

**Arkansas Department of Environmental Quality
Water Quality Management Plan Update Summary Sheet**

Date: 6/22/2017

New Permit Renewal Permit Amended Permit

Type of Discharge: Municipal Wastewater

Facility Name: City of Flippin

Permit No.: AR0021717

Design Flow Rate (MGD): 0.175

Receiving Stream: Fallen Ash Creek, thence to the White River

HUC + Reach Code: 11010003+002¹ **7Q10:** 0.006 cfs

Planning Segment: 4I **County:** Marion

Proposed Effluent Limits in mg/L:

May-October:	10.0/15.0/2.0/6.0	(CBOD5/TSS/NH3-N/DO)
November-March:	10.0/15.0/9.0/6.0	(CBOD5/TSS/NH3-N/DO)
April:	10.0/15.0/4.0/6.0	(CBOD5/TSS/NH3-N/DO)

Current Effluent Limits in mg/L:

May-October:	10.0/15.0/2.0/7.6	(CBOD5/TSS/NH3-N/DO)
November-March:	10.0/15.0/9.0/9.2	(CBOD5/TSS/NH3-N/DO)
April:	10.0/15.0/3.9/9.2	(CBOD5/TSS/NH3-N/DO)

TMDL Limits: None

Justification (Sag = Minimum Modeled Value ≠ Difference in Value):

Reach No.	Length (miles)	DO WQS _C (mg/L)	DO Sag _C (mg/L)	Distance to DO Sag _C (miles)	DO WQS _P (mg/L)	DO Sag _P (mg/L)	Distance to DO Sag _P (miles)
1 _a	0.1	2.0	5.198	0.1	6.0	7.039	0.0
1 _b	0.9	5.0	5.139	0.05	6.0	7.197	0.0

Values in above table are from a modeling analysis dated 6/22/2017.

Outfall Location (Lat/Long): 36° 17' 00" N; 92° 35' 10" W

Remarks: This is for the reissuance of the discharge permit for this existing facility. The previous modeling analysis was updated and corrected. The previous modeling contained incorrect facility flow rate of 0.4 MGD. Based on the updated modeling analysis and corrected NH3-N toxicity calculations, the following proposed 208 Plan updates will be public noticed with draft permit:

- NH3-N monthly average limit revised from 3.9 to 4 mg/L during April.
- Instantaneous minimum DO limit revised from 7.6 mg/L (May-October) and 9.2 mg/L (November-April), to 6.0 mg/L (Year-round).

¹ This reach code is assigned to White River, which is closest 3-digit reach code downstream of facility.

Ammonia Calculations

Facility Name	City of Flippin
Major or Minor	Minor
Permit Number	AR0021717
Receiving Stream	Fallen Ash Creek
7Q10, cfs	0.006
0.25/0.67 multiplier	0.67
Qb, cfs	0.00
Qe, MGD	0.175
Qe, cfs	0.27
Cb, mg/l	0.1

USGS StreamStats
Design Flow
Assumed in Model

COLOR KEY	
	User Inputs
	Calculated values

Ecoregion or River name	Ozark Highlands
Watershed area (mi ²)	10
Regulation No. 2 Chronic Toxicity Criteria (Instream Concentration)	
April	AML, mg/l 3.9 DML, mg/l 3.9
May - October	3.9
November - March	10.3

Allowable Effluent Conc., mg/l

$(Qe * Ce) + (Qb * Cb) = (Qe + Qb) * IWC$

Qe	Effluent Flow		
Ce	Allowable Effluent Concentration		
Qb	% of Low Flow of Receiving Stream		
Cb	Background Concentration		
IWC	Instream Waste Concentration Chronic Toxicity Criteria		

Allowable Effluent Conc. (Ce), mg/l

$Ce = (IWC (Qe + Qb) - Cb \times Qb) / Qe$

April	Monthly Avg., mg/l 3.96	Daily Max, mg/l 3.96
May - October	3.96	3.96
November - March	10.45	10.45

Chronic Toxicity Criteria vs. D.O. Model Limits

Month	Monthly Average, mg/l		Permit Limits	
	Toxicity limit	D.O. limit	Toxicity limit	D.O. limit
April	4.0	9.0	4.0	13.5
May - October	4.0	2.0	4.0	3.0
November - March	10.5	9.0	10.5	13.5

Permit Engineer: Jessica Temple Date: 6/22/2017

Reviewing Engineer: Shane Byrum Date: 6/22/2017

Ammonia Toxicity Criteria

Minor Permits

Fish Early Life Stages Absent - Primary Season (November - March), mg/L

Ecoregion	Temperature	pH	4-day average	30-day average
Arkansas River	14	7.6	10.3	10.3
Arkansas River Valley	14	6.7	16.7	16.7
Boston Mountains	14	6.9	15.8	15.8
Delta	14	7.1	14.7	14.7
Gulf Coastal Plains	14	6.6	17	17
Ouachita Mountains	14	7.1	14.7	14.7
Ouachita River (L. Mo. to Mouth)	14	6.7	16.7	16.7
→→→→ Ozark Highlands	14	7.6	10.3	10.3
Red River	14	7.5	11.3	11.3
White River (Dam #10 Mouth)	14	7.7	9.3	9.3

Fish Early Life Stages Present - Critical Season (April - October), mg/L

Ecoregion	Temperature	pH	4-day average	30-day average
Arkansas River	32	7.6	3.2	3.2
Arkansas River Valley	31	6.7	5.6	5.6
Boston Mountains	31	6.9	5.3	5.3
Delta	30	7.1	5.2	5.2
Gulf Coastal Plains	30	6.6	6.1	6.1
Ouachita Mountains	30	7.1	5.2	5.2
Ouachita River (L. Mo. to Mouth)	32	6.7	5.2	5.2
→→→→ Ozark Highlands	29	7.6	3.9	3.9
Red River	32	7.5	3.5	3.5
White River (Dam #10 Mouth)	32	7.7	2.9	2.9

Major Permits

Fish Early Life Stages Absent - Primary Season (November - March), mg/L

Ecoregion	Temperature	pH	4-day average	30-day average
Arkansas River	14	7.6	10.3	4.1
Arkansas River Valley	14	6.7	16.7	6.7
Boston Mountains	14	6.9	15.8	6.3
Delta	14	7.1	14.7	5.9
Gulf Coastal Plains	14	6.6	17	6.8
Ouachita Mountains	14	7.1	14.7	5.9
Ouachita River (L. Mo. to Mouth)	14	6.7	16.7	6.7
Ozark Highlands	14	7.6	10.3	4.1
Red River	14	7.5	11.3	4.5
White River (Dam #10 Mouth)	14	7.7	9.3	3.7

