WASTELOAD ALLOCATION DEVELOPMENT

Durant Wastewater Treatment Plant
(OPDES OK0039063)

July 2025 (Update 3, January 2026)

Prepared For:

Durant City Utilities Authority
City of Durant, Oklahoma

Prepared by:

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Digitally signed by: S Sundaramoorthy
Date: 2026.01.27 16:14:45 -06'00'

1.0 INTRODUCTION

The Durant City Utilities Authority (City) is in the process of expanding its wastewater treatment plant (WWTP), from 3.55 million gallons a day (MGD) to 4.6 MGD. The Engineering Report prepared by Wall Engineering has been approved by the Oklahoma Department of Environmental Quality (DEQ). DEQ requires, as part of discharge permit modification, for the City to complete the wasteload allocation (WLA) study for 208 Plan amendment necessary for the new discharge permit. City of Durant, through its Design Engineer Wall Engineering, requested S2 Engineering, PLLC (Consultant) to provide professional services for the 208 Plan amendment efforts. S2 Engineering has teamed with Alliance Technical Group from Arkansas as the sub-consultant to S2E for the field work and the modelling efforts.

Durant's current wasteload allocation (WLA) for its discharge to Caney Creek is 4.0 MGD; however, the current plant permitted WLA is for 3.55 MGD. The proposed design flow for the new plant is 4.6 mgd. A new WLA and 208 Plan amendment from Oklahoma Department of Environmental Quality (ODEQ) is required to increase the WLA above the current level. This report provides a summary of the modeling and the proposed new WLA for Durant.

2.0 WATERSHED DESCRIPTION

The City of Durant is located in Bryan County, Oklahoma on the southern end of the state near Lake Texoma. Caney Creek is a small stream in the Lower Red River (Bois D'Arc-Island) watershed (HUC-8 No. 11140101) just south of Durant.

Figure 1 is the location map for the current discharge stream. Where the current discharge enters the stream, it is a small first order stream with a watershed size of approximately 1.3 mi^2 (Figure 2.) The modeled reach spans 5.5 miles downstream of the discharge to the intersection with County Road E2150. The basin falls in the Western Coastal Plains as defined by major Land Resource Areas (MRLA) in the Continental United States and is in the ODEQ planning basin 13 (old 4), Lower Red River (sub-basin ID number 10700).

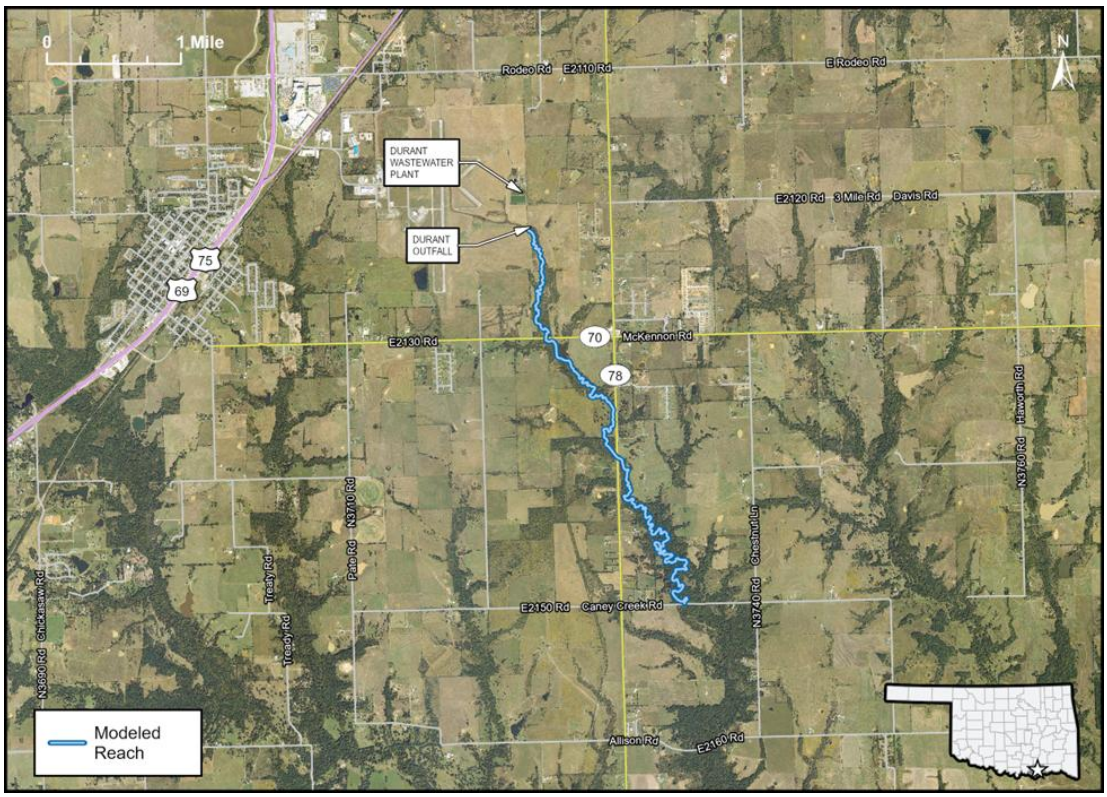


Figure 1. Location of the proposed outfall and the modeled study reach in Caney Creek.

