TOTAL MAXIMUM DAILY LOAD (TMDL) DEVELOPMENT

- CHLORIDES -

for

SOUTH FORK RED RIVER,

SAND LICK FORK,

and

STUMP CAVE BRANCH

(POWELL COUNTY, KENTUCKY)

Natural Resources and Environmental Protection Cabinet

Kentucky Division of Water

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(POWELL COUNTY, KENTUCKY)

KENTUCKY DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

Frankfort, Kentucky

This report has been approved for release:

Jack A. Wilson, Director
Division of Water

Jan 10, 2000
Date

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TMDL FACT SHEET

SOUTH FORK RED RIVER AND SAND LICK FORK

Project Name:	South Fork Red River: Chlorides/TDS/Salinity Sand Lick Fork: Chlorides/TDS/Salinity Stump Cave Branch: Chlorides/TDS/Salinity
Location:	Powell County, Kentucky
Scope/Size:	South Fork Red River: River mile 0.0 to 10.1 Sand Lick Fork: River mile 0.0 to 5.0 Stump Cave Branch: River mile 0.0 to 2.4
TMDL Issues:	Point and Nonpoint Sources
Data Sources:	Kentucky Dept. for Environmental Protection Division of Water (KDEP-DOW), SMC Martin Inc.
Control Measures:	KPDES Regulations, Kentucky Non-point Source TMDL Implementation Plan, Kentucky Watershed Framework
Summary:	The South Fork of the Red River and its major tributary, Sand Lick Fork, were determined as not supporting the designated use of aquatic life. Therefore, the streams were listed on the 303(d) list for Total Maximum Daily Load (TMDL) development. The two stream segments are impacted by chlorides (in conjunction with total dissolved solids [TDS], and salinity), the result of brine discharges to surface streams from oil production activities (stripper wells). While developing the TMDL

report, the decision was made to include a smaller tributary, Stump Cave Branch, also determined as having elevated levels of chlorides. The period of greatest impact is during low-flow conditions.

TMDL Development: Total maximum daily loads in pounds per day (lbs/day) were computed based on the allowable maximum concentration for chlorides (the standard for chronic exposure is 600 milligrams per liter [mg/l] for warm water aquatic habitat) and the estimated 7-day, 10-year low-flow value. The TMDL was done for chlorides because numerical criteria are available for chlorides but not for TDS or salinity. Because these parameters are so closely related to chlorides, the TMDL for chlorides will also account for impairments resulting from TDS and salinity.

Summary of Total Maximum Daily Load Allocations
(in pounds per day)

Source:	South Fork Red River	Sand Lick Fork	Stump Cave Branch
All Sources	1,030	323	128
Background	110	35	14
Waste Load Allocations (WLAs)			
Existing permits	20	0	0
New permits (no offset)	450	144	57
Maximum of (with offset)	720	230	91
Load Allocation (LAs)			
If no offset for WLAs	450	144	57
Minimum of (with offset)	180	58	23

Background loads are based on an in-stream concentration of 65 mg/l for the three streams. After background and permitted discharge loads were subtracted from the Total Maximum Daily Load from all sources, the Remaining Allowable Load (900 lbs/day for South Fork Red River, 288 lbs/day for Sand Lick Fork, and 114 lbs/day for Stump Cave Branch) for each stream will be allocated as follows:

(1) 50% of the Remaining Allowable Load will be made available for future permitted point source discharges (WLAs), 450 lbs/day for South Fork Red River, 144 lbs/day for Sand Lick Fork, and 57 lbs/day for Stump Cave Branch;
(2) 50% of the Remaining Allowable Load will be allocated for nonpoint source discharges (LAs), 450 lbs/day for South Fork Red River, 144 lbs/day for Sand Lick Fork, and 57 lbs/day for Stump Cave Branch.

In addition, if point discharge permit requests should exceed the above criteria (50% of the Remaining Allowable Load), then the KDEP-DOW will allow a permittee to remove an existing nonpoint source (such as an abandoned well, holding pond, or [holding] tank) such that the 50% value of the Remaining Allowable Load allocated for point discharges (WLAs) could be increased (referred to as an offset) based on an estimate in the reduction of the load contributed by the source(s), to the nonpoint source load to the stream (LA). However, the total amount of the Remaining Allowable Load allocated for permitted point source discharges (WLAs) shall not exceed 80% (720 lbs/day for South Fork Red River, 230 lbs/day for Sand Lick Fork,

and 91 lbs/day for Stump Cave Branch). This will allow for a potential nonpoint source (LA) contribution of 180 lbs/day for South Fork Red River, 58 lbs/day for Sand Lick Fork, and 23 lbs/day for Stump Cave Branch and constitutes an explicit margin of safety. The allocations were made in this manner because of the uncertainty of the impact of abandoned ponds and failing separator tanks.

