

SUBSIDENCE MONITORING REPORT

1989

STAR POINT MINES

ACT/007/006

**Cyprus Plateau Mining Corporation
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INTRODUCTION

During the months January through September, subsidence monitoring was conducted on surface lands above underground mining. The land surface above all full extraction mining was visually searched for evidence of surface disturbance. All monitoring points above the longwall mining areas were surveyed for vertical movement. Monitoring points U1, U2, U3, U4 and GS-1 were surveyed for horizontal and vertical movement.

Mining during 1989 was done in the areas shown on Maps 1 and 2.

Monitoring of points U1, U2, U3, and U4 was done in conjunction with special permits with the U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources. A report of monitoring these points was previously submitted to the Division entitled "Annual Report, 1989, Permit PRT-719890."

SURFACE EFFECTS

Surface cracks as shown on Map 61A over longwall mining in Sections 18, T15S, R8E, and Section 12, T15S, R7E, are associated with known faults in Section 12 and with fractures in Section 18.

The cracks in Section 12 originally varied in width from hairline to 6 inches, and displacement across the cracks varied from none to one foot. These cracks are healing nicely, and there are no holes remaining. The cracks do not pose a safety hazard to humans, livestock or wildlife.

Subsidence contours have been plotted using survey data on the Section 12 area. As can be seen on Map 61A, subsidence contours reflect a reaction to the east-west trending faults. On the west side of Section 12, two short cracks have appeared at north-south trending faults.

Overburden in the Section 12 area ranges from 800 to 1500 feet. The area is characterized by a mounded ridge with a steeply incised canyon on the north end.

The cracks in Section 18 vary in width from hairline to 30 inches. Displacement across the cracks varies from none to 2 feet.

Several small areas of outcropping sandstone in Section 18 failed due to surface and near surface movement. No massive failures have occurred.

Overburden in the Section 18 area ranges from 0 to 1100 feet. The area is characterized by a ridge at the north end with a cliff of exposed Castle Gate Sandstone. The majority of the area comprises the headwaters of a small drainage basin characterized by steep canyon sides and very rugged, tree covered terrain. Because the terrain in Section 18 is so rugged, a grid of monitoring points is impractical. Subsidence contours cannot be plotted for this reason.

Cross sections have been plotted through Panels 1-7 (Figure 1), Panel 2 (Figure 2), and Panel 4 (Figure 3).

As can be seen on Figures 2 and 3, subsidence appears to have stabilized, and reached near-maximum drop by the third year after mining. Figure 1 shows the subsidence profile diagonally through the seven longwall panels. The progression of subsidence can be seen to the north as successive panels were mined. Further drop in the longwall Panel 5, 6 and 7 area is expected for the next two years.

A cross section through Points U5-U17 in Section 18 (Figure 4) indicates a maximum vertical drop of 4.53 feet. Only one post-mining survey has been made of these points, therefore progression of subsidence cannot be plotted at this time.

Horizontal and vertical movement graphs have been made of monitoring points U1,

U2, U3 and U4, Figures 5, 6, 7, and 8 respectively. Point U1, which is located directly above the north edge of longwall mining, shows the most vertical and horizontal movement. Point U4 is farthest from mining and shows the least movement.

A horizontal and vertical movement graph (figure 9) has been made of monitoring point GS-1 near the stream in Section 18.

MITIGATION

The surface crack crossing the U.S. Forest development road in Section 12 was repaired in 1987. No additional movement has occurred at this location. No other mitigation measures are necessary in this area.

A portion of the surface cracks near monitoring points U-1 and U-2 in Section 18 have been repaired to reduce the likelihood of accidents. The cracks were backfilled and the area was fenced. Signs were placed in the area warning the public of the potential danger of the unstable ground.

VEGETATION

Subsidence in the Section 12 area has caused minimal vegetation loss. Grasses, shrubs and trees near the cracks do not appear to be affected.

Some vegetation in Section 18 has been lost to the small outcrop failures. When the area has stabilized after mining the Middle Seam, the area will be hand seeded.

SURFACE WATER AND GROUND WATER

There has been no identified impact to ground water in the Section 12 area. There

is no surface water in this area.

The Section 18 area is the subject of a study of the effects of longwall mining on ground water and surface water; the study will run through 1993. The study is being undertaken in conjunction with the U.S. Geological Survey and the Division.

Some stream water has been diverted into the mine near monitoring point GS-1. The stream at this location is small, averaging 13 gallons per minute. Springs and base flow from the canyon bottom recharge the stream below this point. Only a section of stream approximately 800 feet long has been affected. An important point to be learned from the study is whether mudstones and siltstones will expand and stop the downflow of stream water.

