DOE/WIPP 06-3177
Volume 1

Waste Isolation Pilot Plant

Geotechnical Analysis Report For July 2004 – June 2005

April 2006

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FOREWORD AND ACKNOWLEDGMENTS

This report contains an assessment of the geotechnical status of the Waste Isolation Pilot Plant (WIPP). During the excavation of the principal underground access and experimental areas, the status was reported quarterly. Since 1987, when the initial construction phase was completed, reports have been published annually. This report presents and analyzes data collected from July 1, 2004, to June 30, 2005.

This Geotechnical Analysis Report (GAR) was written to meet the needs of several audiences. This report satisfies the requirements presented in the WIPP Hazardous Waste Permit[1] and the Certification of Compliance[2] with Subparts B and C, Title 40 *Code of Federal Regulations* (CFR) Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes." It focuses on the geotechnical performance of the various components of the underground facility, including the shafts, shaft stations, access drifts, and waste disposal areas. The results of investigations of excavation effects and other geotechnical studies are also included.

The report compares the geotechnical performance of the repository to the design criteria. It describes the techniques that were used to acquire the data and the performance history of the instruments. The depth and breadth of the evaluation of the different components of the underground facility vary according to the types and quantities of data available and the complexity of the recorded geotechnical responses. Graphic documentation of data and tabular documentation of instrument history can be provided upon request.

This GAR was prepared by Washington TRU Solutions LLC (WTS) for the U.S. Department of Energy (DOE), Carlsbad Field Office (CBFO), in Carlsbad, New Mexico. Work was supported by the DOE under Contract No. DE-AC29-01AL66444.

[1] New Mexico Environment Department (NMED), 1999, "Waste Isolation Pilot Plant Hazardous Waste Facility Permit," NM4890139088-TSDF, Santa Fe, New Mexico
[2] Federal Register, Vol. 63, No. 95, pp. 27354, May 18, 1998

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ACRONYMS AND ABBREVIATIONS

bp	before present
bsc	below shaft collar
CAO	Carlsbad Area Office
CBFO	Carlsbad Field Office
CFR	Code of Federal Regulations
CH	contact-handled
cm	centimeter(s)
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GAR	Geotechnical Analysis Report
GIS	geomechanical instrumentation system
HWFP	Hazardous Waste Facility Permit
in.	inch(es)
km	kilometer(s)
kPa	kilopascal(s)
kVA	kilovolt ampere(s)
LANL	Los Alamos National Laboratory
lb	pound(s)
m	meter(s)
Ma	million years
MB	marker bed
μin	10^{-6} inch(es)
NMED	New Mexico Environment Department
OMB	orange marker bed
psi	pound(s) per square inch
RH	remote-handled

SDD	system design description
SNL	Sandia National Laboratories
SPDV	Site and Preliminary Design Validation
TRU	transuranic
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions LLC
yr(s)	year(s)

1.0 INTRODUCTION

This Geotechnical Analysis Report (GAR) presents and interprets the geotechnical data from the underground excavations at the Waste Isolation Pilot Plant (WIPP). The data, which are obtained as part of a regular monitoring program, are used to characterize conditions, to compare actual performance to the design assumptions, and to evaluate and forecast the performance of the underground excavations.

GARs have been available to the public since 1983. During the Site and Preliminary Design Validation (SPDV) Program, the architect/engineer for the project produced these reports quarterly to document the geomechanical performance during and immediately after early excavations of the underground facility. Since the completion of the construction phase of the project in 1987, the management and operating contractor for the facility has prepared these reports annually. This report describes the performance and condition of selected areas from July 1, 2004, to June 30, 2005. It is divided into nine chapters.

Chapter 1 provides background information on WIPP, its mission, and the purpose and scope of the Geomechanical Monitoring Program. Chapter 2 describes the local and regional geology of the WIPP site. Chapters 3 and 4 describe the geomechanical instrumentation in the shafts and shaft stations, present the data collected by that instrumentation, and provide interpretation of these data. Chapters 5 and 6 present the results of geomechanical monitoring in the two main portions of the WIPP underground (the access drifts and the waste disposal area). Chapter 7 discusses the results of the Geoscience Program, which include fracture mapping and borehole observations. Chapter 8 summarizes the results of the geomechanical monitoring and compares the current excavation performance to the design requirements. Chapter 9 lists the references and bibliography.

1.1 Location and Description

WIPP is located in southeastern New Mexico, 26 miles (42 kilometers [km]) east of Carlsbad (Figure 1-1). The surface facilities were built on the flat to gently rolling terrain that is characteristic of the Los Medaños area. The underground facility is being excavated approximately 2,150 feet [ft] (655 meters [m]) beneath the surface in the Salado Formation. Figure 1-2 shows a plan view of the underground configuration of WIPP as of June 30, 2005.

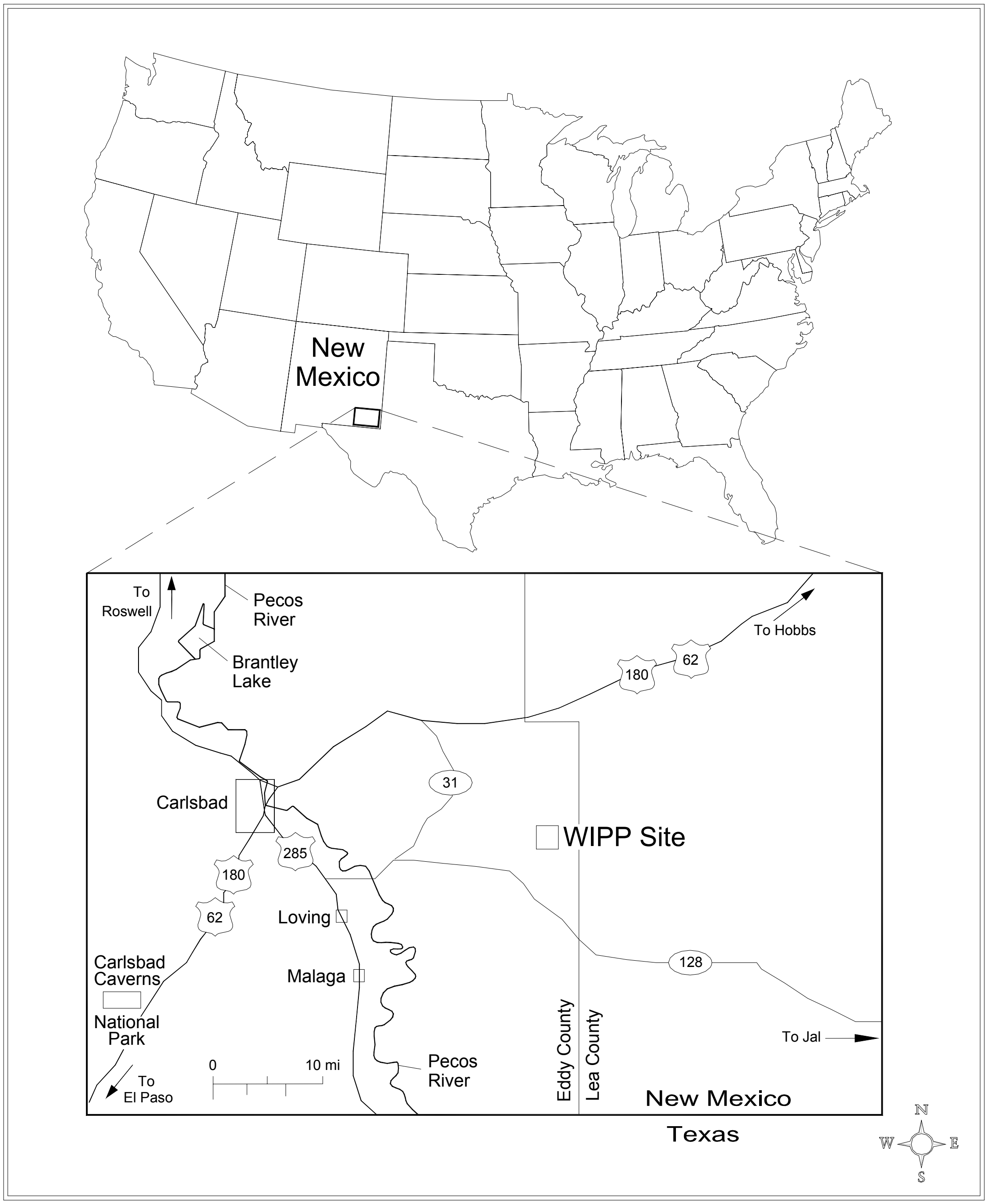

Figure 1-1 – WIPP Location

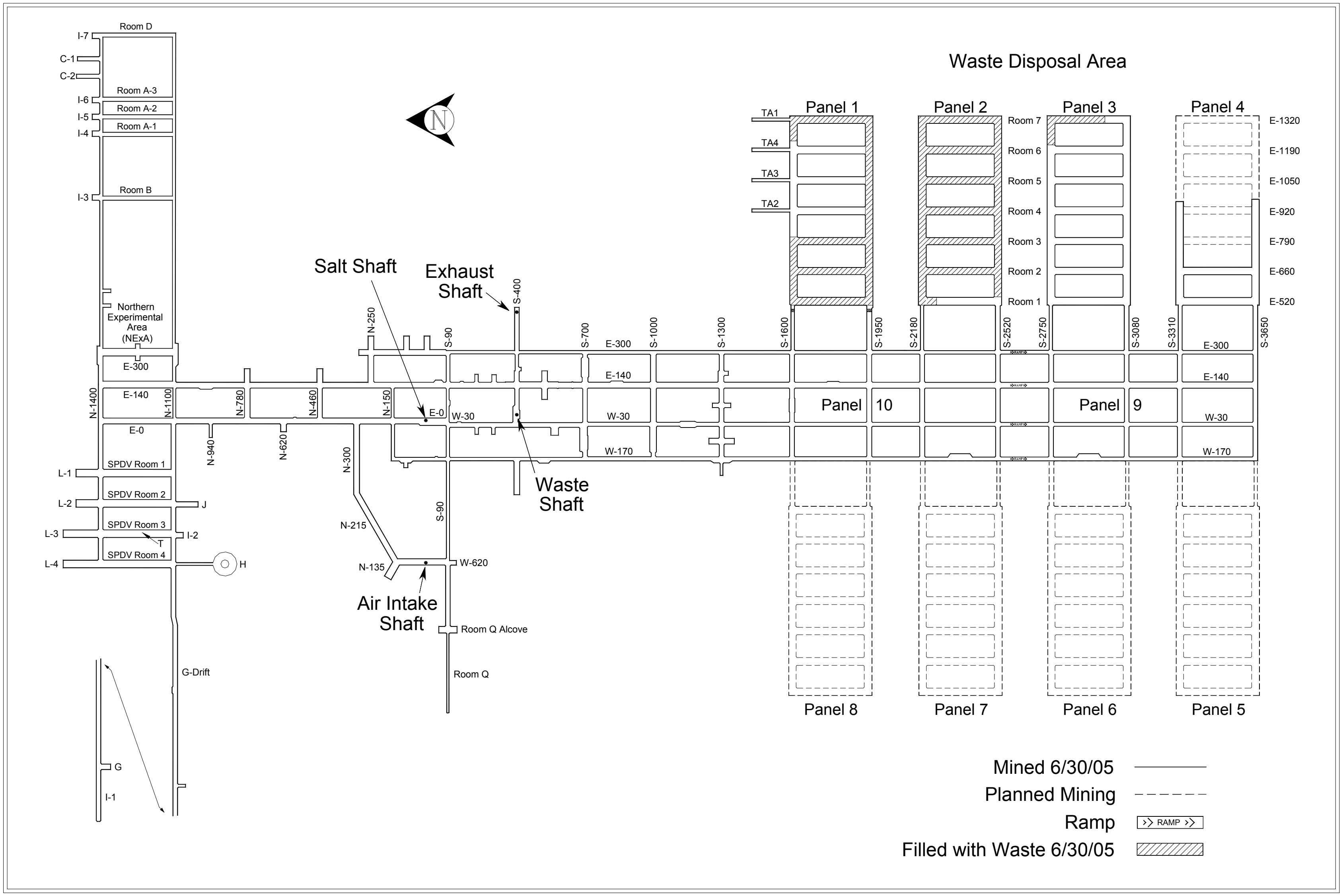

Figure 1-2 – Underground Mining and Waste Disposal Configuration as of 6/30/05

1.2 Mission

In 1979 Congress authorized WIPP (Public Law 96-164, National Security and Military Applications of Nuclear Energy Authorization Act of 1980) to provide ". . . a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission." To fulfill this mission, the U.S. Department of Energy (DOE) constructed a full-scale facility to demonstrate both technical and operational principles of the permanent disposal of transuranic (TRU) and TRU mixed wastes. Technical aspects are those concerned with the design, construction, and performance of the subsurface excavations. Operational aspects refer to the receiving, handling, and emplacement of TRU wastes in the facility. The facility was first used for in situ studies and experiments without the use of radioactive waste. WIPP now receives, handles, and permanently disposes of TRU waste and TRU mixed waste.

1.3 Development Status

To fulfill its mission, the DOE developed WIPP in a phased manner. The goal of the SPDV phase, begun in 1980, was to characterize the site and obtain in situ geotechnical data from underground excavations to determine whether site characteristics and the in situ conditions were suitable for a permanent disposal facility. During this phase, the Salt Shaft, a ventilation shaft, a drift to the southernmost extent of the proposed waste disposal area, a four-room experimental panel, and access drifts were excavated. Surface-based geological and hydrological investigations were also conducted. The data obtained from the SPDV investigations were reported in the "Summary of the Results of the Evaluation of the WIPP Site and Preliminary Design Validation Program" (DOE, 1983).

Based upon the favorable results of the SPDV investigations, additional activities were initiated in 1983. These included the construction of surface structures, conversion of the ventilation shaft for use as the Waste Shaft, excavation of the Exhaust Shaft, development of additional access drifts to the waste disposal area, excavation of the Air Intake Shaft, and excavation of additional experimental rooms to support research and development activities. Geotechnical data acquired during this phase were used to evaluate the performance of the excavations in the context of established design criteria (DOE, 1984). Results of these evaluations were reported in Geotechnical Field Data Reports (DOE, 1985; DOE, 1986a) and were summarized in the Design Validation Final Report (DOE, 1986b).

The Design Validation Final Report concluded that the facility, including waste disposal areas, could be developed and operated to fulfill the long-term mission of WIPP (DOE, 1986b). However, some modifications to the reference design were proposed so that the requirements could be met for the anticipated life of the waste disposal rooms and the demonstration phase while the waste remained retrievable. The information from these studies validated the design of underground openings to safely accommodate the permanent disposal of waste under routine operating conditions.

Panel 1 mining began in 1986 and was completed in 1988. Panel 1 was intended to receive waste for an initial operations demonstration and pilot plant phase that was scheduled to start in October 1988. However, the demonstration and pilot plant phase was not conducted because waste disposal operations had to wait until permits were acquired.

In October 1996, the DOE submitted to the U.S. Environmental Protection Agency (EPA) a compliance certification application in accordance with 40 CFR Parts 191 and 194, which addressed the long-term (10,000-year) performance criteria for the disposal system. On May 18, 1998, the EPA published the final certification that allowed for the receipt of TRU waste at WIPP. Immediately before this certification, the DOE Carlsbad Area Office (CAO) completed the WIPP Operational Readiness Review, which was required before the start-up of a nuclear waste repository. As a result of the review, the CAO notified the Energy Secretary on April 1, 1998, that WIPP was operationally ready to receive waste. On March 26, 1999, the first shipment of TRU waste was received from Los Alamos National Laboratory (LANL). By the end of June 2005, additional generator sites, including Savannah River Site, Hanford Site, Rocky Flats Environmental Technology Site, Idaho National Engineering and Environmental Laboratory, and the Nevada Test Site, had shipped waste to WIPP.

Waste disposal operations in Panel 1 are complete, and closures were constructed in the panel entries. Mining of Panel 2 began in September 1999 and was completed in August 2000. Mining of Panel 3 began on January 2003 and was completed by the end of March 2004. As of June 30, 2005 Rooms 2 through 6 of Panel 2 were filled, and waste was being emplaced in Room 1, Panel 2, and Room 7, Panel 3. Mining of the south main drifts and the Panel 4 entry drifts was completed, and Room 1 was excavated to final dimensions.

1.4 Purpose and Scope of Geomechanical Monitoring Program

As specified in the WIPP HWFP (NMED, 1999), the purpose of the geomechanical monitoring program is to obtain in situ data to support the continuous assessment of the design for underground facilities.

Specifically, the program provides for:

- Early detection of conditions that could affect operational safety.
- Evaluation of disposal room closure that ensures adequate access.
- Guidance for design modifications and remedial actions.
- Data for interpreting the behavior of underground openings compared to the established design criteria.

Data taken by or input into the geomechanical instrumentation system (GIS) are evaluated and reported in this GAR. This annual report fulfills the requirements set forth in Section IV.F.1 and Attachment M2, Section M2-5b(2) of the WIPP Hazardous Waste Facility Permit (NMED, 1999), and 40 CFR §191.14, "Assurance Requirements," implemented through the certification criteria, 40 CFR Part 194.

The Geomechanical Monitoring Program generates the data for four of the compliance monitoring parameters:

- Creep closure and stresses
- Extent of deformation
- Initiation of brittle deformation
- Displacement of deformation features.

Convergence measurements and borehole extensometers provide data on salt creep closure induced by rock excavation. Data on the extent of deformation are generated through borehole extensometers and borehole observations. Fracture mapping of the excavation surface, as well as borehole observations are used to provide data on the initiation of brittle deformation. Displacement of deformation features in the underground facility is monitored by comparing the results of geologic mapping in newly mined areas to the expected stratigraphy.

The GIS provides data that are collected, processed, and stored for analysis. The following subsections briefly describe the major components of the GIS.

Instrumentation

Instrumentation installed for measuring the geomechanical response of the shafts, drifts, and other underground openings includes convergence points, convergence meters, extensometers, rock bolt load cells, pressure cells, strain gauges, piezometers, and joint meters. Table 1-1 lists a summary of the geomechanical instrumentation specifications.

Data Acquisition

The individual geomechanical instruments are read either manually, using portable devices, or remotely by electronically polling the stations from the surface in accordance with approved operating procedures. Remotely read instruments are connected to one of the underground data-loggers, and readings are collected by initiating the appropriate polling routine. Upon completion of a verification process, the data are transferred to a computer database. The manual readout devices are taken to the instrument locations underground. The data are recorded on data sheets and later entered into an electronic database, along with the remotely acquired data.

The underground data acquisition system consists of instruments, polling devices, and a communications network. Instruments are connected to polling devices that are installed in electrical enclosures near the instrument locations. Polling devices are connected by a data link to a surface computer.

Whether acquired manually or remotely, geomechanical data are entered into the database files of the GIS data processing system. The data processing system consists of computer programs that are used to enter, reduce, and transfer the data to permanent storage files. Additional routines allow access to these permanent storage files for numerical analysis, tabular reporting, and graphical plotting. Copies of the instrumentation database and data plots are available upon request[3].

[3] Instrumentation data and data plots are presented in "Geotechnical Analysis Report for July 2004-June 2005 Supporting Data." The document is available upon request from the National Technical Information Service. See the back side of this document's cover sheet for details and addresses.

Table 1-1 – Geomechanical Instrumentation System

Instrument Type	Measures	Range[a]	Resolution[a]
Sonic probe borehole extensometer	Cumulative deformation	0–2 in	0.001 in
Convergence points (tape extensometer)	Cumulative deformation	2–50 ft	0.001 in
Wire convergence meter	Cumulative deformation	0–3.5 ft	0.001 in
Embedded strain gauge	Cumulative strain	0–3000 µin/in	1 µin/in
Spot-welded strain gauge	Cumulative strain	0–2500 µin/in	1 µin/in
Rock bolt load cell	Load	0–50 tons	40 lb
Earth pressure cell	Pressure	0–1000 psi	1 psi
Piezometers	Fluid pressure	0–500 psi	0.5 psi
Joint meter	Cumulative deformation	0–4 in	0.001 in
Vibrating wire borehole extensometer	Cumulative deformation	0–4 in	0.001 in
Wire borehole extensometer	Cumulative deformation	0–20 in	0.001 in
Linear potentiometric borehole extensometer	Cumulative deformation	0–6 in	0.001 in

[a] Manual readout boxes for the instruments were manufactured to output measurements in English units. Range and resolution measurement units have not been converted to metric units. Measurements from these instruments have been converted for presentation elsewhere in this report.

Data Evaluation

Rounding and significant digits are used in the data tables of this document. The reference document is ASTM E 29–04, "Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specification."[4]

Closure measurements are acquired manually from convergence point anchors and remotely from convergence meters. The data are presented in plots as closure versus time. Closure rate data are calculated and presented as part of the data analysis.

Borehole extensometers provide relative displacement data from instrumented rods anchored at various depths in the rock strata. Displacement is measured relative to a fixed point. The deepest anchor is fixed in what is assumed to be undisturbed ground and is used as the reference point. Plots of displacement versus time for individual anchors relative to the reference point are presented. Typically, the plots show greater relative ground movement near the collar (i.e., the opening of the hole). Displacement rate data for the hole collar relative to the deepest anchor are presented in the data analysis.

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The annualized closure rate is calculated as follows:

$$rate(inches/year) = (cfi_2 - cfi_1)/(date_2 - date_1) \times 365.25\, days/year$$

$$where\; cfi = the\; change\; from\; the\; initial\; reading\; (inches)$$

$$cfi_1 = cfi\; reading\; closest\; to\; the\; beginning\; of\; the\; reporting\; period$$

$$cfi_2 = cfi\; reading\; closest\; to\; the\; end\; of\; the\; reporting\; period$$

Rock bolt load cells are used to determine bolt loading. Plots show load versus time for each instrumented bolt.

Earth pressure cells and strain gauges are used to determine the stresses and deformation in and around the shaft liners. Data are depicted in time-based plots.

Piezometers used to measure the gauge pressure of groundwater are installed in the shafts at varying elevations to monitor the hydraulic head acting on the shaft liners. Data are plotted as pressure versus time.

Joint meters, installed perpendicular to a crack, monitor the dilation of the crack with time. Data are presented as displacement versus time.

Data Errors

GIS data are processed through a comprehensive database management system. Whether acquired manually or remotely, GIS data are processed and permanently stored according to approved procedures. On occasion, erroneous readings can occur. There are several possible explanations for erroneous readings, including the following:

- The measuring device was misread.
- The reading was recorded incorrectly.
- The measuring device was not functioning within specifications.

When a reading is believed to be erroneous, an immediate evaluation of the previous reading is performed, and a second reading is collected. If the second reading falls in line with the instrument trend, the first reading is discarded and the second reading is entered in the database. If the second reading and subsequent readings remain out of the instrument trend, the ground conditions in the vicinity of the instrument are assessed to determine the reason for the discrepancy. In addition, the reading frequency may be increased. This process to correct erroneous readings is documented and filed for future reference.

2.0 GEOLOGY

This chapter provides a summary of the stratigraphy of the WIPP region and the site stratigraphy. Readers desiring further geologic information may consult the "Geological Characterization Report, WIPP Site, Southeastern New Mexico" (Powers et al., 1978). This report was developed as a source document on the geology of the WIPP site for individuals, groups, or agencies seeking basic information on geologic history, hydrology, geochemistry, or detailed information, such as physical and chemical properties of repository rocks. A more recent survey of WIPP stratigraphy is included in Holt and Powers (1990).

2.1 Regional Stratigraphy

The stratigraphy in the vicinity of the WIPP site includes rocks of Permian (295 to 250 million years ago [Ma]), Triassic (250 to 203 Ma), and Quaternary (1.75 Ma to present) ages. The descriptions of formations provided in this section are given in order of deposition (oldest to youngest), beginning with the Castile Formation (Figure 2-1).

Permian

The Permian system in the United States is divided into four series. The last of these, the Ochoan Series, contains the host rock in which the WIPP facility is located. The Ochoan Series is of mostly marine origin and consists of four formations: three evaporite formations (the Castile, the Salado, and the Rustler) and one redbeds formation (the Dewey Lake). The Ochoan evaporites overlie marine limestones and sandstones of the Guadalupian Series (Delaware Mountain Group). The younger redbeds represent a transition from the lower evaporite deposition to fluvial deposition on a broad, low-relief, fluvial plain. The Permian rocks are overlain by fluvial deposits of the Triassic and Quaternary periods.

2.1.1.1 Castile Formation

The Castile Formation, lowermost of the four Ochoan formations, is approximately 1,250 ft (380 m) thick in the WIPP vicinity. Lithologically, the Castile is the least complex of the evaporite formations and is composed chiefly of interbedded anhydrite and halite, with limestone present in minor amounts.

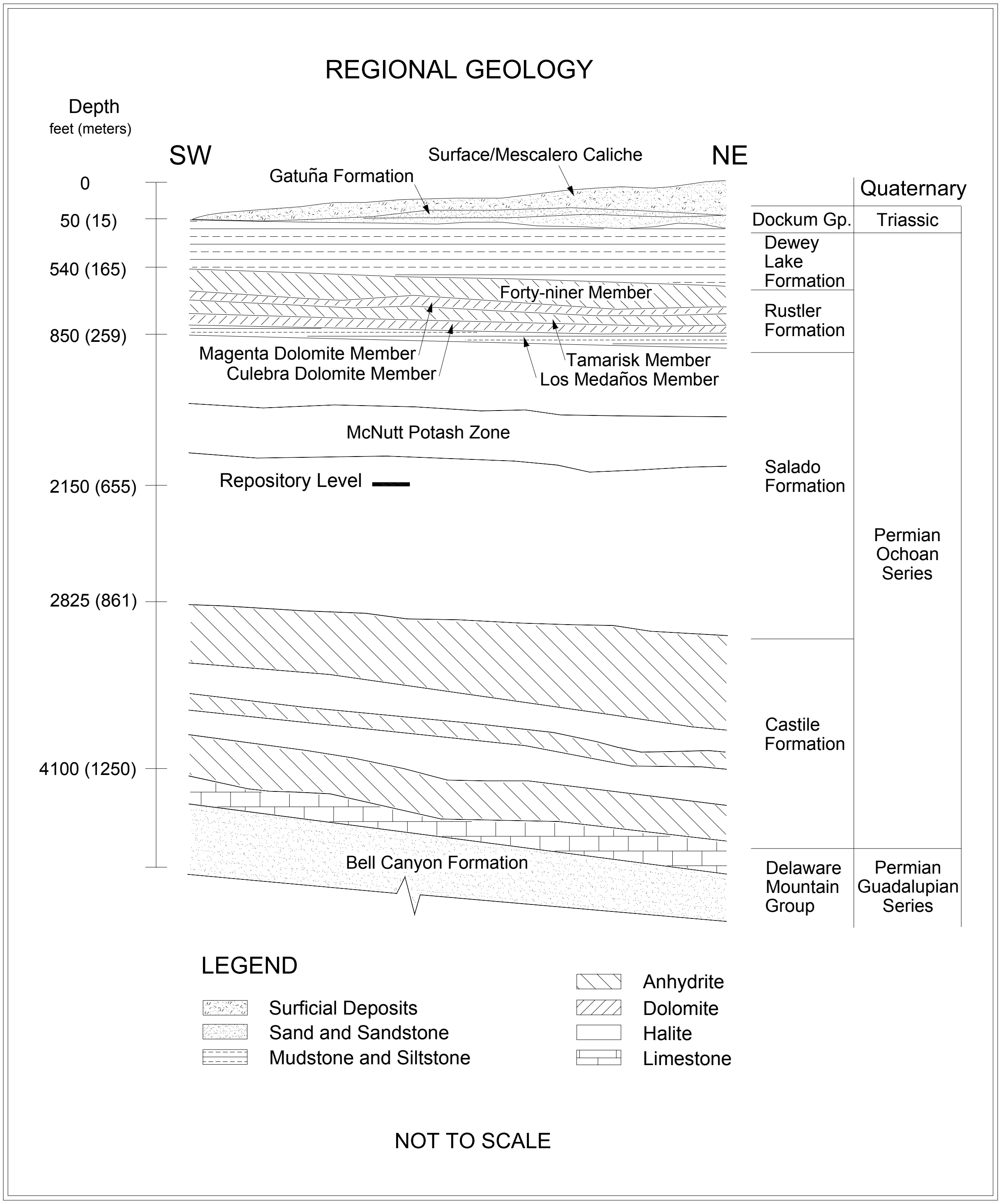

Figure 2-1 – Regional Geology

2.1.1.2 Salado Formation

The Salado Formation comprises nearly 2,000 ft (610 m) evaporites, primarily halite. The formation is subdivided into three informal members: the unnamed lower member, the McNutt potash zone, and the unnamed upper member. Each member contains similar amounts of halite, anhydrite, and polyhalite and is differentiated on the basis of soluble potassium- and magnesium-bearing minerals. The WIPP disposal horizon is located within the unnamed lower member, 2,150 ft (655 m) below the surface.

2.1.1.3 Rustler Formation

The Rustler Formation is subdivided into five members, starting from its base: the Los Medaños Member, the Culebra Dolomite Member, the Tamarisk Member, the Magenta Dolomite Member, and the Forty-niner Member.

In the vicinity of the WIPP site, the Rustler is approximately 310 ft (95 m) thick and thickens to the east. The lower portion (Los Medaños Member) contains primarily fine sandstone to mudstone with lesser amounts of anhydrite, polyhalite, and halite. Bedded and burrowed siliciclastic sedimentary rocks with cross-bedding and fossil remains signify the transition from the strongly evaporitic environments of the Salado to the brackish lagoonal environments of the Rustler (Holt and Powers, 1990).

The upper portion of the Rustler contains interbeds of anhydrite, dolomite, and mudstone. The Culebra Dolomite member is generally brown, finely crystalline and locally argillaceous. The Culebra contains rare to abundant vugs with variable gypsum and anhydrite filling and is the most transmissive hydrologic unit within the Rustler. The Tamarisk Member consists of lower and upper sulfate units separated by a unit that varies laterally from mudstone to mainly halite. The Magenta Dolomite Member is a gypsiferous dolomite with abundant primary sedimentary structures and well-developed algal features. The Forty-niner Member consists of lower and upper sulfate units separated by a mudstone that displays sedimentary features and bedding. East of the site area, halite correlates with the mudstone. The Culebra and Magenta Dolomite members are persistent and serve as important marker units.

2.1.1.4 Dewey Lake Redbeds

The Dewey Lake Redbeds are the uppermost of the Ochoan Series formations. Within the series, the Dewey Lake represents a transition from the lower marine evaporite deposition to fluvial deposition on a broad, low-relief, fluvial plain. The redbeds, approximately 475 ft (145 m) thick, consist of predominantly reddish-brown interbedded fine-grained sandstone, siltstone, and claystone. The formation is differentiated from other formations by its lithology and distinctive color (both of which are remarkably uniform), and sedimentary structures, including horizontal- and cross-laminae and ripple marks. The redbeds also contain locally abundant greenish-gray reduction spots and gypsum-filled fractures. The formation thickens from west to east due to eastward dips and erosion to the west.

Triassic

The only Triassic rocks present in the WIPP region belong to the Dockum Group.

2.1.1.5 Dockum Group

The Dockum Group consists of fine-grained floodplain sediments and coarse alluvial debris of the Triassic age. At the WIPP site, the Dockum Group pinches out near the center of the site and thickens eastward as an erosional wedge. Local subdivisions of the Dockum Group are the Santa Rosa Sandstone and the Chinle Formation; however, only the Santa Rosa occurs in the vicinity of the site. The Santa Rosa consists primarily of poorly sorted sandstone with conglomerate lenses and thin mudstone partings and contains impressions and remnants of fossils. These rocks have more variegated hues than the underlying uniformly colored Dewey Lake.

Quaternary

Quaternary Period deposits include the Gatuña Formation, Mescalero Caliche, and surficial sediments.

2.1.1.6 Gatuña Formation, Mescalero Caliche, and Surficial Sediments

The Gatuña Formation (ranging in age from approximately 1.3 Ma to 600,000 years before present [bp] [Powers and Holt, 1993]) is a stream-laid deposit overlying the Dockum Group in the WIPP vicinity. At the site center the formation consists of approximately 13 ft (4 m) of poorly consolidated sand, gravel, and silty clay. The Gatuña Formation is light red and mottled with dark stains. The unit contains abundant calcium carbonate, but is poorly cemented. Sedimentary structures are abundant (Powers and Holt, 1993, 1995).

The Mescalero Caliche (approximately 500,000 years bp) is approximately 4 ft (1.2 m) thick in the WIPP vicinity. The Mescalero is a hard, resistant soil horizon that lies beneath a cover of wind-blown sand. The horizon is petrocalcic, or very strongly cemented with calcium carbonate. Petrocalcic horizons form slowly beneath a stable landscape at the average depth of infiltration of soil moisture and indicate stability and integrity of the land surface. Many of the surface buildings at WIPP are founded on top of the Mescalero Caliche.

Surficial sediments include sandy soils developed from eolian material and active dune areas. The Berino Series (a soil type) covers about 50 percent of the site and consists of deep sandy soils that developed from wind-worked material of mixed origin. Based on sample analyses, the Berino soil from the WIPP site formed 330,000 ± 75,000 years ago.

2.2 Underground Facility Stratigraphy

The WIPP disposal horizon lies near the midpoint of the Salado Formation. The Salado was deposited in a shallow saline lagoon environment, which progressed through numerous inundation and desiccation cycles that are reflected in the formation. An "ideal" cycle progresses upward as follows: a basal layer consisting predominantly of claystone, followed by a layer of sulfate, which is in turn followed by a layer of halite. The entire sequence is capped by a bed of argillaceous (clay-rich) halite accumulated during a period of mainly subaerial exposure.

A regional system used for numbering the more significant sulfate beds within the Salado designates these beds as marker beds (MB), counted from MB100 near the top of the formation to MB144 near the base. The repository is located between MB138 and MB139 (Figure 2-2) within a sequence of laterally continuous depositional cycles as described above. Within this sequence, layers of clay and anhydrite that are locally designated (as shown) can have a significant impact on the geomechanical performance of the excavations. Clay layers provide surfaces along which slip and separation can occur, whereas anhydrite acts as a brittle unit that does not deform plastically.

In the vicinity of the WIPP facility, the stratigraphy is fairly continuous and uniform. Beds generally dip towards the south-southeast at a slope of approximately 3 percent.

Disposal Horizon Stratigraphy of Panels 1, 2, 7, and 8

This disposal horizon contains Panels 1, 2, 7, and 8, all the shaft areas, the shop areas, the SPDV areas (which are now closed), and all the access drifts to S-2620 (the four main entries that extend south rise in a ramp that starts at S-2620 and ends at S-2740). Panels 7 and 8 have not yet been excavated.

Most underground excavations are located within this disposal horizon (see Figure 2-2). In this horizon, the Orange Marker Bed (OMB) lies near the middle of the rib, i.e., the excavation wall. The OMB is a laterally consistent unit of moderate to light reddish-orange halite about 6 in (15 centimeters [cm]) thick that is used as a point of reference during excavation.

MB139 lies approximately 5 ft (1.5 m) below the excavation floor. MB139 is a 20-to-32 in (50-to-80 cm) thick layer of polyhalitic anhydrite. The top of the anhydrite undulates up to 15 in (38 cm), while the bottom is sub-horizontal and is underlain by clay "E." Above MB139 is a unit of halite that terminates at the base of the OMB. Within this unit, polyhalite is locally abundant and decreases upward, while argillaceous material increases upward.

Above the OMB, a thin sequence of argillaceous halite gives way to a thick sequence of clear halite that becomes increasingly argillaceous upward and is capped by clay "F." Clay "F" occurs as a thin layer occasionally interrupted by partings and breaks and is readily visible in the upper ribs of disposal horizon excavations.

Above clay "F," another sequence of halite begins that, as in lower sequences, becomes increasingly argillaceous upward. This sequence terminates at the clay "G"/Anhydrite "b" interface, approximately 6.5 ft (2 m) above the roof of most disposal horizon excavations, forming a roof beam that typically acts as a unit. The roof of some disposal horizon excavations (e.g., East 140 drift between S-1000 and 1950) has been excavated to the upper contact of Anhydrite "b." In this case, a roof beam is formed by the next depositional sequence beginning with Anhydrite "b" and progressing upward to the clay "H"/Anhydrite "a" interface, approximately 6.5 ft (2 m) above the upper contact of Anhydrite "b."

Disposal Horizon Stratigraphy of Panels 3, 4, 5, and 6

This disposal horizon contains Panels 3, 4, 5, and 6, and all the access drifts south of S-2740. As is the case with the other disposal horizon, some panels (5 and 6) have not yet been excavated. The rise in floor elevation from S-2620 to S-2740 is approximately 6 ft.

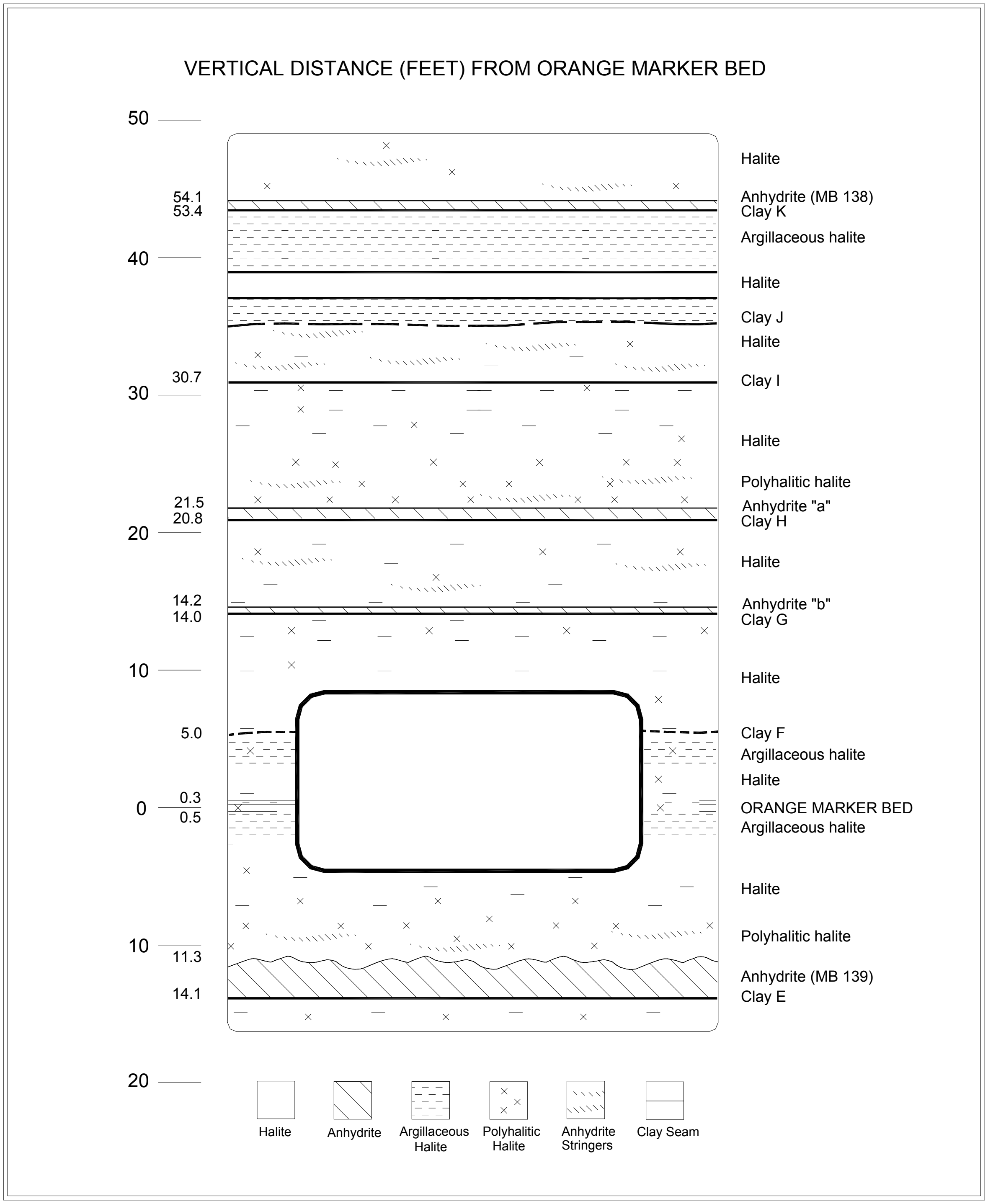

Figure 2-2 – Repository Level Stratigraphy of Panels 1, 2, 7, and 8

In this horizon (see Figure 2-3), the OMB lies at or below the floor. MB139 lies about 12 ft (3.7 m) below the floor. This sequence terminates at the clay "G"/Anhydrite "b" interface. The roof is immediately above Anhydrite "b." Clay "G"/Anhydrite "b" is used as the mining reference during excavation of this disposal horizon.

Northeast Area Stratigraphy

All of the Northeast Area, a former experimental area, is now deactivated and closed to access. These excavations lie at a higher stratigraphic level than the disposal excavations. Floors are at Anhydrite "b." As in the lower units, the halite intervals between the clay seams/anhydrite beds contain relatively pure halite that becomes increasingly argillaceous upward. Above clay "I," two more halite intervals complete the underground facility stratigraphy. Clay "J," at the top of the first of these intervals, may occur as a distinct seam or merely an argillaceous zone. Clay "K" tops the second interval and is overlain by anhydrite MB138.

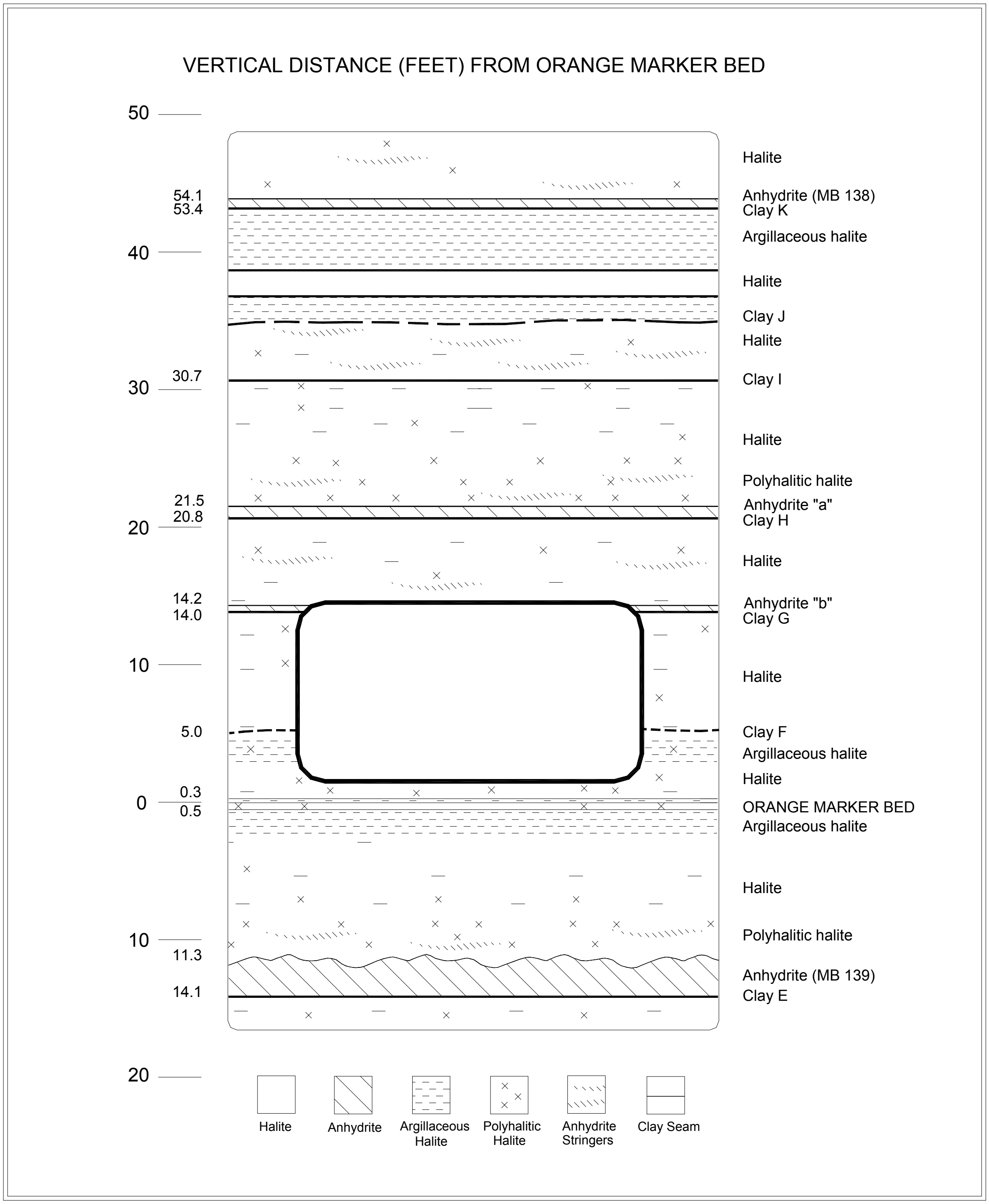

Figure 2-3 – Repository Level Stratigraphy of Panels 3, 4, 5, and 6

PERFORMANCE OF SHAFTS AND KEYS

Four shafts connect the surface with the WIPP underground. These shafts are: the Salt Shaft, which is primarily used for removing excavated salt from the underground; the Waste Shaft, which is the primary shaft for transporting personnel and materials and is used for transporting TRU waste to the underground; the Exhaust Shaft, which is used to exhaust the ventilation air from the underground; and the Air Intake Shaft, which is the primary source of fresh air ventilation to the underground. This chapter describes the geomechanical performance of these shafts.

Although through the years much of the shaft instrumentation has failed, there are no plans to replace failed instrumentation installed in any of the shafts. The project currently has a good understanding of the expected movements in the shafts. The monitoring results, up to the point of instrument failure, did not indicate any unusual shaft movements or displacements. Continued periodic visual inspections confirm the expected shaft performance and provide necessary observations to evaluate shaft performance. It is anticipated that replacement of the failed instrumentation will not provide significant additional information.

2.3 Salt Shaft

The first construction activity undertaken during the SPDV Program was the excavation of the Exploratory Shaft. This shaft was subsequently referred to as the Construction and Salt Shaft and is currently designated the Salt Shaft (see Figure 1-2). The shaft was drilled from July 4 to October 24, 1981, and geologic mapping was conducted in the spring of 1982 (DOE, 1983). Figure 3-1 presents the stratigraphy at the Salt Shaft.

The Salt Shaft is lined with steel casing and has a 10-ft (3-m) inside diameter from the ground surface to a depth of 846 ft (258 m). The steel liner has a thickness of 0.62 in (1.6 cm) at the top, increasing with depth to a thickness of 1.5 in (3.8 cm), including external stiffener rings at the key. Cement grout is placed between the liner and rock face. The 10-ft (3-m) diameter extends through the concrete shaft key to a depth of 880 ft (268 m). The shaft key is a 37.5-ft (11.4-m) long, reinforced-concrete structure that begins 3.5 ft (1.07 m) above the bottom of the steel liner. The shaft from the key to the bottom of the shaft, at a depth of 2,298 ft (700 m), has a nominal diameter of 12 ft (4 m).

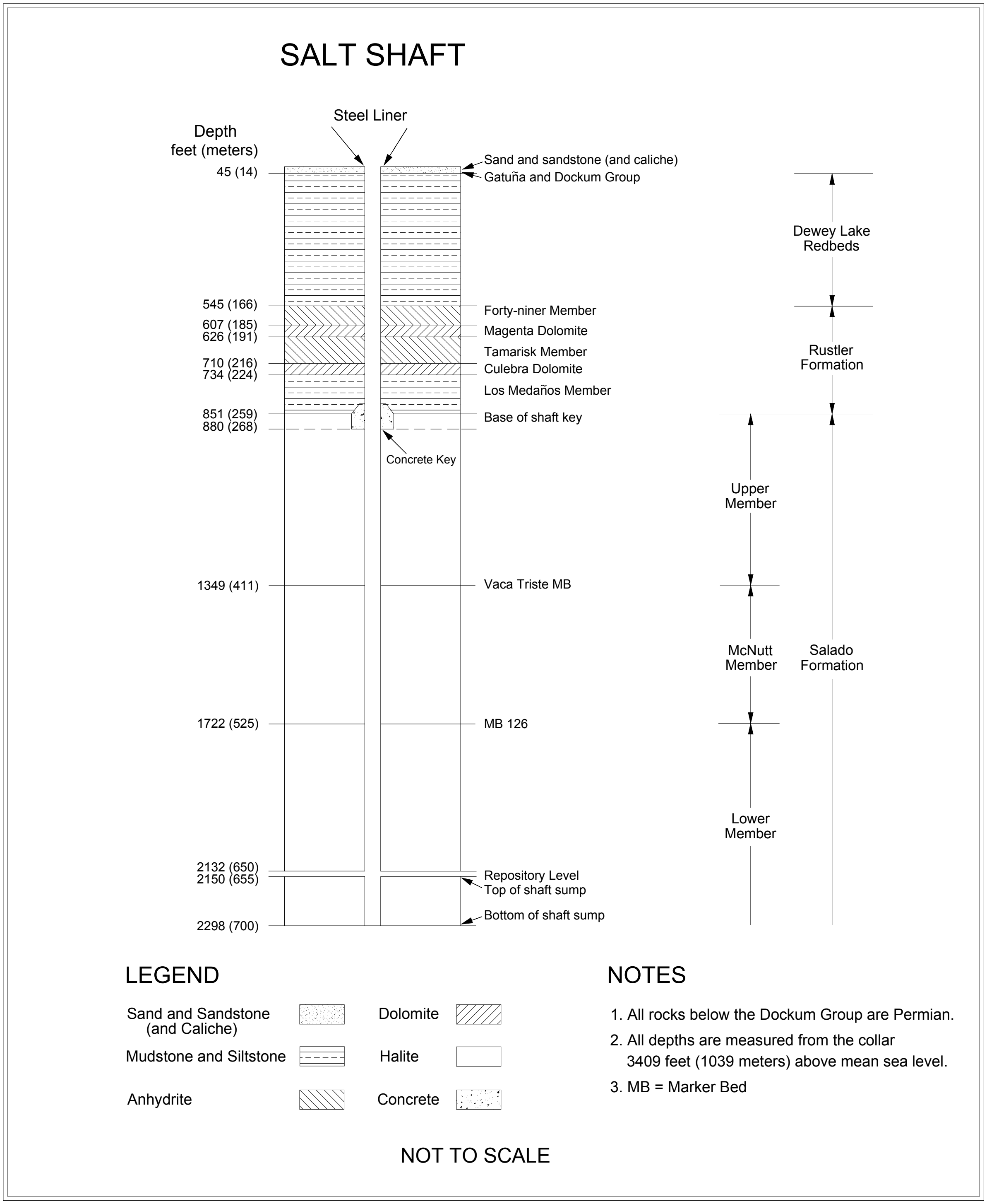

Figure 0-1 – Salt Shaft Stratigraphy

Wire mesh anchored by rock bolts is installed in sections of the lower shaft as a safety screen to contain rock fragments that may become detached. The shaft extends approximately 140 ft (43 m) below the facility horizon in order to accommodate the skip loading equipment and to act as a sump.

Shaft Observations

Underground operations personnel conduct weekly visual shaft inspections. These inspections are performed principally to assess the condition of the hoisting and mechanical systems, but they also include examining the shaft walls for water seepage, loose rock, or sloughing. The visual shaft inspections during this reporting period found that the Salt Shaft was in satisfactory condition. Only routine ground control activities were required during this reporting period.

Instrumentation

Geomechanical instruments (radial convergence points, extensometers, and piezometers) were installed at various levels in the Salt Shaft from April through July of 1982 (Figure 3-2). In the shaft key, instruments included strain gauges, pressure cells, and piezometers (Figure 3-3). The radial convergence points were installed prior to outfitting of the Salt Shaft. Upon completion of the outfitting, no more readings were taken. All of the extensometers in the Salt Shaft have ceased functioning.

All 12 piezometers continue to provide data. The fluid pressures recorded at the end of this reporting period range from approximately 72 pounds per square inch (psi) (496 kilopascals [kPa]) at the 580-ft (177-m) level in the Forty-niner Member to 155 psi (1,069 kPa) at the 691-ft (211-m) level in the Tamarisk Member. The recorded pressure of 145 psi (1,000 kPa) at the Magenta Dolomite Member represents an 18-psi decrease; however, the installations at this level have historically exhibited large fluctuations. The recorded pressures of 140 psi (965 kPa) at the Culebra Dolomite Member represent no significant change from the recorded pressure in the same location at the end of the previous reporting period. The fluid pressure on the shaft liner will continue to be monitored on a regular basis.

Four earth pressure cells were installed in the key section of the Salt Shaft during concrete emplacement at the 860-ft (262-m) level. These instruments measure the normal stress between the concrete key and the Salado Formation as the creep loads up the key structure. Three of the four earth pressure cells continue to provide data. These instruments have indicated essentially no contact pressure since their installation (readings resemble instrument drift at a zero pressure). The contact pressures recorded by the instruments for this reporting period ranged from -26 to 3 psi (-179 to 21 kPa).

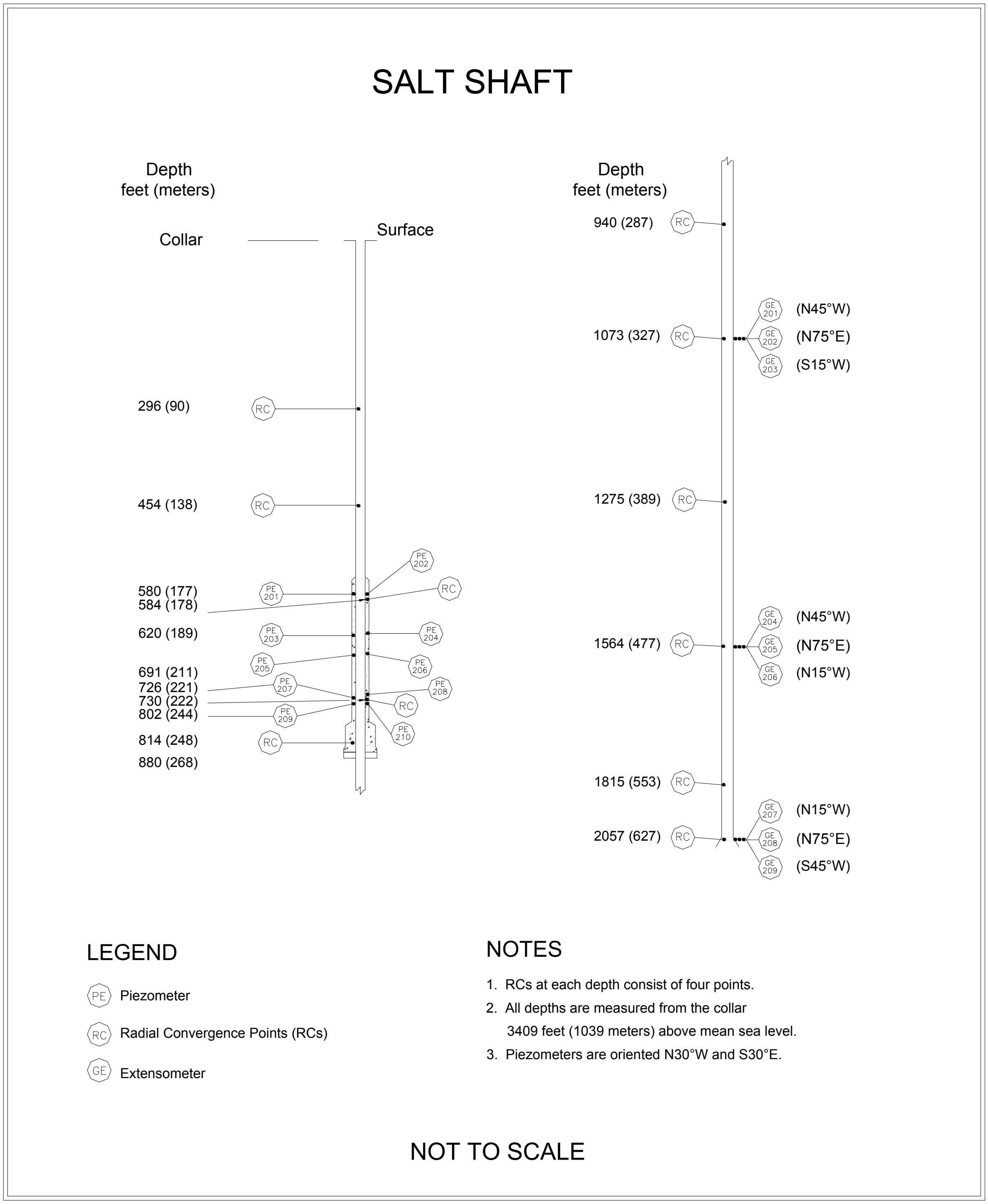

Figure 0-2 – Salt Shaft Instrumentation (Without Shaft Key)

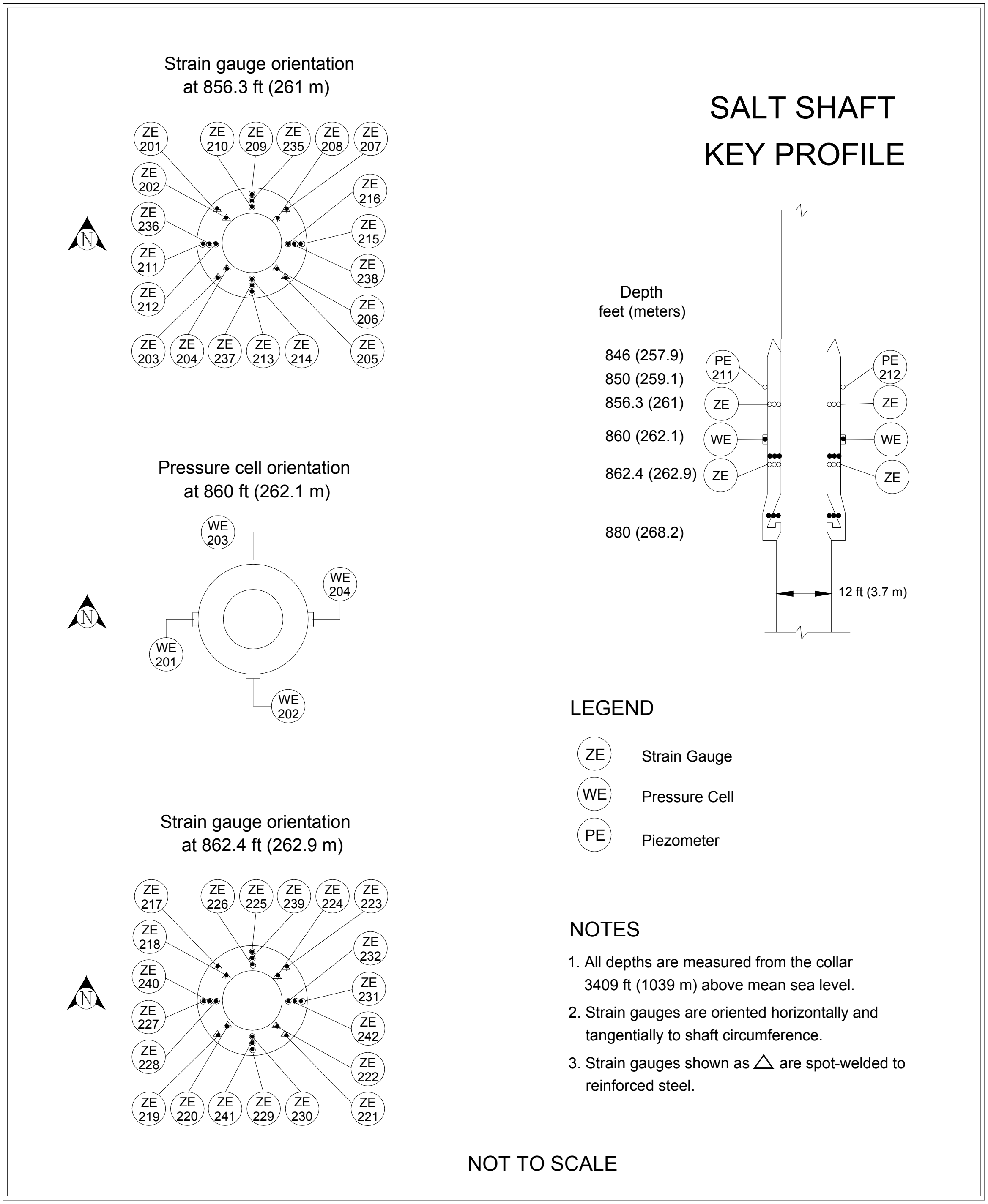

Figure 0-3 – Salt Shaft Key Instrumentation

Sixteen spot-welded and twenty-four embedment strain gauges were installed on and in the shaft key concrete at both the 856.3-ft (261-m) level and at the 862.4-ft (263-m) level. Four spot-welded strain gauges are still functioning at these levels. Maximum strains at the 856.3-ft (261-m) level were 677 and 727 microstrain. Strains at the 862.4-ft (262.9-m) level were 568 and 825 microstrain. The strains from the 12 embedment strain gauges at the 856.3-ft (261-m) level ranged from -804 to 989 microstrain. The strains from the two embedment strain gauges at the 862.4-ft (263-m) level were 200 to 340 microstrain. The strains recorded by the spot-welded strain gauges and the embedment strain gauges during this reporting period are very similar to the strains recorded by these instruments at the end of the previous reporting period.

2.4 Waste Shaft

As part of the SPDV Program, a 6-ft (2-m) diameter ventilation shaft, now referred to as the Waste Shaft, was excavated from December 1981 through February 1982 (see Figure 1-2). This shaft, in combination with the Salt Shaft, provided a two-shaft underground air circulation system. From October 11, 1983, to June 11, 1984, the shaft was enlarged to a diameter of 20 to 23 ft (6 to 7 m) and lined above the key. Stratigraphic mapping (Figure 3-4) was conducted during shaft enlargement from December 9, 1983, to June 5, 1984 (Holt and Powers, 1984).

The Waste Shaft is lined with non-reinforced concrete and has a 19 ft (6 m) inside diameter from the surface to the top of the key at 837 ft (255 m). Liner thickness increases with depth from 10 in (25 cm) at the surface to 20 in (51 cm) at the key. The key is 63 ft (19 m) long and 4.25 ft (1.3 m) thick and is constructed of reinforced concrete. The bottom of the key is 900 ft (274 m) below the surface. The diameter of the shaft is 20 ft (6 m) at the bottom of the key and increases to 23 ft (7 m) just above the shaft station. The shaft below the key is lined with wire mesh anchored by rock bolts. The diameter of 23 ft (7 m) extends to a depth of approximately 2,286 ft (697 m), with the shaft sump comprising the lower 119 ft (36 m) of that interval.

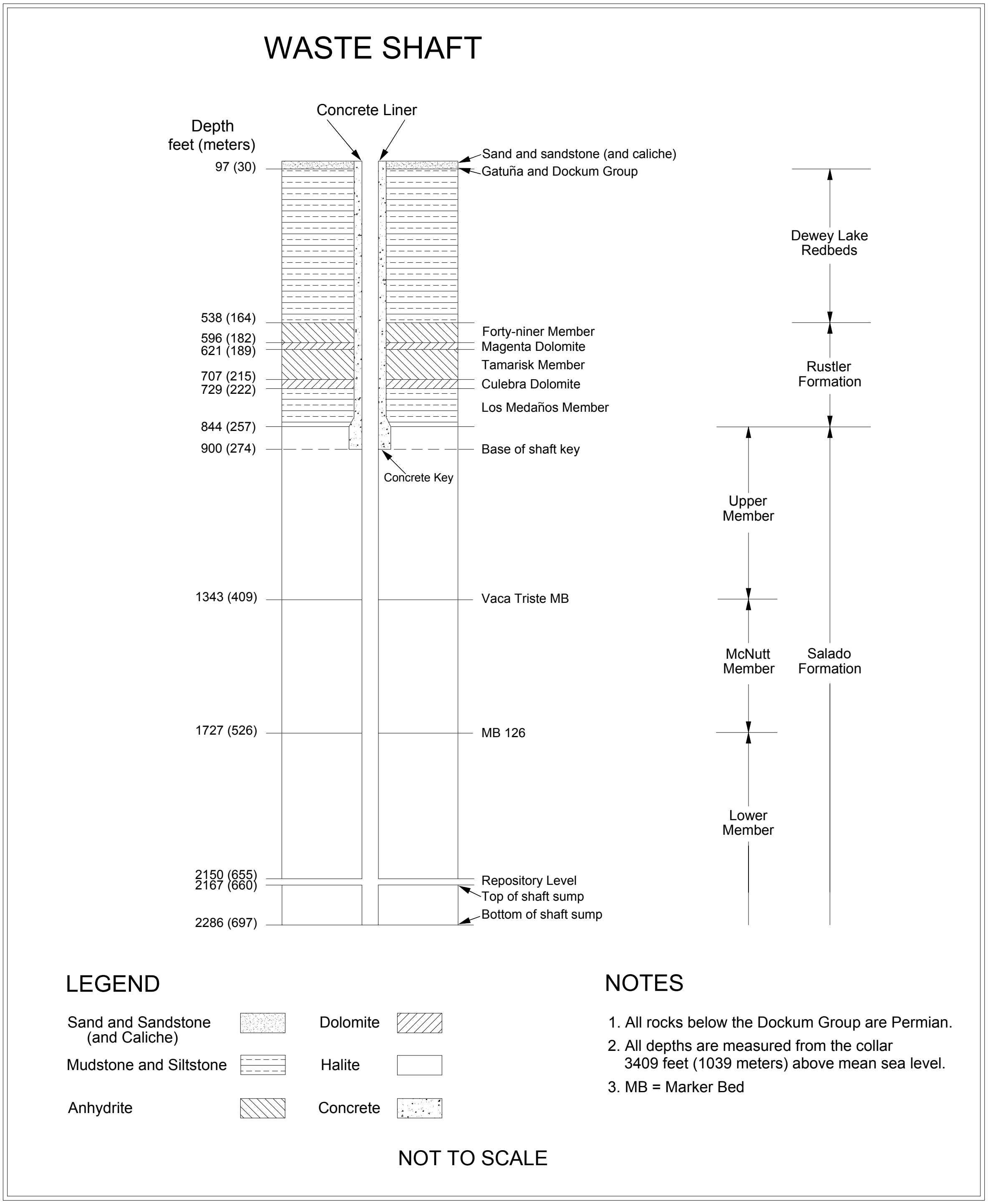

Figure 0-4 – Waste Shaft Stratigraphy

Shaft Observations

Underground operations personnel conduct weekly visual shaft inspections, principally to assess the condition of the hoisting and mechanical systems, but also include observation of the shaft walls for water seepage, loose rock, or sloughing. The visual shaft inspections found that the Waste Shaft was in satisfactory condition. No ground control activities other than routine maintenance were required.

Instrumentation

Radial convergence points, extensometers, piezometers, and earth pressure cells were installed in the Waste Shaft between August 27 and September 10, 1984. Figures 3-5 and 3-6 illustrate the instrumentation configurations in the shaft and shaft key. The radial convergence points were installed prior to the outfitting of the Waste Shaft. Upon completion of the outfitting, no more radial convergence readings were taken.

Nine multiposition borehole extensometers were installed in arrays 1,071 ft (326 m), 1,566 ft (477 m), and 2,059 ft (628 m) below the surface as shown in Figure 3-5. Each array consists of three extensometers. Currently, six out of nine extensometers remain functional; however, few data have been collected during this reporting period due to the malfunction of the data-logger.

Twelve piezometers were installed in the lined section of the Waste Shaft on September 7 and 8, 1984, to monitor fluid pressure behind the shaft liner and key section in the shaft. Data continue to be received from 10 piezometers.

Four earth pressure cells were installed in the key section of the Waste Shaft during concrete emplacement between March 23 and April 3, 1984. These instruments measure the normal stress between the concrete key and the Salado Formation as the salt creep loads the key structure.

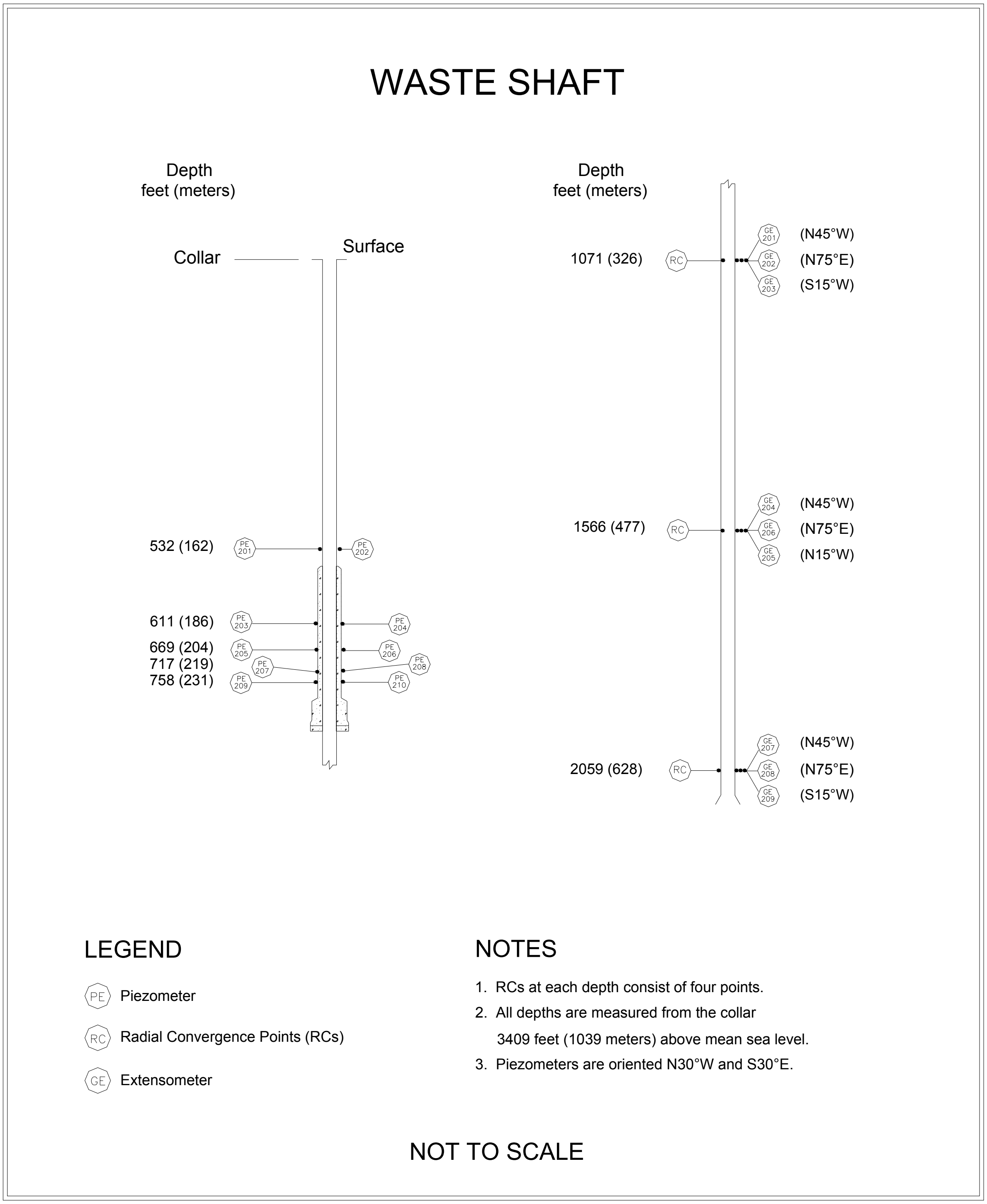

Figure 0-5 – Waste Shaft Instrumentation (Without Shaft Key)

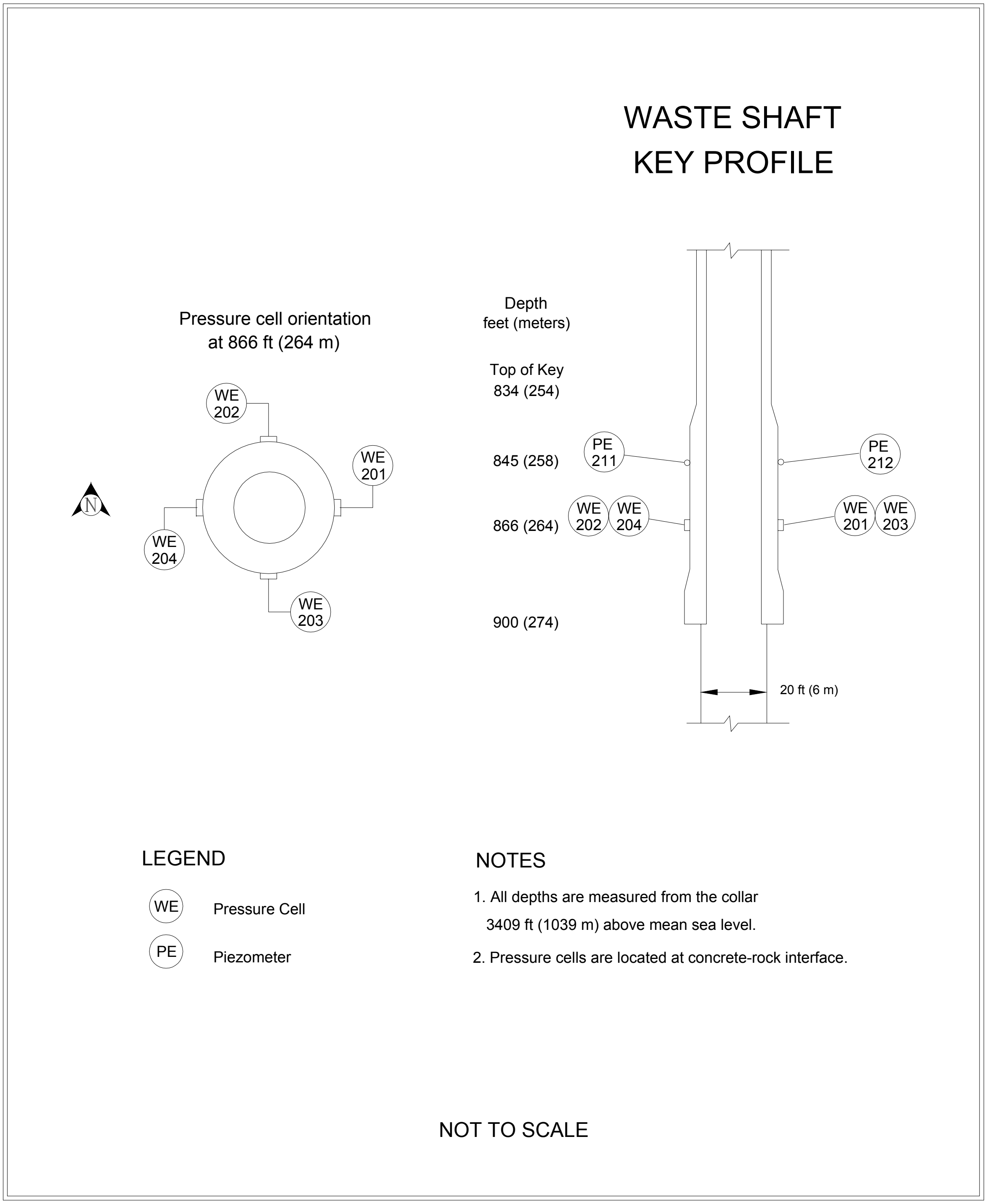

Figure 0-6 – Waste Shaft Key Instrumentation

2.5 Exhaust Shaft

The Exhaust Shaft was drilled from September 22, 1983, to November 29, 1984, to establish a route from the underground to the surface for exhaust air (see Figure 1-2).

Stratigraphic mapping was conducted from July 16, 1984, to January 18, 1985 (DOE, 1986c). Figure 3-7 illustrates the Exhaust Shaft stratigraphy.

The Exhaust Shaft is lined with non-reinforced concrete from the surface to the top of the shaft key at 844 ft (257 m). The liner thickness increases from 10 to 16 in (25 to 41 cm) over that interval. The key is 63 ft (19 m) long and 3.5 ft (1 m) thick. The shaft diameter below the key is 15 ft (5 m), and the interval below the key is lined with wire mesh anchored by rock bolts. The shaft terminates at the facility horizon, approximately 2,150 ft (655 m) deep. This shaft has no sump.

Exhaust Shaft Observations

Quarterly Exhaust Shaft video inspections were conducted according to approved WIPP procedures. Inspections were performed to evaluate the condition and to verify the integrity of the shaft. The shaft was examined for cracks, corrosion, salt buildup, leaks, and debris. In addition, inspections examined the condition of anchors, brackets, and down-hole equipment. Between July 2004 and June 2005, four shaft inspections were conducted: August 31, 2004; November 10, 2004; February 21, 2005; and May 24, 2005.

2.5.1.1 Video Camera

Video inspections use a custom-designed vertical-drop camera. The system consists of a color camera with pan, tilt, and zoom capability. The camera is housed in an aerodynamic housing and suspended by a dual-armored cable. The cable consists of five copper conductors and two multi-mode optical fibers. The cable is reeled out by a winch mounted in a control van. Video inspections are recorded.

2.5.1.2 Shaft Inspection Observations

Quarterly video inspection observations concentrate on four major areas: air monitoring systems, shaft liner, shaft walls, and equipment support and cabling. The air monitoring components consist of one air-velocity and three air-monitoring devices as shown in Figure 3-8. The video inspection includes examination of each device, including the transport assembly, guide tubes, the sample intake, and the support brackets that extend from Station "A" located above the shaft to the Exhaust Shaft collar. From the Exhaust Shaft collar, the air monitoring components extend down 21 ft and into the shaft. Video inspections indicate that the air-sampling components may accumulate salt buildup of up to several inches.

The Exhaust Shaft liner is examined for cracks, seepage, and general shaft stability. Currently, there are three principal zones of seepage in the shaft. The first is about 50 to 55 ft below the shaft collar (bsc). The second is about 60 to 65 ft bsc. The third is about 75 to 80 ft bsc, as shown in Figure 3-9. Monitoring of seepage horizons started before 1995. Water entering the shaft through these cracks is believed to originate from a perched anthropogenic water-bearing horizon at the base of the Santa Rosa Formation. The fluid level in the Santa Rosa near the shaft is about 43 to 44 ft below the surface. Based on examination of the inspection videos, the flow rate into the shaft is estimated at about 1 to 3 gallons per minute.

Conditions in the shaft change as a function of several variables, including airflow, humidity, temperature, and underground mining activities (dust). The seepage cracks noted above are confined primarily to the eastern side of the shaft wall.

When fluid was detected seeping into the Exhaust Shaft in 1995, a catch basin was designed and installed at the base of the shaft to intercept and prevent water from draining into the Waste Shaft Sump. Fluid has been removed from the catch basin since March 1996 as needed. Table 3-1 presents the volume of fluid removal from the catch basin from July 1997 through June 2005. Between July 2004 and June 2005, the volumes of fluid removed from the catch basin ranged from 220 gallons to 1100 gallons (Table 3-1). The largest reported volumes are typically associated with periods of reduced ventilation and increased humidity. For a discussion of the factors affecting the quantity of fluid entering the Exhaust Shaft catch basin, refer to DOE/WIPP 00-2000, *Brine Generation Study*.

The catch basin was damaged in 2004 by fallen debris, either from a salt slab or instrumentation cables or both. A new catch basin was fabricated and installed in December 2004.

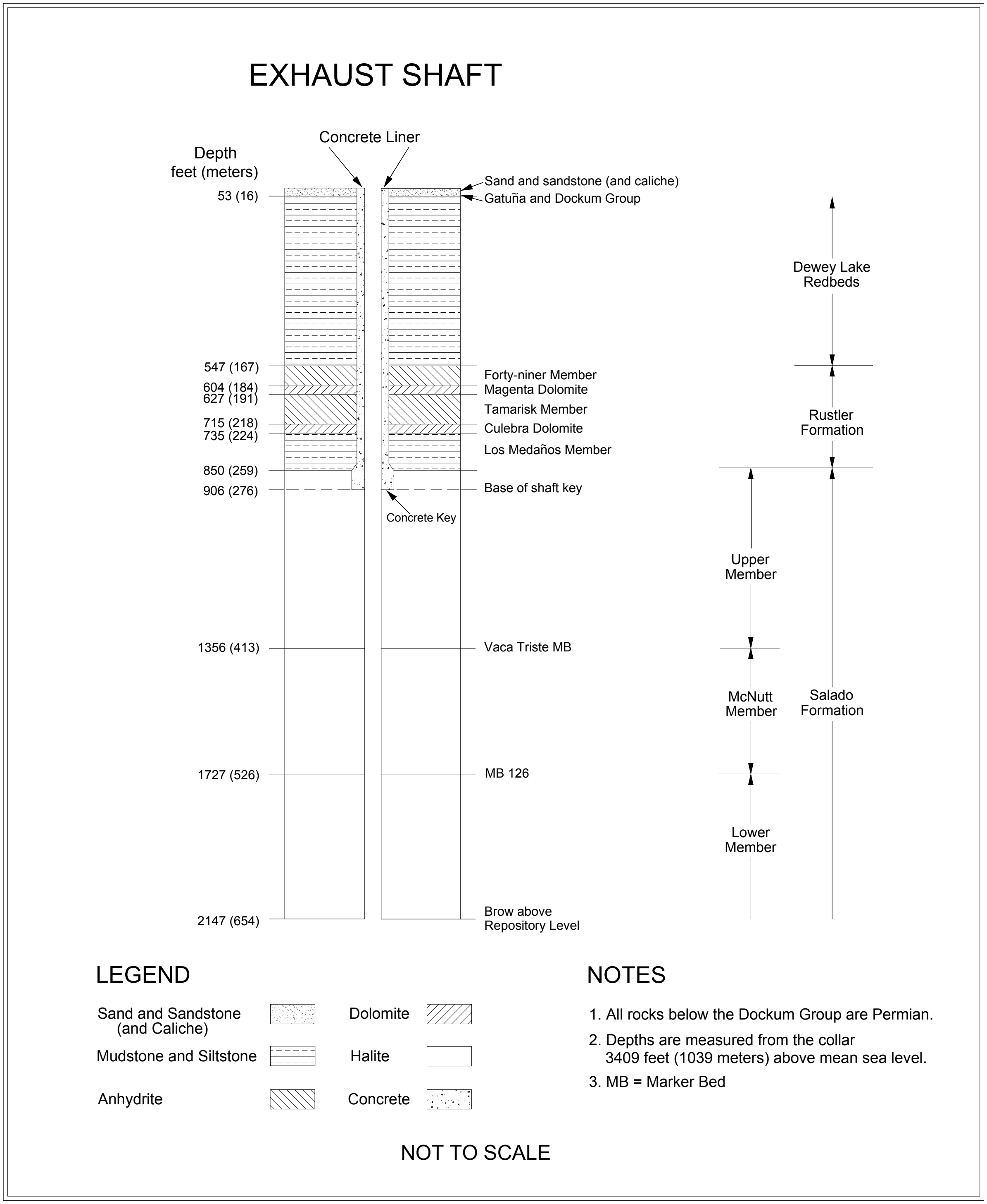

Figure 0-7 – Exhaust Shaft Stratigraphy

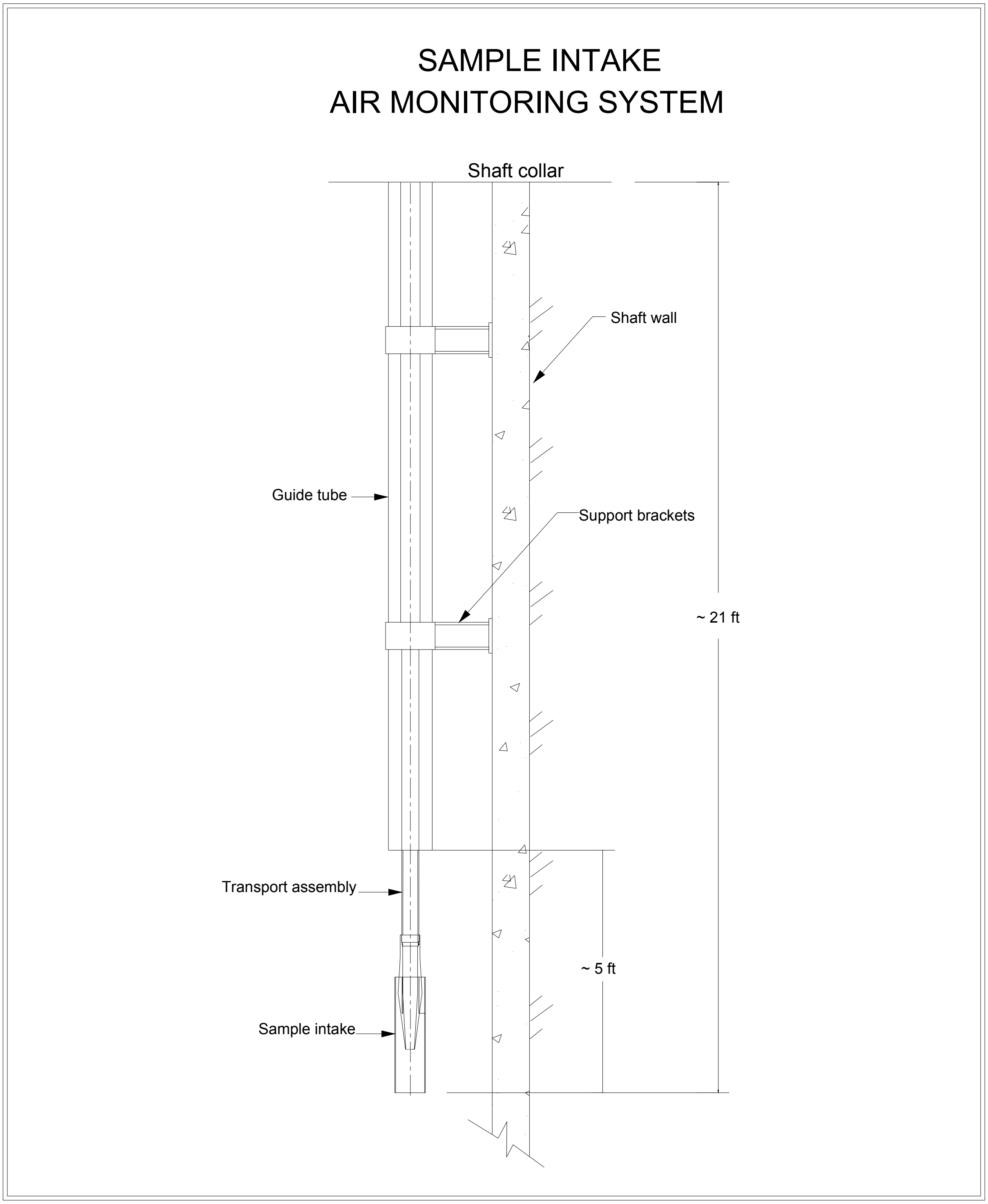

Figure 0-8 – Sample Intake of Exhaust Shaft Air Monitoring System

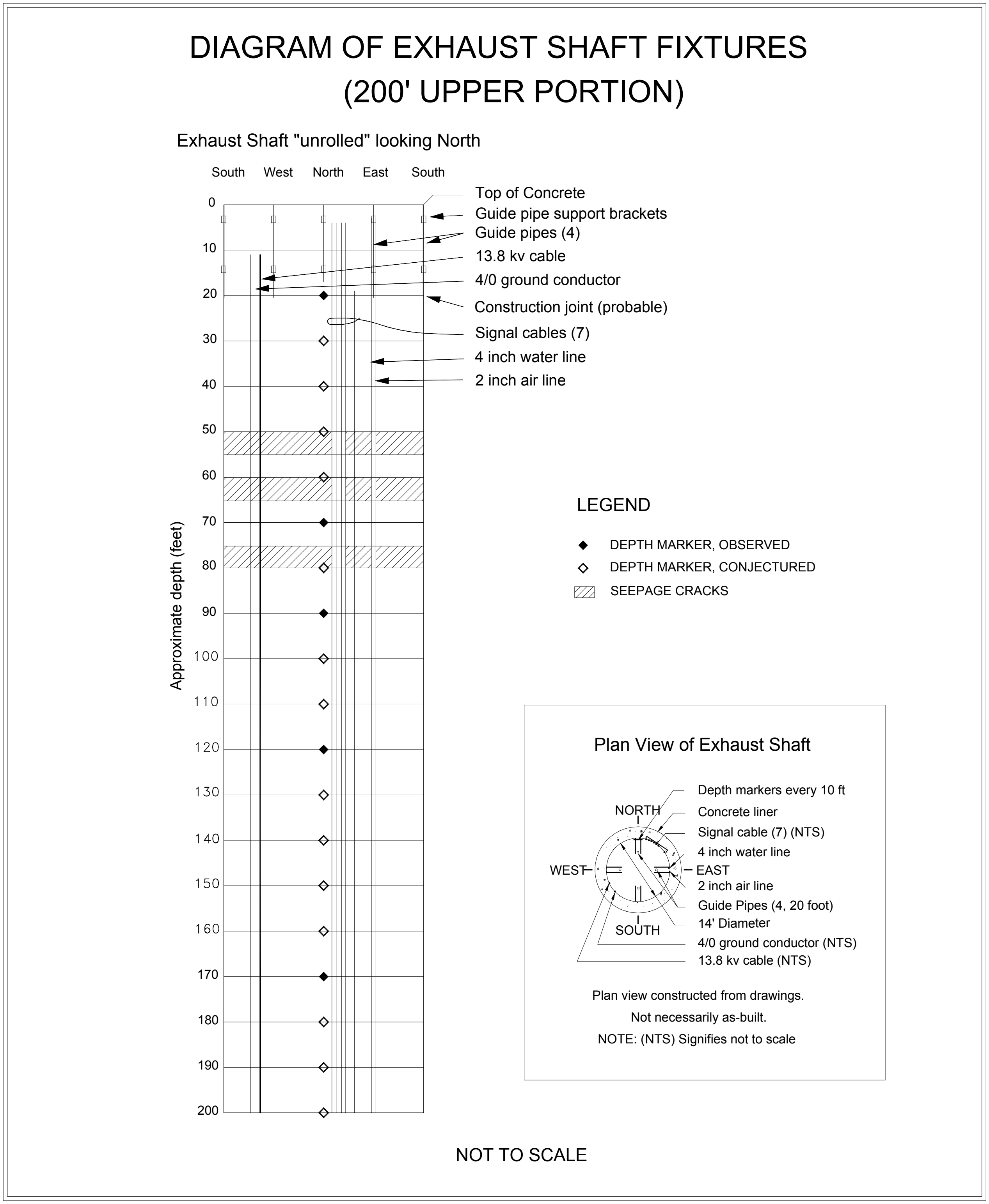

Figure 0-9 – Diagram of Exhaust Shaft Fixtures (Upper 200 ft)

The shaft walls were examined for cracks, moisture, and encrustation, with particular attention paid to three water rings located at the base of the Magenta and Culebra members of the Rustler Formation and the bottom of the shaft key. The condition of the shaft wall varies depending on the airflow, humidity, temperature, and underground mining activities. During this reporting period, there was significant mining activity in Panel 4 and the south access drifts. The principal areas in the shaft with significant salt buildup were the three water rings at the Magenta, the Culebra, and the key, and along upper portions of the east wall of the shaft generally associated with the support brackets, instrument cables and the air- and water-lines.

Though the Magenta and Culebra water rings are encrusted with salt buildup, no water appears to emanate from the liner or water rings. Most of the seepage was observed along the east face of the shaft wall near the instrumentation cables and the air- and water-lines in the upper section of the shaft. Though the presence of water is an inconvenience requiring periodic disposal, at this time it does not appear to have created any hazard or compromised the structural integrity of the shaft, but the presence of brine increases the probability of corrosion and deterioration of utility hangers and brackets. There are no visible signs of dissolution of the salt below the key.

The video inspection also focused on the installed utilities and support brackets. These include the 13.8 kilovolt amp (kVA) power cable and the grounding cable on the west wall of the shaft, the instrumentation cables on the northeast wall of the shaft, and the 4-in. air-line and the 2-in. water-line on the east wall of the shaft. Video inspection of the 13.8 kVA cable and the grounding cable showed no visible signs of damage. There was sporadic salt buildup on the cables. The long-term implication of salt buildup is increased loading on cables and cable hangers. The 4-in. compressed air-line and the 2-in. water-line extend from the surface to the bottom of the shaft. At present, neither line is being used. The integrity of the brackets holding the air-line and water-line was difficult to assess because of salt buildup; however, there was no indication that the brackets were broken. Instrumentation cable breaks were observed in the shaft; however, most of these breaks affected abandoned cables, with negligible impact on shaft monitoring and operations.

Table 0-1 – Water Removed from the Exhaust Shaft Catch Basin

July 1997 – June 1998		July 1998 – June 1999		July 1999 – June 2000		July 2000 – June 2001		July 2001 – June 2002		July 2002 – June 2003	
Date	**Gallons**	**Date**	**Gallons**	**Date**	**Gallons**	**Date**	**Gallons**	**Date**	**Gallons**	**Date**	**Gallons**
7/18/97	275	7/1/98	770	7/19/99	110	7/3/00	220	7/31/01	165	07/02/2002	165
7/28/97	660	7/7/98	330	12/13/99	165	7/15/00	110	8/21/01	1595	07/08/2002	440
8/1//97	550	7/14/98	220	2/21/00	110	9/18/00	330	9/13/01	330	07/09/2002	495
8/4/97	715	7/16/98	275	5/16/00	715	10/24/00	110	10/15/01	770	07/10/2002	660
8/8/97	770	7/23/98	165	6/7/00	165	3/7/01	110	10/30/01	220	07/30/2002	220
8/11/97	660	7/24/98	220	6/12/00	275	3/21/01	165	4/29/02	275	09/17/2002	165
8/15/97	475	7/27/98	825	6/19/00	440	4/10/01	220	6/11/02	550	09/24/2003	Sludge 330
8/18/97	330	7/28/98	330	6/22/00	330	4/17/01	220	6/22/02	330	03/25/2003	Sludge 220
8/22/97	330	8/3/98	495	6/30/00	165	4/24/01	110	**Total**	**4235**	05/27/2003	55
8/25/97	1045	8/10/98	1265	**Total**	**2475**	5/22/01	110			06/03/2003	220
8/25/97	Sludge 110	8/21/98	330			5/22/01	Sludge 440			06/25/2003	330
9/2/97	220	8/24/98	990			6/12/01	1100			**Total**	**3300**
9/15/97	605	8/27/98	1155			6/13/01	110				
9/22/97	550	9/1/98	330			Sludge	110				
10/13/97	825	10/5/98	385			**Total**	**3465**				
10/20/97	220	10/26/98	660								
11/3/97	275	11/23/98	110								
11/10/97	385	2/1/99	385								
11/17/97	385	2/10/99	110								
11/24/97	330	5/4/99	330								
12/10/97	440	5/11/99	110								
12/12/97	550	5/24/99	605								
1/2/98	220	5/26/99	165								
1/12/98	605	6/1/99	165								
2/2/98	660	6/4/99	165								
2/16/98	605	6/10/99	165								
3/16/98	605	6/10/99	Sludge 165								
5/4/98	660	6/16/99	165								
5/11/98	550	6/21/99	1705								
5/18/98	495	6/23/99	275								
5/20/98	110	6/30/99	605								
6/1/98	330	**Total**	**14135**								
6/10/98	90										
6/15/98	385										
6/22/98	165										
Total	**16185**										

Table 3-1 – Water Removed from the Exhaust Shaft Catch Basin (Continued)

July 2003 – June 2004		July 2004 – June 2005		July2005 – June 2006		July 2006 – June 2007		July 2007 – June 2008		July 2008 – June 2009	
Date	**Gallons**	**Date**	**Gallons**								
3/25/03	Sludge 220	11/29/04	Sludge 660								
5/27/03	55	12/06/04	Sludge 275								
6/3/03	220	01/03/05	660								
6/25/03	330	01/10/05	385								
7/8/03	605	05/16/05	660								
7/9/03	550	06/01/05	660								
7/17/03	165	06/06/05	220								
8/12/03	275	06/20/05	440								
10/14/03	165	06/27/05	220								
10/20/03	440	Total	4180								
10/21/03	330										
11/21/03	220										
11/21/03	Sludge 660										
Total	**4235**										

Instrumentation

The Exhaust Shaft was equipped with geomechanical instrumentation in two stages. Earth pressure cells were installed behind the liner key in November 1984. Piezometers and nine multiposition borehole extensometers were installed during November and December 1985. Figures 3-10 and 3-11 illustrate the instrumentation configuration.

No extensometers were read during this reporting period.

Ten of the 21 piezometers remain in working condition. The fluid pressure readings from the working piezometers at the end of the reporting period range from -2.7 psi (-18.6 kPa) at 544-ft (166-m) to 140 psi (966 kPa) at 721-ft (220-m). Maximum pressure readings from the working piezometers during this reporting period were consistent with maximum readings from the previous reporting period, with some of the recorded pressures having decreased slightly.

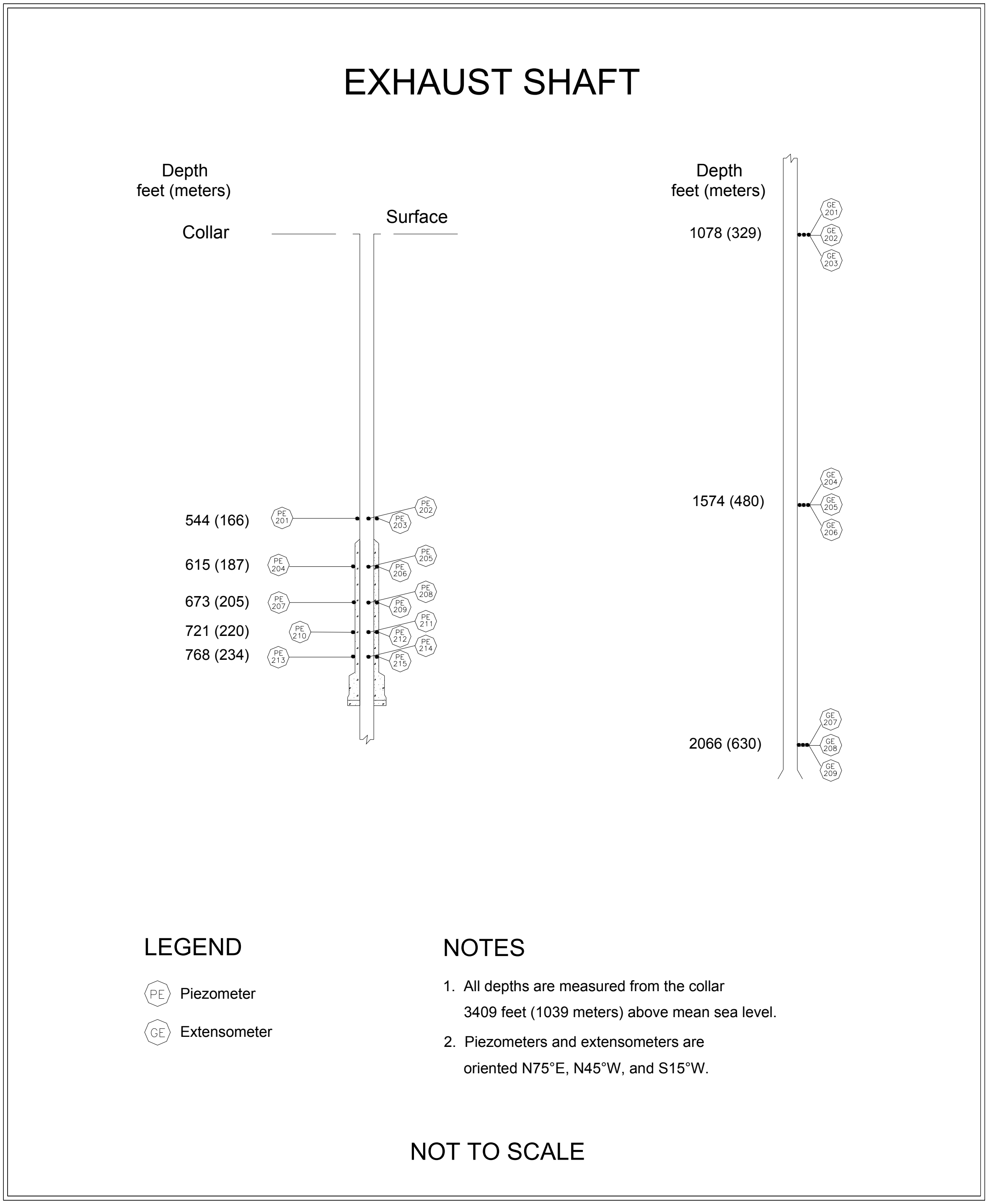

Figure 0-10 – Exhaust Shaft Instrumentation (Without Shaft Key)

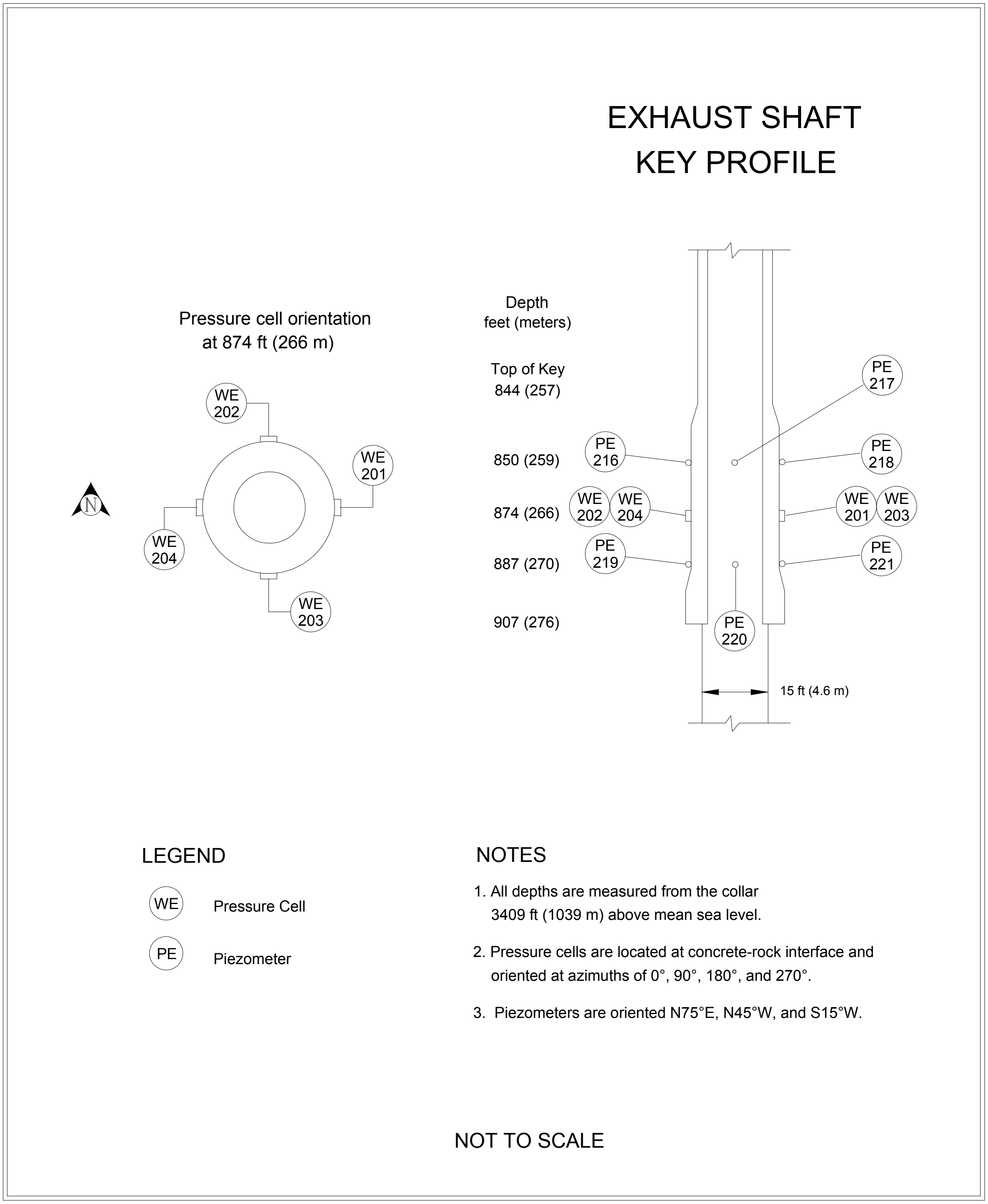

Figure 0-11 – Exhaust Shaft Key Instrumentation

Four earth pressure cells were installed in the key section of the Exhaust Shaft during concrete emplacement. Only two of these earth pressure cells are still functional. During this reporting period, the pressure cell readings indicated less than one psi since the last reporting period. The peak recorded pressures during this period were 56 and 44.3 psi (386 and 305 kPa).

2.6 Air Intake Shaft

The Air Intake Shaft was drilled from December 4, 1987, to August 31, 1988, to establish a primary route for surface air to enter the repository (see Figure 1-2). The stratigraphy was mapped from September 14, 1988, to November 14, 1989 (Holt and Powers, 1990). Figure 3-12 summarizes the Air Intake Shaft stratigraphy.

The Air Intake Shaft is lined with non-reinforced concrete from the surface to the bottom of the shaft key at 903 ft (275 m). The Air Intake Shaft key is 81 ft (25 m) long with an inside diameter of 16 ft (5 m). The shaft diameter below the key is 20 ft (6 m), and the shaft is unlined below the key to the facility horizon at 2,150 ft (655 m). The shaft walls are bolted and meshed from just below the key all the way down to the shaft station. The Air Intake Shaft has no sump.

Shaft Performance

Weekly visual inspections were performed on the Air Intake Shaft during this reporting period, and the shaft was found to be in satisfactory condition. No ground control activities other than routine maintenance were required during this reporting period.

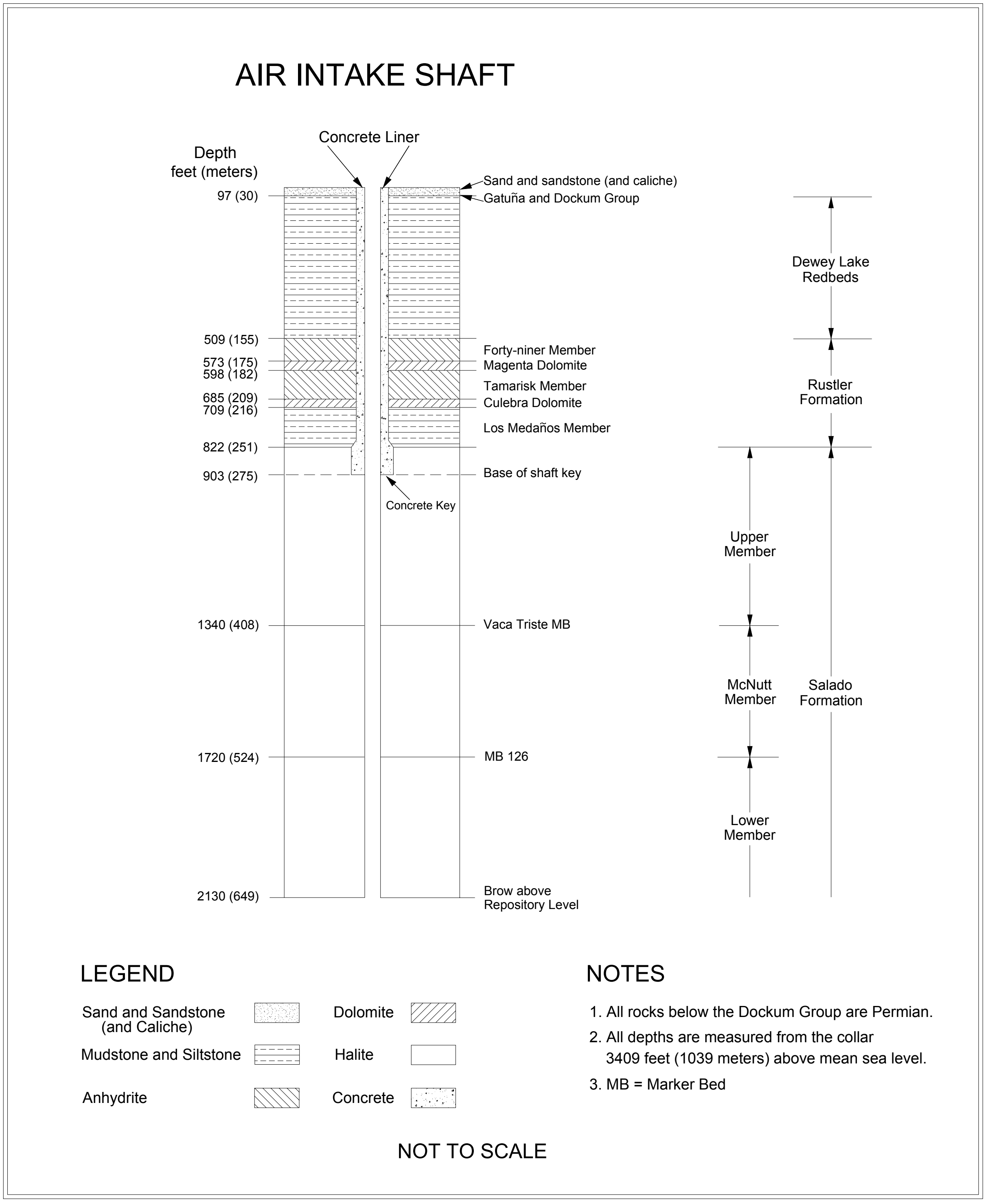

Figure 0-12 – Air Intake Shaft Stratigraphy

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3.0 PERFORMANCE OF SHAFT STATIONS

This chapter describes the instrumentation and geomechanical performance of the shaft stations at the base of the Salt Shaft, the Waste Shaft, and the Air Intake Shaft. The Exhaust Shaft does not have an enlarged shaft station and, therefore, is not included in this chapter.

3.1 Salt Shaft Station

The Salt Shaft Station was excavated between May 2 and June 3, 1982, by drilling and blasting. In 1987 the station was enlarged by removing the roof beam up to Anhydrite "b" between S-90 and N-20 using a mechanical scaler. In 1995, the remaining roof beam at the north end of the station was also removed up to Anhydrite "b." The station area south of the shaft is 90 ft (27.5 m) long and 32 to 38 ft (10 to 12 m) wide. The height of the station south of the shaft is 18 ft (5.5 m). The station dimensions north of the shaft are approximately 30 ft (9 m) long, 32 to 35 ft (10 to 11 m) wide, and 18 ft (5.5 m) high. The shaft extends approximately 140 ft (43 m) below the facility horizon to accommodate the skip loading equipment and to act as a sump. Figure 4-1 shows a generalized cross section of the station.

Modifications to Excavation and Ground Control Activities

No major modifications were performed in the Salt Shaft Station during this reporting period. Ground control was performed as routine maintenance.

Instrumentation

Geomechanical instrumentation was installed in the Salt Shaft Station between June 1982 and February 1983, with subsequent reinstallation of extensometers and convergence points as necessary. Figure 4-2 shows the instrument locations after the roof beam was taken down.

Two extensometers were installed during this reporting period, one 30 ft and the other 60 ft south of the shaft. Four vertical convergence point arrays are currently monitored. Table 4-1 summarizes the vertical closure rates in the Salt Shaft Station from July 2004 through June 2005. Salt Shaft Station vertical closure rates indicate that the rates are decreasing compared to previous reporting periods.

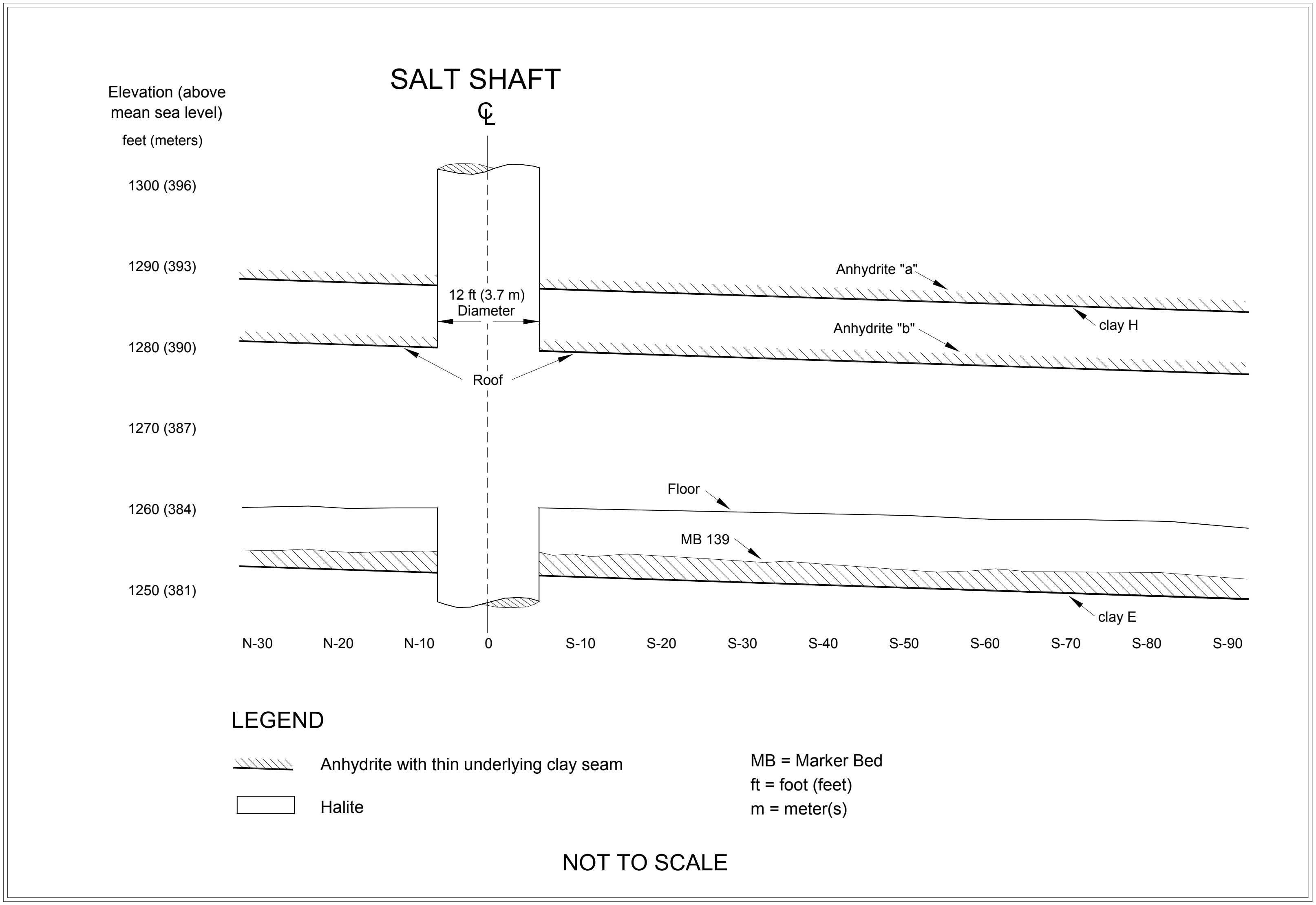

Figure 3-1 – Salt Shaft Station Stratigraphy

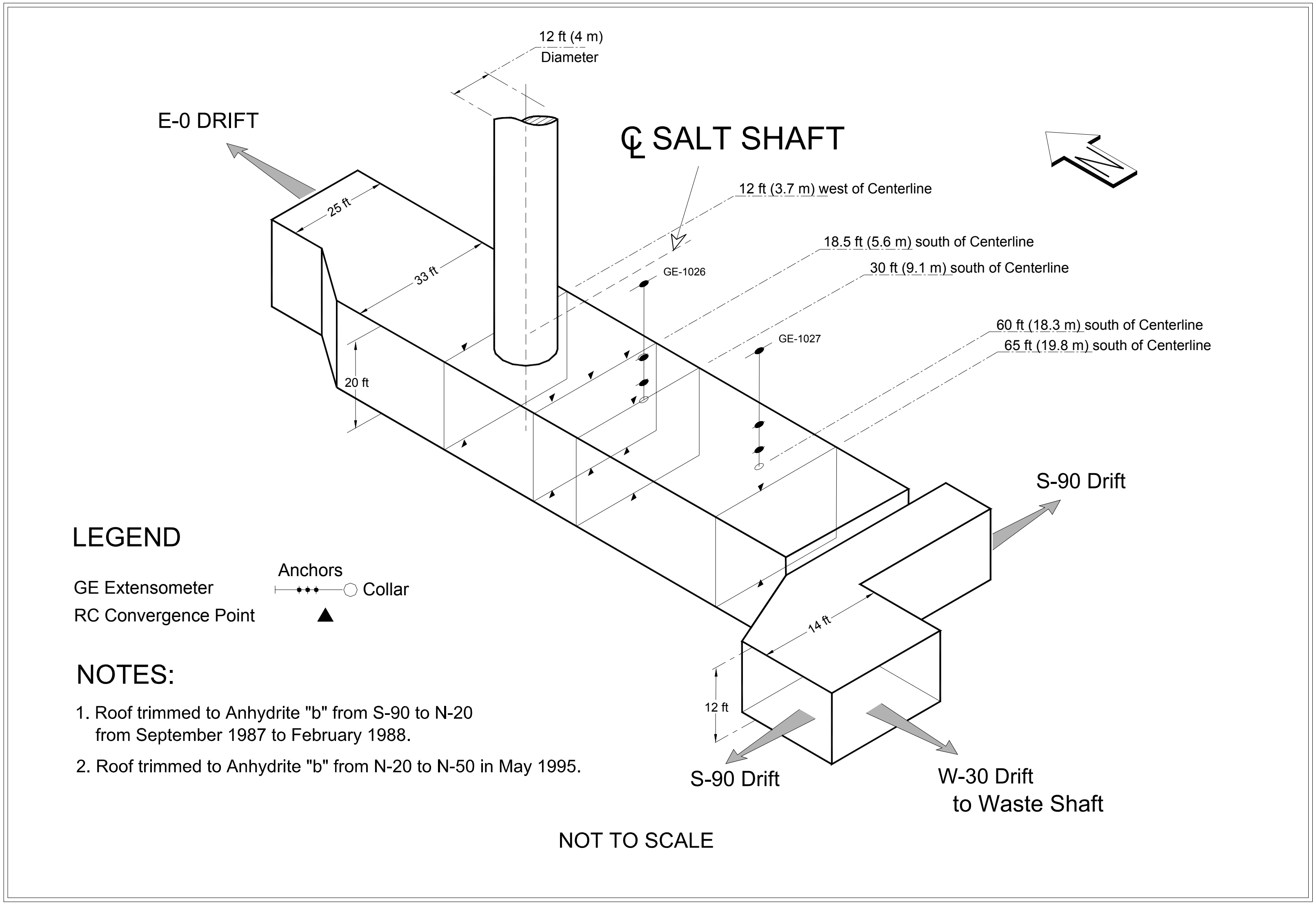

Figure 3-2 – Salt Shaft Station Instrumentation after Roof Beam Excavation

Table 3-1 – Vertical Closure Rates in the Salt Shaft Station

Location	Chord*	Last Reading	Total Cumulative Displacement Inches/(cm.)	Closure Rate 2004 to 2005 in/yr (cm/yr)	Closure Rate 2003 to 2004 in/yr (cm/yr)	Rate Change Percent[a]	Comments
E0, W12	A-C	6/14/05	18.644 (47.356)	0.70 (1.78)	0.73 (1.85)	-3%	
E0, S18	A-E	6/14/05	27.842 (70.719)	1.38 (3.51)	1.39 (3.53)	-1%	
E0, S18	B-D	6/14/05	28.164 (71.537)	1.50 (3.81)	1.50 (3.81)	0%	
E0, S18	F-H	6/14/05	17.885 (45.428)	0.93 (2.36)	0.96 (2.44)	-3%	
E0, S30	A-C	6/14/05	42.359 107.592)	1.45 (3.68)	1.47 (3.73)	-2%	
E0, S65	A-C	6/14/05	38.318 (97.328)	1.07 (2.72)	1.08 (2.74)	-1%	

*Chord is defined in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data."
[a] Increase in convergence rate is calculated from the difference between the 2004–2005 rate and the 2003–2004 rate.

3.2 Waste Shaft Station

The Waste Shaft Station was initially excavated with a continuous miner as a ventilation connection to a 6-ft (2-m) diameter exhaust shaft in November 1982. In 1984, the station was enlarged to a height of 15 to 20 ft (4.5 to 6 m) and a width of 20 to 30 ft (6 to 9 m). The station is approximately 150 ft (46 m) long. In 1988, the station walls were trimmed, and concrete was placed on the floor. Since 1988, the Waste Shaft Station has undergone three major floor renovations. A 53-ft (16-m)-long section of the reinforced concrete was removed in February 1991, in 1995 an additional 30-ft (9-m) section was removed, and in 2000 the most recent floor maintenance included trimming of the floor and reinstallation of the rails supported by segmented concrete panels on a crushed rock backfill. Figure 4-3 shows a cross-section of the Waste Shaft Station.

Modifications to Excavation and Ground Control Activities

No ground control activities were performed in the Waste Shaft Station other than routine roof and rib maintenance and replacement of failed roof bolts.

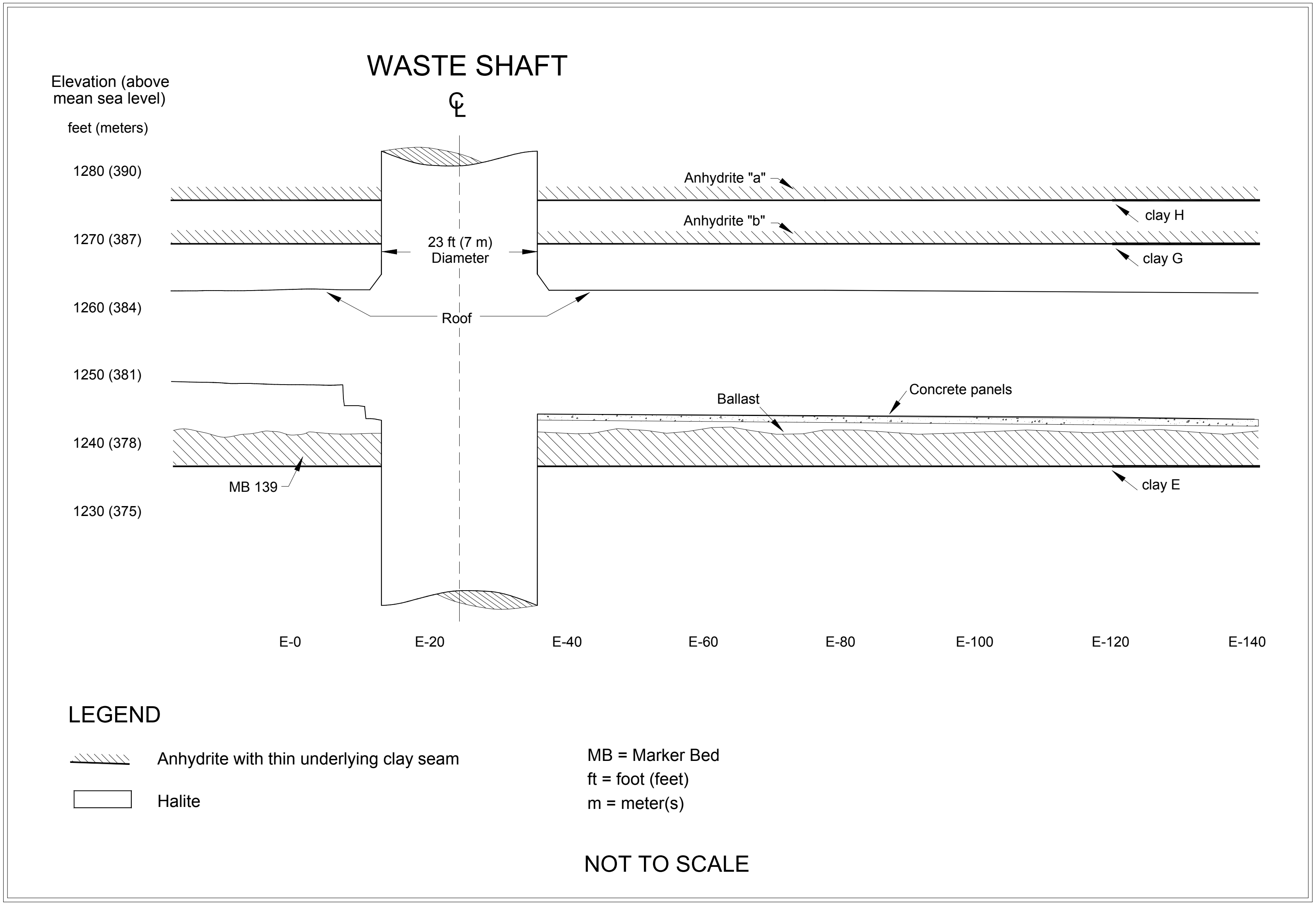

Figure 3-3 – Waste Shaft Station Stratigraphy

Instrumentation

Instruments were initially installed in the Waste Shaft Station between November 12 and December 2, 1982. Figure 4-4 illustrates the locations after enlargement. Four extensometers in the Waste Shaft Station are currently being monitored. In addition, horizontal convergence is being monitored at E-30 and E-90.

Table 4-2 summarizes the recent history of the roof extensometers in the Waste Shaft Station. Extensometers 51X-GE-00268 (W-30) and 51X-GE-01025 (E-87) are installed in boreholes drilled into the roof of the station. Extensometers 51X-GE-00356 and 51X-GE-00357 monitor fracture dilation along the shaft wall above the east brow.

Table 3-2 – Summary of Roof Extensometers in Waste Shaft Station

Instrument	Location	Last Reading	Collar Displacement Relative to Deepest Anchor in (cm)	Displacement Rate 2004 to 2005 in/yr (cm/yr)	Displacement Rate 2003 to 2004 in/yr (cm/yr)	Rate Change Percent [a]	Comments
51X-GE-00268	S400, W30	6/28/05	8.789 (22.324)	0.25 (0.64)	0.65 (1.65)	-62%	
51X-GE-00356	Waste Shaft Brow	6/27/05	0.092 (0.234)	0.06 (0.15)	0.05 (0.13)	36%	
51X-GE-00357	Waste Shaft Brow	6/27/05	0.134 (0.340)	0.13 (0.33)	N/A	N/A	Re-installation
51X-GE-01025	S400, E87	6/30/05	0.760 (1.930)	0.52 (1.32)	0.53 (1.35)	-2%	

[a] Change is calculated from the difference between the 2004–2005 rate and the 2003–2004 rate.

Table 4-3 summarizes the annual horizontal closure rates calculated from convergence point data for this reporting period. The data indicate a decrease in the horizontal closure rate at E-30 of -4.0 percent and a decrease at E-90 of -8.0 percent, respectively, relative to the previous annual closure rates.

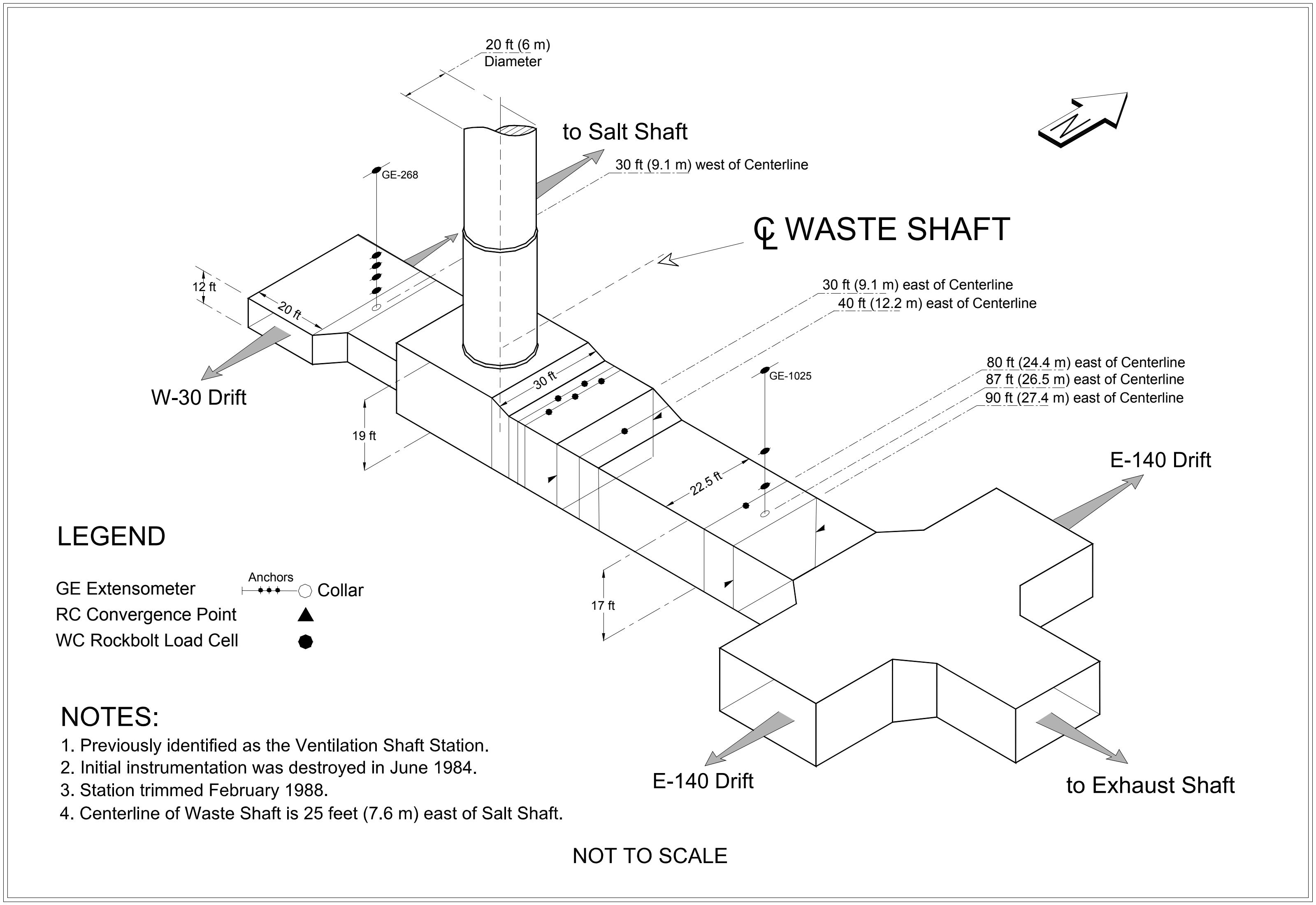

Figure 3-4 – Waste Shaft Station Instrumentation after Wall Trimming

Eighteen rock bolt load cells are installed in the roof and brow of the Waste Shaft Station. The loads on 12 of these rock bolt load cells are monitored regularly. Ten load cells are used to monitor loading on the brow cable support anchor shoes. Load cells at E-40 and E-80 are used to monitor the performance of the threaded bar anchorage.

Table 3-3 – Horizontal Closure Rates in the Waste Shaft Station

Location	Chord[*]	Last Reading	Total Cumulative Displacement Inches (cm.)	Closure Rate 2004to 2005 in/yr (cm/yr)	Closure Rate 2003 to 2004 in/yr (cm/yr)	Rate change Percent [a]	Comments
S400, E30	C-H	6/30/05	17.554 (44.587)	0.81 (2.06)	0.84 (2.13)	-4%	
S400, E90	C-G	6/30/05	20.071 (50.980)	0.89 (2.26)	0.97 (2.46)	-8%	

[*]Chord is defined in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data."
[a] Increase in convergence rate is calculated from the difference between the 2004–2005 rate and the 2003–2004 rate.

3.3 Air Intake Shaft Station

The Air Intake Shaft Station was excavated in late 1987 and early 1988, using a continuous miner. The Air Intake Shaft is not normally used to transport personnel or materials, but it does have a work platform and a small cage that can be raised and lowered to perform routine ground maintenance. There is minimal operational activity at the Air Intake Shaft Station.

Modifications to Excavation and Ground Control Activities

No ground control activities were performed in the Air Intake Shaft Station other than routine roof and rib maintenance and replacement of failed roof bolts.

Instrumentation

Radial convergence point and extensometer instrumentation data near the Air Intake Shaft Station are presented in Chapter 5.0 as part of the discussion on the performance of the access drifts. Twenty rock bolt load cells installed in the Air Intake Shaft Station area are monitored regularly.

4.0 PERFORMANCE OF ACCESS DRIFTS

This chapter describes the geomechanical performance of the central underground access drifts. The Waste Disposal Area is discussed in Chapter 6.0. Four major north-south drifts in the WIPP underground are intersected by shorter east-west cross-drifts. Drift dimensions range from 8 ft (2.4 m) to 21 ft (6.4 m) high and from 14 ft (4.3 m) to 33 ft (9.2 m) wide.

4.1 Modifications to Excavation and Ground Control Activities

Access drifts into Panel 4 were completed during this reporting period. Trimming, scaling, and floor milling activities were performed as necessary in many areas. Table 5-1 summarizes these activities. It also summarizes ground control activities (e.g., rock bolting and installing wire mesh) in various locations in the access drifts.

4.2 Instrumentation

This section discusses instrumentation details and locations for each instrumentation type.

Borehole Extensometers

Four new extensometers were installed during this reporting period in E-140 and the E-300 Northern Experimental Area. All operating underground extensometers continue to be monitored. Forty-five borehole extensometers continue to be monitored.

Convergence Points

Figure 5-1 shows typical convergence point array configurations. Instrumentation installed during this reporting period was limited to the replacement of convergence point arrays in previously mined areas and the installation of new monitoring arrays in the newly mined areas. New and replacement convergence points were installed in 58 locations throughout the WIPP underground access drifts because of mining and trimming activities. Horizontal and vertical convergence point arrays were installed at various locations. Most of these installations were located in the southern access drifts. Convergence points within the access drifts are read manually at least every two months, with more frequent monitoring in some areas. Table 5-2 lists the new and replacement convergence points that were installed during this reporting period.

Table 4-1 – Summary of Modifications and Ground Control Activities in the Access Drifts July 1, 2004, through June 30, 2005

Location	Work Activity
E0 Drift	Trimmed floor between N940 Alcove and N1100. Trimmed floor between N780 and N1100.
E300 Experimental Area (N-1100 – N1400)	Drilled instrumentation and observation boreholes. Installed 4-ft mechanically anchored bolts and chain-link mesh. Trimmed ribs. Trimmed floor, backfilled with salt and leveled.
E300 Drift	Installed 4-ft mechanically anchored bolts and chain-link mesh from S3310 to S3650. Installed 4-ft mechanically anchored bolts and chain-link mesh from S2750 to S3080. Installed 4-ft mechanically anchored bolts and chain-link mesh from S3080 to S3310.
E140 Drift	Installed 4-ft mechanically anchored bolts and chain-link mesh from N780 to N1100. Installed 4-ft mechanically anchored bolts and chain-link mesh on ribs between N1100 and N1400. Installed 12-ft resin-anchored bolts and roof mats north and south of the S1775 truck pass. Installed 10-ft mechanically anchored bolts from S400 to S90. Installed 12-ft resin-anchored bolts and roof mats from S2750 to S3080. Installed 4-ft mechanically anchored bolts and chain-link mesh from S3310 to S3650. Drilled 20-ft deep observation holes between S1000 and S3080. Localized trimming at the N-150 Overcast airlock. Installed 12-ft resin-anchored bolts, chain-link, and roof mats between S90 and Substation #2. Mined the roof beam between S3310 and S3650. Trimmed ribs between S3310 and S3650. Trimmed floor between S400 and S90. Trimmed floor between S700 and S1000.

Table 4-1 – Summary of Modifications and Ground Control Activities in the Access Drifts July 1, 2004, through June 30, 2005	
	Trimmed floor between S1950 and S2520. Installed 4-ft mechanically anchored bolts and chain-link mesh between S90 and N250.
W30 Drift	Completed initial mining between S3310 and S3650. Installed 4-ft mechanically anchored bolts and chain-link mesh from S3310 to S3650.
W170	Completed initial mining between S3310 and S3650. Installed 12-ft resin-anchored bolts and roof mats in the S2900 truck pass. Installed 4-ft mechanically anchored bolts and chain-link mesh from S3310 to S3650. Installed 4-ft mechanically anchored bolts and chain-link mesh from S2520 to S2750.
N1400	Installed 4-ft mechanically anchored bolts and chain-link mesh.
N940	Installed 4-ft mechanically anchored bolts and chain-link mesh in N940 Alcove.
N780	Installed 12-ft resin-anchored bolts in N780 Alcove.
N460	Installed 12-ft resin-anchored bolts in N460 Alcove.
S400	Installed 4-ft mechanically anchored bolts and chain-link mesh along the rib line west of W-170.
S700	Installed 12-ft resin-anchored bolts from W30 to W170. Trimmed the roof-rib juncture between E140 and E300. Drilled 28-ft deep, 30 in-diameter borehole for RH emplacement demonstration activities. Installed 4-ft mechanically anchored bolts and chain-link mesh on ribs from E140 to E300.
S1000	Installed 12-ft resin-anchored bolts from W30 to W170. Installed 12-ft resin-anchored bolts from E140 to W30.
S2180	Installed 4-ft mechanically anchored bolts and chain-link mesh in the E300 – S2180 intersection.
S2750	Installed 4-ft mechanically anchored bolts and chain-link mesh from E300 to W170.

Table 4-1 – Summary of Modifications and Ground Control Activities in the Access Drifts July 1, 2004, through June 30, 2005	
S3080	Installed 4-ft mechanically anchored bolts and chain-link mesh along the miters at the S3080-E140 intersection.
S3310	Trimmed floor between W30 and W170.
S3650	Mined initial excavation between E140 and E300. Installed 4-ft mechanically anchored bolts and chain-link mesh from E300 to W170.

Table 4-2 – New and Replaced Convergence Points Installed in the Access Drifts July 1, 2004, through June 30, 2005

Location	N/R	Field Tag#	Chord*	Date Installed
E140, S2998	R	E140-S2998-2	A-C (Vertical)	7/1/2004
E140, S2915	R	E140-S2915-2	A-C (Vertical)	7/1/2004
E140, S2833	R	E140-S2833-2	A-C (Vertical)	7/1/2004
E140, S2750	R	E140-S2750-2	A-C (Vertical)	7/1/2004
S3080, E220	R	S3080-E220	A-C (Vertical)	7/1/2004
N215, W620	R	N215-W620-2	A-C (Vertical)	7/15/2004
W30, S250	R	W30-S250-4	A-C (Vertical)	8/12/2004
N1420, E140	R	N1420-E140-2	A-C (Vertical)	10/7/2004
E140, N1266	R	E140-N1266-3	A-C (Vertical)	10/7/2004
E140, N1266	R	E140-N1266-4	A-C (Vertical)	10/7/2004
N1100, E140	R	N1100-E140-2	A-C (Vertical)	10/7/2004
E140, N940	R	E140-N940-2	A-C (Vertical)	10/7/2004
E140, N940	R	E140-N940-2	B-D (Horizontal)	10/7/2004
E0, N940	R	E0-N940-5	A-C (Vertical)	1/5/2005
E0, N1110	R	E0-N1110-5	A-C (Vertical)	1/5/2005
E140, S2425	R	E140-S2425-3	A-C (Vertical)	1/13/2005
E140, S2350	R	E140-S2350-4	A-C (Vertical)	1/13/2005
E140, S2275	R	E140-S2275-3	A-C (Vertical)	1/13/2005
E140, S2180	R	E140-S2180-5	A-C (Vertical)	1/13/2005
E140, S2007	R	E140-S2007-5	A-C (Vertical)	1/13/2005
E140, S700	R	E140-S700-5	E-F (Vertical)	1/19/2005
E140, S700	R	E140-S700-5	B-C (Vertical)	1/19/2005
E140, S700	R	E140-S700-6	A-D (Vertical)	1/19/2005
E140, S850	R	E140-S850-8	A-C (Vertical)	1/19/2005
S1000, E160	R	S1000-E160-2	A-C (Vertical)	1/19/2005
E140, S1000	R	E140-S1000-2	A-C (Vertical)	1/19/2005
S1000, E120	R	S1000-E120-3	A-C (Vertical)	1/19/2005
E140, S1025	R	E140-S1025-3	A-C (Vertical)	1/19/2005
E140, S1075	R	E140-S1075-3	F-H (Vertical)	1/19/2005
E140, S1075	R	E140-S1075-3	A-E (Vertical)	1/19/2005
E140, S1075	R	E140-S1075-3	B-D (Horizontal)	1/19/2005
E140, S1150	R	E140-S1150-4	L-H (Vertical)	1/19/2005
E140, S1150	R	E140-S1150-3	A-G (Vertical)	1/19/2005
E140, S1150	R	E140-S1150-3	B-F (Vertical)	1/19/2005
E140, S1225	R	E140-S1225-3	A-E (Vertical)	1/19/2005

Table 4-2 – New and Replaced Convergence Points Installed in the Access Drifts July 1, 2004, through June 30, 2005				
E140, S2065	R	E140-S2065-4	A-C (Vertical)	1/18/2005
N1420, E0	R	N1420-E0-2	A-C (Vertical)	1/31/2005
E140, S262	R	E140-S262-4	A-C (Vertical)	2/16/2005
E300, N1341	R	E300-N1341-2	A-C (Vertical)	2/18/2005
E300, N1186	R	E300-N1186-2	A-C (Vertical)	2/24/2005
E300, N1262	R	E300-N1262-2	A-C (Vertical)	2/23/2005
S90, W400	R	S90-W400-2	A-C (Vertical)	3/4/2005
S90, W590	R	S90-W590-2	A-C (Vertical)	3/4/2005
S1000, E58	R	S1000-E58-4	A-C (Vertical)	3/4/2005
E140, S3480	N	E140-S3480	A-C (Vertical)	4/19/2005
S700, W98	R	S700-W98-2	A-C (Vertical)	4/28/2005
E140, S3395	N	E140-S3395	A-C (Vertical)	4/21/2005
E140, S3395	N	E140-S3395	B-D (Horizontal)	4/21/2005
E140, S3480	N	E140-S3480	B-D (Horizontal)	4/21/2005
E140, S3565	N	E140-S3565	A-C (Vertical)	4/21/2005
S700, W98	R	S700-W98-2	A-C (vertical)	4/28/2005
E140, N5-5	R	E140-N5-5	A-C (Vertical)	5/9/2005
W30, S3395	N	W30-S3395	A-C (Vertical)	5/13/2005
W30, S3395	N	W30-S3395	B-D (Horizontal)	5/13/2005
W30,S3480	N	W30-S3480	A-C (Vertical)	5/13/2005
W30, S3480	N	W30-S3480	B-D (Horizontal)	5/13/2005
W30, S3565	N	W30-S3565	A-C (Vertical)	5/13/2005
W30, S3565	N	W30-S3565	B-D (Horizontal)	5/13/2005
E140, S3565	N	E140-S3565	B-D (Horizontal)	6/10/2005

N = New installation.
R = Replacement installation (i.e., instrument replaces older instrument that has failed or has been mined out).
#Field tag chords are defined in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data"
*Chord configuration is defined in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data" and Figure 5-1.

4.3 Analysis of Convergence Point and Extensometer Data

Convergence point data are obtained by measuring the change in distance between fixed points anchored into the rock across an opening, either from rib-to-rib or from roof-to-floor. Extensometer data are obtained by measuring the displacement from the reference head anchor (collar) to each fixed anchor of the extensometer. These measurements are made, at a minimum, every two months throughout the WIPP underground, except when convergence points are not accessible. Convergence rates and extensometer displacement rates indicate how an excavation is performing; rates that decrease or are relatively constant typify stable excavations, whereas increasing rates may indicate some type of developing instability or may be the response to nearby mining.

Where possible, annual closure rates were calculated from convergence point array data gathered in the access drifts. A complete tabulation of these convergence point data and calculated closure rates is presented in the supporting data document for this report[5]. Locations with increases in annual vertical closure rates of greater than 10 percent are shown in Table 5-3.

[5] Instrumentation data and data plots are presented in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data." The document is available upon request from the National Technical Information Service. See the back side of this documents cover sheet for details and addresses.

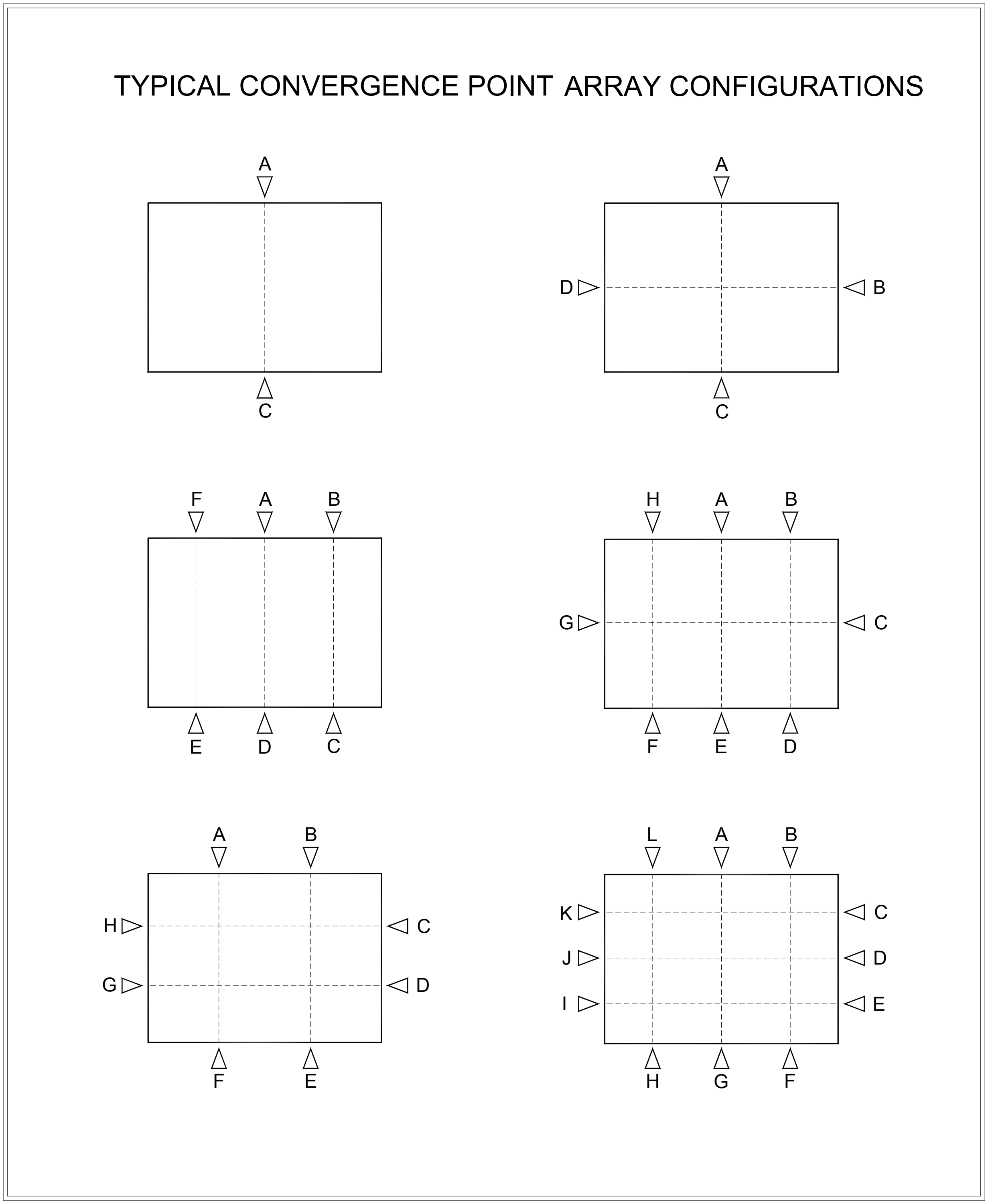

Figure 4-1 – Typical Convergence Point Array Configurations Showing Anchor Designations

Routinely, extensometer displacement rates and convergence rates are plotted against time, and comparisons are made through time to identify any acceleration. Annual convergence rates are calculated by determining the difference between the first and last readings of the reporting period and dividing the difference by the time between the two readings (in years). Instruments that indicate acceleration are analyzed to determine the significance of the acceleration. Factors considered during the analysis include magnitude of the respective rates, percentage increase, convergence history, and any recent excavation in the vicinity.

More than fifty active borehole extensometers were being monitored at various locations in the access drifts. Where displacement data were available, annual displacement rates were calculated for each active installation and compared to the annual displacement rates from the previous reporting period. Approximately fifty percent of the instruments are installed in the E-140 drift to monitor the waste transport route. Most of these extensometers exhibit an increase in deformation rates. The increased movement in the E-140 roof rates may also be attributed to local fracturing and the effects of anhydrite stringer separations in the roof. Although the borehole extensometer data indicate continued deformation and breakup of the lower beam, the roof beam above Clay H remains competent.

Further analysis of the convergence rate accelerations has shown many of them to be relatively insignificant. Other areas, such as the southern portions of the access drifts, had closure rate increases that can be directly attributed to the mining of Panel 3 and the associated access drifts.

Closure rates have increased in various locations by more than ten percent since the last reporting period. Most of these locations are in the E-140 drift. Increased closure rates were observed in E-140 from S-700 to S-1000 and from S-1687 to S-2065. The increased rates from S-700 to S-1000 are probably caused by a combination of the effects of floor trimming and continued ageing and deterioration of the roof beam.

The closure rates observed in E-140 from S-1687 to S-2065 are in an area where the roof beam has been mined to Clay G. The rate of increase in this area may be attributed to roof beam separations formed along shallow anhydrite stringers in the roof. These separations result in the formation of thin roof beams that can easily be deformed toward the opening. Tensile fractures generally develop on the roof surface in areas of maximum deformation.

The rate increases observed in other areas may be attributable to various reasons. The effect of nearby mining and trimming appears to have caused the rate increases at W170/S-3310 and S-3310/W-100. Field observations in these areas do not indicate any significant deterioration that may have caused these increases.

Table 4-3 – Greater than 10 Percent Increases in Annual Vertical Convergence Rates in the Access Drifts

Location	Chord*	Last Reading	Total Cumulative Displacement Inches/(cm.)	Closure Rate 2004 to 2005 in/yr (cm/yr)	Closure Rate 2003 to 2004 in/yr (cm/yr)	Rate Change Percent [a]	Comments
E300, S2998	A-C	06/1/2005	12.379 (31.443)	5.71 (14.5)	4.94 (12.55)	16	
E140, S700	A-D	5/31/2005	22.143 (56.243)	1.78 (4.52)	1.09 (2.77)	63	
E140, S700	E-F	5/31/2005	15.753 (40.013)	1.25 (3.18)	0.8 (2.03)	56	
E140, S850	A-C	5/31/2005	40.032 (101.681)	2.46 (6.25)	1.75 (4.45)	41	
E140, S1000	A-C	5/31/2005	27.511 (69.878)	1.65 (4.19)	1.06 (2.69)	56	
E140, S1687	A-E	6/23/2005	20.979 (53.287)	3.26 (8.28)	2.79 (7.09)	17	
E140, S1862	A-E	6/23/2005	22.665 (57.569)	4.42 (11.23)	3.86 (9.8)	15	
E140, S1862	B-D	6/23/2005	20.948 (53.208)	3.61 (9.17)	3.05 (7.75)	18	
E140, S2065	A-C	6/23/2005	19.526 (49.596)	3.6 (9.14)	2.87 (7.29)	25	
E0, N1266	A-C	6/14/2005	40.945 (104)	2.28 (5.79)	2.02 (5.13)	13	
E0, N940	A-C	6/14/2005	41.826 (106.238)	2.51 (6.38)	2.19 (5.56)	15	
E0, N290	A-C	6/14/2005	41.691 (105.895)	1.5 (3.81)	1.16 (2.95)	29	
W170, S232	A-C	6/21/2005	8.358 (21.229)	0.65 (1.65)	0.56 (1.42)	16	
W170, S3310	A-C	5/31/2005	4.16 (10.566)	1.94 (4.93)	1.45 (3.68)	34	
S1000, E160	A-C	6/28/2005	6.293 (15.984)	0.81 (2.06)	0.69 (1.75)	17	
S3310, W100	A-C	06/1/2005	4.536 (11.521)	1.99 (5.05)	1.77 (4.5)	12	

*Chord is defined in "Geotechnical Analysis Report for July 2004–June 2005 Supporting Data."
[a] Increase in convergence rate is calculated from the difference between the 2004–2005 rate and the 2003–2004 rate.

4.4 Excavation Performance

Approximately 500 readings are collected and assessed regularly from convergence point arrays throughout the WIPP underground. Convergence rates continue to vary seasonally, typically increasing during the warmer and more humid summer months and decreasing during the cooler and drier winter months.

The performance of the access drift excavations during this reporting period was within acceptable criteria. "Acceptable criteria" means that a drift remains accessible, and the ground can be controlled by routine maintenance. Standard remedial ground control in some areas was required to maintain the performance of the excavations. The drifts remain stable and controlled. Most of the annualized rates remain steady, indicating stability. In some locations, where the rates are high, nearby mining activity is most likely the cause. In other locations, where necessary, additional ground control measures have been or will be installed.

5.0 PERFORMANCE OF WASTE DISPOSAL AREA

The Waste Disposal Area as of June 30, 2005, consists of Panels 1, 2, 3, and 4. Panel 1 is closed. Panel 2 and 3 are currently being used for waste disposal, with Rooms 2, 3, 4, 5, 6 and 7 of Panel 2 filled and closed. Panel 4 mining is ongoing as shown in Figure 1-2.

5.1 History

Excavation of the Panel 1 waste disposal area began in May 1986 with the mining of the access entries. Initially, the disposal rooms and drifts were developed as pilot drifts that were later excavated to nominal operational dimensions of 13 ft (4 m) high, 33 ft (10 m) wide, and 300 ft (91 m) long. Room 1 was completed to these dimensions in August 1986, and pilot drifts for Rooms 2 and 3 were excavated in January and February 1987. Rooms 2 and 3 were completed in February and March 1988, and Rooms 4 through 7 were completed in May 1988. Four short access drifts designed to lead to smaller test alcoves were excavated north off the S-1600 drift and Rooms 4-7 in June 1989. Only the access drifts to the alcoves were completed; the alcoves themselves were not excavated. Panel 1 waste emplacement (in Rooms 1, 5, 6, 7, and S-1950) is complete, and the panel is closed to all access. The Panel 1 access entries, S-1600 and S-1950, which extend from the E-300 drift to the isolation walls, remain open, and the instrumentation in this area will continue to be replaced and monitored.

Excavation of the Panel 2 waste disposal area began in September 1999 with the mining of access entries. Initially, the disposal rooms and drifts were developed as pilot drifts that were trimmed to finished dimensions. Room 1 was completed in January 2000, and pilot drifts for Rooms 2 and 3 were excavated in February 2000. Pilot drifts were completed for Rooms 4 through 6 in April 2000. The pilot drift for Room 7 was excavated in May 2000. All the rooms were excavated to final dimensions by August 2000.

Excavation of Panel 3 waste disposal rooms began in May 2002 with the mining of access entries to Panel 3. As with Panel 2, initially, the disposal rooms and drifts were developed as pilot drifts that were trimmed to finished dimensions. All the rooms were excavated to final dimensions by the end of March 2004.

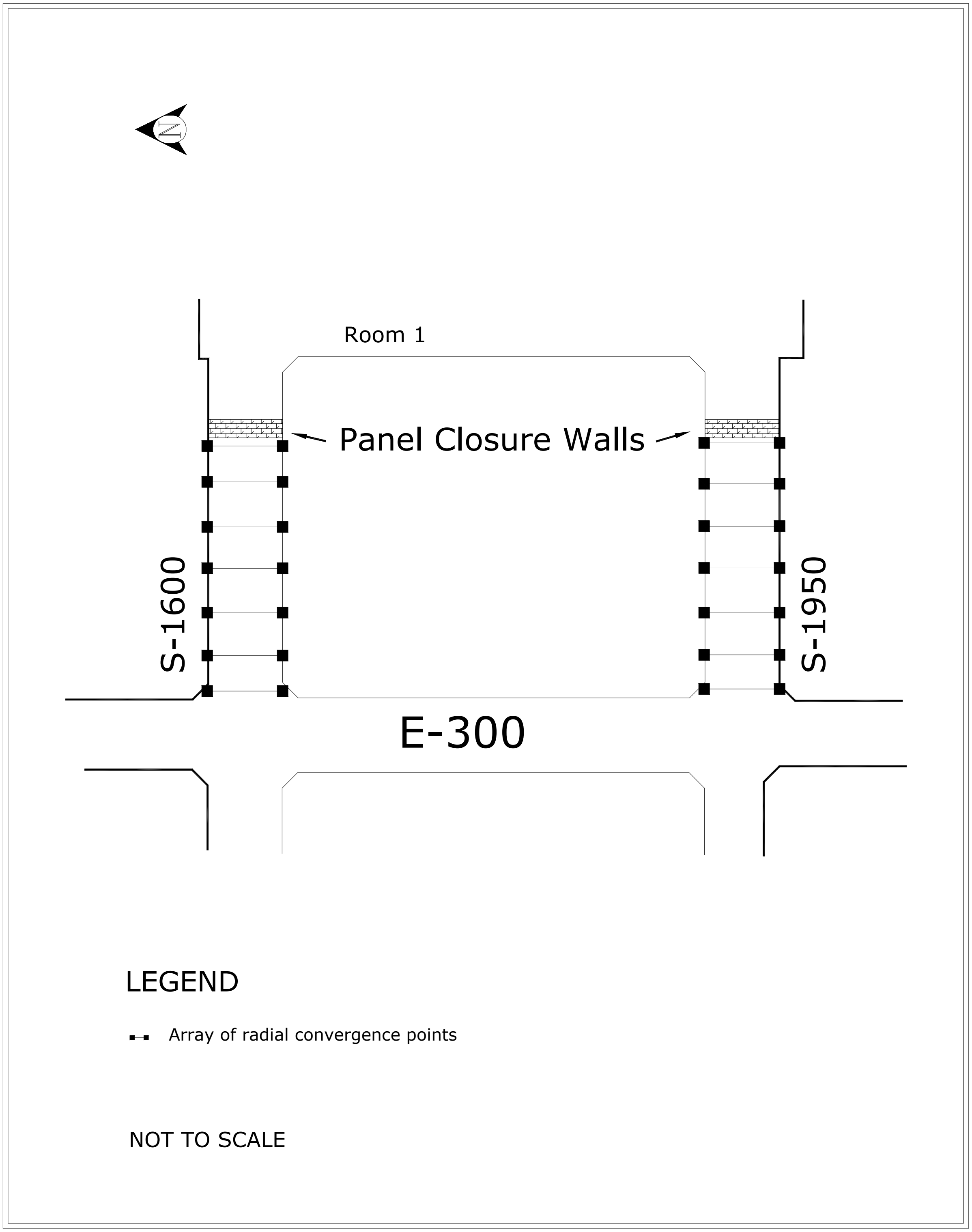

Figure 5-1 – Location of Panel 1 Entry Geotechnical Instruments

5.2 Modifications to Excavations and Ground Control Activities

There were no new excavations mined in Panel 2 during the reporting period. Panel 3 mining was completed by the end of March 2004. Mining of Panel 4 was initiated, but not completed during this reporting period. Routine maintenance and ground control activities in the form of trimming, scaling, rock bolt replacement, and installing wire mesh were performed on ribs, floor, and roof throughout accessible areas of the disposal panels. The floor was trimmed in Rooms 1 and 2 of Panel 2 and in portions of S-2180 and S-2520 to re-establish the minimum operating height required for waste disposal activities. Supplemental bolts were installed in all Panel 3 rooms and access drifts. Table 6-1 summarizes the ground control activities performed in the disposal panels during this reporting period.

5.3 Instrumentation

There were no changes to the Panel 2 instrumentation layout. Monitoring of manually read instruments continued until access was no longer available due to waste disposal. Remote monitoring of the borehole extensometers continued through this reporting period.

The instrumentation of Panel 3 was completed. Convergence points were installed in all of the disposal rooms, intersections, and at selected mid-pillar locations in the access drifts. A borehole extensometer was installed in the roof at each room center. Roof bolt load cells were installed at selected locations throughout the panel.

Instrumentation of the newly mined areas of Panel 4 was initiated. Convergence points were installed in Rooms 1 and 2, and in selected locations in the access drifts. A borehole extensometer and a rock bolt load cell were installed in the roof at the center of Room 1. Figure 6-1 shows the location of the various types of geotechnical instruments in the Panel 1 entries, and Figures 6-2 and 6-3 show the instrumentation layout for Panels 2 and 3.

Table 5-1 – Summary of Modifications and Ground Control Activities in the Waste Disposal Area from July 1, 2004, to June 30, 2005

Location	Work Performed
Panel 1 entries, S-1600 and S-1950	Routine replacement of broken bolts
Panel 2, Rooms 1 through 2, S-2180 and S-2520	Trimmed floor
Panel 3, Rooms 4 and 7	Pattern bolting
Panel 3, Rooms 3 and 6	Installed supplemental ground support
Panel 3, S-2750 and S-3080	Installed supplemental ground support
Panel 4, Panel entries, Rooms 1 and 2	Initial mining complete, Room 1 to full dimensions
Panel 4, S-3310 and S-3650	Initial mining and bolting complete to approximately E-920
Panel 4, Room 1	Pattern bolting complete

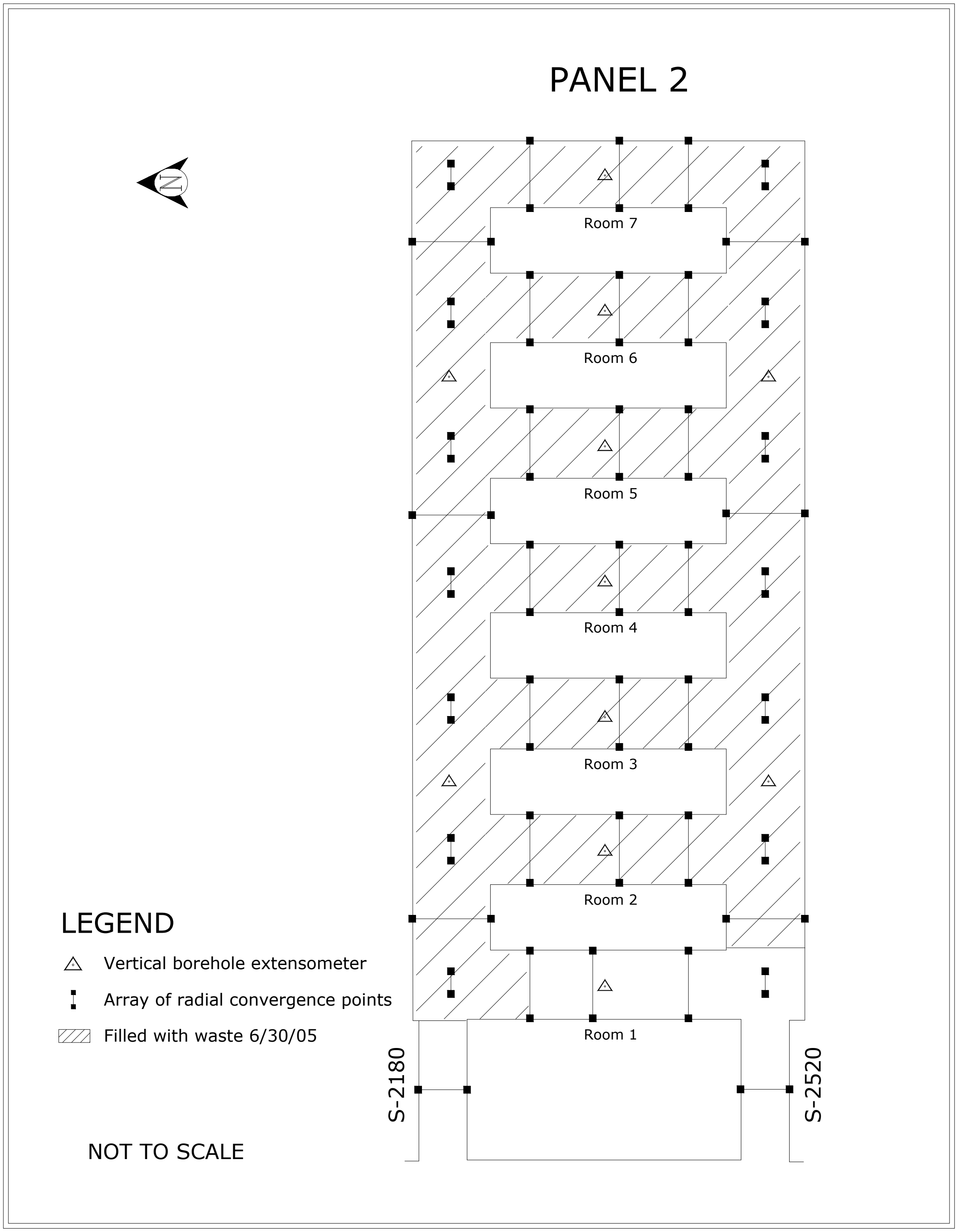

Figure 5-2 – Location of Panel 2 Geotechnical Instruments

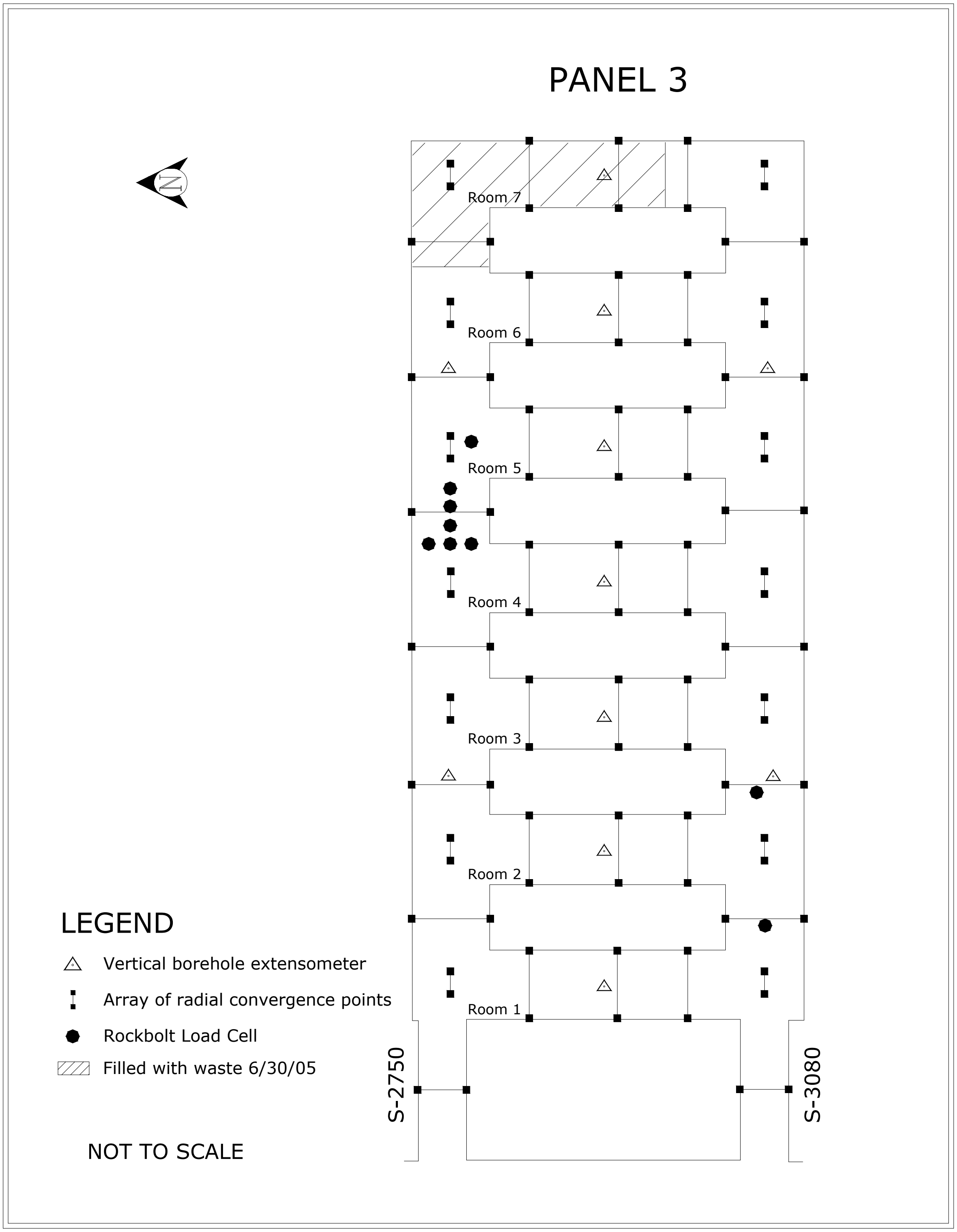

Figure 5-3 – Location of Panel 3 Geotechnical Instruments

5.4 Excavation Performance

Waste handling activities in Panel 1 have been completed, and geotechnical monitoring inside the panel has been discontinued. Convergence monitoring in the panel entries does not indicate an acceleration of closure rates; however, fracturing of the roof beam continues. It is anticipated that routine ground control maintenance will be sufficient to maintain access to this area.

Horizontal and vertical convergence rates, calculated at the center of each of the rooms in Panels 2 and 3, were compared between this and the previous reporting period. Generally, the convergence rates have decreased or remained similar. Increased rates observed in some areas are usually associated with areas of roof beam separation and fracturing. This additional convergence was addressed by floor trimming, to regain the required operating height, and by installing supplemental ground support

Panel 4 mining was started during this reporting period. Preliminary monitoring indicates that the early installation of the support system has reduced the generation of near-surface separations similar to those observed in Panel 3.

5.5 Analysis of Extensometer and Convergence Point Data

Borehole extensometers are installed in the roof at the center of each disposal room and at select locations in the access drifts of Panels 2 and 3. They show a general decrease in the rate of roof beam deformation. Some of the borehole extensometers in Panel 3 did indicate a temporary increase in rates, associated with roof beam separation at shallow anhydrite stringers. Supplemental ground control support was installed in these areas and has subsequently reduced the observed rates.

Although Panel 1 is closed, convergence monitoring continues in the panel entries between E-300 and the panel closure walls. The monitoring results indicate a steady long-term trend. The lowest closure rates were observed nearest to the rigid masonry walls.

Geotechnical monitoring in Panel 2 indicates near steady state closure since initial mining. Temporary effects, due to floor trimming and Panel 3 mining, were observed in the convergence and borehole extensometer data. The greatest deformations were from the S-2520 access drift, which is nearest to Panel 3.

Convergence rates in Panel 3 are generally decreasing or approaching steady state. The initial effects due to mining decreased significantly, similar to the experience in previous panels; however, subsequent monitoring indicated some areas with increased convergence and roof beam deformation. These areas were associated with excavation of Panel 4 and the development of separations along thin anhydrite stringers, observed in the lower roof beam. The number and continuity of these stringers vary; however, the stringers are commonly observed throughout the panel.

Deformation rates in these areas have stabilized or decreased in response to the installation of ground control.

Panel 4 mining continues with the installation of pattern bolts soon after mining. Panel 4 is being bolted and monitored at an earlier stage in its development than was Panel 3. It appears from early observations that the closure rates are trending to be less than what was observed in the Panel 3. This may be due to the effect of earlier bolting on the development of separation at the anhydrite stringers in the roof beam.

6.0 GEOSCIENCE PROGRAM

The Geoscience Program confirms the suitability of the site through the collection of various geologic data and excavation characteristics from the underground. These include the inspection of open boreholes for fractures (separations) and offsets (lateral displacements) in roof beams and the mapping of fracture development on roof surfaces. Data collected through these activities support the design and evaluation of ground support systems.

During this reporting period, the following activities were performed:

- Borehole Inspections
- Fracture Mapping

6.1 Borehole Inspections

Geotechnical observation boreholes are drilled at various locations throughout the underground facility. A location may contain one or more boreholes arranged in an array. These holes are drilled to depths that allow the monitoring of fracture development and offsetting and are inspected for the development of those features. Roof observation holes usually extend up past clays "G" and "H" (Figures 7-1 and 7-2).

The clay seams nearest the excavation surfaces define the immediate roof beam. The roof beam is bounded by clay "G" in most of the access drifts and Panels 1 and 2. Some areas, such as the Salt Shaft Station, portions of the E-0 and E-140 drifts, the south mains south of S-2620, and Panel 3 are excavated to clay "G" and so have roof beams bounded by clay "H."

The offset in a borehole is determined by visually estimating the degree of borehole occlusion. The direction of offset along clay seams is observed as the movement of the strata nearer to the observer relative to the strata farther away. Typically, the nearer strata move toward the center of the excavation (Figures 7-3 and 7-4). Based on previous observations in the underground, the magnitude of offset is usually greater in boreholes located near ribs than in those located along excavation centerlines. Offsetting along the clay layers is observable until the total borehole offset is reached or visibility is obstructed by intervening offsets at other clay seams or fractures. Boreholes are inspected for fractures, using an aluminum rod with a flattened steel wire probe attached to one end perpendicular to the rod (referred to as a "scratcher rod"). Fractures and clay seams are located by moving the probe along the inside of the borehole until it is snagged in one of these features. Depth to each feature is recorded, as is the magnitude of separations encountered. In addition, during this reporting period, the use of a borehole camera has been introduced in conjunction with the scratch rod.

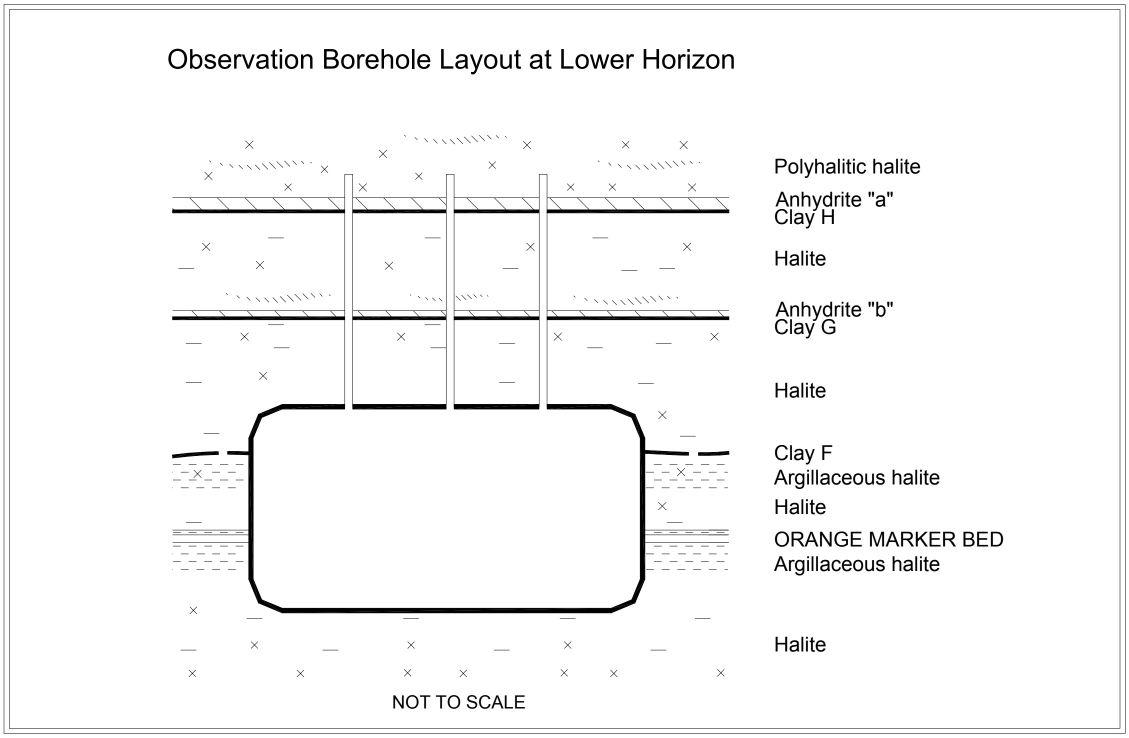

Figure 6-1 – Example of Observation Borehole Layout at Lower Horizon

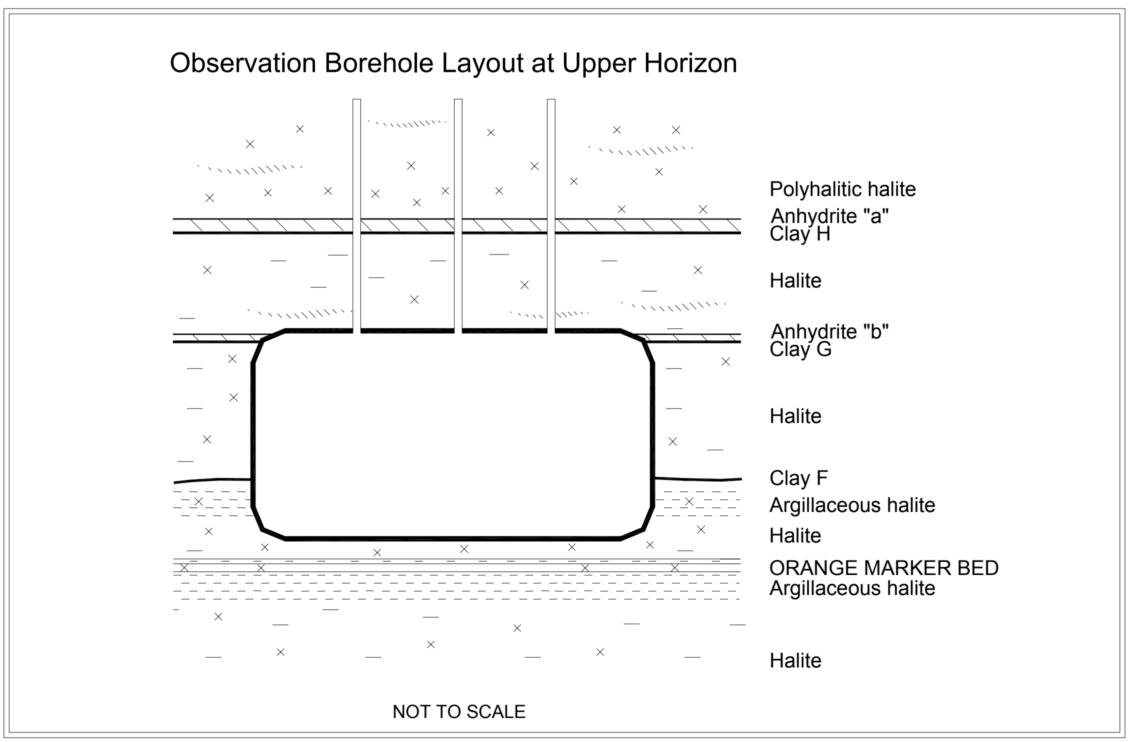

Figure 6-2 – Example of Observation Borehole Layout at Upper Horizon

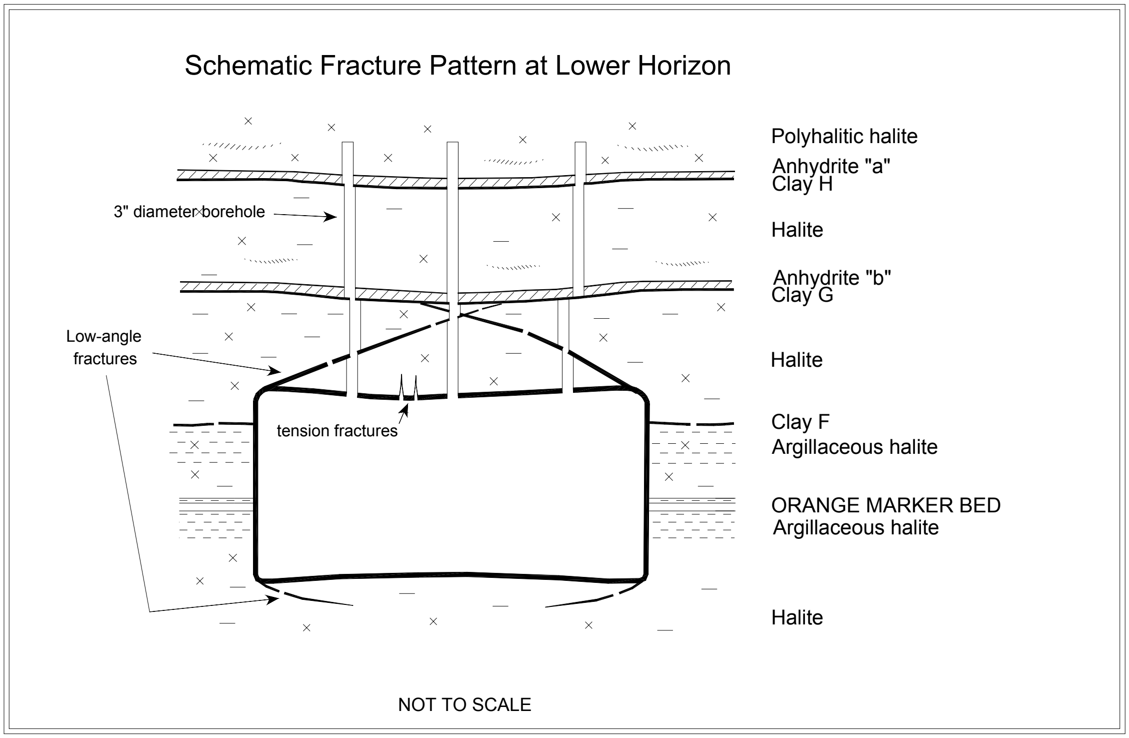

Figure 6-3 – Typical Fracture Patterns at Lower Horizon

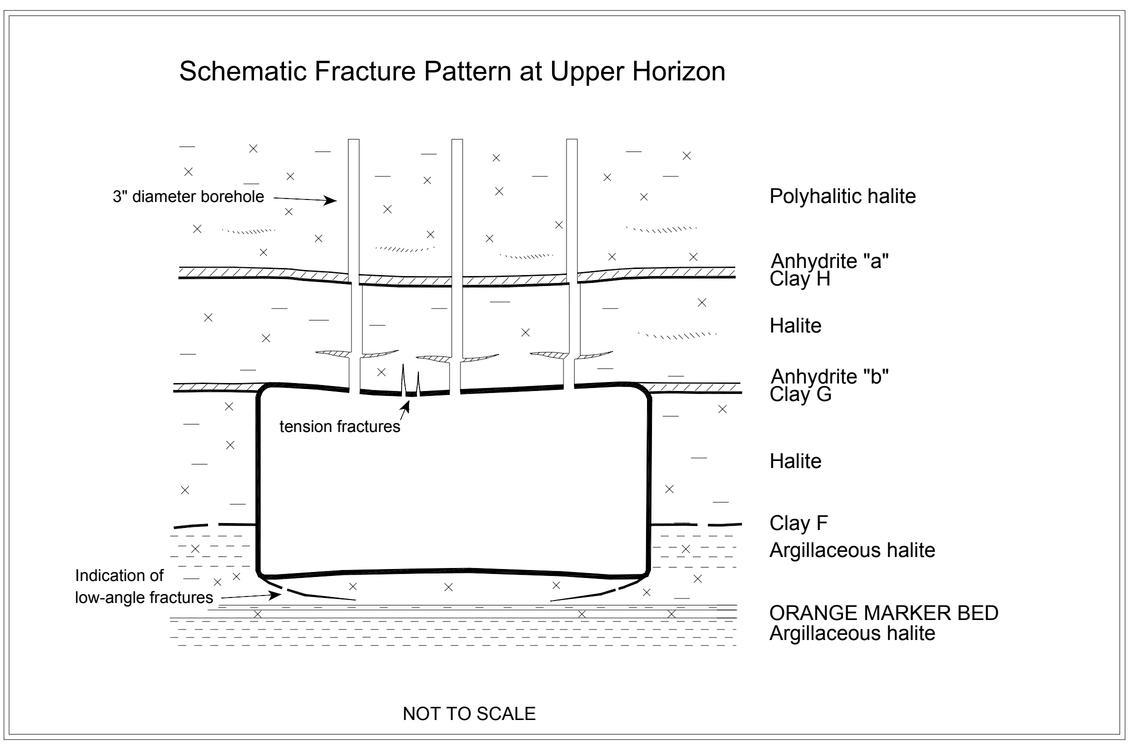

Figure 6-4 – Typical Fracture Patterns at Upper Horizon

The separation and offset data observed in accessible boreholes are presented in the supporting data document for this report. All of the observation holes exhibit some separation within the roof beam. The greatest separations are generally associated with anhydrite stringers in the lower portion of the roof beam. Forty-four of the forty-eight observation holes in Panel 3 show some offset. Most holes show offsetting along anhydrite stringers and clay layers. Only four boreholes did not indicate offsetting. One borehole at the intersection of S-3080 and Room 1 exhibited a 3-inch lateral displacement.

6.2 Fracture Mapping

Routine mapping documents the progression of fractures in the roof exposed on the excavation surfaces of the drifts and rooms in the underground repository. The fracture surveys are generally performed on an annual basis, and the fracture maps are updated. The fracture maps facilitate the analysis of strain in the immediate roof-beam because they document the development and propagation of fractures through time. The supporting data document contains fracture maps for Panels 2 and 3. For this reporting period, Rooms 1 through2 and corresponding portions of S-2180 and S-2750 were accessible in Panel 2.

7.0 SUMMARY

At the inception of the WIPP, criteria were developed that address the design requirements (DOE, 1984). They pertain to all aspects of the mined facility and its operation as a pilot plant for the demonstration of technical and operational methods for permanent disposal of contact-handled (CH) and remote-handled (RH) TRU waste. In 1994, as WIPP's focus moved toward the permanent disposal of TRU waste, these design requirements were reassessed and replaced by a new set of requirements called system design descriptions (SDDs). Table 8-1 shows the comparison of these design requirements with conditions actually observed in the underground from July 2004 through June 2005.

Fracture development in the roof is primarily caused by the concentration of compressive stresses in the roof beam and is influenced by the size and shape of the excavation and the stratigraphy in the immediate vicinity of the opening. In a thick roof beam, pillar deformations induce lateral compressive stresses into the immediate roof and floor. With time, the buildup of stress causes differential movement along stratigraphic boundaries. This differential movement is identified as offsets in observation boreholes and by the bends in failed rock bolts. Large strains associated with lateral movements can induce fracturing in the roof, which is frequently seen near the ribs; however, this process may take a long time (years) to develop.

At the upper repository horizon, clay or anhydrite stringers exert significant influence over the effective thickness of the roof beam. The presence of these stringers causes the roof beam to behave as a series of thin independent beams. Little or no tensile support is provided across the stringer interface. As horizontal end-loading continues, each beam can deflect downward causing a tensile fracture to develop along the bottom of the beam. These tensile fractures can develop in relatively new excavations soon after separation occurs along the stringer interface.

The location and initiation of interface separation is also influenced by the dip of the rock layers. The roofs and floors of the disposal panels are mined level through the sloping beds. At some locations, this may result in a significant difference in roof beam thickness from one side of the excavation to the other. Areas with the thinnest beam are the most likely to develop separations and subsequent fracturing.

Normal drift and room maintenance continued during this reporting period with rib, roof, and floor scaling and trimming in various locations, and rock bolts and wire mesh installed as needed. Supplemental ground control systems consisting of resin-anchored bolts and roof mats were installed in sections of the E-140 and W-170 drifts.

New geomechanical instrumentation was installed in Panel 4 and its access drifts, as well as in various locations throughout the repository to replace mined-out instruments. Remote convergence monitoring no longer continues in non-accessible areas in the north. All accessible areas of the underground are connected to data-loggers or are monitored manually.

The in situ performance of the excavations generally continues to satisfy the appropriate design criteria, although specific areas are being identified where deterioration resulting from aging must be addressed through routine maintenance and installation of engineered systems. This deterioration has been identified through the analysis of data acquired from geomechanical instrumentation and the Geoscience Program. If the planned life of some of the openings needs to be extended, changing the geometry of the access drifts (removing unstable roof beam or rib spalls, or milling the floor for added clearance), or additional ground control (roof removal, installing bolts, mesh, or straps) may be necessary. The ground conditions in the waste disposal area and associated waste transport routes continue to slowly deteriorate; however, routine ground control installations and maintenance continue to allow safe access in the underground facility.

In addition to underground instrumentation, qualitative assessments of fracture development are documented through mapping the underground repository and inspecting the observation boreholes. The information acquired from these programs provides early detection of ground deterioration, contributes to the understanding of the dynamic geomechanical processes in the WIPP underground, and aids in the design of effective ground control and support systems.

Table 7-1 – Comparison of Excavation Performance to System Design Requirements

Requirement	Comments
"The lining shall be designed for a hydrostatic pressure. . . ."	Water pressure observed on piezometers located behind the shaft liners remains below design levels.
"The key shall be designed to resist the lateral pressure generated by salt creep."	Geomechanical data from the Waste Shaft indicate that the shaft key is minimally loaded and is structurally stable. Visual inspections of all shaft keys do not indicate any deterioration due to creep loading.
"The key shall be designed to retain the rock formation and will be provided with chemical seal rings and a water collection ring with drains to prevent water from flowing down the unlined shaft from the lining above."	Shaft inspection observations and instrumentation show no indication of instability due to salt dissolution. No water has been observed flowing along the rock-liner interface.
"The underground waste disposal facilities shall be designed to provide space and adequate access for the underground equipment and temporary storage space to support underground operations."	Geomechanical instrument data and visual observations indicate that the current design provides adequate access and storage and disposal space. Ground control maintenance is performed as necessary to maintain access.
"Entries and sub-entries to the underground disposal area and the experimental areas shall be provided and sized for personnel safety, adequate air flow, and space for equipment."	Deformation of excavation remains within the required limits. Normal periodic maintenance consisting of rock bolting, wire meshing, trimming, and scaling continue throughout the repository. The former experimental area, consisting of the Northeast and Northwest Areas, is now deactivated and closed to access.
"Geomechanical instrumentation shall be provided to measure the cumulative deformation of the rock mass surrounding mined drifts. . . ."	Geotechnical instrumentation is operated and maintained to meet this requirement. This annual report provides a summary and analysis of the geomechanical data.

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DOE/WIPP-06-3177
Volume 2

Geotechnical Analysis Report for July 2004 - June 2005

Supporting Data

March 2006

Waste Isolation Pilot Plant

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1.0 Introduction

This report is a compilation of geotechnical data presented as plots for each active instrument installed in the underground at the Waste Isolation Pilot Plant (WIPP) through June 30, 2005. A summary of the geotechnical analyses that were performed using the enclosed data is provided in Volume 1 of the Geotechnical Analysis Report (GAR).

1.1 Instrumentation

Geomechanical instrument data included in this report reflect the measurements of the geomechanical response of the underground and shafts. The instruments consist of convergence points, borehole extensometers, rockbolt load cells, pressure cells, strain gages, piezometers, and joint meters.

Closure measurements are taken at convergence points. Rock displacement is calculated by measuring the distance between two opposing points. Displacement is monitored over time and is plotted as closure versus time. Annual rates of closure are calculated for the convergence data and are compared with annual closure rates from previous reporting periods.

Borehole extensometers are used to determine the absolute movements of the ground around the openings. With these instruments, rods or wires are placed into a hole and anchored at various depths. The displacement at the extensometer head (located near the excavation face) is measured relative to each of the fixed anchors. These data are used in the extensometer *displacement* plots presented here. As part of the post-processing of acquired extensometer data a *relative displacement* value is calculated. The deepest anchor is assumed to be fixed in undisturbed ground and a displacement for the remaining anchors relative to the deepest anchor is calculated. Annual rates of collar displacement are calculated for each extensometer and are compared with the annual displacement rate reported during the previous reporting period.

Rockbolt load cells are used to determine the ground loading and the effectiveness of rockbolts. Plots consist of load versus time for each instrumented bolt.

Earth pressure cells and strain gages are used in and around the shaft liners to determine their loads. These are also depicted in time-based plots. Monitoring of these instruments indicates whether there is any stress buildup in the shaft lining systems.

Piezometers are used to measure the gauge pressure of groundwater. They have been installed in the shafts at varying elevations to monitor the hydraulic head acting on the shaft liners. Plots from piezometers are presented as pressure versus time.

Joint meters are installed perpendicular to a crack and monitor any changes in separation of the crack which may occur over time.

1.2 Data Plot Explanation

Data are presented in graphical form for ease in interpretation. Time-based plots are used in this report. Each plot generally consists of a legend in the upper right-hand corner that gives the array name and specific location of the instrument or point evaluated. The legend ties the graphical cross-sectional representation of the drift or shaft typically presented in the lower right-hand corner to the symbols on the curve in the graph. For extensometers, each anchor is designated with an alpha character “A” closest to the collar and “C,” “D,” or “E” for the furthest point from the collar (the deepest anchor). For convergence points, the horizontal and vertical sections of the drift are referred to as chords. Breaks in the graph for convergence data and a numeric designator added to the legend typically indicate that the convergence point was lost due to normal mine maintenance activities and later reinstalled.

1.3 Report Organization

Chapter 1.0 provides an introduction to this Supporting Data volume of the GAR. Chapter 2.0 provides instrument data analysis for the Salt Handling Shaft, Waste Shaft, and Exhaust Shaft followed by data plots for the extensometers, piezometers, earth pressure cells, spot welded strain gages, and embedment strain gages installed in the shafts. Chapter 3.0 provides instrument data analysis for the Salt Handling Shaft Station and Waste Shaft Station, an instrument data summary only for the area immediately surrounding the Air Intake Shaft, and data plots for extensometers, convergence points, and rockbolt load cells for all three locations. Chapter 4.0 provides instrument data analysis for the access drifts followed by data plots for the extensometers, convergence points, joint meters and rock bolt load cells. Chapter 5.0 – the northeast and northwest sections of the former WIPP Experimental Area remain inaccessible and readings have been discontinued. Instrumentation data for this area has been presented in previous Geotechnical Annual Reports. Chapter 6.0 provides instrument data analysis for the Waste Disposal Area followed by data plots for the extensometers, rock bolt load cells and convergence points.

Chapter 7.0 provides geologic data collected through the mapping of fractures and the observed displacements in vertical boreholes.

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2.0 Instrumentation Summary for Shafts

Instrumentation data analysis for three of the four shafts at the WIPP follows. Table 2-1 presents data and analysis of the Salt Shaft. Plots of the instrument data are presented as Figures 2-1 through 2-13. Table 2-2 presents data and analysis of the Waste Shaft. Plots of the instrument data are presented as Figures 2-14 through 2-27. Table 2-3 presents data and analysis of the Exhaust Shaft. Plots of the instrument data are presented as Figures 2-28 through 2-35.

