United States
Department of
Agriculture

Soil
Conservation
Service

760 S. Broadway
Salina, Kansas
67401

127 7L92.0/045

102RM-0072

March 18, 1985

Ms. Alice Fuerst
Super Fund Department
Environmental Protection Agency
324 East 11th Street
Kansas City, Missouri 64106

Dear Ms. Fuerst:

Enclosed are some unpublished data on heavy metals in Cherokee County, Kansas. These sites were sampled in 1981 and 1982.

I am also enclosing a copy of "Notes and Summary of Heavy Metals in Cherokee County, Kansas," by Edward Fleming. This is a brief write up relating to the sampling in 1981 and 1982. It contains some of the same data as the other enclosures.

If you have any questions, please contact William E. Roth, our state soil scientist. His phone number is 913-823-4558.

Sincerely,

Richard G. Jones

Richard G. Jones
State Resource Conservationist

Enclosures

S00022764
SUPERFUND RECORDS

United States Department of Agriculture
Soil Conservation Service
Box 600
Salina, Kansas
67401

Subject: SOILS - Heavy Metals Study - Cherokee County, Kansas

Date: December 14, 1981

File Code: 430-13

To: Dr. R. L. Chaney, Resource Agronomist, USDA Biological Water Management & Research Lab, Beltsville, Maryland 20705

I am attaching the data for the six samples we collected this year. The laboratory number is shown on the sheet with the locations.

Sample #4 (2373) was collected near the smelter location site (3000 feet northeast) that was sampled in our previous study ten years ago. I have penciled in that data below our recent data. It appears that there has been a decrease of contaminants but this sample is to a depth of 7 inches rather than the 2 inch depth of the previous sample. If we average the old data to a depth of 7 inches, we do not show any increase in contaminants except lead if we assume that the last inch has one half the concentration of the 4 to 6 inch sample.

Since all these samples have contaminates above the tolerable levels, we plan to widen our area of sampling. We will inform you of our plans when they are completed. Please let us know if you have any suggestions for this sampling.

The grass samples you requested by telephone have been mailed to you from Ed Fleming at Altamont.

If you have any questions or suggestions, please contact Gene Mayhugh or myself.

William E. Roth
State Soil Scientist

Attachments

cc: (w/attachments)
Ed Fleming, SCS, Altamont
Dr. Orville W. Bidwell, KSU, Manhattan
Harold Dickey, SCS, Lawrence
Jerry Welch, Kansas Geologic Survey, Lawrence

Notes and Summary of Heavy Metals Study in Cherokee County, Kansas

By Edward L. Fleming, Soil Scientist

1983

Introduction

The lead and zink mining and milling occurs along the north west side of the Ozark Uplift and occupies about 1188 sq. miles, 800,000 Ac. (1) In Kansas the ~~mining activity occured in Cherokee county~~ within an area of about 80 sq. miles. Extensive mining ~~be~~ begin in the region about 1850 and in Kansas about 1870 and ceased about 1960.

The lead ore was seperated from the rock by crushing then washing (the specific gravity of the two is different). This wash ended up back in streams carrying with it some heavy metals (cadmium, copper, lead, zink). When lead was smelted by heat the by-product produced within the stack was "lead fume or lead arsenic". Much of it escaped into the air and was deposited down wind. Some of this accumulated on the inter-wall of the stack. When it was removed it was thrown into streams or deposited near the site. Later the product was used in paint. The fume coming out of the stack also was high in zink and sulfate. These small historic smelters were scattered through out the area.

In Kansas the production of zink started about 1870. The smelting of zink required much heat; therefore around 1900 zinc ore was transported north and west to the coal and gas fields near Pittsburg, Weir, Cherryvale, Neodesha, Chanute, and Iola, all 50 to 100 miles away. Later gas was piped to the region. As methods of transportation improved, smelting of ore became more centralized. A large plant was built near Galena about 1890 (plant area covers about 60 acres).