Fish Early Life Stages Present - Critical Season (April-October), mg/L

Ecoregion	Temperature	pH	4-day average	30-day average
Arkansas River	32	7.6	3.2	1.3
Arkansas River Valley	31	6.7	5.6	2.2
Boston Mountains	31	6.9	5.3	2.1
Delta	30	7.1	5.2	2.1
Gulf Coastal Plains	30	6.6	6.1	2.4
Ouachita Mountains	30	7.1	5.2	2.1
Ouachita River (L. Mo. to Mouth)	32	6.7	5.2	2.1
Ozark Highlands	29	7.6	3.9	1.6
Red River	32	7.5	3.5	1.4
White River (Dam #10 Mouth)	32	7.7	2.9	1.2

StreamStats Version 3.0

Flow Statistics Ungaged Site Report

Date: Thurs June 22, 2017 1:14:17 PM GMT-5

Study Area: Arkansas

NAD 1983 Latitude: 36.2834 (36 17 00)

NAD 1983 Longitude: -92.586 (-92 35 10)

Drainage Area: 9.88 mi²

@ out fall

Peak Flows Region Grid Basin Characteristics			
Peakflow Region Number=1507			
Unadjusted 10-85 stream slope method in feet per mile.=40.4			
100% Peak Region C 95 4224 (9.88 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	9.88	0.0811	2040

Low Flows Region Grid Basin Characteristics			
Lowflow Region number=1438			
100% Low Flow Region 1 2008 5065 (9.88 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	9.88 (below min value 12.1)	12.1	828.5
Percent Surficial Geology Ordo and Miss (percent)	100	0	100
Mean Basin Hydrologic Soils Index (dimensionless)	2.97 (above max value 2.7)	2.5	2.7
Mean March Precipitation (inches)	4.32	4.1	5.3
Basin Ave Rainfall Nov Apr PRISM 2000 (inches)	23.6	21.3	26.2

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Probability of Zero Flow Basin Characteristics			
Zeroflow Region Number=1445			
100% Pzero Flow Region 1 2008 5065 (9.88 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	9.88 (below min value 12.1)	12.1	829
Tau Annual from Grid (years)	20	5.5	26.7
Percent Surficial Geology Ordo and Miss (percent)	100	0	100

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flows Region Grid Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PK2	1290	ft3/s	42	3	655	2540
PK5	2280	ft3/s	38	5	1240	4220
PK10	3020	ft3/s	37	6	1680	5450
PK25	3990	ft3/s	36	9	2250	7080
PK50	4780	ft3/s	35	11	2710	8440
PK100	5520	ft3/s	35	12	3120	9770
PK500	7400	ft3/s	37	15	4090	13400

<http://pubs.er.usgs.gov/usgspubs/wri/wri954224> (<http://pubs.er.usgs.gov/usgspubs/wri/wri954224>)
 Hodge_ S.A._ and Tasker_ G.D._ 1995_ Magnitude and Frequency of Floods in Arkansas; U.S. Geological Survey Water-Resources Investigations Report 95-4224_ 52 p.

Low Flows Region Grid Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
M7D2Y	0.0467	ft3/s				
M7D10Y	0.006	ft3/s				
M7D10Y1104	0.79	ft3/s				
M7D10Y1112	0.63	ft3/s				
M7D10Y0102	0.79	ft3/s				
M7D10Y0304	1.29	ft3/s				
M7D10Y11	1	ft3/s				
M7D10Y12	0.79	ft3/s				
M7D10Y01	1.25	ft3/s				
M7D10Y02	0.91	ft3/s				
M7D10Y03	1.11	ft3/s				
M7D10Y04	1.15	ft3/s				

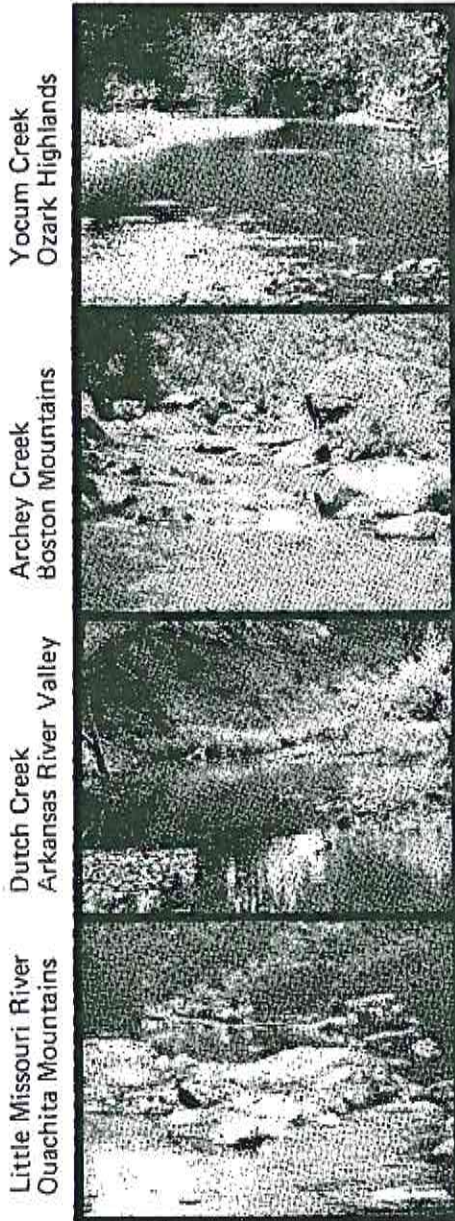
Annual 7Q10
 10V-Apr

<http://pubs.usgs.gov/sir/2008/5065/pdf/SIR2008-5065.pdf> (<http://pubs.usgs.gov/sir/2008/5065/pdf/SIR2008-5065.pdf>)
 Funkhouser_ J.E._ Eng_ Ken_ and Moix_ M.W._ 2008_ Low-Flow Characteristics and Regionalization of Low Flow Characteristics for Selected Streams in Arkansas: U. S. Geological Survey Scientific Investigations Report 2008-5065_ 161 p.

