



CYPRUS
Plateau Mining

**STAR POINT MINE
1997 SUBSIDENCE
MONITORING REPORT**

VOLUME 1 OF 1

ANNUAL REPORT

MARCH 1998

**HANSEN
ALLEN
& LUCE^{INC}**
SALT LAKE CITY, UTAH

**HANSEN
ALLEN
& LUCE** inc
CONSULTING ENGINEERS

Consulting Engineers Specializing in Water Resources,
Civil and Environmental Engineering

Mar 27, 1998

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Mr. Johnny Pappas
Cyprus Plateau Mining Corp.
P.O. Drawer 7007
Price, Utah 84501

RE: 1997 Annual Subsidence Monitoring Report for the Star Point Mine

Dear Mr. Pappas,

As requested we have prepared the 1997 Annual Subsidence Monitoring Report for the Star Point Mine. The Subsidence Monitoring Report includes graphical plots of subsidence monitoring points showing ground elevation changes. An analysis of subsidence has also been included. Included also are mining maps for mining conducted during 1997.

We appreciate the opportunity to assist you with this report. Please call should you have any questions.

Sincerely,

HANSEN, ALLEN & LUCE, INC.



Ben Grimes, PLS
Office Manager

cc: file

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**SUBSIDENCE MONITORING REPORT
1997
STAR POINT MINE
ACT/007/006**

**for:
Cyprus Plateau Mining Corporation
P.O. Drawer PMC
Price, Utah 84501**

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March, 1998

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MINING FOR 1997**
**MAP W6 - STAR POINT NO. 2 MINE, THIRD NORTH MAINS, WATTIS SEAM,
MINING FOR 1997**
**MAP T1-OF 3 - STAR POINT NO. 2 MINE, MIDDLE SEAM, 1997 CM MINING MAP
FOR 1997**

INTRODUCTION

During the months June 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. Monitoring points on the north half of the area above longwall panels 1 through 7, and 13 and 14, (Map 521.121e) have reached effective maximum subsidence and therefore were not surveyed in 1997. The monitoring points on the south half of this area have reached effective maximum subsidence and therefore were not surveyed. Monitoring points U1, U2, U3, U4, have reached effective maximum subsidence and therefore were not surveyed. Monitoring points U-5 through U-17 and GS-1 were not surveyed, these points have reached complete subsidence movement and do not need to be surveyed again. Monitoring points U-18 through U-32 have reached complete subsidence movement and therefore not surveyed. Monitoring points G-1 through G-19 have reached maximum effective subsidence and therefore not surveyed in 1997. Monitoring points G-20 through G-104 (Map 521.121f and 521.121g1) were surveyed for vertical movement. Monitoring points G-105 through G-114 were installed and surveyed ahead of mining.

Mining during 1997 was conducted in the areas shown on Maps W-5, W-6, and T1 of 3 located at the end of this report.

SURFACE EFFECTS

Longwall Mining Panels 1- 7, 13-14, 8-12 and 15 and 16

Surface cracks, as shown on Map 521.121e, over longwall mining in Section 18, T15S, R8E, and Section 12, T15S, R7E, are associated with known faults in the south half and in the northeast quarter of Section 12, and with fractures in Section 18,

The cracks in the south half and in the northeast quarter of Section 12 originally varied in width from hairline to 6 inches, and displacement across the cracks varied from none to two feet. These cracks are continuing to heal nicely; there are not known open holes or unsafe areas. The cracks do not pose a safety hazard to humans, livestock or wildlife. The cracks in the northwest quarter of Section 12 developed during the winter of 1990; they vary in width from hairline to about 2 feet. These cracks were fenced during the summer of 1991 in compliance with the Manti La-Sal National Forest based upon site evaluation and recommendations. These cracks are continuing to heal.

Subsidence contours have been plotted using survey data in the Section 12 area. Monitoring in 1994 showed minimal new subsidence movement, the subsidence contours did not change from last year. As can be seen on Map 521-121e, subsidence contours reflect a reaction to the east-west trending faults. On the west side of Section 12, two short cracks appeared in 1989 at north-south trending faults. These cracks were very small, and have healed to a point where they are almost impossible to find. Overburden in the Section 12 area ranges from 800 to 1,500 feet. The area is characterized by a mounded ridge with a steeply incised canyon on the north end.

Several areas of outcropping sandstone channels in Section 18 failed due to surface and near surface movement. Overburden in the Section 18 area ranges from 0 to 1,100 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 was impractical. Subsidence contours cannot be plotted for this same reason. The cracks in Section 18 vary in width from hairline to 60 inches; displacement across the cracks varies from none to 2 feet.

Cross sections have been plotted through Panels 1-7, 13 and 14, Cross Section, A-A (Figure 1), Cross Section B-B, Panel 2 (Figure 2), and Cross Section C-C Panel 4 (Figure 3). Cross Section F-F has been plotted of monitoring points U-18 through U-32 (Figure 10) showing the angle of draw at this location of 15 degrees. Refer to Map 521.121e for cross section locations.

As can be seen on Figures 1, 2, and 3, subsidence has stopped above the longwall panels in the area of longwall panels 1-7 and 13 and 14. Subsidence reached its maximum during the third year after mining. Figure 1 shows the subsidence profile diagonally through the nine longwall panels. The progression of subsidence can be seen to the north as successive panels were mined.

Cross Section D-D through Points U5-UI7 in Section 18 (Figure 4) indicates a maximum vertical drop of 3.4 feet. Subsidence in this area has reached its maximum. These monitoring points were monitored in 1997 to verify that maximum movement has been reached, and do not need to be monitored again. They were not monitored in 1993 due to hazardous conditions.

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 in the Wattis coal seam, shows the most vertical and horizontal movement. Point U4 which is located north of mining in the Wattis Seam and at the north edge of mining in the Third Seam shows the least movement. These monitoring points have reached maximum subsidence and do not need to be monitored again.

A horizontal and vertical movement graph (Figure 9) has been plotted of monitoring point GS-1 near the stream in Section 18. Probably because of the shallow overburden at the GS-1 point location, maximum subsidence occurred within 15 weeks of the longwall face passing the point. This monitoring point was not surveyed in 1991 and 1993 because of the hazardous condition previously discussed but, was surveyed in 1992. Mining of the Third seam was approximately 220 feet away and appears to have had only minor additional impact on this point.

Longwall Mining Panels 18 through 30

Monitoring points G-1 through G-19 were not surveyed in 1997; Cross Section D-D, Figure 11 shows the subsidence profile. As can be seen on Figure 11, subsidence appears to have reached maximum extent in this area. Monitoring points G-20 through G-49 as shown on Map 521.121f were surveyed for vertical movement. Cross Sections D-D (Figure 11), E-E (Figure 12), G-G (Figure 13), H-H (Figure 14), I-I' (Figure 15), and J-J' (Figure 16) were plotted from the data at these monitoring points. As can be seen on the cross sections, maximum subsidence is 5.33 feet at monitoring station G-

15. Subsidence at the Fox points is greatest at Fox 3, at 5.74 feet.

As shown on Cross Sections D-D and E-E, Figures 11 and 12 respectively, the angle of draw at these locations is 26 degrees and 24 degrees. The angle of draw at Cross Sections G-G and H-H, Figures 13 and 14 respectively are 25 degrees and 5 degrees, respectively. It appears that the angle of draw is affected by faulting or jointing of the strata. No conclusions can be reached about the angle of draw at Cross Sections I-I' and J-J' because subsidence is felt to be within surveying accuracy.

Longwall Mining Panels 31 through 42 - Castle Valley Ridge Lease

Mining in 1997 included a portion of Panel 38, all of Pane 39, 40, 41, and 42, as shown of Map W-6. A minor amount of CM mining was conducted in the south as shown of Map W-5. It should be noted that, due to geologic conditions, the 3rd North Mains were developed more northward than previously presented. Subsidence monitoring has been established to detect any vertical movement.

Monitoring points G-50 through G-104, as shown of Map 521.121g1, were surveyed for vertical movement. Cross sections K-K' (Figure 17), L-L' (Figure 18), M-M' (Figure 19), N-N' (Figure 20), O-O' (Figure 21), and P-P' (Figure 22) were plotted from data at these monitoring points. Maximum subsidence during the 1997 monitoring is 6.59 feet a station G-58 above Longwall Panel Number 32.

Mining of the entries beneath the Little Park channel was not conducted. Even though subsidence Cross Sections N-N', and O-O' indicate minor subsidence beneath the channel, it is not clear that subsidence actually occurred. The channel is outside of the angle of draw expected when comparing the angle of draws experienced elsewhere in the area west of the graben. There is no physical evidence of subsidence at the ground surface in the channel. Further monitoring in 1998 and beyond will document any ground surface movement or cracking in this area.

Some minor cracking was observed above Longwall Panel 41 consisting of openings in the range of 4 to 6 inches. These cracks do not pose a threat to livestock or wildlife. These cracks will be monitored in 1998 for further movement and evaluated for hazards. If any hazards exist CPMC will take the appropriate actions.

MITIGATION

The surface cracks crossing the U.S. Forest Service development road in Section 12 were repaired in 1987, and have shown no further cracking, or movement.

A portion of the surface cracks near monitoring points U1 and U2 in Section 18 have been repaired to reduce the likelihood of accidents. The cracks were backfilled and the area fenced. Signs are in place in the area warning the public of the potential danger of the unstable ground. This area is fee land owned by the U.S. Fuel Company; Cyprus Plateau Mining Corporation has an agreement with U.S. Fuel which allows mining impacts. In the fall of 1995, the cracks were plugged with foam to provide additional protection to the public and provide a base for future backfilling.

The cracks in the northwest quarter of Section 12 are fenced and danger signs placed to warn the public of the hazards. They are in a very rugged area where very few people travel.

The cracks above Longwall Panel 41 will be mitigated if necessary to prevent any hazards.

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. Natural reseeding is occurring and the area is reestablishing itself nicely. No other vegetation losses are evident.

SURFACE WATER AND GROUND WATER

There has been no identified impact to ground water in the Section 12 area and there is no surface water in the area.

The Section 18 is the subject of a study of the effects of longwall mining on ground water and surface water; the study ran through 1992, with the final report completed in 1995. The study was undertaken in conjunction with the U.S. Geological Survey and the Division of Oil, Gas and Mining, the U.S. G. S. published the final report.

A complete discussion of hydrologic impacts can be found in the 1997 Annual Hydrologic Report.

SURFACE STRUCTURES

The only impact to surface structures has been the settling of the U.S. Forest Service development road discussed previously in this report. Repairs to this road were made in 1987, and no further road damage has occurred.