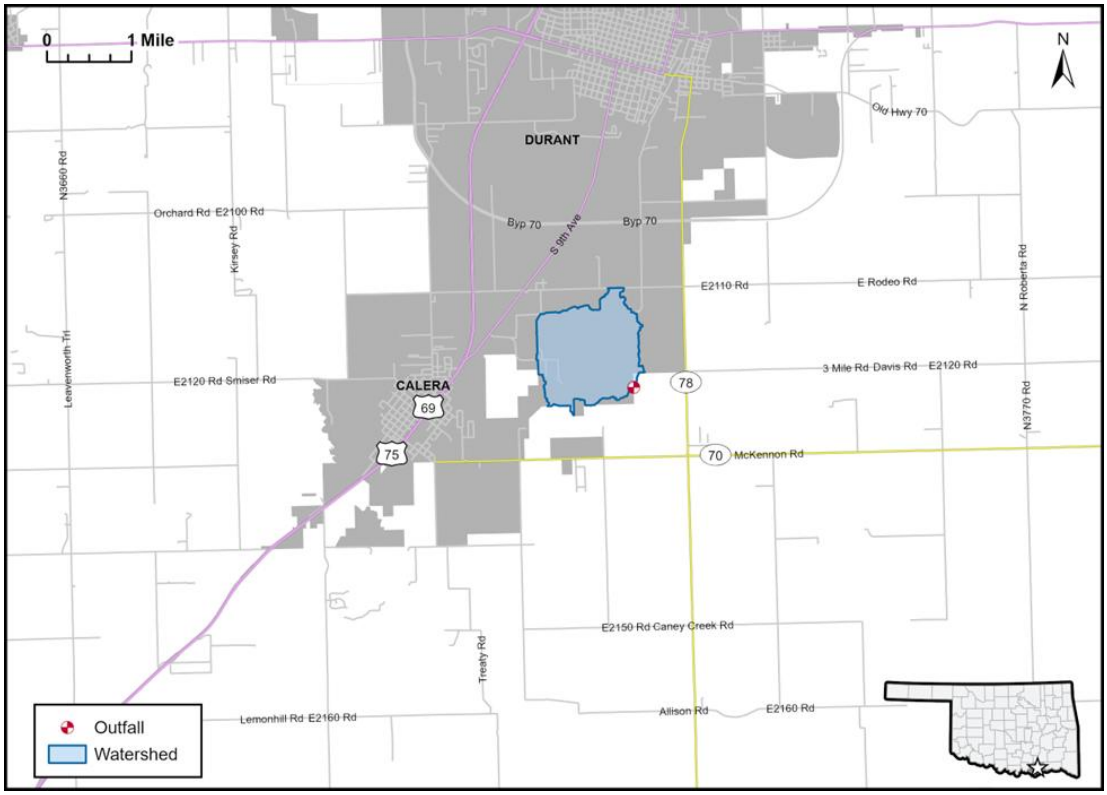


Figure 2. Caney Creek Watershed upstream of the Durant discharge (outfall) location.

Caney Creek is classified as a warm water aquatic community; therefore, it has dissolved oxygen standards of 5 mg/L in the summer and winter and 6 mg/L in spring. Caney Creek is not specifically listed in the Oklahoma Water Quality Standards (WQS). Therefore, the designated uses for Island Bayou, which Caney Creek is a tributary of, is assumed to apply. The watershed designations include Emergency Water Supply, Warm Water Aquatic Community subcategory, Agriculture, and Secondary Body Contact and Aesthetics.

3.0 DESKTOP MODLEING

Since this is an existing discharge with 4.0 mgd already approved in the 208 Plan, with no existing water quality model on record, we have elected to utilize ODEQs spreadsheet based one-reach model (version 4.1), which an earlier version of was likely used to set the original limits. This model has been used by ODEQ for years to set permit limits for municipalities and is based on the widely accepted Streeter-Phelp's reaction kinetics. The model was built using ODEQ's default/recommended model stream conditions and reaction kinetics established for various aquatic life designated uses (warm water, cool water, etc) and utilizes conservative reaction kinetics generally acceptable to both ODEQ and EPA region 6. In most instances the only information that the modeler needs to develop/provide is:

- Proposed Effluent flow.
- Stream reaches length to be modeled.
- Upstream flow (7Q2)
- Stream channel slope
- Stream side (bank) slope
- Stream channel Mannings N
- Proposed WLA (CBOD5, ammonia, dissolved oxygen)

A summary of the input data noted above is provided in Table 1. These inputs were based on ODEQ desktop model defaults which are conservative. The $7Q_2$ estimated by StreamStats[1], is less than 1 cfs, therefore the default of 1 cfs was used. The stream slope was also derived from StreamStats data (Appendix A). Slope was set at the

[1] StreamStats is a USGS on-line tool to retrieve flow information from gauged an un-gauged streams in the US. https://www.usgs.gov/streamstats

lower quartile of the StreamStats data range, to add an additional level of conservatism.

Caney Creek was modeled in one 5.5-mile reach that included the discharge location and extended downstream to county road E2150 (known locally as Caney Creek Rd). The model allows for some variation of reaction kinetics by reach to better represent real world conditions should such supporting data be available.

Field data was collected in September 2025 to support the desktop modeling. Specifically, stream channel dimension and substrate were evaluated. The field data supported the one-reach model calculated stream depths. Field data indicated, the overall stream is small and shallow, with a rifle/run morphology (with some shallow pools) and an overall average depth of 0.6 feet (see field data and stream photos in Appendix A). It has a sandy/gravelly substrate that is not likely to exert significant SOD. To remain conservative, key coefficients and constants (CBOD decay, reaeration, N-decay, etc.) were not varied from those calculated by or set as defaults by the one-reach desktop model (Table 2.) Since the stream is small with a low flow less than 1 cfs and has low-moderate slope, the resulting low to moderate velocity and shallow depths led to use of the Turney-Harris reaeration equation, according to the desktop model guidelines. The Turney-Harris equation has been used by ODEQ for other municipalities discharging to small shallow streams.

Table 1. Model inputs (some calculated by model) that varied due to seasonal requirements.

Parameter	Summer/Critical	Spring	Winter	Data Source
Discharger Flow (mgd)	4.6	4.6	4.6	Engineer
Upstream Flow (cfs)	1	1	1	Default
Stream slope (ft/mi)	8	8	8	Stream Stats
Stream side slope (ft/ft)	0.1	0.1	0.1	Default
Average Depth (ft)	0.6	0.6	0.6	Model/Field Data
Velocity (fps)	0.6	0.6	0.6	Model
Mannings N	0.06	0.06	0.06	Estimated (in default range)
Water Quality Standard	5	6	5	OK WQS

To evaluate the new discharge, the flow rate for Durant was set to the proposed rate of 4.6 mgd. Pollutant concentrations for CBOD and ammonia were then increased to levels attainable by the proposed treatment levels. The model was then run to test if the creek could sufficiently assimilate the additional loading of oxygen demanding substances generated for this discharge including a 20% margin of safety (MOS) that is required by ODEQ for uncalibrated models. The 20% MOS (i.e., 20% WLA reserved from allocation) is automatically established by the model for whatever MOS it is set to. Model runs were explored to assess what oxygen levels would be predicted under the current WLA and at a maximum WLA set to establish reasonable upper bounds that could still meet the WQS. The focus was on the summer/critical season model that usually drives WLA in natural systems, but spring and winter scenarios were also evaluated.

