ADDENDUM

UTAH POWER & LIGHT COMPANY
MINING DIVISION
1986 CLIFF SUBSIDENCE
EAGLE MONITORING REPORT
COTTONWOOD COAL MINE

ADDENDUM REPORT
FEBRUARY 9, 1987

The original report submitted in early January reflects the summation of subsidence monitoring data as required by the U. S. Fish and Wildlife permit #PRT-708354.

Data collected includes the surface effects of mining through the month of December 1986. But since December, activities in the form of cliff spalling has increased, especially in one specific area located in the center of the longwall panel.

We are including this addendum for the purpose of updating the report and in compliance of UMC requirements.

Subsidence Monitoring

Physical measurements of the monitoring prisms have shown movement and these observations are included in this addendum.

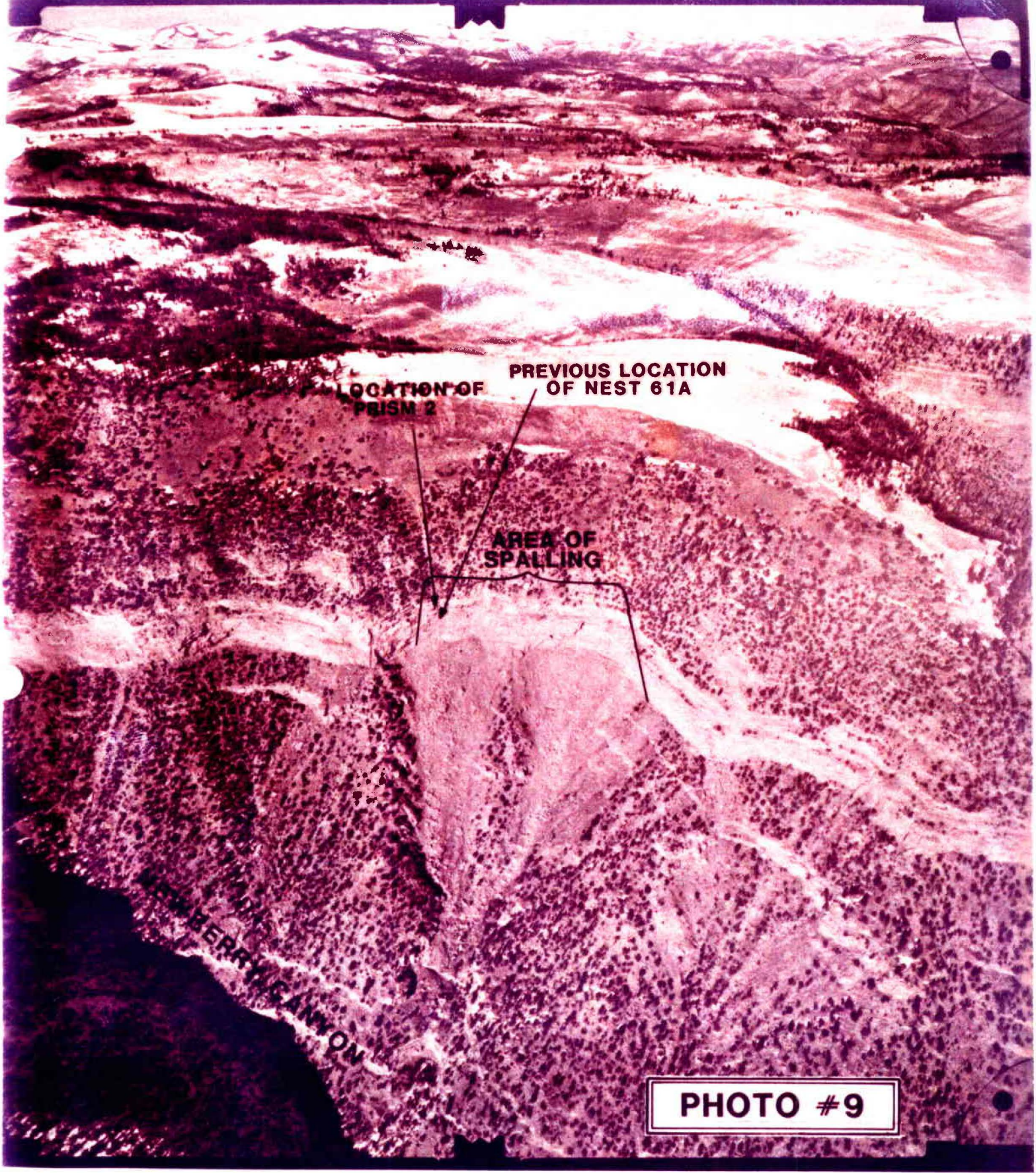
On February 5, one of the four prisms, prism number 2 was lost to spalling. Spalling as of December was limited to an area below prism number 3; however, subsidence induced

spalling has progressed as indicated in photo #9. Approximately twenty (20) percent of the total cliff face has been affected by spalling.

The extent of spalling along the exposed escarpment is such that spalling analysis by photo grid methods is unessential. We will instead provide photographic documentation of the surface affects as they occur.

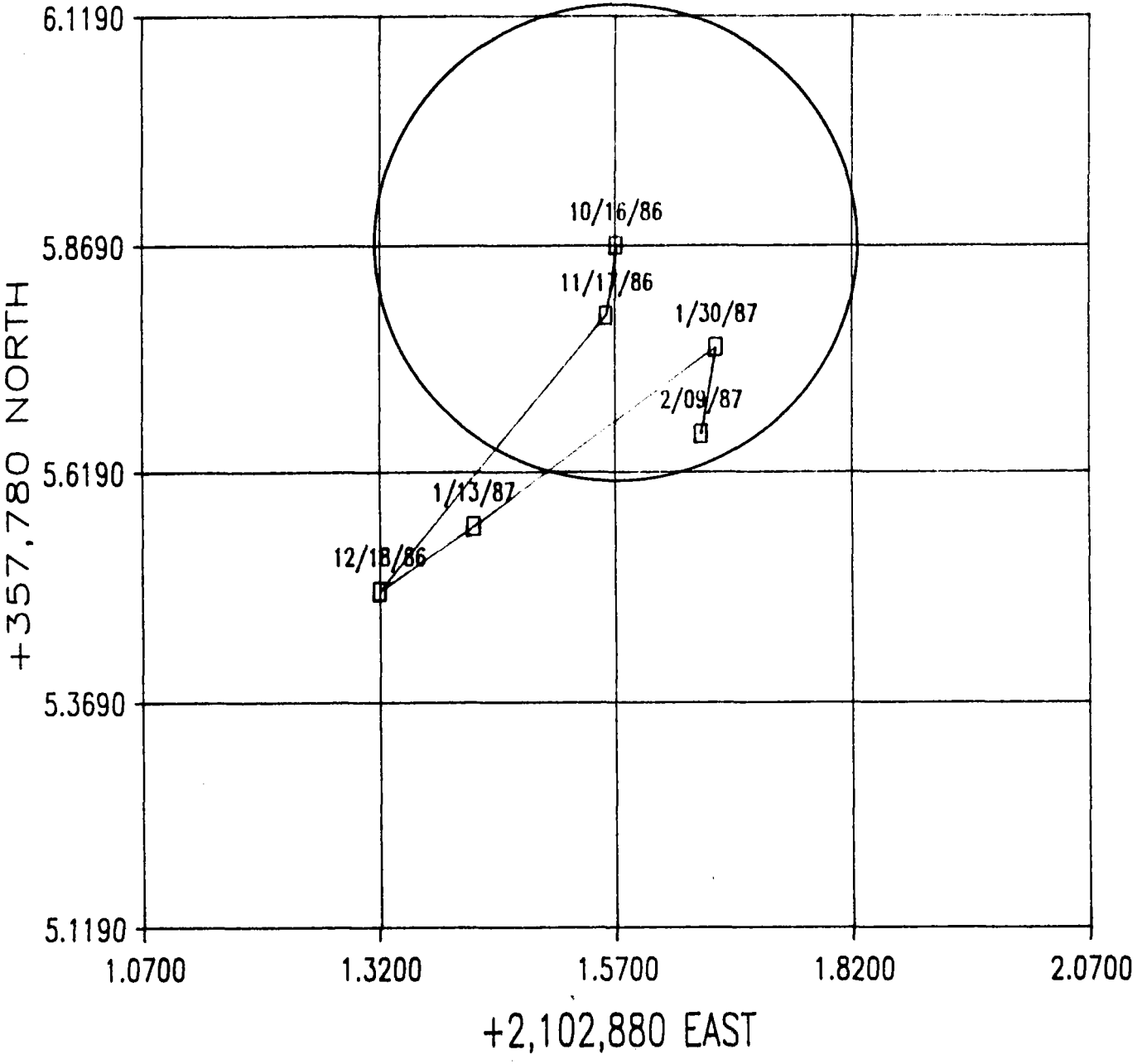
As stated in the 1986 report, "no nests were impacted by spalling"; however, in February nest 61A was destroyed. The nest was inactive and no eagle activity had been observed in the area of the nest. Recovery of the nest is impossible.

Observations of eagle activity in Newberry Canyon during January and early February have been across canyon soaring flights similar to activity observed in late 1986.


LOCATION OF PRISM 2
PREVIOUS LOCATION OF NEST 61A
AREA OF SPALLING
PHOTO #9

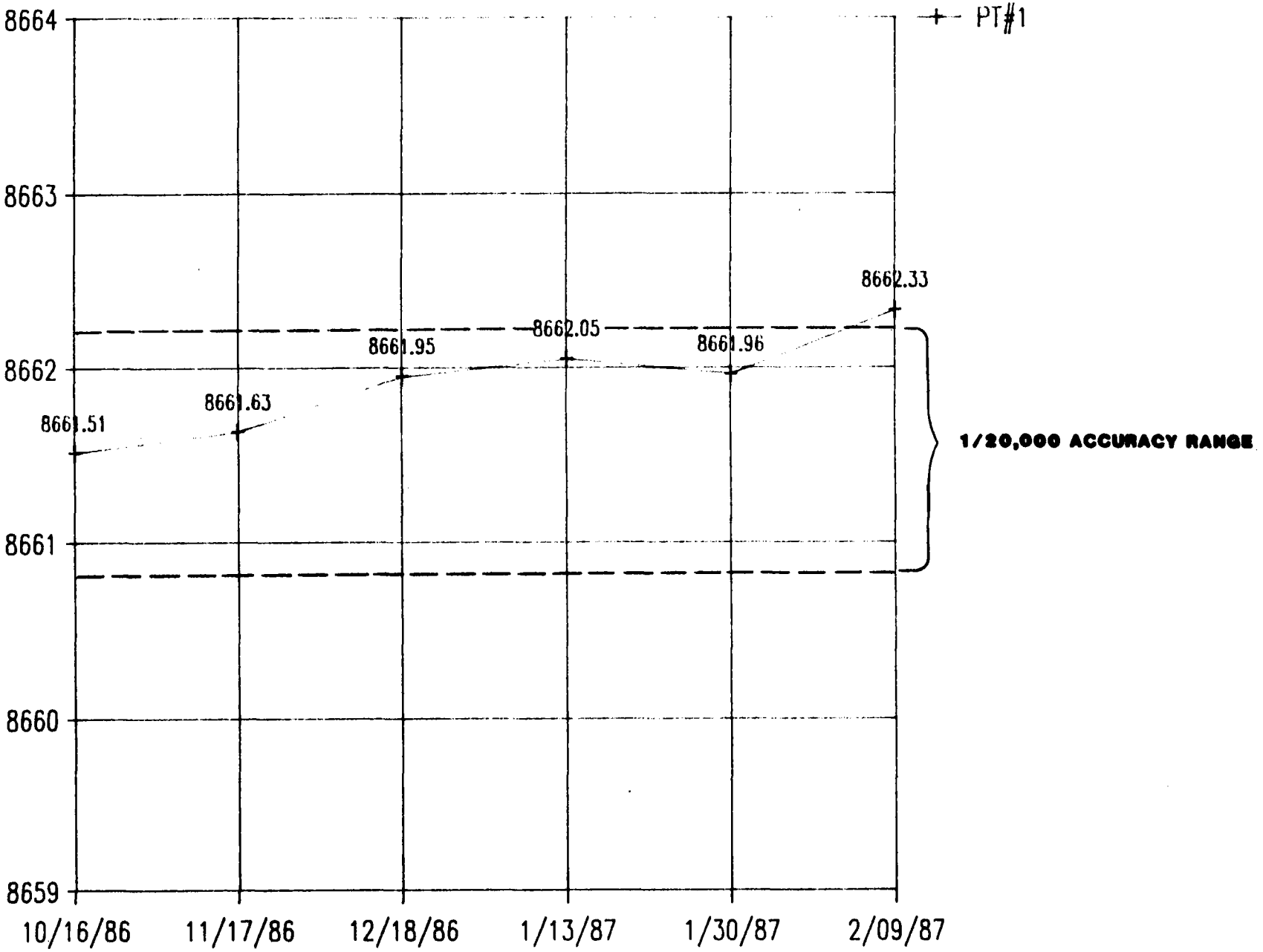
NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 1



