APPENDIX A

FACILITY INFORMATION

NPDES Permit Rating Worksheet
USGS Map
Site/Flow Diagram
Site Visit Memo
DMR Data

NPDES PERMIT RATING WORK SHEET

☐ Regular Addition
☐ DiscretionaryAddition
☐ Score change, but no status change
☐ Deletion

NPDES NO. VA0000299

Facility Name: Celanese Acetate LLC

City: Narrows

Receiving Water: New River

Reach Number: _____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?
1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate

☐ YES; score is 600 (stop here) X NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

☐ YES; score is 700 (stop here)
X NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: _____ Primary SIC Code: 2821 Other SIC Codes: 2823,4911, 4941, 4952, 3471
Industrial Subcategory Code: 002 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	15	☐ 7.	7	35
☐ 1.	1	5	☐ 4.	4	20	☐ 8.	8	40
☐ 2.	2	10	☐ 5.	5	25	X 9.	9	45
			☐ 6.	6	30	☐ 10.	10	50

Code Number Checked: 9

Total Points Factor 1: 45

FACTOR 2: Flow/Stream Flow Volume (*Complete either Section A or Section B; check only one)*

Section A ☐ Wastewater Flow Only Considered

Wastewater Type (See Instructions)		Code	Points
Type I: Flow < 5 MGD	☐	11	0
Flow 5 to 10 MGD	☐	12	10
Flow > 10 to 50 MGD	☐	13	20
Flow > 50 MGD	☐	14	30
Type II: Flow < 1 MGD	☐	21	10
Flow 1 to 5 MGD	☐	22	20
Flow > 5 to 10 MGD	☐	23	30
Flow > 10 MGD	☐	24	50
Type III: Flow < 1 MGD	☐	31	0
Flow 1 to 5 MGD	☐	32	10
Flow > 5 to 10 MGD	☐	33	20
Flow > 10 MGD	X	34	30

Section B ☐ Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of instream Wastewater Concentration at Receiving Stream Low Flow		Code	Points
Type I/III:	< 10 %	☐	41	0
	10 % to < 50 %	☐	42	10
	> 50 %	☐	43	20
Type II:	< 10 %	☐	51	0
	10 % to <50 %	☐	52	20
	> 50 %	☐	53	30

Code Checked from Section A or B: 34
Total Points Factor 2: 30

FACTOR 3: Conventional Pollutants **NPDES NO: VA0000299**
(only when limited by the permit)

A. Oxygen Demanding Pollutant: (check one) ☐ BOD ☐ COD ☐ Other:_____ NA

			Code	*Points*
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	X	100 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: __2_

Points Scored:__5__

B. Total Suspended Solids (TSS)

			Code	*Points*
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	☐	100 to 1000 lbs/day	2	5
	X	> 1000 to 5000 lbs/day	3	15
	☐	> 5000 lbs/day	4	20

Code Checked: __3___

Points Scored: __15___

C. Nitrogen Pollutant: (check one) X Ammonia ☐ Other: _____ NA

		Nitrogen Equivalent	*Code*	*Points*
Permit Limits: (check one)	X	< 300 lbs/day	1	0
	☐	300 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: __1___

Points Scored:__0___

Total Points Factor 3: _20__

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

X YES (If yes, check toxicity potential number below)

☐ NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column ☐ check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	0	☐ 7.	7	15
☐ 1.	1	0	☐ 4.	4	0	☐ 8.	8	20
☐ 2.	2	0	☐ 5.	5	5	X 9.	9	25
			☐ 6.	6	10	☐ 10.	10	30

Code Number Checked: __9__

Total Points Factor 4:__25___

FACTOR 5: Water Quality Factors **NPDES NO. VA0000299**

A. Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:

		Code	Points
X	Yes	1	10
☐	No	2	0

B. Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?

		Code	Points
X	Yes	1	0
☐	No	2	5

C. Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?

		Code	Points
X	Yes	1	10
☐	No	2	0

Code Number Checked: A 1 B 1 C 1

Points Factor 5: A 10 + B 0 + C 10 = 20 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. Base Score: Enter flow code here (from Factor 2): 51 *Enter the multiplication factor that corresponds to the flow code:* 0.1

Check appropriate facility HPRI Code (from PCS):

	HPRI#	*Code*	*HPRI Score*
☐	1	1	20
☐	2	2	0
☐	3	3	30
x	4	4	0
☐	5	5	20

Flow Code	*Multiplication Factor*
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

HPRI code checked: ___

Base Score: (HPRI Score) 0 X (Multiplication Factor) 0.1 = 0 (TOTAL POINTS)

B. Additional Points ☐ NEP Program
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

	Code	Points
☐ Yes	1	10
☐ No	2	0

C. Additional Points ☐ Great Lakes Area of Concern
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

	Code	Points
☐ Yes	1	10
☐ No	2	0

Code Number Checked: A 4 B NA C NA

Points Factor 6: A 0 + B 0 + C 0 = 0 TOTAL

SCORE SUMMARY NPDES NO. VA0000299

Factor	Description	Total Points
1	Toxic Pollutant Potential	45
2	Flows/Streamflow Volume	30
3	Conventional Pollutants	20
4	Public Health Impacts	25
5	Water Quality Factors	20
6	Proximity to Near Coastal Waters	0
	TOTAL (Factors 1 through 6)	140

S1. Is the total score equal to or greater than 80? X Yes (Facility is a major) ☐ No

S2. If the answer to the above questions is no, would you like this facility to be discretionary major?

☐ No

☐ Yes (Add 500 points to the above score and provide reason below:

Reason:

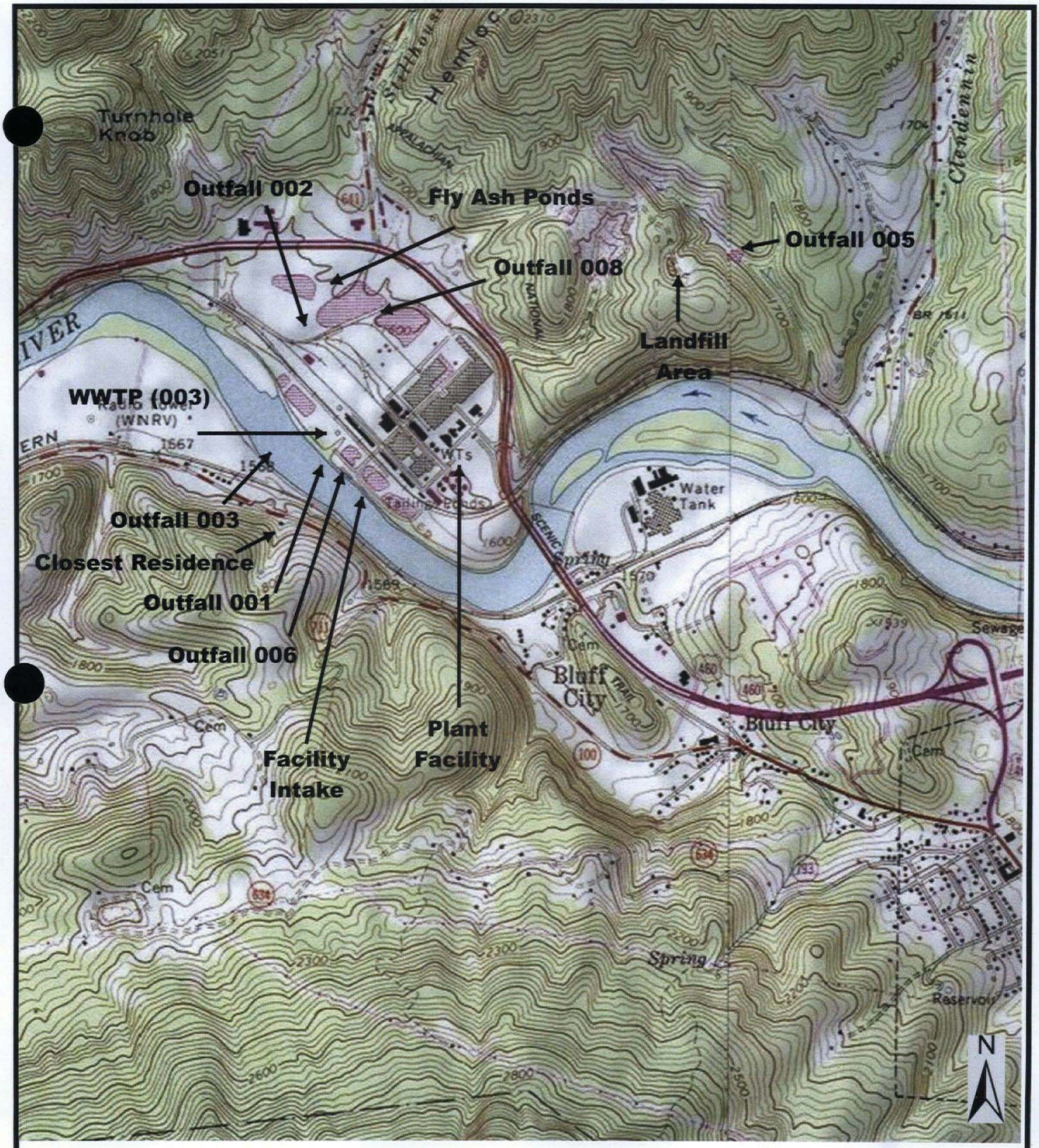
NEW SCORE: 140

OLD SCORE: 140

Lewis J. Pillis
Permit Reviewer's Name

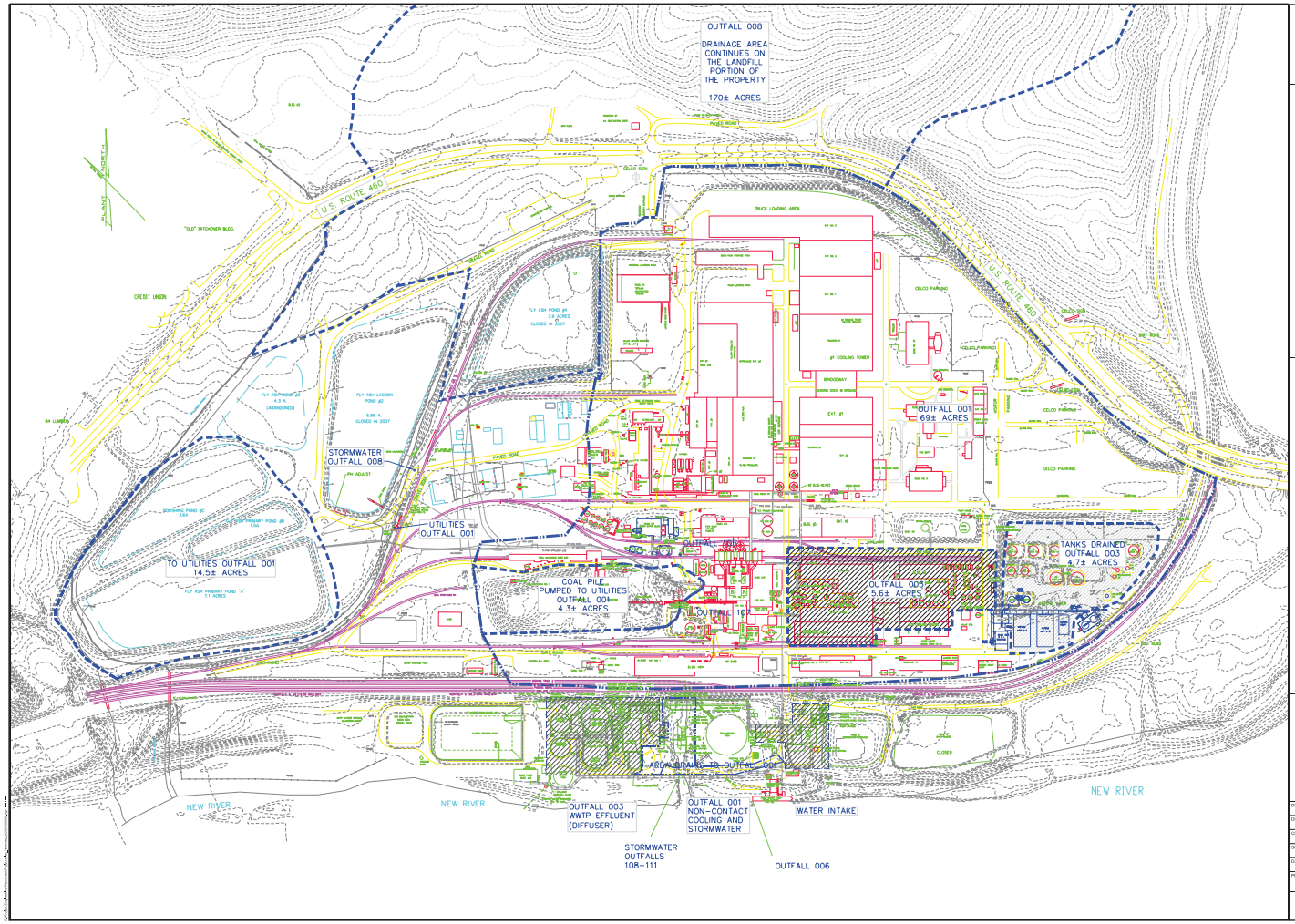
(540) 562-6789
Phone Number

February 13, 2013
Date



CH2MHILL

Figure 1: Site Map
VPDES permit VA0000299 Renewal Application Celanese Acetate LLC
Narrows, VA



Draper Aden Associates
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Hampton Roads, VA

PLANT - DRAINAGE AREAS, INTAKE & OUTFALLS
CELCO NARROWS PLANT
NARROWS, VIRGINIA

REVISIONS

DESIGNED BY:
DRAWN BY: SAE/JFF
CHECKED BY: CSM
SCALE: 1" = 150'
DATE: DECEMBER 18, 2007
PROJECT NUMBER: B07153-01

3

REV NO	CRD	WO OR EST NO	REVISIONS	DRWN	CHKD	APPVD	APPVD	APPVD	APPVD	DATE
1			REVISED PER MARKUP	MTB	SM					8/29/12

DWG NO	REFERENCE DRAWINGS

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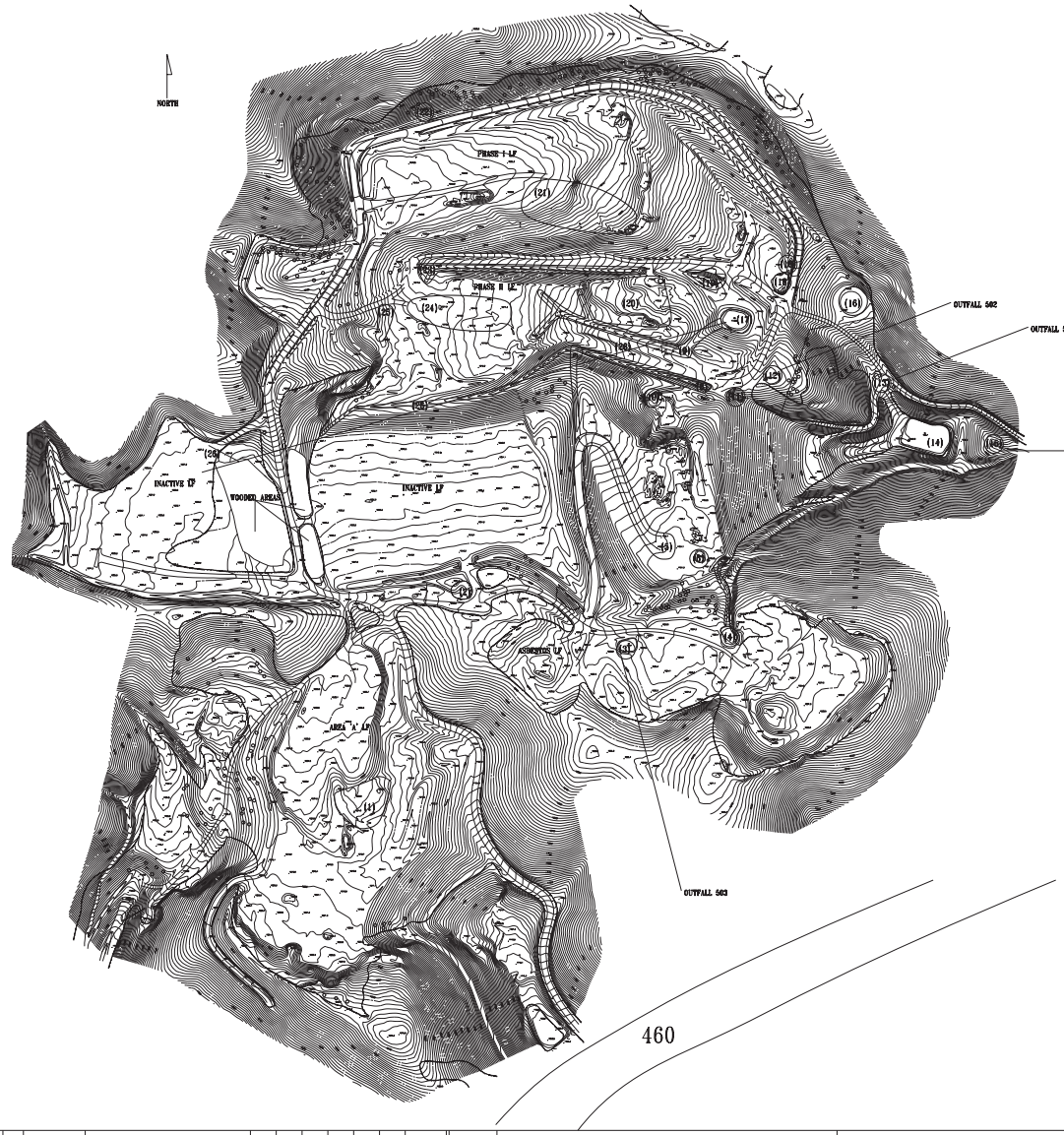
Celanese
Acetate

CELCO PLANT
NARROWS, VIRGINIA

RFA/WO		SCALE: 1"=150'	PLANT GEN.
DRWN: DAA	DATE: 12/19/07	PLOT SCALE: 1=1	GEN.
CHKD	DATE	APPVD	DATE
APPVD	DATE	APPVD	DATE
APPVD	DATE	APPVD	DATE
		ENG MANAGER	DATE

PLOT PLANS
PLANT - DRAINAGE AREAS, INTAKE & OUTFALLS
STORMWATER POLLUTION PREVENTION PLAN

N 0-CD-55958-1



LEGEND

(1) - ACTIVE STUMP BURIAL AREA
(2) - SALT PILE (TARPED)
(3) - SEDIMENT TRAP/OUTFALL 503
(4) - SEDIMENT TRAP
(5) - NEW ROAD
(6) - SEDIMENT TRAP
(7) - RIPRAP LINED DITCH
(8) - RIPRAP LINED & 1 SILT FENCE
(9) - RIPRAP LINED & FABRIC LINED DITCH
(10) - SEDIMENT TRAP INSIDE ASH PILE
(11) - SEDIMENT TRAP OUTSIDE ASH PILE
(12) - OUTFALL 502
(13) - OUTFALL 501
(14) - STORMWATER BASIN
(15) - OUTFALL 005
(16) - LEACHATE TANK
(17) - SEDIMENT POND
(18) - (2) SILT FENCES INSIDE DITCH
(19) - SEDIMENT TRAP
(20) - ACTIVE BORROW AREA
(21) - TOP SOIL & VEGETATION
(22) - RIPRAP LINED DITCHES
(23) - RIPRAP LINED
(24) - OLD BORROW AREA, VEGETATED
(25) - NW DIVERSION BERM
(26) - OLD STORMWATER DRAIN LINE (BELOW GRADE) FOR INACTIVE ASH LANDFILL

NOTES

(A.) - FEATURES LOCATED BASED ON 2012 AERIAL PHOTOGRAPH
(B.) - FEATURE 26 (OLD STORMWATER DRAIN LINE) COMBINES WITH FLOW FROM PHASE I LANDFILL STORMWATER LINE. COMBINED FLOWS ENTER SEDIMENT POND (FEATURE #17)

REV NO	ORD	NO OR EST NO	REVISIONS	DRWN	CHKD	APPVD	APPVD	APPVD	APPVD	DATE
4			ADDED ADDITIONAL LANDFILL EROSION/SEDIMENT CONTROLS	BRB						5/9/19
3			REPLACED LANDFILL AREA WITH AVOCE ENGINEERING DRAWING & CONTOURS	BRB						5/9/19
2			REMOVED PROPOSED ASH LANDFILL AREA BORROW	BRB						5/9/19
1			ADDED SEDIMENT POND LOCATION	JRB						5/19/12

DWG NO

REFERENCE DRAWINGS

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Celanese
A o E T A S

CELCO PLANT
NARROWS, VIRGINIA

RFA/WO
DRWN DAA 12/19/07
CHKD DATE
APPVD DATE
APPVD DATE
SCALE 1"=1000'
PLOT SCALE 1=1
APPVD DATE
APPVD DATE
APPVD DATE
PLANT GEN.
GEN.

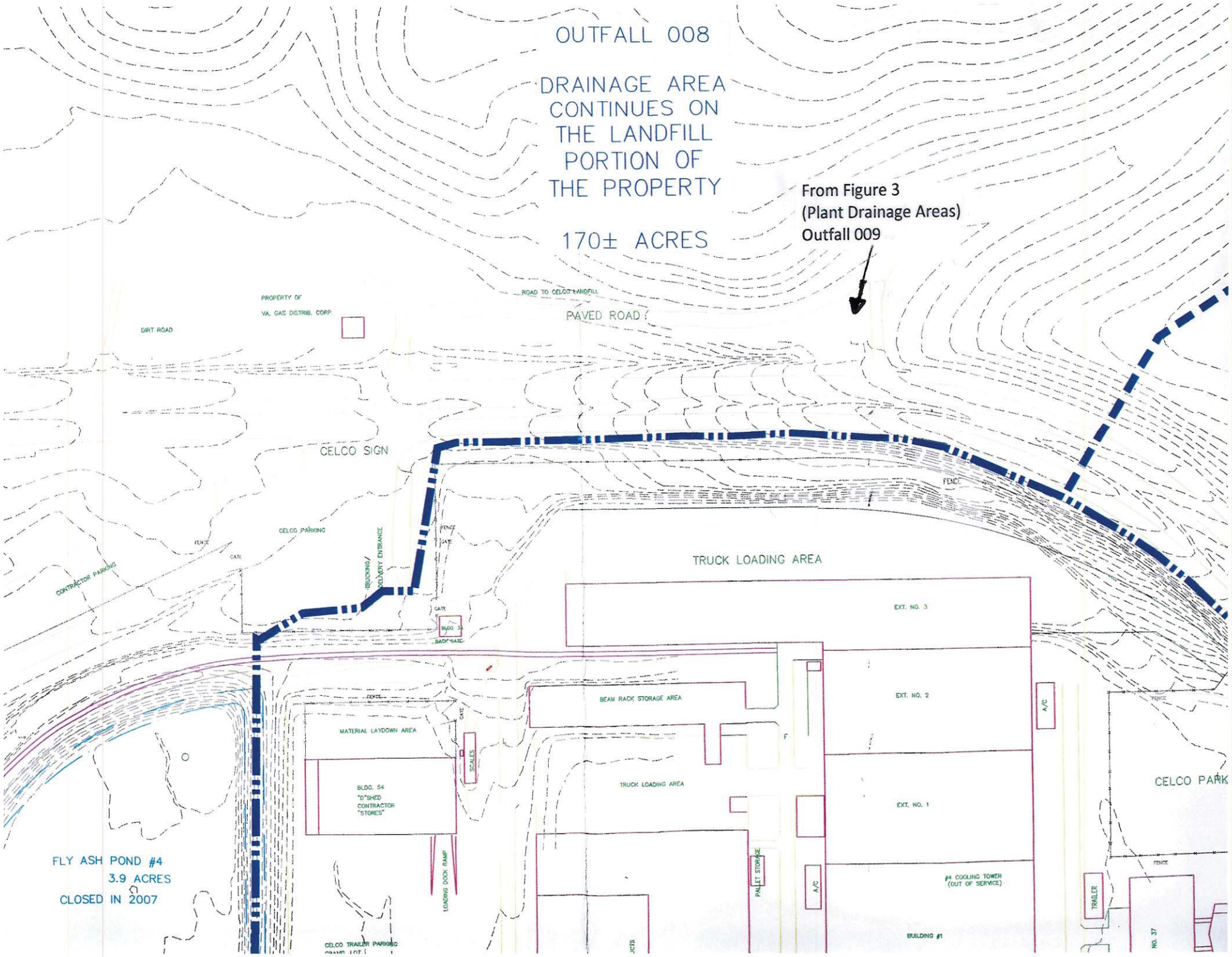
DRAFT
PLOT PLANS

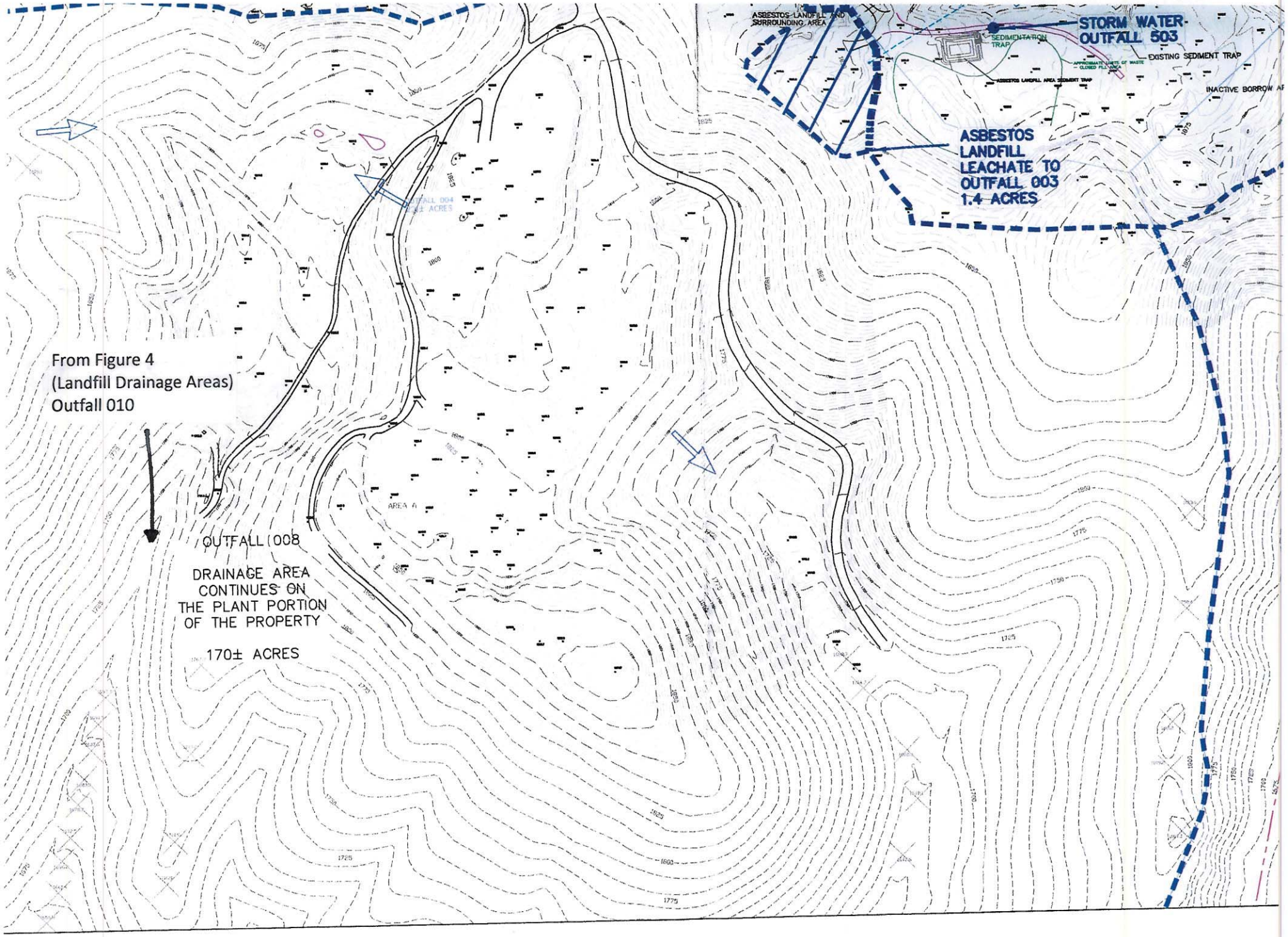
LANDFILL AREA
STORMWATER POLLUTION PREVENTION PLAN
EROSION/SEDIMENT CONTROLS

ENG MANAGER DATE

N 0-CD-55961-4

DATE ISSUED: 3/19/13


OUTFALL 008
DRAINAGE AREA CONTINUES ON THE LANDFILL PORTION OF THE PROPERTY
170± ACRES
From Figure 3 (Plant Drainage Areas) Outfall 009
ROAD TO CELCO LANDFILL
PAVED ROAD
PROPERTY OF VA. GAS DISTRIB. CORP.
DIRT ROAD
CELCO SIGN
CELCO PARKING
CONTRACTOR PARKING
TRUCKING/ DELIVERY ENTRANCE
FENCE
GATE
BACK GATE
TRUCK LOADING AREA
EXT. NO. 3
EXT. NO. 2
EXT. NO. 1
BEAM RACK STORAGE AREA
MATERIAL LAYDOWN AREA
SCALES
BLDG. 54 "D"SHED CONTRACTOR "STORES"
LOADING DOCK RAMP
PALLET STORAGE
A/C
#4 COOLING TOWER (OUT OF SERVICE)
BUILDING #1
TRAILER
NO. 37
CELCO PARK
CELCO TRAILER PARKING
FLY ASH POND #4
3.9 ACRES
CLOSED IN 2007


