



CONTINUATION SHEET

MINUTES OF THE SENATE COMMITTEE ON ENERGY & NATURAL RESOURCES,  
room 123-S, Statehouse, at 8:00 a.m./~~p.m.~~ on February 10, 1988

natural wildlife habitat.

Ken Kern stated two projects of the State Conservation Commission concern the multi purpose small lakes program. Final funding for completion of the Centralia site is being requested to include land treatment for pollution and sediment control. The new site recommended in the proposal is the Wellington project designed to provide additional water supply for that area. The state would fund the added dimensions of the project for flood control and additional recreational needs.

Dr. Don Steeples briefed the committee on the proposed long term study of the Dakota Aquifer in Kansas as an integral part of the Water Plan. Overdevelopment of the Ogallala aquifer has led to a serious decline in water availability in western Kansas and the Dakota is the only known remaining large source of potentially usable ground water. Research is the most cost effective means of understanding the Dakota aquifer for water quantity and predictability of its resource value. The proposed study should result in better management of the Dakota resource than has occurred with the Ogallala. (Attachments III, IV, V)

Questions were directed to David Pope regarding continuing depletion of the Ogallala, enforcement of regulations pertaining to water usage in southwestern Kansas and the impact of economic factors on water supply.

Meeting adjourned. The next meeting will be February 11, 1988.

2-10-88  
QUEST LIST

Ed Reinert	KS League Women Voters
Helen Schabel	K. W. A
Russell & Britts	Ottawa
Margaret Bagop	K.WO
Jerry Duwall	KWO
P. Alvin Mansfield	KGS
Don Steeles	KGS
Stan Grant	KDHE
Allen & Kirk	KWO
Mary Ann Bradford	League of Women Voters KS
Leland E. Rolf	DWR - KSBA
Gary Flickinger	KWO
Joel Wentz	KWO
Charlene Stinard	KS Natural Resource Council
Gene Carliss	Lg. of Municipalities
Gary K. Hullett	KDHE
Jen Johnson	Budget Division
James Power	KDHE
Shaun McGrath	KWO
Lispeth Byer	KNRC
Bill Bryson	KCC
David Popl	DWR USBA
Jerry Coonse et	KGS E

AGENDA

Briefing for the Senate Energy and  
Natural Resources Committee

February 10, 1988

on the Governor's  
Natural Resources Budget Initiative

1. Introductory Remarks.....John Baldwin, Chairman  
Kansas Water Authority
2. Public Involvement in the.....Helen Schabel, Chairperson  
Planning Process Kansas Water Authority  
Basin Planning Committee
3. Department of Health and.....Stanley Grant, Ph.D. Secretary  
Environment  
  
Galena Superfund Site - State Match  
Saltwater Contamination Cleanup  
Wilgus Water Well-Saline County  
Brother's Lease-Rice County  
Raymond Smith Well-Hodgeman County  
Enoch Thompson Well-Pawnee County  
Temple Oil-Montgomery County  
Douglass-Greenwood County  
Burrton-Reno County  
Dinkle Well-Ellis County
4. Department of Wildlife and Parks....Robert Meinen, Secretary  
  
Hillsdale Reservoir-Recreation Facilities  
Cedar Bluff-Purchase of Storage  
Purchase of Wetlands Habitat
5. State Conservation Commission.....Kenneth F. Kern,  
Executive Director  
  
Centralia Site 50 Multipurpose Lake  
Wellington Multipurpose Lake
6. Kansas Geological Survey.....Don Steeples, Ph.D.,  
Deputy Director  
  
Dakota Aquifer Investigation

ATTACH I  
2-10-88

STATE OF KANSAS



DEPARTMENT OF HEALTH AND ENVIRONMENT

Forbes Field

Topeka, Kansas 66620-0001

Phone (913) 296-1500

Mike Hayden, *Governor*

Stanley C. Grant, Ph.D., *Secretary*

Gary K. Hulett, Ph.D., *Under Secretary*

Presentation to

Senate Energy and Natural Resources Committee

February 10, 1988

Groundwater is a major source of water supply throughout Kansas. Approximately 85 percent of all water used in Kansas is supplied from groundwater. In rural areas, groundwater supplies 85 percent of the drinking water. Groundwater is the sole water source for 602 public water drinking supplies that serve 747,000 people. Groundwater resources are abundant in the western two-thirds of the state and are limited in the eastern one-third of Kansas.

A wide range of agricultural, industrial, municipal, and domestic activities can contaminate groundwater. Leachate from waste disposal facilities, particularly hazardous waste landfills, often causes the most concentrated and toxic contamination. Leaks from underground fuel and chemical storage tanks or leaking underground injection wells cause similar contamination. In addition, there are many sources that may cause more widespread contamination, such as septic systems, agricultural chemicals, road salts, and poor maintenance of oil, gas, and water wells.

A year ago, the department put together a publication which listed 332 contaminated sites in Kansas. No part of the state is free of contaminated sites. About one-half (168) of the sites inventoried were the result of petroleum or petroleum-related saltwater; 62 sites were contaminated as a result of volatile organic compounds; 32 were contaminated as a result of metal contamination; 23 were contaminated as a result of pesticide application. The remaining 47 were contaminated by a variety of sources. Of the 332 sites, 233 -- or roughly seventy percent -- were contamination to the groundwater resources.

Governor Hayden's budget recommendations contained funding to implement the state water plan for Fiscal Year 1989. Nine projects totaling \$1,750,000 are to be implemented from the Economic Development Initiatives Fund (Attachment A).

ATTACH II  
2-10-88

The projects to be administered by the Kansas Department of Health and Environment include the Galena Superfund site in Cherokee County and eight saltwater contamination cleanup projects. The \$500,000 recommended for Galena meets the ten percent match required by the federal government for cleanup of the Galena subsite on the National Priority List of the federal Superfund program. Heavy metal contamination of ground and surface water at the site was caused by mining and smelting activities in the region. The eight saltwater contamination cleanup projects are drawn from the department's list of 332 statewide sites that have contaminated ground or surface water. The projects are ones that have been identified by the department as having a high priority for cleanup because of local water use requirements. Attached is a short description of each of the project.

#### Galena Subsite

The final remediation plan for the Galena subsite is yet to be completed. The current proposal involves the following:

1. Surface mine wastes will be removed and milled to remove to the metal sulfides. The metal sulfides will be sold to help defray a portion of the costs. The tailings remaining from the milling operations will be disposed of in one of the following ways to be determined later: (a) left in impoundments for use by the National Guard shaft plugging operations, (b) backfilled into the mine voids without additional material, or (c) left on the surface for use by property owners.
2. Surface drainage will be diverted around specific areas to prevent stream capture by mine shafts and subsidences. Owl Branch will be diverted around the Blue Hole using a concrete-lined channel. A portion of Owl Branch will be diverted to Tributary C to reduce surface water drainage in the lower Owl Branch mine areas. The Tributary A stream bed through Hell's Half Acre will be reestablished with a line channel to eliminate the present stream capture.
3. Recontouring of approximately 900 acres will be done to reduce infiltration and to help convey runoff from the area. Portions of these areas will be revegetated to prevent erosion.
4. Deep aquifer well remediation will be taken to protect the Roubidoux aquifer from contaminant migration from the shallow aquifer. Abandoned wells will be plugged.

The net result of the remediation will be to eliminate several sources of groundwater contamination, to remove the tailing piles thereby allowing the land to be reclaimed and put back into productive use or for economic development.

#### Burrton Oil Field

An example of one of the eight saltwater site projects is Burrton area in Reno County.

Groundwater contamination within the Burrton area has been a problem for a number of years. The chloride contamination has been caused by saltwater disposal ponds, shallow disposal wells, spills, overflows, and line failures which have occurred since 1931 over and within the contamination plume.

An extensive area of groundwater contamination has been identified within the Equus Beds aquifer upgradient from Wichita's public water supply. This contamination seems to be slowly moving through the aquifer and will continue to contaminate areas downgradient.

Chloride contamination, crude oil, and volatile organics from crude oil exists within the shallow groundwater within the Burrton oil pool. There is an extensive monitoring system already established so the funds are needed primarily to perform the actual removal and disposal of contaminated soil and groundwater.

The cost of cleanup has been estimated to be \$300,000; however, with the extensive contamination, these funds may not be adequate to restore the groundwater to background levels. The cleanup being proposed would be adequate to limit any downgradient contamination.

Should the City of Wichita well field become contaminated -- the result of movement of chlorides, crude oil, and volatile organics -- what is the economic impact on Wichita and the surrounding region? What are the alternatives available to Wichita for an alternate water supply? Is there an alternate supply which could be developed? What is the cost? Yes, there is an impact on many citizens. By contrast, several other sites involve farmstead water supplies. The economic impact statewide may not be as great, but, certainly to the individual farmer or rancher it is a significant economic hardship.

#### Conclusion

The exact value that water adds to the economy is difficult if not impossible to measure. Its effect is far too subtle to allow such appraisal, for as the air we breathe it becomes an integral

part of every facet of our daily lives. Any appraisal of its future effect on the Kansas economy should not be limited to minimizing the adversity it has caused in the past. Attention must be focused also on how water can be used for new economic growth.

I hope that I have been able to provide you with a clear understanding of the Governor Hayden's initiatives, using the economic development initiatives fund to restore contaminated groundwater supplies. This is the first step in a long process of restoring our natural resources for the beneficial use of all Kansans.

Presented by:

Stanley C. Grant, Ph.D.  
Secretary  
Kansas Department of Health and Environment

ATTACHMENT A

NATURAL RESOURCES

The Governor's FY 1989 budget includes major new investments in the state's natural resources. The Governor recommends expenditure of \$4 million from the Economic Development Initiatives Fund for 14 projects to enhance local water supply, provide for flood control, restore contaminated groundwater supplies, and develop regional recreational opportunities. The Governor also recommends expenditure of \$170,000 in oil overcharge funds to study the Dakota Aquifer as a major source of future water supply for Kansas. Specific recommendations are summarized in the table below, which details the projects, administering agencies and recommended funding levels.

NATURAL RESOURCES

AGENCY/PROJECT	FUNDING
<b>Department of Health and Environment</b>	
Galena Superfund Site—State Match .....	\$500,000
Saltwater Contamination Cleanup	
Wilgus Water Well—Saline County .....	250,000
Brother's Lease—Rice County .....	100,000
Raymond Smith Well—Hodgeman County .....	125,000
Enoch Thompson Well—Pawnee County .....	50,000
Temple Oil—Montgomery County .....	150,000
Douglass—Greenwood County .....	200,000
Burton—Reno County .....	300,000
Dinkle Well—Ellis County .....	75,000
<b>Department of Wildlife and Parks</b>	
Hillsdale Reservoir—Recreation Facilities .....	700,000
Cedar Bluff—Purchase of Storage .....	365,418
Purchase of Wetlands Habitat .....	27,100
<b>State Conservation Commission</b>	
Centralia Site 50 Multipurpose Lake .....	240,000
Wellington Multipurpose Lake .....	917,482
<b>Kansas Geological Survey</b>	
Dakota Aquifer Investigation .....	170,000
<b>TOTAL .....</b>	<b>\$4,170,000</b>

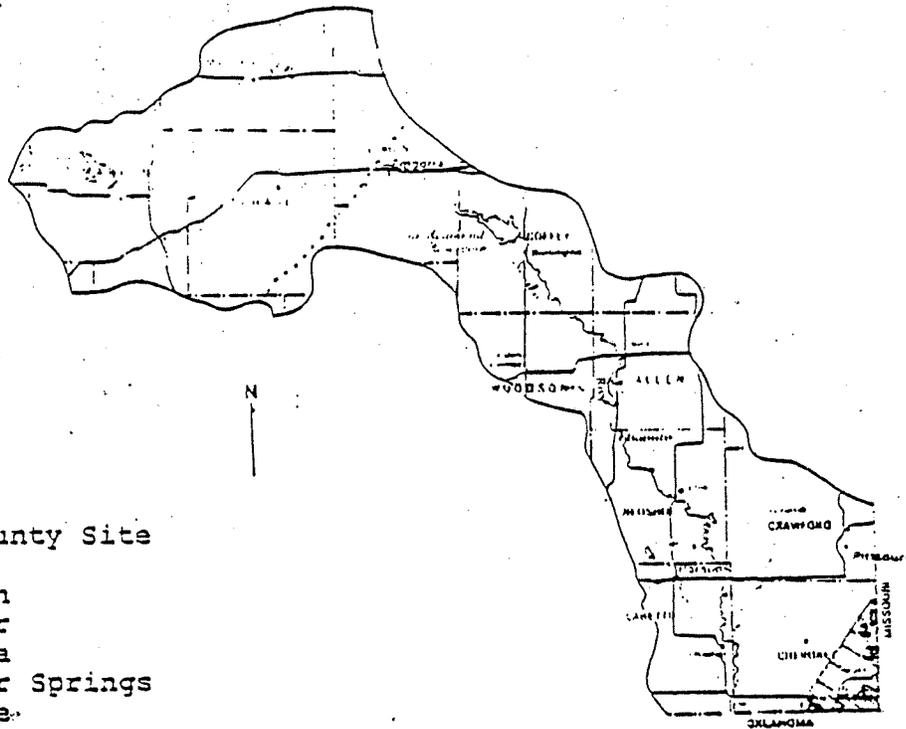
The projects to be administered by the Department of Health and Environment include the Galena Superfund project and eight saltwater contamination cleanup projects. The \$500,000 recommended for Galena meets the ten percent match required by the federal government for cleanup of the Galena subsite of the Cherokee County site on the National Priority List of the federal Superfund program. Heavy metal contamination of ground and surface water at the site was caused by mining and smelting activities in the region. The eight saltwater contamination cleanup projects are drawn from the department's list of 332 statewide sites that have contaminated ground or surface water. The projects are ones that have been identified by the department as having a high priority for cleanup because of local water use requirements.

The Wildlife and Parks projects include \$700,000 for development of recreational facilities at Hillsdale Reservoir in Miami County, including boat ramps and adjacent parking lots, swimming beaches, breakwaters for protection of boat ramps and swimming beaches, and roads. Also recommended is \$385,418 for purchase of water storage in Cedar Bluff Reservoir in Trego County. The funding is necessary to implement the terms of an agreement with the U.S. Bureau of Reclamation whereby the state will gain control of reservoir storage to maximize the lake's fish, wildlife and recreation benefits. The recommendation for Wildlife and Parks includes \$27,100 for acquisition of land in the McPherson area to be protected as a wetlands wildlife refuge.

The recommendation for the State Conservation Commission includes state funding for two multipurpose small lakes projects. Funding of \$240,000 is recommended for land treatment at the Centralia Site 50 Multipurpose Small Lake, which is designed to provide flood control, water supply and recreation benefits to the residents of the area in Nemaha County near Centralia. The recommended amount completes the state's contribution to that project. Also recommended is \$917,482 for the Wellington Multipurpose Small Lake to be constructed by the City of Wellington. The project will provide water supply, flood control and recreation benefits to the city and surrounding area; state funds will be used for flood control, recreation and land treatment elements of the project. The total state share of project funding is \$1,083,000; the remaining \$165,518 would be funded in FY 1990.

The Governor's recommendation for the Kansas Geological Survey includes expenditure of \$170,000 in oil overcharge funds for continued investigation of the Dakota Aquifer. The Dakota represents a major water resource for Western Kansas but further study is required to assess both the water quality and quantity in the aquifer.

## NEOSHO BASIN



### ▲ Cherokee County Site

1. Waco
2. Lawton
3. Badger
4. Galena
5. Baxter Springs
6. Treece

### Cherokee County Remedial Project

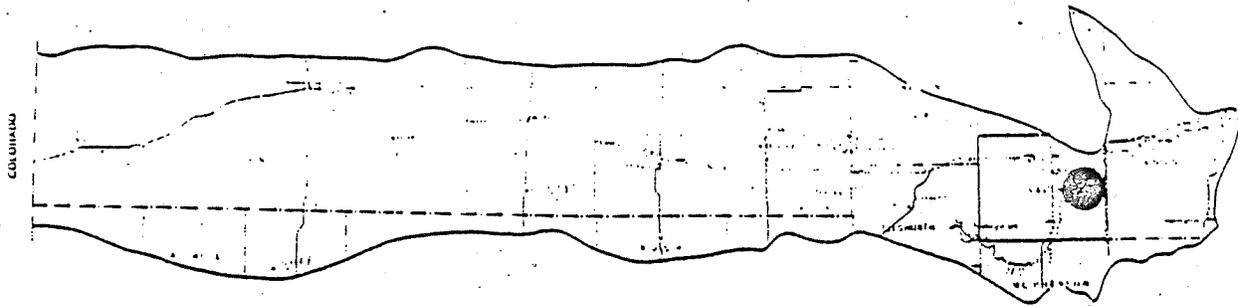
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Cherokee County remedial project is one of the priority sites.

Mining and smelting activities in Cherokee County dating to the 1880's caused widespread environmental contamination throughout the area. This area is designated as a National Priority listing site under CERCLA (Superfund) and initial remedial action plans are in process.

The contamination is primarily heavy metals such as lead and cadmium. The contamination has affected surface and groundwater quality in Cherokee County. Contaminants are present above drinking water standards in the shallow aquifer in the area. Although contamination has not been found in the deeper Roubidoux Aquifer, without corrective action, there is a possibility that the contamination may spread.

The overall remediation project for the Cherokee County site will require a major expenditure of funds. The \$500,000 requested by Kansas Department of Health and Environment is the match necessary for the federal superfund funds to be expended. These state expenditures are 10 percent with the superfund providing 90 percent of the funds.

## SMOKY HILL — SALINE BASIN



Saline County  
● - Water Contamination Site

### Wilgus Well

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Wilgus well site is one of the priority sites.

The groundwater contamination is probably the result of past saltwater disposal and/or lease management on nearby oilfield operations. The chloride contamination is evident throughout a sizable area; however, drilling is needed to determine which sources caused the contamination. Potential exists that residual salts may still exist in abandoned ponds or poorly plugged wells may be leaking into the shallow groundwater.

The Wilgus well area is thought to be confined to the NW 1/4 of Sec. 20, Township 14 South, Range 2 West, Saline County, Kansas. Additional drilling is needed to delineate the extent of the contamination and any potential sources which may still exist.

The cost of investigation and determining the potential for containing and removing the contamination within the Wilgus area is \$250,000. The cost may exceed this level if the contamination proves to be larger than indicated within the 1984 study.

Wilgus Well

Saline County

Legal Description: NWNW 20-14S-2W

Chlorides have been detected in several private wells at levels exceeding the current state action levels (KAL) and federal secondary drinking water standards by ten (10) times (>2500 ppm). The primary source of the chloride contamination appears to be from oil field activity. The study area covers approximately a four (4) section area or 2560 acres of which approximately 320 acres have been directly affected by the chloride contamination.

The City of Salina obtains its water from wells located approximately 1.5 miles to the west of the contamination. No public water supplies are known to exist within the sites' defined boundary. The contaminated wells obtain their water from the upper part of the Wellington Formation and the unconsolidated alluvial deposits of the Smoky Hill River Valley. The alluvial aquifer is capable of yielding from 100 to 500 gpm. The land use in the area is primarily for farming and commercial purposes. The population density in nine square sections around the defined site is greater than 101 persons per square mile due to the close proximity of the city of Salina. The Smoky Hill River is within the sites boundaries to the west, and is classified as a high valued fishery resource.

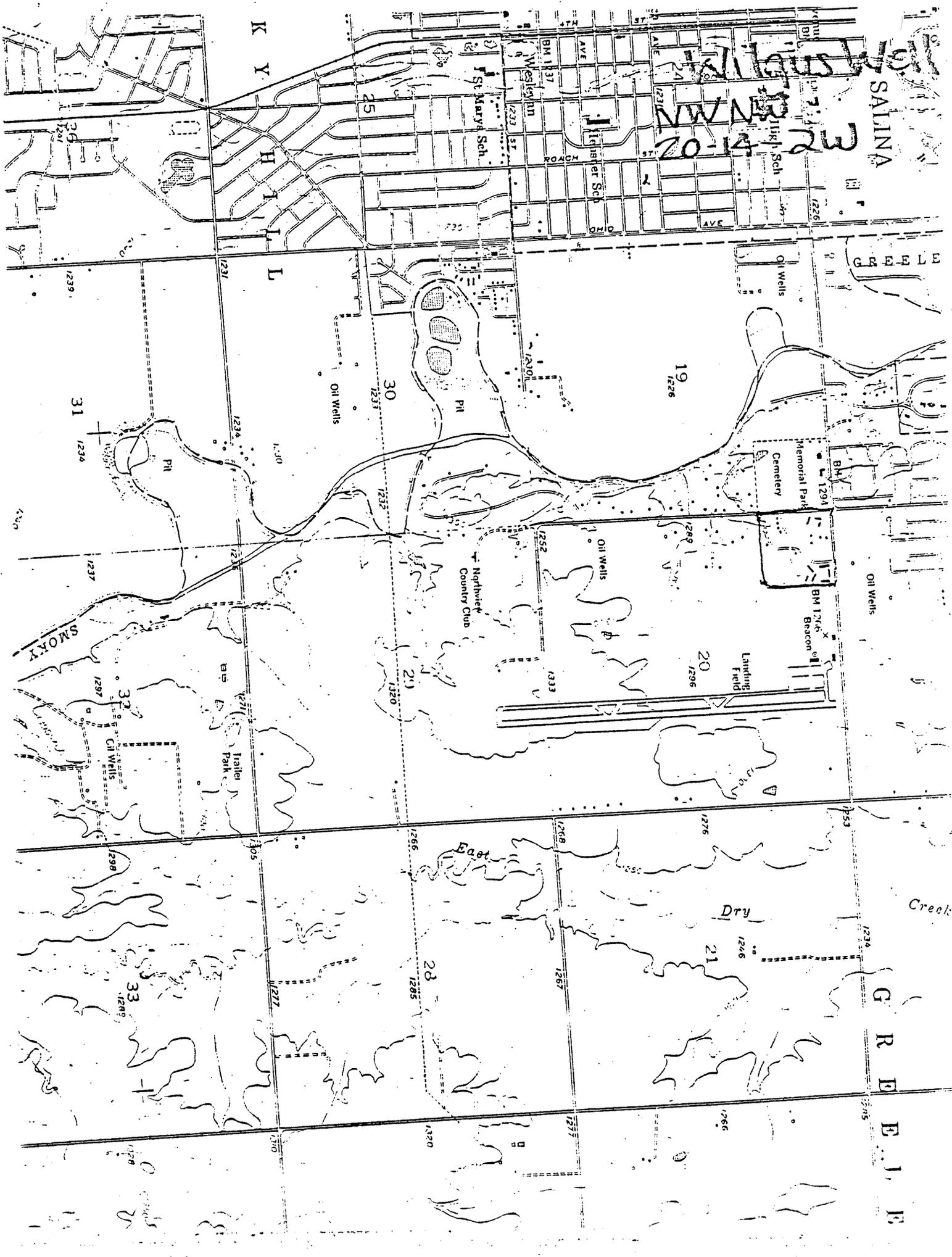
WILGUS WELL

CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	4	3	12
Water Supplies	0	3	0
Contaminant	3	5	15
Vulnerability	3	2	6
Population	4	1	4
Environment	2	1	2
Availability	2	2	4

$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp + E \times We + A \times Wa$$

$$PRN = 3 \times 4 + 4 \times 3 + 0 \times 3 + 3 \times 5 + 3 \times 2 + 4 \times 1 + 2 \times 1 + 2 \times 2$$

$$PRN = 55$$



Salina, Kan.  
NW 1/4 20-14-2W

SALINA

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E

St. Mary's Sch.

