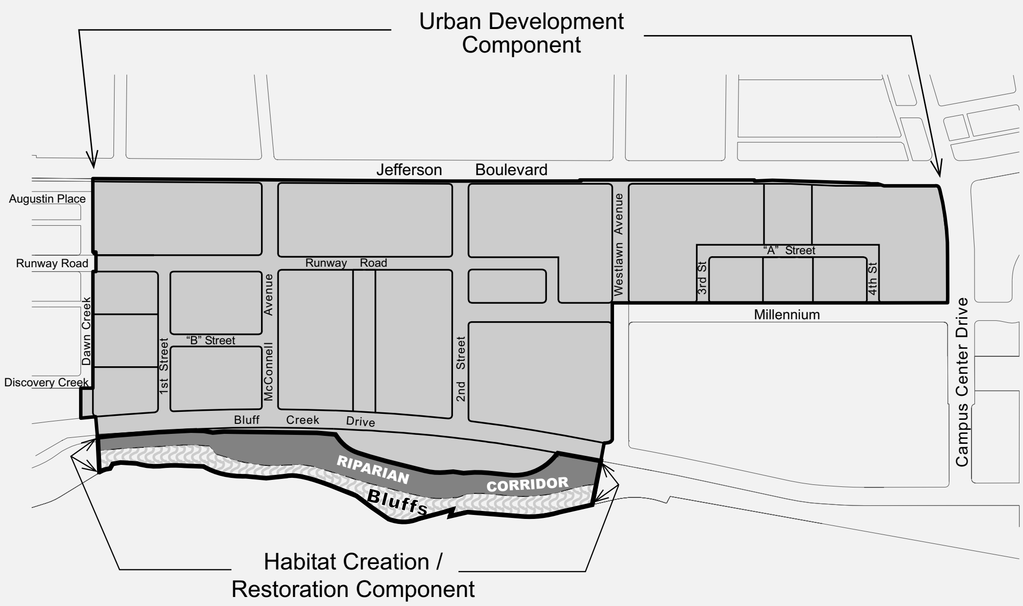
Draft Environmental Impact Report

(DEIR)

Village at Playa Vista



Volume V

Technical Appendix D

D. Earth (Cont.)

City of Los Angeles/EIR No. ENV-2002-6129-EIR

2003

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ENVIRONMENTAL IMPACT REPORT (EIR)

VILLAGE AT PLAYA VISTA

TECHNICAL APPENDICES

VOLUME V

APPENDIX D:

EARTH TECHNICAL APPENDIX

(CONTINUED)

City of Los Angeles
EIR No. ENV-2002-6129-EIR

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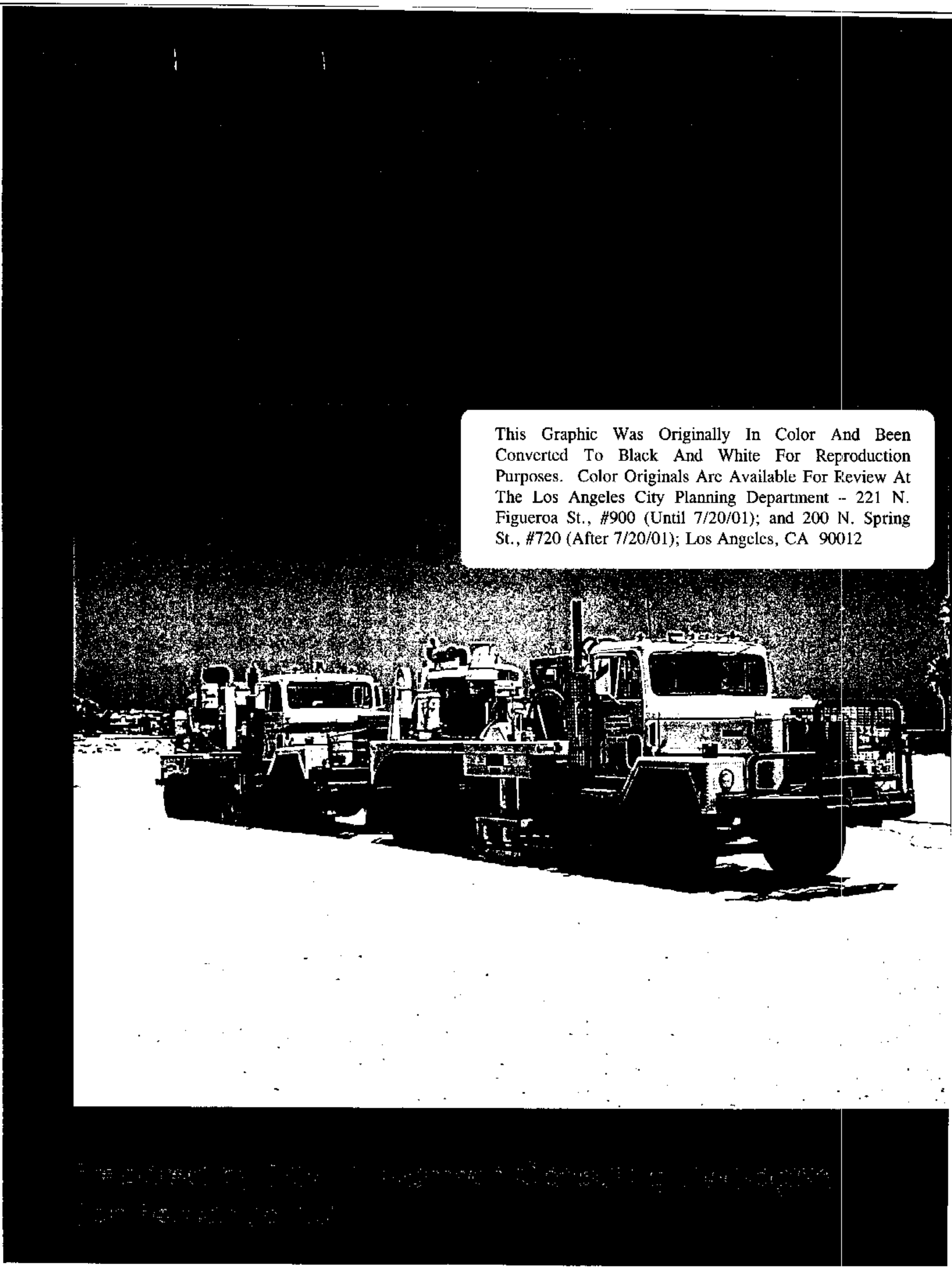
DAVIS AND NAMSON CONSULTING GEOLOGISTS, "AN EVALUATION OF THE SUBSURFACE STRUCTURE OF THE PLAYA VISTA PROJECT SITE AND ADJACENT AREA," NOVEMBER 2000



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An Evaluation of the Subsurface Structure of the Playa Vista Project Site and Adjacent Area

1.0 Introduction

1.1 Problem:

Davis and Namson Consulting Geologists were retained by Playa Vista to evaluate the possibility of subsurface faulting at the Playa Vista project site (Figure 1). Specifically Davis and Namson were requested to evaluate the possibility of a Lincoln Boulevard fault as proposed in the April 2000 report Subsurface Geochemical Assessment of Methane Gas Occurrences, Playa Vista Development First Phase Project, Los Angeles, California, prepared for the City of Los Angeles, Department of Building and Safety, by Exploration Technologies, Inc (ETI, 2000), and to evaluate the possibility of subsurface faulting in other portions of the project site and surrounding area. This would include any previously undiscovered faults under or near the Playa Vista site (Figure 1), evaluation of the postulated Charnock fault (Poland et al., 1959), and evaluation of faults within the Del Rey Hills Area of the Playa Vista oil field interpreted in the California Division of Oil and Gas Summary Operation reports (Metzner,1935; Hodges, 1944, and Riegle, 1953).

1.2 Approach and status of work:

Evaluation of the postulated Lincoln Boulevard fault and other faulting issues at the Playa Vista site has taken two approaches because of the thick Holocene deposits and the shallow water table at the site. These conditions prevented shallow trenching at the site to evaluate active faulting. Earth Consultants International, Inc. (ECINTL) has completed a fault evaluation of the surface and shallow geologic setting at the site (< 50 feet) by reviewing geologic and geotechnical reports and completing a subsurface survey using borings and a

CPT survey* (ECINTL, 2000) across the shallow location of the postulated Lincoln Boulevard fault. Davis and Namson have completed a study of the [1] deeper conditions at the site (50 feet below the surface to the top of crystalline basement) and surrounding area. The study used existing geologic literature and unpublished geotechnical reports, constructed new geologic maps and cross sections of the subsurface based on data from oil and gas wells drilled in the area, purchased previously acquired geophysical data, and acquired and interpreted new geophysical data from the Playa Vista site and surrounding area (Figure 1, Plate I). The geophysical data purchased and acquired for this study consist only of seismic reflection data. A good number of maps, cross sections, and seismic lines displayed as large plates are included in this study (8.0 Plates). Most of the plates have been generalized and reduced to page size figures for the ease of reading and copying the report (Figures 7.0).

In order to understand the subsurface structure under the Playa Vista site and its relationship to the nearby oil fields and known geologic structures, two sets of cross sections were constructed for the study (Figure 2, Plate II): 1) Davis and Namson constructed four well to well cross sections across the site, and 2) Mr. Jack West, Petroleum Geologist, was directed to construct two regional cross sections across the site and to nearby oil fields. The maps and cross sections provide a general image of the subsurface structure and stratigraphic framework under and near the Playa Vista site.

Playa Vista purchased the license to an east-west trending Chevron seismic line located south of the site, and the line has been interpreted and integrated with the geologic data set. The Chevron line was oriented in a manner favorable to intersecting the southward projection of the postulated Lincoln Boulevard fault (Plate I).

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[1] **CPT (core penetrometer technology) surveying, a geologic method of imaging the subsurface.*

The new geophysical data consist of one 2D high-resolution seismic line, a 3D seismic survey over the entire site, and an offshore geophysical survey (Figure 2, Plate II). The 2D line has an northeast-southwest direction and runs along the south side of Jefferson Boulevard crossing the northwest trending postulated Lincoln Boulevard fault (ETI, 2000) and the northwest trending postulated Charnock fault (Poland et al., 1959). The 2D high-resolution line has been processed, interpreted, and integrated with the geologic data set and the 3D seismic survey.

The 3D seismic survey was acquired over the entire Playa Vista site (Plate II), a portion of Centinela Creek, along Ballona Creek, the portion of Dockweiler Beach State Park just south of Ballona Creek, and the outer portion of Marina Del Rey Harbor (bay cable). The 3D seismic survey has been processed, interpreted, and integrated with the geologic data set and the 2D seismic survey.

An offshore geophysical survey was conducted to investigate the possibility of faulting along the base of the bluffs that lie along the south side of the Playa Vista site (Ballona escarpment). The offshore survey is located just offshore of the Dockweiler Beach State Park and west and southwest of the Playa Vista site (Figure 2, Plate II). The offshore seismic was acquired, processed, and interpreted by Dr. Dan Francis, California State University Long Beach, and Dr. Mark Legg, Legg Geophysical, and their report is inserted near the end of this report (section 4.0 Offshore Geophysical Survey).

2.0 Subsurface Geology of the Playa Vista Site

2.1 Setting and previous work:

The Playa Vista site lies within the western shelf portion of the Los Angeles basin (Figure 1, Plate I). The western shelf is a northwest trending structural block between the Newport-Inglewood fault zone and the offshore Santa Monica basin (Wright, 1991). The western shelf terminates to the north against the Santa Monica fault zone and the Santa Monica Mountains. To the south, the western shelf terminates against the Palos Verdes Hills fault and the Palos Verdes Hills. Within the western shelf marine sedimentary rocks of middle Miocene to Quaternary age unconformably overlie a basement complex of Catalina Schist. The western shelf is deformed into several northwest trending anticlines but no major faults traverse the block. The western shelf is only moderately deformed by folds and faults compared to other portions of the Los Angeles basin. The contrast can be appreciated on a regional cross section across the basin (Figure 3, Plate III). In this cross section, note how gently folded and little faulted the western shelf area is in contrast to the highly deformed north side of the Los Angeles basin that is under downtown Los Angeles. The north side of the basin is characterized by abundant steep bedding dips, complex folding, large uplifted basement blocks, and abundant faults some of which are seismically active (Davis, et al., 1989). The earthquake history of the Playa Vista portion of the Los Angeles Basin is described in the ECINTL (2000) report.

The Playa Vista site lies along the Ballona Creek drainage just inland from the Pacific Ocean (Figure 2, Plate II). The surface of the site is nearly level and only a few feet above sea-level. To the south of the site are east-trending bluffs that form the north edge of the Del Rey Hills. Poland et al (1959) refers to the hills as the El Segundo sand hills and the bluffs as the Ballona escarpment. The subsurface stratigraphy and structure of the site and surrounding area is reasonably well understood from numerous oil and gas wells that have been drilled in the area, some water well drilling (Poland et al, 1959; DWR, 1961), and oil-industry seismic reflection data.

Beneath the west end of the Playa Vista site is the eastern edge of the Del Rey Hills Area of the old Playa Del Rey Oil Field. The Playa Del Rey Oil Field is divided into two producing areas: the Venice Area and the Del Rey Hills Area. The Venice Area was discovered in 1929 with oil production from the Schist Conglomerate zone (Figure 4, Plate IV) and oil and gas production from the shallower Upper Zone of the middle and upper Repetto Formation (Barton, 1931). The Del Rey Hills Area was discovered in May, 1931 with oil production from the Schist Conglomerate zone that is just above the Catalina Schist basement (Metzner, 1935). Presently the Southern California Gas Company uses the Del Rey Hills Area as a natural gas storage facility (Riegle, 1953; Hester, 1986).

Both productive areas of the Playa Del Rey Oil Field lie along the Playa Del Rey anticline and the Playa Vista site lies above the east limb of the anticline. The Playa Del Rey anticline is a long, northwest trending basement-cored fold that trends offshore at Venice Beach. The Playa Del Rey anticline is not expressed at the surface and is known from oil and gas wells and geophysical surveys. Well data show the basement core (Catalina Schist) of the anticline is overlain by a thick section of marine strata consisting of sandstone and shale of Miocene, Pliocene and early Quaternary age (Figure 4, Plate IV). Under the Playa Vista site a thick section of Pleistocene and Holocene strata unconformably overlie the older marine rocks and mask the Playa Del Rey anticline (Plate IVB). A detailed description of the geomorphology and Quaternary stratigraphy of the Playa Vista site is presented in the ECINTL (2000) report.

During the initial stages of this study the existing geologic literature and unpublished consultant reports on the area were obtained and studied. There is a fair amount of published and unpublished geologic literature on the Playa Vista site and surrounding area. Of particular interest to this subsurface study are a series of State of California, Division of Oil and Gas Summary of Operations (DOG*) reports on the Playa Del Rey Oil Field. These reports have useful maps, cross sections, and descriptions that provide a good understanding of the subsurface structure and stratigraphy of the oil field. These maps and cross sections were integrated with the Davis and Namson maps and cross sections presented later in this report.
2

[2] ***DOG (now DOGGR-Department of Oil & Gas and Geothermal Resources)**

Barton (1931) was the first to report on the Playa Del Rey Oil Field, and the report describes drilling activities in the area going back to 1921. Included in the Barton report are a map on top of the Nodular Shale and two cross sections covering the Venice Area of the oil field. Metzner (1935) provides a structure map on top of the Catalina Schist, an isopach map of the Schist Conglomerate producing zone, and three generalized cross sections over the entire Playa Del Rey Oil Field. The Metzner report also includes a detailed topographic map that becomes the basis for several surface fault interpretations by that author. The Metzner fault interpretations and the mislocation of these interpretations by ETI (2000) are discussed in section 2.3 of this report (The postulated Lincoln Boulevard fault). Hodges (1944) provides a further update of drilling activities mainly in the Del Rey Hills Area, and a description of the beginning of the gas storage activities in the Del Rey Hills that started in 1942. The Hodges report provides structure maps on top of the Catalina Schist and the Upper Bentonite marker in the Repetto Formation, and an isopach map of the Schist Conglomerate producing zone. Riegle (1953) provides a further update of the gas storage operations at the Del Rey Hills Area and presents several small maps and an hysteresis loops of injection and withdrawal cycles of gas. Summaries of the Playa Del Rey Oil field can be found in Metzner (1943) and DOG (1974). Hester (1986) produced a series of subsurface maps and cross sections over the Playa Del Rey Storage Field (old Del Rey Hills Area) for the Southern California Gas Company, and these maps and cross sections were integrated with the Davis and Namson maps and cross sections presented later in this report.

Other studies that were of importance to the Davis and Namson subsurface evaluation of the Playa Vista site are Poland et al (1959), DWR (1961), and Wright (1991). Poland et al (1959) and DWR (1961) are regional ground water studies that provide useful water well data, and maps and cross sections of the Quaternary section in and around the site. These reports are especially important because they provide data on the Quaternary portion of the subsurface that typically is not well recorded in oil and gas well records. Besides the recent ECINTL (2000) report, other recent geotechnical reports on the Playa Vista site were reviewed by Davis and Namson (Converse, et al., 1979; Law/Crandell,1987a,b). Wright (1991) provides a broad tectonic and historical analysis of the Los Angeles basin and the western shelf area that was helpful to this study.

2.2 Stratigraphy of the Playa Vista Site:

Oil and gas drilling within and near the Playa Vista site has penetrated the entire sedimentary column beneath the Playa Vista site (Figure 4, Plate IVA) with a great number of wells having reached the top of the Catalina Schist (crystalline basement complex). On the basis of lithologic similarities the Catalina Schist is generally considered the southern equivalent of the Franciscan Complex of central and northern California. Suppe and Armstrong (1972) obtained some early Cretaceous K-Ar (potassium-argon) ages on the Catalina Schist that are consistent with the late Jurassic to Eocene age of the Franciscan Formation.

Unconformably above the Catalina Schist is a thick section (5,500 to >10,000 feet) of mostly marine sedimentary rocks that range in age from the middle Miocene to the Quaternary (Figure 4, Plate IVA). This marine sedimentary section thins westward onto the crest of the Playa Del Rey anticline. Deposited directly above the Catalina Schist is the Schist Conglomerate zone that is the principal oil reservoir of the old Playa Del Rey Oil Field. This reservoir is now used for gas storage in the Del Rey Hills Area of the oil field. The Schist Conglomerate zone consists of angular clasts to rounded pebbles of Catalina schist set within a Catalina Schist derived sand matrix. The zone varies in thickness from a few feet to nearly 300 feet near the project site as a result of onlap onto the Catalina Schist basement (Hodges, 1944). Pinch-out of the zone across the Playa Del Rey anticline and below a thick section of overlying shale provides the trap for accumulation and storage of hydrocarbons at the Del Rey Hills Area. The Schist Conglomerate zone is most likely equivalent to the upper member of the Topanga Formation (Blake, 1991) that is early to middle Miocene in age, i.e. 17-14 million years old.

Above the Schist Conglomerate is a dark brown shale known as the Nodular shale that here is the basal member of the Puente Formation (Figure 4). The Nodular shale varies in thickness from 50 to 300 feet and the unit contains distinctive tan nodules. The Nodular shale belongs to foraminiferal division E of Wissler (1943, 1958) making the unit early to late Mohnian (late Miocene) in age or about 14-9 million old.

Overlying the Nodular shale is a dark brown to black shale within the Puente Formation that is consistently about 50 feet thick in the Playa Del Rey Oil Field (Hodges, 1944) and provides an excellent subsurface marker for correlation of well data. The remaining Puente Formation consists of dark brown to black shale and thin sandstone beds. The Puente Formation is a Los Angeles basin facies of the upper Miocene portion of the Monterey Formation (Blake, 1991). The total thickness of the Puente Formation ranges from 650 feet on the crest of the Playa Del Rey anticline to over 1600 feet in the synclinal trough east of the anticline. The black shale marker bed and remaining Puente Formation belong to Wissler's division A-B that is Delmontian in age (latest Miocene) or from 6.5 to 5.0 million years old.

Overlying the Puente Formation is a very thick section of interbedded shale, siltstone and sandstone of the lower Repetto Formation. The Repetto Formation represents the continuation of the deep marine conditions started in the Miocene. The Pliocene age Repetto Formation ranges in thickness from about 2250 feet on the crest of the Playa Vista anticline to about 4400 feet in the synclinal trough east of the anticline. The Repetto ranges in age from 5.0 to 2.5 million years old. The Repetto Formation is divided into three members: a lower member from 5.0 to 4.0 million years old, a middle member from 4.0 to 3.0 million years old, and an upper member from 3.0 to 2.5 million years old. The Repetto Formation contains the "upper zone" of the Venice Area of the Playa Del Rey Oil Field. The "upper zone" is an oil and gas producing zone that was not commercially productive in the Del Rey Hills Area (Figure 4, Plate IVA).

Above the Repetto Formation is the upper Pliocene to lower Quaternary Pico Formation. The Pico Formation consists of interbedded sandstone, siltstone and shale that were deposited as the Los Angeles basin shoaled. The Pico Formation ranges in thickness from about 2150 feet on the crest of the Playa Vista anticline to about 4150 feet in the synclinal trough east of the anticline. The Pico Formation is estimated to from 2.5 to 0.8 million years old (Dr. Dan Ponti, USGS, personal communication). In the Playa Vista area the Pico Formation can be divided into three members: 1) a lower member whose top is equivalent to the Venturian/ Wheelerian stage boundary that is about 2.0 million years old (Blake, 1991), 2) a middle member whose top is poorly constrained but must be from about 1.5 to 1.0 million years (Dr. Dan Ponti, USGS, personal communication), and 3) an upper member whose top is about 0.8 million years old (Dr. Dan Pointi, USGS, personal communication).

The Pico Formation is unconformably overlain by unconsolidated upper Quaternary age strata of the San Pedro Formation, Lakewood Formation and unnamed upper Pleistocene and Holocene strata that include the Ballona aquifer or "50 foot" gravel (Figure 4, Plate IVB). The Quaternary deposits consist of interbedded sandstone, gravel, silt and clay of mostly alluvial, lagoonal, and shallow-marine origin. As a result of the deep down-cutting of Ballona Creek (ancestral Los Angeles River) during the last sea level low stand the Quaternary units at the site are not arranged in a simple layer-cake sequence. Regionally the San Pedro Formation rests above the Pico Formation along an angular unconformity (Poland et al., 1959). The top of the San Pedro Formation in the Playa Del Rey area is estimated to be about 0.3 million years old years (Dr. Dan Ponti, USGS, personal communication). Under the Del Rey Hills, south of the Playa Vista site, the San Pedro Formation is unconformably overlain by the

Lakewood Formation that is exposed in the bluffs (Ballona escarpment). North of the hills and under the Playa Vista site most, if not all, of the Lakewood Formation has been removed by the down-cutting of Ballona Creek. Here the uppermost Pleistocene and Holocene section rests unconformably on lower portions of the San Pedro Formation, or possibly Pico Formation. A more detailed discussion of the upper Pleistocene and Holocene stratigraphy and the results of the CPT survey down to the top of the Ballona aquifer are presented in the ECINTL (2000) report.

2.3 The postulated Lincoln Boulevard fault:

The ETI (2000) report proposes a newly discovered fault with a shallow subsurface location just east of Lincoln Boulevard (Figure 2). A shallow oval-shaped methane anomaly was detected by a four foot soil gas survey and wells monitoring the uppermost Pleistocene and Holocene section above the Ballona aquifer ("50 foot" gravel). The anomaly was mapped by ETI just east of Lincoln Boulevard. In attempting to explain the presence of this anomaly ETI interpreted the anomaly to be the result of a previously unrecognized fault (the Lincoln Boulevard fault). Cross sections in the ETI (2000) report show the postulated Lincoln Boulevard fault dipping westward at 58 degrees and intersecting the top of the Catalina Schist under the eastern part of the Del Rey Hills Area of the Playa Del Rey Oil Field (Figure 5, Plate V). Building on their interpretation ETI states the fault should be considered potentially active. ETI further postulates that the fault could cause large volumes of methane gas to be released to the surface during an earthquake.

It is stated on pg. 1 and 7 of the ETI (2000) report that the position and attitude of the proposed Lincoln Boulevard fault is based on a combination of subsurface geologic data, surface topographic lineations, and a north-south trend of anomalous geochemical data. However, the literature research and well data review of the Playa Vista area conducted by Davis and Namson did not discover any geologic evidence to support the location, geometry and activity of the proposed Lincoln Boulevard fault as will be discussed.

In section 3.1, pg. 7 of the ETI (2000) report, work by Metzner (1935, pg. 7-9) is cited to support the existence of the postulated Lincoln Boulevard fault. Metzner (1935), on the basis of changes in topographic expression, infers several faults in the Del Rey Hills southwest of the Playa Vista project site (Figure 6, Plate VI). However, Metzner never claims there is a fault between his topographic provinces 3 and 4 (this is the only topographic boundary of Metzner's that would lie close to the postulated Lincoln Boulevard fault). Metzner does interpret faults along the western boundary of province 1 (coastline), between provinces 1 and 2, and between provinces 2 and 3. The faults postulated by Metzner have projected surface locations through the far west end of the project site and further west, and not near Lincoln Boulevard or the methane anomaly. The closest of these postulated surface faults are at least 4,000 feet west of the shallow location of the postulated Lincoln Boulevard. Furthermore, Metzner does not show these faults in his subsurface map (top of Catalina Schist/Schist Conglomerate isopach), indicating that Metzner may not have believed these postulated surface faults extended north of the Del Rey Hills.

The results of oil exploration drilling and geophysical work subsequent to Metzner's work casts doubt on the validity of any of these postulated surface faults. None of the subsurface maps within the DOG Summary of Operations Reports completed subsequent to Metzner (1935) show Metzner's postulated surface faults. The maps made by Hester (1986) do not show subsurface evidence for the postulated surface faults of Metzner. The licensed Chevron seismic line (Figure 17, Plate XVII, and section 3.1 of this report) does not show any of the surface faults postulated by Metzner extending into the subsurface. Interestingly Metzner (1935) interpreted the straight coast line from Ballona Creek south to Redondo Beach to be controlled by a nine mile long fault along the western boundary of his province 1 (Figure 6, Plate VI). There is an enormous body of data and literature (Wright, 1991) to refute such a claim, and this underscores the problem of making fault interpretations based solely on geomorphic features.

The ETI (2000, pg. 8) report also cites Riegle (1953) and Wright (1991) as providing subsurface evidence for the postulated Lincoln Boulevard fault in the Del Rey Hills Area. A small fault is shown cutting the top of the Catalina Schist in the southeast corner of section 27, T2S-R15W in Riegle (1953), Hodges (1944), and Metzner (1935). An examination of the various DOG reports show that the fault shown by Riegle (1953) and Hodges (1944) comes from subsurface mapping by Metzner (1935). The subject fault is northwest trending and about 2800 feet long. Metzner (1935) discusses the fact that he can find no clear evidence for displacement along the fault, but he infers the fault from changes in the amounts of oil and water production between wells. The fact that these types of production variations indicate permeability barriers or changes in the elevation of the oil/water contact and can result from geologic conditions other than faulting is not considered by Metzner (1935). The trace of the postulated fault is shown on Metzner's (1935) map on top of the Catalina Schist, but he does not show the fault offsetting the top of the Catalina Schist or the isopach contours of the Schist Conglomerate zone. Hodges (1944) work shows the postulated fault offsetting contours on his top of the Catalina Schist map with a maximum displacement of about 150 feet and down to the east. However, he offers no additional evidence for the fault and he does not explain how the amount and sense of displacement were determined. Hodges (1944, pg. 6) states that the subject fault and a number of other smaller faults in Playa Del Rey oil field die-out before reaching the "upper zone" in the middle and upper Repetto Formation.

Hester (1986) states in his report that he could find no evidence for the northwest trending fault in the southeast corner of section 27, and his top of Catalina Schist, top of Schist Conglomerate, and BM-X Point (equivalent to the top of the Nodular Shale) maps show no such fault. Several of Hester's cross sections provide a detailed view of well to well correlation across the postulated fault. Cross section

III-III' and Q-Q' show no evidence for faulting where the lines cross the postulated fault (just west of the Joyce #1 well). In addition, Hester (1986) noted that the similarity between well dip data and map data did not suggest a fault. Hester (1986) also cites previous Union Oil Company (original operator) work done in the 1960's that states that the fault postulated by Metzner (1935) in the southeast corner of section 27 is nonexistent.

Davis and Namson could find no evidence for the postulated fault in the southeast corner of section 27 and this is reflected in our subsurface maps (Figures 9-11, Plates IX-XI) . Metzner's (1935) fault interpretation is a non-unique explanation for variations in oil and water production that could result from a variety of geologic factors other than faulting. The postulated fault occurs in an area characterized by complex basement relief and changes in the occurrence and thickness of the overlying Schist Conglomerate zone. The changes in the basement and Schist Conglomerate are occur over a large area and are not aligned in a manner suggestive of faulting. Metzner (1935) recognized that most of the complexity was the result of middle Miocene uplift and erosion and the subsequent in-filling of channels with erosional debris. Such a complex depositional setting could easily provide the permeability and stratigraphic changes that would give the oil and water production variations noted by Metzner (1935).

Wright's (1991) summary paper of the entire Los Angeles basin is based on an extensive amount of previously published data on the basin. Cross section A-A' in Wright (1991, pg. 50) shows two small faults to either side of the Playa Del Rey Oil Field. These faults do not extend above the Repetto Formation and it is clear that they are based on the prior DOG reports described above and represent no new data on these faults.

Converse, et al. (1979) and LeRoy Crandell and Associates (1987a,b) completed geologic studies along the bluffs just south of the Playa Vista site. Southward projection of the shallow trace of the postulated Lincoln Boulevard fault would intersect the bluffs and the fault should be exposed in the upper Pleistocene Lakewood Formation outcropping along the bluffs. Converse et al (1979) and LeRoy Crandell and Associates (1987a,b) found no evidence of faulting during course of their studies.

During the summer of 2000, Earth Consultants International (ECINTL) completed a fault evaluation of the surface and shallow geologic setting at the Playa Vista site for Playa Vista. This was done by reviewing geologic and geotechnical reports, and completing a subsurface survey using borings and a CPT survey. The CPT study was completed across the shallow location of the postulated Lincoln Boulevard fault just east of Lincoln Boulevard (ECINTL, 2000). The top of the Ballona aquifer (50-foot gravel) and a sequence of finer-grained deposits directly above the aquifer were mapped. From their subsurface survey and geologic literature review, ECINTL (2000, p. 24) concludes that there is no fault cutting the top of the Ballona aquifer ("50 foot" gravel).

In summary, the ETI (2000) report offers no new evidence for the existence of the Lincoln Boulevard fault, and the preexisting geologic evidence cited by ETI does not support the presence of the Lincoln Boulevard fault. ETI has proposed the Lincoln Boulevard fault to explain the presence of the shallow methane anomaly, but ETI fails to consider that methane anomalies and seepages are not uniquely the result of faulting. It is well known that methane anomalies and seepages can result from a variety of subsurface conditions, not all of them requiring faulting (Thrasher, et al., 1996; Matthews, 1996). Therefore the postulated Lincoln Boulevard fault is a possible but not unique interpretation of the methane anomaly, but the fault interpretation is inconsistent with the existing geologic data from the Playa Vista area.

ETI's earthquake scenario of large volumes of methane gas released along the Lincoln Boulevard fault during an earthquake is exaggerated and certainly unprecedented in the seismic history of California where numerous large and moderate earthquakes have occurred under or adjacent to existing oil and gas fields with no catastrophic releases of gas.

2.4 Geology of the Playa Vista site determined from oil and gas wells:
Davis and Namson were requested by Playa Vista to do their own subsurface geologic evaluation of the possibility of the Lincoln Boulevard fault as proposed by ETI (2000), and to evaluate the possibility of subsurface faulting in other portions of the project site and surrounding area. This new subsurface work is based on the correlation and mapping of the geologic formations and markers determined from oil and gas well data. The result is a series of maps and cross sections that yield a good approximation of the subsurface structure of the Playa Vista site and surrounding area.

Well data has two important drawbacks to doing fault evaluations that need to be considered. First, most oil and gas wells are not logged shallower than 1,000 to 1,500 feet and this portion of the geologic record is often very important to fault studies, as is the case at Playa Vista. Second, well data does not provide a continuous image of the subsurface, and it is impossible to use well data to eliminate the possibility of small displacement faults existing between wells. For these reasons Playa Vista decided to add to the subsurface study by purchasing existing oil industry seismic reflection data (section 3.1 Licensed Chevron seismic line) and by completing their own seismic surveys of the area (section 3.2 2D High resolution seismic line; section 3.3 3D seismic survey; and section 4.0 Offshore Geophysical Survey)

Two regional cross sections using subsurface well data were constructed by Mr. Jack West, Petroleum Geologist, to better the faulting, subsurface structure, and stratigraphic framework within and surrounding the Playa Vista site (Figure 7, Plate VII). The westernmost part of the Playa Vista site overlies the northwest-southeast cross section from the Venice oil field to the Lawndale oil field near Southern California Gas Company Vidor #18. This cross section follows the crest of the Playa Del Rey anticline and shows a number of small faults cutting the top of the Catalina Schist, Schist Conglomerate, Nodular shale member and younger portions of the Modelo Formation (Modelo Formation is equivalent to the Puente Formation used in this report). These faults do no cut the lower Repetto Formation and thus ceased activity at the end of the Miocene (about 5.0 million years ago). The closest of these faults to the Playa Vista site is the down-to-the-south normal fault shown along the crest of the Playa Del Rey anticline between County of Los Angeles DOW R.G.C. #11 well and the Southern California Gas Company Del Rey #10. This fault occurs under the Venice Area of the Playa Del Rey Oil Field and thus north of the Playa Vista site.

The second regional cross section constructed by Jack West is northeast-southwest directed and goes from the Del Rey Hills Area of the Playa Del Rey Oil Field to the Inglewood Oil Field (Figure 7, Plate VII). The cross section follows the southern boundary of the Playa Vista site. The cross section shows that the Playa Vista site lies along the crest and east limb of the Playa Del Rey anticline that is separated by a broad syncline from the Inglewood Oil Field. In the cross section the Inglewood Oil Field lies along the Newport Inglewood fault zone and that oil field is characterized by steep dips and numerous faults. In contrast the Del Rey Hills Area of the Playa Del Rey Oil Field, not adjacent to a major fault zone, is structurally simple with gentle to moderate dips and a lack of faulting.

The cross section also shows the thickening of the entire sedimentary column towards the east and provides some control over the age of the Playa Del Rey anticline. As previously discussed, the Los Angeles basin subsided during the Miocene and early Pliocene and the eastward thickening of the Schist Conglomerate through the middle Repetto Formation is a result of thickening towards the area of maximum subsidence in the central Los Angeles basin (Figure 3, Plate III). Basinwide compression and fold growth started during the late Pliocene (Davis, et al., 1989) and the eastward thickening of the upper Repetto through upper Pico Formations is the result of syntectonic depositional patterns. The Playa Del Rey anticline probably started to grow in the late Repetto and continued to deform to at least the end of Pico Formation deposition. The overlying San Pedro Formation does not appear involved in the growth of the anticline. From these relationships it appears that the anticline grew between about 3 million and 500,000 years ago. This geometry of the east limb of the Playa Del Rey anticline and the eastward thickening of depositional units is also observed in the Davis and Namson cross sections and seismic reflection surveys (section 3.1 Licensed Chevron seismic line; section 3.2 2D High resolution seismic line; and section 3.3 3D seismic survey).

Davis and Namson constructed a series of subsurface structure contour maps and cross sections (Figures 8-15; Plates VIII-XV) by well to well correlation of the spontaneous potential and resistivity curves of electric logs, and the visual descriptions of rocks encountered while drilling (Figure 4, Plate IVA). These maps also integrate previously discussed subsurface mapping done in the area by the State of California, Division of Oil and Gas (DOG), and the Southern California Gas Company (Hester, 1986).

The deepest map is on the top of the Catalina Schist (Figure 9, Plate IX). The map shows the crest and east limb of the Playa Del Rey anticline, and the projected intersection of the postulated Lincoln Boulevard fault with the top of the crystalline basement. As can be seen from the contouring there is no abrupt change in the top of the Catalina Schist that would be expected if the surface was offset by the postulated Lincoln Boulevard fault as depicted by ETI (2000) and shown here as Figure 5 and Plate V. It is worth noting that there are a good number of wells penetrating the Catalina Schist near the projected fault intersection, thus significantly reducing the possibility that small displacement faults exist. Given the number of wells, only a very small discontinuous fault, if any, could be interpreted between wells.

The near surface location of the postulated Charnock fault (Poland, et al., 1959) is shown on the eastern end of the map. The projected subsurface intersection of the Charnock and the top of the Catalina Schist would lie directly below the shallow surface location because Poland et al (1959) interprets the fault as having a vertical surface. The wells adjacent to the Charnock fault are too widely spaced to assist in the determination of the existence of this fault.

The next higher map is on top of the Schist Conglomerate zone (Figure 10, Plate X). The map shows the projected intersection of the postulated Lincoln Boulevard fault with the top of the Schist Conglomerate in an area of rather dense well control. As with the Catalina Schist map there is no change in the top of the Schist Conglomerate zone surface that would suggest the postulated Lincoln Boulevard fault as depicted in the ETI (2000) report.

The stratigraphically highest map is on top of the upper Bentonite marker of the upper part of the Repetto Formation (Figure 11, Plate XI). The map does not extend far enough east to intersect the projected fault plane of the postulated Lincoln Boulevard fault as detailed well control is lacking this far east. The map shows the Playa Del Rey anticline and as discussed by Hodges (1944) the regular shape of the fold indicates no faulting is present above -3700 feet subsea depth in the western portion of the Playa Vista site.

The subsurface mapping was supplemented with four cross sections that give a vertical slice view of the subsurface structure under the Playa Vista site. The locations and the cross section lines are shown in Figure 8 and Plate VIII. The locations of the cross section lines were selected to provide a representative view of the subsurface of the Playa Vista site and to avoid well projections into the lines. The postulated Lincoln Boulevard fault has been placed on the cross sections with the position and geometry shown in Figure 5 and Plate V of this report (Plate 1 of the ETI Report).

Cross section #1 (Figure 12, Plate XII) is a northeast directed line along the southern boundary of the Playa Vista site. Section #1 shows the gentle east dip of the Playa Del Rey anticline and the eastward thickening of sedimentary units. There is nothing in the well data or geometry of the subsurface to suggest the postulated Lincoln Boulevard fault. Cross section #1 passes through the University City Syndicate #1 well that had a gas blow-out of about 3.1 MMCF/day at 1821 feet in August 1930. ETI (2000) believe the blow out was due to the well bore intersecting the proposed Lincoln Boulevard fault as depicted in Figure 5 and Plate V of this report. Examination of the well records show the blowout died on its own after twelve hours. A gas blowout is not unique evidence for a fault. Shallow blowouts were a common occurrence in wells drilled in the Los Angeles basin during the early part of 1900's usually as a result of drilling through an isolated sand body and/or poor drilling procedures. The 2D high resolution seismic line (section 3.2) provides an image that suggests the gas blow out was the result of the well drilling into a small pocket of gas trapped by a stratigraphic pinchout within the upper Pico Formation (Figure 20, Plate XX).

Cross section #2 (Figure 13, Plate XIII) is a northerly line across the Playa Vista site and goes from the Del Rey Hills Area to the small Kidson pool. The cross section crosses the east limb of the Playa Del Rey anticline at a high angle and the low dips shown are apparent. Cross section #2 also passes through the University City Syndicate #1 well. In cross section #2 there is nothing in the well data or geometry of the subsurface to suggest the existence of the postulated Lincoln Boulevard fault.

Cross-section #3 (Figure 14, Plate XIV) is a northeast trending cross section across the northern portion of the Playa Vista site. Section #3 is nearly perpendicular to the trend of the Playa Del Rey anticline and shows a steeper limb dip (true dip) to the Playa Vista anticline, but there is nothing in the well data or geometry of the subsurface to suggest the postulated Lincoln Boulevard fault.

Cross-section #4 (Figure 15) is a northeast line along the southern boundary of the Playa Vista site. Cross-section #4 follows the cross-section #1 line, except that the University City Syndicate #1 is replaced by the Co-Operative Development, Community #1 well to make a straighter cross-section line. Within the Del Rey Hills Area the west end of the cross-section #4 goes northwest along the crest of Playa Del Rey anticline. Cross-section #4 shows the crest and gentle east dip of the Playa Del Rey anticline, and there is nothing in the well data or geometry of the subsurface to suggest the postulated Lincoln Boulevard fault.

In the two regional cross-sections constructed by Jack West and the three subsurface maps and four cross-sections constructed by Davis and Namson there is nothing in the geometry of the subsurface or well data to suggest the presence of the Lincoln Boulevard fault under the Playa Vista site. The maps and cross-sections show the general structure under the Playa Vista site and show no significant fault is possible under the entire site. East of the Del Rey Hills Area of the Playa Del Rey oil field (central and eastern portions of the Playa Vista site) the density of wells is low and it would be possible for one to interpret a small fault under the site if some other evidence for a fault became available. For instance, the density of well data adjacent to the Charnock fault is too low to eliminate its existence. Under the western part of the Playa Vista site (Del Rey Hills Area) the density of wells is high and it is very difficult to interpret even a small of fault between the wells as shown by Hester (1986). As previously discussed, the small fault interpreted by Metzner (1935) to offset the top of the Catalina Schist in southeast corner of section 27 probably does not exist based on subsequent more detailed subsurface work (Hester, 1986). This fault was cited by ETI (2000) as evidence for extension of the postulated Lincoln Boulevard fault into the Southern California Gas Company's Gas Storage reservoir in the Schist Conglomerate zone of the Del Rey Hills Area (Figure 5, Plate V). If small faults are present in the western Part of the Playa Vista site they are confined to the deeper sedimentary units and do cut through the upper Bentonite marker of the Repetto Formation as shown by the subsurface mapping of Hodges (1944) and Jack West cross-sections (Figure 7, Plate VII). This indicates no faulting has occurred in the western part of the Playa Vista during the last 2.5 to 3.0 million years

3.0 Onshore Geophysical Survey

3.1 Licensed Chevron seismic line:

Playa Vista purchased a licensed seismic reflection line from Chevron. Line LAB 85-4 is located about 9,000 to 12,000 feet south of the Playa Vista site and is oriented in an east-west direction (Figure 16, Plate XVI). The Chevron seismic line is licensed data and the wiggle trace presentation cannot be reproduced for this report. Figure 16 and Plate XVI are grayscale plots of the migrated seismic data with a line interpretation of the structure and stratigraphy. Seismic line LAB 85-4 is oriented so that it should intersect the southern projection of the postulated Lincoln Boulevard fault at about shot points 248-254. This portion of the seismic line is characterized by unbroken reflectors through the entire sedimentary section to the top of the crystalline basement -a depth of about 6700 feet. The seismic reflectors are the result of lithologic [density] changes in the rock column with depth and the reflectors provide a continuous subsurface image of sedimentary bedding and contacts. Faults are visible in seismic data because they disrupt and offset the bedding and may produce diffractions at the terminations of reflectors. The unbroken reflectors in the Chevron seismic line and lack of diffractions indicate either the postulated Lincoln Boulevard fault is nonexistent or it dies out before reaching the line.

Line LAB 85-4 is of very high imaging quality for the Los Angeles basin showing a seismic image of the entire sedimentary section to the top of the crystalline basement along the entire seismic line. Above 1.4 sec (approximately 5,000 ft depth) the seismic line shows a number of reflectors that are continuous across the entire line and indicate no faulting has occurred since these layers were deposited. A check shot survey from the nearby Chevron (Shell Oil Co.) Six

Companies #1 well (section 2, T3S-R15W, Plate I) was used to constrain the stratigraphy and age of the reflectors. The continuous reflectors belong to the upper Repetto Formation and younger units. Therefore no faulting has occurred along Chevron line LAB 85-4 during the last 3.0 million years (the age of the base of the upper Repetto Formation).

Below 1.4 sec on LAB 85-4 and at about shot point 200 there is evidence for a small fault cutting the top of the Catalina Schist, Topanga Formation, and Puente Formation. This indicates the fault was active during the late Miocene (5-14 ma). The fault dies out within the middle Repetto Formation and therefore the fault has not moved during the last 3.0 million years. This is not the postulated Lincoln Boulevard fault (ETI, 2000) for three reasons: 1)the location of the small fault is much further east than the on-strike projection of the postulated Lincoln Boulevard fault (as discussed above); 2) the small fault does not cut strata younger than middle Repetto (conversely the postulated Lincoln Boulevard fault, if it exists, must cut upper Quaternary deposits to produce the shallow methane anomaly at the Playa Vista site); and 3) most importantly, and discussed later, the new 3D seismic data collected by Playa Vista show no evidence for the postulated Lincoln Boulevard fault or the small Miocene age fault observed in Chevron seismic line LAB 85-4. The small Miocene fault either dies out before reaching the Playa Vista site or trends east of the Playa Vista site and the new seismic data.

3.2 2D <u>High resolution seismic line</u>:

A 2D high-resolution seismic line was acquired for Playa Vista along the south side of Jefferson Boulevard during the last week of July 2000 (Figure 18, Plate XVIII). Seismic acquisition was performed by Subsurface Exploration Company, and during August and September 2000 Tricon Geophysical did the processing of the 2D seismic data set.