ASBESTOS LANDFILL AND SURROUNDING AREA
STORM WATER-OUTFALL 503
SEDIMENTATION TRAP
EXISTING SEDIMENT TRAP
ASBESTOS LANDFILL AREA SEDIMENT TRAP
INACTIVE BORROW AR
ASBESTOS LANDFILL LEACHATE TO OUTFALL 003 1.4 ACRES
OUTFALL 004
AREA 4
From Figure 4
(Landfill Drainage Areas)
Outfall 010
OUTFALL 008
DRAINAGE AREA CONTINUES ON THE PLANT PORTION OF THE PROPERTY
170± ACRES

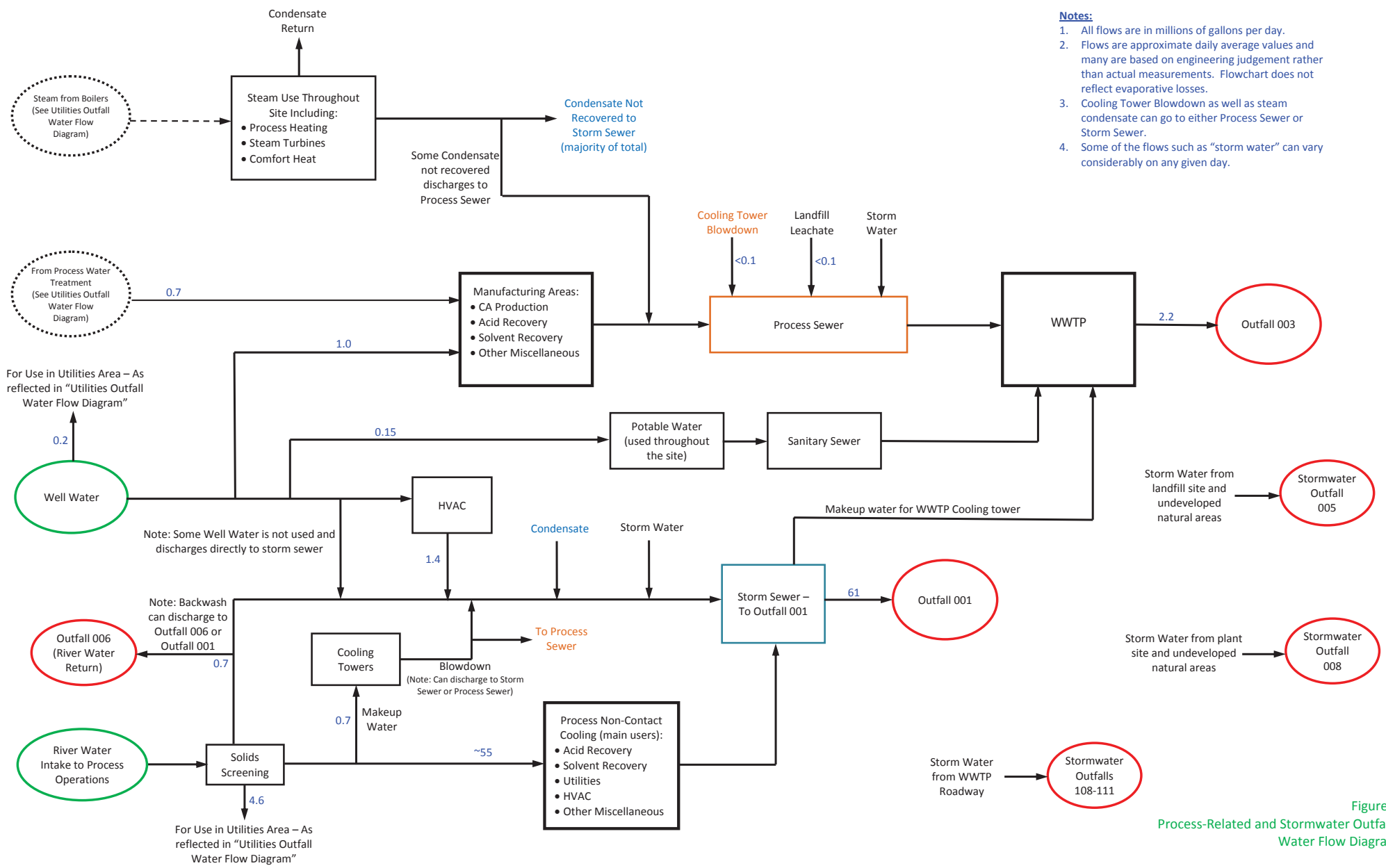
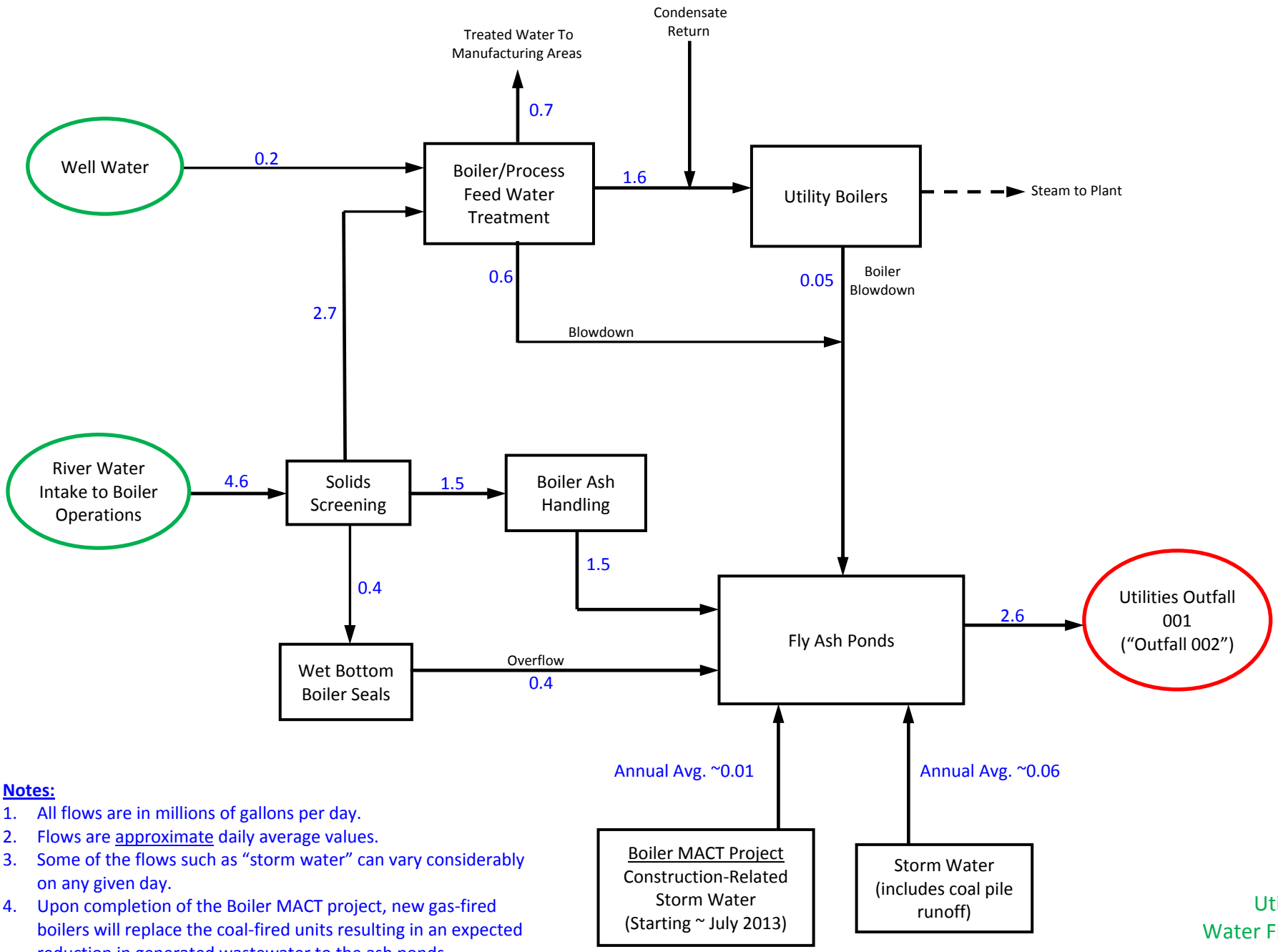


Figure 2
Process-Related and Stormwater Outfalls Water Flow Diagram



Notes:

1. All flows are in millions of gallons per day.
2. Flows are approximate daily average values.
3. Some of the flows such as "storm water" can vary considerably on any given day.
4. Upon completion of the Boiler MACT project, new gas-fired boilers will replace the coal-fired units resulting in an expected reduction in generated wastewater to the ash ponds.

Utilities Outfall
Water Flow Diagram

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit, Celanese Acetate, Narrows, VA0000299

TO: File

FROM: Lewis Pillis

DATE: February 27, 2013

COPIES: file

Yesterday, I toured the Celanese landfills and outdoor areas around the manufacturing plant. Ken Hausle and Andy Hetz of Celanese, and consultants Laura Reid of CH2M Hill and Susie Myers were also present. We met with Eric Johnson, Chris Hylemon, and Rick McNinney after seeing the site to discuss plans to consider different treatment options at 005. Richard Mitchell made a brief presentation of the fuel conversion of the plant boilers. The current 7 coal fired boilers will be replaced with 6 natural gas boilers. Capacity will be increased from 1.4 to 2.4 billion BTU/h (410 to 702 Megawatts). Construction is expected to begin in July 2013. It has not been decided whether ash will be removed from the ash ponds after the conversion, but Celanese will keep the ponds to treat low volume waste waters and some storm water. Storm water from the new boiler construction area will be routed to the ash ponds. Storm water that has been contaminated by ash will be routed to the WWTP.

Landfill drainage patterns have changed as new cells are added. A new sediment trap has been added where new ash is being landfilled. A water truck was wetting a small flat fill area, but the larger, steeper working face could not be accessed by a vehicle. Consequently, ash dust was being blown and was observed in vegetated areas around the working area. According to Celanese, a new E&S Control plan has not been submitted to the County for this work. The trap's surface area is estimated to be 50 sq.ft. and does not flow to a internal outfall 502, currently monitored for TSS. It was stated that a dirt road in the borrow area was contributing too many solids to the storm water basin and was going to be eliminated. A large riprap lined ditch had been added to the outfall 502. Internal outfall 502 does not just monitor the older sediment trap, but monitors a larger area. This internal area is not outlined on the site map submitted with the permit application.

The contaminated spring was flowing at over 10 gpm and had iron deposits in it. There is concrete area, possibly for a change in piping direction on the terrace that was a former landfill road. During the meeting after the site tour, it was noted that a constructed wetlands could be sited in this area.

The asbestos landfill area was well vegetated and cattails were growing in the sediment trap that serves this area (outfall 503). Rip rap in road ditches, adjacent to the process waste landfill 505, was in good condition. There was no evidence of sediment settling in these ditches, probably due to the grade. CDD waste and trash is placed in this landfill. The storm water pond contained water. It was stated that water was about 3 feet deep and had held water since some of the holes in the riser had been plugged. The receiving stream was green near the outfall pipe and was flowing. It was stated that sometimes further

downstream there was no flow.

Vegetation around the CPSL area was good condition. There was no flow in the creek bed below the CPSL. Near Rt 460, the ditch was eroded and bare soil was visible. A flood earlier this year in January 2013 was said to be the cause of erosion. [Celanese rainfall data indicates that there was two inches of rain on 1/30/13]. Vegetative landfill, waste permit no. 207, is located on the other side of this hill. Stumps were present waiting to be buried. Rolloffs that have contained various are stored on the top of this area. No structural BMPs are present in this drainage area. Drainage flows to outfall 008. Sediment was recently removed and rip rap added in the ditch just above outfall 008, due to a high TSS sample result. Pond 2 was about half full of water. Coal ash was present at the influent end of both the primary settling ponds.

In the cellulose acetate [CA] flake manufacturing area, small amounts of CA flake were present on the ground nearly everywhere. It is light weight and gets blown around. Surface drains in the flake area are fitted with drain guards, a geotextile fabric with a sock. These are inspected monthly and replaced as needed, which is usually every 6-8 months. Drains further upgradient do not have drain guards, but the drain outlet is elevated off the drain bottom, so that heavy solids, like gravel, settle out. These are cleaned as needed.

Coal has been consolidated into the plant side of the coal pile area, to make room for the natural gas boilers. Surface drains for internal outfalls adjacent to the coal pile, 105 and 107, are covered with a flexible mat and sand bags. According to Celanese personnel, these should be water tight and there is no way to visually inspect them to see if storm water leaks into them.

While the WWTP was not toured, it is noted that sludge from the WWTP may be landfilled or sent to Royal Oak Farm for composting.

M E M O R A N D U M

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit, Celanese Acetate, Narrows, VA0000299

TO: File

FROM: Lewis Pillis

DATE: March 8, 2013

COPIES: file

Today, Jay Roberts and I visited the Celanese landfills to locate new storm water outfalls, since it has been determined that outfall 008 was located in a stream. Ken Hausle and Chris Hylemon of Celanese, were also present.

An outfall was located just below where runoff from the CPSL and runoff from a adjacent road meet. This area contains large riprap, that is probably covering the stream flow. There was flow in the creek at one location, but disappeared underground. The stream bed was heavily eroded below the CPSL. Near Rt 460, the ditch gradually gave way to a vegetated area until no stream or ditch was evident. The ground was soft in the corner of the adjacent field, where storm water had settled. There was not a direct above ground connection between the stream and the Rt 460 road ditch. Water was seen in the 460 road ditch in this area, but not in the road ditch further upgradient.

Another storm water outfall was located just before the landfill main access road enters Rt 460. Further upgradient, a probable wetlands area was toured. This was upgradient of an abandoned sediment trap. Sediment from a failed road culvert pipe was causing excessive erosion, and depositing sediment in the wetlands area.

Internal outfalls 109-111 were observed. Sediment and dark colored material was visible behind sandbags placed in the outfalls and in the outfall structure of outfall 109. A significant amount of waste had been tracked from the drying pad on to the road near the sludge press buildings. There was also dark colored material built up behind a small asphalt diversion in the road. It appeared that the dark colored material had overtopped the small diversion. It was noted that the site map was not correct, since it showed that storm water from this area would be diverted to the WWTP. The diversion must be higher in order to divert this storm water away from outfalls 109-111.

Appendix K-1
List of Potential Cooling Tower Additives
Celanese Acetate, LLC, Narrows, Virginia

Product Name	Application Point	Description	Schedule of Additive Usage	Approximate Concentration in Blowdown, ppm
GE Continuum AEC 3136[1]	Celanese HVAC Towers 1, 2, 4 (for HVAC, Solvent Recovery, Air Compressors)	Water Based Corrosion Inhibitor/Deposit Control Agent	As needed to maintain levels	<100 ppm as product
ChemTreat CL 4898	HVAC Towers 5, 6 (for HVAC, Solvent Recovery, Air Compressors); CA Cottonhouse Humidity Control Tower (currently OOS); Ketene Cooling Tower; WWTP Cooling Tower	Water Based Corrosion Inhibitor/Deposit Control Agent	As needed to maintain levels	<100 ppm as product
GE Spectrus NX1100/1103[1]	Celanese HVAC Towers 1, 4; WWTP Cooling Tower	Biocide	Daily or monthly, or as needed	50 ppm
ChemTreat CL 2156	HVAC Towers 5, 6; Ketene Cooling Tower	Non-Oxidizing Biocide, Isothiazolin (1.15,0.35%)	1 - 3 times per week	<100 ppm when dosed
Chemtreat CL 40/41	Celanese HVAC Towers 4, 5, 6; Ketene cooling tower	Oxidizing Biocide Activator, 40% Sodium Bromide	Continuous	0.15-0.25 ppm as residual bromine
FO 623	All Celanese Cooling Towers as Needed	Anitfoaming Agent	As needed to prevent foaming	<50 ppm as product
Crown Hydrex 2212 (formerly named CG505)	CCR Towers - Noncontact Cooling Water	Yellow Metal Corrosion Inhibitor, Tolytriazole	Continuous	<100 ppm as product
Crown Hydrex 2253 (formerly named CLG-9)	CCR Towers - Noncontact Cooling Water	Corrosion and Scale Inhibitor	Continuous	<100 ppm as product
Crown Hydrex 2973 (formerly named Defoam S)	CCR Towers - Noncontact Cooling Water	Silicone Antifoam	1 - 3 Times Per Week as Needed	<50 ppm when dosed
Crown Hydrex 2252 (formerly named DTEA II)	CCR Towers - Noncontact Cooling Water	Organic Dispersant	1 - 3 Times Per Week as Needed	<100 ppm when dosed
Bleach	All Celanese Towers - Noncontact Cooling Water	Oxidizing Biocide, 12.5-15% NaOCl	3 Times per day to continuous	0.5-1.0 ppm as residual chlorine

[1] Purchase of GE Products was discontinued; however, these products will continue to be used until all remaining stock is consumed.

Appendix G-1
List of Pesticides/Herbicides
Celanese Acetate, LLC, Narrows, Virginia

Product Name	Description	Manner & Frequency of Application
Talstar® Professional Insecticide	Insecticide	Used inside buildings and outside to control spiders. Not to be used anywhere outdoors that could drain to a storm drain. Applied with sprayer as needed.
Prescription Treatment® brand ULD® BP-300 Contact Insecticide Formula 1	Insecticide	Fogger used only inside the Tin Shop. Applied using fogging machine as needed for flies, spiders.
Mother Earth D Pest Control Dust	Insecticide	Applied by hand or power duster as needed. To control various crawling insects.
DuPont Advion Cockraoch Gel Bait	Insecticide	Applied to cracks & crevices in areas of roach activity, as needed. For indoor use only.
JetStream Water-based Contact Insecticide	Insecticide	Applied as a fogging agent indoors only to control flies and spiders.
Kicker®	Insecticide	Applied inside or outside using a sprayer or fogger to control spiders, fleas.
DuPont Advion Ant Gel bait	Insecticide	Applied in cracks & crevices in areas of ant activity, as needed.
Prentox® ExciteR ™	Insecticide	Applied inside or outside using a sprayer or fogger to control spiders, fleas.
Generation ™ Blue Max Mini Blocks	Rodenticide	For exterior use. Inside tamper resistant bait station. Left in place as needed. Kept away from storm drains.
Zoecon Gentrol® IGR Concentrate	Insecticide	Applied with sprayer to control fleas. Kept away from storm drains
MAXFORCE® FC Professional Insect Conrol® Ant Killer Bait Gel	Insecticide	Applied in cracks & crevices in areas of ant activity, as needed. Kept away from storm drains
Prescription Treatment® brand Avert® Cockroach Gel Bait Formula 3	Insecticide	Applied to cracks & crevices in areas of roach activity, as needed. For indoor use only. Kept away from storm drains
Prescription Treatment® brand ADVANCE™ Cockroach Gel Bait Reservoir	Insecticide	Applied to cracks & crevices in areas of roach activity, as needed. For indoor use only. Kept away from storm drains
MAXFORCE® Professional Insect Control® Fine Granule Insect Bait	Insecticide	Applied to sticky traps as an attractant on building exteriors where ants are foraging. Kept away from storm drains
MAXFORCE® Professional Insect Control® Ant Bait Stations	Insecticide	Used inside buildings. Closed stations.
Prescription Treatment® brand WASP-FREEZE® Wast & Hornet Killer Formula 1	Insecticide	Aerosol can used to treat bees nests. Use as needed. Kept away from storm drains.
Prescription Treatment® brand 565 PLUS XLO® Formula 2	Insecticide	Aerosol can to be used as a crack and crevice treatment for roaches. Kept away from storm drains
Prescription Treatment® brand ULD® BP-100 Contact Insecticide Formula 1	Insecticide	ULD fogger used inside or outside near furnaces (only when no wind). Use as needed for spiders.

Appendix G-1
List of Pesticides/Herbicides
Celanese Acetate, LLC, Narrows, Virginia

Product Name	Description	Manner & Frequency of Application
Phantom® Insecticide	Insecticide	Air sprayer to treat for roaches and ants, as needed. Kept away from storm drains
Prescription Treatment® branch Cy-Kick® CS Pressurized Crack & Crevice Residual	Insecticide	Applied using an air sprayer to various insects. Used both Indoors and outdoors, as needed. Kept away from storm drains
Crossbow* Herbicide	Herbicide	Woody plants, saplings control on RR tracks, along bank at front entrance, & some fencelines. Diluted with water & sprayed usually 2 times per year. Approximately 42 gallons in total applied per year.
Imitator Plus	Herbicide	Used in various locations around the plant for weed control such as the perimeter fence, graveled/ rip rap banks, graveled areas; coal berm, RR tracks, etc. Diluted with water & sprayed usually 3 times per year. Approximately 120 gallons in total applied per year

Celanese Acetate LLC
VA0000299

Outfall 001 DMR Data

		Flow, MGD		pH, SU		HEAT Rejected	T, C	TRC
Year	Month	Mo ave	Daily max	min	max	10^9 BTU		mg/L
2010	1	62.06	64.72	7.1	8.6	16	21.7	<QL
	2	29.12	63.39	7	7.9	12	24.4	<QL
	3	56.65	64.9	7.1	8.2	13	24.4	<QL
	4	64.38	66.91	6.9	8.5	14	31.1	<QL
	5	61.28	66.92	7.3	8.4	15	36.1	<QL
	6	62.25	66.07	6	**9**	13	40.6	<QL
	7	62.96	66.12	7	8.5	13	**41.1**	<QL
	8	65.44	69.77	7.1	8.8	11	40	<QL
	9	65.77	68.77	7.3	8.6	12	39.4	<QL
	10	61.22	64.41	6.8	8.4	12	32.8	<QL
	11	57.65	63.05	7.1	8.6	11	29.4	<QL
	12	53.9	57.21	6.8	8.9	11	25.6	<QL
2011	1	56.31	58.8	6.8	8.7	12	22.2	<QL
	2	58.32	65.9	6.9	8.4	14	25.6	<QL
	3	58.32	68	4	8.2	14	28.3	<QL
	4	58.65	62.32	6.8	8.4	13	32.2	<QL
	5	61.68	70.7	7.1	8.6	13	36.1	<QL
	6	65.19	70.07	7.1	8.5	12	37.2	<QL
	7	**67.52**	70.84	6.8	8.6	11	40.6	<QL
	8	65.72	69.67	6.8	7.9	12	39.4	<QL
	9	61.53	72.37	7.1	8.5	12	38.9	<QL
	10	57.2	63.7	7.2	8.5	11	33.9	<QL
	11	55.61	58.38	6.8	8	11	27.2	<QL
	12	60.59	66.39	6.8	8.8	13	23.9	<QL
2012	1	37.54	61.01	6.9	8.1	12	21.7	<QL
	2	60.08	66.35	6.8	8.2	13	22.2	<QL
	3	62.22	70.22	6.9	8.4	13	27.2	<QL
	4	64.14	66.97	7.2	8.2	13	31.1	<QL
	5	63.88	67.02	6.9	8.5	12	36.1	<QL
	6	63.92	68.06	6.9	8.5	12	38.9	<QL
	7	67.43	73.06	6.4	8.5	12	40	<QL
	8	66.03	69.09	6.8	8.4	12	40	
	9	64.94	73.24	6.5	8.5	11	28.3	
	10	59.95	63.84	6.2	8.3	11	32.2	
	11	63.19	66.81			11	24.4	
	12							
Maximum value =		67.52	73.2			9	41.1	<QL

Celanese Acetate LLC
VA0000299

Outfall 002 DMR Data, from VA0092291

		Flow, MGD		pH, SU		HEAT Rejected	T, C	TSS, mg/L		O&G, mg/L		TRC, mg/L
Year	Month	Mo ave	Daily max	min	max	10^9 BTU		Mo ave	Daily max	Mo ave	Daily max	
2010	1	3.18	4.02	7	7.8	0.2	10.7	9	10	<QL	<QL	<QL
	2	1.28	3.13	6.8	7.9	0.1	7.6	15	39	<QL	<QL	<QL
	3	2.3	3.09	6.5	8.2	0.3	16.2	9	10	<QL	<QL	<QL
	4	2.62	3.53	7.2	8.6	0.4	22.7	5	6	<QL	<QL	<QL
	5	1.62	2.56	5.9	8.4	0.2	27.3	6	12	1.9	7.4	<QL
	6	2.05	2.43	6.9	8.9	0.2	31.1	4	7	<QL	<QL	<QL
	7	2.27	2.72	7.1	8	0.1	31.9	3	4	<QL	<QL	<QL
	8	2.37	3.06	6.6	8.4	0.1	30.7	6	9	<QL	<QL	<QL
	9	2.74	3.4	6.1	8.5	0.1	29.3	3	3	1.9	7.4	<QL
	10	2.85	3.94	6.8	9.5	0.1	21.7	3	4	<QL	<QL	<QL
	11	2.8	3.68	6.8	7.8	0	16.7	4	5	<QL	<QL	<QL
	12	2.63	3.36	7.1	7.8	0	10.4	6	8	<QL	<QL	<QL
2011	1	2.91	3.57	7.1	7.7	0.1	8.6	7	8	<QL	<QL	<QL
	2	3.22	3.86	7.1	8	0.2	12.8	6	6	<QL	<QL	<QL
	3	3.21	4.44	7.3	8.2	0.3	17.7	5	8	<QL	<QL	<QL
	4	3.16	3.98	6.8	8.3	0.3	23	2	3	<QL	<QL	<QL
	5	3.15	3.91	6.3	8.9	0.36	30	2	3	<QL	<QL	<QL
	6	2.62	3.84	7.1	9	0.2	31.1	4	5	<QL	<QL	<QL
	7	2.34	3.3	7.1	8.4	0.1	31.5	7.1	8.4	<QL	<QL	<QL
	8	2.98	3.97	6.4	8.2	0.11	31.8	6	11	<QL	<QL	<QL
	9	3.23	3.99	6.6	8	0.2	27.4	4	4	<QL	<QL	<QL
	10	2.73	3.77	6.8	7.9	0.04	20.6	4	4	<QL	<QL	<QL
	11	2.3	3.17	7	8	0.02	14.7	5	9	<QL	<QL	<QL
	12	2.51	3.85	6.9	8.1	0.02	12.2	4	5	<QL	<QL	<QL
2012	1	1.31	3.01	6.3	8.4	0.04	9.3	4	6	<QL	<QL	<QL
	2	2.74	3.51	6.5	8	0.14	11.9	6	7	<QL	<QL	<QL
	3	2.39	3.37	7.1	8.1	0.23	20.8	5	7	<QL	<QL	<QL
	4	2.56	3.69	7.1	7.8	0.12	21.9	2	3	<QL	<QL	<QL
	5	2.97	4.5	6.6	8.5	0.33	29.9	3	6	<QL	<QL	<QL
	6	3.08	4.15	6.9	8.4	0.3	31.2	5	7	<QL	<QL	<QL
	7	2.53	3.82	6.4	8.7	0.13	32.9	6	10	<QL	<QL	<QL
	8	2.41	3.69	6.8	8.2	0.14	30.9	6	10	<QL	<QL	<QL
	9	2.08	3.58	7.1	8.2	0.1	27.6	3	4	<QL	<QL	<QL
	10	2.52	3.02	7	7.9	0.1	21.6	2	4	<QL	<QL	<QL
	11	2.37	3.51	7	7.9	0.03	12.5	5	7	<QL	<QL	<QL
	12	2.23	3.16	7.1	7.8	0.04	13.3	2	2	<QL	<QL	<QL
Maximum value =		3.23	4.5		9.5		32.9		39			