MONITORING

Monitoring in 1996 will include the following:

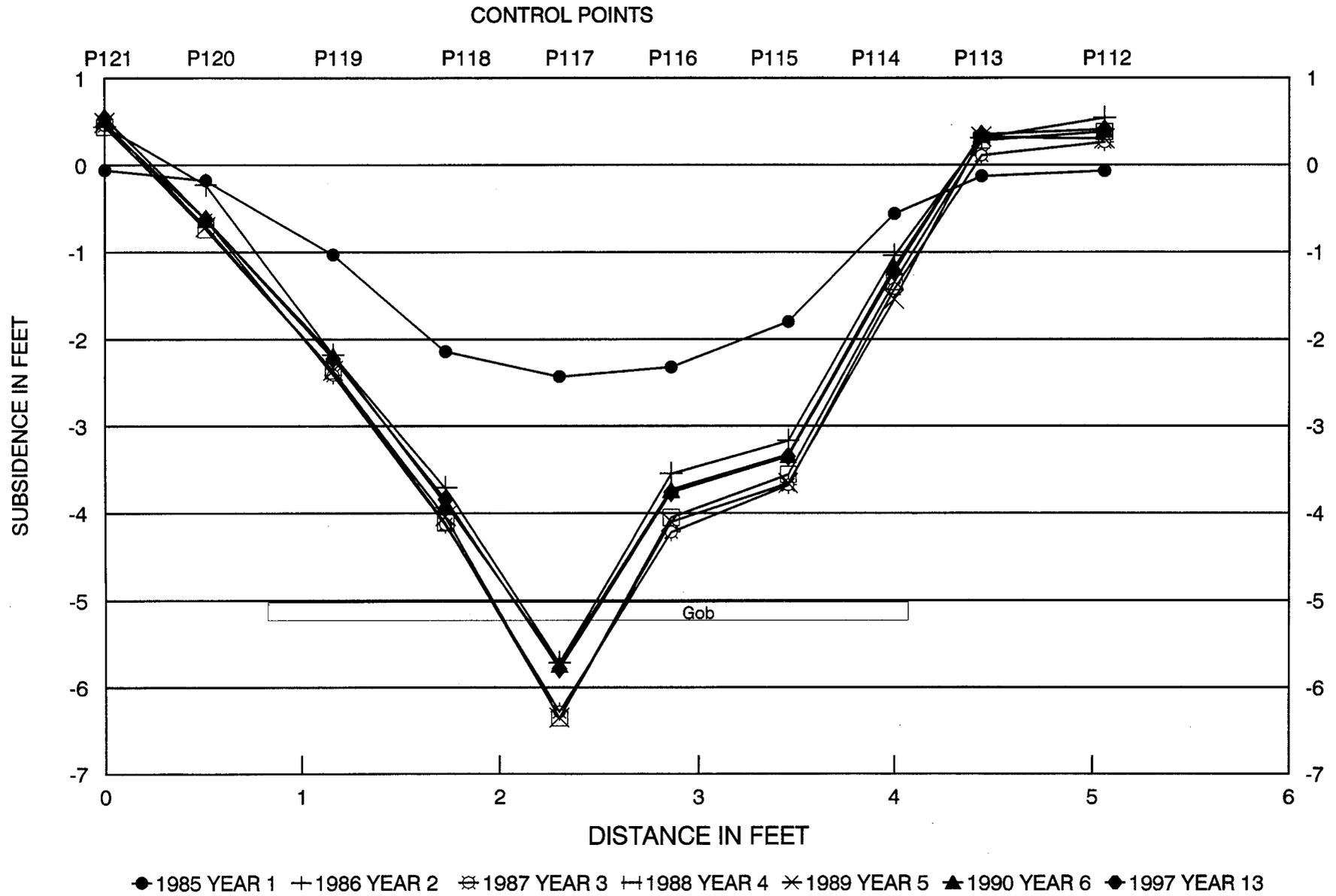
1. Survey monitoring points G-20 through G-114 above longwall panels 19 through 42, as shown on Map 521.121f and Map 521.121g1. Since longwall mining is complete at the Star Point Mine no further monitoring points will be established.
2. Visual observations of the ground surface above all mined areas for surface effects of mining.
3. Visually inspect the Wild Cattle Hollow stream west of longwall panels 18 through 30 for evidence of surface impacts from mining.
4. Monitoring of areas mined by continuous miner methods will be conducted.

1997 MINING

Mining conducted during 1997 is shown on Maps W5 - STAR POINT NO. 2 MINE, THIRD SOUTH MAINS, WATTIS SEAM, MINING FOR 1997; W6 - STAR POINT NO. 2 MINE, THIRD NORTH MAINS, WATTIS SEAM, MINING FOR 1997; T1-OF 3 - STAR POINT NO. 2 MINE, MIDDLE SEAM, 1997 CM MINING MAP FOR 1997, located at the end of this report.

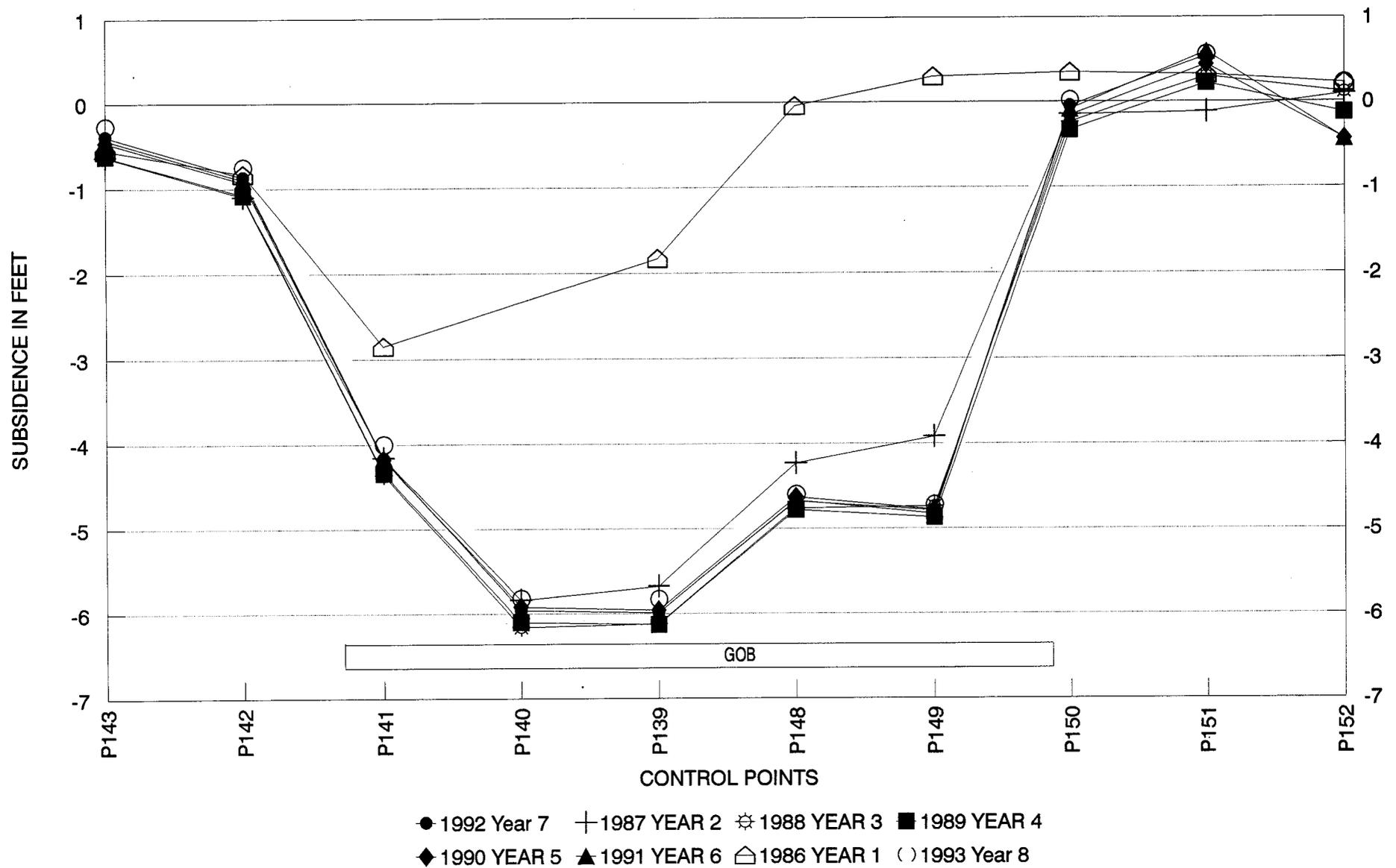
APPENDIX A

FIGURE 2
CROSS SECTION B-B LONGWALL PANEL 2



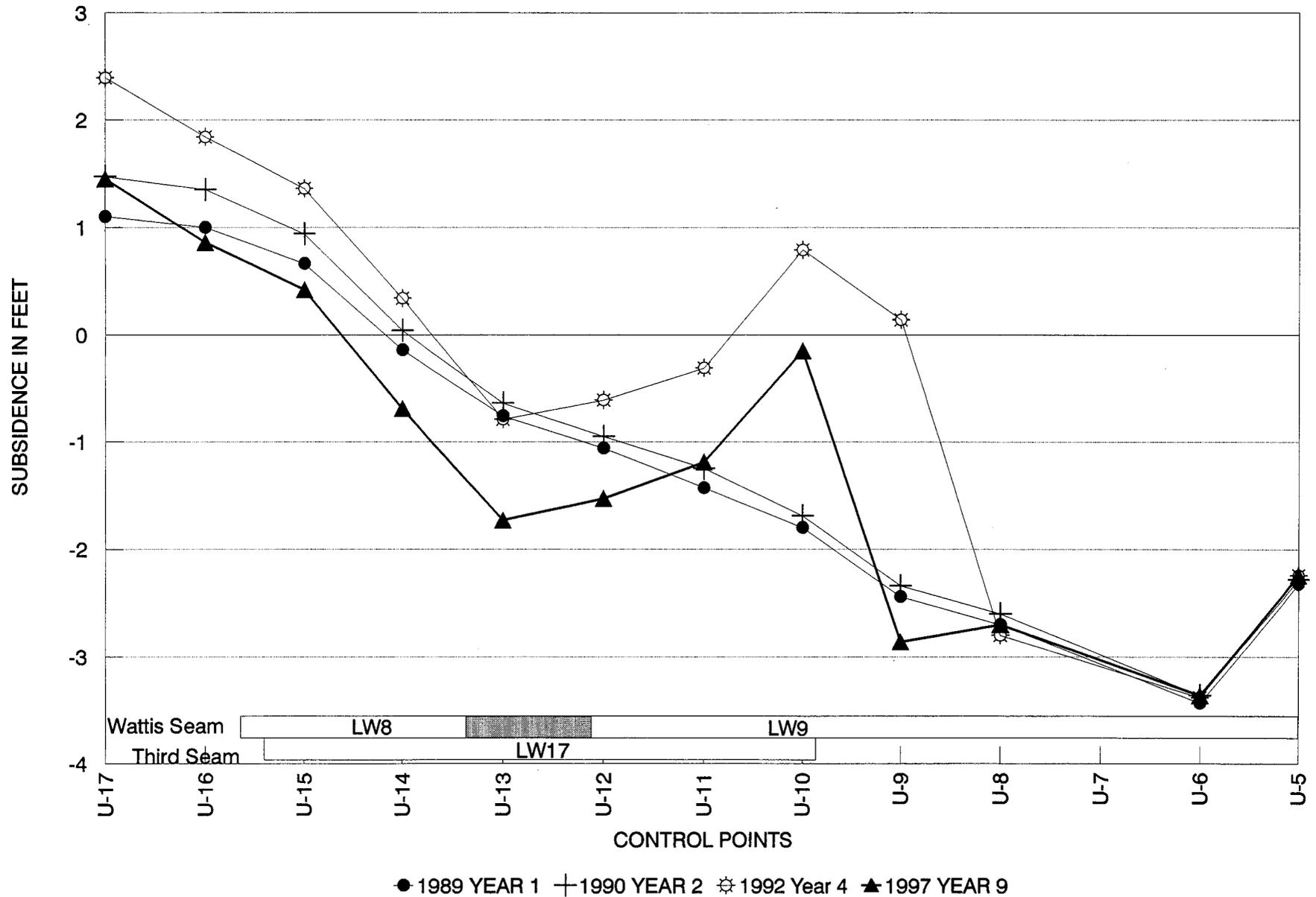
1- Control points are not to scale horizontally - shown in relative position to each other.

FIGURE 3
CROSS SECTION C-C LONGWALL PANEL 4



1- Control points are not to scale horizontally - shown in relative position to each other.