Probability of Zero Flow Statistics						
Statistic	Value	Unit	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PROB 7DAY	0.00783	dim				
PROB7D1104	0.000762	dim				
PROB7D1112	0.000636	dim				
PROB7D11	0.000581	dim				

<http://pubs.usgs.gov/sir/2008/5065/pdf/SIR2008-5065.pdf> (<http://pubs.usgs.gov/sir/2008/5065/pdf/SIR2008-5065.pdf>)
 Funkhouser_ J.E._ Eng_ Ken_ and Moix_ M.W._ 2008_ Low-Flow Characteristics and Regionalization of Low Flow Characteristics for Selected Streams in Arkansas: U. S. Geological Survey Scientific Investigations Report 2008-5065_ 161 p.

Physical, Chemical, and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas' Ecoregions

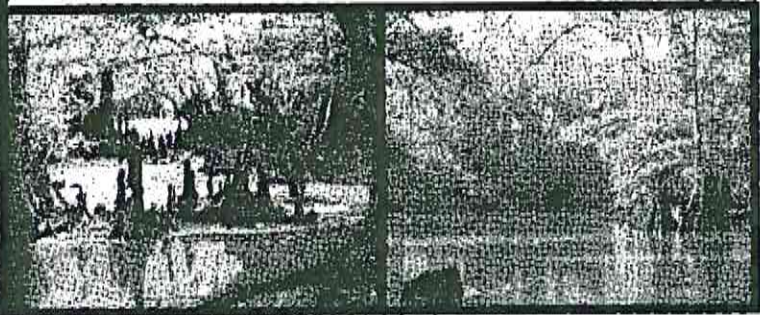
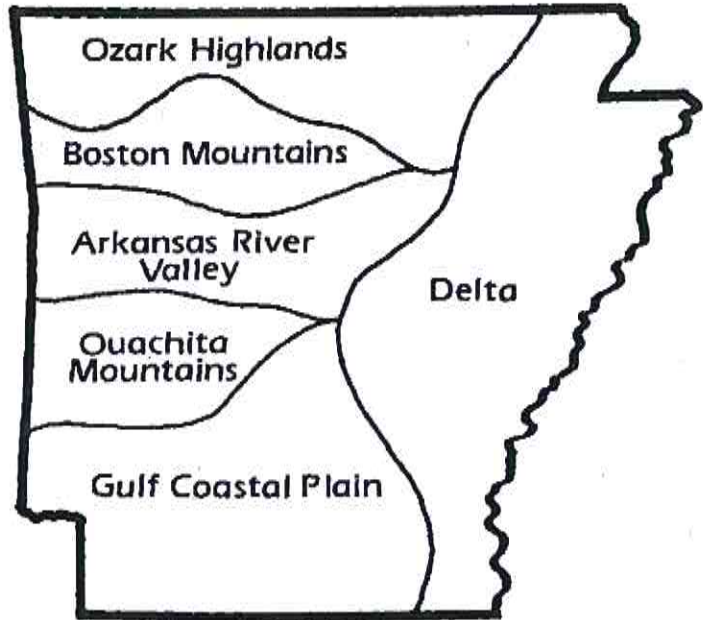


Yocum Creek
Ozark Highlands

Archey Creek
Boston Mountains

Dutch Creek
Arkansas River Valley

Little Missouri River
Ouachita Mountains



Moro Creek
Gulf Coastal Plain

Bayou DeView
Delta

**Volume II: Data Analysis
1987**

**State of Arkansas
Department of Pollution Control and Ecology**

Figure D-10. Dissolved Oxygen and Saturation Values for Ozark Highlands Ecoregion Reference Streams during Summer Period