Methods and Results

In August 1971 soil and vegetative samples were collected in an area extending 5000 feet in all directions from the plant at Galena (about 600 feet east and 1500 feet south of the north west corner of section 13-T34S-R25E). (2) Thirty soil samples were taken to a depth of six inches, 14 samples of grass or other vegetation, and two samples of legumes. Sample points were measured from center of plant area. Only vegetation remaining 3/4 mile of plant area were few blackjack oaks (Quercus marilandica) and scattered clumps of switchgrass (Panicum virgatum). Only legumes within one mile was a few sprigs of lespedeza and a wild legume. Soils sampled were within the following series, Clarksville (somewhat excessively drained), Gerald (somewhat poorly drained), and Nixa (moderately well drained). Mean annual precepitation is about 45 inches.

The conclusion prevails that a serious contamination exists along the northeast-southwest transect, in accord with prevailing southwesterly winds in the summer, and northeasterly winds in the winter. Note figure one. The contamination becomes clear from the following select soil samples and grass samples.

In 1981 soil samples were collected on flood plain of Short Creek which drains area surrounding the Galena smelter site. Also down wind from a small historic smelter and down wind from chat piles.

Soil sample (S81KS-021-1-1*) collected in the upper 8 inches of a Lanton series about 2½ miles down stream from Galena plant contained the following, - Zn 3100 ppm, Cu 55 ppm, Pb 800 ppm, Cd 22 ppm.

Soil sample (S81KS-021-2-1*) collected in upper 8 inches of a Taloka series about one mile down wind from historic plant and present chat piles contained the following - Zn 550 ppm, Cu 7 ppm, Pb 55 ppm, Cd 4 ppm.

Material sampled in winnowed area within area of chat piles and dumps (S81KS-021-3-1*) and upper 6 inches of Taloka series (S81KS-021-5-1 and 6-1*) downwind one half mile and one mile respectively contained the following:

Sample No.	Zn	Cu	Pb	Cd
	ppm			
3-1	16000	30	1000	81
5-1	300	9	95	1.8
6-1	120	7	22	0.6

Note USDA-SCS Salina, Ks. letter dated 12-14-81 file code 430-13 SOILS - Heavy Metals Study-Cherokee County, KS.

Reference Material

(1) "Wilderness Bonanza" The Tri-State District of Missouri, Kansas and Oklahoma by Arrell M. Gibson, University of Oklahoma Press: Norman.

(2) Lagerwerff, J. V., D. L. Brower and G. T. Biersdorf. 1973 Accumulation of cadmium, copper, lead and zinc in soil and vegetation in the proximity of a smelter: In: Trace Substances in Environmental Health-VI, Delbert D. Hemphill, Ed., University of Missouri, Columbia pp 71 - 78.

(3) Lagerwerff, J. V. and D. L. Brower. 1975. Effect of a smelter on the agricultural conditions in the surrounding environment. In: Trace Substances in Environmental Health-VIII, D. D. Hemphill, Ed., University of Missouri, Columbia, pp. 203-212.

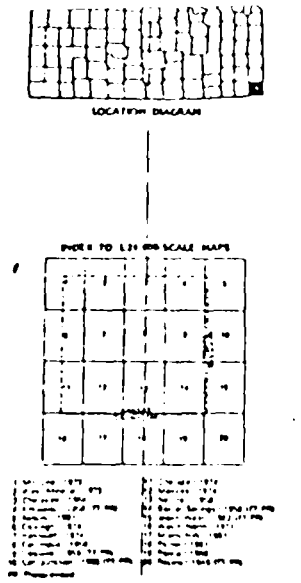
(4) Lagerwerff, J. V. and D. L. Bower. L975 Source Determination of Heavy Metal Contaminants in the Soil of a Mine and Smelter Area. In: Trace Substances in Environmental Health-IX, D. D. Hemphill Ed., University of Missouri, Columbia, pp 207-215.

(5) Letter from John Lagerwerff, Soil Scientist, to F. Van Schilfgaarde, Director, October 1, 1971. Agricultural Research Service, Beltsville, Mi