Table 2-1
Salt Handling Shaft Data Analysis

PIEZOMETERS

Field Tag	Level feet	Figure Number	Date of 2004-2005 Max. Reading	2004-2005 Maximum Pressure Readings (psi)	Date of 2003-2004 Max. Reading	2003-2004 Maximum Pressure Readings (psi)	Change in Maximum Pressure From Previous Year (psi)	Comments
37X-PE-00201	580	2-1	04/04/05	108	06/14/04	86	22	
37X-PE-00202	580	2-1	04/04/05	113	06/14/04	91	22	
37X-PE-00203	620	2-2	04/04/05	223	06/14/04	163	60	Noisy transducer.
37X-PE-00204	620	2-2	04/04/05	180	06/14/04	152	28	
37X-PE-00205	691	2-3	07/06/04	168	06/14/04	171	-3	
37X-PE-00206	691	2-3	07/06/04	161	06/14/04	164	-3	
37X-PE-00207	726	2-4	01/31/05	143	12/01/03	143	0	
37X-PE-00209	802	2-5	07/06/04	77	07/01/03	106	-29	
37X-PE-00210	802	2-5	07/06/04	78	07/01/03	106	-28	
37X-PE-00211	850	2-6	07/06/04	120	06/14/04	124	-5	
37X-PE-00212	850	2-6	07/06/04	128	06/14/04	132	-4	

EARTH PRESSURE CELLS

Field Tag	Level feet	Figure Number	Date of 2004-2005 Max. Reading	2004-2005 Maximum Pressure Readings (psi)	Date of 2003-2004 Max. Reading	2003-2004 Maximum Pressure Readings (psi)	Change in Maximum Pressure From Previous Year (psi)	Comments
37X- WE-00201	860	2-7	07/06/04	-5	08/26/03	-3	-2	
37X- WE-00202	860	2-7	07/06/04	-21	07/01/03	-21	0	
37X- WE-00203	860	2-7	06/02/05	3	07/01/03	2	1	

Table 2-1 (Continued)
Salt Handling Shaft Data Analysis

SPOT WELDED STRAIN GAGES

Field Tag	Level feet	Figure Number	Date of 2004-2005 Max. Reading	2004-2005 Maximum Total microstrain	Date of 2003-2004 Max. Reading	2003-2004 Maximum Total microstrain	Change in Maximum Strain From Previous Year	Comments
37X-ZE-00201	856.3	2-8	10/12/04	727	09/02/03	759	-32	
37X-ZE-00206	856.3	2-8	07/06/04	677	06/14/04	670	7	
37X-ZE-00220	862.4	2-9	10/12/04	825	09/02/03	837	-12	
37X-ZE-00223	862.4	2-9	07/06/04	568	06/14/04	565	3	

EMBEDMENT STRAIN GAGES

Field Tag	Level feet	Figure Number	Date of 2004-2005 Max. Reading	2004-2005 Maximum Total microstrain	Date of 2003-2004 Max. Reading	2003-2004 Maximum Total microstrain	Change in Maximum Strain From Previous Year	Comments
37X-ZE-00209	856.3	2-10	04/04/05	-554	02/04/04	-544	-10	
37X-ZE-00210	856.3	2-10	07/06/04	989	08/26/03	991	-2	
37X-ZE-00211	856.3	2-10	07/06/04	323	08/26/03	332	-9	
37X-ZE-00212	856.3	2-10	01/31/05	-804	03/02/04	-802	-2	
37X-ZE-00213	856.3	2-10	07/06/04	322	06/14/04	321	1	
37X-ZE-00214	856.3	2-10	01/31/05	-125	03/02/04	-127	2	
37X-ZE-00215	856.3	2-10	07/06/04	82	08/26/03	82	0	
37X-ZE-00216	856.3	2-10	07/06/04	587	06/14/04	583	4	
37X-ZE-00225	862.4	2-11	07/06/04	183	08/26/03	183	0	
37X-ZE-00235	856.3	2-12	03/01/05	-427	03/02/04	-418	-9	
37X-ZE-00236	856.3	2-12	07/06/04	96	06/14/04	90	6	
37X-ZE-00237	856.3	2-12	01/31/05	-207	06/14/04	78	-285	Anomalous reading.
37X-ZE-00238	856.3	2-12	07/06/04	485	06/14/04	482	3	
37X-ZE-00239	862.4	2-13	07/06/04	323	08/26/03	320	3	

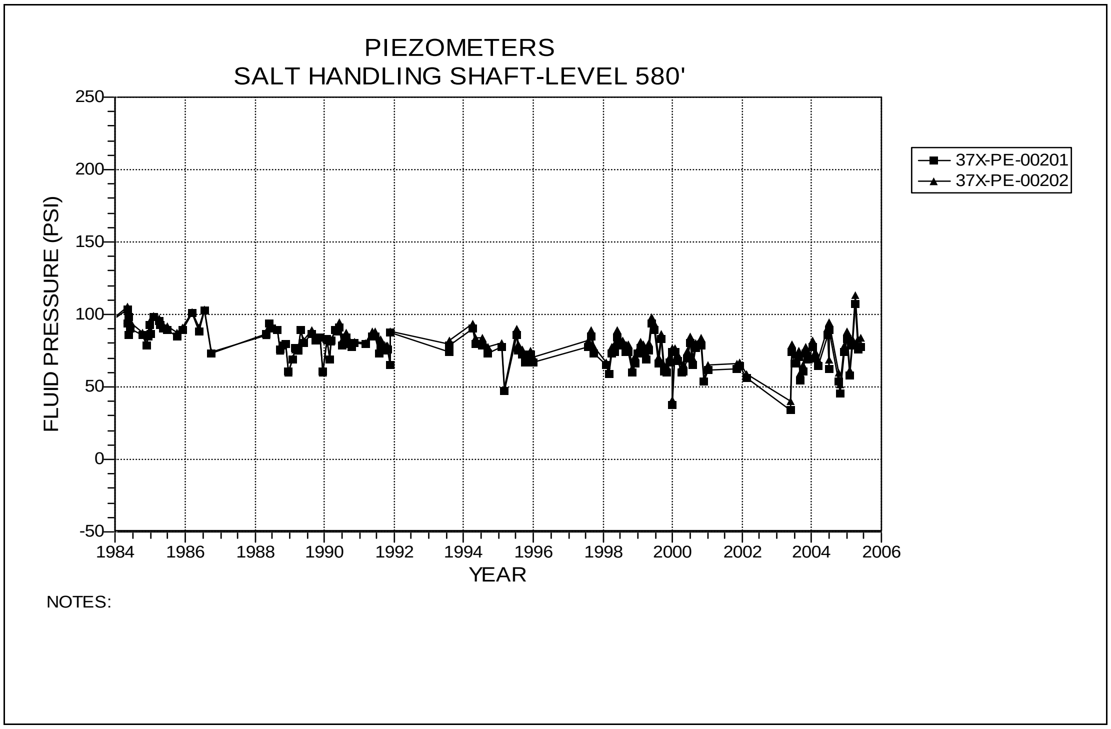


Figure 2-1 Piezometers 37X-PE-00201 and 37X-PE-00202
Salt Handling Shaft – Level 580 at the Forty-niner Member

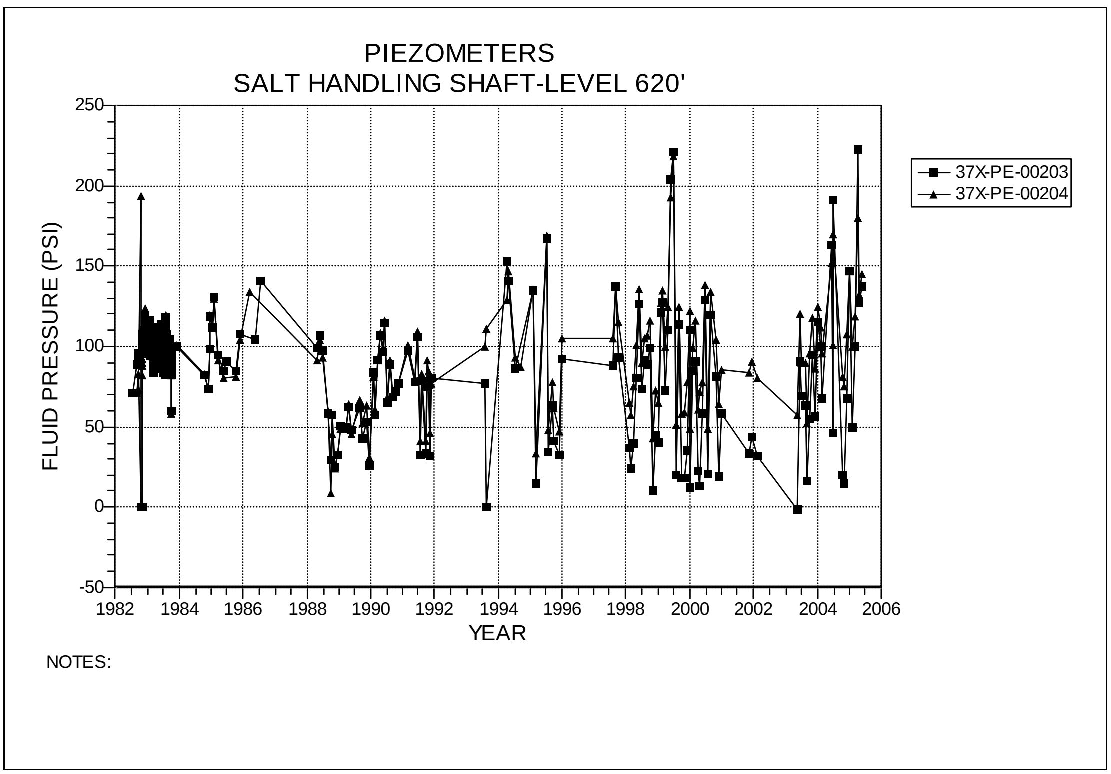


Figure 2-2 Piezometers 37X-PE-00203 and 37X-PE-00204
Salt Handling Shaft – Level 620 at the Magenta Dolomite Member

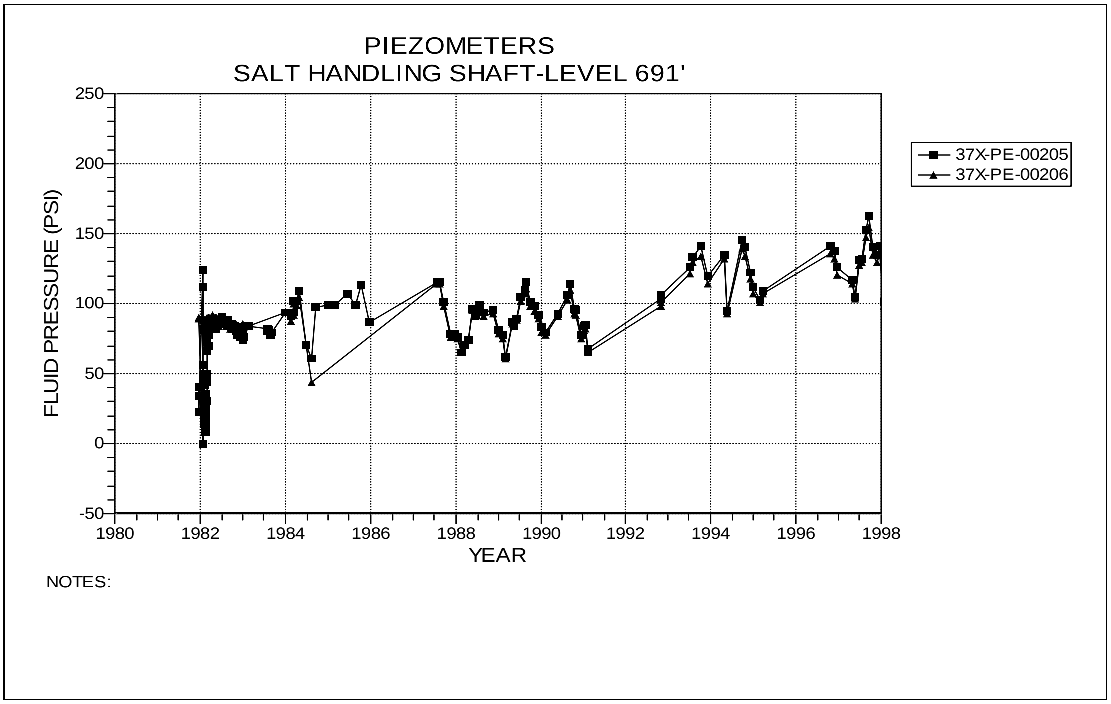


Figure 2-3 Piezometers 37X-PE-00205 and 37X-PE-00206
Salt Handling Shaft – Level 691 at the Tamarisk Member

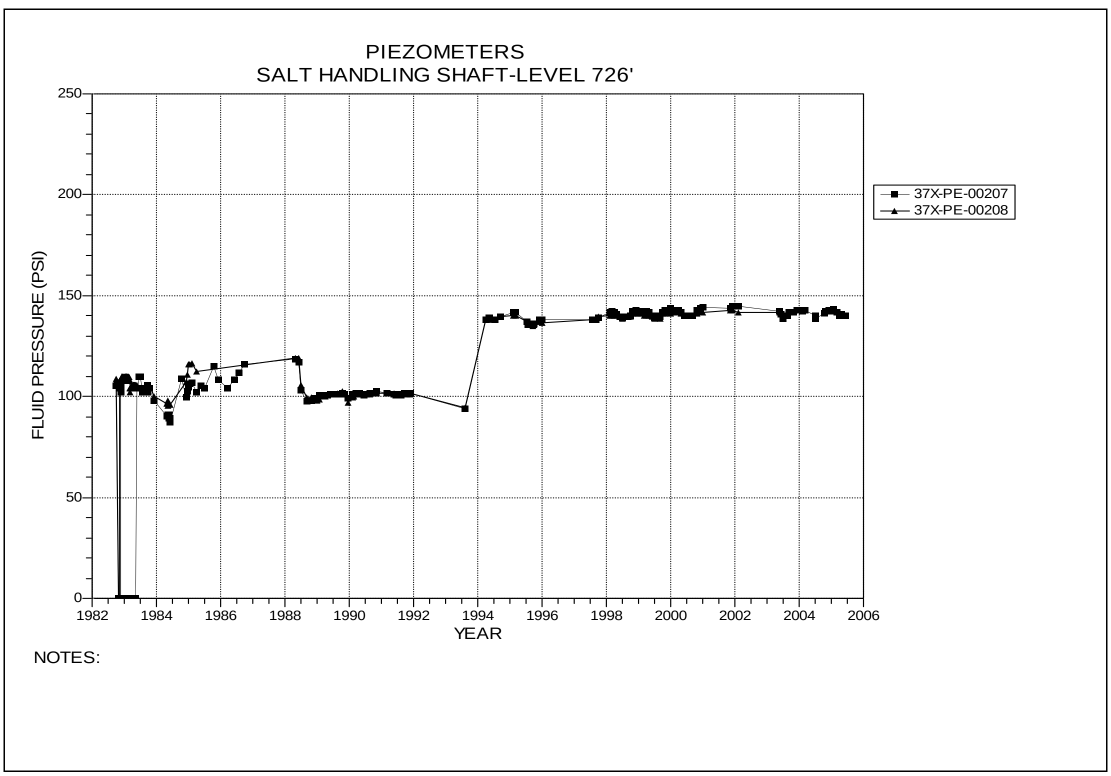


Figure 2-4 Piezometer 37X-PE-00207
Salt Handling Shaft – Level 726 at the Culebra Dolomite Member

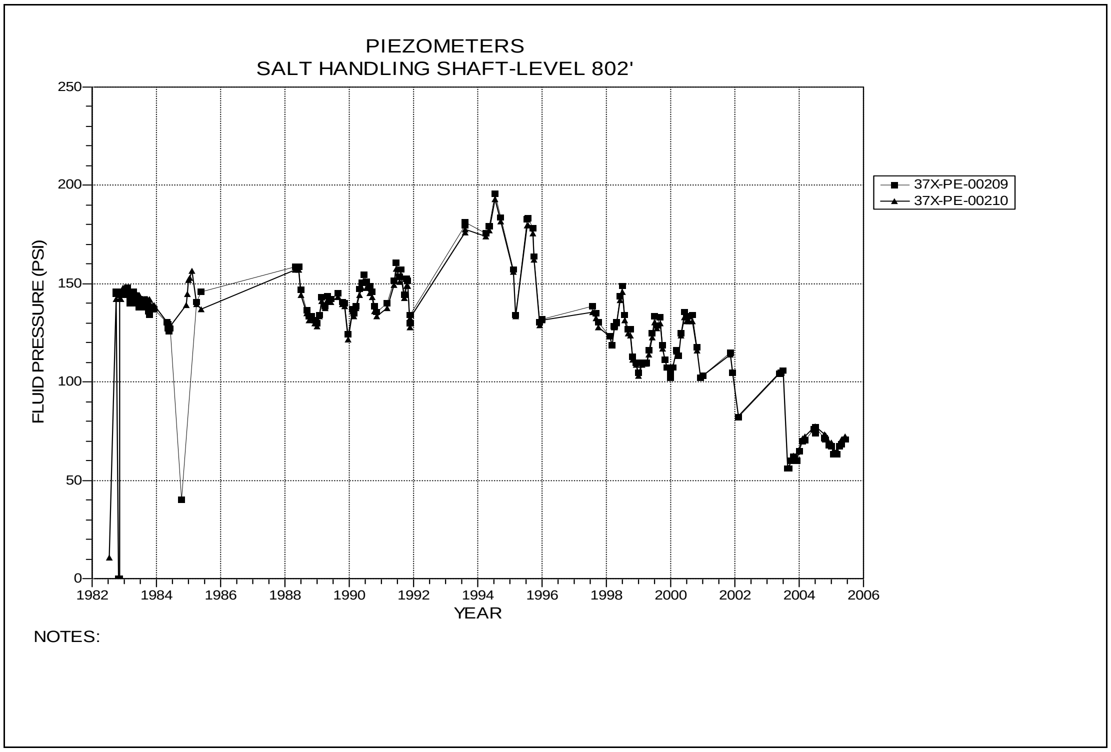


Figure 2-5 Piezometers 37X-PE-00209 and 37X-PE-00210
Salt Handling Shaft – Level 802 at the Los Medaños Member

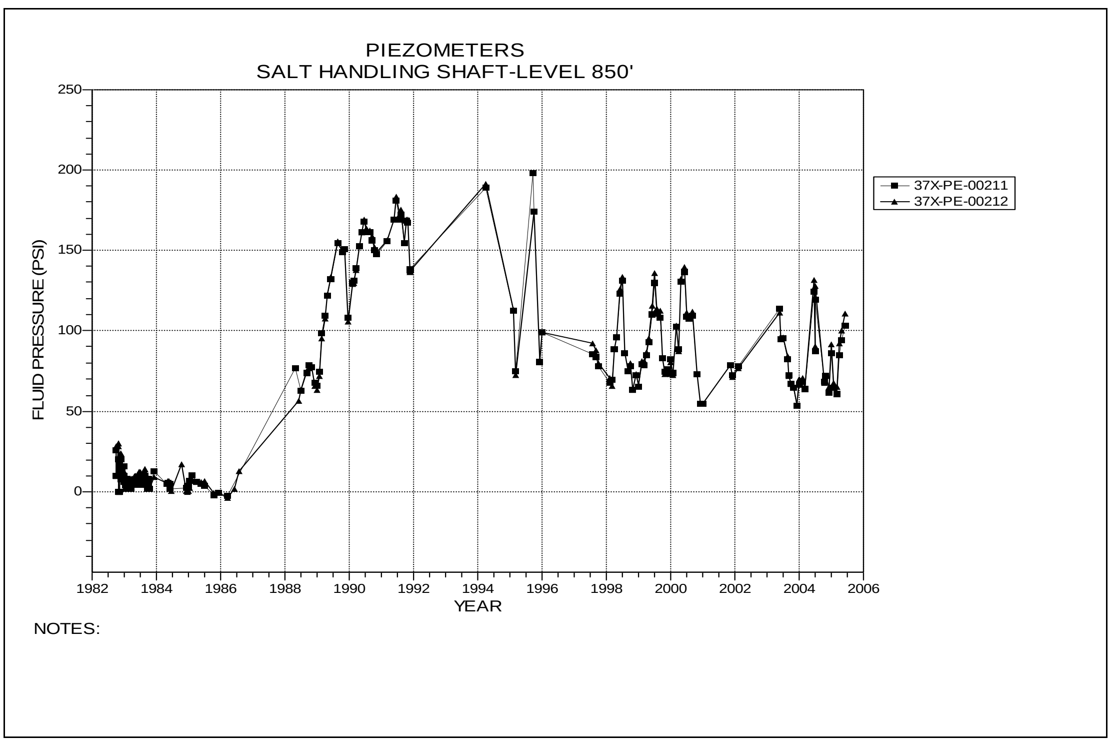


Figure 2-6 Piezometers 37X-PE-00211 and 37X-PE-00212
Salt Handling Shaft – Level 850 at the Rustler-Salado Contact

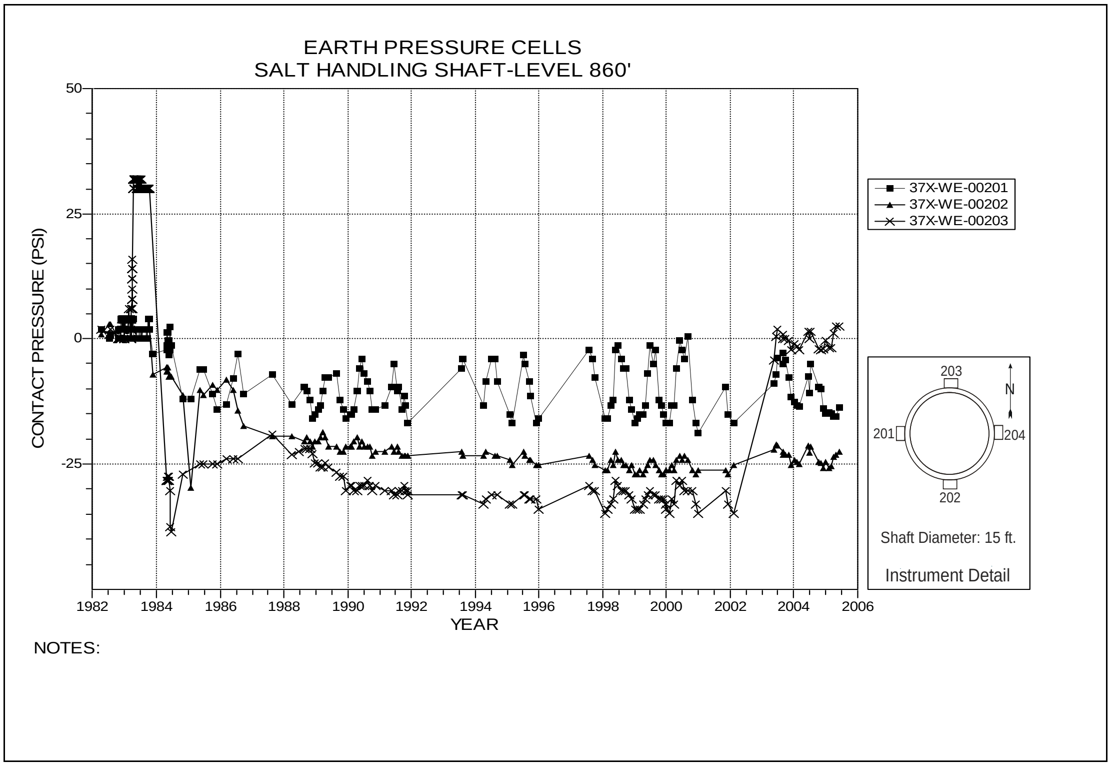


Figure 2-7 Earth Pressure Cells Behind Shaft Key
Salt Handling Shaft Key – Level 860

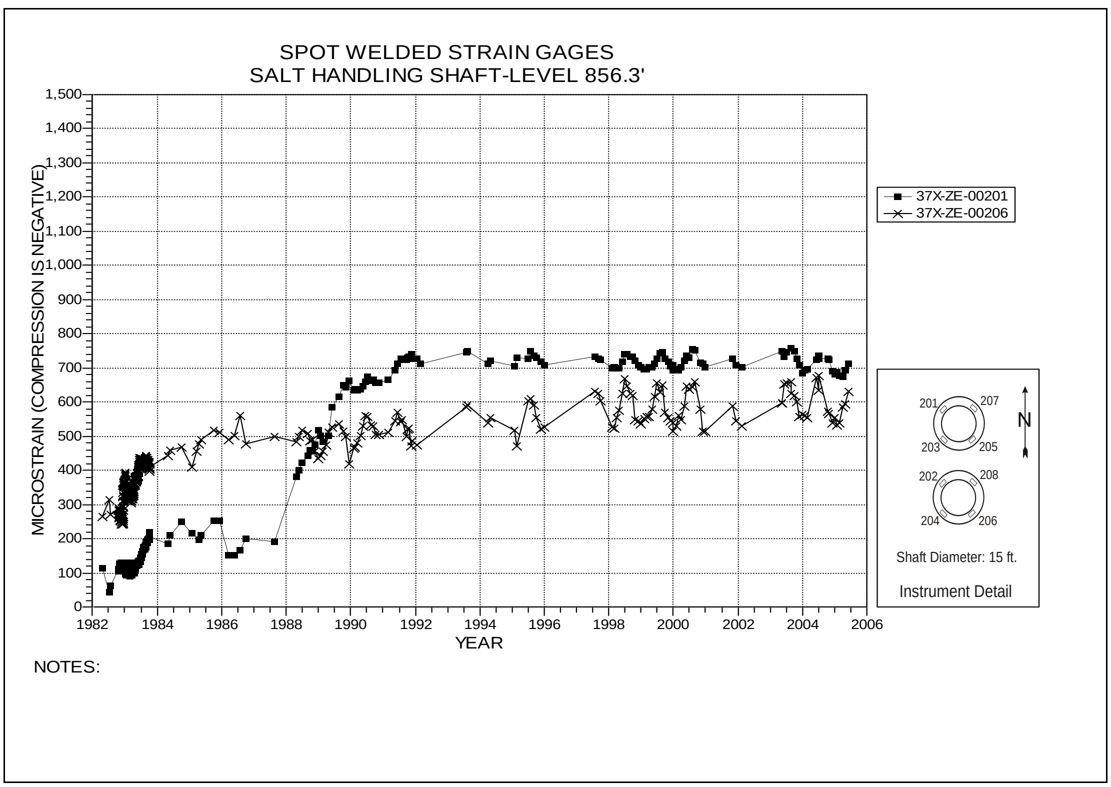


Figure 2-8 Spot Welded Strain Gages
Salt Handling Shaft Key – Level 856.3

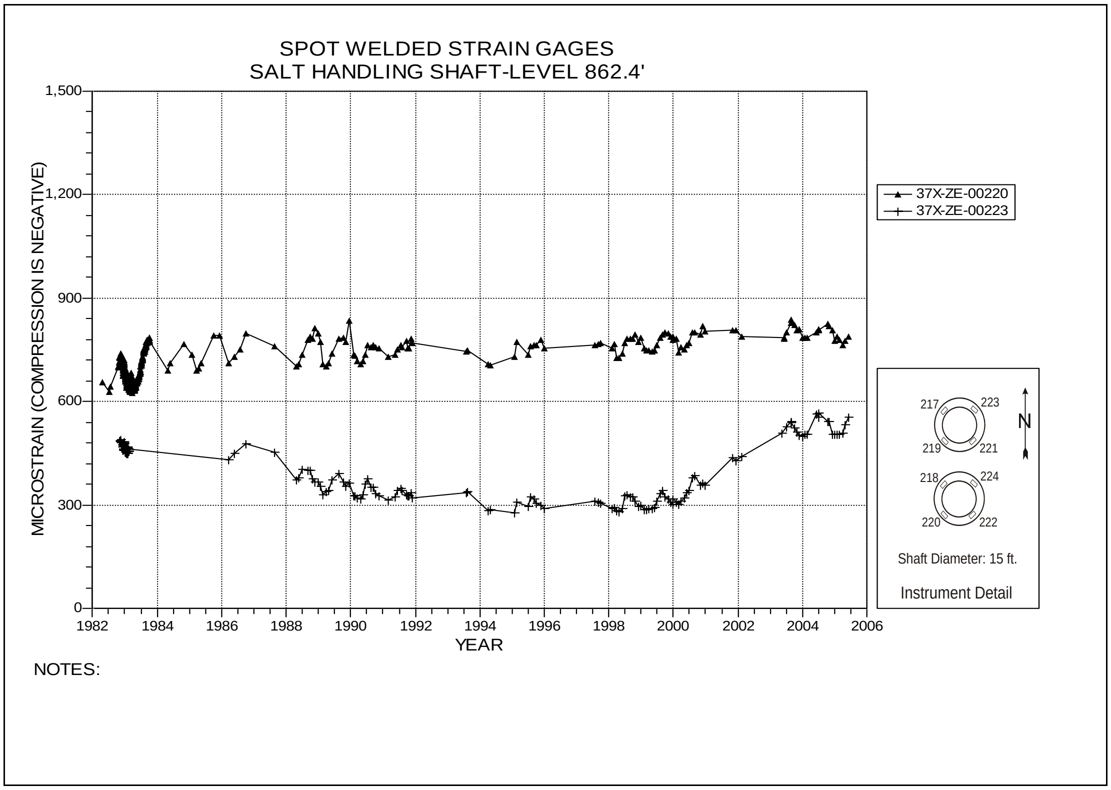


Figure 2-9 Spot Welded Strain Gages
Salt Handling Shaft Key – Level 862.4

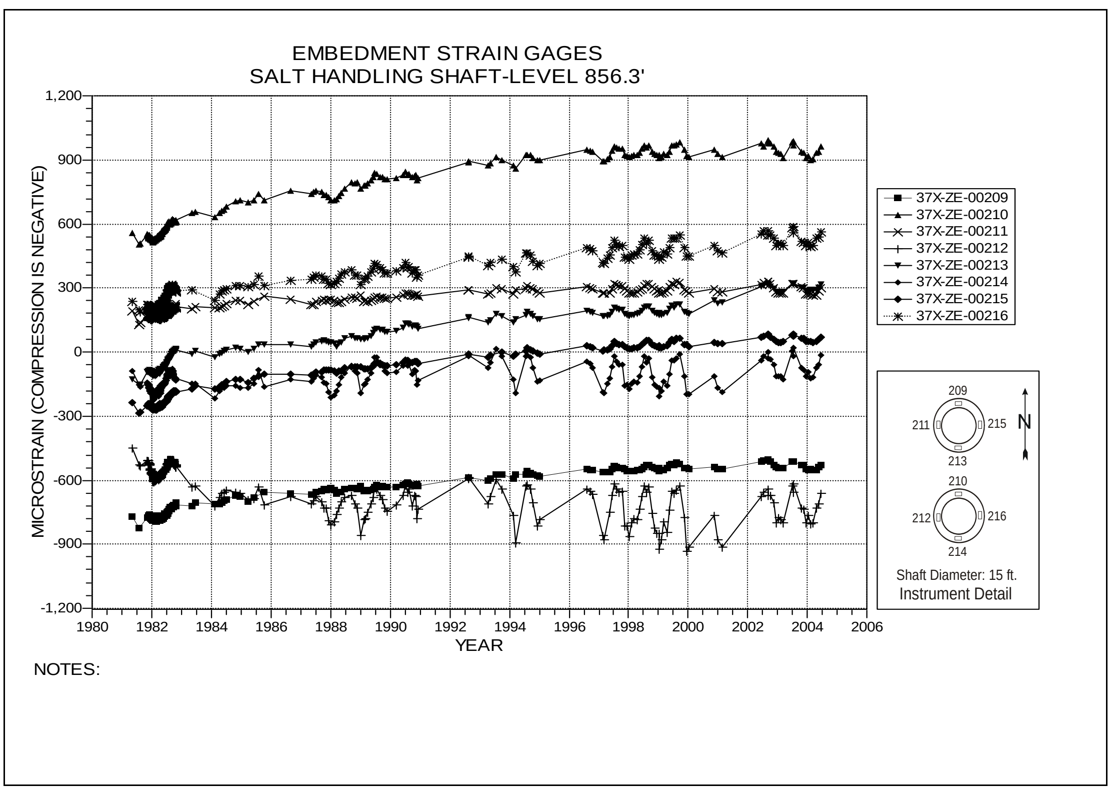


Figure 2-10 Embedment Strain Gages
Salt Handling Shaft Key – Level 856.3

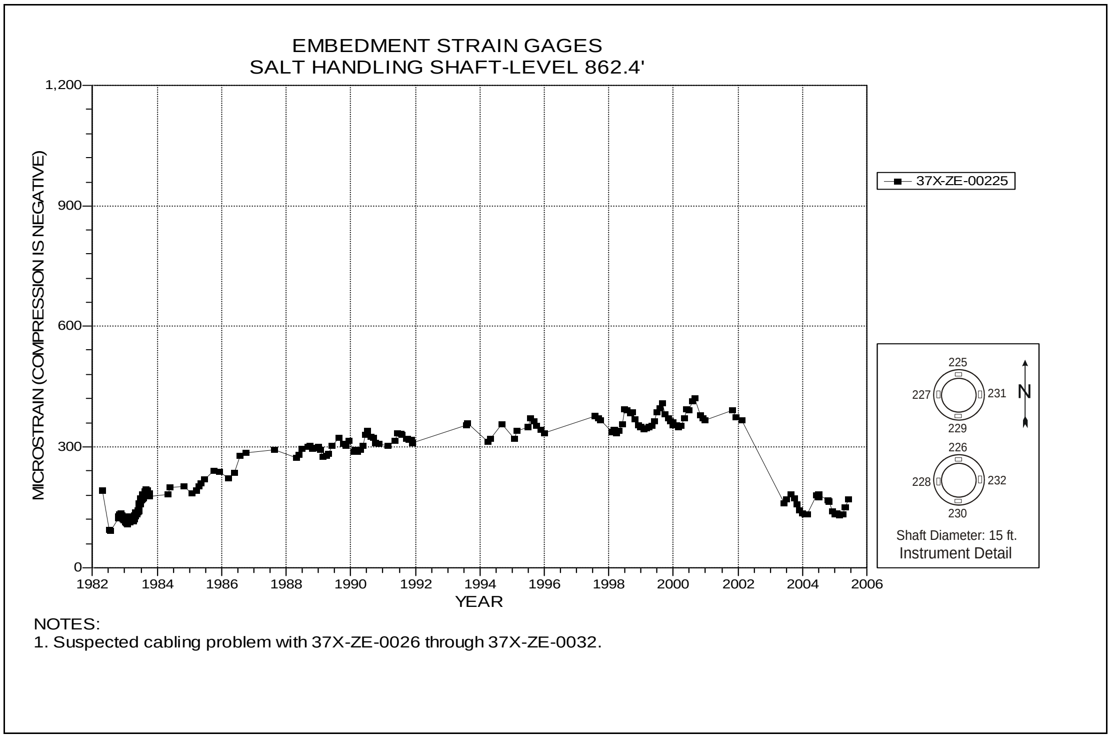


Figure 2-11 Embedment Strain Gages
Salt Handling Shaft Key Level 862.4

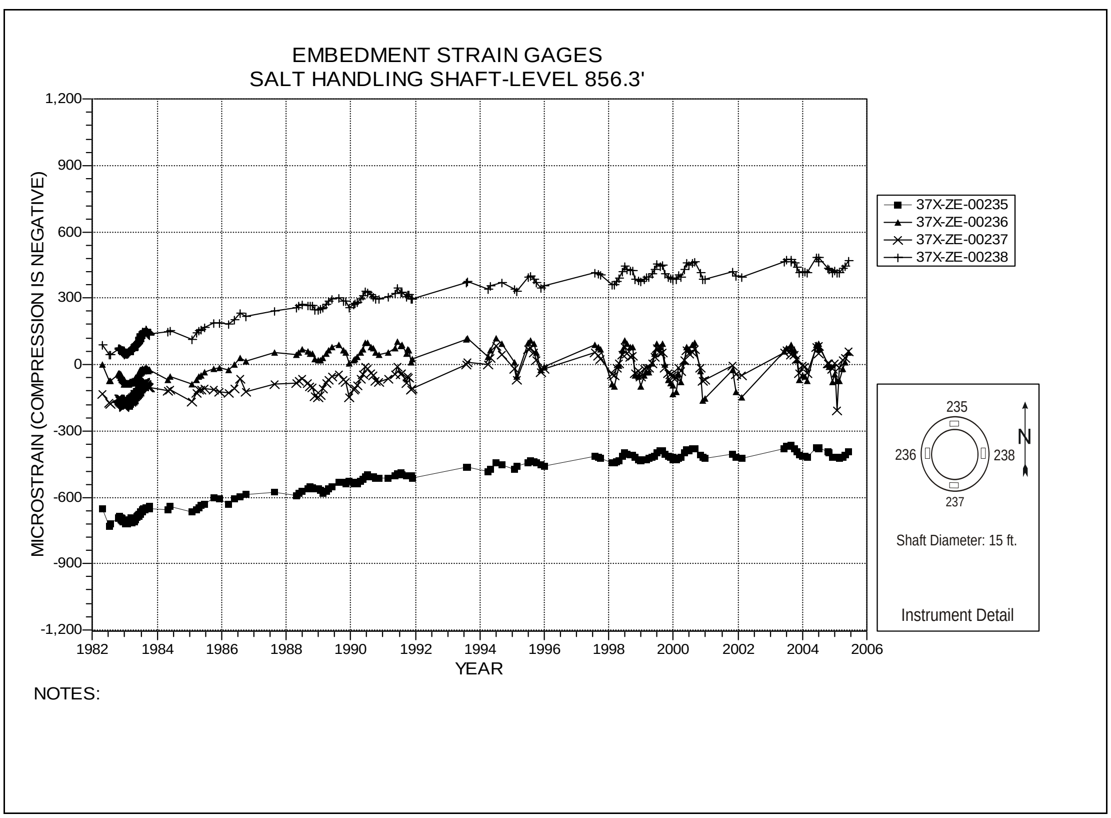


Figure 2-12 Embedment Strain Gages
Salt Handling Shaft Key Level 856.3

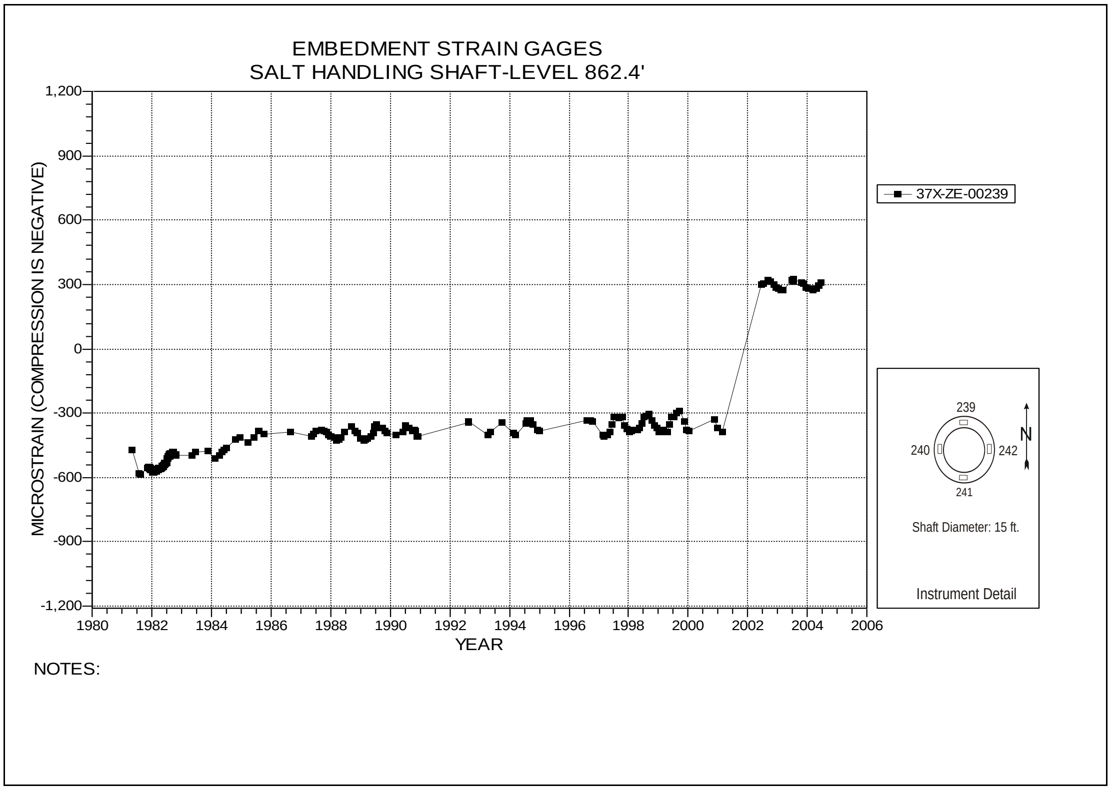


Figure 2-13 Embedment Strain Gages
Salt Handling Shaft Key – Level 862.4

Table 2-2
Waste Shaft Data Analysis

EXTENSOMETERS

Field Tag	Level feet	Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (inches)	Displacement Rate 2004 to 2005 (in/year)	Displacement Rate 2003 to 2004 (in/year)[B]	Rate Change Percent[A]	Comments
31X-GE-00203	1071	2-14	6/29/2005	0.216	0.006	N/R	N/A	
31X-GE-00204	1566	2-15	6/29/2005	0.837	0.052	N/R	N/A	
31X-GE-00205	1566	2-16	6/29/2005	0.713	0.030	N/R	N/A	
31X-GE-00206	1566	2-17	6/29/2005	0.844	0.122	N/R	N/A	
31X-GE-00207	2059	2-18	6/29/2005	2.247	0.444	N/R	N/A	
31X-GE-00208	2059	2-19	6/29/2005	1.993	0.011	N/R	N/A	
31X-GE-00209	2059	2-20	6/29/2005	2.301	0.175	N/R	N/A	

PIEZOMETERS

Field Tag	Level feet	Figure Number	Date of Max. Reading	2004-2005 Readings (psi)	Date of Maximum Max. Reading[B]	2003-2004 Readings (psi)[B]	Change in Maximum Pressure From Previous Year (psi)[A]	Comments
31X-PE-00201	532	2-21	03/10/05	-3	N/R	N/R	N/A	
31X-PE-00202	532	2-21	05/12/05	-4	N/R	N/R	N/A	
31X-PE-00203	611	2-22	05/12/05	33	N/R	N/R	N/A	
31X-PE-00204	611	2-22	03/10/05	3	N/R	N/R	N/A	
31X-PE-00205	669	2-23	04/01/05	0	N/R	N/R	N/A	
31X-PE-00206	669	2-23	05/12/05	-1	N/R	N/R	N/A	
31X-PE-00208	717	2-24	05/12/05	130	N/R	N/R	N/A	
31X-PE-00209	758	2-25	05/12/05	46	N/R	N/R	N/A	
31X-PE-0210[C]	758	2-25	03/10/05	1	N/R	N/R	N/A	
31X-PE-00211	845	2-26	01/21/05	64	N/R	N/R	N/A	
31X-PE-00212	845	2-26	05/12/05	70	N/R	N/R	N/A	

[A] N/A indicates insufficient data to compare yearly maximums.

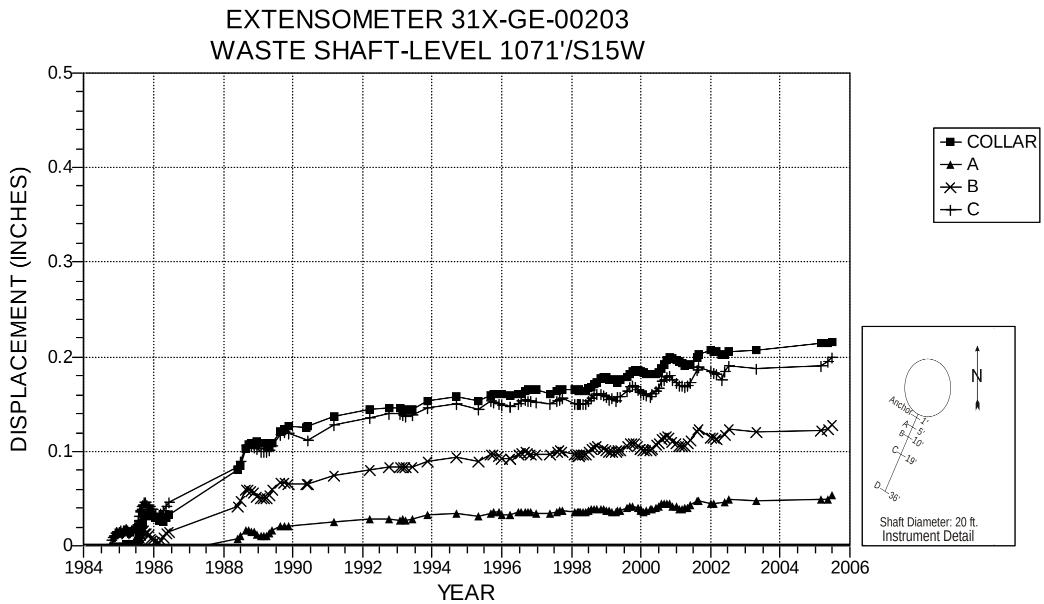
[B] N/R indicates the instruments were not read due to a faulty data logger.

[C] Probable instrument failure.

Table 2-2 (Continued)
Waste Shaft Data Analysis

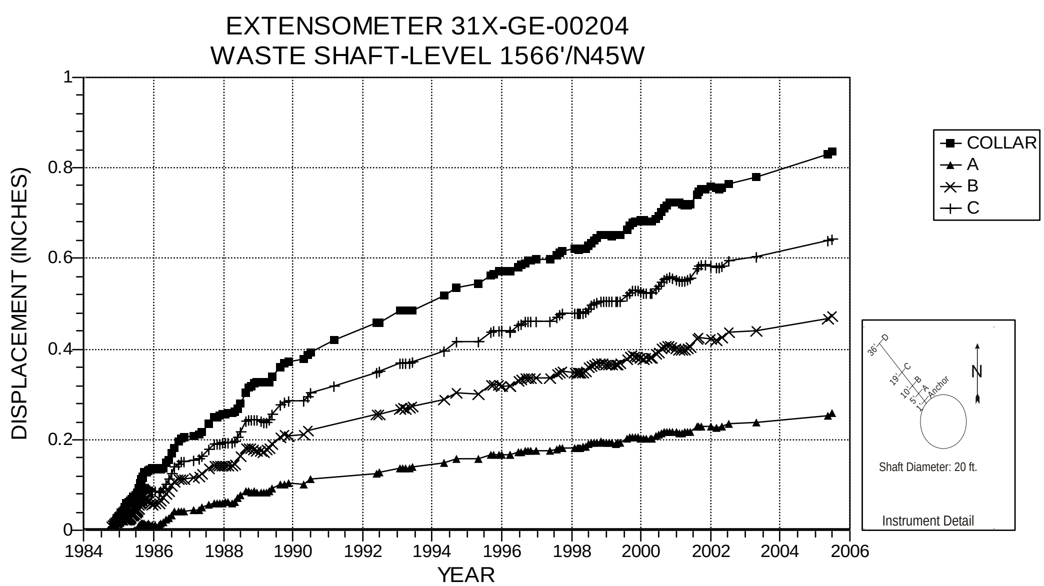
EARTH PRESSURE CELLS

Field Tag	Level feet	Figure Number	Date of 2004-2005 Max. Reading	2004-2005 Maximum Pressure Readings (psi)	Date of 2002-2003 Max. Reading	2002-2003 Maximum Pressure Readings (psi)	Change in Maximum Pressure From Previous Year (psi)	Comments
31X- WE-00201	866	2-27	04/01/05	72	07/10/02	74	-2	Not read previous period.
31X- WE-00202	866	2-27	05/12/05	71	07/03/02	81	-10	Not read previous period.
31X- WE-00203	866	2-27	05/12/05	86	07/03/02	100	-14	Not read previous period.
31X- WE-00204	866	2-27	05/12/05	83	07/03/02	101	-18	Not read previous period.



NOTES:
1. Excavation date: April 1984.

Figure 2-14 Extensometer 31X-GE-00203
Waste Shaft – Level 1071 / S15W



NOTES:
1. Excavation date: May 1984.

Figure 2-15 Extensometer 31X-GE-00204
Waste Shaft – Level 1566 / N45W

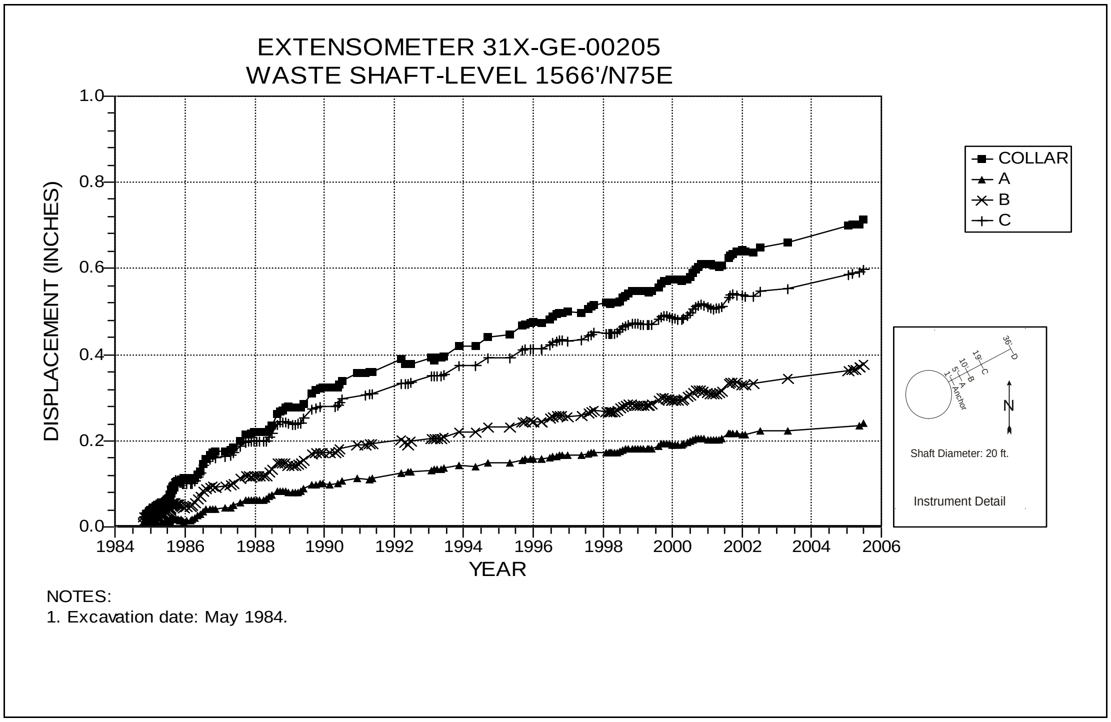


Figure 2-16 Extensometer 31X-GE-00205
Waste Shaft – Level 1566 / N75E

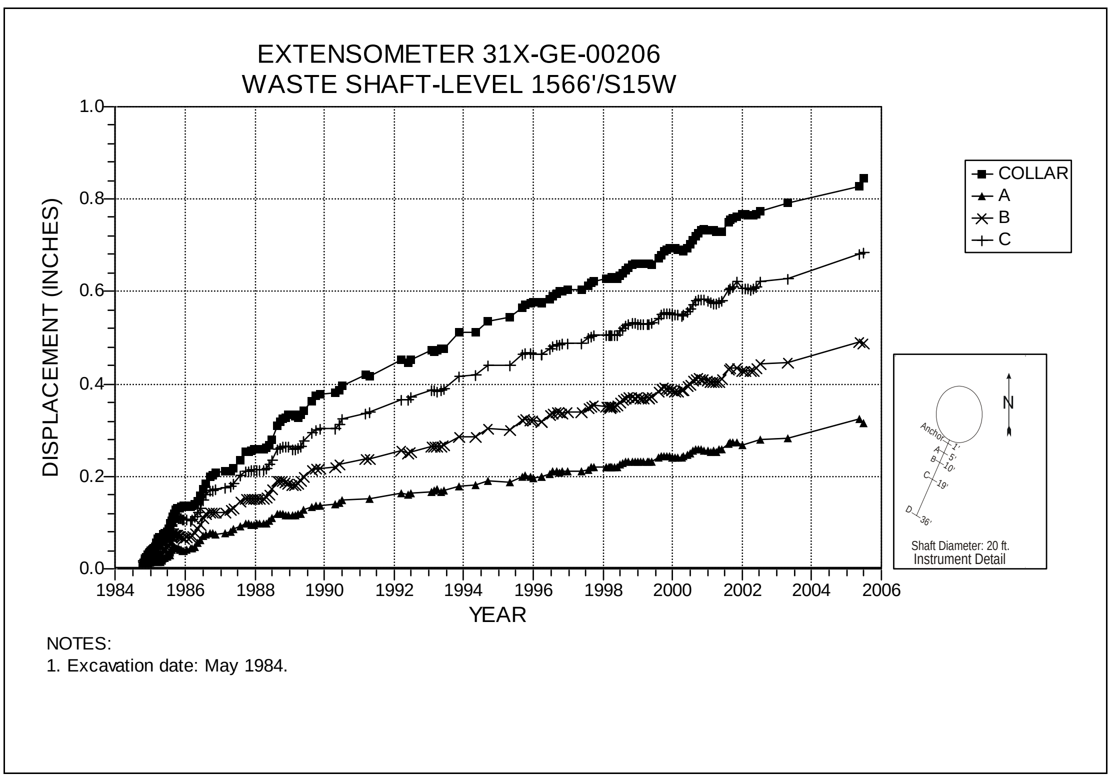


Figure 2-17 Extensometer 31X-GE-00206
Waste Shaft – Level 1566 / S15W

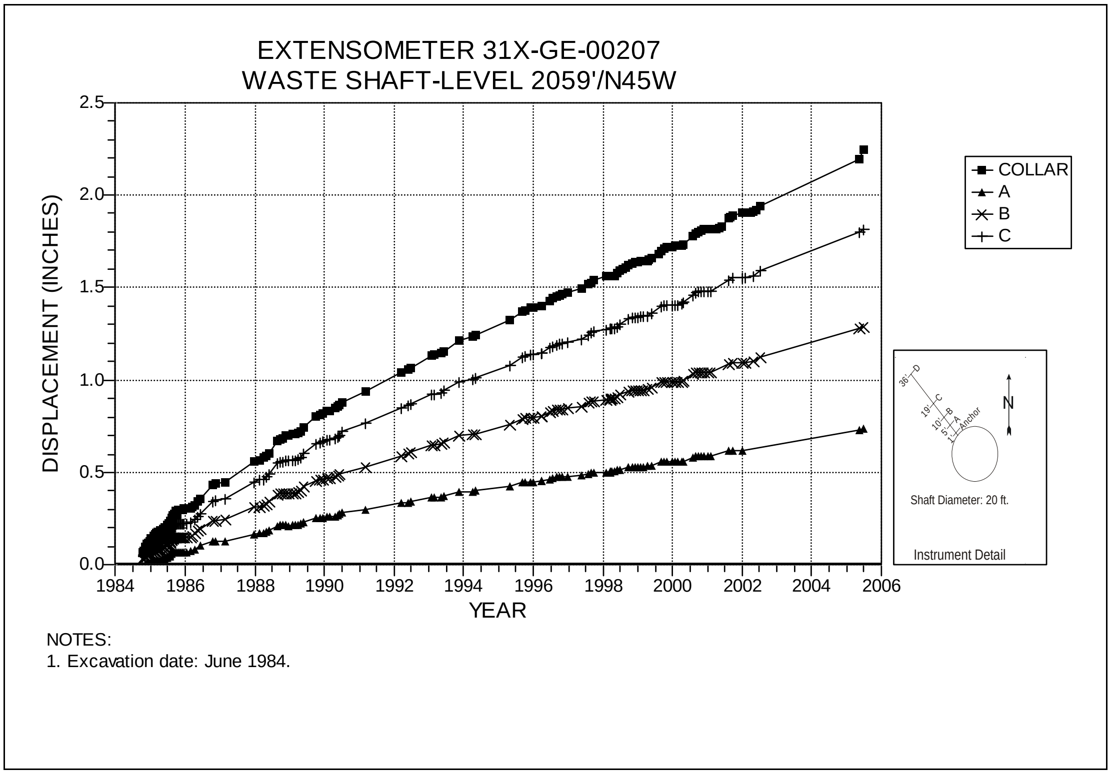


Figure 2-18 Extensometer 31X-GE-00207
Waste Shaft – Level 2059 / N45W

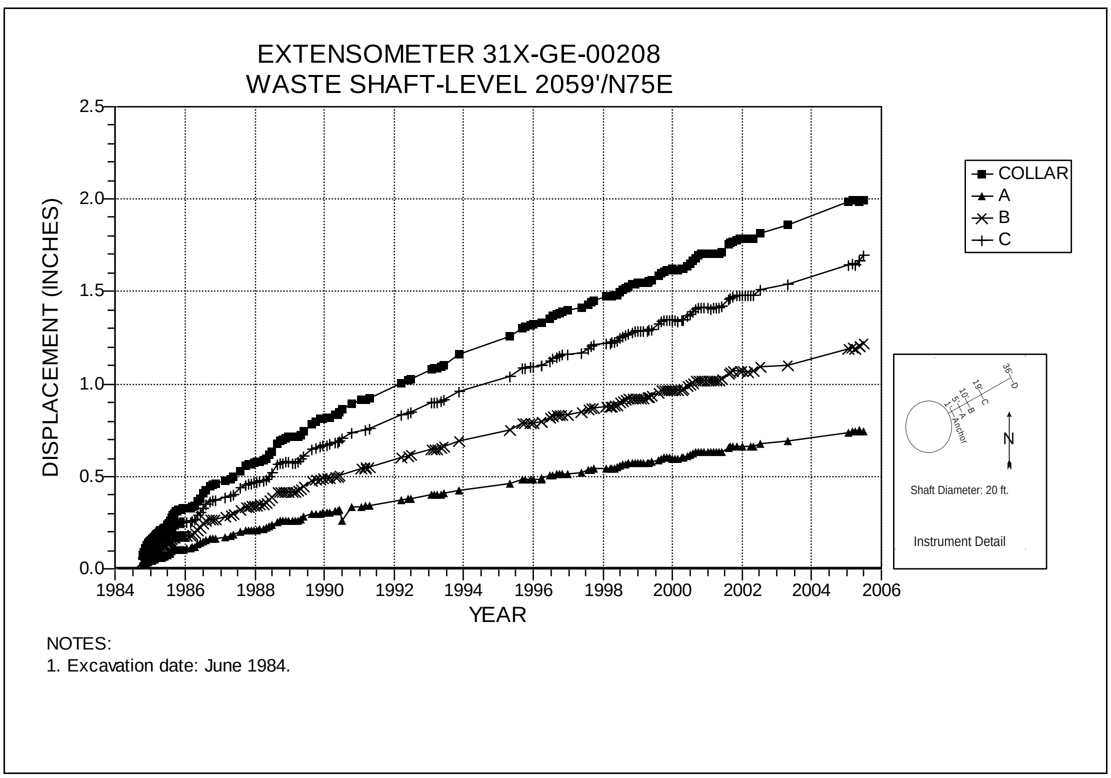


Figure 2-19 Extensometer 31X-GE-00208
Waste Shaft – Level 2059 / N75E

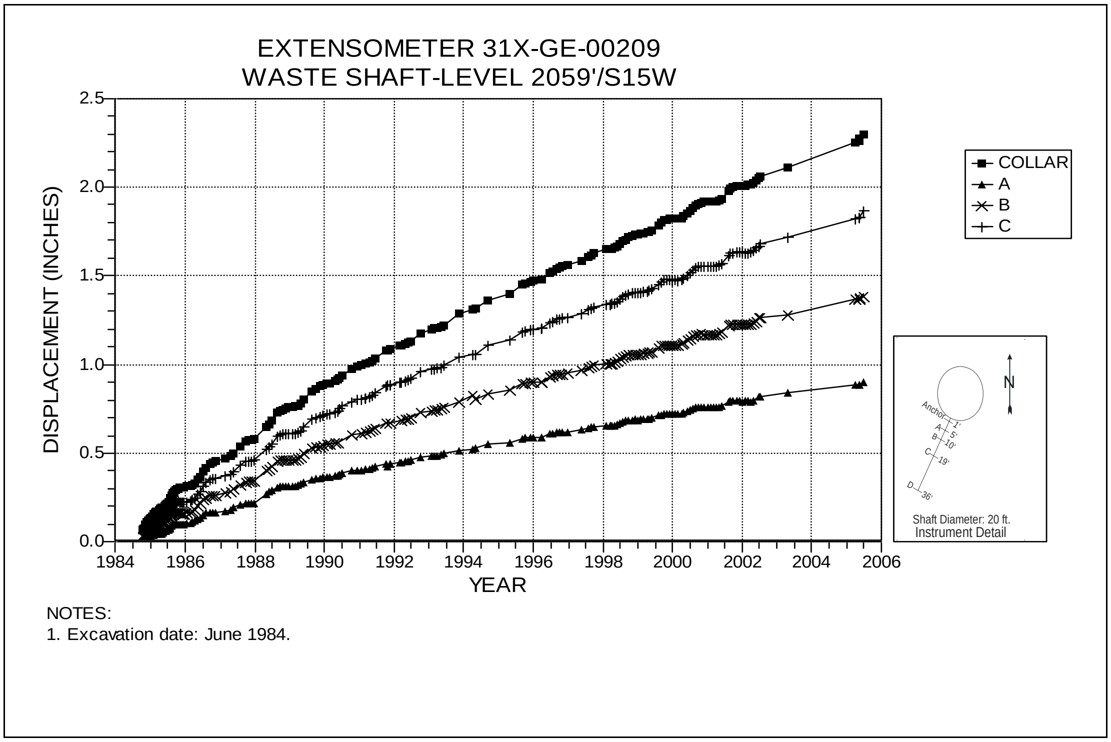


Figure 2-20 Extensometer 31X-GE-00209
Waste Shaft – Level 2059 / S15W

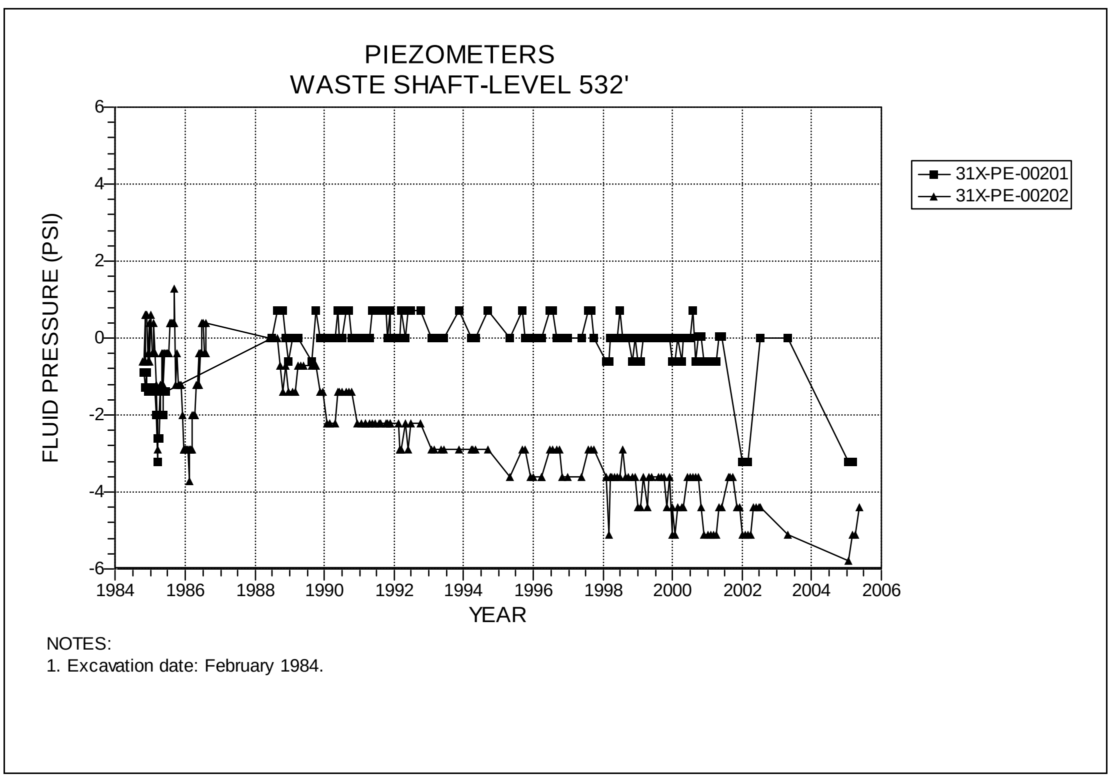


Figure 2-21 Piezometers 31X-PE-00201 and 31X-PE-00202
Waste Shaft – Level 532 at the Base of Dewey Lake Redbeds

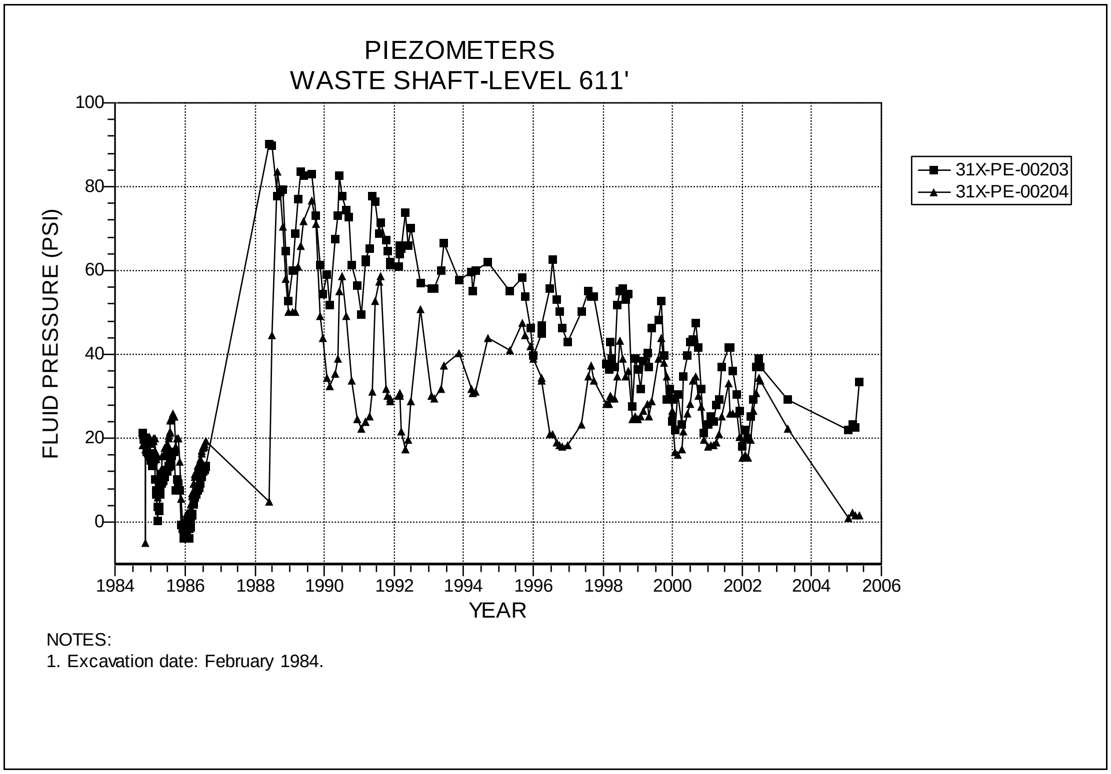


Figure 2-22 Piezometers 31X-PE-00203 and 31X-PE-00204
Waste Shaft – Level 611 at the Magenta Dolomite Member

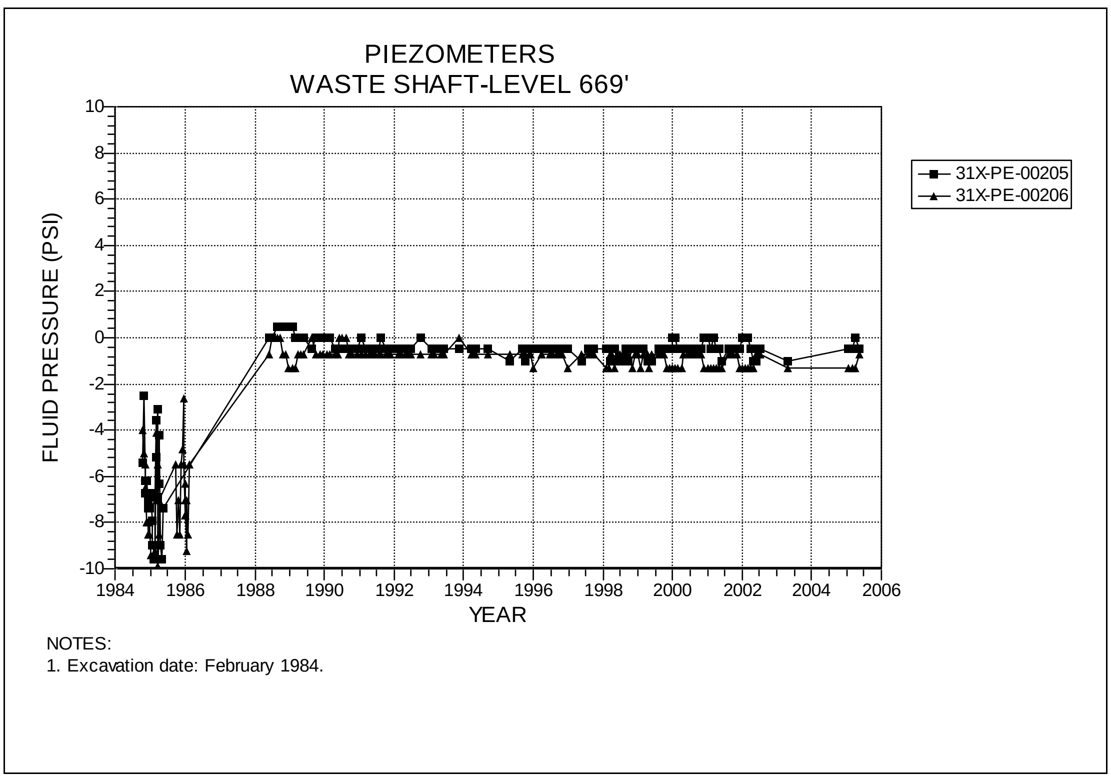


Figure 2-23 Piezometers 31X-PE-00205 and 31X-PE-00206
Waste Shaft – Level 669 at the Tamarisk Member

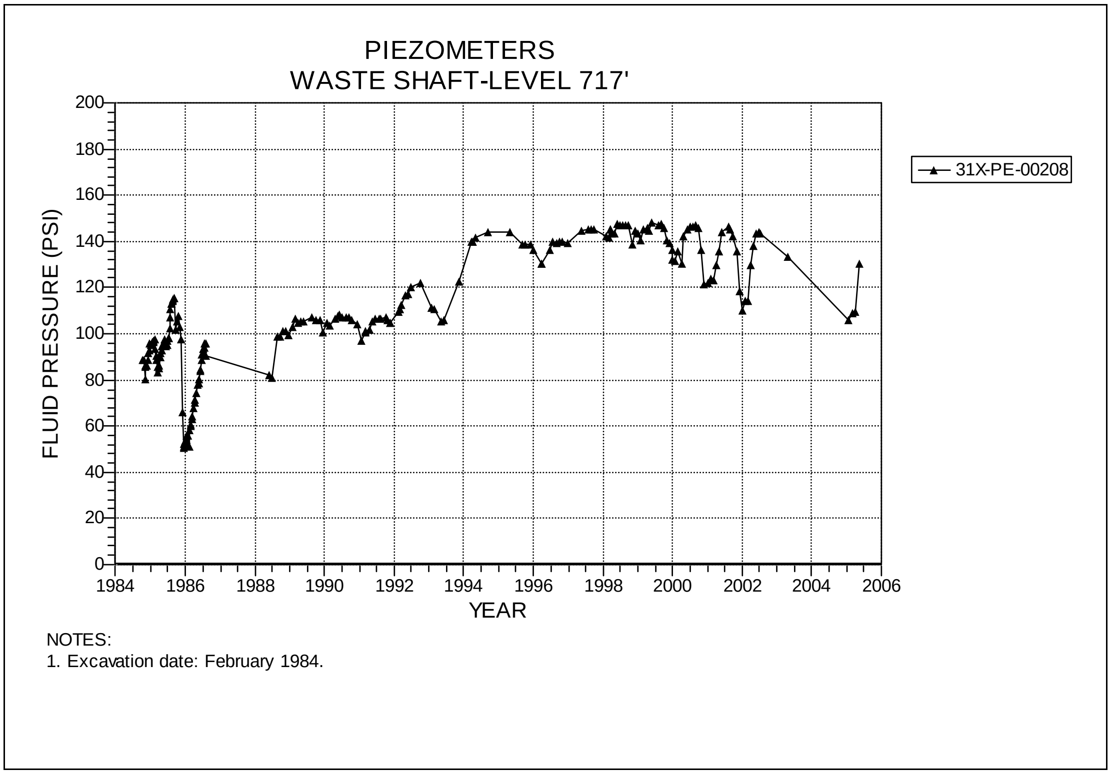


Figure 2-24 Piezometer 31X-PE-00208
Waste Shaft – Level 717 at the Culebra Dolomite Member

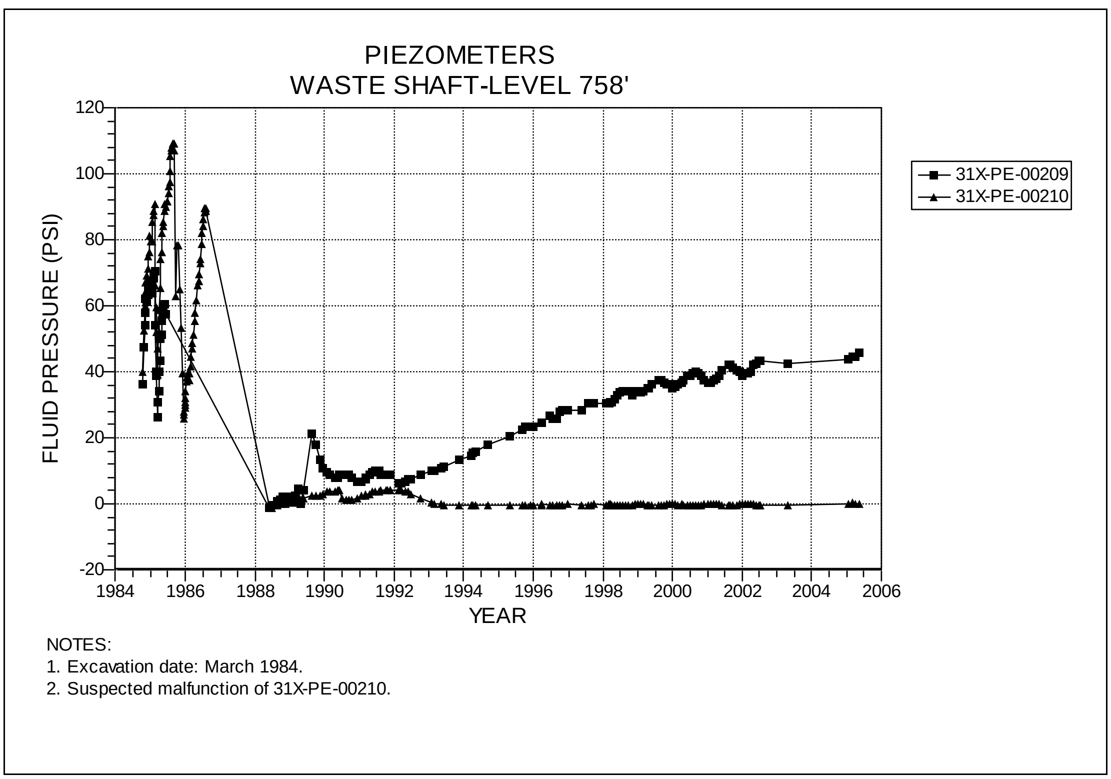
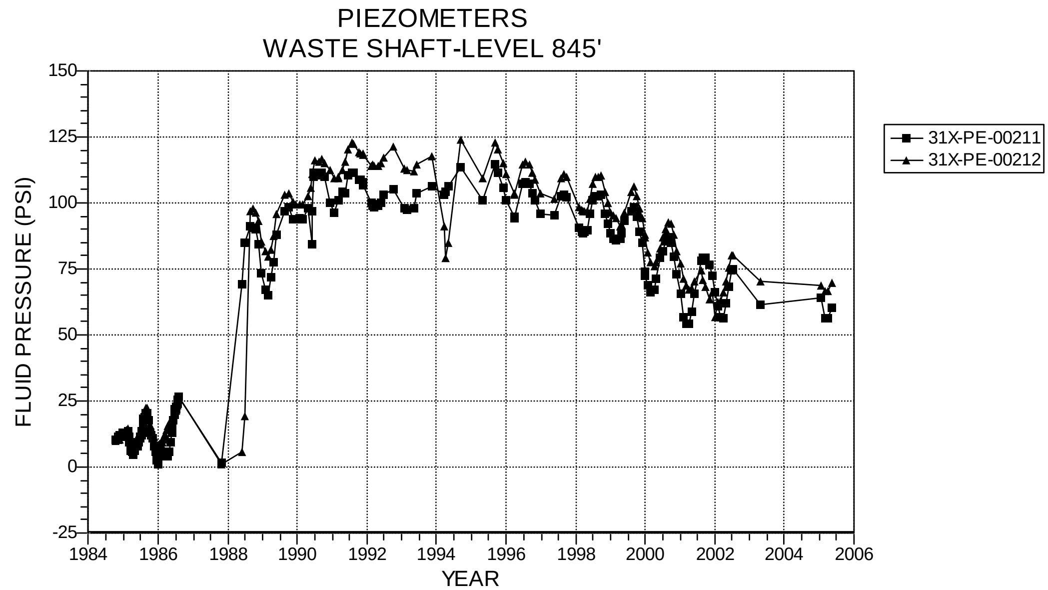
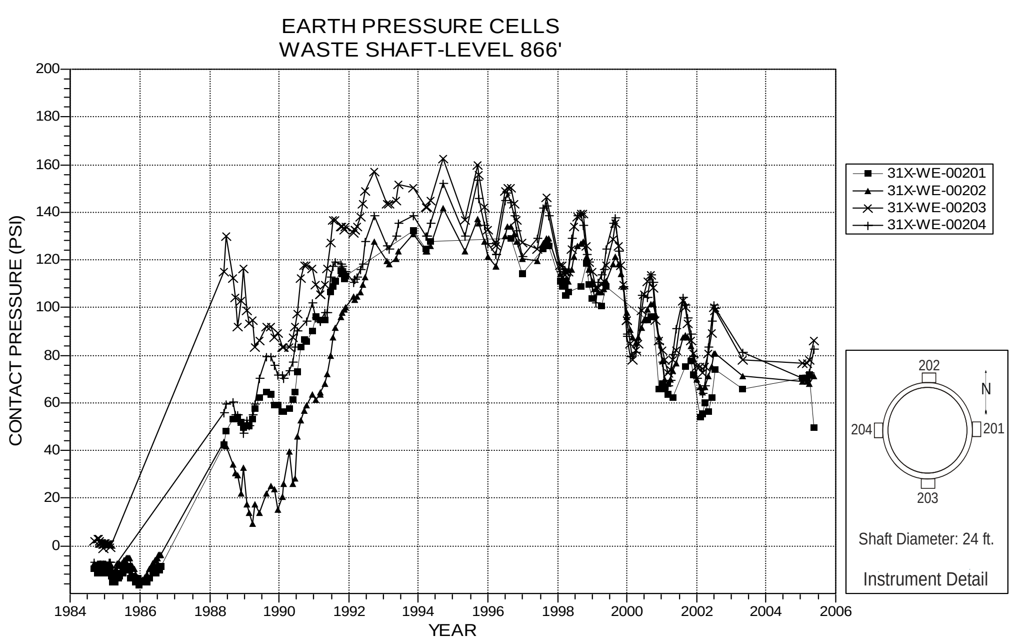


Figure 2-25 Piezometers 31X-PE-00209 and 31X-PE-00210
Waste Shaft – Level 758 at the Los Medaños Member



NOTES:
1. Excavation date: March 1984.
1. Pressure released on PE-211 during maintenance on June 6, 1990.

Figure 2-26 Piezometers 31X-PE-00211 and 31X-PE-00212
Waste Shaft – Level 845 at the Rustler-Salado Contact



NOTES:
1. Excavation date: March 1984.

Figure 2-27 Earth Pressure Cells
Waste Shaft Key – Level 866

Table 2-3
Exhaust Shaft Data Analysis

PIEZOMETERS

Field Tag	Level feet	Figure Number	Date of 2003-2004 Max. Reading	2003-2004 Maximum Pressure Readings (psi)	Date of 2002-2003 Max. Reading	2002-2003 Maximum Pressure Readings (psi)	Change in Maximum Pressure From Previous Year (psi)	Comments
35X-PE-00202	544	2-28	09/01/04	-2	09/02/03	-2	0	
35X-PE-00204	615	2-29	09/01/04	125	09/02/03	125	0	
35X-PE-00205	615	2-29	09/01/04	136	09/02/03	136	0	
35X-PE-00208	673	2-30	09/01/04	6	10/01/03	6	0	
35X-PE-00210	721	2-31	06/02/05	140	08/04/03	141	1	
35X-PE-00213	768	2-32	09/01/04	10	10/01/03	10	0	
35X-PE-00214	768	2-32	08/03/04	7	09/02/03	7	0	
35X-PE-00216	850	2-33	09/01/04	87	10/01/03	89	2	
35X-PE-00218	850	2-33	09/01/04	16	10/01/03	16	0	
35X-PE-00219	887	2-34	10/04/04	29	10/01/03	28	1	
35X-PE-00220	887	2-34	10/04/04	27	10/01/03	27	0	

EARTH PRESSURE CELLS

Field Tag	Level feet	Figure Number	Date of 2003-2004 Max. Reading	2003-2004 Maximum Pressure Readings (psi)	Date of 2002-2003 Max. Reading	2002-2003 Maximum Pressure Readings (psi)	Change in Maximum Pressure From Previous Year (psi)	Comments
35X-WE-00201	874	2-35	11/01/04	44	11/03/03	44	0	
35X-WE-00202	874	2-35	07/15/04	56	08/04/03	55	1	

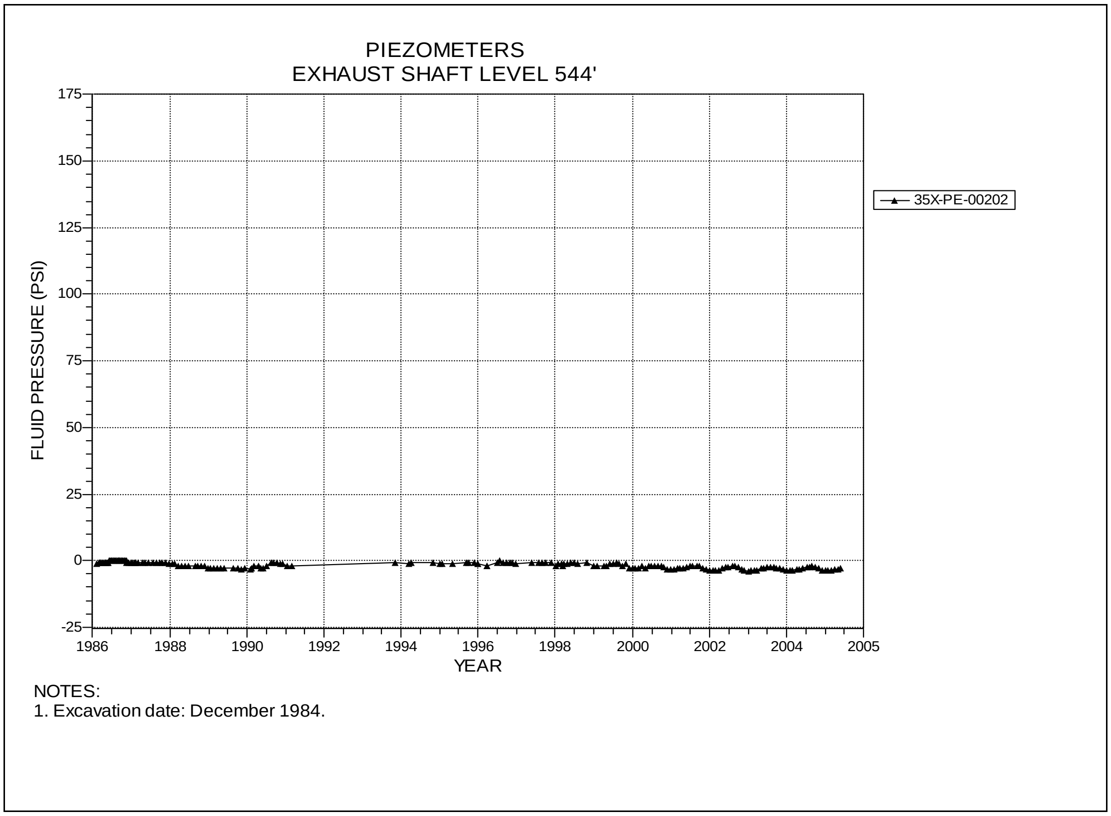


Figure 2-28 Piezometer 35X-PE-00202
Exhaust Shaft – Level 544 at the Base of Dewey Lake Redbeds

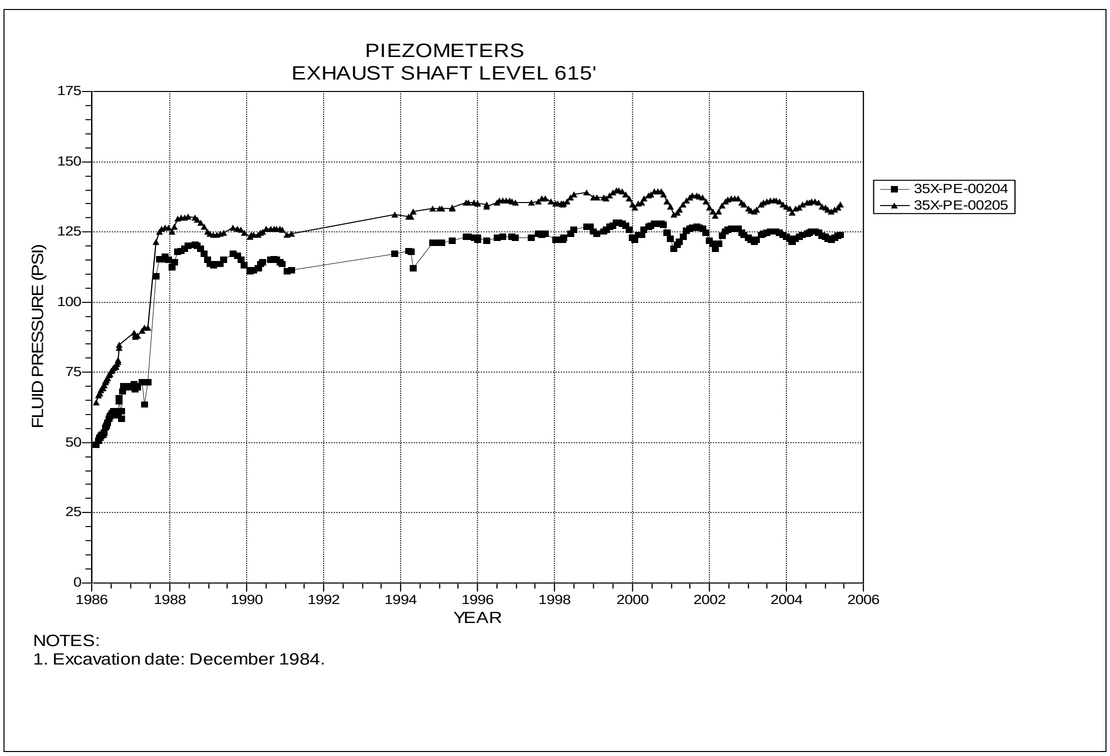


Figure 2-29 Piezometers 35X-PE-00204 and 35X-PE-00205
Exhaust Shaft – Level 615 at the Magenta Dolomite Member

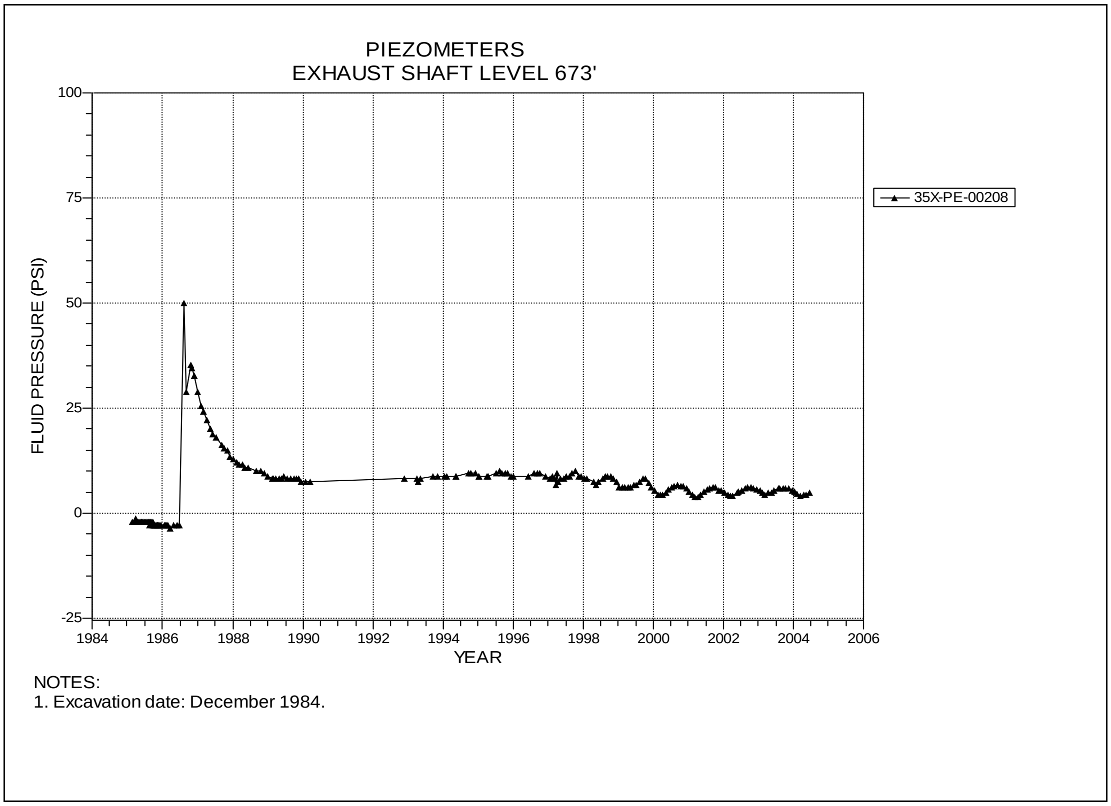


Figure 2-30 Piezometer 35X-PE-00208
Exhaust Shaft – Level 673 at the Tamarisk Member

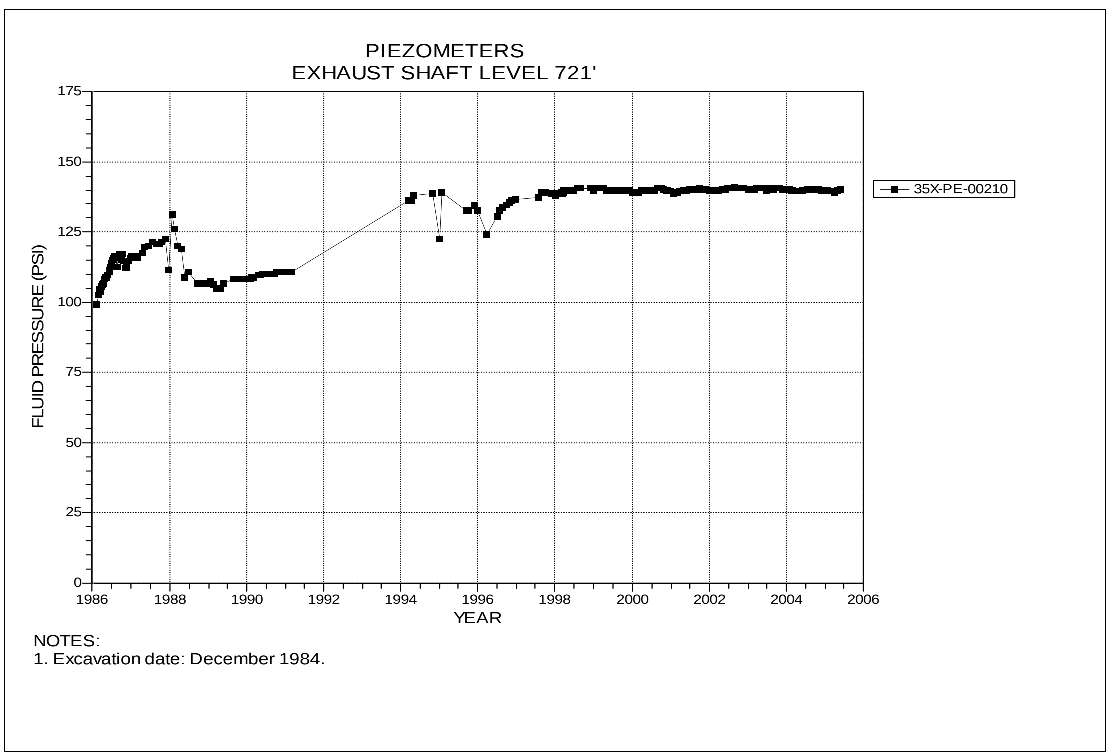


Figure 2-31 Piezometer 35X-PE-00210
Exhaust Shaft – Level 721 at the Culebra Dolomite Member

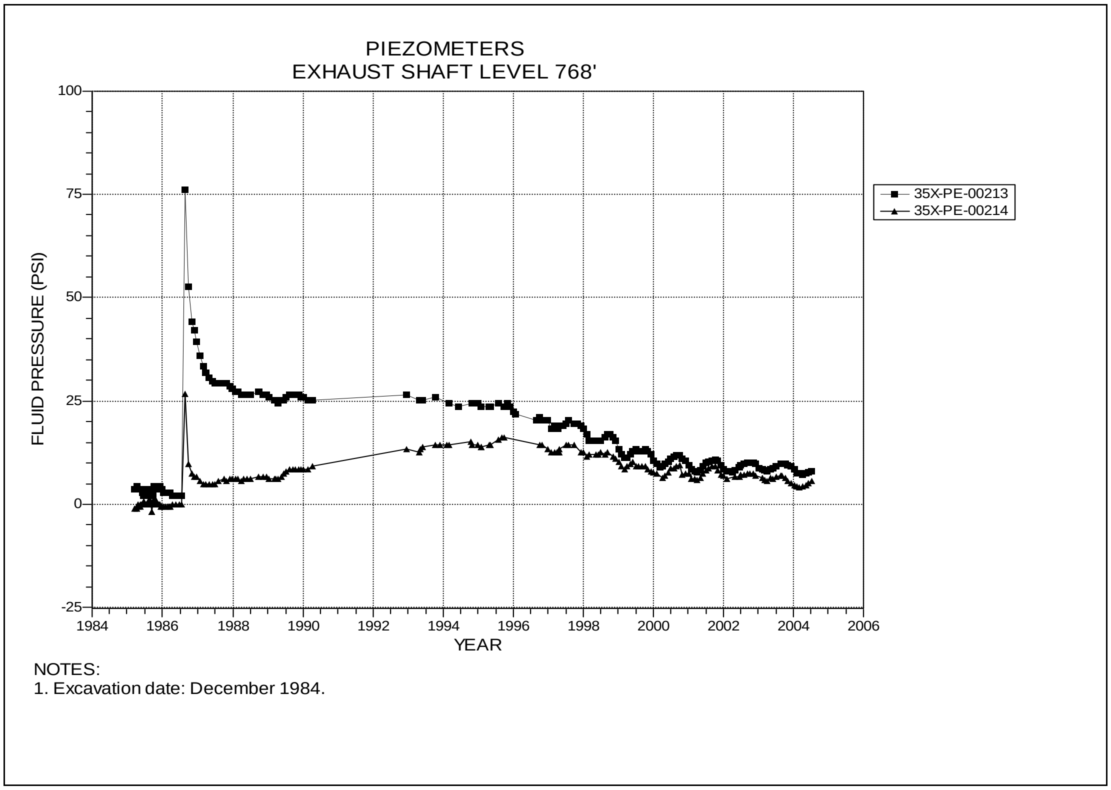


Figure 2-32 Piezometers 35X-PE-00213 and 35X-PE-00214
Exhaust Shaft – Level 768 at the Los Medaños Member

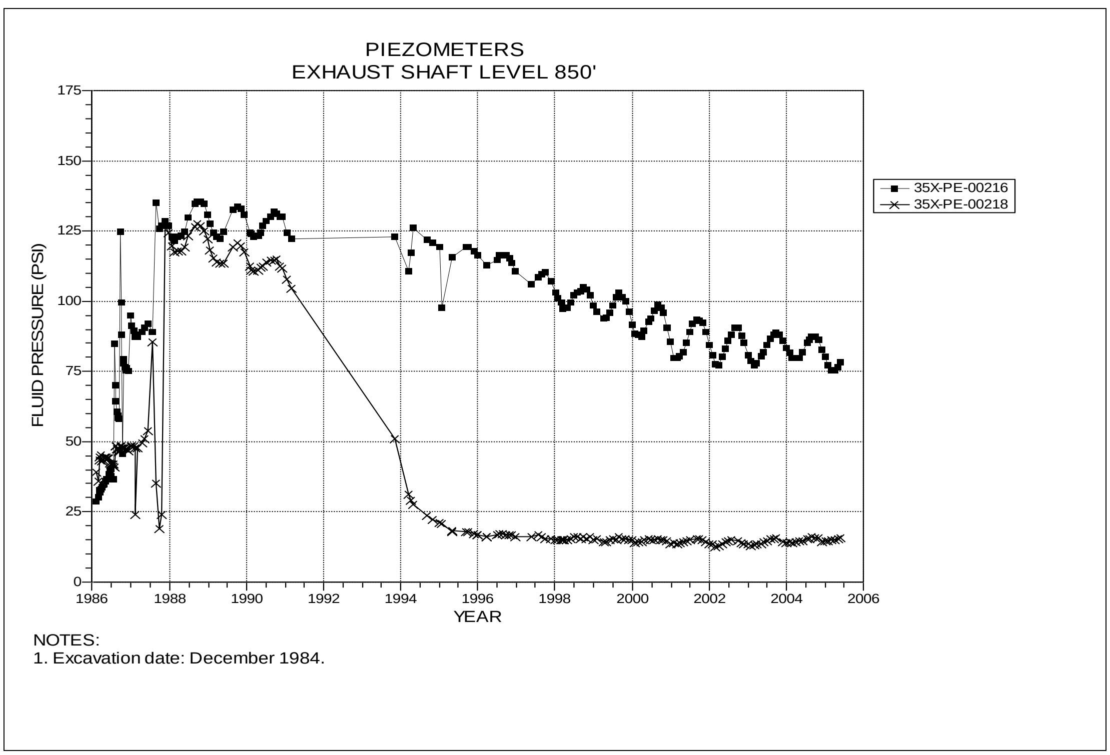


Figure 2-33 Piezometers 35X-PE-00216 and 35X-PE-00218
Exhaust Shaft – Level 850 at the Rustler-Salado Contact

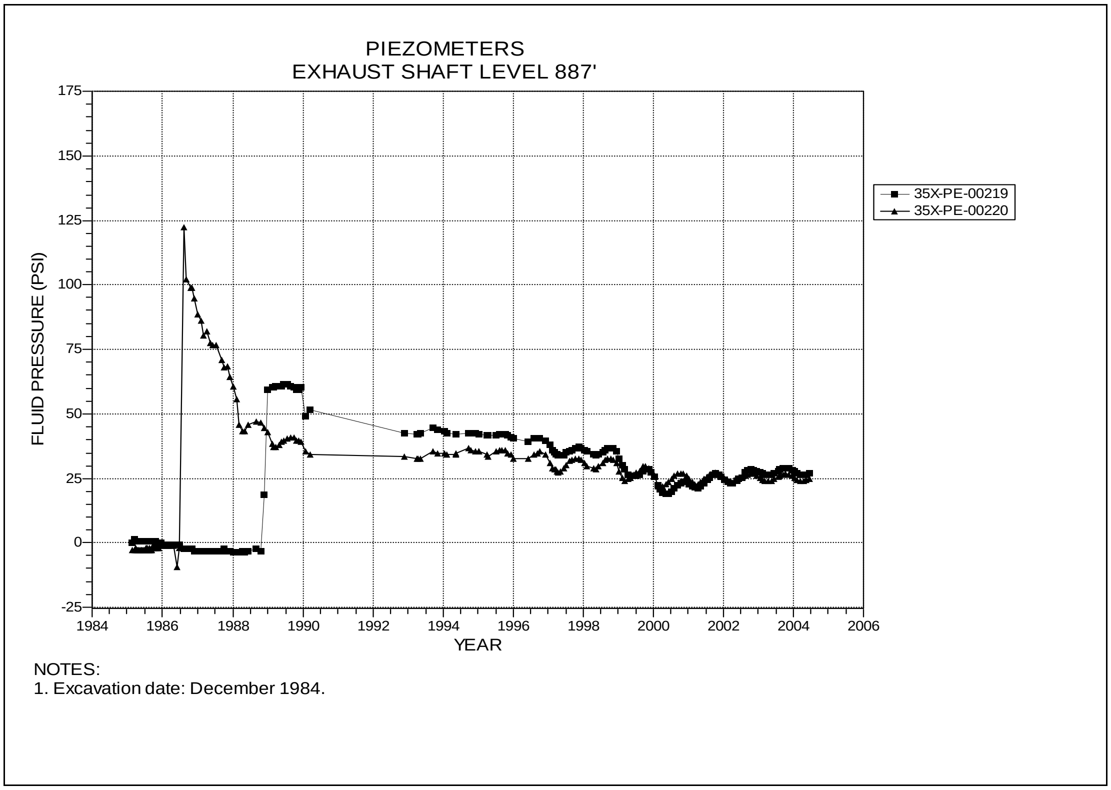


Figure 2-34 Piezometers 35X-PE-00219 and 35X-PE-00220
Exhaust Shaft – Level 887 below the Lower Chemical Seal

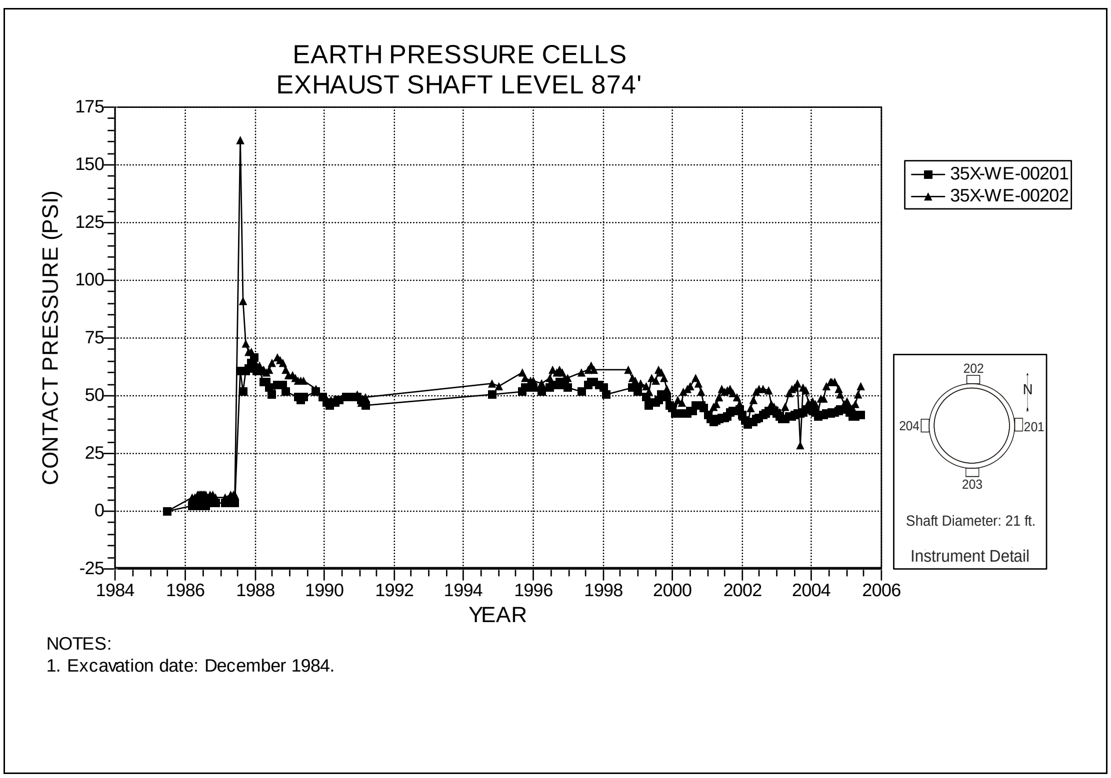


Figure 2-35 Earth Pressure Cells 35X-WE-00201 and 35X-WE-00202
Exhaust Shaft Key – Level 874

3.0 Instrumentation Summary for Shaft Stations

Instrumentation data analysis for the Salt Handling Shaft Station, Waste Shaft Station, and the area around the Air Intake Shaft follow. Table 3-1 presents data analyses for each of the Salt Handling Shaft Station instruments. Figures 3-1 through 3-6 present plots of the instrumentation data for the Salt Handling Shaft Station. Tables 3-2 presents data and analysis for the Waste Shaft Station. Plots from the instrumentation in the Waste Shaft Station are presented as Figures 3-7 through 3-16. Table 3-3 and Figures 3-17 through 3-22 present the data from rock bolt load cells and borehole extensometers located in the immediate area around the Air Intake Shaft.

Table 3-1
Salt Handling Shaft Station Data Analysis

EXTENSOMETERS

Field Tag	Location		Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (Inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent[A]	Comments
51X-GE-01026	E0 DRIFT-S30	Roof	3-1	05/02/05	0.060	0.56	N/A	N/A	Instrument installed 2005.
51X-GE-01027	E0 DRIFT-S60	Roof	3-2	06/02/05	0.083	0.46	N/A	N/A	Instrument installed 2005.

[A] NA indicates insufficient data to compare annualized rates.

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
E0-W12-5 A-C	Salt Shaft-W12	3-3	06/14/05	5.475	5.475	0.70	0.73	-4%	
E0-S18-6 A-E	E0 Drift-S18	3-4	06/14/05	10.286	10.286	1.38	1.39	-1%	
E0-S18-4 B-D	E0 Drift-S18	3-4	06/14/05	11.106	11.106	1.50	1.50	0%	
E0-S18-4 F-H	E0 Drift-S18	3-4	06/14/05	7.029	7.029	0.93	0.96	-3%	
E0-S30-5 A-C	E0 Drift-S30	3-5	06/14/05	10.752	10.752	1.45	1.47	-1%	
E0-S65-3 A-C	E0 Drift-S65	3-6	06/14/05	7.967	7.967	1.07	1.08	-1%	

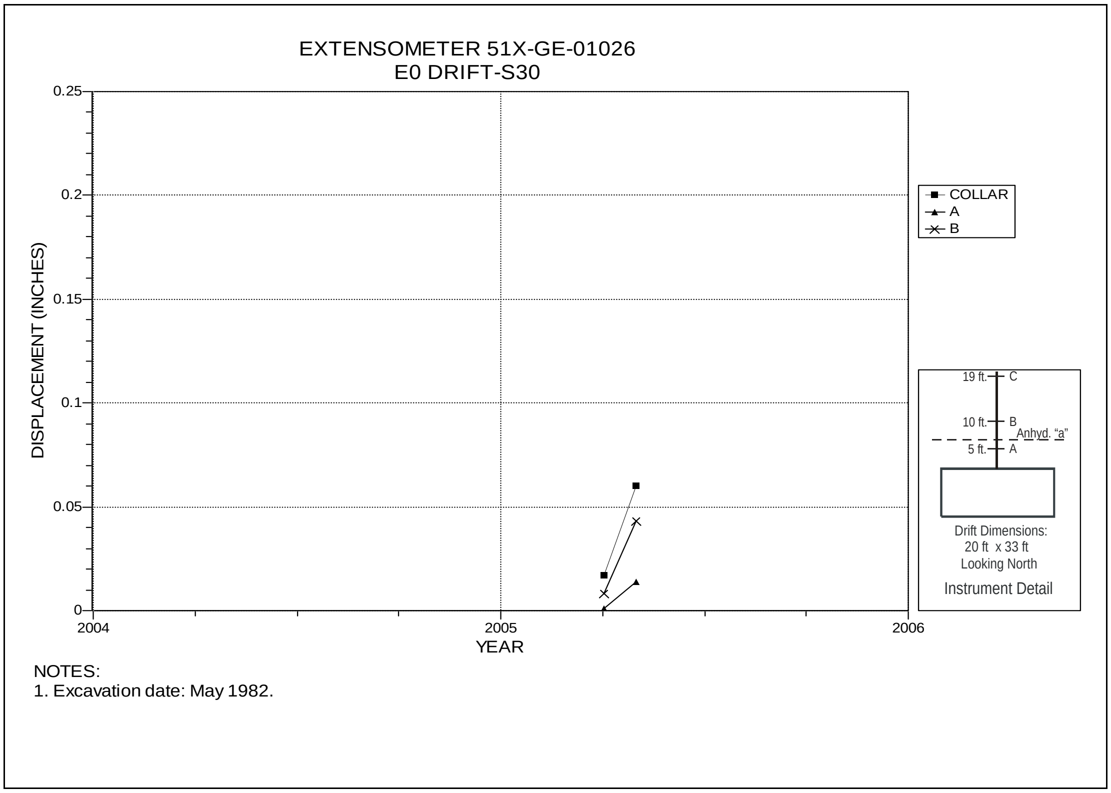


Figure 3-1 Extensometer 51X-GE-01026
Salt Shaft Station at South 30 – Roof

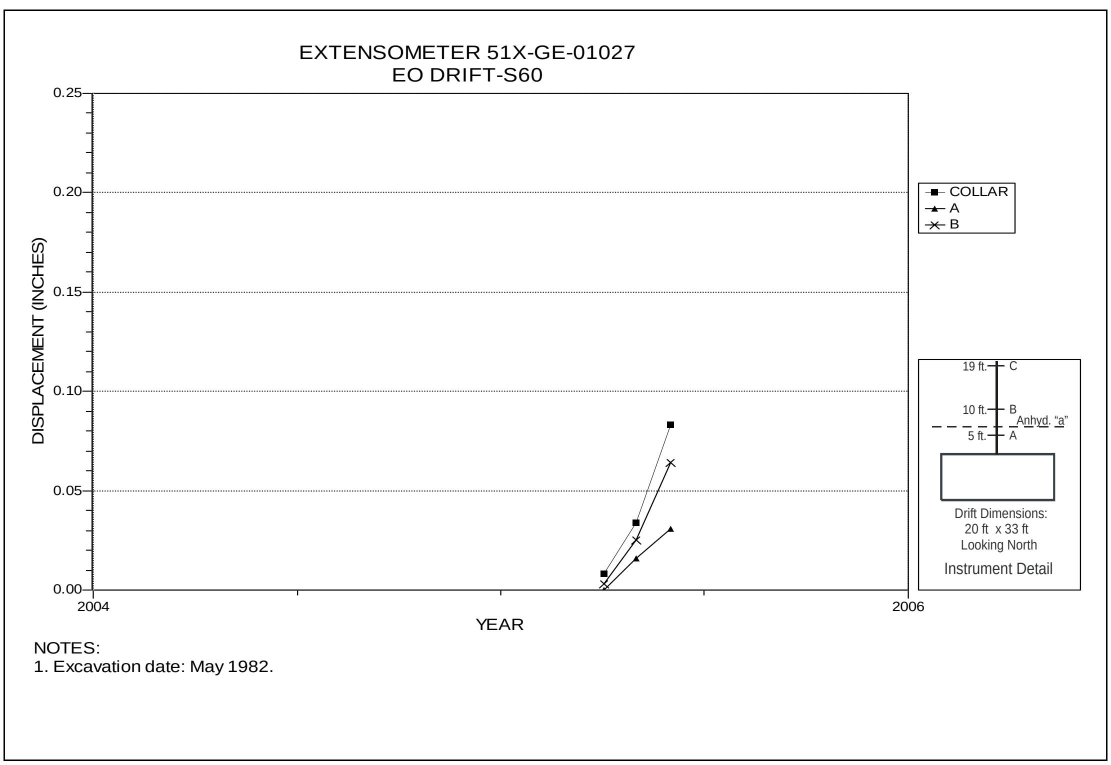
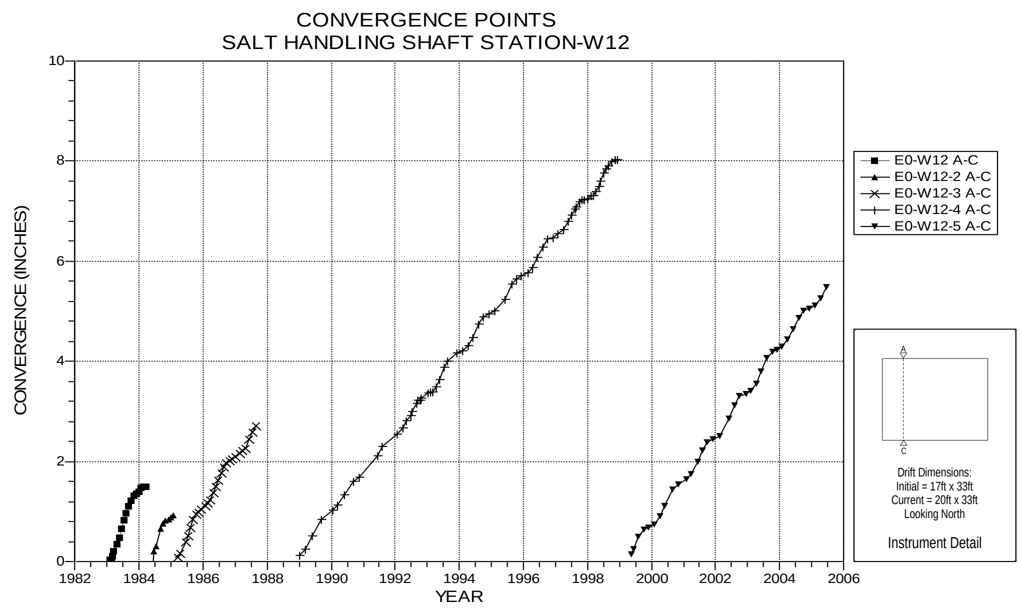
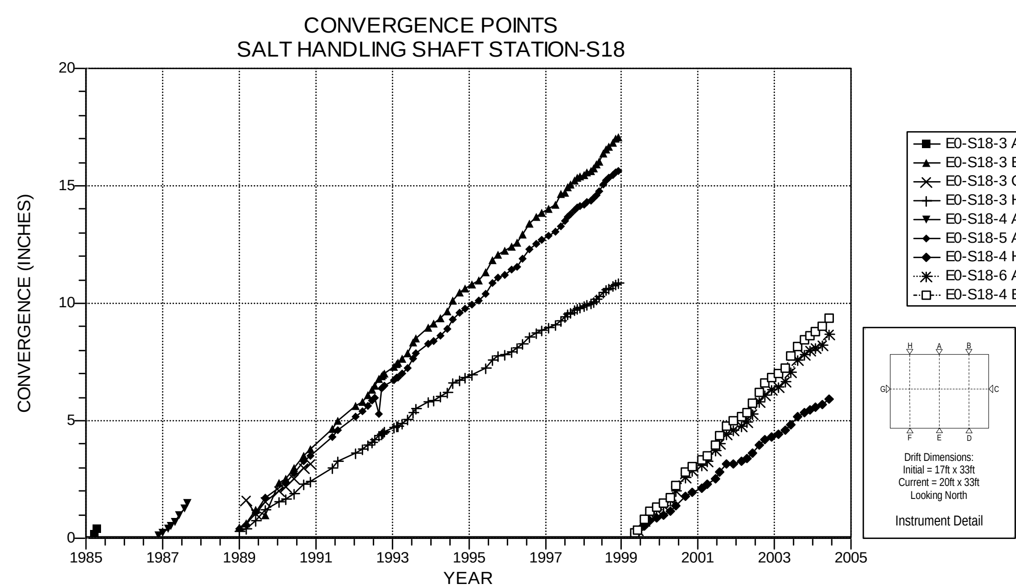


Figure 3-2 Extensometer 51X-GE-01027
Salt Shaft Station at South 60 – Roof



NOTES:
1. Excavation date: May 1982.

Figure 3-3 Convergence Point Array
Salt Handling Shaft Station 12 Feet West of Shaft – Roof to Floor



NOTES:
1. Excavation date: May 1982.

Figure 3-4 Convergence Point Array
Salt Handling Shaft Station at South 18 – All Chords

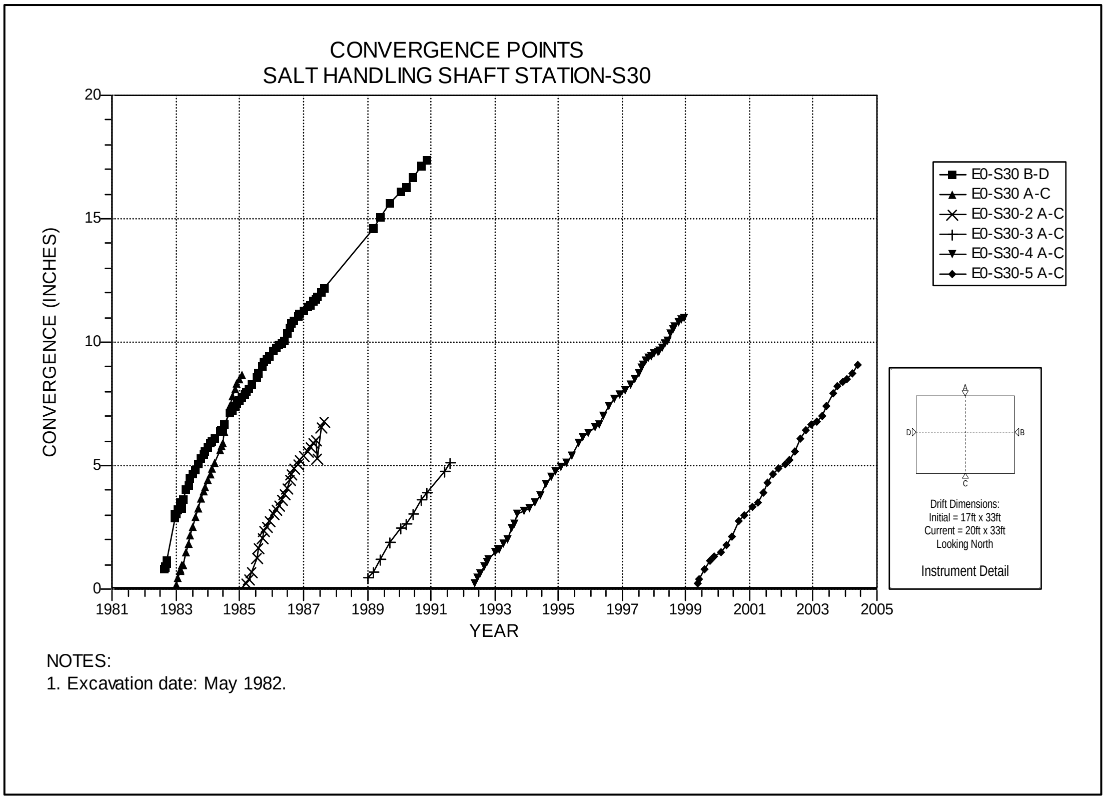


Figure 3-5 Convergence Point Array
Salt Handling Shaft Station at South 30 – All Chords

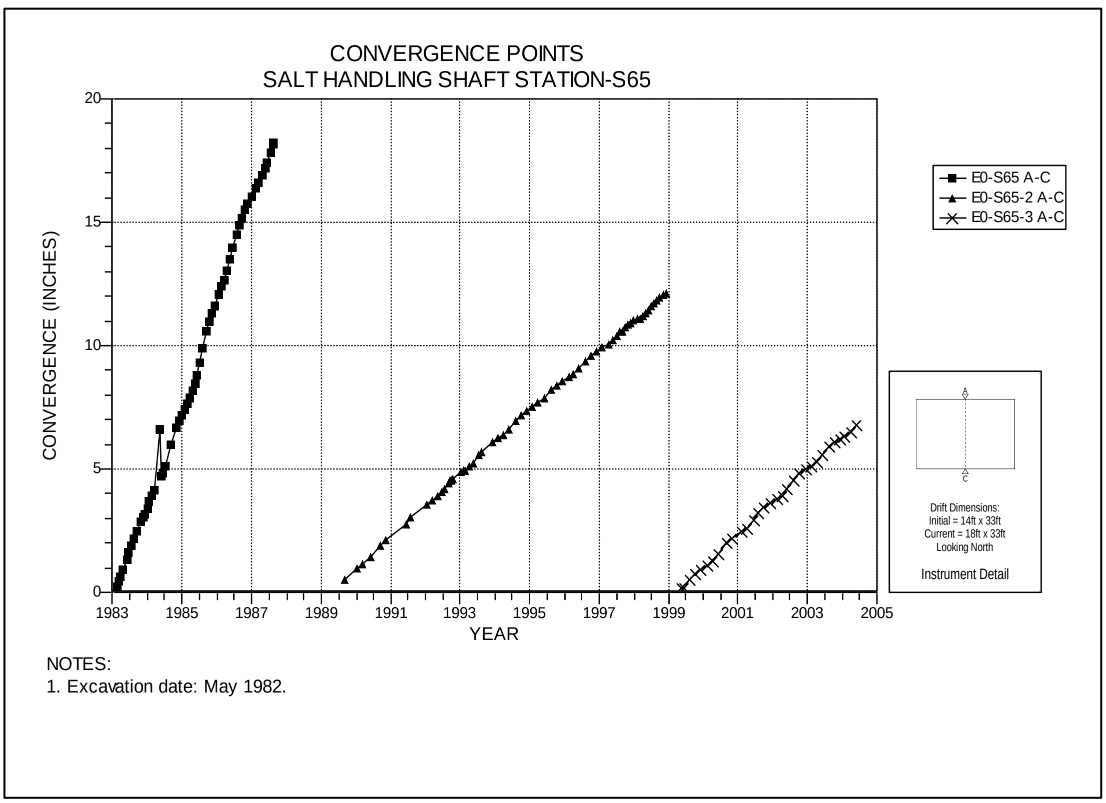


Figure 3-6 Convergence Point Array
Salt Handling Shaft Station at South 65 – Roof to Floor

Table 3-2
Waste Shaft Station Data Analysis

EXTENSOMETERS

Fieldtag	Location		Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (Inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent	Comments
51X-GE-00268	W30 Drift-S400	Roof	3-7	06/28/05	8.789	0.25	0.65	-62%	
51X-GE-00356	Waste Shaft Brow	North	3-8	06/27/05	0.092	0.06	0.05	20%	
51X-GE-00357	Waste Shaft Brow	South	3-9	06/27/05	0.134	0.13	0.13	0%	
51X-GE-01025	S400 Drift-E87	Roof	3-10	06/30/05	0.760	0.52	0.53	-2%	

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading		Cumulative Displacement Inches	Closure Rate 2003 to 2004 in/year	Closure Rate 2002 to 2003 in/year	Rate Change Percent	Comments
			Date	Inches					
S400-E30-2 C-H	S400 Drift-E30	3-11	06/30/05	17.481	17.554	0.81	0.84	-4%	
S400-E90-2 C-G	S400 Drift-E90	3-12	06/30/05	19.88	20.071	0.89	0.97	-8%	

ROCKBOLT LOAD CELLS

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X WG-00226	Waste Shaft Station Brow	3-13	7/15/1992	6/27/2005	27.71	
51X WG-00227	Waste Shaft Station Brow	3-13	7/15/1992	6/27/2005	39.88	
51X WG-00228	Waste Shaft Station Brow	3-13	3/20/1996	6/27/2005	44.13	
51X WG-00229	Waste Shaft Station Brow	3-13	3/20/1996	6/27/2005	30.81	
51X WG-00230	Waste Shaft Station Brow	3-13	3/20/1996	6/27/2005	55.72	
51X WG-00231	Waste Shaft Station Brow	3-14	3/20/1996	6/27/2005	1.23	Broken bolt.
51X WG-00232	Waste Shaft Station Brow	3-14	7/15/1992	6/27/2005	55.03	
51X WG-00233	Waste Shaft Station Brow	3-14	7/15/1992	6/27/2005	4.26	
51X WG-00234	Waste Shaft Station Brow	3-14	7/15/1992	6/27/2005	66.07	
51X WG-00235	Waste Shaft Station Brow	3-14	3/20/1996	6/27/2005	43.70	
51X-WG-00287	S400-E40 Roof	3-15	6/28/2004	6/27/2005	23.10	
51X-WG-00288	S400-E80 Roof	3-16	6/28/2004	6/27/2005	34.92	

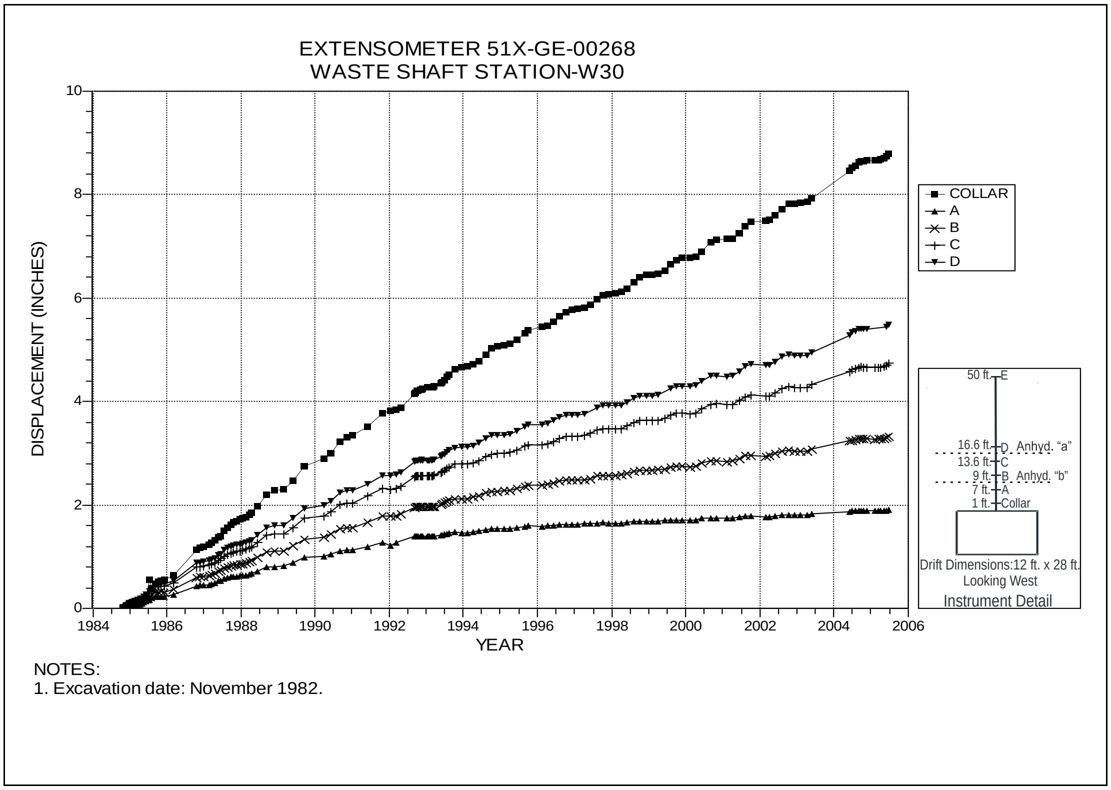


Figure 3-7 Extensometer 51X-GE-00268
Waste Shaft Station at West 30 – Roof

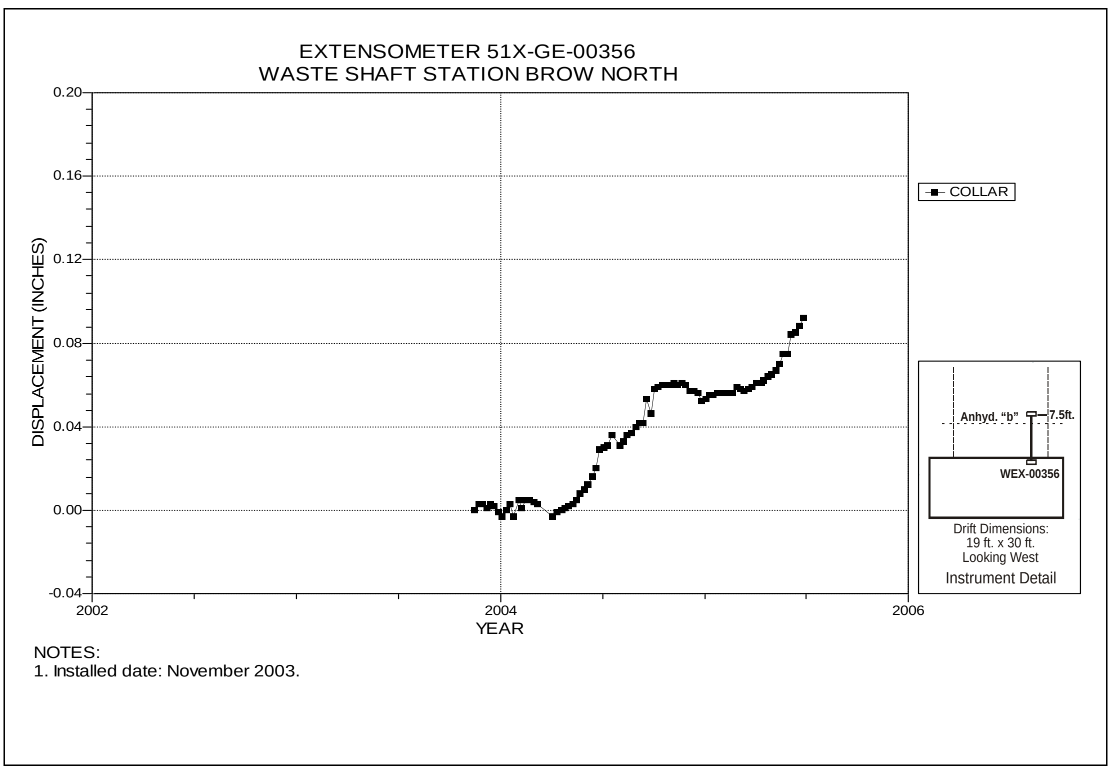
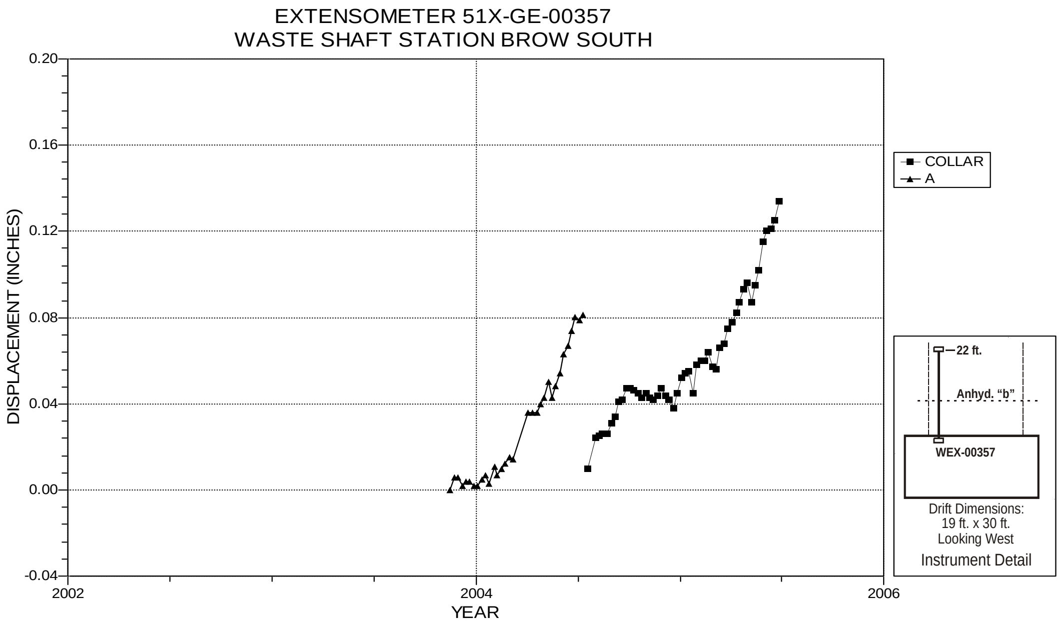
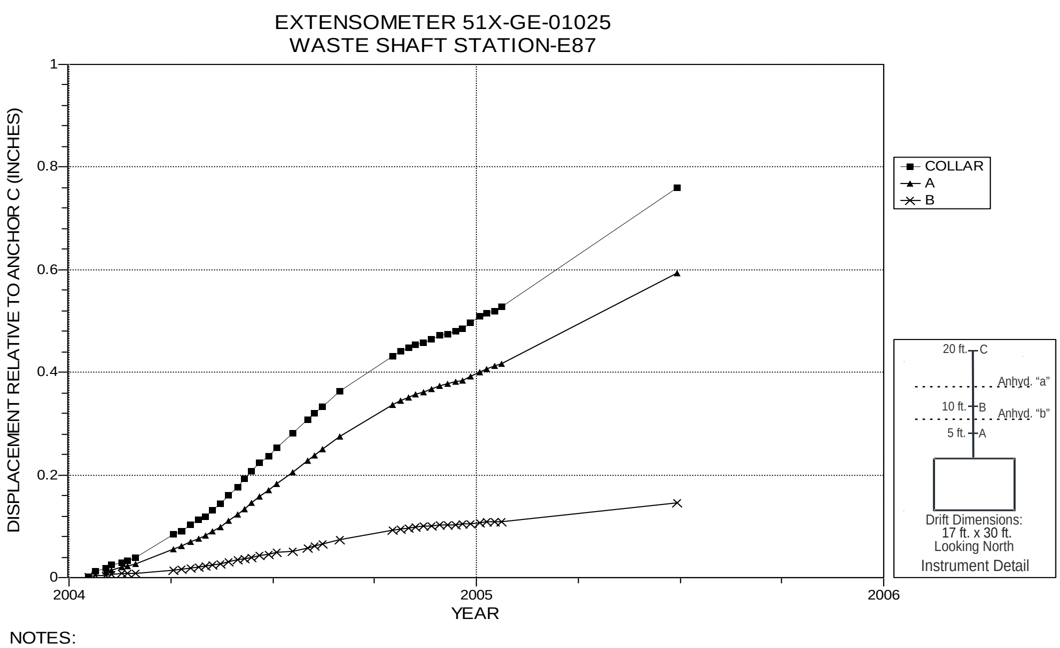


Figure 3-8 Extensometer 51X-GE-00356
Waste Shaft Station Brow – North



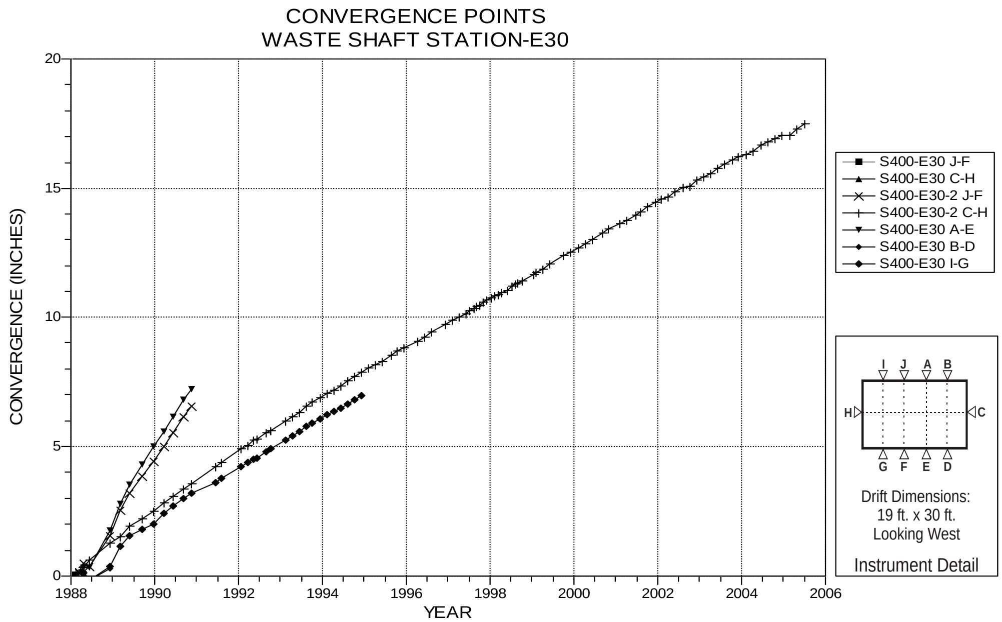
NOTES:
1. Installed date: November 2003.
2. Reinstalled July 2004.

Figure 3-9 Extensometer 51X-GE-00357
Waste Shaft Station Brow – South



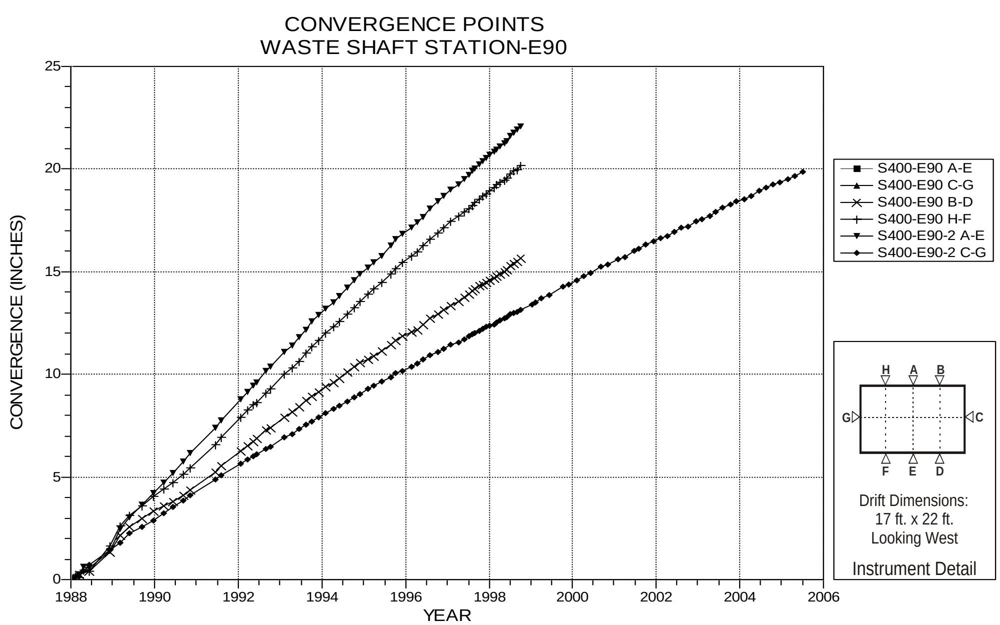
NOTES:

Figure 3-10 Extensometer 51X-GE-01025
Waste Shaft Station at East 87- Roof



NOTES:
1. Excavation date: November 1982.

Figure 3-11 Convergence Point Array
Waste Shaft Station at East 30 – All Chords



NOTES:
1. Excavation date: November 1982.

Figure 3-12 Convergence Point Array
Waste Shaft Station at East 90 – All Chords

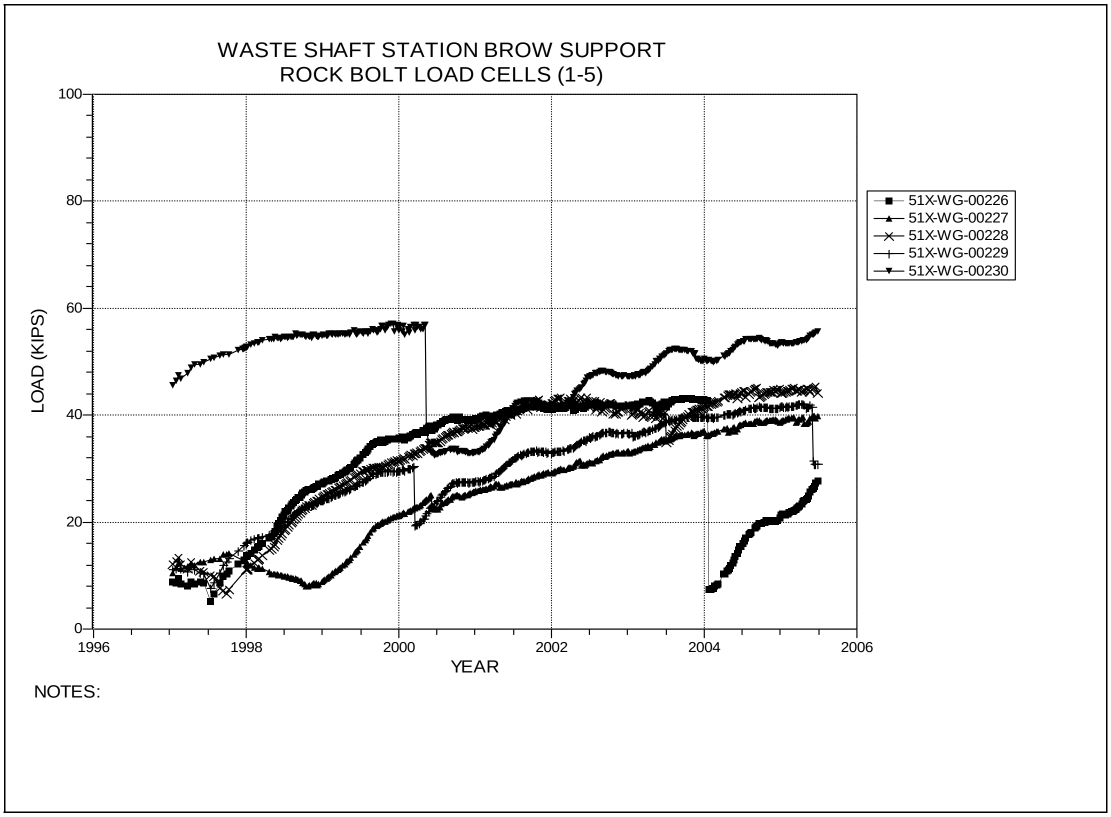


Figure 3-13 Rock Bolt Load Cells
Waste Shaft Station Brow – Roof Bolts Set 1

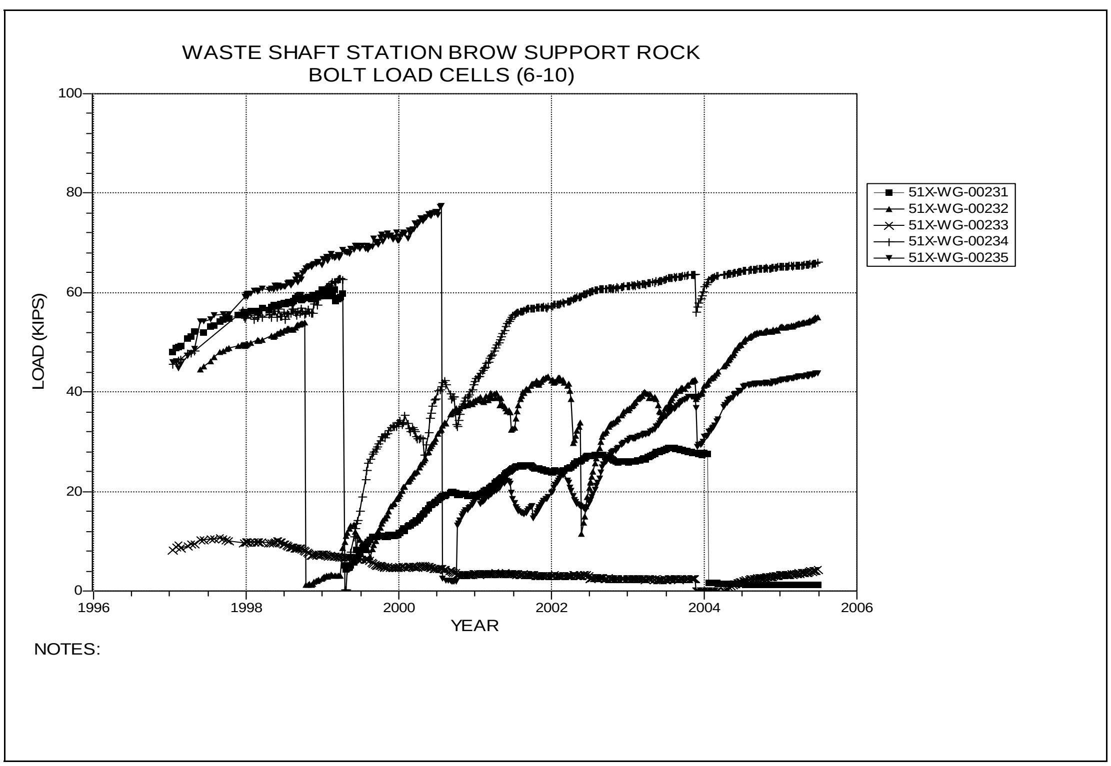


Figure 3-14 Rock Bolt Load Cells
Waste Shaft Station Brow – Roof Bolts Set 2

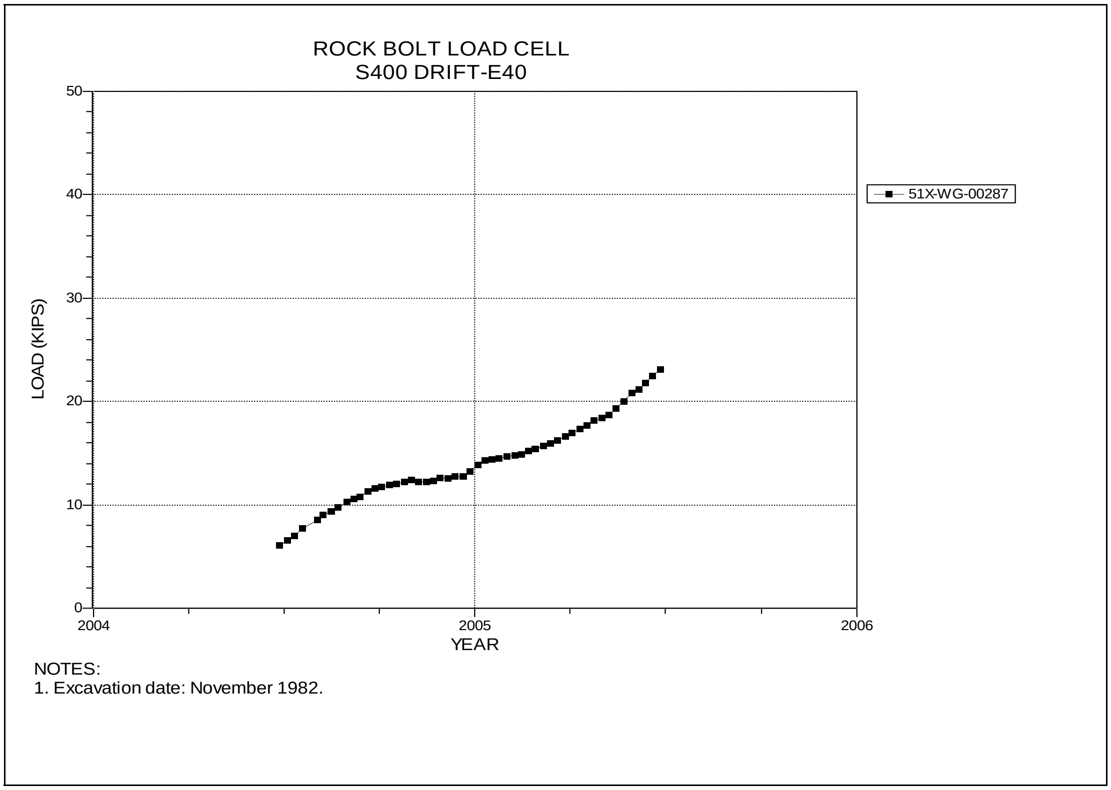


Figure 3-15 Rock Bolt Load Cell
Waste Shaft Station at East 40 – Roof

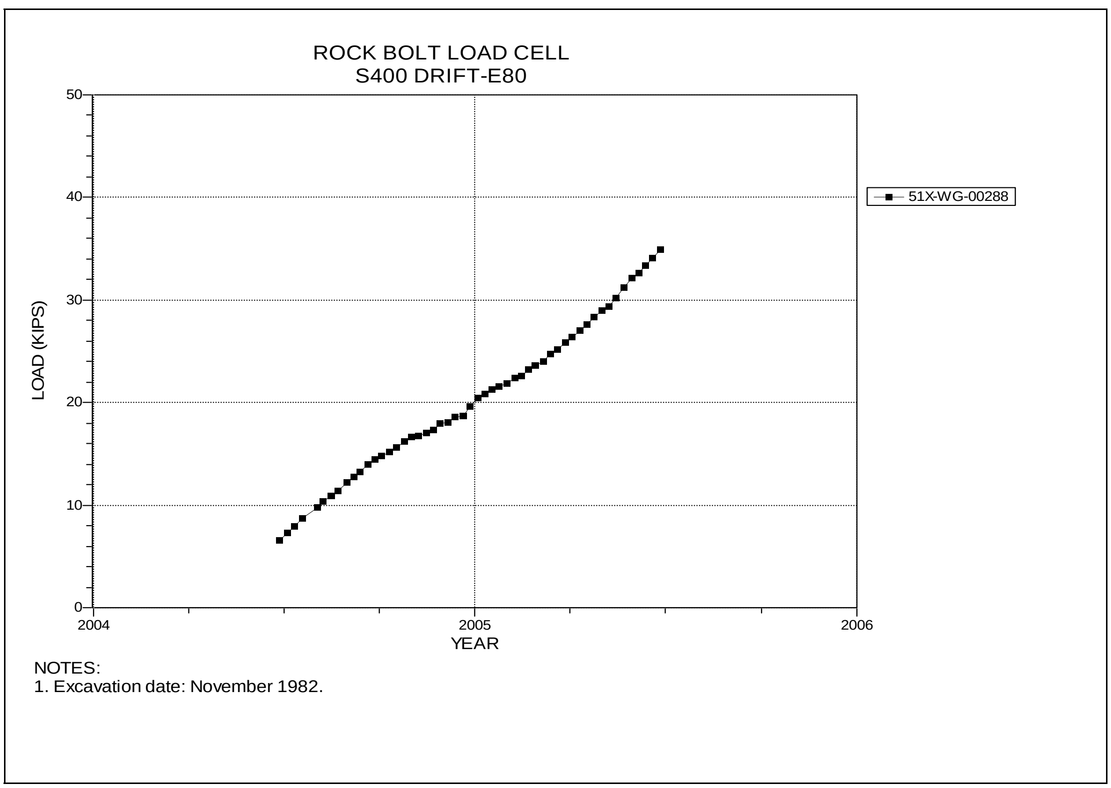


Figure 3-16 Rock Bolt Load Cell
Waste Shaft Station at East 80 – Roof

Table 3-3
Air Intake Shaft Station Data Analysis

EXTENSOMETERS

Field Tag	Location	Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (Inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent	Comments
41X-GE-00122	S65-W620 Roof	3-17	6/27/2005	2.431	0.27	0.29	-7%	
41X-GE-00123	N93-W620 Roof	3-18	6/27/2005	3.153	0.35	0.37	-5%	

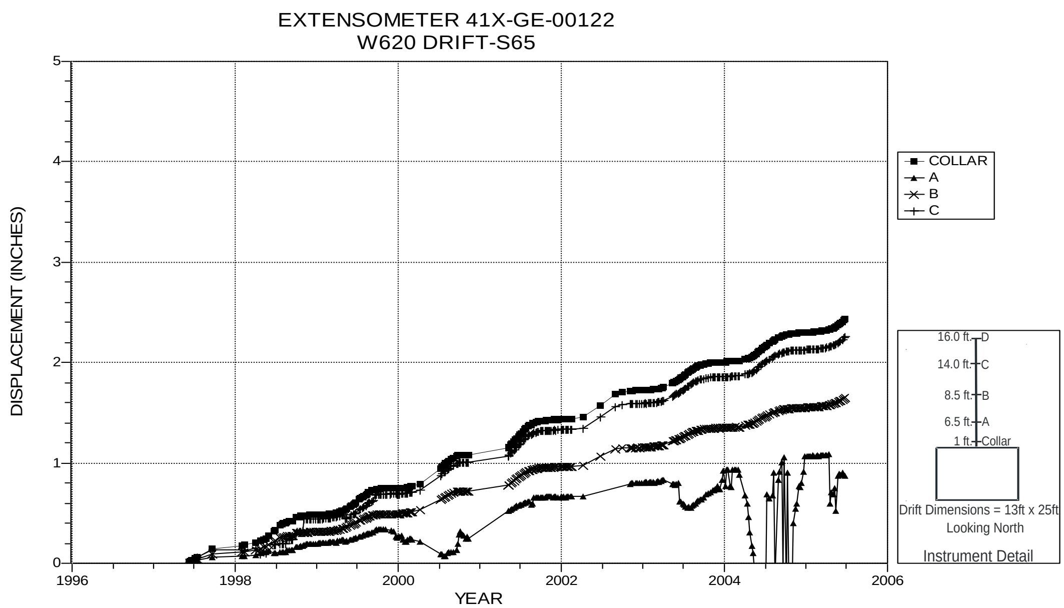
ROCKBOLT LOAD CELLS

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X-WG-00236	AIS Station Brow – South	3-19	01/19/93	06/27/05	50.14	
51X-WG-00237	AIS Station Brow – South	3-19	01/19/93	06/27/05	38.32	
51X-WG-00238	AIS Station Brow – South	3-19	01/19/93	06/27/05	6.51	
51X-WG-00239	AIS Station Brow – South	3-19	01/19/93	06/27/05	13.03	
51X-WG-00240	AIS Station Brow – South	3-19	01/19/93	06/27/05	12.94	
51X-WG-00241	AIS Station Brow – South	3-20	01/19/93	06/27/05	56.19	
51X-WG-00242	AIS Station Brow – South	3-20	01/19/93	06/27/05	17.77	
51X-WG-00243	AIS Station Brow - South	3-20	01/19/93	06/27/05	49.59	
51X-WG-00244	AIS Station Brow – South	3-20	12/24/94	06/27/05	10.72	
51X-WG-00245	AIS Station Brow – South	3-20	01/19/93	06/27/05	58.75	
51X-WG-00246	AIS Station Brow – North	3-21	01/19/93	06/27/05	37.38	
51X-WG-00247	AIS Station Brow – North	3-21	01/19/93	06/27/05	44.71	
51X-WG-00248	AIS Station Brow – North	3-21	01/19/93	06/27/05	50.66	
51X-WG-00249	AIS Station Brow – North	3-21	01/19/93	06/27/05	9.73	

Table 3-3 (Continued)
Air Intake Shaft Station Data Analysis

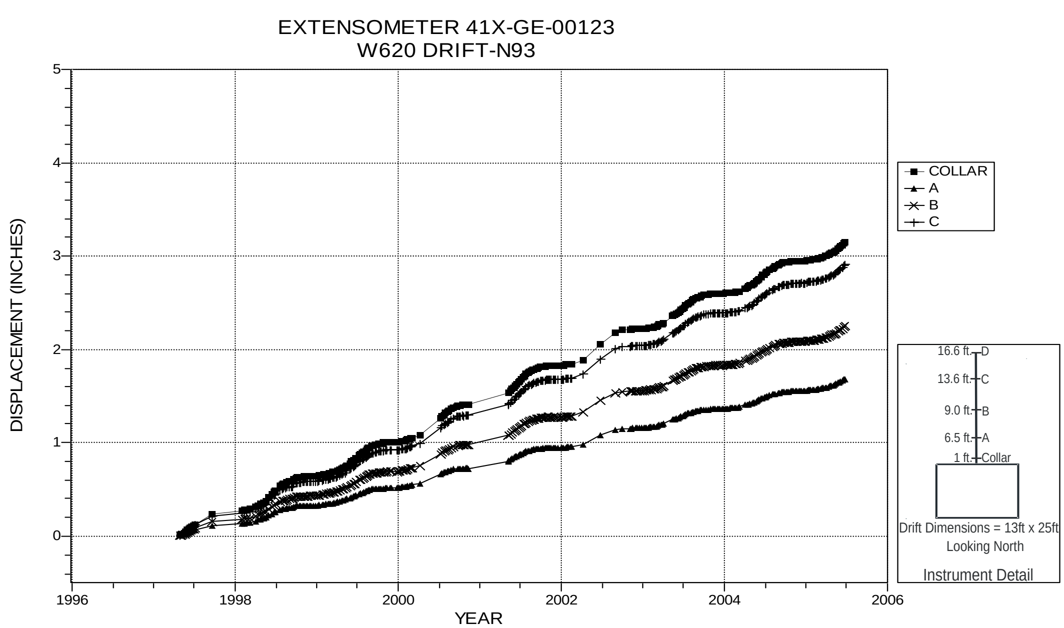
ROCKBOLT LOAD CELLS (Continued)

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X-WG-00250	AIS Station Brow – North	3-21	12/24/94	06/27/05	19.10	
51X-WG-00252	AIS Station Brow – North	3-22	01/19/93	06/27/05	2.93	
51X-WG-00253	AIS Station Brow – North	3-22	01/19/93	06/27/05	26.18	
51X-WG-00254	AIS Station Brow – North	3-22	01/19/93	06/27/05	14.55	
51X-WG-00255	AIS Station Brow - North	3-22	01/19/93	06/27/05	13.85	



NOTES:
1. Excavation date: January 1988.
2. Anchor A transducer malfunction.

Figure 3-17 Extensometer 41X-GE-00122
Air Intake Shaft Station at South 65 – Roof



NOTES:
1. Excavation date: January 1988.

Figure 3-18 Extensometer 41X-GE-00123
Air Intake Shaft Station at North 93 – Roof

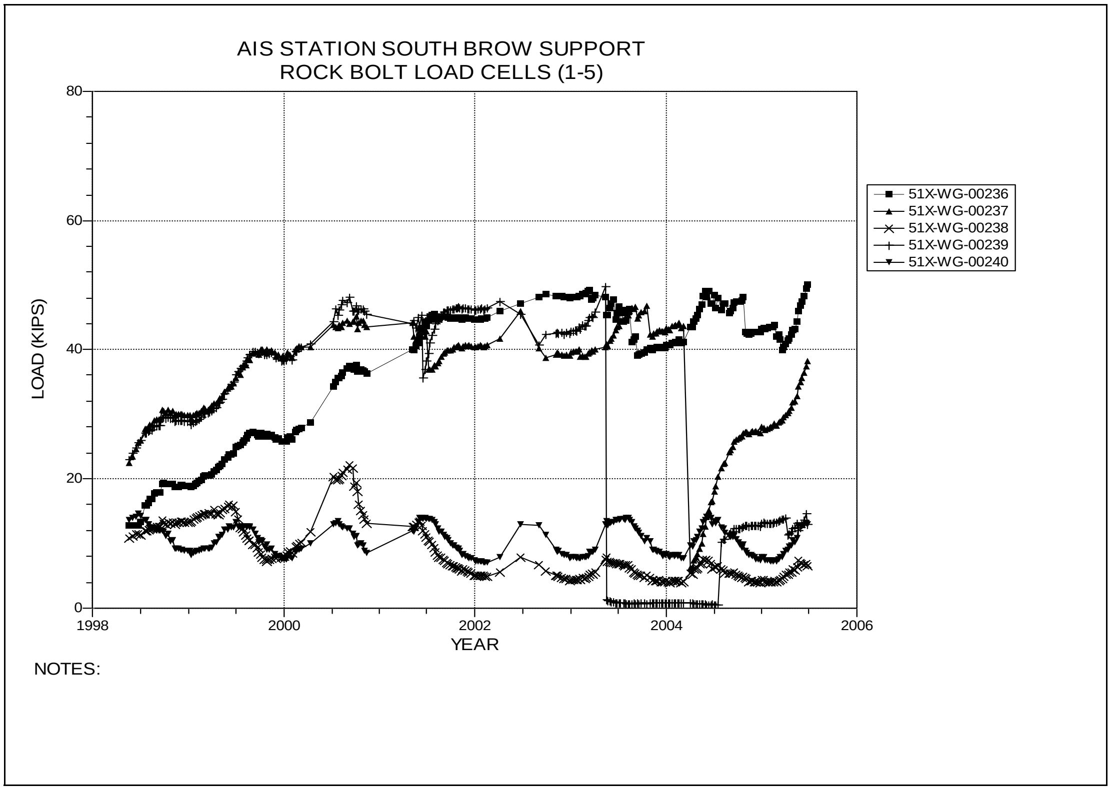


Figure 3-19 Rock Bolt Load Cells
Air Intake Shaft Station Brow – South Side Roof Bolts Set 1

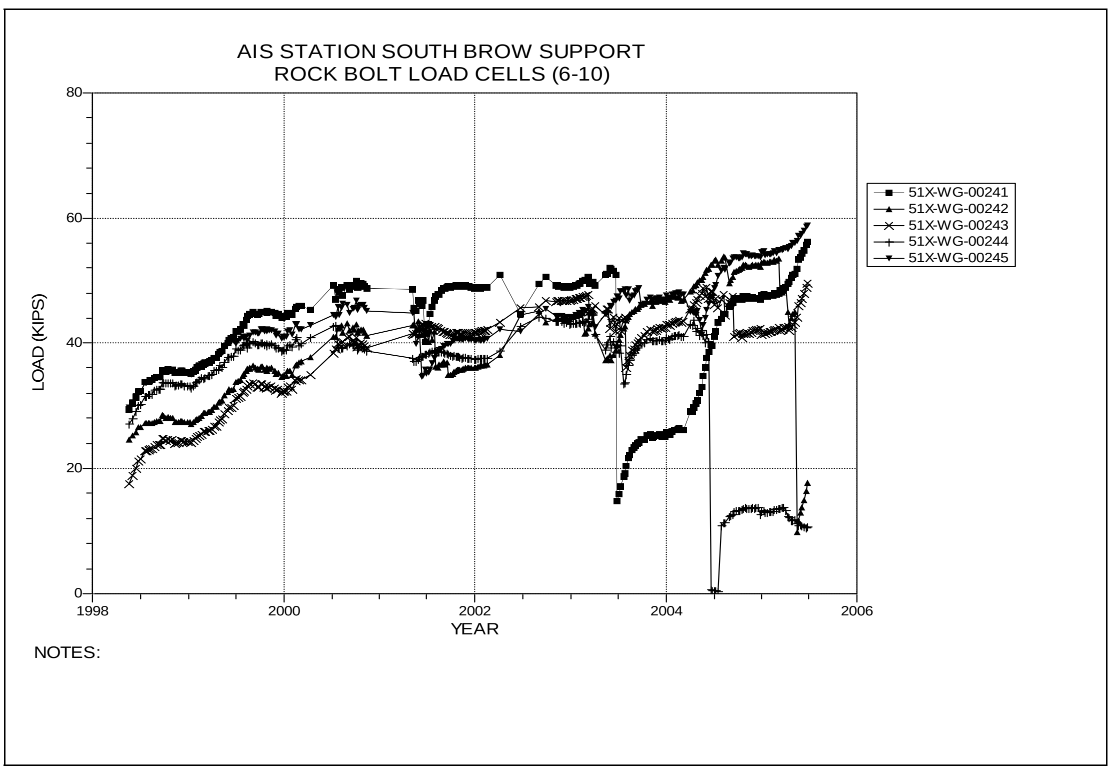


Figure 3-20 Rock Bolt Load Cells
Air Intake Shaft Station Brow – South Side Roof Bolts Set 2

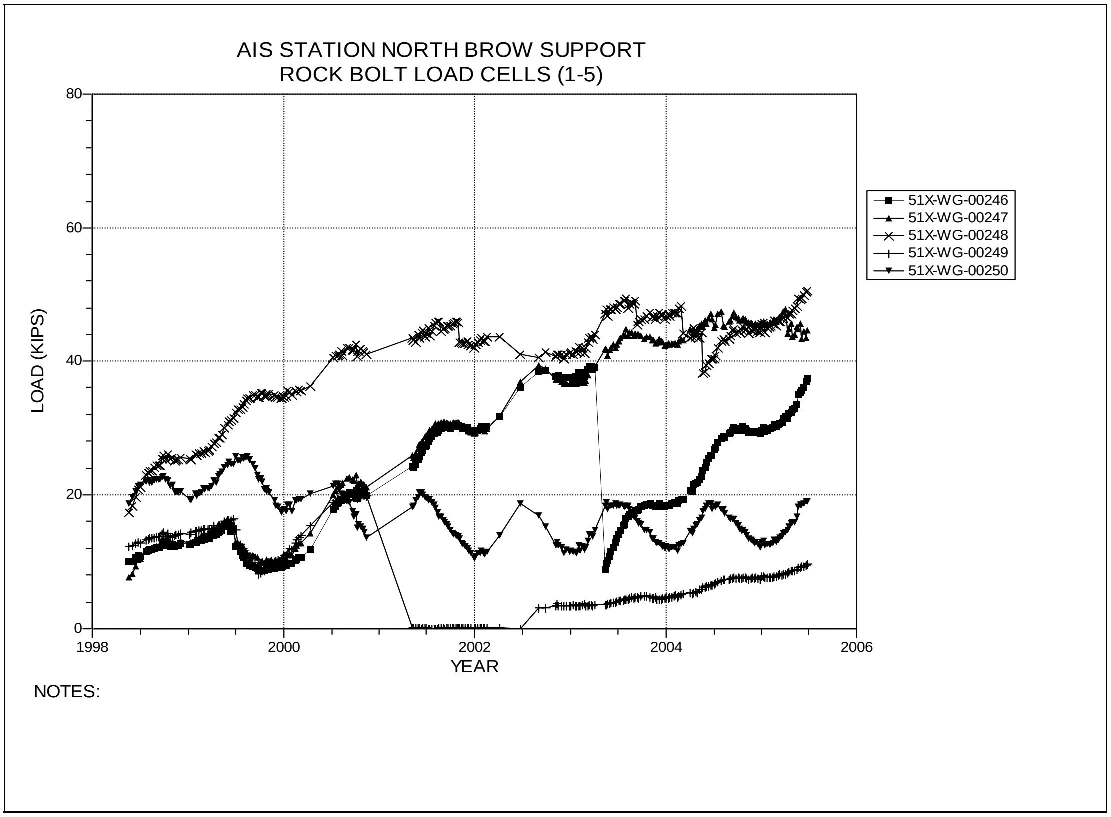


Figure 3-21 Rock Bolt Load Cells
Air Intake Shaft Station Brow – North Side Roof Bolts Set 1

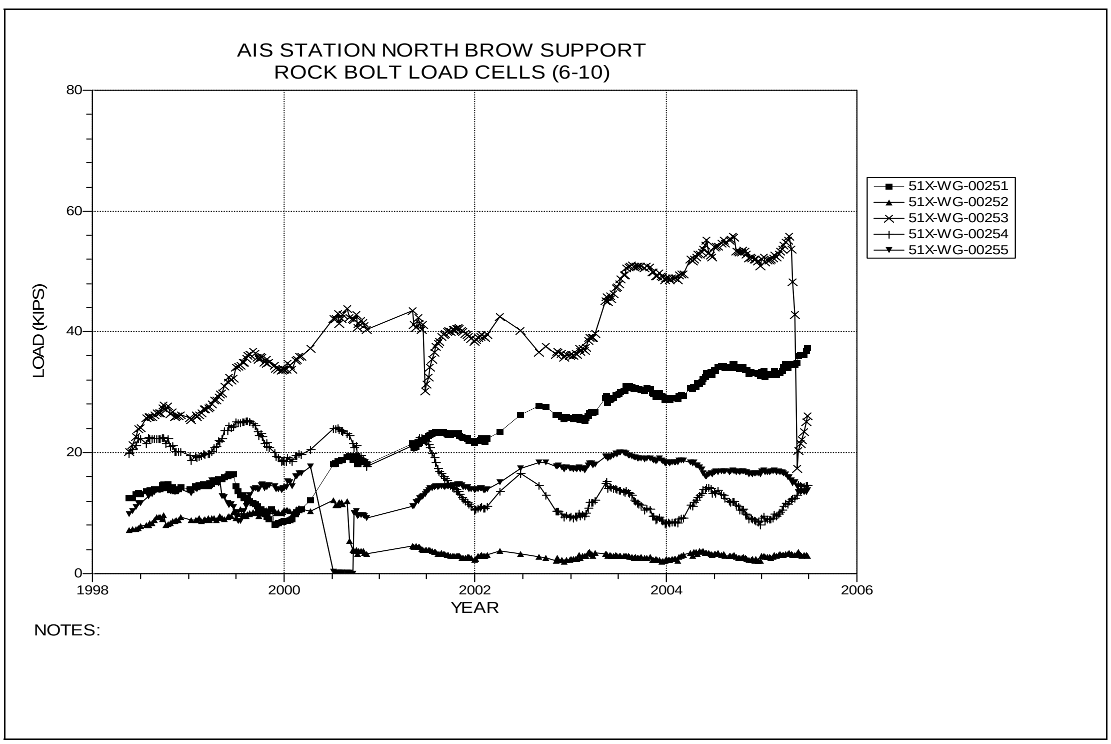


Figure 3-22 Rock Bolt Load Cells
Air Intake Shaft Station Brow – North Side Roof Bolts Set 2

4.0 Instrumentation Summary for the Access Drifts

This chapter presents the instrumentation data and data analyses for the access drifts throughout the WIPP underground. Table 4-1 provides the results of analyses performed on the instrument data including displacement, convergence rates, and rock bolt loading. Figures 4-1 through 4-46 present data from borehole extensometers installed in the access drifts while Figures 4-47 through 4-251 present the convergence point data. Figure 4-252 presents data from joint meters installed at the S1950/E300 overcast. Figure 4-253 through 4-255 presents the data from rock bolt load cells installed at E140/S1550, E140/S1775, and E140/S2900.

Table 4-1
Access Drifts Data Analysis

EXTENSOMETERS

Field Tag	Location		Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (Inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent[A]	Comments
51X-GE-00265	S700 DRIFT-E220	Roof	4-1	05/10/04	11.374	N/A	0.54	N/A	Instrument taken offline.
51X-GE-00364	E140 DRIFT-N1266	Roof	4-2	06/28/05	0.646	0.43	0.57	-25%	
51X-GE-00365	E140 DRIFT-N940	Roof	4-3	06/28/05	0.893	0.61	0.68	-10%	
51X-GE-00373	E300 DRIFT-N1341	Roof	4-4	06/28/05	0.24	0.41	N/A	N/A	Installed in November 2004.
51X-GE-00375	E300 DRIFT-N1262	Roof	4-5	06/28/05	0.111	0.21	N/A	N/A	Installed in December 2004.
51X-GE-00374	E300 DRIFT-N1186	Roof	4-6	06/28/05	0.263	0.47	N/A	N/A	Installed in December 2004.
51X-GE-00105-3	E140 DRIFT-N150-3	Roof	4-7	06/06/05	1.269	0.36	0.28	29%	
51X-GE-00372	E140 DRIFT-S146	Roof	4-8	06/06/05	0.29	0.49	N/A	N/A	Installed in November 2004.
51X-GE-00276	E140 DRIFT-S700	Roof	4-9	06/30/05	9.473	0.58	0.55	5%	
51X-GE-00474	S1000 DRIFT-E120	Roof	4-10	06/28/05	0.831	0.10	0.06	67%	
51X-GE-00472	E140 DRIFT-S1000	Roof	4-11	05/31/05	3.569	0.25	0.15	67%	
51X-GE-00473	S1000 DRIFT-E160	Roof	4-12	06/28/05	0.689	0.13	0.04	225%	
51X-GE-00464	E140 DRIFT-S1025	Roof	4-13	05/31/05	3.596	0.20	0.13	54%	
51X-GE-00333	E140 DRIFT-S1075	Roof	4-14	06/27/05	3.297	0.42	0.45	-7%	
51X-GE-00460-2	E140 DRIFT-S1150	Roof	4-15	05/31/05	1.477	0.60	0.43	40%	
41X-GE-00103	E140 DRIFT-S1150	Roof	4-16	06/27/05	4.844	0.83	0.77	8%	
51X-GE-00461	E140 DRIFT-S1225	Roof	4-17	05/31/05	2.454	0.33	0.25	32%	
51X-GE-00334	E140 DRIFT-S1225	Roof	4-18	06/27/05	3.609	0.52	0.50	4%	
51X-GE-00462	S1300 DRIFT-E120	Roof	4-19	06/28/05	0.446	0.04	0.04	0%	
51X-GE-00465	E140 DRIFT-S1300	Roof	4-20	05/31/05	1.609	0.14	0.10	40%	
51X-GE-00335	E140 DRIFT-S1300	Roof	4-21	06/27/05	0.888	-1.40	0.29	-583%	
51X-GE-00463	S1300 DRIFT-E160	Roof	4-22	06/28/05	2.436	0.31	0.29	7%	
51X-GE-00336	E140 DRIFT-S1375	Roof	4-23	06/27/05	3.991	-0.13	0.76	-117%	
41X-GE-00102-2	E140 DRIFT-S1450	Roof	4-24	06/27/05	5.087	1.08	1.63	-34%	
51X-GE-00442	S1600 DRIFT-E120	Roof	4-25	06/28/05	0.667	0.05	0.05	0%	

[A] NA Indicates insufficient data to compare annualized rates.

Table 4-1 (Contined)
Access Drifts Data Analysis

EXTENSOMETERS (Continued)

Field Tag	Location		Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (Inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent	Comments
51X-GE-00446	E140 DRIFT-S1600	Roof	4-26	05/31/05	2.157	0.20	0.15	33%	
51X-GE-00338-2	E140 DRIFT-S1600	Roof	4-27	06/27/05	5.363	-0.24	1.89	-113%	
51X-GE-00441	S1600 DRIFT-E160	Roof	4-28	06/28/05	1.76	0.15	0.11	36%	
51X-GE-00443	E140 DRIFT-S1685	Roof	4-29	05/31/05	2.968	0.19	0.11	73%	
51X-GE-00339-2	E140 DRIFT-S1685	Roof	4-30	06/27/05	4.078	1.38	1.15	0.2	
51X-GE-00492	E140 DRIFT-S2750	Roof	4-31	06/15/05	1.197	0.89	0.38	134%	
51X-GE-00367	E140 DRIFT-S2916	Roof	4-32	06/27/05	2.877	2.35	3.82	-38%	
51X-GE-00361	E0 DRIFT-N1266	Roof	4-33	06/28/05	1.646	1.15	1.03	12%	
51X-GE-00352	E0 DRIFT-N940	Roof	4-34	06/15/05	0.989	0.41	0.43	-5%	
51X-GE-00353	E0 DRIFT-N626	Roof	4-35	06/15/05	1.042	0.43	0.42	2%	
51X-GE-00355	E0 DRIFT-N300	Roof	4-36	06/15/05	1.787	0.35	0.40	-13%	
51X-GE-00481	N300 DRIFT-W10	Roof	4-37	05/02/05	1.149	0.23	0.38	-39%	
41X-GE-00127	N300 DRIFT-W110	Roof	4-38	06/27/05	5.254	0.24	0.58	-59%	Reached its maximum range.
41X-GE-00126	N300 DRIFT-W212	Roof	4-39	06/27/05	6.637	0.76	0.70	9%	
41X-GE-00125	N215 DRIFT-W417	Roof	4-40	06/27/05	3.885	0.45	0.39	15%	
41X-GE-00124	N215 DRIFT-W519	Roof	4-41	06/27/05	3.802	0.45	0.39	15%	
51X-GE-00494	E300 DRIFT-S2892	Roof	4-42	05/03/05	1.454	0.55	0.68	-19%	
51X-GE-00490	W30 DRIFT-S2750	Roof	4-43	05/03/05	0.543	0.13	0.32	-59%	
51X-GE-00491	W30 DRIFT-S2916	Roof	4-44	05/03/05	1.664	0.74	0.81	-9%	
51X-GE-00489	W30 DRIFT-S3080	Roof	4-45	05/03/05	2.946	0.62	1.33	-53%	
51X-GE-00495	W170 DRIFT-S2634	Roof	4-46	05/03/05	1.748	0.86	0.79	9%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005 Date (Inches)		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
E300-N1341-2 A-C	E300 DRIFT-N1341	4-47	05/27/05	0.439	0.439	2.11	N/A	N/A	Installed February 2005.
E300-N1262-2 A-C	E300 DRIFT-N1262	4-48	05/27/05	0.471	0.471	2.12	N/A	N/A	Installed February 2005.
E300-N1186-2 A-C	E300 DRIFT-N1186	4-49	05/27/05	0.415	0.415	1.75	N/A	N/A	Installed February 2005.
E300-N250-2 A-C	E300 DRIFT-N250	4-50	06/01/05	13.326	27.679	1.55	1.70	-9%	
E300-N170 A-E	E300 DRIFT-N170	4-51	06/01/05	20.639	20.639	1.34	1.35	-1%	
E300-N170 H-F	E300 DRIFT-N170	4-51	06/01/05	18.353	18.353	1.25	1.21	3%	
E300-N170-2 C-G	E300 DRIFT-N170	4-51	06/01/05	1.174	16.067	1.01	1.02	-1%	
E300-N45 A-E	E300 DRIFT-N45	4-52	06/01/05	21.429	21.429	1.49	1.46	2%	
E300-N45 H-F	E300 DRIFT-N45	4-52	06/01/05	18.448	18.448	1.50	1.46	3%	
E300-N45 C-G	E300 DRIFT-N45	4-52	06/01/05	15.456	15.456	0.98	1.02	-4%	
E300-S45-2 A-E	E300 DRIFT-S45	4-53	06/01/05	17.181	17.181	1.05	1.09	-4%	
E300-S45-2 B-D	E300 DRIFT-S45	4-53	06/01/05	13.866	13.866	0.92	0.87	6%	
E300-S45-2 H-F	E300 DRIFT-S45	4-53	06/01/05	14.848	14.848	0.70	0.97	-28%	
E300-S45 C-G	E300 DRIFT-S45	4-53	06/01/05	13.449	13.449	0.76	0.78	-3%	
E300-S90 A-C	E300 DRIFT-S90	4-54	06/13/05	13.459	13.459	0.64	0.68	-6%	
E300-S250-2 A-C	E300 DRIFT-S250	4-55	06/13/05	4.759	9.169	0.58	0.58	0%	
E300-S250-2 B-D	E300 DRIFT-S250	4-55	06/13/05	5.193	9.266	0.60	0.60	0%	
E300-S700 A-C	E300 DRIFT-S700	4-56	06/13/05	16.313	16.313	0.53	0.58	-9%	
E300-S850 A-E	E300 DRIFT-S850	4-57	06/13/05	12.555	12.555	0.39	0.42	-7%	
E300-S850 B-D	E300 DRIFT-S850	4-57	06/13/05	9.406	9.406	0.33	0.31	6%	
E300-S850 H-F	E300 DRIFT-S850	4-57	06/13/05	8.614	8.614	0.30	0.32	-6%	
E300-S850-2 C-G	E300 DRIFT-S850	4-57	06/13/05	4.695	13.973	0.52	0.49	6%	
E300-S1000 A-C	E300 DRIFT-S1000	4-58	06/13/05	16.261	16.261	0.51	0.53	-4%	
E300-S1150-3 A-E	E300 DRIFT-S1150	4-59	06/13/05	8.500	13.990	0.50	0.52	-4%	
E300-S1150-3 B-D	E300 DRIFT-S1150	4-59	06/13/05	5.930	9.989	0.36	0.38	-5%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
E300-S1150-3 H-F	E300 DRIFT-S1150	4-59	06/13/05	5.911	9.531	0.37	0.37	0%	
E300-S1150-2 C-G	E300 DRIFT-S1150	4-60	06/13/05	5.520	15.976	0.59	0.60	-2%	
E300-S1300 A-C	E300 DRIFT-S1300	4-61	06/13/05	9.654	9.654	0.62	0.67	-7%	
E300-S1450 A-C	E300 DRIFT-S1450	4-62	06/13/05	5.225	5.225	0.62	0.66	-6%	
E300-S1450 B-D	E300 DRIFT-S1450	4-62	06/13/05	5.922	5.922	0.76	0.74	3%	
E300-S1687 A-C	E300 DRIFT-S1687	4-63	06/13/05	5.312	5.312	0.70	0.73	-4%	
E300-S1687 B-D	E300 DRIFT-S1687	4-63	06/13/05	5.845	5.845	0.79	0.81	-2%	
E300-S1775 A-C	E300 DRIFT-S1775	4-64	06/13/05	5.032	5.032	0.66	0.72	-8%	
E300-S1775 B-D	E300 DRIFT-S1775	4-64	06/13/05	5.921	5.921	0.78	0.80	-3%	
E300-S1862 A-C	E300 DRIFT-S1862	4-65	06/13/05	5.245	5.245	0.69	0.78	-12%	
E300-S1862 B-D	E300 DRIFT-S1862	4-65	06/13/05	6.303	6.303	0.84	0.88	-5%	
E300-S2065 A-C	E300 DRIFT-S2065	4-66	06/13/05	6.121	6.121	0.80	0.85	-6%	
E300-S2065 B-D	E300 DRIFT-S2065	4-66	06/13/05	7.948	7.948	1.12	1.13	-1%	
E300-S2275 A-C	E300 DRIFT-S2275	4-67	06/13/05	7.275	7.275	1.12	1.24	-10%	
E300-S2275 B-D	E300 DRIFT-S2275	4-67	06/13/05	8.955	8.955	1.45	1.62	-10%	
E300-S2350 A-C	E300 DRIFT-S2350	4-68	06/13/05	8.523	8.523	1.34	1.44	-7%	
E300-S2350 B-D	E300 DRIFT-S2350	4-68	06/13/05	9.441	9.441	1.50	1.68	-11%	
E300-S2425 A-C	E300 DRIFT-S2425	4-69	06/13/05	8.597	8.597	1.34	1.50	-11%	
E300-S2425 B-D	E300 DRIFT-S2425	4-69	06/13/05	9.613	9.613	1.56	1.72	-9%	
E300-S2634 A-C	E300 DRIFT-S2634	4-70	06/01/05	4.342	4.342	1.55	1.94	-20%	
E300-S2634 B-D	E300 DRIFT-S2634	4-70	06/01/05	4.504	4.504	1.59	2.01	-21%	
E300-S2833 A-C	E300 DRIFT-S2833	4-71	06/01/05	4.887	4.887	1.73	2.09	-17%	
E300-S2833 B-D	E300 DRIFT-S2833	4-71	06/01/05	4.886	4.886	1.63	2.07	-21%	
E300-S2916 A-C	E300 DRIFT-S2916	4-72	06/01/05	7.471	7.471	3.03	3.09	-2%	
E300-S2916 B-D	E300 DRIFT-S2916	4-72	06/01/05	5.300	5.300	1.82	2.25	-19%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
E300-S2998 A-C	E300 DRIFT-S2998	4-73	06/01/05	12.379	12.379	5.71	4.94	16%	
E300-S2998 B-D	E300 DRIFT-S2998	4-73	06/01/05	4.997	4.997	1.75	2.14	-18%	
E300-S3195 A-C	E300 DRIFT-S3195	4-74	06/01/05	4.915	4.915	1.86	1.94	-4%	
E300-S3195 B-D	E300 DRIFT-S3195	4-74	06/01/05	5.185	5.185	1.96	2.03	-3%	
N1420-E140-2 A-C	N1420 DRIFT-E140	4-75	06/07/05	1.078	17.568	1.54	N/A	N/A	No access '03-'04.
E140-N1266-4 B-D	E140 DRIFT-N1266	4-76	06/07/05	0.962	23.029	1.37	N/A	N/A	No access '03-'04.
E140-N1266-3 A-C	E140 DRIFT-N1266	4-76	06/07/05	1.642	39.419	2.43	N/A	N/A	No access '03-'04.
E140-N940-2 A-C	E140 DRIFT-N940	4-77	06/07/05	1.718	31.134	2.56	N/A	N/A	No access '03-'04.
E140-N940-2 B-D	E140 DRIFT-N940	4-77	06/07/05	0.668	15.949	1.37	N/A	N/A	No access '03-'04.
E140-N780-2 A-C	E140 DRIFT-N780	4-78	06/14/05	6.684	38.462	2.68	2.77	-3%	
E140-N686-2 A-C	E140 DRIFT-N686	4-79	06/14/05	4.851	19.567	2.11	2.08	1%	
E140-N686-2 B-D	E140 DRIFT-N686	4-79	06/14/05	3.556	3.556	1.47	1.55	-5%	
E140-N626-3 A-C	E140 DRIFT-N626	4-80	06/14/05	5.967	38.561	2.65	2.54	4%	
E140-N626-4 B-D	E140 DRIFT-N626	4-80	06/14/05	3.556	24.916	1.51	1.52	-1%	
E140-N562-2 A-C	E140 DRIFT-N562	4-81	06/14/05	4.613	16.454	1.99	2.01	-1%	
E140-N562-2 B-D	E140 DRIFT-N562	4-81	06/14/05	3.592	11.894	1.51	1.52	-1%	
E140-N460-3 A-C	E140 DRIFT-N460	4-82	06/14/05	6.965	27.861	1.69	1.92	-12%	
E140-N355 A-C	E140 DRIFT-N355	4-83	06/14/05	6.735	6.735	1.59	1.62	-2%	
E140-N355 B-D	E140 DRIFT-N355	4-83	06/14/05	6.030	6.030	1.42	1.46	-3%	
E140-N220-2 A-C	E140 DRIFT-N220	4-84	06/14/05	2.552	24.041	1.48	1.91	-23%	
E140-N150-3 A-C	E140 DRIFT-N150	4-85	06/14/05	1.370	17.813	1.06	1.49	-29%	
E140-N5-5 A-C	E140 DRIFT-N5	4-86	06/14/05	0.163	30.461	1.20	1.25	-4%	
E140-N5-3 B-D	E140 DRIFT-N5	4-86	06/14/05	9.070	24.311	0.98	0.96	2%	
E140-S90-3 A-C	E140 DRIFT-S90	4-87	06/14/05	8.804	16.184	1.10	1.13	-3%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
E140-S262-4 A-C	E140 DRIFT-S262	4-88	06/14/05	0.660	21.593	1.68	1.55	8%	
E140-S262-3 B-D	E140 DRIFT-S262	4-88	06/14/05	12.932	14.285	1.18	0.97	22%	
E140-S460-2 B-D	E140 DRIFT-S460	4-89	05/31/05	19.327	25.271	0.93	0.93	0%	
E140-S460-4 A-C	E140 DRIFT-S460	4-89	05/31/05	14.754	33.010	1.70	1.83	-7%	
E140-S550-4 A-C	E140 DRIFT-S550	4-90	05/31/05	9.567	33.684	1.18	1.17	1%	
E140-S550-4 B-D	E140 DRIFT-S550	4-90	05/31/05	20.189	28.831	1.05	0.95	11%	
E140-S700-4 A-D	E140 DRIFT-S700	4-91	05/31/05	0.515	22.143	1.78	1.09	63%	
E140-S700-4 B-C	E140 DRIFT-S700	4-92	11/23/04	9.388	21.929	1.95	1.11	76%	
E140-S700-5 E-F	E140 DRIFT-S700	4-92	05/31/05	0.334	15.753	1.25	0.80	56%	
E140-S850-8 A-C	E140 DRIFT-S850	4-93	05/31/05	0.897	40.032	2.46	1.75	41%	
E140-S850-4 B-D	E140 DRIFT-S850	4-94	05/31/05	11.074	27.021	1.11	0.92	21%	
E140-S1000-2 A-C	E140 DRIFT-S1000	4-95	05/31/05	0.562	27.511	1.65	1.06	56%	
E140-S1025-3 A-C	E140 DRIFT-S1025	4-96	06/23/05	0.729	13.599	1.38	1.30	6%	
E140-S1075-3 A-E	E140 DRIFT-S1075	4-97	06/23/05	0.753	11.440	1.53	1.48	3%	
E140-S1075-3 B-D	E140 DRIFT-S1075	4-97	06/23/05	0.697	11.058	1.29	1.54	-16%	
E140-S1075-3 F-H	E140 DRIFT-S1075	4-97	06/23/05	0.458	9.292	1.01	1.20	-16%	
E140-S1075-2 C-G	E140 DRIFT-S1075	4-97	06/23/05	9.052	9.052	1.08	1.01	7%	
E140-S1150 C-K	E140 DRIFT-S1150	4-99	06/23/05	9.879	9.879	0.97	1.01	-4%	
E140-S1150-3 A-G	E140 DRIFT-S1150	4-98	06/23/05	1.015	33.470	1.90	1.93	-2%	
E140-S1150-3 B-F	E140 DRIFT-S1150	4-98	06/23/05	0.896	13.425	1.75	1.88	-7%	
E140-S1150-2 D-J	E140 DRIFT-S1150	4-99	06/23/05	9.778	20.771	1.15	1.14	1%	
E140-S1150-2 E-I	E140 DRIFT-S1150	4-99	06/23/05	8.903	8.903	1.05	1.04	1%	
E140-S1150-4 L-H	E140 DRIFT-S1150	4-98	06/23/05	0.681	9.829	1.26	1.33	-5%	
E140-S1225-3 A-E	E140 DRIFT-S1225	4-100	06/23/05	0.867	15.403	1.74	1.87	-7%	
E140-S1225-2 B-D	E140 DRIFT-S1225	4-100	06/23/05	14.072	16.182	1.88	1.92	-2%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches	Inches				
E140-S1225-2 C-G	E140 DRIFT-S1225	4-100	06/23/05	11.074	12.031	1.45	1.39	4%	
E140-S1225-2 H-F	E140 DRIFT-S1225	4-100	06/23/05	10.042	11.641	1.33	1.32	1%	
E140-S1300-4 A-C	E140 DRIFT-S1300	4-101	06/23/05	9.707	26.330	1.18	1.22	-3%	
E140-S1378-2 A-E	E140 DRIFT-S1375	4-102	06/23/05	13.156	23.994	1.78	1.79	-1%	
E140-S1378-2 B-D	E140 DRIFT-S1375	4-102	06/23/05	8.858	18.562	1.17	1.18	-1%	
E140-S1378-2 H-F	E140 DRIFT-S1375	4-102	06/23/05	15.255	26.533	2.01	2.07	-3%	
E140-S1378 C-G	E140 DRIFT-S1375	4-103	06/23/05	11.610	15.780	1.22	1.17	4%	
E140-S1456-4 A-G	E140 DRIFT-S1450	4-104	06/23/05	16.000	51.069	2.95	2.85	4%	
E140-S1456-2 B-F	E140 DRIFT-S1456	4-105	06/23/05	16.431	26.599	2.35	2.32	1%	
E140-S1456-2 L-H	E140 DRIFT-S1456	4-105	06/23/05	12.451	21.221	1.87	1.84	2%	
E140-S1456-2 D-J	E140 DRIFT-S1456	4-106	06/23/05	11.465	32.813	1.49	1.48	1%	
E140-S1456 K-C	E140 DRIFT-S1456	4-107	06/23/05	11.326	11.326	1.21	1.18	3%	
E140-S1456-2 I-E	E140 DRIFT-S1456	4-107	06/23/05	9.597	11.207	1.21	1.19	2%	
E140-S1534-2 A-E	E140 DRIFT-S1534	4-108	06/23/05	28.206	31.367	2.74	3.68	-26%	
E140-S1534-3 B-D	E140 DRIFT-S1534	4-108	06/23/05	3.920	17.364	2.45	2.62	-6%	
E140-S1534-2 H-F	E140 DRIFT-S1534	4-108	06/23/05	17.776	20.846	2.08	2.37	-12%	
E140-S1534-2 C-G	E140 DRIFT-S1534	4-108	06/23/05	10.363	11.886	1.33	1.30	2%	
E140-S1600-5 A-C	E140 DRIFT-S1600	4-109	06/23/05	11.144	27.989	1.46	1.48	-1%	
E140-S1687-2 A-E	E140 DRIFT-S1687	4-110	06/23/05	18.021	20.979	3.26	2.79	17%	
E140-S1687-2 B-D	E140 DRIFT-S1687	4-110	06/23/05	14.874	17.758	2.13	2.18	-2%	
E140-S1687-2 H-F	E140 DRIFT-S1687	4-110	06/23/05	13.057	15.653	1.81	1.96	-8%	
E140-S1687 C-G	E140 DRIFT-S1687	4-110	06/23/05	11.611	11.611	1.38	1.30	6%	
E140-S1775-2 A-G	E140 DRIFT-S1775	4-111	06/23/05	32.564	35.791	5.10	5.60	-9%	
E140-S1775-3 B-F	E140 DRIFT-S1775	4-111	06/23/05	5.201	29.807	3.84	4.29	-10%	
E140-S1775-2 L-H	E140 DRIFT-S1775	4-111	06/23/05	13.981	16.167	2.07	2.15	-4%	
E140-S1775 C-K	E140 DRIFT-S1775	4-112	06/23/05	11.675	11.675	1.30	1.38	-6%	
E140-S1775-2 D-J	E140 DRIFT-S1775	4-112	06/23/05	10.895	12.205	1.51	1.50	1%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
E140-S1775-2 I-E	E140 DRIFT-S1775	4-112	06/23/05	10.358	11.899	1.27	1.47	-14%	
E140-S1862-2 A-E	E140 DRIFT-S1862	4-113	06/23/05	20.059	22.665	4.42	3.86	15%	
E140-S1862-2 B-D	E140 DRIFT-S1862	4-113	06/23/05	18.032	20.948	3.61	3.05	18%	
E140-S1862-2 H-F	E140 DRIFT-S1862	4-113	06/23/05	10.635	12.466	1.84	1.75	5%	
E140-S1862-3 C-G	E140 DRIFT-S1862	4-113	06/23/05	5.081	11.486	1.38	1.35	2%	
E140-S1950-5 A-C	E140 DRIFT-S1950	4-114	06/23/05	5.381	35.491	2.11	2.20	-4%	
E140-S2007-5 A-C	E140 DRIFT-S2007	4-115	06/23/05	1.287	19.377	2.59	2.63	-2%	
E140-S2065-4 A-C	E140 DRIFT-S2065	4-116	06/23/05	1.713	19.526	3.60	2.87	25%	
E140-S2065-2 B-D	E140 DRIFT-S2065	4-116	06/23/05	4.193	10.893	1.66	1.73	-4%	
E140-S2122-3 A-C	E140 DRIFT-S2122	4-117	06/23/05	6.942	20.492	2.84	2.86	-1%	
E140-S2180-5 A-C	E140 DRIFT-S2180	4-118	06/23/05	1.075	24.455	2.46	2.62	-6%	
E140-S2275-3 A-C	E140 DRIFT-S2275	4-119	06/23/05	2.475	28.231	5.03	8.14	-38%	
E140-S2275 B-D	E140 DRIFT-S2275	4-119	06/23/05	10.750	10.750	1.95	2.16	-10%	
E140-S2350-4 A-C	E140 DRIFT-S2350	4-120	06/23/05	2.063	38.049	4.16	6.34	-34%	
E140-S2350-2 B-D	E140 DRIFT-S2350	4-120	06/23/05	11.365	18.256	2.09	2.31	-10%	
E140-S2425-3 A-C	E140 DRIFT-S2425	4-121	06/23/05	1.845	19.136	4.04	5.21	-22%	
E140-S2425 B-D	E140 DRIFT-S2425	4-121	06/23/05	11.293	11.293	2.00	2.33	-14%	
E140-S2520-2 A-C	E140 DRIFT-S2520	4-122	06/23/05	7.474	16.124	3.05	3.14	-3%	
E140-S2634 A-C	E140 DRIFT-S2634	4-123	06/23/05	13.159	13.159	4.64	6.00	-23%	
E140-S2634 B-D	E140 DRIFT-S2634	4-123	06/23/05	5.260	5.260	2.02	2.37	-15%	
E140-S2750-2 A-C	E140 DRIFT-S2750	4-124	06/23/05	2.393	6.422	2.27	2.70	-16%	
E140-S2833-2 A-C	E140 DRIFT-S2833	4-125	06/23/05	3.249	9.585	3.14	4.54	-31%	
E140-S2833 B-D	E140 DRIFT-S2833	4-125	06/23/05	5.087	5.087	1.69	2.05	-18%	
E140-S2915-2 A-C	E140 DRIFT-S2915	4-126	06/23/05	3.982	12.849	3.85	6.08	-37%	
E140-S2915 B-D	E140 DRIFT-S2915	4-126	06/23/05	5.584	5.584	1.83	2.28	-20%	
E140-S2998-2 A-C	E140 DRIFT-S2998	4-127	06/23/05	4.162	13.307	4.14	6.25	-34%	
E140-S2998 B-D	E140 DRIFT-S2998	4-127	06/23/05	5.283	5.283	1.70	2.14	-21%	
E140-S3080 A-C	E140 DRIFT-S3080	4-128	06/23/05	7.074	7.074	2.61	3.07	-15%	
E140-S3195 A-C	E140 DRIFT-S3195	4-129	06/23/05	11.884	11.884	5.45	4.96	10%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
E140-S3195 B-D	E140 DRIFT-S3195	4-129	06/23/05	5.302	5.302	1.88	2.03	-7%	
E140-S3395 A-C	E140 DRIFT-S3395	4-130	06/28/05	1.563	1.563	8.57	N/A	N/A	Installed April 2005.
E140-S3395 B-D	E140 DRIFT-S3395	4-130	06/28/05	0.568	0.568	2.77	N/A	N/A	Installed April 2005.
E140-S3480 A-C	E140 DRIFT-S3480	4-131	06/28/05	0.972	0.972	4.99	N/A	N/A	Installed April 2005.
E140-S3480 B-D	E140 DRIFT-S3480	4-131	06/28/05	0.620	0.620	3.11	N/A	N/A	Installed April 2005.
E140-S3565 A-C	E140 DRIFT-S3565	4-132	06/28/05	0.757	0.757	4.32	N/A	N/A	Installed April 2005.
E140-S3565 B-D	E140 DRIFT-S3565	4-132	06/28/05	0.235	0.235	2.80	N/A	N/A	Installed June 2005.
N1420-E0-2 A-C	N1420 DRIFT-E0	4-133	05/27/05	0.423	14.907	1.27	N/A	N/A	Installed January 2005.
E0-N1266-4 A-C	E0 DRIFT-N1266	4-134	06/14/05	4.019	40.945	2.28	2.02	13%	
E0-N1110-5 A-C	E0 DRIFT-N1110	4-135	06/14/05	0.707		1.85	-1.31	-241%	
E0-N940-5 A-C	E0 DRIFT-N940	4-136	06/14/05	1.052	35.187	2.51	2.19	15%	
E0-N780-2 A-C	E0 DRIFT-N780	4-137	06/14/05	3.712	24.152	2.01	2.03	-1%	
E0-N686 A-C	E0 DRIFT-N686	4-138	06/14/05	5.139	5.139	2.12	2.33	-9%	
E0-N686 B-D	E0 DRIFT-N686	4-138	06/14/05	3.543	3.543	1.49	1.53	-3%	
E0-N626-4 A-C	E0 DRIFT-N626	4-139	06/14/05	4.817	45.795	1.95	2.04	-4%	
E0-N562 A-C	E0 DRIFT-N562	4-140	06/14/05	3.744	3.744	1.61	1.55	4%	
E0-N562 B-D	E0 DRIFT-N562	4-140	06/14/05	3.510	3.510	1.50	1.49	1%	
E0-N460-3 A-C	E0 DRIFT-N460	4-141	06/14/05	7.536	27.683	1.83	1.81	1%	
E0-N300-5 A-C	E0 DRIFT-N290	4-142	06/14/05	2.016	41.691	1.50	1.16	29%	
E0-N225-2 A-C	E0 DRIFT-N225	4-143	06/14/05	6.532	6.623	1.57	1.64	-4%	
E0-N225 B-D	E0 DRIFT-N225	4-143	06/14/05	5.989	5.989	1.33	1.32	1%	
E0-N75 A-C	E0 DRIFT-N80	4-144	06/14/05	6.485	23.505	1.74	1.84	-5%	
E0-N75 B-D	E0 DRIFT-N80	4-144	06/14/05	4.596	4.596	1.19	1.27	-6%	
W30-S120 A-C	W30 DRIFT-S120	4-145	06/15/05	18.447	18.447	0.85	0.85	0%	
W30-S250-4 A-C	W30 DRIFT-S250	4-146	06/15/05	0.829	24.615	1.00	0.93	8%	
W30-S250-5 B-D	W30 DRIFT-S250	4-146	06/15/05	10.355	21.309	0.73	0.67	9%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
W30-S400 A-C	W30 DRIFT-S400	4-147	06/15/05	16.390	16.390	0.74	0.75	-1%	
W30-S500 B-D	W30 DRIFT-S500	4-148	06/15/05	20.126	20.126	0.70	0.63	11%	
W30-S500 A-C	W30 DRIFT-S500	4-148	06/15/05	21.274	21.274	0.73	0.73	0%	
W30-S700-2 A-C	W30 DRIFT-S700	4-149	06/15/05	7.468	27.909	0.85	0.86	-1%	
W30-S850-2 A-E	W30 DRIFT-S850	4-150	06/15/05	9.707	16.460	0.56	0.54	4%	
W30-S850-2 B-D	W30 DRIFT-S850	4-150	06/15/05	6.647	11.209	0.37	0.36	3%	
W30-S850 H-F	W30 DRIFT-S850	4-150	06/15/05	12.210	12.210	0.39	0.38	3%	
W30-S850 C-G	W30 DRIFT-S850	4-150	06/15/05	18.413	18.413	0.67	0.58	16%	
W30-S1000-3 A-C	W30 DRIFT-S1000	4-151	06/15/05	14.800	31.667	1.11	1.09	2%	
W30-S1100 A-C	W30 DRIFT-S1100	4-152	06/15/05	9.077	9.077	0.86	0.83	4%	
W30-S1200 A-C	W30 DRIFT-S1200	4-153	06/15/05	9.120	9.120	0.82	0.84	-2%	
W30-S1300 A-C	W30 DRIFT-S1300	4-154	06/15/05	16.165	16.165	0.95	0.96	-1%	
W30-S1453 A-C	W30 DRIFT-S1453	4-155	06/15/05	11.193	11.193	0.77	0.76	1%	
W30-S1453-2 B-D	W30 DRIFT-S1453	4-155	06/15/05	6.400	11.323	0.74	0.72	3%	
W30-S1600-1 A-C	W30 DRIFT-S1600	4-156	06/15/05	5.970	14.712	0.92	0.93	-1%	
W30-S1775 A-C	W30 DRIFT-S1775	4-157	06/15/05	8.273	8.273	0.55	0.55	0%	
W30-S1775-2 B-D	W30 DRIFT-S1775	4-157	06/15/05	5.776	9.816	0.68	0.68	0%	
W30-S1950 A-C	W30 DRIFT-S1950	4-158	06/15/05	14.144	14.144	0.90	0.97	-7%	
W30-S2067 A-C	W30 DRIFT-S2067	4-159	06/15/05	10.911	10.911	0.83	0.82	1%	
W30-S2067-2 B-D	W30 DRIFT-S2067	4-159	06/15/05	6.606	11.515	0.86	0.84	2%	
W30-S2180 A-C	W30 DRIFT-S2180	4-160	06/13/05	17.413	17.413	1.15	1.21	-5%	
W30-S2275-2 A-C	W30 DRIFT-S2275	4-161	06/06/05	4.736	5.575	0.92	0.89	3%	
W30-S2275 B-D	W30 DRIFT-S2275	4-161	06/06/05	6.491	6.491	1.00	1.03	-3%	
W30-S2350-2 A-C	W30 DRIFT-S2350	4-162	06/06/05	5.241	6.329	0.97	0.98	-1%	
W30-S2350 B-D	W30 DRIFT-S2350	4-162	06/06/05	7.384	7.384	1.14	1.13	1%	
W30-S2425-2 A-C	W30 DRIFT-S2425	4-163	06/06/05	5.596	6.585	1.02	1.02	0%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
W30-S2425 B-D	W30 DRIFT-S2425	4-163	06/06/05	7.717	7.717	1.23	1.23	0%	
W30-S2520-2 A-C	W30 DRIFT-S2520	4-164	06/13/05	8.400	10.321	1.27	1.50	-15%	
W30-S2685-2 A-C	W30 DRIFT-S2685	4-165	05/31/05	6.693	8.827	1.74	1.95	-11%	
W30-S2685-2 B-D	W30 DRIFT-S2685	4-165	05/31/05	5.515	7.695	1.28	1.48	-14%	
W30-S2750 A-C	W30 DRIFT-S2750	4-166	05/31/05	4.144	4.144	1.40	1.59	-12%	
W30-S2833 A-C	W30 DRIFT-S2833	4-167	05/31/05	3.722	3.722	1.38	1.55	-11%	
W30-S2833 B-D	W30 DRIFT-S2833	4-167	05/31/05	3.692	3.692	1.31	1.54	-15%	
W30-S2916 A-C	W30 DRIFT-S2916	4-168	05/31/05	4.982	4.982	2.03	2.14	-5%	
W30-S2916 B-D	W30 DRIFT-S2916	4-168	05/31/05	3.371	3.371	1.21	1.48	-18%	
W30-S2998 A-C	W30 DRIFT-S2998	4-169	05/31/05	3.742	3.742	1.29	1.54	-16%	
W30-S2998 B-D	W30 DRIFT-S2998	4-169	05/31/05	3.665	3.665	1.25	1.51	-17%	
W30-S3080 A-C	W30 DRIFT-S3080	4-170	05/31/05	6.745	6.745	2.21	2.64	-16%	
W30-S3195 A-C	W30 DRIFT-S3195	4-171	05/31/05	4.321	4.321	1.48	1.67	-11%	
W30-S3195 B-D	W30 DRIFT-S3195	4-171	05/31/05	4.049	4.049	1.35	1.52	-11%	
W30-S3310 A-C	W30 DRIFT-S3310	4-172	05/31/05	4.814	4.814	1.94	1.86	4%	
W30-S3395 A-C	W30 DRIFT-S3395	4-173	06/28/05	0.320	0.320	2.35	N/A	N/A	Installed May 2005.
W30-S3395 B-D	W30 DRIFT-S3395	4-173	06/28/05	0.298	0.298	2.08	N/A	N/A	Installed May 2005.
W30-S3480 A-C	W30 DRIFT-S3480	4-174	06/28/05	0.323	0.323	2.34	N/A	N/A	Installed May 2005.
W30-S3480 B-D	W30 DRIFT-S3480	4-174	06/28/05	0.321	0.321	2.31	N/A	N/A	Installed May 2005.
W30-S3565 A-C	W30 DRIFT-S3565	4-175	06/28/05	0.307	0.307	2.34	N/A	N/A	Installed May 2005.
W30-S3565 B-D	W30 DRIFT-S3565	4-175	06/28/05	0.321	0.321	2.26	N/A	N/A	Installed May 2005.
W170-N150-2 A-C	W170 DRIFT-N150	4-176	06/29/05	6.001	7.447	0.42	0.52	-19%	
W170-S5 A-C	W170 DRIFT-S5	4-177	06/29/05	11.260	11.260	0.50	0.58	-14%	
W170-S5-2 B-D	W170 DRIFT-S5	4-177	06/29/05	5.050	12.842	0.65	0.67	-3%	
W170-S90-3 A-C	W170 DRIFT-S90	4-178	06/29/05	2.816	10.086	0.84	0.96	-13%	
W170-S232-2 A-C	W170 DRIFT-S232	4-179	06/21/05	2.746	8.358	0.65	0.56	16%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
W170-S232-2 B-D	W170 DRIFT-S232	4-179	06/21/05	5.865	8.507	0.60	0.55	9%	
W170-S400 A-C	W170 DRIFT-S400	4-180	06/21/05	10.200	10.200	0.60	0.65	-8%	
W170-S560-3 A-C	W170 DRIFT-S560	4-181	06/21/05	2.963	9.058	0.59	0.62	-5%	
W170-S560-2 B-D	W170 DRIFT-S560	4-181	06/21/05	6.609	9.741	0.65	0.62	5%	
W170-S700 A-C	W170 DRIFT-S700	4-182	06/21/05	17.904	17.904	0.61	0.66	-8%	
W170-S850-6 A-E	W170 DRIFT-S850	4-183	06/21/05	2.818	15.307	0.60	0.61	-2%	
W170-S850-5 B-D	W170 DRIFT-S850	4-184	06/21/05	2.386	11.385	0.47	0.47	0%	
W170-S850-6 H-F	W170 DRIFT-S850	4-184	06/21/05	2.062	10.442	0.36	0.42	-14%	
W170-S850-3 C-G	W170 DRIFT-S850	4-185	06/21/05	6.587	17.400	0.67	0.65	3%	
W170-S1000-2 A-C	W170 DRIFT-S1000	4-186	06/21/05	3.770	20.454	0.95	1.05	-10%	
W170-S1150-3 A-E	W170 DRIFT-S1150	4-187	06/21/05	4.953	18.225	0.78	0.71	10%	
W170-S1150-3 B-D	W170 DRIFT-S1150	4-187	06/21/05	3.494	12.732	0.50	0.49	2%	
W170-S1150-2 C-G	W170 DRIFT-S1150	4-187	06/21/05	7.221	18.798	0.75	0.70	7%	
W170-S1150 H-F	W170 DRIFT-S1150	4-187	06/21/05	11.996	11.996	0.49	0.51	-4%	
W170-S1300-3 A-C	W170 DRIFT-S1300	4-188	06/21/05	14.067	17.147	1.28	1.33	-4%	
W170-S1445-3 A-C	W170 DRIFT-S1445	4-189	06/21/05	4.664	9.399	0.66	0.76	-13%	
W170-S1445-2 B-D	W170 DRIFT-S1445	4-189	06/21/05	6.422	9.080	0.68	0.61	11%	
W170-S1600-2 A-C	W170 DRIFT-S1600	4-190	06/21/05	5.790	11.588	0.81	0.83	-2%	
W170-S1779-2 A-C	W170 DRIFT-S1779	4-191	06/21/05	6.074	12.305	0.92	0.91	1%	
W170-S1779-2 B-D	W170 DRIFT-S1779	4-191	06/21/05	7.562	10.697	0.83	0.77	8%	
W170-S1950-2 A-C	W170 DRIFT-S1950	4-192	06/21/05	5.496	10.919	0.79	0.77	3%	
W170-S2060-2 A-C	W170 DRIFT-S2060	4-193	06/21/05	5.732	11.290	0.87	0.82	6%	
W170-S2060-2 B-D	W170 DRIFT-S2060	4-193	06/21/05	7.990	11.314	0.91	0.85	7%	
W170-S2180-2 A-C	W170 DRIFT-S2180	4-194	06/21/05	7.287	13.302	1.05	1.04	1%	
W170-S2275 A-C	W170 DRIFT-S2275	4-195	06/06/05	6.099	6.099	0.99	0.99	0%	
W170-S2275 B-D	W170 DRIFT-S2275	4-195	06/06/05	6.465	6.465	1.09	1.07	2%	
W170-S2350 A-C	W170 DRIFT-S2350	4-196	06/06/05	8.024	8.024	1.32	1.29	2%	
W170-S2350 B-D	W170 DRIFT-S2350	4-196	06/06/05	6.785	6.785	1.09	1.09	0%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
W170-S2425 A-C	W170 DRIFT-S2425	4-197	06/06/05	7.307	7.307	1.13	1.13	0%	
W170-S2425 B-D	W170 DRIFT-S2425	4-197	06/06/05	7.416	7.416	1.15	1.14	1%	
W170-S2520 A-C	W170 DRIFT-S2520	4-198	06/06/05	8.069	8.069	1.25	1.23	2%	
W170-S2685-2 A-C	W170 DRIFT-S2685	4-199	05/31/05	6.119	6.119	1.77	1.67	6%	
W170-S2685-2 B-D	W170 DRIFT-S2685	4-199	05/31/05	5.135	5.135	1.30	1.34	-3%	
W170-S2750 A-C	W170 DRIFT-S2750	4-200	05/31/05	3.968	3.968	1.48	1.52	-3%	
W170-S2833 A-C	W170 DRIFT-S2833	4-201	05/31/05	3.758	3.758	1.45	1.55	-6%	
W170-S2833 B-D	W170 DRIFT-S2833	4-201	05/31/05	3.337	3.337	1.23	1.37	-10%	
W170-S2916 A-C	W170 DRIFT-S2916	4-202	05/31/05	8.519	8.519	2.89	3.91	-26%	
W170-S2916 B-D	W170 DRIFT-S2916	4-202	05/31/05	3.288	3.288	1.36	1.59	-14%	
W170-S2998 A-C	W170 DRIFT-S2998	4-203	05/31/05	4.812	4.812	1.85	2.03	-9%	
W170-S2998 B-D	W170 DRIFT-S2998	4-203	05/31/05	3.785	3.785	1.35	1.54	-12%	
W170-S3080 A-C	W170 DRIFT-S3080	4-204	05/31/05	3.943	3.943	1.44	1.58	-9%	
W170-S3195 A-C	W170 DRIFT-S3195	4-205	05/31/05	4.411	4.411	1.53	1.68	-9%	
W170-S3195 B-D	W170 DRIFT-S3195	4-205	05/31/05	3.853	3.853	1.32	1.44	-8%	
W170-S3310 A-C	W170 DRIFT-S3310	4-206	05/31/05	4.160	4.160	1.94	1.45	34%	
N780-E70 A-C	N780 DRIFT-E70	4-207	05/09/05	3.068	3.068	1.13	1.47	-23%	
N780-E70 B-D	N780 DRIFT-E70	4-207	05/09/05	3.070	3.070	1.18	1.21	-2%	
N460-E70-3 A-C	N460 DRIFT-E70	4-208	05/09/05	5.247	21.759	1.22	1.38	-12%	
N460-E70-2 B-D	N460 DRIFT-E70	4-208	05/09/05	5.991	17.739	1.42	1.46	-3%	
N300-W170-2 A-C	N300 DRIFT-W170	4-209	05/02/05	2.049	24.327	1.38	1.59	-13%	
N300-W170-1 B-D	N300 DRIFT-W170	4-209	05/02/05	7.510	15.755	1.02	1.41	-28%	
N250-E220 A-E	N250 DRIFT-E220	4-210	06/01/05	21.922	21.922	1.48	1.51	-2%	
N250-E220 B-D	N250 DRIFT-E220	4-210	06/01/05	22.738	22.738	1.62	1.63	-1%	
N250-E220 H-F	N250 DRIFT-E220	4-210	06/01/05	16.980	16.980	1.12	1.15	-3%	

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005 Date	Last Reading 2004 to 2005 Inches	Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
N250-E220 C-G	N250 DRIFT-E220	4-210	06/01/05	16.313	16.313	0.99	1.05	-6%	
N215-W500-2 A-C	N215 DRIFT-W500	4-211	05/02/05	1.665	20.012	1.11	1.36	-18%	
N215-W500-2 B-D	N215 DRIFT-W500	4-211	05/02/05	6.199	13.069	0.73	0.84	-13%	
N215-W620-2 A-C	N215 DRIFT-W620	4-212	05/02/05	0.724	16.962	0.85	0.80	6%	
N140-E90 A-C	N140 DRIFT-E90	4-213	05/03/05	12.502	12.502	0.51	0.57	-11%	
N140-E90 B-D	N140 DRIFT-E90	4-213	05/03/05	12.969	12.969	0.66	0.73	-10%	
N140-W50-2 B-D	N140 DRIFT-W50	4-214	05/03/05	7.364	19.570	0.76	1.01	-25%	
S90-W120 A-C	S90 DRIFT-W120	4-215	06/29/05	3.528	3.528	0.58	0.62	-6%	
S90-W120 B-D	S90 DRIFT-W120	4-215	06/29/05	3.727	3.727	0.64	0.69	-7%	
S90-W400-2 A-C	S90 DRIFT-W400	4-216	06/29/05	0.254	13.627	0.60	0.66	-9%	
S90-W400-2 B-D	S90 DRIFT-W400	4-216	06/29/05	5.182	13.105	0.59	0.65	-9%	
S90-W590-2 A-C	S90 DRIFT-W590	4-217	06/29/05	0.219	9.570	0.53	0.60	-12%	
S90-W590-2 B-D	S90 DRIFT-W590	4-217	06/29/05	4.953	8.790	0.53	0.53	0%	
S90-W620 A-C	S90 DRIFT-W620	4-218	06/29/05	17.743	17.743	0.98	1.08	-9%	
S90-W770 A-C	S90 DRIFT-W770	4-219	06/29/05	12.015	12.015	0.76	0.82	-7%	
S90-W770-2 B-D	S90 DRIFT-W770	4-219	06/29/05	5.250	10.937	0.76	0.76	0%	
S90-W905 A-C	S90 DRIFT-W905	4-220	06/29/05	2.613	2.613	1.78	N/A	N/A	Installed June 2004.
CORE-W10 A-C	CORE STORAGE W10	4-221	05/03/05	16.492	16.492	0.70	0.83	-16%	
CORE-W101 A-C	CORE STORAGE W101	4-221	05/03/05	18.380	18.380	0.95	1.04	-9%	
CORE-W117 A-C	CORE STORAGE W117	4-221	05/03/05	16.723	16.723	0.85	0.88	-3%	
CORE-W133 A-C	CORE STORAGE W133	4-221	05/03/05	14.352	14.352	0.68	0.73	-7%	
CORE-W20 A-C	CORE STORAGE W20	4-221	05/03/05	15.368	15.368	0.75	0.81	-7%	
CORE-W30 A-C	CORE STORAGE W30	4-221	05/03/05	16.004	16.004	0.81	0.85	-5%	
CORE-W51 A-C	CORE STORAGE W51	4-221	05/03/05	17.900	17.900	0.97	1.00	-3%	
CORE-W62 A-C	CORE STORAGE W62	4-221	05/03/05	18.593	18.593	1.04	1.06	-2%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
CORE-W73 A-C	CORE STORAGE W73	4-221	05/03/05	18.743	18.743	1.05	1.08	-3%	
S700-E55 A-C	S700 DRIFT-E55	4-222	06/28/05	0.833	0.833	0.68	N/A	N/A	Installed May 2005.
S700-E55 B-D	S700 DRIFT-E55	4-222	06/28/05	0.837	0.837	0.66	N/A	N/A	Installed May 2005.
S700-W98-2 A-C	S700 DRIFT-W98	4-223	06/28/05	0.282	14.783	1.23	1.24	-1%	
S1000-E160-2 A-C	S1000 DRIFT-E160	4-224	06/28/05	0.362	6.293	0.81	0.69	17%	
S1000-E120-3 A-C	S1000 DRIFT-E120	4-225	06/28/05	0.477	8.956	1.11	1.12	-1%	
S1000-E58-4 A-C	S1000 DRIFT-E58	4-226	06/28/05	0.428	15.913	1.08	1.04	4%	
S1000-E58-2 B-D	S1000 DRIFT-E58	4-226	06/28/05	11.142	11.142	0.87	0.77	13%	
S1000-W98-2 A-C	S1000 DRIFT-W98	4-227	06/28/05	2.364	21.133	1.65	1.64	1%	
S1000-W98-2 B-D	S1000 DRIFT-W98	4-227	08/19/04	0.664	13.516	N/A	1.19	N/A	Last read August 2004.
S1300-E160 A-C	S1300 DRIFT-E160	4-228	06/28/05	11.558	11.558	1.17	1.16	1%	
S1300-E120 A-C	S1300 DRIFT-E120	4-229	06/28/05	8.415	8.415	0.81	0.81	0%	
S1300-E24 A-C	S1300 DRIFT-E24	4-230	06/28/05	14.587	14.587	0.91	0.96	-5%	
S1300-W55 A-C	S1300 DRIFT-W55	4-231	06/28/05	11.655	11.655	0.94	1.06	-11%	
S1300-W100-2 A-C	S1300 DRIFT-W100	4-232	06/28/05	17.118	23.638	1.47	1.57	-6%	
S1600-E170 A-C	S1600 DRIFT-E170	4-233	06/28/05	9.894	9.894	0.90	0.92	-2%	
S1600-E110 A-C	S1600 DRIFT-E110	4-234	06/28/05	9.008	9.008	0.86	0.84	2%	
S1950-E113-4 A-C	S1950 DRIFT-E113	4-235	06/29/05	3.317	7.244	0.63	0.67	-6%	
S1950-E281-3 A-C	S1950 DRIFT-E281	4-236	05/27/05	7.334	13.903	1.01	1.01	0%	
S1950-E284-3 A-C	S1950 DRIFT-E284	4-237	05/27/05	7.363	14.002	1.02	1.05	-3%	
S2180-E55-2 A-C	S2180 DRIFT-E55	4-238	06/01/05	6.029	6.349	1.31	1.28	2%	
S2180-E55 B-D	S2180 DRIFT-E55	4-238	03/30/05	4.858	4.858	1.06	1.03	3%	
S2180-E220 A-C	S2180 DRIFT-E220	4-239	06/01/05	6.209	6.209	1.22	1.29	-5%	
S2180-E220 B-D	S2180 DRIFT-E220	4-239	06/01/05	6.435	6.435	1.32	1.33	-1%	
S2180-W100-2 A-C	S2180 DRIFT-W100	4-240	06/06/05	7.654	7.803	1.63	1.57	4%	
S2180-W100-2 B-D	S2180 DRIFT-W100	4-240	06/06/05	4.924	5.110	0.94	0.97	-3%	

[A] NA indicates insufficient data to compare annualized rates.