Figure 19 and Plate XIX are the uninterpreted migrated 2D high-resolution seismic line, and Figure 20 and Plate XX are the same data set interpreted. The 2D line transects most of the Playa Vista site in an east-west direction from the eastern edge of Southern California Gas Company's gas storage field to the eastern end of the Playa Vista property. Interpretation and integration of the 2D line with the oil well data was completed by Davis and Namson during September 2000. The 2D seismic data was integrated with the well data and interpreted using SeisX software (Paradigm Geophysical) on a Unix workstation. A check shot survey from the nearby Chevron (Shell Oil Co.) Six Companies #1 well (section 2, T3S-R15W, Plate I) was used for converting the Universal City Syndicate 31 well to time. The Pico Formation stratigraphy shown on the interpreted line was brought in from the 3D seismic interpretation that had the benefit of more well ties. Included in the plates (8.0 Plates) are interpreted the uninterpreted 2D line (Plate XIX), and the interpreted 2D line (Plate XX) that are plotted at 1"=600 feet to be consistent with the subsurface geologic maps. The interpreted lines were plotted from Seis X by Davis & Namson and the uninterpreted lines were plotted by Tricon Geophysical.

Overall the 2D high-resolution line is of good quality with the eastern two thirds having the best quality (from about shot point 600 eastward). Integration of the 3D seismic interpretation shows the 2D line mostly images the middle and upper Pico Formation in the time interval from about 200 to 800 milliseconds (approximately 600 to 2500 feet depth). Deeper than 800 milliseconds there is little useable data as would be expected from a high resolution line. The 3D seismic survey, described next, images the remaining sedimentary section down to the top of the Catalina Schist and the entire Playa Vista site.

The 2D line shows the detailed structural geometry and stratigraphic framework of the east limb of the Playa Del Rey anticline under the Playa Vista site. The 2D line is of sufficient data quality to show the details of westward stratigraphic thinning along the anticlinal limb. The Playa Vista anticline was growing during deposition of the middle and upper Pico Formation and the westward thinning of beds is a result of the interaction of tectonism and deposition. Of greatest importance to the faulting issues at the Playa Vista site are the set of reflectors from about 400 to 700 milliseconds that are continuous along the entire 2D line. These reflectors belong to the upper portion of the middle Pico Formation. The seismic reflectors are the result of lithologic [density] changes in the rock column with depth and the reflectors provide a continuous subsurface image of sedimentary bedding and contacts. Faults are visible in seismic data because they disrupt and offset the bedding and may produce diffractions at the terminations of reflectors. Consequently the continuous reflectors in the 2D seismic line show that no faulting has occurred under the Playa Vista site east of the eastern edge of the gas storage field (Del Rey Hills Area) during at least the last 1.0 million years (top of middle Pico Formation is estimated to be from 1.5 to 1.0 million years old). As previously discussed, the area west of the 2D line has subsurface mapping and cross section work based on a high density of well data that show it is unlikely that any faults cut the upper Repetto Formation (Figure 7, Plate VII, and Hodges, 1944). This indicates no faulting in the western part of the Playa Vista site during the last 3.0 to 2.5 million years.

The 2D line crosses the shallow location of the postulated Lincoln Boulevard fault just east of Lincoln Boulevard and about shot point 450 (Figure 20, Plate XX). The middle Pico Formation reflectors cross the subsurface projection of the postulated Lincoln Boulevard fault, and show the fault is nonexistent on the 2D line. The eastern half of the 2D line shows a continual set of reflectors from about 200 to 600 milliseconds (Figure 19, Plate XIX) that cross the mapped position of the postulated Charnock fault of Poland, et al. (1959). The intersection of the postulated Charnock fault and the 2D lines is about shot point 1120, and the continuous reflectors and lack of diffractions show that the Charnock fault is nonexistent in the upper Pico Formation. Deeper reflectors belonging to the upper part of the middle Pico Formation also cross the postulated Charnock fault unbroken. The Playa Vista site is near the southern end of where Poland et al.

(1959) postulated the fault and it is possible the fault has died out, turned east of the site, or, being a fault inferred from variations in the ground water table does not exist.

The 2D line images other subsurface relationships that are important to the Playa Vista project site. The 2D line shows that the westward-thinning wedge of Pico Formation strata on to the east limb of the Playa Del Rey anticline as presented in the cross sections (Figures 7, Plate VI; and Figures 12-15, Plates XII-XV) is valid. The westward thinning is accomplished by stratal thinning, pinchouts and onlap of younger beds on to older beds (Figure 20, Plate XX). Within the upper Pico Formation is an angular unconformity that is imaged across the entire line, and the upper Pico strata above this unconformity are onlapping westward onto the older Pico strata below the unconformity. This relationship is particularly evident where the Universal City Syndicate #1 well crosses the unconformity (Figure 20, Plate XX). It is noteworthy that the location of the unconformity is just below the depth of where the Universal well had a gas blow out in 1931. The stratigraphic relationships shown on the 2D high-resolution line provide a very likely explanation for the blow out. Gas migrating updip became trapped within the onlapping sands just above the unconformity.

Between shot points 300 and 600 and above 400 milliseconds the 2D line is characterized by discontinuous reflectors and overlapping reflectors that are interpreted here to be nested channel deposits possibly related to the downcutting and subsequent filling of the ancestral Ballona Creek during the Pleistocene. As discussed in section 2.2 (Stratigraphy of the Playa Vista Site) extreme down cutting of Ballona Creek and subsidence during the late Pleistocene may have produced nearly 400 feet of local relief on the base of the ancestral Ballona channel (Figure 4, Plate IVB). This area is also characterized by a poor signal to noise ratio and low fold that is probably a result of the high degree of surface modification of the Playa Vista site east of Lincoln Boulevard.

In summary the 2D high-resolution seismic line displays unfaulted reflectors along the entire line. The 2D line covers much of the Playa Vista site as it extends from the join of Jefferson and Culver Boulevards eastward to the end of the Playa Vista site. The continuous reflectors belong to the upper portion of the middle Pico Formation and show there been no faulting of any kind since at least the last 1.0 million years. Subsurface mapping based on well data indicate that no faulting has occurred in the Playa Vista site area west of the 2D line during the last 2.5 to 3.0 million years. In addition the 2D seismic line shows no evidence for either the postulated Lincoln Boulevard fault or the postulated Charnock faults below the upper middle Pico Formation reflectors.

3.3 3D seismic survey:

A 3D seismic line was acquired for Playa Vista over the entire Playa Vista project site, and over additional areas along Centinela and Ballona Creeks, Dockweiler State Beach south of Ballona Creek, and in the entrance to Marina Del Rey Harbor (bay cable) during the latter part of July 2000 (Figure 21, Plate XXI, and Figure 22, Plate XXII). Acquisition was performed by Subsurface Exploration Company, and Tricon Geophysical processed the 3D data set during September and October 2000.

The 3D seismic data was integrated with the well data and interpreted by Davis & Namson during October, 2000 using SeisX software (Paradigm Geophysical) on a SGI Unix workstation. The 3D seismic survey is over an area with abundant well data. Wells adjacent to the Inlines and Crosslines are shown on the lines. Integration of well data into the lines allows for a better understanding of the deeper less definitive seismic data, and for stratigraphic and age determination of seismic reflectors. Depending on the well location with respect to the Playa Del Rey anticline, check shot surveys from either the Chevron (Shell Oil Co.) Six Companies #1 well (section 2, T3S-R15W), or the Shell Oil Company, Baldwin Hills Community #1 (section 9, T2S-R14W) were used for converting the geologic well data to time (Plate I).

The 3D seismic data are processed and displayed as Inlines and Crosslines. The Inlines are roughly parallel to Jefferson Boulevard while the Crosslines are roughly parallel to Lincoln Boulevard (Figures 21 and 22, Plates XXI and XXII). Included in the plates (8.0 Plates) are interpreted and uninterpreted Inlines 15, 20, 25, and 30 (Plates XXIIIA-H), and Crosslines 20, 30, 40, 50, 60, and 70 (Plates XXIVA-L). The interpreted and uninterpreted lines are plotted at 1"=600 feet to be consistent with the subsurface geologic maps. The interpreted lines were plotted from Seis X by Davis & Namson and the uninterpreted lines were plotted by Tricon Geophysical.

Figures 23 and 24 are examples of Inlines of the 3D seismic data set that provide northeast-southwest slices of the subsurface under the Playa Vista site. These lines also cross the crest of the Playa Del Rey anticline, the postulated Lincoln Boulevard fault, and the postulated Charnock fault. The shallow data gaps (above 1000 milliseconds) on the left-hand-side of the lines are the result of the 3D seismic survey being unable to access the wetland areas of the Playa Vista project site and some residential areas in the western portion of the study area which resulted in decreased data recovery (fold). In general the 3D survey has better image quality in the central and eastern portions of the Playa Vista site. Undoubtedly this is due to the lack of source lines in the west compared to areas in the central and eastern parts of the site (Figure 22, Plate XXII).

The 3D Inlines (Figures 23 and 24, Plates XXIII and XIV) show the detailed structural geometry and stratigraphic framework of the east limb of the Playa Del Rey anticline under the Playa Vista site. The Inlines shows that the westward-thinning wedge of Pico Formation strata on to the east limb of the Playa Del Rey anticline as shown in the cross-sections (Figures 7, Plate VI; and Figures 12-15, Plates XII-XV) and in the 2D high-resolution lines (Figures 19 and 20, Plates XIX and XX). Of greatest importance to the faulting issues at the Playa Vista site are the set of reflectors from about 400 to 1000 milliseconds and continuous along the entire 3D seismic survey from about Crossline 20 eastward. Crosslines 20 intersects Inlines 20 and 25 about 1300 feet west of the join of Culver and Jefferson Boulevards (Plates XXI and XXII) indicating the unfaulted reflectors underlie most of the Playa Vista site. The seismic reflectors are the result of lithologic [density] changes in the rock column with depth and the reflectors provide a continuous subsurface image of sedimentary bedding and contacts. Faults are visible in seismic data because they disrupt and offset the bedding and may produce diffractions at the terminations of reflectors. The continuous reflectors imaged in the Crosslines belong to the middle Pico Formation indicating that no faulting has occurred under most of Playa Vista site during the last 2.0 million years. This conclusion is consistent with the results of the 2D high-resolution seismic line and the subsurface mapping based on well data.

The 3D seismic survey provides additional information of the faulting issues at the Playa Vista site. The Inlines cross the postulated Lincoln Boulevard fault in the central portion of the survey (from about Crosslines 30 to 50), and the postulated Charnock fault in the eastern portion of the survey (from about Crosslines 50 to 90). In the central area of the 3D seismic survey all stratigraphic tops and subsurface survey data have been converted to two-way travel time using velocity data from the Chevron (Shell Oil Co.) Six Companies #1, as this well has a similar depth and stratigraphy to the east limb of the Playa Del Rey anticline.

The Inlines cross the shallow location of the postulated Lincoln Boulevard fault just east of Lincoln Boulevard and about their intersections with Crosslines 44 to 45 (Figure 23 and 24, and Plates XXIIIA-H, Plates XXIVA-L). In this central area the Inlines show sets of continuous reflectors from about 400 to 1400 milliseconds, eliminating the possibility of a Lincoln Boulevard fault, and any other faulting, from this portion of the survey above 1400 milliseconds. Integration of the well data indicates that the continuous reflectors are from the middle and upper Repetto Formation, and the lower and middle Pico Formation.

Therefore no faulting has occurred in the central portion of the 3D seismic survey during the last 4.0 million years.

In the central portion of the 3D seismic survey and below 1400 milliseconds to the top of Catalina Schist the seismic image is less definitive as would be expected from the decreasing penetration and return of seismic energy. There, the image is characterized by discontinuous reflectors and somewhat noisy data. Well data indicate that the section imaged consists of the top of the Catalina Schist, Schist Conglomerate, Nodular Shale, Puente Formation and lower Repetto Formation. No evidence for faulting is observed in the seismic record below 1400 milliseconds and portions of the top of the Catalina Schist are obvious on the Inlines and Crosslines. Extrapolation of the top of Catalina Schist from portion to portion argues against any significant faulting below 1400 milliseconds under the Playa Vista site.

The eastern portion of the 3D seismic survey (from Crosslines 50 to 90) nearly reaches the synclinal trough that bounds the east limb of the Playa Del Rey anticline. This syncline is shown on Jack West's Playa Del Rey oil field to Inglewood oil field cross section (Figure 7, Plate VII). The eastern portion of the 3D seismic survey shows the Playa Vista site down to the Catalina Schist (Figures 23 and 24). Well tops and subsurface survey data have been converted to two-way travel time using velocity data from the Shell Oil Company, Baldwin Hills Community #1 as this well has a similar depth and stratigraphy to eastern part of the 3D seismic survey.

The Inlines cross the shallow location of the postulated Charnock fault (Poland, et al., 1959) just east of their intersections with Crossline 83 (Figure 23 and 24, and Plates XXIIIA-H, Plates XXIVA-L). Between about Crosslines 50 and 90 the Inlines show sets of continuous reflectors from about 400 to 1400 milliseconds eliminating the possibility of a Charnock fault, or any other faulting, above 1400 milliseconds. Integration of the well data indicates that the continuous reflectors are from the upper Repetto Formation, and the lower and middle Pico Formation.

Therefore there has been no faulting in the eastern portion of the 3D seismic survey during the last 3.0 million years.

In the eastern portion of the 3D seismic survey and below 1400 milliseconds to the top of Catalina Schist the seismic image is less definitive. As with the central portion of survey, the eastern portion is characterized by discontinuous reflectors and somewhat noisy data. Well data indicate that the section imaged consists of the top of the Catalina Schist, Schist Conglomerate, Nodular Shale, Puente Formation, and lower middle Repetto Formation. No evidence for faulting is observed in the 3D seismic survey below 1400 milliseconds.

The western portions of the Inlines provide northeast-southwest subsurface images across the crest of the Playa Del Rey anticline west of the intersections of Crossline 30 (Figure 23 and 24, and Plates XXIIIA-H, Plates XXIVA-L). Crosslines 20 and 30 provide northwest-southeast subsurface images of the crest of the anticline. The Del Rey Hills Area of the old Playa Del Rey oil field is located where the Inlines cross the crest of the anticline. This is an area with abundant well data, and wells adjacent to the Inlines and Crosslines are shown on the lines. Well tops and subsurface survey data have been converted to two-way travel time using velocity data from the Chevron (Shell Oil Co.) Six Companies #1 well that has a similar depth and stratigraphy to the crest and limbs of the Playa Del Rey anticline.

The western portions of the Inlines (Figure 23 and 24, and Plates XXIIIA-H, Plates XXIVA-L) provide good quality images consisting of well defined and continuous reflectors from about 700 to 400 milliseconds that oil well data indicate are from the middle Pico Formation. As a result of the previously mentioned shallow data gaps along the western portion of the 3D seismic survey these well defined reflectors are broken by areas of no data west of Crossline 20 (about 1300 feet west of the join of Culver and Jefferson Boulevards). Where these reflectors are imaged they show no evidence for faulting, however, it was impossible to obtain a complete image of the shallowest portions of the crest of Playa Del Rey anticline west of Crossline 20.

In the western portion of the Inlines and the adjacent Crosslines, moderate quality images of the subsurface were obtained from a zone from 700 to 1400 milliseconds (about 4500 feet) across the crest of the Playa Del Rey anticline. This zone consists of a stack of discontinuous reflectors that show no evidence for faulting. Imaging is less definitive in this zone than in the shallower section, as would be expected from the decreasing penetration and return of acoustic energy. Integration of well data with the lines also does show any indication of faulting within this zone. The well data also indicate that these discontinuous reflectors are from the middle and upper Repetto Formation and lower Pico Formation. The area of the Playa Vista site west of Crossline 20 has geologic data that assist with the fault evaluation. As previously discussed, subsurface mapping and cross section work based on abundant well data in the Del Rey Hills Area show it is unlikely that any faults cut the upper Repetto Formation (Figure 7, Plate VII, and Hodges, 1944). This indicates no faulting in the westernmost part of the Playa Vista site during the last 3.0 to 2.5 million years.

In the western portion of the 3D seismic survey below 1400 milliseconds (about 4500 feet) a zone of moderate to poor image quality was obtained across the crest of the Playa Del Rey anticline. There the images consist of a stack of discontinuous reflectors and rather noisy data. The data from this zone show no evidence for faulting, however the data is poor enough that one cannot eliminate the possibility of minor faulting. The well data indicate that the seismic image below 1400 milliseconds is from the lower Repetto formation to the top of the Catalina Schist. The western portion of the survey is in an area of abundant well control and correlation of that data by Hester (1986) and this study (section 2.0, Subsurface Geology of the Playa Vista Site) show no evidence for faulting. Integration of well data with the 3D seismic data also supports this conclusion.

In summary the 3D seismic survey shows that nearly the entire Playa Vista site is underlain by continuous reflectors belonging to the middle Pico Formation. The 3D data coverage begins to die out in the westernmost part of the Playa Vista site (about 1300 feet west of the join of Culver and Jefferson Boulevards) and this is the only area of the site where the continuous reflectors were not imaged. The continuous reflectors indicate that no faulting has occurred under the Playa Vista site during the last 2.0 million years with the exception of the small unimaged area at the western end of the project site. Abundant well data show it is unlikely that any faults cut the upper Repetto Formation in the westernmost part of the site and thus that no faulting occurred there during the last 3.0 to 2.5 million years.

The 3D seismic survey revealed no evidence for either the postulated Lincoln Boulevard or the postulated Charnock faults in the data shallower than 1400 milliseconds or about 4500 feet. Above 1400 milliseconds the 3D survey is characterized by sets of continuous reflectors where these postulated faults intersect the 3D survey. Integration of oil well data with the 3D seismic data show these continuous reflectors are from the middle and upper Repetto Formation and the overlying Pico Formation. Thus one can conclude there has been no fault activity under the central and eastern portions of the Playa Vista site during the last 4.0 million years. Below that 1400 milliseconds the seismic image is not clear. The conclusion that there is no Lincoln Boulevard fault is consistent with the results of the 2D High Resolution Survey (section 3.2 2D High Resolution seismic line), and the Earth Consultants International study of the shallow geology of the site (ECINTL, 2000). The conclusion that there is no Charnock fault or other faulting above 1400 milliseconds in the eastern part of the 3D seismic survey area is also consistent with the results of the 2D High Resolution seismic line. The fact that the postulated Lincoln Boulevard is not observed in either the 2D or 3D seismic surveys argues against its presence below the depth of good seismic imaging. The only reason for interpreting the fault is to explain the shallow methane anomaly at the Playa Vista site (ETI, 2000). The postulated fault would have to cut through the upper Pliocene and Quaternary deposits in order to be a conduit for methane. If the seismic surveys show there is no fault above 4500 feet then the methane anomaly must have some other cause and there is no basis for suggesting the presence of the Lincoln Boulevard fault.

4.0 Offshore Geophysical Survey

The offshore geophysical survey (Figure 25) was acquired, processed, and interpreted by Dr. Dan Francis of California State University Long Beach and Dr. Marc Legg of Legg Geophysical. Their report was written separately from the main report and has been inserted here with only editing modifications.

4.1 Introduction:

An offshore survey was carried out to determine the existence of through going faults that may be of concern to the Playa Vista site (Figure 25). The survey area (Figure 26) was chosen to detect faults that extend from the vicinity of the Playa Vista property to the immediate offshore area. Of particular concern are faults that might connect with the onshore gas storage facility, or hypothetical faults that define or control the bluffs along the north edge of Westchester and Playa Del Rey (Figure 2). The survey area is adjacent to, and compliments, the onshore 2-D and 3-D survey area. In addition to the survey area indicated in Figure 26, two multi-channel seismic profiles were acquired in the Ballona Creek channel, from near the mouth to within 500 feet of the Culver overpass (Figure 27). These profiles parallel one of the geophone spreads in the 3-D land survey, and also parallel a high resolution profile acquired along Jefferson Blvd.

4.2 Methods:

Four acoustic instruments were deployed to provide overlapping data sets that would image the seafloor itself, and subbottom features at various depths and resolutions:

1. *Side scan sonar* provides information on seafloor characteristics such as topography, bottom type (sandy, rocky), and presence of man-made objects. High frequency (150 kHz) sound waves emanate from both sides of a towed instrument; an image of a swath of seafloor 400 m (about 1200 feet) wide is built up as the sound reflects from seafloor features. We have 100% areal coverage of the seafloor in the survey area shown in Figure 26.

2. *3.5 kHz echo sounding* provides high-resolution vertical profiles of sub-bottom characteristics to a depth of up to 50 feet. Vertically incident sound waves penetrate the seafloor because of their lower frequency (relative to side scan sonar), and reflect from strata and other subsurface geologic features. 3.5 kHz echo soundings were carried out on all of the boat track lines shown in Figure 26.

3. *Single-channel digital uniboom seismic reflection* uses still lower frequency (400-1,200 Hz) but higher energy (300 joules) sound waves to image geological features as deep as 300 feet below the seafloor. Data are digitized and stored in a computer for later processing, which reduces noise and allows plotting of profiles at any desired scale. Uniboom data were collected on every other trackline shown in Figure 26.

4. *Single channel digital sparker seismic reflection* uses a low frequency (70-200 Hz) high energy (1,000 joules) sound source to image, at lower resolution than the uniboom, features as deep as 2,000 feet below the seafloor. Sparker profiles were collected on lines on which uniboom data were not collected.

Because of its lower resolution, the sparker does not provide good images of the upper 50-100 feet, and the uniboom does not adequately image the upper 10-20 feet. This is why three methods, 3.5 kHz, uniboom, and sparker, are needed to provide the most complete overlapping imaging required to detect faulting and determine recency of fault movement. Examples of such imaging in areas other than the Playa Vista survey are depicted in Figures 28, 29 and 30. With the addition of side scan sonar, a three-dimensional imaging (vertical and horizontal) is made possible.

The same sparker sound source was used in Ballona Creek with a 24-channel receiver cable; data from these distributed channels were "stacked" to provide clearer, deeper images. This more costly technique was used in this critical location as a link to the multichannel land seismic survey.

4.3 Results:

The offshore seismic/sonar survey revealed no evidence of faulting related to the bluffs (Ballona escarpment) just south side of the Playa Vista site (Figure 31). Some minor, low-offset faults were found to the north, but none in the location or alignment required for a fault to be associated with the bluffs. The faults

A reflective sedimentary contact (boundary between two layers) 11 to 13 msec below the seafloor was imaged in the uniboom data; this corresponds to a depth of about 40 to 50 feet (Figure 30). The reflector is flat, with only about 5 feet of vertical relief, and extends from south to north across any reasonable extension of the bluffs. The reflector is shown in some uniboom records to be an angular unconformity. The reflector correlates to an unconformable contact in nearby well records; this contact separates 15,000 year old sediments below it from sediments 6,000 years old or younger above. The reflector is offset by a small east-west trending fault just west of the breakwater, well north of any fault that would be related to the bluffs (Figure 31). The vertical separation of this fault is about 4 msec (about 12 feet). This fault is not observed in lines 11, 15, and 17 and the fault is assumed to die out west of the breakwater in the offhsore. A second fault was observed further north with an unknown, but probably small, vertical separation (Figure 31). As with the first fault this fault dies out eastward before reaching lines 15 and 17.

A reflector at about 375 msec (about 1,200-1,400 feet) is imaged in parts of the sparker profiles (Figure 32). This reflector is probably an angular unconformity, as an anticline and other possible structural features are imaged below it. A possible small fault exists well to the south of the bluffs, but it is imaged in only one profile, so its orientation cannot be determined. The reflector is only weakly imaged in the area of the bluffs and farther north (Figure 33). The reason for poor imaging of this reflector in some areas may be due to attenuation or scattering of acoustic energy in seafloor surface sediments; this scattering may be in part controlled by the locations of ancient river channels on the seafloor.

Numerous river channels, formed when sea level was lower, were revealed by side san sonar data (Figure 34). Most of the channels in the northern part of the survey area trend in a southeast direction (bearing approximately 135 degrees). They are crosscut by a younger channel that begins just south of the southern entrance to Marina del Rey, and trends south-southeast (bearing approximately 165 degrees). This younger channel may have been eroded by the Los Angeles River when it flowed out of the present Ballona Creek channel. The channels are evidenced in side scan sonar records by dark (high reflectivity) linear features that may represent rough (for example, gravelly) seafloor. There is no evidence of ridges or other topographic features; any such features more than about 1 foot high would appear in 3.5 kHz profiles (detection of seafloor topography is complicated by sea surface swell of about 3-4 feet at the time of the survey). Thus the high reflectivity is probably from numerous small rocks or other objects on the seafloor that mark the edge of a channel.

The channels show no direct evidence of horizontal (strike-slip) offset that would be due to faulting. The size and sharpness of the imaged linear features in the side scan records limits the maximum horizontal separation of any faults that may exist to no more than about 15 feet.

The younger channel is clearly imaged in two 3.5 kHz profiles (Figure 36); the edges of the channel correlate approximately with the linear features in the side scan sonar records. The channel is only about 10 feet deep in the center, and is backfilled with sediments less than 11,000 year old. This raises the possibility that seafloor sediments in the area of the younger channel are different from those in other parts of the survey area.

The extent of the reflector at 375 msec is almost entirely contained within the confines of the younger channel (Figure 37), suggesting that poor imaging outside the channel is due to loss of energy within shallow sediments. A possible fault is imaged in one profile within the channel (Figure 33), but the extension of the bluffs is north of the channel. This means that the 375 msec reflector provides no direct evidence for or against faulting associated with the bluffs. On the other hand, a stratigraphic horizon seen in numerous wells in the area, at depths ranging from 800 to 1,200 feet (top of the Pico formation), is the most likely correlation with the 375 msec reflector, and with a reflector at 250 msec in the Ballona Creek 24-channel line (Figure 38). If so, a fault with vertical separation necessary to account for the bluffs is unlikely.

The Ballona Creek 24-channel line shows two areas of poor seismic imaging, one near the river mouth and the other east of the point where the Marina del Rey channel turns north away from Ballona Creek (Figure 38). These two "wipeout" zones could be due to methane gas in the pore spaces of the sediments, or to scattering or energy loss due the character of the Ballona Creek riverbed.

4.4 Conclusions of offshore geophysical survey:

The offshore survey area is a region of relatively flat stratigraphy, with shallow marine and river-deposited (from lower stands of sea level) sediments. At least two unconformities have been imaged in the seismic data. Channels are abundant in the upper 50 feet of the sediments. Seismic imaging in such sediments is often incomplete because of scattering or loss of acoustic energy, especially in sediments at the seafloor. This phenomenon may also have affected the 24-channel seismic profile in Ballona Creek.

The offshore data do not image a fault along the offshore projection of the bluffs just south of the Playa Vista site (Ballona escarpment). The continuous nature of offshore reflectors, as far as they are imaged, provides no evidence for such a fault. The existence of 6,000 year old sediments in the Ballona wetlands and offshore (in the younger river channel, cross cutting any reasonable extension of the bluffs), and 100,000-300,000 (?) year old sediments on top of the bluffs in Westchester, argues for erosion as the causative agent for the bluffs. Any bluff-controlling fault would have to terminate at or near the shoreline, an unlikely structural feature. Furthermore, no prominent shoreline-parallel structural feature is observed in the offshore or Ballona Creek data that could terminate a west-trending bluff-related structure.

Two east-west trending faults, with vertical separation of 12 feet or less, were imaged further south near the entrance of Marina Del Rey. Near shore north-south lines indicate these fault do not project onshore.

The Ballona Creek 24-channel lines shows two area of poor seismic imaging, one near the river mouth and the other east of the point where the Marina Del Rey Harbor turns north away from Ballona Creek (Figures 27 and 38). These two "wipeout" zones could be due to scattering or energy loss due to the character of the Ballona Creek riverbed, or less possibly to methane gas in the pore spaces of the sediments. Dredging and compaction prior to development of Marina Del Rey

Harbor and flood control efforts at Ballona Creek may have created a shallow zone of dense material that reflects seismic energy. Alternatively, there may be a zone of river-deposited gravels, cobbles and boulders that scatter seismic energy. A possible insight into the cause of these wipeout zones is provided by an old (1901 version, 1912 printing) topographic map of the area (Figure 39). The original shape of the Ballona lagoon overlaps the present Ballona Creek channel in the area where seismic imaging is good. At that time Ballona Creek emptied into the lagoon farther to the north. Silty or clayey lagoonal sediments would be more transparent to seismic energy than sandy or gravelly river deposits; the latter may be responsible for the wipeout zones in the seismic data. If the cause of the wipeout zone is shallow gas, then the gas would be localized near Ballona Creek, because gas wipeout zones do not appear in the onshore seismic data acquired by Playa Vista.

5.0 Summary and Conclusions

In May 2000 Davis and Namson Consulting Geologists started a study of the subsurface of the Playa Vista site to determine the possibility of a Lincoln Boulevard fault as proposed in the ETI Report (2000), and to evaluate the possibility of other faults at the site. The Davis and Namson study took a multiphase approach to the problem. First, the existing geologic literature and unpublished consultant reports on the area were obtained and reviewed. No mention of a Lincoln Boulevard fault exists in the literature before the ETI (2000) report, and the report offers no new geologic or geophysical evidence for the existence of the Lincoln Boulevard fault. The preexisting geologic evidence cited by ETI (2000), i.e. Metzner (1935), does not support the presence of the Lincoln Boulevard fault. ETI has proposed the Lincoln Boulevard fault to explain the presence of the shallow methane anomaly, but ETI fails to consider that methane anomalies and seepages are not uniquely the result of faulting. It is well known that methane anomalies and seepages can result from a variety of subsurface conditions, not all of them requiring faulting (Thrasher, et al., 1996; Matthews, 1996). Therefore the postulated Lincoln Boulevard fault is a possible but not unique interpretation of the methane anomaly, but the fault interpretation is unsupported by the existing geologic literature from the Playa Vista area. ETI's earthquake scenario of large volumes of methane gas released along the Lincoln Boulevard fault during a future earthquake is unprecedented in the seismic history of California where numerous large and moderate earthquakes have occurred under or adjacent to existing oil and gas fields with no catastrophic releases of gas.

Davis and Namson collected an extensive well database, and subsurface maps and cross sections were constructed using these data and previous subsurface work. Mr. Jack West, Petroleum Geologist, constructed two regional cross sections of the Playa Vista area. The maps and cross sections show the general structure under the Playa Vista site and show no significant fault is possible under the entire site. East of the Del Rey Hills Area of the Playa Del Rey Oil Field (central and eastern portions of the Playa Vista site) the density of wells is low and it would be possible for one to interpret a small fault under the site if some other evidence for a fault became available. For instance, the density of well data adjacent to the Charnock fault is too low to support or eliminate its existence. Under the western part of the Playa Vista site (Del Rey Hills Area) the density of wells is high and it is very difficult to interpret even a small fault between the wells as shown by Hester (1986). As previously discussed, the small fault interpreted by Metzner (1935) to offset the top of the Catalina Schist in the southeast corner of section 27 probably does not exist based on subsequent more detailed subsurface work (Hester, 1986). This fault was cited by ETI (2000) as evidence for extension of the postulated Lincoln Boulevard fault into the Southern California Gas Company's Gas Storage reservoir in the Schist Conglomerate zone of the Del Rey Hills Area (Figure 5, Plate V). If small faults are present in the western part of the Playa Vista site they are confined to the deeper sedimentary units and do not cut through the upper Bentonite marker of the Repetto Formation as shown by the subsurface mapping of Hodges (1944), Hodges (1986), and Jack West cross sections (Figure 7, Plate VII). This indicates no faulting has occurred in the western part of the Playa Vista during the last 2.5 to 3.0 million years

During May and June 2000 a search and review was done for existing seismic reflection data near the Playa Vista area. Playa Vista purchased a seismic data license from Pacific Seismic Company for Chevron Line LAB 85-4. This line is east-west trending and located south of the Playa Vista site and in a orientation that would be intersected by the postulated Lincoln Boulevard fault. The postulated Lincoln Boulevard fault is not imaged on the line, and either the postulated Lincoln Boulevard fault is nonexistent or it dies out before reaching the line. Line LAB 85-4 is of very high imaging quality for the Los Angeles basin showing a seismic image of the entire sedimentary section to the top of the crystalline basement along the entire seismic line. Above 1.4 sec (approximately 5,000 ft depth) the seismic line shows a number of reflectors that are continuous across the entire line and indicate no faulting has occurred since these layers were deposited. The continuous reflectors belong to the upper Repetto Formation and younger units. Therefore no faulting has occurred along Chevron line LAB 85-4 during the last 3.0 million years (the age of the base of the upper Repetto Formation).

An extensive seismic reflection study was initiated and completed under the direction of Davis and Namson during July 2000 to better image the subsurface structure between wells, to evaluate the postulated Lincoln Boulevard fault, and to evaluate other faulting questions such as the postulated Charnock fault at the Playa Vista site. New onshore and offshore geophysical data, mostly seismic reflection, was acquired in a pattern that would image any faulting questions at the Playa Vista site. The onshore seismic surveys consist of a 2D high-resolution line and a 3D survey. The onshore data was processed by Tricon Geophysical during August, September, and the first half of October 2000. Interpretation of the seismic data by Davis and Namson began in early September and was finished at the end of October 2000.

The 2D high-resolution seismic line acquired by Playa Vista is located along Jefferson Boulevard. The 2D line displays unbroken reflectors along the entire line. The 2D line covers much of the Playa Vista site as it extends from the join of Jefferson and Culver Boulevards eastward to the end of the Playa Vista site. The continuous reflectors belong to the upper portion of the middle Pico Formation and show that there has been no faulting of any kind along the 2D line during at least the last 1.0 million years. The 2D seismic line shows no evidence for either the postulated Lincoln Boulevard fault of ETI (2000) or the postulated Charnock fault (Poland et al., 1959).

A 3D seismic line was acquired by Playa Vista over the entire Playa Vista project site, and over additional areas along Centinela and Ballona Creeks, Dockweiler State Beach south of Ballona Creek, and in the entrance to Marina Del Rey Harbor (bay cable). The 3D survey had the same imaging objectives as the 2D high resolution line but the 3D survey covered more of the Playa Vista site and was able to image deeper than the 2D line. The 3D seismic survey shows that nearly the entire Playa Vista site is underlain by continuous reflectors belonging to the middle Pico Formation. The 3D data coverage begins to die out in the westernmost part of the Playa Vista site (about 1300 feet west of the join of Culver and Jefferson Boulevards) and this is the only area of the site where the continuous middle Pico Formation reflectors were not imaged. The continuous reflectors indicate that no faulting has occurred under the Playa Vista site during the last 2.0 million years with the exception of the small unimaged area at the western end of the project site. At the western end of the Playa Vista site abundant well data show it is unlikely that any faults cut the upper Repetto Formation indicating no faulting there during the last 3.0 to 2.5 million years (Hodges, 1944; Hester, 1986). The continuous middle Pico Formation reflectors also show that the postulated Lincoln Boulevard and Charnock faults are not present at that or younger stratigraphic levels.

The 3D seismic survey revealed no evidence for either the postulated Lincoln Boulevard or the postulated Charnock faults being present at deeper levels below the middle Pico Formation. Where these postulated faults cross the 3D survey there are continuous seismic reflectors to about 1400 milliseconds or about 4500 feet depth. Oil well data show these continuous reflectors are from the middle and upper Repetto Formation and the overlying Pico Formation. Thus one can conclude there is no evidence for the postulated Lincoln Boulevard or Charnock faults in strata deposited during the last 4.0 million years. The conclusion of no Lincoln Boulevard fault in much of the sedimentary section under the Playa Vista site is consistent with the results of the 2D high resolution seismic line (section 3.2 of this study), and the Earth Consultants International study of the shallow geology of site (ECINTL, 2000). The conclusion of no Charnock fault present in strata younger than 4.0 million years seismic is also consistent with the results of the 2D high-resolution seismic line. The fact that the postulated Lincoln Boulevard is not observed in either the 2D or 3D seismic surveys down to about 4500 feet depth argues against the very existence of the fault at deeper levels. The only reason for interpreting the fault at the Playa Vista site is to explain the shallow methane anomaly at the Playa Vista site (ETI, 2000). The postulated fault would have to cut through upper Pliocene and Quaternary deposits in order to be a conduit for the shallow methane anomaly. As the seismic surveys show, there is no fault above 4500 feet. Consequently, the methane anomaly must have some cause other than a fault and therefore there is no need for a Lincoln Boulevard fault. It is well known that methane anomalies and seepages can result from a variety of subsurface conditions, not all of them requiring faulting (Thrasher, et al., 1996; Matthews, 1996). Therefore the postulated Lincoln Boulevard fault is a possible but not unique interpretation of the methane anomaly, but the Lincoln Boulevard fault interpretation is inconsistent with the existing geophysical and geologic data from the Playa Vista area.

During July 2000 an extensive offshore geophysical survey was conducted southwest of the Playa Vista Project site under the direction of Dr. Dan Francis of California State University at Long Beach and Dr. Marc Legg of Legg

Geophysical. Drs. Francis and Legg processed and interpreted the offhsore data during August and September 2000. Their report was written separately from the geologic and onshore geophysical study by Davis and Namson and the offshore report has been inserted here into the main study with only editing modifications. The purpose of the survey was to better understand the origin of the bluffs (Ballona escarpment) just south of the Playa Vista site. The offshore geophysical data do not image a fault along the offshore projection of the bluffs. The continuous nature of offshore reflectors, as far as they are imaged, provides no evidence for such a fault. The existence of 6,000 year old sediments in the Ballona wetlands and offshore (in the younger river channel, cross cutting any reasonable extension of the bluffs), and 100,000-300,000 (?) year old sediments on top of the bluffs in Westchester, argues for erosion as the causative agent for the bluffs. Any bluff-controlling fault would have to terminate at or near the shoreline, an unlikely structural feature. The results of the offshore survey show that the bluffs are the result of erosion by the ancestral Ballona Creek and not faulting and uplift.

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7.0 Figures

Figure 35, Map of channels from side scan data.
Figure 36, Channel profiles imaged in two 3.5 kHz profiles, line 12 and line 14

Figure 37, Correlation of 375 msec reflector with river

Figure 38, Ballona Creek 24-channel migrated seismic profile

Figure 39, Topographic map (1901) showing the natural extent of lagoon

Figure Captions

Figure 1, Structure contour and oil field map of the Los Angeles Basin (modified from DOG, 1974; Davis, et al., 1989, 1996; Wright, 1991). Contours on base of Repetto Formation (approx. 4.0 Ma) or Top of Puente Formation (Monterey Formation Equivalent). CF=Compton fault, LCF=Las Cienegas fault, NF=Norwalk fault, NIFZ=Newport-Inglewood fault zone, PVHF=Palos Verdes Hills fault, SMF=Santa Monica fault, THBF=Thums-Huntington Beach fault.

Figure 2, Playa Vista Project Area showing location of offshore and onshore seismic surveys and cross-section lines.

Figure 3, Regional north-south cross section of the Los Angeles Basin and restoration (Davis, et al., 1989).

Figure 4, Type log and generalized stratigraphy of the Playa Vista Project Are, and diagrammatic cross section showing Quaternary stratigraphic framework.

Figure 5, ETI (2000) east-west cross section showing postulated Lincoln Blvd. fault and postulated Charnock fault (Poland, et al., 1959).

Figure 6, Geographic provinces as defined by Metzner (1935), relative to the Playa Vista site and the postulated Lincoln Blvd. fault.

Figure 7, Structural cross section from the Playa Del Rey oil field to the Inglewood oil field.

Figure 8, Playa Vista Project Area showing locations of cross sections by Davis & Namson and Jack West.

Figure 9, Subsurface map of the Playa Vista Area showing contours on the top of the Catalina Schist.

Figure 10, Subsurface map of the Playa Vista Area showing contours on the top of the Schist Conglomerate zone of the Topanga Formation.

Figure 11, Subsurface map of the Playa Vista Area showing contours on the top of the upper Bentonite Marker within the Repetto Formation.

Figure 12, Davis & Namson cross section #1

Figure 13, Davis & Namson cross section #2

Figure 30, Reflective layer imaged in uniboom profile, with arrows indicating reflector.

Figure 31, Contour map showing thickness of sediments above the reflector. Thickness is mapped in two-way travel time; 1 msec is equivalent to about 3 feet. Fault with about 12 ft of vertical separation is marked F1. Another fault farther to the north with unknown separation is marked F2.

Figure 32, Reflector at 375 msec in a typical sparker profile, with arrows indicating the reflector

Figure 33, Map showing parts of tracklines where strong 375 msec reflector is imaged. A possible fault, imaged in one profile, is located at the point labeled "F."

Figure 34, Side scan sonar record showing what are interpreted to be channels on the sea floor.

Figure 35, Map of channels from side scan data. Channels imaged in 3.5 kHz data (lines 12 and 14) are indicated. Box indicates location of Figure 34.

Figure 36, Channel profiles imaged in two 3.5 kHz profiles, line 12 and line 14. Arrows indicate edges of channels. Locations of these images are shown in Figure 34.

Figure 37, Correlation of 375 msec reflector with river channel (combination of Figures 33 and 35).

Figure 38, Ballona Creek 24-channel migrated seismic profile.

Figure 39,Topographic map (1901) showing the natural extent of lagoon. The lagoon crosses the present Ballona Creek channel, where the seismic line is located (indicated by a line on the map). This is shown as Centinela Creek on this old map.

8.0 Plates

Plate I: Regional Structure and Data Location Map.

Plate II: Playa Vista Project Area Map Showing Location of Cross Sections and Offshore and Onshore Seismic Surveys.

Plate III: Regional Cross Section of the Los Angeles Basin and Restoration.

Plate IVA: Type Log and Stratigraphy of the Playa Vista Project Area.

Plate IVB: Quaternary Stratigraphy of the Playa Vista Project Area.

Plate V: Cross Section Showing Postulated Lincoln Blvd. Fault, Plate I ETI (2000)

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Plate VIII: Playa Vista Project Area Map Showing Locations of Cross Sections by Davis & Namson and Jack West.

Plate IX: Structure Map Top of Catalina Schist

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Plate XII: Davis & Namson cross section #1

Plate XIII: Davis & Namson cross section #2

Plate XIV: Davis & Namson cross section #3

Plate XV: Davis & Namson cross section #4

Plate XVI: Map showing location of Chevron seismic line LAB 85-4

Plate XVII: Interpretation of grayscale Chevron Seismic Line LAB 85-4.

Plate XVIII: Playa Vista Project Area Showing Location of High Resolution 2D Seismic Line.

Plate XIX: Uninterpreted High Resolution 2D Seismic Line

Plate XX: Interpreted High Resolution 2D Seismic Line

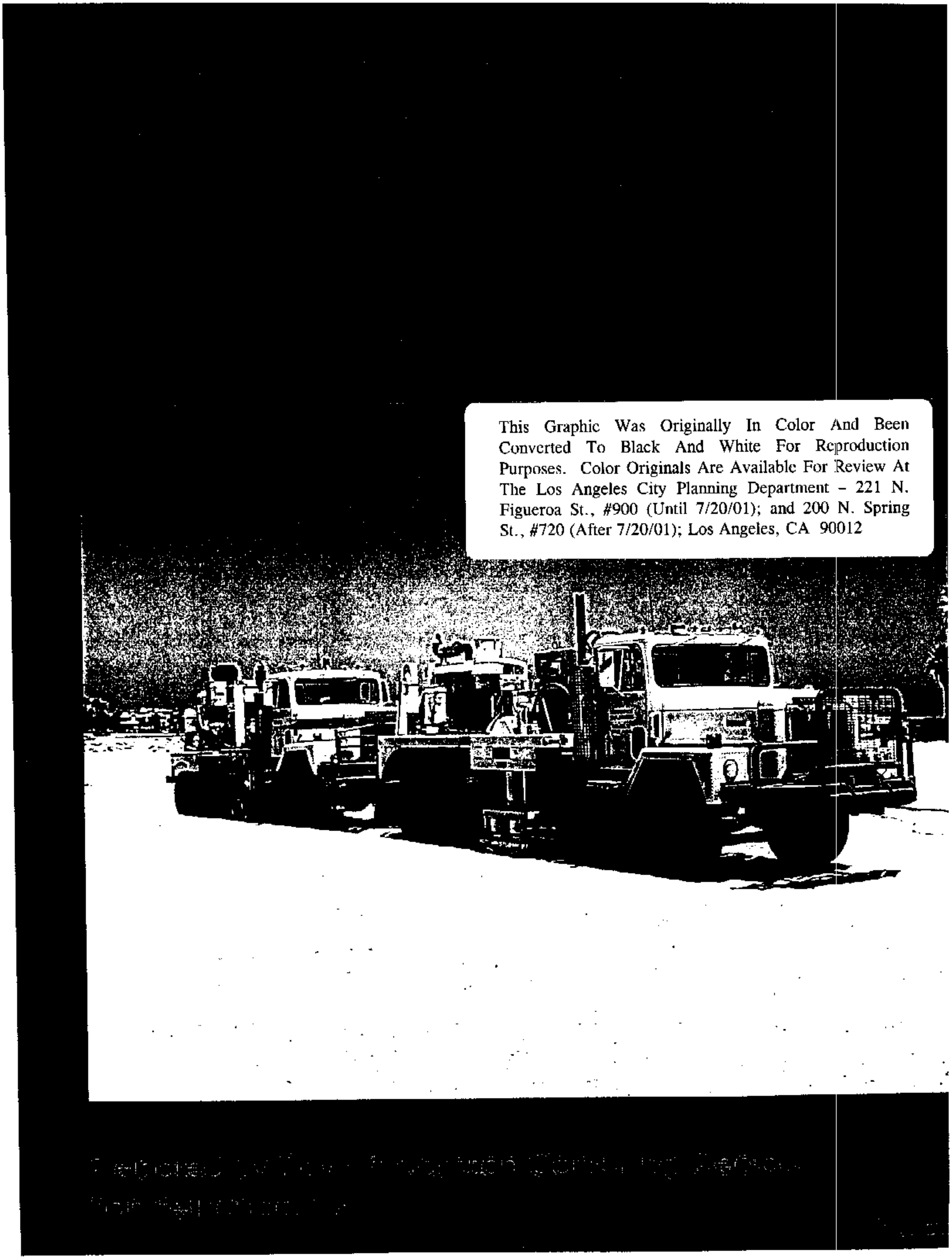
8.0 Appendix I-Acquisition Comments, Playa Vista High Resolution 2D, by Dan Hollis, Subsurface Exploration Company (SECO), Pasadena,CA

The purpose of the high resolution, 2D seismic line was to image from a depth of about 2000-ft to the surface. A spread configuration of 2000'-0'-2000' was chosen: the 2000-ft far offset allows for sufficient offsets to image to a 2000-ft depth and a near offset of 0-ft (no gap) allows imaging as close to the surface as muting of the first arrival energy allows. A 10-ft group interval was chosen to provide high spatial resolution and to minimize spatial aliasing of dipping events. Six potted geophones were used for each receiver station. A sand bag was placed over the geophones to improve ground coupling and to reduce noise. One stationary vibrator was used for each source location. A 20-ft source interval was used for the line, except in the area of high noise near Lincoln Boulevard were a 10-ft source interval was used. Sweep testing indicated that the optimal frequency range is between 15 and 120 Hz. A Varisweep of 15-120 Hz bandwidth was used to acquire the data.