FIGURE 4 U-NORTH NEAR-STREAM PROFILE



1- 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

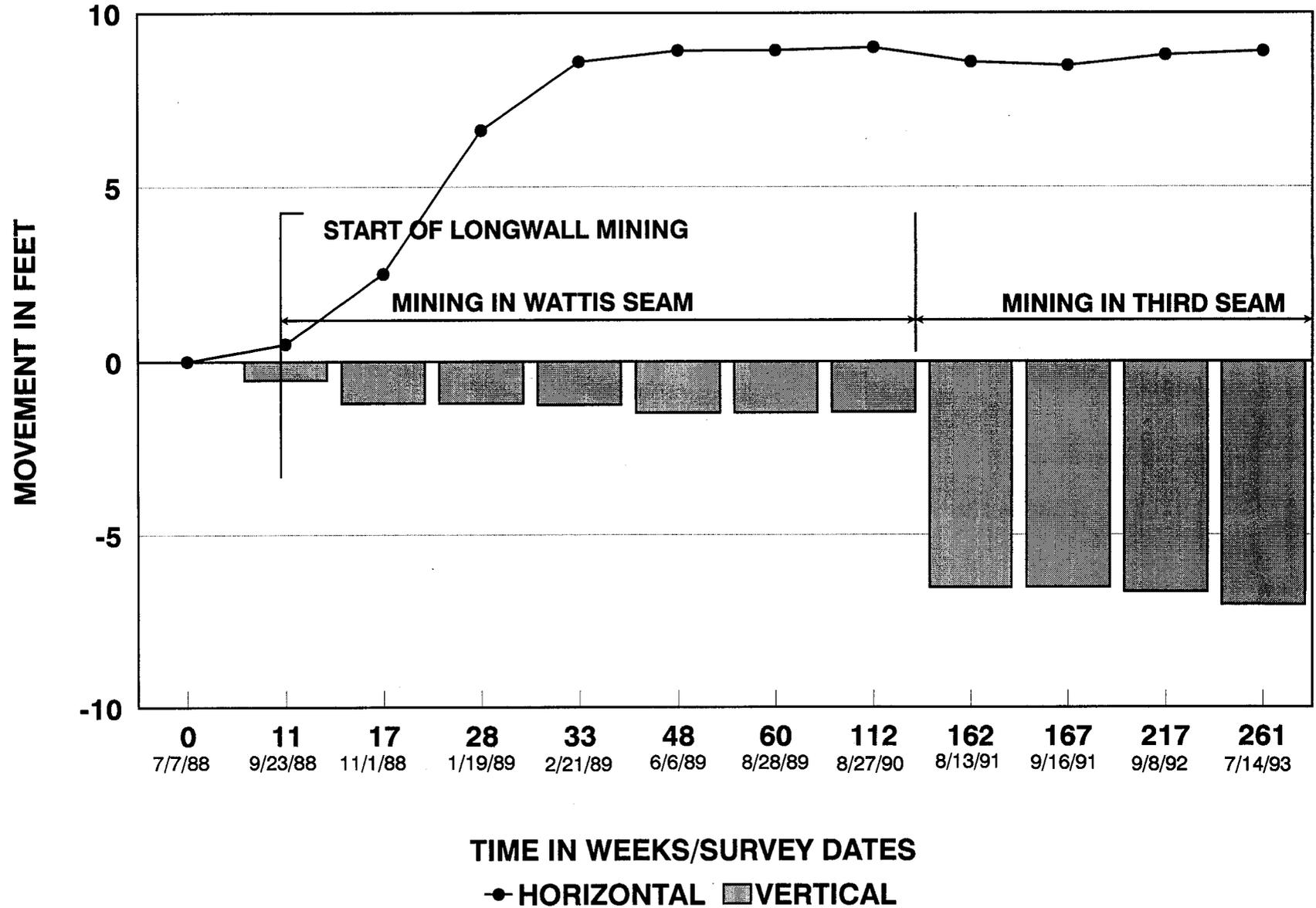


FIGURE 6
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U2

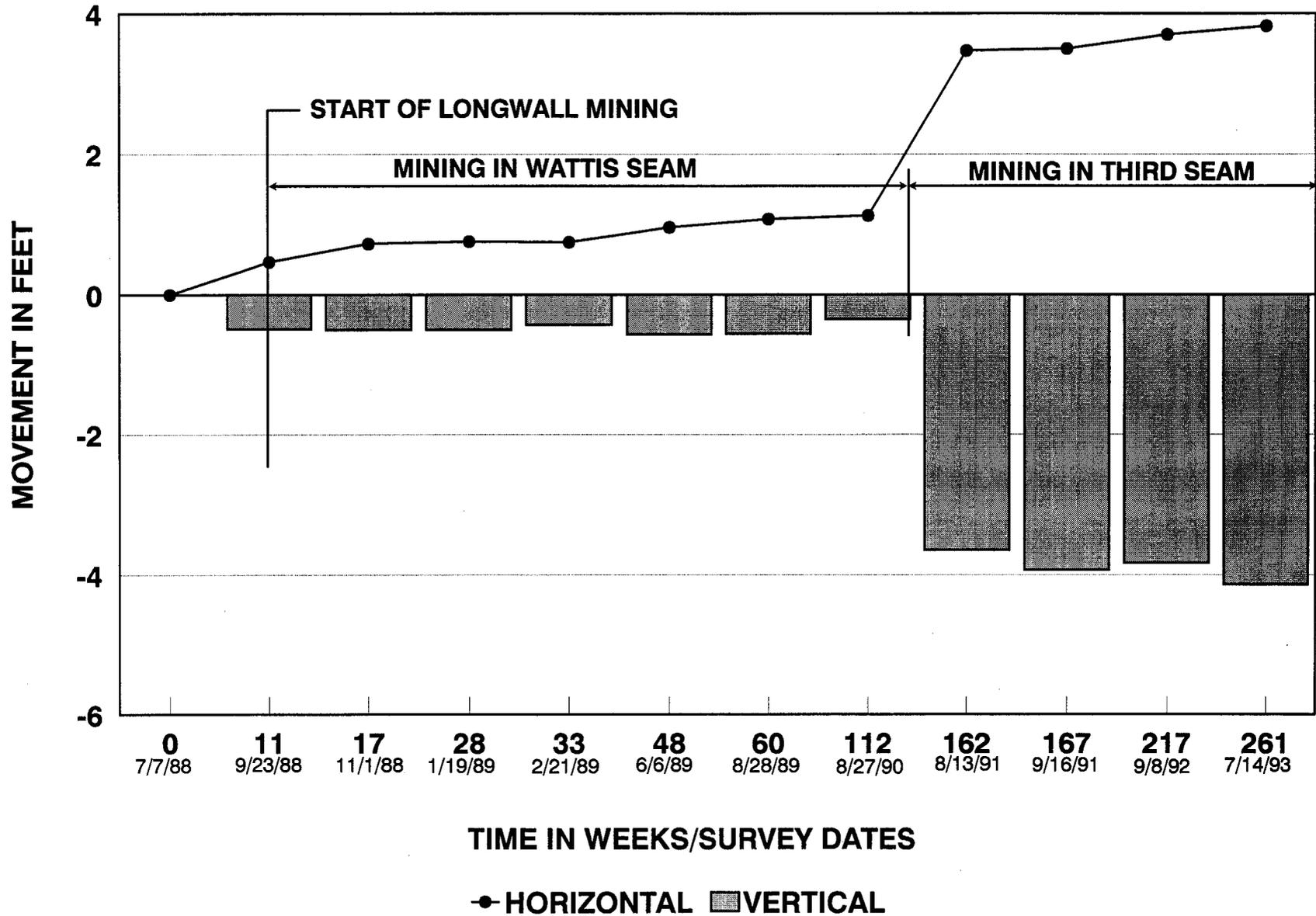


FIGURE 7
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U3

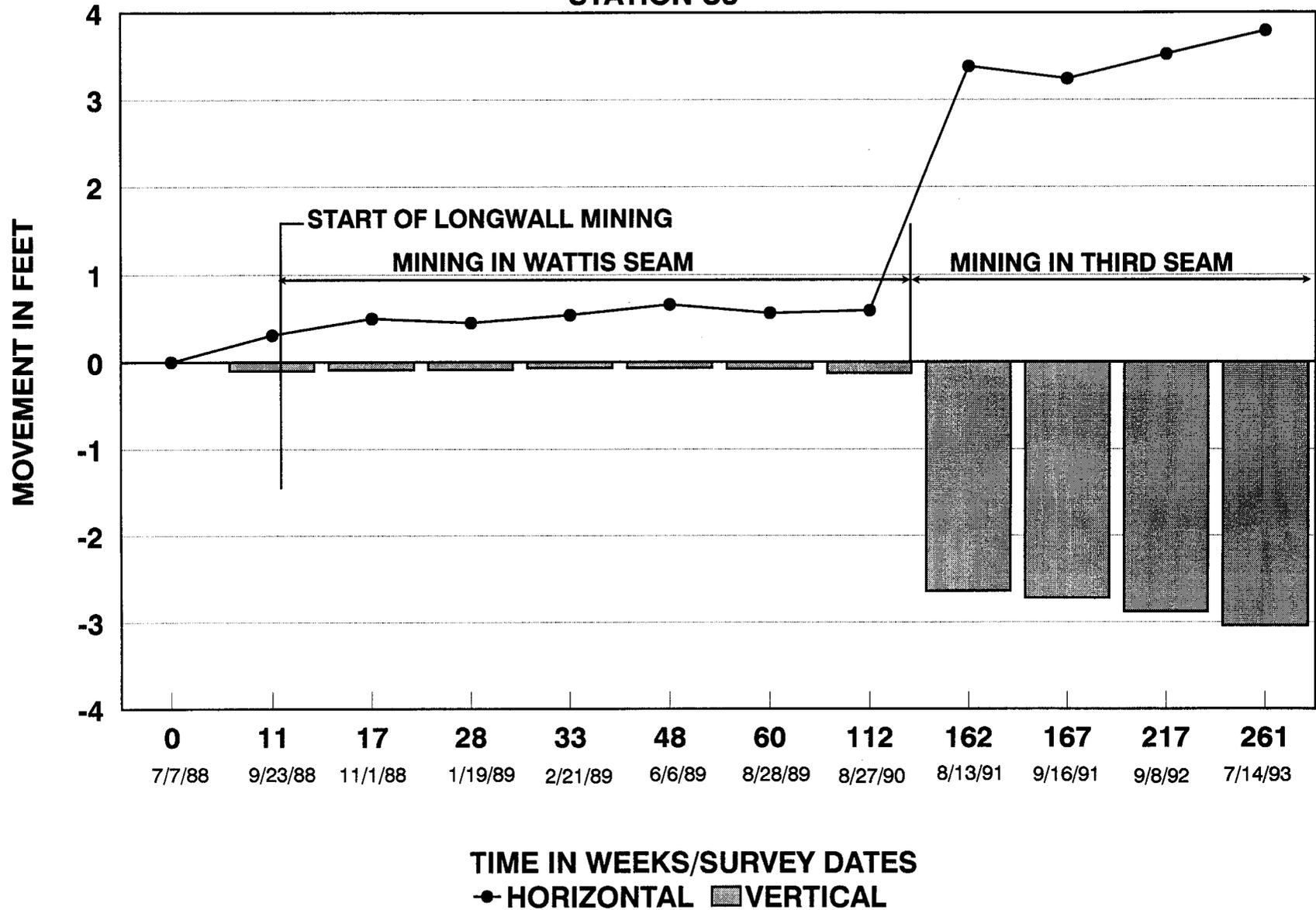