Memorial Sch.

Cemetery

Northview Country Club

SMOXY

East

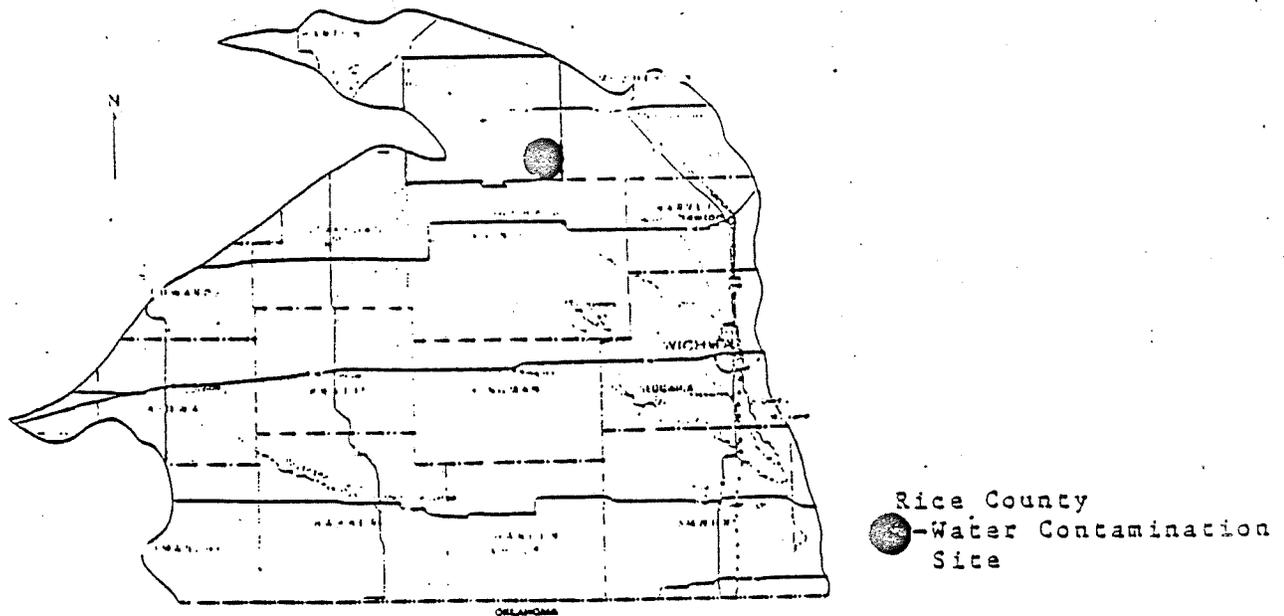
Dry

Creek

G  
R  
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E  
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E

1239, 1231, 1234, 1237, 1297, 1298, 1289, 1278, 1230, 1233, 1235, 1236, 1239, 1240, 1246, 1252, 1253, 1255, 1256, 1266, 1267, 1276, 1277, 1278, 1285, 1290, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500

## LOWER ARKANSAS BASIN



### Brothers Lease

The Kansas Department of Health and Environment has identified 332 water contamination sites statewide. As recommended in the State Water Plan the agency has established the priority sites for clean-up for FY 1989. The Brothers Lease Site is one of the priority sites.

Shallow groundwater was contaminated by an oil field reserve pit located on the Brothers lease. Fluid was recovered from the reserve pit; however, shallow groundwater infiltrates back into the pit. Elevated chlorides exist within the reserve pit and a nearby farm pond.

The site is located within the South 1/2 NE 1/4 of Sec. 12-T21S-R7W, Rice County. The contamination area is confined to a fairly small area at this time. The groundwater usage within the area is considerable so it is important that the area be cleaned up before the contamination migrates into clean areas.

The site clean-up cost is estimated at \$100,000 to cover staff oversight, soil removal, groundwater monitoring wells, recovery wells, operating and disposal costs. The responsible company has filed bankruptcy so cost recovery or responsible party clean-up is not possible.

Brothers Lease

Rice County

Legal Description: NE 12-21S-7W

Chloride contamination has been detected in a farm pond and a shallow aquifer at levels exceeding the current state action levels (KAL) by ten (10) times (> 2500 ppm). The primary source of the chloride contamination appears to be from oil field activity (reserve pit). The study area covers approximately 160 acres.

There are no public water supply wells located within a nine (9) section area around the study area, however several private wells do exist. Groundwater is obtained from unconsolidated Pleistocene deposits (dune sand and terrace deposits). The unconsolidated aquifer yields from 10 to 100 gpm. Regional groundwater flow is southeastward. The land use in the area is primarily grassland for livestock. The population density within the nine section area is less than 5 persons per square mile. Cow Creek is within the proximity of the site and is a high-valued fishery resource.

BROTHERS LEASE  
REVISED

CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	4	3	12
Water Supplies	0	3	0
Contaminant	3	5	15
Vulnerability	3	2	6
Population	0	1	0
Environment	2	1	2
Availability	1	2	2

$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp + E \times We + A \times Wa$$

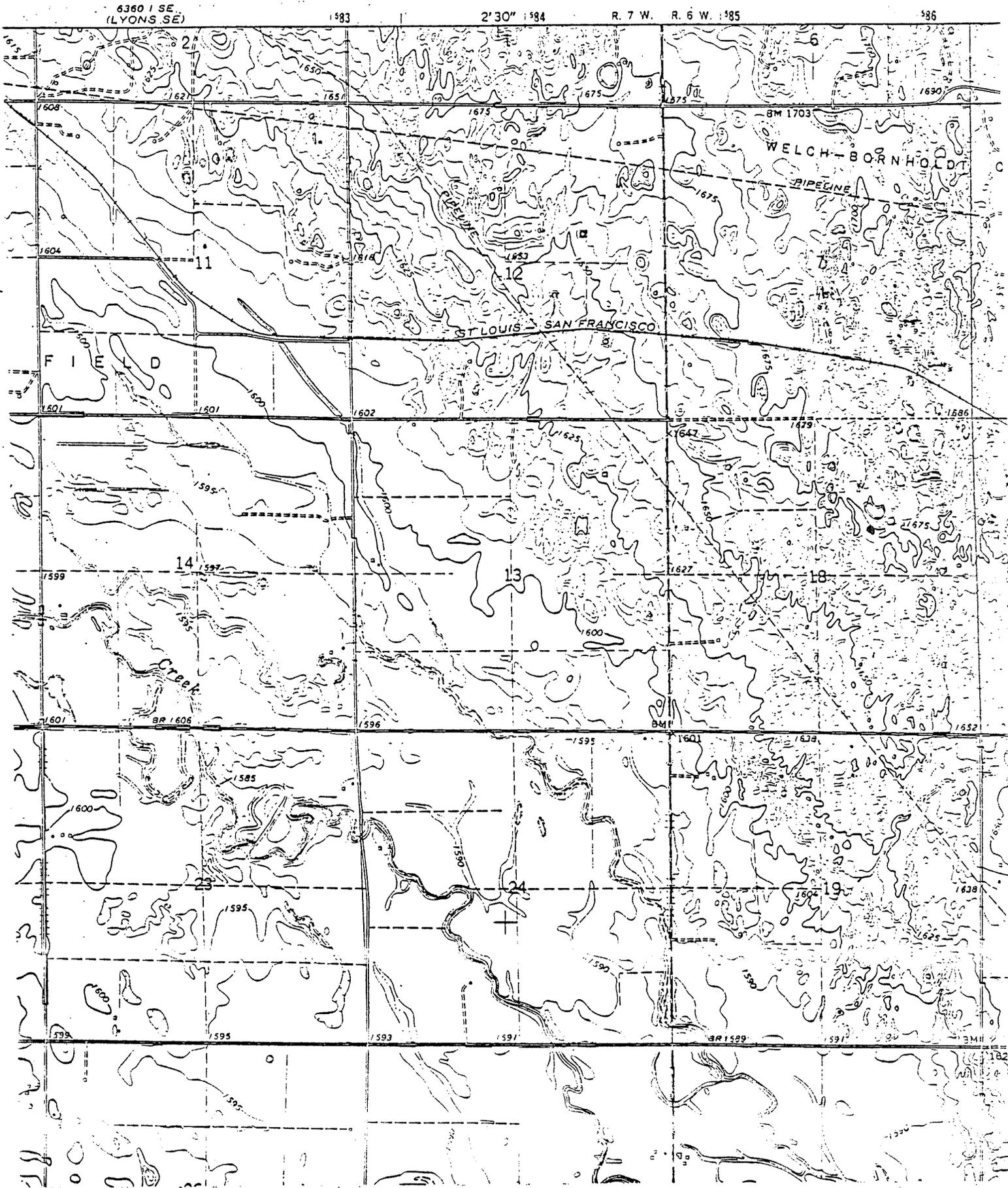
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$$PRN = 49$$

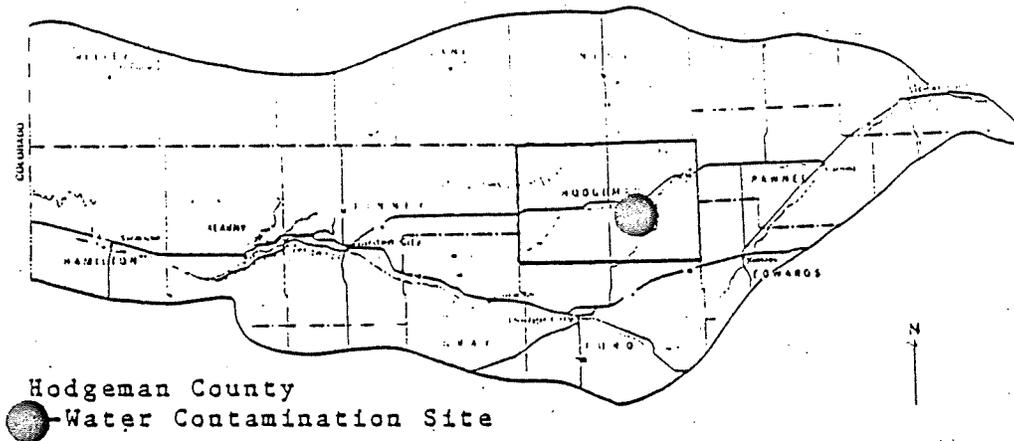
Brothers Lease 12-21-07W  
Rice County - Nickerson, Kansas  
STATE OF KANSAS

NICKERS

7.5 MINUTE



## UPPER ARKANSAS BASIN



### Raymond Smith Well

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Raymond Smith well site is one of the priority sites.

Elevated chlorides exist in the Smith irrigation well. The chloride problems date back about 20 years but seem to be getting worse. The contamination is thought to be from past use of an oil field saltwater disposal pond. The possibility does exist that a poorly plugged oil field well may be allowing the Cedar Hills Formation to leak into the alluvial aquifer.

The site is located in the NW 1/4 of Sec. 1, Township 23 South, Range 23 West, Hodgeman County, Kansas. The contamination is within the Buchner Creek alluvium and has not become widespread at this time.

The site remediation cost has been estimated to be \$125,000 to perform adequate site evaluation and remediation. The costs may drastically exceed this level if a well does prove to be leaking Cedar Hills Formation water into the overlying alluvium.

Raymond Smith

Hodgeman County

Legal Description: NW 1-23S-23W

Chloride contamination has been detected in an irrigation well at levels exceeding the current state action levels (KAL) and the federal secondary drinking water standards (> 250 ppm). This contamination problem dates back twenty years and appears to be from oil field activity. The study area covers approximately 160 acres as the chloride contamination appears to be localized.

There are no public water supply wells within a nine section area around the site. The contaminated well obtains its water from unconsolidated alluvial deposit along Buckner Creek, and is capable of yielding from 500 to 1000 gpm. The land use in the area is primarily for crop and grassland. The population density in a nine square section area around the site is less than 5 persons per square mile. Buckner Creek (Upper Arkansas Basin) is a high-valued fishery resource.

RAYMOND SMITH  
REVISED

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CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	1	3	3
Water Supplies	0	3	0
Contaminant	2	5	10
Vulnerability	3	2	6
Population	0	1	0
Environment	2	1	2
Availability	3	2	6

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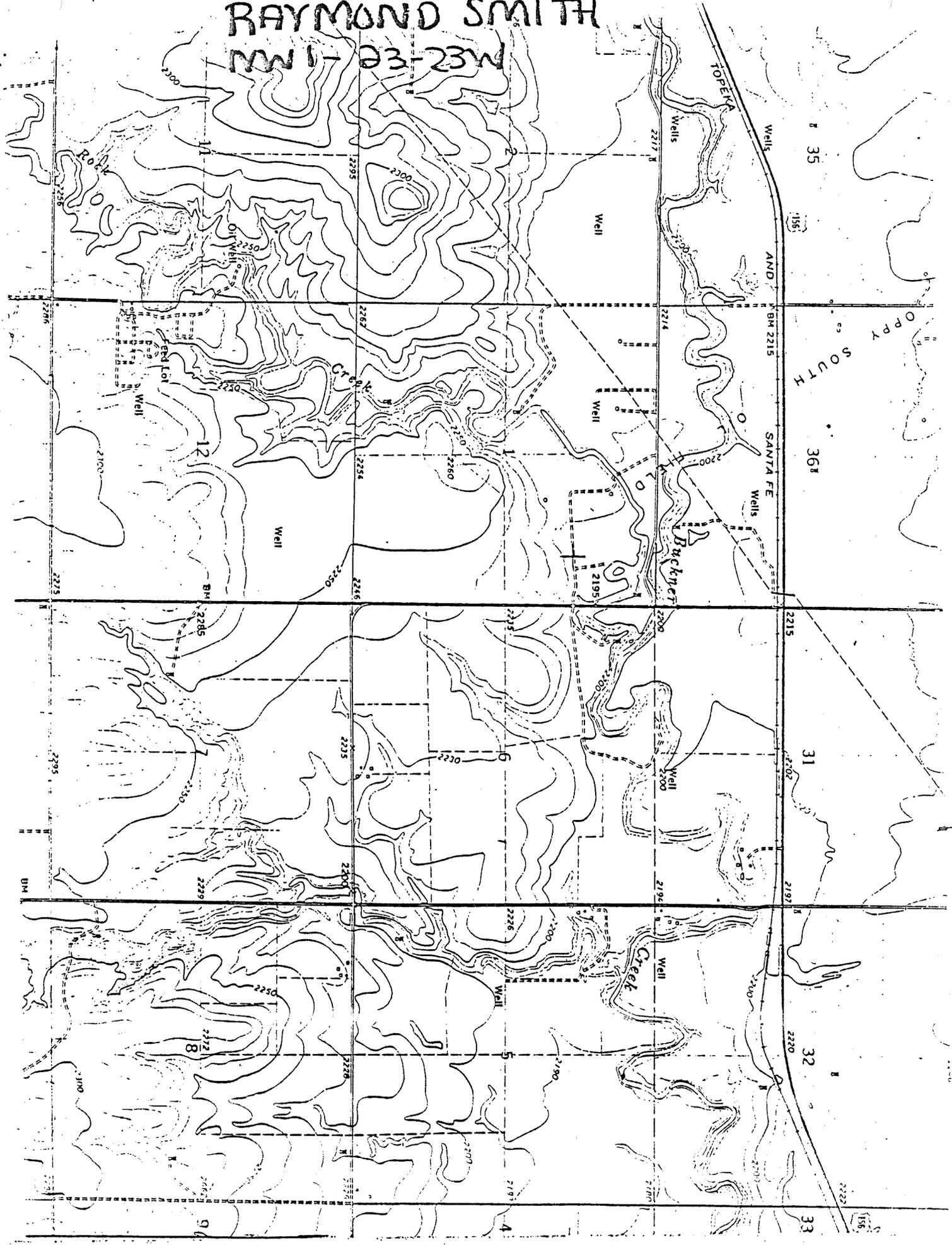
$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp \\ + E \times We + A \times Wa$$

$$PRN = 3 \times 4 + 1 \times 3 + 0 \times 3 + 2 \times 5 + 3 \times 2 + 0 \times 1 + 2 \times 1 + 3 \times 2$$

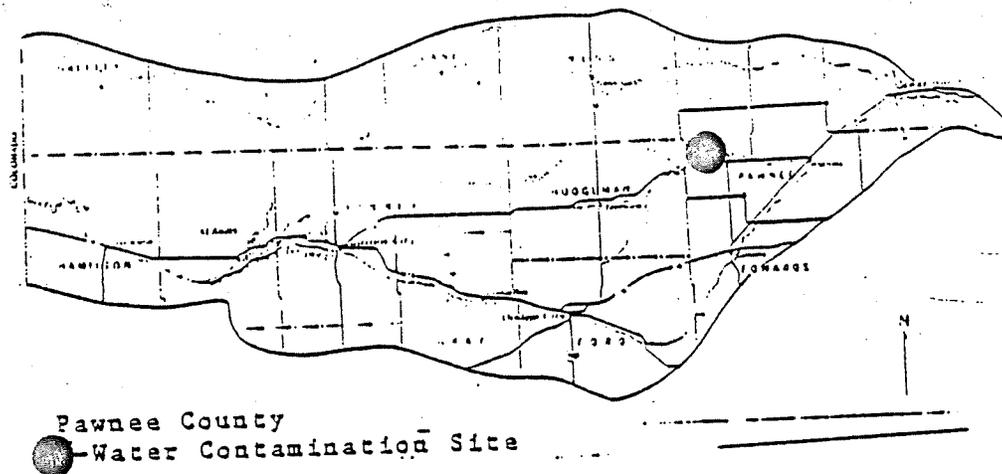
$$PRN = 39$$

# RAYMOND SMITH

## NW 1-03-23W



## UPPER-ARKANSAS BASIN



Enoch Thompson

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Enoch Thompson well site is one of the priority sites.

The Thompson stock well has a chloride concentration of 1180 mg/l which is thought to be a result of past saltwater disposal pond usage. No known source of chloride contamination exists at this time; however, additional evaluation is needed to determine the full areal extent of the plume.

The area of known contamination exists within the NW 1/4 of Sec. 17, Township 21 South, Range 20 West, Pawnee County, Kansas. The initial source of contamination is thought to have been within the SE 1/4 of Sec. 8, Township 21 S, Range 20 West. The Thompson well is completed in the alluvial aquifer at the north edge of the Pawnee River Valley.

The site remediation is estimated to cost \$50,000 to rule out any active sources and produce and dispose of contaminated groundwater until the concentration can be reduced to a usable level.

Enoch Thompson

Pawnee County

Legal Description: NW 17-21S-20W

Chloride contamination has been detected in a stock well at levels exceeding the current state action levels (KAL) and the federal secondary drinking water standards (> 250 ppm). The primary source of the chloride contamination appears to be from oil field activity (saltwater pit). The study area covers approximately 160 acres.

There are no public water supply wells within a nine section area around the site. Two (2) public water supply wells that supply the city of Burdett are located approximately 2.5 miles to the southeast. The contaminated well obtains water from an unconsolidated alluvial aquifer of the Pawnee River Valley. The alluvial aquifer is capable of yielding 500 gpm. The land use in the area is primarily crop and range land. The population density in the Browns Grove township is 16.9 persons per square mile. An unnamed tributary of Pawnee River is located in the study area. Pawnee River is a high-valued fishery resource.

ENOCH THOMPSON  
REVISED

CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	2	3	6
Water Supplies	0	3	0
Contaminant	2	5	10
Vulnerability	3	2	6
Population	2	1	2
Environment	2	1	2
Availability	3	2	6

$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp + E \times We + A \times Wa$$

$$PRN = 3 \times 4 + 2 \times 3 + 0 \times 3 + 2 \times 5 + 3 \times 2 + 2 \times 1 + 2 \times 1 + 3 \times 2$$