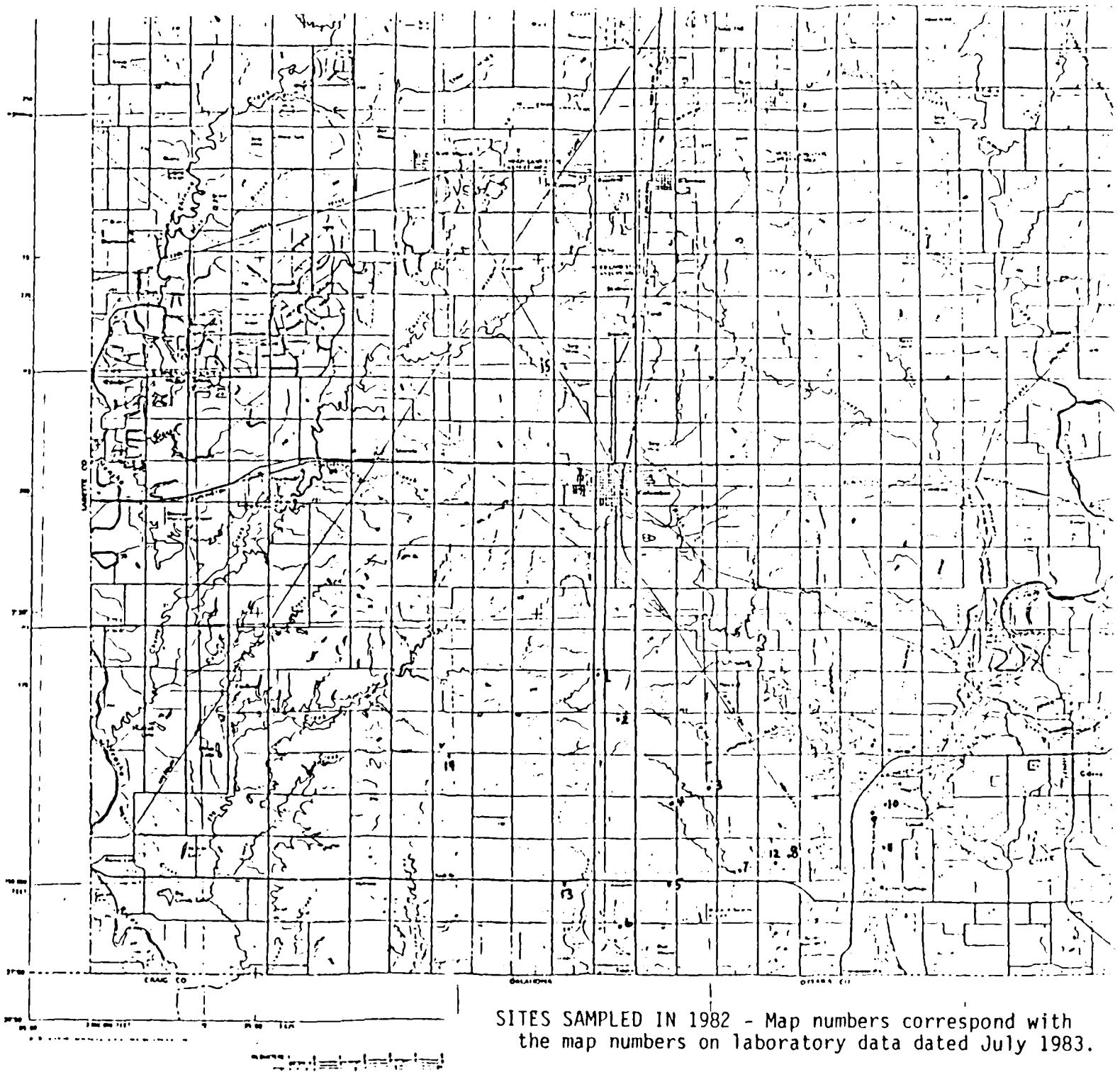
USDA - SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA
JULY 1983

Trace Metal Content of U.S. Soils
(HNO_3 Extract)

	CD	PB	ZN	CU
Mean (ppm)	0.27	21	57	29
Median	0.20	11	54	18
Mode	0.17	9	1.5	17
Std. Dev.	0.26	142	39	39
C. V.	97	670	69	137



Topographic Map Symbols



SITES SAMPLED IN 1982 - Map numbers correspond with the map numbers on laboratory data dated July 1983.