Celanese Acetate LLC
VA0000299

Outfall 003 DMR Data

		Flow, MGD		pH, SU		BOD, kg/d		BOD, mg/L		TSS, kg/d		TSS, mg/L		WET, Tua	*E.Coli*	
Year	Month	Mo ave	Daily max	min	max	Mo ave	Daily max	Mo ave	Daily max	Mo ave	Daily max	Mo ave	Daily max	Max	Mo ave	
	limit=>	*NL*	*NL*	*6*	*9*	*145*	*378*	*NL*	*NL*	*231*	*769*	*NL*	*NL*	*6.0*	*126*	*NL*
2010	1	2.19	2.42	6.9	7.7	<QL	<QL	<QL	<QL	99	195	12	26		15	104
	2	1.08	2.36	7.1	7.9	<QL	43	<QL	5	55	211	12	26		9	186
	3	2.01	2.47	7.3	7.6	<QL	<QL	<QL	<QL	45	83	6	11	1.4	4	8
	4	2.14	2.33	7.1	7.6	<QL	<QL	<QL	<QL	44	70	5	9		4	8
	5	2.38	2.56	6.9	7.8	<QL	<QL	<QL	<QL	77	142	9	16		5	9
	6	2.35	2.56	7	7.6	<QL	<QL	<QL	<QL	84	151	9	17	1.7	8	16
	7	2.28	2.48	7.1	7.5	<QL	<QL	<QL	<QL	85	211	10	23		19	411
	8	2.31	2.52	7.1	7.8	<QL	<QL	<QL	<QL	129	404	15	47		3	7.4
	9	2.26	2.54	6.8	7.5	<QL	<QL	<QL	<QL	102	193	12	21	1.7	4	12
	10	2.18	2.38	6.9	7.8	<QL	<QL	<QL	<QL	81	157	10	20		2	5
	11	2.18	2.44	7.1	7.5	<QL	68	<QL	8	63	188	8	23		3	4
	12	2.21	2.39	7	7.7	<QL	<QL	<QL	<QL	93	203	11	23	2.1	5	7
2011	1	2.07	2.38	6.9	7.7	<QL	<QL	<QL	<QL	83	154	<QL	<QL		3	10
	2	2.2	2.47	7.1	7.5	<QL	<QL	<QL	<QL	78	154	9	21		3	5
	3	2.39	2.57	6.8	7.6	<QL	<QL	<QL	<QL	78	161	9	17	1.6	1.5	5
	4	2.3	2.51	6.9	7.5	<QL	67	<QL	7	65	137	8	16		1	1
	5	2.28	2.48	6.7	7.6	<QL	63	<QL	7	70	156	8	17		3	12
	6	2.24	2.47	6.9	7.5	<QL	74	<QL	9	72	184	8	21	3.1	1	16
	7	2.2	2.35	6.8	7.5	<QL	<QL	<QL	<QL	33	73	4	9		10	21
	8	2.39	2.54	6.9	7.7	<QL	<QL	<QL	<QL	47	75	5	8		6	20
	9	2.29	2.52	7	7.9	<QL	<QL	<QL	<QL	64	166	7	19	1.1	7	16
	10	2.2	2.5	7	7.6	<QL	<QL	<QL	<QL	41	71	5	8		3	20
	11	2.23	2.38	6.9	7.6	<QL	<QL	<QL	<QL	39	74	5	9		5	7
	12	2.22	2.47	7.2	7.8	<QL	<QL	<QL	<QL	39	77	5	10	2	2	5
2012	1	1.16	2.25	4.9	8	<QL	<QL	<QL	<QL	13	48	4	9		3	9
	2	2.24	2.4	7.1	7.6	<QL	89	<QL	11	45	129	5	15		3	11
	3	2.23	2.35	6.9	7.7	<QL	70	<QL	8	48	157	6	22	2	3	11
	4	2.2	2.42	6.8	7.7	<QL	61	<QL	7	45	81	5	10		4	17
	5	2.19	2.37	6.9	7.6	<QL	84	<QL	10	59	210	7	24		7	34
	6	2.22	2.4	6.8	7.8	<QL	<QL	<QL	<QL	46	97	5	12	1.9	5	18
	7	2.31	2.53	6.9	7.6	<QL	<QL	<QL	<QL	50	85	6	9		4	38
	8	2.39	2.58	6.8	7.6	<QL	<QL	<QL	<QL	52	100	6	11		6	16
	9	2.41	2.58	7.1	7.7	<QL	49	<QL	5	57	145	6	15	1.9	3	13
	10	2.28	2.5	7	7.5	<QL	<QL	<QL	<QL	50	104	6	12		2	7
	11	2.11	2.43	7.1	7.7	<QL	104	<QL	13	43	88	5	12		3	8
	12													2.2	19	411
Maximum value =		2.41			8		104		13		404					

Celanese Acetate LLC
VA0000299

Quarterly DMR data outfall 003

Year	Quarter	WET, Tua	Metals in ug/L total metal		
		Max	Chromium	Copper	Nickel
	limit =>	*6.0*	*2770*	*3380*	*3980*
2009	Oct-Dec	1.4	<QL	<QL	<QL
2010	Jan-Mar	1.4	<QL	<QL	<QL
	Apr-Jun	1.7	<QL	<QL	111
	Jul-Sep	1.7	<100	<100	124
	Oct-Dec	2.1	<QL	<QL	142
2011	Jan-Mar	1.6	<QL	<QL	143
	Apr-Jun	3.1	<100	<100	144
	Jul-Sep	1.1	<100	<100	100
	Oct-Dec	2	<100	<100	152
2012	Jan-Mar	2	<100	<100	156
	Apr-Jun	1.9	<100	<100	<100
	Jul-Sep	1.9	<100	<100	<100
	Oct-Dec	2.2	<100	<100	<100
2013	Jan-Mar				

reported on application

Celanese Acetate LLC
VA0000299

Outfall 005 DMR Data

dry weather flows

Quarter	DMR due date		FLOW MGD	pH SU	Temp C	AMMONIA, AS N mg/L
Jul-Sep		10-Oct-08	0.0028	7.6	16	1
Oct-Dec		10-Jan-09	0.003	8.2	5	7.3
Jan-Mar		10-Apr-09	0.01	7.9	7	5.4
Apr-Jun		10-Jul-09	0.072	6.7	17	0.4
Jul-Sep		10-Oct-09	0.011	7.6	22	1
Oct-Dec		10-Jan-10	0.009	7.7	12	11.8
Jan-Mar		10-Apr-10	0.072	7.2	4	1
Apr-Jun		10-Jul-10	0.14	7.6	16	1.1
Jul-Sep		10-Oct-10	0.01	7.7	22	4.3
Oct-Dec		10-Jan-11	0.011	8	9	5
Jan-Mar		10-Apr-11	0.028	7.7	5	9.5
Apr-Jun		10-Jul-11	0.072	7.5	17	3.4
Jul-Sep		10-Oct-11	0.006	7.8	25	7.2
Oct-Dec		10-Jan-12	0.033	7.3	7	6
Jan-Mar		10-Apr-12	0.0065	7.7	4	2.6
Apr-Jun		10-Jul-12	0.0115	8.1	17	1.8
Jul-Sep		10-Oct-12	0.043	7.6	21	0.2
Oct-Dec		10-Jan-13	0.004	7.7	8	6.1
maximum =>			0.14	8.2	25	
90% =>				8.1	22	

Celanese Acetate LLC
VA0000299

Landfill Internal Outfall DMR Data

	DMR due date	501	TSS, mg/L 501	502	TSS, mg/L 502	503	TSS, mg/L 503
TSS	10-Jul-09		88		31		9
FLOW*	10-Jul-09	0.02		0.01		0.01	
TSS	10-Jul-10		19.2		**103.8**		**101.4**
FLOW*	10-Jul-10	0.018		0.017		0.013	
TSS	10-Jul-11		**711**		**724.8**		47.5
FLOW*	10-Jul-11	0.055		0.033		0.026	
TSS	10-Jul-12		93.8		**223.5**		**128**
FLOW*	10-Jul-12	0.008		0.005		0.022	
TSS	10-Oct-12						6
FLOW*	10-Oct-12					0.08	

* FLOW, PRECIPITATION EVENT, Million gallons

Celanese Acetate LLC
VA0000299

Outfall 008 DMR Data

DMR due date	Flow, MG	TSS
10-Jul-09		11
10-Jul-09	0.8	
10-Jul-10		109.5
10-Jul-10	0.368	
10-Jul-11		406.1
10-Jul-11	0.959	
10-Jul-12		16.3
10-Jul-12	0.601	
10-Jul-13		406
10-Jul-13	0.46	

TSS benchmark is 100 mg/L

Celanese Acetate LLC
VA0000299

Outfall 111 DMR Data
Representative of outfalls 108, 109, 110

DMR due date	Flow, MG	TSS, mg/L
10-Jul-09		47
10-Jul-09	0.001	
10-Jul-10		56.7
10-Jul-10	0.0006	
10-Jul-11		**136.1**
10-Jul-11	0.0006	
10-Jul-12		61.6
10-Jul-12	0.000181	
10-Jul-13		**238**
10-Jul-13	0.0003	

FLOW, PRECIPITATION EVENT, MG
TSS benchmark is 100 mg/L

APPENDIX B

RECEIVING WATERS INFORMATION

Flow Frequency Memo
TMDL Information
STOReT Data

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
3019 Peters Creek Road Roanoke, Virginia 24017

SUBJECT: Flow Frequency Determination for Celanese Acetate, LLC
Reissuance of VPDES Permit No. VA0000299

TO: File

FROM: Lewis J. Pillis

DATE: December 7, 2007

COPIES:

Celanese Acetate, LLC discharges to the New River via 6 outfalls and to an unnamed tributary of the New River via 1 outfall. All of the outfalls are located near Bluff City, VA. Stream flow frequencies have been previously determined using the USGS continuous record gage on the New River near Eggleston, VA (#03171500) from 1915 to 1976. The gage was located at the Route 730 bridge in Eggleston, VA. Flow was regulated at the gage by Claytor Reservoir since 1940.

Since flow data is no longer being collected a the Eggleston Gage, flow frequencies for the gage were previously determined by calculating a ratio of the Glen Lyn and Eggleston gage data from the same period of record and multiplying the ratio by the current flow frequencies at Glen Lyn. To solve for the flow frequencies at the discharge point, a ratio of the drainage area of the gage (Eggleston) and the discharge point were used to calculate the flow at the discharge point.

For the reissuance in 2008, changes in critical flows at the Glen Lyn Gage from the previous reissuance are determined. Only one additional year of gage data is used by DEQ, Surface Water Investigations. A factor is used to adjust the critical flows at the Celanese Acetate outfalls without reiterating the previous comparison to the Eggleston gage data. Calculations are shown on the attached spreadsheet. High flow months for the New River were previously determined to be January through May.

Change in critical flows at the Glen Lyn gage, as determined by DEQ, Surface Water Investigations are as follows.

	flows in 2002, MGD	flows in 2003, MGD	change in flow, MGD	New flows just upstream of Celanese Acetate, MGD
1Q10	565	565	0	506
7Q10	662	644	-14	631
30Q5	893	840	-42	915
HM	1963	1915	-38	1795
Annual Average	3262	unknown	unknown	

The values for outfall 005 which discharges to the unnamed tributary were determined by inspection of the USGS Pearisburg Quadrangle topographical map which shows the receiving stream as intermittent at the discharge point. The flow frequencies for intermittent streams are 0.0 cfs for the 1Q10, 7Q10, 30Q5, high flow 1Q10, high flow 7Q10, and the harmonic mean. The stream becomes perennial at its confluence with the New River.

Facility withdrawals from surface water for the past 10 years were examined to aid in calculation of flows after the raw water intake at Celanese Acetate. The highest monthly total was in June of 1999, when the withdrawal averaged 70.2 MGD.

9-NEW030.15 *SORTED STORET DATA*

2002-2012

Date	Temp Celcius
08/15/2005	28.2
07/12/2011	27.9
07/20/2010	27.6
06/25/2002	26.99
06/25/2012	26.6
09/02/2010	26.3
08/21/2002	**26.08**
07/30/2002	25.65
09/11/2007	25.4
09/02/2008	25.2
08/25/2004	24.8
08/15/2006	24.5
07/09/2008	24.2
05/30/2002	23.88
09/24/2002	23.77
08/14/2003	22.71
07/21/2009	22.3
06/15/2004	22.2
06/14/2005	22.1
05/26/2010	21.2
09/21/2009	20.9
10/02/2006	20.1
07/11/2007	19.7
06/12/2003	19.68
09/20/2011	18.5
05/17/2007	17.5
05/20/2008	16.5
05/12/2009	15.9
10/26/2004	15.7
05/05/2011	15.4
03/27/2007	15.2
10/18/2005	15
10/28/2002	14.8
04/26/2012	14.7
04/29/2002	14.34
10/29/2003	14.07
04/27/2004	13.94
04/11/2006	12.5
11/02/2011	12.3
11/17/2009	11.6
04/13/2005	11.57
03/14/2002	10.5
11/21/2002	10.4
03/13/2003	10.34
11/18/2010	10.2
03/10/2009	10.1
04/10/2003	9.5
03/24/2010	8.9
11/28/2007	8.4
03/25/2008	8.4
02/25/2002	7.3
03/08/2011	6.6
02/15/2005	5.8
12/12/2002	5.57
01/17/2012	5.3
12/11/2006	5
01/15/2008	4.9
12/13/2005	4.8
11/19/2008	4.6
12/16/2004	4.57
12/16/2003	4.31
01/18/2007	4.1
01/28/2010	3.6
01/18/2011	3.5
02/11/2003	3.4
02/09/2006	3.4
02/12/2004	3.15
01/22/2003	2.81
01/22/2009	1.1

2007-2012

Date	*Temp Celcius*
07/12/2011	*27.9*
07/20/2010	*27.6*
06/25/2012	*26.6*
09/02/2010	*26.3*
09/11/2007	*25.4*
09/02/2008	*25.2*
07/09/2008	*24.2*
07/21/2009	*22.3*
05/26/2010	*21.2*
09/21/2009	*20.9*
07/11/2007	*19.7*
09/20/2011	*18.5*
05/17/2007	*17.5*
05/20/2008	*16.5*
05/12/2009	*15.9*
05/05/2011	*15.4*
03/27/2007	*15.2*
04/26/2012	*14.7*
11/02/2011	*12.3*
11/17/2009	*11.6*
11/18/2010	*10.2*
03/10/2009	*10.1*
03/24/2010	*8.9*
11/28/2007	*8.4*
03/25/2008	*8.4*
03/08/2011	*6.6*
01/17/2012	*5.3*
01/15/2008	*4.9*
11/19/2008	*4.6*
01/18/2007	*4.1*
01/28/2010	*3.6*
01/18/2011	*3.5*
01/22/2009	*1.1*

2002-2012

Date	Field pH	
06/25/2002 11:45	8.75	1
06/25/2012 12:45	8.7	2
02/11/2003 11:15	8.61	3
09/02/2010 11:45	8.5	4
05/30/2002 12:30	8.42	5
08/15/2005 10:15	8.4	6
11/18/2010 10:50	**8.4**	7
09/20/2011 12:25	8.3	8
11/02/2011 12:45	8.3	9
09/24/2002 13:20	8.28	10
10/28/2002 14:20	8.21	11
08/25/2004 11:00	8.2	12
03/24/2010 11:40	8.2	13
01/18/2007 11:00	8.2	14
02/12/2004 10:25	8.17	15
04/29/2002 13:30	8.15	16
02/25/2002 11:15	8.15	17
08/21/2002 10:55	8.14	18
04/27/2004 10:00	8.12	19
07/12/2011 12:20	8.1	20
07/20/2010 12:15	8.1	21
05/20/2008 12:15	8.1	22
05/12/2009 13:40	8.1	23
12/11/2006 11:25	8.1	24
02/09/2006 09:30	8.1	25
10/18/2005 11:00	8.04	26
09/11/2007 11:30	8	27
08/15/2006 10:45	8	28
07/11/2007 11:35	8	29
01/28/2010 09:50	8	30
04/10/2003 11:45	7.96	31
04/26/2012 12:15	7.9	32
03/25/2008 12:35	7.9	33
01/17/2012 12:25	7.9	34
01/15/2008 13:05	7.9	35
01/18/2011 14:25	7.9	36
12/16/2004 10:40	7.86	37
10/29/2003 15:15	7.85	38
10/26/2004 11:40	7.81	39
06/14/2005 10:30	7.8	40
05/26/2010 11:55	7.8	41
04/13/2005 10:25	7.75	42
08/14/2003 11:45	7.74	43
06/12/2003 11:30	7.74	44
09/21/2009 09:25	7.7	45
05/17/2007 10:50	7.7	46
05/05/2011 13:45	7.7	47
03/13/2003 14:30	7.67	48
06/15/2004 09:30	7.65	49
03/14/2002 10:55	7.65	50
02/15/2005 11:40	7.63	51
01/22/2003 11:30	7.63	52
11/21/2002 09:30	7.58	53
07/30/2002 09:00	7.52	54
11/28/2007 11:00	7.5	55
12/12/2002 10:00	7.45	56
07/09/2008 12:20	7.4	57
04/11/2006 10:10	7.4	58
03/08/2011 12:20	7.4	59
09/02/2008 12:15	7.2	60
03/27/2007 11:50	7.1	61
11/19/2008 09:25	7.1	62
11/17/2009 11:40	7	63
03/10/2009 09:25	7	64
07/21/2009 11:05	6.8	65
12/13/2005 10:45	6.8	66
12/16/2003 10:10	6.57	67
01/22/2009 11:25	6.5	68
		69

Station ID 9-NEW056.22

sorted by Date		rank	sorted by Temp			
Collection Date Time	Temp Celcius		Collection D	Temp Celcius		pH, SU
02/25/2002 09:30	4.8	1	06/25/2002	28.26	02/25/2002	8.71
04/29/2002 14:00	15.66	2	08/21/2002	25.92	05/11/2011	8.5
06/25/2002 13:05	28.26	3	07/19/2011	25.1	02/11/2003	8.49
08/21/2002 11:20	25.92	4	07/11/2007	24.8	08/21/2002	8.47
10/28/2002 15:00	15	5	09/02/2008	24.2	06/25/2002	8.44
12/12/2002 11:30	5.54	6	07/09/2008	24.1	01/20/2011	8.3
02/11/2003 12:20	3.4	7	09/11/2007	24	09/15/2011	8.3
04/10/2003 12:30	9.7	8	06/19/2012	23.2	04/03/2012	8.3
06/12/2003 12:25	19.56	9	09/15/2011	22.5	04/29/2002	8.24
01/18/2007 12:00	4.6	10	06/12/2003	19.56	11/29/2011	8.2
03/27/2007 12:30	13.8	11	05/11/2011	18.4	07/11/2007	8.1
05/17/2007 12:15	17.2	12	05/17/2007	17.2	01/18/2007	8
07/11/2007 13:05	24.8	13	05/20/2008	16.2	09/11/2007	8
09/11/2007 13:05	24	14	04/03/2012	16	01/15/2008	8
11/28/2007 12:20	8.3	15	04/29/2002	15.66	06/19/2012	8
01/15/2008 13:50	4.7	16	10/28/2002	15	04/10/2003	7.97
03/25/2008 13:10	8.6	17	03/27/2007	13.8	10/28/2002	7.95
05/20/2008 13:00	16.2	18	11/29/2011	11.6	05/17/2007	7.9
07/09/2008 14:00	24.1	19	03/24/2011	10.9	07/19/2011	7.9
09/02/2008 13:15	24.2	20	04/10/2003	9.7	03/25/2008	7.8
11/19/2008 10:05	4.2	21	03/25/2008	8.6	03/24/2011	7.8
01/20/2011 13:30	4.3	22	11/28/2007	8.3	01/25/2012	7.8
03/24/2011 12:05	10.9	23	12/12/2002	5.54	07/09/2008	7.7
05/11/2011 13:05	18.4	24	01/25/2012	5.5	06/12/2003	7.69
07/19/2011 13:30	25.1	25	02/25/2002	4.8	11/28/2007	7.6
09/15/2011 13:05	22.5	26	01/15/2008	4.7	05/20/2008	7.6
11/29/2011 14:00	11.6	27	01/18/2007	4.6	12/12/2002	7.44
01/25/2012 14:45	5.5	28	01/20/2011	4.3	03/27/2007	7.4
04/03/2012 14:10	16	29	11/19/2008	4.2	09/02/2008	7.3
06/19/2012 12:45	23.2	30	02/11/2003	3.4	11/19/2008	7.3
	24.26			24.83	90 percentile	8.47
	past 5 years 90%					

2010 Impaired Waters

Categories 4 and 5 by Cause Group Code

New River Basin

Cause Group Code: **N29R-01-PCB** **New River, Claytor Lake, Peak Creek, Reed Creek and Stony Creek**

Location: The impairment begins at the I-77 bridge crossing the New River and extends downstream to the VA/WVA State Line and includes the tributaries Peak Creek, Reed Creek and Stony Creek as described below.

City / County: Giles Co. Montgomery Co. Pulaski Co. Radford City

Use(s): Fish Consumption

Cause(s) /
VA Category: PCB in Fish Tissue/ 5A

The Virginia Department of Health (VDH) issued a fish consumption advisory on August 6, 2001 for polychlorinated biphenyls (PCBs) for the lower portion of the New River (Rt. 114 Bridge downstream to the VA / WVA State Line - 52.0 miles) based on fish tissue collections from Carp. An Advisory extension to Claytor dam was issued 8/06/2003 (11.47 miles) recommends that no carp be consumed in these waters and no more than two meals per month of flathead and channel catfish. The VDH PCB Fish Consumption Advisory was further extended upstream on the New River (13 miles) to the I-77 Bridge to include the lower portions of Peak Creek (4.02 miles), Reed Creek (16.35 miles) and Claytor Lake (4,287 acres) on 12/02/2004. The VDH advises consumption should not exceed two meals per month for carp and smallmouth bass. The VDH level of concern is 50 parts per billion (ppb) in fish tissue.

There are eight fish tissue collection sites within the 2010 data window reporting exceedances of the WQS based 20 ppb fish tissue value (TV) (VDH 50 ppb). These data are reviewed by the VDH in making an advisory determination. A complete listing of collection sites and associated fish tissue data are available at http://www.deq.virginia.gov/fishtissue/fishtissue.html. A more detailed presentation of the data can also be found using an interactive mapping application at http://gisweb.deq.state.va.us/. The VDH Advisory information is also available via the web at http://www.vdh.virginia.gov/Epidemiology/PublicHealthToxicology/Advisories/.

9-SNC000.20- 2004 fish tissue finds with application of the new WQS TV for PCB (20 ppb) the addition of 3 species exceeding the new TV criterion. Rock Bass (size 16-20 cm) at 25.21, SM Bass (size 28.6-30.5 cm) at 22.13 and White sucker (1 fish) at 30.08 ppb. Stony Creek is therefore a 2010 addition based on the new WQS PCB tissue value of 20 ppb.

New River, Claytor Lake, Peak Creek, Reed Creek and Stony Creek **Fish Consumption**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
PCB in Fish Tissue - Total Impaired Size by Water Type:		**4,286.76**	**76.61**

Sources:

Source Unknown

APPENDIX C

PERMIT LIMIT DEVELOPMENT

Outfall 001

Waste Load Allocation Spreadsheet

STATS printouts

Mixing Zone Predictions for Celanese Acetate 001

Effluent Flow = 63.1 MGD
Stream 7Q10 = 567.9 MGD
Stream 30Q10 = 674.9 MGD
Stream 1Q10 = 442.9 MGD
Stream slope = .000954 ft/ft
Stream width = 550 ft
Bottom scale = 3
Channel scale = 1

Mixing Zone Predictions @ 7Q10

Depth = 2.389 ft
Length = 138983.59 ft
Velocity = .7434 ft/sec
Residence Time = 2.1639 days

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 92.43% of the 7Q10 is used.

Mixing Zone Predictions @ 30Q10

Depth = 2.6253 ft
Length = 128403.83 ft
Velocity = .7912 ft/sec
Residence Time = 1.8784 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = 2.0917 ft
Length = 155370.17 ft
Velocity = .6808 ft/sec
Residence Time = 63.3897 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 1.58% of the 1Q10 is used.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Celanese Acetate 001 Permit No.: VA0000299

Receiving Stream: New River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	54	mg/L
90% Temperature (Annual) =	33.3	deg C
90% Temperature (Wet season) =	24.83	deg C
90% Maximum pH =	8.47	SU
10% Maximum pH =	7	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	442.9	MGD
7Q10 (Annual) =	567.9	MGD
30Q10 (Annual) =	674.9	MGD
1Q10 (Wet season) =	442.9	MGD
30Q10 (Wet season)	674.9	MGD
30Q5 =	760.9	MGD
Harmonic Mean =	1928.9	MGD