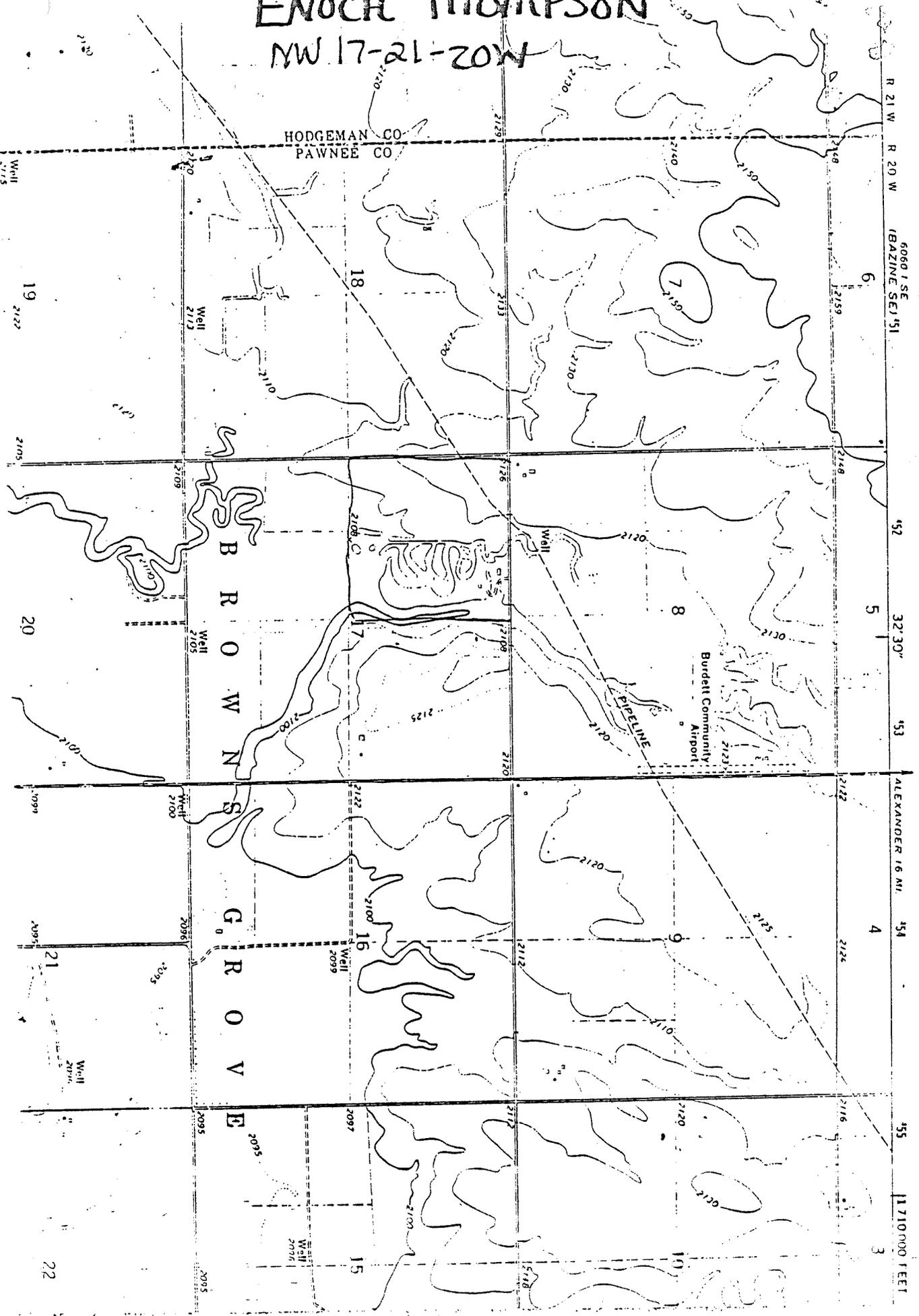
$$PRN = 44$$

# ENOCH THOMPSON

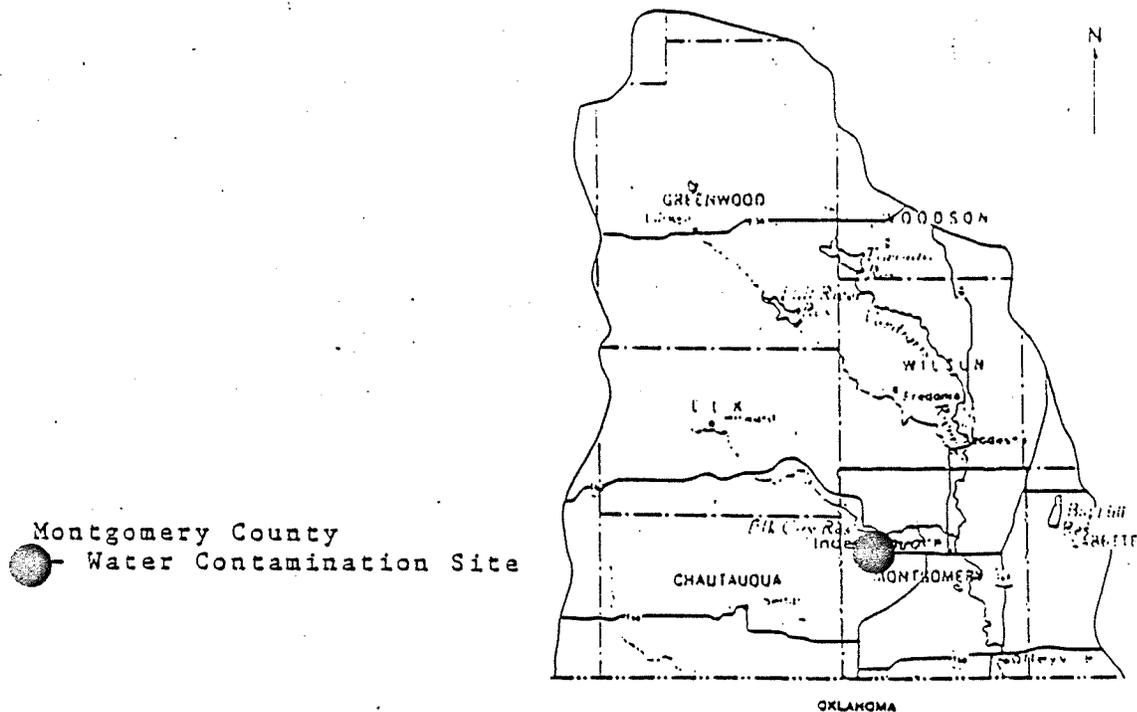
## NW 17-21-20W

STATE OF KANSAS

BURDETT QUADRANG  
KANSAS  
7.5 MINUTE SERIES (TOPOGR  
1:1710000 FEET



# VERDIGRIS BASIN



## Temple Oil Company

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Temple Oil Company site is one of the priority sites.

Surface and subsurface contamination exists from past oil field operations. Two large saltwater disposal ponds were constructed in a sandstone area which caused much of the contamination. The combined surface area of the two ponds is about one-half acre and the ponds contain fluids too high in chloride concentration to be discharged to the surface. An area of approximately two acres of severe soil contamination exists which will require removal.

The contamination area is located within NE 1/4 of Sec. 19, Township 32 South, Range 14 East, Montgomery County, Kansas. The area is of particular concern because the surface runoff from this area is discharged to the Elk River which feeds the Elk City Reservoir. Chloride concentrations have been detected downstream from this site which range as high as 3250 mg/l.

The cost of disposing fluids from the abandoned storage ponds, performing soil removal and closing the surface ponds is estimated to be \$150,000 to complete. The responsible company is bankrupt.

Temple Oil Company (Fowler)

Montgomery County

Legal Description: NE 19-32S-14E

Chloride contamination has been detected in an unnamed tributary of Elk River at levels exceeding the current state action levels (KAL). Chloride concentrations 1/4 of a mile downstream from the potential source exceeded the KAL by ten (10) times (>2500 ppm) in 1983, and was still elevated above the KAL in 1986. The contamination at this site is the result of oil field activity (storage ponds). The study area covers approximately 320 acres.

There is a surface water public supply intake located approximately two (2) miles to the north of this site. There is no public water supply located within the known contaminated area. Groundwater occurs in the Tonganoxie Sandstone member of the Stranger Formation which is capable of yielding 10 to 100 gpm. There are no known private wells located within the study area. The dominant land use in the area consists of rangeland and timberland. The population density for the Louisburg township is 16.5 persons per square mile. The Elk River is within the study area to the northeast, and is a high-valued fishery resource.

TEMPLE OIL CO. (FOWLER)  
REVISED

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CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	3	3	9
Water Supplies	0	3	0
Contaminant	2	5	10
Vulnerability	2	2	4
Population	1	1	1
Environment	2	1	2
Availability	1	2	2

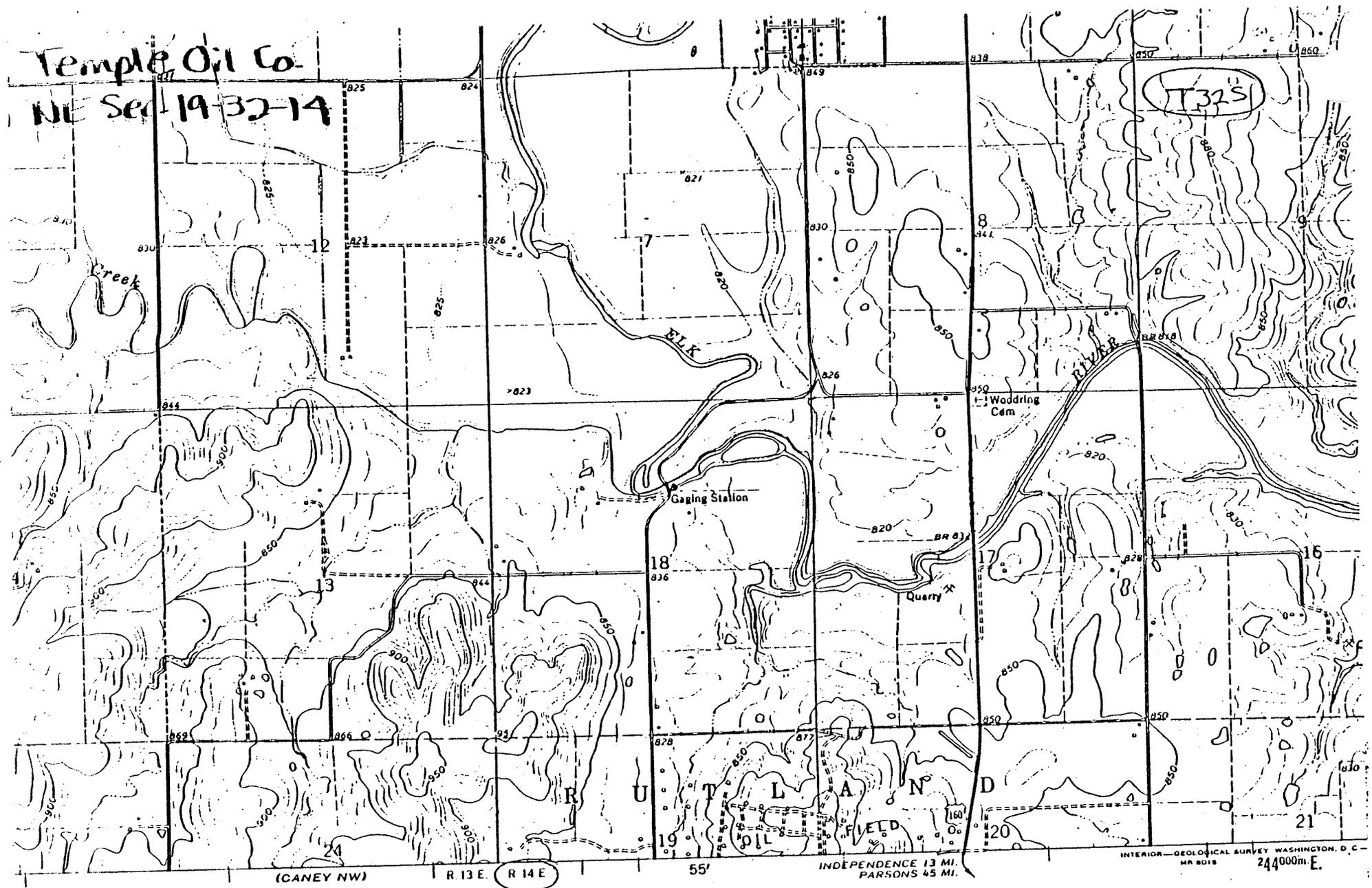
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$$PRN = U \times W_u + D \times W_d + N \times W_n + C \times W_c + V \times W_v + P \times W_p \\ + E \times W_e + A \times W_a$$

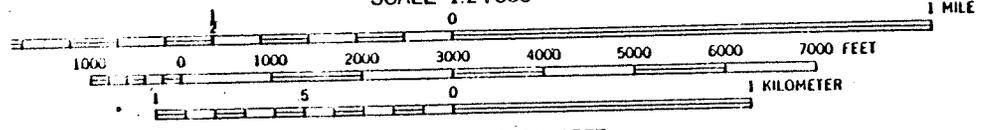
$$PRN = 3 \times 4 + 3 \times 3 + 0 \times 3 + 2 \times 5 + 2 \times 2 + 1 \times 1 + 2 \times 1 + 1 \times 2$$

$$PRN = 40$$

Temple Oil Co.  
NE Sec 19-32-14



SCALE 1:24 000



CONTOUR INTERVAL 10 FEET  
DOTTED LINES REPRESENT 5-FOOT CONTOURS  
DATUM IS MEAN SEA LEVEL

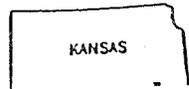
INTERIOR—GEOLOGICAL SURVEY WASHINGTON, D. C.  
MR 8018 244000m. E.

ROAD CLASSIFICATION

Heavy-duty ——— Light-duty - - -  
Medium-duty - - - - - Unimproved di

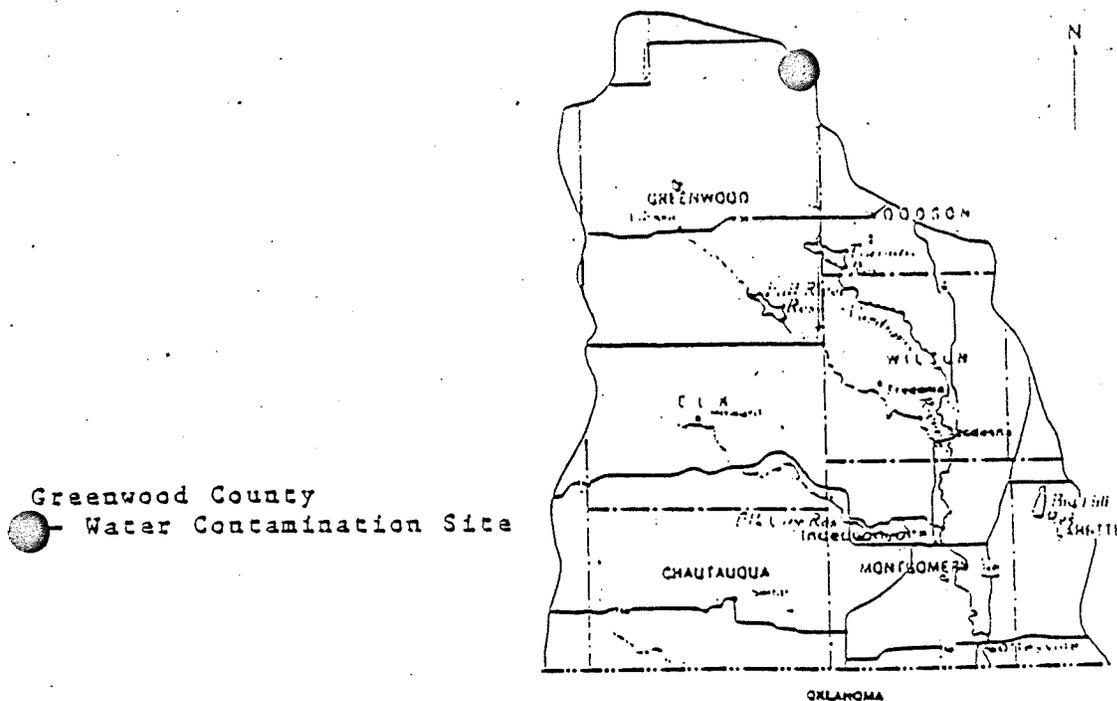
U. S. Route ( ) R

Elk City Quad





# VERDIGRIS BASIN



## Douglass Lease

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Douglass lease site is one of the priority sites.

The Douglass lease contamination area is thought to be the result of a leaking disposal well located three-fourths of a mile southwest of where saltwater was found entering Dinner Creek. Contamination has entered shallow terrace gravel deposits and moves in an eastwardly direction until the saltwater outcrops in the surface drainage.

The saltwater contamination is entering Dinner Creek in the SE 1/4 of Sec. 22, Township 22 South, Range 13 East, Greenwood County, Kansas. The saltwater disposal well thought to have caused the contamination continues to enter the surface drainage.

The site investigation and clean-up is estimated to cost \$200,000. Test drilling is needed to determine the magnitude of the contamination and to design a recovery system. The site clean-up will require the installation of a recovery well or wells and the cost of operating the recovery and disposal systems.

Douglass Lease

Greenwood County

Legal Description: SE 22-22S-13E

Chloride contamination has been detected in an unnamed intermittent tributary of Dinner Creek, at levels exceeding the current state action levels (KAL) by ten (10) times (> 2500 ppm). The primary source of the chloride contamination appears to be from oil field activity (disposal well). The study area covers approximately one (1) square mile or 640 acres.

There are no known public water supply wells within the study area. Groundwater occurs in an unconsolidated (Pleistocene) terrace gravel deposits approximately 50 feet thick. This unnamed aquifer is capable of yielding from 1 to 10 gpm. The land use in the area consists primarily of range land for livestock. The population density in the Madison township is less than 10 persons per square mile. Dinner Creek, which flows into the South Big Creek (Neosho River Basin) approximately five miles downstream, has no occurrences of protected species and is not a fishery resource.

DOUGLASS LEASE

CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	3	3	9
Water Supplies	0	3	0
Contaminant	3	5	15
Vulnerability	1	2	2
Population	1	1	1
Environment	0	1	0
Availability	0	2	0

$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp + E \times We + A \times Wa$$

$$PRN = 3 \times 4 + 3 \times 3 + 0 \times 3 + 3 \times 5 + 1 \times 2 + 1 \times 1 + 0 \times 1 + 0 \times 2$$

$$PRN = 39$$

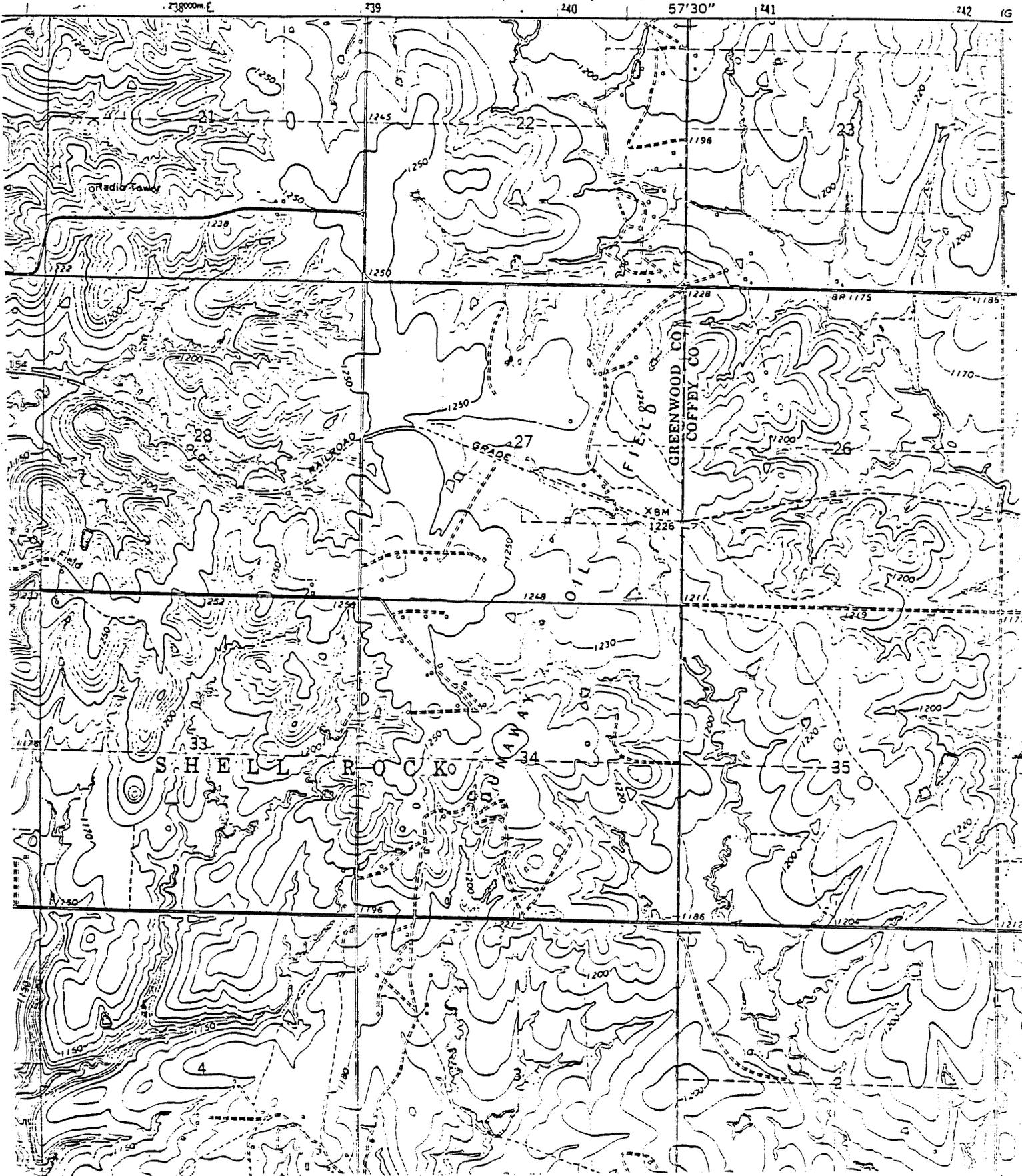
T22S R13E

Gridley Quad

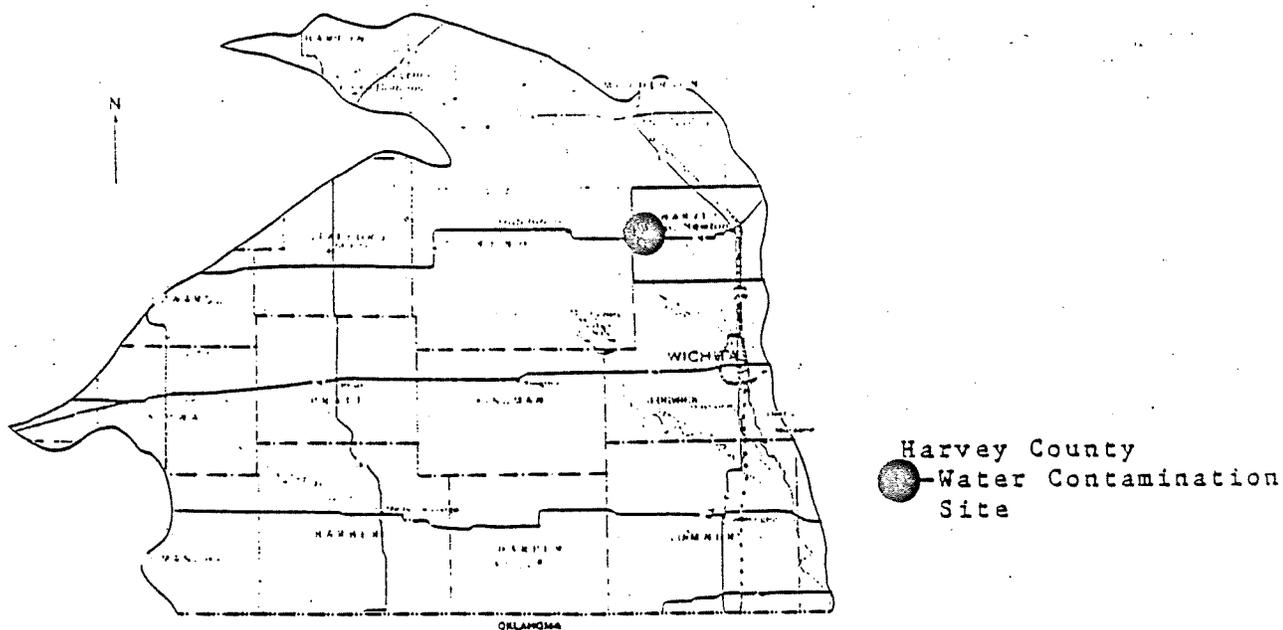
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Douglass Lease  
SE/4 Sec. 22-22-13E

STATE



## LOWER ARKANSAS BASIN



Burrton Oil Field

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Burrton Oil Field site is one of the priority sites.

Groundwater contamination within the Burrton area has been a problem for a number of years. The chloride contamination has been caused by saltwater disposal ponds, shallow disposal wells, spills, overflows and line failures which have occurred since 1931 within the pool.

An extensive area of groundwater contamination has been identified within the Equus Beds Aquifer upgradient from Wichita's public water supply. This contamination seems to be slowly moving through the aquifer and will continue to contaminate areas downgradient.

Chloride contamination, crude oil and volatile organics from crude oil exists within the shallow groundwater within the Burrton Oil Pool. There is an extensive monitoring system already established so the funds are needed primarily to perform the actual removal and disposal of contaminated soil and groundwater.

The cost of clean-up has been estimated to be \$300,000; however, with the extensive contamination, these funds may not be adequate to restore the groundwater to background levels. The clean-up being proposed would be adequate to limit any downgradient contamination.

Burrton Oil Field

Harvey County

Legal Description: T23-24S, R3-4W

Chloride contamination has been detected in many private wells and observation wells at levels exceeding the current state action levels (KAL) and the federal secondary drinking water standards. Chloride concentrations in several wells have exceeded the KAL by ten (10) times (>2500 ppm). The contamination at this site is the result of many years of oil field activity. The Burrton Oil Field study area covers 144 square miles or 92,160 acres of which approximately 14,080 acres have been directly affected by the chloride contamination.

