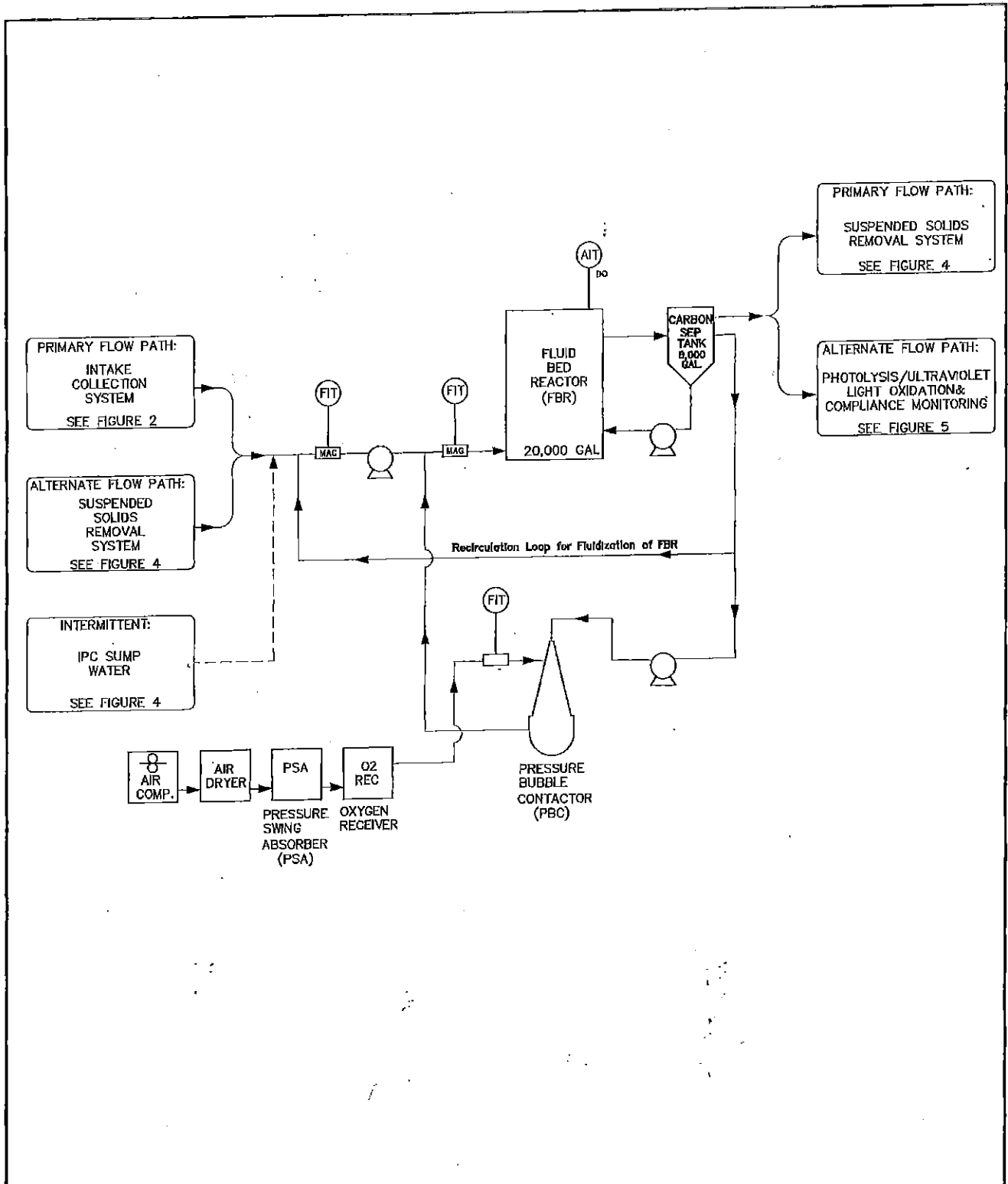
PHARMACIA & UPJOHN COMPANY
 NORTH HAVEN, CONNECTICUT

ATTACHMENT M-NPDES
 PERMIT RENEWAL APPLICATION

JOB NO: 217041
 DATE: JULY 2014
 SCALE: NTS

FIGURE 2

ATTACHMENT 3



NOTES/ABBREVIATIONS:
 DRAWING REFERENCE: GEODESIGN INC. FIGURE NO. 3, PROJECT NO. 127-024, THAT WAS PREPARED AS PART OF THE SEPTEMBER 30, 2002 NPDES PERMIT APPLICATION.

AIT = ANALYSIS INDICATING TRANSMITTER
 FIT = FLOW INDICATING TRANSMITTER
 DO = DISSOLVED OXYGEN


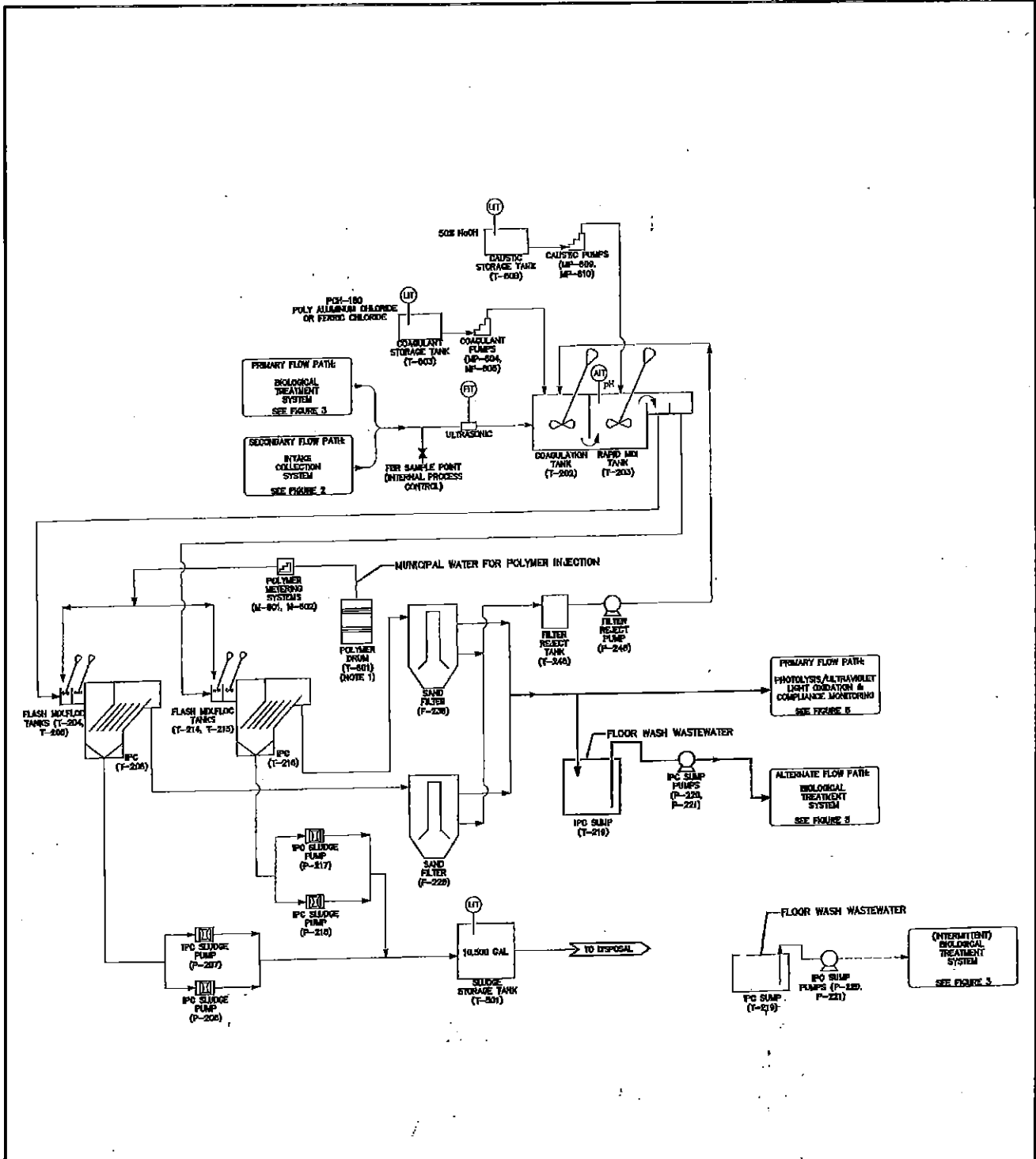
 <p>1524 HIGHLAND AVENUE CHESTER, CONNECTICUT 06411 (860) 257-8867 | www.woodardcurran.com</p> <p>COMMITMENT & INTEGRITY DRIVE REPAIRS</p>	BIOLOGICAL TREATMENT SYSTEM SCHEMATIC FLOW DIAGRAM GROUNDWATER TREATMENT FACILITY		PHARMACIA & UPJOHN COMPANY NORTH HAVEN, CONNECTICUT	JOB NO: 217041 DATE: July 2014 SCALE: NTS
	DESIGNED BY: _____ CHECKED BY: GR DRAWN BY: SH 217041_PRIMARY-ALT FLOW7-05.dwg		ATTACHMENT M-NPDES PERMIT RENEWAL APPLICATION	

FIGURE 3

ATTACHMENT 3



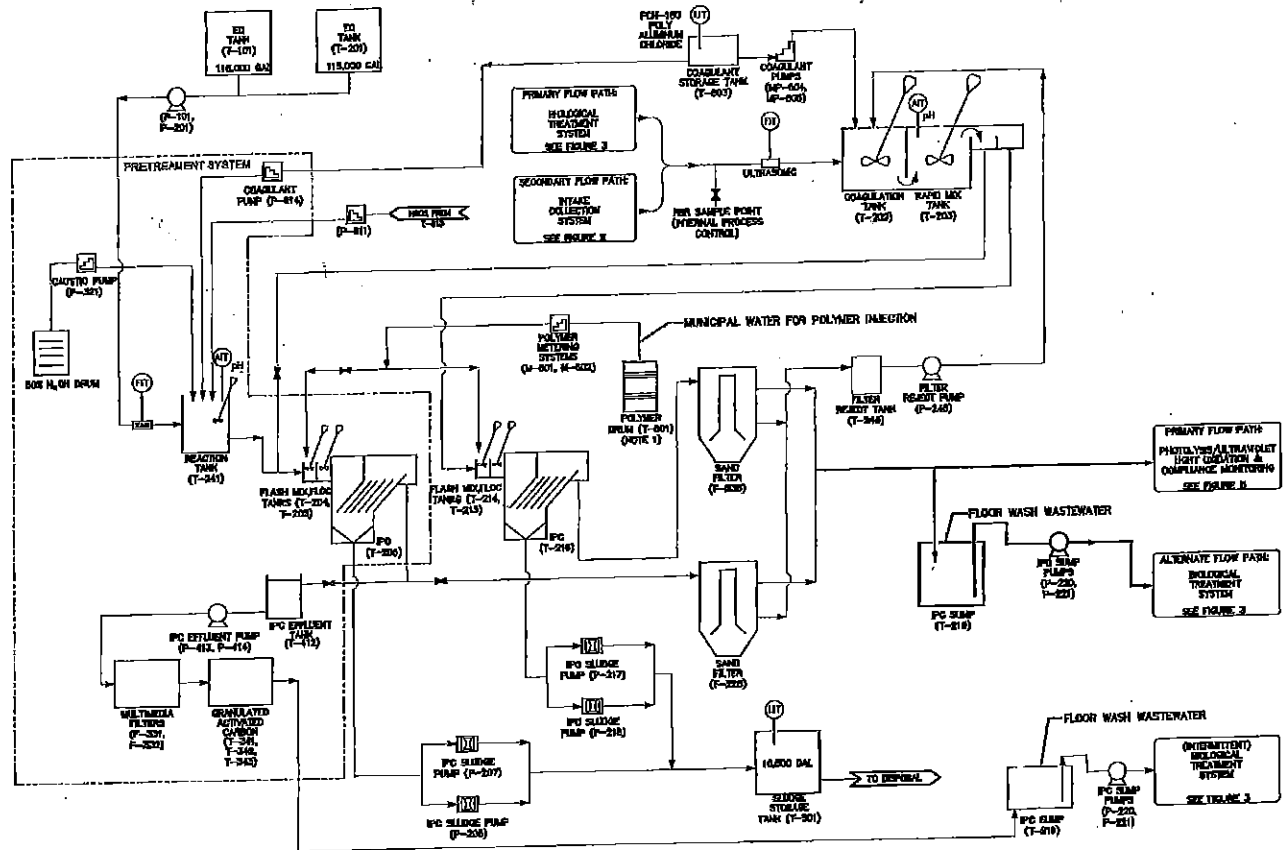
NOTES/ABBREVIATIONS:
 DRAWING REFERENCE: GEODESIGN INC, FIGURE NO. 4, PROJECT NO. 127-024, THAT WAS PREPARED AS PART OF THE SEPTEMBER 30, 2002 NPDES PERMIT APPLICATION.

1. POLYMER IS J-FLOC 452 ANIONIC LIQUID POLYMER OR EQUIVALENT

- AIT = ANALYSIS INDICATING TRANSMITTER
- FIT = FLOW INDICATOR TRANSMITTER
- LIT = LEVEL INDICATING TRANSMITTER

	1530 HIGHLAND AVENUE CHESTER, CONNECTICUT 06410 860.265.0559 | www.woodardcurran.com COMMITMENT & INTEGRITY DRIVE RESULTS	SUSPENDED SOLID REMOVAL SYSTEM SCHEMATIC FLOW DIAGRAM GW TREATMENT FACILITY	JOB NO: 21704 DATE: JULY 2014 SCALE: NTS
	PHARMACIA & UPJOHN COMPANY NORTH HAVEN, CONNECTICUT		ATTACHMENT M-NPDES PERMIT RENEWAL APPLICATION	FIGURE 4
DESIGNED BY: SH DRAWN BY: SH		CHECKED BY: GR 217041_PRIMARY-ALT_FLOW7-09	


ATTACHMENT 3



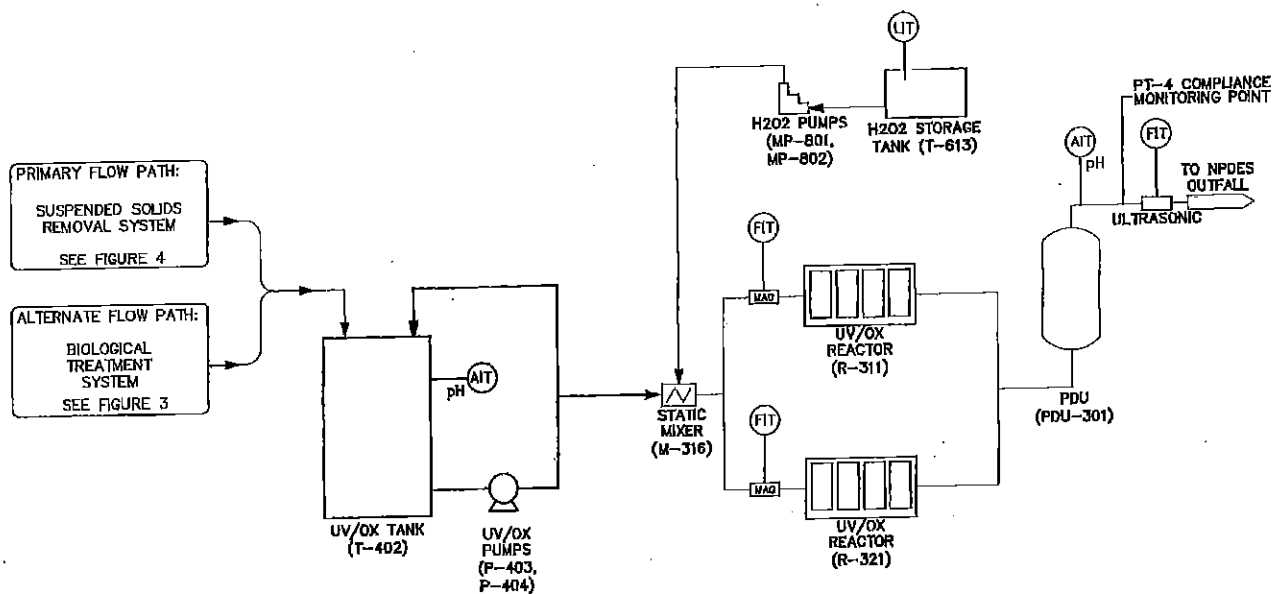
NOTES/ABBREVIATIONS:
 DRAWING REFERENCE: GEODESIGN INC. FIGURE NO. 4, PROJECT NO. 127-024, THAT WAS PREPARED AS PART OF THE SEPTEMBER 30, 2002 NPDES PERMIT APPLICATION.

1. POLYMER IS J-FLOC 452 ANIONIC LIQUID POLYMER OR EQUIVALENT

AIT = ANALYSIS INDICATING TRANSMITTER
 FIT = FLOW INDICATOR TRANSMITTER
 LIT = LEVEL INDICATING TRANSMITTER


 <p>1520 HIGHLAND AVENUE CRESHIRE, CONNECTICUT 06410 860.265.8883 | www.woodardcurran.com</p> <p>COMMITMENT & INTEGRITY DRIVE RESULTS</p>	<p>PRETREATMENT SYSTEM SCHEMATIC FLOW DIAGRAM GROUNDWATER TREATMENT FACILITY</p>		<p>PHARMACIA & UPJOHN COMPANY NORTH HAVEN, CONNECTICUT</p>	<p>JOB NO: 217041 DATE: JULY 2011 SCALE: NTS</p>
	<p>DESIGNED BY: _____ DRAWN BY: SH</p>	<p>CHECKED BY: GR 217041_PRIMARY-ALT FLOW7-08.dwg</p>	<p>ATTACHMENT M-NPDES PERMIT RENEWAL APPLICATION</p>		FIGURE 6

ATTACHMENT 3



NOTES/ABBREVIATIONS:
 DRAWING REFERENCE: GEODESIGN INC. FIGURE NO. 5, PROJECT NO. 127-024, THAT WAS PREPARED AS PART OF THE SEPTEMBER 30, 2002 NPDES PERMIT APPLICATION.

- AIT = ANALYSIS INDICATING TRANSMITTER
- FIT = FLOW INDICATING TRANSMITTER
- LIT = LEVEL INDICATING TRANSMITTER

	1220 HIGHLAND AVENUE CHESTER, CONNECTICUT 06410 860.265.8160 | www.woodardcurran.com	PHOTOLYSIS/ULTRAVIOLET OXIDATION & COMPLIANCE MONITORING GW TREATMENT FACILITY	PHARMACIA & UPJOHN COMPANY NORTH HAVEN, CONNECTICUT	JOB NO: 217041 DATE: July 2014 SCALE: NIS
	COMMITMENT & INTEGRITY DRIVE RESULTS	DESIGNED BY: _____ CHECKED BY: GR DRAWN BY: SH 217041_PRIMARY-ALT FLOW7-08 dwg	ATTACHMENT M-NPDES PERMIT RENEWAL APPLICATION	FIGURE 5

ATTACHMENT 4

PT-3: INFLUENT TO THE GWTF

2012

PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1,2-Dichlorobenzene	µg/L																									
1,2-Dichloroethane	µg/L																					59	25	0	25	59
1,3-Dichlorobenzene	µg/L																					0	7.5	0	7.5	0
1,4-Dichlorobenzene	µg/L																					0	25	0	25	0
1,4-Dioxane	µg/L																					0	25	0	25	0
2-Chloroaniline	µg/L																					0	10000	0	10000	0
3,3'-Dichlorobenzidine	µg/L																					8600		5900		8600
Ammonia	mg/L																					0	250	0	200	0
Benzene	µg/L																					2,75		2,81		2,81
Benzidine	µg/L																					470		560		560
BOD ₅	mg/L																					0	250	0	200	0
Chlorobenzene	µg/L																					17				17
Chloroform	µg/L																					150		210		210
COD	mg/L																					0	7.5	0	7.5	0
cis-1,2-Dichloroethene	µg/L																					63		66		66
Methylene chloride	µg/L																					5.3		0		5.3
Methyl tert butyl ether	µg/L																					0	25	0	25	0
Toluene	µg/L																					0	100	0	100	0
Total Suspended Solids	mg/L																					7.2		11		11
Xylene (m,p)	µg/L																					0	5	7.4		7.4
Xylene (o)	µg/L																					0	10	0	10	0
Vinyl chloride	µg/L																					0	5	0	5	0
																						0	10	0	10	0

2013

PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1,2-Dichlorobenzene	µg/L	0	25	0	25	0	25	0	25	6.3		0	25			20		0	NR	0	NR	0	NR	0	NR	20
1,2-Dichloroethane	µg/L	0	7.5	0	7.5	0	7.5	0	7.5	0	1.5	0	7.5	0	1.5	0	NR	0	NR	0	NR	0	NR	0	NR	0
1,3-Dichlorobenzene	µg/L	0	25	0	25	0	25	0	25	0	5	0	25	0	5	0	NR	0	NR	0	NR	0	NR	0	NR	0
1,4-Dichlorobenzene	µg/L	0	25	0	25	0	25	0	25	0	5	0	25	0	5	0	NR	0	NR	0	NR	0	NR	0	NR	0
1,4-Dioxane	µg/L	0	10000	0	10000	0	10000	0	10000	0	2000	0	10000	0	2000	0	NR	0	NR	0	NR	0	NR	0	NR	0
2-Chloroaniline	µg/L	6800		6400		7500		7700		7100		3900		5200		4900		5500		4500		6900		7600		7700
3,3'-Dichlorobenzidine	µg/L	0	5	0	5	0	5	0	5	0	250	0	5	8.9		8.2		0	NR	0	NR	0	NR	0	NR	8.9
Ammonia	mg/L	2.71		4.5		4.61		2.61		2.61		4.34		2.84		3.24		2.75		2.99		3.09		3.47		4.51
Benzene	µg/L	790		980		830		880		190		630		190		810		640		480		1000		970		1000
Benzidine	µg/L	0	5	0	5	0	5	0	5	0	250	0	5	0	5	0	NR	0	NR	0	NR	0	NR	0	NR	0
BOD ₅	mg/L	15		22		20		18		15		19		22		22		21		14		35		46		46
Chlorobenzene	µg/L	180		240		190		210		45		200		55		280		170		100		250		390		390
Chloroform	µg/L											0	7.5											0	NR	0
COD	mg/L	66		50		44		44		49		66		52		66		66		66		66		79		79
cis-1,2-Dichloroethene	µg/L	0	5	0	5	0	5	0	5	0	5	0	5	0	1	1.1		0	NR	0	NR	0	NR	0	NR	1.1
Methylene chloride	µg/L	0	25	0	25	0	25	0	25	0	5	0	25	0	5	0	NR		0	NR	0	NR	0	NR	0	NR
Methyl tert butyl ether	µg/L	0	100	0	100	0	100	0	100	0	50	0	10	0	50	0	10	0	NR		0	NR	0	NR	0	NR
Toluene	µg/L	16		25		17		13		4.8		22		5.4		160		92		51		120		310		310
Total Suspended Solids	mg/L	8.3		9.3		7.2		6.9		17		7.4		19		24		20		12		20		17		24.0
Xylene (m,p)	µg/L	0	10	0	10	0	10	0	10	0	2	0	10	0	2	4.6		0	NR	0	NR	0	NR	0	NR	4.6
Xylene (o)	µg/L	0	5	0	5	0	5	0	5	0	1	0	5	0	1	1.8		0	NR	0	NR	0	NR	0	NR	1.8
Vinyl chloride	µg/L	0	10	0	10	0	10	0	10	0	2	0	10	0	2	0	NR		0	NR	0	NR	0	NR	0	NR

NR=Not Reported

ATTACHMENT 4

PT-3: INFLUENT TO THE GWTF

2014

PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1-Chloro-2-nitrobenzene	µg/L			1200		0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	500	0	500	220		NR		1200
1,2-Dichlorobenzene	µg/L	0	NR	0	NR	0	NR	NR		15		0	NR	0	NR	0	NR	50	0	100	140		NR		140	
1,2-Dichloroethane	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	7.5	0	30	0	15	NR		0
1,3-Dichlorobenzene	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	25	0	100	0	50	NR		0
1,4-Dichlorobenzene	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	25	0	100	0	50	NR		0
1,4-Dioxane	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	10,000	0	40,000	0	20000	NR		0
2-Chloroaniline	µg/L	14000		11000		11000		NR		14000		12000		13000		11000		15000		14000		9200		NR		15000
3,3-Dichlorobenzidine	µg/L	0	NR	14		0	NR	NR		19		0	NR	23		14		0	500	0	500	26		NR		26.0
Ammonia	mg/L	3.25		3.0		3.27		NR		4.34		3.88				1.23		3.68		3.43		4.59		NR		4.59
Benzene	µg/L	1700		580		1600		NR		3.6		3400		1900		1400		1500		1700		1000		NR		3400
Benzidine	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	5	0	500	0	5	NR		0
BOD ₅	mg/L	0	NR	38		31		NR		57		66		34		24		31		28		31		NR		66
Chlorobenzene	µg/L	430		220		310		NR		150		810		420		410		440		390		470		NR		810
COD	mg/L	100		84		88		NR		100		84		98		68		84		87		80		NR		100
cis-1,2-Dichloroethene	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR			0	20	0	10	NR		0.0
Homologs	µg/L							NR												0	50	0	10	NR		0
Methylene chloride	µg/L	0	NR	0	NR	0	NR	NR		0	NR	0	NR	0	NR	0	NR	0	25	0	100	0	50	NR		0
Methyl tert butyl ether	µg/L	0	NR	0	NR			NR		0	NR	0	NR	0	NR	0	NR	0		0	200	0	100	NR		0
PCBs	µg/L							NR													1	0	1	NR		0
Toluene	µg/L	720		280		440		NR		97		980		540		390		500		610		230		NR		980
Total Suspended Solids	mg/L	10.0		10.0		14.0		NR		42		10		27		14		16		31		26		NR		42.0
Xylene (m,p)	µg/L	0	NR	0	NR			NR		4.9		0	NR	0	NR	0	NR							NR		4.9
Xylene (o)	µg/L	0	NR	0	NR			NR		2.2		0	NR	0	NR	0	NR							NR		2.2
Xylene, Total	µg/L							NR												0	40	0	10	NR		0
Vinyl chloride	µg/L	0	NR	0	NR			NR		0	NR	0	NR	0	NR	0	NR			0	20	0	10	NR		0

NR=Not Reported

2015

PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1-Chloro-2-nitrobenzene	µg/L	500		5		5		150		0	500	5.8		0						0	5	250		10		500
1,2-Dichlorobenzene	µg/L	65		91		87		0	5	0	100	0	25	0	5	84		38		0	50	51		31		91
1,2-Dichloroethane	µg/L	0	15	0	7.5	36		0	3.0	0	30	0	7.5	0	7.5	0	1.5	0.0	3.8	0	15	0	7.5	0	7.5	36
1,3-Dichlorobenzene	µg/L	0	90	0	25	0	5	0	5	0	100	0	25	0	5	0	5	0	12	0	50	0	25	0	5	0
1,4-Dichlorobenzene	µg/L	0	50	0	25	5		0	5	0	100	0	25	0	5	6			0	12	0	50	0	25	0	6
1,4-Dioxane	µg/L	0	20000	0	10000	0	2000	0	4000	0	40000	0	10000	0	10000			0	2000	0	20000	0	10000	0	10000	0
2-Chloroaniline	µg/L	14000		9200		9000		8300		8300		10000		4100				5800		3700		6300		3600		14000
3,3-Dichlorobenzidine	µg/L	14		17		12		98		0	500	0	20	5.4		6.5		0	5	5.5		0	250	0	10	98.0
Ammonia	mg/L	3.48		3.64		3.04		4.15		3.89		3.10		2.35		2.51		2.43		2.46		2.58		2.15		4.16
Benzene	µg/L	1100		1100		1300		260		1900		400		800		1200		1500		720		830		560		1900
Benzidine	µg/L	0	5	0	5	0	5	0	5	0	500	0	5	0	5	0	5			0	5	0	250	0	10	0
BOD ₅	mg/L	24		26		23		52		30		34		26		42		16		17		16		16		52
Chlorobenzene	µg/L	270		360		330		49		450		120		240		360		350		190		230		170		450
COD	mg/L	75		70		96		120		96		71		74		100		100		84		58		100		120
cis-1,2-Dichloroethene	µg/L			6								0	5			6						58		100		6.0
Methylene chloride	µg/L	0	50	0	25	0	5	0	5	0	100	0	25	0	25	0	5	0	12	0	50	0	25	0	25	0
Methyl tert butyl ether	µg/L	0	100							0	200															0
Toluene	µg/L	280		220		290		27		220		51		61		110		80		34		34		22		280
Total Suspended Solids	mg/L	14.0		20.0		17.0		36.0		24		16		15		17		12		9.7		32		36		36.0
Xylene, Total	µg/L			0	5																					0.0
Vinyl chloride	µg/L	0	10													4										4

ATTACHMENT 4

PT-3: INFLUENT TO THE GWTF

2016

PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1-Chloro-2-nitrobenzene	µg/L	50		250		5		250		200		250		500		250		250		5		160		5		500
1,2-Dichlorobenzene	µg/L	0	50	0	5	0	46	6100		58		51		0	5	250		0	50	52		64		61		6100
1,2-Dichloroethane	µg/L	0	15	0	1.5	0	7.5	20		17		0	15.0	0	1.5	45		0	15	32		41		0	7.5	46
1,3-Dichlorobenzene	µg/L	0	50	0	5	0	25	0	25	0	25	0	50	0	5	0	25	0	50	0	50	0	50	0	25	0
1,4-Dichlorobenzene	µg/L	0	50	0	5	0	25	0	25	0	25	0	50	0	5	0	25	0	50	0	50	0	50	0	25	0
1,4-Dioxane	µg/L	0	20000	0	2000	0	10000	0	10000	0	10000	0	20000	0	2000	0	10000	0	20000	0	20000	0	20000	0	10000	0
2-Chloroaniline	µg/L	11000		3800		2800				4900		4700		5700		6800		5300		3100		4300		3000		11000
3,3'-Dichlorobenzidine	µg/L	0	50	0	250	5.3		0	250	0	200	0	250	0	500	0.0	250	0	250	0	5	0	5	0	5	5.3
Ammonia	mg/L	2.84		3.68		2.85		2.93		3.51		3.34		3.10		3.16		2.90		2.86		3.02		3.05		3.58
Benzene	µg/L	950		67		1000		880		690		660		48		820		0	5	1200		1200		1200		1200
Benzidine	µg/L	0	50	0	250	0	5	0	250	0	8	0	250	0	500	0	250	0	250	0	5	0	5	0	5	0
BOD ₅	mg/L	23		18		20		43		29		18		24		18		13		16		15		15		43
Chlorobenzene	µg/L	270		16		270		250		280		240		11		230		0	5	310		340		400		400
COD	mg/L	84		88		56		74		51		0	20	51		60		58		58		58		56		84
Methylene chloride	µg/L	0	50	0	5	0	25	0	25	0	25	0	50	0	5	0	25	0	50	0	50	0	50	0	25	0
Toluene	µg/L	35		0	5.0	14		9		6		0	10	0	5	0	5	0	10	0	10	0	10	0	5	36
Total Suspended Solids	mg/L	84		42.0		11.0		22.0		17		400		8.1		6.8		0	5	0.0	5.0	0	5	0	5	400

2017

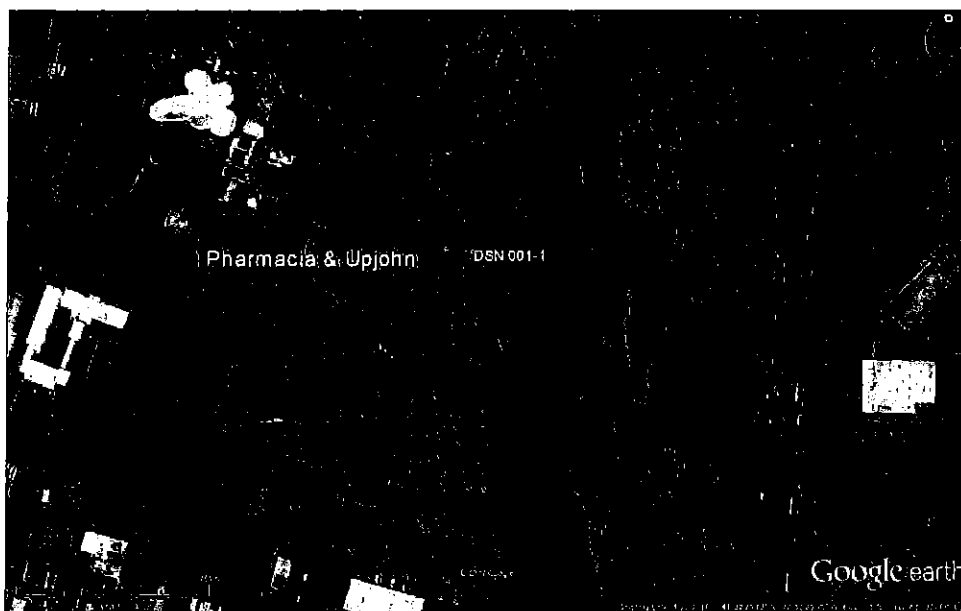
PARAMETER	Units	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Maximum /Year
		Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	Maximum Value Reported	ML	
1-Chloro-2-nitrobenzene	µg/L	250		0	5	200		200		190		200		50		0	100	0	5	0	120	0	5			250
1,2-Dichlorobenzene	µg/L	0	50	51		0	60	48		56		80		84		62		10		14		63				84
1,2-Dichloroethane	µg/L	0	15	23		0	15	23		19		28		16		17		0	1.5	4		12		12		28
1,3-Dichlorobenzene	µg/L	0	5	0	5	0	50	0	5	0	5	0	50	0	5	0	25	0	5	0	12	0	25			0
1,4-Dichlorobenzene	µg/L	0	5	0	5	0	50	0	5	0	5	0	50	0	5	0	25	0	5	0	12	0	25			0
1,4-Dioxane	µg/L	0	20000	0	20000	0	20000	0	20000	0	20000	0	20000	0	20000	0	10000	0	2000	0	5000	0	10000			0
2-Chloroaniline	µg/L	4000		2600		5200		7300		4300		5500		4400		3100		2700		3000		1800				7300
3,3'-Dichlorobenzidine	µg/L	0	250	8.7		0	200	0	200	0	190	0	200	0	50	0	100	0	5	0	120	0	5			8.7
Ammonia	mg/L	3.55		2.95		3.21		3.49		3.17		3.14		3.35		2.76		2.99		2.82		2.32				3.55
Benzene	µg/L	810		920		900		880		770		1100		710		720		70		160		460				1100
Benzidine	µg/L	0	250	0	5	0	200	0	5	0	5	0	200	0	5	0	100	0	5	0	120	0	5			0
BOD ₅	mg/L	340		21		33		62		34		18		14		15		11		10		0	2			340
Chlorobenzene	µg/L	370		330		310		350		270		430		410		340		49		81		230				430
COD	mg/L	320		45		100		100		89		57		89		55		90		96		28				320
cis-1,2-Dichloroethene	µg/L															9				0	2.5	9				9.0
Methylene chloride	µg/L	0	50	0	50	0	50	0	50	0	50	0	50	0	25	0	25	0	5	0	12	0	25			0
Methyl tert butyl ether	µg/L															0	80		0	0	25	0	25			0
Toluene	µg/L	0	10	0	10	0	10	0	10	0	10	0	10	0	5	0	5	0	5	0	5	0	5			0
Total Suspended Solids	mg/L	130		0	5	0	5	48		13		6		10		6		0	5	0	5	0	5			130
Xylene, Total	µg/L															0	5		0	0	2.5	0	2.5			0
Vinyl chloride	µg/L															0	5		0	0	2.5	0	2.5			0

ATTACHMENT 6

The following summarizes the manner in which the mixing zone for DSN 001-1 was allocated.

DISCHARGE AND RECEIVING WATER INFORMATION

The subject discharge, DSN 001-1, consists primarily of treated groundwater from the on-site groundwater treatment facility (GWTF). The treated effluent is conveyed from the GWTF to the sidebank of the river and discharges through a single 8-inch diameter pipe into a cove located on the western side of the Quinnipiac River. The discharge area is located approximately 7 miles (10 river miles) north of New Haven Harbor/Long Island Sound. This section of the Quinnipiac River is a brackish tidal marsh. Salinity values in the area are estimated to range from 1 to 5 parts per trillion (ppt), varying over the tidal cycle. The width of the river in the vicinity of the discharge is approximately 375 feet. The water depth in the discharge area is approximately 3 feet at high tide; at low tide, the mud flats are exposed. The tidal range in the discharge location is approximately 5 feet at spring tide and 4 feet at neap tide. There is reportedly little tidal current within the cove itself, but outside the cove, in the main river channel, there are more moderate currents, ranging from 1.0 to 2.0 feet per second (fps). The Waterbody Segment ID for this portion of the river is CT5200-00_01 and the segment is classified as Class B. Class B receiving waters are designated for: habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. This waterbody segment is identified on the Department's 2016 *Integrated Water Quality Report* as an impaired waterbody. As noted in this report, there is one impaired designated use associated with this waterbody: an impairment to the habitat for fish, other aquatic life and wildlife, with a cause identified as "unknown". The Quinnipiac River is used for boating, fishing, and other recreational activities. The Quinnipiac River Marsh Management Area is located approximately two miles south of the discharge area. No state-special concern or federally threatened or endangered fish are known to be in the general area of the discharge.



ALLOCATION OF MIXING ZONES

The *Connecticut Water Quality Standards* (WQS) allow for the allocation of mixing zones ("zones of influence"). Mixing zones are portions of the receiving water where water quality criteria are allowed to be exceeded. In cases where mixing zones are allocated, applicable water quality criteria are required to be met at the edge of the mixing zone. Allocations of mixing zones are made on a case-by-case basis in consideration of the criteria set forth in RCSA section 22a-426-4(D). In establishing mixing zones, the Commissioner shall consider:

RCSA 22a-426-4(I)(1)(A): the characteristics of the discharge, such as its volume, strength, temperature and the persistence of any substances in the discharge, potential bioaccumulation or bioconcentration of these substances in aquatic organisms, and the potential for any substances, either singly or in combination with other substances present in the discharge or receiving surface water body to result in an unacceptable risk to human health or the environment;

RCSA 22a-426-4(I)(1)(B): an allowance for a continuous zone of passage for free swimming and drifting organisms;

RCSA 22a-426-4(l)(1)(C): the effect of the discharge on spawning grounds or nursery areas of sensitive aquatic organisms or areas utilized by aquatic organisms for shelter and living space;

RCSA 22a-426-4(l)(1)(D): the effect of the discharge on the aesthetic quality of the receiving water including but not limited to the potential to cause objectionable deposits, floating debris, oil, scum, and other materials that form nuisances or produce objectionable color, odor, taste, or turbidity, or that may attract undesirable aquatic life or wildlife, or result in the dominance of nuisance species;

RCSA 22a-426-4(l)(1)(E): the location of other discharges in the receiving surface water body to ensure that the cumulative effect of adjacent zones of influence will not significantly reduce the environmental value or preclude any existing or designated uses of the receiving surface water. Assessment of environmental value will be based on the characteristics of the receiving surface water including but not limited to: (A) type of water body; (B) velocity; (C) depth; (D) number and type of aquatic habitats; (E) migration patterns; (F) nature of the food chain; (G) level of productivity; (H) water temperature; (I) condition of associated biological communities; (J) ability of tributaries to provide biological recruitment; (K) presence of endangered species; and (L) value to human uses (such as aesthetic, commercial, sport fishing and recreational uses).

In addition, the following shall apply:

RCSA 22a-426-4(l)(3): Unless otherwise indicated in sections 22a-426-2 to 22a-426-9, inclusive, of the Regulation of Connecticut State Agencies, the applicable water quality criteria apply outside the zone of influence for a discharge.

RCSA 22a-426-4(l)(4): The zone of influence shall be limited to the maximum extent possible.

RCSA 22a-426-4(l)(5): Establishment of a zone of influence shall not preclude attainment of any existing or designated uses of the receiving surface waters.

RCSA 22a-426-4(l)(6): The area and volume of receiving water allocated to zones of influence shall be determined based on the unique physical, chemical and biological characteristics of the receiving surface water body.

RCSA 22a-426-4(l)(7): The Commissioner may require applicants to provide information on receiving surface water and wastewater characteristics including the volume of flow and area required for mixing and assimilation of waste.

RCSA 22a-426-4(m)(4): Surface waters which are influenced by tidal forces or which experience short-term variation in flow due to periodic or irregular water release from upstream diversions or other causes may require special consideration by the Commissioner when establishing a zone of influence or issuing discharge permits under the provisions of section 22a-430 of the Connecticut General Statutes in order to protect existing and designated uses, including consideration of the minimum flow to which the Connecticut Water Quality Standards apply. Low flow in a tidal water body shall be evaluated under low tide conditions unless another low flow regime is demonstrated to the Commissioner's satisfaction to be protective of water quality and aquatic resources.

Consistent with RCSA section 22a-426-4(l)(7), dye studies, at a minimum, are generally undertaken by a discharger requesting a mixing zone so that the Department can be informed as to the manner in which the discharge mixes in the receiving stream, as well as any impact that the discharge may have on the water body surface, bottom, shoreline, or other areas.

DYE DILUTION STUDY

In August 1987, a dye dispersion study was performed on the DSN 001-1 effluent by The Upjohn Company ("Upjohn"), the permittee at that time. When this study was undertaken, the DSN 001-1 effluent consisted of treated wastewater from Upjohn's chemical/pharmaceutical/pesticide manufacturing operations, with flows nearly 600,000 gpd. Currently, the DSN 001-1 discharge consists primarily of treated groundwater from the site with flows approximately 100,000 gpd. Given that the existing conditions are different than those under which the 1987 dye study was performed, another dye study was performed in 2014.

In August 2014, a new dye dilution study was conducted on the DSN 001-1 effluent in order to evaluate the manner in which the effluent currently mixes with the receiving water. The results of this study are summarized in an October 2014 report by Hydro Data, Inc. titled, *Effluent Mixing Zone Dye Study Report Pharmacia & Upjohn Company LLC Ground Water Treatment Facility*. The August 2014 dye study was conducted during a consecutive spring and neap tide with surveys conducted during each of the four phases of the tidal cycle: maximum flood, maximum ebb, high slack, and low slack (low tide). Effluent flow during the surveys ranged from approximately 98,000 gpd to 139,000 gpd. A 20% solution of Rhodamine WT dye was continuously injected into the effluent approximately 1500 feet upstream of the outfall in order to achieve an initial concentration of 100 ppb in the effluent; dye concentrations at the discharge point were monitored at one-hour intervals during survey operations to ensure that the initial concentration was maintained. Dye injection began approximately 15 hours before the start of the first spring and neap survey in order to achieve a steady state in the receiving stream. Dye concentrations in the receiving stream were measured

using a boat-based fluorometer capable of reading down to a level of 0.04 ppb. Fluorometer readings were taken at approximately one foot below the water surface during each of the four phases. Where applicable, mid-depth readings were also made. The extent of the survey area ranged from the discharge point to a distance offshore where the dye was no longer detected by the fluorometer. Readings continued for one additional tidal cycle after dye injection ceased in order to evaluate accumulation effects. Fluorescence data was corrected for temperature and background concentrations. Water temperature, salinity, tide heights, and water depths were also measured during the study.

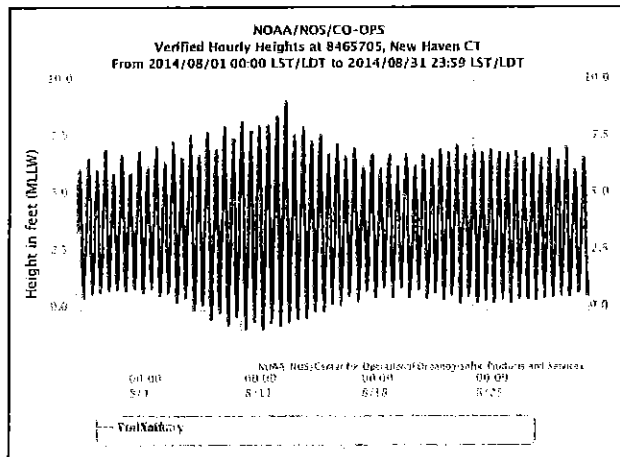
A summary of the conditions at the time of the surveys is as follows:

	SPRING TIDE	NEAP TIDE
DURATION OF SURVEY	August 10 @ 08:00 to August 11 @ 05:30	August 19 @ 07:30 to August 20 @ 04:00
SURVEYS CONDUCTED	8 (over 2 tidal cycles)	9 (over 2 tidal cycles)
POST DYE INJECTION MAPS	4	3
TIDE HEIGHT	4.1 ft to -1.2 ft	3.1 ft to -1.3 ft
TIDAL CURRENTS	Unknown	Unknown
WATER TEMPERATURE	70.0-77.5 °F	67.3-80.4 °F
WATER SALINITY	0.391-5.24 ppt	0.200-1.30 ppt
AIR TEMPERATURE	64-87 °F	57-82 °F
DEW POINT	59-65 °F	55-62 °F
PRECIPITATION	None	None
WIND SPEED	3-4 mph	2-4 mph
VISIBILITY	7-10 miles	6-10 miles
EFFLUENT FLOW	97,780-107,780 gpd	125,000-138,450 gpd
EFFLUENT SALINITY	Unknown	Unknown
EFFLUENT TEMPERATURE	Unknown	Unknown

NOTES:

1. The dye study report notes that the effluent flow was 80 gpm during the surveys. The effluent flows noted above are those reported with the DMRs on the "Monthly Operation Report"
2. No data on the tidal currents, effluent salinity, and effluent temperature were provided.

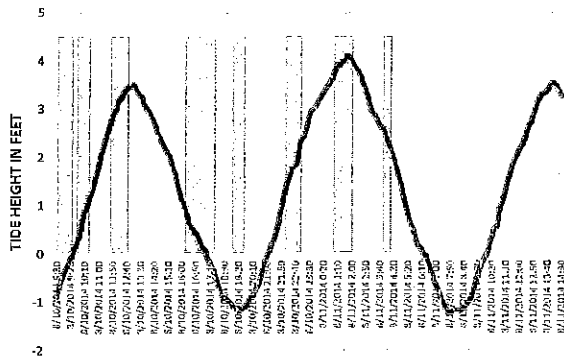
Dye studies are conducted under critical conditions when available dilution is generally at its lowest. Critical conditions are specific to the type of waterbody and are usually combinations of worst-case assumptions of river flow, effluent flow, and environmental effects. Guidance for the determination of waterbody-specific critical design conditions are set forth in the *Technical Support Document for Water Quality-based Toxics Control* ("TSD"). In the case of estuarine waterbodies, the TSD recommends that a dye study be conducted during astronomical tidal conditions, that is, spring tide and neap tide. A spring tide is a higher than normal tide that occurs at the time of a new moon or full moon. A neap tide is a lower than normal tide that occurs during the first and third quarter moon. The density stratification of the waterbody also needs to be considered when determining worst-case scenario conditions. The TSD recommends that in estuaries without stratification, the critical dilution condition includes a combination of low-water slack at spring tide and low freshwater inflows. In estuaries with stratification, a site-specific analysis of a period of minimum stratification and a period of maximum stratification, both at low-water slack, should be made in order to evaluate which one results in the lowest dilution.



The timing of the surveys was scheduled to coincide with astronomical tide conditions. The spring tidal survey was conducted from August 10 to 11, 2014 and the neap tidal survey was conducted from August 19 to 20, 2014. Local tide heights were measured in the field during the surveys. The tidal range measured at that time was 5.1 feet for spring tide and 4.4 feet for neap tide. A summary of the tide height data and timing of the surveys performed is as follows:

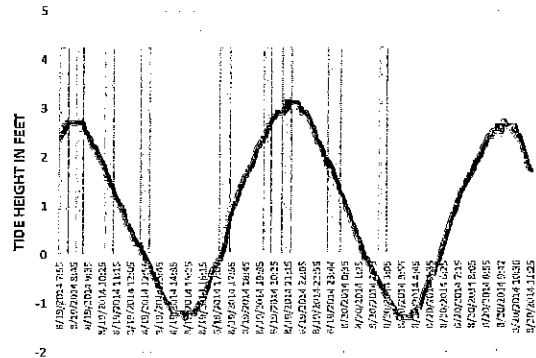
SPRING TIDE SURVEYS

(August 10-August 11, 2014)



NEAP TIDE SURVEYS

(August 19-August 20, 2014)

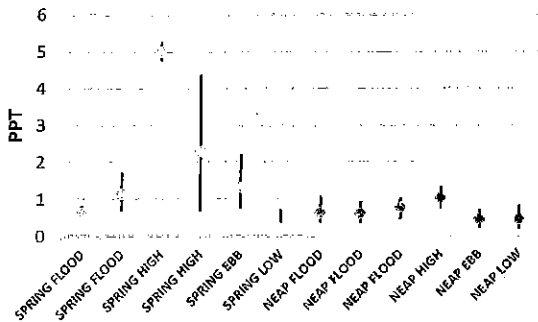


No measurements of tidal currents were included in the report. The report notes that observations made during the surveys indicate that tidal currents are negligible in the cove.

Salinity and temperature measurements were made during the surveys. This data was measured with boat-based equipment in random locations in the study area. The salinity and temperature measurements were taken at depths of 1 foot below the surface; in certain areas temperature was reportedly measured at depths deeper than 1 foot. The salinity values during the surveys ranged from 0.391 to 5.24 ppt at spring tide and 0.200 to 1.30 ppt at neap tide. In both instances, salinity values were the highest at high tide, which is expected given the higher volume of saltwater in the area at this tidal cycle than at the others. Water temperature readings ranged from 70.0 °F to 77.5 °F during spring tide and from 67.3 °F to 80.4 °F during neap tide, fluctuating diurnally over the surveys. The density of the effluent during the survey timeframe was not provided. Density differences (stratification) between receiving water and effluent are unknown.