Table 4-1 (Continued)
Access Drifts Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
S2520-E220 A-C	S2520 DRIFT-E220	4-241	06/06/05	9.514	9.514	1.46	1.63	-10%	
S2520-E220 B-D	S2520 DRIFT-E220	4-241	06/06/05	9.349	9.349	1.52	1.63	-7%	
S2520-W100 A-C	S2520 DRIFT-W100	4-242	06/06/05	8.904	8.904	1.43	1.35	6%	
S2520-W100 B-D	S2520 DRIFT-W100	4-242	06/06/05	8.586	8.586	1.41	1.31	8%	
S2750-E55 A-C	S2750 DRIFT-E55	4-243	06/01/05	4.349	4.349	1.60	1.76	-9%	
S2750-E55 B-D	S2750 DRIFT-E55	4-243	06/01/05	3.898	3.898	1.40	1.54	-9%	
S2750-E220 A-C	S2750 DRIFT-E220	4-244	03/29/05	4.512	4.512	2.01	2.05	-2%	
S2750-E220 B-D	S2750 DRIFT-E220	4-244	03/29/05	3.995	3.995	1.55	1.82	-15%	
S2750-W93 A-C	S2750 DRIFT-W93	4-245	06/01/05	4.118	4.118	1.59	1.74	-9%	
S2750-W93 B-D	S2750 DRIFT-W93	4-245	06/01/05	3.017	3.017	1.11	1.26	-12%	
S3080-E55 A-C	S3080 DRIFT-E55	4-246	05/03/05	4.778	4.778	1.62	2.27	-29%	
S3080-E55-2 B-D	S3080 DRIFT-E55	4-246	05/03/05	1.920	3.620	1.27	1.84	-31%	
S3080-E220-2 A-C	S3080 DRIFT-E220	4-247	06/01/05	1.648	4.382	1.71	1.98	-14%	
S3080-E220 B-D	S3080 DRIFT-E220	4-247	06/01/05	4.431	4.431	1.58	1.89	-16%	
S3080-W100 A-C	S3080 DRIFT-W100	4-248	06/01/05	4.225	4.225	1.56	1.77	-12%	
S3080-W100 B-D	S3080 DRIFT-W100	4-248	06/01/05	3.647	3.647	1.25	1.51	-17%	
S3310-E55 A-C	S3310 DRIFT-E55	4-249	06/01/05	4.709	4.709	1.87	1.97	-5%	
S3310-E55 B-D	S3310 DRIFT-E55	4-249	06/01/05	4.321	4.321	1.75	1.72	2%	
S3310-E220 A-C	S3310 DRIFT-E220	4-250	06/01/05	5.051	5.051	2.00	1.97	2%	
S3310-E220 B-D	S3310 DRIFT-E220	4-250	06/01/05	5.005	5.005	2.00	1.86	8%	
S3310-W100 A-C	S3310 DRIFT-W100	4-251	06/01/05	4.536	4.536	1.99	1.77	12%	
S3310-W100 B-D	S3310 DRIFT-W100	4-251	06/01/05	3.465	3.465	1.73	1.46	18%	

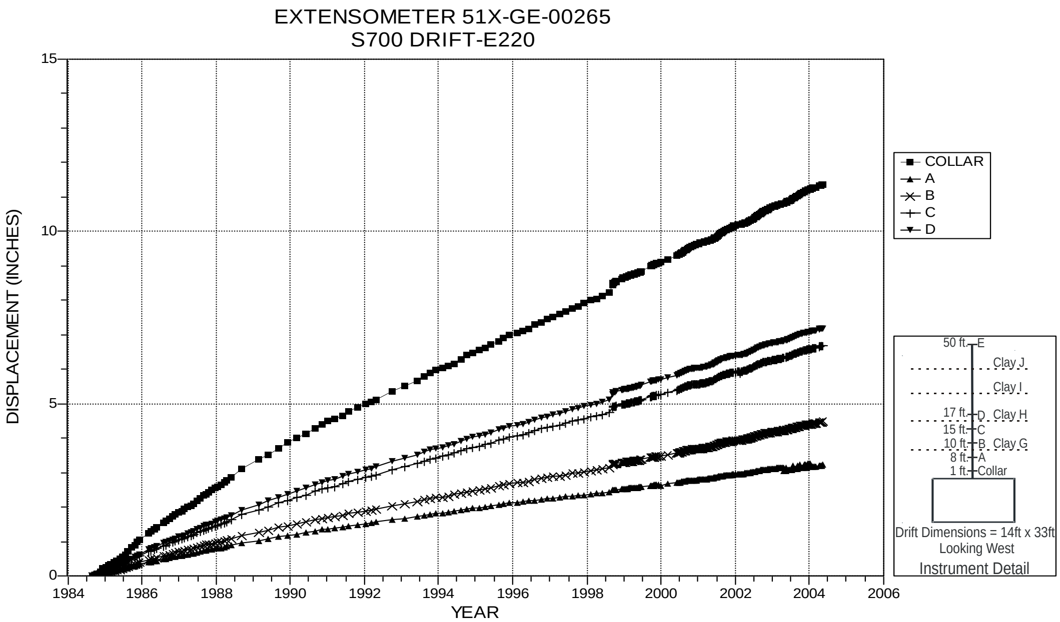
Table 4-1 (Continued)
Access Drifts Data Analysis

JOINT METERS

Field Tag	Location	Figure Number	Date of Last Reading	Cumulative Displacement Inches	Dilation Rate 2004 to 2005 in/year	Dilation Rate 2003 to 2004 in/year	Rate Change Percent	Comments
51X-CG-02703	S1950-E300 Overcast-NE	4-252	06/27/05	0.573	0.02	0.03	-33%	
51X-CG-02706	S1950-E300 Overcast-SW	4-252	06/27/05	1.138	0.07	0.08	-13%	
51X-CG-02707	S1950-E300 Overcast-NW	4-252	06/27/05	1.159	0.07	0.08	-13%	
51X-CG-02708	S1950-E300 Overcast-SE	4-252	06/27/05	0.642	0.03	0.03	0%	

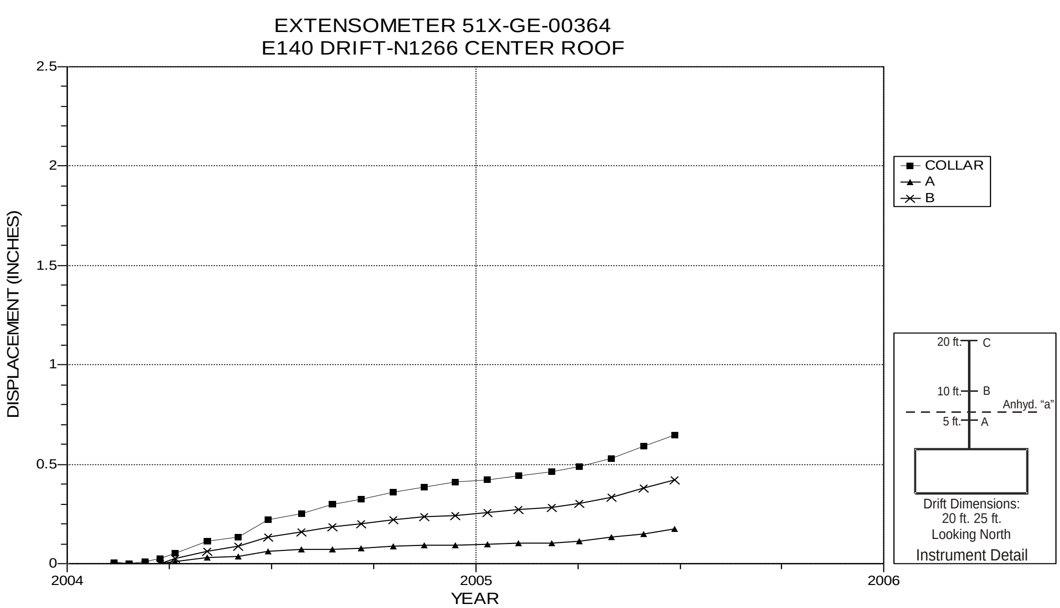
ROCKBOLT LOAD CELLS

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X-WG-00293	E140 DRIFT-S1550	4-253	03/17/04	06/22/05	48.7	
51X-WG-00294	E140 DRIFT-S1775	4-254	03/17/04	06/22/05	53.1	
51X-WG-00295	E140 DRIFT-S2900	4-255	03/31/04	06/22/05	45.0	
51X-WG-00296	E140 DRIFT-S2900	4-255	03/31/04	06/22/05	53.6	



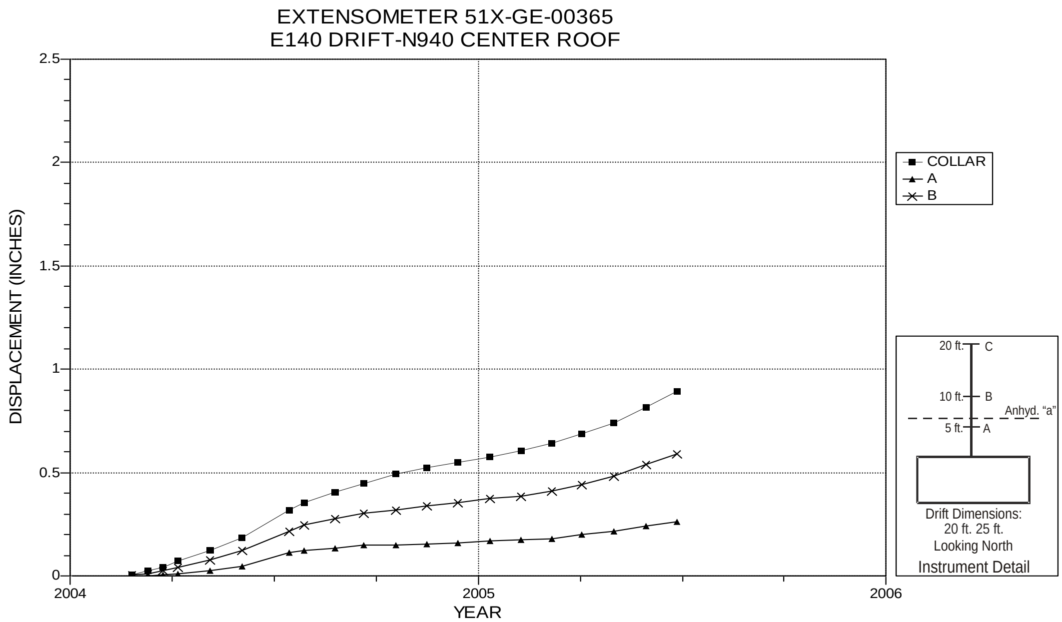
NOTES:
1. Excavation date: May 1984.

Figure 4-1 Extensometer 51X-GE-00265
S700 Drift at E220 – Roof



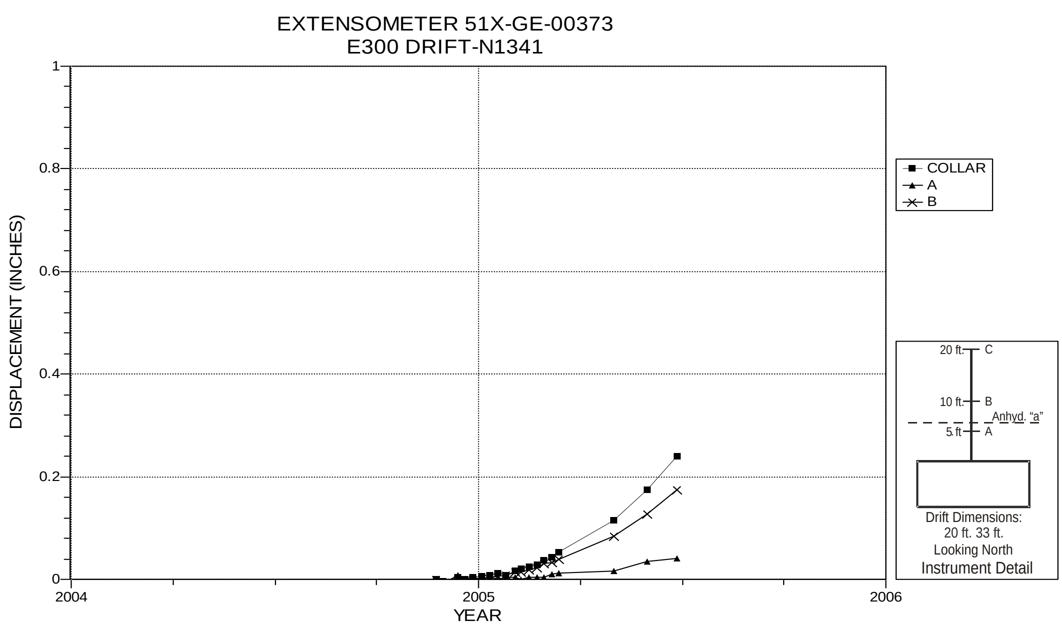
NOTES:
1. Excavation date: February 1983.

Figure 4-2 Extensometer 51X-GE-00364
E140 Drift at N1266 – Roof



NOTES:
1. Excacation date: February 1983.

Figure 4-3 Extensometer 51X-GE-00365
E140 Drift at N940 – Roof



NOTES:
1. Excavation date: August 1989.

Figure 4-4 Extensometer 51X-GE-00373
E300 Drift at N1341 – Roof

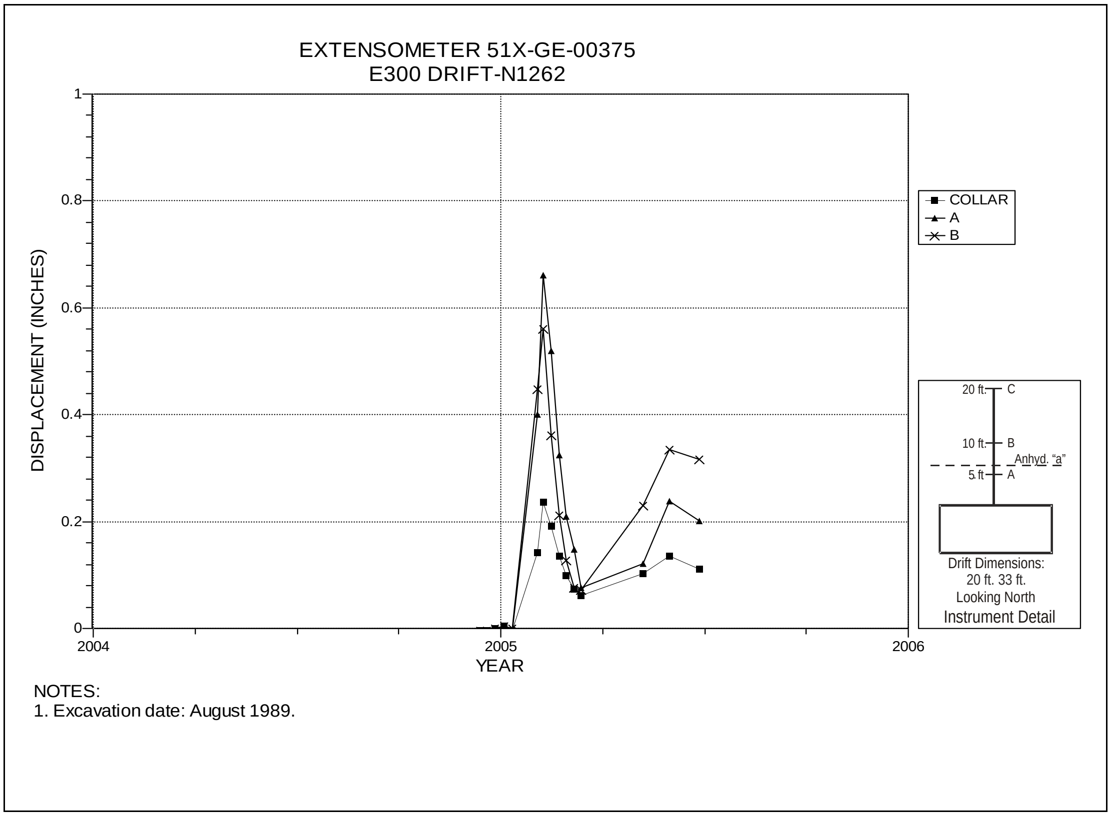


Figure 4-5 Extensometer 51X-GE-00375
E300 Drift at N1262 – Roof

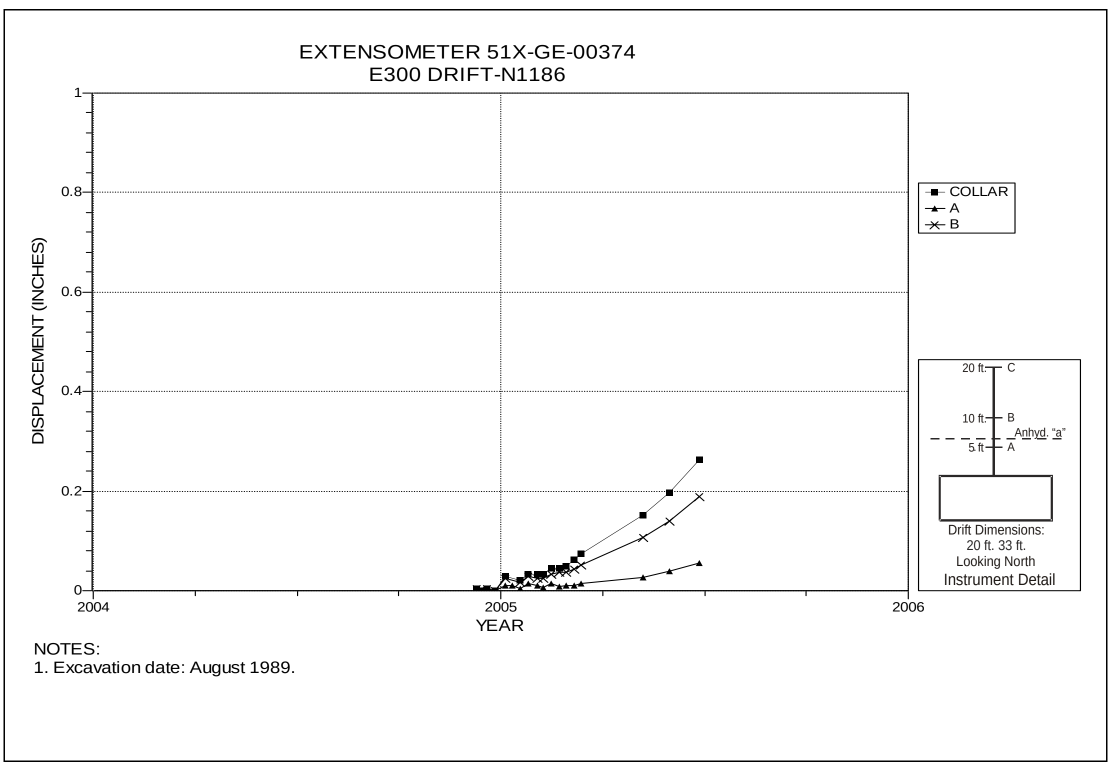
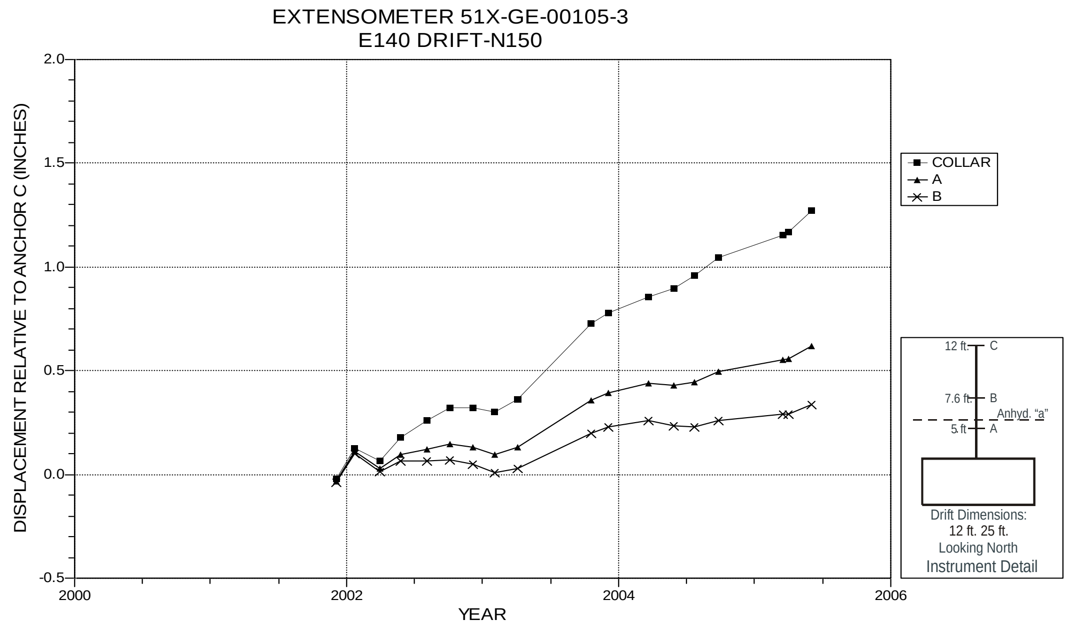
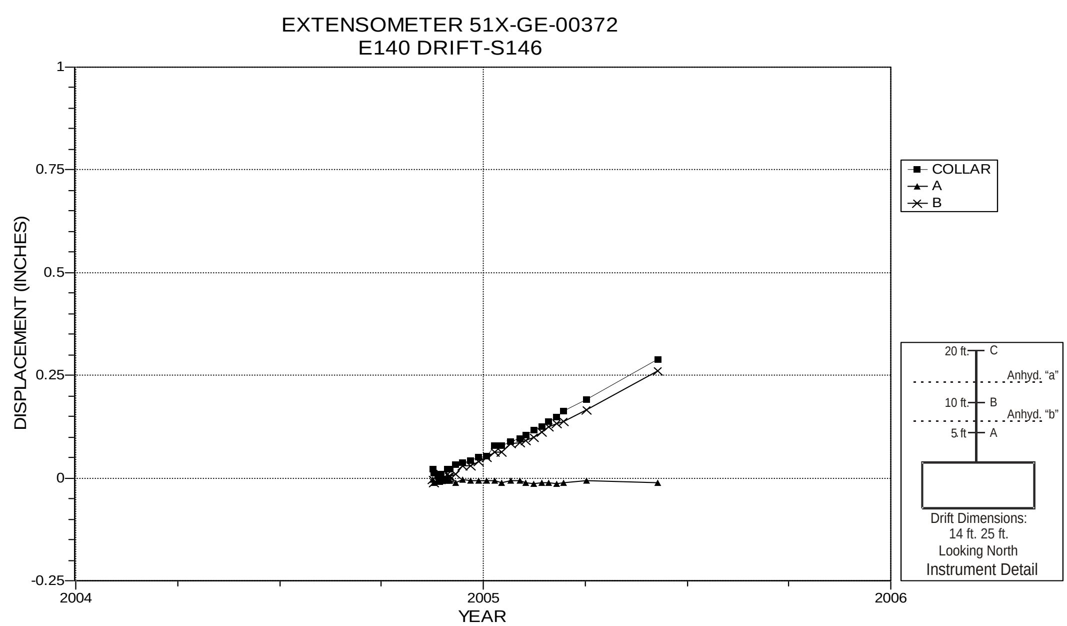


Figure 4-6 Extensometer 51X-GE-00374
E300 Drift at N1186 – Roof



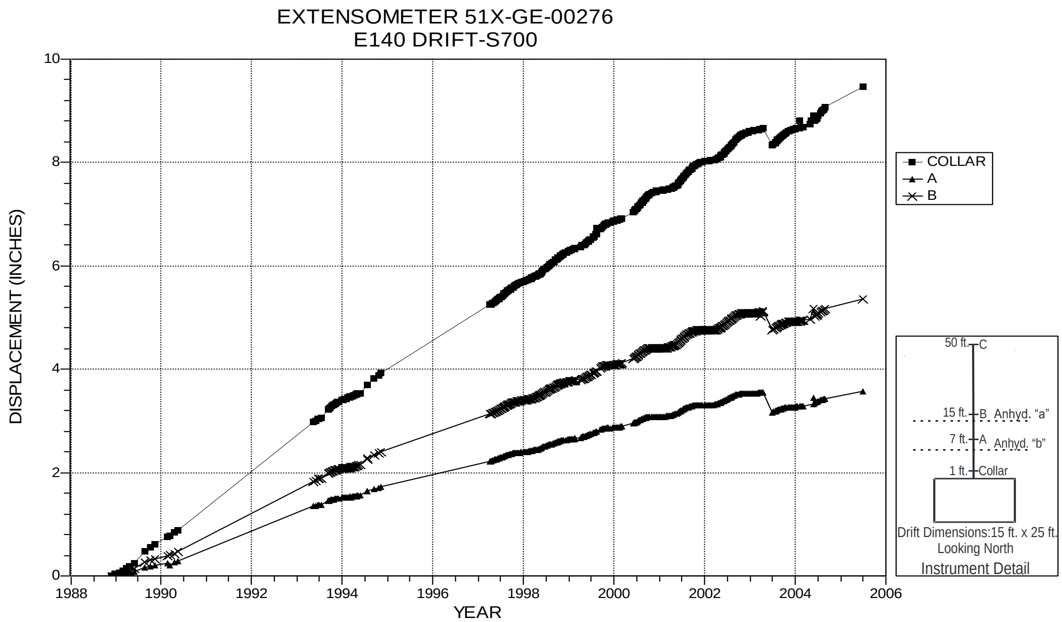
NOTES:
1. Excavation date: November 1982.

Figure 4-7 Extensometer 51X-GE-00105-3
E140 at N150 – Roof



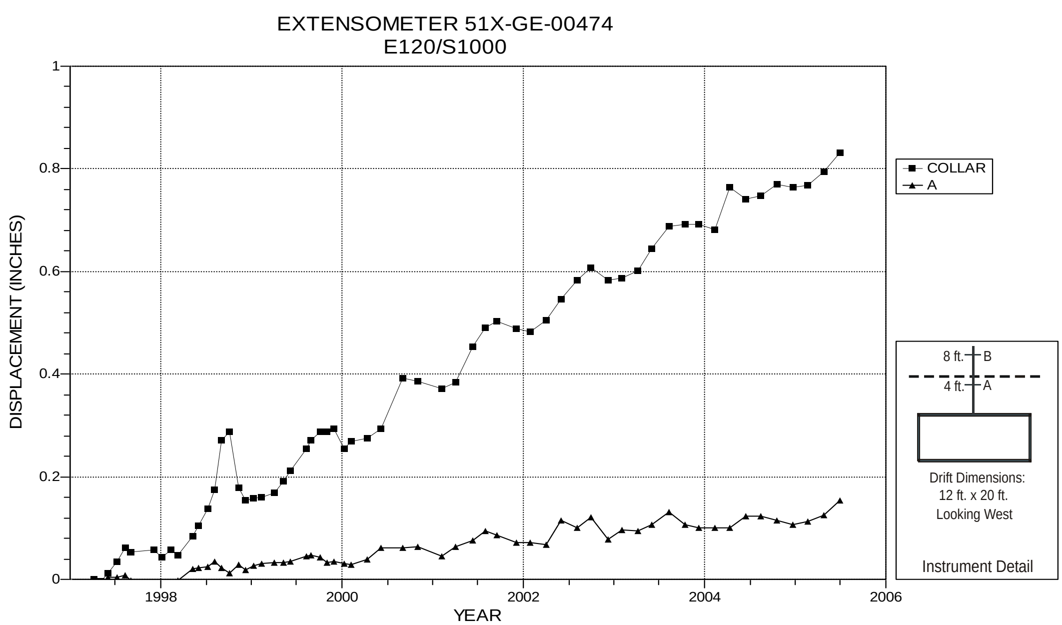
NOTES:
1. Excavation date: November 1982.

Figure 4-8 Extensometer 51X-GE-00372
E140 Drift at S146 – Roof



NOTES:
1. Excavation date: December 1982.
2. Instrument shows an electronic offset in 2003.

Figure 4-9 Extensometer 51X-GE-00276
E140 at S700 – Roof



NOTES:
1. Excavation date: July 1984.

Figure 4-10 Extensometer 51X-GE-00474
S1000 Drift at E120 – Roof

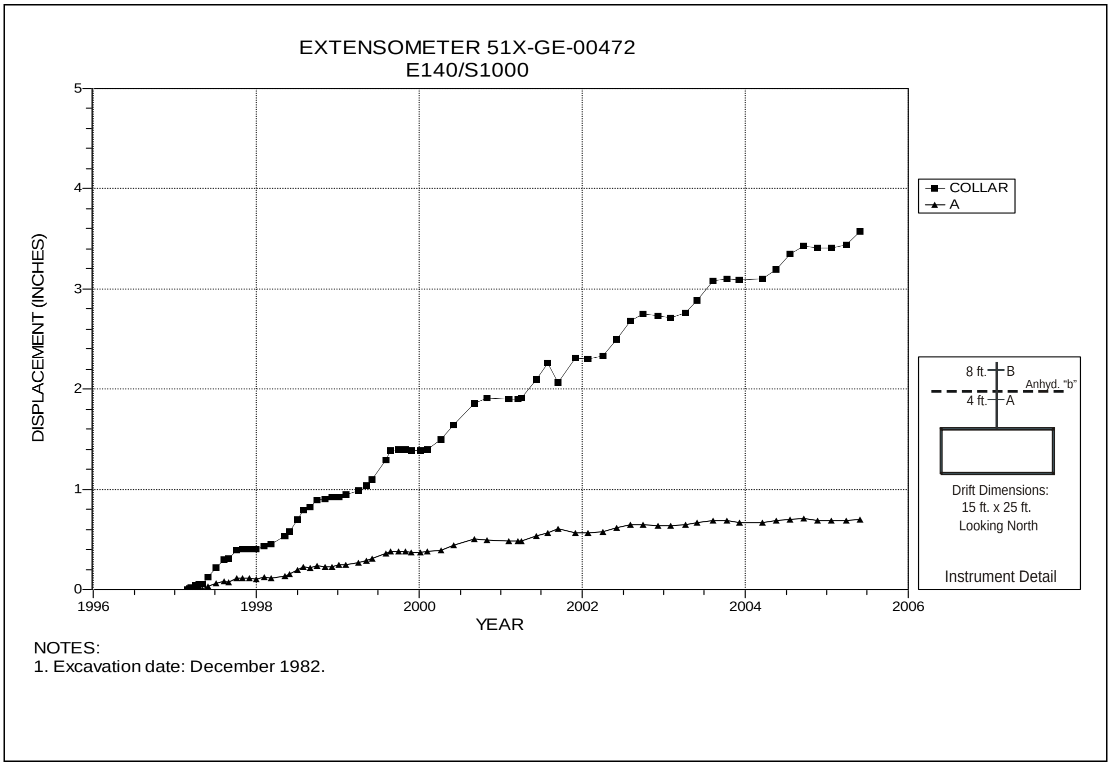


Figure 4-11 Extensometer 51X-GE-00472
E140 Drift at S1000 – Roof

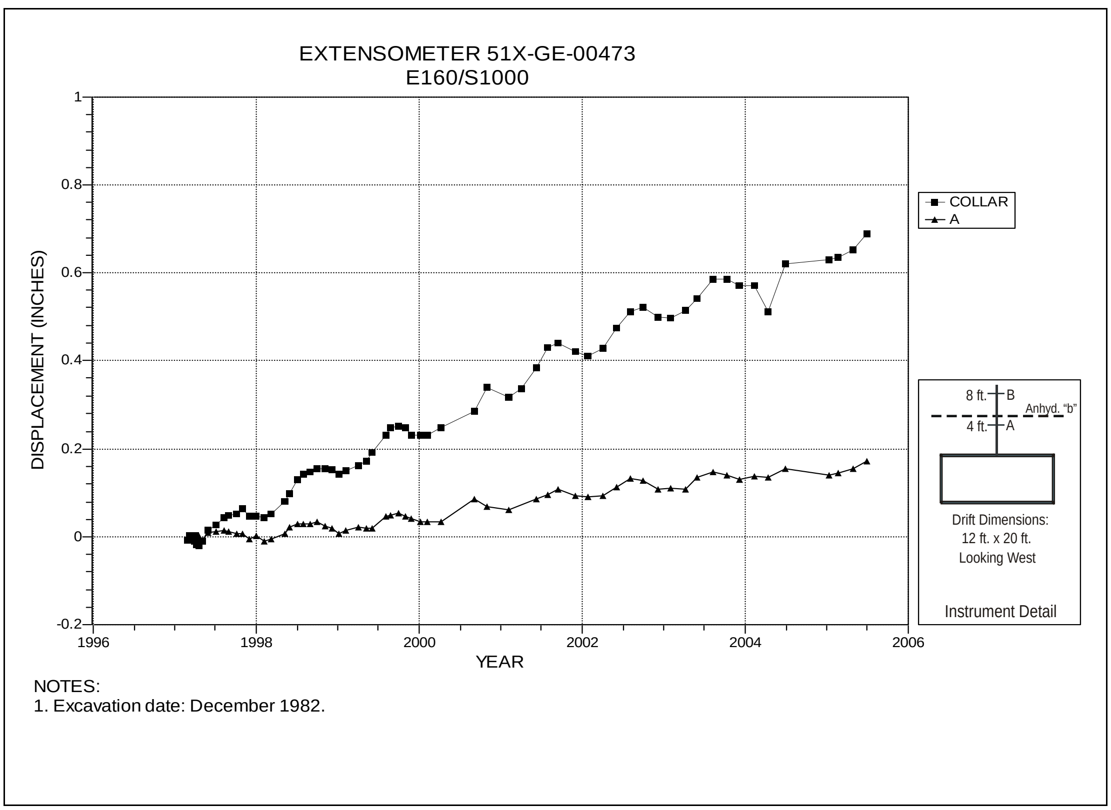


Figure 4-12 Extensometer 51X-GE-00473
S1000 Drift at E160 – Roof

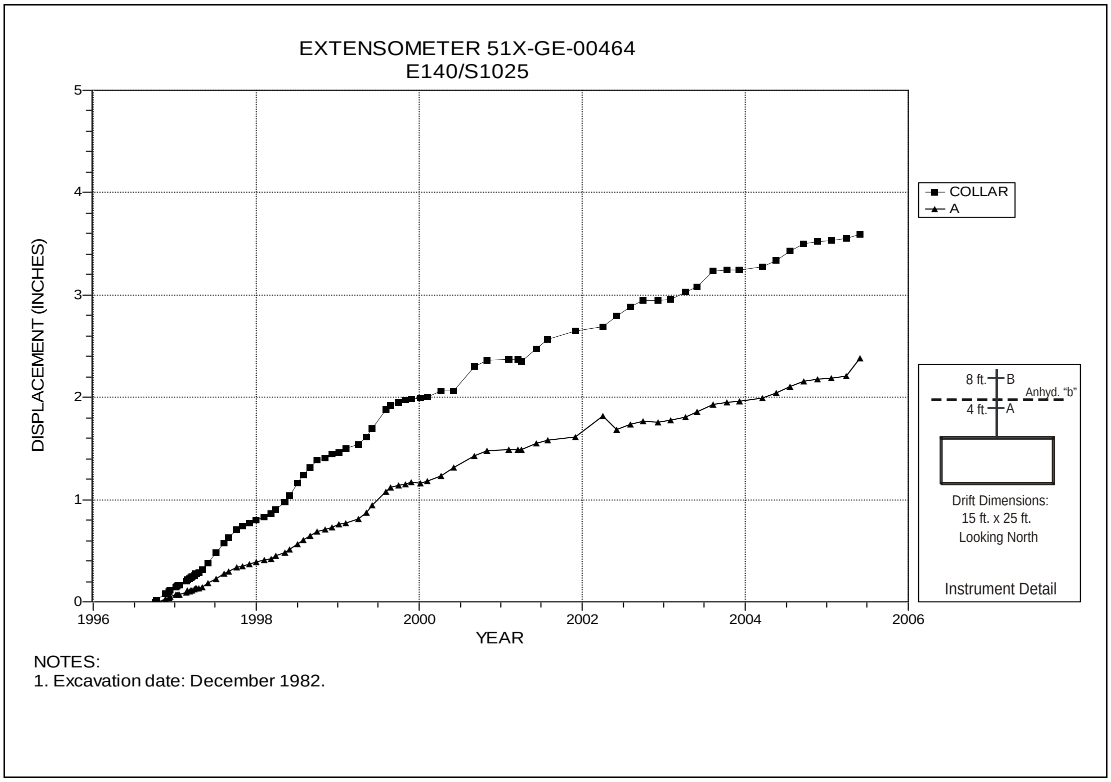


Figure 4-13 Extensometer 51X-GE-00464
E140 Drift at S1025 – Roof

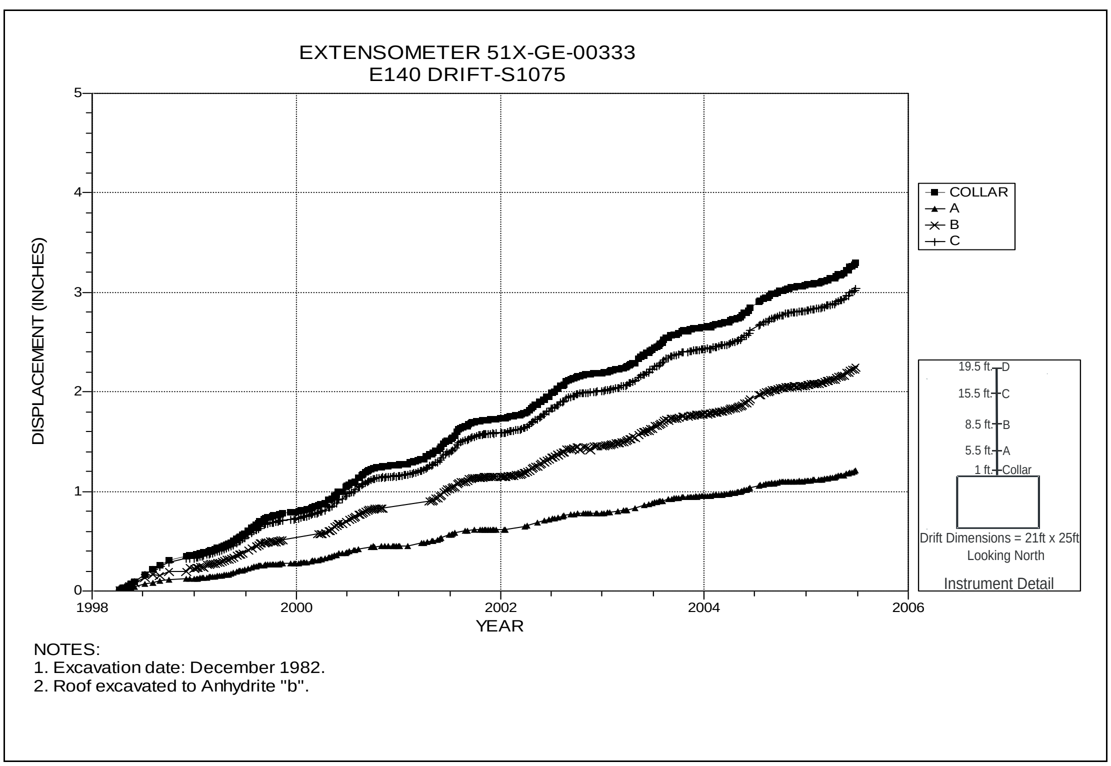


Figure 4-14 Extensometer 51X-GE-00333
E140 Drift at S1075 – Roof

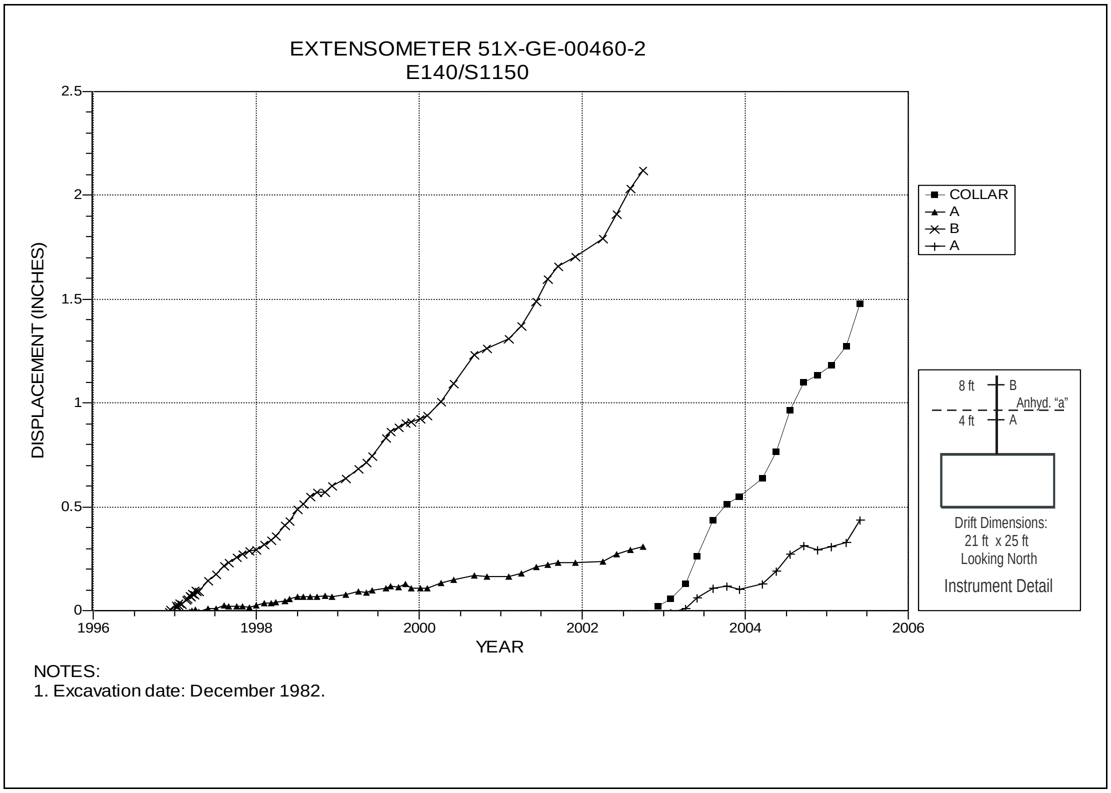


Figure 4-15 Extensometer 51X-GE-00460-2
E140 Drift at S1150 – Roof

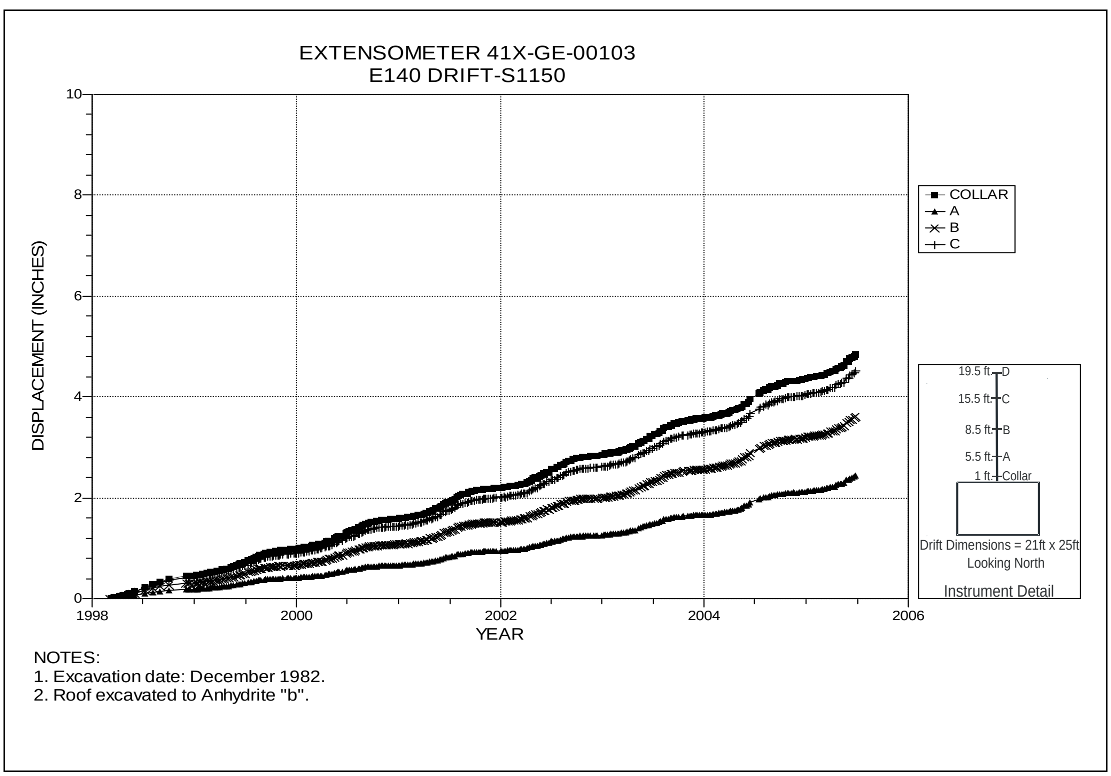


Figure 4-16 Extensometer 41X-GE-00103
E140 at S1150 – Roof

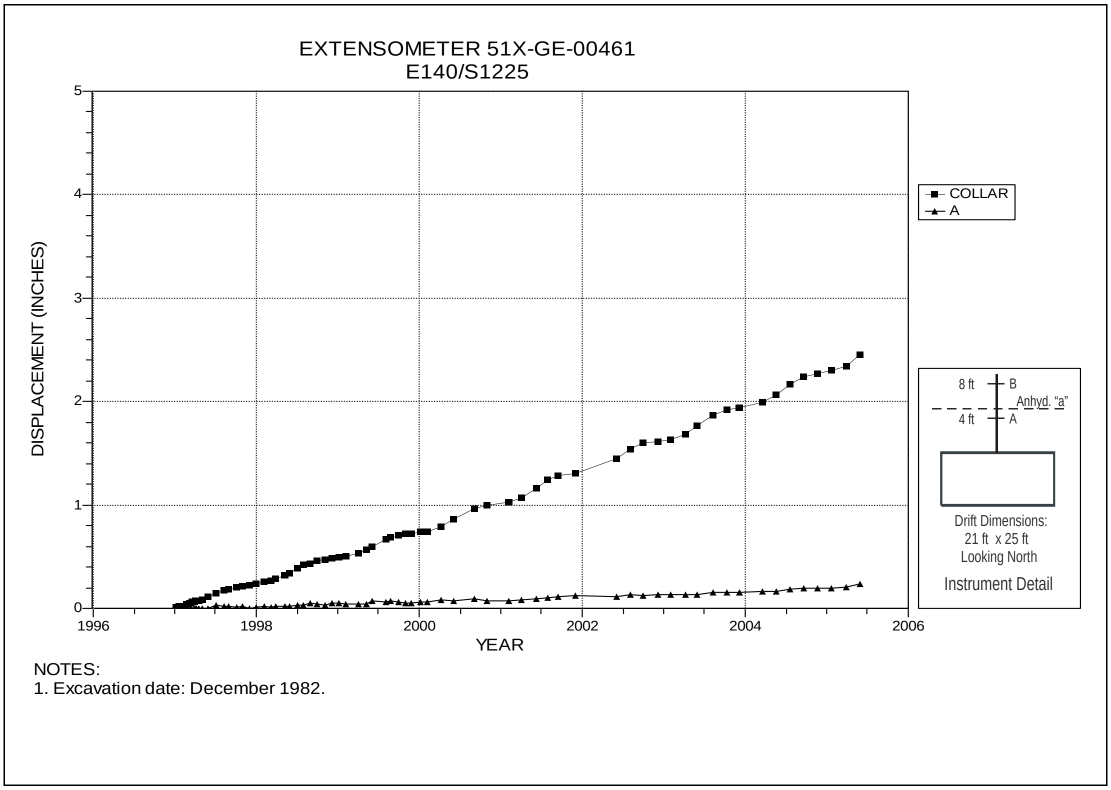


Figure 4-17 Extensometer 51X-GE-00461
E140 Drift at S1225 – Roof

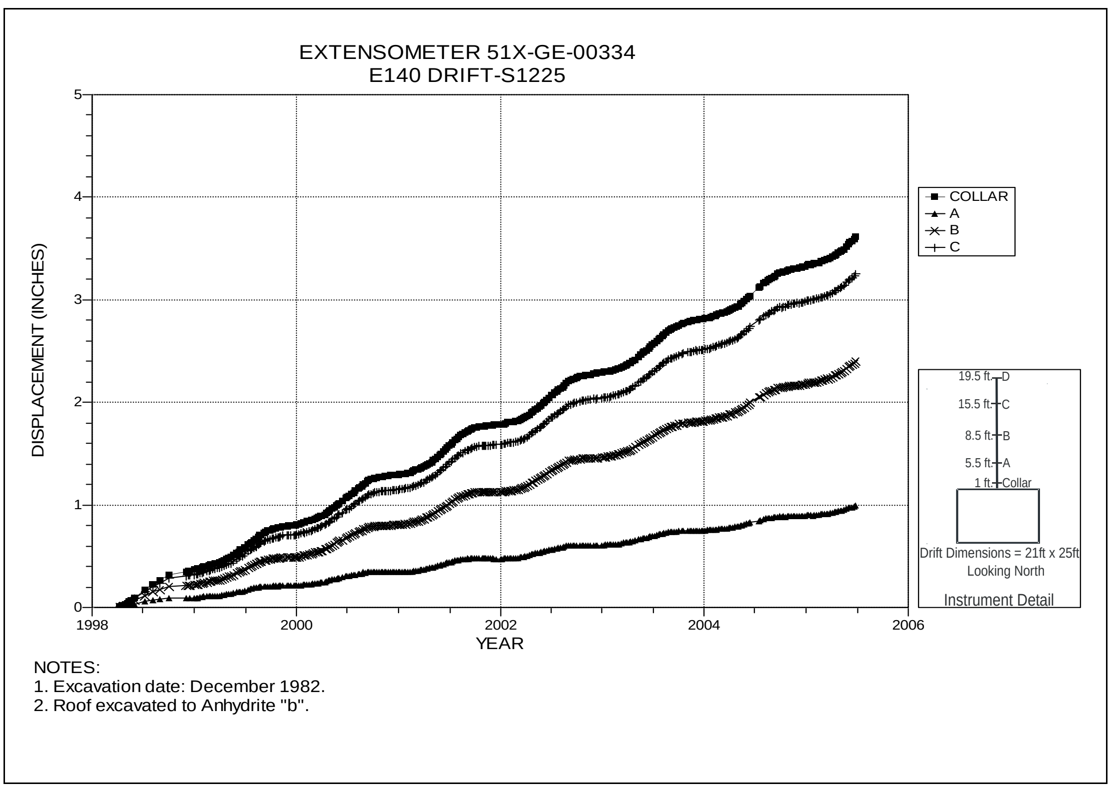


Figure 4-18 Extensometer 51X-GE-00334
E140 Drift at S1225 – Roof

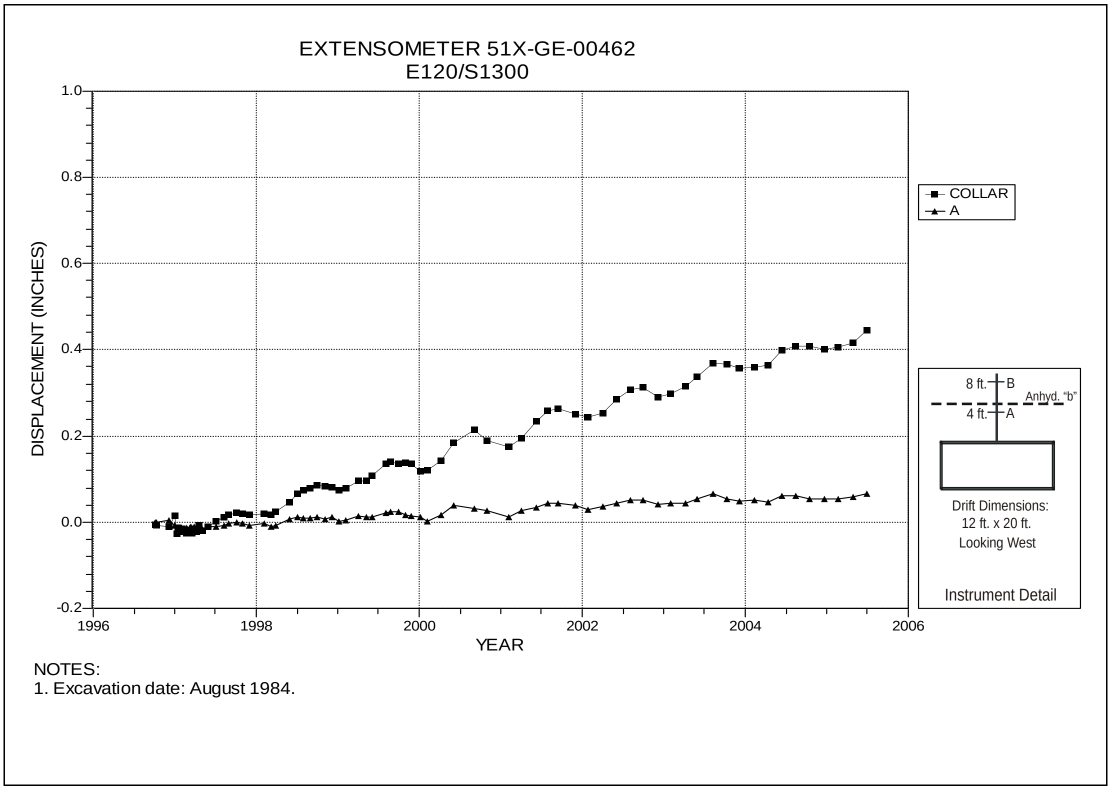


Figure 4-19 Extensometer 51X-GE-00462
E120 at S1300 – Roof

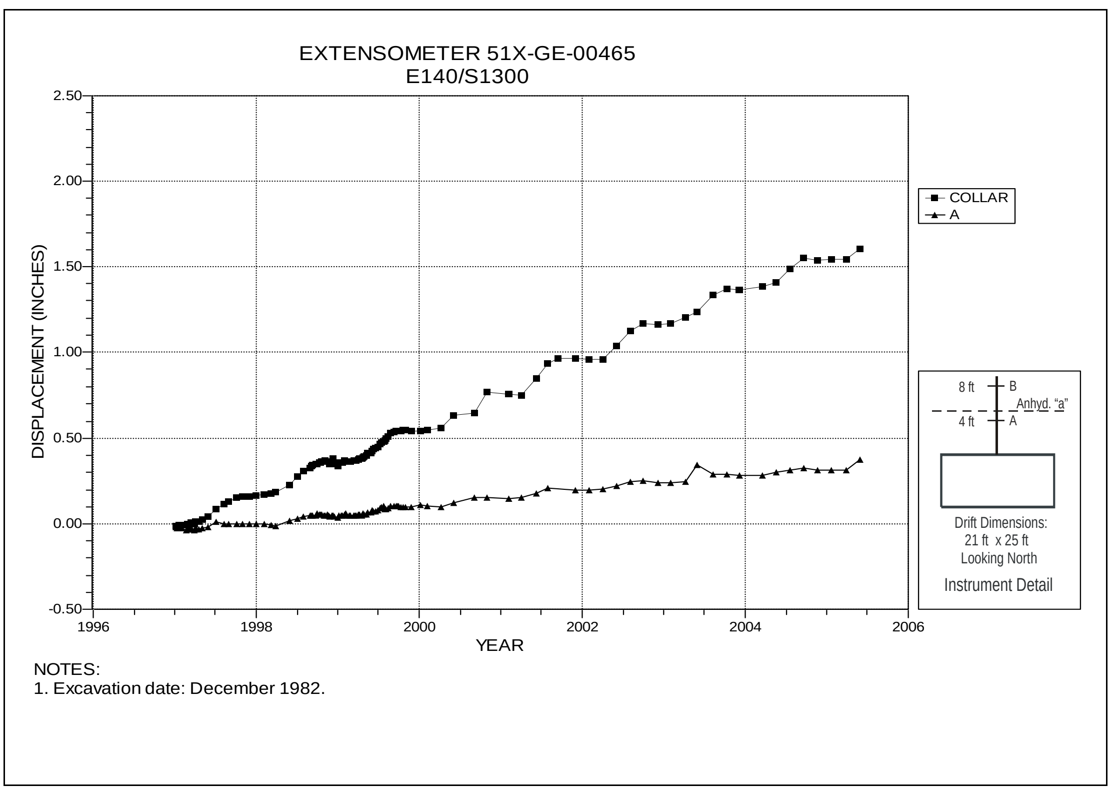
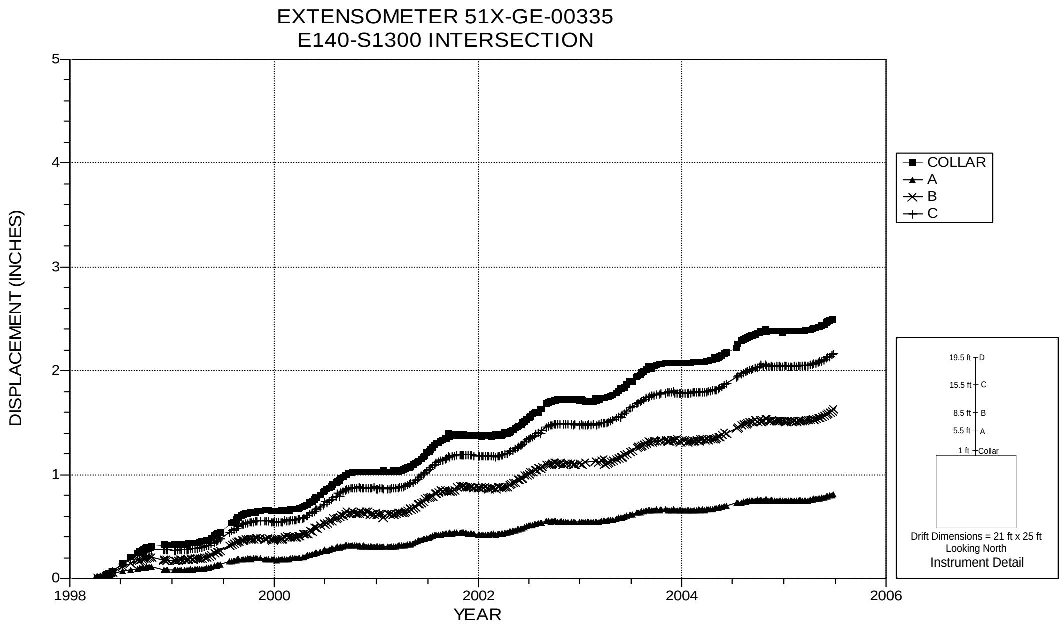
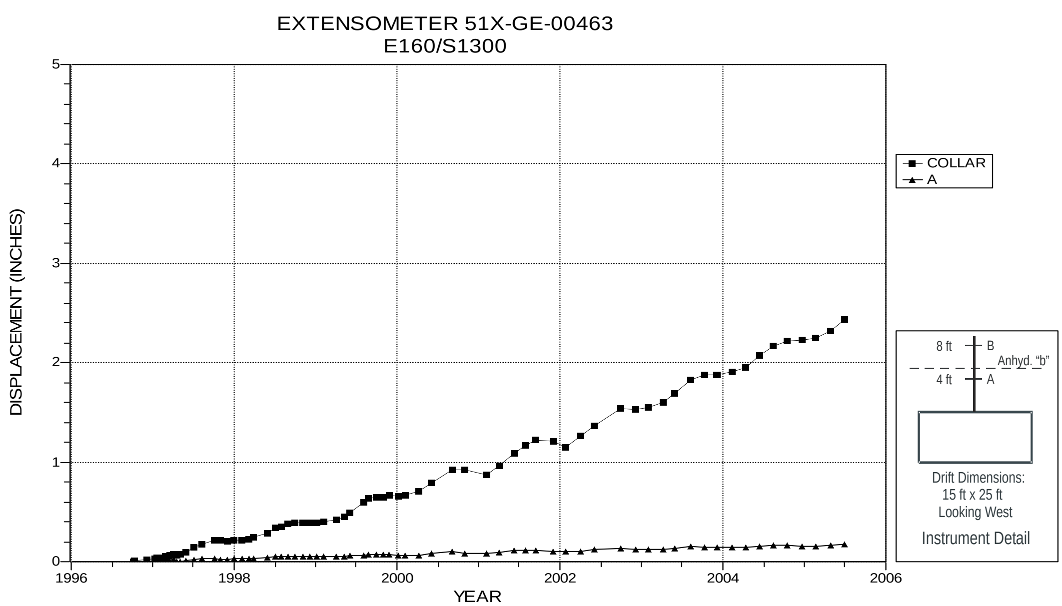


Figure 4-20 Extensometer 51X-GE-00465
E140 Drift at S1300 – Roof



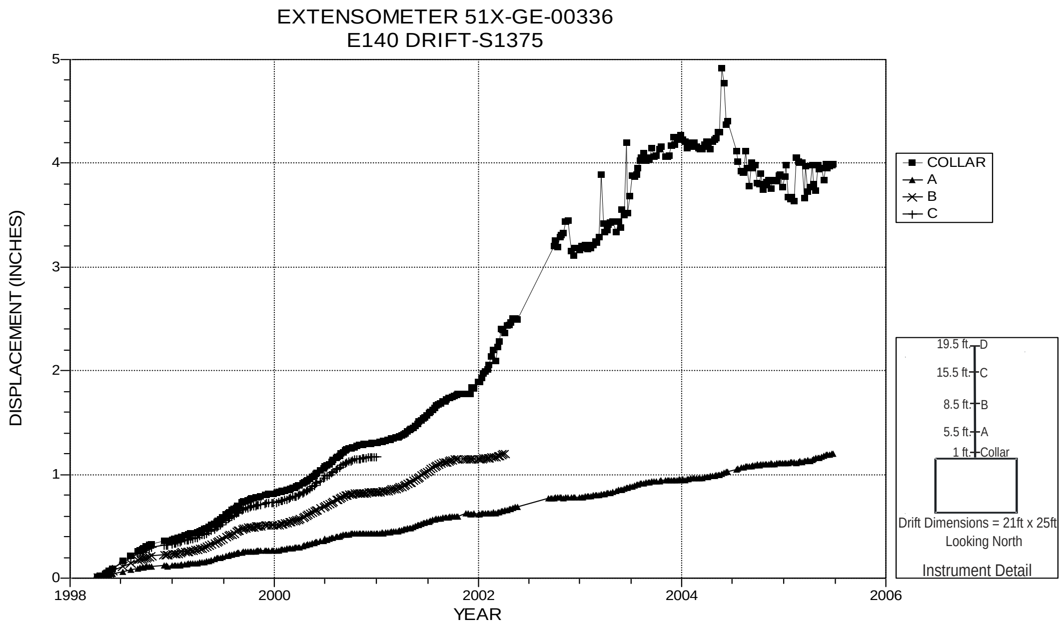
NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b".

Figure 4-21 Extensometer 51X-GE-00335
E140 Drift at S1300 – Roof



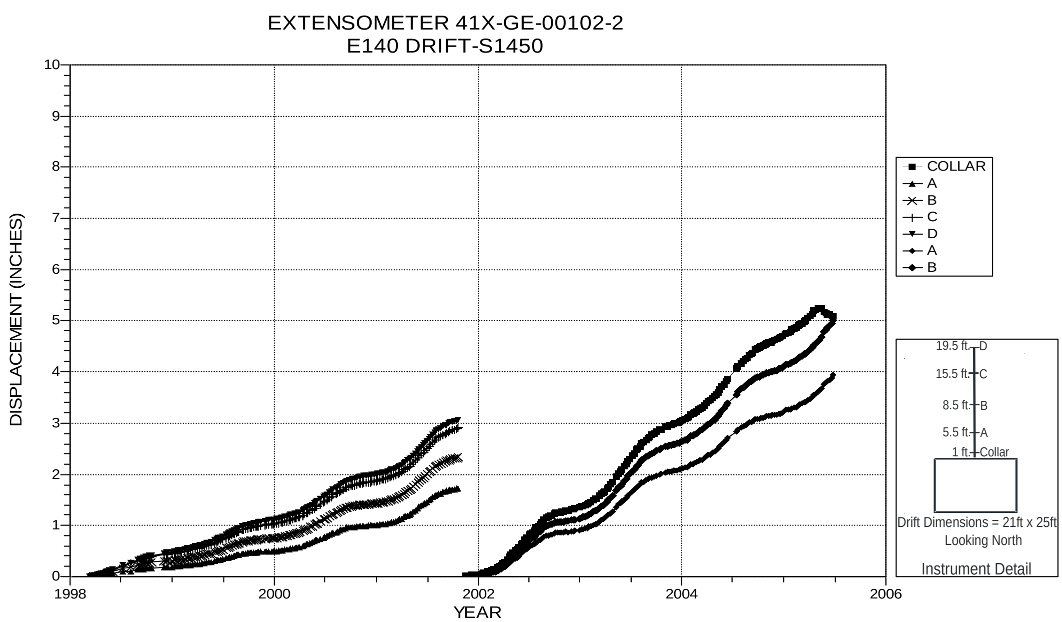
NOTES:
1. Excavation date: June 1984.

Figure 4-22 Extensometer 51X-GE-00463
S1300 Drift at E160 – Roof



NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b".
3. Anchors "B" and "C" have failed, anchor "D" is electrically noisy.

Figure 4-23 Extensometer 51X-GE-00336
E140 Drift at S1375 – Roof



NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b".
3. Present Anchor "D" or "COLLAR" has reached its maximum range.

Figure 4-24 Extensometer 41X-GE-00102-2
E140 Drift at S1450 – Roof

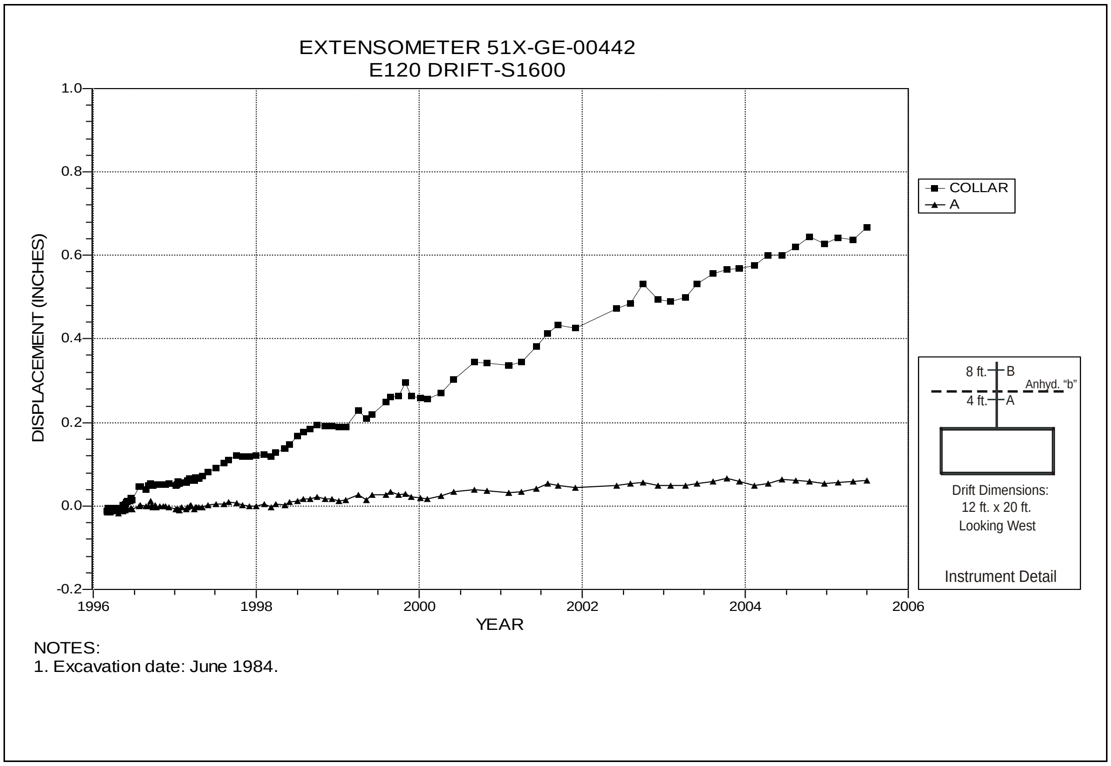


Figure 4-25 Extensometer 51X-GE-00442
S1600 Drift at E120 – Roof

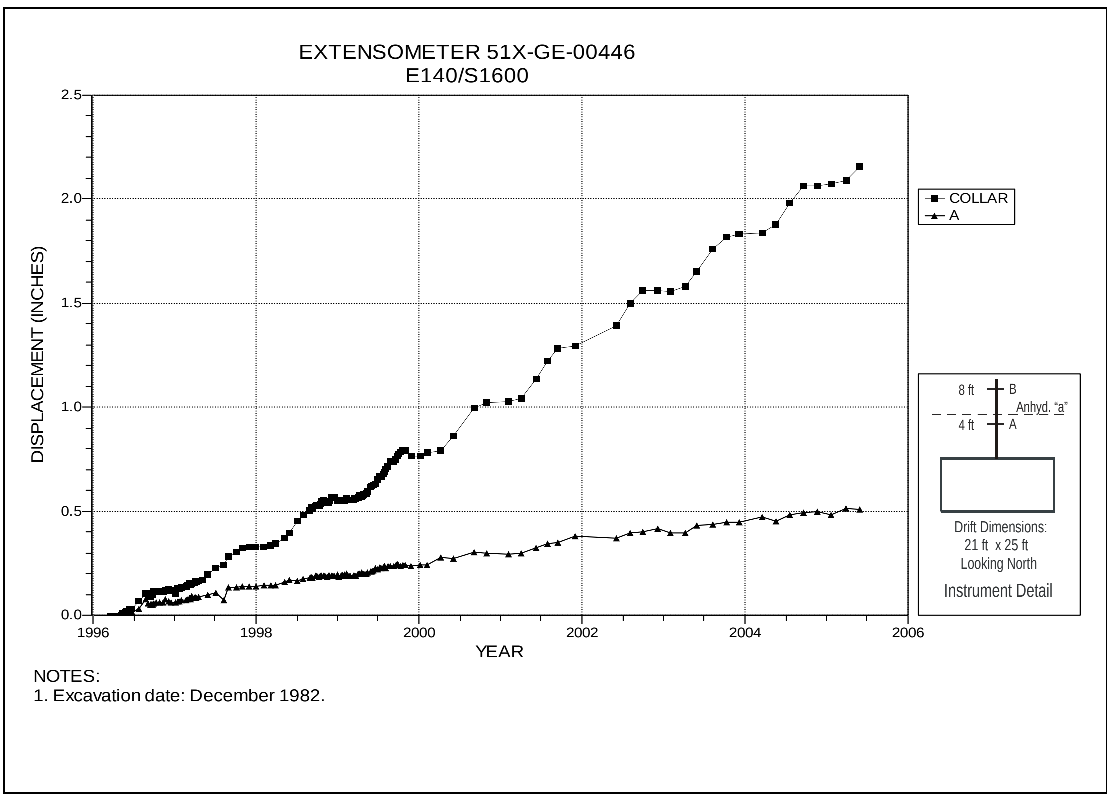
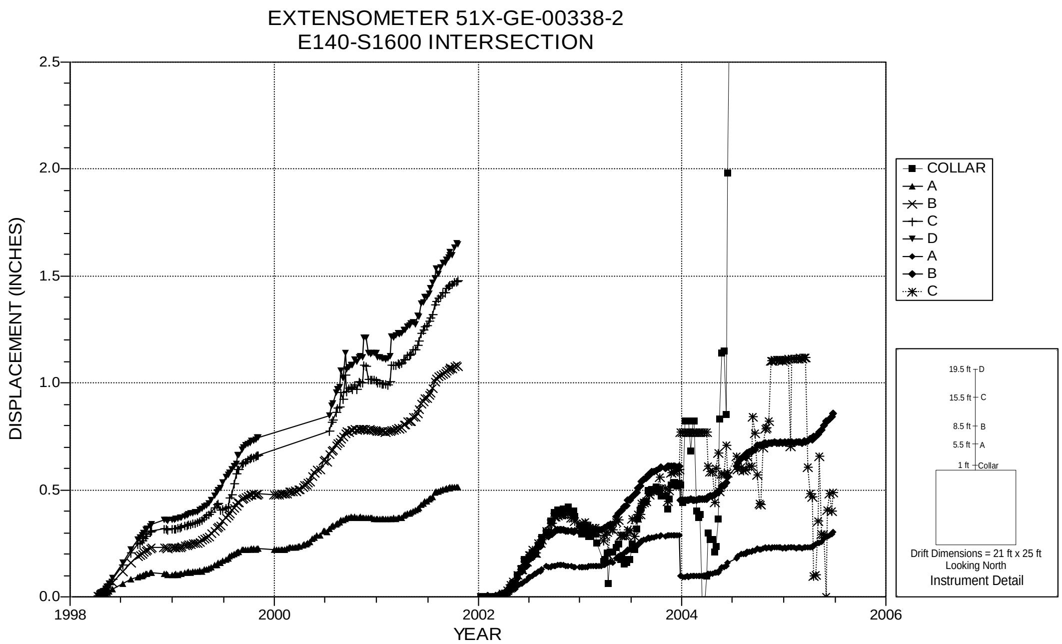
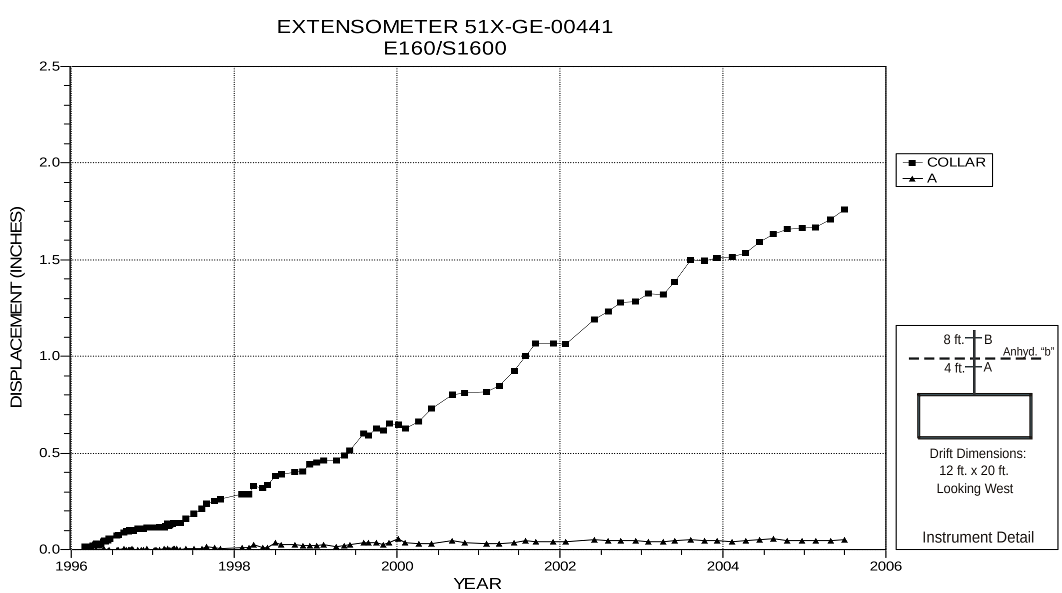


Figure 4-26 Extensometer 51X-GE-00446
E140 Drift at S1600 – Roof



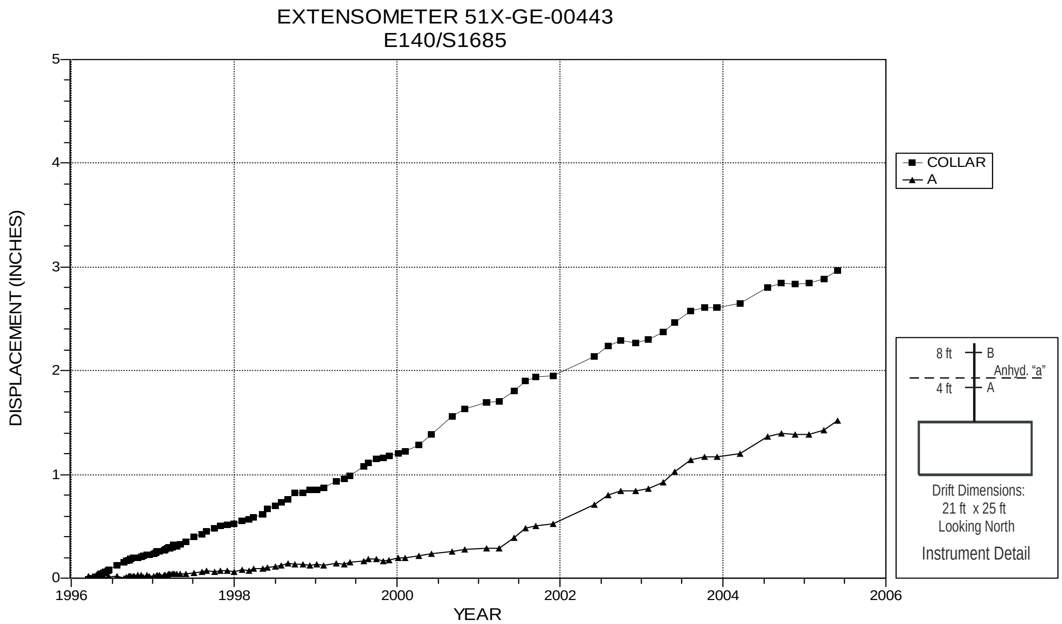
NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b".
3. Instrument is electrically noisy.

Figure 4-27 Extensometer 51X-GE-00338-2
E140 Drift at S1600 Drift Intersection – Roof



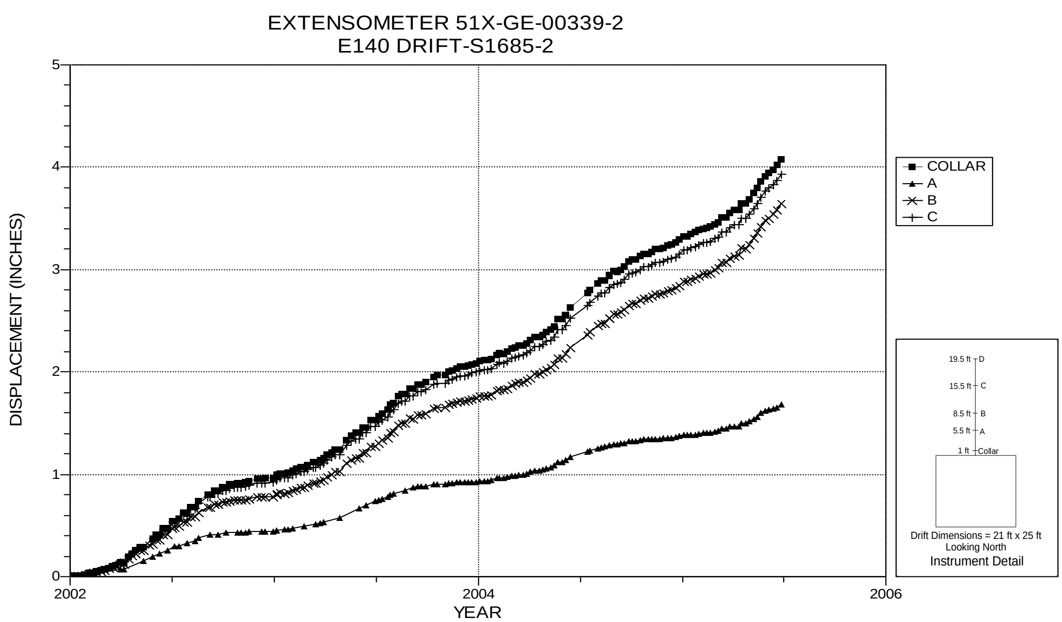
NOTES:
1. Excavation date: December 1982.

Figure 4-28 Extensometer 51X-GE-00411
S1600 Drift at E160 – Roof



NOTES:
1. Excavation date: December 1982.

Figure 4-29 Extensometer 51X-GE-00443
E140 Drift at S1685 – Roof



NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b".
3. Instrument repaired January 2002.

Figure 4-30 Extensometer 51X-GE-00339-2
E140 Drift at S1685 – Roof

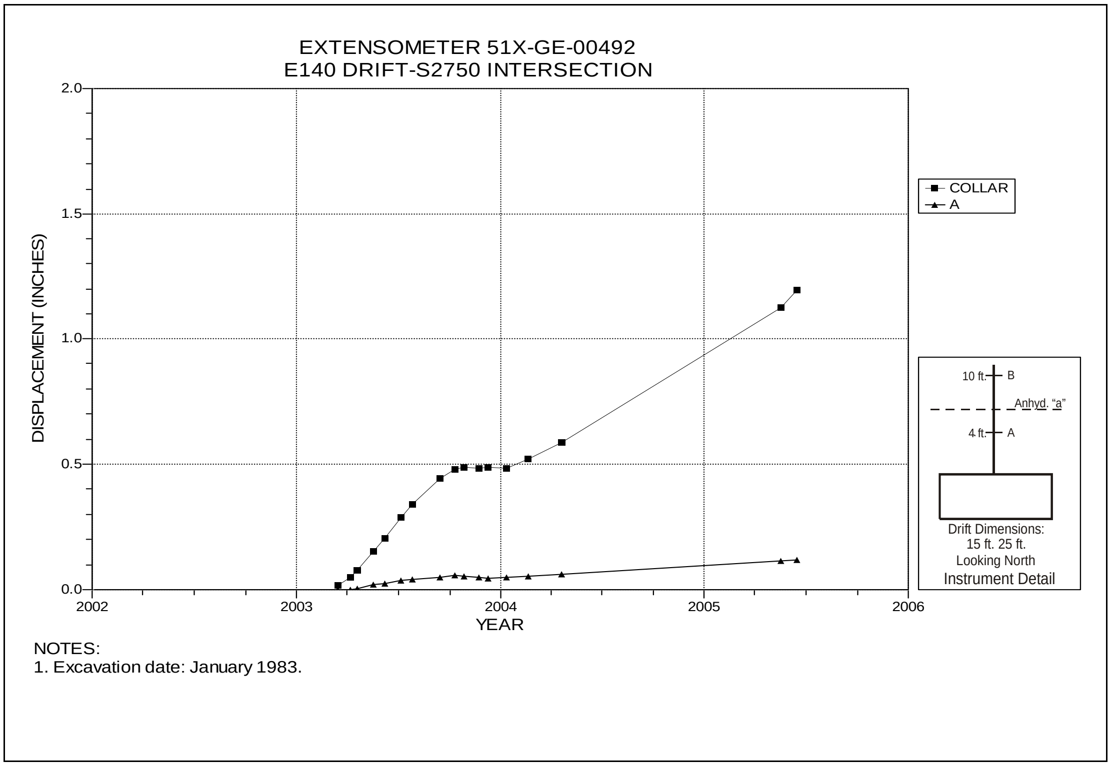


Figure 4-31 Extensometer 51X-GE-00492
E140 Drift at S2750 Drift Intersection – Roof

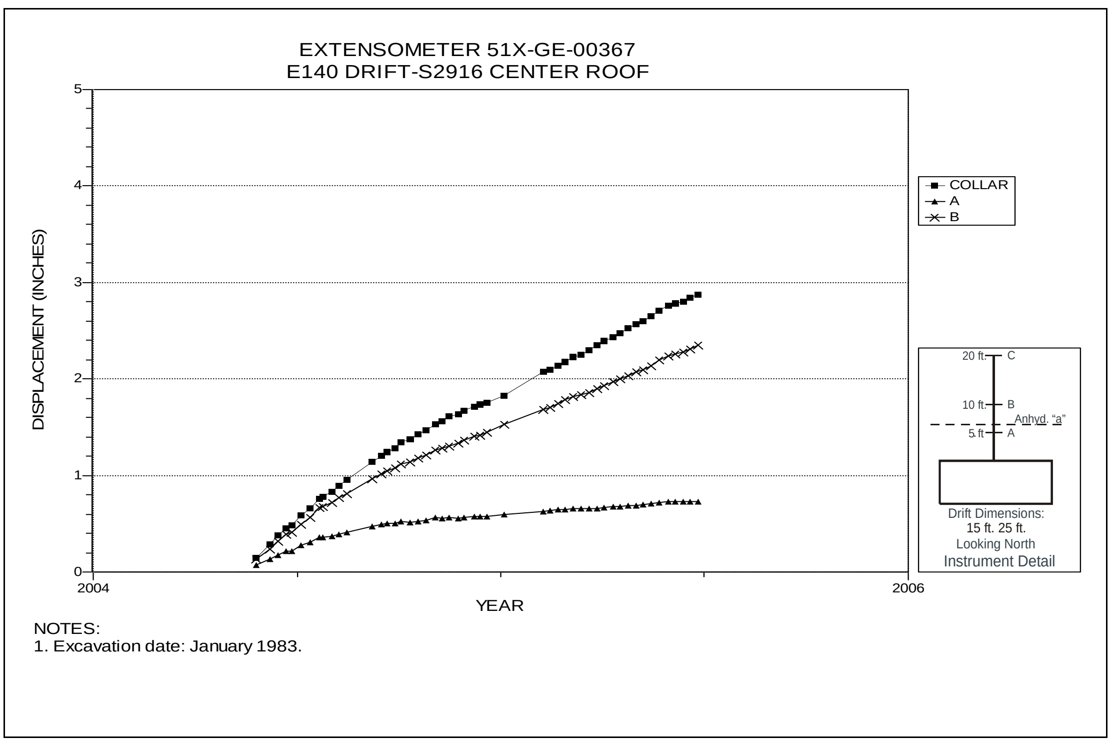


Figure 4-32 Extensometer 51X-GE-00367
E140 Drift at S2916 – Roof

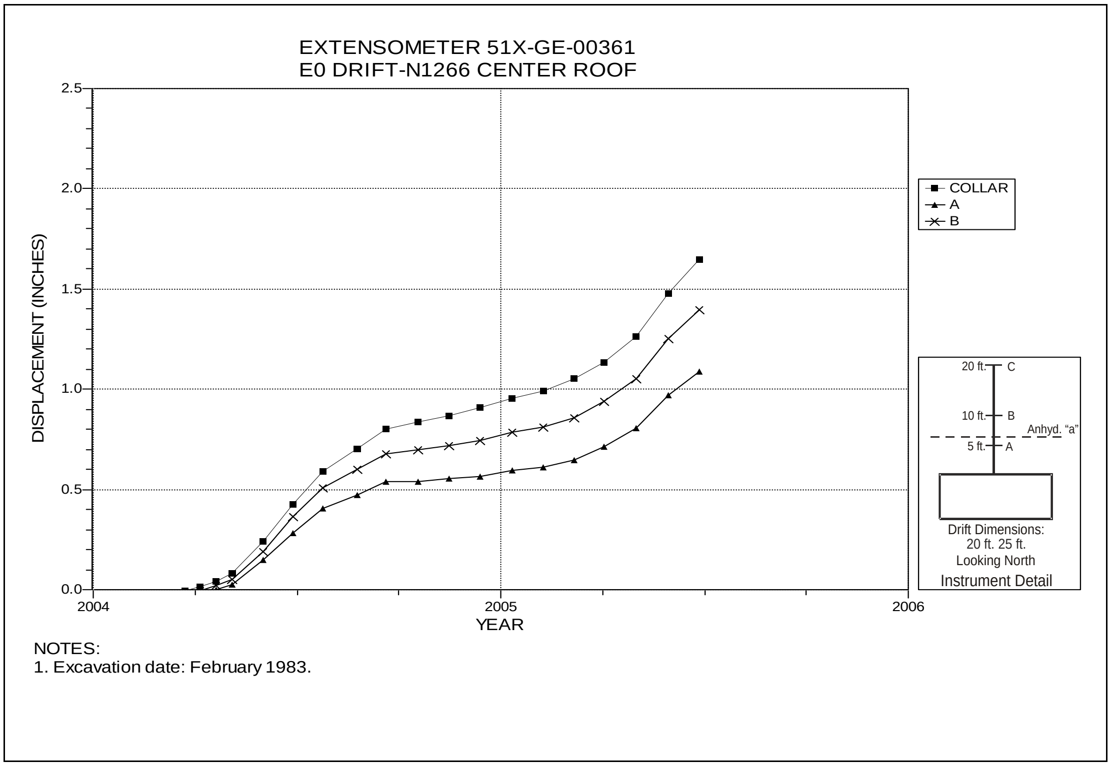


Figure 4-33 Extensometer 51X-GE-00361
E0 Drift at N1266 – Roof

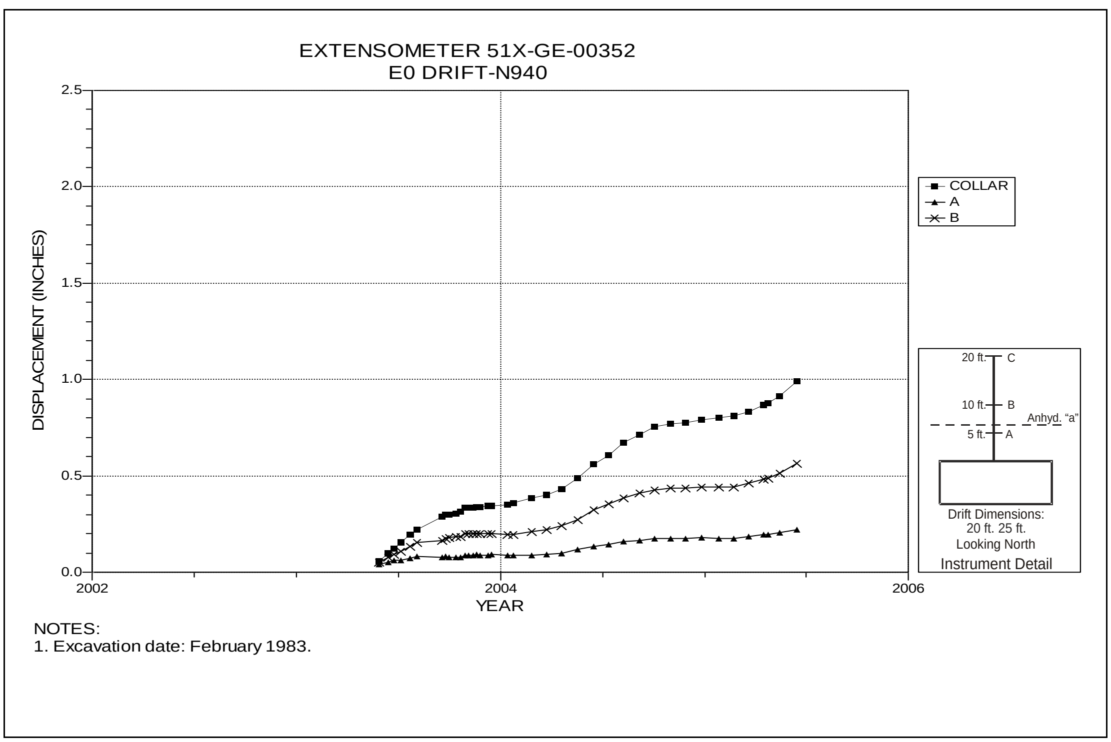
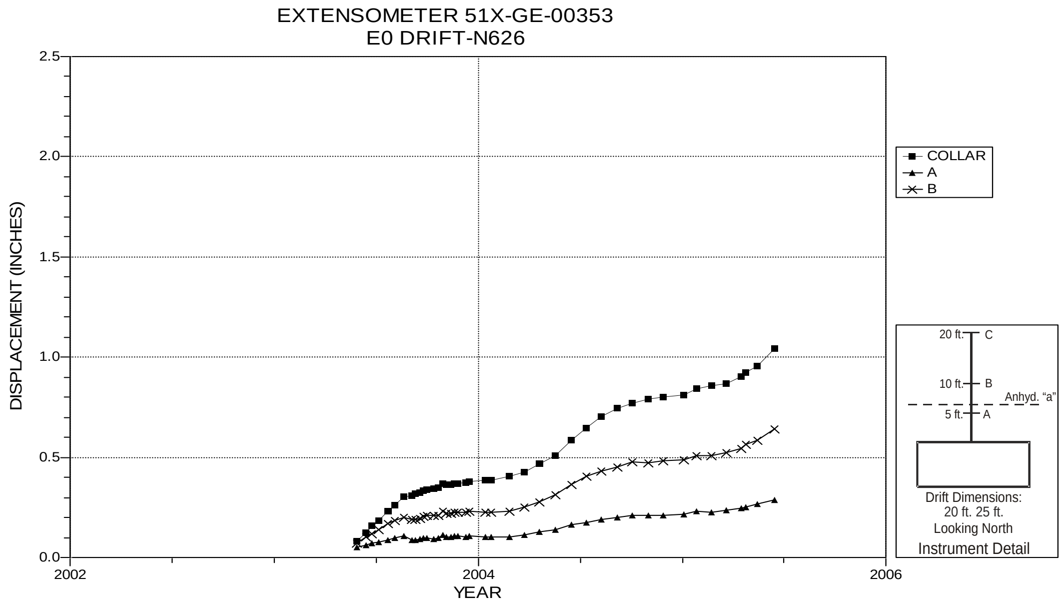
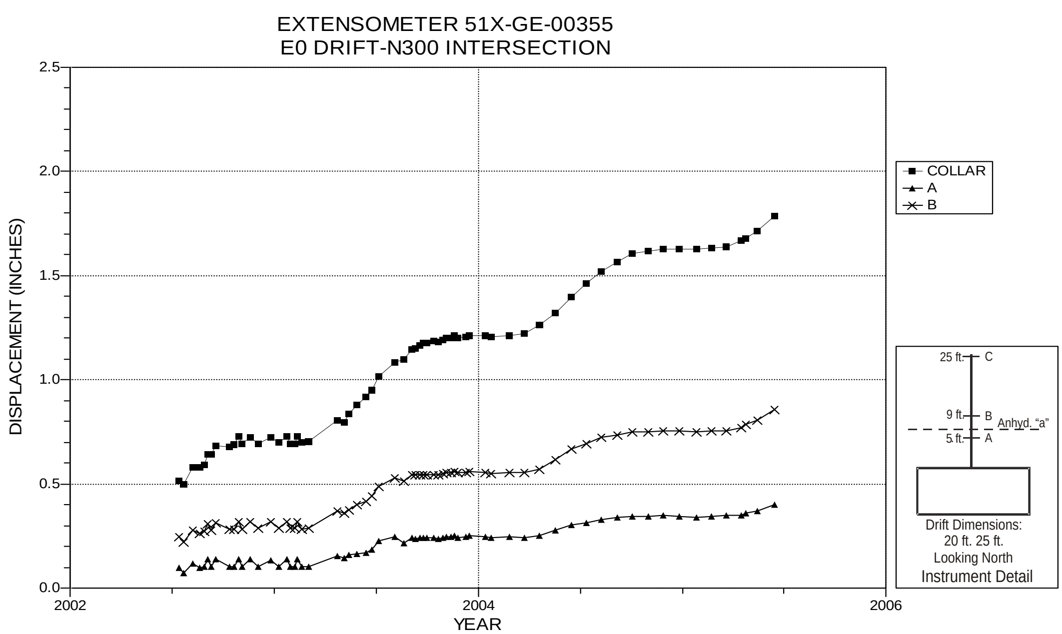


Figure 4-34 Extensometer 51X-GE-00352
E0 Drift at N940 – Roof



NOTES:
1. Excavation date: February 1983.

Figure 4-35 Extensometer 51X-GE-00353
E0 Drift at N626 – Roof



NOTES:
1. Excavation date: December 1982.

Figure 4-36 Extensometer 51X-GE-00355
E0 Drift at N300 – Roof

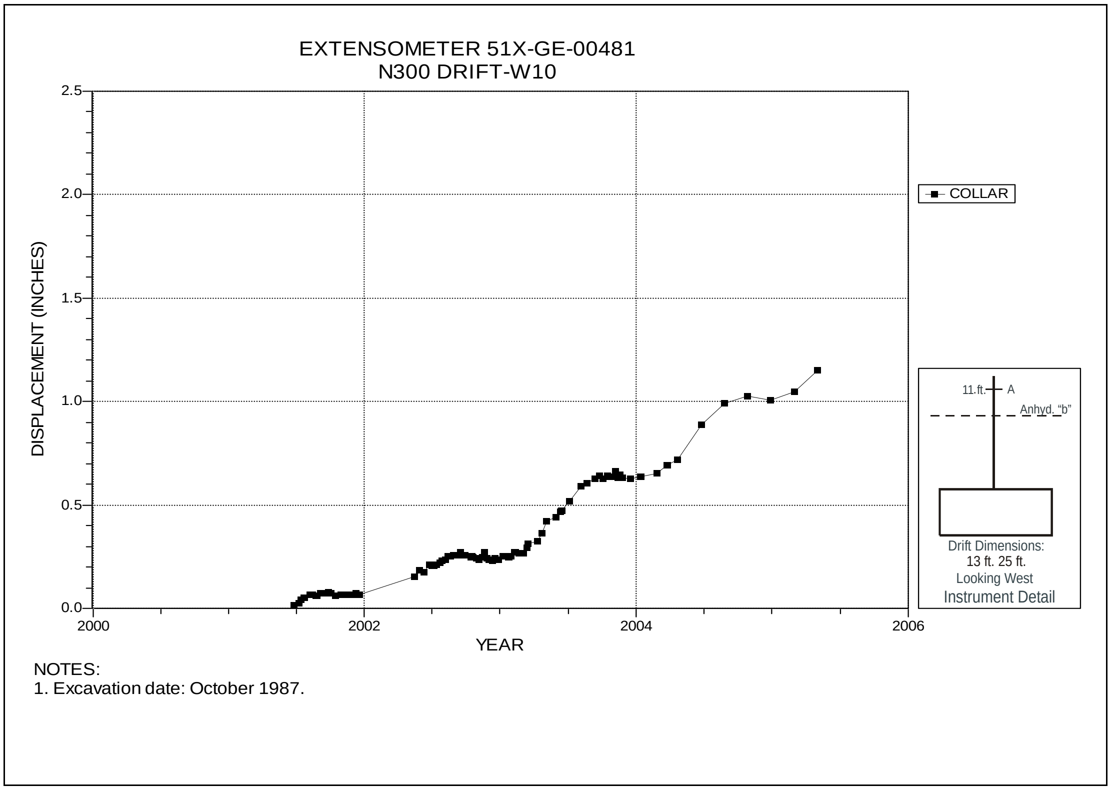


Figure 4-37 Extensometer 51X-GE-00481
N300 Drift at W10 – Roof

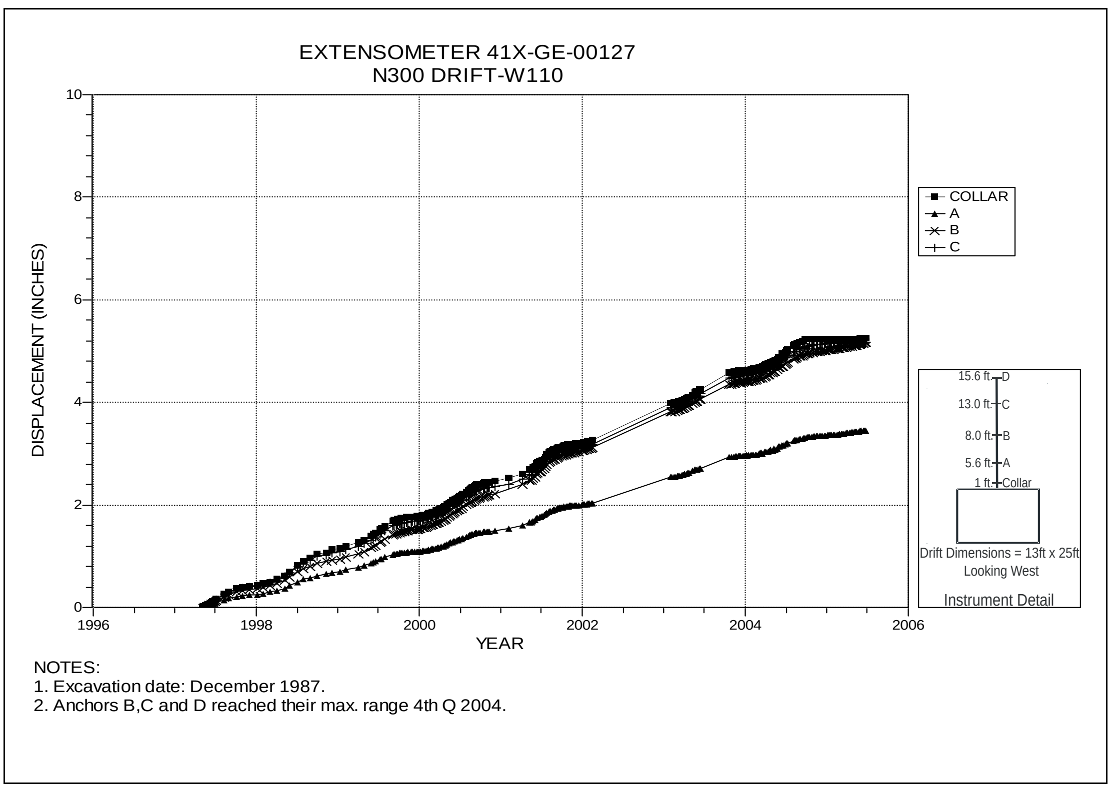
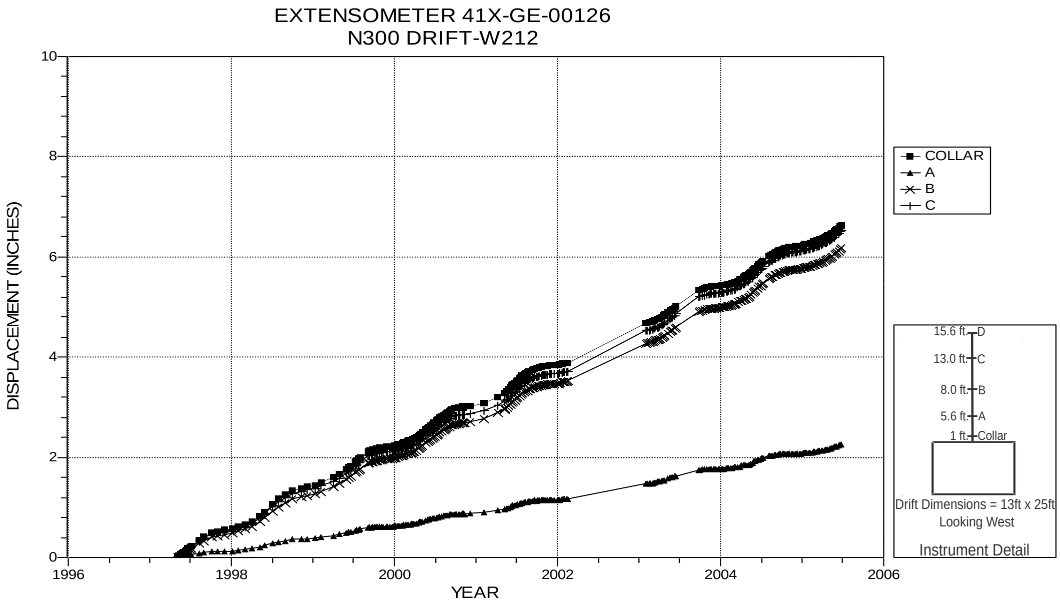
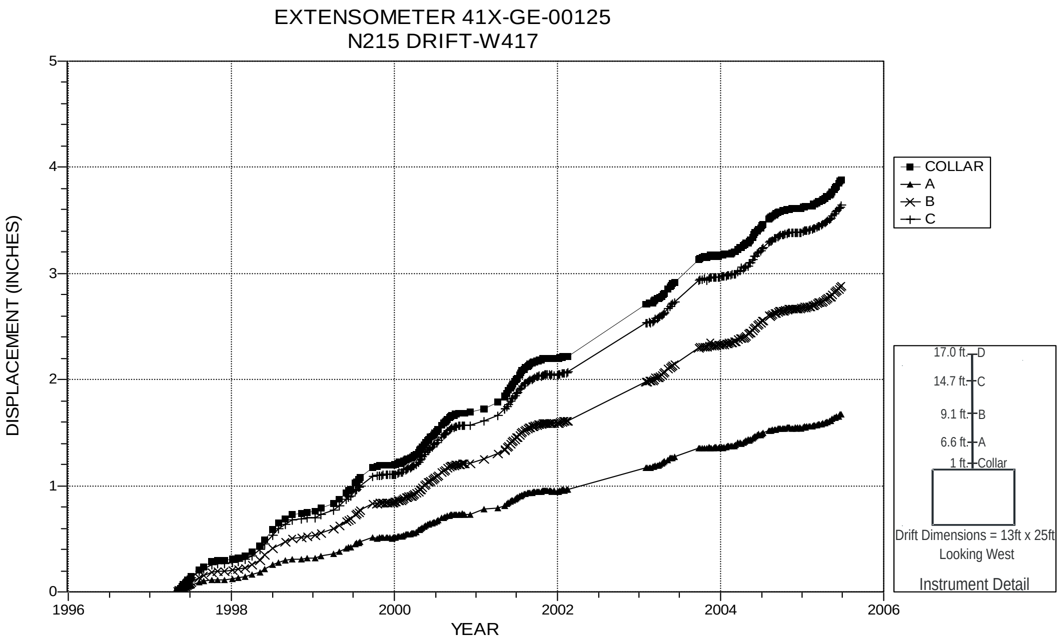


Figure 4-38 Extensometer 41X-GE-00127
N300 Drift at W110 – Roof



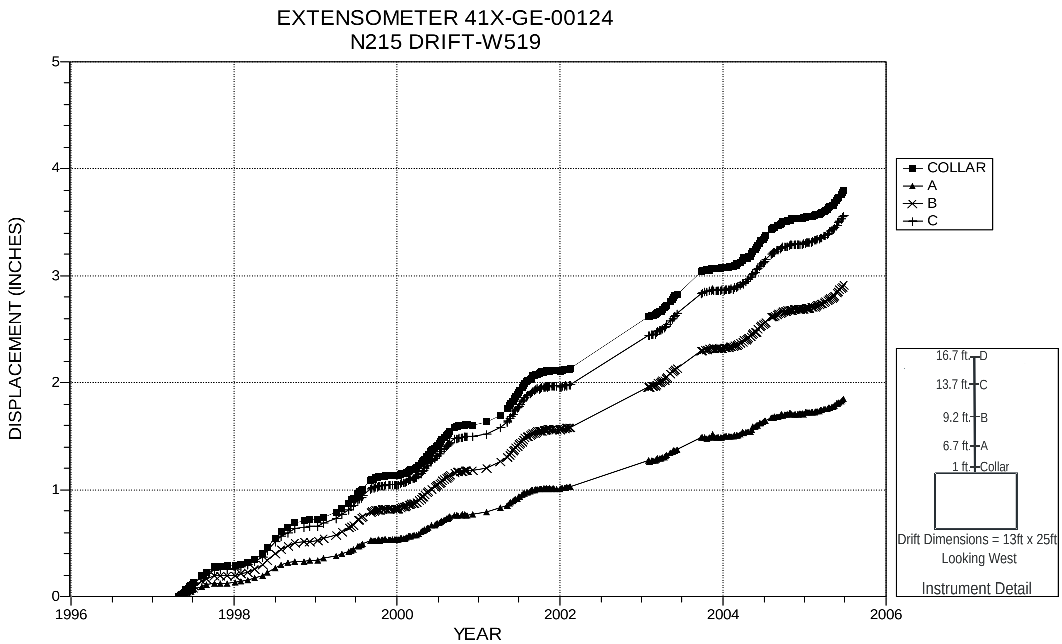
NOTES:
1. Excavation date: December 1987.

Figure 4-39 Extensometer 41X-GE-00126
N300 Drift at W212 – Roof



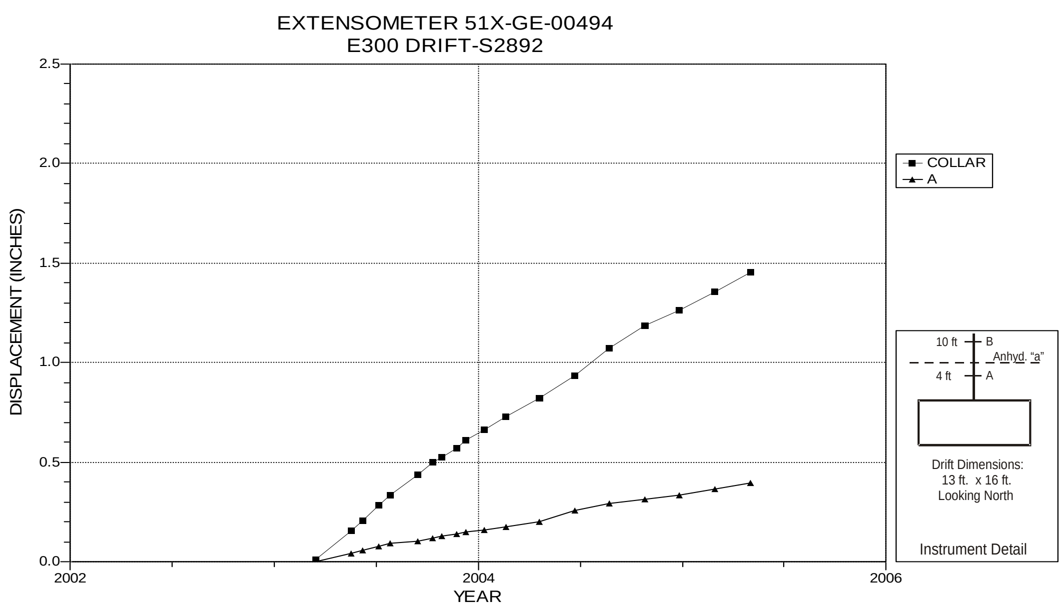
NOTES:
1. Excavation date: December 1987.

Figure 4-40 Extensometer 41X-GE-00125
N215 Drift at W417 – Roof



NOTES:
1. Excavation date: January 1988.

Figure 4-41 Extensometer 41X-GE-00124
N215 Drift at W519 – Roof



NOTES:
1. Excavation date: May 2002.

Figure 4-42 Extensometer 51X-GE-00494
E300 Drift at S2892 – Roof

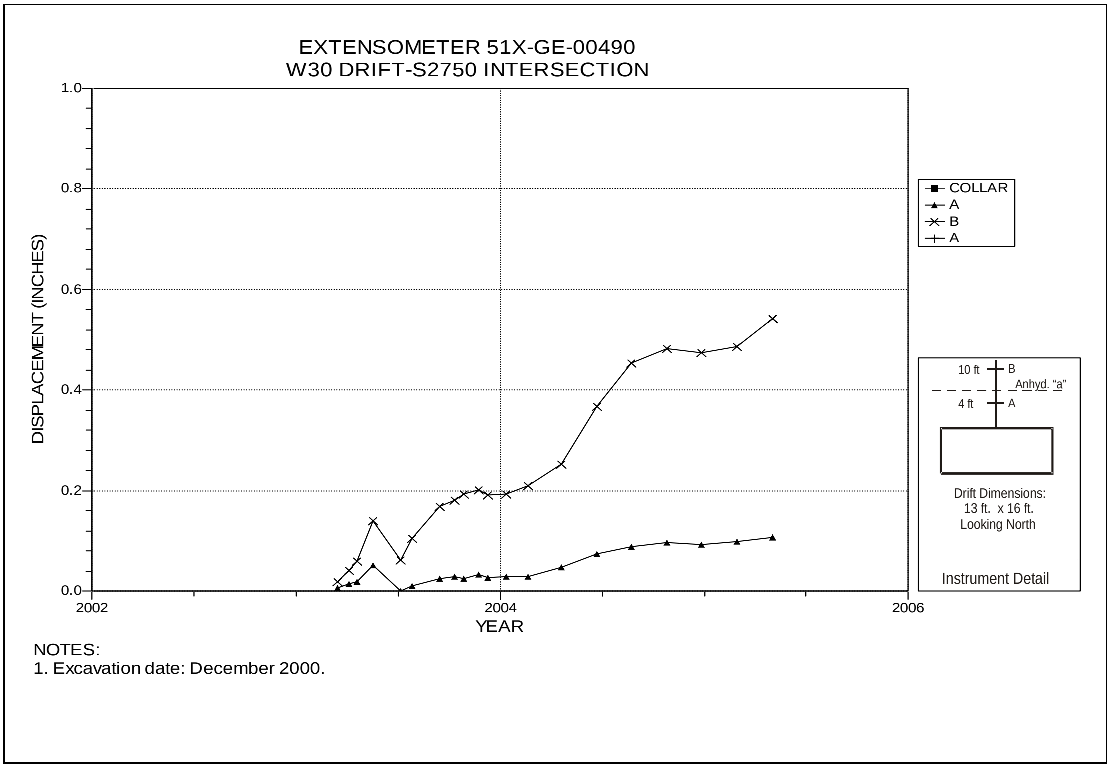


Figure 4-43 Extensometer 51X-GE-00490
W30 Drift at S2750 Drift Intersection – Roof

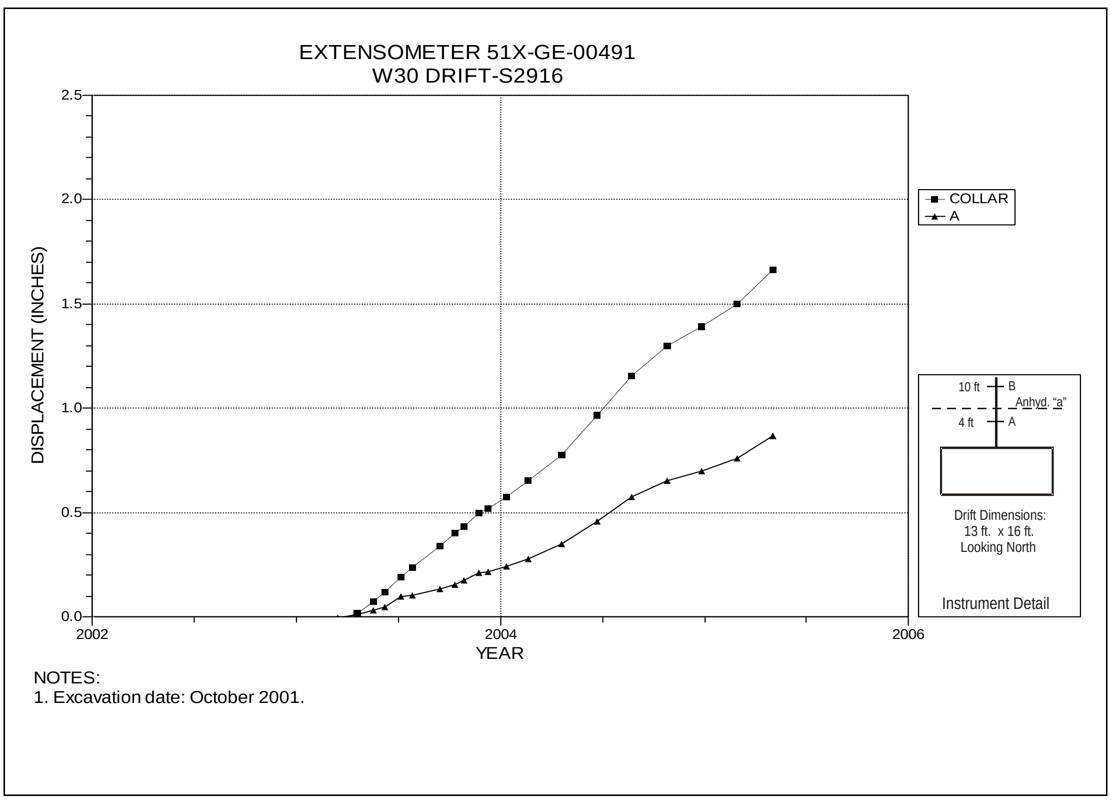


Figure 4-44 Extensometer 51X-GE-00491
W30 Drift at S2916 – Roof

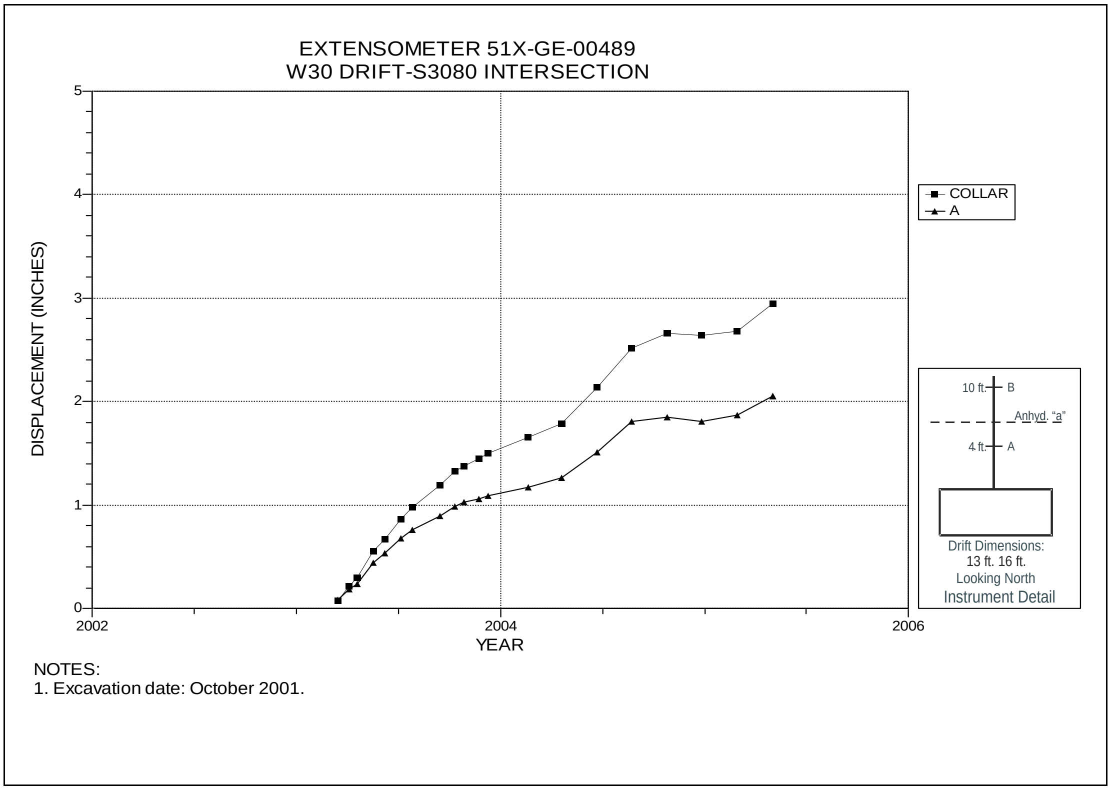


Figure 4-45 Extensometer 51X-GE-00489
W30 Drift at S3080 Drift Intersection – Roof

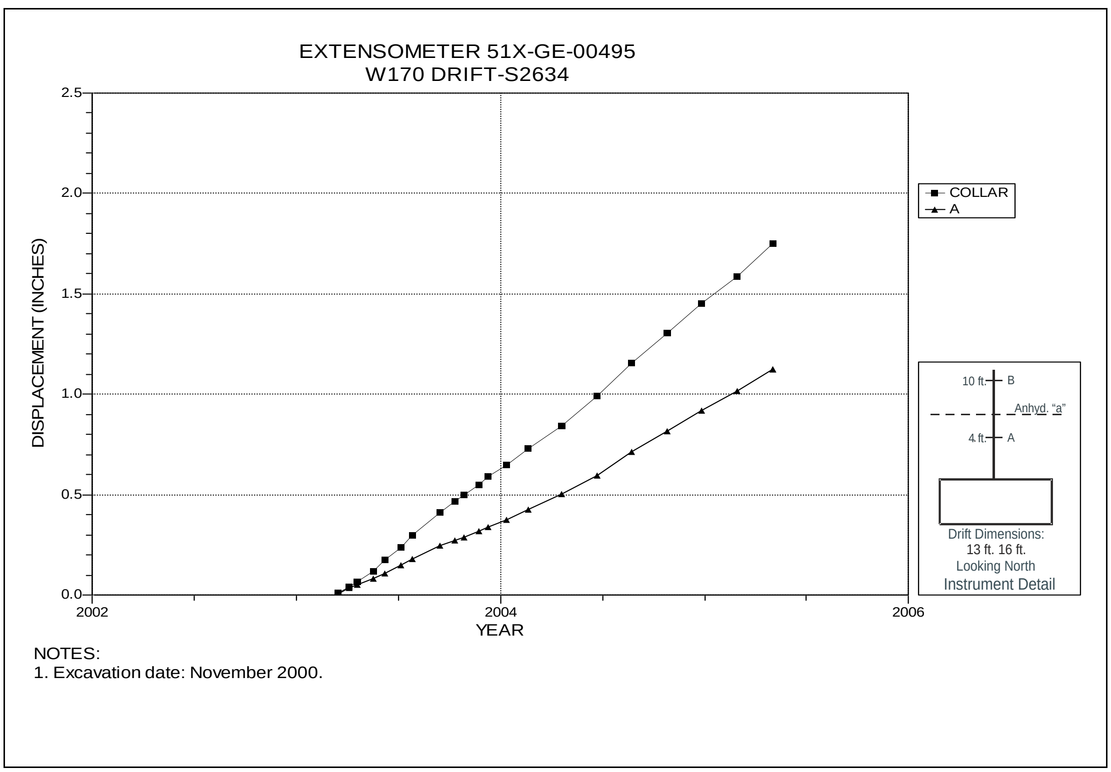
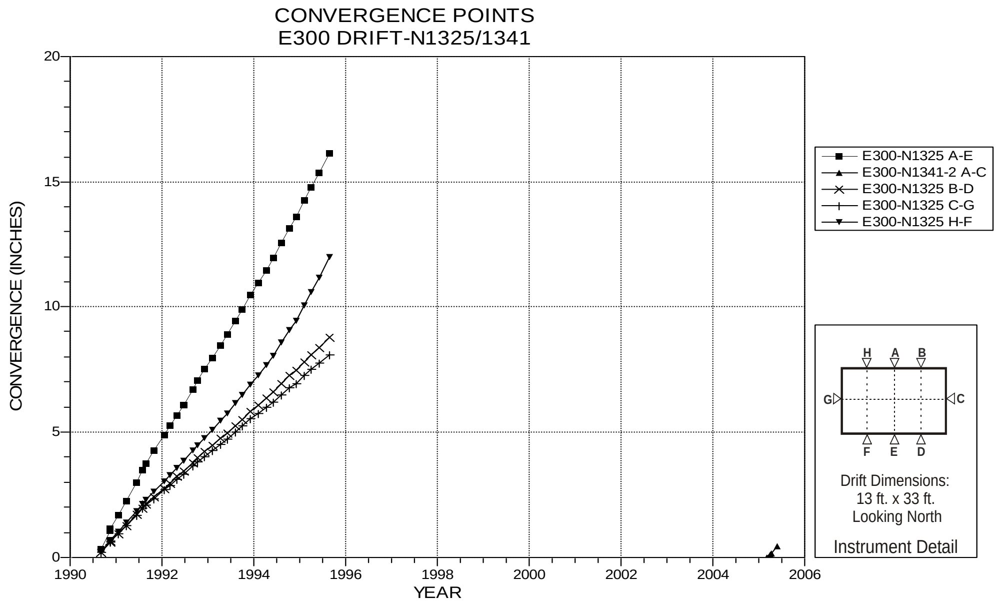
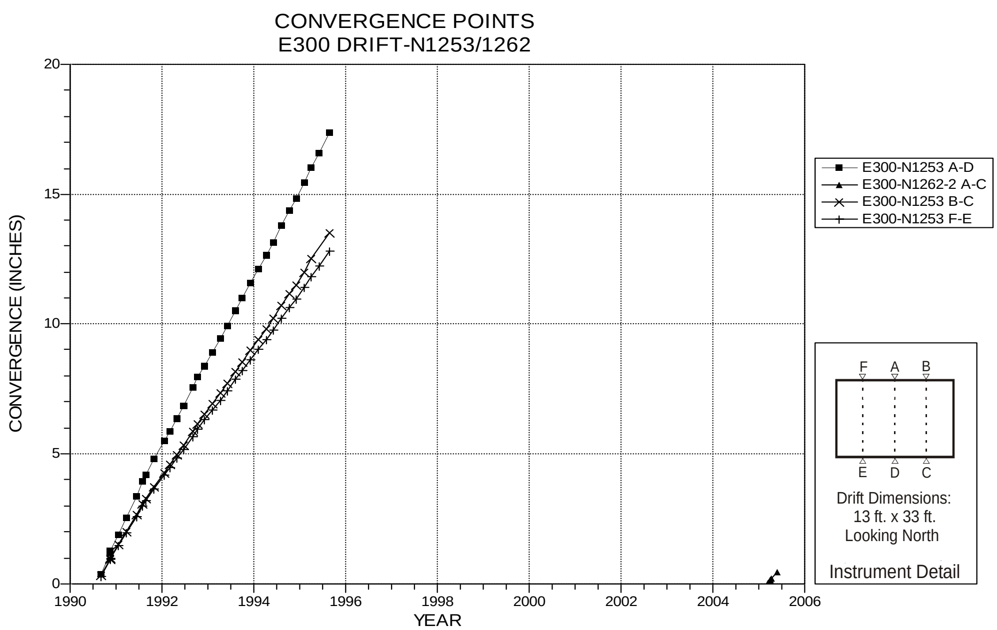


Figure 4-46 Extensometer 51X-GE-00495
W170 Drift at S2634 – Roof



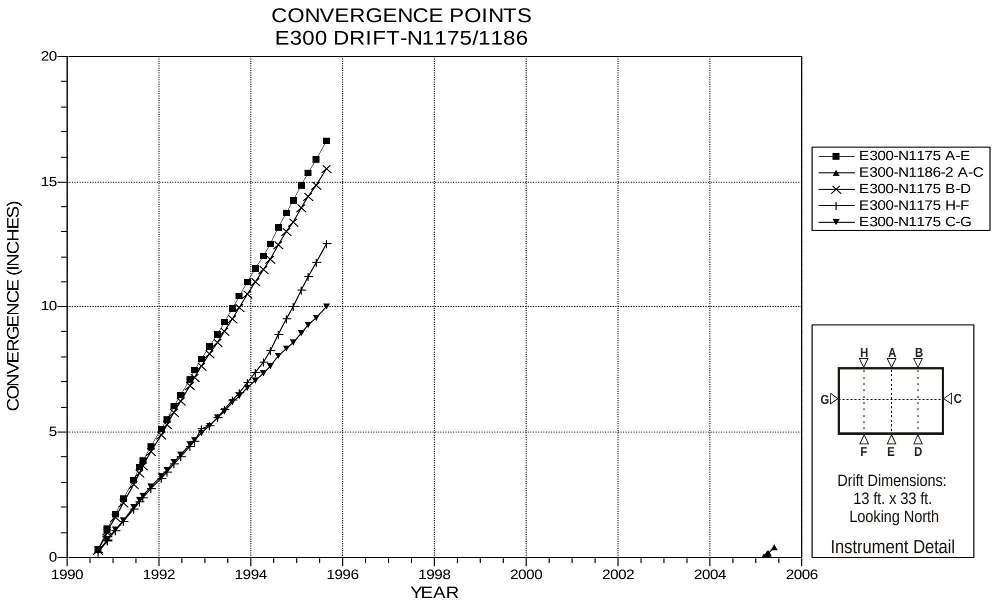
NOTES:
1. Excavation date: August 1989.
2. The initial RC was mined out.
3. The "A-C" chord (same as "A-E") was installed in February 2005.
4. The hiatus in the acquisition of readings was due to the area being inaccessible.

Figure 4-47 Convergence Point Array
E300 Drift at N1341 – All Chords



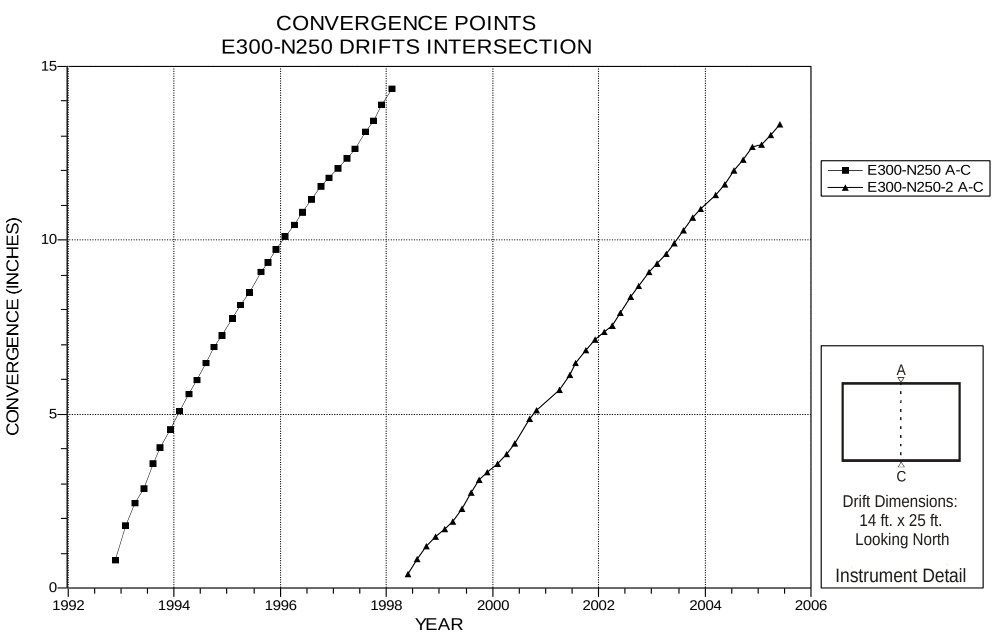
NOTES:
1. Excavation date: August 1989.
2. Accessible once since September 13, 1995.
3. The "A-C" chord (same as "A-D") was installed in February 2005.
4. The hiatus in the acquisition of redings was due to the area being inaccessible.

Figure 4-48 Convergence Point Array
E300 Drift at N1262 – All Chords



NOTES:
1. Excavation date: August 1989.
2. The initial RC array was mined out.
3. The "A-C" chord (same as "A-E") was installed in February 2005.
4. The hiatus in the acquisition of readings was due to the area being inaccessible.

Figure 4-49 Convergence Point Array
E300 Drift at N1186 – All Chords



NOTES:
1. Excavation date: October 1992.

Figure 4-50 Convergence Point Array
E300 Shop – E300 Drift at N250 – Roof to Floor

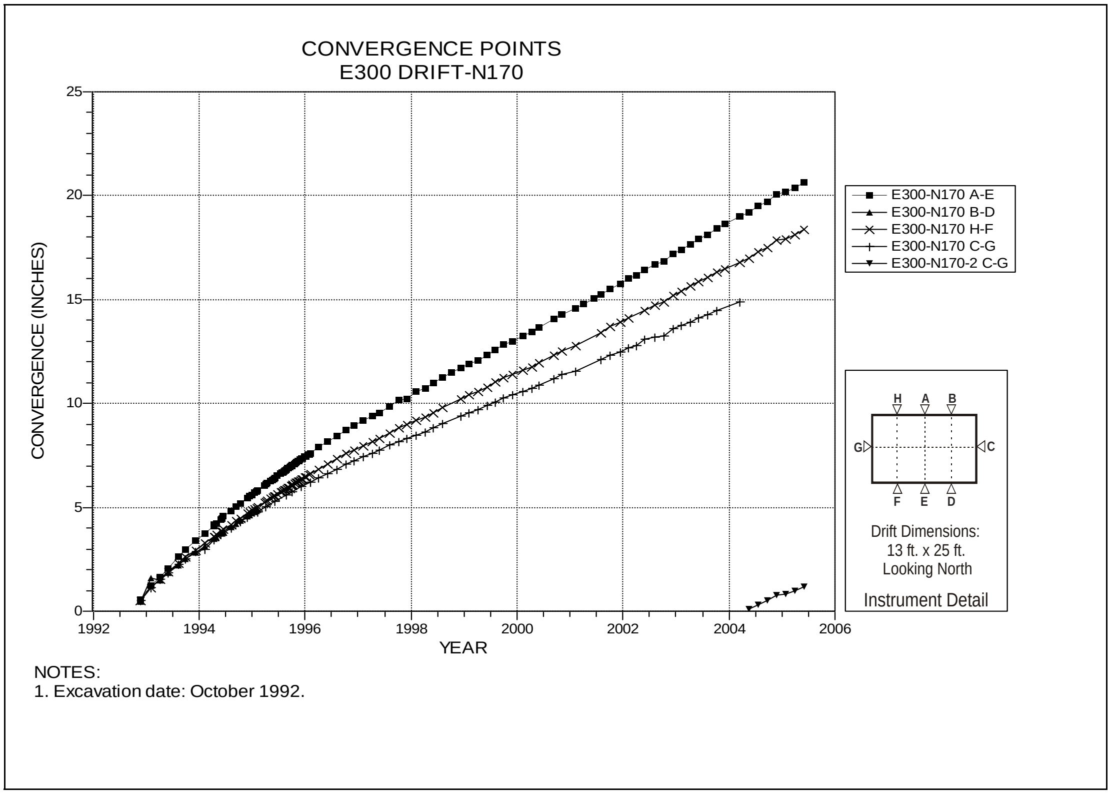


Figure 4-51 Convergence Point Array
E300 Shop – E300 Drift at N170 – All Chords

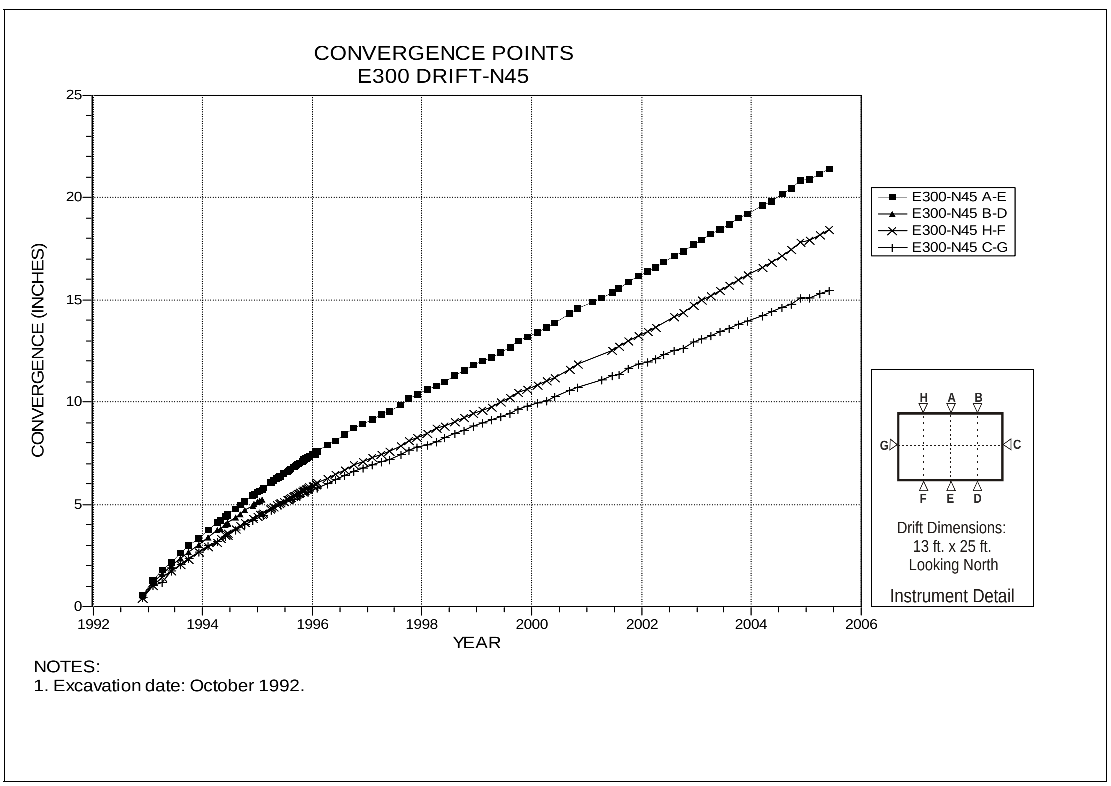


Figure 4-52 Convergence Point Array
E300 Shop – E300 Drift at N45 – All Chords

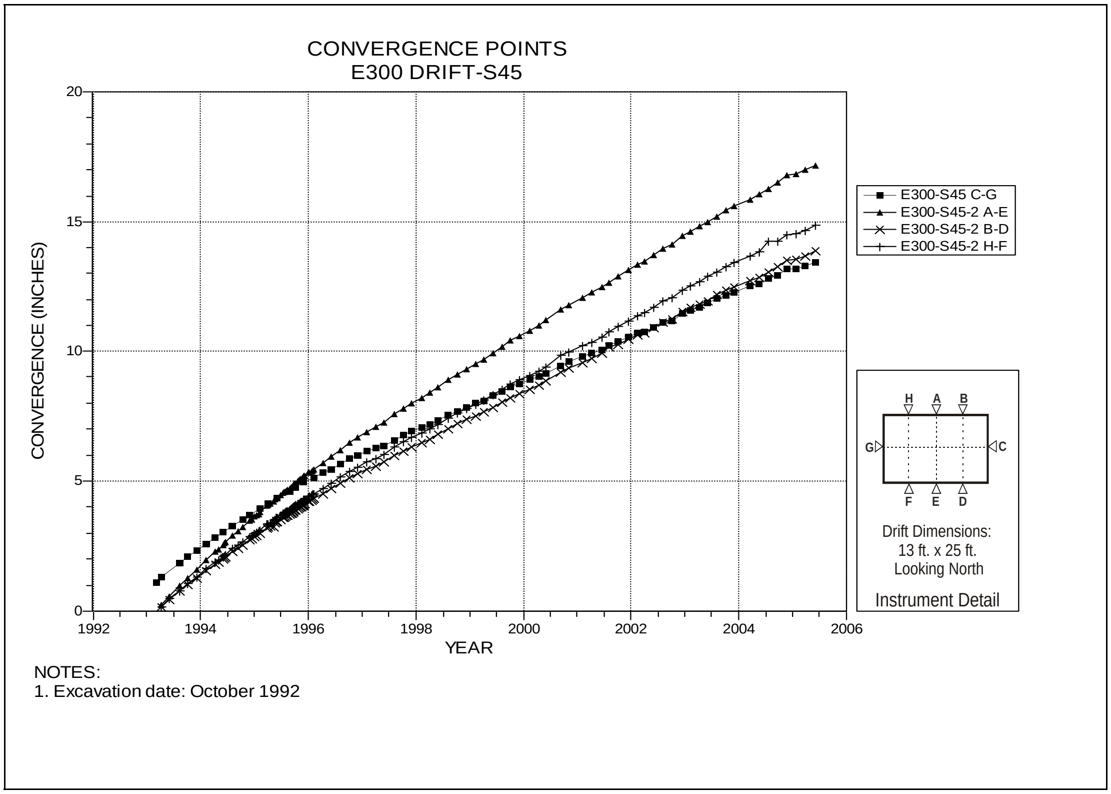


Figure 4-53 Convergence Point Array
E300 Shop – E300 Drift at S45 – All Chords

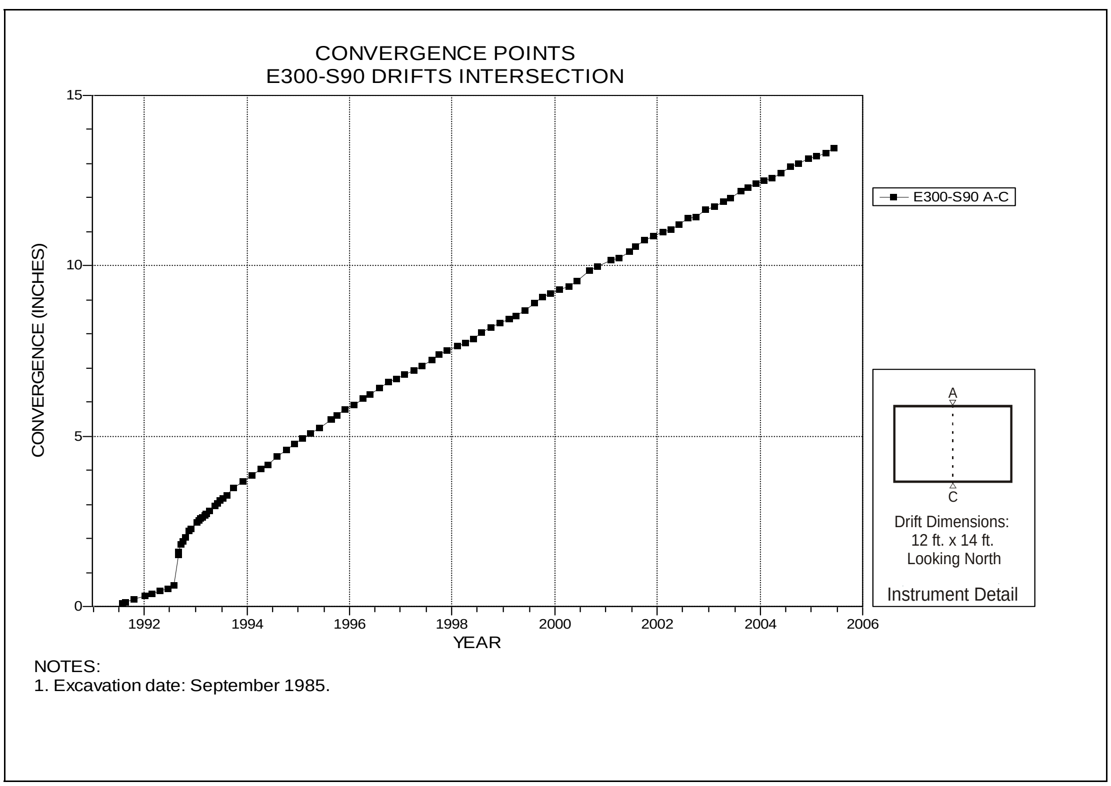


Figure 4-54 Convergence Point Array
E300 Drift at S90 Drift Intersection – Roof to Floor

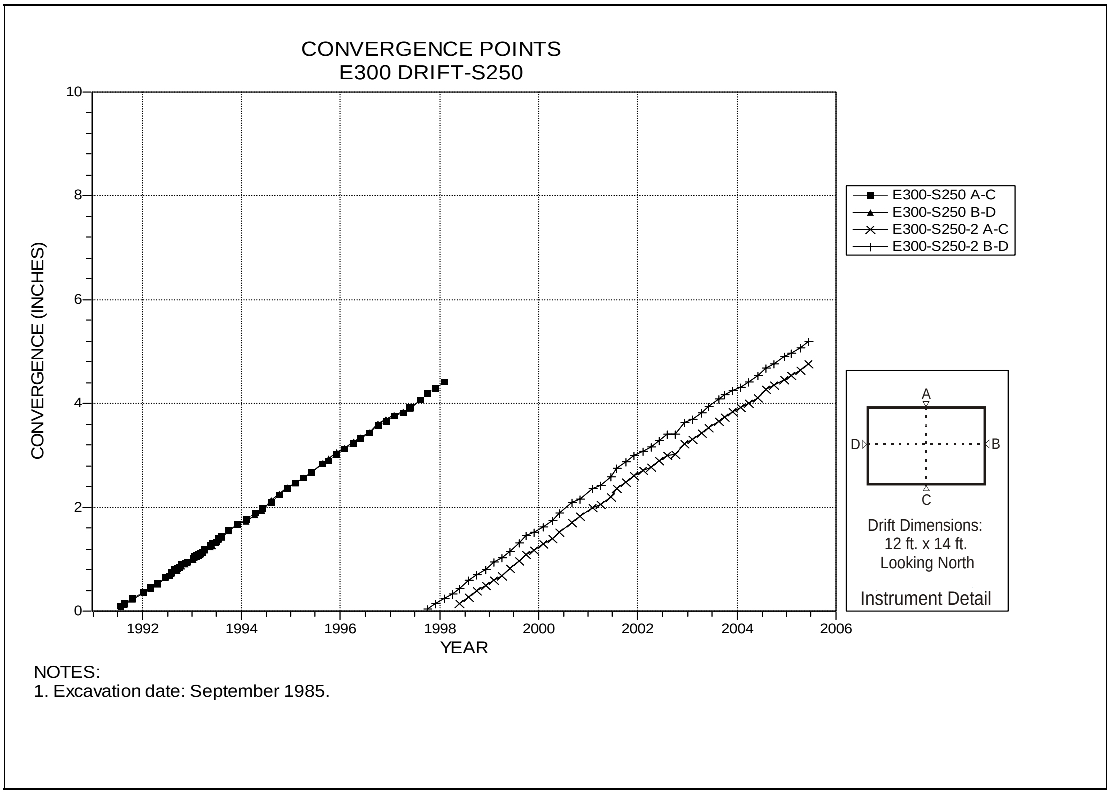


Figure 4-55 Convergence Point Array
E300 Drift at S250 – All Chords

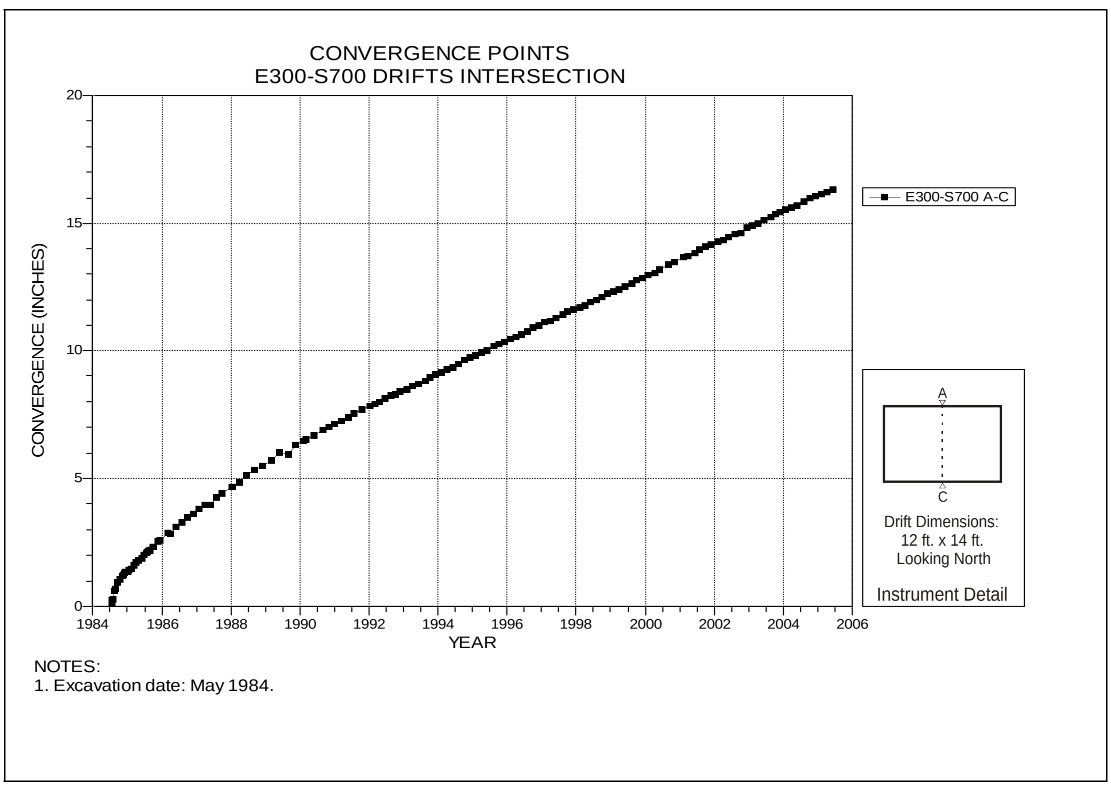


Figure 4-56 Convergence Point Array
E300 Drift at S700 Drift Intersection – Roof to Floor

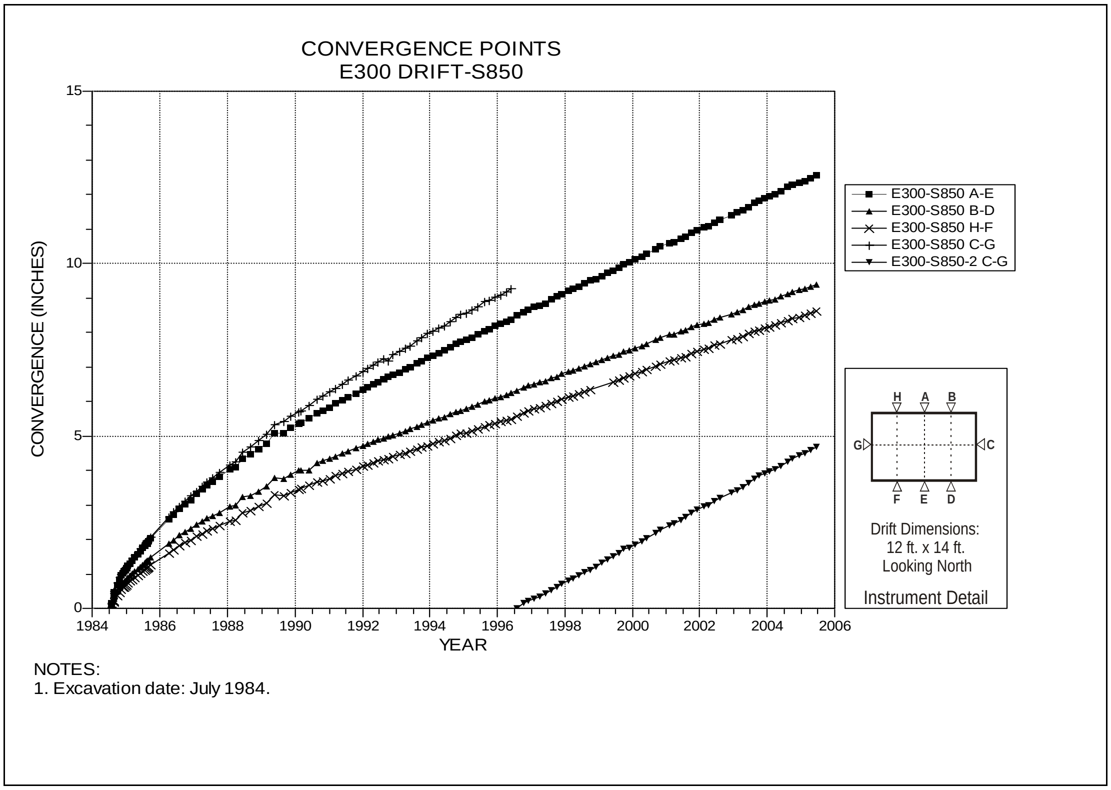


Figure 4-57 Convergence Point Array
E300 Drift at S850 – All Chords

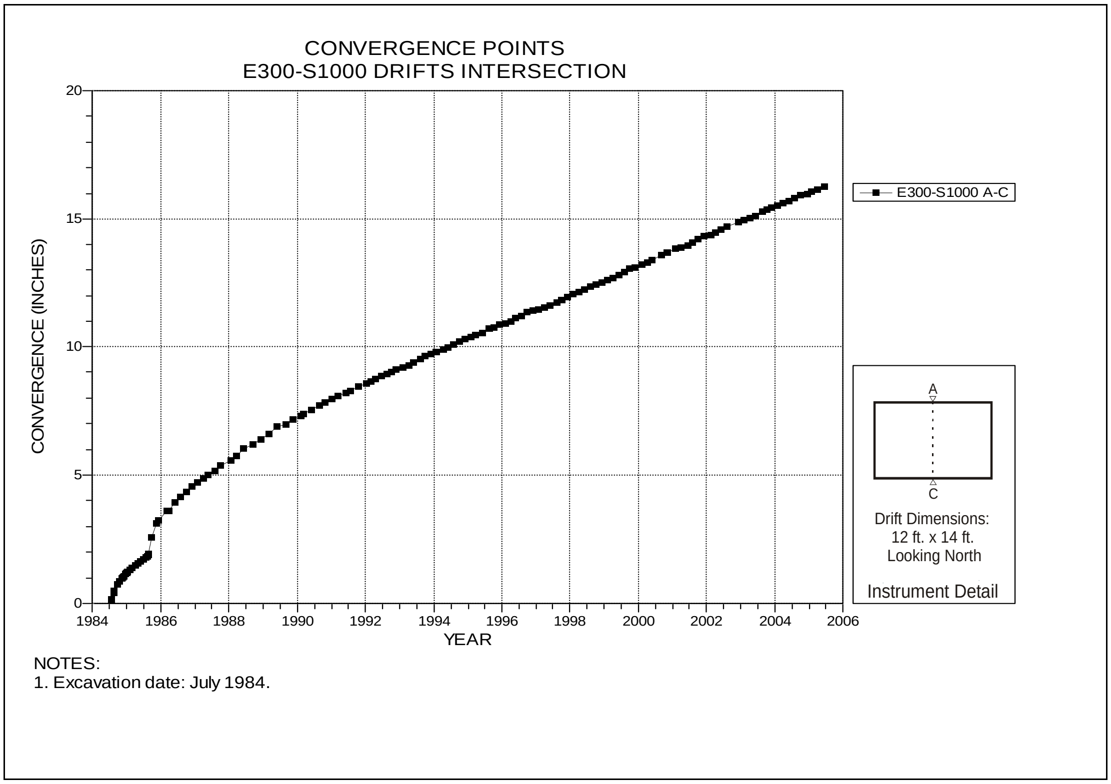


Figure 4-58 Convergence Point Array
E300 Drift at S1000 Drift Intersection – Roof to Floor

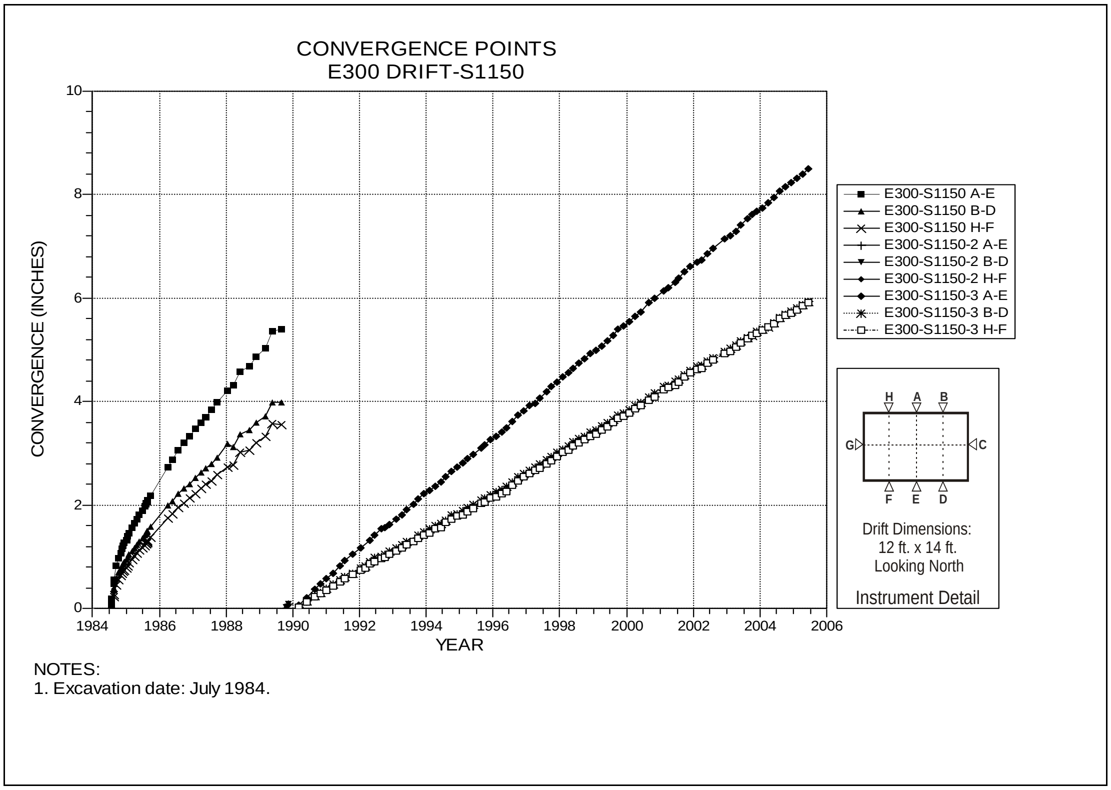


Figure 4-59 Convergence Point Array
E300 Drift at S1150 – Roof to Floor

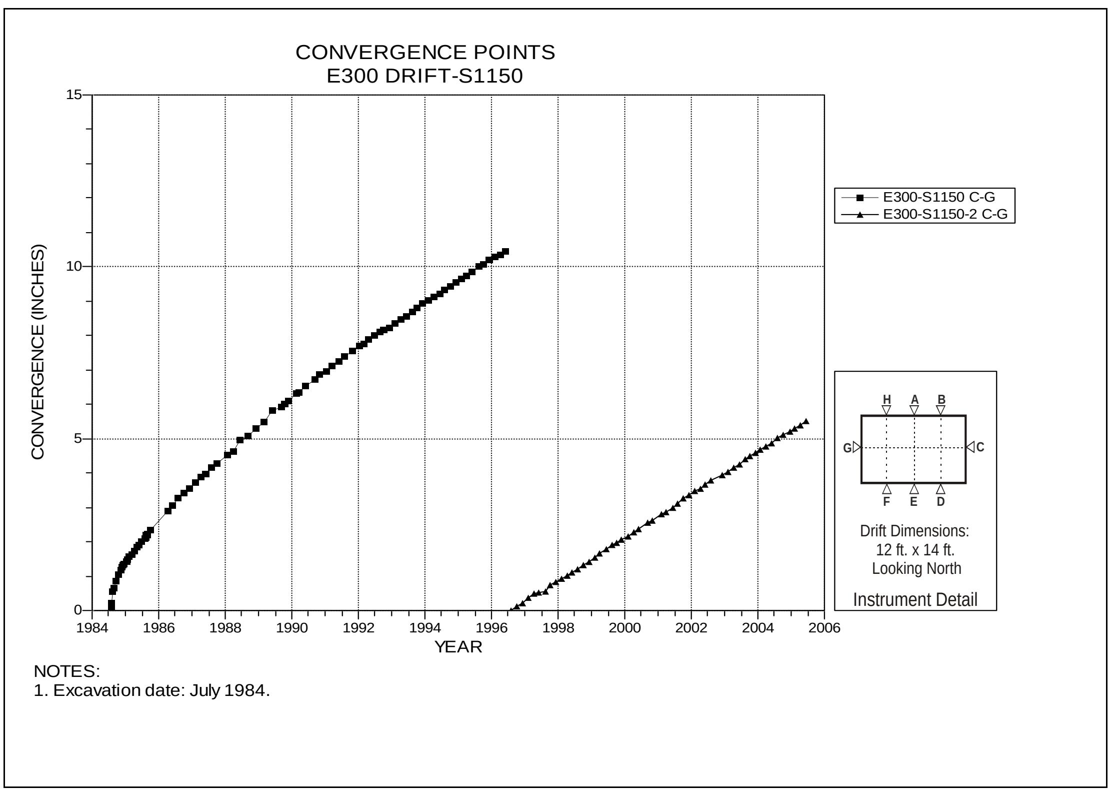
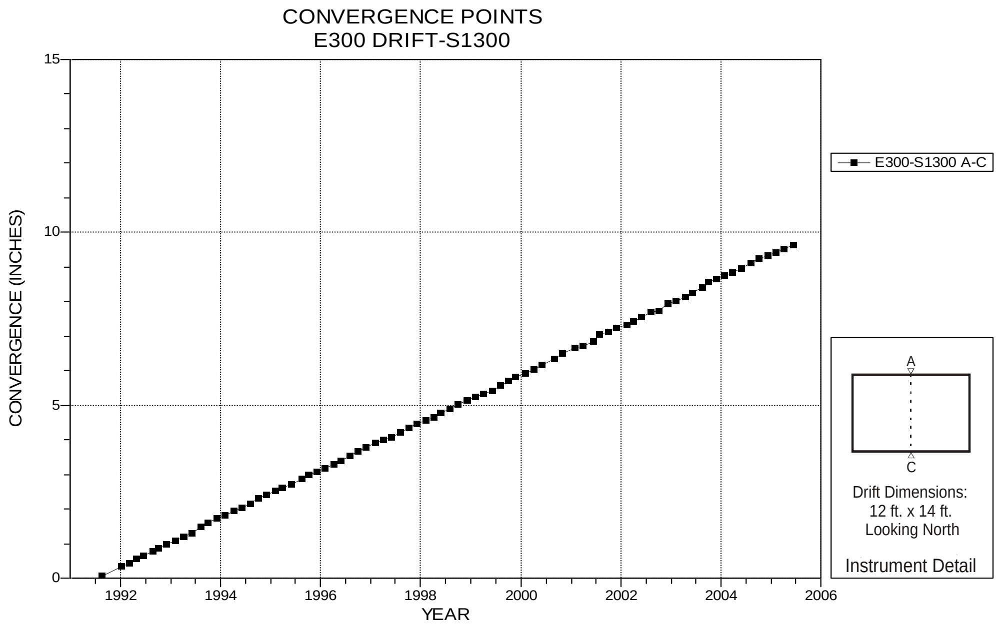
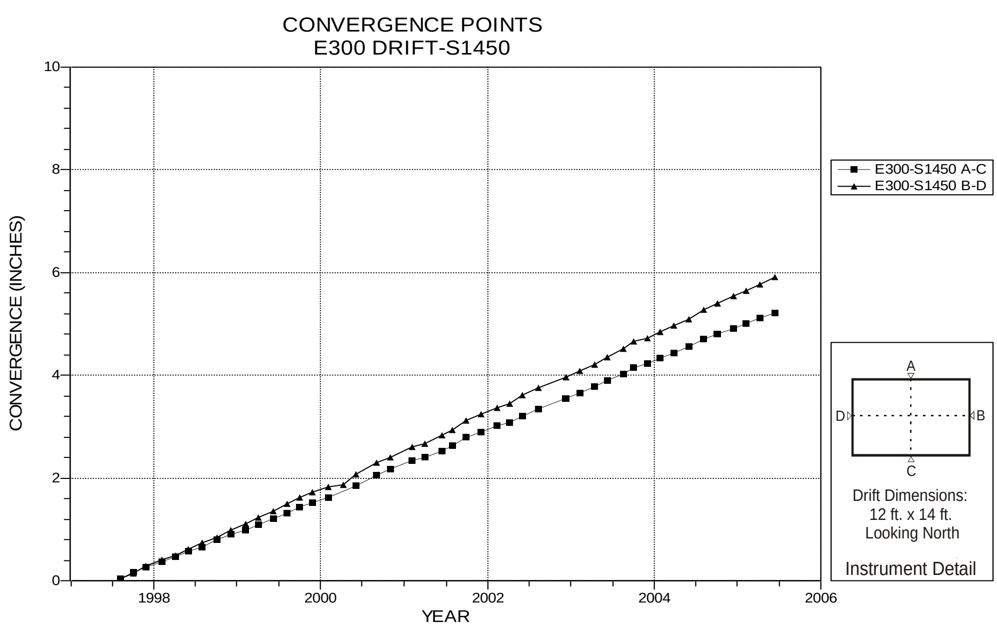


Figure 4-60 Convergence Point Array
E300 Drift at S1150 – Rib to Rib



NOTES:
1. Excavation date: July 1984.

Figure 4-61 Convergence Point Array
E300 Drift at S1300 Drift Intersection – Roof to Floor



NOTES:
1. Excavation date: October 1985.

Figure 4-62 Convergence Point Array
E300 Drift at S1450 – All Chords

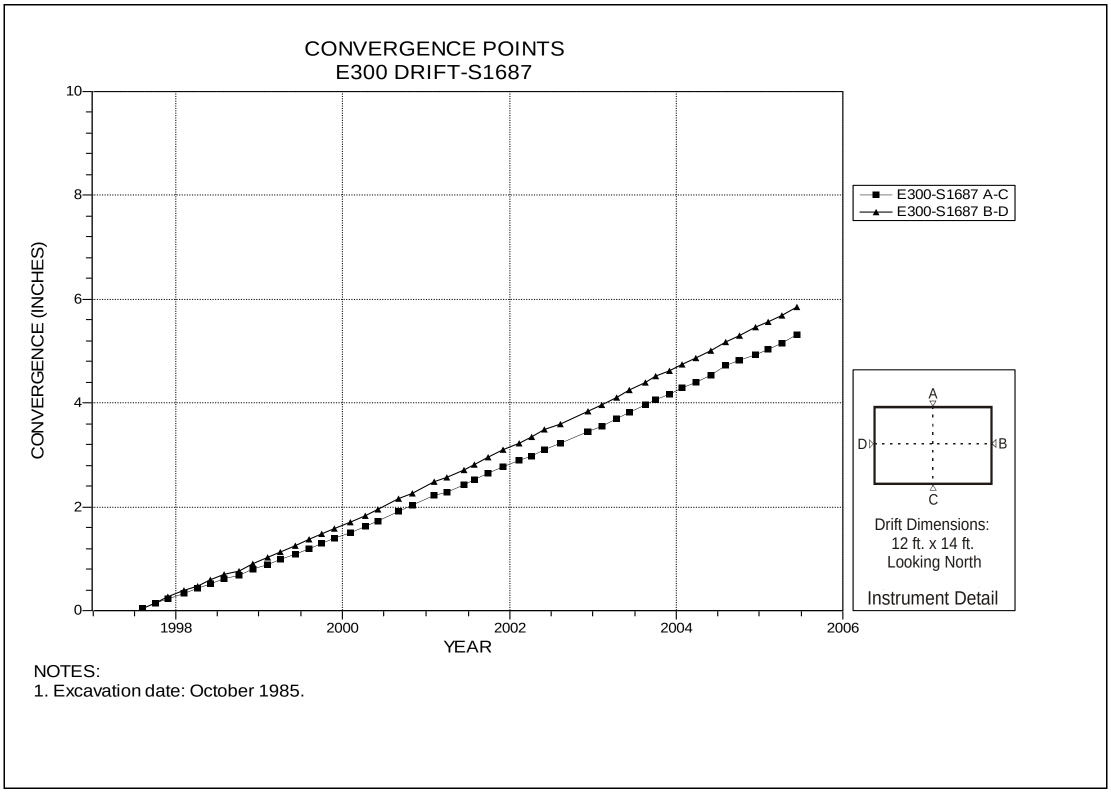


Figure 4-63 Convergence Point Array
E300 Drift at S1687 – All Chords

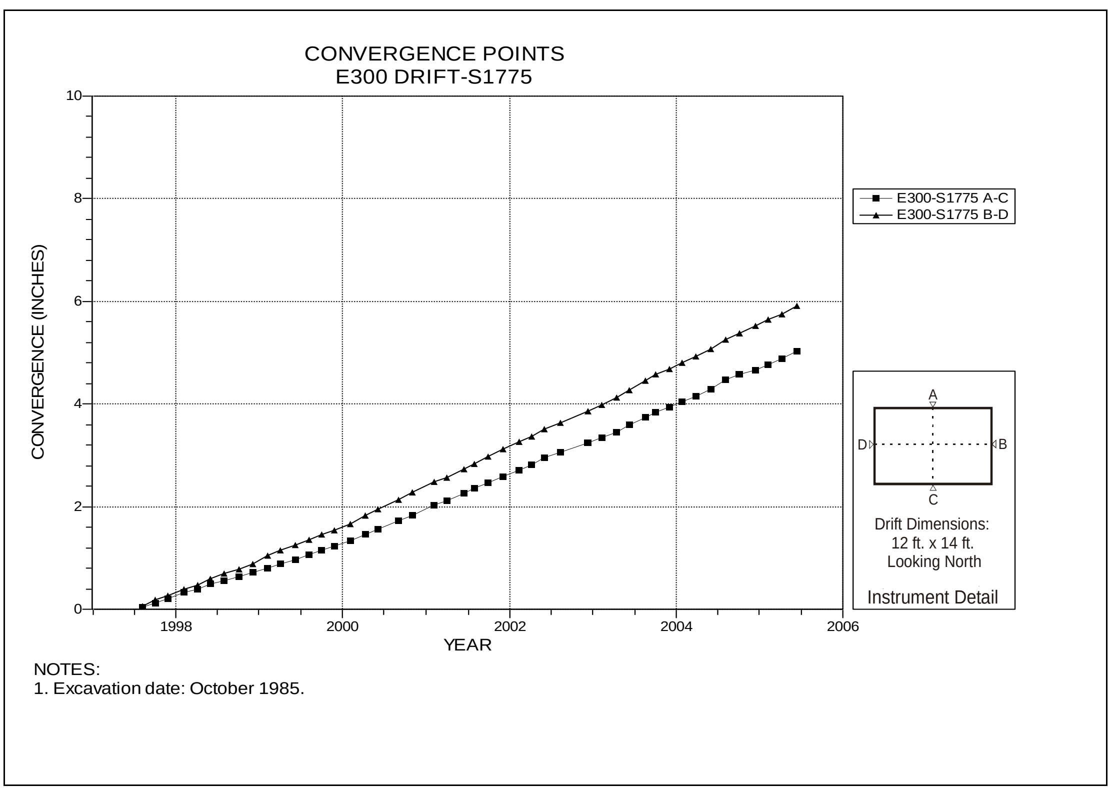


Figure 4-64 Convergence Point Array
E300 Drift at S1775 – All Chords

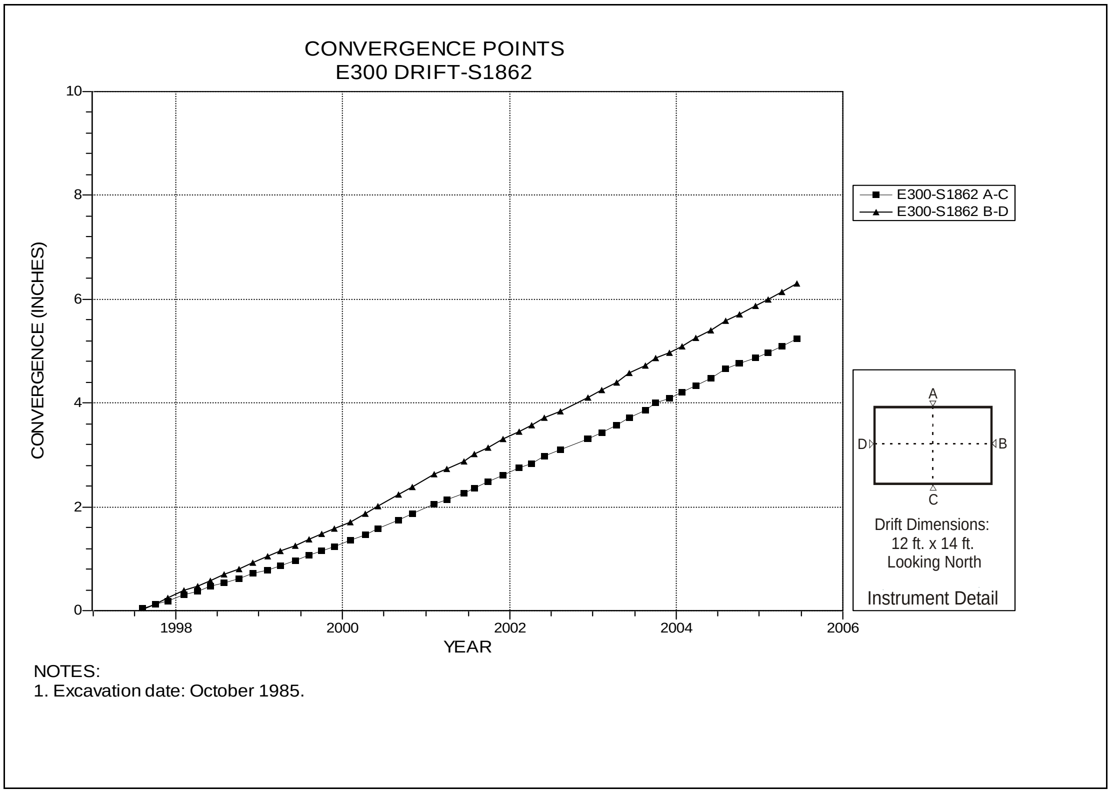


Figure 4-65 Convergence Point Array
E300 Drift at S1862 – All Chords

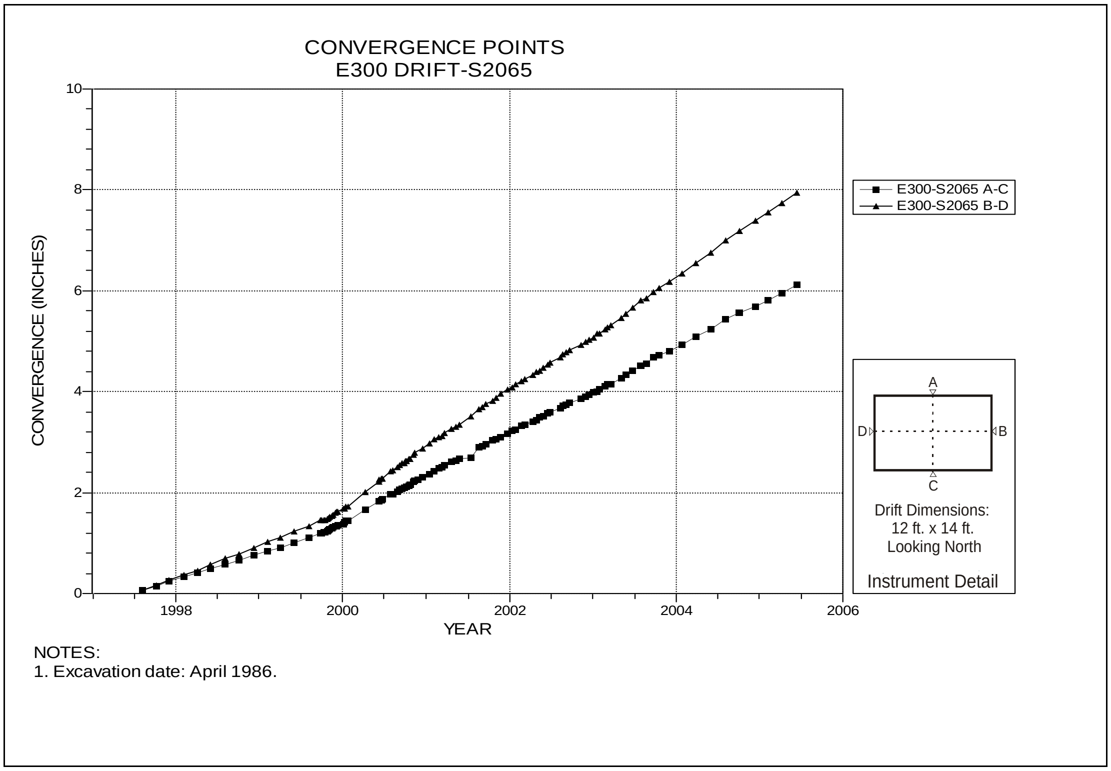


Figure 4-66 Convergence Point Array
E300 Drift at S2065 – All Chords

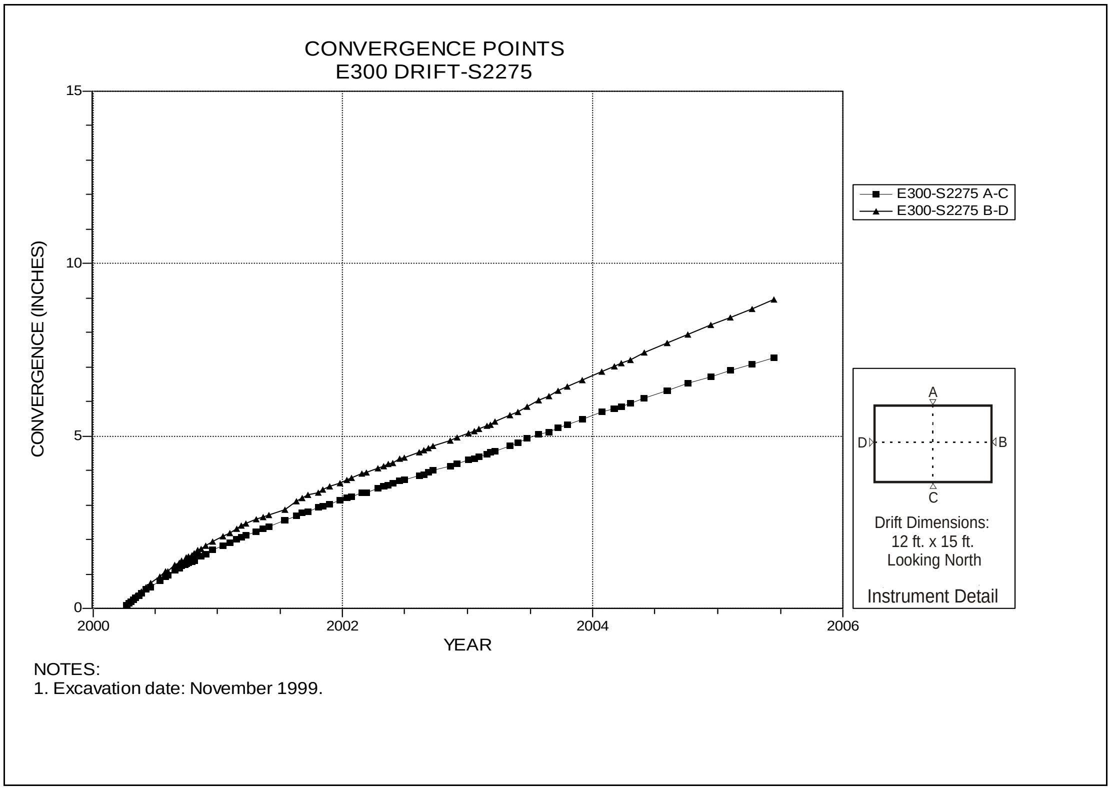


Figure 4-67 Convergence Point Array
E300 Drift at S2275 – All Chords

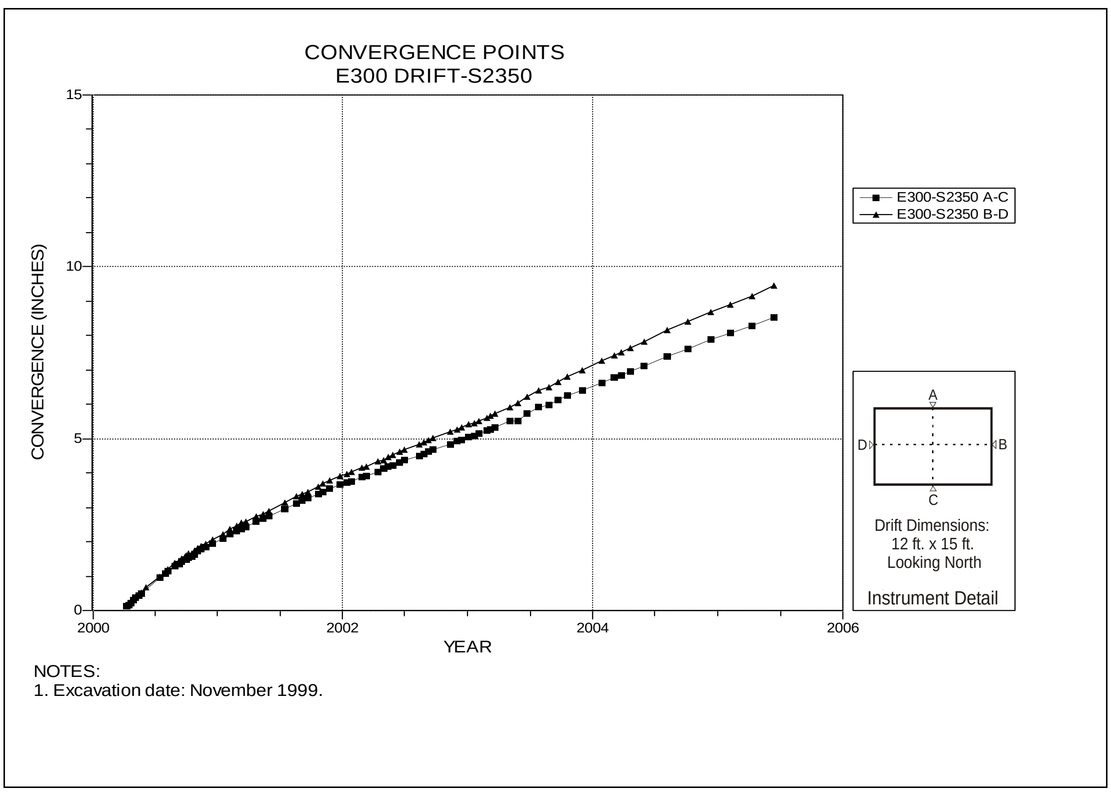


Figure 4-68 Convergence Point Array
E300 Drift at S2350 – All Chords

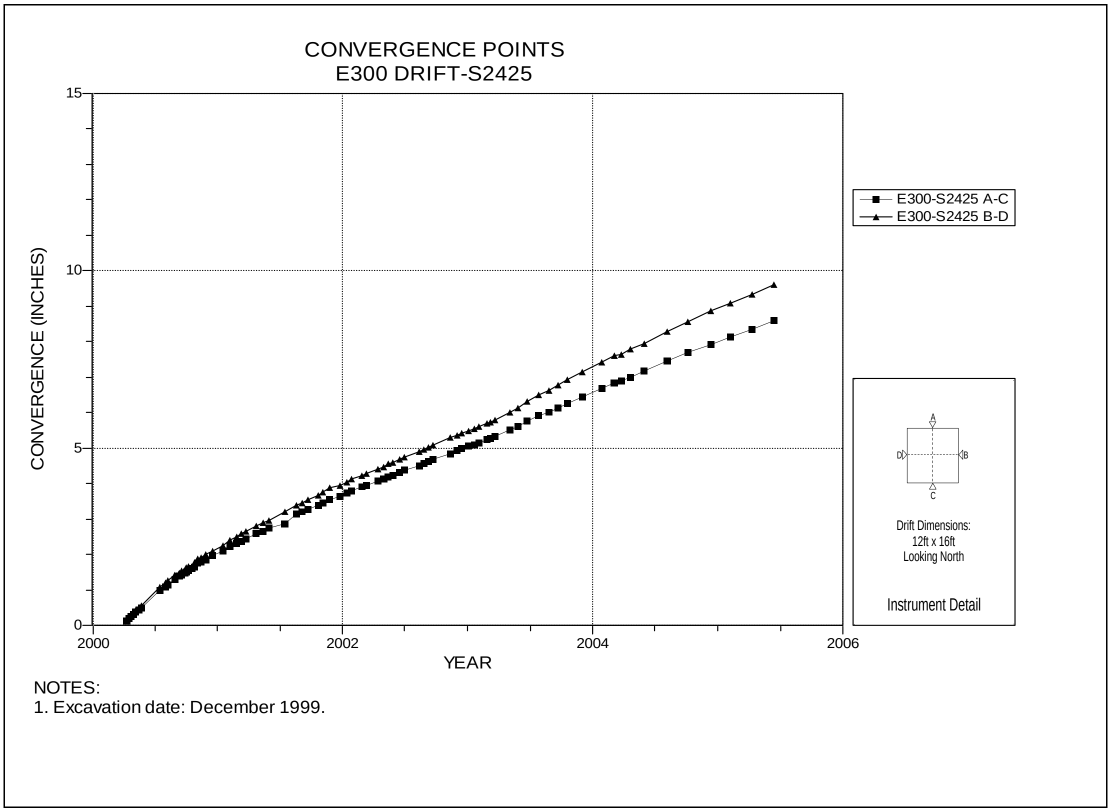


Figure 4-69 Convergence Point Array
E300 Drift at S2425 – All Chords

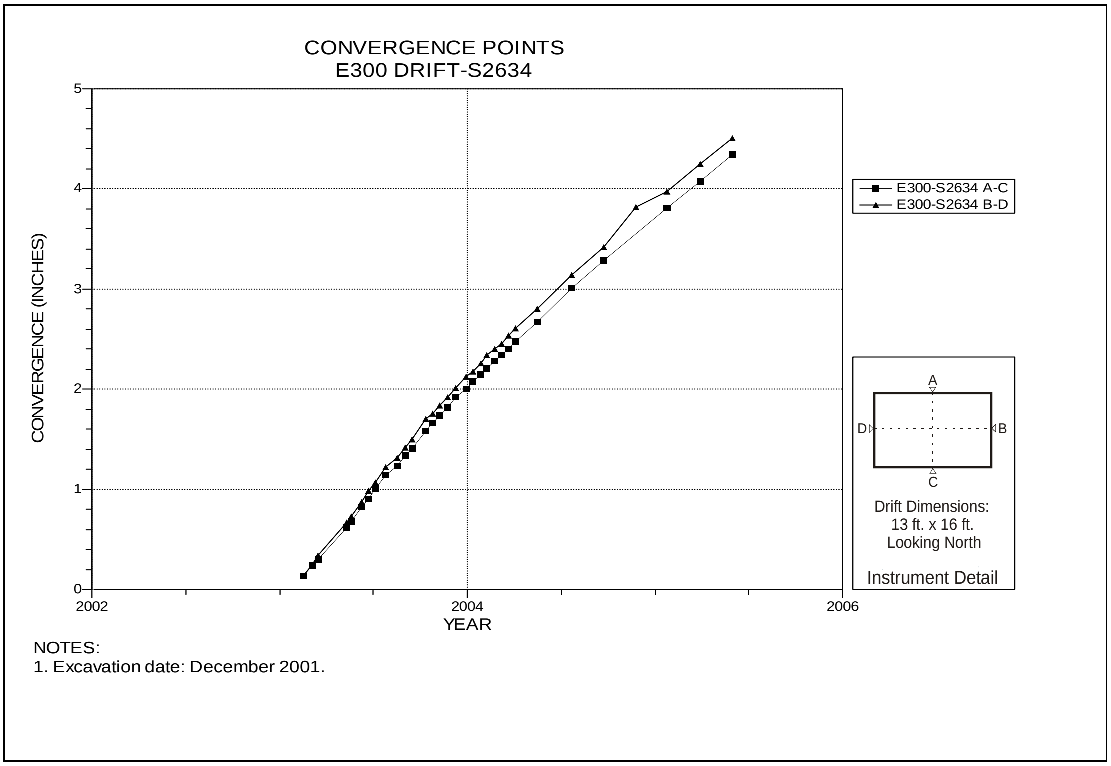


Figure 4-70 Convergence Point Array
E300 Drift at S2634 – All Chords

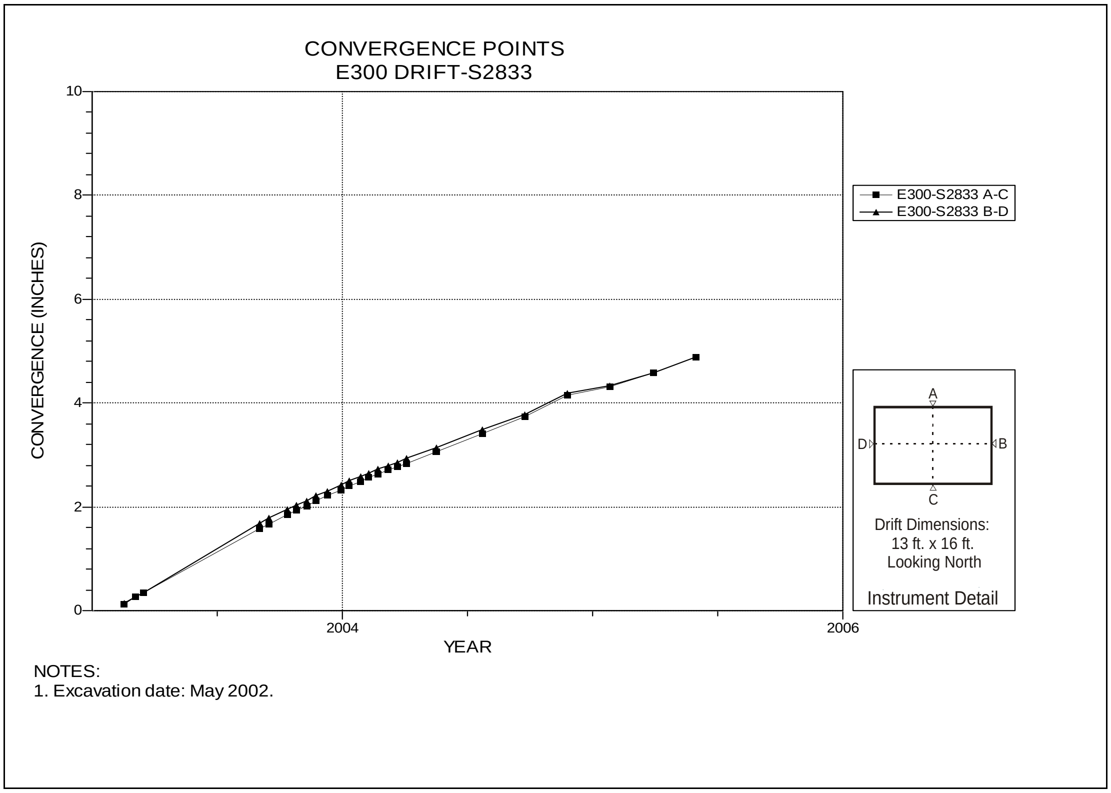


Figure 4-71 Convergence Point Array
E300 Drift at S2833 – All Chords

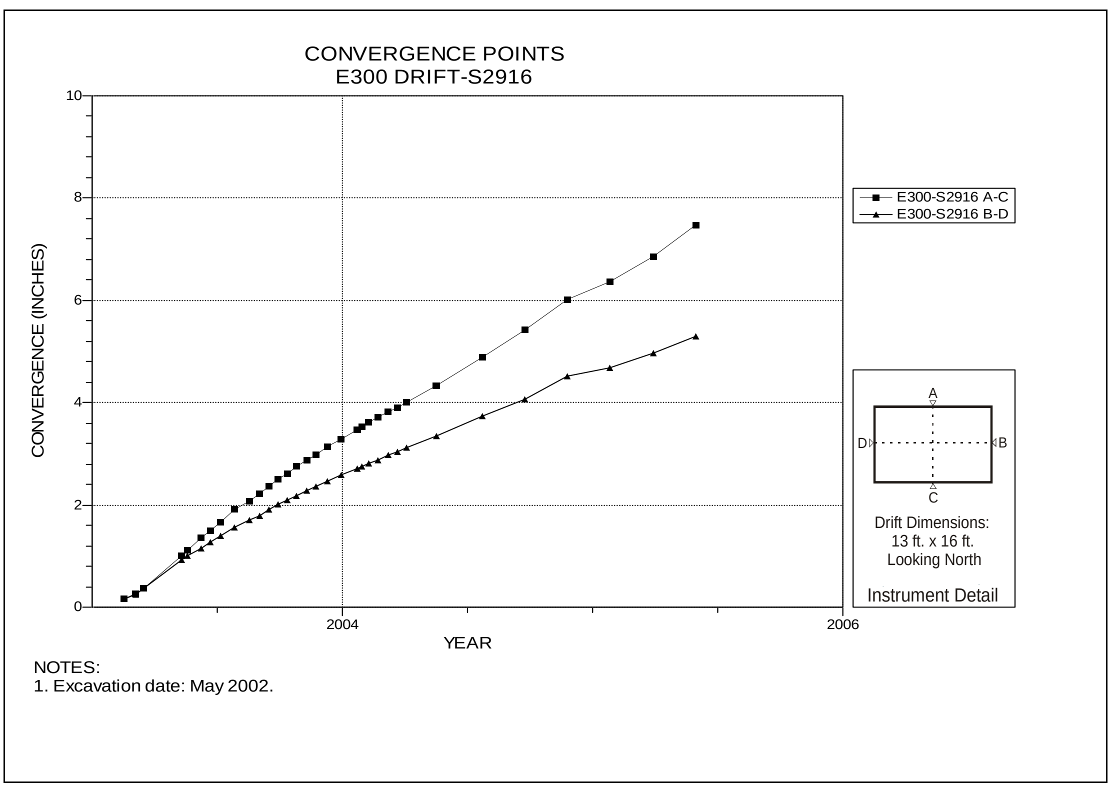


Figure 4-72 Convergence Point Array
E300 Drift at S2916 – All Chords

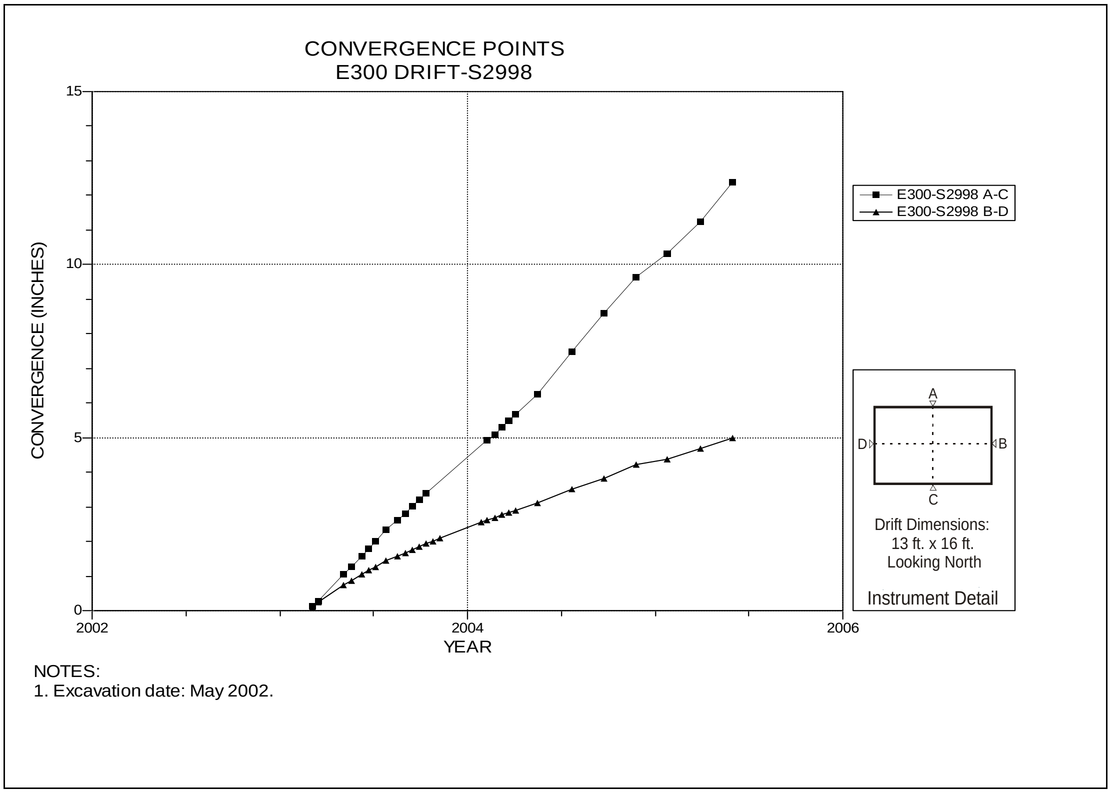


Figure 4-73 Convergence Point Array
E300 Drift at S2998 – All Chords

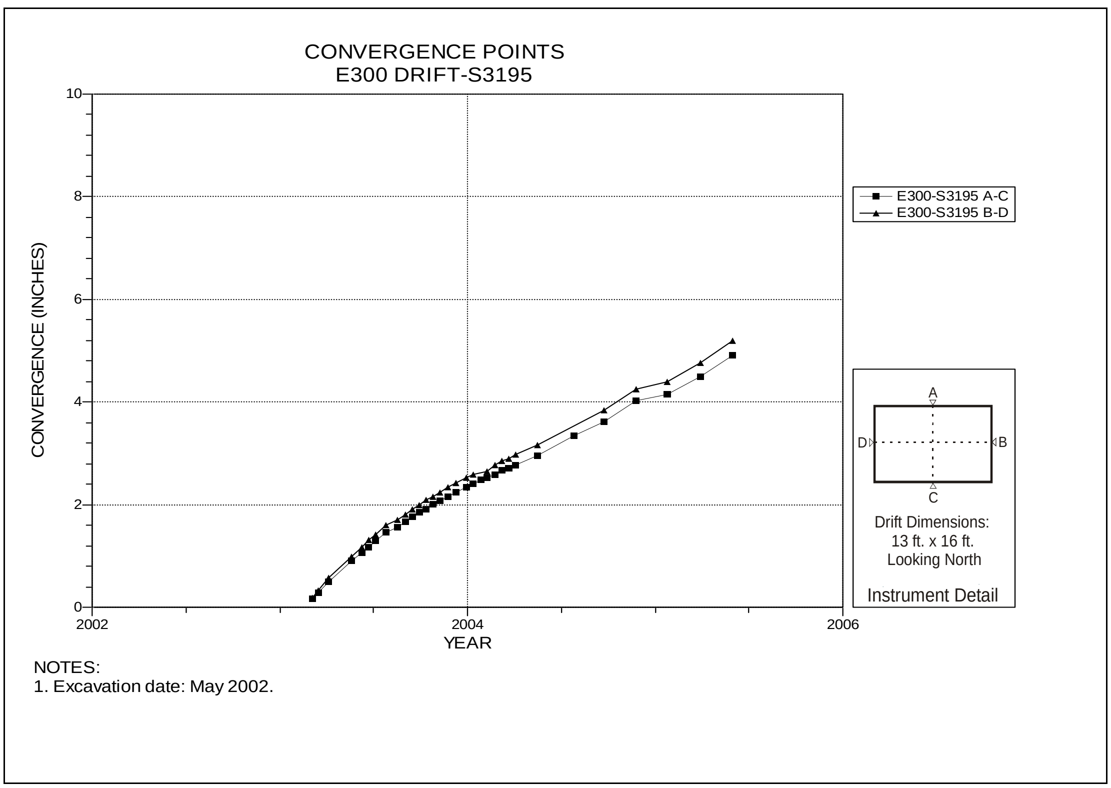


Figure 4-74 Convergence Point Array
E300 Drift at S3195 – All Chords

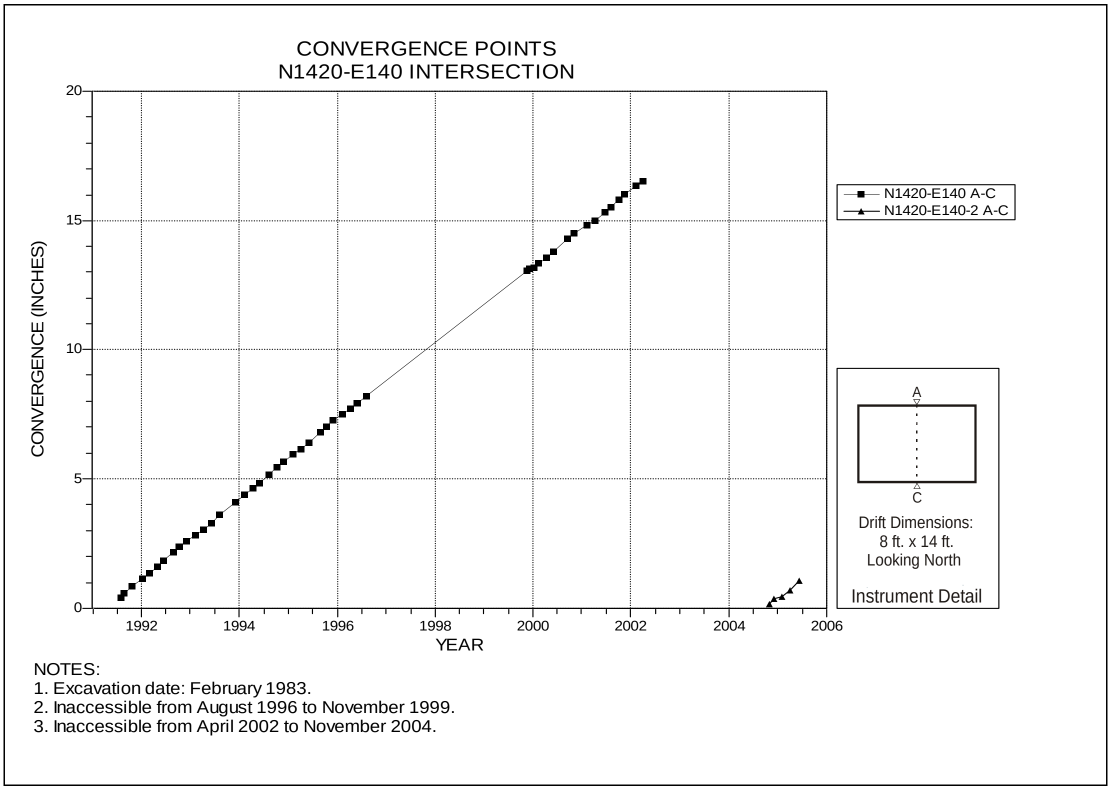


Figure 4-75 Convergence Point Array
E140 Drift at N1420 Drift Intersection – Roof to Floor