Table 2. Model baseline conditions and reaction coefficients.

Parameter	Summer/Critical	Spring	Winter	Data Source
DO Saturation (%)	85	85	85	ODEQ default
Upstream CBOD (mg/L)	2.0	2.0	2.0	ODEQ default
Upstream Ammonia (mg/L)	0.15	0.15	0.15	ODEQ default
CBOD settling (/day)	0.03	0.03	0.05	ODEQ default
CBOD decay (/day)	0.40	0.40	0.40	ODEQ default
N decay (/day)	0.30	0.30	0.30	ODEQ default
Reaeration (/day)	15.66	15.66	15.66	Turney-Harris Equation
Sediment oxygen demand (SOD, g/ft2/day)	0.095	0.095	0.116	ODEQ recommended conservative minimum

4.0 MODEL RESULTS FOR DURANT AND MAXIMUM WLA

Model runs were explored to assess what oxygen levels would be predicted under the current WLA and at a maximum WLA designed to assess reasonable upper limits

in the creek at the proposed flow (4.6 MGD). Each scenario included a 20% MOS. Based on this modeling, the critical/summer season maximum WLA scenario predicted oxygen levels as low as 5.15 mg/L, compared to the standard of 5.0 mg/L (Figure 3.) The spring season maximum had results with the lowest oxygen level of 6.12 mg/L, compared to the spring oxygen standard of 6.0 mg/L, and the winter maximum scenario had a lowest oxygen level of 6.25 mg/L, compared to a 5.0 mg/L standard. Note, the winter season concentrations were limited to 25 mg/L of CBOD5 and 6 mg/L of ammonia both as high as generally allowed for small streams due to treatment type/quality requirements and toxicity (even though higher concentrations were achievable in-stream). The WLA from each of these modeled scenarios are provided in Table 3. In all cases the reaeration appeared to stay ahead of BOD decay allowing no in-streams oxygen sags at the levels modeled. This is not uncommon in shallow streams with good velocity, especially when additional flow is added from a discharge.

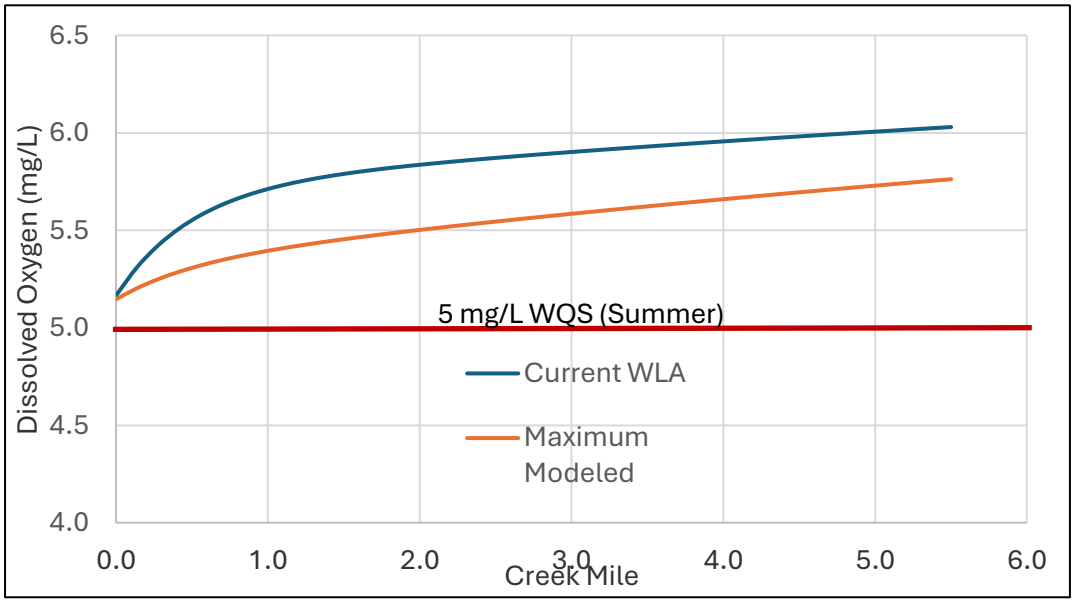


Figure 3. Dissolved oxygen predictions for the current WLA and maximum achievable scenarios.

Table 3. Summary of model run scenarios completed (including the 20% MOS).

Season	Flow (mgd)		Dissolved Oxygen (mg/L)		CBOD5 (mg/L)		Ammonia (mg/L)	
Model Scenario:	Current WLA	Maximum Modeled WLA	Current WLA	Maximum Modeled WLA	Current WLA	Maximum Modeled WLA	Current WLA	Maximum Modeled WLA
Summer	4.0	4.6	5.0	5.0	10.0	12.0	2.0	4.0
Spring	4.0	4.6	6.0	6.0	10.0	18.0	4.0	4.0

Winter	4.0	4.6	6.0	6.0	15.0	25.0	4.1*	6.0
* Included in current Durant's OPDES Permit OK0039063. WLA included in the 208 Plan for winter ammonia is 12 mg/l.								

5.0 PROPOSED WLA FOR DURANT

Table 3 summarizes the maximum WLA (including 20% MOS) as determined by the model runs. The maximum pollutants values shown in Table 3 are higher than the current limits established in Durant's OPDES Permit (OK0039063). Therefore, anti-backsliding requirement (found at Title 40 of the *Code of Federal Regulations* (CFR) 122.44(l)) are applicable in determining the proposed WLA for Durant.

Durant discussed with ODEQ the possibility of relaxation of the backsliding requirements and concluded that such relaxation will not be applicable in this instance. Therefore, Durant proposes to maintain at current WLA limits for the proposed WLA request. Based on these considerations, we request DEQ for approval of the following (proposed) WLA for Durant as shown in Table 4.

Table 4. Summary of proposed WLA for Durant based on a design flow of 4.6 mgd.