USDA - SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA
JULY 1983

KANSAS SHELTER SOILS

MAP No.	SITE NO.	HZ	DEPTH cm	NSSL No.	ZINC ug/g	COPPER ug/g	LEAD ug/g	CADMIUM ug/g
1	S 82 KS-021-6-1	Ap	5-12	3823	35	4.5	14	2.8
1	S 82 KS-021-6-2	E	23-28	3824	28	7.4	12	.12
1	S 82 KS-021-6-3	Btg1	38-43	3825	78	23	16	.29
1	S 82 KS-021-6-4	Btg2	58-65	3826	66	17	13	.23
2	S 82 KS-021-7-1	Ap	7.5-13	3827	40	5.4	15	.23
2	S 82 KS-021-7-2	E	20-25	3828	25	7.5	15	.09
3	S 82 KS-021-8-1	Ap	7.5-15	3829	85	9.4	20	.49
3	S 82 KS-021-8-2	E	23-28	3830	19	8.0	10	.10
4	S 82 KS-021-9-1	Ap	7.5-13	3831	59	7.1	17	.36
4	S 82 KS-021-9-2	E	23-28	3832	19	8.4	18	.10
4	S 82 KS-021-9-3	Bt1	38-45	3833	61	28	15	.24
4	S 82 KS-021-9-4	Bt2	58-65	3834	55	23	16	2.3
5	S 82 KS-021-10-1	A1	2.5-7.5	3835	300	11	50	1.6
5	S 82 KS-021-10-2	A2	10-15	3836	150	8.6	29	.68
6	S 82 KS-021-11-1	Ap	7.5-15	3837	160	4.3	25	.93
6	S 82 KS-021-11-2	E	20-25	3838	64	5.7	12	.28
6	S 82 KS-021-11-3	Bt1	45-50	3839	55	22	16	.17
6	S 82 KS-021-11-4	Bt2	60-65	3840	46	16	16	.35
7	S 82 KS-021-12-1	A	7.5-13	3841	2800	36	720	25
7	S 82 KS-021-12-2	E	23-28	3842	4000	57	210	43
8	S 82 KS-021-13-1	Ap	7.5-12	3843	72	12	74	.35
8	S 82 KS-021-13-2	E	18-23	3844	36	11	15	.10
9	S 82 KS-021-14-1	Ap	7.5-15	3845	2300	39	170	19
9	S 82 KS-021-14-2	A1	18-25	3846	2400	28	220	17
10	S 82 KS-021-15-1	Ap	10-15	3847	780	17	63	4.9
10	S 82 KS-021-15-2	A1	22-28	3848	500	12	37	2.8
11	S 82 KS-021-16-1	Ap	0-18	3849	470	11	49	2.5
11	S 82 KS-021-16-2	A1	20-28	3850	260	10	31	1.0
12	S 82 KS-021-17-1	Ap	0-18	3851	76	7.7	20	.53
12	S 82 KS-021-17-2	E	18-30	3852	22	5.8	8	.09
13	S 82 KS-021-18-1	Ap	0-18	3853	76	5.4	23	.40
13	S 82 KS-021-18-2	E	25-30	3854	13	5.5	13	.08
13	S 82 KS-021-18-3	Bt1	45-50	3855	64	18	16	.39
14	S 82 KS-021-19-1	Ap	0-18	3856	25	4.9	10	.21
14	S 82 KS-021-19-2	E	25-35	3857	14	6.4	11	.11
15	S 82 KS-021-20-1	Ap	0-14	3858	31	18	12	.20
15	S 82 KS-021-20-2	E	20-25	3859	27	11	11	.22
15	S 82 KS-021-20-3	Bt1	35-40	3860	61	30	18	.65

Hepler series, grass and tress down stream from chat pile on flood-plain - 2000 feet W and 1500 feet N. of the ~~N~~E corner of Sec. 33 - T34S - R24E. (Map code 7)

3841 S 82 KS-021-12-1 ..... A 7.5 to 13 cm
3842 S 82 KS-021-12-2* ..... E 23 to 28 cm

Hepler series, cultivated down stream from chat pile on flood plain - 2300 feet S and 1300 feet W. of the NE corner of Sec. 34 - T34S - R24E. (Map code 8)

3843 S 82 KS-021-13-1 ..... Ap 7.5 to 12 cm
3844 S 82 KS-021-13-2*..... E 18 to 23 cm

Verdigris series, cultivated (Spring River valley below power dam) - 1700 feet W and 400 feet S of the NE corner of Sec. 25 - T34S - R24E. (Map code 9)

3845 S 82 KS-021-14-1 ..... Ap 7.5 to 15 cm
3846 S 82 KS-201-14-2*..... A1 18 to 25 cm

Lanton series, cultivated (Spring River valley below power dam) - 2200 feet S and 900 feet W of the NE corner of Sec. 25 - T34S - R24E. (Map code 10)

