

Kansas Geological Survey  
Open-file Report

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COMPILATION OF SOIL GAS DATA COLLECTED BY USGS--

SPRING AND SUMMER OF 1984

Soil gas data was collected for the Kansas Geological Survey along 2 traverses in northeastern Kansas during the spring and summer of 1984 by Alan Roberts and Howard McCarthy of the Branch of Exploration Geochemistry of the U.S. Geological Survey in Denver, Colorado. This study was funded by a grant to the Kansas Geological Survey from Amoco Production Company, Denver.

The northern-most gas sampling traverse followed the path of the COCORP seismic line run in 1981. This line passes through southern Washington, Marshall and Nemaha counties. A southern line of soil gas sampling passes through Ottawa, Dickinson, Geary, Morris and Lyon counties and passes near two wells in Morris and Geary counties that have been found to contain hydrogen gas.

USGS personnel took measurements of the amount of helium gas in the soil along the full extent of these two lines in May of 1984. These measurements were taken a short distance away from county roads generally at half-mile intervals.

In July of 1984, additional soil gases were measured along or near portions of the two helium traverses. The following components of soil gas were measured: H<sub>2</sub>, CO<sub>2</sub> and hydrocarbons.

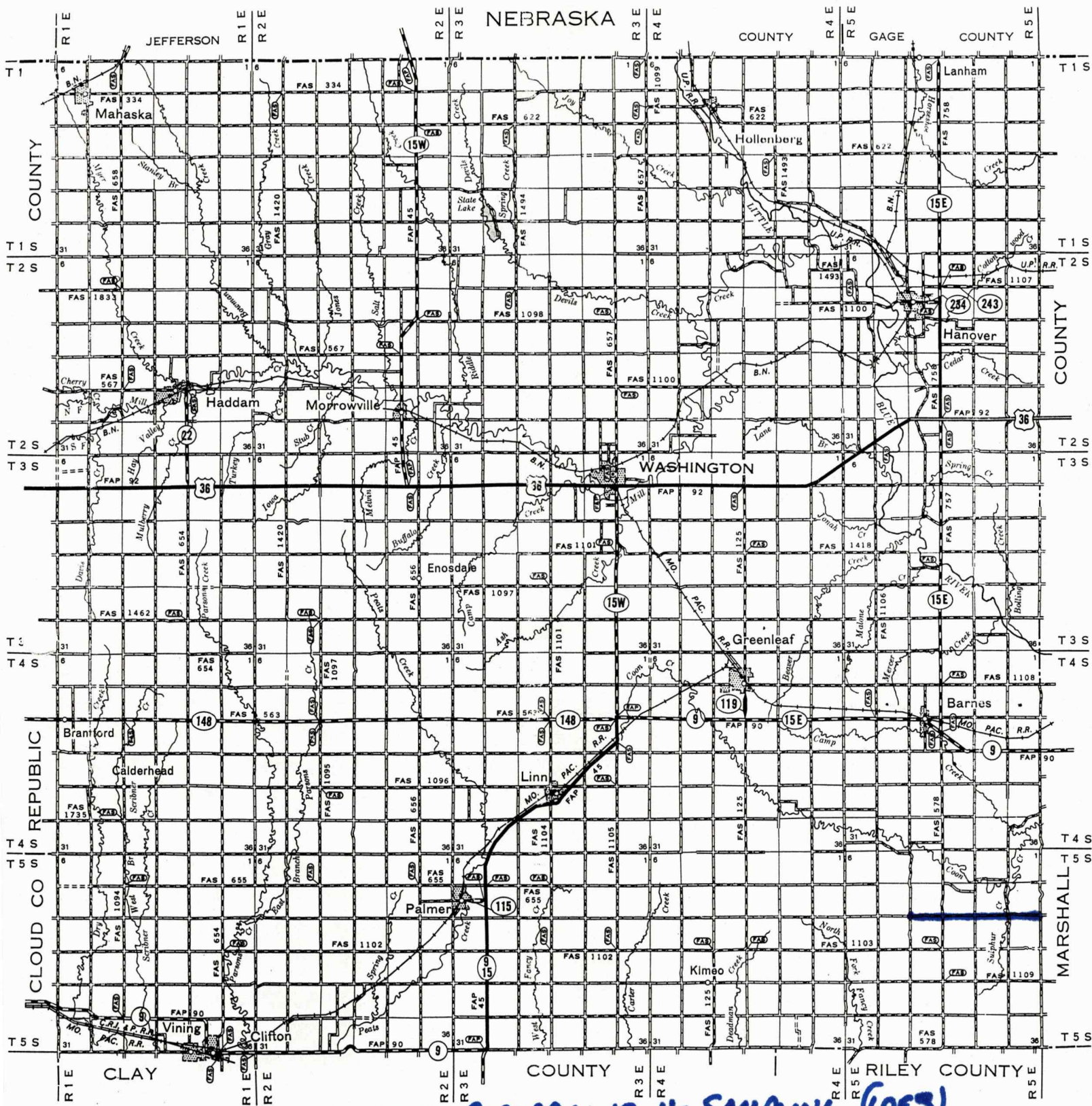
KANSAS GEOLOGICAL SURVEY OPEN-FILE NO. 84-14

Kansas Geological Survey contacts:

W.L. Watney  
J.R. McCauley

This compilation contains:

- FIGURE 1A Washington County highway map  
FIGURE 1B Marshall County highway map  
FIGURE 1C Nemaha County highway map  
These maps show the traverse followed while sampling for helium along the COCORP line in May of 1984.
- FIGURE 2 Plot of helium in parts per billion along the COCORP line
- FIGURE 3A Plot of CO<sub>2</sub> anomalies in soil gas--COCORP line  
FIGURE 3B CO<sub>2</sub> anomalies in soil gas--COCORP line
- FIGURE 4 Hydrocarbon anomalies--COCORP line
- FIGURE 5A Plot of H<sub>2</sub> in soil gas--COCORP line  
FIGURE 5B Anomalous H<sub>2</sub> in soil gas--COCORP line
- FIGURE 6A Ottawa County highway map  
FIGURE 6B Dickinson County highway map  
FIGURE 6C Geary County highway map  
FIGURE 6D Morris County highway map  
FIGURE 6E Lyon County highway map  
These maps show the southern traverse followed while sampling for helium in May 1984.
- FIGURE 7 Plot of helium in parts per billion along the southern line
- FIGURE 8 Percent CO<sub>2</sub> in soil gas--southern line
- FIGURE 9 Hydrocarbon anomalies--southern line
- FIGURE 10 H<sub>2</sub> anomalies in soil gas--southern line



**FIGURE 1A. COCORP LINE HE SAMPLING (OFS)  
MAY 18, 19, 20, 21, 1984**

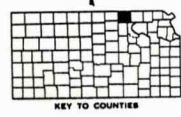
**LEGEND**

**ROADS AND ROADWAY FEATURES**

|    |   |       |
|----|---|-------|
| PR | ROAD  | ===== |
| UN | ROAD  | ----- |
|    | GRAVEL AND DRAINED ROAD                             | ----- |
|    | SOIL SURFACED ROAD                                  | ----- |
|    | GRAVEL OR STONE ROAD - NOT GRADED OR DRAINED        | ----- |
|    | GRAVEL OR STONE ROAD - GRADED AND DRAINED           | ----- |
|    | GRAVEL OR STONE ROAD WITH STABILIZED SURFACE        | ----- |
|    | BITUMINOUS ROAD - LOW TYPE                          | ----- |
|    | PAVED ROAD  | ----- |
|    | DIVIDED HIGHWAY                                     | ----- |
|    | HIGHWAY WITH FULL CONTROL OF ACCESS AND INTERCHANGE | ----- |

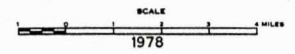
**ROAD SYSTEM DESIGNATION**

|  |       |
|--|-------|
| FEDERAL-AID INTERSTATE HIGHWAY SYSTEM          | ----- |
| FEDERAL-AID PRIMARY HIGHWAY SYSTEM             | ----- |
| FEDERAL-AID SECONDARY HIGHWAY SYSTEM           | ----- |
| INTERSTATE NUMBERED HIGHWAY                    | ----- |
| U.S. NUMBERED HIGHWAY                          | ----- |
| STATE HIGHWAY SYSTEM OR STATE NUMBERED HIGHWAY | ----- |
| END OF DESIGNATED SYSTEM OR MARKED ROUTE       | ----- |