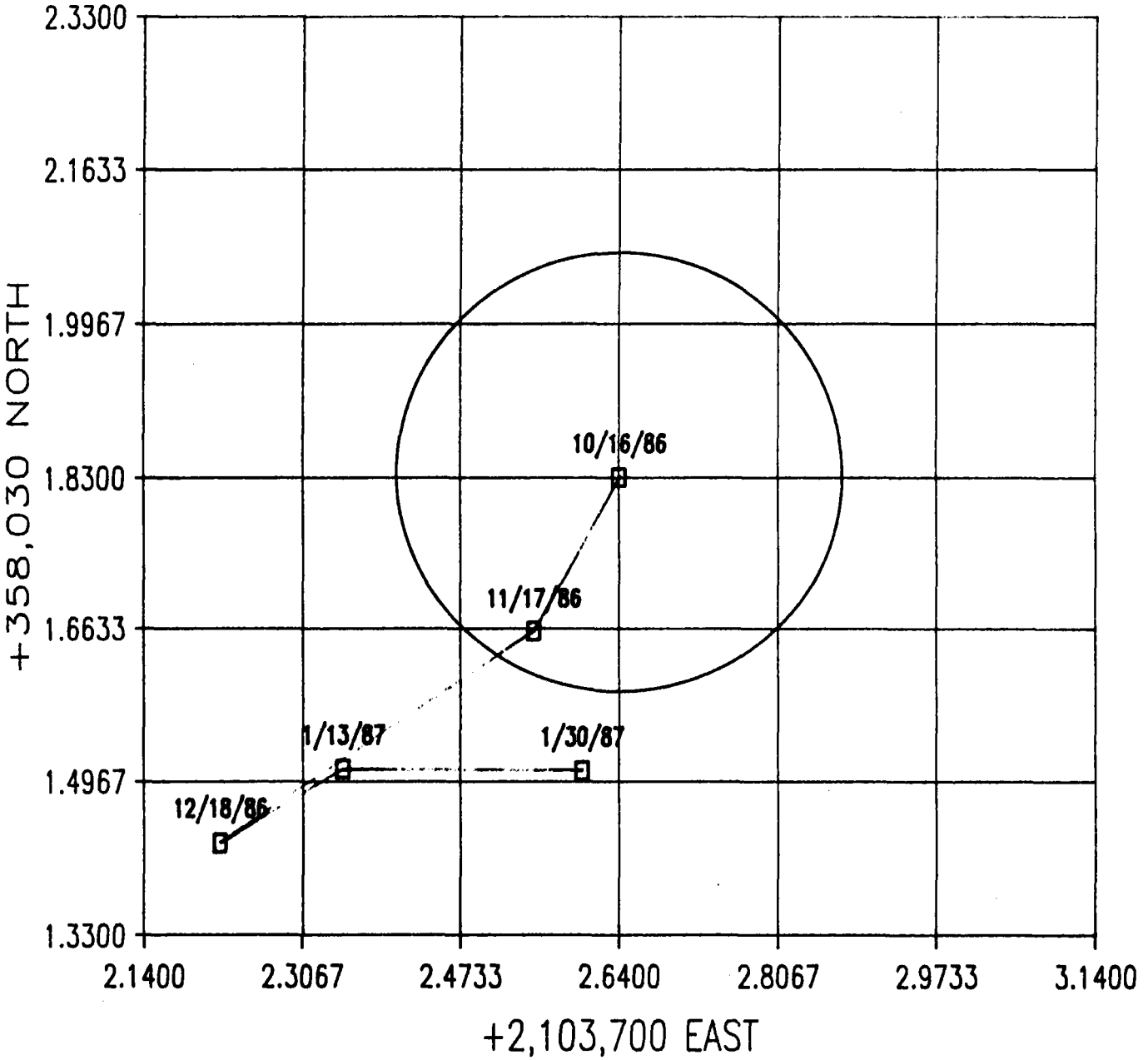
NEWBERRY CANYON SUBSIDENCE MONITORING

Elevation Changes of Point 1



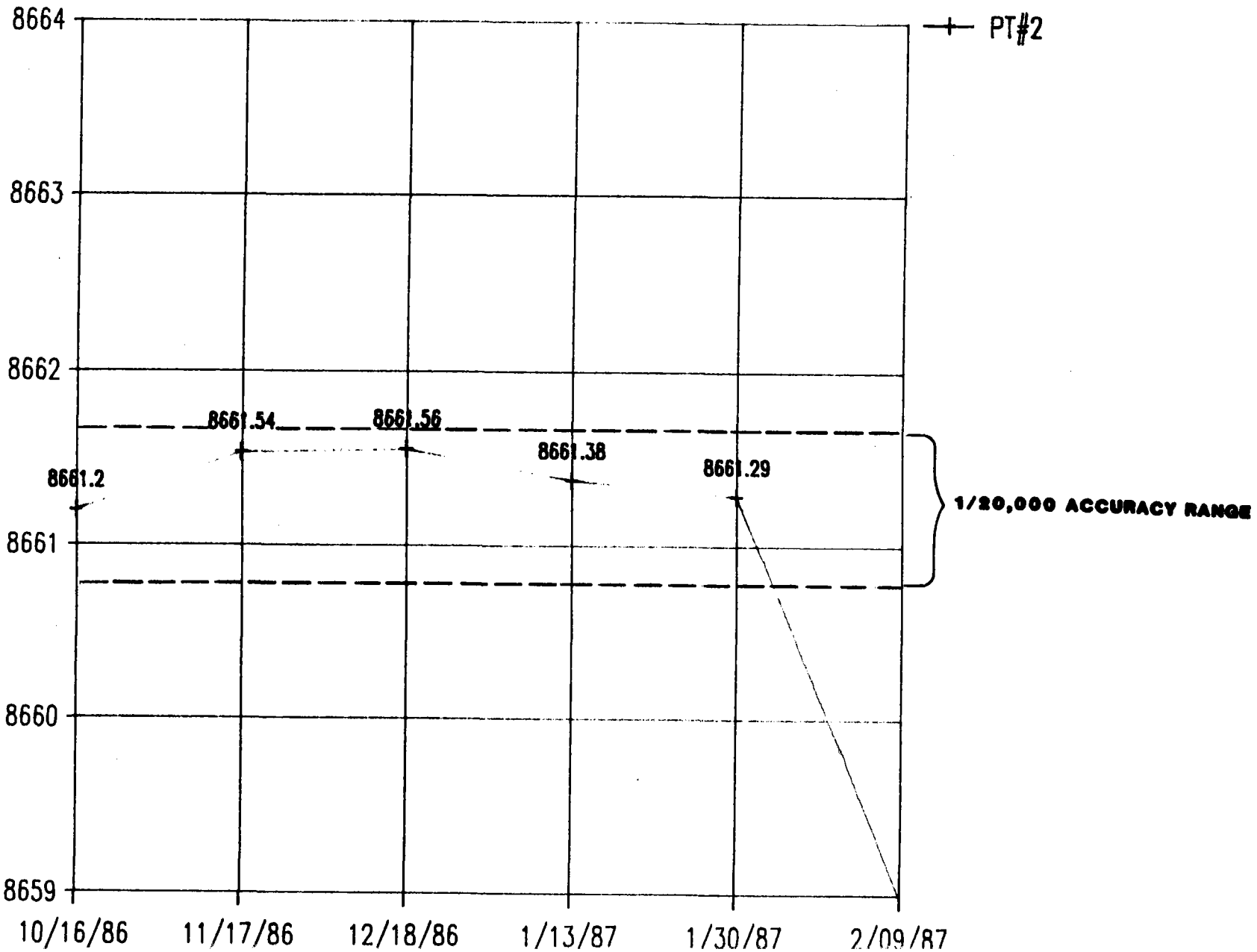
NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 2



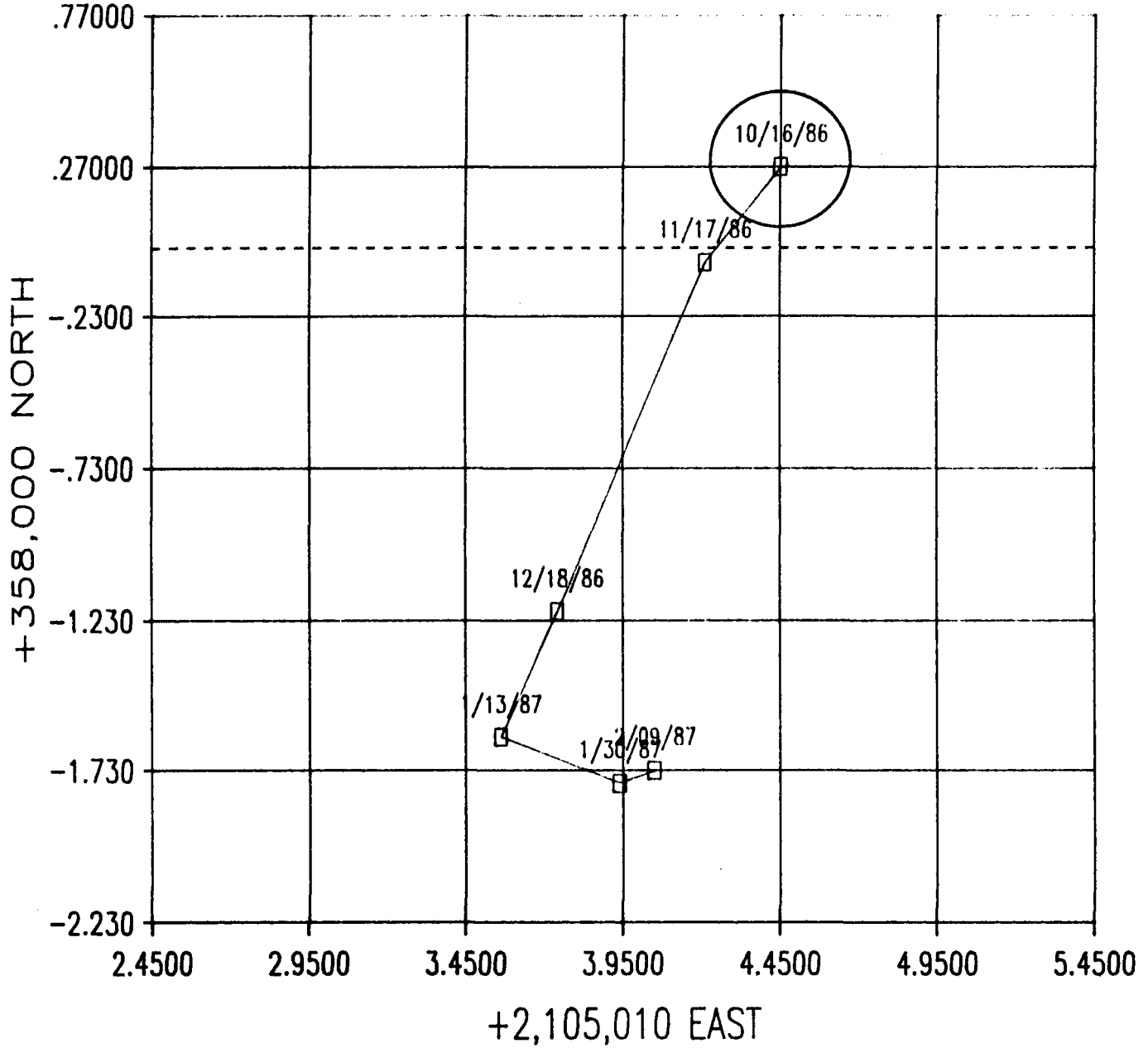
NEWBERRY CANYON SUBSIDENCE MONITORING

Elevation Changes of Point 2



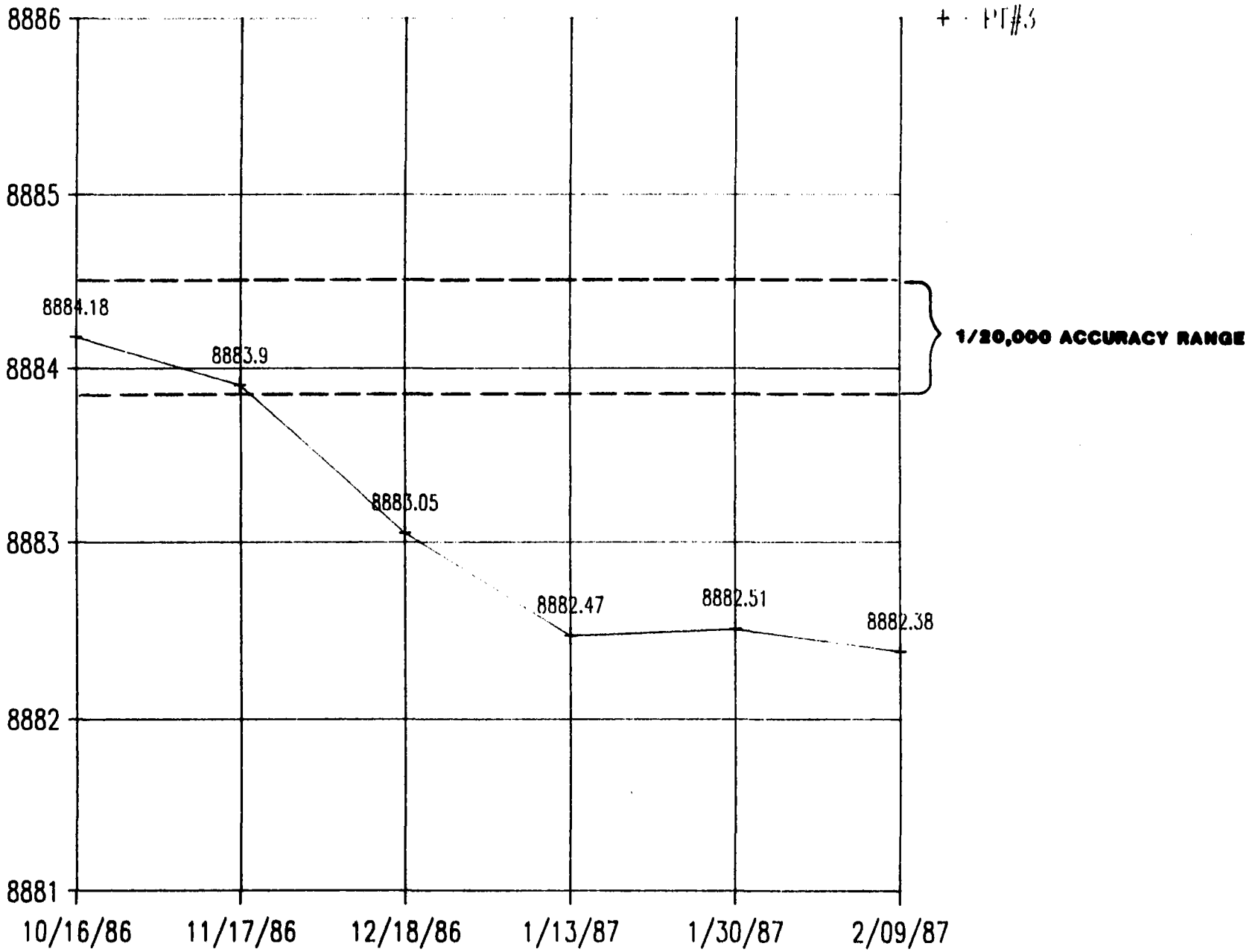
NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 3