Nine (9) public water supply wells are located within the study area but have not been influenced by the contamination. The wells obtain water from the McPherson Formation which includes all of the unconsolidated stream and slope deposits of Pleistocene age that occur in the Little Arkansas Valley, also known as the "Equus beds." This aquifer is generally capable of yielding 500 gpm. Groundwater flow within the study area is to the south-southeast. The dominant land use in the area is crop and pasture land, with about one-third developed to the irrigation limit. The population density in the Burrton township is approximately 60.75 persons per square mile. The Arkansas River is within the study area boundaries to the southeast, and is classified as a high-valued fishery resource.

BURRTON OIL FIELD

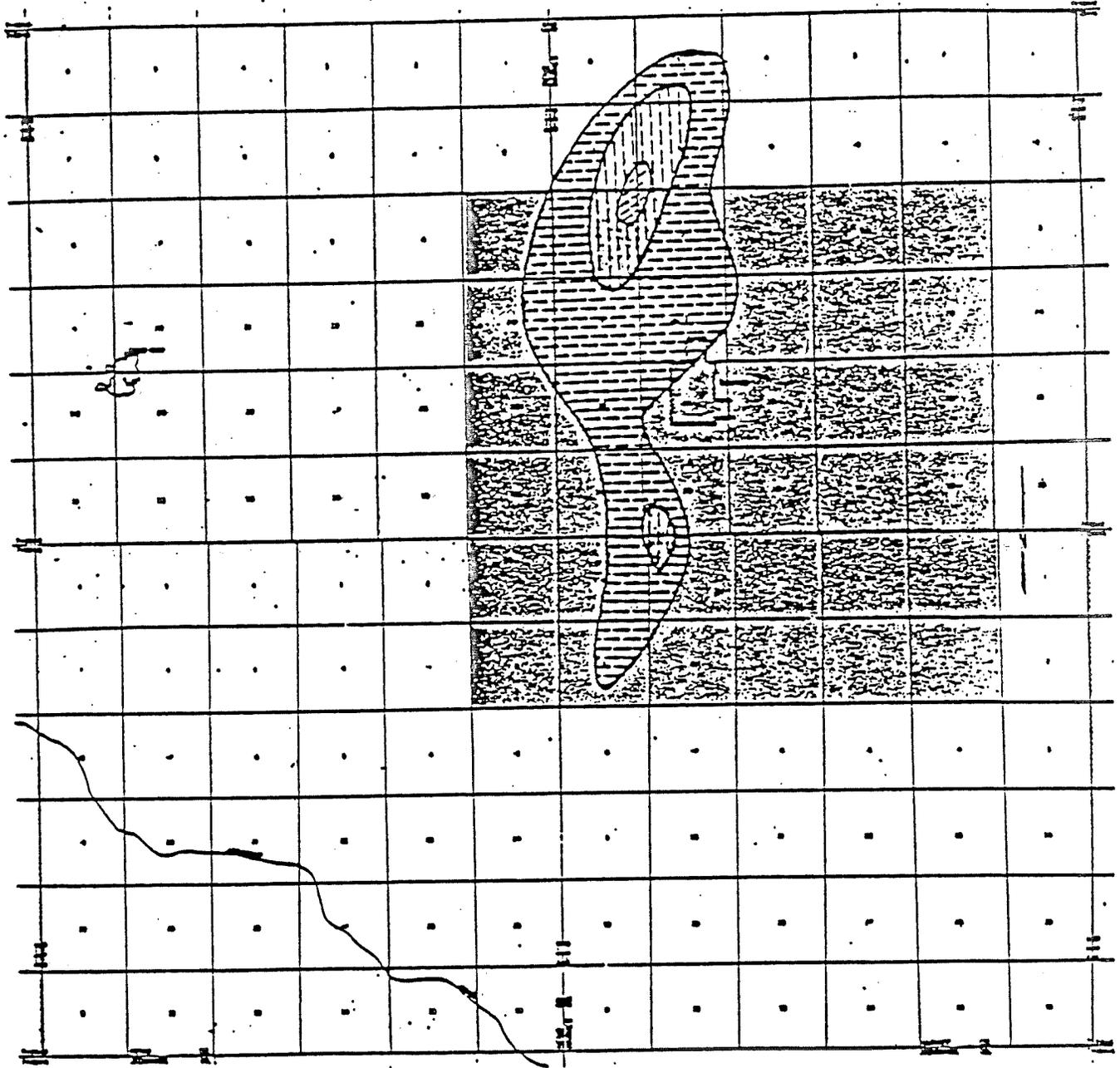
CATEGORY	RATING	WEIGHT	RANKING
Use	4	4	16
Distance	4	3	12
Water Supplies	3	3	9
Contaminant	3	5	15
Vulnerability	3	2	6
Population	3	1	3
Environment	2	1	2
Availability	2	2	4

$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp + E \times We + A \times Wa$$

$$PRN = 4 \times 4 + 4 \times 3 + 3 \times 3 + 3 \times 5 + 3 \times 2 + 3 \times 1 + 2 \times 1 + 2 \times 2$$

$$PRN = 67$$

# 1948 CHLORIDE DATA



From wells less than 50' deep

Proposed IGUCA 

FROM 1948 KDHE FILES

mg/l

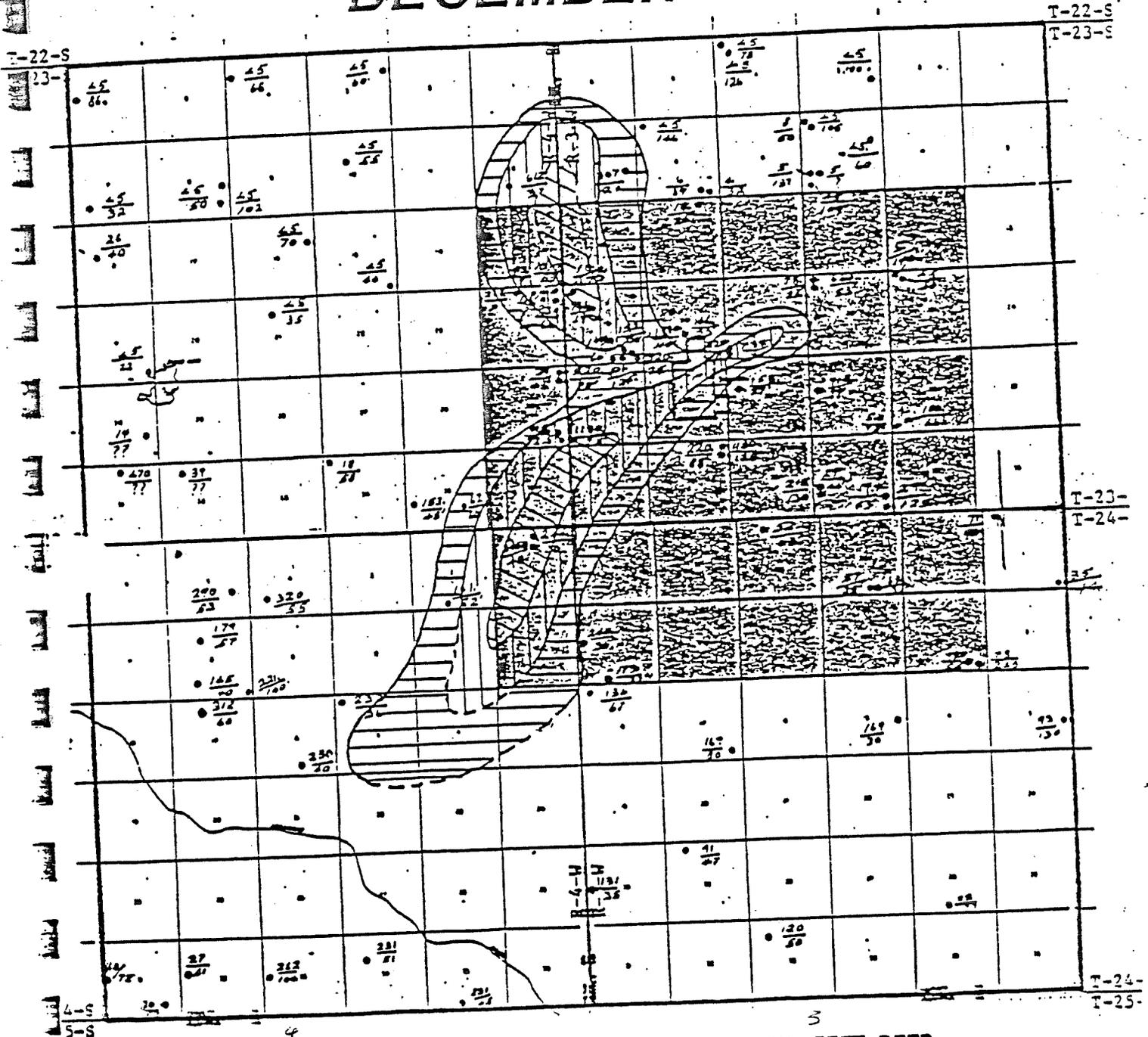
Greater than 1,000 Cl 

Greater than 500 Cl 

Greater than 250 Cl 

Figure 13

# WATER WELL SAMPLING DECEMBER 1982



CONTOURS BASED ON DATA FROM WELLS LESS THAN 50 FEET DEEP

WELL CHLORIDE 120 (MG/L)  
 WELL DEPTH 50 (FT)

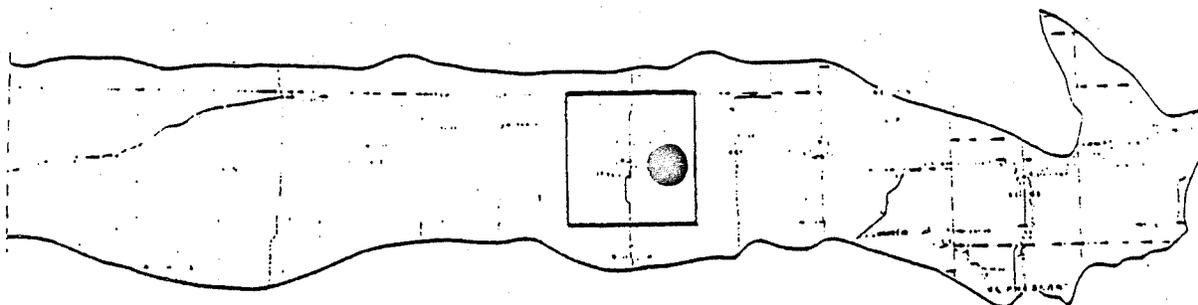
SCALE  
 0 1 2  
 MILES

C1: CONTOUR INTERVALS > 1000 [diagonal lines] 500 [horizontal lines] > 250 [vertical lines]

PROPOSED IGUCA [cross-hatch pattern]

KDHE--- 4/83

## SMOKY HILL — SALINE BASIN



ELLIS COUNTY  
● - Water Contamination Site

### Jim Dinkel Well

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Dinkel well site is one of the priority sites.

A private well and a large area surrounding Mr. Dinkel's farm has been contaminated by oil field pollution resulting from a leaky, shallow disposal well and saltwater ponds.

The contamination area is located within the SE 1/4 of Sec. 32, Township 31 South, Range 17 West, Ellis County, Kansas. The contamination extends one-fourth to one-half mile around the Dinkel farm. The land in the area is used for agricultural purposes with extensive oil production throughout the area.

The estimated cost of site cleanup is \$75,000 to perform the clean-up of the aquifer. The cost would include the pumping and disposal of contaminated groundwater and oversight until the aquifer can be restored to usable quality.

Jim Dinkel

Ellis County

Legal Description: SE 32-13S-17W

Chloride contamination has been detected in a private well and test holes at levels exceeding the current state action levels (KAL) and the federal secondary drinking water standards by ten (10) times (> 2500 ppm). The primary source of the chloride contamination appears to be from oil field activity. The study area covers approximately 640 acres around Mr. Dinkel's farm.

There are no public water supply wells within a nine section area around the site. The contaminated well obtains its water from an unnamed unconsolidated alluvial aquifer which is capable of yielding up to 10 gpm. The land use in the area is primarily crop and range land. The population density in the Cathrine township is less than 5 persons per square mile. The North Fork of Big Creek is located in the study area and is a high-valued fishery resource.

JIM DINKEL

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CATEGORY	RATING	WEIGHT	RANKING
Use	3	4	12
Distance	4	3	12
Water Supplies	0	3	0
Contaminant	3	5	15
Vulnerability	1	2	2
Population	0	1	0
Environment	2	1	2
Availability	0	2	0

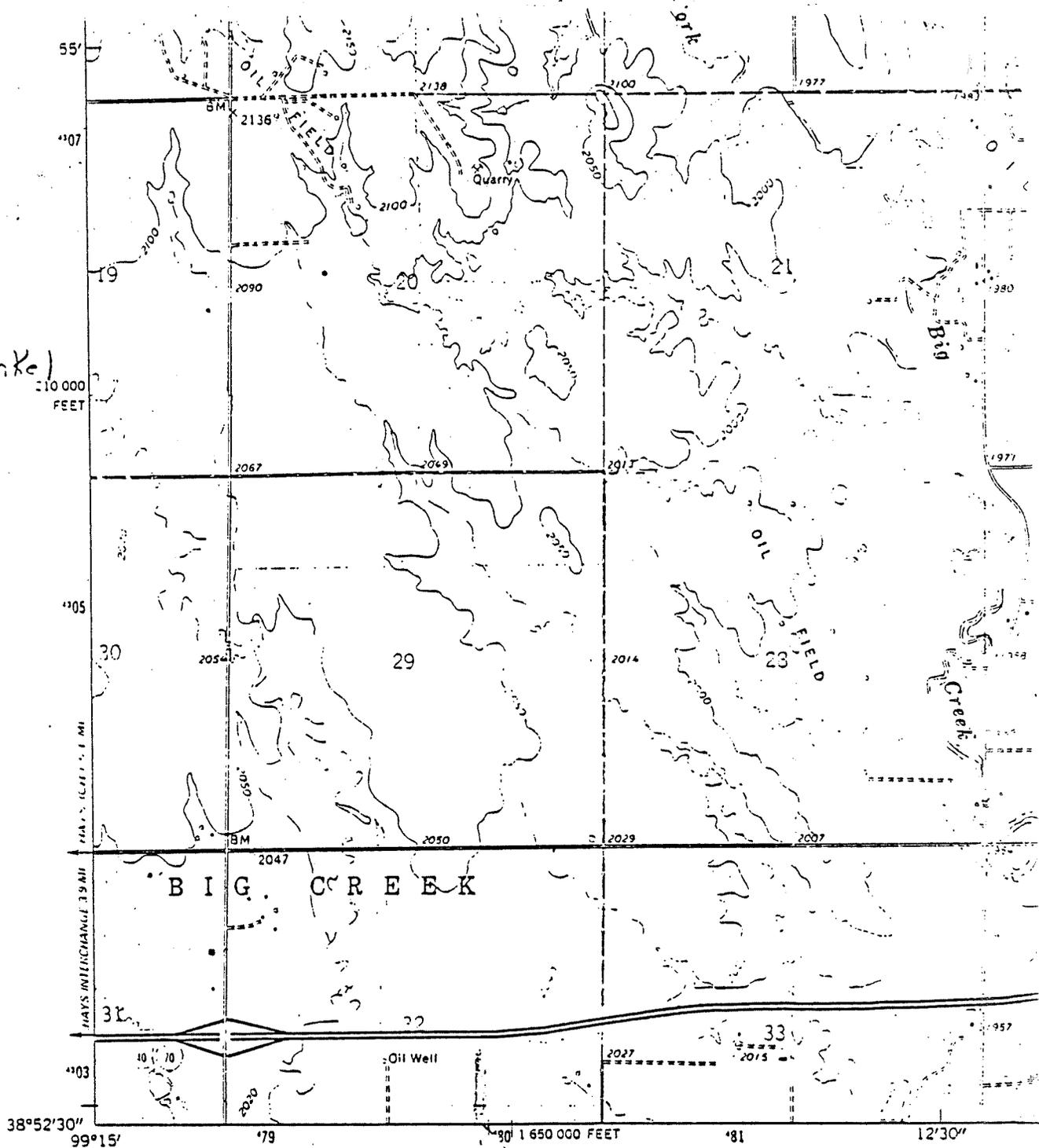
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$$PRN = U \times Wu + D \times Wd + N \times Wn + C \times Wc + V \times Wv + P \times Wp \\ + E \times We + A \times Wa$$

$$PRN = 3 \times 4 + 4 \times 3 + 0 \times 3 + 3 \times 5 + 1 \times 2 + 0 \times 1 + 2 \times 1 + 0 \times 2$$

$$PRN = 43$$

Jim Dinkel  
NW DO



HAYS SOUTH  
61°14' SE

Mapped, edited, and published by the Geological Survey  
as part of the Department of the Interior program  
for the development of the Missouri River Basin

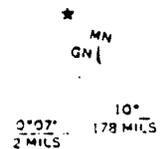
Control by USGS and USC&GS

Topography by photogrammetric methods from aerial  
photographs taken 1959. Field checked 1961

Polyconic projection. 1927 North American datum  
10,000-foot grid based on Kansas coordinate system, north zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 14, shown in blue

Fine red dashed lines indicate selected fence and field lines where  
generally visible on aerial photographs. This information is unchecked

Revisions shown in purple compiled from aerial photographs  
taken 1974. This information not field checked



UTM GRID AND 1974 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

FOR SA

TESTIMONY GIVEN BEFORE THE SENATE ENERGY AND NATURAL  
RESOURCES COMMITTEE, FEBRUARY 10, 1988, REGARDING THE DAKOTA  
AQUIFER STUDY PROGRAM

DR. DON W. STEEPLES, DEPUTY DIRECTOR, KANSAS GEOLOGICAL  
SURVEY

My name is Don Steeples and I am speaking this morning in my capacity as Deputy Director of the Kansas Geological Survey. In that position I am responsible for research program activities of the Survey. My purpose this morning is to brief you about our proposed program of study of the Dakota aquifer in Kansas and to relate this program to the Kansas Geological Survey's internal planning process and to the State Water Plan.

The KGS initiated a self-study and an examination of Kansas needs for geological research upon the appointment of a new director last year. At the same time, through our representation on the Research Committee of the Kansas Water Authority, we participated in the development of the analysis of water research needs of Kansas. From these two efforts, five Kansas Geological Survey programs of research for the future were evolved. The first of these is the study of the Dakota aquifer, which is also the number one priority of research of the State Water Plan.

In cooperation with all of the other state water-related agencies, the Dakota plan of study has been developed and is supported by a memorandum of understanding between the Geological Survey and other agencies, including the federal survey. The interagency memorandum is attached to the back of the proposal summary of which each of you has a copy. The main points of the Dakota study are as follows:

- 1) Overdevelopment of the Ogallala aquifer has led to a serious decline in water availability, both present and future, in wide areas of western Kansas. Current studies do little except

document the decline of the aquifer. The only remaining potential large-scale source of ground water for most of western Kansas is the Dakota aquifer, but it is largely an unknown geohydrologic unit and is thus susceptible to improper future management.

- 2) The Kansas Geological Survey, with the unanimous support of the Water Steering Committee, is prepared to undertake an accelerated study of the Dakota to provide Kansas with an understanding of water quantity and quality and predictability of Dakota water resources. This will lead to better management of the Dakota resource than has occurred with the Ogallala.
- 3) Implementation of the 1987 research committee report in the State Water Plan can be accomplished in part by initiating a long-term study of the Dakota Formation in Kansas and surrounding areas. The Dakota study is part of the Integrated Aquifer Analysis research-need and is listed as a highest priority item.
- 4) Programmatic research is the most cost-effective means of gaining an understanding of the Dakota aquifer. New funds would be combined with existing funding to accomplish a long-term study supported by all water-related agencies, eliminating duplication and giving integration to research efforts by all agencies, including those of the federal geological survey. The Kansas Geological Survey is uniquely qualified and structured to coordinate and conduct long-term geohydrology studies.
- 5) Initiation of this program is proposed on or before July 1, 1988, if funds are appropriated. The total cost of the program over 14 years is estimated at \$6.2 million, of which \$3.0 million would be new funding. First-year new funding is requested at approximately \$170,000 including the State share of cooperative funding with the federal geological survey.
- 6) Study of the Dakota will include gaining knowledge of its sedimentary architecture, structural configuration, hydrology, and water quality to the extent necessary to evaluate the

water-resource potential of this complex aquifer system and the likely effects of its future development.

- 7) Both synopsis of current knowledge and fundamental field studies will be initiated in the first year, providing a knowledge base for construction of sedimentary, stratigraphic, and hydrologic models of the Dakota during the course of the program. Provision is made to address specific concerns or special problems that develop in the state or its communities during the course of research while maintaining progress to completion of the integrated study.

I appreciate the opportunity to present this information today and I would be pleased to discuss the Dakota program strengths with you.

A  
Program Proposal to Assess

THE WATER-RESOURCES POTENTIAL OF THE  
DAKOTA AQUIFER IN KANSAS  
A Long-Term Multi-Agency Research Program

EXECUTIVE SUMMARY

The Dakota aquifer system is an integral part of future water-resources planning for western and south-central Kansas. It is the second most extensive aquifer in Kansas after the High Plains aquifer (Ogallala and associated alluvial aquifers). Figure 1 shows the geographic extent of the Dakota aquifer in Kansas. In the near future, severe depletion of the Ogallala aquifer due to overdevelopment will cause a critical water shortage in western and northwestern Kansas. The Dakota aquifer will be the next available source of water for this region. Preliminary work by the Kansas Geological Survey, funded by a grant from the Kansas Corporation Commission, has shown that fresh and usable waters are present locally in the Dakota aquifer of northwest Kansas. At present, however, insufficient information concerning the quantity and quality of Dakota waters limits the ability of State water planners to evaluate this aquifer as a future major source of water for this region. Equally important, it is crucial to assess the potential effects of development in advance in order to avoid depletions similar to those being experienced in the Ogallala. A significant research effort is needed to develop a sound technical basis on which future water-management and planning efforts can depend.

Responding to this need, the Kansas Geological Survey is proposing to conduct a comprehensive multi-phased, multi-agency study of the Dakota aquifer system in Kansas. The proposed objectives of the program are: (1) to develop a usable and detailed geologic framework of the Dakota aquifer and related rocks that extend from the outcrop areas in central Kansas to the Colorado and Nebraska state lines; (2) to develop a better understanding of the structural configuration of the aquifer; (3) to characterize water availability, the movement of ground water, and the variation of water chemistry within the Dakota aquifer system on a regional and subregional basis; and (4) to assess the effects of various water-management scenarios on the performance of the Dakota aquifer using three-dimensional mathematical simulations (ground-water models). With the completion of objectives 1, 2, and 3, addressing policy concerns and water-management plans (4) for this complex aquifer system will be possible. In an effort to deal with inter-state problems concerning the Dakota, the KGS will contact water planners and managers in adjoining states in order to address concerns dealing with joint areas.