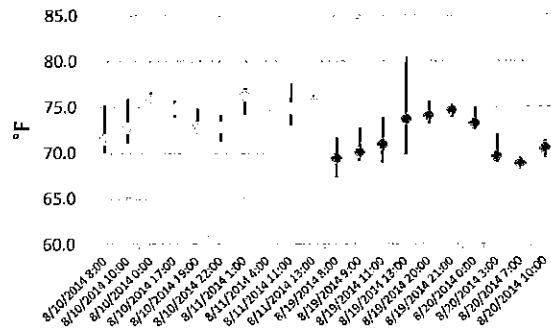
QUINNIPIAC RIVER SALINITY

(August 10/11 & August 19/20, 2014)

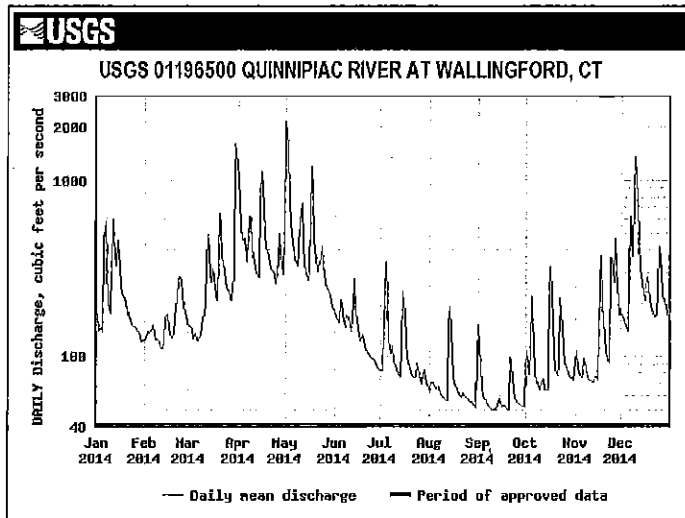


QUINNIPIAC RIVER TEMPERATURE

(August 10/11 & 19/20, 2014)



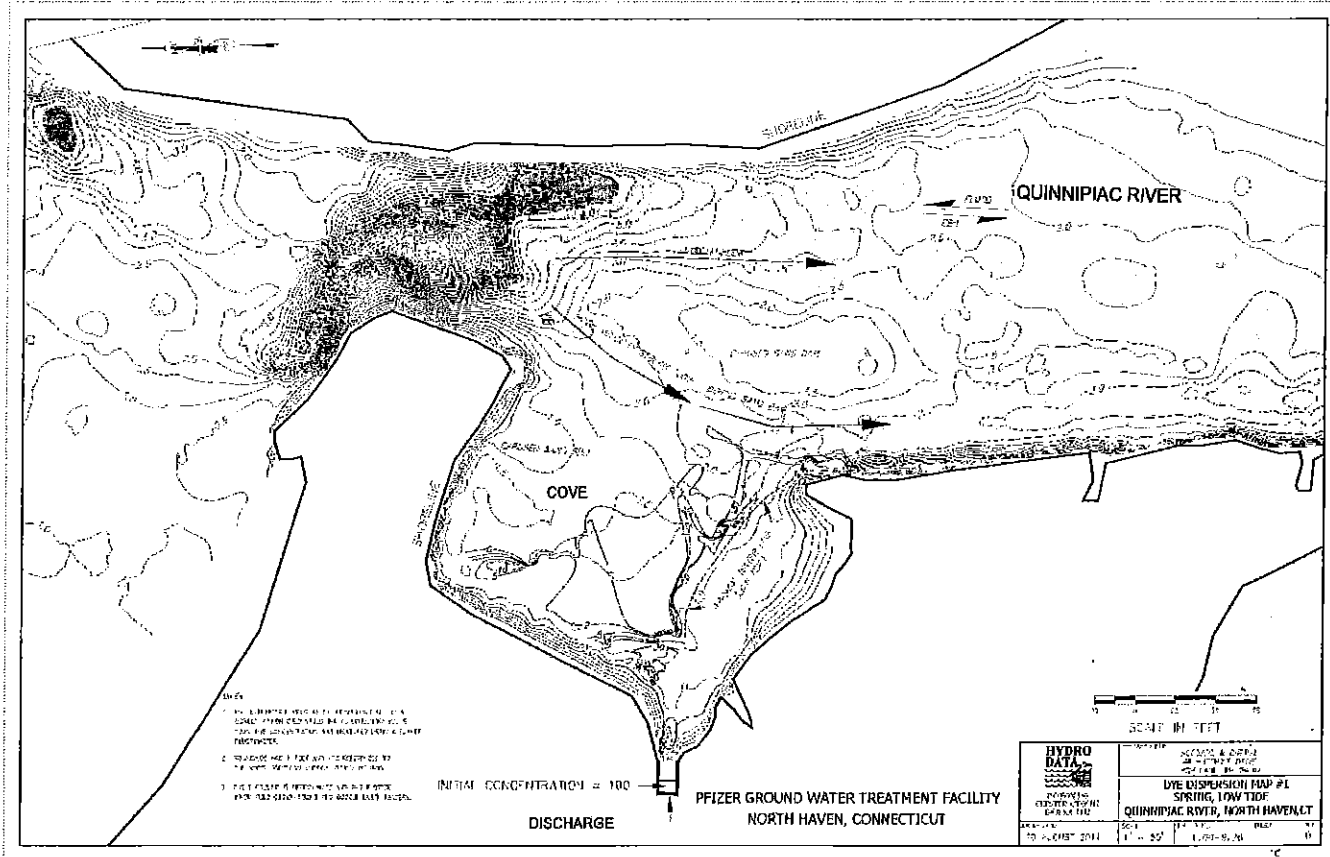
The mixing of the wastewater is effected by both the tide and the river flow, so the timing of the dye study was also coordinated so that it would be conducted during low flow conditions in the Quinniac River. Stream flow was monitored at USGS 01196500, a gage that is located upstream of the site in Wallingford, in the non-tidal segment of the river. Flow readings from this gage were monitored in order to determine a suitable time to conduct the dye study. Based on the data in this gage, river flows during the spring tide surveys ranged from 58.0 to 57.1 cubic feet per second (cfs) and during the neap tide surveys ranged from 62.9 to 61.1 cfs. The river flows on those days represent between 8.0 to 10.7 percentile of the daily mean discharge flow records in the gage (1930-2017). The drainage area at USGS 01196500 is 115 mi². The drainage area at the discharge location is approximately 130 mi². Using drainage basin ratios, the estimated river flows at the discharge site were approximately 64.5 to 65.6 cfs during the spring tide surveys and 69.1 to 71.1 cfs during the neap tide surveys.



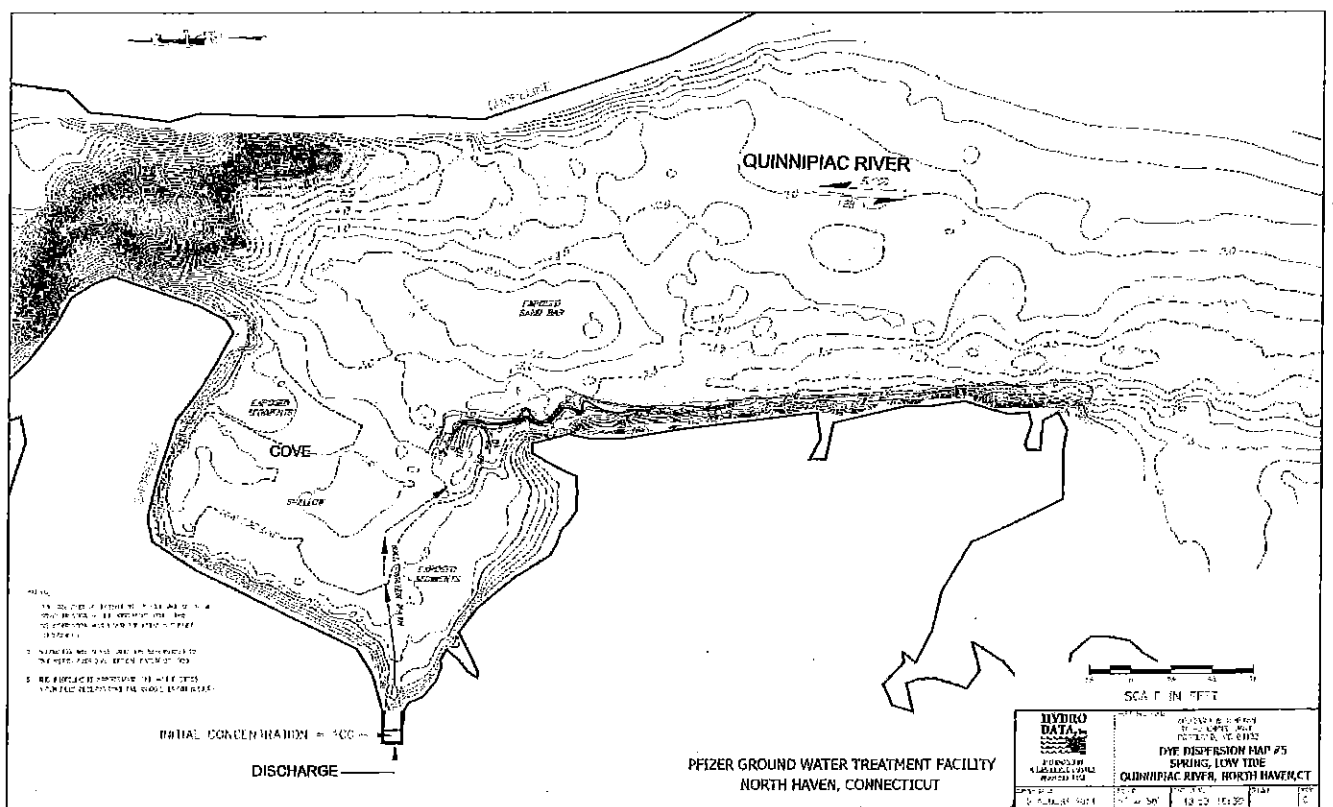
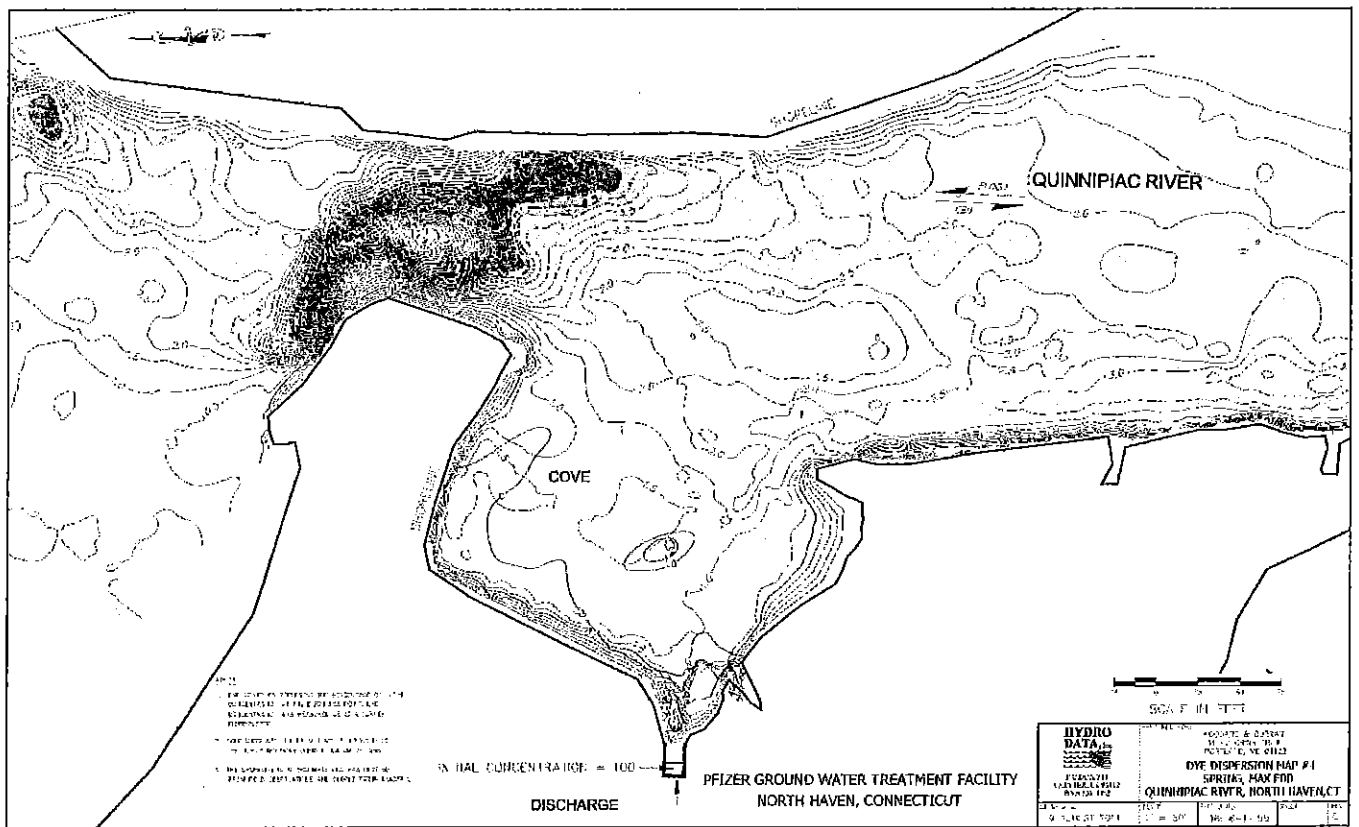
DATE	FLOW AT USGS 01196500 (CFS)
AUGUST 8, 2014	61.6
AUGUST 9, 2014	58.7
AUGUST 10, 2014	58.0
AUGUST 11, 2014	57.1
AUGUST 12, 2014	56.1
AUGUST 13, 2014	171
AUGUST 14, 2014	189
AUGUST 15, 2014	101
AUGUST 16, 2014	76.6
AUGUST 17, 2014	69.5
AUGUST 18, 2014	65.6
AUGUST 19, 2014	62.9
AUGUST 20, 2014	61.1
AUGUST 21, 2014	59.2
AUGUST 22, 2014	61.6
AUGUST 23, 2014	60.2

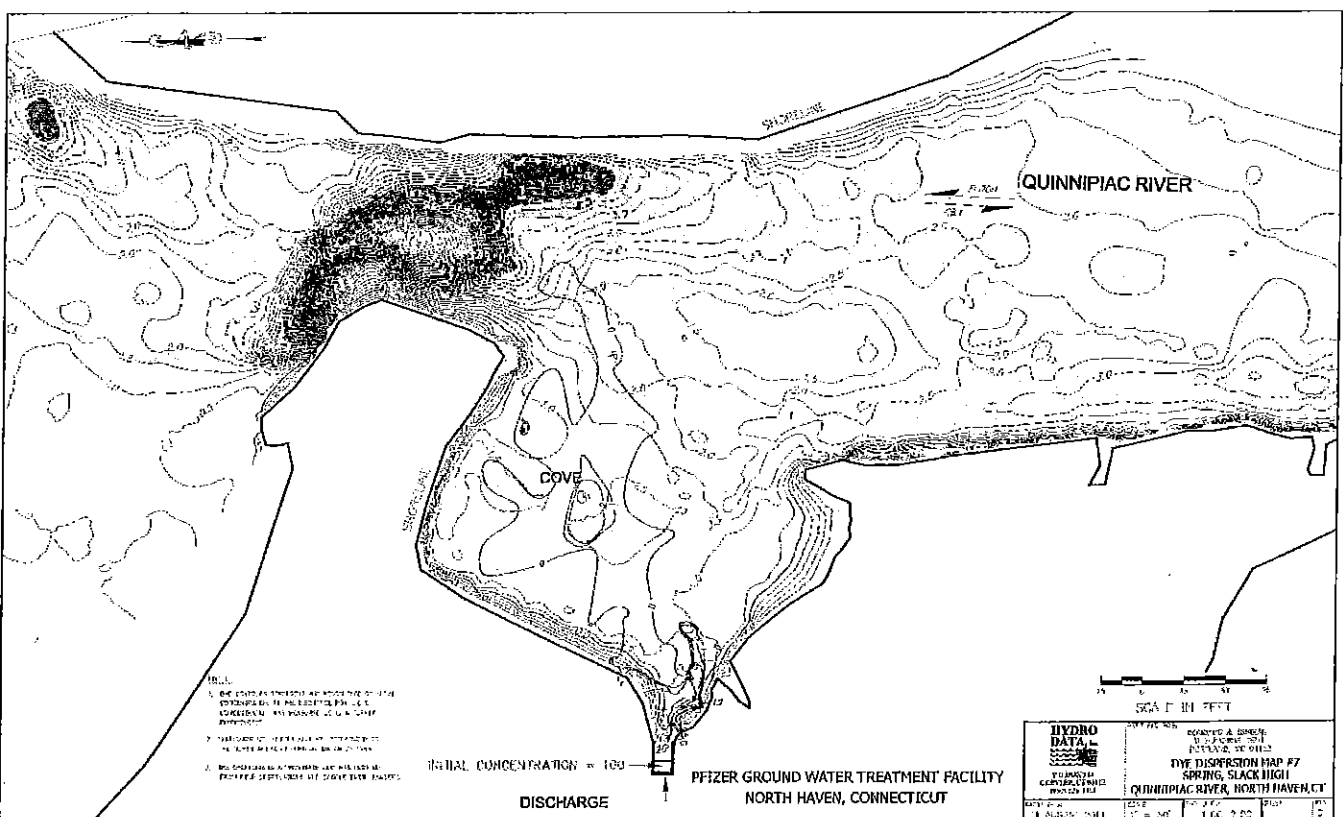
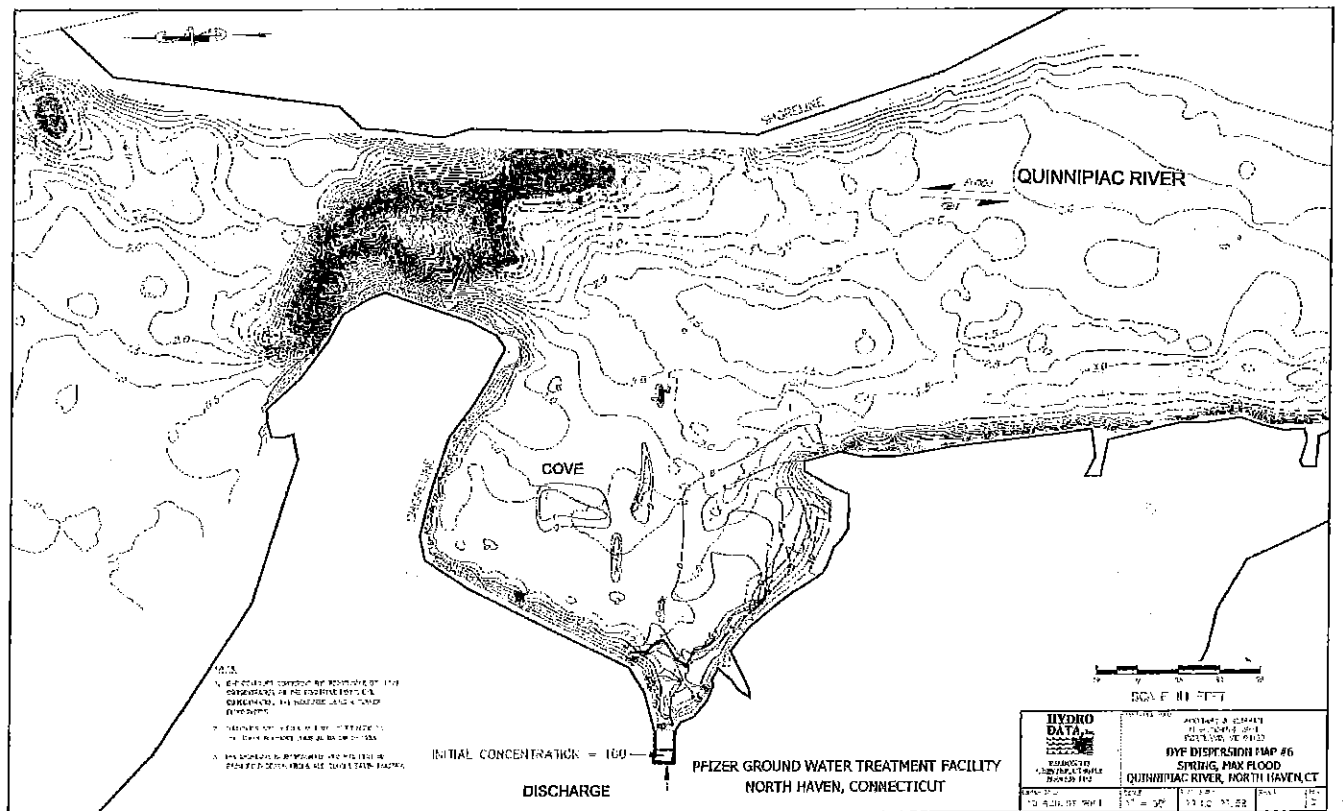
Surveys were conducted during each of the four phases of the tidal cycle, maximum flood, maximum ebb, high slack, and low slack (low tide). Results of the dye study indicate that varying levels of dilution were realized over the course of a tidal cycle, with the least amount of dilution occurring at low tide. At low tide, the mud flats are exposed and the effluent travels across the mud flats in the cove before getting to the main river channel for dilution. The dilution maps also indicate that at low tide, the effluent is shore hugging, up to 180 feet in one instance. For all other tidal cycles, complete¹ lateral mixing ranged from within several feet of the outfall to about 180 feet from the outfall.

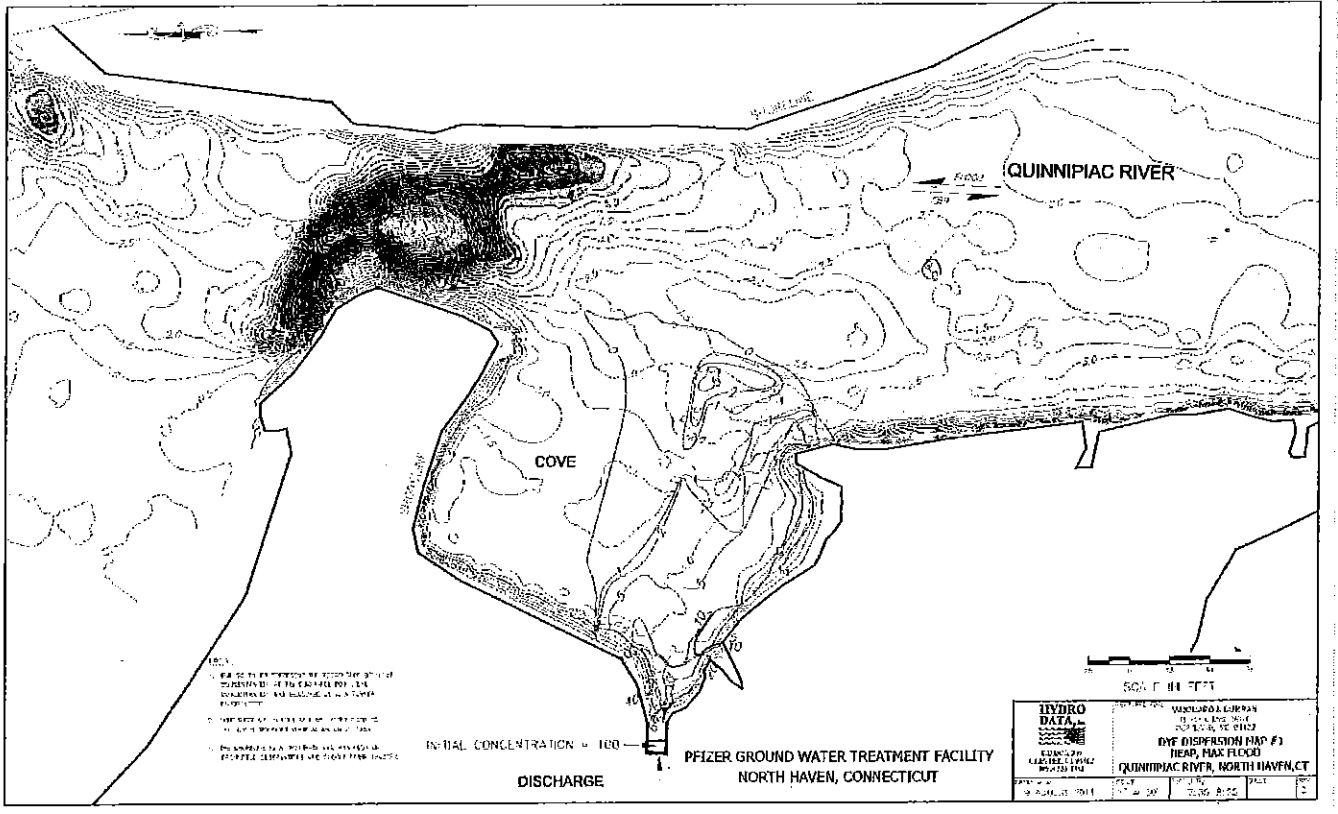
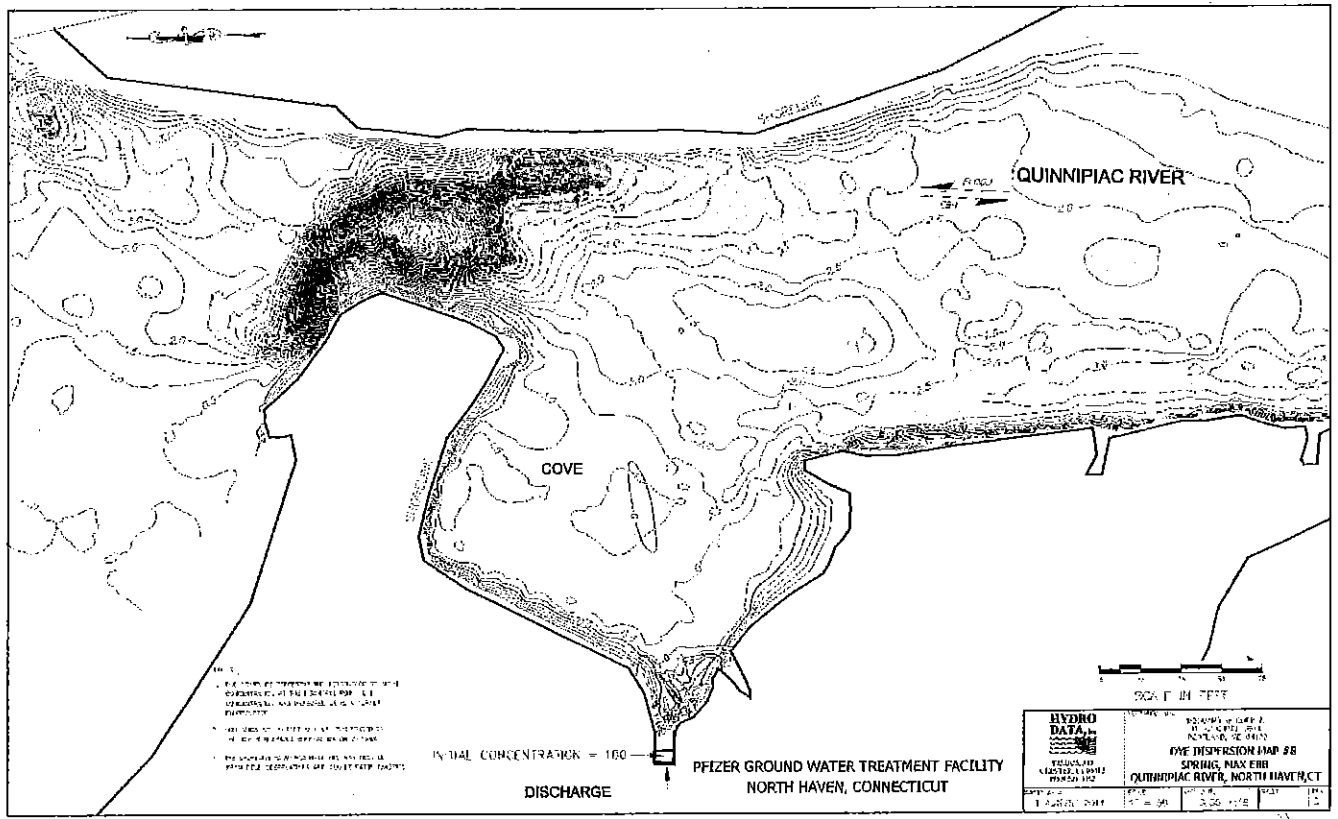
The figures below are the dilution contours for the spring and neap tide surveys. Contours are plotted as the percent of initial concentration of dye (100 ppb).

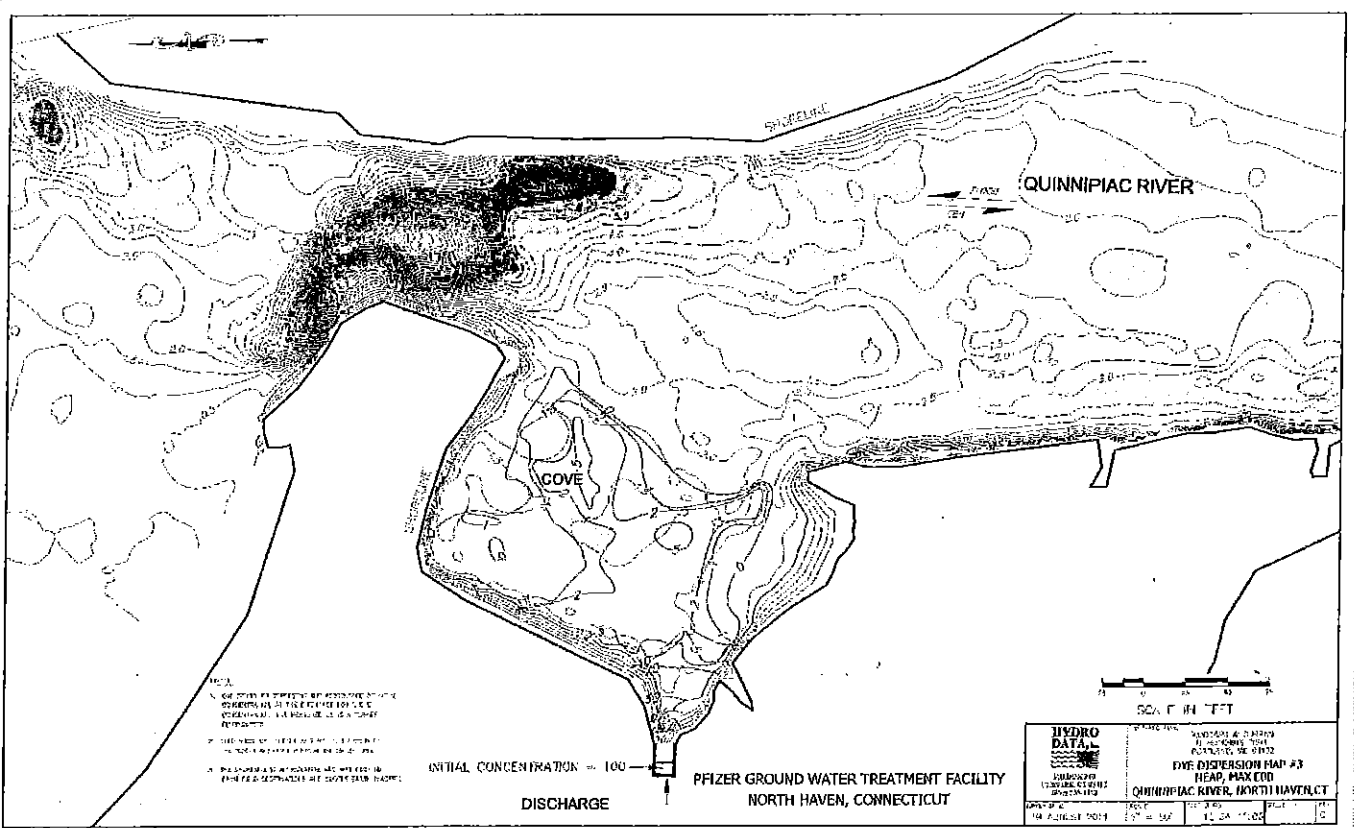
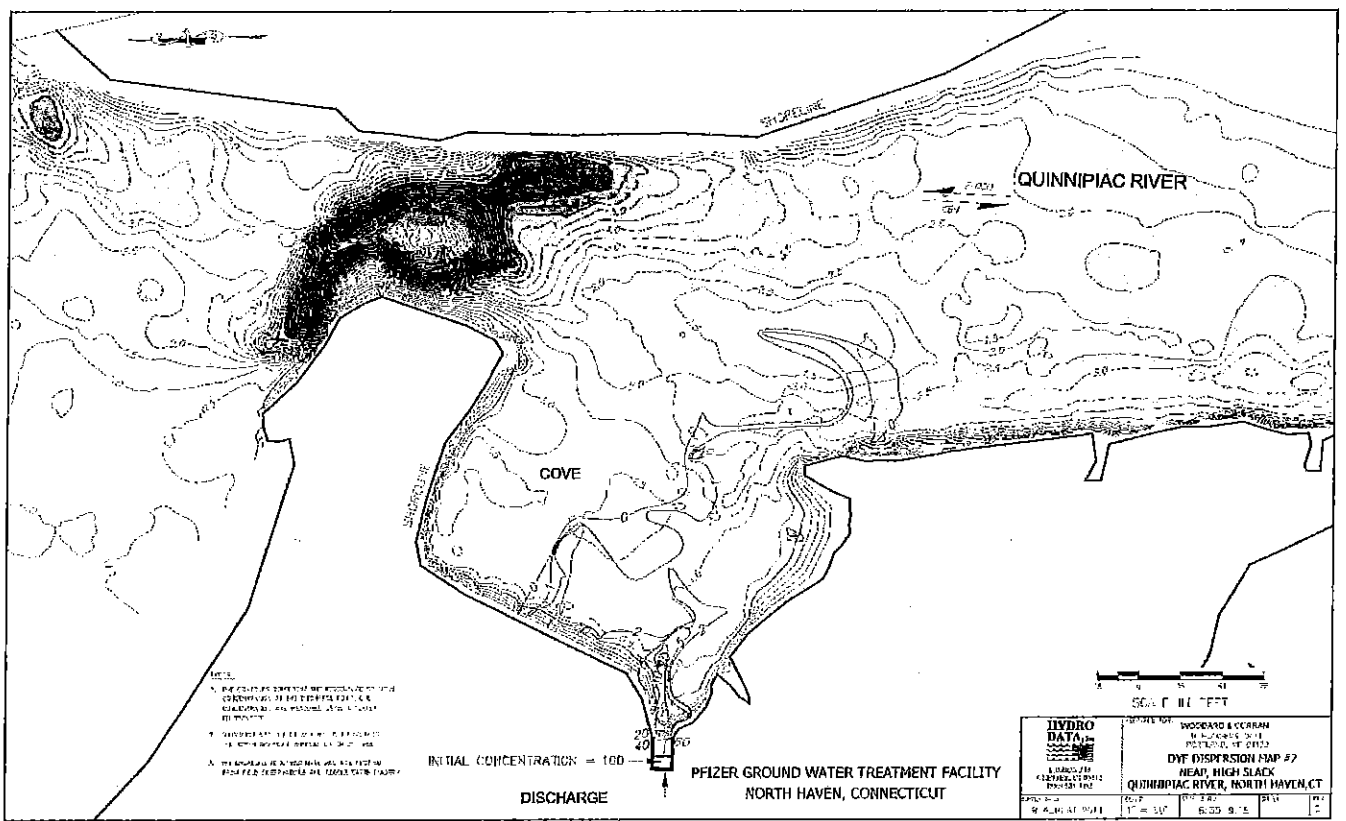


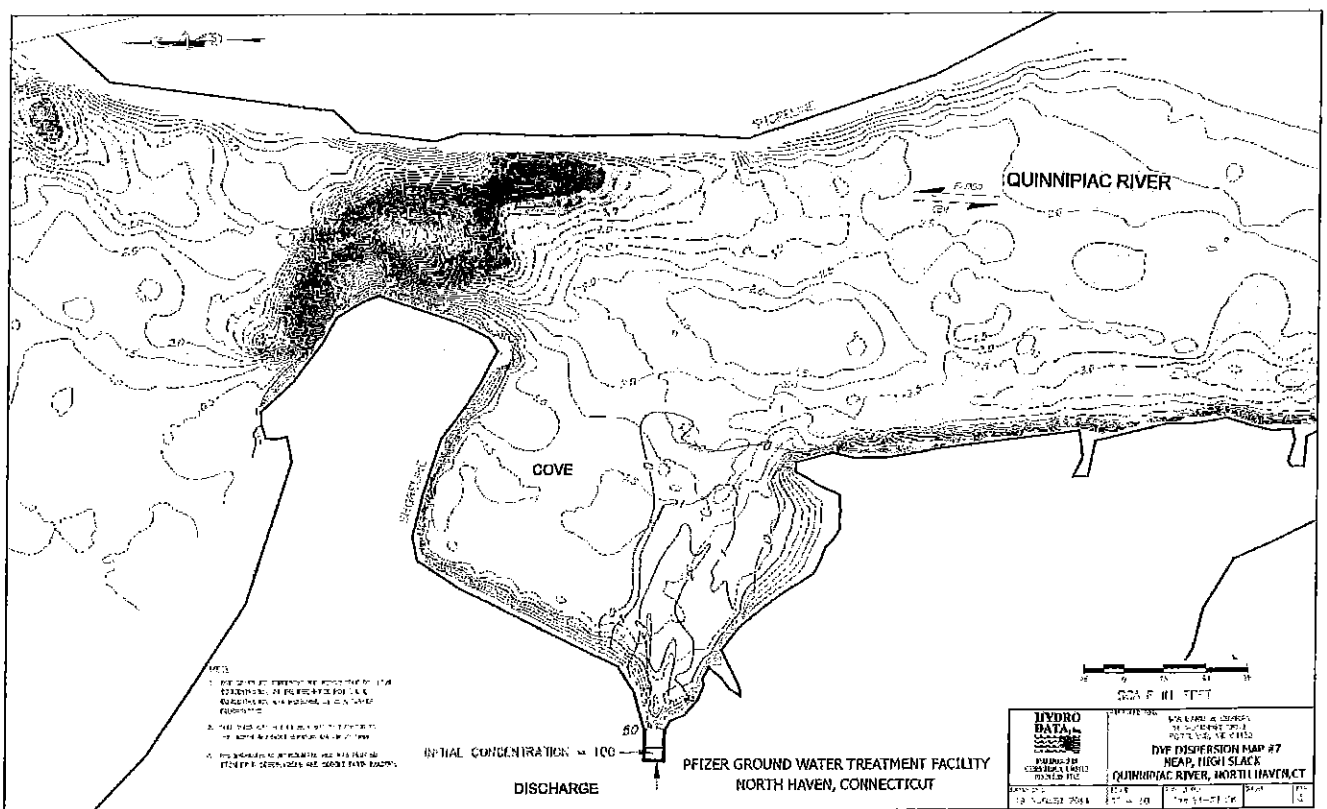
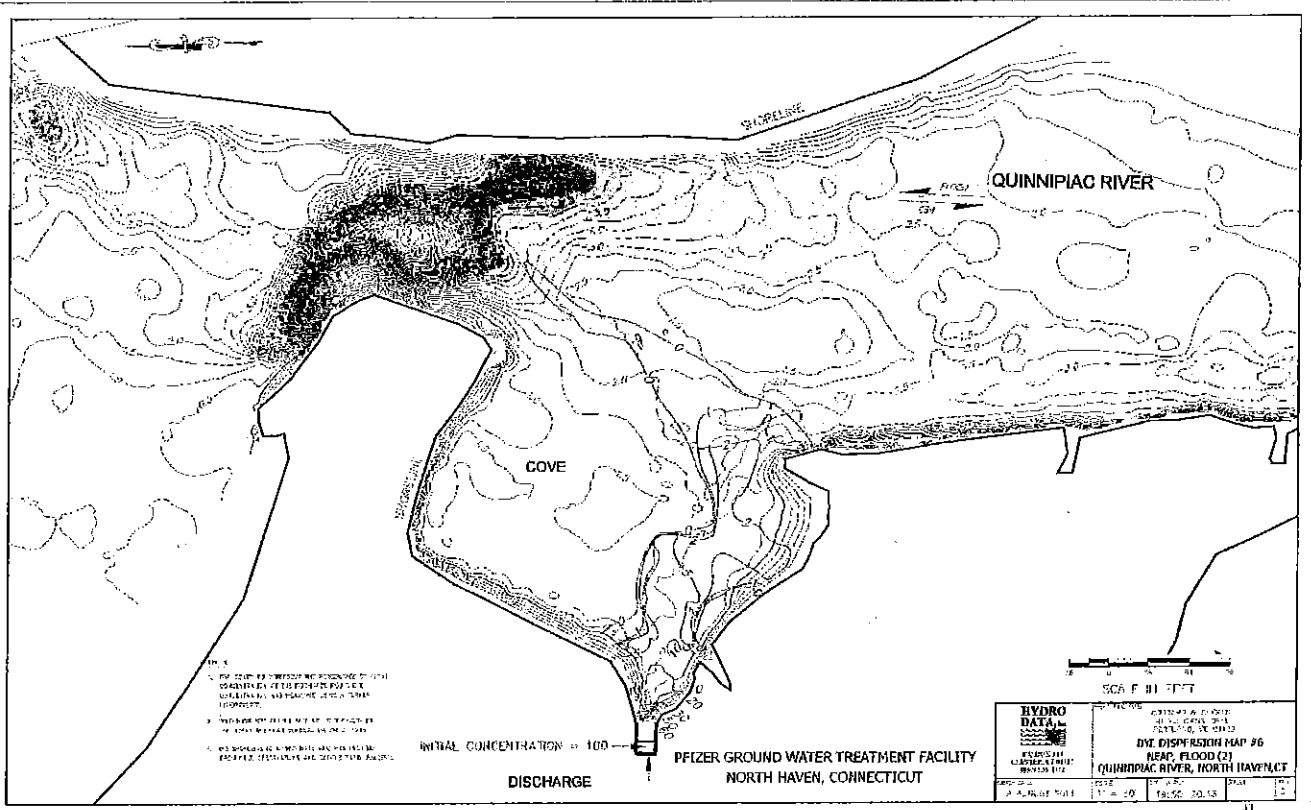
¹ The TSD defines a "completely mixed condition" as no measurable difference in the concentration of a pollutant across a transect of the waterbody (e.g., does not vary by 5 percent).

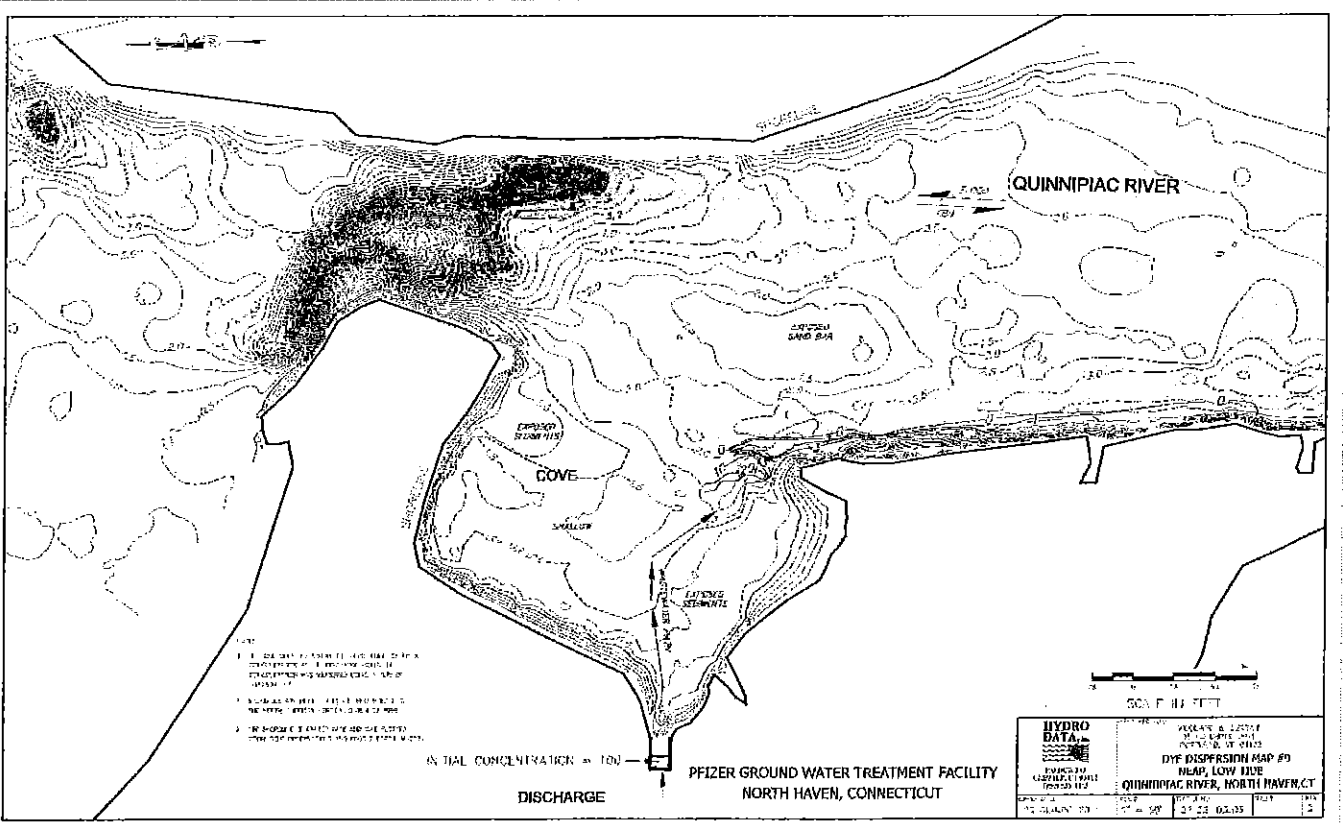
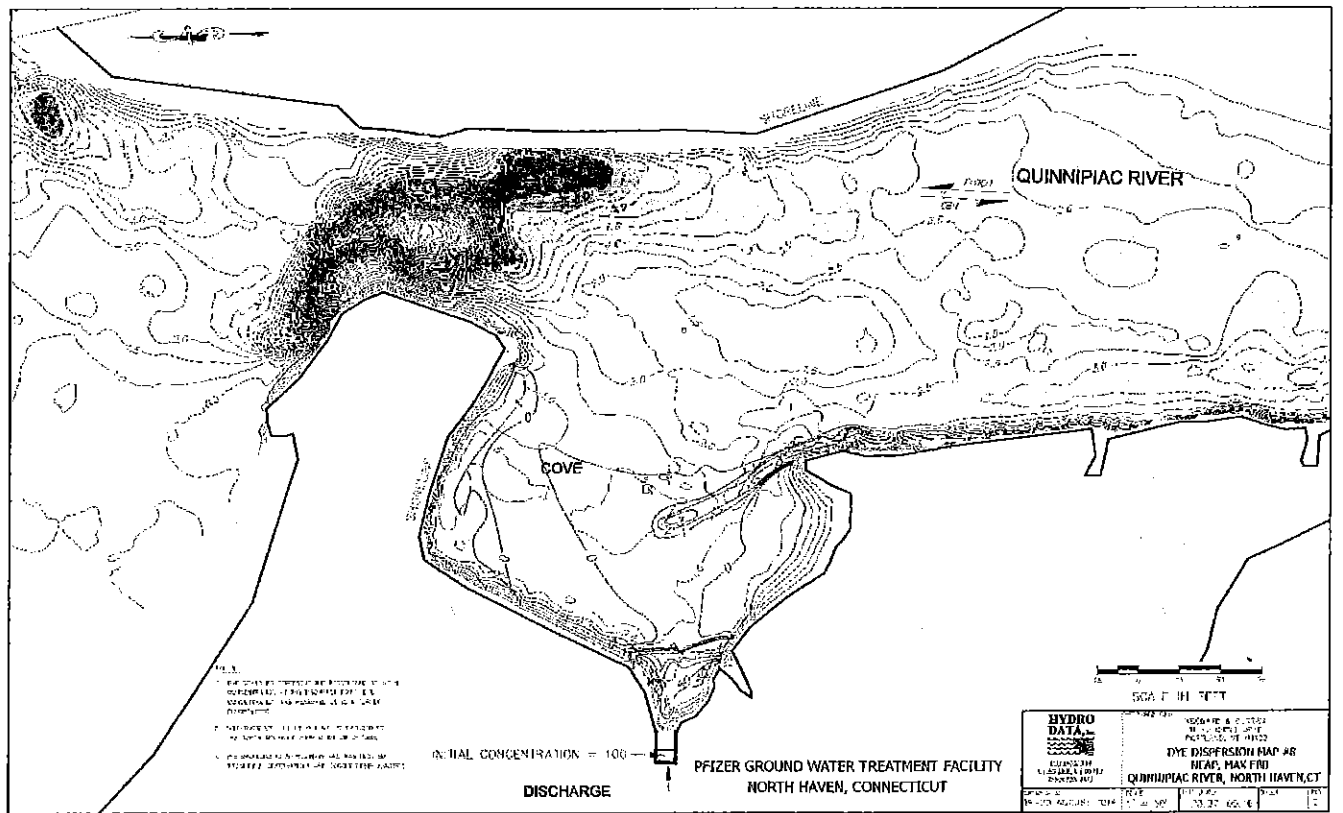












Photos taken during the surveys:

PHOTO MAP

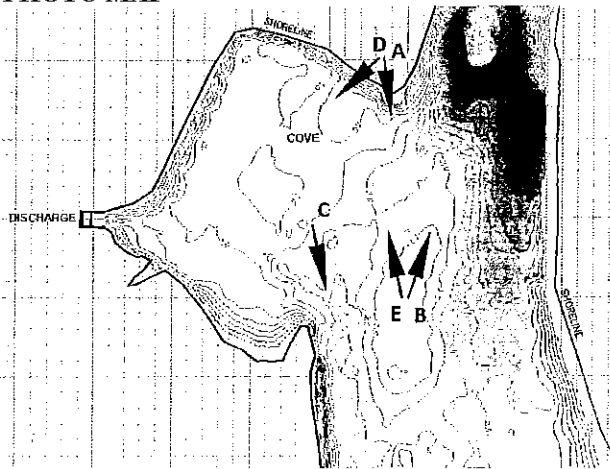


PHOTO A: August 19, 2014 @ 2:45 PM



PHOTO B: August 10, 2014 @ 7:30 PM



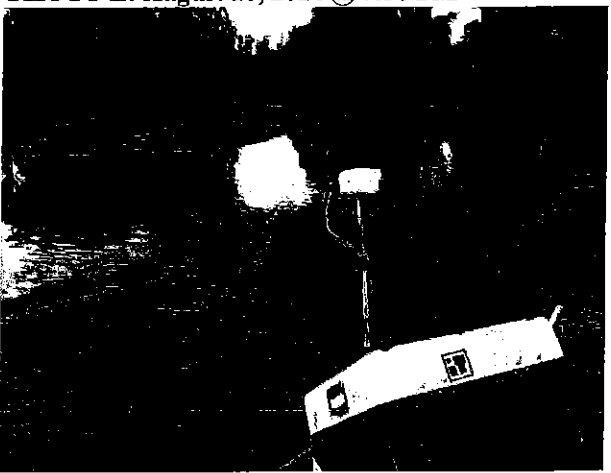
PHOTO C: August 10, 2014 @ 7:30 PM



PHOTO D: August 19, 2014 @ 2:45 PM



PHOTO E: August 10, 2014 @ 7:30 PM



CONDITIONS FOR MIXING ZONE ALLOCATION

Several criteria need to be evaluated in order to determine whether a mixing zone can be allocated. These factors are as follows:

- Characteristics of the Discharge:** The WQS require that the volume, strength and persistence of the discharge be considered when allocating a mixing zone. The subject discharge consists primarily of treated groundwater from the site. The pollutants in the groundwater are associated with Upjohn's chemical/pharmaceutical/pesticide manufacturing operations and include a variety of volatiles and semi-volatiles, including benzene, chlorobenzene, chlorinated anilines, and benzidines. In general, mixing zones are allocated to those pollutants which require some level of in-stream dilution (i.e., the numeric criteria cannot consistently be met end-of-pipe), provided that treatment, or at a minimum BMPs, are implemented to reduce the pollutant levels in the discharge. In this case, the subject effluent is treated on-site prior to discharge; pollutant removal rates vary depending on the pollutant and can generally range from 65%-100%. This results in many pollutants in the discharge being met in the pipe and therefore not requiring a mixing zone. To the extent that any of the pollutants in the discharge have a human health designation of either "A" (Known Human Carcinogen), "C" (Probable or Possible Carcinogen), or "HB" ("High Potential to Bioaccumulate or Bioconcentrate), no mixing zone applies.
- Conditions of the Receiving Water:** The WQS require that the area and volume of the receiving water allocated for a mixing zone be determined based on the unique physical, chemical, and biological characteristics of the receiving water. Among other things, the assimilative capacity of the receiving stream is considered. That is, does the receiving stream have the capacity to provide dilution to the discharge. The permittee has collected some information concerning the pollutant levels in the receiving stream upstream of the discharge. This information is summarized in the table below for several pollutants. Based on this data, the average concentrations for aluminum, copper, and cyanide are higher than the ambient water quality criteria in the WQS. Therefore, the receiving stream does not have the capacity to provide dilution for these pollutants. No mixing zone is allocated to these pollutants.