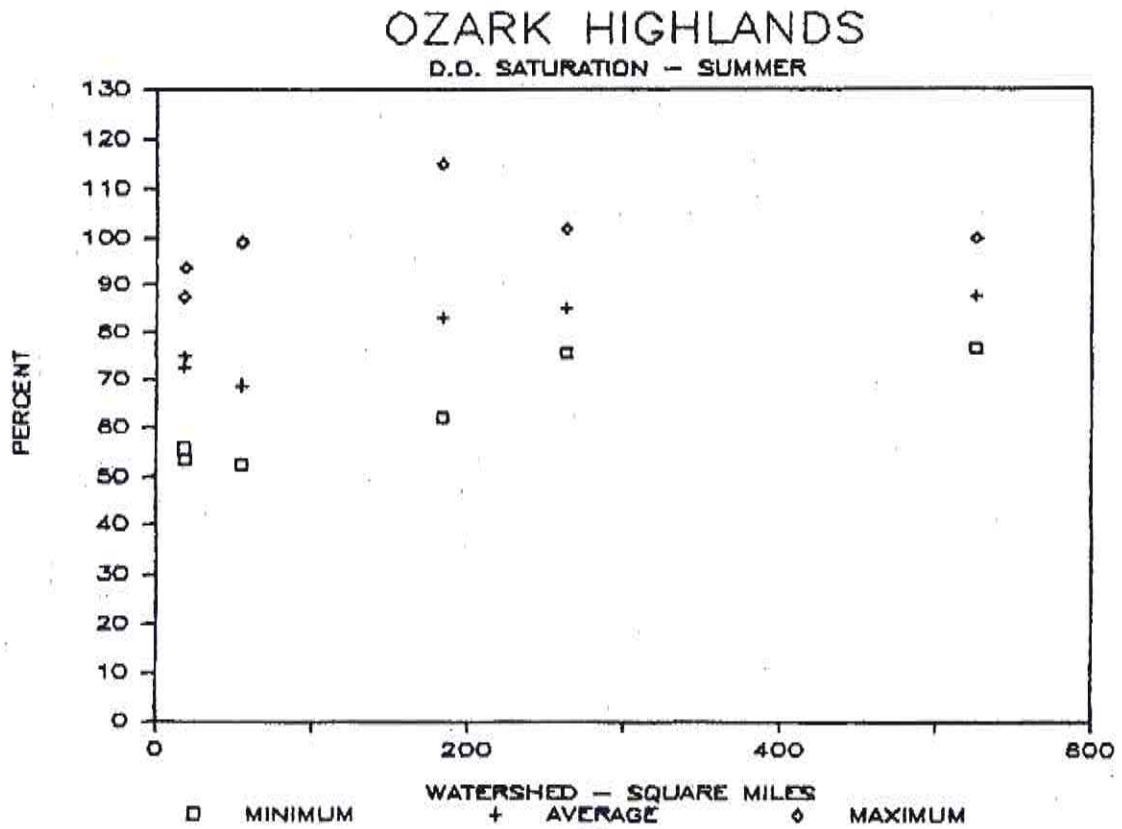
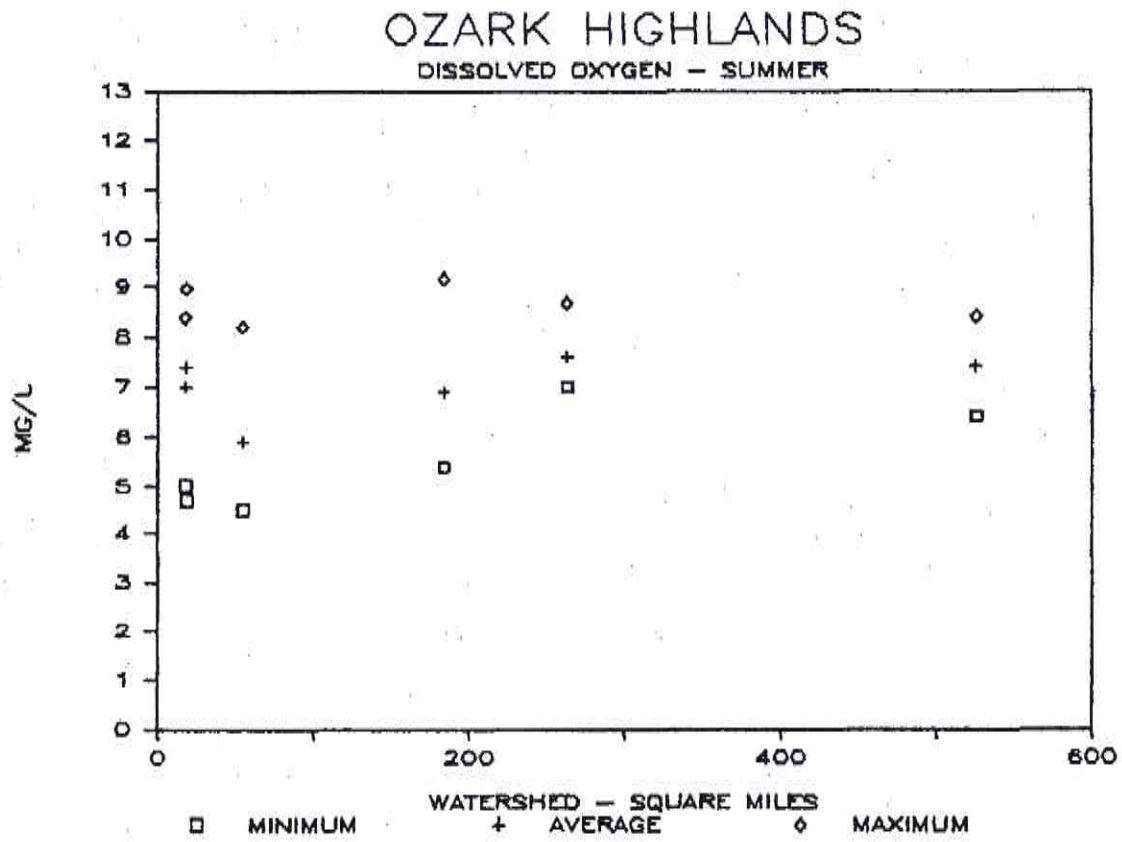
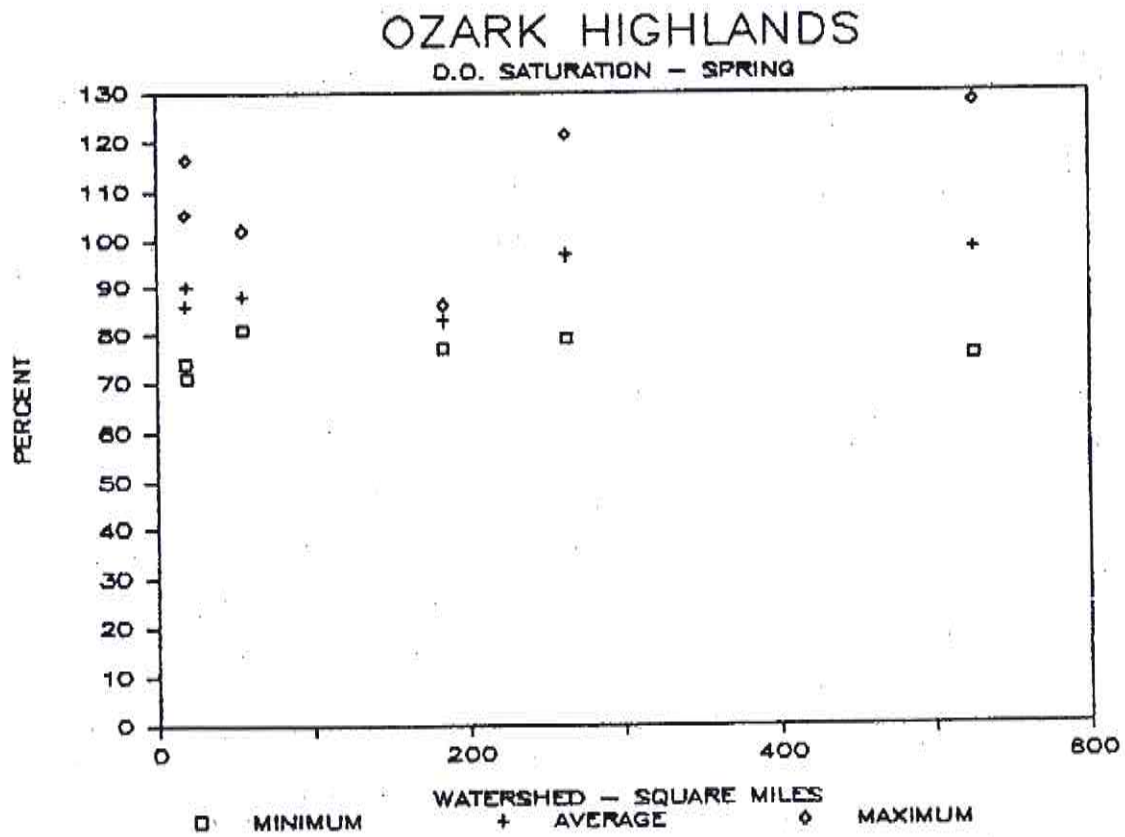
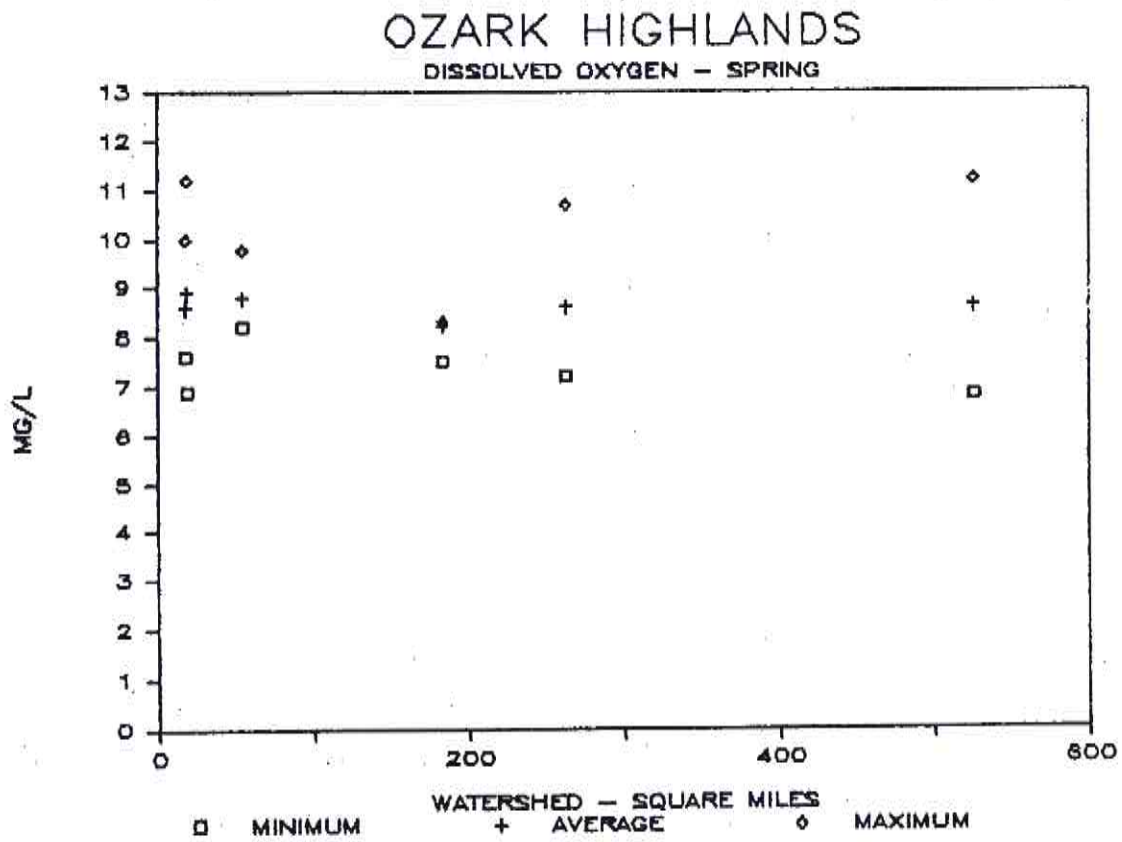