FIGURE 8
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION U4

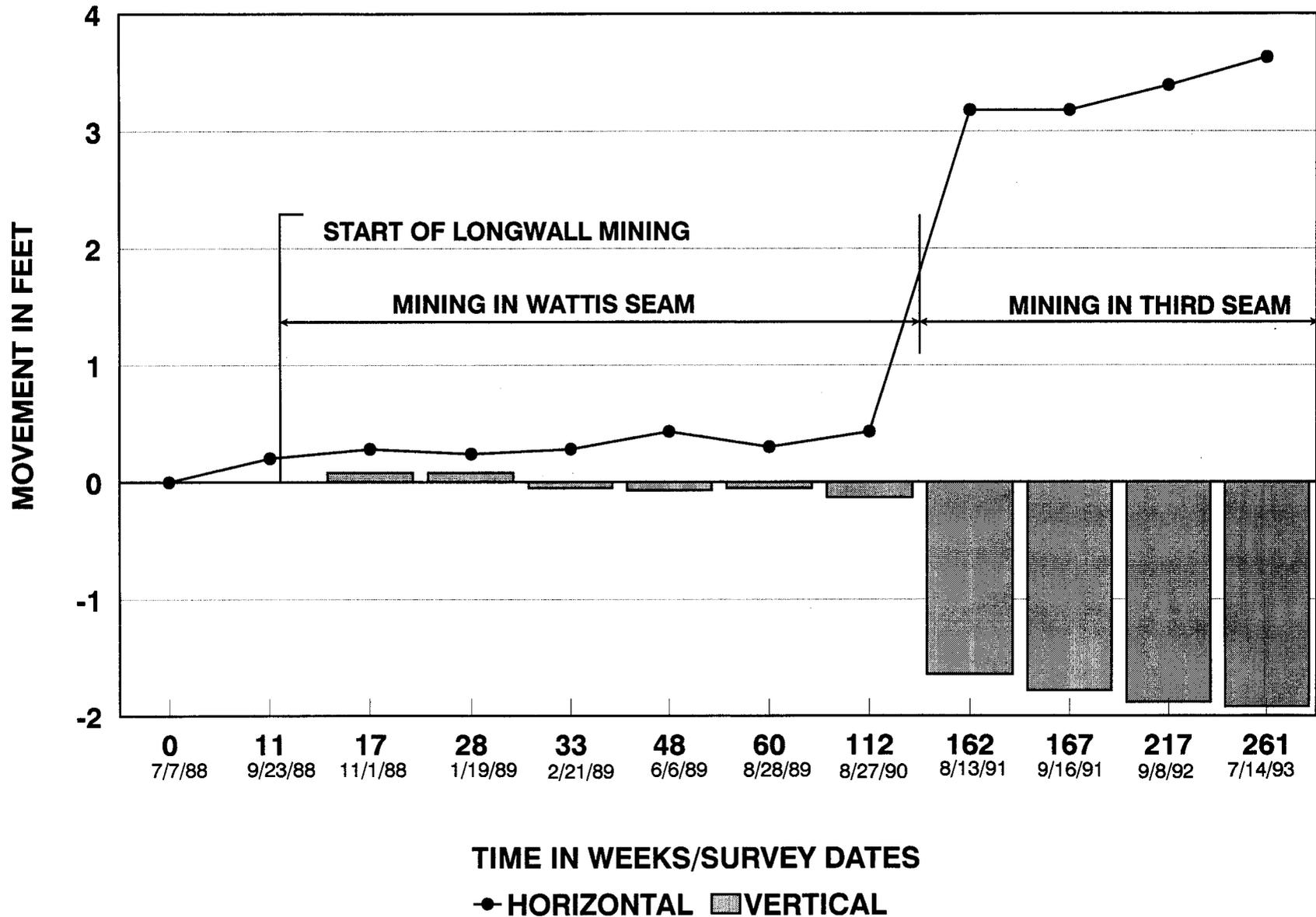


FIGURE 9
STATION GS-1 U-NORTH
HORIZONTAL AND VERTICAL MOVEMENT GRAPH

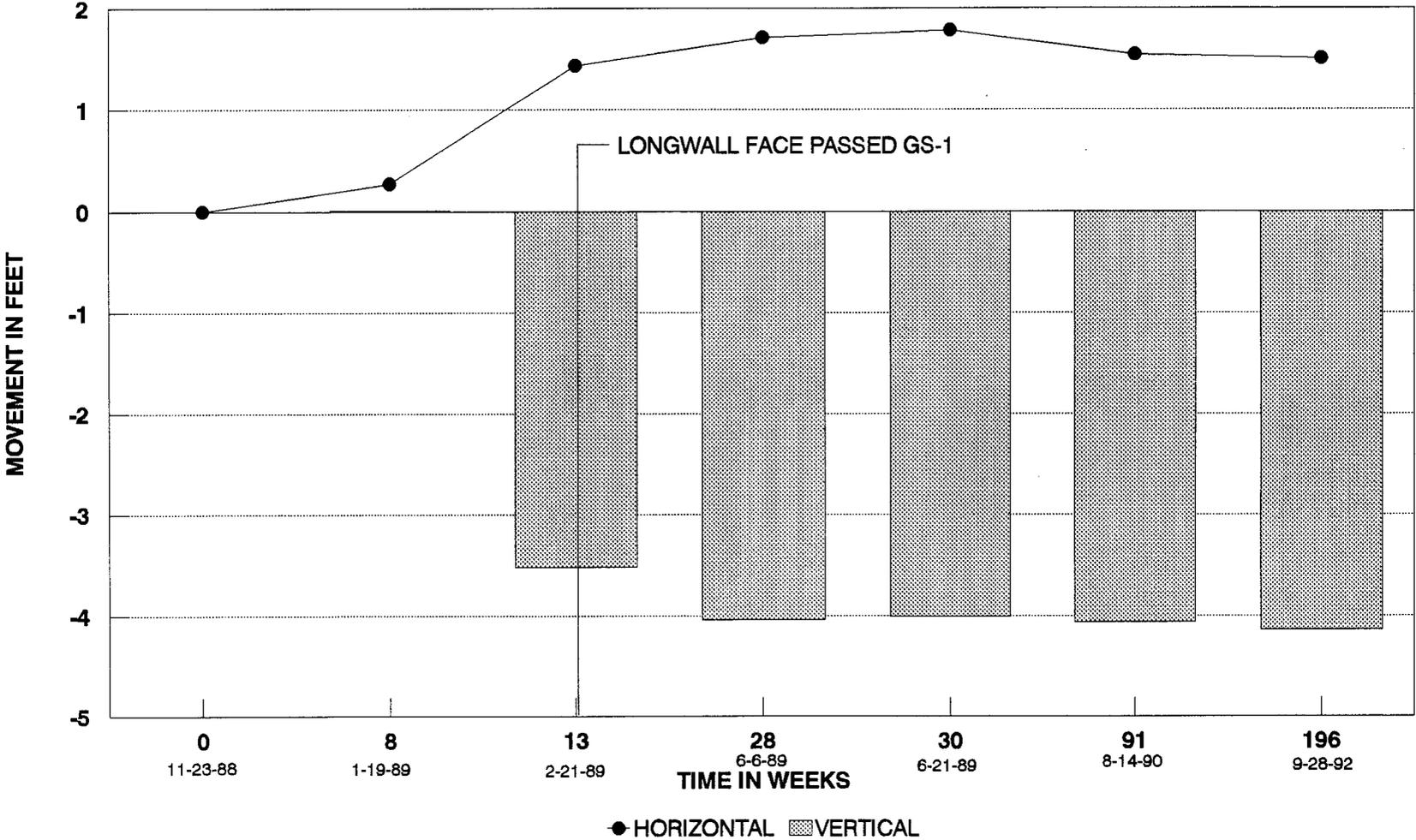


FIGURE 10
CROSS SECTION F-F

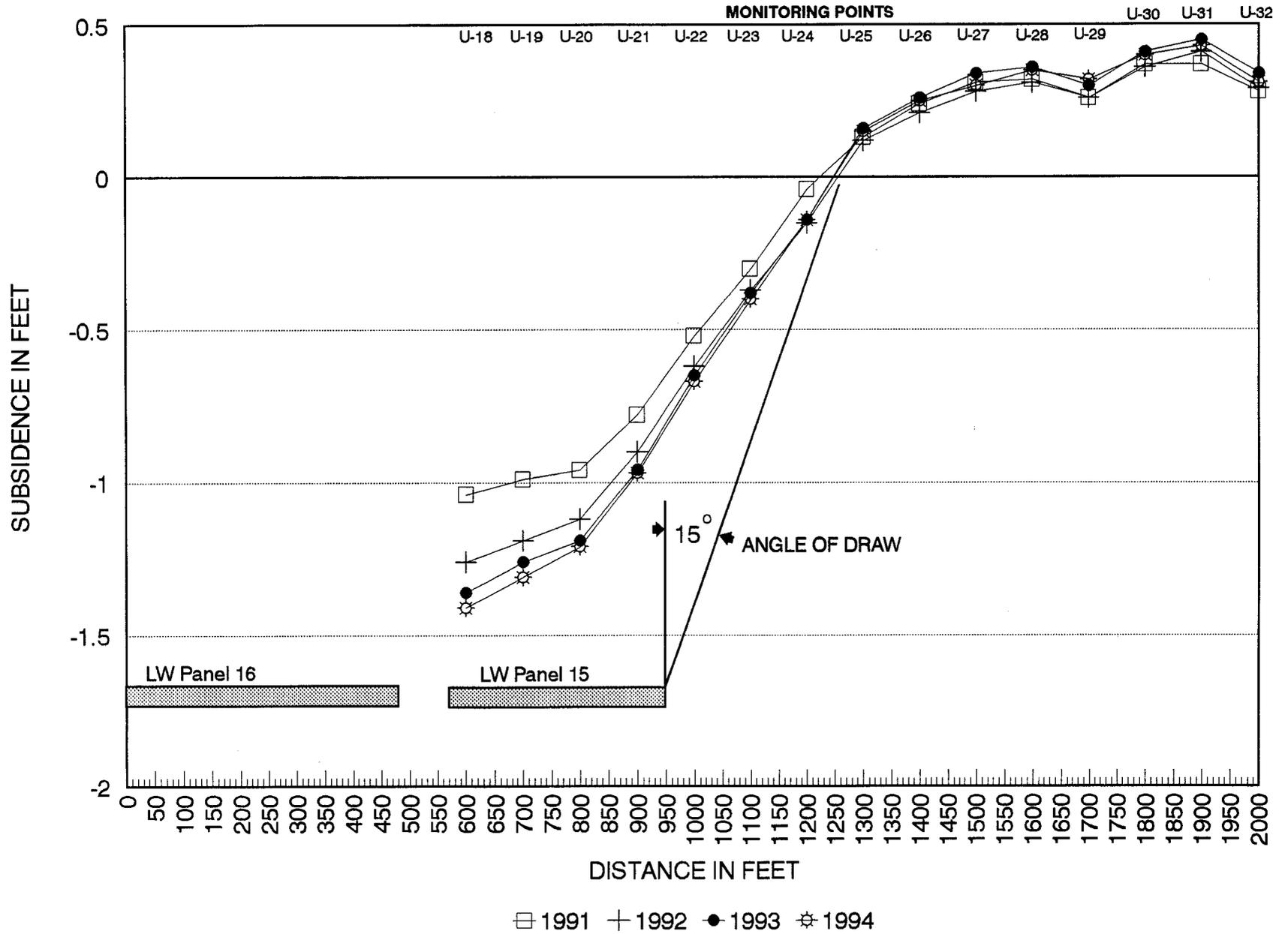
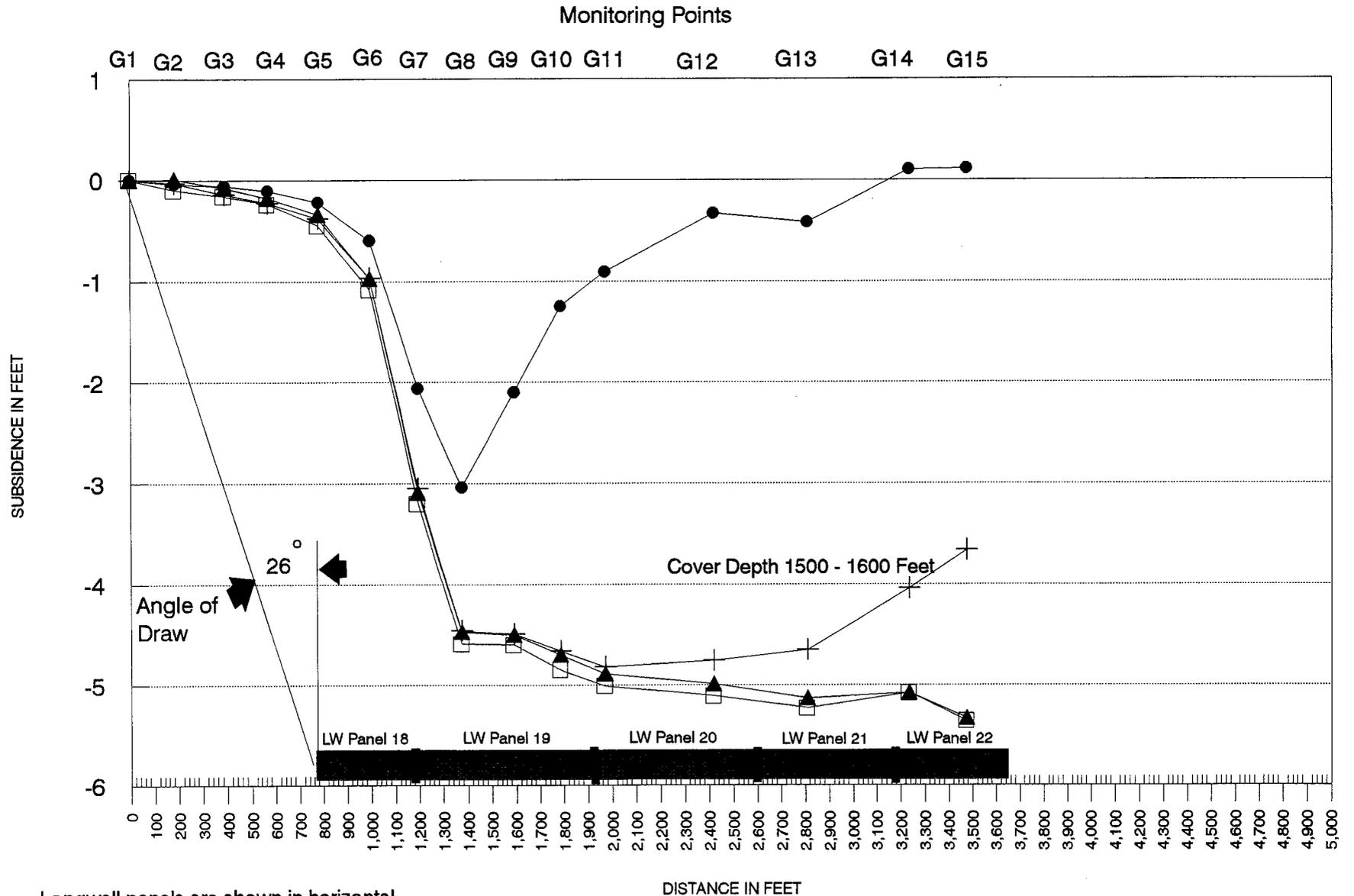