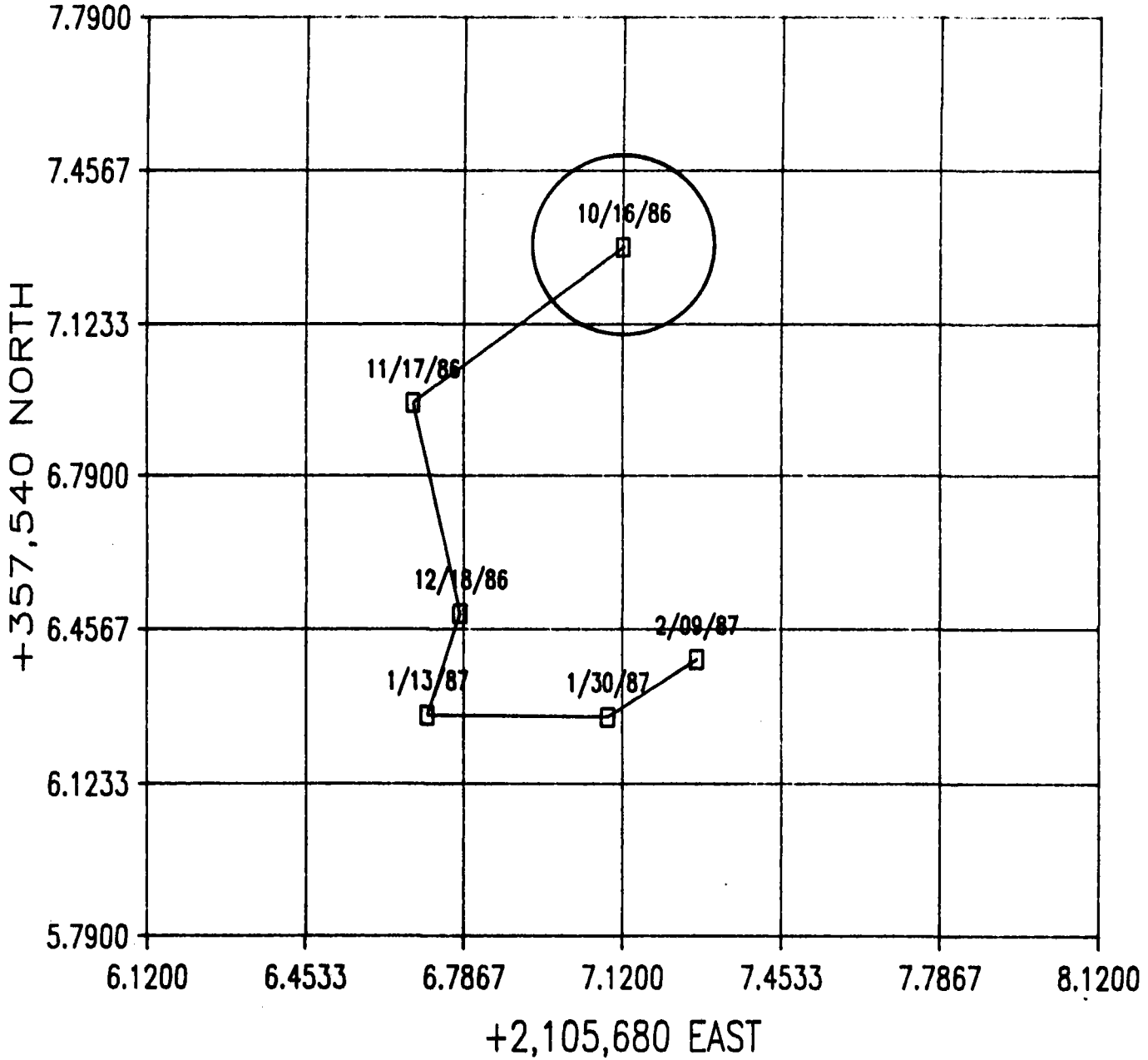
NEWBERRY CANYON SUBSIDENCE MONITORING

Elevation Changes of Point 3



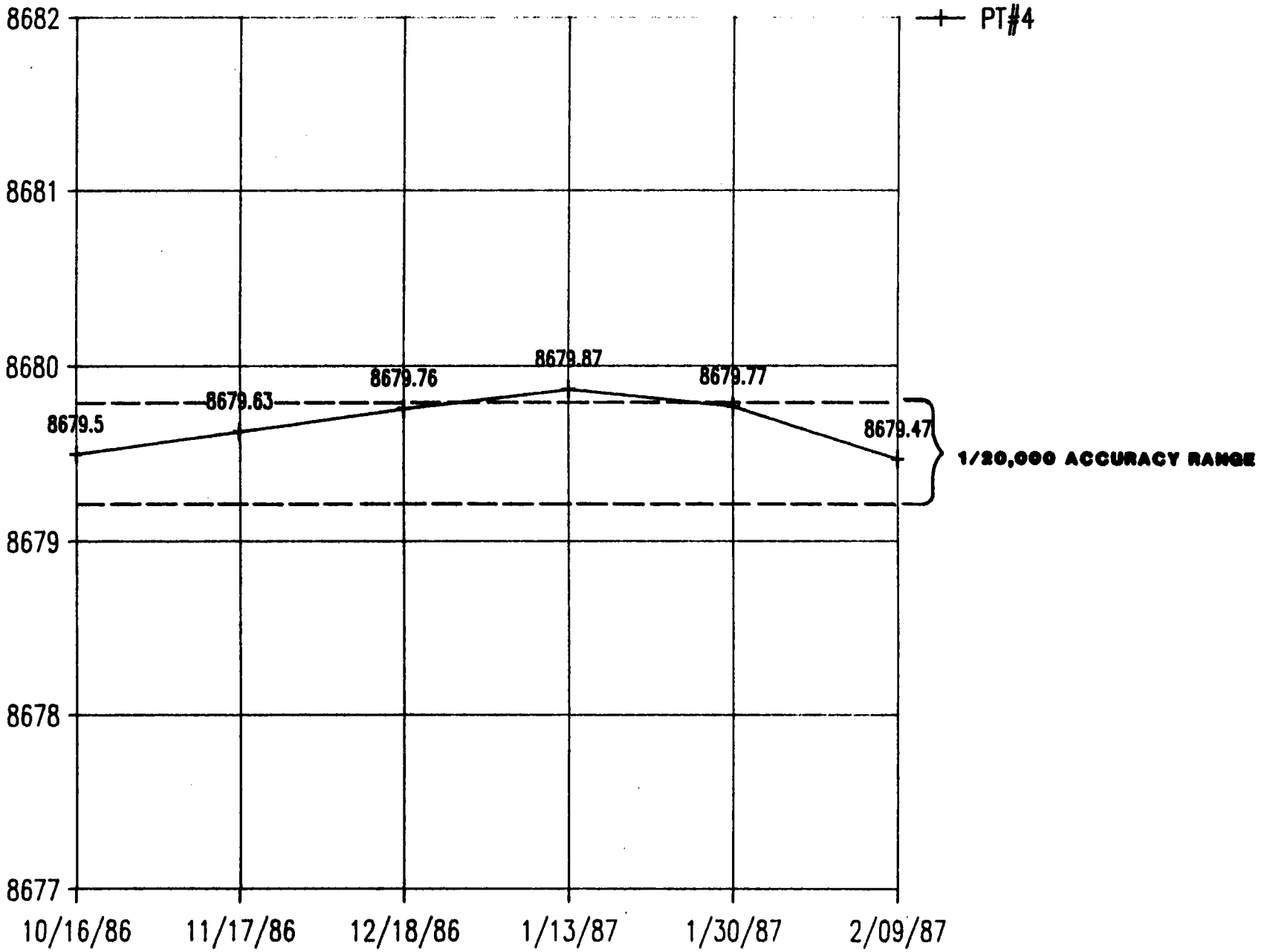
NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 4



NEWBERRY CANYON SUBSIDENCE MONITORING

Elevation Changes of Point 4



APPENDIX B

Golden Eagle Nesting/Cliff Subsidence

MONITORING PLAN

GOLDEN EAGLE NESTING/CLIFF SUBSIDENCE

MONITORING PLAN

INTRODUCTION

Active Golden Eagle nests have been located by the Fish and Wildlife Service (FWS) within the boundaries of Utah Power & Light Company's (UP&L) coal mining properties (see APPENDIX A Map #1). Several nest clusters are situated on vertical sandstone cliffs which overlie the longwall panels in the Cottonwood Mine (see Maps #2 and #3).

There is concern among regulatory agencies that mining related subsidence and cliff spalling may impact eagle nesting. Therefore, Utah Power and Light will implement the following monitoring plan to identify potential impacts on these species.

OBJECTIVES

1. To collect information on nest location, nest status and nesting success of Golden Eagles within the study area.

2. To monitor the effects of subsidence on Golden Eagles nests in potentially impact areas.

3. Collection of nest and subsidence monitoring information to develop methods to eliminate or minimize adverse subsidence related impacts on Golden Eagles in the study area and to serve as guidance to avoid or resolve similar resource conflicts in the future.

STUDY AREA

For the purpose of this monitoring effort, the study area will require a Golden Eagle nest taking permit and will consist of that area referred to as Newberry Canyon which overlies the Sixth and Seventh East longwall panels in the Cottonwood Mine. All nests subject to potential subsidence in Newberry Canyon will be included for determination of impacts on nesting.

This area will be monitored for cliff subsidence and spalling. A portion of representative cliffs, beyond the limits of predicted subsidence, will be monitored for spalling, as a control site to provide comparative data.

Additionally, an aerial nest inventory survey will be conducted within a ten mile radius area as indicated on map CM-10680-EM in early 1987.
(APPENDIX A, MAP 2)

PERSONNEL AND EQUIPMENT

Nest inventory surveys will be conducted by the following qualified personnel:

U. S. Fish and Wildlife Service (FWS)	- Mike Lockhart or Bruce Waddell
Utah Division of Wildlife Resources (DWR)	- Miles Moretti
Utah Power & Light Company (UP&L)	- Val Payne

A Jet Ranger or Lama helicopter with complete onboard communications, capable of transporting three (3) field personnel will be used. Both the helicopter and the pilot involved in the nest inventory surveys will be certified to meet FWS requirements.

Cliff subsidence monitoring will be conducted by UP&L engineering personnel using total station Electronic Distance Metering (EDM) equipment and standard surveying practices.

METHODOLOGY

An aerial nest inventory survey was completed in May 1986, within a ten mile radius area of Newberry Canyon. Similar Golden Eagle nest inventory surveys will be completed during the 1987 breeding season. Data developed will be similar to that discussed in the FWS publication Raptor Nest Information Management System, RAPA file and RAPB file.

Surveys will be conducted using a helicopter and observers as previously stated. Similar to the 1986 surveys, the work will be completed by flying near the cliff nest sites at a speed and proximity such that nests are observable.

The inventory flight will be conducted and observed by FWS at approximately mid-incubation (mid-April). During the flight, suitable cliff nest sites within a ten mile radius of Newberry Canyon will be examined for Golden Eagle nests. The appropriate file data and nest status will be recorded for observed nests. The location of all raptor species nests observed in Newberry Canyon, will be recorded.

In addition to the 1986 inventory flight, eagle activity within the ten mile radius area will be observed and recorded, for a twelve (12) month period beginning June 1986.

Photogrammetric subsidence monitoring in Newberry Canyon will be completed as presently outlined in the UP&L Subsidence Monitoring Plan. In addition, cliff subsidence monitoring will be accomplished through the use of EDM equipment.

Prior to longwall mining, a permanent control station will be located (horizontally and vertically) from which the cliff nesting area can be observed. Four reflector prisms will be installed on the cliff above the nest area. The prisms will be located (horizontally and vertically) in reference to the permanent control station. This will provide a method of determing both horizontal and vertical movement in the cliff strata. This method of observation will facilitate correlation of surface subsidence with the position of the longwall face.

Initial pre-mining observations will provide baseline information for the cliff strata. Once extraction of the longwall panel begins, observations will be conducted at two (2) month intervals if the nests in Newberry Canyon are inactive. However, if an active pair of eagles is present in Newberry Canyon, EDM monitoring will be completed each month during the breeding season (February through June) and at two-month intervals during July through January.

Fracturing and spalling of the cliff face will be determined by a ground station photo/grid system. Permanent photo stations will be located from which photographs of the nesting area cliff face can be taken (see map CE-10587-EM). Photographs will be taken using a 35 mm SLR camera with a telephoto lens. Statistically adequate photographic sampling of the cliff face, which represents affected and control situations, will be made to determine the relative degree of spalling. A grid system will be superimposed upon the photographs whereby areas of fracturing and/or spalling can be identified. The grid will be of adequate complexity to allow replacations and pooled data analysis. Photographic sampling will be conducted according to the same schedule as the EDM monitoring.

Eagle activity associated with active nests in the Newberry Canyon study area will be monitored in conjunction with EDM and photographic data collection. Nest activity data will be recorded on the Nest Activity Data Form

correlated with underground mining activities, EDM measurements and cliff spalling data.

Subsidence and Golden Eagle nest monitoring will continue until *major subsidence has ceased, or until such time that data demonstrates a conflict between Golden Eagle nesting and cliff subsidence does not exist.

Data will be reported in UP&L's annual Subsidence Monitoring Report. However, significant subsidence events which affect nests will be immediately reported to Utah DOGM, OSMRE, FWS and DWR. If it is determined that mine related subsidence is going to impact an active eagle nest, Utah Power and Light shall be responsible for salvage.

COMPENSATION - MITIGATION

A stated objective of the monitoring plan is to use the plan data, "to develop methods to eliminate or minimize adverse subsidence related impacts on Golden Eagles". Therefore, specific mitigation or compensation measures cannot be identified until the impacts are defined. However, in accordance with the requirements of the applicable statutes, regulations and permits related to the monitoring plan, UP&L will cooperate with FWS in developing appropriate mitigation or compensation measures if adverse subsidence related impacts occur. Possible compensation or mitigation measures may include:

* Major subsidence represents 80% of extracted seam height.

1. Creation of artificial nest sites or structures.
2. Relocation of nests.
3. Salvage or relocation of nestlings.
4. Habitat enhancement.

UP&L will obtain current information on recent activities related to Golden Eagle nest manipulation for use in developing compensation or mitigation measures.

APPENDIX C

PRISM SURVEY DATA

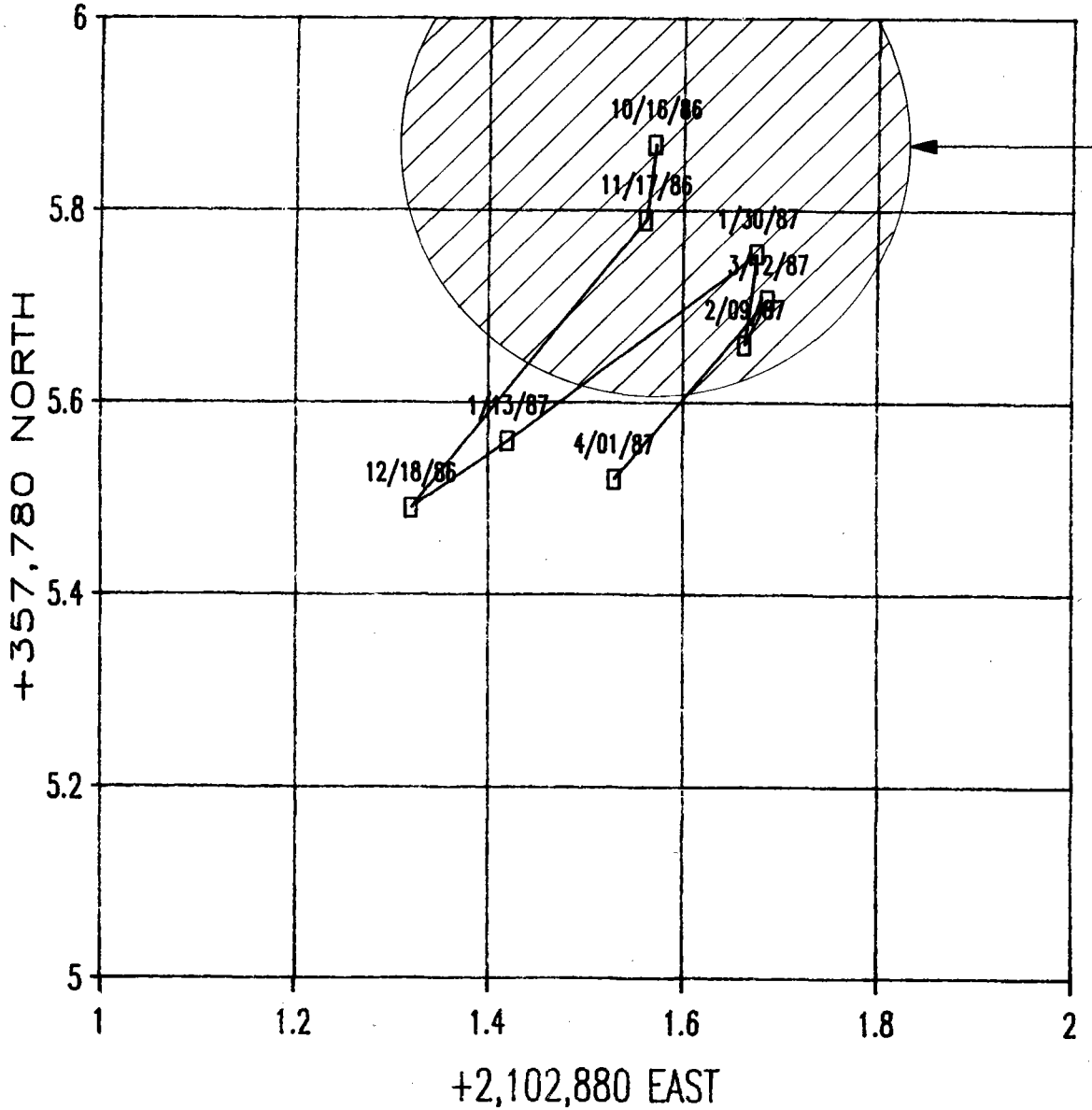
NEWBERRY CANYON SUBSIDENCE MONITORING

	DATE OF MEASUREMENT	PT#1 CHANGE ELEVATION	PT#1 COORDINATES NORTH	EAST	PT#2 ELEVATION	PT#2 COORDINATES NORTH	EAST
1	10/16/86	8,661.510	357,785.869	2,102,881.570	8,661.200	358,031.830	2,103,702.640
2	11/17/86	8,661.630	357,785.790	2,102,881.560	8,661.540	358,031.660	2,103,702.550
3	12/18/86	8,661.950	357,785.490	2,102,881.320	8,661.560	358,031.430	2,103,702.220
4	1/13/87	8,662.050	357,785.560	2,102,881.420	8,661.380	358,031.510	2,103,702.350
5	1/30/87	8,661.960	357,785.755	2,102,881.676	8,661.290	358,031.508	2,103,702.601
6	2/09/87	8,662.330	357,785.660	2,102,881.663			
7	3/12/87	8,662.060	357,785.707	2,102,881.687			
8	4/01/87	8,661.630	357,785.520	2,102,881.529			
9	4/22/87	8,661.420	357,785.473	2,102,881.375			
10	5/28/87	8,661.700	357,785.293	2,102,881.309			
11	6/10/87	8,661.510	357,785.446	2,102,881.432			
12	6/23/87	8,661.650	357,785.529	2,102,881.423			
13	7/10/87	8,661.650	357,785.394	2,102,881.446			
14	8/08/87	8,661.650	357,785.441	2,102,881.469			
15	9/09/87	8,661.900	357,784.933	2,102,881.406			
16	11/12/87	8,661.640	357,784.986	2,102,881.521			