Mixing Information		
Annual - 1Q10 Mix =	1.6	%
- 7Q10 Mix =	92.4	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	1.6	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	68	mg/L
90% Temp (Annual) =	41.1	deg C
90% Temp (Wet season) =	37.8	deg C
90% Maximum pH =	9	SU
10% Maximum pH =	6	SU
Discharge Flow =	67.5	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	1.2E+04	--	--	na	9.9E+01	--	--	na	1.2E+03	**--**	**--**	**na**	**1.2E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	1.1E+02	--	--	na	9.3E-01	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	7.4E+01	--	--	na	2.5E-01	--	--	na	7.4E+00	**--**	**--**	**na**	**7.4E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.3E+00	--	na	1.5E-02	7.5E-01	--	na	5.0E-05	5.7E+00	--	na	1.5E-03	**3.3E+00**	**--**	**na**	**1.5E-03**
Ammonia-N (mg/l) (Yearly)	0	1.53E+00	3.11E-01	na	--	1.69E+00	3.42E+00	na	--	7.82E-01	7.77E-02	na	--	5.91E+00	8.54E-01	na	--	**1.69E+00**	**8.54E-01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	1.53E+00	5.20E-01	na	--	1.69E+00	5.72E+00	na	--	7.82E-01	1.30E-01	na	--	5.91E+00	1.43E+00	na	--	**1.69E+00**	**1.43E+00**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.9E+05	--	--	na	4.0E+03	--	--	na	4.9E+04	**--**	**--**	**na**	**4.9E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	7.9E+03	--	--	na	6.4E+01	--	--	na	7.9E+02	**--**	**--**	**na**	**7.9E+02**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.8E+02	1.3E+03	na	--	8.5E+01	3.8E+01	na	--	6.4E+02	3.5E+02	na	--	**3.8E+02**	**3.5E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.5E+04	--	--	na	5.1E+01	--	--	na	1.5E+03	**--**	**--**	**na**	**1.5E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	5.9E-02	--	--	na	2.0E-04	--	--	na	5.9E-03	**--**	**--**	**na**	**5.9E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.6E+02	--	--	na	5.3E-01	--	--	na	1.6E+01	**--**	**--**	**na**	**1.6E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	8.0E+05	--	--	na	6.5E+03	--	--	na	8.0E+04	**--**	**--**	**na**	**8.0E+04**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	6.5E+02	--	--	na	2.2E+00	--	--	na	6.5E+01	**--**	**--**	**na**	**6.5E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	4.1E+04	--	--	na	1.4E+02	--	--	na	4.1E+03	**--**	**--**	**na**	**4.1E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	2.3E+04	--	--	na	1.9E+02	--	--	na	2.3E+03	**--**	**--**	**na**	**2.3E+03**
Cadmium	0	2.5E+00	7.2E-01	na	--	2.7E+00	6.3E+00	na	--	5.1E-01	1.8E-01	na	--	3.8E+00	1.7E+00	na	--	**2.7E+00**	**1.7E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	4.7E+02	--	--	na	1.6E+00	--	--	na	4.7E+01	**--**	**--**	**na**	**4.7E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.7E+00	3.8E-02	na	2.4E-01	6.0E-01	1.1E-03	na	8.1E-04	4.5E+00	1.0E-02	na	2.4E-02	**2.7E+00**	**1.0E-02**	**na**	**2.4E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	9.5E+05	2.0E+06	na	--	2.2E+05	5.8E+04	na	--	1.6E+06	5.4E+05	na	--	**9.5E+05**	**5.4E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	2.1E+01	9.7E+01	na	--	4.8E+00	2.8E+00	na	--	3.6E+01	2.6E+01	na	--	**2.1E+01**	**2.6E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	2.0E+04	--	--	na	1.6E+02	--	--	na	2.0E+03	**--**	**--**	**na**	**2.0E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	3.8E+03	--	--	na	1.3E+01	--	--	na	3.8E+02	**--**	**--**	**na**	**3.8E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.3E+05	--	--	na	1.1E+03	--	--	na	1.3E+04	**--**	**--**	**na**	**1.3E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	2.0E+04	--	--	na	1.6E+02	--	--	na	2.0E+03	**--**	**--**	**na**	**2.0E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.8E+03	--	--	na	1.5E+01	--	--	na	1.8E+02	**--**	**--**	**na**	**1.8E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.2E-02	3.6E-01	na	--	2.1E-02	1.0E-02	na	--	1.6E-01	9.6E-02	na	--	**9.2E-02**	**9.6E-02**	**na**	**--**
Chromium III	0	4.1E+02	4.6E+01	na	--	4.5E+02	4.0E+02	na	--	8.8E+01	1.1E+01	na	--	6.7E+02	1.1E+02	na	--	**4.5E+02**	**1.1E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.8E+01	9.7E+01	na	--	4.0E+00	2.8E+00	na	--	3.0E+01	2.6E+01	na	--	**1.8E+01**	**2.6E+01**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	1.2E+02	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	5.3E-01	--	--	na	1.8E-03	--	--	na	5.3E-02	**--**	**--**	**na**	**5.3E-02**
Copper	0	9.2E+00	5.4E+00	na	--	1.0E+01	4.8E+01	na	--	1.9E+00	1.4E+00	na	--	1.5E+01	1.3E+01	na	--	**1.0E+01**	**1.3E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.4E+01	4.6E+01	na	2.0E+05	5.5E+00	1.3E+00	na	1.6E+03	4.2E+01	1.2E+01	na	2.0E+04	**2.4E+01**	**1.2E+01**	**na**	**2.0E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	9.2E-02	--	--	na	3.1E-04	--	--	na	9.2E-03	**--**	**--**	**na**	**9.2E-03**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	6.5E-02	--	--	na	2.2E-04	--	--	na	6.5E-03	**--**	**--**	**na**	**6.5E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.2E+00	8.8E-03	na	6.5E-02	2.8E-01	2.5E-04	na	2.2E-04	2.1E+00	2.4E-03	na	6.5E-03	**1.2E+00**	**2.4E-03**	**na**	**6.5E-03**
Demeton	0	--	1.0E-01	na	--	--	8.8E-01	na	--	--	2.5E-02	na	--	--	2.4E-01	na	--	**--**	**2.4E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	1.9E-01	1.5E+00	na	--	4.3E-02	4.3E-02	na	--	3.2E-01	4.0E-01	na	--	**1.9E-01**	**4.0E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.6E+04	--	--	na	1.3E+02	--	--	na	1.6E+03	**--**	**--**	**na**	**1.6E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	1.2E+04	--	--	na	9.6E+01	--	--	na	1.2E+03	**--**	**--**	**na**	**1.2E+03**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	2.3E+03	--	--	na	1.9E+01	--	--	na	2.3E+02	**--**	**--**	**na**	**2.3E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	8.3E+00	--	--	na	2.8E-02	--	--	na	8.3E-01	**--**	**--**	**na**	**8.3E-01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	5.0E+03	--	--	na	1.7E+01	--	--	na	5.0E+02	**--**	**--**	**na**	**5.0E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	1.1E+04	--	--	na	3.7E+01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	8.7E+04	--	--	na	7.1E+02	--	--	na	8.7E+03	**--**	**--**	**na**	**8.7E+03**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.2E+05	--	--	na	1.0E+03	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	3.6E+03	--	--	na	2.9E+01	--	--	na	3.6E+02	**--**	**--**	**na**	**3.6E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	4.4E+03	--	--	na	1.5E+01	--	--	na	4.4E+02	**--**	**--**	**na**	**4.4E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	6.2E+03	--	--	na	2.1E+01	--	--	na	6.2E+02	**--**	**--**	**na**	**6.2E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.7E-01	4.9E-01	na	1.6E-02	6.0E-02	1.4E-02	na	5.4E-05	4.5E-01	1.3E-01	na	1.6E-03	**2.7E-01**	**1.3E-01**	**na**	**1.6E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	5.4E+05	--	--	na	4.4E+03	--	--	na	5.4E+04	**--**	**--**	**na**	**5.4E+04**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	1.0E+04	--	--	na	8.5E+01	--	--	na	1.0E+03	**--**	**--**	**na**	**1.0E+03**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.3E+07	--	--	na	1.1E+05	--	--	na	1.3E+06	**--**	**--**	**na**	**1.3E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	5.5E+04	--	--	na	4.5E+02	--	--	na	5.5E+03	**--**	**--**	**na**	**5.5E+03**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	6.5E+04	--	--	na	5.3E+02	--	--	na	6.5E+03	**--**	**--**	**na**	**6.5E+03**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	3.4E+03	--	--	na	2.8E+01	--	--	na	3.4E+02	**--**	**--**	**na**	**3.4E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	1.0E+03	--	--	na	3.4E+00	--	--	na	1.0E+02	**--**	**--**	**na**	**1.0E+02**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	6.3E-07	--	--	na	5.1E-09	--	--	na	6.3E-08	**--**	**--**	**na**	**6.3E-08**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	5.9E+01	--	--	na	2.0E-01	--	--	na	5.9E+00	**--**	**--**	**na**	**5.9E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.4E-01	4.9E-01	na	1.1E+03	5.5E-02	1.4E-02	na	8.9E+00	4.2E-01	1.3E-01	na	1.1E+02	**2.4E-01**	**1.3E-01**	**na**	**1.1E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.4E-01	4.9E-01	na	1.1E+03	5.5E-02	1.4E-02	na	8.9E+00	4.2E-01	1.3E-01	na	1.1E+02	**2.4E-01**	**1.3E-01**	**na**	**1.1E+02**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.4E-01	4.9E-01	--	--	5.5E-02	1.4E-02	--	--	4.2E-01	1.3E-01	--	--	**2.4E-01**	**1.3E-01**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	1.1E+03	--	--	na	8.9E+00	--	--	na	1.1E+02	**--**	**--**	**na**	**1.1E+02**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	9.5E-02	3.2E-01	na	7.4E-01	2.2E-02	9.0E-03	na	6.0E-03	1.6E-01	8.5E-02	na	7.4E-02	**9.5E-02**	**8.5E-02**	**na**	**7.4E-02**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.7E+00	--	--	na	3.0E-02	--	--	na	3.7E-01	**--**	**--**	**na**	**3.7E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.6E+04	--	--	na	2.1E+02	--	--	na	2.6E+03	**--**	**--**	**na**	**2.6E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.7E+03	--	--	na	1.4E+01	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	6.5E+04	--	--	na	5.3E+02	--	--	na	6.5E+03	**--**	**--**	**na**	**6.5E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	8.8E-02	na	--	--	2.5E-03	na	--	--	2.4E-02	na	--	**--**	**2.4E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.7E-01	3.3E-02	na	2.3E-02	1.3E-01	9.5E-04	na	7.9E-05	9.8E-01	8.9E-03	na	2.3E-03	**5.7E-01**	**8.9E-03**	**na**	**2.3E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.7E-01	3.3E-02	na	1.2E-02	1.3E-01	9.5E-04	na	3.9E-05	9.8E-01	8.9E-03	na	1.2E-03	**5.7E-01**	**8.9E-03**	**na**	**1.2E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	8.6E-02	--	--	na	2.9E-04	--	--	na	8.6E-03	**--**	**--**	**na**	**8.6E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	5.3E+03	--	--	na	1.8E+01	--	--	na	5.3E+02	**--**	**--**	**na**	**5.3E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.4E+00	--	--	na	4.9E-03	--	--	na	1.4E-01	**--**	**--**	**na**	**1.4E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	5.0E+00	--	--	na	1.7E-02	--	--	na	5.0E-01	**--**	**--**	**na**	**5.0E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.0E+00	--	na	5.3E+01	2.4E-01	--	na	1.8E-01	1.8E+00	--	na	5.3E+00	**1.0E+00**	**--**	**na**	**5.3E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.3E+04	--	--	na	1.1E+02	--	--	na	1.3E+03	**--**	**--**	**na**	**1.3E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	9.8E+02	--	--	na	3.3E+00	--	--	na	9.8E+01	**--**	**--**	**na**	**9.8E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.8E+01	na	--	--	5.0E-01	na	--	--	4.7E+00	na	--	**--**	**4.7E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.3E+00	--	--	na	1.8E-02	--	--	na	5.3E-01	**--**	**--**	**na**	**5.3E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.8E+05	--	--	na	9.6E+02	--	--	na	2.8E+04	**--**	**--**	**na**	**2.8E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	7.1E+01	6.4E+00	na	--	7.8E+01	5.6E+01	na	--	1.4E+01	1.6E+00	na	--	1.1E+02	1.5E+01	na	--	**7.8E+01**	**1.5E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	8.8E-01	na	--	--	2.5E-02	na	--	--	2.4E-01	na	--	**--**	**2.4E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	1.5E+00	6.8E+00	- -	- -	3.5E-01	1.9E-01	- -	--	2.6E+00	1.8E+00	- -	--	**1.5E+00**	**1.8E+00**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.8E+04	--	--	na	1.5E+02	--	--	na	1.8E+03	**--**	**--**	**na**	**1.8E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.7E+05	--	--	na	5.9E+02	--	--	na	1.7E+04	**--**	**--**	**na**	**1.7E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	2.6E-01	na	--	--	7.5E-03	na	--	--	7.1E-02	na	--	**--**	**7.1E-02**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.3E+02	1.2E+01	na	4.6E+03	1.4E+02	1.1E+02	na	5.6E+04	2.8E+01	3.1E+00	na	4.6E+02	2.1E+02	2.9E+01	na	5.6E+03	**1.4E+02**	**2.9E+01**	**na**	**5.6E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	8.5E+03	--	--	na	6.9E+01	--	--	na	8.5E+02	**--**	**--**	**na**	**8.5E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	8.9E+02	--	--	na	3.0E+00	--	--	na	8.9E+01	**--**	**--**	**na**	**8.9E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.8E+03	--	--	na	6.0E+00	--	--	na	1.8E+02	**--**	**--**	**na**	**1.8E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.5E+02	--	--	na	5.1E-01	--	--	na	1.5E+01	**--**	**--**	**na**	**1.5E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.1E+01	5.8E+01	na	--	7.0E+00	1.7E+00	--	--	5.3E+01	1.6E+01	--	--	**3.1E+01**	**1.6E+01**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	7.2E-02	1.1E-01	na	--	1.6E-02	3.3E-03	na	--	1.2E-01	3.1E-02	na	--	**7.2E-02**	**3.1E-02**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.2E-01	na	1.9E-02	--	3.5E-03	na	6.4E-05	--	3.3E-02	na	1.9E-03	**--**	**3.3E-02**	**na**	**1.9E-03**
Pentachlorophenol [C]	0	3.3E+00	4.9E+00	na	3.0E+01	3.7E+00	4.3E+01	na	8.9E+02	1.5E+00	1.2E+00	na	3.0E+00	1.2E+01	1.2E+01	na	8.9E+01	**3.7E+00**	**1.2E+01**	**na**	**8.9E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	1.1E+07	--	--	na	8.6E+04	--	--	na	1.1E+06	**--**	**--**	**na**	**1.1E+06**
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.9E+04	--	--	na	4.0E+02	--	--	na	4.9E+03	**--**	**--**	**na**	**4.9E+03**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.2E+01	4.4E+01	na	5.2E+04	5.0E+00	1.3E+00	na	4.2E+02	3.8E+01	1.2E+01	na	5.2E+03	**2.2E+01**	**1.2E+01**	**na**	**5.2E+03**
Silver	0	1.7E+00	--	na	--	1.9E+00	--	na	--	3.2E-01	--	na	--	2.4E+00	--	na	--	**1.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.2E+03	--	--	na	4.0E+00	--	--	na	1.2E+02	**--**	**--**	**na**	**1.2E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	9.8E+02	--	--	na	3.3E+00	--	--	na	9.8E+01	**--**	**--**	**na**	**9.8E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	5.8E+00	--	--	na	4.7E-02	--	--	na	5.8E-01	**--**	**--**	**na**	**5.8E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	7.4E+04	--	--	na	6.0E+02	--	--	na	7.4E+03	**--**	**--**	**na**	**7.4E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	8.1E-01	1.8E-03	na	8.3E-02	1.8E-01	5.0E-05	na	2.8E-04	1.4E+00	4.7E-04	na	8.3E-03	**8.1E-01**	**4.7E-04**	**na**	**8.3E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	5.1E-01	6.3E-01	na	--	1.2E-01	1.8E-02	na	--	8.7E-01	1.7E-01	na	--	**5.1E-01**	**1.7E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	8.6E+02	--	--	na	7.0E+00	--	--	na	8.6E+01	**--**	**--**	**na**	**8.6E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	4.7E+03	--	--	na	1.6E+01	--	--	na	4.7E+02	**--**	**--**	**na**	**4.7E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	8.9E+03	--	--	na	3.0E+01	--	--	na	8.9E+02	**--**	**--**	**na**	**8.9E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	7.1E+02	--	--	na	2.4E+00	--	--	na	7.1E+01	**--**	**--**	**na**	**7.1E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	7.1E+02	--	--	na	2.4E+00	--	--	na	7.1E+01	**--**	**--**	**na**	**7.1E+01**
Zinc	0	8.3E+01	7.2E+01	na	2.6E+04	9.2E+01	6.3E+02	na	3.2E+05	1.8E+01	1.8E+01	na	2.6E+03	1.4E+02	1.7E+02	na	3.2E+04	**9.2E+01**	**1.7E+02**	**na**	**3.2E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	7.9E+02
Arsenic	1.5E+02
Barium	na
Cadmium	1.0E+00
Chromium III	6.5E+01
Chromium VI	7.1E+00
Copper	4.1E+00
Iron	na
Lead	9.0E+00
Manganese	na
Mercury	6.2E-01
Nickel	1.7E+01
Selenium	7.1E+00
Silver	7.6E-01
Zinc	3.7E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Celanese Acetate 001 plus 003 Permit No.: VA0000299

Receiving Stream: New River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	54	mg/L
90% Temperature (Annual) =	33.3	deg C
90% Temperature (Wet season) =	24.83	deg C
90% Maximum pH =	8.47	SU
10% Maximum pH =	7	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	442.9	MGD
7Q10 (Annual) =	567.9	MGD
30Q10 (Annual) =	674.9	MGD
1Q10 (Wet season) =	442.9	MGD
30Q10 (Wet season)	674.9	MGD
30Q5 =	760.9	MGD
Harmonic Mean =	1928.9	MGD

Mixing Information		
Annual - 1Q10 Mix =	1.6	%
- 7Q10 Mix =	92.4	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	1.6	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	68	mg/L
90% Temp (Annual) =	41.1	deg C
90% Temp (Wet season) =	37.8	deg C
90% Maximum pH =	9	SU
10% Maximum pH =	6	SU
Discharge Flow =	69.91	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	1.2E+04	--	--	na	9.9E+01	--	--	na	1.2E+03	**--**	**--**	**na**	**1.2E+03**
Acrolein	0	--	--	na	9.3E+00	--	--	na	1.1E+02	--	--	na	9.3E-01	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	7.1E+01	--	--	na	2.5E-01	--	--	na	7.1E+00	**--**	**--**	**na**	**7.1E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.3E+00	--	na	1.4E-02	7.5E-01	--	na	5.0E-05	5.5E+00	--	na	1.4E-03	**3.3E+00**	**--**	**na**	**1.4E-03**
Ammonia-N (mg/l) (Yearly)	0	1.52E+00	3.10E-01	na	--	1.67E+00	3.30E+00	na	--	7.80E-01	7.74E-02	na	--	5.72E+00	8.25E-01	na	--	**1.67E+00**	**8.25E-01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	1.52E+00	5.18E-01	na	--	1.67E+00	5.52E+00	na	--	7.80E-01	1.30E-01	na	--	5.72E+00	1.38E+00	na	--	**1.67E+00**	**1.38E+00**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.8E+05	--	--	na	4.0E+03	--	--	na	4.8E+04	**--**	**--**	**na**	**4.8E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	7.6E+03	--	--	na	6.4E+01	--	--	na	7.6E+02	**--**	**--**	**na**	**7.6E+02**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.7E+02	1.3E+03	na	--	8.5E+01	3.8E+01	na	--	6.2E+02	3.4E+02	na	--	**3.7E+02**	**3.4E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.5E+04	--	--	na	5.1E+01	--	--	na	1.5E+03	**--**	**--**	**na**	**1.5E+03**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	5.7E-02	--	--	na	2.0E-04	--	--	na	5.7E-03	**--**	**--**	**na**	**5.7E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.5E+02	--	--	na	5.3E-01	--	--	na	1.5E+01	**--**	**--**	**na**	**1.5E+01**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	7.7E+05	--	--	na	6.5E+03	--	--	na	7.7E+04	**--**	**--**	**na**	**7.7E+04**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	6.3E+02	--	--	na	2.2E+00	--	--	na	6.3E+01	**--**	**--**	**na**	**6.3E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	4.0E+04	--	--	na	1.4E+02	--	--	na	4.0E+03	**--**	**--**	**na**	**4.0E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	2.3E+04	--	--	na	1.9E+02	--	--	na	2.3E+03	**--**	**--**	**na**	**2.3E+03**
Cadmium	0	2.5E+00	7.2E-01	na	--	2.7E+00	6.1E+00	na	--	5.1E-01	1.8E-01	na	--	3.7E+00	1.6E+00	na	--	**2.7E+00**	**1.6E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	4.6E+02	--	--	na	1.6E+00	--	--	na	4.6E+01	**--**	**--**	**na**	**4.6E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.6E+00	3.7E-02	na	2.3E-01	6.0E-01	1.1E-03	na	8.1E-04	4.4E+00	9.8E-03	na	2.3E-02	**2.6E+00**	**9.8E-03**	**na**	**2.3E-02**
Chloride	0	8.6E+05	2.3E+05	na	--	9.5E+05	2.0E+06	na	--	2.2E+05	5.8E+04	na	--	1.6E+06	5.2E+05	na	--	**9.5E+05**	**5.2E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	2.1E+01	9.4E+01	na	--	4.8E+00	2.8E+00	na	--	3.5E+01	2.5E+01	na	--	**2.1E+01**	**2.5E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.9E+04	--	--	na	1.6E+02	--	--	na	1.9E+03	**--**	**--**	**na**	**1.9E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	3.7E+03	--	--	na	1.3E+01	--	--	na	3.7E+02	**--**	**--**	**na**	**3.7E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.3E+05	--	--	na	1.1E+03	--	--	na	1.3E+04	**--**	**--**	**na**	**1.3E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.9E+04	--	--	na	1.6E+02	--	--	na	1.9E+03	**--**	**--**	**na**	**1.9E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.8E+03	--	--	na	1.5E+01	--	--	na	1.8E+02	**--**	**--**	**na**	**1.8E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.1E-02	3.5E-01	na	--	2.1E-02	1.0E-02	na	--	1.5E-01	9.4E-02	na	--	**9.1E-02**	**9.4E-02**	**na**	**--**
Chromium III	0	4.1E+02	4.6E+01	na	--	4.5E+02	3.9E+02	na	--	8.8E+01	1.1E+01	na	--	6.5E+02	1.0E+02	na	--	**4.5E+02**	**1.0E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.8E+01	9.4E+01	na	--	4.0E+00	2.8E+00	na	--	2.9E+01	2.5E+01	na	--	**1.8E+01**	**2.5E+01**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	1.2E+02	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	5.1E-01	--	--	na	1.8E-03	--	--	na	5.1E-02	**--**	**--**	**na**	**5.1E-02**
Copper	0	9.2E+00	5.4E+00	na	--	1.0E+01	4.6E+01	na	--	1.9E+00	1.4E+00	na	--	1.4E+01	1.2E+01	na	--	**1.0E+01**	**1.2E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.4E+01	4.4E+01	na	1.9E+05	5.5E+00	1.3E+00	na	1.6E+03	4.0E+01	1.2E+01	na	1.9E+04	**2.4E+01**	**1.2E+01**	**na**	**1.9E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	8.9E-02	--	--	na	3.1E-04	--	--	na	8.9E-03	**--**	**--**	**na**	**8.9E-03**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	6.3E-02	--	--	na	2.2E-04	--	--	na	6.3E-03	**--**	**--**	**na**	**6.3E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.2E+00	8.5E-03	na	6.3E-02	2.8E-01	2.5E-04	na	2.2E-04	2.0E+00	2.3E-03	na	6.3E-03	**1.2E+00**	**2.3E-03**	**na**	**6.3E-03**
Demeton	0	--	1.0E-01	na	--	--	8.5E-01	na	--	--	2.5E-02	na	--	--	2.3E-01	na	--	**--**	**2.3E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	1.9E-01	1.4E+00	na	--	4.3E-02	4.3E-02	na	--	3.1E-01	3.9E-01	na	--	**1.9E-01**	**3.9E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.5E+04	--	--	na	1.3E+02	--	--	na	1.5E+03	**--**	**--**	**na**	**1.5E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	1.1E+04	--	--	na	9.6E+01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	2.3E+03	--	--	na	1.9E+01	--	--	na	2.3E+02	**--**	**--**	**na**	**2.3E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	8.0E+00	--	--	na	2.8E-02	--	--	na	8.0E-01	**--**	**--**	**na**	**8.0E-01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	4.9E+03	--	--	na	1.7E+01	--	--	na	4.9E+02	**--**	**--**	**na**	**4.9E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	1.1E+04	--	--	na	3.7E+01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	8.4E+04	--	--	na	7.1E+02	--	--	na	8.4E+03	**--**	**--**	**na**	**8.4E+03**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.2E+05	--	--	na	1.0E+03	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	3.4E+03	--	--	na	2.9E+01	--	--	na	3.4E+02	**--**	**--**	**na**	**3.4E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	4.3E+03	--	--	na	1.5E+01	--	--	na	4.3E+02	**--**	**--**	**na**	**4.3E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	6.0E+03	--	--	na	2.1E+01	--	--	na	6.0E+02	**--**	**--**	**na**	**6.0E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.6E-01	4.8E-01	na	1.5E-02	6.0E-02	1.4E-02	na	5.4E-05	4.4E-01	1.3E-01	na	1.5E-03	**2.6E-01**	**1.3E-01**	**na**	**1.5E-03**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	5.2E+05	--	--	na	4.4E+03	--	--	na	5.2E+04	**--**	**--**	**na**	**5.2E+04**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	1.0E+04	--	--	na	8.5E+01	--	--	na	1.0E+03	**--**	**--**	**na**	**1.0E+03**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.3E+07	--	--	na	1.1E+05	--	--	na	1.3E+06	**--**	**--**	**na**	**1.3E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	5.3E+04	--	--	na	4.5E+02	--	--	na	5.3E+03	**--**	**--**	**na**	**5.3E+03**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	6.3E+04	--	--	na	5.3E+02	--	--	na	6.3E+03	**--**	**--**	**na**	**6.3E+03**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	3.3E+03	--	--	na	2.8E+01	--	--	na	3.3E+02	**--**	**--**	**na**	**3.3E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	9.7E+02	--	--	na	3.4E+00	--	--	na	9.7E+01	**--**	**--**	**na**	**9.7E+01**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	6.1E-07	--	--	na	5.1E-09	--	--	na	6.1E-08	**--**	**--**	**na**	**6.1E-08**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	5.7E+01	--	--	na	2.0E-01	--	--	na	5.7E+00	**--**	**--**	**na**	**5.7E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.4E-01	4.8E-01	na	1.1E+03	5.5E-02	1.4E-02	na	8.9E+00	4.0E-01	1.3E-01	na	1.1E+02	**2.4E-01**	**1.3E-01**	**na**	**1.1E+02**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.4E-01	4.8E-01	na	1.1E+03	5.5E-02	1.4E-02	na	8.9E+00	4.0E-01	1.3E-01	na	1.1E+02	**2.4E-01**	**1.3E-01**	**na**	**1.1E+02**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.4E-01	4.8E-01	--	--	5.5E-02	1.4E-02	--	--	4.0E-01	1.3E-01	--	--	**2.4E-01**	**1.3E-01**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	1.1E+03	--	--	na	8.9E+00	--	--	na	1.1E+02	**--**	**--**	**na**	**1.1E+02**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	9.5E-02	3.1E-01	na	7.1E-01	2.2E-02	9.0E-03	na	6.0E-03	1.6E-01	8.2E-02	na	7.1E-02	**9.5E-02**	**8.2E-02**	**na**	**7.1E-02**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.6E+00	--	--	na	3.0E-02	--	--	na	3.6E-01	**--**	**--**	**na**	**3.6E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.5E+04	--	--	na	2.1E+02	--	--	na	2.5E+03	**--**	**--**	**na**	**2.5E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.7E+03	--	--	na	1.4E+01	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	6.3E+04	--	--	na	5.3E+02	--	--	na	6.3E+03	**--**	**--**	**na**	**6.3E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	8.5E-02	na	--	--	2.5E-03	na	--	--	2.3E-02	na	--	**--**	**2.3E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.7E-01	3.2E-02	na	2.3E-02	1.3E-01	9.5E-04	na	7.9E-05	9.5E-01	8.7E-03	na	2.3E-03	**5.7E-01**	**8.7E-03**	**na**	**2.3E-03**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.7E-01	3.2E-02	na	1.1E-02	1.3E-01	9.5E-04	na	3.9E-05	9.5E-01	8.7E-03	na	1.1E-03	**5.7E-01**	**8.7E-03**	**na**	**1.1E-03**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	8.3E-02	--	--	na	2.9E-04	--	--	na	8.3E-03	**--**	**--**	**na**	**8.3E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	5.1E+03	--	--	na	1.8E+01	--	--	na	5.1E+02	**--**	**--**	**na**	**5.1E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	1.4E+00	--	--	na	4.9E-03	--	--	na	1.4E-01	**--**	**--**	**na**	**1.4E-01**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	4.9E+00	--	--	na	1.7E-02	--	--	na	4.9E-01	**--**	**--**	**na**	**4.9E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.0E+00	--	na	5.1E+01	2.4E-01	--	na	1.8E-01	1.7E+00	--	na	5.1E+00	**1.0E+00**	**--**	**na**	**5.1E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.3E+04	--	--	na	1.1E+02	--	--	na	1.3E+03	**--**	**--**	**na**	**1.3E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	9.4E+02	--	--	na	3.3E+00	--	--	na	9.4E+01	**--**	**--**	**na**	**9.4E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.7E+01	na	--	--	5.0E-01	na	--	--	4.6E+00	na	--	**--**	**4.6E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	5.1E+00	--	--	na	1.8E-02	--	--	na	5.1E-01	**--**	**--**	**na**	**5.1E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	2.7E+05	--	--	na	9.6E+02	--	--	na	2.7E+04	**--**	**--**	**na**	**2.7E+04**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	7.1E+01	6.4E+00	na	--	7.8E+01	5.4E+01	na	--	1.4E+01	1.6E+00	na	--	1.0E+02	1.5E+01	na	--	**7.8E+01**	**1.5E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	8.5E-01	na	--	--	2.5E-02	na	--	--	2.3E-01	na	--	**--**	**2.3E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	1.5E+00	6.5E+00	- -	- -	3.5E-01	1.9E-01	- -	--	2.6E+00	1.8E+00	- -	--	**1.5E+00**	**1.8E+00**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.8E+04	--	--	na	1.5E+02	--	--	na	1.8E+03	**--**	**--**	**na**	**1.8E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.7E+05	--	--	na	5.9E+02	--	--	na	1.7E+04	**--**	**--**	**na**	**1.7E+04**
Methoxychlor	0	--	3.0E-02	na	--	--	2.6E-01	na	--	--	7.5E-03	na	--	--	6.8E-02	na	--	**--**	**6.8E-02**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.3E+02	1.2E+01	na	4.6E+03	1.4E+02	1.0E+02	na	5.5E+04	2.8E+01	3.1E+00	na	4.6E+02	2.0E+02	2.8E+01	na	5.5E+03	**1.4E+02**	**2.8E+01**	**na**	**5.5E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	8.2E+03	--	--	na	6.9E+01	--	--	na	8.2E+02	**--**	**--**	**na**	**8.2E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	8.6E+02	--	--	na	3.0E+00	--	--	na	8.6E+01	**--**	**--**	**na**	**8.6E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.7E+03	--	--	na	6.0E+00	--	--	na	1.7E+02	**--**	**--**	**na**	**1.7E+02**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.5E+02	--	--	na	5.1E-01	--	--	na	1.5E+01	**--**	**--**	**na**	**1.5E+01**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	3.1E+01	5.6E+01	na	--	7.0E+00	1.7E+00	--	--	5.1E+01	1.5E+01	--	--	**3.1E+01**	**1.5E+01**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	7.2E-02	1.1E-01	na	--	1.6E-02	3.3E-03	na	--	1.2E-01	3.0E-02	na	--	**7.2E-02**	**3.0E-02**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.2E-01	na	1.8E-02	--	3.5E-03	na	6.4E-05	--	3.2E-02	na	1.8E-03	**--**	**3.2E-02**	**na**	**1.8E-03**
Pentachlorophenol [C]	0	3.3E+00	4.9E+00	na	3.0E+01	3.7E+00	4.2E+01	na	8.6E+02	1.5E+00	1.2E+00	na	3.0E+00	1.1E+01	1.1E+01	na	8.6E+01	**3.7E+00**	**1.1E+01**	**na**	**8.6E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	1.0E+07	--	--	na	8.6E+04	--	--	na	1.0E+06	**--**	**--**	**na**	**1.0E+06**
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.8E+04	--	--	na	4.0E+02	--	--	na	4.8E+03	**--**	**--**	**na**	**4.8E+03**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.2E+01	4.3E+01	na	5.0E+04	5.0E+00	1.3E+00	na	4.2E+02	3.7E+01	1.1E+01	na	5.0E+03	**2.2E+01**	**1.1E+01**	**na**	**5.0E+03**
Silver	0	1.7E+00	--	na	--	1.9E+00	--	na	--	3.2E-01	--	na	--	2.3E+00	--	na	--	**1.9E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	1.1E+03	--	--	na	4.0E+00	--	--	na	1.1E+02	**--**	**--**	**na**	**1.1E+02**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	9.4E+02	--	--	na	3.3E+00	--	--	na	9.4E+01	**--**	**--**	**na**	**9.4E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	5.6E+00	--	--	na	4.7E-02	--	--	na	5.6E-01	**--**	**--**	**na**	**5.6E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	7.1E+04	--	--	na	6.0E+02	--	--	na	7.1E+03	**--**	**--**	**na**	**7.1E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	8.0E-01	1.7E-03	na	8.0E-02	1.8E-01	5.0E-05	na	2.8E-04	1.3E+00	4.6E-04	na	8.0E-03	**8.0E-01**	**4.6E-04**	**na**	**8.0E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	5.1E-01	6.1E-01	na	--	1.2E-01	1.8E-02	na	--	8.4E-01	1.6E-01	na	--	**5.1E-01**	**1.6E-01**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	8.3E+02	--	--	na	7.0E+00	--	--	na	8.3E+01	**--**	**--**	**na**	**8.3E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	4.6E+03	--	--	na	1.6E+01	--	--	na	4.6E+02	**--**	**--**	**na**	**4.6E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	8.6E+03	--	--	na	3.0E+01	--	--	na	8.6E+02	**--**	**--**	**na**	**8.6E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	6.9E+02	--	--	na	2.4E+00	--	--	na	6.9E+01	**--**	**--**	**na**	**6.9E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	6.9E+02	--	--	na	2.4E+00	--	--	na	6.9E+01	**--**	**--**	**na**	**6.9E+01**
Zinc	0	8.3E+01	7.2E+01	na	2.6E+04	9.2E+01	6.1E+02	na	3.1E+05	1.8E+01	1.8E+01	na	2.6E+03	1.3E+02	1.6E+02	na	3.1E+04	**9.2E+01**	**1.6E+02**	**na**	**3.1E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	7.6E+02
Arsenic	1.5E+02
Barium	na
Cadmium	9.8E-01
Chromium III	6.3E+01
Chromium VI	7.0E+00
Copper	4.0E+00
Iron	na
Lead	8.7E+00
Manganese	na
Mercury	6.2E-01
Nickel	1.7E+01
Selenium	6.8E+00
Silver	7.6E-01
Zinc	3.7E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

1/30/2013 10:27:22 AM

Facility = Celanese Acetate 001 + 003
Chemical = TRC
Chronic averaging period = 4
WLAa = 21
WLAc = 94
Q.L. = 100
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 200
Variance = 14400
C.V. = 0.6
97th percentile daily values = 486.683
97th percentile 4 day average = 332.758
97th percentile 30 day average= 241.210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 21
Average Weekly limit = 12.5266068039467
Average Monthly LImit = 10.4080444412213

The data are:

200

APPENDIX D

PERMIT LIMIT DEVELOPMENT

Outfall 002

Waste Load Allocation Spreadsheet

STATS printouts

Mixing Zone Predictions for Celanese Acetate 002

Effluent Flow = 3.23 MGD
Stream 7Q10 = 637.8 MGD
Stream 30Q10 = 744.8 MGD
Stream 1Q10 = 512.8 MGD
Stream slope = .000954 ft/ft
Stream width = 550 ft
Bottom scale = 3
Channel scale = 1

Mixing Zone Predictions @ 7Q10

Depth = 2.4118 ft
Length = 137880.01 ft
Velocity = .7481 ft/sec
Residence Time = 2.1333 days

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 93.75% of the 7Q10 is used.