Figure D-11. Dissolved Oxygen and Saturation Values for Ozark Highlands Ecoregion Reference Streams during Spring Period



Stream Hydraulics for Critical Season

Q mgd	V	D	W	Ka (O'Conner Dobbins)
0.005	0.005	0.175	9.635	11.980
0.01	0.007	0.215	10.327	10.797
0.015	0.009	0.243	10.754	10.160
0.02	0.011	0.265	11.068	9.730
0.025	0.012	0.283	11.318	9.410
0.03	0.013	0.299	11.526	9.156
0.035	0.015	0.313	11.705	8.947
0.04	0.016	0.326	11.862	8.770
0.045	0.017	0.338	12.003	8.616
0.05	0.018	0.349	12.130	8.481
0.055	0.019	0.359	12.246	8.361
0.06	0.020	0.368	12.353	8.252
0.065	0.021	0.377	12.452	8.154
0.07	0.022	0.386	12.545	8.064
0.075	0.023	0.394	12.632	7.981
0.08	0.024	0.401	12.714	7.904
0.085	0.025	0.409	12.791	7.832
0.09	0.026	0.416	12.864	7.765
0.095	0.027	0.423	12.934	7.702
0.1	0.028	0.429	13.001	7.643
0.105	0.029	0.436	13.064	7.588
0.11	0.029	0.442	13.125	7.535
0.115	0.030	0.448	13.184	7.485
0.12	0.031	0.453	13.240	7.437
0.125	0.032	0.459	13.294	7.392
0.13	0.033	0.464	13.346	7.348
0.135	0.033	0.470	13.397	7.307
0.14	0.034	0.475	13.445	7.267
0.145	0.035	0.480	13.493	7.229
0.15	0.035	0.485	13.539	7.192
0.155	0.036	0.490	13.583	7.157
0.16	0.037	0.494	13.626	7.123
0.165	0.038	0.499	13.668	7.090
0.17	0.038	0.503	13.709	7.059
0.175	0.039	0.508	13.749	7.028
0.18	0.040	0.512	13.788	6.998
0.185	0.040	0.516	13.825	6.970
0.19	0.041	0.520	13.862	6.942
0.195	0.041	0.525	13.898	6.915
0.2	0.042	0.529	13.934	6.889

Velocity Coefficient	Depth Coefficient	Width Coefficient	Product of Coefficients (should equal 1)
0.085	0.751	15.665	1.000
Velocity Exponent	Depth Exponent	Width Exponent	Sum of Exponents (should equal 1)
0.6	0.3	0.1	1.0

This worksheet is the hydraulics for stream flows up to 0.2 MGD.

The Velocity, Depth, and Width values in chart to left are from the following empirical equations which were developed based on the empirical relationships presented on page 2-33 of EPA September 1983 Technical Guidance Manual for Performing Waste Load Allocations, Book II (Streams and Rivers).

