

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

WATER QUALITY MANAGEMENT PLAN UPDATE

SUMMARY SHEET

Type of Discharge: Municipal___, IndustrialX, Other _____

Facility Name El Dorado Chemical Co.

Receiving Stream Unnamed tributary of Flat Creek

Segment 2D County Union

Permit No. AR 0000752 Update Method _____

Date _____ Flow 1.12 MGD

Critical Limits NH3-N/EFF. D.O. 14/4 June-Oct

Seasonal Limits NH3-N/EFF. D.O. 14/6 Nov-May

Justification Desk Top Model

Already included in WQMP Y/N Y

If Yes, list the information currently in the Plan:

Receiving Stream Same

Limits 0/0 BOD5/NH3-N

Section, Range & Township, or Latitude and Longitude

Existing _____

New Site _____

Water Quality Standards Change by Use Attainability Analysis Y/N N

If yes, list changes _____

DESK TOP MODEL
FOR THE EL DORADO CHEMICAL COMPANY PROCESS WATER
DISCHARGE TO UNNAMED TRIBUTARY OF FLAT CREEK

AUGUST 10, 1989

I. Introduction

A desk top model was performed on an unnamed tributary of Flat Creek, the current receiving stream of the El Dorado Chemical Company process water discharge, in order to determine the ammonia limits that will maintain the dissolved oxygen standard of this stream. The present treatment facility consists of a nitrification-denitrification process, with the water then entering a holding lagoon. The discharge is into the unnamed tributary in the SW 1/4 Section 7, Range 15 West, Township 17 South in Union County. El Dorado Chemical Company is currently operating under NPDES # AR0000752, which is being reviewed for renewal.

The present discharge site is located in planning segment 2D of the Ouachita River basin. The design flow of the present facility is 1.12 MGD (million gallons per day).

The unnamed tributary of Flat Creek, with a drainage area of one mi² at the discharge site, is classified as a Gulf Coastal mid-size watershed fishery as a result of the volume of discharge (exceeding 1 cfs), and as such, has an applicable dissolved oxygen standard of 3 mg/l, with a 1 mg/l diurnal fluctuation being allowed for not more than 8 hours in any 24 hour period, when the stream temperature exceeds 22°C. At stream temperatures of 22°C or less, a 5 mg/l dissolved oxygen standard applies to this stream.

The desk top model, utilizing the steady state Streeter-Phelps equation, was used to determine the effluent limits necessary to protect the dissolved oxygen standard in the receiving stream during both critical and primary season discharge periods.

II. Data Used in the Model

The input parameters used in the model for the El Dorado Chemical Company process water discharge are:

Q7-10 flow = 0 cfs
Stream depth = .75 feet
Stream velocity = .1 feet/second
Critical temperature = 28°C
Seasonal temperature = 22°C*
D.O. saturation = 75%**
*Upper temperature limit for fish spawn
**As determined by ecoregion studies

The reaeration rate, K_a , was calculated using the O'Connor-Dobbins formula:

$$K_a = \frac{12.9 U^{.5}}{1.5 H}$$

where U = velocity, feet/second
 H = stream depth, feet

This resulted in K_a of 6.3/day. The formula used is recommended in Appendix A of Technical Guidance Manual for Performing Wasteload Allocations.

The deoxygenation rate, K_d , used was 0.0/day, based on the absence of BOD in the process water.

The EPA accepted literature value of 0.4/day was used for the ammonia removal rate, K_n .

The benthic demand, B , used in the model was 0.3 gm/m²/day for the 14 mg/l NH₃N projection into the receiving stream.