	DATE OF MEASUREMENT	PT#3 CHANGE ELEVATION	PT#3 COORDINATES NORTH	EAST	PT#4 CHANGE ELEVATION	PT#4 COORDINATES NORTH	EAST
1	10/16/86	8,884.180	358,000.270	2,105,014.450	8,679.500	357,547.290	2,105,687.120
2	11/17/86	8,883.900	357,999.950	2,105,014.210	8,679.630	357,546.950	2,105,686.680
3	12/18/86	8,883.050	357,998.800	2,105,013.740	8,679.760	357,546.490	2,105,686.780
4	1/13/87	8,882.470	357,998.380	2,105,013.560	8,679.870	357,546.270	2,105,686.710
5	1/30/87	8,882.510	357,998.227	2,105,013.939	8,679.770	357,546.266	2,105,687.090
6	2/09/87	8,882.390	357,998.265	2,105,014.052	8,679.470	357,546.392	2,105,687.277
7	3/12/87	8,882.440	357,997.980	2,105,013.765	8,679.720	357,546.190	2,105,687.016
8	4/01/87	8,882.330	357,997.912	2,105,013.765	8,679.710	357,546.132	2,105,686.956
9	4/22/87	8,882.160	357,997.899	2,105,013.749	8,679.390	357,546.238	2,105,687.095
10	5/28/87	8,882.190	357,997.412	2,105,013.483	8,679.210	357,545.872	2,105,686.928
11	6/10/87	8,881.760	357,996.702	2,105,013.890	8,678.190	357,545.007	2,105,687.736
12	6/23/87	8,880.640	357,995.299	2,105,013.909	8,675.410	357,541.191	2,105,686.338
13	7/10/87	8,880.470	357,994.704	2,105,013.740	8,675.230	357,540.849	2,105,685.961
14	8/08/87	8,879.720	357,993.848	2,105,013.380	8,674.970	357,540.436	2,105,685.561
15	9/09/87	8,879.770	357,993.523	2,105,013.273	8,674.880	357,540.302	2,105,685.496
16	11/12/87	8,879.560	357,993.575	2,105,013.528	8,675.090	357,540.162	2,105,685.690

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 1
10-16-86 TO 4-1-87



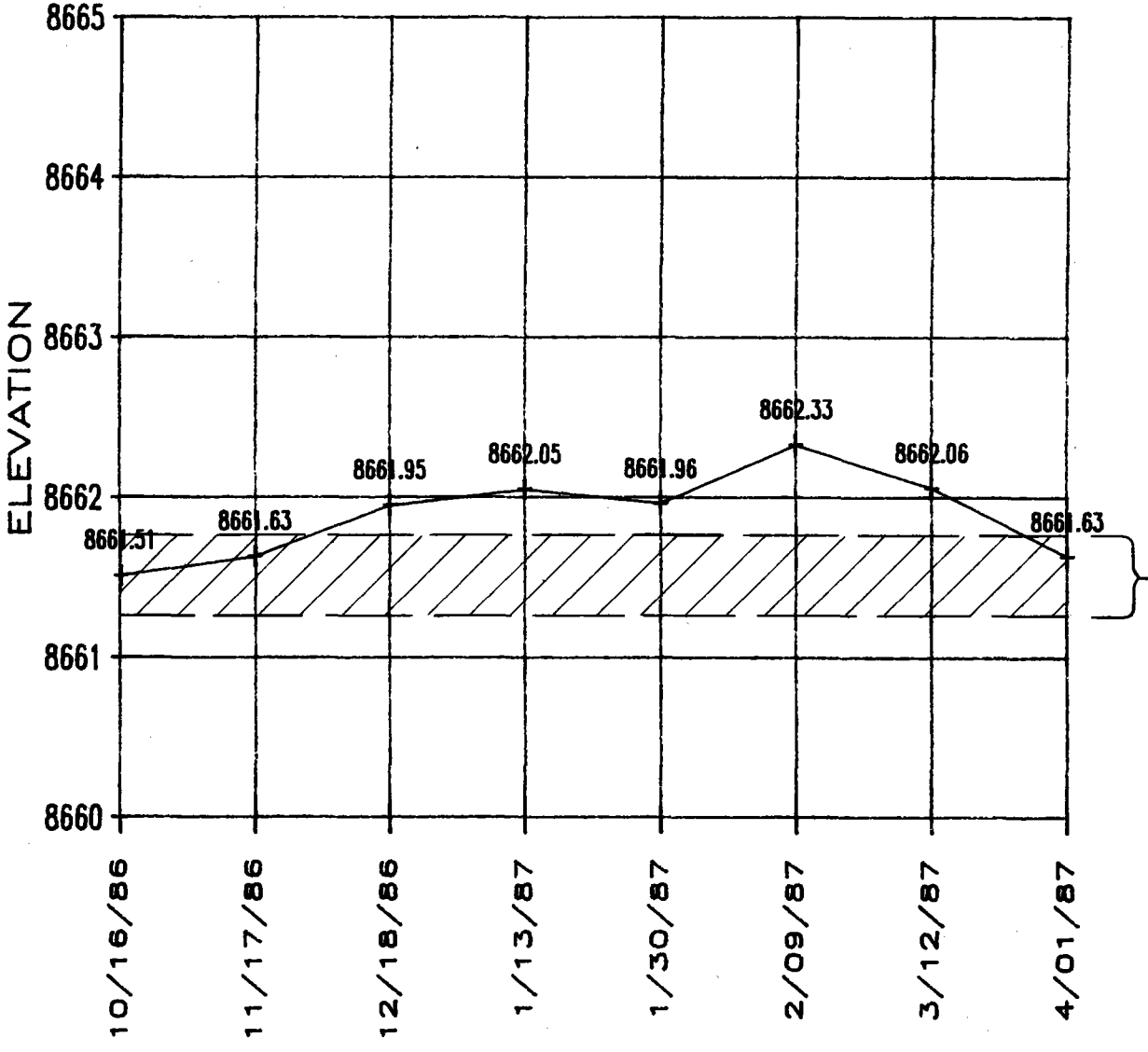
ACCURACY RANGE
1/20,000

SCALE: 1" = 0.19'

NOTE:
NET HORIZONTAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
S 6° 42' 01" W 0.35 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#1 CHANGE
10-16-86 TO 4-1-87



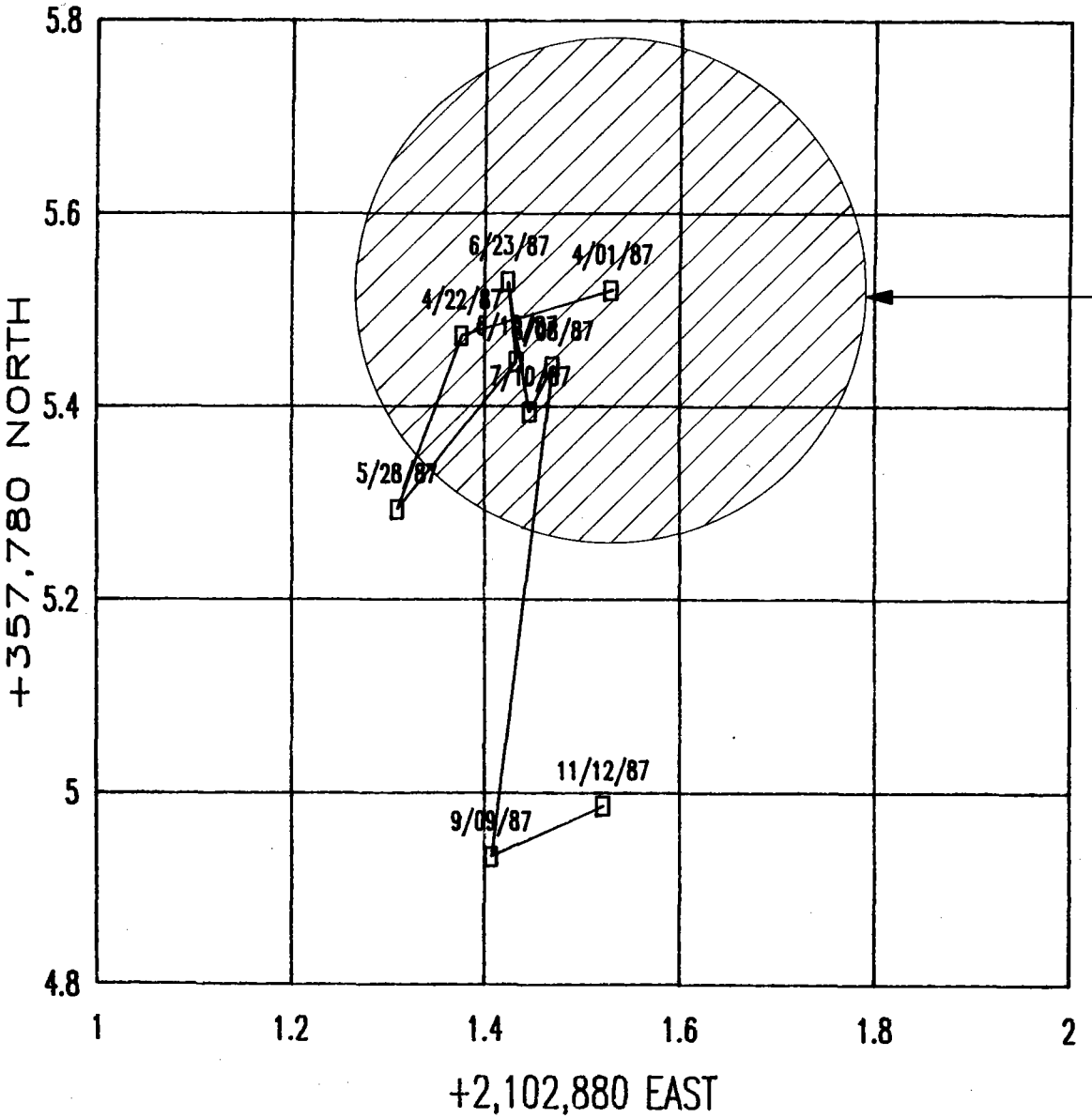
ACCURACY RANGE
1/20,000

SCALE: 1" = 1.11'

NOTE:
NET VERTICAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
IS WITHIN THE ACCURACY RANGE
THEREFORE IT IS INTERPRETED
AS ZERO.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 1
4-1-87 TO 9-9-87



ACCURACY RANGE
1/20,000

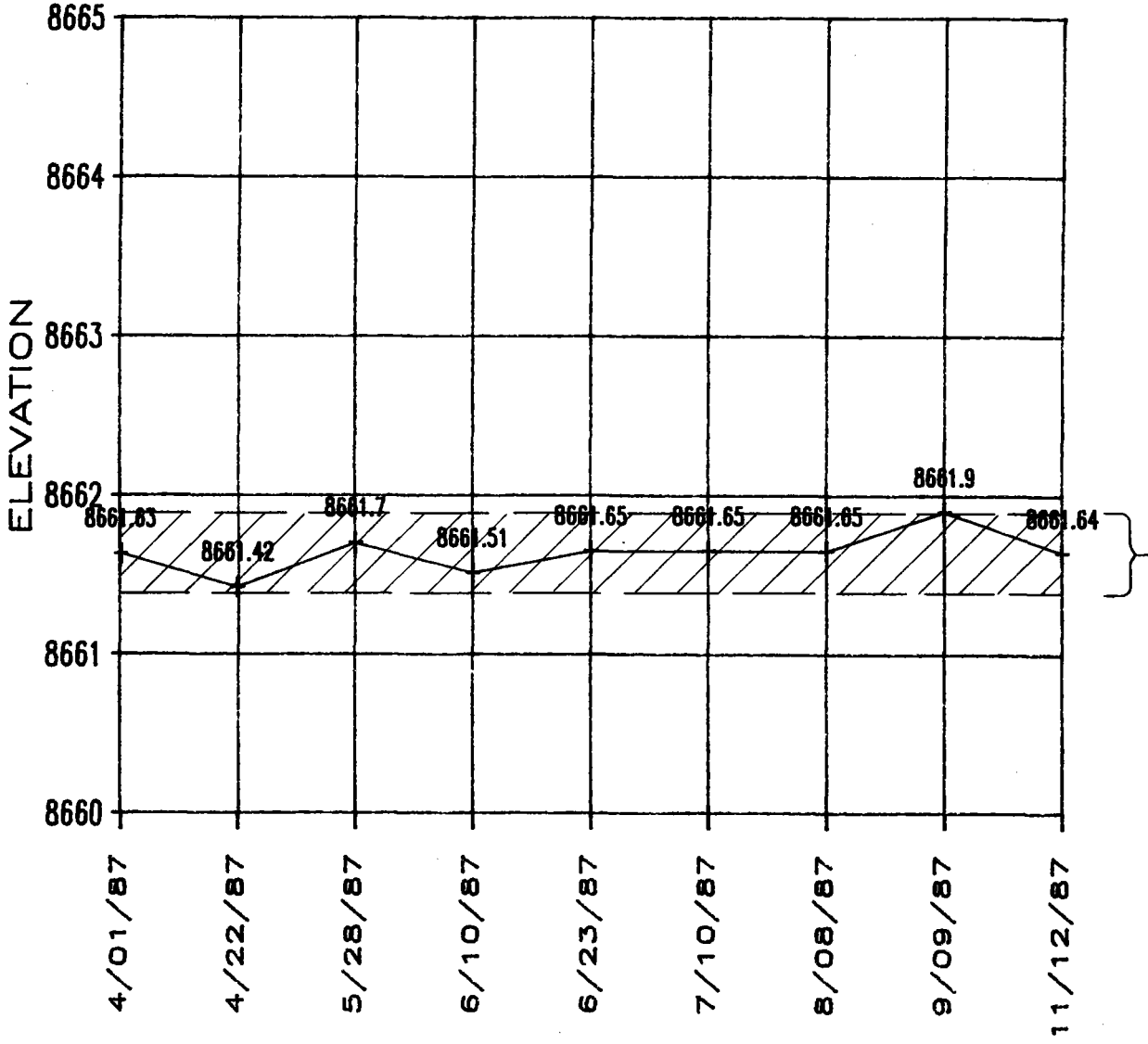
SCALE: 1" = 0.19'