A complete discussion of hydrologic impacts can be found in the 1989 Annual Hydrologic Report.

SURFACE STRUCTURES

The only impact to surface structures has been the settling of the U.S. Forest development road discussed previously in this report. Repair work was conducted on this road in 1987.

PROJECTED MINING - 1990

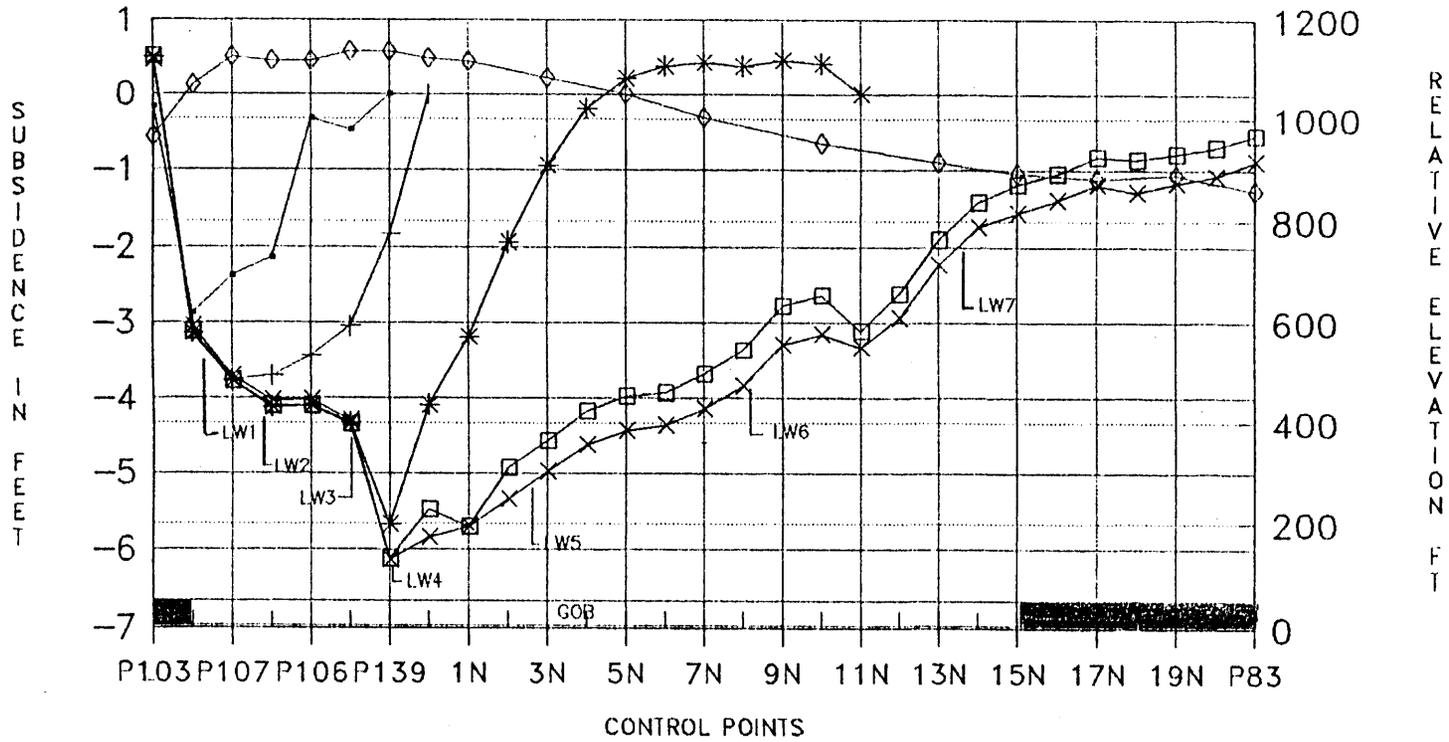
Mining will be done in the areas as shown on Maps 1 and 2, and on Map 61C.

MONITORING

Monitoring in 1990 will include the following:

1. Survey monitoring points above longwall mining areas (Panels 1-7) for vertical movement.
2. Survey monitoring points U1-U4, GS-1, 86-18-1, 86-18-2, and Cow 3, for horizontal and vertical movement.
3. Survey monitoring points U5-U17 for vertical movement.
4. Establish new monitoring points U18-U32 as shown on Map 61A to monitor mining in the Middle Seam in Section 18.
5. Establish monitoring points P168-P190 as shown on Map 61C.
6. Take ground based photographs of the cliff in Section 18 according to the approved special permits with the U.S. Fish and Wildlife Service and the Utah Division of Wildlife Resources.
7. Visual observations of the ground surface above all mined areas for surface effects of mining.