Velocity = 0.085 Q^{0.6}

Depth = 0.751 Q^{0.3}

Width = 15.665 Q^{0.1}

Quick Calculator

Headwater in CFS

Primary Season Stream Hydraulics

		0.072323	0.5	0.567722	0.4	24.35498	0.1
			FPS		Feet		Feet
<input type="text" value="0.175"/> Discharger 1 in MGD	_____	Reach 1 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 2 in MGD	_____	Reach 2 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 3 in MGD	_____	Reach 3 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 4 in MGD	_____	Reach 4 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 5 in MGD	_____	Reach 5 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 6 in MGD	_____	Reach 6 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 7 in MGD	_____	Reach 7 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 8 in MGD	_____	Reach 8 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 9 in MGD	_____	Reach 9 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>
<input type="text" value="0"/> Discharger 10 in MGD	_____	Reach 10 Velocity	<input type="text" value="0.074"/>	Depth	<input type="text" value="0.581"/>	Width	<input type="text" value="24.499"/>

CFS is MGD

MGD is CFS

Model Input Data

Facility Name: City of Flippin

Permit Number: AR0021717

W.S. Drainage Area (mi²): 9.88 (at outfall); 10.2 (0.1 miles downstream of outfall)

Ecoregion: Ozark Highlands

	Critical Season (May-Oct.)		Primary Season (Nov.-Apr.)	
	Reach 1a	Reach 1b	Reach 1a	Reach 1b
D.O. Standard (mg/L)	2.0	2.0 5.0	6.0	6.0
Temp. Standard (°C)	29		22	
Q stream (cfs)	0.277		1.061	
Velocity stream (fps)	0.039		0.074	
Depth stream (ft)	0.508		0.581	

Q_{DESIGN} : 0.175 MGD

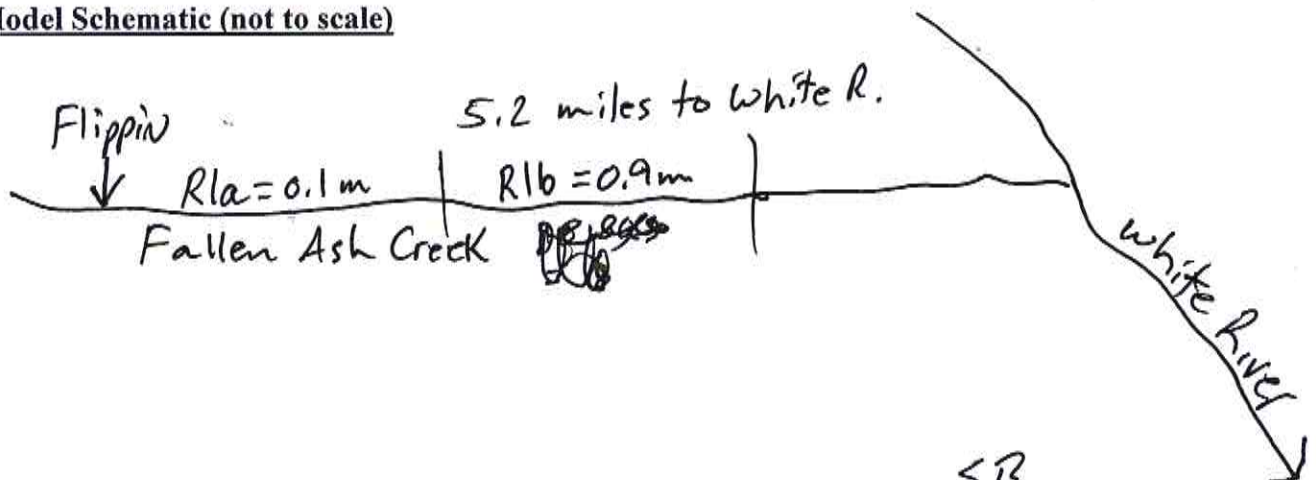
Q_{upstream} (cfs): 0.006 (Annual 7Q10 from USGS StreamStats)

0.79 (Nov-Apr 7Q10 from USGS StreamStats)

Receiving Stream: Fallen Ash Creek, thence to the White River

Permit type: Domestic

Model Schematic (not to scale)



Engineer: SB

Date: 6-22-2017

Input Model Coefficients

Reach 1 (Fallen Ash Creek)

Coefficient – at 20° C	Input value	Justification
BOD _{ult} /BOD ₅	2.3	EPA Guidance
K _d (1/day)	0.4	MOA
K _n (1/day)	0.4	MOA
SOD (g/m ² /day)	0.5	MOA for TSS = 15 mg/l
K _a (1/day)	7.0 (critical season) 7.9 (primary season)	O'Conner-Dobbins formula

Engineer: SB
Date: 6-22-2017

BVC

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*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
*****

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21717-C

6/22/2017

--*-*-* Run Information *-*-*-*-*

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Name of receiving stream ----- Fallen Ash Creek
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Flippin_critical

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--*-*-* Upstream Parameters *-*-*-*-*

Parameter	Value	Comment
Flow (cfs)	0.006	7Q10 StreamStat
Temperature (°C)	29.000	Reg 2 WQS
Dissolved Oxygen (mg/l)	5.775	75%sat erstudy
5-Day BOD (mg/l)	1.000	assumed
Ult. CBOD / 5-Day BOD	2.300	epa guidance
pH (su)	7.000	assumed
Ammonia (mg/l)	0.100	assumed
Alkalinity (mg/l)	-0.000	

--*-*-* Effluent Parameters *-*-*-*-*

Number of Discharges = 1

For Discharge Number 1 (Flippin)

Parameter	Value	Comment
Flow (MGD)	0.175	design flow
Temperature (°C)	29.000	
Dissolved Oxygen (mg/l)	6.000	
5-Day BOD (mg/l)	10.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	7.000	
Ammonia (mg/l)	2.000	
Alkalinity (mg/l)	-0.000	
Beginning of Reach Number	1.000	

10/15/2/6

--*-*-* Reach Information *-*-*-*-*

Number of Reaches = 1
Reaeration Type is O'Connor-Dobbins

For Reach Number 1

Parameter	Value	Comment
Length (mile)	1.000	
Velocity (fps)	0.039	
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.508	
Temperature (°C)	29.000	Calculated

BOD Removal Rate	(1/day)	0.400	
NH3 Decay Rate	(1/day)	0.400	
Sediment Oxygen Demand	(g/m ² /day)	0.510	k20=0.5 (tss=15)
Photosynthesis/respiration	(mg/L/day)	-0.000	