NOTE:
NET HORIZONTAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
S 11° 50' 08" W 0.60 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#1 CHANGE

4-1-87 TO 9-9-87



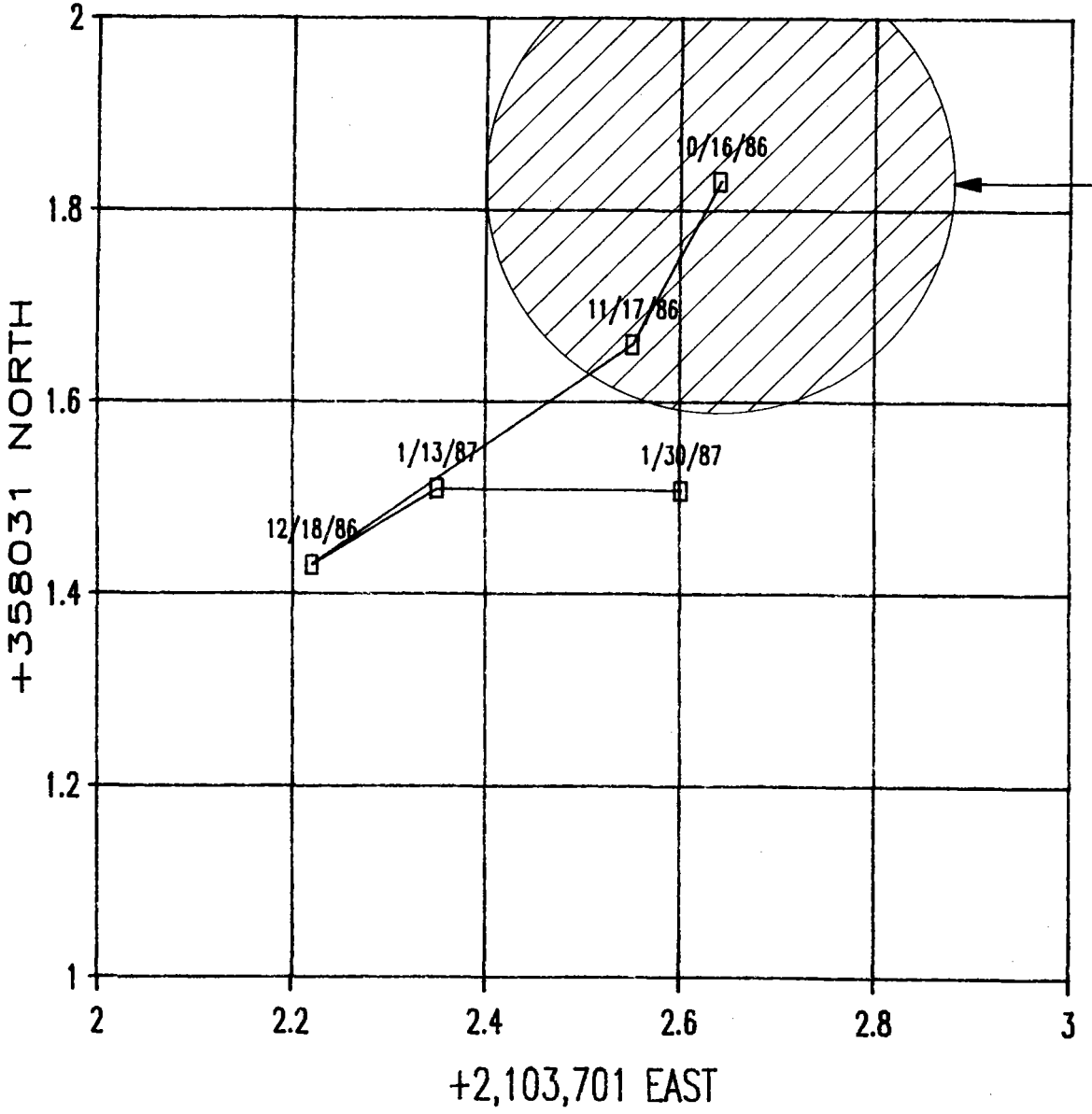
ACCURACY RANGE
1/20,000

SCALE: 1" = 1.11'

NOTE:
NET VERTICAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
0.27 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 2
10-16-86 TO 1-30-87



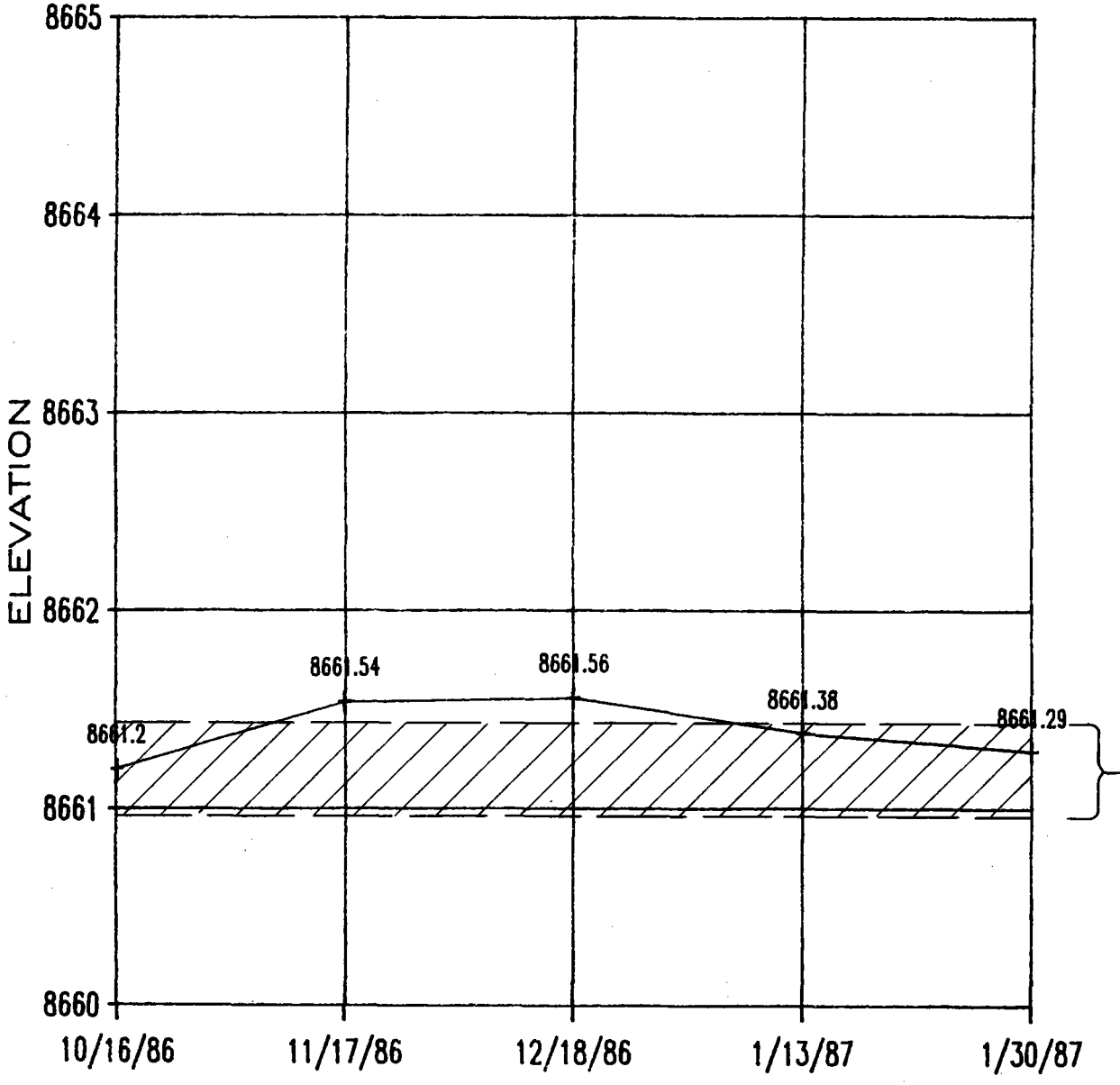
ACCURACY RANGE
1/20,000

SCALE: 1" = 0.19'

NOTE:
NET HORIZONTAL MOVEMENT
OCT. 16, 1986 TO JAN. 30, 1987
S 6° 54' 21" W 0.32 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#2 CHANGE
10-16-86 TO 1-30-87

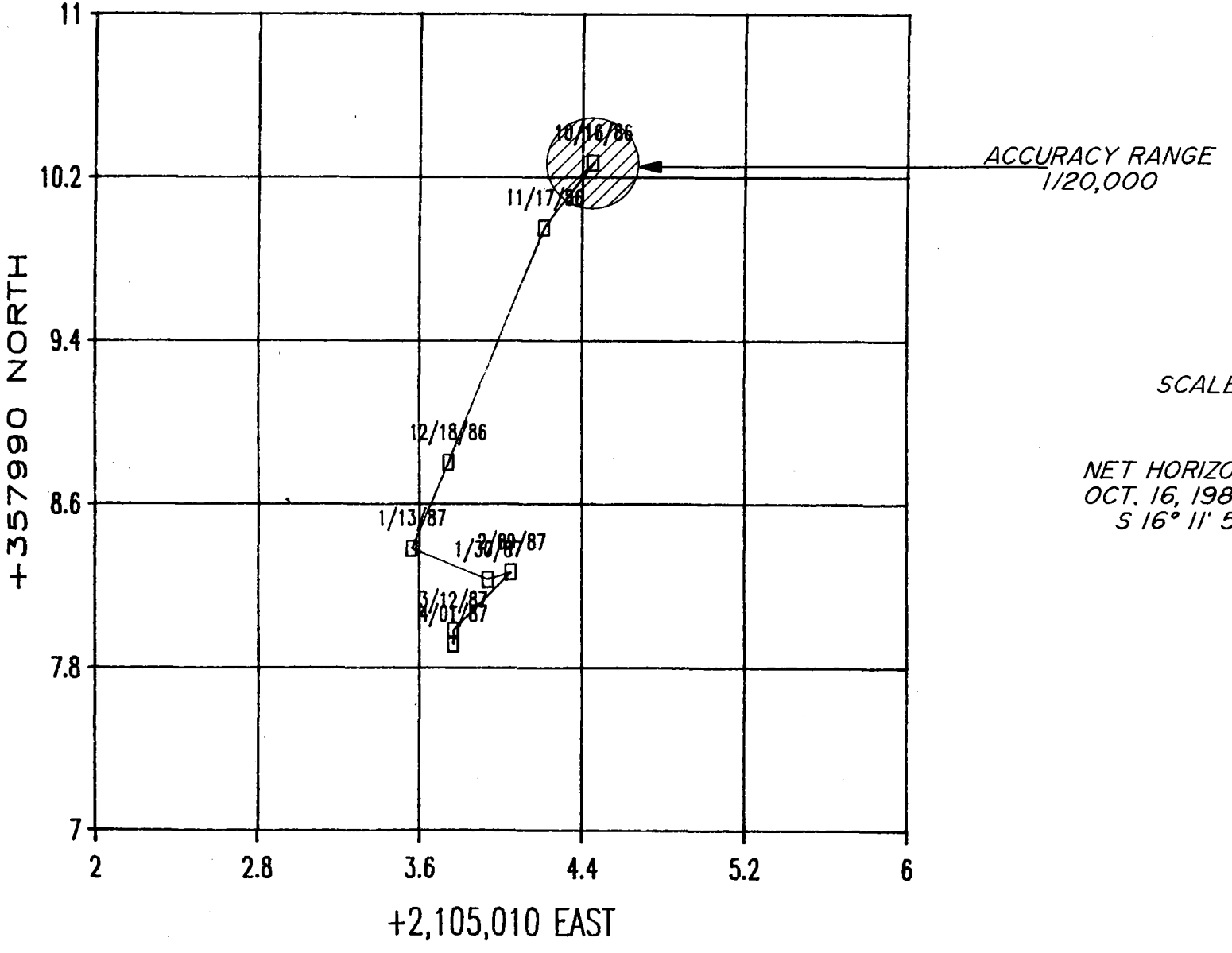


SCALE: 1" = 0.88'

NOTE:
NET VERTICAL MOVEMENT
OCT. 16, 1986 TO JAN. 30, 1987
IS WITHIN THE ACCURACY RANGE
THEREFORE IT IS INTERPRETED
AS ZERO.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 3
10-16-86 TO 4-1-87

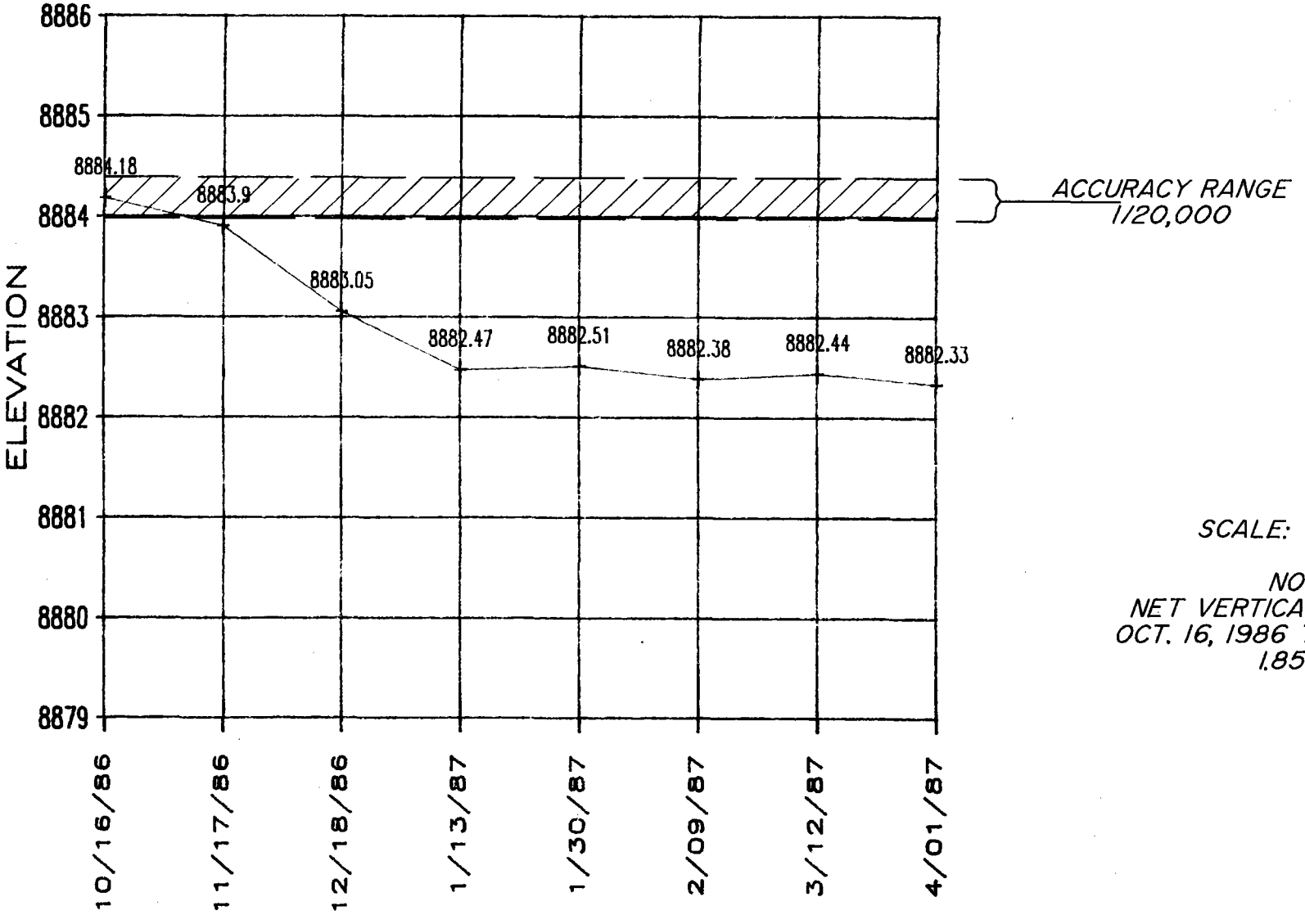


SCALE: 1" = 0.75'