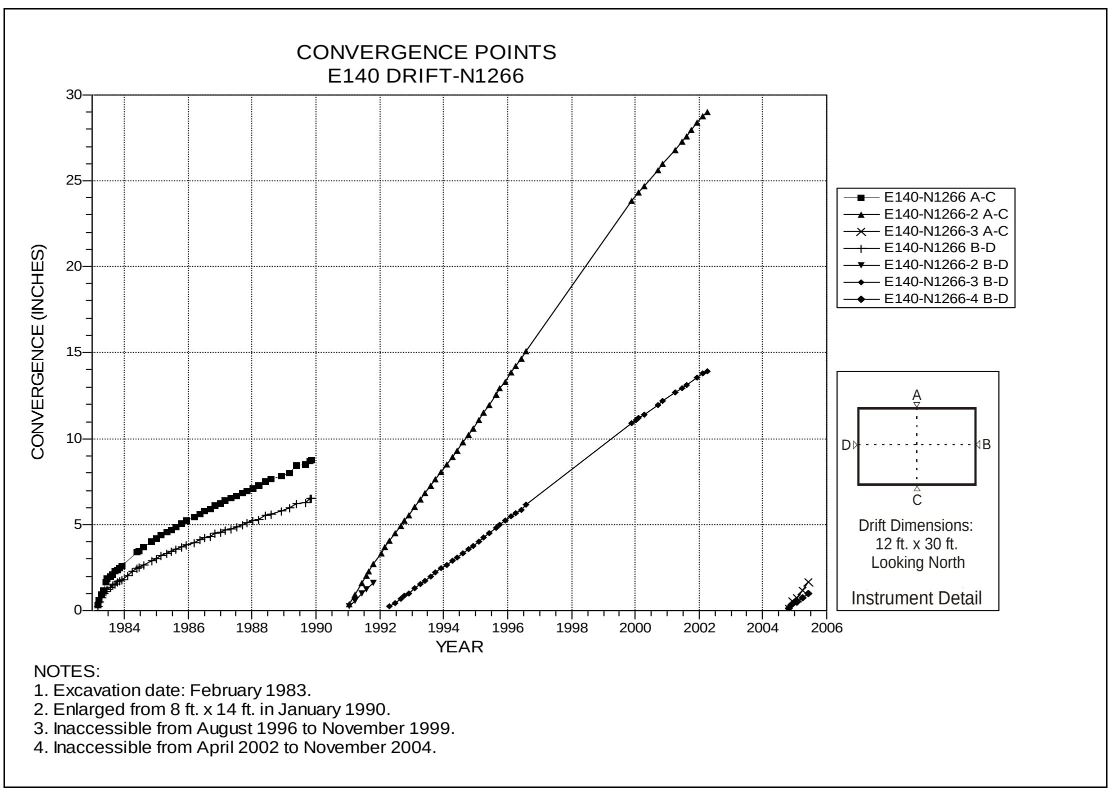


Figure 4-76 Convergence Point Array
E140 Drift at N1266 – All Chords

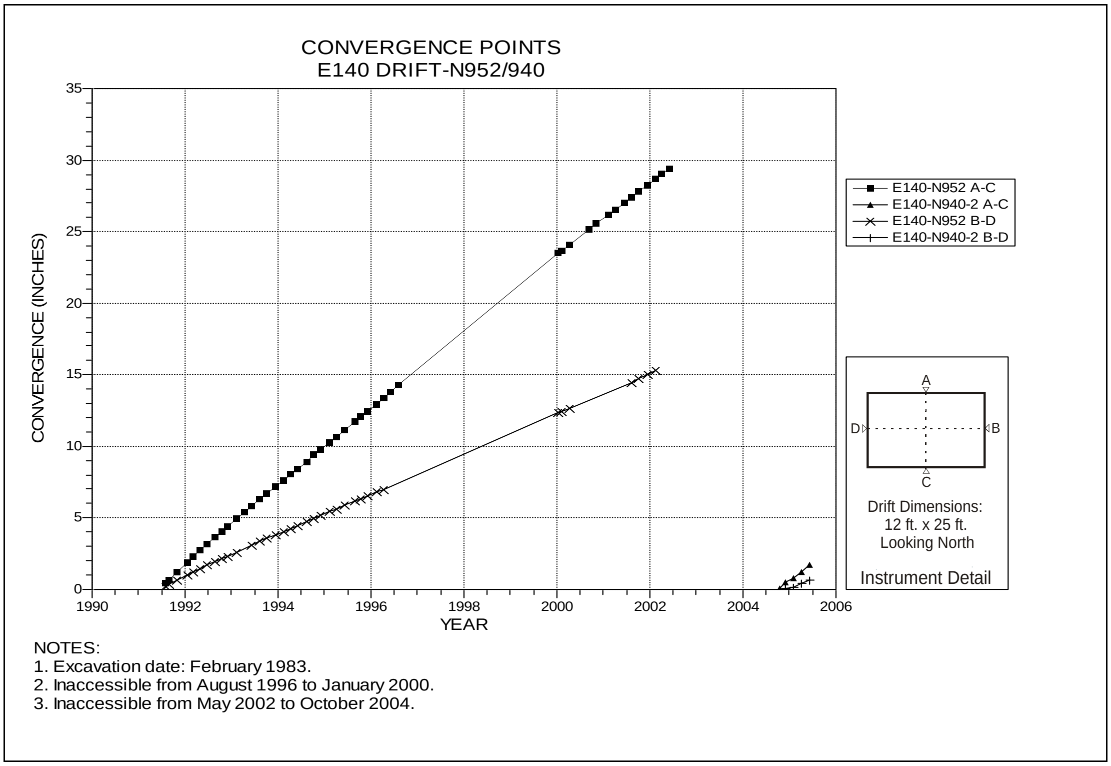


Figure 4-77 Convergence Point Array
E140 Drift at N940 – All Chords

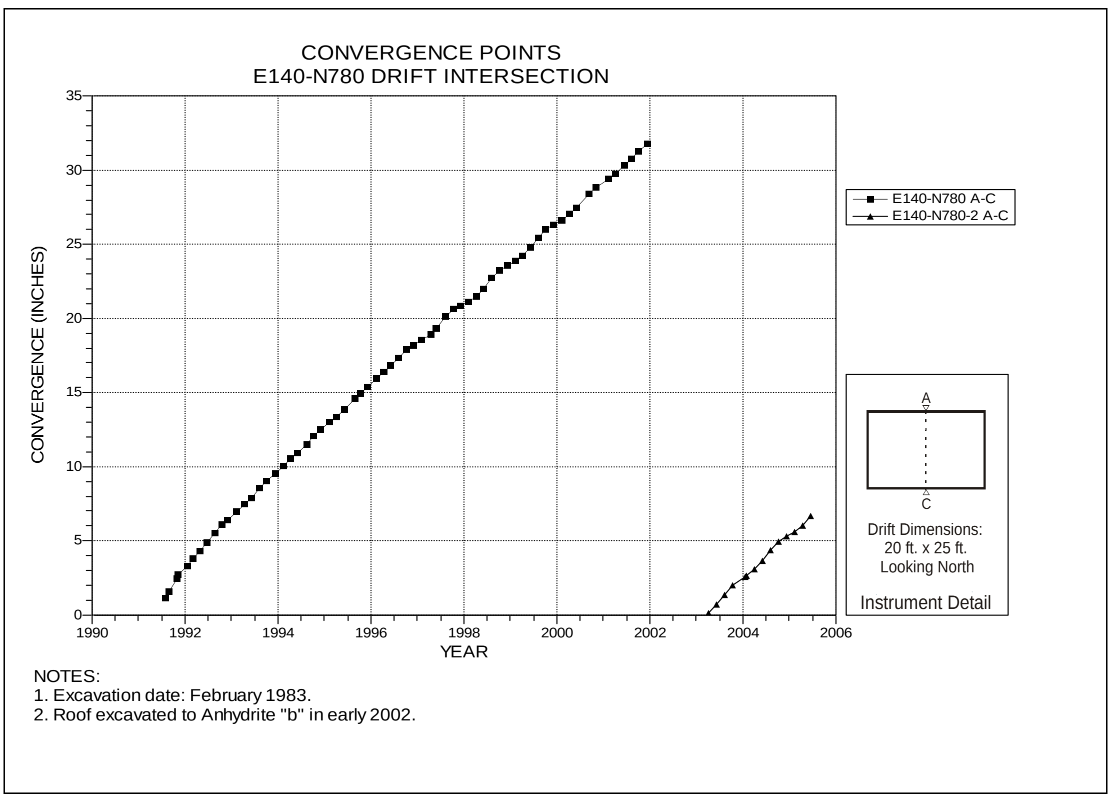


Figure 4-78 Convergence Point Array
E140 Drift at N780 Drift Intersection – Roof to Floor

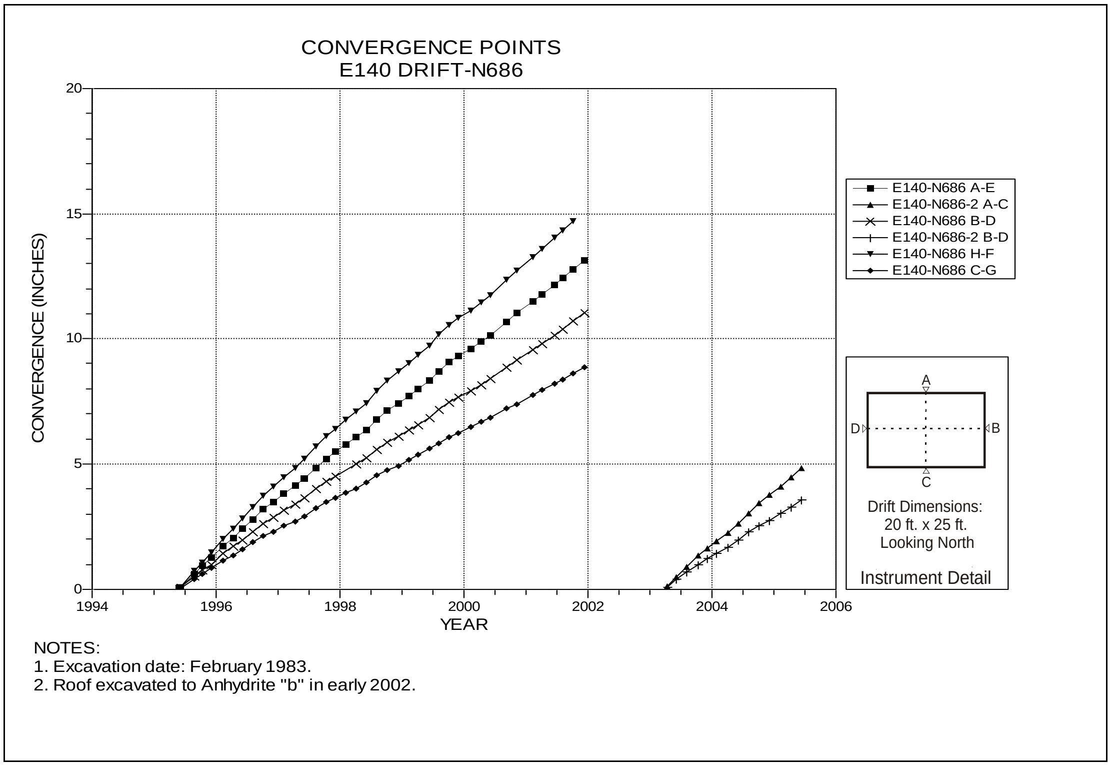


Figure 4-79 Convergence Point Array
E140 Drift at N686 – All Chords

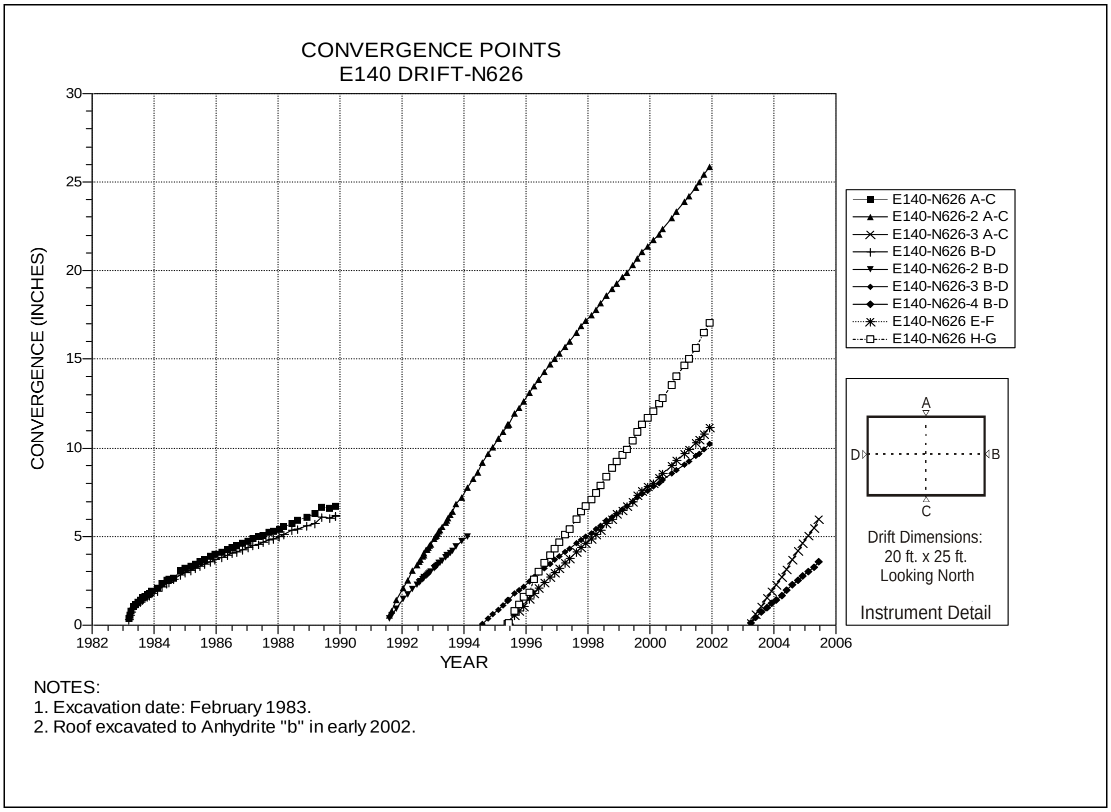


Figure 4-80 Convergence Point Array
E140 Drift at N626 – All Chords

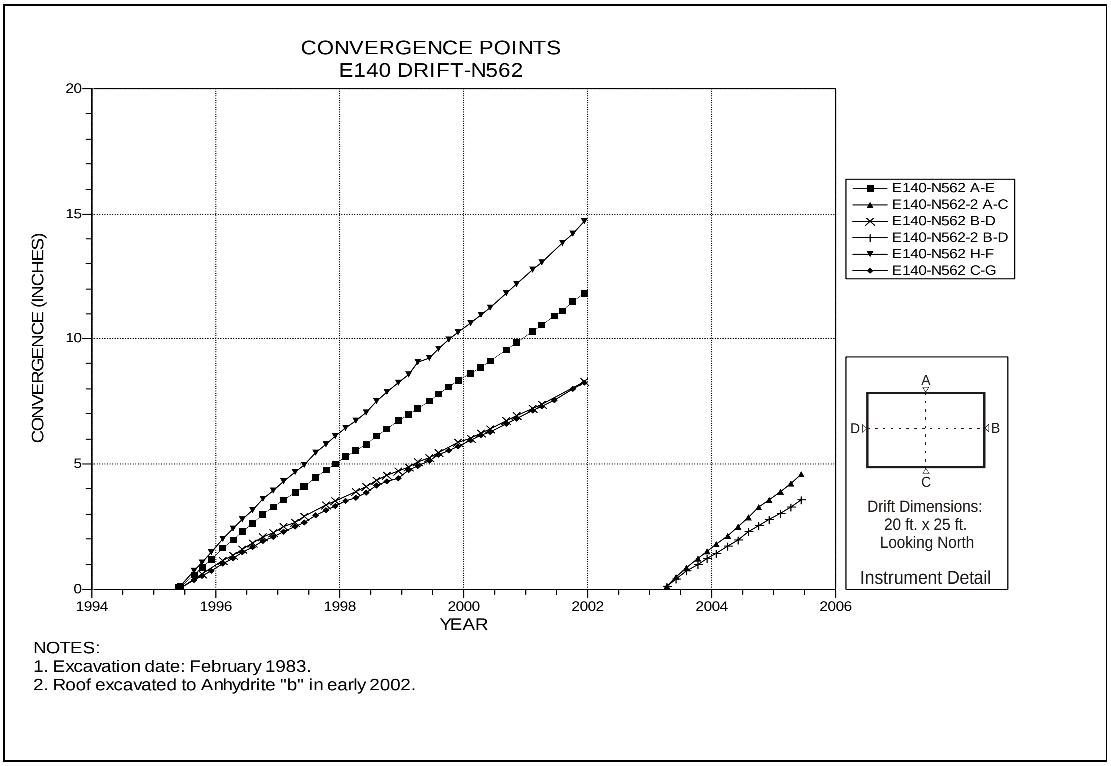


Figure 4-81 Convergence Point Array
E140 Drift at N562 – All Chords

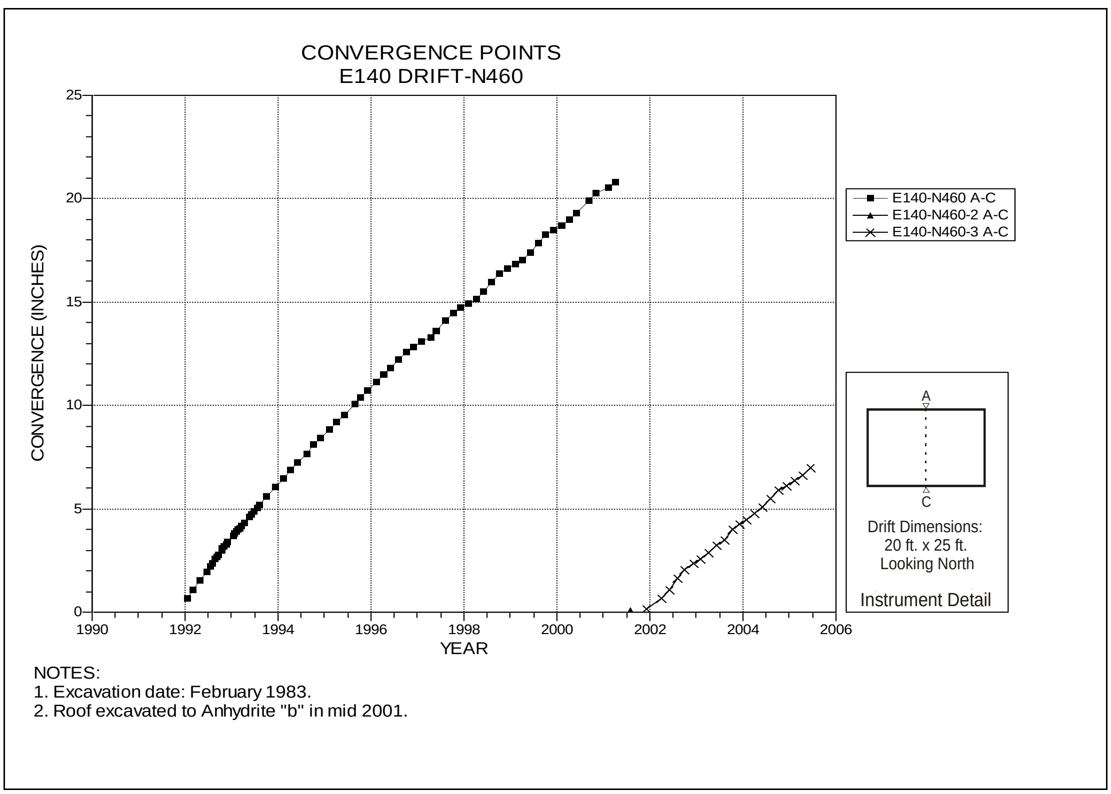


Figure 4-82 Convergence Point Array
E140 Drift at N460 Drift Intersection – Roof to Floor

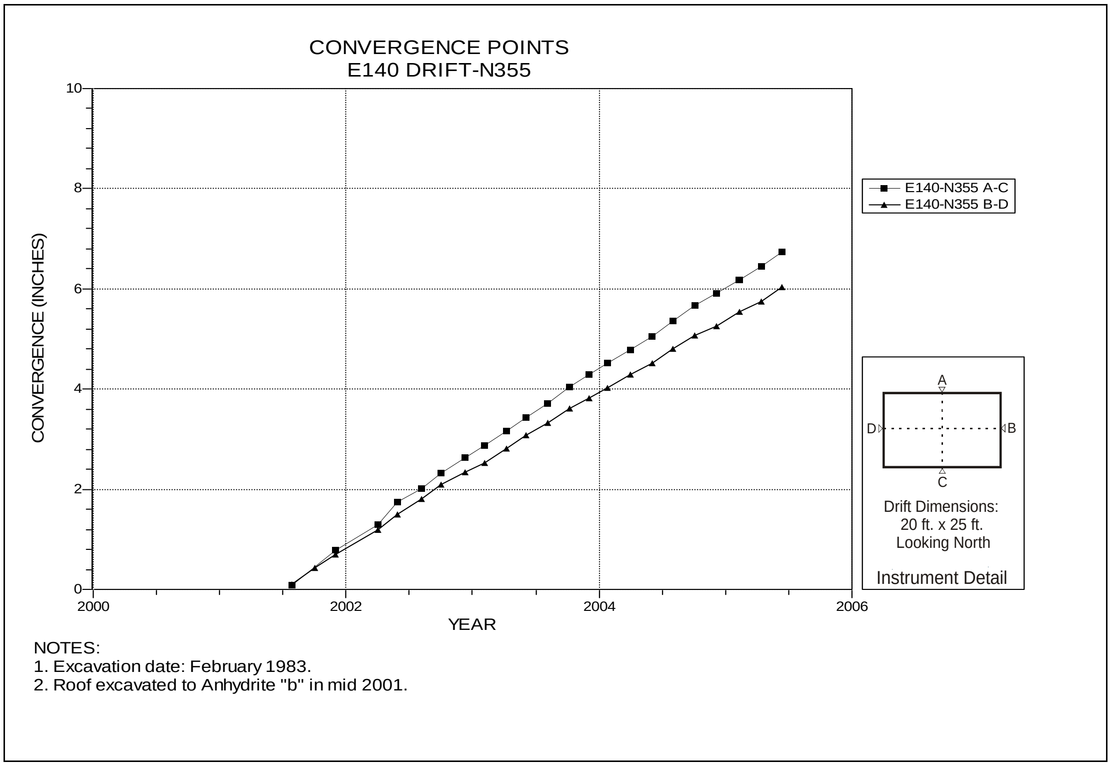


Figure 4-83 Convergence Point Array
E140 Drift at N355 – All Chords

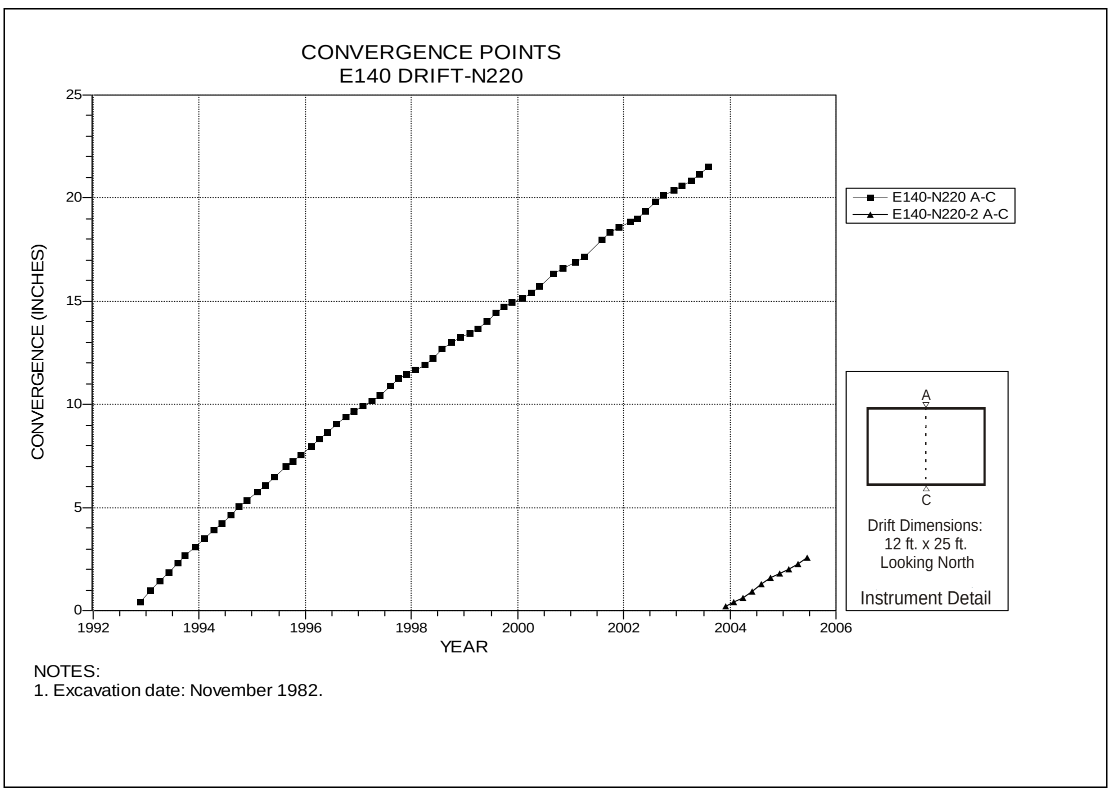


Figure 4-84 Convergence Point Array
E140 Drift at N220 – Roof to Floor

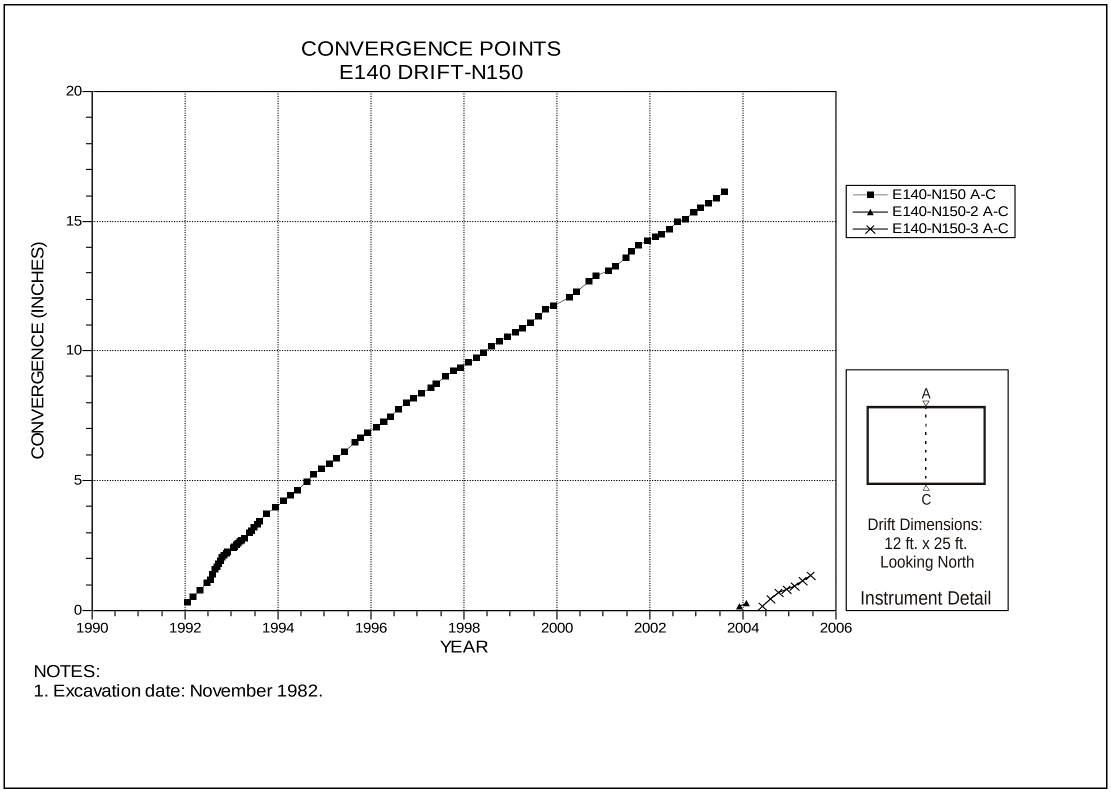


Figure 4-85 Convergence Point Array
E140 Drift at N150 Drift Intersection – Roof to Floor

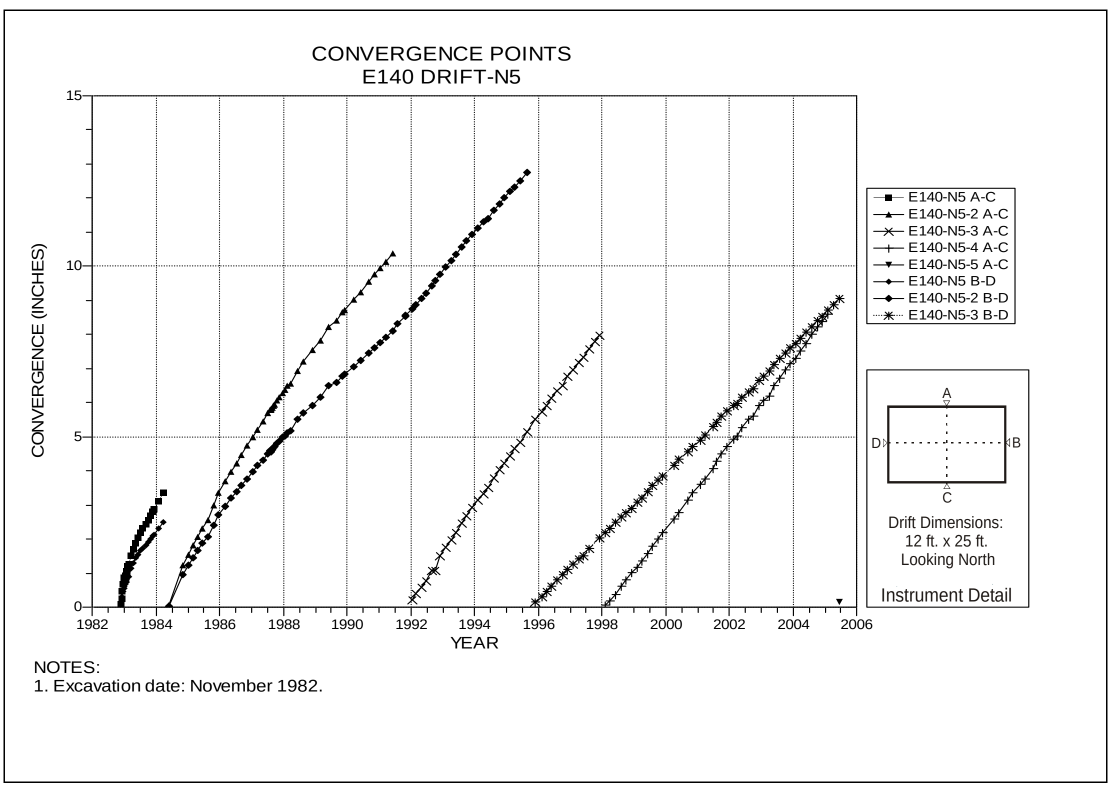


Figure 4-86 Convergence Point Array
E140 Drift at N5 – All Chords

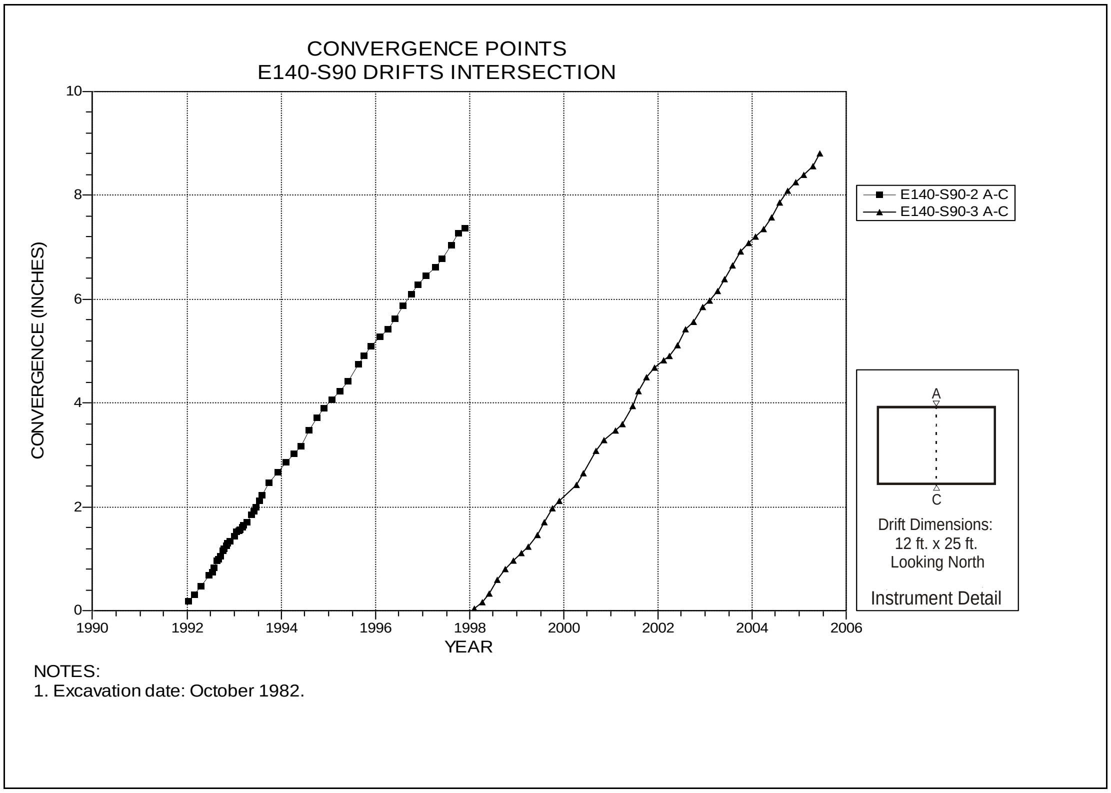


Figure 4-87 Convergence Point Array
E140 Drift at S90 Drift Intersection – Roof to Floor

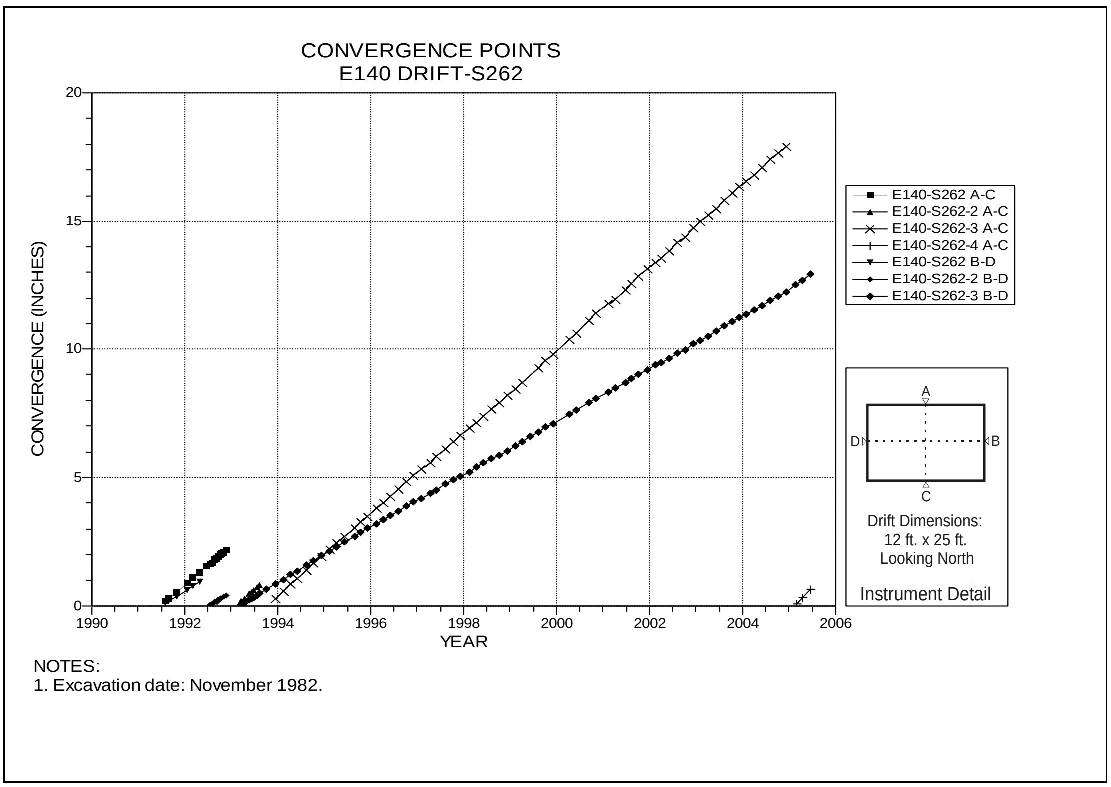


Figure 4-88 Convergence Point Array
E140 Drift at S262 – All Chords

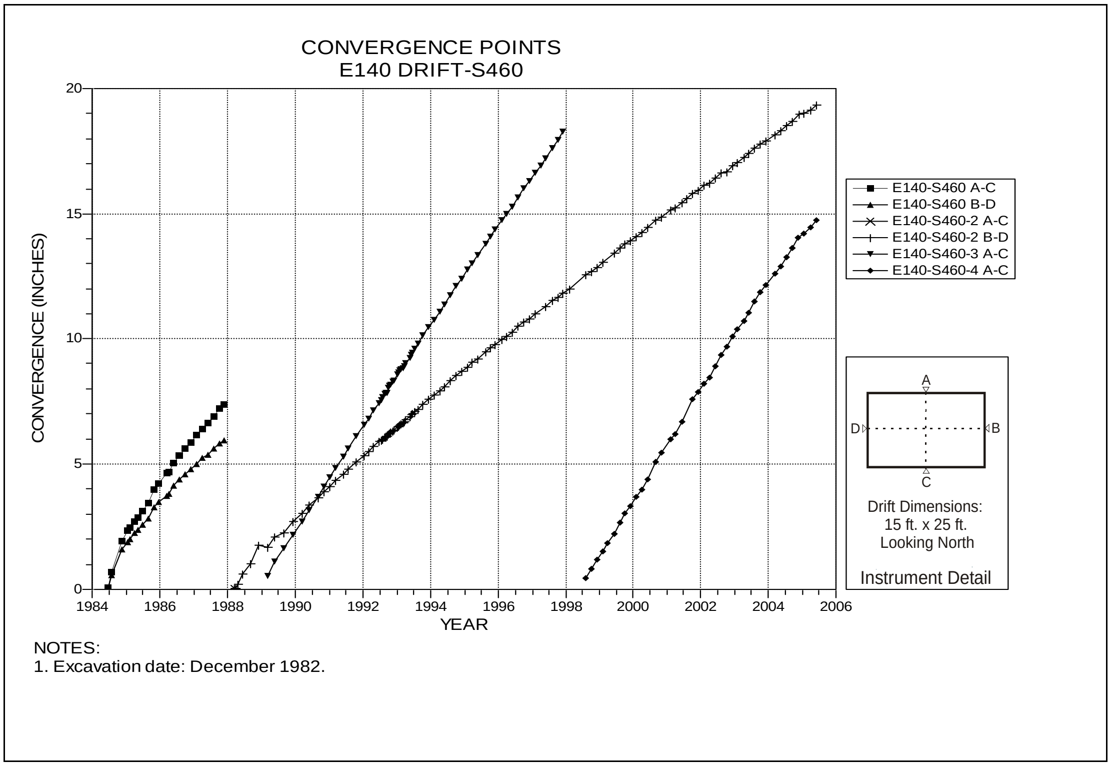


Figure 4-89 Convergence Point Array
E140 Drift at S460 – All Chords

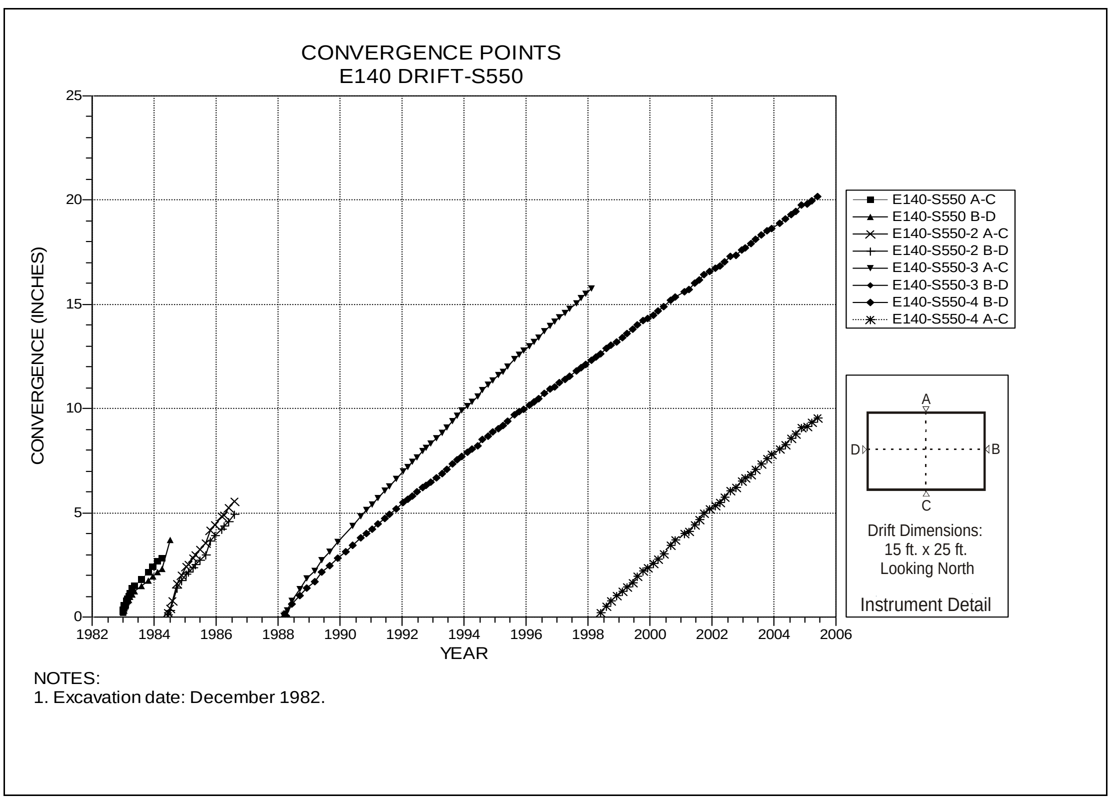
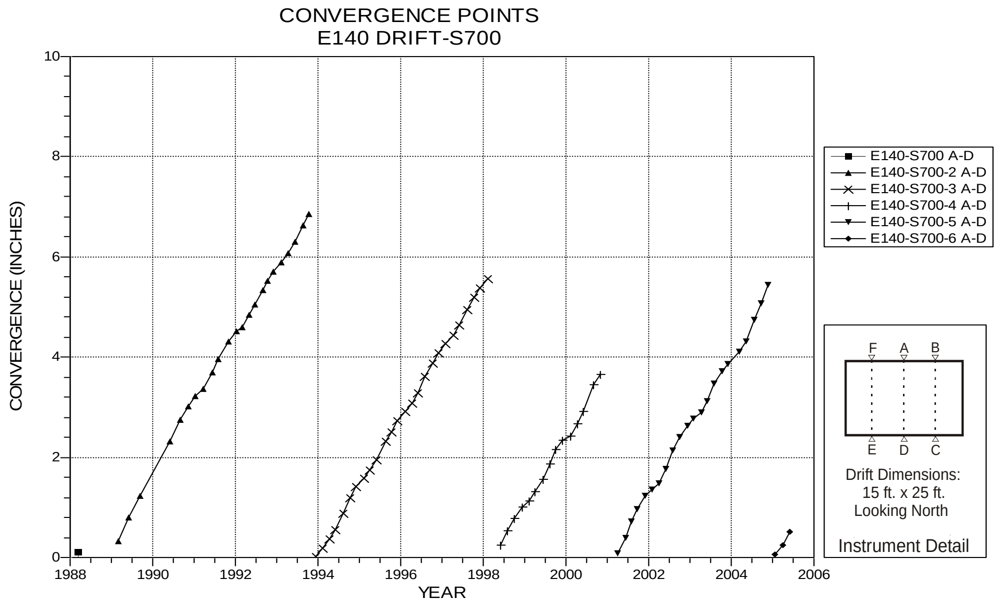
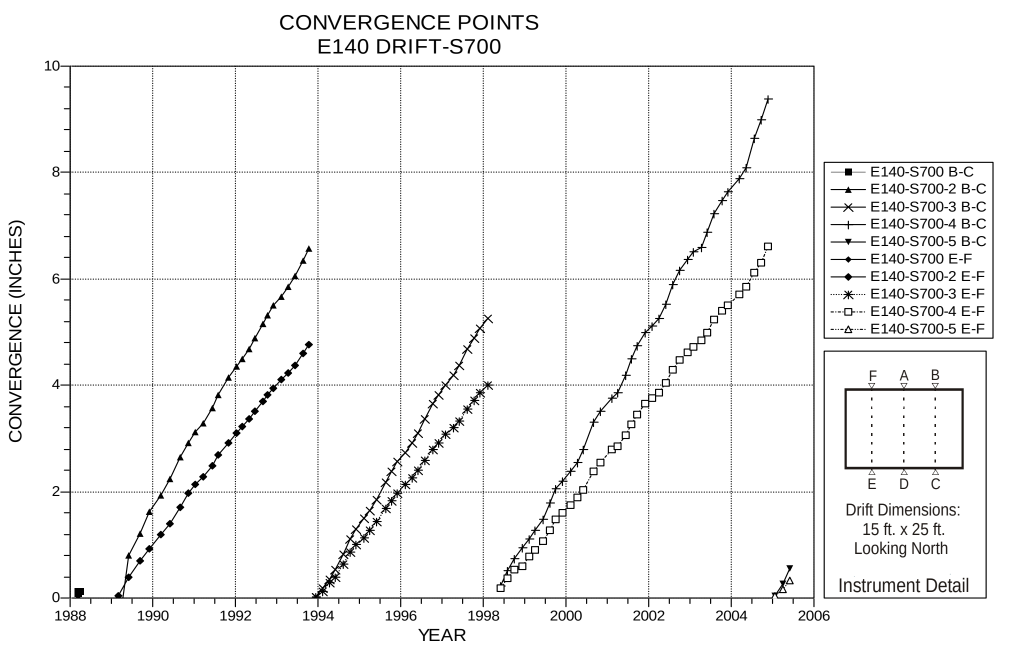


Figure 4-90 Convergence Point Array
E140 Drift at S550 – All Chords



NOTES:
1. Excavation date: December 1982.

Figure 4-91 Convergence Point Array
E140 Drift at S700 Drift Intersection – Roof to Floor Centerline



NOTES:
1. Excavation date: December 1982.

Figure 4-92 Convergence Point Array
E140 Drift at S700 Drift Intersection – Roof to Floor Quarter Points

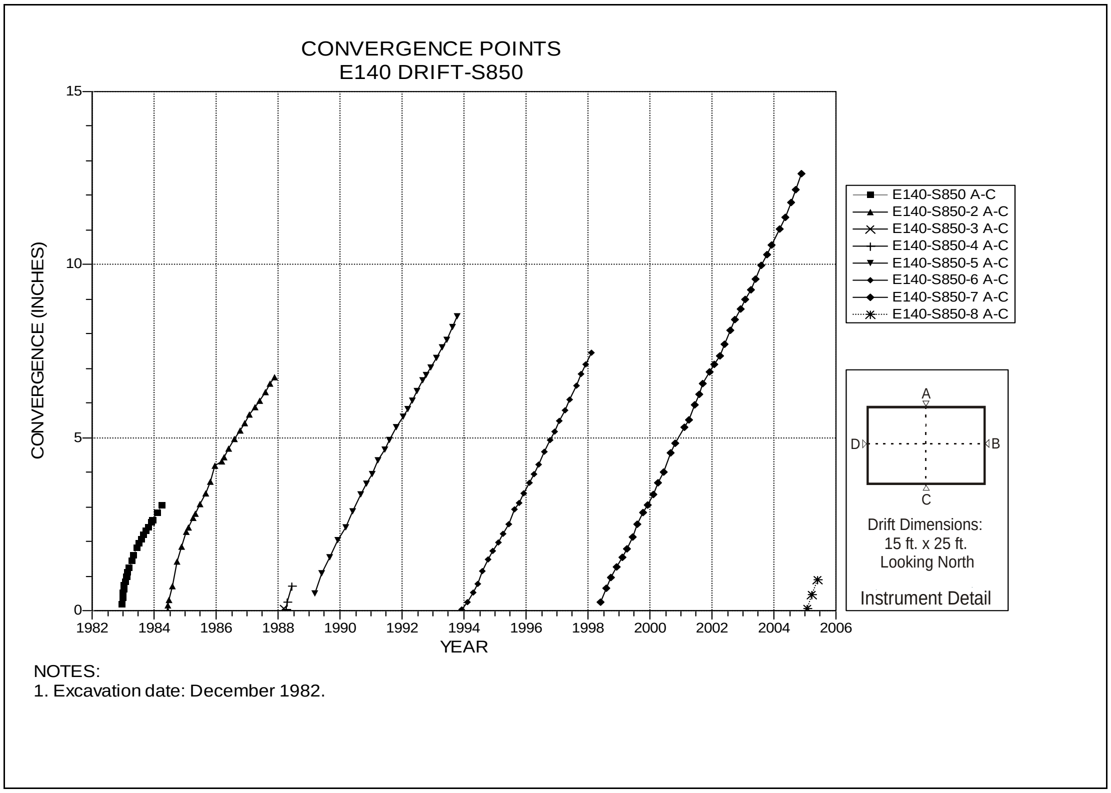


Figure 4-93 Convergence Point Array
E140 Drift at S850 – Roof to Floor

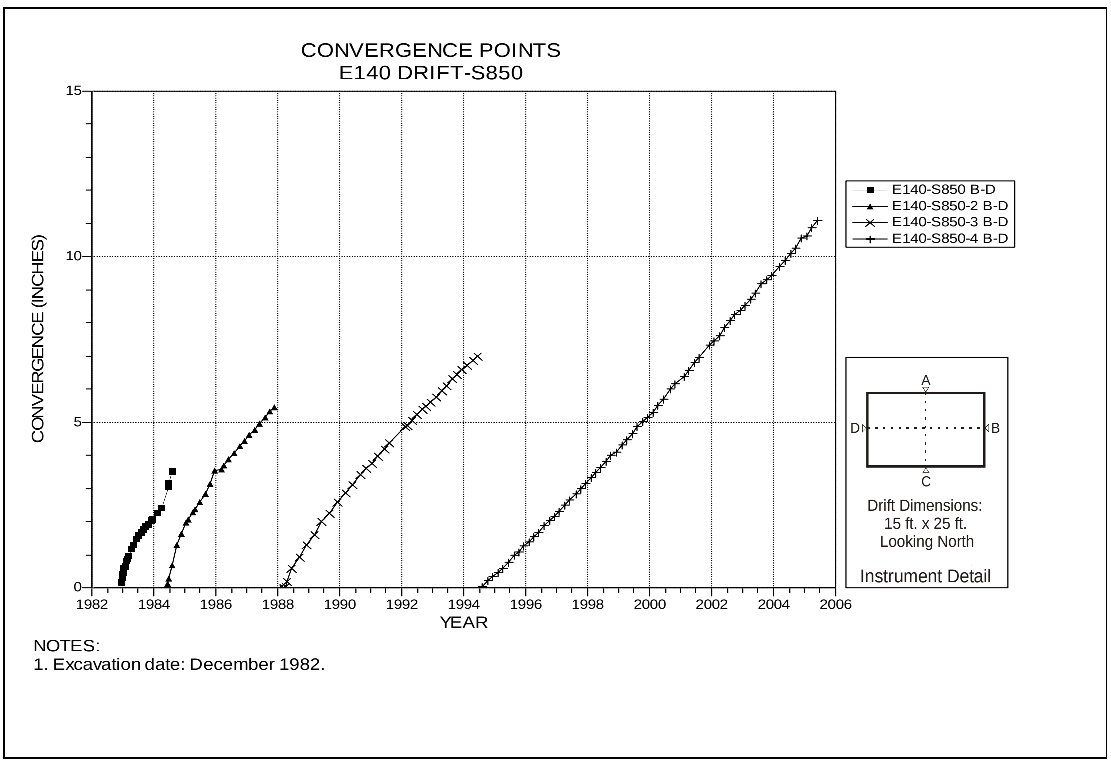


Figure 4-94 Convergence Point Array
E140 Drift at S850 – Rib to Rib

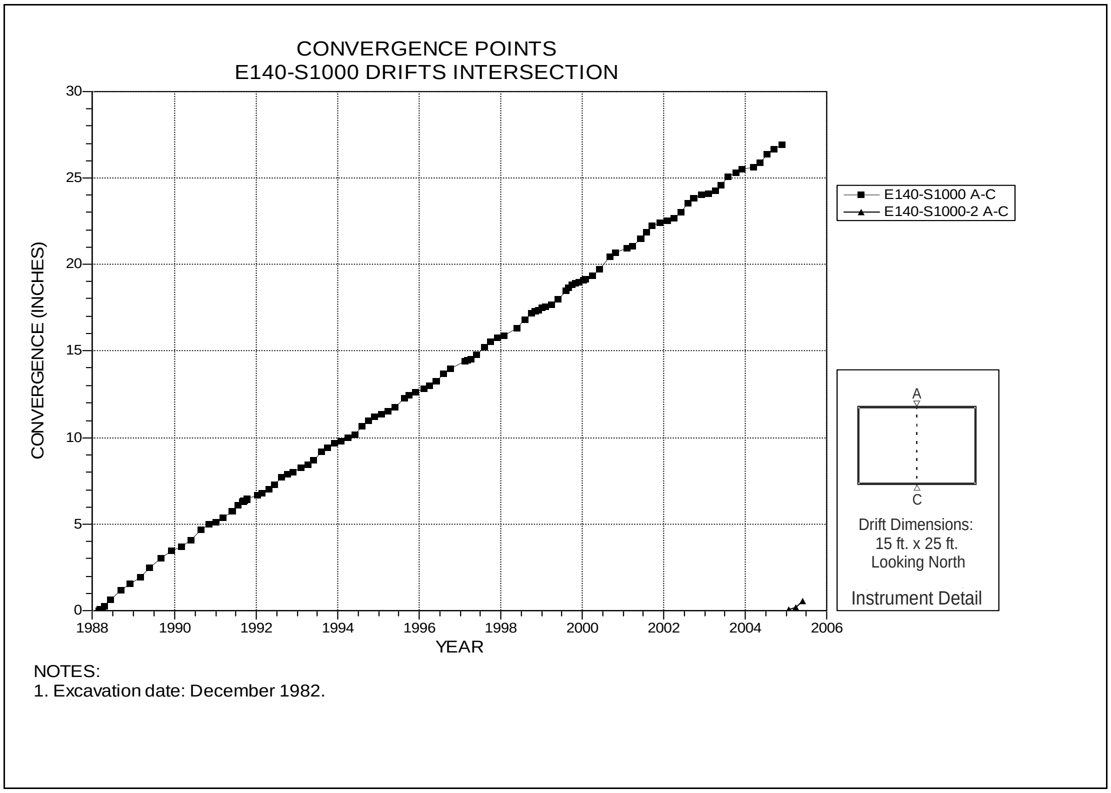


Figure 4-95 Convergence Point Array
E140 Drift at S1000 Drift Intersection – Roof to Floor

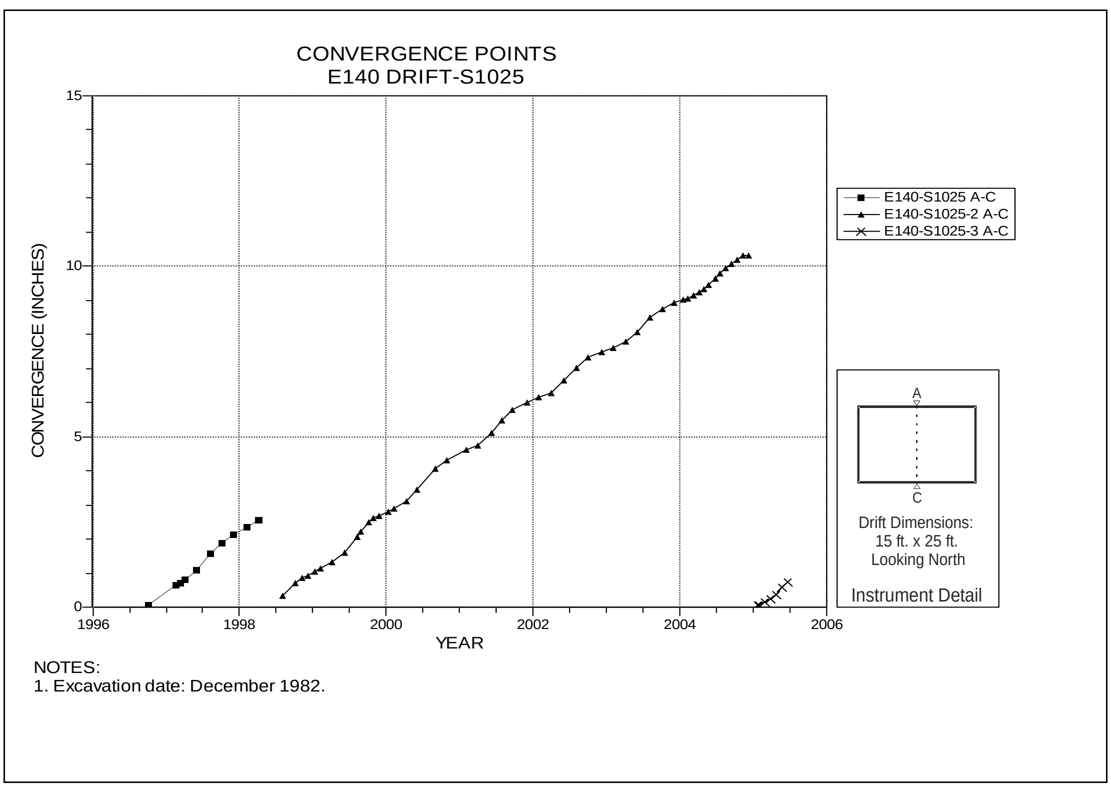


Figure 4-96 Convergence Point Array
E140 Drift at S1025 – Roof to Floor

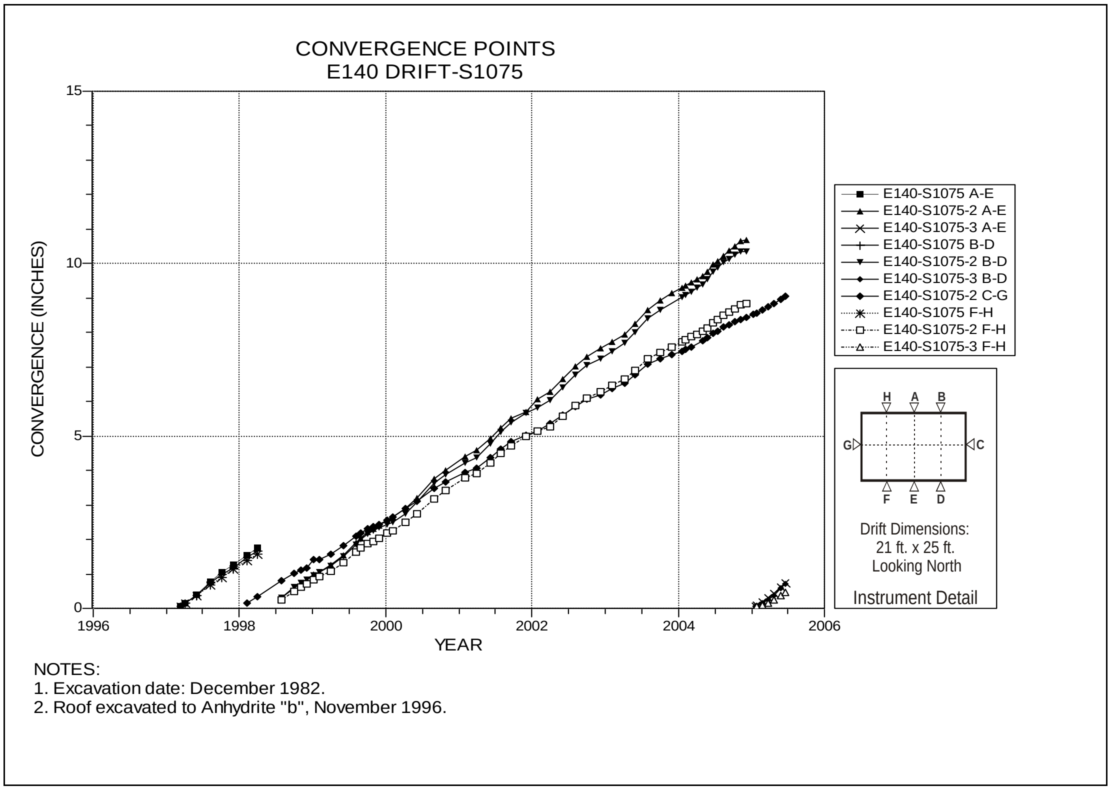


Figure 4-97 Convergence Point Array
E140 Drift at S1075 – All Chords

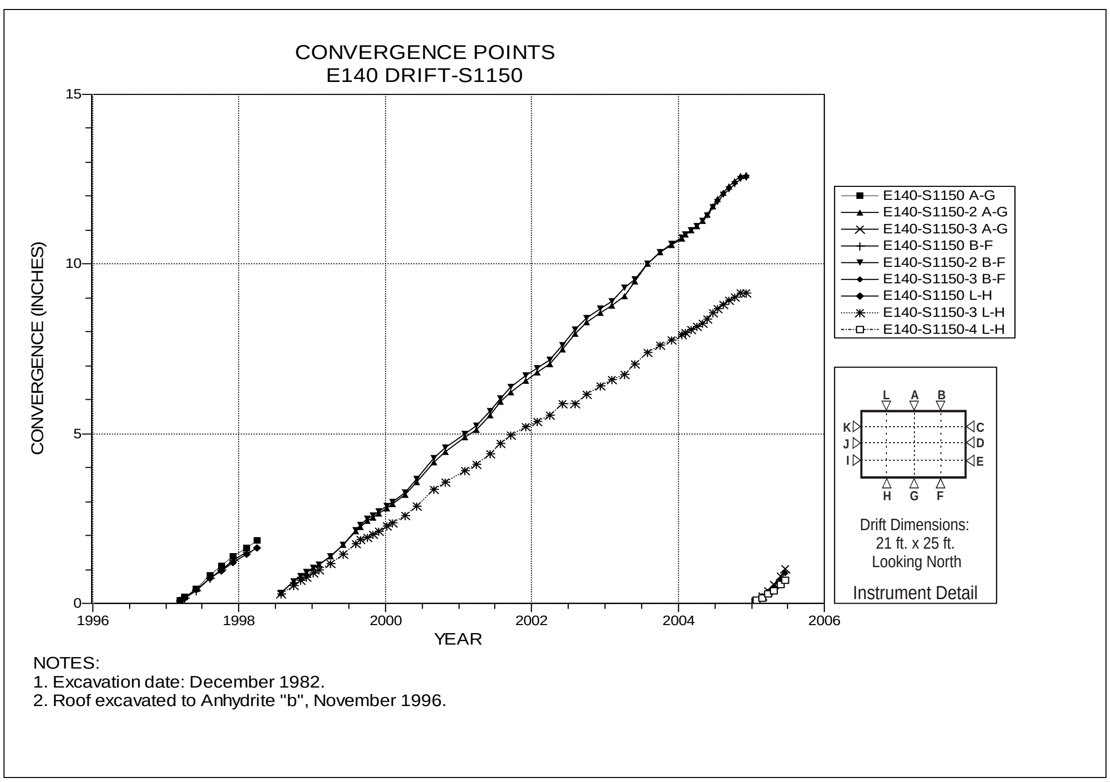


Figure 4-98 Convergence Point Array
E140 Drift at S1150 – Roof to Floor

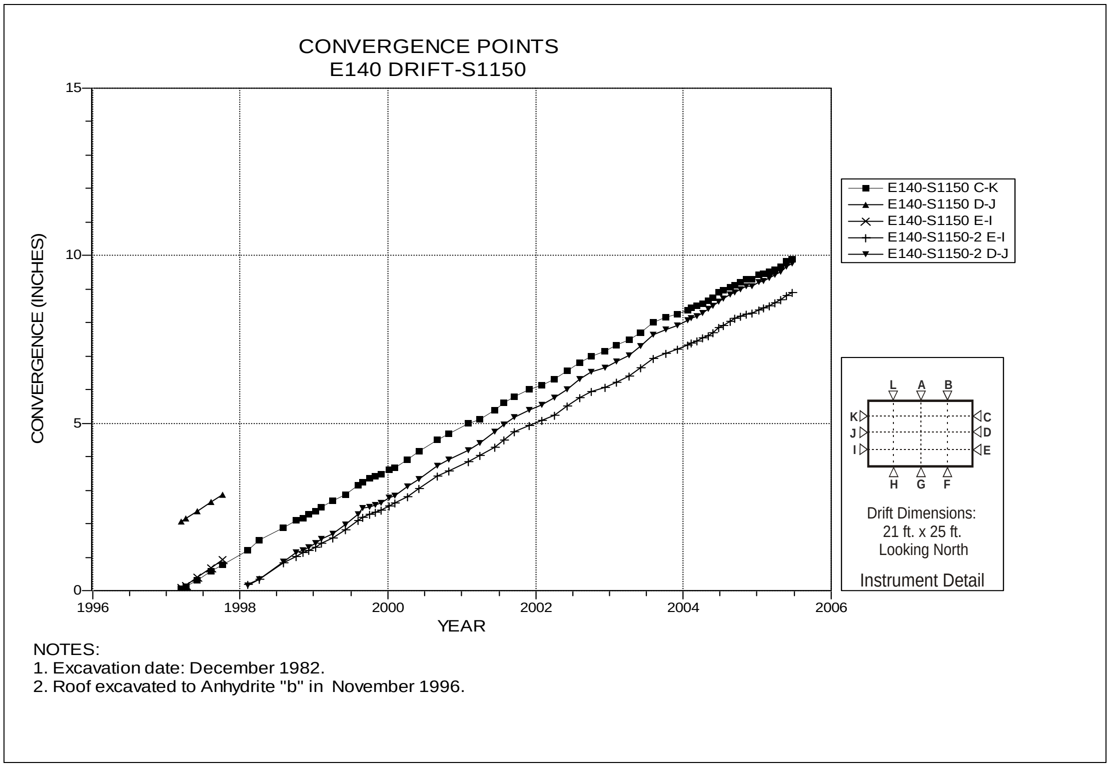


Figure 4-99 Convergence Point Array
E140 Drift at S1150 – Rib to Rib

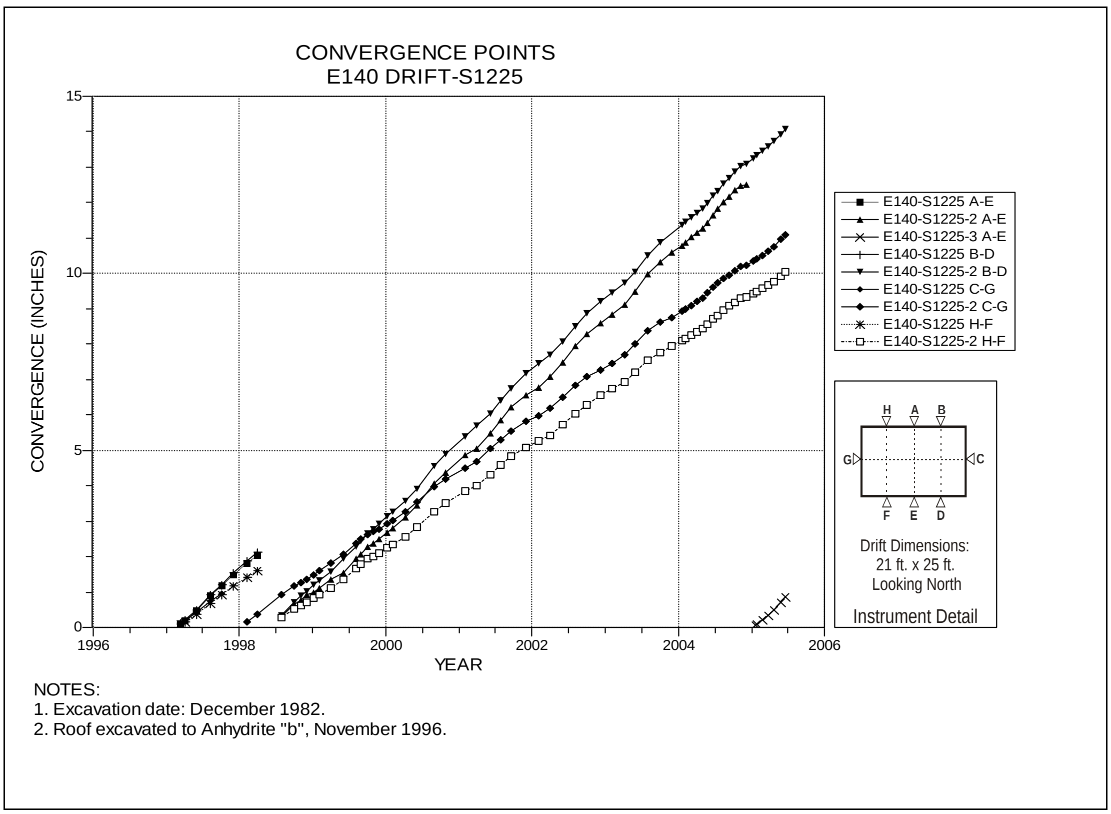


Figure 4-100 Convergence Point Array
E140 Drift at S1225 – All Chords

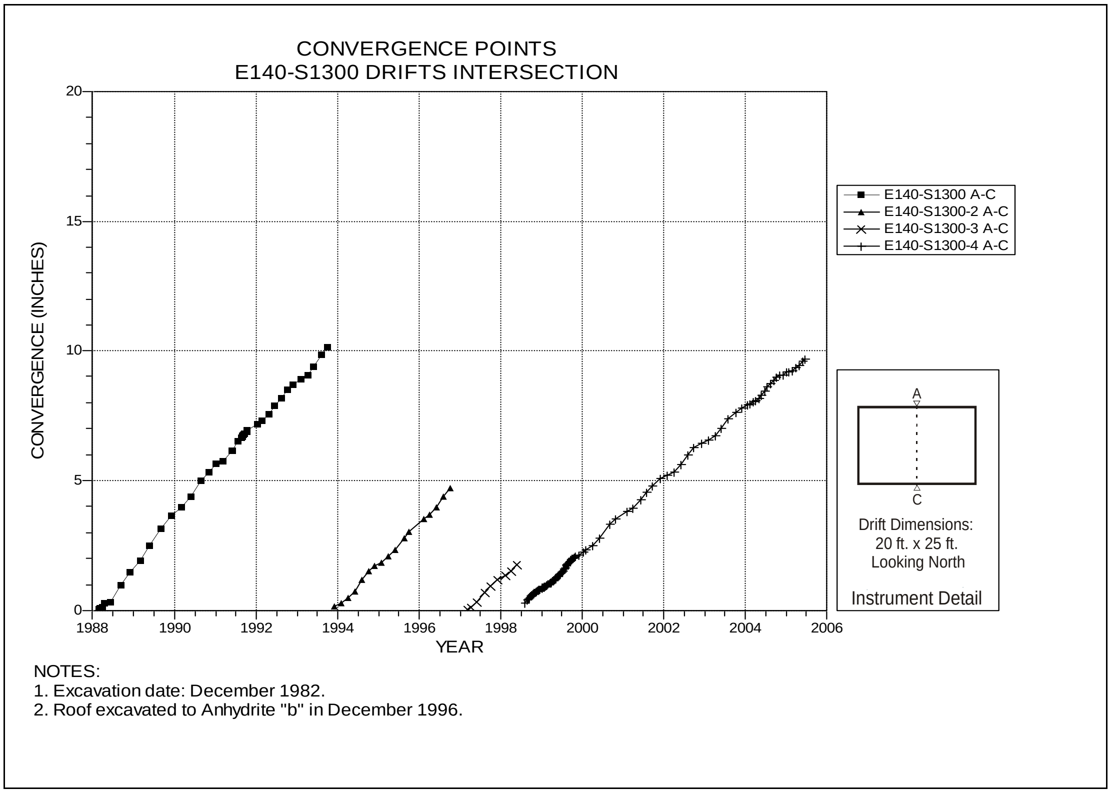


Figure 4-101 Convergence Point Array
E140 Drift at S1300 Drift Intersection – Roof to Floor

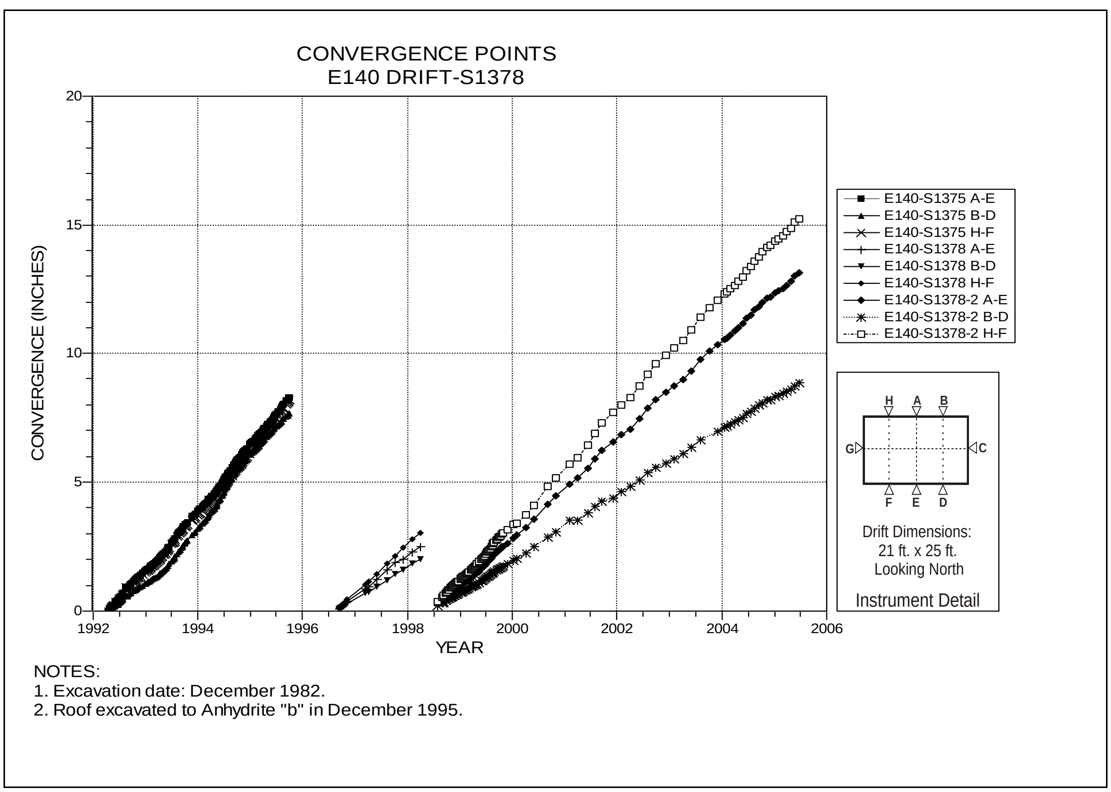


Figure 4-102 Convergence Point Array
E140 Drift at S1378 – Roof to Floor

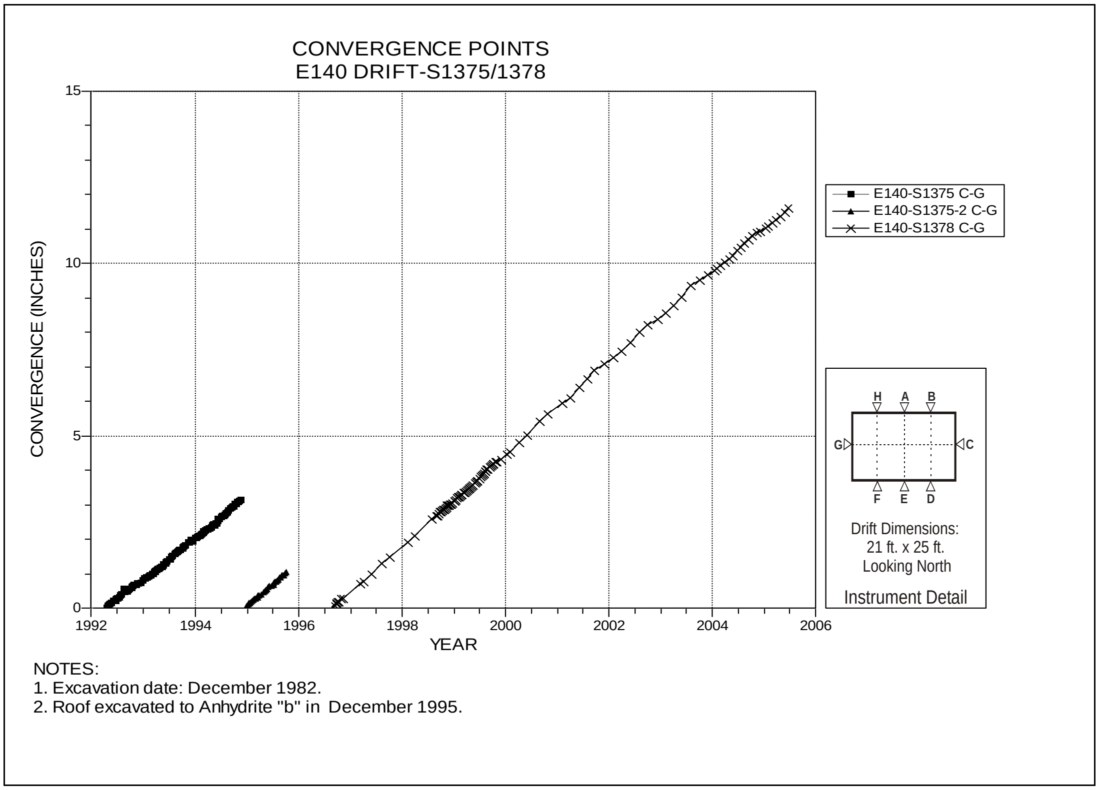


Figure 4-103 Convergence Point Array
E140 Drift at S1378 – Rib to Rib

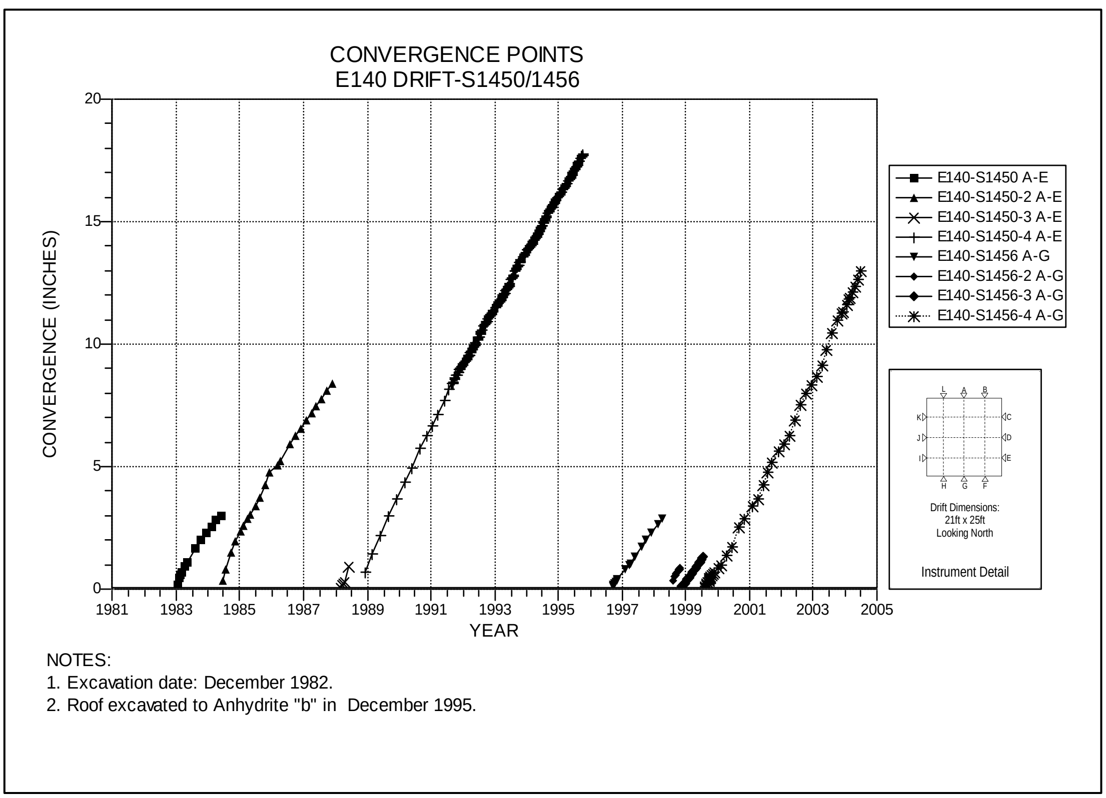
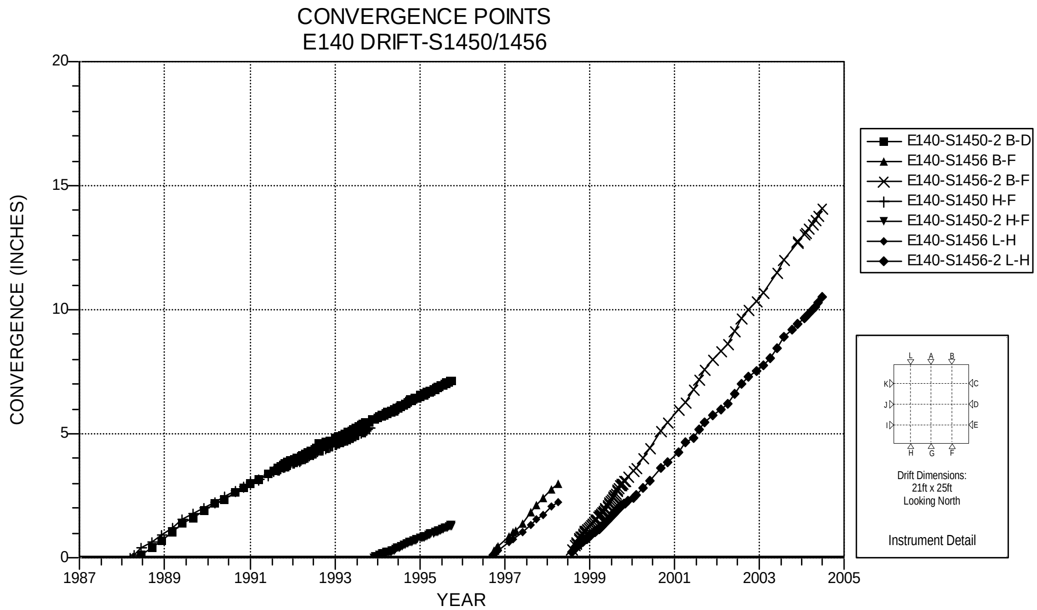
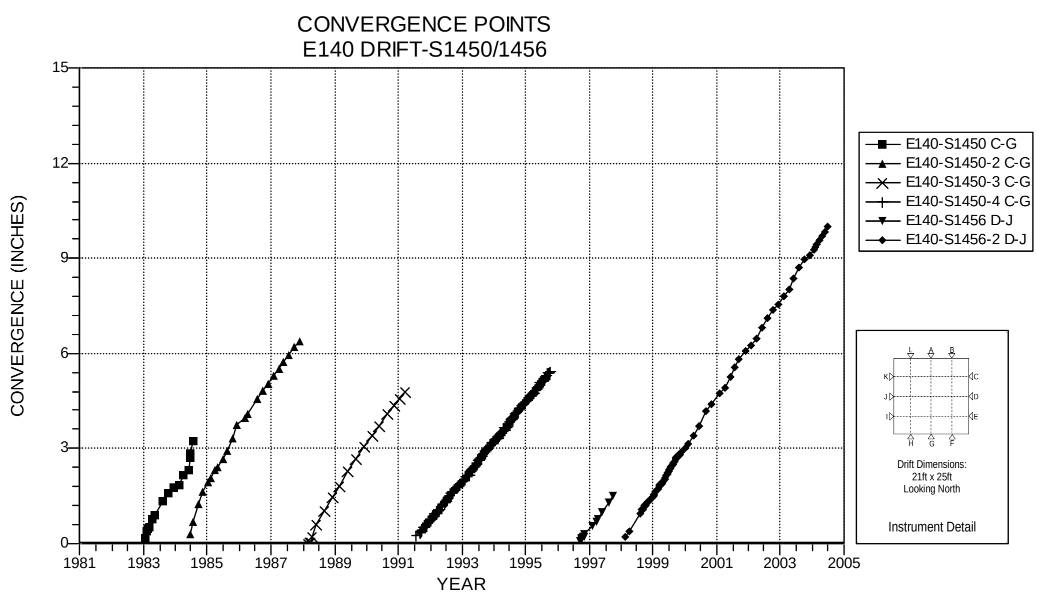


Figure 4-104 Convergence Point Array
E140 Drift at S1450/1456 – Roof to Floor – Centerline



NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b" in December 1995.

Figure 4-105 Convergence Point Array
E140 Drift at S1450/S1456 – Roof to Floor – Quarter Points



NOTES:
1. Excavation date: December 1982.
2. Roof excavated to Anhydrite "b" in December 1995.

Figure 4-106 Convergence Point Array
E140 Drift at S1450/S1456 – Rib to Rib – Midheight

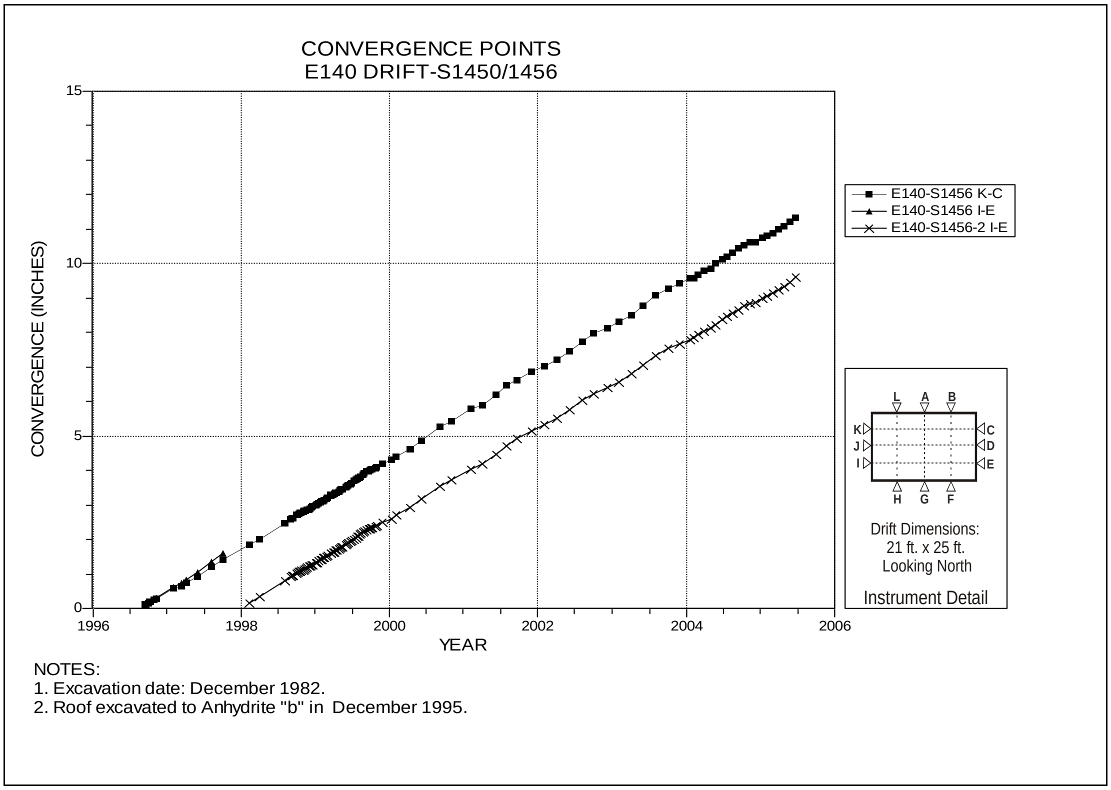


Figure 4-107 Convergence Point Array
E140 Drift at S1450/S1456 – Rib to Rib – Quarter Points

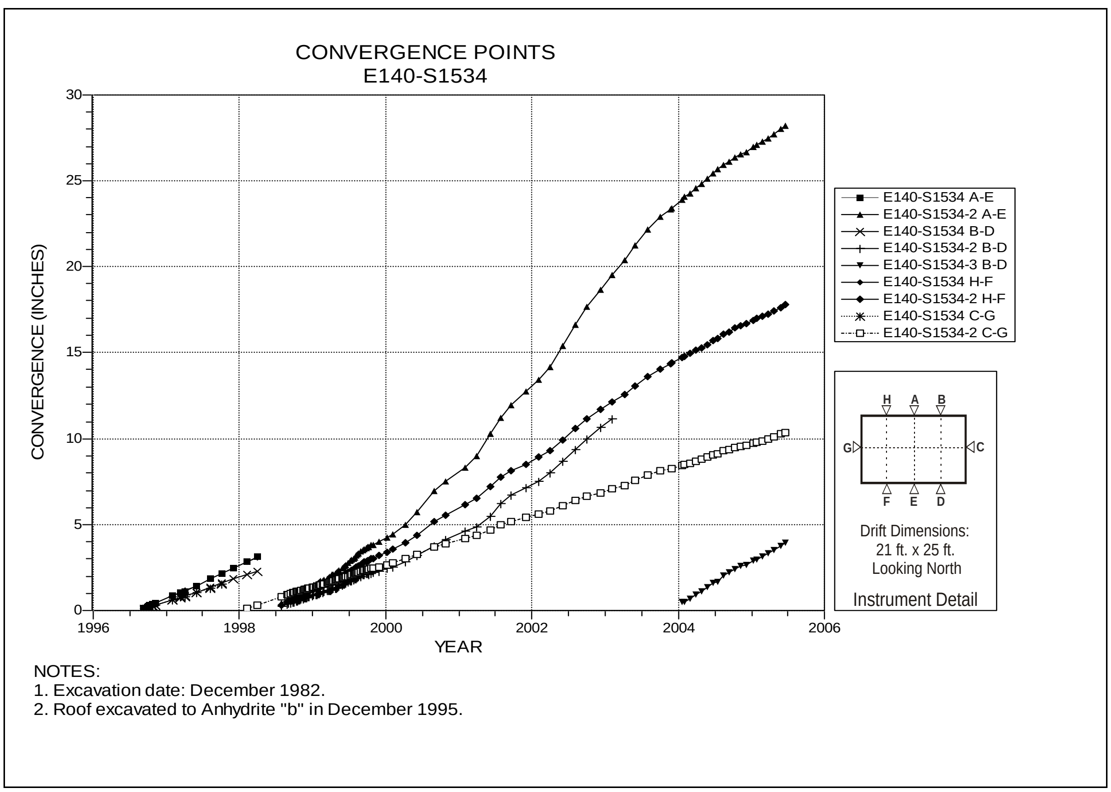


Figure 4-108 Convergence Point Array
E140 Drift at S1534 – All Chords

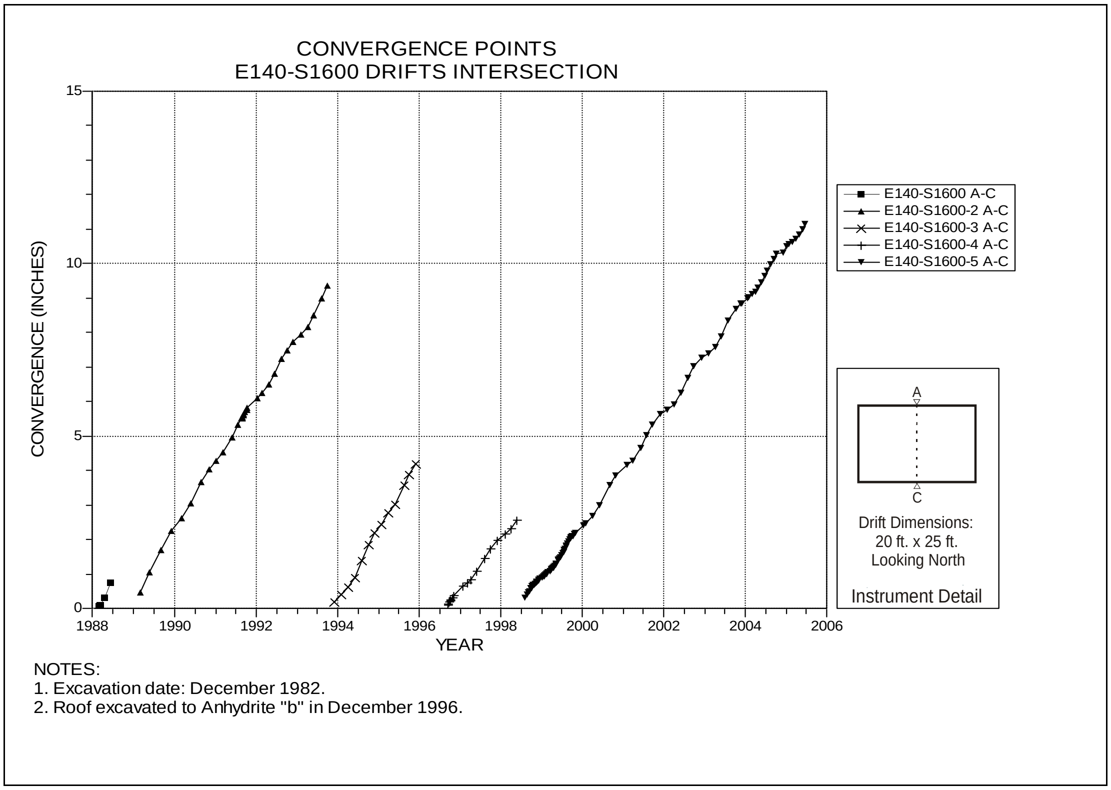


Figure 4-109 Convergence Point Array
E140 Drift at S1600 Drift Intersection – Roof to Floor

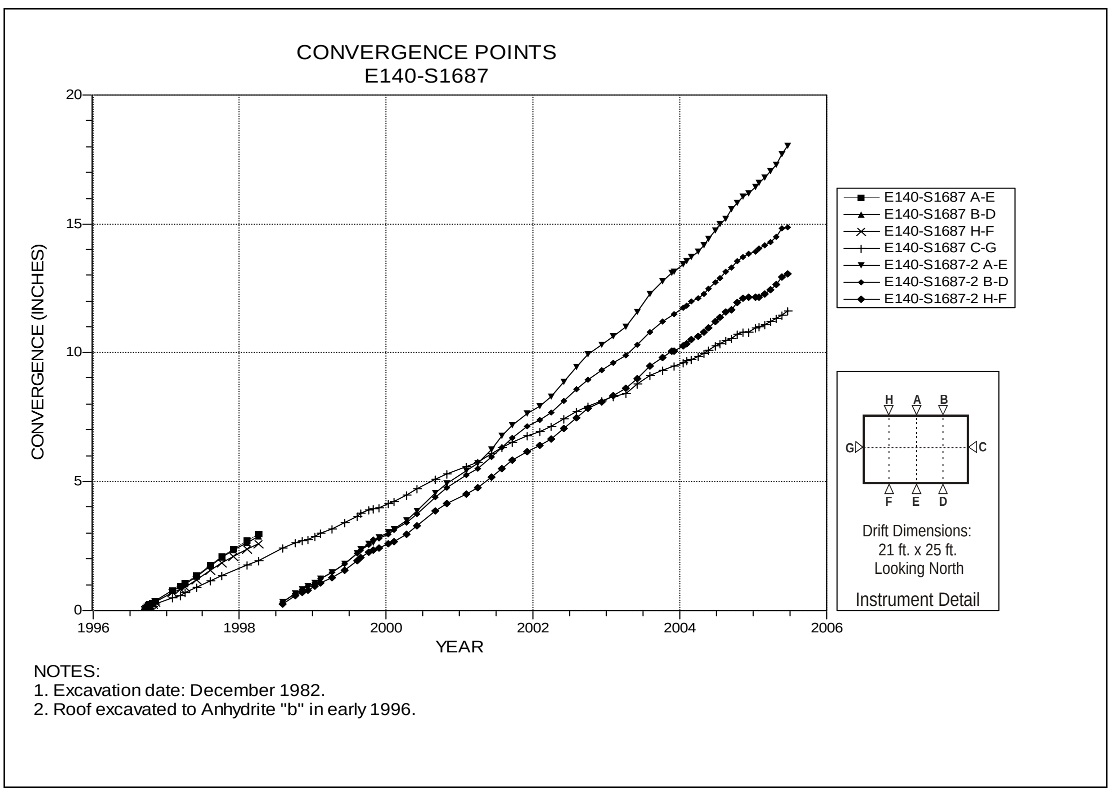


Figure 4-110 Convergence Point Array
E140 Drift at S1687 – All Chords

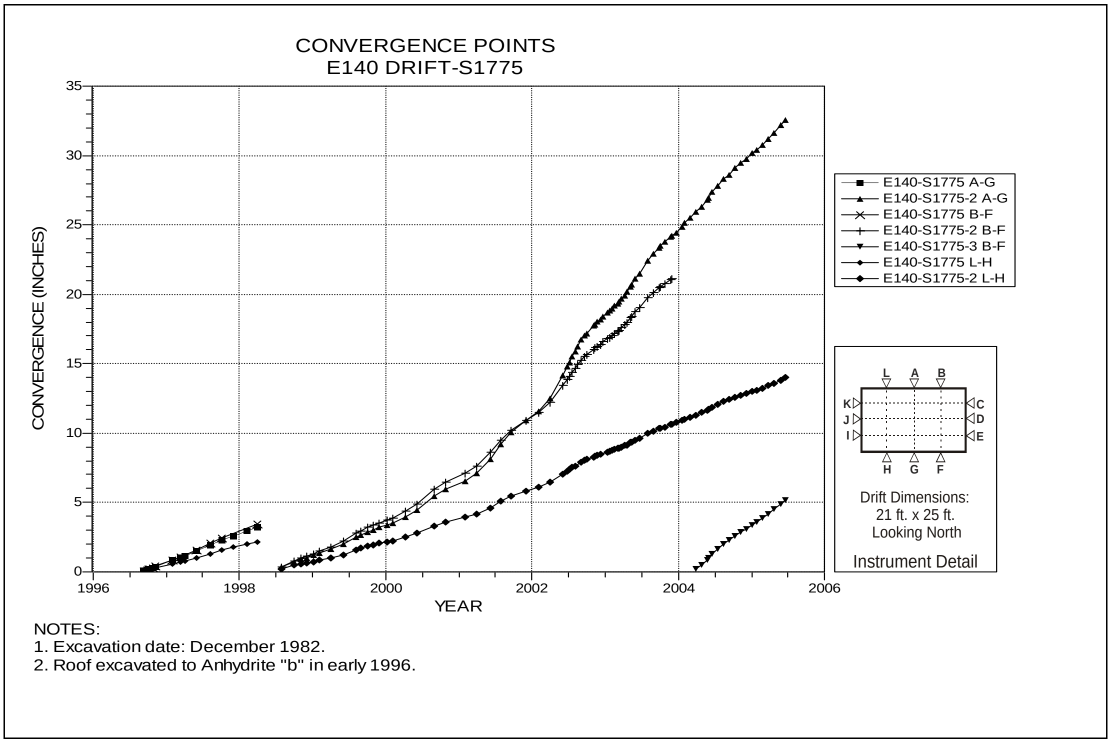


Figure 4-111 Convergence Point Array
E140 Drift at S1775 – Roof to Floor

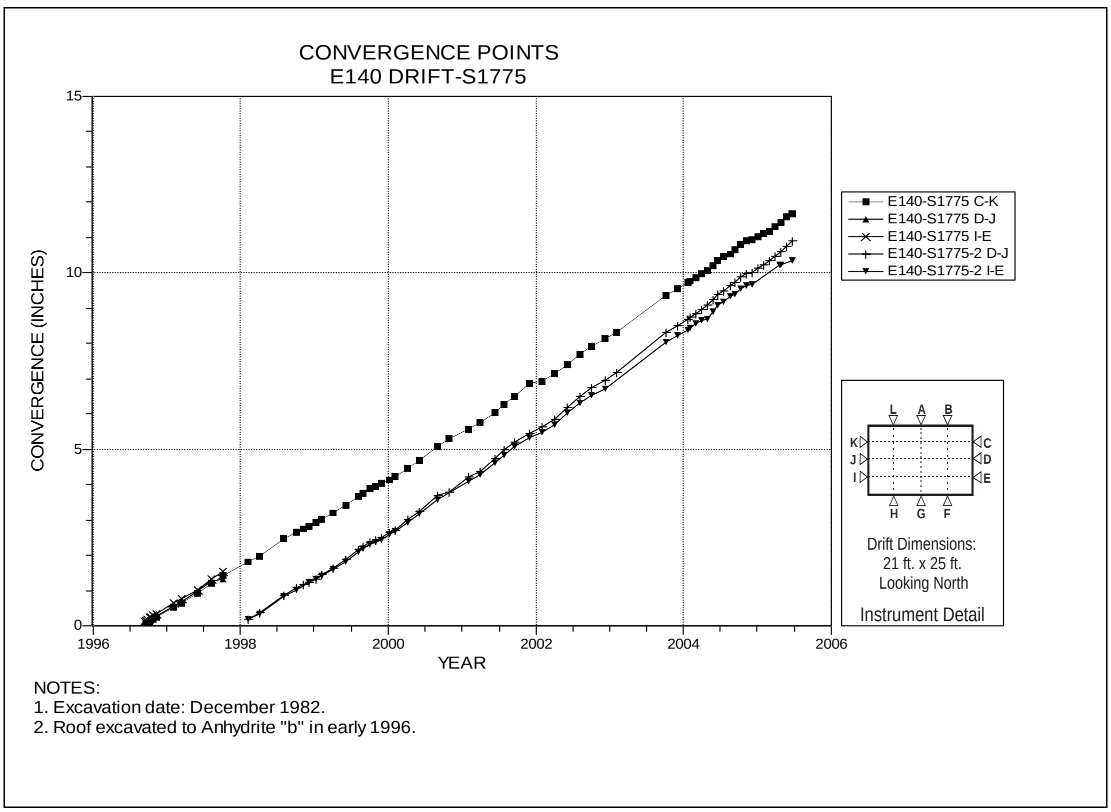


Figure 4-112 Convergence Point Array
E140 Drift at S1775 – Rib to Rib

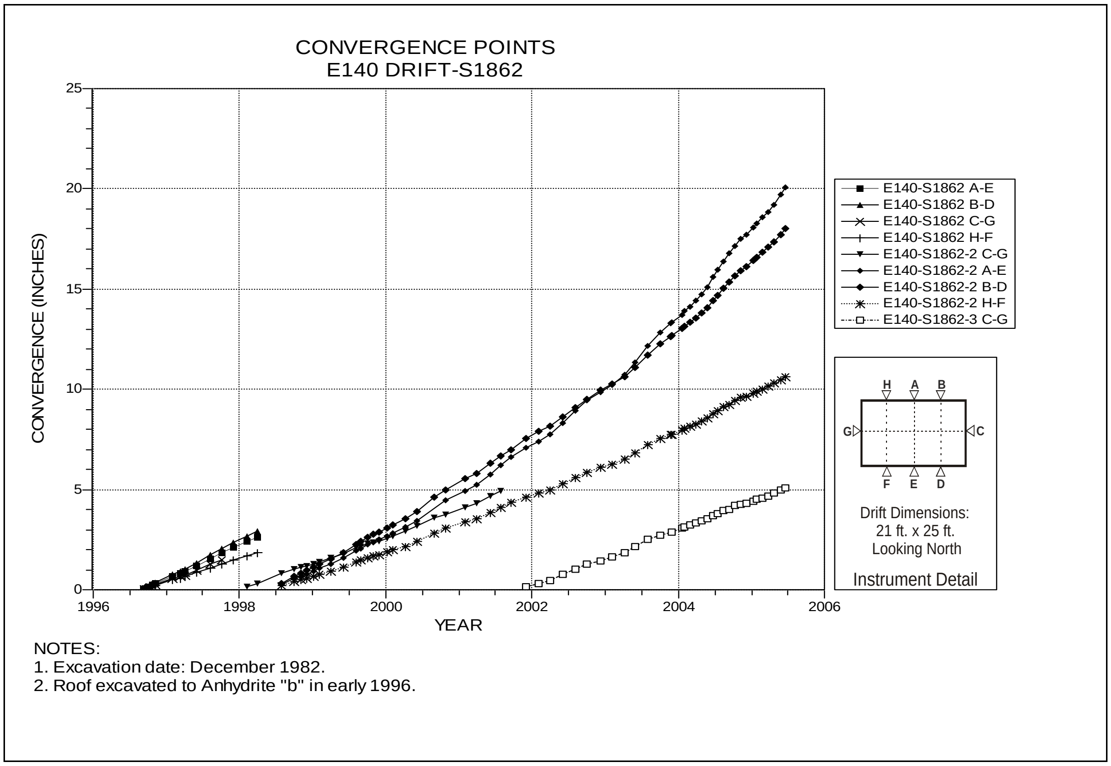


Figure 4-113 Convergence Point Array
E140 Drift at S1862 – All Chords

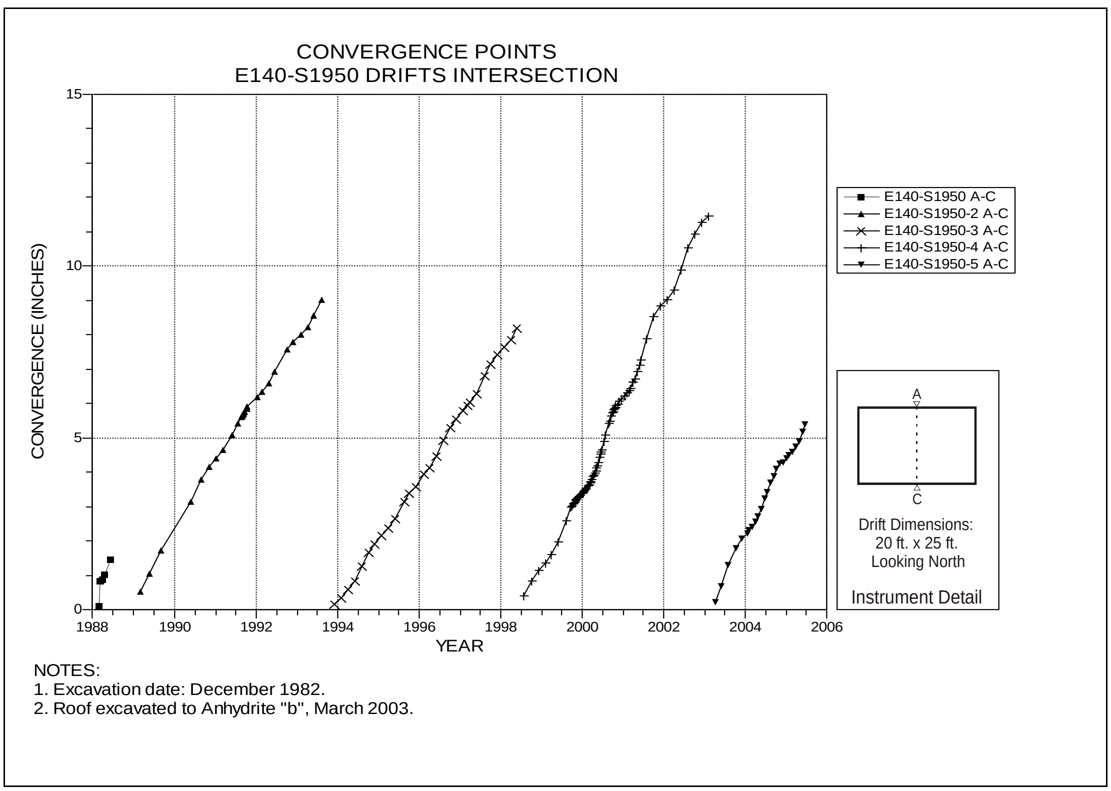


Figure 4-114 Convergence Point Array
E140 Drift at S1950 Drift Intersection – Roof to Floor

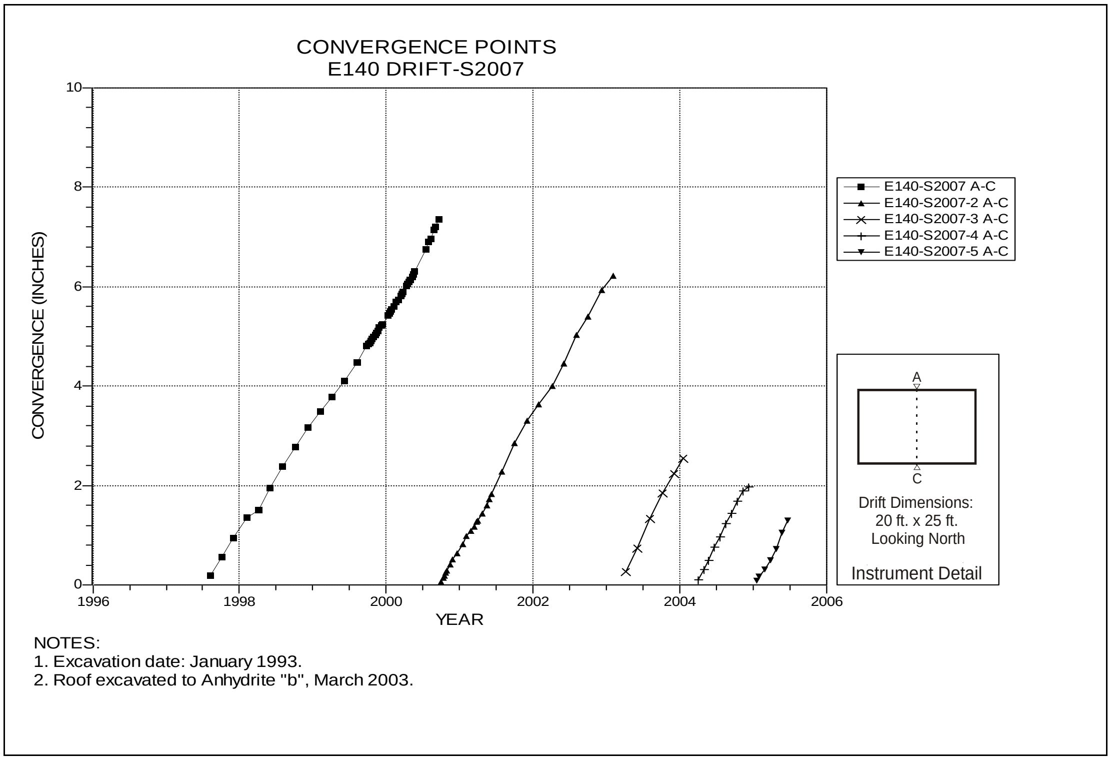


Figure 4-115 Convergence Point Array
E140 Drift at S2007 – Roof to Floor

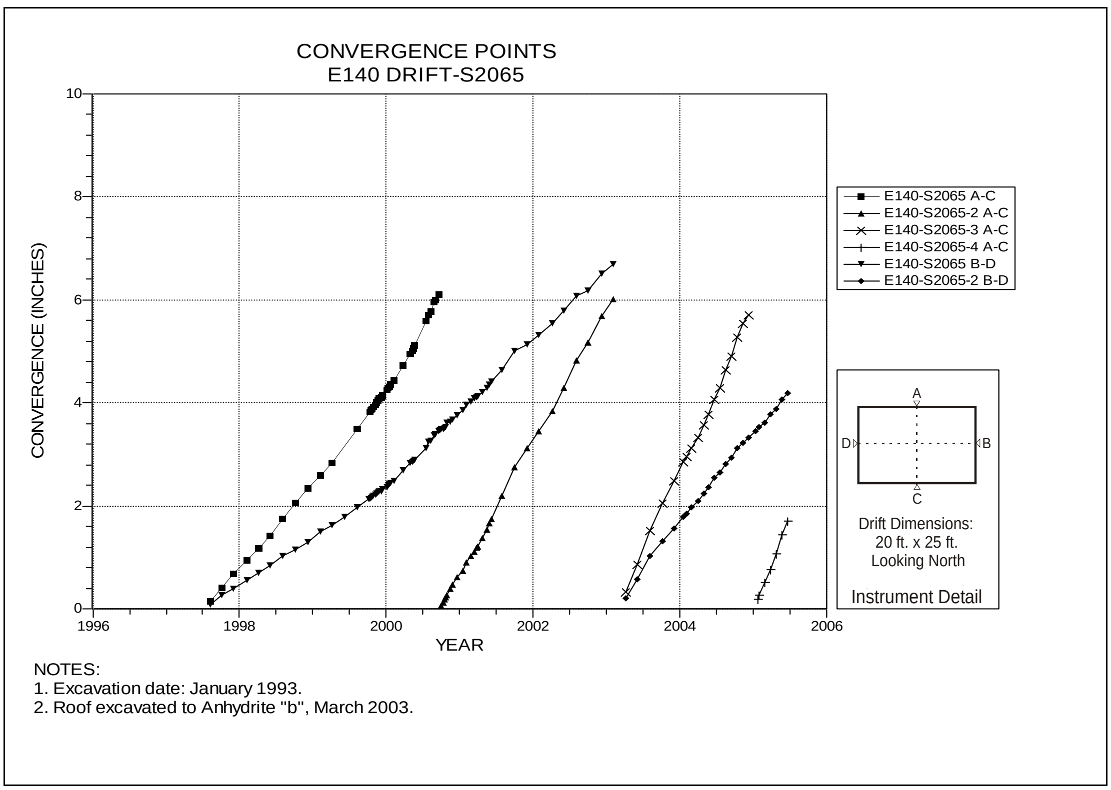


Figure 4-116 Convergence Point Array
E140 Drift at S2065 – All Chords

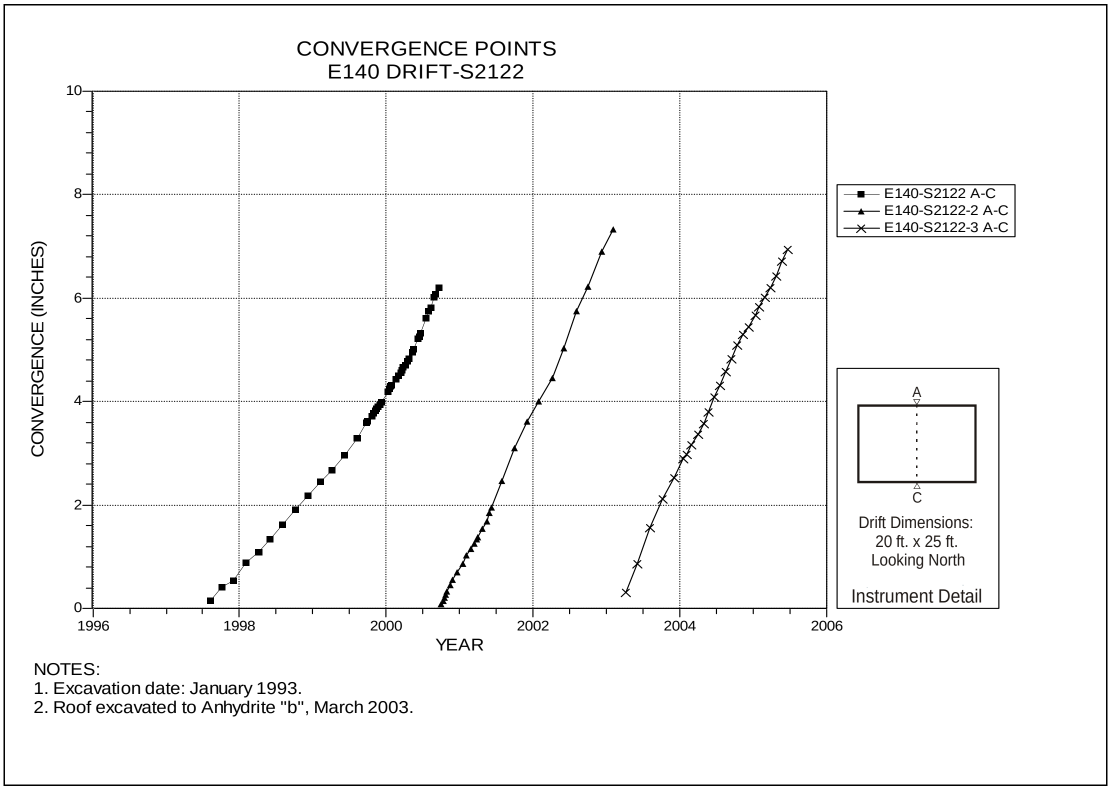


Figure 4-117 Convergence Point Array
E140 Drift at S2122 – Roof to Floor

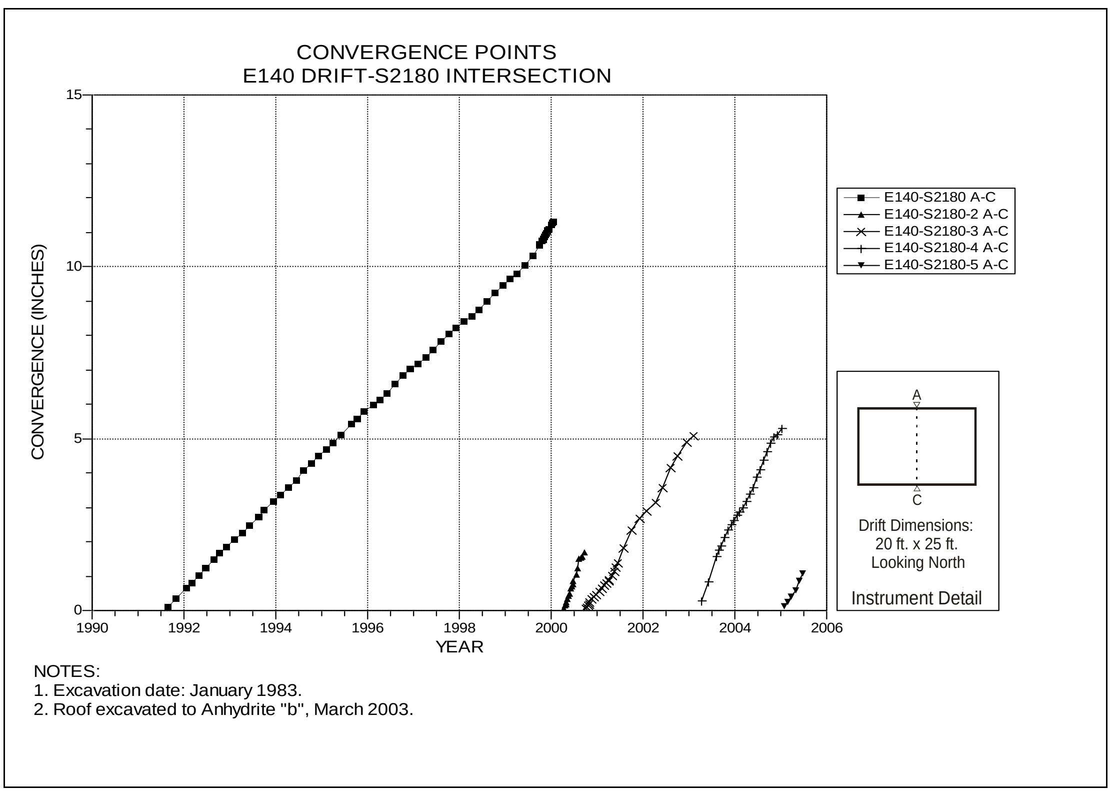


Figure 4-118 Convergence Point Array
E140 Drift at S2180 Drift Intersection – Roof to Floor

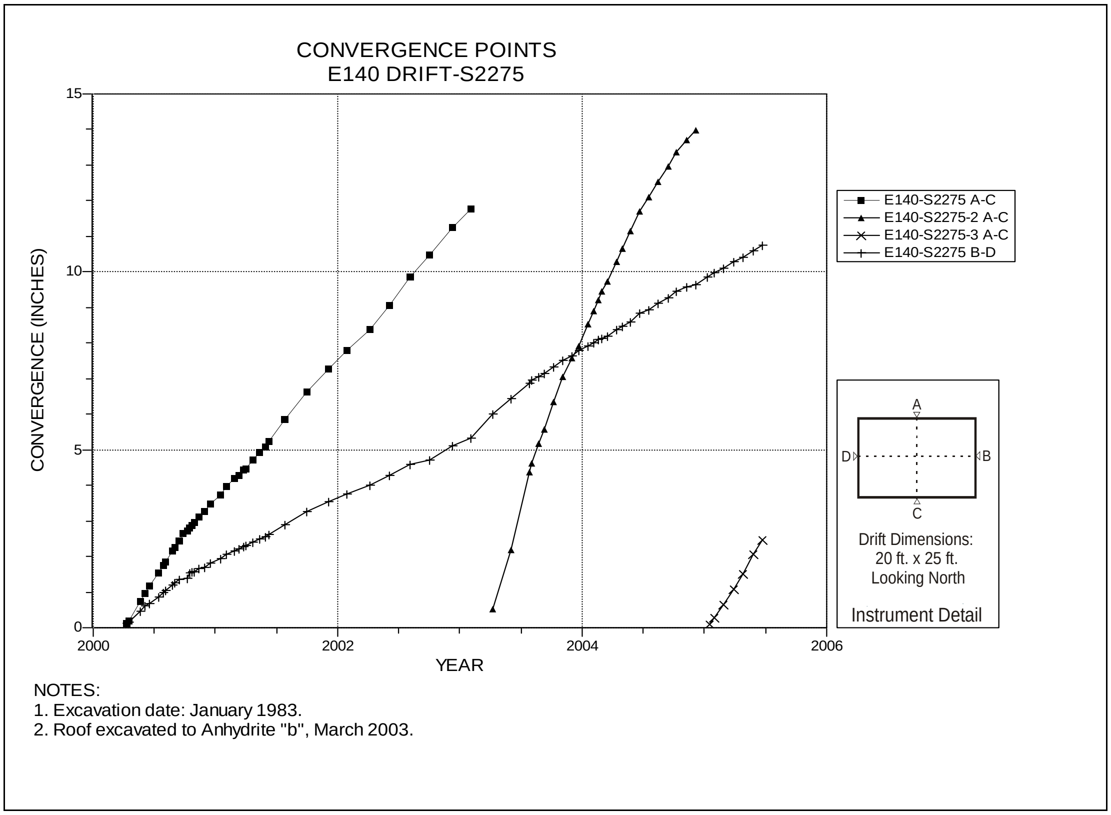


Figure 4-119 Convergence Point Array
E140 Drift at S2275 – All Chords

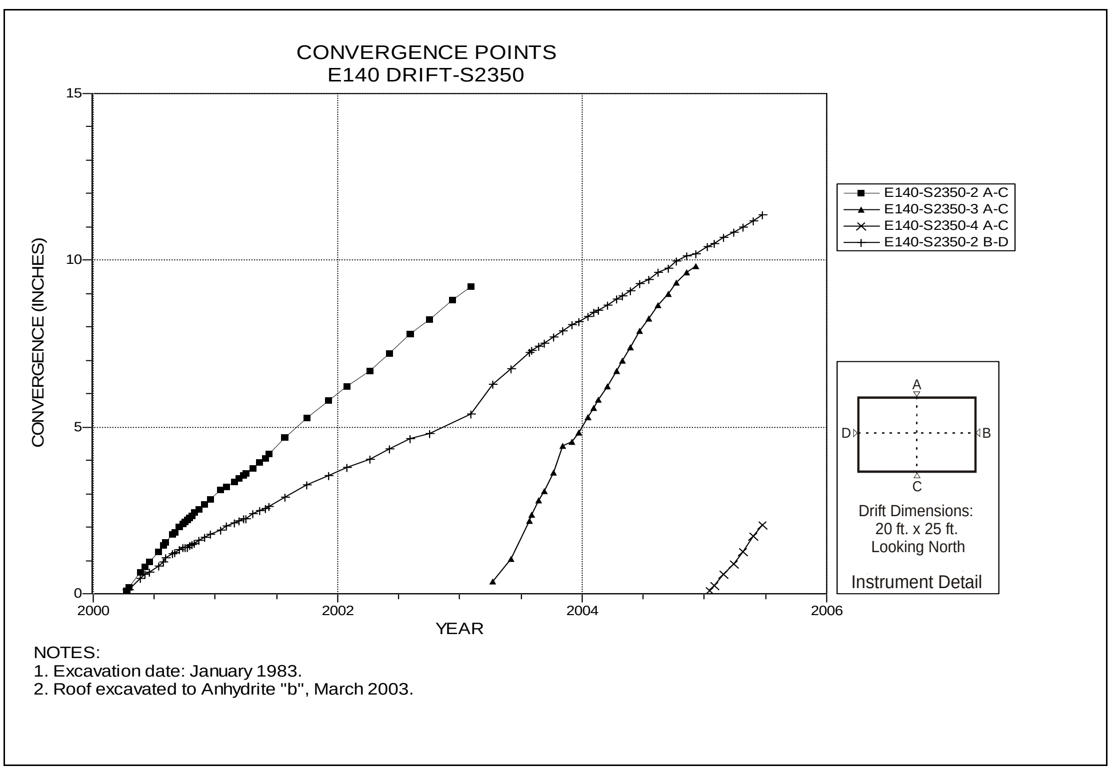


Figure 4-120 Convergence Point Array
E140 Drift at S2350 – All Chords

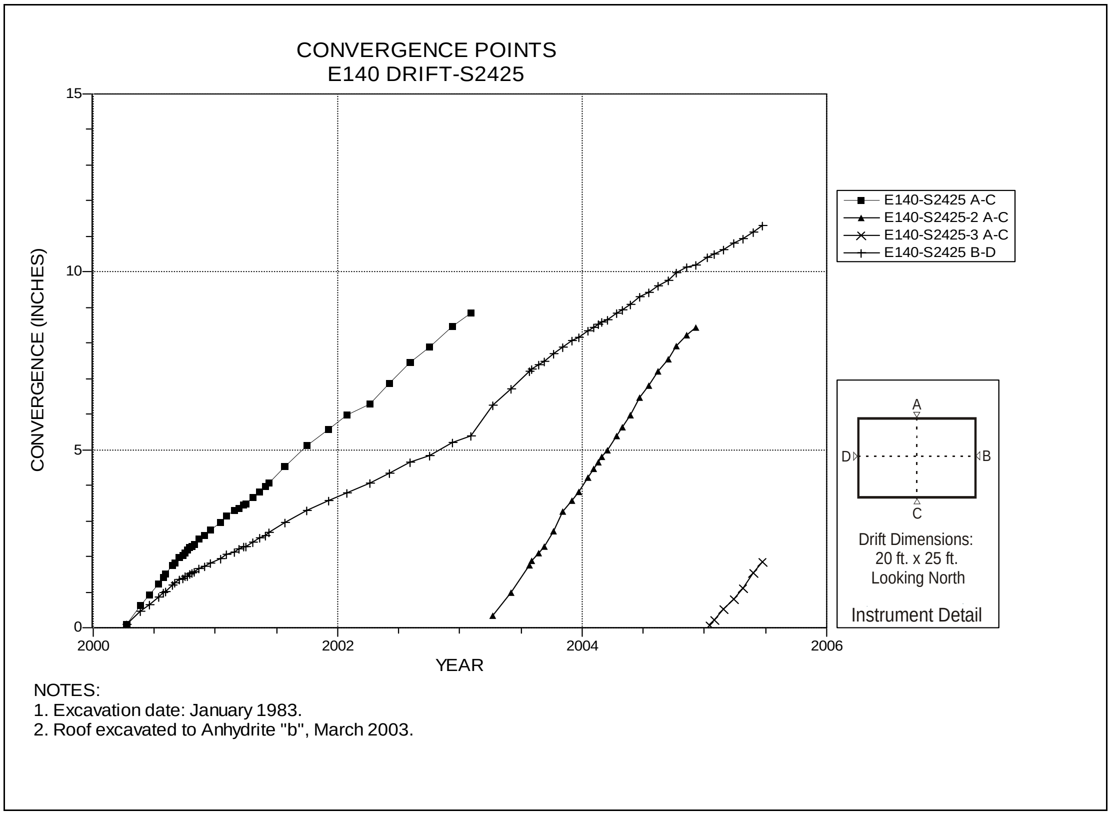


Figure 4-121 Convergence Point Array
E140 Drift at S2425 – All Chords

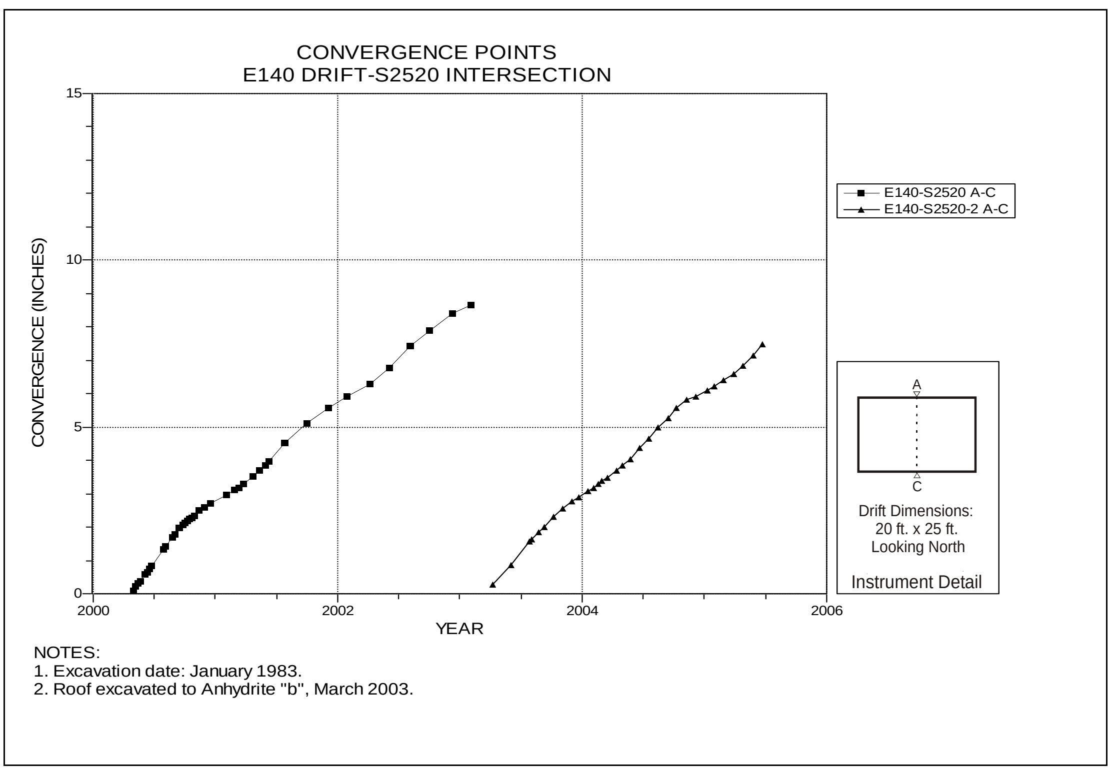


Figure 4-122 Convergence Point Array
E140 Drift at S2520 Drift Intersection – Roof to Floor

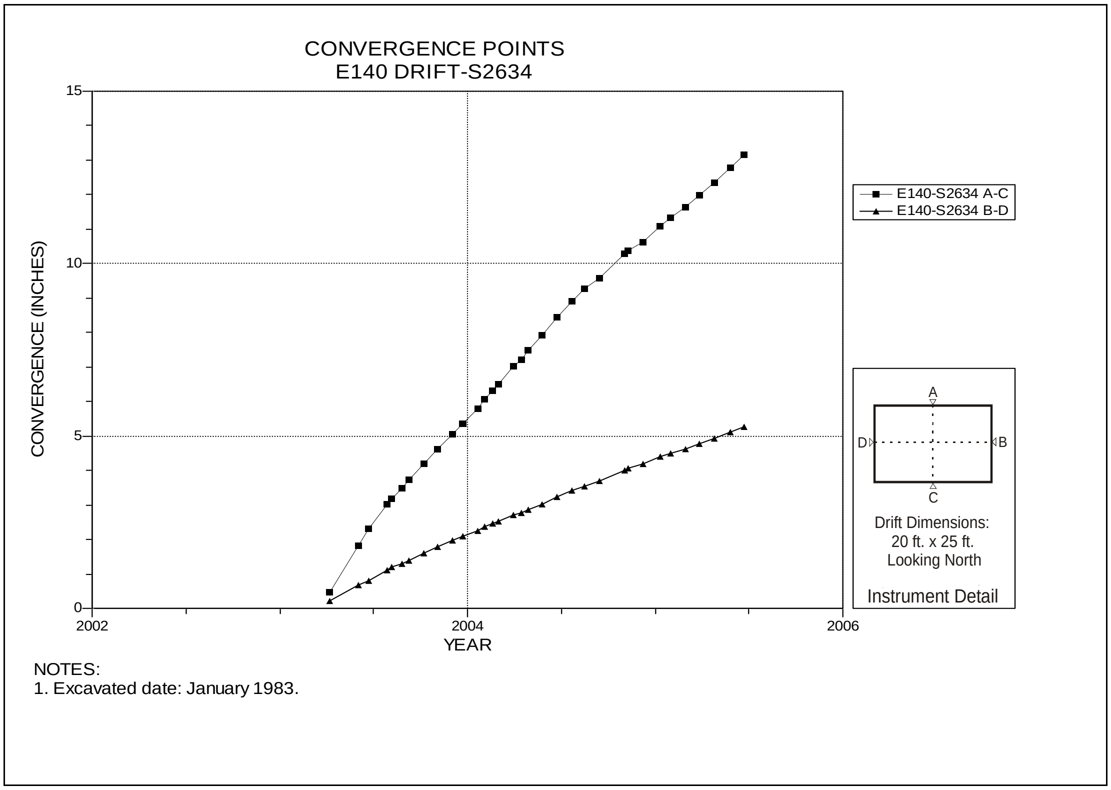


Figure 4-123 Convergence Point Array
E140 Drift at S2634 – All Chords

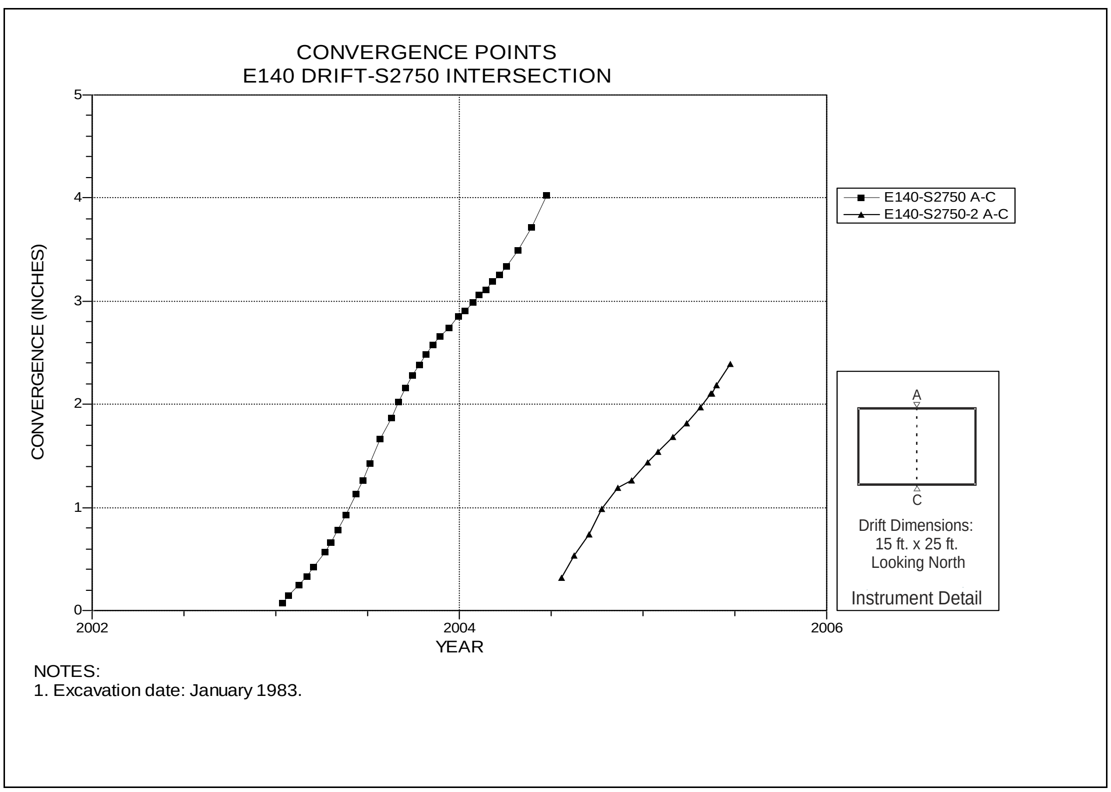


Figure 4-124 Convergence Point Array
E140 Drift at S2750 Drift Intersection – Roof to Floor

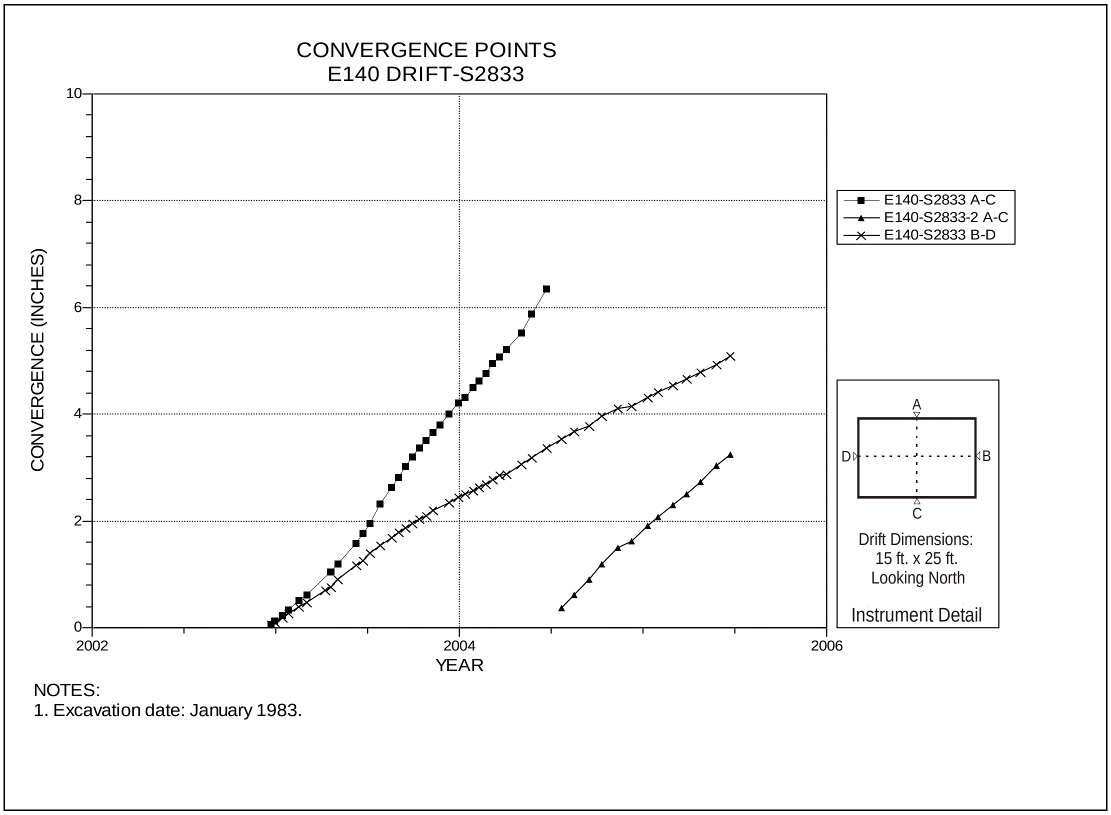


Figure 4-125 Convergence Point Array
E140 Drift at S2833 – All Chords

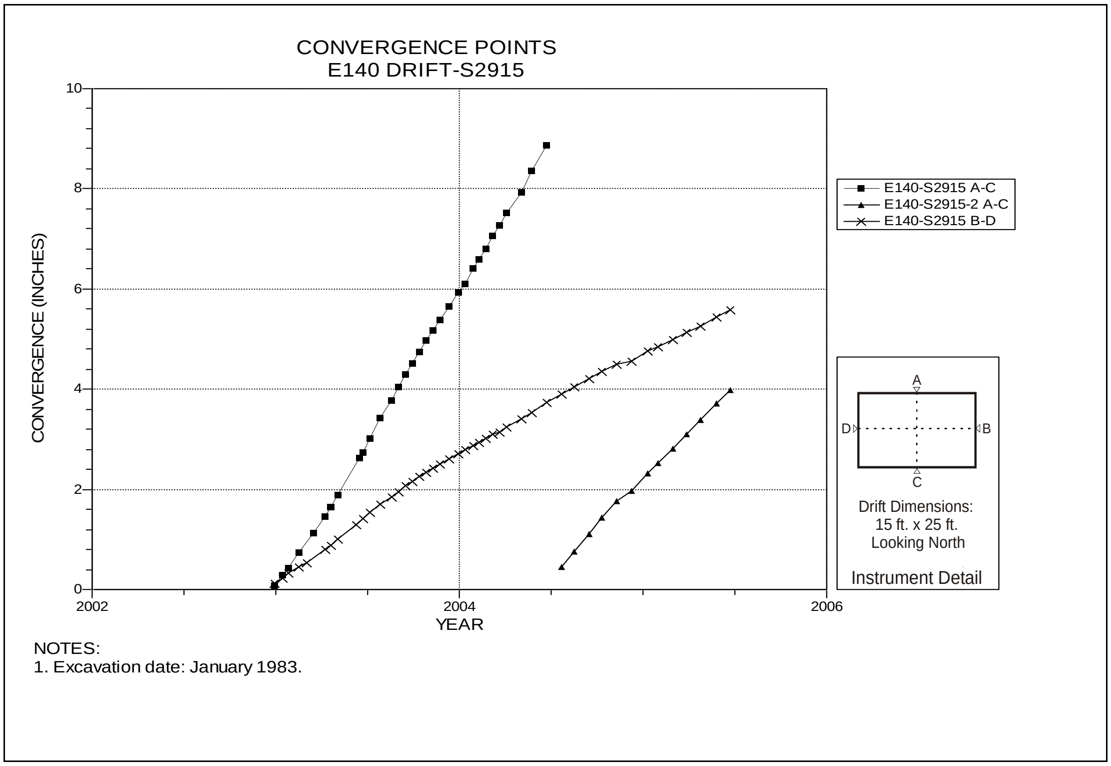


Figure 4-126 Convergence Point Array
E140 Drift at S2915 – All Chords

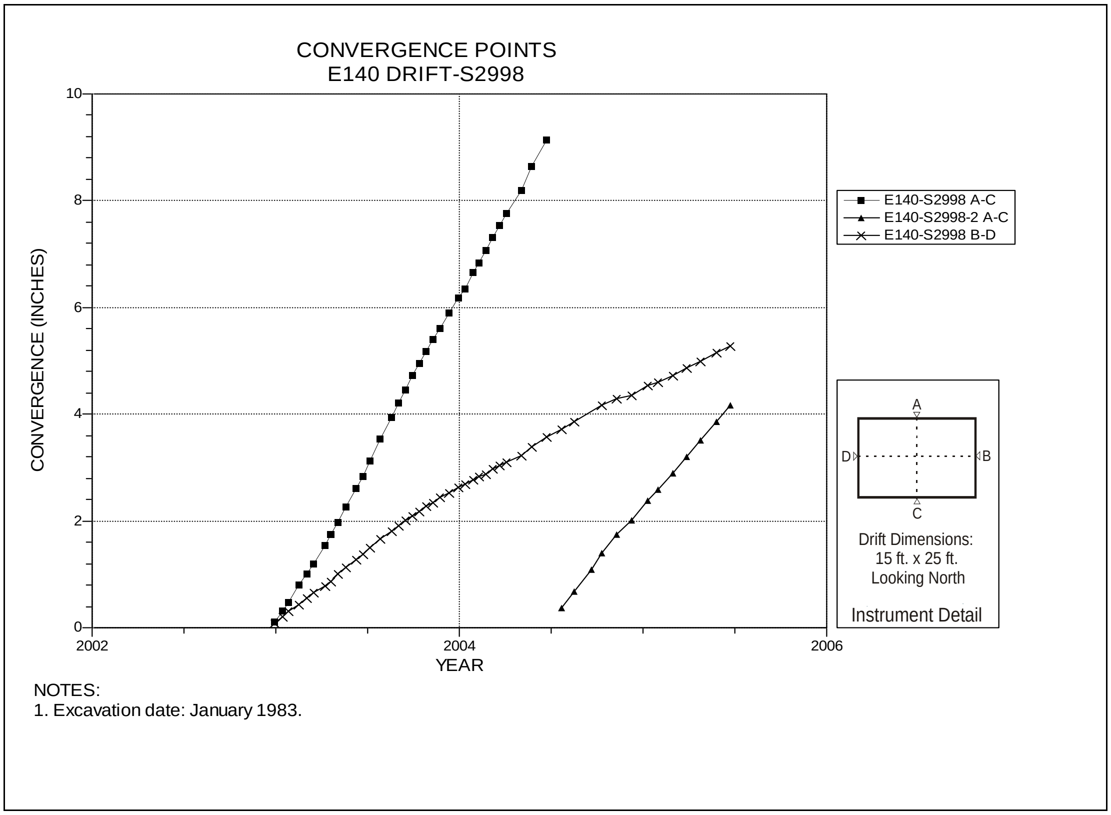


Figure 4-127 Convergence Point Array
E140 Drift at S2998 – All Chords

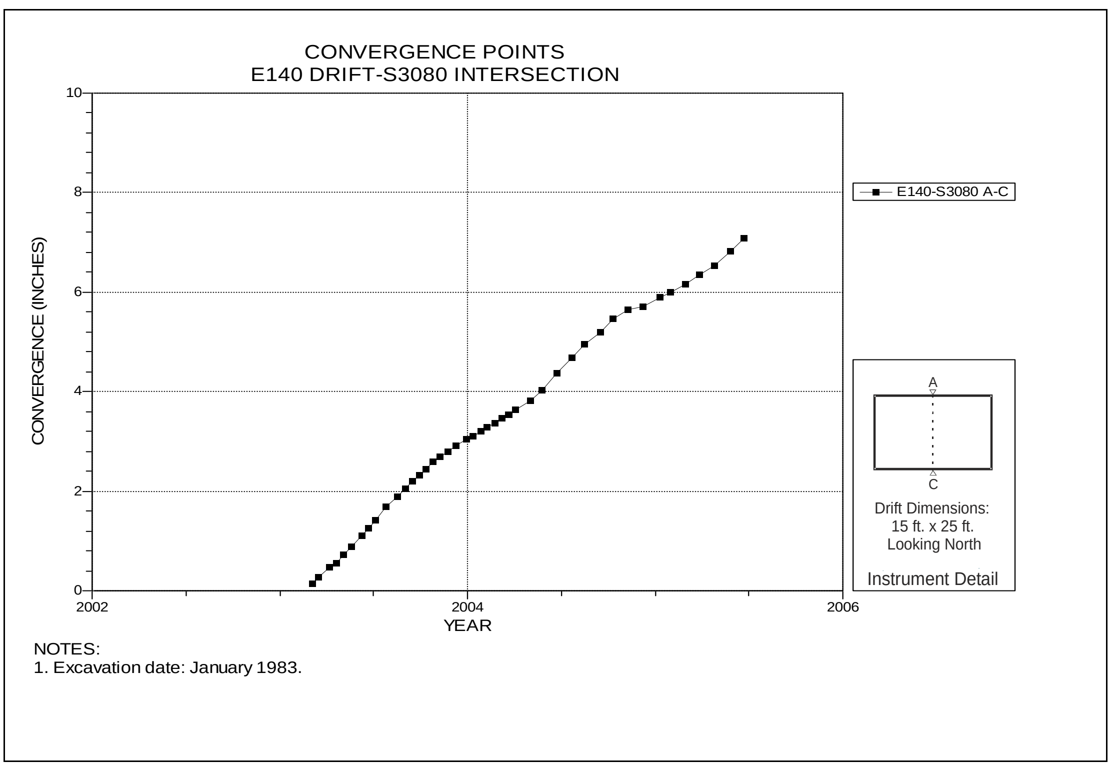


Figure 4-128 Convergence Point Array
E140 Drift at S3080 Drift Intersection – Roof to Floor

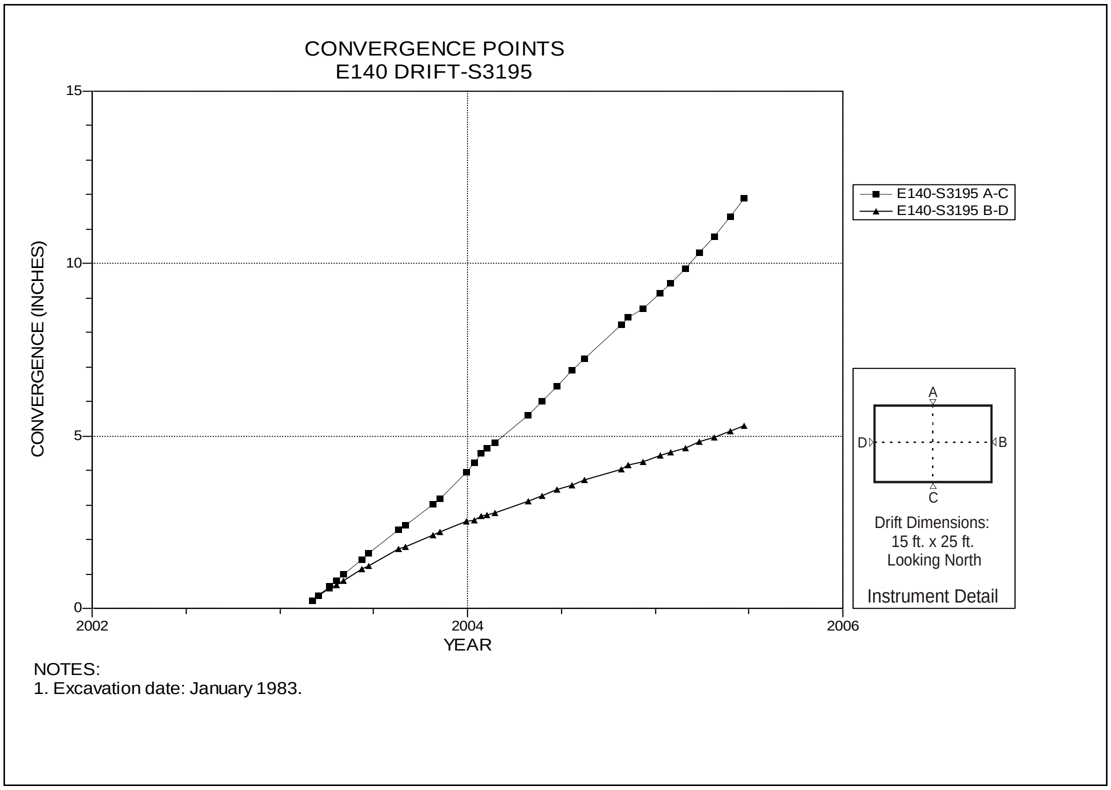


Figure 4-129 Convergence Point Array
E140 Drift at S3195 – All Chords

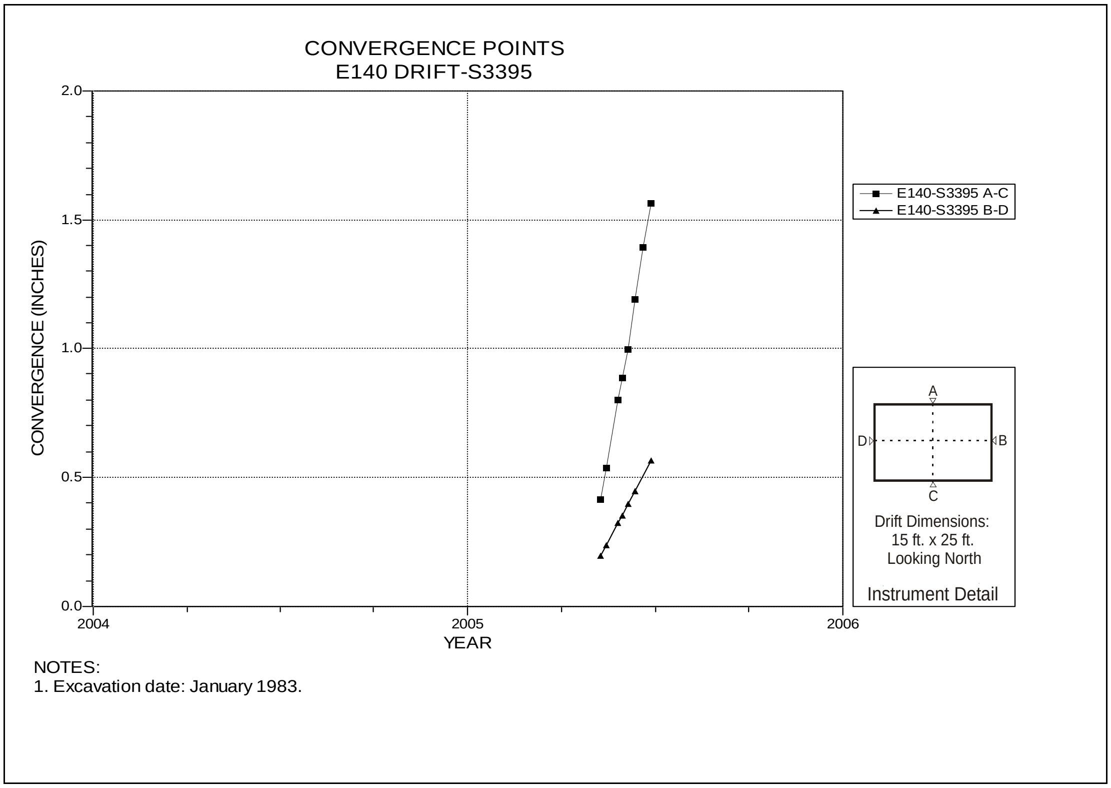


Figure 4-130 Convergence Point Array
E140 Drift at S3395 – All Chords

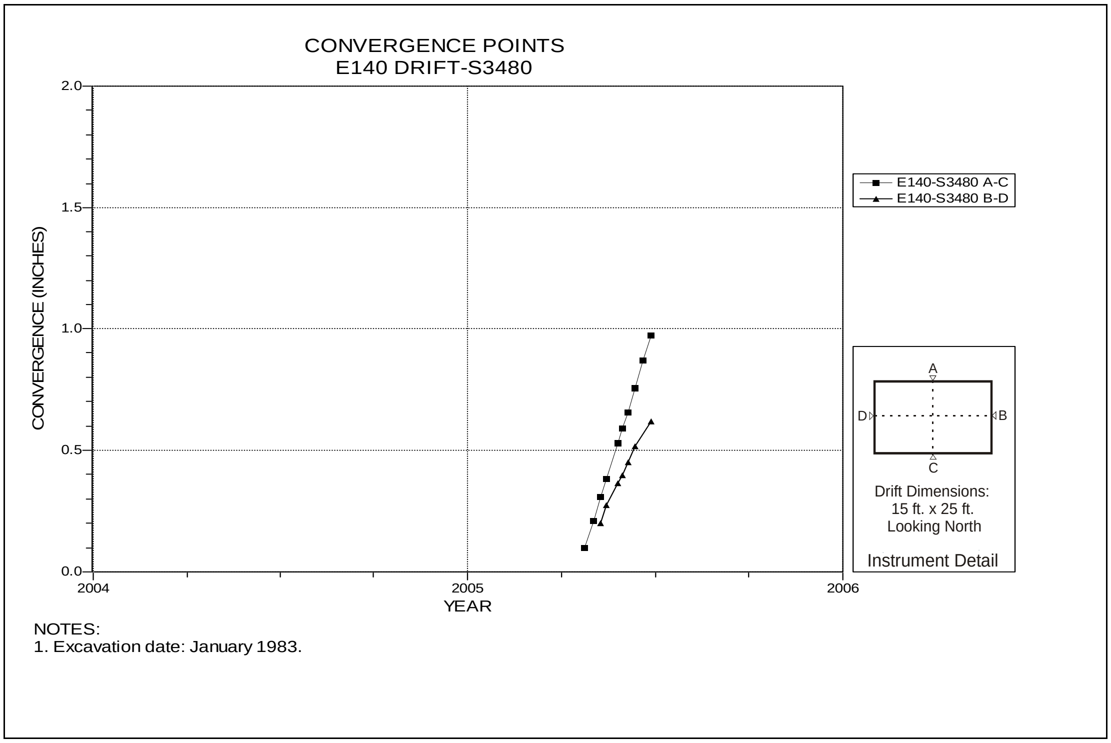


Figure 4-131 Convergence Point Array
E140 Drift at S3480 – All Chords

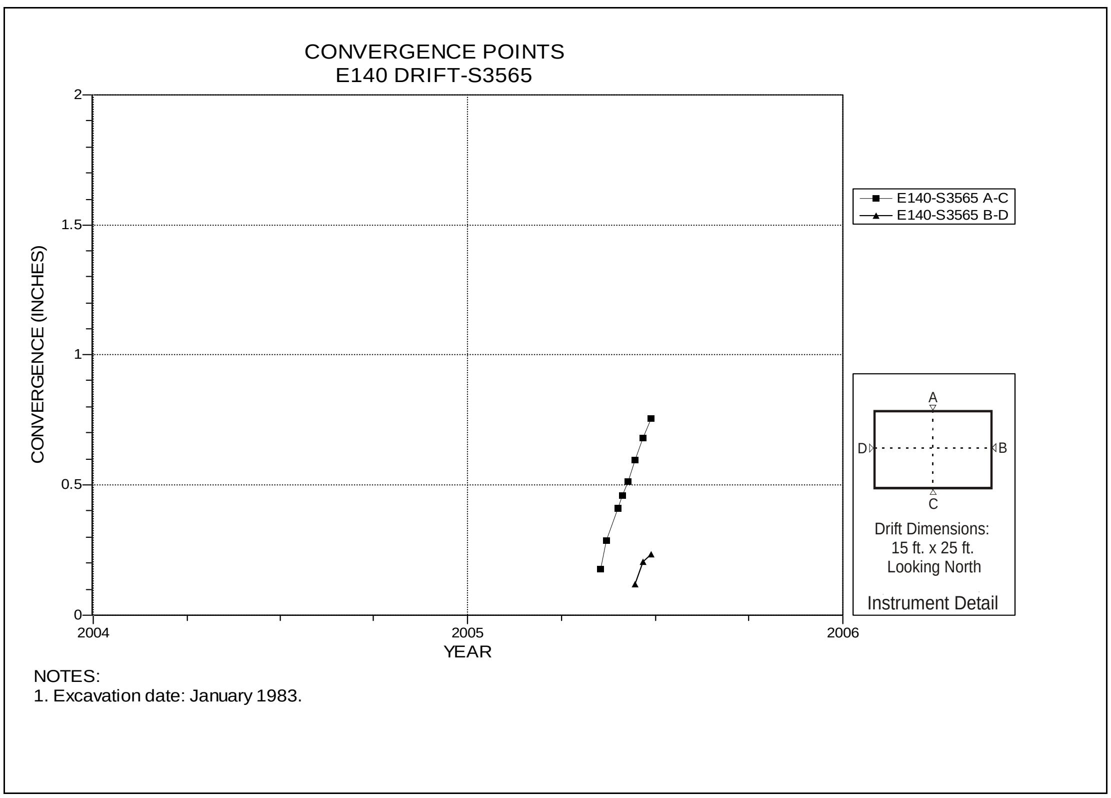


Figure 4-132 Convergence Point Array
E140 Drift at S3565 – All Chords

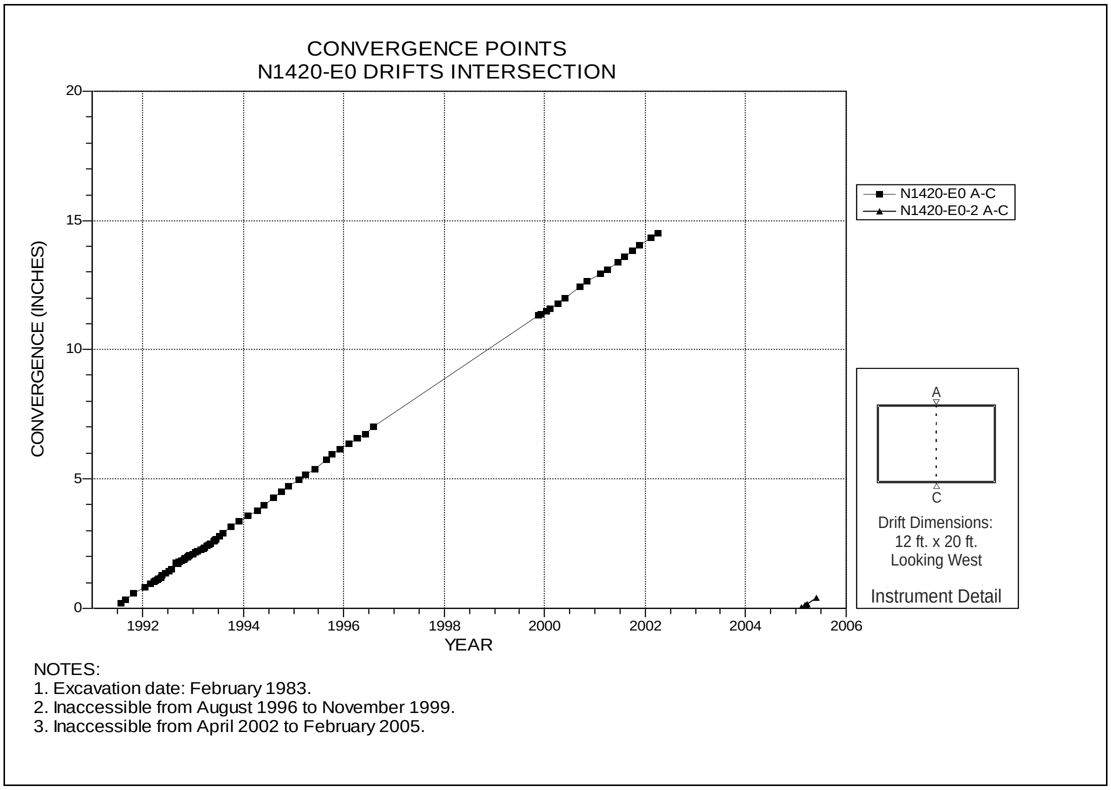


Figure 4-133 Convergence Point Array
E0 Drift at N1420 Drift Intersection – All Chords

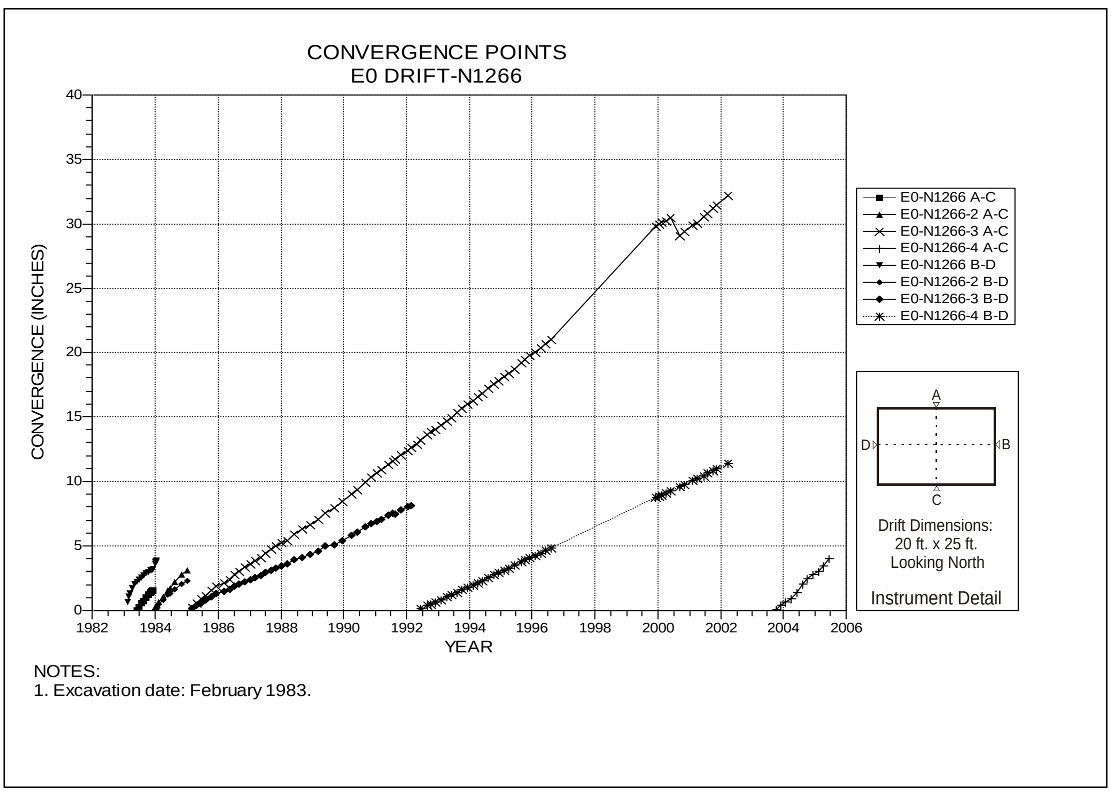
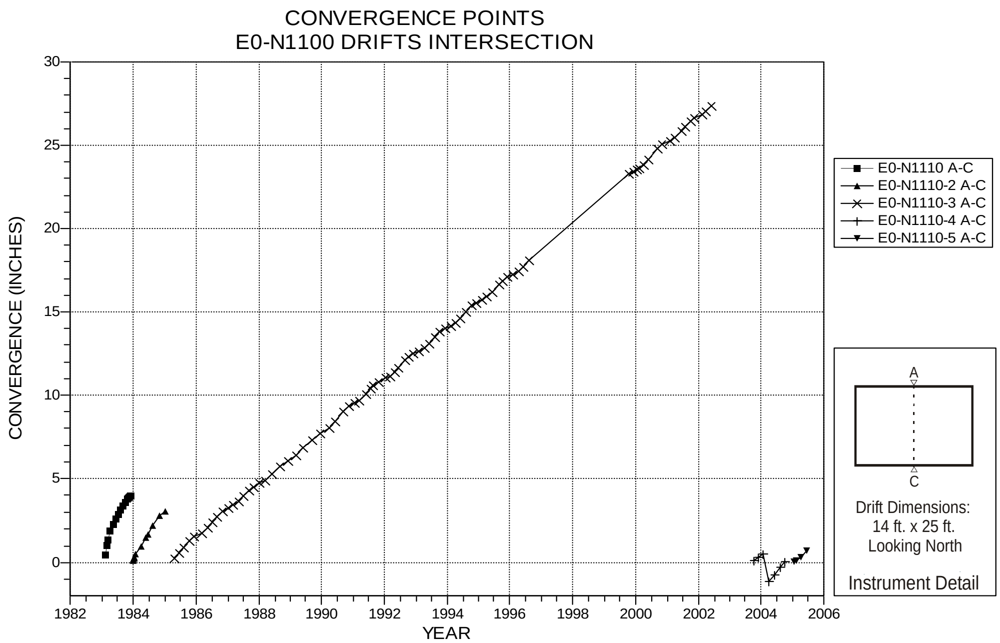
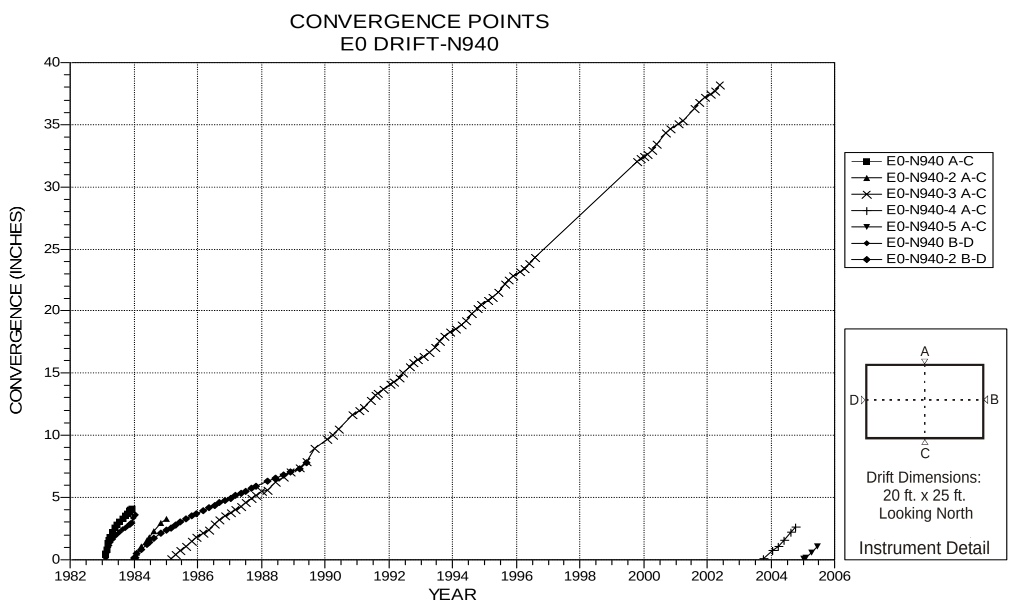


Figure 4-134 Convergence Point Array
E0 Drift at N1266 – All Chords



NOTES:
1. Excavation date: February 1983.
2. Inaccessible from August 1996 to November 1999.
3. Inaccessible from May 2002 to October 2003..
4. Possible anchor slippage April 2004.

Figure 4-135 Convergence Point Array
E0 Drift at N1100 Drift Intersection – All Chords



NOTES:
1. Excavation date: February 1983.

Figure 4-136 Convergence Point Array
E0 Drift at N940 – All Chords

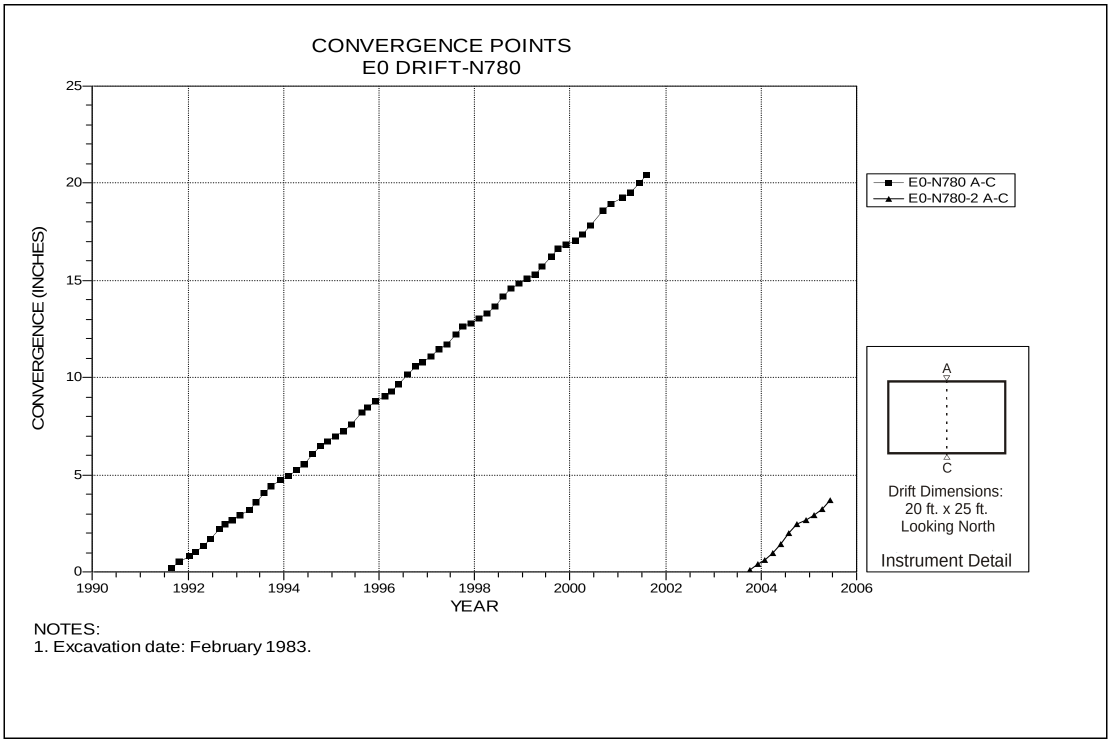


Figure 4-137 Convergence Point Array
E0 Drift at N780 – Roof to Floor

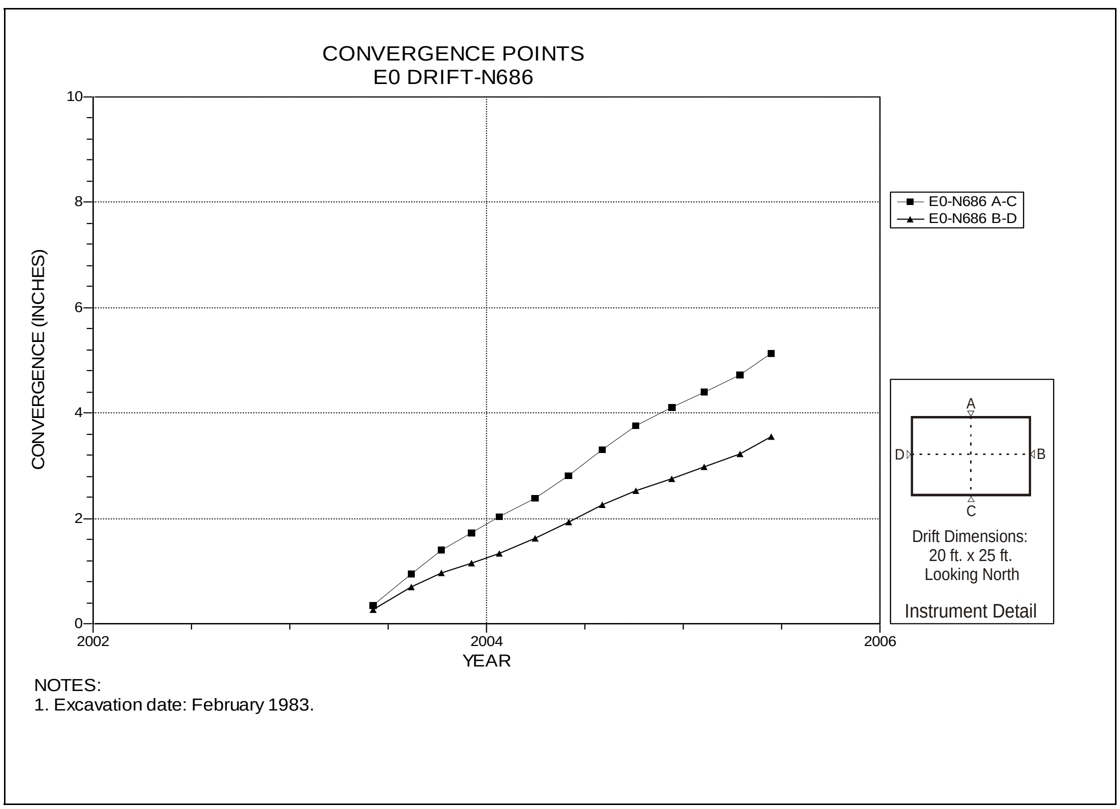
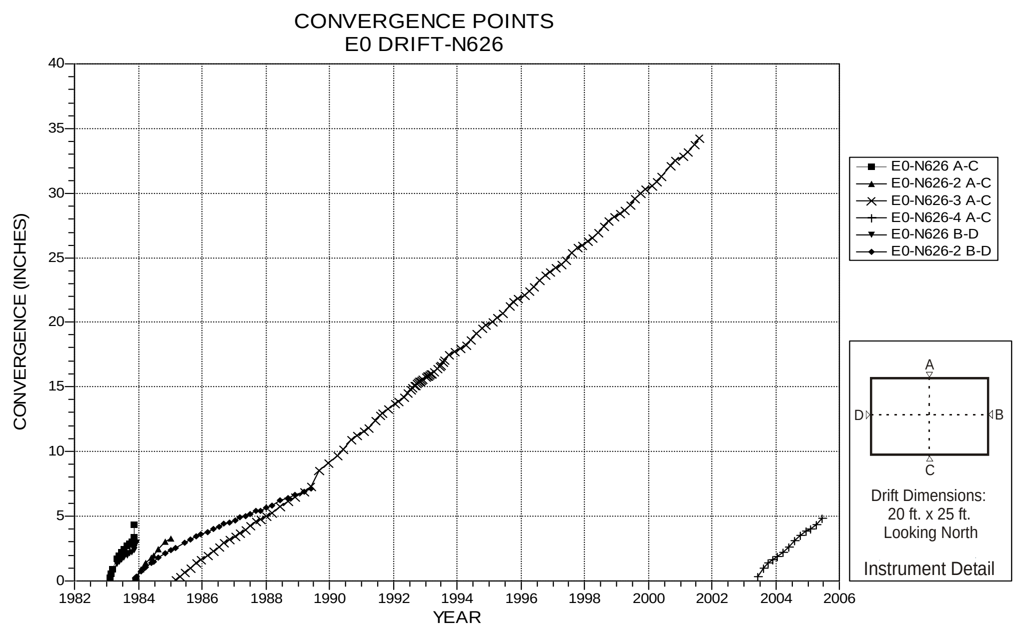
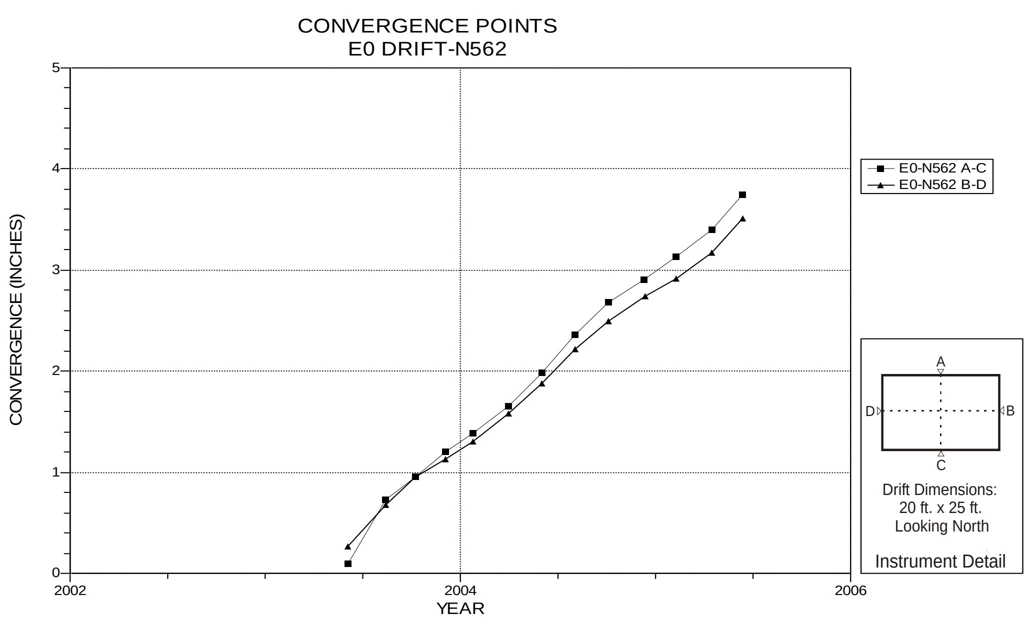


Figure 4-138 Convergence Point Array
E0 Drift at N686 – All Chords



NOTES:
1. Excavation date: February 1983.
2. Roof excavated to Anhydrite "b".

Figure 4-139 Convergence Point Array
E0 Drift at N626 – All Chords



NOTES:
1. Excavation date: February 1983.