Season	Flow (mgd)	Dissolved Oxygen (mg/L)	CBOD5 (mg/L)	CBOD5 Load (lbs./day)	Ammonia (mg/L)	Ammonia Load (lbs./day)
Summer	4.6	5.0	10.0	383.6	2.0	76.7
Spring	4.6	6.0	10.0	383.6	4.0	153.5
Winter	4.6	6.0	15.0	575.5	4.1	157.3

---End of Report----

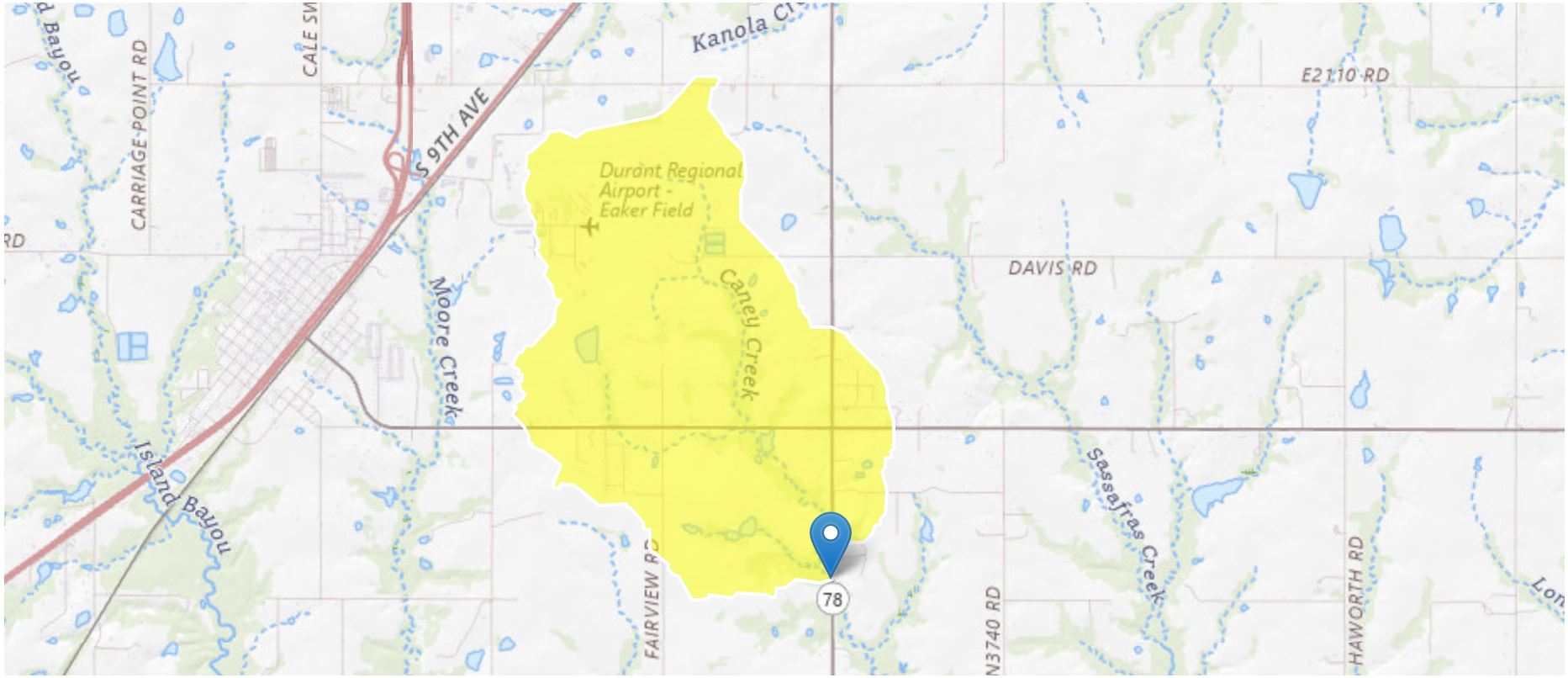
Print outs from all model runs are provided in Appendix B.

APPENDIX A

StreamStats, Field Data and Photos

StreamStats Report

Region ID: OK
Workspace ID: OK20250610163644094000
Clicked Point (Latitude, Longitude): 33.91227, -96.37349
NHD Stream GNIS Name of Click Point: Caney Creek
Time: 2025-06-10 11:37:17 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
APRAVPRE	Mean April Precipitation	3.89	inches
BSLDEM10M	Mean basin slope computed from 10 m DEM	1.8	percent
CANOPY_PCT	Percentage of drainage area covered by canopy as described in OK SIR 2009_5267	2.51	percent
CONTDA	Area that contributes flow to a point on a stream	4.28	square miles
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	18.9	feet per mi
DAUNREG	Unregulated drainage area used in OK regulated equations	4.28	square miles
DECAVPRE	Mean December Precipitation	3.02	inches
DRNAREA	Area that drains to a point on a stream		square miles
ELEV	Mean Basin Elevation	675	feet
FEBAVPRE	Mean February Precipitation	2.66	inches
IMPNLCD01	Percentage of impervious area determined from NLCD 2001 impervious dataset	2.08	percent
JUNAVPRE	Mean June Precipitation	4.92	inches
MARAVPRE	Mean March Precipitation	3.75	inches
MAYAVPRE	Mean May Precipitation	5.88	inches
NRCSPCT	Percent of contributing drainage area regulated by NRCS floodwater-retarding structures	0	percent
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	621	feet
PRECIP	Mean Annual Precipitation	44.9	inches

Parameter Code	Parameter Description	Value	Unit
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	44.59	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	19.7	inches
PREG_11_05	Mean monthly precipitation for November through May at the stream outlet	24.9	inches
SOILPERM	Average Soil Permeability	0.37	inches per hour

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Duration Region 2 2009 5267]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CONTDA	Contributing Drainage Area	4.28	square miles	4.02	7159
CSL10_85fm	Stream Slope 10 and 85 Method ft per mi	18.9	feet per mi	2.07	27
OUTLETELEV	Elevation of Gage	621	feet	518	1190
PREG_11_05	Nov to May Gage Precipitation	24.9	inches	21.7	24.8

Flow-Duration Statistics Disclaimers [Duration Region 2 2009 5267]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Flow-Duration Statistics Flow Report [Duration Region 2 2009 5267]

Statistic	Value	Unit
20 Percent Duration	2.71	ft^3/s
50 Percent Duration	0.244	ft^3/s
80 Percent Duration	0	ft^3/s
90 Percent Duration	0	ft^3/s
95 Percent Duration	0	ft^3/s