NOTE:
NET HORIZONTAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
S 16° 11' 55" W 2.46 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#3 CHANGE
10-16-86 TO 4-1-87

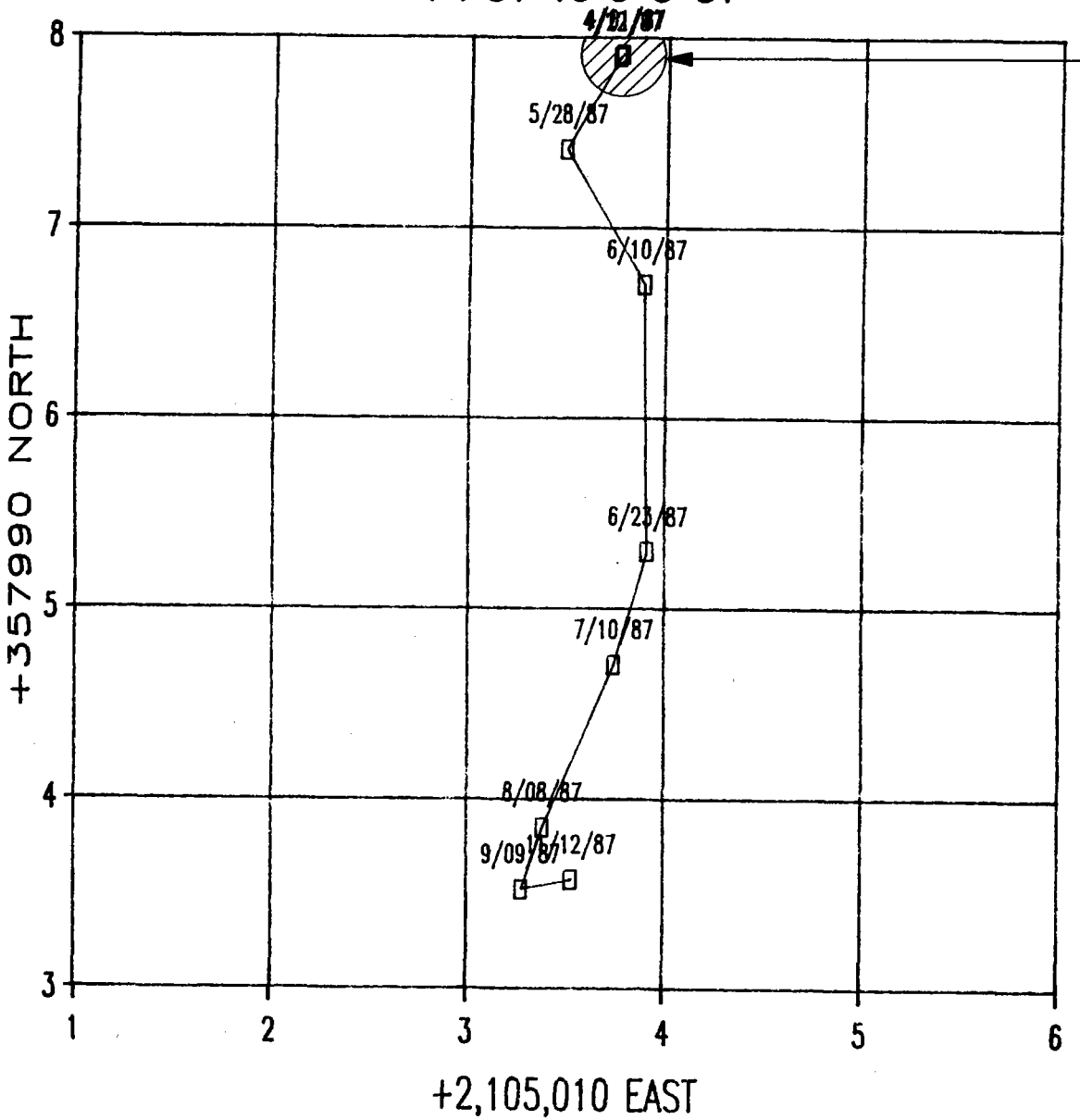


SCALE: 1" = 1.59'

NOTE:
NET VERTICAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
1.85 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 3
4-1-87 TO 9-9-87



ACCURACY RANGE
1/20,000

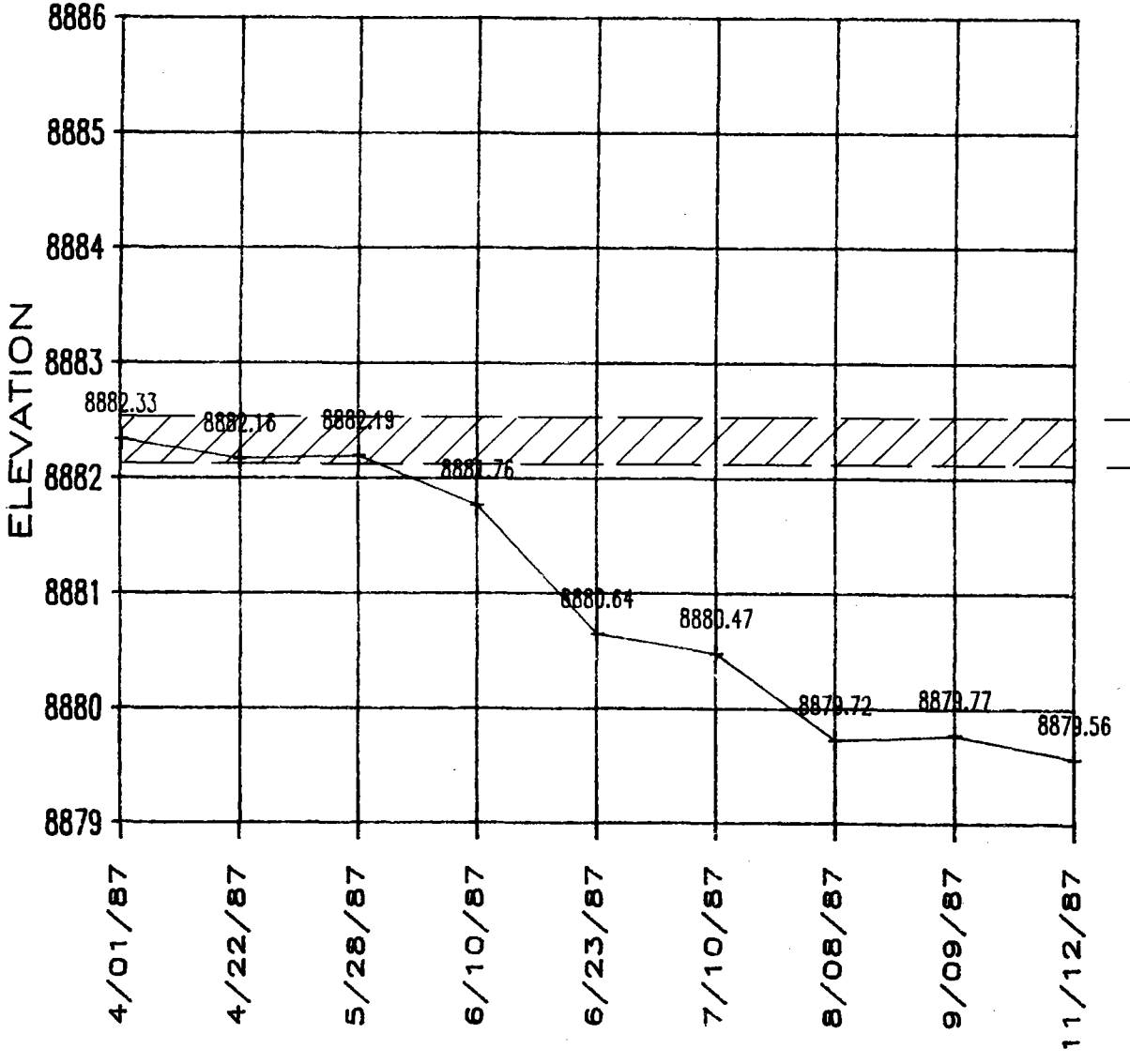
SCALE: 1" = 0.92'

NOTE:
NET HORIZONTAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
S 6° 23' 46" W 4.42 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#3 CHANGE

4-1-87 TO 9-9-87



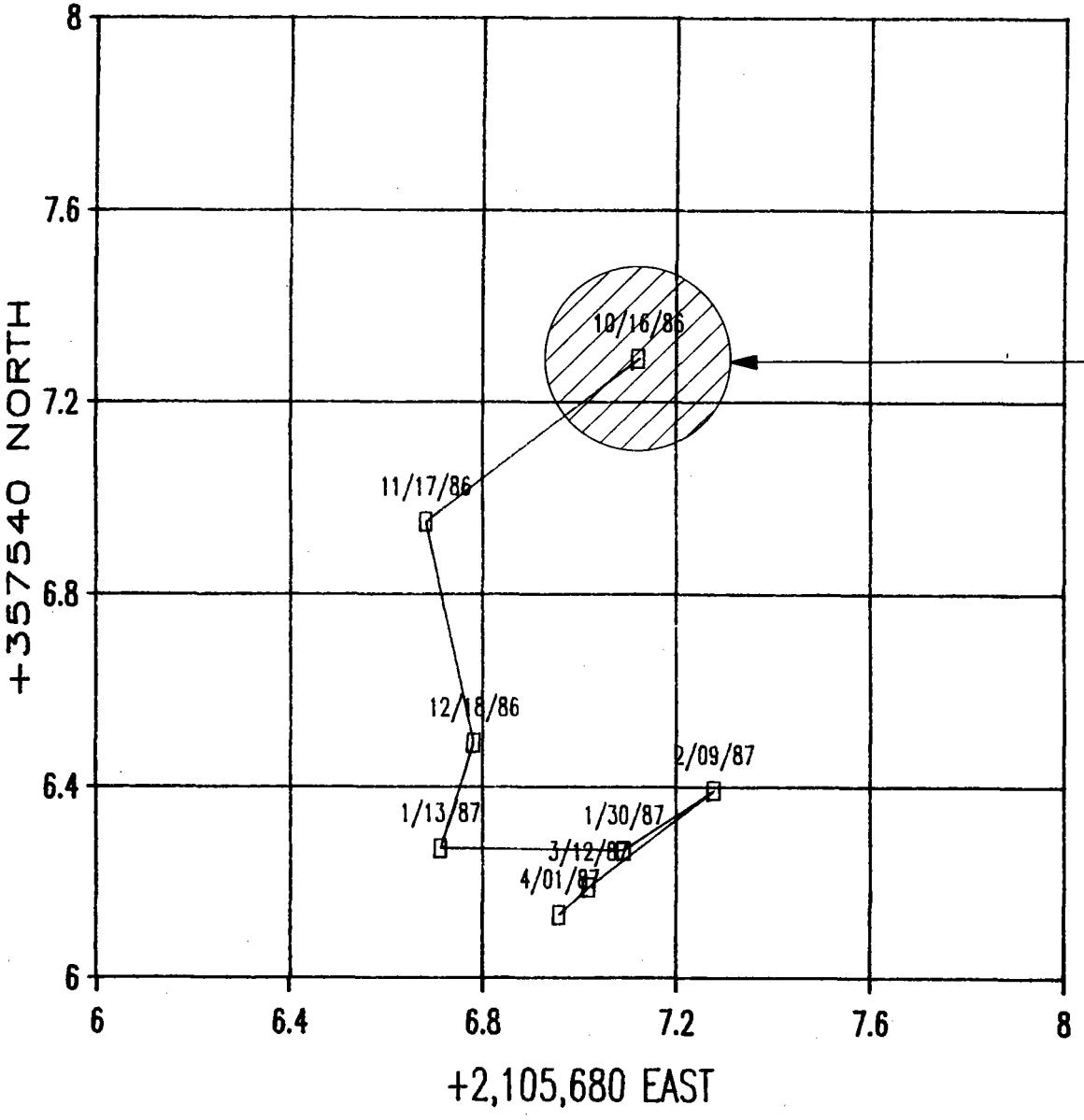
ACCURACY RANGE
1/20,000

SCALE: 1" = 1.59'

NOTE:
NET VERTICAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
2.56 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 4
10-16-86 TO 4-1-87



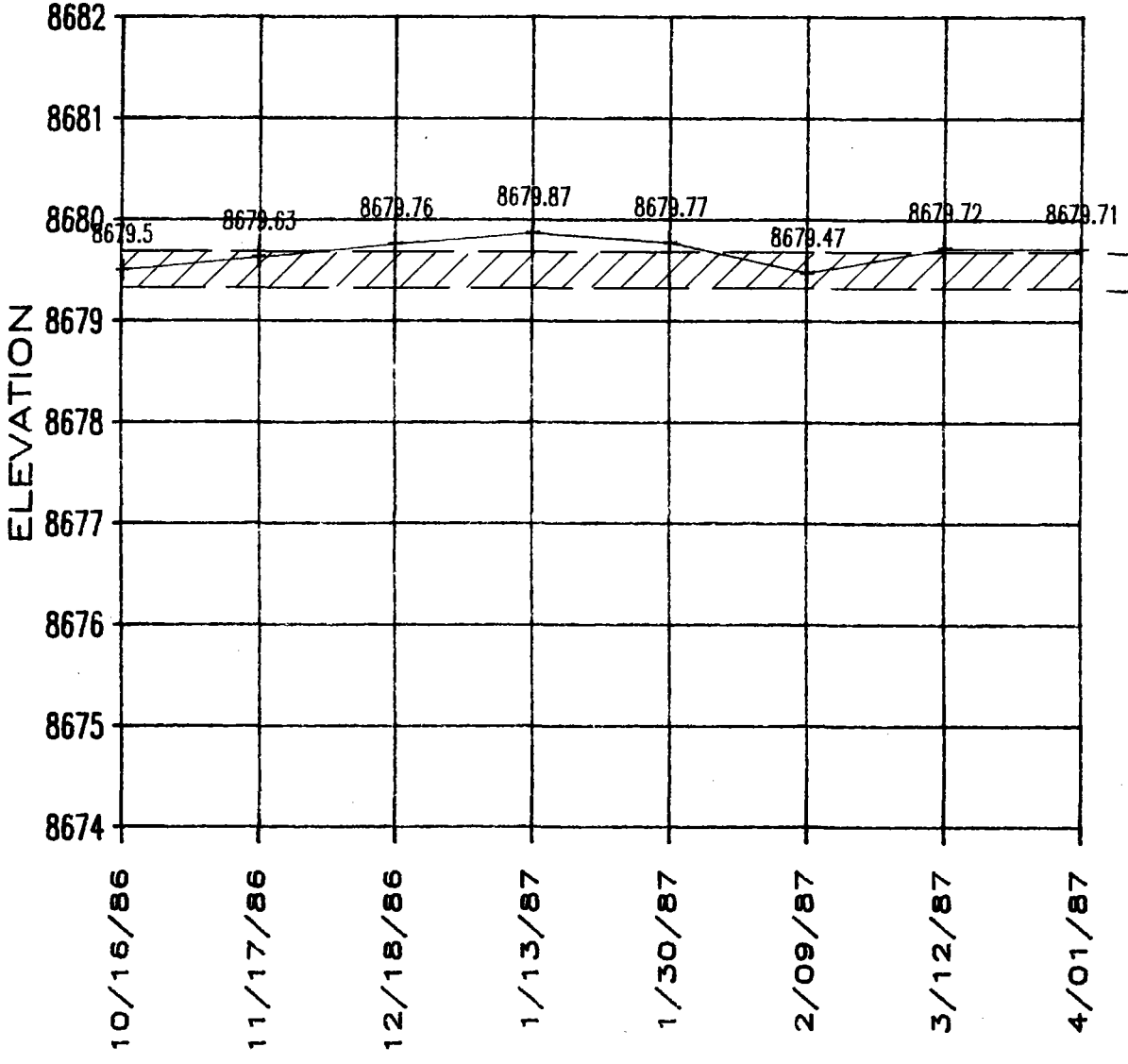
ACCURACY RANGE
1/20,000

SCALE: 1" = 0.37'