The Dakota aquifer system has the potential for providing new or supplemental water supplies to meet current and future municipal, agricultural, and industrial demands in much of western Kansas. The major water-resource issues that concern the Dakota relate to (1) the quantity and quality of available ground water; (2) the degree of natural saltwater contamination from underlying units; (3) the potential for degradation of water quality due to shallow disposal of oil-field brines in zones beneath the Dakota; and (4) the effect of saline-water discharge on surface-water quality in central Kansas. The suitability of the Dakota aquifer for future water supplies will depend on currently unknown water-quality characteristics in much of the area and on defining hydraulically connected parts of the overall hydrologic system.

Addressing the future water-related issues involving the Dakota aquifer will require an integrated, detailed study of the geologic units, the flow of water through the system, and the variation of water quality throughout the unit. The proposed study will be conducted in several phases over a period of 14 years. Figure 2 shows the timing of the various program elements and tasks to be completed during this program. The Kansas Geological Survey is willing to commit a considerable portion of its resources to ensure the successful completion of this research program. Attached to this document is a preliminary budget summarizing the resources that will be committed to this program by both the KGS and the U.S. Geological Survey. In addition, the budget stresses the need for the funding requested from the legislature in order to complete the program in a timely manner.

The first year of the program will characterize water availability, movement, and quality in this aquifer system; create several Program water-related data bases; develop new cost-effective field

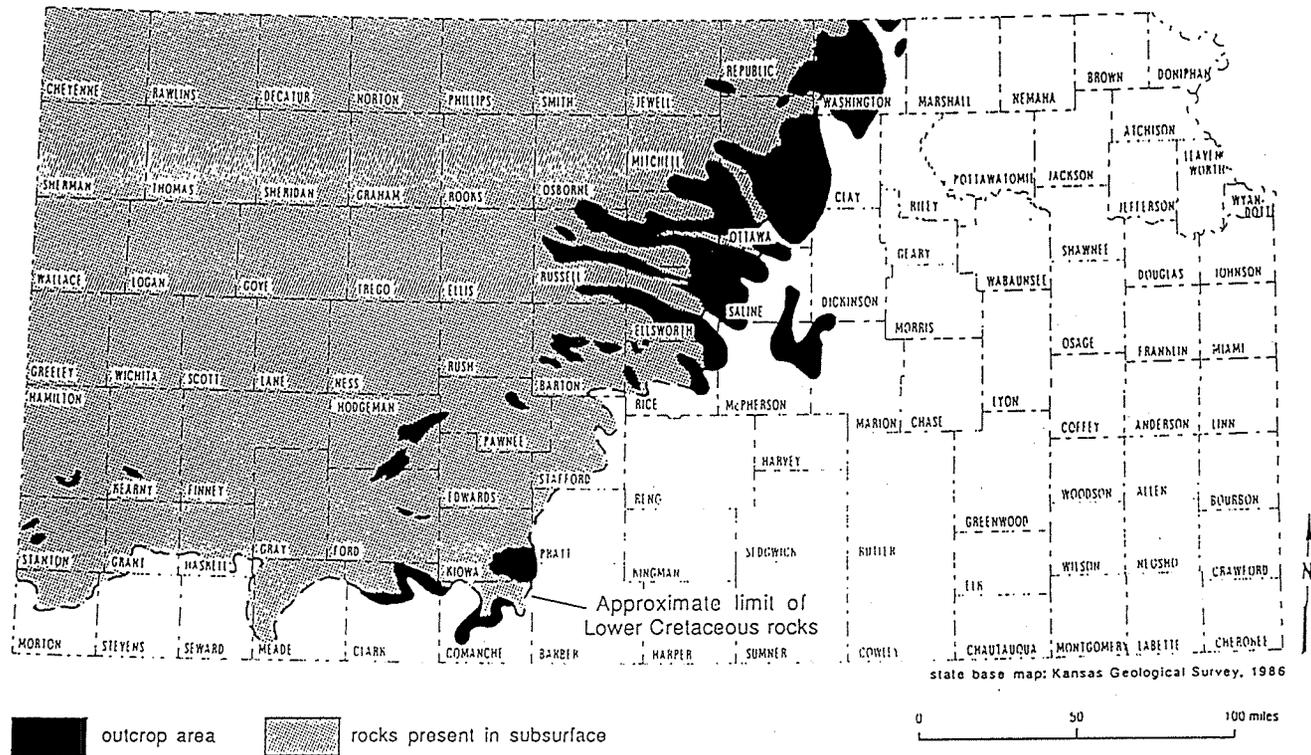


Figure 1

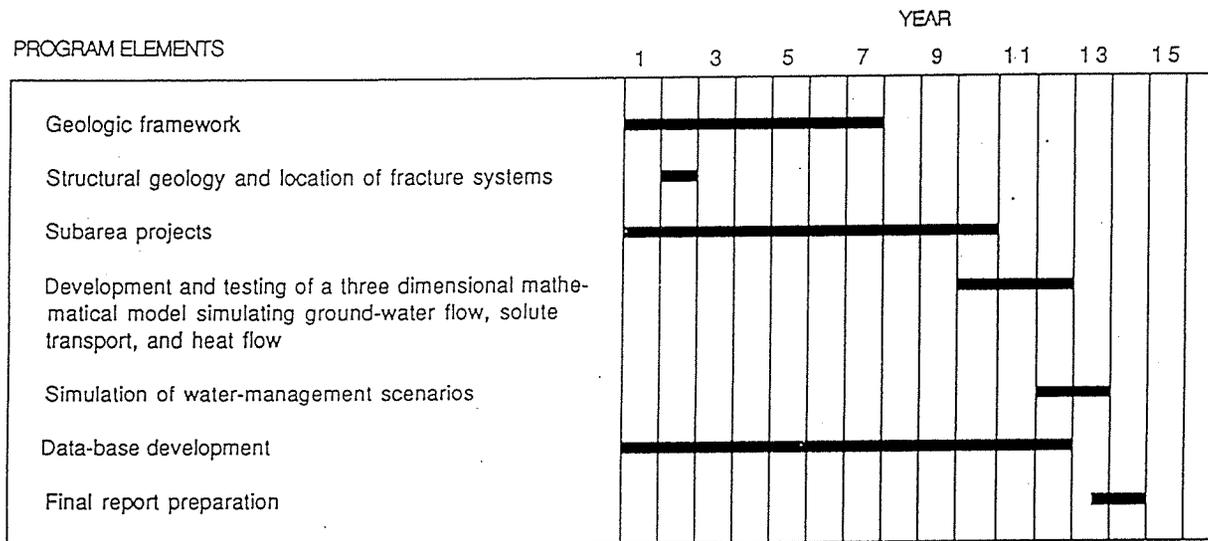


Figure 2

techniques for acquiring information about the geologic framework in areas of sparse data coverage; and update the technical document to reflect any changes in approach or priorities that may arise as a result of the first year's work. The function of the technical document is to provide a structure for the Dakota Program that will be modified and updated to reflect the needs of those involved in the research and the Water Steering Committee.

As part of the work plan, the geographic extent of the Dakota aquifer system will be divided into subareas that will serve as the basis of future programs (Figure 3). The subarea projects will be conducted during years 2 through 10 of the program. Each subarea project will address the basic questions of the geology, hydrology, water quantity, and water quality of the Dakota aquifer. After completion of all the subarea projects (years 11 through 14), the results will be combined and used to address water-management concerns on a statewide basis.

Reports and maps will be completed at the end of each individual research effort. Project reports on the subareas of study will describe the hydrogeology and water chemistry of each part of the Dakota aquifer system in Kansas. Other reports will deal with regional geology, stratigraphy, and other aspects of the research that are not fully addressed in the project subarea reports. Short yearly summaries will present the progress made on individual research projects and any significant findings. Use of this information will permit delineation of regions of the state where usable water supplies are available in the Dakota. It is expected that these documents will aid in defining future research areas on the aquifer system and will update the technical document.

Where appropriate, project results will be added to the Kansas Water Database. Copies of geologic data bases will be made available in paper and electronic form as needed. A final report summarizing the results of subarea-research projects will be prepared and used to assess the impacts of future water-management decisions on the Dakota aquifer system. Additionally, provision will be made to address the short-term needs of water planners and managers that might be outside the research topics of the subarea being investigated at the moment.

Kansas Geological Survey takes the responsibility as the lead agency for conducting and managing this long-term research program and will coordinate its efforts with other Federal, State, and local water-related agencies, where appropriate. This is in accordance with the August 3, 1987, Memorandum of Understanding related to the Dakota aquifer study between KGS and the Kansas State Board of Agriculture, Kansas Water Office, Kansas Department of Health and Environment, U.S Geological Survey, the Groundwater Management Districts, and the Kansas Corporation Commission. KGS shall annually seek advice and recommendations from the Interagency Water Steering Committee on matters that relate to the conduct of this program and will make every attempt to incorporate the Committee's comments into the project work plans to be developed during the course of the program. The members of the Water Steering Committee are the Director (Division of Information Systems and Communications), Director (Kansas Biological Survey), Chairman (Kansas Corporation Commission), Secretary (Kansas Department of Wildlife and Parks), Director (Kansas Geological Survey), Director (Kansas Water Office), Secretary (State Board of Agriculture), Director (State Conservation Commission), and the Secretary (Kansas Department of Health and Environment).

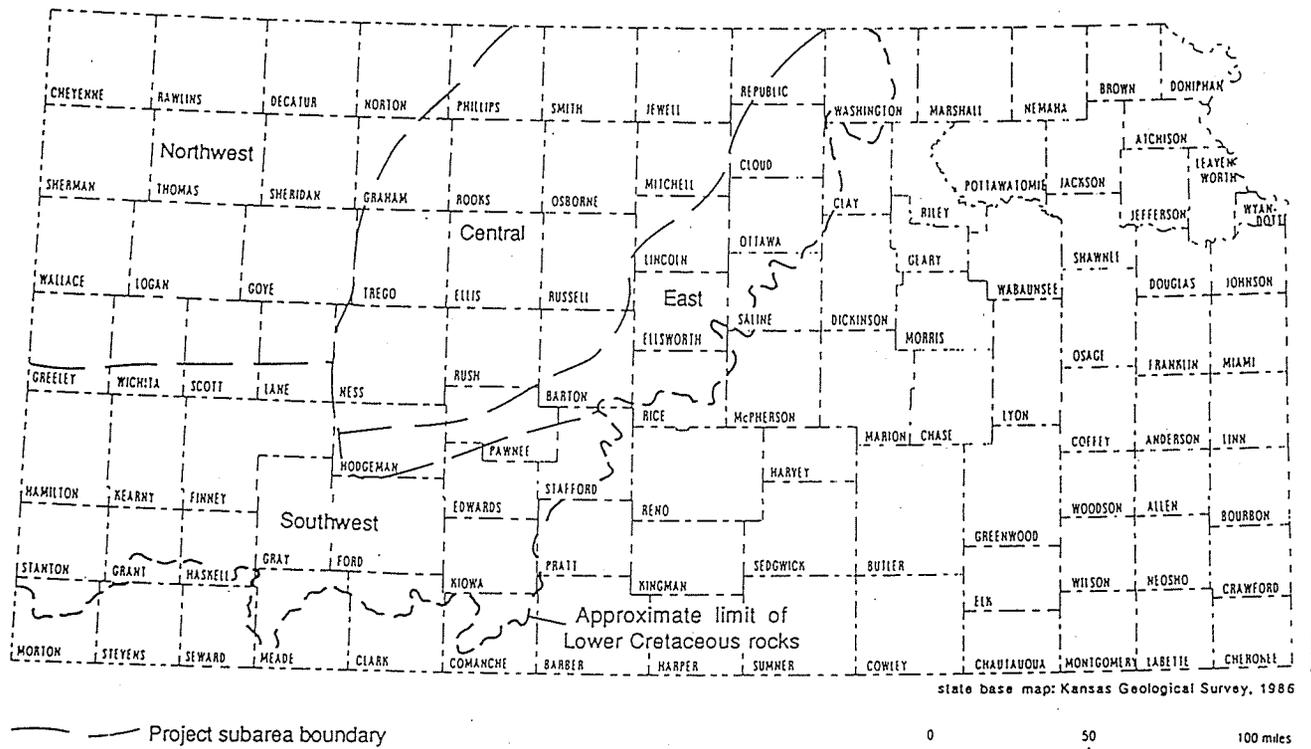


Figure 3

# TOTAL PROJECT BUDGET SUMMARY

July 1, 1988-June 30, 2002

	New Legislative Appropriation To KGS	For USGS	KGS Matching Funds	USGS Fed Matching Funds
<b>PERSONNEL</b>				
12 Scientists			1,581,126	
3 Drillers			86,535	
Secretarial Support			136,775	
Admin. Support	136,775			
Student Research Assistants (9 Mo 50% FTE - 3 Mo 100% FTE)	595,276			
<b>SUBTOTAL</b>	<u>732,051</u>		<u>1,804,436</u>	
<b>FRINGE BENEFITS</b>				
Permanent Staff 21%	28,726		378,929	
Student Research Assistants (0.7% 9 Mo - 8% 3 Mo)	21,549			
<b>SUBCONTRACTS</b>				
USGS Colorado School of Mines	69,660	850,000		850,000
<b>TRAVEL</b>	315,000			
<b>SERVICES</b>				
Computer Time	176,800			
Water Analysis			67,500	
Water Analysis for Isotopes			10,215	
Monitoring Site Construction	125,010			
Installation of 3 5-1/2 in. Steel -Cased boreholes	45,000			
Seismic Studies	499,500			
Wireline Logging	110,025			
X-Ray Mineralogy			17,010	
<b>SUBTOTAL</b>	956,335		94,725	
<b>RESEARCH SUPPLIES</b>			43,540	
<b>EQUIPMENT</b>				
Air Pump Unit	7,000			
Pump/Slug Test Monitoring Equip.	15,000			
<b>TOTAL</b>	2,145,321	850,000	2,321,630	850,000

A PROJECT PROPOSAL

TO CHARACTERIZE THE DAKOTA AQUIFER IN  
KANSAS IN ORDER TO ASSESS FUTURE WATER-  
RESOURCES PLANNING AND MANAGEMENT  
NEEDS

Submitted by

The Kansas Geological Survey

University of Kansas

## Introduction and Overview

The goal of the first-year project in the Dakota Program is to develop a research plan that fulfills the information needs of State water-resources planners and managers. In order to accomplish this goal, it is necessary to characterize ground-water quality and movement and water availability in the Dakota aquifer of western Kansas. As part of this effort, it is also desirable to evaluate the methods and concepts used in previous investigations of this complex aquifer system. To assist in this statewide characterization, new data bases will be developed from the data collected by Federal, State, and local agencies. This characterization and evaluation process will allow an assessment to be made of the status of research on the Dakota aquifer. The concerns of the various State and local water agencies will be actively solicited and used to help define the information needed to make future decisions dealing with water in the Dakota aquifer of western Kansas. Finally, the results of this characterization and evaluation, together with the definition of information needs, will provide a basis for developing future research projects in the Dakota Program and for updating the technical document for the Program.

Described below are the tasks that will be completed or initiated during the first year of the Dakota Program.

### Tasks to be Completed or Initiated in the First Year

#### 1. Data Collection, Review, Assembly, and Synthesis

Future research directions for the Dakota Program will depend on developing a regional, coherent picture of the aquifer based on information from previous studies. This involves collecting all available data from Federal, State, and local water-related agencies, private industry, and the literature. In addition, the source and quality of the data must be documented before new water-related data bases are assembled. These data bases will aid in developing a preliminary regional characterization of water quality, flow, and availability in the Dakota aquifer.

Data are available from the following sources: the U.S. Geological Survey Kansas District Office and Central Midwest Regional Aquifer Systems Analysis (CMRASA) Program, Petroleum Information, the U.S. Department of Energy NURE Program, the water-related and geologic data bases of the Kansas Geological Survey, the Kansas Department of Health and Environment, the Kansas Corporation Commission, the Division of Water Resources, and the Groundwater Management Districts. These sources will be contacted in order to obtain all of the pertinent data that might be useful for this characterization. The collected data will be reviewed to document its value for inclusion into a data base. The Kansas Geological Survey will work to develop a cooperative agreement with the U.S. Geological Survey to accomplish this data collection and documentation process. Under such an agreement, the U.S. Geological Survey will be responsible for all of their Kansas water-related data and other related information used in the CMRASA study of the Great Plains Aquifer System (Dakota and Cheyenne aquifers, and the Kiowa aquitard). The Kansas Geological Survey will collect and document the water-related data pertaining to the Dakota aquifer in the data bases of the various State agencies and the Groundwater Management Districts.

At the completion of this process, both agencies will combine the documented data sets into new data bases, carefully avoiding duplication. The created geologic and hydrologic data bases will be organized into a data-base management system with geographic-information system (GIS) capabilities. In this format the data will be more useful to the various research projects on the Dakota aquifer and will facilitate transfer of information and results to the various user groups inside and outside the Program. The hydrologic data base developed for the Dakota Program will be compatible with the Kansas Water Database Standards (February 1986) and will be used to periodically update the Kansas Water Database during the Program.

The geologic information used in the data base is expected to be diverse. Sources will include, but not be limited to, formation tops from petroleum-industry scout cards, wireline and driller's logs, logs produced from an examination of drill cuttings, seismic data, and maps of surface geology. Each data base will be updated as new information becomes available during succeeding phases of the program.

A wireline (borehole geophysical) log data base will be developed primarily to establish the regional stratigraphic and structural framework of the Dakota and related aquifer units. It is expected that the most available logs will be gamma-ray, resistivity, and porosity (either neutron, sonic, or density).

These logs will be digitized from paper copy or input directly into computer storage if already in digital form on tape.

The hydrologic data base will also be diverse and will include, but not be limited to, information pertaining to well location and construction, water levels, chemical quality, results of pump tests or other hydrologic testing, streamflow, pertinent geologic information, and water-use data.

Initial development of project data bases will utilize the existing FORMS utility on the KGS's Data General MV/20000 computer. This utility provides full-screen applications development for data entry and management. The Kansas Geological Survey is currently evaluating data-base management systems (DBMS). A relational DBMS should be installed during this first year of study. This will enhance capabilities to associate multiple attributes with point, line, or area features. In the event that this is not possible during this first year, temporary access to the U.S. Geological Survey data-base management and GIS system will be negotiated as part of a cooperative agreement until the KGS systems are fully operational.

The new geologic and hydrologic data bases will be used to summarize data and produce maps and cross sections of the Dakota and interconnecting bedrock aquifers. This process will be facilitated by the application of the GIS. Maps and cross sections will show the variation in ground-water quality, flow patterns, top configuration, and thickness of the Dakota aquifer; relationships with other aquifer systems; and distribution of data points. Statistical analysis of the data also will be possible once the data are in an organized form.

## 2. Definition of the Geologic Framework

A thorough understanding of the geologic framework is necessary in order to: (1) predict water availability and the flow of water and dissolved constituents in the Dakota aquifer; (2) identify areas where the Dakota aquifer is hydraulically connected with other adjacent aquifers; and (3) map the depth to the top of the Dakota from the land surface as this factor may affect future use.

Figure 1 is a schematic stratigraphic column showing the major geologic units that comprise the Lower Cretaceous-age rocks in Kansas. These rocks are composed of interbedded sandstones and shales that were deposited under a complex of marine and nonmarine (terrestrial) conditions during the early part of the Cretaceous Period (approximately 100-110 million years ago). As a result, the distribution of sandstones and shales in the Dakota aquifer is extremely complex as indicated by the finely and coarsely stippled patterns in the figure.

At present, no usable geologic framework for the Lower Cretaceous rocks in the subsurface exists. This has occurred because of miscorrelation of formation boundaries between surface exposures and the subsurface and limited understanding of Lower Cretaceous depositional systems. Typically, formation tops are picked empirically from either wireline logs or drill cuttings. However, due to variation between the petrophysical properties measured by the logging tools and lithologic characteristics that define formational boundaries in the outcrop, miscorrelation of formations frequently occurs. These are problems that can be resolved only by defining the stratigraphy and the geologic-time framework of the units, by working out the relationships between rock types within the Lower Cretaceous, and then by defining formational boundaries in a logical way.

During the first year, work will begin by examining data sources that are readily available, such as geologic reports of the Kansas Geological Survey, theses and dissertations from universities, geologic data from outcrop and subsurface studies, and the core and sample library of the Kansas Geological Survey. Particular attention will be paid to the availability of cores for use in correlating time lines from surface exposures into the subsurface. Also during this first year, field work will begin along the outcrop to establish this geologic framework and to work out the sedimentary history of the Lower Cretaceous rocks. This will include some test drilling of the subsurface to extend the time lines established in the outcrop areas. Once these objectives are accomplished, distribution of depositional environments can be broadly outlined to predict the location of major zones of sandstone in the Dakota Formation and related rocks. Work on establishing the geologic framework is expected to be completed by the end of the fourth year of the Dakota Program.

## 3. Feasibility of Using Seismic Stratigraphy Methods

The seismic-reflection method has been used by the petroleum industry for the past 60 years to determine subsurface geologic structure to depths of several thousand feet. Refinements in seismic-reflection technology in the past 20 years have allowed for examination of stratigraphic variations by

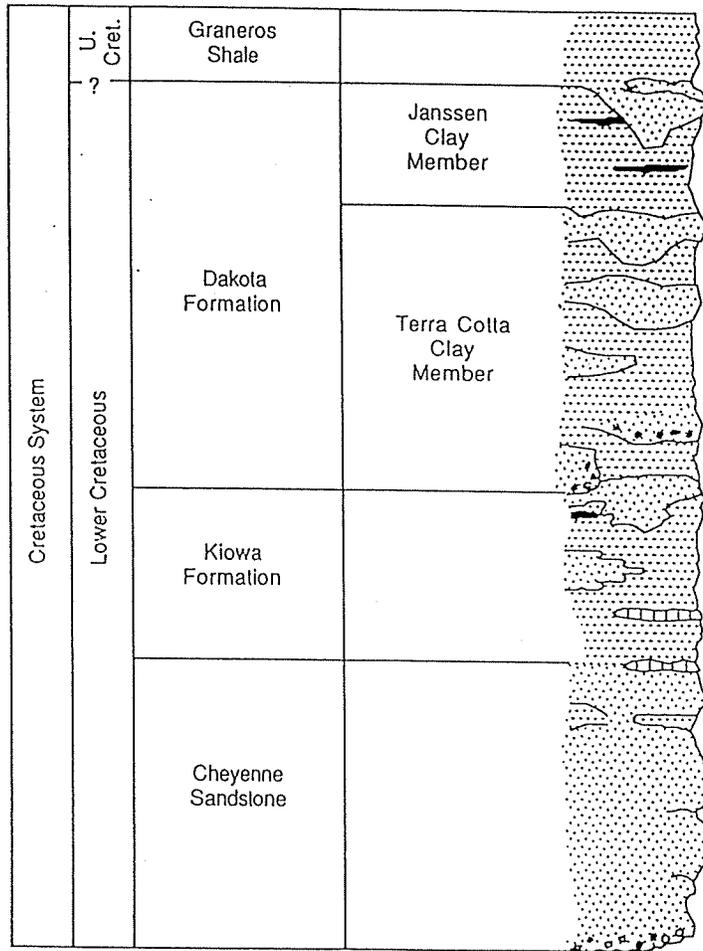


Figure 1

seismic methods, commonly called seismic stratigraphy. Work at the Kansas Geological Survey has refined the resolution capability of the method to be very effective at depths of less than 1500 feet. Because the Dakota is present throughout much of Kansas at depths of less than 1500 feet, the methodology exists to examine both the gross geologic structure of the Dakota and the stratigraphy within the Dakota.