QUINNIPIAC RIVER POLLUTANT CONCENTRATIONS

POLLUTANT	UNITS	APR 22, 2015	MAY 28, 2015	JUN 29, 2015	JUL 31, 2015	AUG 25, 2015	SEP 30, 2015	OCT 30, 2015	NOV 24, 2015	DEC 28, 2015	AVERAGE
Aluminum, Total	µg/L	288.2	70.81	110	149.2	55.88	174	280.1	98.9	106.4	148.2
Ammonia, Total	µg/L	<71	313	150	<44	146	158	<52	308	304	153.2
Copper, Total	µg/L	9.03	4.83	11.6	4.92	5.94	5.93	13.12	5.41	4.8	7.29
Cyanide, Total	µg/L	<1	<4	<1	<2	<4	6	7	<5	<3	1.44
2-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--
3-Chloroaniline	--	--	--	--	--	--	--	--	--	--	--
Dichloran	--	--	--	--	--	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	--	--	--	--	--	--

Samples taken upstream of the outfall location on an ebb tide

- Prevention of Acutely Toxic Conditions.** Among other things, the WQS require that discharges to surface waters do not cause acute or chronic toxicity to freshwater and marine aquatic life. Acutely toxic conditions are defined as those lethal to aquatic organisms that may pass through the mixing zone. In allowing a mixing zone, an assumption is made that a small area near the outfall can exist where pollutant values are in excess of acutely toxic conditions and that such conditions can exist without causing adverse effects to the overall waterbody. If an analysis of concentrations and hydraulic residence times within the mixing zone indicates that organisms drifting through the plume along the path of maximum exposure would not be exposed to concentrations exceeding the acute criteria when averaged over the 1-hour averaging period for acute criteria, then lethality to swimming or drifting organisms should not be expected. In many situations, travel time through the acute mixing zone must be less than roughly 15 minutes if a 1-hour average exposure is not to exceed the acute criterion.



PHARMACIA & UPJOHN OUTFALL, DSN 001-1

The TSD identifies four methods that can be used to prevent lethality to passing organisms in the mixing zone:

- The first method is to prohibit concentrations in excess of the acute criteria in the pipe itself, as measured directly at the end of the pipe.

Based on a review of approximately five years worth of DMR data, the acute criteria is not always met end-of-pipe for some pollutants. Therefore, the first method is not met.

- The second approach is to require that the acute criteria be met within a very short distance from the outfall during chronic design-flow conditions for receiving waters. If this alternative is selected, the use of a high-velocity discharge with an initial velocity of 3 meters per second, or more, together with a mixing zone spatial limitation of 50 times the discharge length scale in any direction, should ensure that the acute criteria is met within a few minutes under practically all conditions. The discharge length scale is defined as the square root of the cross-sectional area of the discharge pipe. In this case, the velocity of the discharge is as follows:

**At a maximum daily effluent flow = 252,000 gpd = 0.01104 m³/s
With a pipe diameter of 8 inches (0.2032 meters), the area of the outfall pipe = 0.0324 m²**

$$\therefore \text{Velocity discharge} = 0.341 \text{ m/s}$$

Since the velocity is less than 3 m/s, the first condition of the second method is not met.

- A third alternative is not to use a high-velocity discharge. Rather, the most restrictive of the following conditions are met for the outfall:

a) The acute criteria should be met within 10 percent of the distance from the edge of the outfall structure to the edge of the regulatory mixing zone in any spatial direction:

Assuming a regulatory mixing zone is set at ¼ of the width of river at the discharge point, 10% of this distance is:

$$10\% * \frac{1}{4} * 375 \text{ feet} = \underline{9.4 \text{ feet}}$$

b) The acute criteria should be met within a distance of 50 times the discharge length scale in any spatial direction:

With a pipe diameter of 8 inches (0.667 feet), the cross-sectional area of the outfall pipe = 0.35 ft²

$$\therefore 50 * \sqrt{0.35 \text{ feet}^2} = \underline{29.6 \text{ feet}}$$

c) The acute criteria should be met within a distance of five times the local water depth in any horizontal direction from any discharge outlet. The local water depth is defined as the natural water depth (existing prior to the installation of the discharge outlet) prevailing under mixing zone design conditions (e.g., low flow, low tide):

Mixing zone design conditions for acute criteria are low tide. Assuming a depth of 6 inches (0.5 ft):

$$\therefore 5 * 0.5 \text{ feet} = \underline{2.5 \text{ feet}} \text{ (most restrictive)}$$

- A fourth alternative (applicable to any waterbody) is for the discharger to provide data showing that a drifting organism would not be exposed to 1-hour average concentrations exceeding the acute criteria, or would not receive harmful exposure when evaluated by other valid toxicological analysis. The TSD suggests a method to demonstrate compliance with the fourth alternative. This method incorporates mortality rates (based on toxicity studies for the pollutant(s) of concern and a representative organism) along with the concentration isopleths of the mixing zone and the length of time the organism may spend in each isopleth. It is expressed by the following equation:

$$\sum \left(\frac{T(n)}{ET(X) \text{ at } C(n)} \right) < 1$$

Where: T(n) is the exposure time an organism is in isopleth, n
 ET(X) is the exposure time required to produce an effect in a certain percent of the organisms exposed to a particular concentration, C, in isopleth, n

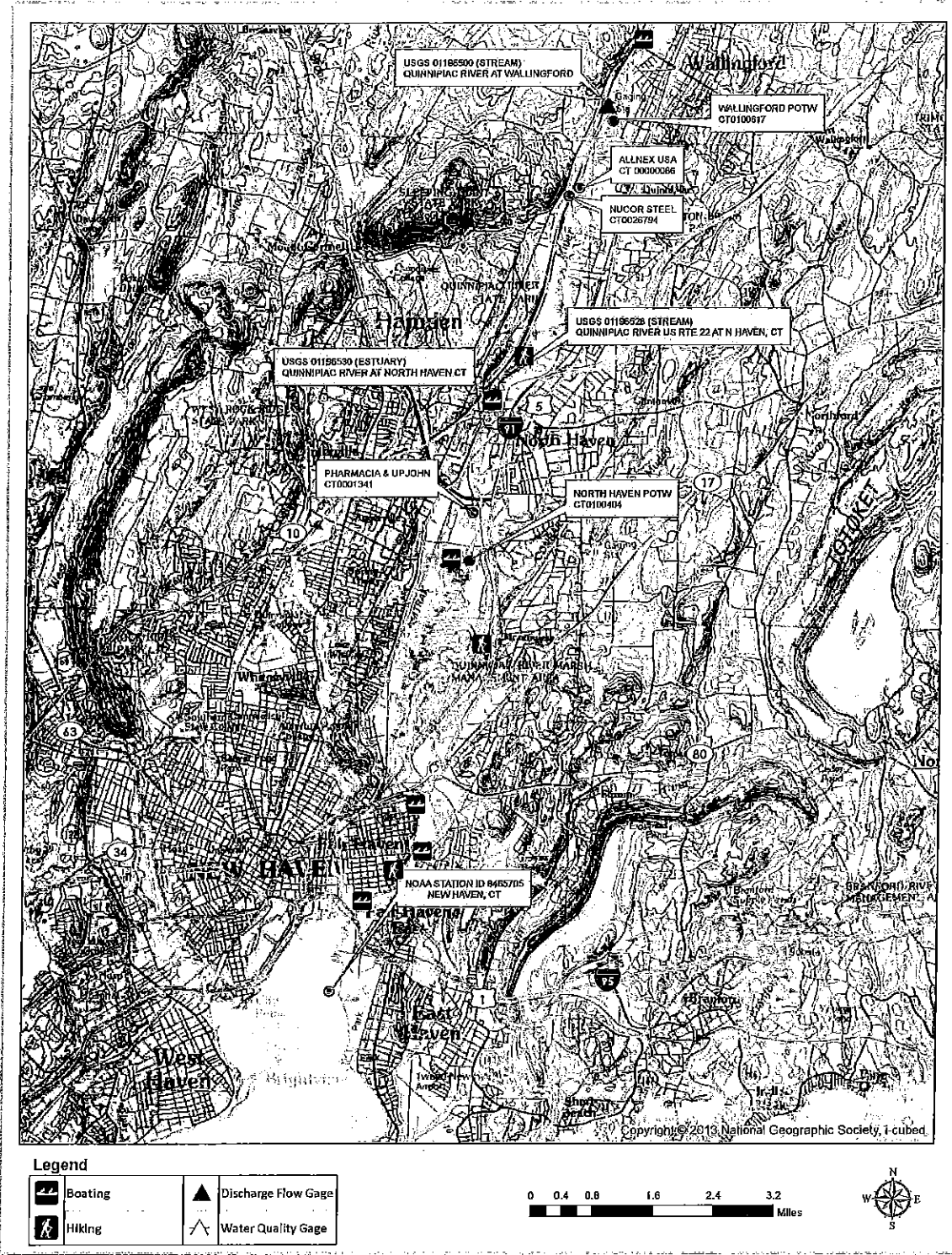
If the summation of ratios of exposure time to effect time is less than 1 hour, then the percent effect will not occur.

No information/data has been provided relative to Alternative 4.

- **Aesthetics:** The WQS require that the effect of the discharge on the aesthetic quality of the receiving water be considered. This includes, but is not limited to, the potential to cause objectionable deposits, floating debris, oil, scum, and other materials that form nuisances or produce objectionable color, odor, taste, or turbidity, or that may attract undesirable aquatic life or wildlife, or result in the dominance of nuisance species. Allocation of a mixing zone in this case is not expected to cause aesthetic issues with the receiving water.
- **Overall Effect of the Discharge on Aquatic Life, including Endangered Species, and the Spawning Grounds:** The WQS require consideration of the effect of the discharge on spawning grounds or nursery areas of sensitive aquatic organisms or areas utilized by aquatic organisms for shelter and living space, and an allowance for a continuous zone of passage for free swimming and drifting organisms. Allocation of a mixing zone in this case is not expected to effect the aquatic life in the area, its movement, or any spawning or nursery grounds.
- **Location of the discharge in relation to other dischargers.** The WQS require a consideration of the location of the discharge as it relates to the location of other discharges in the receiving water body to ensure that the cumulative effect of adjacent mixing zones will not significantly reduce the environmental value or preclude any existing or designated uses of the receiving surface water. There are several other dischargers in the vicinity of Pharmacia & Upjohn. [See map below]. No overlapping of mixing zones would occur between this discharge and any other in the area.

In consideration of the above, the following pollutants are considered for a mixing zone:

- Ammonia
- 2-Chloroaniline
- 3-Chloroaniline
- Dichloran
- Formaldehyde
- Vanadium



CALCULATION OF THE MIXING ZONE

In order to determine the applicable mixing zone for a discharge, dilution under critical conditions must be evaluated. While dye studies can give an estimate of what the mixing conditions may be, dye studies are rarely undertaken when all required conditions are critical. Modeling is generally required to evaluate critical dilution. The TSD and EPA's *Technical Guidance Manual for Performing Waste Load Allocations* provide guidance concerning various models, model selection, model calibration, sensitivity analysis, model testing refinement, and validation.

Computer models used to conduct mixing zone analyses are designed to simulate the behavior of a hydrodynamic system in order to make predictions as to the manner in which the effluent will mix in the receiving stream at certain prescribed conditions. Many of these types of models are based on jet integral techniques and use the laws of conservation of mass and momentum to predict the processes affecting circulation and mixing. Jet integral models simulate the discharge as a column of water moving through the receiving water, incorporating (“entraining”) ambient water, causing the effluent flow to become diluted as a result of the entrainment. Movement of the discharge is first determined by momentum and then by its buoyancy, which can be positive (i.e., when the discharge tends to rise) or negative (i.e., when the discharge tends to sink). Mixing determined by the initial momentum and buoyancy of the discharge is referred to as “near-field” mixing. The second stage of mixing is ambient-induced and covers a more extensive area in which the effect of initial momentum and buoyancy is diminished and the discharge is mixed primarily by ambient turbulence. This stage of mixing is referred to as “far field” mixing. In general, buoyant jet models require input data regarding: discharge depth, effluent flow rates, density of effluent, density of the receiving water, ambient current speed and direction, and outfall characteristics such as port size, spacing, and orientation. Output from the model includes the dimensions of the plume over a series of intervals, time of travel to points along the plume centerline, and the average dilution at each interval.

The reliability of model predictions depends, in part, on the model used. Selection of a model considers suitability (i.e., is the model appropriate for the discharge type and the goals of the study), sufficiency (i.e., is it adequate for the purpose), and validity (i.e., does the model actually measure what it indicates that it is measuring). Consideration should also be given to how much data exists to run the model. In cases where only a few measurements are available, the TSD recommends that steady-state modeling be used, as opposed to dynamic modeling. Steady-state models consider that effluent flow and loading are constant and all inputs are time-averaged; dynamic models incorporate variability of the individual inputs. Consideration also needs to be given to the basis of the models; that is, are they theoretical (i.e., models based on mathematical equations that describe the mixing processes) or empirical (i.e., models based on observation and experiment). Models types can range from complex three-dimensional models that directly solve the conservation equations for the full dynamic to those that are less complex and model the discharge using geometric schematizations and dynamic simplifications.

In terms of the less complex mixing zone models, there are two suites of models available: CORMIX and Visual Plumes. Visual Plumes is an EPA-supported set of models available through the Center for Exposure Assessment Modeling at <https://www.epa.gov/exposure-assessment-models/surface-water-models>. CORMIX is also a model that can be used to predict mixing zones and can be accessed at <http://www.cormix.info/>. Both Visual Plumes and CORMIX contain several subsystems of models, as follows:

MODEL	CORMIX				VISUAL PLUMES			
	CORMIX1	CORMIX2	CORMIX3	DEHYDRO	DIKHV	NRFIELD (RSB)	UM3	PDS
MODEL BASIS	Theoretical	Theoretical	Theoretical	Theoretical	Theoretical	Empirical	Theoretical	Theoretical
MODEL TYPE	Steady-state	Steady-state	Steady-state	Steady-state	Steady-state	Steady-state	Steady-state	Steady-state
OUTFALL TYPE	Single Port	Multiport	Single Port	Single Port Multiport	Single Port Multiport	Multiport	Single Port Multiport	Single Port (Channel)
OUTFALL ORIENTATION	Above water Submerged	Submerged	Above water	Above water Submerged	Submerged	Submerged	Submerged	Surface Discharge
RECEIVING WATER TYPES	Rivers Lakes Estuaries Coastal Waters	Rivers Lakes Estuaries Coastal Waters	Rivers Lakes Estuaries Coastal Waters	Coastal Waters	Rivers Lakes Estuaries Coastal Waters	Rivers Lakes Estuaries Coastal Waters	Rivers Lakes Estuaries Coastal Waters	Rivers Lakes Estuaries Coastal Waters
RECEIVING WATER DEPTHS	Deep Shallow	Deep Shallow	Deep Shallow	Deep Shallow	Deep Shallow	Deep Shallow	Deep Shallow	Deep Shallow
POLLUTANT TYPES	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat	Conservative First Order Decay Heat
DENSITY STRATIFICATION	Positively buoyant Neutrally buoyant Negatively buoyant	Positively buoyant Neutrally buoyant Negatively buoyant	Positively buoyant Neutrally buoyant	Dease and/or sediment discharges in coastal environments	Positively buoyant	Positively buoyant	Positively buoyant Negatively buoyant	Positively buoyant
BOUNDARY INTERACTIONS	Yes	Yes	Yes	Yes	No	No	No	No

In this case, the following site conditions apply to the discharge that needs to be modeled:

- The outfall is a single port, side-bank discharge
- The discharge location is into a shallow cove
- The discharge is either above water or submerged
- The receiving water is a tidal estuary
- The density stratification is estimated to be slightly positively buoyant
- There is a limited amount of in-stream data

CORMIX1 satisfies the above conditions.

The Cornell Mixing Zone Expert System (CORMIX) is a suite of software models used to predict the mixing of effluent in an ambient receiving water. CORMIX1 has the ability to predict dilution characteristics of effluent flow resulting from a single port discharge of arbitrary density (positively, neutrally, or negatively buoyant), location, and

geometry into a steady-state or tidal receiving water. Data about the discharge, outfall geometry, and ambient receiving water conditions are input into the model and CORMIX1 uses equations of fluid motion and mass transport to predict the trajectory of the effluent and its dilution in the receiving water. The prediction and session reports produced by CORMIX1 describe the flow trajectory using a three-dimensional system over a series of time steps, providing pollutant concentrations and dilutions for each step. The reports also include predictions of conditions relative to the interaction of the wastewater and the receiving water, including: near-field stability, bottom interactions, contact with shore, bank or shoreline interactions. CORMIX evaluations have been summarized in peer-reviewed literature. Version 11.0 is the current version of CORMIX available.

The predictive capability of CORMIX1 was evaluated to determine whether the dilution that it predicted was similar to the dilution obtained during the 2014 dye study. The input data to CORMIX1 included the effluent and ambient conditions noted in the 2014 dye study report; assumptions were made about other input parameters. The input values used were as follows:

	SPRING TIDE				NEAP TIDE			
	ME	LT/LS	MF	HS	ME	LT/LS	MF	HS
EFFLUENT CONDITIONS								
Flow Rate (gpm)	71.4	71.4	71.4	71.4	91.5	91.5	91.5	91.5
Density (kg/m ³) ¹	998.02	998.02	998.02	998.02	998.02	998.02	998.02	998.02
Concentration, conservative (ppb)	100	100	100	100	100	100	100	100
EFFLUENT GEOMETRY								
Nearest bank	Right	Right	Right	Right	Right	Right	Right	Right
Distance to nearest bank (ft)	0	0	0	0	0	0	0	0
Submerged or Above Surface	Above	Above	Above	Subm	Above	Above	Above	Subm
Port height above water surface (ft)	0.2	1.5	0.2	---	0.5	1.5	0.5	---
Port height above channel bottom (ft)	---	---	---	1.5	---	---	---	1.5
Port diameter (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Vertical angle (θ) (°)	0	0	0	0	0	0	0	0
Horizontal angle (α) (°)	90	90	90	90	90	90	90	90
AMBIENT CONDITIONS								
Waterbody Type	Tidal	Tidal	Tidal	Tidal	Tidal	Tidal	Tidal	Tidal
Average Depth (H _a) (ft)	1.3	0.5	1.3	2.2	1.0	0.1	1.0	2.1
Depth at discharge (H _d) (ft)	1.3	0.5	1.3	2.2	1.0	0.1	1.0	2.1
Bounded/Unbounded	Unb	Unb	Unb	Unb	Unb	Unb	Unb	Unb
Maximum tidal velocity (m/s) ²	0.38	0.38	0.26	0.26	0.42	0.42	0.38	0.38
Tidal period (hr)	12.6	12.6	12.6	12.6	12.8	12.8	12.8	12.8
Instantaneous tidal velocity (m/s)	0.37	0.20	0.25	0.23	0.34	0.20	0.36	0.28
Time (hr before/after)	2.5 hr a	1 hr b	2 hr a	1 hr a	1 hr a	2 hr b	2 hr b	2.5 hr b
Temperature (°F)	74.8	72.8	72.8	76.2	73.2	69.6	74.1	74.6
Temperature (°C)	23.8	22.7	22.7	24.6	22.9	20.9	23.4	23.7
Density (ppt)	1.5	1	1	4	1	1	1	1
Density at Surface (kg/m ³)	998.5	998.4	998.4	1000.2	998.3	998.8	998.2	998.1
Density at Bottom (kg/m ³)	998.5	998.4	998.4	1000.2	998.3	998.8	998.2	998.1
Manning's n	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Wind (mph)	4	4	4	3	4	2	4	4

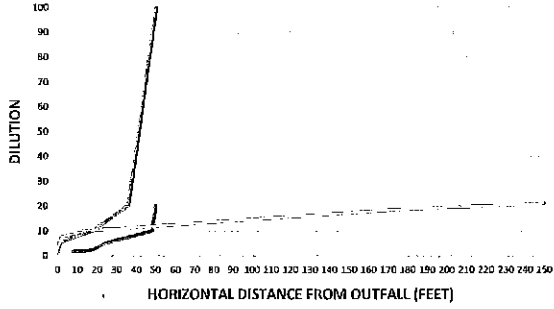
NOTES:

1. No effluent density data was provided; the above value is an estimate.
2. No tidal current data was provided in the 2014 dye study report. The tidal current values used for the modeling were those collected during the previous dye study in 1987. Depth of measurements unknown.
3. Manning's n of 0.020 corresponds to a "smooth earth channel, no weeds" per CORMIX Manual, Table 4.3

The CORMIX1 model predictions generally compare adequately to the dye study data at locations near the outfall. However, for several of the tidal stages, the CORMIX1 results underestimated the dilution at distances further from the outfall as compared to the dye study dilutions. This would not preclude use of the model as there is acceptable agreement between the model simulations and the measured conditions in the area of concern (i.e., in the area closer to the outfall, as opposed to the area far beyond the outfall).

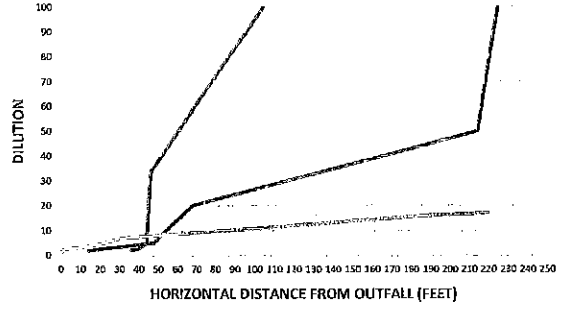
Results of CORMIX1 in predicting model dilution as compared to dilution observed during the 2014 dye study is as follows:

SPRING MAXIMUM EBB



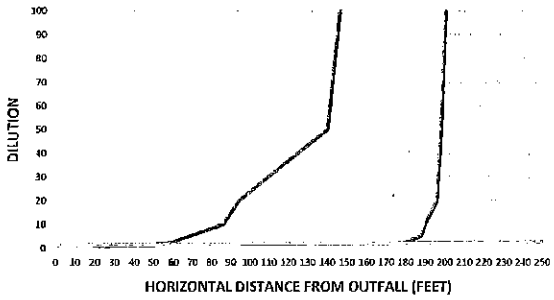
MAX EBB MAP #4 MAX EBB MAP #5 CORMIX1 PREDICTION

NEAP MAXIMUM EBB



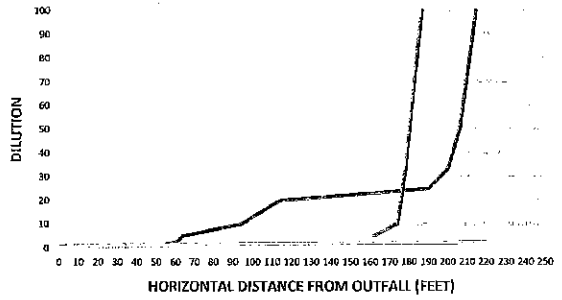
MAX EBB MAP #3 MAX EBB MAP #6 CORMIX1 PREDICTION

SPRING LOW TIDE



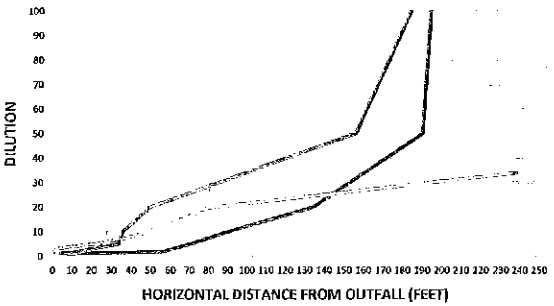
LOW TIDE MAP #1 LOW TIDE MAP #5 CORMIX1 PREDICTION

NEAP LOW TIDE



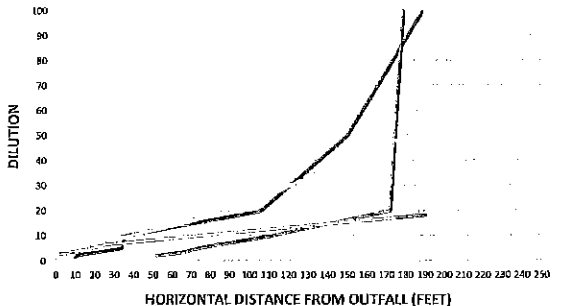
LOW TIDE MAP #4 LOW TIDE MAP #6 CORMIX1 PREDICTION

SPRING MAXIMUM FLOOD



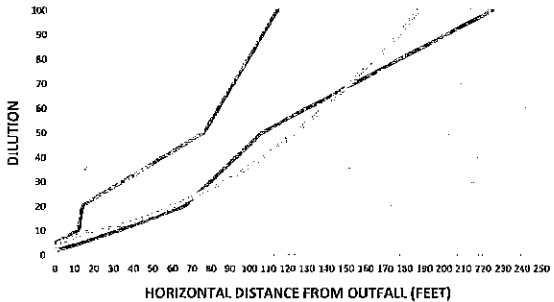
MAX FLOOD MAP #2 MAX FLOOD MAP #7 CORMIX1 PREDICTION

NEAP MAXIMUM FLOOD



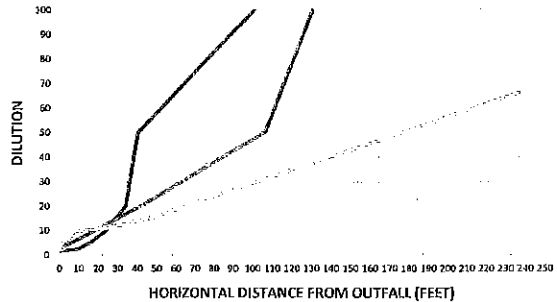
MAX FLOOD MAP #1 MAX FLOOD MAP #8 CORMIX1 PREDICTION

SPRING HIGH SLACK



HIGH SLACK MAP #3 HIGH SLACK MAP #7 CORMIX1 PREDICTION

NEAP HIGH SLACK



HIGH SLACK MAP #2 HIGH SLACK MAP #8 CORMIX1 PREDICTION

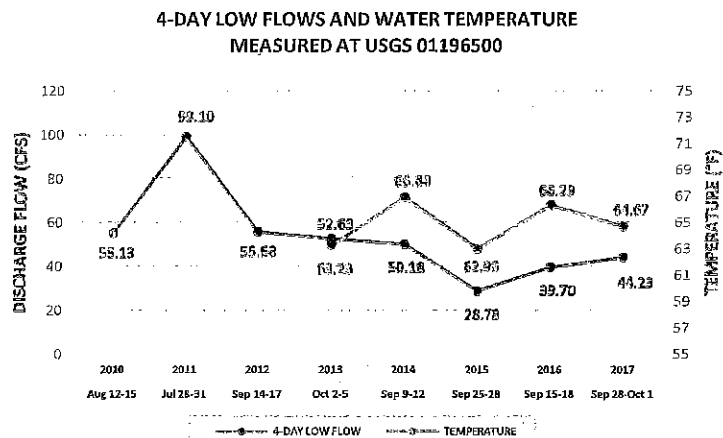
Finally, CORMIX1 was used to predict dilution under critical acute and chronic conditions for purpose of determining permit limits. Model inputs used were selected in order to provide a conservative assessment of receiving water impacts resulting in the lowest dilution occurring at times when the environment is the most sensitive. The TSD and other EPA documents provide guidance as to suitable parameters to use for critical design conditions. The WQS set low tide as a critical design condition, which is suitable for acute conditions. Chronic effects are based on 4-day exposures after mixing at critical conditions. In this case, the following critical design conditions were used:

	ACUTE	CHRONIC
EXPOSURE DURATION	1 Hour	4 Days
	Acute Exposure Duration	Chronic Exposure Duration
AMBIENT CURRENT SPEED	0.03 m/s (0.1 fps)	0.21 m/s (0.675 fps)
	10th percentile of neap tide currents measured	Median of 6 neap tide current measurements
TIDE ELEVATION	0.5 foot	1.3 feet
	Spring tide low water	Spring tide mean low water
EFFLUENT FLOW	252,000 gpd	106,560 gpd
	Proposed Maximum Daily Flow	Proposed Average Monthly Flow

NOTE: No tidal current data was provided in the 2014 dye study report. An estimate of the 10th percentile and the median current at neap tide was made using the data in the 1987 dye study report.

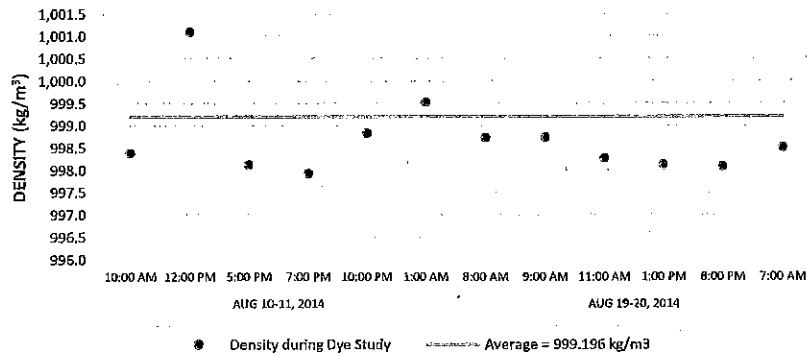
Other modeling assumptions were as follows:

- Tidal Reversal: CORMIX1 has the capability of simulating tidal effects in predicting effluent mixing. The rate of tidal reversal (time gradient of the tidal velocity) near slack tide is important in terms of concentration build-up, as tidal reversals will reduce the effective dilution of a discharge by re-entraining the discharge plume remaining from the previous tidal cycle. The CORMIX Manual recommends that several CORMIX predictions be made at hourly or half hourly intervals following the reversal in order to evaluate the critical conditions. Based on this, the acute design condition used was 0.5 hour after slack and the chronic design condition used was 1 hour after slack.
- Wind: A conservative windspeed of 1 mph was used in both the acute and chronic design conditions.
- Ambient Water Density, Temperature, and Flows: The only ambient density data that exists is that collected during the two dye studies and this data is limited. These dye study events both occurred in the late summer/early fall. No density data for the spring season exists and estimates as to what the density may be during this time of the year had to be made. There is a USGS gage upstream of the discharge (USGS 01196500) that collects, among other things, discharge flow and water temperature data. Data collected at the gage was evaluated to determine the lowest four-day river flows and the corresponding four-day water temperatures. The lowest four-day flows from the time period reviewed were 28.78 cfs (occurring during September 25-28, 2015), about half of what the four-day low flows were during the 2014 dye study.



The TSD recommends that in addition to evaluating estuaries at critical design conditions, an off-design condition should also be checked. The off-design condition (e.g., higher flow or lower stratification) should include the period of maximum velocity during a tidal cycle. This off-design condition results in greater dilution than the design condition, but it causes the maximal extension of the plume. In addition, since the density of the ambient water will vary season to season, the TSD suggests that no one season or stratification condition can be selected as the most critical dilution situation for all cases and that conditions of both high and low freshwater inflow should be investigated as each affects the density and velocity of the receiving water and therefore the transport of the pollutants. In this case, a winter off-design condition was run, as well as a spring off-design condition.

ESTIMATE OF RIVER WATER DENSITY MEASURED DURING DYE STUDY



Data input and dilutions projected by CORMIX1 are summarized in the table below:

	RUN 1 ACUTE	RUN 2 CHRONIC (AUGUST)	RUN 3 CHRONIC (OFF-DESIGN WINTER)	RUN 4 CHRONIC (OFF-DESIGN SPRING)
EFFLUENT CONDITIONS				
Flow Rate (gpm)	175 (252,000 gpd)	74 (106,560 gpd)	74 (106,560 gpd)	74 (106,560 gpd)
Density (kg/m ³)	997.541	997.541	999.607	998.410
EFFLUENT GEOMETRY				
Nearest bank	Right	Right	Right	Right
Distance to nearest bank (ft)	0	0	0	0
Port Submerged or Above Surface	Above	Above	Above	Submerged
Port height above water surface (ft)	1.5	0.2	0.2	---
Port height above channel bottom (ft)	---	---	---	1.5
Port diameter (ft)	0.67	0.67	0.67	0.67
Vertical angle (θ) (°)	0	0	0	0
Horizontal angle (σ) (°)	90	90	90	90
AMBIENT CONDITIONS				
Waterbody Type	Tidal	Tidal	Tidal	Tidal
Average Depth (H _a) (ft)	0.5	1.3	1.7	2.2
Depth at discharge (H _d) (ft)	0.5	1.3	1.7	2.2
Bounded/Unbounded	Unbounded	Unbounded	Unbounded	Unbounded
Maximum tidal velocity (m/s)	0.42	0.38	0.38	0.38
Tidal period (hr)	12.7	12.7	12.7	12.7
Instantaneous tidal velocity (m/s)	0.03 m/s (0.1 fps)	0.21 m/s (0.675 fps)	0.21 m/s (0.675 fps)	0.21 m/s (0.675 fps)
Time (before/after slack)	0.5 hour after	1 hour after	1 hour after	1 hour after
Density at Surface (kg/m ³)	998.0	999.196	1000.72	1000
Density at Bottom (kg/m ³)	998.0	999.196	1000.72	1000.49
Stratification	---	---	---	Linear
Manning's n	0.020	0.020	0.020	0.020
Wind (mph)	1	1	1	1
PREDICTED DILUTION USING CORMIX1, v11.0:	1.0:1 (at 2.5 feet from the outfall)	16.6:1 (at 93.75 ft from the outfall)	17.8:1 (at 93.75 ft from the outfall)	25.2:1 (at 93.75 ft from the outfall)

NOTE: The sensitivity analysis indicated that density was the most sensitive factor.

See attached for CORMIX results.

In tidal areas, pollutants in a continuous discharge can be re-introduced back into the discharge area on an incoming tide, ultimately causing some portion of the pollutants to accumulate in the far-field. This has the effect of reducing the actual dilution available. There are two methods for estimating the accumulation of the discharged material in a tidal area: a numerical model or a dye dispersion study. The dye dispersion method is summarized in EPA's *Technical Guidance Manual for Performing Waste Load Allocations*. When a dye dispersion study is conducted, it includes a build-up phase, where dye is introduced into the system, a quasi-steady-state phase, where the dye reaches an equilibrium state in the receiving stream, and a fall-off period, which is the timeframe after the dye injection has been terminated. If monitoring is conducted at a point x,y from the discharge location during a quasi-steady state cycle, a maximum concentration, C_{max} , should be found. If dye injection is terminated and sampling continues during the fall-off period, the concentration found will include some fraction of dye returning from the previous cycle, r_d ("dye return rate"); this concentration can be expressed as $C_{max} * r_d$. If the sampling is repeated, then the maximum quasi steady-state concentration, $\bar{C}_{max(x,y)}$, will be the sum of the samples collected:

$$\bar{C}_{max(x,y)} = C_{1(x,y)} + C_{2(x,y)} + C_{3(x,y)} + \dots$$

The observed series of values should approximate a geometric progression and can be represented as:

$$\bar{C}_{max(x,y)} = C_{max(x,y)} + C_{max(x,y)}r_d + C_{max(x,y)}r_d^2 + C_{max(x,y)}r_d^3 + \dots$$

or

$$\bar{C}_{max(x,y)} = C_{max(x,y)} \frac{1}{1 - r_d}$$

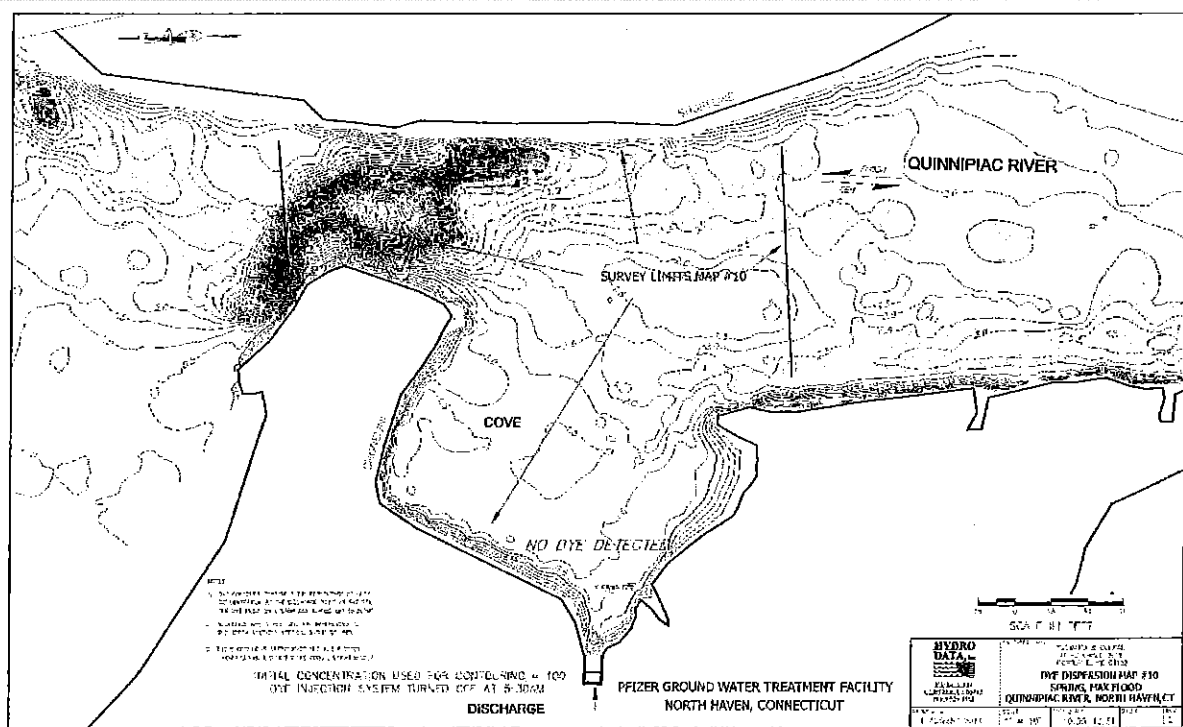
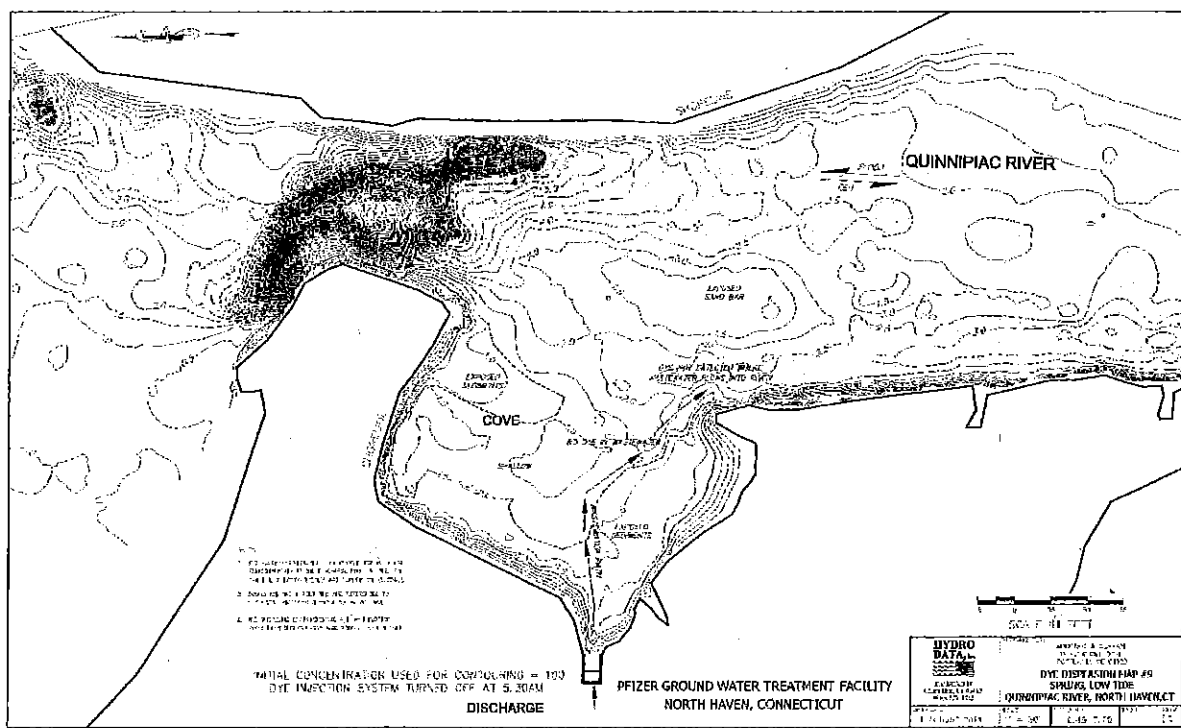
With the results of r_d , the final dilution factor can be calculated as follows:

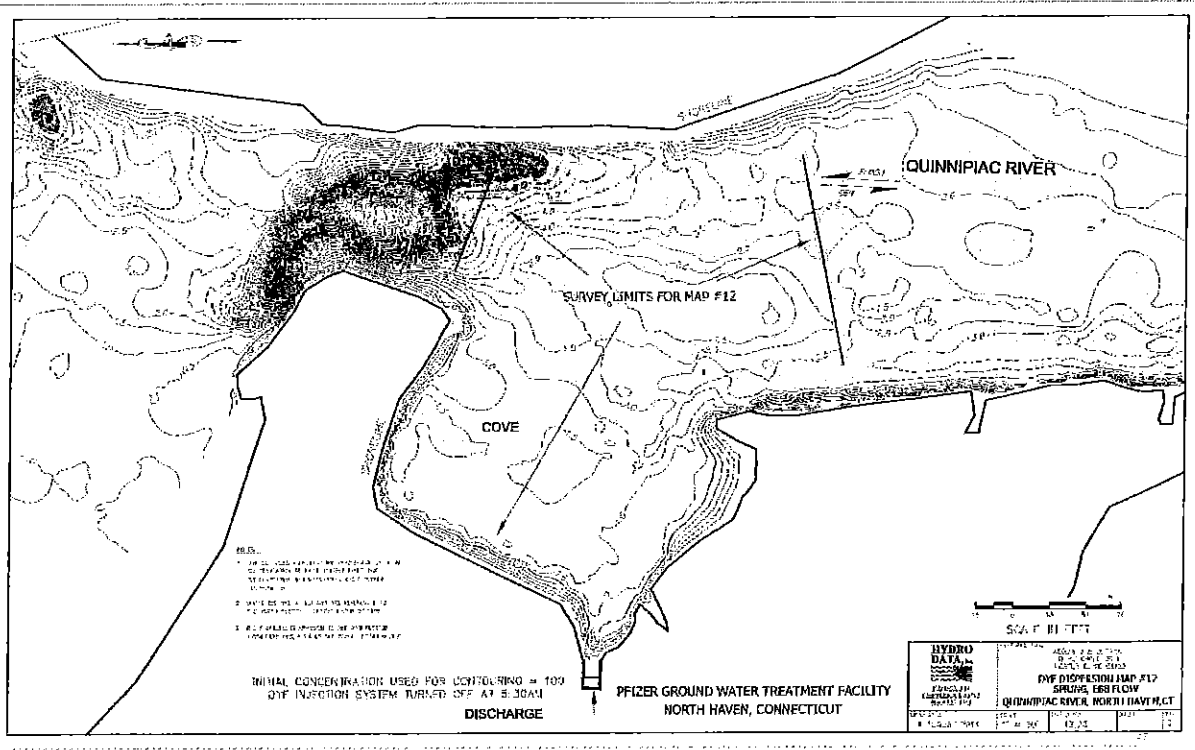
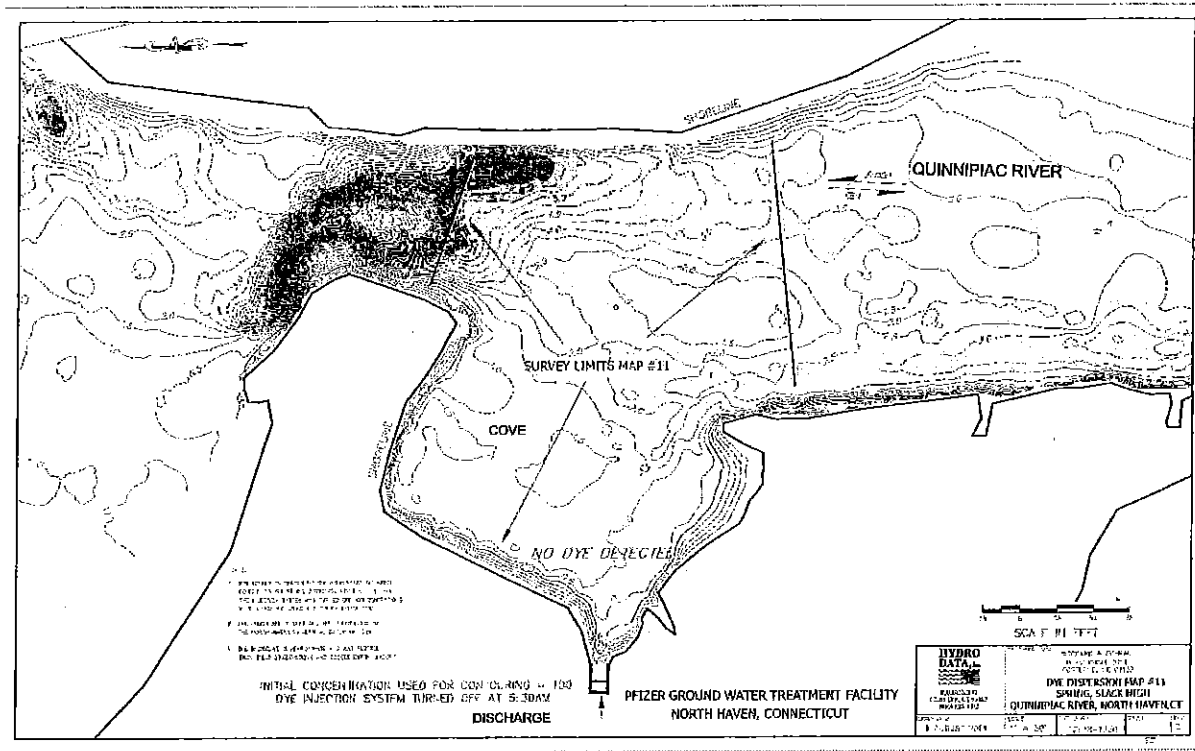
$$DF_{FINAL} = DF_{CALCULATED}(1 - r_d)$$

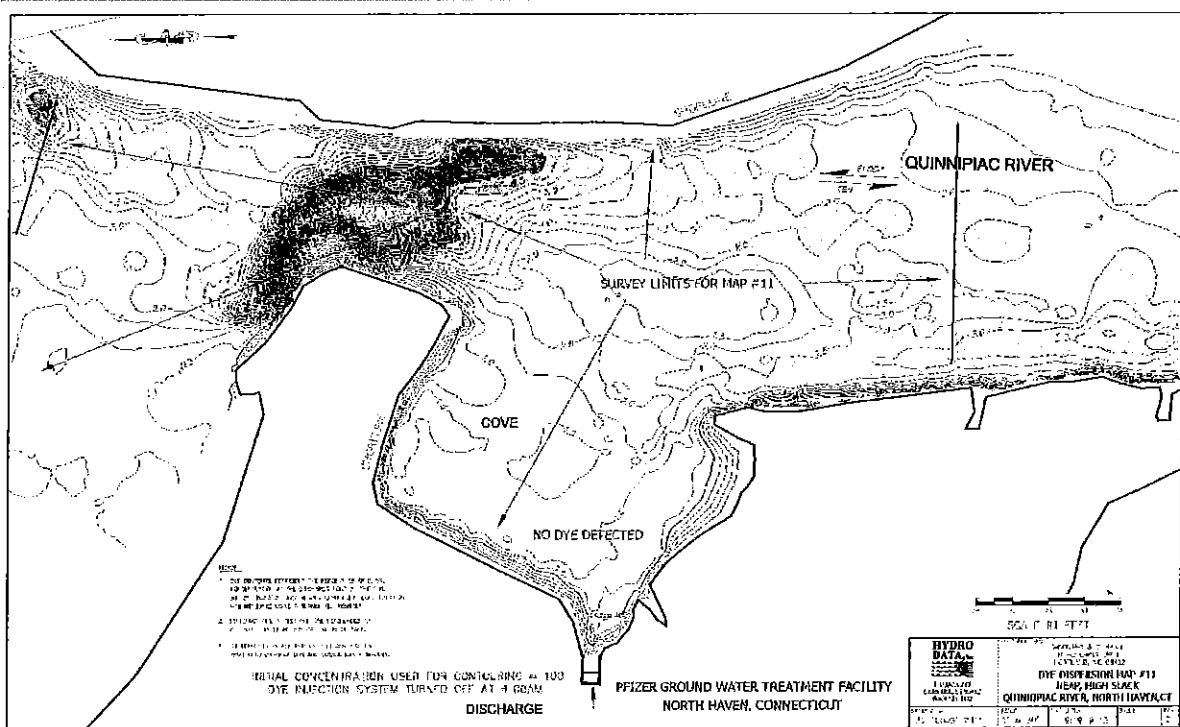
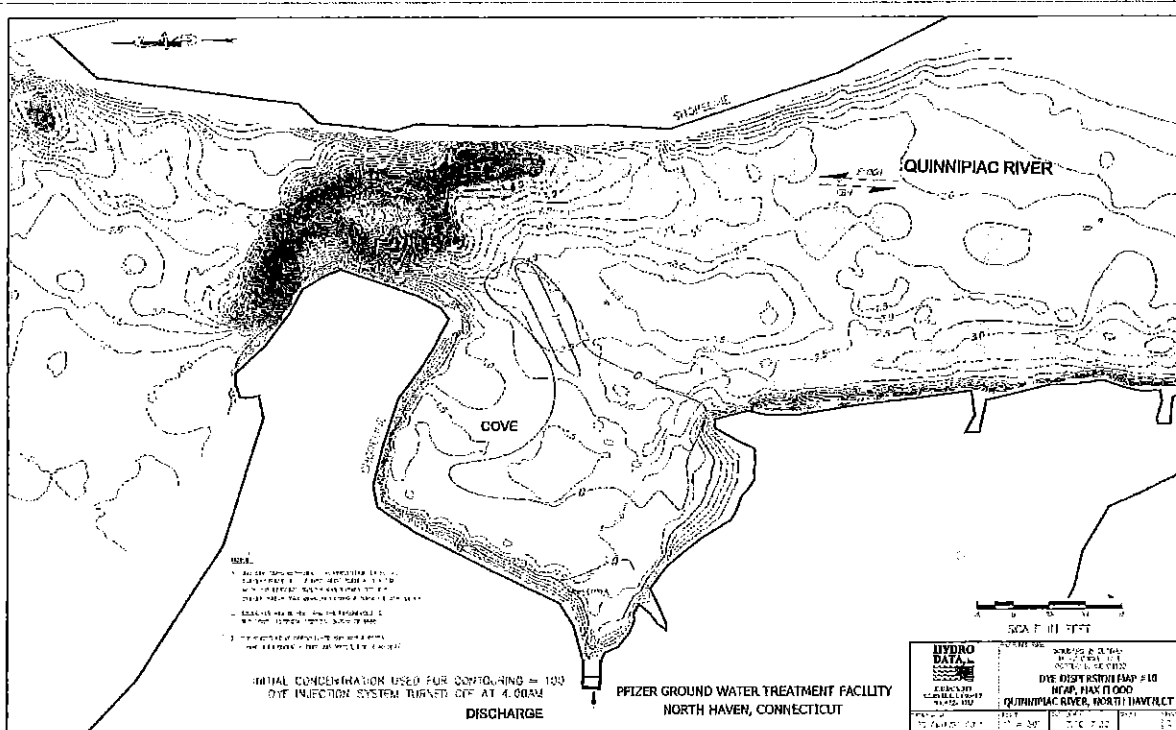
The 2014 spring tide dye study was performed from August 10 to August 11. Dye injection began at 5:00 PM on August 9th and was terminated at 5:30 AM on August 11th. After the dye injection ceased, data was collected during the next Low Tide, Maximum Flood, High Slack, and Maximum Ebb tidal cycles, in order to collect dye concentrations during the fall-off period. Results indicated that no concentrations of dye were detected in the receiving stream at any of these tide stages. [See maps below]. The 2014 neap tide dye study was performed from August 19 to August 20. Dye injection began at 3:00 PM on August 18th and was terminated at 4:00 AM on August 20th. After the dye injection ceased, data was collected during the next Maximum Flood, High Slack, and Maximum Ebb tidal cycles, in order to collect dye concentrations during the fall-off period. Results indicated that some dye was detected in the receiving stream during Maximum Flood, but beyond the edge of the chronic mixing zone. [See maps below]. Overall, the data collected during the fall-off period indicates that in the discharge area, no return dye was measured. However, it is not clear whether the initial concentration of dye in the effluent was high enough to be able to be read by the fluorometer during the fall-off period. In other words, there may have been return dye present in the receiving water during this time, but at levels that could not be read by the analytical equipment. Therefore, no r_d could be calculated from the fall-off data.