FIGURE 11 CROSS SECTION D-D



Longwall panels are shown in horizontal relationship to subsidence only.

FIGURE 12
CROSS SECTION E-E

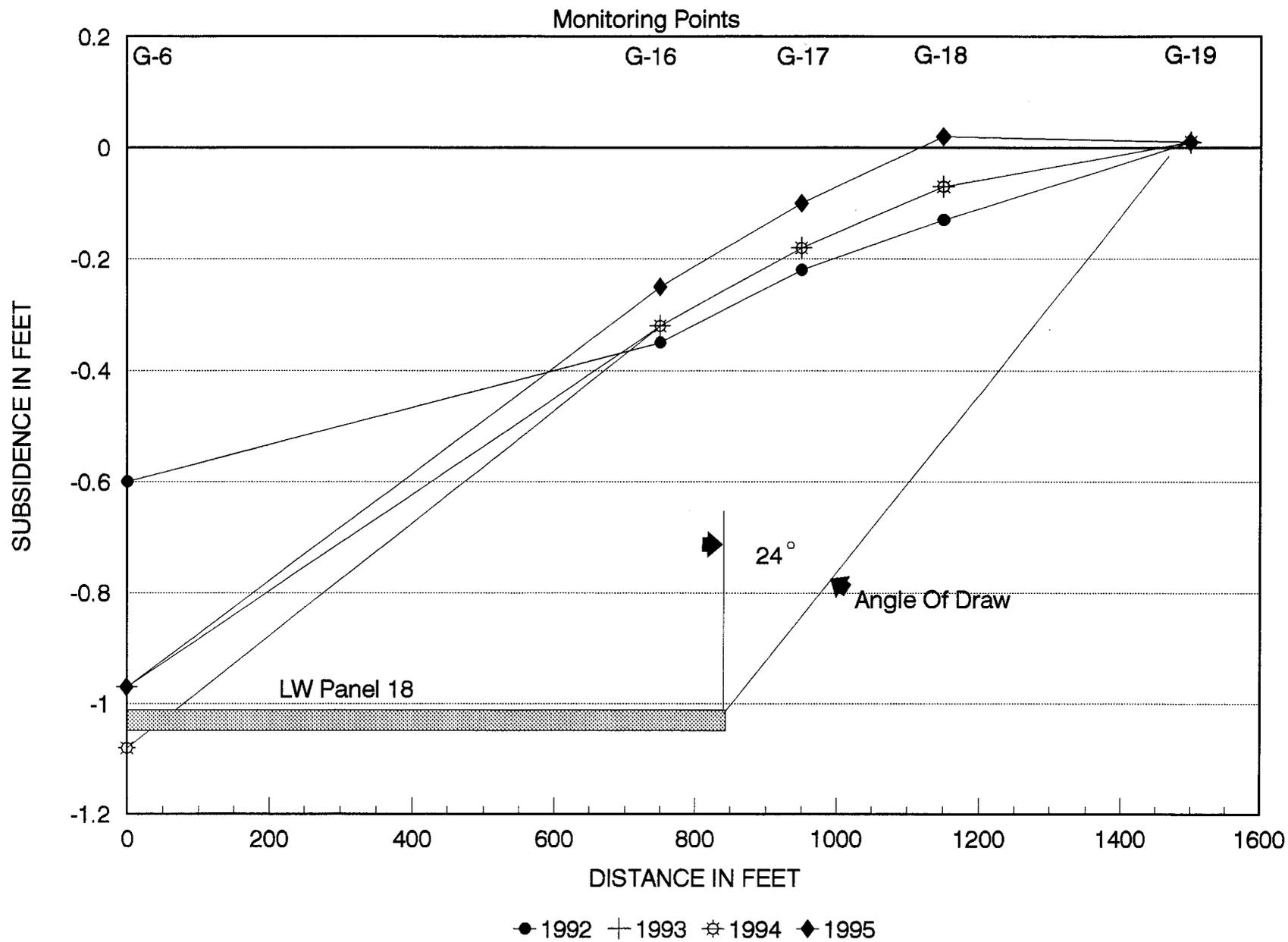


FIGURE 13
CROSS SECTION G - G

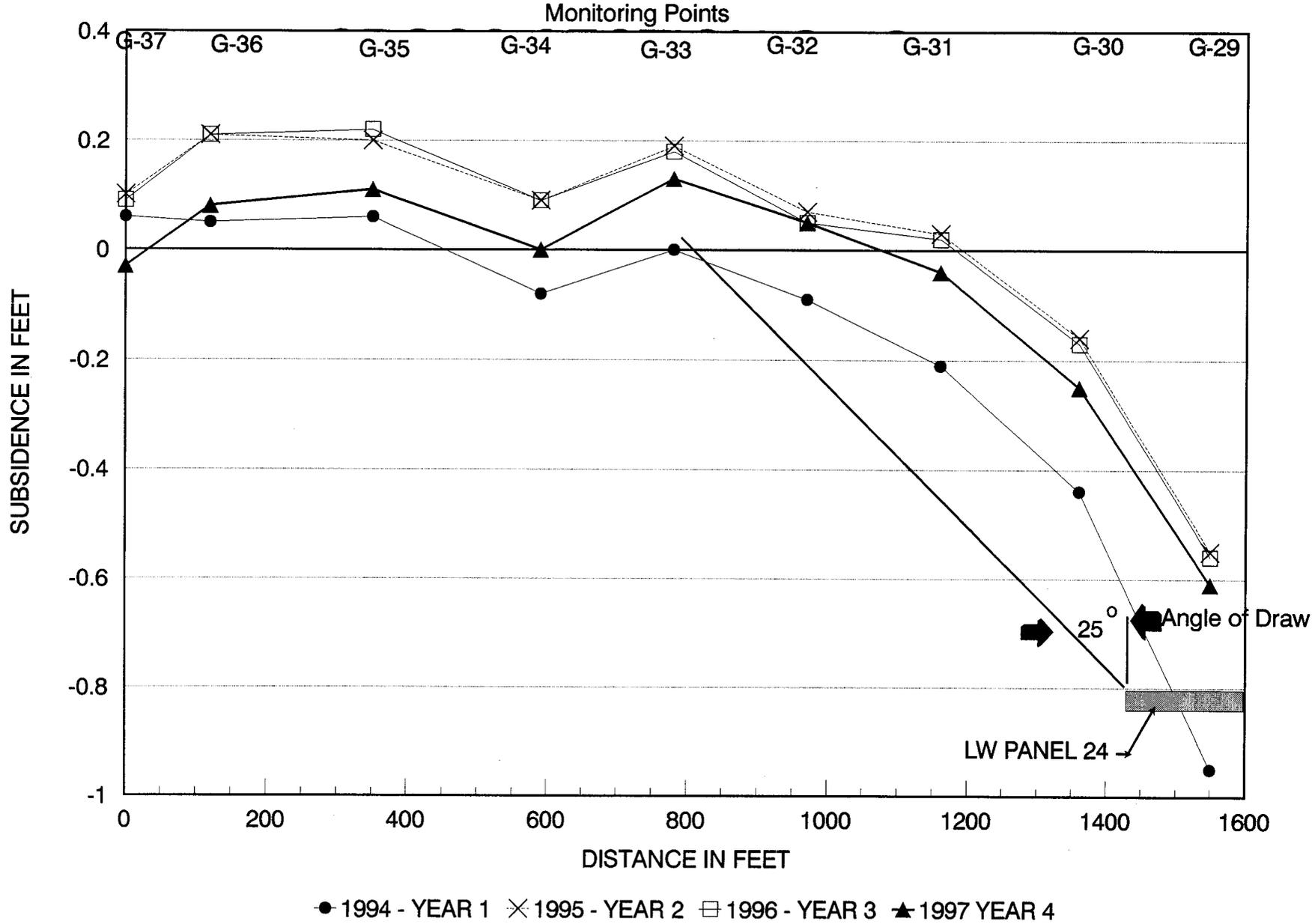
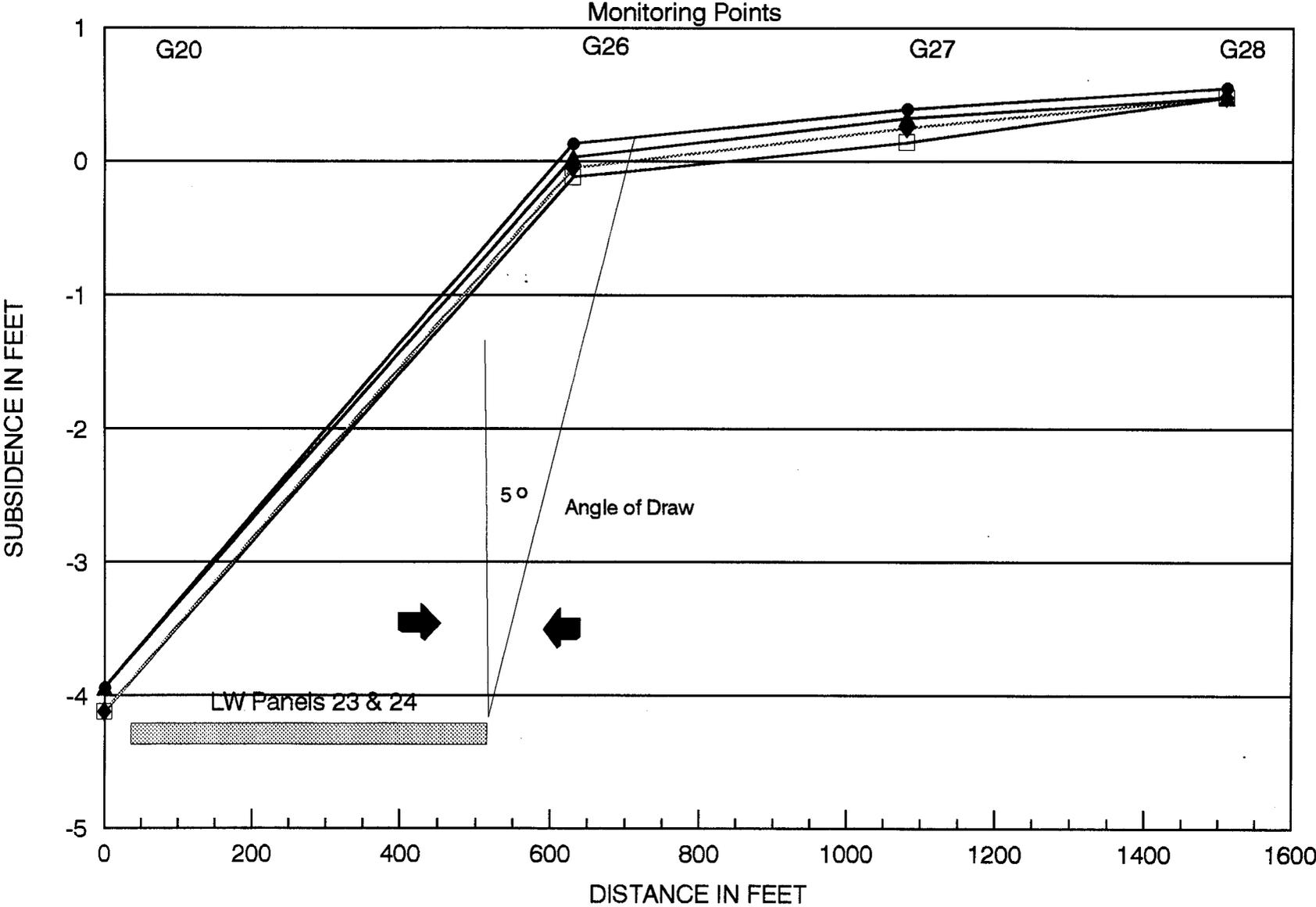