It is proposed that the first year of the project will be used to refine the technique so that eventually it will be applicable to a detailed examination of the Dakota on a wide scale. A small-scale study would involve running short seismic-reflection lines at locations where good drill data and borehole geophysical logs are available. The survey would have three objectives: (1) to determine what field procedure is required to obtain good reflection data from the Dakota (this will allow cost-effectiveness estimates for any future large-scale seismic surveys); (2) to verify the interpretation of the seismic-reflection data using synthetic seismograms generated from borehole geophysical logs; and (3) to compare the synthetic seismograms and the seismic-reflection data to permit reasonable estimates of resolution capability of the method for any future surveys.

## Expected Results and Products

At the end of the first year, KGS expects to have prepared the following items: (1) a regional characterization of the Dakota aquifer in Kansas, based on what is currently understood, using maps and cross sections, to show the geology and hydrology of this system; (2) geologic and hydrologic data bases containing the documented data from previous investigations of the Dakota (these will be compatible with the Kansas Water Database); (3) an assessment of the suitability of seismic-reflection methods for "filling in" areas of sparse data coverage; and (4) an updated technical document for the Dakota Program specifying the projects and the subdivisions of the geographic extent of the Dakota aquifer into subareas and their order of study.

BUDGET FOR FY 89  
YEAR 1  
July 1, 1988-June 30, 1989

	New Legislative Appropriation to KGS	Legislative for USGS	KGS Matching Funds	USGS Fed Matching Funds
PERSONNEL				
4 Scientists, \$3575/Mo, 51%			87,516	
3 Drillers \$1722/Mo, 22%			13,638	
Secretarial Support 50%			8,000	
Admin. Support 50%	8,000			
4 Student Research Assistants \$1150/Mo (9 Mo 50% FTE - 3 Mo. 100% FTE)	34,500			
SUBTOTAL	42,500		109,154	
FRINGE BENEFITS				
Permanent Staff 21%	1,680		22,922	
Student 9 Mo 0.7%, and 3 Mo 8%	1,248			
SUBCONTRACTS				
USGS		60,700		60,700
Colorado School of Mines Tim Cross, 1 Mo	6,600			
TRAVEL				
	22,500			
SERVICES				
Computer Time (\$170/CPU Hour x 60 CPU hours)	10,200			
Seismic Studies	20,000			
RESEARCH SUPPLIES				
			3,110	
TOTAL				
	\$104,728	\$60,700	\$135,186	\$60,700

Date: November 30, 1987

**MEMORANDUM OF UNDERSTANDING**

between

**THE KANSAS STATE BOARD OF AGRICULTURE, KANSAS WATER OFFICE,  
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT,  
KANSAS DEPARTMENT OF WILDLIFE AND PARKS,  
KANSAS GEOLOGICAL SURVEY, U.S. GEOLOGICAL SURVEY,  
GROUNDWATER MANAGEMENT DISTRICTS, KANSAS CORPORATION COMMISSION  
KANSAS BIOLOGICAL SURVEY, STATE CONSERVATION COMMISSION  
AND THE DIVISION OF INFORMATION SYSTEMS AND COMMUNICATIONS  
RELATED TO  
DAKOTA AQUIFER STUDY**

The intent of this agreement is to establish a basis for mutual understanding and cooperation between the Kansas State Board of Agriculture, Kansas Water Office, Kansas Department of Health and Environment, Kansas Department of Wildlife and Parks, Kansas Geological Survey, U.S. Geological Survey, groundwater management districts, Kansas Corporation Commission, Kansas Biological Survey, State Conservation Commission and the Division of Information Systems and Communications for the purpose of conducting and coordinating a Dakota Aquifer Study to begin in FY 1989, and extend, depending upon a continued source of funding, through FY 2001. This study will utilize current knowledge from all relevant Dakota-related studies conducted prior to the enactment of this memorandum of understanding.

**I. INTRODUCTION**

More than 80 percent of the water used in Kansas comes from groundwater sources. However, some of the presently known and well defined major sources of groundwater (particularly the Ogallala Aquifer) are being depleted. In order to maintain and enhance the continued growth of the Kansas economy, it is essential that the state try to identify and develop additional sources of groundwater supply.

One major potential source of additional groundwater supply is the Dakota Aquifer System, which underlies most of central and western Kansas. However, the present knowledge about the quantity and quality of water that is available from this aquifer is not adequate to define all of the locations in central and western Kansas where it is a dependable source of water supply.

More definitive knowledge about the Dakota Aquifer system will provide valuable information for developing technically sound and economical state water plans, for making future water appropriation decisions, for developing optimum utilization of the state's groundwater resources and for protecting the water of the Dakota Aquifer from possible contamination by the disposal of oil field brines.

## II. RECENT STUDIES RELEVANT TO THE DAKOTA AQUIFER

In 1986 and 1987, a number of monitoring sites (new observation wells and old wells) have been installed or acquired in the western and central Kansas counties of Ellis, Russell, Sheridan, Graham, Thomas and Cheyenne. Consequently, water samples from these wells have been taken and analyzed from the Dakota Formation and related beds. This work utilized \$100,000 of the Kansas Corporation Commission fee fund money and \$30,000 Regional Aquifer Systems Analysis money from the U.S. Geological Survey.

Another study of related interest is the Cedar Hills Sandstone Disposal well study. This is an ongoing interagency study with a goal of evaluating disposal wells that may be intensifying the natural salt water flow into the Great Bend Prairie. It is hoped that this work can

determine if and where monitoring may be necessary for new Cedar Hills wells or where future Cedar Hills disposal should be prohibited. Hydrologic information on the Cedar Hills is important because, in a number of areas, this formation may have an adverse effect on the quality of water in the Dakota Formation through connecting sandstone zones.

### **III. INTERAGENCY WATER STEERING COMMITTEE**

#### **A. Committee Membership**

The Director (Division of Information Systems and Communications), Director (Kansas Biological Survey), Chairman (Kansas Corporation Commission, Secretary (Kansas Department of Health and Environment), Secretary (Kansas Department of Wildlife and Parks), Director (Kansas Geological Survey), Director (Kansas Water Office), Secretary (State Board of Agriculture) and the Director (State Conservation Commission) shall serve on the Interagency Water Steering Committee. The committee chairperson shall be the Director of the Kansas Water Office.

#### **B. Committee Objectives**

1. Support the Kansas Geological Survey as the appropriate agency to request research funding for the Comprehensive Dakota Aquifer Study.
2. Approve and support the Plan of Study, as described in the attachment.
3. Discuss all major budgetary and policy concerns related to the Plan of Study and recommend appropriate action.
4. Review recommendations/concerns submitted by the Interagency Dakota Technical Committee and recommend appropriate action.

5. Meet on a semi-annual basis or upon request of the Interagency Water Steering Committee chairperson.

#### **IV. INTERAGENCY DAKOTA TECHNICAL COMMITTEE**

##### **A. Committee Membership**

The agencies/entities listed in Section VII, shall designate not more than two persons to serve on the technical committee. Each agency/entity shall have only one vote. The committee chairperson shall be appointed by the Director of the Kansas Water Office.

##### **B. Committee Objectives**

1. Reach agreement on recommendations regarding the Plan of Study and submit them to the Interagency Water Steering Committee for approval and/or revision.
2. Meet on a semi-annual basis to discuss and review the Kansas Geological Survey's semi-annual status report on the Dakota Aquifer Study or upon request of the Interagency Dakota Technical Committee chairperson.
3. Provide the steering committee with minutes from each technical committee meeting.
4. Provide the steering committee with a summary of any major budgetary or policy concerns.

#### **V. CONTRACTUAL AGENCY**

All special funding for the Dakota Aquifer Study should be placed or transferred to the Kansas Geological Survey budget to be used as appropriate to the study plan, as determined by the Kansas Geological Survey, with oversight provided by the Interagency Water Steering Committee. The Technical Committee shall make

recommendations to the Steering Committee as to suggested allocations of funding for cooperative programs with the U.S. Geological Survey. The Kansas Geological Survey may, and is encouraged to, exercise cooperative agreements with the U.S. Geological Survey to provide federal funding and manpower to the project.

#### **VI. PLAN OF STUDY**

A comprehensive long-term technical proposal for Dakota Aquifer Research has been prepared by the Kansas Geological Survey and has been endorsed by the Interagency Dakota Technical Committee as a working document. The official Plan Of Study will be developed in annual increments. It shall be reviewed and modified, if necessary, by the Technical Committee and submitted to the Steering Committee. The Steering Committee shall then suggest any additional changes in the Plan Of Study to the Kansas Geological Survey and decide upon appropriate budgetary action. The Executive Summary and "A Project Proposal to Characterize the Dakota Aquifer in Kansas in Order to Assess Future Water Resources Planning and Management Needs" are attached as the initial Plan of Study and are part of the Memorandum of Understanding.

#### **VII. SIGNATURE**

In witness thereof, the parties have signed this agreement and agree to abide with the basic conditions, within the law, of this memorandum of understanding.

1 Dec 87  
Date

*J. Harkins*  
Joseph F. Harkins, Director  
Kansas Water Office

December 1, 1987  
Date

*Keith Henley*  
Keith Henley, Chairman  
Kansas Corporation Commission

Dec. 1, 1987  
Date

*Stanley Grant*  
Stanley Grant, Secretary  
Kansas Department of Health  
and Environment

Dec. 2, 1987  
Date

*Sam Brownback*  
Sam Brownback, Secretary  
Kansas State Board of  
Agriculture

Dec 1, 1987  
Date

*Thomas L. Huntzinger*  
Tom L. Huntzinger, Acting  
District Chief, U.S. Geological  
Survey

Dec 4, 1987  
Date

*Ralph K. Davis*  
Ralph K. Davis  
Groundwater Management District  
Association

December 1, 1987  
Date

*Lee C. Gerhard*  
Lee C. Gerhard, Director  
Kansas Geological Survey

Dec. 2/1987  
Date

*Robert L. Meinen*  
Robert L. Meinen, Secretary  
Kansas Department of Wildlife  
and Parks

December 1, 1987  
Date

*Edward Martinko*  
Edward Martinko, Director  
Kansas Biological Survey

12/2/87  
Date

Kenneth F. Kern  
Kenneth F. Kern, Exec. Director  
State Conservation Commission

12-01-87  
Date

Russell Getter  
Russell Getter  
Division of Information Systems  
and Communication

STATE OF KANSAS



Mike Hayden, Governor

KANSAS WATER OFFICE  
Joseph F. Harkins  
Director

Suite 200  
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913-296-3185

**M E M O R A N D U M**

Date: January 15, 1988  
To: Interested Persons  
From: Joseph F. Harkins  
Subject: Governor's Budget

Attached is information on Governor Hayden's \$4,170,000 funding package to implement the State Water Plan for Fiscal Year 1989.

Attachment A is taken from the Governor's message to the Legislature. Note in particular his statement on long-term funding from lottery proceeds (page 44, last paragraph), and improved coordination (page 53).

Attachment B is a summary list of recommended projects

Attachment C contains details of each recommended project.

JFH:dk  
Attachments

ATTACH V  
2-10-88

**Attachment A**

## Conservation of Natural Resources

One of the hallmarks of my administration will be the commitment to protect our environment and to manage our state's natural resources wisely. How we address these issues in the next few years will have far-reaching implications for the quality of life enjoyed by present and future generations of Kansans. The generations of Kansans that will follow in our footsteps must be presented with an environment that is clean, an environment in which they can raise their families in health and safety, an environment in which they can fulfill their dreams and aspirations. We can no longer continue to deal with our environmental and natural resource problems on a piece-meal, crisis-to-crisis basis.

Conservation of natural resources is intimately linked with the long-term economic vitality of our state. Responsible, effective economic development must go hand-in-hand with preserving the unique environment that is Kansas. In turn, maintenance of a healthy environment and proper management of our natural resources will provide a climate that is conducive to balanced and sustained economic growth.

For these reasons, I am recommending that a portion of the lottery proceeds set aside for economic development purposes be committed this year to conservation and development of natural resources in Kansas. And further, I am recommending that when the state's financial obligations for property reappraisal are completed, a portion of the lottery proceeds be dedicated to projects which conserve and develop our

state's natural resources. Your support of these actions will provide funding for state purposes which have been inadequately tended in the past and will at the same time avoid tying an unpredictable revenue source to on-going operations of state government.

In accord with these objectives, I want to review several recommendations concerning the environment and natural resources.

### Water

Our forefathers learned quickly of the vast differences between the east where we have as much as forty inches of average annual rainfall, and the west where rainfall averages as little as fifteen inches a year. They were faced with the eminent threat of flooding in the east and droughts in the west. They encountered shortages of water supplies for planned urban development in both the east and the west. They lacked access to water-based recreational facilities in many areas of the east; such facilities were virtually nonexistent in the western half of the state.

Over the years, we have made substantial progress in responding to these inherent problems. We have built thousands of dams, large and small, to protect our urban and rural areas from costly floods and provide much needed water supply and recreation. In the west we surveyed and exploited one of the world's largest underground freshwater bodies, the Ogallala Aquifer, and fostered one of the most productive agricultural economies in the world.

We have learned, sometimes the hard way, that once we alter our environment, we must protect those alterations from the forces of nature. For example, dams already built must be inspected and maintained; reservoirs cannot be allowed to fill up with silt or the water supplies and the recreational facilities we have come to enjoy will disappear.

We have also learned that there are limits on our ability to modify the natural environment. Sometimes we have gone too far. We cannot afford to deplete our precious groundwater resources, or we will do irreparable harm to our natural environment. When we destroy too much of our natural wetlands and riparian areas, we do more harm than good. We must strike a balance and live in harmony with nature, even if that means returning wetland and riparian areas to their original state.

Responding to the excesses and shortages dealt to us by nature is not our only problem. We must deal with the man-made problems we have brought upon ourselves, the most serious of which is chemical and saltwater pollution of our water supplies.

Plans which respond to issues affecting our natural resources have been developed. The Kansas Water Authority and the Kansas Water Office in cooperation with citizens from across our state have identified water problems and outlined a course of action for conserving our water resources. The time for implementation is upon us, and I am recommending action on a number of fronts.

For FY 1989, I am recommending funding for the completion of the Centralia Site 50 multipurpose small lake and for state participation in the Wellington multipurpose small lake. These multipurpose projects will provide the optimum utilization of the best available reservoir sites. The state's assistance in these projects will assure that the maximum benefits are achieved for the combined purposes of flood control, water supply storage, and recreation.

In 1987, funds were appropriated for the purpose of adding water supply to the Centralia flood control structure. The state's share for the land treatment will help protect this reservoir from siltation. The Wellington site is being developed by the city to expand its existing water supply capacity. The state's participation in this project will be for adding flood control to the structure, sharing in the recreation benefits of the structure and the associated land treatment.

#### Recreation and Wildlife

As we have gone through the difficult times of the past few years, we have become increasingly aware of the significant contributions of recreation and tourism to our Kansas economy. Other states around us are eagerly pursuing recreation and tourism development. The state must invest in outdoor recreational facilities in order to maintain and improve this important segment of our economy.

For example, recreational facilities at Hillsdale Lake are inadequate to meet the demand generated by proximity to the Kansas City metropolitan area. At the present time, there are only limited park facilities at the reservoir. This minimal development has led to a concern about public safety. There is little security at the lake, and the available boat ramps are insufficient to get all boats out of the water quickly in the event of a storm.

In 1981, the legislature created Hillsdale State Park. However, no state money was appropriated to construct the park at that time. The Department of Corrections received \$300,000 in FY 1988 for recreation development and maintenance at the park. The Kansas Department of Wildlife and Parks is developing an agreement with the federal government to lease the lands around Hillsdale Lake. Johnson and Miami counties have a high interest in Hillsdale recreational development, and their advice will be valuable as we pursue this agreement. I am recommending funding to develop a master plan for recreation and wildlife at Hillsdale Lake. Also included is funding for the Department of Wildlife and Parks to begin implementation of this master plan in cooperation with the Department of Corrections and local officials.

Last month I signed a memorandum of understanding with the Bureau of Reclamation which clears the way for the state and federal government to maximize the benefits of Cedar Bluff Reservoir. Since water supply from the reservoir is inadequate to meet all demands, this agreement is an essential first-step in changing

the operation of the reservoir to maximize the fish, wildlife, and recreation uses of the reservoir for the people of Kansas.

Cedar Bluff Lake is the only major opportunity for water-based recreation in this region of Kansas. The final draft of this agreement was reviewed at a public meeting in Ness City which was attended by over 175 people. Those in attendance indicated resounding support for its implementation.

Execution of this agreement will require approval from the U.S. Congress to reassign the project purposes of the lake and funding through the Kansas Department of Wildlife and Parks to acquire the storage area. Your support of this proposal will give the State of Kansas control of the storage space in the lake and result in the maximum utilization of the lake's fish, wildlife, and recreational benefits.

Since 1955, an estimated 40 percent of the wetlands in Kansas have been lost due to conversion, depletion, and stream alteration. Although remaining wetlands are not extensive in size, they are important to numerous wildlife species and for improving water quality by helping to control non-point source pollution. Wetlands in south-central Kansas are also important for regional groundwater recharge during summer drawdown periods.

To implement the wetland protection program established last year, I am recommending funding to begin acquisition of critical natural wetlands from willing sellers. This money can also be matched equally with Ducks Unlimited funds for waterfowl management.

In Kansas, where well over ninety-five percent of the land area is privately owned, any meaningful conservation of our wildlife resources must be done through habitat protection and enhancement on these privately owned lands. The Department of Wildlife and Parks will be focusing on cooperative efforts with farmers and other private landowners to protect and develop wildlife habitat. A unique opportunity to do so is presented through the Conservation Reserve Program (CRP) authorized under the federal Food Security Act of 1985. Highly successful in Kansas, CRP has already taken nearly two million acres of highly erodible cropland out of production, and estimates are that this figure may reach three and one-half million acres in the next several years.

I am recommending that the Department of Wildlife and Parks establish an incentives program to encourage farmers to consider CRP practices that are most beneficial to wildlife -- such as tree and shrub planting -- by helping defray their costs of establishing these practices. This program will not only benefit wildlife habitat but will also help to assure long-term protection of the soil.

#### Water Quality

Clearly, prevention is the best method of protecting the water supplies of the state from contamination. However, modern society has a myriad of substances that have the potential to contaminate surface water and groundwaters in varying degrees. Public concern over water quality issues has been

growing steadily in recent years. As the number of pollution incidents increase, they touch the lives of an increasing number of citizens.

Serious contamination of water supplies resulting from mining in southeastern Kansas and extensive saltwater contamination in the oil-producing areas of our state demand, and will receive, my attention in the months ahead.

A first priority is to protect our public drinking water from contamination. Industry, agriculture, and our individual lifestyles all have impact on the quality of the water supplies of the cities and towns of the state. Kansans must have a dependable supply of clean water for their consumption, and they must have modern and dependable wastewater treatment facilities in their communities. The federal government has adopted a phased withdrawal of assistance for these purposes, and I am recommending the establishment of a state revolving-loan fund for building wastewater treatment plants in Kansas communities.

Not only are clean, dependable water supplies necessary for human health and well-being, but they are key elements looked for in any responsible economic development efforts. Protection of our water can be assured only by effective controls on water pollution--controls that prevent pollutants from entering our streams, rivers, lakes, and groundwaters. I am pledged to take every step necessary to reduce the contamination of the waters of the state!

The Kansas Department of Health and Environment has identified over 330 contamination sites statewide and has established priority sites for cleanup for FY 1989. I am recommending a major initiative for the Kansas Department of Health and Environment to clean up these highest priority contamination problems.

Mining and smelting activities in Cherokee County dating to the 1880s caused widespread environmental contamination throughout the area. The contamination has affected both surface and groundwater quality with contaminants above drinking water standards in the shallow aquifers. This area has been designated as a national priority under the federal superfund, and initial cleanup plans are in progress. I am recommending matching funds necessary for the first phase of cleanup in Cherokee County.

Eight saltwater contamination sites were also established as priority sites for cleanup. These eight sites are of particular concern because of their potential for spreading contamination to nearby water supplies. Therefore, I am recommending funding to clean up these eight saltwater contamination sites for FY 1989.

Finally, I am recommending funding from the hazardous waste cleanup fund. A portion of these funds will be used for the cleanup of four priority contamination sites. The balance will be used by the Kansas Department of Health and Environment to respond to emergency cleanup situations statewide. Each year there are incidents within the state in which hazardous materials are released into the environment. Approximately 400 incidents of this type occur

annually. Responses to such incidents vary widely according to the nature and the magnitude of the spill. While the response may be relatively small, the handling of such incidents requires flexibility in both the technical approach and in the expenditure of funds. For these reasons, it is important for the Kansas Department of Health and Environment to maintain the funds necessary to respond to these emergencies.

#### Improved Coordination

During the fourteen years I was in the legislature, there were several attempts to improve the organizational capacity of state government to deal with the important issues of water, other natural resources, and the environment. I believe we should continually look for the most efficient and effective methods of dealing with our responsibilities in these areas.

Last year, I took the initiative in executive reorganization to consolidate the Kansas Park and Resources Authority with the Kansas Fish and Game Commission into a single, cabinet-level Department of Wildlife and Parks. This action raised the standing of this segment of natural resources in state government. This reorganization is already paying dividends in improved coordination and cooperation, not only between wildlife and recreation interests, but with other departments such as Commerce and Corrections and the Water Office.

While I do not rule out additional reorganization in the future, I believe much can be done to improve the efficiency and effectiveness of the system we have in

place today. As a starting point, I have directed the heads of all water-related agencies to explore options for developing more coordinated planning and management. They have already begun their discussions, and I expect to have a proposal from them that can be reflected in the 1990 budget. My intent is to encourage full cooperation and communication among all agencies to achieve greater efficiency. I can say to you that the people I have selected to manage our state agencies are committed to this goal.

## NATURAL RESOURCES

The Governor's FY 1989 budget includes major new investments in the state's natural resources. The Governor recommends expenditure of \$4 million from the Economic Development Initiatives Fund for 14 projects to enhance local water supply, provide for flood control, restore contaminated groundwater supplies, and develop regional recreational opportunities. The Governor also recommends expenditure of \$170,000 in oil overcharge funds to study the Dakota Aquifer as a major source of future water supply for Kansas. Specific recommendations are summarized in the table below, which details the projects, administering agencies and recommended funding levels.