Figure 4-140 Convergence Point Array
E0 Drift at N562 – All Chords

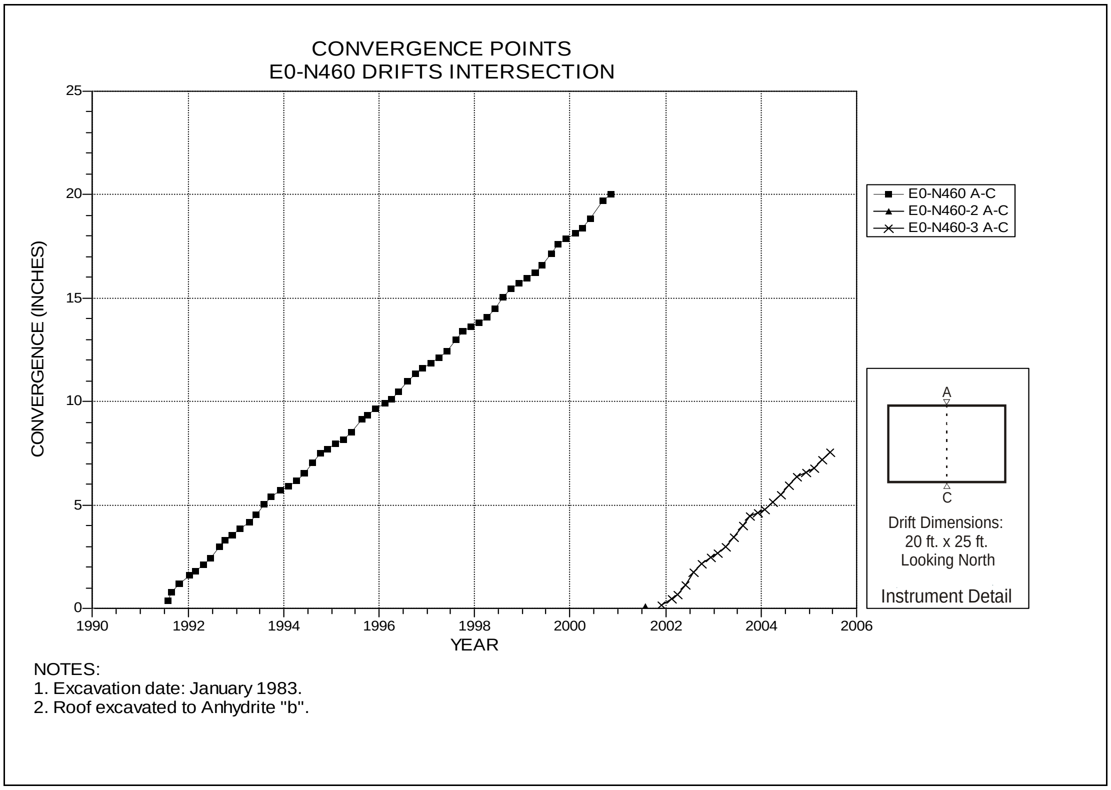


Figure 4-141 Convergence Point Array
E0 Drift at N460 Drift Intersection – Roof to Floor

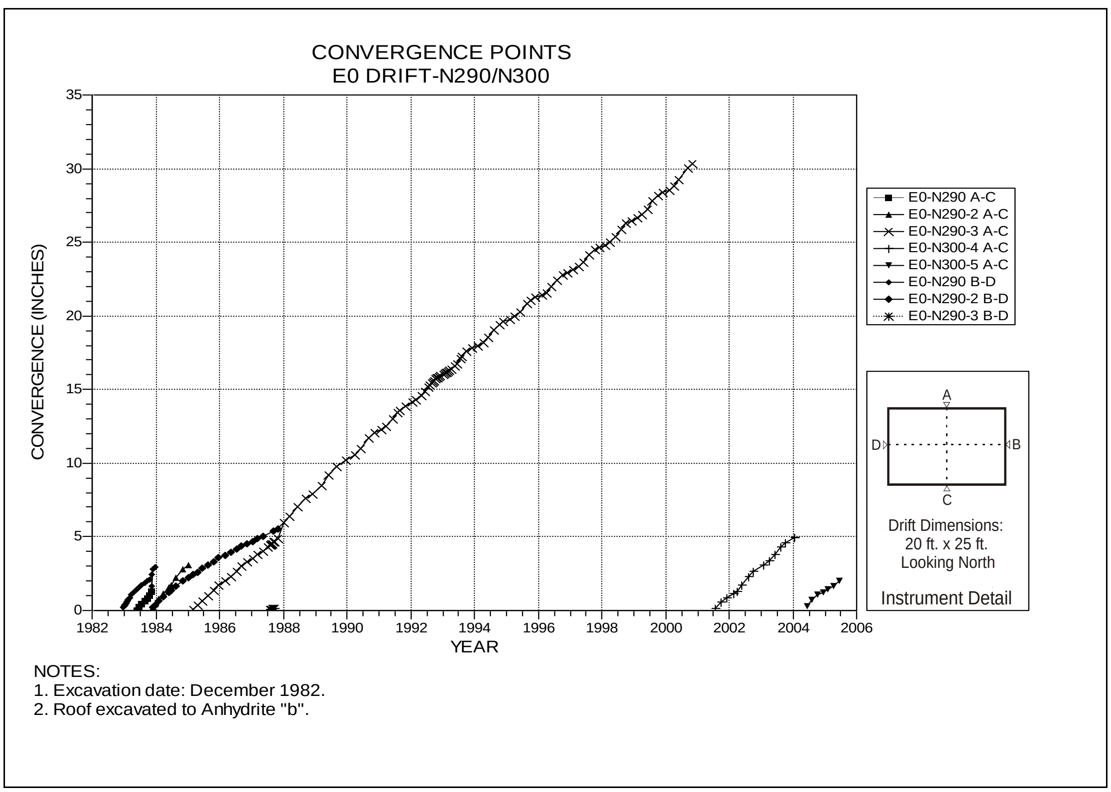


Figure 4-142 Convergence Point Array
E0 Drift at N300 – All Chords

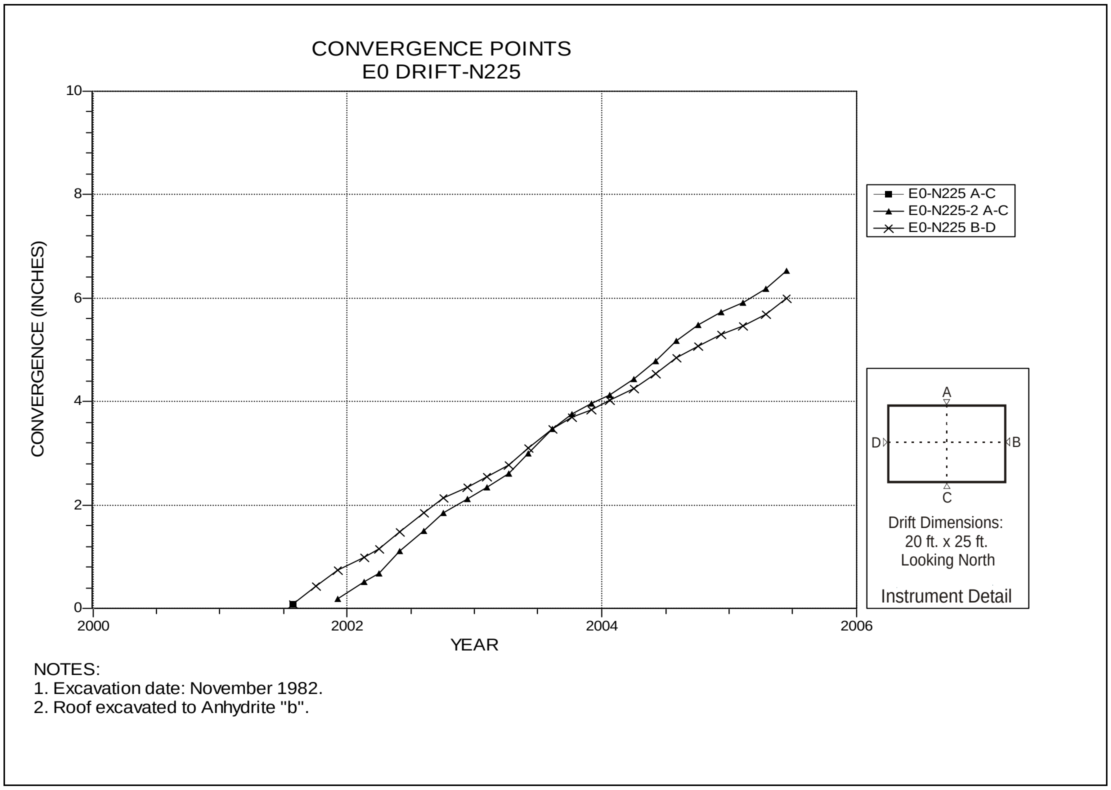


Figure 4-143 Convergence Point Array
E0 Drift at N225 – All Chords

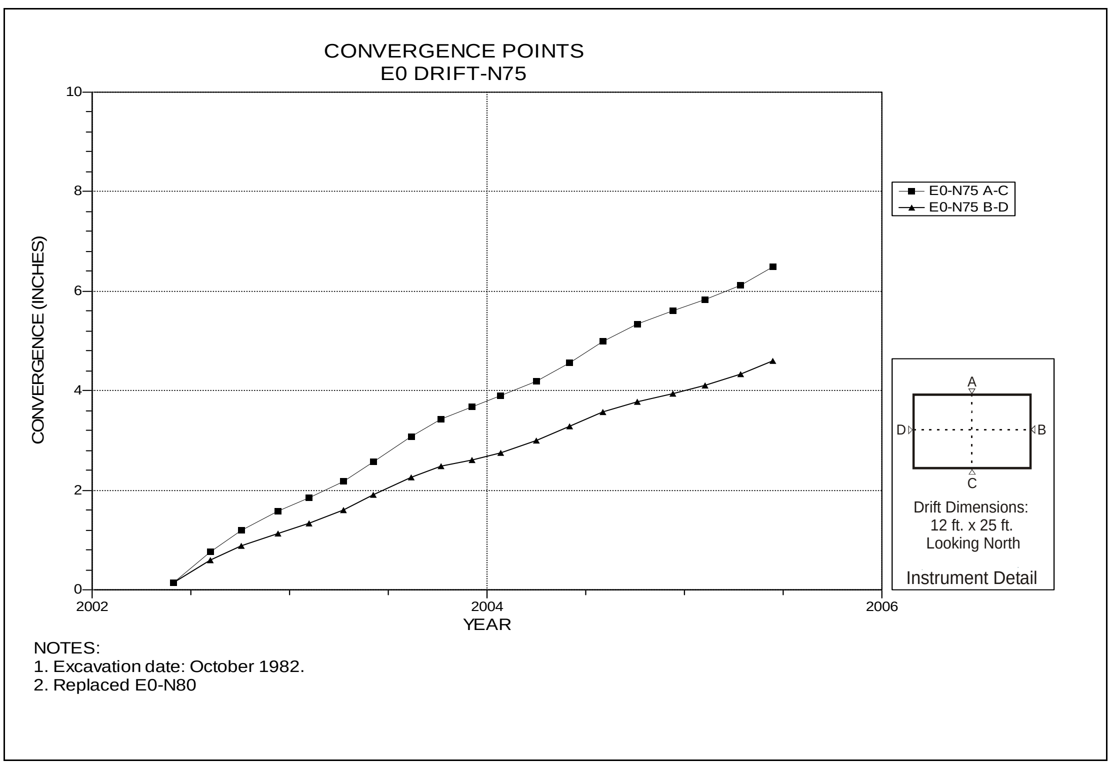


Figure 4-144 Convergence Point Array
E0 Drift at N75 – All Chords

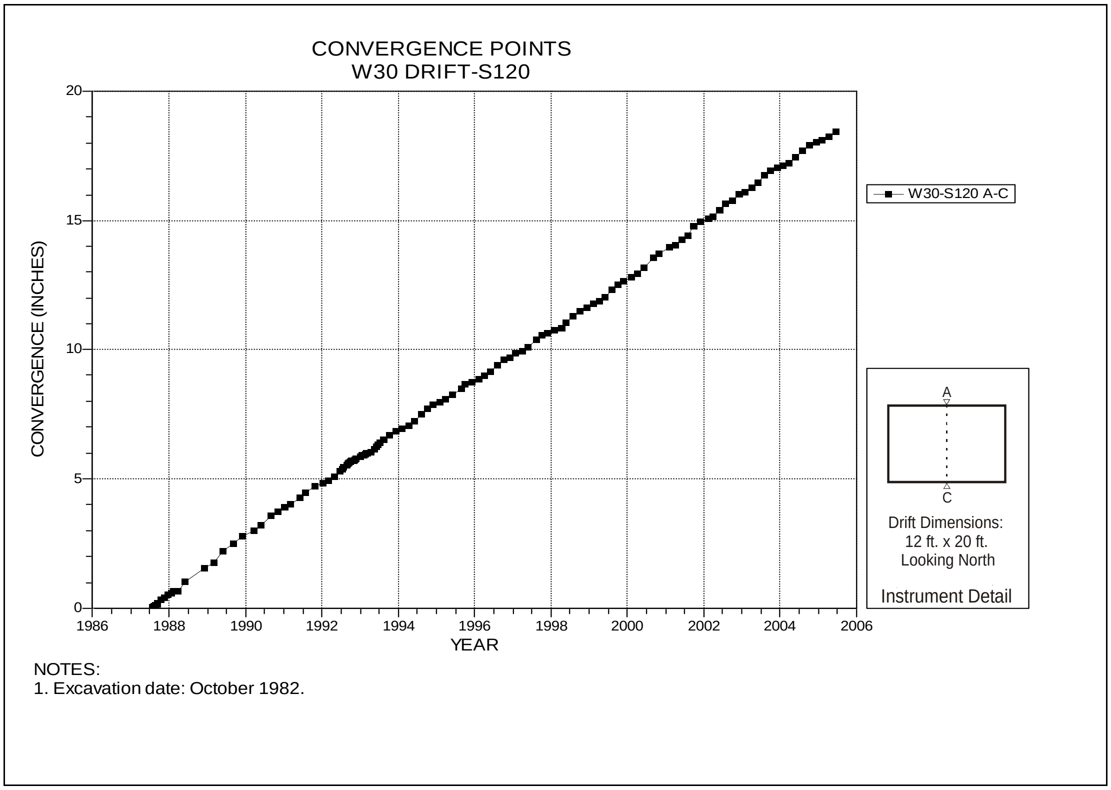


Figure 4-145 Convergence Point Array
W30 Drift at S120 – Roof to Floor

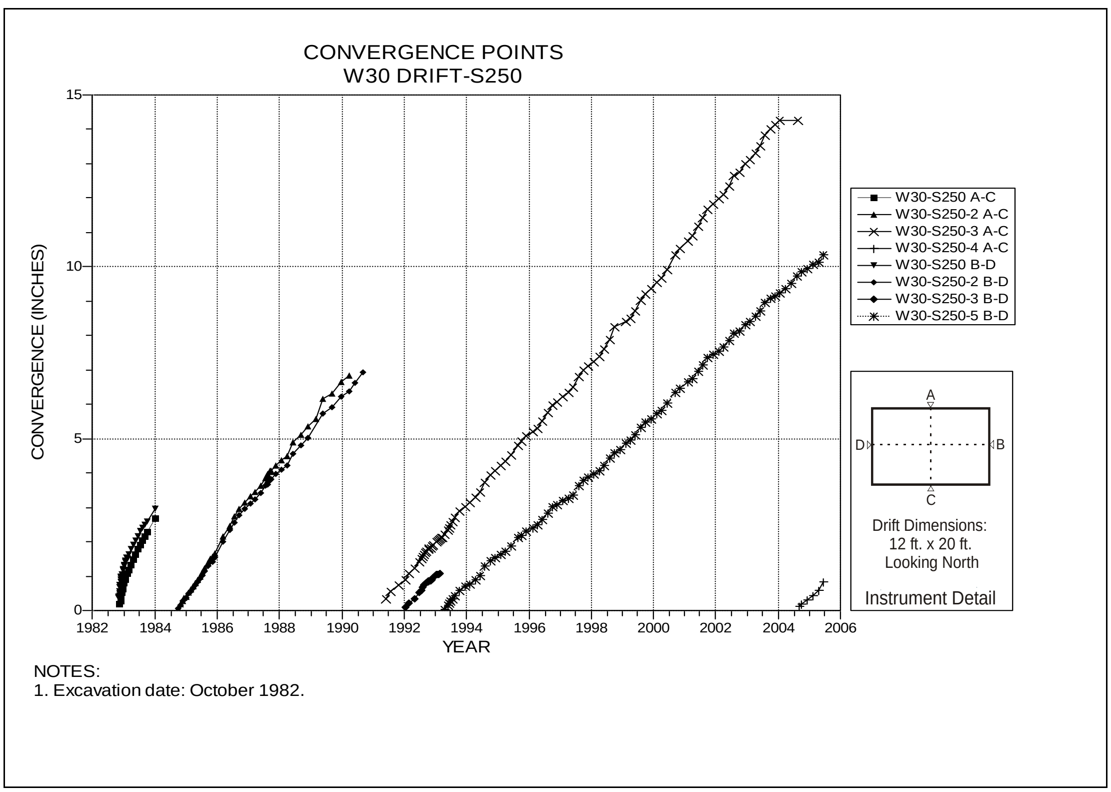


Figure 4-146 Convergence Point Array
W30 Drift at S250 – All Chords

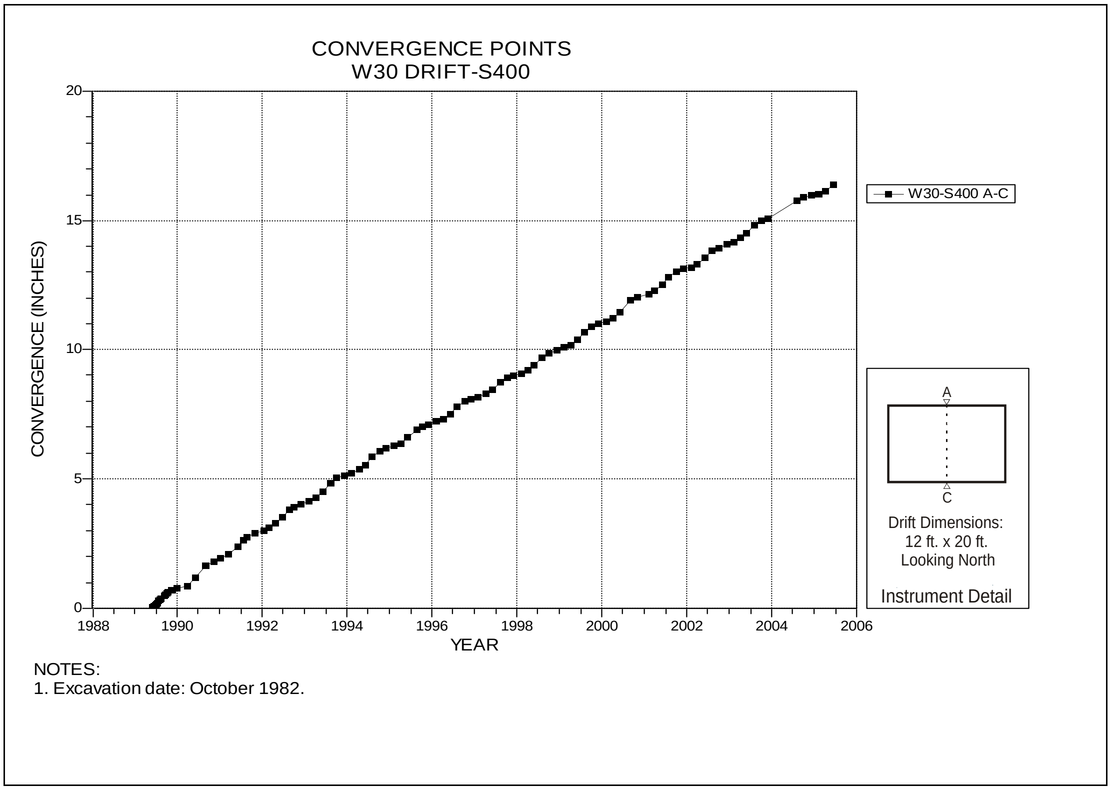


Figure 4-147 Convergence Point Array
W30 Drift at S400 Drift Intersection – Roof to Floor

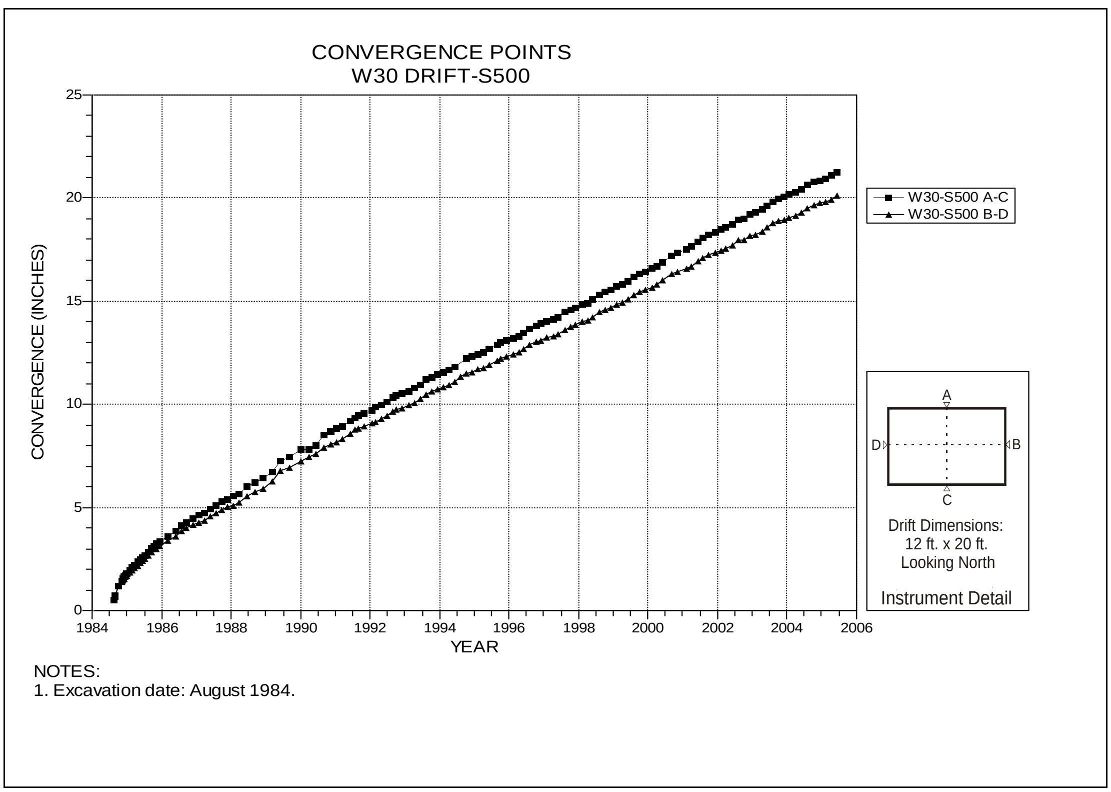


Figure 4-148 Convergence Point Array
W30 Drift at S500 – All Chords

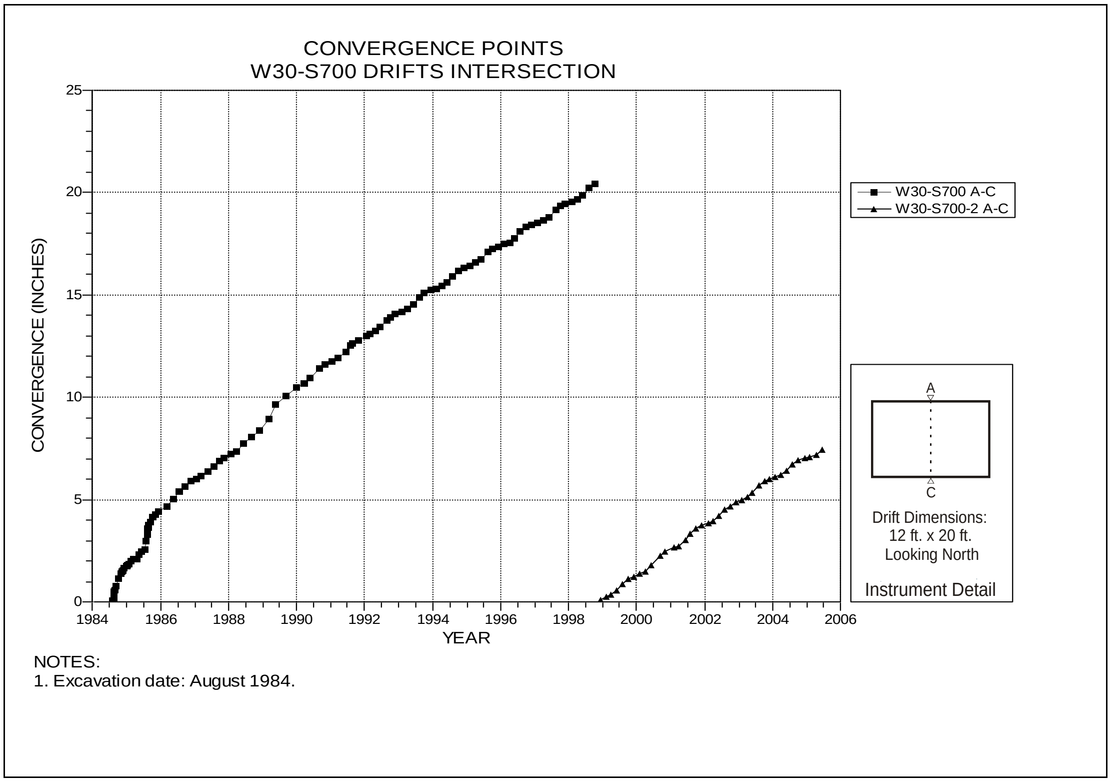


Figure 4-149 Convergence Point Array
W30 Drift at S700 Drift Intersection – Roof to Floor

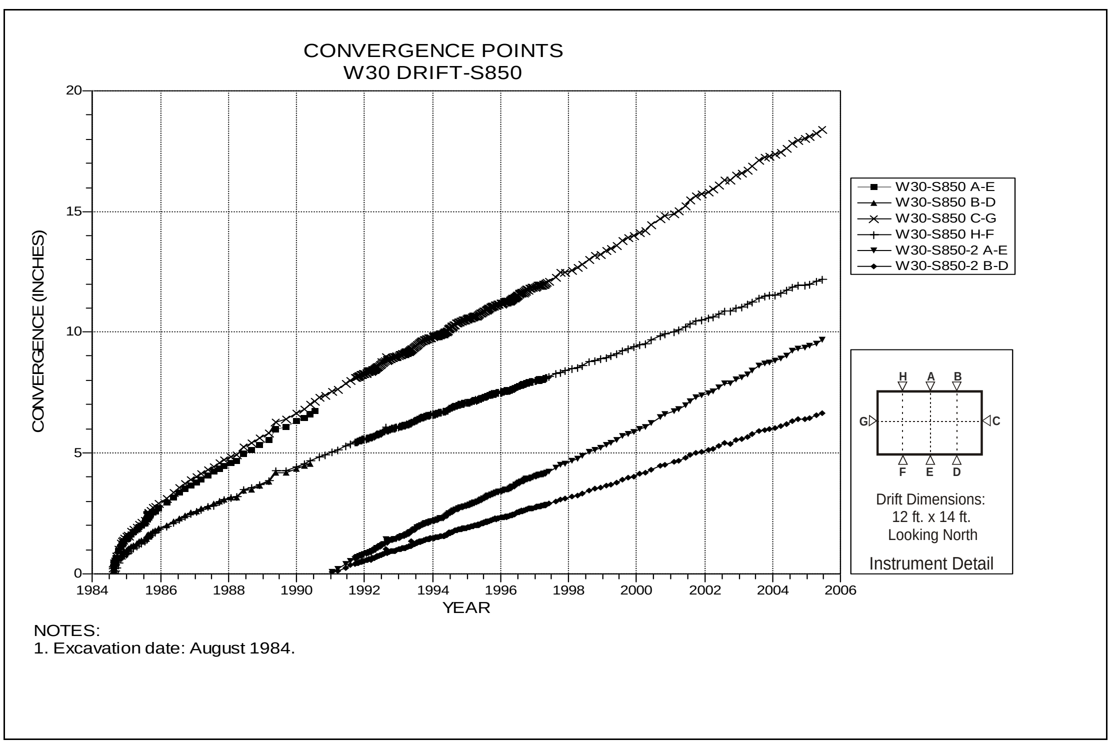


Figure 4-150 Convergence Point Array
W30 Drift at S850 – All Chords

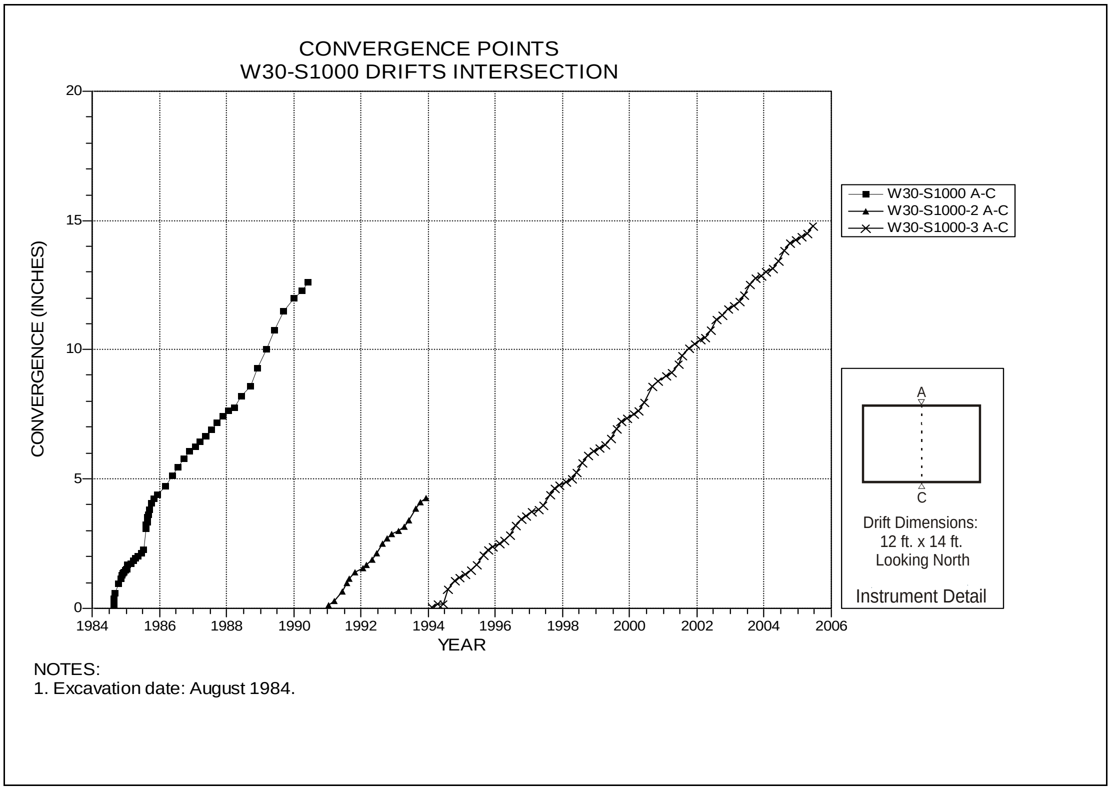


Figure 4-151 Convergence Point Array
W30 Drift at S1000 Drift Intersection – Roof to Floor

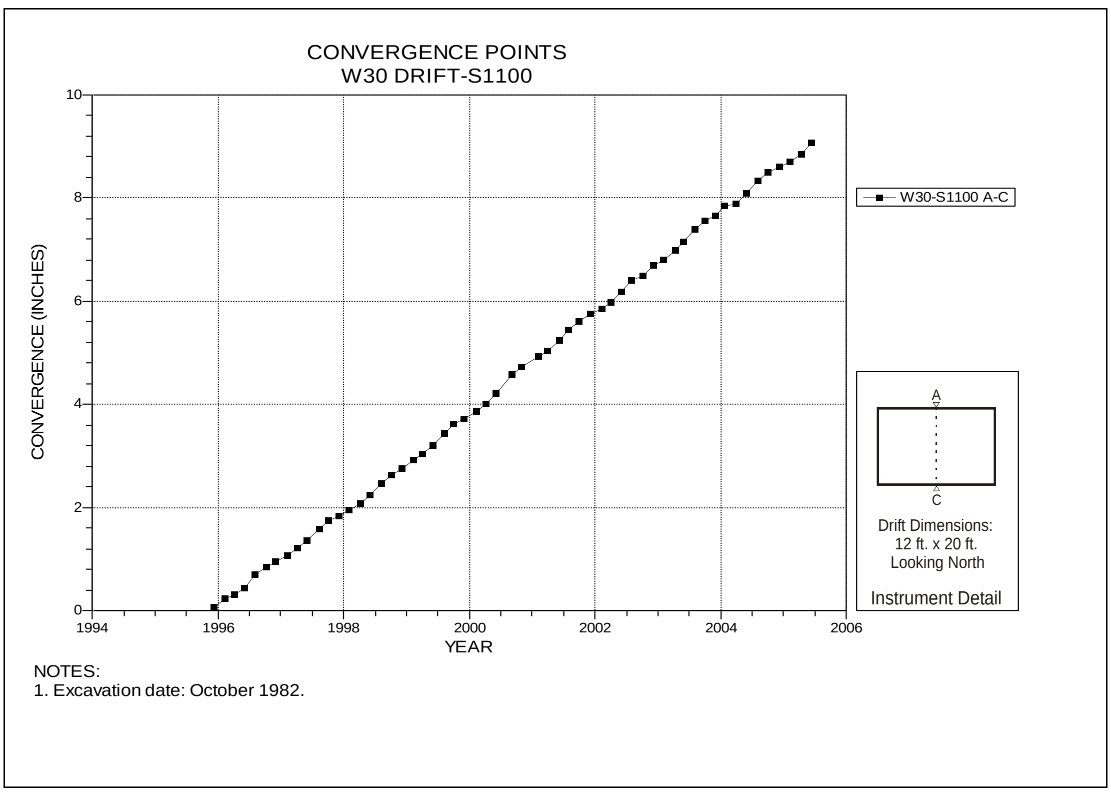


Figure 4-152 Convergence Point Array
W30 Drift at S1100 – Roof to Floor

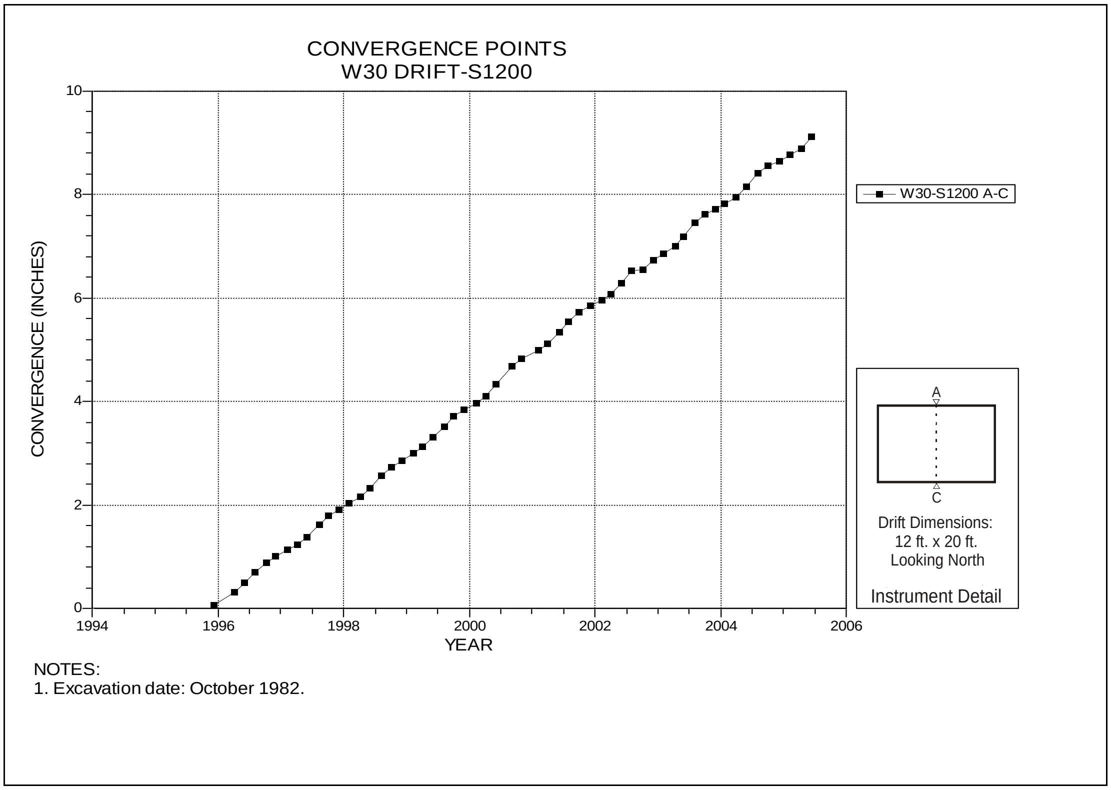


Figure 4-153 Convergence Point Array
W30 Drift at S1200 – Roof to Floor

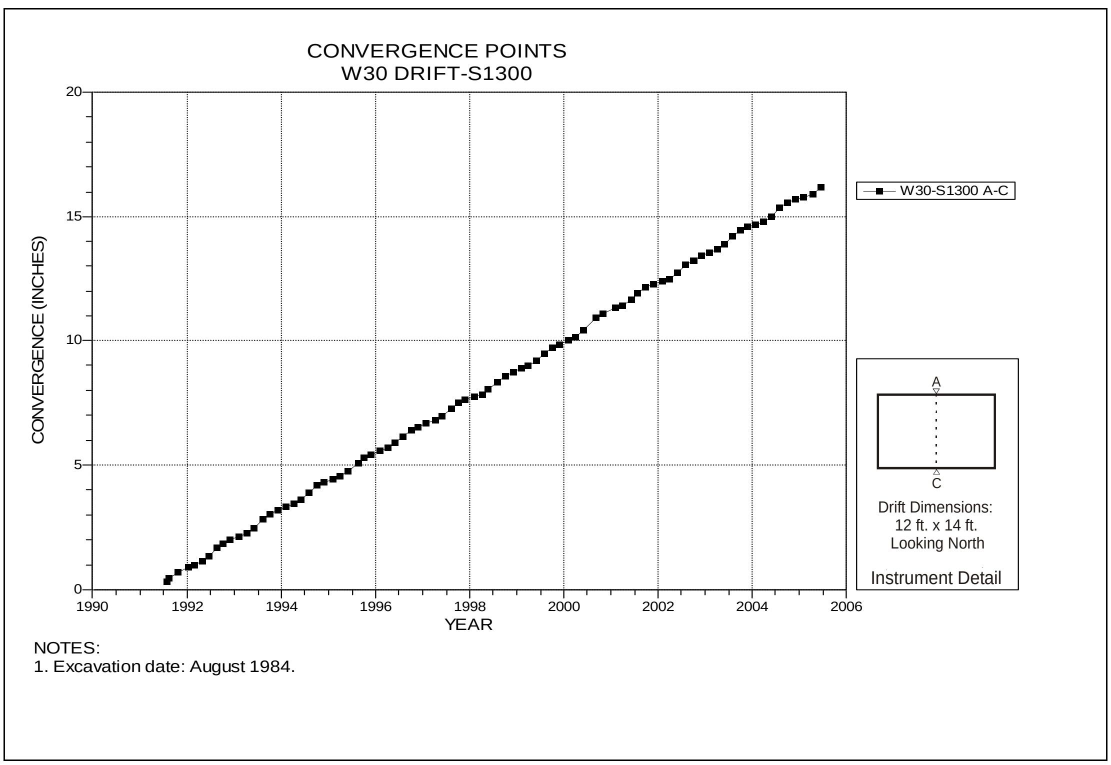


Figure 4-154 Convergence Point Array
W30 Drift at S1300 Drift Intersection – Roof to Floor

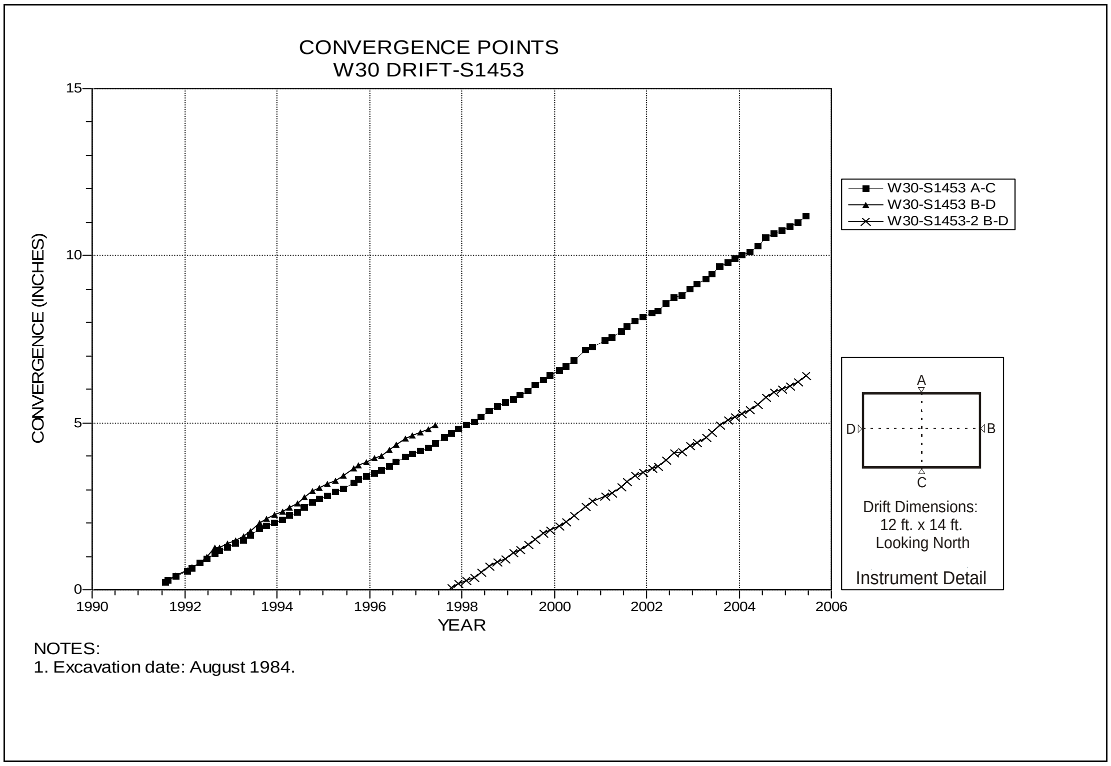


Figure 4-155 Convergence Point Array
W30 Drift at S1453 – All Chords

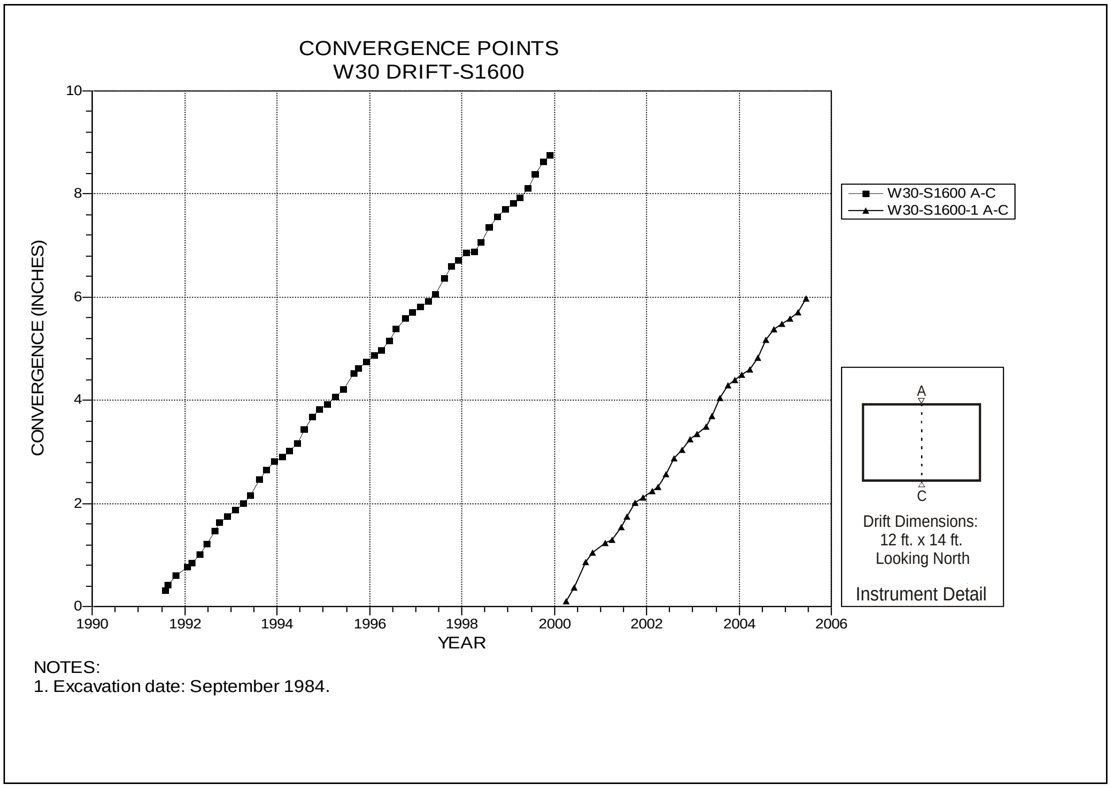


Figure 4-156 Convergence Point Array
W30 Drift at S1600 Drift Intersection – Roof to Floor

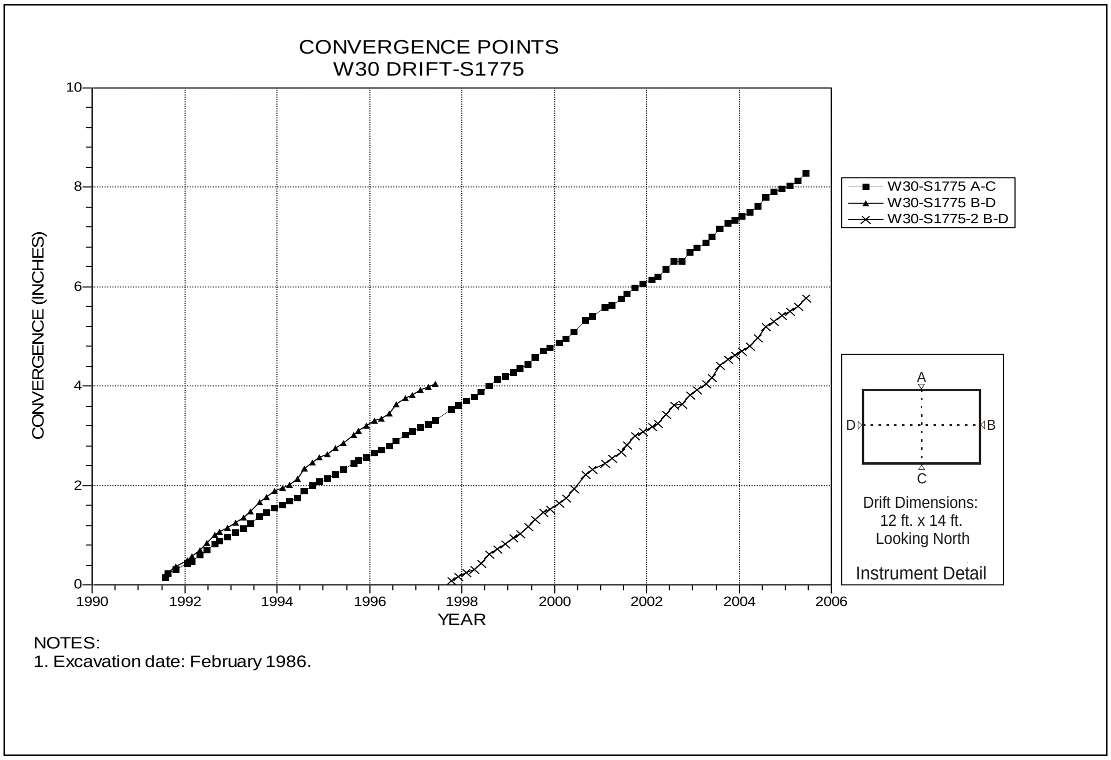


Figure 4-157 Convergence Point Array
W30 Drift at S1775 – All Chords

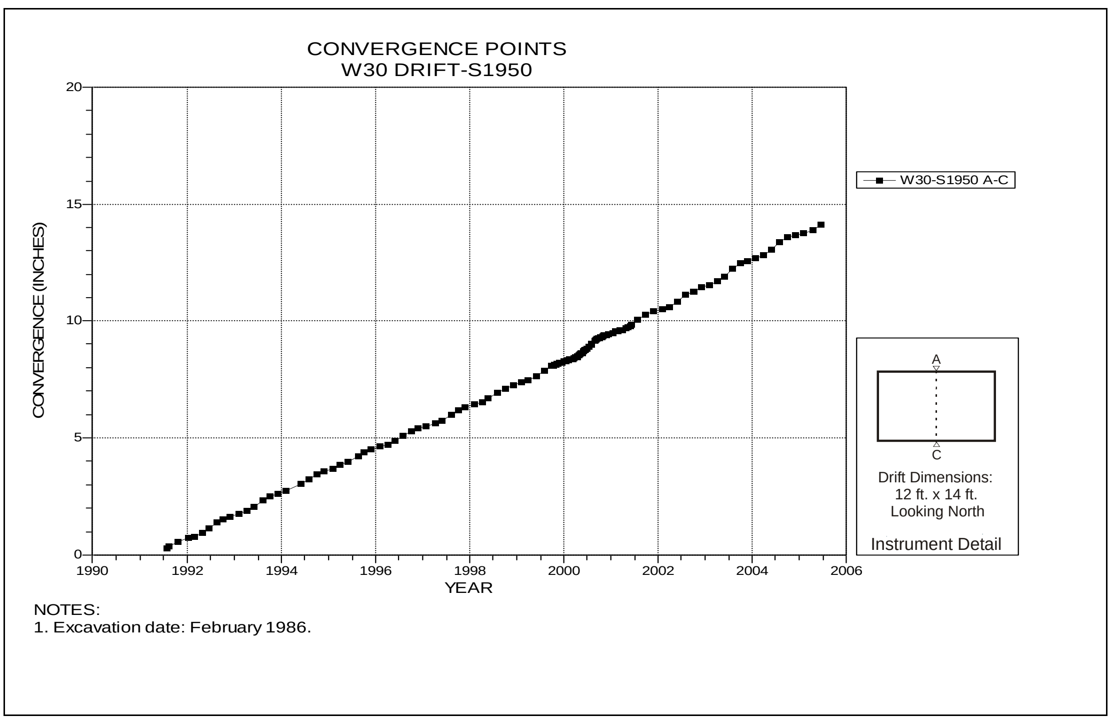


Figure 4-158 Convergence Point Array
W30 Drift at S1950 Drift Intersection – Roof to Floor

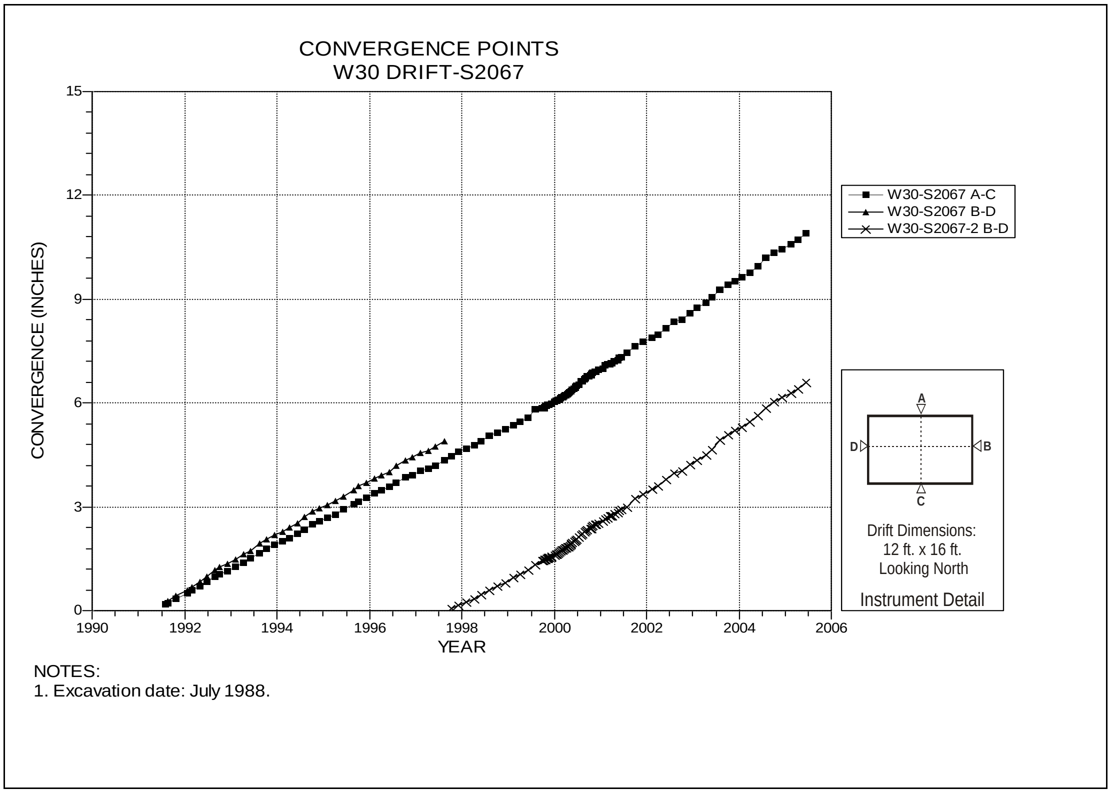


Figure 4-159 Convergence Point Array
W30 Drift at S2067 – All Chords

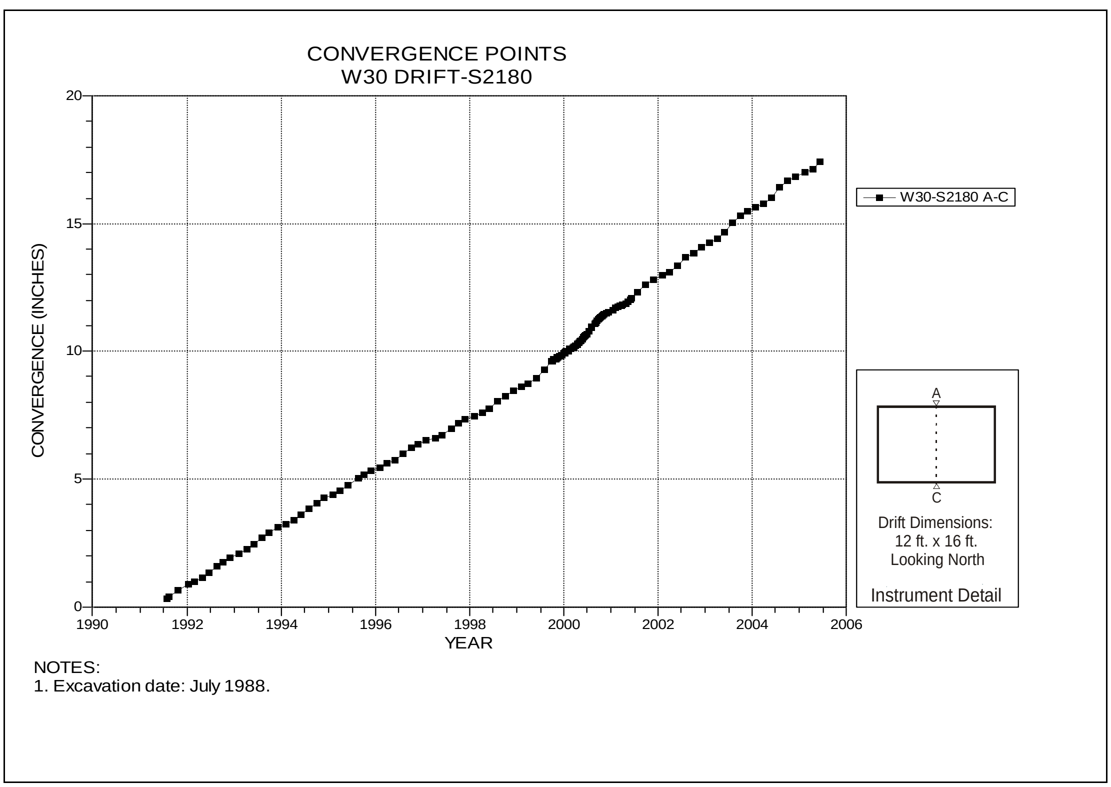


Figure 4-160 Convergence Point Array
W30 Drift at S2180 Drift Intersection – Roof to Floor

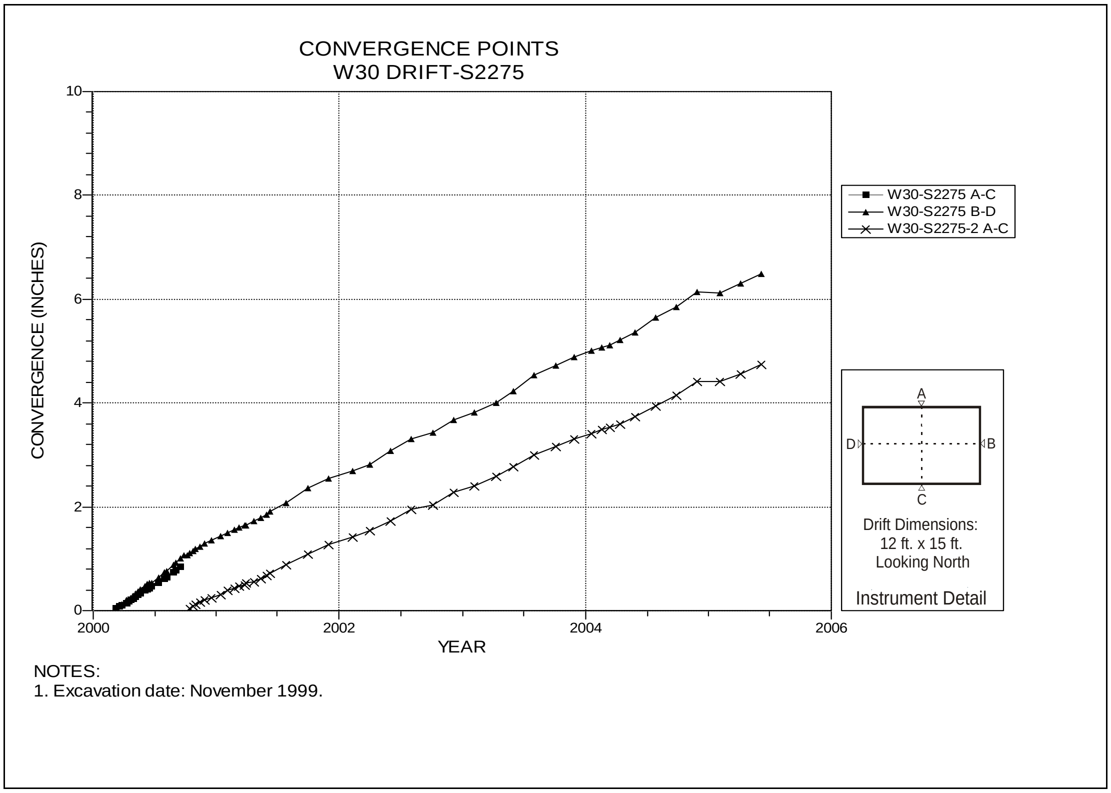


Figure 4-161 Convergence Point Array
W30 Drift at S2275 – All Chords

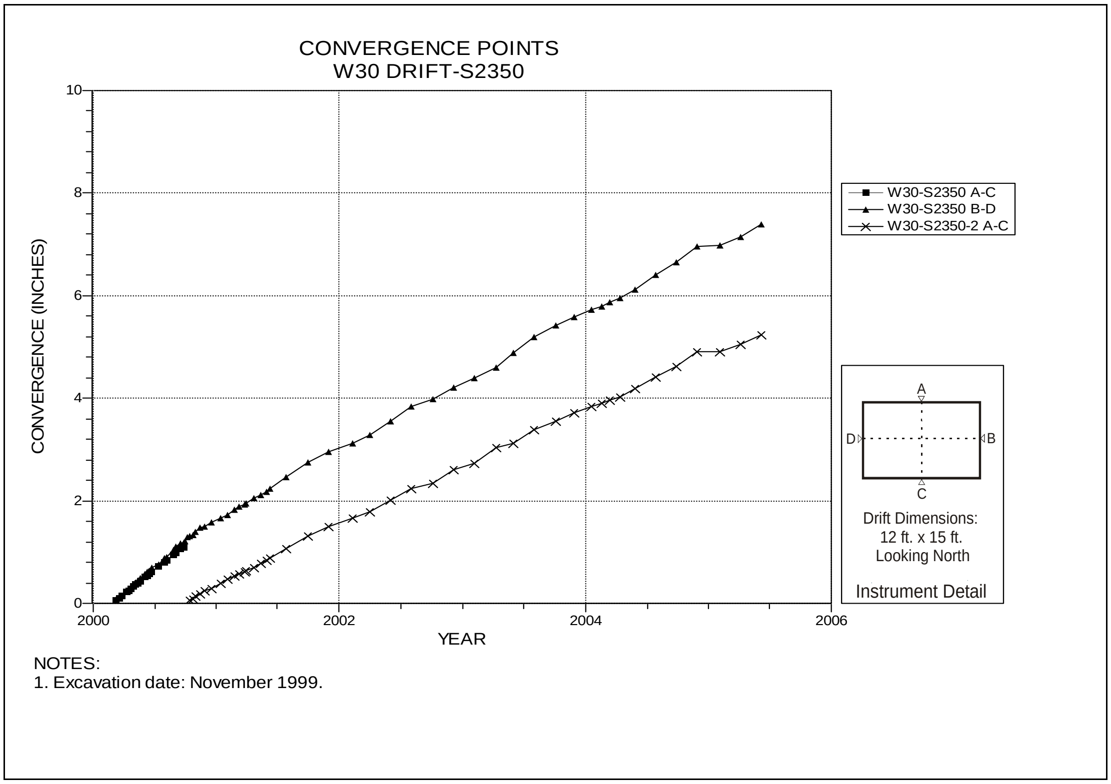


Figure 4-162 Convergence Point Array
W30 Drift at S2350 – All Chords

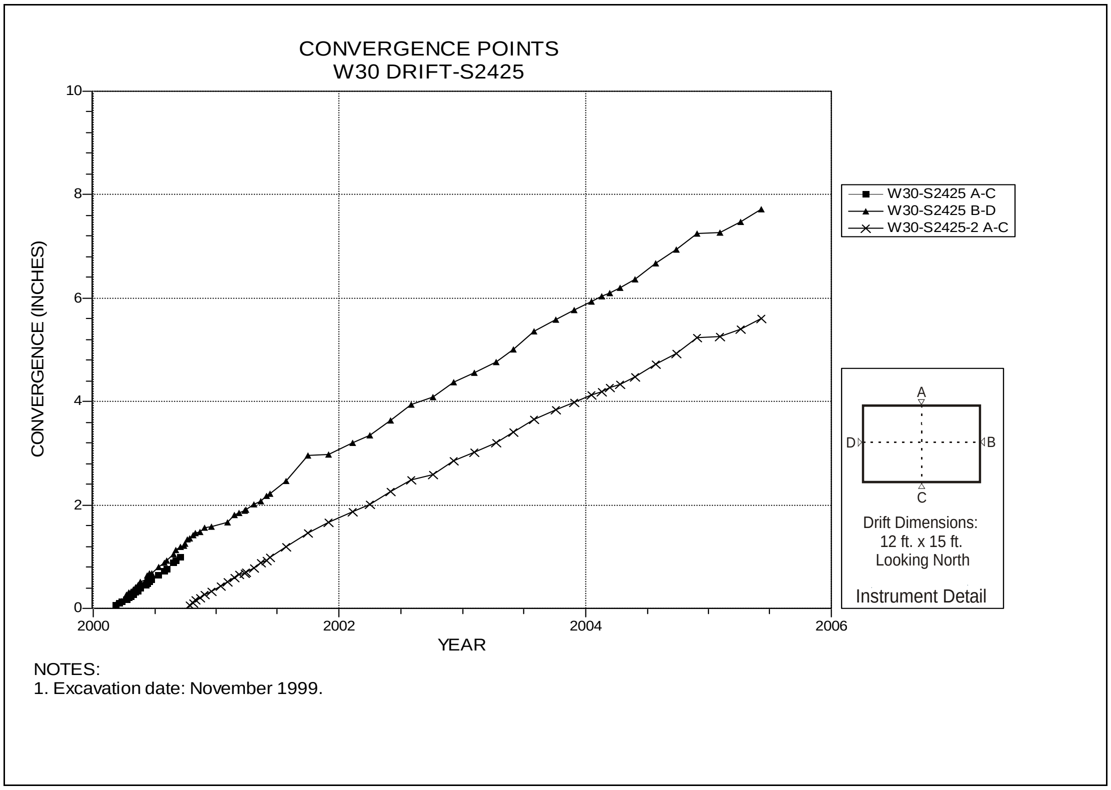


Figure 4-163 Convergence Point Array
W30 Drift at S2425 – All Chords

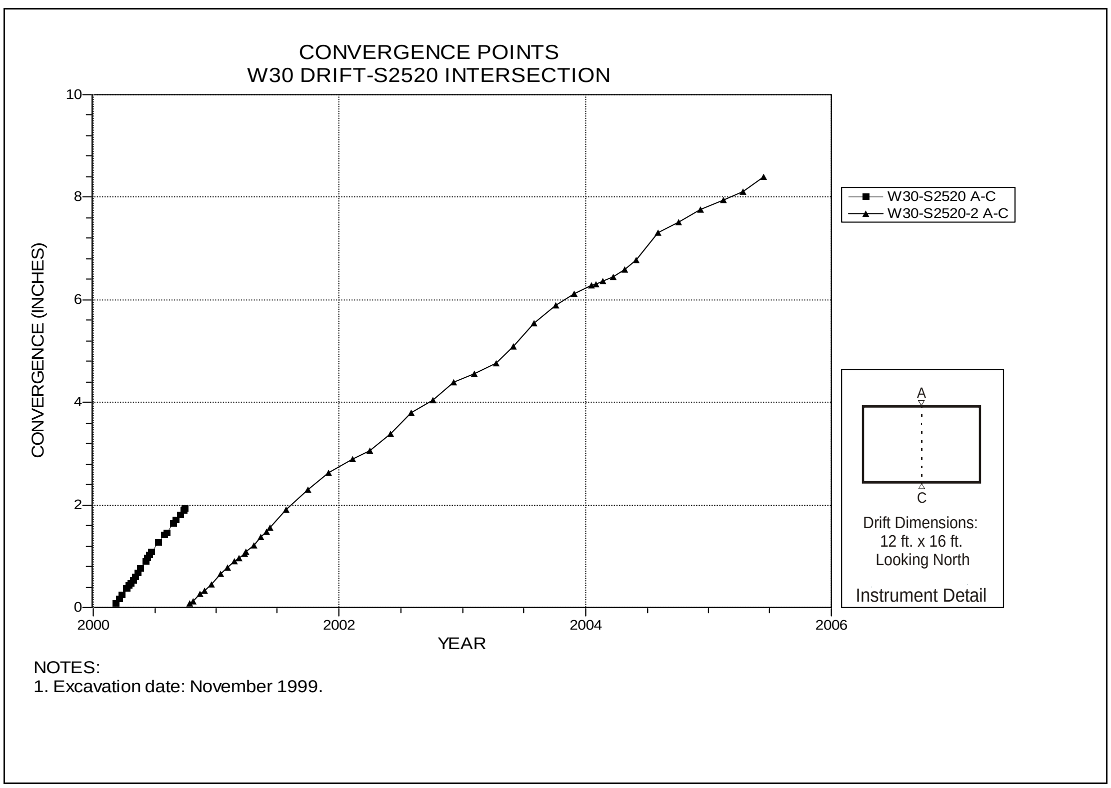


Figure 4-164 Convergence Point Array
W30 Drift at S2520 Drift Intersection – Roof to Floor

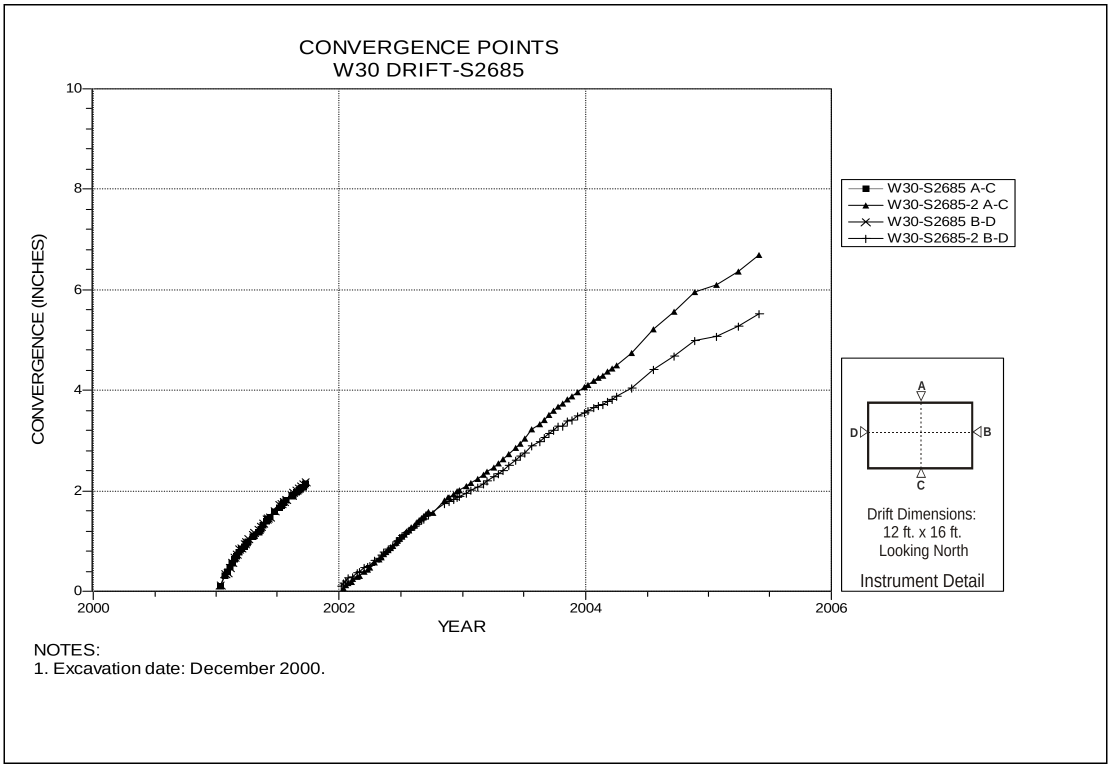


Figure 4-165 Convergence Point Array
W30 Drift at S2685 – All Chords

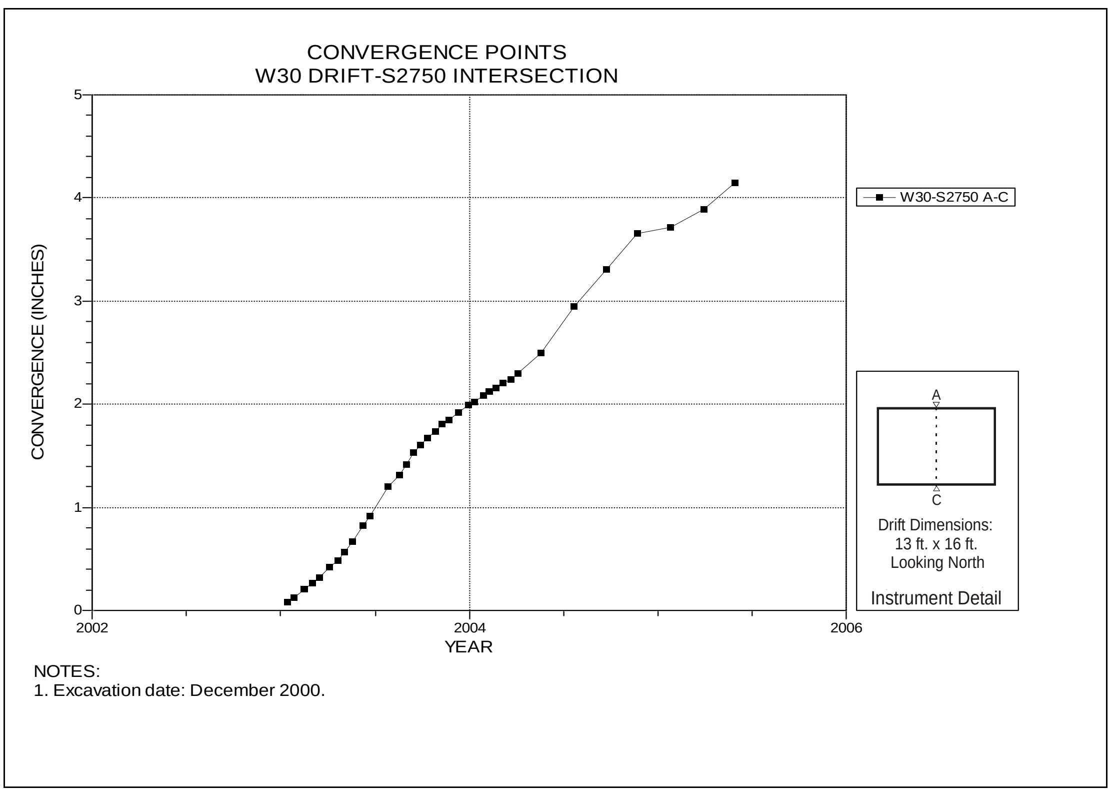


Figure 4-166 Convergence Point Array
W30 Drift at S2750 Drift Intersection – Roof to Floor

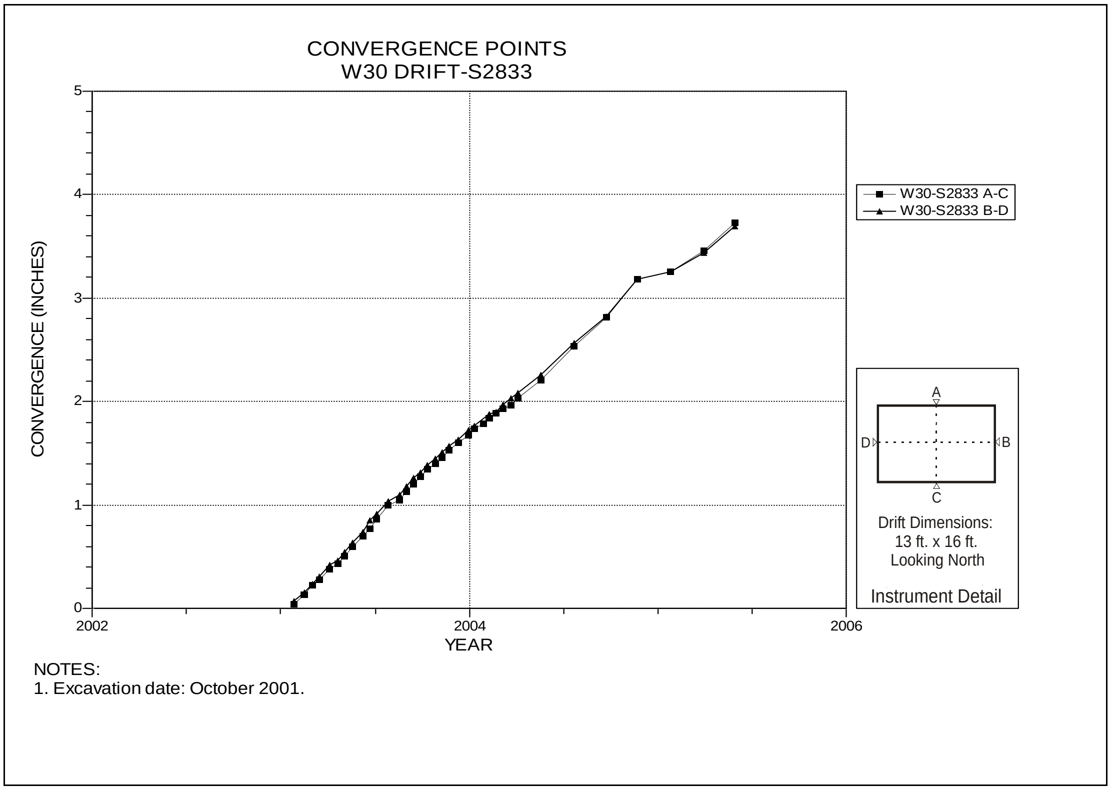


Figure 4-167 Convergence Point Array
W30 Drift at S2833 – All Chords

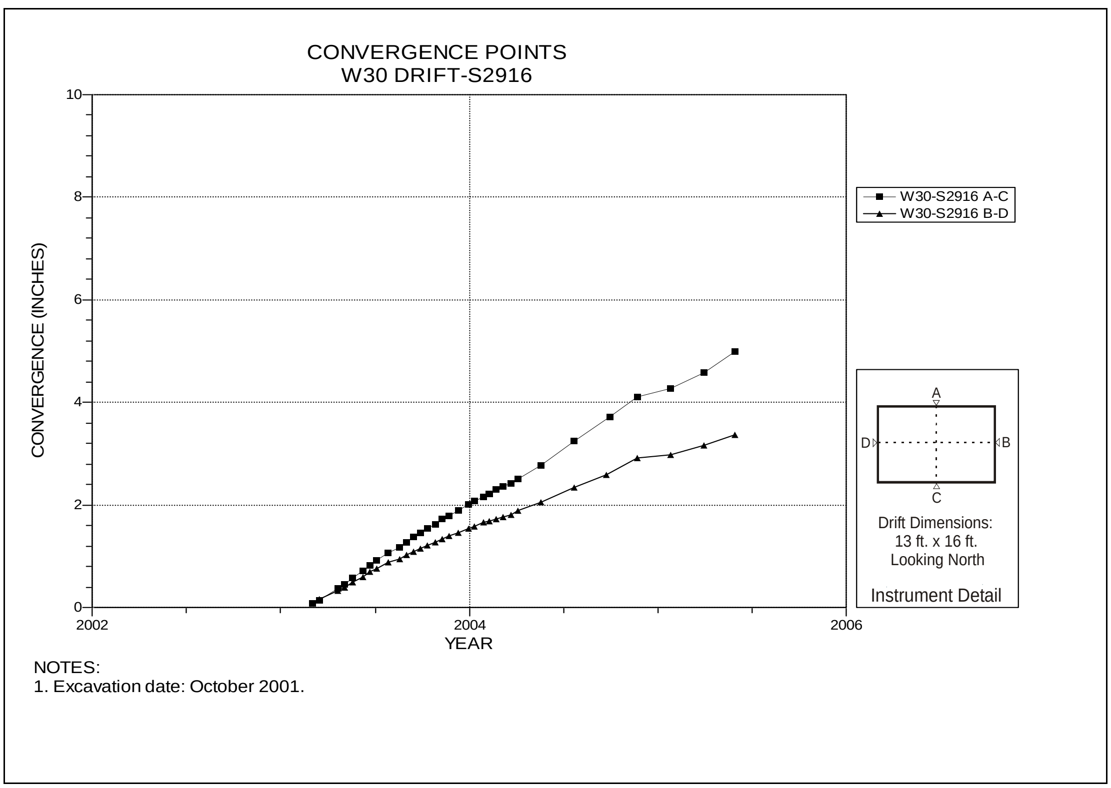


Figure 4-168 Convergence Point Array
W30 Drift at S2916 – All Chords

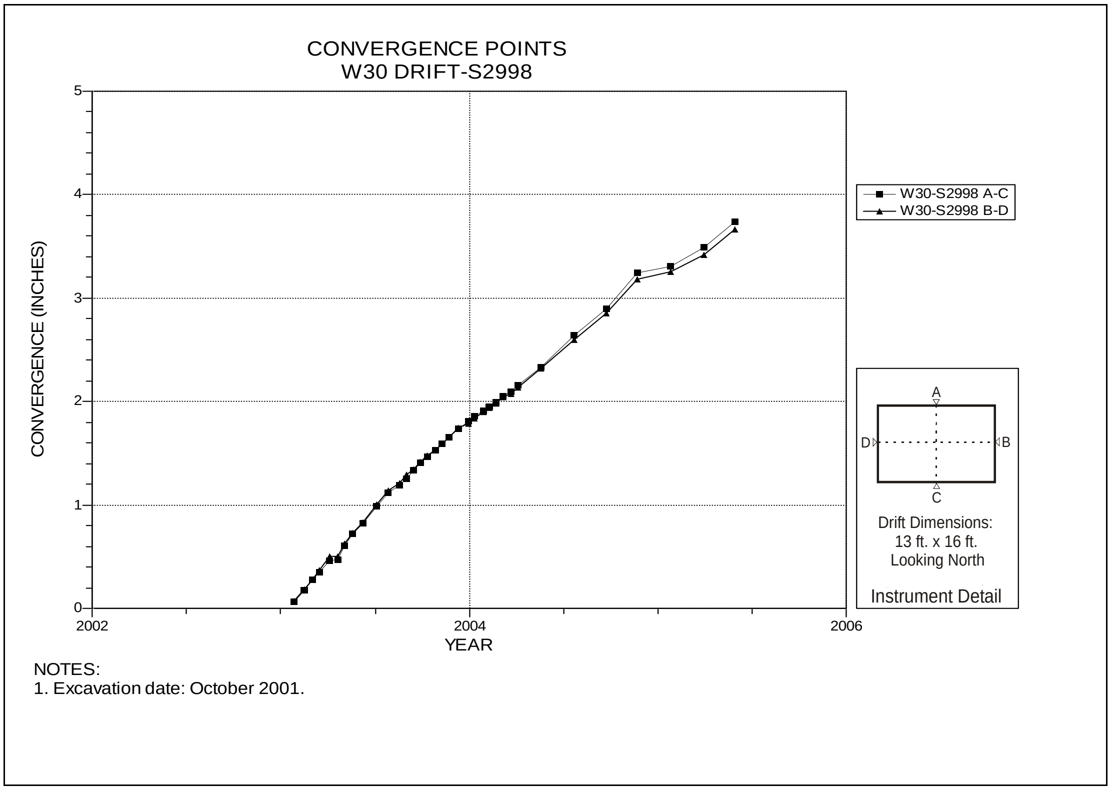


Figure 4-169 Convergence Point Array
W30 Drift at S2998 – All Chords

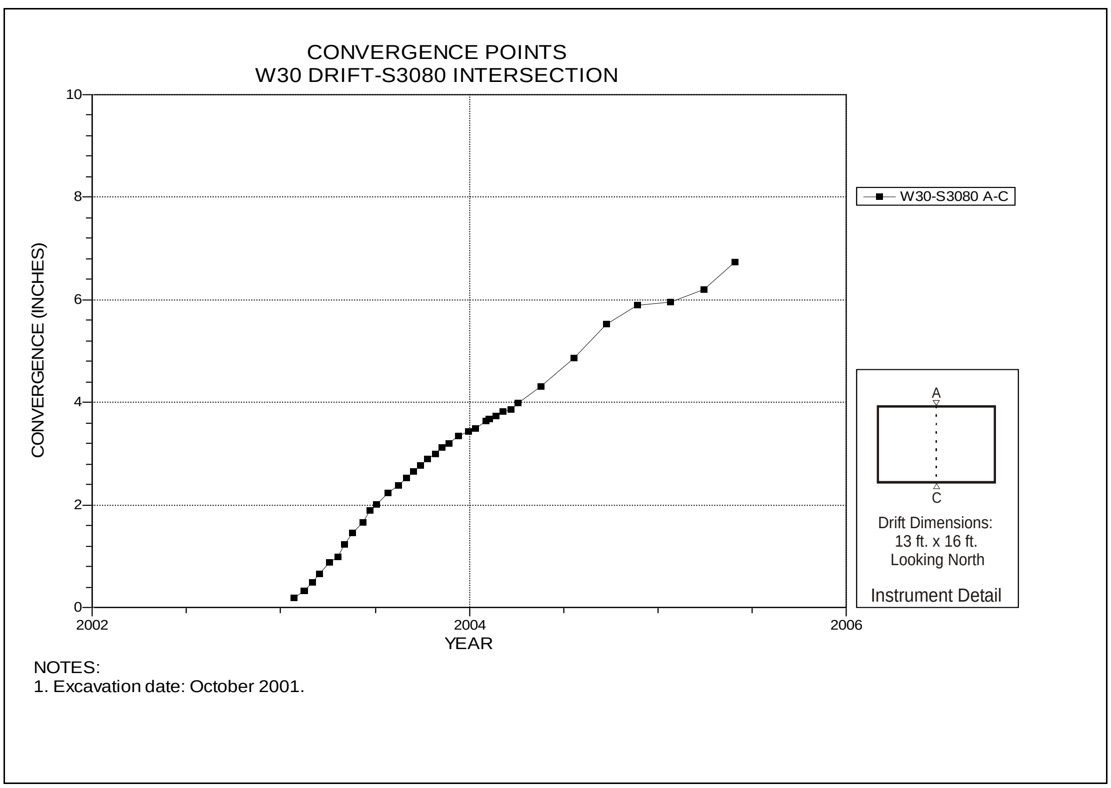


Figure 4-170 Convergence Point Array
W30 Drift at S3080 Drift Intersection – Roof to Floor

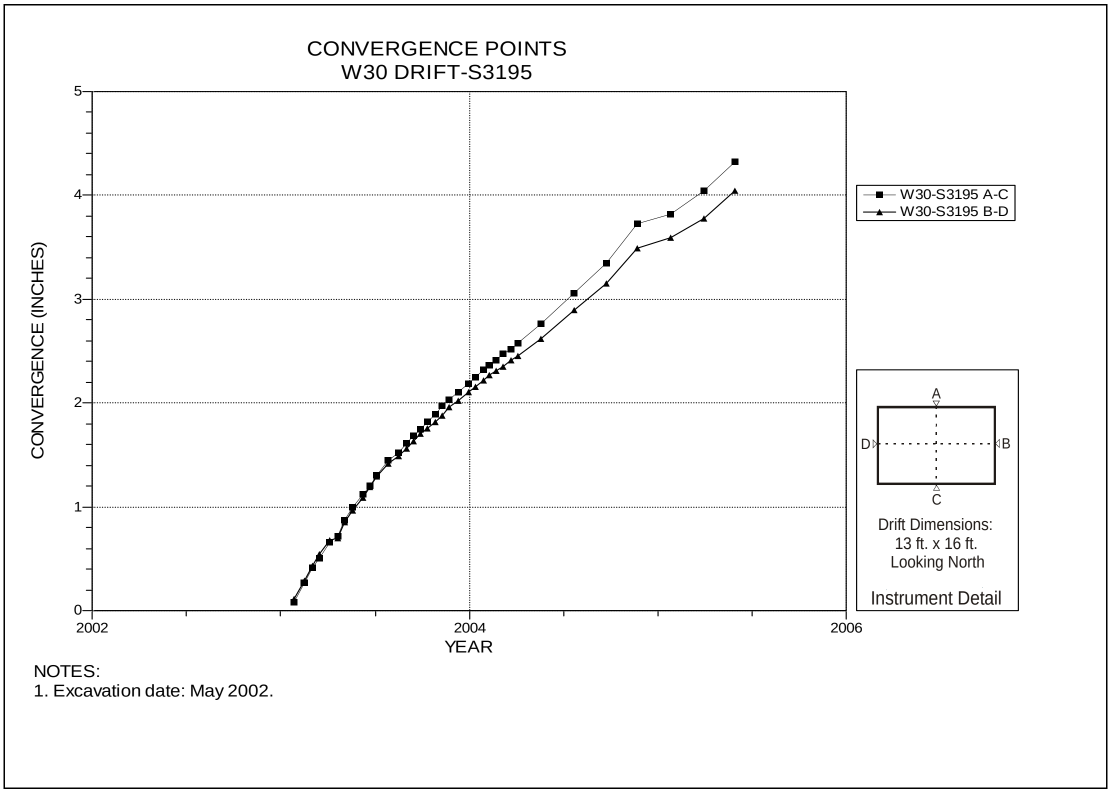


Figure 4-171 Convergence Point Array
W30 Drift at S3195 – All Chords

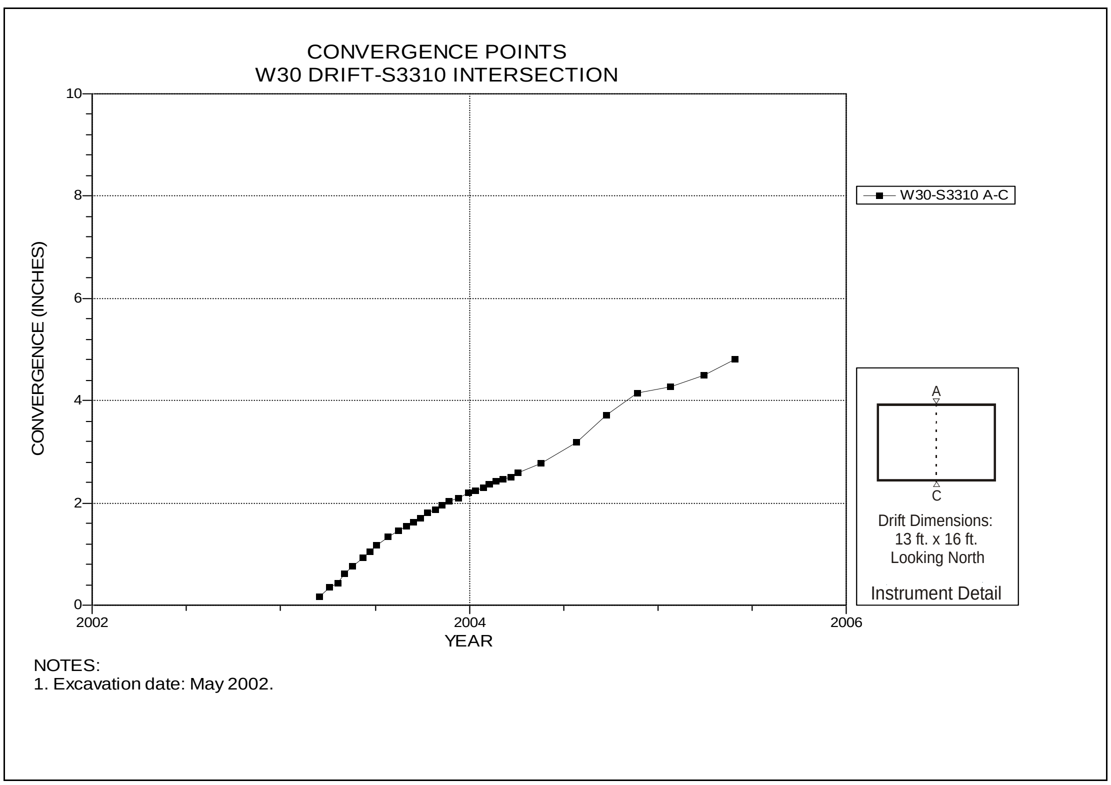


Figure 4-172 Convergence Point Array
W30 Drift at S3310 Drift Intersection – Roof to Floor

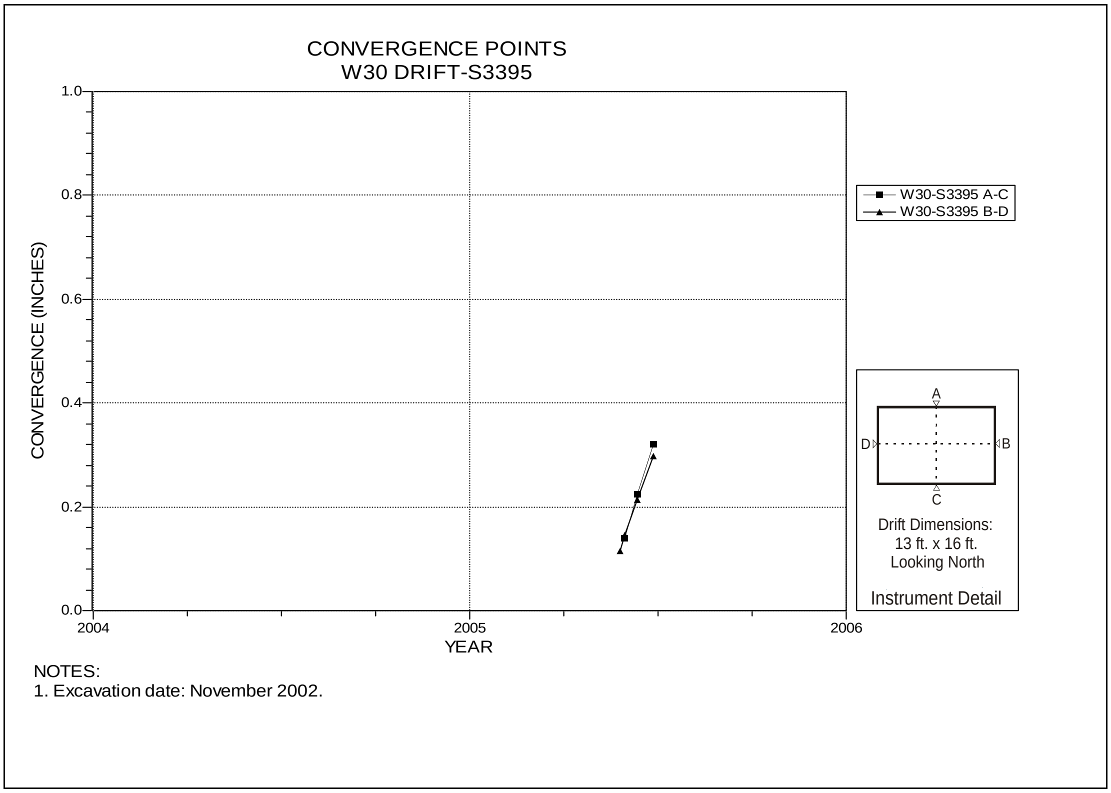


Figure 4-173 Convergence Point Array
W30 Drift at S3395 – All Chords

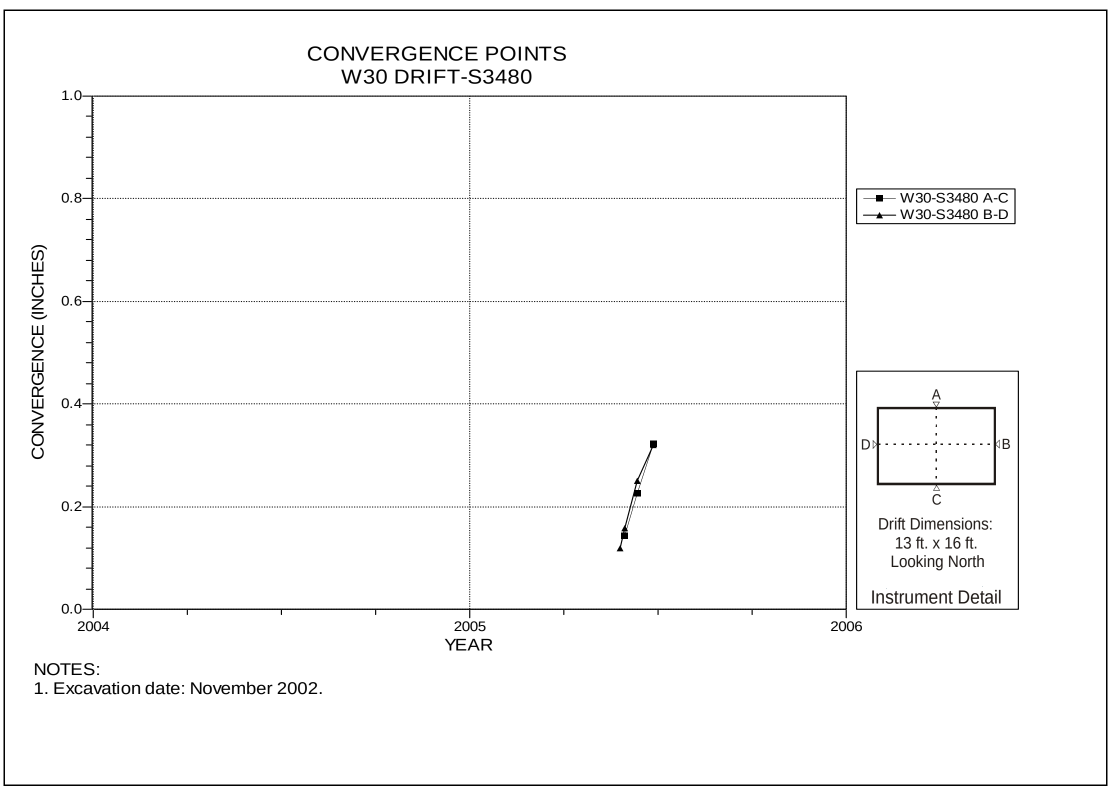


Figure 4-174 Convergence Point Array
W30 Drift at S3480 – All Chords

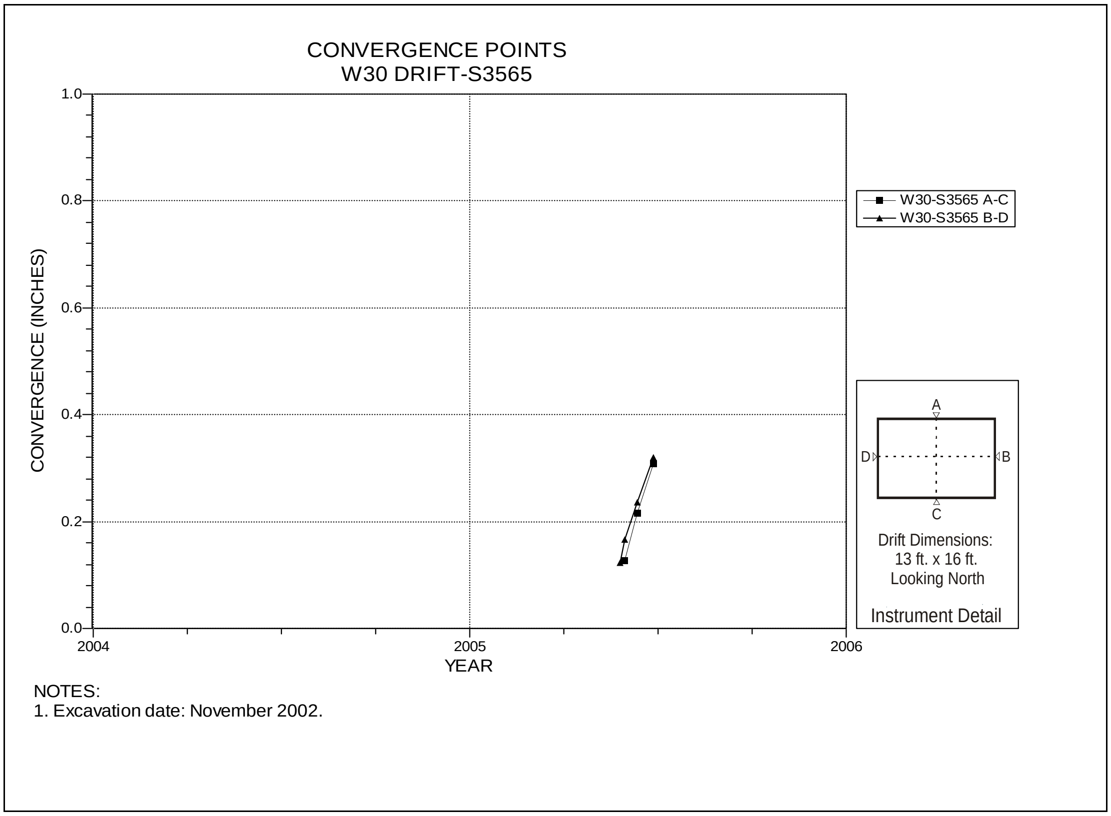


Figure 4-175 Convergence Point Array
W30 Drift at S3565 – All Chords

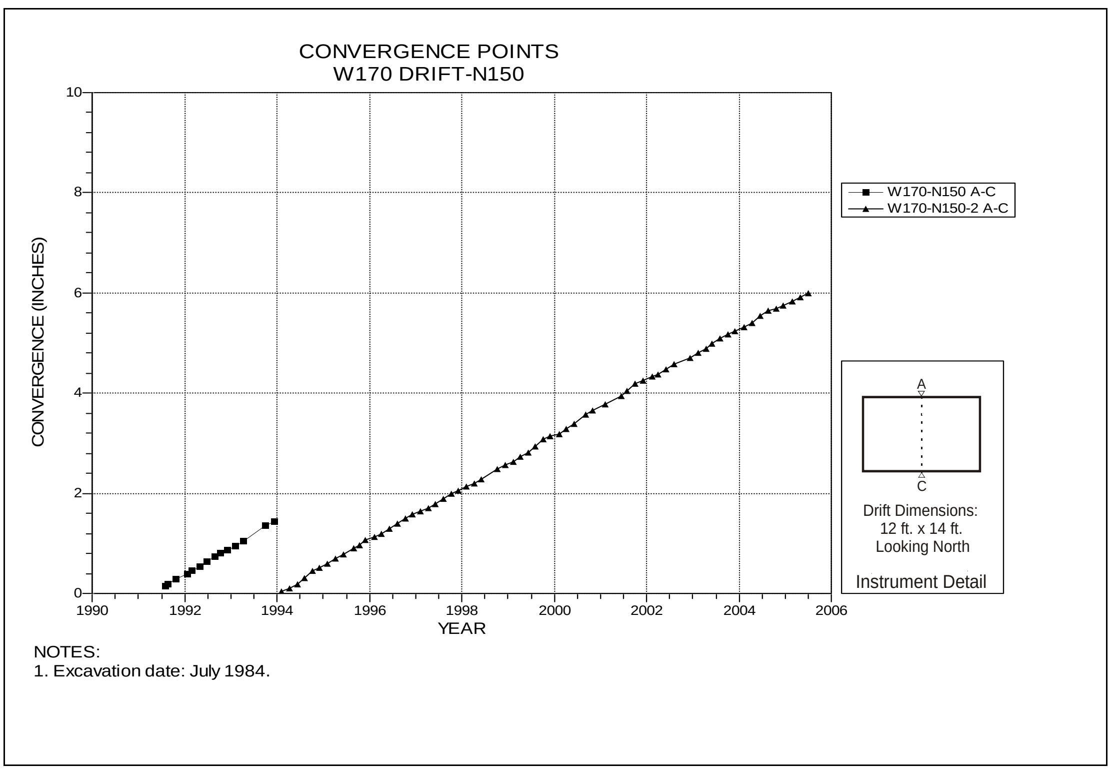


Figure 4-176 Convergence Point Array
W170 Drift at N150 Drift Intersection – Roof to Floor

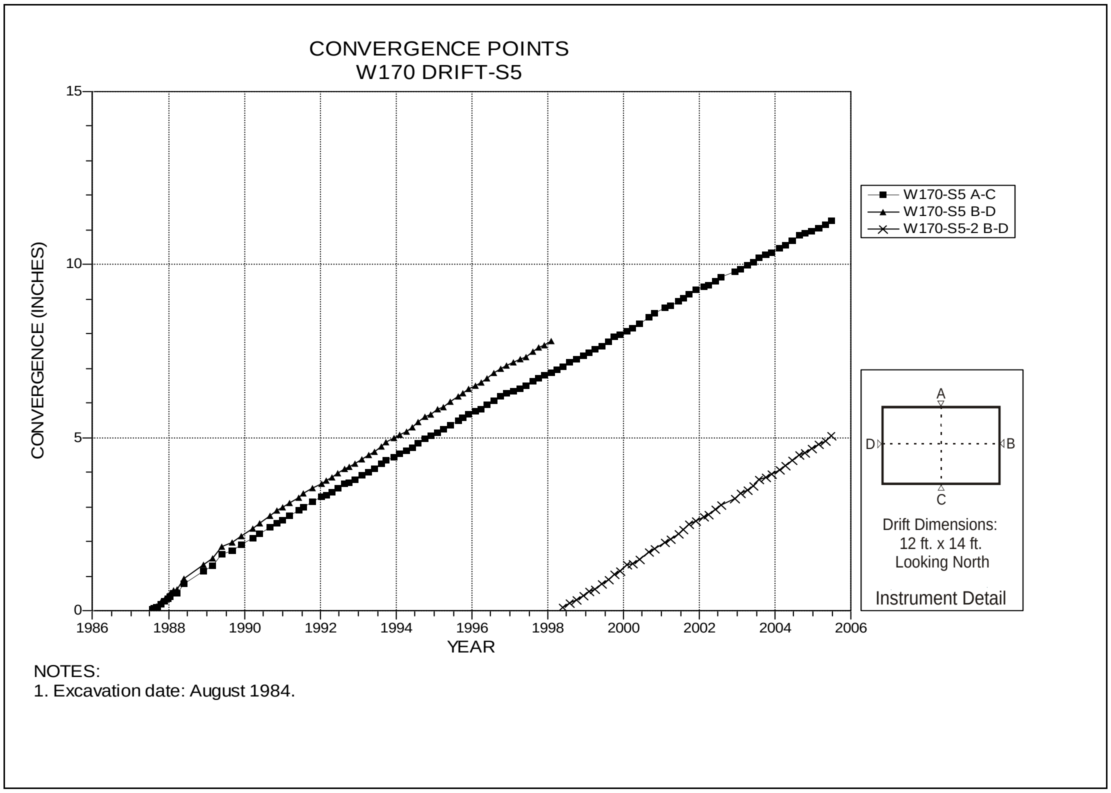


Figure 4-177 Convergence Point Array
W170 Drift at S5 – All Chords

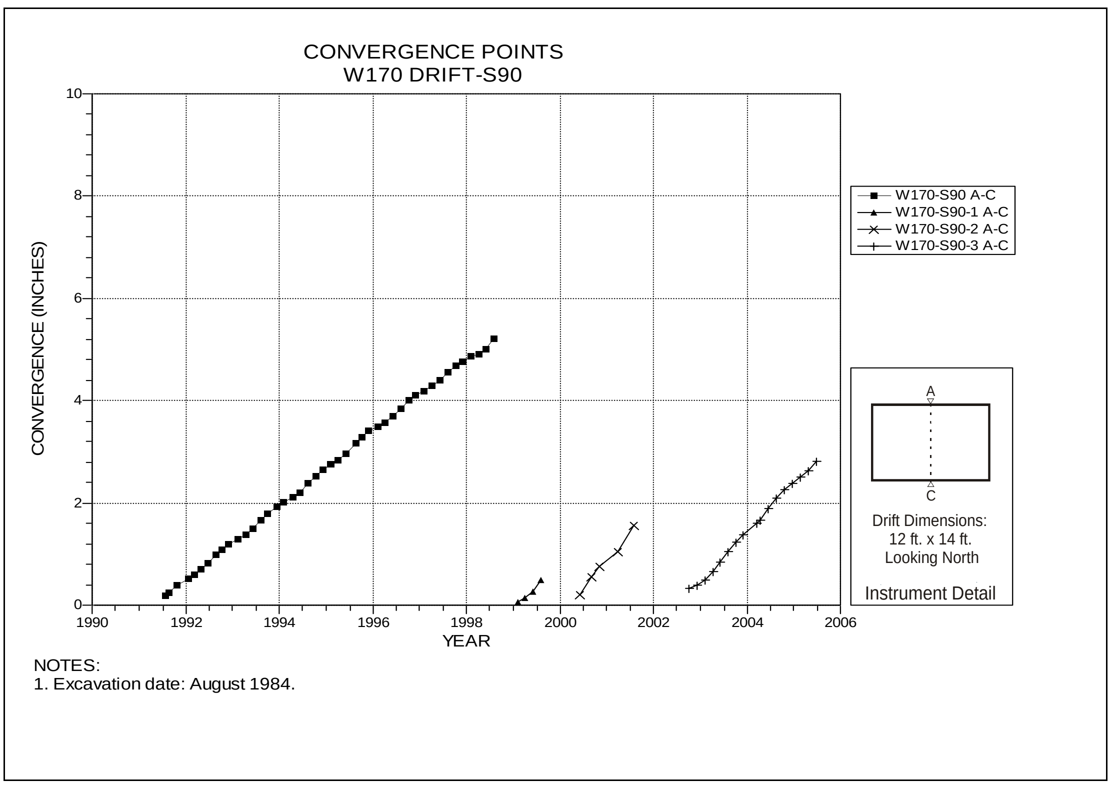


Figure 4-178 Convergence Point Array
W170 Drift at S90 – Roof to Floor

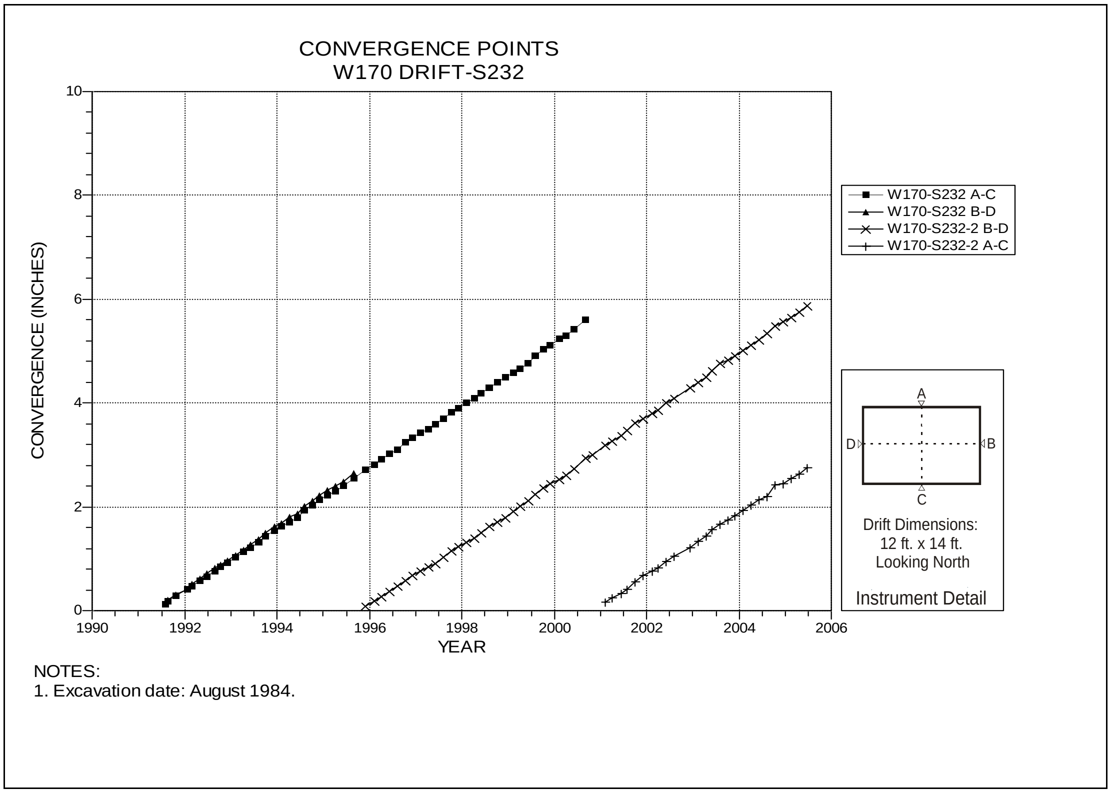


Figure 4-179 Convergence Point Array
W170 Drift at S232 – All Chords

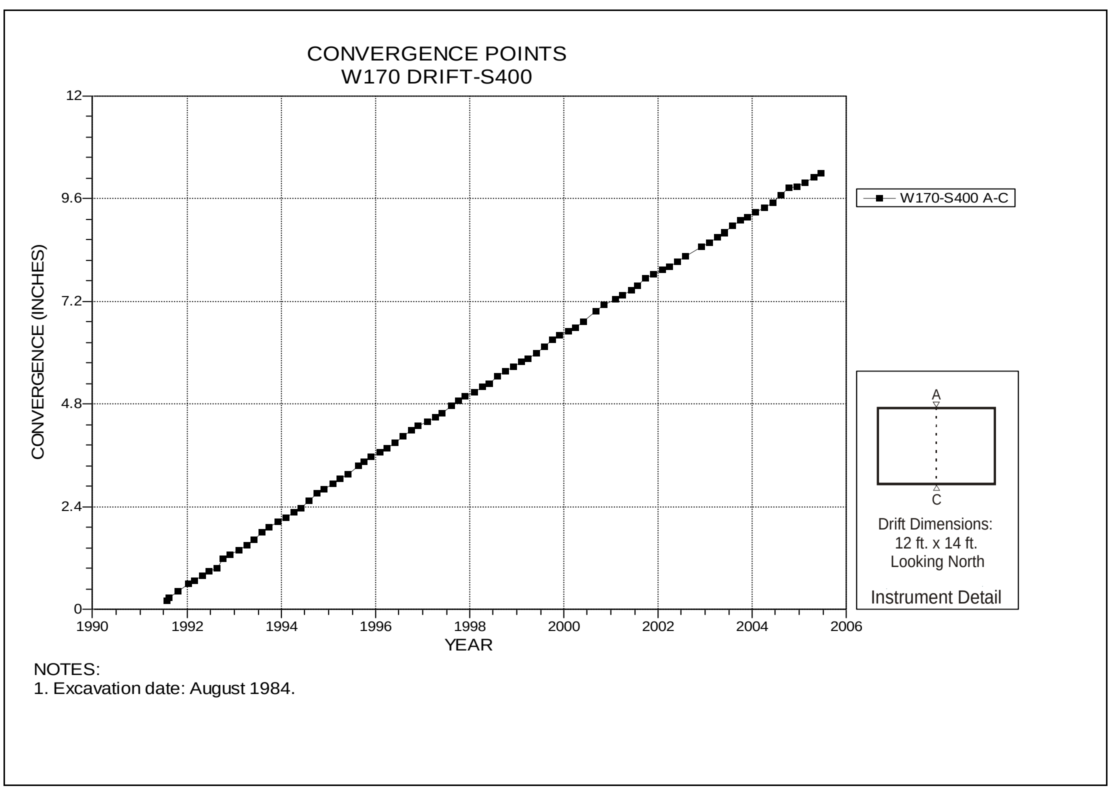


Figure 4-180 Convergence Point Array
W170 Drift at S400 Drift Intersection – Roof to Floor

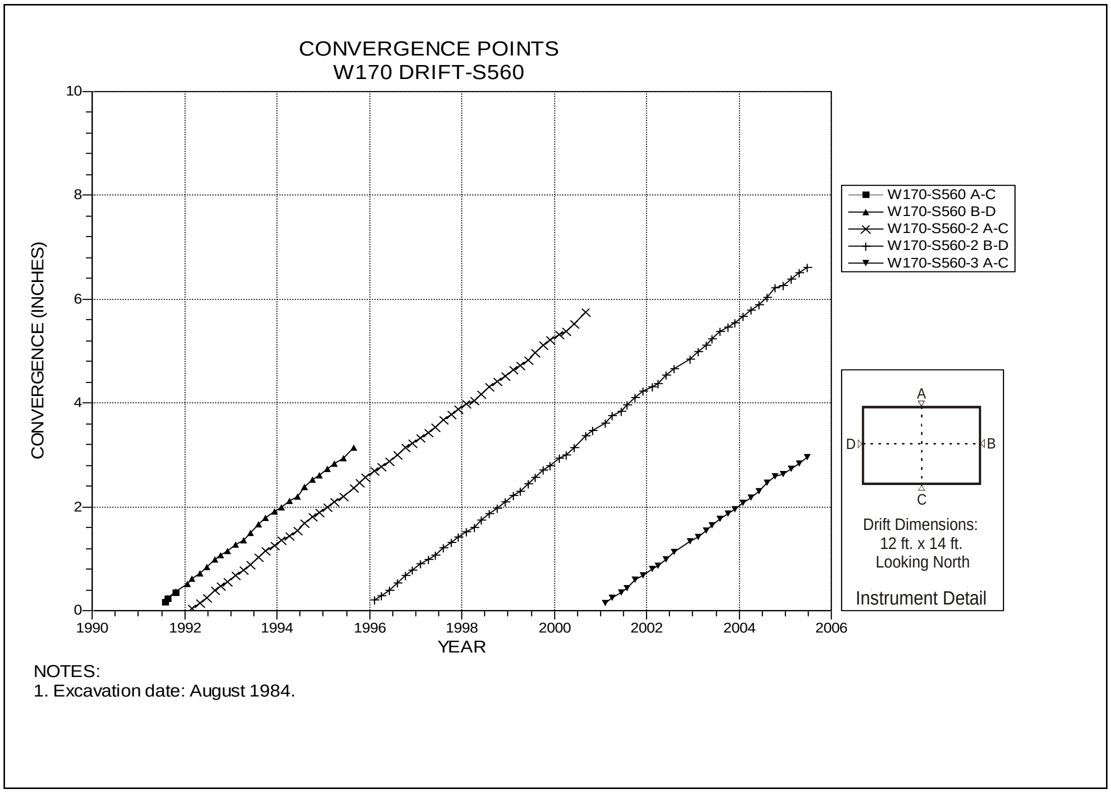


Figure 4-181 Convergence Point Array
W170 Drift at S560 – All Chords

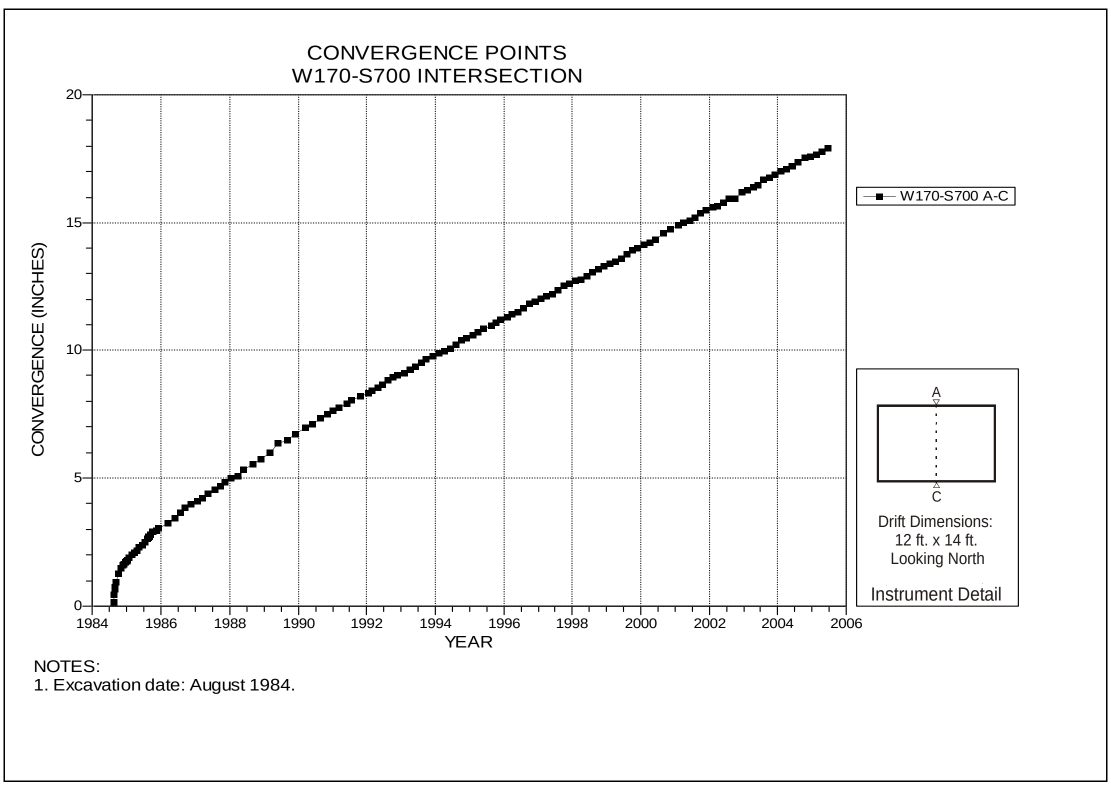


Figure 4-182 Convergence Point Array
W170 Drift at S700 Drift Intersection – Roof to Floor

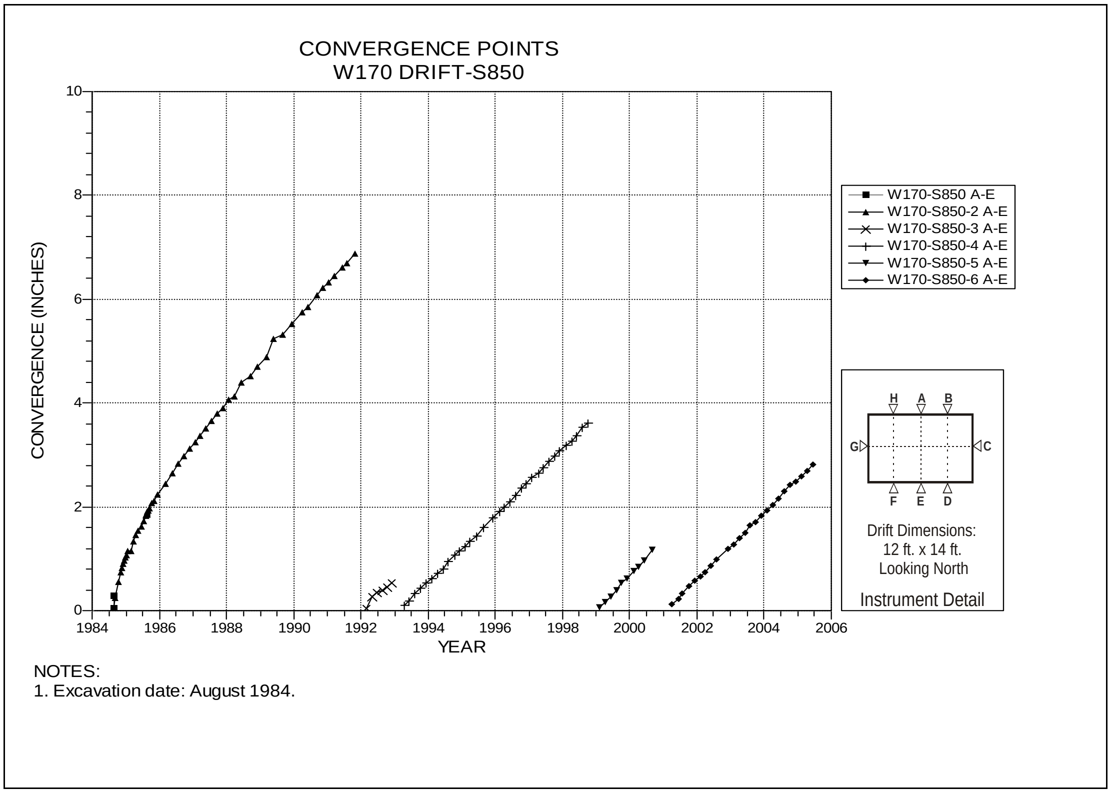


Figure 4-183 Convergence Point Array
W170 Drift at S850 – Roof to Floor – Centerline

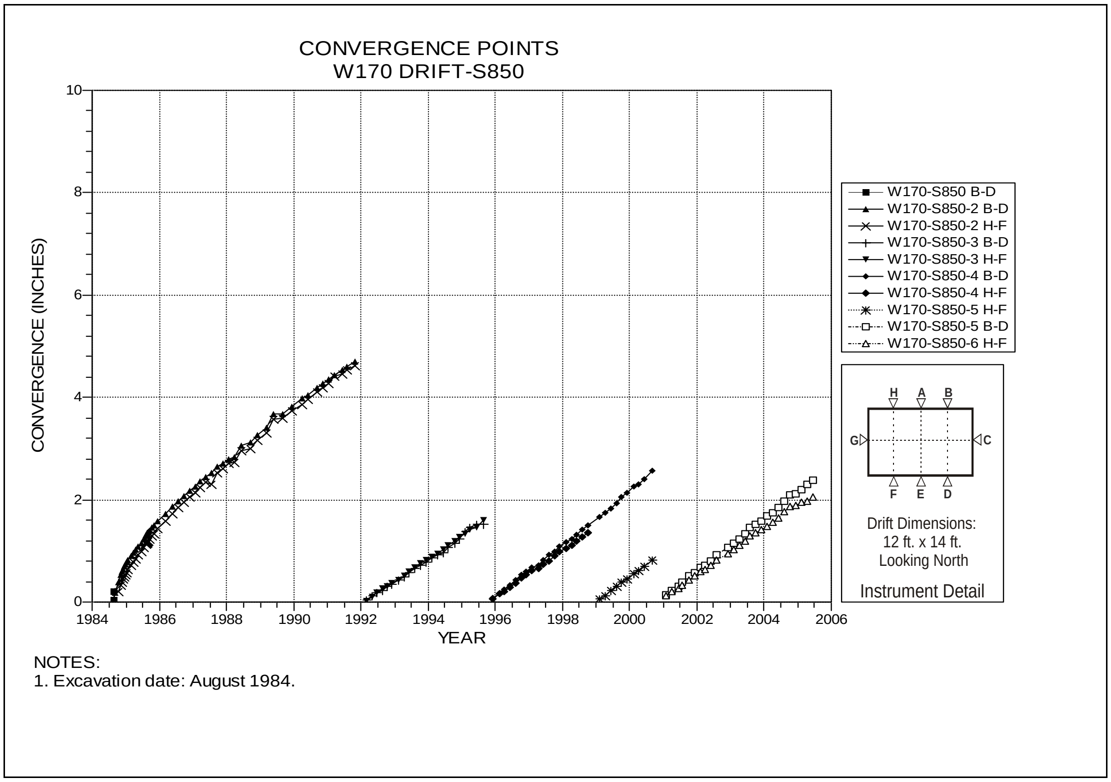


Figure 4-184 Convergence Point Array
W170 Drift at S850 – Roof to Floor – Quarter Points

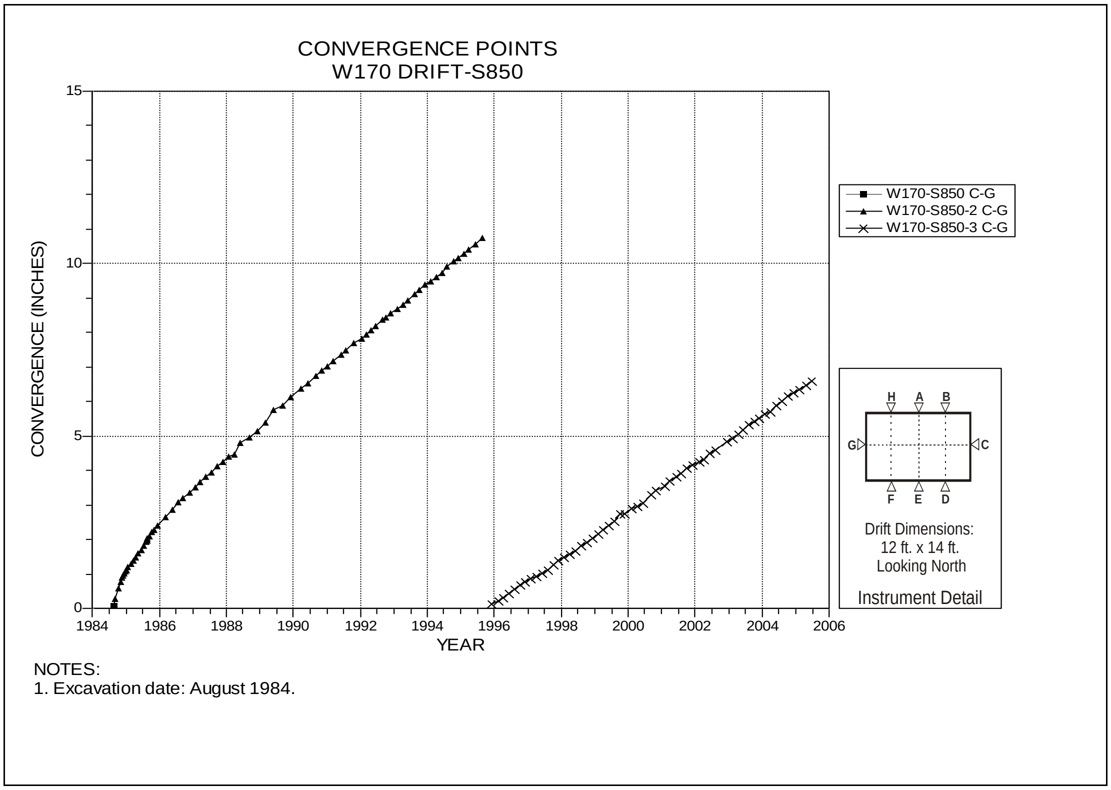


Figure 4-185 Convergence Point Array
W170 Drift at S850 – Rib to Rib

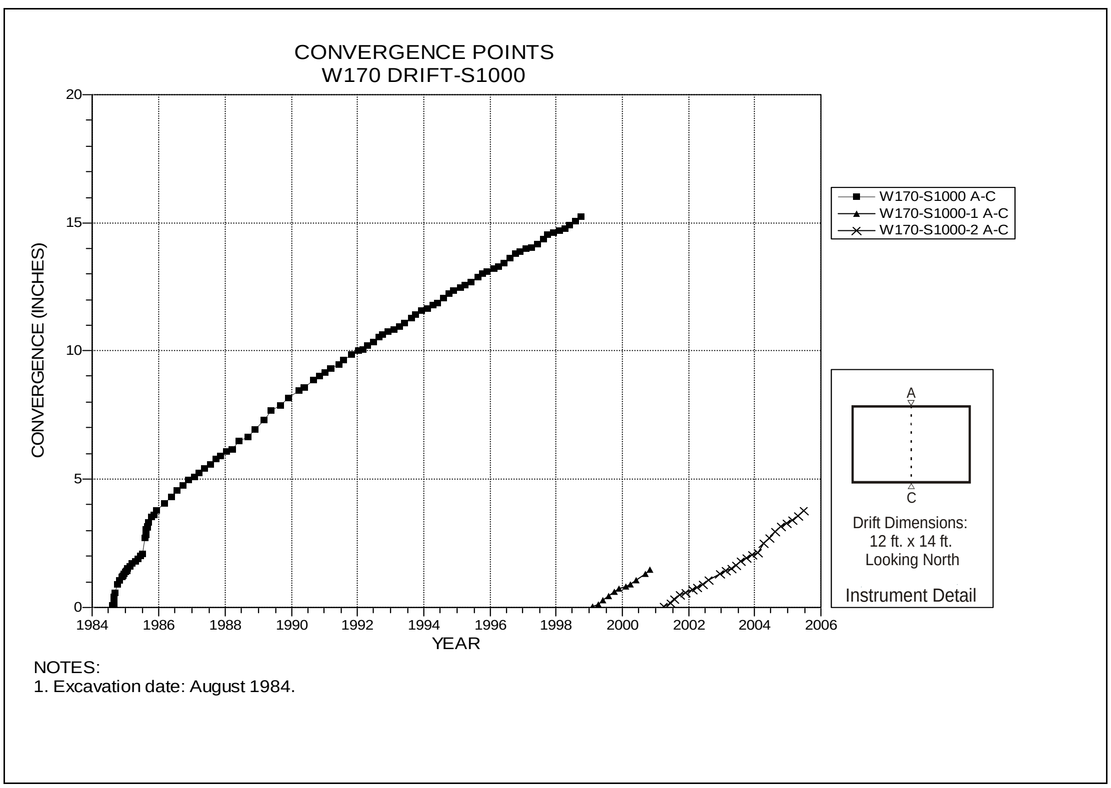


Figure 4-186 Convergence Point Array
W170 Drift at S1000 – Roof to Floor

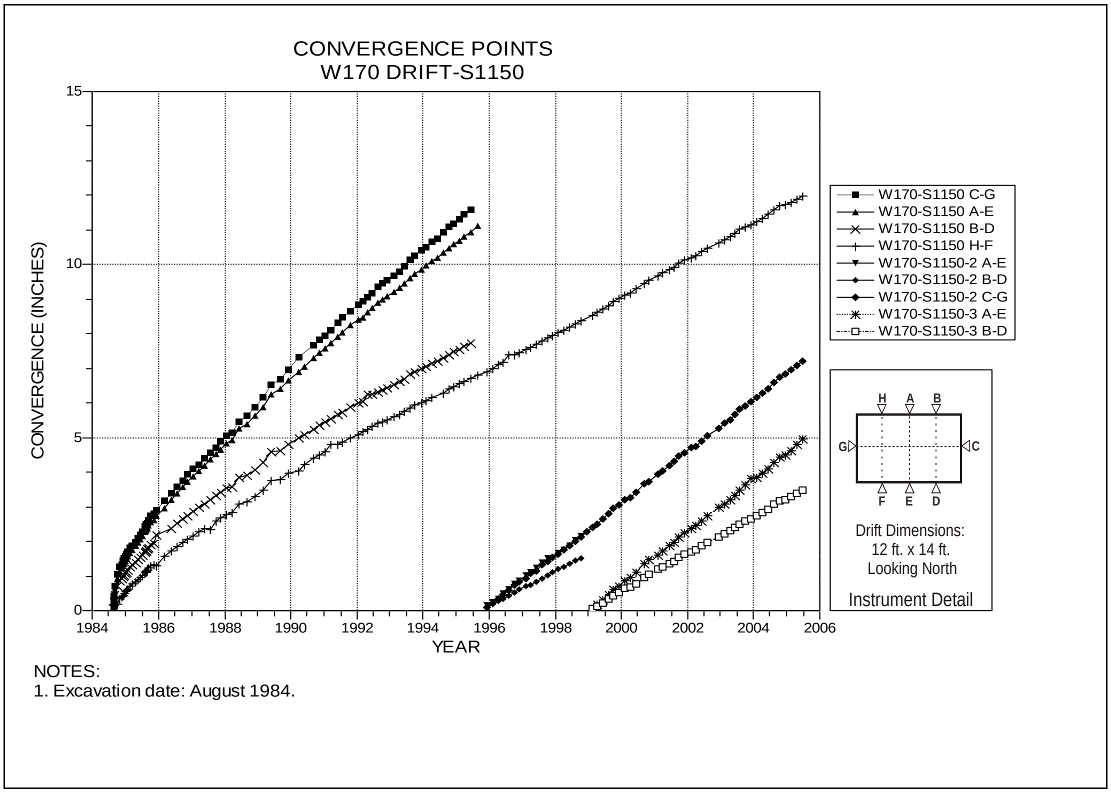


Figure 4-187 Convergence Point Array
W170 Drift at S1150 – All Chords

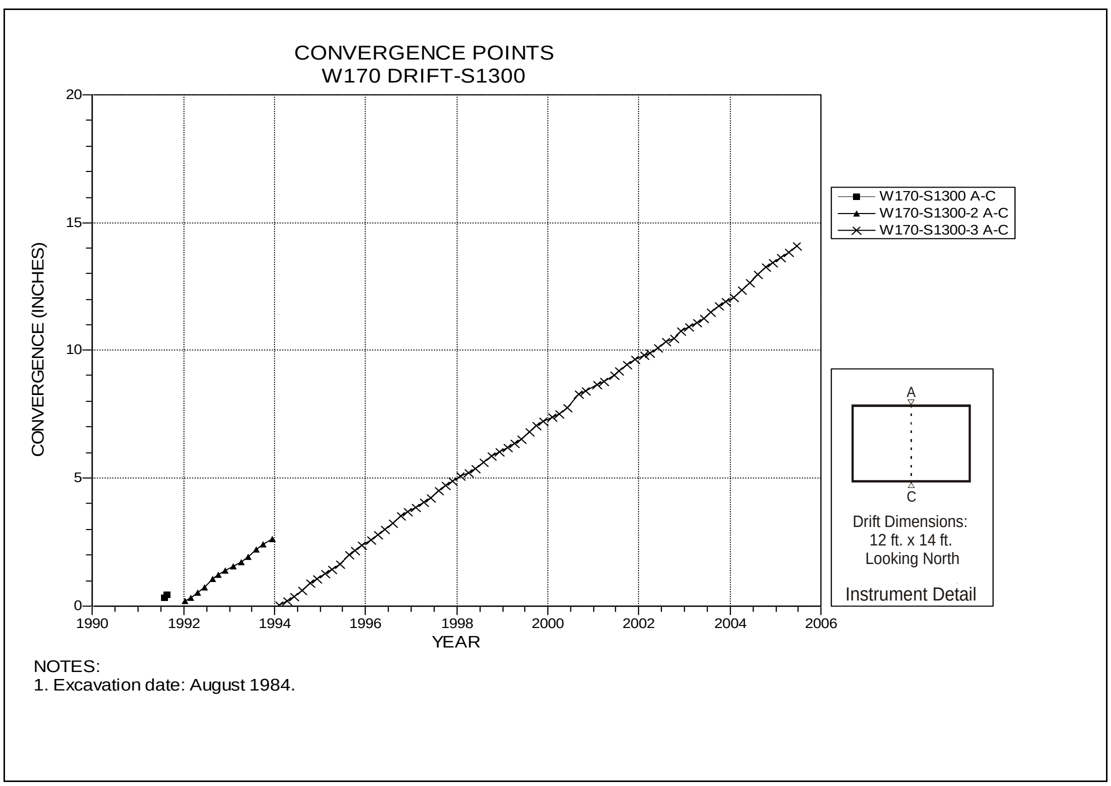


Figure 4-188 Convergence Point Array
W170 Drift at S1300 Drift Intersection – Roof to Floor

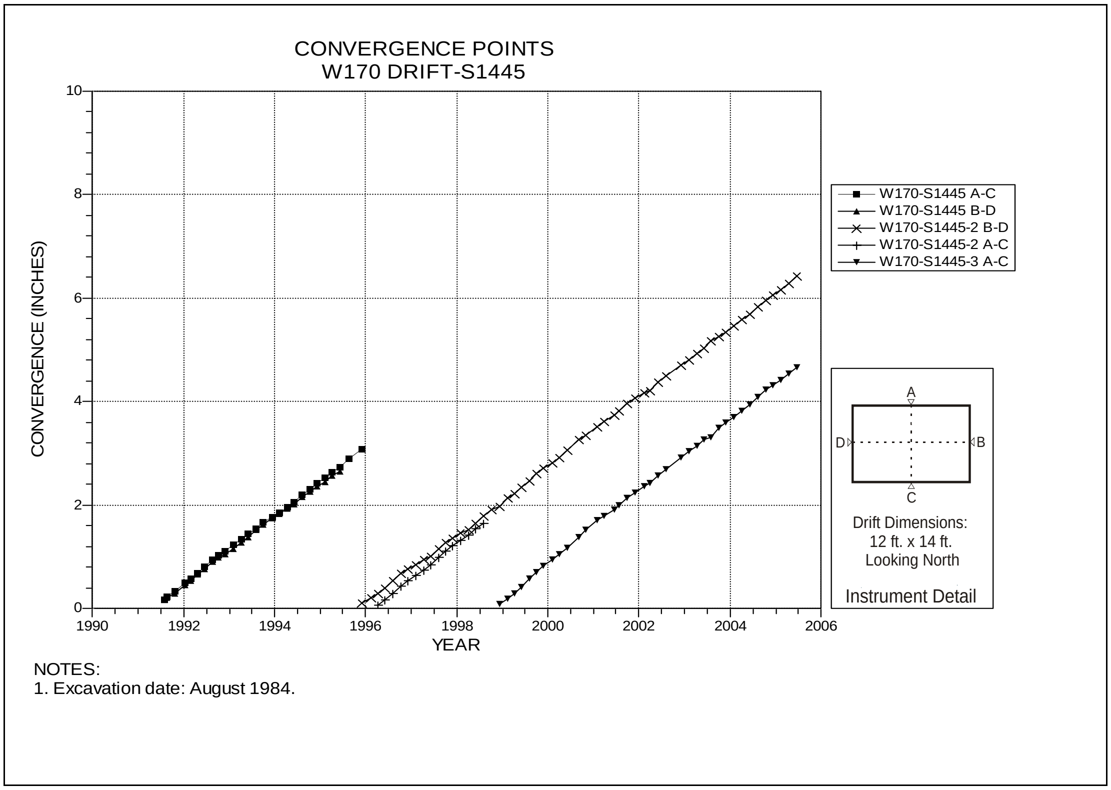


Figure 4-189 Convergence Point Array
W170 Drift at S1445 – All Chords

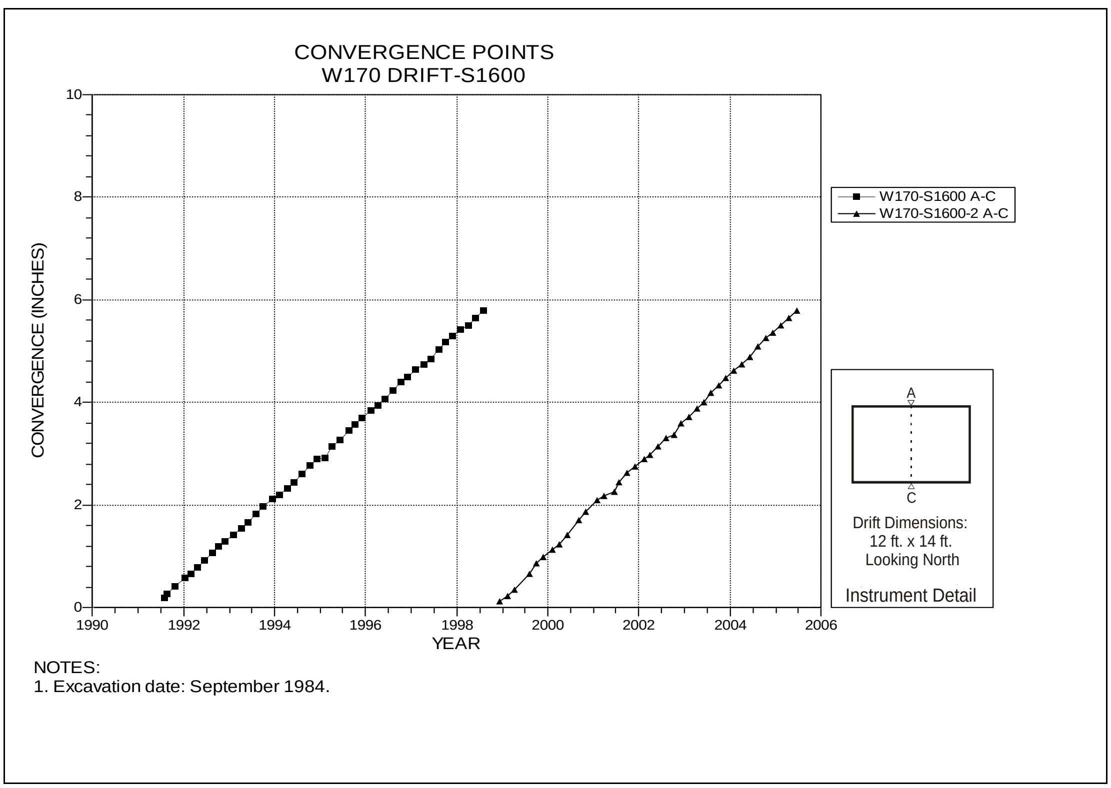


Figure 4-190 Convergence Point Array
W170 Drift at S1600 Drift Intersection – Roof to Floor

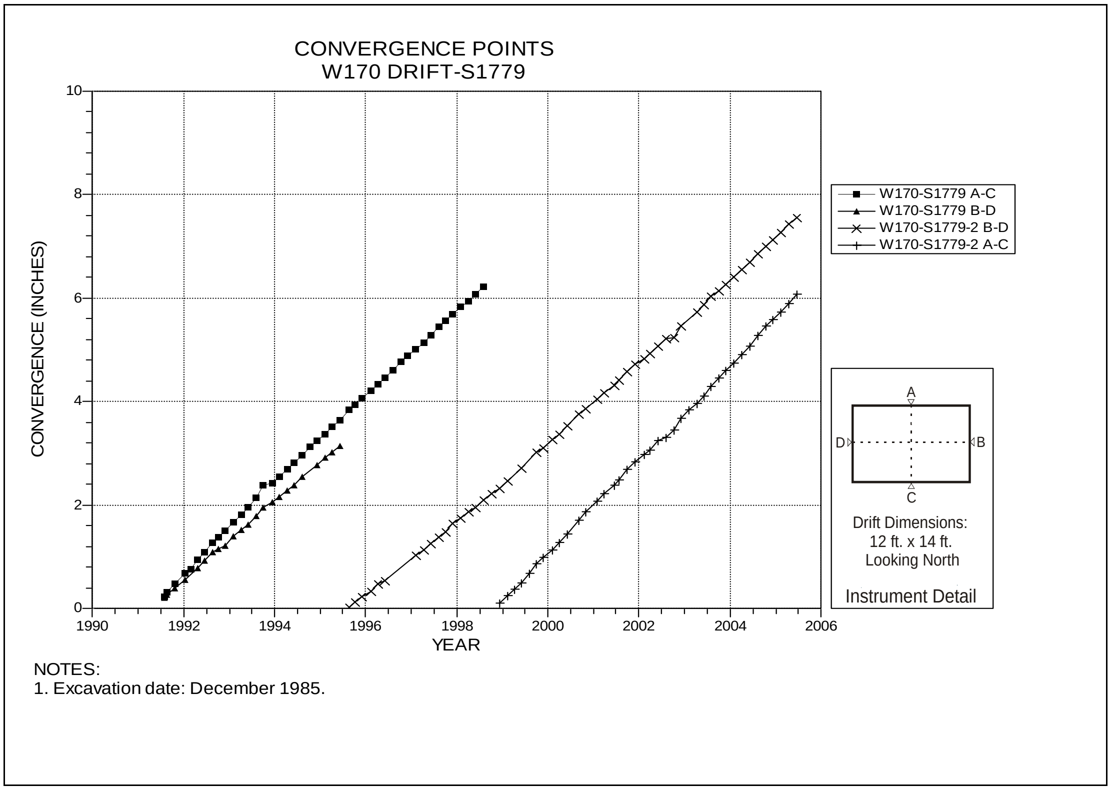


Figure 4-191 Convergence Point Array
W170 Drift at S1779 – All Chords

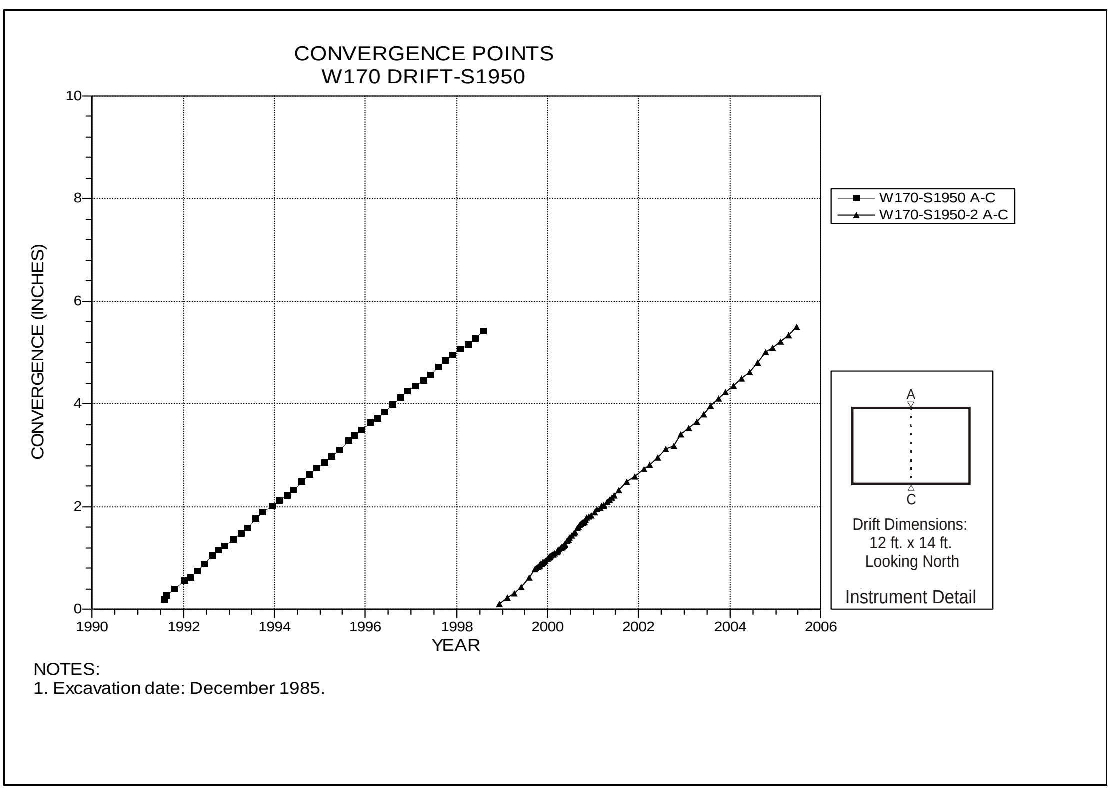


Figure 4-192 Convergence Point Array
W170 Drift at S1950 Drift Intersection – Roof to Floor

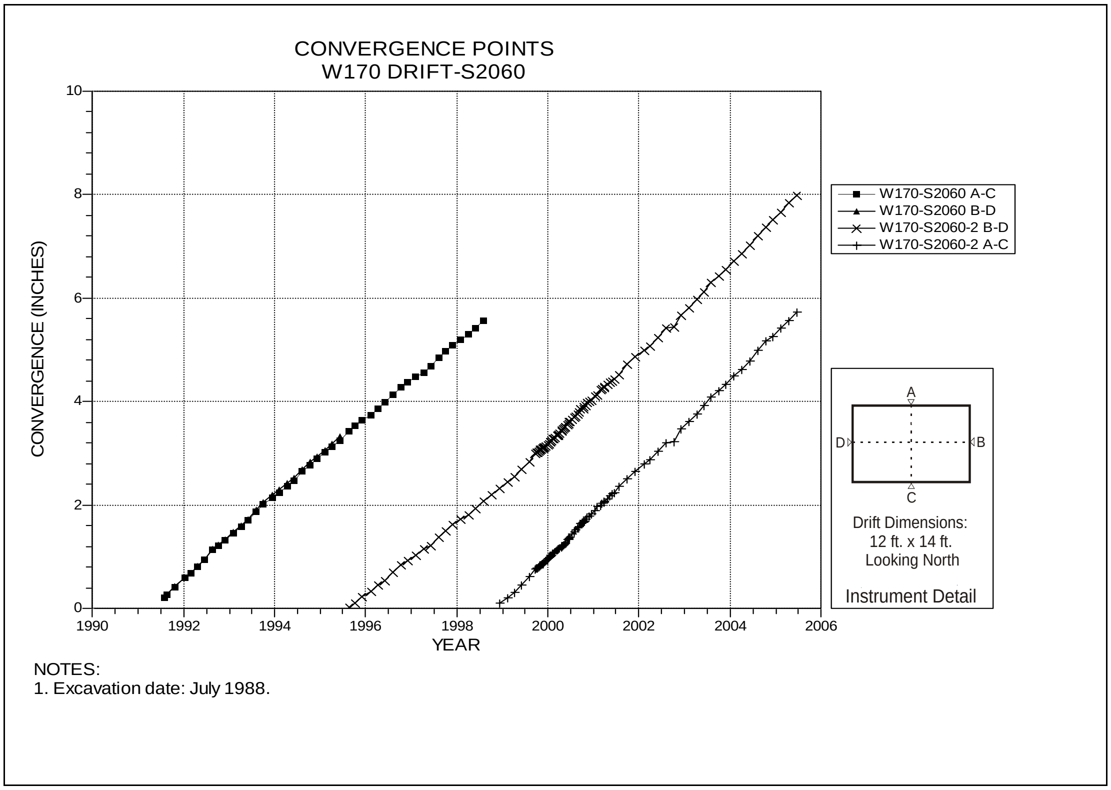


Figure 4-193 Convergence Point Array
W170 Drift at S2060 – All Chords

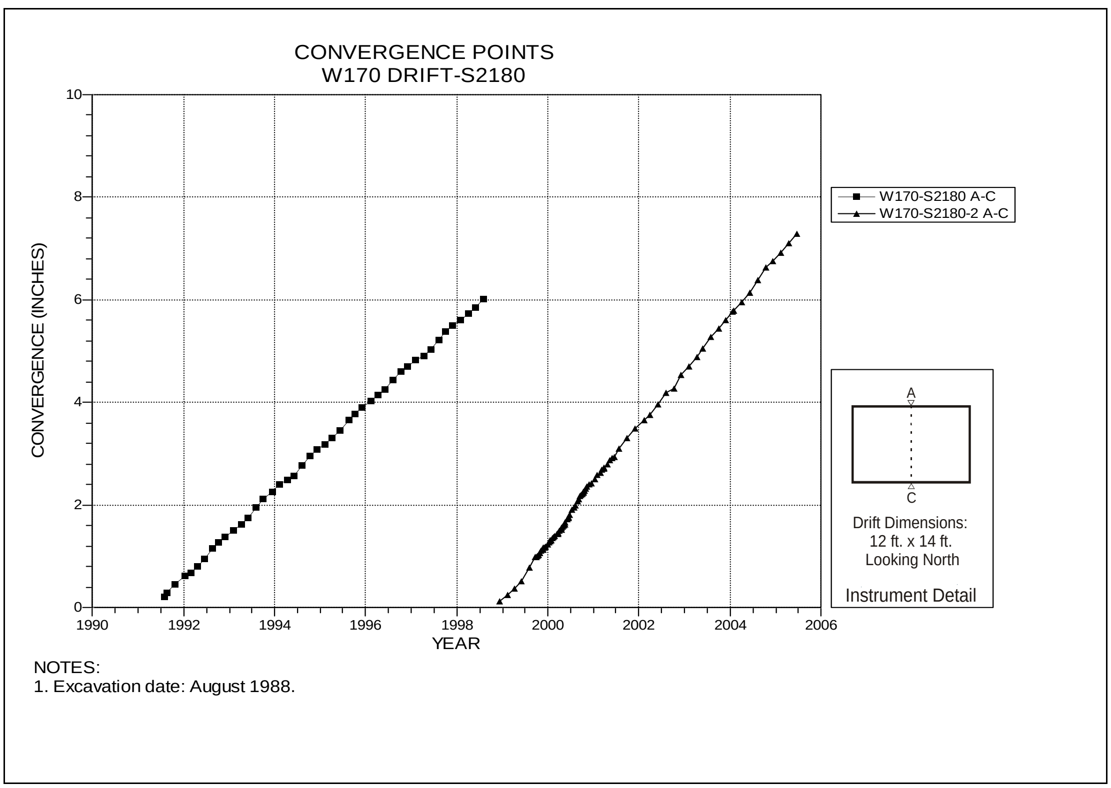


Figure 4-194 Convergence Point Array
W170 Drift at S2180 Drift Intersection – Roof to Floor

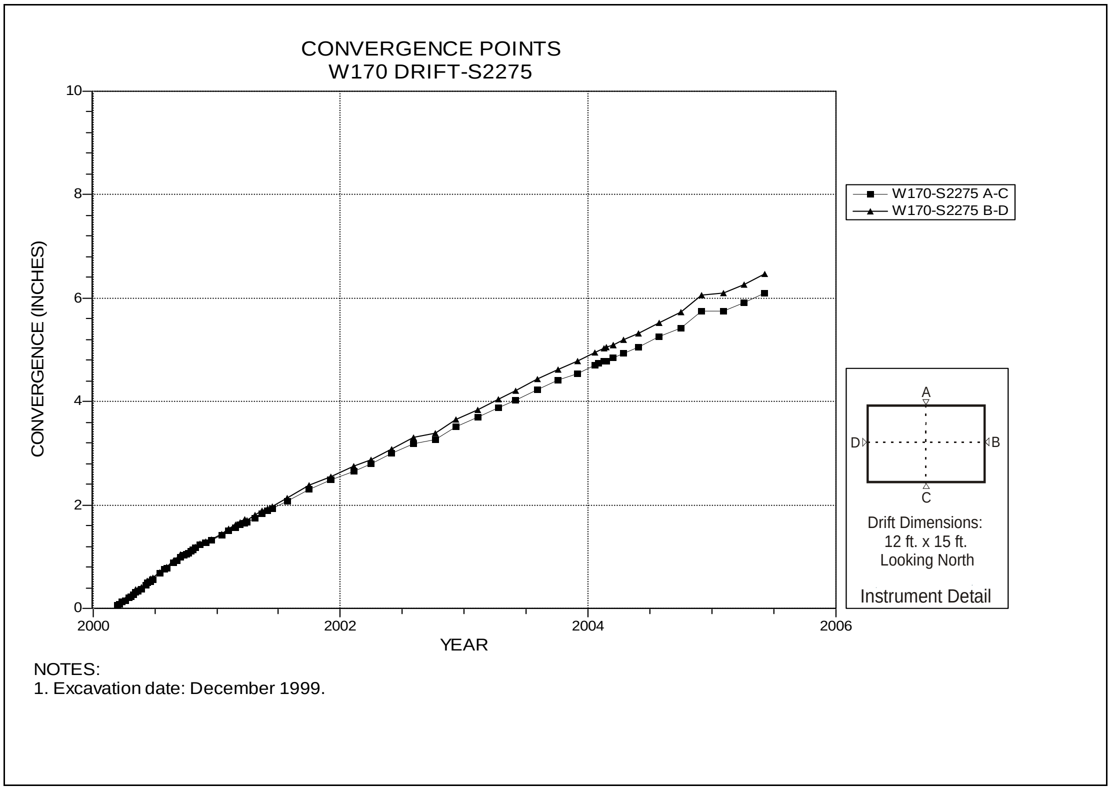


Figure 4-195 Convergence Point Array
W170 Drift at S2275 – All Chords

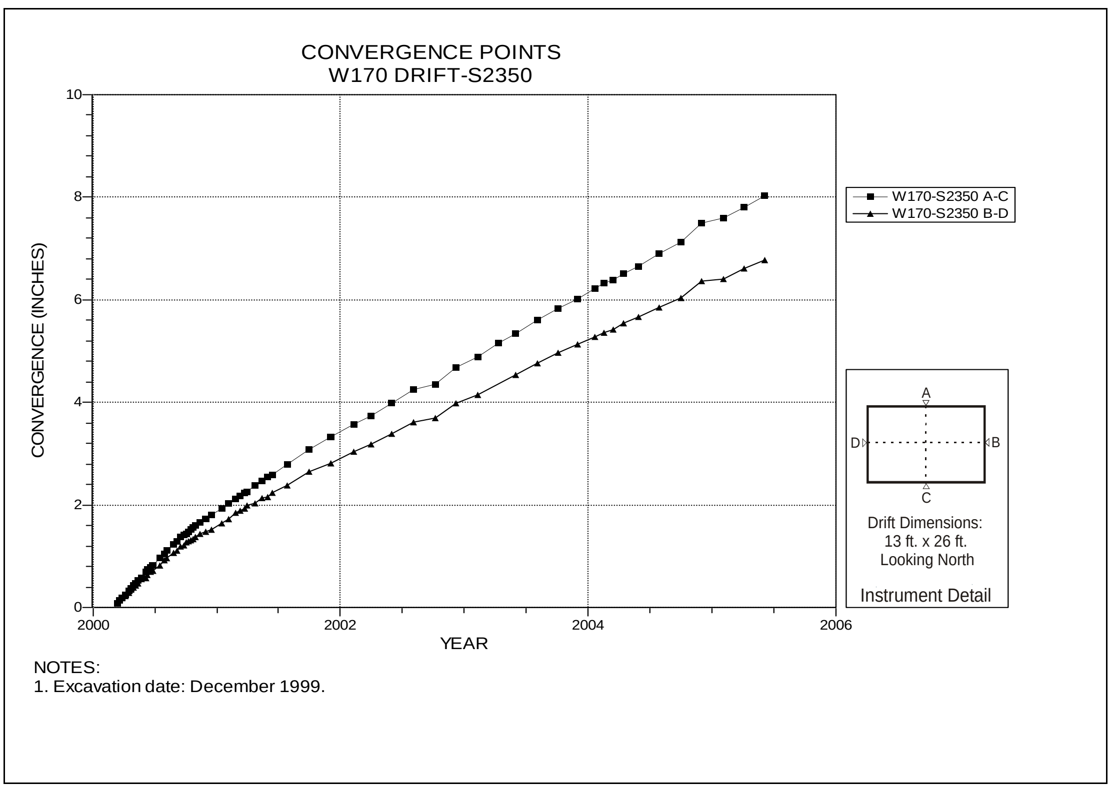


Figure 4-196 Convergence Point Array
W170 Drift at S2350 – All Chords

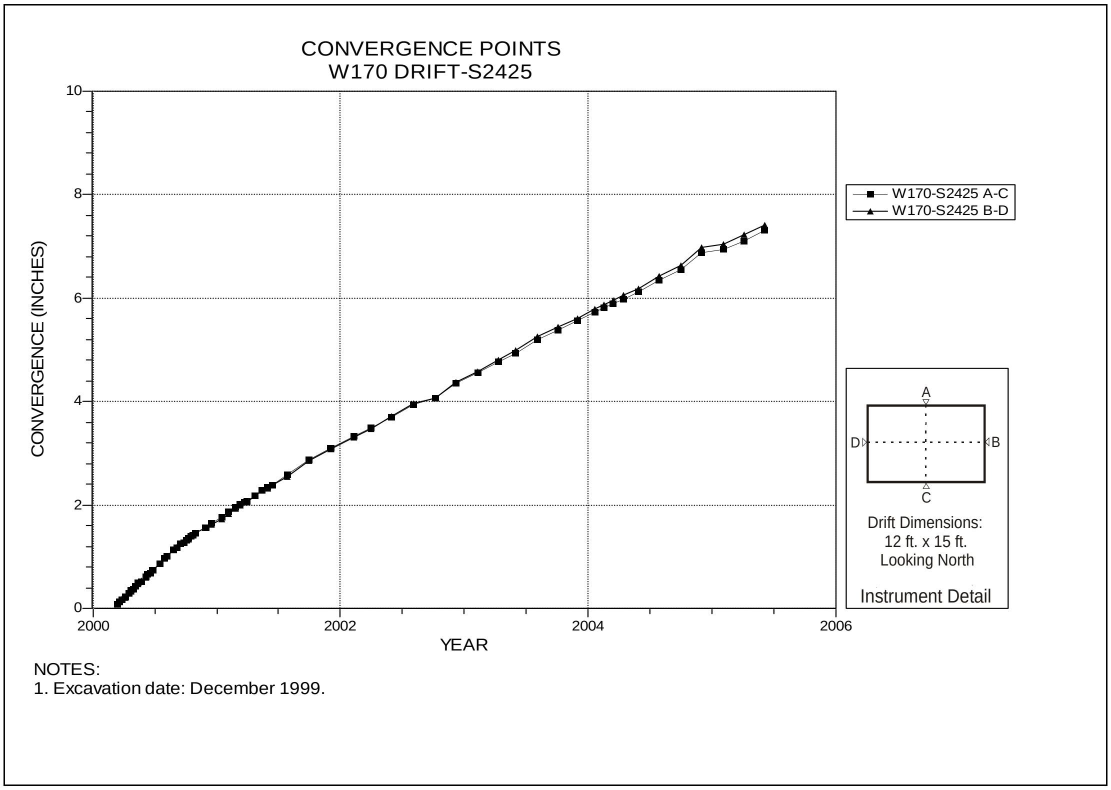


Figure 4-197 Convergence Point Array
W170 Drift at S2425 – All Chords

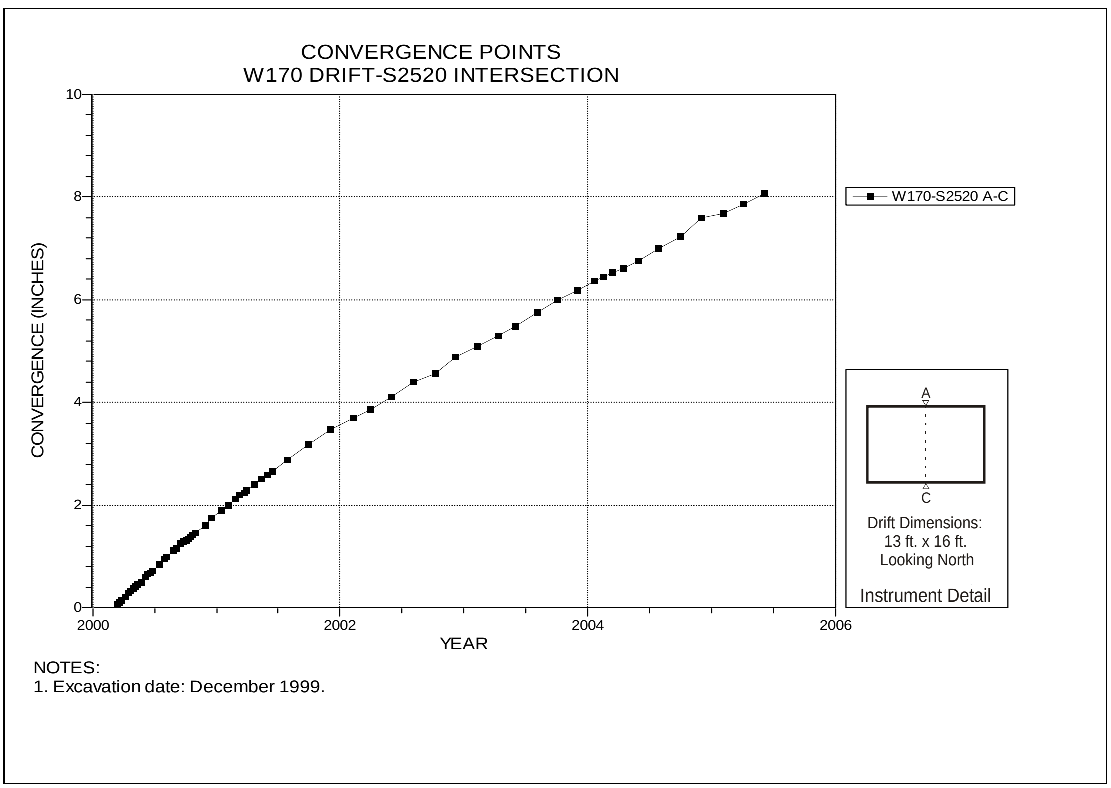


Figure 4-198 Convergence Point Array
W170 Drift at S2520 Drift Intersection – Roof to Floor

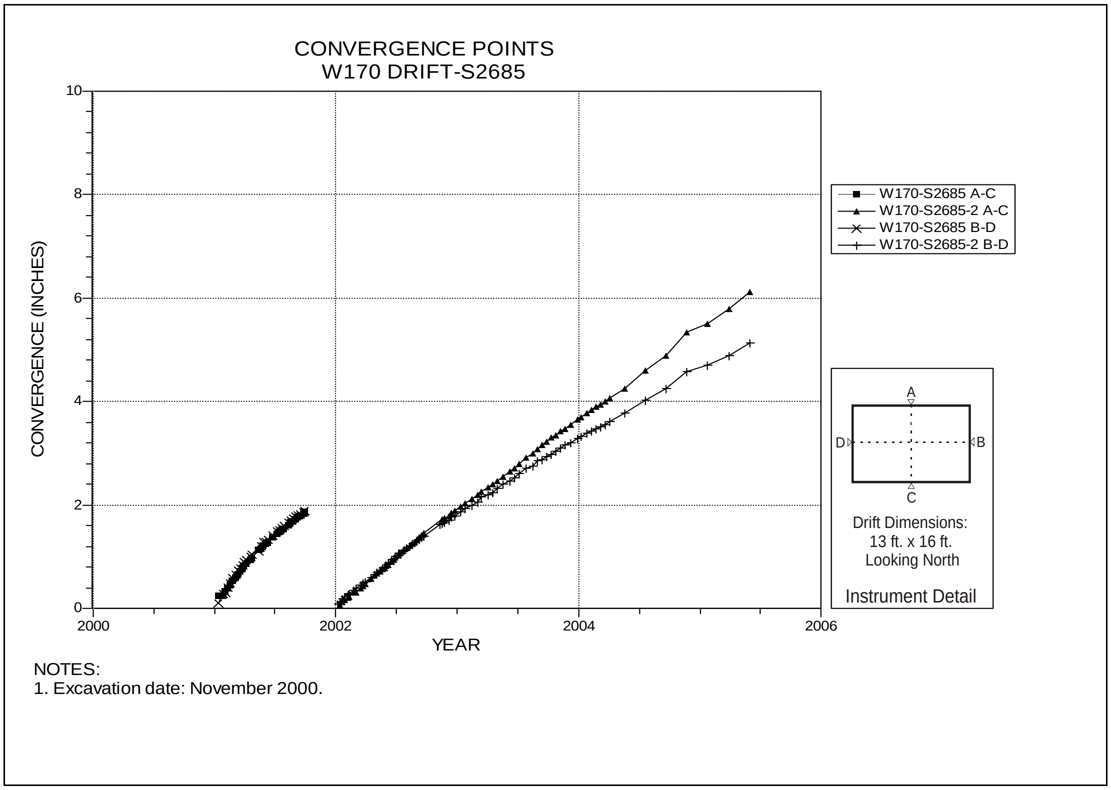


Figure 4-199 Convergence Point Array
W170 Drift at S2685 – All Chords

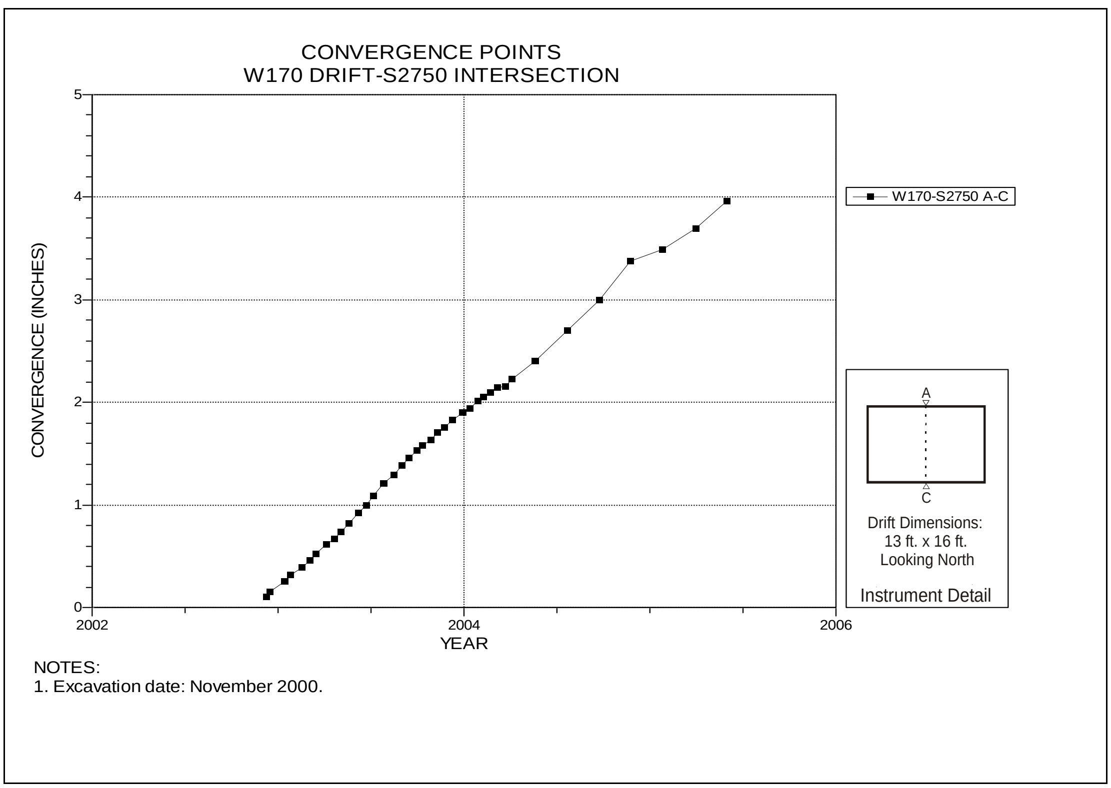


Figure 4-200 Convergence Point Array
W170 Drift at S2750 Drift Intersection – Roof to Floor

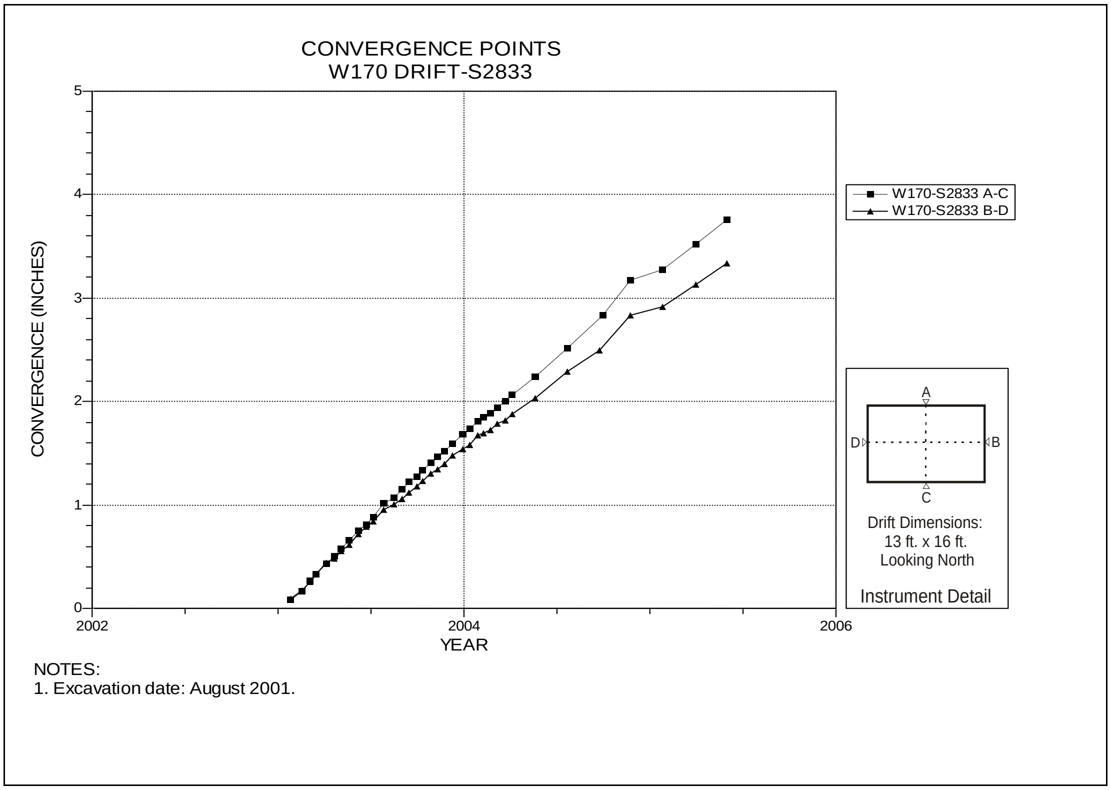


Figure 4-201 Convergence Point Array
W170 Drift at S2833 – All Chords

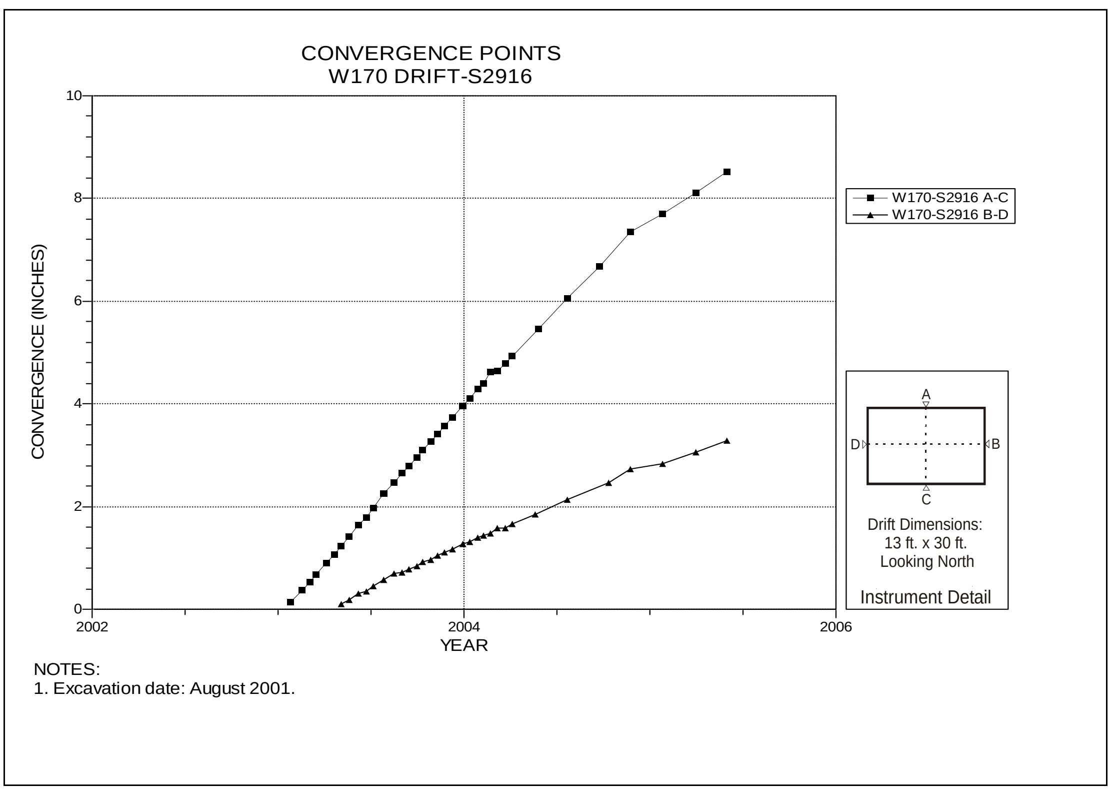


Figure 4-202 Convergence Point Array
W170 Drift at S2916 – All Chords

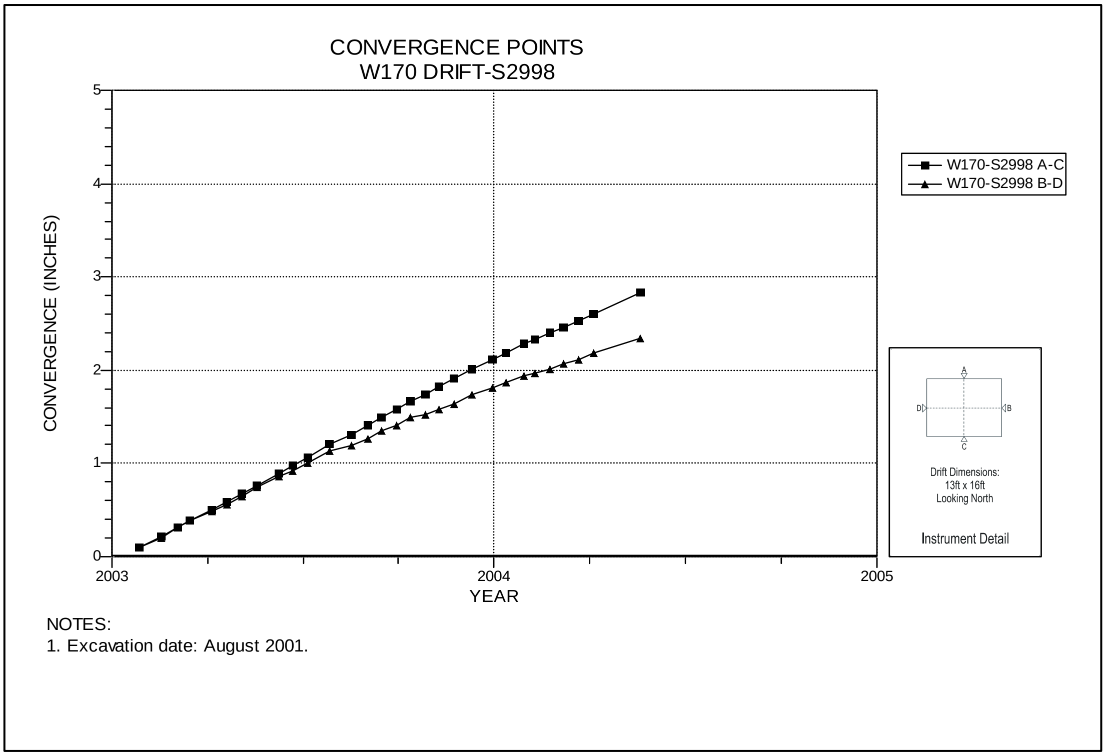


Figure 4-203 Convergence Point Array
W170 Drift at S2998 – All Chords

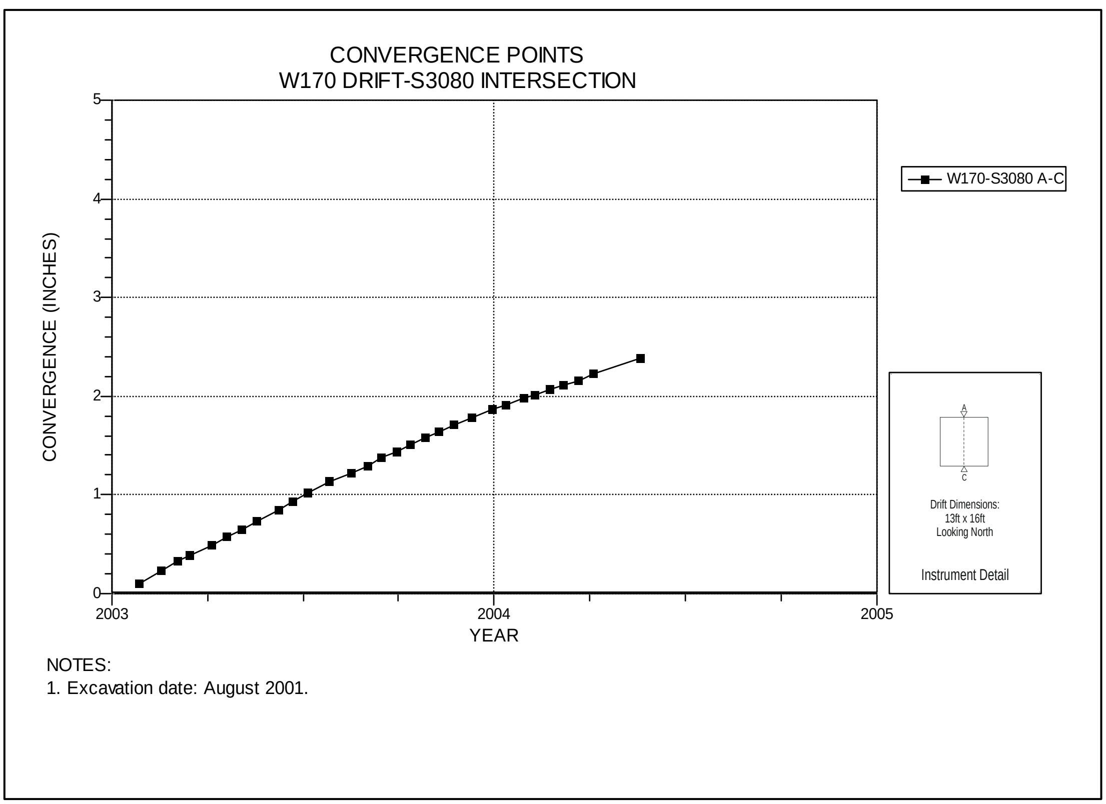


Figure 4-204 Convergence Point Array
W170 Drift at S3080 Drift Intersection – Roof to Floor

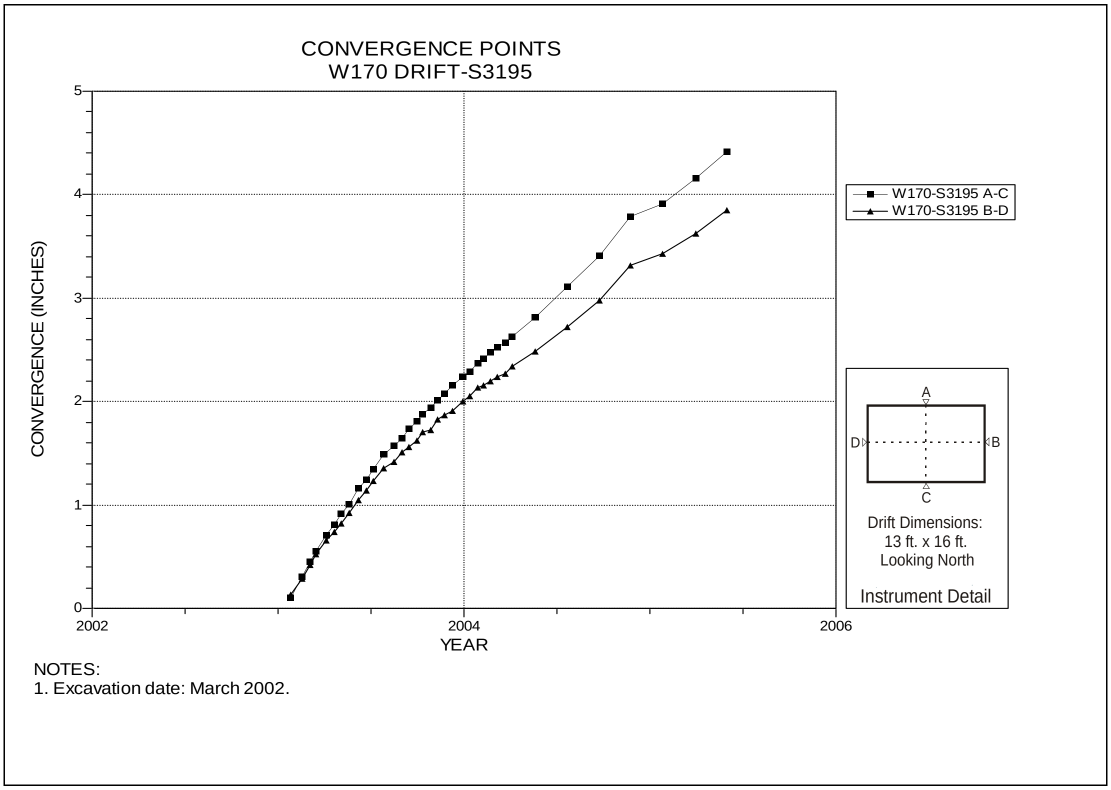


Figure 4-205 Convergence Point Array
W170 Drift at S3195 – All Chords

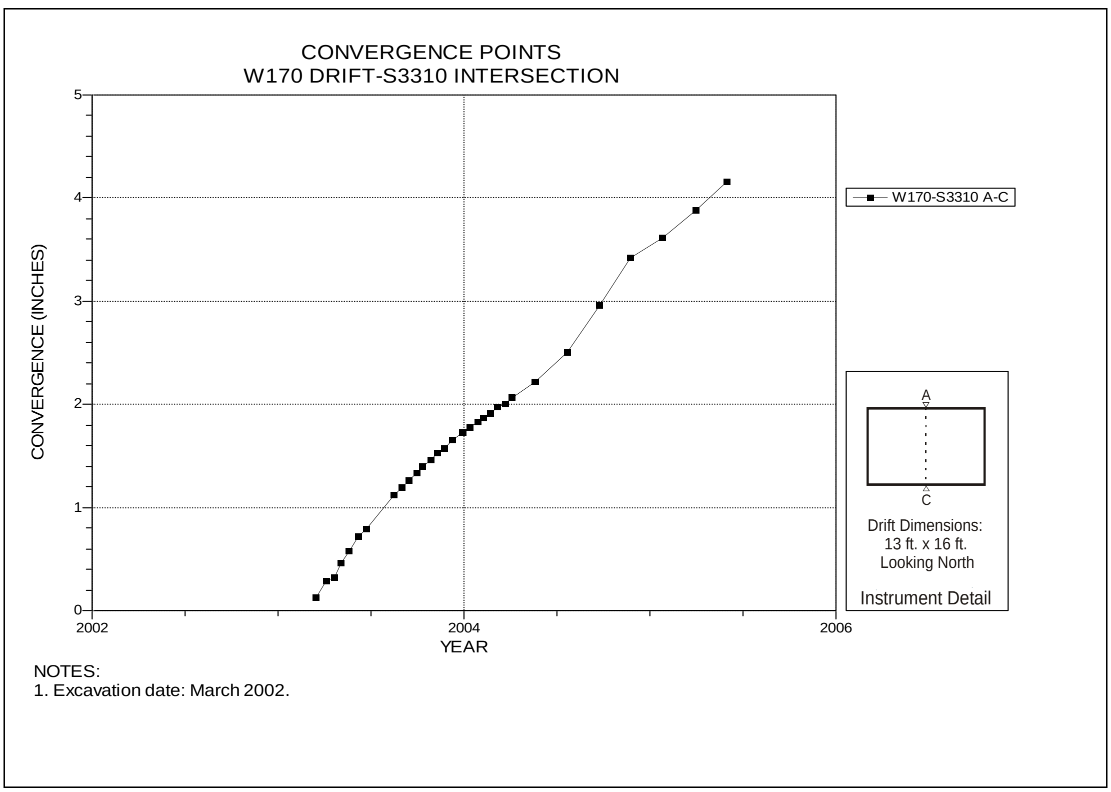


Figure 4-206 Convergence Point Array
W170 Drift at S3310 Drift Intersection – Roof to Floor

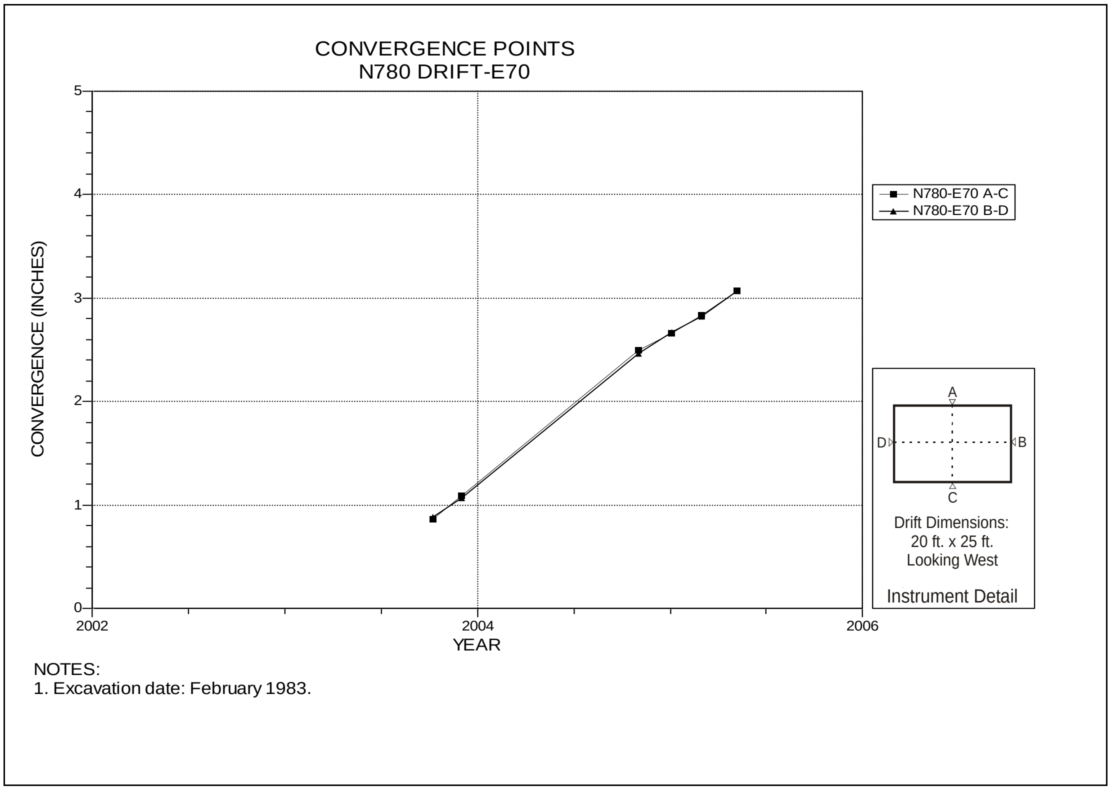


Figure 4-207 Convergence Point Array
N780 Drift at E70 – All Chords

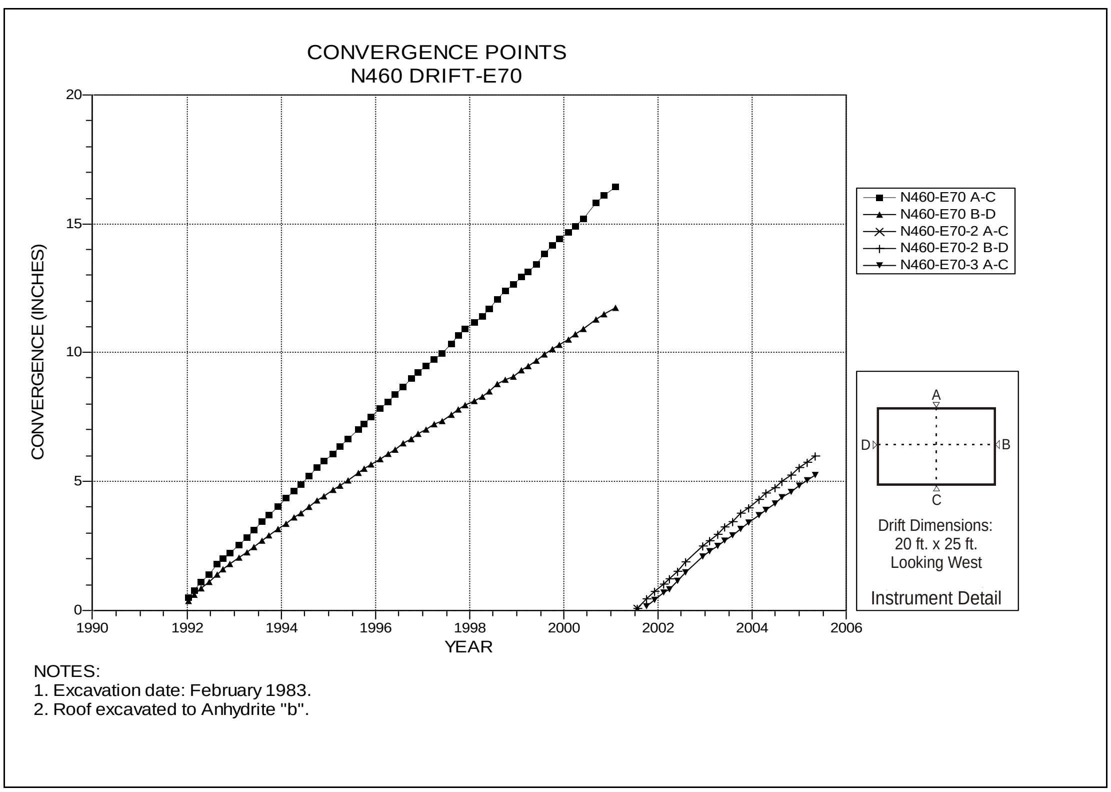
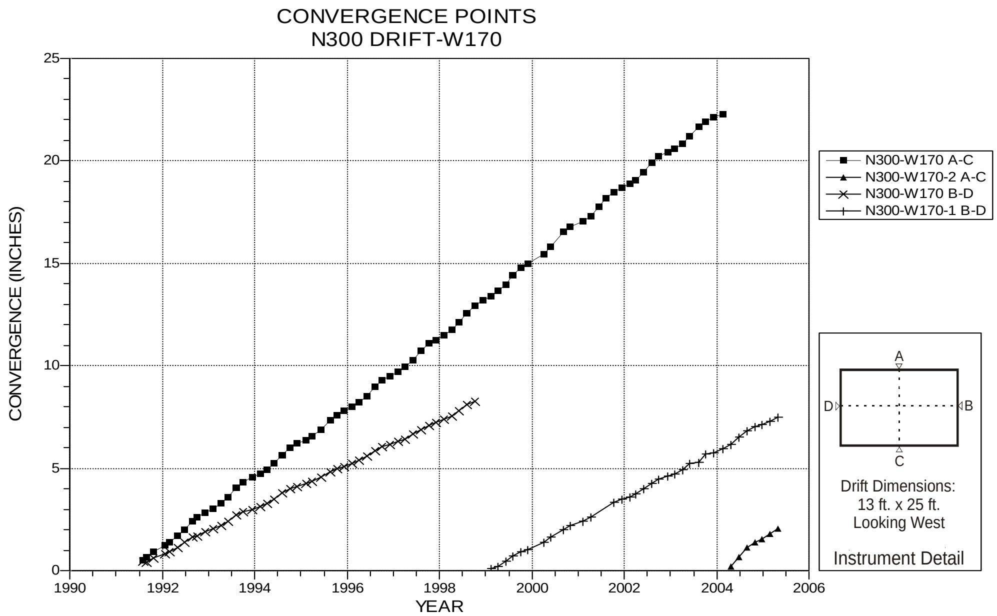
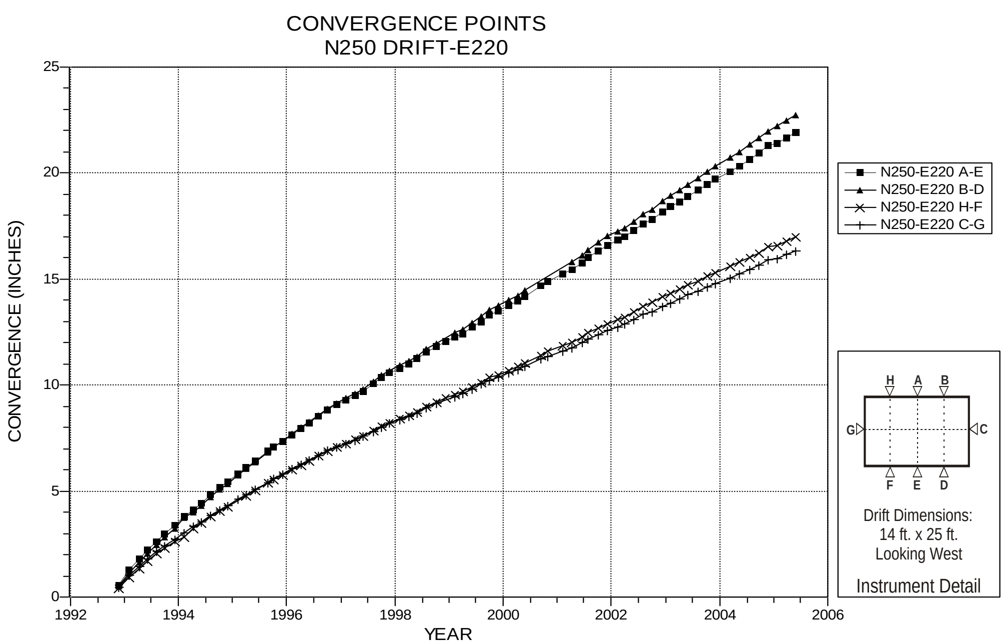


Figure 4-208 Convergence Point Array
N460 Drift at E70 – All Chords



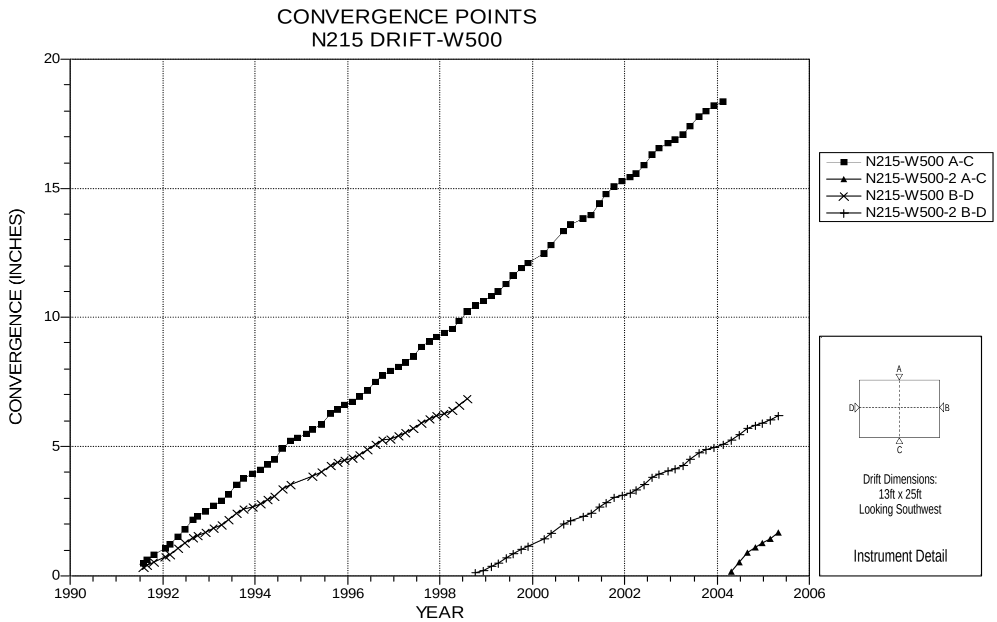
NOTES:
1. Excavation date: October 1987.

Figure 4-209 Convergence Point Array
N250 Drift at W170 – All Chords



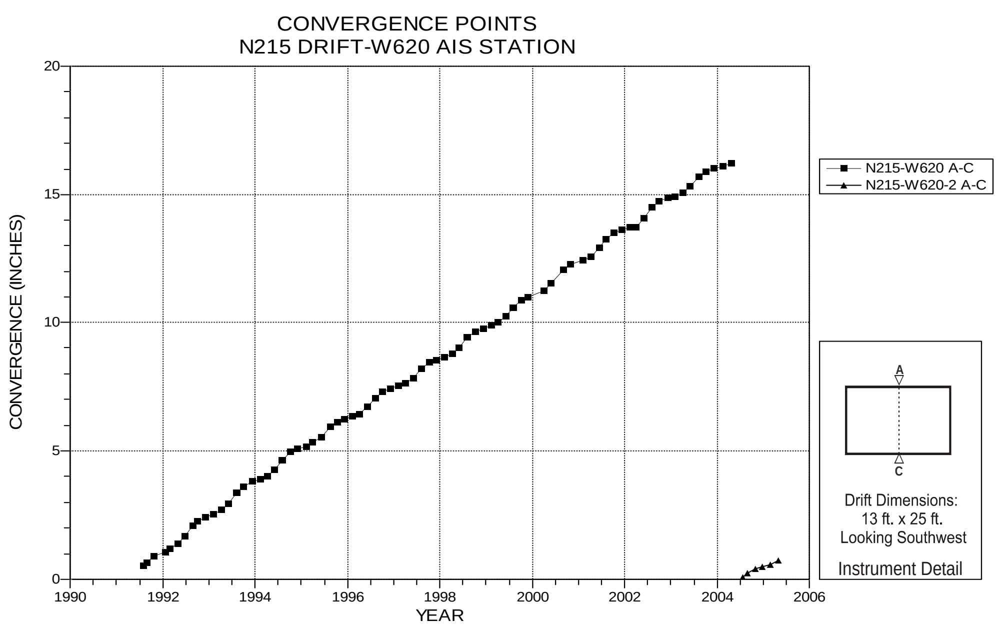
NOTES:
1. Excavation date: October 1992.

Figure 4-210 Convergence Point Array
N300 Drift at E220 – All Chords



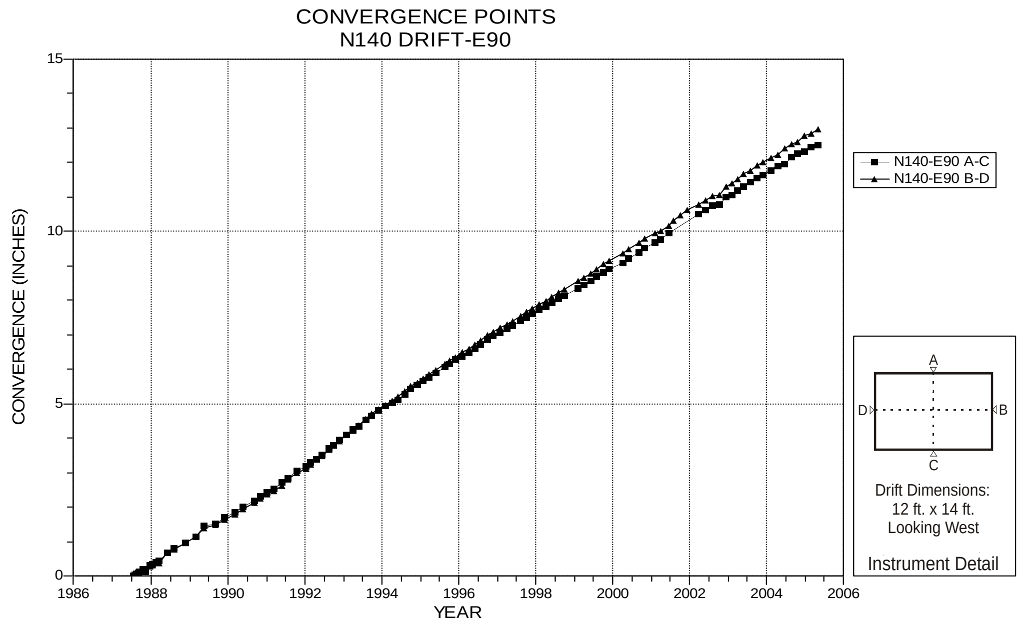
NOTES:
1. Excavation date: December 1987.

Figure 4-211 Convergence Point Array
N215 Drift at W500 – All Chords



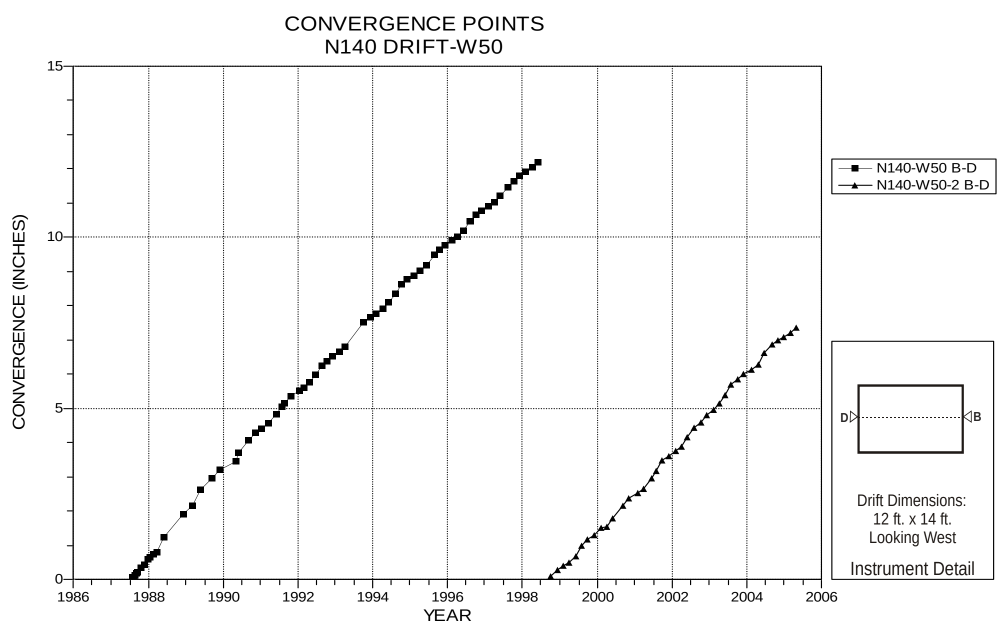
NOTES:
1. Excavation date: January 1988.

Figure 4-212 Convergence Point Array
N215 Drift at W620 at Air Intake Shaft – Roof to Floor



NOTES:
1. Excavation date: November 1982.

Figure 4-213 Convergence Point Array
N140 Drift at E90 – All Chords



NOTES:
1. Excavation date: July 1984.