FIGURE 14
CROSS SECTION H-H



● 1994 YEAR 1 ▲ 1995 YEAR 2 ◆ 1996 YEAR 3 □ 1997 YEAR 4

FIGURE 15
CROSS SECTION I-I'

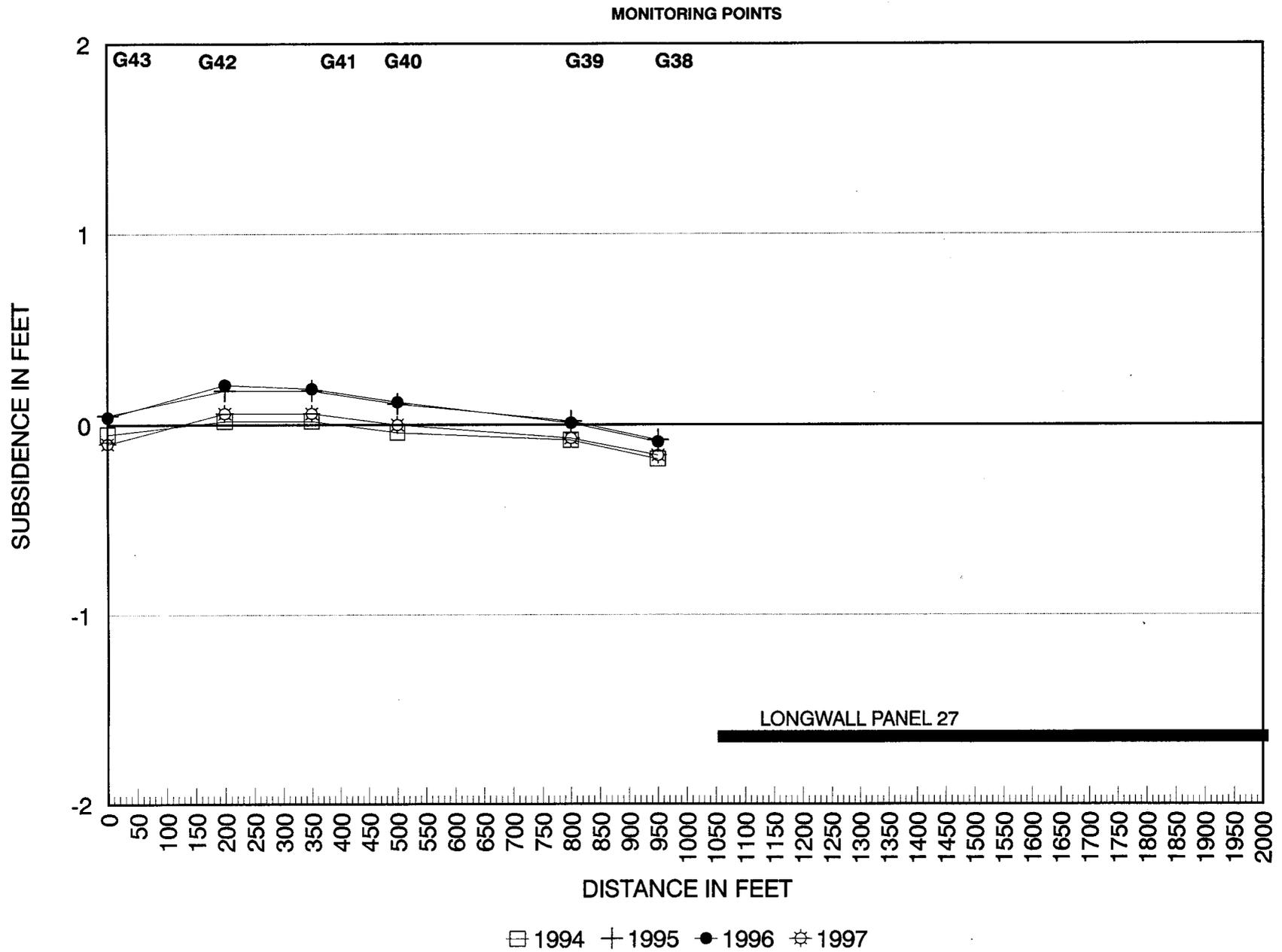


FIGURE 16
CROSS SECTION J-J'

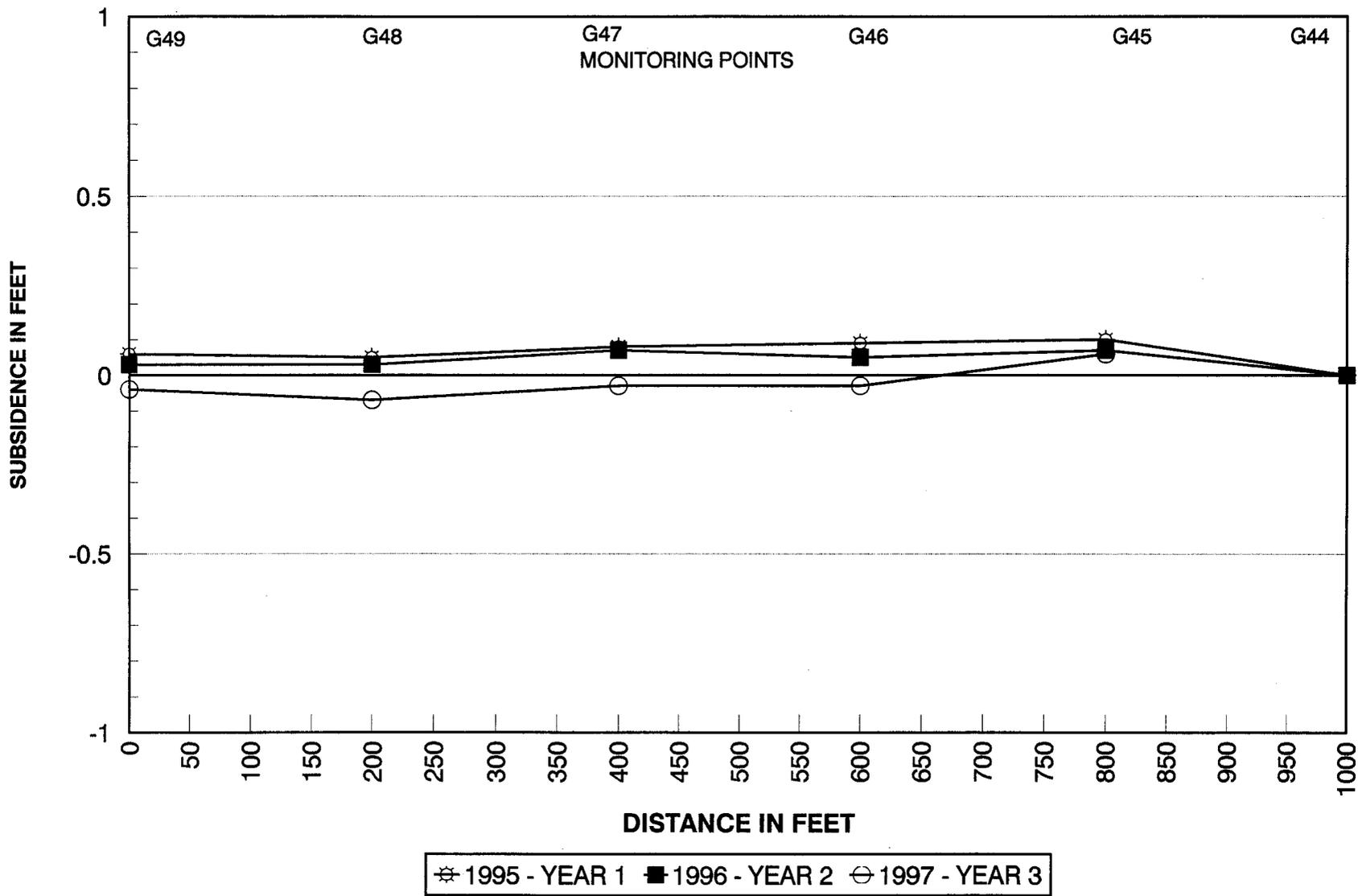


FIGURE 17
CROSS SECTION K-K'