Implementation Controls: Discharge permits were required from oil producers starting in 1987. Many of these permits were not renewed by the producers because production has ceased or has significantly decreased. Production in Kentucky has dropped from 17,700 barrels in 1986 to 9,400 barrels in 1996. Correspondingly, production has decreased in the Sand Lick Fork and South Fork Red River basins. The drop in production is the result of a drop in crude oil prices worldwide, making production less economical, particularly for smaller producers. Chloride levels from nonpoint sources should decrease over time as dilution lowers concentration levels in existing ponds. Preliminary results of a synoptic survey of the two stream reaches made in September 1998 by KDEP-DOW personnel indicate that the levels of chloride, TDS, and salinity have decreased significantly from the 1984 synoptic survey levels. Fish were observed in all stream reaches during the 1998 synoptic survey. If oil production in the basins appreciably increases (which would most likely result from increasing oil prices or an oil supply shortage), permit compliance will be pursued and periodic monitoring of stream water quality including chloride, TDS, and salinity levels will be conducted as deemed appropriate.

CHLORIDES TMDL DEVELOPMENT

South Fork Red River, Sand Lick Fork, and Stump Cave Branch, Powell County, Kentucky

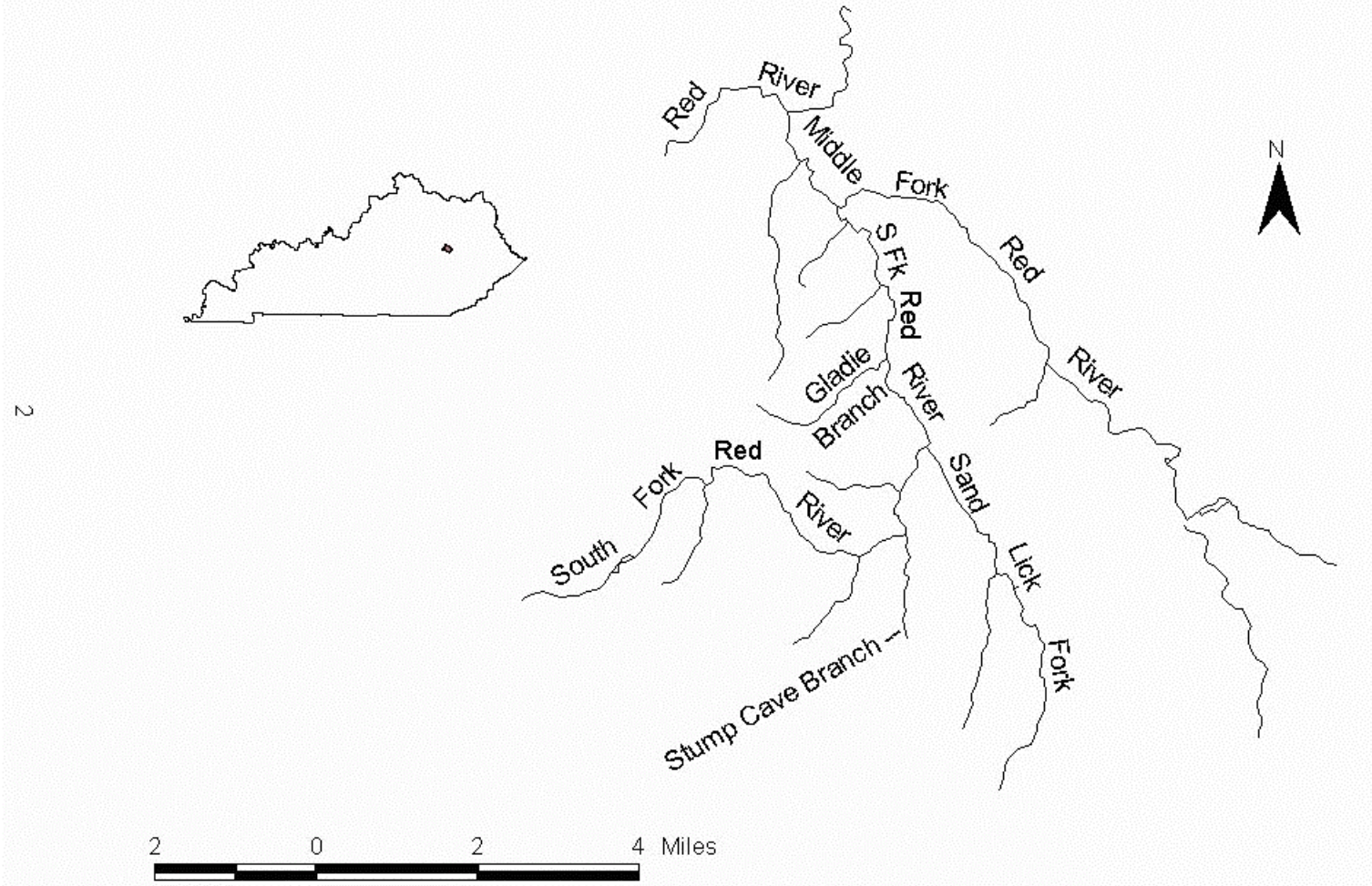
Introduction

Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to develop total maximum daily loads (TMDLs) for water bodies that are not meeting designated uses under technology-based controls for pollution. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a water body based on the relation between pollution sources and in-stream water quality conditions. States can then establish water-quality based controls to reduce pollution from both point and nonpoint sources and restore the quality of their water resources.

Problem Definition

The South Fork of the Red River and its major tributary, Sand Lick Fork (Fig. 1), were determined as not supporting the designated use of aquatic life in the 1986 and subsequent 305(b) reports. Therefore, the streams were listed on the 1990 and subsequent 303(d) lists for Total Maximum Daily Load (TMDL) development. The two stream segments are impacted by chlorides (in conjunction with total dissolved solids [TDS] and salinity) as a result of brine discharges to surface streams from oil production activities (stripper wells). The period of greatest impact is during low-flow (SCM Martin, Inc., 1983; Evaldi and Kipp, 1991). Stump Cave Branch (Fig. 1) has also been identified as having elevated levels of chlorides, and therefore is included in this report.

Figure 1. South Fork Red River Basin, Powell County, Kentucky



2