3847 S 82 KS-021-15-1 ..... Ap 10 to 15 cm
3848 S 82 KS-021-15-2*..... A1 22 to 28 cm

Hepler series, cultivated (Spring River valley below power dam) 2400 feet W. and 1400 feet S. of the NE corner of Sec. 31 - T34S - R25E (Map code 11)

3849 S 82 KS-021-16-1 ..... Ap 0 to 18 cm
3850 S 82 KS-021-16-2*..... A1 20 to 28 cm

Hepler series, cultivated down stream from chat pile on flood plain - 2400 feet E and 2500 feet N of the SW corner of Sec. 34 - T34S - R24E. (Map code 12)

3851 S 82 KS-201-17-1 ..... Ap 0 to 18 cm
3852 S 82 KS-021-172* ..... E 18 to 30 cm

Taloka series, cultivated - 1000 feet E and 500 feet S of the NW corner of Section 2, T35S - R23E. (Map code 13)

3853 S 82 KS-021-18-1 ..... Ap 0 to 18 cm
3854 S 82 KS-021-18-2 ..... E 25 to 30 cm
3855 S 82 KS-021-18-3*..... Bt1 45 to 50 cm

Parsons series, cultivated - 2200 feet E and 500 feet S of the NW corner of Sec. 20 - T34S - R23E. (Map code 14)

3856 S 82 KS-021-19-1 ..... Ap 0 to 18 cm
3857 S 82 KS-021-19-2*..... E 25 to 35 cm

Parsons series, cultivated - 1500 feet W and 2300 feet N. of the SE corner of Sec. 34 - T34S - R23E. (map code 15)

3858 S 82 KS-021-20-1 ..... Ap 0-14 cm
3859 S 82 KS-021-19-2 ..... E 20-25 cm
3860 S 82 KS-021-19-3* ..... Bt1 35-40 cm

Heavy Metal study in Cherokee County, Kansas.
Location: Note each sample below.
Date: July 1982
Collected by E. L. Fleming and H. D. Owens

Parsons series, cultivated - 1000 feet E. and 500 feet S. of the NW corner of sec. 12 - T34S - R23E. (Map Code 1)

3823 S 82 KS-021-6-1 .....Ap 5 to 12 cm
3824 S 82 KS-021-6-2 .....E 23 to 28 cm
3825 S 82 KS-021-6-3 .....Btg1 38 to 43 cm
3826 S 82 Ks-021-6-4* .....Btg2 58 to 65 cm

Parsons series, cultivated - 2000 feet W. and 500 feet S. of the NE corner of section 13 - T34S - R23E. (Map code 2)

3827 S 82 KS-021-7-1 .....Ap 7.5 to 13 cm
3828 S 82 KS-021-7-2* .....E 20 to 25 cm

Taloka series, cultivated - 500 feet W and 500 feet N of the SE corner of section 20 - T34S - R24E. (Map code 3)

3829 S 82 KS-021-8-1 ..... Ap 7.5 to 15 cm.
3830 S 82 KS-021-8-2* .... E 23 to 28 cm.

Taloka series, cultivated - 1000 feet S and 500 feet W of the NE corner of Sec. 30 - T34S - R24E. (Mape Code 4)

3831 S 82 KS-021-9-1 ..... Ap 7.5 to 13 cm
3832 S 82 KS-021-9-2 ..... E 23 to 28 cm
3833 S 82 KS-021-9-3 ..... Bt1 38 to 45 cm.
3834 S 82 KS-021-9-4*..... Bt2 58 to 65 cm

Taloka series, native grass - 1500 feet W. and 500 feet S. of the NE corner of sec. 6 - T35S - R24E. (Map code 5)

3835 S 82 KS-021-10-1 .... A1 2.5 to 7.5 cm
3836 S 82 KS-021-10-2*.... A2 10 to 15 cm

Taloka series, cultivated - 2000 feet W. and 500 feet S. of the NE corner of sec. 12 - T35S - R23E. (Map code 6)

3837 S 82 KS-021-11-1 ..... Ap 7.5 to 15 cm
3838 S 82 KS-021-11-2 ..... F 20 to 25 cm
3839 S 82 KS-021-11-3 ..... Bt1 45 to 50 cm
3840 S 82 KS-021-11-4* ..... Bt2 60 to 65 cm