Mixing Zone Predictions @ 30Q10

Depth = 2.6466 ft
Length = 127541.39 ft
Velocity = .7954 ft/sec
Residence Time = 1.8558 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = 2.1166 ft
Length = 153838.61 ft
Velocity = .6862 ft/sec
Residence Time = 62.2762 hours

Recommendation:

A complete mix assumption is appropriate for this situation providing no more than 1.61% of the 1Q10 is used.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Celanese Acetate 002 Permit No.: VA0000299

Receiving Stream: New River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	54	mg/L
90% Temperature (Annual) =	33.3	deg C
90% Temperature (Wet season) =	24.83	deg C
90% Maximum pH =	8.47	SU
10% Maximum pH =	7	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	512.8	MGD
7Q10 (Annual) =	637.8	MGD
30Q10 (Annual) =	744.8	MGD
1Q10 (Wet season) =	512.8	MGD
30Q10 (Wet season)	744.8	MGD
30Q5 =	1000	MGD
Harmonic Mean =	1998.8	MGD

Mixing Information		
Annual - 1Q10 Mix =	1.6	%
- 7Q10 Mix =	93.8	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	1.6	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	136	mg/L
90% Temp (Annual) =	31.5	deg C
90% Temp (Wet season) =	37.8	deg C
90% Maximum pH =	8.5	SU
10% Maximum pH =	6	SU
Discharge Flow =	3.23	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	3.1E+05	--	--	na	9.9E+01	--	--	na	3.1E+04	**--**	**--**	**na**	**3.1E+04**
Acrolein	0	--	--	na	9.3E+00	--	--	na	2.9E+03	--	--	na	9.3E-01	--	--	na	2.9E+02	**--**	**--**	**na**	**2.9E+02**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	1.5E+03	--	--	na	2.5E-01	--	--	na	1.5E+02	**--**	**--**	**na**	**1.5E+02**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	1.1E+01	--	na	3.1E-01	7.5E-01	--	na	5.0E-05	1.2E+02	--	na	3.1E-02	**1.1E+01**	**--**	**na**	**3.1E-02**
Ammonia-N (mg/l) (Yearly)	0	3.34E+00	3.42E-01	na	--	1.18E+01	7.91E+01	na	--	8.48E-01	8.54E-02	na	--	1.35E+02	1.98E+01	na	--	**1.18E+01**	**1.98E+01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	3.34E+00	5.87E-01	na	--	1.18E+01	1.36E+02	na	--	8.48E-01	1.47E-01	na	--	1.35E+02	3.40E+01	na	--	**1.18E+01**	**3.40E+01**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	1.2E+07	--	--	na	4.0E+03	--	--	na	1.2E+06	**--**	**--**	**na**	**1.2E+06**
Antimony	0	--	--	na	6.4E+02	--	--	na	2.0E+05	--	--	na	6.4E+01	--	--	na	2.0E+04	**--**	**--**	**na**	**2.0E+04**
Arsenic	0	3.4E+02	1.5E+02	na	--	1.2E+03	2.8E+04	na	--	8.5E+01	3.8E+01	na	--	1.4E+04	7.4E+03	na	--	**1.2E+03**	**7.4E+03**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	3.2E+05	--	--	na	5.1E+01	--	--	na	3.2E+04	**--**	**--**	**na**	**3.2E+04**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	1.2E+00	--	--	na	2.0E-04	--	--	na	1.2E-01	**--**	**--**	**na**	**1.2E-01**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	3.3E+03	--	--	na	5.3E-01	--	--	na	3.3E+02	**--**	**--**	**na**	**3.3E+02**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	2.0E+07	--	--	na	6.5E+03	--	--	na	2.0E+06	**--**	**--**	**na**	**2.0E+06**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	1.4E+04	--	--	na	2.2E+00	--	--	na	1.4E+03	**--**	**--**	**na**	**1.4E+03**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	8.7E+05	--	--	na	1.4E+02	--	--	na	8.7E+04	**--**	**--**	**na**	**8.7E+04**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	5.9E+05	--	--	na	1.9E+02	--	--	na	5.9E+04	**--**	**--**	**na**	**5.9E+04**
Cadmium	0	2.9E+00	7.0E-01	na	--	1.0E+01	1.3E+02	na	--	4.9E-01	1.8E-01	na	--	7.9E+01	3.5E+01	na	--	**1.0E+01**	**3.5E+01**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	9.9E+03	--	--	na	1.6E+00	--	--	na	9.9E+02	**--**	**--**	**na**	**9.9E+02**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	8.5E+00	8.0E-01	na	5.0E+00	6.0E-01	1.1E-03	na	8.1E-04	9.6E+01	2.1E-01	na	5.0E-01	**8.5E+00**	**2.1E-01**	**na**	**5.0E-01**
Chloride	0	8.6E+05	2.3E+05	na	--	3.0E+06	4.3E+07	na	--	2.2E+05	5.8E+04	na	--	3.4E+07	1.1E+07	na	--	**3.0E+06**	**1.1E+07**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	6.7E+01	2.0E+03	na	--	4.8E+00	2.8E+00	na	--	7.6E+02	5.5E+02	na	--	**6.7E+01**	**5.5E+02**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	5.0E+05	--	--	na	1.6E+02	--	--	na	5.0E+04	**--**	**--**	**na**	**5.0E+04**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	8.1E+04	--	--	na	1.3E+01	--	--	na	8.1E+03	**--**	**--**	**na**	**8.1E+03**
Chloroform	0	--	--	na	1.1E+04	--	--	na	3.4E+06	--	--	na	1.1E+03	--	--	na	3.4E+05	**--**	**--**	**na**	**3.4E+05**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	5.0E+05	--	--	na	1.6E+02	--	--	na	5.0E+04	**--**	**--**	**na**	**5.0E+04**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	4.7E+04	--	--	na	1.5E+01	--	--	na	4.7E+03	**--**	**--**	**na**	**4.7E+03**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	2.9E-01	7.6E+00	na	--	2.1E-02	1.0E-02	na	--	3.3E+00	2.0E+00	na	--	**2.9E-01**	**2.0E+00**	**na**	**--**
Chromium III	0	4.6E+02	4.5E+01	na	--	1.6E+03	8.4E+03	na	--	8.7E+01	1.1E+01	na	--	1.4E+04	2.2E+03	na	--	**1.6E+03**	**2.2E+03**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	5.7E+01	2.0E+03	na	--	4.0E+00	2.8E+00	na	--	6.4E+02	5.5E+02	na	--	**5.7E+01**	**5.5E+02**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	3.1E+03	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	1.1E+01	--	--	na	1.8E-03	--	--	na	1.1E+00	**--**	**--**	**na**	**1.1E+00**
Copper	0	1.1E+01	5.3E+00	na	--	3.7E+01	9.9E+02	na	--	1.9E+00	1.3E+00	na	--	3.0E+02	2.6E+02	na	--	**3.7E+01**	**2.6E+02**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	7.8E+01	9.7E+02	na	5.0E+06	5.5E+00	1.3E+00	na	1.6E+03	8.8E+02	2.6E+02	na	5.0E+05	**7.8E+01**	**2.6E+02**	**na**	**5.0E+05**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	1.9E+00	--	--	na	3.1E-04	--	--	na	1.9E-01	**--**	**--**	**na**	**1.9E-01**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	1.4E+00	--	--	na	2.2E-04	--	--	na	1.4E-01	**--**	**--**	**na**	**1.4E-01**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	3.9E+00	1.9E-01	na	1.4E+00	2.8E-01	2.5E-04	na	2.2E-04	4.4E+01	5.0E-02	na	1.4E-01	**3.9E+00**	**5.0E-02**	**na**	**1.4E-01**
Demeton	0	--	1.0E-01	na	--	--	1.9E+01	na	--	--	2.5E-02	na	--	--	5.0E+00	na	--	**--**	**5.0E+00**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	6.0E-01	3.2E+01	na	--	4.3E-02	4.3E-02	na	--	6.8E+00	8.4E+00	na	--	**6.0E-01**	**8.4E+00**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	4.0E+05	--	--	na	1.3E+02	--	--	na	4.0E+04	**--**	**--**	**na**	**4.0E+04**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	3.0E+05	--	--	na	9.6E+01	--	--	na	3.0E+04	**--**	**--**	**na**	**3.0E+04**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	5.9E+04	--	--	na	1.9E+01	--	--	na	5.9E+03	**--**	**--**	**na**	**5.9E+03**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	1.7E+02	--	--	na	2.8E-02	--	--	na	1.7E+01	**--**	**--**	**na**	**1.7E+01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	1.1E+05	--	--	na	1.7E+01	--	--	na	1.1E+04	**--**	**--**	**na**	**1.1E+04**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	2.3E+05	--	--	na	3.7E+01	--	--	na	2.3E+04	**--**	**--**	**na**	**2.3E+04**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	2.2E+06	--	--	na	7.1E+02	--	--	na	2.2E+05	**--**	**--**	**na**	**2.2E+05**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	3.1E+06	--	--	na	1.0E+03	--	--	na	3.1E+05	**--**	**--**	**na**	**3.1E+05**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	9.0E+04	--	--	na	2.9E+01	--	--	na	9.0E+03	**--**	**--**	**na**	**9.0E+03**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	9.3E+04	--	--	na	1.5E+01	--	--	na	9.3E+03	**--**	**--**	**na**	**9.3E+03**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	1.3E+05	--	--	na	2.1E+01	--	--	na	1.3E+04	**--**	**--**	**na**	**1.3E+04**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	8.5E-01	1.0E+01	na	3.3E-01	6.0E-02	1.4E-02	na	5.4E-05	9.6E+00	2.8E+00	na	3.3E-02	**8.5E-01**	**2.8E+00**	**na**	**3.3E-02**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	1.4E+07	--	--	na	4.4E+03	--	--	na	1.4E+06	**--**	**--**	**na**	**1.4E+06**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	2.6E+05	--	--	na	8.5E+01	--	--	na	2.6E+04	**--**	**--**	**na**	**2.6E+04**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	3.4E+08	--	--	na	1.1E+05	--	--	na	3.4E+07	**--**	**--**	**na**	**3.4E+07**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	1.4E+06	--	--	na	4.5E+02	--	--	na	1.4E+05	**--**	**--**	**na**	**1.4E+05**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	1.6E+06	--	--	na	5.3E+02	--	--	na	1.6E+05	**--**	**--**	**na**	**1.6E+05**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	8.7E+04	--	--	na	2.8E+01	--	--	na	8.7E+03	**--**	**--**	**na**	**8.7E+03**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	2.1E+04	--	--	na	3.4E+00	--	--	na	2.1E+03	**--**	**--**	**na**	**2.1E+03**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	1.6E-05	--	--	na	5.1E-09	--	--	na	1.6E-06	**--**	**--**	**na**	**1.6E-06**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	1.2E+03	--	--	na	2.0E-01	--	--	na	1.2E+02	**--**	**--**	**na**	**1.2E+02**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	7.8E-01	1.0E+01	na	2.8E+04	5.5E-02	1.4E-02	na	8.9E+00	8.8E+00	2.8E+00	na	2.8E+03	**7.8E-01**	**2.8E+00**	**na**	**2.8E+03**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	7.8E-01	1.0E+01	na	2.8E+04	5.5E-02	1.4E-02	na	8.9E+00	8.8E+00	2.8E+00	na	2.8E+03	**7.8E-01**	**2.8E+00**	**na**	**2.8E+03**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	7.8E-01	1.0E+01	--	--	5.5E-02	1.4E-02	--	--	8.8E+00	2.8E+00	--	--	**7.8E-01**	**2.8E+00**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	2.8E+04	--	--	na	8.9E+00	--	--	na	2.8E+03	**--**	**--**	**na**	**2.8E+03**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	3.0E-01	6.7E+00	na	1.9E+01	2.2E-02	9.0E-03	na	6.0E-03	3.4E+00	1.8E+00	na	1.9E+00	**3.0E-01**	**1.8E+00**	**na**	**1.9E+00**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	9.3E+01	--	--	na	3.0E-02	--	--	na	9.3E+00	**--**	**--**	**na**	**9.3E+00**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	6.5E+05	--	--	na	2.1E+02	--	--	na	6.5E+04	**--**	**--**	**na**	**6.5E+04**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	4.3E+04	--	--	na	1.4E+01	--	--	na	4.3E+03	**--**	**--**	**na**	**4.3E+03**
Fluorene	0	--	--	na	5.3E+03	--	--	na	1.6E+06	--	--	na	5.3E+02	--	--	na	1.6E+05	**--**	**--**	**na**	**1.6E+05**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	1.9E+00	na	--	--	2.5E-03	na	--	--	5.0E-01	na	--	**--**	**5.0E-01**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	1.8E+00	7.1E-01	na	4.9E-01	1.3E-01	9.5E-04	na	7.9E-05	2.1E+01	1.9E-01	na	4.9E-02	**1.8E+00**	**1.9E-01**	**na**	**4.9E-02**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	1.8E+00	7.1E-01	na	2.4E-01	1.3E-01	9.5E-04	na	3.9E-05	2.1E+01	1.9E-01	na	2.4E-02	**1.8E+00**	**1.9E-01**	**na**	**2.4E-02**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	1.8E+00	--	--	na	2.9E-04	--	--	na	1.8E-01	**--**	**--**	**na**	**1.8E-01**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	1.1E+05	--	--	na	1.8E+01	--	--	na	1.1E+04	**--**	**--**	**na**	**1.1E+04**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	3.0E+01	--	--	na	4.9E-03	--	--	na	3.0E+00	**--**	**--**	**na**	**3.0E+00**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	1.1E+02	--	--	na	1.7E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	3.4E+00	--	na	1.1E+03	2.4E-01	--	na	1.8E-01	3.8E+01	--	na	1.1E+02	**3.4E+00**	**--**	**na**	**1.1E+02**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	3.4E+05	--	--	na	1.1E+02	--	--	na	3.4E+04	**--**	**--**	**na**	**3.4E+04**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	2.0E+04	--	--	na	3.3E+00	--	--	na	2.0E+03	**--**	**--**	**na**	**2.0E+03**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	3.7E+02	na	--	--	5.0E-01	na	--	--	9.9E+01	na	--	**--**	**9.9E+01**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.1E+02	--	--	na	1.8E-02	--	--	na	1.1E+01	**--**	**--**	**na**	**1.1E+01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	6.0E+06	--	--	na	9.6E+02	--	--	na	6.0E+05	**--**	**--**	**na**	**6.0E+05**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	8.5E+01	6.2E+00	na	--	3.0E+02	1.2E+03	na	--	1.4E+01	1.6E+00	na	--	2.2E+03	3.1E+02	na	--	**3.0E+02**	**3.1E+02**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	1.9E+01	na	--	--	2.5E-02	na	--	--	5.0E+00	na	--	**--**	**5.0E+00**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	5.0E+00	1.4E+02	- -	- -	3.5E-01	1.9E-01	- -	--	5.6E+01	3.8E+01	- -	--	**5.0E+00**	**3.8E+01**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	4.7E+05	--	--	na	1.5E+02	--	--	na	4.7E+04	**--**	**--**	**na**	**4.7E+04**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	3.7E+06	--	--	na	5.9E+02	--	--	na	3.7E+05	**--**	**--**	**na**	**3.7E+05**
Methoxychlor	0	--	3.0E-02	na	--	--	5.6E+00	na	--	--	7.5E-03	na	--	--	1.5E+00	na	--	**--**	**1.5E+00**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.5E+02	1.2E+01	na	4.6E+03	5.2E+02	2.3E+03	na	1.4E+06	2.7E+01	3.0E+00	na	4.6E+02	4.4E+03	6.0E+02	na	1.4E+05	**5.2E+02**	**6.0E+02**	**na**	**1.4E+05**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	2.1E+05	--	--	na	6.9E+01	--	--	na	2.1E+04	**--**	**--**	**na**	**2.1E+04**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	1.9E+04	--	--	na	3.0E+00	--	--	na	1.9E+03	**--**	**--**	**na**	**1.9E+03**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	3.7E+04	--	--	na	6.0E+00	--	--	na	3.7E+03	**--**	**--**	**na**	**3.7E+03**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	3.2E+03	--	--	na	5.1E-01	--	--	na	3.2E+02	**--**	**--**	**na**	**3.2E+02**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	9.9E+01	1.2E+03	na	--	7.0E+00	1.7E+00	--	--	1.1E+03	3.3E+02	--	--	**9.9E+01**	**3.3E+02**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	2.3E-01	2.4E+00	na	--	1.6E-02	3.3E-03	na	--	2.6E+00	6.4E-01	na	--	**2.3E-01**	**6.4E-01**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	2.6E+00	na	4.0E-01	--	3.5E-03	na	6.4E-05	--	6.9E-01	na	4.0E-02	**--**	**6.9E-01**	**na**	**4.0E-02**
Pentachlorophenol [C]	0	5.0E+00	6.6E+00	na	3.0E+01	1.8E+01	1.2E+03	na	1.9E+04	2.1E+00	1.6E+00	na	3.0E+00	3.4E+02	3.3E+02	na	1.9E+03	**1.8E+01**	**3.3E+02**	**na**	**1.9E+03**
Phenol	0	--	--	na	8.6E+05	--	--	na	2.7E+08	--	--	na	8.6E+04	--	--	na	2.7E+07	**--**	**--**	**na**	**2.7E+07**
Pyrene	0	--	--	na	4.0E+03	--	--	na	1.2E+06	--	--	na	4.0E+02	--	--	na	1.2E+05	**--**	**--**	**na**	**1.2E+05**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	7.1E+01	9.3E+02	na	1.3E+06	5.0E+00	1.3E+00	na	4.2E+02	8.0E+02	2.5E+02	na	1.3E+05	**7.1E+01**	**2.5E+02**	**na**	**1.3E+05**
Silver	0	2.2E+00	--	na	--	7.8E+00	--	na	--	3.0E-01	--	na	--	4.9E+01	--	na	--	**7.8E+00**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	2.5E+04	--	--	na	4.0E+00	--	--	na	2.5E+03	**--**	**--**	**na**	**2.5E+03**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	2.0E+04	--	--	na	3.3E+00	--	--	na	2.0E+03	**--**	**--**	**na**	**2.0E+03**
Thallium	0	--	--	na	4.7E-01	--	--	na	1.5E+02	--	--	na	4.7E-02	--	--	na	1.5E+01	**--**	**--**	**na**	**1.5E+01**
Toluene	0	--	--	na	6.0E+03	--	--	na	1.9E+06	--	--	na	6.0E+02	--	--	na	1.9E+05	**--**	**--**	**na**	**1.9E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	2.6E+00	3.7E-02	na	1.7E+00	1.8E-01	5.0E-05	na	2.8E-04	2.9E+01	9.9E-03	na	1.7E-01	**2.6E+00**	**9.9E-03**	**na**	**1.7E-01**
Tributyltin	0	4.6E-01	7.2E-02	na	--	1.6E+00	1.3E+01	na	--	1.2E-01	1.8E-02	na	--	1.8E+01	3.6E+00	na	--	**1.6E+00**	**3.6E+00**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	2.2E+04	--	--	na	7.0E+00	--	--	na	2.2E+03	**--**	**--**	**na**	**2.2E+03**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	9.9E+04	--	--	na	1.6E+01	--	--	na	9.9E+03	**--**	**--**	**na**	**9.9E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	1.9E+05	--	--	na	3.0E+01	--	--	na	1.9E+04	**--**	**--**	**na**	**1.9E+04**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	1.5E+04	--	--	na	2.4E+00	--	--	na	1.5E+03	**--**	**--**	**na**	**1.5E+03**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	1.5E+04	--	--	na	2.4E+00	--	--	na	1.5E+03	**--**	**--**	**na**	**1.5E+03**
Zinc	0	9.4E+01	7.1E+01	na	2.6E+04	3.3E+02	1.3E+04	na	8.1E+06	1.8E+01	1.8E+01	na	2.6E+03	2.8E+03	3.5E+03	na	8.1E+05	**3.3E+02**	**3.5E+03**	**na**	**8.1E+05**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	2.0E+04
Arsenic	4.8E+02
Barium	na
Cadmium	4.1E+00
Chromium III	6.5E+02
Chromium VI	2.3E+01
Copper	1.5E+01
Iron	na
Lead	1.2E+02
Manganese	na
Mercury	2.0E+00
Nickel	2.1E+02
Selenium	2.8E+01
Silver	3.1E+00
Zinc	1.3E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

APPENDIX E

PERMIT LIMIT DEVELOPMENT

Outfall 003

Federal Effluent Guideline Calculations

Excerpt from EPA, Technical Support Document for Water Quality-based Toxics Control, 1991revision

CORMIX Modeling

Waste Load Allocation Spreadsheet

WETLIM10 spreadsheet

Celanese Acetate, LLC VA0000299

Outfall 003
Calculation of OCPSF BPT Effluent Limitations (EL) from LTAEF

LTAEF, MGD = 1.69

		BOD, Average		BOD, Maximum		TSS, Average		TSS, Maximum	
OCPSF Subpart	Fractional Production	BPT EL	kg/day	BPT EL	kg/day	BPT EL	kg/day	BPT EL	kg/day
Thermoplastic	0.312	24	47.898	64	127.73	40	79.83	130	259.45
Other Fibers	0.282	18	32.469	48	86.585	36	64.939	115	207.44
Commodity	0.406	30	77.911	80	207.76	46	119.46	149	386.96
Total	1		158.28		422.08		264.23		853.85
Sanitary			5.96		8.94		5.96		8.94
Permit Limitation			**164**		**431**		**270**		**863**

Sample Calculation:
Load limit for each subpart, kg/day = EL x LTAEF x 3.785 x fractional production

Sanitary load:	average load	max load
	52500*30*3.785	1.5 x ave
	5.961375	8.9421

feeders and other nonmobile organisms, spatial distribution of organisms and reinforcement of weakened populations are enhanced, and embryos and larvae of some fish species develop while drifting [11]. Anadromous and catadromous species must be able to reach suitable spawning areas. Their young (and in some cases the adults) must be assured a return route to their growing and living areas. Many species make migrations for spawning and other purposes. Barriers or blocks that prevent or interfere with these types of essential transport and movement can be created by water with inadequate chemical or physical quality.

As explained above, a State regulatory agency may decide to deny a mixing zone in a site-specific case. For example, denial should be considered when bioaccumulative pollutants are in the discharge. The potential for a pollutant to bioaccumulate in living organisms is measured by (1) the bioconcentration factor (BCF), which is chemical-specific and describes the degree to which an organism or tissue can acquire a higher contaminant concentration than its environment (e.g., surface water); (2) the duration of exposure; and (3) the concentration of the chemical of interest. While any BCF value greater than 1 indicates that bioaccumulation potential exists, bioaccumulation potential is generally not considered to be significant unless the BCF exceeds 100 or more. Thus, a chemical that is discharged to a receiving stream, resulting in low concentrations, and that has a low BCF value will not create a bioaccumulation hazard. Conversely, a chemical that is discharged to a receiving stream, resulting in a low concentration but having a high BCF value, may cause in a bioaccumulation hazard. Also, some chemicals of relatively low toxicity, such as zinc, will bioconcentrate in fish without harmful effects resulting from human consumption.

Another example of when a regulator should consider prohibiting a mixing zone is in situations where an effluent is known to attract biota. In such cases, provision of a continuous zone of passage around the mixing area will not serve the purpose of protecting aquatic life. A review of the technical literature on avoidance/attraction behavior revealed that the majority of toxicants elicited an avoidance or neutral response at low concentrations [13]. However, some chemicals did elicit an attractive response, but the data were not sufficient to support any predictive methods. Temperature can be an attractive force and may counter an avoidance response to a pollutant, resulting in attraction to the toxicant discharge. Innate behavior such as migration may also supersede an avoidance response and cause fish to incur a significant exposure.

4.3.2 Minimizing the Size of Mixing Zones

Concentrations above the chronic criteria are likely to prevent sensitive taxa from taking up long-term residence in the mixing zone. In this regard, benthic organisms and territorial organisms are likely to be of greatest concern. The higher the concentrations occurring within an isopleth, the more taxa are likely to be excluded, thereby affecting the structure and function of the ecological community. It is thus important to minimize the overall size of the mixing zone and the size of elevated concentration isopleths within the mixing zone.

4.3.3 Prevention of Lethality to Passing Organisms

The *Water Quality Standards Handbook* [14] indicates that whether to establish a mixing zone policy is a matter of State discretion, but that any State policy allowing for mixing zones must be consistent with the CWA and is subject to approval of the Regional Administrator. The handbook provides additional discussion regarding the basis for a State mixing zone policy.

Lethality is a function of the magnitude of pollutant concentrations and the duration an organism is exposed to those concentrations. Requirements for wastewater plumes that tend to attract aquatic life should incorporate measures to reduce the toxicity (e.g., via pretreatment, dilution) to minimize lethality or any irreversible toxic effects on aquatic life.

EPA's water quality criteria provide guidance on the magnitude and duration of pollutant concentrations causing lethality. The criterion maximum concentration (CMC) is used as a means to prevent lethality or other acute effects. As explained in Appendix D, the CMC is a toxicity level and should not be confused with an LC_{50} level. The CMC is defined as one-half of the final acute value for specific toxicants and 0.3 acute toxic unit (TU_a) for effluent toxicity (see Chapter 2). The CMC describes the condition under which lethality will not occur if the duration of the exposure to the CMC level is less than 1 hour. The CMC for whole effluent toxicity is intended to prevent lethality or acute effects in the aquatic biota. The CMC for individual toxicants prevents acute effects in all but a small percentage of the tested species. Thus, the areal extent and concentration isopleths of the mixing zone must be such that the 1-hour average exposure of organisms passing through the mixing zone is less than the CMC. The organism must be able to pass through quickly or flee the high-concentration area. The objective of developing water quality recommendations for mixing zones is to provide time-exposure histories that produce negligible or no measurable effects on populations of critical species in the receiving system.

Lethality to passing organisms can be prevented in the mixing zone in one of four ways. The first method is to prohibit concentrations in excess of the CMC in the pipe itself, as measured directly at the end of the pipe. As an example, the CMC should be met in the pipe whenever a continuous discharge is made to an intermittent stream. The second approach is to require that the CMC be met within a very short distance from the outfall during chronic design-flow conditions for receiving waters (see Section 4.4.2).

If the second alternative is selected, hydraulic investigations and calculations indicate that 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 CMC 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 any discharge pipe.

A third alternative (applicable to any waterbody) is not to use a high-velocity discharge. Rather the discharger should provide

data to the State regulatory agency showing that the most restrictive of the following conditions are met for each outfall:

- The CMC 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.

- The CMC should be met within a distance of 50 times the discharge length scale in any spatial direction. In the case of a multiport diffuser, this requirement must be met for each port using the appropriate discharge length scale of that port. This restriction will ensure a dilution factor of at least 10 within this distance under all possible circumstances, including situations of severe bottom interaction, surface interaction, or lateral merging.

- The CMC 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 for rivers). This restriction will prevent locating the discharge in very shallow environments or very close to shore, which would result in significant surface and bottom concentrations.

A fourth alternative (applicable to any waterbody) is for the discharger to provide data to the State regulatory agency showing that a drifting organism would not be exposed to 1-hour average concentrations exceeding the CMC, or would not receive harmful exposure when evaluated by other valid toxicological analysis, as discussed in Section 2.2.2. Such data should be collected during environmental conditions that replicate critical conditions.

For the third and fourth alternatives, examples of such data include monitoring studies, except for those situations where collecting chemical samples to develop monitoring data would be impractical, such as at deep outfalls in oceans, lakes, or embayments. Other types of data could include field tracer studies using dye, current meters, other tracer materials, or detailed analytical calculations, such as modeling estimations of concentration or dilution isopleths.

The Water Quality Criteria—1972 [11] outlines a method, applicable to the fourth alternative, to determine whether a mixing zone is tolerable for a free-swimming or drifting organism. The method incorporates mortality rates (based on toxicity studies for the pollutant 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. The intent of the method is to prevent the actual time of exposure from exceeding the exposure time required to elicit an effect [10]:

$$\Sigma \frac{T(n)}{ET(X) \text{ at } C(n)} \leq 1$$

where T(n) is the exposure time an organism is in isopleth n, and ET(X) is the "effect time." That is, ET(X) is the exposure time required to produce an effect (including a delayed effect) in X percent of organisms exposed to a concentration equal to C(n), the concentration in isopleth n. ET(X) is experimentally determined; the effect is usually mortality. If the summation of ratios of exposure time to effect time is less than 1, then the percent effect will not occur.