FIGURE 1
CROSS SECTION A-A

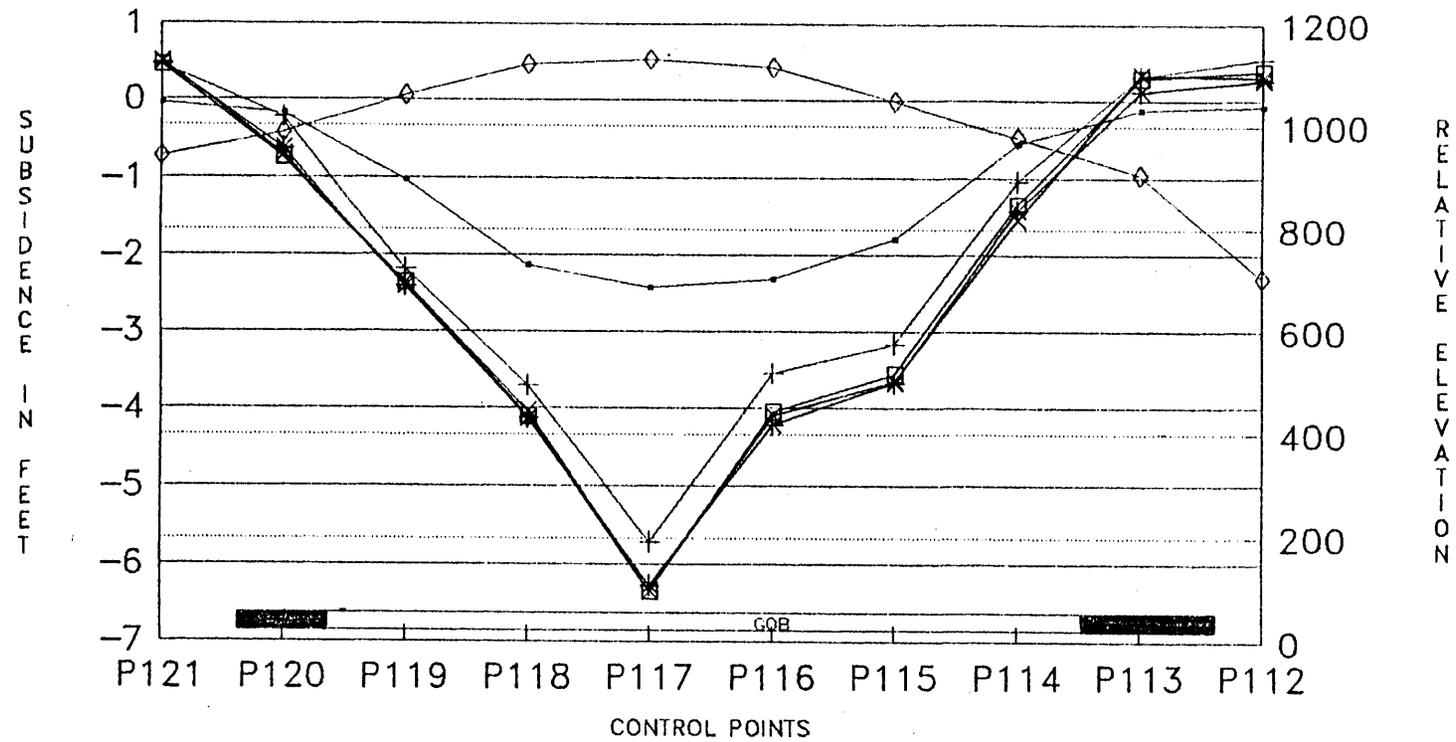


—•—	1985	-+-	1986	*—	1987
—□—	1988	-x-	1989	—◇—	GROUND SURFACE

NOTE -1- CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

2- LW_ INDICATES CENTER OF LONGWALL PANELS

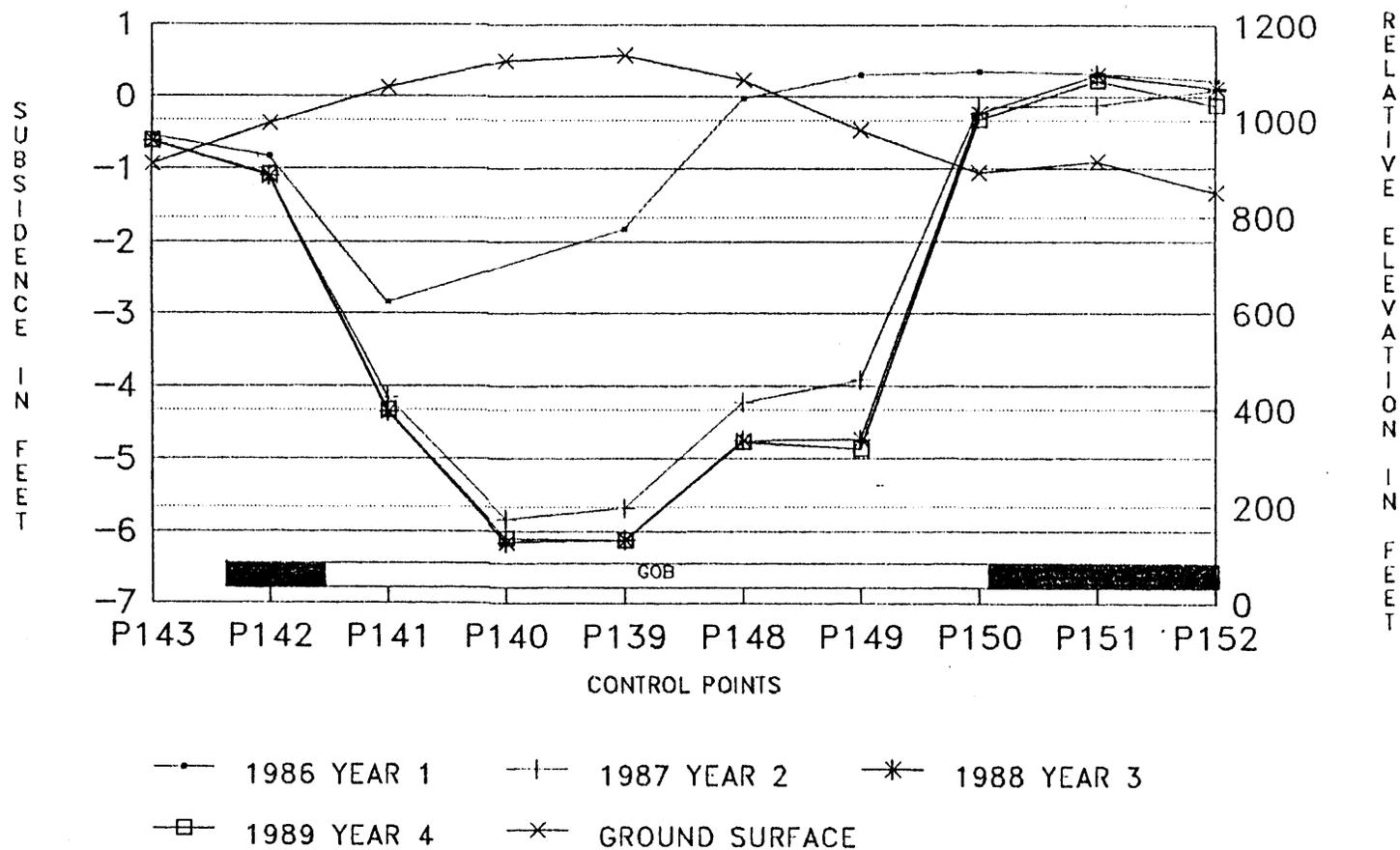
FIGURE 2
CROSS SECTION B-B LONGWALL PANEL 2