## NATURAL RESOURCES

AGENCY/PROJECT	FUNDING
<b>Department of Health and Environment</b>	
Galena Superfund Site—State Match .....	\$500,000
<b>Saltwater Contamination Cleanup</b>	
Wilgus Water Well—Saline County .....	250,000
Brother's Lease—Rice County .....	100,000
Raymond Smith Well—Hodgeman County .....	125,000
Enoch Thompson Well—Pawnee County .....	50,000
Temple Oil—Montgomery County .....	150,000
Douglass—Greenwood County .....	200,000
Burrton—Reno County .....	300,000
Dinkle Well—Ellis County .....	75,000
<b>Department of Wildlife and Parks</b>	
Hillsdale Reservoir—Recreation Facilities .....	700,000
Cedar Bluff—Purchase of Storage .....	365,418
Purchase of Wetlands Habitat .....	27,100
<b>State Conservation Commission</b>	
Centralia Site 50 Multipurpose Lake .....	240,000
Wellington Multipurpose Lake .....	917,482
<b>Kansas Geological Survey</b>	
Dakota Aquifer Investigation .....	170,000
<b>TOTAL .....</b>	<b>\$4,170,000</b>

The projects to be administered by the Department of Health and Environment include the Galena Superfund project and eight saltwater contamination cleanup projects. The \$500,000 recommended for Galena meets the ten percent match required by the federal government for cleanup of the Galena subsite of the Cherokee County site on the National Priority List of the federal Superfund program. Heavy metal contamination of ground and surface water at the site was caused by mining and smelting activities in the region. The eight saltwater contamination cleanup projects are drawn from the department's list of 332 statewide sites that have contaminated ground or surface water. The projects are ones that have been identified by the department as having a high priority for cleanup because of local water use requirements.

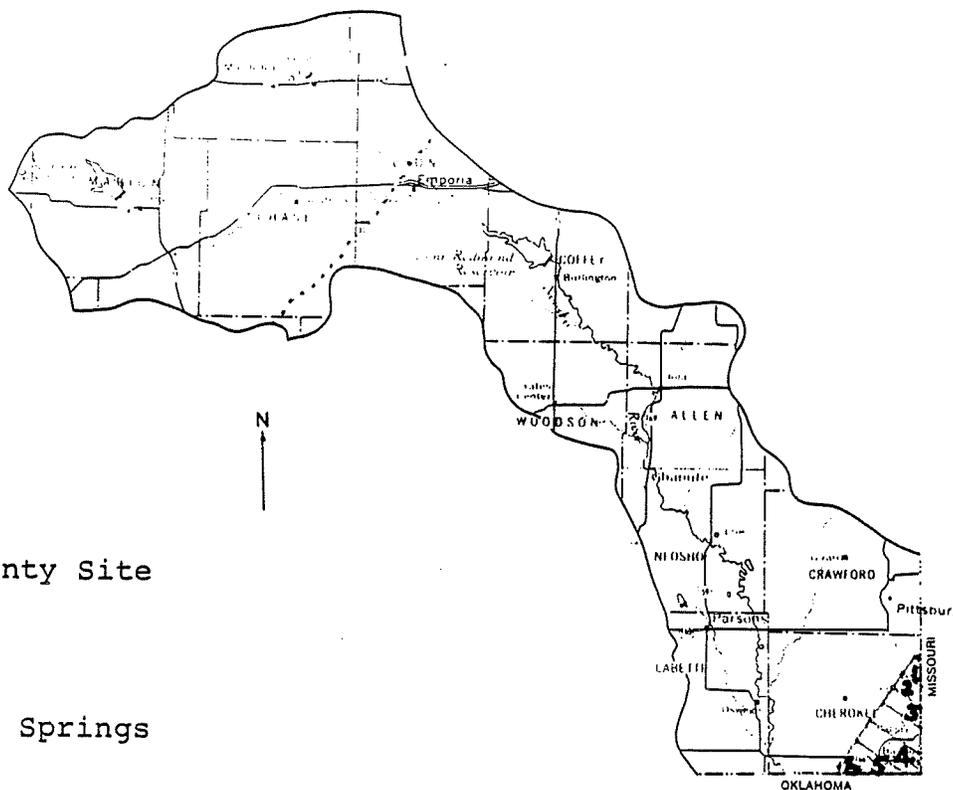
The Wildlife and Parks projects include \$700,000 for development of recreational facilities at Hillsdale Reservoir in Miami County, including boat ramps and adjacent parking lots, swimming beaches, breakwaters for protection of boat ramps and swimming beaches, and roads. Also recommended is \$365,418 for purchase of water storage in Cedar Bluff Reservoir in Trego County. The funding is necessary to implement the terms of an agreement with the U.S. Bureau of Reclamation whereby the state will gain control of reservoir storage to maximize the lake's fish, wildlife and recreation benefits. The recommendation for Wildlife and Parks includes \$27,100 for acquisition of land in the McPherson area to be protected as a wetlands wildlife refuge.

The recommendation for the State Conservation Commission includes state funding for two multipurpose small lakes projects. Funding of \$240,000 is recommended for land treatment at the Centralia Site 50 Multipurpose Small Lake, which is designed to provide flood control, water supply and recreation benefits to the residents of the area in Nemaha County near Centralia. The recommended amount completes the state's contribution to that project. Also recommended is \$917,482 for the Wellington Multipurpose Small Lake to be constructed by the City of Wellington. The project will provide water supply, flood control and recreation benefits to the city and surrounding area; state funds will be used for flood control, recreation and land treatment elements of the project. The total state share of project funding is \$1,083,000; the remaining \$165,518 would be funded in FY 1990.

The Governor's recommendation for the Kansas Geological Survey includes expenditure of \$170,000 in oil overcharge funds for continued investigation of the Dakota Aquifer. The Dakota represents a major water resource for Western Kansas but further study is required to assess both the water quality and quantity in the aquifer.

**ATTACHMENT C**

# NEOSHO BASIN



## Cherokee County Remedial Project

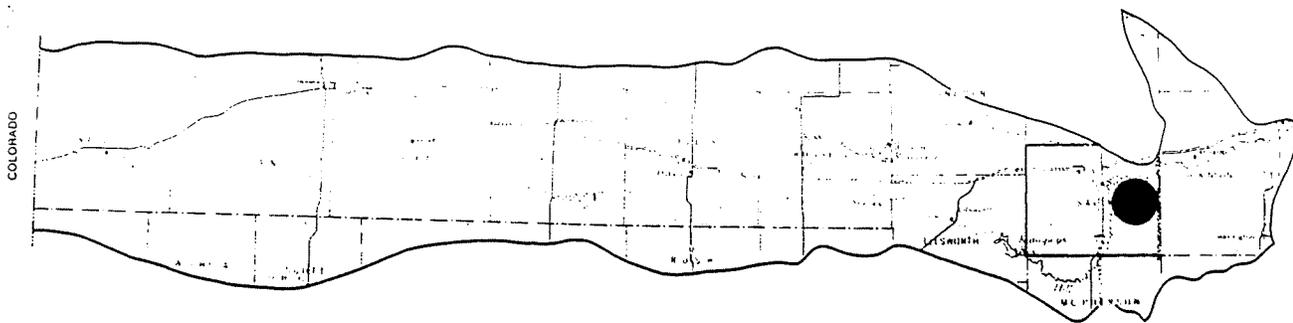
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Cherokee County remedial project is one of the priority sites.

Mining and smelting activities in Cherokee County dating to the 1880's caused widespread environmental contamination throughout the area. This area is designated as a National Priority listing site under CERCLA (Superfund) and initial remedial action plans are in process.

The contamination is primarily heavy metals such as lead and cadmium. The contamination has affected surface and groundwater quality in Cherokee County. Contaminants are present above drinking water standards in the shallow aquifer in the area. Although contamination has not been found in the deeper Roubidoux Aquifer, without corrective action, there is a possibility that the contamination may spread.

The overall remediation project for the Cherokee County site will require a major expenditure of funds. The \$500,000 requested by Kansas Department of Health and Environment is the match necessary for the federal superfund funds to be expended. These state expenditures are 10 percent with the superfund providing 90 percent of the funds.

## SMOKY HILL — SALINE BASIN



Saline County

● - Water Contamination Site

### Wilgus Well

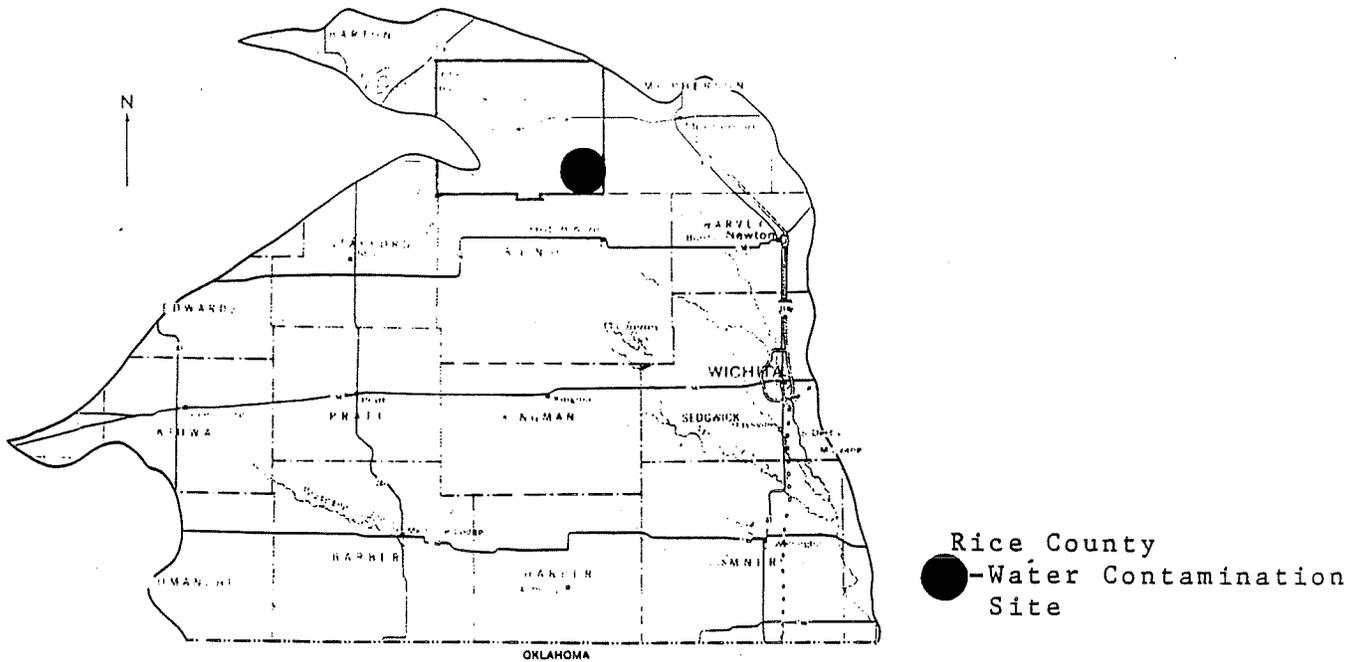
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Wilgus well site is one of the priority sites.

The groundwater contamination is probably the result of past saltwater disposal and/or lease management on nearby oilfield operations. The chloride contamination is evident throughout a sizable area; however, drilling is needed to determine which sources caused the contamination. Potential exists that residual salts may still exist in abandoned ponds or poorly plugged wells may be leaking into the shallow groundwater.

The Wilgus well area is thought to be confined to the NW 1/4 of Sec. 20, Township 14 South, Range 2 West, Saline County, Kansas. Additional drilling is needed to delineate the extent of the contamination and any potential sources which may still exist.

The cost of investigation and determining the potential for containing and removing the contamination within the Wilgus area is \$250,000. The cost may exceed this level if the contamination proves to be larger than indicated within the 1984 study.

## LOWER ARKANSAS BASIN



### Brothers Lease

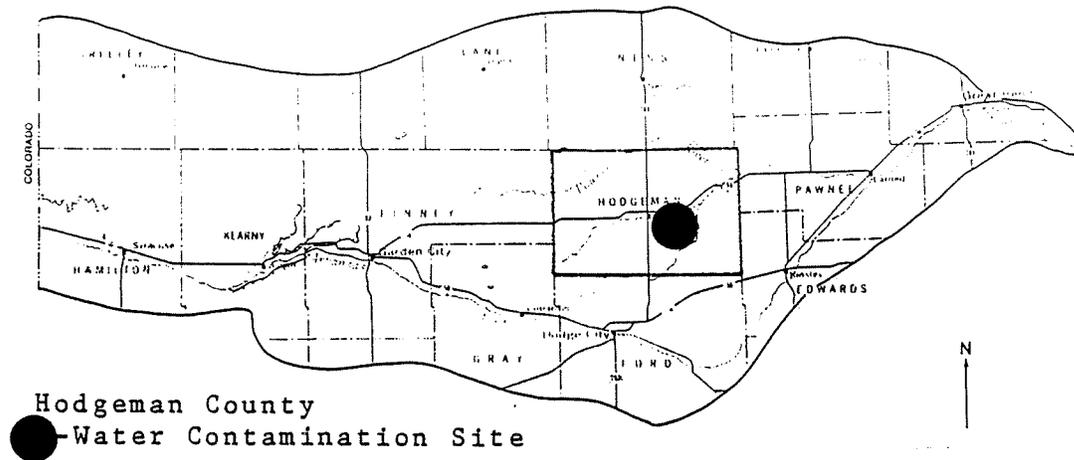
The Kansas Department of Health and Environment has identified 332 water contamination sites statewide. As recommended in the State Water Plan the agency has established the priority sites for clean-up for FY 1989. The Brothers Lease Site is one of the priority sites.

Shallow groundwater was contaminated by an oil field reserve pit located on the Brothers lease. Fluid was recovered from the reserve pit; however, shallow groundwater infiltrates back into the pit. Elevated chlorides exist within the reserve pit and a nearby farm pond.

The site is located within the South 1/2 NE 1/4 of Sec. 12-T21S-R7W, Rice County. The contamination area is confined to a fairly small area at this time. The groundwater usage within the area is considerable so it is important that the area be cleaned up before the contamination migrates into clean areas.

The site clean-up cost is estimated at \$100,000 to cover staff oversight, soil removal, groundwater monitoring wells, recovery wells, operating and disposal costs. The responsible company has filed bankruptcy so cost recovery or responsible party clean-up is not possible.

## UPPER ARKANSAS BASIN



### Raymond Smith Well

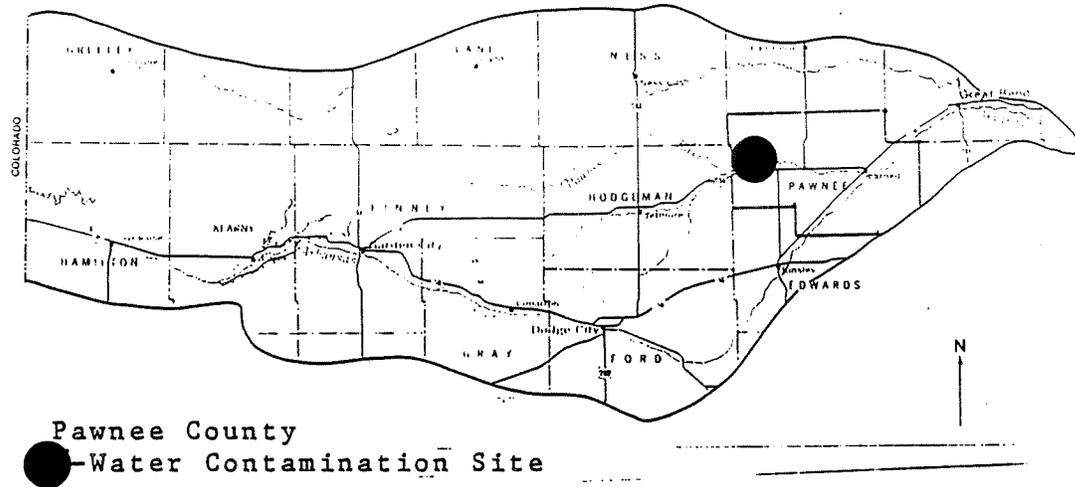
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Raymond Smith well site is one of the priority sites.

Elevated chlorides exist in the Smith irrigation well. The chloride problems date back about 20 years but seem to be getting worse. The contamination is thought to be from past use of an oil field saltwater disposal pond. The possibility does exist that a poorly plugged oil field well may be allowing the Cedar Hills Formation to leak into the alluvial aquifer.

The site is located in the NW 1/4 of Sec. 1, Township 23 South, Range 23 West, Hodgeman County, Kansas. The contamination is within the Buchner Creek alluvium and has not become widespread at this time.

The site remediation cost has been estimated to be \$125,000 to perform adequate site evaluation and remediation. The costs may drastically exceed this level if a well does prove to be leaking Cedar Hills Formation water into the overlying alluvium.

## UPPER ARKANSAS BASIN



Enoch Thompson

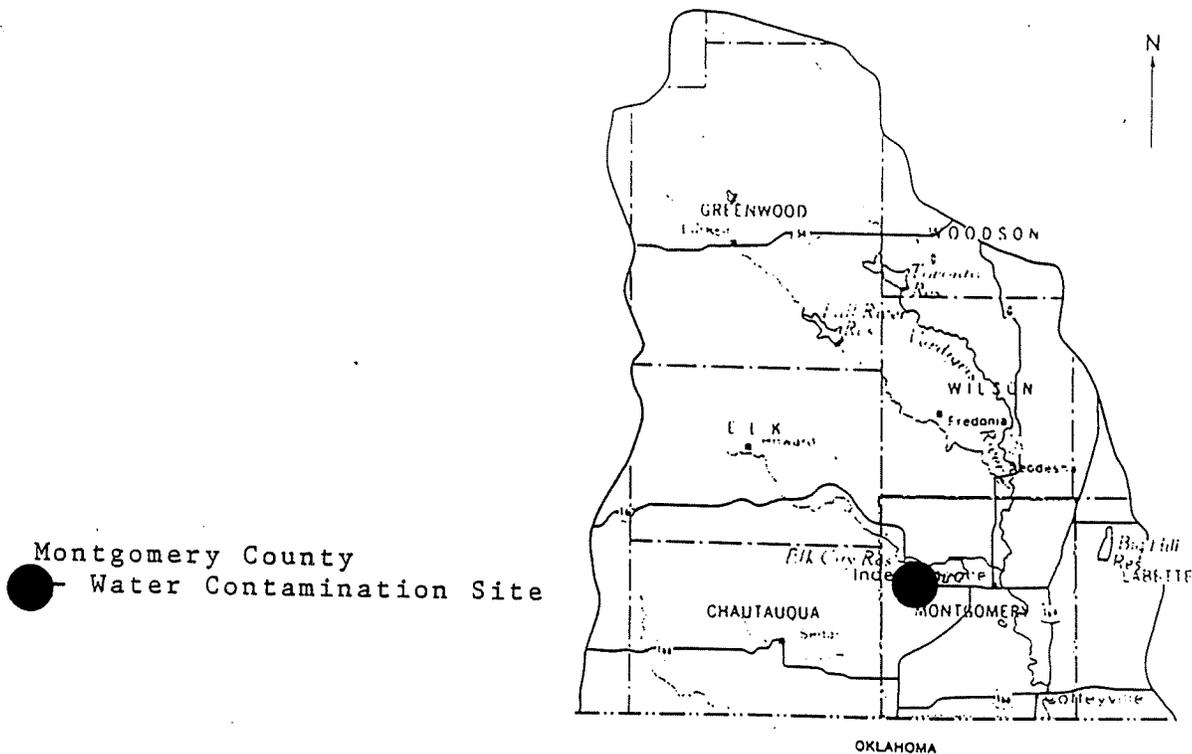
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Enoch Thompson well site is one of the priority sites.

The Thompson stock well has a chloride concentration of 1180 mg/l which is thought to be a result of past saltwater disposal pond usage. No known source of chloride contamination exists at this time; however, additional evaluation is needed to determine the full areal extent of the plume.

The area of known contamination exists within the NW 1/4 of Sec. 17, Township 21 South, Range 20 West, Pawnee County, Kansas. The initial source of contamination is thought to have been within the SE 1/4 of Sec. 8, Township 21 S, Range 20 West. The Thompson well is completed in the alluvial aquifer at the north edge of the Pawnee River Valley.

The site remediation is estimated to cost \$50,000 to rule out any active sources and produce and dispose of contaminated groundwater until the concentration can be reduced to a usable level.

# VERDIGRIS BASIN



## Temple Oil Company

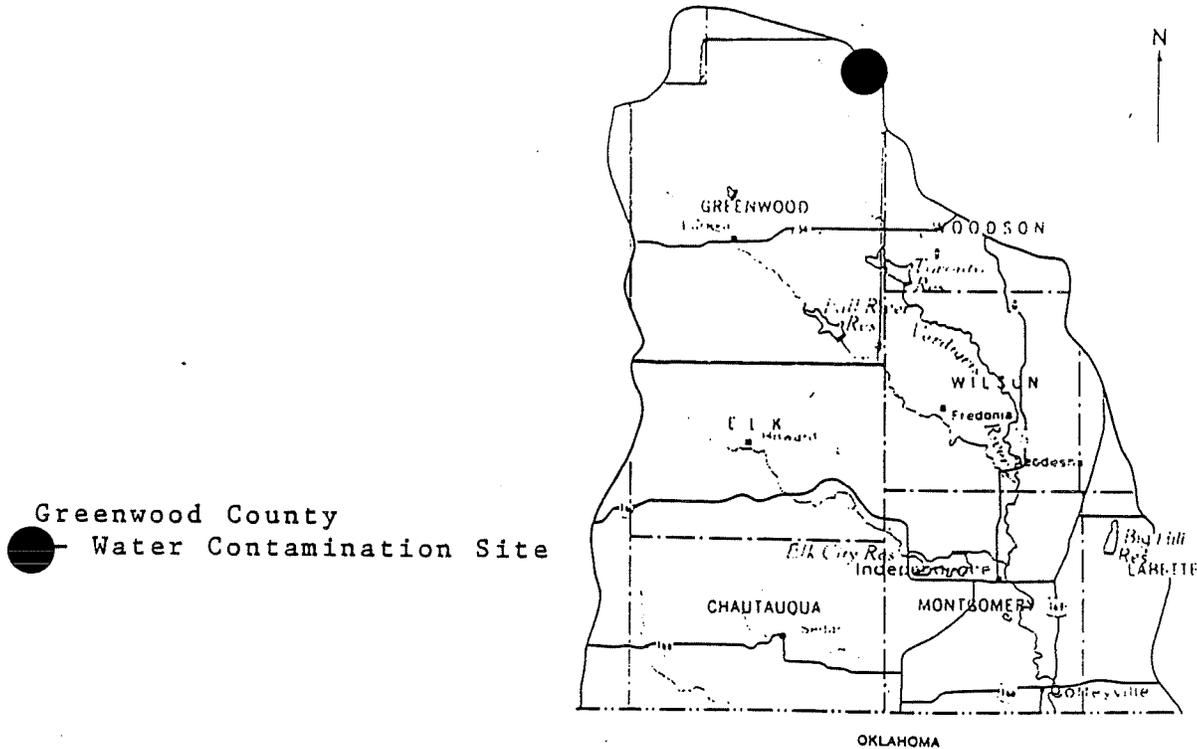
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Temple Oil Company site is one of the priority sites.

Surface and subsurface contamination exists from past oil field operations. Two large saltwater disposal ponds were constructed in a sandstone area which caused much of the contamination. The combined surface area of the two ponds is about one-half acre and the ponds contain fluids too high in chloride concentration to be discharged to the surface. An area of approximately two acres of severe soil contamination exists which will require removal.