Figure 4-214 Convergence Point Array
N140 Drift at W50 – Rib to Rib

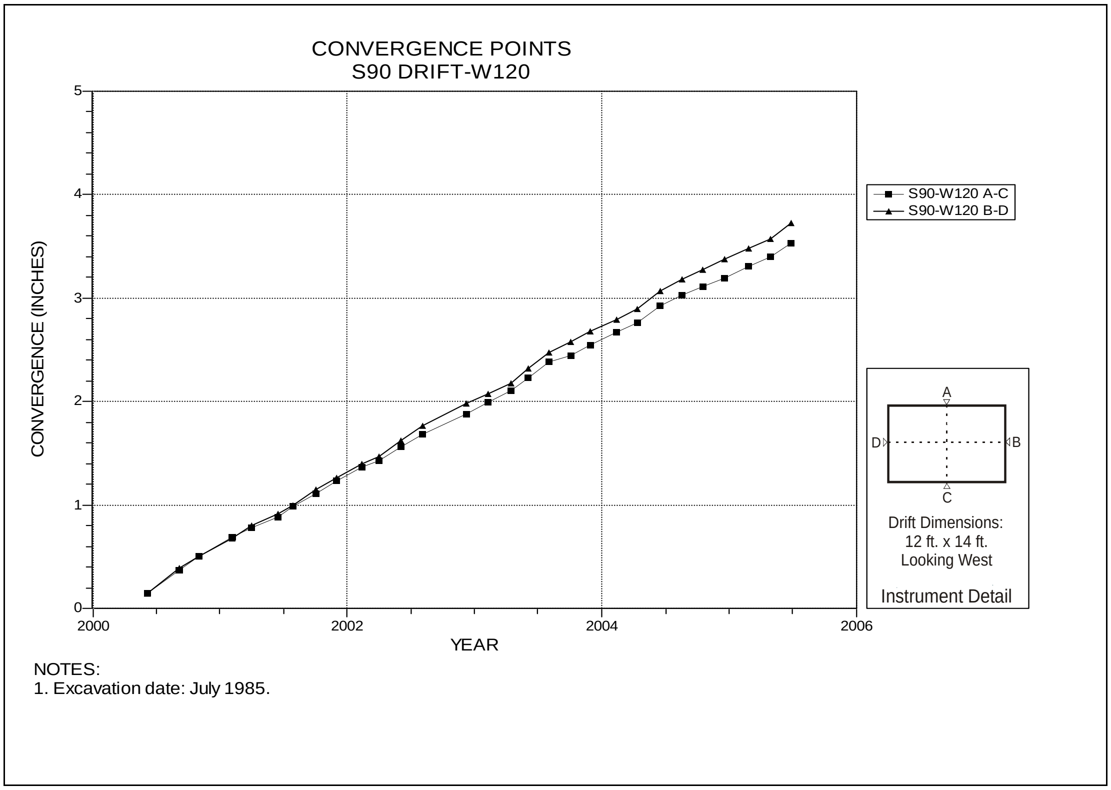


Figure 4-215 Convergence Point Array
S90 Drift at W120 – All Chords

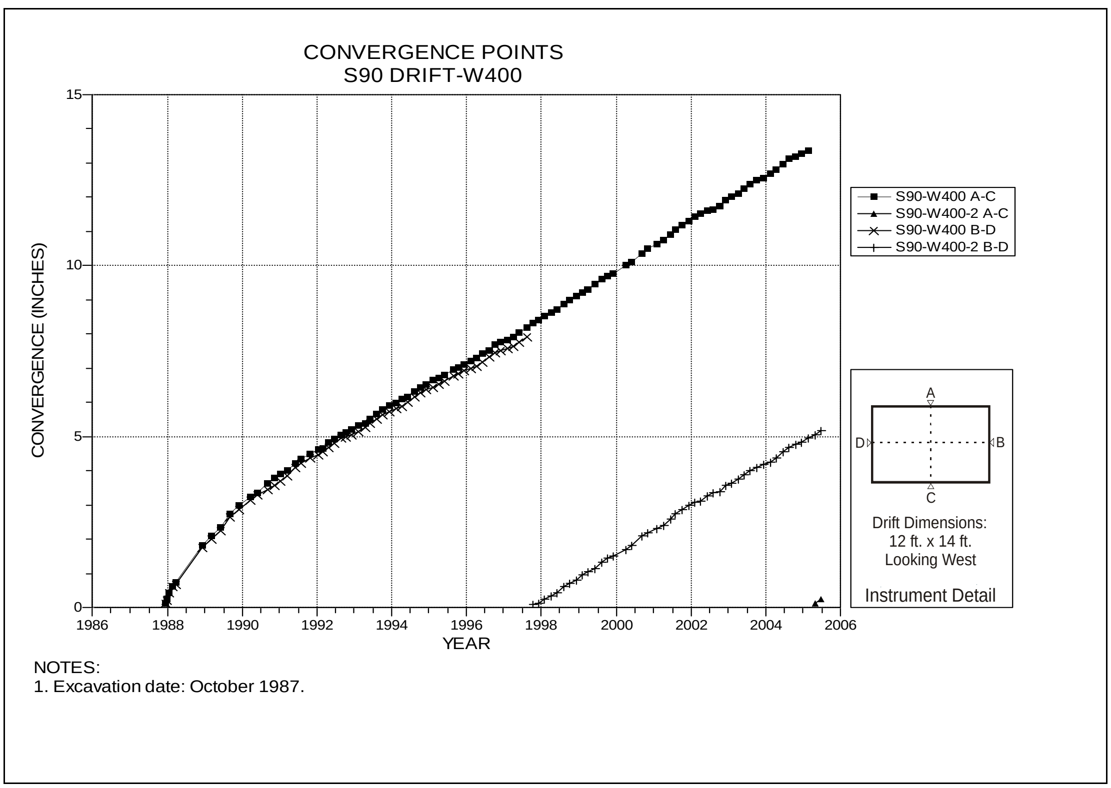


Figure 4-216 Convergence Point Array
S90 Drift at W400 – All Chords

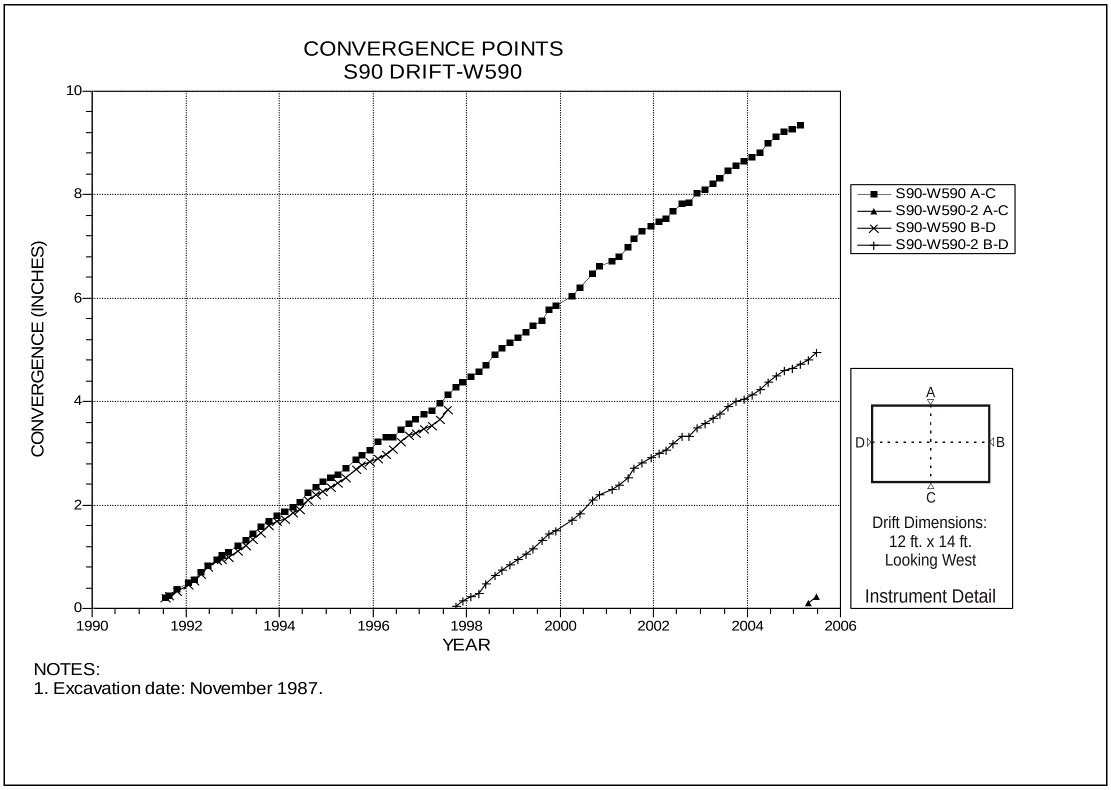


Figure 4-217 Convergence Point Array
S90 Drift at W590 – All Chords

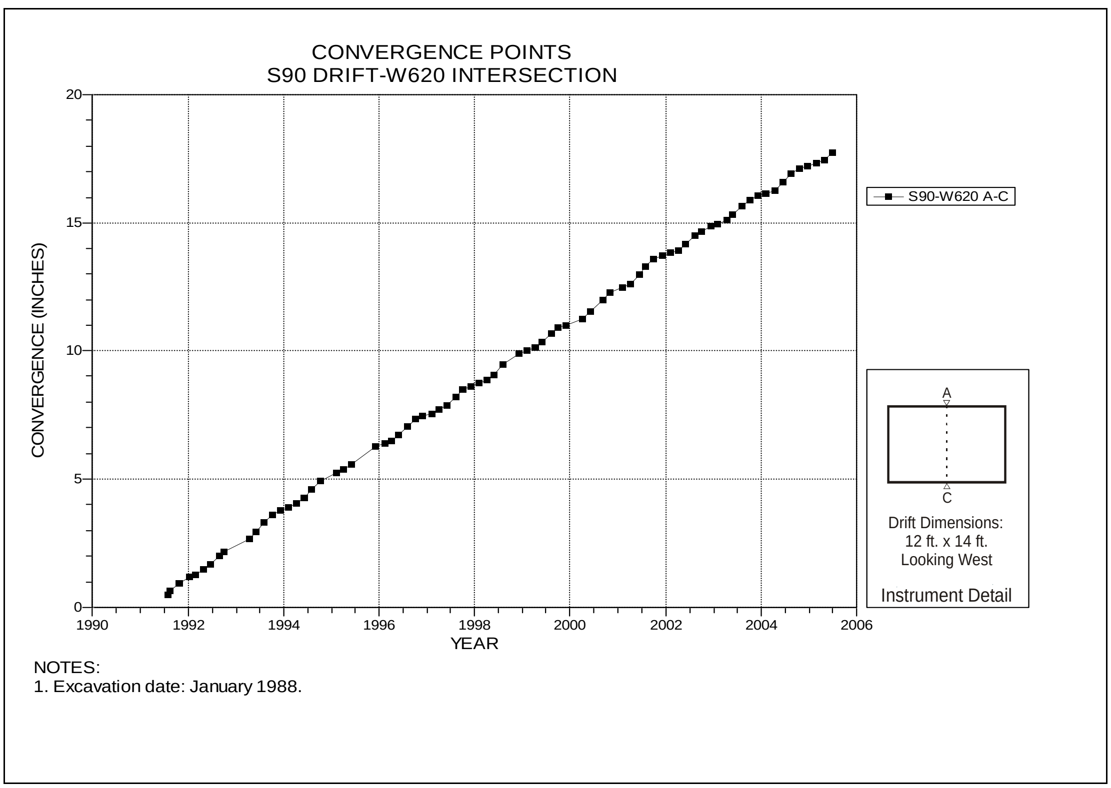


Figure 4-218 Convergence Point Array
S90 Drift at W620 – Roof to Floor

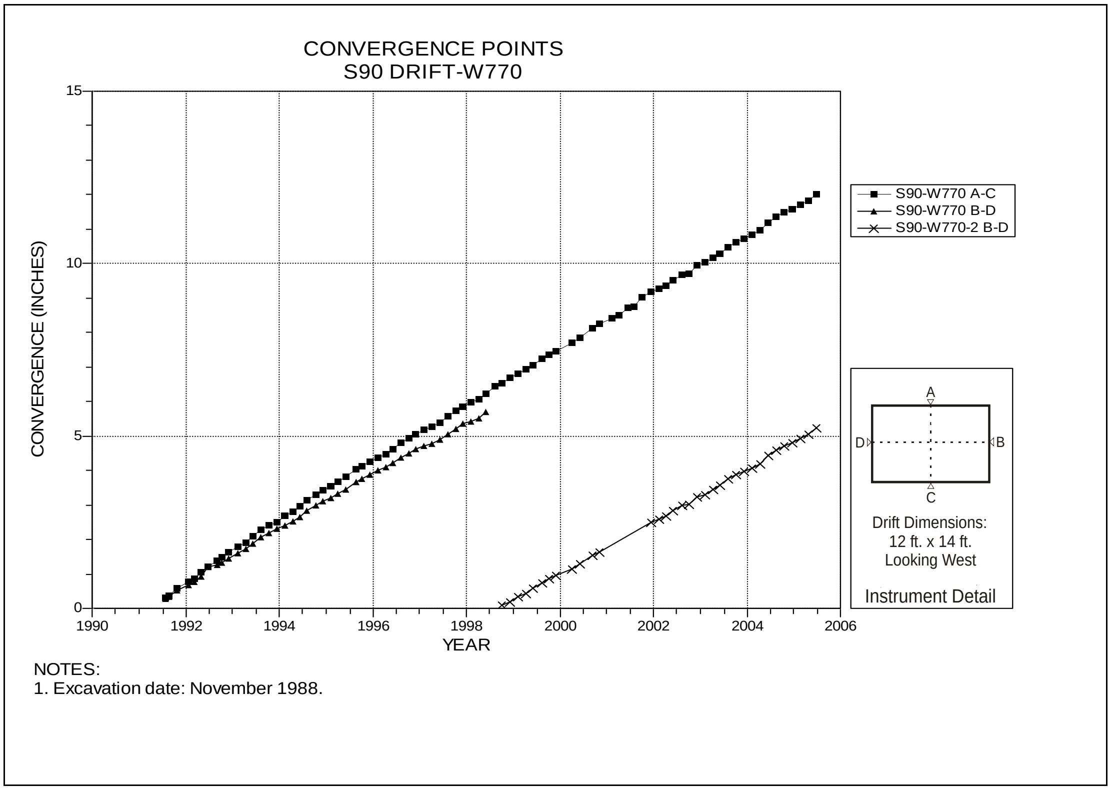


Figure 4-219 Convergence Point Array
S90 Drift at W770 – All Chords

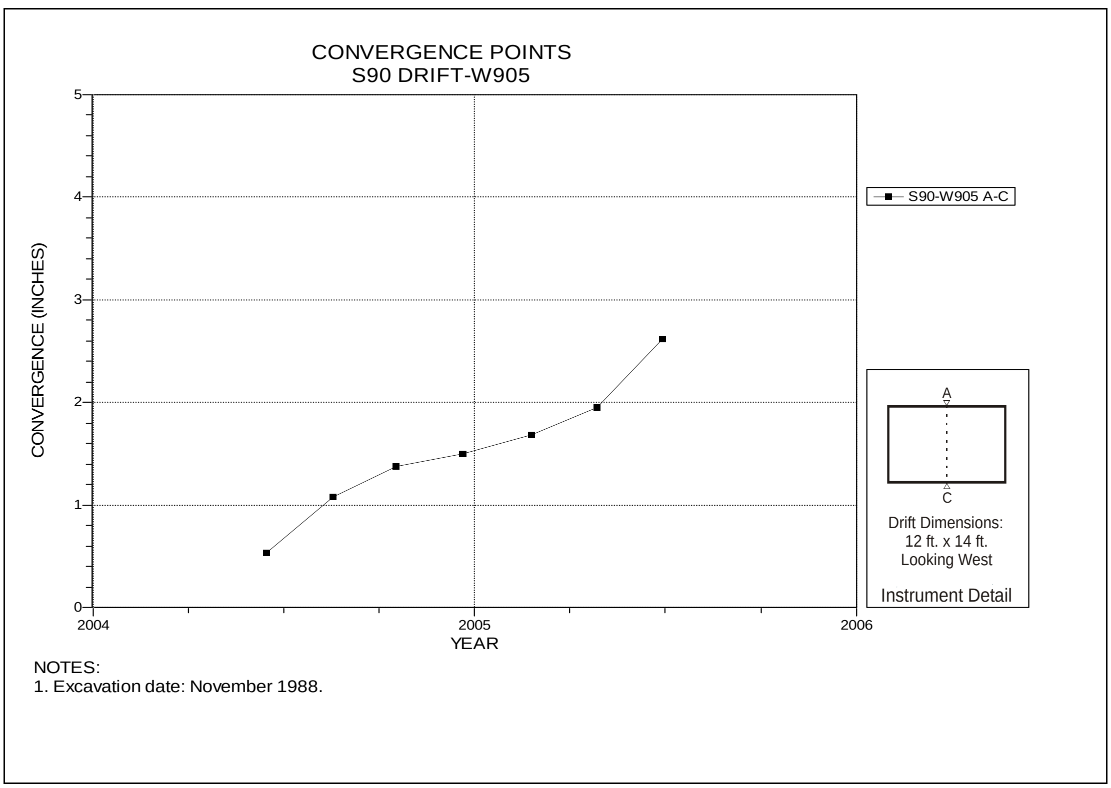


Figure 4-220 Convergence Point Array
S90 Drift at W905 – Roof to Floor

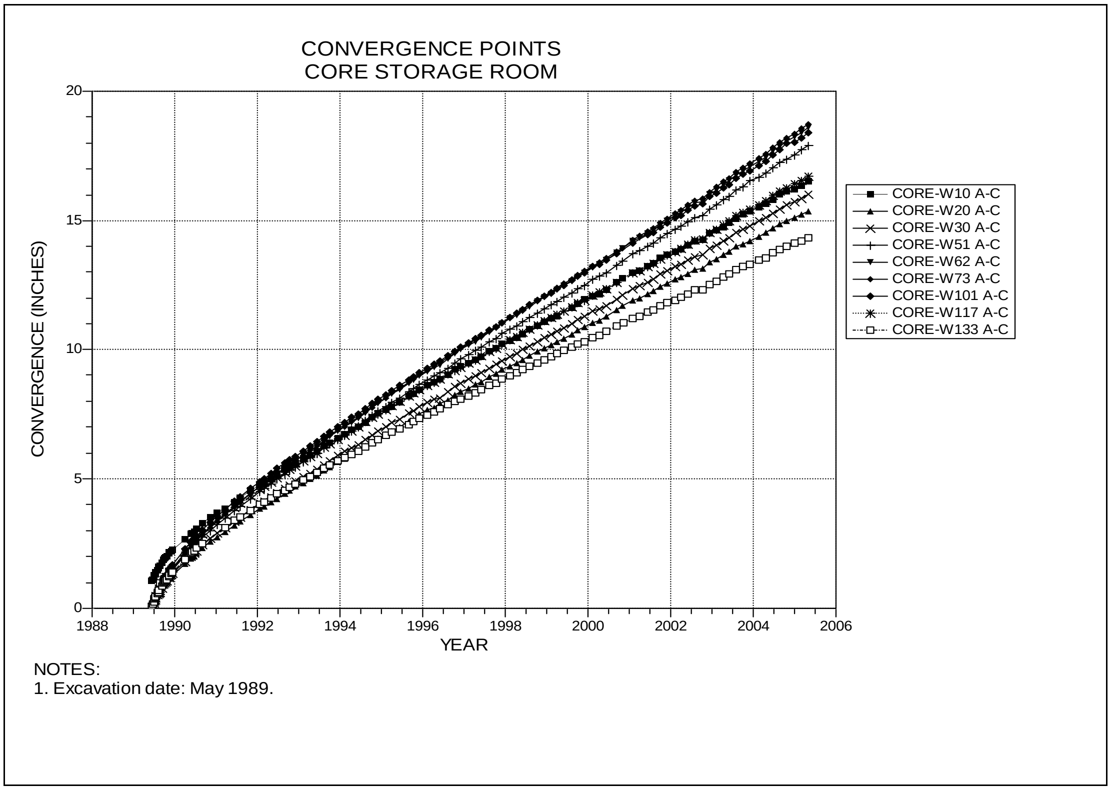


Figure 4-221 Convergence Point Array
S400 Core Storage Library – All Chords

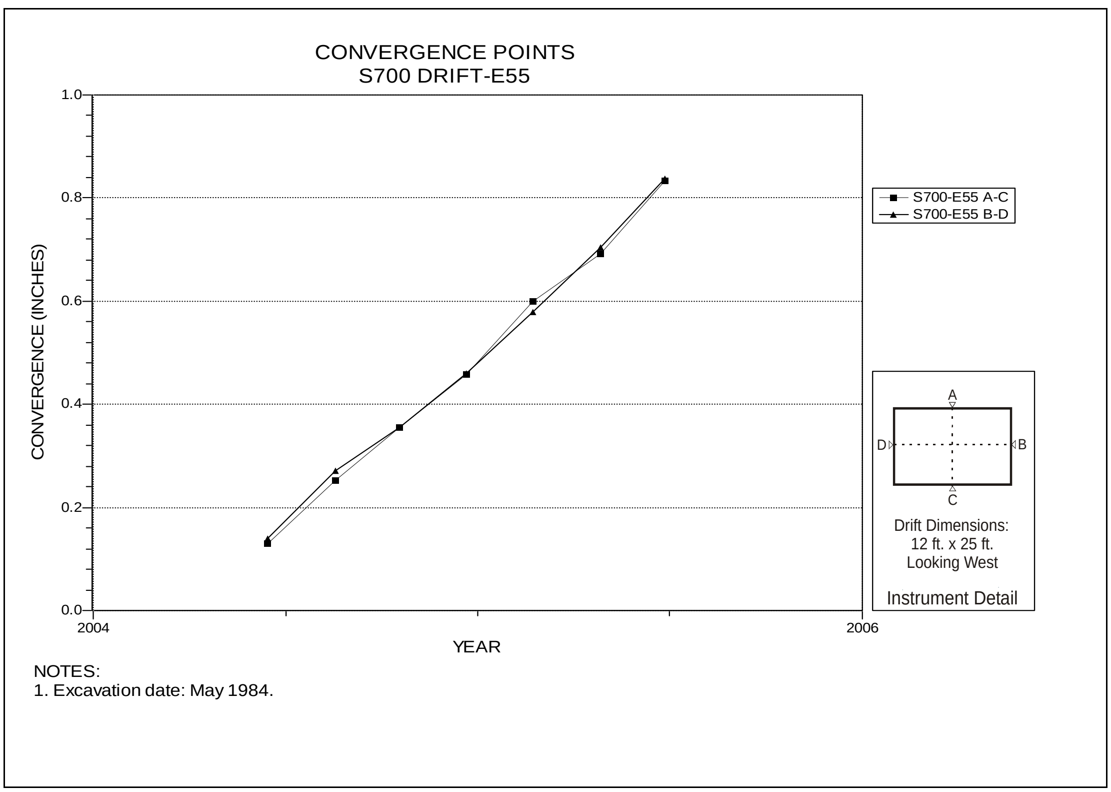


Figure 4-222 Convergence Point Array
S700 Drift at E55 – All Chords

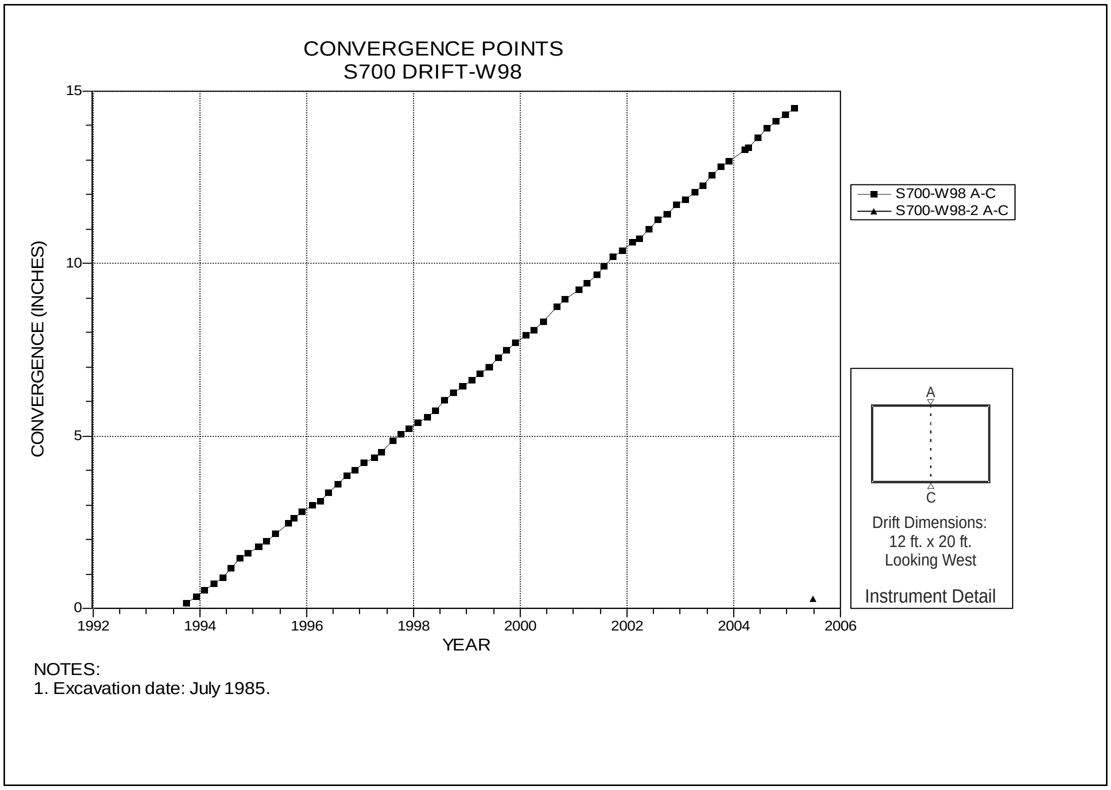


Figure 4-223 Convergence Point Array
S700 Drift at W98 – Roof to Floor

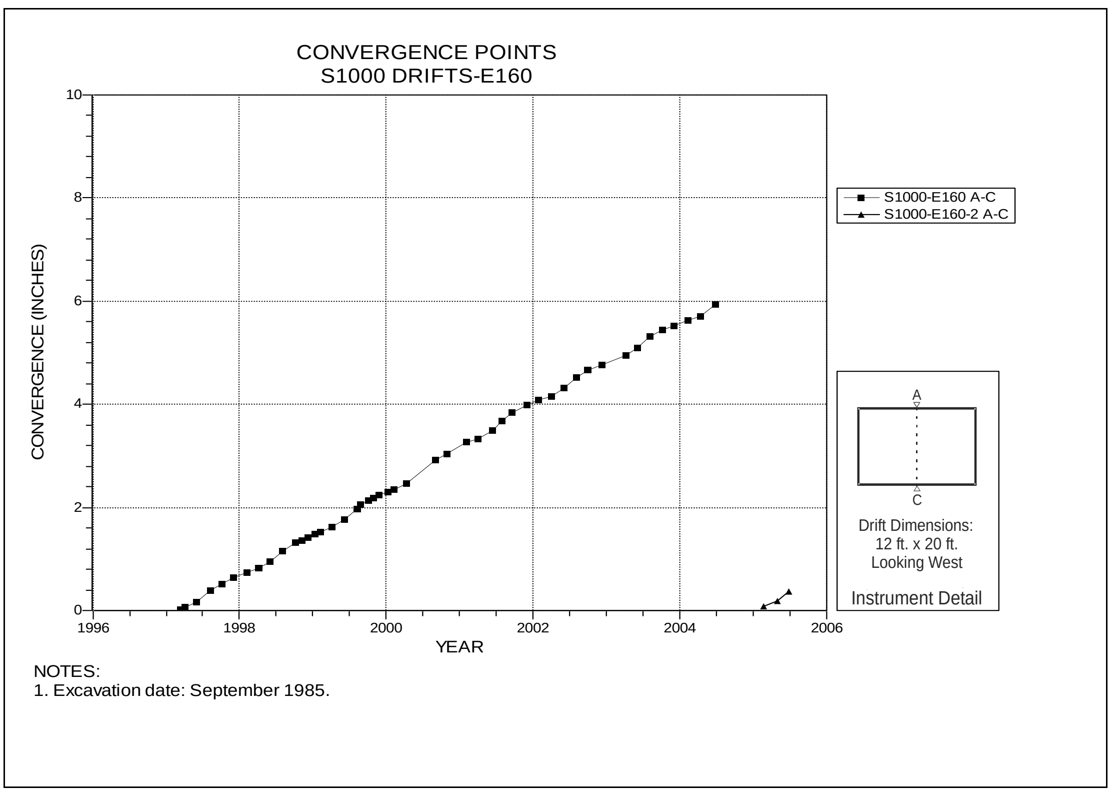


Figure 4-224 Convergence Point Array
S1000 Drift at E160 – Roof to Floor

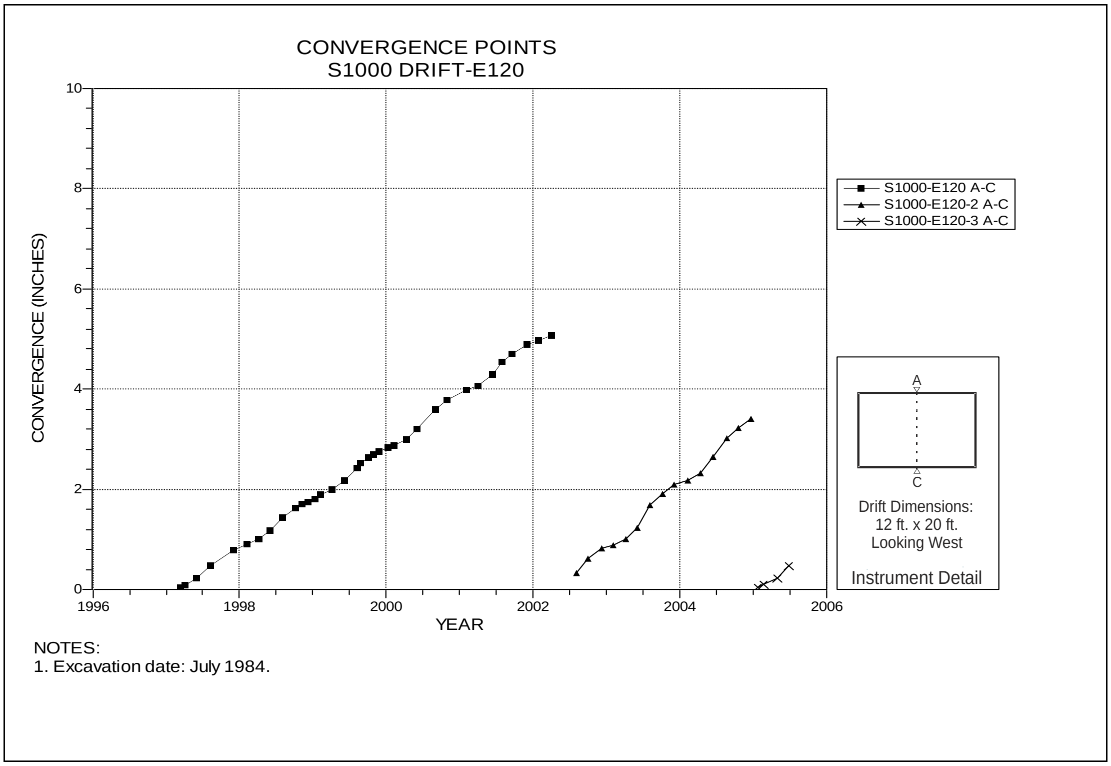


Figure 4-225 Convergence Point Array
S1000 Drift at E120 – Roof to Floor

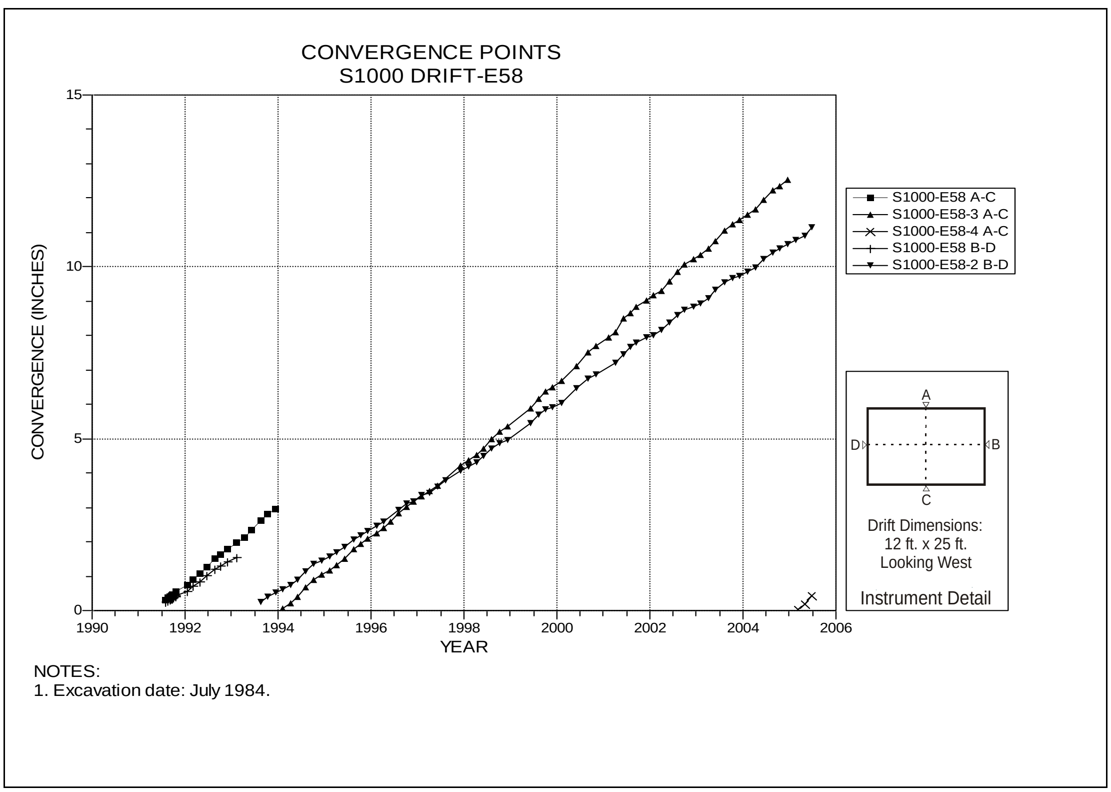


Figure 4-226 Convergence Point Array
S1000 Drift at E58 – All Chords

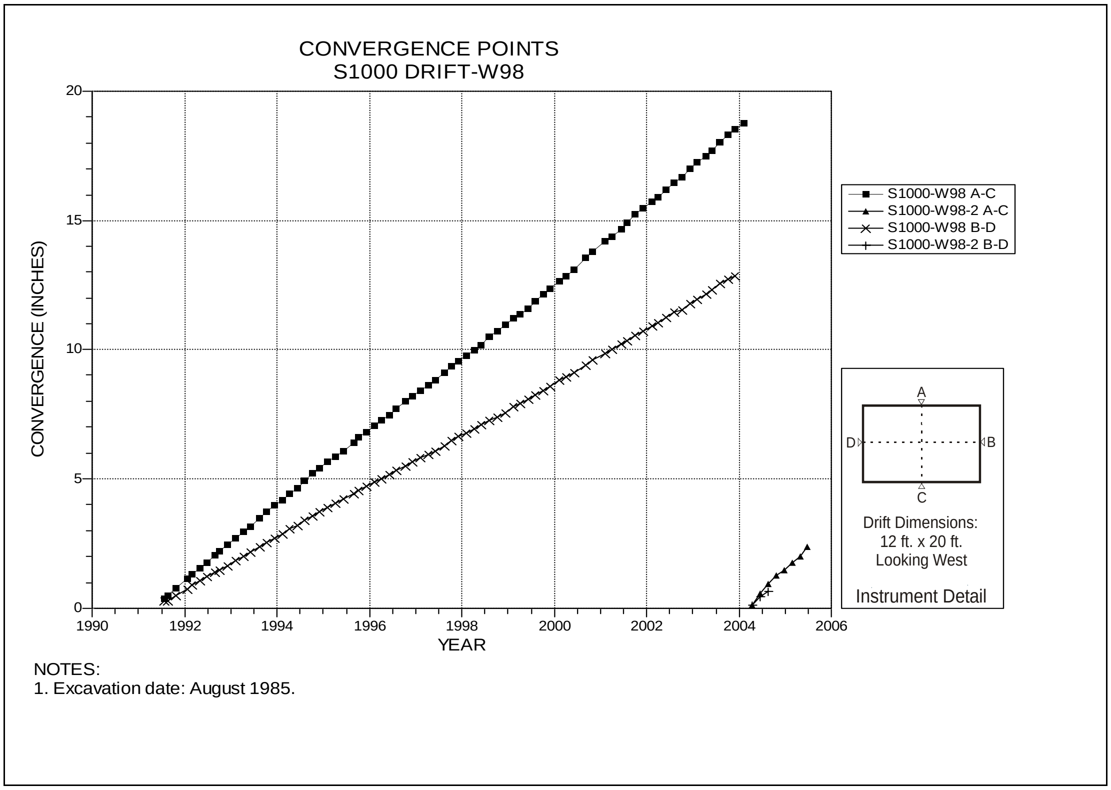


Figure 4-227 Convergence Point Array
S1000 Drift at W98 – All Chords

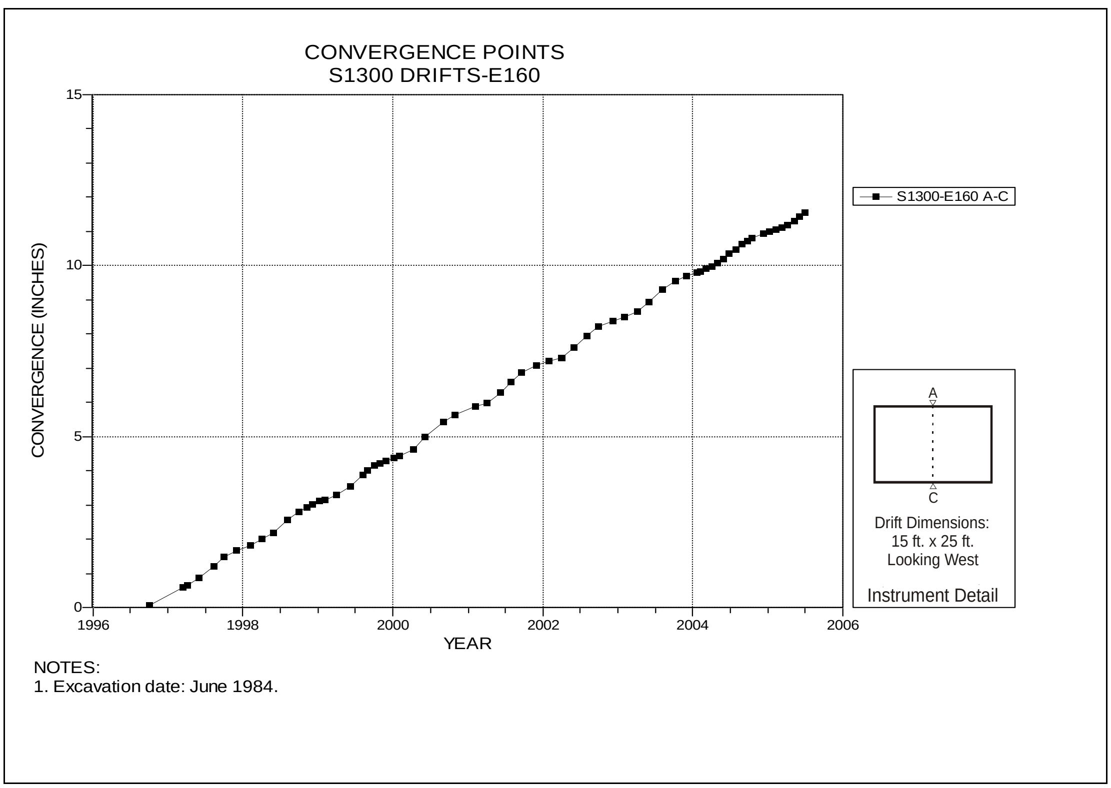


Figure 4-228 Convergence Point Array
S1300 Drift at E160 – Roof to Floor

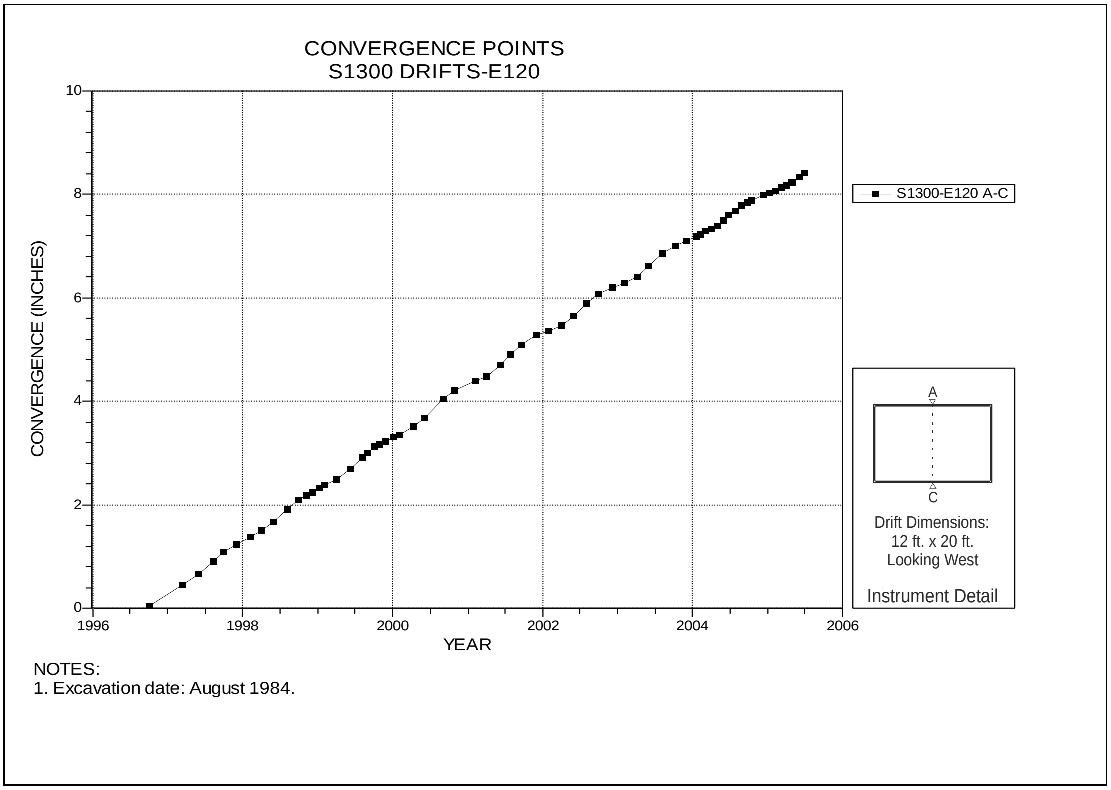


Figure 4-229 Convergence Point Array
S1300 Drift at E120 – Roof to Floor

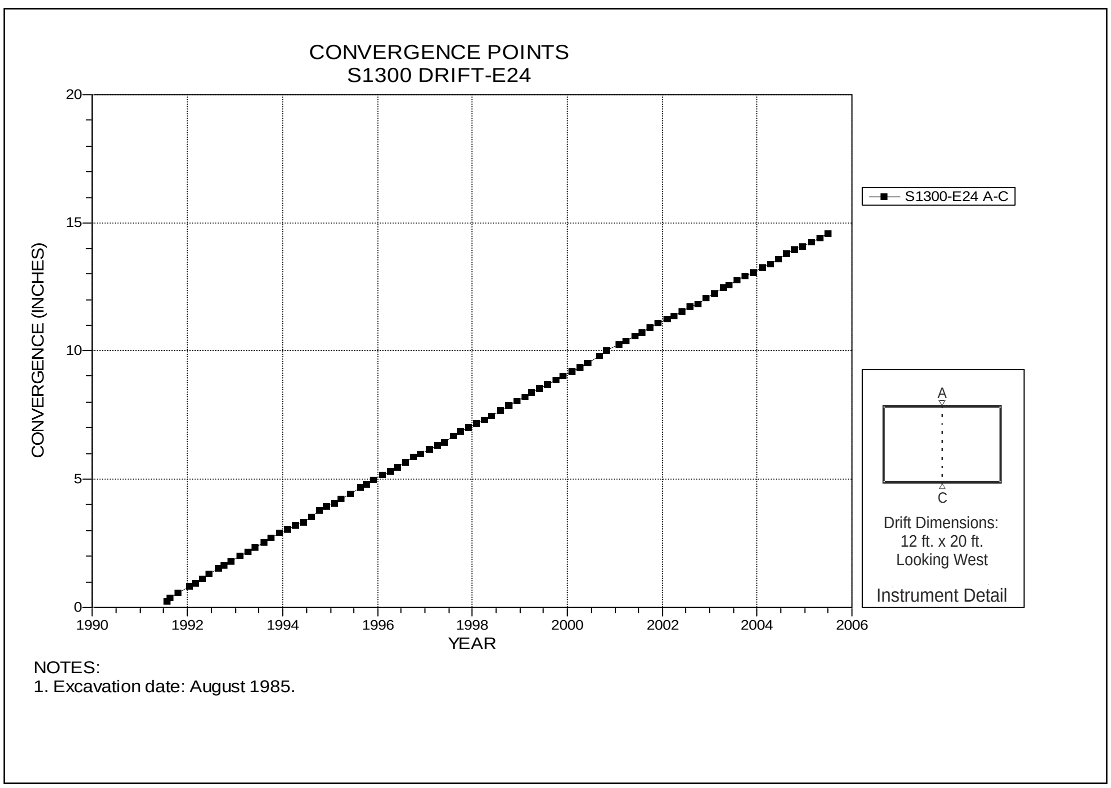


Figure 4-230 Convergence Point Array
S1300 Drift at E24 – Roof to Floor

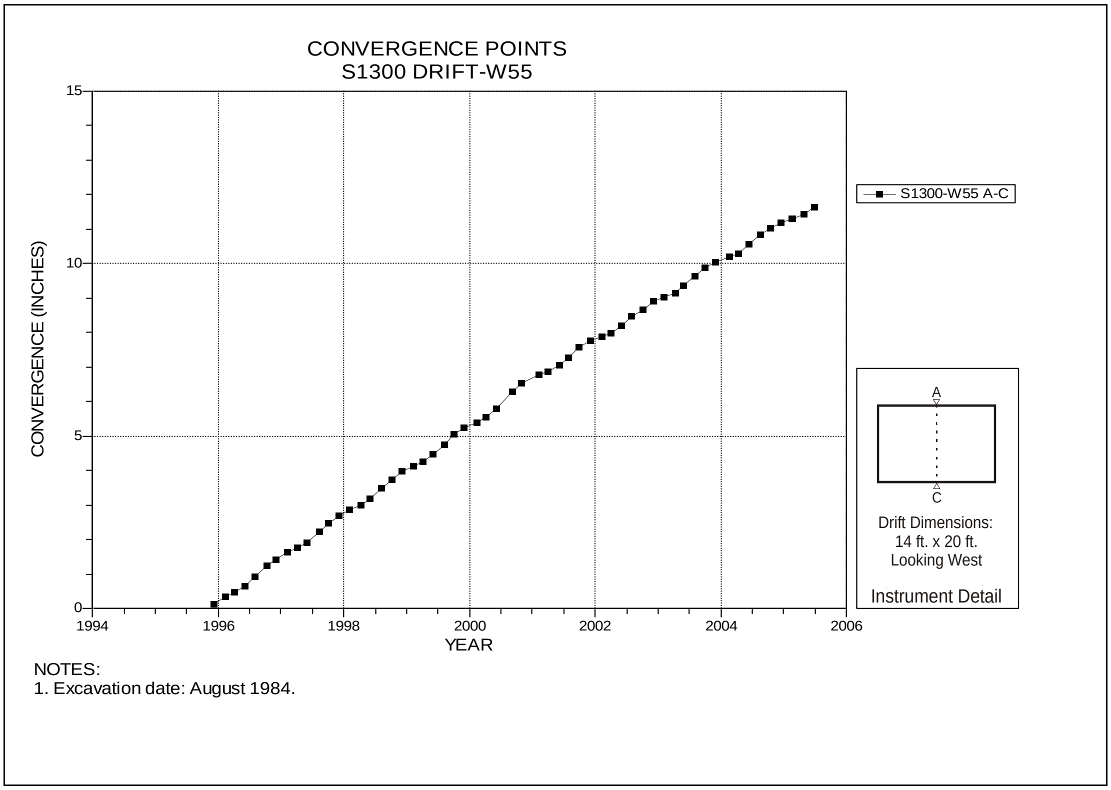


Figure 4-231 Convergence Point Array
S1300 Drift at W55 – Roof to Floor

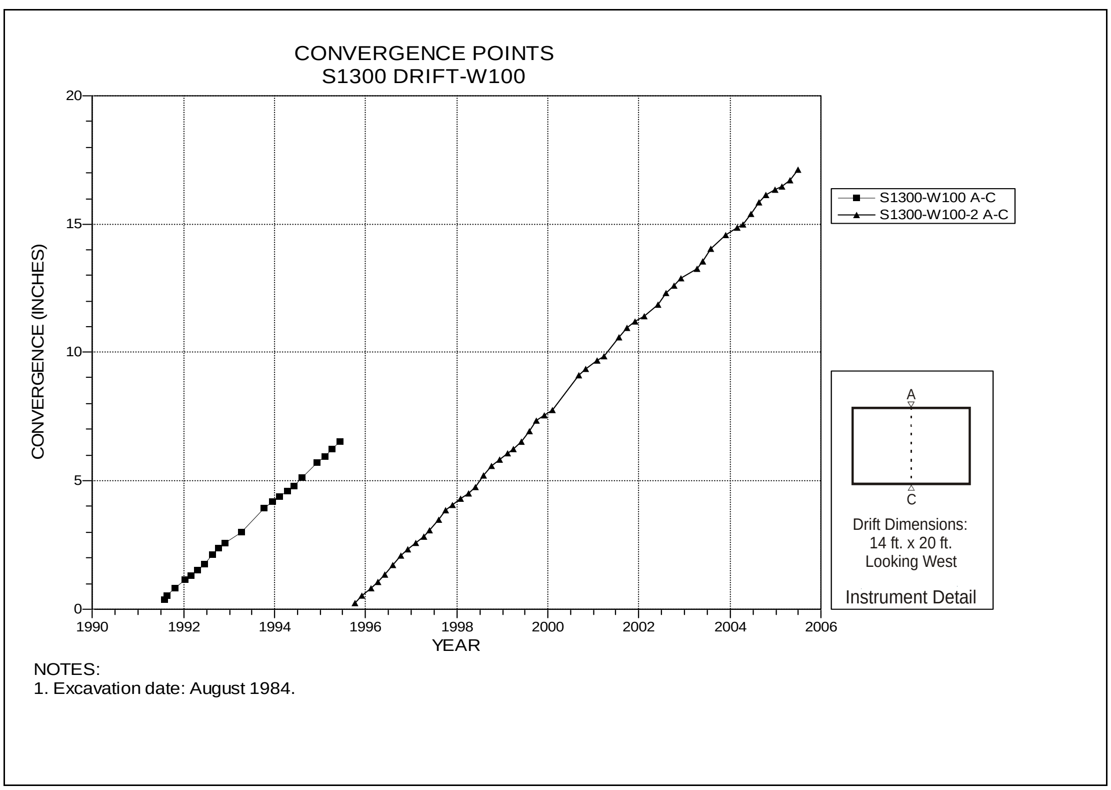
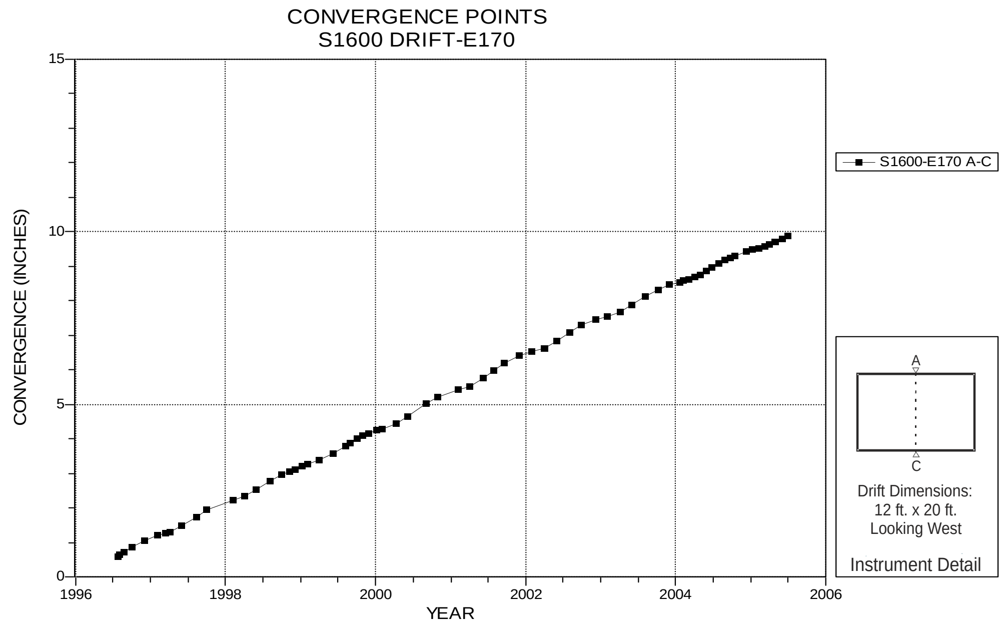
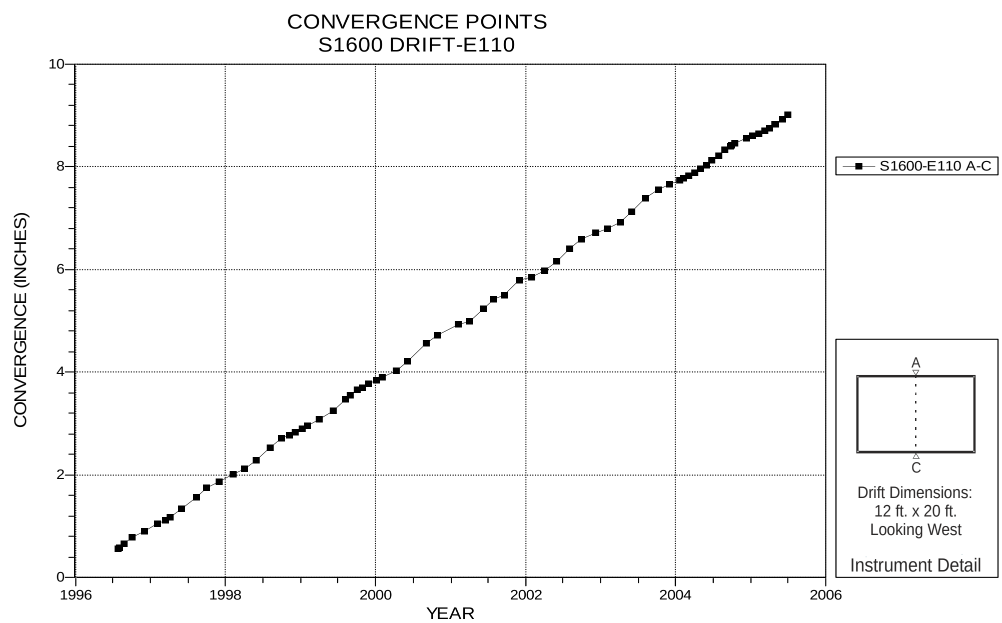


Figure 4-232 Convergence Point Array
S1300 Drift at W100 – Roof to Floor



NOTES:
1. Excavation date: September 1985.

Figure 4-233 Convergence Point Array
S1600 Drift at E170 – Roof to Floor



NOTES:
1. Excavation date: June 1984.

Figure 4-234 Convergence Point Array
S1600 Drift at E110 – Roof to Floor

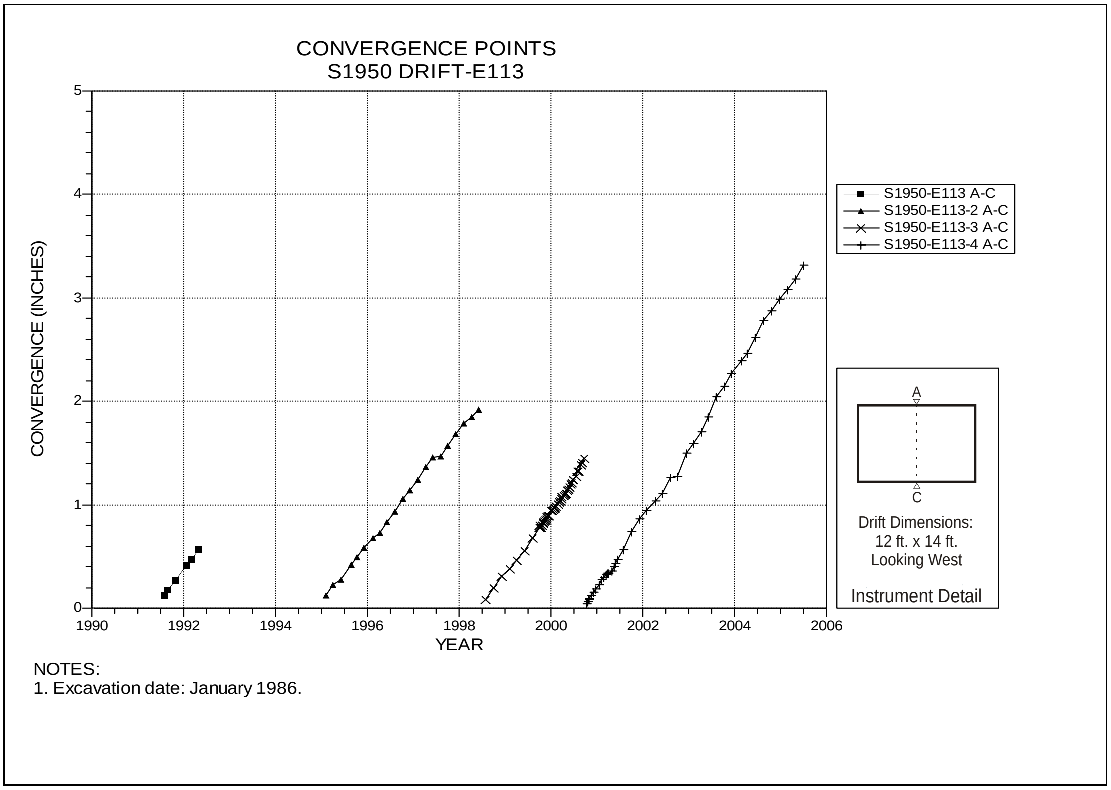


Figure 4-235 Convergence Point Array
S1950 Drift at E113 – Roof to Floor

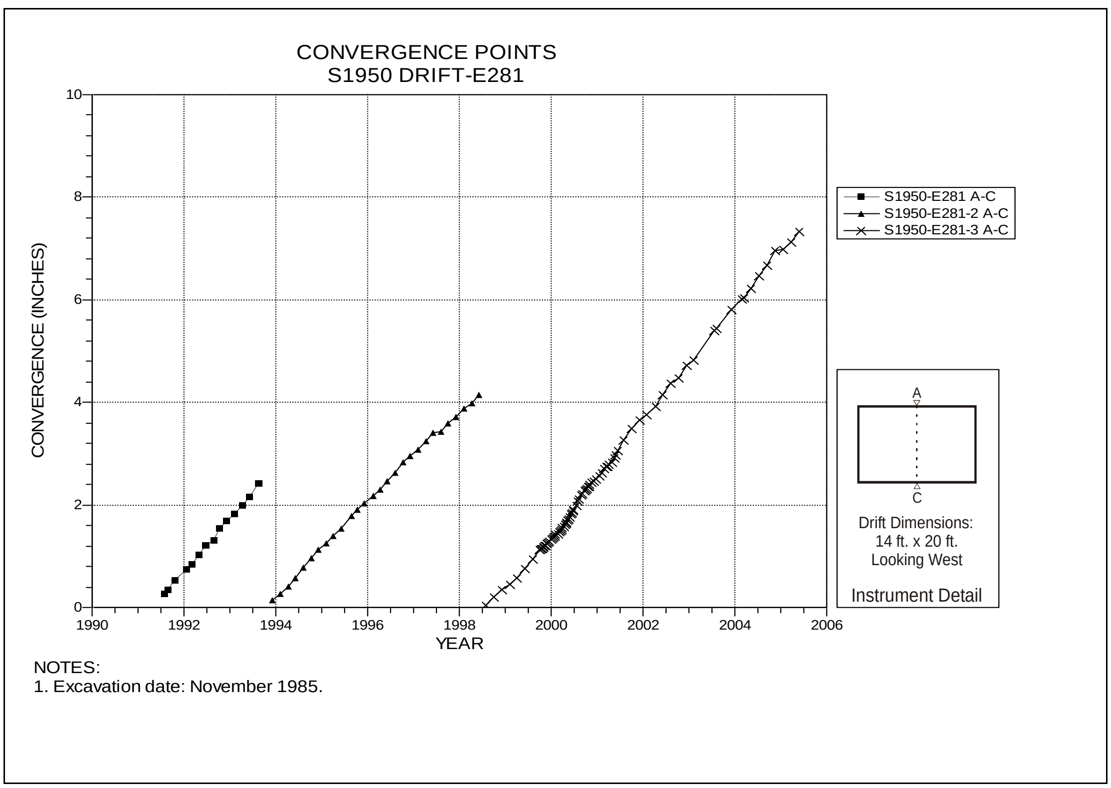


Figure 4-236 Convergence Point Array
S1950 Drift at E281 – Roof to Floor

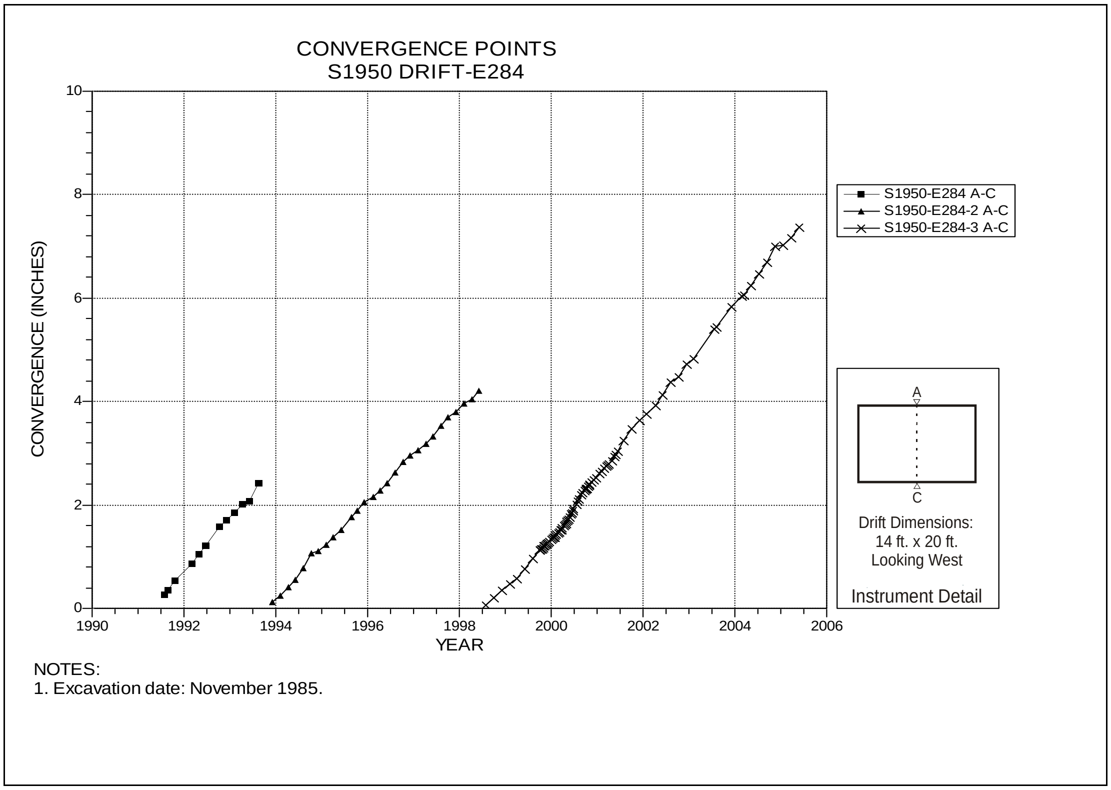


Figure 4-237 Convergence Point Array
S1950 Drift at E284 – Roof to Floor

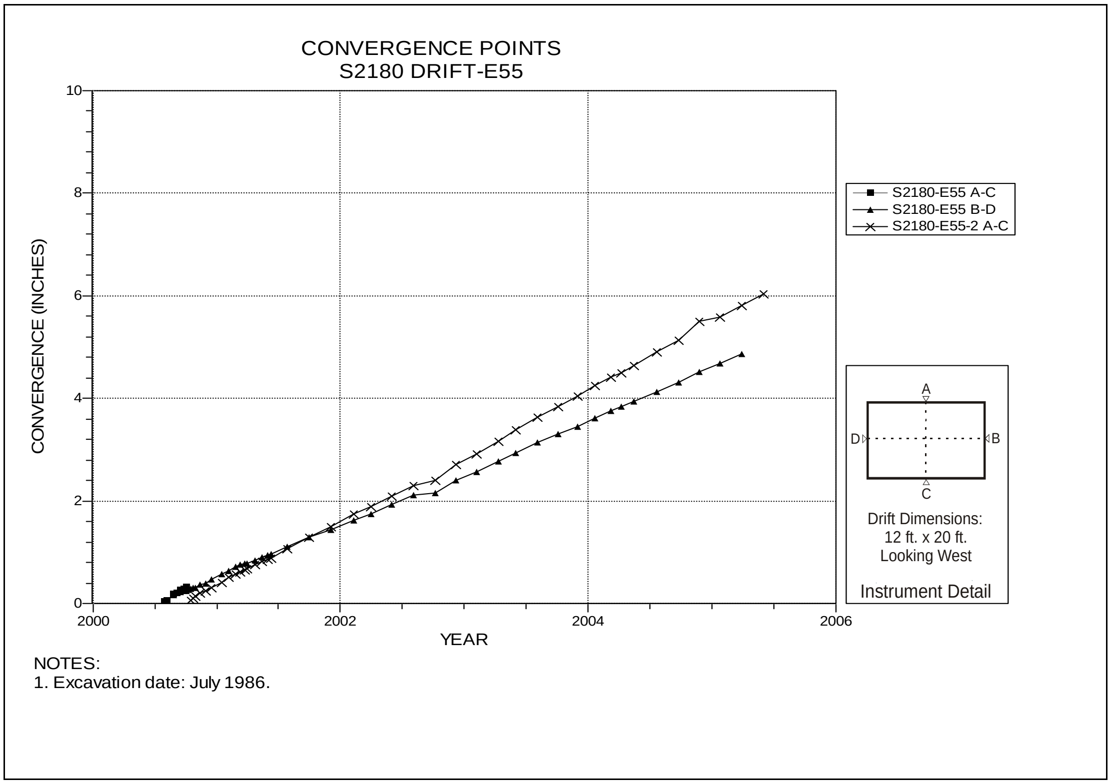


Figure 4-238 Convergence Point Array
S2180 Drift at E55 – All Chords

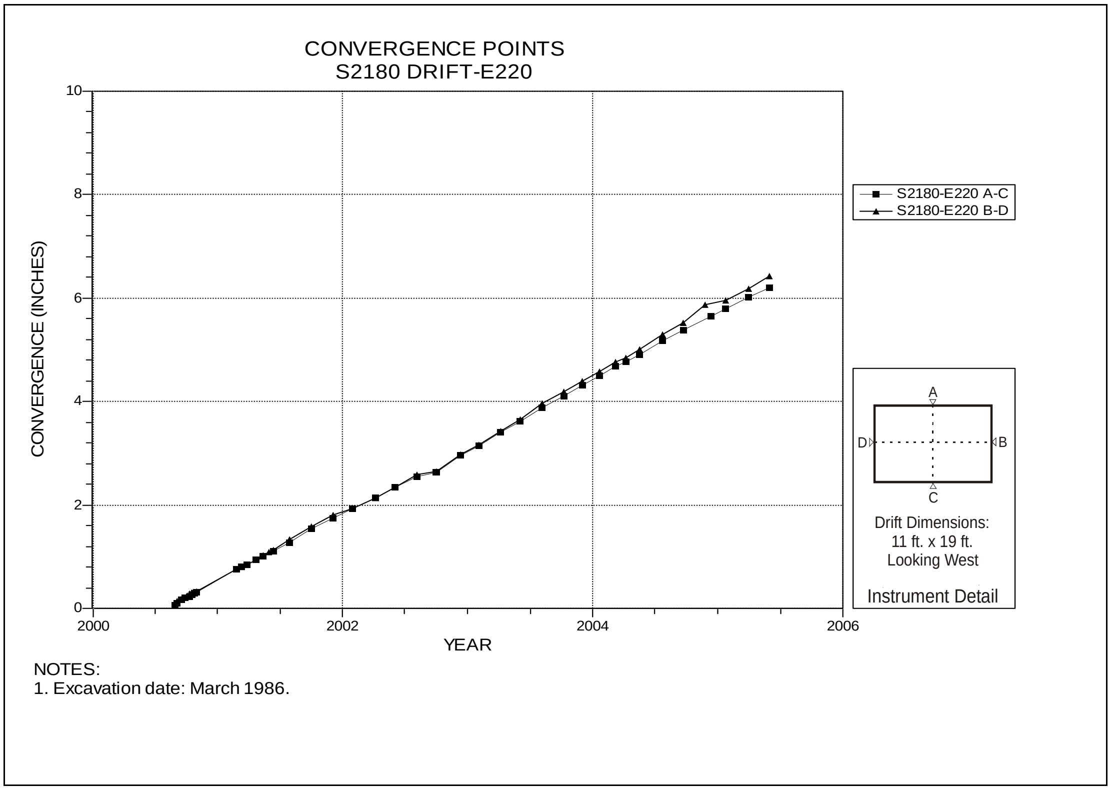


Figure 4-239 Convergence Point Array
S2180 Drift at E220 – All Chords

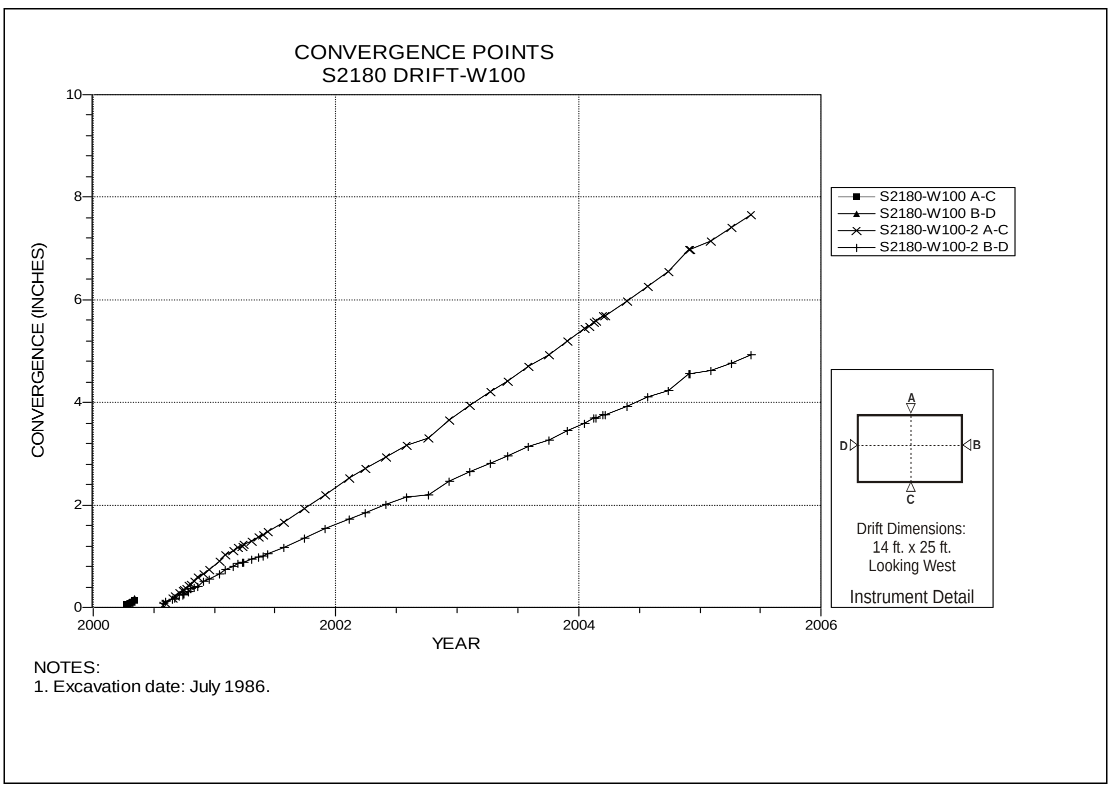


Figure 4-240 Convergence Point Array
S2180 Drift at W100 – All Chords

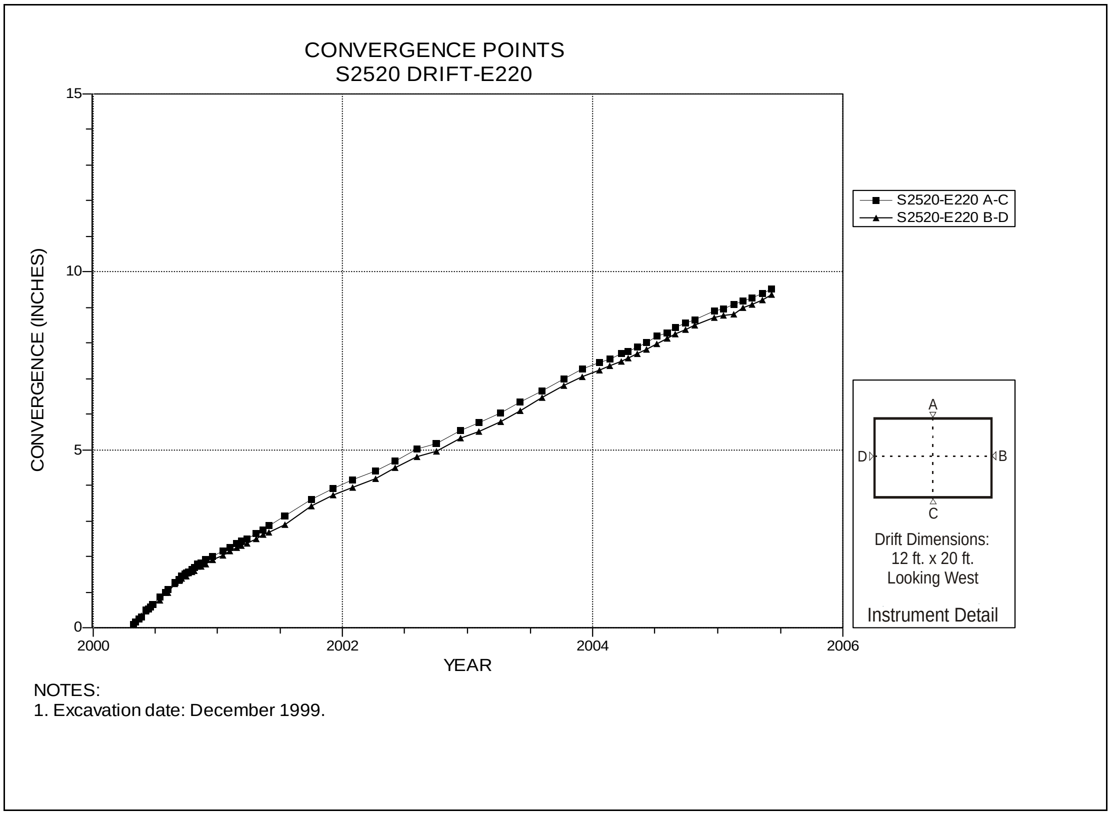


Figure 4-241 Convergence Point Array
S2520 Drift at E220 – All Chords

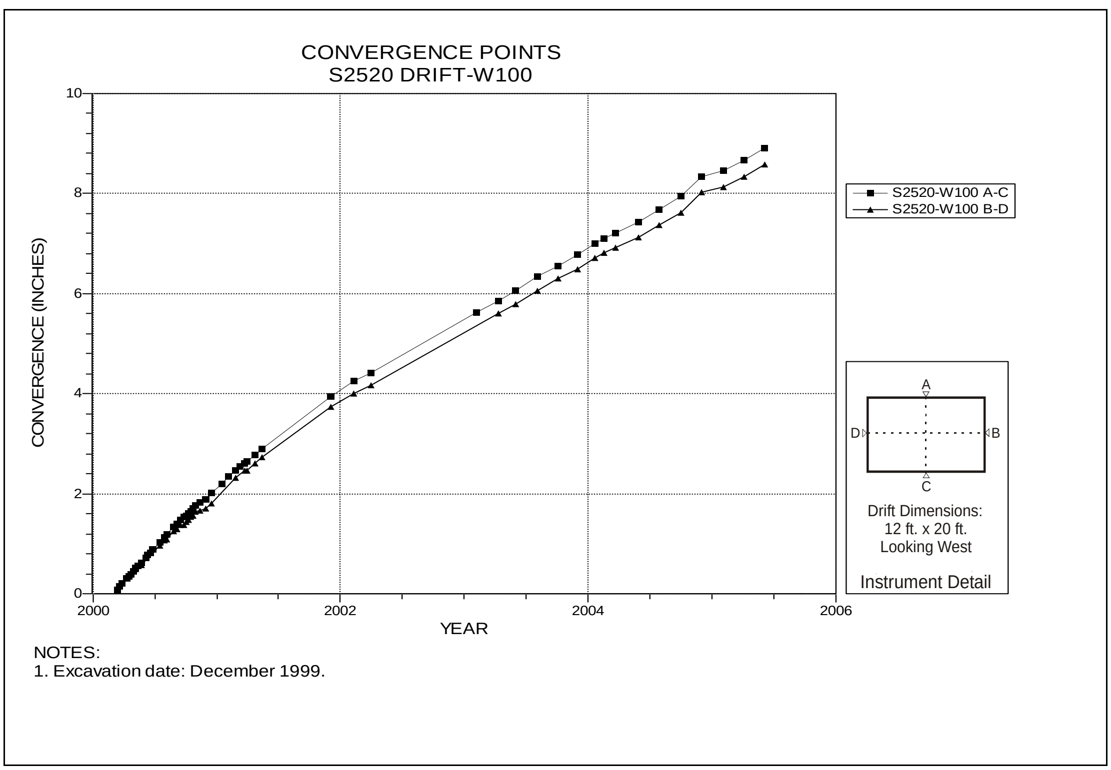
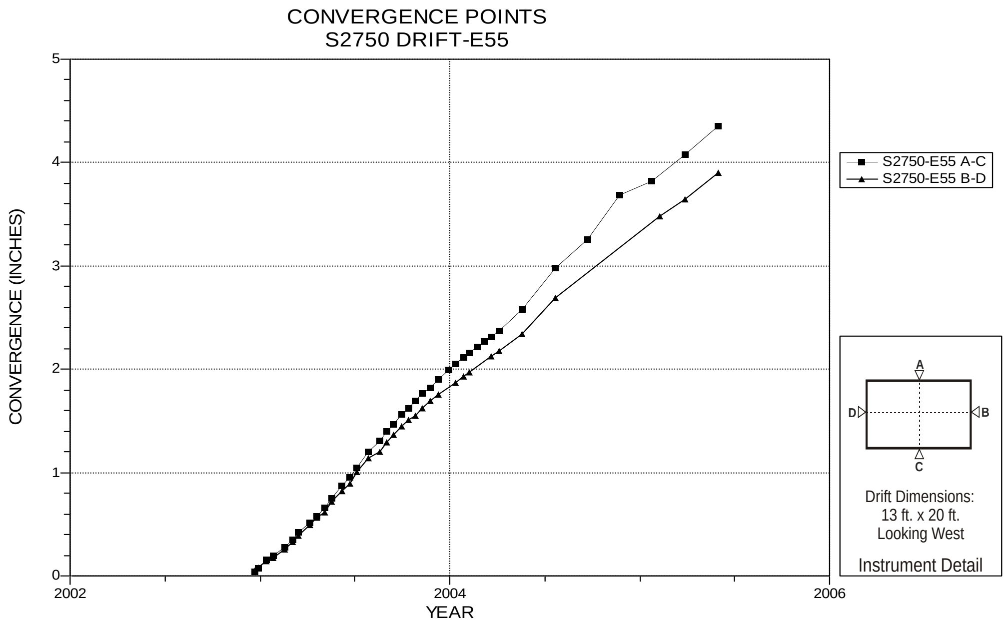
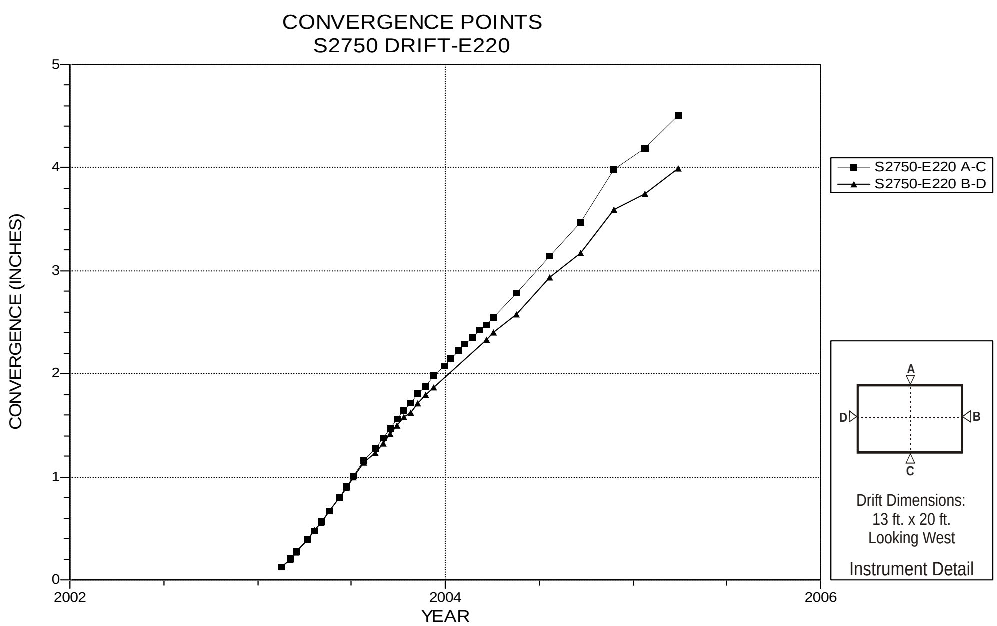


Figure 4-242 Convergence Point Array
S2520 Drift at W100 – All Chords



NOTES:
1. Excavation date: February 2001.

Figure 4-243 Convergence Point Array
S2750 Drift at E55 – All Chords



NOTES:
1. Excavation date: April 2001.

Figure 4-244 Convergence Point Array
S2750 Drift at E220 – All Chords

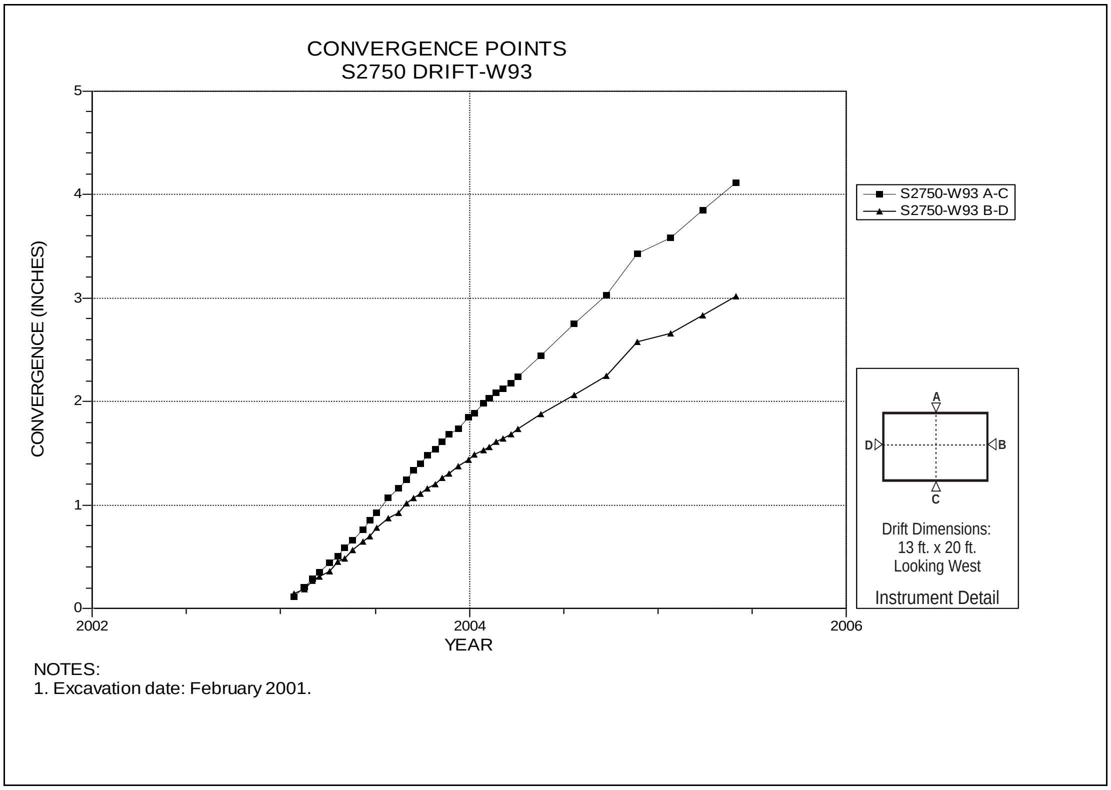


Figure 4-245 Convergence Point Array
S2750 Drift at W93 – All Chords

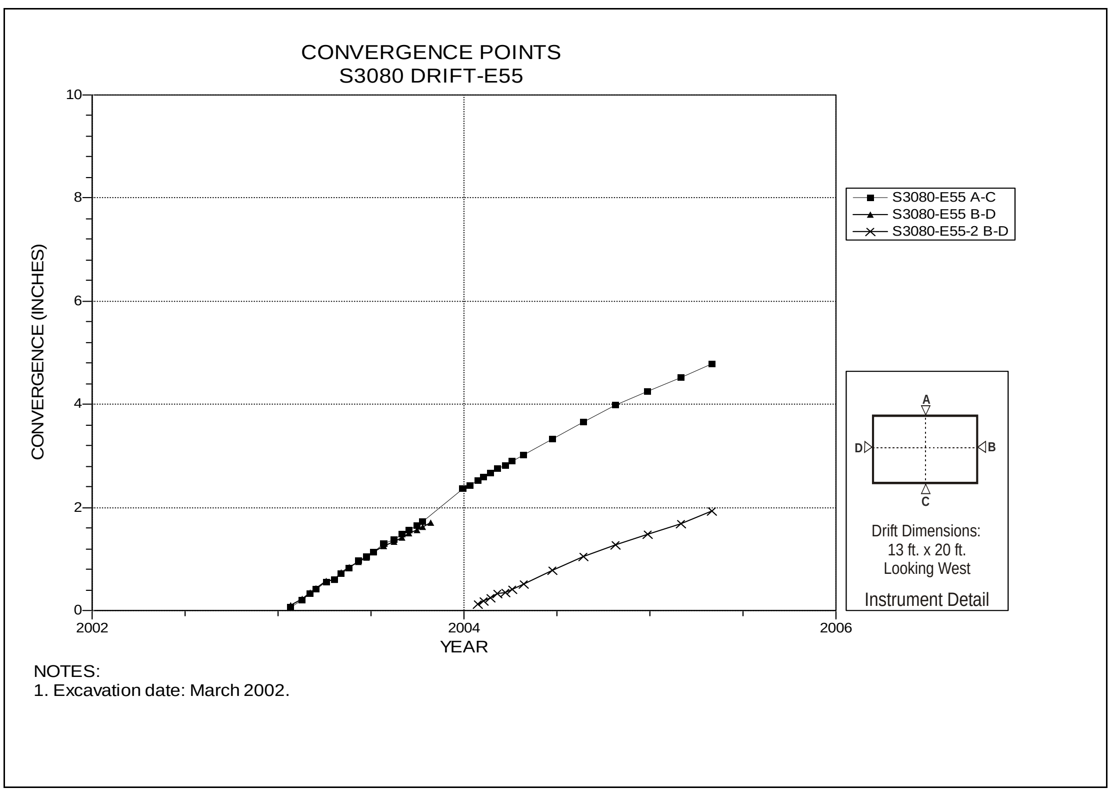


Figure 4-246 Convergence Point Array
S3080 Drift at E55 – All Chords

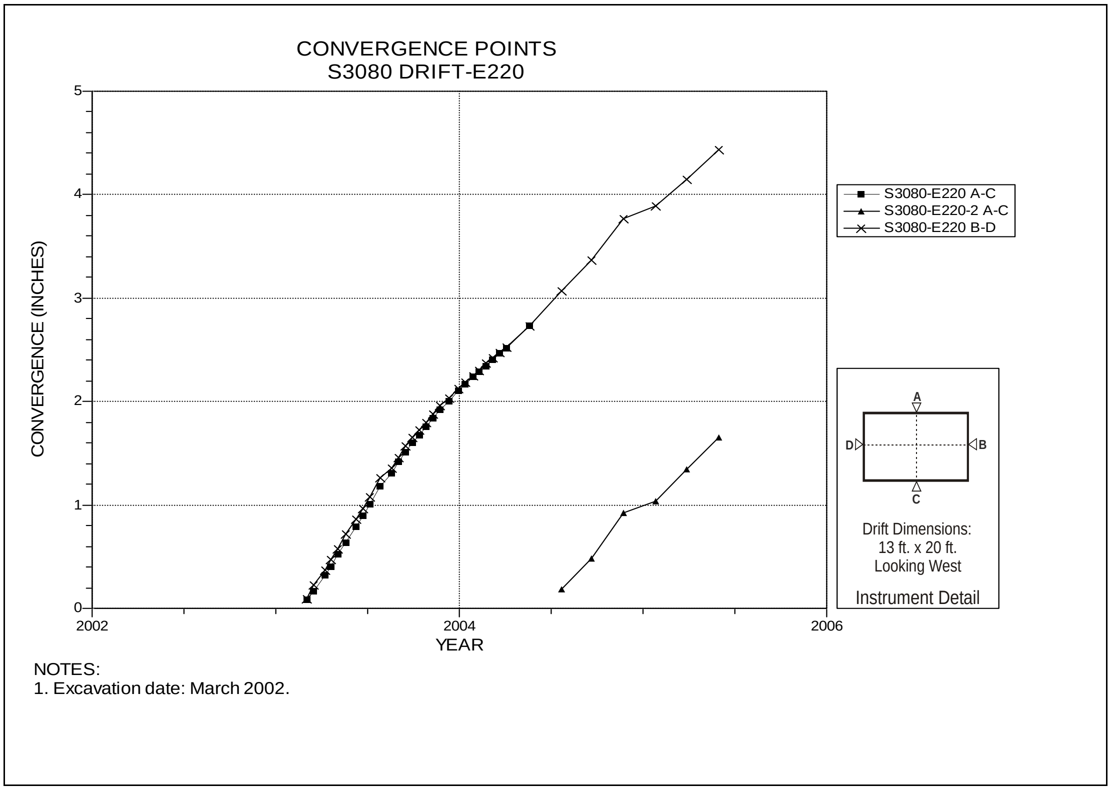


Figure 4-247 Convergence Point Array
S3080 Drift at E220 – All Chords

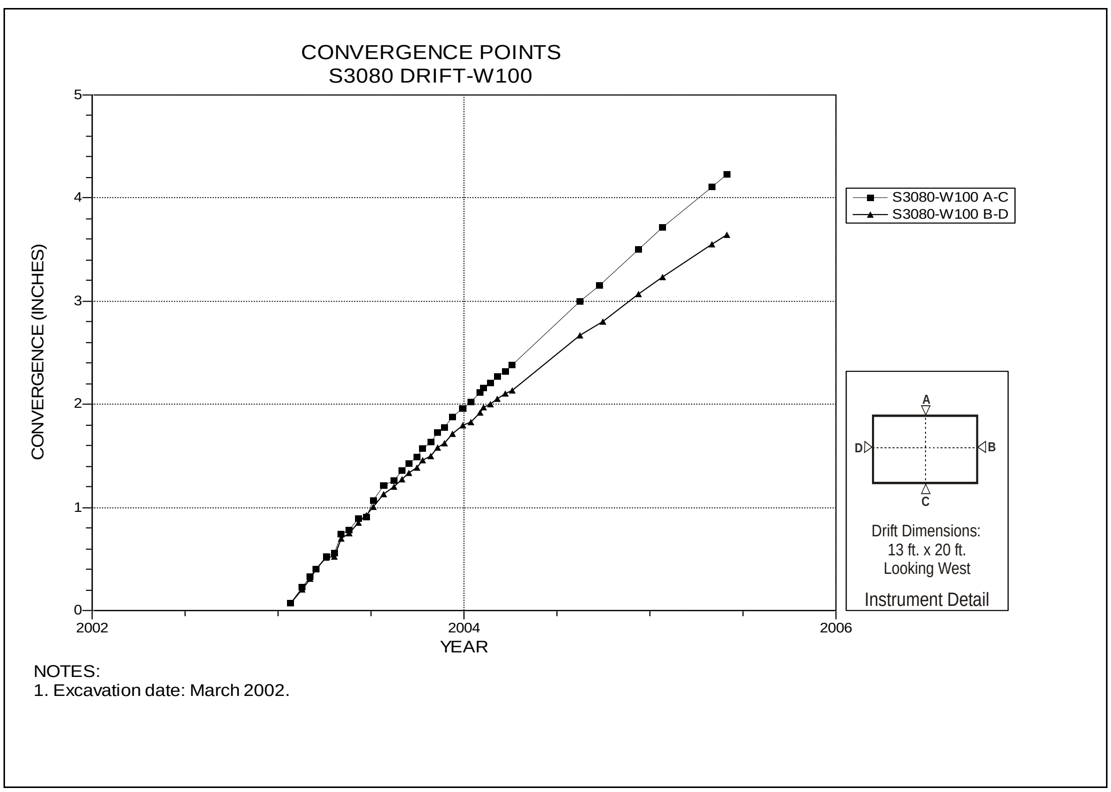


Figure 4-248 Convergence Point Array
S3080 Drift at W100 – All Chords

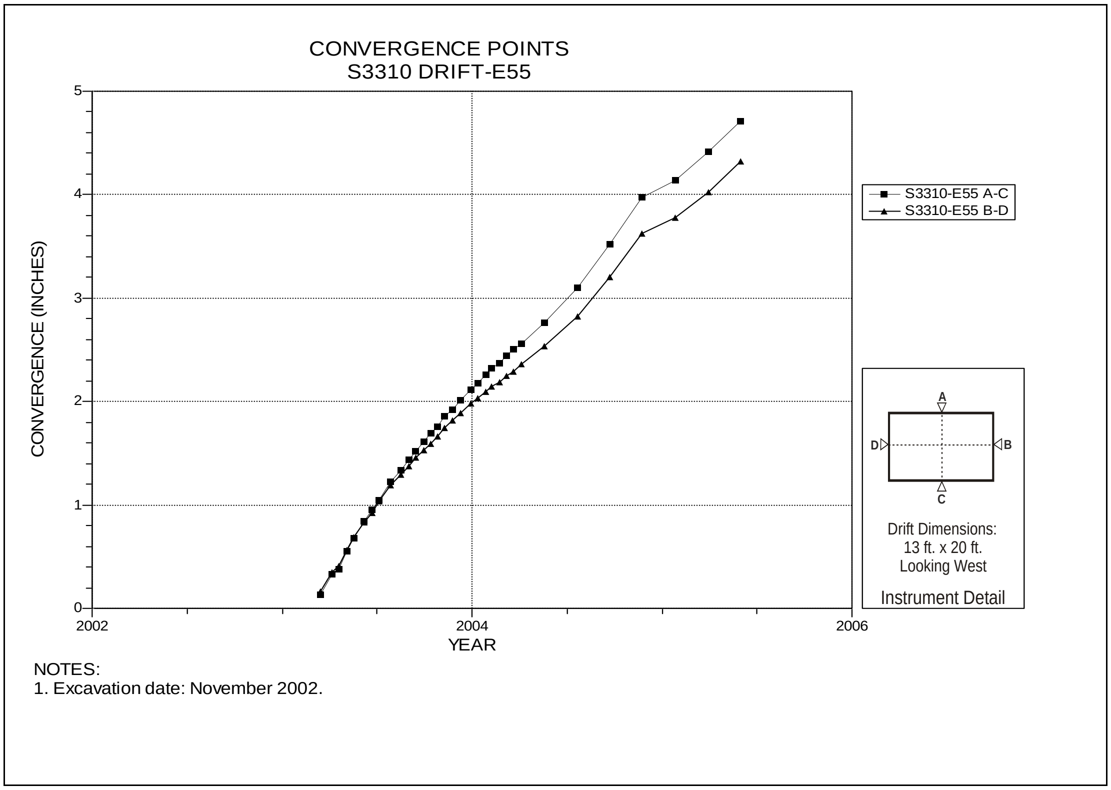


Figure 4-249 Convergence Point Array
S3310 Drift at E55 – All Chords

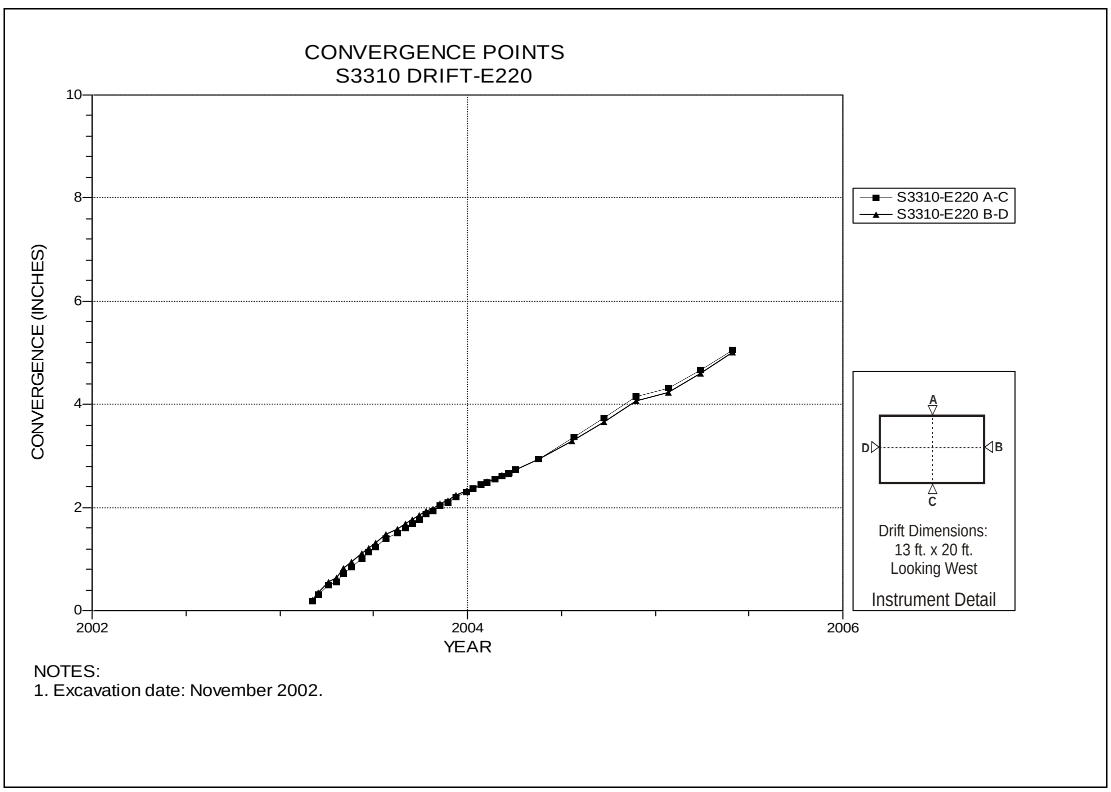


Figure 4-250 Convergence Point Array
S3310 Drift at E220 – All Chords

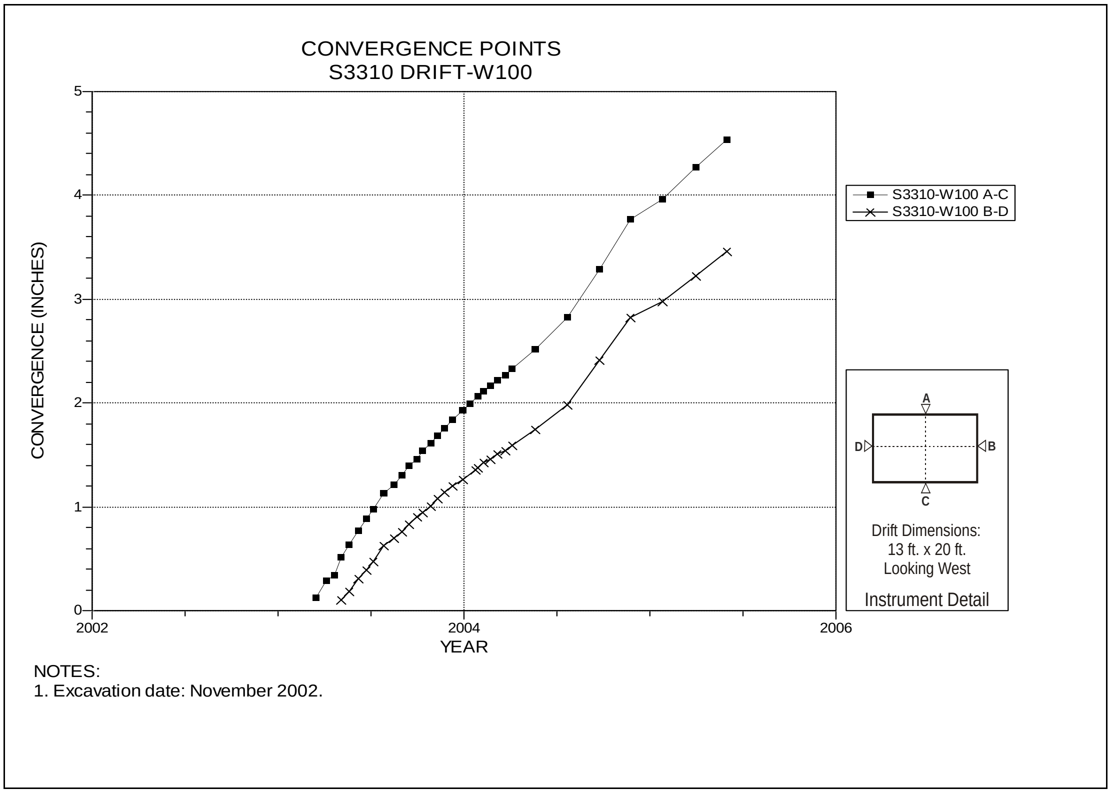


Figure 4-251 Convergence Point Array
S3310 Drift at W100 – All Chords

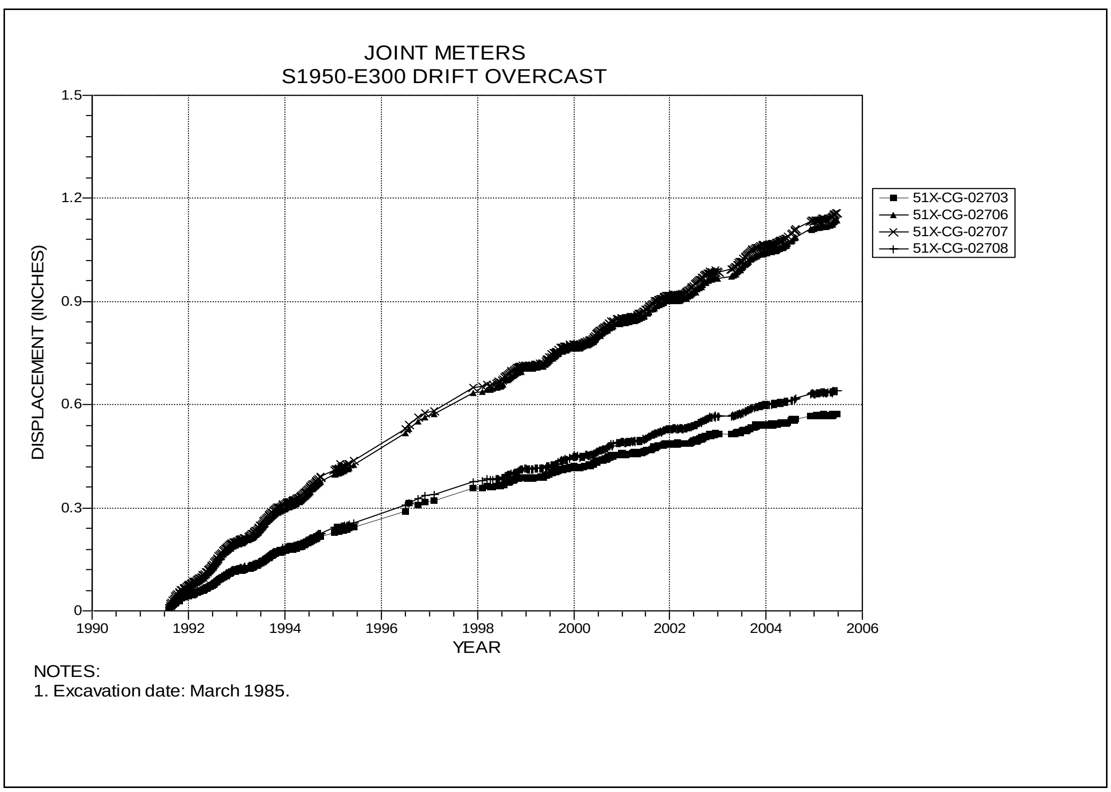
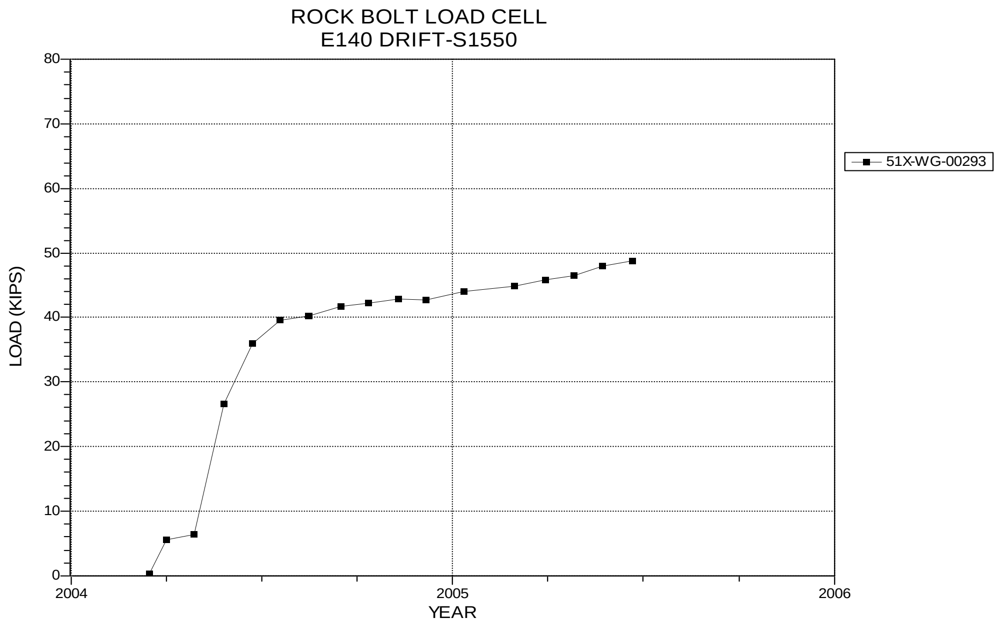
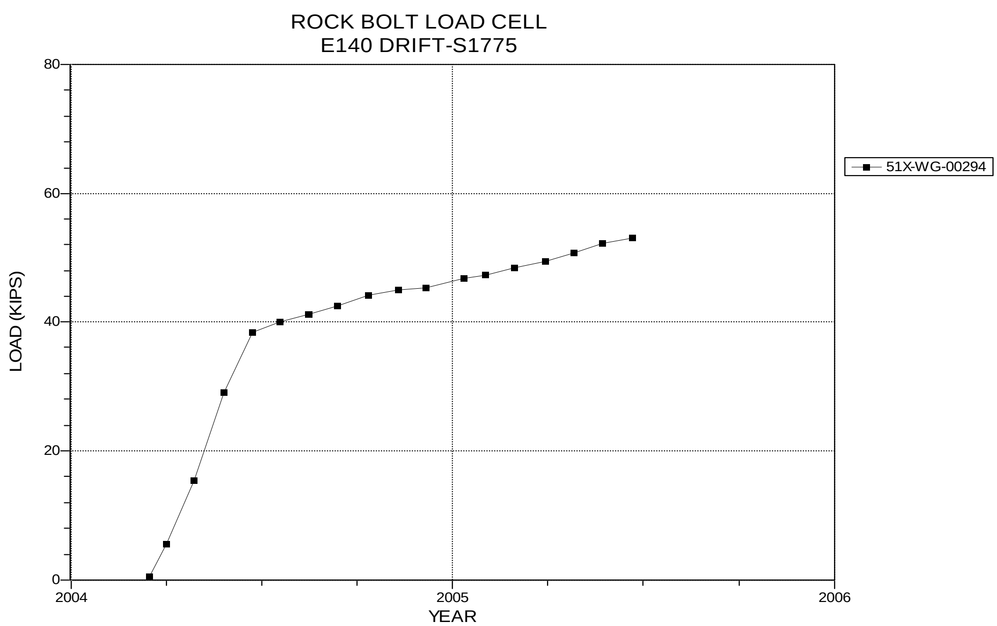


Figure 4-252 Joint Meters
S1950 Drift at E300 – Drift Overcast



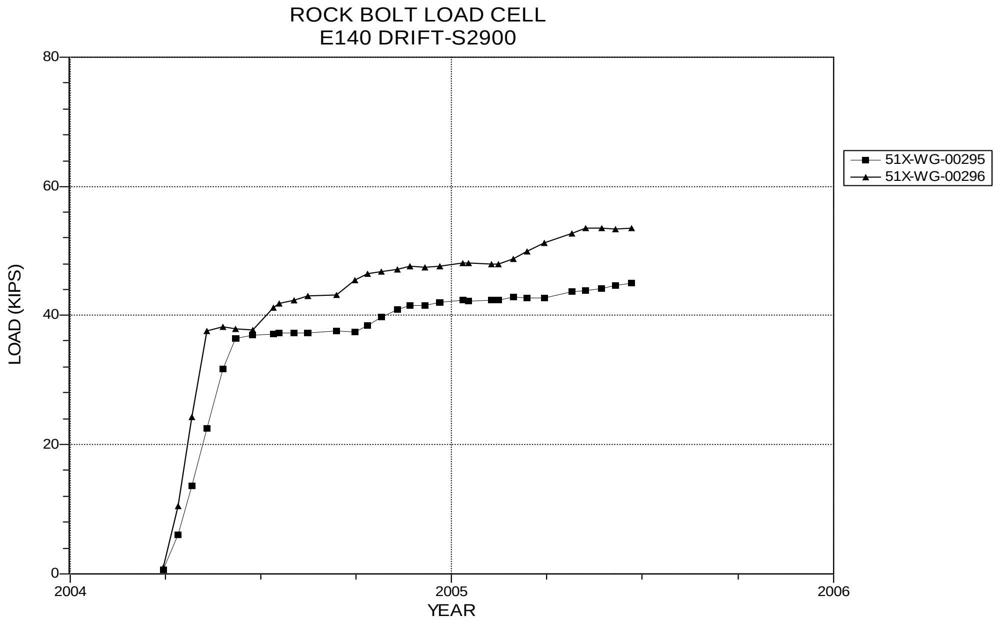
NOTES:
1. Excavation date: December 1982.

Figure 4-253 Rock Bolt Load Cells
E140 Drift at S1550



NOTES:
1. Excavation date: December 1982.

Figure 4-254 Rock Bolt Load Cells
E140 Drift at S1775



NOTES:
1. Excavation date: January 1983.

Figure 4-255 Rock Bolt Load Cells
E140 Drift at S2900

5.0 Instrumentation Summary for the Northern Experimental Area

The northeast and northwest sections of the former WIPP Experimental Areas are no longer accessible and readings were discontinued in June 2002. Instrumentation data for this area has been presented in previous Geotechnical Annual Reports. However, plans continue for the utilization of E300 for future WIPP-based science experiments. Remediation activities in the E300 Room and the adjacent access drifts were completed during this reporting period. Radial convergence points and borehole extensometers were installed. The data are presented in Chapter 4.0 (access drifts).

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6.0 Instrumentation Summary for the Waste Disposal Area

This chapter presents a summary of the data collected from instruments located in the Waste Disposal Area at the WIPP. Table 6-1 presents data and analysis of the access drifts associated with Panel 1. Plots of the instrument data are presented as Figures 6-1 through 6-15.

Panel 2 was the active disposal area; however, limited disposal was also performed in Panel 3 during this reporting period. Remote monitoring continued to instrumentation tied into the Geotechnical Instrumentation System throughout the reporting period. Manually read instrumentation data was collected in areas not blocked by emplaced waste. Table 6-2 presents data and analysis of Panel 2. Plots of the instrument data are presented as Figures 6-16 through 6-42.

Panel 3 was mined to final dimensions and instrumentation was installed during the previous reporting period. Table 6-3 presents data and analysis of Panel 3. Plots of the instrument data are presented as Figures 6-43 through 6-105.

The mining of Panel 4 was started in January 2005. Instrumentation continues to be installed as mining progresses. Table 6-4 presents data analyses for the instruments installed and read before the end of the June 30, 2005 data cutoff. Data plots are also provided in Figures 6-106 through 6-115.

Table 6-1
Panel 1 Access Drifts Data Analysis

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
S1600-E311-2 A-C	S1600 DRIFT-E311	6-1	05/04/05	11.157	16.604	0.62	0.79	-22%	
S1600-E311-5 B-D	S1600 DRIFT-E311	6-1	05/04/05	5.709	14.952	0.57	0.72	-21%	
S1600-E332-3 A-C	S1600 DRIFT-E332	6-2	05/04/05	10.126	14.553	0.70	0.84	-17%	
S1600-E357-2 A-C	S1600 DRIFT-E357	6-3	05/04/05	11.647	17.045	0.89	0.96	-7%	
S1600-E382-2 A-C	S1600 DRIFT-E382	6-4	05/04/05	11.751	17.131	0.86	0.94	-9%	
S1600-E407-2 A-G	S1600 DRIFT-E407	6-5	05/04/05	12.614	18.056	0.95	1.02	-7%	
S1600-E407-2 B-F	S1600 DRIFT-E407	6-5	05/04/05	11.605	16.611	0.87	0.95	-8%	
S1600-E407-2 H-L	S1600 DRIFT-E407	6-5	05/04/05	12.286	17.351	0.96	1.00	-4%	
S1600-E432-2 A-C	S1600 DRIFT-E432	6-6	05/04/05	14.465	21.224	1.04	1.11	-6%	
S1600-E453 A-C	S1600 DRIFT-E453	6-7	05/04/05	0.970	0.970	0.47	0.56	-16%	
S1600-E453 B-D	S1600 DRIFT-E453	6-7	05/04/05	0.978	0.978	0.53	0.56	-5%	
S1950-E311-6 A-C	S1950 DRIFT-E311	6-8	05/10/05	1.704	23.665	0.99	1.06	-7%	
S1950-E311-3 B-D	S1950 DRIFT-E311	6-8	05/10/05	8.074	21.117	0.96	1.12	-14%	
S1950-E332-4 A-C	S1950 DRIFT-E332	6-9	05/10/05	9.615	28.274	1.29	1.41	-9%	
S1950-E332-4 B-D	S1950 DRIFT-E332	6-9	05/10/05	5.404	23.391	1.12	1.23	-9%	
S1950-E357-7 A-C	S1950 DRIFT-E357	6-10	05/10/05	12.076	32.318	1.65	1.74	-5%	
S1950-E357-4 B-D	S1950 DRIFT-E357	6-10	05/10/05	5.872	24.372	1.26	1.31	-4%	
S1950-E382-5 A-C	S1950 DRIFT-E382	6-11	05/10/05	14.408	33.093	1.83	1.98	-8%	
S1950-E382-3 B-D	S1950 DRIFT-E382	6-11	05/10/05	12.014	26.396	1.35	1.40	-4%	
S1950-E407-4 A-G	S1950 DRIFT-E407	6-12	05/10/05	13.942	35.818	2.22	2.12	5%	
S1950-E407-3 H-L	S1950 DRIFT-E407	6-12	05/10/05	15.358	36.115	1.87	2.15	-13%	
S1950-E407-3 C-K	S1950 DRIFT-E407	6-13	04/27/04	10.180	23.157	N/A	1.21	N/A	Last read 04/27/04.
S1950-E407-3 D-J	S1950 DRIFT-E407	6-13	05/10/05	12.732	26.909	1.41	1.48	-5%	
S1950-E432-3 A-C	S1950 DRIFT-E432	6-14	05/10/05	14.345	36.166	1.97	2.04	-3%	
S1950-E432-3 B-D	S1950 DRIFT-E432	6-14	05/10/05	12.074	26.475	1.31	1.41	-7%	
S1950-E457-5 A-C	S1950 DRIFT-E457	6-15	05/10/05	1.311	33.657	0.65	0.74	-12%	
S1950-E457-4 B-D	S1950 DRIFT-E457	6-15	05/10/05	10.051	25.343	0.56	0.63	-11%	

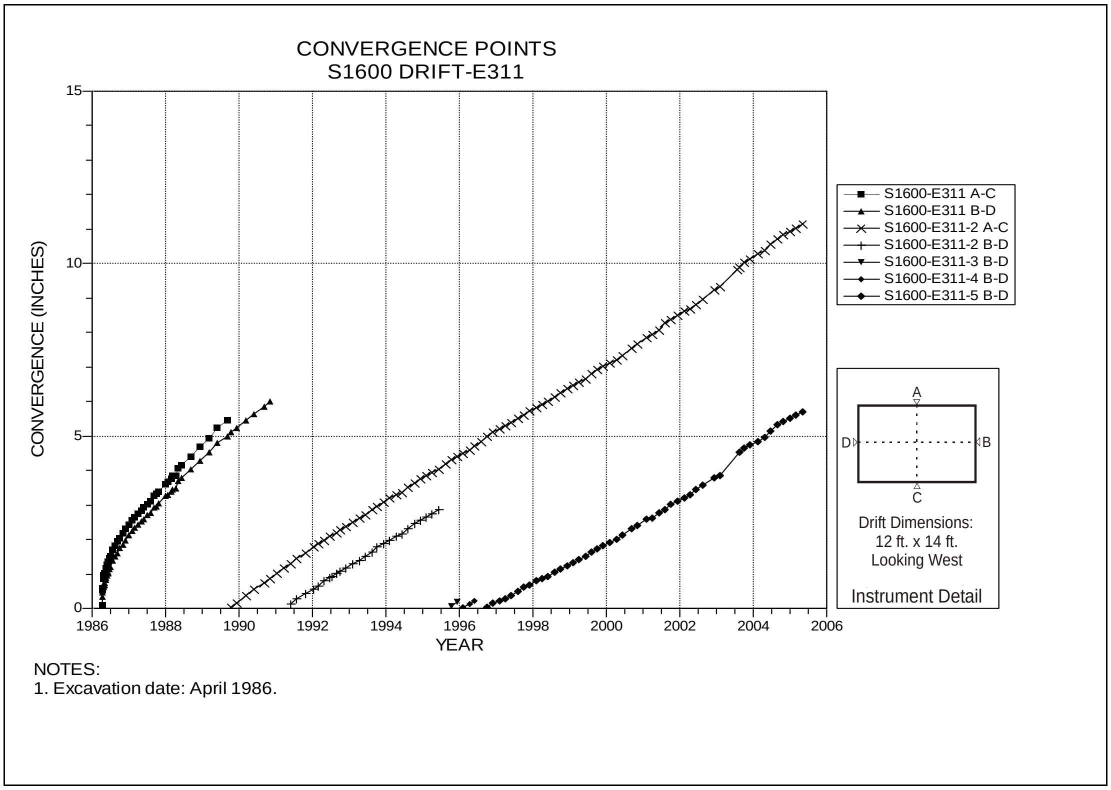


Figure 6-1 Convergence Point Array
S1600 Drift at E311 – All Chords

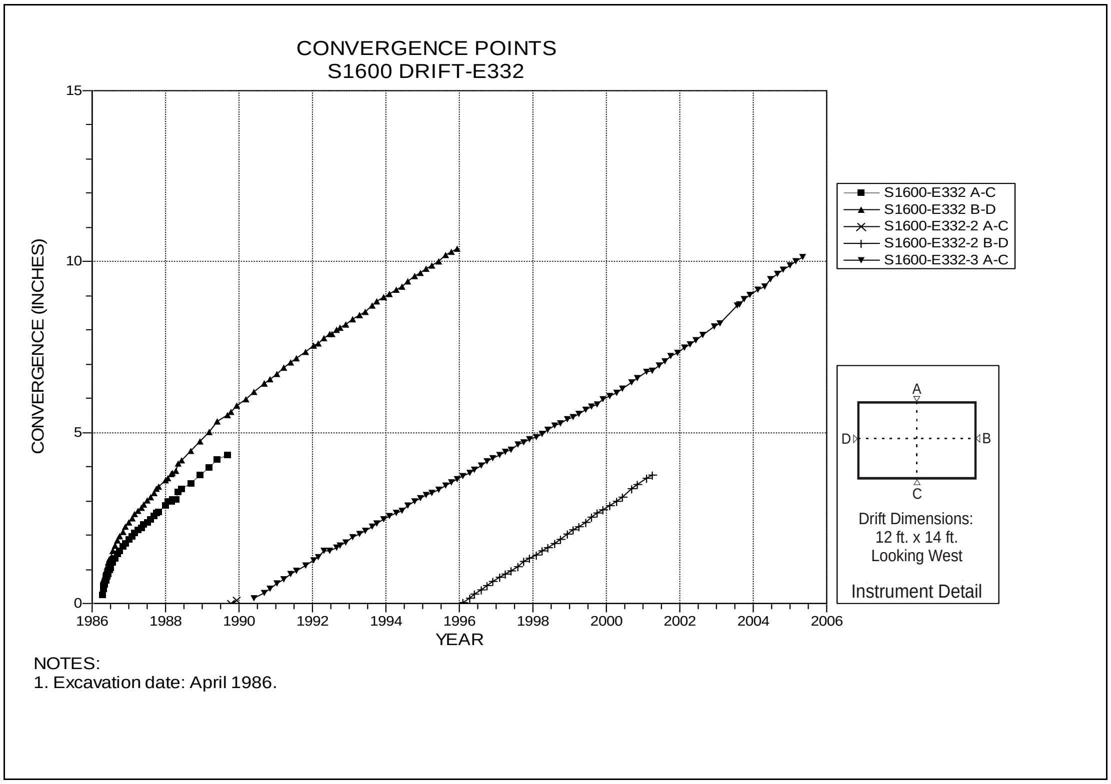


Figure 6-2 Convergence Point Array
S1600 Drift at E332 – All Chords

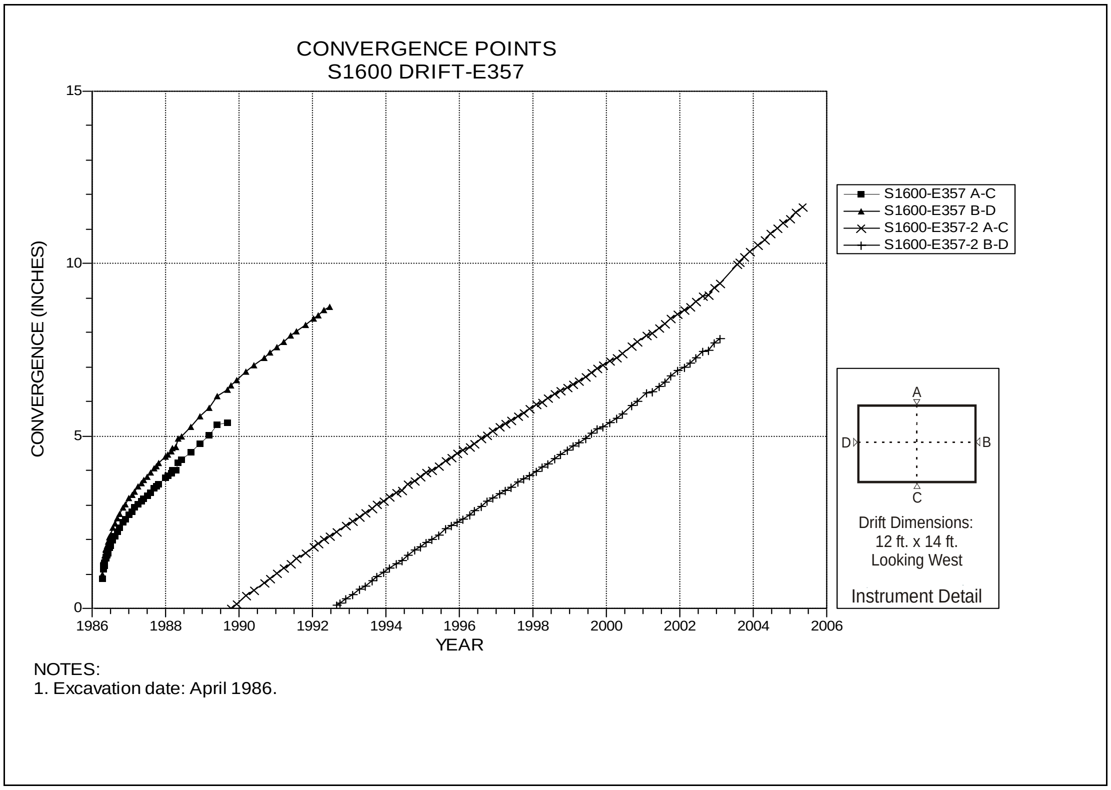


Figure 6-3 Convergence Point Array
S1600 Drift at E357 – All Chords

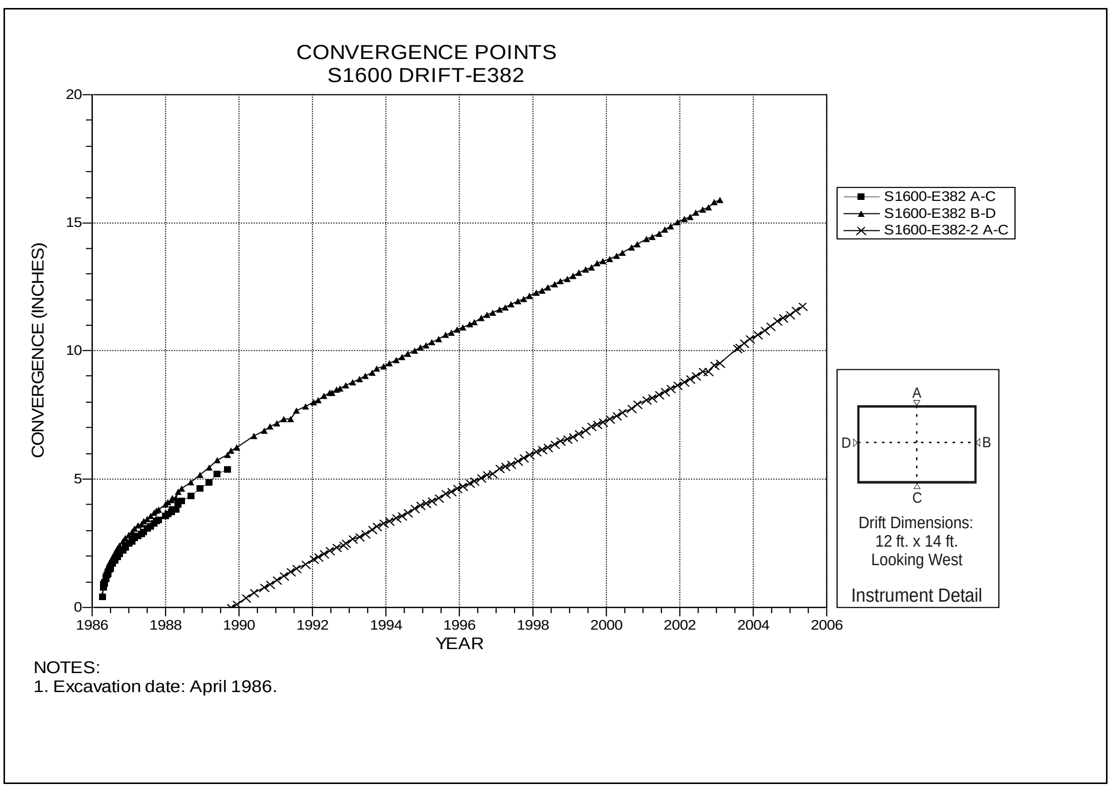


Figure 6-4 Convergence Point Array
S1600 Drift at E382 – All Chords

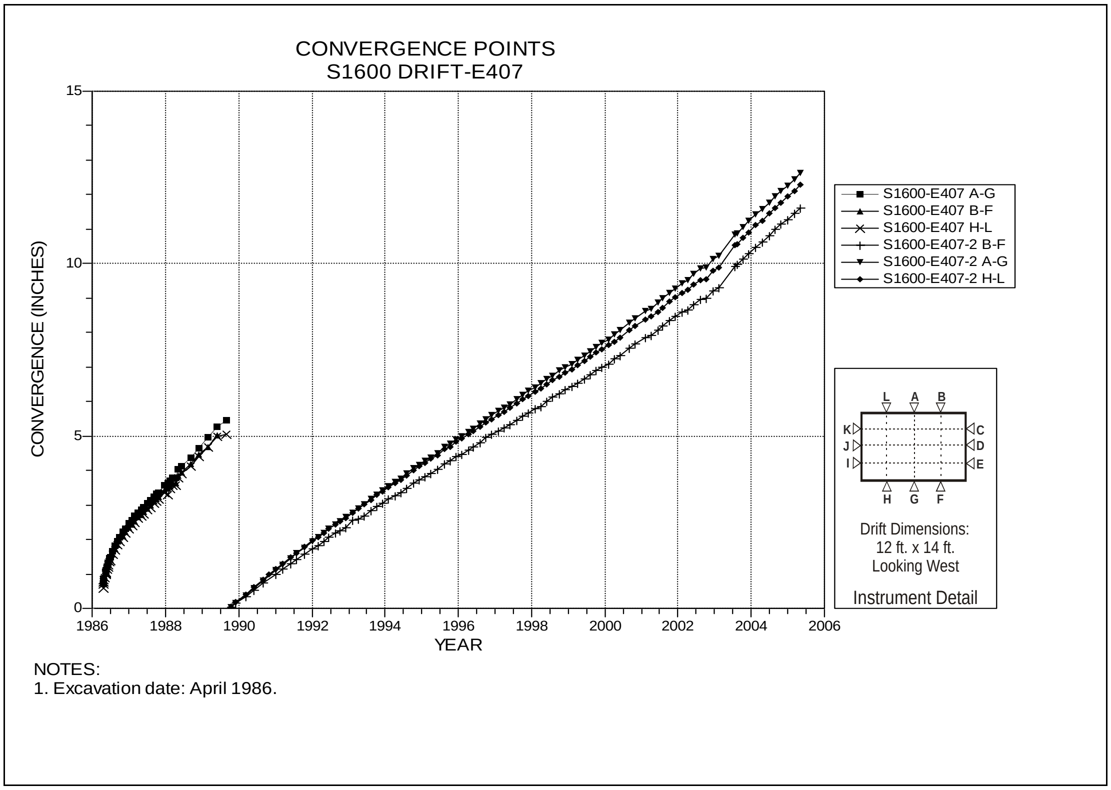


Figure 6-5 Convergence Point Array
S1600 Drift at E407 – Roof to Floor

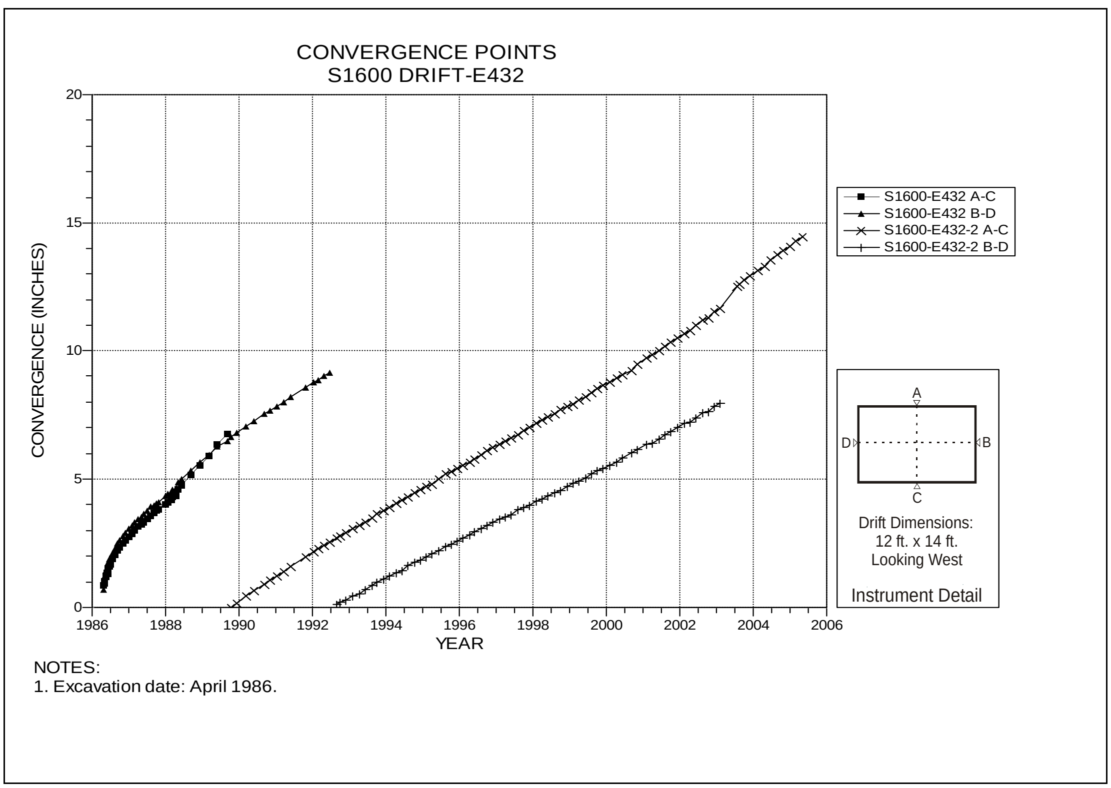


Figure 6-6 Convergence Point Array
S1600 Drift at E432 – All Chords

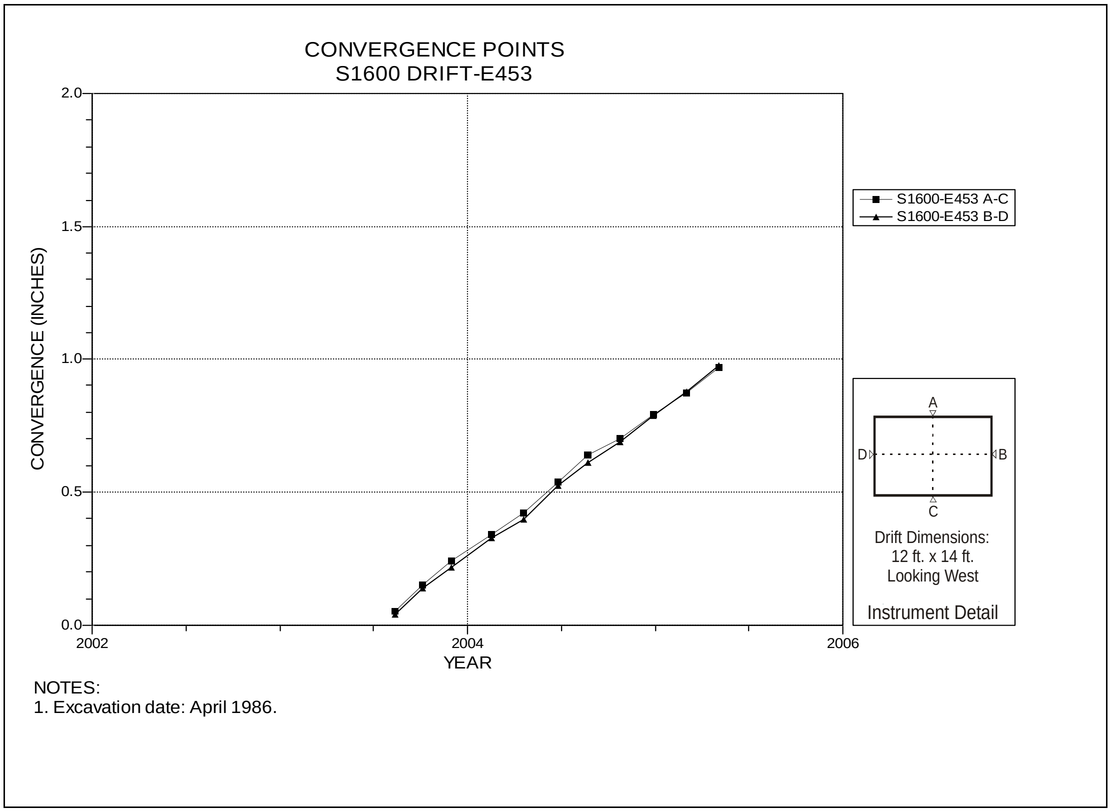


Figure 6-7 Convergence Point Array
S1600 Drift at E453 – All Chords

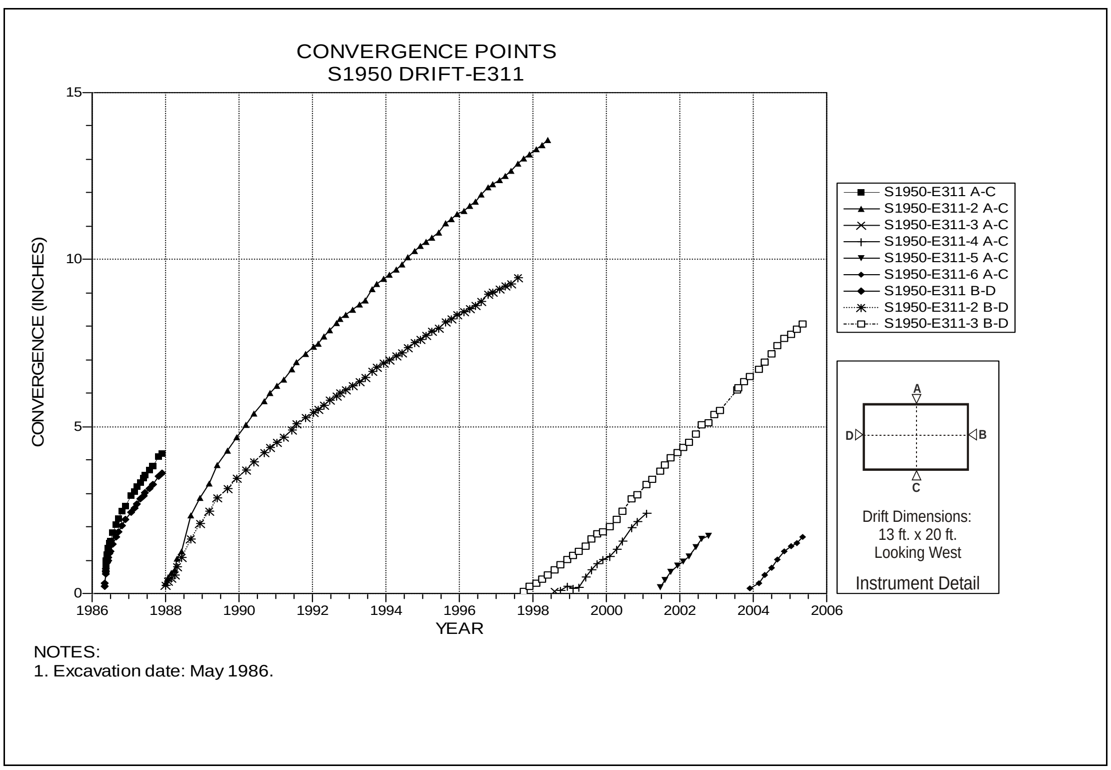


Figure 6-8 Convergence Point Array
S1950 Drift at E311 – All Chords

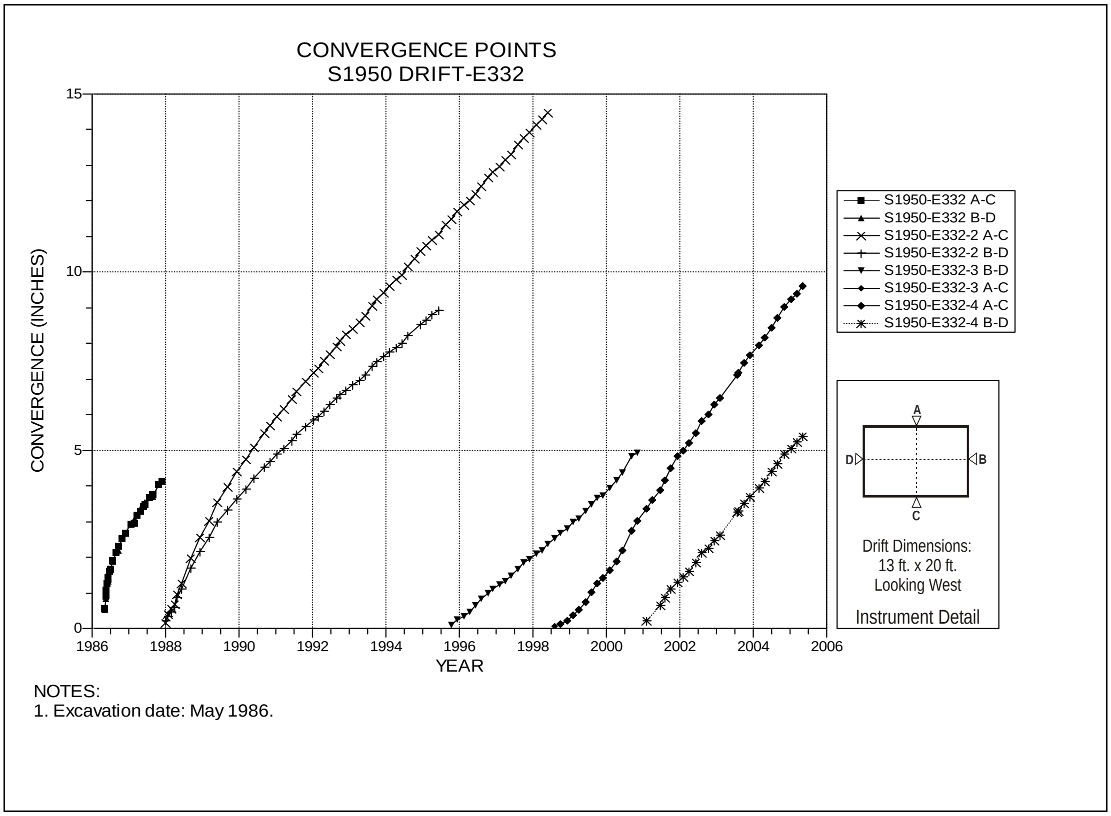


Figure 6-9 Convergence Point Array
S1950 Drift at E332 – All Chords

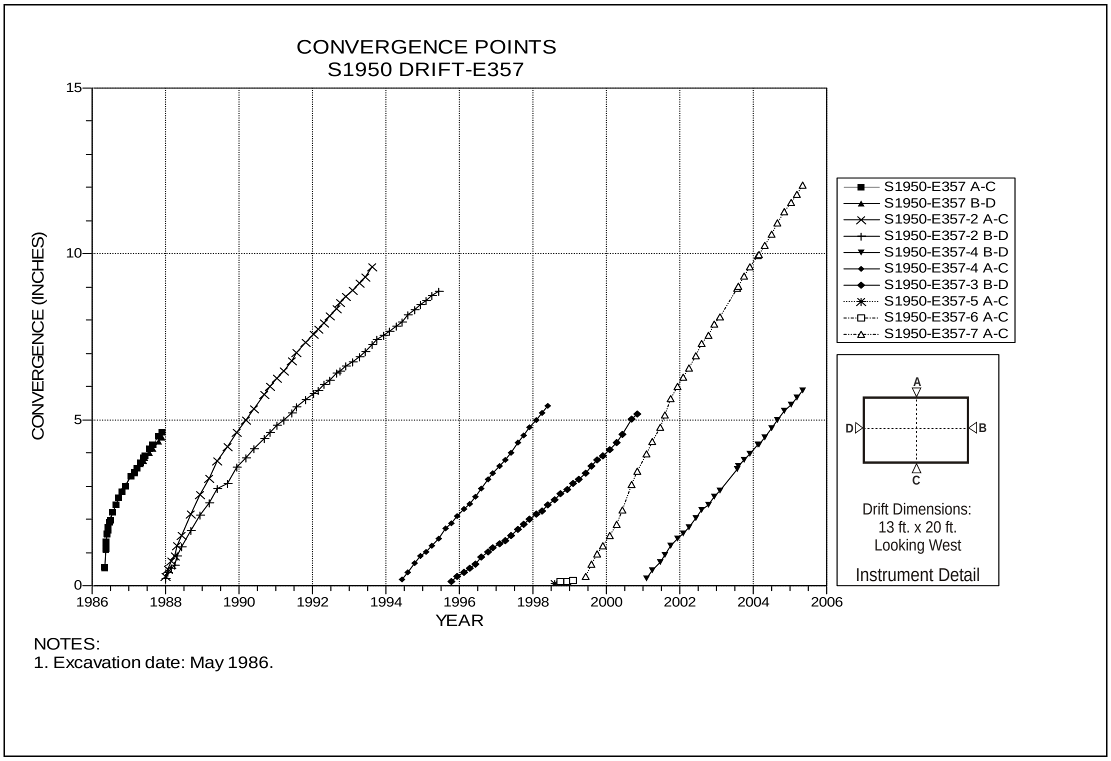


Figure 6-10 Convergence Point Array
S1950 Drift at E357 – All Chords

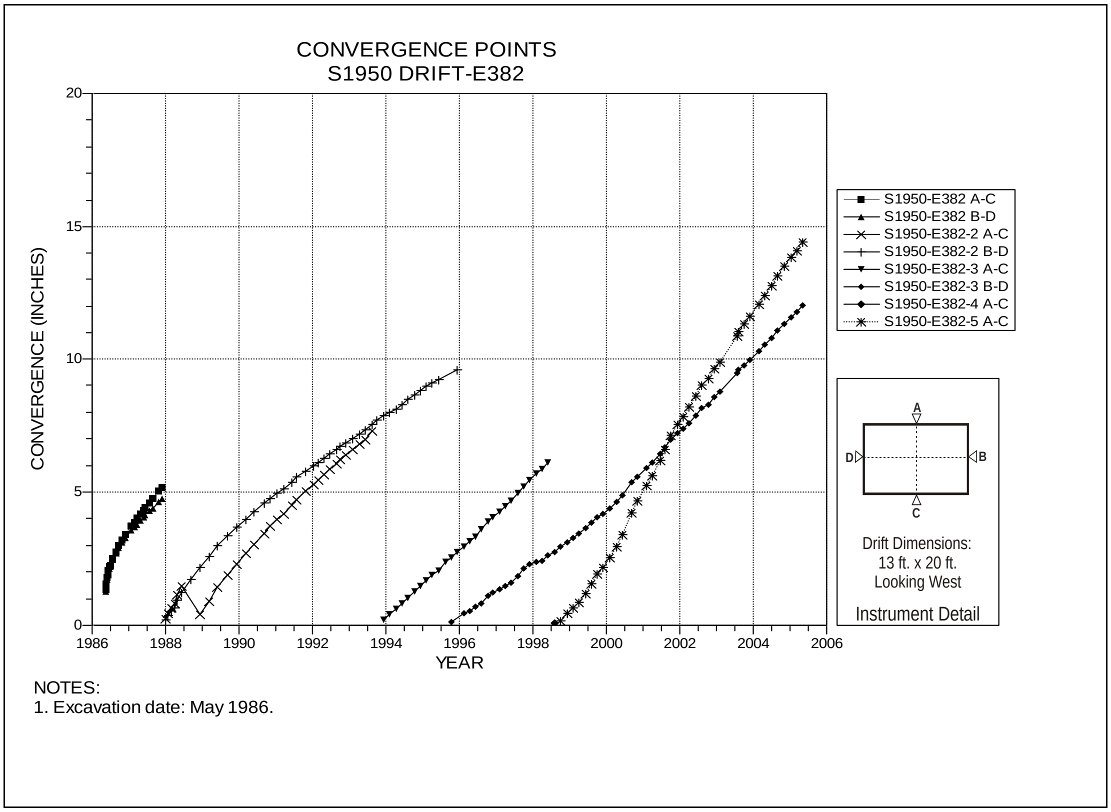


Figure 6-11 Convergence Point Array
S1950 Drift at E382 – All Chords

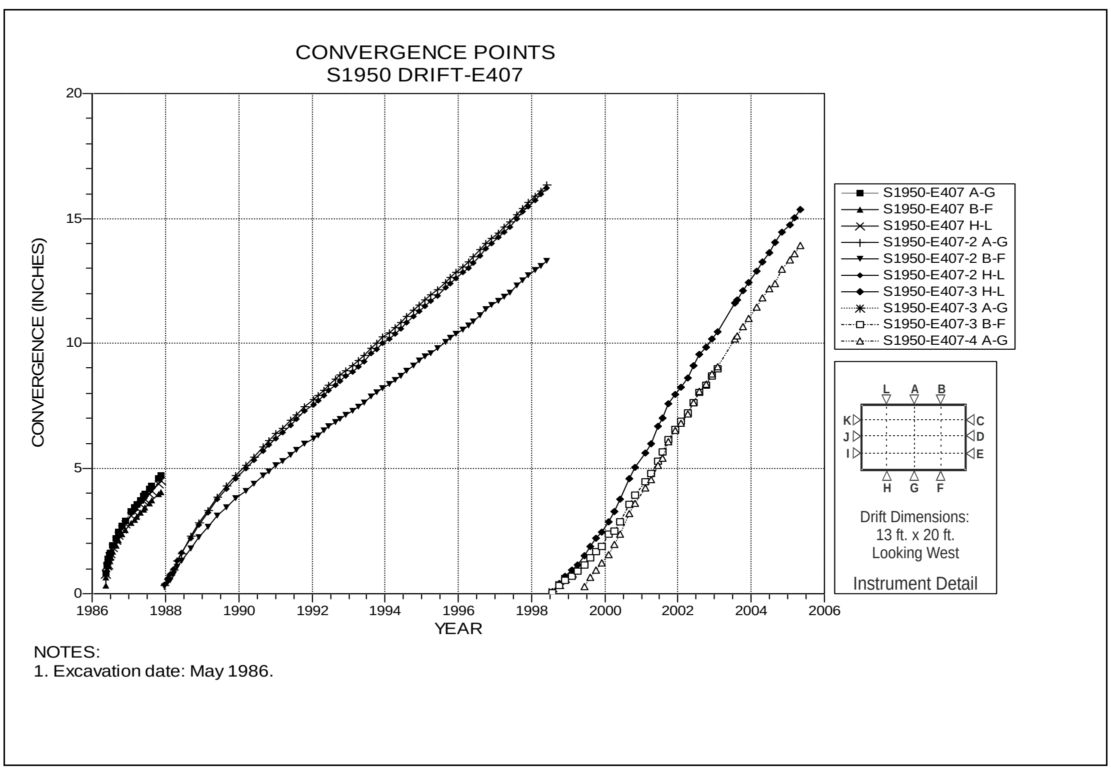


Figure 6-12 Convergence Point Array
S1950 Drift at E407 – Roof to Floor

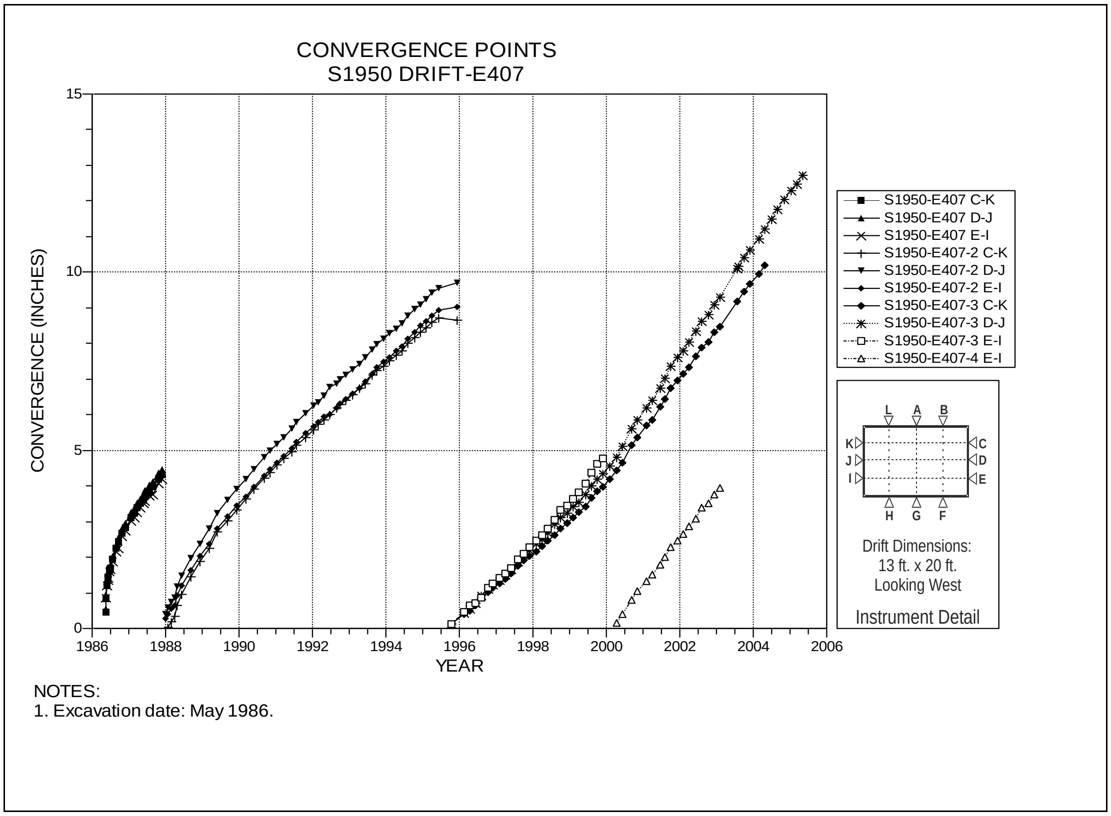


Figure 6-13 Convergence Point Array
S1950 Drift at E407 – Rib to Rib

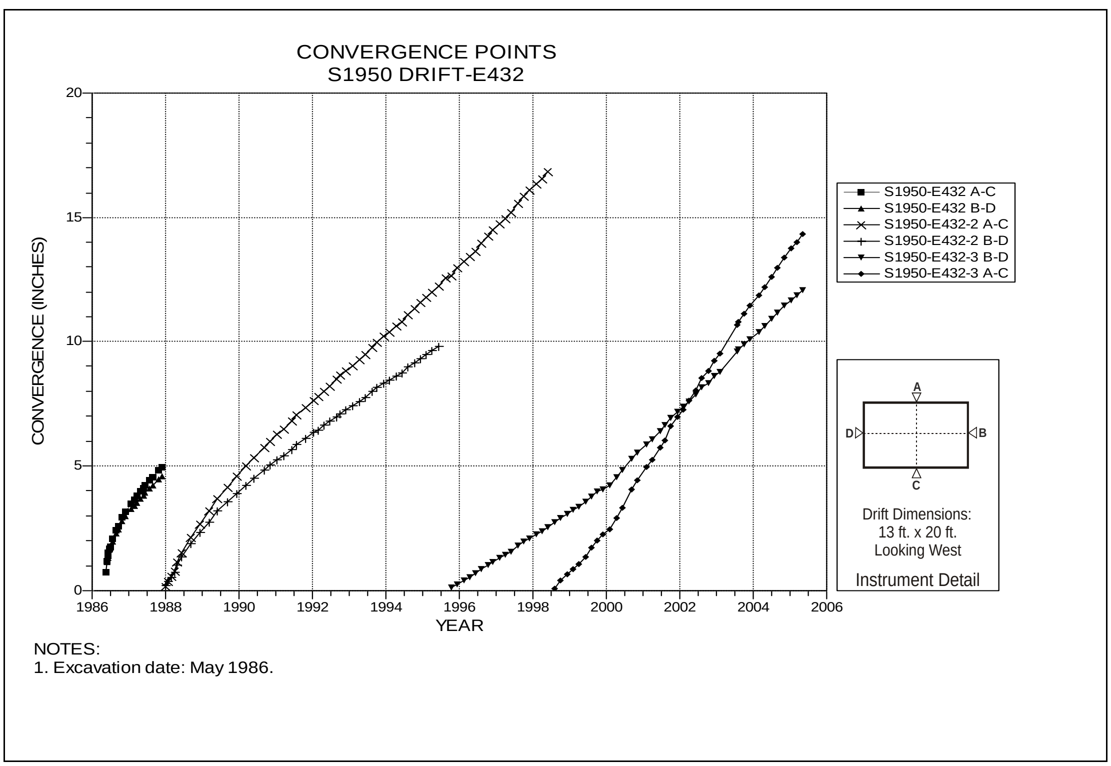


Figure 6-14 Convergence Point Array
S1950 Drift at E432 – All Chords

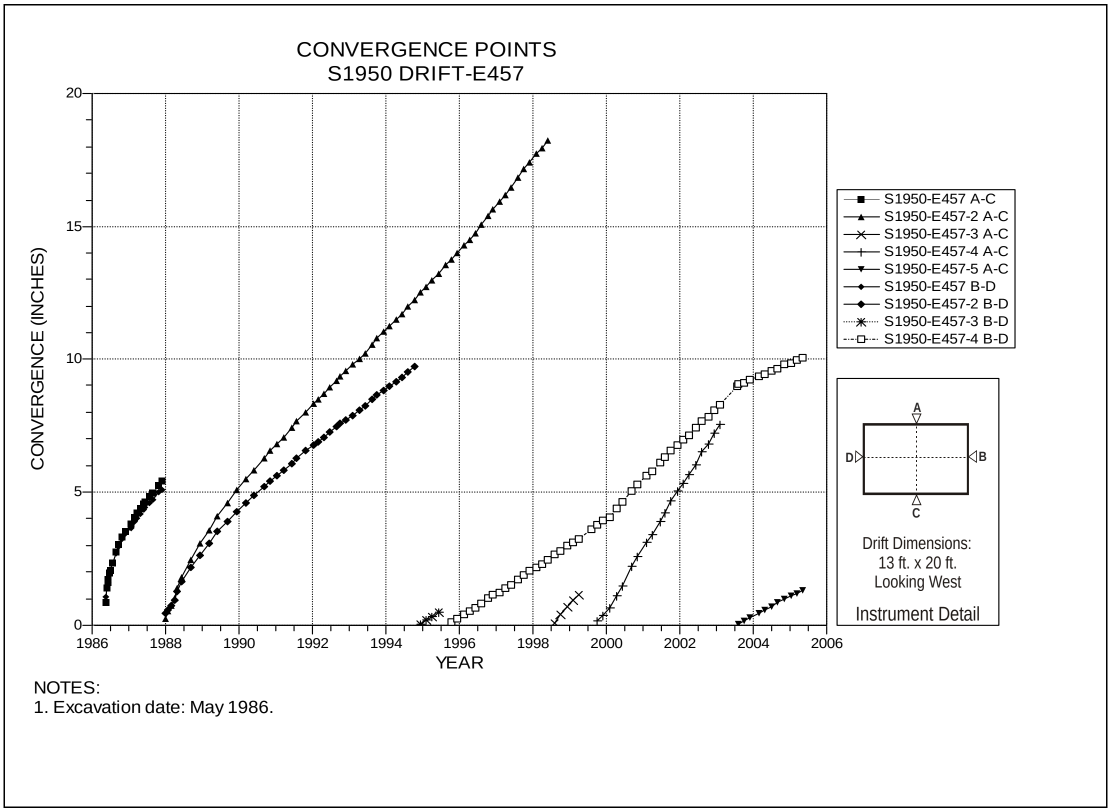


Figure 6-15 Convergence Point Array
S1950 Drift at E457 – All Chords

Table 6-2
Panel 2 Data Analysis

EXTENSOMETERS

Field Tag	Location		Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent	Comments
51X-GE-00341	PANEL 2 ROOM 1	CENTER ROOF	6-16	06/27/05	6.248	1.55	1.39	12%	
51X-GE-00342	PANEL 2 ROOM 2	CENTER ROOF	6-17	06/27/05	4.354	0.84	0.94	-11%	
51X-GE-00343	PANEL 2 ROOM 3	CENTER ROOF	6-18	06/27/05	6.472	1.75	1.36	29%	
51X-GE-00344	PANEL 2 ROOM 4	CENTER ROOF	6-19	06/27/05	5.08	1.07	1.01	6%	
51X-GE-00345	PANEL 2 ROOM 5	CENTER ROOF	6-20	06/27/05	5.193	1.12	1.03	9%	
51X-GE-00346	PANEL 2 ROOM 6	CENTER ROOF	6-21	06/27/05	0.000	2.02	-4.54	144%	Anchor "C" broken.
51X-GE-00347	PANEL 2 ROOM 7	CENTER ROOF	6-22	06/27/05	5.352	1.27	1.06	20%	
51X-GE-00348	S2180 DRIFT - E725	ROOF	6-23	06/27/05	18.456	13.13	2.14	514%	Instrument failure.
51X-GE-00350	S2520 DRIFT - E735	ROOF	6-24	06/27/05	7.138	1.93	1.84	5%	
51X-GE-00349	S2520 DRIFT - E1120	ROOF	6-25	06/27/05	0.000	-6.45	2.76	-334%	Anchor "C" broken.

Table 6-2 (Continued)
Panel 2 Data Analysis

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
S2180-E410-2 A-C	S2180 DRIFT-E410	6-26	06/15/05	1.551	6.371	1.18	1.30	-9%	
S2180-E410 B-D	S2180 DRIFT-E410	6-26	06/15/05	7.578	7.578	1.50	1.54	-3%	
S2180-E520-2 A-C	S2180 DRIFT-E520	6-27	02/24/05	2.208	11.124	2.24	2.37	-5%	
S2180-E586-2 A-C	S2180 DRIFT-E586	6-28	10/04/04	1.785	13.421	3.36	3.14	7%	
S2180-E586-2 B-D	S2180 DRIFT-E586	6-28	10/04/04	5.400	8.881	2.12	1.90	12%	
S2520-E410-3 A-C	S2520 DRIFT-E410	6-29	06/06/05	3.585	11.778	2.49	2.65	-6%	
S2520-E410 B-D	S2520 DRIFT-E410	6-29	06/06/05	12.130	12.130	2.36	2.44	-3%	
S2520-E520-3 A-C	S2520 DRIFT-E520	6-30	01/17/05	6.490	20.370	6.01	5.45	10%	
S2520-E586-2 A-C	S2520 DRIFT-E586	6-31	02/15/05	4.889	19.102	4.27	4.54	-6%	
S2520-E586 B-D	S2520 DRIFT-E586	6-31	02/15/05	11.851	11.851	2.31	2.46	-6%	
S2520-E660-3 A-C	S2520 DRIFT-E660	6-32	11/24/04	4.466	19.898	5.01	4.88	3%	
S2520-E790-2 A-C	S2520 DRIFT-E790	6-33	07/08/04	2.543	15.762	N/A	4.67	N/A	N/A due to waste emplacement.
E520-S2275-2 A-C	E520 DRIFT-S2275	6-34	02/09/05	4.361	17.928	3.65	3.67	-1%	
E520-S2275 B-D	E520 DRIFT-S2275	6-34	02/09/05	10.824	10.824	2.04	2.16	-6%	
E520-S2350-3 A-C	E520 DRIFT-S2350	6-35	02/09/05	5.326	20.432	4.64	4.34	7%	
E520-S2350 B-D	E520 DRIFT-S2350	6-35	02/09/05	12.939	12.939	2.41	2.69	-10%	
E520-S2425-2 A-C	E520 DRIFT-S2425	6-36	01/13/05	4.431	17.705	4.08	3.97	3%	
E520-S2425 B-D	E520 DRIFT-S2425	6-36	02/09/05	12.048	12.048	2.35	2.51	-6%	
E660-S2275-3 A-C	E660 DRIFT-S2275	6-37	11/15/04	7.763	13.903	3.69	3.27	13%	
E660-S2275 B-D	E660 DRIFT-S2275	6-37	11/15/04	11.376	11.376	2.38	2.07	15%	
E660-S2350-4 A-C	E660 DRIFT-S2350	6-38	11/15/04	8.773	19.059	4.06	3.96	3%	
E660-S2350 B-D	E660 DRIFT-S2350	6-38	11/15/04	12.095	12.095	2.61	2.15	21%	
E660-S2425-3 A-C	E660 DRIFT-S2425	6-39	11/15/04	9.972	19.212	4.58	4.30	7%	
E660-S2425 B-D	E660 DRIFT-S2425	6-39	11/15/04	12.064	12.064	2.48	2.32	7%	
E790-S2275-2 A-C	E790 DRIFT-S2275	6-40	07/08/04	1.545	12.295	N/A	2.70	N/A	N/A due to waste emplacement.

Table 6-2 (Continued)
Panel 2 Data Analysis

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
			Date	Inches					
E790-S2275 B-D	E790 DRIFT-S2275	6-40	07/08/04	9.307	9.307	N/A	1.90	N/A	N/A due to waste emplacement.
E790-S2350-3 A-C	E790 DRIFT-S2350	6-41	07/08/04	2.143	16.047	N/A	3.68	N/A	N/A due to waste emplacement.
E790-S2350 B-D	E790 DRIFT-S2350	6-41	07/08/04	10.253	10.253	N/A	2.27	N/A	N/A due to waste emplacement.
E790-S2425-2 A-C	E790 DRIFT-S2425	6-42	07/08/04	2.092	14.235	N/A	3.72	N/A	N/A due to waste emplacement.
E790-S2425 B-D	E790 DRIFT-S2425	6-42	07/08/04	10.709	10.709	N/A	2.49	N/A	N/A due to waste emplacement.

[A] NA Indicates insufficient data to compare annualized rates.

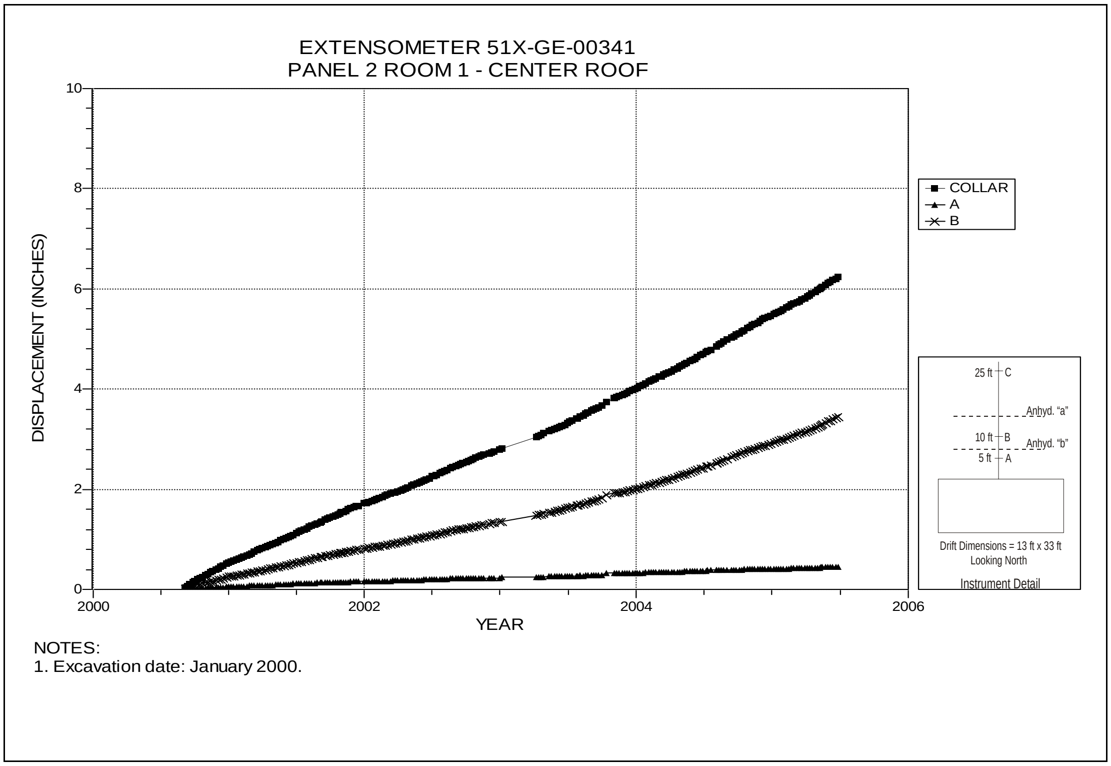


Figure 6-16 Extensometer 51X-GE-00341
Room 1, Panel 2 – Room Center – Roof

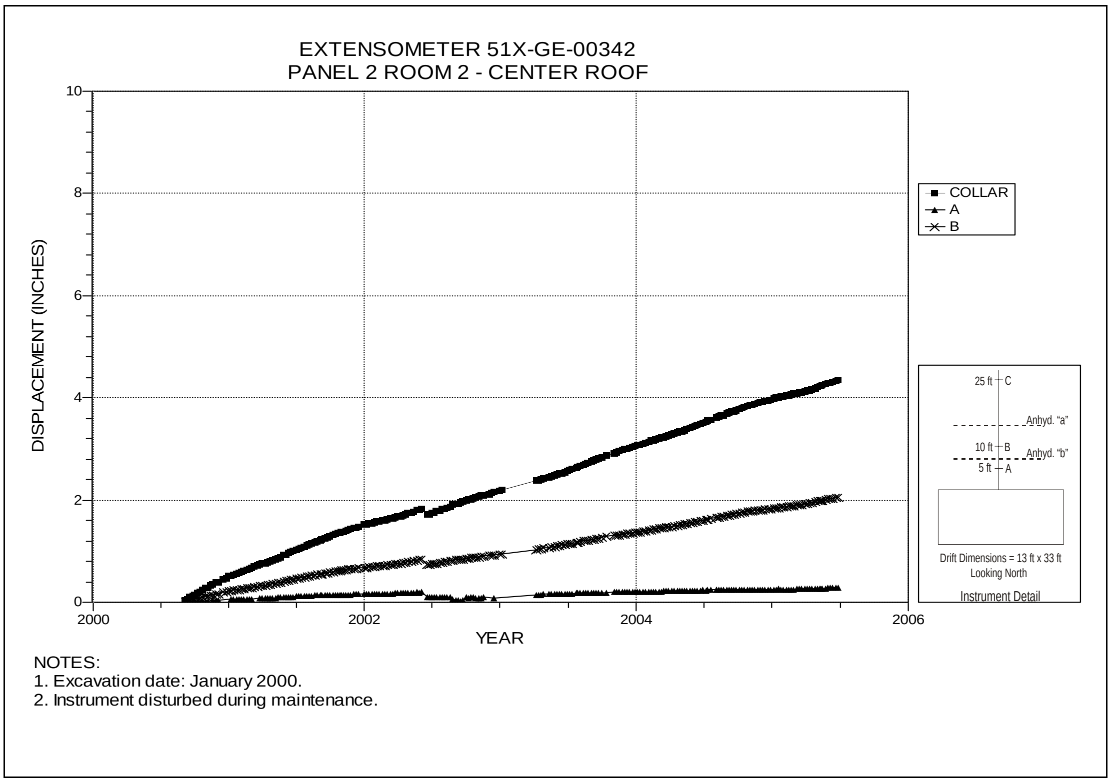


Figure 6-17 Extensometer 51X-GE-00342
Room 2, Panel 2 – Room Center – Roof

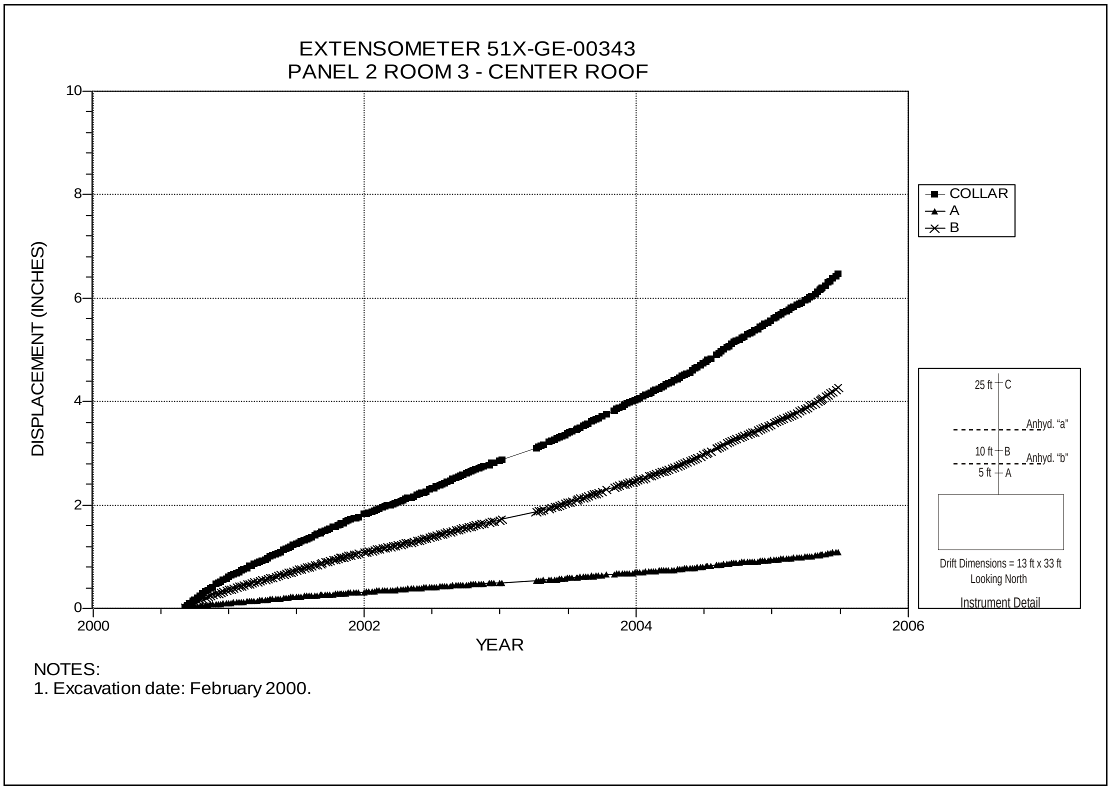


Figure 6-18 Extensometer 51X-GE-00343
Room 3, Panel 2 – Room Center – Roof

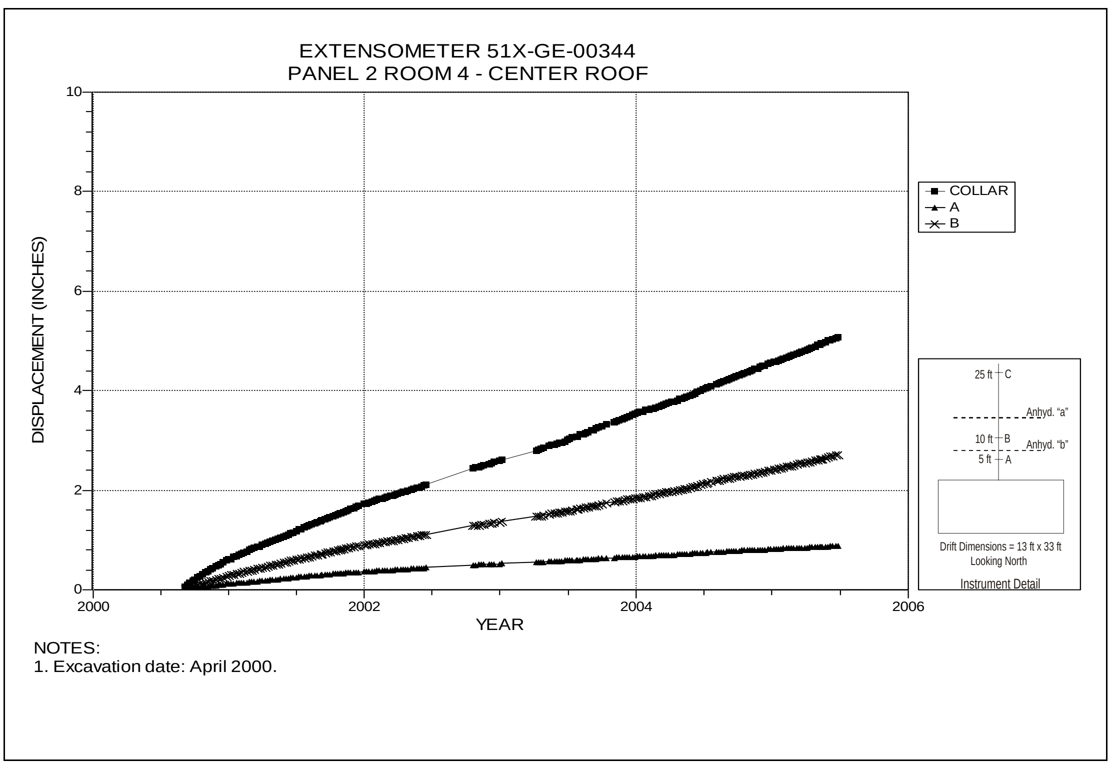
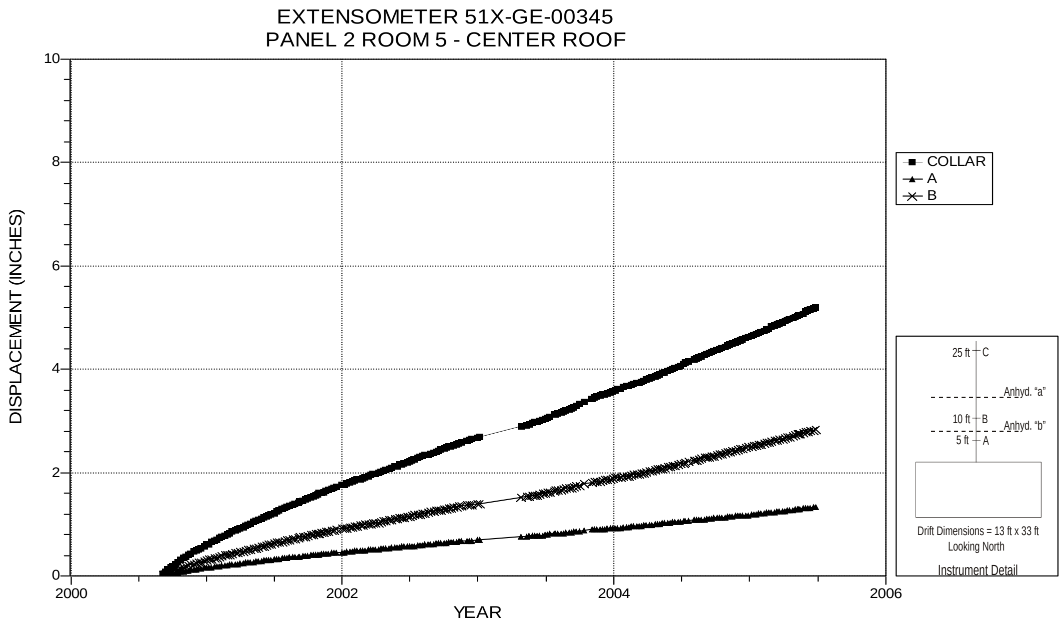
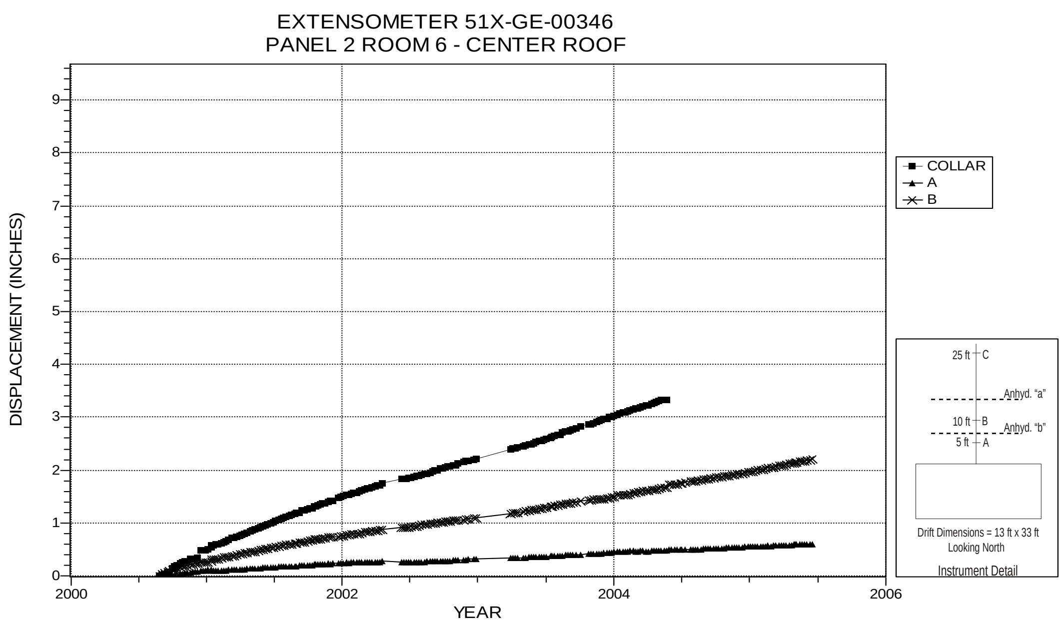


Figure 6-19 Extensometer 51X-GE-00344
Room 4, Panel 2 – Room Center – Roof



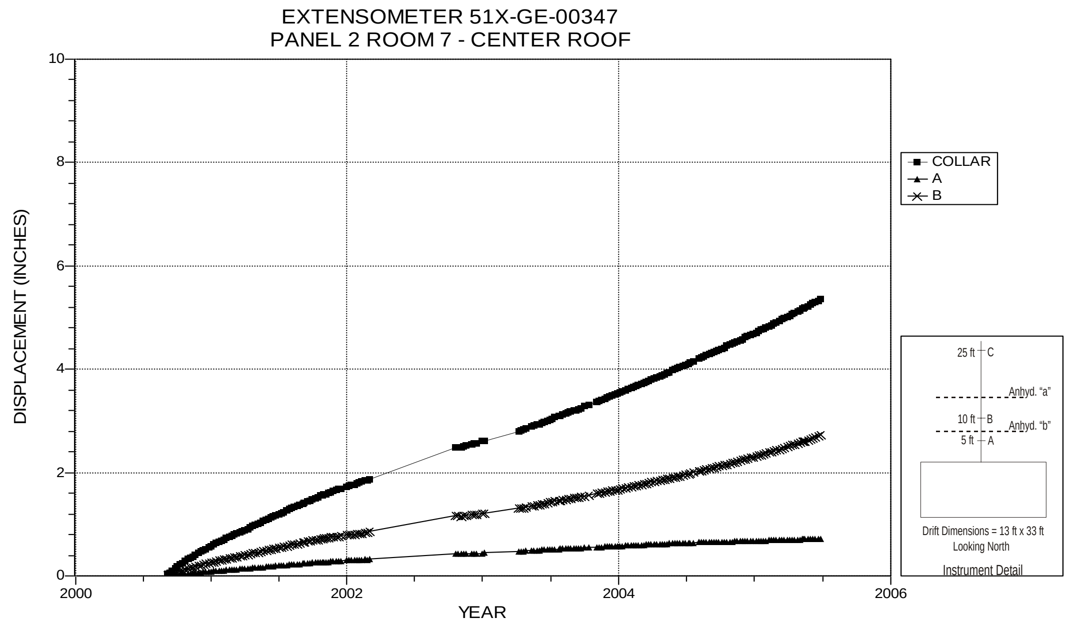
NOTES:
1. Excavation date: April 2000.

Figure 6-20 Extensometer 51X-GE-00345
Room 5, Panel 2 – Room Center – Roof



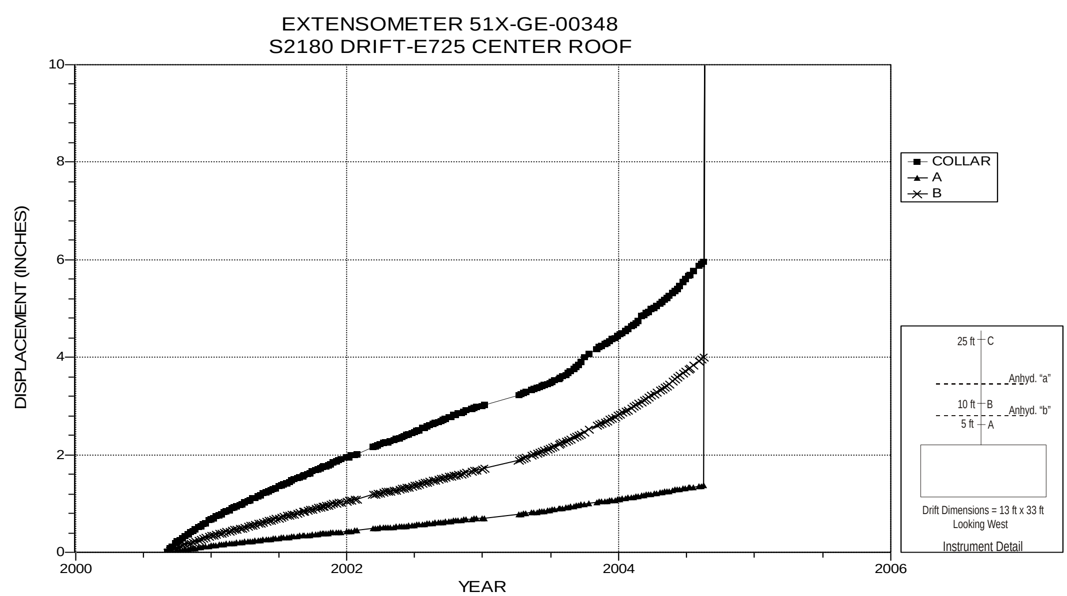
NOTES:
1. Excavation date: April 2000.
2. Anchor "C" has failed.

Figure 6-21 Extensometer 51X-GE-00346
Room 6, Panel 2 – Room Center – Roof



NOTES:
1. Excavation date: May 2000.

Figure 6-22 Extensometer 51X-GE-00347
Room 7, Panel 2 – Room Center – Roof



NOTES:
1. Excavation date: January 2000.

Figure 6-23 Extensometer 51X-GE-00348
S2180 Drift at E725 – Roof

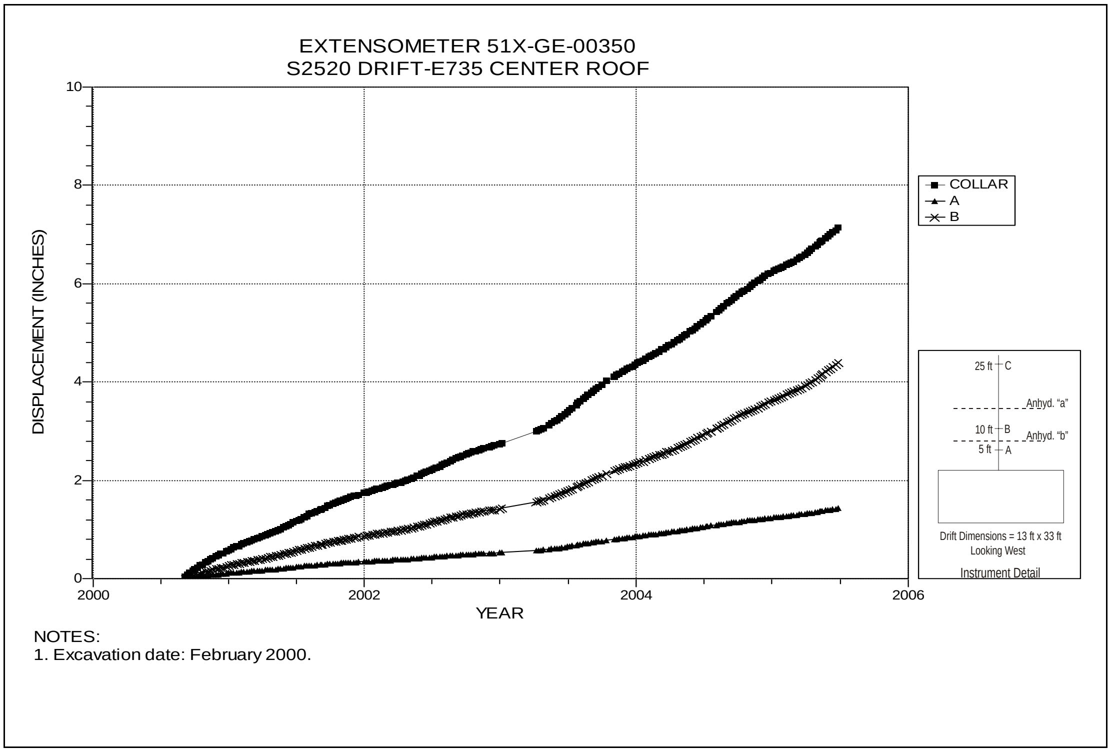


Figure 6-24 Extensometer 51X-GE-00350
S2520 Drift at E735 – Roof

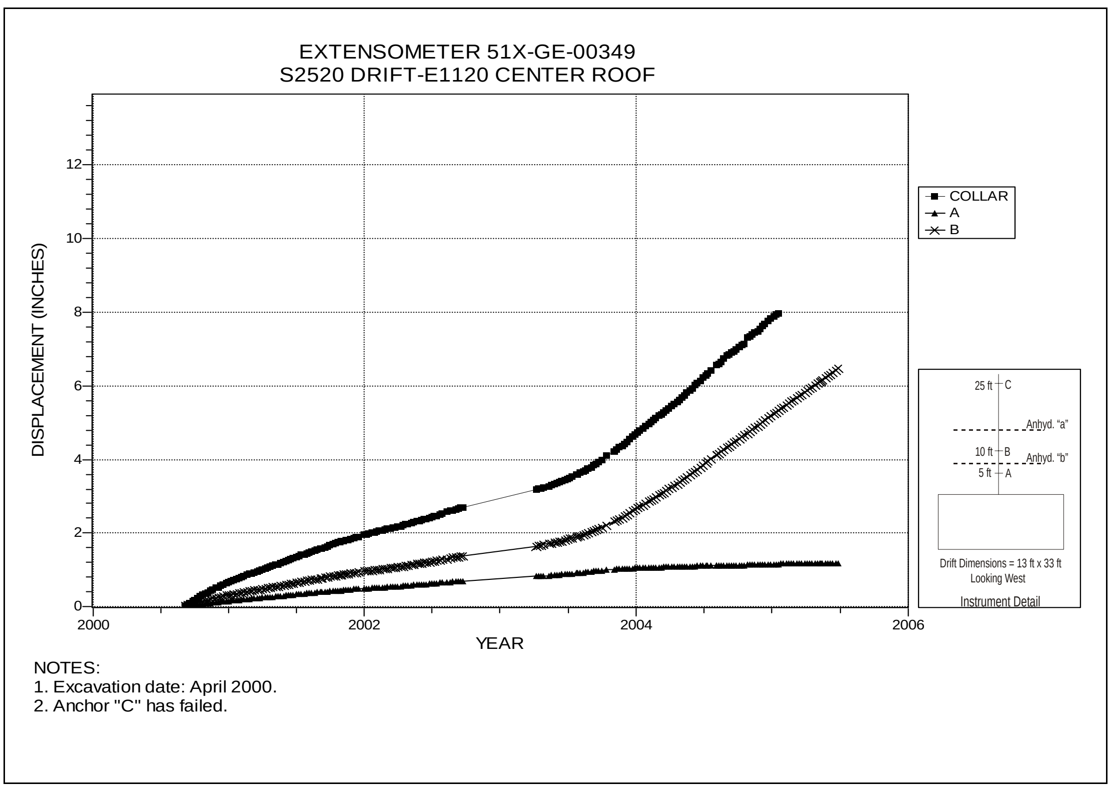


Figure 6-25 Extensometer 51X-GE-00349
S2520 Drift at E1120 – Roof

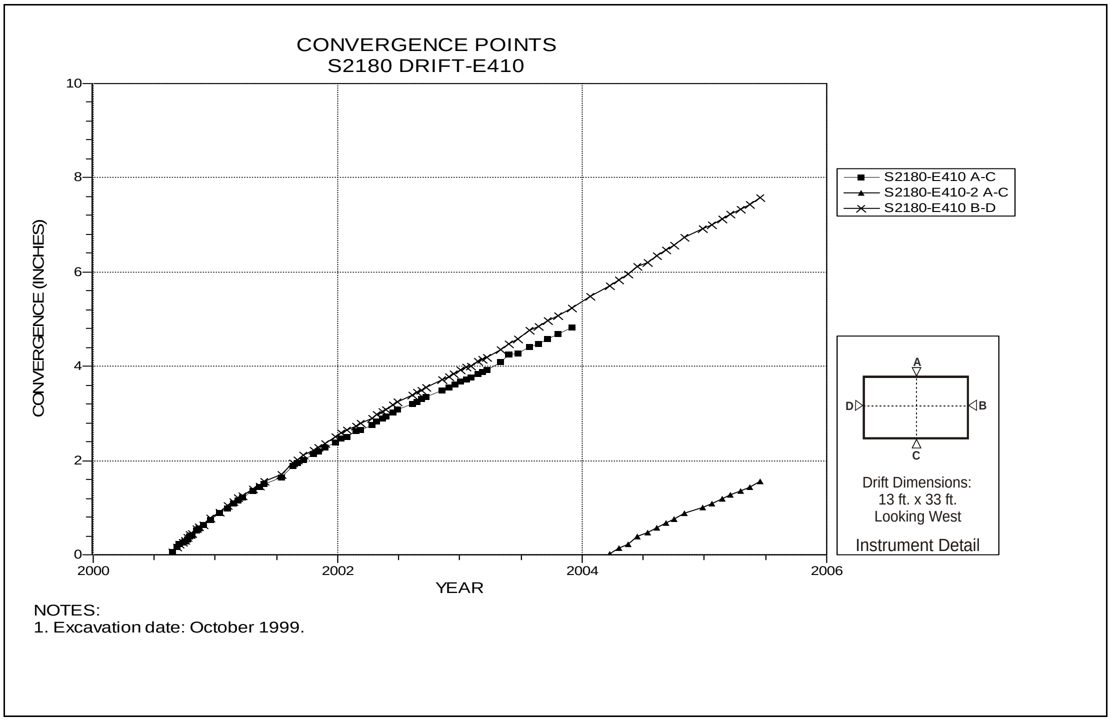


Figure 6-26 Convergence Point Array
S2180 Drift at E410 – All Chords

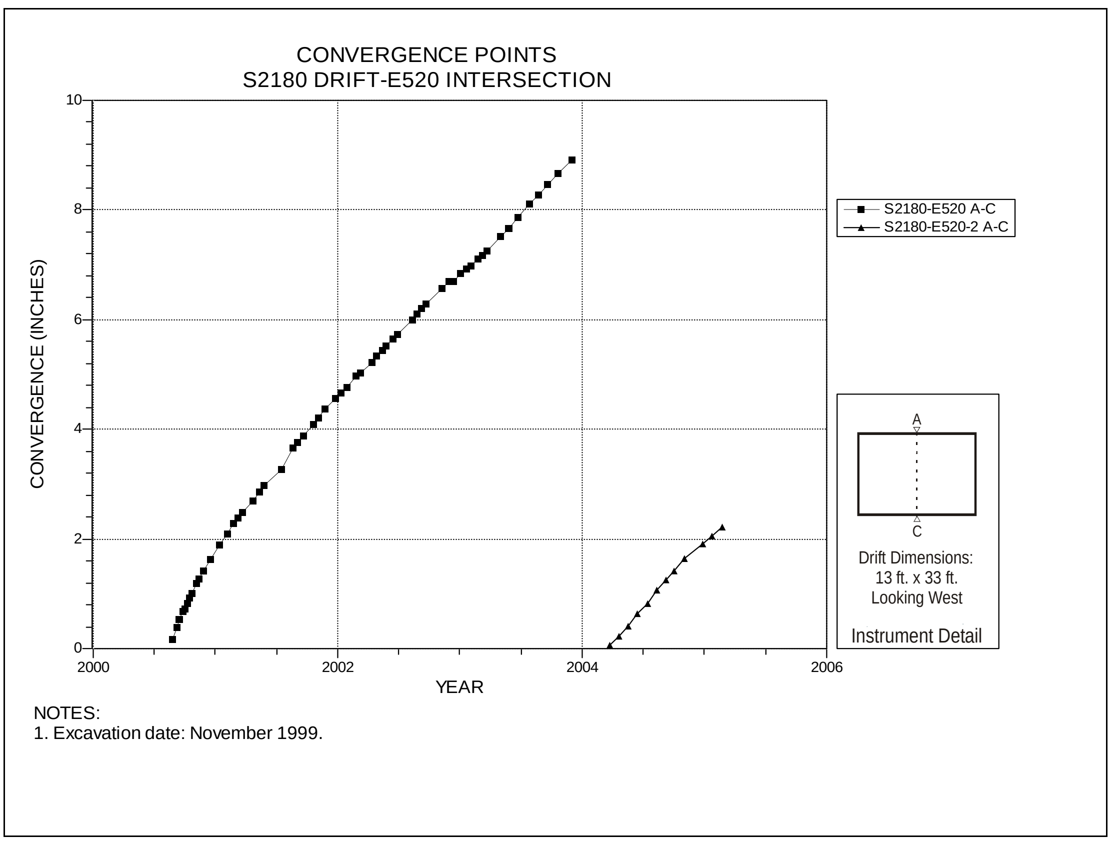


Figure 6-27 Convergence Point Array
S2180 Drift at E520 Drift Intersection (Room 1, Panel 2) – Roof to Floor

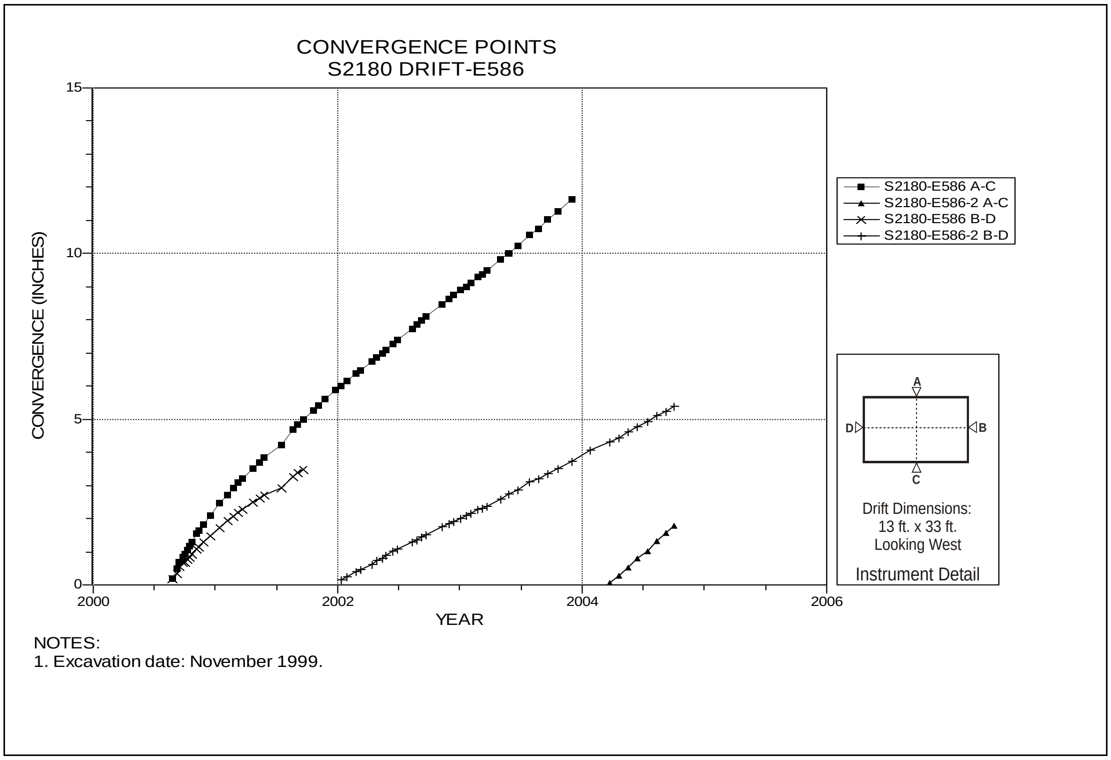


Figure 6-28 Convergence Point Array
S2180 Drift at E586 – All Chords

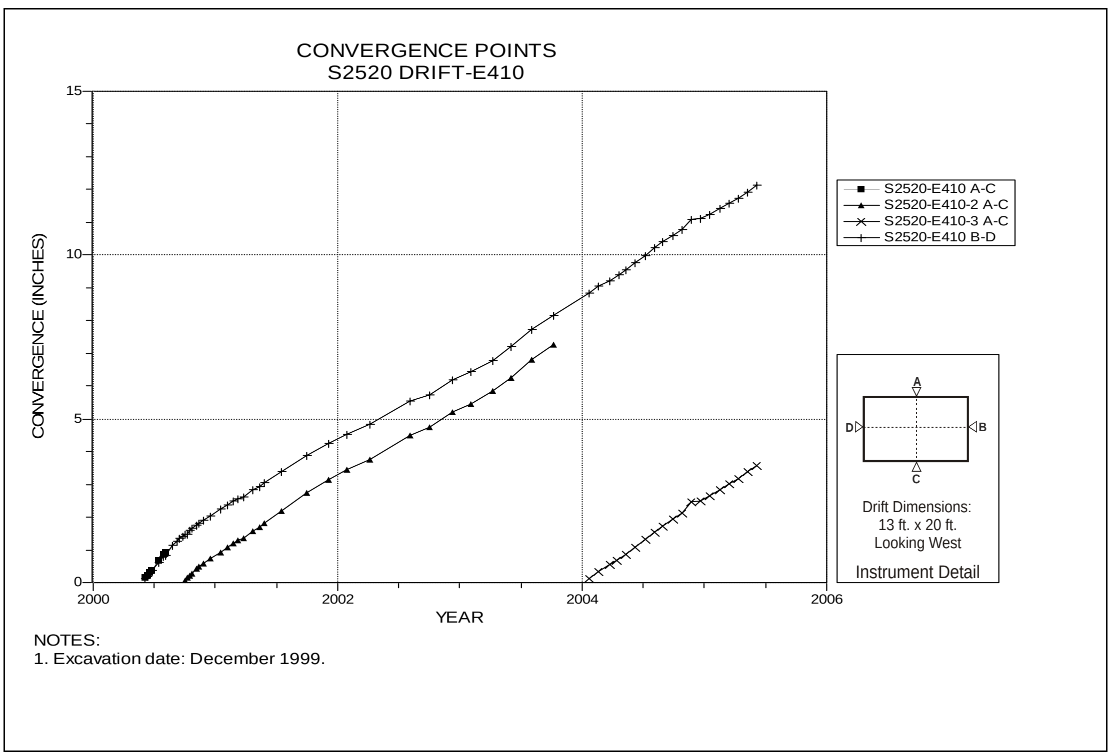
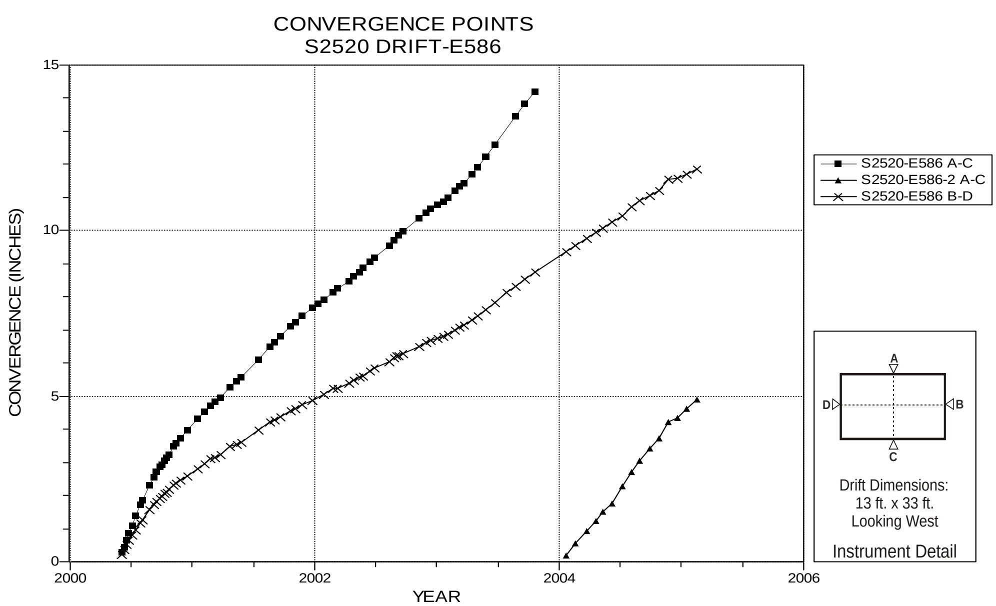


Figure 6-29 Convergence Point Array
S2520 Drift at E410 Drift – All Chords

NOTES:
1. Excavation date: December 2000.

Figure 6-30 Convergence Point Array
S2520 Drift at E520 Drift Intersection (Room 1, Panel 2) – Roof to Floor



NOTES:
1. Excavation date: January 2000.