USDA - SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

TABULATION OF -15 BAR MOISTURE DATE: Jul 13, 1983

FIELD NO.	SAMPLE	CAN NO.	WEIGHTS AIR-DRY	WEIGHTS OVEN-DRY	TARE WT.	PCT WATER
82KS-021-6-1	3782P3823	1	33.64	32.95	18.40	4.7
82KS-021-6-2	3782P3824	2	33.04	32.23	19.13	6.2
82KS-021-6-3	3782P3825	3	37.92	35.17	21.49	20.1
82KS-021-6-4	3782P3826	4	35.56	33.46	19.17	14.7
82KS-021-7-1	3782P3827	5	34.68	33.88	19.40	5.5
82KS-021-7-2	3782P3828	6	27.19	26.13	12.42	7.7
82KS-021-8-1	3782P3829	7	31.15	30.24	19.57	8.5
82KS-021-8-2	3782P3830	8	30.67	29.79	18.45	7.8
82KS-021-9-1	3782P3831	9	26.29	25.49	12.54	6.2
82KS-021-9-2	3782P3832	10	33.88	32.95	19.38	6.9
82KS-021-9-3	3782P3833	11	34.54	32.04	19.67	20.2
82KS-021-9-4	3782P3834	12	33.53	30.87	18.48	21.5
82KS-021-10-1	3782P3835	13	31.38	30.10	19.35	11.9
82KS-021-10-2	3782P3836	14	30.52	29.47	18.74	9.8
82KS-021-11-1	3782P3837	15	31.46	30.96	18.20	3.9
82KS-021-11-2	3782P3838	16	25.69	25.04	12.41	5.1
82KS-021-11-3	3782P3839	17	32.70	30.40	19.67	21.4
82KS-021-11-4	3782P3840	18	30.72	27.66	12.69	20.4
82KS-021-12-1	3782P3841	19	31.57	30.40	19.56	10.8
82KS-021-12-2	3782P3842	20	30.10	29.41	18.52	6.3
82KS-021-13-1	3782P3843	21	30.66	29.69	17.93	8.2
82KS-021-13-2	3782P3844	22	30.54	29.41	17.78	9.7
82KS-021-14-1	3782P3845	23	31.79	30.65	18.41	9.3
82KS-021-14-2	3782P3846	24	35.00	33.64	19.21	9.4
82KS-021-15-1	3782P3847	25	30.66	29.63	18.12	8.9
82KS-021-15-2	3782P3848	26	33.78	32.55	19.45	9.4
82KS-021-16-1	3782P3849	27	32.10	31.19	18.72	7.3
82KS-021-16-2	3782P3850	28	30.89	29.85	18.31	9.0
82KS-021-17-1	3782P3851	29	31.36	30.53	18.54	6.9
82KS-021-17-2	3782P3852	30	32.11	31.46	12.89	3.5
82KS-021-18-1	3782P3853	31	29.17	28.79	18.53	3.7
82KS-021-18-2	3782P3854	32	30.76	30.23	19.24	4.8
82KS-021-18-3	3782P3855	33	34.40	31.93	19.41	19.7
82KS-021-19-1	3782P3856	34	31.35	30.84	19.40	4.5
82KS-021-19-2	3782P3857	35	31.73	31.09	18.75	5.2
82KS-021-20-1	3782P3858	36	31.94	31.10	19.31	7.1
82KS-021-20-2	3782P3859	37	31.18	30.20	18.21	8.2
82KS-021-20-3	3782P3860	38	33.02	30.34	18.52	22.7

United States Department of Agriculture

Soil Conservation Service

Midwest National Technical Center
Federal Building, Room 345
100 Centennial Mall North, Box 82502
Lincoln, NE 68501

FTS 541-5363; Commercial 402-471-5363

Subject: SOILS - Check Data - Kansas, 1982: Cherokee County - Heavy Metals Study (RP82-KS224)

Date: July 14, 1983

To: William E. Roth
State Soil Scientist
Soil Conservation Service
760 South Broadway
Salina, KS 67401

File Code: 430-13-5

Attached are data, list of sites, and a sheet listing the mean, median, and mode values for trace element content of soils in the United States. Please contact us if you have any questions concerning the data.