9.0 Appendix II-Notes regarding processing of Playa Vista High Resolution 2D survey, by Dan Davidson, Tricon Geophysical, Denver, CO

The data were received in SEG Y format from the field acquisition company on two 8mm magnetic tapes. The data were reformatted to DISCO internal format for further processing. The data were then displayed and the traces were edited to remove "dead" traces and review the data for completeness and overall quality. To process the seismic reflection data from raw field format (shot domain) to a stacked common depth point (CDP) profile requires that the spatial relationship between shots and receivers be described. This description is called the geometry. The geometry of the line was finalized after thoroughly consulting with the surveyor concerning anomalous group locations, and with the seismic crew observer concerning the cable layout, especially in the area of Lincoln Blvd., and the locations of noisy areas from road crossings, pipeline crossing, and construction crew activity. After finalizing the geometry, it is used by almost all of the following processing steps. Gain tests were performed on selected shot records. Based on these tests a spherical divergence correction was designed and applied to balance the amplitude spectrum of the data. Spectral analyses were performed on selected shot records with and without deconvolution filter operators applied. It was determined that the data had usable frequency content up to approximately 80 Hertz (Hz). A surface consistent spiking deconvolution operator was selected because it balanced the frequency spectrum and improved resolution of the data at frequencies greater than 60 Hz. Datum static corrections were applied to correct for variations in the surface topography. Refraction statics were not applied because the quality of the first break of the refraction event was of insufficient quality to pick reliably. The data were then sorted to CDP order and interactive velocity analyses were performed across the line at intervals of 50 CDPs. Normal moveout (NMO) and surface consistent residual statics were applied and then the seismic data were stacked preliminarily. A second pass of velocities and residual statics were applied and the data were stacked again. The area from station 400-700 approximately was then analyzed a third time as this area of the line had the more serious noise problems in the vicinity of Lincoln Blvd. After an acceptable velocity and statics models were determined, a CDP consistent statics correction model was calculated and applied to the data to further define the static model and produce a stacked section having higher resolution.

Automatic gain control (AGC) with a small window (250 milliseconds in length) was then applied to the data before stack to better image the shallow data by balancing the trace amplitude. The data were then stacked.
After final stack the data were migrated with a finite difference migration to correct for raypath curvature. A Tau-P spectral enhancement was applied to the data to increase the signal to noise ratio. Finally, a 12-80 Hz bandpass filter and a post-stack trace balance was applied to improve the final display.



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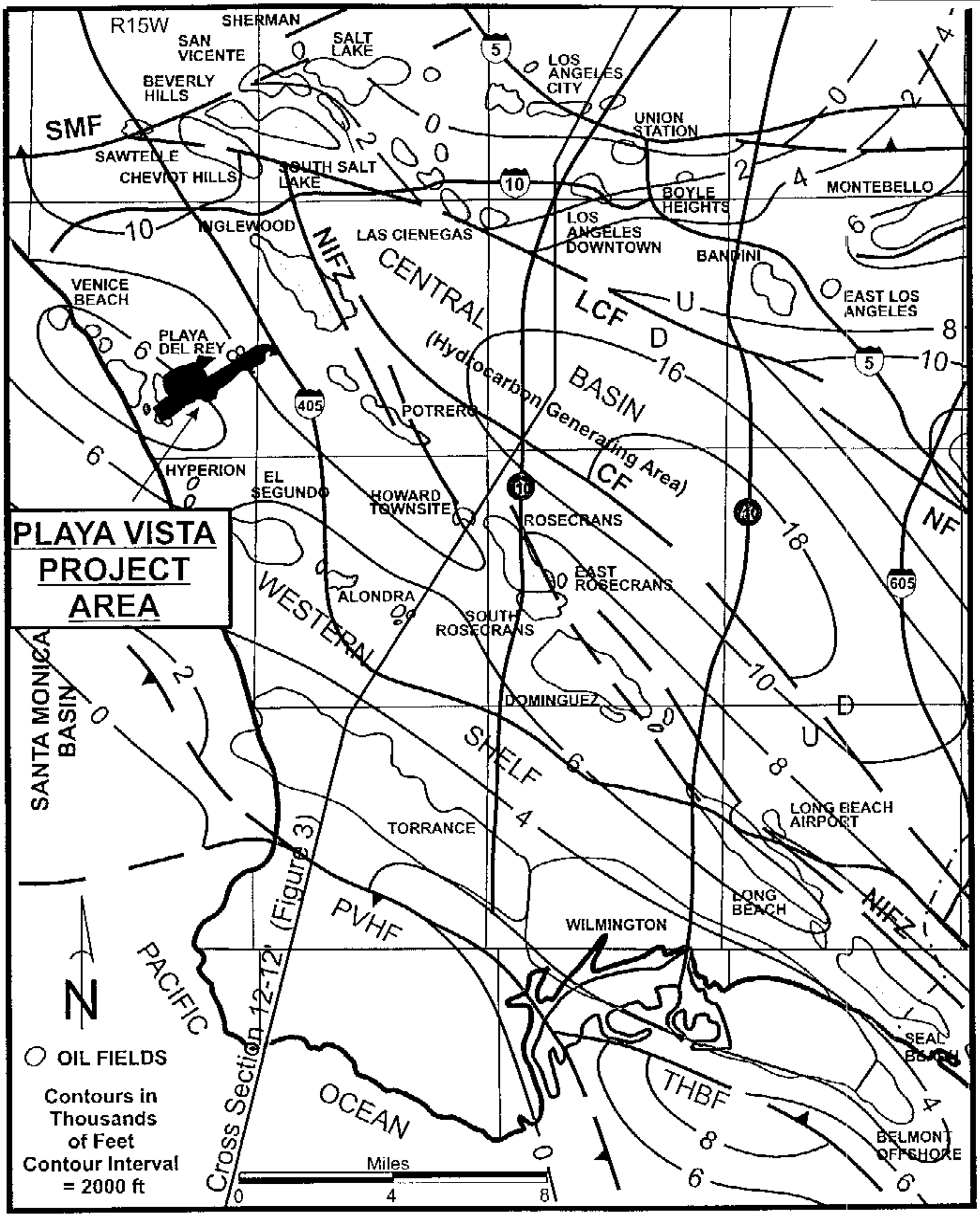

Figure 1. Structure contour and oil field map of the Los Angeles Basin (modified from DOG, 1974; Wright, 1991, Davis et al., 1989,1996). Contours on base of Repetto Formation (approx. 4.0 Ma) or Top of Puente Formation (Monterey Fm equivalent). CF = Compton fault, LCF = Las Cienegas fault, NF = Norwalk fault, NIFZ =Newport-Inglewood fault zone, PVHF = Palos Verdes Hills fault, SMF = Santa Monica fault, THBF = Thums-Huntington Beach fault

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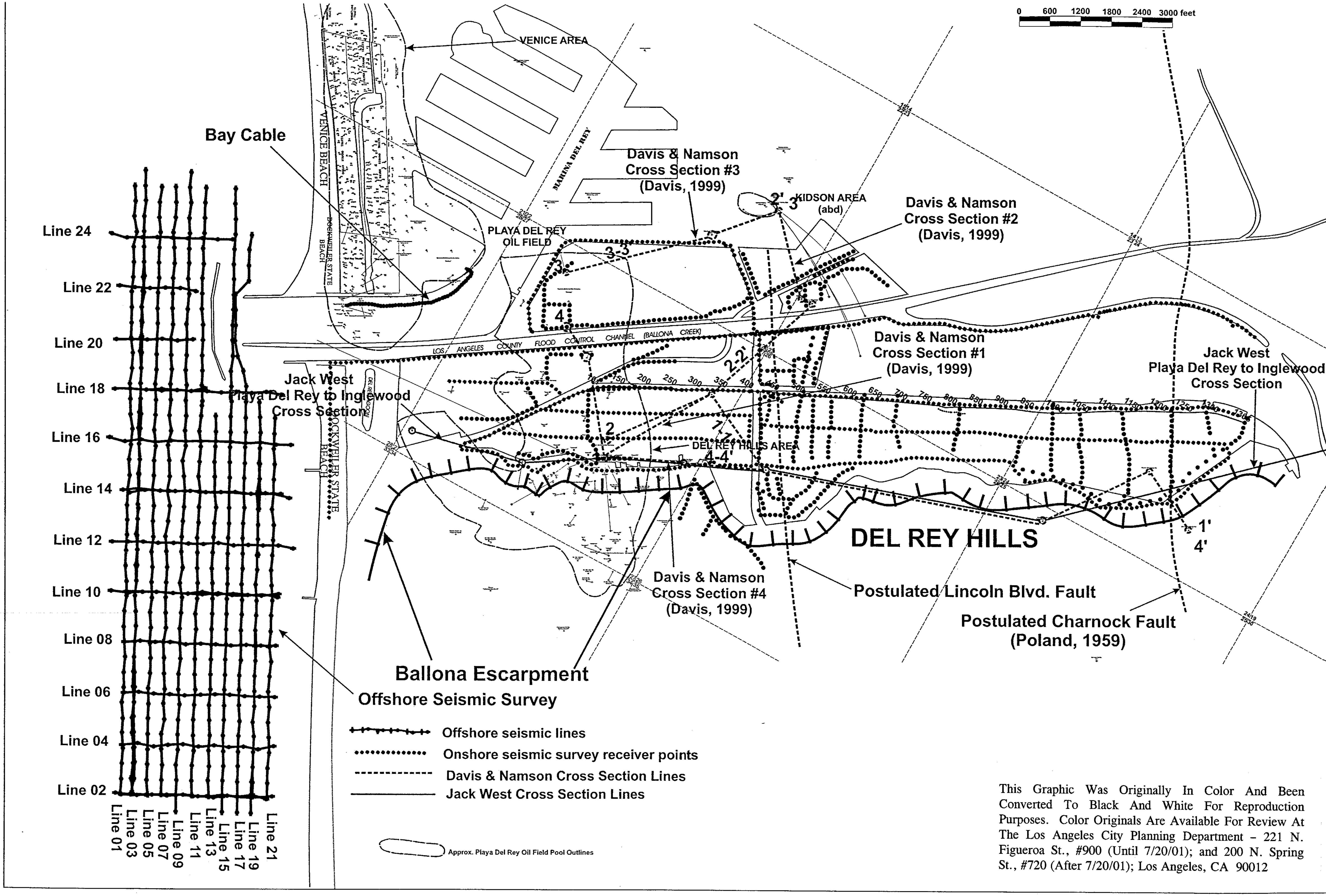

Figure 2. Playa Vista Project Area showing location of offshore and onshore seismic surveys and cross section lines.

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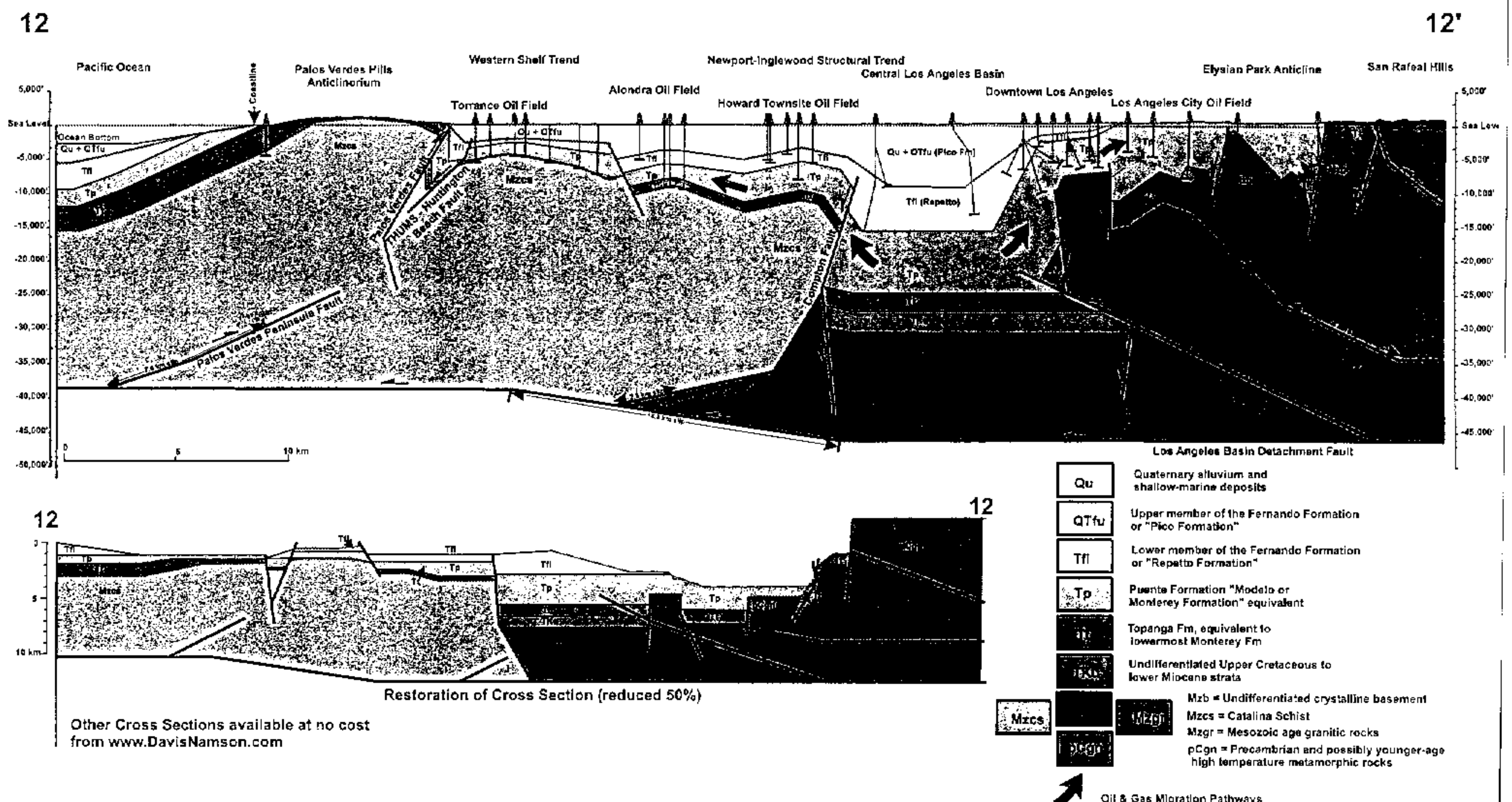

Figure 3. Regional north-south cross section of the Los Angeles Basin and restoration (Davis et al., 1989).

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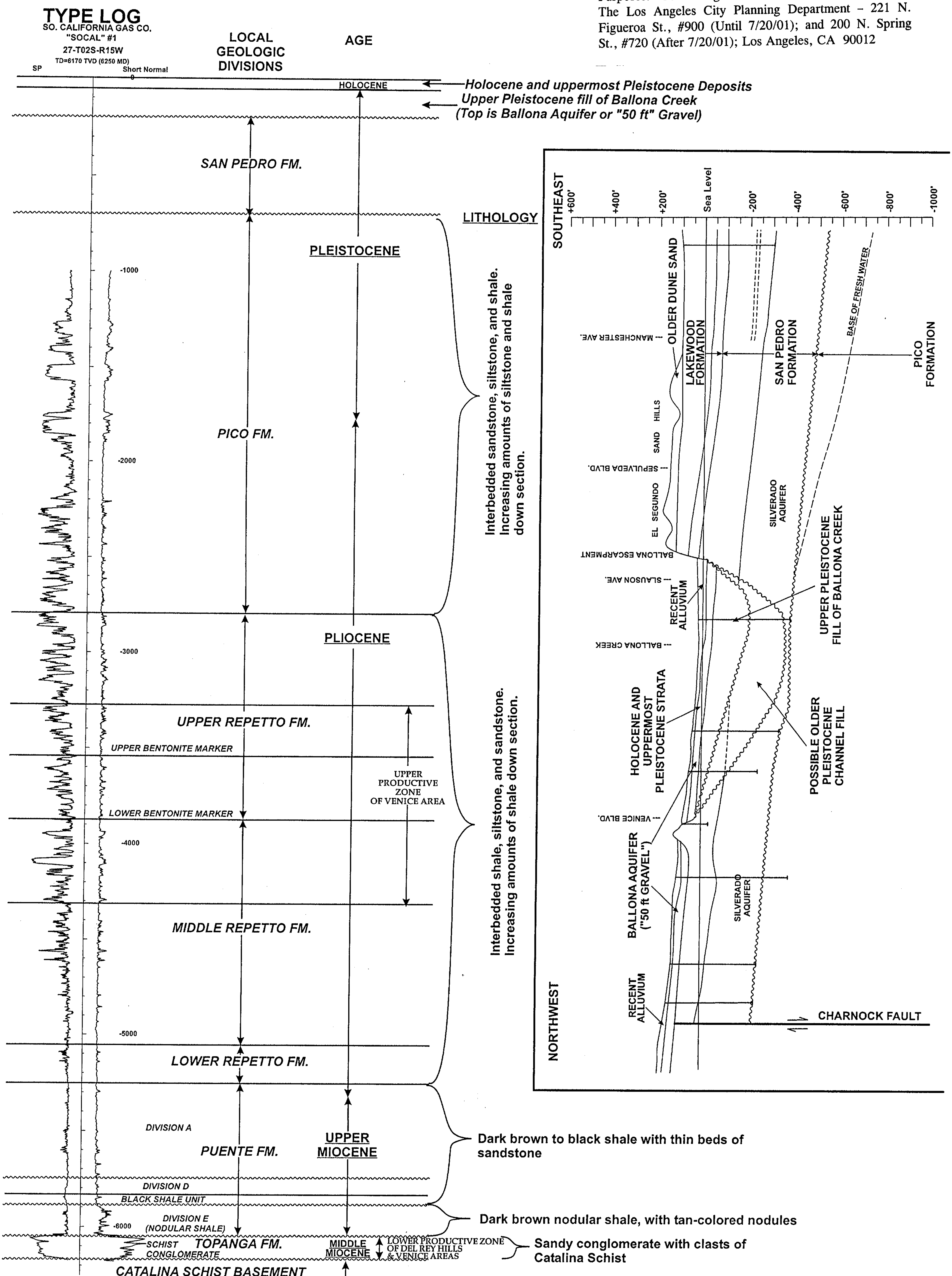

Figure 4. Type log and generalized stratigraphy of the Playa Vista Project Area, and diagrammatic cross section showing Quaternary stratigraphic framework.

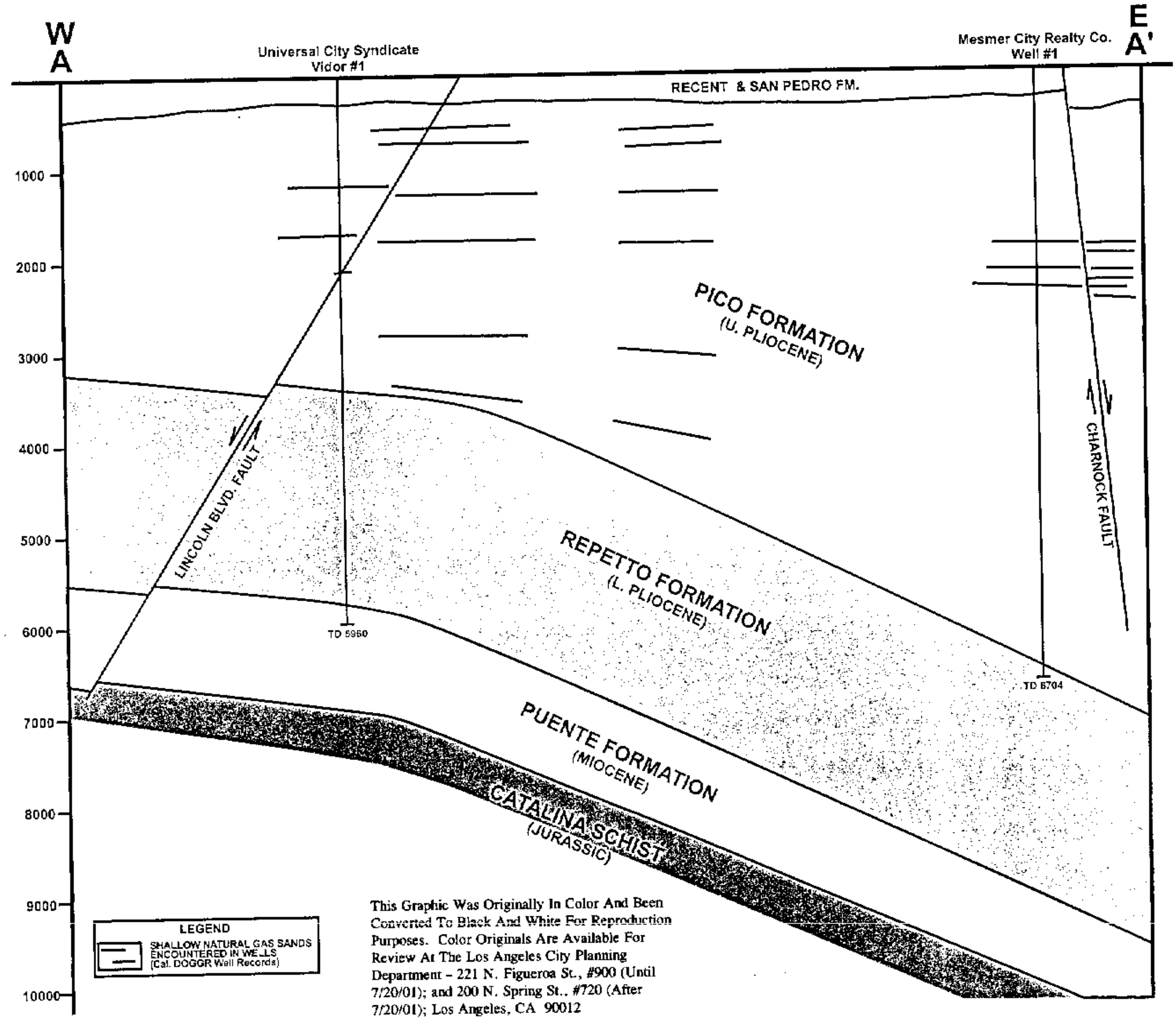

Figure 5. ETI (2000) east-west cross section showing postulated Lincoln Blvd. Fault and postulated Charnock Fault (Poland et al., 1959)

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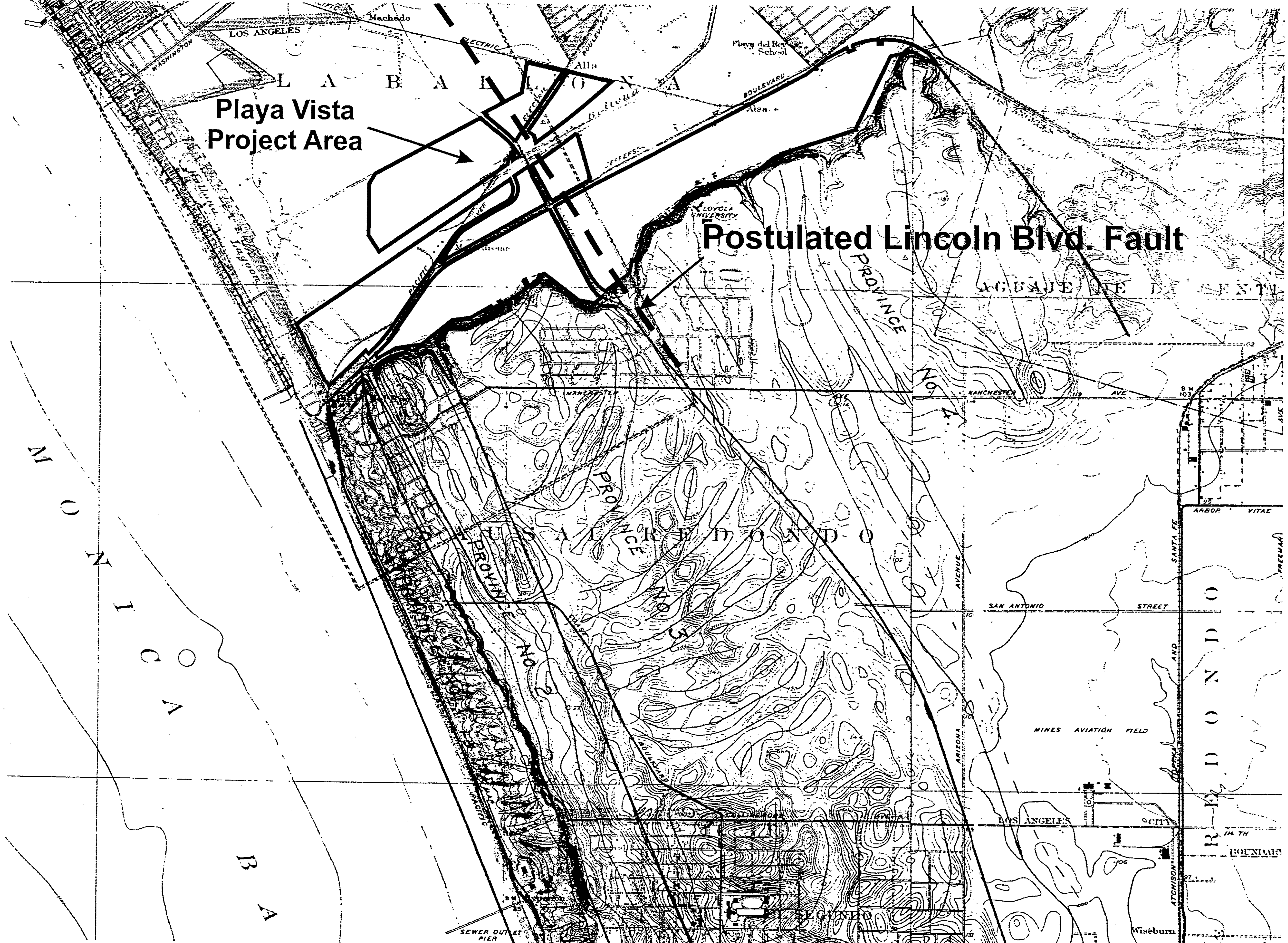
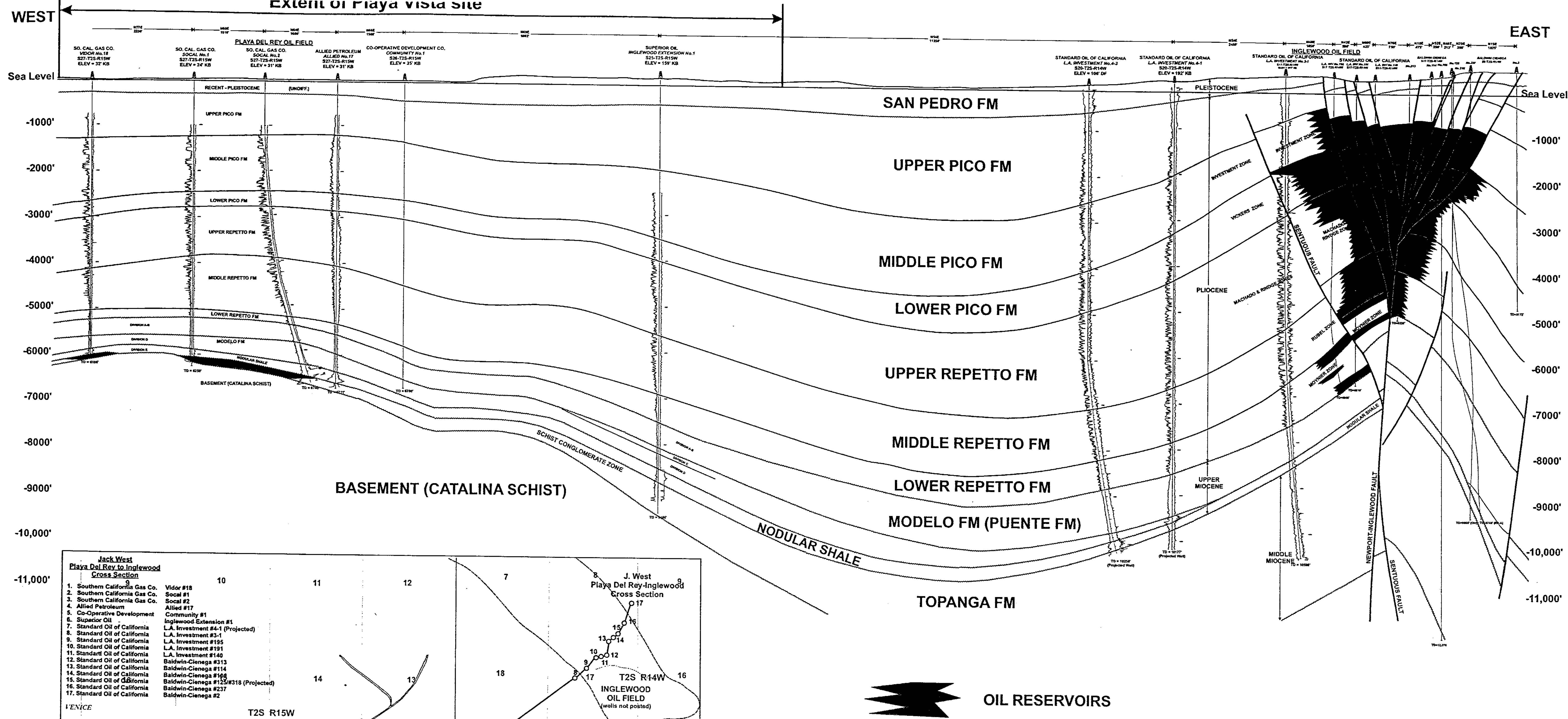


Figure 6. Geographic provinces as defined by Metzner (1935), relative to the Playa Vista site and the postulated Lincoln Blvd. Fault.



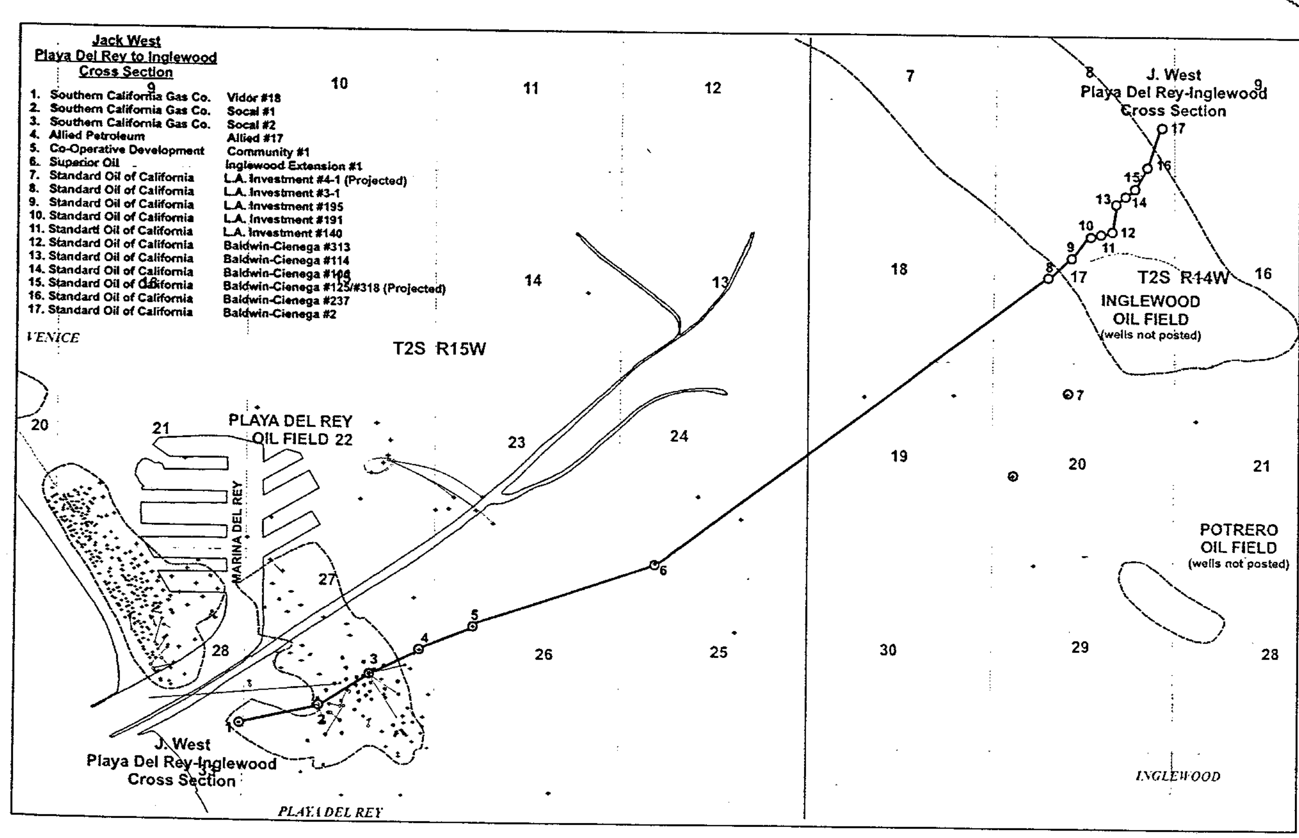


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Figure 7. Structural cross section from the Playa Del Rey oil field to the Inglewood oil field (Jack West, 2000)

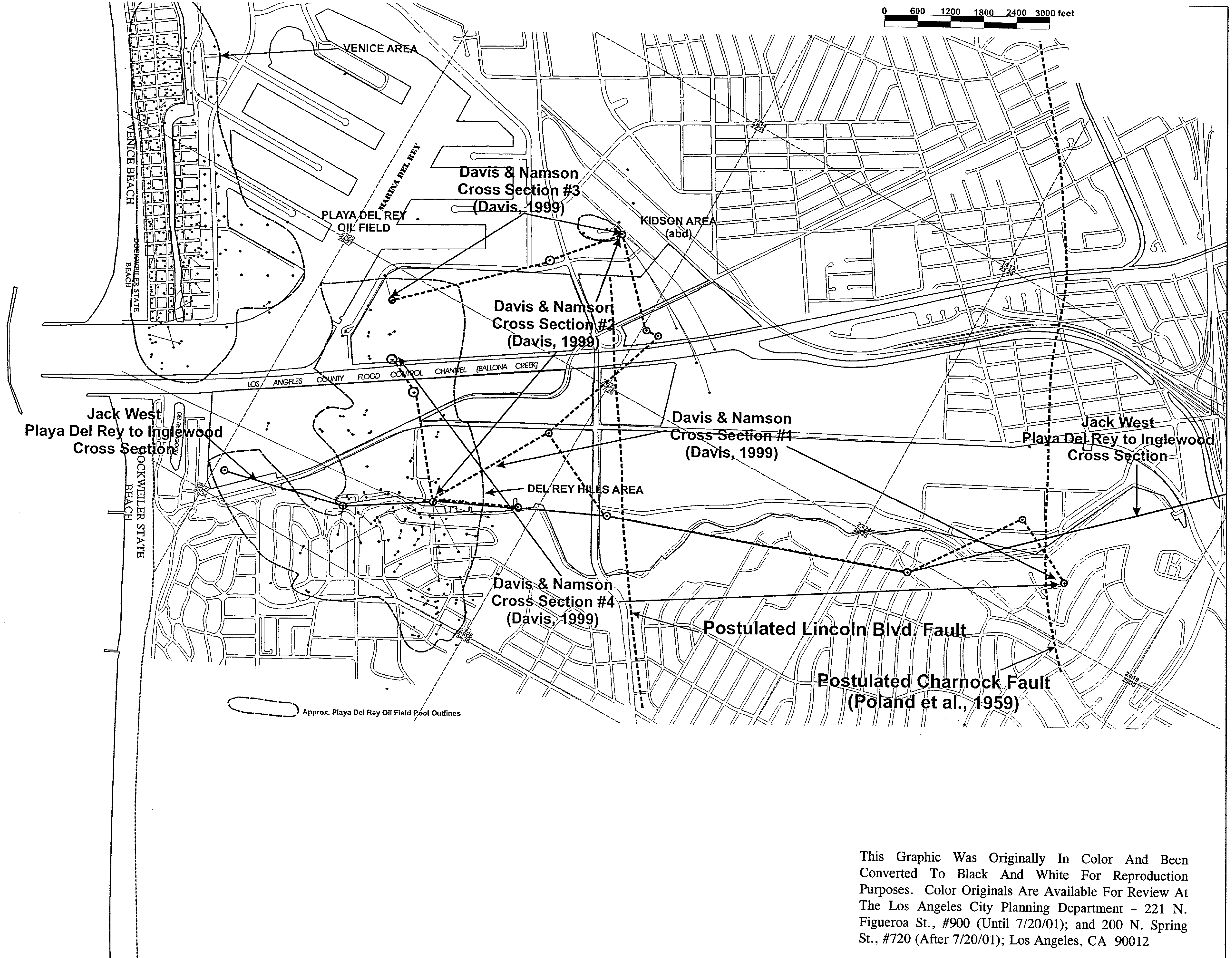

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Figure 8. Playa Vista Project Area showing locations of cross sections by Davis & Namson and Jack West

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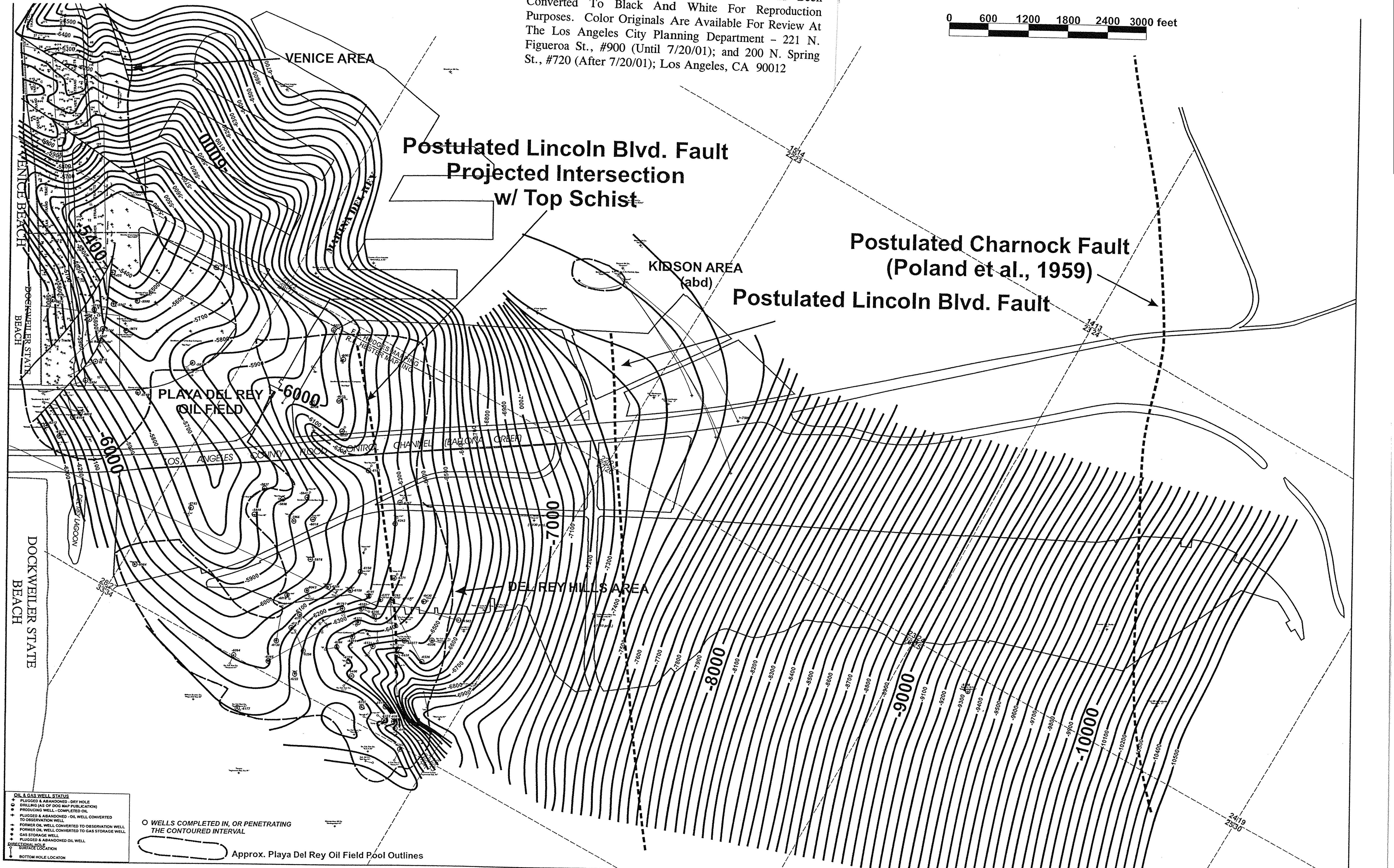

Figure 9. Subsurface map of the Playa Vista Area showing contours on the top of the Catalina Schist (partially based on Hester, 1986, and Hodges, 1944)

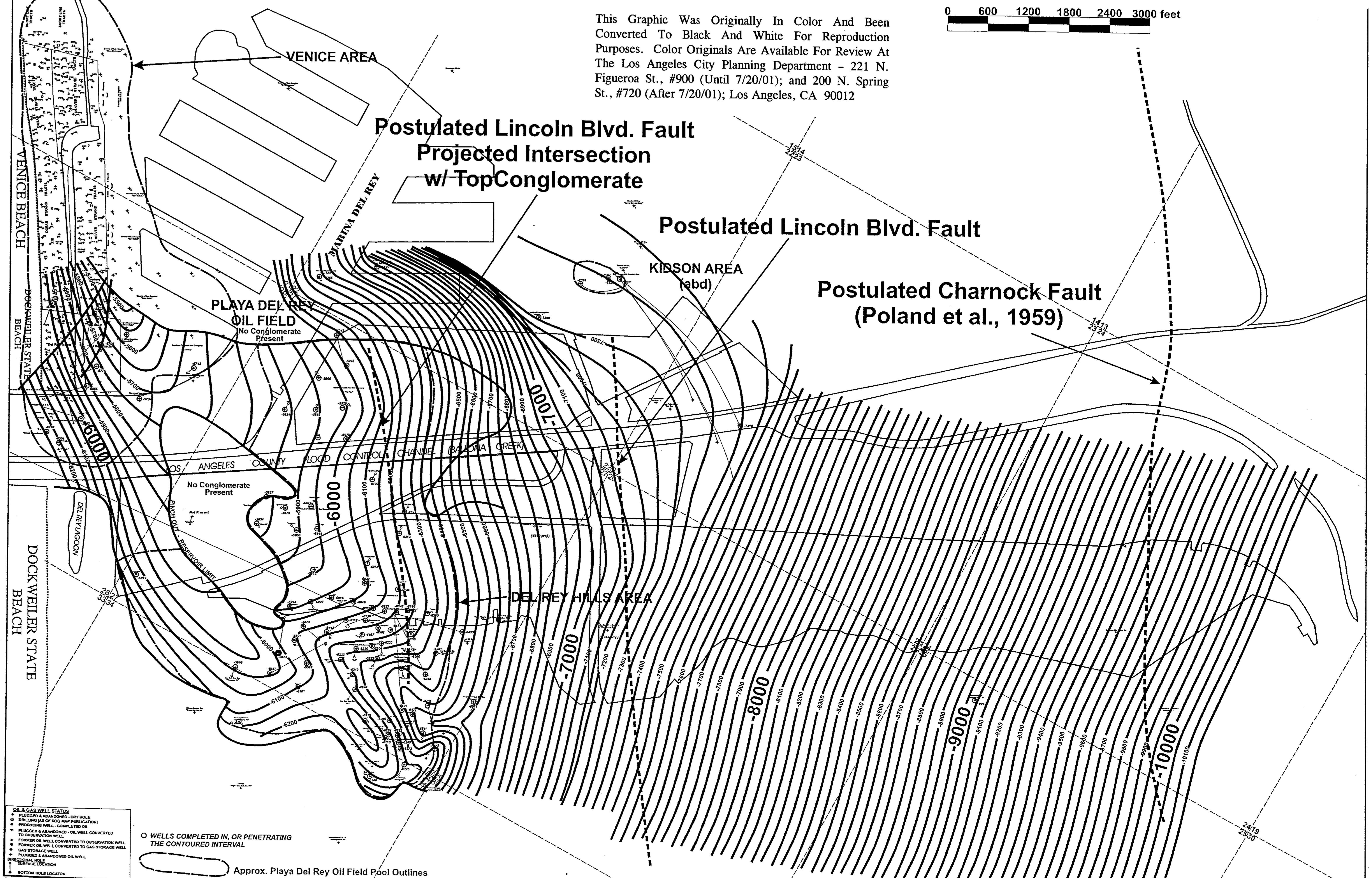

Figure 10. Subsurface map of the Playa Vista Area showing contours on the top of the Schist Conglomerate zone of the Topanga Formation (partially based on Hester, 1986).