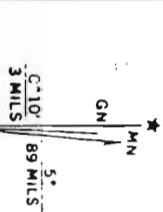
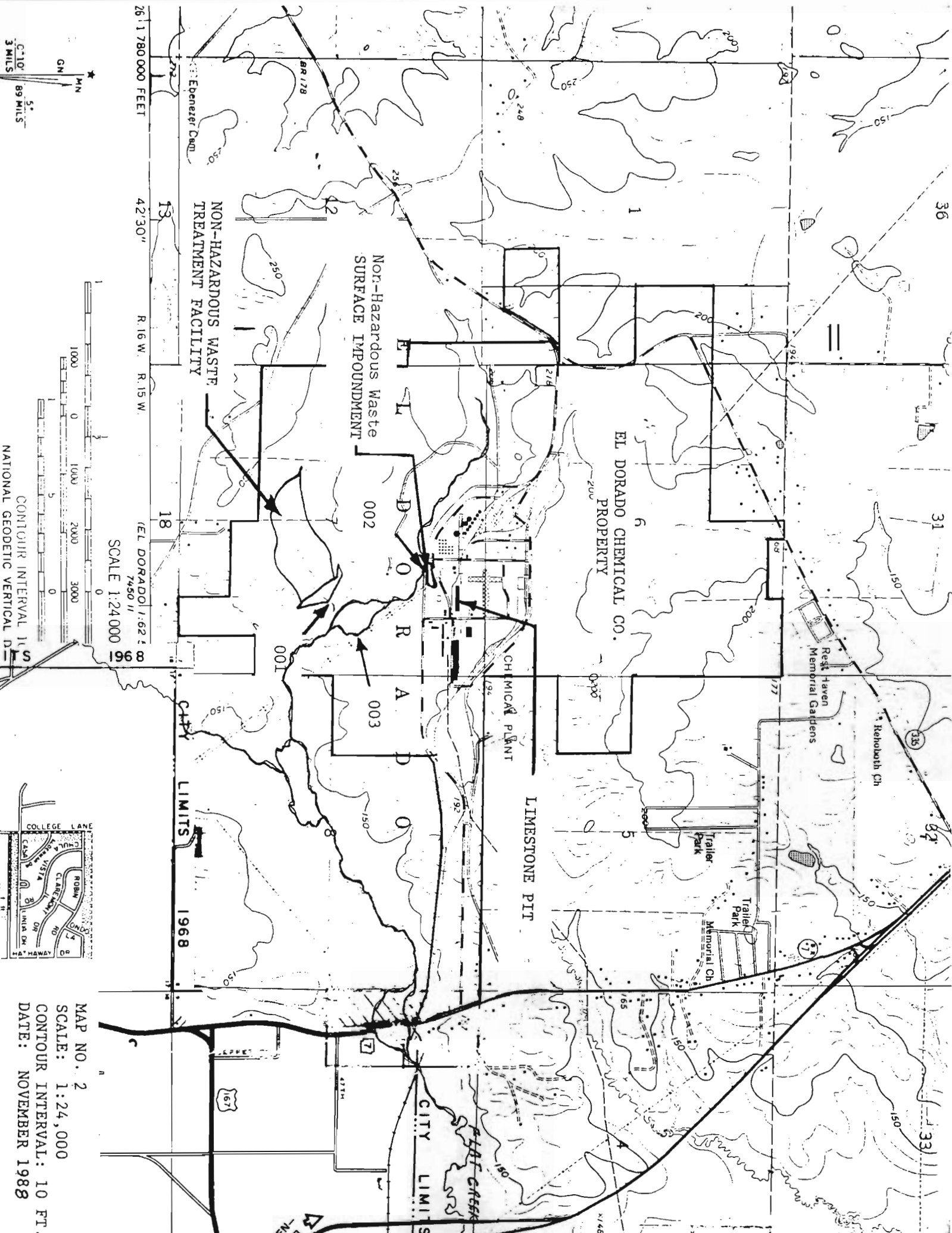
III. Results

The results of the computer runs applicable to the El Dorado Chemical Company process water discharge are tabulated below.