In the early 1800s, oil was discovered during salt well drilling (SMC Martin Inc., 1983). At that time, oil was considered an unwanted by-product of the process, but in the 1850s, the oil became a desired commodity. Production was high throughout the early 1900s, but yields, and subsequently production, have declined over time. For the past several decades, most wells in Eastern Kentucky have yielded less than about 10 gallons of oil per day. These are termed 'stripper wells.' Almost half of the producers own only one well, and eight out of ten producers own six wells or fewer. Brine is also extracted during the process, and for each barrel of oil, approximately ten barrels of brine are produced (SMC Martin Inc., 1983). The oil and brine are separated, and the brine is stored in a large tank or discharged to a holding pond. Brine is sometimes disposed of by injection into wells and is also used to force oil in the well to the surface. Before 1987, brine was also discharged directly to the surface stream. The discharge of brine to the receiving stream adversely affects aquatic life in the stream.

During runoff events, contaminants such as chlorides will typically move rapidly through the stream system and become diluted. However, during low-flow conditions there may be only a minor contribution to streamflow through groundwater discharge for many streams (SCM Martin, Inc., 1983). Karst topography is present in the area and is often an indicator that at least some flow is usually present in the stream at most times during the year. However, the result is limited dilution of the chlorides that are present in the stream or that are discharged to the stream. In addition, some of the flow that may exist in the stream may be from discharges of the brine solution from the separator tanks (discharges or failing separator tanks) or discharges and possibly seepage from holding ponds. Low flow therefore represents the critical condition when adverse stream impacts due to chlorides exist in the stream.

Target Identification

The endpoint or goal of the TMDL is to achieve a chloride concentration (and associated load in lbs/day) that allows for the sustainability of aquatic life in these stream reaches. The chronic chloride criterion to protect Warm Water Aquatic Habitat Use in Kentucky is 600 mg/l (Title 401, Kentucky Administrative Regulations, Chapter 5:031). This criterion was developed from a study conducted in 1985 by the University of Kentucky (Birge et al, 1985) through the KDEP-DOW. Because the critical period of the effect of chlorides on water quality occurs during low-flow conditions (as previously discussed), the 7-day, 10-year low-flow value ($7Q_{10}$) was selected as the design flow. The $7Q_{10}$ is also used as the permitted flow value.

The $7Q_{10}$ flow was estimated at selected locations throughout the basin and in particular at the mouth of the South Fork Red River, Sand Lick Fork, and Stump Cave Branch. The estimates were based on a combination of: (1) techniques described by Ruhl and Martin (1991); (2) comparison of drainage area to flow at sites in the Red River watershed during low-flow conditions (USGS, 1985 and 1986); and (3) information obtained during the October 1, 1984, synoptic sampling survey of the South Fork Red River and major tributaries (KDEP-DOW, 1990). The $7Q_{10}$ low flows at the mouth of the South Fork Red River, Sand Lick Fork, and Stump Cave Branch were determined to be 0.32, 0.10, and 0.04 cubic feet per second (ft^3/s), respectively. There have been several permits issued to dischargers in the South Fork Red River watershed, but many of these permits are listed as ‘inactive.’ The permitted flow at the only active site in the watershed is for 40 gallons per day, which is much less than 0.01 ft^3/s.