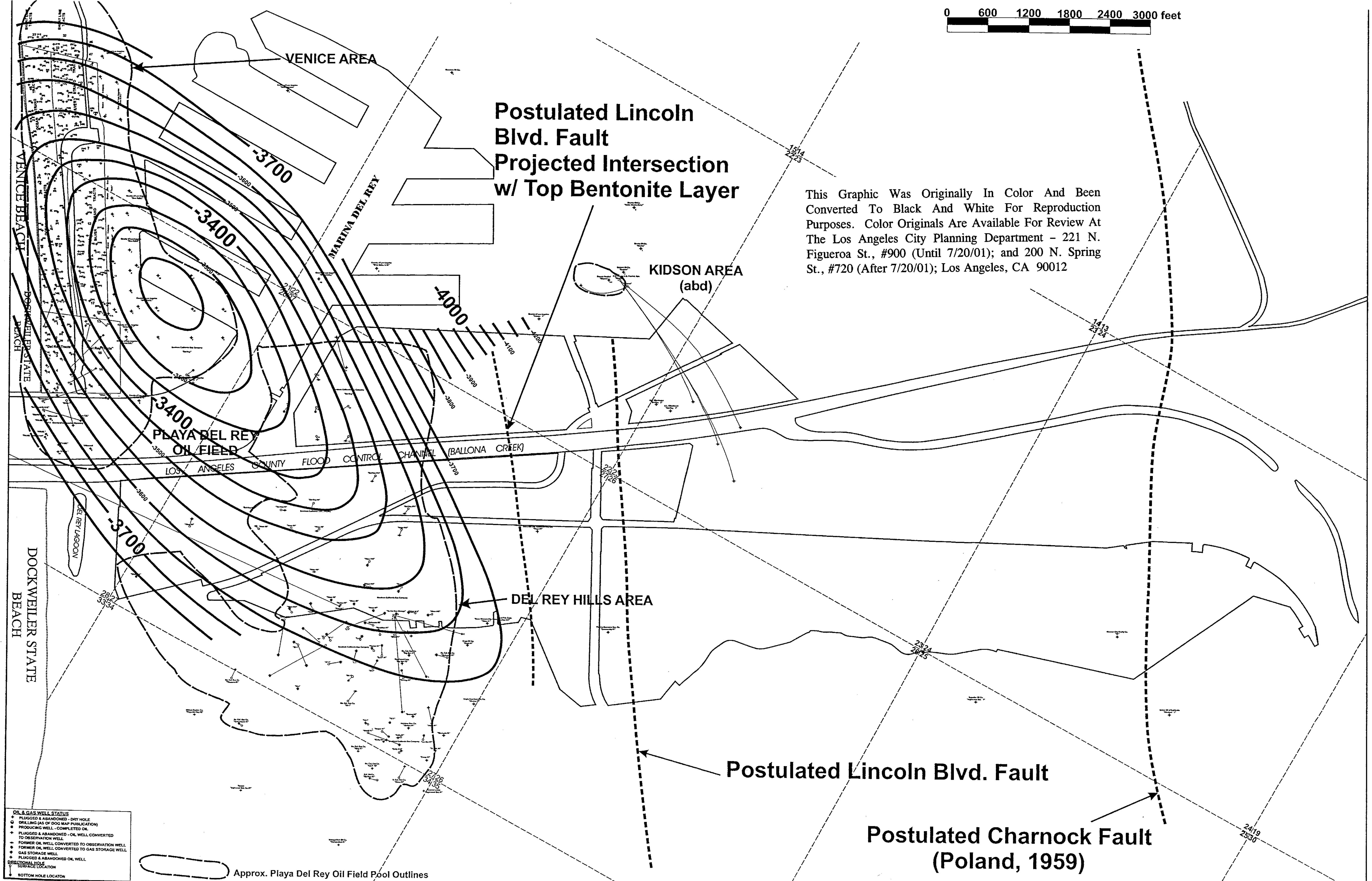

Figure 11. Subsurface map of the Playa Vista Area showing contours on the top of the upper Bentonite Marker within the upper Repetto Formation (from Hodges, 1944).

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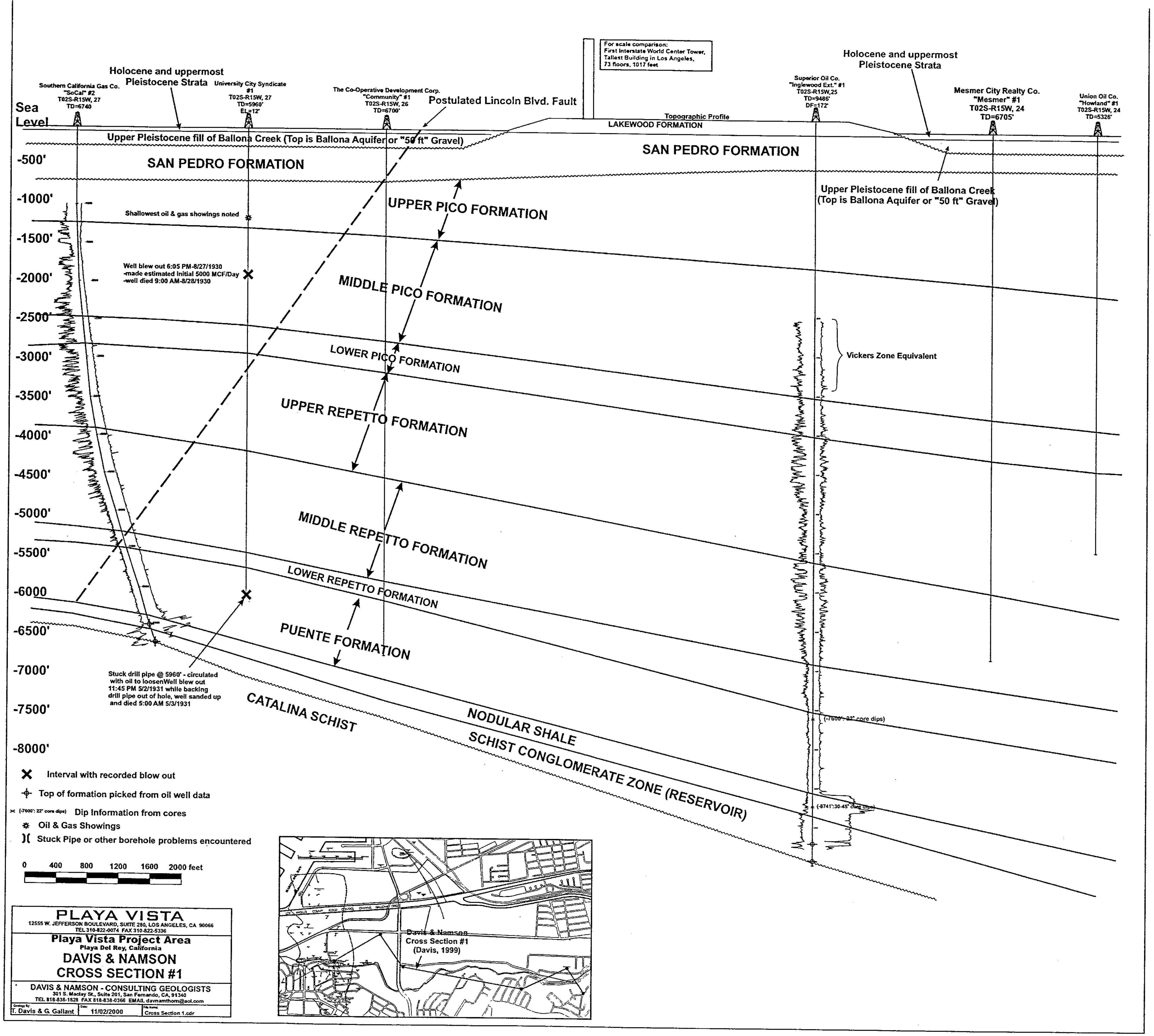
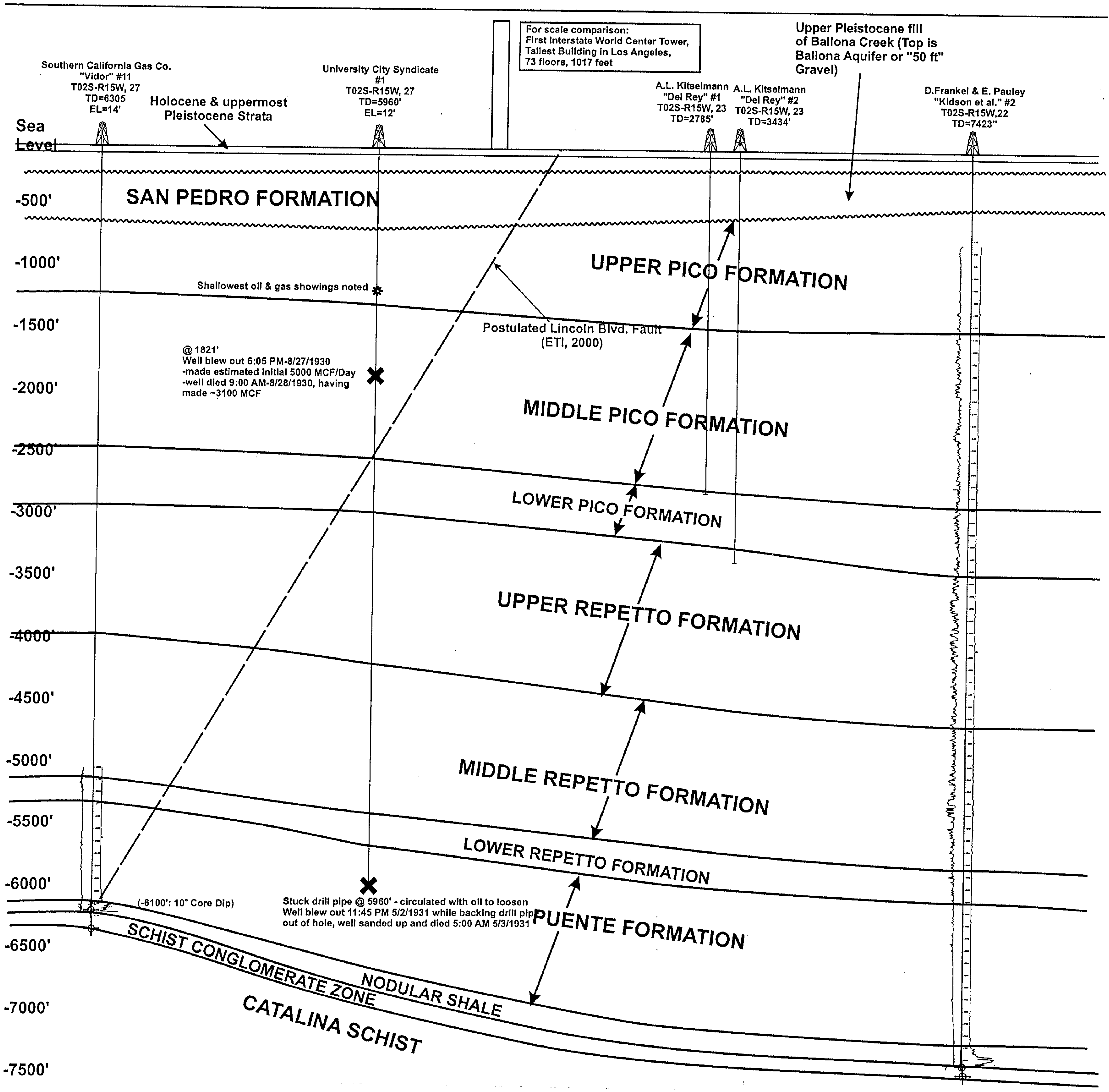


Figure 12. Davis & Namson Cross-Section #1



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- ✖ Interval with recorded blow out
- ⌖ Top of formation picked from oil well data
- ⪥ (-7600': 22° core dips) Dip Information from cores
- ☼ Oil & Gas Showings

0 400 800 1200 1600 2000 feet

PLAYA VISTA
12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Playa Vista Project Area
Playa Del Rey, California

DAVIS & NAMSON
CROSS SECTION #2

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/02/2000	Cross Section 2.cdr

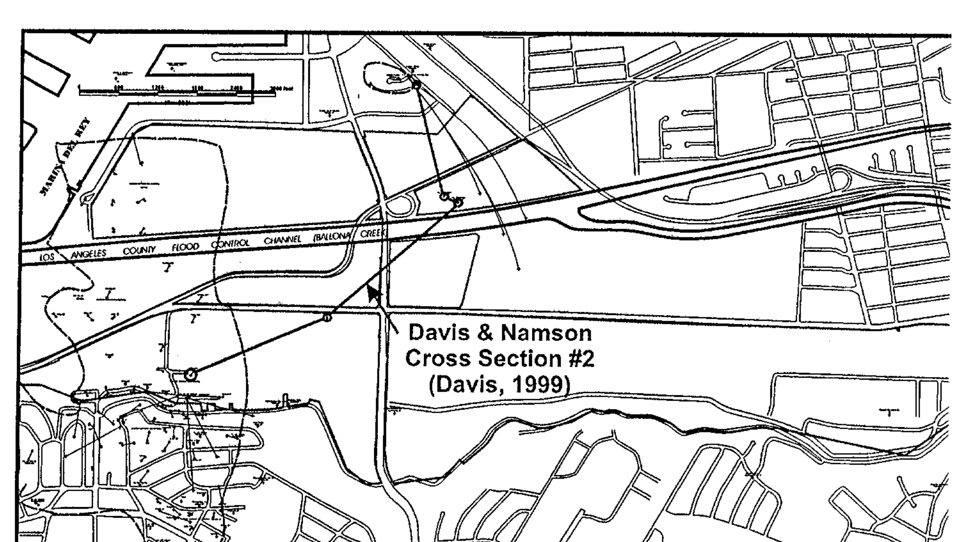

Figure 13. Davis & Namson Cross-Section #2

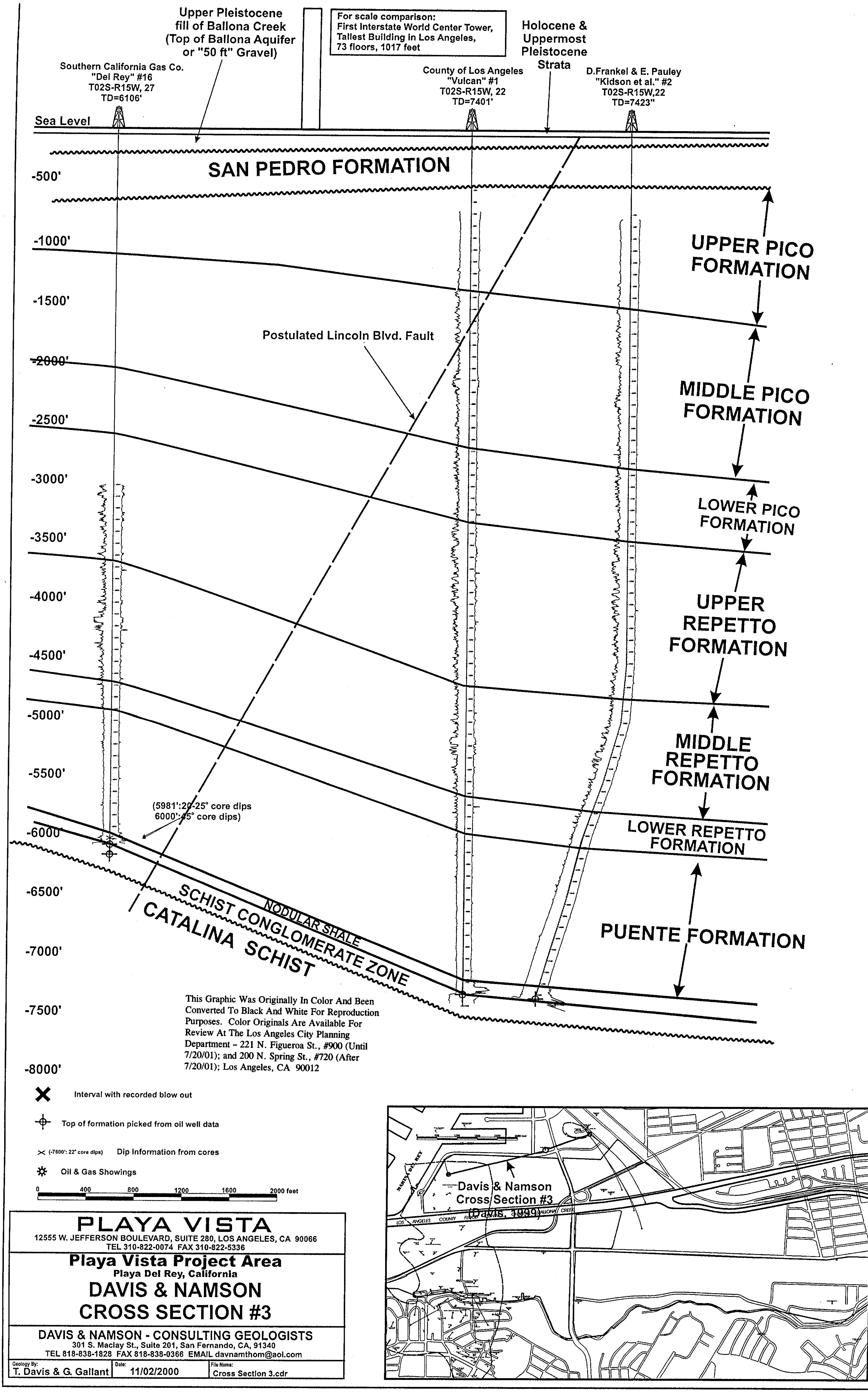

Figure 14. Davis & Namson Cross-Section #3

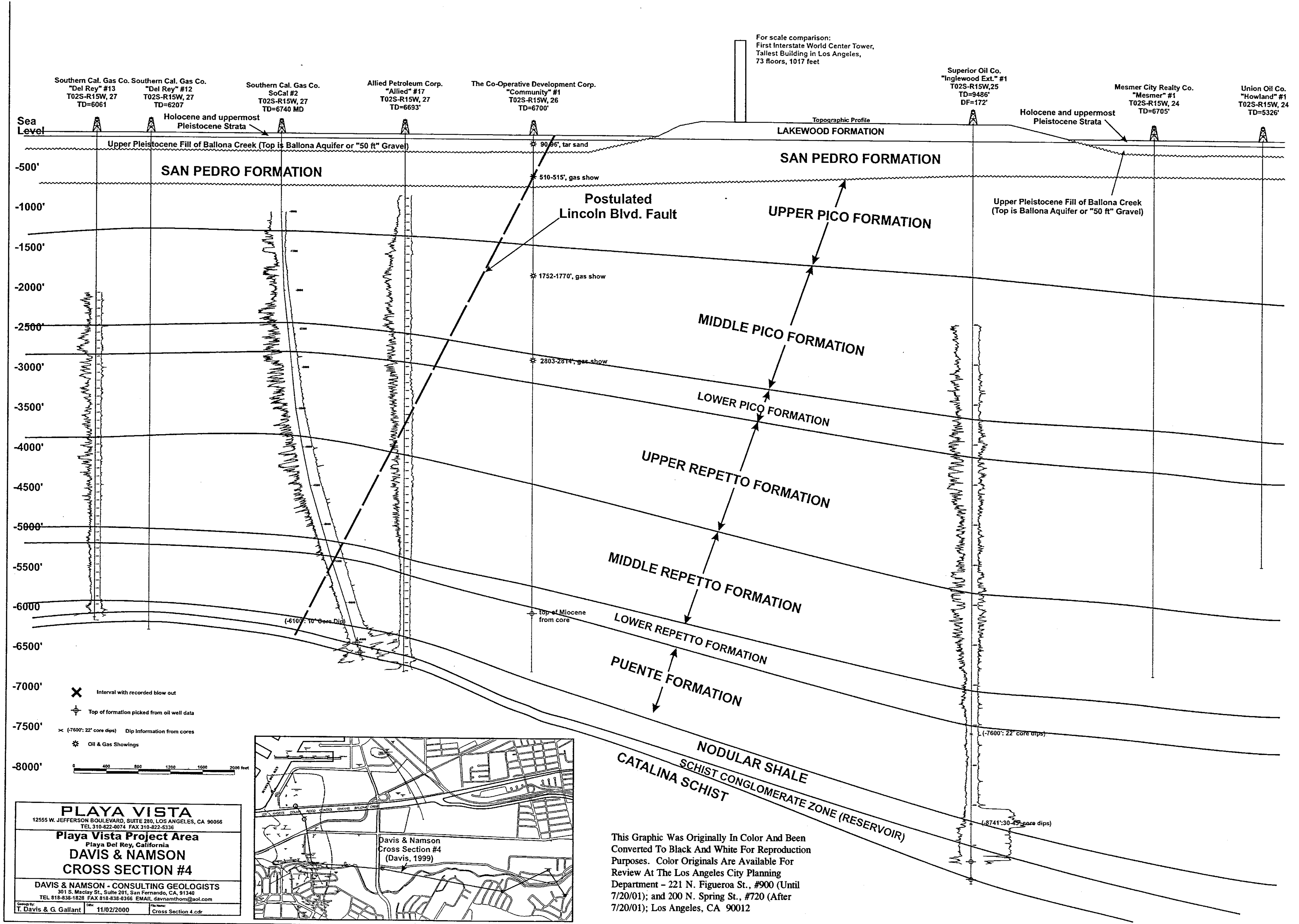

Figure 15. Davis & Namson Cross-Section #4

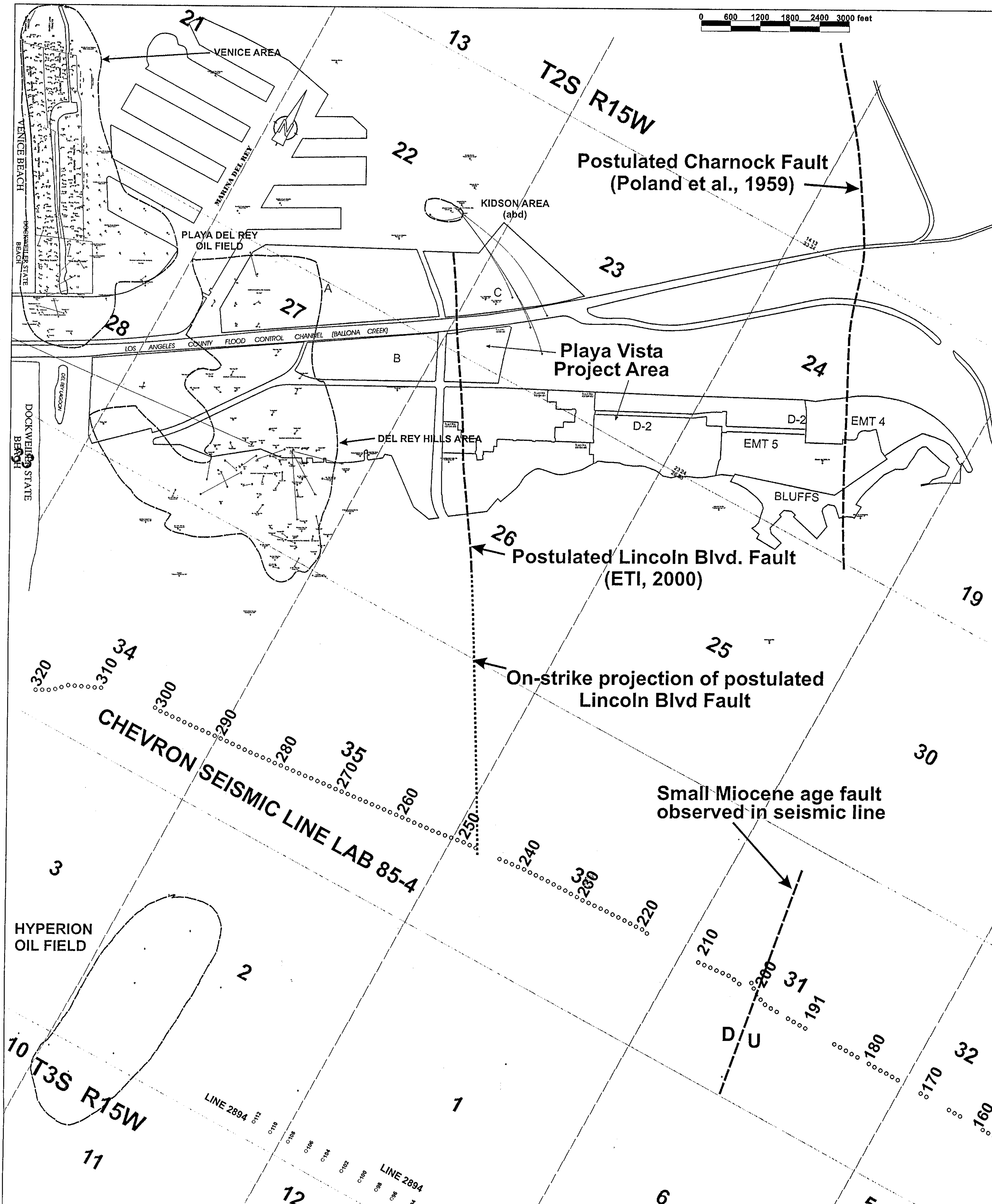

Figure 16. Map showing location of Chevron seismic line LAB 85-4 relative to the Playa Vista site.

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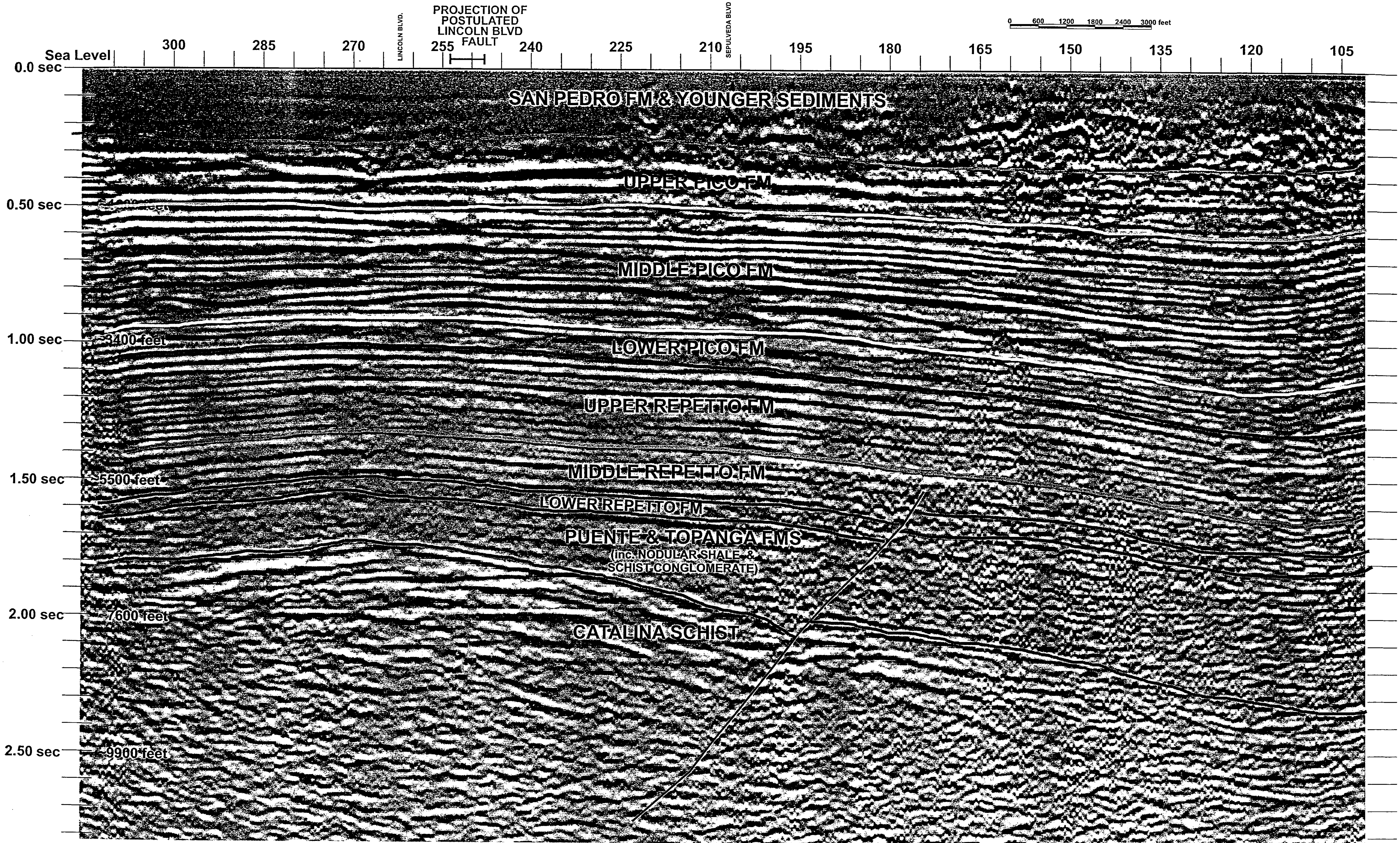

Figure 17. Interpretation of grayscale Chevron Seismic Line LAB 85-4

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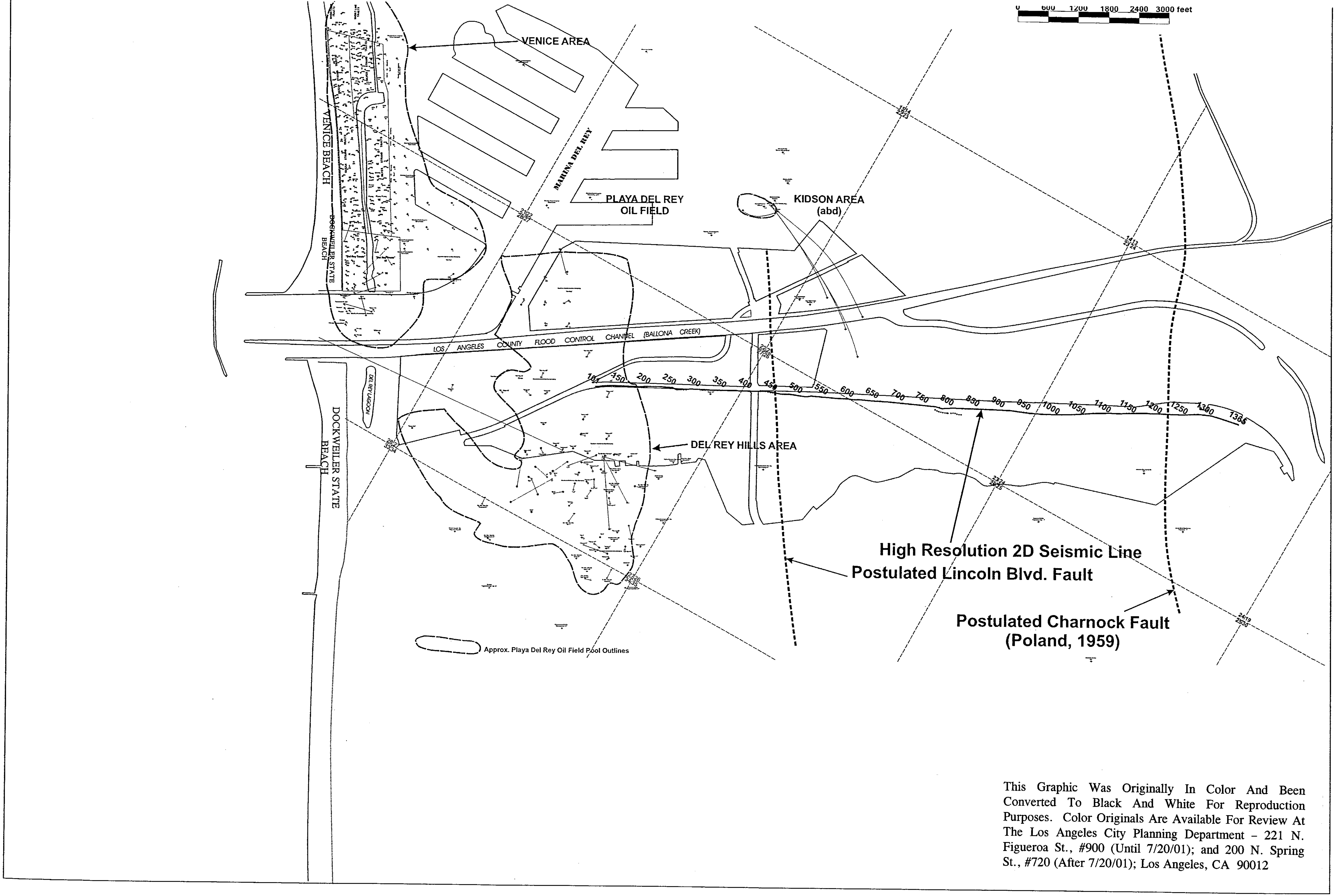

Figure 18. Playa Vista Project Area showing location of high resolution 2D seismic line

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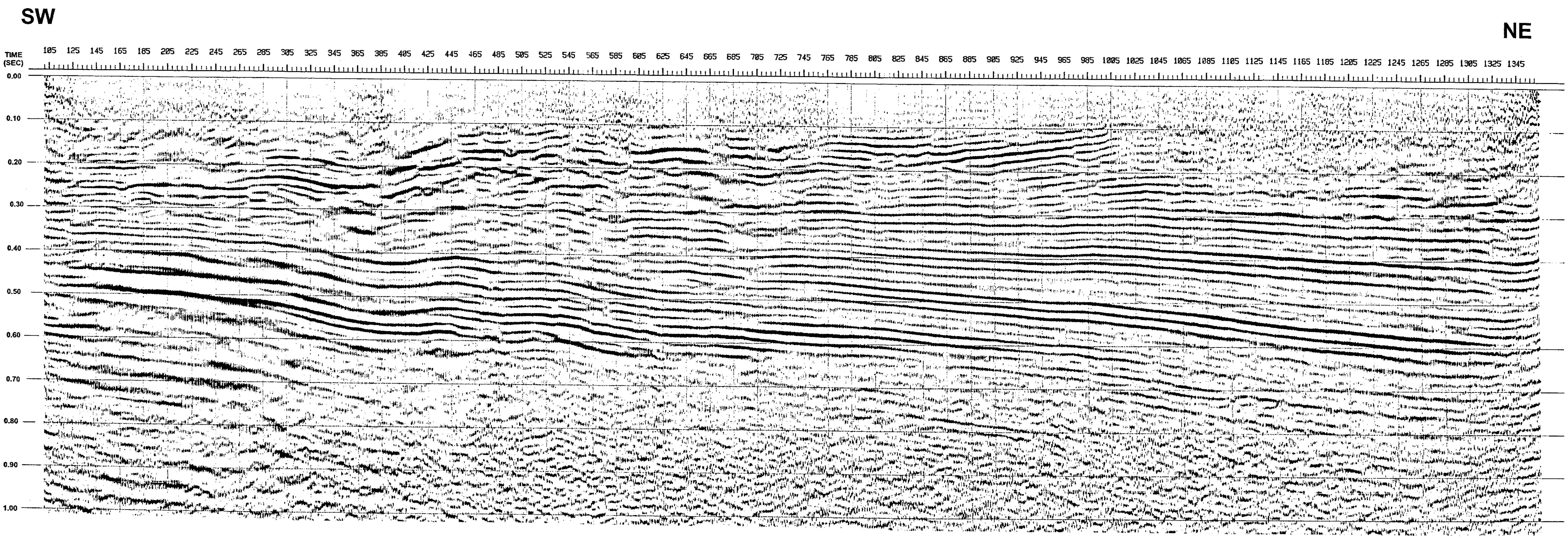

Figure 19. Uninterpreted high resolution 2D seismic line

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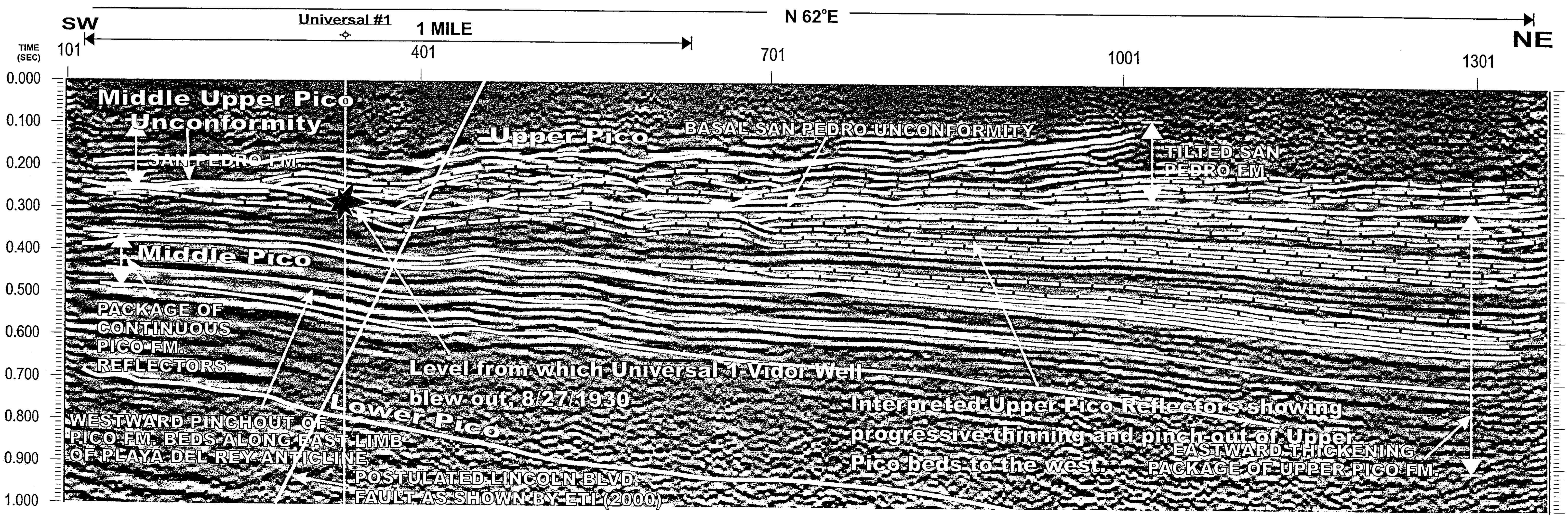

Figure 20. Interpreted high resolution 2D seismic line

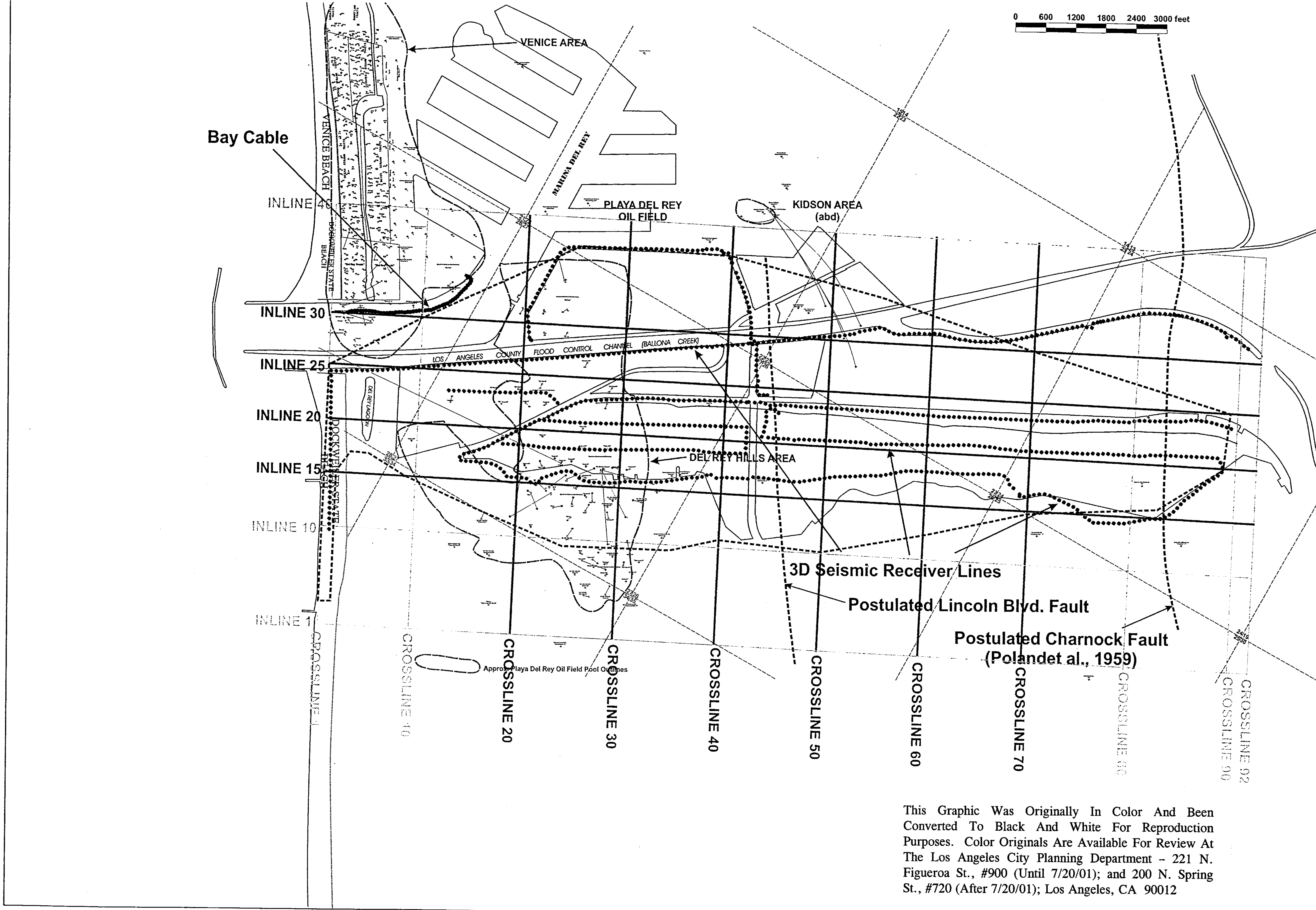

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Figure 21. Playa Vista project area showing locations of 3D seismic receiver lines and 3D seismic grid

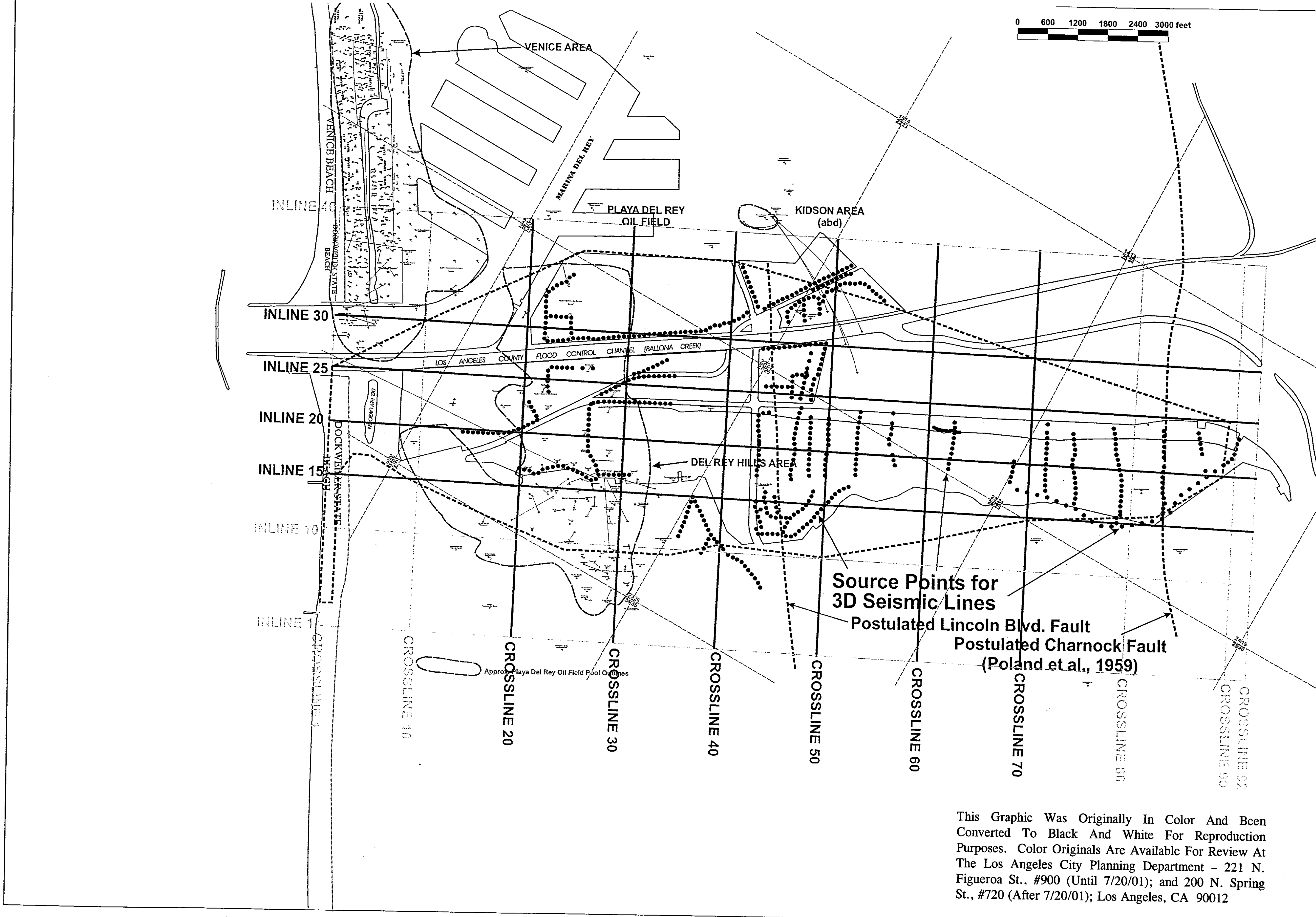

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Figure 22. Playa Vista project area showing locations of source points (vibrator points) for 3D seismic survey and 3D seismic grid

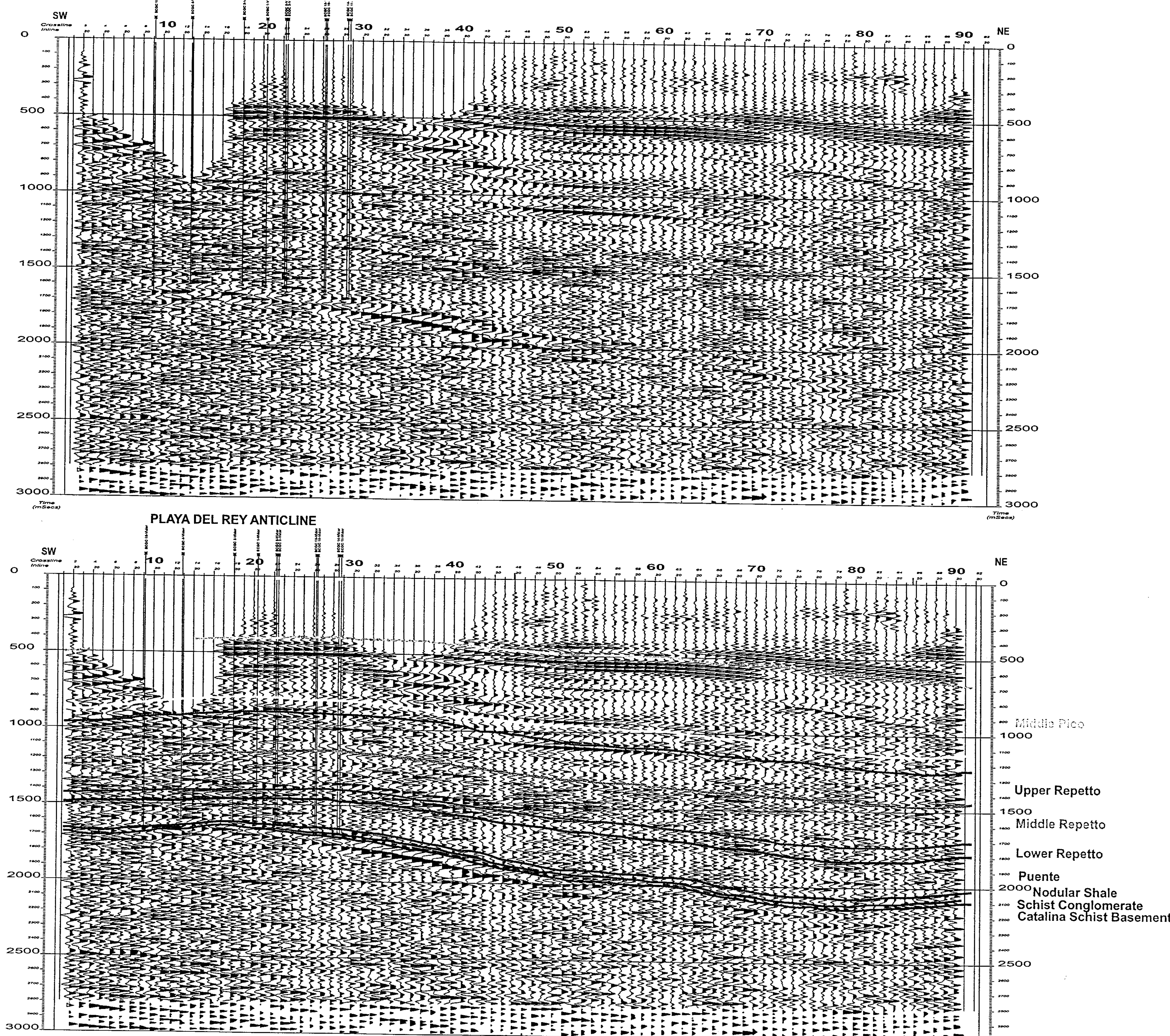

Figure 23. Uninterpreted (top) and interpreted (bottom) Inline 20 from the Playa Vista 3D seismic survey.