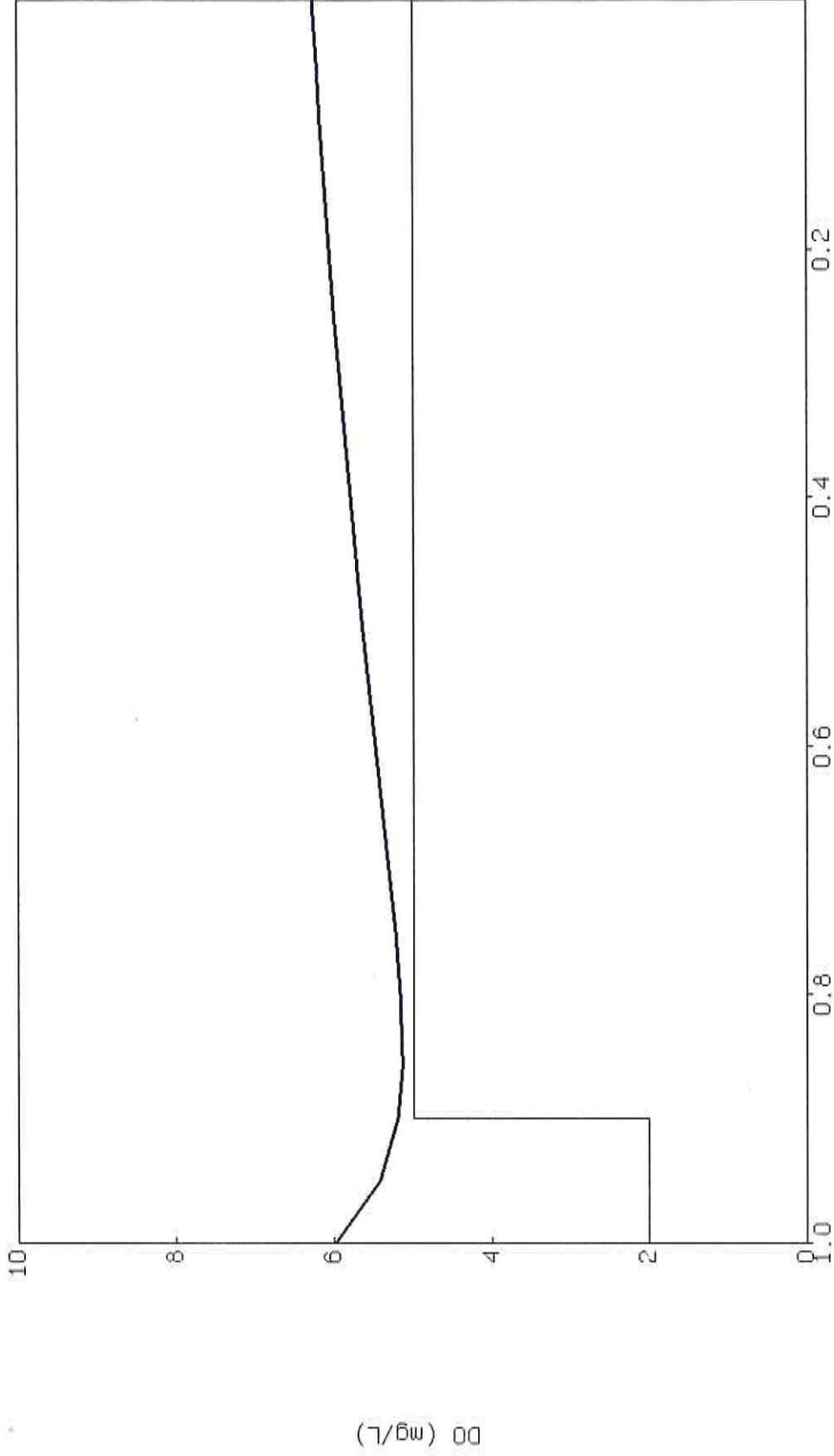
Temperature-corrected BOD removal rate	(1/day)	0.605
Temperature-corrected NH3 decay rate	(1/day)	0.800
Calculated reaeration rate at 20° C	(1/day)	7.036
Temperature-corrected reaeration rate	(1/day)	8.718
Calculated reach-averaged width	(ft)	13.959

--*-*-* Results for Fallen Ash Creek *-*-*-*-*

Discharge is to -- Fallen Ash Creek
Run Title is -- Flippin_critical

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
1.000	5.995		22.551		1.959	
0.950	5.427		21.507		1.840	
0.900	5.198		20.512		1.728	
0.850	5.139		19.563		1.623	
0.800	5.161		18.658		1.525	
0.750	5.223		17.794		1.432	
0.700	5.301		16.971		1.345	
0.650	5.386		16.185		1.263	
0.600	5.471		15.436		1.187	
0.550	5.555		14.722		1.115	
0.500	5.635		14.041		1.047	
0.450	5.712		13.391		0.983	
0.400	5.786		12.771		0.924	
0.350	5.855		12.180		0.868	
0.300	5.922		11.617		0.815	
0.250	5.985		11.079		0.765	
0.200	6.044		10.566		0.719	
0.150	6.101		10.077		0.675	
0.100	6.154		9.611		0.634	
0.050	6.205		9.166		0.596	
-0.000						
-0.000	6.254		8.742		0.560	

Dissolved Oxygen Profile
Flippin_critical



River Mile

Max unionized ammonia = 0.0146 mg/L

BVC

```

*****
*                               SIMPLIFIED METHOD PROGRAM                               *
*                               COMPLETE INPUT LISTING                               *
*****

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21717-P 6/22/2017

----*--*--* Run Information *--*--*--*--*

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Name of receiving stream ----- Fallen Ash Creek
Number of discharges ----- 1
Number of reaches ----- 1
Reaeration type ----- O'Connor-Dobbins
Run title ----- Flippin_Primary

```

----*--*--* Upstream Parameters *--*--*--*--*

Parameter	Value	Comment
Flow (cfs)	0.790	7Q10 Nov-Apr
Temperature (°C)	22.000	Reg 2 WQS
Dissolved Oxygen (mg/l)	7.395	85%sat erstudy
5-Day BOD (mg/l)	1.000	assumed
Ult. CBOD / 5-Day BOD	2.300	epa guidance
pH (su)	7.000	assumed
Ammonia (mg/l)	0.100	assumed
Alkalinity (mg/l)	-0.000	

----*--*--* Effluent Parameters *--*--*--*--*

Number of Discharges = 1

For Discharge Number 1 (Flippin)

Parameter	Value	Comment
Flow (MGD)	0.175	design flow
Temperature (°C)	22.000	
Dissolved Oxygen (mg/l)	6.000	
5-Day BOD (mg/l)	10.000	
Ult. CBOD / 5-Day BOD	2.300	
pH (su)	7.000	
Ammonia (mg/l)	9.000	
Alkalinity (mg/l)	-0.000	
Beginning of Reach Number	1.000	