Based on the $7Q_{10}$ flow and chloride concentration of 600 mg/l, the permissible loads of chloride (in lbs/day) at the mouth of the South Fork Red River, at the mouth of Sand Lick Fork, and at

the mouth of Stump Cave Branch are 1,030 lbs/day, 323 lbs/day, and 128 lbs/day, respectively. Allowable chloride concentrations and loads for a number of locations in the South Fork Red River basin (including Sand Lick Fork and Stump Cave Branch) are presented in Table 1. Again, these values are based on the state standard for instream chloride concentration of 600 mg/l and the $7Q_{10}$ low-flow value. The maximum daily chloride load for the main stem of the Red River at Stanton and Clay City has previously been determined as 4,990 lbs/day based on a chloride concentration of 250 mg/l and a $7Q_{10}$ flow of 3.7 ft^3/s. This was established in 1987 when the KDEP-DOW began the oil and gas well permitting program. The lower chloride concentration value of 250 mg/l is the state standard for water supply streams and is assigned to the main stem of the Red River because there are several drinking water intakes located on the Red River below the confluence with the Middle Fork Red River (into which the South Fork Red River flows). The allowable chloride load for Middle Fork Red River below the confluence with the South Fork Red River (based on a chloride concentration of 600 mg/l) is 2,460 lbs/day (Table 1). This value is less than the Red River main stem maximum allowable load of 4,880 lbs/day (which is the adjusted value accounting for background and permitted chloride discharges).

Source Assessment

Chloride was previously discharged directly to the streams, but permit limits based on the criterion developed in 1985 were required after 1987. However, there are a number of abandoned wells, separator tanks, and holding ponds that exist throughout the upper part of the South Fork Red River basin (which includes the Sand Lick Fork and Stump Cave Branch basins). The separator tanks and holding ponds deteriorate over time and are potential contributors of chlorides to the streams. The abandoned wells and holding ponds are also potential sources of chlorides during even small runoff events.

Table 1.

Allowable Concentrations and Loads for the South Fork Red River Basin
Based on the State Water Quality Standards and the 7-Day 10-Year Streamflow.

[mi^2, square miles; $7Q_{10}$, 7-day 10-year low flow; ft^3/s, cubic feet per second; mg/l, milligrams per liter; ppt, parts per thousand; lbs/day, pounds per day; NA, Not Available]

Location	DOW Sample Site	Drainage Area mi^2	$7Q_{10}$ design flow ft^3/s	Chloride Conc. mg/l	TDS Conc. mg/l	Salinity Conc. ppt	Chloride Load lbs/day
Middle Fork Red River above South Fork (control)	42-2	30.0	0.44	600	NA	NA	1,420
Stump Cave Branch	42-8	2.1	0.04	600	NA	NA	128
South Fork Red River above Stump Cave Branch	42-7	7.9	0.12	600	NA	NA	387
South Fork Red River above Sand Lick Fork	42-6	11.2	0.16	600	NA	NA	516
Sand Lick Fork	42-5	6.9	0.10	600	NA	NA	323
South Fork Red River below Sand Lick Fork	42-4	21.5	0.32	600	NA	NA	1,030
South Fork Red River above Middle Fork Red River	42-3	22.0	0.32	600	NA	NA	1,030
Middle Fork Red River below South Fork Red River	42-1	52.0	0.76	600	NA	NA	2,460

Linkage Between Numeric Targets and Sources - Model Development

Data on chloride, total dissolved solids, and salinity have been collected at selected stream locations throughout the three watersheds. These data are included in reports by the KDEP-DOW (1990) and by SCM Martin Inc. (1983). The data indicate that Stump Cave Branch and Sand Lick Fork had the highest concentrations of chlorides and TDS of the stream locations sampled in the South Fork Red River basin (Tables 2 - 4). Table 2 includes data from the October 1, 1984, synoptic survey conducted by KDEP-DOW personnel. Tables 3 and 4 include data from the SCM Martin Inc. synoptic surveys conducted during the spring and fall of 1982. No specific sampling dates were provided in the SCM Martin report (1983); therefore, streamflow values could not be estimated for the sampling locations (from which loads would be computed). Flow conditions in the Red River basin during the October 1, 1984, synoptic survey were at, or slightly below, the $7Q_{10}$ level based on daily streamflow values from gages in the basin (USGS, 1985 and 1986). Therefore, the $7Q_{10}$ design flow estimates were used to compute loads for the samples from the October 1, 1984, synoptic survey (Table 2).