Robert H. Jordan, acting for

MAURICE J. MAUSBACH
Liaison to the Midwest
National Soil Survey Laboratory

Attachments

cc:
J. W. Tippie, State Conservationist, SCS, Salina, KS
R. F. Harner, Head, Soils Staff, MNTC, SCS, Lincoln, NE
A. R. Hidlebaugh, National Coordinator, Soil Survey Research, SCS, Washington,
C. S. Holzhey, Head, NSSL, MNTC, SCS, Lincoln, NE

United States
Department of
Agriculture

Soil
Conservation
Service

Midwest TSC
Federal Building, Room 393
100 Centennial Mall North, Box 82503
Lincoln, NE 68501

FTS 541-5363; Commercial 402-471-5363

Subject: 430-SOILS - Lead-Cadmium Study

Date: October 30, 1981

To: Richard E. Mayhugh
Soil Correlator
SCS, Salina, KS

The heavy metal data requested for Cherokee County soils are as follows:

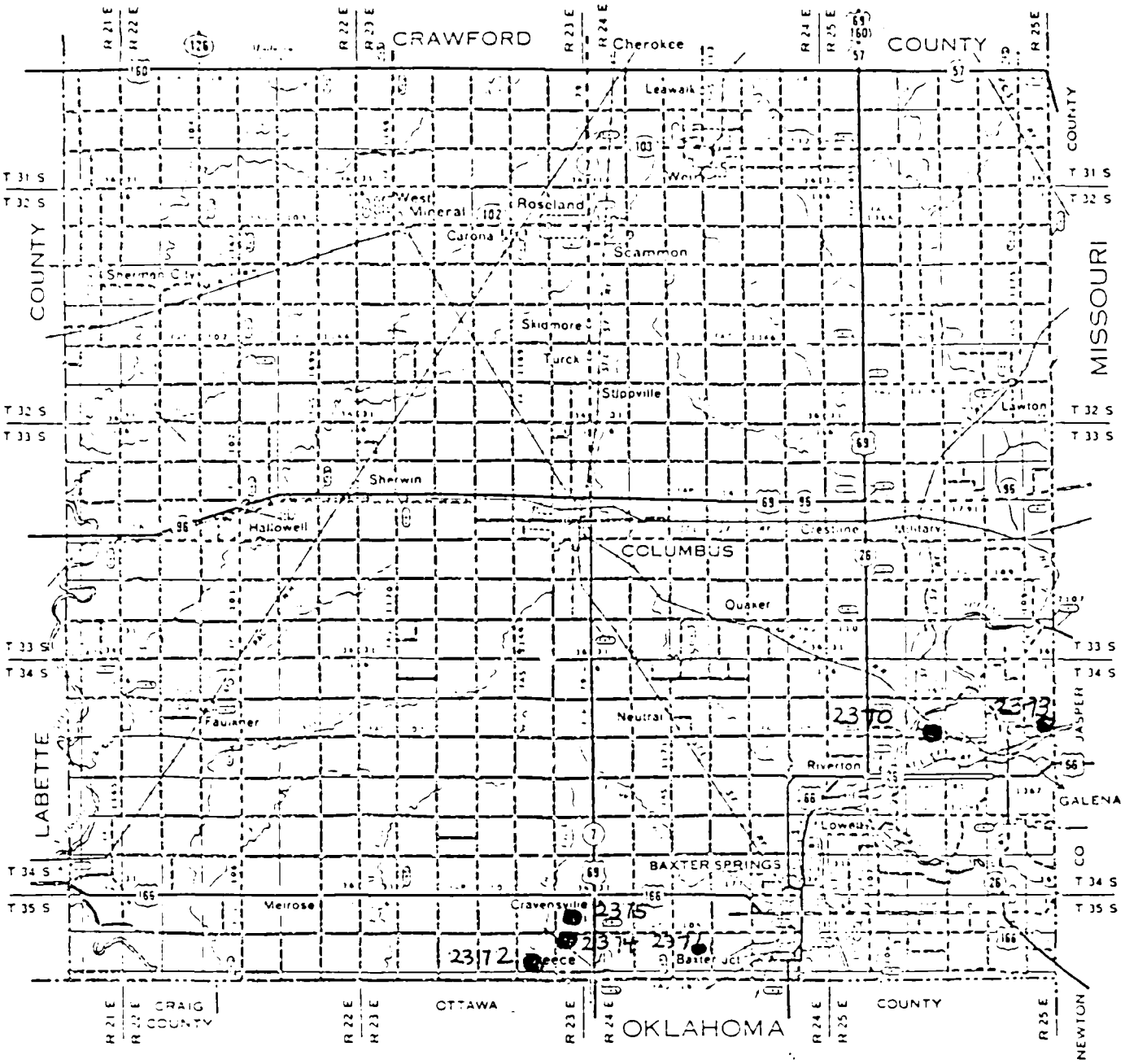
Soil	ZN	CU	PB	CD
	ppm			
2370	3100	55	800	22
2371	550	7	55	4
2372	16000	30	1000	81
2373	1600	24	260	19
2374	300	9	95	1.8
2375	120	7	22	0.6
	2140	19.4	900	22.4