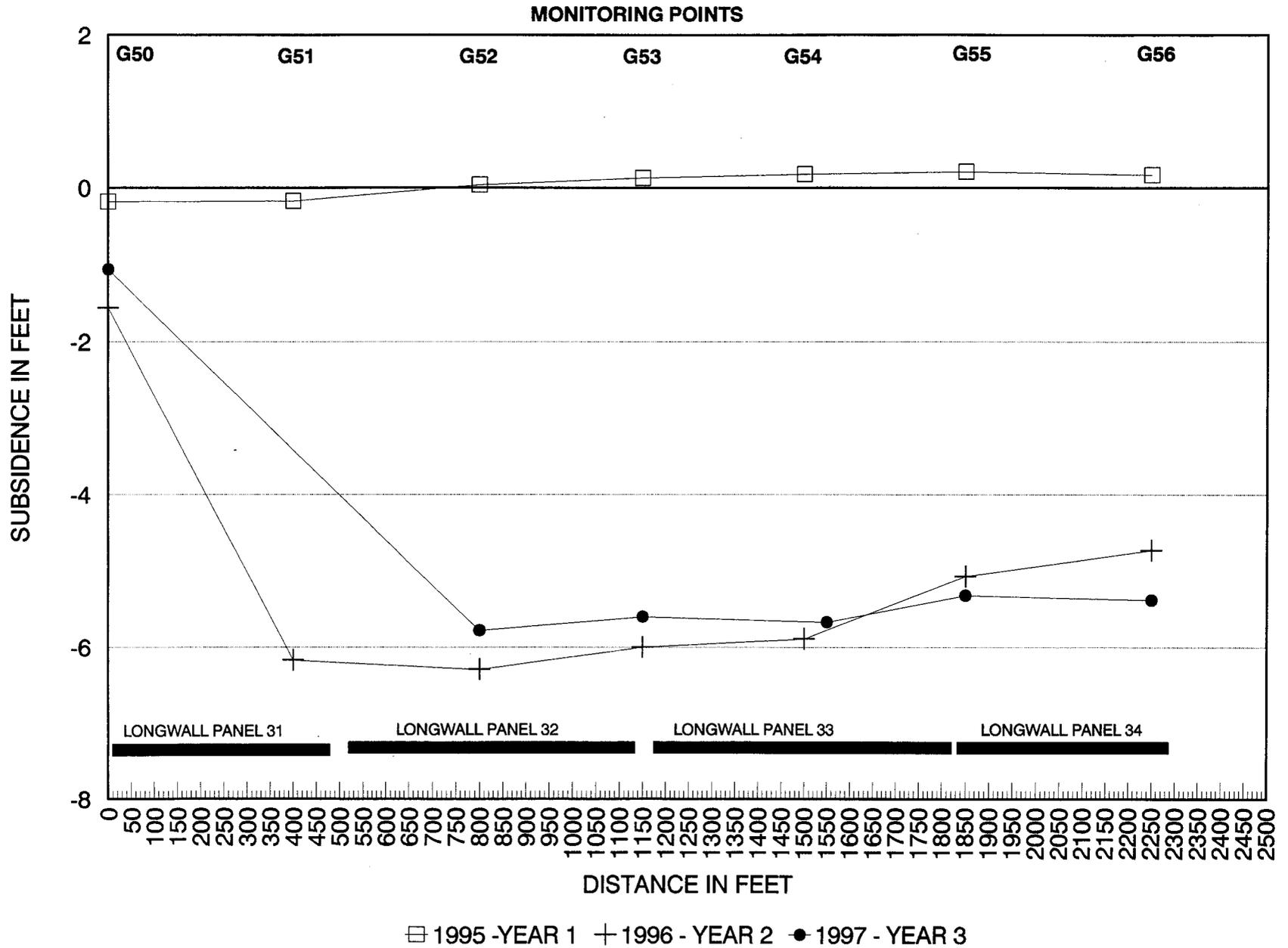
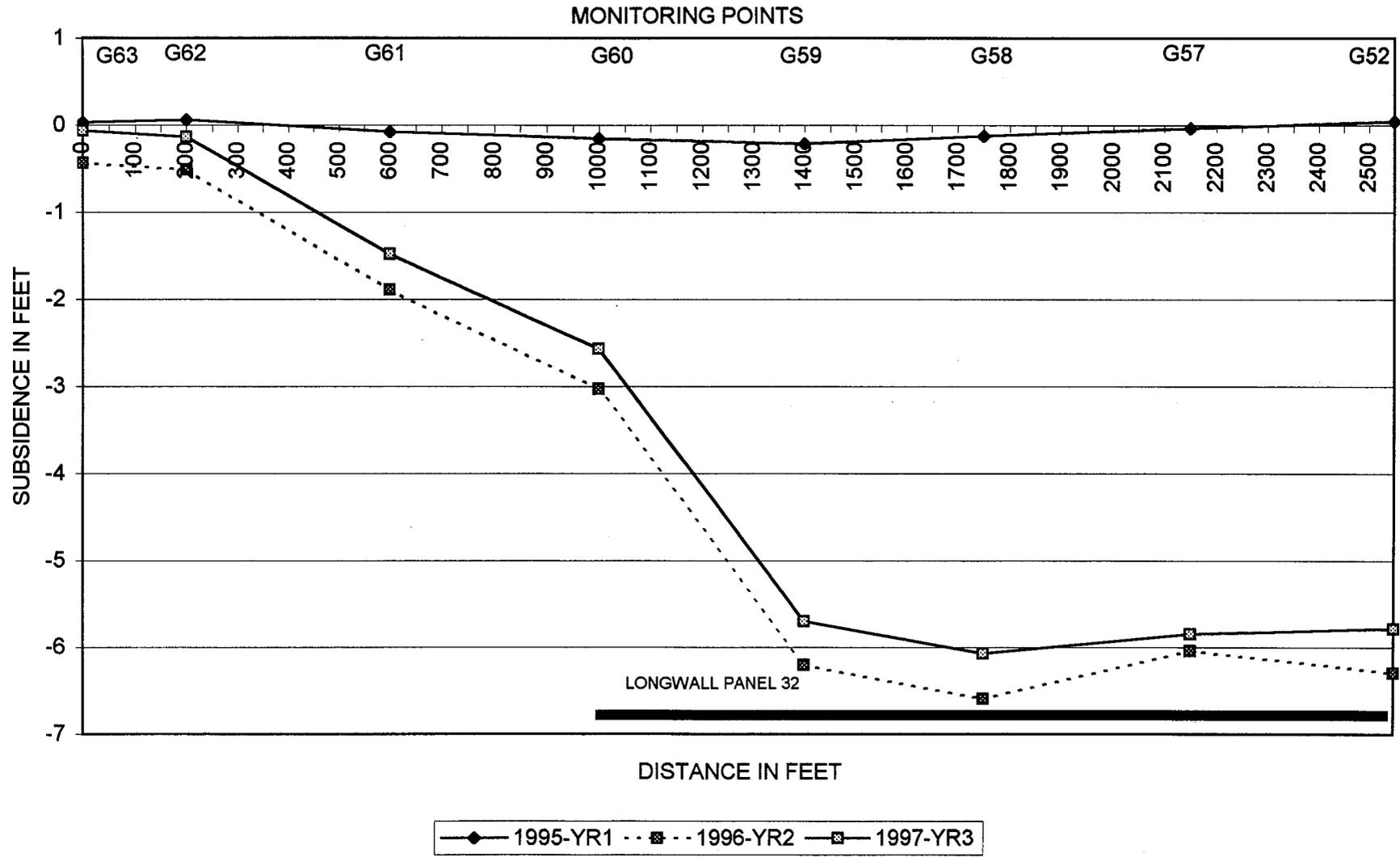


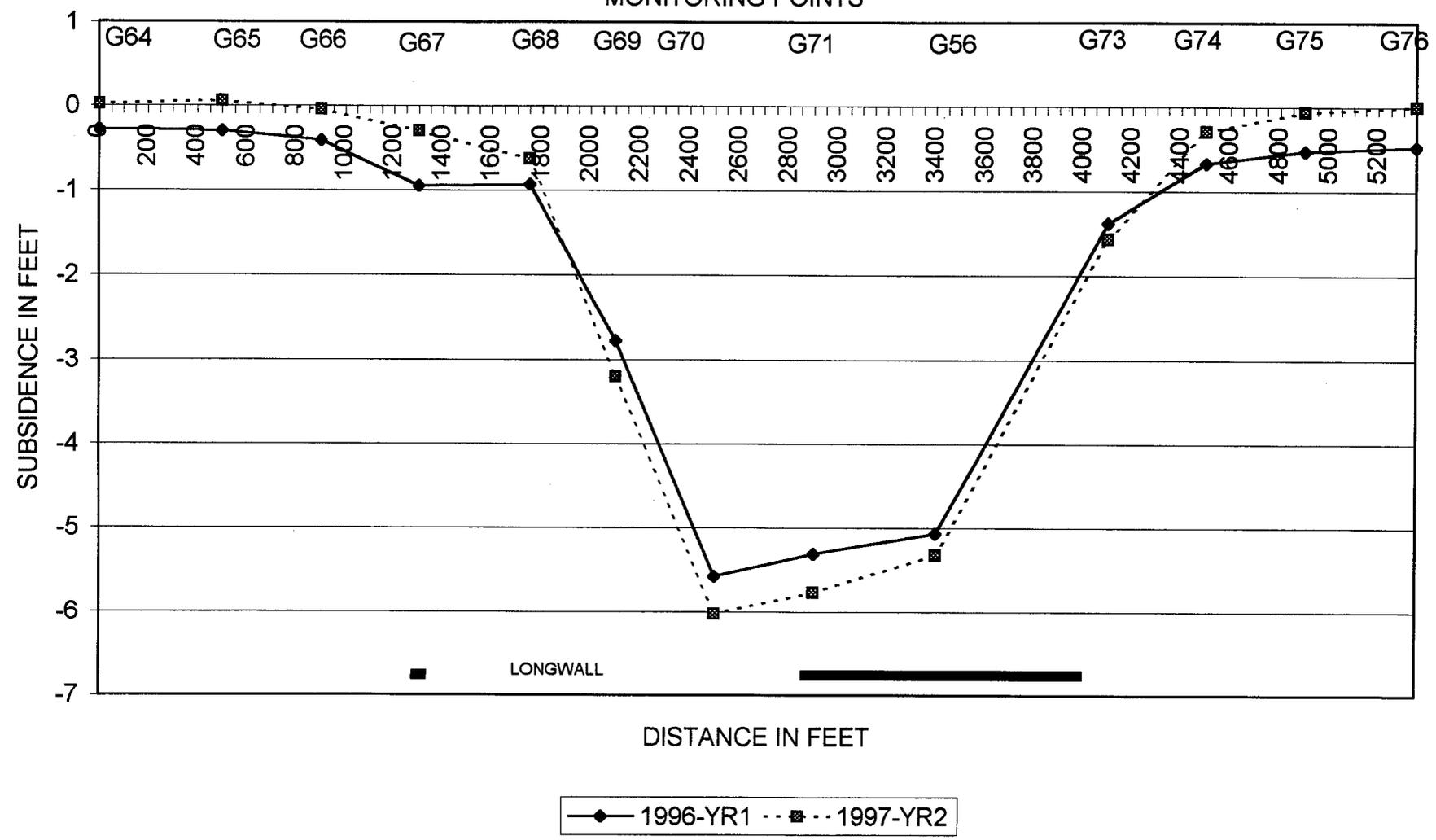
FIGURE 18
CROSS SECTION L-L'



LONGWALL PANEL IS SHOWN IN HORIZONTAL RELATIONSHIP TO SUBSIDENCE ONLY, VERTICAL LOCATION IS NOT TO SCALE.