Flow-Duration Statistics Citations

Esralew, R.A., Smith, S.J.,2009, Methods for estimating flow-duration and annual mean-flow statistics for ungaged streams in Oklahoma: U.S. Geological Survey Scientific Investigations Report 2009-5267, 131 p. (http://pubs.usgs.gov/sir/2009/5267/)

General Flow Statistics

General Flow Statistics Parameters [Duration Region 2 2009 5267]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CONTDA	Contributing Drainage Area	4.28	square miles	4.02	7159
PREG_06_10	Jun to Oct Gage Precipitation	19.7	inches	15.7	18

General Flow Statistics Disclaimers [Duration Region 2 2009 5267]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

General Flow Statistics Flow Report [Duration Region 2 2009 5267]

Statistic	Value	Unit
Average daily streamflow	4.04	ft^3/s

General Flow Statistics Citations

Esralew, R.A., Smith, S.J.,2009, Methods for estimating flow-duration and annual mean-flow statistics for ungaged streams in Oklahoma: U.S. Geological Survey Scientific Investigations Report 2009-5267, 131 p. (http://pubs.usgs.gov/sir/2009/5267/)

Bankfull Statistics

Bankfull Statistics Parameters [Atlantic Plain D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area		square miles	0.30888	1086.8715

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area		square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Atlantic Plain D Bieger 2015]

Statistic	Value	Unit

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit

Bankfull Statistics Citations

NHD Features of Delineated Basin

NHD Streams Intersecting Basin Delineation Boundary

This functionality attempts to find the stream name at the delineation point. The name of the nearest intersecting National Hydrography Dataset (NHD) stream is selected by default to appear in the report above. NHD streams do not correspond to the StreamStats stream grid and may not be accurate. If you would like a different stream to appear in the above section, please make a selection below.

GNIS ID	GNIS Name	Distance from Clicked Point (ft)	Feature Type	Selected Stream Name
01090912	Caney Creek	0.25	Intermittent	Caney Creek

Watershed Boundary Dataset (WBD) HUC 8 Intersecting Basin Delineation Boundary

This functionality attempts to find the intersecting HUC 8 of the delineated watershed. HUC boundaries do not correspond to the StreamStats data and may not be accurate.

HUC 8	Name
11140101	Bois D'arc-Island
11140102	Blue

NHD Hydrologic Features Citations

U.S. Geological Survey, 2022, USGS TNM - National Hydrography Dataset, accessed July 21, 2022 at URL https://hydro.nationalmap.gov/arcgis/rest/services/nhd/MapServer/6. (https://hydro.nationalmap.gov/arcgis/rest/services/nhd/MapServer/6) U.S. Geological Survey, 2022, USGS TNM - National

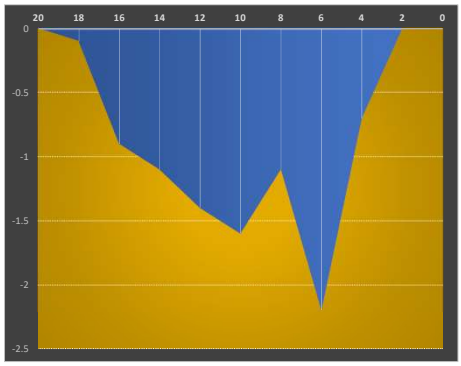
Hydrography Dataset, accessed July 21, 2022 at URL https://hydro.nationalmap.gov/arcgis/rest/services/wbd/MapServer/4. (https://hydro.nationalmap.gov/arcgis/rest/services/wbd/MapServer/4)

Application Version: 4.29.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Caney Creek, Durant, OK - Cross Section Data

1441													
Position (ft from RB)	20	18	16	14	12	10	8	6	4	2	0		
Depth	0	-0.1	-0.9	-1.1	-1.4	-1.6	-1.1	-2.2	-0.7	0	0		

Width: 18
Avg Depth: 1.0
Max Depth: 2.2
slope LB: 45
Slope RB: 45
substrate Silt mostly
Geomorph: Run



slope estimate 3ft/mile (min)

Overall Summary	
Average Width	17.7
Average Depth	0.68

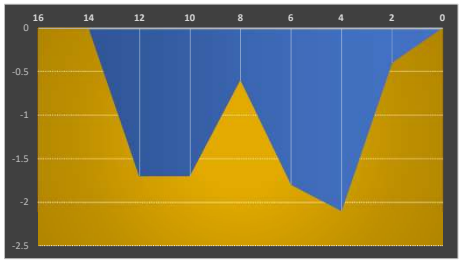
zero on one bank and each transect treated independantly

average depth 0.64

zeros on both banks and all data treated as one reach

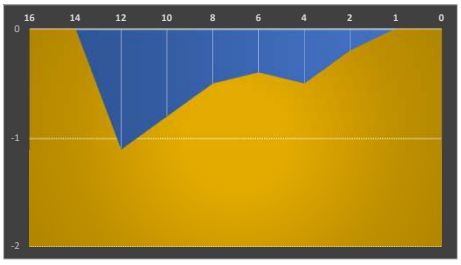
1442												
Position (ft from RB)	16	14	12	10	8	6	4	2	0			
Depth	0	0	-1.7	-1.7	-0.6	-1.8	-2.1	-0.4	0			

Width: 14
Avg Depth: 1.2
Max Depth: 2.1
slope LB:
Slope RB:
substrate Silt mostly
Geomorph: run/pool



1443												
Position (ft from RB)	16	14	12	10	8	6	4	2	1	0		
Depth	0	0	-1.1	-0.8	-0.5	-0.4	-0.5	-0.2	0	0		

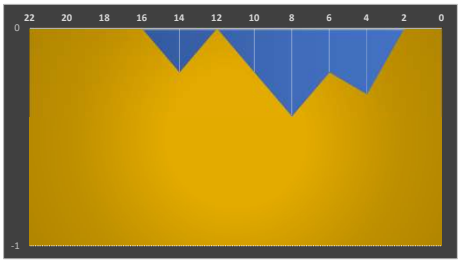
Width: 13
Avg Depth: 0.5
Max Depth: 1.1
slope LB:
Slope RB:
substrate Silt mostly
Geomorph: Riffle



1444												
Position (ft from RB)	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	0	0	-0.2	0	-0.2	-0.4	-0.2	-0.3	0	0