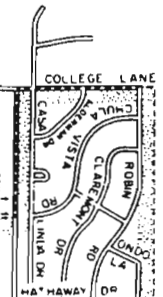
EFFLUENT LIMITS-MONTHS (NH ₃ N/EFF.DO)	Qe MGD	Qs CFS	TEMP. C°	RECEIVING STREAM	D.O. (MG/L)
14/4--JUNE-OCT	1.12	0	28	UN. TRIB.	3.2
14/6--NOV-MAY	1.12	0	22	UN. TRIB.	4.8

IV. Recommendations

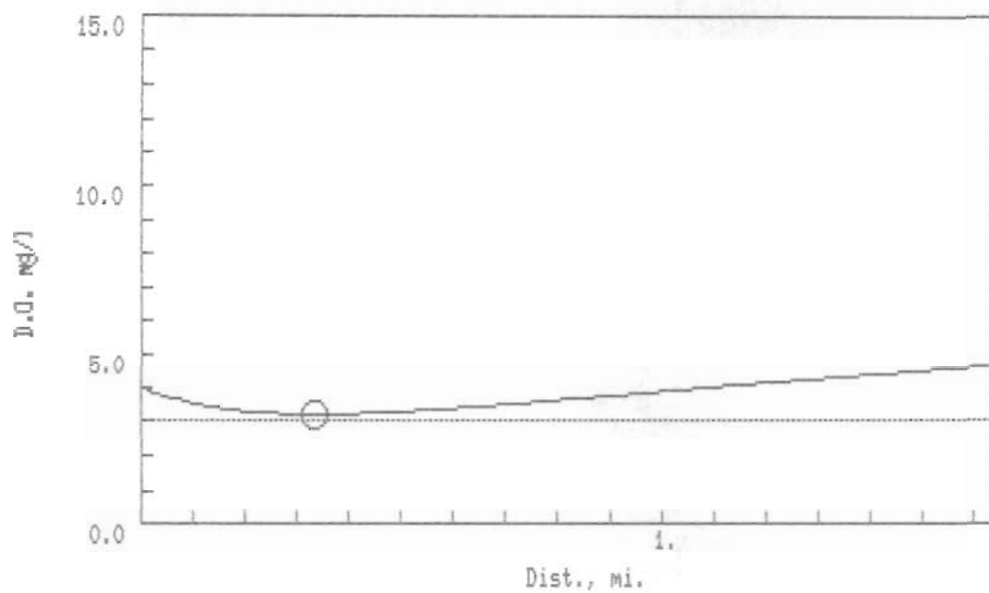
It is our recommendation that the El Dorado Chemical Company process water treatment facility discharge no more than 14 mg/l NH₃N into the unnamed tributary of Flat Creek at any time during the year. An effluent dissolved oxygen of 4 mg/l is required during June through October, and 6 mg/l is required November through May in order to maintain the dissolved oxygen standard of this stream. The model input data and dissolved oxygen sag curves are attached.



C-10' 89 MILS
 5'
 GN
 MN
 3 MILS
 R 16 W R 15 W
 26 1 780 000 FEET
 42'30"
 13 18
 EL DORADO 1:62 4 8 961
 7450 11
 SCALE 1:24 000
 CONTOUR INTERVAL 10 FT.
 NATIONAL GEODETIC VERTICAL DATUM



MAP NO. 2
 SCALE: 1:24,000
 CONTOUR INTERVAL: 10 FT.
 DATE: NOVEMBER 1988



EL DORADO CHEMICAL 14 MG/L NH3N TO UN.TRIB.FLAT CR.
 Date of this run: 08/10/89

Stream Temperature = 28.0 deg C
 Stream flow = 0.00 cfs
 Stream D.O. = 0.0 mg/l
 Stream UOD = 0.0 mg/l
 Stream Velocity = 0.1 fps

Waste Temperature = 28.0 deg C
 Waste flow = 1.20 mgd
 Waste flow = 1.9 cfs
 Waste D.O. = 4.0 mg/l
 Waste BODU = 0.0 mg/l