NOTE:
NET HORIZONTAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
S 8° 03' 39" W 1.17 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#4 CHANGE
10-16-86 TO 4-1-87



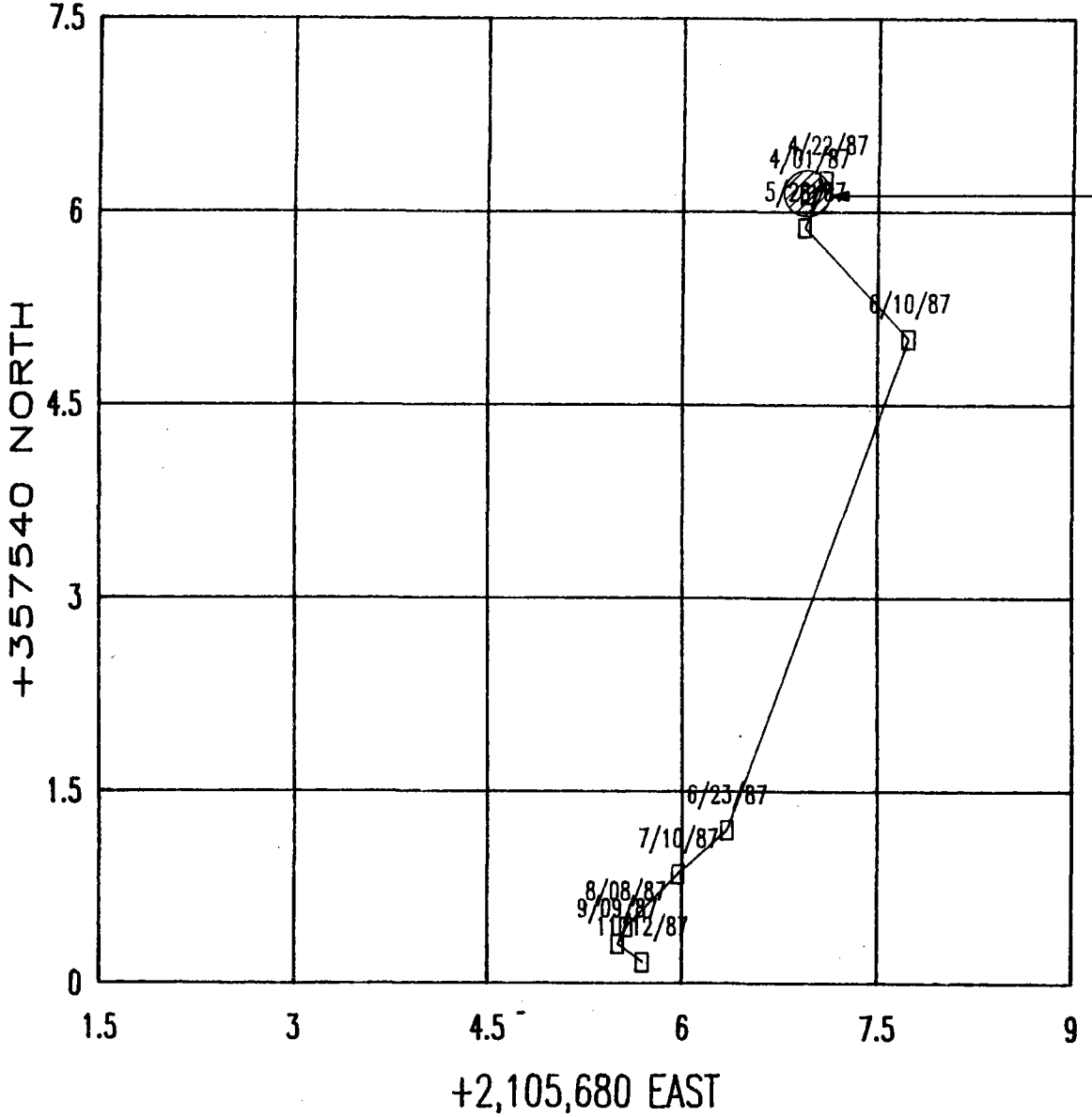
ACCURACY RANGE
1/20,000

SCALE: 1" = 1.75'

NOTE:
NET VERTICAL MOVEMENT
OCT. 16, 1986 TO APR. 1, 1987
0.21 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PLAN VIEW OF POINT 4
4-1-87 TO 9-9-87



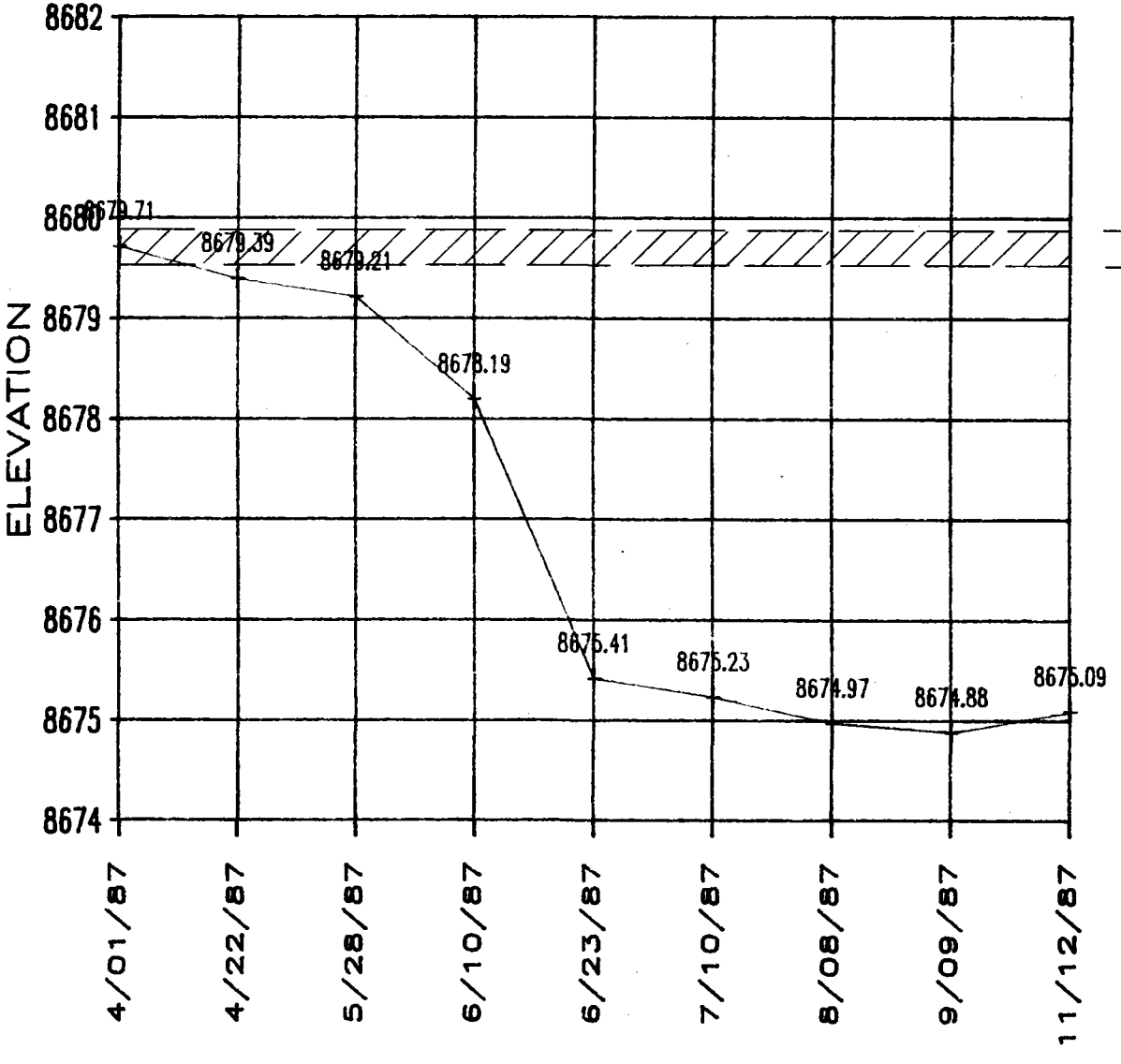
ACCURACY RANGE
1/20,000

SCALE: 1" = 1.40'

NOTE:
NET HORIZONTAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
S 14° 03' 34" W 6.01 FT.

NEWBERRY CANYON SUBSIDENCE MONITORING

PT#4 CHANGE
4-1-87 TO 9-9-87



ACCURACY RANGE
1/20,000

SCALE: 1" = 1.75'

NOTE:
NET VERTICAL MOVEMENT
APR. 1, 1987 TO SEPT. 9, 1987
4.83 FT.