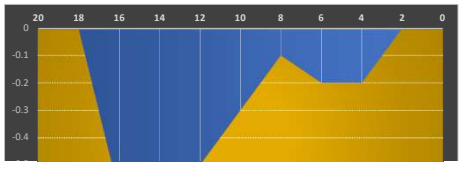
0

Width: 14
Avg Depth: 0.2
Max Depth: 0.4
slope LB:
Slope RB:
substrate Silt/Sand/fine gravel
some bedrock
Geomorph: riffle



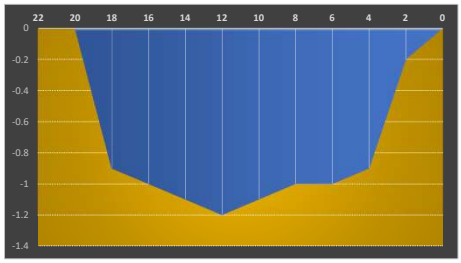
1445												
Position (ft from RB)	20	18	16	14	12	10	8	6	4	2	0	
Depth	0	0	-0.6	-0.7	-0.5	-0.3	-0.1	-0.2	-0.2	0	0	

Width: 16
Avg Depth: 0.3
Max Depth: 0.7
slope LB:
Slope RB:
substrate silt/sand/fine gravel
some bedrock
Geomorph: run, cut bank



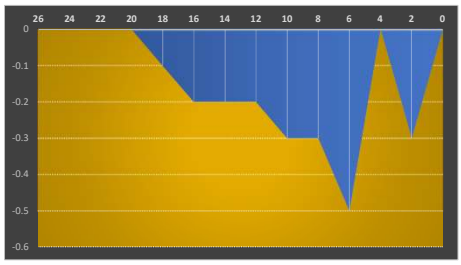
1446												
Position (ft from RB)	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	-0.9	-1	-1.1	-1.2	-1.1	-1	-1	-0.9	-0.2	0

Width: 20
Avg Depth: 0.8
Max Depth: 1.2
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: run



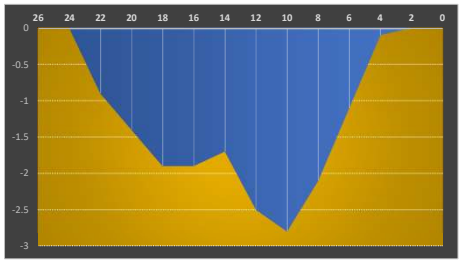
1447														
Position (ft from RB)	26	24	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	0	0	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3	-0.5	0	-0.3	0

Width: 20
Avg Depth: 0.2
Max Depth: 0.5
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: riffle



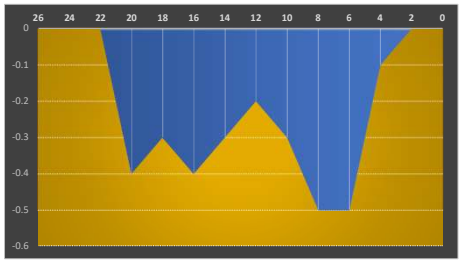
1448														
Position (ft from RB)	26	24	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	-0.9	-1.4	-1.9	-1.9	-1.7	-2.5	-2.8	-2.1	-1.1	-0.1	0	0

Width: 22
Avg Depth: 1.5
Max Depth: 2.8
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: run/pool



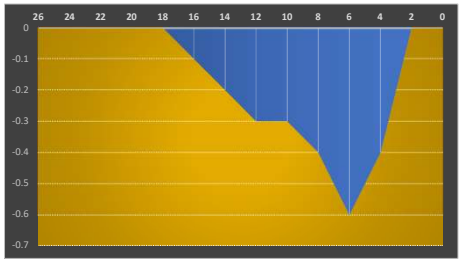
1449														
Position (ft from RB)	26	24	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	0	-0.4	-0.3	-0.4	-0.3	-0.2	-0.3	-0.5	-0.5	-0.1	0	0

Width: 20
Avg Depth: 0.3
Max Depth: 0.5
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: riffle



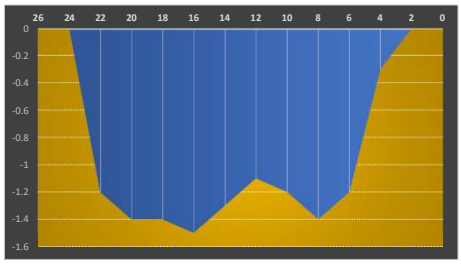
1450														
Position (ft from RB)	26	24	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	0	0	0	-0.1	-0.2	-0.3	-0.3	-0.4	-0.6	-0.4	0	0

Width: 16
Avg Depth: 0.3
Max Depth: 0.6
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: top of riffle



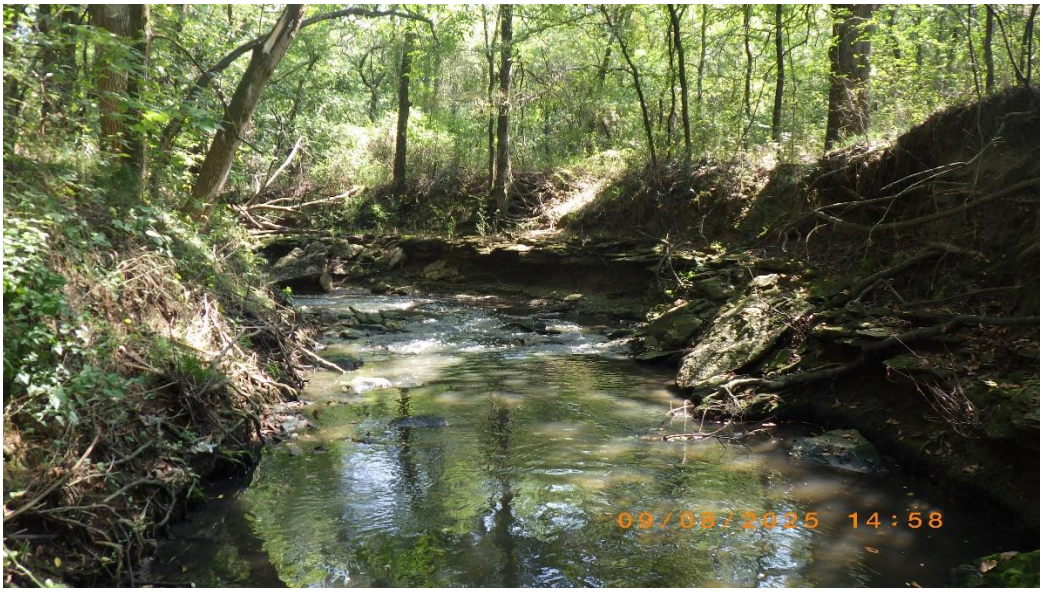
1451													
Position (ft from RB)	26	24	22	20	18	16	14	12	10	8	6	4	2	0
Depth	0	0	-1.2	-1.4	-1.4	-1.5	-1.3	-1.1	-1.2	-1.4	-1.2	-0.3	0	0