4.3.4 Prevention of Bioaccumulation Problems for Human Health

States are not required to allow mixing zones. Where unsafe fish tissue levels or other evidence indicates a lack of assimilative capacity in a particular waterbody for a bioaccumulative pollutant, care should be taken in calculating discharge limits for this pollutant or the additivity of multiple pollutants. In particular, relaxing discharge limits because of the provision of a mixing zone may not be appropriate in this situation.

4.4 MIXING ZONE ANALYSES

Proper design of a mixing zone study for a particular waterbody requires estimation of the distance from the outfall to the point where the effluent mixes completely with the receiving water. The boundary is usually defined as the location where the concentrations across a transect of the waterbody differ by less than 5 percent. The boundary can be determined based on the results of a tracer study or the use of mixing zone models. Both procedures, along with simple order-of-magnitude dilution calculations, are discussed in the following subsections.

If the distance to complete mixing is insignificant, then mixing zone modeling is not necessary and the fate and transport models described in Section 4.5 can be used to perform the WLA. **It is important to remember that the assumption of complete mixing is not a conservative assumption for toxic discharges; an assumption of minimal mixing is the conservative approach.** If completely mixed conditions do not occur within a short distance of the outfall, the WLA study should rely on mixing zone monitoring and modeling. Just as in the case of completely mixed models, mixing zone analysis can be performed using both steady-state and dynamic techniques. State requirements regarding the mixing zone will determine how water quality criteria are used in the TMDL.

This section is divided into five subsections. The first discusses recommendations for outfall designs and means to maximize initial dilution. The second provides a brief description of the four major waterbody types and the critical design period when mixing zone analysis should be performed for each. The third provides a brief description of tracer studies and how they may be used to define a mixing zone. The fourth and fifth subsections discuss simplified methods and sophisticated models to predict the two stages of mixing (i.e., discharge-induced and ambient-induced mixing). For a detailed explanation of the mechanisms involved in estimating both stages of mixing, two references are recommended, Holley and Jirka [15] and Fischer et al. [16]. Although the models presented in Sections 4.4.4 and 4.4.5 simplify the mixing process, the assessor should have an understanding of the basic physical concepts governing mixing to use these

Figure 8

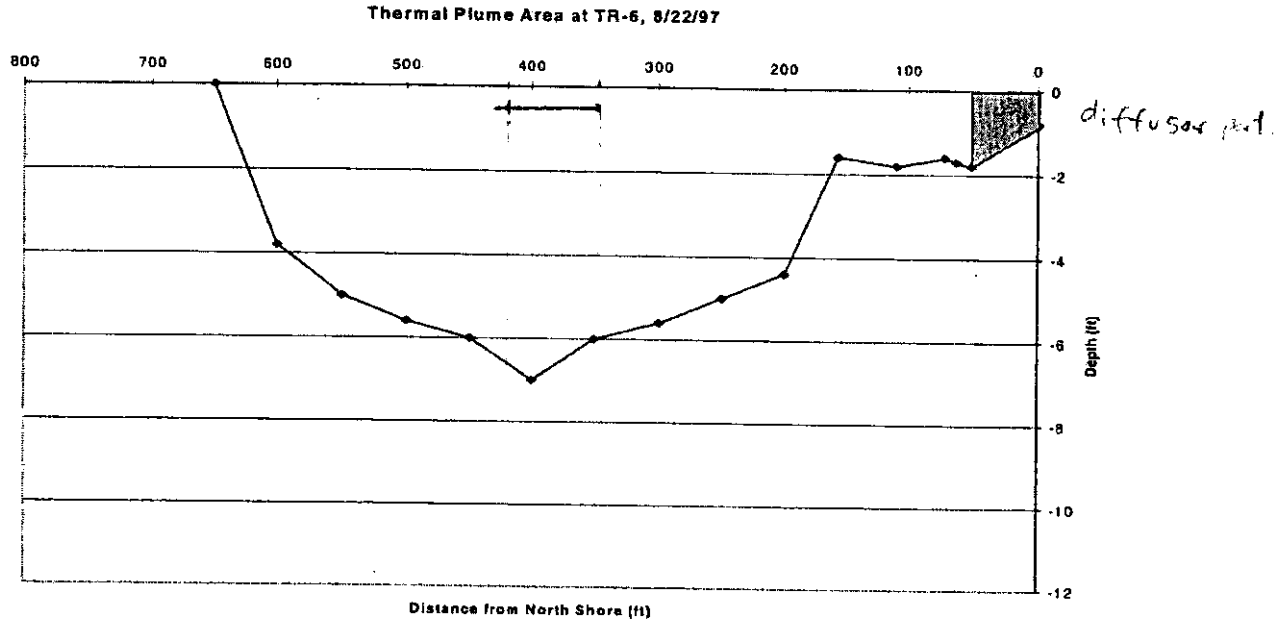
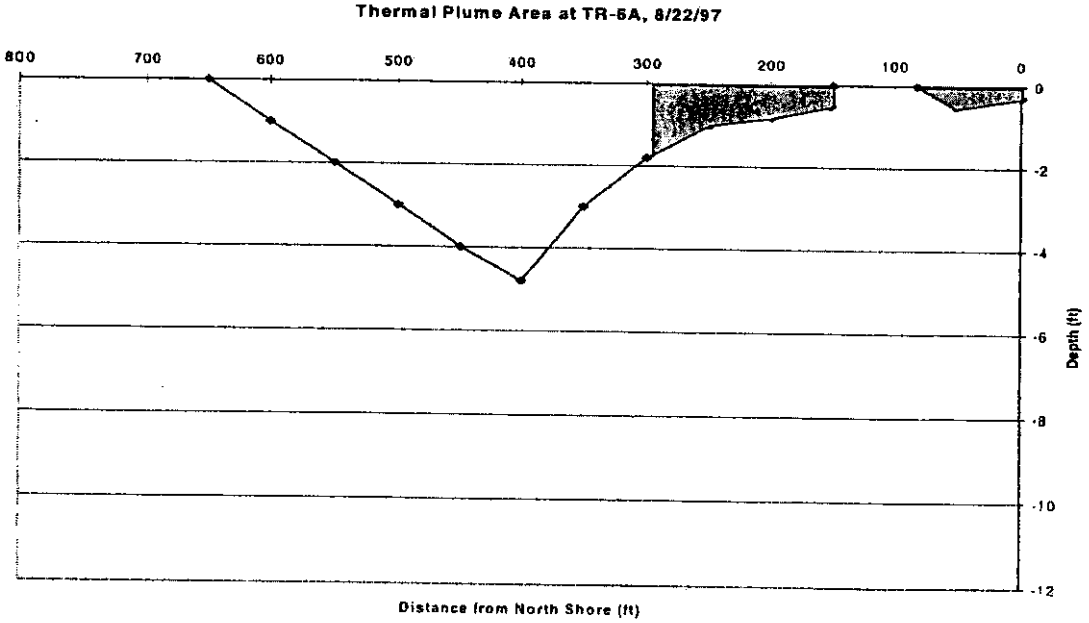
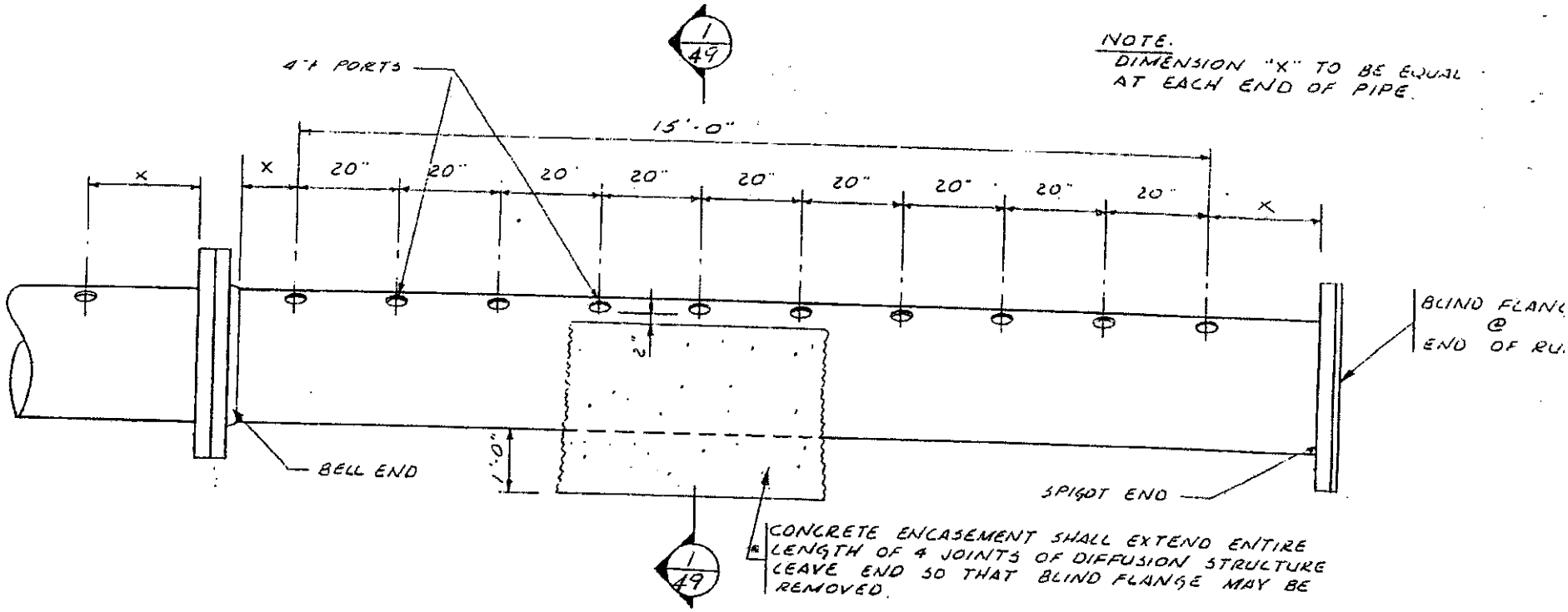


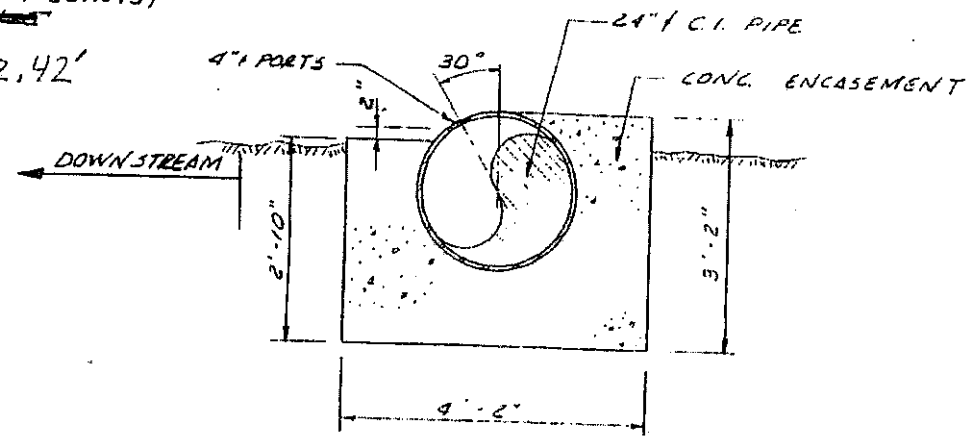
Figure 9





ELEVATION
(TYPICAL OF 4 JOINTS)

1" = 2.42'



SECTION 1/49
1/2" = 1'-0"

DETAIL - DIFFUSION STRUCTURE

Reque for modeling assistance f diffusor discharge

To: Dale Phillips, OWRM

Name of Discharger: Hoechst Celanese, Celco Plant
Flow of Discharge: Flow - 2.09 MGD Temp. - 18.9-26.1 °C (Long term av
Temperature of discharge:
Salinity of discharge:
Name of receiving stream: New River
7Q10 at discharge site: 684.554 MGD (1059.162 cfs)
1Q10 at discharge site: 522.192 MGD (807.950 cfs)
Tidal range at site: NA
Max tidal velocity at site: NA
Temperature of stream: 8.7-20°C
Salinity of stream:
Average depth of stream: 6 feet
Width of stream: ~500 feet
Depth of diffusor: 6 feet
Length of diffusor: 74 feet
Number of ports: 40 (each port is 4" in diameter)
Distance of 1st. port from bank: ~347 feet (~153 feet from opposite Bank)
Distance of last port from bank: ~419 feet (~80 feet from opposite Bank)

Brief schematic drawing of diffusor, with description of port details (if appropriate) and the direction of jet flow from ports shown in both the horizontal and vertical directions (put below or on attachment).

RECEIVED 27
WCRO
ADM ___ WRM ___
RS ___ WRD ___
TS ___ FILE ✓
COPY ___

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          Celanese003
 Design case:              Acute_6_Feet_Deep
 FILE NAME:                cormix\sim\CELCO11 .cx2
 Time of Fortran run:      03/10/08--16:31:48

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =     198.12  AS     =    362.56  QA     =     22.40  ICHREG= 1
 HA     =       1.83  HD     =      1.83
 UA     =       .062  F      =      .100  USTAR = .6908E-02
 UW     =      2.000  UWSTAR= .2198E-02
 Uniform density environment
 STRCND=  U           RHOAM =  999.1605

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional_perpendicular
 BANK   =  LEFT      DISTB =     81.05  YB1    =     69.80  YB2    =     92.30
 LD     =     22.50  NOPEN =   40       SPAC   =       .58
 D0     =      .102  A0     =      .008  H0     =       .05
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =      90.00  THETA =     60.00  SIGMA =        .00  BETA   =     90.00
 U0     =      .398  Q0     =      .129        = .1290E+00
 RHO0   =  995.0253  DRHO0 = .4135E+01  GP0    = .4059E-01
 C0     = .1000E+03  CUNITS=  %
 IPOLL =  1          KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     = .5733E-02  m0     = .2281E-02  j0     = .2327E-03  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =      .014  lM     =       .60  lm     =       .60
 lmp    =  99999.00  lbp    =  99999.00  la     =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     = .1290E+00  M0     = .5131E-01  J0     = .5235E-02
 Associated 3-d length scales (meters)
 LQ     =       .57  LM     =      1.49  Lm     =      3.67  Lb     =     22.20
                                          Lmp    =  99999.00  Lbp    =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =     16.44  FRD0   =      6.19  R      =      6.43
 (slot)              (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MU2    2
 2  Applicable layer depth HS =     1.83  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     = .1000E+03  CUNITS=  %
 NTOX   =  0
 NSTD   =  0
 REGMZ  =  0
 XINT   =   2500.00  XMAX   =   2500.00
```

X-Y-Z COORDINATE SYSTEM:
ORIGIN is located at the bottom and the diffuser mid-point:
81.05 m from the LEFT bank/shore.
X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.05	1.0	.100E+03	.01	11.25

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 1.83m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.05	1.0	.100E+03	.01	11.25
.22	.00	.07	4.0	.247E+02	.06	11.18
.45	.00	.08	5.3	.188E+02	.10	11.11
.67	.00	.10	6.3	.159E+02	.15	11.04
.90	.00	.12	7.1	.141E+02	.19	10.98
1.13	.00	.14	7.8	.128E+02	.24	10.93
1.35	.00	.15	8.5	.118E+02	.28	10.87
1.58	.00	.17	9.1	.110E+02	.33	10.82
1.80	.00	.19	9.6	.104E+02	.37	10.77
2.03	.00	.21	10.1	.986E+01	.42	10.73
2.25	.00	.22	10.6	.941E+01	.46	10.68
2.47	.00	.24	11.1	.901E+01	.51	10.64
2.70	.00	.26	11.6	.866E+01	.55	10.60
2.92	.00	.27	12.0	.835E+01	.60	10.57
3.15	.00	.29	12.4	.807E+01	.64	10.53
3.37	.00	.31	12.8	.781E+01	.69	10.50
3.60	.00	.33	13.2	.759E+01	.73	10.46
3.82	.00	.34	13.6	.738E+01	.78	10.43
4.05	.00	.36	13.9	.718E+01	.82	10.40
4.27	.00	.38	14.3	.700E+01	.87	10.38
4.50	.00	.40	14.6	.684E+01	.91	10.35
4.72	.00	.41	15.0	.669E+01	.96	10.32
4.95	.00	.43	15.3	.654E+01	1.00	10.30
5.17	.00	.45	15.6	.641E+01	1.05	10.28
5.40	.00	.47	15.9	.628E+01	1.09	10.25
5.62	.00	.48	16.2	.616E+01	1.14	10.23

5.85	.00	.50	16.5	.605E+01	1.18	10.21
6.07	.00	.52	16.8	.594E+01	1.23	10.19
6.30	.00	.53	17.1	.584E+01	1.27	10.17
6.52	.00	.55	17.4	.575E+01	1.32	10.16
6.75	.00	.57	17.7	.566E+01	1.36	10.14
6.97	.00	.59	18.0	.557E+01	1.41	10.13
7.20	.00	.60	18.2	.549E+01	1.45	10.11
7.42	.00	.62	18.5	.541E+01	1.50	10.10
7.65	.00	.64	18.8	.533E+01	1.54	10.09
7.87	.00	.66	19.0	.526E+01	1.59	10.08
8.10	.00	.67	19.3	.519E+01	1.63	10.07
8.32	.00	.69	19.5	.512E+01	1.68	10.06
8.55	.00	.71	19.8	.506E+01	1.72	10.05
8.77	.00	.72	20.0	.499E+01	1.77	10.04
9.00	.00	.74	20.3	.494E+01	1.81	10.03
9.22	.00	.76	20.5	.488E+01	1.83	10.03
9.45	.00	.78	20.7	.482E+01	1.83	10.02
9.68	.00	.79	21.0	.477E+01	1.83	10.02
9.90	.00	.81	21.2	.472E+01	1.83	10.02
10.13	.00	.83	21.4	.467E+01	1.83	10.01
10.35	.00	.85	21.7	.462E+01	1.83	10.01
10.58	.00	.86	21.9	.457E+01	1.83	10.01
10.80	.00	.88	22.1	.452E+01	1.83	10.01
11.03	.00	.90	22.3	.448E+01	1.83	10.01
11.25	.00	.92	22.5	.444E+01	1.83	10.00

Cumulative travel time = 142. sec

END OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

END OF MOD251: DIFFUSER PLUME IN CO-FLOW

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

The initial plume WIDTH values in the next far-field module will be CORRECTED by a factor 1.28 to conserve the mass flux in the far-field!

BEGIN MOD241: 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)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
11.25	.00	1.83	22.5	.444E+01	1.83	12.78	1.83	.00
15.24	.00	1.83	23.6	.424E+01	1.60	15.27	1.83	.23
19.24	.00	1.83	24.5	.409E+01	1.45	17.56	1.83	.38
23.23	.00	1.83	25.2	.397E+01	1.33	19.71	1.83	.50
27.23	.00	1.83	25.9	.386E+01	1.24	21.75	1.83	.59

31.22	.00	1.83	26.5	.377E+01	1.16	23.70	1.83	.67
35.21	.00	1.83	27.1	.369E+01	1.10	25.56	1.83	.73
39.21	.00	1.83	27.7	.362E+01	1.05	27.36	1.83	.78
43.20	.00	1.83	28.2	.355E+01	1.01	29.10	1.83	.82
47.20	.00	1.83	28.7	.349E+01	.97	30.79	1.83	.86
51.19	.00	1.83	29.2	.343E+01	.93	32.43	1.83	.90
55.19	.00	1.83	29.7	.337E+01	.90	34.03	1.83	.93
59.18	.00	1.83	30.1	.332E+01	.88	35.59	1.83	.95
63.17	.00	1.83	30.6	.327E+01	.86	37.12	1.83	.97
67.17	.00	1.83	31.1	.322E+01	.84	38.61	1.83	.99
71.16	.00	1.83	31.6	.317E+01	.82	40.08	1.83	1.01
75.16	.00	1.83	32.0	.312E+01	.80	41.51	1.83	1.03
79.15	.00	1.83	32.5	.308E+01	.79	42.92	1.83	1.04
83.14	.00	1.83	33.0	.303E+01	.77	44.31	1.83	1.06
87.14	.00	1.83	33.5	.299E+01	.76	45.67	1.83	1.07
91.13	.00	1.83	34.0	.294E+01	.75	47.02	1.83	1.08
95.13	.00	1.83	34.5	.290E+01	.74	48.34	1.83	1.09
99.12	.00	1.83	35.0	.286E+01	.73	49.65	1.83	1.10
103.12	.00	1.83	35.5	.282E+01	.72	50.93	1.83	1.11
107.11	.00	1.83	36.0	.277E+01	.72	52.20	1.83	1.11
111.10	.00	1.83	36.6	.273E+01	.71	53.45	1.83	1.12
115.10	.00	1.83	37.1	.269E+01	.70	54.69	1.83	1.13
119.09	.00	1.83	37.7	.265E+01	.70	55.91	1.83	1.13
123.09	.00	1.83	38.3	.261E+01	.70	57.12	1.83	1.13
127.08	.00	1.83	38.9	.257E+01	.69	58.32	1.83	1.14
131.07	.00	1.83	39.5	.253E+01	.69	59.50	1.83	1.14
135.07	.00	1.83	40.1	.250E+01	.69	60.67	1.83	1.14
139.06	.00	1.83	40.7	.246E+01	.68	61.83	1.83	1.15
143.06	.00	1.83	41.3	.242E+01	.68	62.97	1.83	1.15
147.05	.00	1.83	42.0	.238E+01	.68	64.11	1.83	1.15
151.05	.00	1.83	42.7	.234E+01	.68	65.24	1.83	1.15
155.04	.00	1.83	43.4	.231E+01	.68	66.35	1.83	1.15
159.03	.00	1.83	44.1	.227E+01	.68	67.45	1.83	1.15
163.03	.00	1.83	44.8	.223E+01	.68	68.55	1.83	1.15
167.02	.00	1.83	45.5	.220E+01	.68	69.64	1.83	1.15
171.02	.00	1.83	46.2	.216E+01	.68	70.71	1.83	1.15
175.01	.00	1.83	47.0	.213E+01	.68	71.78	1.83	1.15
179.00	.00	1.83	47.8	.209E+01	.68	72.84	1.83	1.15
183.00	.00	1.83	48.6	.206E+01	.68	73.89	1.83	1.15
186.99	.00	1.83	49.4	.202E+01	.68	74.94	1.83	1.15
190.99	.00	1.83	50.2	.199E+01	.69	75.97	1.83	1.14
194.98	.00	1.83	51.1	.196E+01	.69	77.00	1.83	1.14
198.98	.00	1.83	51.9	.192E+01	.69	78.03	1.83	1.14
202.97	.00	1.83	52.8	.189E+01	.69	79.04	1.83	1.14
206.96	.00	1.83	53.7	.186E+01	.70	80.05	1.83	1.13
210.96	.00	1.83	54.7	.183E+01	.70	81.05	1.83	1.13

Cumulative travel time = 3356. sec

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

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
210.96	81.05	1.83	54.7	.183E+01	.70	162.10	1.83	1.13
214.09	81.05	1.83	55.3	.181E+01	.71	162.85	1.83	1.12
217.21	81.05	1.83	56.0	.179E+01	.71	163.61	1.83	1.12
220.34	81.05	1.83	56.7	.176E+01	.72	164.36	1.83	1.11
223.47	81.05	1.83	57.3	.174E+01	.72	165.11	1.83	1.11
226.60	81.05	1.83	58.0	.172E+01	.73	165.86	1.83	1.10
229.73	81.05	1.83	58.7	.170E+01	.73	166.60	1.83	1.10
232.86	81.05	1.83	59.4	.168E+01	.74	167.35	1.83	1.09
235.98	81.05	1.83	60.1	.166E+01	.74	168.09	1.83	1.09

239.11	81.05	1.83	60.8	.164E+01	.75	168.83	1.83	1.08
242.24	81.05	1.83	61.5	.162E+01	.75	169.58	1.83	1.08
245.37	81.05	1.83	62.3	.161E+01	.76	170.31	1.83	1.07
248.50	81.05	1.83	63.0	.159E+01	.76	171.05	1.83	1.07
251.63	81.05	1.83	63.7	.157E+01	.77	171.79	1.83	1.06
254.75	81.05	1.83	64.5	.155E+01	.78	172.52	1.83	1.05
257.88	81.05	1.83	65.2	.153E+01	.78	173.26	1.83	1.05
261.01	81.05	1.83	66.0	.152E+01	.79	173.99	1.83	1.04
264.14	81.05	1.83	66.7	.150E+01	.79	174.72	1.83	1.04
267.27	81.05	1.83	67.5	.148E+01	.80	175.45	1.83	1.03
270.40	81.05	1.83	68.3	.147E+01	.80	176.18	1.83	1.03
273.53	81.05	1.83	69.0	.145E+01	.81	176.90	1.83	1.02
276.65	81.05	1.83	69.8	.143E+01	.82	177.63	1.83	1.01
279.78	81.05	1.83	70.6	.142E+01	.82	178.35	1.83	1.01
282.91	81.05	1.83	71.4	.140E+01	.83	179.08	1.83	1.00
286.04	81.05	1.83	72.2	.138E+01	.83	179.80	1.83	1.00
289.17	81.05	1.83	73.0	.137E+01	.84	180.52	1.83	.99
292.30	81.05	1.83	73.8	.135E+01	.85	181.24	1.83	.98
295.42	81.05	1.83	74.6	.134E+01	.85	181.95	1.83	.98
298.55	81.05	1.83	75.5	.132E+01	.86	182.67	1.83	.97
301.68	81.05	1.83	76.3	.131E+01	.86	183.38	1.83	.97
304.81	81.05	1.83	77.1	.130E+01	.87	184.10	1.83	.96
307.94	81.05	1.83	78.0	.128E+01	.88	184.81	1.83	.95
311.07	81.05	1.83	78.8	.127E+01	.88	185.52	1.83	.95
314.19	81.05	1.83	79.7	.125E+01	.89	186.23	1.83	.94
317.32	81.05	1.83	80.6	.124E+01	.89	186.94	1.83	.94
320.45	81.05	1.83	81.4	.123E+01	.90	187.65	1.83	.93
323.58	81.05	1.83	82.3	.121E+01	.91	188.35	1.83	.92
326.71	81.05	1.83	83.2	.120E+01	.91	189.06	1.83	.92
329.84	81.05	1.83	84.1	.119E+01	.92	189.76	1.83	.91
332.96	81.05	1.83	85.0	.118E+01	.93	190.46	1.83	.90
336.09	81.05	1.83	85.9	.116E+01	.93	191.17	1.83	.90
339.22	81.05	1.83	86.8	.115E+01	.94	191.87	1.83	.89
342.35	81.05	1.83	87.7	.114E+01	.95	192.57	1.83	.88
345.48	81.05	1.83	88.6	.113E+01	.95	193.26	1.83	.88
348.61	81.05	1.83	89.6	.112E+01	.96	193.96	1.83	.87
351.73	81.05	1.83	90.5	.110E+01	.97	194.66	1.83	.86
354.86	81.05	1.83	91.4	.109E+01	.97	195.35	1.83	.86
357.99	81.05	1.83	92.4	.108E+01	.98	196.05	1.83	.85
361.12	81.05	1.83	93.3	.107E+01	.98	196.74	1.83	.85
364.25	81.05	1.83	94.3	.106E+01	.99	197.43	1.83	.84
367.38	81.05	1.83	95.3	.105E+01	1.00	198.12	1.83	.83

Cumulative travel time = 5873. sec
Plume is LATERALLY FULLY MIXED at the end of the buoyant spreading regime.

END OF MOD241: BUOYANT AMBIENT SPREADING

BEGIN MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = .256E-02 m^2/s
Horizontal diffusivity (initial value) = .320E-02 m^2/s

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
367.38	81.05	1.83	95.3	.105E+01	1.00	198.12	1.83	.83
410.03	81.05	1.83	99.3	.101E+01	1.04	198.12	1.83	.79
452.68	81.05	1.83	103.7	.964E+00	1.09	198.12	1.83	.74
495.33	81.05	1.83	108.4	.922E+00	1.14	198.12	1.83	.69
537.99	81.05	1.83	113.5	.881E+00	1.19	198.12	1.83	.64
580.64	81.05	1.83	119.1	.840E+00	1.25	198.12	1.83	.58
623.29	81.05	1.83	125.1	.799E+00	1.31	198.12	1.83	.52
665.94	81.05	1.83	131.7	.759E+00	1.38	198.12	1.83	.45
708.60	81.05	1.83	138.9	.720E+00	1.46	198.12	1.83	.37
751.25	81.05	1.83	146.7	.682E+00	1.54	198.12	1.83	.29
793.90	81.05	1.83	155.3	.644E+00	1.63	198.12	1.83	.20
836.55	81.05	1.83	164.7	.607E+00	1.73	198.12	1.83	.10

Plume interacts with BOTTOM.
The passive diffusion plume becomes VERTICALLY FULLY MIXED within this prediction interval.

879.21	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00

Effluent is FULLY MIXED over the entire channel cross-section.
Except for possible far-field decay or reaction processes, there are NO FURTHER CHANGES with downstream direction.

921.86	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
964.51	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1007.16	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1049.82	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1092.47	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1135.12	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1177.77	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1220.43	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1263.08	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1305.73	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1348.38	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1391.04	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1433.69	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1476.34	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1518.99	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1561.65	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1604.30	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1646.95	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1689.60	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1732.26	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1774.91	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1817.56	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1860.21	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1902.86	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1945.52	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
1988.17	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2030.82	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2073.47	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2116.13	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2158.78	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2201.43	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2244.09	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2286.74	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2329.39	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2372.04	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2414.70	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2457.35	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00
2500.00	81.05	1.83	174.6	.573E+00	1.83	198.12	1.83	.00

Cumulative travel time = 40193. sec

Simulation limit based on maximum specified distance = 2500.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX2:                                          Subsystem version:
 Submerged Multiport Diffuser Discharges    CORMIX_v.3.20_____September_1996
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          Celanese003
 Design case:              Chronic_7Q10_6_ft_deep
 FILE NAME:                cormix\sim\CELCO16 .cx2
 Time of Fortran run:      03/11/08--11:02:27

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS    =    198.12  AS    =    362.56  QA    =     27.90  ICHREG= 1
 HA    =      1.83  HD    =      1.83
 UA    =      .077  F     =      .100  USTAR = .8604E-02
 UW    =     2.000  UWSTAR= .2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  999.1605

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= unidirectional_perpendicular
 BANK  =  LEFT       DISTB =     81.05  YB1   =     69.80  YB2   =     92.30
 LD    =     22.50  NOPEN =   40        SPAC  =       .58
 D0    =      .102  A0    =      .008  H0    =       .05
 Nozzle/port arrangement:   unidirectional_without_fanning
 GAMMA =     90.00  THETA =     60.00  SIGMA =       .00  BETA  =     90.00
 U0    =      .398  Q0    =      .129        = .1290E+00
 RHO0  =  995.0253  DRHO0 = .4135E+01  GP0   = .4059E-01
 C0    = .1000E+03  CUNITS=  %
 IPOLL =  1         KS    = .0000E+00  KD    = .0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    = .5733E-02  m0    = .2281E-02  j0    = .2327E-03  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =      .014  lM    =      .60  lm    =      .39
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    = .1290E+00  M0    = .5131E-01  J0    = .5235E-02
 Associated 3-d length scales (meters)
 LQ    =      .57  LM    =     1.49  Lm    =     2.94  Lb    =    11.49
                                     Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     16.44  FRD0  =     6.19  R     =     5.16
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU2    2
 2  Applicable layer depth HS =     1.83  2
 2222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    = .1000E+03  CUNITS=  %
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   2500.00  XMAX  =   2500.00
```

X-Y-Z COORDINATE SYSTEM:
ORIGIN is located at the bottom and the diffuser mid-point:
81.05 m from the LEFT bank/shore.
X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

BEGIN MOD201: DIFFUSER DISCHARGE MODULE

Due to complex near-field motions: EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.05	1.0	.100E+03	.01	11.25

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

In this laterally contracting zone the diffuser plume becomes VERTICALLY FULLY MIXED over the entire layer depth (HS = 1.83m).
Full mixing is achieved after a plume distance of about five layer depths from the diffuser.