—●— 1985 YEAR 1 —+— 1986 YEAR 2 —*— 1987 YEAR 3
 —□— 1988 YEAR 4 —×— 1989 YEAR 5 —◇— GROUND SURFACE

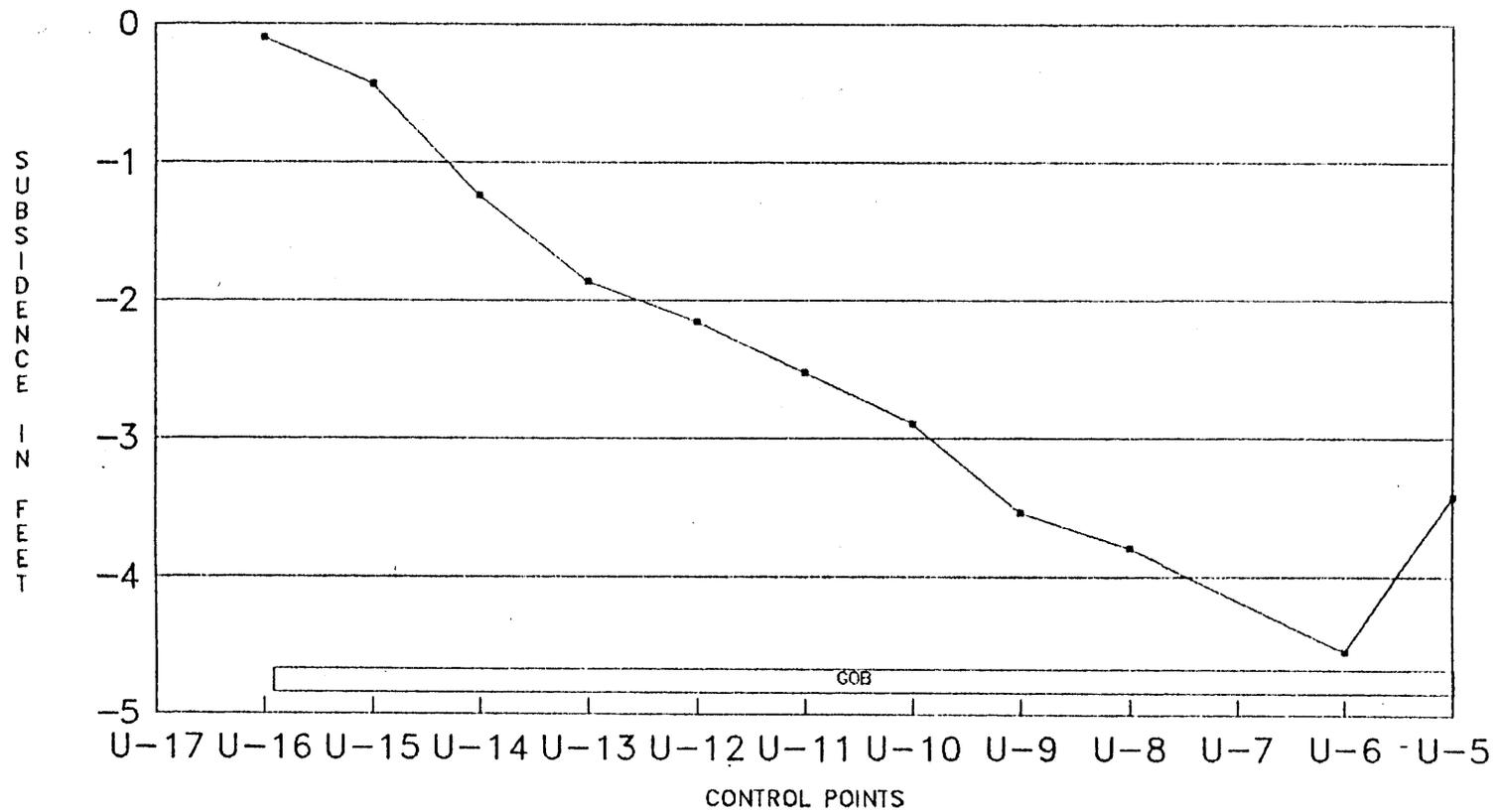
NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