The contamination area is located within NE 1/4 of Sec. 19, Township 32 South, Range 14 East, Montgomery County, Kansas. The area is of particular concern because the surface runoff from this area is discharged to the Elk River which feeds the Elk City Reservoir. Chloride concentrations have been detected downstream from this site which range as high as 3250 mg/l.

The cost of disposing fluids from the abandoned storage ponds, performing soil removal and closing the surface ponds is estimated to be \$150,000 to complete. The responsible company is bankrupt.

# VERDIGRIS BASIN



Greenwood County  
● Water Contamination Site

## Douglass Lease

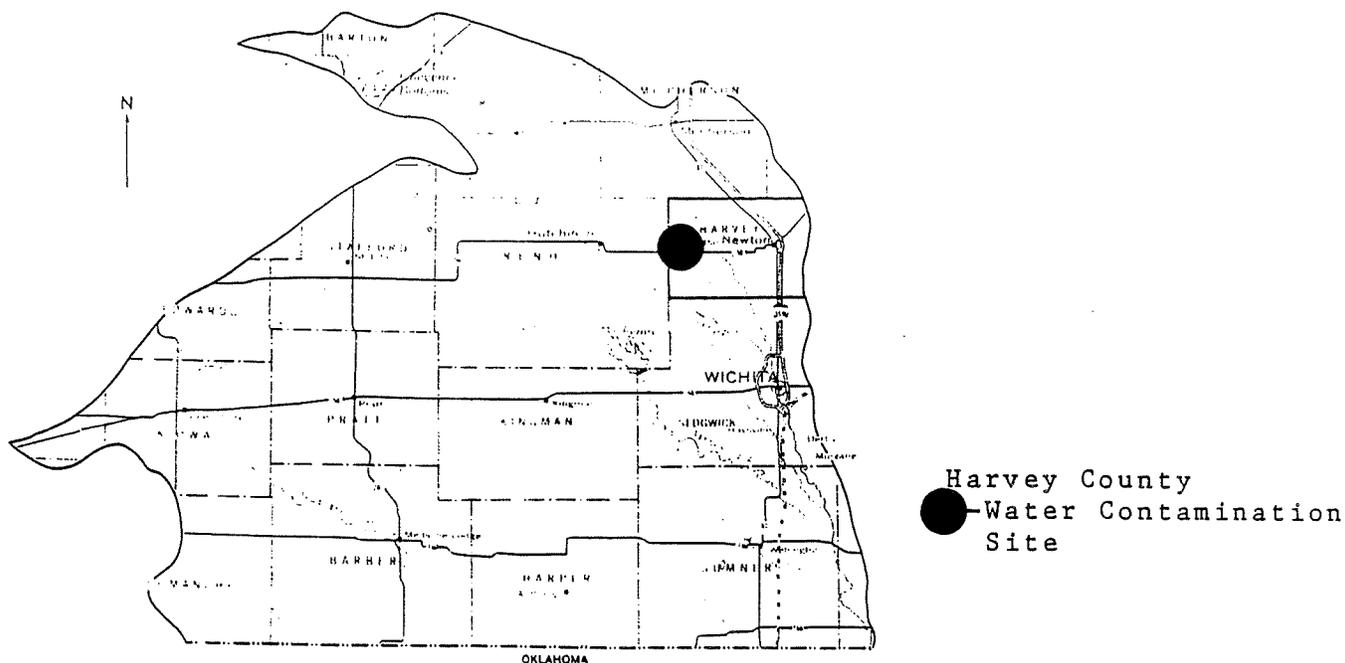
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Douglass lease site is one of the priority sites.

The Douglass lease contamination area is thought to be the result of a leaking disposal well located three-fourths of a mile southwest of where saltwater was found entering Dinner Creek. Contamination has entered shallow terrace gravel deposits and moves in an eastwardly direction until the saltwater outcrops in the surface drainage.

The saltwater contamination is entering Dinner Creek in the SE 1/4 of Sec. 22, Township 22 South, Range 13 East, Greenwood County, Kansas. The saltwater disposal well thought to have caused the contamination continues to enter the surface drainage.

The site investigation and clean-up is estimated to cost \$200,000. Test drilling is needed to determine the magnitude of the contamination and to design a recovery system. The site clean-up will require the installation of a recovery well or wells and the cost of operating the recovery and disposal systems.

## LOWER ARKANSAS BASIN



### Burrton Oil Field

The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Burrton Oil Field site is one of the priority sites.

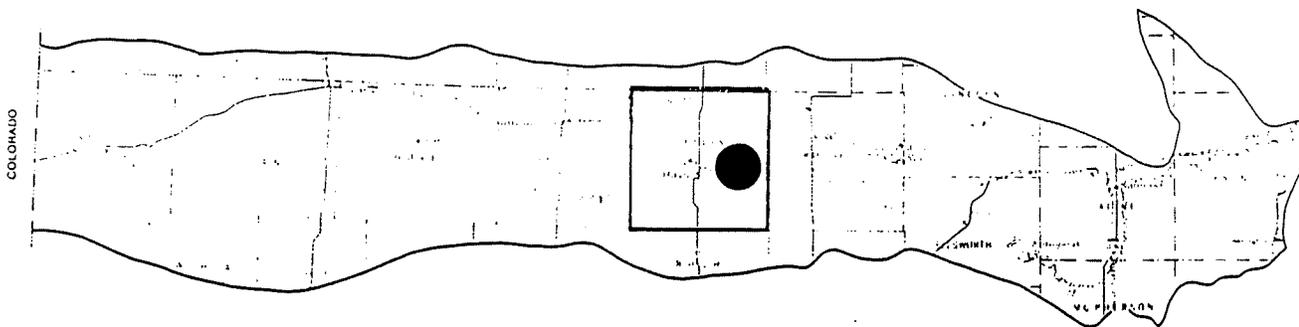
Groundwater contamination within the Burrton area has been a problem for a number of years. The chloride contamination has been caused by saltwater disposal ponds, shallow disposal wells, spills, overflows and line failures which have occurred since 1931 within the pool.

An extensive area of groundwater contamination has been identified within the Equus Beds Aquifer upgradient from Wichita's public water supply. This contamination seems to be slowly moving through the aquifer and will continue to contaminate areas downgradient.

Chloride contamination, crude oil and volatile organics from crude oil exists within the shallow groundwater within the Burrton Oil Pool. There is an extensive monitoring system already established so the funds are needed primarily to perform the actual removal and disposal of contaminated soil and groundwater.

The cost of clean-up has been estimated to be \$300,000; however, with the extensive contamination, these funds may not be adequate to restore the groundwater to background levels. The clean-up being proposed would be adequate to limit any downgradient contamination.

## SMOKY HILL — SALINE BASIN



Ellis County

● -Water Contamination Site

### Jim Dinkel Well

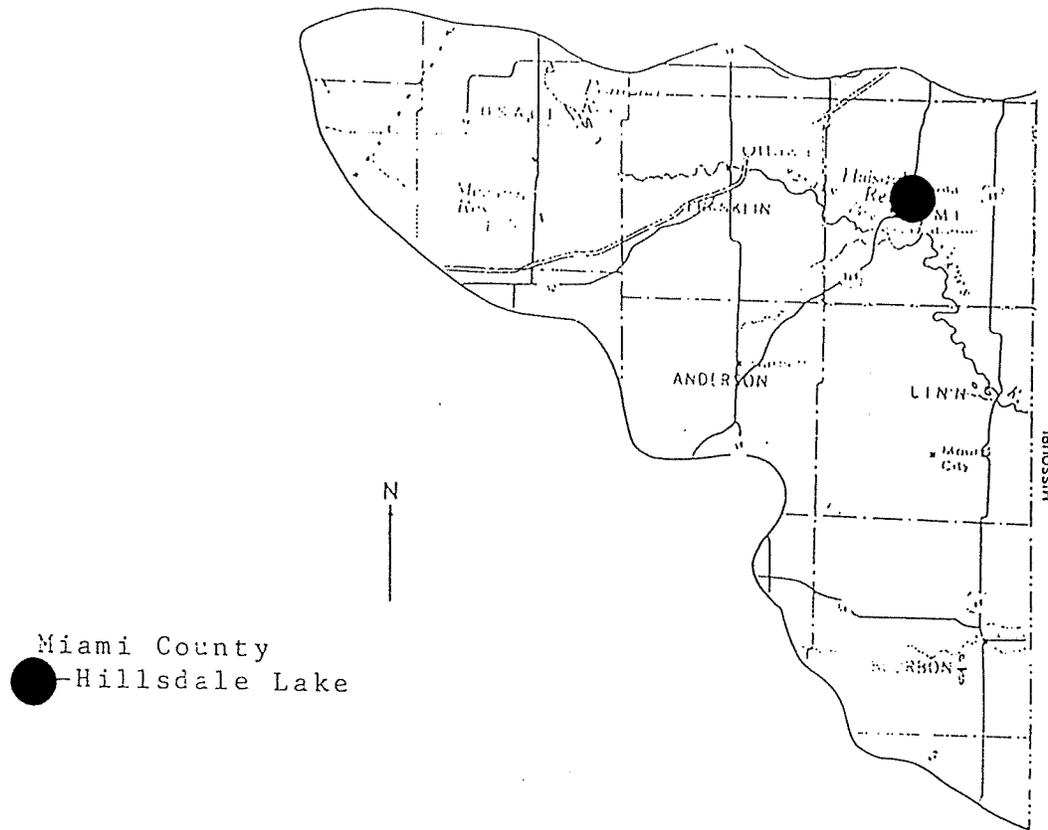
The Kansas Department of Health and Environment has identified over 332 water contamination sites statewide. As recommended in the State Water Plan, the agency has established the priority sites for clean-up for FY 1989. The Dinkel well site is one of the priority sites.

A private well and a large area surrounding Mr. Dinkel's farm has been contaminated by oil field pollution resulting from a leaky, shallow disposal well and saltwater ponds.

The contamination area is located within the SE 1/4 of Sec. 32, Township 31 South, Range 17 West, Ellis County, Kansas. The contamination extends one-fourth to one-half mile around the Dinkel farm. The land in the area is used for agricultural purposes with extensive oil production throughout the area.

The estimated cost of site cleanup is \$75,000 to perform the clean-up of the aquifer. The cost would include the pumping and disposal of contaminated groundwater and oversight until the aquifer can be restored to usable quality.

# MARAIS DES CYGNES BASIN



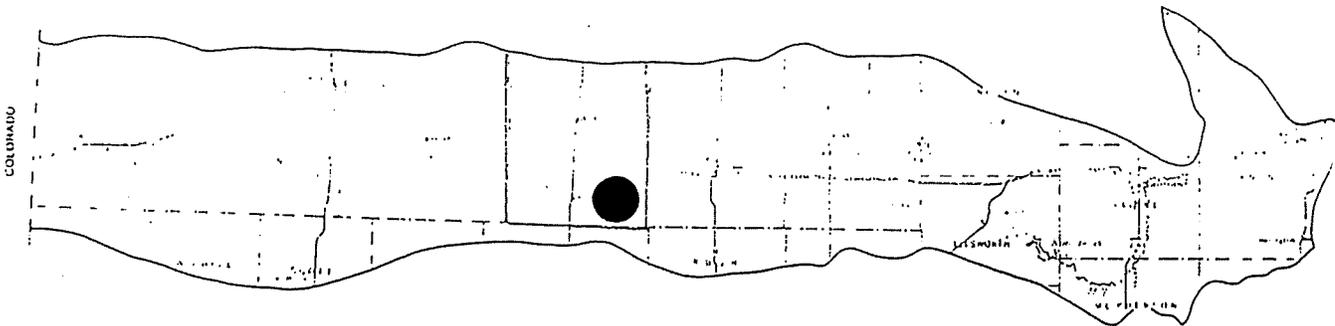
## Recreational Facilities at Hillsdale Lake

Recreational facilities at Hillsdale Lake are inadequate to meet the demand generated by proximity to Kansas City and other population centers. Concern about public safety has been expressed. Unlike many other federal reservoirs, no Kansas state park has been developed at Hillsdale.

In 1981, the legislature created Hillsdale State Park. However, no state money was appropriated to construct the park at that time. The legislature reaffirmed its commitment to construct the park in 1984 and the State Water Plan recommended its construction in 1986. At the present time, there are only limited park facilities at the reservoir.

The Kansas Department of Wildlife and Parks will need an appropriation of \$700,000 for FY 1989 to complete the development of recreational facilities at the reservoir. This expenditure will include local ramps, swimming beaches, parking lots for boat ramps, breakwaters for protection of boat ramps and swimming beaches and roads.

# SMOKY HILL — SALINE BASIN



Trego County

● - Cedar Bluff Lake

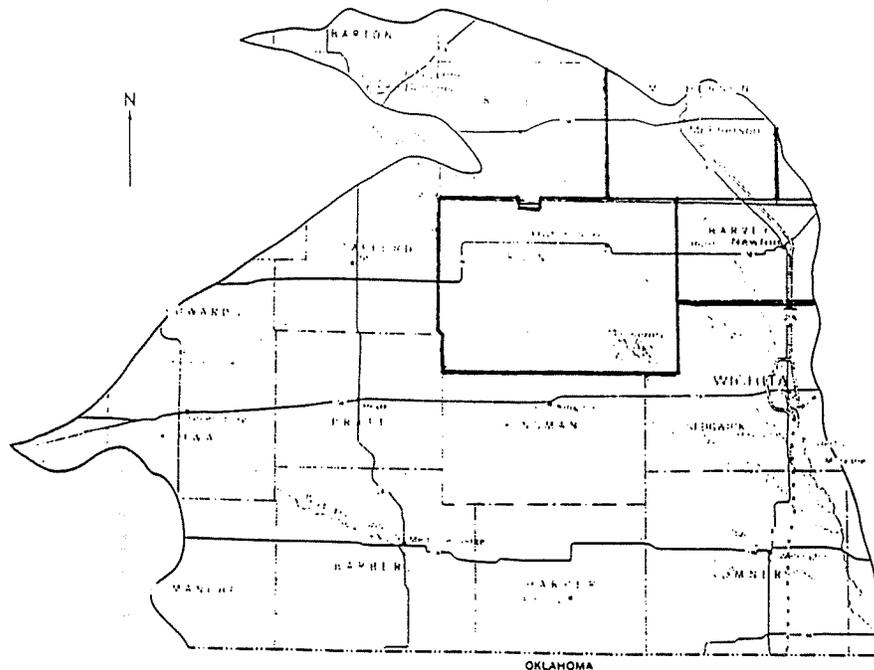
## Cedar Bluff Lake

The State of Kansas has negotiated an agreement with the Bureau of Reclamation to maximize the benefits of Cedar Bluff Reservoir. Since the water supply from the reservoir is inadequate to meet all demands, the State Water Plan recommended that alternative uses of the reservoir be investigated. This investigation resulted in the agreement.

A memorandum of understanding between the Cedar Bluff Irrigation District, the Department of Wildlife and Parks, the U.S. Fish and Wildlife Service and the U.S. Bureau of Reclamation has been signed to implement this agreement. The memorandum of understanding was reviewed at a public meeting in Ness City, Kansas, attended by over 175 people who indicated resounding support to execute the agreement.

Pending approval from the U.S. Congress authorizing the Bureau of Reclamation to re-assign the project purposes of Cedar Bluff Lake, the Kansas Department of Wildlife and Parks needs \$365,424 which would be the total payment to the Bureau of Reclamation. This payment would give the State of Kansas control of storage space in the lake and result in the Department of Wildlife and Parks being able to maximize the lake's fish, wildlife and recreation benefits.

## LOWER ARKANSAS BASIN



Harvey, McPherson and  
Reno Counties  
-Natural Wetlands

### Wetland Habitat Acquisition

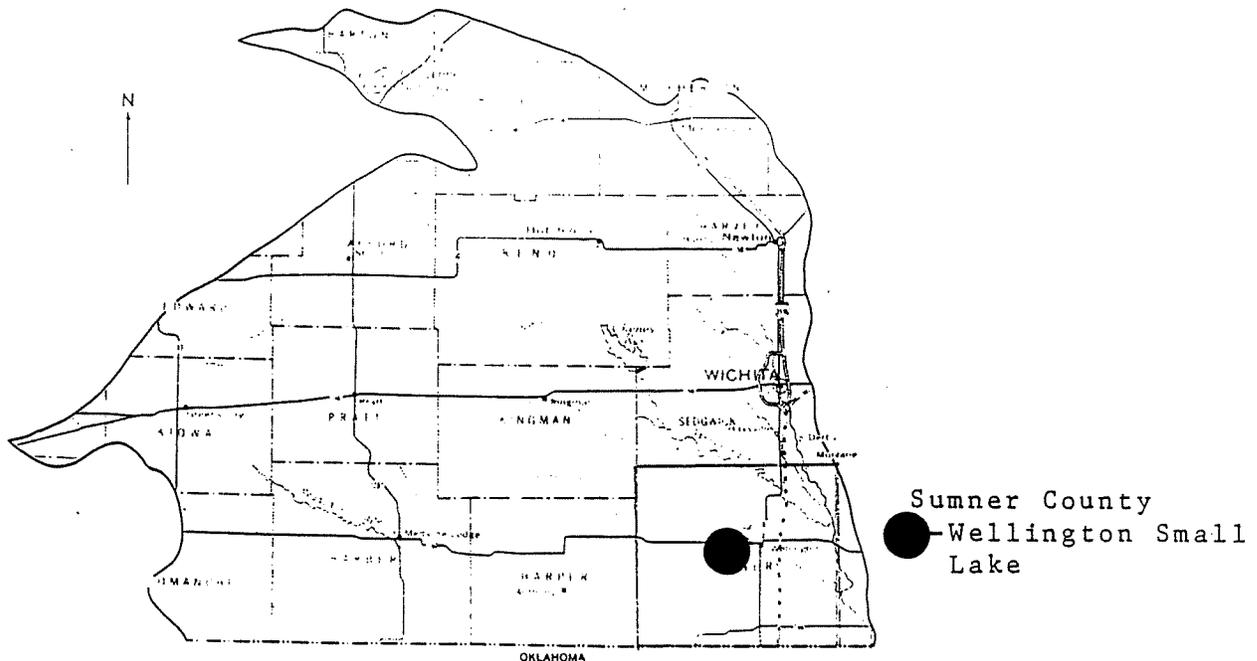
An estimated 40 percent loss of wetlands in the state has occurred since 1955, due to conversion, depletion and stream alteration. This proposal is to acquire natural marshes that exist in the Big Basin Area near McPherson from willing sellers. The money could also be used to purchase and reclaim drained wetlands. The land acquired would be protected as wetlands wildlife refuge.

Willing sellers could be identified through cooperation with conservation districts, Agricultural Stabilization and Conservation Service offices, and possibly Farmers Home Administration. Field personnel can identify quality wetlands and visit with landowners. The opportunity for this program is good. Currently, the financial situation of the farm community is such that the possibility of retiring drained lands would be welcomed by some landowners.

An appropriation of \$27,100 for the Kansas Department of Wildlife and Parks is needed for purchase and initial development costs. The money could be matched equally with Ducks Unlimited funds for waterfowl management.



## LOWER ARKANSAS BASIN



Wellington Multipurpose Small Lake

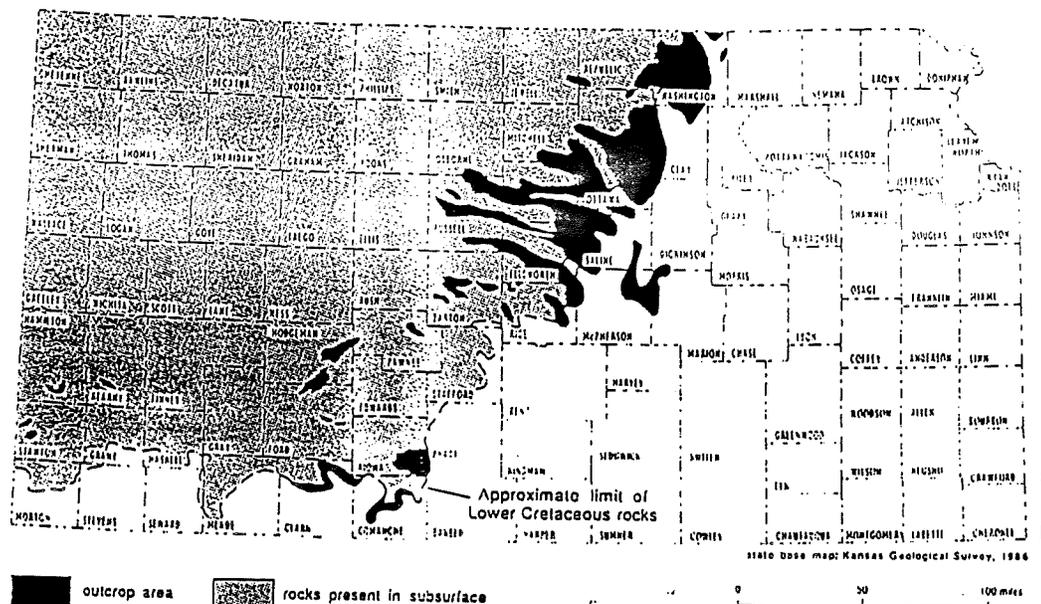
The project would be to add on flood control and recreation to a water supply lake being developed by the city. Land treatment of the drainage area is also required to protect the lake from siltation.

The city's present supply sources are inadequate for prolonged drought conditions, both for present and future demands. A 1982 comprehensive study of the city's supply and demands found the best and most economical plan was to expand the existing supply. The new dam would be about two-thirds of a mile downstream of existing dam on East Prairie Creek. The dam location is the SW 1/4 NW 1/4 NW 1/4 Sec. 3, Township 33 West, Range 2 West, Sumner County. This lake will be about two and one-half feet higher than existing lake.

The new dam will provide a high degree of flood reduction downstream on Prairie and East Prairie creeks. Partial flood damage reduction would benefit a reach of the Chikaskia.

The present lake is used extensively for camping, fishing boating and picnicking. The new dam will increase the surface area from 380 acres to 670 acres. New access roads, picnic shelter, fishing shelters and a boat ramp are planned around the new lake area. Some existing access roads and facilities will be relocated or modified.

The state share would cover 100 percent of the engineering and construction of the flood control portion, 50 percent of the engineering and construction of the recreation portion and 80 percent of the needed land treatment. State share costs are \$795,000 for engineering and construction and \$288,000 for cost-share on land treatment for a total State Conservation Commission appropriation of \$1,083,000.



### The Water Resources Potential of the Dakota Aquifer

In the near future, depletion of the Ogallala Aquifer will cause a water shortage in western Kansas. The Dakota Aquifer, outlined on the map above, will be the next available source of water for this region; however insufficient information exists on the quantity and quality of Dakota water.

It is crucial to assess the potential effects of development in order to avoid depletions similar to those being experienced in the Ogallala. For this reason the Kansas Water Authority Annual Research Report identified the Dakota Aquifer as a highest priority research need.

A long term multi-agency plan of study to obtain this information on the Dakota Aquifer has been developed by the Kansas Geological Survey and incorporated in a Memorandum Of Understanding that has been signed by the nine agency heads on the Water Steering Committee and by the Groundwater Management District Association and the U.S. Geological Survey.

The multi-year study will require new appropriations of approximately \$3,000,000. A first year appropriation of \$165,428 is needed for the Kansas Geological Survey.

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