Figure 6-31 Convergence Point Array
S2520 Drift at E586 – All Chords

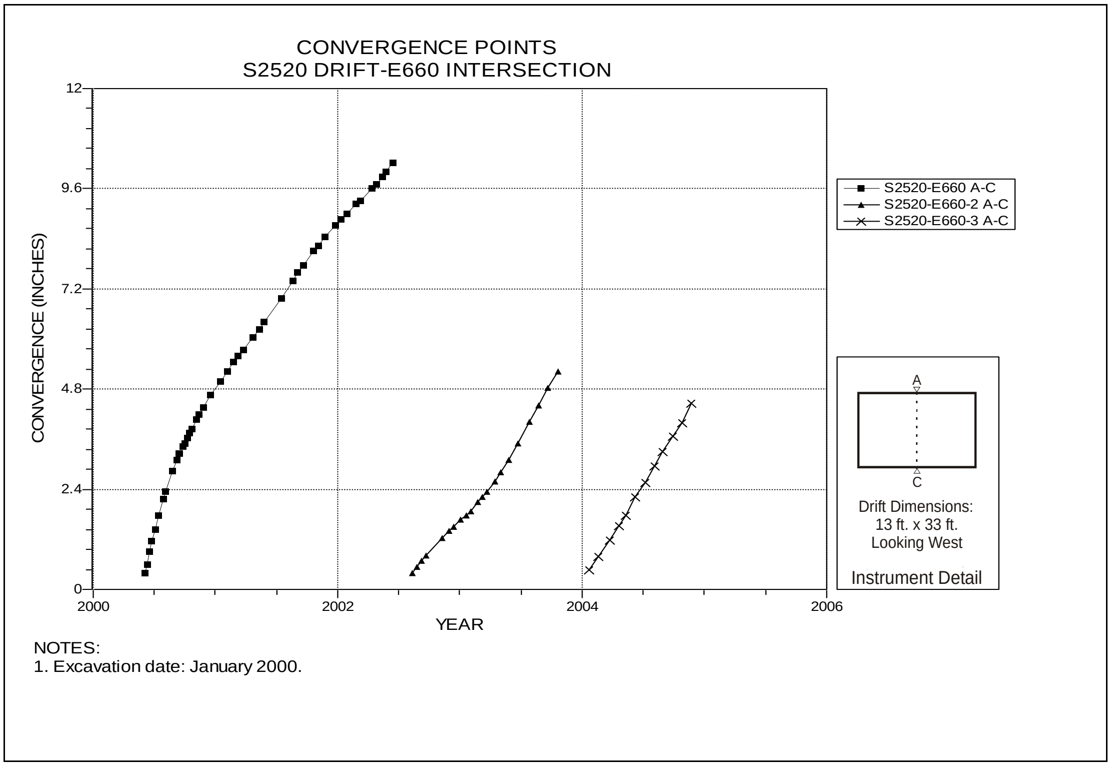


Figure 6-32 Convergence Point Array
S2520 Drift at E660 Drift Intersection (Room 2, Panel 2) – Roof to Floor

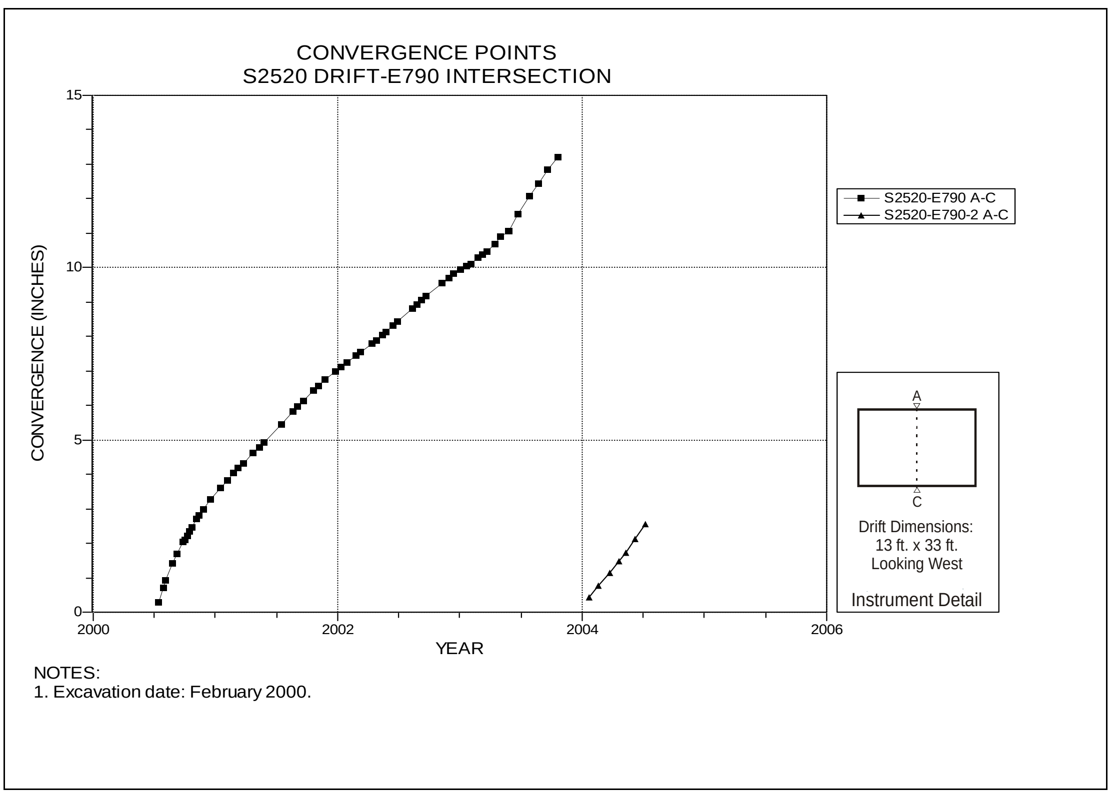


Figure 6-33 Convergence Point Array
S2520 Drift at E790 Drift Intersection (Room 3, Panel 2) – Roof to Floor

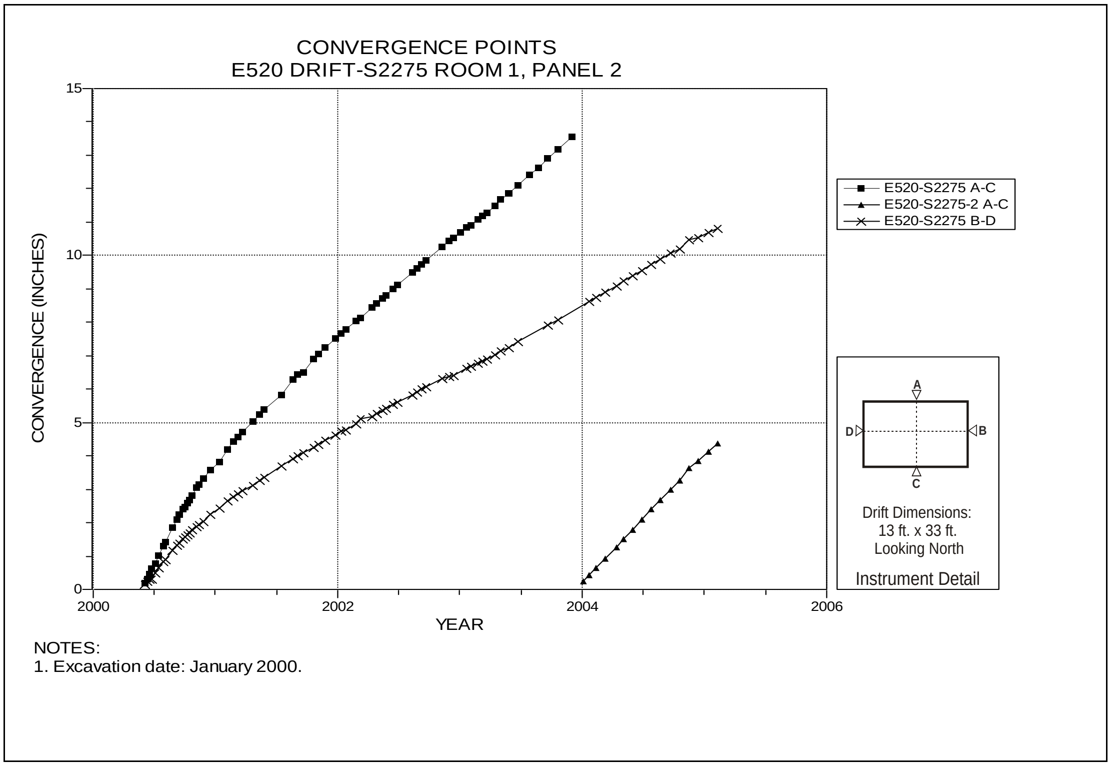


Figure 6-34 Convergence Point Array
Room 1, Panel 2 at S2275 – All Chords

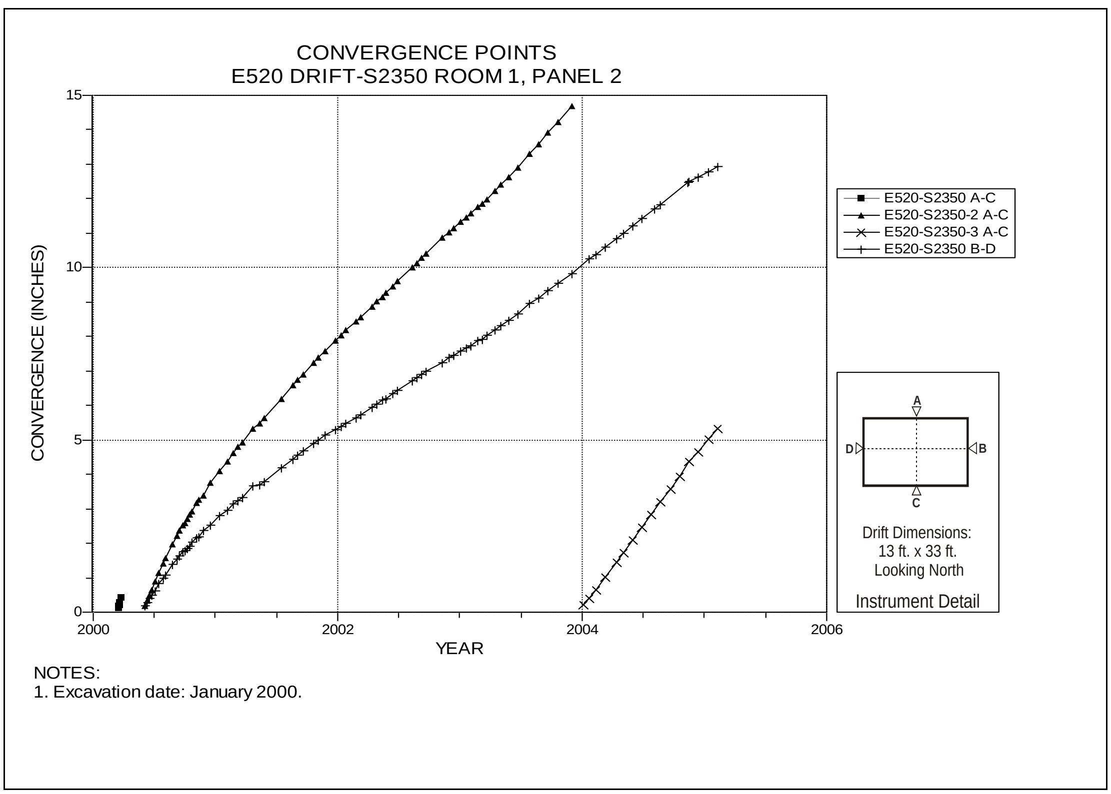


Figure 6-35 Convergence Point Array
Room 1, Panel 2 at S2350 – Room Center – All Chords

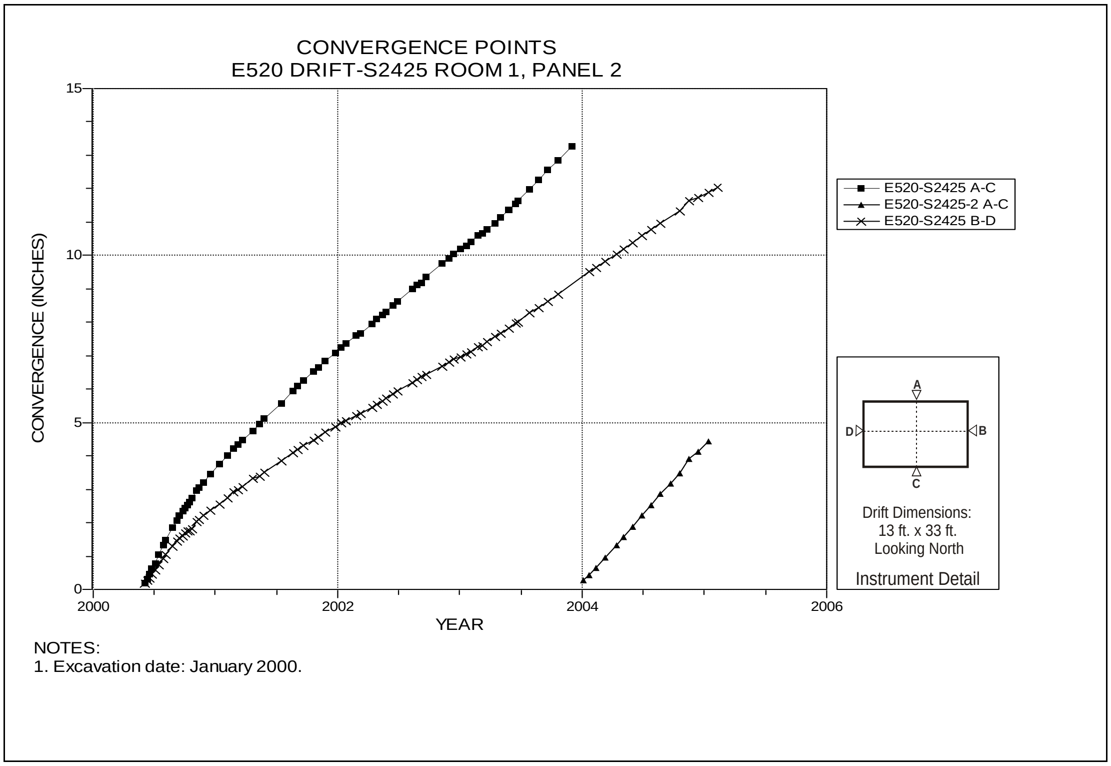


Figure 6-36 Convergence Point Array
Room 1, Panel 2 at S2425 – All Chords

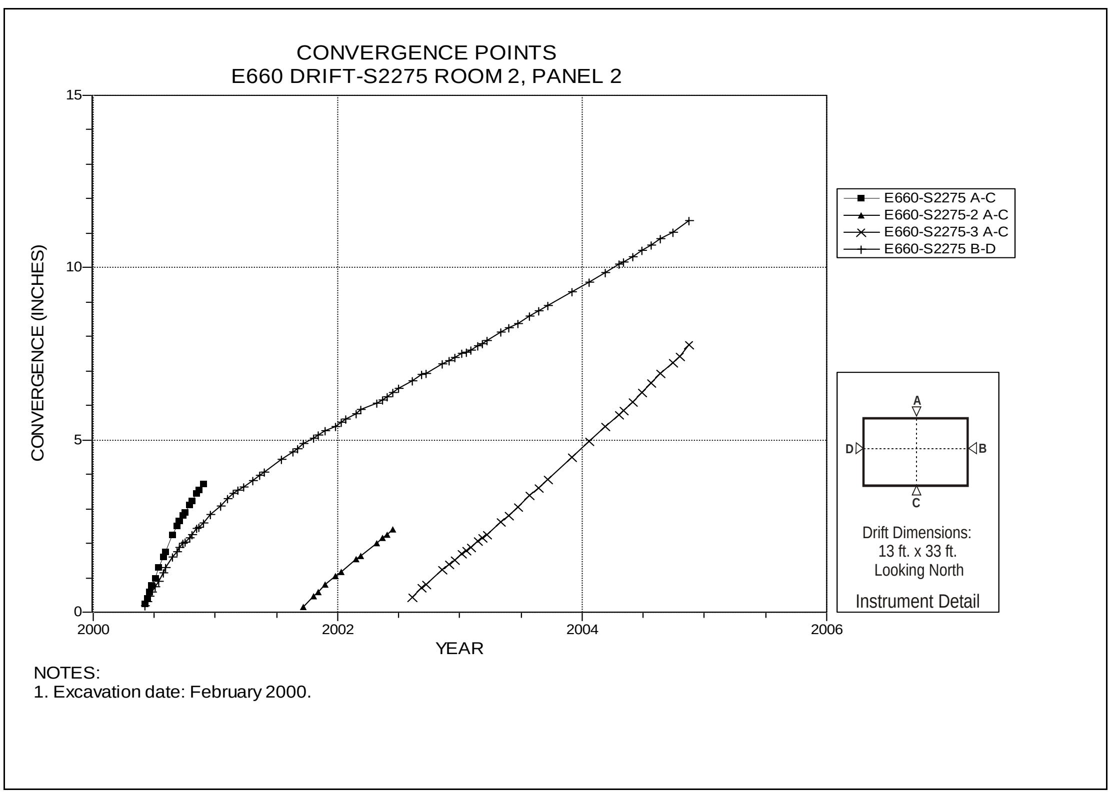


Figure 6-37 Convergence Point Array
Room 2, Panel 2 at S2275 – All Chords

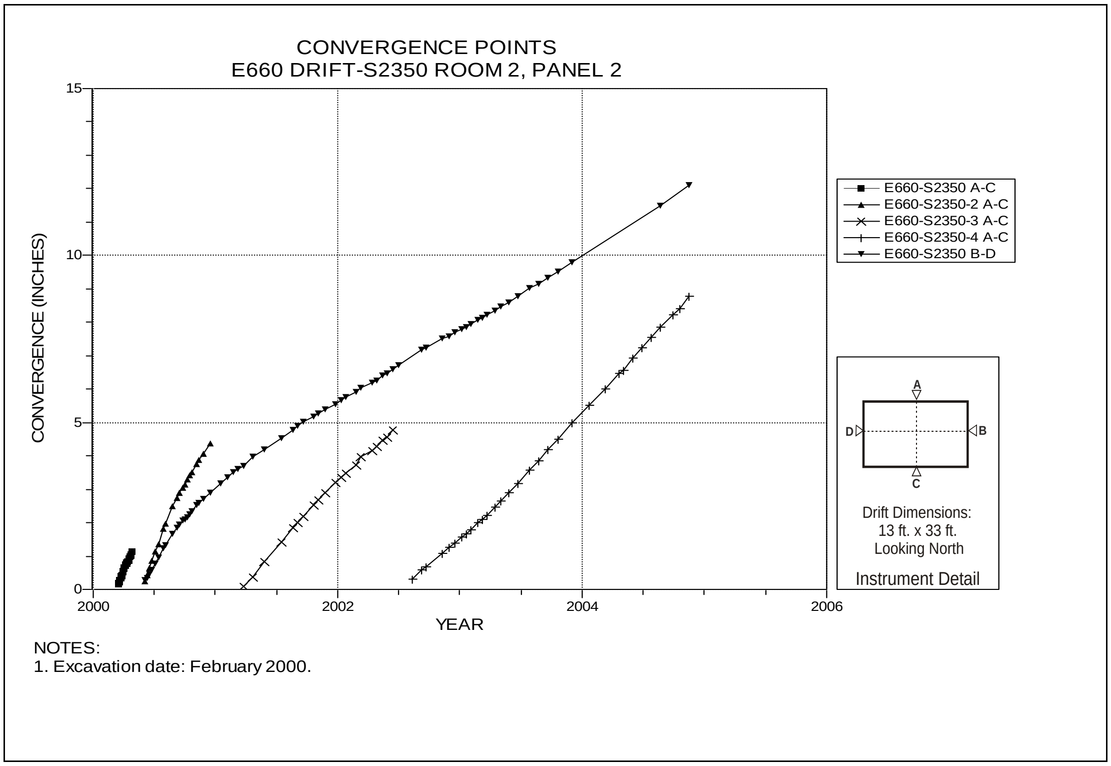


Figure 6-38 Convergence Point Array
Room 2, Panel 2 at S2350 – Room Center – All Chords

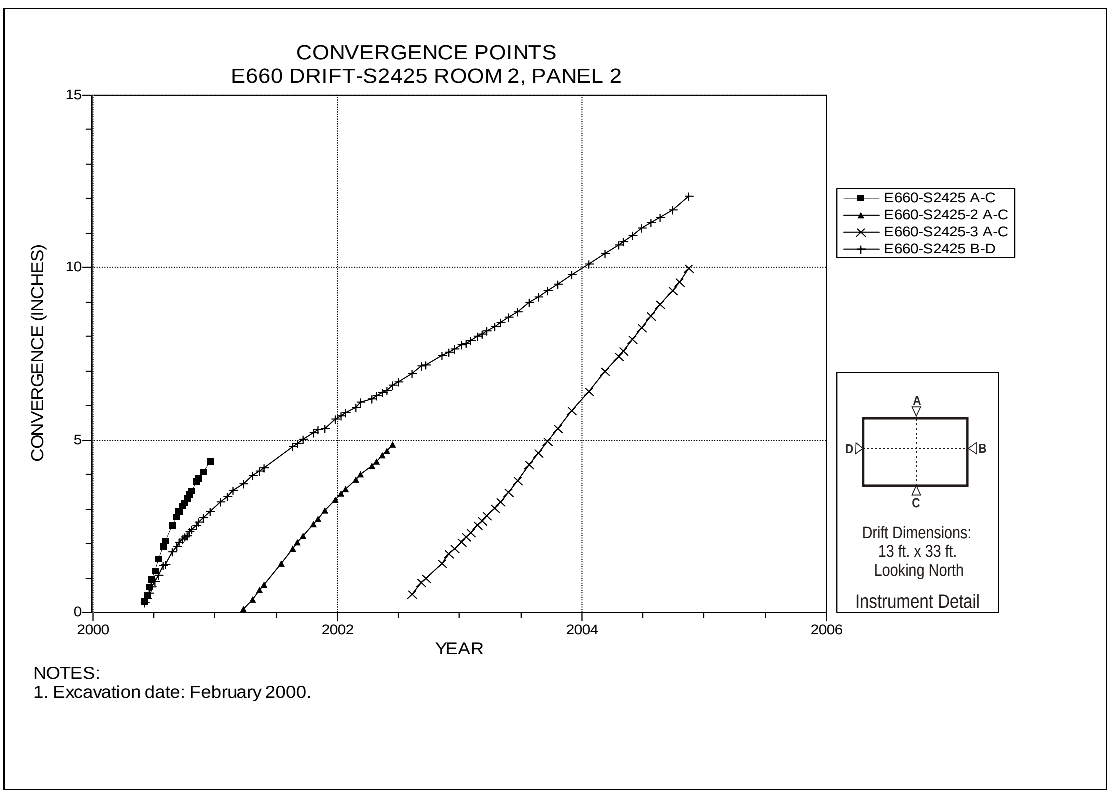


Figure 6-39 Convergence Point Array
Room 2, Panel 2 at S2425 – All Chords

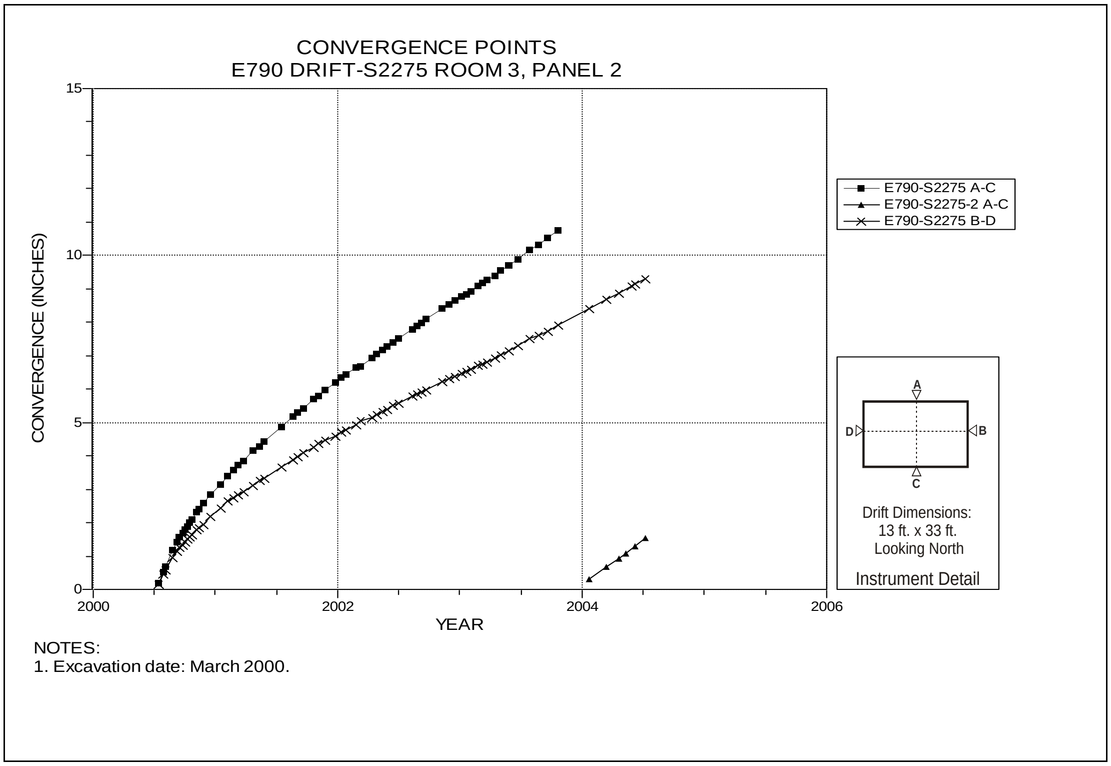


Figure 6-40 Convergence Point Array
Room 3, Panel 2 at S2275 – All Chords

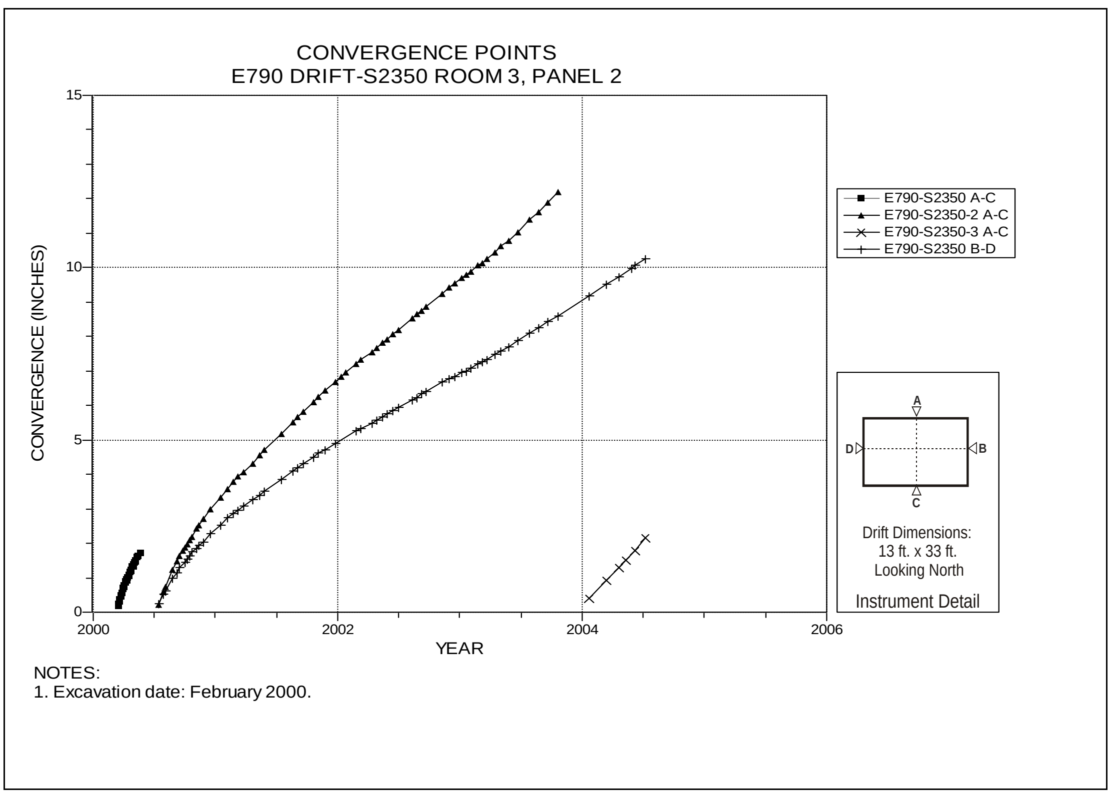


Figure 6-41 Convergence Point Array
Room 3, Panel 2 at S2350 – Room Center – All Chords

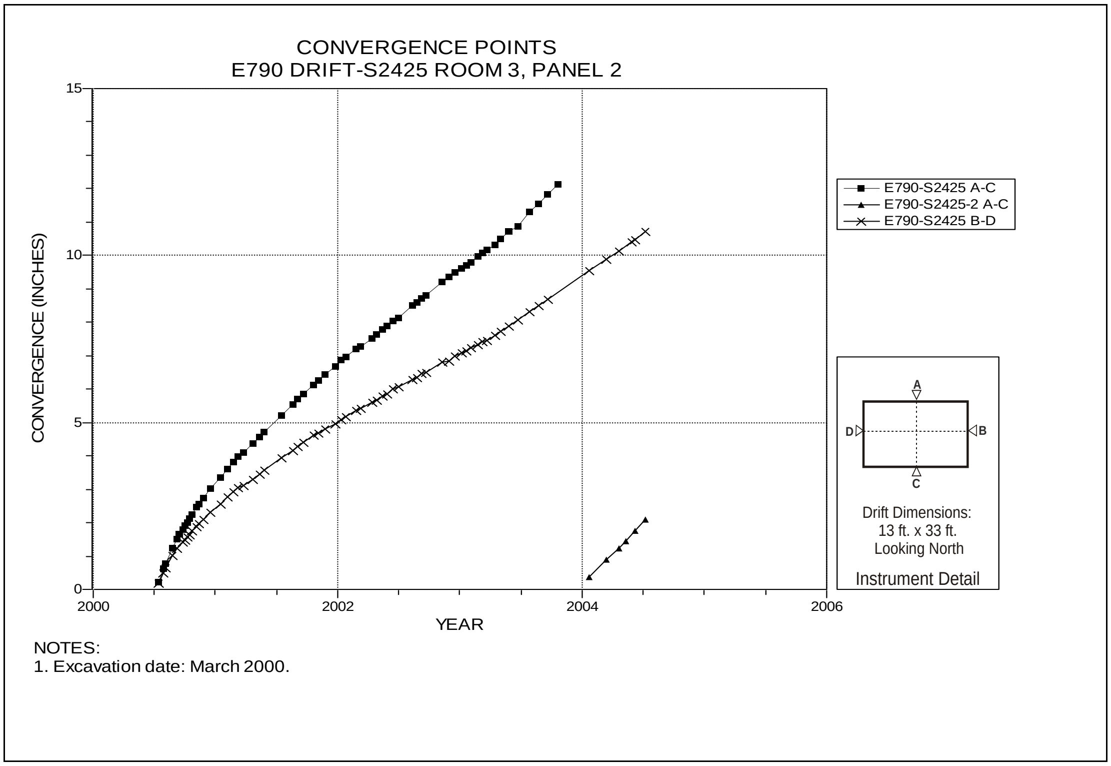


Figure 6-42 Convergence Point Array
Room 3, Panel 2 at S2425 – All Chords

Table 6-3
Panel 3 Data Analysis

EXTENSOMETERS

Field Tag	Location	Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
51X-GE-00354-2	PANEL 3 ROOM 1 CENTER ROOF	6-43	06/27/05	5.704	2.63	3.41	-23%	
51X-GE-00358	PANEL 3 ROOM 2 CENTER ROOF	6-44	06/27/05	3.461	2.34	2.32	1%	
51X-GE-00359	PANEL 3 ROOM 3 CENTER ROOF	6-45	06/27/05	7.463	5.37	4.26	26%	
51X-GE-00360	PANEL 3 ROOM 4 CENTER ROOF	6-46	06/27/05	3.339	2.11	2.71	-22%	
51X-GE-00362	PANEL 3 ROOM 5 CENTER ROOF	6-47	06/27/05	6.390	5.03	3.12	61%	
51X-GE-00363	PANEL 3 ROOM 6 CENTER ROOF	6-48	06/27/05	6.788	4.44	5.23	-15%	
51X-GE-00366	PANEL 3 ROOM 7 CENTER ROOF	6-49	06/27/05	2.182	1.49	2.12	-30%	
51X-GE-00370	S2750 DRIFT-E725 ROOF	6-50	06/27/05	2.758	3.07	N/A	N/A	New installation this period.
51X-GE-00371	S2750 DRIFT-E1115 ROOF	6-51	06/27/05	1.876	2.15	N/A	N/A	New installation this period.
51X-GE-00369	S3080 DRIFT-E725 ROOF	6-52	06/27/05	5.150	5.73	N/A	N/A	New installation this period.
51X-GE-00368	S3080 DRIFT-E1120 ROOF	6-53	06/27/05	2.625	2.82	N/A	N/A	New installation this period.

[A] NA Indicates insufficient data to compare annualized rates.

ROCKBOLT LOAD CELLS

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X-WG-00289	S2750 DRIFT-E950	6-54	02/09/04	06/20/05	19.9	Mechanical bolts, except where indicated otherwise.
51X-WG-00290	S2750 DRIFT-E950	6-54	02/09/04	06/20/05	9.1	
51X-WG-00291	S2750 DRIFT-E950	6-54	02/09/04	06/20/05	16.3	
51X-WG-00297	S2750 DRIFT-E958	6-54	06/22/04	06/20/05	41.8	Threaded bar.
51X-WG-00299	S2750 DRIFT-E980	6-54	02/09/04	06/20/05	18.0	
51X-WG-00298	S2750 DRIFT-E1020	6-54	02/09/04	06/20/05	19.5	
51X-WG-00292	S2750 DRIFT-E1050	6-54	02/09/04	06/20/05	13.3	
51X-WG-00300	S3080 DRIFT-E580	6-55	07/22/04	06/22/05	39.6	Threaded bar.
51X-WG-00302	S3080 DRIFT-E727	6-56	05/16/05	06/29/05	30.5	Threaded bar.

Table 6-3 (Continued)
Panel 3 Data Analysis

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent	Comments
			Date	Inches					
S2750-E410 A-C	S2750 DRIFT-E410	6-57	06/01/05	4.684	4.684	2.10	2.77	-24%	
S2750-E410 B-D	S2750 DRIFT-E410	6-57	06/01/05	4.081	4.081	1.77	2.51	-29%	
S2750-E520-2 A-C	S2750 DRIFT-E520	6-58	06/20/05	3.973	6.831	3.90	4.80	-19%	
S2750-E586-2 A-C	S2750 DRIFT-E586	6-59	06/20/05	7.594	9.724	7.54	6.88	10%	
S2750-E586 B-D	S2750 DRIFT-E586	6-59	06/20/05	2.736	2.736	2.78	N/A	N/A	Installed this period.
S2750-E660-2 A-C	S2750 DRIFT-E660	6-60	06/20/05	4.833	6.525	4.81	5.57	-14%	
S2750-E725 A-C	S2750 DRIFT-E725	6-61	06/20/05	5.510	5.510	5.77	N/A	N/A	Installed this period.
S2750-E725 B-D	S2750 DRIFT-E725	6-61	06/20/05	2.986	2.986	3.08	N/A	N/A	Installed this period.
S2750-E790-2 A-C	S2750 DRIFT-E790	6-62	06/20/05	6.629	9.249	6.59	7.54	-13%	
S2750-E855 A-C	S2750 DRIFT-E855	6-63	06/20/05	6.385	6.385	6.70	N/A	N/A	Installed this period.
S2750-E855 B-D	S2750 DRIFT-E855	6-63	06/20/05	3.048	3.048	3.13	N/A	N/A	Installed this period.
S2750-E920-2 A-C	S2750 DRIFT-E920	6-64	06/20/05	6.373	9.539	6.35	7.61	-17%	
S2750-E986-2 A-C	S2750 DRIFT-E986	6-65	06/20/05	5.122	8.387	5.09	7.50	-32%	
S2750-E1050-2 A-C	S2750 DRIFT-E1050	6-66	06/20/05	4.797	8.446	4.70	7.27	-35%	
S2750-E1115 A-C	S2750 DRIFT-E1115	6-67	06/20/05	5.015	5.015	5.24	N/A	N/A	Installed this period.
S2750-E1115 B-D	S2750 DRIFT-E1115	6-67	06/20/05	3.075	3.075	3.18	N/A	N/A	Installed this period.
S2750-E1190-3 A-C	S2750 DRIFT-E1190	6-68	06/20/05	4.201	6.283	4.10	6.31	-35%	
S2750-E1255-2 A-C	S2750 DRIFT-E1255	6-69	04/26/05	3.598	6.016	4.16	6.30	-34%	
S2750-E1320-2 A-C	S2750 DRIFT-E1320	6-70	04/26/05	2.666	4.492	3.06	4.73	-35%	
S3080-E410-2 A-C	S3080 DRIFT-E410	6-71	06/29/05	2.395	4.933	2.37	2.68	-12%	
S3080-E410 B-D	S3080 DRIFT-E410	6-71	06/29/05	4.861	4.861	2.25	2.56	-12%	
S3080-E520-2 A-C	S3080 DRIFT-E520	6-72	06/22/05	4.266	7.520	4.24	4.36	-3%	
S3080-E586-2 A-C	S3080 DRIFT-E586	6-73	06/22/05	5.551	8.936	5.03	8.75	-43%	
S3080-E586 B-D	S3080 DRIFT-E586	6-73	06/22/05	3.012	3.012	2.88	2.98	-3%	
S3080-E660-2 A-C	S3080 DRIFT-660	6-74	06/22/05	5.977	5.977	5.86	6.33	-7%	
S3080-E725 A-C	S3080 DRIFT-E725	6-75	06/22/05	8.066	8.066	8.25	N/A	N/A	Installed this period.
S3080-E725 B-D	S3080 DRIFT-E725	6-75	06/22/05	3.263	3.263	3.23	N/A	N/A	Installed this period.
S3080-E790-2 A-C	S3080 DRIFT-E790	6-76	06/22/05	6.270	9.152	6.08	6.21	-2%	
S3080-E857-2 A-C	S3080 DRIFT-E857	6-77	06/22/05	4.572	7.945	4.63	6.10	-24%	
S3080-E857 B-D	S3080 DRIFT-E857	6-77	06/22/05	3.175	3.175	3.15	N/A	N/A	Installed this period.

Table 6-3 (Continued)
Panel 3 Data Analysis

CONVERGENCE POINTS (Continued)

Field Tag	Location	Figure Number	Last Reading 2004 to 2005 Date	Last Reading 2004 to 2005 Inches	Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
S3080-E920-2 A-C	S3080 DRIFT-E920	6-78	06/22/05	7.242	11.88	7.01	9.49	-26%	
S3080-E986-2 A-C	S3080 DRIFT-E986	6-79	06/22/05	6.165	7.988	6.16	7.65	-19%	
S3080-E986 B-D	S3080 DRIFT-E986	6-79	06/22/05	3.267	3.267	3.24	N/A	N/A	
S3080-E1050-2 A-C	S3080 DRIFT-E1050	6-80	06/22/05	6.739	8.845	6.44	7.93	-19%	
S3080-E1120 A-C	S3080 DRIFT-E1120	6-81	06/22/05	5.955	5.955	5.98	N/A	N/A	Installed this period
S3080-E1120 B-D	S3080 DRIFT-E1120	6-81	06/22/05	3.015	3.015	2.99	N/A	N/A	Installed last period.
S3080-E1190-2 A-C	S3080 DRIFT-E1190	6-82	06/22/05	6.435	8.798	6.48	7.25	-11%	
S3080-E1255-2 A-C	S3080 DRIFT-E1255	6-83	06/22/05	4.388	7.41	4.19	8.08	-48%	
S3080-E1255 B-D	S3080 DRIFT-E1255	6-83	06/22/05	4.791	4.791	2.70	5.14	-47%	
S3080-E1320-2 A-C	S3080 DRIFT-E1320	6-84	06/22/05	3.273	5.037	3.00	4.57	-34%	
E520-S2833-2 A-C	E520 DRIFT-S2833	6-85	06/24/05	4.16	9.117	4.07	5.28	-23%	
E520-S2833 B-D	E520 DRIFT-S2833	6-85	06/24/05	6.953	6.953	3.05	3.92	-22%	
E520-S2916-2 A-C	E520 DRIFT-S2916	6-86	06/24/05	5.401	12.08	5.14	7.10	-28%	
E520-S2916 B-D	E520 DRIFT-S2916	6-86	04/27/05	6.262	6.262	2.86	3.86	-26%	
E520-S2998-2 A-C	E520 DRIFT-S2998	6-87	06/24/05	4.832	11.95	4.75	7.42	-36%	
E520-S2998 B-D	E520 DRIFT-S2998	6-87	06/24/05	3.561	3.561	2.75	3.76	-27%	
E660-S2833 B-D	E660 DRIFT-S2833	6-88	06/24/05	0.172	0.172	N/A	N/A	N/A	Installed this period.
E660-S2833-2 A-C	E660 DRIFT-S2833	6-88	06/24/05	7.12	7.12	5.82	6.62	-12%	
E660-S2916-2 A-C	E660 DRIFT-S2916	6-89	06/24/05	5.788	9.084	4.67	5.74	-19%	
E660-S2916 B-D	E660 DRIFT-S2916	6-89	06/24/05	3.724	3.724	2.81	4.09	-31%	
E660-S2998-2 A-C	E660 DRIFT-S2998	6-90	06/24/05	7.465	10.97	5.93	6.70	-11%	
E660-S2998 B-D	E660 DRIFT-S2998	6-90	06/24/05	3.826	3.826	2.87	4.60	-38%	
E790-S2833-2 A-C	E790 DRIFT-S2833	6-91	06/24/05	6.132	10.49	4.82	7.15	-33%	
E790-S2833 B-D	E790 DRIFT-S2833	6-91	06/24/05	4.05	4.05	2.93	5.24	-44%	
E790-S2916-2 A-E	E790 DRIFT-S2916	6-92	06/24/05	8.87	13.9	7.21	8.12	-11%	
E790-S2916 C-G	E790 DRIFT-S2916	6-92	06/24/05	5.515	5.515	3.10	8.25	-62%	
E790-S2998-2 A-C	E790 DRIFT-S2998	6-93	06/24/05	5.525	8.934	4.29	6.42	-33%	
E790-S2998 B-D	E790 DRIFT-S2998	6-93	01/11/05	4.32	4.32	3.33	8.96	-63%	
E920-S2833-2 A-C	E920 DRIFT-S2833	6-94	06/24/05	5.006	9.613	3.80	7.53	-50%	
E920-S2833 B-D	E920 DRIFT-S2833	6-94	06/24/05	4.009	4.009	2.83	5.78	-51%	

[A] NA Indicates insufficient data to compare annualized rates.

Table 6-3 (Continued)
Panel 3 Data Analysis

CONVERGENCE POINTS Continued)

Field Tag	Location	Figure Number	Last Reading 2003 to 2004		Cumulative Displacement Inches	Closure Rate 2003 to 2004 in/year	Closure Rate 2002 to 2003 in/year	Rate Change Percent	Comments
			Date	Inches					
E920-S2916-2 A-C	E920 DRIFT-S2916	6-95	06/24/05	6.066	10.91	4.73	8.05	-41%	
E920-S2916 B-D	E920 DRIFT-S2916	6-95	06/24/05	4.397	4.397	3.18	6.75	-53%	
E920-S2998-2 A-C	E920 DRIFT-S2998	6-96	06/24/05	5.649	10.08	4.32	7.55	-43%	
E920-S2998 B-D	E920 DRIFT-S2998	6-96	06/24/05	4.235	4.235	3.02	6.49	-53%	
E1050-S2833 A-C	E1050 DRIFT-S2833	6-97	05/27/05	4.004	4.004	4.15	4.63	-10%	
E1050-S2833 B-D	E1050 DRIFT-S2833	6-97	06/24/05	4.785	4.785	2.85	5.95	-52%	
E1050-S2916-2 A-C	E1050 DRIFT-S2916	6-98	06/24/05	6.96	8.898	6.79	6.62	3%	
E1050-S2916 B-D	E1050 DRIFT-S2916	6-98	06/24/05	5.052	5.052	3.02	6.38	-53%	
E1050-S2998 A-C	E1050 DRIFT-S2998	6-99	06/24/05	6.228	6.228	5.97	7.00	-15%	
E1050-S2998 B-D	E1050 DRIFT-S2998	6-99	06/24/05	5.291	5.291	3.05	7.04	-57%	
E1190-S2833 A-C	E1190 DRIFT-S2833	6-100	06/24/05	4.221	4.221	3.86	5.90	-35%	
E1190-S2833 B-D	E1190 DRIFT-S2833	6-100	06/24/05	5.091	5.091	2.85	5.63	-49%	
E1190-S2916-2 A-C	E1190 DRIFT-S2916	6-101	06/24/05	8.318	10.7	7.83	9.23	-15%	
E1190-S2916 B-D	E1190 DRIFT-S2916	6-101	05/27/05	5.056	5.056	3.00	5.74	-48%	
E1190-S2998 A-C	E1190 DRIFT-S2998	6-102	06/24/05	6.42	6.42	6.01	7.92	-24%	
E1190-S2998 B-D	E1190 DRIFT-S2998	6-102	06/24/05	5.366	5.366	2.93	6.09	-52%	
E1320-S2833 A-C	E1320 DRIFT-S2833	6-103	04/26/05	3.844	3.844	4.15	6.52	-36%	
E1320-S2833 B-D	E1320 DRIFT-S2833	6-103	04/26/05	4.447	4.447	2.88	7.93	-64%	
E1320-S2916-2 A-C	E1320 DRIFT-S2916	6-104	05/27/05	4.132	6.34	4.07	5.71	-29%	
E1320-S2916 B-D	E1320 DRIFT-E2916	6-104	05/27/05	4.624	4.624	2.77	5.11	-46%	
E1320-S2998 A-C	E1320 DRIFT-S2998	6-105	05/27/05	4.296	4.296	4.28	5.93	-28%	
E1320-S2998 B-D	E1320 DRIFT-S2998	6-105	05/27/05	4.536	4.536	2.68	5.05	-47%	

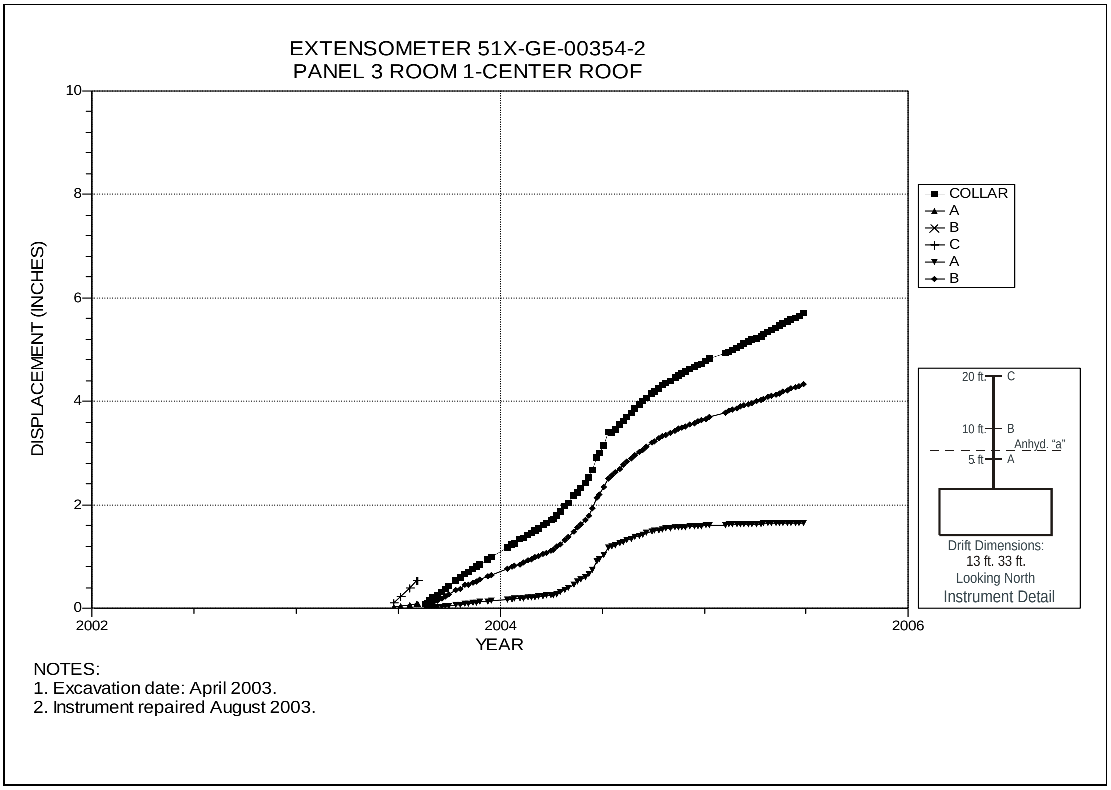


Figure 6-43 Extensometer 51X-GE-00354-2
Room 1, Panel 3 – Room Center – Roof

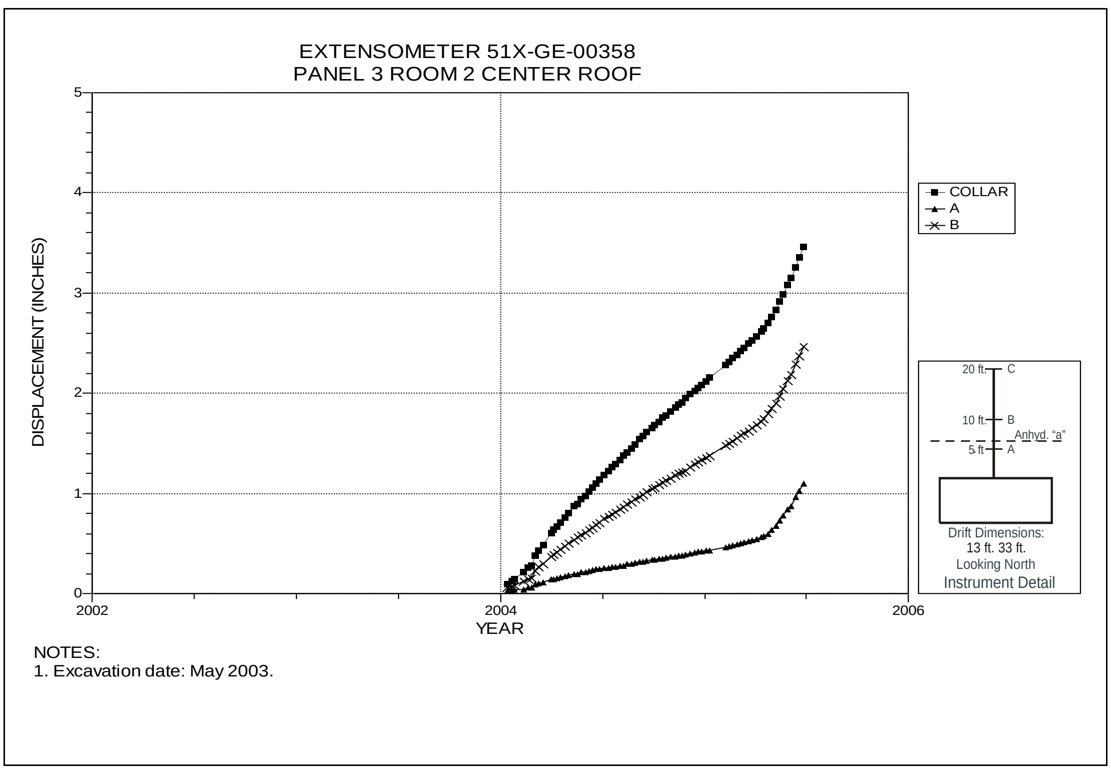


Figure 6-44 Extensometer 51X-GE-00358
Room 2, Panel 3 – Room Center – Roof

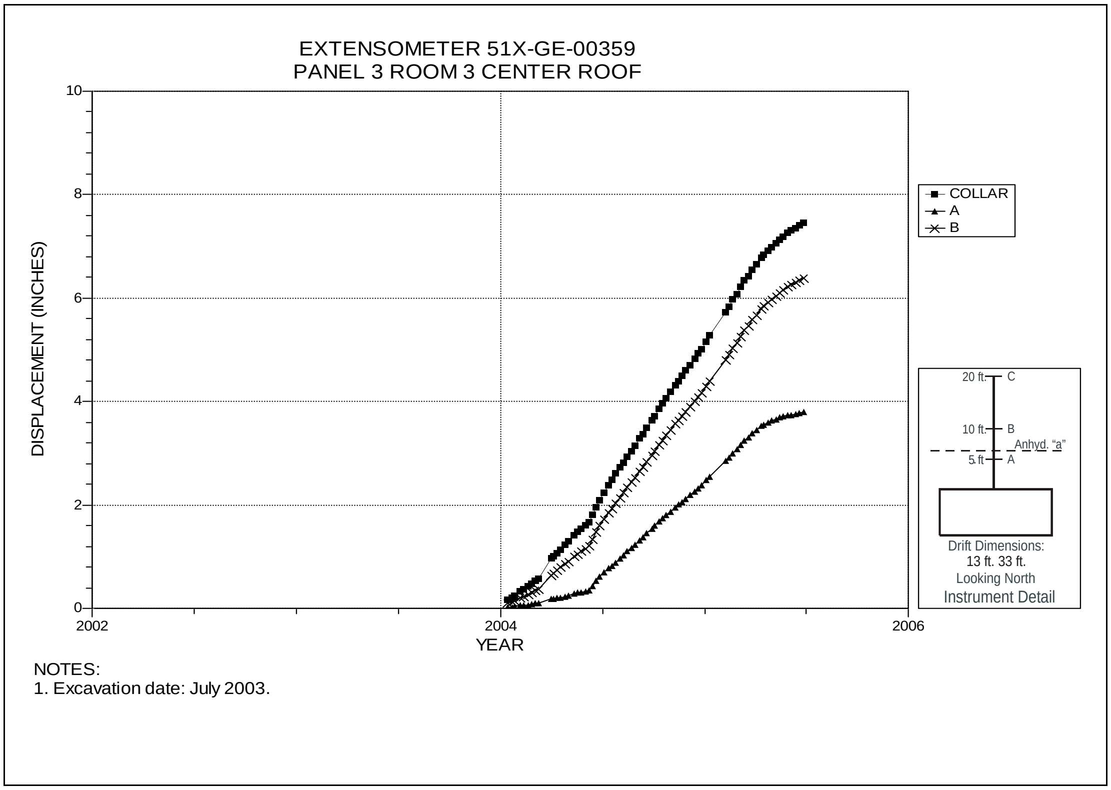


Figure 6-45 Extensometer 51X-GE-00359
Room 3, Panel 3 – Room Center – Roof

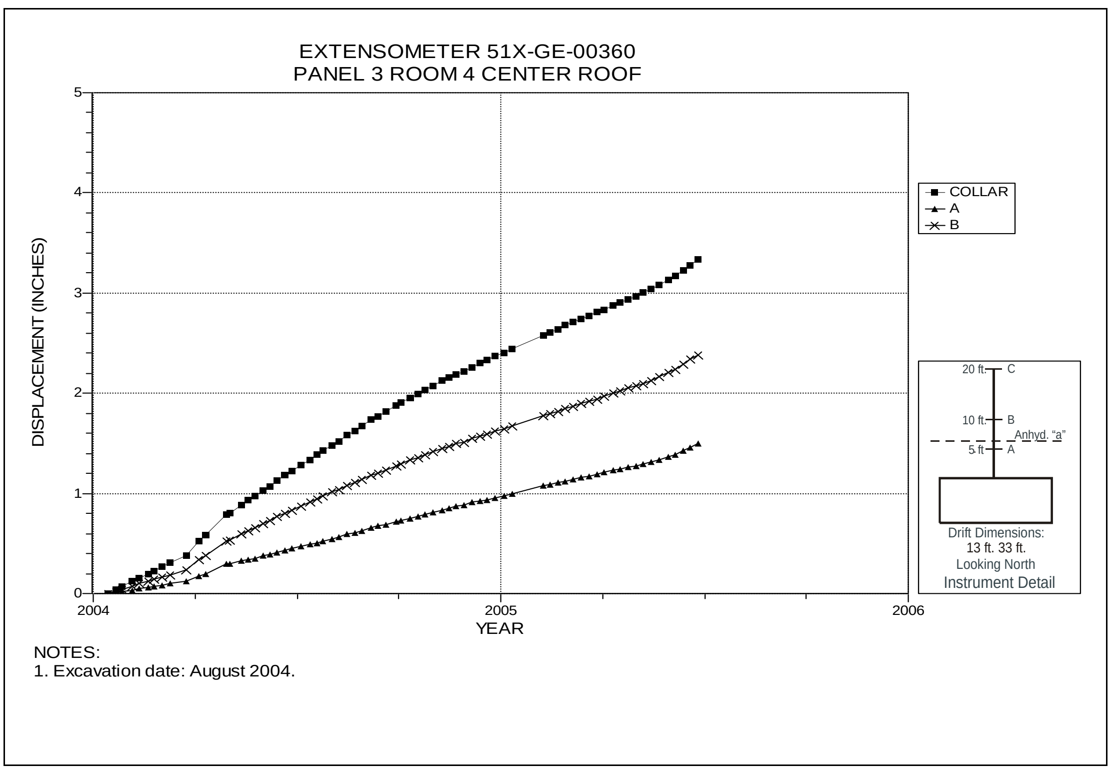
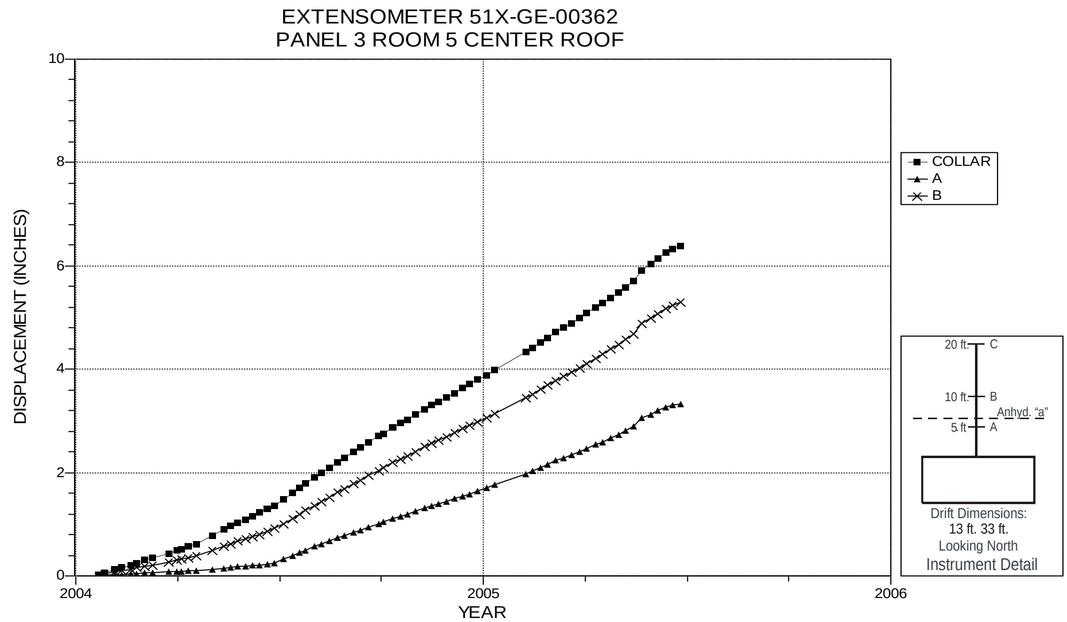
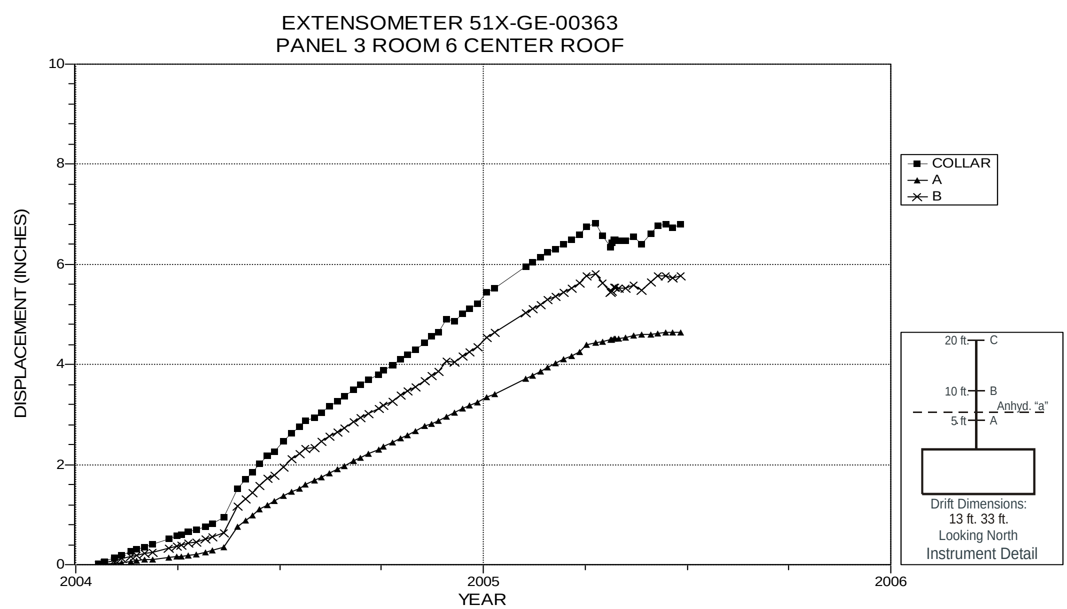


Figure 6-46 Extensometer 51X-GE-00360
Room 4, Panel 3 – Room Center – Roof



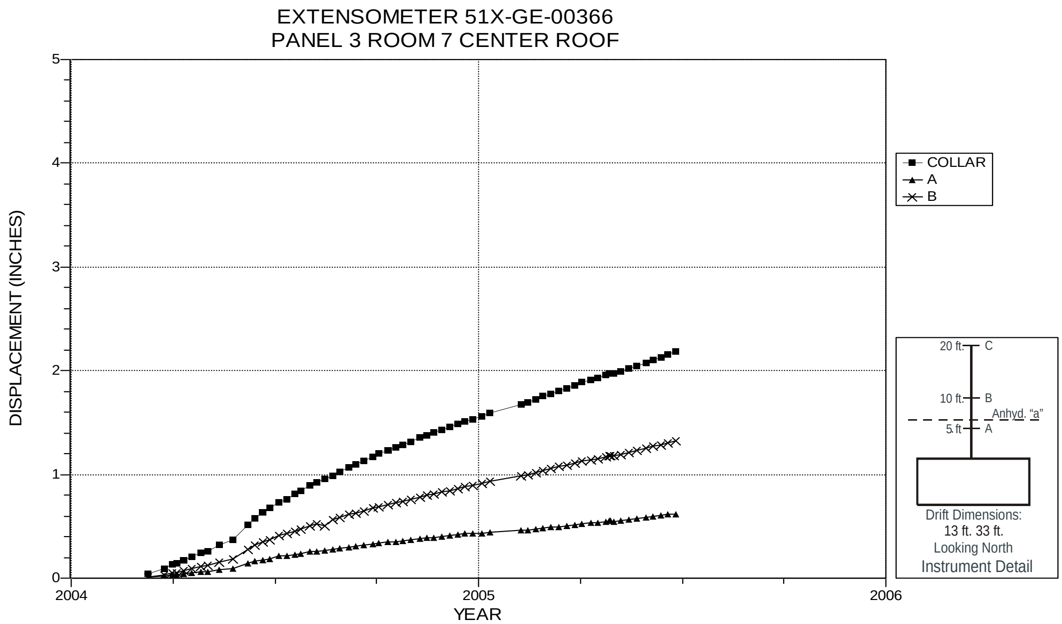
NOTES:
1. Excavation date: September 2004.

Figure 6-47 Extensometer 51X-GE-00362
Room 5, Panel 3 – Room Center – Roof



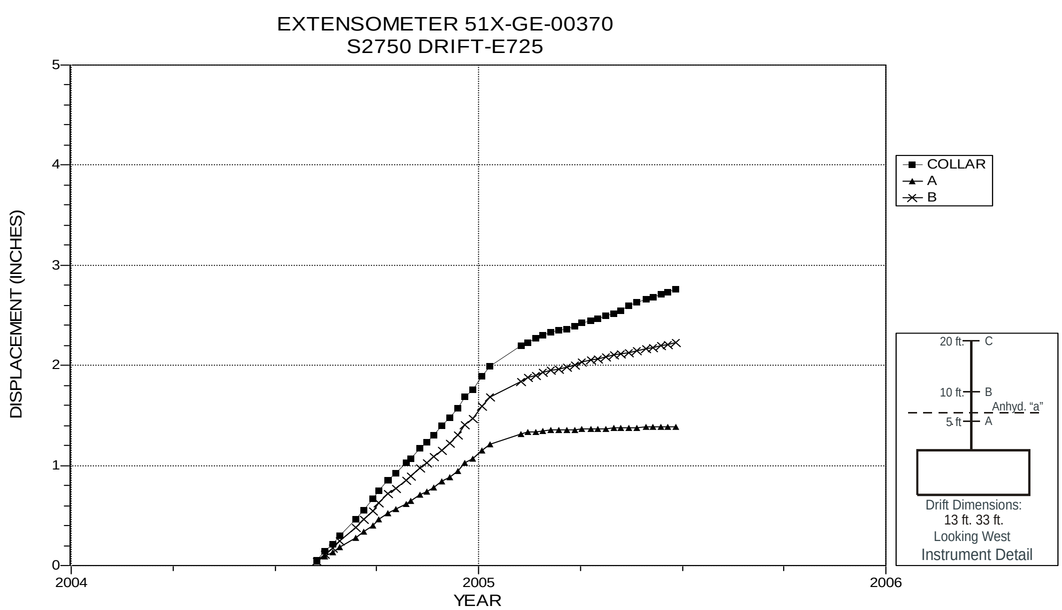
NOTES:
1. Excavation date: October 2004.
2. Anchors "B" and "C" are electrically noisy.

Figure 6-48 Extensometer 51X-GE-00363
Room 6, Panel 3 – Room Center – Roof



NOTES:
1. Excavation date: November 2004.

Figure 6-49 Extensometer 51X-GE-00366
Room 7, Panel 3 – Room Center – Roof



NOTES:
1. Excavation date: May 2003.

Figure 6-50 Extensometer 51X-GE-00370
S2750 Drift at E725 – Roof

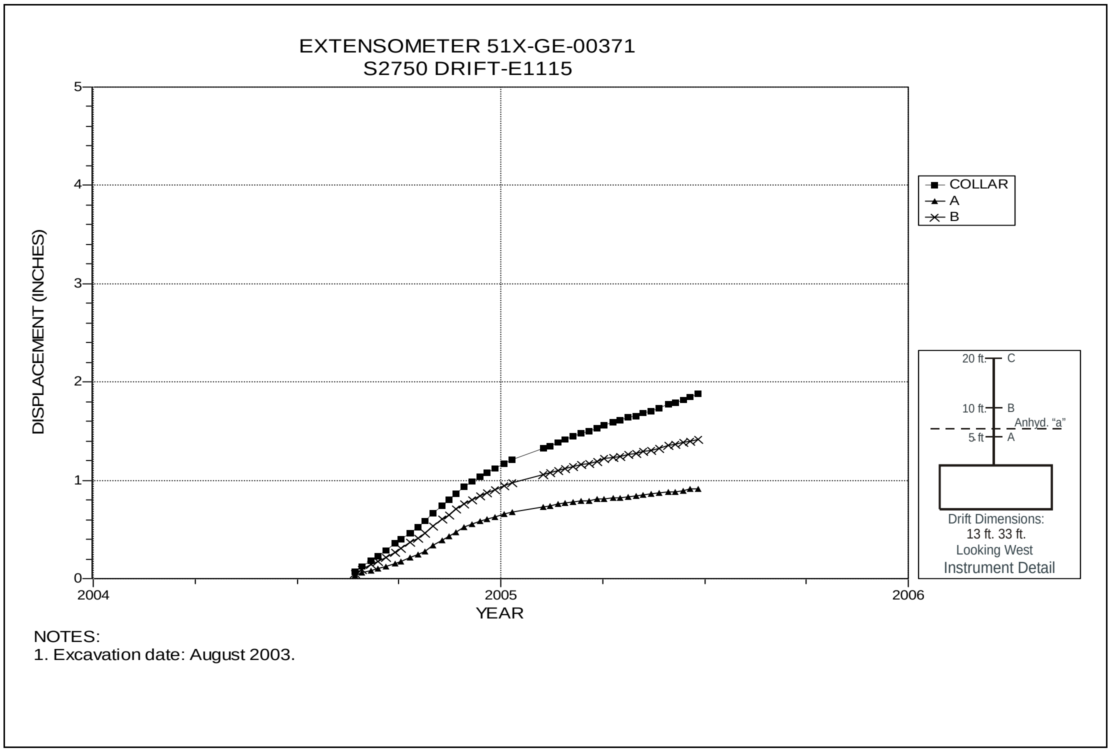


Figure 6-51 Extensometer 51X-GE-00371
S2750 Drift at E1115 – Roof

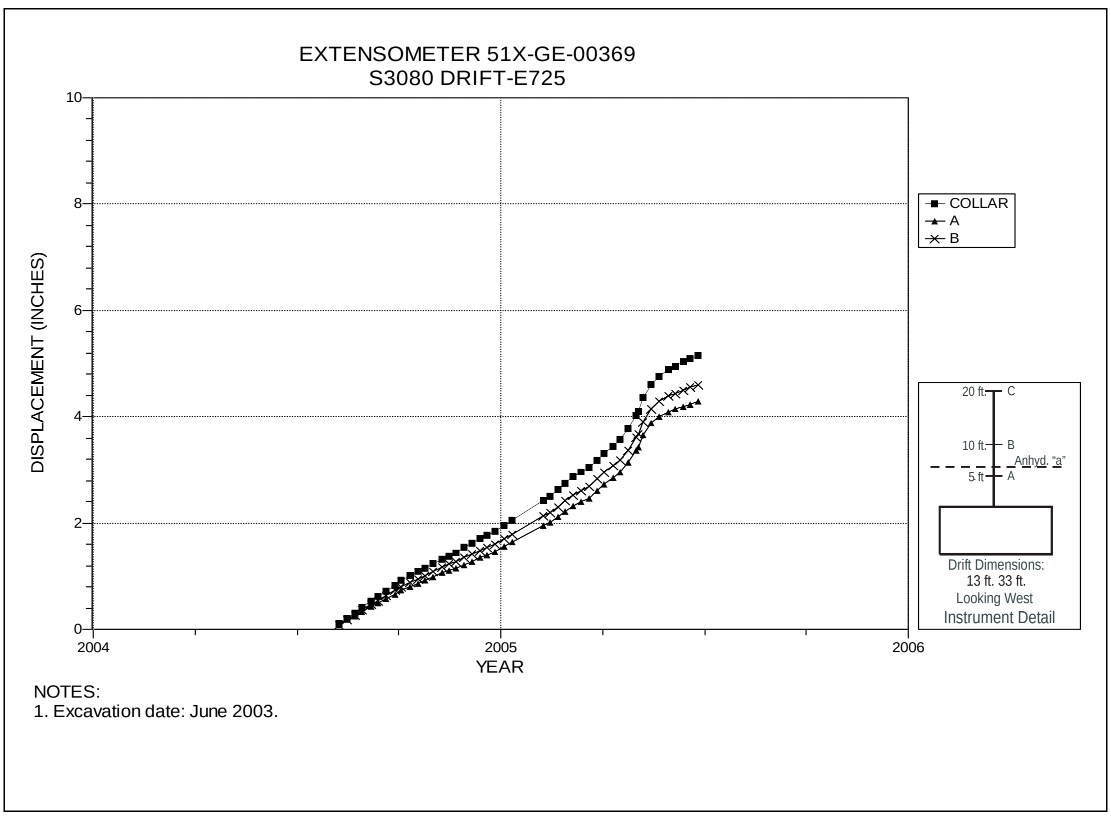


Figure 6-52 Extensometer 51X-GE-00369
S3080 Drift at E725 – Roof

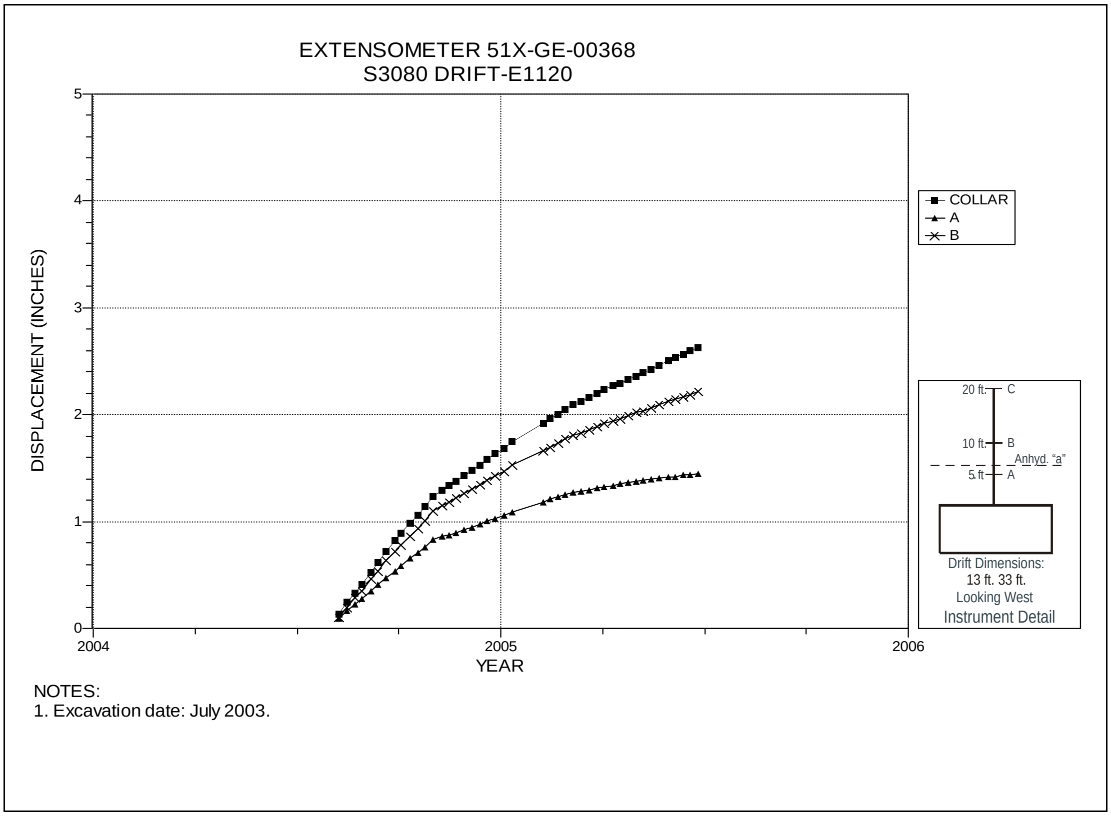


Figure 6-53 Extensometer 51X-GE-00368
S3080 Drift at E1120 – Roof

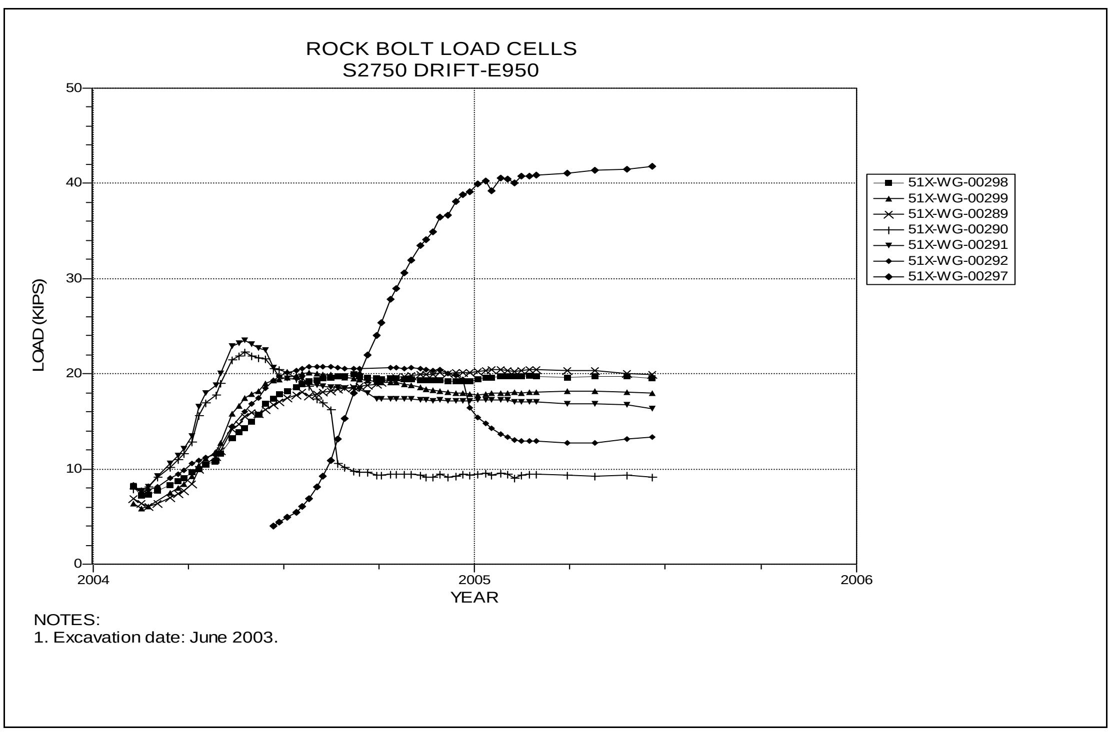
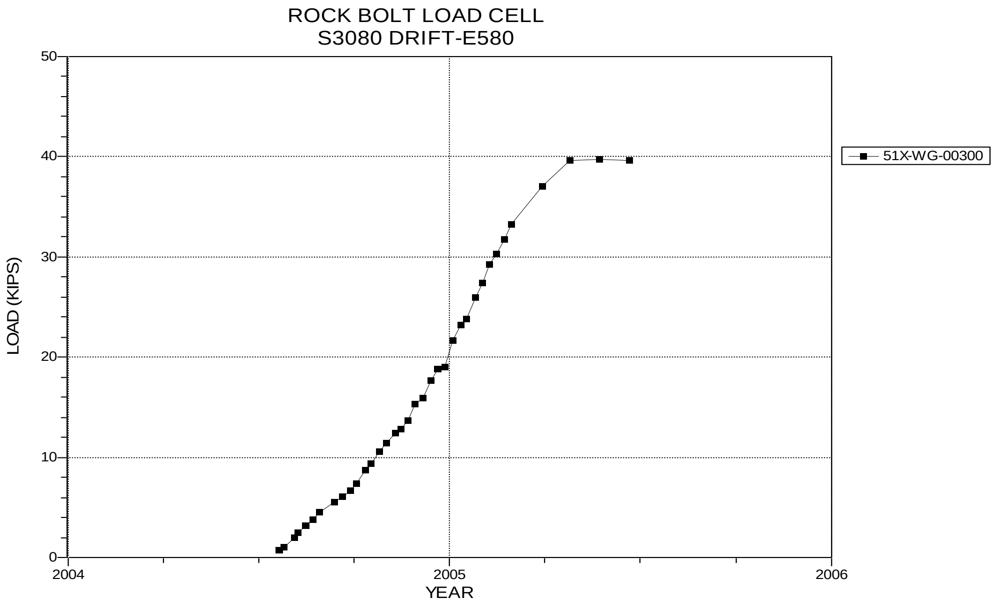
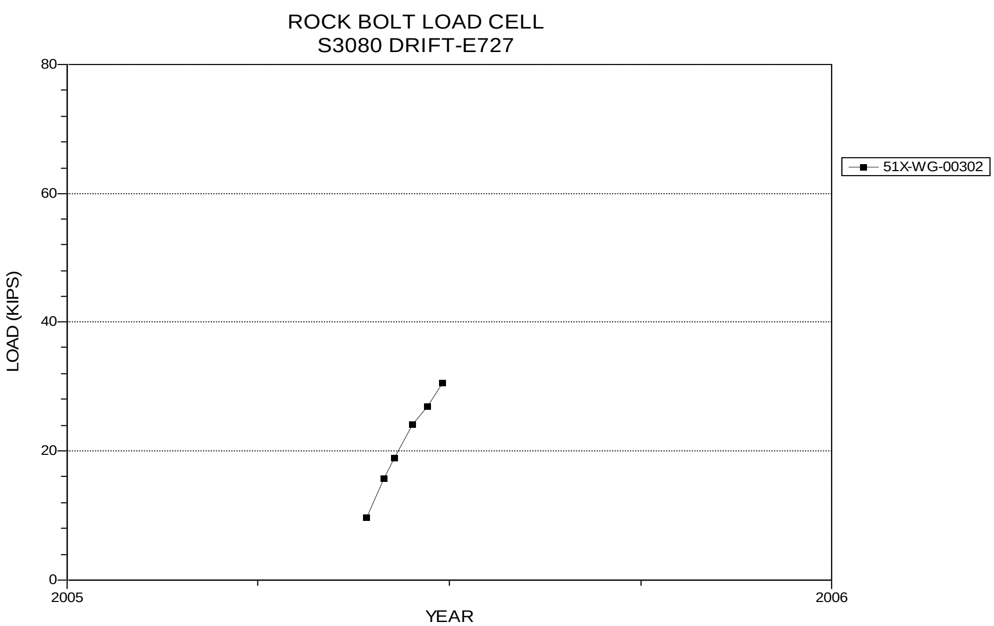


Figure 6-54 Rock Bolt Load Cells
S2750 Drift at E950/E1050 – Roof



NOTES:
1. Excavation date: March 2003.

Figure 6-55 Rock Bolt Load Cell
S3080 Drift at E580 – Roof



NOTES:
1. Excavation date: June 2003.

Figure 6-56 Rock Bolt Load Cells
S3080 Drift at E727 – Roof

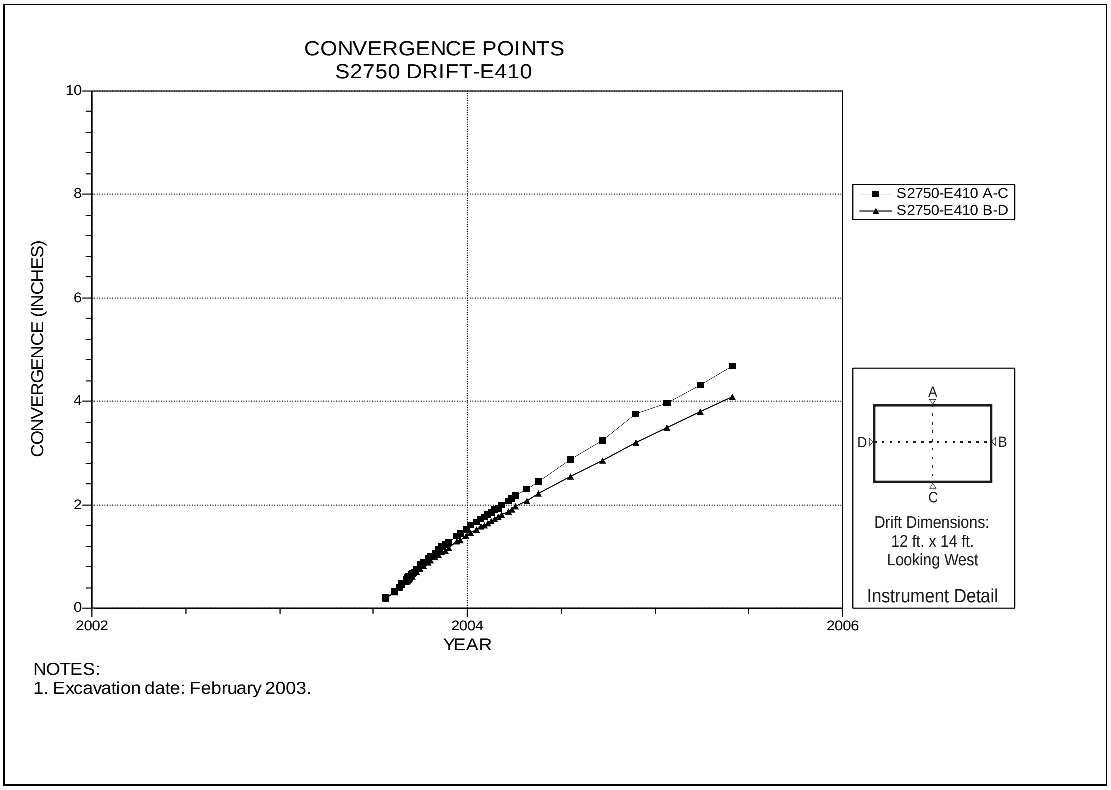


Figure 6-57 Convergence Point Array
S2750 Drift at E410 – All Chords

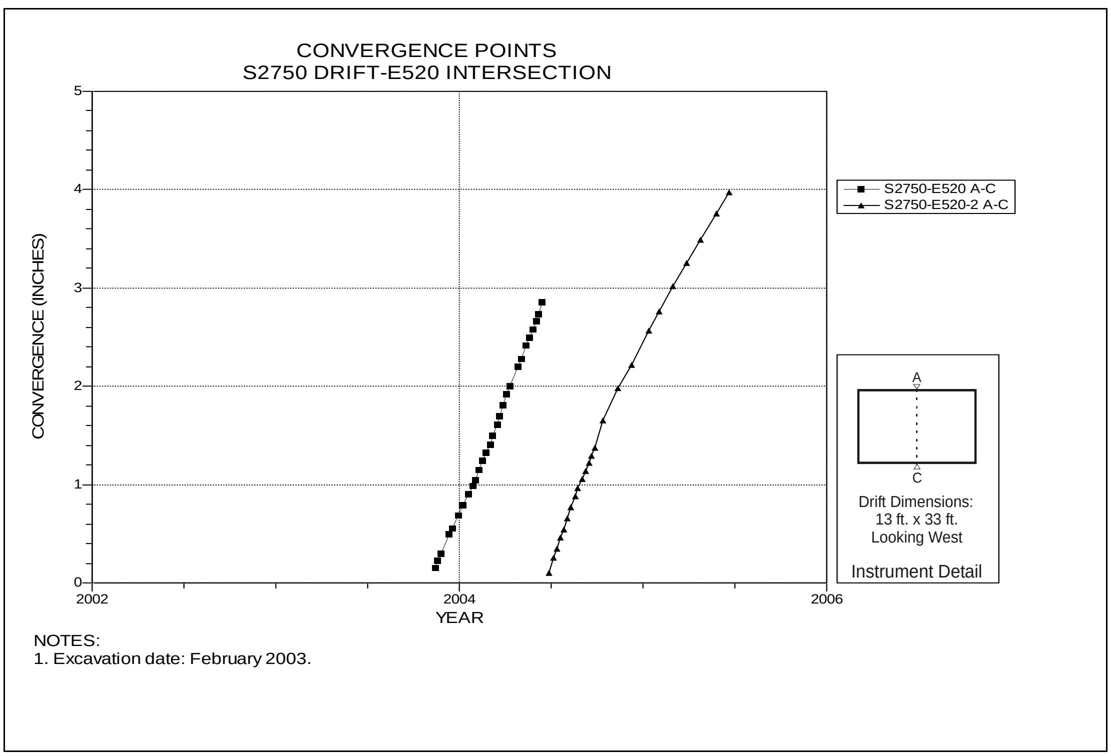
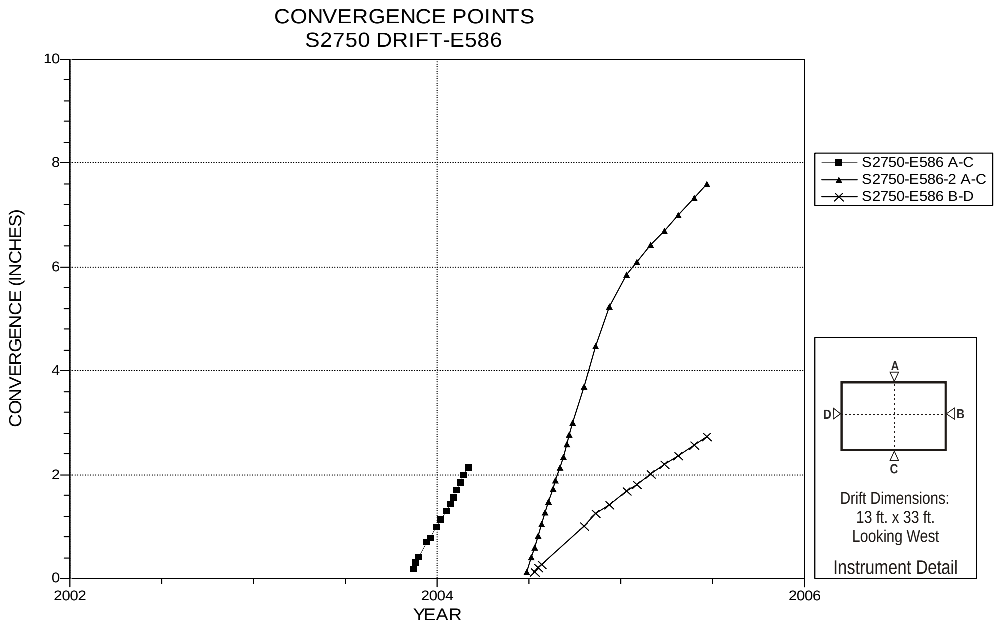
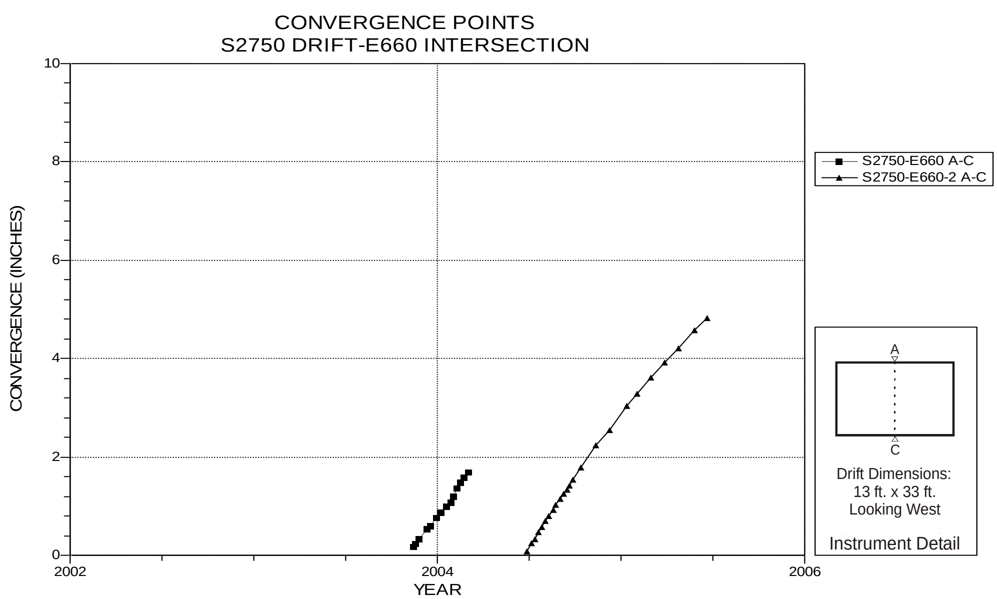


Figure 6-58 Convergence Point Array
S2750 Drift at E520 Drift Intersection (Room 1, Panel 3) – Roof to Floor



NOTES:
1. Excavation date: February 2003.

Figure 6-59 Convergence Point Array
S2750 Drift at E586 – Roof to Floor



NOTES:
1. Excavation date: March 2003.

Figure 6-60 Convergence Point Array
S2750 Drift at E660 Drift Intersection (Room 2, Panel 3) – Roof to Floor

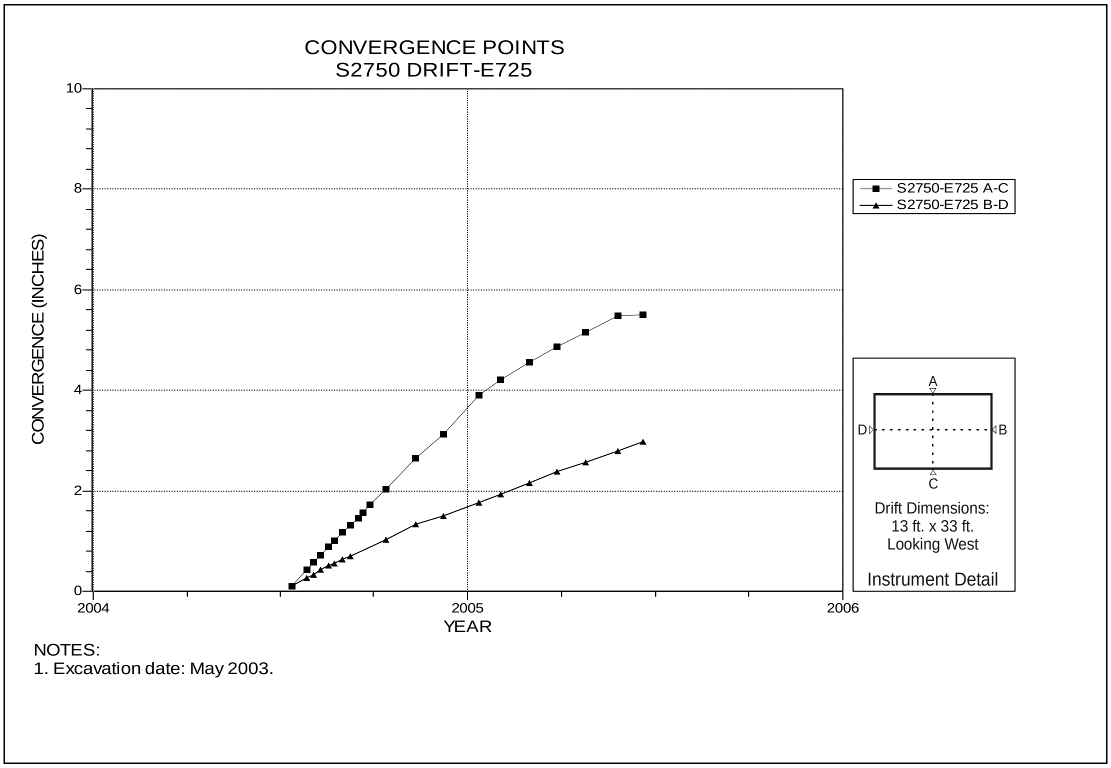


Figure 6-61 Convergence Point Array
S2750 Drift at E725 – All Chords

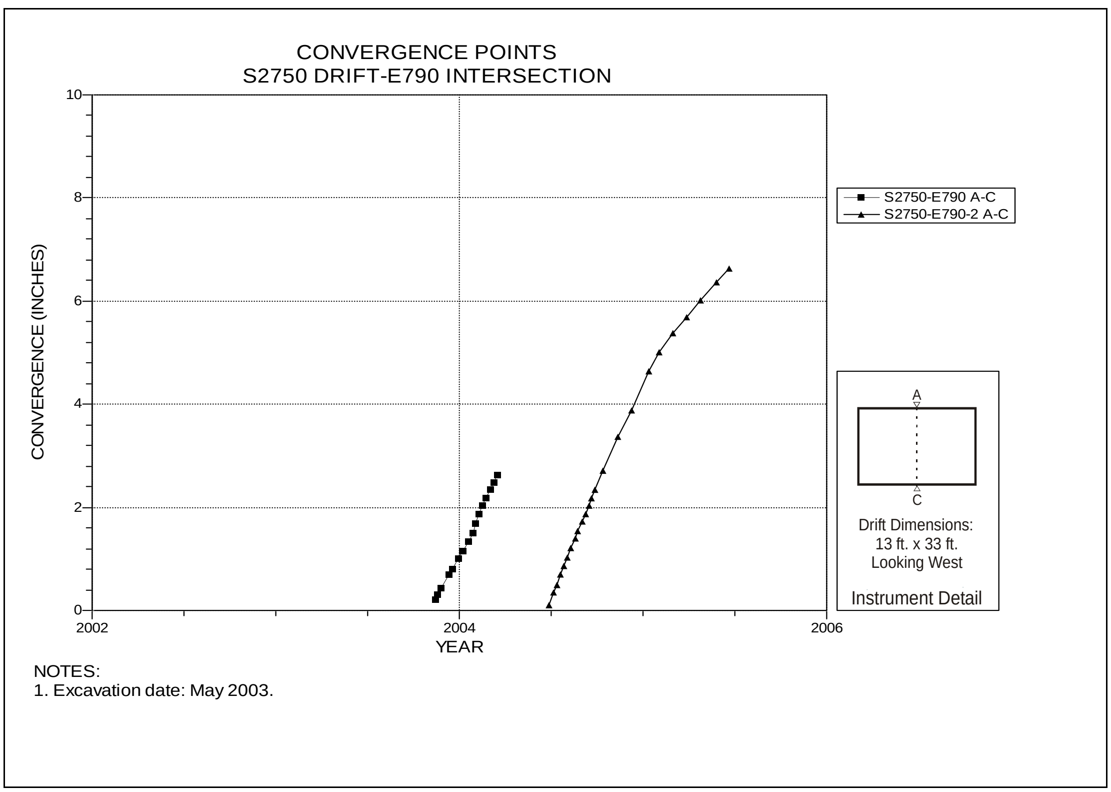


Figure 6-62 Convergence Point Array
S2750 Drift at E790 Drift Intersection (Room 3, Panel 3) – Roof to Floor

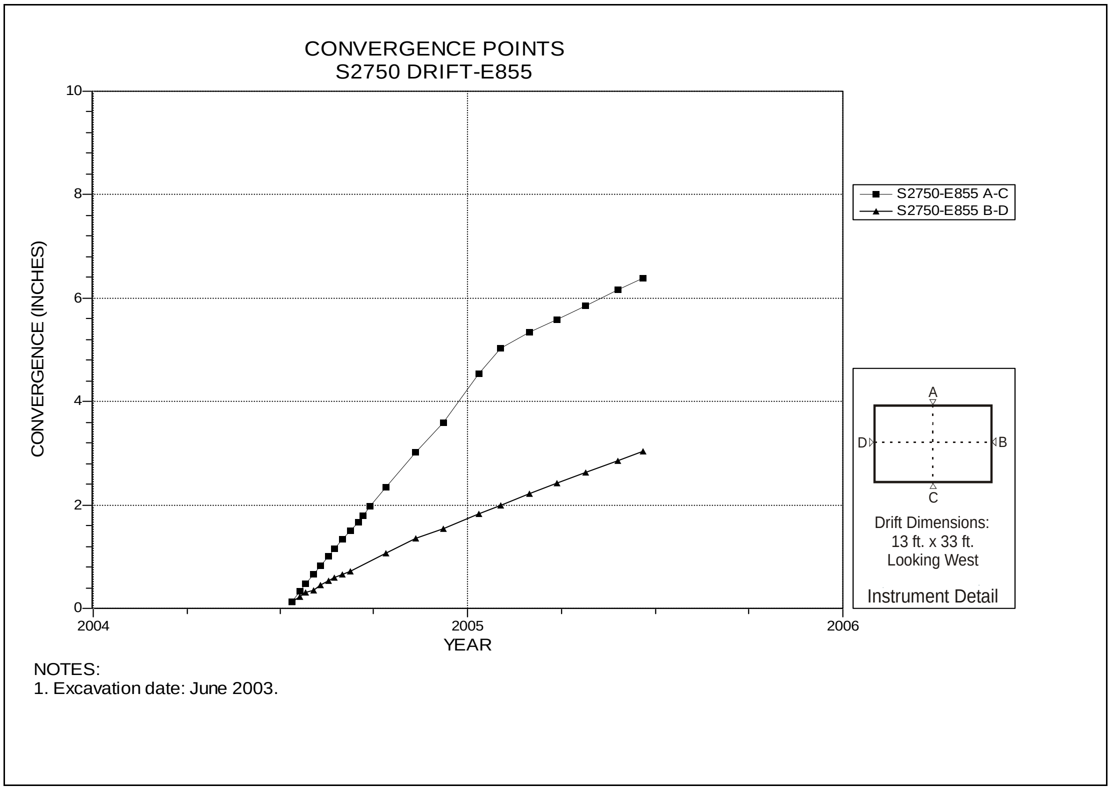


Figure 6-63 Convergence Point Array
S2750 Drift at E855 – All Chords

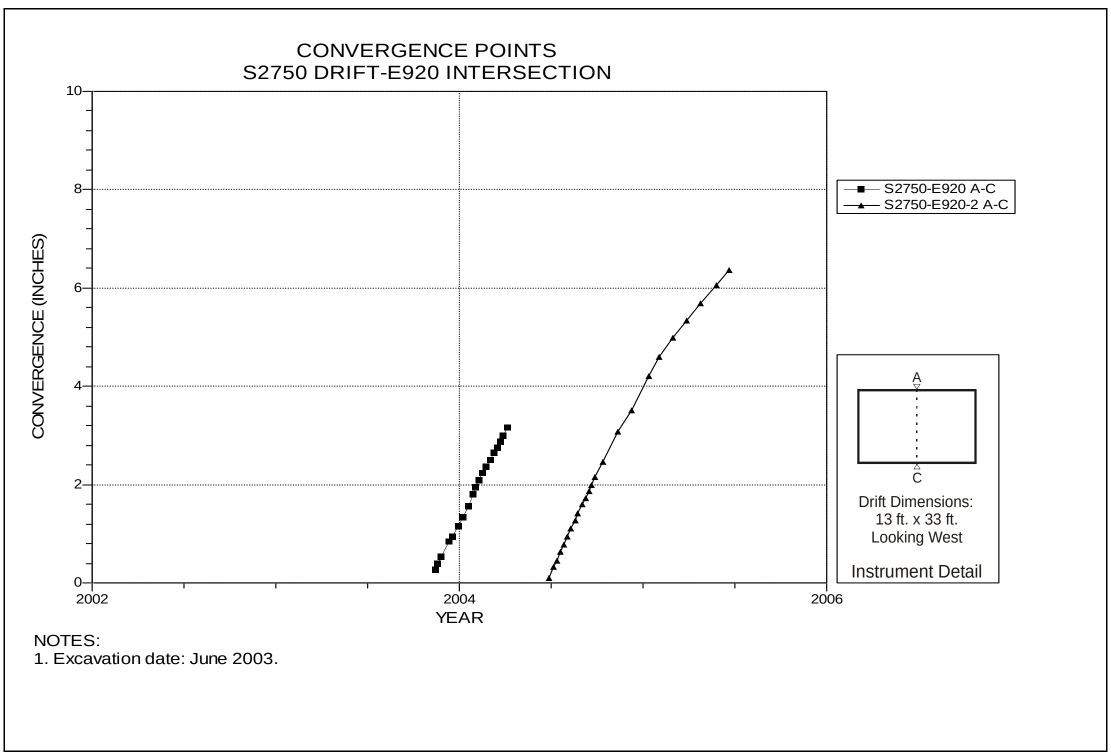


Figure 6-64 Convergence Point Array
S2750 Drift at E920 Drift Intersection (Room 4 Panel 3) – Roof to Floor

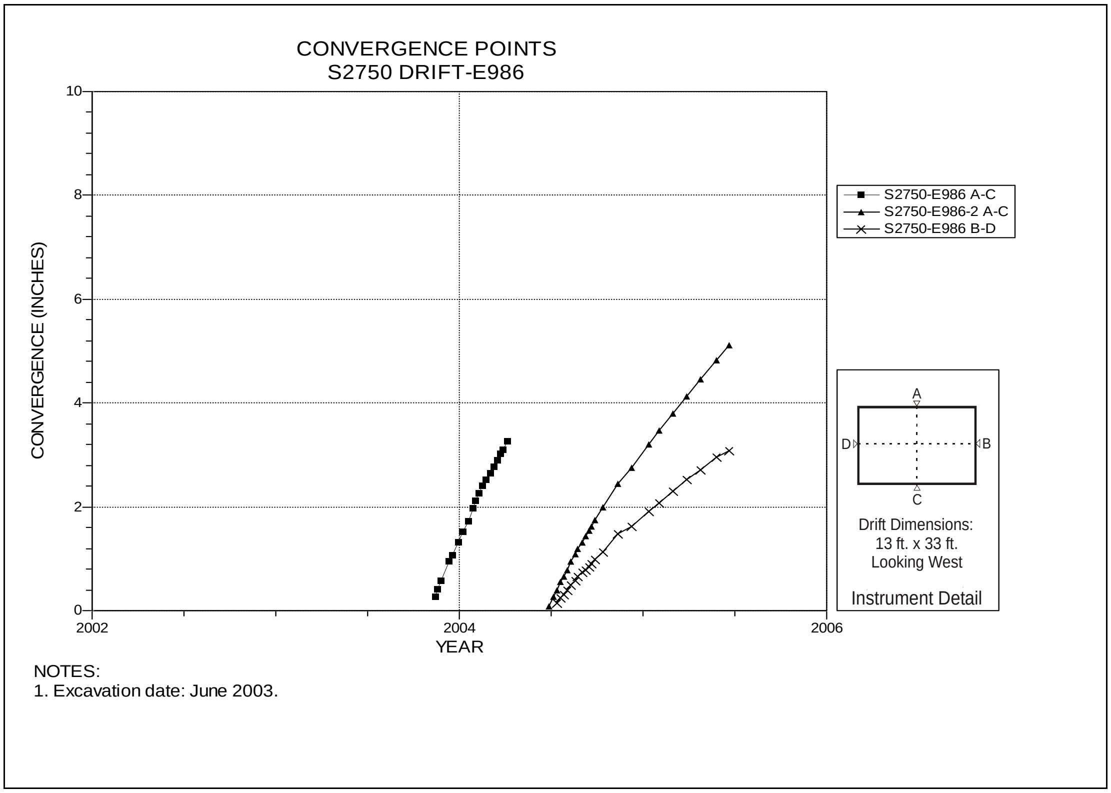


Figure 6-65 Convergence Point Array
S2750 Drift at E986 – Roof to Floor

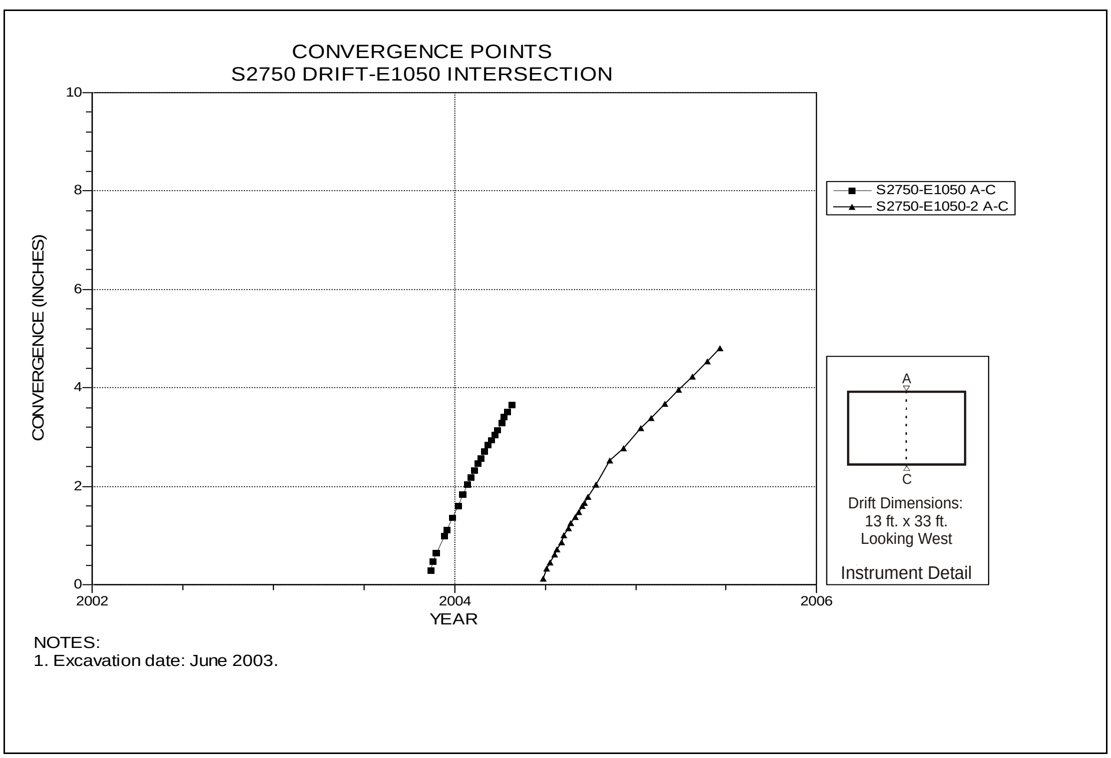


Figure 6-66 Convergence Point Array
S2750 Drift at E1050 Drift Intersection (Room 5 Panel 3) – Roof to Floor

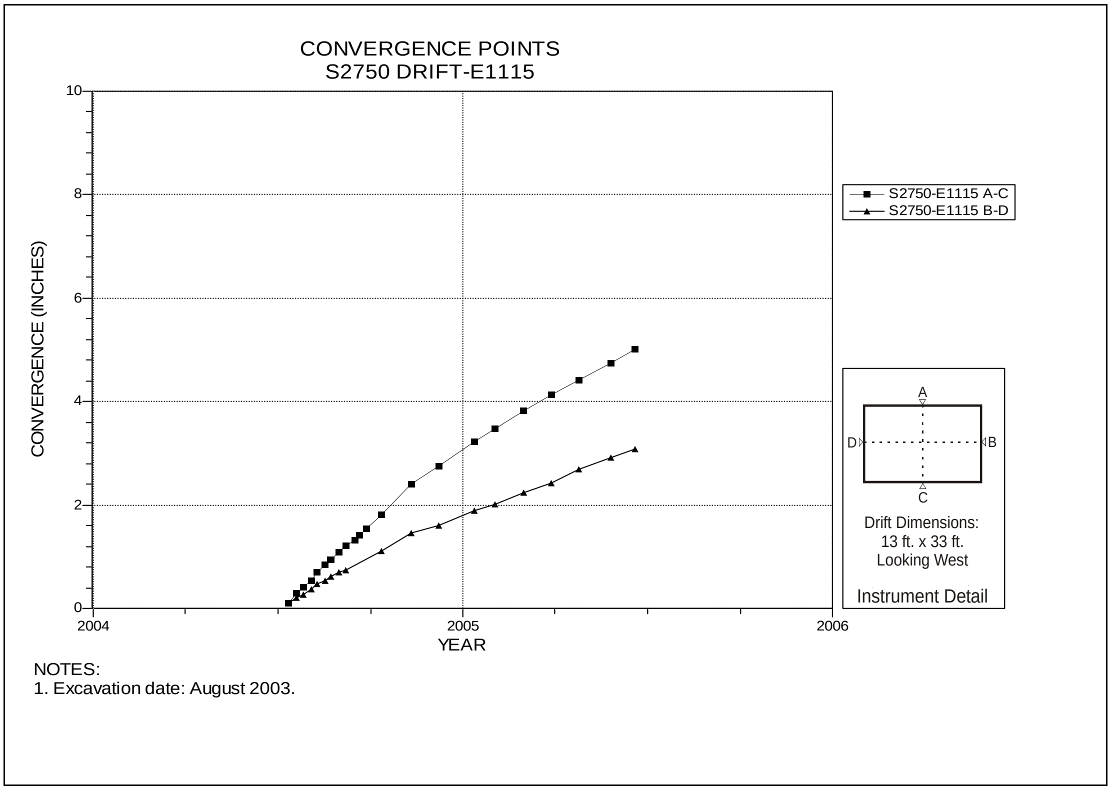


Figure 6-67 Convergence Point Array
S2750 Drift at E1115 – All Chords

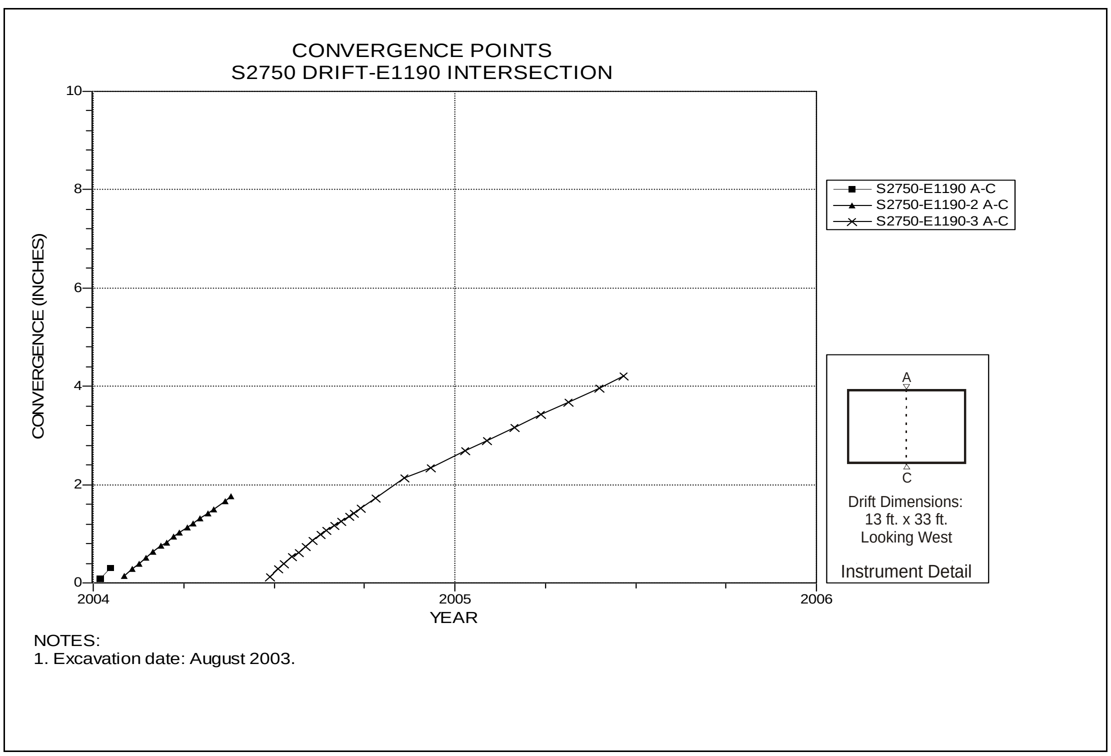


Figure 6-68 Convergence Point Array
S2750 Drift at E1190 Drift Intersection (Room 6 Panel 3) – Roof to Floor

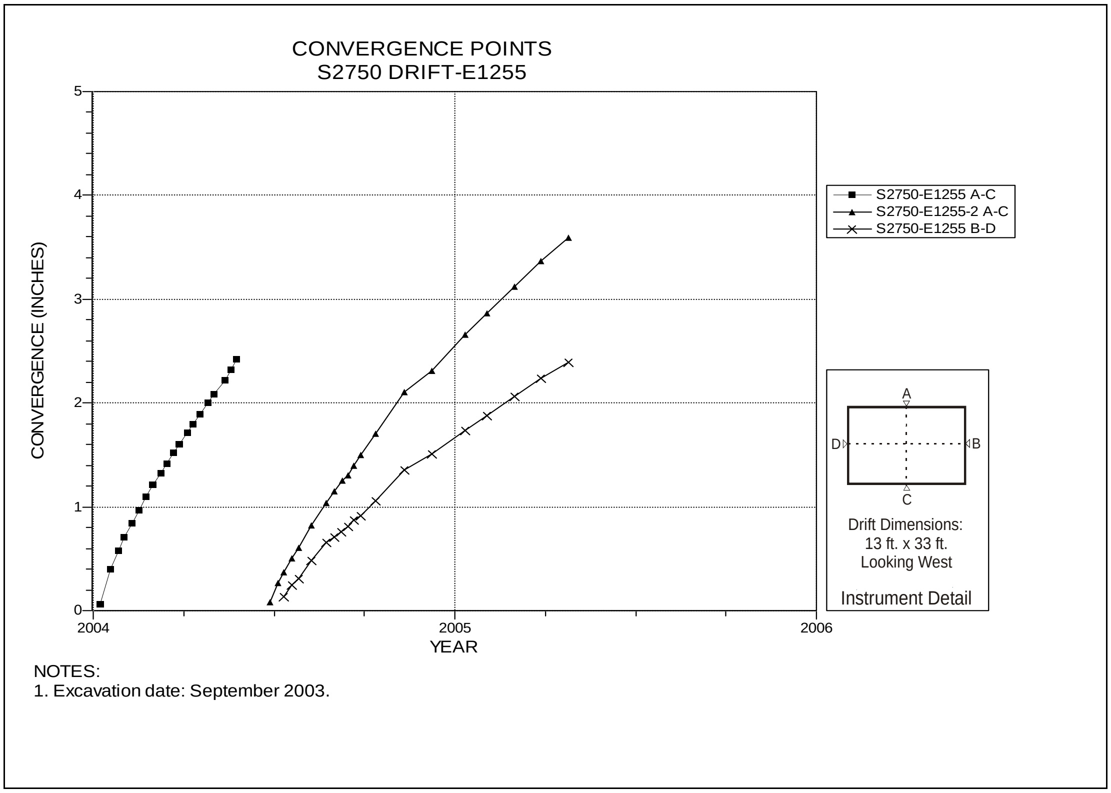


Figure 6-69 Convergence Point Array
S2750 Drift at E1255 – All Chords

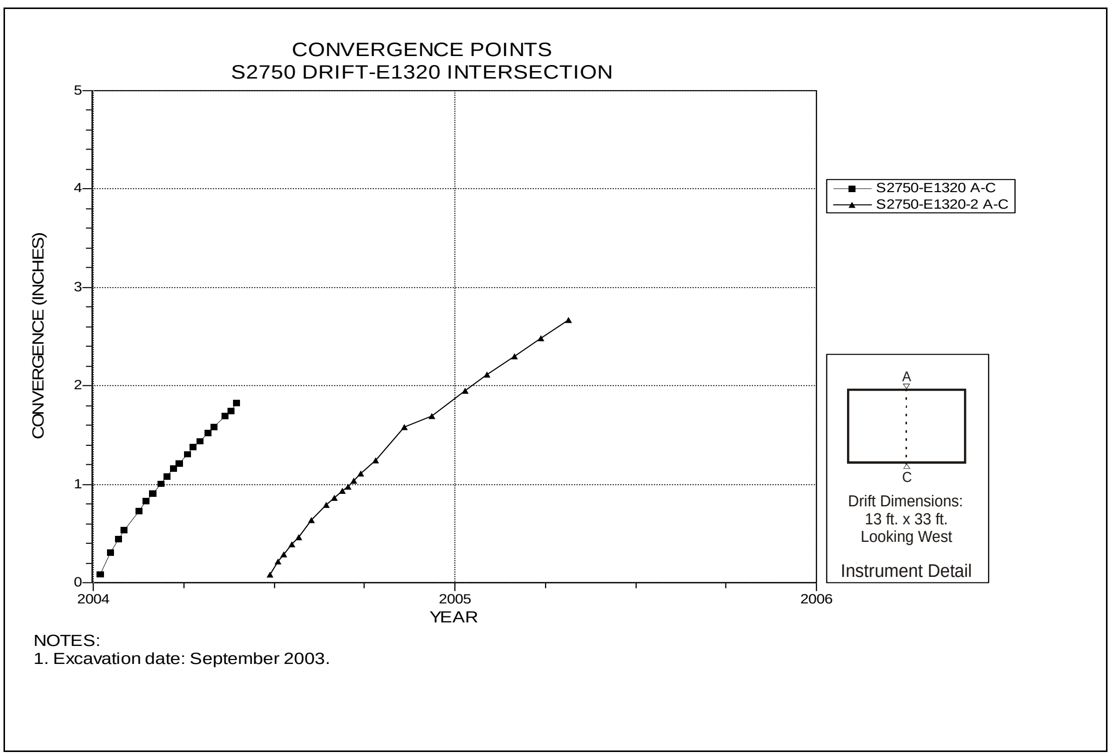


Figure 6-70 Convergence Point Array
S2750 Drift at E1320 Drift Intersection (Room 7 Panel 3) – Roof to Floor

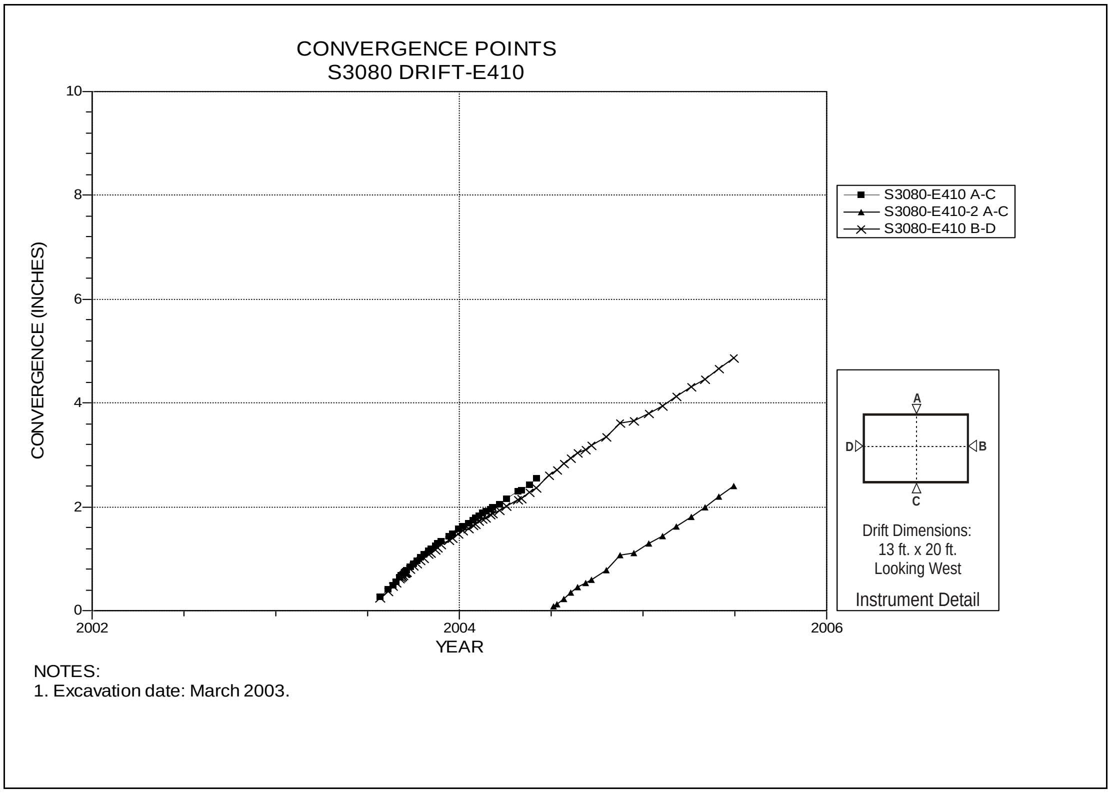


Figure 6-71 Convergence Point Array
S3080 Drift at E410 – All Chords

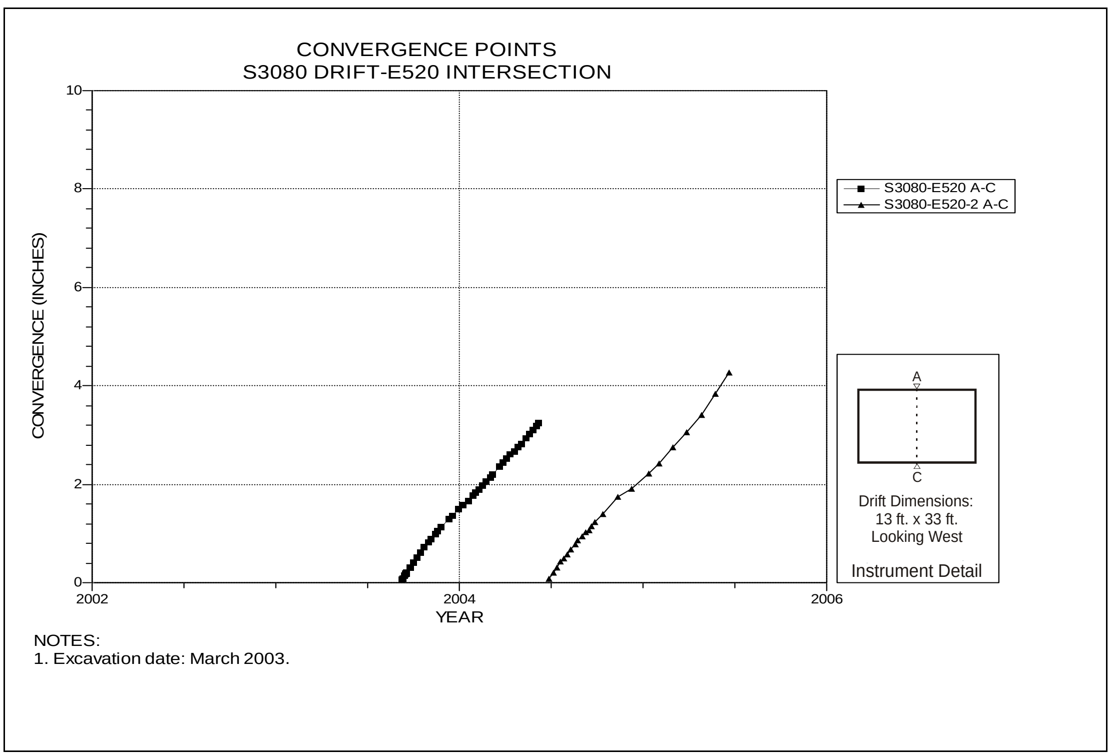


Figure 6-72 Convergence Point Array
S3080 Drift at E520 Drift Intersection (Room 1, Panel 3) – Roof to Floor

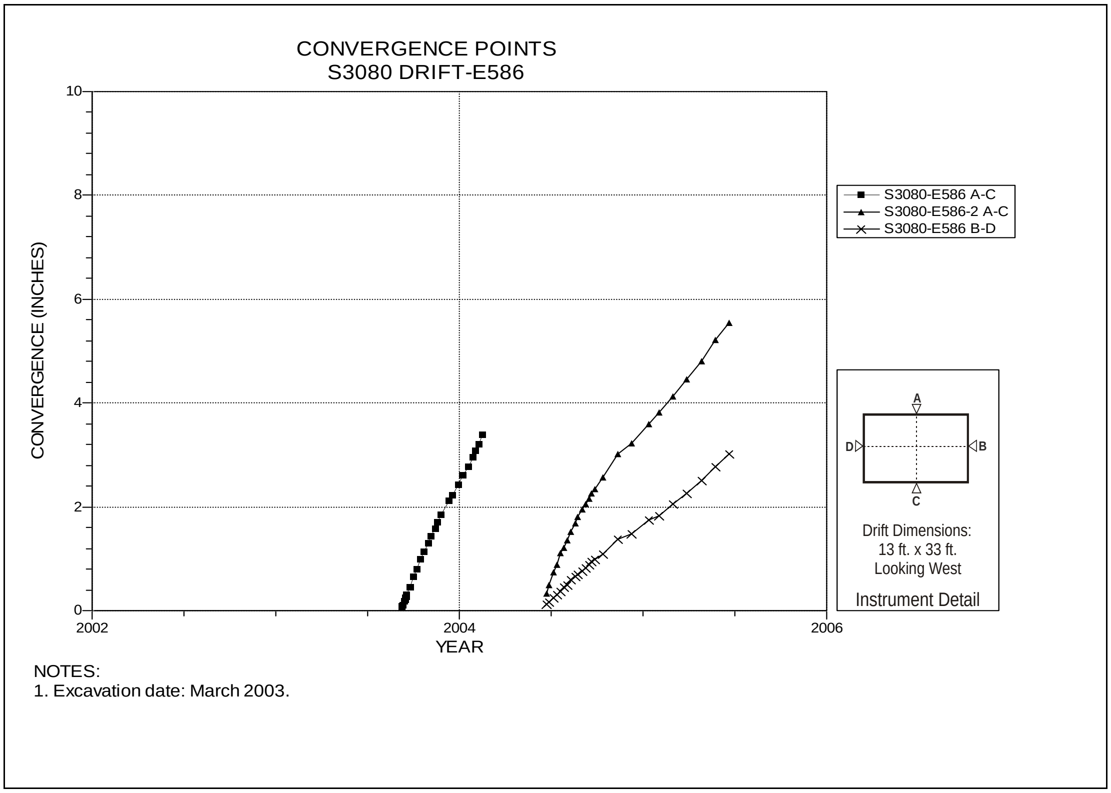


Figure 6-73 Convergence Point Array
S3080 Drift at E586 – All Chords

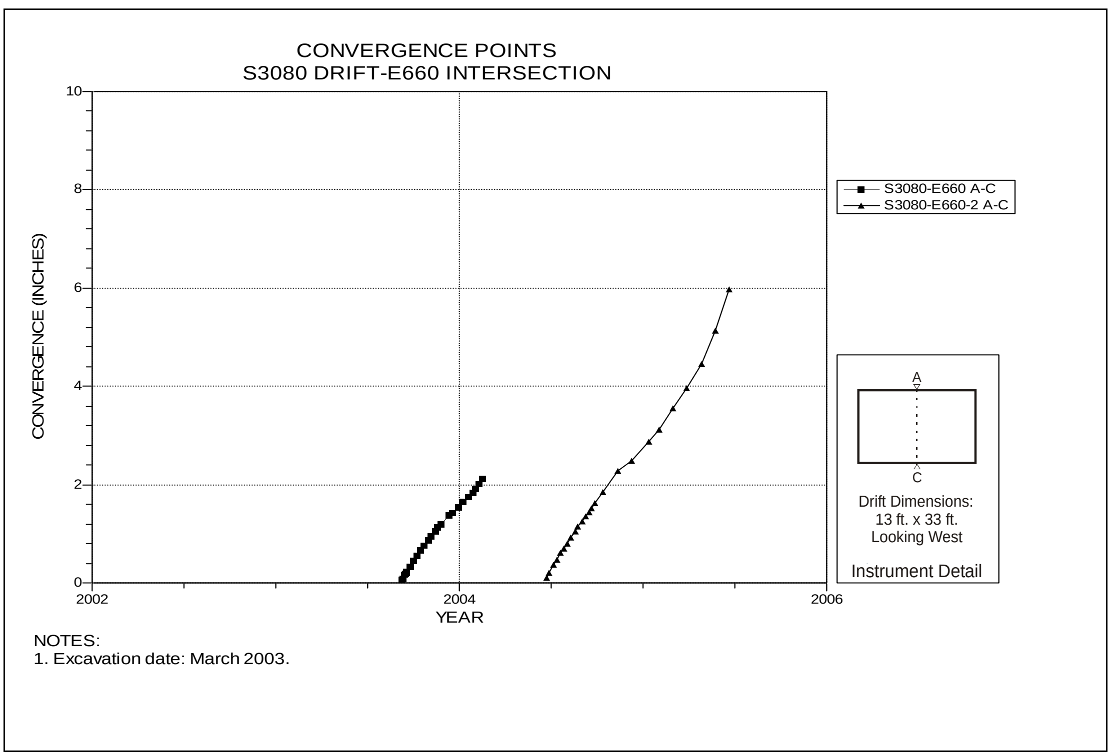


Figure 6-74 Convergence Point Array
S3080 Drift at E660 Drift Intersection (Room 2, Panel 3) – Roof to Floor

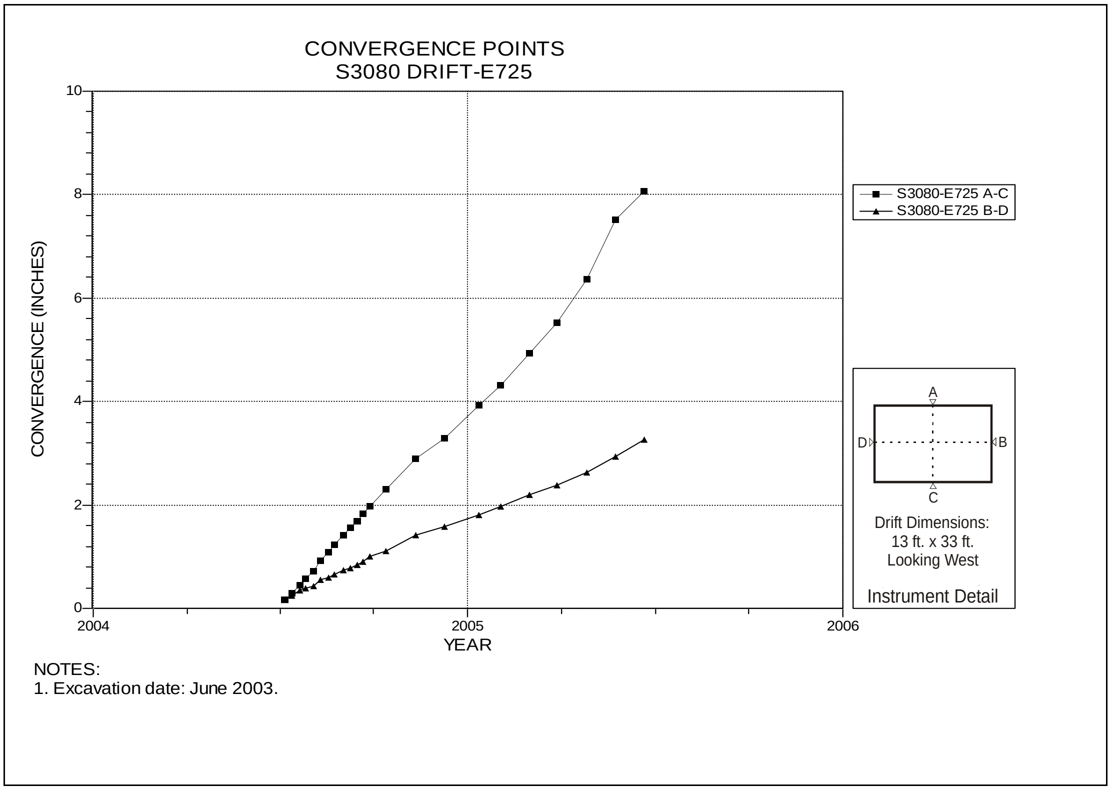


Figure 6-75 Convergence Point Array
S3080 Drift at E725 – All Chords

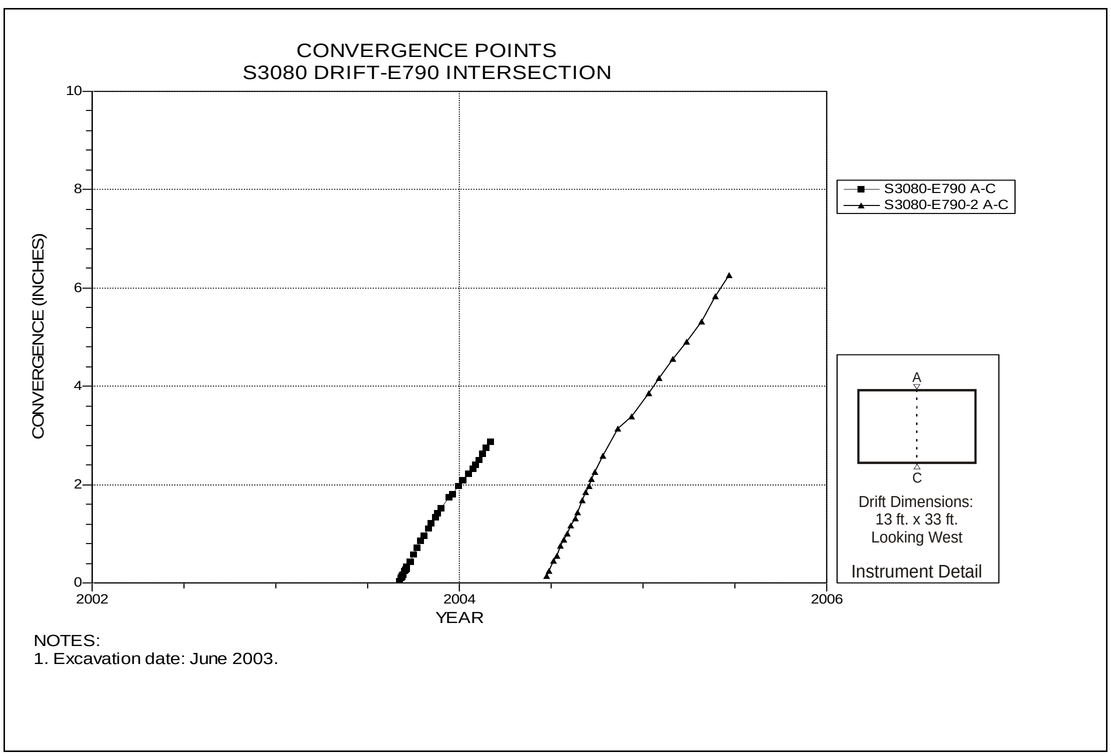


Figure 6-76 Convergence Point Array
S3080 Drift at E790 Drift Intersection (Room 3, Panel 3) – Roof to Floor

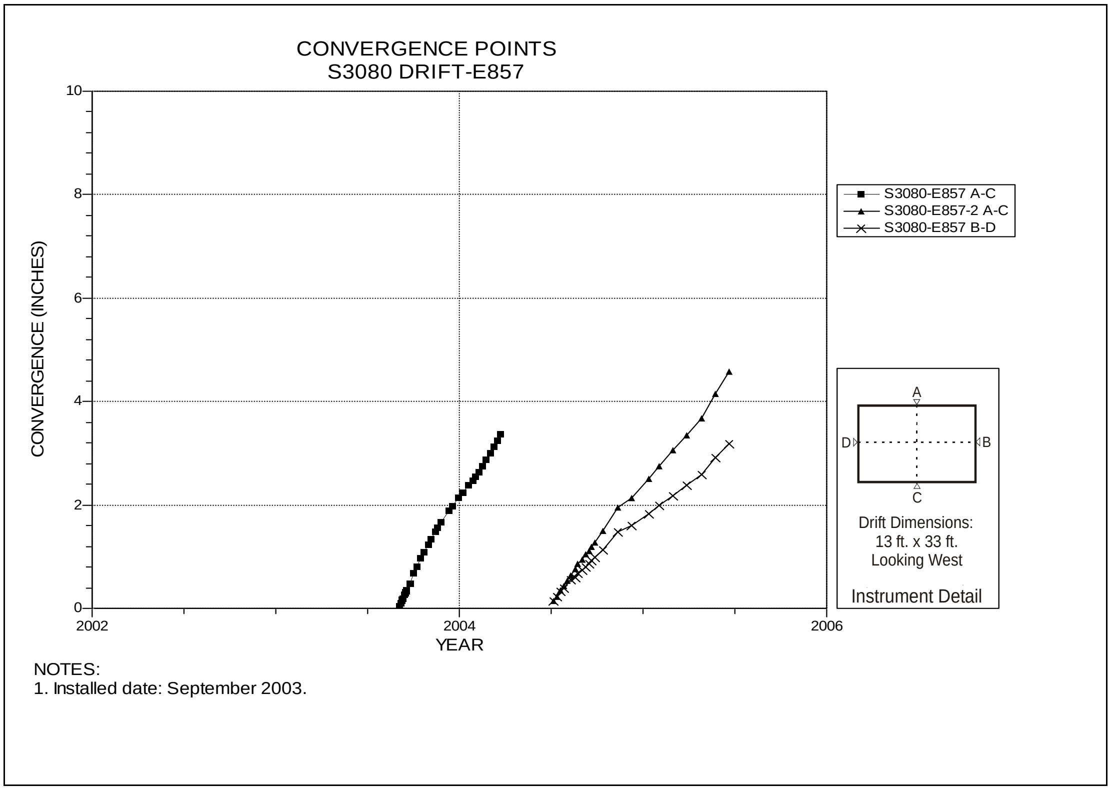


Figure 6-77 Convergence Point Array
S3080 Drift at E857 – All Chords

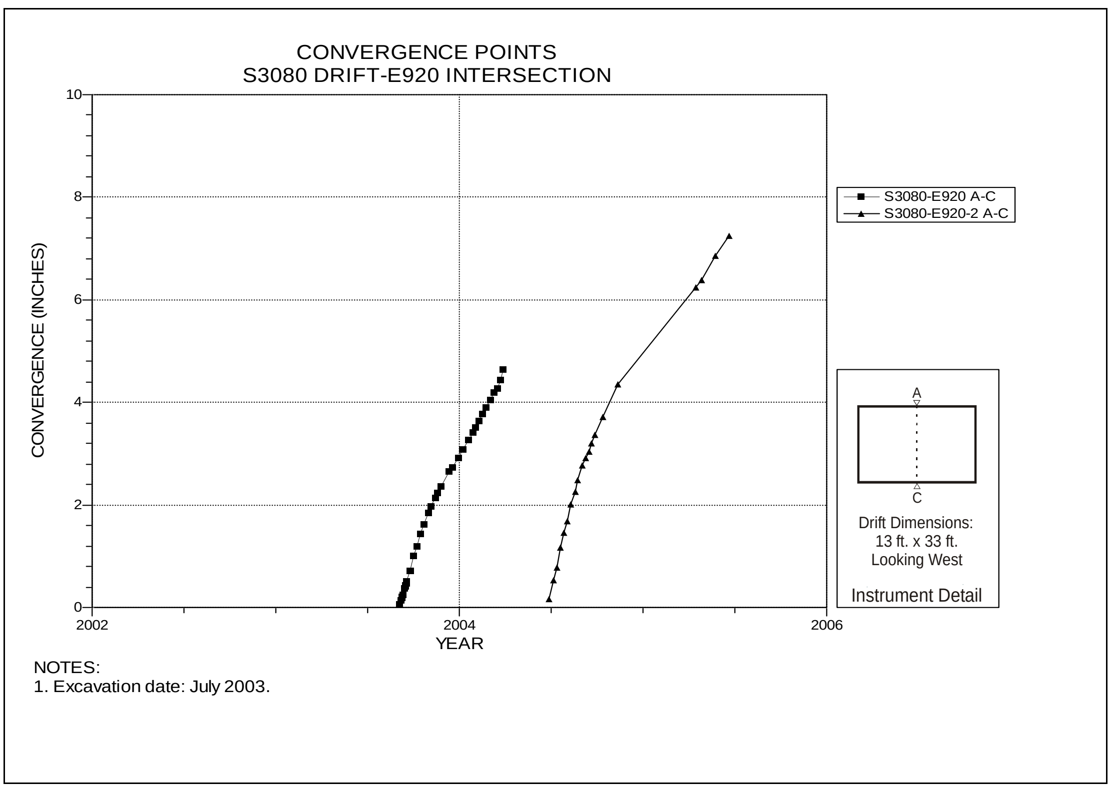


Figure 6-78 Convergence Point Array
S3080 Drift at E920 Drift Intersection (Room 4, Panel 3) – Roof to Floor

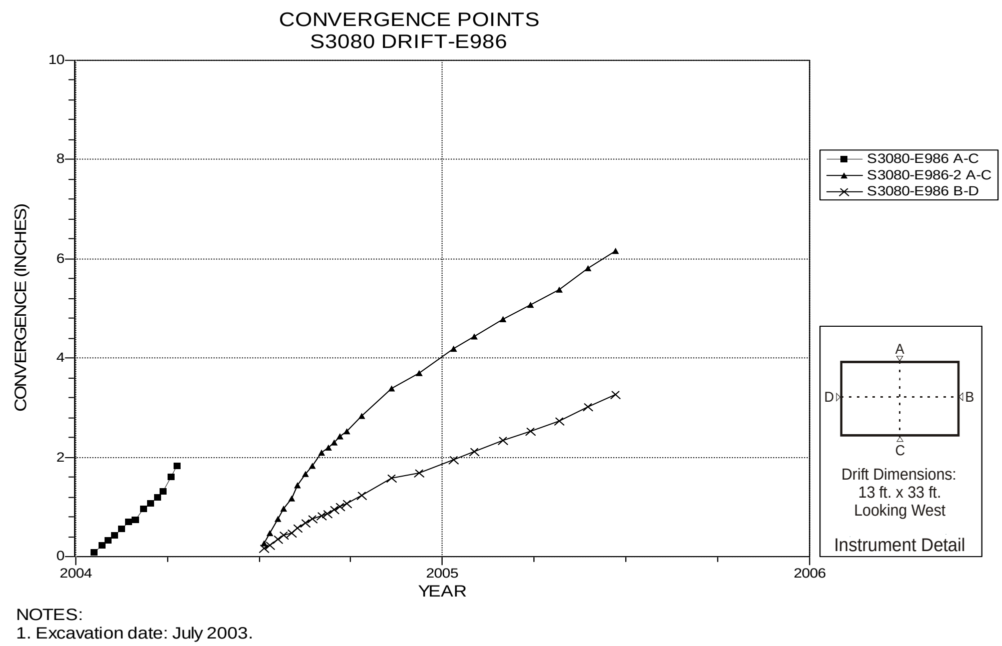


Figure 6-79 Convergence Point Array
S3080 Drift at E986 – All Chords

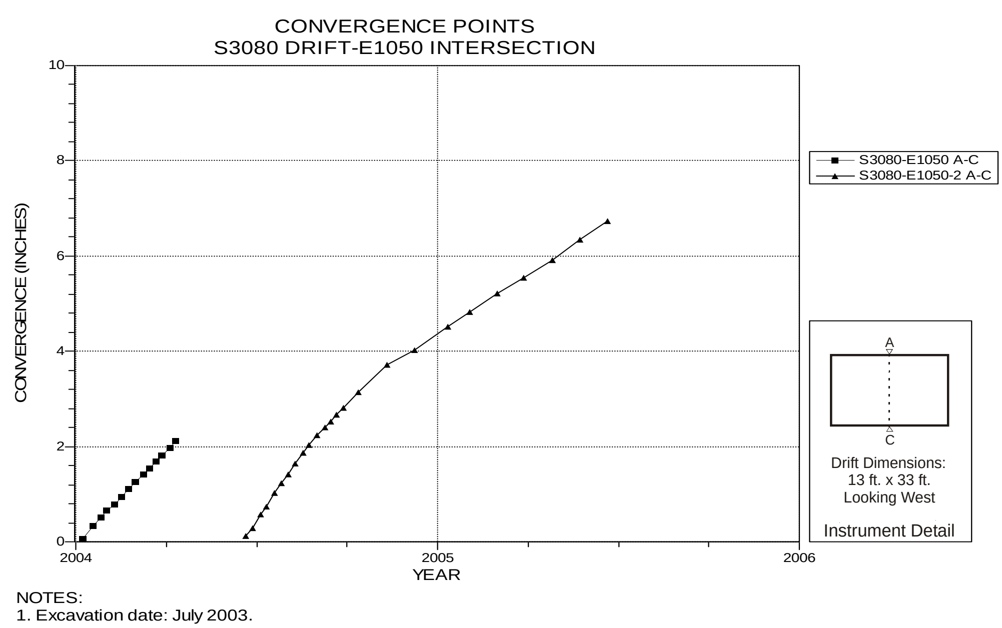


Figure 6-80 Convergence Point Array
S3080 Drift at E1050 Drift Intersection (Room 5, Panel 3) – Roof to Floor

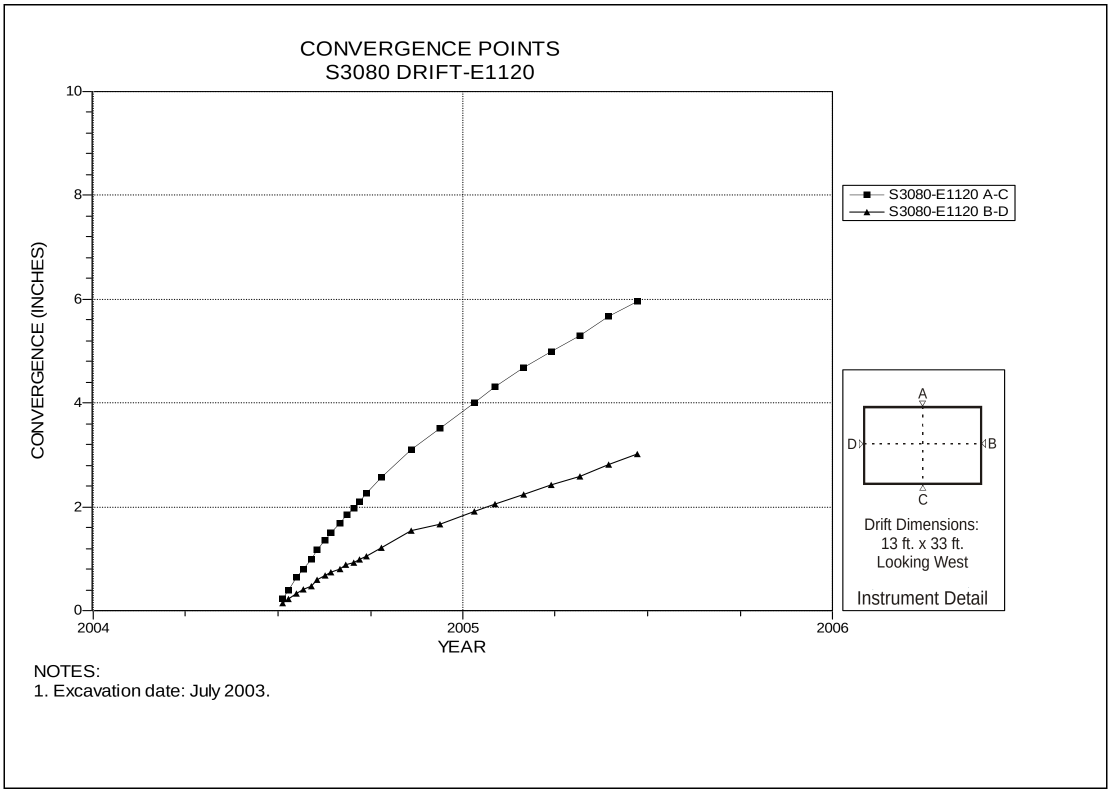


Figure 6-81 Convergence Point Array
S3080 Drift at E1120 – All Chords

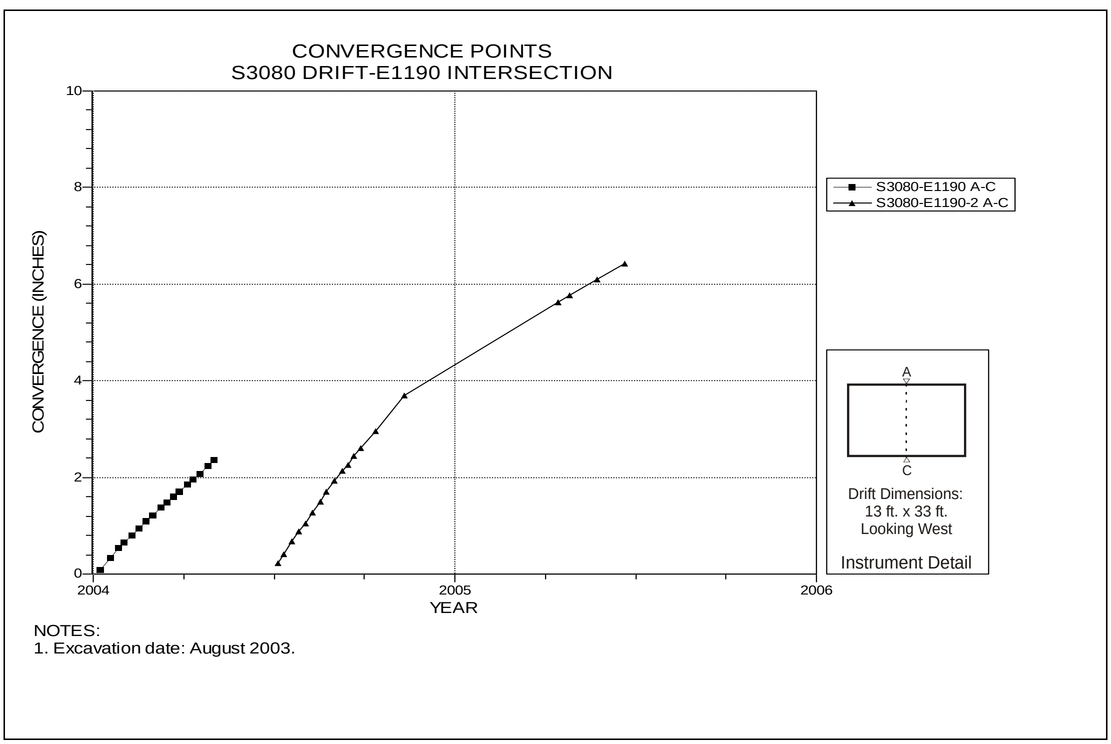


Figure 6-82 Convergence Point Array
S3080 Drift at E1190 Drift Intersection (Room 6, Panel 3) – Roof to Floor

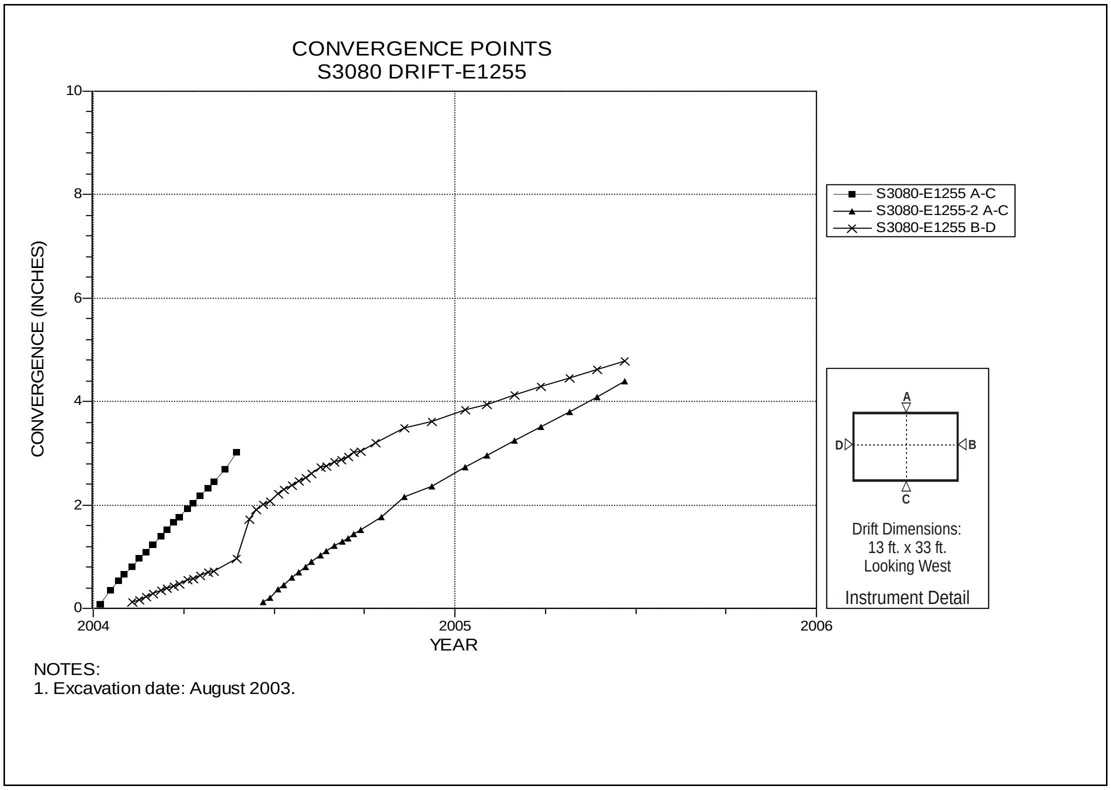


Figure 6-83 Convergence Point Array
S3080 Drift at E1255 – All Chords

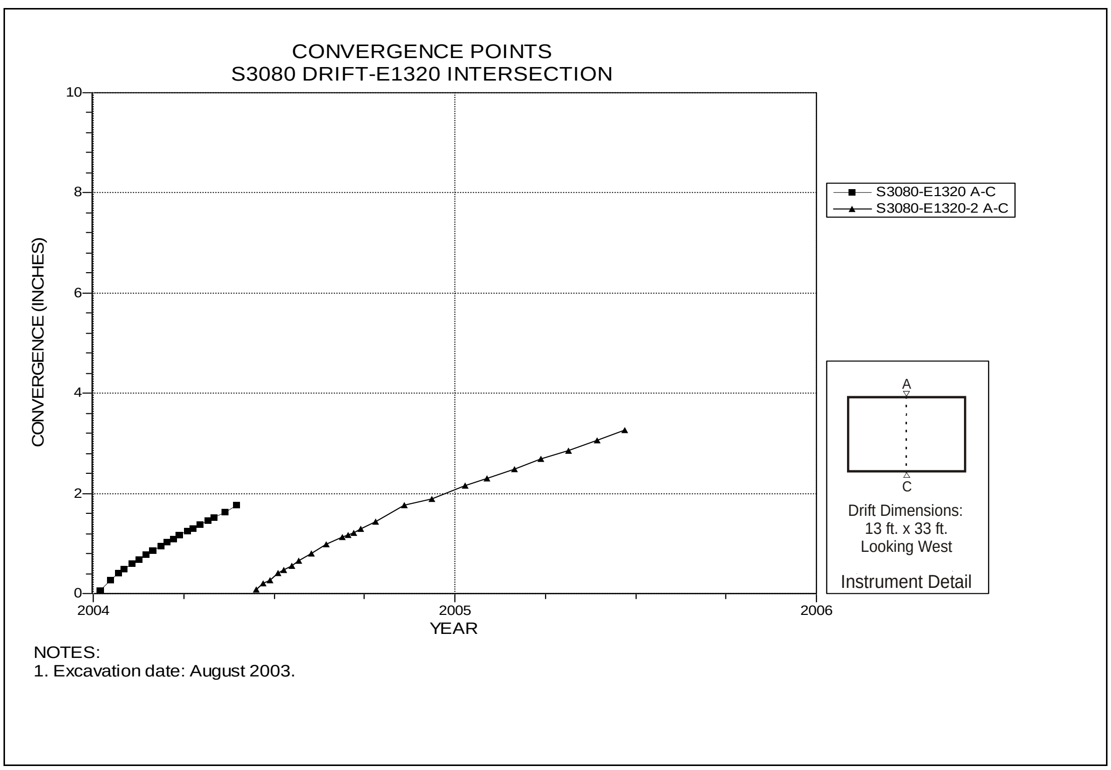


Figure 6-84 Convergence Point Array
S3080 Drift at E1320 Drift Intersection (Room 7, Panel 3) – Roof to Floor

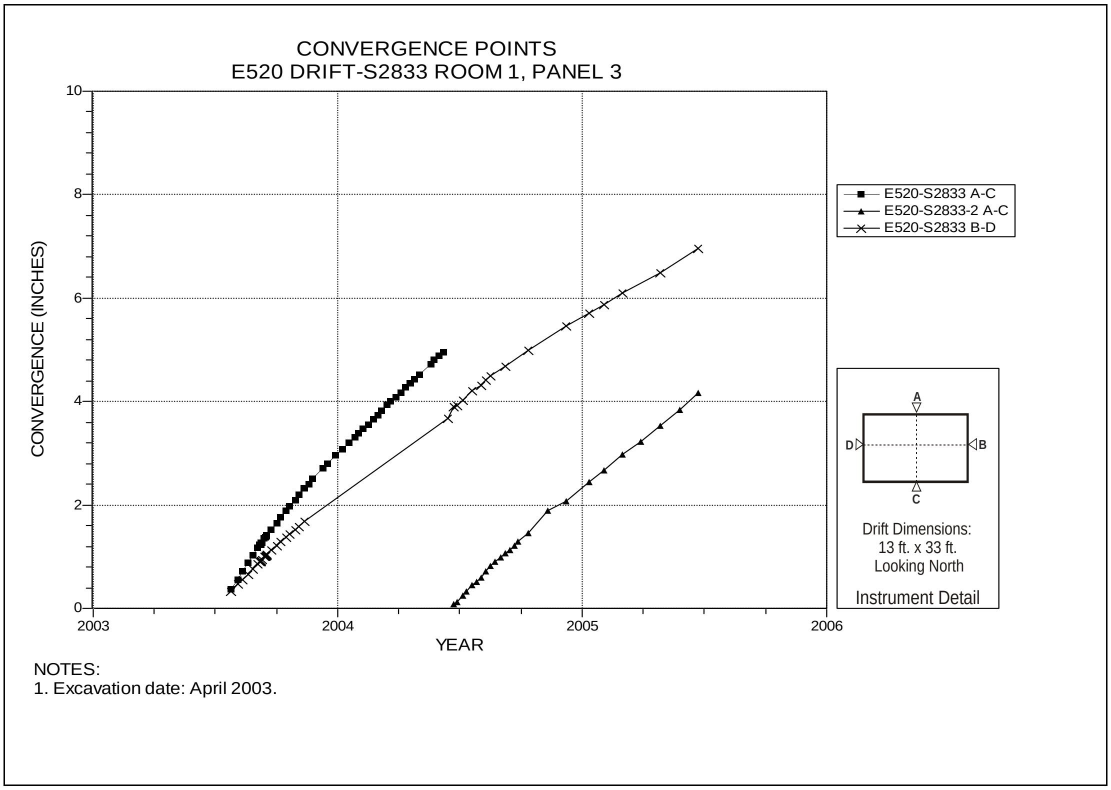


Figure 6-85 Convergence Point Array
Room 1, Panel 3 at S2833 – All Chords

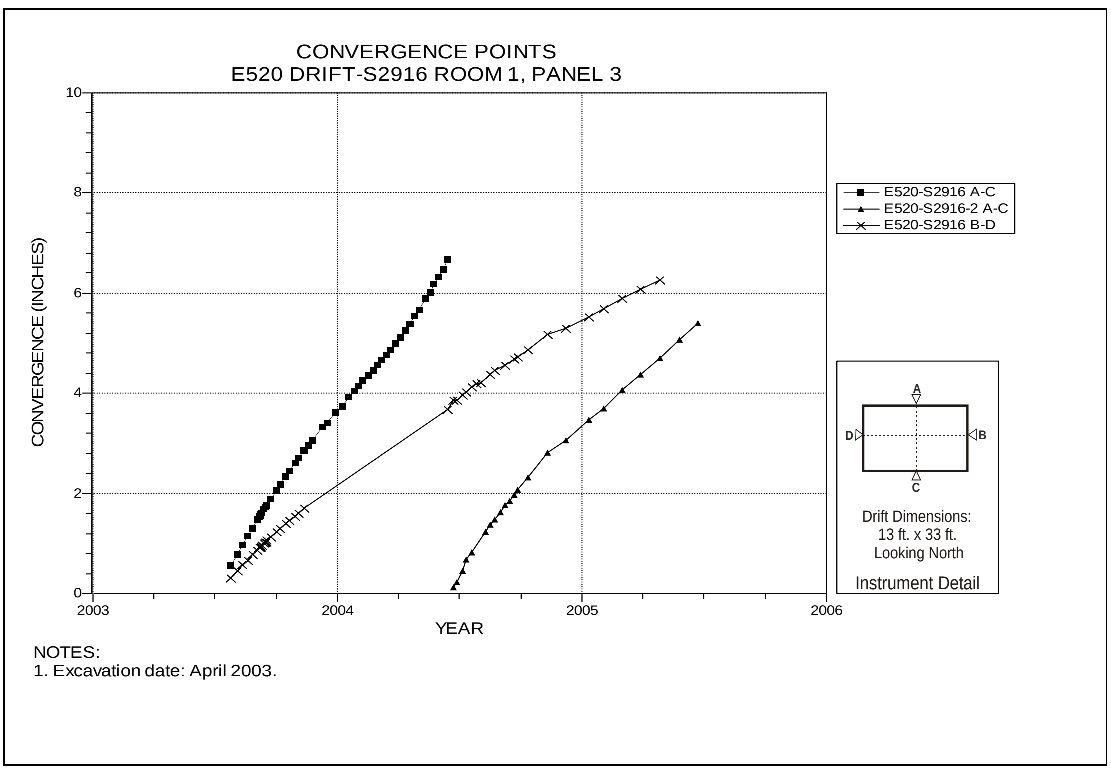


Figure 6-86 Convergence Point Array
Room 1, Panel 3 at S2916 – Room Center – All Chords

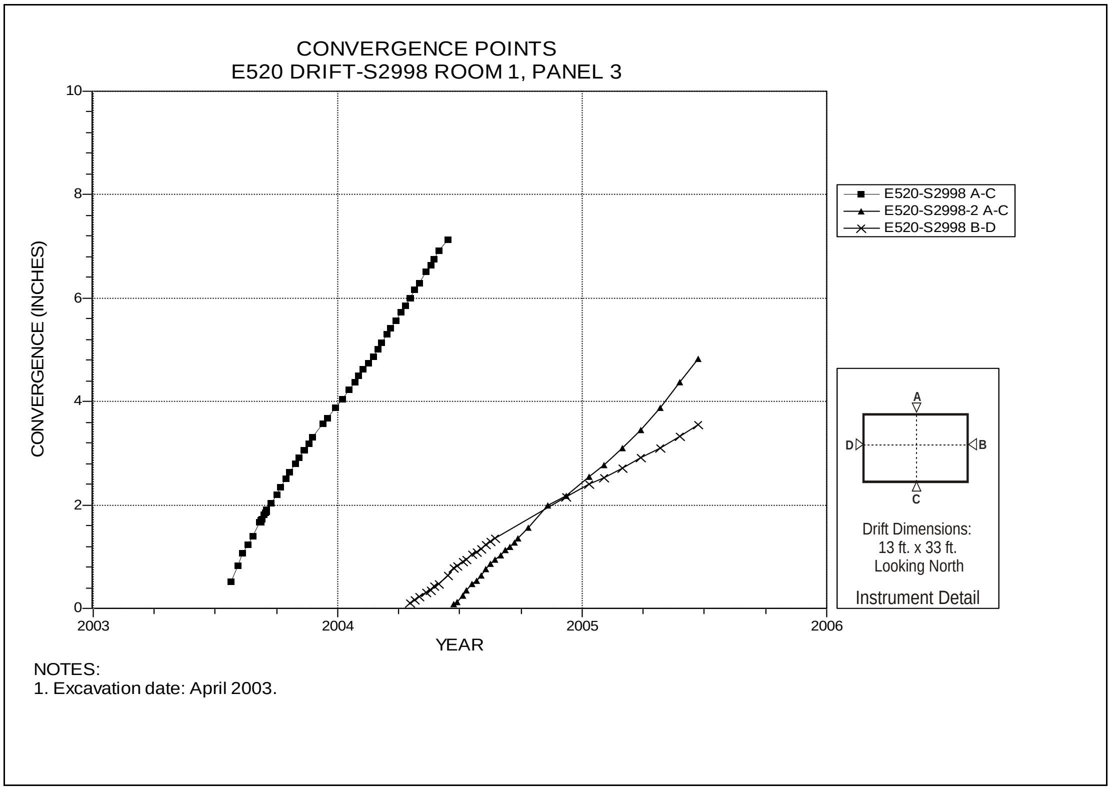


Figure 6-87 Convergence Point Array
Room 1, Panel 3 at S2998 – All Chords

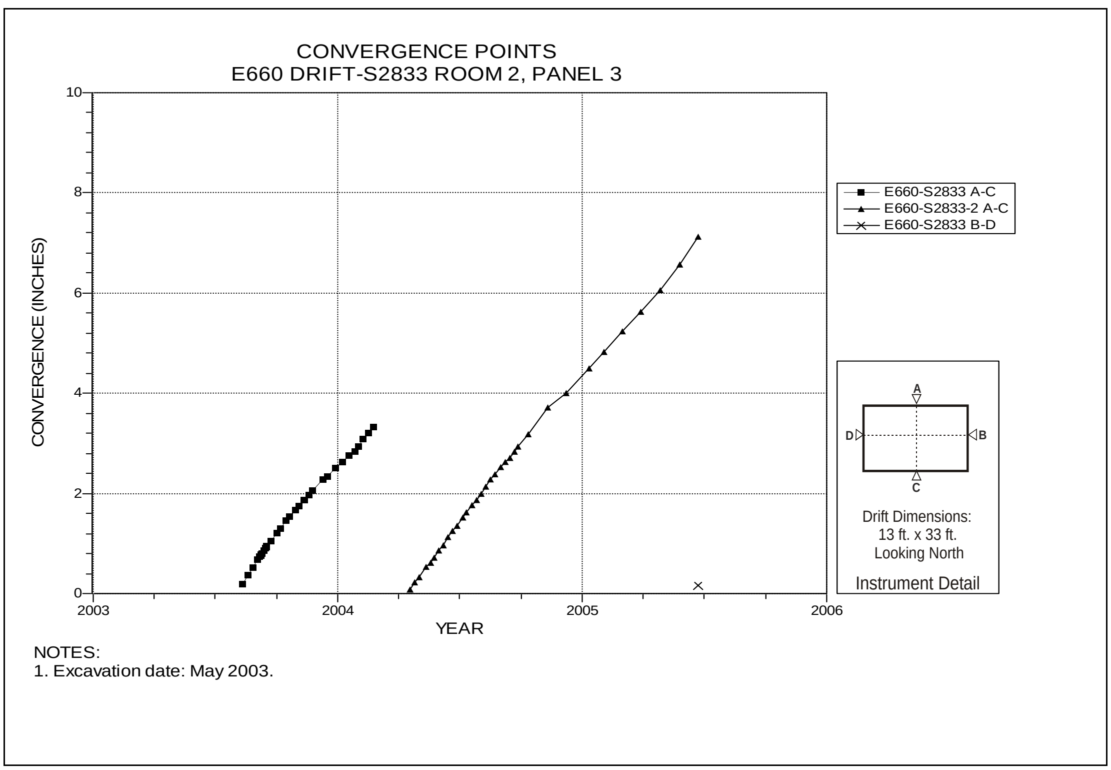


Figure 6-88 Convergence Point Array
Room 2, Panel 3 at S2833 – Roof to Floor

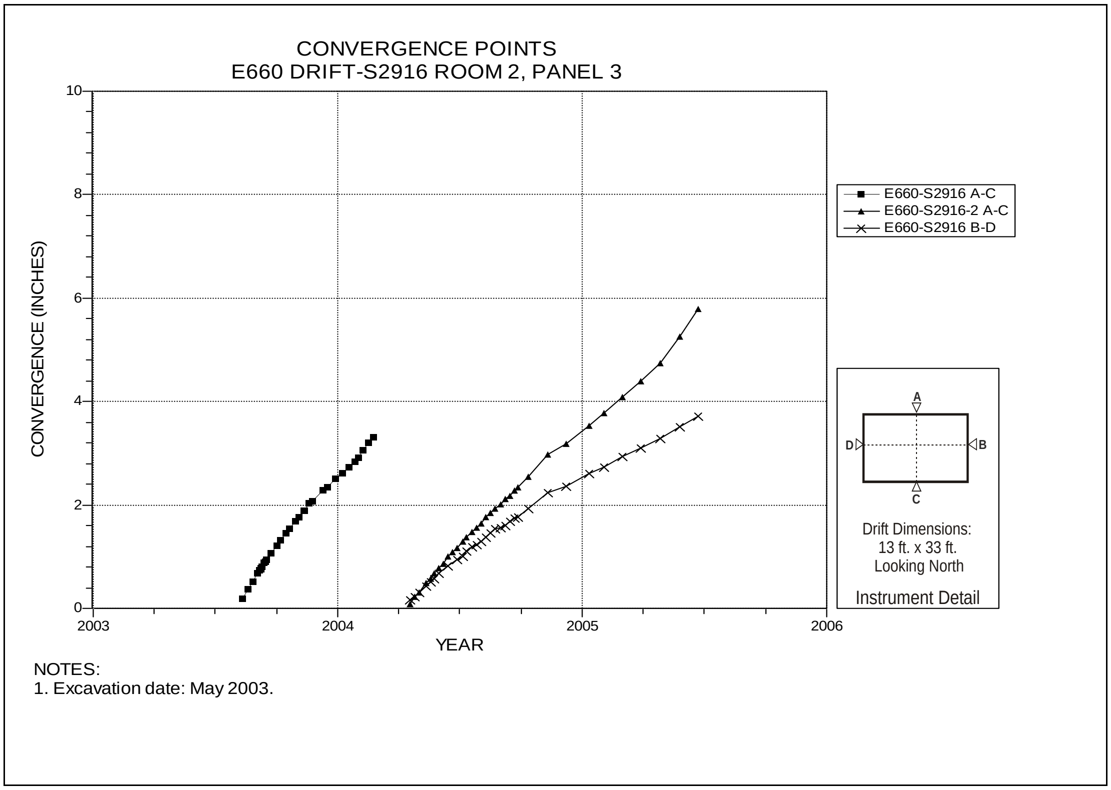


Figure 6-89 Convergence Point Array
Room 2, Panel 3 at S2916 – Room Center – All Chords

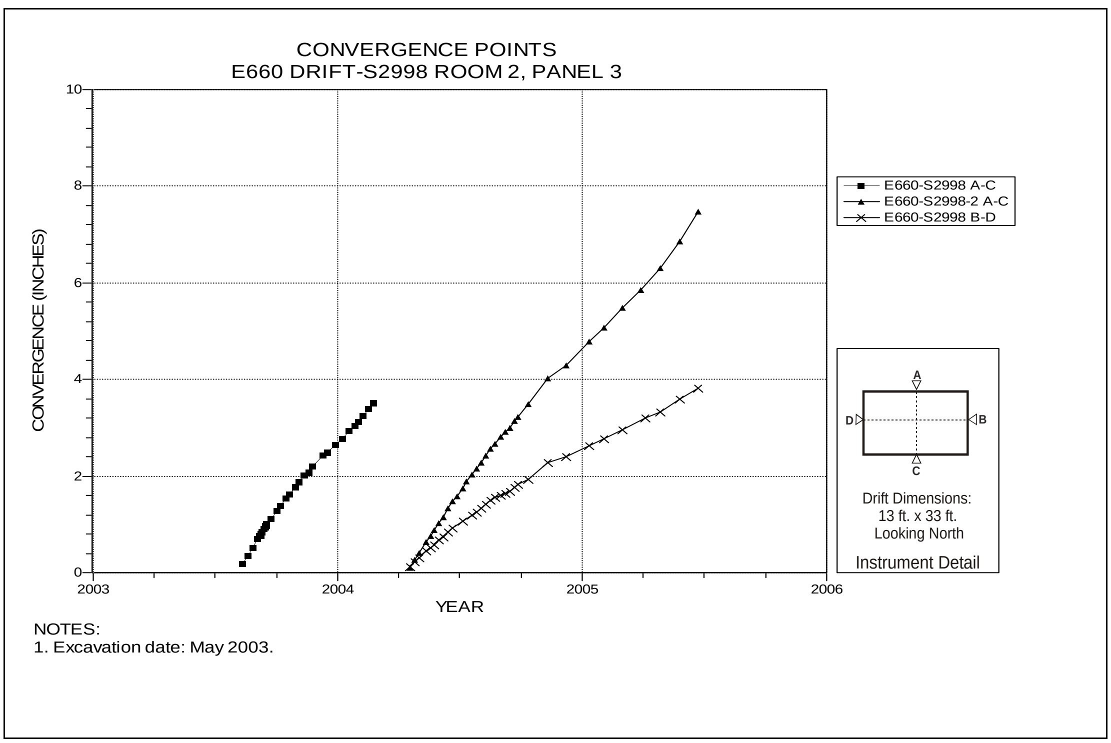


Figure 6-90 Convergence Point Array
Room 2, Panel 3 at S2998 – All Chords

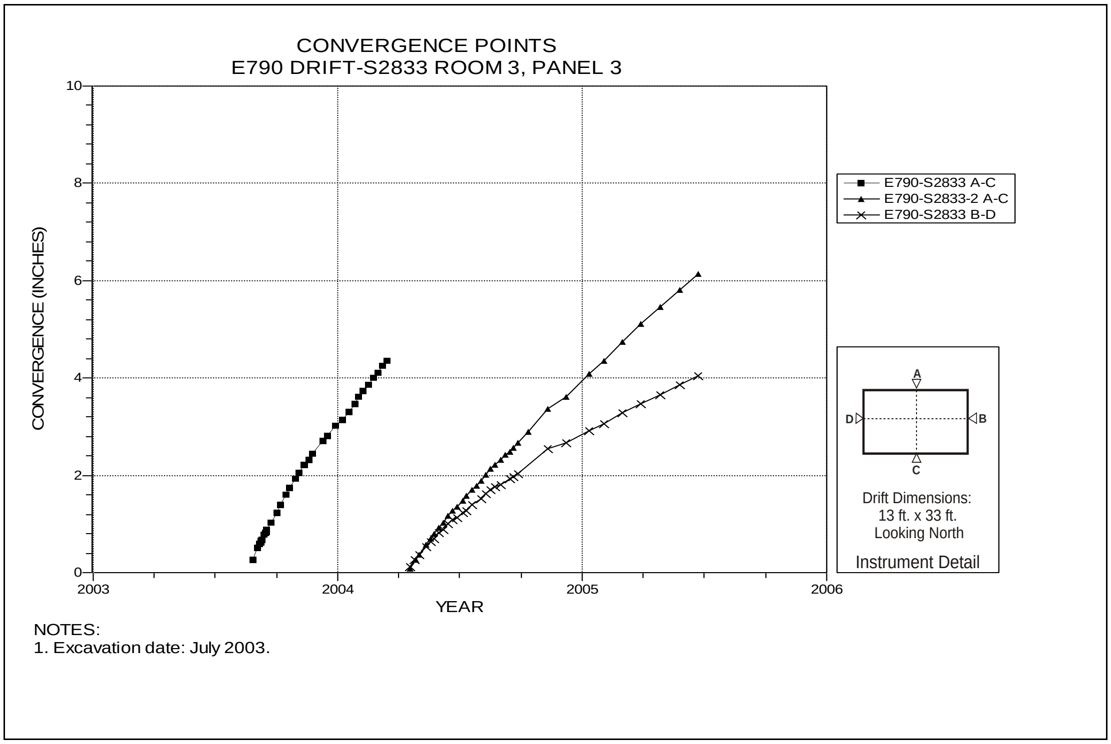


Figure 6-91 Convergence Point Array
Room 3, Panel 3 at S2833 – All Chords

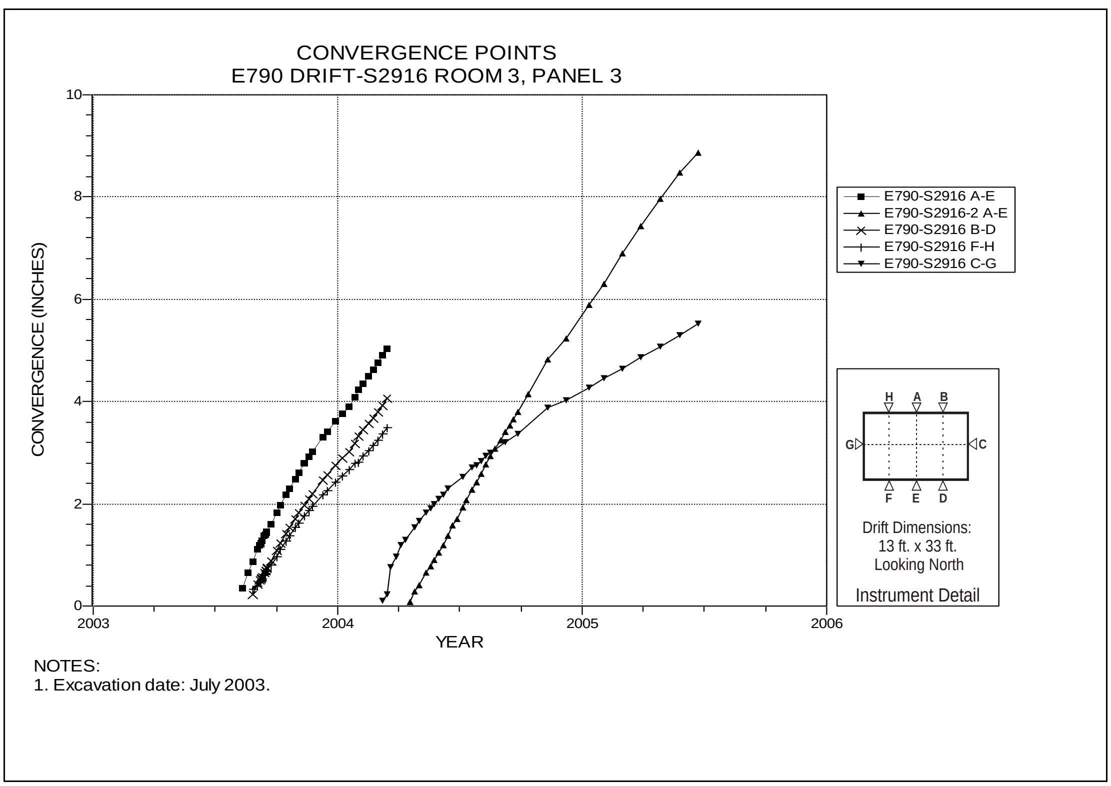


Figure 6-92 Convergence Point Array
Room 3, Panel 3 at S2916 – Room Center – All Chords

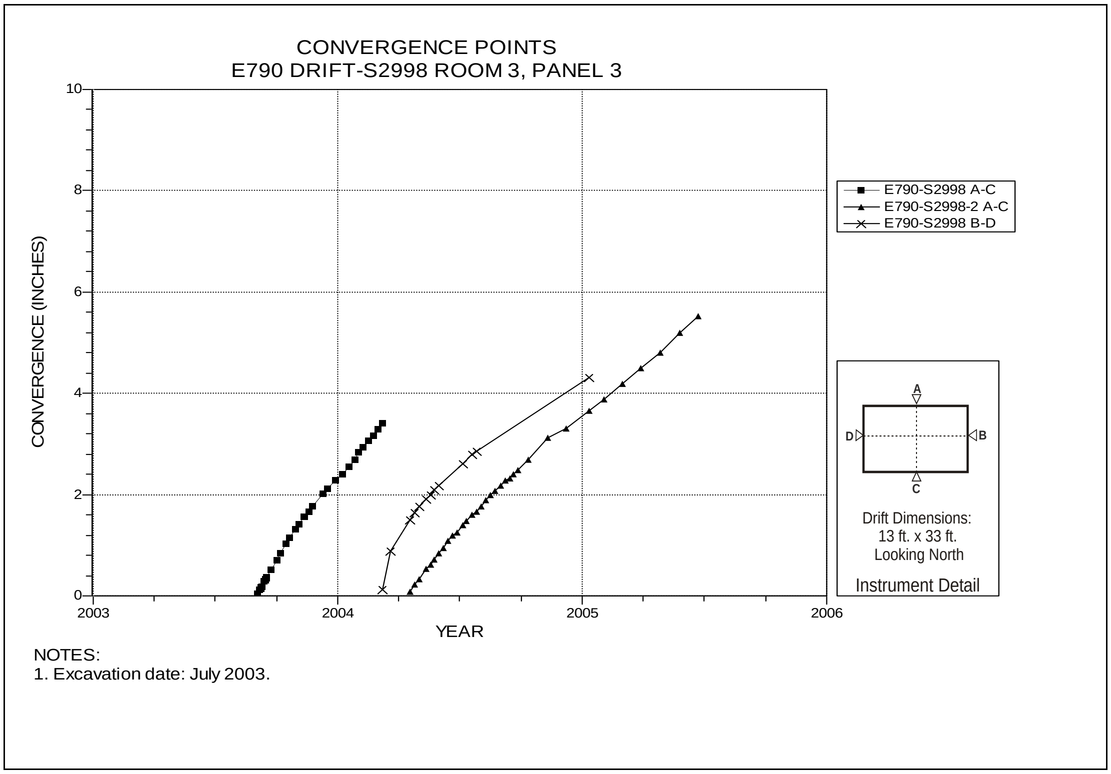


Figure 6-93 Convergence Point Array
Room 3, Panel 3 at S2998 – All Chords

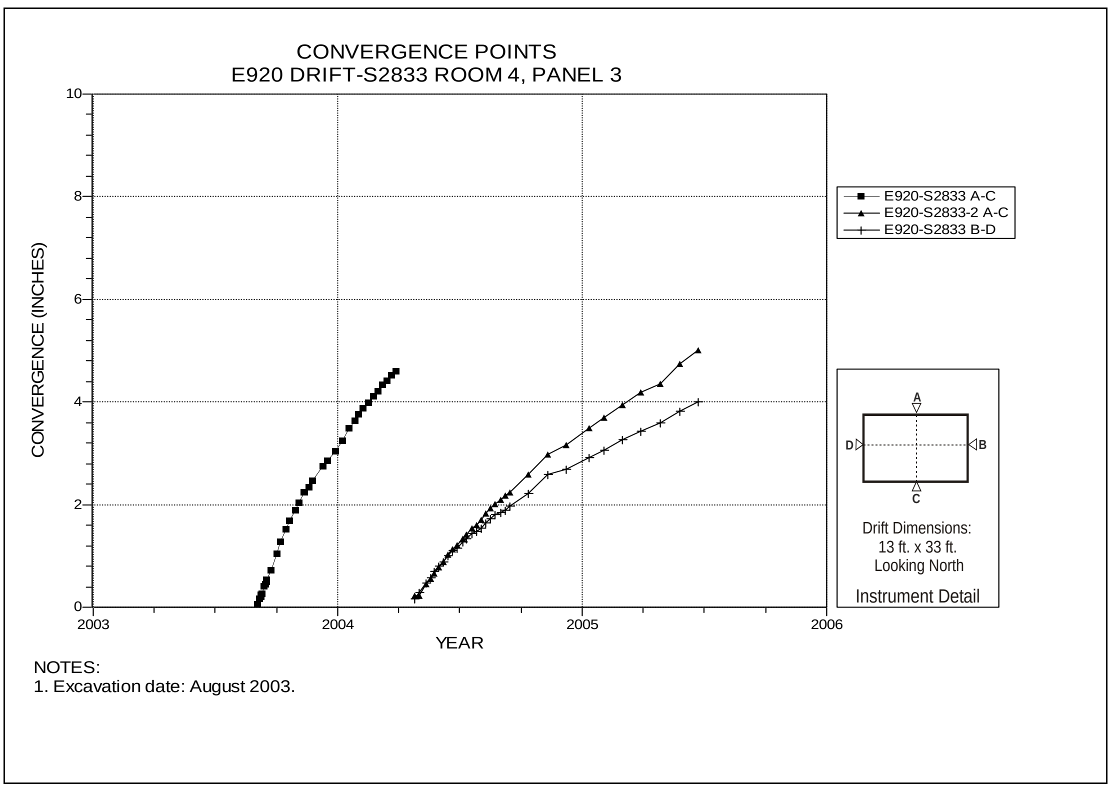


Figure 6-94 Convergence Point Array
Room 4, Panel 3 at S2833 – All Chords

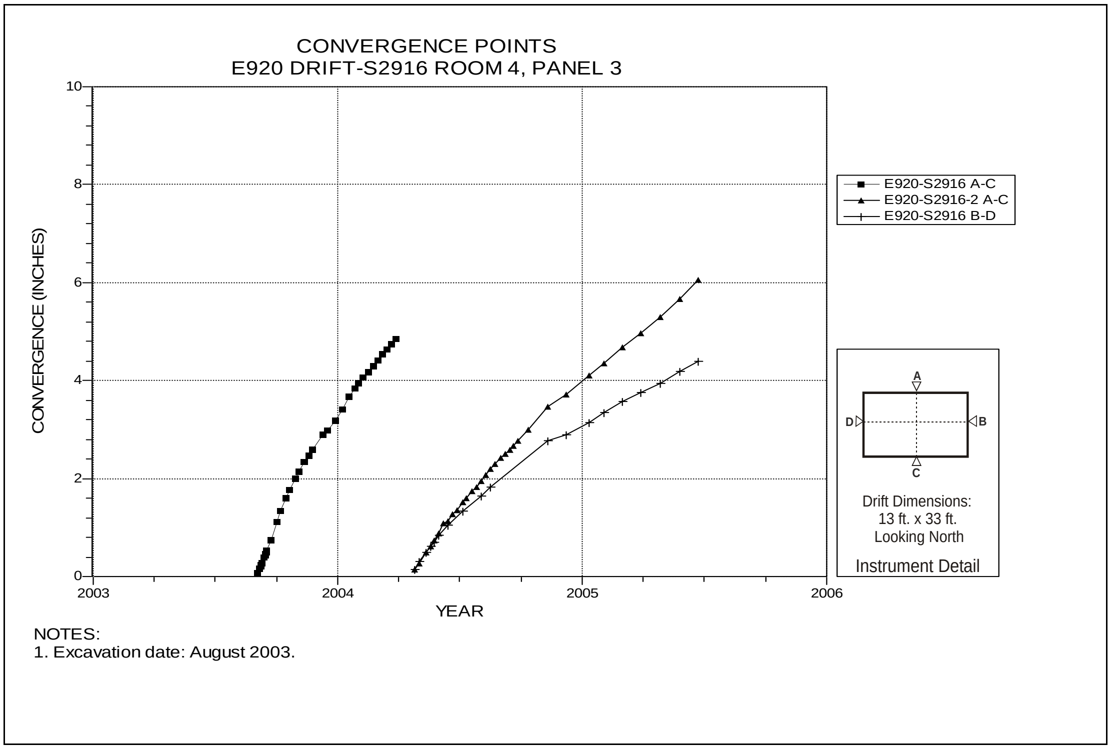


Figure 6-95 Convergence Point Array
Room 4, Panel 3 at S2916 – Room Center – All Chords

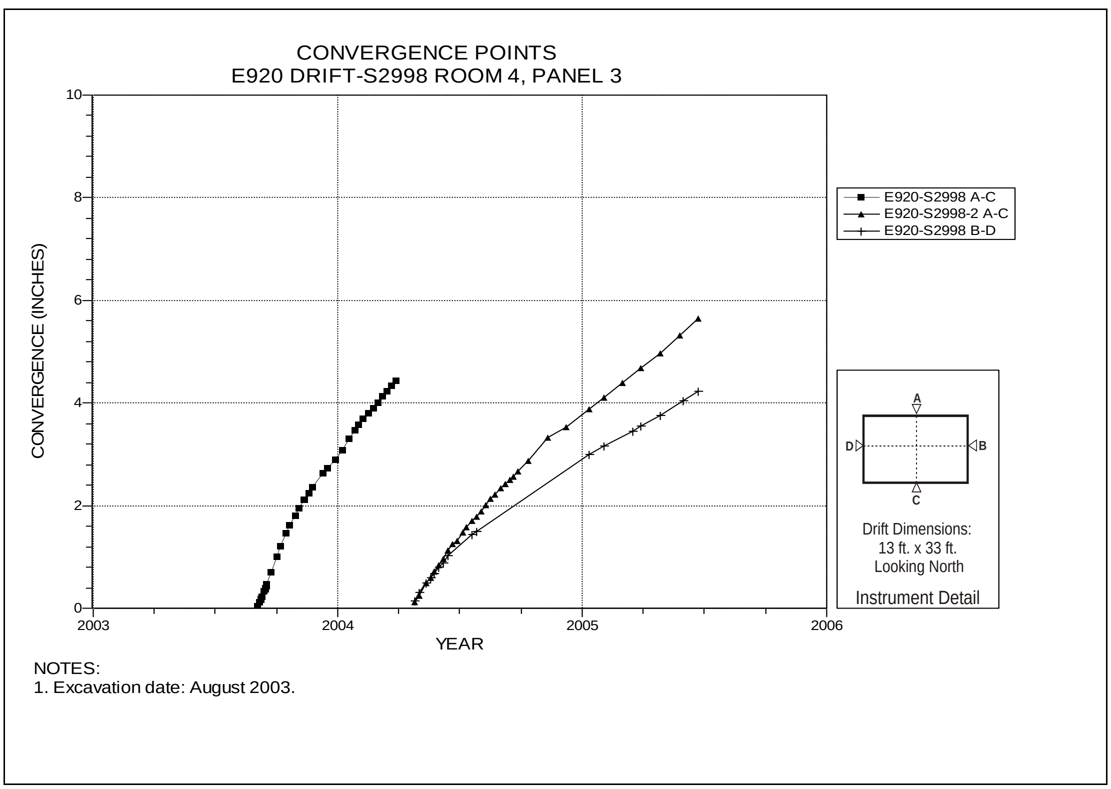


Figure 6-96 Convergence Point Array
Room 4, Panel 3 at S2998 – All Chords

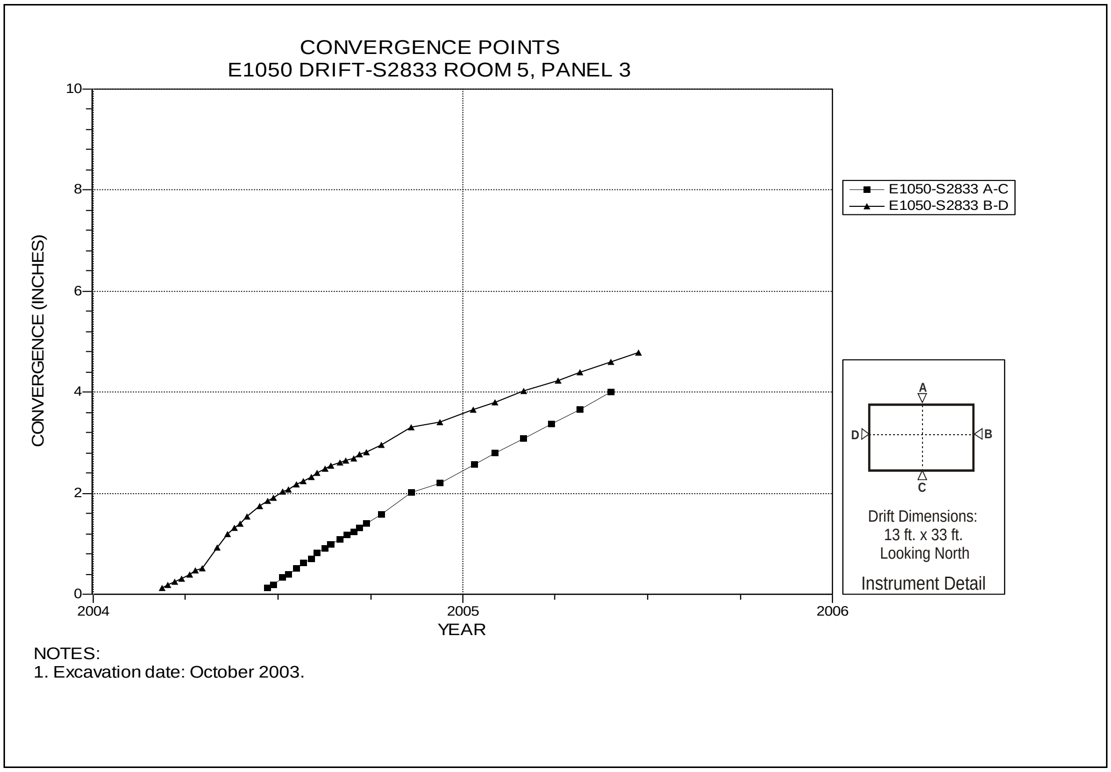


Figure 6-97 Convergence Point Array
Room 5, Panel 3 at S2833 – All Chords

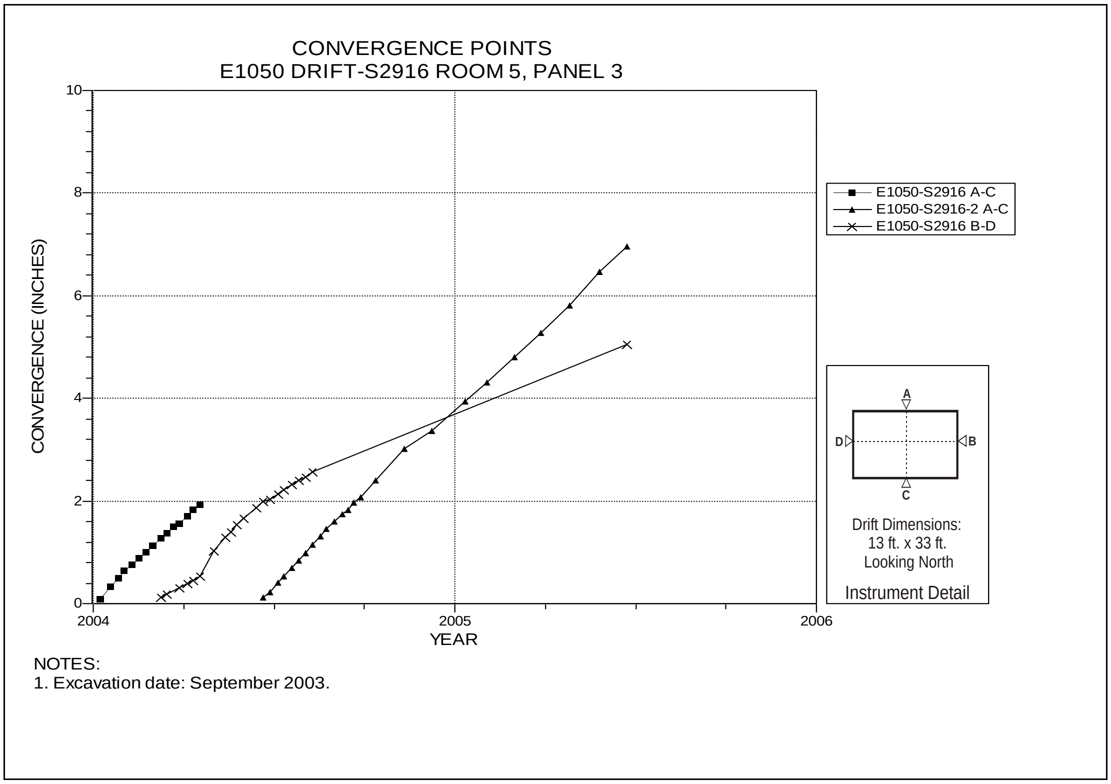


Figure 6-98 Convergence Point Array
Room 5, Panel 3 at S2916 – Room Center – All Chords

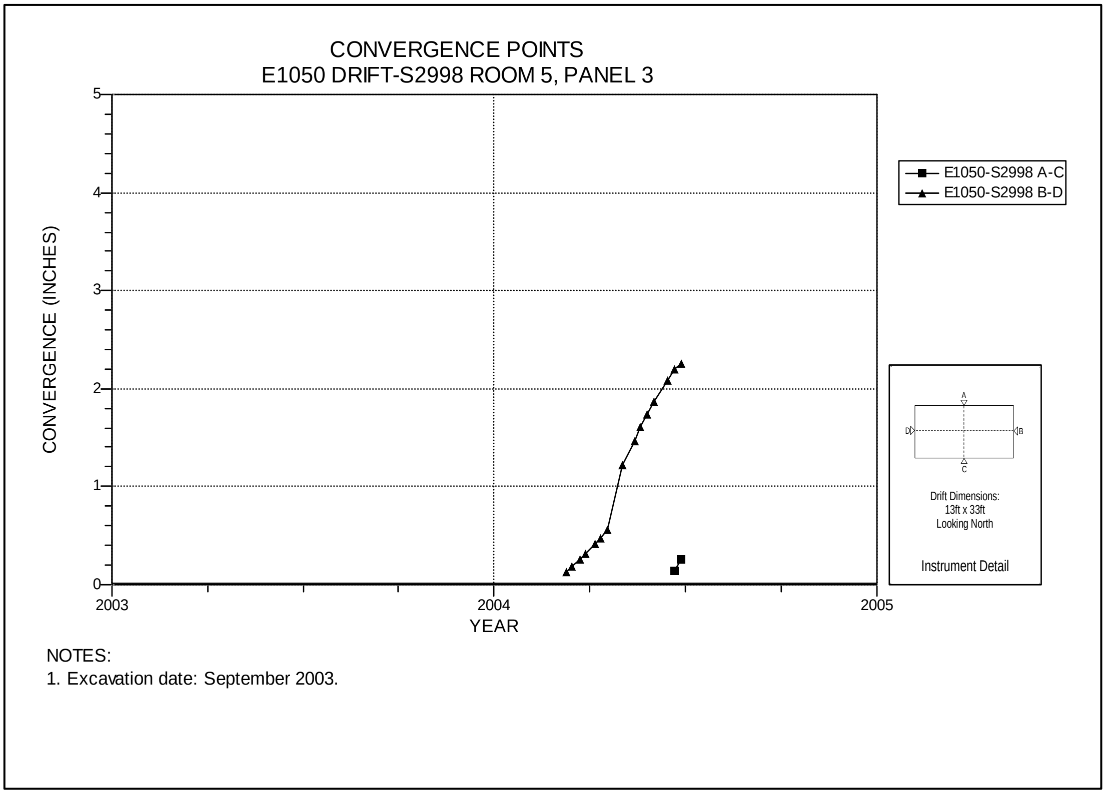


Figure 6-99 Convergence Point Array
Room 5, Panel 3 at S2998 – All Chords

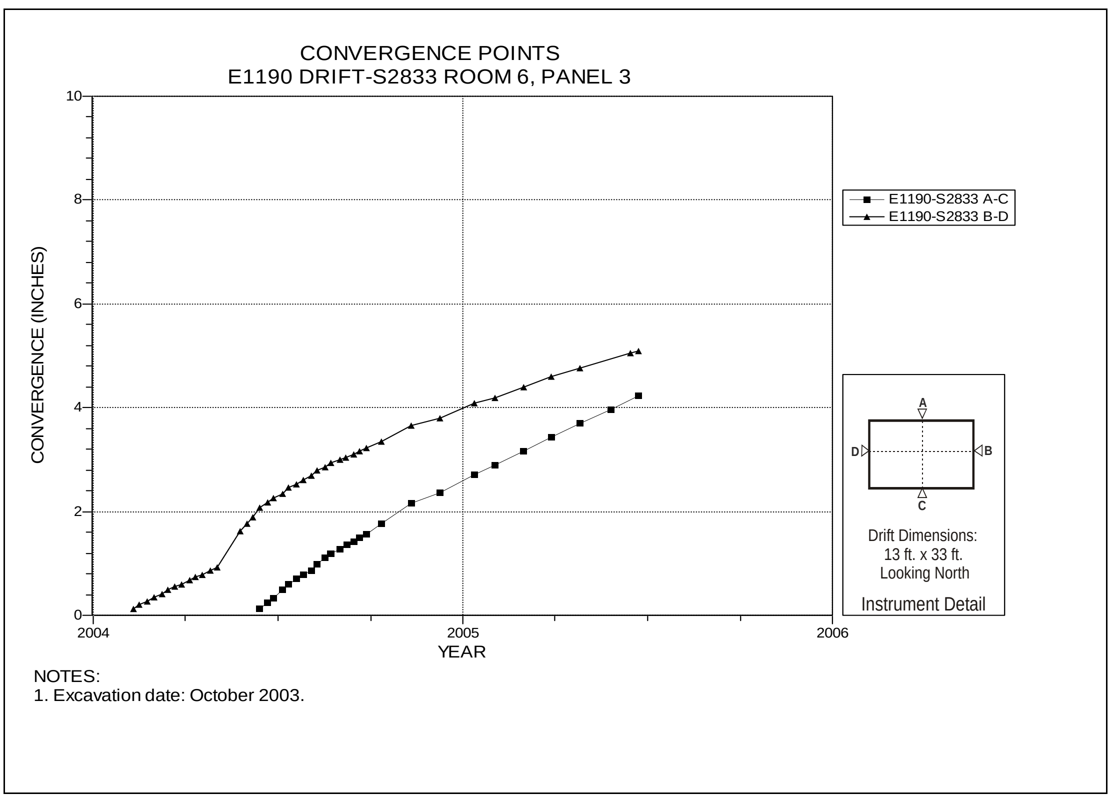


Figure 6-100 Convergence Point Array
Room 6, Panel 3 at S2833 – All Chords

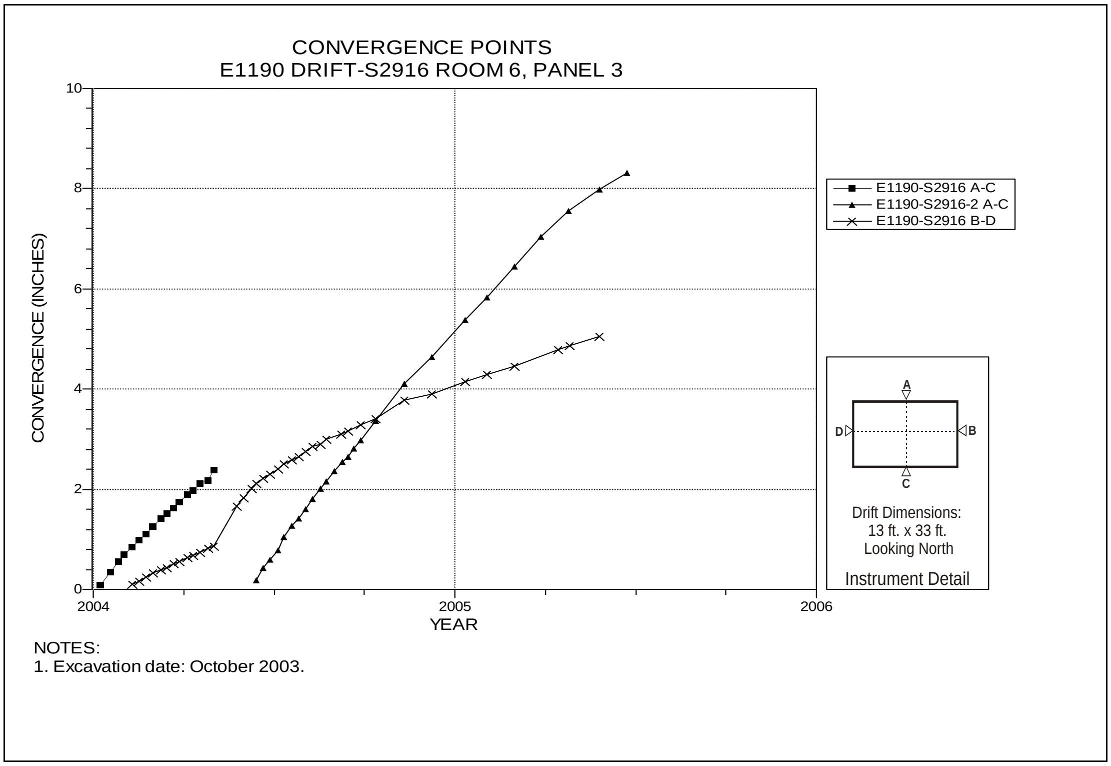


Figure 6-101 Convergence Point Array
Room 6, Panel 3 at S2916 – Room Center – All Chords

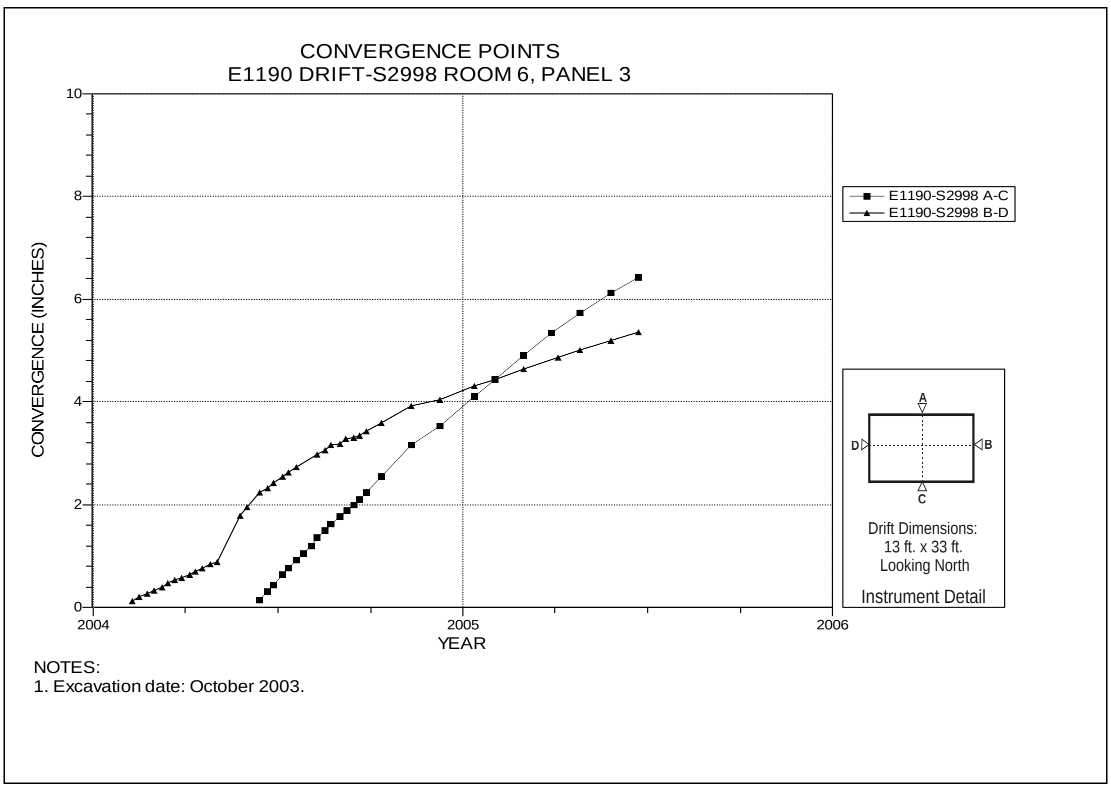


Figure 6-102 Convergence Point Array
Room 6, Panel 3 at S2998 – All Chords

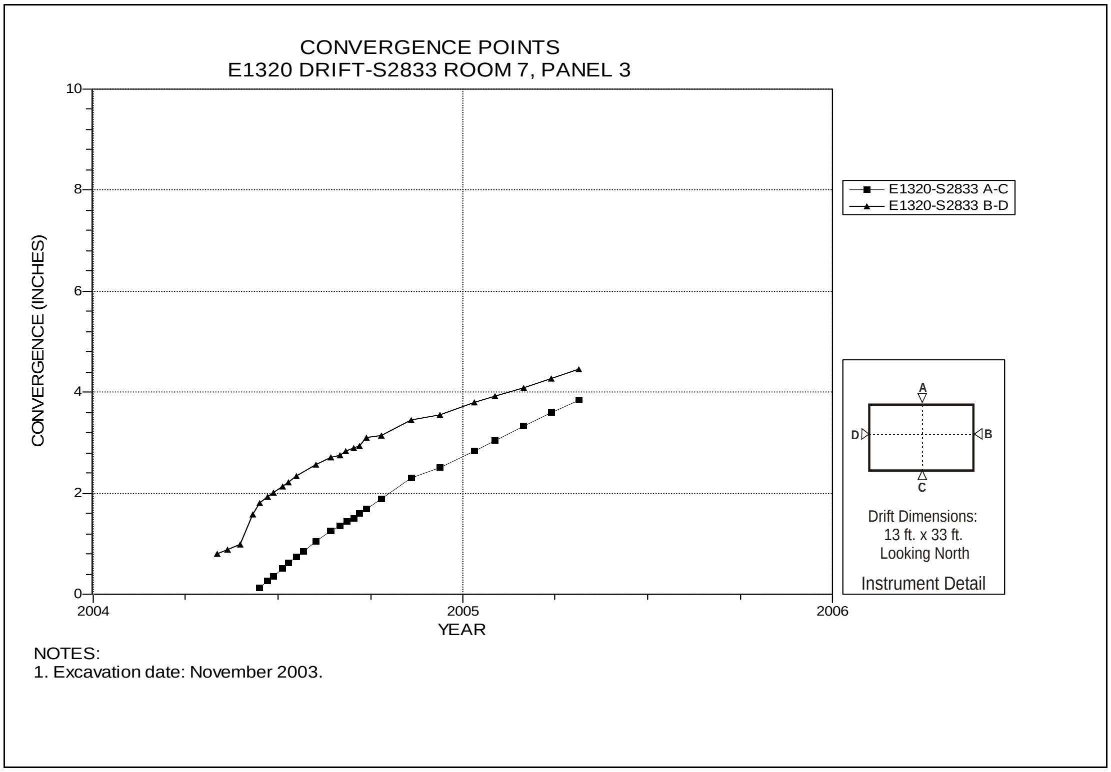


Figure 6-103 Convergence Point Array
Room 7, Panel 3 at S2833 – All Chords

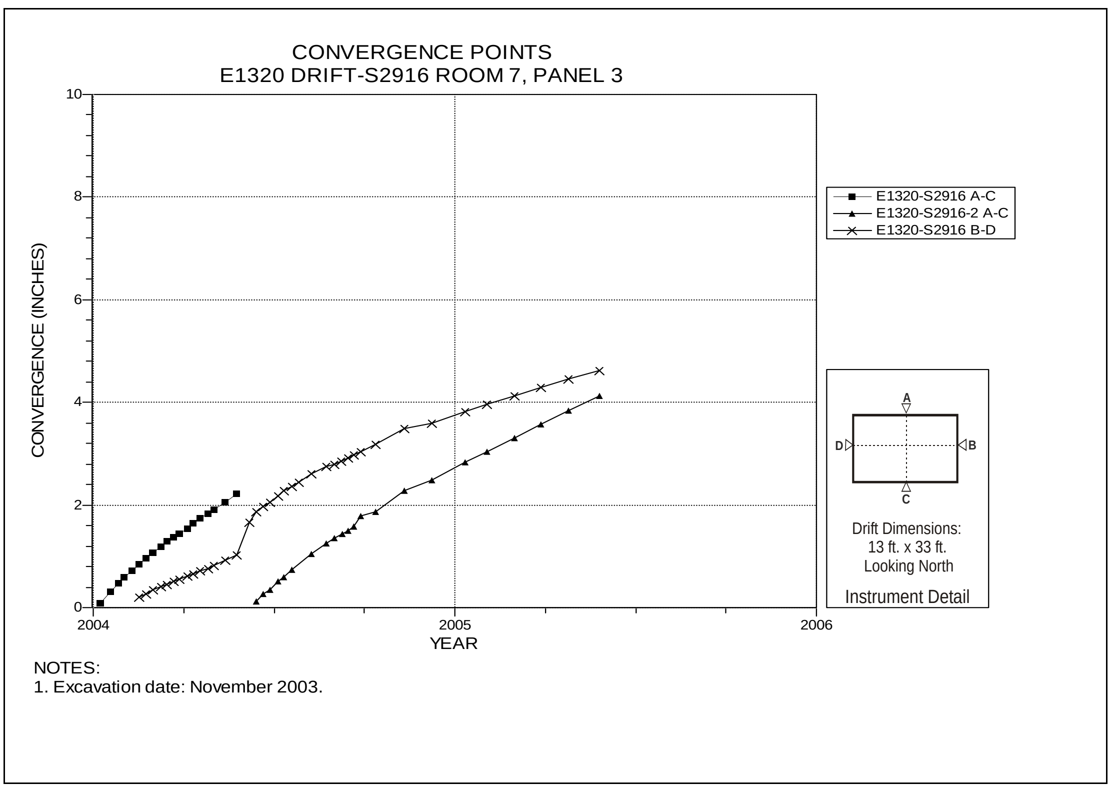
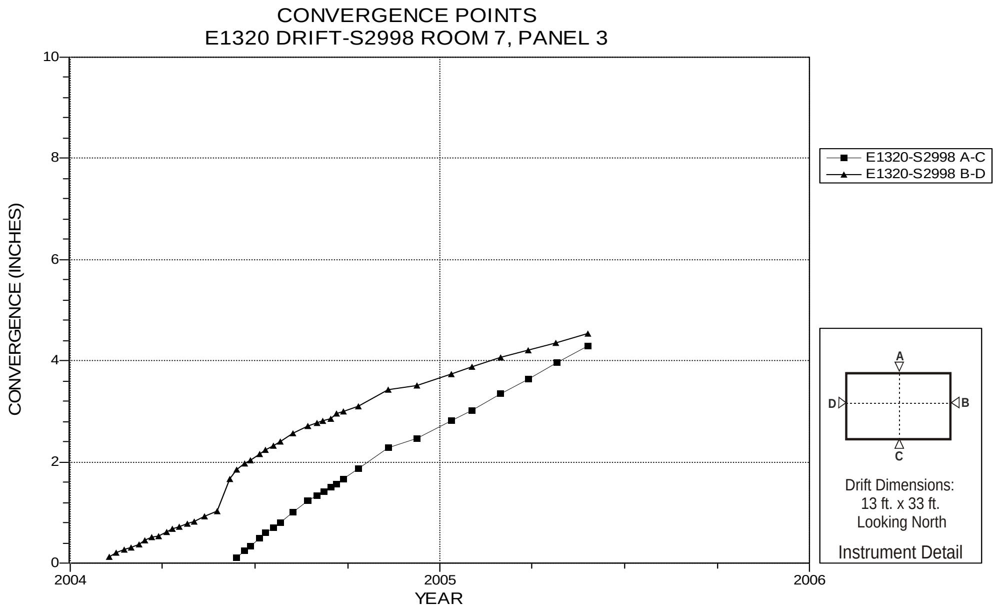


Figure 6-104 Convergence Point Array
Room 7, Panel 3 at S2916 – Room Center – All Chords



NOTES:
1. Excavation date: November 2003.

Figure 6-105 Convergence Point Array
Room 7, Panel 3 at S2998 – All Chords

Table 6-4
Panel 4 Data Analysis

EXTENSOMETER

Field Tag	Location	Figure Number	Date of Last Reading	Collar Displacement Relative to Deepest Anchor (inches)	Displacement Rate 2004 to 2005 in/year	Displacement Rate 2003 to 2004 in/year	Rate Change Percent [A]	Comments
51X-GE-00500	PANEL 4 ROOM 1 CENTER ROOF	6-106	06/28/05	0.792	5.362	N/A	N/A	Installed May 2005.

[A] NA Indicates insufficient data to compare annualized rates.