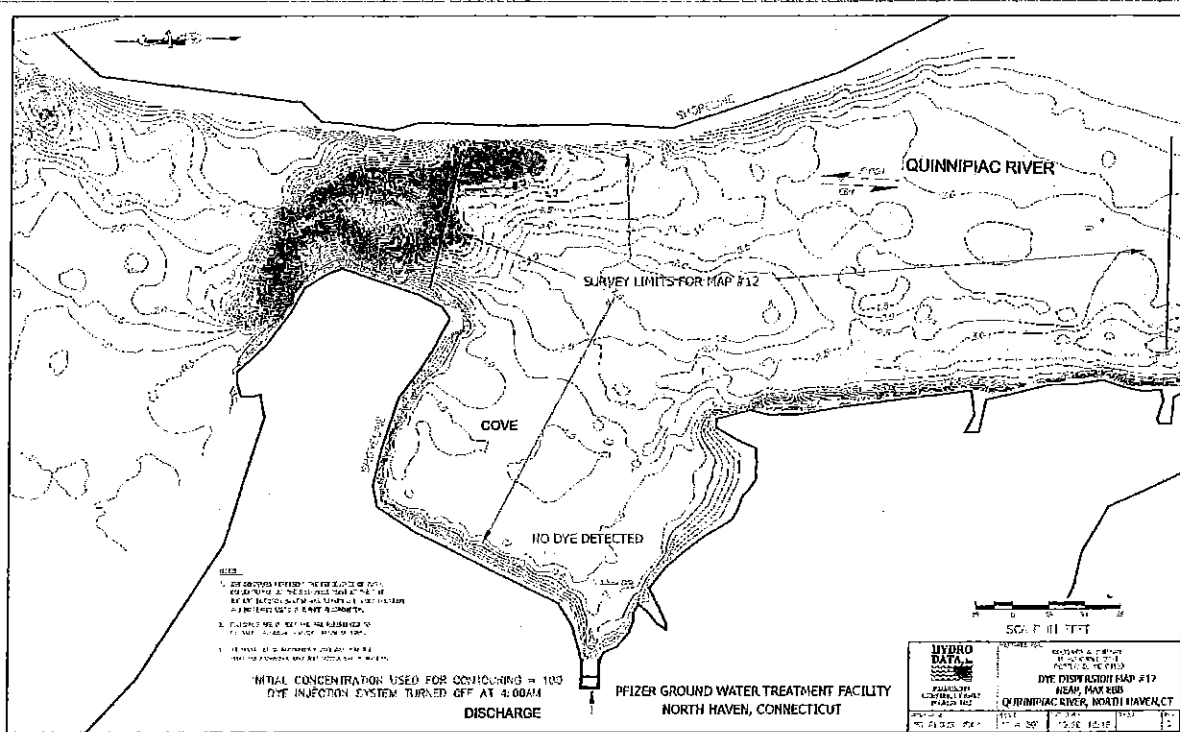
EPA's *Technical Guidance Manual for Performing Waste Load Allocations*, suggests that if r_d data is not available, the methods in Fischer et. al. (1979) for estimating flushing in tidal estuaries could be used to estimate r_d . Using these methods, the flushing time was estimated to be 64.53 hours. At a design of four days (96 hours), the flushing rate is 100%. Therefore, the estimated return dye rate is 0% and DF_{FINAL} is 16.6:1.

$$DF_{FINAL} = 16.6(1 - 0)$$









MIXING ZONE ALLOCATION

Allocation of mixing zones is determined on a case-by-case basis contingent on several factors, including the physical, chemical, and biological characteristics of the discharge and the receiving system, the organisms in the receiving system, and a determination that the assimilative capacity of the receiving system can accommodate the discharge. In this case, the following site characteristics were also considered: the effluent discharges into a shallow cove, mixing of the discharge is classified as incomplete, mixing at low tide is negligible, the tidal currents in area are not completely understood, and the background/ambient water concentrations for all the pollutants are also not clearly understood. Finally, while the dye contours from the 2014 study show that the discharge is shore-hugging in the main stem of the river, no portion of the allocated mixing zone includes this area.

The TSD sets forth criteria as to the sizing of acute mixing zones. Sizing of the chronic mixing zone is not specifically prescribed in the TSD or the WQS, only that it be limited to the maximum extent practicable. In this case, spatial dimensions were used to limit the areal extent of the chronic mixing zone; 25% of the width of the river as measured during mean water will be the maximum extent of the chronic mixing zone. The dilution factors at the edge of the allocated mixing zones are noted below, along with the corresponding dimensions. These are the smallest mixing zones practicable and which meet all applicable criteria. Existing and designated uses are expected to be maintained with these zones. All criteria must be met at the edge of the geographically-defined boundary of the applicable mixing zones.

	DILUTION FACTOR	DIMENSIONS	POLLUTANTS
ACUTE	1:1	2.5 feet from the outfall	Ammonia, 2-Chloroaniline, 3-Chloroaniline, Dichloran, Formaldehyde, and Vanadium
CHRONIC	16.6:1	93.75 feet from the outfall	
HUMAN HEALTH	16.6:1	93.75 feet from the outfall	

SPECIAL CONDITIONS

The permittee will collect temperature and salinity data, on at least a monthly basis, to evaluate the density of the effluent for future mixing zone analyses.

BACKSLIDING

In the existing permit, the DF_{@400,000 gpd} is 48.7:1. In the proposed permit, the DF_{@106,560} is 16.6:1. Backsliding is not an issue.

REFERENCES

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Doneker, R. L., and G. H. Jirka. 2017. *CORMIX User Manual*, US. EPA, Washington D.C. (EPA-823-K-07-001)

Hydro Data, Inc. 2014. *Effluent Mixing Zone Dye Study Report Pharmacia & Upjohn Company LLC Groundwater Treatment Facility*, Chester, Connecticut.

Fischer, H.B., E.J. List, C.Y. Koh, J. Imberger, and N.H. Brooks. 1979. *Mixing in Inland and Coastal Waters*. New York: Academic Press

Normandeau Associates, Inc., *Upjohn Effluent Dispersion Study Quinnipiac River*, Bedford, NH, 1988.

The Quinnipiac River Fund. No date. Map. Retrieved from <http://www.thequinnipiacriver.com/map>

U.S. EPA. 1990. *Technical Guidance Manual for Performing Waste Load Allocations Book III: Estuaries Part 1*. (EPA-823-R-92-002)

U.S. EPA. 1992. *Technical Guidance Manual for Performing Waste Load Allocations Book III: Estuaries Part 3*. (EPA-823-R-92-004)

U.S. EPA. 1991. *Technical Support Document For Water Quality-based Toxics Control*. (EPA-505-2-90-001)

U.S. EPA. 2010. *NPDES Permit Writers' Manual*, Office of Wastewater Management, Water Permits Division. (EPA-833-K-10-001)

U.S. Geological Survey. 2017. National Water Information System. Retrieved from <http://waterdata.usgs.gov/nwis/>

CORMIX SESSION REPORT:
 CORMIX MIXING ZONE EXPERT SYSTEM
 CORMIX Version 11.0G
 HYDRO1:Version-11.0.0.0 April, 2018

SITE NAME/LABEL: Pharmacia
 DESIGN CASE: Pharmacia ACUTE
 FILE NAME: P:\CORMIX FILES\PharmaciaACUTEFinal.prd
 Using subsystem CORMIX1: Single Port Discharges
 Start of session: 05/25/2018--10:04:53

SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:
 Cross-section = unbounded
 Average depth HA = 0.03 m
 Depth at discharge HD = 0.03 m
 Darcy-Weisbach friction factor F = 0.1003
 Calculated from Manning's n = 0.02
 Wind velocity UW = 0.45 m/s
 TIDAL SIMULATION at time Tsim = 0.5 hours
 Instantaneous ambient velocity UA = 0.03 m/s
 Maximum tidal velocity UaMAX = 0.42 m/s
 Rate of tidal reversal dUA/dt = 0.06 (m/s)/hour
 Period of reversal T = 12.7000 hours
 Stratification Type STRCND = U
 Surface density RHOAS = 998 kg/m³
 Bottom density RHOAB = 998 kg/m³

DISCHARGE PARAMETERS: Single Port Discharge
 Nearest bank = right
 Distance to bank DISTB = 0.10 m
 Port diameter DO = 0.0683 m
 Port cross-sectional area AO = 0.0037 m²
 Discharge velocity UO = 3.01 m/s
 Discharge flowrate QO = 0.011041 m³/s
 Discharge port height HO = 0.03 m
 Vertical discharge angle THETA = -84 deg
 Horizontal discharge angle SIGMA = 90 deg
 Discharge density RHO0 = 997.5410 kg/m³
 Density difference DRHO = 0.4590 kg/m³
 Buoyant acceleration GBO = 0.0045 m/s²
 Discharge concentration CO = 100 ppb
 Surface heat exchange coeff. KS = 0 m/s
 Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:
 LQ = 0.06 m La = 6.08 m Lb = 1.84 m
 LM = 11.04 m Lm' = 99999 m Lb' = 99999 m
 UNSTEADY TIDAL SCALES:
 Tu = 0.2414 hours Lu = 12.59 m Lmin = 0.14 m

NON-DIMENSIONAL PARAMETERS:
 Port densimetric Froude number FRO = 171.69
 Velocity ratio R = 100.45

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
 Toxic discharge = no
 Water quality standard specified = no
 Regulatory mixing zone = no
 Region of interest = 1000 m downstream

HYDRODYNAMIC CLASSIFICATION:

FLOW CLASS = IPV5

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.

Applicable layer depth = water depth = 0.03 m

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:
 Origin is located at the BOTTOM below the port/diffuser center:
 0.10 m from the right bank/shore.
 Number of display steps NSTEP = 20 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :

Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.

Pollutant concentration at NFR edge c = 100 ppb

Dilution at edge of NFR s = 1

NFR Location: x = 33.12 m

(centerline coordinates) y = 0 m

z = 0.02 m

NFR plume dimensions: half-width (bh) = 0.08 m

thickness (bv) = 0.03 m

Cumulative travel time: 0 sec.

Buoyancy assessment:

The effluent density is less than the surrounding ambient water density at the discharge level. Therefore, the effluent is **POSITIVELY BUOYANT** and will tend to rise towards the surface.

NEAR-FIELD MIXING SUMMARY:

Plume becomes vertically fully mixed **ALREADY IN NEAR-FIELD** at 0 m downstream and continues as vertically mixed into the far-field.

PLUME BANK CONTACT SUMMARY:

Plume in unbounded section does not contact bank in this simulation.

UNSTEADY TIDAL ASSESSMENT:

Because of the unsteadiness of the ambient current during the tidal reversal, **CORMIX** predictions have been **TERMINATED** at:

x = 33.12 m
y = 0 m
z = 0.02 m.

For this condition **AFTER TIDAL REVERSAL**, mixed water from the previous half-cycle becomes re-entrained into the near field of the discharge, increasing pollutant concentrations compared to steady-state predictions. A pool of mixed water formed at slack tide will be advected downstream in this phase.

***** **TOXIC DILUTION ZONE SUMMARY** *****
No TDZ was specified for this simulation.

***** **REGULATORY MIXING ZONE SUMMARY** *****
No RMZ and no ambient water quality standard have been specified.

***** **FINAL DESIGN ADVICE AND COMMENTS** *****

REMINDER: The user must take note that **HYDRODYNAMIC MODELING** by any known technique is **NOT AN EXACT SCIENCE**.

Extensive comparison with field and laboratory data has shown that the **CORMIX** predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about **+50%** (standard deviation).

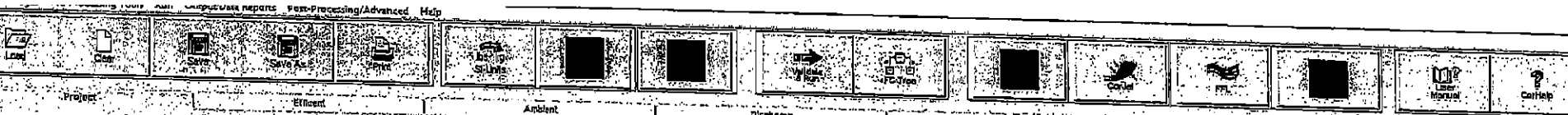
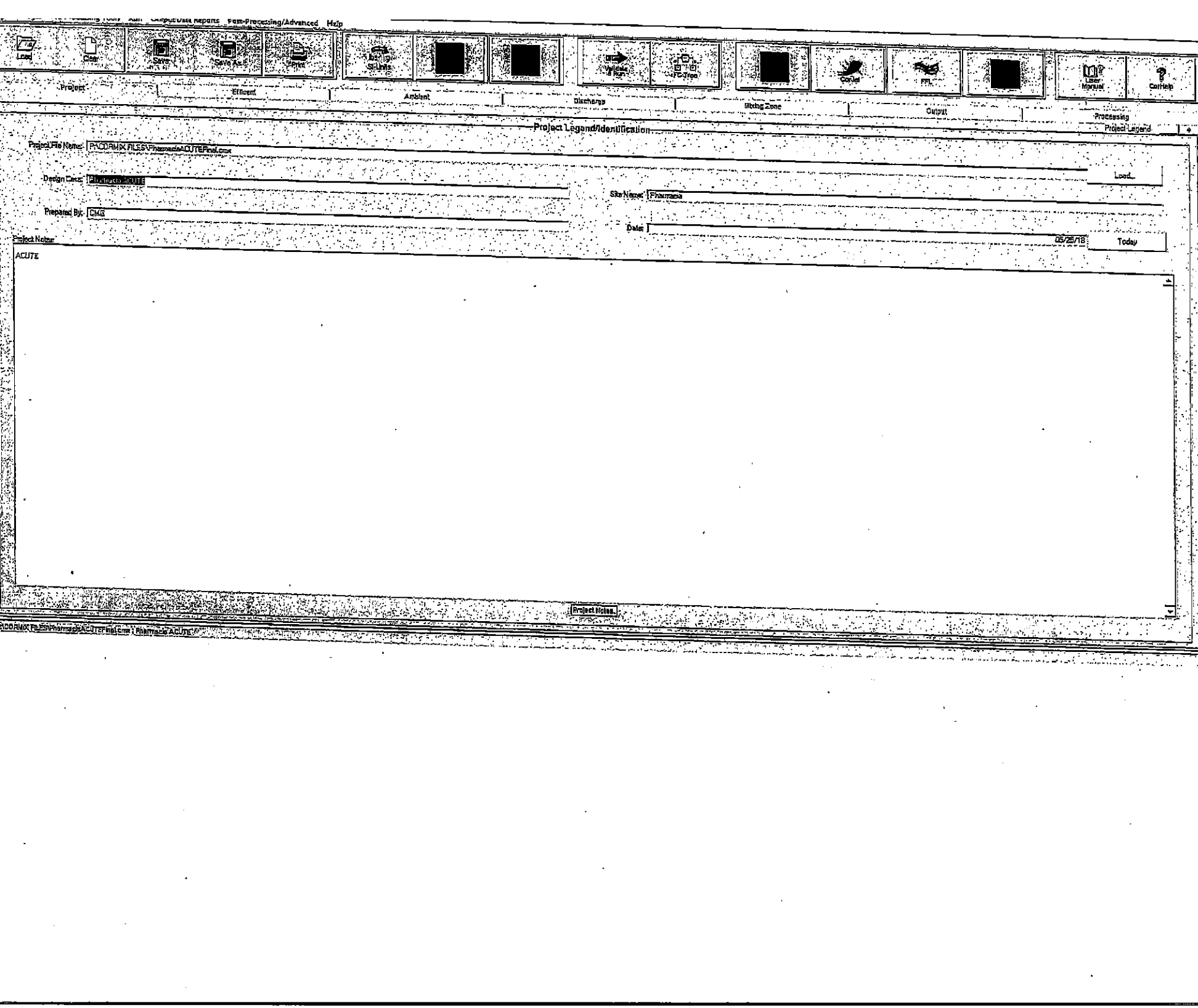
As a further safeguard, **CORMIX** will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

Limiting time due to TIDAL REVERSAL as per distance (xmax = 8.59 m) has been reached or exceeded.

END OF MOD134: UNSTABLE RECIRCULATION REGION OVER LAYER DEPTH

** End of NEAR-FIELD REGION (NFR) **

CORMIK1: Single Port Discharges End of Prediction File
|||||



Project Efficient Ambient Discharge Mixing Zone Output Processing Project Legend

Project Legend/Identification

Project File Name: Load

Design Date:

Prepared By:

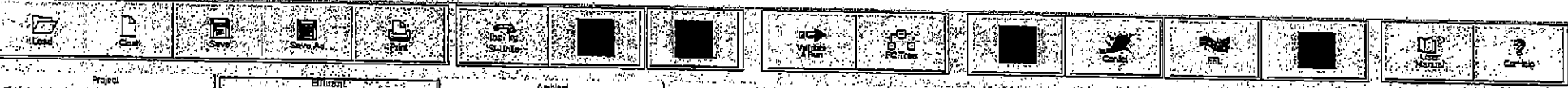
Site Name:

Date: Today

Project Notes

ACUTE

Project Notes



Project: Effluent Ambient Discharge Mixing Zone Output Processing Effluent Page

Effluent Characterization/Pollutant Type

Pollutant Type

Conservative Pollutant Non-Conservative Pollutant Heated Discharge Bore Discharge

The pollutant does NOT undergo chemical/biological decay/growth processes.

Discharge Concentration (Excess) 100 Type

Effluent Characterization

Effluent Flow Rate/Velocity

Flow Rate Velocity Flow Rate: 175 GPM (US)

Effluent Density

Fresh Non-Fresh Density: 997.541 kg/m3 Compute

Ambient Geometry/Flow Field Data

Average Depth: 0.1 m
Depth of Discharge: 0.1 m
Wind Speed: 1 m/s
Steady Unsteady:

Bounded Unbounded

Water Body is NOT REQUIRED

Period (hr): 12.7
Max Value: 0.42 m/s

Total Velocity: 0.03 m/s
 At time (hr) BEFORE slack
 At slack
 At time (hr) AFTER slack
Delta Time (hr): 0.5

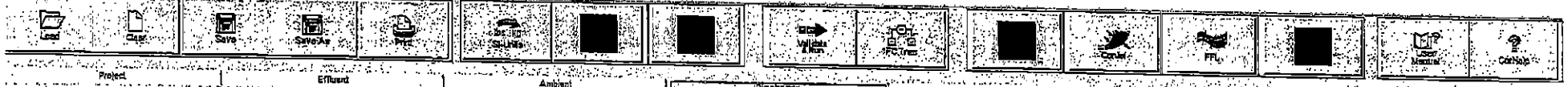
Manning: Darcy
Manning's n: 0.02

Ambient Density Data

Fresh Water Non-Fresh Water

Uniform
Stratified

Average Density: 999 kg/m³ Compute



Project Effluent Ambient Discharge Mixing Zone Output Processing Discharge Page

Discharge Geometry Data

CORMDX Single Port CORMDX Multipoint CORMDX Surface

Single Port Discharge

Nearest bank is on the: Left Right

Distance to nearest bank: ft

Vertical Angle THETA: degrees

Horizontal Angle SIGMA: degrees

Port Specification

Port Diameter? Port Area

Port Diameter: ft

Select Discharge Configuration

Submerged Above Surface

Jet-Like

Diffusor-Like

Spray-Like

Port Height Above WS: ft

Water Surface Slope: m2

Mixing Zone Specifications
Note: Concentration units are set in the Discharge Concentration field on the Effluent page.

Non-Toxic Effluent: Toxic Effluent

WS Standard: No WS Standard

Ambient Water Quality Standard is NOT specified for this conventional effluent.

Mixing Zone Specified: No Mixing Zone Specified

Mixing Zone is NOT specified.

Region of Interest: 1000 m

Output Slope per Module: 20

CORMIX SESSION REPORT:

XX

CORMIX MIXING ZONE EXPERT SYSTEM
CORMIX Version 11.0G
ICXDROL:Version-11.0.0.0 April, 2010

SITE NAME/LABEL: Pharmacia
DESIGN CASE: Pharmacia CHRONIC
FILE NAME: P:\CORMIX FILES\Pharmacia\CHRONIC\final.prd
Using subsystem CORMIX1: Single Port Discharges
Start of session: 05/25/2018--09:47:27

SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:

Cross-section = unbounded
Average depth HA = 0.40 m
Depth at discharge HD = 0.40 m
Darcy-Weisbach friction factor F = 0.0427
Calculated from Manning's n = 0.02
Wind velocity UW = 0.45 m/s
TIDAL SIMULATION at time Tsim = 1 hours
Instantaneous ambient velocity UA = 0.21 m/s
Maximum tidal velocity UaMAX = 0.38 m/s
Rate of tidal reversal dUA/dt = 0.21 (m/s)/hour
Period of reversal T = 12.7000 hours
Stratification Type STRCND = U
Surface density RHOAS = 999.1960 kg/m^3
Bottom density RHOAB = 999.1960 kg/m^3

DISCHARGE PARAMETERS:

Single Port Discharge
Nearest bank = right
Distance to bank DISTB = 0.02 m
Port diameter DO = 0.0734 m
Port cross-sectional area AO = 0.0042 m^2
Discharge velocity UO = 1.10 m/s
Discharge flowrate QO = 0.004669 m^3/s
Discharge port height RO = 0.40 m
Vertical discharge angle THETA = -83 deg
Horizontal discharge angle SIGMA = 90 deg
Discharge density RHOQ = 997.5410 kg/m^3
Density difference DRHO = 1.6550 kg/m^3
Buoyant acceleration GPO = 0.0162 m/s^2
Discharge concentration CO = 100 ppb
Surface heat exchange coeff. KS = 0 m/s
Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:

LQ = 0.07 m Ln = 0.34 m Lb = 0.01 m
LM = 2.21 m Lm' = 99999 m Lb' = 99999 m

UNSTEADY TIDAL SCALES:

Tu = 0.0767 hours Lu = 4.45 m Lmin = 0.17 m

NON-DIMENSIONAL PARAMETERS:

Port densimetric Froude number FRO = 31.93
Velocity ratio R = 5.25

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:

Toxic discharge = no
Water quality standard specified = no
Regulatory mixing zone = yes
Regulatory mixing zone specification = distance
Regulatory mixing zone value = 20.58 m (m^2 if area)
Region of interest = 1000 m

HYDRODYNAMIC CLASSIFICATION:

[FLOW CLASS = IPV4]

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.

Applicable layer depth = water depth = 0.40 m

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:

Origin is located at the BOTTOM below the port/diffuser center;
0.02 m from the right bank/shore.
Number of display steps NSTEP = 20 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :

Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.

Pollutant concentration at NFR edge c = 45.690400 ppb
Dilution at edge of NFR s = 2.2
NFR Location: x = 0.45 m
(centerline coordinates) y = 0.10 m
z = 0.40 m

NER plume dimensions: half-width (bh) = 0.06 m
thickness (bv) = 0.40 m
Cumulative travel time: 2.0682 sec.

Buoyancy assessment:
The effluent density is less than the surrounding ambient water density at the discharge level.
Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards the surface.

Near-field instability behavior:
The discharge flow will experience instabilities with full vertical mixing in the near-field.
There may be benthic impact of high pollutant concentrations.

FAR-FIELD MIXING SUMMARY:
Plume is vertically fully mixed WITHIN NEAR-FIELD (or a fraction thereof), but RE-STRATIFIES LATER.
Plume becomes vertically fully mixed again at 71.60 m downstream.

PLUME BANK CONTACT SUMMARY:
Plume in unbounded section contacts nearest bank at 0.77 m downstream.

UNSTEADY TIDAL ASSESSMENT:
Because of the unsteadiness of the ambient current during the tidal reversal, CORMIX predictions have been TERMINATED at:

x = 120.32 m
y = -0.02 m
z = 0.40 m.

For this condition AFTER TIDAL REVERSAL, mixed water from the previous half-cycle becomes re-entrained into the near field of the discharge, increasing pollutant concentrations compared to steady-state predictions. A pool of mixed water formed at slack tide will be advected downstream in this phase.

***** TOXIC DILUTION ZONE SUMMARY *****
No TDE was specified for this simulation.

***** REGULATORY MIXING ZONE SUMMARY *****

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 6.313902 ppb
Corresponding dilution s = 16.6
Plume location: x = 20.57 m
(centerline coordinates) y = -0.02 m
z = 0.40 m

Plume dimensions: half-width (bh) = 1.70 m
thickness (bv) = 0.27 m

Cumulative travel time: 136.0020 sec.

Note:
Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

***** FINAL DESIGN ADVICE AND COMMENTS *****
REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +/-50% (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

X	Y	Z	S	C	D	Uc	TT
0.00	0.00	0.40	1.0	0.100E+03	0.04	1.103	.00000E+00
0.01	0.02	0.26	1.0	0.100E+03	0.04	1.103	.64733E-03
0.01	0.02	0.25	1.0	0.100E+03	0.04	1.103	.65731E-02
0.01	0.02	0.24	1.0	0.100E+03	0.04	1.103	.13371E-01
0.01	0.02	0.23	1.0	0.100E+03	0.04	1.103	.20398E-01
0.01	0.02	0.22	1.0	0.100E+03	0.04	1.103	.27661E-01
0.01	0.02	0.21	1.0	0.100E+03	0.04	1.103	.35169E-01
0.01	0.03	0.20	1.0	0.985E+02	0.04	1.103	.42914E-01
0.01	0.03	0.19	1.0	0.955E+02	0.05	1.103	.50917E-01
0.02	0.03	0.18	1.1	0.925E+02	0.05	1.103	.59179E-01
0.02	0.03	0.17	1.1	0.897E+02	0.05	1.103	.67707E-01
0.02	0.03	0.16	1.1	0.870E+02	0.05	1.065	.76509E-01
0.02	0.03	0.15	1.2	0.843E+02	0.05	1.027	.85592E-01
0.03	0.03	0.14	1.2	0.818E+02	0.05	0.990	.94964E-01
0.03	0.03	0.13	1.3	0.793E+02	0.05	0.955	.10463E+00
0.03	0.03	0.12	1.3	0.769E+02	0.06	0.920	.11461E+00
0.03	0.04	0.11	1.3	0.745E+02	0.06	0.886	.12490E+00
0.04	0.04	0.10	1.4	0.723E+02	0.06	0.853	.13551E+00
0.04	0.04	0.09	1.4	0.701E+02	0.06	0.822	.14645E+00
0.04	0.04	0.08	1.5	0.679E+02	0.06	0.791	.15773E+00
0.05	0.04	0.07	1.5	0.659E+02	0.06	0.761	.16937E+00
0.05	0.04	0.07	1.6	0.639E+02	0.06	0.732	.18136E+00

Cumulative travel time = 0.1814 sec (0.00 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD133: LAYER BOUNDARY IMPINGEMENT/FULL VERTICAL MIXING

Control volume inflow:

X	Y	Z	S	C	D	TT
0.05	0.04	0.07	1.6	0.641E+02	0.06	.18136E+00

Profile definitions:

BV = layer depth (vertically mixed)
 BH = top-hat half-width, in horizontal plane normal to trajectory
 ZU = upper plume boundary (Z-coordinate)
 ZL = lower plume boundary (Z-coordinate)
 S = hydrodynamic average (bulk) dilution
 C = average (bulk) concentration (includes reaction effects, if any)
 TT = Cumulative travel time

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
-0.01	0.10	0.40	1.6	0.637E+02	0.00	0.00	0.40	0.40	.18136E+00
0.03	0.10	0.40	1.6	0.637E+02	0.40	0.02	0.40	0.00	.18136E+00
0.08	0.10	0.40	1.6	0.633E+02	0.40	0.03	0.40	0.00	.31213E+00
0.13	0.10	0.40	1.6	0.606E+02	0.40	0.03	0.40	0.00	.53164E+00
0.17	0.10	0.40	1.8	0.568E+02	0.40	0.04	0.40	0.00	.75115E+00
0.22	0.10	0.40	1.9	0.531E+02	0.40	0.04	0.40	0.00	.97066E+00
0.26	0.10	0.40	2.0	0.502E+02	0.40	0.05	0.40	0.00	.11902E+01
0.31	0.10	0.40	2.1	0.481E+02	0.40	0.05	0.40	0.00	.14097E+01
0.36	0.10	0.40	2.1	0.469E+02	0.40	0.06	0.40	0.00	.16292E+01
0.40	0.10	0.40	2.2	0.462E+02	0.40	0.06	0.40	0.00	.18487E+01
0.45	0.10	0.40	2.2	0.457E+02	0.40	0.06	0.40	0.00	.20682E+01

Cumulative travel time = 2.0682 sec (0.00 hrs)

END OF MOD133: LAYER BOUNDARY IMPINGEMENT/FULL VERTICAL MIXING

** End of NEAR-FIELD REGION (NER) **

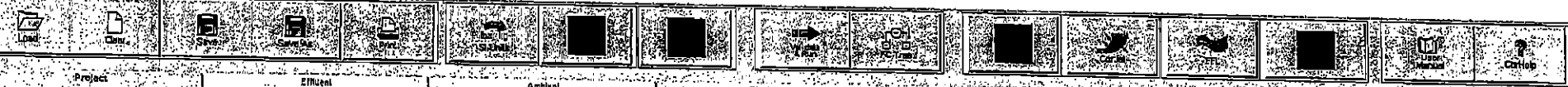
BEGIN MOD141: BUOYANT AMBIENT SPREADING

Profile definitions:

BV = top-hat thickness, measured vertically
 BH = top-hat half-width, measured horizontally in Y-direction
 ZU = upper plume boundary (Z-coordinate)
 ZL = lower plume boundary (Z-coordinate)
 S = hydrodynamic average (bulk) dilution
 C = average (bulk) concentration (includes reaction effects, if any)
 TT = Cumulative travel time

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
0.45	0.10	0.40	2.2	0.457E+02	0.40	0.06	0.40	0.00	.20682E+01
0.46	0.10	0.40	2.2	0.452E+02	0.38	0.06	0.40	0.01	.21447E+01
0.48	0.10	0.40	2.2	0.447E+02	0.37	0.07	0.40	0.03	.22212E+01
0.50	0.10	0.40	2.3	0.443E+02	0.36	0.07	0.40	0.04	.22977E+01
0.51	0.10	0.40	2.3	0.438E+02	0.35	0.07	0.40	0.05	.23742E+01
0.53	0.10	0.40	2.3	0.435E+02	0.34	0.08	0.40	0.06	.24507E+01
0.55	0.10	0.40	2.3	0.431E+02	0.33	0.08	0.40	0.06	.25272E+01
0.56	0.10	0.40	2.3	0.427E+02	0.32	0.08	0.40	0.07	.26037E+01
0.58	0.10	0.40	2.4	0.424E+02	0.32	0.08	0.40	0.08	.26802E+01
0.59	0.10	0.40	2.4	0.421E+02	0.31	0.09	0.40	0.09	.27567E+01
0.61	0.10	0.40	2.4	0.418E+02	0.30	0.09	0.40	0.09	.28331E+01
0.63	0.10	0.40	2.4	0.415E+02	0.30	0.09	0.40	0.10	.29096E+01
0.64	0.10	0.40	2.4	0.413E+02	0.29	0.09	0.40	0.10	.29861E+01
0.66	0.10	0.40	2.4	0.410E+02	0.29	0.10	0.40	0.11	.30626E+01
0.67	0.10	0.40	2.5	0.406E+02	0.28	0.10	0.40	0.12	.31391E+01



Project Legend/Identification

Project File Name: F:\CORMIX FILES\Pharmacia\CHRONIC\Proa.cmg

Load...

Design Cases: [10/25/96] [10/25/96]

Site Name: Pharmacia

Prepared By: QMG

Date:

05/25/96

Today

Project Name:

CHRONIC

Project Name:

F:\CORMIX FILES\Pharmacia\CHRONIC\Proa.cmg



Effluent Characterization/Pollutant Type

Pollutant Type

Conservative Pollutant: Non-Conservative Pollutant Heated Discharge Bine Discharge

The pollutant does NOT undergo chemical/biological decay/growth processes.

Discharge Concentration (Excess): 100 ppm

Effluent Characterization

Effluent Flow Rate/Velocity

Flow Rate: 174 GPM (US)

Effluent Density

Density: 397.541 kg/m3



Project: Ambient Discharge Mixing Zone Output Processing Ambient Page

Ambient Geometry/Flow Field Data

Average Depth: 1.3 [m]

Depth at Discharge: 1.3 [m]

Wind Speed: 1 [mph]

Steady Unsteady

Period (s): 12.7 [s] Direct

Max Veloc: 0.38 [m/s]

Tidal Velocity: 0.21 [m/s]

At line (s): BEFORE slack

At slack

At line (s): AFTER slack

Delay Time (s):

Manning: Darcy

Manning's n: 0.02

Water Body is NOT BOUNDED

Ambient Cross-section Option:

Ambient Density Data

Fresh Water Non-Fresh Water

Uniform Stratified

Average Density: 1000.196 [kg/m³]

Compute...

Discharge Geometry Data

Single Port Discharge

Nearest bank is on the: Left

Vertical Angle THETA: degrees

Distance to nearest bank: ft

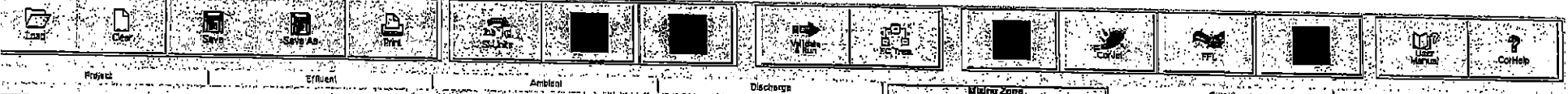
Horizontal Angle SIGMA: degrees

Port Specifications

Port Diameter	Port Area
Port Diameter: <input type="text" value="0.67"/> ft	

Select Offshore Discharge Configuration

<input checked="" type="radio"/> Submerged	<input type="radio"/> Above Surface
<input checked="" type="radio"/> Jet Dis	<input type="radio"/> Deflected Jet <input type="radio"/> Spray Line
Port Height Above WS: <input type="text" value="0.2"/> ft	
Port Diameter: <input type="text" value="0.67"/> ft	



Mixing Zone Specification

Note: Concentration units are set in the Discharge Concentration field on the Effluent page.

Non-Toxic Effluent Toxic Effluent

WQ Standard No WQ Standard

Ambient Water Quality Standard is NOT specified for this conventional effluent.

Mixing Zone Specified No Mixing Zone Specified

Distance Width Area Trajectory

Mixing Zone Specified as a downstream distance, M

Distance: 50.75 m

Region of Interest: 1000 m

Output Steps per Module: 20

CORMIX SESSION REPORT:

XX

CORMIX MIXING ZONE EXPERT SYSTEM

CORMIX Version 11.0G

HYDROL:Version-11.0.0.0 April, 2018

SITE NAME/LABEL: Pharmacia
 DESIGN CASE: Pharmacia CHRONIC
 FILE NAME: P:\CORMIX FILES\Pharmacia\CHRONIC\offdesign1Final.prd
 Using subsystem CORMIX1: Single Port Discharges
 Start of session: 05/25/2018--10:37:35

 SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:
 Cross-section = unbounded
 Average depth HA = 0.58 m
 Depth at discharge HD = 0.58 m
 Darcy-Weisbach friction factor F = 0.0376
 Calculated from Manning's n = 0.02
 Wind velocity UW = 0.45 m/s
 TIDAL SIMULATION at time Tsim = 1 hours
 Instantaneous ambient velocity UA = 0.21 m/s
 Maximum tidal velocity UaMAX = 0.38 m/s
 Rate of tidal reversal dUA/dt = 0.21 (m/s)/hour
 Period of reversal T = 12.7000 hours
 Stratification Type STRCND = U
 Surface density RHOAS = 1000.72 kg/m^3
 Bottom density RHOAB = 1000.72 kg/m^3

DISCHARGE PARAMETERS: Single Port Discharge
 Nearest bank = right
 Distance to bank DISTB = 0.02 m
 Port diameter D0 = 0.0734 m
 Port cross-sectional area A0 = 0.0042 m^2
 Discharge velocity U0 = 1.10 m/s
 Discharge flowrate Q0 = 0.004669 m^3/s
 Discharge port height H0 = 0.50 m
 Vertical discharge angle THETA = -03 deg
 Horizontal discharge angle SIGMA = 90 deg
 Discharge density RHO0 = 999.6070 kg/m^3
 Density difference DRHO = 1.1130 kg/m^3
 Buoyant acceleration GPO = 0.0109 m/s^2
 Discharge concentration C0 = 100 ppb
 Surface heat exchange coeff. KS = 0 m/s
 Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:
 LQ = 0.07 m Lu = 0.34 m Lb = 0.01 m
 LM = 2.69 m Ln' = 99999 m Lb' = 99999 m

UNSTEADY TIDAL SCALES:
 Tu = 0.0767 hours Lu = 4.45 m Lmin = 0.17 m

NON-DIMENSIONAL PARAMETERS:
 Port densimetric Froude number FRO = 38.97
 Velocity ratio R = 5.25

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
 Toxic discharge = no
 Water quality standard specified = no
 Regulatory mixing zone = yes
 Regulatory mixing zone specification = distance
 Regulatory mixing zone value = 28.58 m (m^2 if area)
 Region of interest = 1000 m

HYDRODYNAMIC CLASSIFICATION:

| FLOW CLASS = IPV3 |

This flow configuration applies to a layer corresponding to the full water depth at the discharge site.
 Applicable layer depth = water depth = 0.58 m

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:
 Origin is located at the BOTTOM below the port/diffuser center:
 0.02 m from the right bank/shore.
 Number of display steps NSTEP = 20 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :
 Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.
 Pollutant concentration at NFR edge c = 21.7576 ppb
 Dilution at edge of NFR s = 4.6
 NFR Location: x = 0.35 m
 {centerline coordinates} y = 0.07 m
 z = 0 m

NER plume dimensions: half-width (bh) = 0.23 m
 thickness (bv) = 0.23 m
Cumulative travel time: 1.4141 sec.

Buoyancy assessment:

The effluent density is less than the surrounding ambient water density at the discharge level.
Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards the surface.

FAR-FIELD MIXING SUMMARY:

Plume becomes vertically fully mixed at 64.96 m downstream.

PLUME BANK CONTACT SUMMARY:

Plume in unbounded section contacts nearest bank at 0.35 m downstream.

UNSTEADY TIDAL ASSESSMENT:

Because of the unsteadiness of the ambient current during the tidal reversal, CORMIX predictions have been TERMINATED at:

x = 120.32 m
y = -0.02 m
z = 0 m.

For this condition AFTER TIDAL REVERSAL, mixed water from the previous half-cycle becomes re-entrained into the near field of the discharge, increasing pollutant concentrations compared to steady-state predictions. A pool of mixed water formed at slack tide will be advected downstream in this phase.

******* TOXIC DILUTION ZONE SUMMARY *******

No TDZ was specified for this simulation.

******* REGULATORY MIXING ZONE SUMMARY *******

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 6.001565 ppb
Corresponding dilution s = 17.8
Plume location: x = 28.57 m
 y = -0.02 m
 z = 0 m

Plume dimensions: half-width (bh) = 1.39 m
 thickness (bv) = 0.34 m

Cumulative travel time: 135.7998 sec.

Note:

Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

******* FINAL DESIGN ADVICE AND COMMENTS *******

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about $\pm 50\%$ (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

0.01	0.02	0.44	1.0	0.100E+03	0.04	1.103	.12534E-02
0.01	0.02	0.42	1.0	0.100E+03	0.04	1.103	.12908E-01
0.01	0.02	0.40	1.0	0.100E+03	0.04	1.103	.26671E-01
0.01	0.02	0.39	1.0	0.991E+02	0.04	1.103	.41327E-01
0.02	0.03	0.36	1.1	0.933E+02	0.05	1.103	.56920E-01
0.02	0.03	0.35	1.1	0.879E+02	0.05	1.080	.73497E-01
0.02	0.03	0.33	1.2	0.826E+02	0.05	1.007	.91110E-01
0.03	0.03	0.31	1.3	0.780E+02	0.05	0.938	.10962E+00
0.04	0.04	0.29	1.4	0.735E+02	0.06	0.872	.12967E+00
0.04	0.04	0.27	1.4	0.692E+02	0.06	0.811	.15074E+00
0.05	0.04	0.26	1.5	0.652E+02	0.06	0.753	.17310E+00
0.06	0.04	0.24	1.6	0.615E+02	0.07	0.698	.19679E+00
0.07	0.04	0.22	1.7	0.579E+02	0.07	0.647	.22189E+00
0.08	0.05	0.20	1.8	0.546E+02	0.07	0.599	.24846E+00
0.09	0.05	0.19	1.9	0.515E+02	0.08	0.554	.27656E+00
0.10	0.05	0.17	2.1	0.486E+02	0.08	0.512	.30623E+00
0.11	0.05	0.16	2.2	0.459E+02	0.08	0.473	.33751E+00
0.12	0.05	0.14	2.3	0.434E+02	0.09	0.438	.37044E+00
0.13	0.06	0.13	2.4	0.410E+02	0.09	0.405	.40503E+00
0.14	0.06	0.11	2.6	0.389E+02	0.09	0.375	.44129E+00
0.16	0.06	0.10	2.7	0.369E+02	0.10	0.347	.47922E+00

Cumulative travel time = 0.4792 sec (0.00 hrs)

END OF CORJET (MOD110): JRT/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

Control volume inflow:

X	Y	Z	S	C	B	TT
0.16	0.06	0.10	2.7	0.371E+02	0.10	.47922E+00

Profile definitions:

BV = top-hat thickness, measured vertically
 BH = top-hat half-width, measured horizontally in Y-direction
 ZU = upper plume boundary (Z-coordinate)
 ZL = lower plume boundary (Z-coordinate)
 S = hydrodynamic average (bulk) dilution
 C = average (bulk) concentration (includes reaction effects, if any)
 TT = Cumulative travel time

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
0.06	0.05	0.00	2.7	0.369E+02	0.00	0.00	0.00	0.00	.47922E+00
0.09	0.06	0.00	2.7	0.370E+02	0.14	0.07	0.14	0.00	.47922E+00
0.12	0.06	0.00	2.7	0.370E+02	0.17	0.10	0.17	0.00	.47922E+00
0.15	0.06	0.00	2.7	0.370E+02	0.19	0.12	0.19	0.00	.47922E+00
0.18	0.06	0.00	2.8	0.359E+02	0.20	0.14	0.20	0.00	.57481E+00
0.21	0.06	0.00	3.1	0.319E+02	0.21	0.16	0.21	0.00	.71469E+00
0.24	0.06	0.00	3.6	0.277E+02	0.22	0.18	0.22	0.00	.85458E+00
0.27	0.07	0.00	4.0	0.249E+02	0.22	0.19	0.22	0.00	.99446E+00
0.30	0.07	0.00	4.3	0.231E+02	0.22	0.20	0.22	0.00	.11343E+01
0.32	0.07	0.00	4.5	0.223E+02	0.23	0.22	0.23	0.00	.12742E+01
0.35	0.07	0.00	4.6	0.218E+02	0.23	0.23	0.23	0.00	.14141E+01

Cumulative travel time = 1.4141 sec (0.00 hrs)

END OF MOD131: LAYER BOUNDARY/TERMINAL LAYER APPROACH

** End of NEAR-FIELD REGION (NER) **

In this design case, the discharge is located CLOSE TO BANK/SHORE.
 Some lateral boundary interaction occurs at end of the near-field.
 This may be related to a design case with a very LOW AMBIENT VELOCITY.
 The dilution values in one or more of the preceding zones may be too high.
 Carefully evaluate results in near-field and check degree of interaction.