TMDL Development

Total maximum daily loads (TMDLs) are comprised of the sum of individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and natural background levels for a given watershed and a margin of safety (MOS). The sum of these components must not result in the exceedance of water quality standards for that watershed. The TMDL is the total amount of pollutant that can be assimilated by the receiving stream without violating water quality standards. The TMDL document establishes the allowable stream loadings that are less than or equal to the TMDL and thereby provide the basis to establish water-quality based controls.

Table 2.

Concentrations and Loads of Selected Constituents at Selected Sampling Locations in the South Fork Red River Basin for the October 1, 1984, Synoptic Survey by the Kentucky Department for Environmental Protection - Division of Water.

[mi^2, square miles; $7Q_{10}$, 7-day 10-year low flow; ft^3/s, cubic feet per second; mg/l, milligrams per liter; ppt, parts per thousand; lbs/day, pounds per day]

Location	DOW Sample Site	Drainage Area mi^2	$7Q_{10}$ design flow* ft^3/s	Chloride Conc. mg/l	TDS Conc. mg/l	Salinity Conc. ppt	Chloride Load lbs/day
Middle Fork Red River above South Fork (control)	42-2	30.0	0.44	58	212	0	137
Stump Cave Branch	42-8	2.1	0.04	10,400	17,700	13.5	2,240
South Fork Red River above Stump Cave Branch	42-7	7.9	0.12	1,240	2,890	2	801
South Fork Red River above Sand Lick Fork	42-6	11.2	0.16	3,180	7,570	5	2,740
Sand Lick Fork	42-5	6.9	0.10	6,480	15,500	13	3,490
South Fork Red River below Sand Lick Fork	42-4	21.5	0.32	4,850	11,700	9	8,370
South Fork Red River above Middle Fork Red River	42-3	22.0	0.32	2,960	7,220	6	5,110
Middle Fork Red River below South Fork Red River	42-1	52.0	0.76	1,580	3,900	4	6,480

* The $7Q_{10}$ design flow was used with the data from the 10/01/84 survey.

Table 3.

Concentrations of Selected Constituents at Selected Sampling Locations in the South Fork Red River Basin for the April and May 1982 Synoptic Survey by SCM Martin, Incorporated

[mi^2., square miles; mg/l, milligrams per liter; ppt, parts per thousand; NA, Not Available]

Location	SCM Martin Sampling Site	DOW Sampling Site	Drainage Area mi^2	Flow during survey	Chloride Conc. mg/l	TDS Conc. mg/l	Salinity Conc. ppt
Middle Fork Red River above South Fork (control)	RD-15	42-2	30.0	NA	65	202	NA
Gladie Branch (control)	RD-05	NA	NA	NA	7.6	134	NA
South Fork Red River (headwaters)	RD-08	NA	NA	NA	227	538	NA
Stump Cave Branch	RD-11	42-8	2.1	NA	620	1,470	NA
South Fork Red River above Stump Cave Branch	RD-12	42-7	7.9	NA	260	610	NA
South Fork Red River above Sand Lick Creek	RD-09	42-6	11.2	NA	180	438	NA
Sand Lick Fork	RD-10	42-5	6.9	NA	760	1,730	NA
South Fork Red River below Sand Lick Creek	RD-06	42-4	21.5	NA	370	864	NA
South Fork Red River above Middle Fork Red River	RD-04	42-3	22.0	NA	300	706	NA
Middle Fork Red River below South Fork Red River	NA	42-1	52.0	NA	NA	NA	NA

Table 4.

Concentrations of Selected Constituents at Selected Sampling Locations in the South Fork Red River Basin for the October 1982 Synoptic Survey by SCM Martin, Incorporated.