Geo. Holmgren

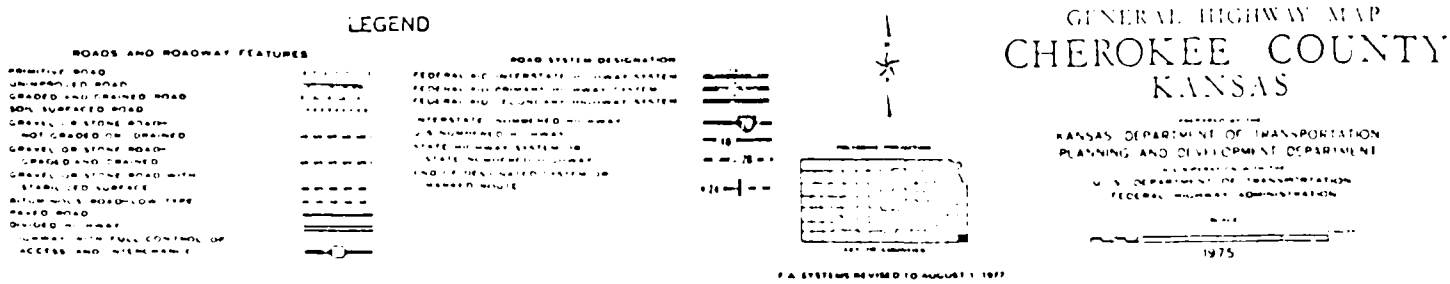
GEORGE HOLMGREN
Research Soil Scientist
National Soil Survey Laboratory

cc:
E. L. Fleming, Soil Scientist, SCS, Emporia, KS
G. J. Post, Soil Correlator, Soils Staff, MTSC, SCS, Lincoln, NE

SITES SAMPLED IN 1981



Map numbers correspond with the soil numbers on letter dated October 30, 1981.



Cherokee County, Kansas - Heavy Metal Study

Date: October 20, 1981

Collector: Edward L. Fleming, Soil Scientist

Sample Number	Soil No.	Item Collected
S81KS-021-1-1*	2370	0 to 8 inches of Lanton silt loam collected from Short Creek flood plain about 2½ miles down stream from smelter. 1700 feet east and 200 feet north of SW corner of sec. 9, T. 34., R. 25 E.
S81KS-021-2-1*	2371	0 to 8 inches of Taloka silt loam collected about one half mile northeast of old smelter. 300 feet north and 250 feet west of SE corner of sec. 9, T. 35 S., R 24 E.
S81KS-021-3-1*	2372	Sample collected from winnowed area within map unit Dumps, mine. 1500 feet west of SE corner of Sec. 11, T. 35 S., R. 23 E.
S81KS-021-4-1	2373	0 to 7 inches of Nixa cherty silt loam collected about one half mile northeast of smelter. 1700 feet north and 1600 feet east of SW corner of sec. 12, T. 34 S., R. 25 E.
S81KS-021-5-1*	2374	0 to 6 inches of Taloka silt loam collected about one half mile north and east of map unit Dumps, mine. 1000 feet south and 500 feet east of NW corner of sec. 12., T. 35 S., R. 23 E.
S81KS-021-6-1*	2375	0 to 6 inches of Taloka silt loam collected about one mile north and east of map unit Dumps, mine. 1500 feet east and 500 feet north of SW corner of sec. 1, T. 35 S., R. 23 E.