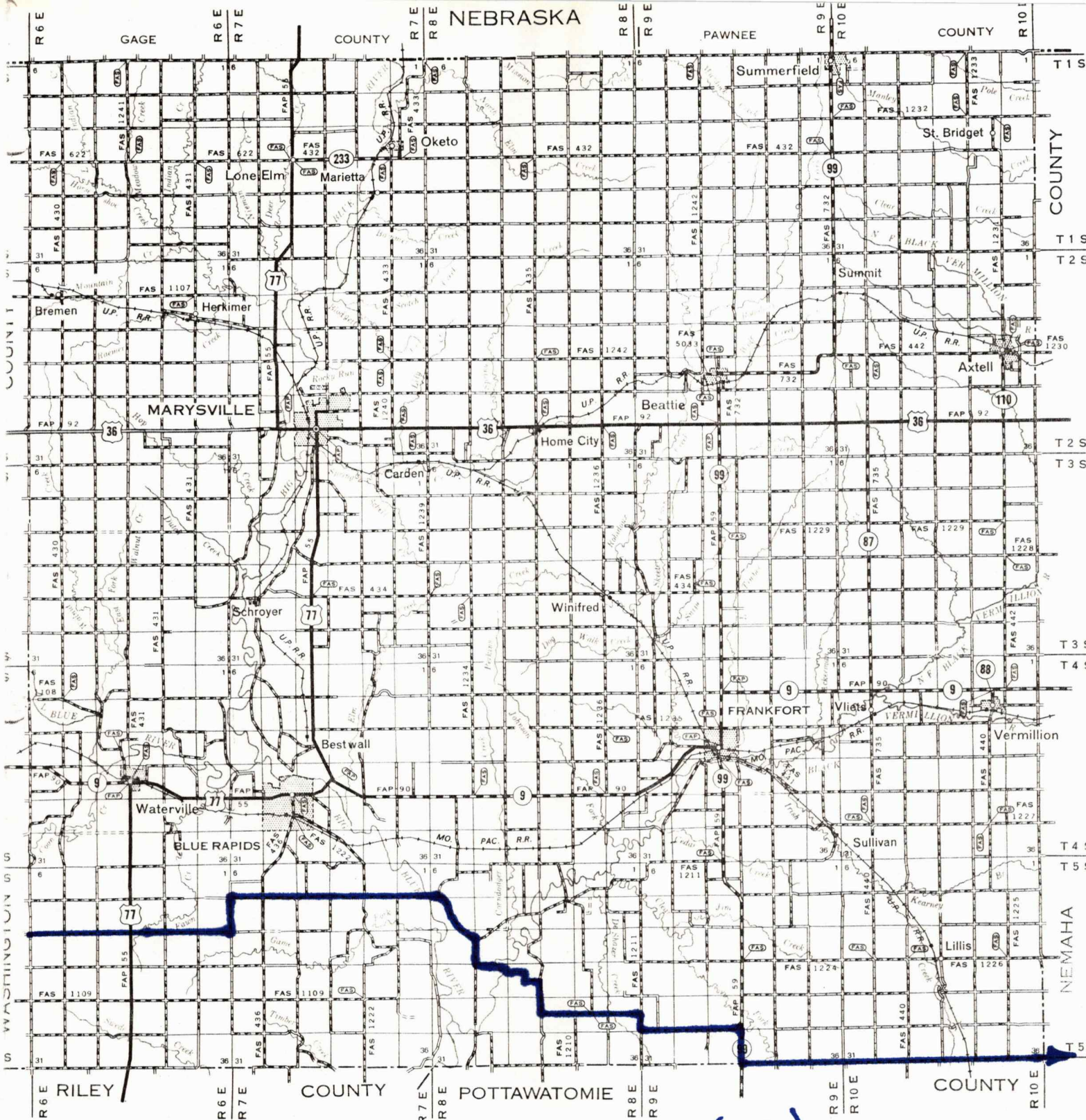


**GENERAL HIGHWAY MAP  
WASHINGTON COUNTY  
KANSAS**

PREPARED BY THE  
KANSAS DEPARTMENT OF TRANSPORTATION  
PLANNING AND DEVELOPMENT DEPARTMENT  
IN COOPERATION WITH THE  
U. S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION



F.A. SYSTEMS REVISED TO OCTOBER 15, 1980



**FIGURE 1B. COCORP LINE HE SAMPLING (20FS)  
MAY 18, 19, 20, 21, 1984**

**LEGEND**

**ROADS AND ROADWAY FEATURES**

- PRIMITIVE ROAD ..... [Symbol]
- UNIMPROVED ROAD ..... [Symbol]
- GRADED AND DRAINED ROAD ..... [Symbol]
- SOIL SURFACED ROAD ..... [Symbol]
- GRAVEL OR STONE ROAD - NOT GRADED OR DRAINED ..... [Symbol]
- GRAVEL OR STONE ROAD - GRADED AND DRAINED ..... [Symbol]
- GRAVEL OR STONE ROAD WITH STABILIZED SURFACE ..... [Symbol]
- BITUMINOUS ROAD - LOW TYPE PAVED ROAD ..... [Symbol]
- DIVIDED HIGHWAY ..... [Symbol]
- HIGHWAY WITH FULL CONTROL OF ACCESS AND INTERCHANGE ..... [Symbol]

**ROAD SYSTEM DESIGNATION**

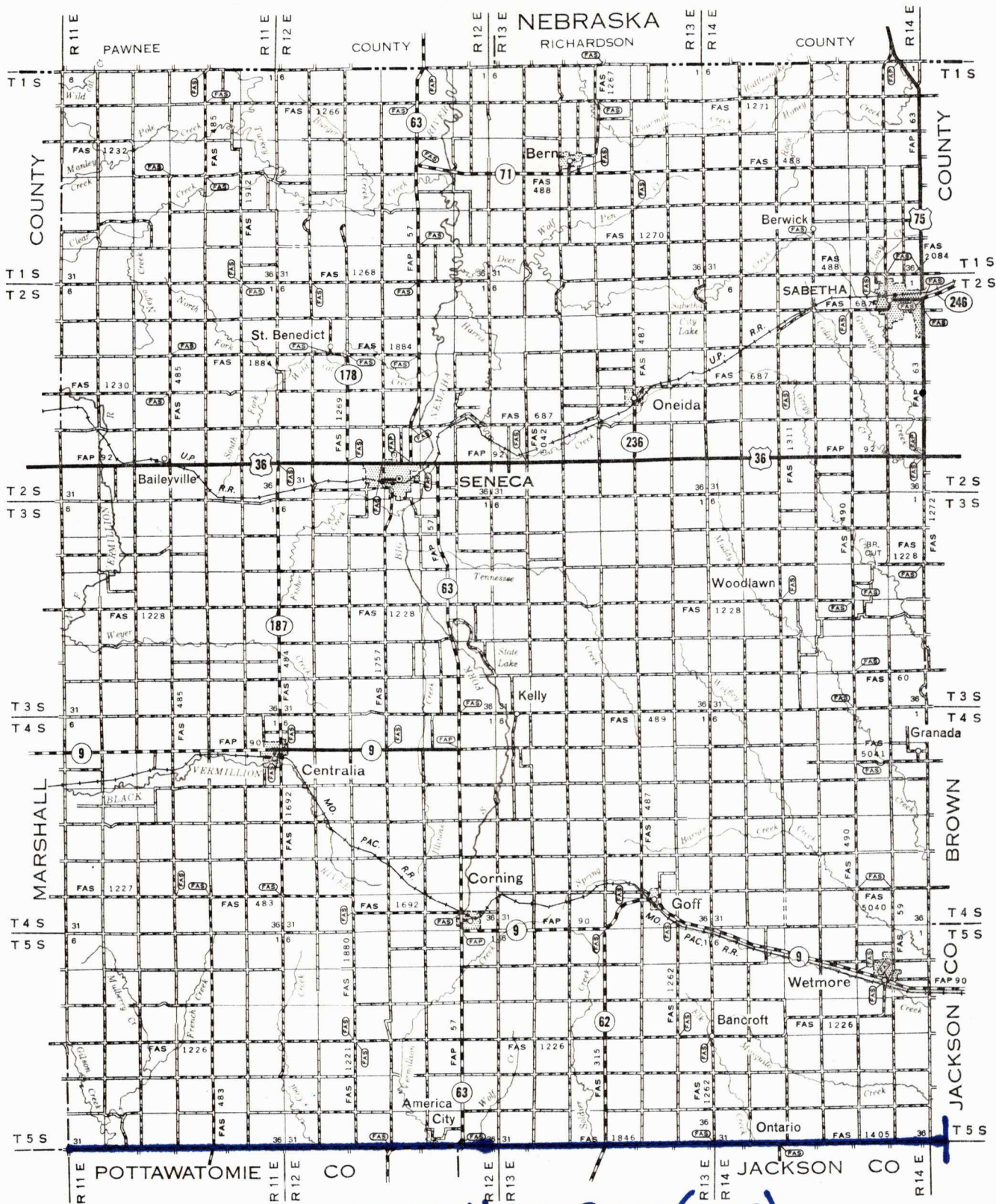
- FEDERAL-AID INTERSTATE HIGHWAY SYSTEM [Symbol]
- FEDERAL-AID PRIMARY HIGHWAY SYSTEM [Symbol]
- FEDERAL-AID SECONDARY HIGHWAY SYSTEM [Symbol]
- INTERSTATE NUMBERED HIGHWAY [Symbol]
- U S NUMBERED HIGHWAY [Symbol]
- STATE HIGHWAY SYSTEM OR STATE NUMBERED HIGHWAY [Symbol]
- END OF DESIGNATED SYSTEM OR MARKED ROUTE [Symbol]

**GENERAL HIGHWAY MAP  
MARSHALL COUNTY  
KANSAS**

PREPARED BY THE  
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FEDERAL HIGHWAY ADMINISTRATION



SCALE  
0 1 2 MILES



**FIGURE 1C. COCORP LINE He SAMPLING (SOFs)**  
**MAY 18, 19, 20, 21, 1984**

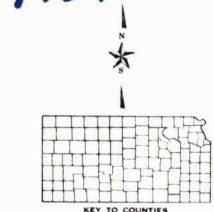
**LEGEND**

**ROADS AND ROADWAY FEATURES**

|   |       |
|---|-------|
| PRIMITIVE ROAD                                      | ----- |
| UNIMPROVED ROAD                                     | ----- |
| GRADED AND DRAINED ROAD                             | ----- |
| SOIL SURFACED ROAD                                  | ----- |
| GRAVEL OR STONE ROAD - NOT GRADED OR DRAINED        | ----- |
| GRAVEL OR STONE ROAD - GRADED AND DRAINED           | ----- |
| GRAVEL OR STONE ROAD WITH STABILIZED SURFACE        | ----- |
| BITUMINOUS ROAD-LOW TYPE                            | ----- |
| PAVED ROAD  | ----- |
| DIVIDED HIGHWAY                                     | ----- |
| HIGHWAY WITH FULL CONTROL OF ACCESS AND INTERCHANGE | ----- |

**ROAD SYSTEM DESIGNATION**

|  |       |       |
|--|-------|-------|
| FEDERAL AID INTERSTATE HIGHWAY SYSTEM          | ----- | FAI   |
| FEDERAL AID PRIMARY HIGHWAY SYSTEM             | ----- | FAP   |
| FEDERAL AID SECONDARY HIGHWAY SYSTEM           | ----- | FAS   |
| INTERSTATE NUMBERED HIGHWAY                    | ----- | ----- |
| U.S. NUMBERED HIGHWAY                          | ----- | ----- |
| STATE HIGHWAY SYSTEM OR STATE NUMBERED HIGHWAY | ----- | ----- |
| END OF DESIGNATED SYSTEM OR MARKED ROUTE       | ----- | ----- |



**GENERAL HIGHWAY MAP**  
**NEMAHA COUNTY**  
**KANSAS**

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 FEDERAL HIGHWAY ADMINISTRATION

F.A. SYSTEMS REVISED TO OCTOBER 1, 1980

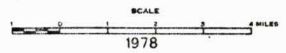


FIGURE 2. KANSAS COCORP HELIUM TRAVERSE, MAY 1984

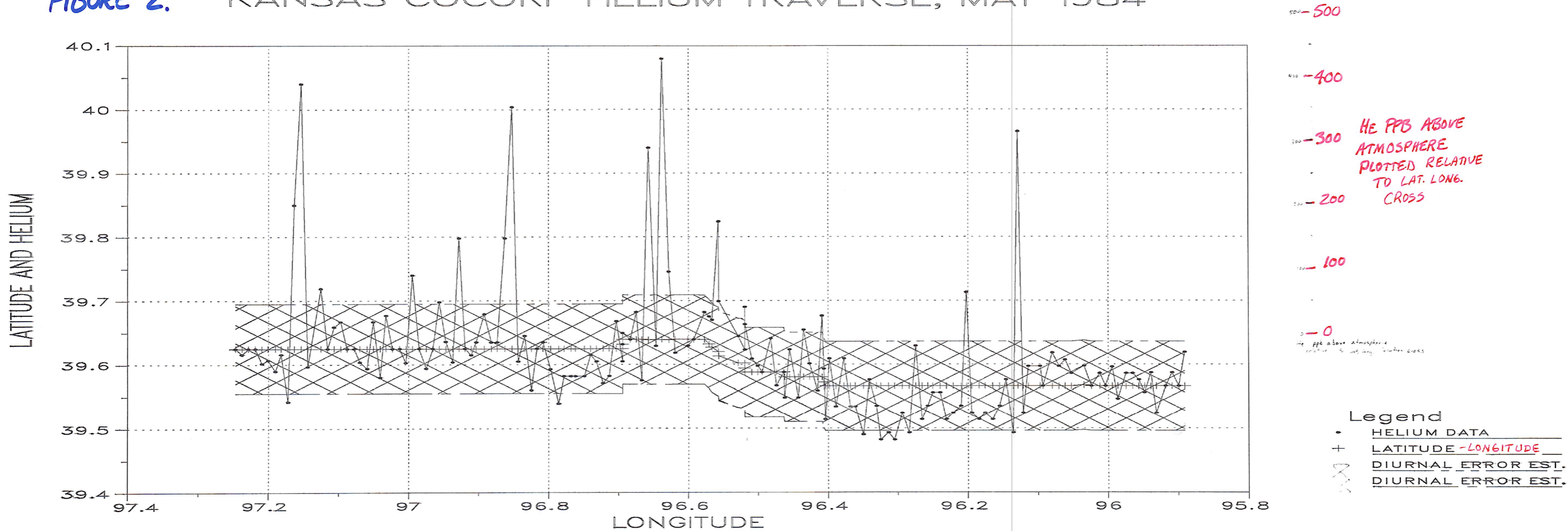
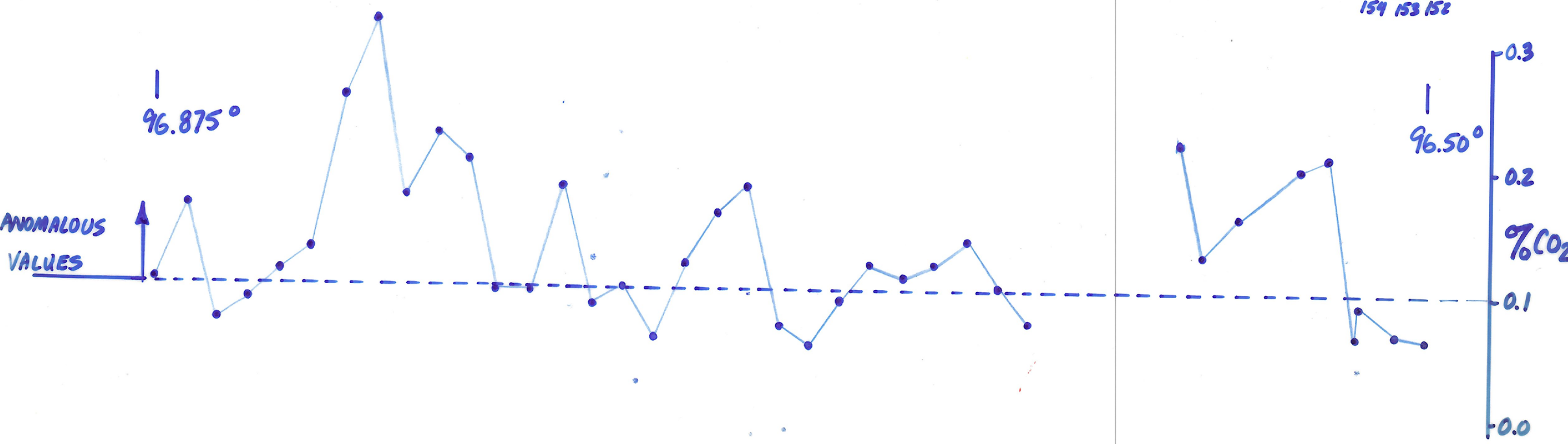
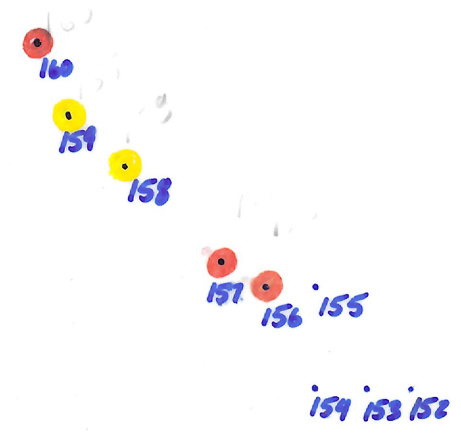
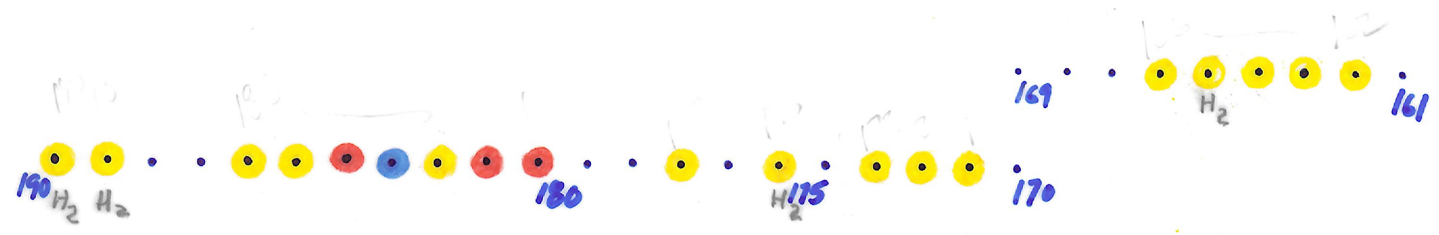


FIGURE 3A. PLOT OF CO<sub>2</sub> ANOMALIES IN SOIL GAS - COLORPLINE

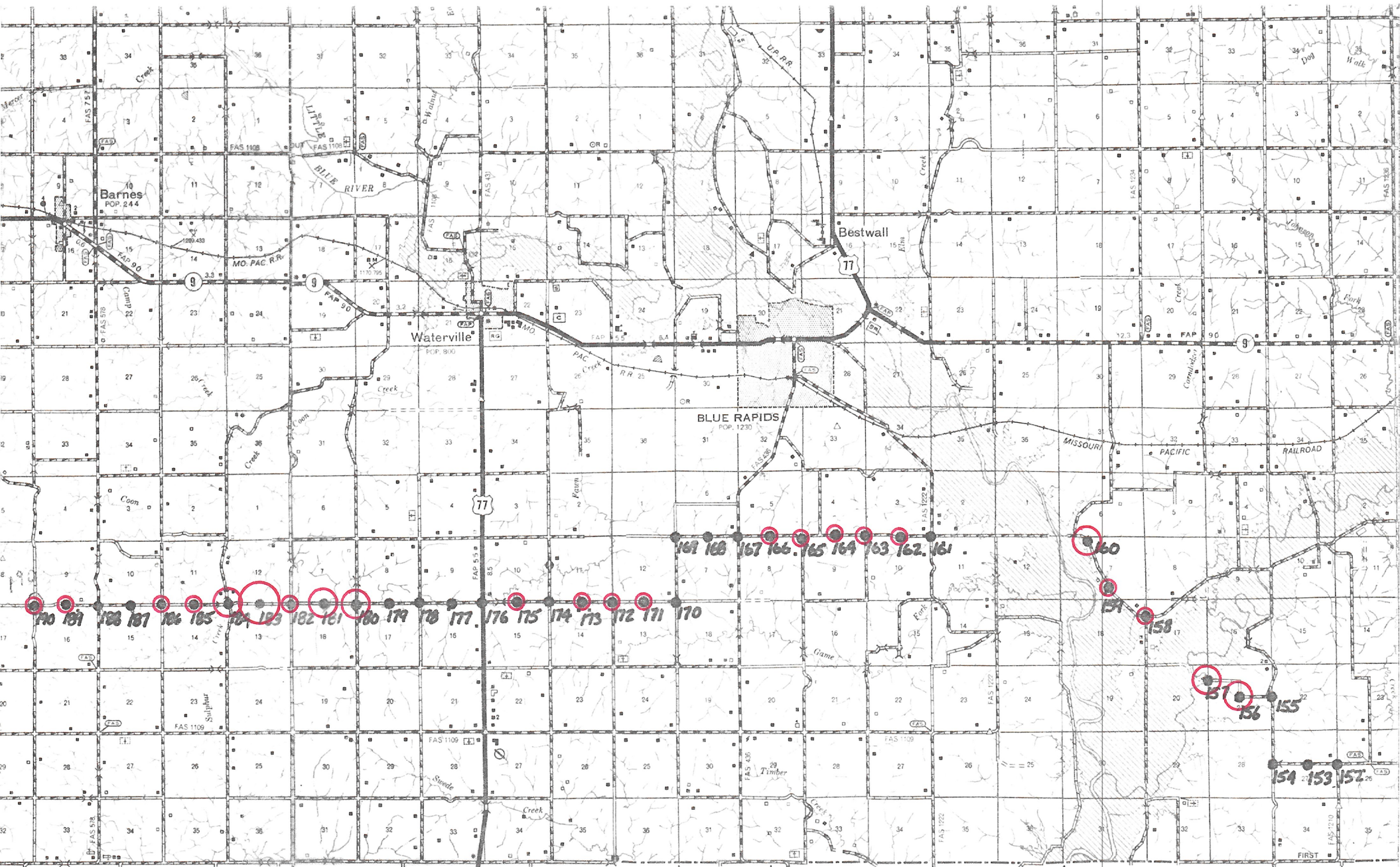
SCALE 1" = 2 MI.

- CO<sub>2</sub> %
- > 0.3
  - > 0.2
  - > 0.1



96.875

96.50



COUNTY RILEY COUNTY POTTAWATOMIE

96° 50'

R 5 E

R 6 E

RILEY

R 6 E

R 7 E

96° 40'

COUNTY

R 7 E

R 8 E

POTTAWATOMIE

96° 30'

- ≥ 0.1
- ≥ 0.2
- ≥ 0.3

FIGURE 3B. CO<sub>2</sub> ANOMALIES IN SOIL GAS - COCORP LINE

SCALE 1" = 2 MI.

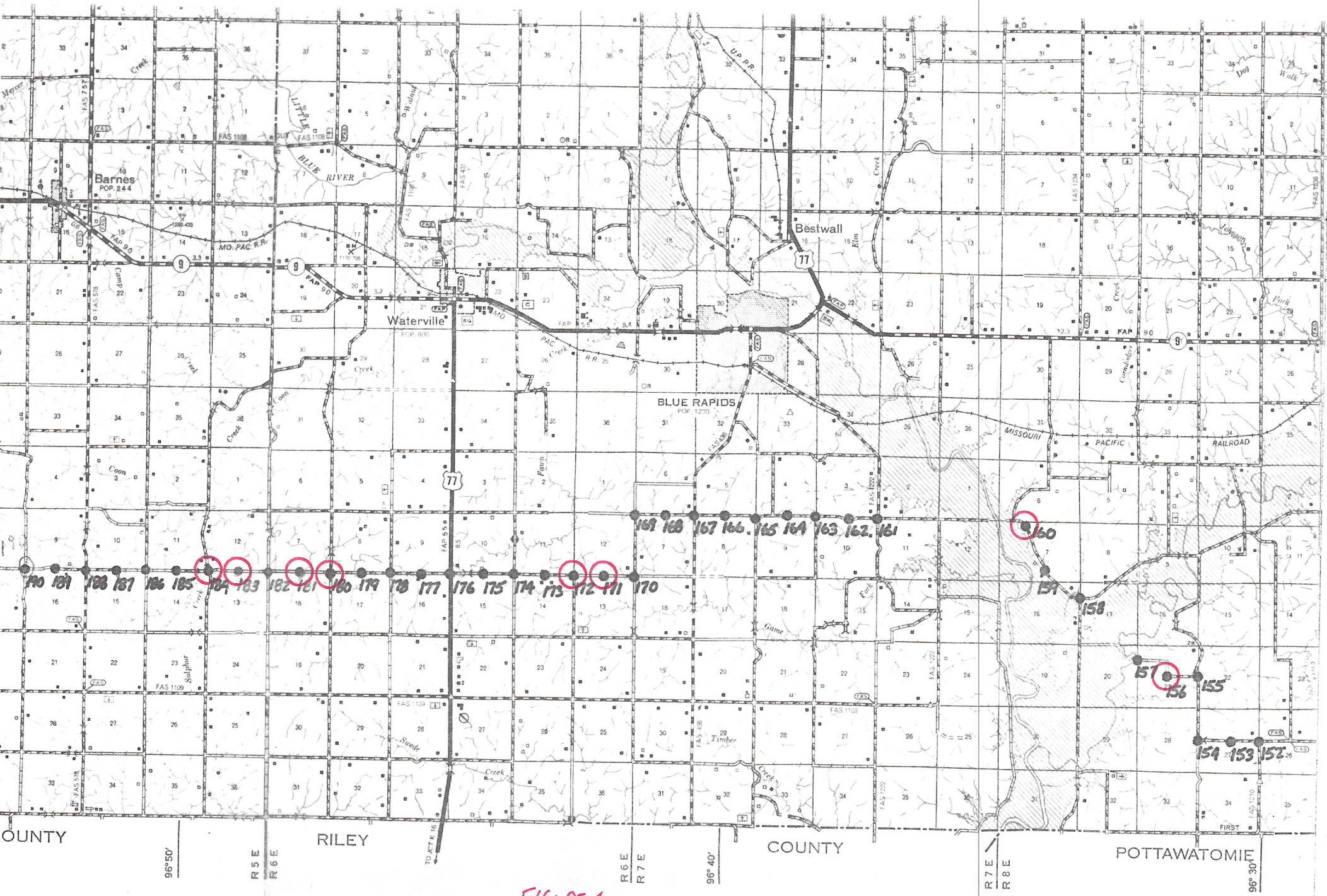
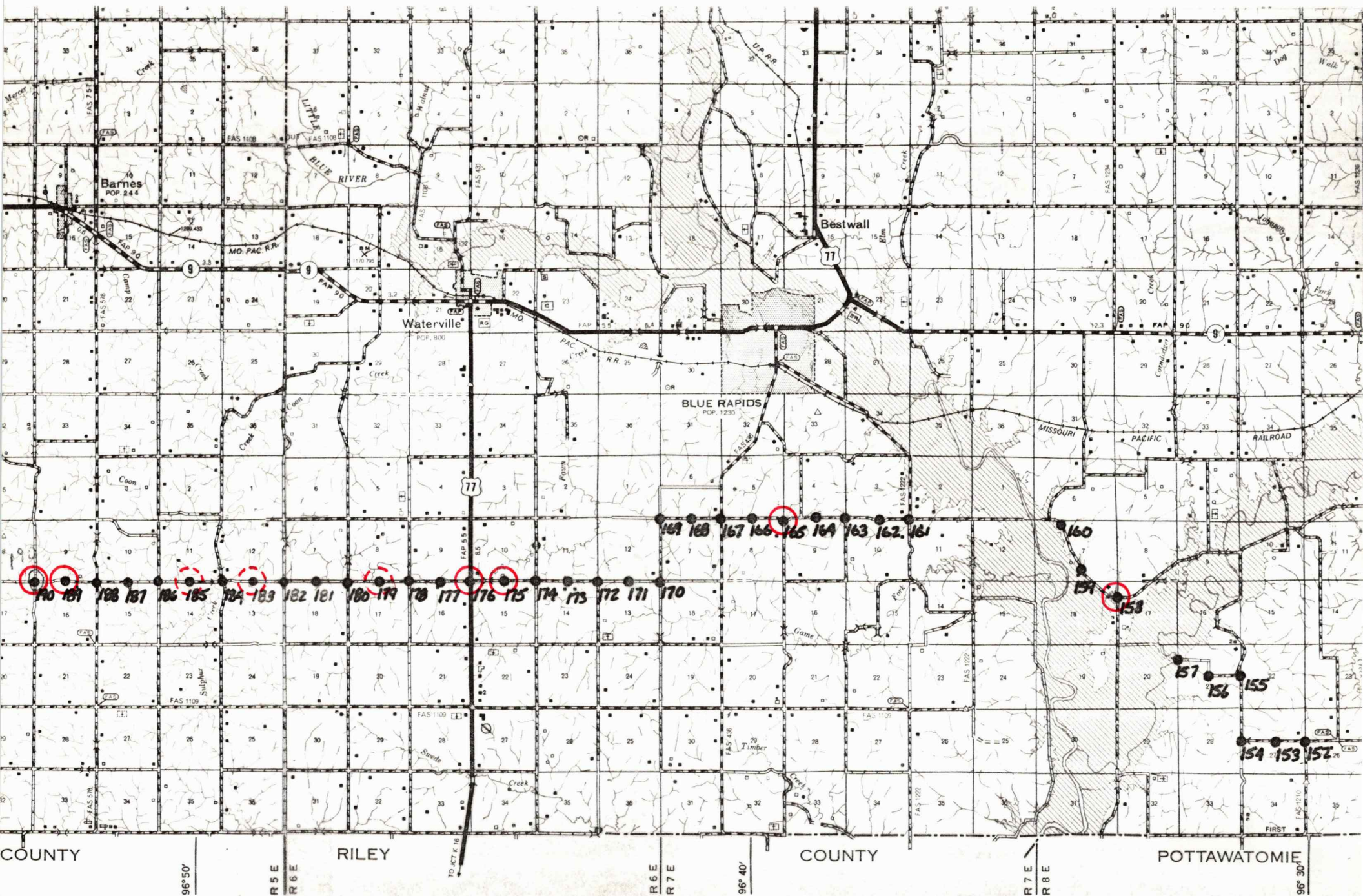
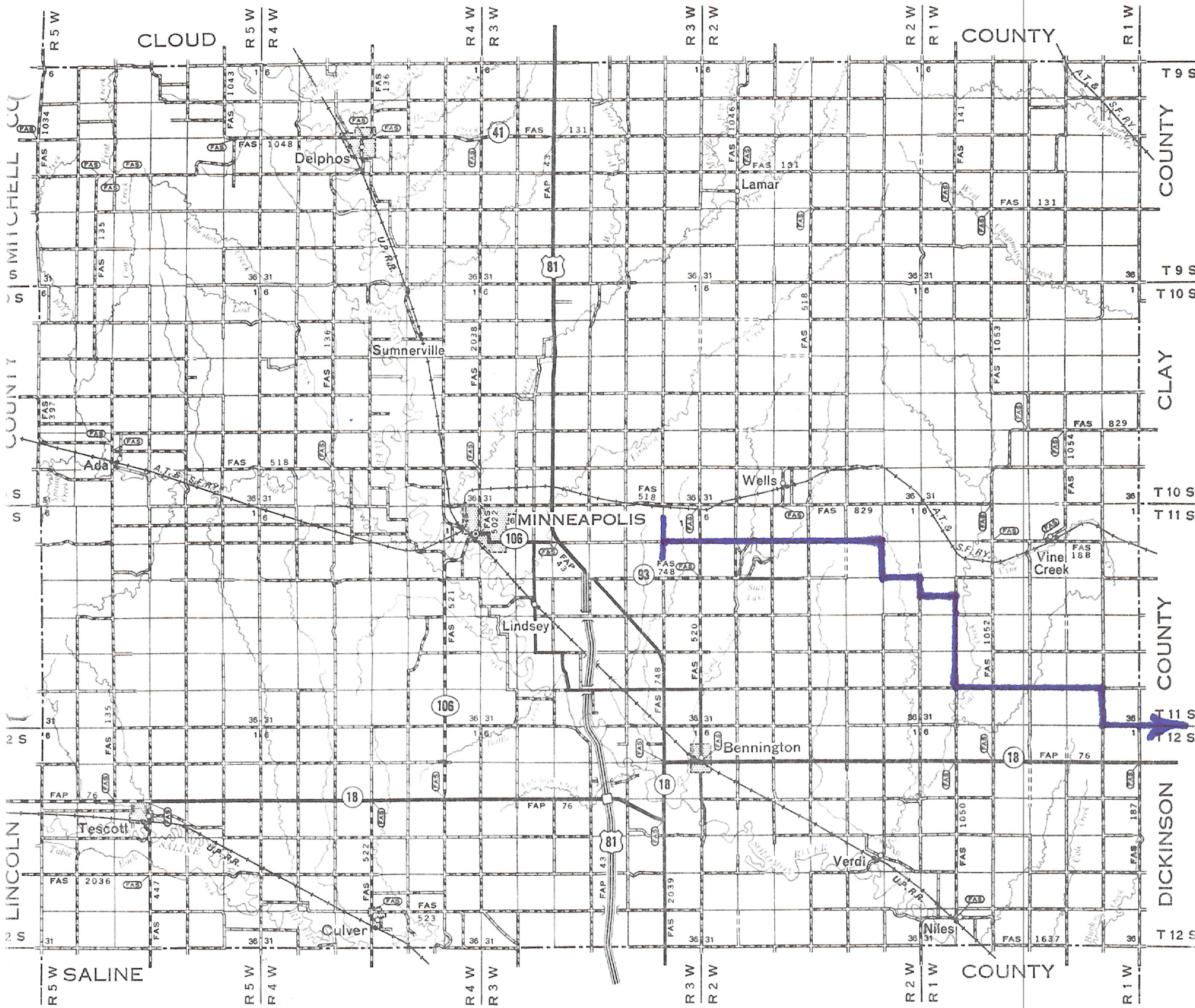


FIGURE 4.  
 ○ HYDROCARBON ANOMALIES - COCORP LINE (C1-C4)  
 SCALE 1" = 2MI.





○ ANOMALY ANOMALOUS H<sub>2</sub> IN SOIL GAS - (COCORP LINE (H<sub>2</sub>/40))  
 ( ) POSSIBLE ANOMALY  
 SCALE 1" = 2 MI.



**FIGURE 6A. SOUTHERN LINE He SAMPLING (10F5)**  
**MAY 19, 15, 16, 17, 18, 1984**

**LEGEND**

**ROADS AND ROADWAY FEATURES**

|   |       |
|---|-------|
| PRIMITIVE ROAD                                      | ..... |
| UNIMPROVED ROAD                                     | ..... |
| GRADED AND DRAINED ROAD                             | ..... |
| SOIL SURFACED ROAD                                  | ..... |
| GRAVEL OR STONE ROAD - NOT GRADED OR DRAINED        | ..... |
| GRAVEL OR STONE ROAD - GRADED AND DRAINED           | ..... |
| GRAVEL OR STONE ROAD WITH STABILIZED SURFACE        | ..... |
| BITUMINOUS ROAD - LOW TYPE PAVED ROAD               | ..... |
| DIVIDED HIGHWAY                                     | ..... |
| HIGHWAY WITH FULL CONTROL OF ACCESS AND INTERCHANGE | ..... |

**ROAD SYSTEM DESIGNATION**

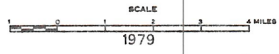
|  |       |     |
|--|-------|-----|
| FEDERAL-AID INTERSTATE HIGHWAY SYSTEM          | ..... | FAS |
| FEDERAL-AID PRIMARY HIGHWAY SYSTEM             | ..... | FAP |
| FEDERAL-AID SECONDARY HIGHWAY SYSTEM           | ..... | FAS |
| INTERSTATE NUMBERED HIGHWAY                    | ..... | 70  |
| U.S. NUMBERED HIGHWAY                          | ..... | 40  |
| STATE HIGHWAY SYSTEM OR STATE NUMBERED HIGHWAY | ..... | 20  |
| END OF DESIGNATED SYSTEM OR MARKED ROUTE       | ..... | 24  |



FA SYSTEMS REVISED TO FEB. 1, 1982

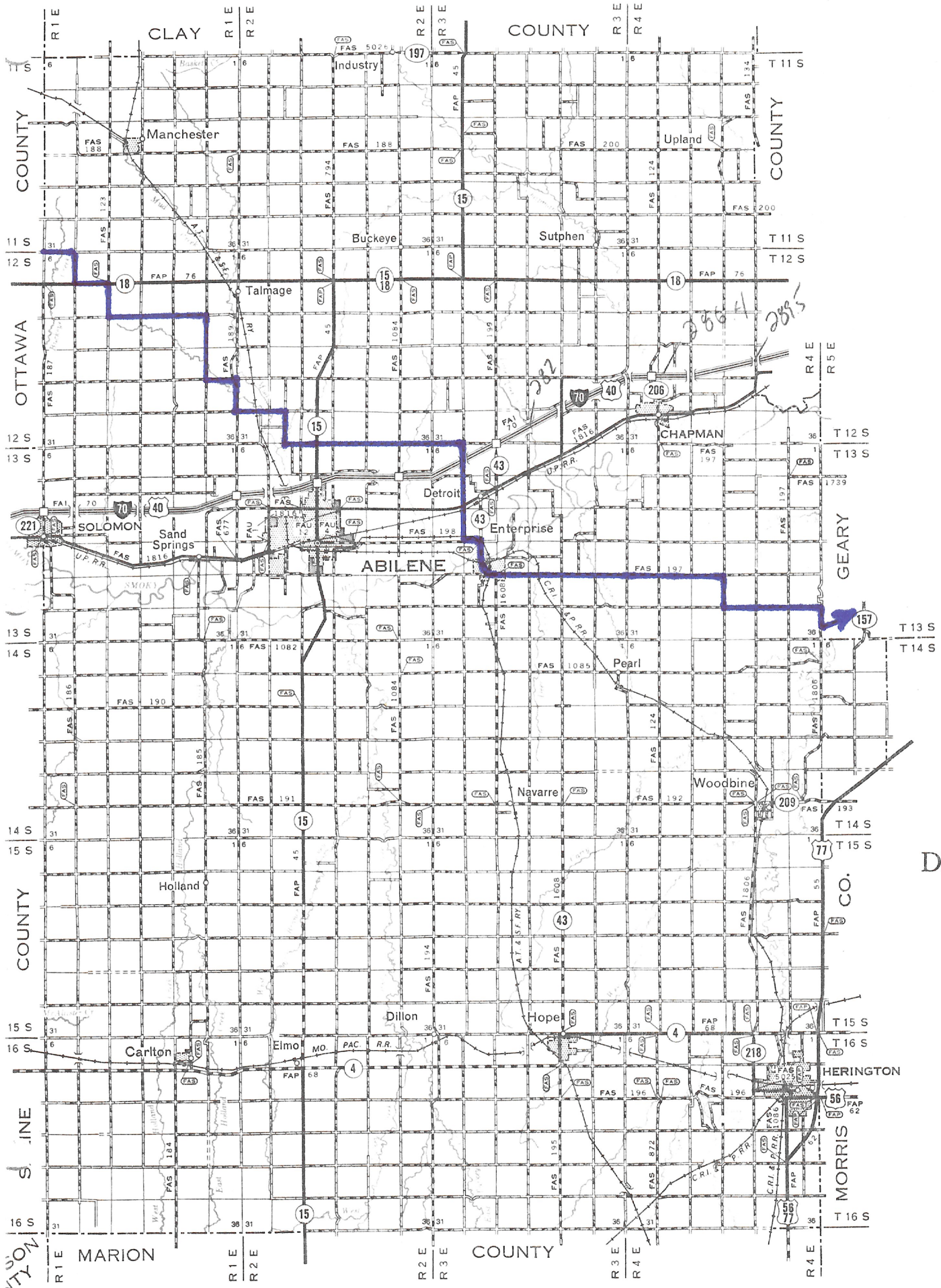
**GENERAL HIGHWAY MAP  
 OTTAWA COUNTY  
 KANSAS**

PREPARED BY THE  
 KANSAS DEPARTMENT OF TRANSPORTATION  
 PLANNING AND DEVELOPMENT DEPARTMENT  
 IN COOPERATION WITH THE  
 U. S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION

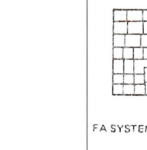


# FIGURE 6B. SOUTHERN LINE He SAMPLING (20F 5)

MAY 14, 15, 16, 17, 18, 1984



- ROADS AND**
- PRIMITIVE ROAD .....
  - UNIMPROVED ROAD .....
  - GRADED AND DRAINED SOIL SURFACED ROAD .....
  - GRAVEL OR STONE ROAD .....
  - NOT GRADED OR DRAINED GRAVEL OR STONE ROAD .....
  - GRADED AND DRAINED BITUMINOUS ROAD-LOW PAVED ROAD .....
  - STABILIZED SURFACE BITUMINOUS ROAD-LOW PAVED ROAD .....
  - DIVIDED HIGHWAY .....
  - HIGHWAY WITH FULL ACCESS AND INTERC...
- ROAD S**
- FEDERAL-AID INTERST...
  - FEDERAL-AID PRIMARY I...
  - FEDERAL-AID SECOND...
  - INTERSTATE NUMBERE...
  - U S NUMBERED HIGHWA...
  - STATE HIGHWAY SYSTEM...
  - STATE NUMBERED HIGH...
  - END OF DESIGNATED BY...
  - MARKED ROUTE .....

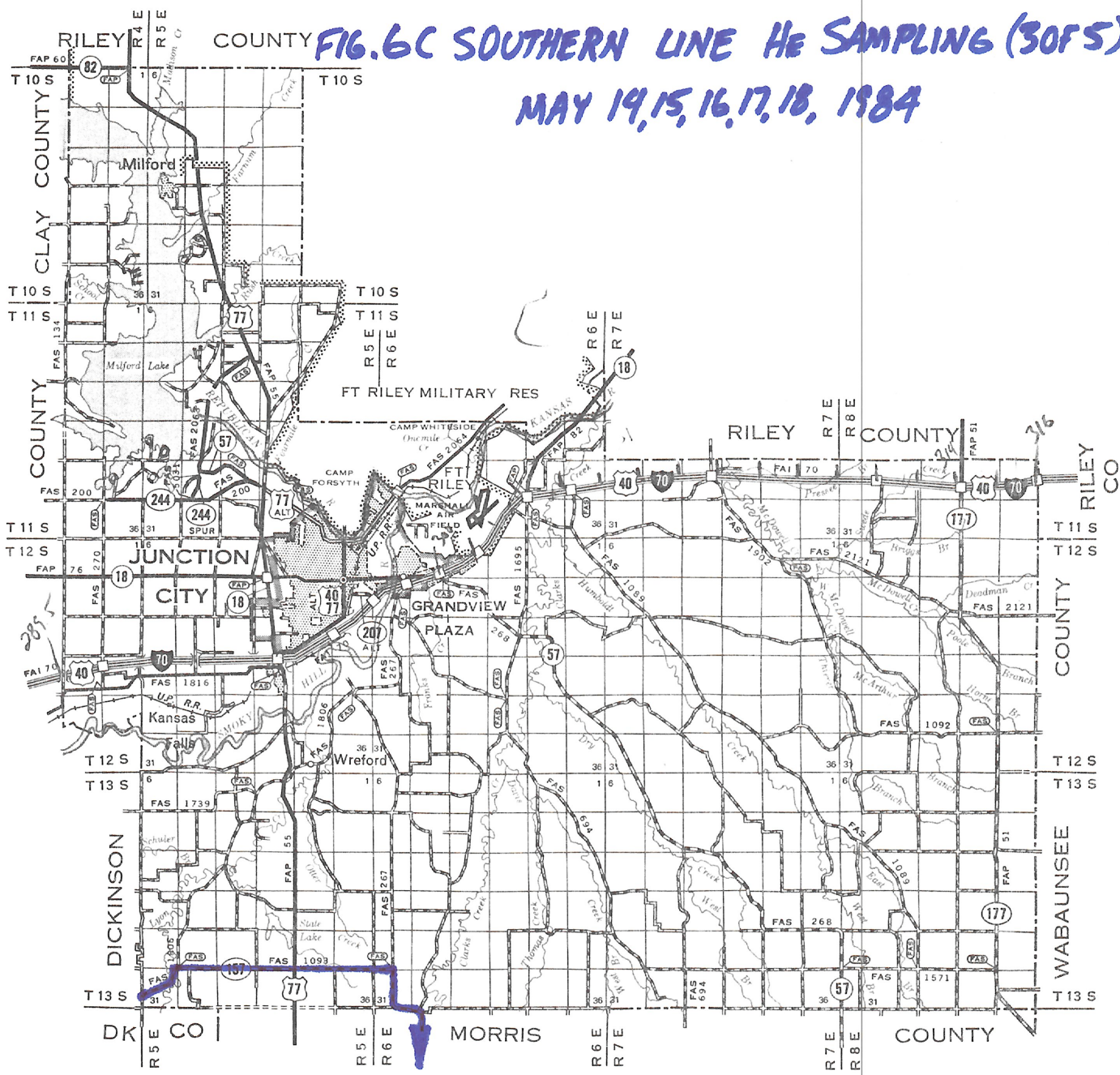


GENERAL B  
DICKINSON  
KAN

PREPARED BY  
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IN COOPERATION WITH  
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FEDERAL HIGHWAY ADMINISTRATION

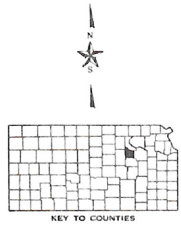


**FIG. 6C SOUTHERN LINE HE SAMPLING (30FS)**  
**MAY 14, 15, 16, 17, 18, 1984**



**LEGEND**

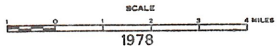
| ROADS AND ROADWAY FEATURES                          |       | ROAD SYSTEM DESIGNATION                        |     |
|---|-------|--|-----|
| PRIMITIVE ROAD                                      | ----- | FEDERAL-AID INTERSTATE HIGHWAY SYSTEM          | FAI |
| UNIMPROVED ROAD                                     | ----- | FEDERAL-AID PRIMARY HIGHWAY SYSTEM             | FAP |
| GRADED AND DRAINED ROAD                             | ===== | FEDERAL-AID SECONDARY HIGHWAY SYSTEM           | FAS |
| SOIL SURFACED ROAD                                  | ----- | INTERSTATE NUMBERED HIGHWAY                    | 70  |
| GRAVEL OR STONE ROAD - NOT GRADED OR DRAINED        | ----- | U.S. NUMBERED HIGHWAY                          | 40  |
| GRAVEL OR STONE ROAD - GRADED AND DRAINED           | ===== | STATE HIGHWAY SYSTEM OR STATE NUMBERED HIGHWAY | 20  |
| GRAVEL OR STONE ROAD WITH STABILIZED SURFACE        | ----- | END OF DESIGNATED SYSTEM OR MARKED ROUTE       | 24  |
| BITUMINOUS ROAD - LOW TYPE                          | ===== |  |     |
| PAVED ROAD  | ===== |  |     |
| DIVIDED HIGHWAY                                     | ===== |  |     |
| HIGHWAY WITH FULL CONTROL OF ACCESS AND INTERCHANGE | ===== |  |     |

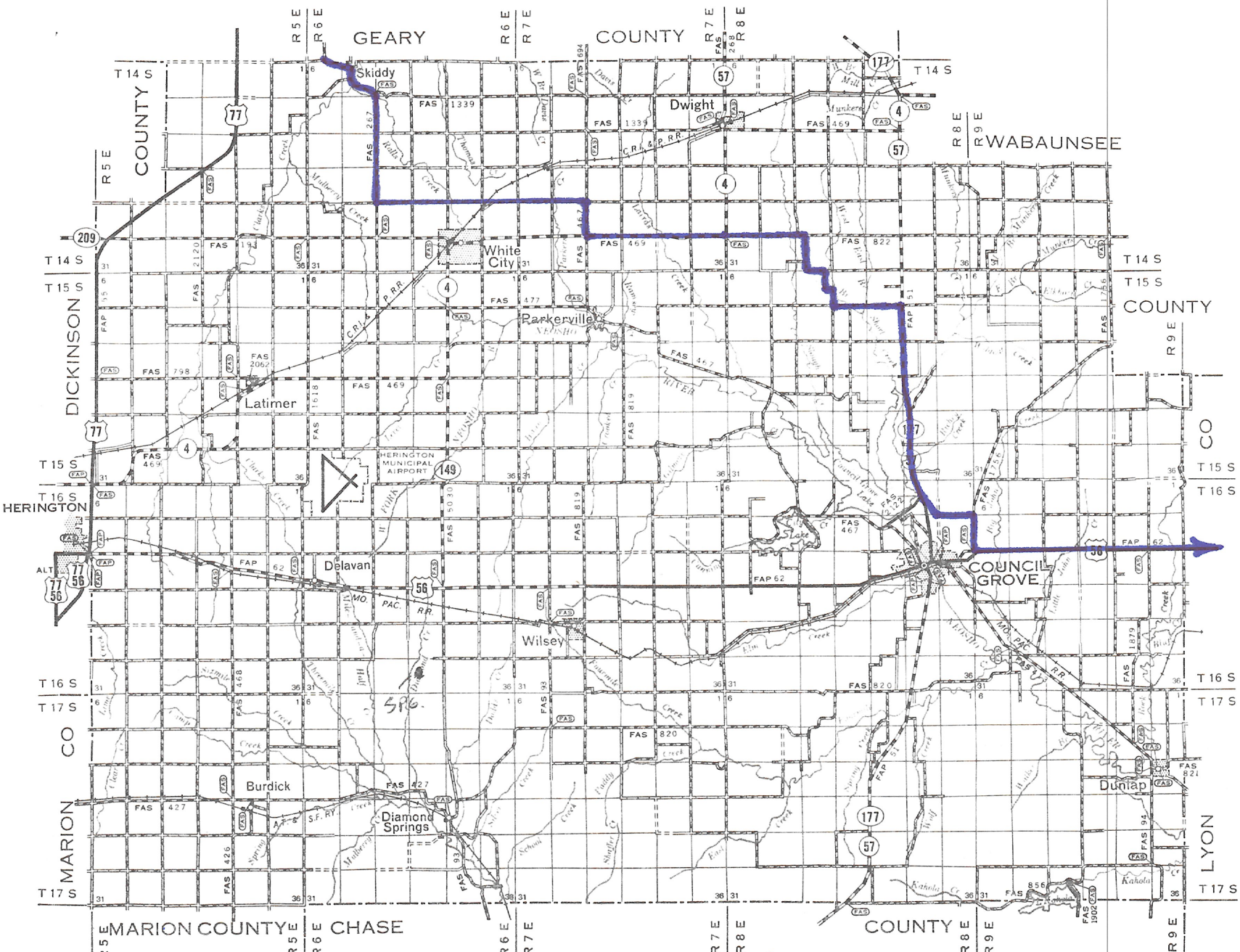


F.A. SYSTEMS REVISED TO OCTOBER 1, 1980

**GENERAL HIGHWAY MAP  
 GEARY COUNTY  
 KANSAS**

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 FEDERAL HIGHWAY ADMINISTRATION





**FIGURE 6D. SOUTHERN LINE HE SAMPLING (4 OF 5)  
MAY 14, 15, 16, 17, 18 1984**

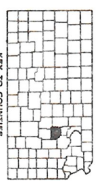
**GENERAL HIGHWAY MAP  
MORRIS COUNTY  
KANSAS**

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FEDERAL HIGHWAY ADMINISTRATION

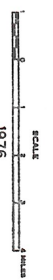
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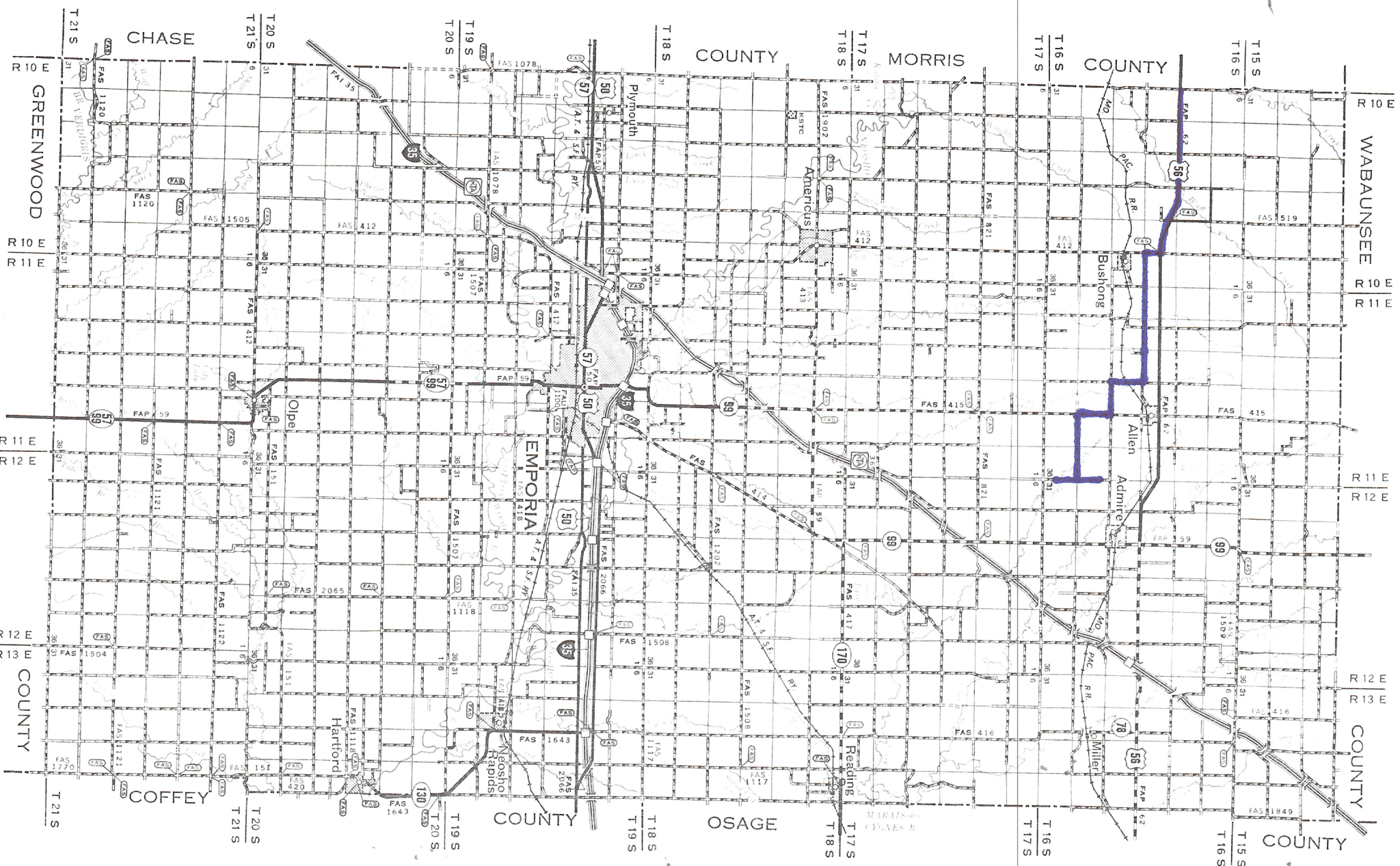
- ROADS AND ROADWAY FEATURES**
- 1 ROAD.....
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  - 97 ROAD.....
  - 98 ROAD.....
  - 99 ROAD.....
  - 100 ROAD.....

- ROAD SYSTEM DESIGNATION**
- FEDERAL-AID INTERSTATE HIGHWAY SYSTEM.....
  - FEDERAL-AID PRIMARY HIGHWAY SYSTEM.....
  - FEDERAL-AID SECONDARY HIGHWAY SYSTEM.....
  - INTERSTATE NUMBERED HIGHWAY.....
  - STATE NUMBERED HIGHWAY.....
  - STATE HIGHWAY NUMBER OR STATE NUMBERED HIGHWAY END OF DESIGNATED SYSTEM OR MARKED ROUTE.....



F.A. SYSTEMS REVISED TO APRIL 1, 1980





**FIGURE 6E. SOUTHERN LINE HE SAMPLING (50FS)  
MAY 14, 15, 16, 17, 18, 1984**

LYON

PRINTING:  
DRAWING:  
GRADED #  
SOIL SURF  
GRAVEL C  
GRAVEL O  
GRAVEL S  
STABILIZ  
BRUNING  
DIVISION  
HIGHWAY  
ACCESS

FEDERAL A  
FEDERAL-A  
INTERSTAT  
U S NUMB  
STATE HIGH  
STATE NC  
STATE NC  
MARKED

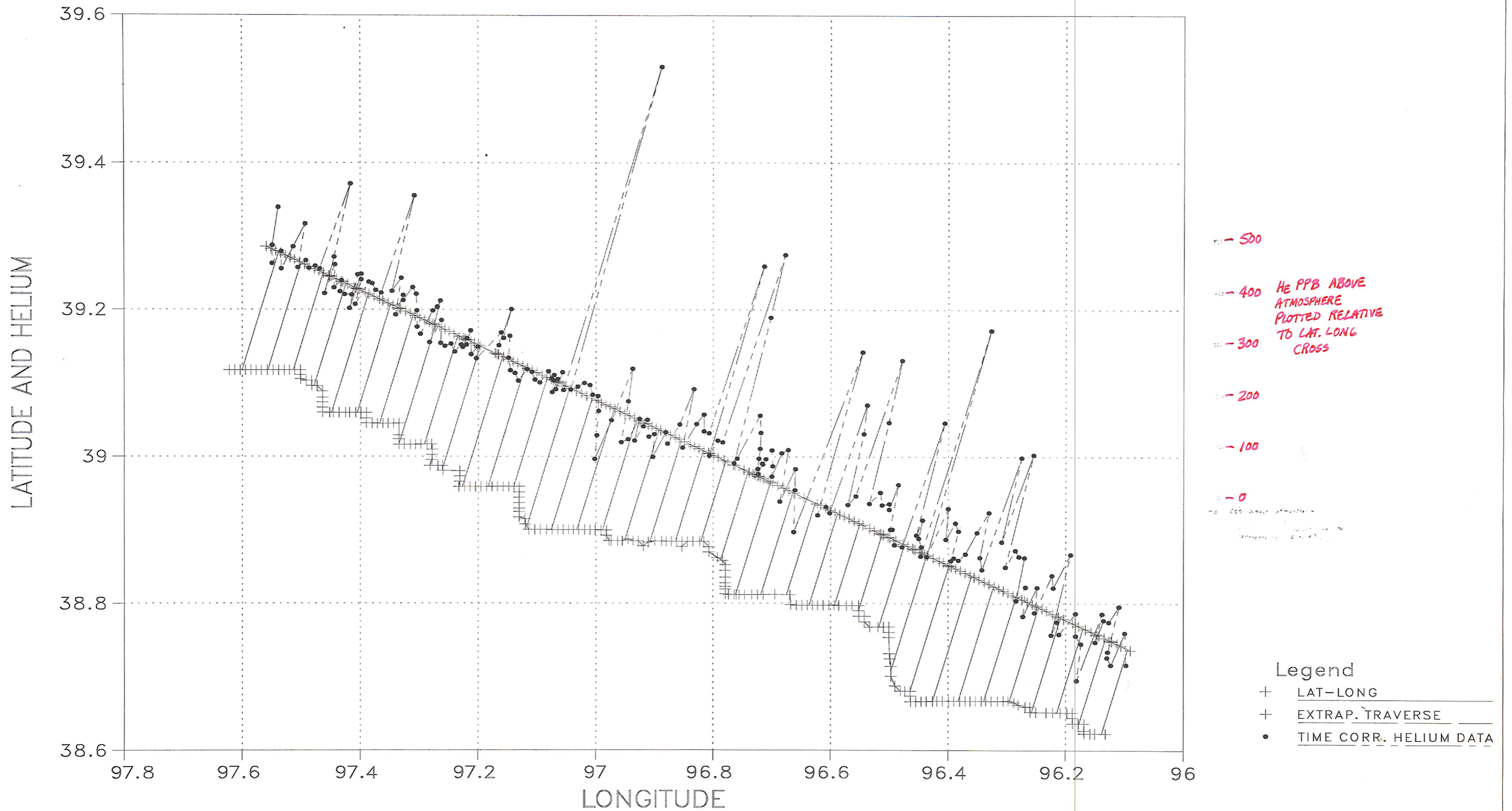


GEN  
IV

KANSAS  
PLANNI  
U

FIGURE 7.

HYDROGEN AREA HELIUM TRAVERSE, MAY 1984  
CORRECTED FOR VARIATION WITHIN A DAY



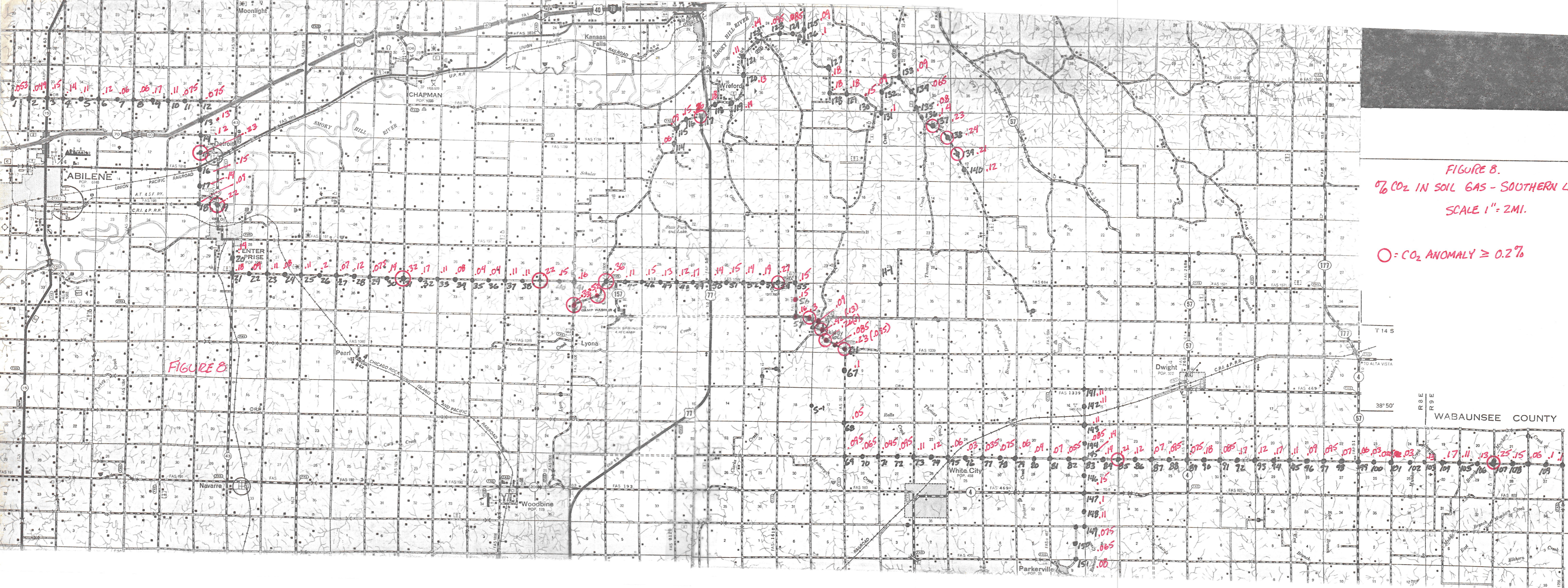


FIGURE 8.  
 % CO<sub>2</sub> IN SOIL GAS - SOUTHERN LINE  
 SCALE 1" = 2MI.

○ = CO<sub>2</sub> ANOMALY ≥ 0.2%

CO<sub>2</sub> VALUES

County No 112 113

T 14 S  
 T 15 S

R 8 E  
 R 9 E  
 N 5 E

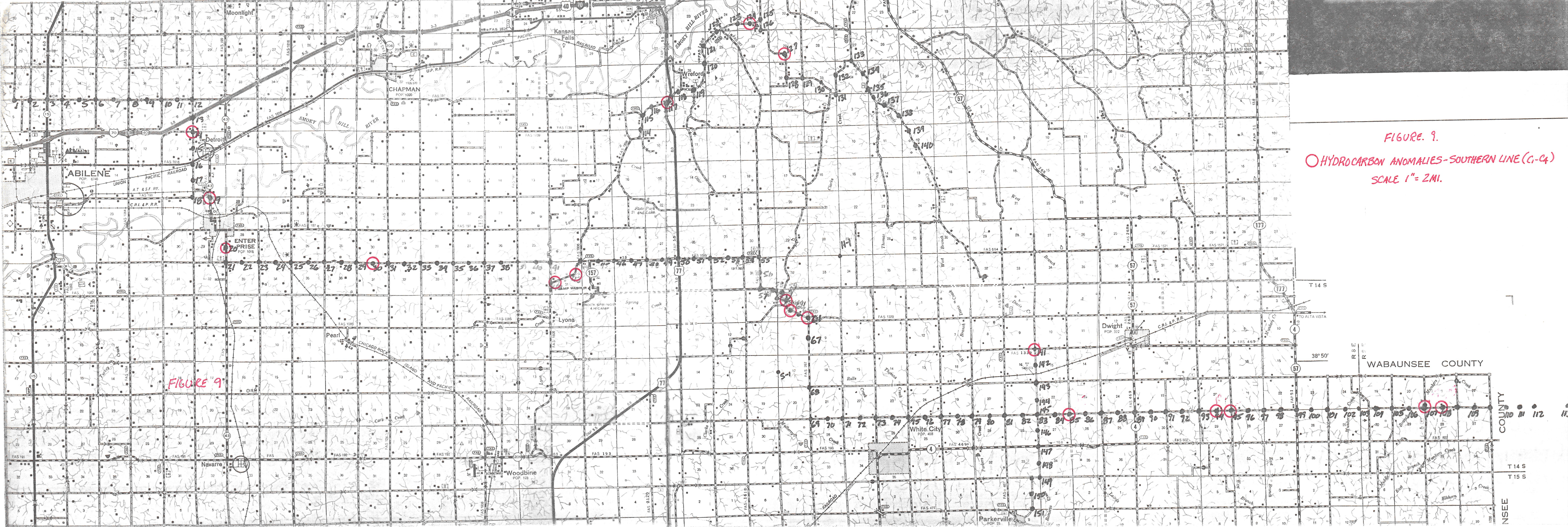


FIGURE 9.  
 ○ HYDROCARBON ANOMALIES-SOUTHERN LINE (C-C4)  
 SCALE 1" = 2MI.

FIGURE 9

WABAUNSEE COUNTY  
 COUNTY  
 N 112  
 T 14 S  
 T 15 S  
 N 51

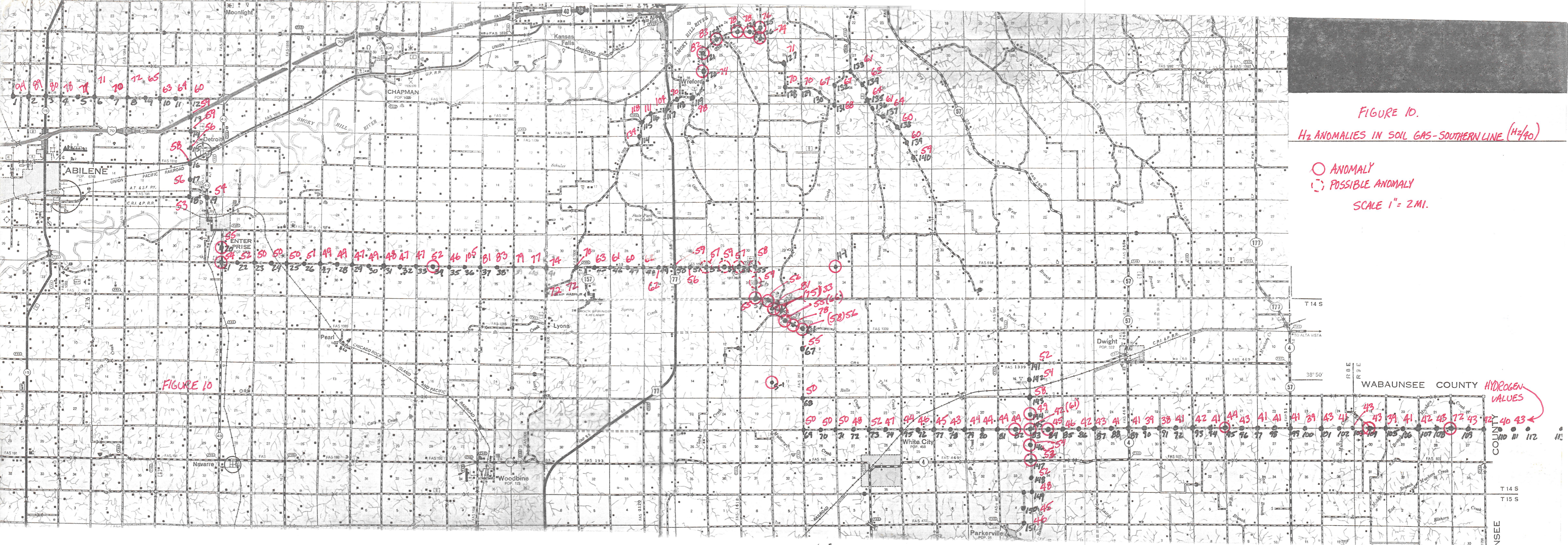


FIGURE 10.  
 H<sub>2</sub> ANOMALIES IN SOIL GAS-SOUTHERN LINE (H<sub>2</sub>/40)

○ ANOMALY  
 ⊖ POSSIBLE ANOMALY  
 SCALE 1" = 2 MI.

FIGURE 10

WABAUNSEE COUNTY HYDROGEN VALUES

WABAUNSEE COUNTY  
 T 14 S  
 T 15 S  
 N 50 E  
 N 51 E  
 N 52 E  
 N 53 E  
 N 54 E  
 N 55 E  
 N 56 E  
 N 57 E  
 N 58 E  
 N 59 E  
 N 60 E  
 N 61 E  
 N 62 E  
 N 63 E  
 N 64 E  
 N 65 E  
 N 66 E  
 N 67 E  
 N 68 E  
 N 69 E  
 N 70 E  
 N 71 E  
 N 72 E  
 N 73 E  
 N 74 E  
 N 75 E  
 N 76 E  
 N 77 E  
 N 78 E  
 N 79 E  
 N 80 E  
 N 81 E  
 N 82 E  
 N 83 E  
 N 84 E  
 N 85 E  
 N 86 E  
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 N 94 E  
 N 95 E  
 N 96 E  
 N 97 E  
 N 98 E  
 N 99 E  
 N 100 E  
 N 101 E  
 N 102 E  
 N 103 E  
 N 104 E  
 N 105 E  
 N 106 E  
 N 107 E  
 N 108 E  
 N 109 E  
 N 110 E  
 N 111 E  
 N 112 E