APPENDIX D

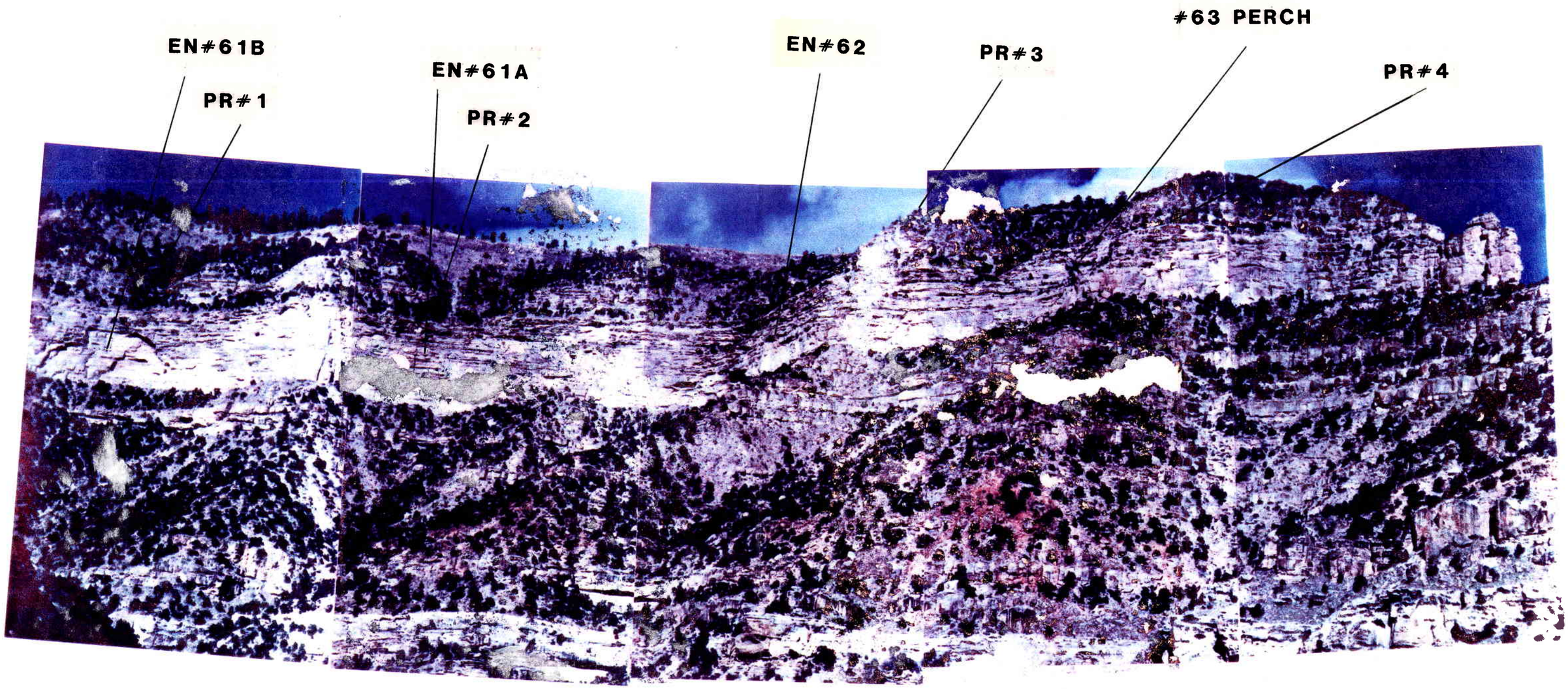
PHOTOGRAPHS

APPENDIX D
PHOTOGRAPHS INDEX

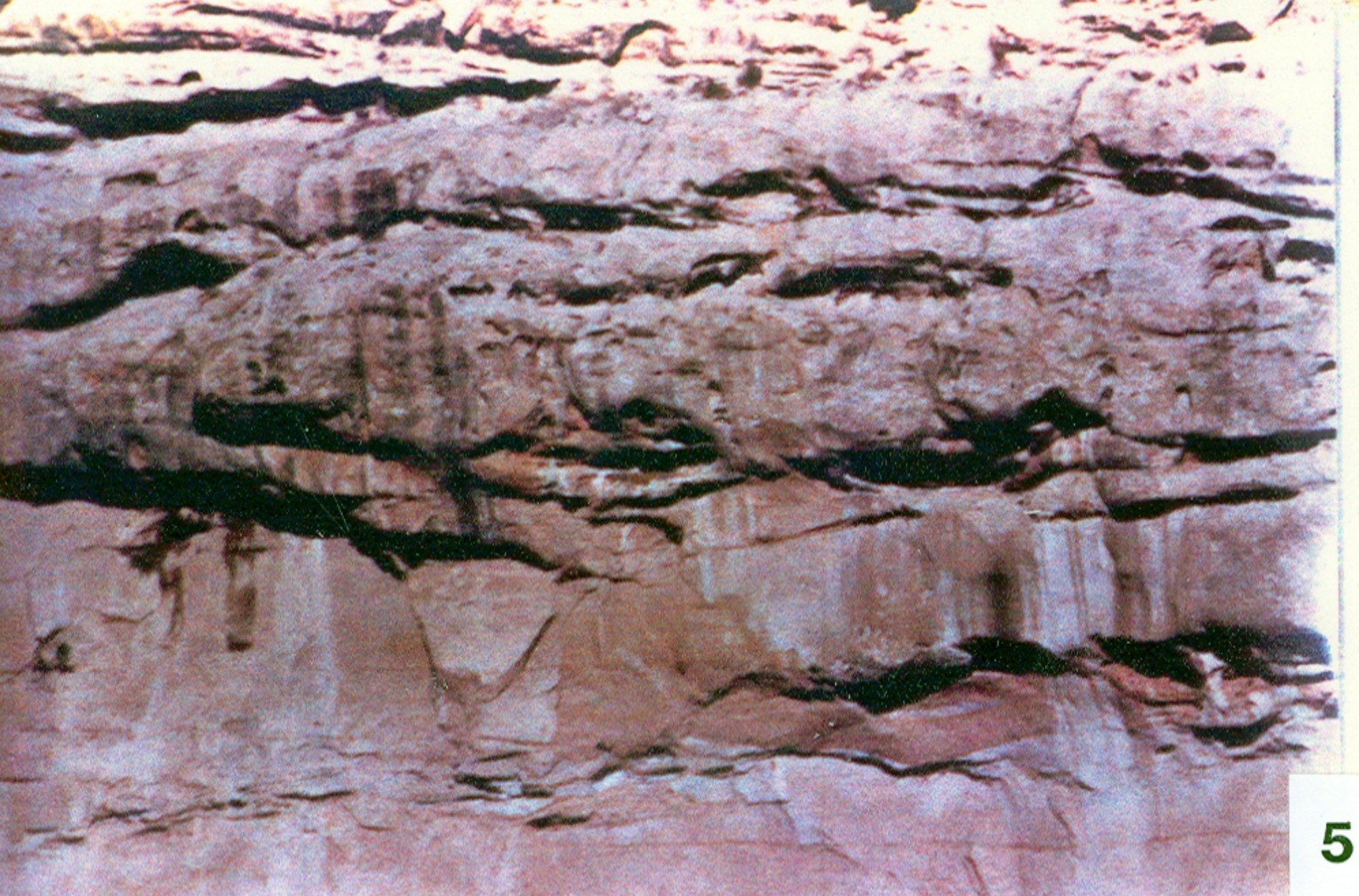
Photograph Number	Area	Subject
1	Newberry Canyon	Newberry Canyon, Sept. 1986
2	Newberry Canyon	Nest 61A
3	Newberry Canyon	Nest 61B
4	Newberry Canyon	Nest 61C
5	Newberry Canyon	Nest 62
6	Newberry Canyon	Perch 63
7	Newberry Canyon	South Ridge Perch
8	Newberry Canyon	South East Mountain Perch
9	Newberry Canyon	Newberry Canyon Control (NCC)
10	Newberry Canyon	Prism 1 (PR1)
11	Newberry Canyon	Prism 2 (PR2)
12	Newberry Canyon	Prism 3 (PR3)
13	Newberry Canyon	Prism 4 (PR4)
14	Newberry Canyon	Surface Cracks, Top of North Ridge (Looking East)
15	Newberry Canyon	Surface Cracks, Top of North Ridge (Looking West)
16	Newberry Canyon	Newberry Canyon, April, 1987
17	Newberry Canyon	Newberry Canyon, Sept., 1987
18	Newberry Canyon Visual Impact	State Road 10 Northeast of Castle Dale
19	Newberry Canyon Visual Impact	State Road 29, East of Haul Road Interchange (Route to Recreation Areas)
20	Newberry Canyon Visual Impact	Intersection of State Roads 10 and 29
21	Newberry Canyon Visual Impact	Northwest Orangeville, State Road 29

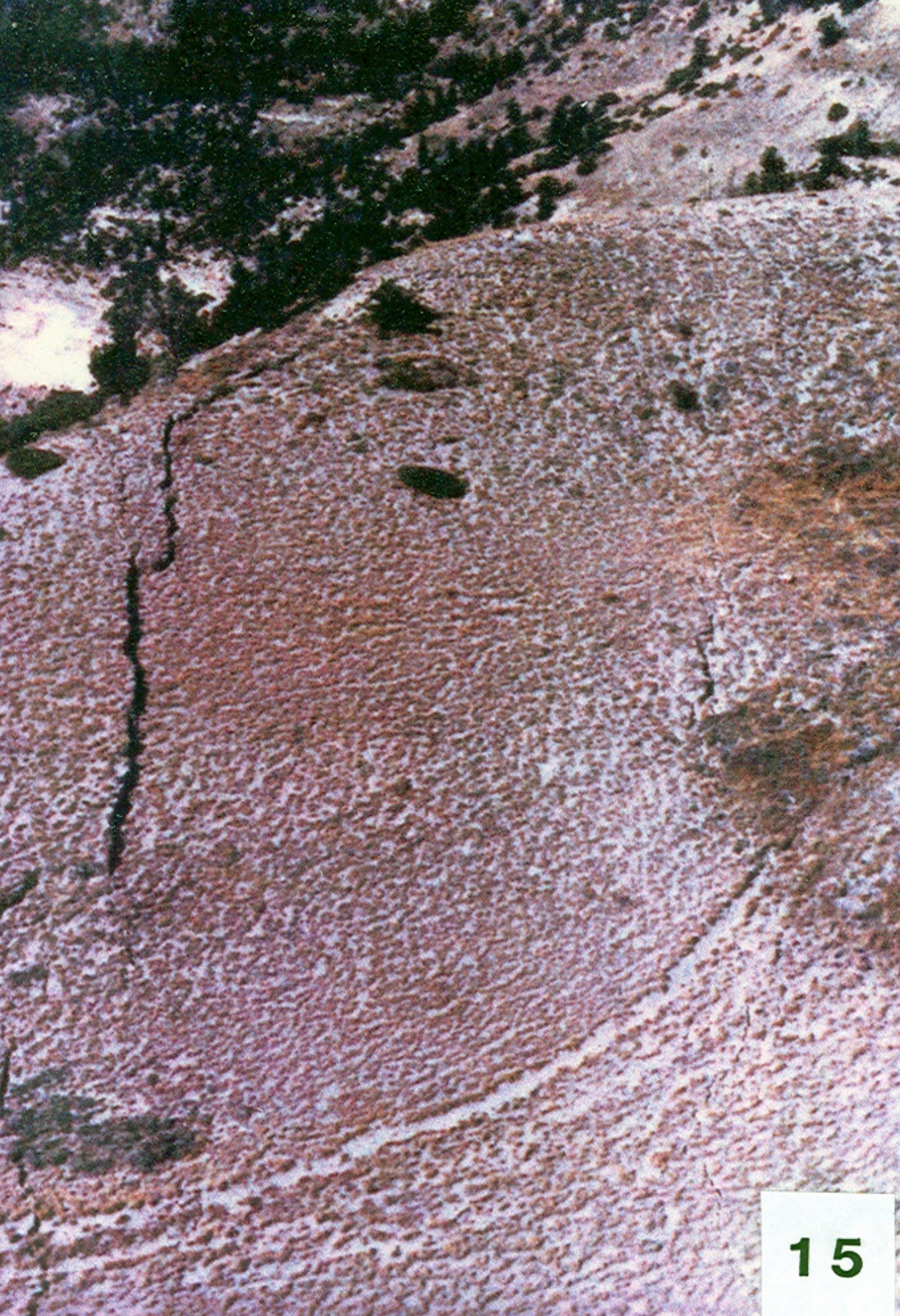
APPENDIX D
PHOTOGRAPHS INDEX

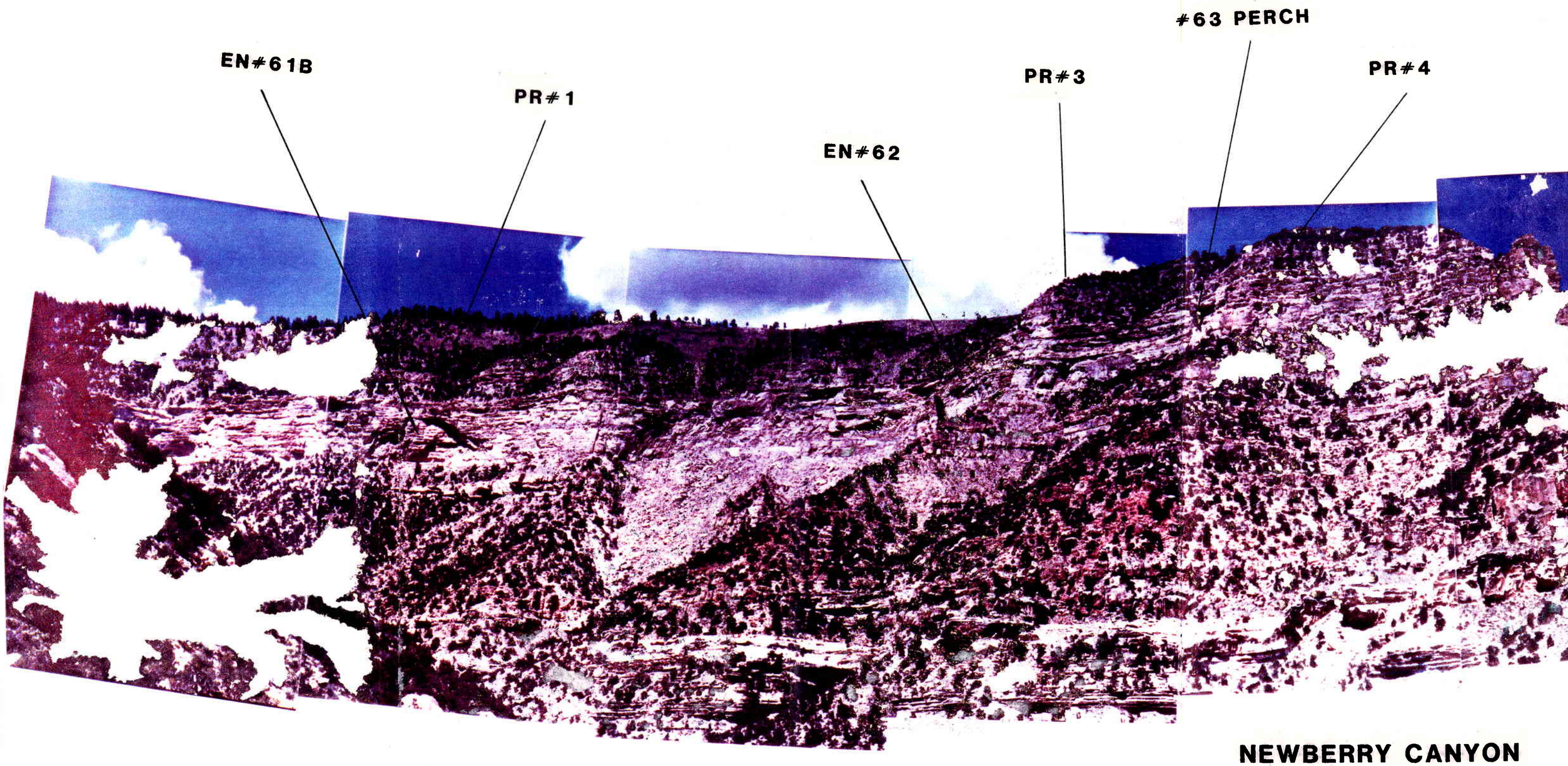
Photograph Number	Area	Subject
22	Newberry Canyon Visual Impact	Southeast Orangeville, State Road 57
23	Newberry Canyon Visual Impact	Haul Road (State Road 57) South of State Road 29 Interchange (Route to Recreation Areas)
24	Newberry Canyon Visual Impact	County Road, North of Deseret Terminal
25	Newberry Canyon Visual Impact	Northwest Castle Dale
26	Miller Canyon	Nests 100 to 97A
27	Miller Canyon	Stick Nest to 97B
28	Miller Canyon	Nests 100 and 98 Cluster
29	Miller Canyon	Nests, 98 Cluster
30	Miller Canyon	Stick Nest
31	Miller Canyon	Nest 97A
32	Miller Canyon	Nest 97B



NEWBERRY CANYON
SEPTEMBER 1986

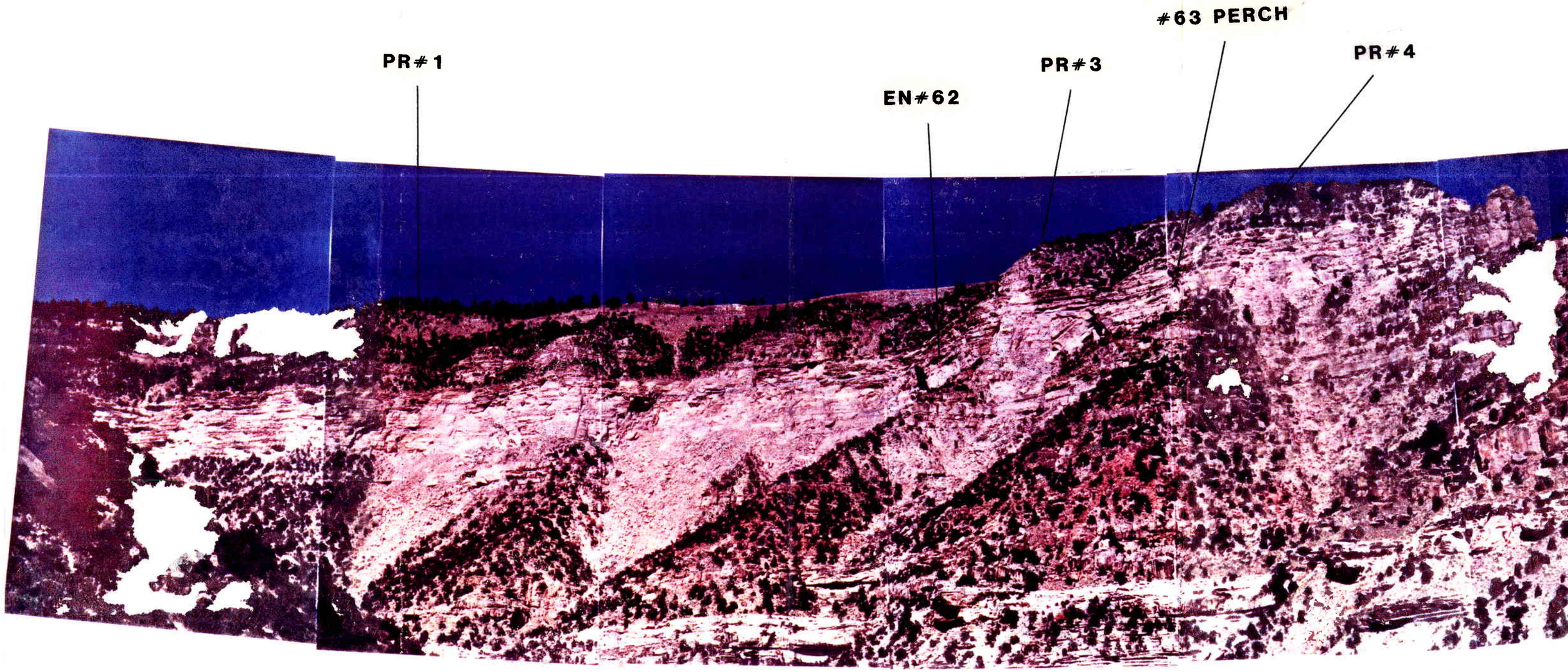






NEWBERRY CANYON

APRIL 1987



NEWBERRY CANYON

SEPTEMBER 1987