Profile definitions:
BV = layer depth (vertically mixed)
BH = top-hat half-width, in horizontal plane normal to trajectory
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.00	.05	1.0	.100E+03	.01	11.25
.22	.00	.07	4.7	.214E+02	.06	11.20
.45	.00	.08	6.2	.162E+02	.10	11.15
.67	.00	.10	7.3	.136E+02	.15	11.10
.90	.00	.12	8.3	.120E+02	.19	11.06
1.13	.00	.14	9.2	.109E+02	.24	11.02
1.35	.00	.15	10.0	.100E+02	.28	10.98
1.58	.00	.17	10.7	.935E+01	.33	10.94
1.80	.00	.19	11.4	.880E+01	.37	10.90
2.03	.00	.21	12.0	.834E+01	.42	10.87
2.25	.00	.22	12.6	.794E+01	.46	10.84
2.47	.00	.24	13.2	.760E+01	.51	10.81
2.70	.00	.26	13.7	.730E+01	.55	10.78
2.92	.00	.27	14.2	.703E+01	.60	10.75
3.15	.00	.29	14.7	.680E+01	.64	10.73
3.37	.00	.31	15.2	.658E+01	.69	10.70
3.60	.00	.33	15.7	.638E+01	.73	10.68
3.82	.00	.34	16.1	.621E+01	.78	10.66
4.05	.00	.36	16.6	.604E+01	.82	10.64
4.27	.00	.38	17.0	.589E+01	.87	10.62
4.50	.00	.40	17.4	.575E+01	.91	10.60
4.72	.00	.41	17.8	.562E+01	.96	10.58
4.95	.00	.43	18.2	.550E+01	1.00	10.56
5.17	.00	.45	18.6	.538E+01	1.05	10.54
5.40	.00	.47	19.0	.527E+01	1.09	10.53
5.62	.00	.48	19.3	.517E+01	1.14	10.51

5.85	.00	.50	19.7	.508E+01	1.18	10.50
6.07	.00	.52	20.0	.499E+01	1.23	10.48
6.30	.00	.53	20.4	.490E+01	1.27	10.47
6.52	.00	.55	20.7	.482E+01	1.32	10.46
6.75	.00	.57	21.1	.474E+01	1.36	10.45
6.97	.00	.59	21.4	.467E+01	1.41	10.44
7.20	.00	.60	21.7	.460E+01	1.45	10.43
7.42	.00	.62	22.1	.453E+01	1.50	10.42
7.65	.00	.64	22.4	.447E+01	1.54	10.41
7.87	.00	.66	22.7	.441E+01	1.59	10.40
8.10	.00	.67	23.0	.435E+01	1.63	10.39
8.32	.00	.69	23.3	.429E+01	1.68	10.39
8.55	.00	.71	23.6	.424E+01	1.72	10.38
8.77	.00	.72	23.9	.419E+01	1.77	10.37
9.00	.00	.74	24.2	.414E+01	1.81	10.37
9.22	.00	.76	24.5	.409E+01	1.83	10.37
9.45	.00	.78	24.8	.404E+01	1.83	10.36
9.68	.00	.79	25.0	.399E+01	1.83	10.36
9.90	.00	.81	25.3	.395E+01	1.83	10.36
10.13	.00	.83	25.6	.391E+01	1.83	10.35
10.35	.00	.85	25.9	.387E+01	1.83	10.35
10.58	.00	.86	26.1	.383E+01	1.83	10.35
10.80	.00	.88	26.4	.379E+01	1.83	10.35
11.03	.00	.90	26.7	.375E+01	1.83	10.35
11.25	.00	.92	26.9	.371E+01	1.83	10.35

Cumulative travel time = 123. sec

END OF MOD271: ACCELERATION ZONE OF UNIDIRECTIONAL CO-FLOWING DIFFUSER

BEGIN MOD251: DIFFUSER PLUME IN CO-FLOW

Phase 1: Vertically mixed, Phase 2: Re-stratified

Phase 2: The flow has RESTRATIFIED at the beginning of this zone.

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

END OF MOD251: DIFFUSER PLUME IN CO-FLOW

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

The initial plume WIDTH values in the next far-field module will be
CORRECTED by a factor 1.19 to conserve the mass flux in the far-field!

BEGIN MOD241: 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)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
11.25	.00	1.83	26.9	.371E+01	1.83	12.27	1.83	.00
16.79	.00	1.83	28.3	.354E+01	1.59	14.80	1.83	.24
22.33	.00	1.83	29.4	.340E+01	1.43	17.13	1.83	.40
27.87	.00	1.83	30.5	.328E+01	1.32	19.30	1.83	.51
33.41	.00	1.83	31.4	.318E+01	1.23	21.36	1.83	.60

38.95	.00	1.83	32.3	.310E+01	1.16	23.32	1.83	.67
44.49	.00	1.83	33.2	.302E+01	1.10	25.20	1.83	.73
50.03	.00	1.83	34.0	.294E+01	1.05	27.01	1.83	.78
55.57	.00	1.83	34.8	.287E+01	1.01	28.76	1.83	.82
61.11	.00	1.83	35.7	.280E+01	.98	30.46	1.83	.85
66.65	.00	1.83	36.5	.274E+01	.95	32.11	1.83	.88
72.19	.00	1.83	37.4	.267E+01	.93	33.71	1.83	.90
77.73	.00	1.83	38.3	.261E+01	.91	35.28	1.83	.92
83.26	.00	1.83	39.2	.255E+01	.89	36.81	1.83	.94
88.80	.00	1.83	40.1	.249E+01	.87	38.31	1.83	.96
94.34	.00	1.83	41.1	.243E+01	.86	39.78	1.83	.97
99.88	.00	1.83	42.1	.238E+01	.85	41.23	1.83	.98
105.42	.00	1.83	43.1	.232E+01	.84	42.64	1.83	.99
110.96	.00	1.83	44.2	.226E+01	.84	44.04	1.83	.99
116.50	.00	1.83	45.3	.221E+01	.83	45.41	1.83	1.00
122.04	.00	1.83	46.4	.215E+01	.83	46.75	1.83	1.00
127.58	.00	1.83	47.6	.210E+01	.83	48.08	1.83	1.00
133.12	.00	1.83	48.8	.205E+01	.82	49.39	1.83	1.01
138.66	.00	1.83	50.1	.200E+01	.82	50.68	1.83	1.01
144.20	.00	1.83	51.4	.194E+01	.83	51.96	1.83	1.00
149.74	.00	1.83	52.8	.189E+01	.83	53.22	1.83	1.00
155.28	.00	1.83	54.2	.185E+01	.83	54.46	1.83	1.00
160.82	.00	1.83	55.6	.180E+01	.83	55.69	1.83	1.00
166.36	.00	1.83	57.2	.175E+01	.84	56.91	1.83	.99
171.90	.00	1.83	58.7	.170E+01	.84	58.11	1.83	.99
177.44	.00	1.83	60.3	.166E+01	.85	59.30	1.83	.98
182.98	.00	1.83	62.0	.161E+01	.86	60.48	1.83	.97
188.52	.00	1.83	63.7	.157E+01	.86	61.64	1.83	.97
194.06	.00	1.83	65.5	.153E+01	.87	62.80	1.83	.96
199.60	.00	1.83	67.3	.149E+01	.88	63.94	1.83	.95
205.14	.00	1.83	69.2	.145E+01	.89	65.08	1.83	.94
210.67	.00	1.83	71.1	.141E+01	.90	66.20	1.83	.93
216.21	.00	1.83	73.1	.137E+01	.91	67.31	1.83	.92
221.75	.00	1.83	75.1	.133E+01	.92	68.42	1.83	.91
227.29	.00	1.83	77.3	.129E+01	.93	69.51	1.83	.90
232.83	.00	1.83	79.4	.126E+01	.94	70.60	1.83	.89
238.37	.00	1.83	81.6	.122E+01	.95	71.68	1.83	.88
243.91	.00	1.83	83.9	.119E+01	.96	72.75	1.83	.87
249.45	.00	1.83	86.3	.116E+01	.98	73.81	1.83	.85
254.99	.00	1.83	88.7	.113E+01	.99	74.87	1.83	.84
260.53	.00	1.83	91.2	.110E+01	1.00	75.92	1.83	.83
266.07	.00	1.83	93.7	.107E+01	1.02	76.96	1.83	.81
271.61	.00	1.83	96.3	.104E+01	1.03	77.99	1.83	.80
277.15	.00	1.83	98.9	.101E+01	1.04	79.02	1.83	.79
282.69	.00	1.83	101.7	.984E+00	1.06	80.04	1.83	.77
288.23	.00	1.83	104.4	.958E+00	1.08	81.05	1.83	.75

Cumulative travel time = 3705. sec

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

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
288.23	81.05	1.83	104.4	.958E+00	1.08	162.10	1.83	.75
292.28	81.05	1.83	106.4	.940E+00	1.09	162.82	1.83	.74
296.32	81.05	1.83	108.3	.923E+00	1.11	163.54	1.83	.72
300.37	81.05	1.83	110.3	.906E+00	1.12	164.26	1.83	.71
304.41	81.05	1.83	112.3	.890E+00	1.14	164.97	1.83	.69
308.46	81.05	1.83	114.3	.875E+00	1.15	165.69	1.83	.68
312.51	81.05	1.83	116.4	.859E+00	1.17	166.40	1.83	.66
316.55	81.05	1.83	118.4	.845E+00	1.18	167.12	1.83	.65
320.60	81.05	1.83	120.5	.830E+00	1.20	167.83	1.83	.63

324.64	81.05	1.83	122.6	.816E+00	1.21	168.54	1.83	.62
328.69	81.05	1.83	124.7	.802E+00	1.23	169.25	1.83	.60
332.74	81.05	1.83	126.8	.789E+00	1.24	169.96	1.83	.59
336.78	81.05	1.83	128.9	.776E+00	1.26	170.66	1.83	.57
340.83	81.05	1.83	131.1	.763E+00	1.28	171.37	1.83	.55
344.88	81.05	1.83	133.3	.750E+00	1.29	172.07	1.83	.54
348.92	81.05	1.83	135.5	.738E+00	1.31	172.77	1.83	.52
352.97	81.05	1.83	137.7	.726E+00	1.32	173.48	1.83	.51
357.01	81.05	1.83	139.9	.715E+00	1.34	174.18	1.83	.49
361.06	81.05	1.83	142.2	.703E+00	1.36	174.88	1.83	.47
365.11	81.05	1.83	144.4	.692E+00	1.37	175.57	1.83	.46
369.15	81.05	1.83	146.7	.682E+00	1.39	176.27	1.83	.44
373.20	81.05	1.83	149.0	.671E+00	1.41	176.97	1.83	.42
377.24	81.05	1.83	151.3	.661E+00	1.42	177.66	1.83	.41
381.29	81.05	1.83	153.7	.651E+00	1.44	178.36	1.83	.39
385.34	81.05	1.83	156.0	.641E+00	1.45	179.05	1.83	.38
389.38	81.05	1.83	158.4	.631E+00	1.47	179.74	1.83	.36
393.43	81.05	1.83	160.8	.622E+00	1.49	180.43	1.83	.34
397.48	81.05	1.83	163.2	.613E+00	1.50	181.12	1.83	.33
401.52	81.05	1.83	165.7	.604E+00	1.52	181.81	1.83	.31
405.57	81.05	1.83	168.1	.595E+00	1.54	182.49	1.83	.29
409.61	81.05	1.83	170.6	.586E+00	1.55	183.18	1.83	.28
413.66	81.05	1.83	173.1	.578E+00	1.57	183.86	1.83	.26
417.71	81.05	1.83	175.6	.570E+00	1.59	184.55	1.83	.24
421.75	81.05	1.83	178.1	.561E+00	1.60	185.23	1.83	.23
425.80	81.05	1.83	180.7	.554E+00	1.62	185.91	1.83	.21
429.85	81.05	1.83	183.2	.546E+00	1.64	186.59	1.83	.19
433.89	81.05	1.83	185.8	.538E+00	1.66	187.27	1.83	.17
437.94	81.05	1.83	188.4	.531E+00	1.67	187.95	1.83	.16
441.98	81.05	1.83	191.0	.523E+00	1.69	188.63	1.83	.14
446.03	81.05	1.83	193.7	.516E+00	1.71	189.30	1.83	.12
450.08	81.05	1.83	196.4	.509E+00	1.72	189.98	1.83	.11
454.12	81.05	1.83	199.0	.502E+00	1.74	190.65	1.83	.09
458.17	81.05	1.83	201.7	.496E+00	1.76	191.32	1.83	.07
462.21	81.05	1.83	204.5	.489E+00	1.78	192.00	1.83	.05
466.26	81.05	1.83	207.2	.483E+00	1.79	192.67	1.83	.04
470.31	81.05	1.83	210.0	.476E+00	1.81	193.34	1.83	.02
474.35	81.05	1.83	212.7	.470E+00	1.83	194.01	1.83	.00
478.40	81.05	1.83	215.5	.464E+00	1.83	194.67	1.83	.00
482.45	81.05	1.83	218.3	.458E+00	1.83	195.34	1.83	.00
486.49	81.05	1.83	221.2	.452E+00	1.83	196.01	1.83	.00
490.54	81.05	1.83	224.0	.446E+00	1.83	196.67	1.83	.00

Cumulative travel time = 6322. sec

END OF MOD241: BUOYANT AMBIENT SPREADING

BEGIN MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

Vertical diffusivity (initial value) = .317E-02 m^2/s
Horizontal diffusivity (initial value) = .396E-02 m^2/s

The passive diffusion plume is VERTICALLY FULLY MIXED at beginning of region.

Profile definitions:
BV = Gaussian s.d.*sqrt(pi/2) (46%) thickness, measured vertically
= or equal to layer depth, if fully mixed
BH = Gaussian s.d.*sqrt(pi/2) (46%) half-width,
measured horizontally in Y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
490.54	81.05	1.83	224.0	.446E+00	1.83	196.67	1.83	.00
530.73	81.05	1.83	224.1	.446E+00	1.83	196.69	1.83	.00
570.92	81.05	1.83	224.1	.446E+00	1.83	196.70	1.83	.00
611.11	81.05	1.83	224.1	.446E+00	1.83	196.72	1.83	.00
651.29	81.05	1.83	224.1	.446E+00	1.83	196.74	1.83	.00
691.48	81.05	1.83	224.1	.446E+00	1.83	196.75	1.83	.00
731.67	81.05	1.83	224.1	.446E+00	1.83	196.77	1.83	.00
771.86	81.05	1.83	224.2	.446E+00	1.83	196.79	1.83	.00
812.05	81.05	1.83	224.2	.446E+00	1.83	196.80	1.83	.00
852.24	81.05	1.83	224.2	.446E+00	1.83	196.82	1.83	.00
892.43	81.05	1.83	224.2	.446E+00	1.83	196.83	1.83	.00
932.62	81.05	1.83	224.2	.446E+00	1.83	196.85	1.83	.00
972.81	81.05	1.83	224.3	.446E+00	1.83	196.87	1.83	.00
1013.00	81.05	1.83	224.3	.446E+00	1.83	196.88	1.83	.00
1053.19	81.05	1.83	224.3	.446E+00	1.83	196.90	1.83	.00
1093.38	81.05	1.83	224.3	.446E+00	1.83	196.92	1.83	.00
1133.57	81.05	1.83	224.3	.446E+00	1.83	196.93	1.83	.00
1173.75	81.05	1.83	224.4	.446E+00	1.83	196.95	1.83	.00
1213.94	81.05	1.83	224.4	.446E+00	1.83	196.97	1.83	.00
1254.13	81.05	1.83	224.4	.446E+00	1.83	196.98	1.83	.00
1294.32	81.05	1.83	224.4	.446E+00	1.83	197.00	1.83	.00
1334.51	81.05	1.83	224.4	.446E+00	1.83	197.02	1.83	.00
1374.70	81.05	1.83	224.4	.446E+00	1.83	197.03	1.83	.00
1414.89	81.05	1.83	224.5	.446E+00	1.83	197.05	1.83	.00
1455.08	81.05	1.83	224.5	.445E+00	1.83	197.06	1.83	.00
1495.27	81.05	1.83	224.5	.445E+00	1.83	197.08	1.83	.00
1535.46	81.05	1.83	224.5	.445E+00	1.83	197.10	1.83	.00
1575.65	81.05	1.83	224.5	.445E+00	1.83	197.11	1.83	.00
1615.84	81.05	1.83	224.6	.445E+00	1.83	197.13	1.83	.00
1656.03	81.05	1.83	224.6	.445E+00	1.83	197.15	1.83	.00
1696.21	81.05	1.83	224.6	.445E+00	1.83	197.16	1.83	.00
1736.40	81.05	1.83	224.6	.445E+00	1.83	197.18	1.83	.00
1776.59	81.05	1.83	224.6	.445E+00	1.83	197.20	1.83	.00
1816.78	81.05	1.83	224.7	.445E+00	1.83	197.21	1.83	.00
1856.97	81.05	1.83	224.7	.445E+00	1.83	197.23	1.83	.00
1897.16	81.05	1.83	224.7	.445E+00	1.83	197.24	1.83	.00
1937.35	81.05	1.83	224.7	.445E+00	1.83	197.26	1.83	.00
1977.54	81.05	1.83	224.7	.445E+00	1.83	197.28	1.83	.00
2017.73	81.05	1.83	224.7	.445E+00	1.83	197.29	1.83	.00
2057.92	81.05	1.83	224.8	.445E+00	1.83	197.31	1.83	.00
2098.11	81.05	1.83	224.8	.445E+00	1.83	197.33	1.83	.00
2138.30	81.05	1.83	224.8	.445E+00	1.83	197.34	1.83	.00
2178.49	81.05	1.83	224.8	.445E+00	1.83	197.36	1.83	.00
2218.67	81.05	1.83	224.8	.445E+00	1.83	197.38	1.83	.00
2258.86	81.05	1.83	224.9	.445E+00	1.83	197.39	1.83	.00
2299.05	81.05	1.83	224.9	.445E+00	1.83	197.41	1.83	.00
2339.24	81.05	1.83	224.9	.445E+00	1.83	197.43	1.83	.00
2379.43	81.05	1.83	224.9	.445E+00	1.83	197.44	1.83	.00
2419.62	81.05	1.83	224.9	.445E+00	1.83	197.46	1.83	.00
2459.81	81.05	1.83	224.9	.445E+00	1.83	197.47	1.83	.00
2500.00	81.05	1.83	225.0	.445E+00	1.83	197.49	1.83	.00

Cumulative travel time = 32315. sec

Simulation limit based on maximum specified distance = 2500.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD261: PASSIVE AMBIENT MIXING IN UNIFORM AMBIENT

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Celanese Acetate 003 using CORMIX DILUTIONS Permit No.: VA0000299

Receiving Stream: New River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	54	mg/L
90% Temperature (Annual) =	33.3	deg C
90% Temperature (Wet season) =	24.83	deg C
90% Maximum pH =	8.47	SU
10% Maximum pH =	7	SU
Tier Designation (1 or 2) =	2	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	19.1	MGD
7Q10 (Annual) =	103.5	MGD
30Q10 (Annual) =	742	MGD
1Q10 (Wet season) =	19.1	MGD
30Q10 (Wet season)	742	MGD
30Q5 =	1000	MGD
Harmonic Mean =	1996	MGD