Consider locating outfall further away from bank or shore.
 In the next prediction module, the plume centerline will be set
 to follow the bank/shore.

BEGIN MOD141: BUOYANT AMBIENT SPREADING

Plume is ATTACHED to RIGHT bank/shore.
 Plume width is now determined from RIGHT bank/shore.

Profile definitions:

BV = top-hat thickness, measured vertically
 BH = top-hat half-width, measured horizontally in Y-direction
 ZU = upper plume boundary (Z-coordinate)
 ZL = lower plume boundary (Z-coordinate)
 S = hydrodynamic average (bulk) dilution
 C = average (bulk) concentration (includes reaction effects, if any)
 TT = Cumulative travel time

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL	TT
0.35	-0.02	0.00	4.6	0.218E+02	0.33	0.31	0.33	0.00	.14141E+01
1.12	-0.02	0.00	4.9	0.206E+02	0.29	0.38	0.29	0.00	.50802E+01
1.89	-0.02	0.00	5.1	0.197E+02	0.26	0.44	0.26	0.00	.87463E+01
2.66	-0.02	0.00	5.3	0.189E+02	0.24	0.50	0.24	0.00	.12412E+02
3.43	-0.02	0.00	5.5	0.181E+02	0.23	0.56	0.23	0.00	.16079E+02

CORMIX SESSION REPORT;
XX
CORMIX MIXING ZONE EXPERT SYSTEM

CORMIX Version 11.06
HYDRO:Version-11.0.0.0 April,2018

SITE NAME/LABEL: Pharmacia
DESIGN CASE: Pharmacia CHRONIC
FILE NAME: P:\CORNIX FILES\Pharmacia\CHRONIC\offdesign2\Final.prd
Using subsystem CORMIX1: Single Port Discharges
Start of session: 05/25/2018--10:45:18

SUMMARY OF INPUT DATA:

AMBIENT PARAMETERS:
Cross-section = unbounded
Average depth HA = 0.67 m
Depth at discharge HD = 0.67 m
Darcy-Weisbach friction factor F = 0.0350
Calculated from Manning's n = 0.02
Wind velocity UW = 0.45 m/s
TIDAL SIMULATION at time Tsim = 1 hours
Instantaneous ambient velocity UA = 0.21 m/s
Maximum tidal velocity UAMAX = 0.38 m/s
Rate of tidal reversal dUA/dt = 0.21 (m/s)/hour
Period of reversal T = 12.7000 hours
Stratification Type STRCND = A
Surface density RHOAS = 1000 kg/m³
Bottom density RHOAB = 1000.49 kg/m³

DISCHARGE PARAMETERS: Single Port Discharge
Nearest bank = right
Distance to bank DISTH = 0 m
Port diameter DO = 0.2042 m
Port cross-sectional area AO = 0.0328 m²
Discharge velocity UO = 0.14 m/s
Discharge flowrate QO = 0.004669 m³/s
Discharge port height HO = 0.46 m
Vertical discharge angle THETA = 0 deg
Horizontal discharge angle SIGMA = 90 deg
Discharge density RHOQ = 998.4070 kg/m³
Density difference DRHO = 1.8380 kg/m³
Buoyant acceleration GFO = 0.018 m/s²
Discharge concentration CO = 100 ppb
Surface heat exchange coeff. KS = 0 m/s
Coefficient of decay KD = 0 /s

DISCHARGE/ENVIRONMENT LENGTH SCALES:
LQ = 0.18 m Lm = 0.12 m Lb = 0.01 m
LM = 0.45 m Lm' = 99999 m Lb' = 99999 m

UNSTEADY TIDAL SCALES:
Tu = 0.0546 hours Tu = 2.25 m Lmin= 0.48 m

NON-DIMENSIONAL PARAMETERS:
Port densimetric Froude number FRO = 2.35
Velocity ratio R = 0.68

MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
Toxic discharge = no
Water quality standard specified = no
Regulatory mixing zone = yes
Regulatory mixing zone specification = distance
Regulatory mixing zone value = 28.58 m (m² if area)
Region of interest = 1000 m

HYDRODYNAMIC CLASSIFICATION:

FLOW CLASS = IPH4AI

This flow configuration applies to a layer corresponding to the full water depth at the discharge site. The ambient density stratification at the discharge site is relatively weak and unimportant so the discharge flow penetrates to the surface and/or breaks down the existing stratification through vigorous mixing.

Applicable layer depth = water depth = 0.67 m

MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

X-Y-Z Coordinate system:
Origin is located at the BOTTOM below the port/diffuser center:
0 m from the right bank/shore.
Number of display steps NSTEP = 20 per module.

NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing. It has no regulatory implication. However, this information may be useful for the discharge designer because the mixing in the NFR is usually sensitive to the discharge design conditions.
Pollutant concentration at NFR edge c = 11.531600 ppb
Dilution at edge of NFR s = 8.7

NER Location: x = 1.72 m
(centerline coordinates) y = 0.12 m
z = 0.67 m
NER plume dimensions: half-width (bh) = 0.34 m
thickness (bv) = 0.34 m
Cumulative travel time: 7.5837 sec.

Buoyancy assessment:
The effluent density is less than the surrounding ambient water density at the discharge level.
Therefore, the effluent is **POSITIVELY BUOYANT** and will tend to rise towards the surface.

Stratification assessment:
The specified ambient density stratification is weak relative to the discharge conditions and is dynamically unimportant. The discharge will behave as if the ambient were unstratified.

Benthic attachment:
For the present combination of discharge and ambient conditions, the discharge plume becomes attached to the channel bottom within the NER immediately following the efflux. High benthic concentrations may occur.

PLUME BANK CONTACT SUMMARY:
Plume in unbounded section contacts nearest bank at 1.72 m downstream.

UNSTEADY TIDAL ASSESSMENT:
Because of the unsteadiness of the ambient current during the tidal reversal, CORMIX predictions have been **TERMINATED** at:

x = 120.32 m
y = 0 m
z = 0.67 m.

For this condition **AFTER TIDAL REVERSAL**, mixed water from the previous half-cycle becomes re-entrained into the near field of the discharge, increasing pollutant concentrations compared to steady-state predictions. A pool of mixed water formed at slack tide will be advected downstream in this phase.

***** TOXIC DILUTION ZONE SUMMARY *****
No TDZ was specified for this simulation.

***** REGULATORY MIXING ZONE SUMMARY *****

The plume conditions at the boundary of the specified RMZ are as follows:

Pollutant concentration c = 3.974055 ppb
Corresponding dilution s = 25.2
Plume location: x = 28.57 m
(centerline coordinates) y = 0 m
z = 0.67 m

Plume dimensions: half-width (bh) = 2.66 m
thickness (bv) = 0.25 m

Cumulative travel time: 135.4885 sec.

Note:
Plume concentration c and dilution s values are reported based on prediction file values - assuming linear interpolation between predicted points just before and just after the RMZ boundary has been detected.

Please ensure a small step size is used in the prediction file to account for this linear interpolation. Step size can be controlled by increasing (reduces the prediction step size) or decreasing (increases the prediction step size) the - Output Steps per Module - in CORMIX input.

***** FINAL DESIGN ADVICE AND COMMENTS *****
REMEMBER: The user must take note that **HYDRODYNAMIC MODELING** by any known technique is **NOT AN EXACT SCIENCE**.

Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +/-50% (standard deviation).

As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.

ATTACHMENT 7

REASONABLE POTENTIAL DETERMINATION

Discharger: Pharmacia & Upjohn Company, LLC Address: 41 Sillies Lane Permit Number: CT0001341 Application Number: 201407119 DSN: 001-1	Receiving Water: Receiving Water Type: Quininiplac River Average Effluent Flow: 106,560 gpd Maximum Effluent Flow: 252,000 gpd	Receiving Water: Receiving Water Type: Freshwater/Saltwater (Salinity <1-5 ppt) Dilution Factor (Acute): 1.0 Dilution Factor (Chronic & Human Health): 16.6 Dilution Factor (Acute): 1.0
--	---	--

POLLUTANT	USE	Water Quality Criteria			Maximum Measured Effluent Concentration (µg/L)	Total Observations for Maximum Effluent Concentration	CV	Multiplier	Dilution Factor	Dilution Factor	Dilution Factor	Average Outflow River Concentration (µg/L)	Receiving Water Concentration (acute) (µg/L)	Receiving Water Concentration (chronic) (µg/L)	Receiving Water Concentration (human health) (µg/L)	Is there reasonable potential?
		Aquatic Life		Human Health												
		Acute (µg/L)	Chronic (µg/L)	Human Health (µg/L)												
Ammonia (Total as N), FW		3,149	689	5440	83	0.8	1.9	1.0	16.6	16.6	172	10336	784		YES	
Ammonia (Total as N), SW		1,745	262	5440	83	0.8	1.9	1.0	16.6	16.6	172	10336	784		YES	
Antimony				640	0	3	0.6	1.0		16.6	1.2			1.1	NO RPA NEEDED	
Arsenic, Total	A	69	36	0.021	0	27	0.6	1.0	1.0	16.6	1.0	0.00	0.00	0.000	NO RPA NEEDED	
Cadmium		1.0	0.125	10,769	0	3	0.6	1.0	1.0	16.6	0.08	0.000	0.075	0.075	NO RPA NEEDED	
Chlorine, Total Residual		13	7.5		0	33	0.6	1.0	1.0	16.6		0.00	0.00		NO RPA NEEDED	
Chromium		323	42	1,009,615	7	8	0.6	1.0	1.0	16.6		7.0	0.4	0.4	NO	
Copper		4.8	3.1		7	8	0.6	1.0	1.0	1.0	7.29	7.0	7.0		YES	
Cyanide, Total		1	1	140	30	57	0.6	1.6	1.0	1.0	3.2	48.0	48.0	5.9	YES	
Lead		30	1.2		0	51	0.6	1.0	1.0	1.0	2.24	0.00	0.00		NO RPA NEEDED	
Mercury, Total	HB	1.4	0.77	0.051	0.00038	51	0.6	1.0	1.0	16.6	1.0	0.00038	0.00002	0.00038	NO	
Nickel		74	8.2	4,600	4	8	0.6	1.0	1.0	16.6	2.99	4.00	3.05	3.1	NO	
Silver		1.02		107,692	0	3	0.6	1.0	1.0	16.6		0.00		0.0	NO RPA NEEDED	
Zinc		65	65	26,000	34	51	0.6	1.0	1.0	16.6	31.6	34.0	31.7	31.7	NO	

Benzene	A			51	80	98	0.6	1.0			1.0			80	YES
Chlorobenzene				1,600	51	98	0.6	1.0			16.6	0		3.1	NO
Chloroethane					0	8	0.6	1.0			16.6				NO RPA NEEDED
Chloroform	C			470	0.3	68	0.6	1.0			1.0			0.3	NO
1,1-Dichloroethane					0.65	18	0.6	1.0			16.6				NO
1,2-Dichloroethane	C			37	1.9	98	0.6	1.0			1.0			1.9	NO
1,1-Dichloroethylene	C			3.2	0	3	0.6	1.0			1.0			0	NO RPA NEEDED
Ethylbenzene				2,100	0	30	0.6	1.0			16.6	0		0	NO RPA NEEDED
Methylbromide				1,500	0.69	3	0.6	1.0			16.6	0		0.042	NO
Methylene chloride	C			590	0	97	0.6	1.0			1.0			0	NO RPA NEEDED
Tetrachloroethylene				3.3	0	18	0.6	1.0			16.6			0	NO RPA NEEDED
Toluene				15,000	1.9	98	0.6	1.0			16.6	0		0.11	NO
1,2-trans-Dichloroethylene				10,000	0	18	0.6	1.0			16.6	0		0	NO RPA NEEDED
1,1,1-Trichloroethane				200,000	0	3	0.6	1.0			16.6			0	NO RPA NEEDED
Trichloroethylene	C			30	0	6	0.6	1.0			1.0			0	NO RPA NEEDED
Vinyl chloride	C			2.4	0	98	0.6	1.0			1.0			0	NO RPA NEEDED

2-Chlorophenol				150	17	96	0.6	1.0			16.6	0		1.02	NO
2,4-Dichlorophenol				290	0	3	0.6	1.0			16.6	0		0.0	NO RPA NEEDED
2,4-Dimethylphenol				850	0	3	0.6	1.0			16.6			0.0	NO RPA NEEDED
Phenol				860,000	10	96	0.6	1.0			16.6	1.3		1.85	NO
2,4,6-Trichlorophenol	C-HB			2.4	0	8	0.6	1.0			1.0			0.0	NO RPA NEEDED

Acenaphthene	HB			6.1	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Acenaphthylene	C-HB			49.2	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Anthracene	C-HB			4.92	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Benzidine	A			0.00020	0	98	0.6	1.0			1.0			0.0	NO RPA NEEDED
Benzo(a)anthracene	C-HB			0.018	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Benzo(a)pyrene	C-HB			0.018	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
3,4-Benzofluoranthene	C-HB			0.018	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Bis(2-Chloroethyl)ether	C			0.53	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Bis(2-ethylhexyl)phthalate	C-HB			2.2	14	60	0.6	1.0			1.0			14.0	YES
Chrysene	C-HB			0.018	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
1,2-Dichlorobenzene	HB			1,300	28	98	0.6	1.0			1.0			28.0	NO
1,3-Dichlorobenzene	HB			960	0	98	0.6	1.0			1.0			0.0	NO RPA NEEDED
1,4-Dichlorobenzene	HB			190	9	99	0.6	1.0			1.0			9.0	NO
3,3'-Dichlorobenzidine	C-HB			0.026	0	94	0.6	1.0			1.0			0.0	NO RPA NEEDED
Fluoranthene	C-HB			1.28	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Fluorene	C-HB			49.2	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Naphthalene				20,513	0	8	0.6	1.0			16.6	0		0.0	NO RPA NEEDED
Nitrobenzene				690	0.76	3	0.6	1.0			16.6			0.0	NO
Phenanthrene	C-HB			49.17	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
Pyrene	C-HB			49.17	0	3	0.6	1.0			1.0			0.0	NO RPA NEEDED
1,2,4-Trichlorobenzene				70	0	3	0.6	1.0			16.6			0.0	NO RPA NEEDED

PCBs (as Aroclors)	C-HB			0.014	0.000064	0	97	0.6	1.0					0.0	0.0	NO RPA NEEDED
PCBs (as Homologs)	C-HB			0.014	0.000064	0	94	0.6	1.0					0.0	0.0	NO RPA NEEDED
PCBs (as Congeners)	C-HB			0.014	0.000064	0.0397	3	0.6	1.0		16.6	1.0		0.0397	0.0397	YES

CONTINUED ON THE NEXT PAGE

POLLUTANT	A.C./H.B.	Water Quality Criteria			Maximum Measured Effluent Concentration µg/L	Total Observations for Maximum Effluent Concentration	CV	Multiplier	Dilution Factor	Dilution Factor	Dilution Factor	Average Outfalls River Concentration µg/L	Receiving Water Concentration (est.) µg/L	Receiving Water Concentration (obs.) µg/L	Receiving Water Concentration (human health) µg/L	Is there reasonable potential?
		Aquatic Life		Human Health												
		Acute µg/L	Chronic µg/L													
1-Chloro-2-nitrobenzene	*			10.2	44	98	0.6	1.0			1.0			44	YES	
1,4-Dioxane	*			43.3	102	98	0.6	1.0			1.0			102	YES	
2-Chloroaniline		64.3	3.24		1900	99	0.6	1.0	1.0	16.6		1900	114		YES	
3-Chloroaniline		8.0	0.87		1.2	98	0.6	1.0	1.0	16.6		1.2	0.07		NO	
4-Chloroaniline	*			2.83	12	98	0.6	1.0			1.0			12	YES	
3,3'-Dimethylbenzidine	*			0	64	0.6	1.0				1.0				NO RPA NEEDED	
Aluminum, Total		750	87		149	57	0.5	1.5	1.0	1.0	1.0	148	224	224	YES	
Aniline	*			0	57	0.6	1.0								NO RPA NEEDED	
Azobenzene	*			0.2	3	98	0.6	1.0			1.0			3.0	YES	
Benzoic Acid				0	8	0.6	1.0								NO RPA NEEDED	
Carbazole	*			0	60	0.6	1.0								NO RPA NEEDED	
Carbon disulfide				0	7	0.6	1.0								NO RPA NEEDED	
cis-1,2-Dichloroethene				149	2	98	0.6	1.0			16.6			0.12	NO	
Chloride		860,000	230,000		0	0	0.6	1.0							CANNOT DETERMINE	
Cresol, o-				0	8	0.6	1.0								NO RPA NEEDED	
Cresol, m-				0	8	0.6	1.0								NO RPA NEEDED	
Cresol, p-				0	8	0.6	1.0								NO RPA NEEDED	
Dichloran		56.3	3.38		10	94	0.6	1.0	1.0	16.6		10.0	0.60		NO	
Diphenamid				0	3	0.6	1.0								NO RPA NEEDED	
Formaldehyde		846	94		224	60	0.6	1.0	1.0	16.6		224	13.5		NO	
Iron, Total			1,000		340	51	0.6	1.0		16.6			20.5		NO	
m-Toluidine				0	98	0.6	1.0								NO RPA NEEDED	
Methyl tert butyl ether	*			0	98	0.6	1.0								NO RPA NEEDED	
Sulfide			2.0		0	3	0.6	1.0		16.6			0.0		NO RPA NEEDED	
Vanadium				27	46.2	3	0.6	1.0			16.6			2.8	NO	
Xylene				0	98	0.6	1.0								NO RPA NEEDED	

NOTES:

- Note 3 associated with Table 3 in the WQS states: "For brackish waters, use the more restrictive of the aquatic life criteria for freshwater and for saltwater."
- Criteria for Total PCBs applies to the sum of the Aroclors, Congeners, or Homologs.
- No dilution is allowed for a pollutant whose human health criteria is classified as: "A", "C", or "HB".
- The average background concentrations for copper, cyanide, lead, and aluminum are higher than the most stringent applicable numeric criteria. Therefore, the Dilution Factor for these pollutants is 1.
- Criteria for the metals apply to the dissolved fraction, unless otherwise noted, as per Note 7 of the WQS. EPA's document titled, *The Metals Translator: Guidance For Calculating a Total Recoverable Permit Limits From a Dissolved Criterion*, June 1996 (EPA 823-B-96-007) suggests that an RPA for subject metals first be conducted using a translator of 1. When a translator of 1 is used for: Chromium, Copper, Nickel, and Zinc, only Copper exceeds the numeric criteria. Therefore, a translator was used for copper only. The only dissolved-to-total copper data available is from USGS 01196530 (1986-1994). See page 43 for WLA calculations. Copper limits are expressed in the total form.
- When data sets included all non-detects or were primarily non-detects, the CV and multiplier were estimated (0.6 and 1.0). Otherwise, a calculated CV and Multiplier was used.
- No RPA is needed if the maximum effluent concentration is 0.
- There is no criteria in the CT WQS for: 1,1,1-trichloroethane, iron, or sulfide. The criteria used for the RPA for these pollutants is from EPA's National Recommended Water Quality Criteria.
- There is no criteria in the CT WQS for: 1-chloro-2-nitrobenzene, 1,4-dioxane, 2-chloroaniline, 3-chloroaniline, 4-chloroaniline, azobenzene, cis-1,2-dichloroethene, dichloran, formaldehyde, and vanadium. These criteria were developed using the procedures identified on page 20.

ATTACHMENT 7

WATER QUALITY-BASED LIMITS FOR POLLUTANTS WITH REASONABLE POTENTIAL

Discharger: Pharmacia & Upjohn Company, LLC Address: 41 Silles Lane Permit Number: CT0001341 Application Number: 201407119 DSN: 001-1	Receiving Water: Quinnipiac River Average Effluent Flow: 106,560 gpd	0.165 cfs Dilution Factor 16.6 Dilution Factor _{Ac,Hb} : 1.0
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POLLUTANT	SP C C	Acute Dilution Factor	Chronic Dilution Factor	Human Health Dilution Factor	WLA (acute) µg/L	WLA (chronic) µg/L	WLA (human health) µg/L	LTA CV	LTA (acute)	LTA (chronic)	LTA (human health)	Limiting LTA	Limiting criteria	Anticipated Number of Samples per Month	Average Monthly Limit µg/L	Maximum Daily Limit µg/L	Instantaneous Limit µg/L	Average Monthly Limit g/day	Maximum Daily Limit g/day
Ammonia (Total as N), FW		1	16.6		3,149	8,758		0.8	785	3850		785.4	ACUTE	2	1,626	3,149	4,724	657	1,271
Ammonia (Total as N), SW		1	16.6		1,745	1,669		0.8	435	734		435.3	ACUTE	2	902	1,745	2,618	364	705
Antimony, Total																			
Arsenic, Total	A																		
Cadmium, Total																			
Chlorine, Total Residual																			
Chromium, Total																			
Copper, Total		1	1		9.6	6.2		0.6	3.1	3.3		3.1	ACUTE	2	5.5	9.6	14.4	2.2	3.9
Cyanide, Total		1	1		1.0	1.0		0.6	0.3	0.5		0.3	ACUTE	2	0.58	1.0	1.5	0.23	0.40
Lead, Total																			
Mercury, Total	HB																		
Nickel, Total																			
Silver, Total																			
Zinc, Total																			

Benzene	A			1			51.0	0.6			51.0	51.0	HUMAN HEALTH	2	51.0	88.4	133	20.6	35.7
Chlorobenzene																			
Chloroethane																			
Chloroform	C																		
1,1-Dichloroethane																			
1,2-Dichloroethane	C																		
1,1-Dichloroethylene	C																		
Ethylbenzene																			
Methylbromide																			
Methylene chloride	C																		
Tetrachloroethylene																			
Toluene																			
1,2-trans-Dichloroethylene																			
1,1,1-Trichloroethane																			
Trichloroethylene	C																		
Vinyl chloride	C																		

2-Chlorophenol																			
2,4-Dichlorophenol																			
2,4-Dimethylphenol																			
Phenol																			
2,4,6-Trichlorophenol	C-HB																		

Acenaphthene	HB																		
Acenaphthylene	C-HB																		
Anthracene	C-HB																		
Benzidine	A																		
Benzo(a)anthracene	C-HB																		
Benzo(a)pyrene	C-HB																		
3,4-Benzofluoranthene	C-HB																		
Bis(2-Chloroethyl)ether	C																		
Bis(2-ethylhexyl)phthalate	C-HB			1		2.2	0.6			2.2	2.2	HUMAN HEALTH	2	2.2	3.8	5.7	0.89	1.54	
Chrysene	C-HB																		
1,2-Dichlorobenzene	HB																		
1,3-Dichlorobenzene	HB																		
1,4-Dichlorobenzene	HB																		
3,3'-Dichlorobenzidine	C-HB																		
Fluoranthene	C-HB																		
Fluorene	C-HB																		
Naphthalene																			
Nitrobenzene																			
Phenanthrene	C-HB																		
Pyrene	C-HB																		
1,2,4-Trichlorobenzene																			

PCBs (as Aroclors)	C-HB																		
PCBs (as Homologs)	C-HB																		
PCBs (as Congeners)	C-HB		16.6	1		0.232	0.00064	0.6		0.12	0.00064	0.00064	HUMAN HEALTH	1	0.00064	0.00069	0.00140	0.00025	0.00038

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POLLUTANT	to 10 13 2	Acute Dilution Factor	Chronic Dilution Factor	Human Health Dilution Factor	WLA (acute) µg/L	WLA (chronic) µg/L	WLA (human health) µg/L	LTA CV	LTA (acute)	LTA (chronic)	LTA (human health)	Limiting LTA	Limiting criteria	Anticipated Number of Samples per Month	Average Monthly Limit µg/L	Maximum Daily Limit µg/L	Instantaneous Limit µg/L	Average Monthly Limit µ/day	Maximum Daily Limit µ/day
1-Chloro-2-nitrobenzene	*			1			10.2	0.6			10.2	10.2	HUMAN HEALTH	2	10.2	17.7	26.5	4.1	7.1
1,4-Dioxane	*			1			43.3	0.6			43.3	43.3	HUMAN HEALTH	2	43.3	75.0	113	17.5	30.3
2-Chloroaniline		1	16.6		64.3	53.8		0.6	20.6	28.4		20.6	ACUTE	2	37.1	64.3	96.5	15.0	26.0
3-Chloroaniline																			
4-Chloroaniline	*			1			2.830	0.6			2.83	2.83	HUMAN HEALTH	2	2.83	4.90	7.35	1.1	2.0
3,3'-Dimethylbenzidine	*																		
Aluminum, Total			1			87.0		0.5		51		51	CHRONIC	2	83.9	136	204	33.8	54.8
Aniline	*																		
Azobenzene	*			1			0.200	0.6			0.20	0.20	HUMAN HEALTH	2	0.20	0.35	0.52	0.08	0.14
Benzoic Acid																			
Carbazole	*																		
Carbon disulfide																			
cis-1,2-Dichloroethene																			
Chloride																			
Cresol, o-																			
Cresol, m-																			
Cresol, p-																			
Dichloran																			
Diphenamid																			
Formaldehyde																			
Iron, Total																			
m-Totulidine																			
Methyl tert butyl ether	*																		
Sulfide																			
Vanadium																			
Xylene																			

ATTACHMENT 7

Pharmacia & Upjohn Company LLC Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<u>Copper</u>			<u>Cyanide</u>			<u>Lead</u>			<u>Mercury</u>			<u>Nickel</u>			<u>Silver</u>		
DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML
Mar 04, 2013	0	5	Jan 06, 2013	4		Mar 04, 2013	0	5	Mar 04, 2013	0	0.2	Mar 04, 2013	0	5	Mar 04, 2013	0	5
Mar 03, 2014	0	5	Feb 05, 2013	4		Mar 06, 2013	0	5	Mar 06, 2013	0	0.2	Mar 03, 2014	0	5	Mar 03, 2014	0	1
Mar 02, 2015	0	5	Mar 19, 2013	19		Mar 08, 2013	0	5	Mar 08, 2013	0	0.2	Mar 02, 2015	0	5	Mar 02, 2015	0	1
Mar 07, 2016	0	5	Apr 23, 2013	9		Jun 03, 2013	0	5	Jun 03, 2013	0	0.2	Mar 07, 2016	0	5	Mar 07, 2016	0	1
Mar 06, 2017	0	5	May 14, 2013	9		Jun 05, 2013	0	5	Jun 05, 2013	0	0.2	Mar 06, 2017	0	2	Mar 06, 2017	0	1
			Jun 02, 2013	2		Jun 07, 2013	0	5	Jun 07, 2013	0	0.2						
			Jul 23, 2013	5		Sep 16, 2013	0	5	Sep 16, 2013	0	0.2						
			Aug 13, 2013	9		Sep 18, 2013	0	5	Sep 18, 2013	0	0.2						
			Sep 19, 2013	9		Sep 20, 2013	0	5	Sep 20, 2013	0	0.2						
			Oct 08, 2013	13		Dec 02, 2013	0	5	Dec 02, 2013	0	0.2						
			Nov 25, 2013	14		Dec 04, 2013	0	5	Dec 04, 2013	0	0.2						
			Dec 05, 2013	14		Dec 06, 2013	0	5	Dec 06, 2013	0	0.2						
			Jan 21, 2014	28		Mar 03, 2014	0	5	Mar 03, 2014	0	0.2						
			Feb 25, 2014	22		Mar 05, 2014	0	5	Mar 05, 2014	0	0.2						
			Mar 11, 2014	23		Mar 07, 2014	0	5	Mar 07, 2014	0	0.2						
			Apr 08, 2014	21		Jun 02, 2014	0	5	Jun 02, 2014	0	0.2						
			May 13, 2014	13		Jun 04, 2014	0	5	Jun 04, 2014	0	0.2						
			Jun 10, 2014	13		Jun 06, 2014	0	5	Jun 06, 2014	0	0.2						
			Jul 15, 2014	29		Sep 15, 2014	0	5	Sep 15, 2014	0	0.2						
			Aug 17, 2014	13		Sep 17, 2014	0	5	Sep 17, 2014	0	0.2						
			Sep 10, 2014	18		Sep 19, 2014	0	5	Sep 19, 2014	0	0.2						
			Oct 22, 2014	17		Dec 01, 2014	0	5	Dec 01, 2014	0	0.2						
			Nov 25, 2014	24		Dec 03, 2014	0	5	Dec 03, 2014	0	0.2						
			Dec 05, 2014	25		Dec 05, 2014	0	5	Dec 05, 2014	0	0.2						
			Jan 21, 2014	24		Mar 02, 2015	0	5	Mar 02, 2015	0	0.2						
			Feb 25, 2015	24		Mar 04, 2015	0	5	Mar 04, 2015	0	0.2						
			Mar 02, 2015	26		Mar 06, 2015	0	5	Mar 06, 2015	0	0.2						
			Apr 01, 2015	23		Jun 01, 2015	0	5	Jun 01, 2015	0	0.2						
			May 06, 2015	19		Jun 03, 2015	0	5	Jun 03, 2015	0	0.2						
			Jun 17, 2015	28		Jun 05, 2015	0	5	Jun 05, 2015	0	0.2						
			Jul 01, 2015	25		Sep 14, 2015	0	1	Sep 14, 2015	0	0.2						
			Aug 19, 2015	20		Sep 16, 2015	0	5	Sep 16, 2015	0	0.2						
			Sep 16, 2015	21		Sep 18, 2015	0	5	Sep 18, 2015	0	0.2						
			Oct 21, 2015	18		Dec 07, 2015	0	5	Dec 07, 2015	0	0.2						
			Nov 11, 2015	23		Dec 09, 2015	0	5	Dec 09, 2015	0	0.2						
			Dec 18, 2015	30		Dec 11, 2015	0	5	Dec 11, 2015	0	0.2						
			Jan 13, 2016	23		Mar 07, 2016	0	5	Mar 07, 2016	0	0.2						
			Feb 24, 2016	25		Mar 09, 2016	0	5	Mar 09, 2016	0	0.2						
			Mar 02, 2016	27		Mar 11, 2016	0	5	Mar 11, 2016	0	0.2						
			Apr 06, 2016	13		Sep 12, 2016	0	5	Sep 12, 2016	0	0.2						
			May 04, 2016	3		Sep 14, 2016	0	5	Sep 14, 2016	0	0.2						
			Jun 22, 2016	12		Sep 16, 2016	0	5	Sep 16, 2016	0	0.2						
			Jul 27, 2016	11		Mar 06, 2017	0	5	Mar 06, 2017	0	0.2						
			Aug 10, 2016	10		Mar 08, 2017	0	5	Mar 08, 2017	0	0.2						
			Sep 12, 2016	3		Mar 10, 2017	0	5	Mar 10, 2017	0	0.2						
			Oct 19, 2016	7		Jun 05, 2017	0	5	Jun 05, 2017	0	0.2						
			Nov 02, 2016	14		Jun 07, 2017	0	5	Jun 07, 2017	0	0.2						
			Dec 14, 2016	4		Jun 09, 2017	0	5	Jun 09, 2017	0	0.2						
			Jan 25, 2017	5		Sep 11, 2017	0	5	Sep 11, 2017	0	0.2						
			Feb 22, 2017	14		Sep 13, 2017	0	5	Sep 13, 2017	0	0.2						
			Mar 06, 2017	10		Sep 15, 2017	0	5	Sep 15, 2017	0	0.2						
			Apr 28, 2017	14													
			May 03, 2017	9													
			Jun 07, 2017	11													
			Jul 05, 2017	0	1												
			Aug 16, 2017	3													
			Sep 06, 2017	0	?												
			Oct 04, 2017	0	10												
			Nov 15, 2017	3													
Jun 01, 2017	7		Jun 01, 2017	7		Jun 01, 2017	0	0.4	Jun 01, 2017	0	0.0005	Jun 01, 2017	2.0		Jun 01, 2017	0	0.2
Jun 14, 2017	7		Jun 14, 2017	9		Jun 14, 2017	0	0.4	Jun 14, 2017	0	0.0005	Jun 14, 2017	4.2		Jun 14, 2017	0	0.2
Jun 28, 2017	8		Jun 28, 2017	8		Jun 28, 2017	0	0.4	Jun 28, 2017	0.00038		Jun 28, 2017	4.0		Jun 28, 2017	0	0.2

	<u>Copper</u>	<u>Cyanide</u>	<u>Lead</u>	<u>Mercury</u>	<u>Nickel</u>	<u>Silver</u>
MEAN	3	14	0	0.00013	3.40	0
SD	3	8	0	0.00022	1.22	0
CV	1.39	0.60	#DIV/0!	1.73	0.36	#DIV/0!
CV (to 1 decimal place)	1.4	0.6	#DIV/0!	1.7	0.4	#DIV/0!
MAX	7	30	0	0	4.2	0
MIN	0	0	0	0	2.0	0
N	8	62	54	3	3	8
S	1.04	0.55	#DIV/0!	1.17	0.39	#DIV/0!
Percentile	0.99	0.99	0.99	0.99	0.99	0.99
Pn	0.56	0.93	0.92	0.22	0.22	0.56
Multiplier	9.6	1.6	#DIV/0!	37.7	3.3	#DIV/0!

ATTACHMENT 7

Pharmacia & Upjohn Company LLC

Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<u>1,1-Dichloroethane</u>		<u>1,1-Dichloroethylene</u>		<u>Ethylbenzene</u>		<u>Methyl bromide</u>		<u>Methylene chloride</u>		<u>Tetrachloroethylene</u>				
DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L			
Nov 07, 2012	0			Mar 04, 2013	0	1		Nov 07, 2012	0	Mar 04, 2013	0	1.5		
Dec 03, 2012	0			Mar 06, 2013	0	1		Dec 03, 2012	0	Mar 06, 2013	0	1.5		
Dec 05, 2012	0			Mar 08, 2013	0	1		Dec 05, 2012	0	Mar 08, 2013	0	1.5		
Dec 07, 2012	0			Sep 16, 2013	0	1		Dec 07, 2012	0	Mar 03, 2014	0	1.5		
Jan 02, 2013	0			Sep 18, 2013	0	1		Jan 02, 2013	0	Mar 05, 2014	0	1.5		
Feb 06, 2013	0			Sep 20, 2013	0	1		Feb 06, 2013	0	Mar 07, 2014	0	1.5		
Mar 04, 2013	0			Mar 03, 2014	0	1		Mar 04, 2013	0	Mar 02, 2015	0	10		
Mar 06, 2013	0			Mar 05, 2014	0	1		Mar 06, 2013	0	Mar 04, 2015	0	10		
Mar 08, 2013	0			Mar 07, 2014	0	1		Mar 08, 2013	0	Mar 06, 2015	0	10		
Apr 03, 2013	0			Sep 15, 2014	0	10		Apr 03, 2013	0	Mar 07, 2016	0	10		
May 01, 2013	0			Sep 17, 2014	0	10		May 01, 2013	0	Mar 08, 2016	0	10		
Jun 03, 2013	0			Sep 19, 2014	0	10		Jun 03, 2013	0	Mar 11, 2016	0	10		
Jun 05, 2013	0			Mar 02, 2015	0	10		Jun 05, 2013	0	Mar 06, 2017	0	10		
Jun 07, 2013	0			Mar 04, 2015	0	10		Jun 07, 2013	0	Mar 08, 2017	0	10		
Jul 03, 2013	0			Mar 06, 2015	0	10		Aug 07, 2013	0	Mar 10, 2017	0	10		
Aug 07, 2013	0			Sep 14, 2015	0	10		Sep 16, 2013	0					
Sep 16, 2013	0			Sep 16, 2015	0	10		Sep 16, 2013	0					
Sep 18, 2013	0			Sep 18, 2015	0	10		Sep 18, 2013	0					
Sep 20, 2013	0			Mar 07, 2016	0	10		Sep 20, 2013	0					
Oct 02, 2013	0			Mar 09, 2016	0	10		Oct 02, 2013	0					
Nov 05, 2013	0			Mar 11, 2016	0	10		Nov 05, 2013	0					
Dec 02, 2013	0			Sep 12, 2016	0	10		Dec 02, 2013	0					
Dec 04, 2013	0			Sep 14, 2016	0	10		Dec 04, 2013	0					
Dec 06, 2013	0			Sep 16, 2016	0	10		Dec 06, 2013	0					
Jan 08, 2014	0			Mar 06, 2017	0	10		Jan 08, 2014	0					
Feb 06, 2014	0			Mar 08, 2017	0	10		Feb 06, 2014	0					
Mar 03, 2014	0			Mar 10, 2017	0	10		Mar 03, 2014	0					
Mar 05, 2014	0			Sep 11, 2017	0	10		Mar 05, 2014	0					
Mar 07, 2014	0			Sep 13, 2017	0	10		Mar 07, 2014	0					
Apr 09, 2014	0			Sep 17, 2017	0	10		Apr 09, 2014	0					
May 07, 2014	0							May 07, 2014	0					
Jun 02, 2014	0							Jun 02, 2014	0					
Jun 04, 2014	0							Jun 04, 2014	0					
Jun 06, 2014	0							Jun 06, 2014	0					
Jul 02, 2014	0							Jul 02, 2014	0					
Aug 06, 2014	0							Aug 06, 2014	0					
Sep 15, 2014	0							Sep 15, 2014	0					
Sep 17, 2014	0							Sep 17, 2014	0					
Sep 19, 2014	0							Sep 19, 2014	0					
Oct 01, 2014	0							Oct 01, 2014	0					
Nov 05, 2014	0							Nov 05, 2014	0					
Dec 01, 2014	0							Dec 01, 2014	0					
Dec 03, 2014	0							Dec 03, 2014	0					
Dec 05, 2014	0							Dec 05, 2014	0					
Jan 07, 2015	0							Jan 07, 2015	0					
Feb 04, 2015	0							Feb 04, 2015	0					
Mar 02, 2015	0							Mar 02, 2015	0					
Mar 04, 2015	0							Mar 04, 2015	0					
Mar 06, 2015	0							Mar 06, 2015	0					
Apr 01, 2015	0							Apr 01, 2015	0					
May 09, 2015	0							May 09, 2015	0					
Jun 01, 2015	0							Jun 01, 2015	0					
Jun 03, 2015	0							Jun 03, 2015	0					
Jun 05, 2015	0							Jun 05, 2015	0					
Jun 05, 2015	0							Jun 05, 2015	0					
Jul 08, 2015	0							Jul 08, 2015	0					
Aug 05, 2015	0							Aug 05, 2015	0					
Sep 14, 2015	0							Sep 14, 2015	0					
Sep 16, 2015	0							Sep 16, 2015	0					
Sep 18, 2015	0							Sep 18, 2015	0					
Oct 07, 2015	0							Oct 07, 2015	0					
Nov 04, 2015	0							Nov 04, 2015	0					
Dec 07, 2015	0							Dec 07, 2015	0					
Dec 09, 2015	0							Dec 09, 2015	0					
Dec 11, 2015	0							Dec 11, 2015	0					
Jan 06, 2016	0							Jan 06, 2016	0					
Feb 03, 2016	0							Feb 03, 2016	0					
Feb 17, 2016	0							Feb 17, 2016	0					
Mar 07, 2016	0							Mar 07, 2016	0					
Mar 09, 2016	0							Mar 09, 2016	0					
Mar 11, 2016	0							Mar 11, 2016	0					
Apr 06, 2016	0							Apr 06, 2016	0					
May 04, 2016	0							May 04, 2016	0					
Jun 06, 2016	0							Jun 06, 2016	0					
Jun 08, 2016	0							Jun 08, 2016	0					
Jun 10, 2016	0							Jun 10, 2016	0					
Jul 06, 2016	0							Jul 06, 2016	0					
Aug 03, 2016	0							Aug 03, 2016	0					
Aug 05, 2016	0							Aug 05, 2016	0					
Sep 12, 2016	0							Sep 12, 2016	0					
Sep 14, 2016	0							Sep 14, 2016	0					
Sep 16, 2016	0							Sep 16, 2016	0					
Oct 05, 2016	0							Oct 05, 2016	0					
Nov 02, 2016	0							Nov 02, 2016	0					
Dec 05, 2016	0							Dec 05, 2016	0					
Dec 07, 2016	0							Dec 07, 2016	0					
Dec 09, 2016	0							Dec 09, 2016	0					
Jan 04, 2017	0							Jan 04, 2017	0					
Feb 01, 2017	0							Feb 01, 2017	0					
Mar 06, 2017	0							Mar 06, 2017	0					
Mar 08, 2017	0							Mar 08, 2017	0					
Mar 10, 2017	0							Mar 10, 2017	0					
Apr 05, 2017	0							Apr 05, 2017	0					
May 03, 2017	1.9							May 03, 2017	0					
Jun 05, 2017	0							Jun 05, 2017	0					
Jun 07, 2017	0							Jun 07, 2017	0					
Jun 09, 2017	0							Jun 09, 2017	0					
Jul 05, 2017	0							Jul 05, 2017	0					
Aug 02, 2017	0							Aug 02, 2017	0					
Sep 11, 2017	0							Sep 11, 2017	0					
Sep 13, 2017	0							Sep 13, 2017	0					
Sep 15, 2017	0							Sep 15, 2017	0					
Oct 04, 2017	0							Oct 04, 2017	0					
Nov 01, 2017	0							Nov 01, 2017	0					
Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5
Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5
Jun 26, 2017	0	0.5	Jun 26, 2017	0	0.5	Jun 26, 2017	0	0.5	Jun 26, 2017	0	0.5	Jun 26, 2017	0	0.5

	<u>1,1-Dichloroethane</u>	<u>1,1-Dichloroethylene</u>	<u>Ethylbenzene</u>	<u>Methyl bromide</u>	<u>Methylene chloride</u>	<u>Tetrachloroethylene</u>
MEAN	0.02	0.00	0.00	0.23	0.00	0.00
SD	0.19	0.00	0.00	0.40	0.00	0.00
CV	10.25	#DIV/0!	#DIV/0!	1.73	#DIV/0!	#DIV/0!
CV (to 1 decimal place)	10.2	#DIV/0!	#DIV/0!	1.7	#DIV/0!	#DIV/0!
MAX	1.8	0	0	0.69	0	0
MIN	0	0	0	0	0	0
N	105	3	33	3	104	18
S	2.15	#DIV/0!	#DIV/0!	1.17	#DIV/0!	#DIV/0!
Percentile	0.99	0.99	0.99	0.99	0.99	0.99
Pn	0.96	0.22	0.67	0.22	0.96	0.77
Multipier	3.7	#DIV/0!	#DIV/0!	37.7	#DIV/0!	#DIV/0!