Width: 22
Avg Depth: 1.1
Max Depth: 1.5
slope LB:
Slope RB:
substrate silt/sand/fine gravel
Geomorph: pool



Photographs of Caney Creek, Durant, OK


09/08/2025 13:24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APPENDIX B

Model Runs

INPUT PARAMETERS FOR MODIFIED STREETER-PHELPS MODEL

CITY: **Durant - Current WLA**
PERFORMED BY: Alliance
DATE: 6/1/2025

I DISCHARGE INFORMATION

LOCATION: **Durant** BASIN: **13-10700**
COUNTY: **Bryan**

PROPOSED PERMIT FLOW:

Summer	Spring	Winter	
4.000	4.000	4.000	MGD

II RECEIVING STREAM

STREAM NAME **Caney Creek**
MODELED LENGTH **5.50** MILES NUMBER OF SEGMENTS **40**

	Summer	Spring	Winter	
UPSTREAM FLOW (7Q2)	0.00	0.00	0.00	CFS
STREAM SLOPE (S)		8.00		FT/MILE
SIDE SLOPE (P)		0.10		FT/FT
MANNING'S N		0.06		
VELOCITY COEFFICIENT (Cv)		3.194		
DEPTH COEFFICIENT (Ch)		0.136		

		Summer		Spring		Winter	
Upstream Flow 7Q2 (cfs)	Velocity (fps)	1.0	0.62	1.0	0.62	1.0	0.62
	Depth (ft)		0.54		0.54		0.54
Upstream Flow 0.0 (cfs)	Velocity (fps)	0.0	0.60	0.0	0.60	0.0	0.60
	Depth (ft)		0.51		0.51		0.51

III WATER QUALITY CRITERIA OF RECEIVING STREAM

AQUATIC COMMUNITY FLAG **2** WARM WATER AQUATIC COMMUNITY
AVERAGE D.O. REQUIREMENT
SUMMER **5.00** MG/L
SPRING **6.00** MG/L
WINTER **5.00** MG/L

IV UPSTREAM CONDITIONS

D.O. SATURATION **85.00** %
UPSTREAM CBOD5 **2.00** MG/L
UPSTREAM NH3-N **0.15** MG/L

V RATE CONSTANTS at 20° C

CBOD DECAY RATE (K1)
0.2*(H/8)^-0.434 (/DAY)

Summer	Spring	Winter
0	0	0
0.40	**0.40**	**0.40**

REAERATION RATES (K2)

	SUMMER		SPRING		WINTER	
	UPSTREAM FLOW		UPSTREAM FLOW		UPSTREAM FLOW	
	1.0 (cfs)	0.0 (cfs)	1.0 (cfs)	0.0 (cfs)	1.0 (cfs)	0.0 (cfs)
1). TURNEY-HARRIS K2=1.33*S^0.32/n^0.64	15.66	15.66	15.66	15.66	15.66	15.66
2). TEXAS K2=4.022*V^0.273/H^0.894	6.17	6.42	6.17	6.42	6.17	6.42

SELECTTED K2 FORMULA

Flag	Formula	Flag	Formula	Flag	Formula
1	TURNEY-HARRIS	1	TURNEY-HARRIS	1	TURNEY-HARRIS
15.66	**15.66**	**15.66**	**15.66**	**15.66**	**15.66**

		SUMMER	SPRING	WINTER	
		0	0	0	
CBOD SETTLING RATE (Ks)	**KS**	**0.03**	**0.03**	**0.03**	/DAY
		0	0	0	
NBOD DECAY (Kn)	**KN**	**0.30**	**0.30**	**0.30**	/DAY
		0.095	0.095	0	
SEDIMENT OXYGEN DEMAND	**SOD**	**0.095**	**0.095**	**0.091**	G/FT2/D

VI PROPOSED WASTELOAD ALLOCATIONS (WLA)

	CBOD5 (MG/L)	NH3-N (MG/L)	EFFLUENT D.O. (MG/L)	TEMP (° C)	MINIMUM D.O. 0.00 CFS	MINIMUM D.O. 7Q2 / 1.0 CFS	Reserved Capacity?
SUMMER	10.0	2.0	5.0	32	5.00 MG/L	5.17 MG/L	YES
SPRING	10.0	4.0	6.0	25	6.00 MG/L	6.14 MG/L	YES
WINTER	15.0	12.0	6.0	18	6.00 MG/L	6.28 MG/L	YES

VII MARGIN OF SAFETY AND ALLOCATIONS

WLAs and Multiplier

	CBOD5 (MG/L)	NH3-N (MG/L)	D.O. (MG/L)	Factor
SUMMER	10.0	2.0	5.0	1.94
SPRING	10.0	4.0	6.0	2.00
WINTER	15.0	12.0	6.0	2.74

Margin Of Safety

Required MOS
20.0%

Maximum Wasteload Allocations

	Maximum Wasteload (lbs/day)
	Dissolved Oxygen
SUMMER	2046.6
SPRING	2676.9
WINTER	7856.7

Maximum Assimilative Capacity

	Max Assimilative Capacity (lbs/day)
	Dissolved Oxygen
SUMMER	**2562.59**
SPRING	**3029.55**
WINTER	**8091.76**

Allocations (in Dissolved Oxygen)

SEASON	Load Allocation (lbs/day)	Wasteload Allocation (lbs/day)	Margin Of Safety (20%) (lbs/day)	Reserved Capacity (lbs/day)
SUMMER	516.0	1054.2	512.5	479.9
SPRING	352.6	1341.1	605.9	729.9
WINTER	235.0	2872.3	1618.4	3366.1