ROCKBOLT LOAD CELL

Field Tag	Location	Figure Number	Date of Initial Reading	Date of Last Reading	Load (kips)	Comments
51X-WG-00301	E520 DRIFT-S3480	6-107	03/14/05	06/28/05	14.255	

CONVERGENCE POINTS

Field Tag	Location	Figure Number	Last Reading 2004 to 2005		Cumulative Displacement Inches	Closure Rate 2004 to 2005 in/year	Closure Rate 2003 to 2004 in/year	Rate Change Percent[A]	Comments
			Date	Inches					
S3310-E410 A-C	S3310 DRIFT-E410	6-108	06/28/05	0.247	0.247	4.33	N/A	N/A	New installation.
S3310-E520 A-C	S3310 DRIFT-E520	6-109	06/30/05	0.607	0.607	N/A	N/A	N/A	New installation.
S3310-E590 A-C	S3310 DRIFT-E590	6-110	06/28/05	0.821	0.821	13.64	N/A	N/A	New installation.
S3310-E660 A-C	S3310 DRIFT-E660	6-111	06/28/05	1.677	1.677	N/A	N/A	N/A	New installation.
S3310-E920 A-C	S3310 DRIFT-E920	6-112	06/28/05	1.607	1.607	7.88	N/A	N/A	New installation.
E520-S3395 A-C	E520 DRIFT-S3395	6-113	06/28/05	2.683	2.683	13.04	N/A	N/A	New installation.
E520-S3395 B-D	E520 DRIFT-S3395	6-113	05/31/05	2.233	2.233	19.74	N/A	N/A	New installation.
E520-S3480 A-C	E520 DRIFT-S3480	6-114	06/28/05	2.932	2.932	14.71	N/A	N/A	New installation.
E520-S3480 B-D	E520 DRIFT-S3480	6-114	05/10/05	0.707	0.707	10.78	N/A	N/A	New installation.
E520-S3565 A-C	E520 DRIFT-S3565	6-115	06/28/05	2.837	2.837	14.51	N/A	N/A	New installation.
E520-S3565 B-D	E520 DRIFT-S3565	6-115	05/03/05	0.440	0.440	9.55	N/A	N/A	New installation.

[A] NA Indicates insufficient data to compare annualized rates.

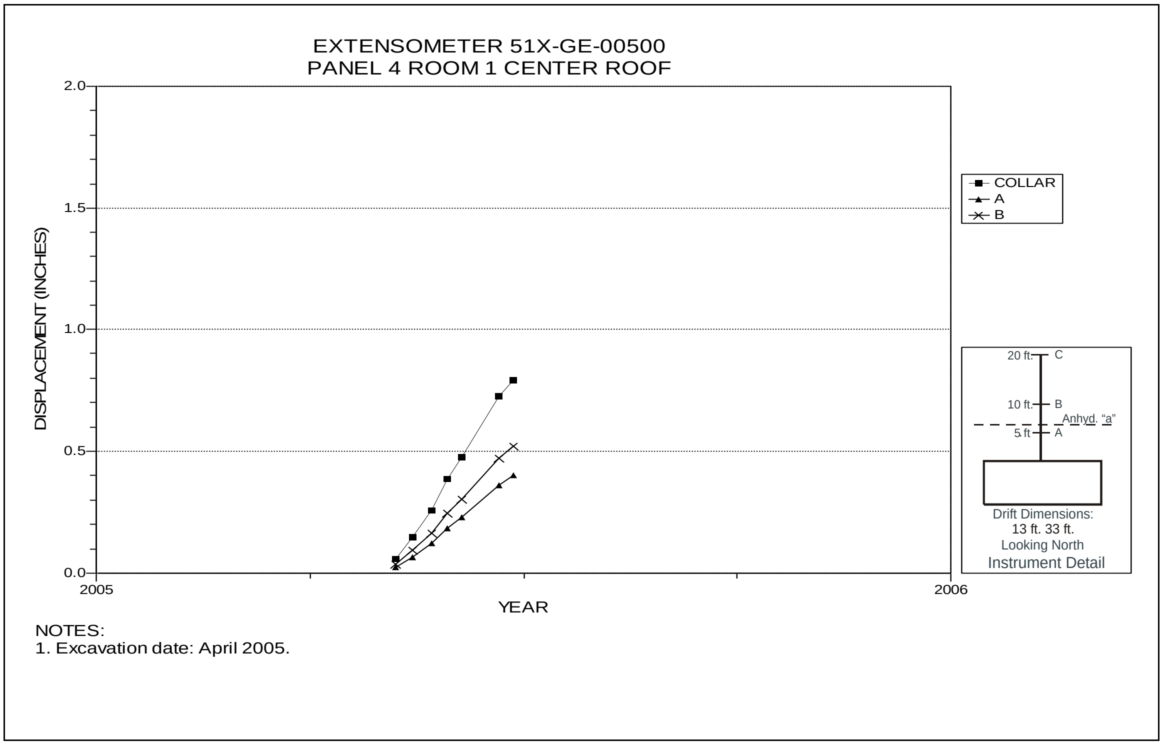


Figure 6-106 Extensometer 51X-GE-00500
Room 1, Panel 4 – Room Center – Roof

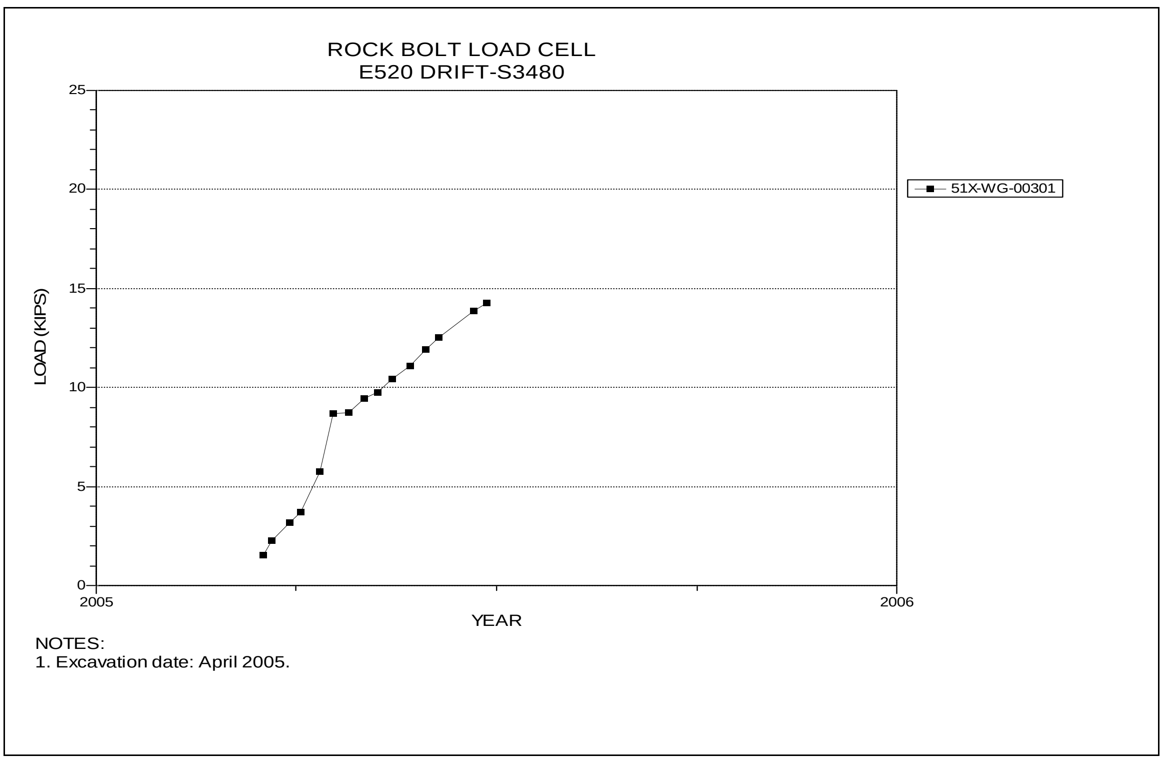


Figure 6-107 Rock Bolt Load Cell
Room 1, Panel 4

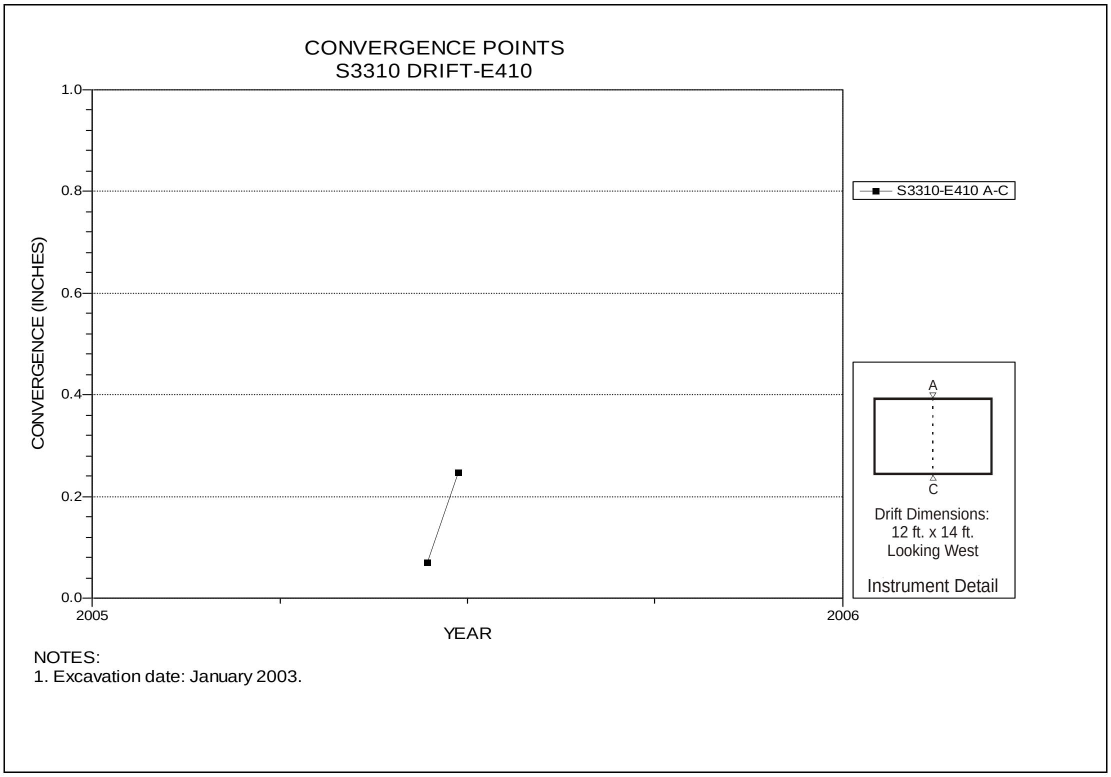


Figure 6-108 Convergence Point Array
S3310 Drift at E410 – Roof to Floor

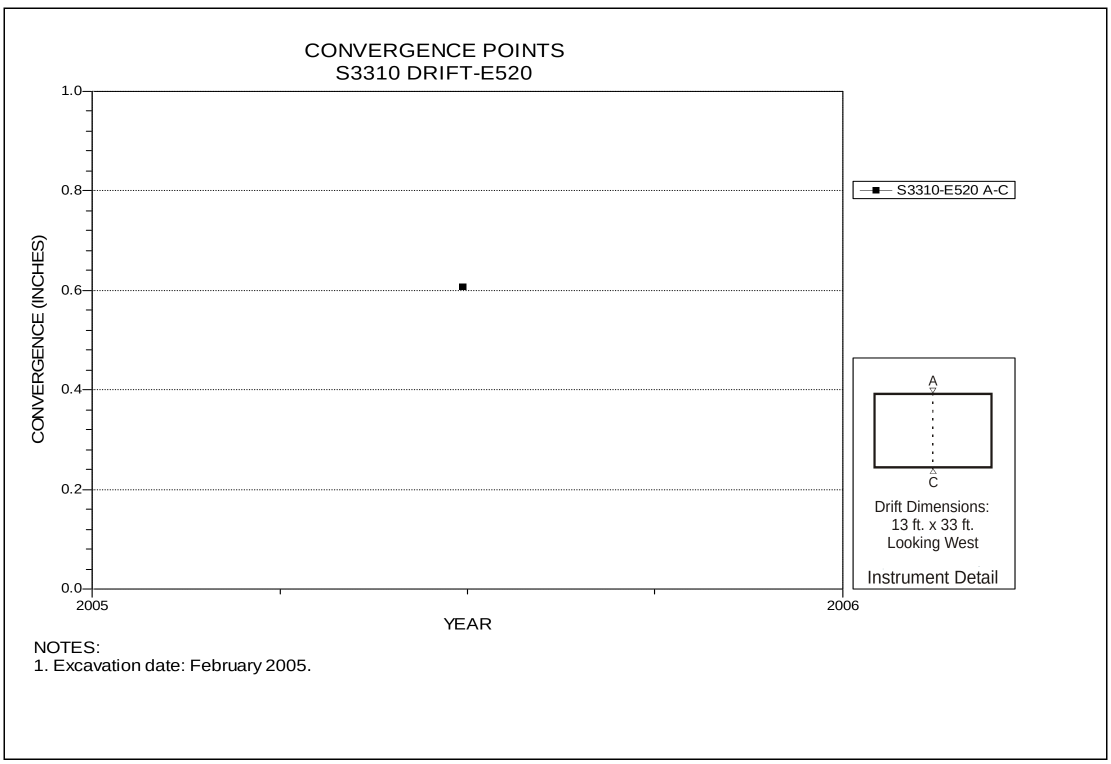


Figure 6-109 Convergence Point Array
S3310 Drift at E520 Drift Intersection (Room 1, Panel 4) – Roof to Floor

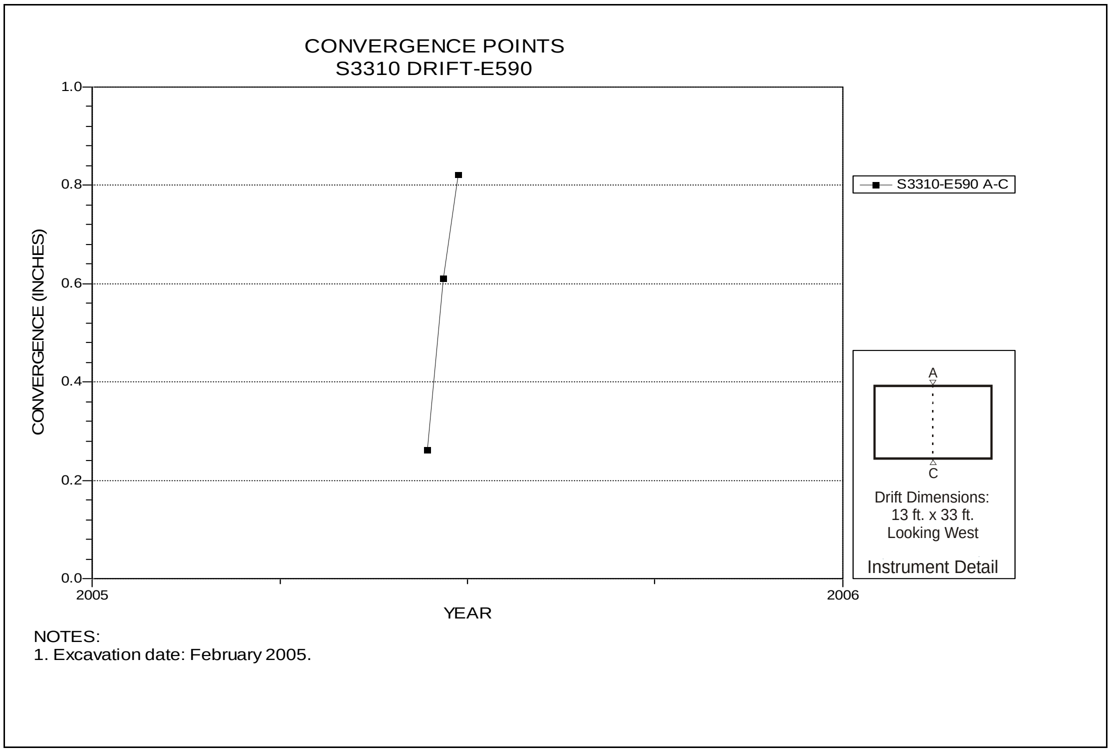


Figure 6-110 Convergence Point Array
S3310 Drift at E590 – Roof to Floor

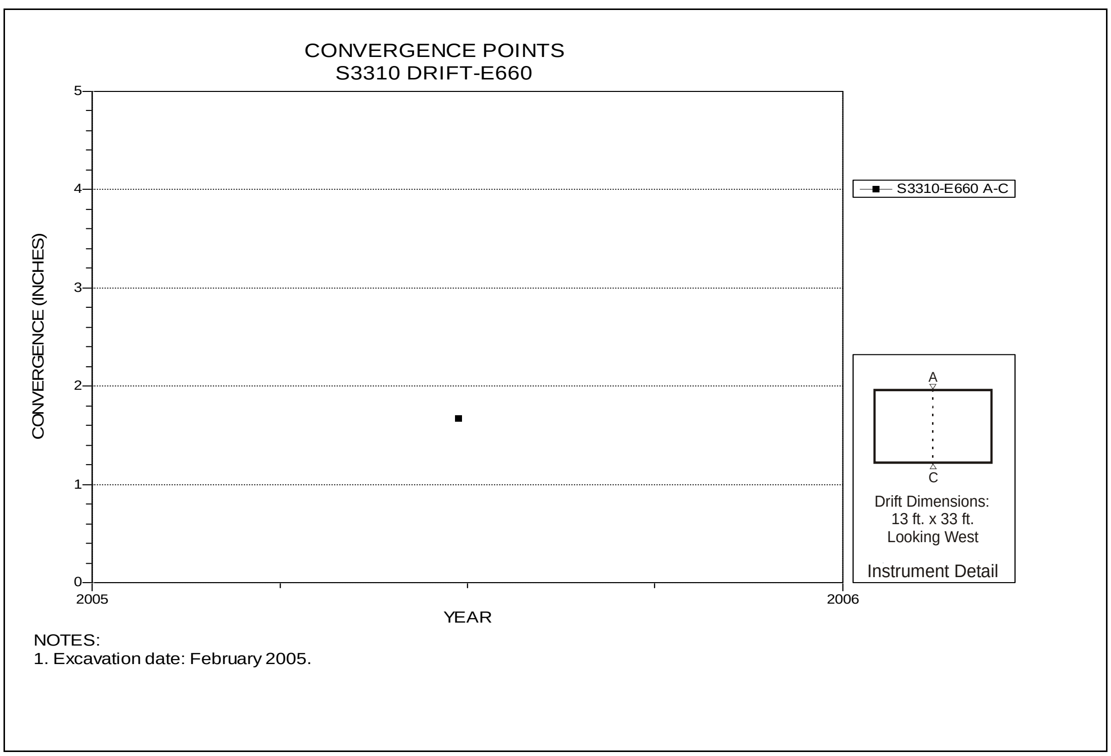


Figure 6-111 Convergence Point Array
S3310 Drift at E660 Drift – Roof to Floor

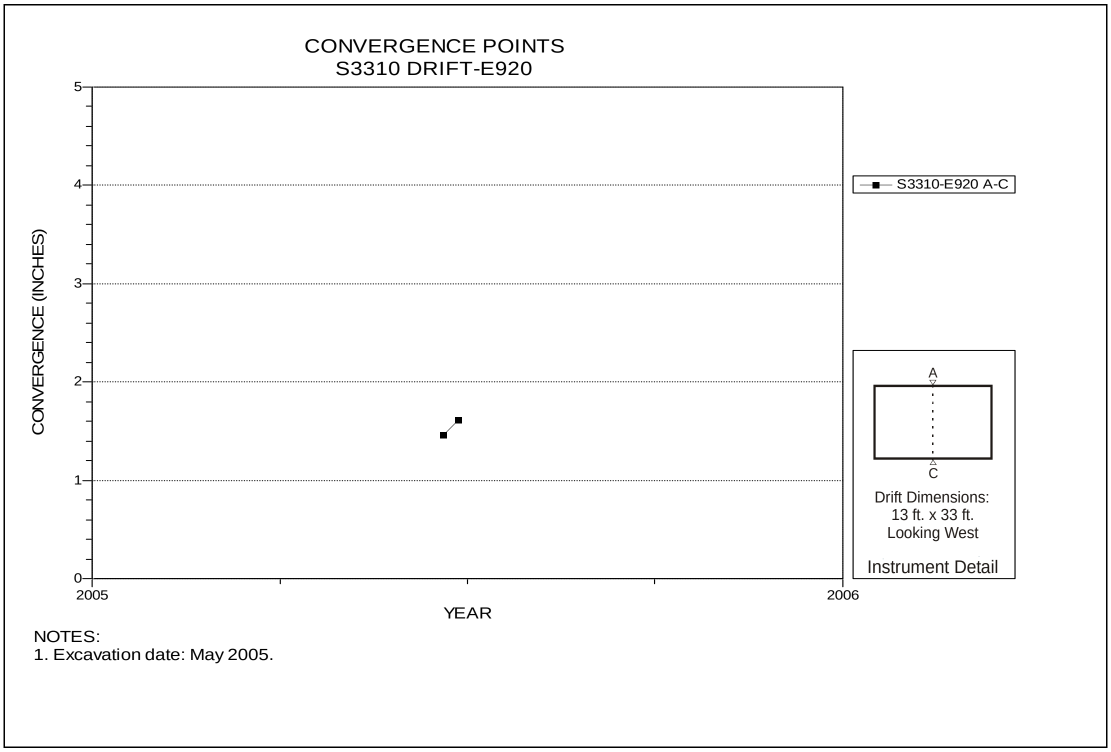


Figure 6-112 Convergence Point Array
S3310 Drift at E920 – Roof to Floor

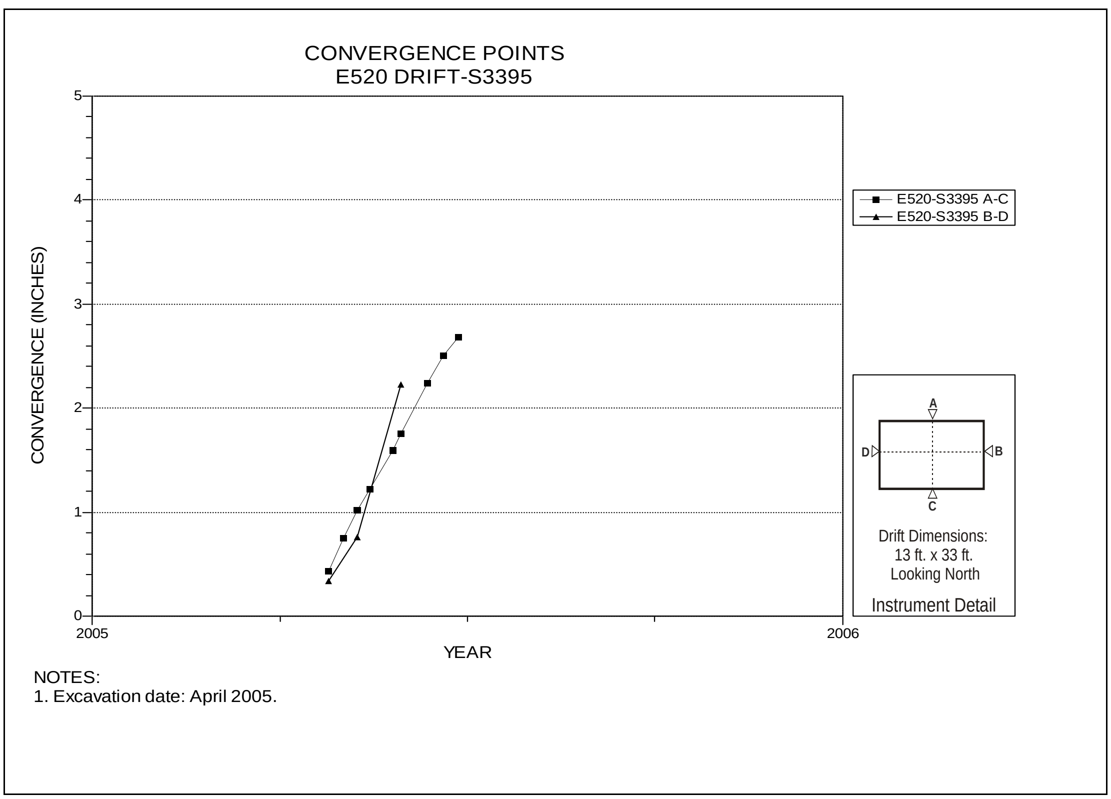


Figure 6-113 Convergence Point Array
Room 1, Panel 4 at S3395 Drift – All Chords

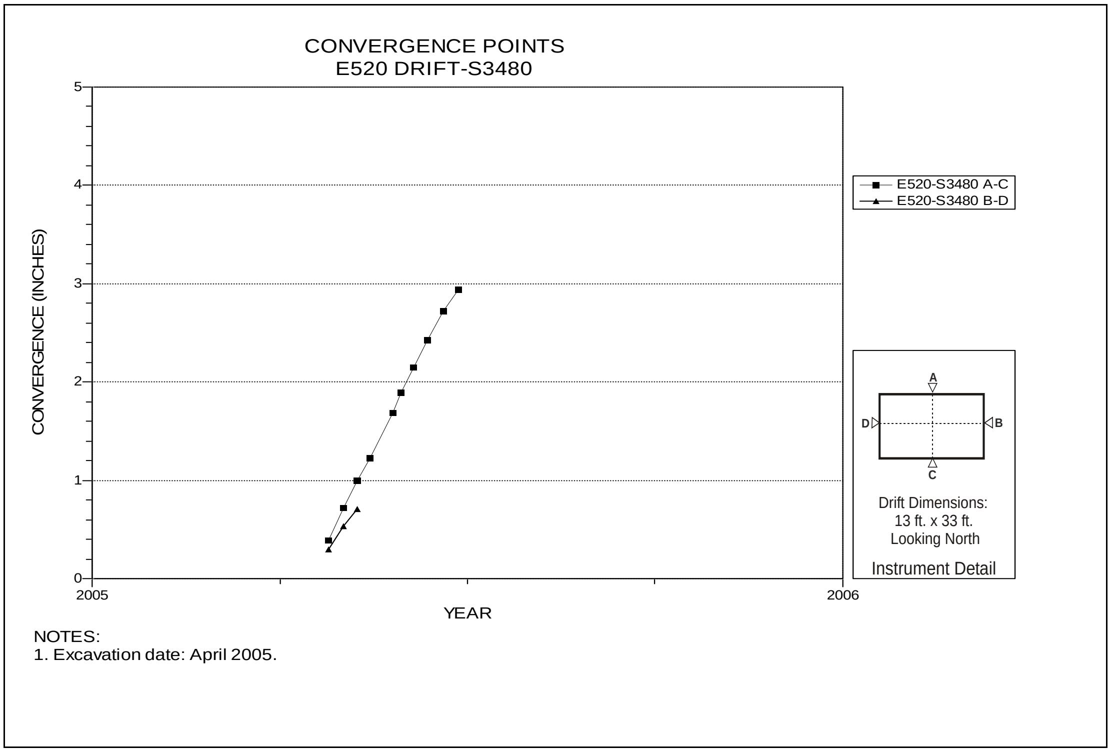


Figure 6-114 Convergence Point Array
Room 1, Panel 4 at S3480 Drift – All Chords

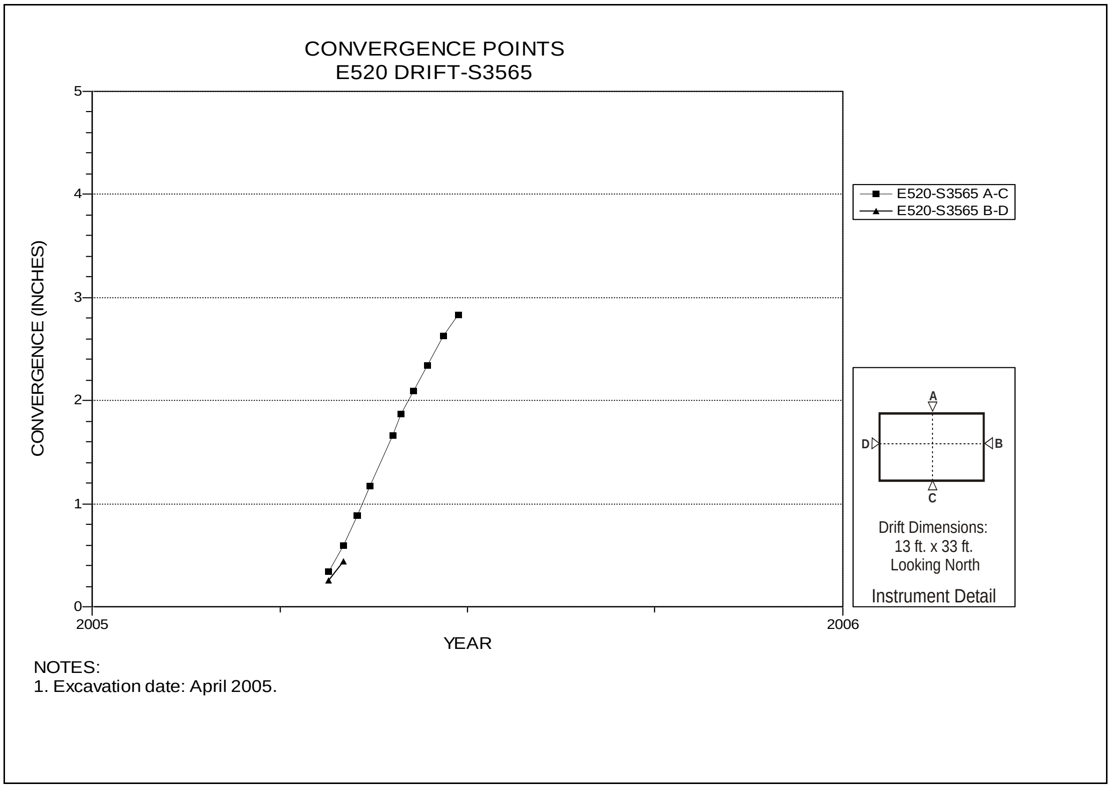


Figure 6-115 Convergence Point Array
Room 1, Panel 4 at S3565 Drift – All Chords

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7.0 Geoscience Program Supporting Data

This chapter presents supporting data acquired as part of the Geoscience Program. It includes observations of clay seam displacements and other features in vertical observation holes, and fracture maps of excavation surfaces.

7.1 Borehole Inspections

This section presents a summary of the clay seam displacements (offsets) and fracture densities measured in observation boreholes located through the WIPP underground facility. Relative lateral displacement of rock strata above and below a clay layer is measured as offset within a borehole. Fracture density is a calculated parameter based on the number of fractures (separations) and fracture zones observed in an observation borehole. Fracture density is calculated to be the number of fractures plus twice the number of fracture zones in a roof beam divided by the thickness of the beam (in feet). Table 7-1 presents the observed offset data for boreholes, the observed fractures and fracture zones, and the calculated fracture densities. Table 7-2 is a summary of new boreholes drilled during this reporting period.

7.2 Fracture Mapping

This section presents graphical results of the fracture mapping done in Panels 2 and 3 of the Waste Disposal Area. Figures 7-1 through 7-17 are plan view fracture maps for the roof in these panels.

7.3 Stratigraphic Mapping

This section presents graphical results of stratigraphic mapping performed in Panel 3 of the Waste Disposal Area. Figures 7-18 through 7-30 are plan view stratigraphic maps for the north rib in S2750, the east rib in Rooms 1-7 and the south rib in S3080.

Table 7-1
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 Room 1													
OH 401	S 2832	E 521	08/06/03	06/15/05			6.1	Offset		6.1	0.25	3.00	8	0.13
					1	0	6.1	Clay H	0.16	6.1	0.25		N/A	N/A
							5.5	Separation		5.5	0.13		N/A	N/A
OH 401-1	S 2830	E 520	02/14/05	02/14/05	1	0	6.0	Clay H	0.17	6.0	0.50	3.00	N/A	N/A
							5.8	Separation		5.8	0.38		N/A	N/A
OH 402	S 2910	E 520	08/06/03	07/15/04			7.6	Separation		7.6	0.38	3.00	N/A	N/A
							6.4	Separation		6.4	0.13		N/A	N/A
					2	0	6.0	Clay H	0.33	6.0	0.75		N/A	N/A
							5.4	Separation		5.4	0.06		N/A	N/A
							1.6	Separation		1.6	1.00		N/A	N/A
OH 402-1	S 2910	E 515	06/09/04	06/15/05			7.4	Separation		7.4	0.13	3.00	N/A	N/A
							6.2	Offset		6.2	0.50		17	0.49
					3	0	6.2	Clay H	0.48	6.2	0.38		N/A	N/A
							5.6	Offset		5.6	0.38		13	0.37
							5.6	Separation		5.6	0.38		N/A	N/A
							1.4	Offset		1.4	0.38		13	0.37
							1.4	Separation		1.4	0.38		N/A	N/A
							0.5	Separation		0.5	0.50		N/A	N/A
OH 402-2	S 2910	E 525	06/09/04	06/15/05			7.6	Separation		7.6	0.25	3.00	N/A	N/A
							6.1	Offset		6.1	1.00		33	0.98
					2	0	6.1	Clay H	0.33	6.1	0.25		N/A	N/A
							2.5	Separation		2.5	0.25		N/A	N/A
							1.5	Offset		1.5	0.50		17	0.49
							1.5	Separation		1.5	2.50		N/A	N/A
OH 403	S 2998	E 520	06/09/04	06/15/05			6.8	Separation		6.8	0.38	3.00	N/A	N/A
					2	0	6.2	Clay H	0.32	6.2	1.00		N/A	N/A
							5.6	Separation		5.6	0.13		N/A	N/A
							1.8	Offset		1.8	0.13		4	0.12
							1.8	Separation		1.8	0.38		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam

[2] Number of fracture zones in immediate roof beam

[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 Room 2													
OH 404	S 2833	E 656	08/06/03	06/15/05			7.8	Separation		7.8	0.25	3.00	N/A	N/A
							6.0	Offset		6.0	0.75		25	0.40
					2	0	6.0	Clay H	0.33	6.0	0.38		N/A	N/A
							5.5	Offset		5.5	0.25		8	0.13
							5.5	Separation		5.5	0.25		N/A	N/A
							1.7	Offset		1.7	0.25		8	0.13
							1.7	Separation		1.7	1.13		N/A	N/A
OH 405	S 2916	E 657	08/06/03	06/15/05			5.8	Offset		5.8	0.38	3.00	13	0.20
					3	0	5.8	Clay H	0.52	5.8	0.75		N/A	N/A
							5.6	Separation		5.6	0.13		N/A	N/A
							5.2	Separation		5.2	0.13		N/A	N/A
							4.8	Hangup		4.8	N/A		N/A	N/A
							1.5	Separation		1.5	0.25		N/A	N/A
OH 406	S 2998	E 656	08/06/03	06/15/05			9.0	Rough Spot		9.0	N/A	3.00	N/A	N/A
							8.0	Separation		8.0	0.13		N/A	N/A
							7.0	Separation		7.0	0.25		N/A	N/A
							6.6	Offset		6.6	0.38		13	0.20
							6.6	Separation		6.6	0.38		N/A	N/A
							6.2	Offset		6.2	0.25		8	0.13
					3	0	6.2	Clay H	0.48	6.2	0.13		N/A	N/A
							5.8	Separation		5.8	0.13		N/A	N/A
							5.5	Separation		5.5	0.13		N/A	N/A
							2.0	Offset		2.0	0.25		8	0.13
							2.0	Separation		2.0	2.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 Room 3													
OH 407	S 2830	E 790	08/06/03	06/15/05			6.5	Separation		6.5	0.50	3.00	N/A	N/A
					1	0	6.0	Clay H	0.17	6.0	0.13		N/A	N/A
							1.8	Offset		1.8	0.13		4	0.07
							1.8	Separation		1.8	0.13		N/A	N/A
OH 408	S 2910	E 790	08/06/03	06/15/05			7.3	Separation		7.3	1.00	3.00	N/A	N/A
							7.1	Separation		7.1	0.13		N/A	N/A
							6.0	Offset		6.0	0.13		4	0.07
					5	0	6.0	Clay H	0.83	6.0	0.25		N/A	N/A
							5.8	Separation		5.8	0.25		N/A	N/A
							5.6	Separation		5.6	0.13		N/A	N/A
							5.4	Separation		5.4	0.25		N/A	N/A
							5.2	Separation		5.2	0.13		N/A	N/A
							1.9	Offset		1.9	0.13		4	0.07
							1.9	Separation		1.9	2.13		N/A	N/A
OH 409	S 2990	E 790	08/06/03	06/15/05			7.6	Offset		7.6	0.13	3.00	4	0.07
							7.6	Separation		7.6	0.25		N/A	N/A
							6.1	Offset		6.1	0.13		4	0.07
					1	0	6.1	Clay H	0.16	6.1	0.13		N/A	N/A
							2.0	Separation		2.0	0.13		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 Room 4													
OH 410	S 2835	E 924	09/04/03	06/15/05			6.9	Separation		6.9	0.13	3.00	N/A	N/A
							6.5	Offset		6.5	1.00		33	0.56
							6.5	Separation		6.5	0.25		N/A	N/A
							6.3	Offset		6.3	0.38		13	0.21
					0	0	6.3	Clay H	0.00	6.3	0.13		N/A	N/A
OH 411	S 2910	E 920	09/04/03	06/15/05	3	0	6.0	Clay H	0.50	6.0	0.75	3.00	N/A	N/A
							5.9	Separation		5.9	0.13		N/A	N/A
							5.5	Offset		5.5	0.50		17	0.28
							5.5	Separation		5.5	0.13		N/A	N/A
							1.7	Offset		1.7	0.25		8	0.14
							1.7	Separation		1.7	0.50		N/A	N/A
OH 412	S 3014	E 923	09/04/03	06/15/05			7.7	Separation		7.7	0.13	3.00	N/A	N/A
							6.7	Separation		6.7	0.25		N/A	N/A
							6.1	Offset		6.1	0.25		8	0.14
					1	0	6.1	Clay H	0.16	6.1	0.38		N/A	N/A
							2.0	Separation		2.0	0.25		N/A	N/A
	Panel 3 Room 5													
OH 413	S 2830	E 1060	11/19/03	06/15/05			6.5	Offset		6.5	0.13	3.00	4	0.08
							6.5	Separation		6.5	0.50		N/A	N/A
							6.2	Offset		6.2	0.25		8	0.16
					1	0	6.2	Clay H	0.16	6.2	0.13		N/A	N/A
							1.4	Separation		1.4	0.25		N/A	N/A
OH 414	S 2910	E 1060	11/05/03	06/15/05			7.8	Separation		7.8	1.00	3.00	N/A	N/A
							7.1	Separation		7.1	0.13		N/A	N/A
							6.5	Offset		6.5	0.25		8	0.16
					2	0	6.5	Clay H	0.31	6.5	0.13		N/A	N/A
							5.7	Separation		5.7	0.13		N/A	N/A
							1.9	Offset		1.9	0.13		4	0.08
							1.9	Separation		1.9	1.25		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
Panel 3 Room 5 (continued)														
OH 415	S 2990	E 1060	11/05/03	06/15/05			7.8	Separation		7.8	1.00	3.00	N/A	N/A
							6.4	Offset		6.4	0.25		8	0.16
					1	0	6.4	Clay H	0.16	6.4	0.50		N/A	N/A
							2.0	Offset		2.0	0.13		4	0.08
							2.0	Separation		2.0	1.00		N/A	N/A
Panel 3 Room 6														
OH 416	S 2830	E 1190	11/19/03	06/13/05			6.1	Offset		6.1	0.13	3.00	4	0.08
					0	0	6.1	Clay H	0.00	6.1	0.13		N/A	N/A
							0.3	Rough Spot		0.3			N/A	N/A
OH 417	S 2910	E 1190	11/19/03	06/13/05			7.7	Separation		7.7	1.13	3.00	N/A	N/A
							6.7	Offset		6.7	0.13		4	0.08
							6.7	Separation		6.7	0.13		N/A	N/A
							5.8	Offset		5.8	0.13		4	0.08
					1	0	5.8	Clay H	0.17	5.8	0.25		N/A	N/A
							1.5	Offset		1.5	0.25		8	0.16
							1.5	Separation		1.5	2.75		N/A	N/A
							0.3	Rough Spot		0.3			N/A	N/A
OH 418	S 2990	E 1190	11/19/03	06/13/05			7.6	Separation		7.6	0.75	3.00	N/A	N/A
							6.6	Separation		6.6	0.25		N/A	N/A
							6.0	Offset		6.0	0.25		8	0.16
					2	0	6.0	Clay H	0.33	6.0	0.50	3.00	N/A	N/A
							2.5	Separation		2.5	0.25		N/A	N/A
							1.5	Offset		2.5	0.50		17	0.32
							1.5	Separation		1.5	0.75		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 Room 7													
OH 419	S 2832	E 1320	12/18/03	04/25/05	0	0	6.6	Separation	0.00	6.6	0.50	3.00	N/A	N/A
							5.9	Hangup		5.9			N/A	N/A
OH 420	S 2922	E 1321	12/18/03	04/25/05			7.7	Separation		7.7	0.13	3.00	N/A	N/A
					0	0	6.1	Clay H	0.00	6.1	0.25		N/A	N/A
OH 421	S 2998	E 1321	12/18/03	04/25/05	1	0	5.9	Hangup	0.17	5.9		3.00	N/A	N/A
							4.8	Offset		4.8	0.13		4	0.09
							4.8	Separation		4.8	0.13		N/A	N/A
	Panel 3 South 2750													
OH 438	S 2748	E 526	08/08/03	06/27/05			6.7	Separation		6.7	0.25	3.00	N/A	N/A
							5.6	Offset		5.6	2.00		67	1.06
					2	0	5.6	Clay H	0.36	5.6	0.13		N/A	N/A
							5.1	Offset		5.1	0.38		13	0.20
							5.1	Separation		5.1	0.38		N/A	N/A
							1.0	Offset		1.0	0.13		4	0.07
							1.0	Separation		1.0	0.50		N/A	N/A
OH 428	S 2748	E 654	08/06/03	06/27/05			6.0	Offset		6.0	2.50	3.00	83	1.32
					5	0	6.0	Clay H	0.83	6.0	0.25		N/A	N/A
							5.9	Separation		5.9	0.25		N/A	N/A
							5.6	Offset		5.6	0.38		13	0.20
							5.6	Separation		5.6	0.25		N/A	N/A
							5.4	Separation		5.4	0.13		N/A	N/A
							4.9	Separation		4.9	0.13		N/A	N/A
							1.5	Offset		1.5	0.13		4	0.07
							1.5	Separation		1.5	0.25		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 South 2750 (continued)													
OH 439	S 2750	E 789	08/08/03	06/27/05			7.9	Separation		7.9	0.50	3.00	N/A	N/A
							6.6	Offset		6.6	1.00		33	0.53
							6.6	Separation		6.6	1.25		N/A	N/A
					2	0	6.0	Clay H	0.33	6.0	0.13		N/A	N/A
							5.4	Separation		5.4	0.13		N/A	N/A
							1.5	Offset		1.5	0.50		17	0.26
							1.5	Separation		1.5	2.00		N/A	N/A
OH 429	S 2748	E 924	08/09/03	06/27/05			7.7	Offset		7.7	0.38	3.00	13	0.20
							7.7	Separation		7.7	1.25		N/A	N/A
							6.7	Offset		6.7	0.38		13	0.20
							6.7	Separation		6.7	0.38		N/A	N/A
					5	0	6.0	Clay H	0.83	6.0	0.13		N/A	N/A
							5.9	Separation		5.9	0.13		N/A	N/A
							5.7	Separation		5.7	0.13		N/A	N/A
							5.4	Offset		5.4	2.00		67	1.06
							5.4	Separation		5.4	0.13		N/A	N/A
							2.5	Offset		2.5	0.13		4	0.07
							2.5	Separation		2.5	2.25		N/A	N/A
							1.1	Offset		1.1	0.06		2	0.03
							1.0	Separation		1.1	0.13		N/A	N/A
OH 496	S 2750	E 977	02/05/04	06/13/05			8.2	Offset		8.2	0.25	3.00	8	0.18
							8.2	Separation		8.2	1.25		N/A	N/A
							6.9	Separation		6.9	1.00		N/A	N/A
							6.5	Offset		6.5	0.25		8	0.18
					1	0	6.5	Clay H	0.15	6.5	0.25		N/A	N/A
							1.0	Offset		1.0	1.00		33	0.74
							1.0	Separation		1.0	7.75		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 South 2750 (continued)													
OH 494	S 2750	E 990	01/13/04	06/13/05			7.5	Separation		7.5	0.75	3.00	N/A	N/A
							5.9	Offset		5.9	0.25		8	0.18
					4	0	5.9	Separation	0.68	5.9	0.25		N/A	N/A
							5.5	Separation		5.5	0.75		N/A	N/A
							5.1	Offset		5.1	0.25		8	0.18
							5.1	Separation		5.1	0.25		N/A	N/A
							1.5	Offset		1.5	0.50		17	0.35
							1.5	Separation		1.5	1.50		N/A	N/A
							1.0	Offset		1.0	0.25		8	0.18
							1.0	Separation		1.0	0.25		N/A	N/A
OH 430	S 2746	E 1060	09/25/03	06/13/05			7.5	Separation		7.5	0.13	3.00	N/A	N/A
							6.5	Separation		6.5	0.13		N/A	N/A
							5.8	Offset		5.8	2.00		67	1.16
					1	0	5.8	Clay H	0.17	5.8	1.00		N/A	N/A
							1.5	Offset		1.5	1.00		33	0.58
							1.5	Separation		1.5	0.25		N/A	N/A
OH 495	S 2748	E 1119	01/13/04	06/13/05			6.9	Separation		6.9	0.25	3.00	N/A	N/A
							6.3	Offset		6.3	0.25		8	0.15
					3	0	6.3	Clay H	0.48	6.3	0.75		N/A	N/A
							5.7	Offset		5.7	0.25		8	0.18
							5.7	Separation		5.7	0.25		N/A	N/A
							1.6	Offset		1.6	0.13		4	0.09
							1.6	Separation		1.6	0.38		N/A	N/A
							0.5	Separation		0.5	0.50		N/A	N/A
OH 480	S 2746	E 1195	09/25/03	06/27/05			5.8	Separation		5.8	0.25	3.00	N/A	N/A
							5.6	Offset		5.6	2.25		75	1.28
					0	0	5.6	Clay H	0.00	5.6	0.25		N/A	N/A
							3.9	Rough Spot		3.9			N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	South 2750 (continued)													
OH 481	S 2747	E 1316	09/25/03	04/25/05			16.0	Hangup		16.0		3.00	N/A	N/A
							6.6	Hangup		6.6			N/A	N/A
							5.7	Offset		5.7	1.25		42	0.79
					0	0	5.7	Clay H	0.00	5.7	0.25		N/A	N/A
	Panel 3 South 3080													
OH 440	S 3082	E 523	08/08/03	06/21/05			6.1	Offset		6.1	3.00	3.00	100	1.60
					4	0	6.1	Clay H	0.66	6.1	0.50		17	N/A
							5.9	Separation		5.9	0.13		N/A	N/A
							5.7	Separation		5.7	0.38		N/A	N/A
							1.8	Separation		1.8	0.13		N/A	N/A
							0.6	Separation		0.6	0.50		N/A	N/A
OH 510	S 3080	E 580	08/02/04	06/21/05			7.6	Offset		7.6	0.13	3.00	4	0.14
							7.6	Separation		7.6	2.25		N/A	N/A
							6.6	Separation		6.6	0.50		N/A	N/A
							6.1	Offset		6.1	0.38		13	0.42
					4	0	6.1	Clay H	0.66	6.1	0.50		N/A	N/A
							5.5	Offset		5.5	0.38		13	0.42
							5.5	Separation		5.5	0.13		N/A	N/A
							4.5	Separation		4.5	0.13		N/A	N/A
							4.4	Separation		4.4	0.13		N/A	N/A
							1.5	Offset		1.5	0.50		17	0.57
							1.5	Separation		1.5	4.00		N/A	N/A
OH 431	S 3082	E 654	08/06/03	06/21/05			7.6	Separation		7.6	0.25	3.00	N/A	N/A
							7.0	Separation		7.0	0.13		N/A	N/A
							6.4	Offset		6.4	0.75		25	0.40
					3	0	6.4	Clay H	0.47	6.4	0.25		N/A	N/A
							6.2	Separation		6.2	0.13		N/A	N/A
							5.4	Separation		5.4	0.50		N/A	N/A
							1.8	Offset		1.8	0.13		4	0.07
							1.8	Separation		1.8	0.25		N/A	N/A
OH 591	S 3080	E 725	06/21/05	06/21/05			7.8	Separation		7.8	0.25	3.00	N/A	N/A
					1	0	5.9	Rough Spot	0.17	5.9			N/A	N/A
							1.6	Separation		0.6	2.75		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
Panel 3 South 3080 (continued)														
OH 461	S 3082	E 789	09/03/03	06/21/05			7.3	Offset		7.3	0.13	3.00	4	0.07
							7.3	Separation		7.3	1.75		N/A	N/A
							6.5	Offset		6.5	0.13		4	0.07
							6.5	Separation		6.5	0.13		N/A	N/A
							6.0	Offset		6.0	0.25		8	0.14
					3	0	6.0	Clay H	0.50	6.0	0.25		N/A	N/A
							5.8	Separation		5.8	0.13		N/A	N/A
							2.5	Separation		2.5	0.25		N/A	N/A
							1.5	Offset		1.5	0.13		4	0.07
							1.5	Separation		1.5	0.50		N/A	N/A
OH 432	S 3081	E 921	09/03/03	06/15/05			8.0	Offset		8.0	0.75	3.00	25	0.42
							8.0	Separation		7.6	1.50		N/A	N/A
							6.5	Separation		6.5	1.00		N/A	N/A
							6.4	Separation		6.4	0.25		N/A	N/A
							6.0	Separation		6.0	0.13		N/A	N/A
							5.8	Offset		5.8	0.38		13	0.07
					3	0	5.8	Clay H	0.52	5.8	1.00		N/A	N/A
							4.1	Offset		4.1	0.13		4	0.07
							4.1	Separation		4.1	0.13		N/A	N/A
							2.7	Separation		2.7	0.50		N/A	N/A
							1.7	Offset		1.7	1.00		33	0.56
							1.7	Separation		1.7	1.50		N/A	N/A
OH 504	S 3080	E 955	04/22/04	03/07/05			6.9	Offset		6.9	0.75	3.00	25	N/A
							6.9	Separation		6.9	0.25		N/A	N/A
							6.6	Offset		6.6	0.50		17	0.14
					2	0	6.6	Clay H	0.30	6.6	0.13		N/A	N/A
							1.6	Offset		1.6	0.50		17	0.57
							1.6	Separation		1.6	6.00		N/A	N/A
							1.5	Separation		1.5	0.38		N/A	N/A
							1.0	Separation		1.0	0.13		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 3 South 3080 (continued)													
OH 466	S 3080	E 981	09/08/03	06/15/05			6.9	Separation		6.9	0.38	3.00	N/A	N/A
							6.7	Separation		6.7	0.38		N/A	N/A
							6.5	Offset		6.5	0.50		17	0.00
							6.5	Separation		6.5	0.13		N/A	N/A
							6.1	Separation		6.1	0.50		N/A	N/A
							6.0	Offset		6.0	1.25		42	0.71
					1	0	6.0	Clay H	0.17	6.0	0.13		N/A	N/A
							1.6	Offset		1.6	1.25		42	0.07
							1.6	Separation		1.6	3.00		N/A	N/A
OH 505	S 3080	E 1005	04/22/04	06/21/05			6.6	Offset		6.6	0.75	3.00	25	0.64
							6.6	Separation		6.6	0.38		N/A	N/A
							6.1	Offset		6.1	0.50		17	0.43
					1	0	6.1	Clay H	0.16	6.1	0.38		N/A	N/A
							1.6	Offset		1.6	0.50		17	0.43
							1.6	Separation		1.6	2.50		N/A	N/A
OH 506	S 3080	E 1055	04/22/04	06/15/05			7.4	Offset		7.4	0.50	3.00	17	0.44
							7.4	Separation		7.4	0.25		N/A	N/A
							6.5	Offset		6.5	0.50		17	0.44
							6.5	Separation		6.5	0.13		N/A	N/A
							6.1	Offset		6.1	0.75		25	0.65
					1	0	6.1	Clay H	0.16	6.1	0.13		N/A	N/A
							1.5	Offset		1.5	0.75		25	0.65
							1.5	Separation		1.5	3.00		N/A	N/A
OH 467	S 3082	E 1055	09/08/03	06/15/05			7.9	Offset		7.9	1.50	3.00	50	0.85
							7.9	Separation		7.9	1.50		N/A	N/A
							6.4	Offset		6.4	1.50		50	0.85
							6.4	Separation		6.4	0.50		N/A	N/A
							6.1	Offset		6.1	0.50		17	0.28
					2	0	6.1	Clay H	0.33	6.1	0.25		N/A	N/A
							5.4	Separation		5.4	0.13		N/A	N/A
							1.6	Offset		1.6	0.13		4	0.07
							1.6	Separation		1.6	3.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location	Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
Panel 3 South 3080 (continued)													
OH 433	S 3080 E 1102	09/08/03	06/13/05			6.5	Offset		6.5	0.13	3.00	4	0.07
						6.5	Separation		6.5	0.50		N/A	N/A
				1	0	5.9	Clay H	0.17	5.9	0.75		N/A	N/A
						1.6	Offset		1.6	0.75		25	0.43
						1.6	Separation		1.6	1.25		N/A	N/A
OH 527	S 3080 E 1188	02/14/05	06/13/05			8.0	Separation		8.0	0.75	3.00	N/A	N/A
						6.9	Separation		6.9	0.25		N/A	N/A
						6.3	Offset		6.3	0.13		4	0.38
				3	0	6.3	Clay H	0.48	6.3	0.50		N/A	N
						4.9	Offset		4.9	0.13		4	0.38
						4.9	Separation		4.9	0.25		N/A	N
						2.9	Separation		2.9	0.25		N/A	N
						1.6	Offset		1.6	0.13		4	0.38
						1.6	Separation		1.6	3.50		N/A	N/A
OH 426	S 3081 E 1320	12/18/03	04/25/05			6.8	Separation		6.7	0.13	3.00	N/A	N/A
						5.7	Offset		5.7	0.50		17	0.37
				0	0	5.7	Clay H	0.00	5.7	0.13		N/A	N/A
Panel 2 Room 1													
OH 359	S 2271 E 523	07/24/00	01/04/05	1	0	6.6	Separation	0.15	6.6	0	3.00	N/A	N/A
						1.7	Offset		1.7	0.25		8	0.06
						1.7	Separation		1.7	0.25		N/A	N/A
OH 360	S 2350 E 523	07/24/00	01/04/05			7.5	Offset		7.5	1	3.00	33	0.22
						7.5	Separation		7.5	0.25		N/A	N/A
						6.5	Offset		6.5	0.50		17	0.11
				0	0	6.5	Separation	0.00	6.5	0.13		N/A	N/A
OH 361	S 2422 E 523	07/24/00	01/04/05			7.2	Offset		7.2	0.75	3.00	25	N/A
				1	0	7.2	Separation	0.14	7.2	0.25		N/A	N/A
						5.0	Separation		5.0	0.13		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	Panel 1 Closure - South 1950 & South 1600													
OH 391	S 1951	E 456	07/22/03	06/30/05	1	0	5.9	Separation	0.17	5.9	0.50	3.00	N/A	N/A
							4.4	Offset		4.4	1.50		50	0.77
							3.6	Separation		4.4	3.00		N/A	N/A
OH 392	S 1953	E 448	07/22/03	06/30/05	0	0	3.8	Offset		3.8	2.25	3.00	75	1.16
							3.8	Separation		3.8	2.75		N/A	N/A
OH 393	S 1614	E 451	07/22/03	01/04/05	0	0		No features	N/A			3.00	N/A	N/A
OH 394	S 1613	E 434	07/22/03	01/04/05	0	0		No features	N/A			3.00	N/A	N/A
	East 300													
OH 507	N 1175	E 300	07/27/04	06/29/05	0	0	6.4	Rough Spot		6.4		3.00	N/A	N/A
OH 508	N 1250	E 300	07/27/04	07/27/04	0	0	6.0	Separation	0.00	6.0	0.25	3.00	N/A	N/A
OH 509	N 1350	E 300	07/27/04	06/29/05	1	0	6.3	Hangup		6.3		3.00	N/A	N/A
							5.4	Separation		5.4	0.25		N/A	N/A
OH 422	S 2825	E 300	08/06/03	06/27/05	0	0	6.1	Clay H	0.00	6.1	0.06	3.00	N/A	N/A
OH 423	S 2890	E 300	08/06/03	06/27/05	1	0	5.8	Clay H	0.17	5.8	0.13	3.00	N/A	N/A
							1.0	Separation		1.0	0.13		N/A	N/A
OH 424	S 2950	E 300	08/06/03	06/27/05	2	0	5.5	Clay H	0.36	5.5	0.25	3.00	N/A	N/A
							5.0	Separation		5.0	0.13		N/A	N/A
							1.3	Separation		1.3	0.50		N/A	N/A
OH 425	S 3020	E 300	08/06/03	06/27/05	1	0	5.6	Clay H	0.18	5.6	0.38	3.00	N/A	N/A
							0.5	Separation		0.5	0.38		N/A	N/A
OH 453	S 3310	E 300	08/20/04	08/20/04			6.1	Offset		6.1	0.25	3.00	8	N/A
					0	0	6.1	Clay H	0.00	6.1	0.13		N/A	N/A
							5.9	Hangup		5.9	N/A		N/A	N/A
OH 457	S 3260	E 300	08/28/03	06/23/05			6.1	Offset		6.1	0.25	3.00	8	0.14
					1	0	6.1	Clay H	0.16	6.1	0.38		N/A	N/A
							6.0	Separation		6.0	0.25		N/A	N/A
OH 458	S 3200	E 300	08/28/03	06/23/05	0	0	6.0	Clay H	0.00	6.0	0.13	3.00	N/A	N/A
OH 459	S 3140	E 300	08/28/03	06/23/05	0	0	5.5	Rough Spot	0.00	5.5	N/A	3.00	N/A	N/A
OH 569	S 3650	E 300	04/20/05	06/23/05	0	0		No Features				3.00	N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140													
OH 521	N 40	E 140	11/22/04	06/30/05	0	0	6.6	Separation	0.00	6.6	0.13	3.00	N/A	N/A
OH 522	S 85	E 140	11/22/04	11/22/04	1	0	8.0	Hangup	0.13	8.0	N/A	3.00	N/A	N/A
OH 523	S 164	E 140	11/22/04	06/30/05			7.8	Separation	0.00	7.8	0.25	3.00	N/A	N/A
							6.0	Separation		6.0	0.50		N/A	N/A
OH 524	S 182	E 140	11/22/04	06/30/05	0	0	5.8	Rough Spot	0.00	5.8	N/A	3.00	N/A	N/A
OH 525	S 224	E 140	11/22/04	06/30/05			7.4	Separation		7.4	0.25	3.00	N/A	N/A
					1	0	7.0	Separation	0.14	7.0	0.13		N/A	N/A
OH 498	S 415	E 140	02/17/04	06/30/05	7	0	4.8	Separation	1.46	4.8	1.50	3.00	N/A	N/A
							4.2	Separation		4.8	2.00		N/A	N/A
							3.7	Separation		3.7	0.75		N/A	N/A
							3.5	Separation		3.5	0.13		N/A	N/A
							3.0	Offset		3.0	0.75		25	0.55
							3.0	Separation		3.0	2.25		N/A	N/A
							2.9	Separation		2.9	0.25		N/A	N/A
							1.6	Separation		1.5	0.13		N/A	N/A
OH 574	S 500	E 140	06/16/05	06/16/05	2	0	5.6	Clay G	0.36	5.6	1.00	3.00	N/A	N/A
							4.6	Separation		4.6	0.38		N/A	N/A
							4.0	Offset		4.0	1.00		33	N/A
							4.0	Separation		4.0	3.00		N/A	N/A
OH 499	S 510	E 140	02/17/04	02/17/04	1	0	5.7	Clay G	0.18	5.7	0.25	3.00	N/A	N/A
							5.6	Separation		5.6	1.00		N/A	N/A
							5.5	Separation		5.5	0.25		N/A	N/A
							5.4	Separation		5.4	0.25		N/A	N/A
							4.1	Offset		4.1	1.00		33	N/A
							4.1	Separation		4.1	3.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location	Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)												
OH 576	S 850 E 140	06/16/05	06/16/05	3	0	6.6	Separation	0.45	6.6	0.38	3.00	N/A	N/A
						4.7	Separation		4.7	0.25		N/A	N/A
						3.4	Offset		3.4	0.25		8	N/A
						3.4	Separation		3.4	2.00		N/A	N/A
						3.3	Separation		3.3	0.13		N/A	N/A
OH 575	S 1000 E 140	06/13/05	06/13/05	2	0	6.0	Separation	0.33	6.0	0.75	3.00	N/A	N/A
						4.6	Separation		4.6	0.50		N/A	N/A
						4.1	Separation		4.1	1.00		N/A	N/A
OH 577	S 1160 E 140	06/16/05	06/16/05	2	0	6.5	Separation	0.31	6.5	0.13	3.00	N/A	N/A
						5.5	Separation		5.5	0.13		N/A	N/A
						2.6	Separation		2.6	0.38		N/A	N/A
OH 578	S 1300 E 140	06/16/05	06/16/05	0	0		No Features				3.00	N/A	N/A
OH 579	S 1463 E 140	06/16/05	06/16/05	7	0	5.5	Separation	1.27	5.5	1.50	3.00	N/A	N/A
						4.4	Separation		4.4	2.00		N/A	N/A
						4.1	Separation		4.1	0.13		N/A	N/A
						2.4	Offset		2.4	0.13		4	N/A
						2.4	Separation		2.4	1.25		N/A	N/A
						1.6	Separation		1.6	0.50		N/A	N/A
						0.8	Separation		0.8	0.13		N/A	N/A
						0.7	Separation		0.7	0.50		N/A	N/A
OH 580	S 1463 E 140	06/16/05	06/16/05			6.4	Separation	0.00	6.4	0.50	3.00	N/A	N/A
				4	0	6.1	Separation		6.1	0.38		N/A	N/A
						2.5	Separation		2.5	1.00		N/A	N/A
						1.7	Separation		1.7	0.25		N/A	N/A
						1.2	Offset		1.2	0.13		4	N/A
						1.2	Separation		1.2	0.38		N/A	N/A
						0.5	Separation		0.5	0.38		N/A	N/A
OH 581	S 1463 E 140	06/16/05	06/16/05	2	0	1.2	Separation		1.2	0.50	3.00	N/A	N/A
						1.1	Offset		1.1	0.13		4	N/A
						1.1	Separation		1.1	0.25		N/A	N/A
OH 582	S 1600 E 140	06/16/05	06/16/05	0	0	6.0	Rough Spot		6.0		3.00	N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 511	S 1775	E 140	08/04/04	06/29/05			7.7	Separation		7.7	0.25	3.00	N/A	N/A
					13	0	6.7	Separation	1.94	6.7	1.25		N/A	N/A
							6.6	Separation		6.6	0.25		N/A	N/A
							6.1	Separation		6.1	1.75		N/A	N/A
							6.0	Separation		6.0	0.13		N/A	N/A
							5.7	Separation		5.7	1.25		N/A	N/A
							5.6	Separation		5.6	1.00		N/A	N/A
							5.2	Separation		5.2	0.50		N/A	N/A
							4.7	Separation		4.7	0.50		N/A	N/A
							3.8	Offset		3.8	0.13		4	0.14
							3.8	Separation		3.8	1.00		N/A	N/A
							3.4	Offset		3.4	0.38		13	0.42
							3.4	Separation		3.4	0.13		N/A	N/A
							2.7	Separation		2.7	0.38		N/A	N/A
							2.7	Separation		2.7	0.25		N/A	N/A
							2.6	Separation		2.6	1.00		N/A	N/A
							0.8	Separation		0.8	2.00		N/A	N/A
OH 142-2	S 1780	E 140	06/29/05	06/29/05			7.0	Separation		7.0	0.13	3.00	N/A	N/A
							6.8	Separation		6.8	0.50		N/A	N/A
					4	0	6.4	Separation	0.63	6.4	1.00		N/A	N/A
							3.1	Separation		3.1	0.75		N/A	N/A
							2.7	Separation		2.7	1.25		N/A	N/A
							1.6	Separation		1.6	1.75		N/A	N/A
							0.9	Separation		0.9	1.50		N/A	N/A
OH 143-2	S 1780	E 140	06/29/05	06/29/05			7.1	Separation		7.1	2.50	3.00	N/A	N/A
					6	0	6.5	Rubble Zone	0.92	6.5	4.50		N/A	N/A
							6.0	Offset		6.5	0.25		8	N/A
							6.0	Separation		6.0	1.25		N/A	N/A
							5.7	Separation		5.7	0.50		N/A	N/A
							3.9	Separation		3.9	0.38		N/A	N/A
							2.4	Offset		2.4	0.13		4	N/A
							2.4	Rubble Zone		2.4	5.00		N/A	N/A
							1.5	Separation		1.5	1.50		N/A	N/A
							1.0	Separation		1.0	1.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 144-2	S 1780	E 140	06/29/05	06/29/05			7.6	Separation		7.6	0.25	3.00	N/A	N/A
							6.9	Separation		6.9	1.50		N/A	N/A
					6	0	6.4	Separation	0.94	6.4	1.00		N/A	N/A
							6.3	Separation		6.3	0.50		N/A	N/A
							5.9	Separation		5.9	0.25		N/A	N/A
							4.1	Separation		4.1	0.75		N/A	N/A
							2.7	Separation		2.7	2.25		N/A	N/A
							1.7	Separation		1.7	1.00		N/A	N/A
							1.3	Separation		1.3	0.75		N/A	N/A
OH 146-2	S 1832	E 140	06/15/04	06/29/05			6.1	Separation		6.1	0.70	3.00	N/A	N/A
					5	0	5.9	Offset	0.85	5.9	2.50		83	2.41
							5.9	Separation		5.9	1.30		N/A	N/A
							4.4	Offset		4.4	0.50		17	0.48
							4.4	Separation		4.4	4.00		N/A	N/A
							3.6	Separation		3.6	1.25		N/A	N/A
							2.3	Offset		2.3	0.13		4	0.12
							2.3	Separation		2.3	1.75		N/A	N/A
							1.3	Offset		1.3	0.38		13	0.36
							1.3	Separation		1.3	0.50		N/A	N/A
							0.7	Separation		0.7	0.25		N/A	N/A
OH 147-2	S 1832	E 140	06/15/04	06/29/05			6.5	Offset		6.5	1.00	3.00	33	0.96
					4	0	6.5	Clay H	0.62	6.5	2.00		N/A	N/A
							3.4	Separation		3.4	0.13		N/A	N/A
							3.1	Offset		3.1	0.25		8	0.24
							3.1	Separation		3.1	1.00		N/A	N/A
							2.4	Offset		2.4	0.38		13	0.36
							2.4	Separation		2.4	1.75		N/A	N/A
							1.4	Offset		1.4	0.50		17	0.48
							1.4	Separation		1.4	1.75		N/A	N/A
							0.8	Separation		0.8	0.13		N/A	N/A
OH 583	S 1950	E 140	06/16/05	06/16/05	1	0	2.8	Separation		2.8	0.13	3.00	N/A	N/A
OH 474	S 1999	E 140	01/21/05	06/24/05			6.2	Offset		6.2	0.13	3.00	4	0.30
					1	0	6.2	Clay H	0.16	6.2	0.25		N/A	N/A
							1.4	Separation		1.4	0.25		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 512	S 2010	E 140	08/04/04	06/24/05	1	0	1.4	Separation		1.4	0.50	3.00	N/A	N/A
OH 513	S 2351	E 140	08/11/04	06/24/05	1	0	6.3	Separation	0.16	6.3	0.25	3.00	N/A	N/A
							1.3	Separation		1.3	3.00		N/A	N/A
OH 473	S 2092	E 140	01/21/05	06/24/05	4	0	5.5	Separation	0.73	5.5	0.13	3.00	N/A	N/A
							5.1	Separation		5.1	0.25		N/A	N/A
							4.8	Separation		4.8	0.38		N/A	N/A
							3.9	Separation		3.9	0.25		N/A	N/A
							1.2	Offset		1.2	0.13		4	0.30
							1.2	Separation		1.2	0.50		N/A	N/A
OH 472	S 2167	E 140	01/21/05	06/24/05			5.8	Clay H		5.8	0.38		N/A	N/A
OH 584	S 2180	E 140	06/16/05	06/16/05	0	0		No Features				3.00	N/A	N/A
OH 454	S 2275	E 140	12/30/04	06/24/09			6.5	Separation		6.5	0.13	3.00	N/A	N/A
							6.0	Separation		6.0	0.25		N/A	N/A
					6	0	5.7	Separation	1.05	5.7	0.50		N/A	N/A
							5.6	Separation		5.6	0.25		N/A	N/A
							5.5	Separation		5.5	0.25		N/A	N/A
							5.3	Separation		5.3	0.13		N/A	N/A
							5.0	Separation		5.0	0.13		N/A	N/A
							2.3	Offset		2.3	0.25		8	0.06
							2.3	Separation		2.3	4.50		N/A	N/A
							1.3	Offset		1.3	0.38		13	0.08
							1.3	Separation		1.3	0.25		N/A	N/A
OH 471	S 2333	E 140	01/21/05	06/24/05	3	0	6.1	Separation	0.49	6.0	0.75	3.00	N/A	N/A
							5.2	Separation		5.2	0.25		N/A	N/A
							5.0	Offset		5.0	0.50		17	1.19
							5.0	Separation		5.0	0.13		N/A	N/A
							1.3	Offset		1.3	0.50		17	1.19
							1.3	Separation		1.3	3.25		N/A	N/A
OH 513	S 2351	E 140	8/11//04	06/24/05	1	0	6.3	Clay H	0.16	6.3	0.25	3.00	N/A	N/A
							1.3	Separation		1.3	3.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 585	S 2358	E 140	06/16/05	06/16/05	1	0	6.1	Clay H	0.16	6.1	0.50	3.00	N/A	N/A
							1.9	Separation		1.9	1.13		N/A	N/A
OH 586	S 2358	E 140	06/16/05	06/16/05	2	0	6.1	Separation	0.33	6.1	0.25	3.00	N/A	N/A
							6.0	Separation		6.0	0.38		N/A	N/A
							1.3	Separation		1.3	3.00		N/A	N/A
OH 587	S 2358	E 140	06/16/05	06/16/05	2	0	5.9	Rough Spot	0.34	5.9		3.00	N/A	N/A
							2.6	Separation		2.6	0.13		N/A	N/A
							1.6	Separation		1.6	3.00		N/A	N/A
OH 588	S 2520	E 140	06/16/05	06/16/05	1	0	5.8	Separation	0.17	5.8	0.38	3.00	N/A	N/A
							5.2	Separation		5.2	0.50		N/A	N/A
OH 468	S 2640	E 140	03/29/04	06/24/05			7.4	Separation		7.4	0.25	3.00	N/A	N/A
							6.4	Separation		6.4	0.13		N/A	N/A
					5	0	6.0	Separation	0.83	6.0	0.25		N/A	N/A
							5.8	Separation		5.8	0.38		N/A	N/A
							5.1	Separation		5.1	0.38		N/A	N/A
							4.9	Separation		4.9	0.38		N/A	N/A
							3.6	Separation		3.6	0.13		N/A	N/A
							1.0	Offset		1.0	1.00		33	0.81
							1.0	Separation		1.0	4.25		N/A	N/A
OH 589	S 2750	E 140	06/16/05	06/16/05			6.5	Separation		6.5	0.25	3.00	N/A	N/A
					1	0	5.9	Separation	0.17	5.9	0.50		N/A	N/A
OH 516	S 2800	E 140	11/16/04	11/16/04	1	0	5.9	Clay H	0.17	5.9	0.25	3.00	N/A	N/A
							1.1	Separation		1.1	0.75		N/A	N/A
OH 517	S 2850	E 140	11/16/04	11/16/04	3	0	5.6	Clay H	0.54	0.3	0.25	3.00	N/A	N/A
							5.4	Separation		5.4	0.13		N/A	N/A
							1.0	Separation		1.0	1.75		N/A	N/A
							0.6	Hangup		0.6	N/A		N/A	N/A
							0.5	Separation		0.5	0.13		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 518	S 2900	E 140	11/16/04	11/16/04	3	0	5.6	Clay H	0.54	5.6	1.00	3.00	N/A	N/A
							4.5	Separation		4.5	0.13		N/A	N/A
							2.1	Separation		2.1	0.13		N/A	N/A
							1.0	Separation		1.0	2.00		N/A	N/A
OH 520	S 2907	E 140	11/16/04	11/16/04			6.5	Separation		6.5	0.13	3.00	N/A	N/A
					3	0	6.0	Separation	0.50	6.0	1.25		N/A	N/A
							5.3	Separation		5.3	0.38		N/A	N/A
							2.2	Separation		2.2	2.25		N/A	N/A
							1.0	Separation		1.0	2.00		N/A	N/A
OH 500	S 2920	E 140	02/20/04	06/24/05	6	0	6.1	Separation	0.98	6.1	1.00	3.00	N/A	N/A
							6.0	Separation		6.0	0.75		N/A	N/A
							5.6	Offset		5.6	0.50		17	0.37
							5.6	Separation		5.6	0.25		N/A	N/A
							5.4	Offset		5.4	0.50		17	0.37
							5.4	Separation		5.4	0.13		N/A	N/A
							5.2	Offset		5.2	0.25		8	0.19
							5.2	Separation		5.2	0.25		N/A	N/A
							2.0	Offset		2.0	0.50		17	0.37
							2.0	Separation		2.0	2.25		N/A	N/A
							1.0	Offset		1.0	0.75		25	0.56
							1.0	Separation		1.0	1.00		N/A	N/A
OH 519	S 2950	E 140	11/16/04	11/17/04			8.3	Separation		8.3	1.25	3.00	N/A	N/A
							7.4	Separation		7.4	0.50		N/A	N/A
							6.9	Separation		6.9	0.50		N/A	N/A
					3	0	6.0	Separation	0.50	6.0	3.00		N/A	N/A
							5.8	Separation		5.8	0.25		N/A	N/A
							2.1	Separation		2.1	9.00		N/A	N/A
							1.0	Separation		1.0	3.00		N/A	N/A
OH 501	S 2986	E 140	02/20/04	06/24/05			5.6	Offset		5.6	3.00	3.00	100	2.23
					5	0	5.5	Separation	0.91	1.0	1.00		N/A	N/A
							1.7	Offset		1.7	0.75		25	0.56
							1.7	Separation		1.7	6.00		N/A	N/A
							1.0	Offset		1.0	1.00		33	0.74
							1.0	Separation		1.0	1.00		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	East 140 (continued)													
OH 590	S 3080	E 140	06/16/05	06/16/05	2	0	5.6	Separation	0.36	5.6	1.00	3.00	N/A	N/A
							5.1	Rough Spot		5.1			N/A	N/A
							1.3	Separation		1.3	0.25		N/A	N/A
							0.4	Separation		0.4	0.50		N/A	N/A
OH 493	S 3180	E 140	01/13/04	06/24/05	4	0	5.6	Separation	0.71	5.6	0.25	3.00	N/A	N/A
							5.4	Separation		5.4	0.25		N/A	N/A
							5.0	Separation		5.0	0.50		N/A	N/A
							5.2	Offset		5.2	0.13		4	0.09
							5.2	Separation		5.2	0.13		N/A	N/A
							0.6	Separation		0.6	2.75		N/A	N/A
OH 571	S 3480	E 140	02/28/05	04/20/05	0	0		No Features				3.00	N/A	N/A
OH 567	S 3650	E 140	06/21/05	06/21/05	0	0	6.6	Separation	0.00	6.6	0.26	3.00	N/A	N/A
							5.2	Offset		5.2	0.13		4	N/A
							5.2	Hangup		5.2			N/A	N/A
	Panel 4 Room 1													
OH 529	S 3380	E 520	03/14/05	06/23/05	1	0	5.9	Clay H	0.00	5.9	0.25	3.00	N/A	N/A
OH 530	S 3480	E 520	03/14/05	06/23/05	1	0	5.6	Clay H	0.18	5.6	0.13		N/A	N/A
							4.5	Separation		4.5	0.13		N/A	N/A
OH 531	S 3580	E 520	03/14/05	06/23/05	1	0	5.9	Clay H	0.17	5.9	0.13		N/A	N/A
							5.2	Separation		5.2	0.25		N/A	N/A
	South 3310													
OH 528	S 3310	E 520	02/23/05	06/23/05			8.0	Separation		8.0	0.13	3.00	N/A	N/A
							6.4	Separation		6.4	0.25		N/A	N/A
					3	0	5.6	Clay H	0.54	5.6	0.25		N/A	N/A
							5.0	Separation		5.0	0.25		N/A	N/A
							0.5	Separation		0.5	0.25		N/A	N/A
							0.3	Separation		0.3	0.25		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam

[2] Number of fracture zones in immediate roof beam

[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location	Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	South 3650												
OH 532	S 3650 E 520	02/21/05	06/23/05			5.7	Offset		5.7	0.50	3.00	17	1.50
				0	0	5.7	Clay H		5.7	0.25		N/A	N/A
OH 564	S 3650 W 90	04/20/05	06/21/05	0	0	5.6	Clay H		5.6	0.13	3.00	N/A	N/A
OH 566	S 3650 E 90	06/21/05	06/21/05				No Features				3.00	N/A	N/A
OH 568	S 3650 E 235	06/21/05	06/21/05				No Features				3.00	N/A	N/A
OH 569	S 3650 E 300	04/20/05	06/23/05				No Features				3.00	N/A	N/A
	West 30												
OH 455	S 2913 W 17	08/28/03	06/21/05				No Features				3.00	N/A	N/A
OH 456	S 2950 W 30	08/28/03	06/21/05			5.5	Offset		5.5	0.25	3.00	8	N/A
				1	0	5.5	Clay H	0.18	5.5	0.25		N/A	N/A
						0.8	Separation		0.8	0.13		N/A	N/A
OH 463	S 3079 W 17	09/03/03	06/21/05			7.2	Separation		7.2	0.25	3.00	N/A	N/A
				2	0	5.6	Offset	0.36	5.6	0.25		8	0.14
						5.6	Clay H		5.6	2.50		N/A	N/A
						1.5	Offset		1.5	0.25		8	0.14
						1.5	Separation		1.5	1.50		N/A	N/A
OH 565	S 3650 W 17	02/28/05	06/21/05				No Features				3.00	N/A	N/A
OH 449	S 3314 W 18	08/28/03	06/21/05				No Feature				3.00	N/A	N/A
OH 514	S 3400 W 30	12/08/04	06/23/05				No Features				3.00	N/A	N/A
OH 515	S 3490 W 30	12/08/04	06/23/05				No Features				3.00	N/A	N/A
OH 526	S 3590 W 30	12/08/04	06/23/05			5.9	Rough Spot		5.9		3.00	N/A	N/A
	West 170												
OH 441	S 2750 W 170	08/18/03	06/21/05	3	0	5.9	Clay H	0.51	5.9	0.25	3.00	N/A	N/A
						5.5	Separation		5.5	0.50		N/A	N/A
						4.6	Separation		4.6	0.38		N/A	N/A
						1.4	Separation		1.4	0.25		N/A	N/A
OH 442	S 2820 W 170	08/18/03	06/21/05				No Feature Identified				3.00	N/A	N/A

1 Fr = Number of fractures in immediate roof beam
2 Number of fracture zones in immediate roof beam
3 Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	West 170 (continued)													
OH 443	S 2914	W 170	08/18/03	06/21/05	6	0	3.8	Offset		3.8	2.75	3.00	92	1.49
							3.8	Separation		3.8	0.75		N/A	N/A
							3.0	Separation		3.0	0.13		N/A	N/A
							2.7	Separation		2.7	1.50		N/A	N/A
							2.5	Separation		2.5	0.25		N/A	N/A
							2.3	Offset		2.3	1.00		33	0.54
							2.3	Separation		2.3	1.50		N/A	N/A
							0.5	Offset		0.5	0.50		17	0.27
							0.5	Separation		0.5	2.00		N/A	N/A
OH 444	S 3000	W 170	08/18/03	06/21/05			6.4	Separation		6.4	0.13	3.00	N/A	N/A
							5.7	Separation		5.7	0.13		N/A	N/A
							5.6	Offset		5.6	0.25		8	0.14
					1	0	5.6	Clay H	0.18	5.6	0.13		N/A	N/A
							1.4	Separation		1.4	0.50		N/A	N/A
OH 445	S 3079	W 170	08/18/03	06/21/05			5.2	Offset		5.2	0.50	3.00	17	0.27
					2	0	5.2	Clay H	0.38	5.2	0.13		N/A	N/A
							5.0	Offset		5.0	0.38		13	0.20
							5.0	Separation		5.0	0.13		N/A	N/A
							0.4	Offset		0.4	0.50		17	0.27
							0.4	Separation		0.4	0.25		N/A	N/A
OH 446	S 3198	W 170	08/28/03	06/21/05	0	0	5.6	Clay H	0.00	5.6	0.50	3.00	N/A	N/A
OH 447	S 3314	W 170	08/28/03	06/21/05			5.8	Offset		5.8	0.38	3.00	13	0.21
					0	0	5.8	Clay H	0.00	5.8	0.13		N/A	N/A
	South 2750													
OH 460	S 2750	W 100	09/03/03	06/21/05			6.0	Offset		6.0	0.50	3.00	17	N/A
					1	0	6.0	Clay H	0.17	6.0	0.25		N/A	N/A
							1.5	Separation		1.5	0.50		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	South 3080													
OH 462	S 3082	W 91	09/03/03	06/23/05	1	0	6.0	Separation	0.17	6.0	0.50	3.00	N/A	N/A
							5.8	Separation		5.8	0.13		N/A	N/A
OH 464	S 3080	E 65	09/03/03	06/23/05	0	0	5.3	No features		5.3			N/A	N/A
OH 503	S 3080	E 230	04/12/04	06/15/05			7.0	Offset		7.0	1.0	3.00	33	N/A
							7.0	Separation		7.0	0.3		N/A	N/A
							6.6	Offset		6.6	1.0		33	0.85
					2	0	6.6	Separation	0.30	6.6	0.1		N/A	N/A
							2.2	Offset		2.2	0.5		17	0.43
							2.2	Separation		2.2	7.0		N/A	N/A
							1.4	Offset		1.4	0.1		4	0.11
							1.4	Separation		1.4	1.0		N/A	N/A
							1.1	Offset		1.1	0.1		4	0.11
	South 3310													
OH 448	S 3316	W 95	08/28/03	06/23/05	0	0	5.8	Hangup	0.00	5.8		3.00	N/A	N/A
OH 450	S 3310	E 65	08/28/03	06/23/05	0	0		No features				3.00	N/A	N/A
OH 452	S 3310	E 230	08/28/03	06/30/05	0	0	5.7	Offset		5.7	0.13	3.00	4	N/A
							5.7	Clay H	0.00	5.7	0.13		N/A	N/A
							5.4	Rough spot		5.4	0.50		N/A	N/A
	North End													
OH492	N 780	E 140	01/09/04	06/29/05			6.5	Rough spot		6.5	0.00	3.00	N/A	N/A
OH483	N 940	E 140	01/07/04	06/29/05			6.5	Offset		6.5	0.25	3.00	8	N/A
					1	0	6.5	Clay H	0.15	6.5	0.50		N/A	N/A
							1.3	Separation		1.3	0.25		N/A	N/A
OH484	N 1265	E 140	01/07/04	06/29/05	1	0	6.2	Clay H	0.16	6.2	0.25	3.00	N/A	N/A
							1.5	Separation		1.5	0.13		N/A	N/A
OH485	N 1400	E 140	01/07/04	06/29/05	0	0	6.5	Offset		6.5	0.25	3.00	8	N/A
							6.5	Clay H	0.00	6.5	0.25		N/A	N/A
OH491	N 620	E 0	01/09/04	06/29/05			6.1	Offset		6.1	0.38	3.00	13	N/A
					0	0	6.1	Clay H	0.00	6.1	0.13		N/A	N/A
OH490	N 780	E 0	01/09/04	06/29/05			6.6	Offset		6.6	0.13	3.00	4	0.08
							5.9	Offset		5.9	0.25		8	0.17
					0	0	5.9	Clay H	0.00	5.9	0.75		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-1 (continued)
Observation Borehole Fractures and Offset Data Summary

Hole	Location		Initial Inspection Date	Recent Inspection Date	Fr [1]	FZ [2]	Beam Height (ft)	Feature	Fracture Density [3]	Feature Depth (ft)	Feature Magnitude (in)	Hole Diameter (in)	Hole Closure (%)	Offset Rate (in/yr)
	North End (continued)													
OH489	N 940	E 0	01/09/04	06/29/05			6.1	Offset		6.1	0.25	3.00	8	N/A
					0	0	6.1	Clay H	0.00	6.1	0.13		N/A	N/A
OH488	N 1100	E 0	01/07/04	06/29/05			6.4	Separation		6.4	0.25	3.00	N/A	N/A
					0	0	6.0	Separation	0.00	6.0	0.13		N/A	N/A
OH487	N 1266	E 0	01/07/04	06/29/05	1	0	4.9	Separation	0.20	4.9	1.50	3.00	N/A	N/A
							1.6	Separation		1.6	0.38		N/A	N/A
							1.1	Rough Spot		1.1			N/A	N/A
OH486	N 1400	E 0	01/07/04	06/29/05			6.6	Separation		6.6	0	3.00	N/A	N/A
					0	0	6.1	Clay H	0.00	6.1	0.25		N/A	N/A

[1] Fr = Number of fractures in immediate roof beam
[2] Number of fracture zones in immediate roof beam
[3] Fracture Density = (Fr + 2 FZ) / Beam Height

Table 7-2
Summary of New Boreholes

Hole	Northing	Easting	Location	Drill Date	Depth (feet)	Diameter (inches)	Purpose Of Hole
OH 142-2	7907	7040	S1780-E145	6/29/05	20.0	3	Observation
OH 143-2	7097	7045	S1780-E150	6/29/05	20.1	3	Observation
OH 144-2	7097	7050	S1780-E155	6/29/05	20.0	3	Observation
OH 401-1	6858	7415	S2830-E520	2/14/05	20.0	3	Observation
OH 471	7342	7047	S2333-E140	1/21/05	14.8	3	Observation
OH 472	7523	7046	S2167-E140	1/21/05	15.0	3	Observation
OH 473	7596	7048	S2092-E140	1/21/05	15.0	3	Observation
OH 474	7676	7049	S1992-E140	1/21/05	14.9	3	Observation
OH 503	6607	7125	S3080-E230	4/12/05	19.1	3	Observation
OH 507	10862	7195	N1175-E300	7/20/04	25.2	3	Observation
OH 508	10937	7195	N1250-E300	7/20/04	23.2	3	Observation
OH 509	11012	7195	N1350-E300	7/20/04	25.0	3	Observation
OH 510	6607	7475	S3080-E580	8/2/04	20.3	3	Observation
OH 511	7912	7048	S1775-E140	8/4/04	50.0	3	Observation
OH 512	7677	7049	S2010-E140	8/4/04	50.0	3	Observation
OH 513	7336	7047	S2351-E140	8/11/04	50.0	3	Observation
OH 514	6287	6865	S3400-W30	12/8/04	20.1	3	Observation
OH 515	6197	6865	S3490-W30	12/8/04	20.5	3	Observation
OH 516	6887	7035	S2800-E140	11/16/04	11.6	3	Observation
OH 517	6837	7035	S2850-E140	11/16/04	11.6	3	Observation
OH 518	6787	7035	S2900-E140	11/16/04	11.6	3	Observation
OH 519	6737	7035	S2950-E140	11/16/04	11.6	3	Observation
OH 520	6780	7035	S2907-E140	11/16/04	11.6	3	Observation
OH 521	9727	7035	N40-E140	11/20/04	20.6	3	Observation
OH 522	9602	7035	S90-E140	11/20/04	20.0	3	Observation
OH 523	9523	7035	S164-E140	11/20/04	8.0	3	Observation
OH 524	9505	7035	S182-E140	11/20/04	20.0	3	Observation
OH 525	9463	7035	S224-E140	11/20/04	10.4	3	Observation
OH 526	6097	6865	S3509-W30	12/8/04	20.5	3	Observation
OH 527	6607	8082	S3080-E1190	2/14/05	20.4	3	Observation
OH 528	6377	7415	S3310-E520	2/21/05	20.0	3	Observation
OH 529	6307	7414	S3380-E520	3/13/05	20.0	3	Observation
OH 530	6207	7414	S3480-E520	3/13/05	20.0	3	Observation
OH 531	6107	7414	S3580-E520	3/13/05	20.1	3	Observation
OH 532	6037	7415	S3650-E520	2/21/05	20.0	3	Observation
OH 533	6377	7554	S3310-E660	4/23/05	20.0	3	Observation
OH 535	6207	7554	S3480-E660	6/16/05	20.1	3	Observation
OH 536	6107	7554	S3580-E660	5/28/05	20.1	3	Observation
OH 537	6037	7554	S3650-E660	5/28/05	22.0	3	Observation
OH 538	6377	7684	S3310-E790	5/11/05	20.1	3	Observation
OH 543	6377	7814	S3310-E920	5/28/05	20.1	3	Observation
OH 565	6040	6877	S3650-W30	2/28/05	20.4	3	Observation
OH 567	6039	7046	S3650-E140	3/14/05	20.4	3	Observation
OH 569	6037	7194	S3650-E300	4/20/05	20.3	3	Observation
OH 571	6160	7047	S3527-E140	2/28/05	20.3	3	Observation
OH 574	9187	7035	S500-E140	6/16/05	20.1	3	Observation
OH 576	8837	7035	S850-E140	6/16/05	20.0	3	Observation

Table 7-2 (Continued))
Summary of New Boreholes

Hole	Northing	Easting	Location	Drill Date	Depth (feet)	Diameter (inches)	Purpose Of Hole
OH 577	8527	7035	S1160-E140	6/16/05	20.1	3	Observation
OH 578	8387	7035	S1300-E140	6/16/05	20.0	3	Observation
OH 579	8224	7040	S1463-E145	6/16/05	20.1	3	Observation
OH 580	8224	7045	S1463-E150	6/16/05	20.0	3	Observation
OH 581	8224	7050	S1463-E155	6/16/05	20.1	3	Observation
OH 582	8087	7035	S1600-E140	6/16/05	20.1	3	Observation
OH 583	7737	7035	S1950-E140	6/16/05	20.2	3	Observation
OH 584	7507	7035	S2180-E145	6/16/05	20.1	3	Observation
OH 585	7329	7040	S2358-E145	6/16/05	20.2	3	Observation
OH 586	7329	7045	S2358-E150	6/16/05	20.2	3	Observation
OH 587	7329	7050	S2358-E155	6/16/05	20.2	3	Observation
OH 588	7167	7035	S2520-E140	6/16/05	20.3	3	Observation
OH 589	6937	7035	S2750-E140	6/16/05	20.3	3	Observation
OH 590	6607	7035	S3080-E140	6/16/05	20.0	3	Observation
OH 591	6607	7619	S3080-E725	6/16/05	20.0	3	Observation
OH 592	6377	7486	S3310-E592	4/23/05	20.1	3	Observation
OH 593	6377	7619	S3310-E725	5/11/05	20.1	3	Observation
OH 594	6377	7749	S3310-E855	5/28/05	20.3	3	Observation
OH 595	6037	7486	S3650-E592	5/28/05	24.6	3	Observation

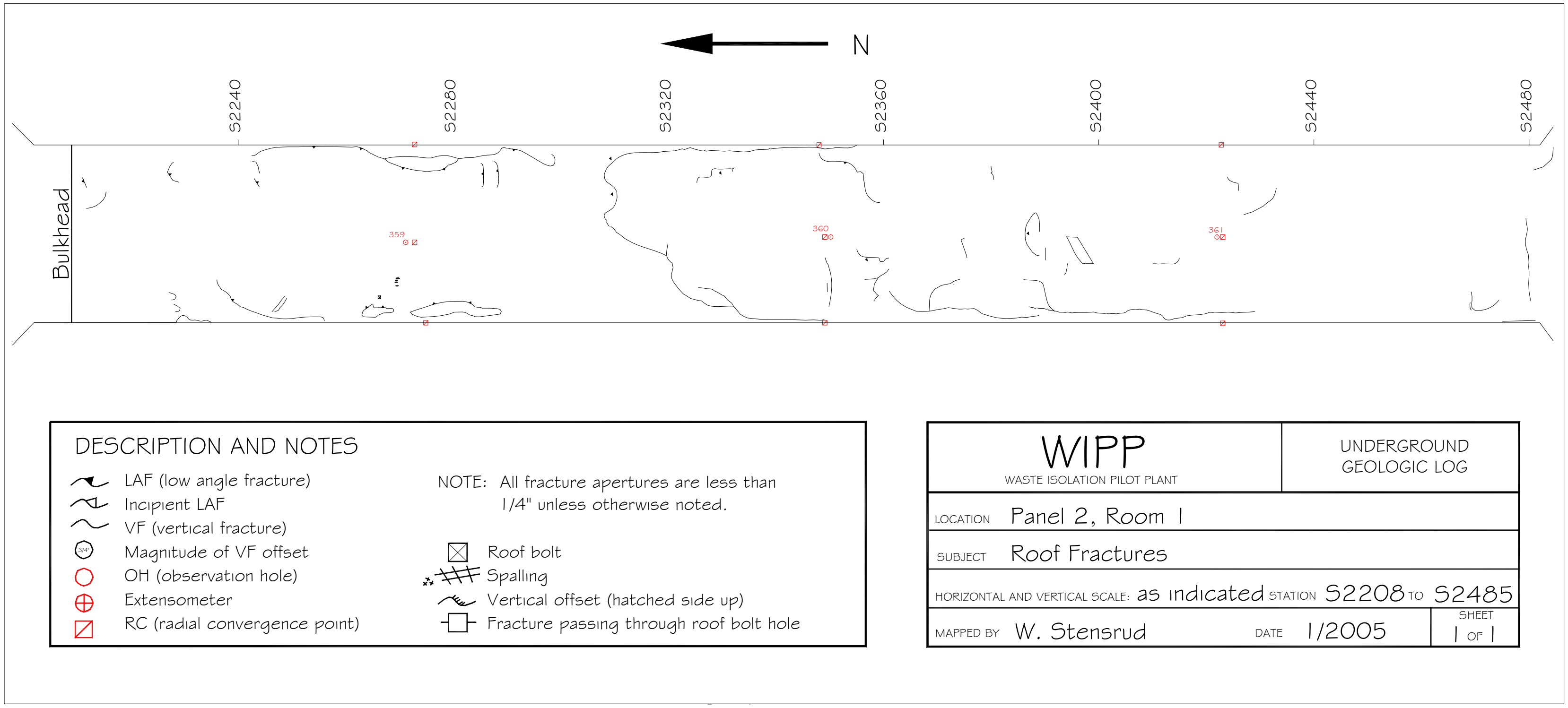


Figure 7-1
Panel 2, Room 1, S2208-S2485 Roof Fractures

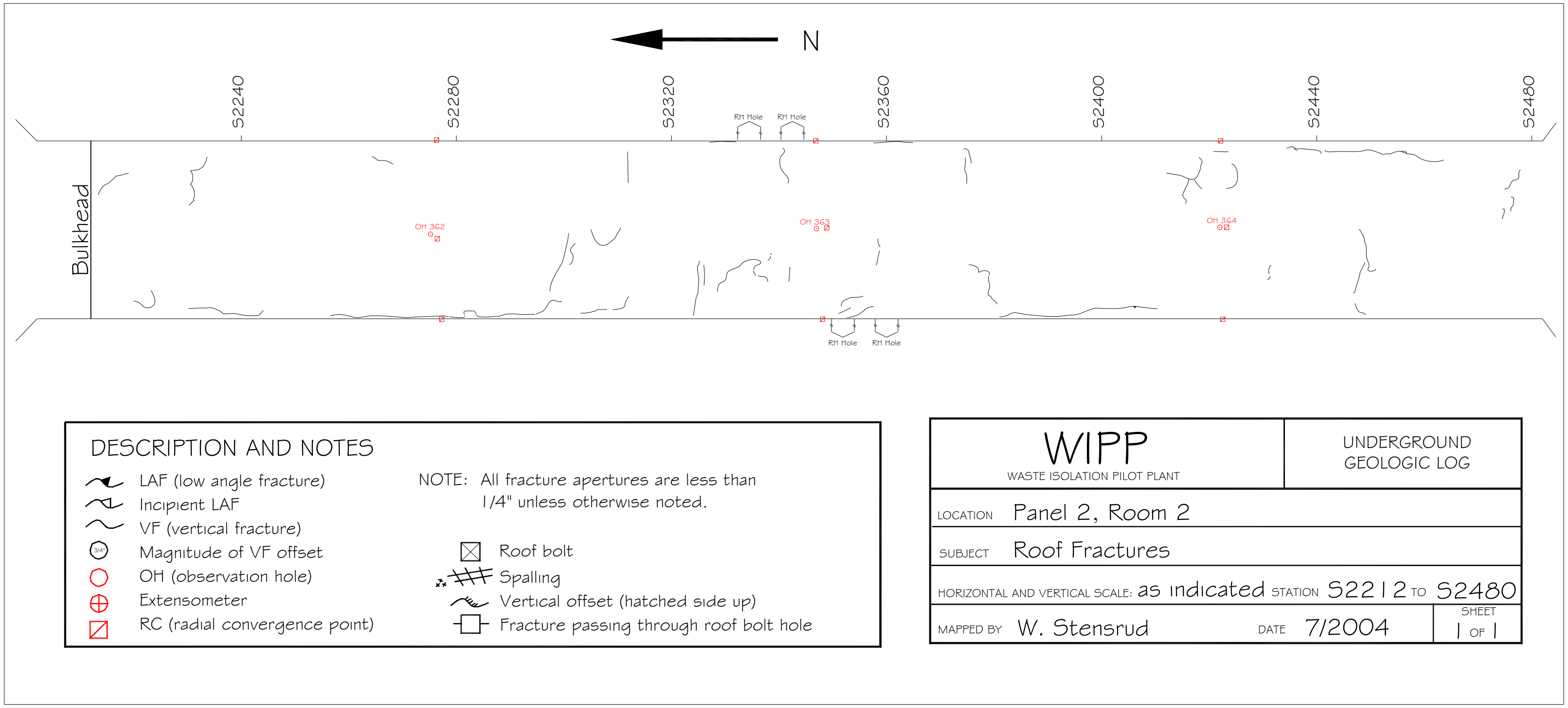


Figure 7-2
Panel 2, Room 2, S2212-S2480 Roof Fractures

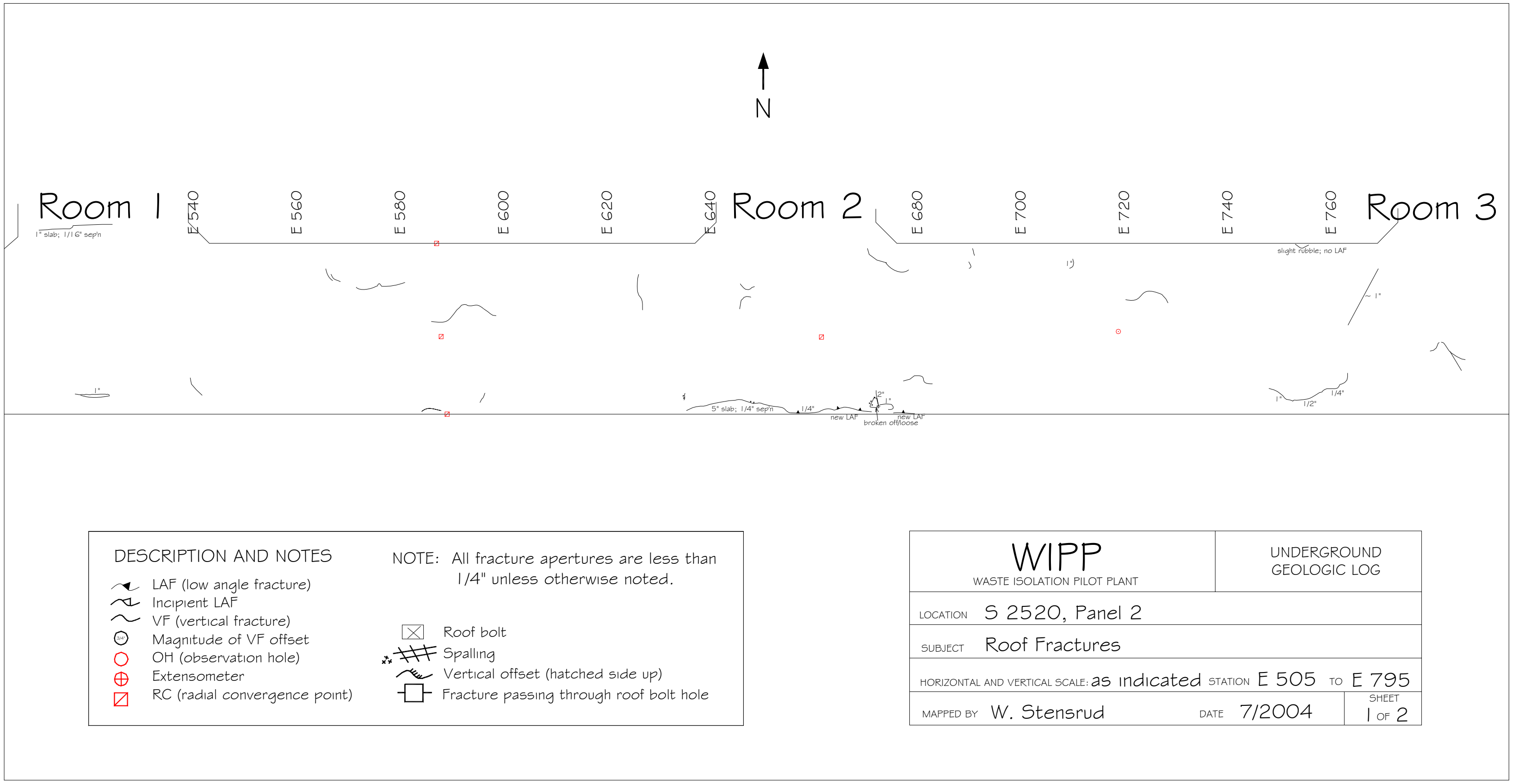


Figure 7-3
Panel 2, S2530, E505-E795 Roof Fractures

Figure 7-4
Panel 3, S2520, S2770-S3070 Roof Fractures

Figure 7-5
Panel 3, Room 2, S2770-S3070 Roof Fractures

Figure 7-6
Panel 3, Room 3, S2770-S3070 Roof Fractures

Figure 7-7
Panel 3, Room 4, S2770-S3070 Roof Fractures

Figure 7-8
Panel 3, Room 5, S2770-S3070 Roof fractures

Figure 7-9
Panel 3, Room 6, S2770-S3070 Roof Fractures

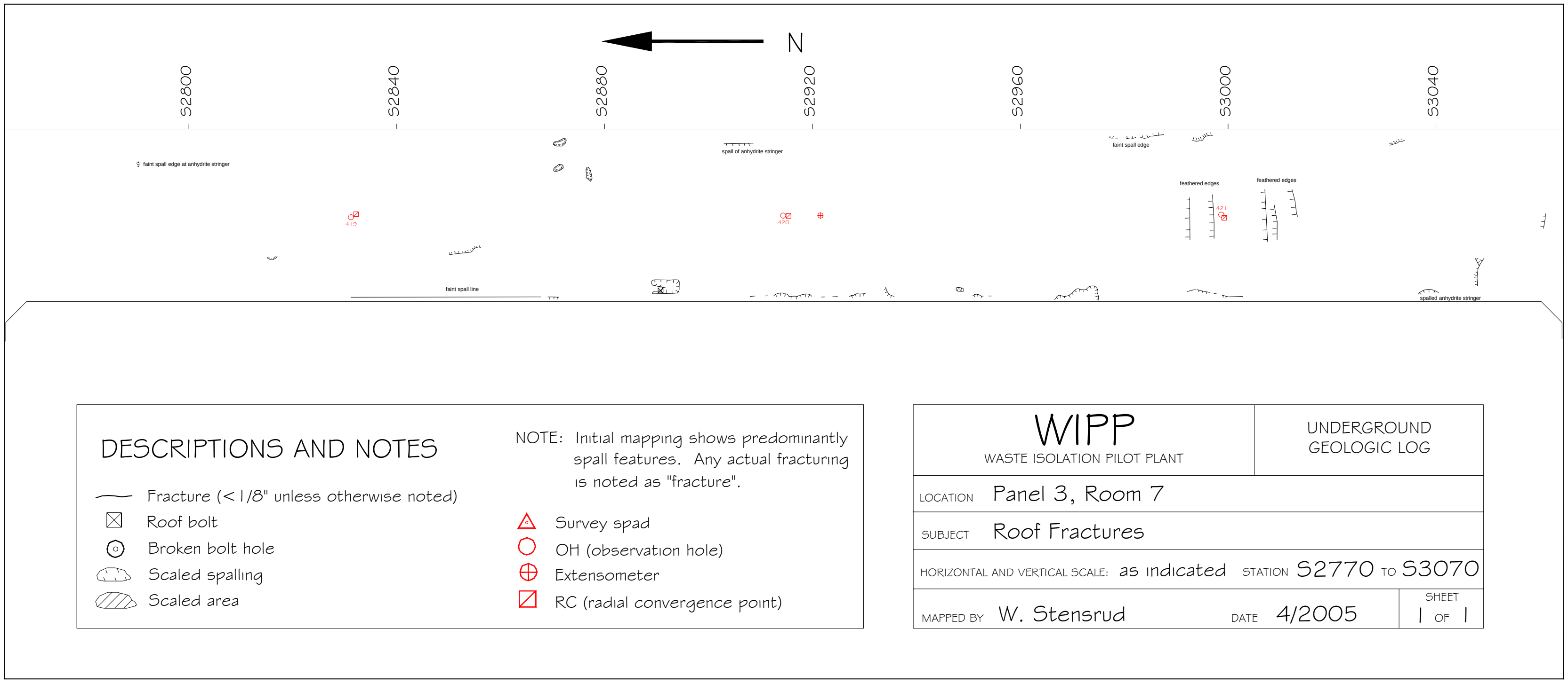


Figure 7-10
Panel 3, Room 7, S2770-S3070 Roof Fractures

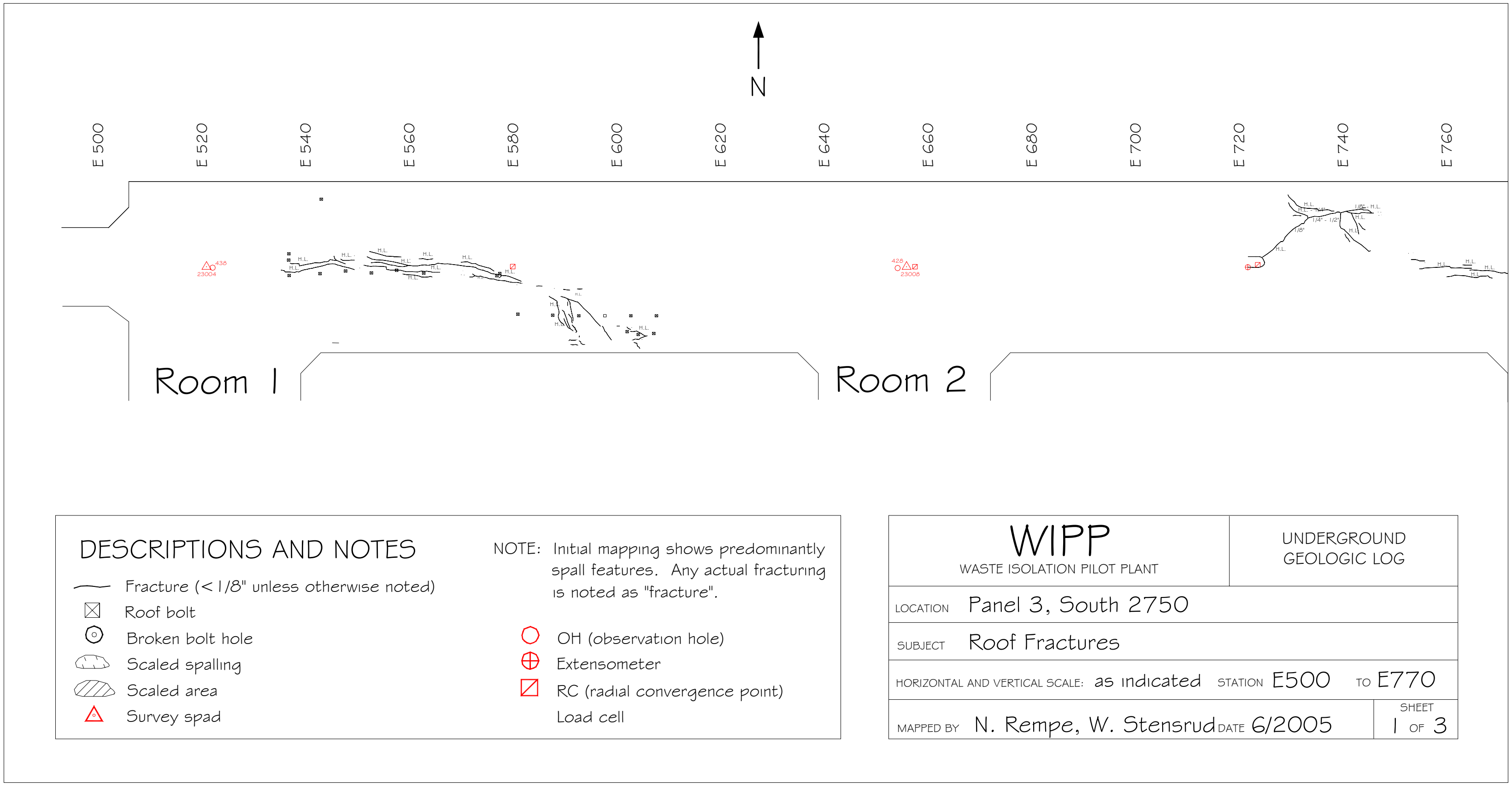


Figure 7-11
Panel 3, S2750, E500-E770 Roof Fractures

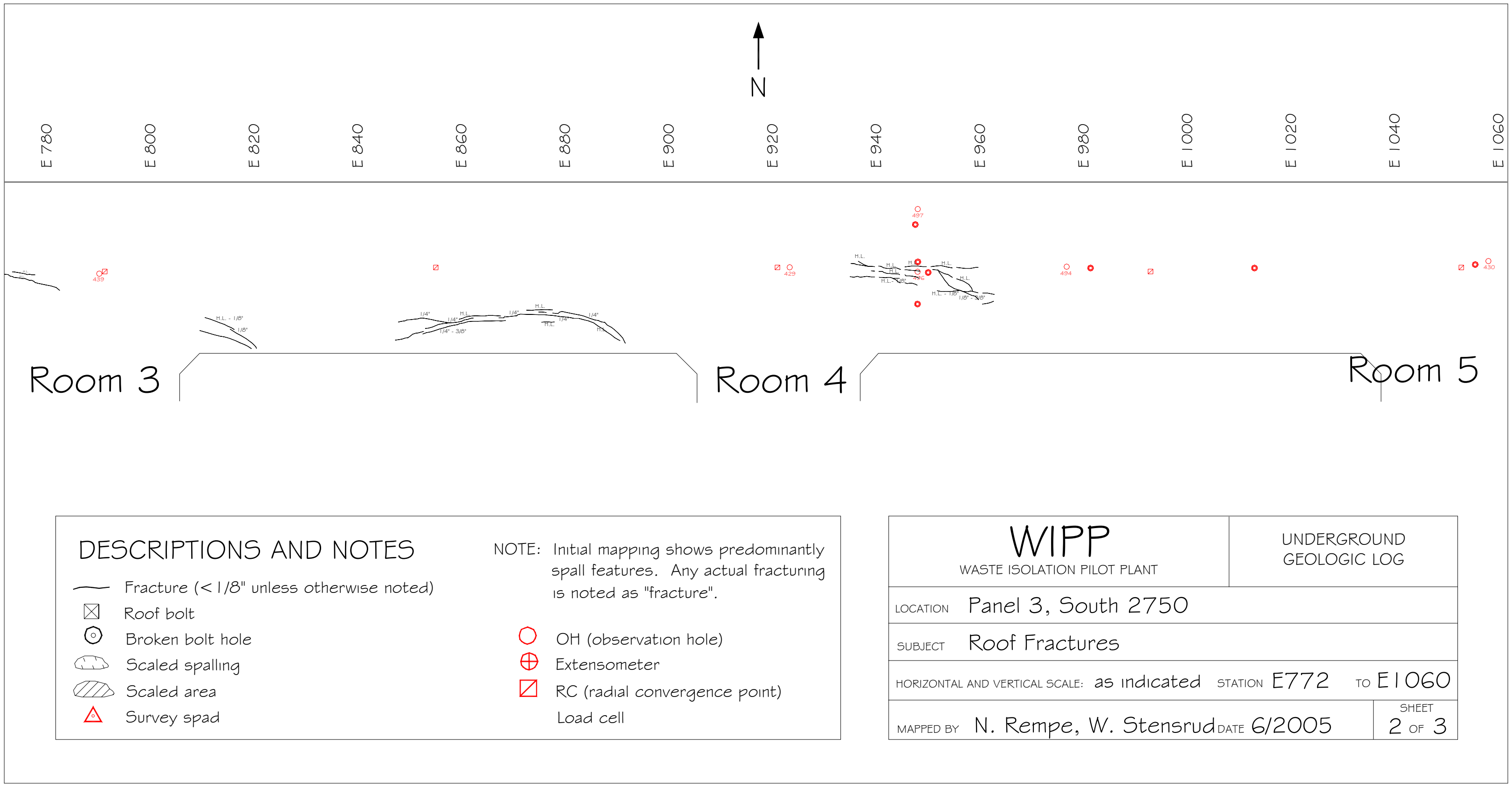


Figure 7-12
Panel 3, S2750, E772-E1060 Roof Fractures

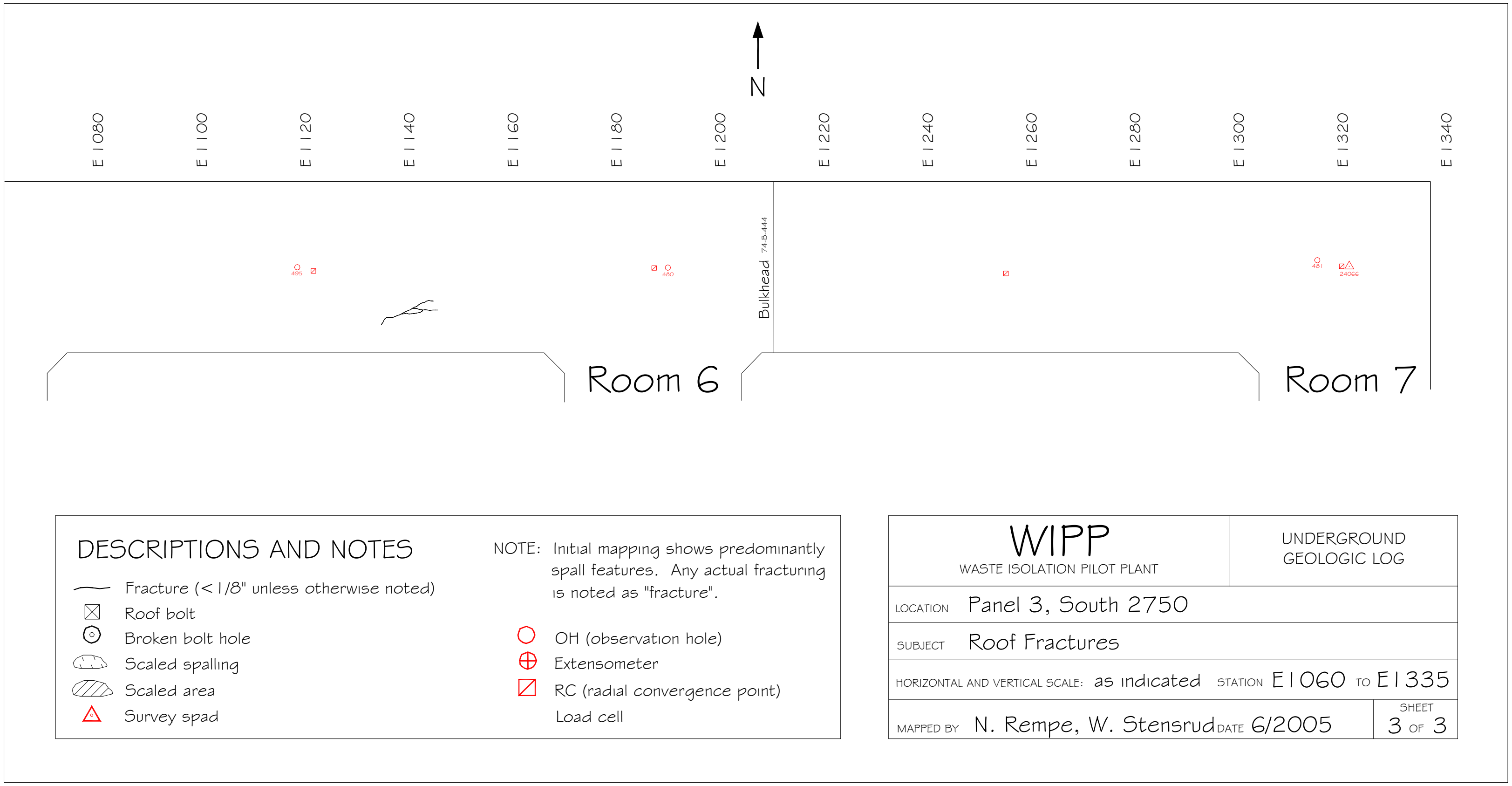


Figure 7-13
Panel 3, S2750, E1060-E1335 Roof Fractures

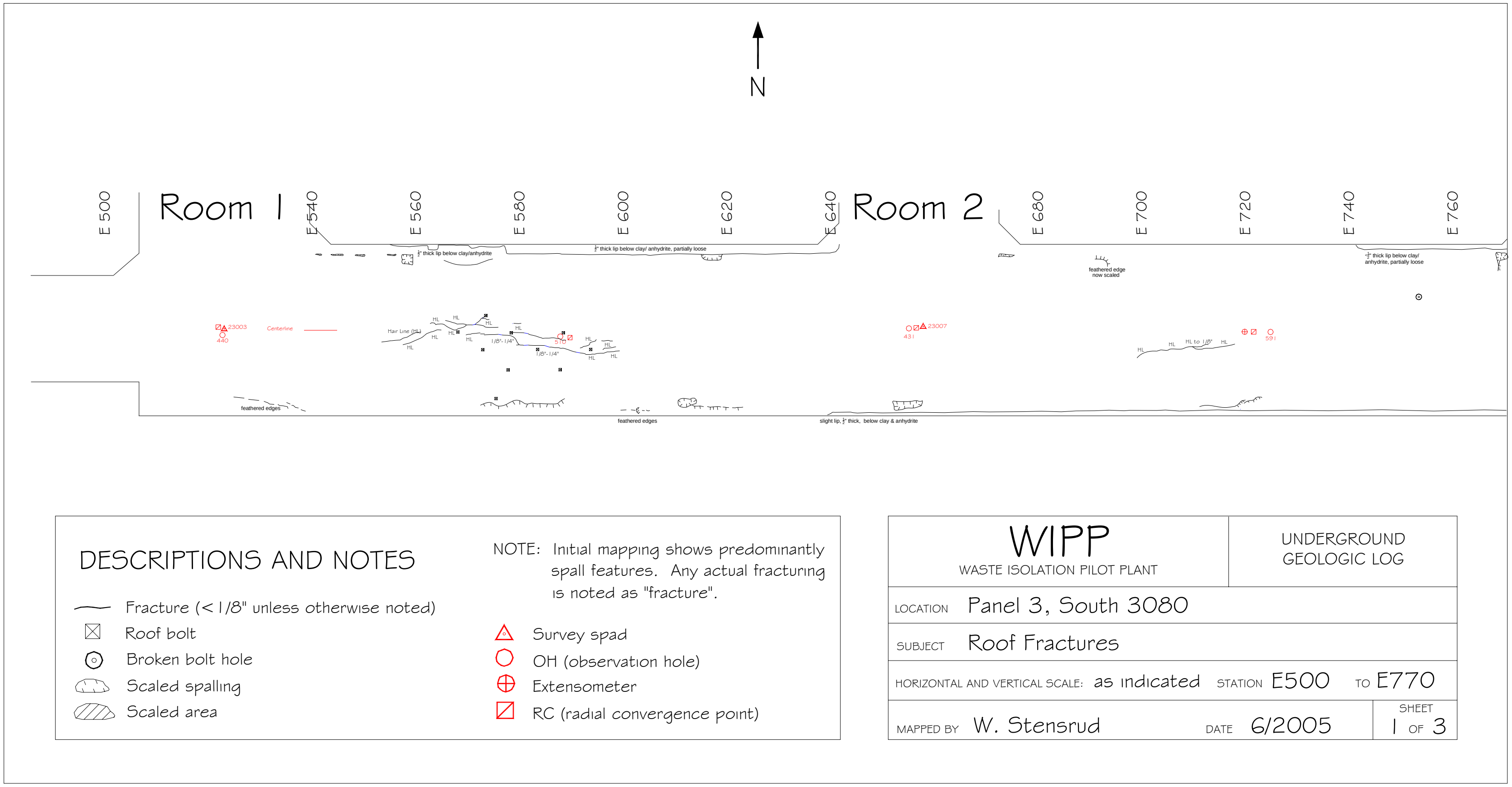


Figure 7-14
Panel 3, S3080, E500-E770 Roof Fractures

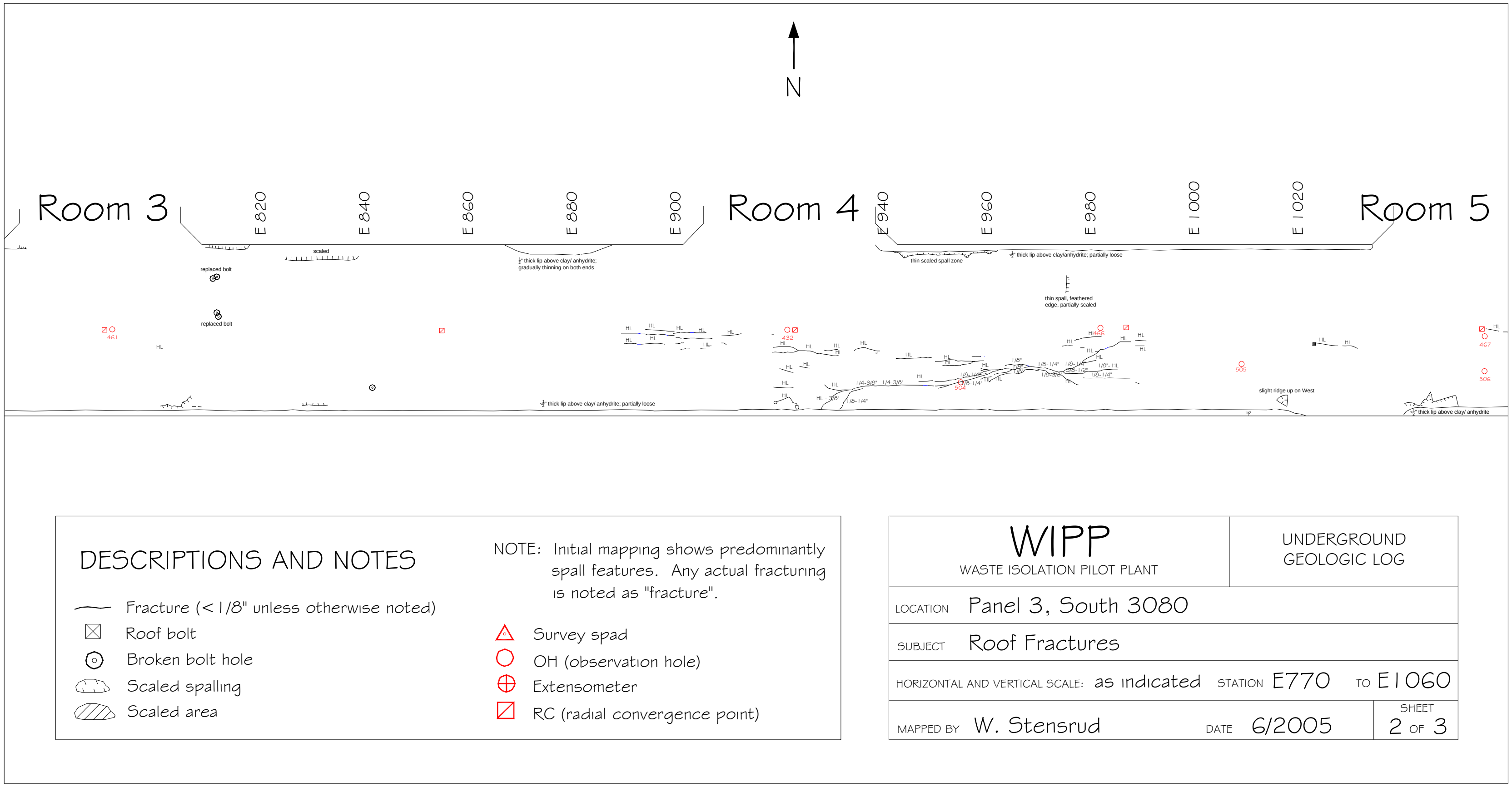


Figure 7-15
Panel 3, S3080, E770-E1060 Roof Fractures

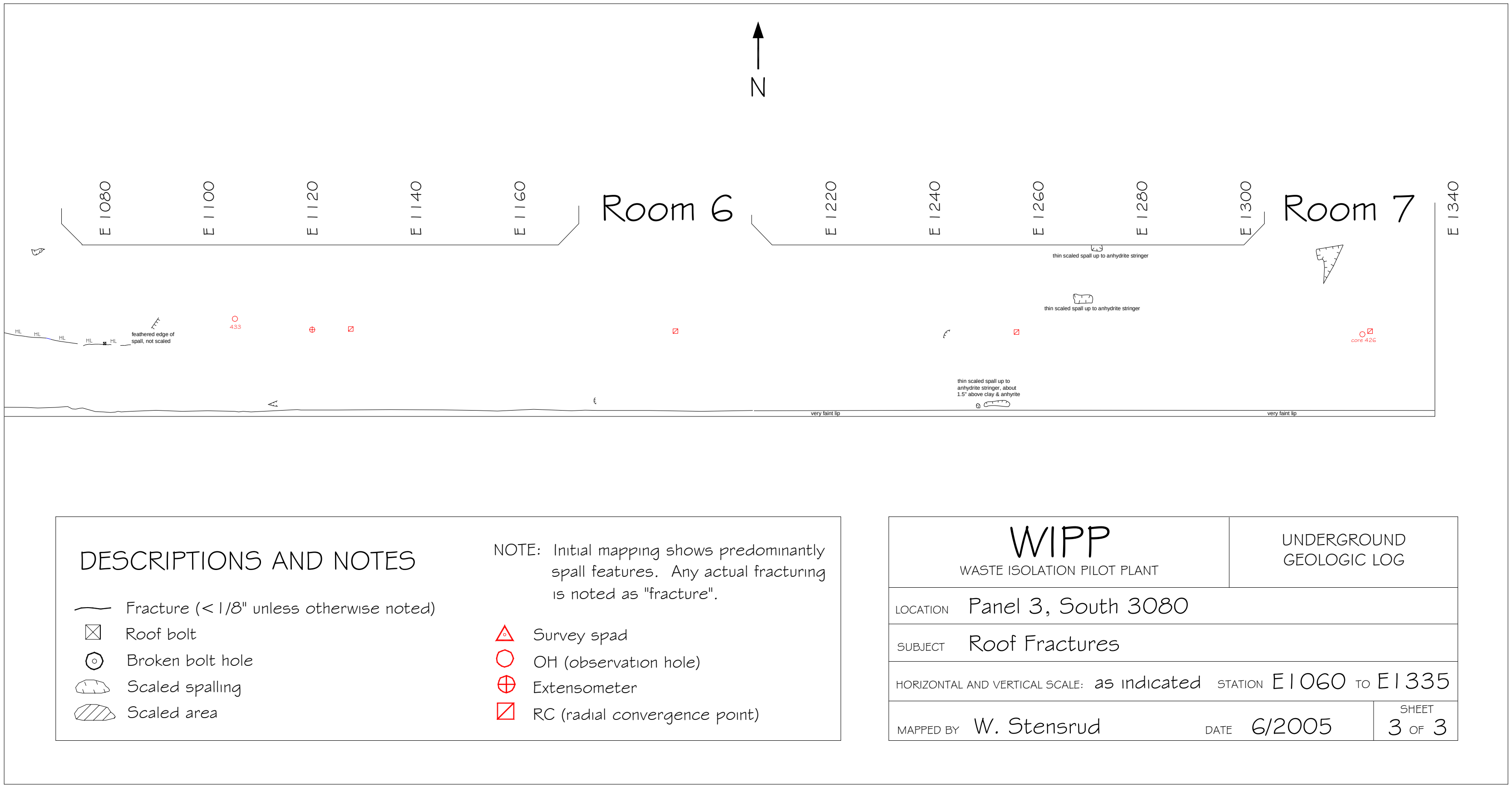
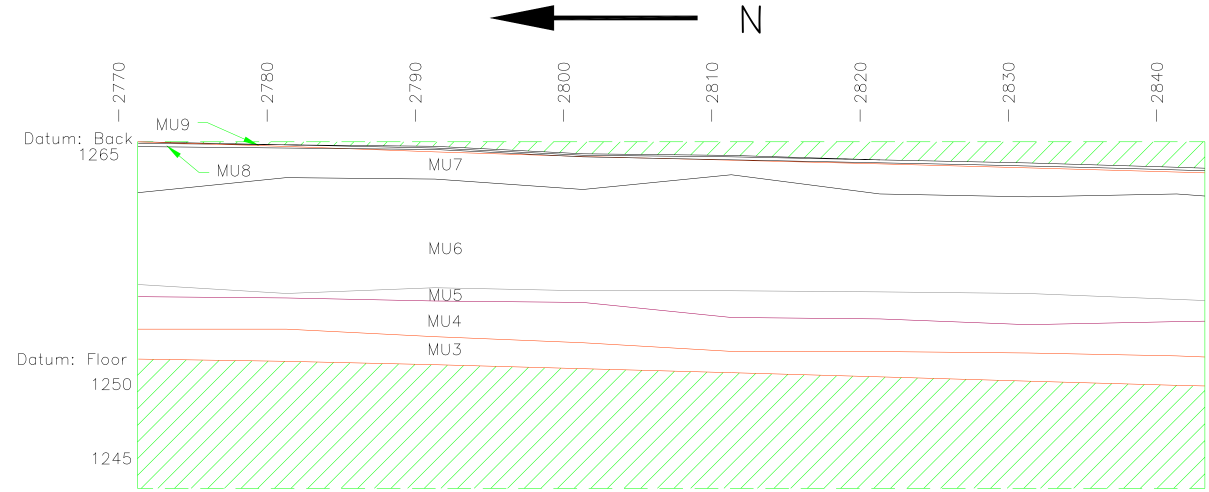


Figure 7-16
Panel 3, S3080, E1060-E1335 Roof Fractures



DESCRIPTION AND NOTES

Mapping Units (MU's)

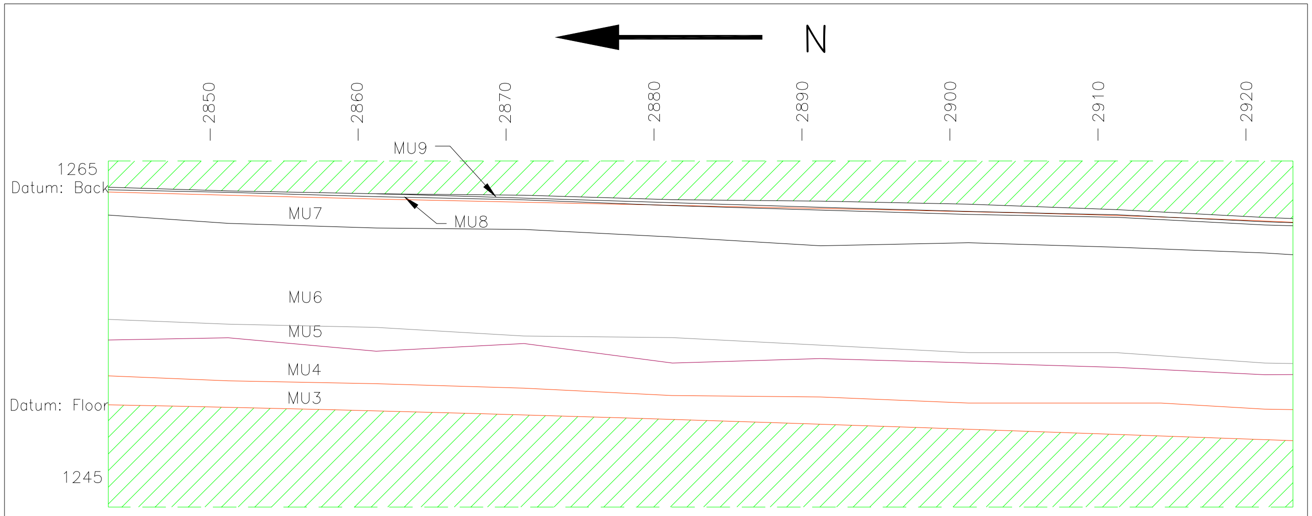
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT			
LOCATION Panel 3, Room 1			
SUBJECT Stratigraphy			
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057		
MAPPED BY W. Stensrud	DATE 6/21/04	SHEET 1 OF 4	

Figure 7-17
Panel 3, Room 1, S2767-S3057 Stratigraphic Map (1of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
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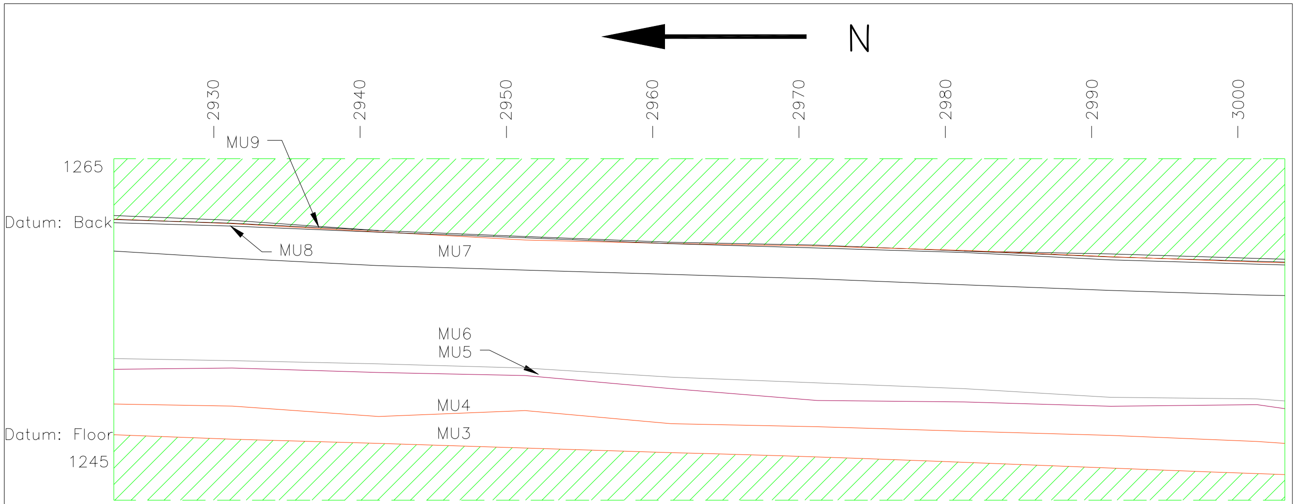
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 1		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 6/21/04	SHEET 2 OF 4

Figure 7-18
Panel 3, Room1, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

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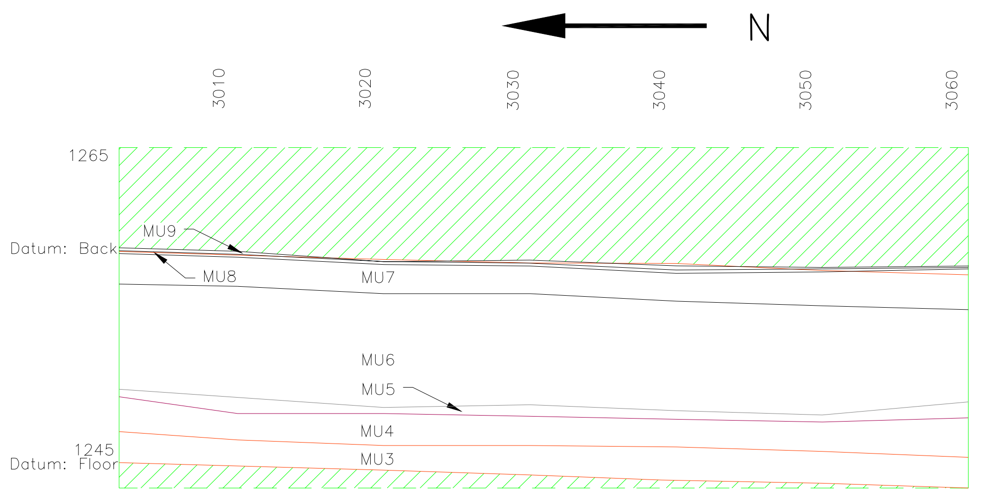
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 1		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 6/21/04	SHEET 3 OF 4

Figure 7-19
Panel 3, Room 1, S2767-S3057 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

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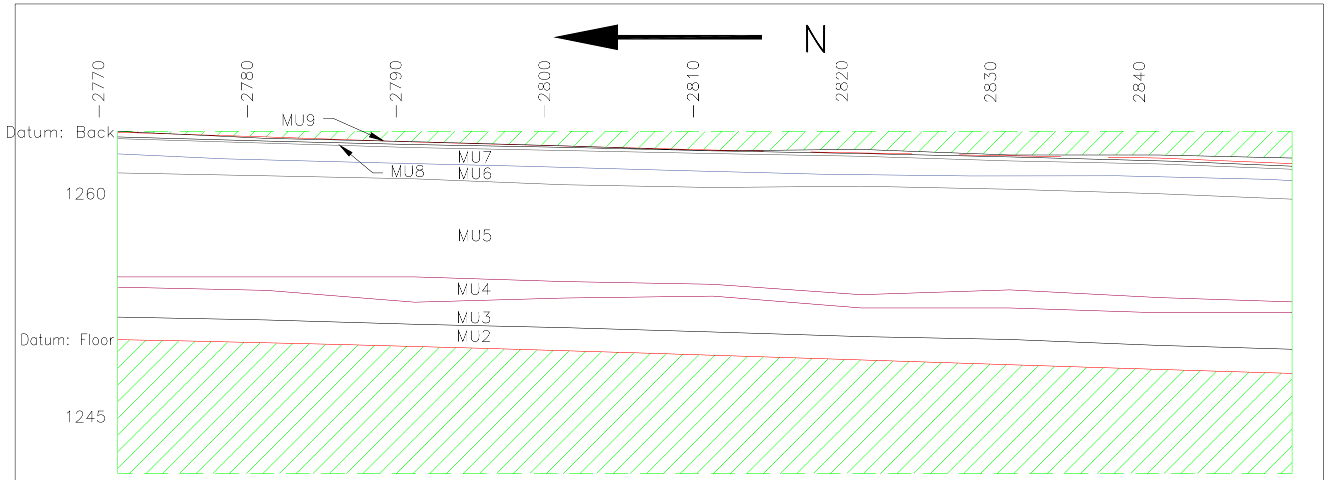
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 1	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 6/21/04 — SHEET 4 OF 4

Figure 7-20
Panel 3, Room 1, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

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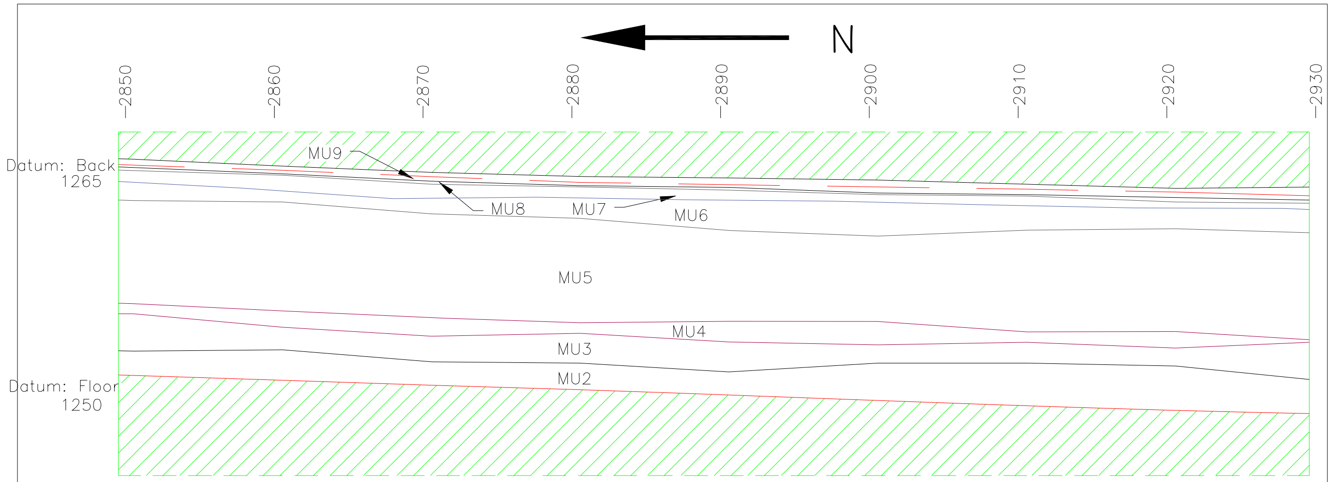
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 2	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 3/11/04 — SHEET 1 OF 4

Figure 7-21
Panel 3, Room 2, S2767-S3057 Stratigraphic Map (1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

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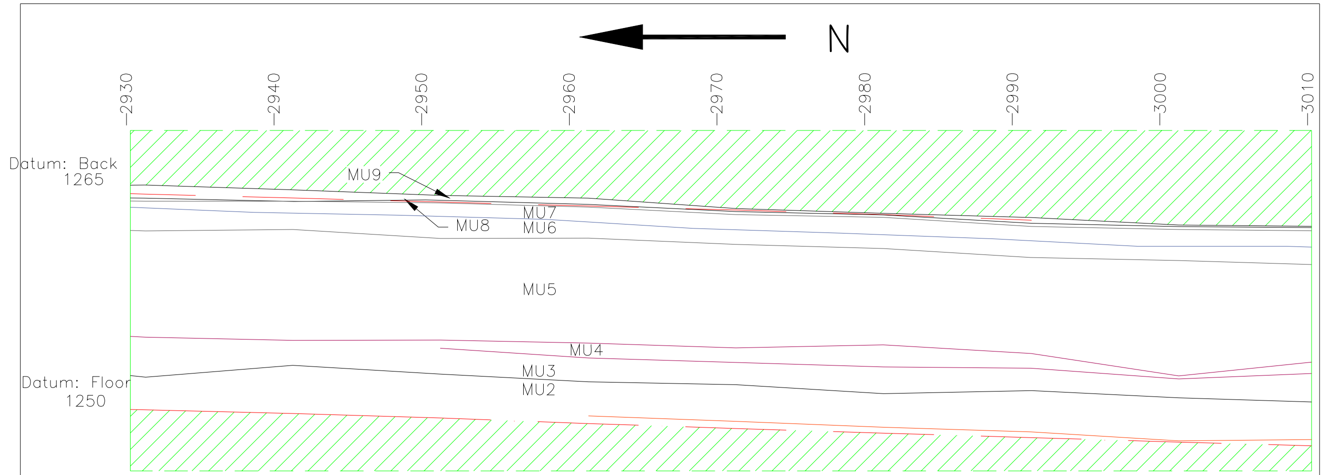
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 2		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 3/11/04	SHEET 2 OF 4

Figure 7-22
Panel 3, Room 2, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

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MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
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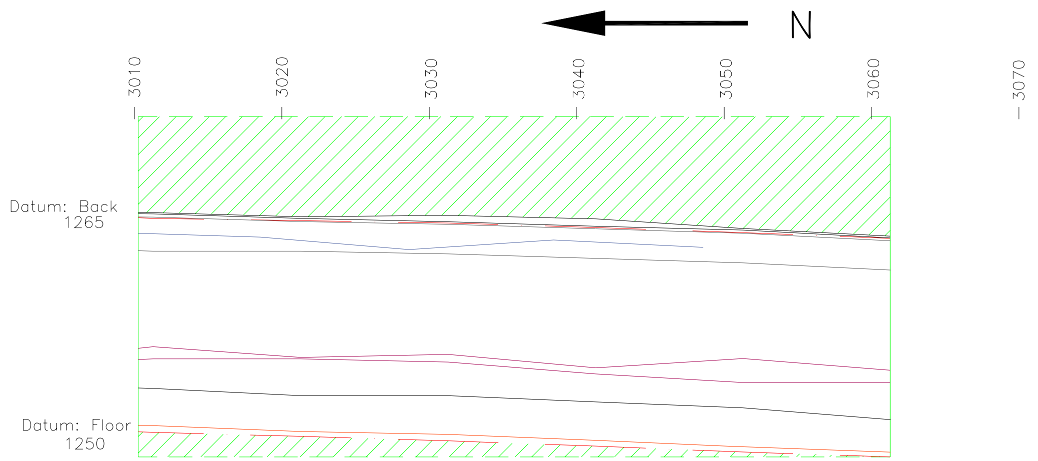
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 2		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 3/11/04	SHEET 3 OF 4

Figure 7-23
Panel 3, Room 2, S2767-S3067 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

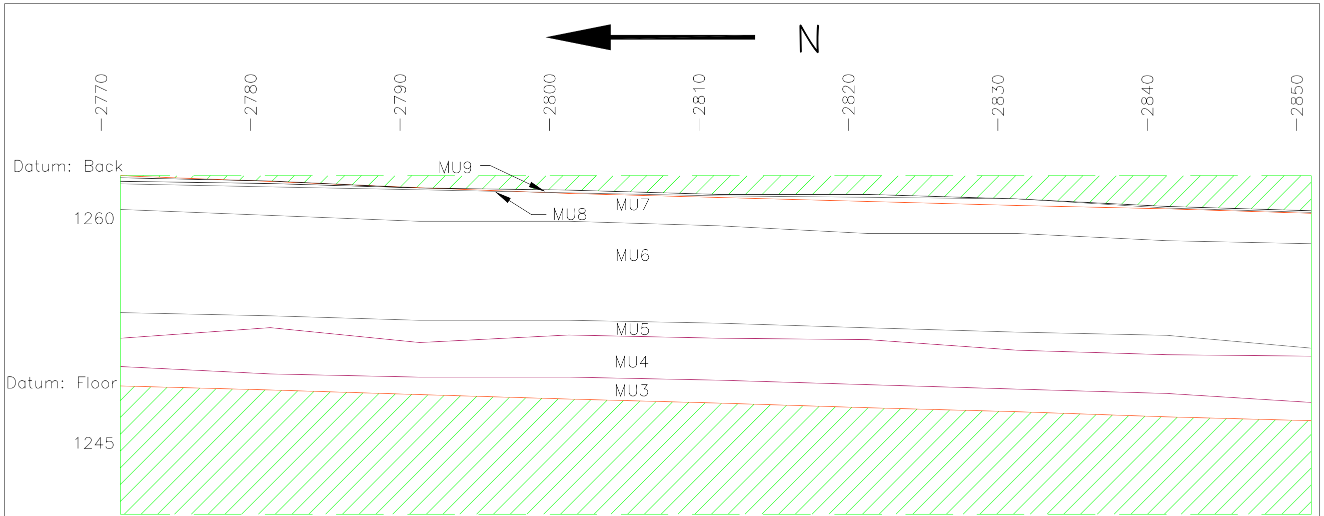
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 2		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 3/11/04	SHEET 4 OF 4

Figure 7-24
Panel 3, Room 2, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

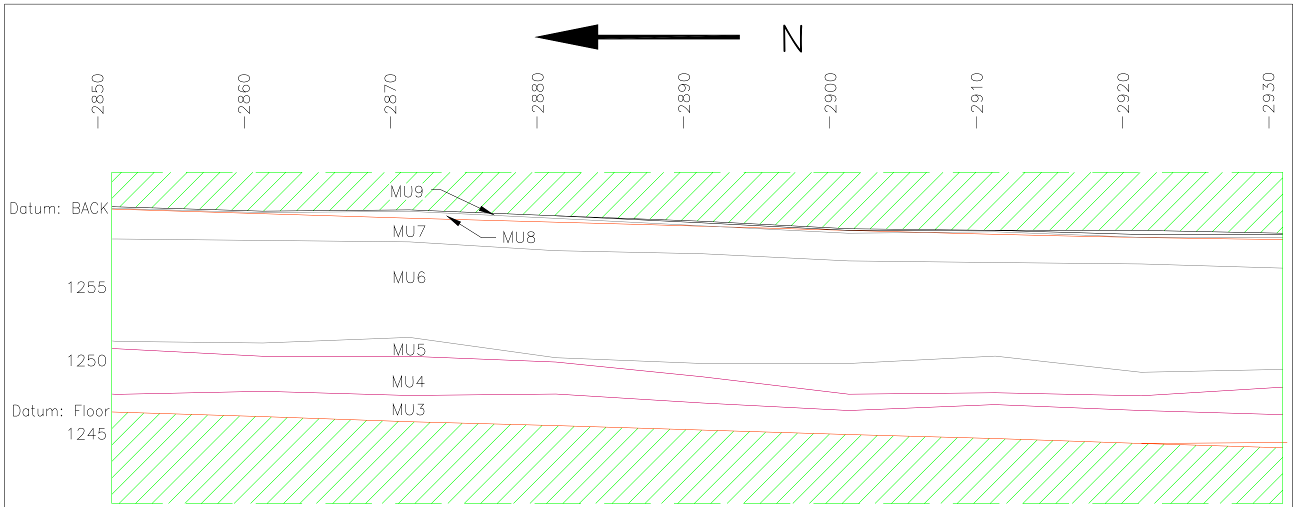
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 3	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 3/23/2004 — SHEET 1 OF 4

Figure 7-25
Panel 3, Room 3, S2767-S3057 Stratigraphic Map (1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

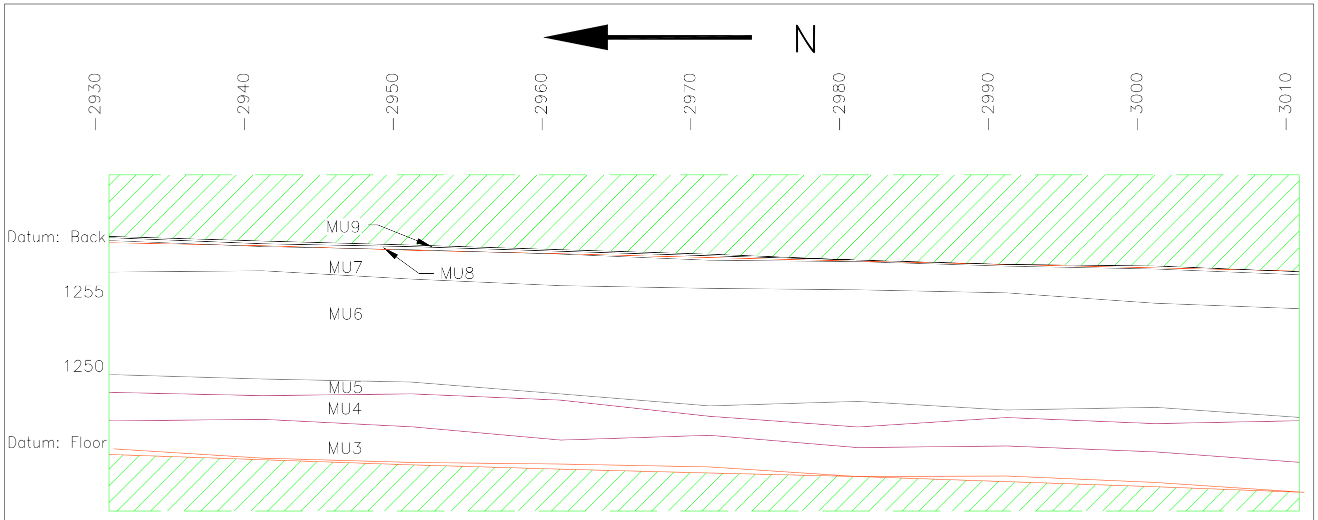
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 3		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 3/23/2004	SHEET 2 OF 4

Figure 7-26
Panel 3, Room 3, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

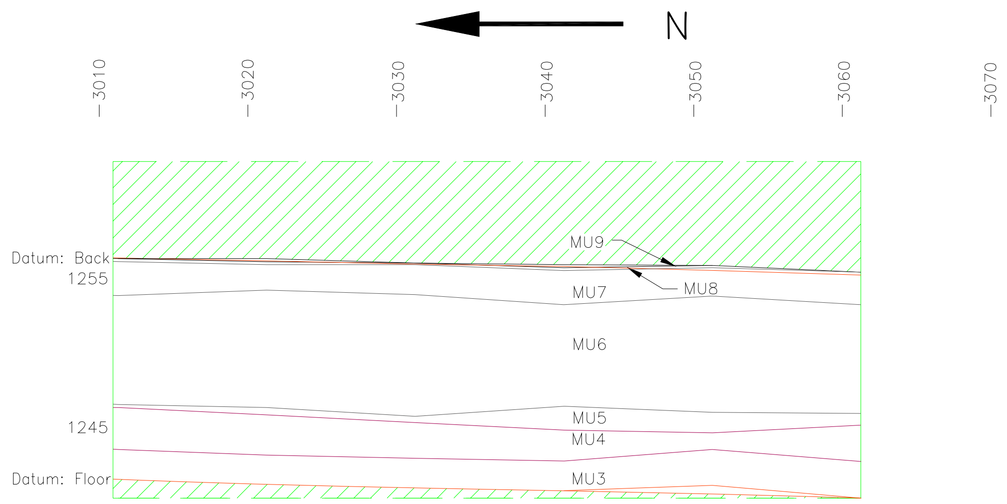
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 3	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 3/23/2004 SHEET 3 OF 4

Figure 7-27
Panel 3, Room 3, S2767-S3057 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

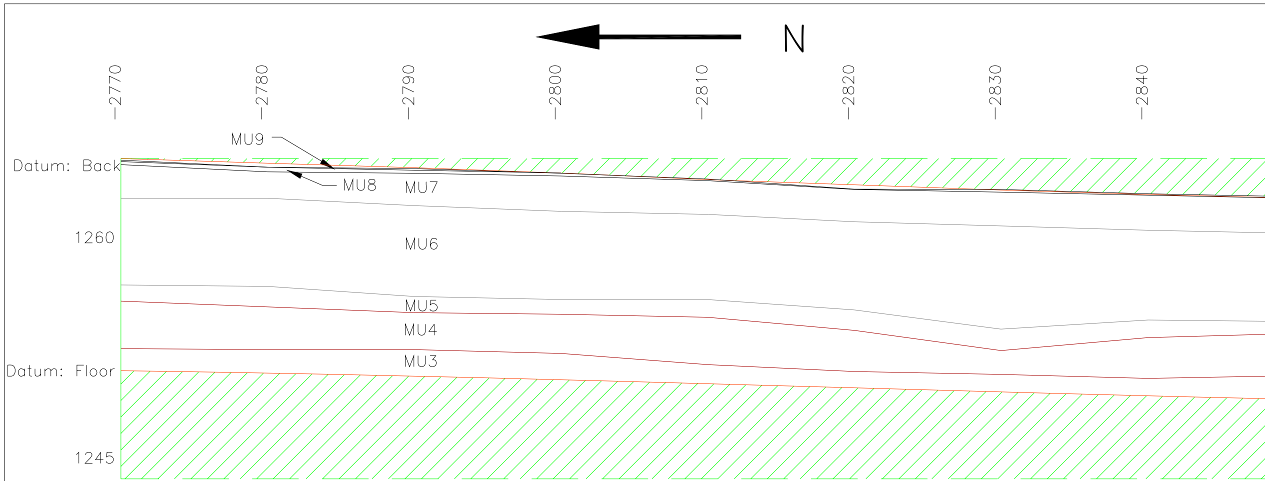
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 3		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 3/23/2004	SHEET 4 OF 4

Figure 7-28
Panel 3, Room 3, S2767-S3057 Stratigraphic Map (4of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

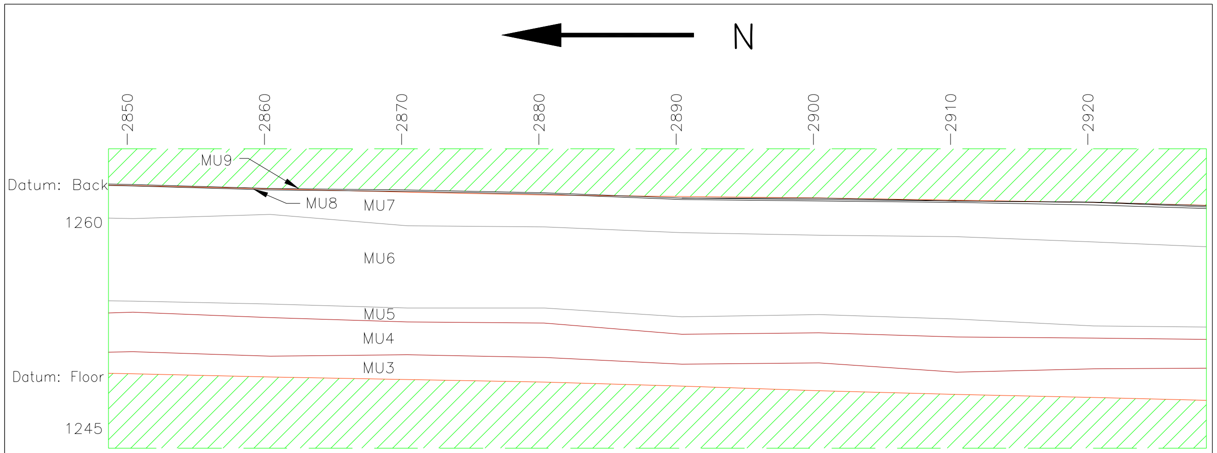
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 4	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 4/13/2004 SHEET 1 OF 4

Figure 7-29
Panel 3, Room 4, S2767-S3057 Stratigraphic Map(1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

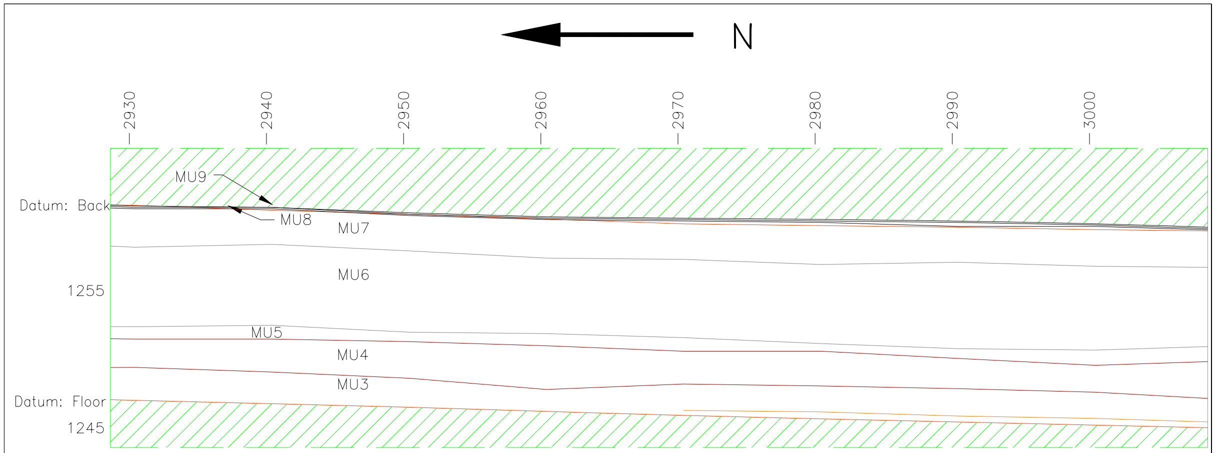
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 4	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 4/13/2004 — SHEET 2 OF 4

Figure 7-30
Panel 3, Room 4, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 4	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 4/13/2004 SHEET 3 OF 4

Figure 7-31
Panel 3, Room 4, S2767-S3057 Stratrigraphic Map (3of 4)

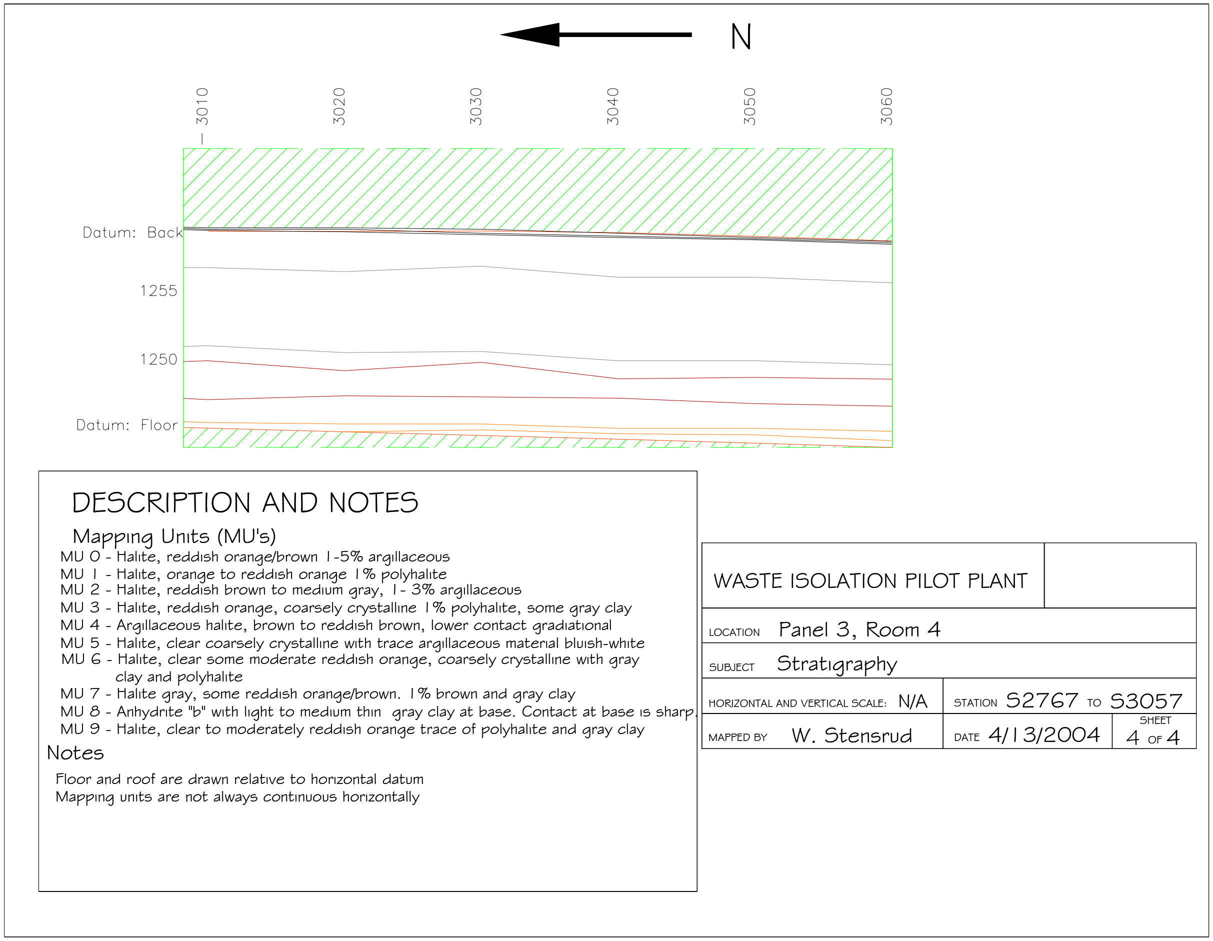
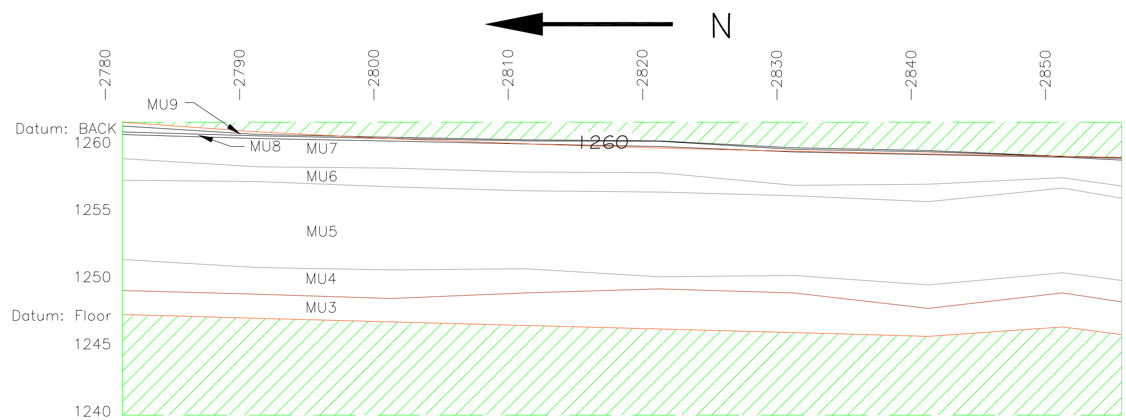


Figure 7-32
Panel 3, Room 4, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

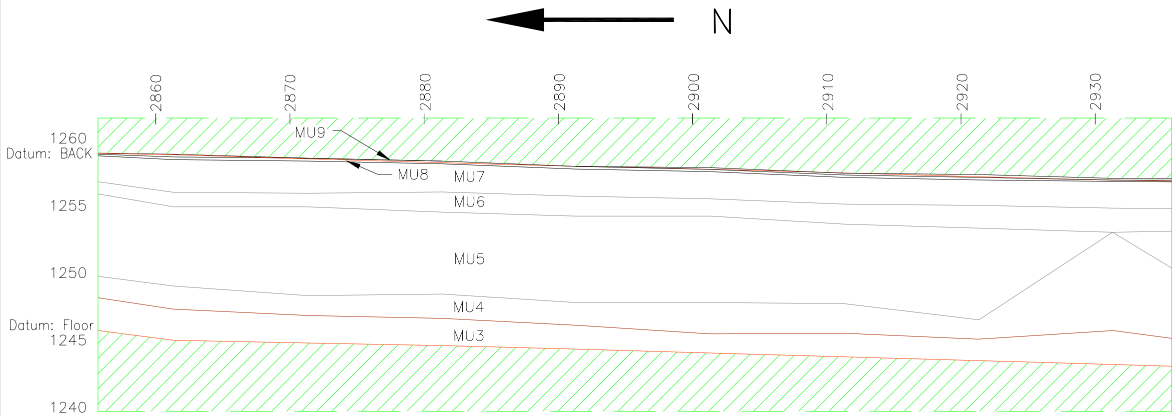
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 5		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 5/6/04	SHEET 1 OF 4

Figure 7-33
Panel 3, Room 5, S2767-S3057 Stratigraphic Map (1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

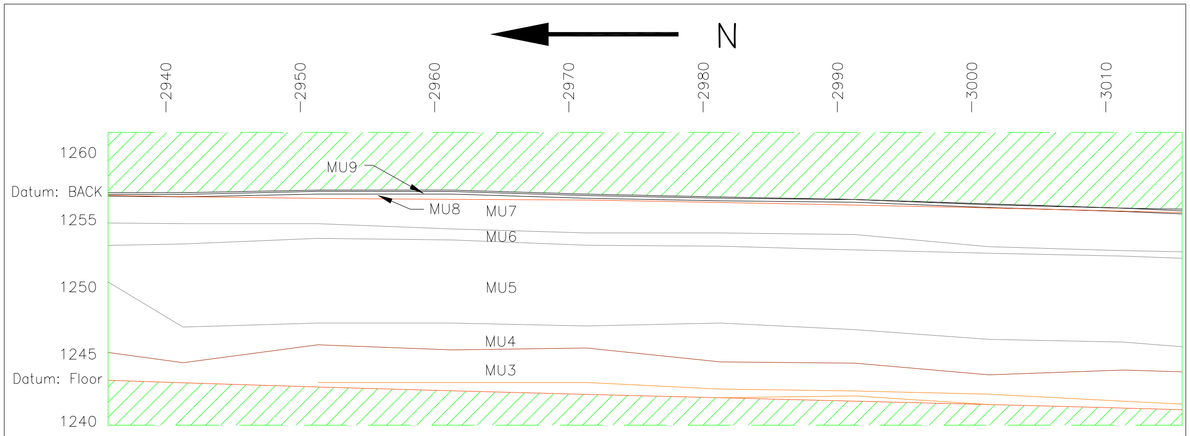
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 5	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 5/6/04 — SHEET 2 OF 4

Figure 7-34
Panel 3, Room 5, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

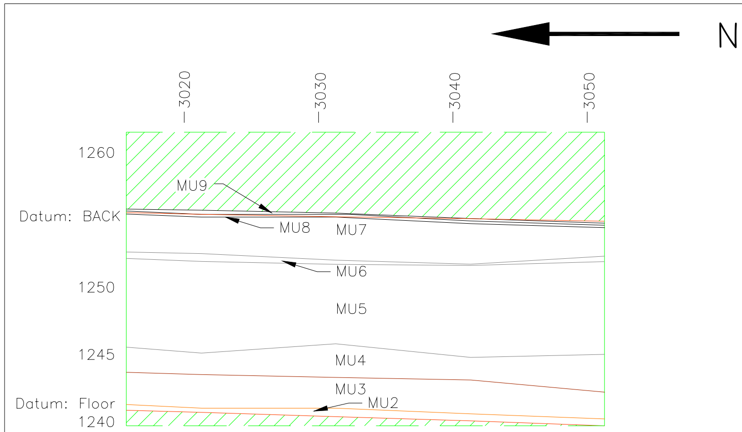
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 5	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 5/6/04 — SHEET 3 OF 4

Figure 7-35
Panel 3, Room 5, S2767-S3057 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

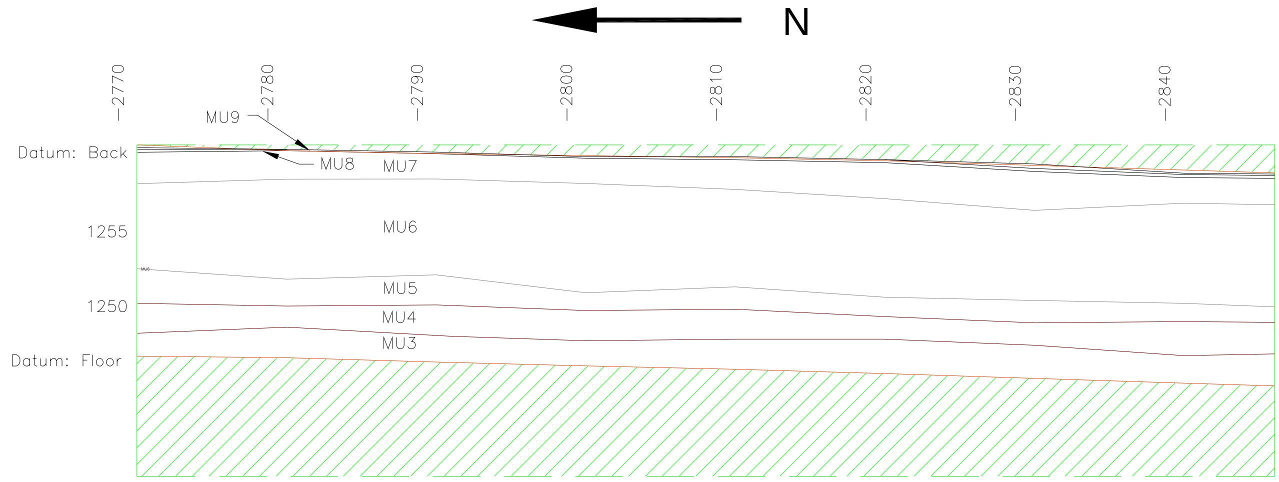
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 5		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 5/6/04	SHEET 4 OF 4

Figure 7-36
Panel 3, Room 5, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

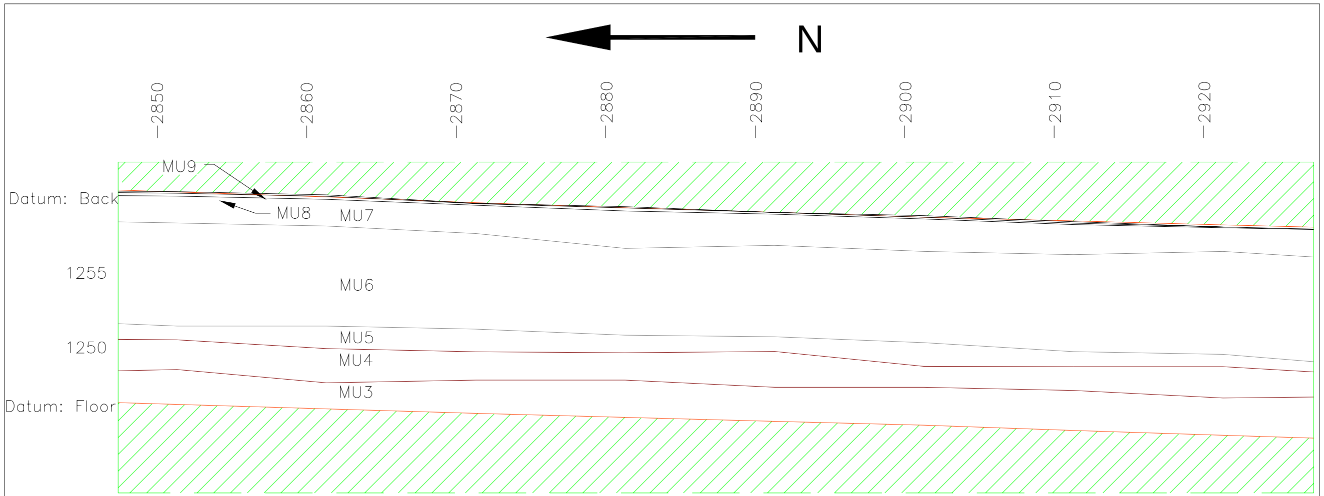
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT			
LOCATION Panel 3, Room 6			
SUBJECT Stratigraphy			
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057		
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 1 OF 4	

Figure 7-37
Panel 3, Room 6, S2767-S3057 Stratigraphic Map (1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

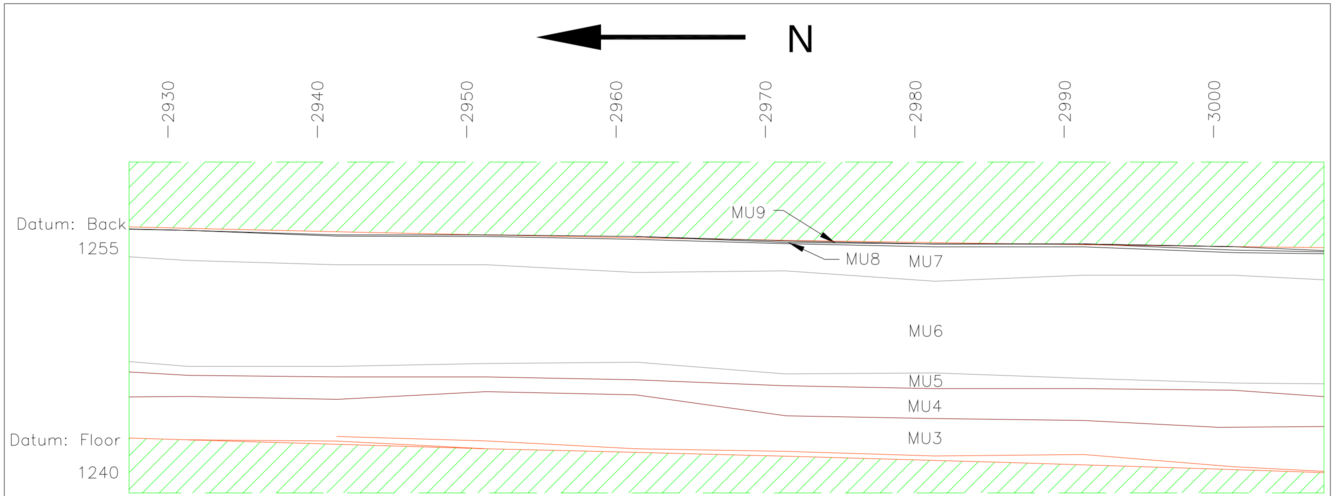
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 6		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 2 OF 4

Figure 7-38
Panel 3, Room 6, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

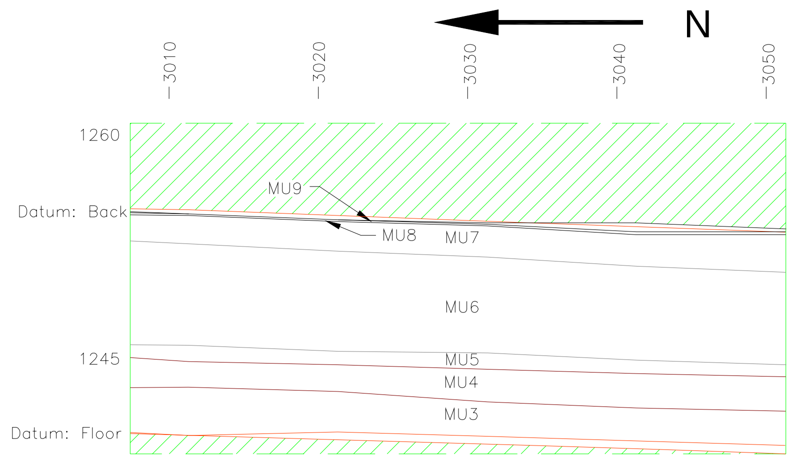
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT			
LOCATION Panel 3, Room 6			
SUBJECT Stratigraphy			
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767	TO S3057	
MAPPED BY W. Stensrud	DATE 5/27/04		SHEET 3 OF 4

Figure 7-39
Panel 3, Room 6, S2767-S3057 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

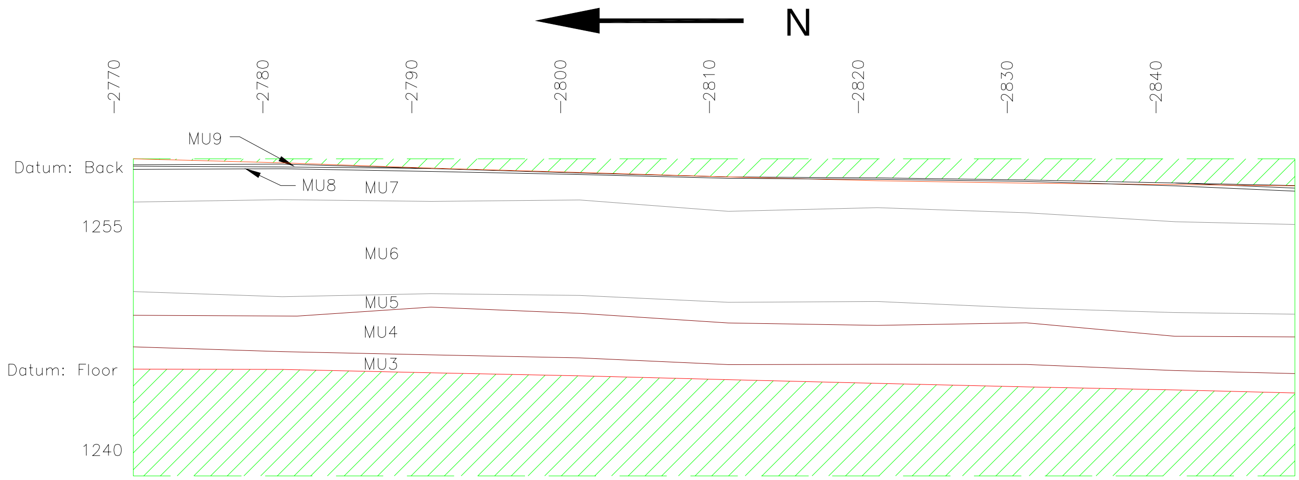
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 6		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 4 OF 4

Figure 7-40
Panel 3, Room 6, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

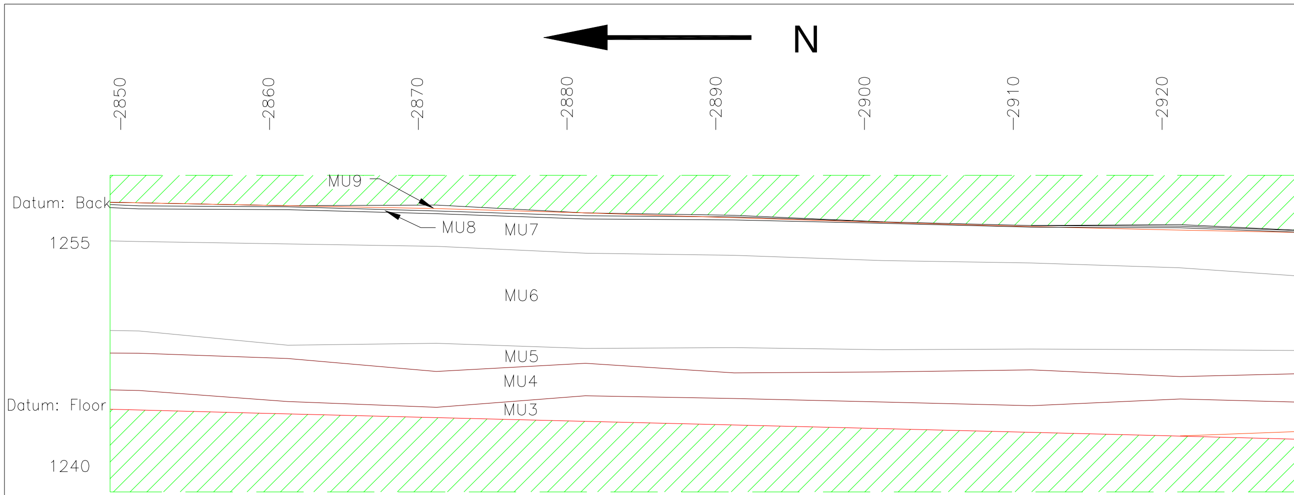
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT	
LOCATION Panel 3, Room 7	
SUBJECT Stratigraphy	
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057
MAPPED BY W. Stensrud	DATE 6/7/04 SHEET 1 OF 4

Figure 7-41
Panel 3, Room 7, S2767-S3057 Stratigraphic Map (1 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

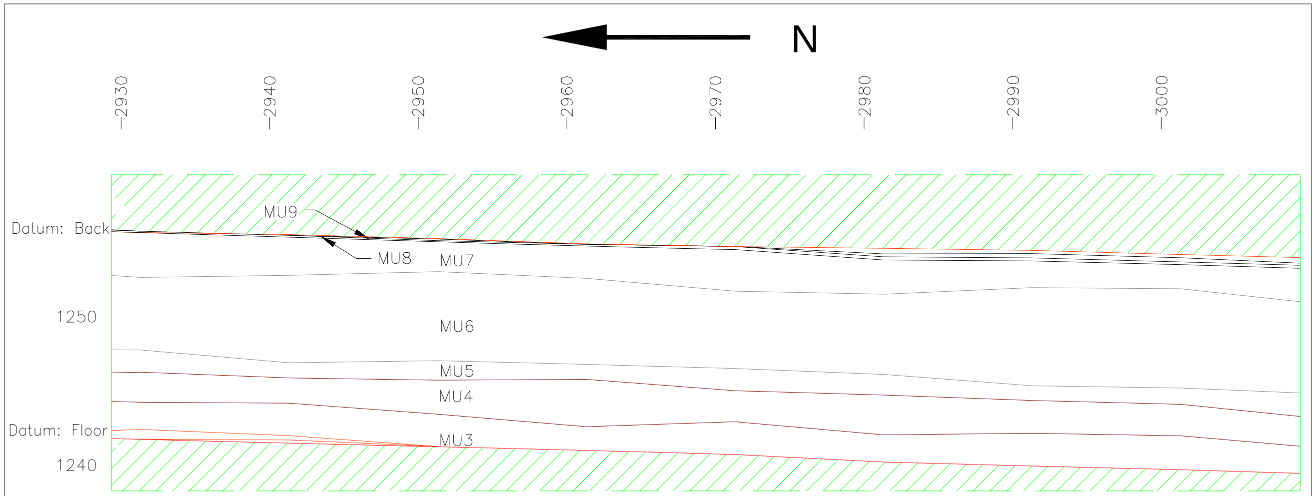
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 7		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 6/7/04	SHEET 2 OF 4

Figure 7-42
Panel 3, Room 7, S2767-S3057 Stratigraphic Map (2 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

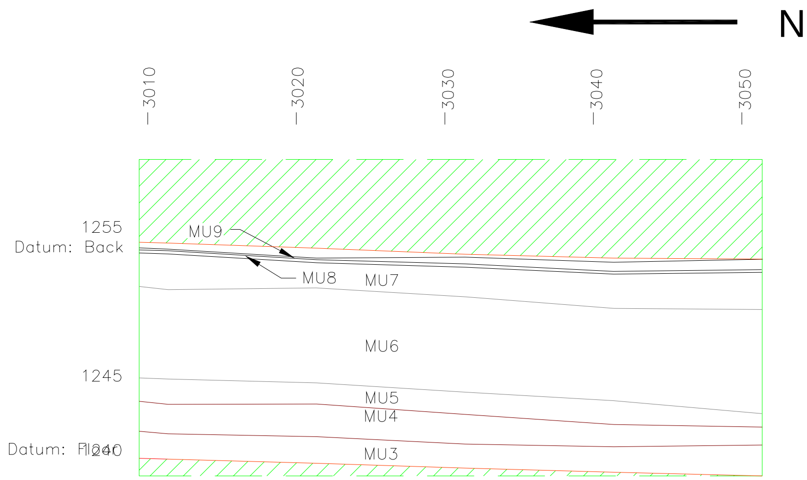
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 7		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 6/7/04	SHEET 3 OF 4

Figure 7-43
Panel 3, Room 7, S2767-S3057 Stratigraphic Map (3 of 4)



DESCRIPTION AND NOTES

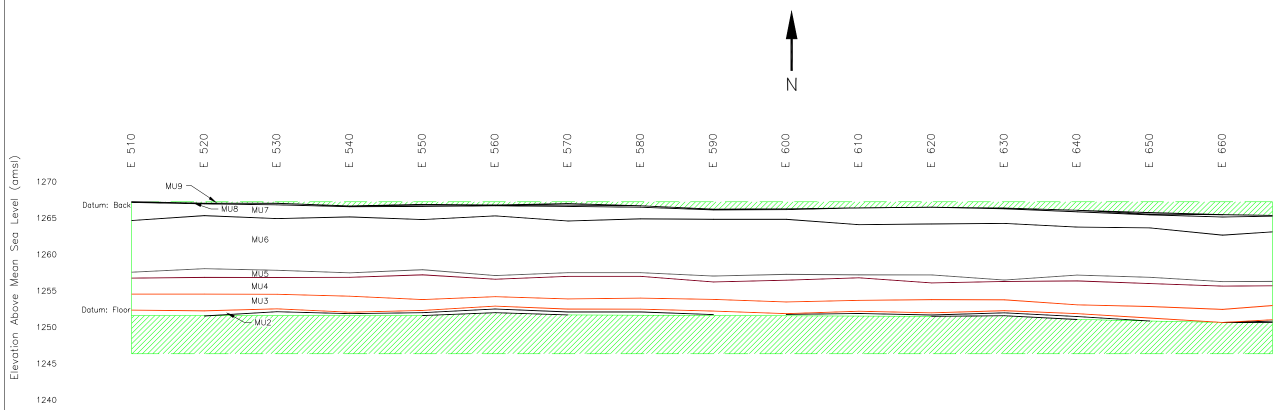
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3, Room 7		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION S2767 TO S3057	
MAPPED BY W. Stensrud	DATE 6/7/04	SHEET 4 OF 4

Figure 7-44
Panel 3, Room 7, S2767-S3057 Stratigraphic Map (4 of 4)



DESCRIPTION AND NOTES

Mapping Units (MU's)

MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT

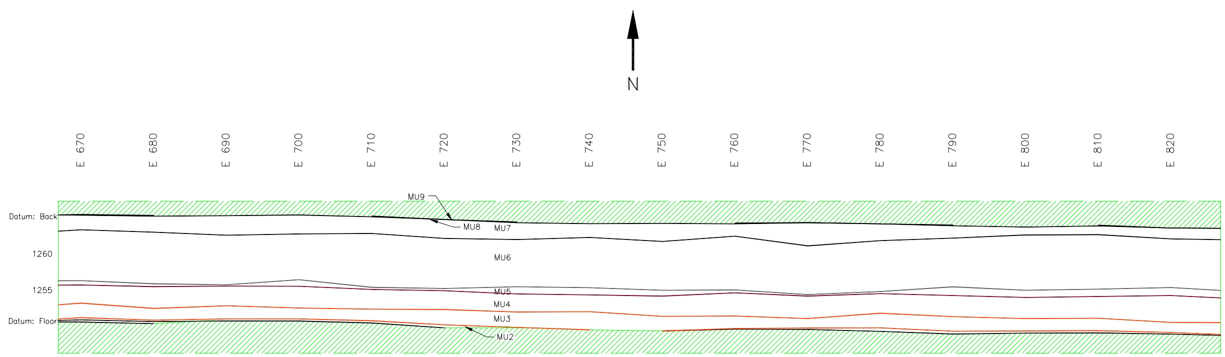
LOCATION SOUTH 2750

SUBJECT Stratigraphy

HORIZONTAL AND VERTICAL SCALE: N/A | STATION E510 TO E1300

MAPPED BY W. Stensrud | DATE 5/27/04 | SHEET 1 OF 5

Figure 7-45
Panel 3, South 2750, E510-E1300 Stratigraphic Map (1 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

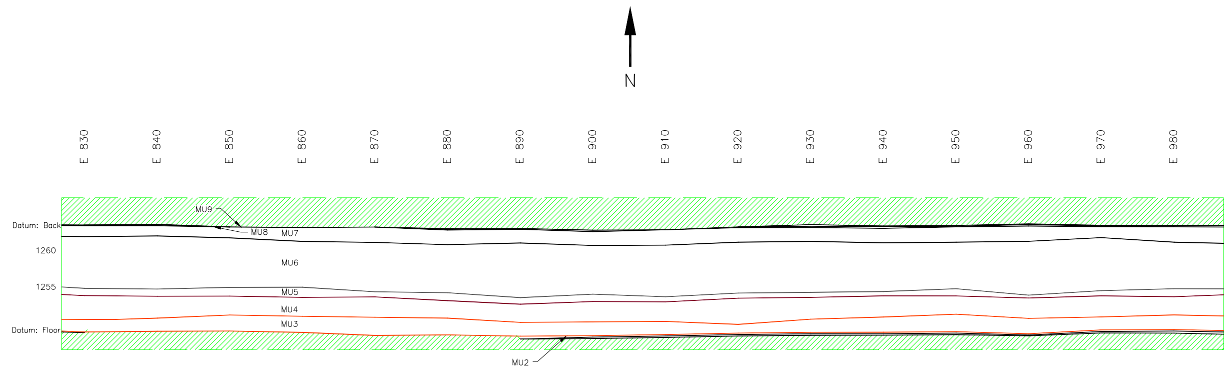
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION SOUTH 2750		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 2 OF 5

Figure 7-46
Panel 3, South 2750, E510-E1300 Stratigraphic Map (2 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

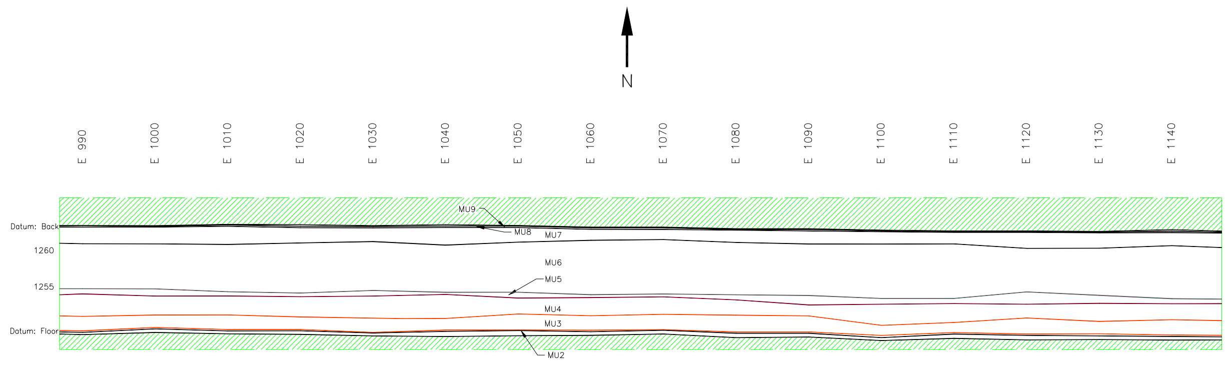
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT			
LOCATION SOUTH 2750			
SUBJECT Stratigraphy			
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300		
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 3 OF 5	

Figure 7-47
Panel 3, South 2750, E510-E1300 Stratigraphic Map (3 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

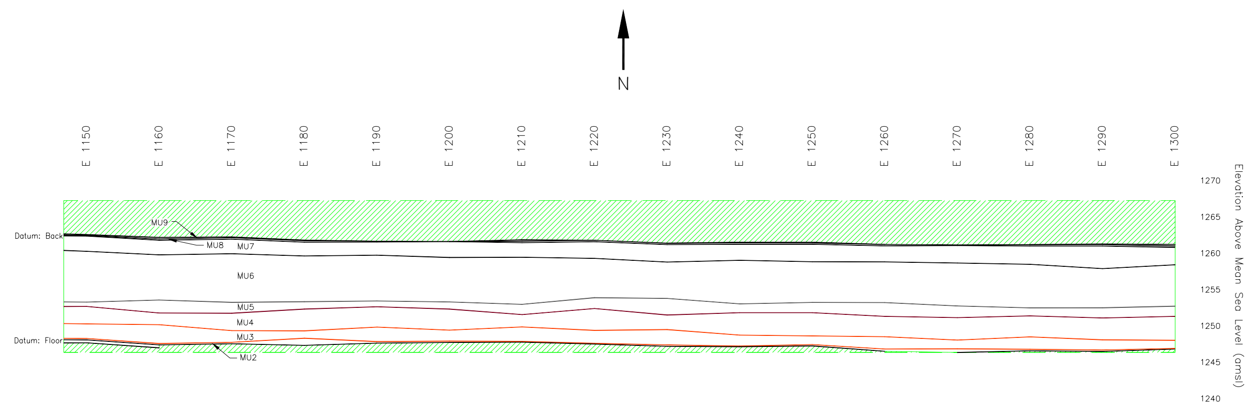
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION SOUTH 2750		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 4 OF 5

Figure 7-48
Panel 3, South 2750, E510-E1300 Stratigraphic Map (4 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

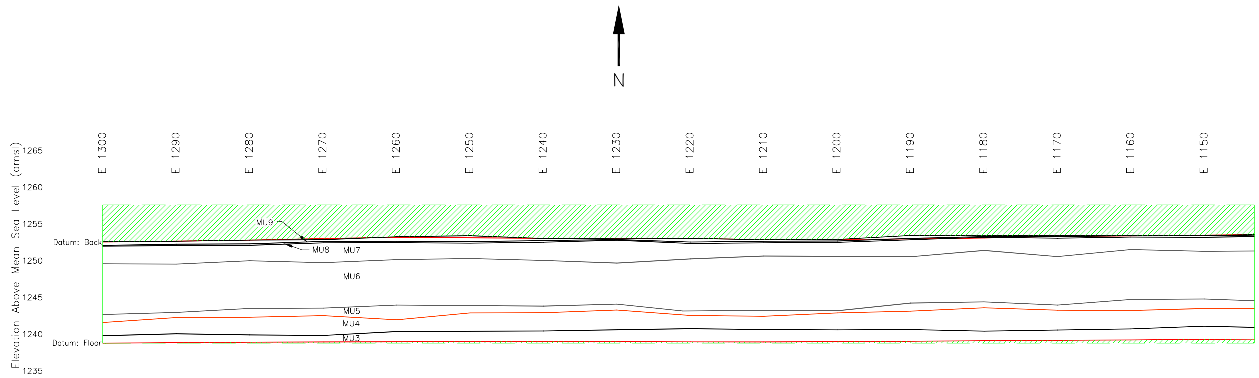
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION SOUTH 2750		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 5 OF 5

Figure 7-49
Panel 3, South 2750, E510-E1300 Stratigraphic Map (5 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

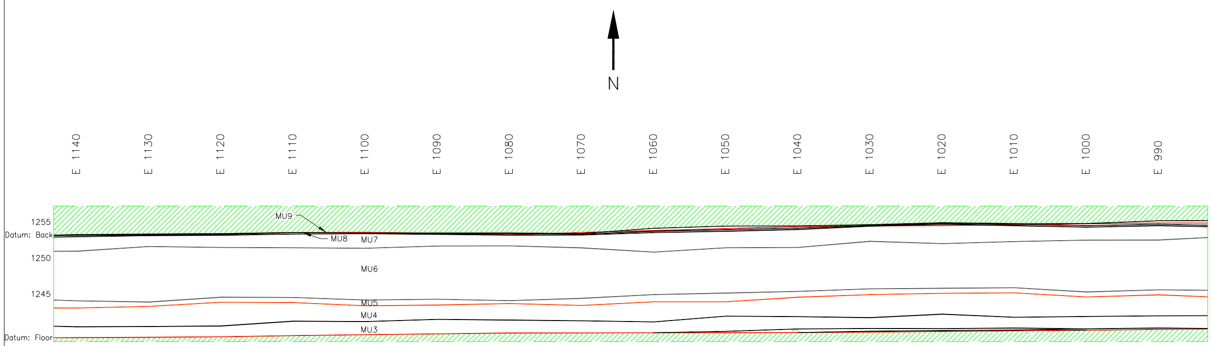
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3 South 3080		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 1 OF 5

Figure 7-50
Panel 3, South 3080, E510-E1300 Stratigraphic Map (1 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

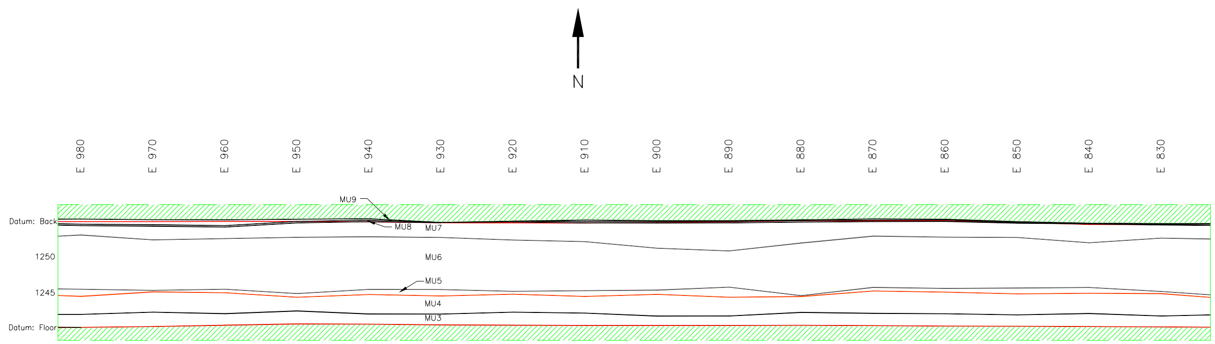
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT			
LOCATION Panel 3 South 3080			
SUBJECT Stratigraphy			
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510	TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04		SHEET 2 OF 5

Figure 7-51
Panel 3, South 3080, E510-E1300 Stratigraphic Map (2 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

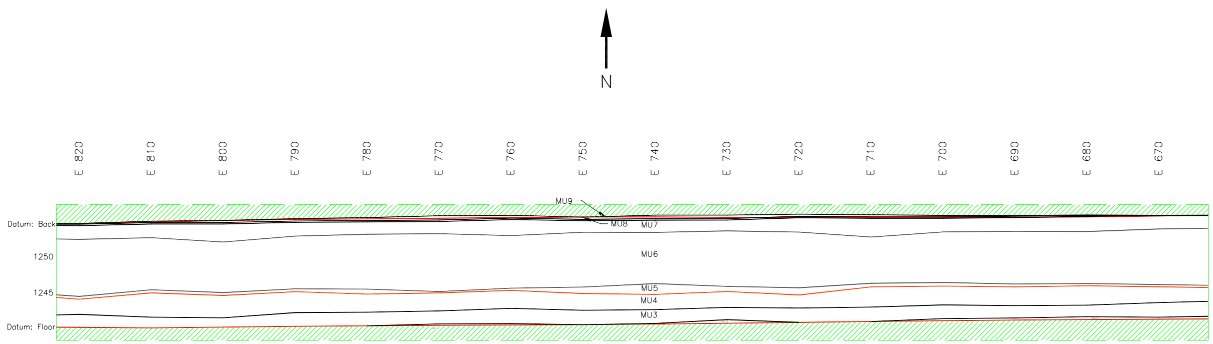
MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1 - 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3 South 3080		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 3 OF 5

Figure 7-52
Panel 3, South 3080, E510-E1300 Stratigraphic Map (3 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT

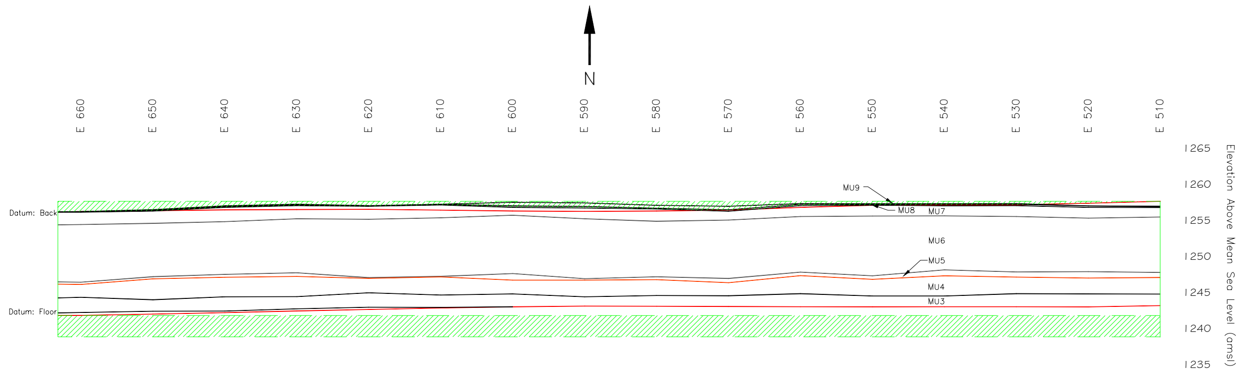
LOCATION Panel 3 South 3080

SUBJECT Stratigraphy

HORIZONTAL AND VERTICAL SCALE: N/A — STATION E510 TO E1300

MAPPED BY W. Stensrud — DATE 5/27/04 — SHEET 4 OF 5

Figure 7-53
Panel 3, South 3080, E510-E1300 Stratigraphic Map (4 of 5)



DESCRIPTION AND NOTES

Mapping Units (MU's)

MU 0 - Halite, reddish orange/brown 1-5% argillaceous
MU 1 - Halite, orange to reddish orange 1% polyhalite
MU 2 - Halite, reddish brown to medium gray, 1- 3% argillaceous
MU 3 - Halite, reddish orange, coarsely crystalline 1% polyhalite, some gray clay
MU 4 - Argillaceous halite, brown to reddish brown, lower contact gradiational
MU 5 - Halite, clear coarsely crystalline with trace argillaceous material bluish-white
MU 6 - Halite, clear some moderate reddish orange, coarsely crystalline with gray clay and polyhalite
MU 7 - Halite gray, some reddish orange/brown. 1% brown and gray clay
MU 8 - Anhydrite "b" with light to medium thin gray clay at base. Contact at base is sharp.
MU 9 - Halite, clear to moderately reddish orange trace of polyhalite and gray clay

Notes

Floor and roof are drawn relative to horizontal datum
Mapping units are not always continuous horizontally

WASTE ISOLATION PILOT PLANT		
LOCATION Panel 3 South 3080		
SUBJECT Stratigraphy		
HORIZONTAL AND VERTICAL SCALE: N/A	STATION E510 TO E1300	
MAPPED BY W. Stensrud	DATE 5/27/04	SHEET 5 OF 5

Figure 7-54
Panel 3, South 3080, E510-E1300 Stratigraphic Map (5 of 5)