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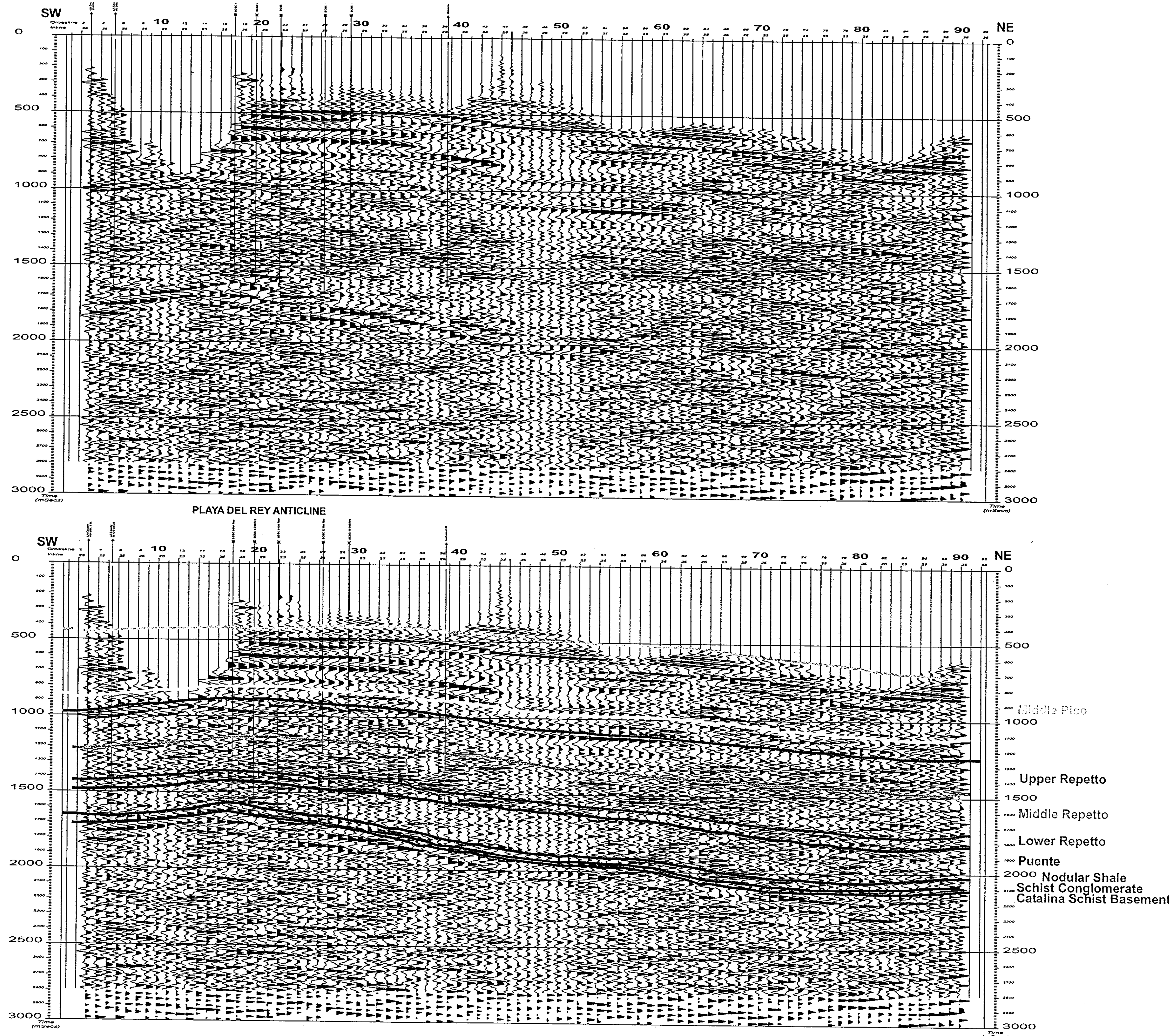

Figure 24. Uninterpreted (top) and interpreted (bottom) Inline 25 from the Playa Vista 3D seismic survey.

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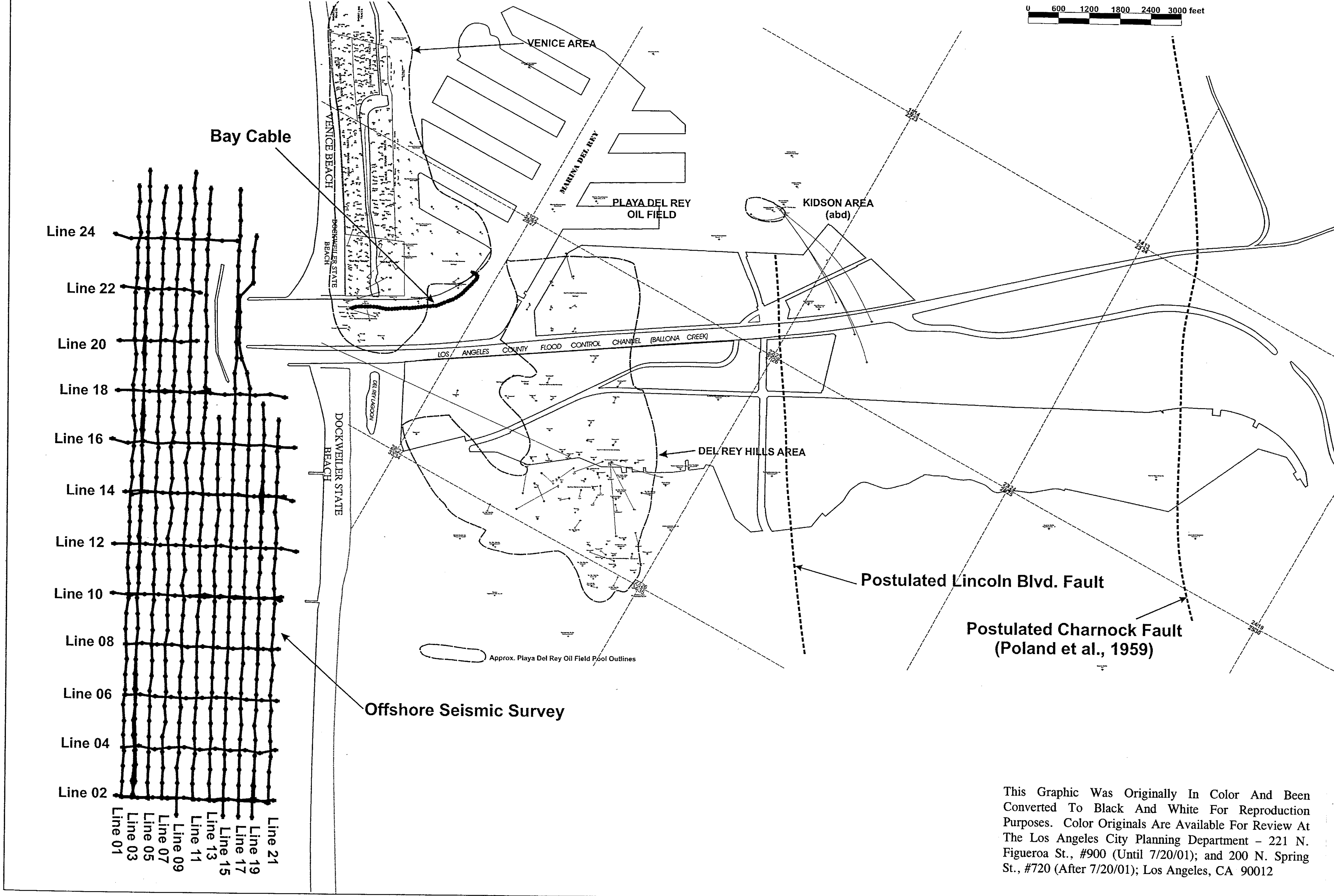

Figure 25. Playa Vista Project Area showing location of offshore seismic survey and bay cable

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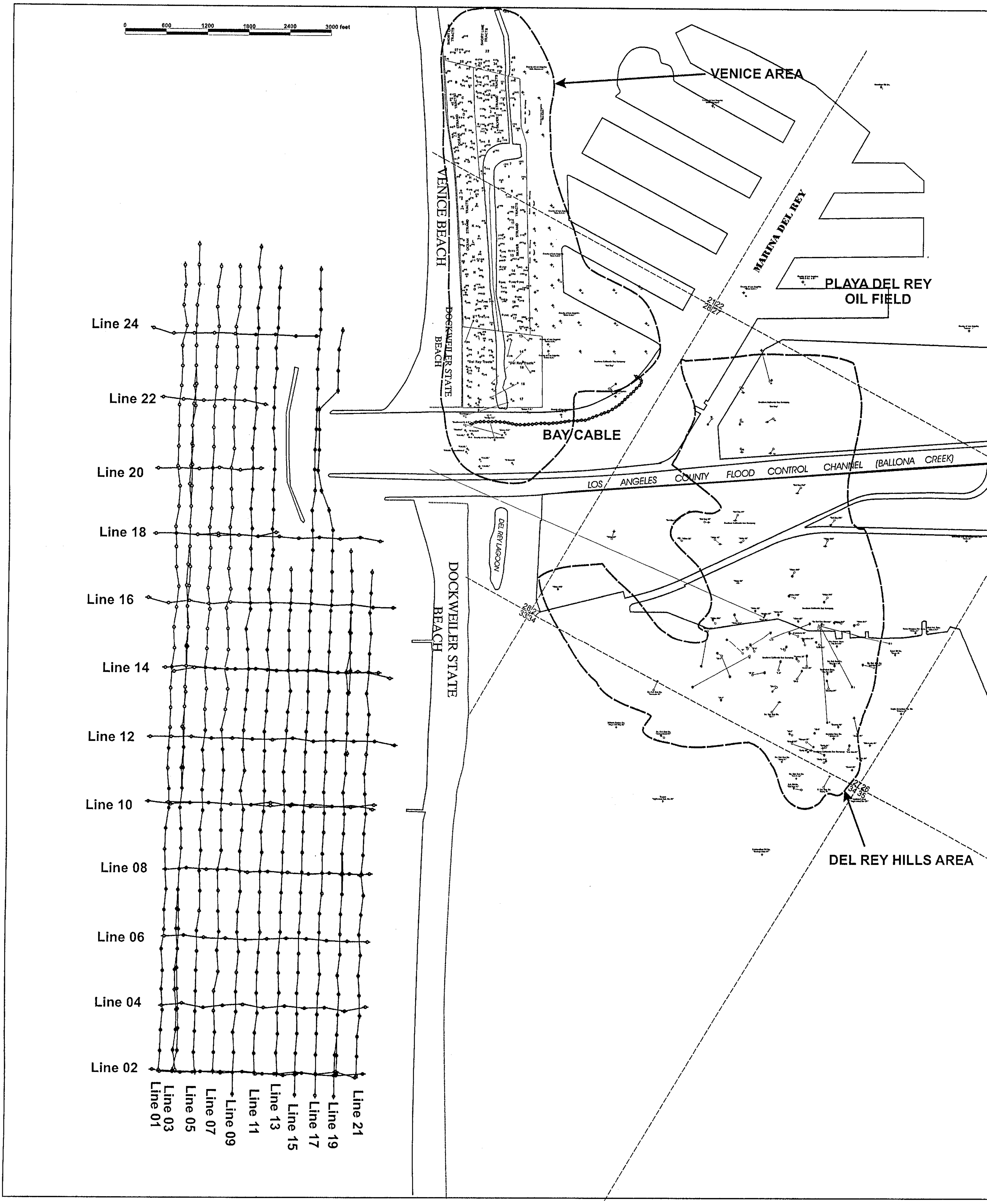

Figure 26. Offshore survey area showing tracklines, navigated by differential GPS (Global Positioning System). Accuracy of navigated points is within 5 meters.

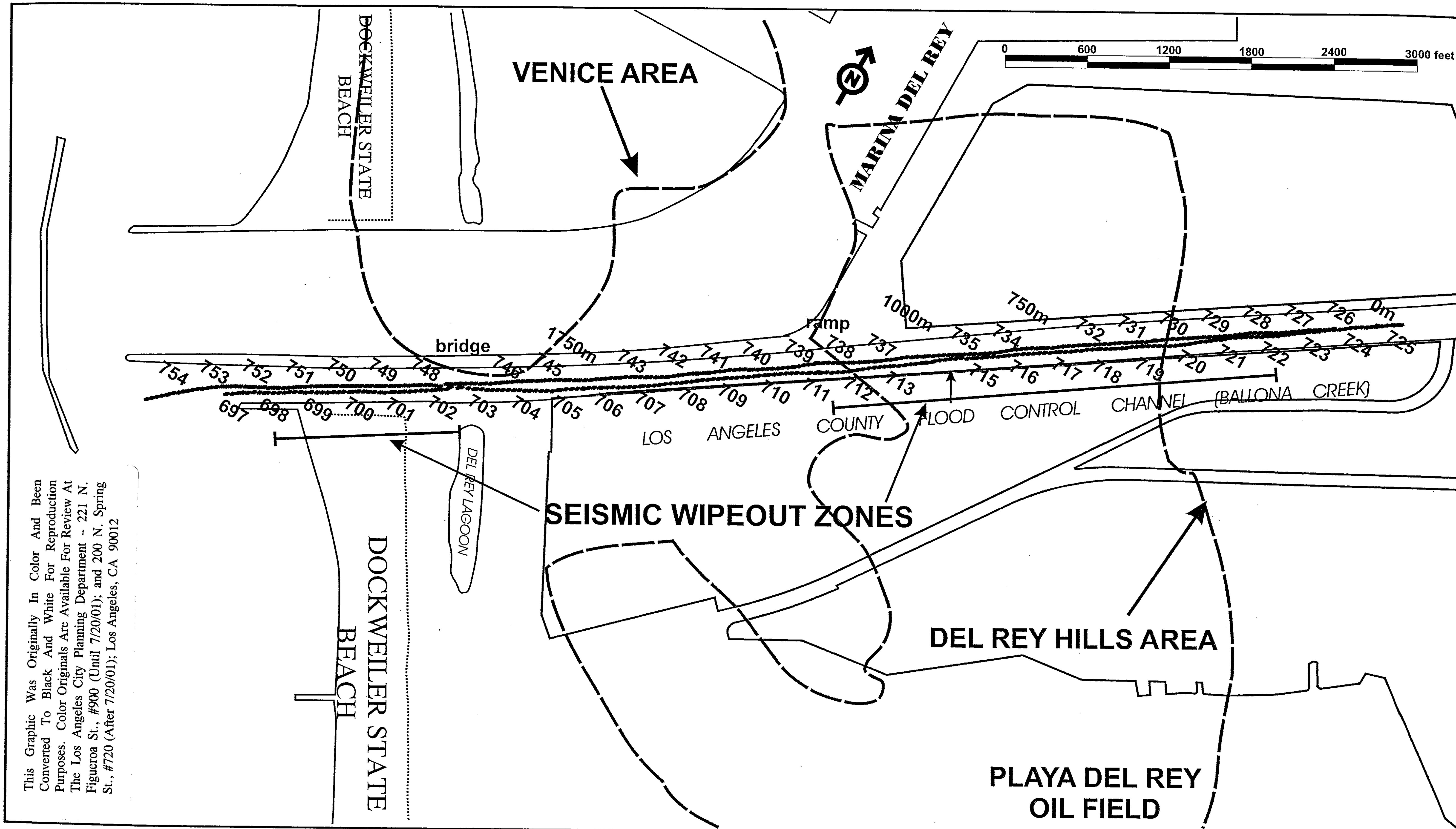

Figure 27. Ballona Creek track lines. Two profiles were acquired, one west-east, and the other east-west. Two wipeout zones (described in text) are indicated.

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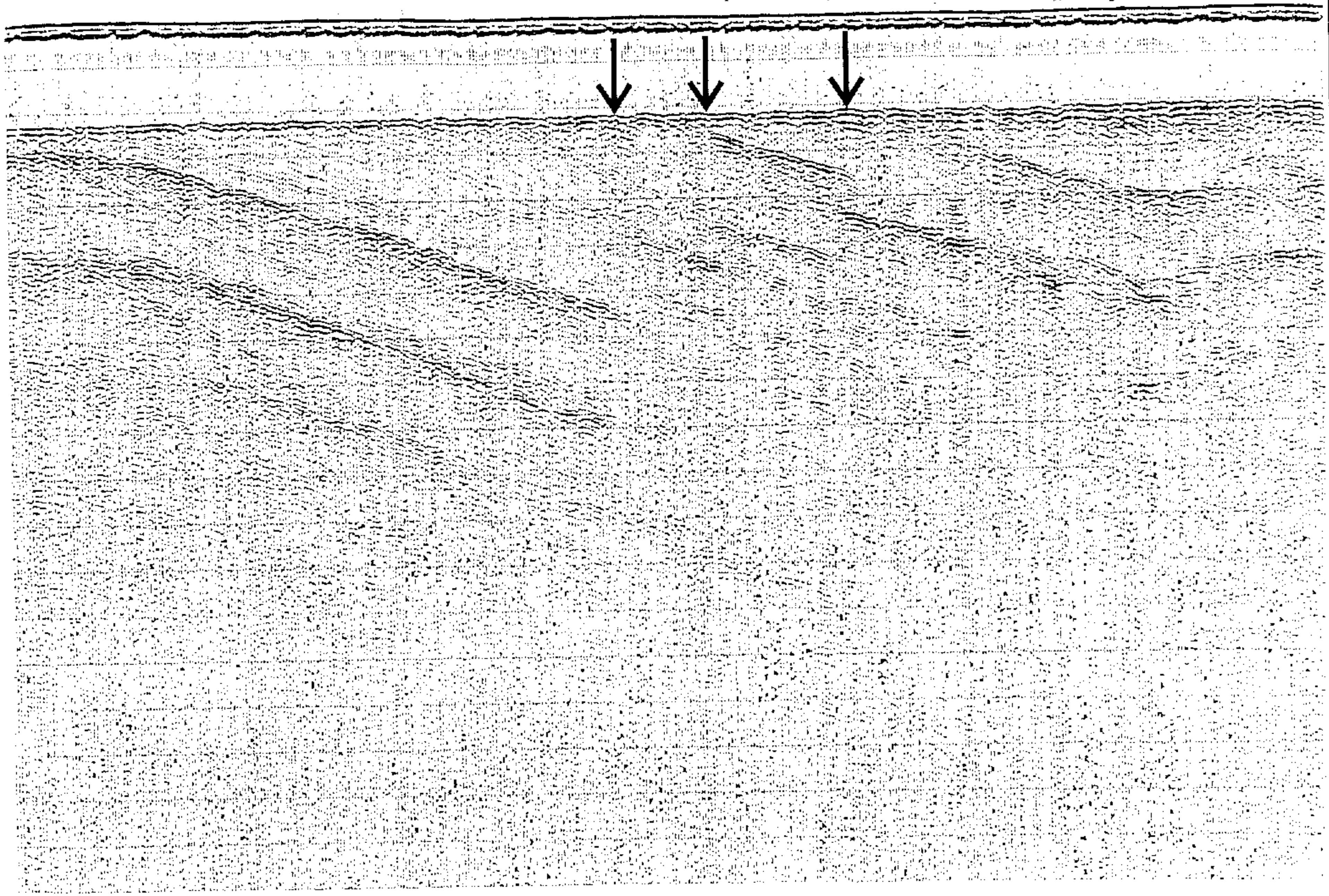

Figure 28. Example of offshore southern California faults imaged by uniboom (Cabrillo Fault Zone off Point Fermin, with three faults within the zone shown by arrows).

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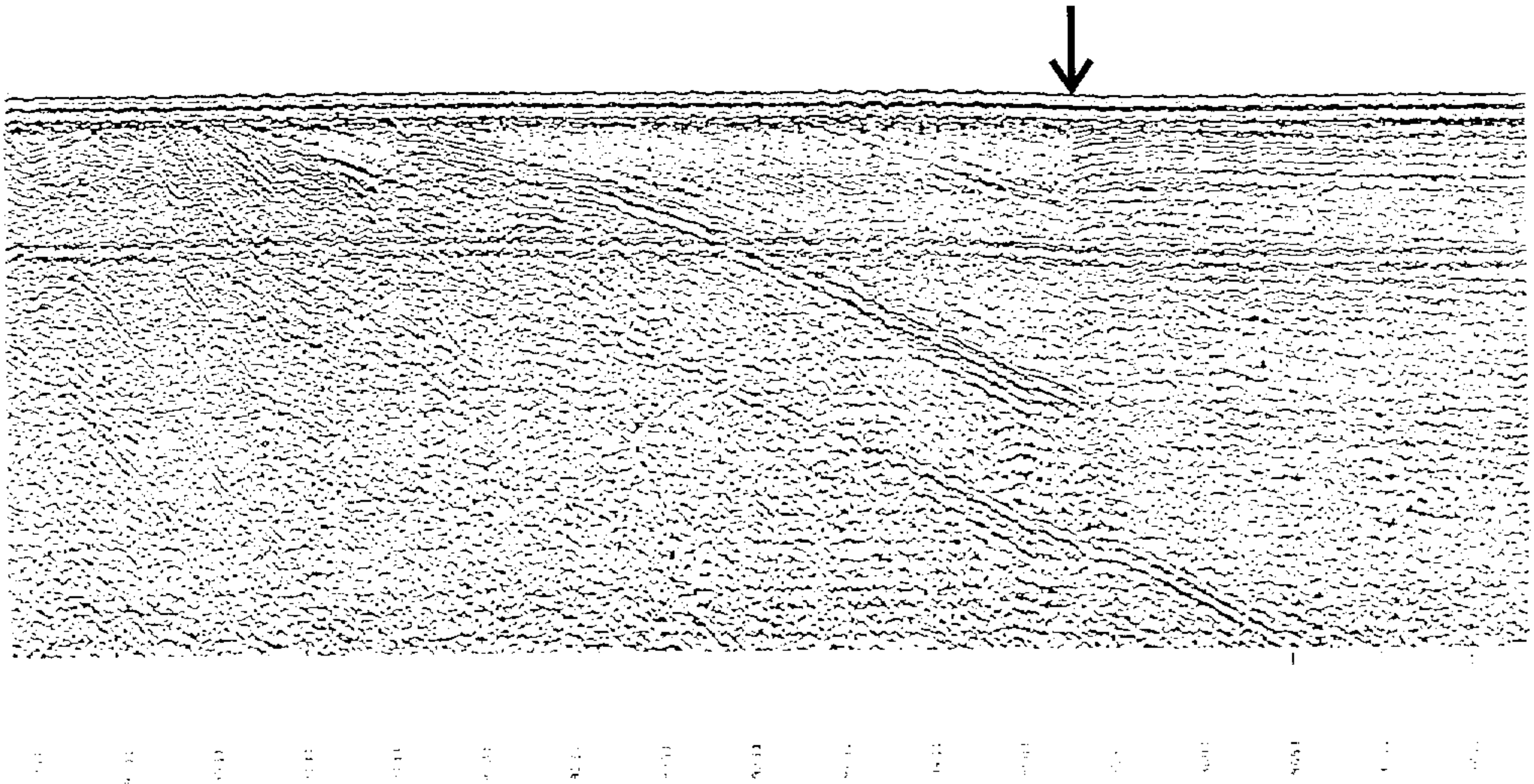

Figure 29. Example of offshore southern California faults imaged by sparker (Palos Verdes Fault, shown by arrow, 10 km south of Los Angeles Harbor).

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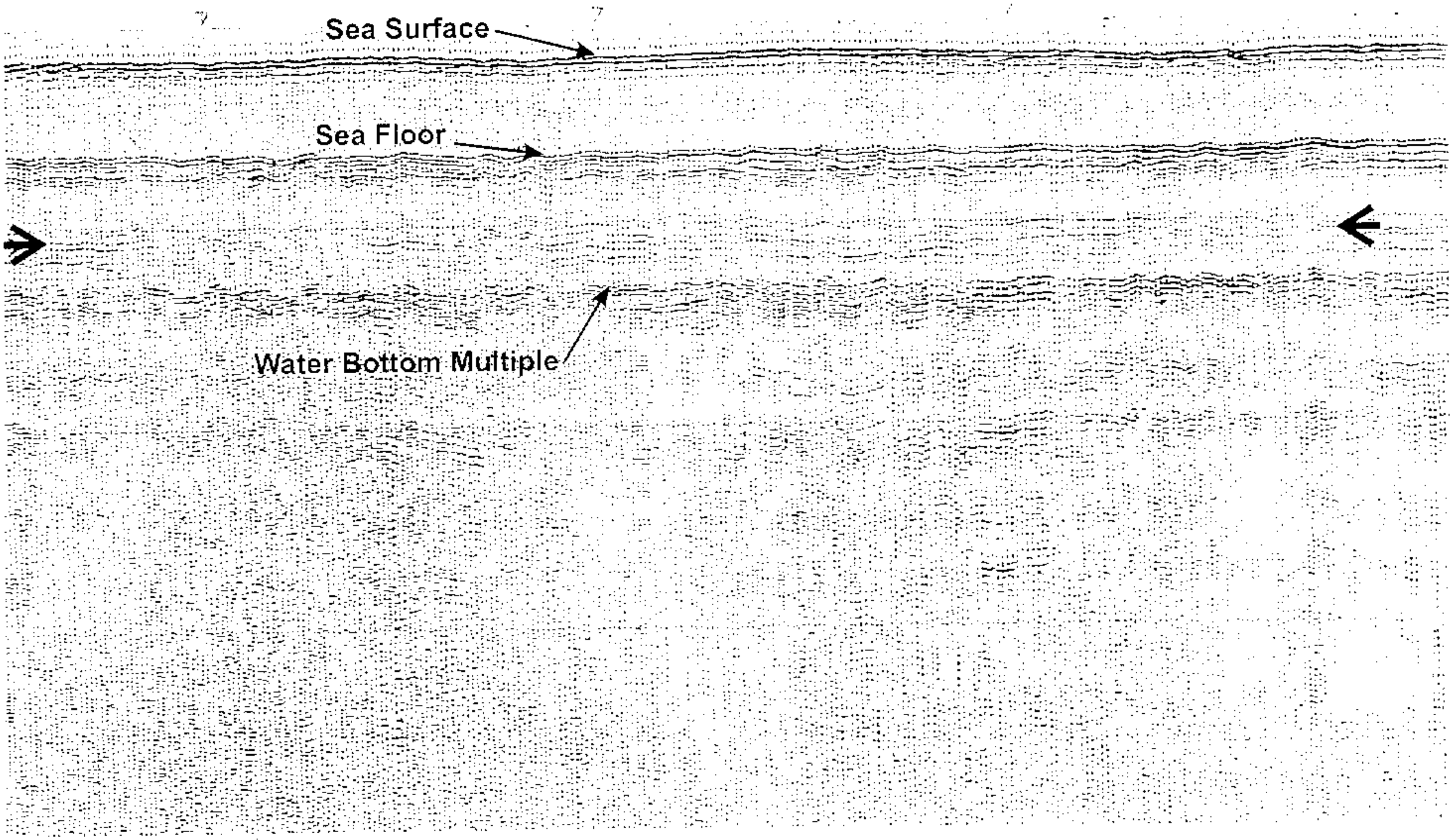

Figure 30. Reflective layer imaged in a typical uni boom profile, with arrows indicating reflector

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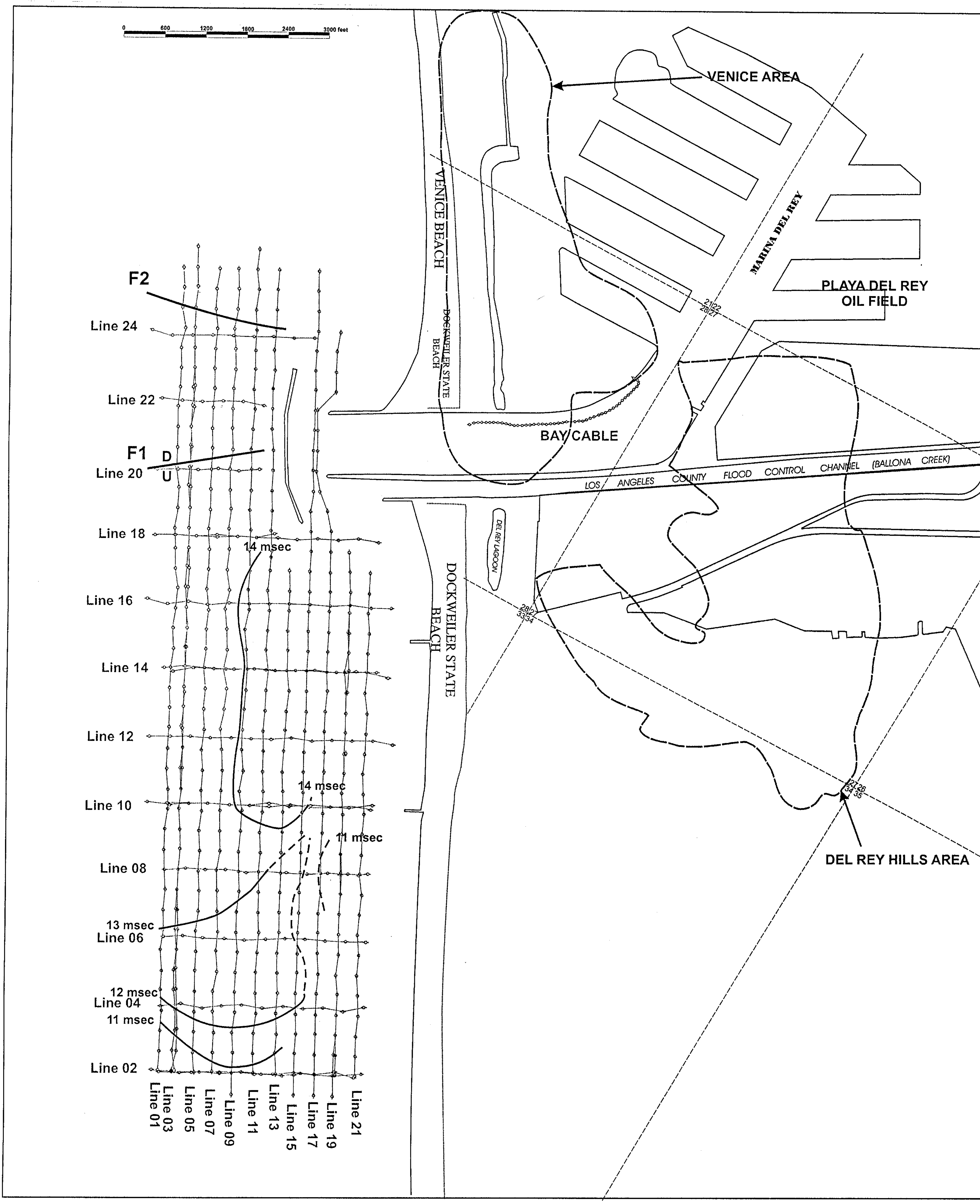

Figure 31. Contour map showing thickness of sediments above the reflector. Thickness is mapped in two-way travel time; 1 msec is equivalent to about 3 feet. Fault with about 12 ft of vertical separation is marked F1. Another fault farther to the north with unknown separation is marked F2.

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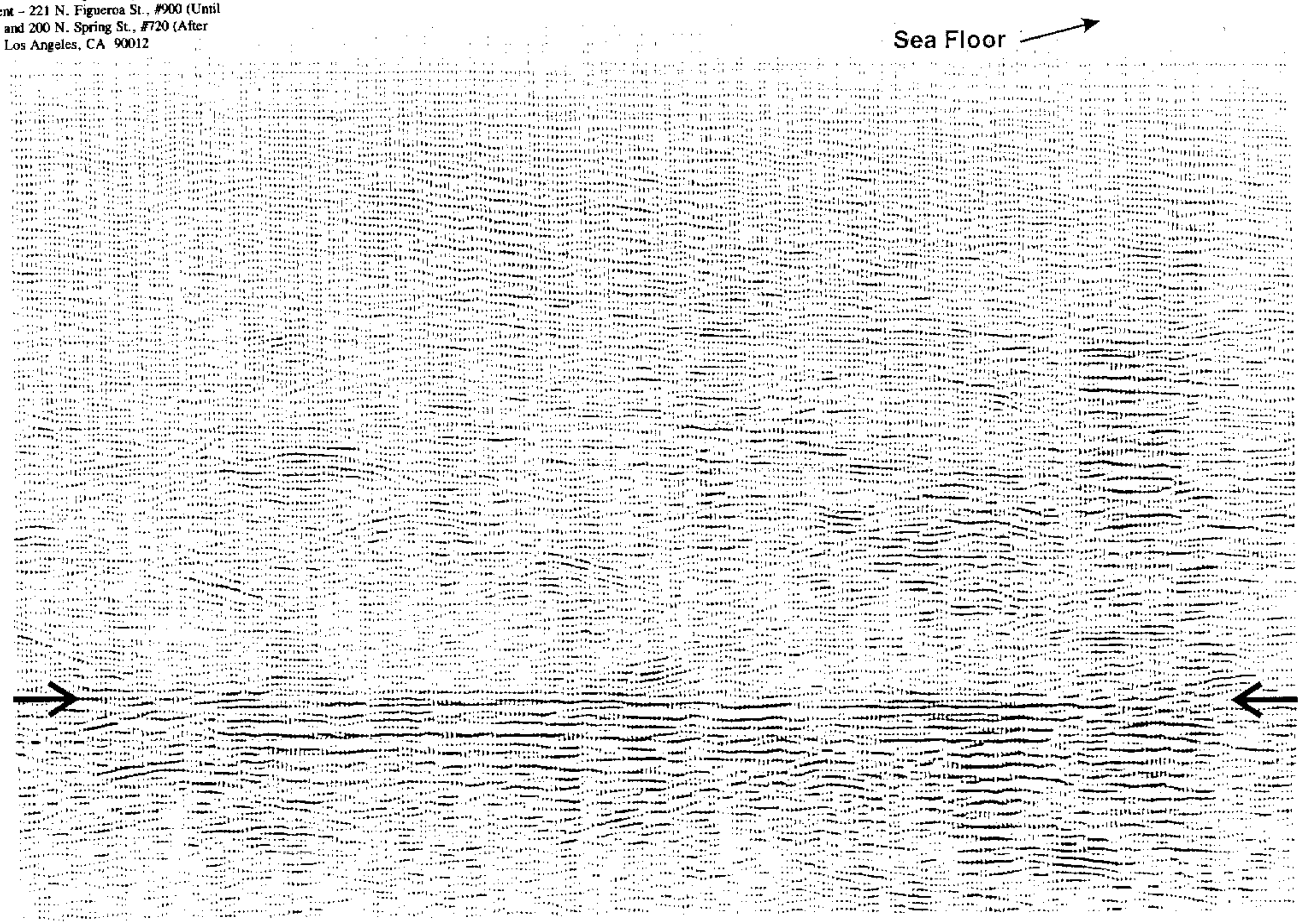

Figure 32. Reflector at 375 msec in a typical sparker profile, with arrows indicating the reflector

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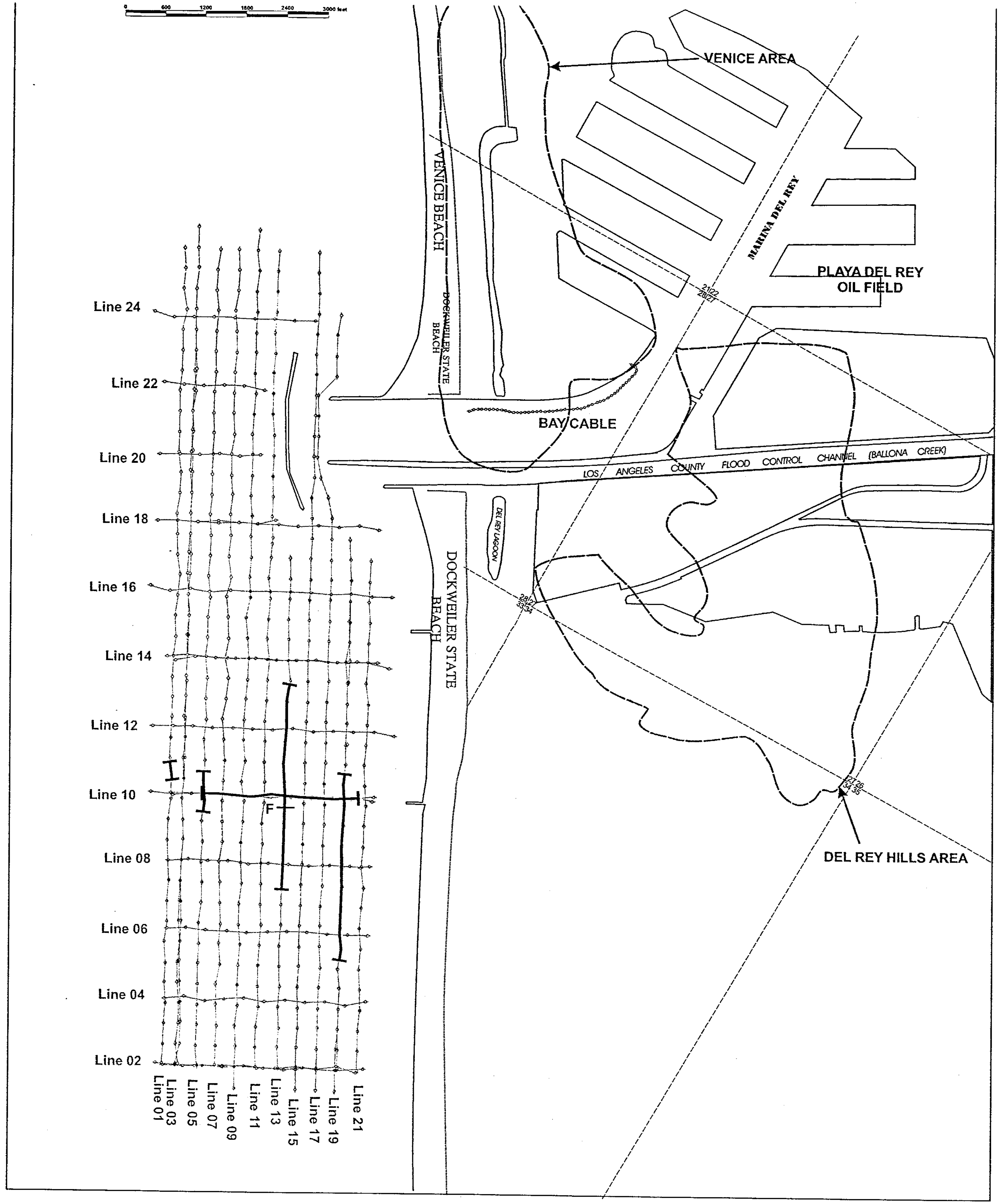

Figure 33. Map showing parts of tracklines where strong 375 msec reflector is imaged. A possible fault, imaged in one profile, is located at the point labeled "F".

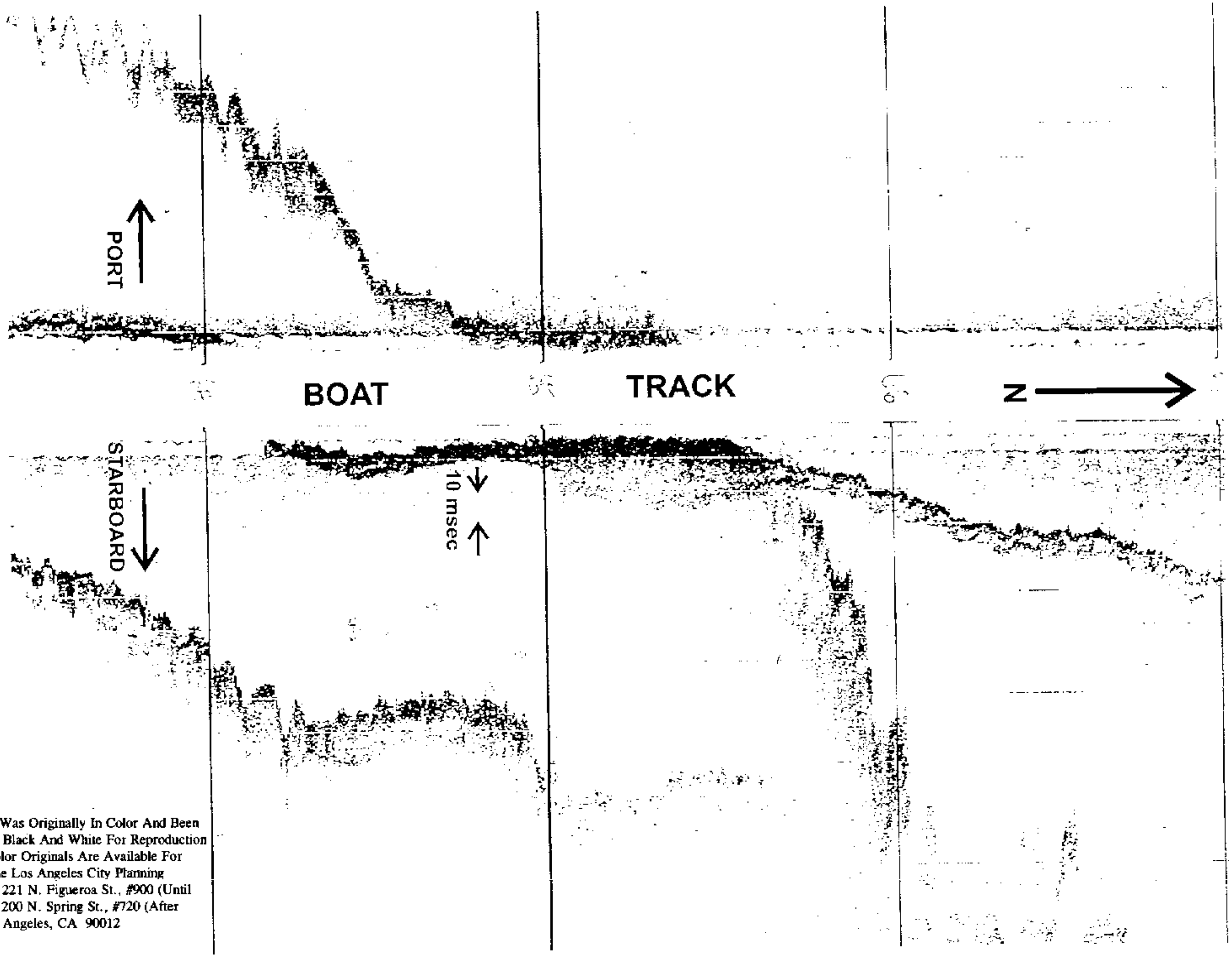

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Figure 34. Side scan sonar record showing what are interpreted to be channels on the sea floor.