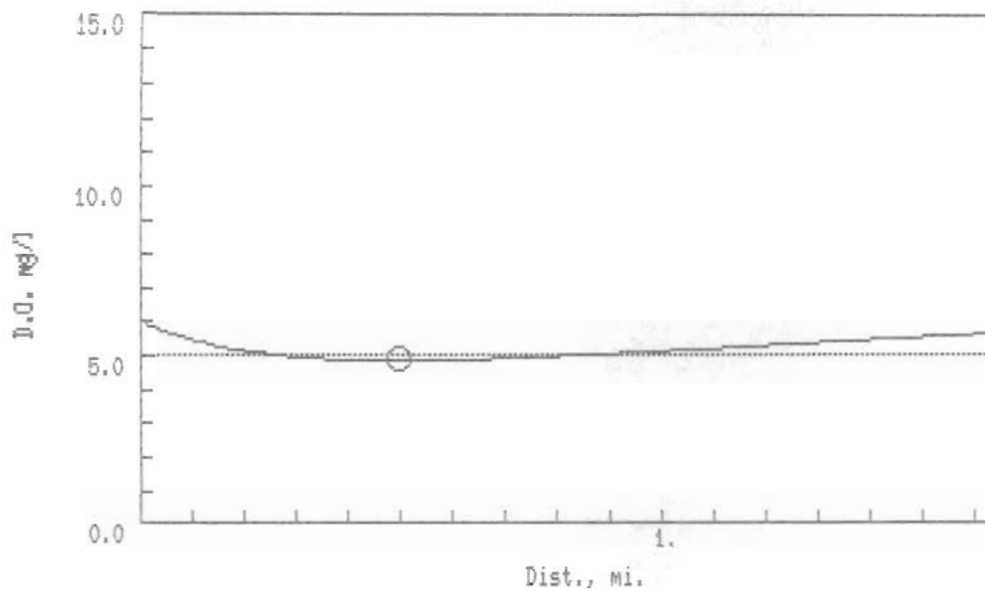
Benthall Demand = 0.3 g/m**2/day
 Mean Depth = 0.8 ft.
 S = 1.3 g/m**3/day
 S corrected = 2.3 g/m**3/day

Ammonia_nitrogen = 14.0 mg/l
 NUOD = 64.0 mg/l
 Total UOD of waste = 64.0 mg/l

Rate constants, per day, (base e)
 Kd = 0.0 Kd corrected = 0.0
 Ka = 6.3 Ka corrected = 7.6
 Kn = 0.4 Kn corrected = 0.6

Temperature of MIX = 28.0 deg C
 UOD of mix = 64.0 mg/l
 D.O. of mix = 4.0 mg/l

D.O. saturation = 7.9 mg/l
 Minimum D.O. = 3.2 mg/l
 Critical distance = 0.3 miles



EL DORADO CHEMICAL 14 MG/L NH₃N TO UN.TRIB.FLAT CR.
 Date of this run: 08/10/89

Stream Temperature = 22.0 deg C
 Stream flow = 0.00 cfs
 Stream D.O. = 0.0 mg/l
 Stream UOD = 0.0 mg/l
 Stream Velocity = 0.1 fps

Waste Temperature = 22.0 deg C
 Waste flow = 1.20 mgd
 Waste flow = 1.9 cfs
 Waste D.O. = 6.0 mg/l
 Waste BODU = 0.0 mg/l

Benthal Demand = 0.3 g/m**2/day
 Mean Depth = 0.8 ft.
 S = 1.3 g/m**3/day
 S corrected = 1.5 g/m**3/day

Ammonia_nitrogen = 14.0 mg/l
 NUOD = 64.0 mg/l
 Total UOD of waste = 64.0 mg/l

Rate constants, per day, (base e)
 Kd = 0.0 Kd corrected = 0.0
 Ka = 6.3 Ka corrected = 6.6
 Kn = 0.4 Kn corrected = 0.4

Temperature of MIX = 22.0 deg C
 UOD of mix = 64.0 mg/l
 D.O. of mix = 6.0 mg/l

D.O. saturation = 8.8 mg/l
 Minimum D.O. = 4.8 mg/l
 Critical distance = 0.5 miles