[mi^2., square miles; mg/l, milligrams per liter; ppt, parts per thousand; NA, Not Available]

Location	SCM Martin Sampling Site	DOW Sampling Site	Drainage Area mi^2	Flow during survey	Chloride Conc. mg/l	TDS Conc. mg/l	Salinity Conc. ppt
Middle Fork Red River above South Fork (control)	RD-15	42-2	30.0	NA	65	258	NA
Gladie Branch (control)	RD-05	NA	NA	NA	13	208	NA
South Fork Red River (headwaters)	RD-08	NA	NA	NA	2,650	4,800	NA
Stump Cave Branch	RD-11	42-8	2.1	NA	4,200	7,490	NA
South Fork Red River above Stump Cave Branch	RD-12	42-7	7.9	NA	700	1,640	NA
South Fork Red River above Sand Lick Creek	RD-09	42-6	11.2	NA	950	1,970	NA
Sand Lick Fork	RD-10	42-5	6.9	NA	1,000	1,970	NA
South Fork Red River below Sand Lick Creek	RD-06	42-4	21.5	NA	780	1,700	NA
South Fork Red River above Middle Fork Red River	RD-04	42-3	22.0	NA	680	1,560	NA
Middle Fork Red River below South Fork Red River	NA	42-1	52.0	NA	NA	NA	NA

For the South Fork Red River reach, the total allowable chloride load is 1,030 lbs/day. The currently active permitted dischargers can account for a chloride load of 20 lbs/day. These are direct point source discharges of brine to the stream (WLAs). This allows for a maximum remaining chloride load of 1,010 lbs/day for future permitted discharges (WLAs), and contributions from nonpoint sources and from natural background (LAs). Chloride concentrations at the control site (indicative of background conditions), Tables 2 - 4, were about 65 mg/l (110 lbs/day). This allows for future permitting and nonpoint contributions (most likely from failing separator tanks or holding ponds, or seepage from holding ponds) up to a maximum of about 900 lbs/day.

To accommodate future permittees for the South Fork Red River reach, 50% of this maximum load (450 lbs/day) will be allocated for point discharge permits. The remaining 50% of this maximum load (450 lbs/day) will be set aside as a factor of safety (implicit) to account for the unknown nonpoint sources (failing separator tanks or holding ponds, abandoned wells, seepage from holding ponds, or other sources). Permit applications exceeding 50% of the allowable total maximum daily load of 450 lbs/day would be approved by the KDEP-DOW provided that the applicant removed an equivalent amount from nonpoint sources in the watershed, such as separator tanks or abandoned holding ponds. At no time would permits be approved beyond 80% of the allowable TMDL of 900 lbs/day (720 lbs/day). This would provide at least a 20% margin of safety (explicit) to account for uncontrollable or unidentified nonpoint sources.

For the Sand Lick Fork reach, the total allowable chloride load is 323 lbs/day. The current active permitted discharges can account for no chloride loading. Therefore, currently there are no permitted direct discharges for Sand Lick Fork (WLAs). This allows for a maximum remaining chloride load of 323 lbs/day for future permitted discharges (WLAs) and contributions from nonpoint sources and from natural background (LAs). Chloride concentrations at the control site (indicative of background conditions) were about 65 mg/l (35 lbs/day). This allows for future permitting and nonpoint source contributions (most likely from failing separator tanks or holding ponds, or seepage from holding ponds) up to a maximum of about 288 lbs/day.

To accommodate future permittees for the Sand Lick Fork reach, 50% of this maximum load (144 lbs/day) will be allocated for point discharge permits. The remaining 50% of this maximum load (144 lbs/day) will be set aside as a factor of safety (implicit) to account for the unknown nonpoint sources (failing separator tanks or holding ponds, abandoned wells, seepage from holding ponds, or other sources). Permit applications exceeding 50% of the allowable total maximum daily load of 144 lbs/day would be approved by the KDEP-DOW provided that the applicant removed an equivalent amount (load) from nonpoint sources in the watershed, such as separator tanks or abandoned holding ponds. At no time would permits be approved beyond 80% of the allowable TMDL of 288 lbs/day (230 lbs/day). This would provide at least a 20% margin of safety (explicit) to account for uncontrollable or unidentified nonpoint sources.

For the Stump Cave Branch reach, the total allowable chloride load is 128 lbs/day. The current active permitted discharges can account for no chloride loading. Therefore, currently there are no permitted direct discharges for Stump Cave Branch (WLAs). This allows for a maximum remaining chloride load of 128 lbs/day for

future permitted discharges (WLAs) and contributions from nonpoint sources and from natural background (LAs). Chloride concentrations at the control site (indicative of background conditions) were about 65 mg/l (14 lbs/day). This allows for future permitting and nonpoint source contributions (most likely from failing separator tanks or holding ponds, or seepage from holding ponds) up to a maximum of about 114 lbs/day.

To accommodate future permittees for the Stump Cave Branch, 50% of this maximum load (57 lbs/day) will be allocated for point discharge permits. The remaining 50% of this maximum load (57 lbs/day) will be set aside as a factor of safety to account for the unknown nonpoint sources (failing separator tanks or holding ponds, abandoned wells, seepage from holding ponds, or other sources). Permit applications exceeding 50% of the allowable total maximum load of 57 lbs/day would be approved by the KDEP-DOW provided that the applicant removed an equivalent amount (load) from nonpoint sources in the watershed, such as separator tanks or abandoned holding ponds. At no time would permits be approved beyond 80% of the allowable TMDL of 114 lbs/day (91 lbs/day). This would provide at least a 20% margin of safety (explicit) to account for uncontrollable or unidentified nonpoint sources.