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Pharmacia & Upjohn Company LLC
Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

Toluene		1,2-trans-Dichloroethene		1,1,1-Trichloroethane		Trichloroethylene		Vinyl chloride			
DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L		
Nov 07, 2012	0	Mar 04, 2013	0			Mar 04, 2013	0	Nov 07, 2012	0		
Dec 03, 2012	0	Mar 06, 2013	0			Mar 05, 2014	0	Dec 03, 2012	0		
Dec 05, 2012	0	Mar 08, 2013	0			Mar 02, 2015	0	Dec 05, 2012	0		
Dec 07, 2012	0	Mar 09, 2013	0			Mar 07, 2016	0	Dec 07, 2012	0		
Jan 02, 2013	0	Mar 05, 2014	0			Mar 06, 2017	10	Jan 02, 2013	0		
Feb 06, 2013	0	Mar 07, 2014	0					Feb 06, 2013	0		
Mar 04, 2013	0	Mar 02, 2015	0					Mar 04, 2013	0		
Mar 06, 2013	0	Mar 04, 2015	0					Mar 06, 2013	0		
Mar 08, 2013	0	Mar 05, 2015	0					Mar 08, 2013	0		
Apr 03, 2013	0	Mar 07, 2016	0					Apr 03, 2013	0		
May 01, 2013	0	Mar 09, 2016	0					May 01, 2013	0		
Jun 03, 2013	0	Mar 11, 2016	0					Jun 03, 2013	0		
Jun 05, 2013	0	Mar 06, 2017	0					Jun 05, 2013	0		
Jun 07, 2013	0	Mar 08, 2017	0					Jun 07, 2013	0		
Jul 03, 2013	0	Mar 10, 2017	0					Jul 03, 2013	0		
Aug 07, 2013	0							Aug 07, 2013	0		
Sep 16, 2013	0							Sep 16, 2013	0		
Sep 18, 2013	0							Sep 18, 2013	0		
Sep 20, 2013	0							Sep 20, 2013	0		
Oct 02, 2013	0							Oct 02, 2013	0		
Nov 06, 2013	0							Nov 06, 2013	0		
Dec 02, 2013	0							Dec 02, 2013	0		
Dec 04, 2013	0							Dec 04, 2013	0		
Dec 06, 2013	0							Dec 06, 2013	0		
Jan 08, 2014	0							Jan 08, 2014	0		
Feb 06, 2014	0							Feb 06, 2014	0		
Mar 03, 2014	0							Mar 03, 2014	0		
Mar 05, 2014	0							Mar 05, 2014	0		
Mar 07, 2014	0							Mar 07, 2014	0		
Apr 08, 2014	1.9							Apr 08, 2014	0		
May 07, 2014	0							May 07, 2014	0		
Jun 02, 2014	0							Jun 02, 2014	0		
Jun 04, 2014	0							Jun 04, 2014	0		
Jun 06, 2014	0							Jun 06, 2014	0		
Jul 02, 2014	0							Jul 02, 2014	0		
Aug 06, 2014	0							Aug 06, 2014	0		
Sep 15, 2014	0							Sep 15, 2014	0		
Sep 17, 2014	0							Sep 17, 2014	0		
Sep 19, 2014	0							Sep 19, 2014	0		
Oct 01, 2014	0							Oct 01, 2014	0		
Nov 05, 2014	0							Nov 05, 2014	0		
Dec 01, 2014	0							Dec 01, 2014	0		
Dec 03, 2014	0							Dec 03, 2014	0		
Dec 05, 2014	0							Dec 05, 2014	0		
Jan 07, 2015	0							Jan 07, 2015	0		
Feb 04, 2015	0							Feb 04, 2015	0		
Mar 02, 2015	0							Mar 02, 2015	0		
Mar 04, 2015	0							Mar 04, 2015	0		
Mar 06, 2015	0							Mar 06, 2015	0		
Apr 01, 2015	0							Apr 01, 2015	0		
May 06, 2015	0							May 06, 2015	0		
Jun 01, 2015	0							Jun 01, 2015	0		
Jun 03, 2015	0							Jun 03, 2015	0		
Jun 05, 2015	0							Jun 05, 2015	0		
Jul 08, 2015	0							Jul 08, 2015	0		
Aug 05, 2015	0							Aug 05, 2015	0		
Sep 14, 2015	0							Sep 14, 2015	0		
Sep 16, 2015	0							Sep 16, 2015	0		
Sep 18, 2015	0							Sep 18, 2015	0		
Oct 07, 2015	0							Oct 07, 2015	0		
Nov 04, 2015	0							Nov 04, 2015	0		
Dec 07, 2015	0							Dec 07, 2015	0		
Dec 09, 2015	0							Dec 09, 2015	0		
Dec 11, 2015	0							Dec 11, 2015	0		
Jan 08, 2016	0							Jan 08, 2016	0		
Feb 03, 2016	0							Feb 03, 2016	0		
Feb 17, 2016	0							Feb 17, 2016	0		
Mar 07, 2016	0							Mar 07, 2016	0		
Mar 09, 2016	0							Mar 09, 2016	0		
Mar 11, 2016	0							Mar 11, 2016	0		
Apr 06, 2016	0							Apr 06, 2016	0		
May 04, 2016	0							May 04, 2016	0		
Jun 06, 2016	0							Jun 06, 2016	0		
Jun 08, 2016	0							Jun 08, 2016	0		
Jun 10, 2016	0							Jun 10, 2016	0		
Jul 06, 2016	0							Jul 06, 2016	0		
Aug 03, 2016	0							Aug 03, 2016	0		
Sep 12, 2016	0							Sep 12, 2016	0		
Sep 14, 2016	0							Sep 14, 2016	0		
Sep 16, 2016	0							Sep 16, 2016	0		
Oct 05, 2016	0							Oct 05, 2016	0		
Nov 02, 2016	0							Nov 02, 2016	0		
Dec 05, 2016	0							Dec 05, 2016	0		
Dec 07, 2016	0							Dec 07, 2016	0		
Dec 09, 2016	0							Dec 09, 2016	0		
Jan 04, 2017	0							Jan 04, 2017	0		
Feb 01, 2017	0							Feb 01, 2017	0		
Mar 06, 2017	0							Mar 06, 2017	0		
Mar 08, 2017	0							Mar 08, 2017	0		
Mar 10, 2017	0							Mar 10, 2017	0		
Apr 05, 2017	0							Apr 05, 2017	0		
May 03, 2017	0							May 03, 2017	0		
Jun 05, 2017	0							Jun 05, 2017	0		
Jun 07, 2017	0							Jun 07, 2017	0		
Jun 09, 2017	0							Jun 09, 2017	0		
Jul 05, 2017	0							Jul 05, 2017	0		
Aug 02, 2017	0							Aug 02, 2017	0		
Sep 11, 2017	0							Sep 11, 2017	0		
Sep 13, 2017	0							Sep 13, 2017	0		
Sep 15, 2017	0							Sep 15, 2017	0		
Oct 04, 2017	0							Oct 04, 2017	0		
Nov 01, 2017	0							Nov 01, 2017	0		
Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5	Jun 01, 2017	0	0.5
Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5	Jun 14, 2017	0	0.5
Jun 28, 2017	0	0.5	Jun 28, 2017	0	0.5	Jun 28, 2017	0	0.5	Jun 28, 2017	0	0.5

	Toluene	1,2-trans-Dichloroethene	1,1,1-Trichloroethane	Trichloroethylene	Vinyl chloride
MEAN	0.02	0.00	0.00	0.00	0.00
SD	0.18	0.00	0.00	0.00	0.00
CV	10.25	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CV (to 1 decimal place)	10.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
MAX	1.9	0.0	0.0	0.0	0.0
MIN	0	0	0	0	0
N	105	18	3	6	105
S	2.18	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Percentile	0.99	0.99	0.99	0.99	0.99
Pn	0.98	0.77	0.22	0.58	0.86
Multiplier	3.7	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

ATTACHMENT 7

Pharmacia & Upjohn Company LLC Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<u>Acenaphthylene</u>		<u>Anthracene</u>		<u>Benzo(a)pyrene</u>		<u>Benzo(a)anthracene</u>		<u>Benzo(a)pyrene</u>		<u>3,4-Benzofluoranthene</u>	
DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML
Mar 04, 2013	0	2	Nov 07, 2012	0	5						
Mar 03, 2014	0	2	Dec 03, 2012	0	5						
Mar 02, 2015	0	2	Dec 05, 2012	0	5						
Mar 07, 2016	0	10	Dec 07, 2012	0	5						
Mar 06, 2017	0	10	Jan 02, 2013	0	5						
			Feb 06, 2013	0	5						
			Mar 04, 2013	0	5						
			Mar 06, 2013	0	5						
			Mar 08, 2013	0	5						
			Apr 03, 2013	0	5						
			May 01, 2013	0	5						
			Jun 03, 2013	0	5						
			Jun 05, 2013	0	5						
			Jun 07, 2013	0	5						
			Jul 03, 2013	0	5						
			Aug 07, 2013	0	5						
			Sep 16, 2013	0	5						
			Sep 18, 2013	0	5						
			Sep 20, 2013	0	5						
			Oct 02, 2013	0	5						
			Nov 06, 2013	0	5						
			Dec 02, 2013	0	5						
			Dec 04, 2013	0	5						
			Dec 06, 2013	0	5						
			Jan 06, 2014	0	5						
			Feb 06, 2014	0	5						
			Mar 03, 2014	0	5						
			Mar 05, 2014	0	5						
			Mar 07, 2014	0	5						
			Apr 09, 2014	0	5						
			May 07, 2014	0	5						
			Jun 02, 2014	0	5						
			Jun 04, 2014	0	5						
			Jun 06, 2014	0	5						
			Jul 02, 2014	0	5						
			Aug 06, 2014	0	5						
			Sep 15, 2014	0	5						
			Sep 17, 2014	0	5						
			Sep 19, 2014	0	5						
			Oct 01, 2014	0	5						
			Nov 05, 2014	0	5						
			Dec 01, 2014	0	5						
			Dec 03, 2014	0	5						
			Dec 05, 2014	0	5						
			Jan 07, 2015	0	5						
			Feb 04, 2015	0	5						
			Mar 02, 2015	0	5						
			Mar 04, 2015	0	5						
			Mar 06, 2015	0	5						
			Apr 01, 2015	0	5						
			May 06, 2015	0	5						
			Jun 01, 2015	0	5						
			Jun 03, 2015	0	5						
			Jun 05, 2015	0	5						
			Jul 01, 2015	0	5						
			Aug 05, 2015	0	5						
			Sep 14, 2015	0	5						
			Sep 16, 2015	0	5						
			Sep 18, 2015	0	5						
			Oct 07, 2015	0	5						
			Nov 04, 2015	0	5						
			Dec 07, 2015	0	5						
			Dec 09, 2015	0	5						
			Dec 11, 2015	0	5						
			Jan 06, 2016	0	5						
			Feb 03, 2016	0	5						
			Feb 17, 2016	0	5						
			Mar 07, 2016	0	5						
			Mar 09, 2016	0	5						
			Mar 11, 2016	0	5						
			Apr 13, 2016	0	5						
			May 04, 2016	0	5						
			Jun 06, 2016	0	5						
			Jun 08, 2016	0	5						
			Jun 10, 2016	0	5						
			Jul 06, 2016	0	5						
			Aug 03, 2016	0	5						
			Sep 12, 2016	0	5						
			Sep 14, 2016	0	5						
			Sep 16, 2016	0	5						
			Oct 05, 2016	0	5						
			Nov 02, 2016	0	5						
			Dec 05, 2016	0	5						
			Dec 07, 2016	0	5						
			Dec 09, 2016	0	5						
			Jan 04, 2017	0	5						
			Feb 01, 2017	0	5						
			Mar 06, 2017	0	5						
			Mar 08, 2017	0	5						
			Mar 10, 2017	0	5						
			Apr 05, 2017	0	5						
			May 03, 2017	0	5						
			Jun 05, 2017	0	5						
			Jun 07, 2017	0	5						
			Jun 09, 2017	0	5						
			Jul 05, 2017	0	5						
			Aug 02, 2017	0	5						
			Sep 06, 2017	0	5						
			Oct 04, 2017	0	5						
			Nov 01, 2017	0	5						
Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2
Jun 14, 2017	0	2	Jun 14, 2017	0	2	Jun 14, 2017	0	2	Jun 14, 2017	0	2
Jun 28, 2017	0	2	Jun 28, 2017	0	2	Jun 28, 2017	0	2	Jun 28, 2017	0	2

	<u>Acenaphthylene</u>	<u>Anthracene</u>	<u>Benzo(a)pyrene</u>	<u>Benzo(a)anthracene</u>	<u>Benzo(a)pyrene</u>	<u>3,4-Benzofluoranthene</u>
MEAN	0.00	0.00	0.00	0.00	0.00	0.00
SD	0.00	0.00	0.00	0.00	0.00	0.00
CV	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
CV (to 1 decimal place)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
MAX	0.0	0.0	0.0	0.0	0.0	0.0
MIN	0	0	0	0	0	0
N	8	3	103	3	3	3
S	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Percentile	0.99	0.99	0.99	0.99	0.99	0.99
Pn	0.66	0.22	0.99	0.22	0.22	0.22
Multiplier	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

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Pharmacia & Upjohn Company LLC

Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<u>Bis(2-Chloroethyl)ether</u>		<u>Bis(2-ethylhexyl)phthalate</u>		<u>Chrysene</u>		<u>1,2-Dichlorobenzene</u>		<u>1,3-Dichlorobenzene</u>		<u>1,4-Dichlorobenzene</u>	
DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L	DATE	ug/L
Dec 03, 2012	0	Dec 03, 2012	0	Nov 07, 2012	0	Nov 07, 2012	0	Nov 07, 2012	0	Nov 07, 2012	0
Dec 05, 2012	0	Dec 05, 2012	3	Dec 03, 2012	0	Dec 03, 2012	0	Dec 03, 2012	0	Dec 03, 2012	0
Dec 07, 2012	0	Dec 07, 2012	3	Dec 05, 2012	0	Dec 05, 2012	5	Dec 05, 2012	0	Dec 05, 2012	0
Mar 04, 2013	0	Dec 07, 2012	3	Dec 07, 2012	0	Dec 07, 2012	0	Dec 07, 2012	0	Dec 07, 2012	0
Mar 08, 2013	0	Jan 02, 2013	0	Jan 02, 2013	0	Jan 02, 2013	0	Jan 02, 2013	0	Jan 02, 2013	0
Mar 08, 2013	0	Feb 06, 2013	0	Feb 06, 2013	0	Feb 06, 2013	0	Feb 06, 2013	0	Feb 06, 2013	0
Jun 03, 2013	0	Mar 04, 2013	0	Mar 04, 2013	0	Mar 04, 2013	0	Mar 04, 2013	0	Mar 04, 2013	0
Jun 05, 2013	0	Mar 06, 2013	0	Mar 06, 2013	0	Mar 06, 2013	0	Mar 06, 2013	0	Mar 06, 2013	0
Jun 07, 2013	0	Mar 08, 2013	0	Mar 08, 2013	0	Mar 08, 2013	0	Mar 08, 2013	0	Mar 08, 2013	0
Sep 16, 2013	0	Apr 03, 2013	0	Apr 03, 2013	0	Apr 03, 2013	0	Apr 03, 2013	0	Apr 03, 2013	0
Sep 18, 2013	0	May 01, 2013	0	May 01, 2013	0	May 01, 2013	0	May 01, 2013	0	May 01, 2013	0
Sep 20, 2013	0	Jun 03, 2013	0	Jun 03, 2013	0	Jun 03, 2013	0	Jun 03, 2013	0	Jun 03, 2013	0
Dec 02, 2013	0	Jun 05, 2013	0	Jun 05, 2013	0	Jun 05, 2013	0	Jun 05, 2013	0	Jun 05, 2013	0
Dec 04, 2013	0	Jun 07, 2013	0	Jun 07, 2013	0	Jun 07, 2013	0	Jun 07, 2013	0	Jun 07, 2013	0
Dec 06, 2013	0	Jul 03, 2013	0	Jul 03, 2013	0	Jul 03, 2013	0	Jul 03, 2013	0	Jul 03, 2013	0
Mar 03, 2014	0	Aug 07, 2013	0	Aug 07, 2013	0	Aug 07, 2013	0	Aug 07, 2013	0	Aug 07, 2013	0
Mar 05, 2014	0	Sep 16, 2013	0	Sep 16, 2013	0	Sep 16, 2013	0	Sep 16, 2013	0	Sep 16, 2013	0
Mar 07, 2014	0	Sep 18, 2013	0	Sep 18, 2013	0	Sep 18, 2013	0	Sep 18, 2013	0	Sep 18, 2013	0
Jun 02, 2014	0	Sep 20, 2013	0	Sep 20, 2013	0	Sep 20, 2013	0	Sep 20, 2013	0	Sep 20, 2013	0
Jun 04, 2014	0	Oct 02, 2013	0	Oct 02, 2013	0	Oct 02, 2013	0	Oct 02, 2013	0	Oct 02, 2013	0
Jun 06, 2014	0	Nov 06, 2013	0	Nov 06, 2013	0	Nov 06, 2013	0	Nov 06, 2013	0	Nov 06, 2013	0
Sep 15, 2014	0	Dec 02, 2013	0	Dec 02, 2013	0	Dec 02, 2013	0	Dec 02, 2013	0	Dec 02, 2013	0
Sep 17, 2014	0	Dec 04, 2013	0	Dec 04, 2013	0	Dec 04, 2013	0	Dec 04, 2013	0	Dec 04, 2013	0
Sep 19, 2014	0	Dec 06, 2013	0	Dec 06, 2013	0	Dec 06, 2013	0	Dec 06, 2013	0	Dec 06, 2013	0
Dec 01, 2014	0	Jan 08, 2014	0	Jan 08, 2014	0	Jan 08, 2014	0	Jan 08, 2014	0	Jan 08, 2014	0
Dec 03, 2014	0	Feb 06, 2014	0	Feb 06, 2014	0	Feb 06, 2014	0	Feb 06, 2014	0	Feb 06, 2014	0
Dec 05, 2014	0	Mar 03, 2014	0	Mar 03, 2014	0	Mar 03, 2014	0	Mar 03, 2014	0	Mar 03, 2014	0
Mar 02, 2015	0	Mar 05, 2014	0	Mar 05, 2014	0	Mar 05, 2014	0	Mar 05, 2014	0	Mar 05, 2014	0
Mar 04, 2015	0	Mar 07, 2014	0	Mar 07, 2014	0	Mar 07, 2014	0	Mar 07, 2014	0	Mar 07, 2014	0
Mar 06, 2015	0	Apr 09, 2014	0	Apr 09, 2014	0	Apr 09, 2014	0	Apr 09, 2014	0	Apr 09, 2014	0
Jun 01, 2015	0	May 07, 2014	0	May 07, 2014	0	May 07, 2014	0	May 07, 2014	0	May 07, 2014	0
Jun 03, 2015	0	Jun 02, 2014	0	Jun 02, 2014	0	Jun 02, 2014	0	Jun 02, 2014	0	Jun 02, 2014	0
Jun 05, 2015	14	Jun 04, 2014	0	Jun 04, 2014	0	Jun 04, 2014	0	Jun 04, 2014	0	Jun 04, 2014	0
Sep 14, 2015	0	Jun 05, 2014	0	Jun 05, 2014	0	Jun 05, 2014	0	Jun 05, 2014	0	Jun 05, 2014	0
Sep 16, 2015	0	Jul 02, 2014	0	Jul 02, 2014	0	Jul 02, 2014	0	Jul 02, 2014	0	Jul 02, 2014	0
Sep 18, 2015	0	Aug 06, 2014	0	Aug 06, 2014	0	Aug 06, 2014	0	Aug 06, 2014	0	Aug 06, 2014	0
Dec 07, 2015	0	Sep 15, 2014	0	Sep 15, 2014	0	Sep 15, 2014	0	Sep 15, 2014	0	Sep 15, 2014	0
Dec 09, 2015	0	Sep 17, 2014	0	Sep 17, 2014	0	Sep 17, 2014	0	Sep 17, 2014	0	Sep 17, 2014	0
Dec 11, 2015	0	Sep 19, 2014	0	Sep 19, 2014	0	Sep 19, 2014	0	Sep 19, 2014	0	Sep 19, 2014	0
Mar 07, 2016	0	Oct 01, 2014	7	Oct 01, 2014	7	Oct 01, 2014	0	Oct 01, 2014	0	Oct 01, 2014	0
Mar 09, 2016	0	Nov 05, 2014	0	Nov 05, 2014	0	Nov 05, 2014	0	Nov 05, 2014	0	Nov 05, 2014	0
Mar 11, 2016	0	Dec 01, 2014	0	Dec 01, 2014	0	Dec 01, 2014	0	Dec 01, 2014	0	Dec 01, 2014	0
Jun 06, 2016	0	Dec 03, 2014	0	Dec 03, 2014	0	Dec 03, 2014	0	Dec 03, 2014	0	Dec 03, 2014	0
Jun 08, 2016	0	Dec 05, 2014	0	Dec 05, 2014	0	Dec 05, 2014	0	Dec 05, 2014	0	Dec 05, 2014	0
Jun 10, 2016	0	Jan 07, 2015	15	Jan 07, 2015	15	Jan 07, 2015	0	Jan 07, 2015	0	Jan 07, 2015	0
Sep 12, 2016	5.5	Feb 04, 2015	9	Feb 04, 2015	9	Feb 04, 2015	0	Feb 04, 2015	0	Feb 04, 2015	0
Sep 14, 2016	0	Mar 02, 2015	0	Mar 02, 2015	0	Mar 02, 2015	0	Mar 02, 2015	0	Mar 02, 2015	0
Sep 16, 2016	0	Mar 04, 2015	0	Mar 04, 2015	0	Mar 04, 2015	0	Mar 04, 2015	0	Mar 04, 2015	0
Dec 05, 2016	0	Mar 06, 2015	0	Mar 06, 2015	0	Mar 06, 2015	0	Mar 06, 2015	0	Mar 06, 2015	0
Dec 07, 2016	0	Apr 01, 2015	0	Apr 01, 2015	0	Apr 01, 2015	0	Apr 01, 2015	0	Apr 01, 2015	0
Dec 09, 2016	0	May 06, 2015	0	May 06, 2015	0	May 06, 2015	0	May 06, 2015	0	May 06, 2015	0
Mar 06, 2017	0	Jun 01, 2015	0	Jun 01, 2015	0	Jun 01, 2015	0	Jun 01, 2015	0	Jun 01, 2015	0
Mar 08, 2017	0	Jun 03, 2015	0	Jun 03, 2015	0	Jun 03, 2015	0	Jun 03, 2015	0	Jun 03, 2015	0
Mar 10, 2017	0	Jun 05, 2015	0	Jun 05, 2015	0	Jun 05, 2015	0	Jun 05, 2015	0	Jun 05, 2015	0
Jun 05, 2017	0	Jul 01, 2015	0	Jul 01, 2015	0	Jul 01, 2015	0	Jul 01, 2015	0	Jul 01, 2015	0
Jun 07, 2017	0	Aug 05, 2015	24	Aug 05, 2015	24	Aug 05, 2015	0	Aug 05, 2015	0	Aug 05, 2015	0
Jun 09, 2017	0	Sep 14, 2015	0	Sep 14, 2015	0	Sep 14, 2015	0	Sep 14, 2015	0	Sep 14, 2015	0
Sep 11, 2017	0	Sep 16, 2015	0	Sep 16, 2015	0	Sep 16, 2015	0	Sep 16, 2015	0	Sep 16, 2015	0
Sep 13, 2017	0	Sep 18, 2015	0	Sep 18, 2015	0	Sep 18, 2015	0	Sep 18, 2015	0	Sep 18, 2015	0
Sep 15, 2017	0	Oct 07, 2015	0	Oct 07, 2015	0	Oct 07, 2015	0	Oct 07, 2015	0	Oct 07, 2015	0
		Nov 04, 2015	24	Nov 04, 2015	24	Nov 04, 2015	0	Nov 04, 2015	0	Nov 04, 2015	0
		Dec 07, 2015	0	Dec 07, 2015	0	Dec 07, 2015	0	Dec 07, 2015	0	Dec 07, 2015	0
		Dec 09, 2015	28	Dec 09, 2015	28	Dec 09, 2015	0	Dec 09, 2015	0	Dec 09, 2015	0
		Dec 11, 2015	0	Dec 11, 2015	0	Dec 11, 2015	0	Dec 11, 2015	0	Dec 11, 2015	0
		Jan 06, 2016	0	Jan 06, 2016	0	Jan 06, 2016	0	Jan 06, 2016	0	Jan 06, 2016	0
		Feb 03, 2016	22	Feb 03, 2016	22	Feb 03, 2016	0	Feb 03, 2016	0	Feb 03, 2016	0
		Feb 17, 2016	21	Feb 17, 2016	21	Feb 17, 2016	0	Feb 17, 2016	0	Feb 17, 2016	0
		Mar 07, 2016	5	Mar 07, 2016	5	Mar 07, 2016	0	Mar 07, 2016	0	Mar 07, 2016	0
		Mar 09, 2016	5	Mar 09, 2016	5	Mar 09, 2016	0	Mar 09, 2016	0	Mar 09, 2016	0
		Mar 11, 2016	0	Mar 11, 2016	0	Mar 11, 2016	0	Mar 11, 2016	0	Mar 11, 2016	0
		Apr 06, 2016	7	Apr 06, 2016	7	Apr 06, 2016	0	Apr 06, 2016	0	Apr 06, 2016	0
		May 04, 2016	7	May 04, 2016	7	May 04, 2016	0	May 04, 2016	0	May 04, 2016	0
		Jun 06, 2016	0	Jun 06, 2016	0	Jun 06, 2016	0	Jun 06, 2016	0	Jun 06, 2016	0
		Jun 08, 2016	0	Jun 08, 2016	0	Jun 08, 2016	0	Jun 08, 2016	0	Jun 08, 2016	0
		Jun 10, 2016	0	Jun 10, 2016	0	Jun 10, 2016	0	Jun 10, 2016	0	Jun 10, 2016	0
		Jul 06, 2016	0	Jul 06, 2016	0	Jul 06, 2016	0	Jul 06, 2016	0	Jul 06, 2016	0
		Aug 03, 2016	0	Aug 03, 2016	0	Aug 03, 2016	0	Aug 03, 2016	0	Aug 03, 2016	0
		Sep 12, 2016	28	Sep 12, 2016	28	Sep 12, 2016	0	Sep 12, 2016	0	Sep 12, 2016	0
		Sep 14, 2016	0	Sep 14, 2016	0	Sep 14, 2016	0	Sep 14, 2016	0	Sep 14, 2016	0
		Sep 16, 2016	0	Sep 16, 2016	0	Sep 16, 2016	0	Sep 16, 2016	0	Sep 16, 2016	0
		Oct 05, 2016	0	Oct 05, 2016	0	Oct 05, 2016	0	Oct 05, 2016	0	Oct 05, 2016	0
		Nov 02, 2016	0	Nov 02, 2016	0	Nov 02, 2016	0	Nov 02, 2016	0	Nov 02, 2016	0
		Dec 05, 2016	0	Dec 05, 2016	0	Dec 05, 2016	0	Dec 05, 2016	0	Dec 05, 2016	0
		Dec 07, 2016	0	Dec 07, 2016	0	Dec 07, 2016	0	Dec 07, 2016	0	Dec 07, 2016	0
		Dec 09, 2016	0	Dec 09, 2016	0	Dec 09, 2016	0	Dec 09, 2016	0	Dec 09, 2016	0
		Jan 04, 2017	0	Jan 04, 2017	0	Jan 04, 2017	0	Jan 04, 2017	0	Jan 04, 2017	0
		Feb 01, 2017	0	Feb 01, 2017	0	Feb 01, 2017	0	Feb 01, 2017	0	Feb 01, 2017	0
		Mar 06, 2017	0	Mar 06, 2017	0	Mar 06, 2017	0	Mar 06, 2017	0	Mar 06, 2017	0
		Mar 08, 2017	0	Mar 08, 2017	0	Mar 08, 2017	0	Mar 08, 2017	0	Mar 08, 2017	0
		Mar 10, 2017	0	Mar 10, 2017	0	Mar 10, 2017	0	Mar 10, 2017	0	Mar 10, 2017	0
		Apr 05, 2017	12	Apr 05, 2017	12	Apr 05, 2017	0	Apr 05, 2017	0	Apr 05, 2017	0
		May 03, 2017	21	May 03, 2017	21	May 03, 2017	0	May 03, 2017	0	May 03, 2017	0
		Jun 05, 2017	0	Jun 05, 2017	0	Jun 05, 2017	0	Jun 05, 2017	0	Jun 05, 2017	0
		Jun 07, 2017	0	Jun 07, 2017	0	Jun 07, 2017	0	Jun 07, 2017	0	Jun 07,	

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Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<u>3,3'-Dichlorobenzidine</u>			<u>Fluoranthrene</u>			<u>Fluorene</u>			<u>Naphthalene</u>			<u>Nitrobenzene</u>			<u>Phenanthrene</u>		
DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML
Nov 07, 2012	0	5							Mar 04, 2013	0	2				Mar 04, 2013	0	2
Dec 03, 2012	0	5							Mar 03, 2014	0					Mar 03, 2014	0	2
Dec 05, 2012	0	5							Mar 02, 2015	0	10				Mar 02, 2015	0	10
Dec 07, 2012	0	5							Mar 07, 2016	0	10				Mar 07, 2016	0	10
Jan 02, 2013	0	5							Mar 06, 2017	0	10				Mar 06, 2017	0	10
Feb 06, 2013	0	5															
Mar 04, 2013	0	5															
Mar 06, 2013	0	5															
Mar 08, 2013	0	5															
Apr 03, 2013	0	5															
May 01, 2013	0	5															
Jun 03, 2013	0	5															
Jun 05, 2013	0	5															
Jun 07, 2013	0	5															
Jul 03, 2013	0	5															
Aug 07, 2013	0	5															
Sep 16, 2013	0	5															
Sep 18, 2013	0	5															
Sep 20, 2013	0	5															
Oct 02, 2013	0	5															
Nov 08, 2013	0	5															
Dec 02, 2013	0	5															
Dec 04, 2013	0	5															
Dec 06, 2013	0	5															
Jan 08, 2014	0	5															
Feb 05, 2014	0	5															
Mar 03, 2014	0	5															
Mar 05, 2014	0	5															
Mar 07, 2014	0	5															
Apr 09, 2014	0	5															
May 07, 2014	0	5															
Jun 02, 2014	0	5															
Jun 04, 2014	0	5															
Jun 06, 2014	0	5															
Jul 02, 2014	0	5															
Aug 06, 2014	0	5															
Sep 15, 2014	0	5															
Sep 17, 2014	0	5															
Sep 19, 2014	0	5															
Oct 01, 2014	0	5															
Nov 05, 2014	0	5															
Dec 01, 2014	0	5															
Dec 03, 2014	0	5															
Dec 05, 2014	0	5															
Jan 07, 2015	0	5															
Feb 04, 2015	0	5															
Mar 02, 2015	0	5															
Mar 04, 2015	0	5															
Mar 06, 2015	0	5															
Apr 01, 2015	0	5															
May 06, 2015	0	5															
Jun 01, 2015	0	5															
Jun 03, 2015	0	5															
Jun 05, 2015	0	5															
Jul 01, 2015	0	5															
Aug 05, 2015	0	5															
Sep 14, 2015	0	5															
Sep 16, 2015	0	5															
Sep 18, 2015	0	5															
Oct 07, 2015	0	5															
Nov 04, 2015	0	5															
Dec 07, 2015	0	5															
Dec 09, 2015	0	5															
Dec 11, 2015	0	5															
Jan 08, 2016	0	5															
Feb 03, 2016	0	5															
Feb 17, 2016	0	5															
Mar 07, 2016	0	5															
Mar 09, 2016	0	5															
Mar 11, 2016	0	5															
Apr 13, 2016	0	5															
May 04, 2016	0	5															
Jun 06, 2016	0	5															
Jun 08, 2016	0	5															
Jun 10, 2016	0	5															
Jul 06, 2016	0	5															
Aug 03, 2016	0	5															
Sep 12, 2016	0	5															
Sep 14, 2016	0	5															
Sep 16, 2016	0	5															
Oct 05, 2016	0	5															
Nov 02, 2016	0	5															
Dec 05, 2016	0	5															
Dec 07, 2016	0	5															
Dec 09, 2016	0	5															
Jan 04, 2017	0	5															
Feb 01, 2017	0	5															
Mar 01, 2017	0	5															
Apr 05, 2017	0	5															
May 03, 2017	0	5															
Jun 05, 2017	0	5															
Jul 05, 2017	0	5															
Aug 02, 2017	0	5															
Sep 06, 2017	0	5															
Oct 04, 2017	0	5															
Nov 01, 2017	0	5															
Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2	Jun 01, 2017	0	2
Jun 14, 2017	0	0.1	Jun 14, 2017	0	2	Jun 14, 2017	0	2	Jun 14, 2017	0	2	Jun 14, 2017	0.76		Jun 14, 2017	0	2
Jun 28, 2017	0	0.1	Jun 28, 2017	0	2	Jun 28, 2017	0	2	Jun 28, 2017	0	2	Jun 28, 2017	0	2	Jun 28, 2017	0	2

	<u>3,3'-Dichlorobenzidine</u>	<u>Fluoranthrene</u>	<u>Fluorene</u>	<u>Naphthalene</u>	<u>Nitrobenzene</u>	<u>Phenanthrene</u>
MEAN	0	0	0	0	0.25	0
SD	0	0	0	0	0.44	0
CV	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.73	#DIV/0!
CV (to 1 decimal place)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.7	#DIV/0!
MAX	0	0	0	0	0.76	0
MIN	0	0	0	0	0	0
N	99	3	3	3	3	8
S	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.17	#DIV/0!
Percentile	0.99	0.99	0.99	0.99	0.99	0.99
Pn	0.95	0.22	0.22	0.59	0.22	0.56
Multifactor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	37.7	#DIV/0!

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Pharmacia & Upjohn Company LLC Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<i>Pyrene</i>		<i>1,2,4-Trichlorobenzene</i>		<i>PCBs (as Aroclors)</i>		<i>PCBs (as Homologs)</i>		<i>PCBs (as Congeners)</i>			
DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML
			Nov 07, 2012	0	0.25	Nov 07, 2012	0	1			
			Dec 03, 2012	0	0.25	Dec 03, 2012	0	1			
			Dec 05, 2012	0	0.25	Dec 05, 2012	0	1			
			Dec 07, 2012	0	0.25	Dec 07, 2012	0	1			
			Jan 02, 2013	0	0.25	Jan 02, 2013	0	1			
			Feb 06, 2013	0	0.25	Feb 06, 2013	0	1			
			Mar 04, 2013	0	0.25	Mar 04, 2013	0	1			
			Mar 08, 2013	0	0.25	Mar 08, 2013	0	1			
			Mar 08, 2013	0	0.25	Mar 08, 2013	0	1			
			Apr 03, 2013	0	0.25	Apr 03, 2013	0	1			
			May 01, 2013	0	0.25	May 01, 2013	0	1			
			Jun 03, 2013	0	0.25	Jun 03, 2013	0	1			
			Jun 05, 2013	0	0.25	Jun 05, 2013	0	1			
			Jun 07, 2013	0	0.25	Jun 07, 2013	0	1			
			Jul 03, 2013	0	0.20-0.25	Jul 03, 2013	0	0.513			
			Aug 07, 2013	0	0.20-0.25	Aug 07, 2013	0	1			
			Sep 16, 2013	0	0.20-0.25	Sep 16, 2013	0	1			
			Sep 18, 2013	0	0.20-0.25	Sep 18, 2013	0	1			
			Sep 20, 2013	0	0.20-0.25	Sep 20, 2013	0	1			
			Oct 02, 2013	0	0.20-0.25	Oct 02, 2013	0	1			
			Nov 06, 2013	0	0.20-0.25	Nov 06, 2013	0	1			
			Dec 02, 2013	0	0.20-0.25	Dec 02, 2013	0	1			
			Dec 04, 2013	0	0.20-0.25	Dec 04, 2013	0	1			
			Dec 06, 2013	0	0.20-0.25	Dec 06, 2013	0	1			
			Jan 08, 2014	0	0.20-0.25	Jan 08, 2014	0	1			
			Feb 06, 2014	0	0.20-0.25	Feb 06, 2014	0	1			
			Mar 03, 2014	0	0.20-0.25	Mar 03, 2014	0	1			
			Mar 05, 2014	0	0.20-0.25	Mar 05, 2014	0	1			
			Mar 07, 2014	0	0.20-0.25	Mar 07, 2014	0	1			
			Apr 09, 2014	0	0.20-0.25	Apr 09, 2014	0	1			
			May 07, 2014	0	0.20-0.25	May 07, 2014	0	1			
			Jun 02, 2014	0	0.20-0.25	Jun 02, 2014	0	1			
			Jun 04, 2014	0	0.20-0.25	Jun 04, 2014	0	1			
			Jun 06, 2014	0	0.20-0.25	Jun 06, 2014	0	1			
			Jul 02, 2014	0	0.20-0.25	Jul 02, 2014	0	1			
			Aug 06, 2014	0	0.20-0.25	Aug 06, 2014	0	1			
			Sep 15, 2014	0	1	Sep 15, 2014	0	1			
			Sep 17, 2014	0	1	Sep 17, 2014	0	1			
			Sep 19, 2014	0	1	Sep 19, 2014	0	1			
			Oct 01, 2014	0	1	Oct 01, 2014	0	1			
			Nov 05, 2014	0	1	Nov 05, 2014	0	10			
			Dec 01, 2014	0	1	Dec 01, 2014	0	1			
			Dec 03, 2014	0	1	Dec 03, 2014	0	1			
			Dec 05, 2014	0	1	Dec 05, 2014	0	1			
			Jan 07, 2015	0	1	Jan 07, 2015	0	1			
			Feb 04, 2015	0	1	Feb 04, 2015	0	1			
			Mar 02, 2015	0	1	Mar 02, 2015	0	1			
			Mar 04, 2015	0	1	Mar 04, 2015	0	1			
			Mar 06, 2015	0	1	Mar 06, 2015	0	1			
			Apr 01, 2015	0	1	Apr 01, 2015	0	1			
			May 06, 2015	0	1	May 06, 2015	0	1			
			Jun 01, 2015	0	1	Jun 01, 2015	0	1			
			Jun 03, 2015	0	1	Jun 03, 2015	0	1			
			Jun 05, 2015	0	1	Jun 05, 2015	0	1			
			Jul 01, 2015	0	1	Jul 01, 2015	0	1			
			Aug 05, 2015	0	1	Aug 05, 2015	0	1			
			Sep 14, 2015	0	1	Sep 14, 2015	0	1			
			Sep 16, 2015	0	1	Sep 16, 2015	0	1			
			Sep 18, 2015	0	1	Sep 18, 2015	0	1			
			Oct 07, 2015	0	1	Oct 07, 2015	0	1			
			Nov 04, 2015	0	1	Nov 04, 2015	0	1			
			Dec 07, 2015	0	1	Dec 07, 2015	0	1			
			Dec 09, 2015	0	1	Dec 09, 2015	0	1			
			Dec 11, 2015	0	1	Dec 11, 2015	0	1			
			Jan 06, 2016	0	1	Jan 06, 2016	0	1			
			Feb 03, 2016	0	1	Feb 03, 2016	0	1			
			Mar 07, 2016	0	1	Mar 07, 2016	0	1			
			Mar 09, 2016	0	1	Mar 09, 2016	0	1			
			Mar 11, 2016	0	1	Mar 11, 2016	0	1			
			Apr 06, 2016	0	1	Apr 06, 2016	0	1			
			May 04, 2016	0	1	May 04, 2016	0	1			
			Jun 06, 2016	0	1	Jun 06, 2016	0	1			
			Jun 08, 2016	0	1	Jun 08, 2016	0	1			
			Jun 10, 2016	0	1	Jun 10, 2016	0	1			
			Jul 06, 2016	0	1	Jul 06, 2016	0	1			
			Aug 03, 2016	0	1	Aug 03, 2016	0	1			
			Sep 12, 2016	0	1	Sep 12, 2016	0	1			
			Sep 14, 2016	0	1	Sep 14, 2016	0	1			
			Sep 16, 2016	0	1	Sep 16, 2016	0	1			
			Oct 05, 2016	0	1	Oct 05, 2016	0	1			
			Nov 02, 2016	0	1	Nov 02, 2016	0	1			
			Dec 05, 2016	0	1	Dec 05, 2016	0	1			
			Dec 07, 2016	0	1	Dec 07, 2016	0	1			
			Dec 09, 2016	0	1	Dec 09, 2016	0	1			
			Jan 04, 2017	0	1	Jan 04, 2017	0	50			
			Feb 01, 2017	0	1	Feb 01, 2017	0	50			
			Mar 06, 2017	0	1	Mar 06, 2017	0	50			
			Mar 08, 2017	0	1	Mar 08, 2017	0	50			
			Mar 10, 2017	0	1	Mar 10, 2017	0	50			
			Apr 05, 2017	0	1	Apr 05, 2017	0	50			
			May 03, 2017	0	1	May 03, 2017	0	10			
			Jun 05, 2017	0	1	Jun 05, 2017	0	10			
			Jun 07, 2017	0	1	Jun 07, 2017	0	10			
			Jun 09, 2017	0	1	Jun 09, 2017	0	10			
			Jul 05, 2017	0	1	Jul 05, 2017	0	10			
			Aug 02, 2017	0	1	Aug 02, 2017	0	10			
			Sep 11, 2017	0	1	Sep 11, 2017	0	10			
			Sep 13, 2017	0	1	Sep 13, 2017	0	10			
			Sep 15, 2017	0	1	Sep 15, 2017	0	10			
			Oct 04, 2017	0	1	Oct 04, 2017	0	10			
			Nov 01, 2017	0	1	Nov 01, 2017	0	10			
			Jun 01, 2017	0	2	Jun 01, 2017	0	0.039	3.8E-05		
			Jun 14, 2017	0	2	Jun 14, 2017	0	0.047	0.0181	3.8E-05	
			Jun 28, 2017	0	2	Jun 28, 2017	0	0.047	0.0397	3.8E-05	

	<i>Pyrene</i>	<i>1,2,4-Trichlorobenzene</i>	<i>PCBs (as Aroclors)</i>	<i>PCBs (as Homologs)</i>	<i>PCBs (as Congeners)</i>
MEAN	0	0	0	0	0
SD	0	0	0	0	0
CV	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.91
CV (to 1 decimal place)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.9
MAX	0	0	0	0	0.0397
MIN	0	0	0	0	0
N	3	3	164	161	3
S	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.77
Percentile	0.99	0.99	0.99	0.99	0.99
Pn	0.22	0.22	0.96	0.96	0.22
Multiplier	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	11.0

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Pharmacia & Upjohn Company LLC Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

cls-1,2-Dichloroethane			Chloride			s-Cresol			m,p-Cresol			Dichloran			Dibhenamid		
DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML	DATE	ug/L	ML
Nov 07, 2012	0	1	Mar 04, 2013	0	5	Mar 04, 2013	0	5	Nov 07, 2012	0	5	Nov 07, 2012	0	5			
Dec 03, 2012	0	1	Mar 03, 2014	0		Mar 03, 2014	0		Dec 03, 2012	0	5	Dec 03, 2012	0	5			
Dec 05, 2012	0	1							Dec 05, 2012	0	5	Dec 05, 2012	0	5			
Dec 07, 2012	0	1	Mar 07, 2016	0		Mar 07, 2016	0		Dec 07, 2012	0	5	Dec 07, 2012	0	5			
Jan 02, 2013	0	1	Mar 06, 2017	0	10	Mar 06, 2017	0	10	Jan 02, 2013	0	5	Jan 02, 2013	0	5			
Feb 09, 2013	0	1							Feb 09, 2013	0	5	Feb 09, 2013	0	5			
Mar 04, 2013	0	1							Mar 04, 2013	0	5	Mar 04, 2013	0	5			
Mar 05, 2013	0	1							Mar 05, 2013	0	5	Mar 05, 2013	0	5			
Mar 08, 2013	0	1							Mar 08, 2013	0	5	Mar 08, 2013	0	5			
Apr 03, 2013	0	1							Apr 03, 2013	0	5	Apr 03, 2013	0	5			
May 01, 2013	0	1							May 01, 2013	0	5	May 01, 2013	0	5			
Jun 03, 2013	0	1							Jun 03, 2013	0	5	Jun 03, 2013	0	5			
Jun 05, 2013	0	1							Jun 05, 2013	0	5	Jun 05, 2013	0	5			
Jun 07, 2013	0	1							Jun 07, 2013	0	5	Jun 07, 2013	0	5			
Jul 03, 2013	0	1							Jul 03, 2013	0	5	Jul 03, 2013	0	5			
Aug 07, 2013	0	1							Aug 07, 2013	0	5	Aug 07, 2013	0	5			
Sep 16, 2013	0	1							Sep 16, 2013	0	5	Sep 16, 2013	0	5			
Sep 18, 2013	0	1							Sep 18, 2013	0	5	Sep 18, 2013	0	5			
Sep 20, 2013	0	1							Sep 20, 2013	0	5	Sep 20, 2013	0	5			
Oct 02, 2013	0	1							Oct 02, 2013	0	5	Oct 02, 2013	0	5			
Nov 08, 2013	0	1							Nov 08, 2013	0	5	Nov 08, 2013	0	5			
Dec 02, 2013	0	1							Dec 02, 2013	0	5	Dec 02, 2013	0	5			
Dec 04, 2013	0	1							Dec 04, 2013	0	5	Dec 04, 2013	0	5			
Dec 06, 2013	0	1							Dec 06, 2013	0	5	Dec 06, 2013	0	5			
Jan 08, 2014	0	1							Jan 08, 2014	0	5	Jan 08, 2014	0	5			
Feb 06, 2014	0	1							Feb 06, 2014	0	5	Feb 06, 2014	0	5			
Mar 03, 2014	0	1							Mar 03, 2014	0	5	Mar 03, 2014	0	5			
Mar 05, 2014	0	1							Mar 05, 2014	0	5	Mar 05, 2014	0	5			
Mar 07, 2014	0	1							Mar 07, 2014	0	5	Mar 07, 2014	0	5			
Apr 09, 2014	0	1							Apr 09, 2014	0	5	Apr 09, 2014	0	5			
May 07, 2014	0	1							May 07, 2014	0	5	May 07, 2014	0	5			
Jun 02, 2014	0	1							Jun 02, 2014	0	5	Jun 02, 2014	0	5			
Jun 04, 2014	0	1							Jun 04, 2014	0	5	Jun 04, 2014	0	5			
Jun 06, 2014	0	1							Jun 06, 2014	0	5	Jun 06, 2014	0	5			
Jul 02, 2014	0	1							Jul 02, 2014	0	5	Jul 02, 2014	0	5			
Aug 06, 2014	0	1							Aug 06, 2014	0	5	Aug 06, 2014	0	5			
Sep 15, 2014	0	1							Sep 15, 2014	0	5	Sep 15, 2014	0	5			
Sep 17, 2014	0	1							Sep 17, 2014	0	5	Sep 17, 2014	0	5			
Sep 18, 2014	0	1							Sep 18, 2014	0	5	Sep 18, 2014	0	5			
Oct 01, 2014	0	1							Oct 01, 2014	0	5	Oct 01, 2014	0	5			
Nov 05, 2014	0	1							Nov 05, 2014	0	5	Nov 05, 2014	0	5			
Dec 01, 2014	0	1							Dec 01, 2014	5		Dec 01, 2014	5				
Dec 03, 2014	0	1							Dec 03, 2014	0	5	Dec 03, 2014	0	5			
Dec 05, 2014	0	1							Dec 05, 2014	0	5	Dec 05, 2014	0	5			
Jan 07, 2015	0	1							Jan 07, 2015	5		Jan 07, 2015	5				
Feb 04, 2015	0	1							Feb 04, 2015	10		Feb 04, 2015	10				
Mar 02, 2015	0	1							Mar 02, 2015	0	5	Mar 02, 2015	0	5			
Mar 04, 2015	0	1							Mar 04, 2015	5		Mar 04, 2015	5				
Mar 05, 2015	0	1							Mar 05, 2015	5		Mar 05, 2015	5				
Apr 01, 2015	0	1							Apr 01, 2015	5		Apr 01, 2015	5				
May 06, 2015	0	1							May 06, 2015	5		May 06, 2015	5				
Jun 01, 2015	0	1							Jun 01, 2015	0	5	Jun 01, 2015	0	5			
Jun 03, 2015	0	1							Jun 03, 2015	0	5	Jun 03, 2015	0	5			
Jun 05, 2015	0	1							Jun 05, 2015	5		Jun 05, 2015	5				
Jul 08, 2015	0	1							Jul 08, 2015	0	5	Jul 08, 2015	0	5			
Aug 05, 2015	0	1							Aug 05, 2015	7		Aug 05, 2015	7				
Sep 14, 2015	0	1							Sep 14, 2015	0	5	Sep 14, 2015	0	5			
Sep 16, 2015	0	1							Sep 16, 2015	0	5	Sep 16, 2015	0	5			
Sep 18, 2015	0	1							Sep 18, 2015	7		Sep 18, 2015	7				
Oct 07, 2015	0	1							Oct 07, 2015	0	5	Oct 07, 2015	0	5			
Nov 04, 2015	0	1							Nov 04, 2015	0	5	Nov 04, 2015	0	5			
Dec 07, 2015	0	1							Dec 07, 2015	0	5	Dec 07, 2015	0	5			
Dec 09, 2015	0	1							Dec 09, 2015	0	5	Dec 09, 2015	0	5			
Dec 11, 2015	0	1							Dec 11, 2015	0	5	Dec 11, 2015	0	5			
Jan 06, 2016	0	1							Jan 06, 2016	0	5	Jan 06, 2016	0	5			
Feb 03, 2016	1								Feb 03, 2016	0	5	Feb 03, 2016	0	5			
Feb 17, 2016	0	1							Feb 17, 2016	0	5	Feb 17, 2016	0	5			
Mar 07, 2016	0	1							Mar 07, 2016	0	5	Mar 07, 2016	0	5			
Mar 09, 2016	0	1							Mar 09, 2016	0	5	Mar 09, 2016	0	5			
Mar 11, 2016	0	1							Mar 11, 2016	5		Mar 11, 2016	5				
Apr 08, 2016	0	1							Apr 08, 2016	0	5	Apr 08, 2016	0	5			
May 04, 2016	0	1							May 04, 2016	0	5	May 04, 2016	0	5			
Jun 06, 2016	0	1							Jun 06, 2016	0	5	Jun 06, 2016	0	5			
Jun 08, 2016	0	1							Jun 08, 2016	0	5	Jun 08, 2016	0	5			
Jun 10, 2016	0	1							Jun 10, 2016	0	5	Jun 10, 2016	0	5			
Jul 06, 2016	0	1							Jul 06, 2016	0	5	Jul 06, 2016	0	5			
Aug 03, 2016	0	1							Aug 03, 2016	0	5	Aug 03, 2016	0	5			
Sep 12, 2016	0	1							Sep 12, 2016	0	5	Sep 12, 2016	0	5			
Sep 14, 2016	0	1							Sep 14, 2016	0	5	Sep 14, 2016	0	5			
Sep 16, 2016	0	1							Sep 16, 2016	0	5	Sep 16, 2016	0	5			
Oct 05, 2016	0	1							Oct 05, 2016	0	5	Oct 05, 2016	0	5			
Nov 02, 2016	0	1							Nov 02, 2016	0	5	Nov 02, 2016	0	5			
Dec 05, 2016	0	1							Dec 05, 2016	0	5	Dec 05, 2016	0	5			
Dec 07, 2016	0	1							Dec 07, 2016	0	5	Dec 07, 2016	0	5			
Dec 09, 2016	0	1							Dec 09, 2016	0	5	Dec 09, 2016	0	5			
Jan 04, 2017	0	1							Jan 04, 2017	0	5	Jan 04, 2017	0	5			
Feb 01, 2017	0	1							Feb 01, 2017	0	5	Feb 01, 2017	0	5			
Mar 06, 2017	0	1							Mar 06, 2017	0	5	Mar 06, 2017	0	5			
Mar 08, 2017	0	1							Mar 08, 2017	0	5	Mar 08, 2017	0	5			
Mar 10, 2017	0	1							Mar 10, 2017	0	5	Mar 10, 2017	0	5			
Apr 05, 2017	0	1							Apr 05, 2017	0	5	Apr 05, 2017	0	5			
May 03, 2017	2								May 03, 2017	0	5	May 03, 2017	0	5			
Jun 05, 2017	0	1							Jun 05, 2017	0	5	Jun 05, 2017	0	5			
Jun 07, 2017	0	1							Jun 07, 2017	0	5	Jun 07, 2017	0	5			
Jun 09, 2017	0	1							Jun 09, 2017	0	5	Jun 09, 2017	0	5			
Jul 05, 2017	0	1							Jul 05, 2017	0	5	Jul 05, 2017	0	5			
Aug 02, 2017	0	1							Aug 02, 2017	0	5	Aug 02, 2017	0	5			
Sep 11, 2017																	

ATTACHMENT 7

Pharmacia & Upjohn Company LLC

Reasonable Potential Evaluation: Data Summary

DSN 001-1 Data: 1) Nov 2012 to Nov 2017 DMR Data; 2) Sufficiently Sensitive Attachment O data (June 2017)

<i>Xylenes (Total)</i>		
DATE	ug/L	NR
Nov 07, 2012	0	2
Dec 03, 2012	0	2
Dec 05, 2012	0	2
Dec 07, 2012	0	2
Jan 02, 2013	0	2
Feb 06, 2013	0	2
Mar 04, 2013	0	2
Mar 06, 2013	0	2
Mar 08, 2013	0	2
Apr 03, 2013	0	2
May 01, 2013	0	2
Jun 03, 2013	0	2
Jun 05, 2013	0	2
Jun 07, 2013	0	2
Jul 03, 2013	0	2
Aug 07, 2013	0	2
Sep 16, 2013	0	2
Sep 18, 2013	0	2
Sep 20, 2013	0	2
Oct 02, 2013	0	2
Nov 06, 2013	0	2
Dec 02, 2013	0	2
Dec 04, 2013	0	2
Dec 06, 2013	0	2
Jan 08, 2014	0	2
Feb 06, 2014	0	2
Mar 03, 2014	0	1
Mar 05, 2014	0	1
Mar 07, 2014	0	1
Apr 09, 2014	0	1
May 07, 2014	0	1
Jun 02, 2014	0	1
Jun 04, 2014	0	1
Jun 06, 2014	0	1
Jul 02, 2014	0	1
Aug 06, 2014	0	1
Sep 15, 2014	0	1
Sep 17, 2014	0	1
Sep 19, 2014	0	1
Oct 01, 2014	0	1
Nov 05, 2014	0	1
Dec 01, 2014	0	1
Dec 03, 2014	0	1
Dec 05, 2014	0	1
Jan 07, 2015	0	1
Feb 04, 2015	0	1
Mar 02, 2015	0	1000
Mar 04, 2015	0	1000
Mar 06, 2015	0	1000
Apr 01, 2015	0	1000
Apr 06, 2015	0	1000
Jun 01, 2015	0	1000
Jun 03, 2015	0	1000
Jun 05, 2015	0	1000
Jul 08, 2015	0	1000
Aug 05, 2015	0	1000
Sep 14, 2015	0	1000
Sep 15, 2015	0	1000
Sep 18, 2015	0	1000
Oct 07, 2015	0	1000
Nov 04, 2015	0	1000
Dec 07, 2015	0	1000
Dec 08, 2015	0	1000
Dec 11, 2015	0	1000
Jan 06, 2016	0	1000
Feb 03, 2016	0	1000
Feb 17, 2016	0	1000
Mar 07, 2016	0	1000
Mar 09, 2016	0	1000
Mar 11, 2016	0	1000
Apr 05, 2016	0	1000
May 04, 2016	0	1000
Jun 06, 2016	0	1000
Jun 08, 2016	0	1000
Jun 10, 2016	0	1000
Jul 06, 2016	0	1000
Aug 03, 2016	0	1000
Sep 12, 2016	0	1000
Sep 14, 2016	0	1000
Sep 16, 2016	0	1000
Oct 05, 2016	0	1000
Nov 02, 2016	0	1000
Dec 05, 2016	0	1000
Dec 07, 2016	0	1000
Dec 09, 2016	0	1000
Jan 04, 2017	0	1000
Feb 01, 2017	0	1
Mar 06, 2017	0	1000
Mar 08, 2017	0	1000
Mar 10, 2017	0	1000
Apr 05, 2017	0	1
May 03, 2017	0	1
Jun 05, 2017	0	1000
Jun 07, 2017	0	1000
Jun 09, 2017	0	1000
Jul 05, 2017	0	1000
Aug 02, 2017	0	1
Sep 11, 2017	0	1
Sep 13, 2017	0	1
Sep 15, 2017	0	1
Oct 04, 2017	0	1
Nov 01, 2017	0	1
Jun 01, 2017	0	0.5
Jun 14, 2017	0	0.5
Jun 26, 2017	0	0.5

<i>Xylenes (Total)</i>		
MEAN	0	
SD	0	
CV	#DIV/0!	
CV (to 1 decimal place)	#DIV/0!	
MAX	0	
MIN	0	
N	105	
S	#DIV/0!	
Percentile	0.99	
Pn	0.96	
Multiplier	#DIV/0!	