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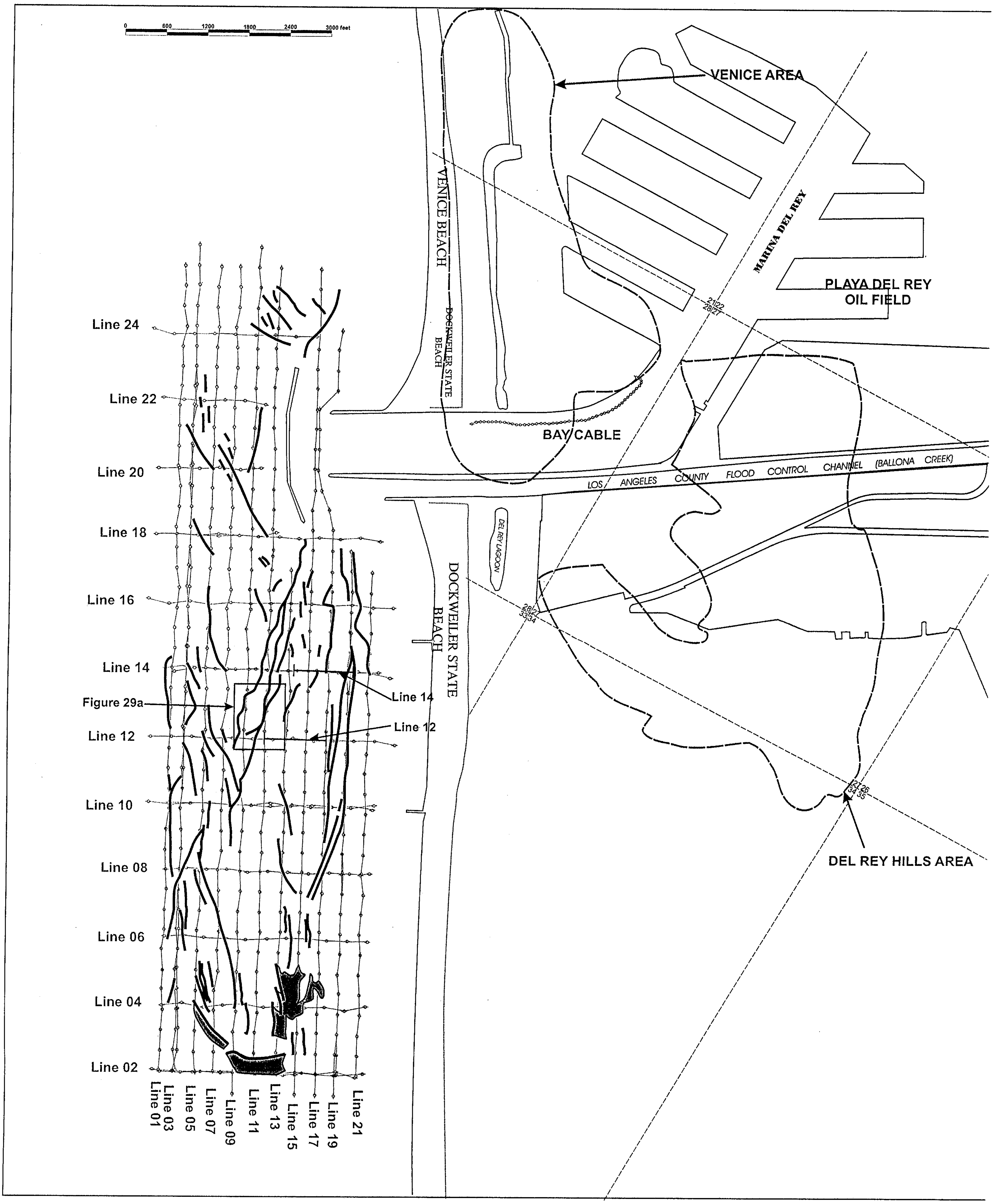

Figure 35. Map of channels from side scan data. Channels imaged in 3.5 khz data (lines 12 and 14) are indicated. Box indicates location of Figure 34.

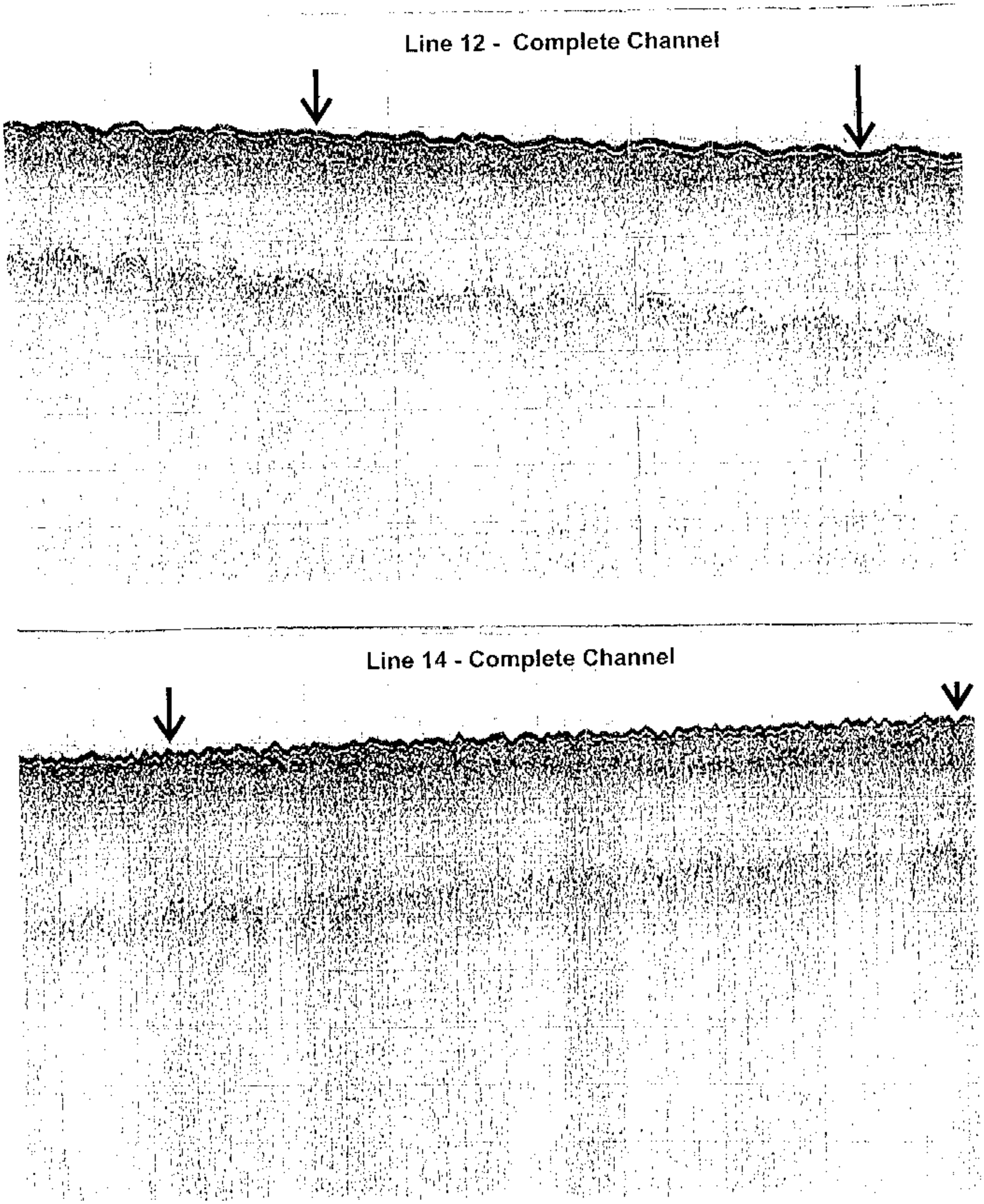

Figure 36. Channel profiles imaged in two 3.5 khz profiles, line 12 and line 14. Arrows indicate edges of channels. Locations of these images are shown in Figure 34.

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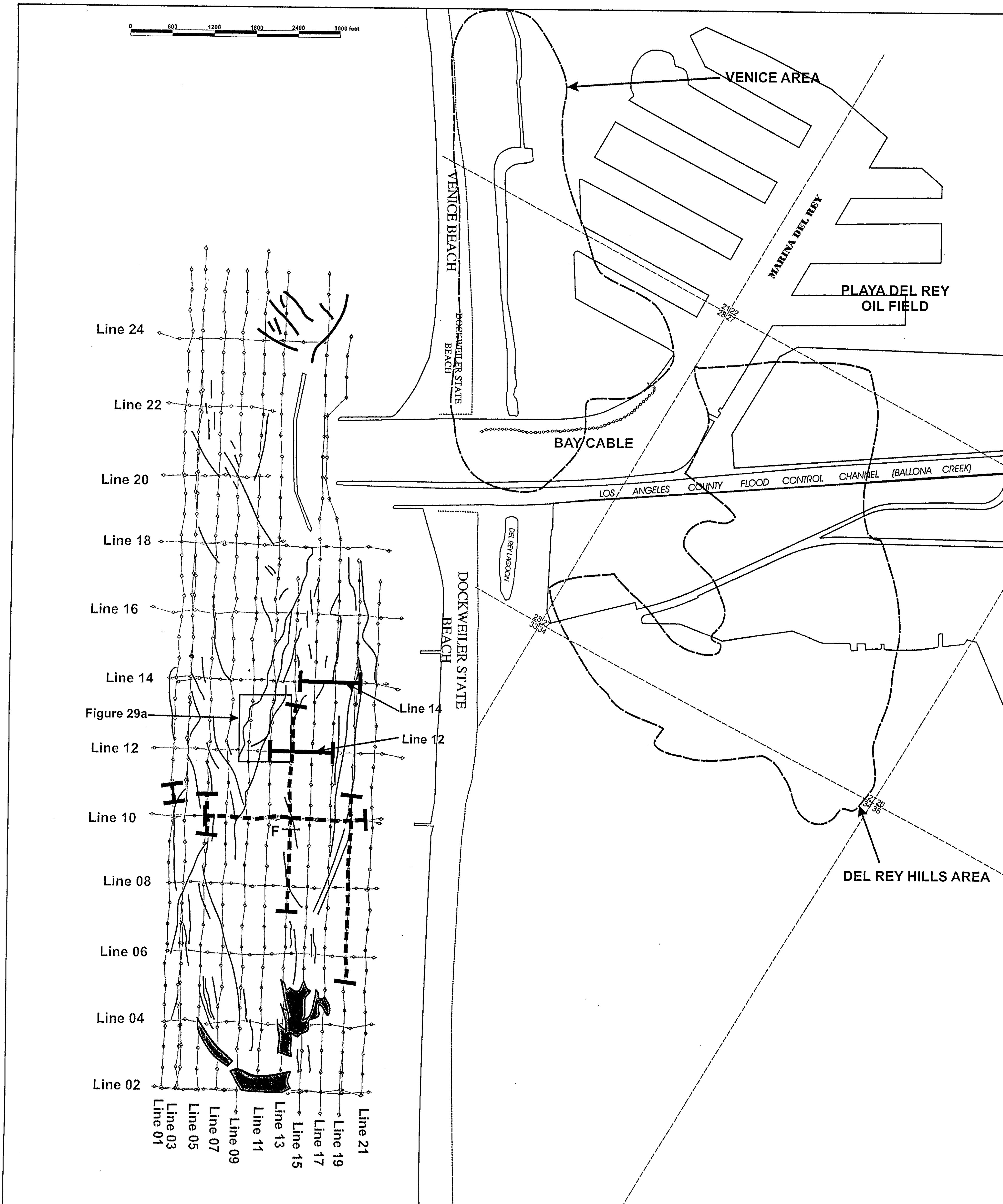

Figure 37. Correlation of 375 msec reflector with river channel (combination of figures 33 and 35).

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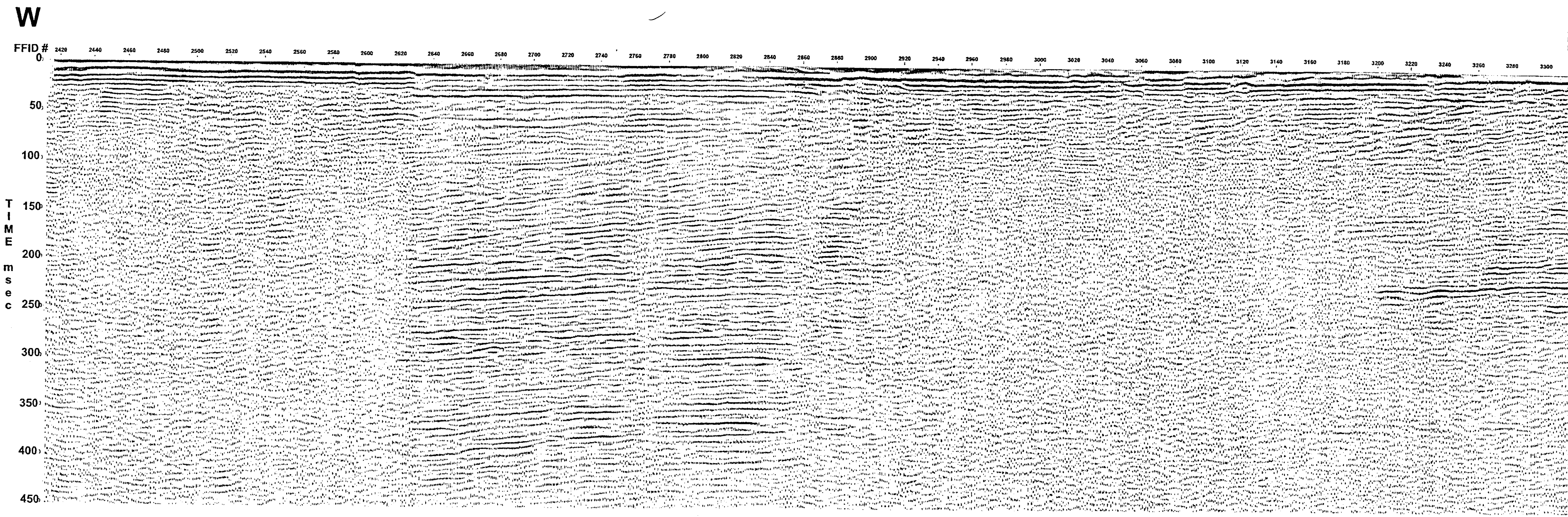


Figure 38. Ballona Creek 24-channel migrated seismic profile.

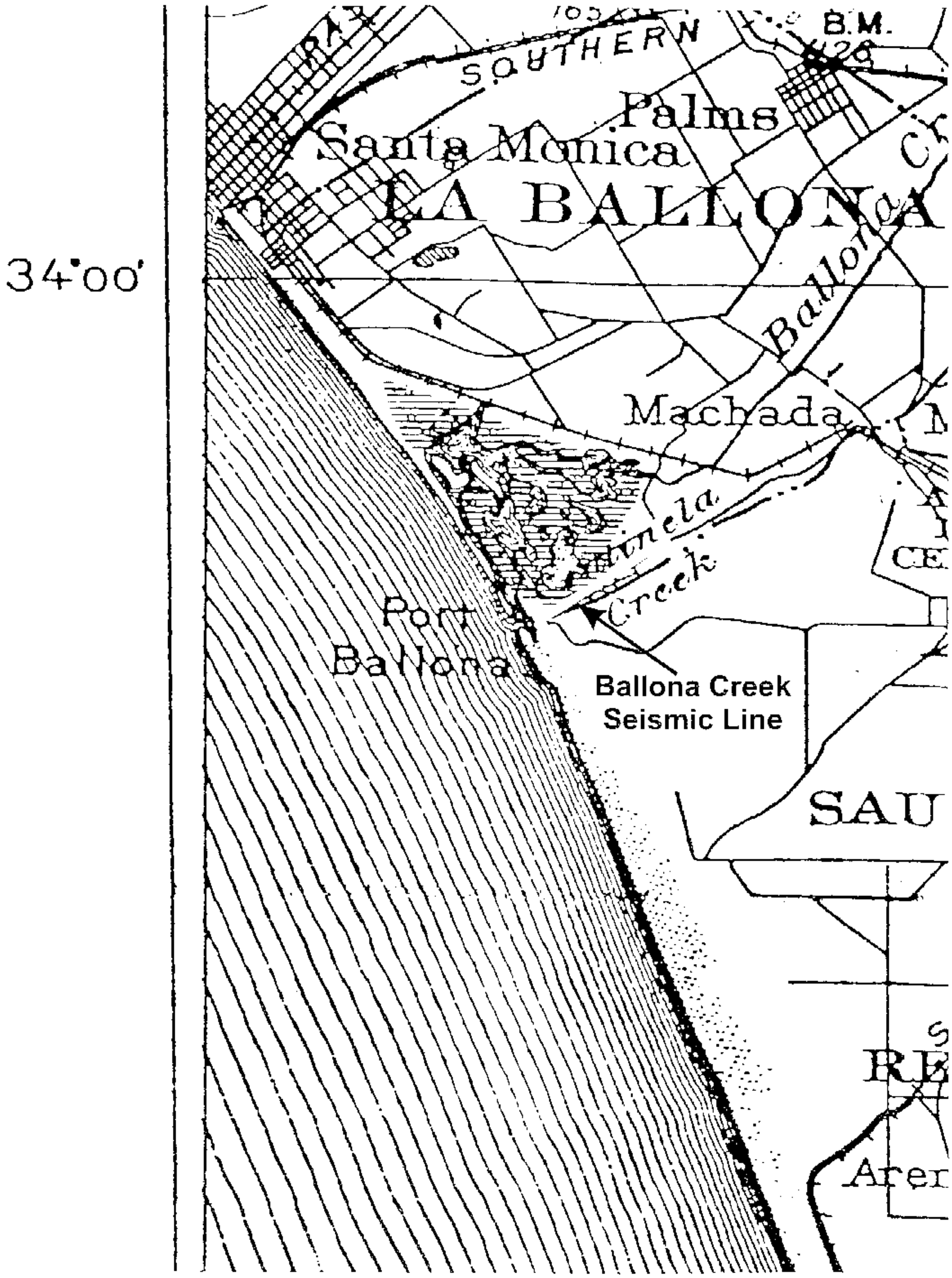
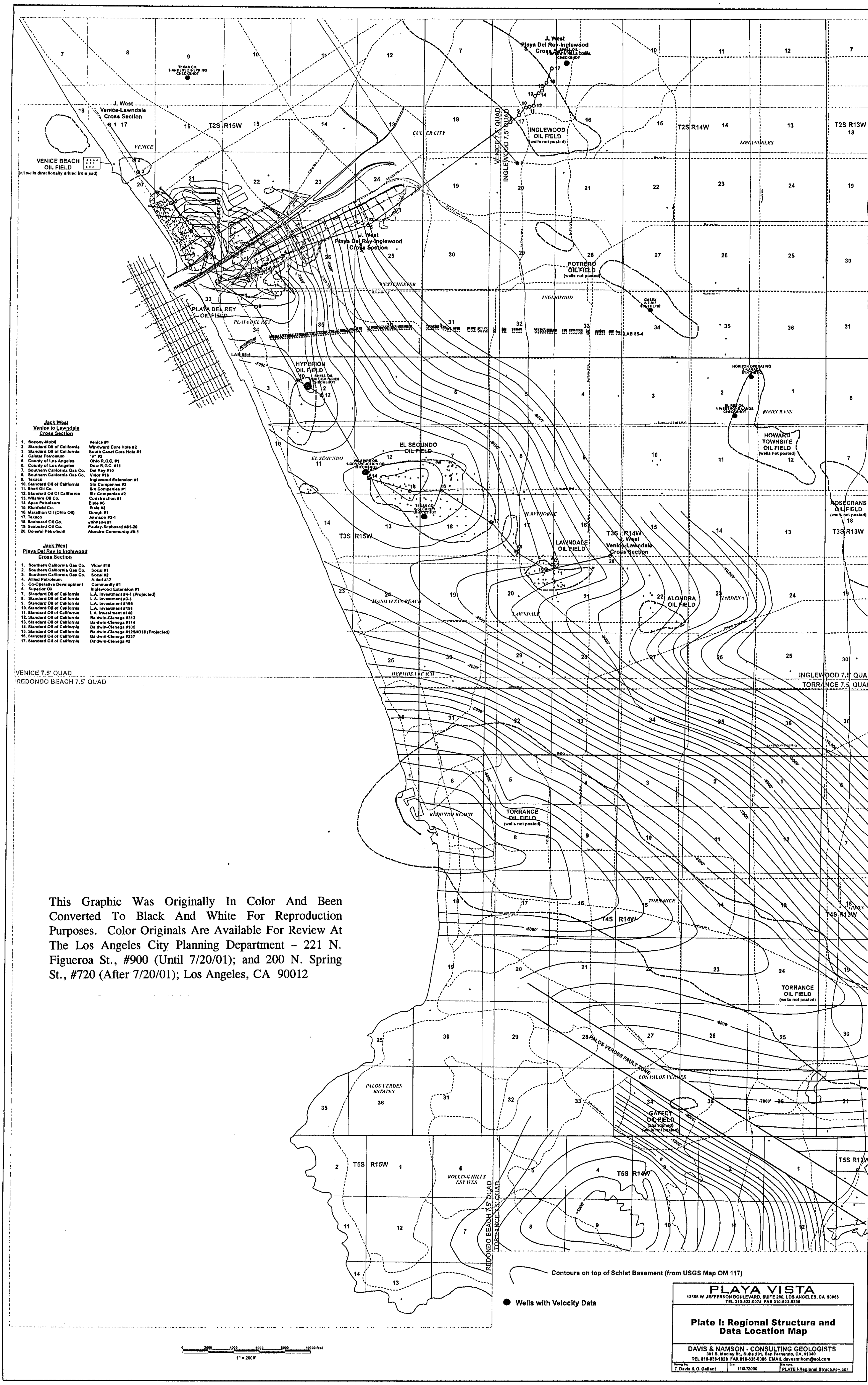


Figure 39. Topographic map (1901) showing the natural extent of lagoon. The lagoon crosses the present Ballona Creek channel, where the seismic line is located (indicated by a line on the map). This is shown as Centinela Creek on this old map.



Jack West
Venice to Lawndale
Cross Section

1. Socony-Mobil — Venice #1
2. Standard Oil of California — Windward Core Hole #2
3. Standard Oil of California — South Canal Core Hole #1
4. Calstar Petroleum — "V" #2
5. County of Los Angeles — Ohio R.G.C. #1
6. County of Los Angeles — Dow R.G.C. #11
7. Southern California Gas Co. — Del Rey #10
8. Southern California Gas Co. — Vidor #18
9. Texaco — Inglewood Extension #1
10. Standard Oil of California — Six Companies #3
11. Shell Oil Co. — Six Companies #1
12. Standard Oil Of California — Six Companies #2
13. Wilshire Oil Co. — Construction #1
14. Apex Petroleum — Elsie #6
15. Richfield Co. — Elsie #2
16. Marathon Oil (Ohio Oil) — Gough #1
17. Texaco — Johnson #2-1
18. Seaboard Oil Co. — Johnson #1
19. Seaboard Oil Co. — Pauley-Seaboard #81-20
20. General Petroleum — Alondra-Community #8-1

Jack West
Playa Del Rey to Inglewood
Cross Section

1. Southern California Gas Co. — Vidor #18
2. Southern California Gas Co. — Socal #1
3. Southern California Gas Co. — Socal #2
4. Allied Petroleum — Allied #17
5. Co-Operative Development — Community #1
6. Superior Oil — Inglewood Extension #1
7. Standard Oil of California — L.A. Investment #4-1 (Projected)
8. Standard Oil of California — L.A. Investment #3-1
9. Standard Oil of California — L.A. Investment #195
10. Standard Oil of California — L.A. Investment #191
11. Standard Oil of California — L.A. Investment #140
12. Standard Oil of California — Baldwin-Cienega #313
13. Standard Oil of California — Baldwin-Cienega #114
14. Standard Oil of California — Baldwin-Cienega #105
15. Standard Oil of California — Baldwin-Cienega #125/#318 (Projected)
16. Standard Oil of California — Baldwin-Cienega #237
17. Standard Oil of California — Baldwin-Cienega #2

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Plate I: Regional Structure and Data Location Map

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Geology By:	Date	File Name:
T. Davis & G. Gallant	11/8//2000	PLATE I-Regional Structure~.cdr

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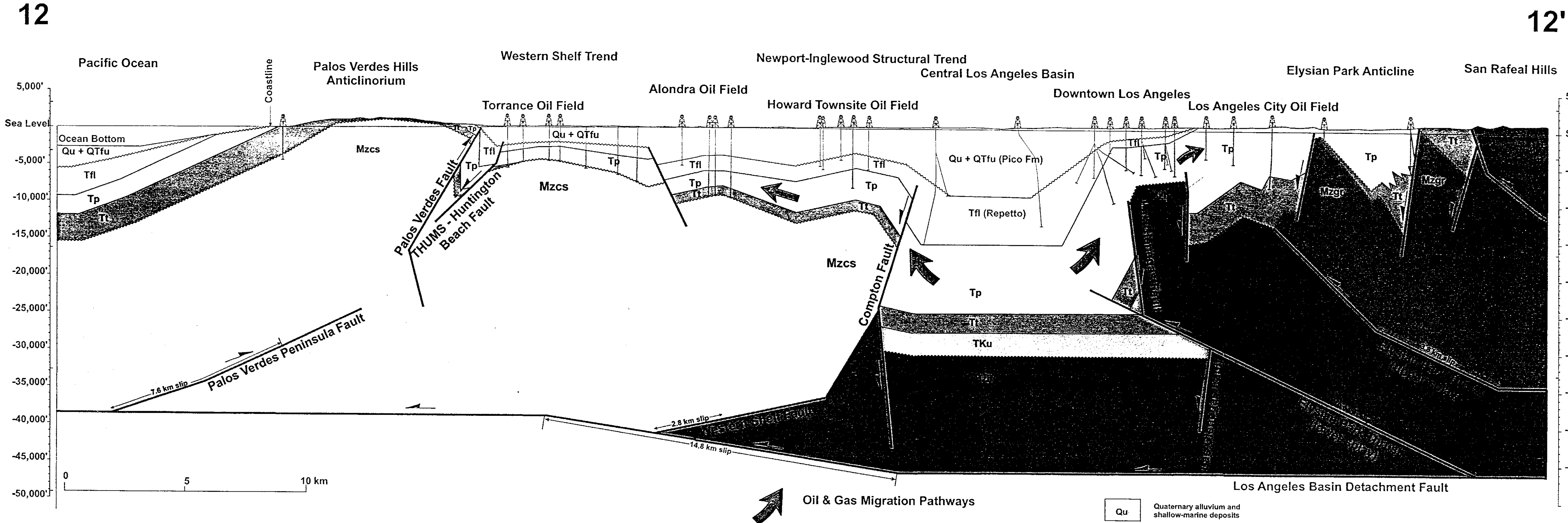
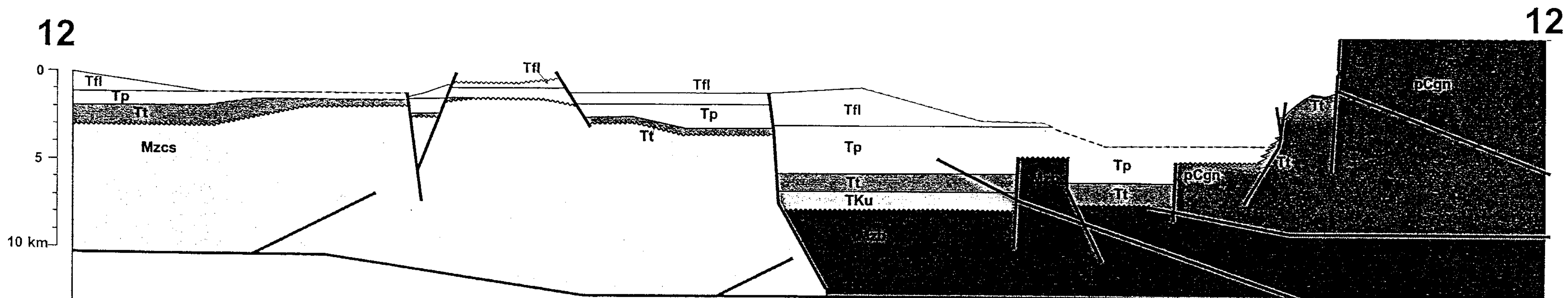
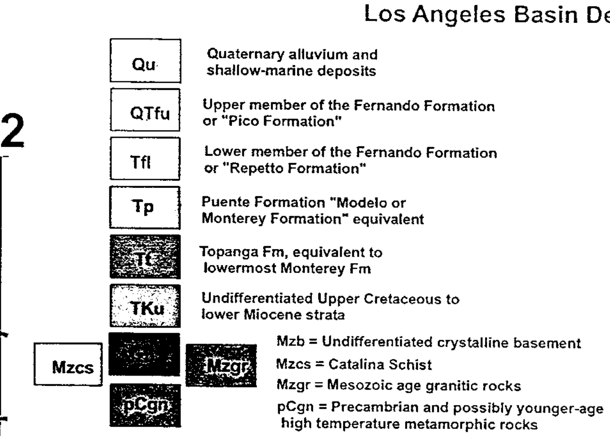




Restoration of Cross Section



Other Cross Sections available at no cost from www.DavisNamson.com

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Plate III: Regional Cross Section of the Los Angeles Basin and Restoration (from Davis et al., 1989)

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T. Davis | 11/8/2000 | PLate III~.cdr

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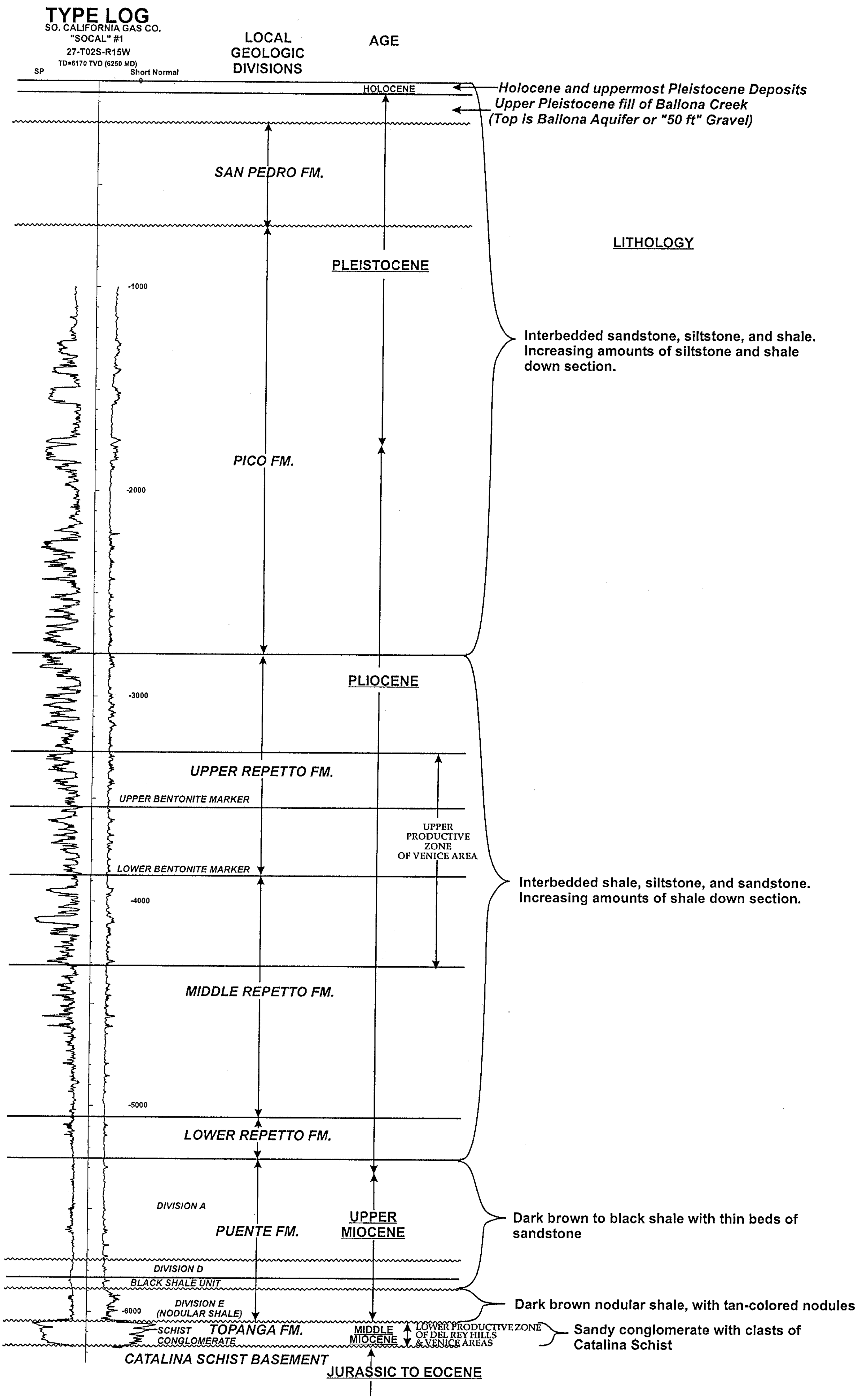

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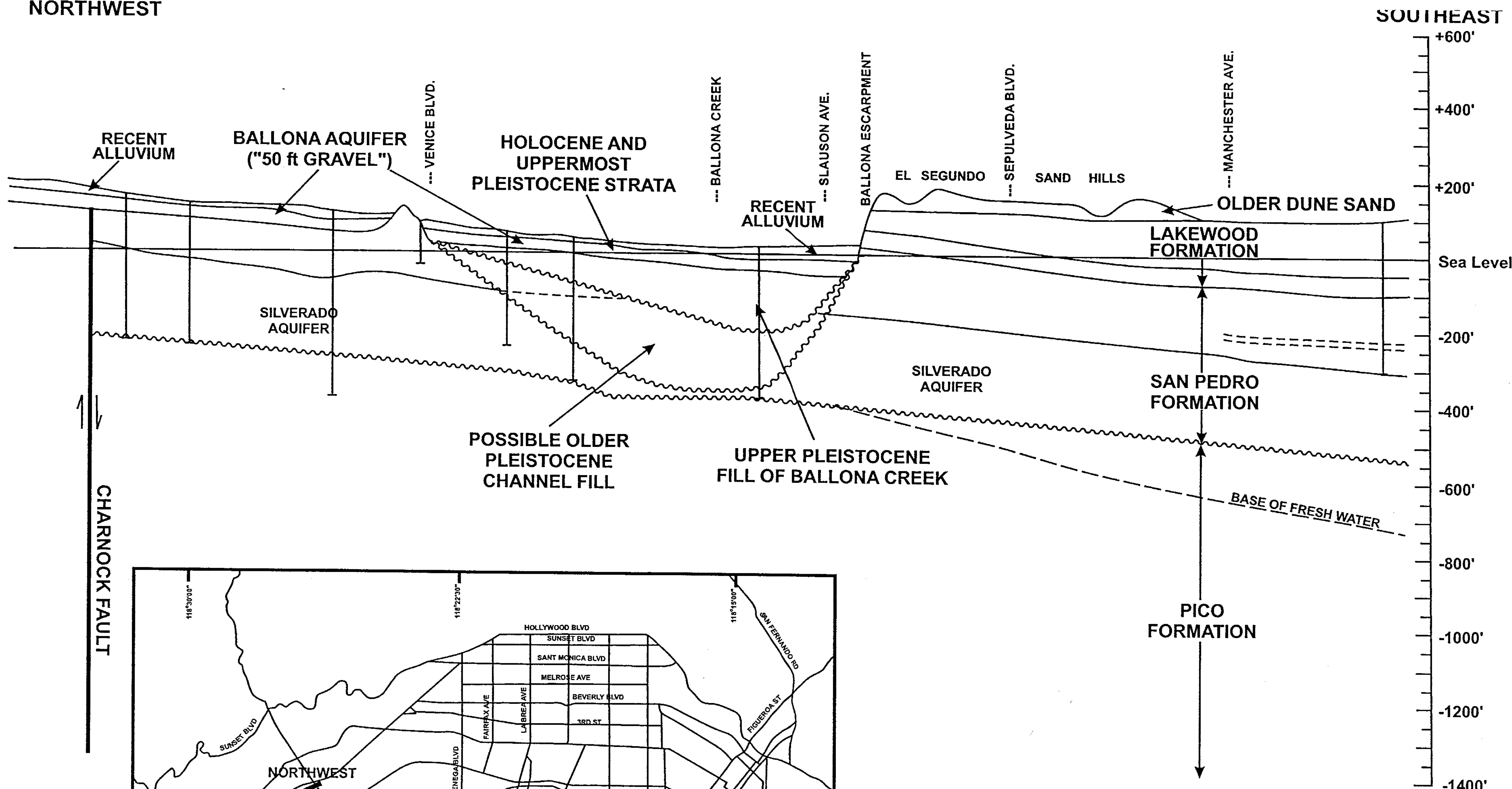
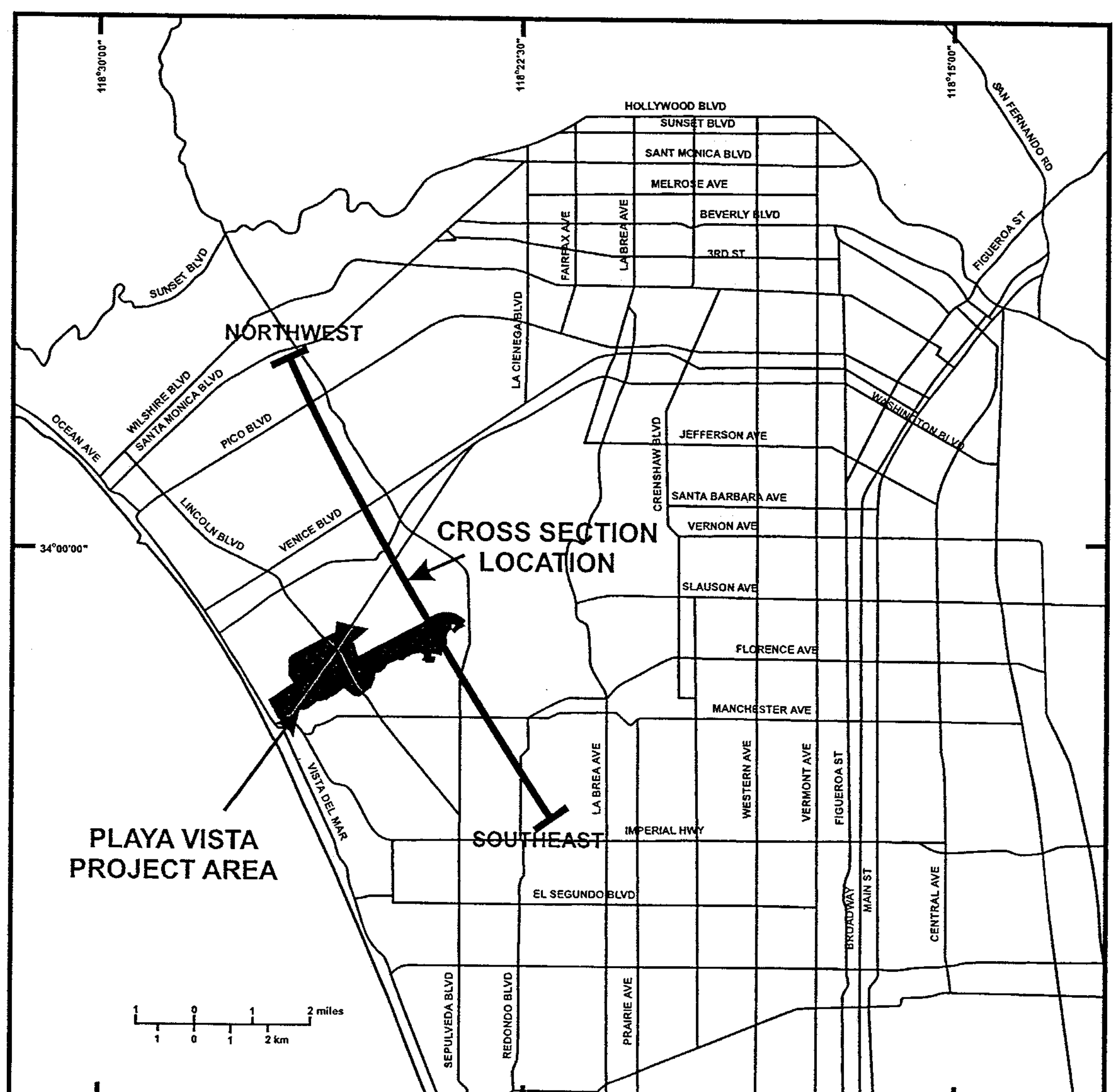
Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/8/2000	Plate IVa~.cdr





Location of cross section showing uppermost Pleistocene and Holocene strata across the Ballona Creek Area. (Modified from DWR, 1961)

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Plate IV-B: Diagrammatic Cross Section showing Quaternary Stratigraphic Framework of the Playa Vista Area

(modified from DWR, 1961)

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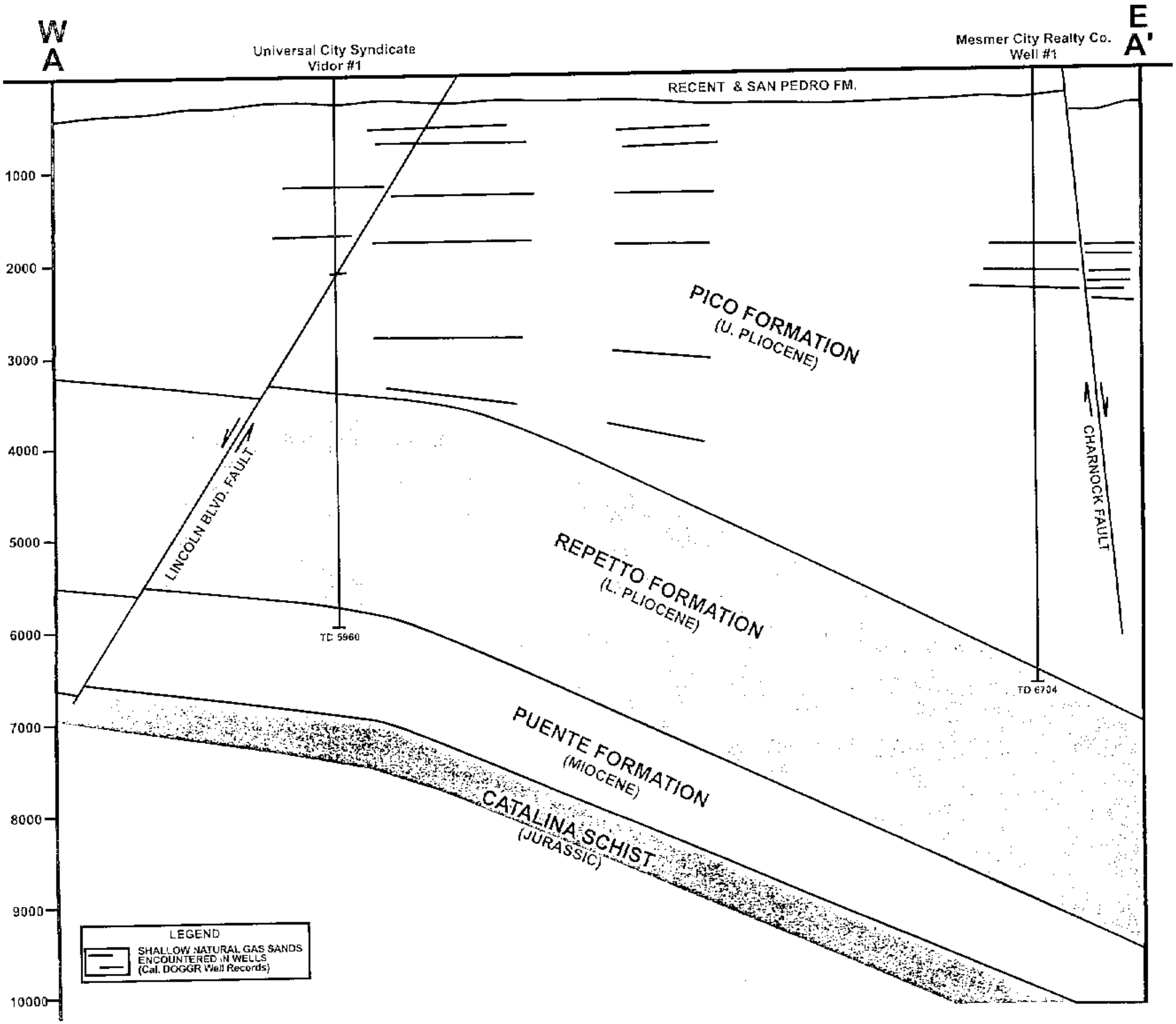