Currently, there is little oil production taking place within the watershed because the price of oil is very low (less than $15 per barrel). Production in Kentucky dropped from 17,700 barrels in 1986 to 9,400 barrels in 1996 (Environmental Quality Commission, 1997). As a result, direct discharges are small, and chloride loads from the failing separator tanks and holding ponds should decrease over time as the separator tanks empty and as dilution occurs in the holding ponds. Sampling conducted in the summer of 1998 indicated that water quality conditions in the streams throughout the South Fork Red River had improved significantly

from that observed October 1, 1984. For example, during the October 1, 1984, synoptic survey, no fish were observed in Stump Cave Branch. However, during the 1998 synoptic survey, a healthy fish population was observed. Also, preliminary concentration values of chloride and TDS were much lower than those observed on October 1, 1984. This improvement, however, may be more a function of limited oil production in the basin (because of low oil prices) than of permitting actions. If oil production in the basins appreciably increases (which would most likely result from increasing oil prices or an oil supply shortage), permit compliance would be pursued and periodic monitoring of stream water quality, including chloride, TDS, and salinity levels, will be conducted as deemed appropriate.

References

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INDEX OF TMDL SUBMITTAL DOCUMENTATION

303(d) LIST INFORMATION

State	Kentucky
Name of 303(d) listed waterbody	South Fork Red River (Powell County)
Segment as identified from 303(d) list	River Mile 0.0 to 10.1
City/County	Powell County
Watershed(s)/8-digit cataloging unit code	05100204
3-digit EPA reach file number	035
Length (mi) or area (acres) of impairment	10.1 miles
Water quality standards being violated	Chlorides Concentration > 600 mg/l
Water use classification	Aquatic Life (Warm Water Aquatic Habitat)
Pollutant of concern	Chlorides from oil brines
Location description of waterbody	50 miles southeast of Lexington, KY
Sources(s) of impairment	Oil production activities

PUBLIC NOTIFICATION INFORMATION

Form of public notification	Press release and letters to a mailing list to request comments on the draft report. Report was available on the Internet.
Beginning/ending dates of public notice	April 16, 1999/May 17, 1999
Notice mentioned TMDL proposal	✓ yes _____ no
Comments received from public	None received
Responsiveness summary prepared	Not applicable

INDEX OF TMDL SUBMITTAL DOCUMENTATION (cont.)

TMDL INFORMATION

Critical Conditions		___ high flow _X_ low flow ___other_____
Seasonality		_X_Annual ___Summer/Winter ___Monthly
TMDL development tool(s)		_____Water quality model(s) _____ Mass balance equations __X__ Other Intensive Synoptic Survey
Supporting Models/Documents		Kentucky Department for Environmental Protection, Technical Report No.26 Birge, W. J., Report on Chlorides and Warmwater Species Protection SCM Martin Inc., Report on Eastern KY Stripper Wells
TOTAL MAXIMUM DAILY LOADS (Notes, such as: TMDL's for intermediate flows can be interpolated between those given). Can be in table format if necessary, but this may require only a single value. In that case, continue on with the previous format.		1,030 lbs/day for South Fork Red River at river mile 0.0 based on an allowable chloride concentration of 600 mg/l and a 7-day 10-year low flow value of 0.32 cubic feet per second.
Loadings	Wasteload Allocation (Point Sources)	450 lbs/day to a maximum (offset) of 720 lbs/day - excludes 20 lbs/day currently permitted
	Load Allocation (Nonpoint Sources)	450 lbs/day to a minimum (offset) of 180 lbs/day - excludes background load of 110 lbs/day
	Margin of Safety X Explicit	180 lbs/day (if maximum allowable load is permitted)
	X Implicit	Allowable chloride conc. based on findings by Birge (conservative assumptions used)

INDEX OF TMDL SUBMITTAL DOCUMENTATION

303(d) LIST INFORMATION

State	Kentucky
Name of 303(d) listed waterbody	Sand Lick Fork (Powell County)
Segment as identified from 303(d) list	River Mile 0.0 to 5.0
City/County	Powell County
Watershed(s)/8-digit cataloging unit code	05100204
3-digit EPA reach file number	075
Length (mi) or area (acres) of impairment	5.0 miles
Water quality standards being violated	Chlorides Concentration > 600 mg/l
Water use classification	Aquatic Life (Warm Water Aquatic Habitat)
Pollutant of concern	Chlorides from oil brines
Location description of waterbody	50 miles southeast of Lexington, KY
Sources(s) of impairment	Oil production activities

PUBLIC NOTIFICATION INFORMATION

Form of public notification	Press release and letters to a mailing list to request comments on the draft report. Report was available on the Internet.
Beginning/ending dates of public notice	April 16, 1999/May 17, 1999
Notice mentioned TMDL proposal	✓ yes ____ no
Comments received from public	None received
Responsiveness summary prepared	Not applicable

INDEX OF TMDL SUBMITTAL DOCUMENTATION (cont.)