Locations of D.O. Sags

	MINIMUM D.O. 0.0 CFS	RIVER MILE	MINIMUM D.O. 1.0 CFS	RIVER MILE
SUMMER	5.00 MG/L	0.00	5.17 MG/L	0.00
SPRING	6.00 MG/L	0.00	6.14 MG/L	0.00
WINTER	6.00 MG/L	0.00	6.28 MG/L	0.00

Print Data Sheet

Print All

INPUT PARAMETERS FOR MODIFIED STREETER-PHELPS MODEL

CITY: **Durant - Max**
PERFORMED BY: Alliance
DATE: 6/1/2025

I DISCHARGE INFORMATION

LOCATION: **Durant** BASIN: **13-10700**
COUNTY: **Bryan**

PROPOSED PERMIT FLOW:

Summer	Spring	Winter	
4.600	**4.600**	**4.600**	MGD

II RECEIVING STREAM

STREAM NAME **Caney Creek**
MODELED LENGTH **5.50** MILES NUMBER OF SEGMENTS **40**

	Summer	Spring	Winter	
UPSTREAM FLOW (7Q2)	**0.00**	**0.00**	**0.00**	CFS
STREAM SLOPE (S)		**8.00**		FT/MILE
SIDE SLOPE (P)		**0.10**		FT/FT
MANNING'S N		**0.06**		
VELOCITY COEFFICIENT (Cv)		3.194		
DEPTH COEFFICIENT (Ch)		0.136		

		Summer		Spring		Winter	
Upstream Flow 7Q2 (cfs)	Velocity (fps)	1.0	0.64	1.0	0.64	1.0	0.64
	Depth (ft)		0.56		0.56		0.56
Upstream Flow 0.0 (cfs)	Velocity (fps)	0.0	0.62	0.0	0.62	0.0	0.62
	Depth (ft)		0.53		0.53		0.53

III WATER QUALITY CRITERIA OF RECEIVING STREAM

AQUATIC COMMUNITY FLAG **2** WARM WATER AQUATIC COMMUNITY
AVERAGE D.O. REQUIREMENT
SUMMER **5.00** MG/L
SPRING **6.00** MG/L
WINTER **5.00** MG/L

IV UPSTREAM CONDITIONS

D.O. SATURATION **85.00** %
UPSTREAM CBOD5 **2.00** MG/L
UPSTREAM NH3-N **0.15** MG/L

V RATE CONSTANTS at 20° C

CBOD DECAY RATE (K1)
0.2*(H/8)^-0.434 (/DAY)

Summer	Spring	Winter
0	0	0
0.40	**0.40**	**0.40**

REAERATION RATES (K2)

	SUMMER		SPRING		WINTER	
	UPSTREAM FLOW		UPSTREAM FLOW		UPSTREAM FLOW	
	1.0 (cfs)	0.0 (cfs)	1.0 (cfs)	0.0 (cfs)	1.0 (cfs)	0.0 (cfs)
1). TURNEY-HARRIS K2=1.33*S^0.32/n^0.64	15.66	15.66	15.66	15.66	15.66	15.66
2). TEXAS K2=4.022*V^0.273/H^0.894	5.98	6.19	5.98	6.19	5.98	6.19

SELECTTED K2 FORMULA

Flag	Formula	Flag	Formula	Flag	Formula
1	TURNEY-HARRIS	1	TURNEY-HARRIS	1	TURNEY-HARRIS
15.66	**15.66**	**15.66**	**15.66**	**15.66**	**15.66**

		SUMMER	SPRING	WINTER	
		0	0	0	
CBOD SETTLING RATE (Ks)	**KS**	**0.03**	**0.03**	**0.05**	/DAY
		0	0	0	
NBOD DECAY (Kn)	**KN**	**0.30**	**0.30**	**0.30**	/DAY
		0.095	0.095	0	
SEDIMENT OXYGEN DEMAND	**SOD**	**0.095**	**0.095**	**0.149**	G/FT2/D

VI PROPOSED WASTELOAD ALLOCATIONS (WLA)

	CBOD5 (MG/L)	NH3-N (MG/L)	EFFLUENT D.O. (MG/L)	TEMP (° C)	MINIMUM D.O. 0.00 CFS	MINIMUM D.O. 7Q2 / 1.0 CFS	Reserved Capacity?
SUMMER	12.0	4.0	5.0	32	5.00 MG/L	5.15 MG/L	YES
SPRING	18.0	4.0	6.0	25	6.00 MG/L	6.12 MG/L	YES
WINTER	25.0	6.0	6.0	18	6.00 MG/L	6.25 MG/L	YES

VII MARGIN OF SAFETY AND ALLOCATIONS

WLAs and Multiplier

	CBOD5 (MG/L)	NH3-N (MG/L)	D.O. (MG/L)	Factor
SUMMER	12.0	4.0	5.0	1.36
SPRING	18.0	4.0	6.0	1.33
WINTER	25.0	6.0	6.0	2.55

Margin Of Safety

Required MOS
20.0%

Maximum Wasteload Allocations

	Maximum Wasteload (lbs/day)
	Dissolved Oxygen
SUMMER	2343.1
SPRING	2994.6
WINTER	8164.1

Maximum Assimilative Capacity

	Max Assimilative Capacity (lbs/day)
	Dissolved Oxygen
SUMMER	2897.56
SPRING	3372.80
WINTER	8557.01

Allocations (in Dissolved Oxygen)

SEASON	Load Allocation (lbs/day)	Wasteload Allocation (lbs/day)	Margin Of Safety (20%) (lbs/day)	Reserved Capacity (lbs/day)
SUMMER	554.5	1718.7	579.5	44.9
SPRING	378.2	2248.1	674.6	71.9
WINTER	392.9	3195.7	1711.4	3256.9

Locations of D.O. Sags

	MINIMUM D.O. 0.0 CFS	RIVER MILE	MINIMUM D.O. 1.0 CFS	RIVER MILE
SUMMER	5.00 MG/L	0.00	5.15 MG/L	0.00
SPRING	6.00 MG/L	0.00	6.12 MG/L	0.00
WINTER	6.00 MG/L	0.00	6.25 MG/L	0.00

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Alliance
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