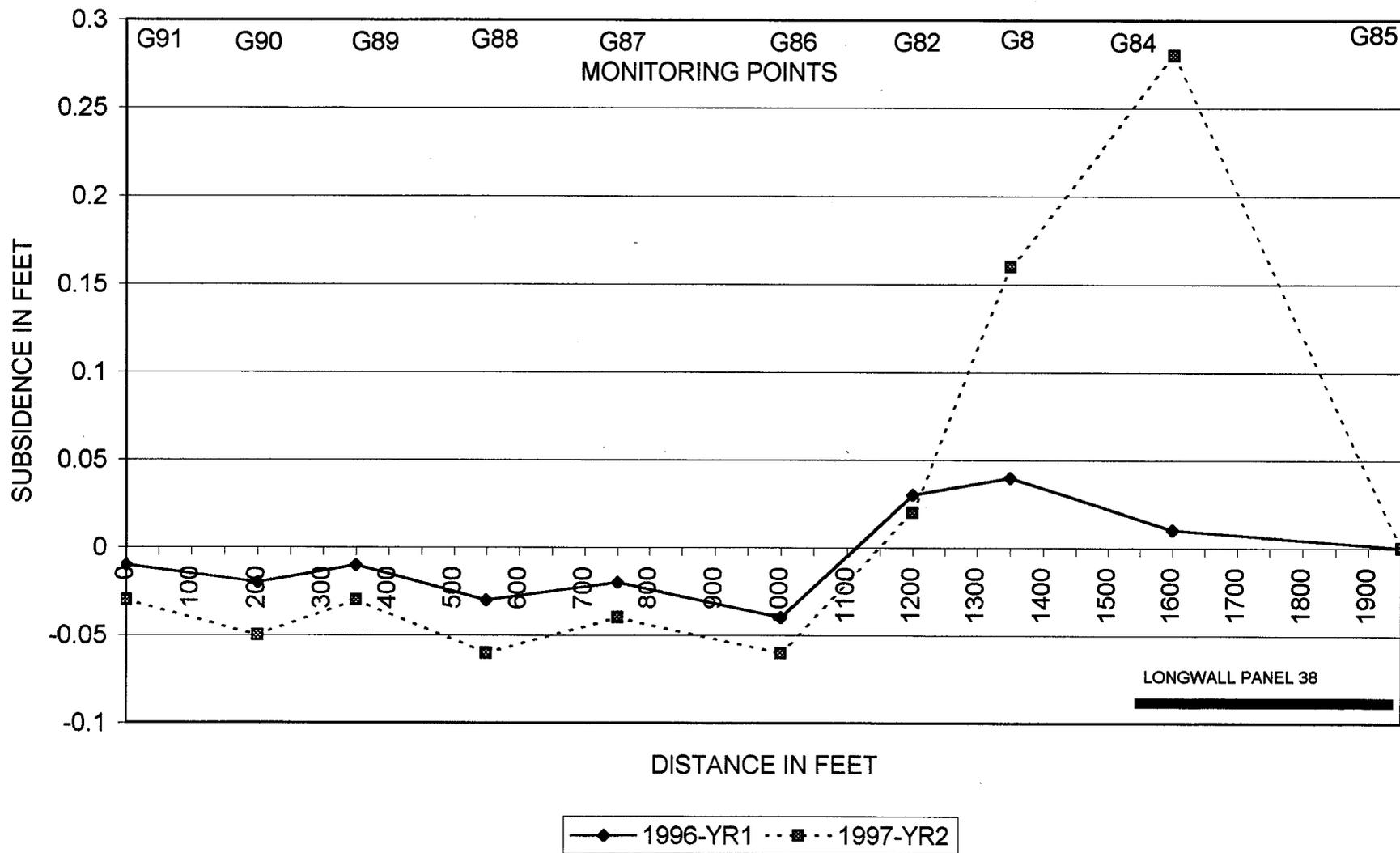
FIGURE 19
CROSS SECTION M-M'

MONITORING POINTS



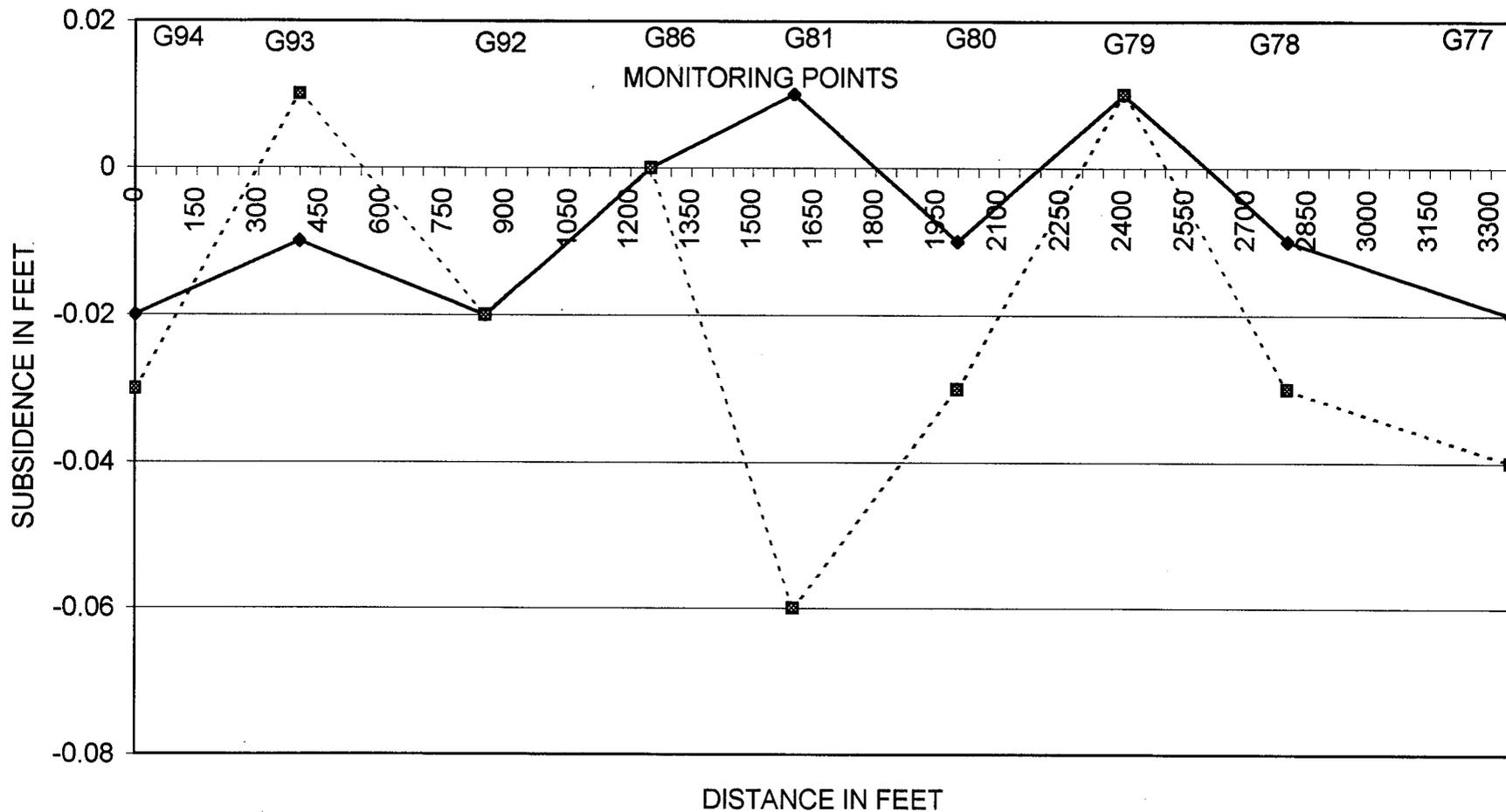
LONGWALL PANEL IS SHOWN IN HORIZONTAL RELATIONSHIP TO SUBSIDENCE ONLY, VERTICAL LOCATION IS NOT TO SCALE.

FIGURE 20
CROSS SECTION N-N'



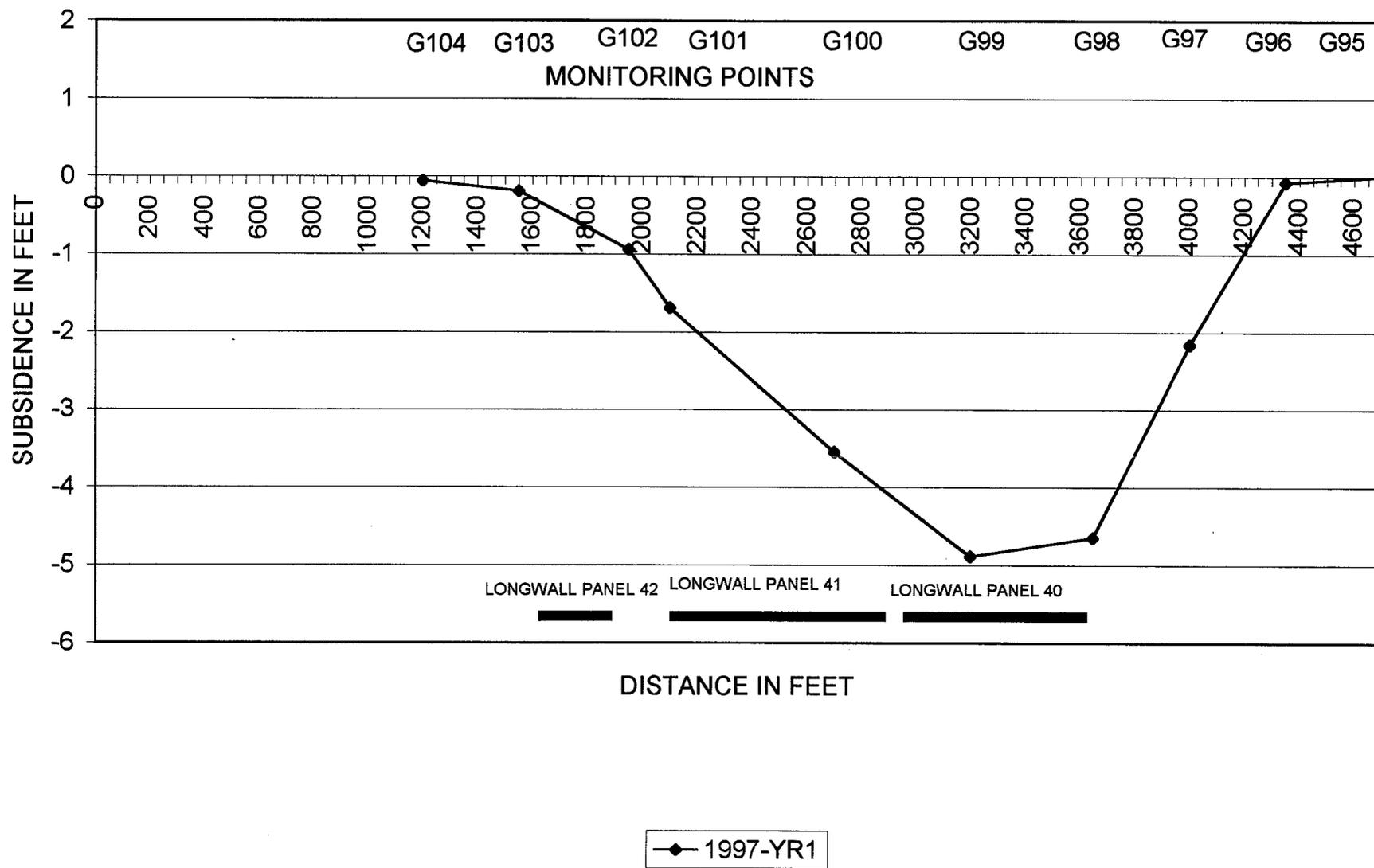
LONGWALL PANEL IS SHOWN IN HORIZONTAL RELATIONSHIP TO SUBSIDENCE ONLY, VERTICAL LOCATION IS NOT TO SCALE.

FIGURE 21
CROSS SECTION O-O'



—◆— 1996-YR1 - - ■ - - 1997-YR2

FIGURE 22
CROSS SECTION P-P'



LONGWALL PANEL IS SHOWN IN HORIZONTAL RELATIONSHIP TO SUBSIDENCE ONLY, VERTICAL LOCATION IS NOT TO SCALE.