ATTACHMENT 7

WATER QUALITY BASED CRITERIA FOR POLLUTANTS WITH NO NUMERIC WATER QUALITY CRITERION IN THE WATER QUALITY STANDARDS, OCTOBER 2013

The regulations at 40 CFR 122.44(d)(1)(i) state that limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. Section 40 CFR 122.44 further states:

(vi) Where a State has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits using one or more of the following options:

- (A) Establish effluent limits using a calculated numeric water quality criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and will fully protect the designated use. Such a criterion may be derived using a proposed State criterion, or an explicit State policy or regulation interpreting its narrative water quality criterion, supplemented with other relevant information which may include: EPA's *Water Quality Standards Handbook*, October 1983, risk assessment data, exposure data, information about the pollutant from the Food and Drug Administration, and current EPA criteria documents; or
- (B) Establish effluent limits on a case-by-case basis, using EPA's water quality criteria, published under section 304(a) of the CWA, supplemented where necessary by other relevant information; or
- (C) Establish effluent limitations on an indicator parameter for the pollutant of concern

Sections 2.3 and 2.4 of the *Technical Support Document for Water Quality Based Toxic Control*, 1991, (TSD) provide guidance as to how numeric criteria should be derived if no State criteria exists, including a recommendation that *Guidelines for Deriving Criterion for Aquatic Life and Human Health* [45 FR 79341, November 28, 1990, and 50 FR 30784, July 29, 1985] be consulted. Based on the information in 40 CFR 122.44 and the information in the TSD, the following procedures were used to develop the criteria necessary to satisfy 40 CFR 122.44(d)(1)(vi):

AQUATIC LIFE CRITERIA: First, the most current version of the *National Recommended Water Quality Criteria* was consulted to determine if national criteria exists. If no national criteria was found, then criteria was developed in accordance with *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, 1985. If the required number of studies could not be obtained, then criteria was developed in accordance with the procedures in 40 CFR 131, Appendix B.

HUMAN HEALTH CRITERIA: First, the most current version of the *National Recommended Water Quality Criteria* was consulted to determine if national criteria was found. If no national criteria was found, then criteria was developed in accordance with EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health*, 2000. As set forth in the TSD, IRIS should be consulted for risk-based values. If no IRIS data existed for a chemical, then the following hierarchy was used: HEAST (Health Effects Assessment Summary Tables), PPRTV (Provisional Peer-Reviewed Toxicity Values), and ATSDR (Agency for Toxic Substance and Disease Registry). Other assumptions used to determine the human health criteria are: Body Weight: 80 kg; Fish Consumption Rate: 0.020 kg/day (i.e., the rate used for the last update to the water quality standards); Bioaccumulation Factor: Current value in EPISUITE 4.1.

1-CHLORO-2-NITROBENZENE (CAS 88-73-3) [SYNONYM: O-CHLORONITROBENZENE]

<p>AQUATIC LIFE (FRESHWATER)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">ACUTE (µg/L)</td> <td style="text-align: center;">CHRONIC (µg/L)</td> </tr> <tr> <td style="text-align: center;">ND</td> <td style="text-align: center;">ND</td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book</p>	ACUTE (µg/L)	CHRONIC (µg/L)	ND	ND	<p>AQUATIC LIFE (SALTWATER)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">ACUTE (µg/L)</td> <td style="text-align: center;">CHRONIC (µg/L)</td> </tr> <tr> <td style="text-align: center;">ND</td> <td style="text-align: center;">ND</td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book</p>	ACUTE (µg/L)	CHRONIC (µg/L)	ND	ND
ACUTE (µg/L)	CHRONIC (µg/L)								
ND	ND								
ACUTE (µg/L)	CHRONIC (µg/L)								
ND	ND								

<p>HUMAN HEALTH (NONCARCINOGEN)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">/(mg/kg-day)</td> <td style="width: 30%; text-align: right;">SOURCE(S)</td> </tr> <tr> <td>Reference Dose (RfD)</td> <td>=</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Relative Source Contribution (RSC)</td> <td>=</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Body Weight (BW)</td> <td>=</td> <td>kg</td> <td></td> <td></td> </tr> <tr> <td>Fish Intake (FI)</td> <td>=</td> <td>kg/day</td> <td></td> <td></td> </tr> <tr> <td>Bioaccumulation Factor (BAF)</td> <td>=</td> <td>L/kg</td> <td></td> <td></td> </tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 30%; border: 1px solid black;">Reference Ambient Concentration</td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%; border: 1px solid black;">mg/L</td> <td style="width: 5%;"></td> <td style="width: 45%;"></td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="text-align: center;">=</td> <td style="border: 1px solid black;">µg/L</td> <td style="text-align: center;">(Organism)</td> <td></td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST</p>		=		/(mg/kg-day)	SOURCE(S)	Reference Dose (RfD)	=				Relative Source Contribution (RSC)	=				Body Weight (BW)	=	kg			Fish Intake (FI)	=	kg/day			Bioaccumulation Factor (BAF)	=	L/kg			Reference Ambient Concentration	=	mg/L				=	µg/L	(Organism)		<p>HUMAN HEALTH (CARCINOGEN)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">/(mg/kg-day)</td> <td style="width: 30%; text-align: right;">SOURCE(S)</td> </tr> <tr> <td>Oral Slope Factor</td> <td>=</td> <td>0.025</td> <td></td> <td>HEAST, 1997</td> </tr> <tr> <td>Risk Exposure Level</td> <td>=</td> <td>0.000001</td> <td></td> <td></td> </tr> <tr> <td>Risk Specified Dose (RSD)</td> <td>=</td> <td>0.000040</td> <td>mg/kg-day</td> <td></td> </tr> <tr> <td>Body Weight (BW)</td> <td>=</td> <td>80</td> <td>kg</td> <td></td> </tr> <tr> <td>Fish Intake (FI)</td> <td>=</td> <td>0.0200</td> <td>kg/day</td> <td></td> </tr> <tr> <td>Bioaccumulation Factor (BAF)</td> <td>=</td> <td>15.64</td> <td>L/kg</td> <td>Amot & Gobas, 2003 [upper trophic]</td> </tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 30%; border: 1px solid black;">Reference Ambient Concentration</td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%; border: 1px solid black;">0.0102 mg/L</td> <td style="width: 5%;"></td> <td style="width: 45%;"></td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="text-align: center;">=</td> <td style="border: 1px solid black;">10.2 µg/L</td> <td style="text-align: center;">(Organism)</td> <td></td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS</p>		=		/(mg/kg-day)	SOURCE(S)	Oral Slope Factor	=	0.025		HEAST, 1997	Risk Exposure Level	=	0.000001			Risk Specified Dose (RSD)	=	0.000040	mg/kg-day		Body Weight (BW)	=	80	kg		Fish Intake (FI)	=	0.0200	kg/day		Bioaccumulation Factor (BAF)	=	15.64	L/kg	Amot & Gobas, 2003 [upper trophic]	Reference Ambient Concentration	=	0.0102 mg/L				=	10.2 µg/L	(Organism)	
	=		/(mg/kg-day)	SOURCE(S)																																																																																		
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1,4-DIOXANE (CAS 123-91-1)

<p>AQUATIC LIFE (FRESHWATER)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">ACUTE (µg/L)</td> <td style="text-align: center;">CHRONIC (µg/L)</td> </tr> <tr> <td style="text-align: center;">ND</td> <td style="text-align: center;">ND</td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book</p>	ACUTE (µg/L)	CHRONIC (µg/L)	ND	ND	<p>AQUATIC LIFE (SALTWATER)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">ACUTE (µg/L)</td> <td style="text-align: center;">CHRONIC (µg/L)</td> </tr> <tr> <td style="text-align: center;">ND</td> <td style="text-align: center;">ND</td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book</p>	ACUTE (µg/L)	CHRONIC (µg/L)	ND	ND
ACUTE (µg/L)	CHRONIC (µg/L)								
ND	ND								
ACUTE (µg/L)	CHRONIC (µg/L)								
ND	ND								

<p>HUMAN HEALTH (NONCARCINOGEN)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">/(mg/kg-day)</td> <td style="width: 30%; text-align: right;">SOURCE(S)</td> </tr> <tr> <td>Reference Dose (RfD)</td> <td>=</td> <td>0.03</td> <td></td> <td>IRIS, 2010</td> </tr> <tr> <td>Relative Source Contribution (RSC)</td> <td>=</td> <td>0.2</td> <td></td> <td></td> </tr> <tr> <td>Body Weight (BW)</td> <td>=</td> <td>80</td> <td>kg</td> <td></td> </tr> <tr> <td>Fish Intake (FI)</td> <td>=</td> <td>0.0200</td> <td>kg/day</td> <td></td> </tr> <tr> <td>Bioaccumulation Factor (BAF)</td> <td>=</td> <td>0.925</td> <td>L/kg</td> <td>Amot & Gobas, 2003 [upper trophic]</td> </tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 30%; border: 1px solid black;">Reference Ambient Concentration</td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%; border: 1px solid black;">25.9 mg/L</td> <td style="width: 5%;"></td> <td style="width: 45%;"></td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="text-align: center;">=</td> <td style="border: 1px solid black;">25946 µg/L</td> <td style="text-align: center;">(Organism)</td> <td></td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Human Health</p>		=		/(mg/kg-day)	SOURCE(S)	Reference Dose (RfD)	=	0.03		IRIS, 2010	Relative Source Contribution (RSC)	=	0.2			Body Weight (BW)	=	80	kg		Fish Intake (FI)	=	0.0200	kg/day		Bioaccumulation Factor (BAF)	=	0.925	L/kg	Amot & Gobas, 2003 [upper trophic]	Reference Ambient Concentration	=	25.9 mg/L				=	25946 µg/L	(Organism)		<p>HUMAN HEALTH (CARCINOGEN)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">/(mg/kg-day)</td> <td style="width: 30%; text-align: right;">SOURCE(S)</td> </tr> <tr> <td>Oral Slope Factor</td> <td>=</td> <td>0.1</td> <td></td> <td>IRIS, 2013</td> </tr> <tr> <td>Risk Exposure Level</td> <td>=</td> <td>0.000001</td> <td></td> <td></td> </tr> <tr> <td>Risk Specified Dose (RSD)</td> <td>=</td> <td>0.000010</td> <td>mg/kg-day</td> <td></td> </tr> <tr> <td>Body Weight (BW)</td> <td>=</td> <td>80</td> <td>kg</td> <td></td> </tr> <tr> <td>Fish Intake (FI)</td> <td>=</td> <td>0.0200</td> <td>kg/day</td> <td></td> </tr> <tr> <td>Bioaccumulation Factor (BAF)</td> <td>=</td> <td>0.9248</td> <td>L/kg</td> <td>Amot & Gobas, 2003 [upper trophic]</td> </tr> </table> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 30%; border: 1px solid black;">Reference Ambient Concentration</td> <td style="width: 10%; text-align: center;">=</td> <td style="width: 10%; border: 1px solid black;">0.0433 mg/L</td> <td style="width: 5%;"></td> <td style="width: 45%;"></td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="text-align: center;">=</td> <td style="border: 1px solid black;">43.3 µg/L</td> <td style="text-align: center;">(Organism)</td> <td></td> </tr> </table> <p>NOTE: No National Recommended Water Quality Criteria - Human Health</p>		=		/(mg/kg-day)	SOURCE(S)	Oral Slope Factor	=	0.1		IRIS, 2013	Risk Exposure Level	=	0.000001			Risk Specified Dose (RSD)	=	0.000010	mg/kg-day		Body Weight (BW)	=	80	kg		Fish Intake (FI)	=	0.0200	kg/day		Bioaccumulation Factor (BAF)	=	0.9248	L/kg	Amot & Gobas, 2003 [upper trophic]	Reference Ambient Concentration	=	0.0433 mg/L				=	43.3 µg/L	(Organism)	
	=		/(mg/kg-day)	SOURCE(S)																																																																																		
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ATTACHMENT 8

2-CHLOROANILINE (CAS 95-51-2)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
64.3	3.24

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book
See attached for aquatic life criteria calculations

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	=(	/(mg/kg-day)	SOURCE(S)
Reference Dose (RfD)	=		
Relative Source Contribution (RSC)	=		
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

HUMAN HEALTH (CARCINOGEN)

	=(	/(mg/kg-day)	SOURCE(S)
Oral Slope Factor	=		
Risk Exposure Level	=		
Risk Specified Dose (RSD)	=	mg/kg-day	
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

3-CHLOROANILINE (CAS 108-42-9)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
8.0	0.87

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book
See attached for aquatic life criteria calculations

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	=(	/(mg/kg-day)	SOURCE(S)
Reference Dose (RfD)	=		
Relative Source Contribution (RSC)	=		
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

HUMAN HEALTH (CARCINOGEN)

	=(	/(mg/kg-day)	SOURCE(S)
Oral Slope Factor	=		
Risk Exposure Level	=		
Risk Specified Dose (RSD)	=	mg/kg-day	
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

4-CHLOROANILINE (CAS 106-47-8)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	=(	0.004	/(mg/kg-day)	SOURCE
Reference Dose (RfD)	=			RIS, 1988
Relative Source Contribution (RSC)	=	0.2		
Body Weight (BW)	=	80	kg	
Fish Intake (FI)	=	0.0200	kg/day	
Bioaccumulation Factor (BAF)	=	7.061	L/kg	

Reference Ambient Concentration	=	0.453	mg/L	
	=	453	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health

HUMAN HEALTH (CARCINOGEN)

	=(	0.2	/(mg/kg-day)	SOURCE
Oral Slope Factor	=			PPRTV
Risk Exposure Level	=	0.000001		
Risk Specified Dose (RSD)	=	0.0000050	mg/kg-day	
Body Weight (BW)	=	80	kg	
Fish Intake (FI)	=	0.0200	kg/day	
Bioaccumulation Factor (BAF)	=	7.061	L/kg	Arnold & Gobas, 2003 (upper trophic)

Reference Ambient Concentration	=	0.00283	mg/L	
	=	2.83	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST

ATTACHMENT 8

AZOBIENZENE (CAS 103-33-3)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	==	/(mg/kg-day)	SOURCE(S)
Reference Dose (RfD)			
Relative Source Contribution (RSC)			
Body Weight (BW)		kg	
Fish Intake (FI)		kg/day	
Bioaccumulation Factor (BAF)		L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST

HUMAN HEALTH (CARCINOGEN)

CLASS: B2

	==	/(mg/kg-day)	SOURCE(S)
Oral Slope Factor		0.11	IRIS, 2010
Risk Exposure Level		0.000001	
Risk Specified Dose (RSD)		0.000009 mg/kg-day	
Body Weight (BW)		80 kg	
Fish Intake (FI)		0.0200 kg/day	
Bioaccumulation Factor (BAF)		183.9 L/kg	Amot & Gobas, 2003 (upper trophic)

Reference Ambient Concentration	=	0.0002 mg/L	
	=	0.20 µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health

CIS-1,2-DICHLOROETHENE (CAS 156-59-2) [SYNONYM: CIS-1,2-DICHLOROETHYLENE]

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	==	/(mg/kg-day)	SOURCE(S)
Reference Dose (RfD)		0.002	IRIS, 2010
Relative Source Contribution (RSC)		0.2	
Body Weight (BW)		80 kg	
Fish Intake (FI)		0.0200 kg/day	
Bioaccumulation Factor (BAF)		10.71 L/kg	Amot & Gobas, 2003 (upper trophic)

Reference Ambient Concentration	=	0.149 mg/L	
	=	149 µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health

HUMAN HEALTH (CARCINOGEN)

	==	/(mg/kg-day)	SOURCE(S)
Oral Slope Factor			
Risk Exposure Level			
Risk Specified Dose (RSD)		mg/kg-day	
Body Weight (BW)		kg	
Fish Intake (FI)		kg/day	
Bioaccumulation Factor (BAF)		L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health
IRIS, 2010 states there is "inadequate information to assess the carcinogenic potential"

DICHLORAN (CAS 99-30-9) [SYNONYM: 2,6-DICHLORO-4-NITROBENENAMINE]

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
56.3	3.38

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

See attached for aquatic life criteria calculations

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	==	/(mg/kg-day)	SOURCE(S)
Reference Dose (RfD)			
Relative Source Contribution (RSC)			
Body Weight (BW)		kg	
Fish Intake (FI)		kg/day	
Bioaccumulation Factor (BAF)		L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

HUMAN HEALTH (CARCINOGEN)

	==	/(mg/kg-day)	SOURCE(S)
Oral Slope Factor			
Risk Exposure Level			
Risk Specified Dose (RSD)		mg/kg-day	
Body Weight (BW)		kg	
Fish Intake (FI)		kg/day	
Bioaccumulation Factor (BAF)		L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

ATTACHMENT 8

FORMALDEHYDE (CAS 50-00-0)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
846	94

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book
See attached for aquatic life criteria calculations

HUMAN HEALTH (NONCARCINOGEN)

	REFERENCE DOSE	RELATIVE SOURCE CONTRIBUTION	BODY WEIGHT	FISH INTAKE	BIOACCUMULATION FACTOR	SOURCE(S)
Reference Dose (RID)	=	0.2	80	0.0200	1.056	IRIS, 1990
Relative Source Contribution (RSC)	=	0.2				
Body Weight (BW)	=		80			
Fish Intake (FI)	=			0.0200		
Bioaccumulation Factor (BAF)	=				1.056	Arnott & Gobas, 2003 (upper trophic)

Reference Ambient Concentration	=	151.5	mg/L
	=	151,515	µg/L (Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (CARCINOGEN)

	ORAL SLOPE FACTOR	RISK EXPOSURE LEVEL	RISK SPECIFIED DOSE	BODY WEIGHT	FISH INTAKE	BIOACCUMULATION FACTOR	SOURCE
Oral Slope Factor	=						
Risk Exposure Level	=						
Risk Specified Dose (RSD)	=						
Body Weight (BW)	=						
Fish Intake (FI)	=						
Bioaccumulation Factor (BAF)	=						

Reference Ambient Concentration	=		mg/L
	=		µg/L (Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

VANADIUM, AS VANADIUM PENTOXIDE (CAS 1314-62-1)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

	REFERENCE DOSE	RELATIVE SOURCE CONTRIBUTION	BODY WEIGHT	FISH INTAKE	BIOACCUMULATION FACTOR	SOURCE(S)
Reference Dose (RID)	=	0.00085	80	0.0200	24.82	EPA, July 2011 (dref)
Relative Source Contribution (RSC)	=	0.2				
Body Weight (BW)	=		80			
Fish Intake (FI)	=			0.0200		
Bioaccumulation Factor (BAF)	=				24.82	Arnott & Gobas, 2003 (upper trophic)

Reference Ambient Concentration	=	0.027	mg/L
	=	27	µg/L (Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (CARCINOGEN)

	ORAL SLOPE FACTOR	RISK EXPOSURE LEVEL	RISK SPECIFIED DOSE	BODY WEIGHT	FISH INTAKE	BIOACCUMULATION FACTOR	SOURCE
Oral Slope Factor	=						
Risk Exposure Level	=						
Risk Specified Dose (RSD)	=						
Body Weight (BW)	=						
Fish Intake (FI)	=						
Bioaccumulation Factor (BAF)	=						

Reference Ambient Concentration	=		mg/L
	=		µg/L (Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST; No PPRTV; No ATSDR

ATTACHMENT 8

3,3'-DIMETHYLBENZIDINE (CAS 119-93-7)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

Reference Dose (RID)	=	/(mg/kg-day)	<u>SOURCE</u>
Relative Source Contribution (RSC)	=		
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS

HUMAN HEALTH (CARCINOGEN)

Oral Slope Factor	=	9.2 (mg/kg-day)	<u>SOURCE</u>
Risk Exposure Level	=	0.000001	HEAST, 1997
Risk Specified Dose (RSD)	=	0.00000109 mg/kg-day	
Body Weight (BW)	=	80 kg	
Fish Intake (FI)	=	0.0200 kg/day	
Bioaccumulation Factor (BAF)	=	17.69 L/kg	Arnot & Gobat, 2003 (upper trophic)

CLASS: B2

Reference Ambient Concentration	=	0.00002 mg/L	
	=	0.02 µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS

CARBAZOLE (CAS 86-74-8)

AQUATIC LIFE (FRESHWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

AQUATIC LIFE (SALTWATER)

ACUTE (µg/L)	CHRONIC (µg/L)
ND	ND

NOTE: No National Recommended Water Quality Criteria - Aquatic Life; No Gold Book

HUMAN HEALTH (NONCARCINOGEN)

Reference Dose (RID)	=	/(mg/kg-day)	<u>SOURCE(S)</u>
Relative Source Contribution (RSC)	=		
Body Weight (BW)	=	kg	
Fish Intake (FI)	=	kg/day	
Bioaccumulation Factor (BAF)	=	L/kg	

Reference Ambient Concentration	=	mg/L	
	=	µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS; No HEAST

HUMAN HEALTH (CARCINOGEN)

Oral Slope Factor	=	0.02 (mg/kg-day)	<u>SOURCE(S)</u>
Risk Exposure Level	=	0.000001	HEAST, 1997
Risk Specified Dose (RSD)	=	0.000050 mg/kg-day	
Body Weight (BW)	=	80 kg	
Fish Intake (FI)	=	0.0200 kg/day	
Bioaccumulation Factor (BAF)	=	258.4 L/kg	Arnot & Gobat, 2003 (upper trophic)

CLASS: B2

Reference Ambient Concentration	=	0.00077 mg/L	
	=	0.77 µg/L	(Organism)

NOTE: No National Recommended Water Quality Criteria - Human Health; No IRIS

EPI Suite Results For CAS 88-73-3

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 1.145 (BCF = 13.96 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.2588 days (HL = 0.5511 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.194 (BCF = 15.64)
Log BAF Arnot-Gobas method (upper trophic) = 1.194 (BAF = 15.64)
log Kow used: 2.24 (expkow database)

EPI Suite Results For CAS 123-91-1

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 0.500 (BCF = 3.162 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -1.5075 days (HL = 0.03108 days)
Log BCF Arnot-Gobas method (upper trophic) = -0.034 (BCF = 0.9248)
Log BAF Arnot-Gobas method (upper trophic) = -0.034 (BAF = 0.9248)
log Kow used: -0.27 (expkow database)

EPI Suite Results For CAS 106-47-8

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 0.874 (BCF = 7.489 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.5751 days (HL = 0.266 days)
Log BCF Arnot-Gobas method (upper trophic) = 0.849 (BCF = 7.061)
Log BAF Arnot-Gobas method (upper trophic) = 0.849 (BAF = 7.061)
log Kow used: 1.83 (expkow database)

EPI Suite Results For CAS 103-33-3

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 1.000 (BCF = 10 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.2284 days (HL = 0.591 days)
Log BCF Arnot-Gobas method (upper trophic) = 2.264 (BCF = 183.8)
Log BAF Arnot-Gobas method (upper trophic) = 2.264 (BAF = 183.9)
log Kow used: 3.82 (expkow database)

EPI Suite Results For CAS 156-59-2

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 0.987 (BCF = 9.696 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.2518 days (HL = 0.5601 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.030 (BCF = 10.71)
Log BAF Arnot-Gobas method (upper trophic) = 1.030 (BAF = 10.71)
log Kow used: 2.00 (expkow database)

EPI Suite Results For CAS 50-00-0

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 0.500 (BCF = 3.162 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -1.2600 days (HL = 0.05495 days)
Log BCF Arnot-Gobas method (upper trophic) = 0.024 (BCF = 1.056)
Log BAF Arnot-Gobas method (upper trophic) = 0.024 (BAF = 1.056)
log Kow used: 0.35 (expkow database)

EPI Suite Results For CAS 001314-62-1

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 1.628 (BCF = 42.48 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -1.0899 days (HL = 0.0813 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.395 (BCF = 24.82)
Log BAF Arnot-Gobas method (upper trophic) = 1.395 (BAF = 24.82)
log Kow used: 2.97 (estimated)

EPI Suite Results For CAS 119-93-7

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 1.211 (BCF = 16.25 L/kg wet-wt)
Log Biotransformation Half-life (HL) = -0.6921 days (HL = 0.2032 days)
Log BCF Arnot-Gobas method (upper trophic) = 1.248 (BCF = 17.69)
Log BAF Arnot-Gobas method (upper trophic) = 1.248 (BAF = 17.69)
log Kow used: 2.34 (expkow database)

EPI Suite Results For CAS 86-74-8

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method = 2.121 (BCF = 132.3 L/kg wet-wt)
Log Biotransformation Half-life (HL) = 0.1528 days (HL = 1.422 days)
Log BCF Arnot-Gobas method (upper trophic) = 2.412 (BCF = 258.3)
Log BAF Arnot-Gobas method (upper trophic) = 2.412 (BAF = 258.4)
log Kow used: 3.72 (expkow database)

2-CHLOROANILINE (o-Chloroaniline; 2-Chlorobenzenamine)

CAS (95-51-2)

Study Search Conducted: July 2017
Aquatic Toxicity Studies Evaluated:

STUDY #	ORGANISM			TEST CONDITIONS					TEST RESULTS				REFERENCE INFORMATION		REJECTION CODES
	Common Name	Species Name	Age/ Life Stage	Duration	Flow- Through or Static	Freshwater Saltwater	Chemical Purity	ECOTOX Control Code	Endpoint	Effect	Effect Measurement	Concentration	ECOTOX #	Author(s)	
ACUTE:															
1	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
2	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
3	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
4	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
5	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
6	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
7	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
8	Daphnia magna	Daphnia magna	Juvenile	21 days	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5000 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	1
9	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
10	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
11	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
12	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
13	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
14	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
15	Amphipod	Gammarus fasciatus	—	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	—	Boell, R.L. (1989)	3
16	Water Flea	Daphnia magna	<24 hours	48 hrs	Renewal	Freshwater	>98	C	EC50	Intoxicator	Immobilite	450 ug/L	ECOTOX (55961)	Pedersen, F.E., et al. (1998)	4
17	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
18	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
19	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
20	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
21	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
22	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
23	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	>98	S	EC50	Intoxicator	Immobilite	1800 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	4
24	Fathead minnow	Pimephales promelas	28-34 days	96 hrs	Flow	Freshwater	>95	C	LC50	Mortality	Mortality	5950 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	6
25	Fathead minnow	Pimephales promelas	28-34 days	96 hrs	Flow	Freshwater	>95	C	LC50	Mortality	Mortality	5130 ug/L	ECOTOX (15031)	Broderius, S.J., et al. (1995)	6
26	Fathead minnow	Pimephales promelas	29 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5680 ug/L	ECOTOX (12858)	Gelger, D.L., et al. (1996)	6
27	Fathead minnow	Pimephales promelas	36 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5810 ug/L	ECOTOX (12448)	Brooke, L.T., et al. (1984)	6
28	Fathead minnow	Pimephales promelas	36 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5810 ug/L	ECOTOX (12448)	Brooke, L.T., et al. (1984)	6
29	Fathead minnow	Pimephales promelas	36 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5810 ug/L	ECOTOX (12448)	Brooke, L.T., et al. (1984)	6
30	Fathead minnow	Pimephales promelas	36 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5810 ug/L	ECOTOX (12448)	Brooke, L.T., et al. (1984)	6
31	Fathead minnow	Pimephales promelas	36 days	96 hrs	Flow	Freshwater	>98	S	LC50	Mortality	Mortality	5810 ug/L	ECOTOX (12448)	Brooke, L.T., et al. (1984)	6
32	Rainbow trout	Oncorhynchus mykiss	Juvenile	96 hr	Flow	Freshwater	>99	—	LC50	Mortality	Mortality	1040 ug/L	—	Hutton, D. G. (1989)	3
EXTENDED ACUTE:															
33	Amphipod	Gammarus fasciatus	Juvenile	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	3
CHRONIC:															
34	Water Flea	Daphnia magna	<24 hours	21 days	Renewal	Freshwater	>99.0	—	NOEC	reproductio	—	32 ug/L	ECOTOX (947)	Kuhn, R., et al. (1989)	5
35	Water Flea	Daphnia magna	<24 hours	21 days	Renewal	Freshwater	>99.0	—	NOEC	reproductio	—	25 ug/L	—	Hutton, D. G. (1989)	5
36	Water Flea	Daphnia magna	<24 hours	21 days	Renewal	Freshwater	>99.0	—	NOEC	reproductio	—	25 ug/L	—	Hutton, D. G. (1989)	5
37	Rainbow trout	Oncorhynchus mykiss	Eggs	105 days	low-through	Freshwater	>99.0	—	NOEC	Growth	Length	3.7 ug/L	—	Pierson, K. B. (1989)	5
BIOCONCENTRATION:															
38	Amphipod	Gammarus fasciatus	Juvenile	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	6,7
39	Amphipod	Gammarus fasciatus	Juvenile	96 hr	Flow	Freshwater	>99.0	—	LC50	Mortality	Mortality	5400 ug/L	ECOTOX (846)	Kuhn, R., et al. (1989)	6,7

ECOTOX CONTROL NOTES

- C= Concurrent Controls
- NR=Not Recorded
- S=Satisfactory

REJECTION CODES:

- 1=Not an aquatic animal
- 2=Single-celled organism
- 3=Exposure duration or endpoint inconsistent with *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*
- 4=Control results not recorded
- 5=Study report not in English
- 6=Species not resident to North America (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*)
- 7=Bioaccumulation/Bioconcentration test

OTHER NOTES:

- 1. Study #9 was conducted for E.I. Du Pont de Nemours at Enseco in Marblehead, MA
- 2. Study #32, #36, and #37 were conducted for E.I. Du Pont de Nemours at Haskell Laboratory in Newark, DE
- 3. Study #32 reported the 96-hr LC50 value of 1040 ug/L using nominal concentrations. Using measured concentrations, the 96-hr LC50 would be 1135 ug/L.
- 4. Study #35 indicates that the following test concentrations were used for the subject chemical: 3.16, 1.00, 0.316, 0.100, 0.0316, 0.0100, 0.00316, and 0.001 mg/L. A MATC calculated from the NOEC and LOEC is 56.6 ug/L.
- 5. Study #36 reports a MATC of 34 ug/L.
- 6. Study #37 reports a MATC of 6.7 ug/L.
- 7. The Daphnia values do not differ by more than a factor of ten (p. 15 of *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*)

2-CHLOROANILINE

FRESHWATER

ACUTE

	PHYLUM	CLASS	FAMILY	SPECIES	ENDPOINT	VALUE (ug/L)	SAV	GMAV
1	The family Salmonidae in the class Osteichthyes	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	96-hr LC50	1135	1135
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species	Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	5650	5561
		Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	5130	
		Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	5680	
		Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	5810	
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)							
4	A planktonic crustacean (e.g., cladoceran, copepod, etc.)	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	48-hr EC50	450	900
		Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	48-hr EC50	1800	
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)	Arthropoda	Malacostraca	Gammaridae	<i>Gammarus fasciatus</i>	96-hr LC50	5400	5400
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)							
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)							
8	A family in any other order of insect or any phylum not already represented							

Number of Minimum Data Requirements Satisfied:	Adjustment Factor:
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

TABLE A-3—SECONDARY ACUTE FACTORS from 40 CFR 132, Appendix A, July 1, 2017

	FAMILY	GMAV	RANK
1	Salmonidae	1135	2
2	Cyprinidae	5561	3
3	---	---	---
4	Daphniidae	900	1
5	Gammaridae	5400	4
6	---	---	---
7	---	---	---
8	---	---	---

n = 4

Number of minimum data requirements satisfied: 4
Adjustment Factor: 7.0

Lowest GMAV: 900 ug/L
SAV=Lowest GMAV/Adjustment Factor: 129 ug/L
SMC=SAV/2: 64.3 ug/L

CHRONIC

	PHYLUM	CLASS	FAMILY	SPECIES	MATC (ug/L)	SMCV (ug/L)	GMCV (ug/L)	TEST/TYPE	
1	The family Salmonidae in the class Osteichthyes	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	6.7	6.7	6.7	#37: Early Life Stage
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species								
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)								
4	A planktonic crustacean (e.g., cladoceran, copepod, etc.)	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	56.6	43.9	43.9	#35: Life Cycle
		Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	34.0			#38: Life Cycle
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)								
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)								
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)								
8	A family in any other order of insect or any phylum not already represented								

	ACUTE	CHRONIC	ACUTE-TO-CHRONIC RATIO	ACRS
1	Fish 96 hr-LC50 ug/L 1135	105-day MATC ug/L 6.7	6.7	169.4
2	Invertebrate 48 hr EC50 ug/L 900	21-day MATC ug/L 56.6	15.9	20.5
	900	34	26.5	
	LC50 ug/L ---	MATC ug/L ---	ACUTE-TO-CHRONIC RATIO ---	
3	Other acutely-sensitive species			18

SACR (GEOMEAN OF THE ACRS): 39.7
SCV=SAV/SACR: 3.24 ug/L

NOTES:

- The data available does not satisfy the required eight families [per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses*, 1985]. In order to address the requirements of 40 CFR 122.44(d)(1)(vi), and alternative procedure allowing for the use of a data set less than the minimum is necessary. The procedures outlined in 40 CFR 132, Appendix A, Parts XII, XIII, and XIV were used as guidance to develop criteria used to conduct an Reasonable Potential Analysis.
- The dilution water used in the acute and chronic studies were similar.
- The two calculated ACRs differ by less than a factor of ten

3-CHLOROANILINE (m-Chloroaniline; 3-Chlorobenzenamine)

CAS (108-4-29)

Study Search Conducted: July 2017
 Aquatic Toxicity Studies Evaluated:

STUDY #	ORGANISM			TEST CONDITIONS				TEST RESULTS				REFERENCE INFORMATION		REJECTION CODES		
	Common Name	Species Name	Age/Life Stage	Duration	Flow-Through or Static	Freshwater/Saltwater	Chemical Purity	ECOTOX Control Code	Endpoint	Effect Measure	Concentration	ECOTOX #	Author(s)			
ACUTE:																
1	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
2	Water Flea	<i>Daphnia magna</i>	Adult	48 hrs	Static	Freshwater	99.9	C	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
3	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	C	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
4	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
5	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
6	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	1	
7	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	2	
8	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	3	
9	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
10	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
11	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
12	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
13	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
14	Water Flea	<i>Daphnia magna</i>	Adult	6-24 hrs	48 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	350 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	5
15	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
16	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
17	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
18	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
19	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
20	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	7	
EXTENDED ACUTE:																
21	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	4	
CHRONIC:																
22	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	4	
23	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	6	
24	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	4	
25	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	4	
26	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	7	
27	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	7	
28	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	7	
29	Water Flea	<i>Daphnia magna</i>	Adult	21 days	Renewal	Freshwater	NR	S	NOEC	Reproduction	General	13 µg/L	ECOTOX (847)	Kuhn, R., et. al. (1989)	7	
BIOCONCENTRATION:																
30	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	8	
31	Water Flea	<i>Daphnia magna</i>	Adult	96 hrs	Static	Freshwater	NR	S	EC50	Intoxication	Immature	1000 µg/L	ECOTOX (846)	Kuhn, R., et. al. (1989)	8	

ECOTOX CONTROL NOTES

- C= Concurrent Controls
- NR=Not Recorded
- S=Satisfactory

REJECTION CODES:

- 1=Not an aquatic animal
- 2=Single-celled organism
- 3=Saltwater species
- 4=Exposure duration or endpoint inconsistent with *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*
- 5=Control results not recorded
- 6=Study report not in English
- 7=Species not resident to North America (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*)
- 8=Bioaccumulation/Bioconcentration test

OTHER NOTES:

1. Study #28 indicates that the following test concentrations were used for the subject chemical: 800, 400, 200, 100, 50, 25, 12.5, and 6.25 µg/L. A MATC calculated from the NOEC and LOEC is 17 µg/L.

3-CHLOROANILINE

FRESHWATER

ACUTE								
	PHYLUM	CLASS	FAMILY	SPECIES	ENDPOINT	VALUE (ug/L)	SMAV	GMAV
1	The family Salmonidae in the class Osteichthyes							
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species							
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)							
4	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	48-hr EC50	350	350	350
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)							
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)							
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)							
8	A family in any other order of Insect or any phylum not already represented							

	FAMILY	GMAV	RANK
1	---	---	---
2	---	---	---
3	---	---	---
4	Daphniidae	350	1
5	---	---	---
6	---	---	---
7	---	---	---
8	---	---	---

n= 1

Number of minimum data requirements satisfied: 1
Adjustment Factor: 21.9

Lowest GMAV: 350 ug/L
SAV=Lowest GMAV/Adjustment Factor: 16 ug/L
SMC=SAV/2: 8.0 ug/L

Requirements Satisfied:	Factor:
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

TABLE A-1--SECONDARY ACUTE FACTORS from 40 CFR 132, Appendix A, July 1, 2017

CHRONIC								
	PHYLUM	CLASS	FAMILY	SPECIES	MATC	SCV	SACR	TEST/TYPE
1	The family Salmonidae in the class Osteichthyes							
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species							
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)							
4	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	18.0	18.0	18.0	#35: Life Cycle
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)							
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)							
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)							
8	A family in any other order of Insect or any phylum not already represented							

	ACUTE	CHRONIC	ACUTE-TO-CHRONIC RATIO	ACRS
	96 hr-LC50 ug/L	MATC ug/L		
1	Fish	---	---	18
2	Invertebrate	350	18.0	19.4
3	Other acutely-sensitive species	---	---	18

SACR (GEOMEAN OF THE ACRS): 18.5
SCV=SAV/SACR: 0.87 ug/L

NOTES:

1. The data available does not satisfy the required eight families (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses*, 1985). In order to address the requirements of 40 CFR 122.44(d)(1)(vi), and alternative procedure allowing for the use of a data set less than the minimum is necessary. The procedures outlined in 40 CFR 132, Appendix A, Parts XII, XIII, and XIV were used as guidance to develop criteria used to conduct an Reasonable Potential Analysis.

DICHLORAN (2,6-Dichloro-4-nitroaniline, 2,6-Dichloro-4-nitrobenzenamine, Dicloran)

CAS (99-30-9)

Study Search Conducted: July 2017

Aquatic Toxicity Studies Evaluated:

STUDY #	ORGANISM			TEST CONDITIONS				TEST RESULTS				REFERENCE INFORMATION		REJECTION CODES	
	Common Name	Species Name	Age/ Life Stage	Duration	Flow-Through or Static	Freshwater Saltwater	Chemical Purity	ECOTOX Control Code	Endpoint	Effect	Effect Measurement	Concentration	Reference		Author(s)
ACUTE:															
1	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
2	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
3	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
4	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
5	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
6	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
7	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
8	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
9	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
10	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
11	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
12	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
13	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
14	Water Flea	Daphnia magna	<24 hours	48 hrs	Static	Freshwater	97	K	EC50	Inotoxication	Immobile	2070 ug/L	ECOTOX (344)	U.S EPA, 2006	3
15	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
16	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
17	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
18	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
19	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
20	Bluegill	Lepomis macrochirus	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	1080 ug/L	ECOTOX (344)	U.S EPA, 2006	8
21	Rainbow Trout	Oncorhynchus mykiss	Juveniles	96 hrs	Static	Freshwater	95	K	LC50	Mortality	Mortality	900 ug/L	U.S EPA, 2006	8	

EXTENDED ACUTE:

CHRONIC:

22	Water Flea	Daphnia magna	<24 hours	21 days	Semi-Static	Freshwater	---	---	NOEC	Reproduction & Growth		32 ug/L	---	U.S EPA, 2006
23	Rainbow Trout	Oncorhynchus mykiss	Juveniles	28 days	low-Through	Freshwater	---	---	NOEC	Growth		50 ug/L	---	U.S EPA, 2006
24	Rainbow Trout	Oncorhynchus mykiss	by Larv	91 days	low-Through	Freshwater	---	---	NOEC	Reproduction (Survival)		11 ug/L	---	Hutton, 1989

BIOCONCENTRATION:

ECOTOX CONTROL NOTES

K=Data for control is presented but without accompanying methodology to identify procedures used

REJECTION CODES:

- 1=Not an aquatic animal
- 2=Saltwater organism
- 3=Exposure duration or endpoint inconsistent with *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*
- 4=EC concentration unknown based on concentration series used in test
- 5=Species not resident to North America (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*)
- 6=Chemical purity unacceptable or chemical tested is a mixture
- 7=Outlier
- 8=Study unavailable

OTHER NOTES:

- 1. The document *Environmental Fate and Ecological Risk Assessment for the Re-registration of DCNA*, prepared by the US EPA Office of Pesticide Programs (ID: EPA-HQ-OPP-2005-0265-0023; date posted in docket: July 19, 2006) was used as the basis for determining acceptable or supplemental tests for Dichloran.
- 2. Study #24 was conducted for The Upjohn Company at Haskell Laboratory in Newark, DE
- 3. Study #22: MATC = 56.6 ug/L (nominal).
- 4. Study #23: MATC = 89.4 ug/L (nominal).
- 5. Study #24 reports a MATC of 16 ug/L (measured).

DICHLORAN

FRESHWATER

ACUTE

	PHYLUM	CLASS	FAMILY	SPECIES	ENDPOINT	VALUE (ug/L)	SMAVs	GMAVs
1	The family Salmonidae in the class Osteichthyes	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	96-hr LC50	900	900
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis macrochirus</i>	96-hr LC50	1080	1080
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)							
4	A planktonic crustacean (e.g., cladoceran, copepod, etc.)	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	48-hr EC50	2070	2070
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)							
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)							
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)							
8	A family in any other order of insect or any phylum not already represented							

	FAMILY	GMAV	RANK
1	Salmonidae	900	1
2	Centrarchidae	1080	2
3	---	---	---
4	Daphniidae	2070	3
5	---	---	---
6	---	---	---
7	---	---	---
8	---	---	---

n= 3

Number of minimum data requirements satisfied: 3
 Adjustment Factor: 8.0

Lowest GMAV: 900 ug/L
 SAV=Lowest GMAV/Adjustment Factor: 113 ug/L
 SAV/2= 56.3 ug/L

Requirements Satisfied:	Factor:
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

TABLE A-1—SECONDARY ACUTE FACTORS from 40 CFR 132, Appendix A, July 1, 2016

CHRONIC

	PHYLUM	CLASS	FAMILY	SPECIES	MATC (ug/L)	SMCV (ug/L)	GMCV (ug/L)	TEST/TYPE
1	The family Salmonidae in the class Osteichthyes	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	16.0	16.0	16.0 #24: Early Life Stage
2	A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species							
3	A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)							
4	A planktonic crustacean (e.g., cladoceran, copepod, etc.)	Arthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	56.6	56.6	56.6 #22: Life Cycle
5	A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)							
6	An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)							
7	A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)							
8	A family in any other order of insect or any phylum not already represented							

	ACUTE	CHRONIC	ACUTE-TO-CHRONIC RATIO	ACR
1	96 hr-LC50 ug/L	96-day MATC ug/L	ACUTE-TO-CHRONIC RATIO	1: 56.3
2	48 hr EC50 ug/L	21-day MATC ug/L	ACUTE-TO-CHRONIC RATIO	2: 36.6
3	LC50 ug/L	MATC ug/L	ACUTE-TO-CHRONIC RATIO	3: 18 Default

SACR (GEOMEAN OF THE ACRS): 33.3
 SCV=SAV/SACR: 3.38 ug/L

NOTES:

- The data available does not satisfy the required eight families (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses*, 1985). In order to address the requirements of 40 CFR 122.44(d)(1)(vi), and alternative procedure allowing for the use of a data set less than the minimum is necessary. The procedures outlined in 40 CFR 132, Appendix A, Parts XII, XIII, and XIV were used as guidance to develop criteria used to conduct a Reasonable Potential Analysis.
- Study #23 was not an life cycle or early life stage study and was therefore not used to calculate the Fish ACR.

1	...	...	...	...	...	...	...	...	3
2	...	...	...	...	...	...	...	...	3
3	...	...	...	...	...	...	...	...	3
4	...	...	...	...	...	...	...	...	3
5	...	...	...	...	...	...	...	...	3
6	...	...	...	...	...	...	...	...	3
7	...	...	...	...	...	...	...	...	3
8	...	...	...	...	...	...	...	...	3
9	...	...	...	...	...	...	...	...	3
10	...	...	...	...	...	...	...	...	3
11	...	...	...	...	...	...	...	...	3
12	...	...	...	...	...	...	...	...	3
13	...	...	...	...	...	...	...	...	3
14	...	...	...	...	...	...	...	...	3
15	...	...	...	...	...	...	...	...	3
16	...	...	...	...	...	...	...	...	3
17	...	...	...	...	...	...	...	...	3
18	...	...	...	...	...	...	...	...	3
19	...	...	...	...	...	...	...	...	3
20	...	...	...	...	...	...	...	...	3
21	...	...	...	...	...	...	...	...	3
22	...	...	...	...	...	...	...	...	3
23	...	...	...	...	...	...	...	...	3
24	...	...	...	...	...	...	...	...	3
25	...	...	...	...	...	...	...	...	3
26	...	...	...	...	...	...	...	...	3
27	...	...	...	...	...	...	...	...	3
28	...	...	...	...	...	...	...	...	3
29	...	...	...	...	...	...	...	...	3
30	...	...	...	...	...	...	...	...	3
31	...	...	...	...	...	...	...	...	3
32	...	...	...	...	...	...	...	...	3
33	...	...	...	...	...	...	...	...	3
34	...	...	...	...	...	...	...	...	3
35	...	...	...	...	...	...	...	...	3
36	...	...	...	...	...	...	...	...	3
37	...	...	...	...	...	...	...	...	3
38	...	...	...	...	...	...	...	...	3
39	...	...	...	...	...	...	...	...	3
40	...	...	...	...	...	...	...	...	3
41	...	...	...	...	...	...	...	...	3
42	...	...	...	...	...	...	...	...	3
43	...	...	...	...	...	...	...	...	3
44	...	...	...	...	...	...	...	...	3
45	...	...	...	...	...	...	...	...	3
46	...	...	...	...	...	...	...	...	3
47	...	...	...	...	...	...	...	...	3
48	...	...	...	...	...	...	...	...	3
49	...	...	...	...	...	...	...	...	3
50	...	...	...	...	...	...	...	...	3

BIOCONCENTRATION:

ECOTOX CONTROL NOTES

- C= Concurrent Controls
- NR=Not Recorded
- S=Satisfactory
- K=Data for control is presented but without accompanying methodology to identify procedures used

REJECTION CODES:

- 1=Not an aquatic animal
- 2=Single-celled organism
- 3=Exposure duration or endpoint inconsistent with *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*
- 4=Controls insufficient
- 5=Species not resident to North America (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses, 1985*)
- 6=Purity unacceptable or a mixture was tested
- 7=Results reported as approximate or reported as greater than or less than a value or reported in improper units

FORMALDEHYDE

FRESHWATER

ACUTE

	PHYLUM	CLASS	FAMILY	SPECIES	ENDPOINT	VALUE (ug/L)	SMAVs	GMAVs
1 The family Salmonidae in the class Osteichthyes	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	96-hr LC50	118000	127541	127541
	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	96-hr LC50	118000		
	Chordata	Actinopterygii	Salmonidae	<i>Oncorhynchus mykiss</i>	96-hr LC50	149000		
2 A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis macrochirus</i>	96-hr LC50	100000	86095	122043
	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis macrochirus</i>	96-hr LC50	80800		
	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis macrochirus</i>	96-hr LC50	100000		
	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis macrochirus</i>	96-hr LC50	68000		
	Chordata	Actinopterygii	Centrarchidae	<i>Lepomis cyanellus</i>	96-hr LC50	173000		
3 A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)	Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	26300	24949	24949
	Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	24500		
	Chordata	Actinopterygii	Cyprinidae	<i>Pimephales promelas</i>	96-hr LC50	24100		
4 A planktonic crustacean (e.g., cladoceran, copepod, etc.)	Anthropoda	Branchiopoda	Daphniidae	<i>Ceriodaphnia dubia</i>	48-hr EC50	12980	12980	10320
	Anthropoda	Branchiopoda	Daphniidae	<i>Ceriodaphnia dubia</i>	48-hr EC50	12980		
	Anthropoda	Branchiopoda	Daphniidae	<i>Daphnia pulex</i>	48-hr EC50	5800		
	Anthropoda	Branchiopoda	Daphniidae	<i>Daphnia magna</i>	48-hr EC50	14600		
5 A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)								
6 An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)								
7 A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)	Mollusca	Bivalvia	Corbiculidae	<i>Corbicula manilensis</i>	96-hr LC50	95000	109407	109407
	Mollusca	Bivalvia	Corbiculidae	<i>Corbicula manilensis</i>	96-hr LC50	126000		
8 A family in any other order of insect or any phylum not already represented								

FAMILY	GMAV	RANK
1 <i>Salmonidae</i>	127541	5
2 <i>Centrarchidae</i>	122043	4
3 <i>Cyprinidae</i>	24949	2
4 <i>Daphniidae</i>	10320	1
5 ---	---	---
6 ---	---	---
7 <i>Corbiculidae</i>	109407	3
8 ---	---	---

n = 5

Number of minimum data requirements satisfied: 5
Adjustment Factor: 6.1

Lowest GMAV: 10320 ug/L
SAV=Lowest GMAV/Adjustment Factor: 1692 ug/L
SAV/2= 846 ug/L

Requirements Satisfied:	Factor:
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

TABLE A-1--SECONDARY ACUTE FACTORS from 40 CFR 132, Appendix A, July 1, 2016

CHRONIC

	PHYLUM	CLASS	FAMILY	SPECIES	MATC (ug/L)	SMCV (ug/L)	GMCV (ug/L)	TEST/TYPE
1 The family Salmonidae in the class Osteichthyes								
2 A second family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species								
3 A third family in the phylum Chordata (may be in the class Osteichthyes or may be an amphibian, etc.)								
4 A planktonic crustacean (e.g., cladoceran, copepod, etc.)								
5 A benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish, etc.)								
6 An insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge, etc.)								
7 A family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca, etc.)								
8 A family in any other order of insect or any phylum not already represented								

	ACUTE LC50 (ug/L)	CHRONIC MATC (ug/L)	ACUTE-TO-CHRONIC RATIO	ACR
1 Fish	---	---	---	1: 18
2 Invertebrate	---	---	---	2: 18
3 Other acutely-sensitive species	---	---	---	3: 18

SACR (GEOMEAN OF THE ACRS): 18
SCV=SAV/SACR: 94 ug/L

NOTES:

1. The data available does not satisfy the required eight families (per *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses*, 1985). In order to address the requirements of 40 CFR 122.44(d)(1)(vi), and alternative procedure allowing for the use of a data set less than the minimum is necessary. The procedures outlined in 40 CFR 132, Appendix A, Parts XII, XIII, and XIV were used as guidance to develop criteria used to conduct an Reasonable Potential Analysis.