Plate V. ETI (2000) east-west cross section showing postulated Lincoln Blvd. Fault and postulated Charnock Fault (Poland et al., 1959)

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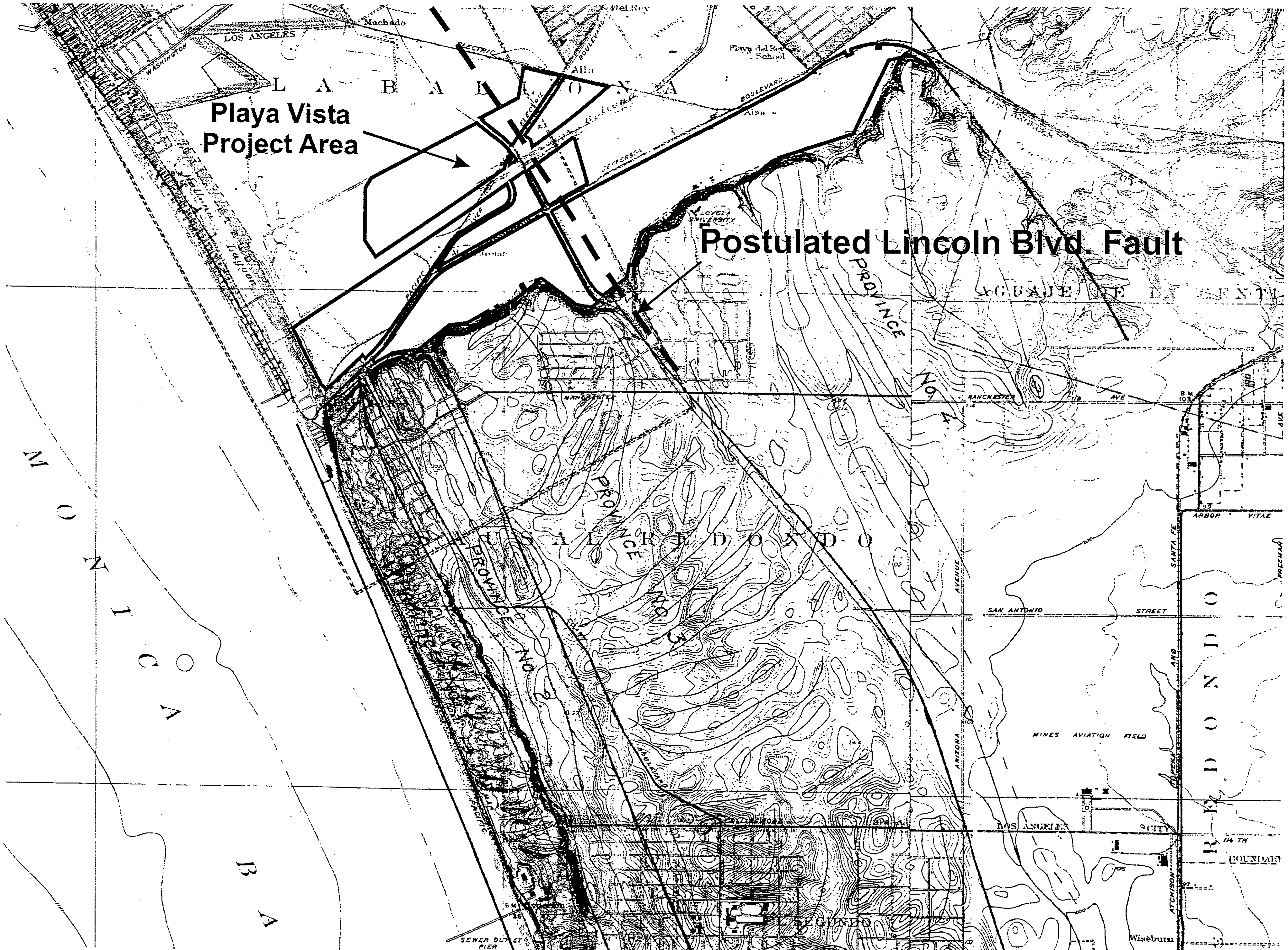

Plate VI . **Geographic provinces as defined by Metzner (1935), relative to the Playa Vista site and the postulated Lincoln Blvd. Fault.**

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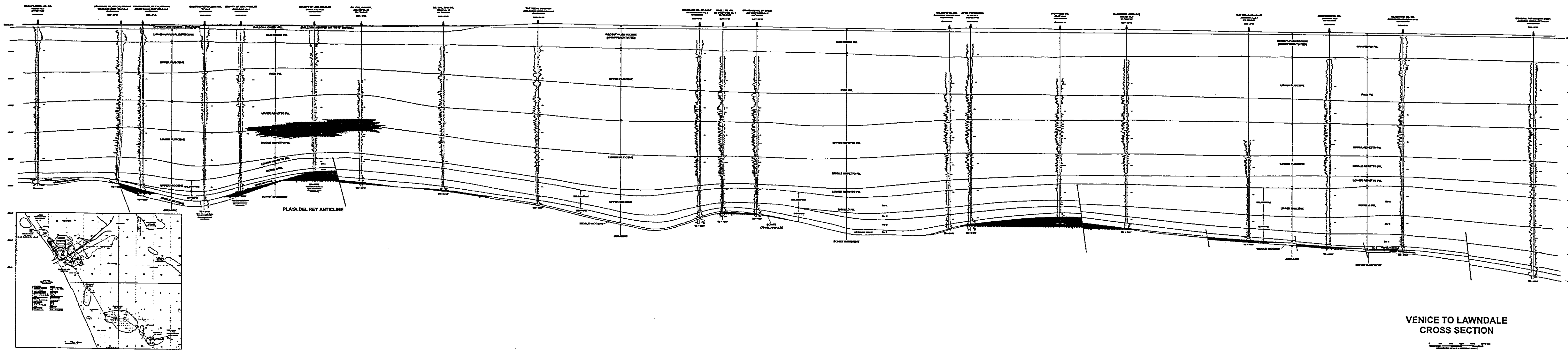
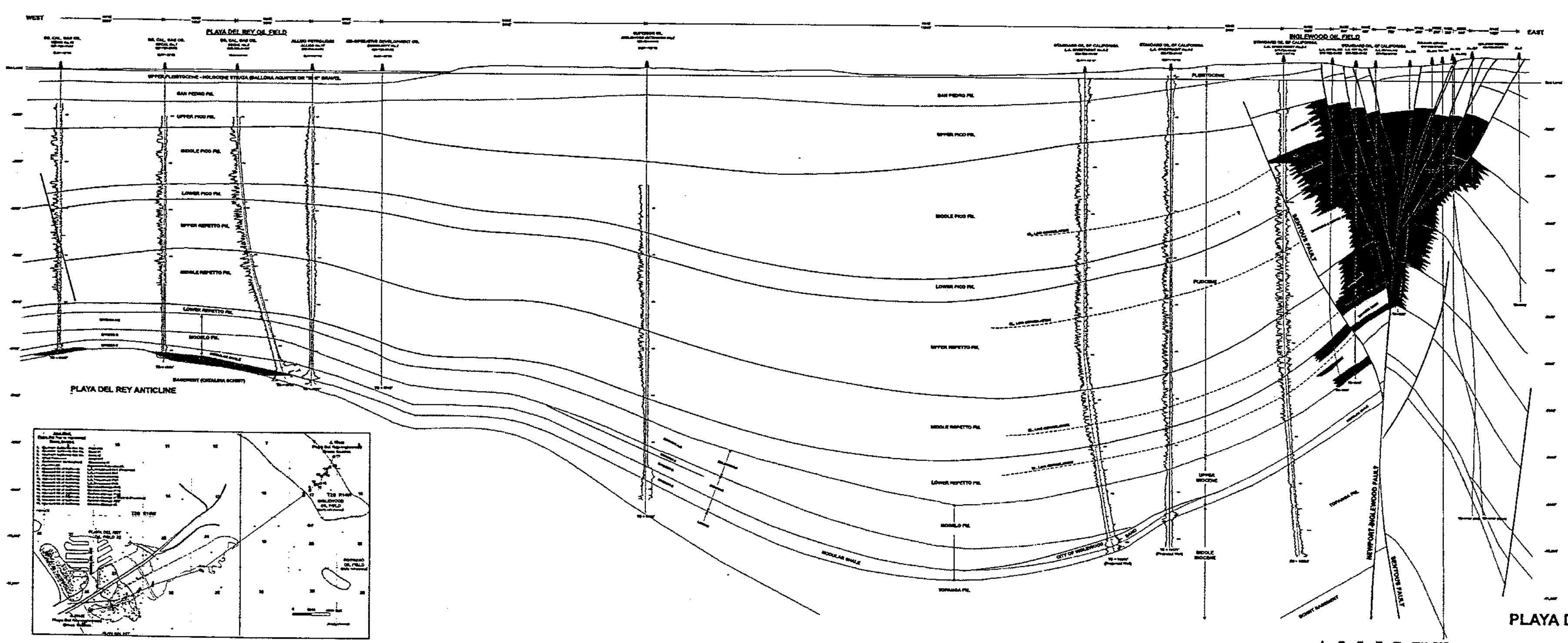


VENICE TO LAWNDALE
CROSS SECTION



PLAYA DEL REY TO INGLEWOOD
CROSS SECTION

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Plate VII: Jack West Regional Cross Sections of the Playa Vista Project Area		
DAVIS & NAMSON - CONSULTING GEOLOGISTS [illegible], San Fernando, CA [illegible] TEL [illegible] FAX [illegible] EMAIL [illegible]		
T. Davis & G. Gallant	11/8/2000	Plate VII-.cdr

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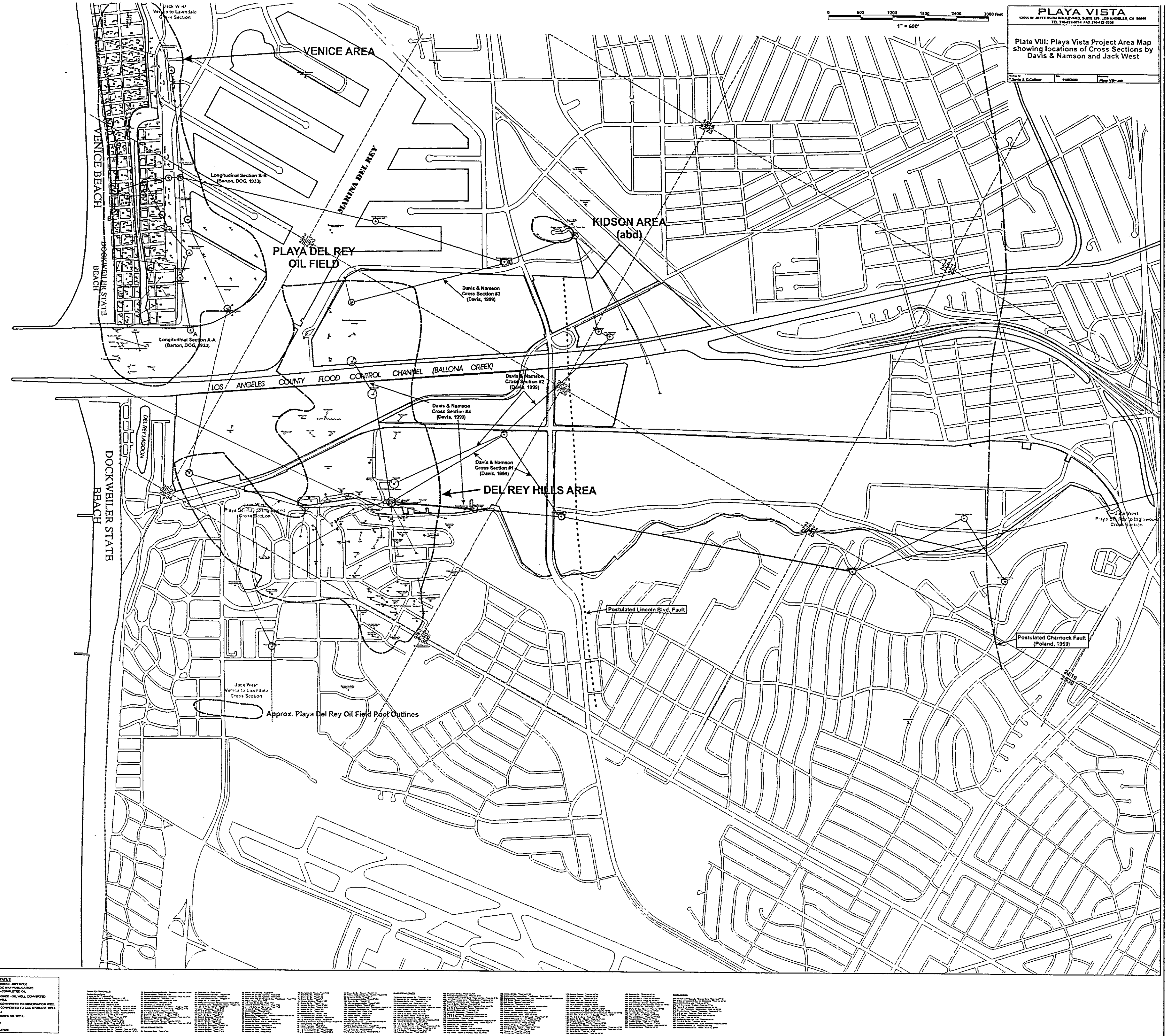

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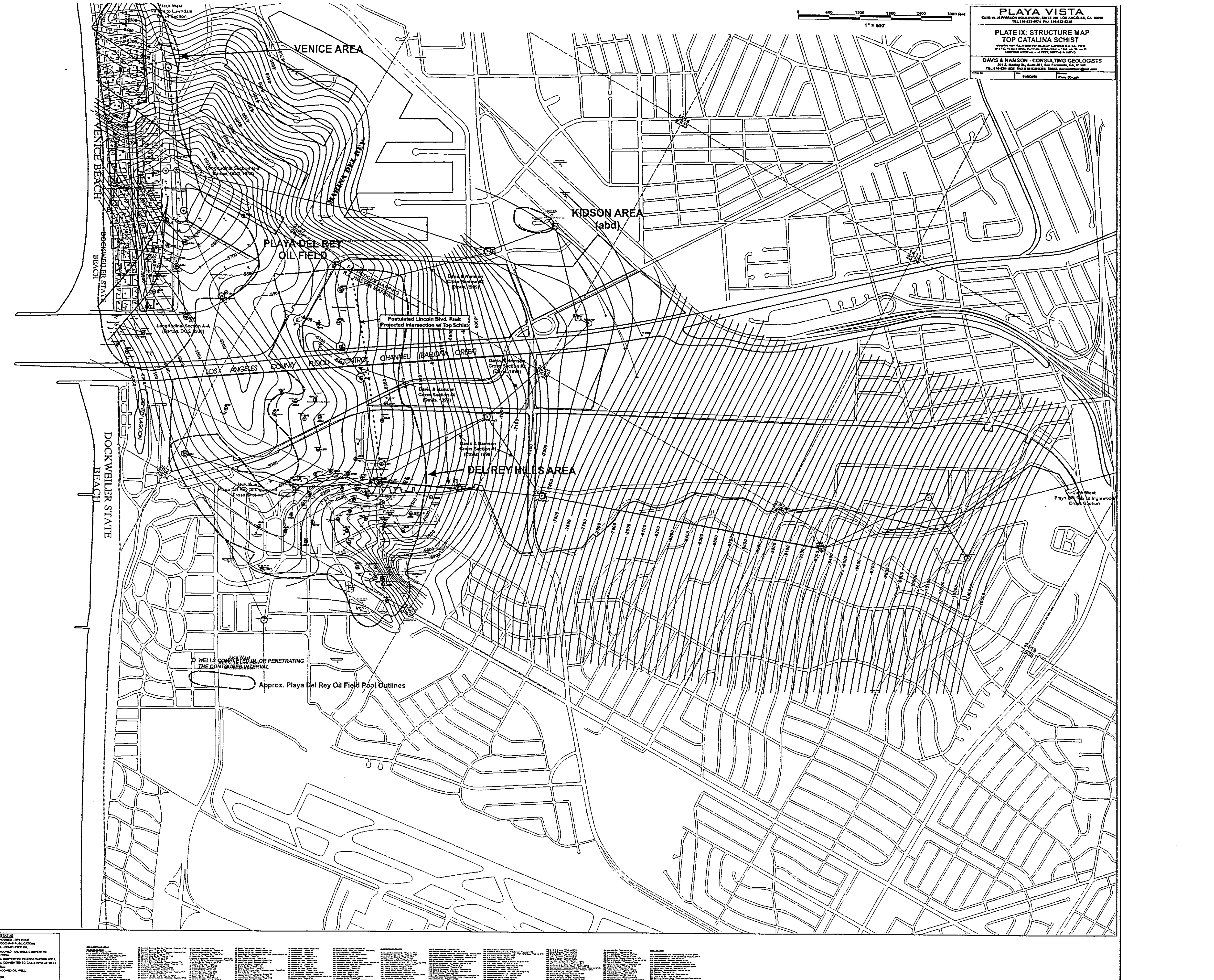

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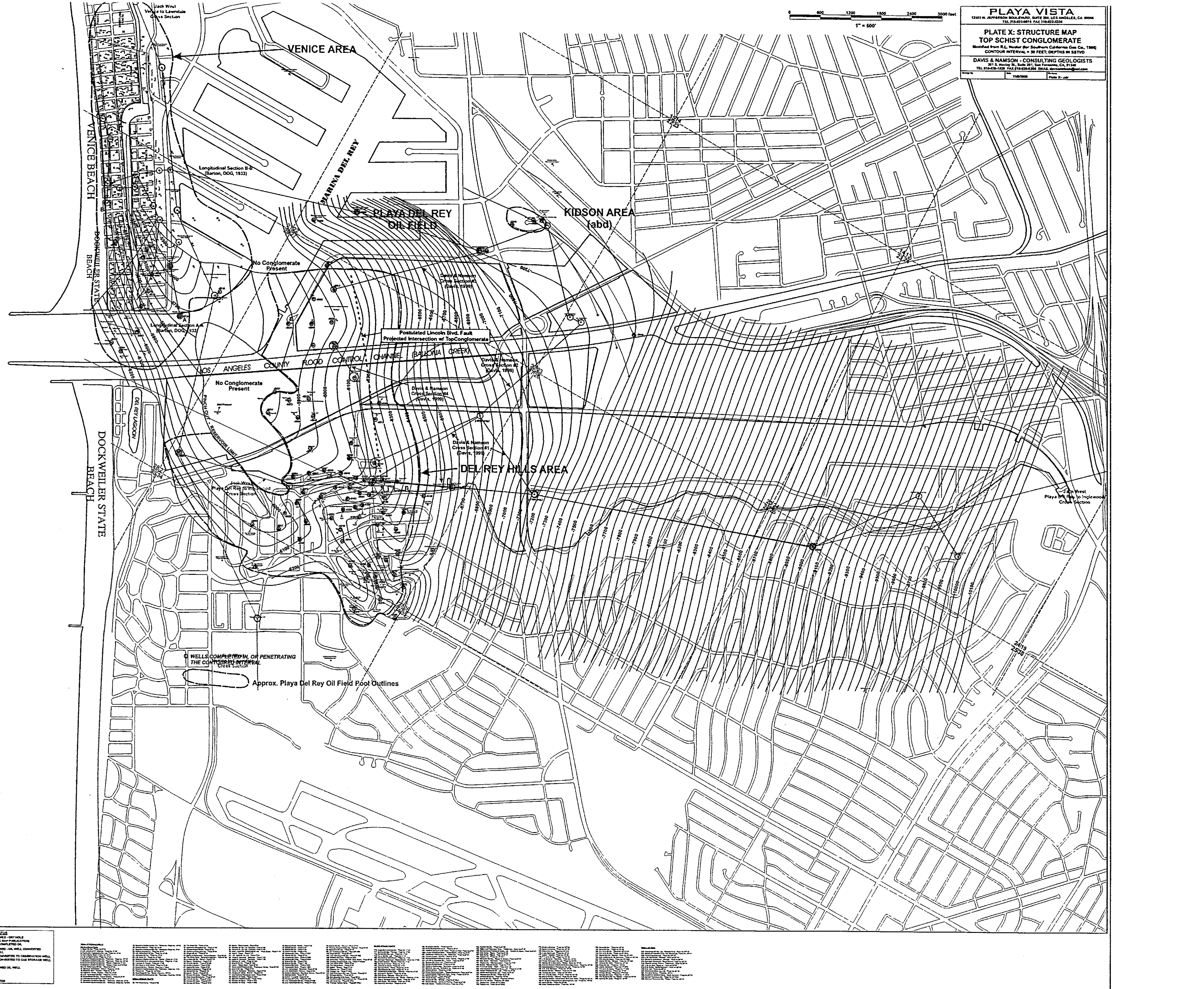

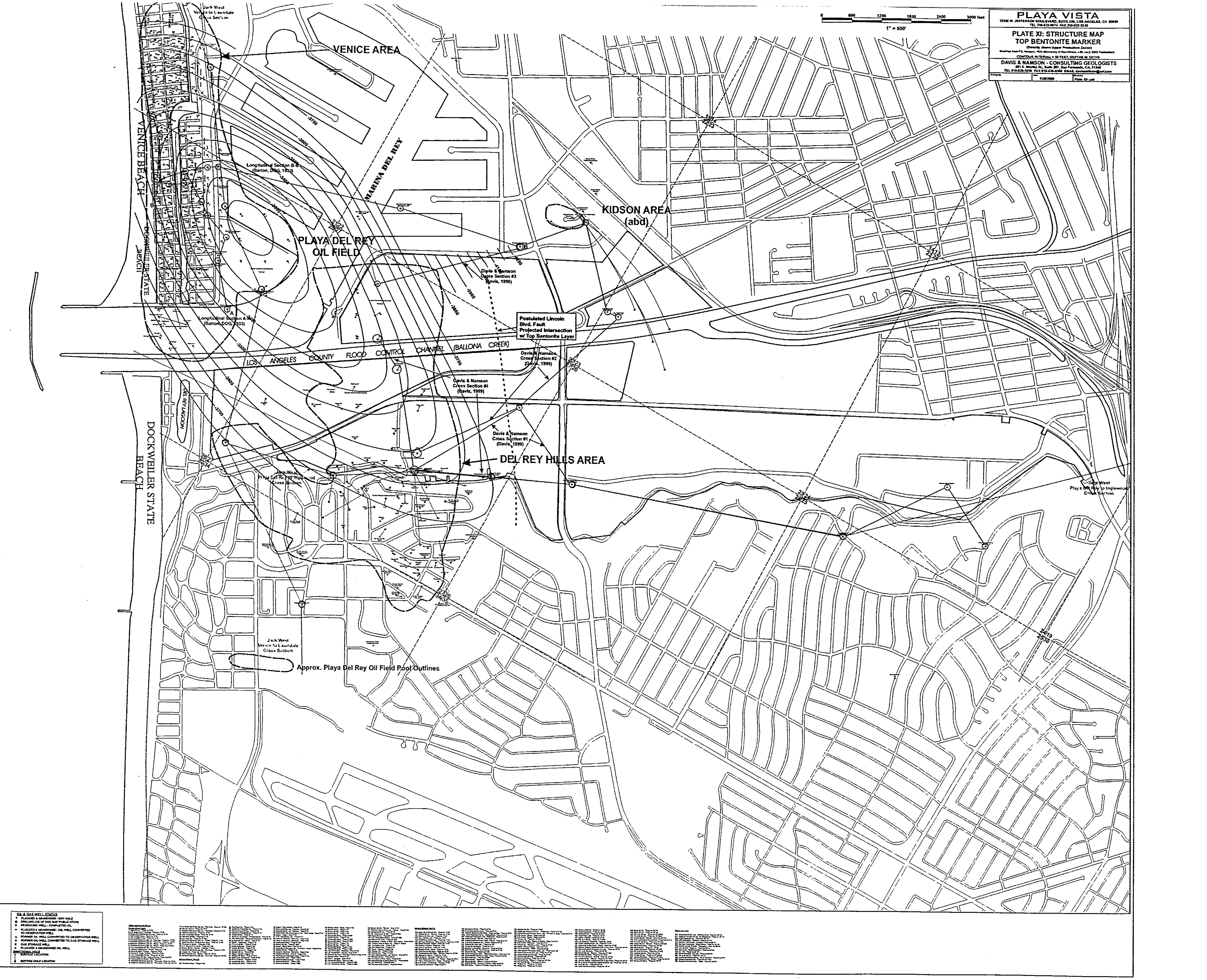

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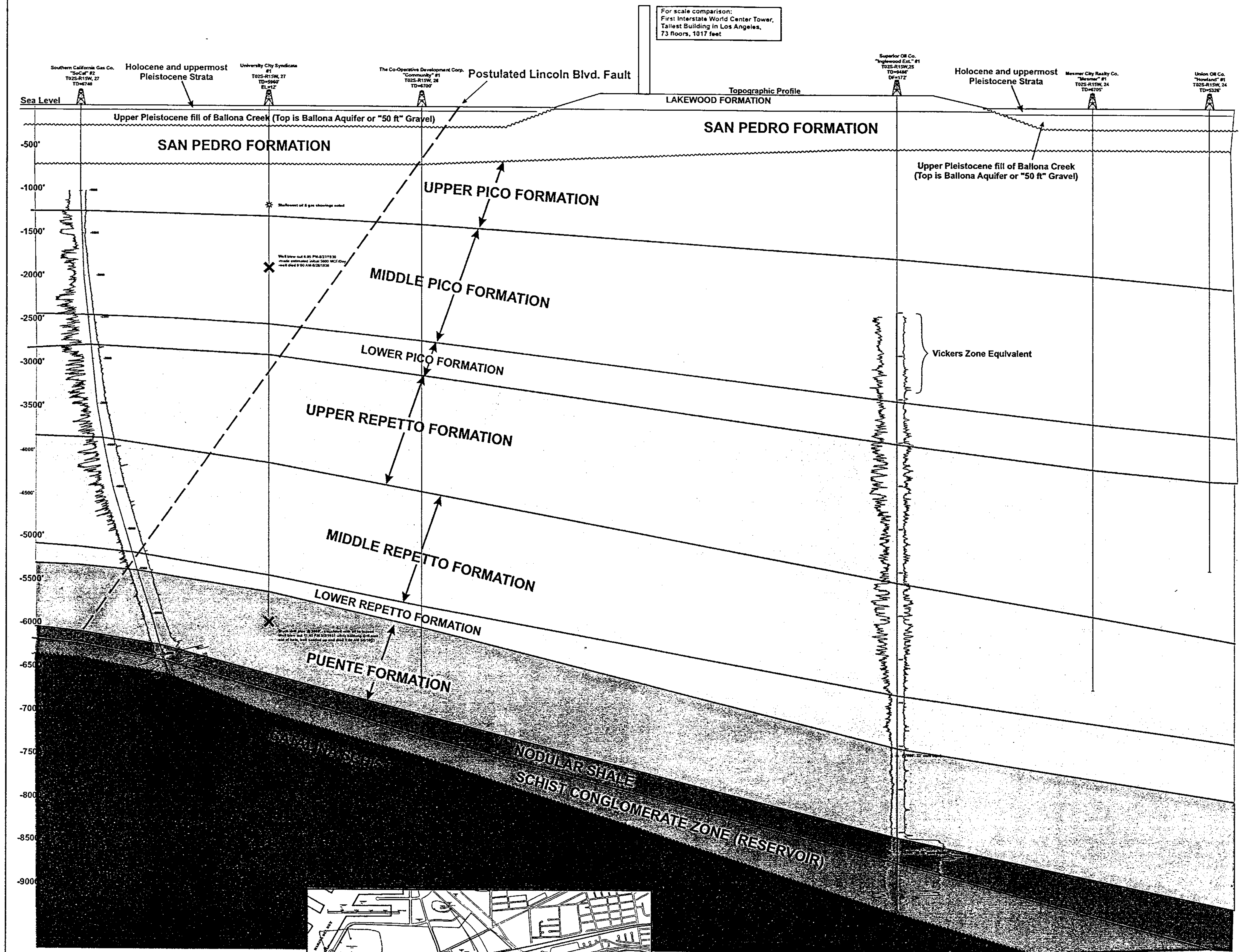

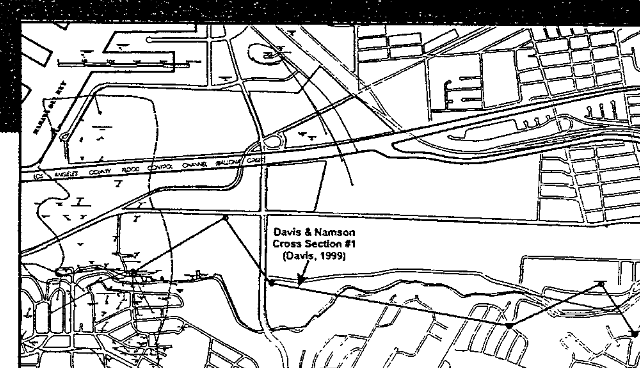

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PLATE XII: DAVIS & NAMSON CROSS SECTION #1

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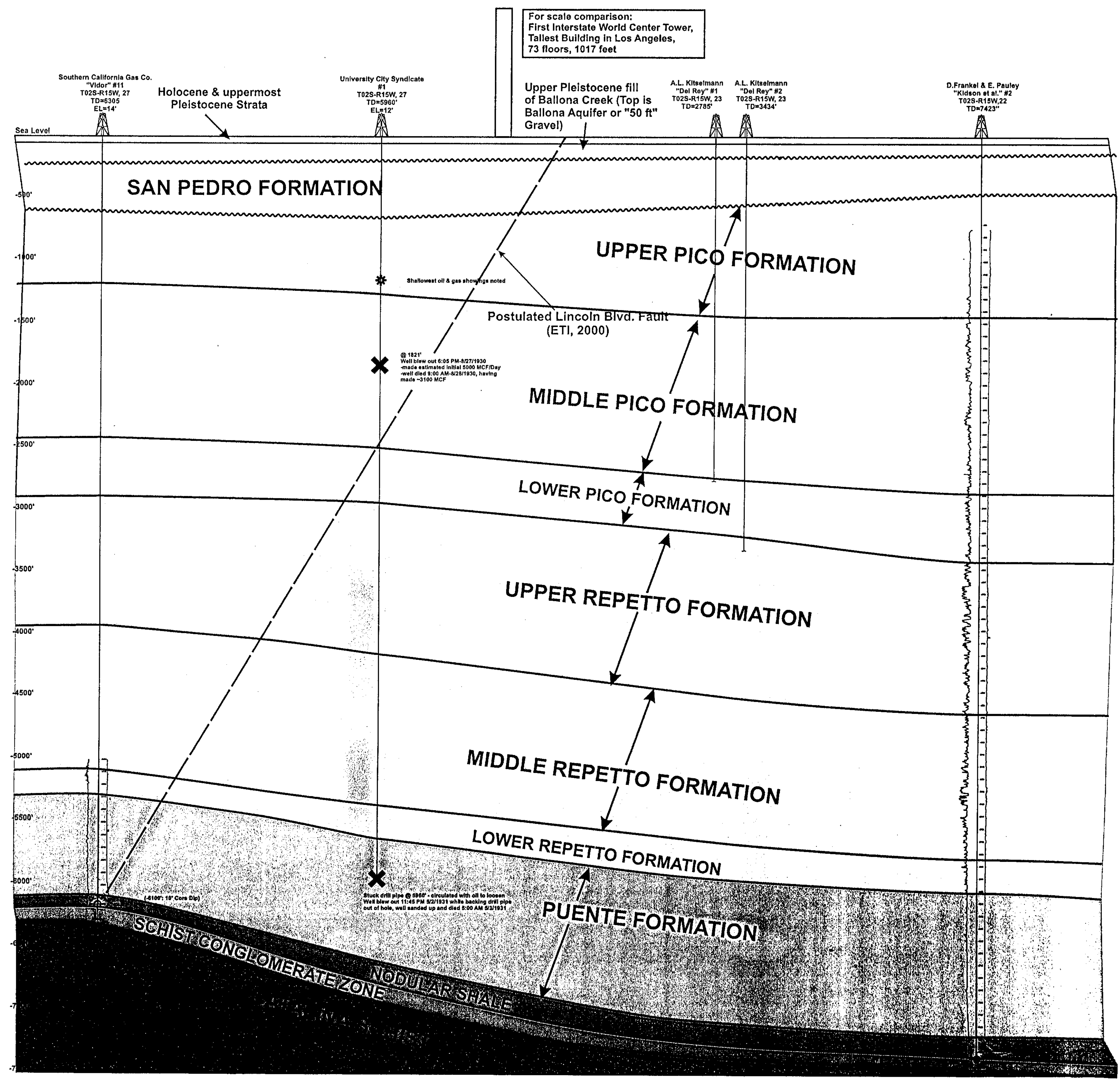
T. Davis & G. Gallant | 11/8/2000 | Plate XII-.cdr

- ✕ Interval with recorded blow out
- Top of formation picked from oil well data
- Dip Information from cores
- Oil & Gas Showings
-)(Stuck Pipe or other borehole problems encountered

0 400 800 1200 1600 2000 feet

Horizontal Scale=Vertical Scale 1" = 400'



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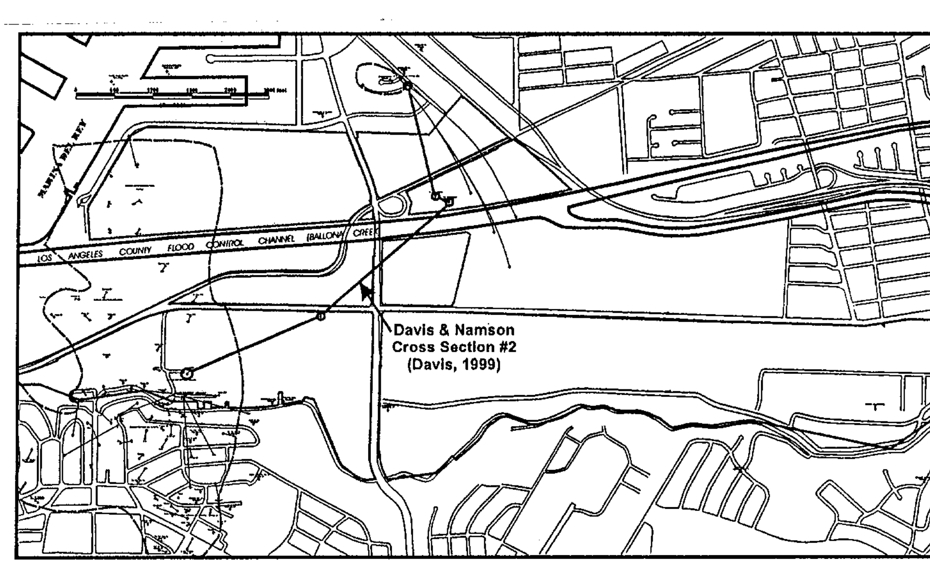
-8000'

- ✖ Interval with recorded blow out
- ⌖ Top of formation picked from oil well data
- ≻≺ (-7600': 22° core dips) Dip Information from cores
- ☼ Oil & Gas Showings
-)(Stuck Pipe or other borehole problems encountered

0 400 800 1200 1600 2000 feet
Horizontal Scale=Vertical Scale 1" = 400'



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Playa Vista Project Area
Playa Del Rey, California

PLATE XIII: DAVIS & NAMSON CROSS SECTION #2

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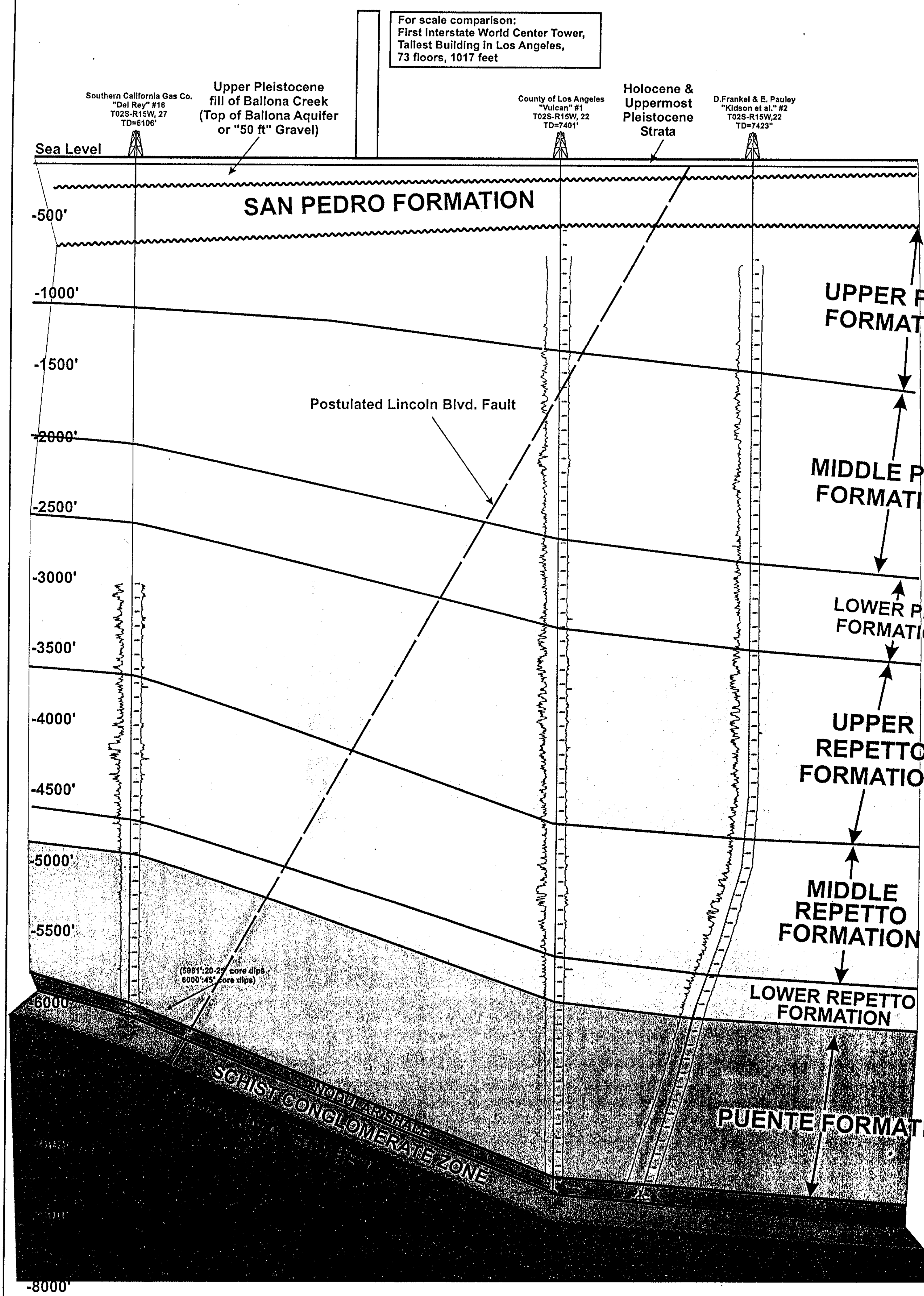
Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/8/2000	Plate XIII~.cdr



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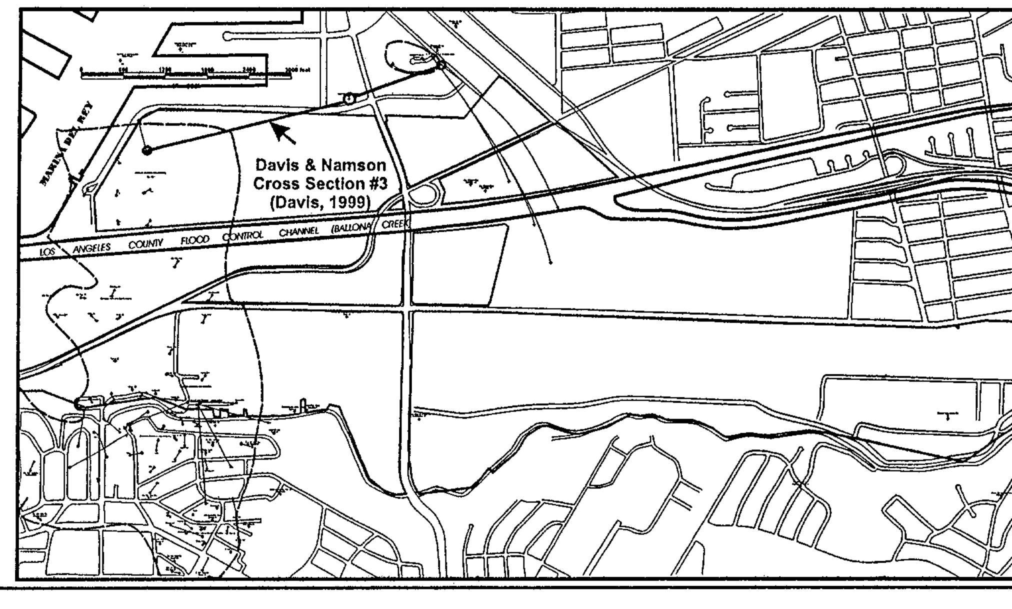
- ✕ Interval with recorded blow out
- ⌖ Top of formation picked from oil well data
- >< (-7600': 22° core dips) Dip Information from cores
- ✲ Oil & Gas Showings
-)(Stuck Pipe or other borehole problems encountered

0 400 800 1200 1600 2000 feet

Horizontal Scale=Vertical Scale 1" = 400'



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Playa Vista Project Area

Playa Del Rey, California

PLATE XIV: DAVIS & NAMSON CROSS SECTION #3

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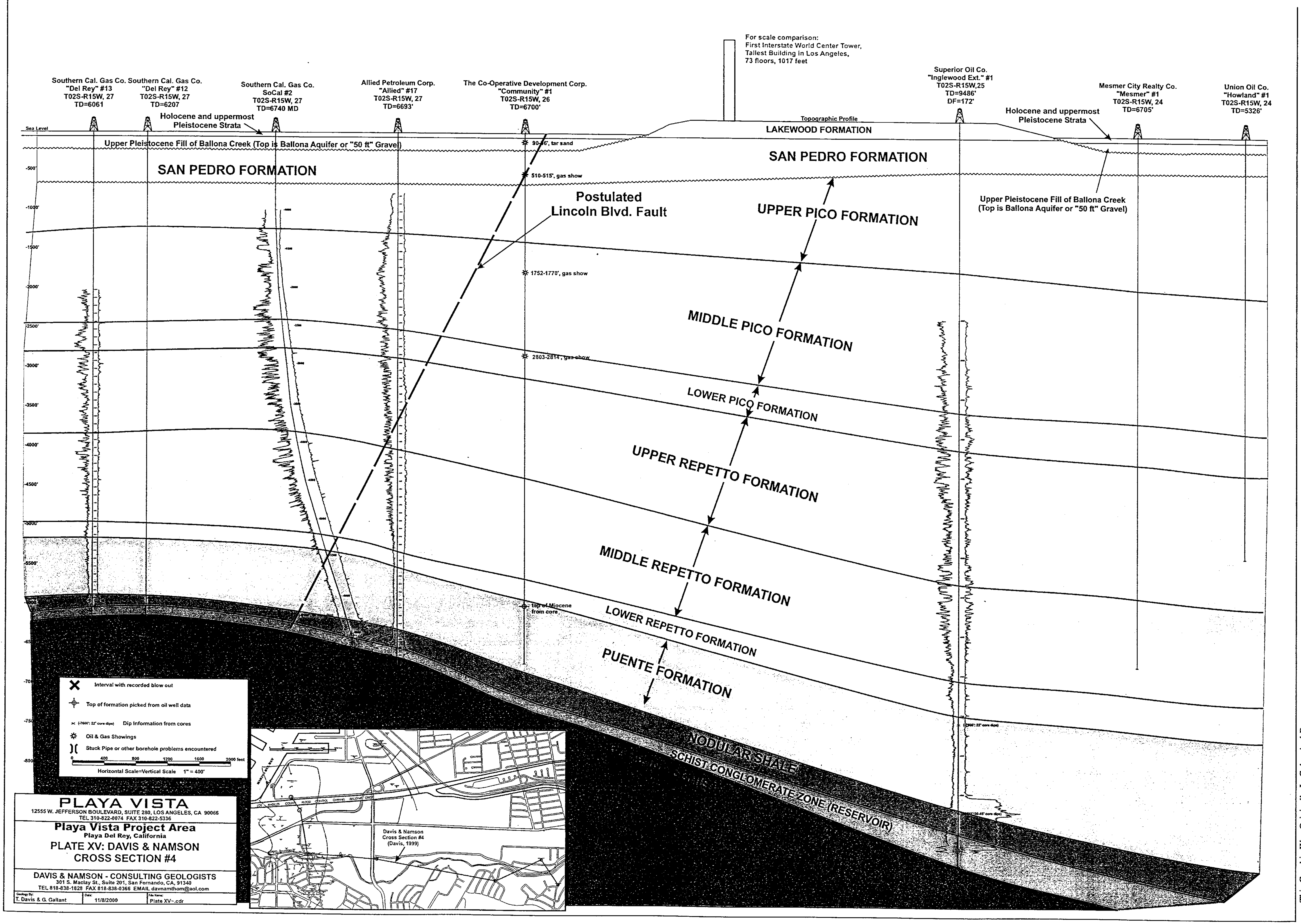
Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/8/2000	Plate XIV~.cdr