Mixing Information		
Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	3530	mg/L
90% Temp (Annual) =	32.9	deg C
90% Temp (Wet season) =	32.9	deg C
90% Maximum pH =	8	SU
10% Maximum pH =	4.9	SU
Discharge Flow =	1	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	9.9E+05	--	--	na	9.9E+01	--	--	na	9.9E+04	**--**	**--**	**na**	**9.9E+04**
Acrolein	0	--	--	na	9.3E+00	--	--	na	9.3E+03	--	--	na	9.3E-01	--	--	na	9.3E+02	**--**	**--**	**na**	**9.3E+02**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	5.0E+03	--	--	na	2.5E-01	--	--	na	5.0E+02	**--**	**--**	**na**	**5.0E+02**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	6.0E+01	--	na	1.0E+00	7.5E-01	--	na	5.0E-05	1.5E+01	--	na	1.0E-01	**1.5E+01**	**--**	**na**	**1.0E-01**
Ammonia-N (mg/l) (Yearly)	0	3.67E+00	3.42E-01	na	--	7.37E+01	2.54E+02	na	--	9.16E-01	8.55E-02	na	--	1.84E+01	6.35E+01	na	--	**1.84E+01**	**6.35E+01**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	3.67E+00	5.90E-01	na	--	7.37E+01	4.39E+02	na	--	9.16E-01	1.48E-01	na	--	1.84E+01	1.10E+02	na	--	**1.84E+01**	**1.10E+02**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.0E+07	--	--	na	4.0E+03	--	--	na	4.0E+06	**--**	**--**	**na**	**4.0E+06**
Antimony	0	--	--	na	6.4E+02	--	--	na	6.4E+05	--	--	na	6.4E+01	--	--	na	6.4E+04	**--**	**--**	**na**	**6.4E+04**
Arsenic	o	3.4E+02	1.5E+02	na	--	6.8E+03	1.6E+04	na	--	8.5E+01	3.8E+01	na	--	1.7E+03	3.9E+03	na	--	**1.7E+03**	**3.9E+03**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	1.0E+06	--	--	na	5.1E+01	--	--	na	1.0E+05	**--**	**--**	**na**	**1.0E+05**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	4.0E+00	--	--	na	2.0E-04	--	--	na	4.0E-01	**--**	**--**	**na**	**4.0E-01**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	1.1E+04	--	--	na	5.3E-01	--	--	na	1.1E+03	**--**	**--**	**na**	**1.1E+03**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	6.5E+07	--	--	na	6.5E+03	--	--	na	6.5E+06	**--**	**--**	**na**	**6.5E+06**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	4.4E+04	--	--	na	2.2E+00	--	--	na	4.4E+03	**--**	**--**	**na**	**4.4E+03**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	2.8E+06	--	--	na	1.4E+02	--	--	na	2.8E+05	**--**	**--**	**na**	**2.8E+05**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.9E+06	--	--	na	1.9E+02	--	--	na	1.9E+05	**--**	**--**	**na**	**1.9E+05**
Cadmium	0	9.9E+00	1.0E+00	na	--	2.0E+02	1.1E+02	na	--	2.5E+00	2.5E-01	na	--	5.0E+01	2.7E+01	na	--	**5.0E+01**	**2.7E+01**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	3.2E+04	--	--	na	1.6E+00	--	--	na	3.2E+03	**--**	**--**	**na**	**3.2E+03**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	4.8E+01	4.5E-01	na	1.6E+01	6.0E-01	1.1E-03	na	8.1E-04	1.2E+01	1.1E-01	na	1.6E+00	**1.2E+01**	**1.1E-01**	**na**	**1.6E+00**
Chloride	0	8.6E+05	2.3E+05	na	--	1.7E+07	2.4E+07	na	--	2.2E+05	5.8E+04	na	--	4.3E+06	6.0E+06	na	--	**4.3E+06**	**6.0E+06**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	3.8E+02	1.1E+03	na	--	4.8E+00	2.8E+00	na	--	9.5E+01	2.9E+02	na	--	**9.5E+01**	**2.9E+02**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.6E+06	--	--	na	1.6E+02	--	--	na	1.6E+05	**--**	**--**	**na**	**1.6E+05**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	2.6E+05	--	--	na	1.3E+01	--	--	na	2.6E+04	**--**	**--**	**na**	**2.6E+04**
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.1E+07	--	--	na	1.1E+03	--	--	na	1.1E+06	**--**	**--**	**na**	**1.1E+06**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.6E+06	--	--	na	1.6E+02	--	--	na	1.6E+05	**--**	**--**	**na**	**1.6E+05**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.5E+05	--	--	na	1.5E+01	--	--	na	1.5E+04	**--**	**--**	**na**	**1.5E+04**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	1.7E+00	4.3E+00	na	--	2.1E-02	1.0E-02	na	--	4.2E-01	1.1E+00	na	--	**4.2E-01**	**1.1E+00**	**na**	**--**
Chromium III	0	1.1E+03	6.6E+01	na	--	2.2E+04	6.9E+03	na	--	2.8E+02	1.7E+01	na	--	5.6E+03	1.7E+03	na	--	**5.6E+03**	**1.7E+03**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	3.2E+02	1.1E+03	na	--	4.0E+00	2.8E+00	na	--	8.0E+01	2.9E+02	na	--	**8.0E+01**	**2.9E+02**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	1.0E+01	--	--	--	1.0E+04	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	3.6E+01	--	--	na	1.8E-03	--	--	na	3.6E+00	**--**	**--**	**na**	**3.6E+00**
Copper	0	2.9E+01	8.0E+00	na	--	5.8E+02	8.3E+02	na	--	7.3E+00	2.0E+00	na	--	1.5E+02	2.1E+02	na	--	**1.5E+02**	**2.1E+02**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	4.4E+02	5.4E+02	na	1.6E+07	5.5E+00	1.3E+00	na	1.6E+03	1.1E+02	1.4E+02	na	1.6E+06	**1.1E+02**	**1.4E+02**	**na**	**1.6E+06**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	6.2E+00	--	--	na	3.1E-04	--	--	na	6.2E-01	**--**	**--**	**na**	**6.2E-01**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	4.4E+00	--	--	na	2.2E-04	--	--	na	4.4E-01	**--**	**--**	**na**	**4.4E-01**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	2.2E+01	1.0E-01	na	4.4E+00	2.8E-01	2.5E-04	na	2.2E-04	5.5E+00	2.6E-02	na	4.4E-01	**5.5E+00**	**2.6E-02**	**na**	**4.4E-01**
Demeton	0	--	1.0E-01	na	--	--	1.0E+01	na	--	--	2.5E-02	na	--	--	2.6E+00	na	--	**--**	**2.6E+00**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	3.4E+00	1.8E+01	na	--	4.3E-02	4.3E-02	na	--	8.5E-01	4.4E+00	na	--	**8.5E-01**	**4.4E+00**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.3E+06	--	--	na	1.3E+02	--	--	na	1.3E+05	**--**	**--**	**na**	**1.3E+05**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	9.6E+05	--	--	na	9.6E+01	--	--	na	9.6E+04	**--**	**--**	**na**	**9.6E+04**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.9E+05	--	--	na	1.9E+01	--	--	na	1.9E+04	**--**	**--**	**na**	**1.9E+04**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	5.6E+02	--	--	na	2.8E-02	--	--	na	5.6E+01	**--**	**--**	**na**	**5.6E+01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	3.4E+05	--	--	na	1.7E+01	--	--	na	3.4E+04	**--**	**--**	**na**	**3.4E+04**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	7.4E+05	--	--	na	3.7E+01	--	--	na	7.4E+04	**--**	**--**	**na**	**7.4E+04**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	7.1E+06	--	--	na	7.1E+02	--	--	na	7.1E+05	**--**	**--**	**na**	**7.1E+05**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.0E+07	--	--	na	1.0E+03	--	--	na	1.0E+06	**--**	**--**	**na**	**1.0E+06**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.9E+05	--	--	na	2.9E+01	--	--	na	2.9E+04	**--**	**--**	**na**	**2.9E+04**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	3.0E+05	--	--	na	1.5E+01	--	--	na	3.0E+04	**--**	**--**	**na**	**3.0E+04**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	4.2E+05	--	--	na	2.1E+01	--	--	na	4.2E+04	**--**	**--**	**na**	**4.2E+04**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	4.8E+00	5.9E+00	na	1.1E+00	6.0E-02	1.4E-02	na	5.4E-05	1.2E+00	1.5E+00	na	1.1E-01	**1.2E+00**	**1.5E+00**	**na**	**1.1E-01**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	4.4E+07	--	--	na	4.4E+03	--	--	na	4.4E+06	**--**	**--**	**na**	**4.4E+06**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	8.5E+05	--	--	na	8.5E+01	--	--	na	8.5E+04	**--**	**--**	**na**	**8.5E+04**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.1E+09	--	--	na	1.1E+05	--	--	na	1.1E+08	**--**	**--**	**na**	**1.1E+08**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	4.5E+06	--	--	na	4.5E+02	--	--	na	4.5E+05	**--**	**--**	**na**	**4.5E+05**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	5.3E+06	--	--	na	5.3E+02	--	--	na	5.3E+05	**--**	**--**	**na**	**5.3E+05**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.8E+05	--	--	na	2.8E+01	--	--	na	2.8E+04	**--**	**--**	**na**	**2.8E+04**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	6.8E+04	--	--	na	3.4E+00	--	--	na	6.8E+03	**--**	**--**	**na**	**6.8E+03**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	5.1E-05	--	--	na	5.1E-09	--	--	na	5.1E-06	**--**	**--**	**na**	**5.1E-06**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	4.0E+03	--	--	na	2.0E-01	--	--	na	4.0E+02	**--**	**--**	**na**	**4.0E+02**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E+00	5.9E+00	na	8.9E+04	5.5E-02	1.4E-02	na	8.9E+00	1.1E+00	1.5E+00	na	8.9E+03	**1.1E+00**	**1.5E+00**	**na**	**8.9E+03**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E+00	5.9E+00	na	8.9E+04	5.5E-02	1.4E-02	na	8.9E+00	1.1E+00	1.5E+00	na	8.9E+03	**1.1E+00**	**1.5E+00**	**na**	**8.9E+03**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	4.4E+00	5.9E+00	--	--	5.5E-02	1.4E-02	--	--	1.1E+00	1.5E+00	--	--	**1.1E+00**	**1.5E+00**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	8.9E+04	--	--	na	8.9E+00	--	--	na	8.9E+03	**--**	**--**	**na**	**8.9E+03**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	1.7E+00	3.8E+00	na	6.0E+01	2.2E-02	9.0E-03	na	6.0E-03	4.3E-01	9.4E-01	na	6.0E+00	**4.3E-01**	**9.4E-01**	**na**	**6.0E+00**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.0E+02	--	--	na	3.0E-02	--	--	na	3.0E+01	**--**	**--**	**na**	**3.0E+01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.1E+06	--	--	na	2.1E+02	--	--	na	2.1E+05	**--**	**--**	**na**	**2.1E+05**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.4E+05	--	--	na	1.4E+01	--	--	na	1.4E+04	**--**	**--**	**na**	**1.4E+04**
Fluorene	0	--	--	na	5.3E+03	--	--	na	5.3E+06	--	--	na	5.3E+02	--	--	na	5.3E+05	**--**	**--**	**na**	**5.3E+05**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	1.0E+00	na	--	--	2.5E-03	na	--	--	2.6E-01	na	--	**--**	**2.6E-01**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	1.0E+01	4.0E-01	na	1.6E+00	1.3E-01	9.5E-04	na	7.9E-05	2.6E+00	9.9E-02	na	1.6E-01	**2.6E+00**	**9.9E-02**	**na**	**1.6E-01**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	1.0E+01	4.0E-01	na	7.8E-01	1.3E-01	9.5E-04	na	3.9E-05	2.6E+00	9.9E-02	na	7.8E-02	**2.6E+00**	**9.9E-02**	**na**	**7.8E-02**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	5.8E+00	--	--	na	2.9E-04	--	--	na	5.8E-01	**--**	**--**	**na**	**5.8E-01**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	3.6E+05	--	--	na	1.8E+01	--	--	na	3.6E+04	**--**	**--**	**na**	**3.6E+04**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	9.8E+01	--	--	na	4.9E-03	--	--	na	9.8E+00	**--**	**--**	**na**	**9.8E+00**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	3.4E+02	--	--	na	1.7E-02	--	--	na	3.4E+01	**--**	**--**	**na**	**3.4E+01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.9E+01	--	na	3.6E+03	2.4E-01	--	na	1.8E-01	4.8E+00	--	na	3.6E+02	**4.8E+00**	**--**	**na**	**3.6E+02**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.1E+06	--	--	na	1.1E+02	--	--	na	1.1E+05	**--**	**--**	**na**	**1.1E+05**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	6.6E+04	--	--	na	3.3E+00	--	--	na	6.6E+03	**--**	**--**	**na**	**6.6E+03**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.1E+02	na	--	--	5.0E-01	na	--	--	5.2E+01	na	--	**--**	**5.2E+01**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	3.6E+02	--	--	na	1.8E-02	--	--	na	3.6E+01	**--**	**--**	**na**	**3.6E+01**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	1.9E+07	--	--	na	9.6E+02	--	--	na	1.9E+06	**--**	**--**	**na**	**1.9E+06**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	3.4E+02	1.1E+01	na	--	6.8E+03	1.2E+03	na	--	8.4E+01	2.8E+00	na	--	1.7E+03	3.0E+02	na	--	**1.7E+03**	**3.0E+02**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	1.0E+01	na	--	--	2.5E-02	na	--	--	2.6E+00	na	--	**--**	**2.6E+00**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	2.8E+01	8.0E+01	- -	- -	3.5E-01	1.9E-01	- -	--	7.0E+00	2.0E+01	- -	--	**7.0E+00**	**2.0E+01**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.5E+06	--	--	na	1.5E+02	--	--	na	1.5E+05	**--**	**--**	**na**	**1.5E+05**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	1.2E+07	--	--	na	5.9E+02	--	--	na	1.2E+06	**--**	**--**	**na**	**1.2E+06**
Methoxychlor	0	--	3.0E-02	na	--	--	3.1E+00	na	--	--	7.5E-03	na	--	--	7.8E-01	na	--	**--**	**7.8E-01**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	3.6E+02	1.8E+01	na	4.6E+03	7.3E+03	1.9E+03	na	4.6E+06	9.1E+01	4.5E+00	na	4.6E+02	1.8E+03	4.7E+02	na	4.6E+05	**1.8E+03**	**4.7E+02**	**na**	**4.6E+05**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	6.9E+05	--	--	na	6.9E+01	--	--	na	6.9E+04	**--**	**--**	**na**	**6.9E+04**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	6.0E+04	--	--	na	3.0E+00	--	--	na	6.0E+03	**--**	**--**	**na**	**6.0E+03**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	1.2E+05	--	--	na	6.0E+00	--	--	na	1.2E+04	**--**	**--**	**na**	**1.2E+04**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	1.0E+04	--	--	na	5.1E-01	--	--	na	1.0E+03	**--**	**--**	**na**	**1.0E+03**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	5.6E+02	6.9E+02	na	--	7.0E+00	1.7E+00	--	--	1.4E+02	1.7E+02	--	--	**1.4E+02**	**1.7E+02**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	1.3E+00	1.4E+00	na	--	1.6E-02	3.3E-03	na	--	3.3E-01	3.4E-01	na	--	**3.3E-01**	**3.4E-01**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.5E+00	na	1.3E+00	--	3.5E-03	na	6.4E-05	--	3.7E-01	na	1.3E-01	**--**	**3.7E-01**	**na**	**1.3E-01**
Pentachlorophenol [C]	0	3.7E+00	4.7E+00	na	3.0E+01	7.4E+01	5.0E+02	na	6.0E+04	9.2E-01	1.2E+00	na	3.0E+00	1.9E+01	1.2E+02	na	6.0E+03	**1.9E+01**	**1.2E+02**	**na**	**6.0E+03**
Phenol	0	--	--	na	8.6E+05	--	--	na	8.6E+08	--	--	na	8.6E+04	--	--	na	8.6E+07	**--**	**--**	**na**	**8.6E+07**
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.0E+06	--	--	na	4.0E+02	--	--	na	4.0E+05	**--**	**--**	**na**	**4.0E+05**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	4.0E+02	5.2E+02	na	4.2E+06	5.0E+00	1.3E+00	na	4.2E+02	1.0E+02	1.3E+02	na	4.2E+05	**1.0E+02**	**1.3E+02**	**na**	**4.2E+05**
Silver	0	1.4E+01	--	na	--	2.8E+02	--	na	--	3.5E+00	--	na	--	7.1E+01	--	na	--	**7.1E+01**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	8.0E+04	--	--	na	4.0E+00	--	--	na	8.0E+03	**--**	**--**	**na**	**8.0E+03**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	6.6E+04	--	--	na	3.3E+00	--	--	na	6.6E+03	**--**	**--**	**na**	**6.6E+03**
Thallium	0	--	--	na	4.7E-01	--	--	na	4.7E+02	--	--	na	4.7E-02	--	--	na	4.7E+01	**--**	**--**	**na**	**4.7E+01**
Toluene	0	--	--	na	6.0E+03	--	--	na	6.0E+06	--	--	na	6.0E+02	--	--	na	6.0E+05	**--**	**--**	**na**	**6.0E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	1.5E+01	2.1E-02	na	5.6E+00	1.8E-01	5.0E-05	na	2.8E-04	3.7E+00	5.2E-03	na	5.6E-01	**3.7E+00**	**5.2E-03**	**na**	**5.6E-01**
Tributyltin	0	4.6E-01	7.2E-02	na	--	9.2E+00	7.5E+00	na	--	1.2E-01	1.8E-02	na	--	2.3E+00	1.9E+00	na	--	**2.3E+00**	**1.9E+00**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	7.0E+04	--	--	na	7.0E+00	--	--	na	7.0E+03	**--**	**--**	**na**	**7.0E+03**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	3.2E+05	--	--	na	1.6E+01	--	--	na	3.2E+04	**--**	**--**	**na**	**3.2E+04**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	6.0E+05	--	--	na	3.0E+01	--	--	na	6.0E+04	**--**	**--**	**na**	**6.0E+04**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	4.8E+04	--	--	na	2.4E+00	--	--	na	4.8E+03	**--**	**--**	**na**	**4.8E+03**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	4.8E+04	--	--	na	2.4E+00	--	--	na	4.8E+03	**--**	**--**	**na**	**4.8E+03**
Zinc	0	2.3E+02	1.1E+02	na	2.6E+04	4.7E+03	1.1E+04	na	2.6E+07	5.9E+01	2.6E+01	na	2.6E+03	1.2E+03	2.7E+03	na	2.6E+06	**1.2E+03**	**2.7E+03**	**na**	**2.6E+06**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	6.4E+04
Arsenic	6.8E+02
Barium	na
Cadmium	1.6E+01
Chromium III	1.0E+03
Chromium VI	3.2E+01
Copper	5.8E+01
Iron	na
Lead	1.8E+02
Manganese	na
Mercury	2.8E+00
Nickel	2.8E+02
Selenium	4.0E+01
Silver	2.8E+01
Zinc	4.7E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	6.03	TUa	LC_{50} =	17	% Use as	5.88	TUa
ACUTE WLAa	6.03						

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.69426944 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	60.3	TU_c	NOEC =	2	% Use as	50.00	TU_c
BOTH*	60.3	TU_c	NOEC =	2	% Use as	50.00	TU_c
AML	60.3	TU_c	NOEC =	2	% Use as	50.00	TU_c

ACUTE WLAa,c	60.3
CHRONIC WLAc	104.5

* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 24.7799636 a limit may result using WLA.EXE

Enter data in the cells with blue type:

Entry Date:	03/13/13
Facility Name:	Celanese Acetate
VPDES Number:	VA0000299
Outfall Number:	003

% Flow to be used from MIX.EXE

Plant Flow:	1	MGD		
Acute 1Q10:	0	MGD	100	%
Chronic 7Q10:	0	MGD	100	%

Difuser /modeling study?

Enter Y/N	Y	
Acute	20.1	:1
Chronic	104.5	:1

Are data available to calculate CV? (Y/N)	Y	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	N	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWC_a	4.975124378	%	Plant flow/plant flow + 1Q10
IWC_c	0.956937799	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	20.1	100/IWCa
Dilution, chronic	104.5	100/IWCc

WLA_a	6.03	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	104.5	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	60.3	ACR X's WLA_a - converts acute WLA to chronic units

ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation	0.325930911	Default of 0.6 - if data are available, use tables Page 2)
Constants eA	0.578573563	Default = 0.41
eB	0.747197346	Default = 0.60
eC	1.728388685	Default = 2.43
eD	1.728388685	Default = 2.43 (1 samp) No. of samples 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	34.88798586	WLAa,c X's eA						
LTA_c	78.08212263	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	60.3	TU_c	NOEC =	1.658375	(Protects from acute/chronic toxicity)		NOEC = 2	%
MDL** with LTA_c	134.9562573	TU_c	NOEC =	0.740981	(Protects from chronic toxicity)		NOEC = 1	%
AML with lowest LTA	60.3	TU_c	NOEC =	1.658375	Lowest LTA X's eD		NOEC = 2	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

						Rounded LC50's	%
MDL with $LTA_{a,c}$	6.03	TU_a	LC50 =	16.583748	%	LC50 = 17	%
MDL with LTA_c	13.49562573	TU_a	LC50 =	7.409808	%	LC50 = 8	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.325930911 (Default 0.6)

δ^2 = 0.100958704

δ = 0.317739995

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.54718958

eA = 0.578573563

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.026211205

δ_4 = 0.161898749

B = -0.29142594

eB = 0.747197346

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.100958704

δ = 0.317739995

C = 0.547189579

eC = 1.728388685

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = **1** This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.100958704

δ_n = 0.317739995

D = 0.547189579

eD = 1.728388685

	Vertebrate IC_{25} Data or LC_{50} Data **********	LN of data		Invertebrate IC_{25} Data or LC_{50} Data **********	LN of data
1	0		1	86.3	4.457830
2			2	47.1	3.852273
3			3	64.2	4.162003
4			4	32.2	3.471966
5			5	89	4.488636
6			6	50	3.912023
7			7	49	3.891820
8			8	52	3.951244
9			9	74	4.304065
10			10	46	3.828641
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		
St Dev	NEED DATA	NEED DATA	St Dev	18.726618	0.31774
Mean	0	0	Mean	58.98	4.0320502
Variance	0	0.000000	Variance	350.68622	0.100959
CV	0		CV	0.3259309	

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Convert LC_{50}'s and NOEC's to Chronic TU's

for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50,

enter it here:	NO DATA	$\%LC_{50}$
	NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	4.0	24.77996		
Dilution series to use for limit			2	50
Dilution factor to recommend:	0.200886		0.1414214	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	20.1	4.98	14.1	7.07
	4.0	24.78	2.0	50.00
	0.8	123.35	0.3	353.55
	0.16	614.05	0.0	2500.00
Extra dilutions if needed	0.03	3056.69	0.0	17677.67
	0.01	15216.05	0.0	125000.00

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

APPENDIX F

PERMIT LIMIT DEVELOPMENT

Outfall 005

Waste Load Allocation Spreadsheet
STATS printout
WETLIM10 spreadsheet

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Celanese outfall 005 dry weather

Permit No.: VA0000299

Receiving Stream: New River UT

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		
Mean Hardness (as CaCO3) =	192	mg/L
90% Temperature (Annual) =	22	deg C
90% Temperature (Wet season) =	21	deg C
90% Maximum pH =	8.1	SU
10% Maximum pH =	7	SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows		
1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD

Mixing Information		
Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =	100	%
- 30Q10 Mix =	100	%

Effluent Information		
Mean Hardness (as CaCO3) =	192	mg/L
90% Temp (Annual) =	25	deg C
90% Temp (Wet season) =	21	deg C
90% Maximum pH =	8.1	SU
10% Maximum pH =	7	SU
Discharge Flow =	0.14	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.9E+02**
Acrolein	0	--	--	na	9.3E+00	--	--	na	9.3E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.3E+00**
Acrylonitrile[C]	0	--	--	na	2.5E+00	--	--	na	2.5E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.5E+00**
Aldrin [C]	0	3.0E+00	--	na	5.0E-04	3.0E+00	--	na	5.0E-04	--	--	--	--	--	--	--	--	**3.0E+00**	**--**	**na**	**5.0E-04**
Ammonia-N (mg/l) (Yearly)	0	6.95E+00	1.07E+00	na	--	6.95E+00	1.07E+00	na	--	--	--	--	--	--	--	--	--	**6.95E+00**	**1.07E+00**	**na**	**--**
Ammonia-N (mg/l) (High Flow)	0	6.95E+00	1.38E+00	na	--	6.95E+00	1.38E+00	na	--	--	--	--	--	--	--	--	--	**6.95E+00**	**1.38E+00**	**na**	**--**
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+04**
Antimony	0	--	--	na	6.4E+02	--	--	na	6.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.4E+02**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	**3.4E+02**	**1.5E+02**	**na**	**--**
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Benzene [C]	0	--	--	na	5.1E+02	--	--	na	5.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E+02**
Benzidine[C]	0	--	--	na	2.0E-03	--	--	na	2.0E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E-03**
Benzo (a) anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
Benzo (b) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
Benzo (k) fluoranthene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
Benzo (a) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
Bis2-Chloroethyl Ether[C]	0	--	--	na	5.3E+00	--	--	na	5.3E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.3E+00**
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.5E+04**
Bis 2-Ethylhexyl Phthalate[C]	0	--	--	na	2.2E+01	--	--	na	2.2E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.2E+01**
Bromoform [C]	0	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+03**
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+03**
Cadmium	0	8.2E+00	1.9E+00	na	--	8.2E+00	1.9E+00	na	--	--	--	--	--	--	--	--	--	**8.2E+00**	**1.9E+00**	**na**	**--**
Carbon Tetrachloride [C]	0	--	--	na	1.6E+01	--	--	na	1.6E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+01**
Chlordane [C]	0	2.4E+00	4.3E-03	na	8.1E-03	2.4E+00	4.3E-03	na	8.1E-03	--	--	--	--	--	--	--	--	**2.4E+00**	**4.3E-03**	**na**	**8.1E-03**
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	**8.6E+05**	**2.3E+05**	**na**	**--**
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.9E+01**	**1.1E+01**	**na**	**--**
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+03**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+02**
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+04**
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+03**
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+02**
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	**8.3E-02**	**4.1E-02**	**na**	**--**
Chromium III	0	9.7E+02	1.3E+02	na	--	9.7E+02	1.3E+02	na	--	--	--	--	--	--	--	--	--	**9.7E+02**	**1.3E+02**	**na**	**--**
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	**1.6E+01**	**1.1E+01**	**na**	**--**
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	1.8E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-02**
Copper	0	2.5E+01	1.6E+01	na	--	2.5E+01	1.6E+01	na	--	--	--	--	--	--	--	--	--	**2.5E+01**	**1.6E+01**	**na**	**--**
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.2E+01	5.2E+00	na	1.6E+04	--	--	--	--	--	--	--	--	**2.2E+01**	**5.2E+00**	**na**	**1.6E+04**
DDD [C]	0	--	--	na	3.1E-03	--	--	na	3.1E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.1E-03**
DDE [C]	0	--	--	na	2.2E-03	--	--	na	2.2E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.2E-03**
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	1.1E+00	1.0E-03	na	2.2E-03	--	--	--	--	--	--	--	--	**1.1E+00**	**1.0E-03**	**na**	**2.2E-03**
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-01**	**na**	**--**
Diazinon	0	1.7E-01	1.7E-01	na	--	1.7E-01	1.7E-01	na	--	--	--	--	--	--	--	--	--	**1.7E-01**	**1.7E-01**	**na**	**--**
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.3E+03**
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	9.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.6E+02**
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.9E+02**
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	2.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.8E-01**
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	1.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+02**
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.7E+02**
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	7.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.1E+03**
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.0E+04**
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E+02**
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+02**
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	2.1E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+02**
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	2.4E-01	5.6E-02	na	5.4E-04	--	--	--	--	--	--	--	--	**2.4E-01**	**5.6E-02**	**na**	**5.4E-04**
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	4.4E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.4E+04**
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	8.5E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.5E+02**
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.1E+06	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+06**
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.5E+03**
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.3E+03**
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.8E+02**
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	3.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.4E+01**
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	5.1E-08	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E-08**
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	2.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+00**
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	**na**	**8.9E+01**
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	**na**	**8.9E+01**
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.2E-01	5.6E-02	--	--	--	--	--	--	--	--	--	--	**2.2E-01**	**5.6E-02**	**--**	**--**
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.9E+01**
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	8.6E-02	3.6E-02	na	6.0E-02	--	--	--	--	--	--	--	--	**8.6E-02**	**3.6E-02**	**na**	**6.0E-02**
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.0E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E-01**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.1E+03**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.4E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.4E+02**
Fluorene	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.3E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-02**	**na**	**--**
Heptachlor [C]	0	5.2E-01	3.8E-03	na	7.9E-04	5.2E-01	3.8E-03	na	7.9E-04	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**7.9E-04**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	3.9E-04	5.2E-01	3.8E-03	na	3.9E-04	--	--	--	--	--	--	--	--	**5.2E-01**	**3.8E-03**	**na**	**3.9E-04**
Hexachlorobenzene[C]	0	--	--	na	2.9E-03	--	--	na	2.9E-03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.9E-03**
Hexachlorobutadiene[C]	0	--	--	na	1.8E+02	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E+02**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.9E-02**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	1.7E-01	--	--	na	1.7E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E-01**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	1.8E+00	9.5E-01	--	na	1.8E+00	--	--	--	--	--	--	--	--	**9.5E-01**	**--**	**na**	**1.8E+00**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+03**
Hexachloroethane[C]	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+01**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**2.0E+00**	**na**	**--**
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.8E-01**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[C]	0	--	--	na	9.6E+03	--	--	na	9.6E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.6E+03**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	2.7E+02	3.1E+01	na	--	2.7E+02	3.1E+01	na	--	--	--	--	--	--	--	--	--	**2.7E+02**	**3.1E+01**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E-01**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	1.4E+00	7.7E-01	- -	- -	--	--	--	--	--	--	--	--	**1.4E+00**	**7.7E-01**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+03**
Methylene Chloride [C]	0	--	--	na	5.9E+03	--	--	na	5.9E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.9E+03**
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	**--**	**3.0E-02**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	3.2E+02	3.5E+01	na	4.6E+03	3.2E+02	3.5E+01	na	4.6E+03	--	--	--	--	--	--	--	--	**3.2E+02**	**3.5E+01**	**na**	**4.6E+03**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	6.9E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.9E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	3.0E+01	--	--	na	3.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+01**
N-Nitrosodiphenylamine[C]	0	--	--	na	6.0E+01	--	--	na	6.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.0E+01**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	5.1E+00	--	--	na	5.1E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.1E+00**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	2.8E+01	6.6E+00	na	--	--	--	--	--	--	--	--	--	**2.8E+01**	**6.6E+00**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	**6.5E-02**	**1.3E-02**	**na**	**--**
PCB Total[C]	0	--	1.4E-02	na	6.4E-04	--	1.4E-02	na	6.4E-04	--	--	--	--	--	--	--	--	**--**	**1.4E-02**	**na**	**6.4E-04**
Pentachlorophenol [C]	0	8.7E+00	6.7E+00	na	3.0E+01	8.7E+00	6.7E+00	na	3.0E+01	--	--	--	--	--	--	--	--	**8.7E+00**	**6.7E+00**	**na**	**3.0E+01**
Phenol	0	--	--	na	8.6E+05	--	--	na	8.6E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.6E+05**
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+03**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.0E+01	5.0E+00	na	4.2E+03	--	--	--	--	--	--	--	--	**2.0E+01**	**5.0E+00**	**na**	**4.2E+03**
Silver	0	1.1E+01	--	na	--	1.1E+01	--	na	--	--	--	--	--	--	--	--	--	**1.1E+01**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	4.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.0E+01**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.3E+01**
Thallium	0	--	--	na	4.7E-01	--	--	na	4.7E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.7E-01**
Toluene	0	--	--	na	6.0E+03	--	--	na	6.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**6.0E+03**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	7.3E-01	2.0E-04	na	2.8E-03	--	--	--	--	--	--	--	--	**7.3E-01**	**2.0E-04**	**na**	**2.8E-03**
Tributyltin	0	4.6E-01	7.2E-02	na	--	4.6E-01	7.2E-02	na	--	--	--	--	--	--	--	--	--	**4.6E-01**	**7.2E-02**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	7.0E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.0E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.6E+02**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	3.0E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+02**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+01**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+01**
Zinc	0	2.0E+02	2.1E+02	na	2.6E+04	2.0E+02	2.1E+02	na	2.6E+04	--	--	--	--	--	--	--	--	**2.0E+02**	**2.1E+02**	**na**	**2.6E+04**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	6.4E+02
Arsenic	9.0E+01
Barium	na
Cadmium	1.1E+00
Chromium III	7.6E+01
Chromium VI	6.4E+00
Copper	9.4E+00
Iron	na
Lead	1.9E+01
Manganese	na
Mercury	4.6E-01
Nickel	2.1E+01
Selenium	3.0E+00
Silver	4.2E+00
Zinc	8.1E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

1/9/2013 7:56:22 AM

Facility = Celanese outfall 005
Chemical = ammonia
Chronic averaging period = 30
WLAa = 6.95
WLAc = 1.29
Q.L. = .1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 18
Expected Value = 5.08492
Variance = 71.1560
C.V. = 1.658906
97th percentile daily values = 22.8307
97th percentile 4 day average = 15.2644
97th percentile 30 day average= 7.98182
< Q.L. = 0
Model used = lognormal

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 3.68984672990552
Average Weekly limit = 3.68984672990552
Average Monthly LImit = 3.68984672990552

The data are:

1
7.3
5.4
0.4
1
11.8
1
1.1
4.3
5
9.5
3.4
7.2
6
2.6
1.8
0.2
6.1

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	100% =	NOAEC	LC_{50} =	NA	% Use as	NA	TUa
ACUTE WLAa		0.3					

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	1.462574684	TU_c	NOEC =	69	% Use as	1.44	TU_c
BOTH*	3.000000074	TU_c	NOEC =	34	% Use as	2.94	TU_c
AML	1.462574684	TU_c	NOEC =	69	% Use as	1.44	TU_c

ACUTE WLAa,c	3	
CHRONIC WLAc	1	

Note: Inform the permittee that if the mean of the data exceeds this TUc: 1.0 a limit may result using WLA.EXE

* Both means acute expressed as chronic

Enter data in the cells with blue type:

Entry Date:	03/14/13
Facility Name:	
VPDES Number:	VA0000299
Outfall Number:	5

			% Flow to be used from MIX.EXE	**Difuser /modeling study?**	
Plant Flow:	0.14	MGD		Enter Y/N	n
Acute 1Q10:	0	MGD	100 %	Acute	1 :1
Chronic 7Q10:	0	MGD	100 %	Chronic	1 :1

Are data available to calculate CV? (Y/N)	N	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	N	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWC_a	100	%	Plant flow/plant flow + 1Q10
IWC_c	100	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	1	100/IWCa
Dilution, chronic	1	100/IWCc

WLA_a	0.3	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	1	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	3	ACR X's WLA_a - converts acute WLA to chronic units
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)

Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp)

No. of samples: 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	1.2328341	WLAa,c X's eA						
LTA_c	0.6010373	WLAc X's eB					Rounded NOEC's	%
MDL** with $LTA_{a,c}$	3.000000074	TU_c	NOEC =	33.333333	(Protects from acute/chronic toxicity)		NOEC = 34	%
MDL** with LTA_c	1.462574684	TU_c	NOEC =	68.372577	(Protects from chronic toxicity)		NOEC = 69	%
AML with lowest LTA	1.462574684	TU_c	NOEC =	68.372577	Lowest LTA X's eD		NOEC = 69	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

							Rounded LC50's	%
MDL with $LTA_{a,c}$	0.300000007	TU_a	LC50 =	333.333325	%	Use NOAEC=100%	LC50 = NA	%
MDL with LTA_c	0.146257468	TU_a	LC50 =	683.725769	%	Use NOAEC=100%	LC50 = NA	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data	Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********		**********	
1	0		1	0
2			2	
3			3	
4			4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	
11			11	
12			12	
13			13	
14			14	
15			15	
16			16	
17			17	
18			18	
19			19	
20			20	
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA
(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB
(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC
(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD
(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Convert LC_{50}'s and NOEC's to Chronic TU's

for use in WLA.EXE

Table 3. **ACR used: 10**

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA %LC_{50}

NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	100	1.0		
Dilution series to use for limit			69	1.4492754
Dilution factor to recommend:	0.5		0.8306624	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	50.0	2.00	83.1	1.20
	25.0	4.00	69.0	1.45
	12.5	8.00	57.3	1.74
	6.25	16.00	47.6	2.10
Extra dilutions if needed	3.12	32.05	39.5	2.53
	1.56	64.10	32.9	3.04

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia