UTAH POWER & LIGHT COMPANY
SUBSIDENCE MONITORING PROGRAM
ANNUAL REPORT FOR 1985

February 1986

Submitted to: United States Department of the Interior
Office of Surface Mining
Minerals Management Service
Utah Division of Oil, Gas and Mining

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Des-Bee-Dove Mines

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Introduction

Utah Power & Light Company's (UP&L) East Mountain Subsidence Monitoring Study is an ongoing project designed to detect, observe and report the effects of mining induced subsidence above the Deer Creek, Wilberg and Des-Bee-Dove Mines (see Figure 1). This is the fifth such annual report submitted and covers the period between August 31, 1984 and August 31, 1985.

The initial report submitted in 1982 details the monitoring methods used in this study; therefore, they are not discussed here in depth. Briefly, UP&L uses aerial photogrammetric survey methods augmented by conventional monumented on-the-ground surveys and an annual helicopter reconnaissance flight to monitor subsidence. The Bureau of Mines surveyed for subsidence above areas of multiple seam longwall mining in the Deer Creek and Wilberg Mines through August 1985. This work, if needed, will be continued by UP&L beginning in 1986.

Location

Figure 2 shows all areas above UP&L's coal mines which have potential for mining induced subsidence and were studied in 1985 to detect subsidence. A helicopter reconnaissance flight on July 9, 1985 revealed no new areas of fractures or visible surface disturbance. One new

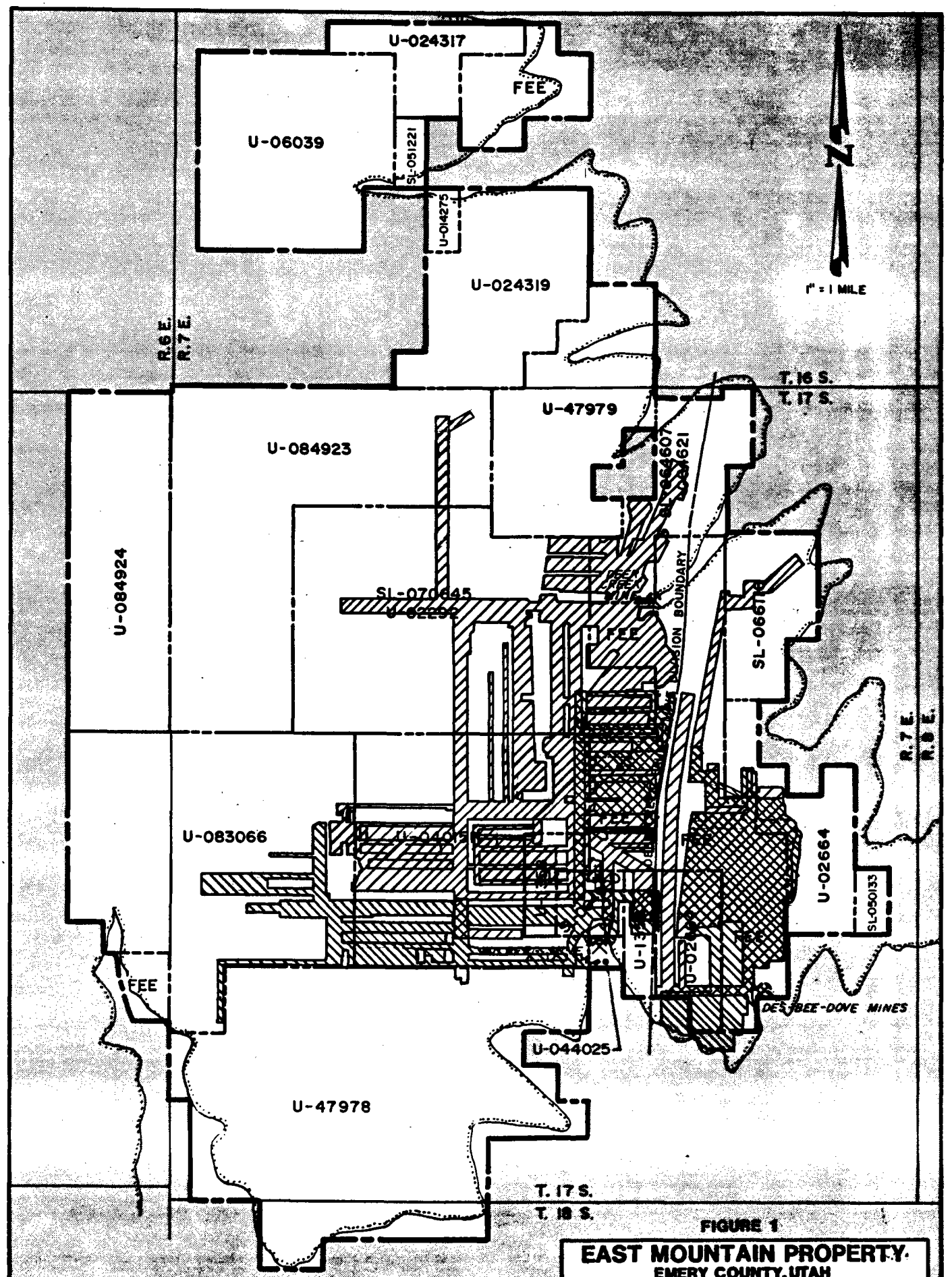
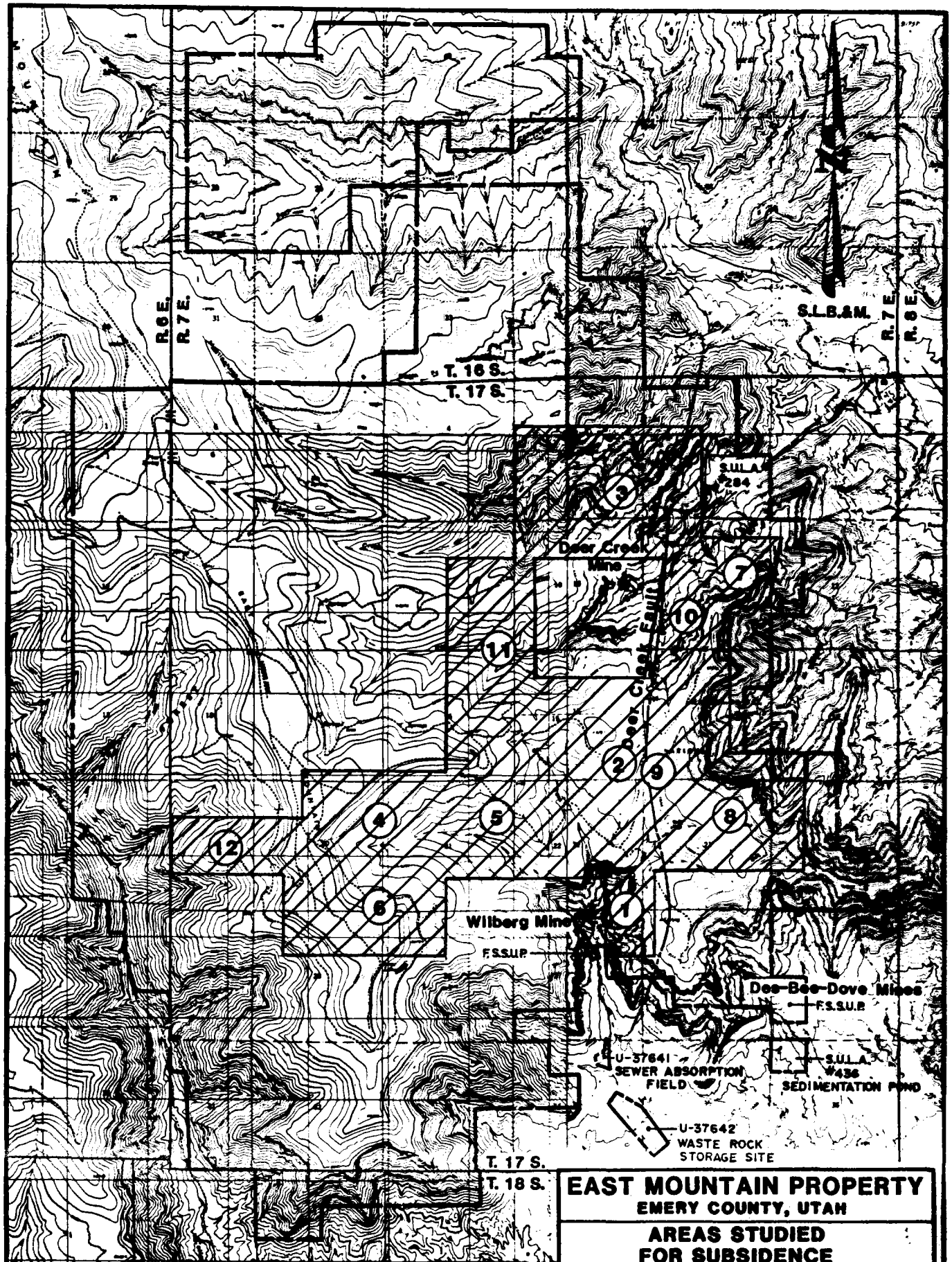


FIGURE 1

EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH
LOCATION MAP

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

MINE WORKINGS UPDATED TO 9/1/85



NUMBERS KEYED TO TEXT

= AREAS STUDIED FOR SUBSIDENCE

= U.P.&L.CO. PERMIT BOUNDARY LINE

EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH

AREAS STUDIED FOR SUBSIDENCE

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DATE: 2/11/86	BY: LJ GUM
SCALE: 1"=1 Mile	FIGURE 2

area of subsidence was detected in 1985 by photogrammetric methods. This occurred above the A North and A South room-and-pillar sections in the Deer Creek Mine.

Each of the areas shown in Figure 2 are discussed in detail in the following paragraphs. Previous reports described the topographic and geologic setting of the subsidence areas, thus, mention of such will only be given when necessary in this report. If the reader has questions regarding this information, previous subsidence monitoring reports should be consulted.

As mentioned before, various methods have been employed in detecting and measuring subsidence. In the following, unless otherwise noted, measurements were made by aerial photogrammetry.

In some areas of subsidence the angle of draw has been calculated and reported herein. However, in areas where mine workings are surrounded by burned coal, the failure of the clinker beds promotes subsidence outside of the mined area making it nearly impossible to make a reliable angle of draw estimate. In other cases, the zone of subsidence covers a small area and is contained within the area of final mining. This suggests that the subsidence hasn't stabilized and a calculation of angle of draw would be meaningless. Many sections are surrounded by other, older workings. In these cases an angle-of-draw cannot be reliably calculated due to the influence of the older workings.

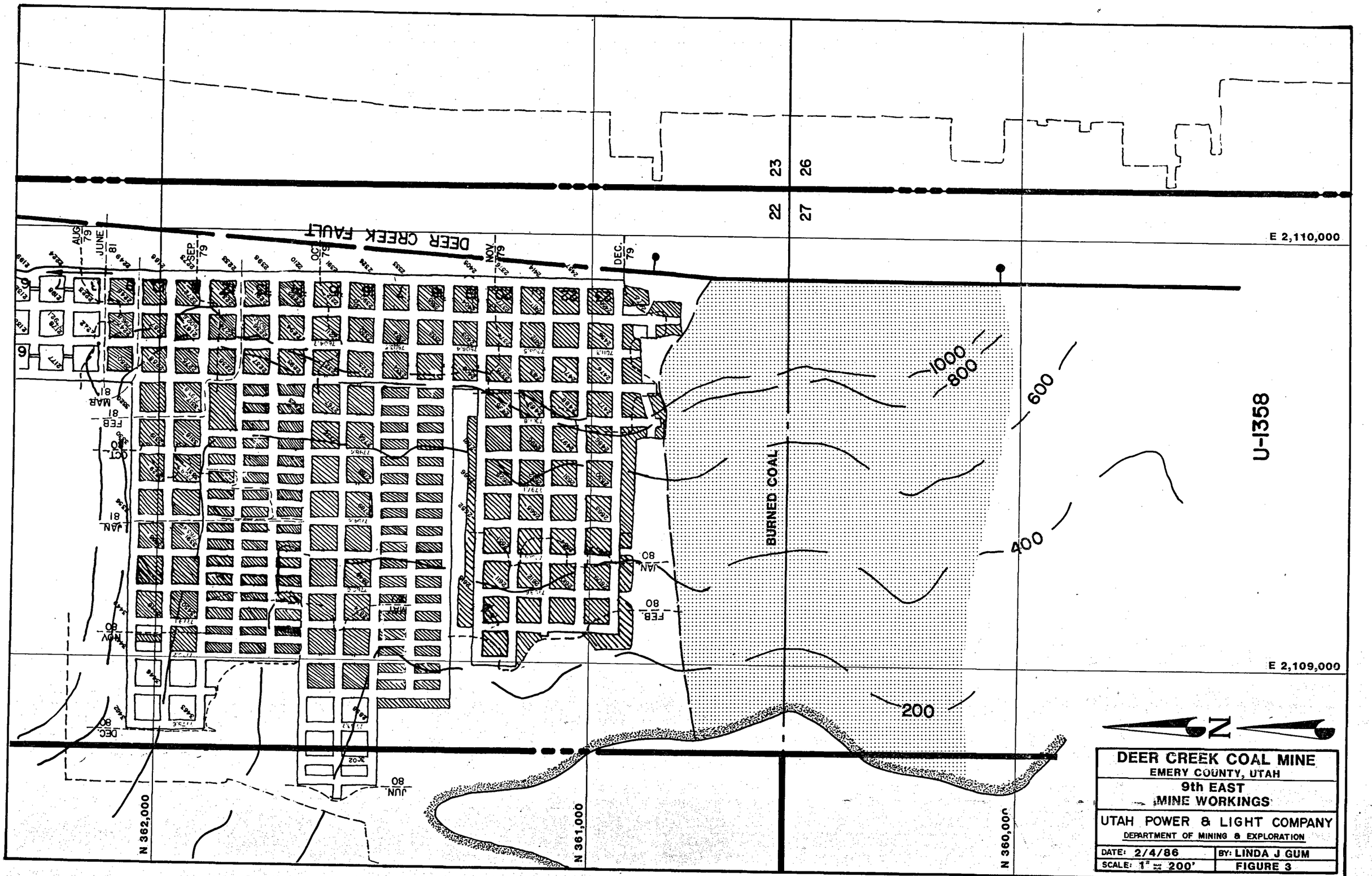
Area 1

Deer Creek 9th East - Wilberg 1st Right

Subsidence in this area was first documented in the 1981 subsidence monitoring report submitted in December 1982. The relationship of the area of subsidence with the present Deer Creek and Wilberg Mine workings is shown in Figure 3, 4 and 5. The Deer Creek 9th East workings in this area have been abandoned since 1981 but pillar extraction in Wilberg 1st Right proceeded until June 1984.

Subsidence monitoring during 1985 showed a continuation of subsidence in and around the graben-like structure seen in this area. The maximum subsidence observed to date is 25 feet and occurs about 200 feet south of the southernmost mined-out area in 1st Right Wilberg over an area in which both the Hiawatha and Blind Canyon Seams are burned. This supports the theory that the clinker beds have been crushed allowing subsidence to occur well outside the area of mine workings.

The angle of draw of subsidence in this area appears to be influenced by the Deer Creek Fault plane. On the east side of the mine workings the subsidence abruptly stops in an easterly direction about 200 feet east of the mine workings which coincides with the Deer Creek Fault trace.


DEER CREEK FAULT
BURNED COAL
E 2,110,000
E 2,109,000
N 362,000
N 361,000
N 360,000
1000
800
600
400
200
U-1358
N
DEER CREEK COAL MINE
EMERY COUNTY, UTAH
9th EAST
MINE WORKINGS
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: 2/4/86
BY: LINDA J GUM
SCALE: 1" = 200'
FIGURE 3

DEER CREEK FAULT

23
26
22
27

E 2,110,000

E 2,109,000

MAR. 81
FEB. 81
AIR DOOR
FEB. 81
MAR. 81
JUNE 81
JULY 81
SEPT. 81
JAN. 81
JUNE 81
DEC. 80
NOV. 80
NOV. 80
NOV. 80
DEC. 80

BURNED COAL

N 362,000

N 361,000

N 360,000

200

DATA:
JOY 8' DIA. EXHAUST FAN
4160 VOLTS 40 AMPS 3 PHASE
FULL CAPACITY 119 AMPS
1175 R.P.M. 1000 H.P.
BLADE SETTING 22°
RELIANCE 1000H.P. MOTOR
500 H.P. DIESEL BACKUP
C.F.M. AT
WATER GAUGE

MINE WORKINGS UPDATED TO : JANUARY 1, 1986

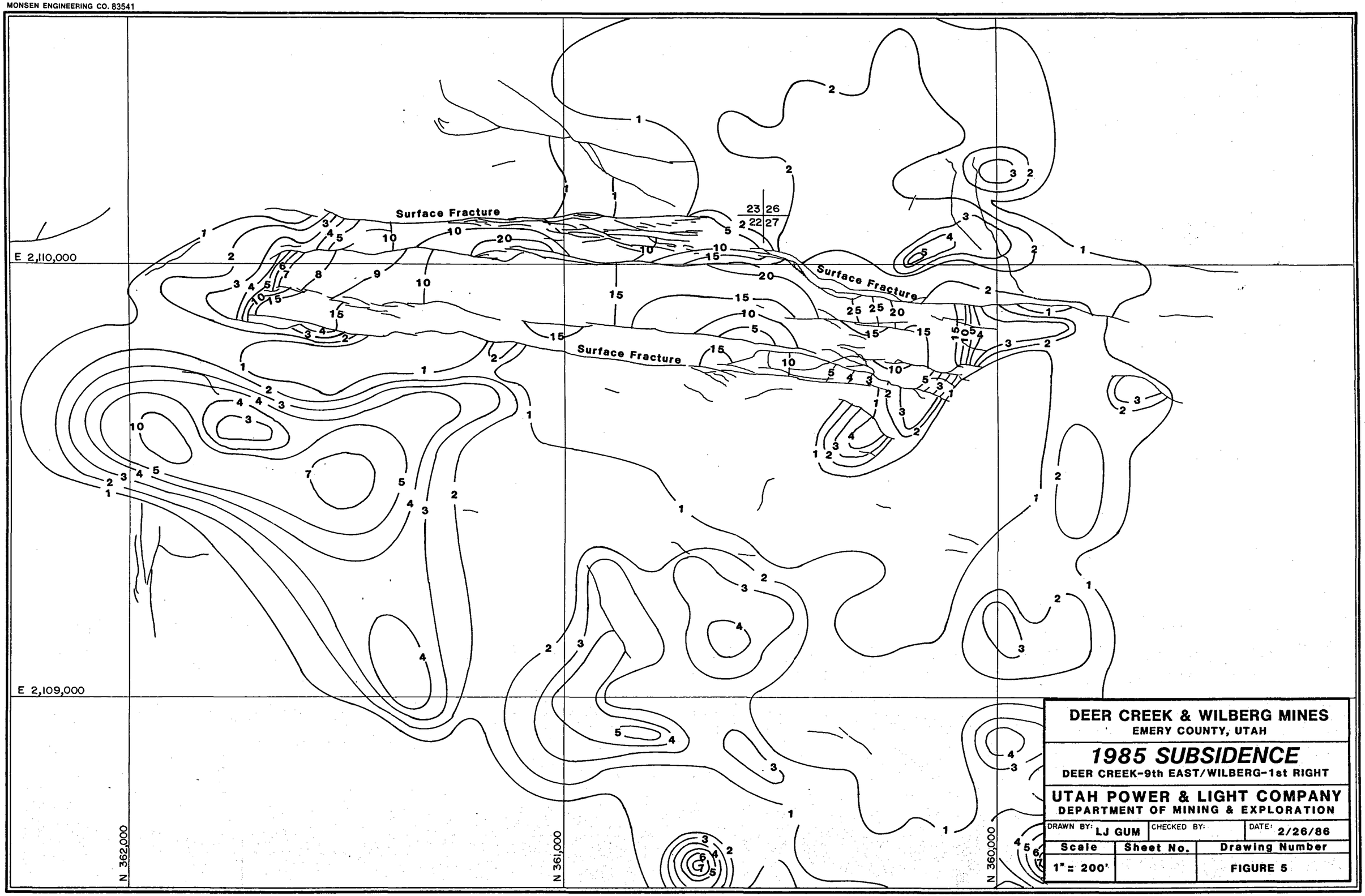
WILBERG COAL MINE
EMERY COUNTY, UTAH

1st RIGHT MINE WORKINGS

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DATE: 2/4/86	BY: LINDA J GUM
SCALE: 1" = 200'	FIGURE 4

MONSEN ENGINEERING CO. 83541



DEER CREEK & WILBERG MINES
EMERY COUNTY, UTAH

1985 SUBSIDENCE

DEER CREEK-9th EAST/WILBERG-1st RIGHT

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 2/26/86
Scale	Sheet No.	Drawing Number
1" = 200'		FIGURE 5

In this area the mine workings are covered with 1200 feet of overburden indicating a 9.5° angle of draw on subsidence.

No hydrologic impacts have been observed within this area of subsidence.

Area 2

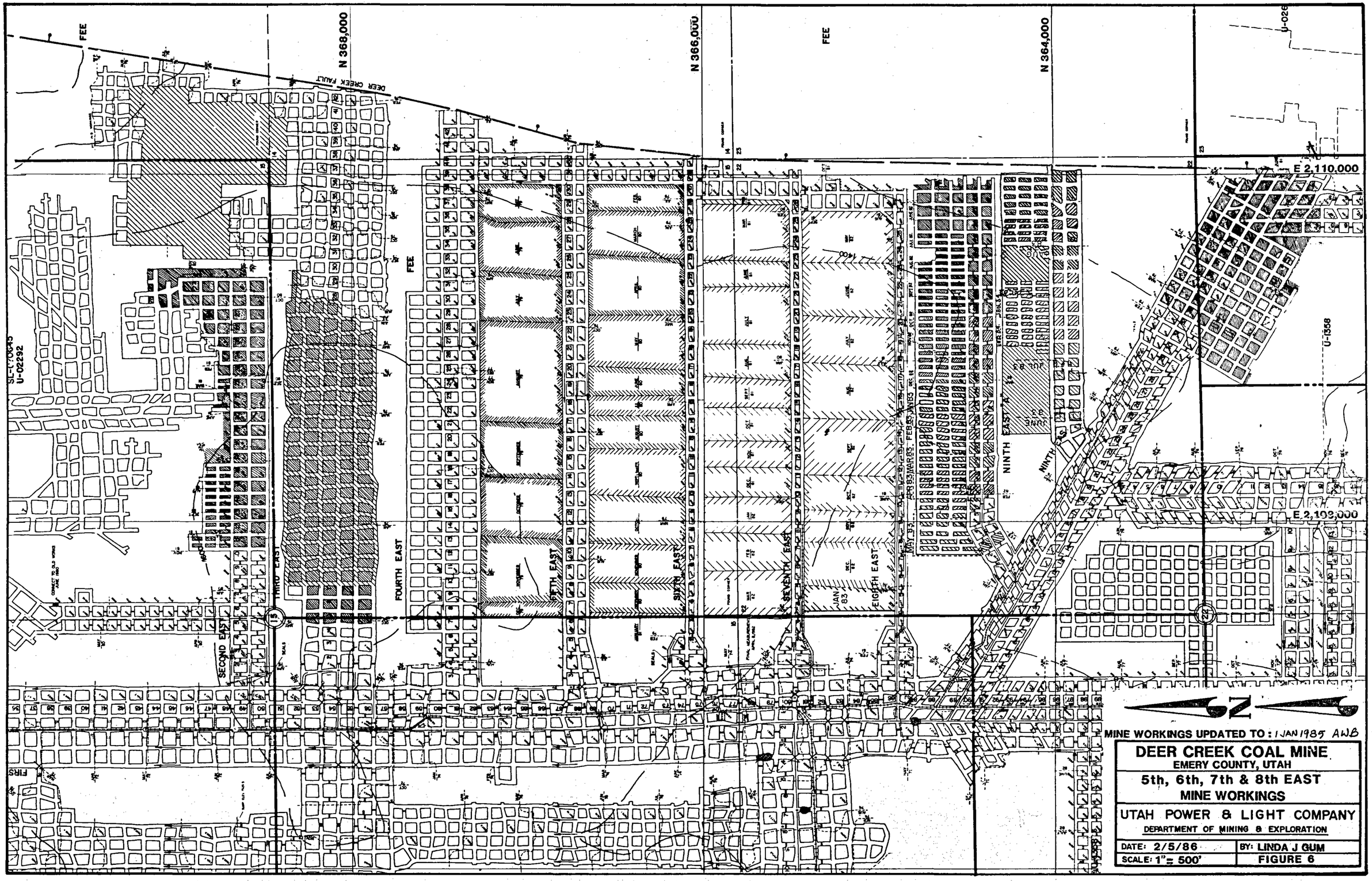
Deer Creek 5th, 6th, 7th and 8th East Longwall Panels

Wilberg 6th, 7th, and 10th Thru 13th Right Longwall Panels

Mining in the Deer Creek Mine in this area had been completed by January 1983. Underlying this seam in the Wilberg Mine, coal extraction continued from September 1, 1984 until December 19, 1984 when mining was terminated due to a fire. During this time the 6th Right panel, 620 feet of the 5th Right panel, and 1,000 feet of the 13th Right longwall panel were completed (Figures 6 and 7).

In 1985 this area was surveyed by both photogrammetric methods and U. S. Bureau of Mines on-the-ground monumentation (Figures 8a and 8b). Once again, the two surveys were in fairly close agreement. The photogrammetric survey showed a maximum of 13 feet of subsidence while on-the-ground methods indicated that 12 feet had occurred. In both surveys maximum subsidence occurred over the Deer Creek 6th East and Wilberg 6th and 7th Right longwall panels. The area of subsidence continued to elongate to the north and south in 1985 but neither UP&L nor USBM personnel have detected any surface fissures or other visible disturbance.

An angle-of-draw has been calculated where possible on the western side of this area. On the eastern side the angle is influenced by the Deer Creek fault and adjacent



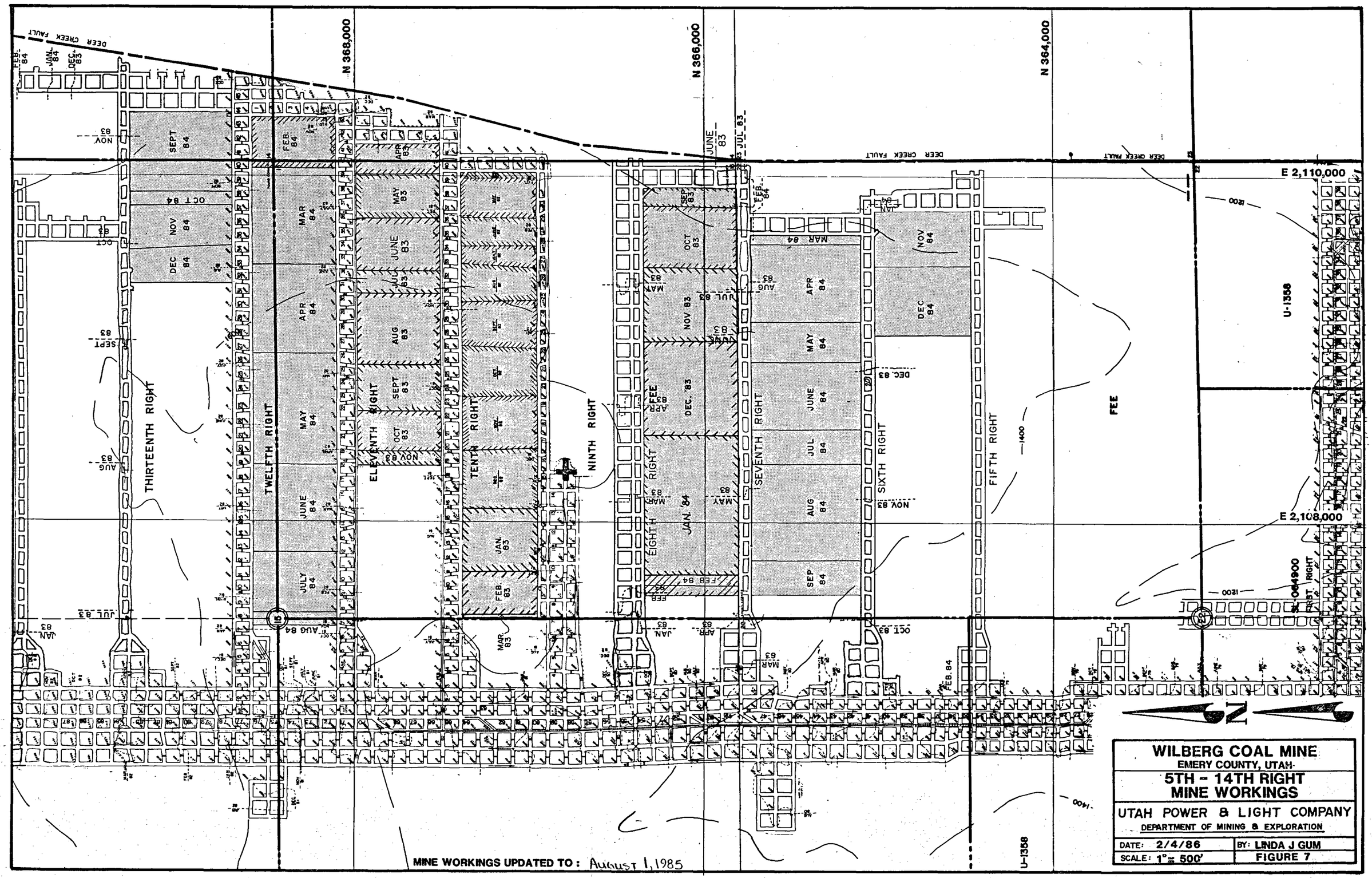
MINE WORKINGS UPDATED TO: 1 JAN 1985 AWB

DEER CREEK COAL MINE
EMERY COUNTY, UTAH

5th, 6th, 7th & 8th EAST MINE WORKINGS

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DATE: 2/5/86	BY: LINDA J GUM
SCALE: 1" = 500'	FIGURE 6



WILBERG COAL MINE
EMERY COUNTY, UTAH

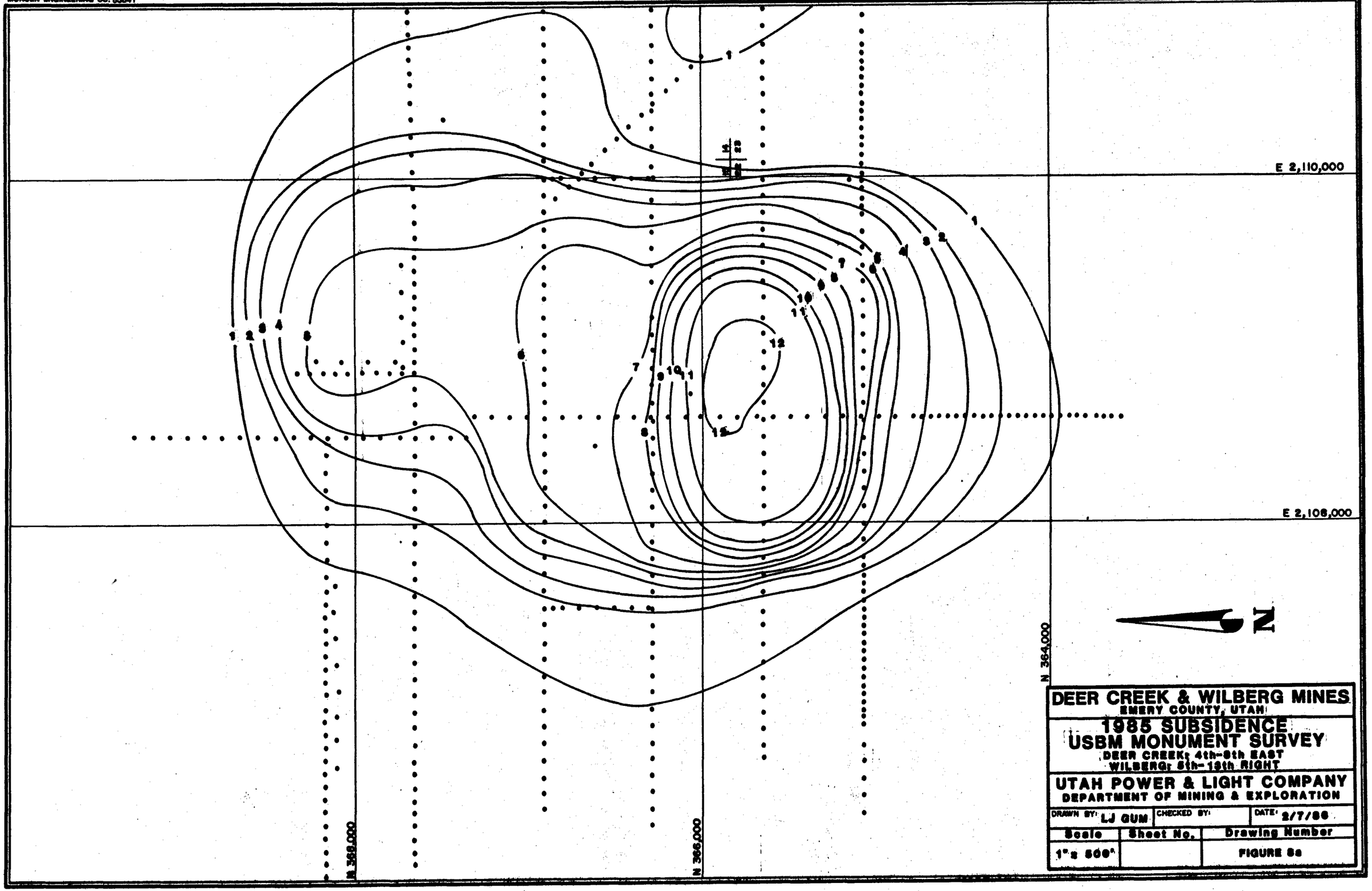
5TH - 14TH RIGHT MINE WORKINGS

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DATE: 2/4/86	BY: LINDA J GUM
SCALE: 1" = 500'	FIGURE 7

MINE WORKINGS UPDATED TO: August 1, 1985

MONSEN ENGINEERING CO. 83641



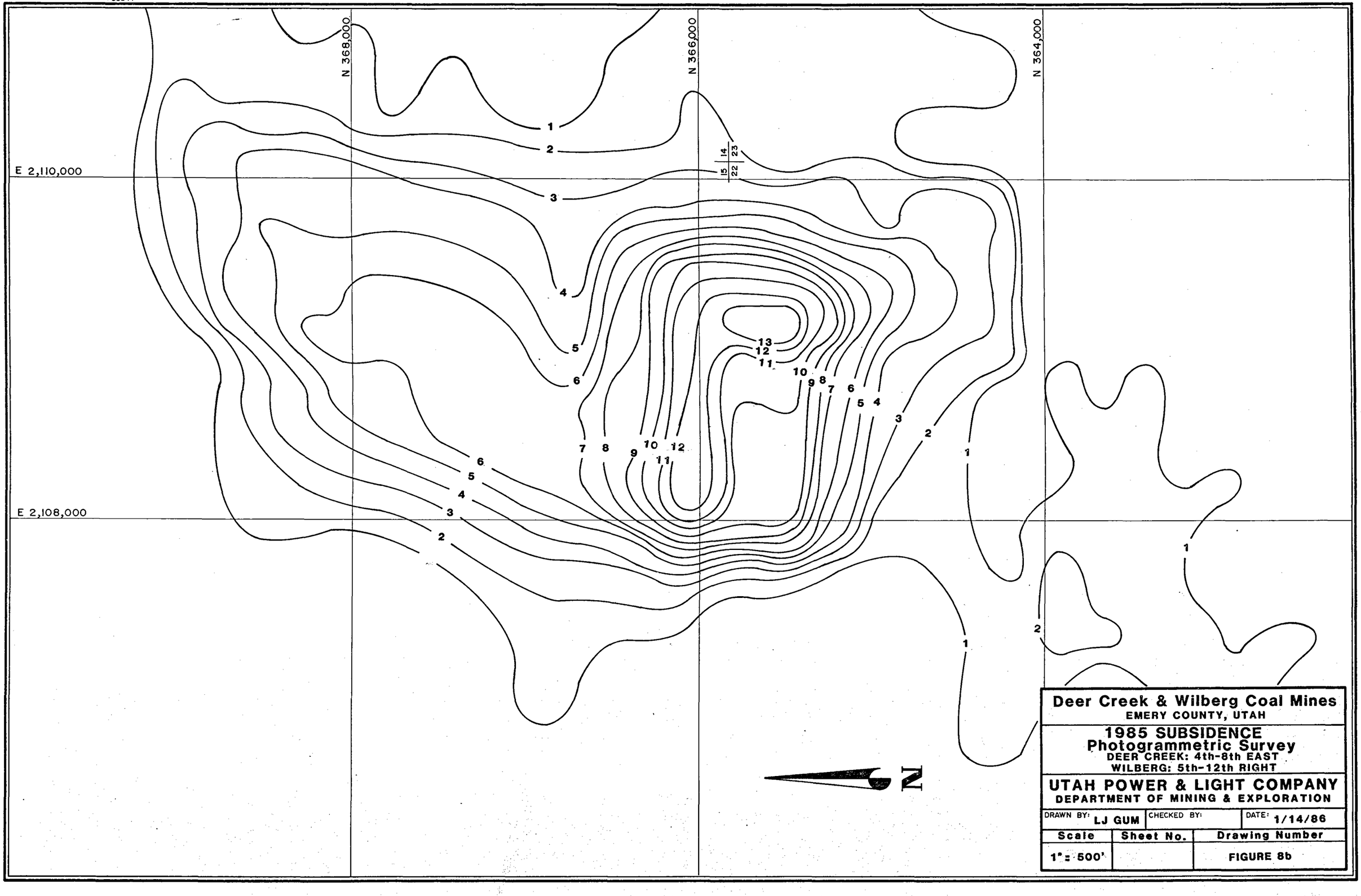
DEER CREEK & WILBERG MINES
EMERY COUNTY, UTAH

1985 SUBSIDENCE
USBM MONUMENT SURVEY
DEER CREEK: 4th-8th EAST
WILBERG: 8th-12th RIGHT

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 2/7/86
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 8a

MONSEN ENGINEERING CO. 83541



Deer Creek & Wilberg Coal Mines
EMERY COUNTY, UTAH

1985 SUBSIDENCE
Photogrammetric Survey
DEER CREEK: 4th-8th EAST
WILBERG: 5th-12th RIGHT

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/14/86
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 8b

Little Dove Mine workings across the fault; thus, we are unable to calculate a meaningful angle-of-draw there. Other mine workings to the north and south in the Deer Creek Mine cause similar problems with any calculation on those sides. On the western side the angle-of-draw ranges from near vertical to 20 degrees.

No springs have been identified over this subsidence area but two springs, one-fourth to one-third mile to the west show no effects from mining (see Hydrologic Monitoring Report, 1986).

Area 3

Deer Creek 1st North Area

Most of the 1st North section of the Deer Creek Mine was abandoned and sealed in 1978 after being mined out. The southern portion is still open and will be used for access to a block of coal which lies to the west. Pillar extraction in the 3rd Left and 1½ North sections was completed in early 1980. Subsidence has since been detected over each of the sections and over burned coal to the east of the 1st North workings (Figures 9 and 10). The greatest subsidence observed in the area occurs over a zone of complete pillar extraction in 1½ North where subsidence reached 15 feet even though only 7.5 feet of coal was removed. Because of the location of this anomally, it must be attributed to mass wasting. Over the rest of the area maximum subsidence was 5 feet. Several zones of fracturing have been observed above the 1st and 1½ North sections mainly on the north side of the ridge that extends over the workings.

The strata in the area are dry because they lack adequate hydrologic recharge. Therefore, the subsidence will not effect the hydrology.

The calculated angle-of-draw for this area ranges from vertical to 40 degrees but these are not considered reliable angles since burned coal, steep slopes and fracturing have complicated the subsidence process.

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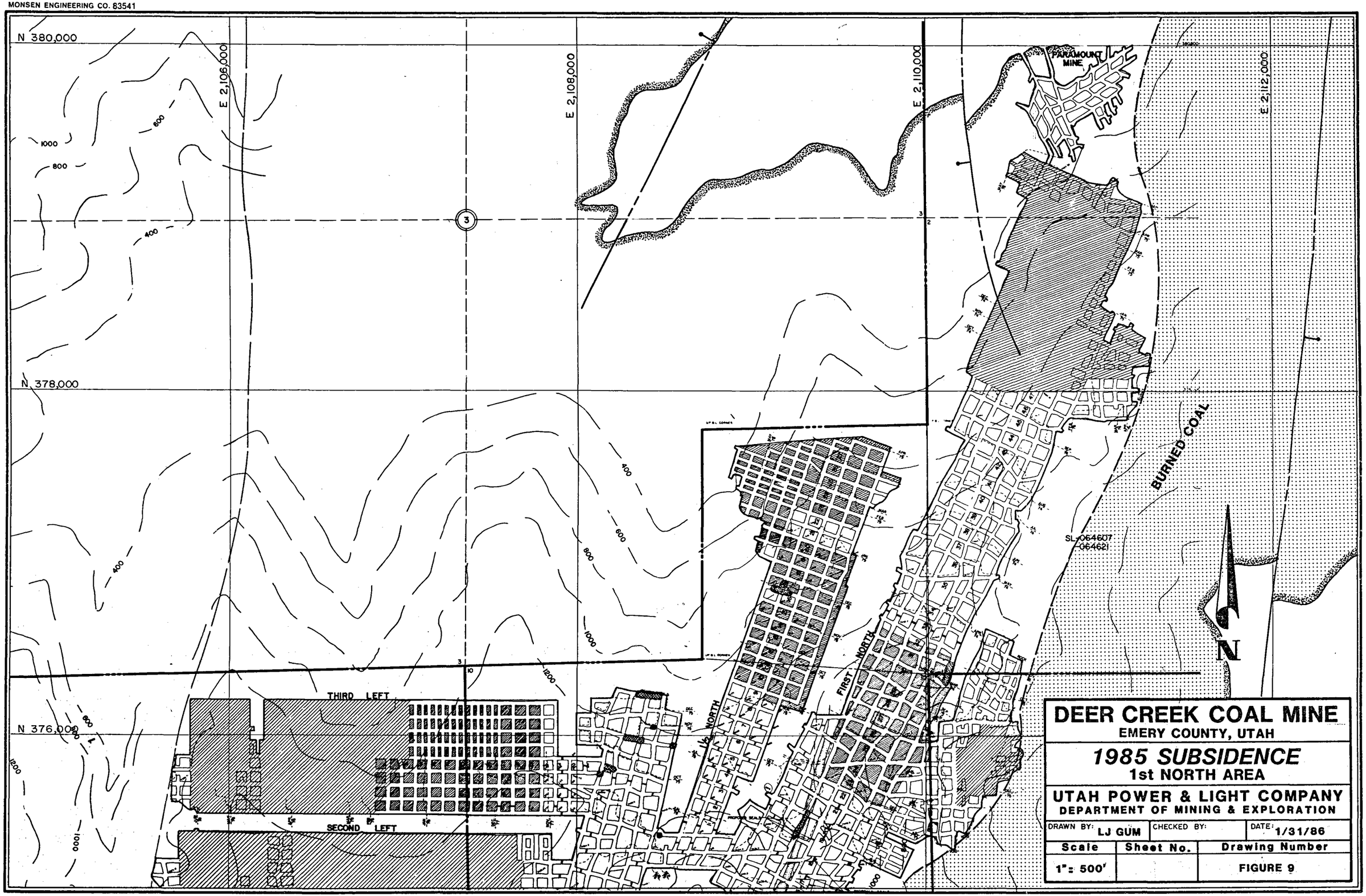


DEER CREEK COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

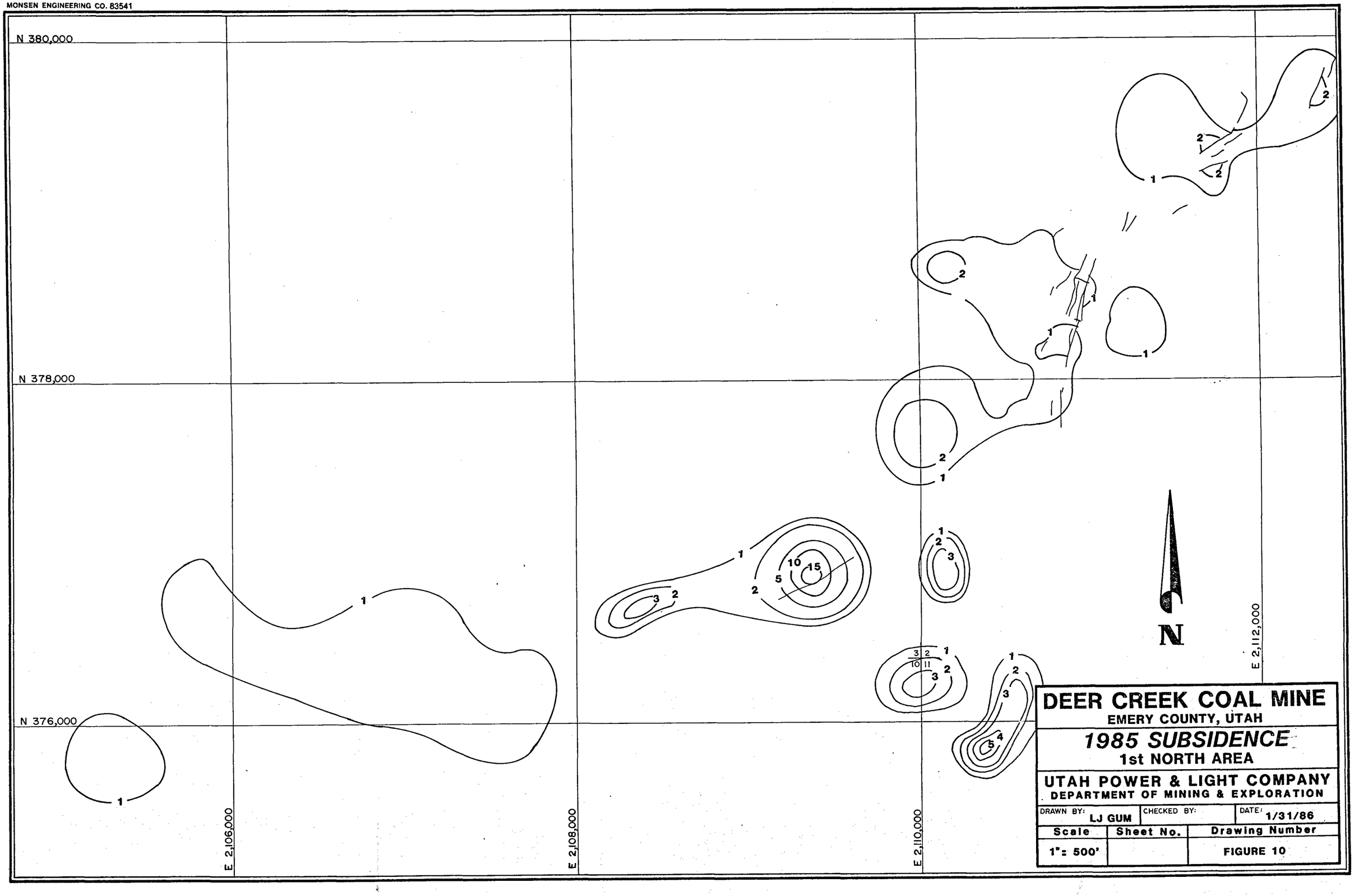
1st NORTH AREA

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/31/86
Scale	Sheet No.	Drawing Number
1": 500'		FIGURE 9

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

1st NORTH AREA

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/31/86
Scale	Sheet No.	Drawing Number
1": 500'		FIGURE 10

Area 4

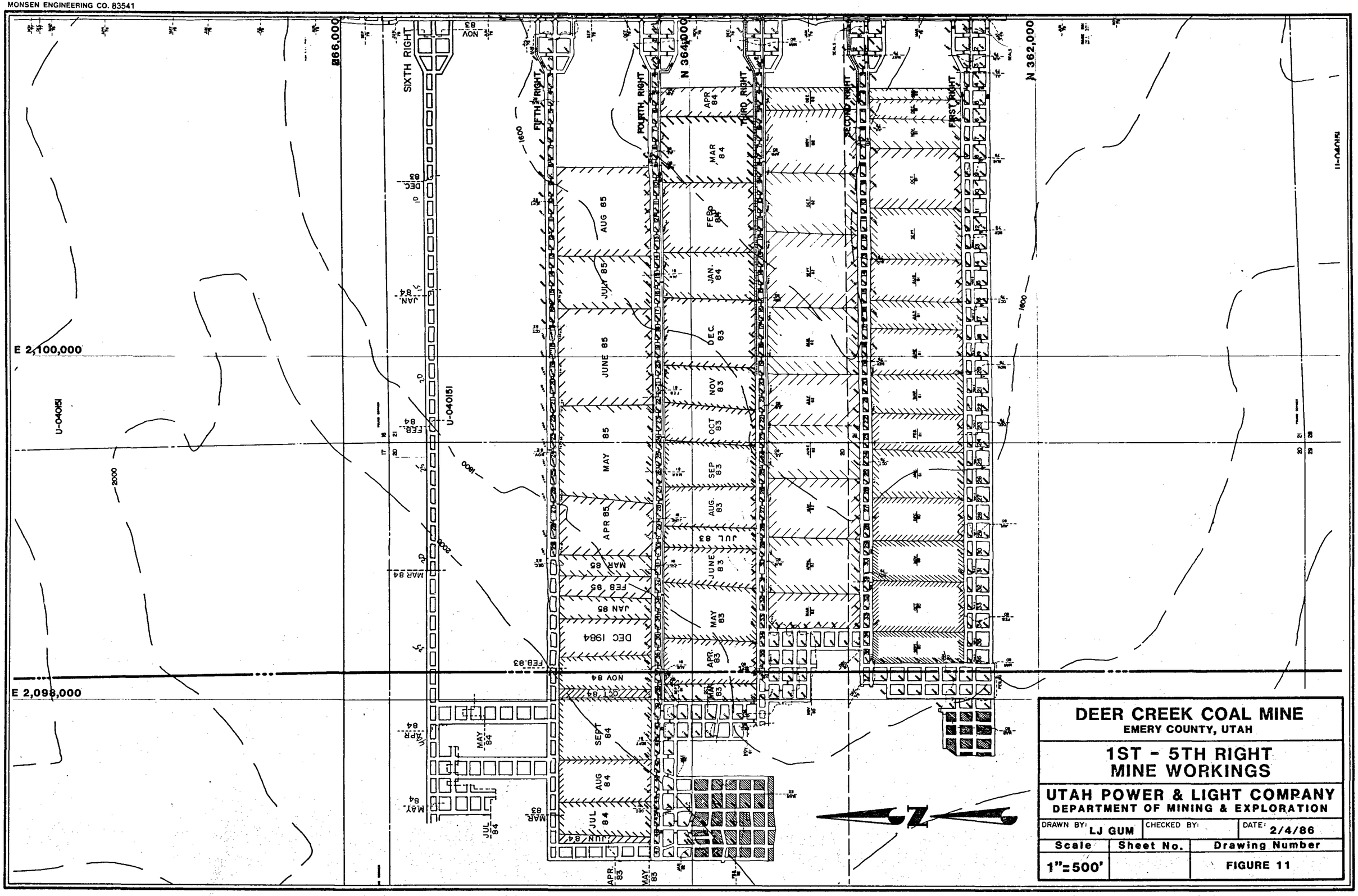
Deer Creek 2nd through 5th Right Longwall Panels

Subsidence in this area was detected for the first time in 1984 by photogrammetric methods. Longwall mining commenced in the 2nd Right longwall panel in 1980 and by the end of August 1985 the 2nd, 3rd, and 4th Right panels, and 3940 feet of the 5th Right longwall panel had been completed (figure 11).

The maximum subsidence yet noted is 7.7 feet, centered over the 3rd Right longwall panel. Up to 5 feet of subsidence also occurred over two room-and-pillar sections to the west which had been completely mined out and abandoned by mid-1982 (Figure 12). No fractures or other visible surface disturbance have been detected in this area. The area is overlain by 1600 to 2000 feet of overburden. The calculated angle for the subsidence ranges from near vertical to about 22° but more meaningful estimates may be possible when subsidence has stabilized.

Several springs are located on East Mountain above the Deer Creek 1st through 5th Right and 1st through 5th Left (see Area 5) mine workings. Figure 13 is a graph comparing the discharge from these springs with the annual precipitation on East Mountain. Fluctuations in spring flow appear to be related to variations in precipitation. This relationship appears to hold well for all years except 1985.

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE
EMERY COUNTY, UTAH

1ST - 5TH RIGHT MINE WORKINGS

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

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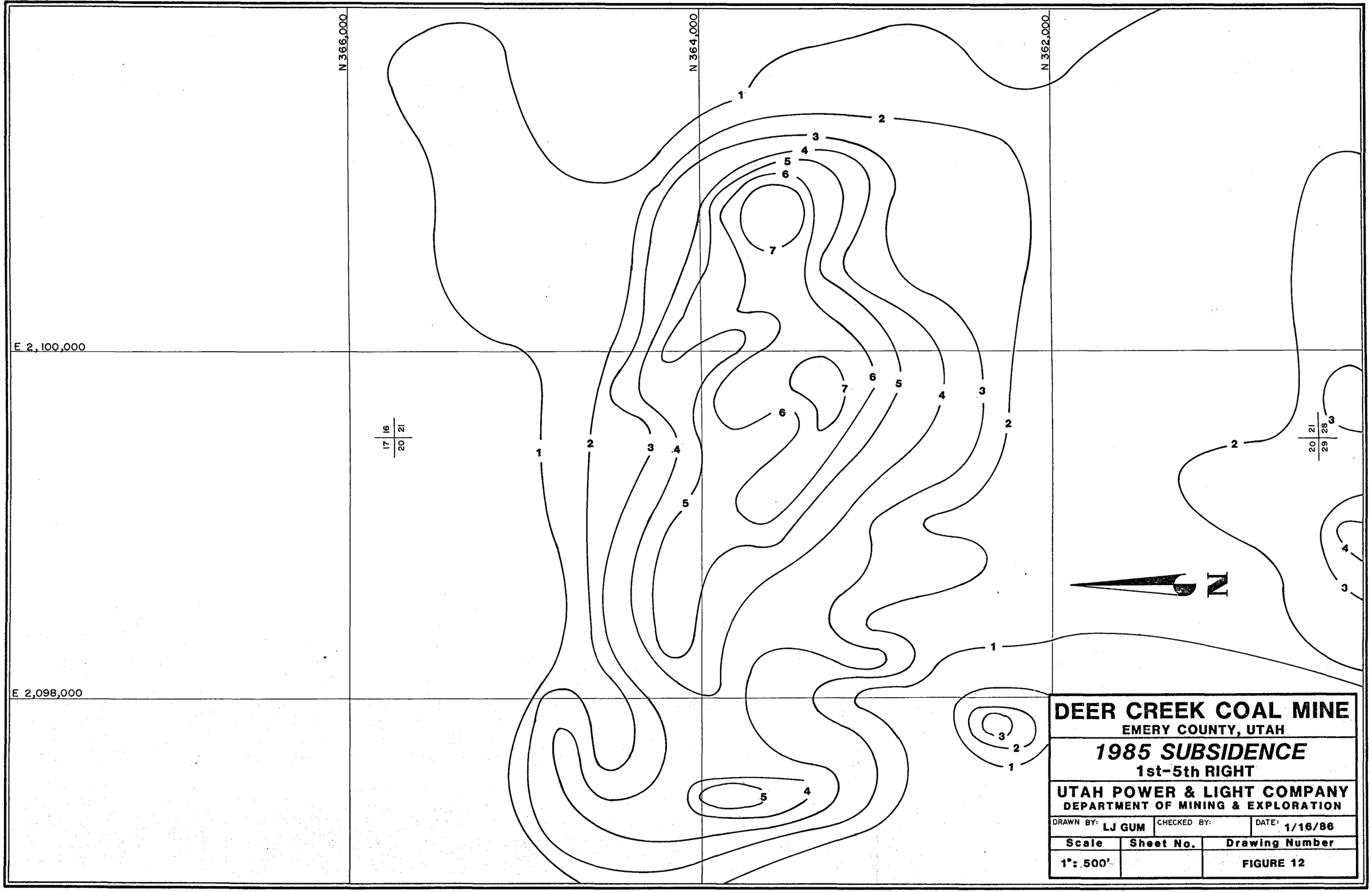
Scale	Sheet No.	Drawing Number
1"=500'		FIGURE 11

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

1st-5th RIGHT

UTAH POWER & LIGHT COMPANY

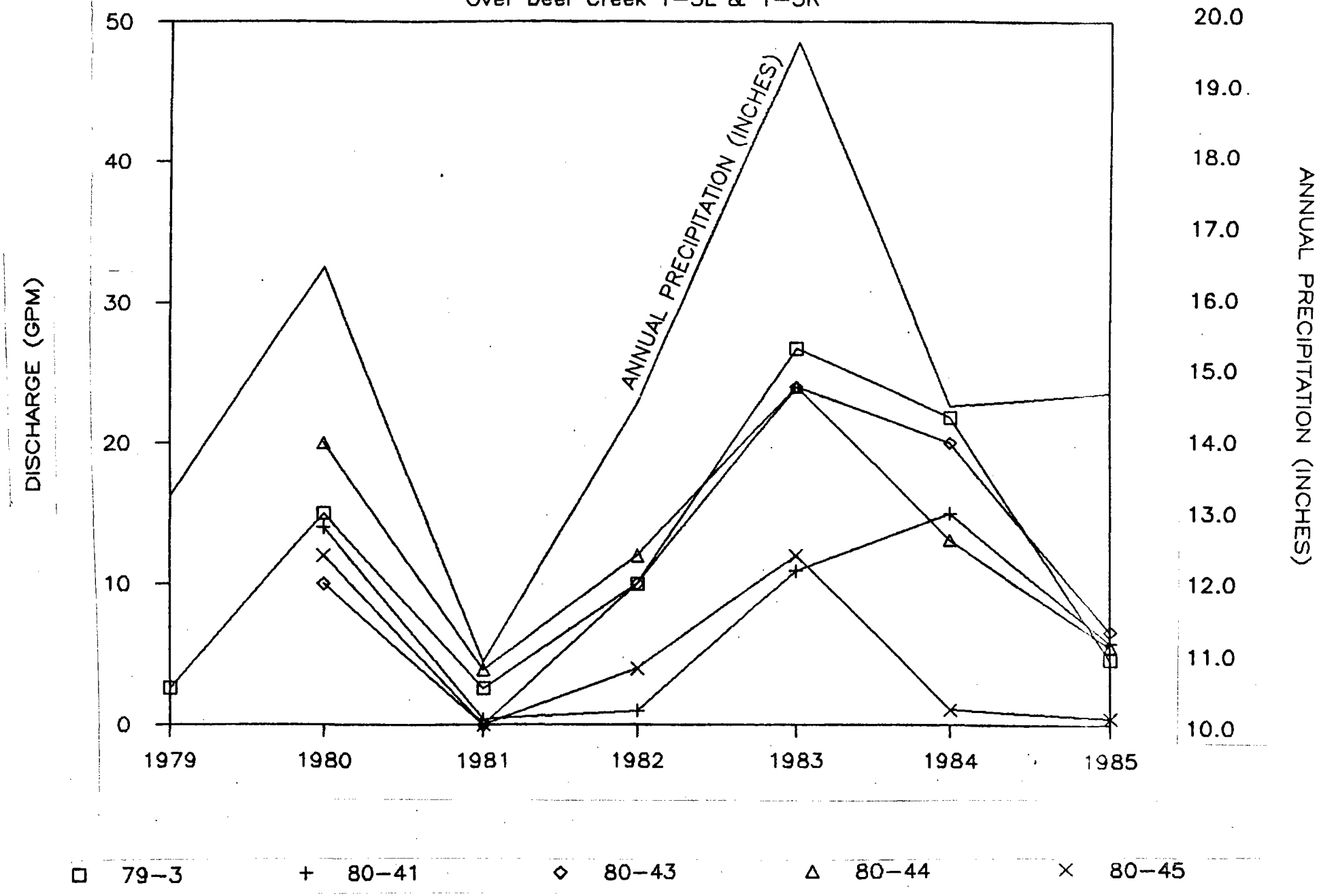
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/16/86
Scale	Sheet No.	Drawing Number
1": 500'		FIGURE 12

Figure 3

EAST MOUNTAIN SPRINGS

Over Deer Creek 1–5L & 1–5R



In examining temperature data obtained from a weather station on East Mountain we found that during the months April and May of 1985 temperatures averaged 7 degrees above normal. These unusually high temperatures caused most of the snow-melt to occur before the springs could be sampled in July, when peak runoff usually occurs. This accounts for the lower than expected spring discharges measured in 1985.

The left fork of the Grimes Wash crosses through the middle of this subsidence area. The monitoring of this stream revealed no changes which are attributable to mining.

Area 5

Deer Creek 2nd Through 5th Left Longwall Panels

Photogrammetric monitoring revealed subsidence in this area for the first time in 1984. Mining of the 2nd Left panel began in January 1983. By September of 1985 the 2nd, 3rd and 4th Left panels, and 770 feet of the 5th Left panel had been completed (Figure 14).

Subsidence has reached a maximum of 5.5 feet to date; this occurs along the western end of the 3rd Left panel (Figure 15). The maximum angle of draw is now approximately 23° but since the area may continue to subside for a time, this is not considered a reliable figure. Overburden in the area ranges from 1000 to 1450 feet. No surface disturbance has been seen.

As mentioned in the previous section, it is believed that none of the springs located above these workings show any adverse effects due to mining (see Figure 13 in the preceding section).

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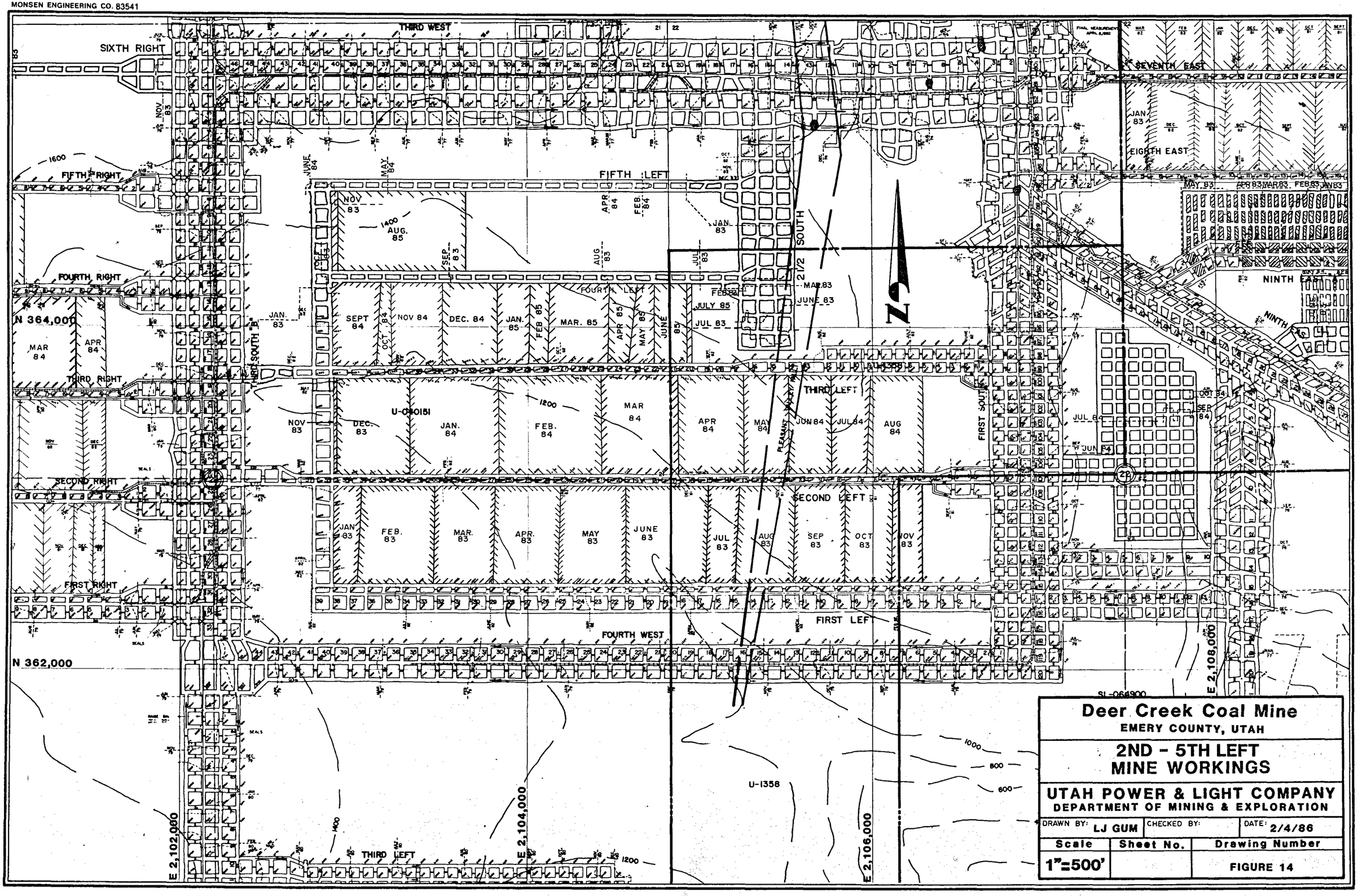

Deer Creek Coal Mine

EMERY COUNTY, UTAH

2ND - 5TH LEFT MINE WORKINGS

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

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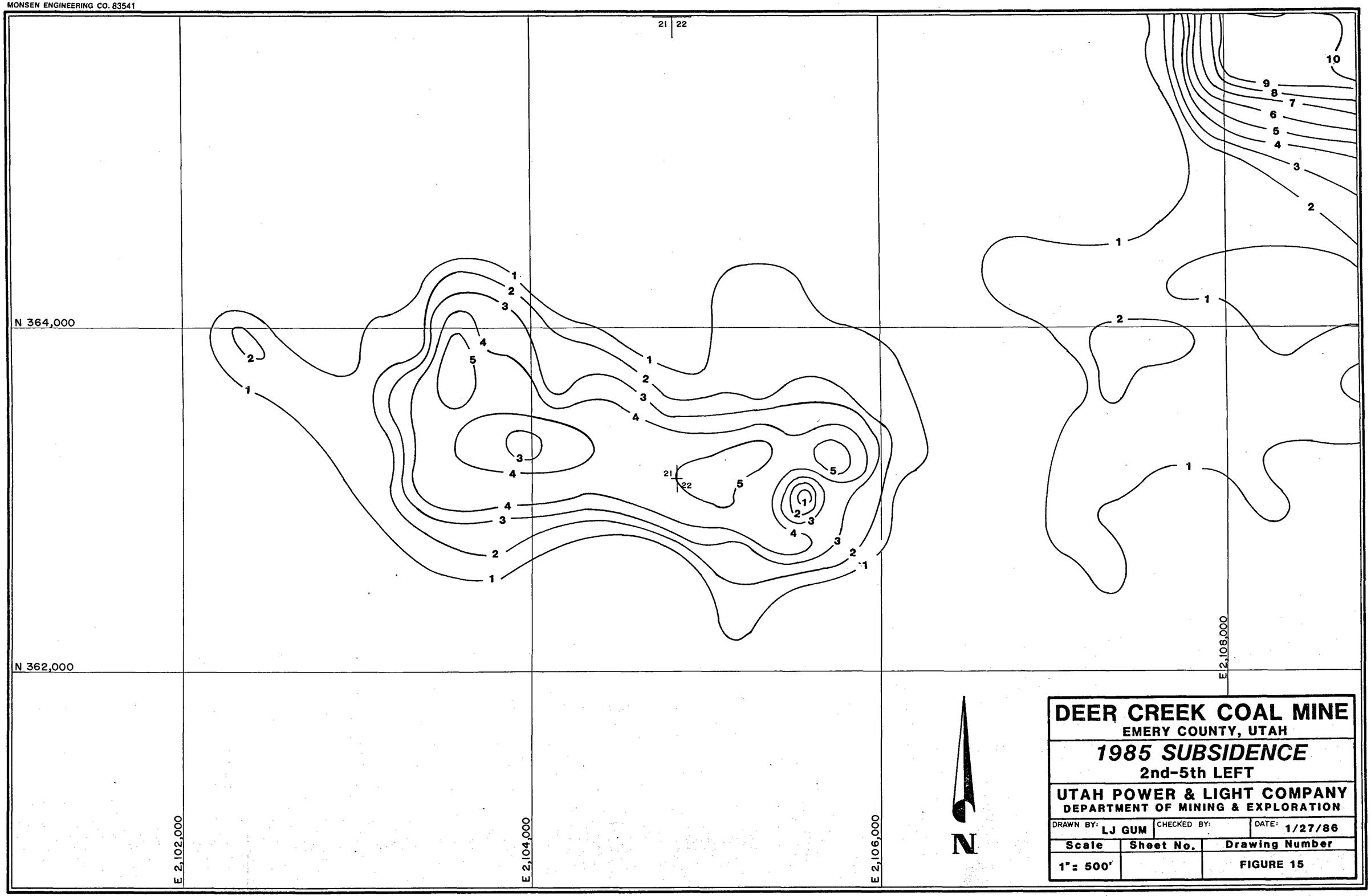
Scale	Sheet No.	Drawing Number
1"=500'		FIGURE 14

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

2nd-5th LEFT

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/27/86
Scale	Sheet No.	Drawing Number
1"= 500'		FIGURE 15

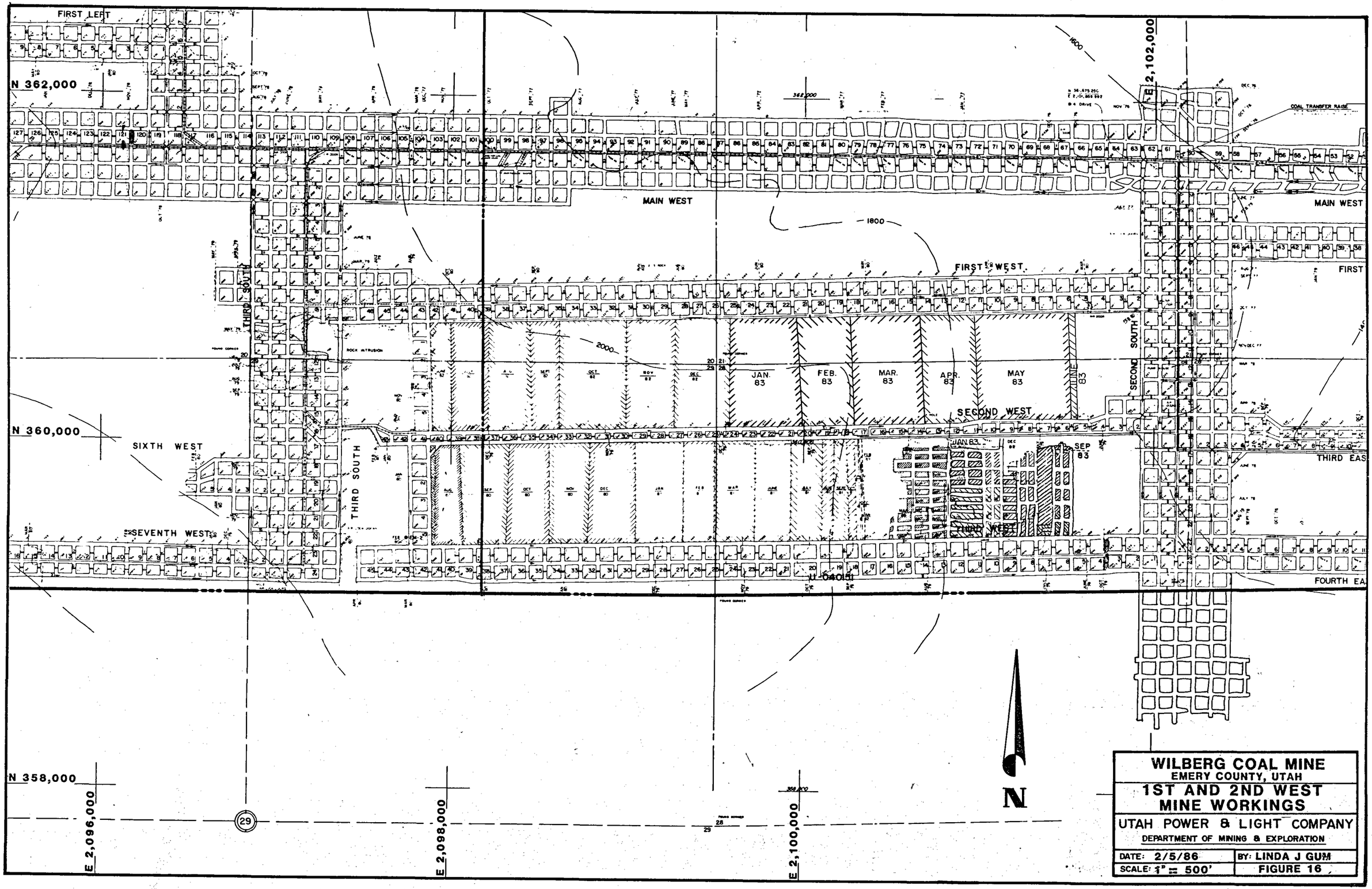
Area 6

Wilberg - 1st and 2nd West Longwall Panels

The Bureau of Mines monitoring of a system of surface monuments revealed subsidence over the Wilberg 1st and 2nd West longwall panels during 1983 (Figure 16). Mining in these two panels was completed by early June 1983 but subsidence continued in the 1984 monitoring period.

Maximum subsidence measured is now 4.2 feet using photogrammetry (Figure 17). No surface fractures or other visible disturbance have been found. On the south side of the area the subsidence diminishes to less than 0.5 feet within 1200 feet south of the longwall panels. With 2000 feet of overburden, this equates to an angle of draw of 21°.

Four springs located just north of this area show no effect from the subsidence.


FIRST LEFT
N 362,000
E 2,102,000
MAIN WEST
FIRST WEST
THIRD SOUTH
SECOND SOUTH
SECOND WEST
JAN. 83
FEB. 83
MAR. 83
APR. 83
MAY 83
JUNE 83
SEP 83
COAL TRANSFER RAISE
N 360,000
SIXTH WEST
SEVENTH WEST
THIRD WEST
FOURTH EA
N 358,000
E 2,096,000
E 2,098,000
E 2,100,000
N
WILBERG COAL MINE
EMERY COUNTY, UTAH
1ST AND 2ND WEST
MINE WORKINGS
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: 2/5/86
BY: LINDA J GUM
SCALE: 1" = 500'
FIGURE 16

MONSEN ENGINEERING CO. 83541

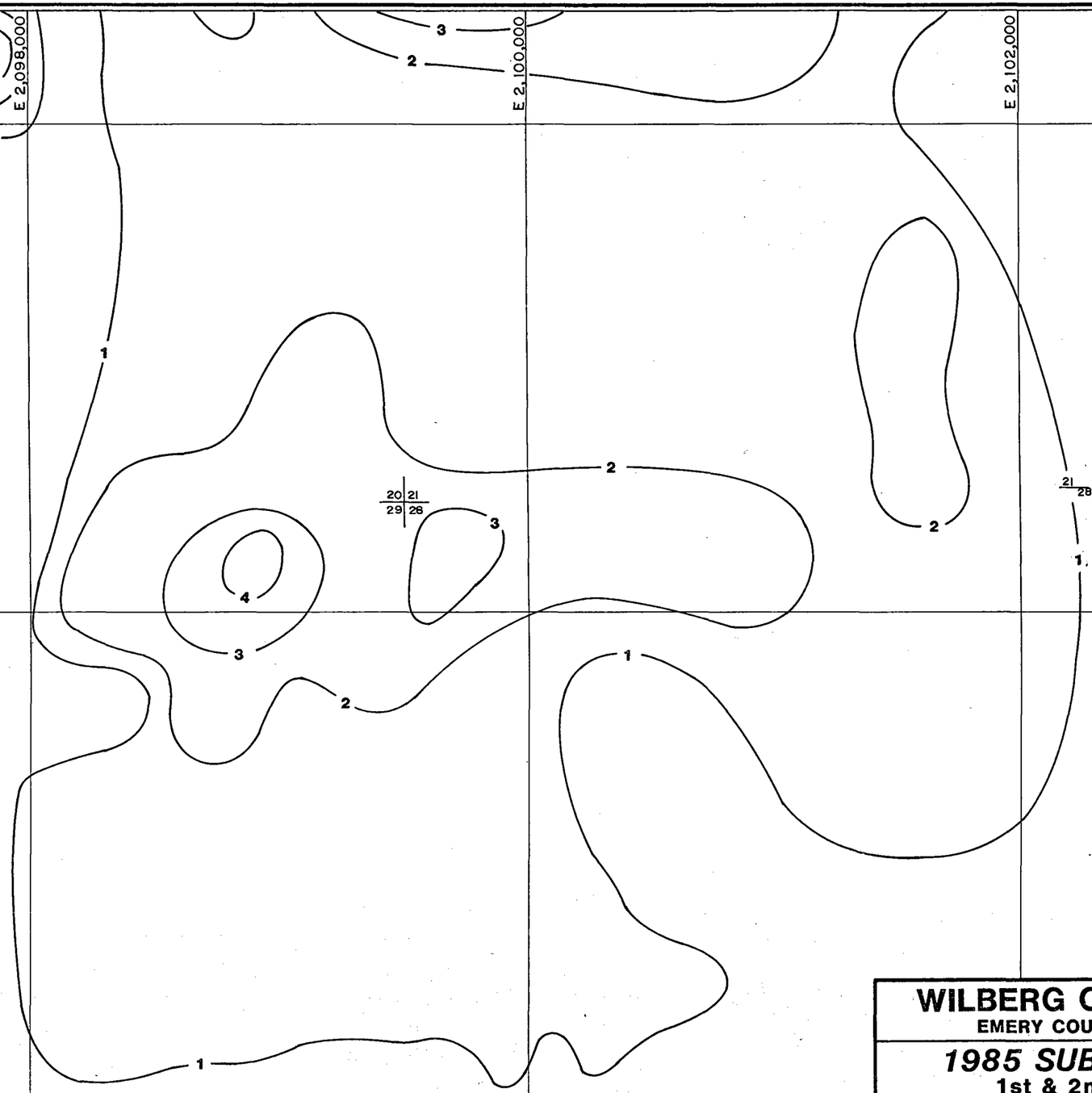
E 2,096,000 E 2,098,000 E 2,100,000 E 2,102,000

N 362,000

N 360,000

N 358,000

20/29 20 21/29 28 21/28 29/28



WILBERG COAL MINE
EMERY COUNTY, UTAH

1985 SUBSIDENCE
1st & 2nd WEST

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/28/86
Scale	Sheet No.	Drawing Number
1"= 500'		FIGURE 17

Area 7

Beehive Mine 2nd North off 8th West

Pillar extraction mining was terminated in December 1983 in this section of the Beehive Mine. The area is surrounded by burned coal (Figure 18).

During the period from August 31, 1983 to August 31, 1984 subsidence continued to occur, reaching a maximum of 5.7 feet over the extracted mine workings. To the south of the workings over the burned coal a maximum of 14.6 feet of subsidence was observed (Figure 19). In examining aerial photography of the area taken in 1985, it appears that this subsidence is also due to mass wasting on the cliff edge. The rocks on the ridge were highly fractured prior to mining and it is probable that other instances of movement may occur given the fractured nature of the strata on the surface and the fact that this area overlies burned coal.

Because the area is surrounded by clinker beds it is not possible to calculate an accurate angle of draw.

The strata here lack adequate recharge and are dry; it is not expected that the subsidence will influence the hydrology in the area.

SL-066116

400

600

800

BURNED COAL

BURNED COAL

N 376,000

E 2,116,000

N 374,000

E 2,115,000

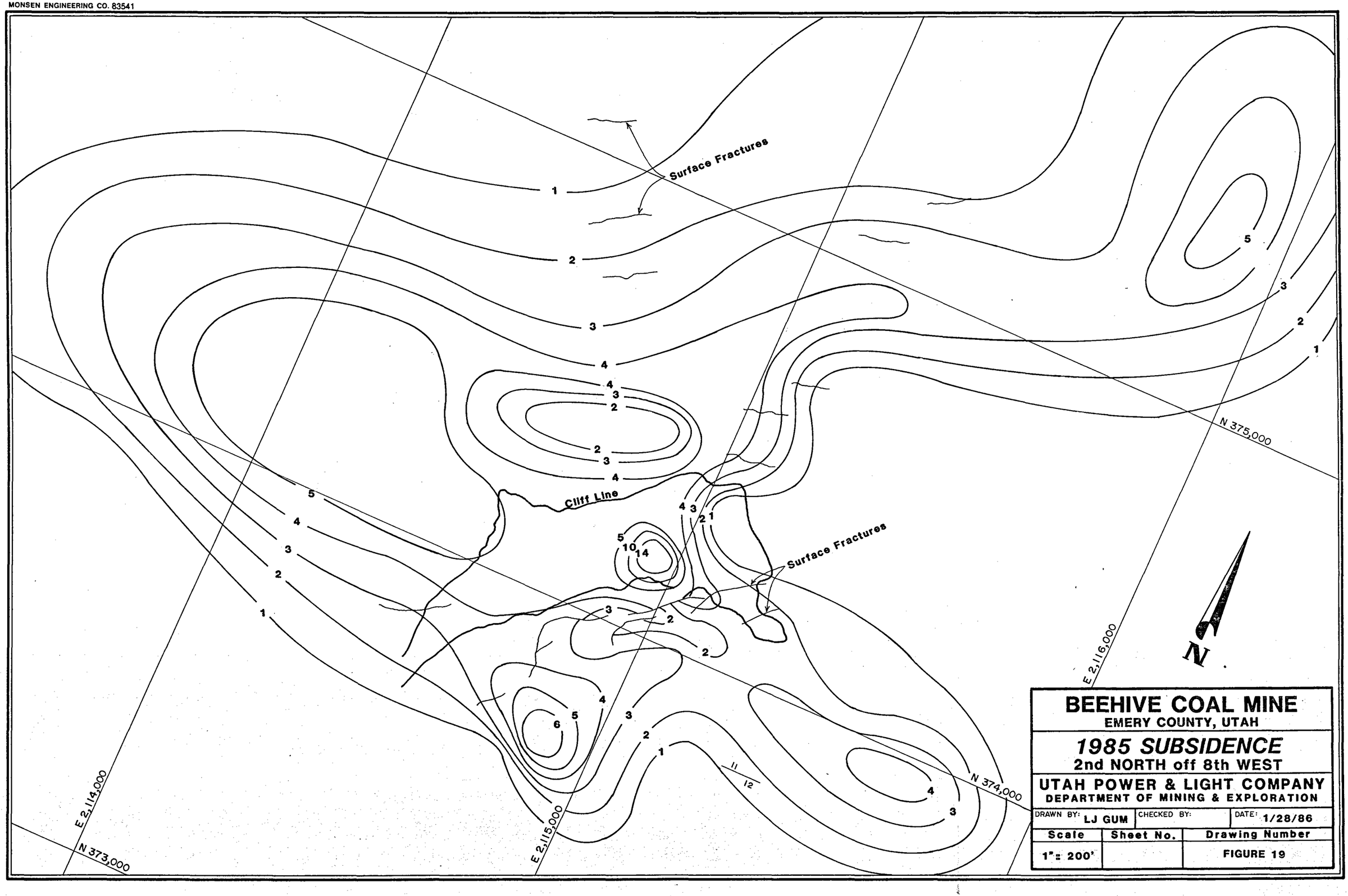
N 373,000

E 2,114,000

N

BEEHIVE COAL MINE	
EMERY COUNTY, UTAH	
2nd NORTH off 8th WEST MINE WORKINGS	
UTAH POWER & LIGHT COMPANY	
DEPARTMENT OF MINING & EXPLORATION	
DATE: APR. 10, 1984	BY: LINDA J GUM
SCALE: 1" = 200'	FIGURE 18

MONSEN ENGINEERING CO. 83541



BEEHIVE COAL MINE
EMERY COUNTY, UTAH

1985 SUBSIDENCE
2nd NORTH off 8th WEST

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/28/86
Scale	Sheet No.	Drawing Number
1" = 200'		FIGURE 19

Area 8

Beehive 4th Thru 9th West and 3rd Thru 6th East

Deseret 5th Thru 8th West and 3rd Thru 10th East

Some of the subsidence in this area may have gone undetected because pillar extraction, and presumably subsidence, in part of the Beehive Mine occurred before the establishment of baseline elevation data (Figures 20 and 21). In this case, the only measurable subsidence would be due to pillar extraction in the underlying Deseret Mine and would not be a true indication of total subsidence.

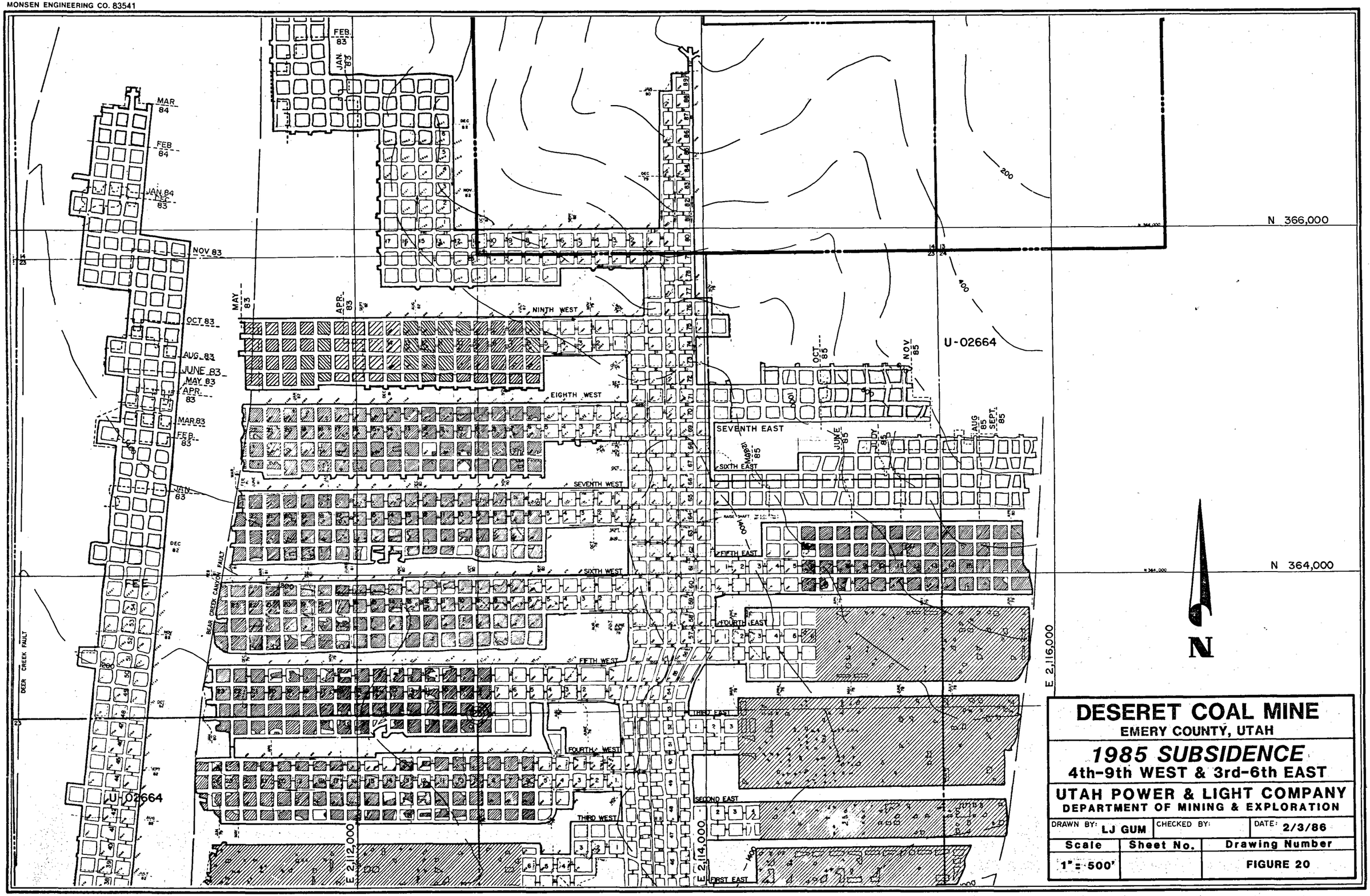
Subsidence in the southern part of this area is somewhat less than expected, probably due to the above reasons. Further north, where mining in both seams has been more recent, observed subsidence has reached 5.0 feet (very close to the predicted maximum of 6.3 feet, see Figure 22).

Because the subsidence area is, for the most part, surrounded by mined out or active workings no accurate angle of draw can be calculated.

No surface fractures or other visible signs of disturbance have ever been noted in the area.

There are no springs in the immediate vicinity and it is believed that the subsidence has not affected the hydrology.

MONSEN ENGINEERING CO. 83541



DESERET COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

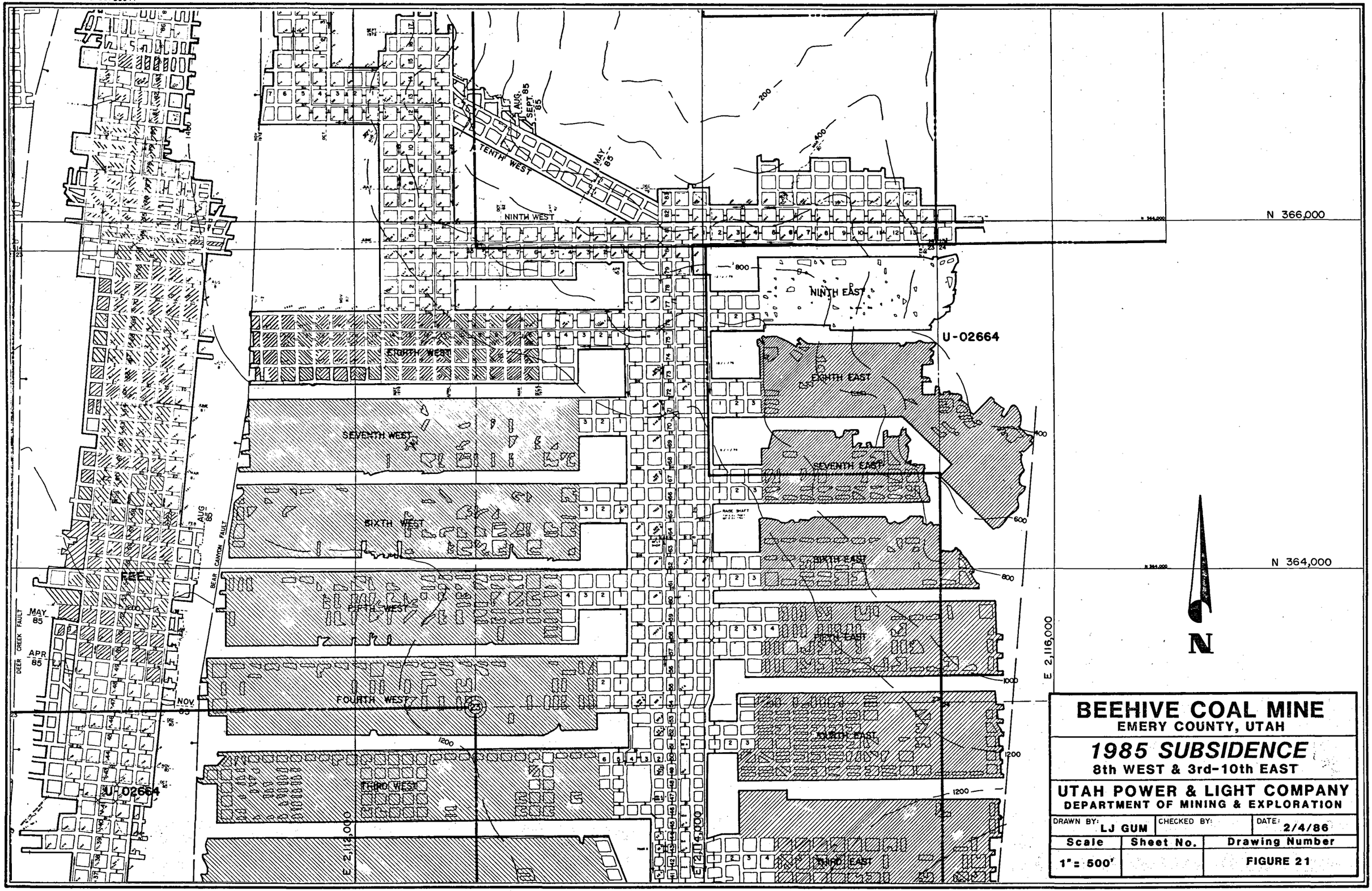
4th-9th WEST & 3rd-6th EAST

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 2/3/86
Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 20

MONSEN ENGINEERING CO. 83541



BEEHIVE COAL MINE
EMERY COUNTY, UTAH

1985 SUBSIDENCE
8th WEST & 3rd-10th EAST

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY:	CHECKED BY:	DATE:
LJ GUM		2/4/86

Scale	Sheet No.	Drawing Number
1" = 500'		FIGURE 21

MONSEN ENGINEERING CO. 83541

E 2,112,000

E 2,114,000

E 2,116,000

N 366,000

N 364,000

14
23

14 | 13
23 | 24

1

2

3

4

5

4

3

2

1

1

1

N

DES-BEE-DOVE COAL MINE		
EMERY COUNTY, UTAH		
1985 SUBSIDENCE		
BEEHIVE 4th-9th WEST & 3rd-6th EAST DESERET 5th-8th WEST & 3rd-10th EAST		
UTAH POWER & LIGHT COMPANY		
DEPARTMENT OF MINING & EXPLORATION		
DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/8/86
Scale	Sheet No.	Drawing Number
1"= 500'		FIGURE 22

Areas 9 and 10

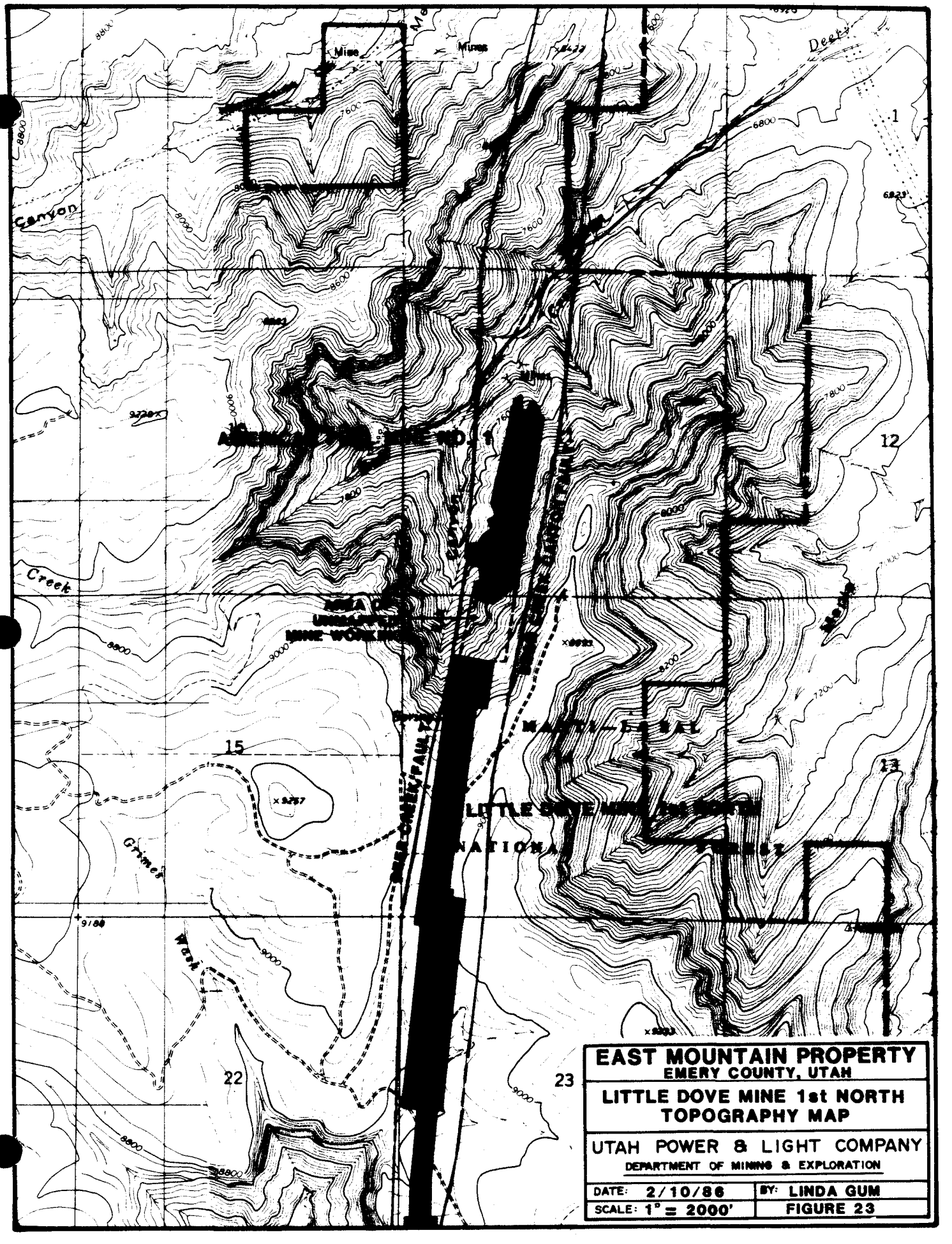
Little Dove 1st North - Old American Fuels Mine

The Little Dove Mine and old American Fuel Mine are both located in a graben formed by the Deer Creek and Bear Creek Canyon Faults (see Figure 23). In August of 1982 the 1st North section of the Little Dove Mine intersected the old American Fuels Mine workings about 1,000 feet south of where available maps had indicated that they extend. Mining conditions in that area of Little Dove revealed that strata were highly stressed. In some cases pillars were crushed before they could be extracted.

Maximum subsidence over the 1st North Little Dove workings remained at less than 2 feet in 1985 over an area of partial pillar extraction (compare Figures 24 and 25). The 4 feet of subsidence seen on Figure 25 actually occurs over the adjacent mined out workings of the Deer Creek and Wilberg Mines (Area 1).

The latest mining in the old American Fuels Mine occurred in 1966. Since UP&L began observations, maximum subsidence has reached 4 feet over these old workings (Figures 26 and 27). Another small subsidence zone further south shows almost 4 feet of subsidence; no change since 1983. In that area several small surface fractures mark the reactivated trace of the Bear Creek Canyon Fault.

On the east side of the American Fuels Mine workings the angle of draw has been calculated at 8° to 9°. The subsidence has not affected the hydrology in any way.



EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH

LITTLE DOVE MINE 1st NORTH TOPOGRAPHY MAP

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DATE: 2/10/86	BY: LINDA GUM
SCALE: 1" = 2000'	FIGURE 23

2nd NORTH-OFF 8th WEST

APRIL

MARCH

FEB.

JAN.

DEC.

OLD WORKINGS 8-13-82

SEAL AUG 82

AREA OF UNMAPPED OLD MINE WORKINGS

FEE

BOTTOM COAL EXTRACTION FEB 28 83

JUNE 82

MAY 82

APR 82

MAR 82

FEB 82

JAN 82

E 2,111,000

N 370,000

N 369,000

N 368,000

14

15

N

LITTLE DOVE COAL MINE EMERY COUNTY, UTAH	
1st NORTH MINE WORKINGS	
UTAH POWER & LIGHT COMPANY DEPARTMENT OF MINING & EXPLORATION	
DATE: 2/4/86	BY: LINDA J GUM
SCALE: 1" = 200'	FIGURE 24

MONSEN ENGINEERING CO. 83541

N 370,000

N 369,000

N 368,000

E 2,111,000

E 2,110,000

1

2

3

4

LITTLE DOVE COAL MINE

EMERY COUNTY, UTAH

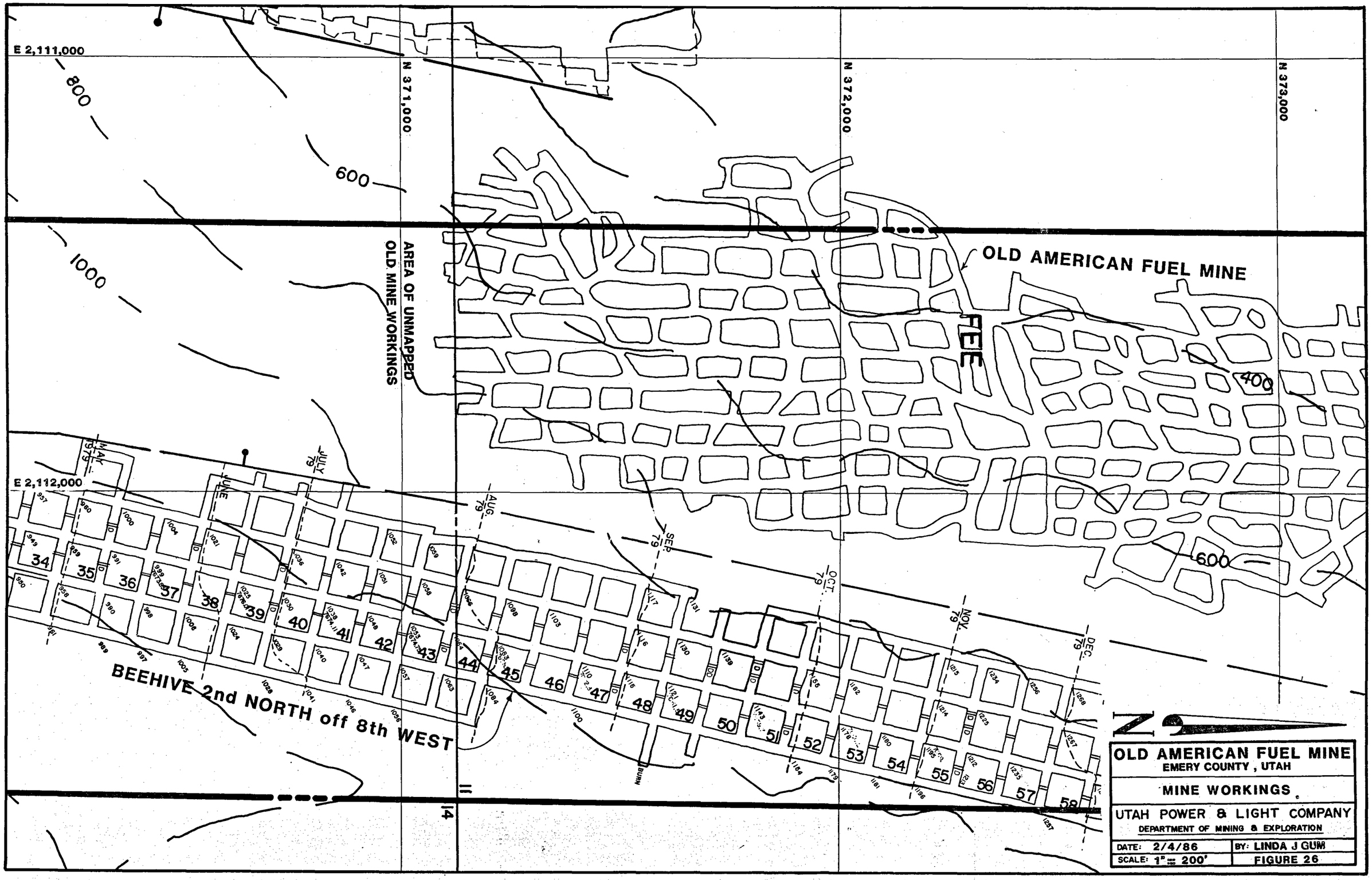
1985 SUBSIDENCE

1st NORTH

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 2/10/86
Scale	Sheet No.	Drawing Number
1" = 200'		FIGURE 25


E 2,111,000
E 2,112,000
N 371,000
N 372,000
N 373,000
800
600
1000
400
600
AREA OF UNMAPPED OLD MINE WORKINGS
OLD AMERICAN FUEL MINE
FEE
BEEHIVE 2nd NORTH off 8th WEST
MAY 79
JUNE
JULY 79
AUG. 79
SEP. 79
OCT. 79
NOV. 79
DEC. 79
BURN
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
OLD AMERICAN FUEL MINE
EMERY COUNTY, UTAH
MINE WORKINGS
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION
DATE: 2/4/86
BY: LINDA J GUM
SCALE: 1" = 200'
FIGURE 26

MONSEN ENGINEERING CO. 83541

E 2,111,000

E 2,112,000

N 371,000

N 372,000

N 373,000

N

OLD AMERICAN FUEL MINE
EMERY COUNTY, UTAH

1985 SUBSIDENCE

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 2/3/86
Scale	Sheet No.	Drawing Number
1": 200'		FIGURE 27

Area 11

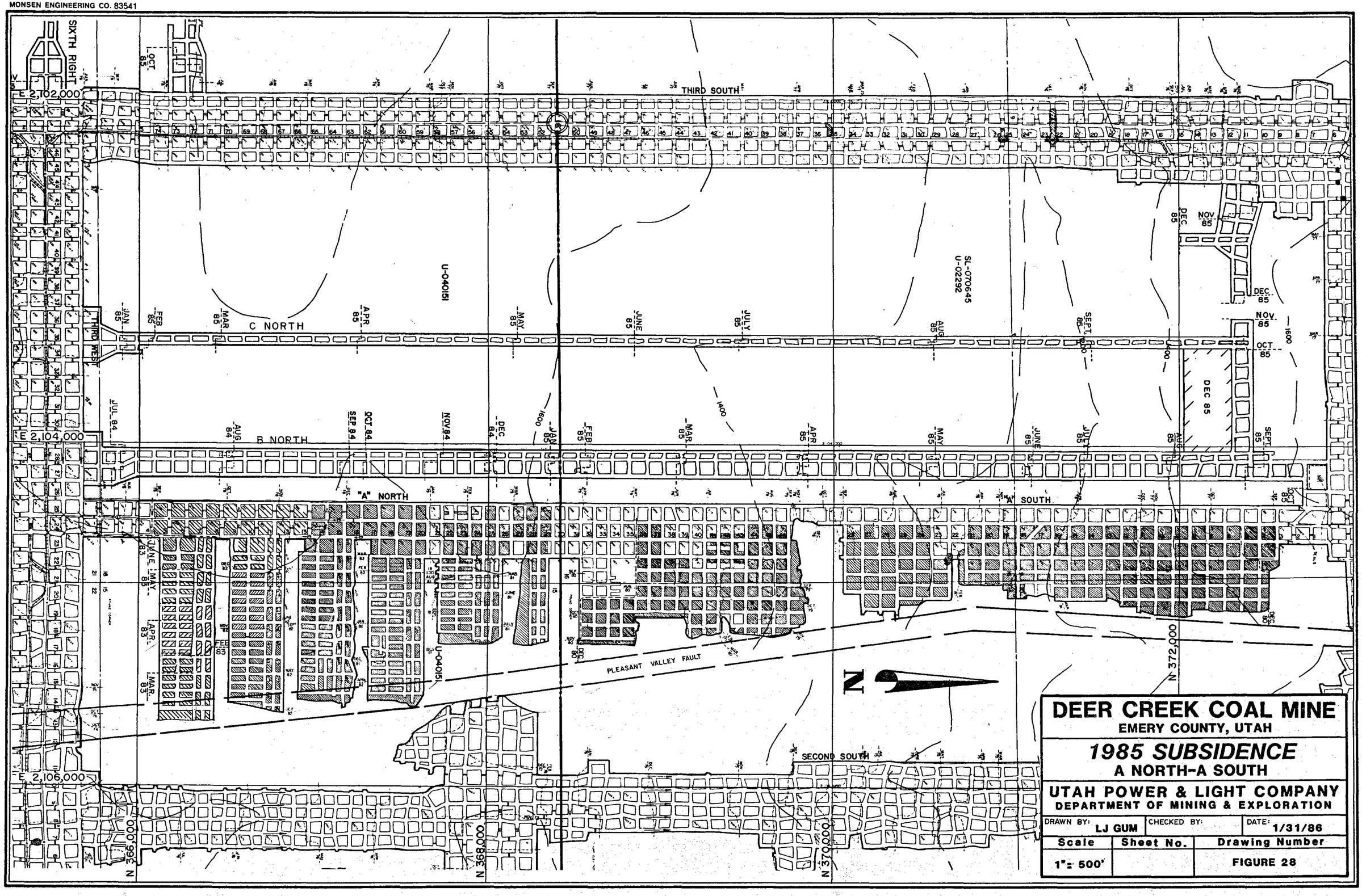
Deer Creek A North and A South

Pillar extraction in A North and A South was completed in June 1983. These sections of Deer Creek extend from A North and A South eastward to the Pleasant Valley Fault (Figure 28). No measurable subsidence occurred during the 1984 monitoring period but, in 1985 just over one foot of subsidence was measured by photogrammetric methods (Figure 29).

No fractures or other disturbance of the surface of the area has been observed. The maximum angle-of-draw calculated thus far is 34° but the average angle for the area is near vertical.

Three springs are located 300 to 1000 feet to the west of these workings but none fall within the area of measured subsidence. Their hydrology has shown no effect due to mining.

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE

EMERY COUNTY, UTAH

1985 SUBSIDENCE

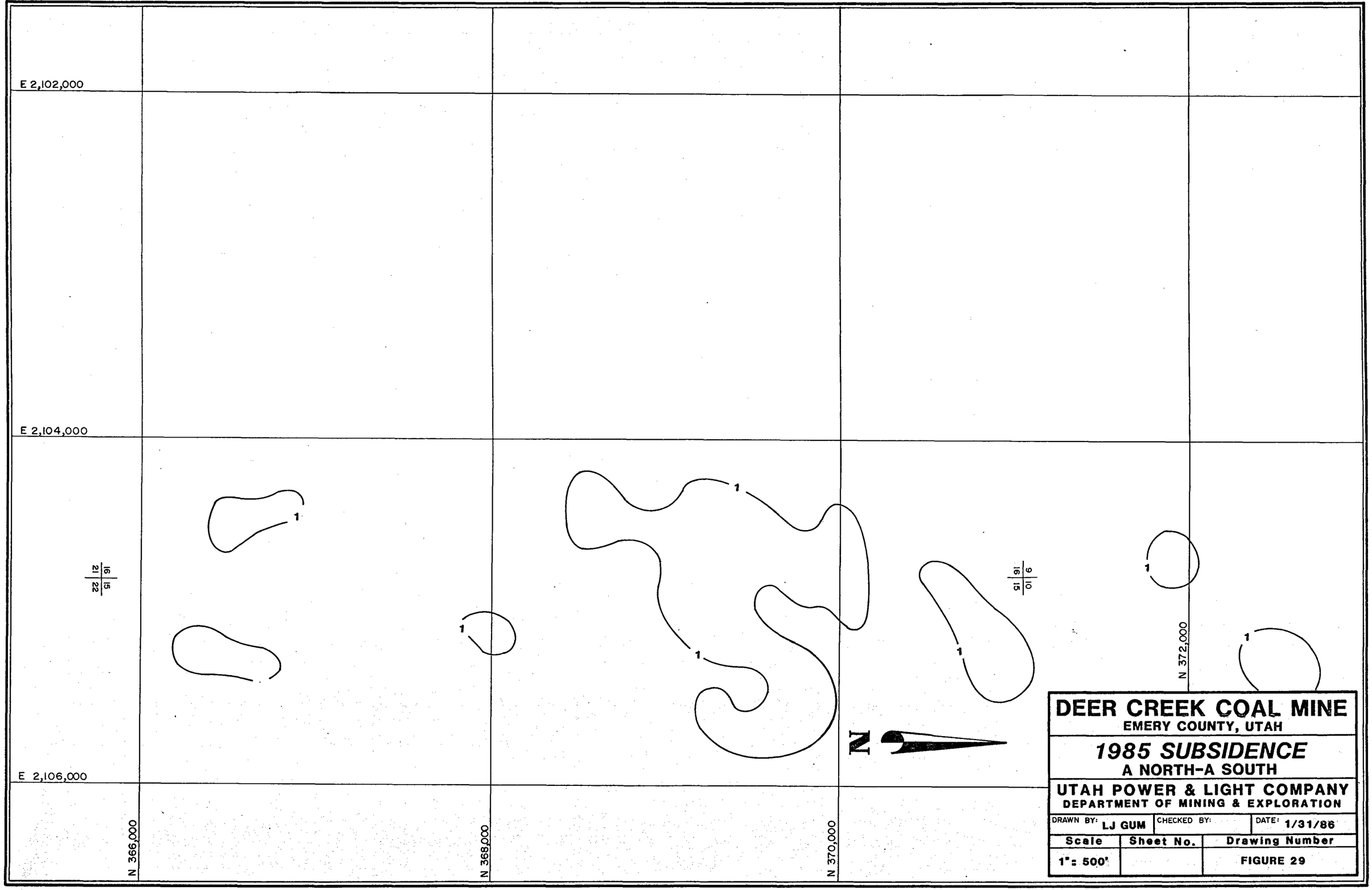
A NORTH-A SOUTH

UTAH POWER & LIGHT COMPANY

DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/31/86
Scale	Sheet No.	Drawing Number
1"= 500'		FIGURE 28

MONSEN ENGINEERING CO. 83541



DEER CREEK COAL MINE
EMERY COUNTY, UTAH

1985 SUBSIDENCE
A NORTH-A SOUTH

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

DRAWN BY: LJ GUM	CHECKED BY:	DATE: 1/31/86
Scale	Sheet No.	Drawing Number
1": 500'		FIGURE 29

Other Studied Areas

No surface disturbance or subsidence was observed over any other area monitored for subsidence during 1985. In area 12 (Figure 2) a 7-foot thick block of coal measuring 2300 feet by 530 feet was extracted during 1981 and 1982 (the 2nd Left longwall panel, Wilberg Mine). To date no measurable subsidence has occurred. This and other areas shown in Figure 2 will continue to be monitored as mining progresses.

Predicted Maximum Subsidence

Using methods developed by the British National Coal Board (NCB), once again we have attempted to make a comparison between observed and predicted maximum subsidence for the various areas on UP&L's property. The NCB method utilizes graphs compiled from numerous field observations and takes into consideration the length and width of the mined-out area, thickness of coal extracted and depth of cover. The method is claimed to be correct to ± 10% in the majority of cases. The table below compares predicted maximum subsidence with observed subsidence for areas on East Mountain.

Area	Subsidence	
	Predicted Maximum	Observed
DC 9E/W 1R*	8.9'	25.2'
DC 5-8E/W 6-12R	14.4'	13.2'
DC 1N Area*	5.4'	15.0'
DC 2-5R	8.6'	7.7'
DC 2-5L	7.7'	5.5'
W 1-2W	5.3'	4.2'
Bee 2N off 8W*	9.9'	14.6'
Bee 4W/Des 5W	6.3'	5.0'
LD 1N	2.2'	1.6'
DC 4R Room*	0.4'	5.8'
DC 1R Room*	0.1'	3.0'
DC AN & AS Rooms	4.1'	1.6'
W 2L	1.8'	0'

* These areas do not fit NCB prediction model.

A quick glance at the above table reveals five areas of anomalously high observed subsidence. These cases do not fit the certain limiting conditions that should exist in order for the NCB method to remain valid. The DC 9th East - Wilberg 1st Right area is surrounded by burned coal and bounded on the east by the Deer Creek Fault. As previously

mentioned, crushing of clinker beds and reactivation of the fault plane have added another complication to the subsidence in this area. Two other anomalies are small room-and-pillar sections off 1st and 4th Right, Deer Creek. In these sections the mined-out area is small compared to the overburden thickness, thus very little, if any, observed subsidence would be expected. Indeed, subsidence of the magnitude detected is very surprising since it has rarely been detected over other, similar sections.

The last two areas of anomalously high subsidence occur on steep rocky ridges over the Deer Creek 1½ North and Beehive 2nd North off 8th West room-and-pillar sections. In both of these cases it appears that mass wasting occurred at the measurement point causing the unusually large drop in the surface elevation.

Some of the remaining areas are approaching their predicted subsidence maxima. Where mining has been completed for several years subsidence is at or near its predicted value. In other sections, on-going mining is enlarging the mined-out area which will not only cause observed subsidence to increase, but also predicted maximum subsidence, by changing the parameters used in its determination.

Future comparisons of this type should help determine if the NCB model is valid for the East Mountain area.

Mitigation of Surface Effects

Over most areas where subsidence has occurred on East Mountain present land use has not been affected in any way. Areas 2, 4, 5, 6 and 8 are good examples of subsidence without visible surface disturbance or adverse hydrologic effects. In such areas no mitigation will be necessary.

In a few areas, such as areas 1, 3 and 7, fractures have been detected. In order to protect livestock UP&L has erected a fence around area 1 where fractures are of sufficient magnitude to pose a threat to wandering cattle. A reclamation plan is being formulated for this area by the U. S. Forest Service. UP&L's compliance with this plan would mitigate any damages there.

In areas 3 and 7, where only minor fracturing has occurred on remote ridges and the present land use has not been affected, more damage would be done by gaining access to and repairing fractures than can be justified, therefore, mitigation is counter-productive in these areas.

Summary

As of August 1985, UP&L has identified eleven areas of mining induced subsidence on the East Mountain property. Terrain in the subsidence areas ranges from relatively flat mountain tops with thick overburden of up to 2,100 feet; to steep slopes and cliffs with overburden of less than 200 feet. The most noticeable subsidence occurs in these steep cliff areas where mining next to burned coal appears to have caused crushing of the clinker beds. Most of the fractures observed over mined areas have occurred under these conditions, especially where the Castlegate Sandstone (or similar lithologic unit) crops out or is near the surface. These sandstones yield to stresses by brittle deformation (fracturing). The remaining fractures which have been discovered are reactivated surface traces of the Bear Creek Canyon or Deer Creek faults.

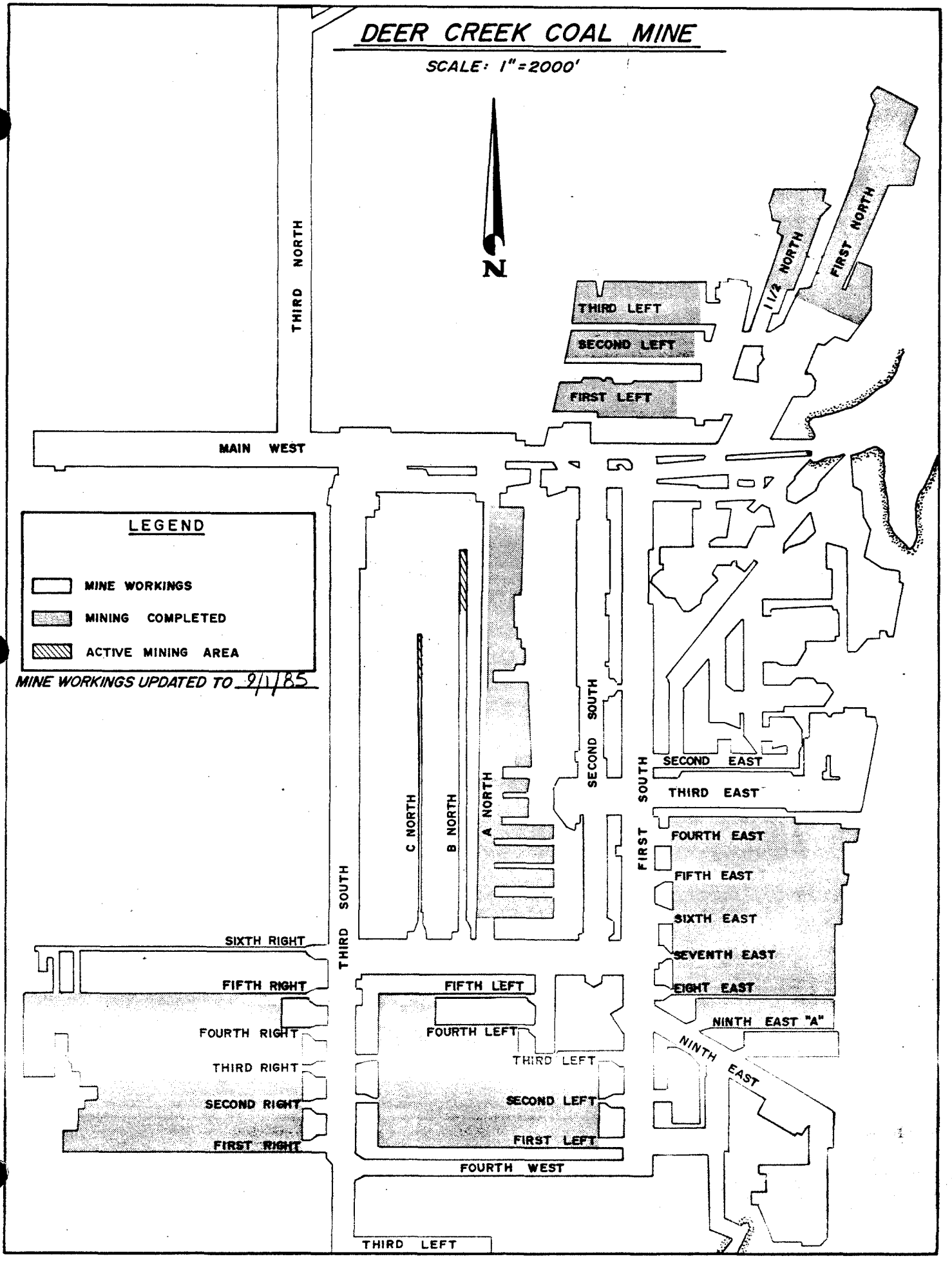
In areas where overburden is thicker and other, more clay-rich formations crop out, longwall and room-and-pillar mining methods have allowed the multiple seam mining of large quantities of coal without apparent impact on the environment because the overburden behaves somewhat plastically. Such areas as the Beehive - Deseret east and west room-and-pillar sections and the Deer Creek 4th through 8th East - Wilberg 5th through 13th Right longwall panels have demonstrated that subsidence can occur over a broad area with no visual or hydrologic effects. In excess of 80%

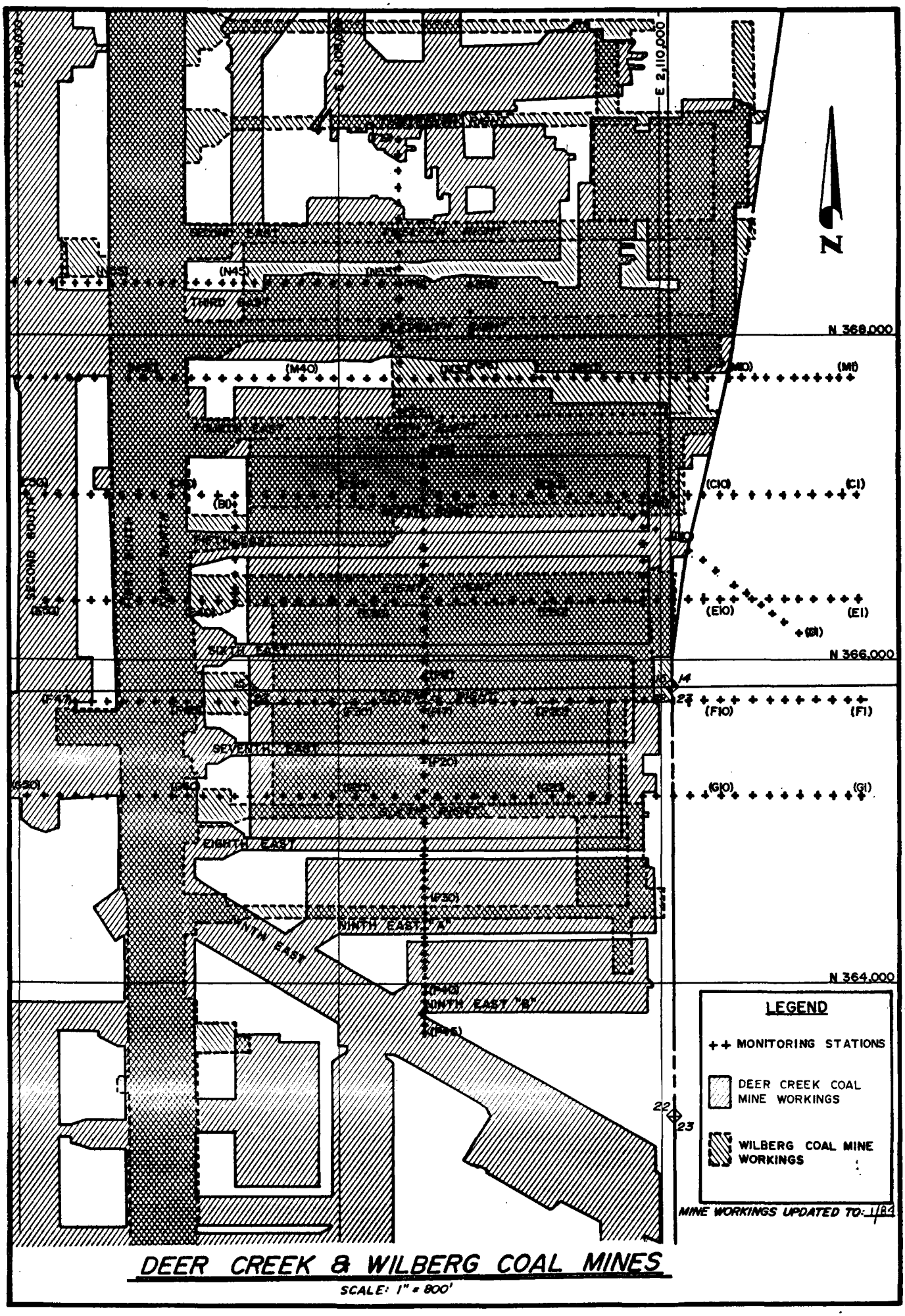
of the East Mountain property has conditions similar to these areas. It is, therefore, felt that the mining methods being utilized are well suited to the geologic conditions, allowing subsidence to occur without impacting the hydrology or present land use of the area.

Once again, an effort was made this year to predict maximum possible subsidence for the various areas where subsidence has been detected. This prediction was then compared with observed subsidence for each area. We hope to be able to use this type of comparison in the future to help determine if the NCB model is valid for East Mountain mining conditions.

APPENDIX

DEER CREEK MINE


DEER CREEK COAL MINE
SCALE: 1"=2000'
N
THIRD NORTH
MAIN WEST
THIRD LEFT
SECOND LEFT
FIRST LEFT
1 1/2 NORTH
FIRST NORTH
LEGEND
MINE WORKINGS
MINING COMPLETED
ACTIVE MINING AREA
MINE WORKINGS UPDATED TO 9/1/85
C NORTH
B NORTH
A NORTH
SECOND SOUTH
THIRD SOUTH
FIRST SOUTH
SECOND EAST
THIRD EAST
FOURTH EAST
FIFTH EAST
SIXTH EAST
SEVENTH EAST
EIGHT EAST
NINTH EAST "A"
NINTH EAST
SIXTH RIGHT
FIFTH RIGHT
FOURTH RIGHT
THIRD RIGHT
SECOND RIGHT
FIRST RIGHT
FIFTH LEFT
FOURTH LEFT
THIRD LEFT
SECOND LEFT
FIRST LEFT
FOURTH WEST
THIRD LEFT



DEER CREEK & WILBERG COAL MINES

SCALE: 1" = 800'

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
BM 1	9025.91	9025.46	0.45
BM 2	9159.51	9148.33	11.18
BM 3	9188.67	9182.12	6.55
BM 4	9104.14	9103.78	0.36
BM 5	9096.70	9096.42	0.28
BM 6	8943.36	8942.22	1.14
BM 7	9106.90	9106.62	0.28
BM 8	8980.15	8979.53	0.62
BM 9	8961.81	8961.81	0.00
BM10	9167.32	9162.64	4.68
C 1	8998.65	8998.00	0.65
C 2	8988.15	8987.41	0.74
C 3	8978.20	8977.38	0.82
C 4	8971.85	8970.46	1.39
C 5	8970.99	8970.04	0.95
C 6	8976.02	8975.05	0.97
C 7	8984.61	8983.58	1.03
C 8	8990.13	8989.08	1.05
C 9	8993.46	8992.34	1.12
C 10	8997.67	8996.54	1.13
C 11	9001.98	9001.00	0.98
C 12	9008.04	9006.20	1.84
C 13	9017.60	9013.70	3.90
C 14	9030.62	9026.28	4.34
C 15	9054.08	9049.32	4.76
C 16	9076.04	9070.93	5.11
C 17	9096.46	9090.77	5.69
C 18	9120.88	9114.82	6.06
C 19	9137.26	9130.92	6.34
C 20	9152.74	9146.28	6.46
C 21	9166.18	9159.66	6.52
C 22	9173.53	9166.90	6.63
C 23	9175.25	9168.52	6.73
C 24	9170.81	9164.06	6.75
C 25	9170.54	9163.83	6.71
C 26	9181.64	9174.97	6.67
C 27	9188.24	9181.65	6.59
C 28	9187.66	9181.13	6.53
C 29	9189.62	9183.25	6.37
C 30	9190.13	9183.85	6.28
C 31	9193.08	9187.09	5.99
C 32	9188.37	9182.60	5.77
C 33	[illegible]	[illegible]	[illegible]
C 34	9183.94	9179.30	4.64
C 35	9179.18	9175.58	3.60
C 36	9178.90	9176.10	2.80
C 37	9178.13	9176.09	2.04
C 38	9175.22	9173.54	1.68
C 39	9170.81	9169.43	1.38
C 40	9162.20	9161.08	1.12
C 41	9148.84	9147.88	0.96
C 42	9135.52	9134.71	0.81

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
C 43	9125.00	9124.38	0.62
C 44	9117.09	9116.54	0.55
C 45	9105.25	9104.77	0.48
C 46	9084.48	9083.99	0.49
C 47	9065.21	9063.65	1.56
C 48	9046.81	9045.97	0.84
C 49	9028.02	9026.56	1.46
C 50	9004.20	9002.83	1.37
P 1	9143.31	9131.44	11.88
P 2	9151.12	9139.07	12.06
P 3	9154.42	9142.36	12.07
P 4	9157.80	9146.20	11.60
P 5	9160.44	9149.68	10.77
P 6	9159.07	9149.43	9.65
P 7	9160.70	9152.26	8.45
P 8	9165.59	9158.11	7.49
P 9	9171.03	9163.94	7.10
P 10	9176.25	9169.48	6.77
P 11	9180.58	9173.95	6.64
P 12	9183.72	9176.98	6.74
P 13	9191.28	9185.51	5.78
P 14	9194.67	9189.05	5.63
P 15	9197.23	9191.82	5.41
P 16	9203.57	9197.85	5.73
P 17	9129.72	9118.05	11.67
P 18	9114.29	9102.57	11.73
P 19	9100.43	9088.82	11.61
P 20	9089.13	9077.89	11.24
P 21	9074.91	9065.04	9.88
P 22	9061.37	9053.87	7.51
P 23	9048.42	9042.73	5.69
P 24	9042.65	9037.93	4.70
P 25	9038.54	9034.30	4.25
SP25	9039.18	9035.18	4.01
P 26	9036.75	9032.83	3.93
SP26	9036.84	9033.16	3.69
P 27	9035.61	9032.08	3.54
SP27	9039.56	9030.32	3.24
P 28	9027.03	9024.05	2.99
SP28	9020.71	9018.07	2.64
SP29	9014.04	9011.62	2.43
SP30	9007.47	9005.28	2.19
[illegible]	[illegible]	[illegible]	[illegible]
SP32	8991.51	8989.73	1.78
SP33	8979.06	8977.47	1.59
SP34	8966.51	8965.04	1.48
SP35	8954.85	8953.57	1.28
SP36	8945.07	8943.88	1.19
SP37	8937.55	8936.48	1.07
SP38	8932.96	8932.01	0.95
SP39	8929.45	8928.61	0.85
SP40	8926.20	8925.46	0.75

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
SP41	8923.56	8922.88	0.68
SP42	8922.57	8922.01	0.57
SP43	8922.02	8921.50	0.53
SP44	8921.65	8921.19	0.47
SP45	8921.35	8920.94	0.42
D 1	8960.18	8959.09	1.09
D 2	8953.04	8952.02	1.02
D 3	8949.27	8947.33	1.94
D 4	8949.94	8949.04	0.90
D 5	8957.29	8956.46	0.83
D 6	8967.44	8966.59	0.85
D 7	8975.26	8974.38	0.88
D 8	8983.90	8982.95	0.95
D 9	8990.92	8989.68	1.24
D 10	8999.20	8997.61	1.59
D 11	9007.03	9004.30	2.73
D 12	9016.69	9012.80	3.89
D 13	9029.19	9024.89	4.30
A 1	9015.87	9013.04	2.83
A 2	9014.25	9010.92	3.33
A 3	9009.87	9006.55	3.32
A 4	9004.22	9001.24	2.98
A 5	9001.00	8999.42	1.58
A 6	8998.65	8997.04	1.61
A 7	8993.71	8992.07	1.64
A 8	8991.47	8989.97	1.50
B 1	9173.78	9172.13	1.65
B 2	9170.78	9169.10	1.68
B 3	9158.29	9156.51	1.78
B 4	9141.32	9139.61	1.71
B 5	9124.50	9122.74	1.76
B 6	9111.43	9109.78	1.65
B 7	9095.66	9093.92	1.74
E 1	9008.16	9007.63	0.53
E 2	8997.85	8997.25	0.61
E 3	8987.42	8986.71	0.72
E 4	8977.75	8976.97	0.78
E 5	8968.10	8967.25	0.86
E 6	8959.71	8958.90	0.81
E 7	[illegible]	[illegible]	[illegible]
E 8	8957.98	8957.28	0.70
E 9	8959.92	8959.26	0.67
E 10	8960.97	8960.29	0.68
E 11	8967.90	8967.13	0.77
E 12	8983.37	8982.18	1.20
E 13	8993.84	8992.15	1.69
E 14	9007.06	9003.25	3.82
E 15	9029.96	9025.25	4.72
E 16	9055.05	9049.92	5.14

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
E 17	9076.10	9070.64	5.47
E 18	9094.27	9088.34	5.94
E 19	9104.22	9097.97	6.25
E 20	9105.05	9098.48	6.57
E 21	9118.34	9111.55	6.80
E 22	9129.72	9122.67	7.06
E 23	9140.18	9132.91	7.28
E 24	9147.95	9140.43	7.53
E 25	9154.02	9146.31	7.72
E 26	9157.11	9149.26	7.86
E 27	9159.69	9151.73	7.96
E 28	9161.39	9153.35	8.05
E 29	9159.70	9151.89	7.82
E 30	9155.41	9147.63	7.78
E 31	9148.90	9141.22	7.68
E 32	9141.48	9133.98	7.50
E 33	9134.71	9127.51	7.20
E 34	9125.08	9118.67	6.42
E 35	9116.05	9111.71	4.34
E 36	9112.04	9109.03	3.02
E 37	9105.12	9103.12	2.01
E 38	9090.76	9089.23	1.53
E 39	9075.68	9074.46	1.23
E 40	9065.14	9064.04	1.10
E 41	9051.25	9050.27	0.99
E 42	9040.70	9039.76	0.95
E 43	9034.43	9033.67	0.77
E 44	9031.28	9030.55	0.74
E 45	9025.88	9025.20	0.68
E 46	9006.92	9006.32	0.60
E 47	8988.15	8987.48	0.67
E 48	8971.80	8971.30	0.50
E 49	8951.26	8950.63	0.44
E 50	8942.68	8942.25	0.44
F 1	9023.07	9022.36	0.72
F 2	9008.49	9007.68	0.82
F 3	8995.51	8994.80	0.72
F 4	8982.79	8981.82	0.98
F 5	8970.51	8969.53	0.99
F 6	8956.47	8955.58	0.90
F 7	8945.05	8944.29	0.76
F 8	8931.96	8931.31	0.65
F 10	8926.09	8925.53	0.57
F 11	8941.36	8940.77	0.60
F 12	8955.26	8954.53	0.74
F 13	8966.19	8965.08	1.12
F 14	8978.04	8974.81	3.24
F 15	9000.47	8995.36	5.11
F 16	9026.38	9020.33	5.95
F 17	9061.13	9053.68	7.45
F 18	9081.04	9071.63	9.42

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
F 19	9093.32	9082.35	10.80
F 20	9099.94	9088.51	11.44
F 21	9107.45	9095.68	11.78
F 22	9114.79	9102.81	11.99
F 23	9120.92	9108.89	12.03
F 24	9124.11	9112.07	12.03
F 25	9125.36	9113.38	11.99
F 26	9123.82	9116.90	11.92
F 27	9137.39	9125.51	11.88
F 28	9143.67	9131.95	11.73
F 29	9142.21	9130.57	11.64
F 30	9133.76	9122.18	11.59
F 31	9121.28	9109.94	11.35
F 32	9108.36	9097.21	11.16
F 33	9093.02	9082.32	10.70
F 34	9083.37	9073.41	9.97
F 35	9075.64	9068.48	7.16
F 36	9070.91	9067.76	3.16
F 37	9057.40	9055.44	1.97
F 38	9039.82	9038.36	1.47
F 39	9027.80	9026.54	1.26
F 40	9008.94	9007.89	1.06
F 41	8989.27	8988.34	0.94
F 42	8973.19	8972.39	0.81
F 43	8952.18	8951.46	0.73
F 44	8931.29	8930.64	0.66
F 45	8911.66	8911.08	0.59
F 46	8893.75	8893.21	0.55
F 47	8889.64	8889.21	0.43
G 1	9017.27	9016.26	1.02
G 2	9010.00	9009.15	0.85
G 3	8996.96	8996.18	0.78
G 4	8986.77	8985.98	0.79
G 5	8979.31	8978.56	0.75
SG 5	8974.82	8974.16	0.67
G 6	8968.83	8968.18	0.66
SG 6	8964.78	8964.25	0.54
G 7	8957.86	8957.34	0.53
SG 7	8951.87	8951.46	0.42
G 8	8940.86	8940.44	0.43
SG 8	8931.87	8931.55	0.33
G 9	8920.29	8919.91	0.39
G 10	8904.15	8903.73	0.42
SG10	8900.79	8900.56	0.24
G 11	8897.67	8897.16	0.52
SG11	8906.69	8906.14	0.49
G 12	8916.99	8916.31	0.68
SG12	8929.77	8929.01	0.77
G 13	8939.73	8938.57	1.16
SG13	8949.34	8946.47	2.88
G 14	8956.60	8953.55	3.06

DEER CREEK SUBSIDENCE: 1985 Surface Monumentation

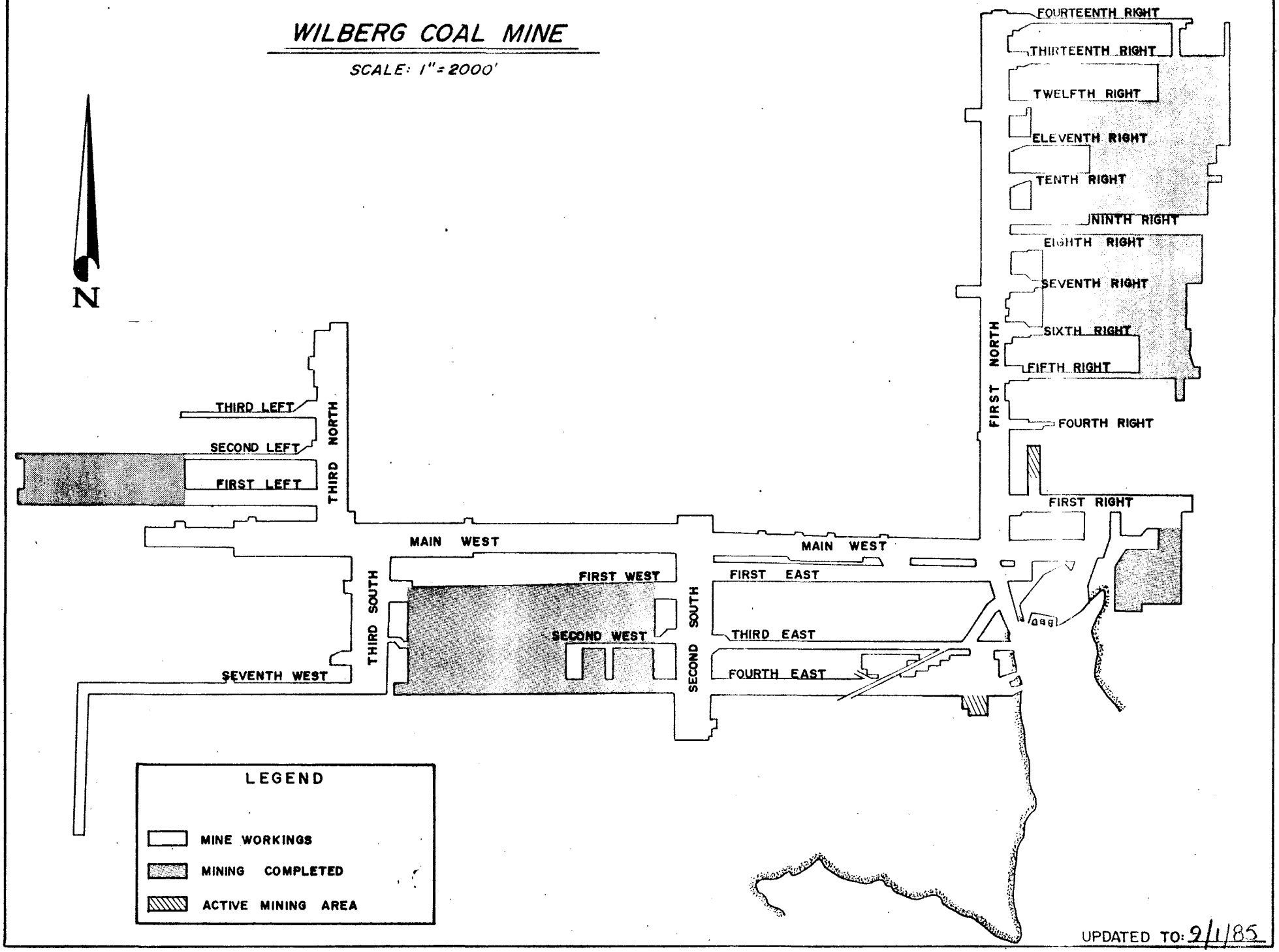
Station	Base File Elevation	Sept. 1985 Elevation	Total Subsidence
SG14	8970.00	8966.39	3.61
G 15	8986.45	8982.38	4.08
G 16	9020.60	9016.17	4.44
G 17	9049.24	9044.21	5.03
G 18	9068.76	9062.63	6.14
G 19	9080.04	9072.79	7.26
G 20	9086.97	9079.22	7.75
G 21	9090.12	9082.36	7.77
G 22	9085.88	9078.37	7.51
G 23	9082.52	9075.22	7.31
G 24	9079.10	9071.98	7.12
G 25	9072.97	9065.97	7.00
G 26	9066.68	9059.63	7.06
G 27	9058.06	9050.98	7.08
G 28	9050.08	9043.08	7.01
G 29	9042.11	9035.34	6.78
G 30	9033.43	9026.94	6.50
G 31	9025.21	9019.08	6.14
G 32	9018.40	9012.60	5.81
G 33	9006.13	9000.69	5.44
G 34	8995.21	8990.73	4.48
G 35	8981.85	8979.10	2.76
SG35	8974.89	8972.85	2.05
G 36	8964.21	8962.55	1.66
SG36	8956.26	8954.92	1.35
G 37	8945.34	8944.22	1.13
SG37	8937.39	8936.45	0.94
G 38	8930.39	8929.56	0.83
SG38	8923.44	8922.76	0.69
G 39	8916.86	8916.20	0.67
SG39	8913.78	8913.22	0.57
G 40	8908.02	8907.44	0.59
SG40	8902.15	8901.66	0.50
G 41	8892.67	8892.17	0.51
SG41	8886.58	8886.14	0.44
G 42	8877.43	8876.97	0.47
SG42	8872.97	8872.47	0.50
G 43	8863.93	8863.52	0.42
SG43	8861.41	8861.09	0.33
G 44	8858.04	8857.73	0.31
SG44	8859.48	8859.17	0.32
G 45	8859.54	8859.17	0.38
G 46	8872.68	8872.35	0.32
G 47	[illegible]	[illegible]	[illegible]
G 48	8898.13	8897.87	0.26
G 49	8913.06	8912.82	0.24
G 50	8927.28	8927.02	0.27

APPENDIX

WILBERG MINE

WILBERG COAL MINE

SCALE: 1" = 2000'



UPDATED TO: 2/1/85

WILBERG SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	1985 Elevation	Total Subsidence
P2	9638.13	9638.13	0.00
BM2	9282.42	NA	NA
BM3	8980.15	8979.53	0.62
BM9	8961.81	NA	NA
BM10	9067.32	NA	NA
B1	9637.48	NA	NA
B2	9637.40	9637.28	0.12
B3	9636.68	9636.49	0.19
B4	9635.25	9634.94	0.31
B5	9633.91	9633.42	0.49
B6	9632.56	9631.79	0.77
B7	9631.13	9629.85	1.28
B8	9626.92	9624.31	2.61
B9	9624.58	9621.76	2.82
B10	NA	NA	NA
B11	NA	NA	NA
B12	NA	NA	NA
B13	NA	NA	NA
A1	9647.02	9647.06	-0.04
A2	9645.81	9645.79	0.02
A3	9644.09	9644.00	0.09
A4	9640.17	9639.98	0.19
A5	9636.54	9636.19	0.35
A6	9633.89	9633.28	0.61
A7	9633.23	9632.21	1.02
A8	9632.33	9630.80	1.53
A9	9632.49	9630.69	1.80
A10	9630.70	9628.77	1.93
A11	9629.99	9628.01	1.98
A12	9628.88	9626.70	2.18
A13	9627.27	9625.39	1.88
A14	9624.34	9622.66	1.68
A15	9621.75	9620.35	1.40
A16	9617.33	9616.25	1.08
A17	9533.08	NA	NA
A18	9459.85	NA	NA
A19	9400.86	NA	NA
A20	9366.92	NA	NA
A21	9331.97	NA	NA
A22	9308.38	NA	NA
A23	9294.86	NA	NA
[illegible]	[illegible]	[illegible]	[illegible]
A25	9242.18	NA	NA
A26	9191.45	NA	NA
A27	9138.56	NA	NA
A28	9183.71	NA	NA
M1	8970.56	8969.97	0.59
M2	8963.07	8962.44	0.63
M3	8956.49	8955.82	0.67
M4	8949.64	8948.92	0.72

WILBERG SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	1985 Elevation	Total Subsidence
M5	8943.68	8942.87	0.81
M6	8939.48	8938.63	0.85
M7	8936.48	8935.54	0.94
M8	8939.38	8938.41	0.97
M9	8945.41	8944.44	0.97
M10	8953.63	8952.55	1.08
M11	8962.77	8961.62	1.15
M12	8970.55	8969.28	1.27
M13	8977.47	8975.99	1.48
M14	8985.02	8983.21	1.81
M15	8994.98	8992.14	2.84
M16	9006.30	9002.72	3.58
M17	9024.22	9020.29	3.93
M18	9053.05	9048.62	4.43
M19	9072.41	9067.73	4.68
M20	9092.87	9087.96	4.91
M21	9120.57	9115.46	5.11
M22	9137.29	9132.11	5.18
M23	9149.41	9144.15	5.26
M24	9157.68	9152.38	5.30
M25	9165.06	9159.73	5.33
M26	9174.49	9169.18	5.31
M27	9185.50	9180.21	5.29
M28	9192.01	9186.77	5.24
M29	9198.45	9193.30	5.15
M30	9203.97	9198.97	5.00
M31	9208.53	9203.74	4.79
M32	9213.36	9208.87	4.49
M33	9217.35	9213.24	4.11
M34	9221.90	9218.24	3.66
M35	9230.35	9227.08	3.27
M36	9243.60	9240.74	2.86
M37	9255.34	9252.78	2.56
M38	9263.59	9261.39	2.20
M39	9264.29	9262.33	1.96
M40	9243.46	9241.80	1.66
M41	9216.92	9215.57	1.35
M42	9194.21	9192.96	1.25
M43	9183.29	9182.36	0.93
M44	9172.13	9171.43	0.70
M45	9158.34	9157.75	0.59
M46	9141.57	9141.09	0.48
M47	9130.48	9130.05	0.43
[illegible]	[illegible]	[illegible]	[illegible]
M49	9115.27	9115.13	0.14
M50	9112.33	9112.15	0.18
M51	9110.83	9110.69	0.14
M52	9109.35	9109.23	0.12
M53	9109.18	9109.12	0.06
M54	9112.33	9112.26	0.07
M55	9114.53	9114.49	0.04
M56	9117.60	9117.57	0.03
M57	9124.05	9124.01	0.04

WILBERG SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	1985 Elevation	Total Subsidence
M58	9126.99	9126.97	0.02
M59	9129.59	9129.55	0.04
M60	9131.82	9131.80	0.02
M61	9132.95	9132.92	0.03
R1	9200.61	9195.50	5.11
R2	9197.72	9192.54	5.18
R3	9195.69	9190.48	5.21
R4	9191.72	9186.49	5.23
R5	9187.39	9182.15	5.24
R6	9183.60	9178.37	5.23
R7	9179.93	9174.78	5.15
R8	9176.07	9171.17	4.90
R9	9172.12	9167.69	4.43
R10	NA	NA	NA
R11	NA	NA	NA
R12	NA	NA	NA
R13	NA	NA	NA
R14	NA	NA	NA
R15	NA	NA	NA
R16	NA	NA	NA
R17	NA	NA	NA
R18	NA	NA	NA
R19	NA	NA	NA
R20	NA	NA	NA
R21	NA	NA	NA
R22	NA	NA	NA
R23	NA	NA	NA
R24	NA	NA	NA
R25	NA	NA	NA
R26	NA	NA	NA
R27	NA	NA	NA
R28	NA	NA	NA
R29	NA	NA	NA
R30	NA	NA	NA
T1	9211.33	9207.47	3.86
T2	9215.45	9211.66	3.79
T3	9221.05	9217.35	3.70
T4	9218.12	9214.44	3.68
T5	9213.19	9209.48	3.71
T6	9208.05	9204.25	3.80
T7	9198.90	9195.03	3.87
T8	[illegible]	[illegible]	[illegible]
T9	9180.18	9176.64	3.54
T10	9175.17	9172.50	2.67
T11	9166.34	9164.46	1.88
T12	9157.12	9155.83	1.29
T13	9149.99	9149.03	0.96
T14	9143.34	9142.55	0.79
T15	9142.84	9142.18	0.66
T16	9138.80	9138.56	0.24
T17	9138.63	9138.24	0.39

WILBERG SUBSIDENCE: 1985 Surface Monumentation

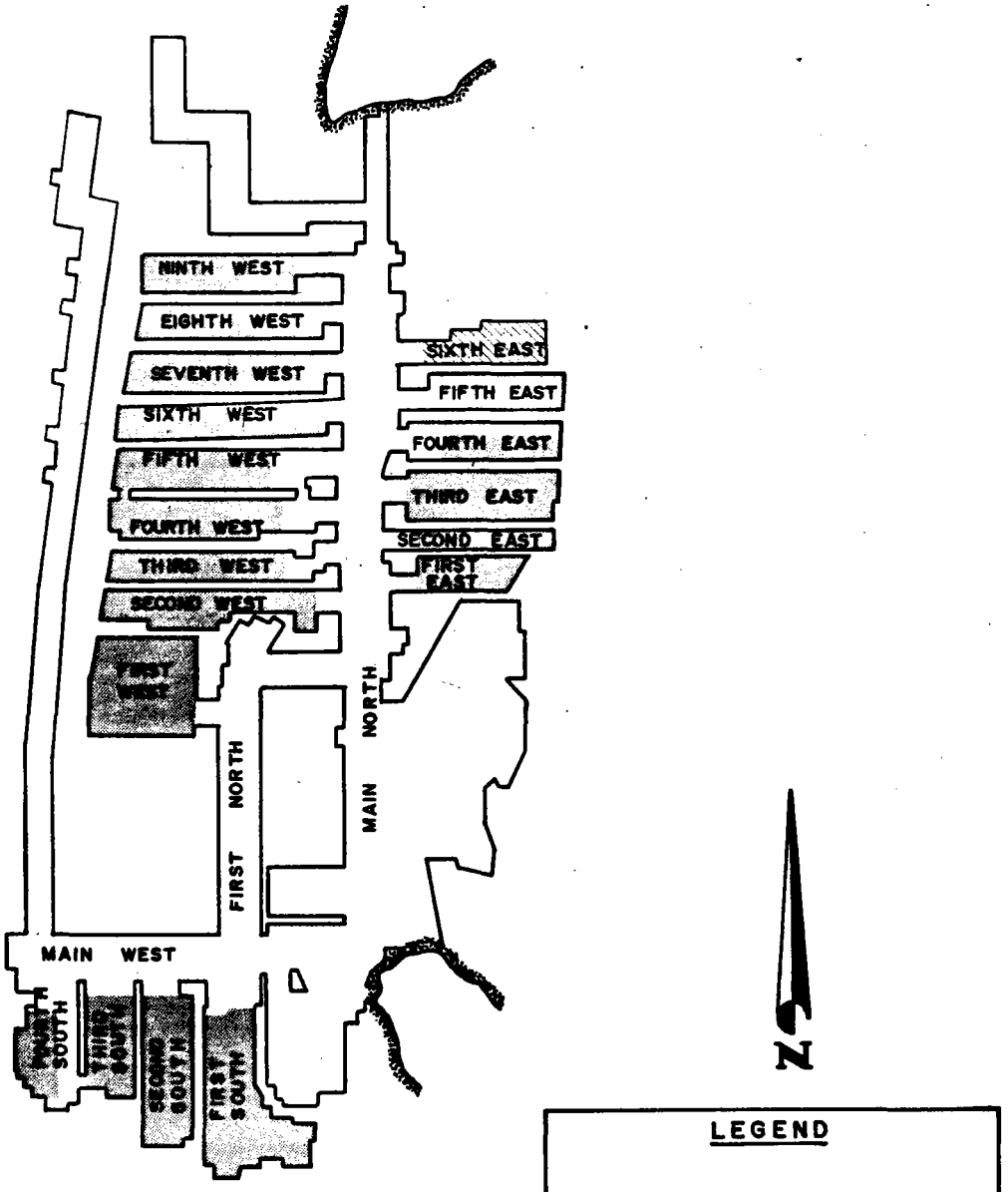
Station	Base File Elevation	1985 Elevation	Total Subsidence
T18	9135.71	9135.21	0.50
T19	9130.84	9130.33	0.51
T20	NA	NA	NA
XT21	NA	NA	NA
T22	NA	NA	NA
T23	NA	NA	NA
T24	NA	NA	NA
T25	NA	NA	NA
T26	NA	NA	NA
T27	NA	NA	NA
T28	NA	NA	NA
T29	NA	NA	NA
T30	NA	NA	NA
S1	9127.74	9122.58	5.16
S2	9154.74	9149.45	5.29
S3	9171.51	9166.16	5.35
S4	9187.49	9182.19	5.30
S5	9199.45	9194.29	5.16
S6	9194.83	9189.59	5.24
S7	9189.38	9184.16	5.22
S8	9182.62	9177.31	5.31
S9	9177.22	9172.07	5.15
S10	9200.95	9200.26	0.69
S11	9192.35	9191.90	0.45
S12	9180.67	9180.32	0.35
S13	9174.60	9173.89	0.71
S14	9170.64	9170.52	0.12
S15	9165.38	9165.30	0.08
S16	9160.87	9160.83	0.04
S17	9154.68	9154.64	0.04
S18	NA	NA	NA
S19	NA	NA	NA
S20	NA	NA	NA
S21	NA	NA	NA
S22	NA	NA	NA
S23	NA	NA	NA
S24	NA	NA	NA
S25	NA	NA	NA
S26	NA	NA	NA
S27	NA	NA	NA
S28	NA	NA	NA
S29	NA	NA	NA
[illegible]	[illegible]	[illegible]	[illegible]
N35	9186.07	9183.18	2.89
N36	9189.83	9187.27	2.56
N37	9198.56	9196.31	2.25
N38	9201.41	9199.48	1.93
N39	9202.91	9201.32	1.59
N40	9204.29	9203.04	1.25
N41	9202.09	9201.13	0.96
N42	9197.81	9197.09	0.72

WILBERG SUBSIDENCE: 1985 Surface Monumentation

Station	Base File Elevation	1985 Elevation	Total Subsidence
N43	9194.00	9193.43	0.57
N44	9190.92	9190.48	0.44
N45	9185.46	9185.10	0.36
N46	9181.01	9180.63	0.38
N47	9177.78	9177.52	0.26
N48	9175.54	9175.36	0.18
N49	9173.89	9173.62	0.27
N50	9171.85	9171.72	0.13
N51	9169.37	9169.29	0.08
N52	9166.86	9166.79	0.07
N53	9164.13	9164.07	0.06
N54	9159.99	9159.91	0.08
N55	9155.71	9155.66	0.05
N56	9151.17	9151.12	0.05
N57	9148.55	9148.52	0.03
N58	9146.27	9146.25	0.02
N59	9144.82	9144.81	0.01
N60	9143.05	9143.04	0.01
N61	9141.22	9141.21	0.01
N62	9140.91	9140.91	0.00
N63	9137.62	9137.62	0.00
N64	9134.43	9134.44	-0.01
N65	9128.66	9128.66	0.00
N66	NA	NA	NA
N67	NA	NA	NA
N68	NA	NA	NA
N69	NA	NA	NA
N70	NA	NA	NA
Z1	9264.75	NA	NA
Z2	9265.18	NA	NA
Z3	9264.14	NA	NA
Z4	9264.74	NA	NA
Z5	9264.65	NA	NA
Z6	9264.70	NA	NA
Z7	9255.40	NA	NA
Z8	9247.76	NA	NA
Z9	9252.72	NA	NA
Z10	9253.11	NA	NA
Z11	9251.29	NA	NA
Z12	9252.85	NA	NA

APPENDIX

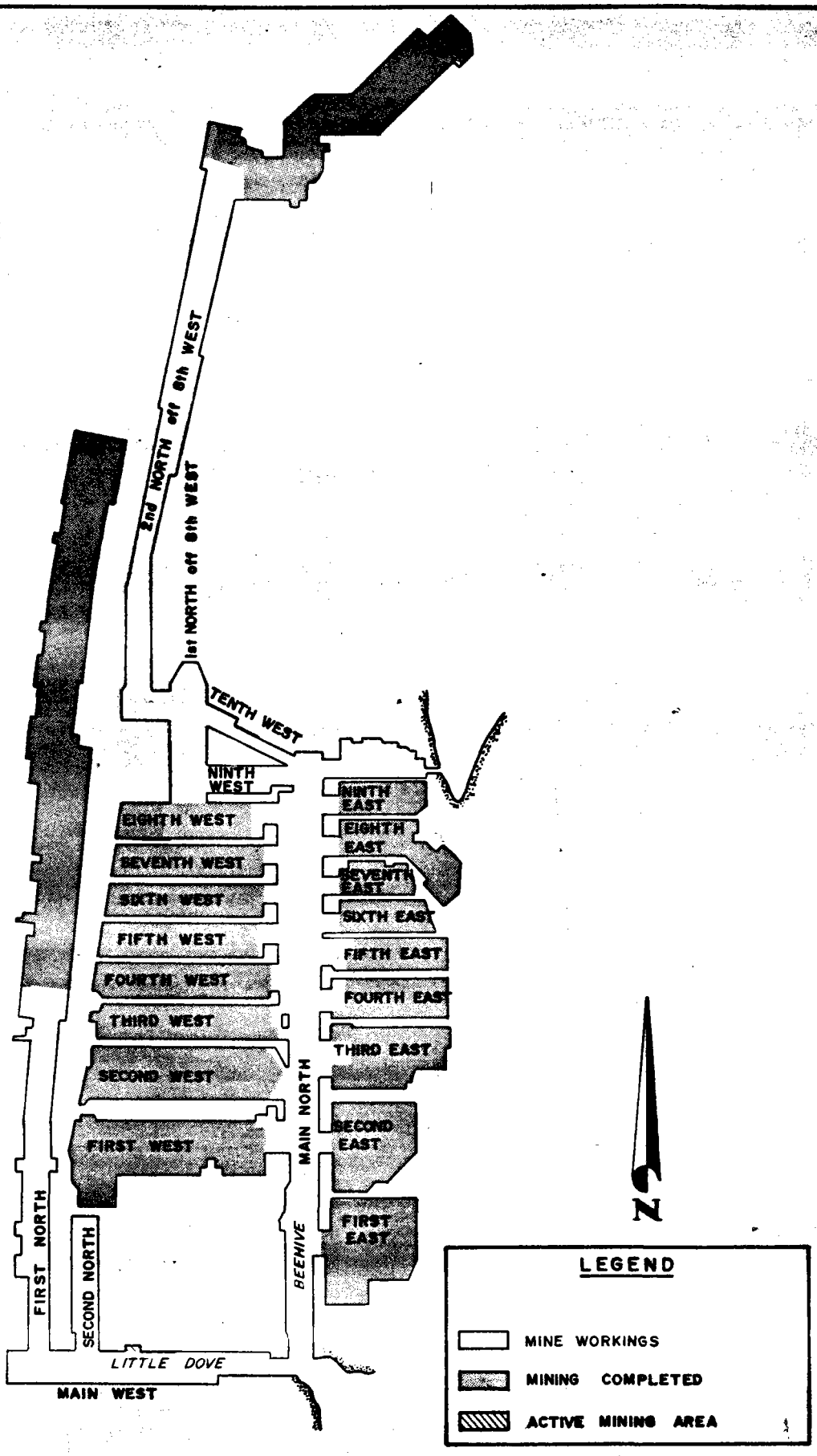
DES-BEE-DOVE MINE



MINE WORKINGS UPDATED TO 9/1/85

DESERET COAL MINE

SCALE: 1"=2000'



BEEHIVE & LITTLE DOVE COAL MINES

SCALE: 1" = 2000'

UPDATED TO: 9/1/85