FIGURE 3
CROSS SECTION C-C LONGWALL PANEL 4



NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

FIGURE 4
CROSS SECTION D-D SECTION 18 NEAR STREAM



—•— 1989 YEAR 1

NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

FIGURE 5
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U1

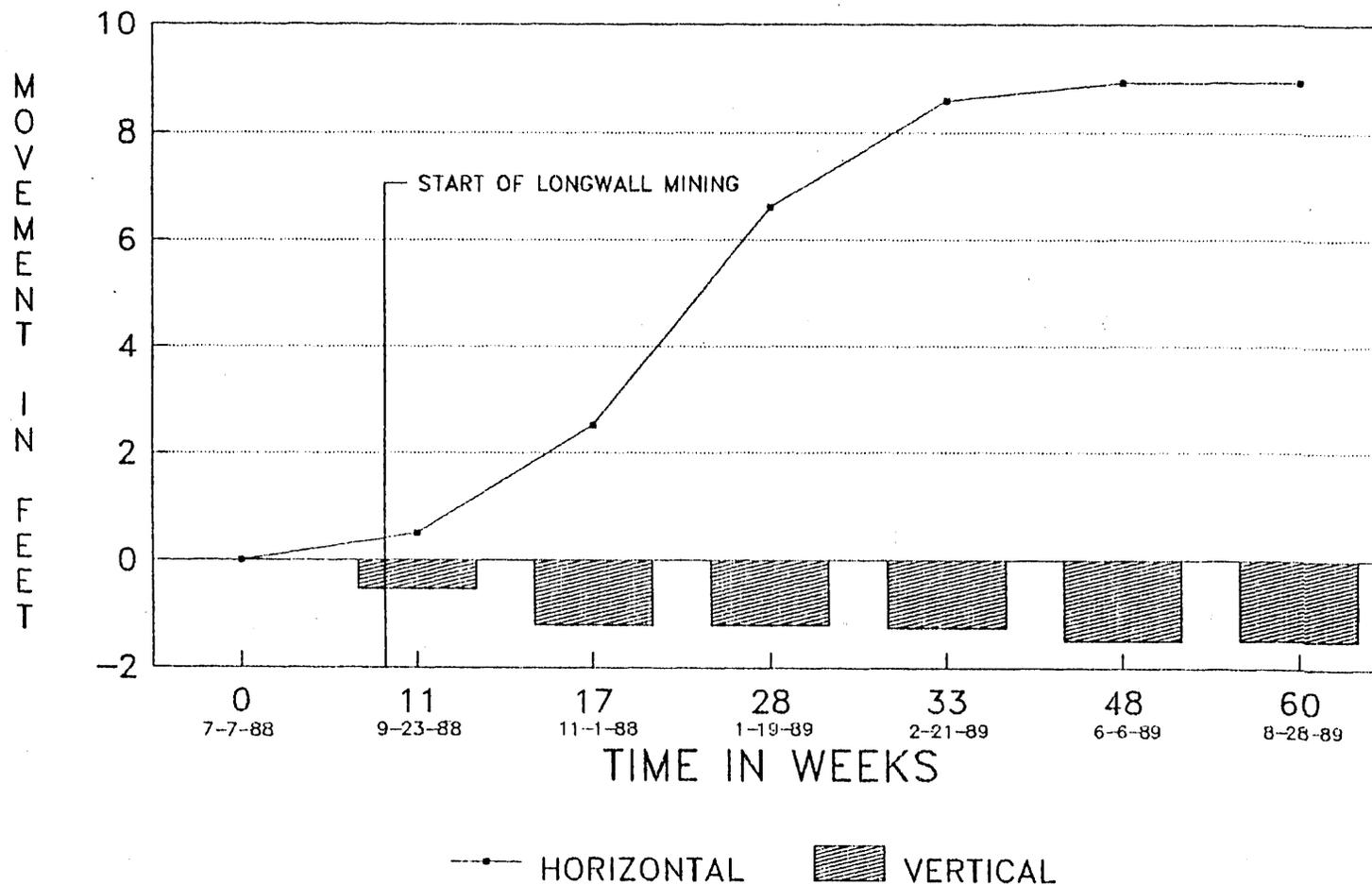


FIGURE 6
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U2

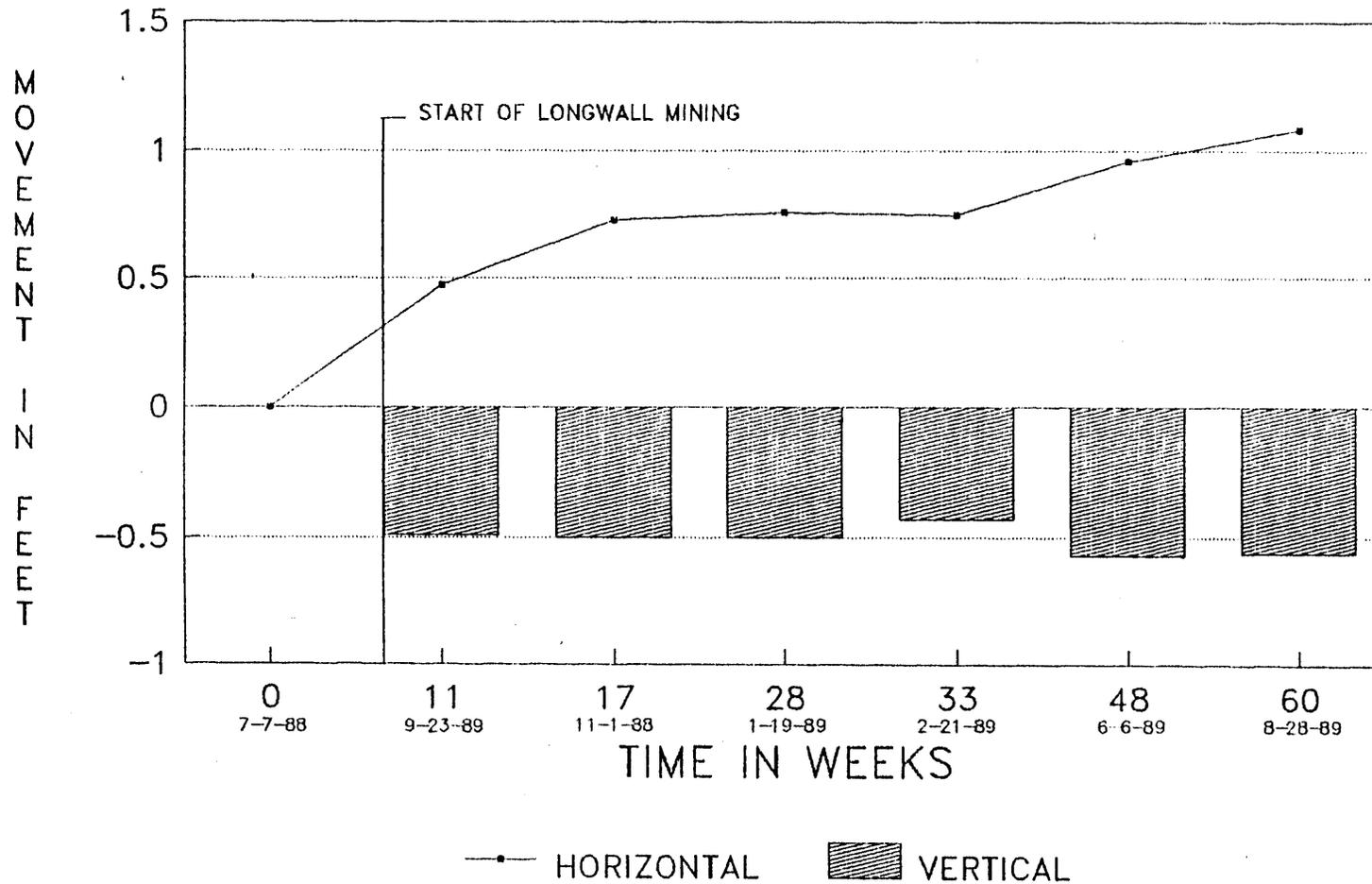


FIGURE 7
 U-NORTH SUBSIDENCE MONITORING
 HORIZONTAL AND VERTICAL MOVEMENT GRAPH