TMDL INFORMATION

Critical Conditions		___ high flow _X_ low flow ___other_____
Seasonality		_X_Annual ___Summer/Winter ___Monthly
TMDL development tool(s)		_____Water quality model(s) _____ Mass balance equations __X__ Other Intensive Synoptic Survey
Supporting Models/Documents		Kentucky Department for Environmental Protection, Technical Report No.26 Birge, W. J., Report on Chlorides and Warmwater Species Protection SCM Martin Inc., Report on Eastern KY Stripper Wells
TOTAL MAXIMUM DAILY LOADS (Notes, such as: TMDL's for intermediate flows can be interpolated between those given). Can be in table format if necessary, but this may require only a single value. In that case, continue on with the previous format.		323 lbs/day for Sand Lick Fork at river mile 0.0 based on an allowable chloride concentration of 600 mg/l and a 7-day 10-year low flow value of 0.10 cubic feet per second.
Loadings	Wasteload Allocation (Point Sources)	144 lbs/day to a maximum (offset) of 230 lbs/day - no current permits for this watershed
	Load Allocation (Nonpoint Sources)	144 lbs/day to a minimum (offset) of 58 lbs/day - excludes background load of 35 lbs/day
	Margin of Safety _X_ Explicit	58 lbs/day (if maximum allowable load is permitted)
	_X_ Implicit	Allowable chloride conc. based on findings by Birge (conservative assumptions used)

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303(d) LIST INFORMATION

State	Kentucky
Name of 303(d) listed waterbody	Stump Cave Branch (Powell County)
Segment as identified from 303(d) list	River Mile 0.0 to 2.4
City/County	Powell County
Watershed(s)/8-digit cataloging unit code	05100204
3-digit EPA reach file number	135
Length (mi) or area (acres) of impairment	2.4 miles
Water quality standards being violated	Chlorides Concentration > 600 mg/l
Water use classification	Aquatic Life (Warm Water Aquatic Habitat)
Pollutant of concern	Chlorides from oil brines
Location description of waterbody	50 miles southeast of Lexington, KY
Sources(s) of impairment	Oil production activities

PUBLIC NOTIFICATION INFORMATION

Form of public notification	Press release and letters to a mailing list to request comments on the draft report. Report was available on the Internet.
Beginning/ending dates of public notice	April 16, 1999/May 17, 1999
Notice mentioned TMDL proposal	✓ yes ____ no
Comments received from public	None received
Responsiveness summary prepared	Not applicable

INDEX OF TMDL SUBMITTAL DOCUMENTATION (cont.)

TMDL INFORMATION

Critical Conditions		___ high flow _X_ low flow ___other_____
Seasonality		_X_Annual ___Summer/Winter ___Monthly
TMDL development tool(s)		_____Water quality model(s) _____ Mass balance equations __X__ Other Intensive Synoptic Survey
Supporting Models/Documents		Kentucky Department for Environmental Protection, Technical Report No.26 Birge, W. J., Report on Chlorides and Warmwater Species Protection SCM Martin Inc., Report on Eastern KY Stripper Wells
TOTAL MAXIMUM DAILY LOADS (Notes, such as: TMDL's for intermediate flows can be interpolated between those given). Can be in table format if necessary, but this may require only a single value. In that case, continue on with the previous format.		128 lbs/day for Stump Cave Branch at river mile 0.0 based on an allowable chloride concentration of 600 mg/l and a 7-day 10-year low flow value of 0.04 cubic feet per second.
Loadings	Wasteload Allocation (Point Sources)	57 lbs/day to a maximum (offset) of 91 lbs/day - no current permits for this watershed
	Load Allocation (Nonpoint Sources)	57 lbs/day to a minimum (offset) of 23 lbs/day - excludes background load of 14 lbs/day
	Margin of Safety _X_ Explicit	23 lbs/day (if maximum allowable load is permitted)
	_X_ Implicit	Allowable chloride conc. based on findings by Birge (conservative assumptions used)