ATTACHMENT 7

METALS TRANSLATOR FOR COPPER USGS 01196530 QUINNIPIAC R AT NORTH HAVEN, CT

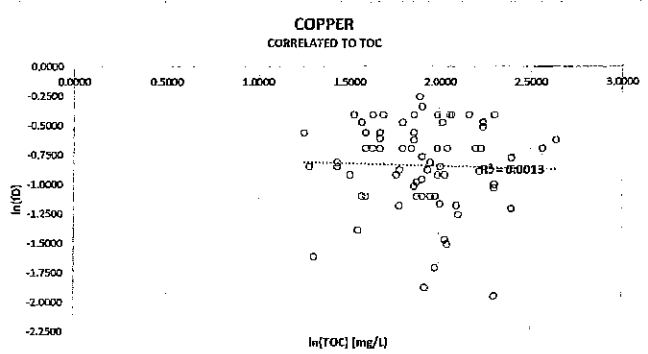
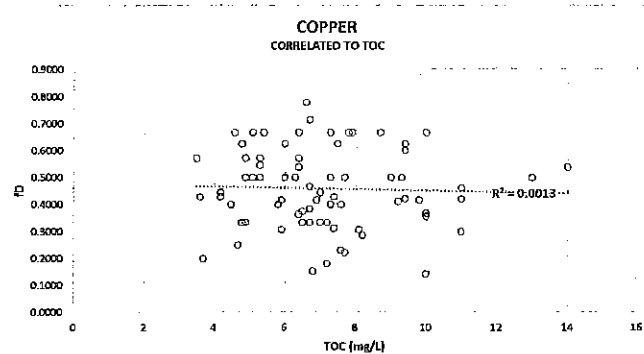
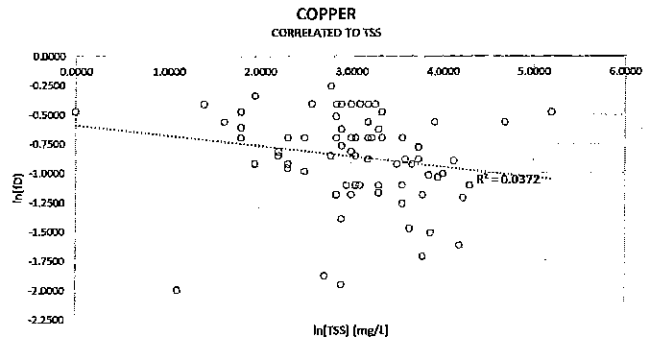
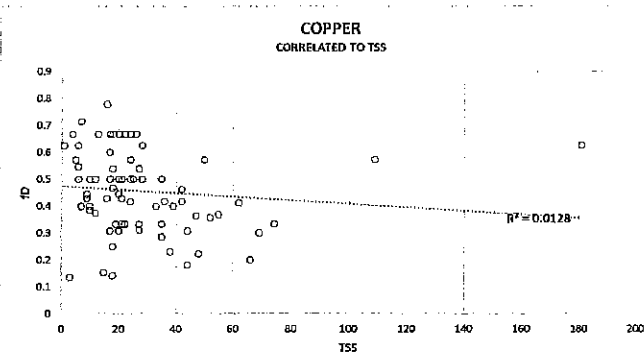
agency_cd site_no	sample_dt sample_tm	parm_cd 01040		parm_cd 01042		parm_cd 00900		parm_cd 00400		parm_cd 00500		parm_cd 70300		TSS (estimated) mg/L	parm_cd 00680		rd
		result_va	meth_cd	result_va	meth_cd	result_va	meth_cd	result_va	meth_cd	result_va	meth_cd	result_va	meth_cd		result_va	meth_cd	
USGS 1196530	6/10/93 9:30 AM	4	PLM43	13	GF099	103	ALGOR	7.6	242	ROE12	222	ROE10	20	00500-70300	6.6	OX009	0.3077
USGS 1196530	7/8/93 8:45 AM	6	PLM43	44	GF099	105	ALGOR	7.5	192	ROE12	189	ROE10	3	00500-70300	10	OX009	0.1364
USGS 1196530	8/9/93 9:00 AM	6	PLM43	14	GF099	155	ALGOR	7.6	302	ROE12	305	ROE10	-3	00500-70300	11	OX009	0.4286
USGS 1196530	9/7/93 9:15 AM	6	PLM43	9	GF099	128	ALGOR	7.6	274	ROE12	256	ROE10	18	00500-70300	7.7	OX009	0.8667
USGS 1196530	10/20/93 9:45 AM	5	PLM43	8	GF099	114	ALGOR	7.5	244	ROE12	238	ROE10	6	00500-70300	10	OX009	0.6250
USGS 1196530	10/26/94 9:15 AM	4	PLM43	8	GF099	114	ALGOR	7.4	240	ROE12	220	ROE10	20	00500-70300	7.9	OX009	0.8667
USGS 1196530	12/9/94 10:40 AM	4	PLM43	6	GF099	87.7	ALGOR	7.6	186	ROE12	160	ROE10	26	00500-70300	5.1	OX009	0.8667
USGS 1196530	12/9/94 10:41 AM	4	PLM43	6	GF099	85.2	ALGOR	7.6	188	ROE12	170	ROE10	18	00500-70300			0.8667
MEAN		4.88		13.25		111.49			233.50		220.00		13.50		8.33		0.5205
STDEV		0.99		12.81		22.52			42.44		47.67		10.14		2.11		0.2062
95 PERCENTILE		6.00		33.50		145.55			292.20		287.85		23.90		10.70		0.8667
GEOMEAN		4.79		10.28		108.61			230.15		215.58				8.08		0.4659

AVERAGE VALUE DURING CRITICAL SEASON:

0.5004

CODES:

agency_cd Agency Code
 site_no USGS site number
 sample_dt Begin date
 sample_tm Begin time
 parm_cd Parameter code
 result_va Parameter value
 meth_cd Method code
 01040 Copper, water, filtered, micrograms per liter
 01042 Copper, water, unfiltered, recoverable, micrograms per liter
 00900 Hardness, water, milligrams per liter as calcium carbonate
 00400 pH, water, unfiltered, field, standard units
 00500 Total solids dried at 105 degrees Celsius, water, unfiltered, milligrams per liter
 70300 Dissolved solids dried at 180 degrees Celsius, water, filtered, milligrams per liter
 00680 Organic carbon, water, unfiltered, milligrams per liter
 CX006 Copper in filtered water by chelation extraction with APDC & MIBK, and AAS. USGS I-1271-85. USGS TWRI 5-A/1/1989, p. 193
 GF098 Copper in filtered water by GF-AAS. USGS I-2274-85. USGS of 93-125, p. 71.
 PLM43 Metals, filtered water, Inductively coupled plasma mass spectrometry. USGS I-2477-92. USGS 92-634.
 CX016 Copper recoverable from unfiltered water by dilute HCL (USGS) digestion, chelation, extraction with APDC & MIBK and AAS. USGS I-3271-85. USGS TWRI 5-A/1/1989, p. 193.
 GF099 Copper recoverable from unfiltered water by GF-AAS. USGS I-4274-89. USGS of 93-125, p. 71
 ALGOR Computation by NWIS algorithm. NWIS User's Manual, QW System, Section 3.6.7.
 EL003 pH, WWR, FLD, ELEC USGS I-1586-77
 ROE12 Residue on evaporation at 105 deg. C of unfiltered water, by weight USGS I-3750-85 USGS TWRI 5-A/1/1989, p. 441
 ROE10 Residue on evaporation at 180 deg. C of filtered water, by weight USGS I-1750-85 USGS TWRI 5-A/1/1989, p. 437
 OX009 Carbon, organic, total, wet oxidation USGS O-3100-83 USGS TWRI 5-A/3/1987, p. 15



ATTACHMENT 7

Pharmacia & Upjohn Company LLC Reasonable Potential Evaluation: Quinnipiac River Data (upstream of the discharge)

SAMPLING DATE	AMMONIA		ANTIMONY		CADMIUM		CHROMIUM		COPPER		CYANIDE		LEAD		NICKEL		ZINC	
	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)
April 22, 2015	71	75	1.54	2	0.12	1	1.68	---	9.03	---	1	5	4.8	---	1.51	---	37.77	---
May 28, 2015	313	---	0.75	2	0.09	1	1.05	---	4.83	---	4	5	1.11	---	2.07	---	18.47	---
June 29, 2015	150	---	0.62	3	0.06	1	1.43	---	11.6	---	2	5	3.24	---	1.98	---	38.7	---
July 31, 2015	44	75	1.35	2	0	1	1.28	---	4.82	---	2	5	1.7	---	2.56	---	17.54	---
August 25, 2015	146	---	0.78	2	0.1	1	0.98	---	5.94	---	4	5	1.36	---	2.81	---	14.26	---
September 30, 2015	158	---	0.56	1	0.05	1	1.48	---	5.93	---	6	---	2.55	---	2.27	---	35.5	---
October 30, 2015	52	75	1.75	2	0.11	1	4.23	---	13.12	---	7	---	3.05	---	4.08	---	77.15	---
November 24, 2015	308	---	2.8	---	0.06	1	1.89	---	5.41	---	0	5	1.15	---	2.65	---	19.4	---
December 28, 2015	304	---	0.68	4	0.09	1	1.99	---	4.8	---	3	5	1.18	---	7.21	---	25.96	---
AVERAGE	172		1.2		0.08		1.76		7.29		3.2		2.24		2.89		31.6	

SAMPLING DATE	CHLOROBENZENE		ETHYLBENZENE		BROMOMETHANE		TOLUENE		MS-1,2-DICHLOROETH	
	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)
April 22, 2015	0	3.5	0	1	0	---	0	1	0	1.5
May 28, 2015	0	3.5	0	1	0	---	0	1	0	1.5
June 29, 2015	0	3.5	0	1	1.4	5	0	1	0	1.5
July 31, 2015	0	3.5	0	1	0	---	0	1	0	1.5
August 25, 2015	0	3.5	0	1	0	---	0	1	0	1.5
September 30, 2015	0	3.5	0	1	0	---	0	1	0	1.5
October 30, 2015	0	3.5	0	1	0	---	0	1	0	1.5
November 24, 2015	0	3.5	0	1	1.7	5	0	1	0	1.5
December 28, 2015	0	3.5	0	1	2.4	5	0	1	0	1.5
AVERAGE	0		0		0.61		0		0	

SAMPLING DATE	2-CHLOROPHENOL		2,4-DICHLOROPHENOL		PHENOL		NAPHTHALENE	
	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)
April 22, 2015	0	2	0	5	0	5	0	2
May 28, 2015	0	2	0	5	0	5	0	2
June 29, 2015	0	2	0	5	0	5	0	2
July 31, 2015	0	2	0	5	0	5	0	2
August 25, 2015	0	2	0	5	0	5	0	2
September 30, 2015	0	2	0	5	0	5	0	2
October 30, 2015	0	2	0	5	0	5	0	2
November 24, 2015	0	2	0	5	0	5	0	2
December 28, 2015	0	2	0	5	12	5	0	2
AVERAGE	0		0		1.33		0	

SAMPLING DATE	ALUMINUM	
	Reported Value (pp/L)	ML (pp/L)
April 22, 2015	288.2	---
May 28, 2015	70.81	---
June 29, 2015	110	---
July 31, 2015	149.2	---
August 25, 2015	55.88	---
September 30, 2015	174	---
October 30, 2015	280.1	---
November 24, 2015	98.9	---
December 28, 2015	106.4	---
AVERAGE	148	

SAMPLING DATE	SALINITY (LAB)		SALINITY (FIELD)		TEMPERATURE (°C)	CONDUCTIVITY (µS/cm)	pH	DISSOLVED OXYGEN (mg/L)	TOTAL DISSOLVED SOLID (pp/L)
	Reported Value (pp/L)	ML (pp/L)	Reported Value (pp/L)	ML (pp/L)					
April 22, 2015	---	---	0.13	---	12.82	201	7.15	0.06	0.17
May 28, 2015	0	2	0.24	---	21.02	465	7.52	2.93	0.327
June 29, 2015	0	2	0.18	---	19.06	327	7.41	1.59	0.245
July 31, 2015	3.5	---	3.91	---	26.62	7181	7.47	2.26	4.514
August 25, 2015	0	2	0.44	---	17.11	562	7.32	1.23	0.375
September 30, 2015	0	2	1.6	---	15.96	412	7.11	2.1	0.267
October 30, 2015	0	2	0.38	---	14.19	216	6.76	1.3	0.177
November 24, 2015	0	2	0.25	---	8.3	1710	6.94	4.58	1.729
December 28, 2015	0	2	1.12	---	9.19	583	7.3	2.89	0.552
AVERAGE	0.44		0.91			1294.11		2.10	0.93

ATTACHMENT 7

REASONABLE POTENTIAL ANALYSIS AND WATER QUALITY-BASED LIMIT DETERMINATION SUMMARY SHEET

A "reasonable potential" analysis involves determining whether the facility's discharge has the potential to cause, the reasonable potential to cause, or contributes to an excursion of the State's water quality standards. The analysis involves an effluent characterization process designed to determine which pollutants have the potential to exceed the standards. If the pollutant has the potential or the reasonable potential to exceed the standards, water quality-based limits are required. The reasonable potential analysis and permit limit determinations are performed in accordance with the procedures outlined in the EPA Guidance Manual entitled *Technical Support Document for Water Quality Based Toxics Control*, March 1991.

DATA SOURCES: Effluent Data: OMR Data: 2013-2017; Attachment C data
Background Data: Quinnipiac River water sampling (2015); USGS 01190530

DETERMINATION OF FRESHWATER OR SALTWATER CRITERIA: EPA's document *National Guidance of the Applicability of Freshwater and Saltwater Criteria* (EPA-822-R-02-047) is used to determine if freshwater criteria or salt water criteria are appropriate. This document provides the following guidance:
If the receiving waters at the discharge point have salinity values less than 1 ppt, the discharge should be evaluated for freshwater criteria
If the receiving waters at the discharge point have salinity values between 1 ppt and 10 ppt, the discharge should be evaluated for the more stringent of the freshwater or saltwater criteria
If the receiving waters at the discharge point have salinity values greater than 10 ppt, the discharge should be evaluated for saltwater criteria
The salinity in the receiving water is: 1-5 ppt

CRITERIA: State of Connecticut's *Water Quality Standards*, RCSA section 22a-426-1 to 22a-426-9 [Standards effective February 25, 2011; Regulations effective October 10, 2013]

SITE-SPECIFIC CRITERIA FOR COPPER: Site-specific criteria exists for copper for the following waterbodies in the State:

Waterbody	Reach
Bantam River	Litchfield POTW to confluence with Shepaug River
Blackberry River	Norfolk POTW to confluence with Roaring Brook
Factory Brook	North Canaan POTW to confluence with Housatonic River
Five Mile River	Salisbury POTW to mouth
Hockanum River	New Canaan POTW to mouth
Mill Brook	Vernon POTW to confluence with Connecticut River
Naugatuck River	Plainfield Village POTW to mouth
Norwalk River	Torrington POTW to confluence with Housatonic River
Pegabuck River	Ridgefield Brook to Branchville
Poolatuck River	Plymouth POTW to confluence with Farmington River
Quinnipiac River	Newington POTW to confluence with Housatonic River
Sill River	Southington POTW to Broadway, North Haven
Williams Brook	Winsted POTW to confluence with Farmington River
Williamitic River	Lyme/kill Brook to confluence with Housatonic River
	Ledyard POTW to mouth
	Stafford Springs POTW to Trout Management Area (Willington)
	Eagleville Dam to confluence with Sheluckel River

No site-specific copper criteria applies to this site.

TRANSLATORS FOR METALS CRITERIA EXPRESSED AS DISSOLVED Note 7 on Table 3 of the WQS indicates that metals concentrations are expressed in the dissolved form, unless noted otherwise. No explicit state policy exists on the manner in which the dissolved criteria is to be translated to a total or total recoverable value. The TSD (Section 5.7.3) recommends four options that can be used to convert the dissolved criteria to the total form: 1) if no ambient data exists, assume no difference between the dissolved and total recoverable phase; 2) develop a site-specific relationship between the phases of metals; 3) use a relationship developed by EPA from national data; 4) use a metal speciation model.

A translator of 1 was initially used, consistent with EPA 823-B-96-007. Under this test, only copper has reasonable potential to exceed water quality criteria. Some paired (dissolved and total) ambient data exists in an upstream USGS gage (USGS 01190530). See pages 39-40 for details on how the translator, 1D, for copper was determined.

COPPER:

ACUTE:				
WQC _{DISSOLVED}	DF	Background _{TOTAL}	f_D	WLA _{TOTAL}
4.8 ug/L	1	7.29 ug/L	0.5004	9.69 ug/L
CHRONIC:				
WQC _{DISSOLVED}	DF	Background _{TOTAL}	f_D	WLA _{TOTAL}
3.1 ug/L	1	7.29 ug/L	0.5004	6.20 ug/L

AMMONIA CRITERIA: (FRESHWATER) Freshwater ammonia criteria in the State's *Water Quality Standards* are expressed in terms of ambient surface water temperature and pH. Ammonia concentrations are determined as follows:

ACUTE:		CHRONIC:	
$pH_{\text{ambient}} =$	$T_{\text{ambient}} =$	$pH_{\text{ambient}} =$	$T_{\text{ambient}} =$
8.3	26.5 °C	8.3	26.5 °C
[Enter the highest pH]	[Enter the highest temperature]	[Enter the highest pH]	[Enter the highest temperature]
Ammonia-nitrogen criteria (if salmonids are present) =	3.1 mg/L as N	Ammonia-nitrogen criteria (when early life stages are present) =	0.69 mg/L as N
Ammonia-nitrogen criteria (if salmonids are absent) =	4.7 mg/L as N	Ammonia-nitrogen criteria (when early life stages are absent) =	0.69 mg/L as N
Ammonia-nitrogen criteria (if salmonids are present) =	3.146 ug/L as N	Ammonia-nitrogen criteria (when early life stages are present) =	889 ug/L as N
Ammonia-nitrogen criteria (if salmonids are absent) =	4.718 ug/L as N	Ammonia-nitrogen criteria (when early life stages are absent) =	889 ug/L as N

AMMONIA CRITERIA: (SALTWATER) Saltwater ammonia criteria in the State's *Water Quality Standards* are expressed as un-ionized ammonia (as NH_3). Equivalent total ammonia concentrations are dependent on receiving water temperature, pH, and salinity. "Ambient Water Quality Criteria for Ammonia (Saltwater)-1989" describes the procedure for converting un-ionized ammonia concentrations to total ammonia concentrations. This calculation is as follows:

ACUTE:		CHRONIC:	
$T_{\text{ambient}} =$	$pH_{\text{ambient}} =$	$T_{\text{ambient}} =$	$pH_{\text{ambient}} =$
26.5 °C	8.3 SU	26.5 °C	8.3 SU
[Enter the highest temperature]	[Enter the highest pH]	[Enter the highest temperature]	[Enter the highest pH]
$Salinity_{\text{ambient}} =$	$Salinity_{\text{ambient}} =$	$Salinity_{\text{ambient}} =$	$Salinity_{\text{ambient}} =$
1 ppt	1 ppt	1 ppt	1 ppt
[Enter the lowest salinity]	[Enter the lowest salinity]	[Enter the lowest salinity]	[Enter the lowest salinity]
$pK_a =$	9.209	$pK_a =$	9.209
%UA =	11.0 %	%UA =	11.0 %
Un-ionized ammonia criteria (as NH_3) =	233 ug/L	Un-ionized ammonia criteria (as NH_3) =	35 ug/L
Total ammonia criteria (as NH_3) =	2,123 ug/L	Total ammonia criteria (as NH_3) =	319 ug/L
Total ammonia criteria (as N) =	3,245 ug/L	Total ammonia criteria (as N) =	262 ug/L

DILUTION FACTOR: Dye Dilution Re-Modeling: 16.6 : 1

Average flow of DSN 001-1 (gpd): 106,560 gpd
 Average flow of DSN 001-1 (cfs): 0.165 cfs
 Maximum hours of discharge/day: 24 hours

Dilution Factor = 16.6 :1
 IWC% = 6.02 %

Dilution is not allowed for carcinogens ("A" and "C") and highly-bioaccumulative pollutants ("HB").

BASIS FOR REASONABLE POTENTIAL:

The maximum receiving water concentration for each pollutant is compared to the appropriate criteria where the maximum receiving water concentration is determined as follows:

$$\text{MAXIMUM RECEIVING WATER CONCENTRATION} = \frac{((\text{Statistical Multiplier}) * (\text{Maximum Effluent Concentration})) * (\text{Maximum Background Receiving Water Concentration})}{(\text{Dilution Factor}) * (\text{Dilution Factor})}$$

If the receiving water concentration is greater than the concentration of the applicable criteria for that pollutant, there is reasonable potential for the discharge to cause an in-stream excursion. If reasonable potential exists, water-quality based limits are included in the permit for the subject pollutant. Should the receiving water concentration be sufficiently close to the applicable criteria, considering the degree of confidence in the values, the Department may include limits also.

BASIS FOR WATER-QUALITY LIMIT DETERMINATION:

If it is determined that reasonable potential exists, water-quality based permit limits are calculated as follows:

1. Determine the Waste Load Allocation (WLA) for each applicable criteria:

$$\text{WLA (acute, chronic, human health)} = \frac{(\text{Criteria}) * (\text{Dilution Factor})}{(\text{Average Background Receiving Water Concentration}) * (\text{Dilution Factor} - 1)}$$

If the criteria is in the dissolved form, the WLA is determined as follows:

$$\text{WLA (acute, chronic)} = \frac{((\text{Criteria})_{\text{dissolved}}) * (\text{Dilution Factor})}{(\text{Average Background Receiving Water Concentration}) * (\text{Dilution Factor} - 1)}$$

2. Determine the Long Term Average (LTA) for each applicable criteria:

$$\text{LTA (acute)} = \text{WLA}_{\text{acute}} * \exp[0.5\sigma^2 - z\sigma]$$

$$\text{LTA (chronic)} = \text{WLA}_{\text{chronic}} * \exp[0.5\sigma^2 - z\sigma]$$

$$\text{LTA (human health)} = \text{WLA}_{\text{human health}}$$

3. Determine the limiting LTA (i.e., the lowest LTA of the applicable criteria)

4. Calculate the Average Monthly Limit (AML):

$$\text{AML (acute, chronic)} = \text{LTA}_{\text{acute or chronic}} * \exp[2\sigma - 0.5\sigma^2]$$

$$\text{AML (human health)} = \text{WLA}_{\text{human health}}$$

5. Calculate the Maximum Daily Limit (MDL):

$$\text{MDL (acute, chronic)} = \text{LTA}_{\text{acute or chronic}} * \exp[2\sigma - 0.5\sigma^2]$$

$$\text{MDL (human health)} = \text{WLA}_{\text{human health}} * \exp[2\sigma - 0.5\sigma^2]$$

ATTACHMENT 8

WHOLE EFFLUENT TOXICITY (WET) REASONABLE POTENTIAL ANALYSIS & LIMIT DETERMINATION

RPA:

Chronic Toxicity Ambient Criterion = 1.0 TU_c

TU_c = 100/NOEC

Chronic Dilution Factor:
Dilution of Effluent @ Edge of Mixing Zone:

16.6 :1
6.0 %

Projected maximum value @ edge of mixing zone = Maximum value * Multiplier * %

	<i>Mysidopsis bahia</i>						<i>Cyprinodon variegatus</i>			
	Survival		Growth		Reproduction		Survival		Growth	
	NOEC	TU _b	NOEC	TU _c	NOEC	TU _c	NOEC	TU _c	NOEC	TU _c
March 12	100%	1.0	100%	1.0	100%	1.0	100%	1.0	100%	1.0
June 12	100%	1.0	100%	1.0	10%	10.0	100%	1.0	100%	1.0
September 12	100%	1.0	100%	1.0	100%	1.0	100%	1.0	100%	1.0
December 12	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
March 13	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
June 13	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
September 13	100%	1.0	100%	1.0	100%	1.0	100%	1.0	100%	1.0
December 13	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
March 14	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
June 14	100%	1.0	20%	5.0	NOT ESTIMATED		100%	1.0	100%	1.0
September 14	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
December 14	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
March 15	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
June 15	100%	1.0	100%	1.0	100%	1.0	100%	1.0	100%	1.0
September 15	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
December 15	100%	1.0	100%	1.0	100%	1.0	100%	1.0	10%	10.0
March 16	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
June 16	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
September 16	100%	1.0	100%	1.0	100%	1.0	100%	1.0	80%	1.3
December 16	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
March 17	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
June 17	100%	1.0	100%	1.0	NOT ESTIMATED		100%	1.0	100%	1.0
<i>Maximum</i>		1.0		5.0		10.0		1.0		10.0
<i>n</i>		22		22		7		22		22
<i>CV (default)</i>		0.6		0.6		0.6		0.6		0.6
<i>Multiplier</i>		2.3		2.3		3.6		2.3		2.3
<i>Projected Maximum Value</i>		0.14		0.69		2.17		0.14		1.39
<i>Is Projected Maximum Value > 1.0?</i>		NO		NO		YES		NO		YES

The TU_c values are greater than the chronic ambient criteria of 1.0 TU_c. Therefore, reasonable potential exists.

The Reasonable Potential Analysis was conducted in accordance with Section 3.3 (Box 3-2) of the Technical Support Document for Water Quality-based Toxics Control, March 1991.

Limits:

ACUTE: The permit must include effluent limitations to meet the narrative water quality standard for acute toxicity.

CHRONIC: Since there is reasonable potential, WET limitations to meet the narrative water quality standard for chronic toxicity must be included in the permit. The limits are based on the chronic mixing zone (i.e., an IWC of 6.0%). Therefore, the concentration at which no observable effect should occur (i.e., C-NOEC) must be greater than or equal to 6.0%.

DSN 001-1

PARAMETER	UNIT	EXISTING PERMIT								PROPOSED PERMIT							
		Average Monthly Limit	Maximum Daily Limit	Sampling/Reporting Frequency	Sample Type	Instantaneous Limit	Sampling/Reporting Frequency	Sample Type	Limit Basis	Average Monthly Limit	Maximum Daily Limit	Sampling/Reporting Frequency	Sample Type	Instantaneous Limit	Sampling/Reporting Frequency	Sample Type	Limit Basis
Copper, Total	µg/L	60	120	Annually	DC	180	NR	Grab	BPJ	5.5	9.6	Twice/Month	DC	14.4	NR	Grab	WQB
Copper, Total	g/day	90	181	Annually	DC	NA	NR	NA	BPJ	2.2	3.9	Twice/Month	DC	NA	NR	NA	WQB
Cyanide, Total	µg/L	25	50	Weekly	GSA	75	NR	Grab	WQB	0.58	1.0	Monthly	GSA	1.5	NR	NA	WQB
Cyanide, Total	g/day	—	—	—	—	—	—	—	—	0.23	0.40	Monthly	GSA	NA	NR	NA	WQB
Dibenzofuran	µg/L	—	—	Annually	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Dichloran	µg/L	500	750	Monthly	DC	1130	NR	Grab	BPJ	—	—	Monthly	DC	NA	NR	NA	—
Di-N-Butylphthalate	µg/L	25	54	Annually	DC	81	NR	Grab	BPJ	—	—	—	—	—	—	—	—
Diphenamid	µg/L	—	—	Weekly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Ethylbenzene	µg/L	—	—	Semiannual	Grab	NA	NR	NA	—	—	—	Annually	GSA	NA	NR	NA	—
Flow Rate (Average Daily)	gpd	400,000	—	Continuous	Flow	NA	NR	NA	—	106,580	—	Continuous	Flow	NA	NR	NA	—
Flow, Maximum during 24 hours	gpd	—	525,000	Continuous	Flow	NA	NR	NA	—	—	252,000	Continuous	Flow	NA	NR	NA	—
Flow (Day of Sampling)	gpd	—	525,000	Weekly	Flow	NA	NR	NA	—	—	252,000	Twice/Month	Flow	NA	NR	NA	—
Fluoranthene	µg/L	—	—	—	—	—	—	—	—	—	—	Annually	DC	NA	NR	NA	—
Fluorene	µg/L	—	—	—	—	—	—	—	—	—	—	Annually	DC	NA	NR	NA	—
Formaldehyde	µg/L	—	—	Quarterly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Iron, Total	µg/L	—	—	Quarterly	DC	NA	NR	NA	—	—	—	Quarterly	DC	NA	NR	NA	—
Lead, Total	µg/L	200	400	Quarterly	DC	500	NR	Grab	BPJ	—	—	Annually	DC	NA	NR	NA	—
m-Toluidine	µg/L	—	—	Monthly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Manganese	mg/L	—	—	Quarterly	DC	NA	NR	NA	—	—	—	—	—	—	—	—	—
Mercury	µg/L	—	—	Quarterly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Mercury	g/day	—	—	Quarterly	DC	NA	NR	NA	—	—	—	—	—	—	—	—	—
Methylbromide	µg/L	—	—	—	—	—	—	—	—	—	—	Annually	DC	NA	NR	NA	—
Methylene chloride	µg/L	—	—	Monthly	Grab	NA	NR	NA	—	—	—	Annually	GSA	NA	NR	NA	—
Methyl tert butyl ether	µg/L	—	—	Monthly	Grab	NA	NR	NA	—	—	—	Annually	GSA	NA	NR	NA	—
Naphthalene	µg/L	—	—	Annually	DC	NA	NR	NA	—	—	—	Annually	DC	NA	NR	NA	—
Nickel	µg/L	330	670	Annually	DC	1000	NR	Grab	WQB	—	—	Annually	DC	NA	NR	NA	—
Nitrate (as N)	µg/L	—	—	Weekly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Nitrite (as N)	µg/L	—	—	Weekly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Nitrobenzene	µg/L	—	—	—	—	—	—	—	—	—	—	Annually	DC	NA	NR	NA	—
Nitrogen, Total	lbs/day	113	—	Weekly	DC	NA	NR	NA	TMDL	75.0	—	Monthly	DC	NA	NR	NA	TMDL
Organic Nitrogen (as N)	µg/L	—	—	Weekly	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Oxygen, Dissolved	µg/L	NA	NA	NR	NA	—	Weekly	Grab	—	NA	NA	NR	NA	—	Monthly	Grab	—
PCBs, Total Aroclors	µg/L	0.00017	0.00034	Monthly	DC	0.00051	NR	Grab	WQB	0.00064	0.000111	Twice/Month	DC	0.00068	NR	Grab	WQB
PCBs, Total Aroclors	g/day	—	—	—	—	—	—	—	—	0.00026	0.000045	Twice/Month	DC	NA	NR	NA	WQB
PCBs, Total Congeners	µg/L	—	—	Monthly	DC	NA	NR	NA	—	0.00084	0.000093	Twice/Month	DC	0.00014	NR	Grab	WQB
PCBs, Total Congeners	g/day	—	—	—	—	—	—	—	—	0.00026	0.000038	Twice/Month	DC	NA	NR	NA	WQB
Pentachlorophenol	µg/L	—	—	Annually	DC	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
pH, Minimum	SU	NA	NA	NR	NA	6.0	Cont	RDM	—	NA	NA	NR	NA	6.5	Cont	Min	WQB
pH, Maximum	SU	NA	NA	NR	NA	9.0	NR	RDM	—	NA	NA	NR	NA	8.0	Cont	Min	WQB
pH, Day of Sampling	SU	NA	NA	NR	NA	6.0-9.0	NR	RDS	—	NA	NA	NR	NA	6.5-8.0	Cont	RDS	WQB
Phenanthrene	µg/L	49	98	Annually	DC	147	NR	Grab	WQB	—	—	Annually	DC	NA	NR	NA	—
Phenol	µg/L	14	24	Monthly	DC	36	NR	Grab	BPJ	—	—	Annually	DC	NA	NR	NA	—
Phosphorus, Total	mg/L	—	—	—	—	—	—	—	—	—	—	Monthly	DC	NA	NR	NA	—
Pyrene	µg/L	—	—	—	—	—	—	—	—	—	—	Annually	DC	NA	NR	NA	—
Silver, Total	µg/L	48	96	Annually	DC	144	NR	Grab	WQB	—	—	Annually	DC	NA	NR	NA	—
Sulfide	mg/L	—	—	—	—	—	—	—	—	—	—	Monthly	DC	NA	NR	NA	—
Tetrachloroethylene	µg/L	—	—	Semiannual	Grab	NA	NR	NA	—	—	—	Annually	DC	NA	NR	NA	—
Toluene	µg/L	24	76	Monthly	Grab	NA	NR	NA	BPJ	—	—	Monthly	DC	NA	NR	NA	—
Total Suspended Solids	µg/L	30	60	Weekly	DC	90	NR	Grab	BPJ	30	60	Monthly	DC	90	NR	NA	BPJ
Total Suspended Solids	g/day	—	—	—	—	—	—	—	—	12.1	24.2	Monthly	DC	NA	NR	NA	BPJ
Trichloroethylene	µg/L	—	—	Annually	Grab	NA	NR	NA	—	—	—	Annually	DC	NA	NR	NA	—
Xylene	µg/L	—	—	Monthly	Grab	NA	NR	NA	—	—	—	Annually	DC	NA	NR	NA	—
Vanadium	µg/L	—	—	Weekly	DC	NA	NR	NA	—	—	—	Annually	DC	NA	NR	NA	—
Vinyl chloride	µg/L	—	—	Monthly	Grab	NA	NR	NA	—	—	—	Monthly	DC	NA	NR	NA	—
Zinc, Total	µg/L	300	600	Quarterly	DC	NA	NR	NA	BPJ	—	—	Annually	DC	NA	NR	NA	—

The 1997 NPDES permit included BPJ limits for many pollutants. The basis for these limits is not clear but appears to originate from some application of the technology-based limits that applied to the discharge when the discharge consisted of effluent generated from CCPSF, Pharmaceutical, and Pesticide manufacturing operations. Specifically, these pollutants are:

- CCPSF: 1,2-Dichlorobenzene, 2-Chlorophenol, 2,4-Dinitrophenol, 4-Nitrophenol, Acenaphthene, Benzene, Chlorobenzene, Chromium, Copper, Cyanide, Di-N-Butylphthalate, Lead, Phenanthrene, Phenol, Toluene, Zinc
- Pharmaceutical: COD
- Pesticides: Dichloran

The basis for the limits for the following pollutants are unknown: 1,4-Dioxane, 3,3-Dimethylbenzidine, Ammonia

The basis for the BPJ limits for many pollutants in the existing permit is unknown/unclear. Additionally, the conditions of the facility and the quality of the effluent now are substantially different than the conditions that existed at the time when the BPJ limits were imposed (i.e., in 1997). Therefore, limits on those pollutants noted to the left are removed. A reasonable potential analysis was performed on each of these pollutants and WQB limits are included in proposed permit for those pollutants which demonstrate reasonable potential to exceed water quality criteria.

ATTACHMENT 10

INTERIM LIMITS: 1,4-DIOXANE

DISTRIBUTION: **LOGNORMAL**

LOG TRANSFORMED MEAN =	4.2713	μ_y
LOG TRANSFORMED VARIANCE =	0.1236	σ_y^2
NUMBER OF SAMPLES IN MONTH =	2	n
E(X) =	76.18	
V(X) =	763	
cv(X) =	0.36	
σ_n^2 =	0.06	
μ_n =	4.30	
σ_n =	0.25	
MAXIMUM DAILY LIMIT =	192	$\mu\text{g/L}$ 95th percentile
AVERAGE MONTHLY LIMIT =	112	$\mu\text{g/L}$ 95th percentile

Data Analysis	
Mean	4.2712808
Standard Error	0.2029503
Median	4.2668963
Mode	#N/A
Standard Deviation	0.3515202
Sample Variance	0.1235665
Kurtosis	#DIV/0!
Skewness	0.0561196
Range	0.7029995
Minimum	3.9219733
Maximum	4.6249728
Sum	12.813842
Count	3

DATE	ug/L	LOG Transformed
Jun 01, 2017	50.5	3.9220
Jun 14, 2017	102	4.6250
Jun 28, 2017	71.3	4.2669

APPENDIX E OF THE TSD

INSTANTANEOUS MAXIMUM LIMIT = 192 $\mu\text{g/L}$

AVERAGE EFFLUENT FLOW =	106,560	gpd
MAXIMUM DAILY LIMIT =	52	g/day
AVERAGE MONTHLY LIMIT =	45	g/day

ATTACHMENT 10

INTERIM LIMITS: AMMONIA

DISTRIBUTION: LOGNORMAL

LOG TRANSFORMED MEAN =	6.5659	μ_x
LOG TRANSFORMED VARIANCE =	1.0852	σ_x^2
NUMBER OF SAMPLES IN MONTH =	2	n
$E(X) = 1222.31$ $V(X) = 2928226$ $cv(X) = 1.40$		
$\sigma_n^2 = 0.68$ $\mu_n = 6.77$ $\sigma_n = 0.83$		
MAXIMUM DAILY LIMIT =	3942 $\mu\text{g/L}$	95th percentile
AVERAGE MONTHLY LIMIT =	3383 $\mu\text{g/L}$	95th percentile

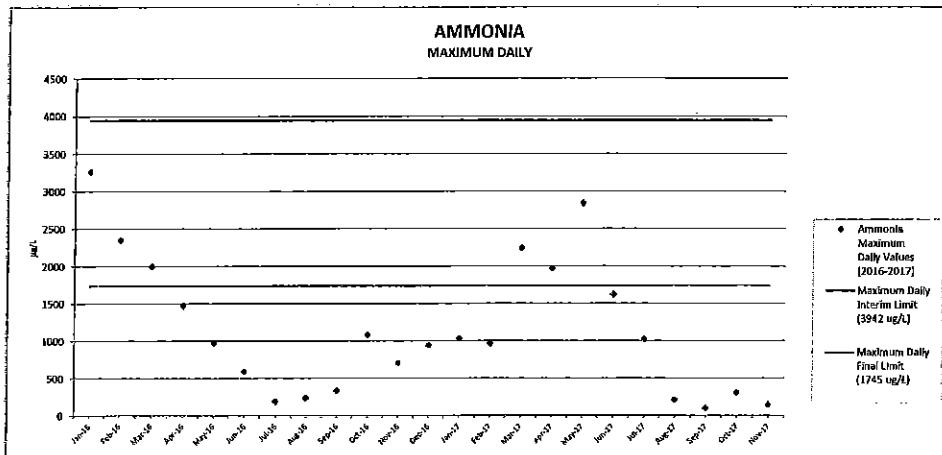
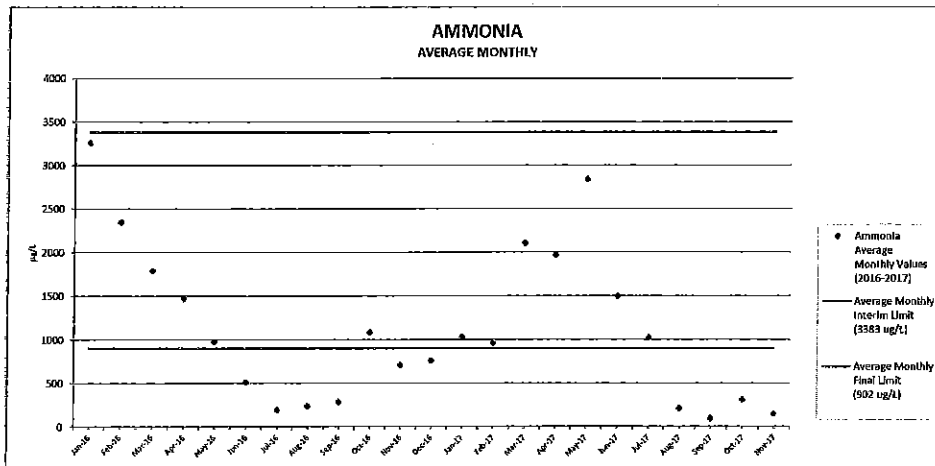
Data Analysis	
Mean	6.565915581
Standard Error	0.17125659
Median	6.866933204
Mode	#N/A
Standard Deviation	1.041713166
Sample Variance	1.08516632
Kurtosis	-0.78455509
Skewness	-0.55411686
Range	3.70745584
Minimum	4.382026635
Maximum	8.089482474
Sum	242.9388765
Count	37

DATE	ug/L	LOG Transformed
Jan 06, 2016	3260	8.0895
Feb 03, 2016	2350	7.7622
Mar 07, 2016	1720	7.4501
Mar 09, 2016	2000	7.6009
Mar 11, 2016	1650	7.4085
Apr 06, 2016	1470	7.2930
May 04, 2016	973	6.8804
Jun 06, 2016	588	6.3767
Jun 08, 2016	364	5.8972
Jun 10, 2016	577	6.3578
Jul 06, 2016	190	5.2470
Aug 03, 2016	236	5.4638
Sep 12, 2016	276	5.6204
Sep 14, 2016	241	5.4848
Sep 16, 2016	335	5.8141
Oct 05, 2016	1080	6.9847
Nov 02, 2016	706	6.5596
Dec 05, 2016	703	6.5554
Dec 07, 2016	632	6.4489
Dec 09, 2016	937	6.8427
Jan 04, 2017	1030	6.9373
Feb 01, 2017	960	6.8669
Mar 06, 2017	1980	7.5909
Mar 08, 2017	2240	7.7142
Mar 10, 2017	2110	7.6544
Apr 05, 2017	1970	7.5858
May 03, 2017	2840	7.9516
Jun 05, 2017	1580	7.3852
Jun 07, 2017	1620	7.3902
Jun 09, 2017	1300	7.1701
Jul 05, 2017	1020	6.9276
Aug 02, 2017	211	5.3519
Sep 11, 2017	96	4.5643
Sep 13, 2017	80	4.3820
Sep 15, 2017	102	4.6250
Oct 04, 2017	309	5.7333
Nov 01, 2017	147	4.9904

APPENDIX E OF THE TSD

INSTANTANEOUS MAXIMUM LIMIT = 5914 $\mu\text{g/L}$

AVERAGE EFFLUENT FLOW =	106,560 gpd
MAXIMUM DAILY LIMIT =	1591 g/day
AVERAGE MONTHLY LIMIT =	1366 g/day



ATTACHMENT 10

INTERIM LIMITS: CYANIDE

DISTRIBUTION: DELTA-LOGNORMAL

LOG TRANSFORMED MEAN =	2.0709	μ_y
LOG TRANSFORMED VARIANCE =	0.5383	σ_y^2
NUMBER OF SAMPLES IN MONTH =	2	n
$k =$	114	
$r =$	54	
$k-r =$	60	
$D =$	10	
$\delta =$	0.47368421	
MDL $\phi^2 =$	0.9050	95th percentile
$z^* =$	1.31	
AML $\phi^2 =$	0.9050	95th percentile
$z^* =$	1.31	
$E(X^*) =$	10.20	
$V(X^*) =$	30	
$cv(X^*) =$	0.54	
$\sigma_n^2 =$	0.17	
$\mu_n =$	2.24	
$\sigma_n =$	0.41	
$A =$	0.24	
$B =$	-0.2752379	
$C =$	0.56435	
MAXIMUM DAILY LIMIT =	21	µg/L
AVERAGE MONTHLY LIMIT =	16	µg/L

APPENDIX E OF THE TSD

INSTANTANEOUS MAXIMUM LIMIT = 31 µg/L

AVERAGE EFFLUENT FLOW = 106,560 gpd

MAXIMUM DAILY LIMIT = 8.4 g/day
 AVERAGE MONTHLY LIMIT = 6.5 g/day

Data Analysis	
Mean	2.070891378
Standard Error	0.09454458
Median	2.079441642
Mode	1.098612289
Standard Deviation	0.732339165
Sample Variance	0.538320653
Kurtosis	-1.261618078
Skewness	0.043468916
Range	2.197224577
Minimum	1.098612289
Maximum	3.295836666
Sum	124.2534827
Count	60

DATE	µg/L	LOG Transformed	Detection Limit
January 6, 2016	16	2.7728	
January 13, 2016	23	3.1355	
January 20, 2016	19	2.9444	
January 27, 2016	17	2.8332	
February 3, 2016	19	2.9444	
February 10, 2016	21	3.0445	
February 17, 2016	23	3.1355	
February 26, 2016	26	3.2581	
March 2, 2016	27	3.2958	
March 7, 2016	28	3.2581	
March 9, 2016	26	3.2581	
March 11, 2016	21	3.0445	
March 16, 2016	21	3.0445	
March 23, 2016	7	1.9459	
March 30, 2016	8	2.0794	
April 6, 2016	13	2.5649	
April 13, 2016	7	1.9459	
April 20, 2016	0		10
April 27, 2016	0		10
May 4, 2016	0		10
May 11, 2016	0		10
May 18, 2016	0		10
May 25, 2016	3	1.0986	
June 1, 2016	0		10
June 6, 2016	0		10
June 8, 2016	0		10
June 10, 2016	0		10
June 15, 2016	0		10
June 22, 2016	12	2.4849	
June 29, 2016	0		10
July 6, 2016	0		10
July 13, 2016	0		10
July 20, 2016	5	1.6084	
July 27, 2016	11	2.3979	
August 3, 2016	5	1.6084	
August 10, 2016	10	2.3026	
August 17, 2016	0		10
August 24, 2016	5	1.6084	
August 31, 2016	0		10
September 7, 2016	0		10
September 12, 2016	3	1.0986	
September 14, 2016	0		10
September 16, 2016	0		10
September 21, 2016	0		10
September 28, 2016	15	2.7081	
October 5, 2016	0		10
October 12, 2016	5	1.6084	
October 19, 2016	7	1.9459	
October 26, 2016	3	1.0986	
November 2, 2016	14	2.6391	
November 9, 2016	11	2.3979	
November 18, 2016	0		10
November 22, 2016	3	1.0986	
November 30, 2016	8	2.0794	
December 5, 2016	0		10
December 7, 2016	0		10
December 9, 2016	3	1.0986	
December 14, 2016	4	1.3863	
December 21, 2016	3	1.0986	
December 27, 2016	3	1.0986	
January 4, 2017	0		10
January 11, 2017	4	1.3863	
January 18, 2017	3	1.0986	
January 25, 2017	6	1.6084	
February 1, 2017	8	2.0794	
February 8, 2017	0		10
February 15, 2017	8	2.0794	
February 22, 2017	14	2.6391	
March 1, 2017	3	1.0986	
March 6, 2017	10	2.3026	
March 8, 2017	0		10
March 10, 2017	0		10
March 15, 2017	0		10
March 22, 2017	8	2.0794	
March 29, 2017	3	1.0986	
April 5, 2017	0		10
April 12, 2017	0		10
April 19, 2017	10	2.3026	
April 26, 2017	14	2.6391	
May 3, 2017	9	2.1972	
May 10, 2017	6	1.7918	
May 19, 2017	0		10
May 24, 2017	4	1.3863	
May 24, 2017	3	1.0986	
June 5, 2017	9	2.1972	
June 7, 2017	11	2.3979	
June 9, 2017	10	2.3026	
June 14, 2017	9	2.1972	
June 21, 2017	3	1.0986	
June 28, 2017	0		10
July 5, 2017	0		10
July 12, 2017	0		10
July 19, 2017	0		10
July 26, 2017	0		10
August 2, 2017	0		10
August 9, 2017	0		10
August 16, 2017	3	1.0986	
August 23, 2017	0		10
August 30, 2017	0		10
September 5, 2017	0		10
September 11, 2017	0		10
September 13, 2017	0		10
September 15, 2017	0		10
September 20, 2017	0		10
September 27, 2017	0		10
October 4, 2017	0		10
October 11, 2017	0		10
October 18, 2017	0		10
October 25, 2017	0		10
November 1, 2017	0		10
November 8, 2017	0		10
November 15, 2017	3	1.0986	
November 22, 2017	0		10
November 29, 2017	0		10