 STATION U3

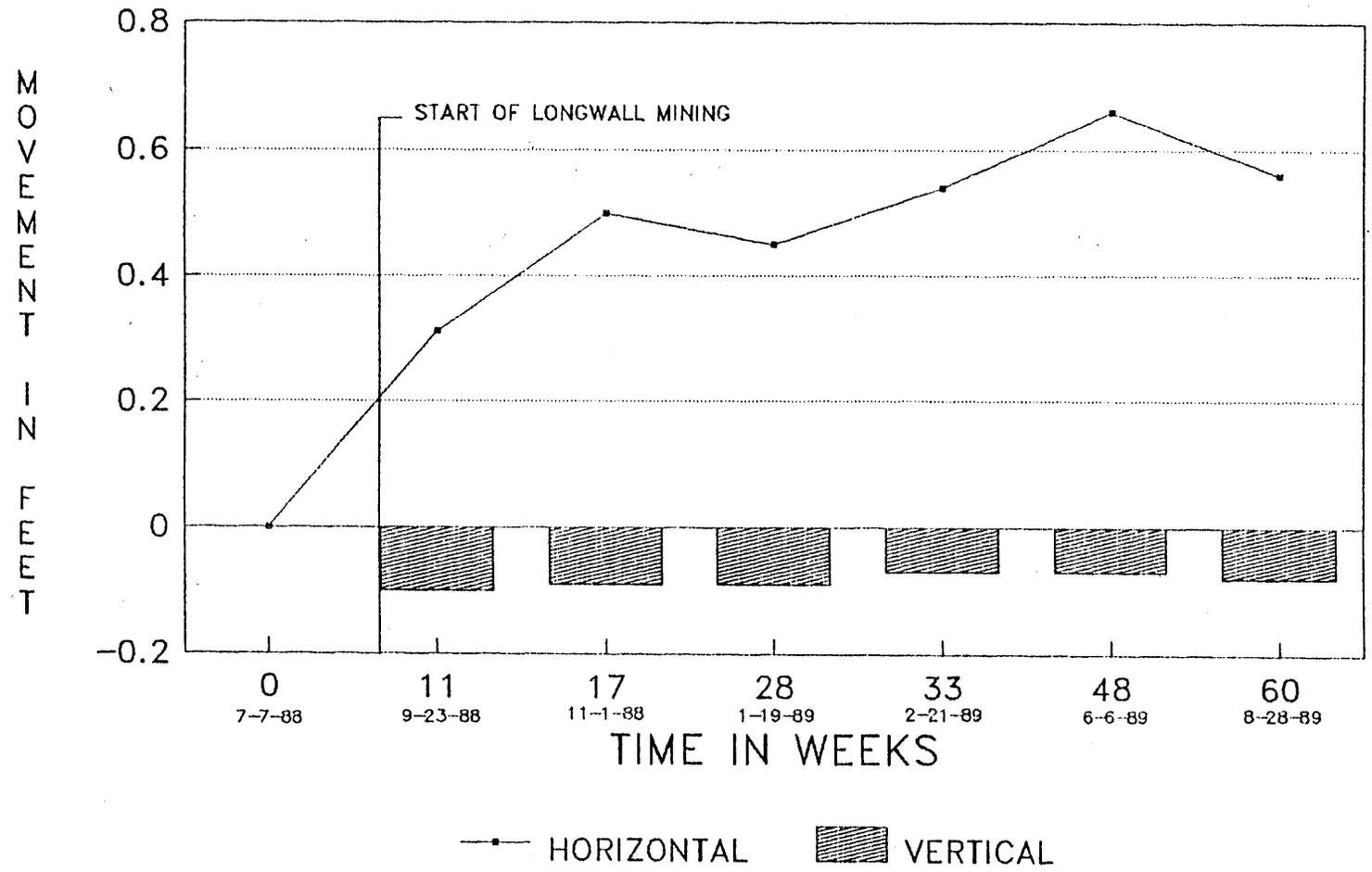


FIGURE 8
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U4

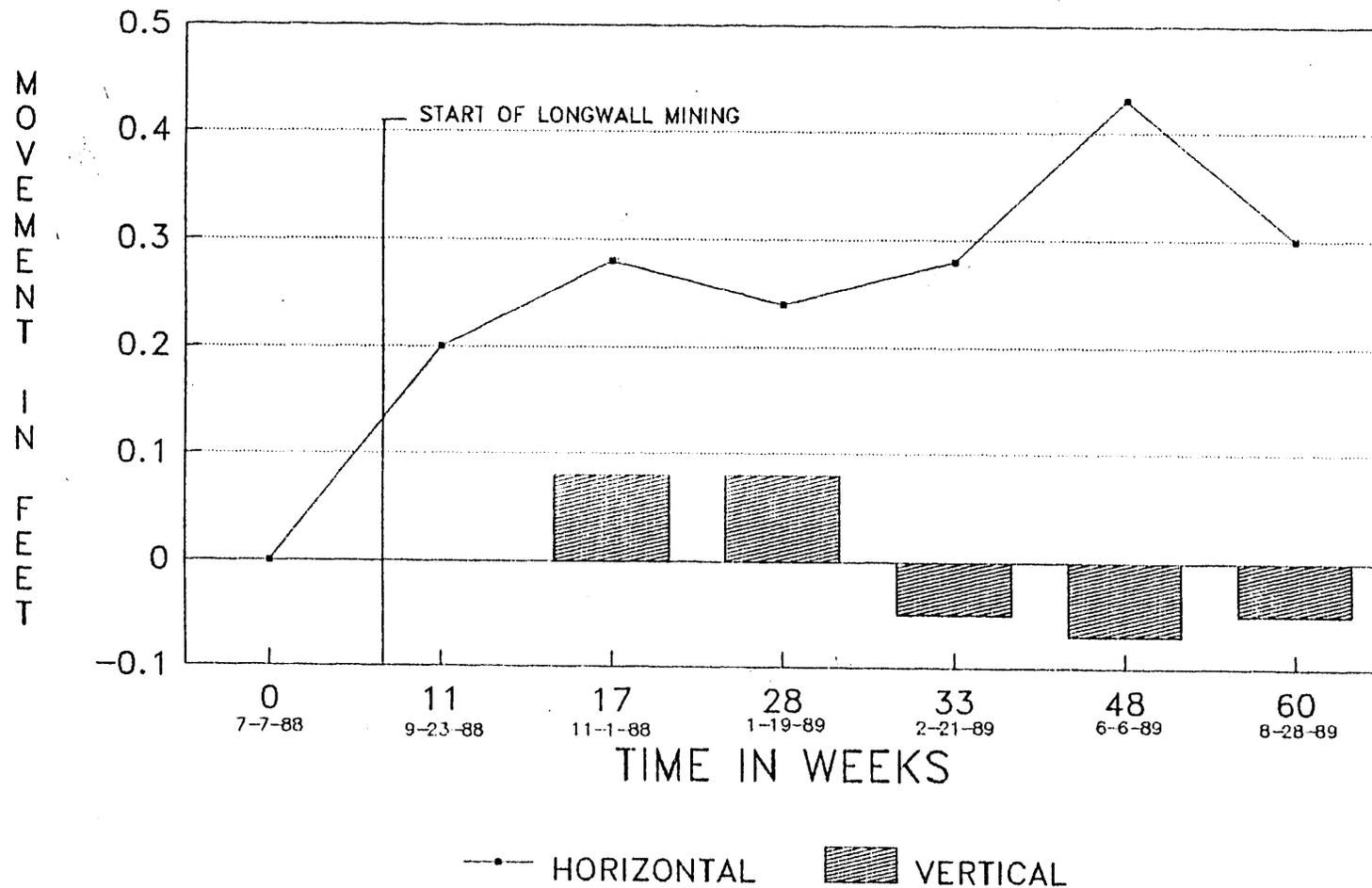


FIGURE 9
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION GS-1