10/15/9/6

----*--*--* Reach Information *--*--*--*--*

Number of Reaches = 1
Reaeration Type is O'Connor-Dobbins

For Reach Number 1

Parameter	Value	Comment
Length (mile)	1.000	
Velocity (fps)	0.074	
Slope (ft/mile)	-0.000	
Average Depth (ft)	0.581	
Temperature (°C)	22.000	Calculated

BOD Removal Rate	(1/day)	0.400	
NH3 Decay Rate	(1/day)	0.400	
Sediment Oxygen Demand	(g/m ² /day)	0.340	k20=0.5 (tss=15)
Photosynthesis/respiration	(mg/L/day)	-0.000	

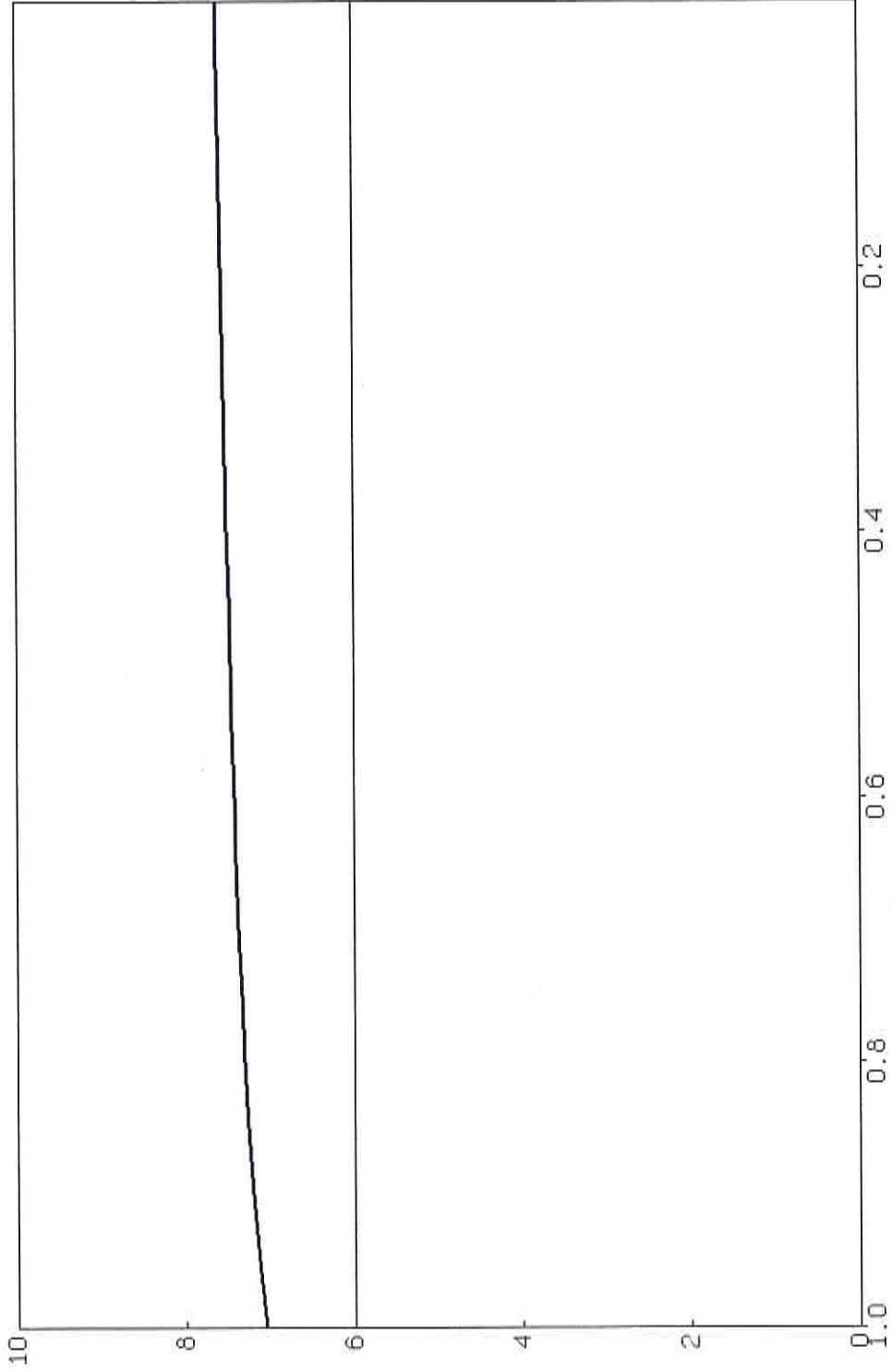
Temperature-corrected BOD removal rate	(1/day)	0.438
Temperature-corrected NH3 decay rate	(1/day)	0.467
Calculated reaeration rate at 20° C	(1/day)	7.924
Temperature-corrected reaeration rate	(1/day)	8.310
Calculated reach-averaged width	(ft)	24.667

--*-*-* Results for Fallen Ash Creek *-*-*-*-*

Discharge is to -- Fallen Ash Creek
Run Title is -- Flippin_Primary

River Mile	DO Predicted	DO Observed	BOD Predicted	BOD Observed	NH3 Predicted	NH3 Observed
1.000	7.039		7.581		2.370	
0.950	7.128		7.445		2.325	
0.900	7.197		7.311		2.281	
0.850	7.251		7.180		2.237	
0.800	7.295		7.051		2.195	
0.750	7.331		6.925		2.153	
0.700	7.361		6.800		2.112	
0.650	7.388		6.678		2.071	
0.600	7.412		6.558		2.032	
0.550	7.433		6.441		1.993	
0.500	7.453		6.325		1.955	
0.450	7.472		6.212		1.918	
0.400	7.489		6.100		1.881	
0.350	7.506		5.991		1.845	
0.300	7.523		5.883		1.810	
0.250	7.539		5.778		1.776	
0.200	7.554		5.674		1.742	
0.150	7.569		5.572		1.708	
0.100	7.584		5.472		1.676	
0.050	7.598		5.374		1.644	
-0.000						
-0.000	7.612		5.278		1.612	

Dissolved Oxygen Profile
Flippin_Primary



River Mile

Max unionized ammonia = 0.0108 mg/L

DO (mg/L)