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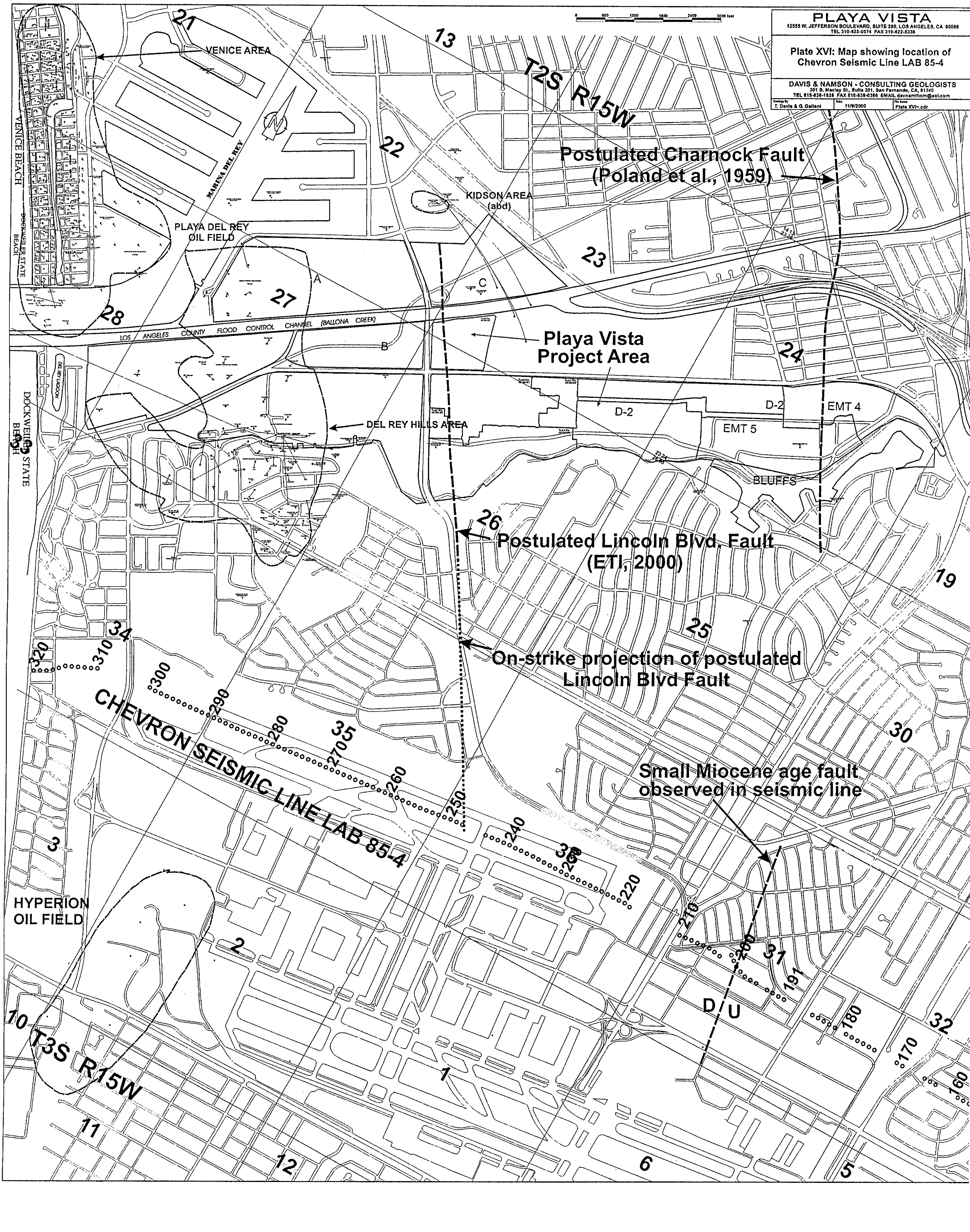

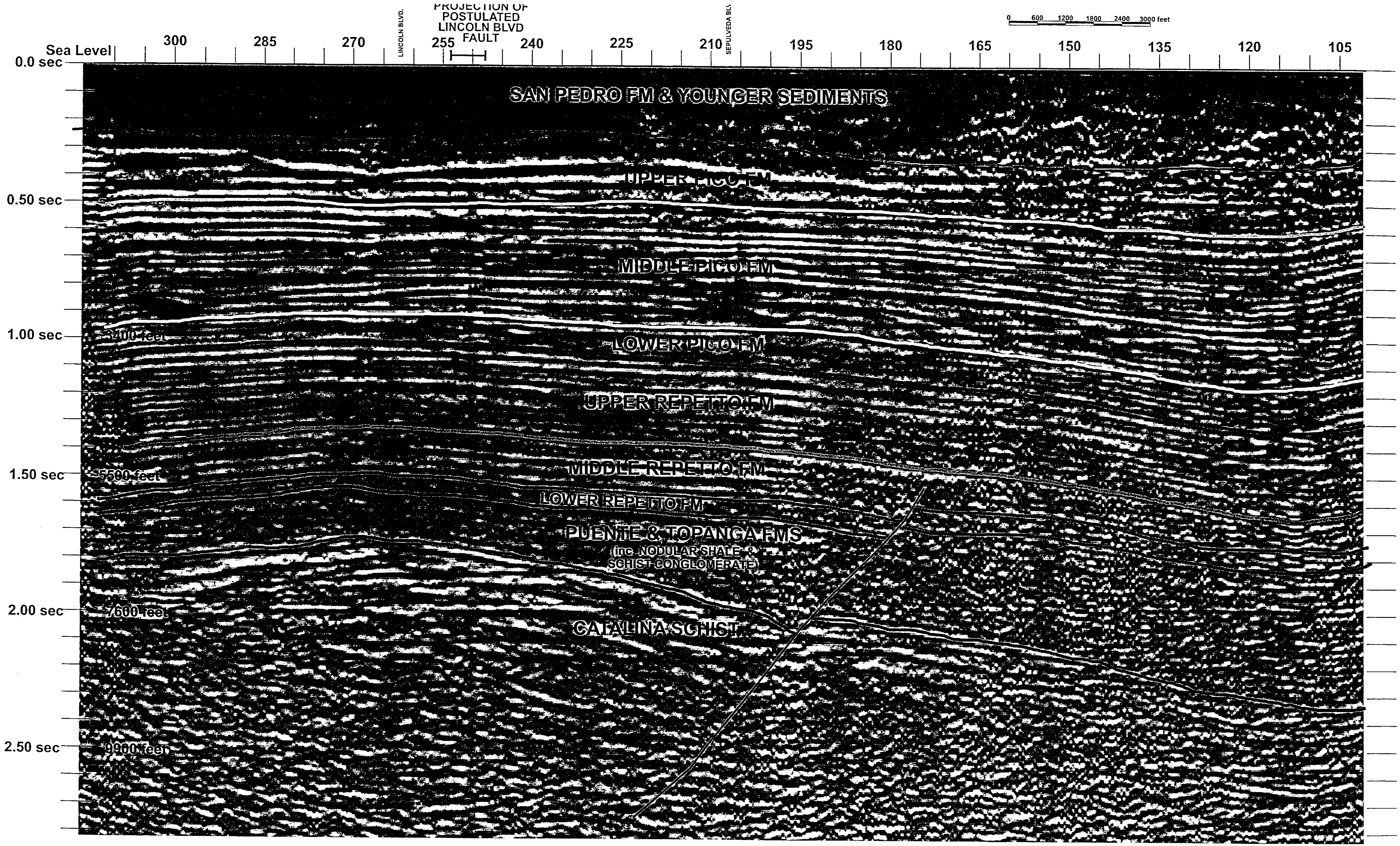

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Plate XVII: Interpretation of grayscale Chevron Seismic Line LAB 85-4

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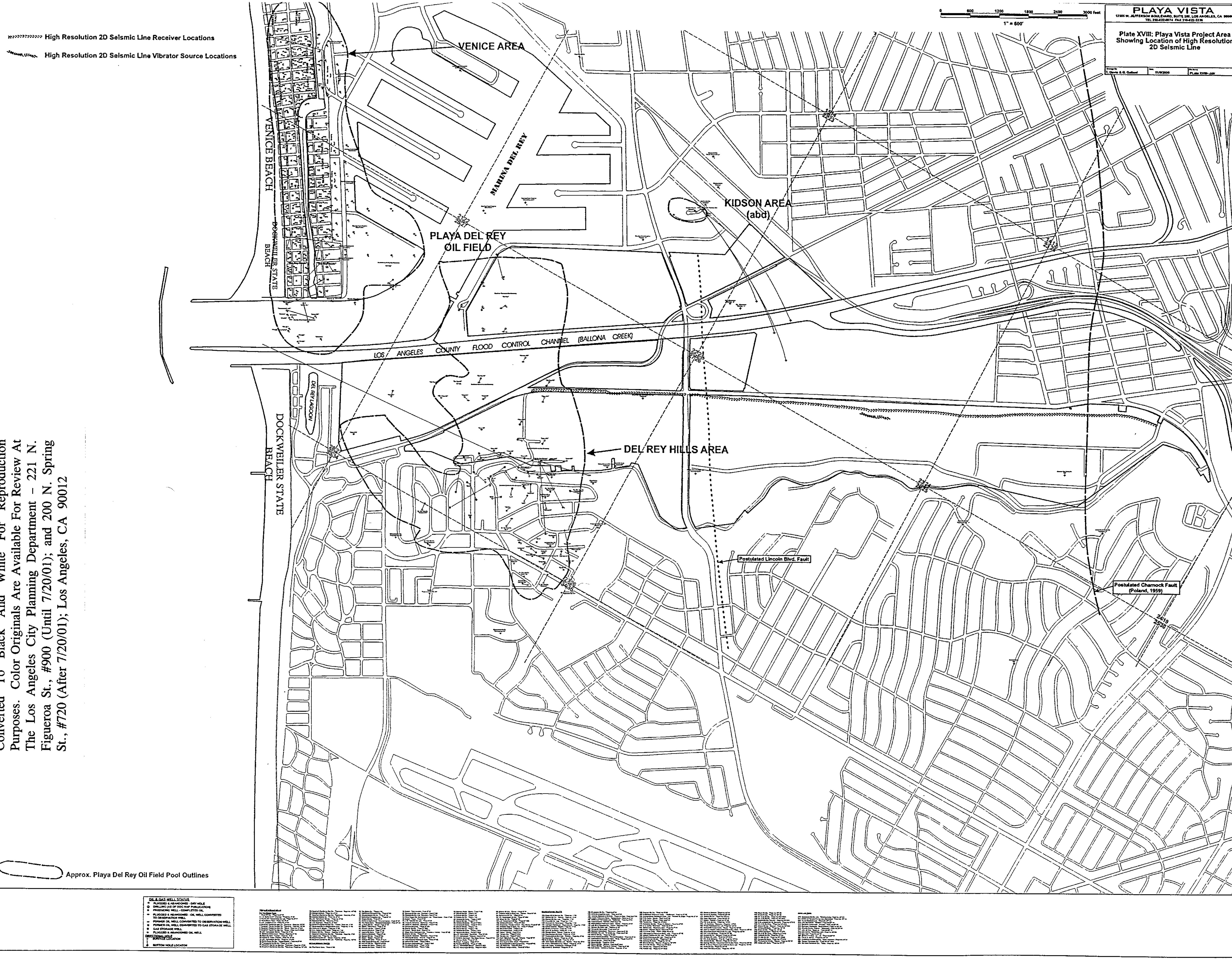
Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/9/2000	Plate XVII~.cdr



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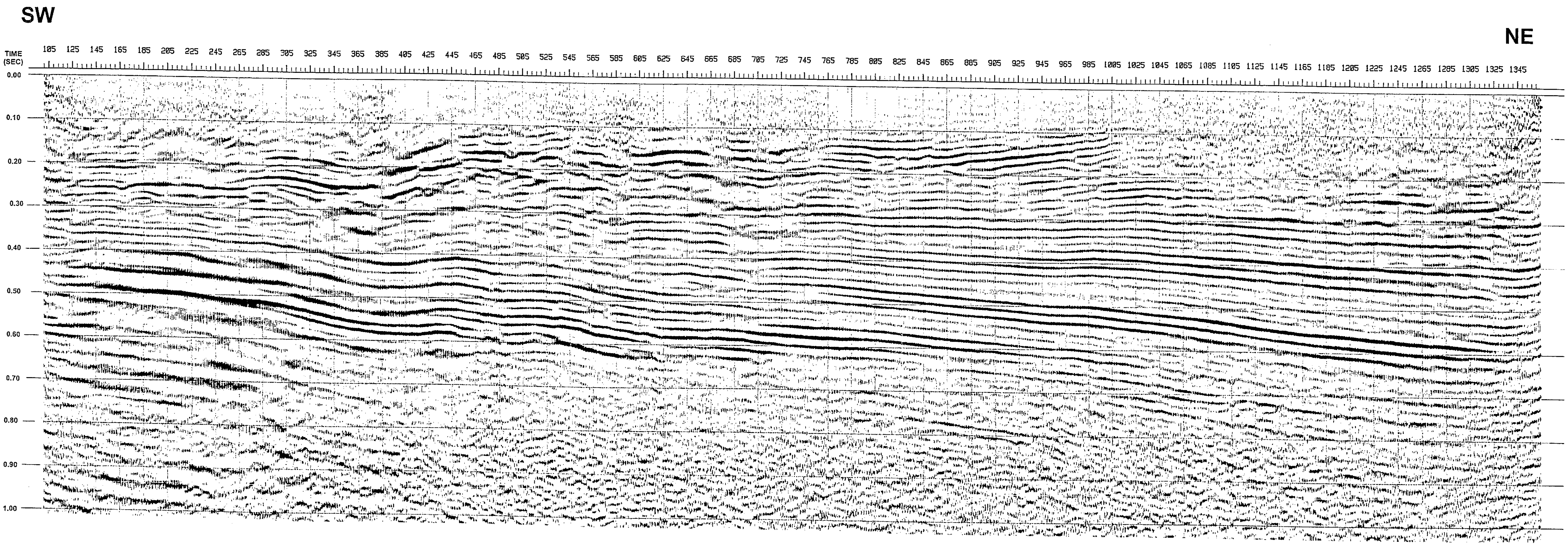

Plate XIX. **Uninterpreted high resolution 2D seismic line**

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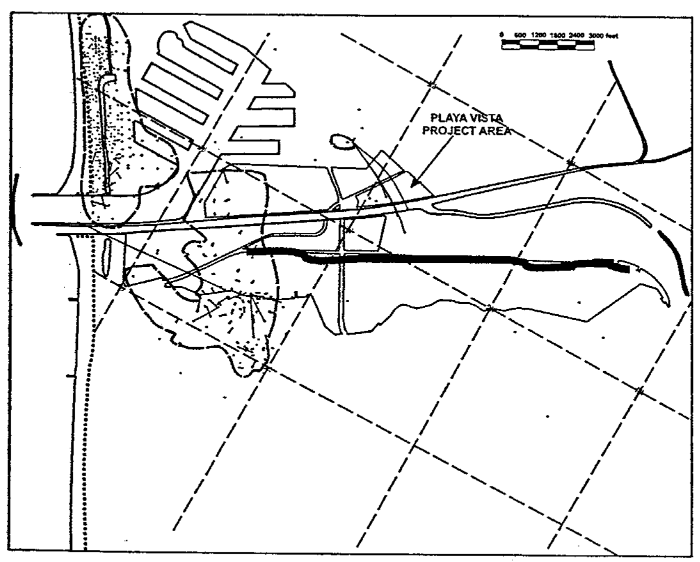

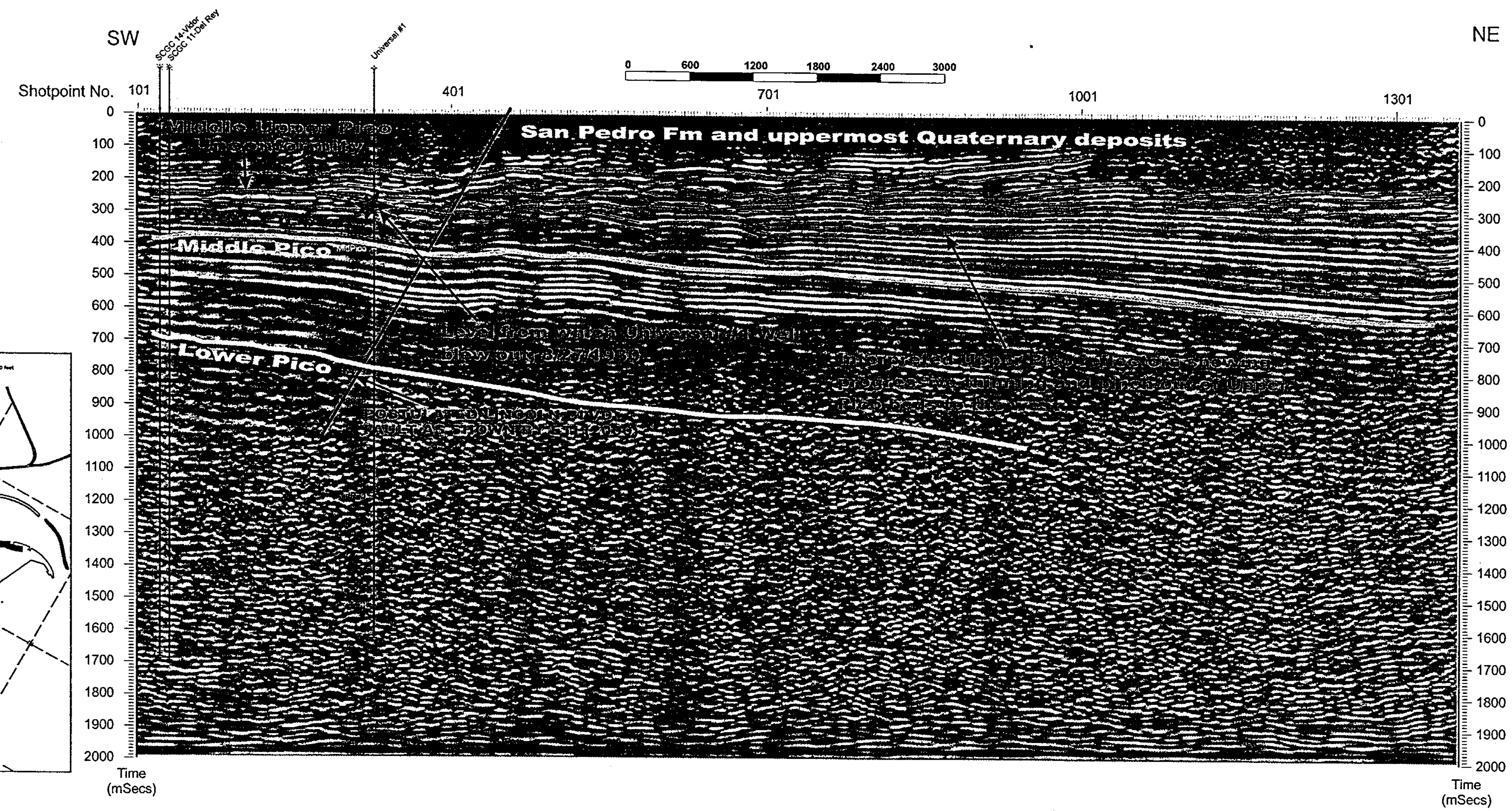

PROJECT INFORMATION

Playa Vista

pvhr2dmig_90.MIG.0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY CROSSLINE 25

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X v.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=600')
TIME SCALE	10 INCHES/1.6 SECONDS (1"=~600')
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	HiRes 2D Line.hgl
SEISMIC FILE:	PVHR2d_85.MIG.0.sgy
FILE DESCRIPTION:	HiRes 2D Line.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XX: Interpreted High Resolution 2D Seismic Line

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/9/2000	Plate XX~.cdr

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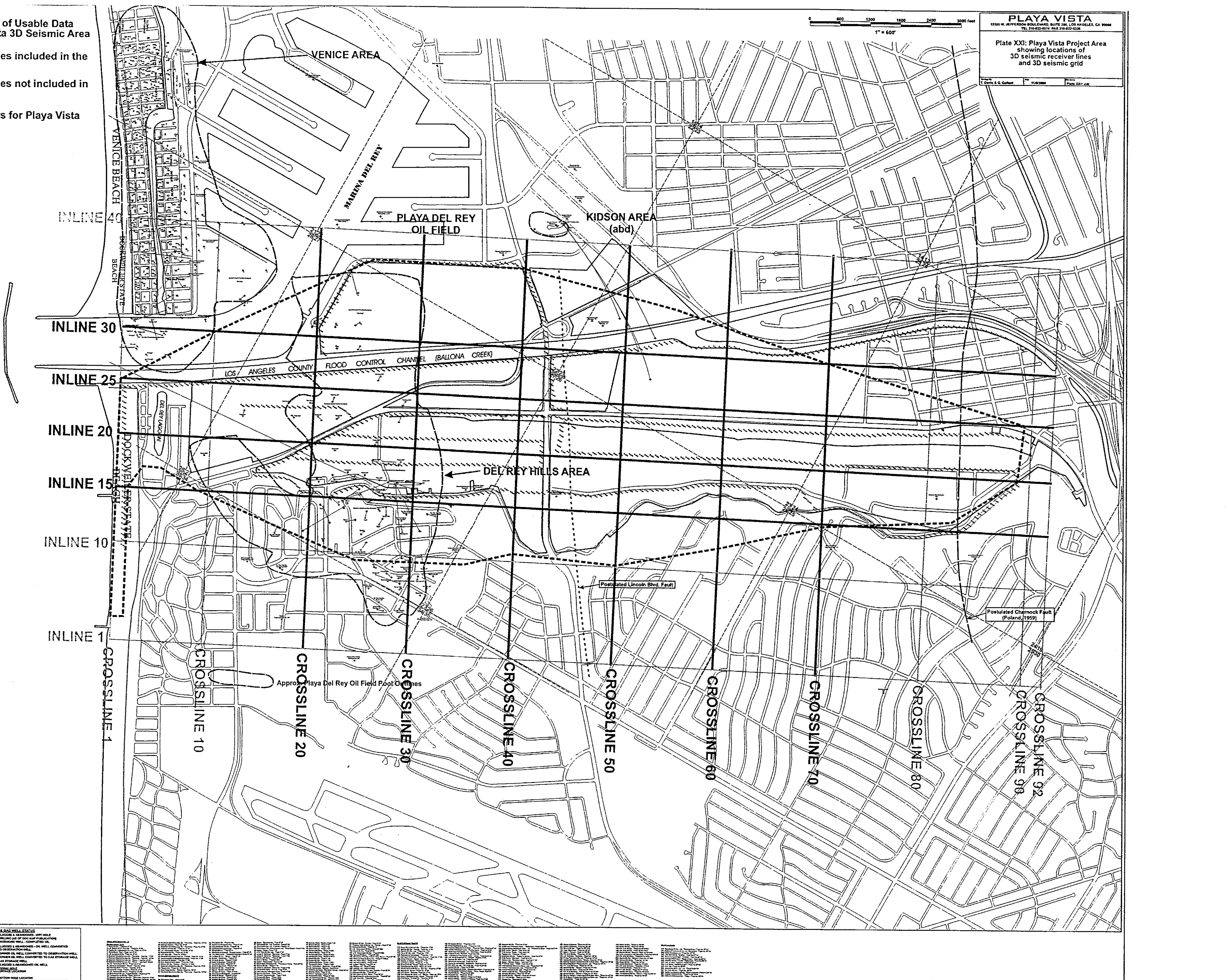

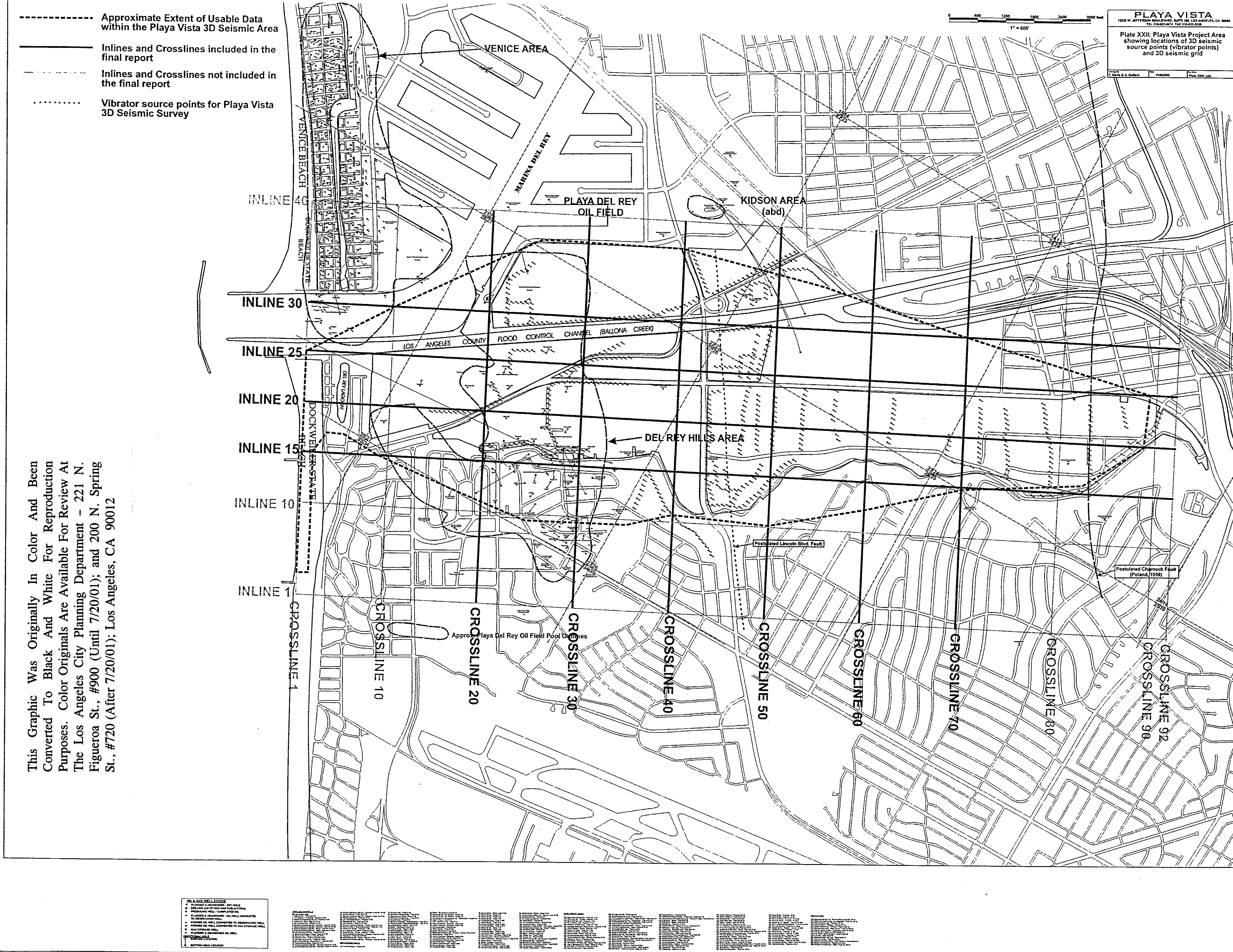

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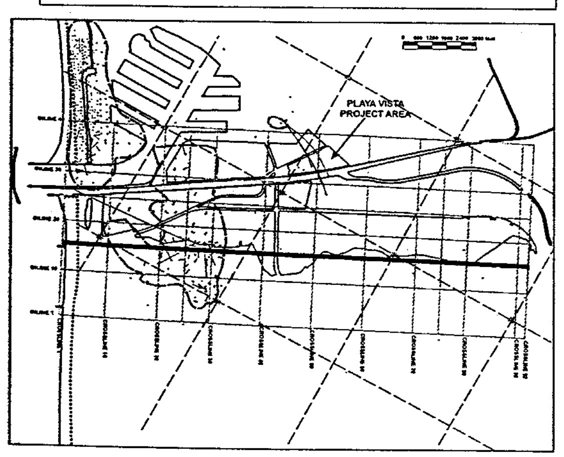
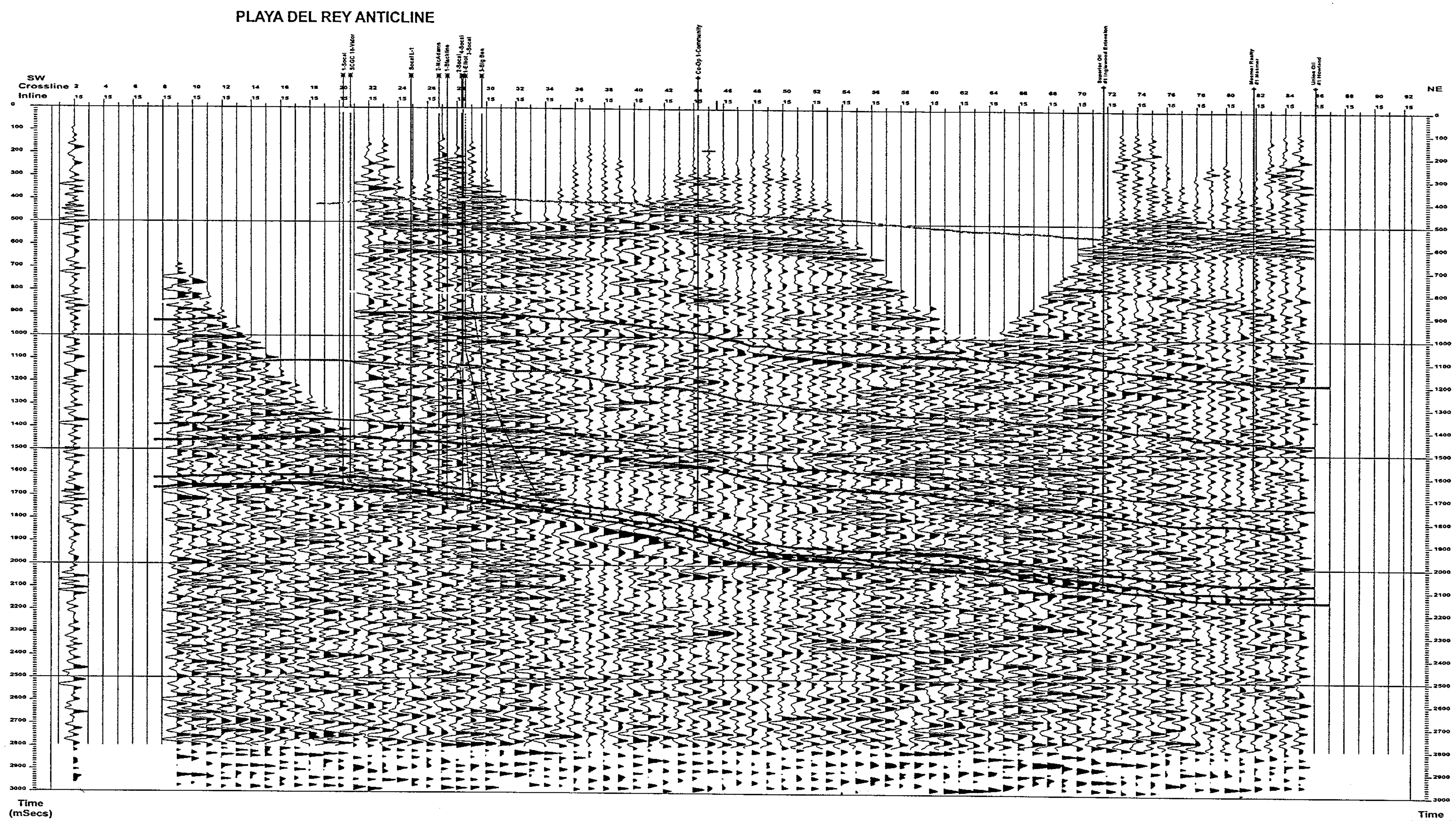
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista
pv3dfmig_90.MIG.0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY LINE 15

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X V.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=600')
TIME SCALE	10 INCHES/1.0 SECONDS (1"=600')
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	PV3Dline15.hgl
SEISMIC FILE:	pv3dfmig_90.MIG.0.sgy
FILE DESCRIPTION:	N/A
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIIIA: Playa Vista 3D Seismic Survey Interpreted Inline 15

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By	Date:	File Name:
T. Davis & G. Gallant	11/06/2000	Plate XXIIIA~.cdr

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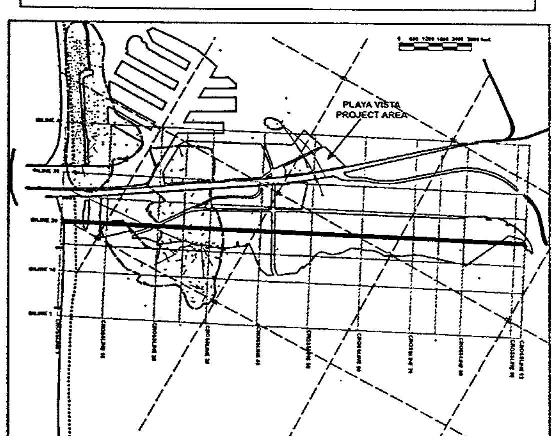
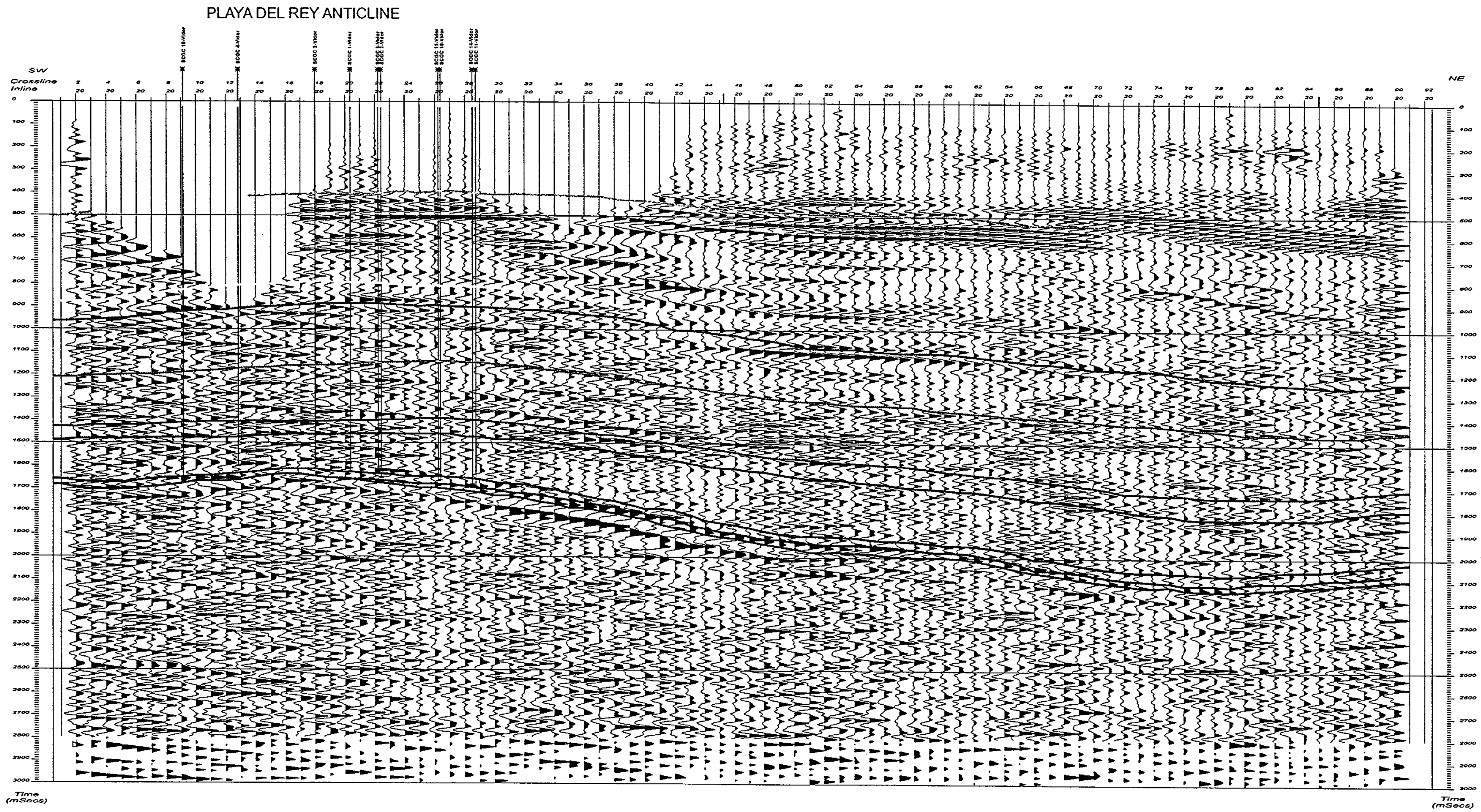
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista

pv3dfmig_90,MIG,0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY LINE 20

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X V.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=600')
TIME SCALE	10 INCHES/1.6 SECONDS (1"=400')
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	PV3Dline20.hgl
SEISMIC FILE:	pv3dfmig_90,MIG,0.sgy
FILE DESCRIPTION:	Line20_wi.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIIIB: Playa Vista 3D Seismic Survey Interpreted Inline 20

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/06/2000	Plate XXIIIB-.cdr

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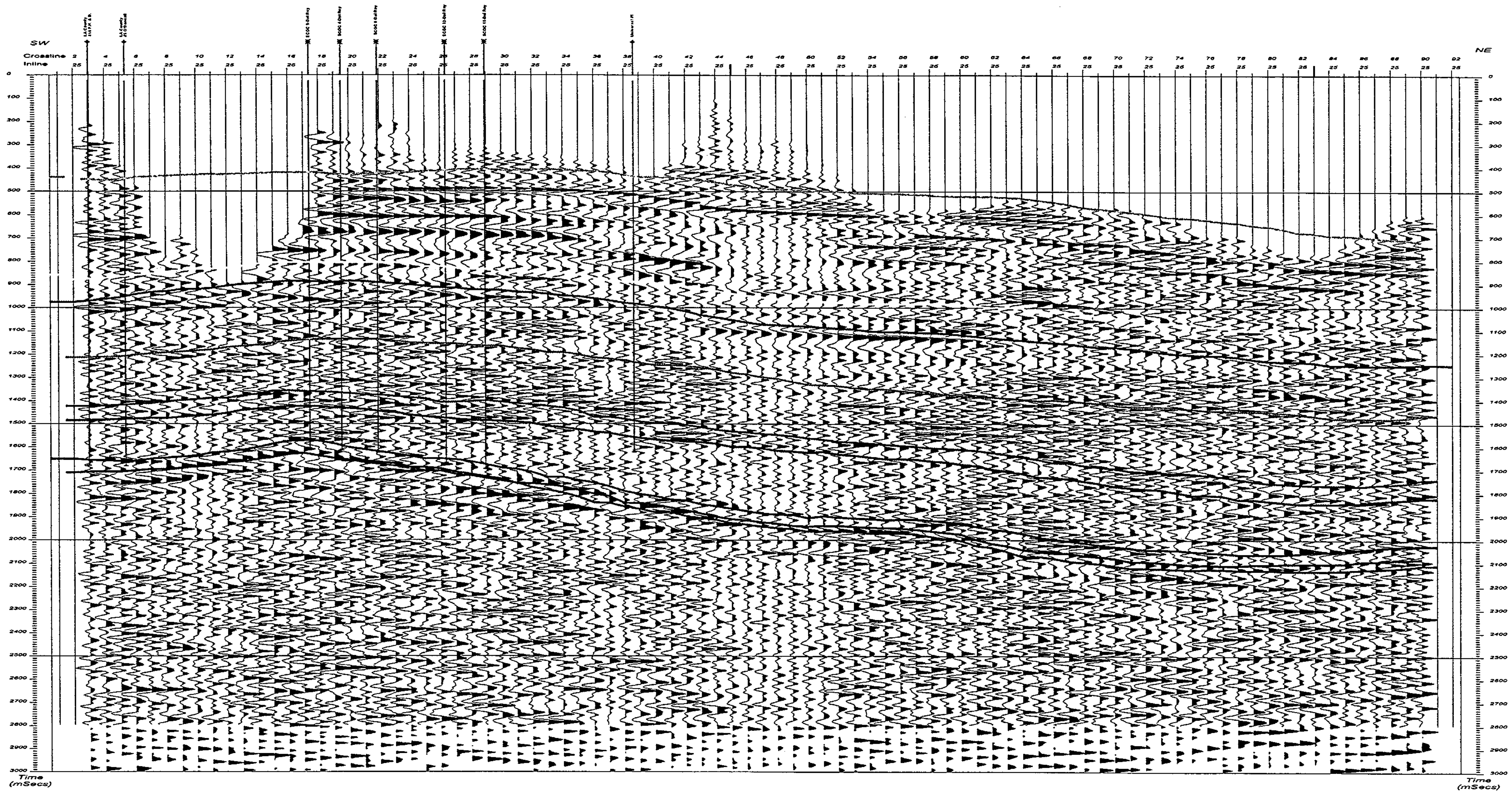
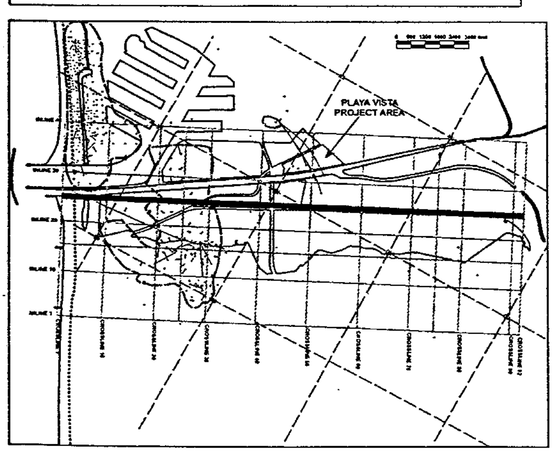
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista

pv3dfmig_90.MIG.0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY LINE 25

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X v3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=600')
TIME SCALE	10 INCHES/1.4 SECONDS (1"=600')
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	124
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	PV3Dline25.hgl
SEISMIC FILE:	pv3dfmig_90.MIG.0.sgy
FILE DESCRIPTION:	Line25_wt.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA
12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIIIC: Playa Vista 3D Seismic Survey Interpreted Inline 25

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/06/2000	Plate XXIIIC~.cdr

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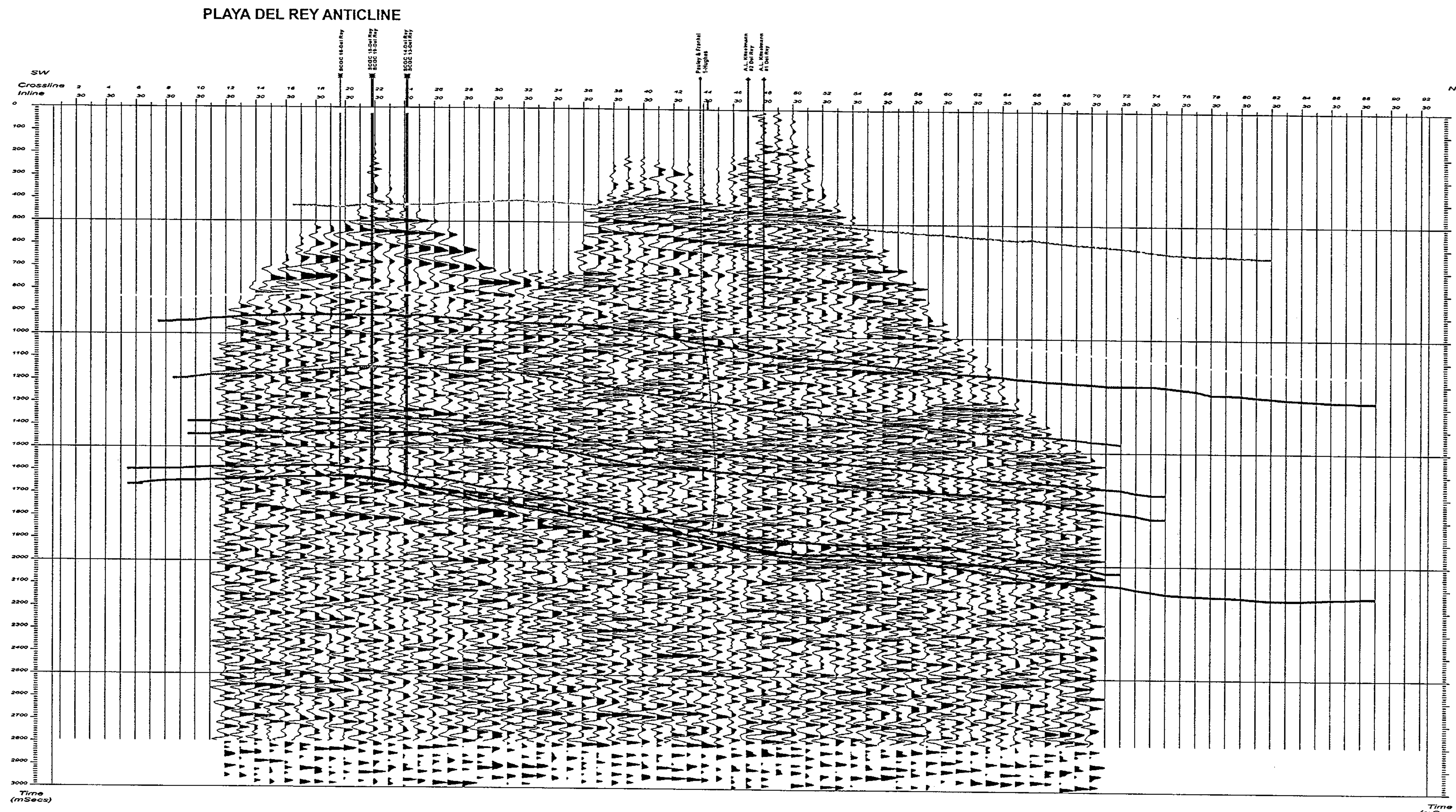
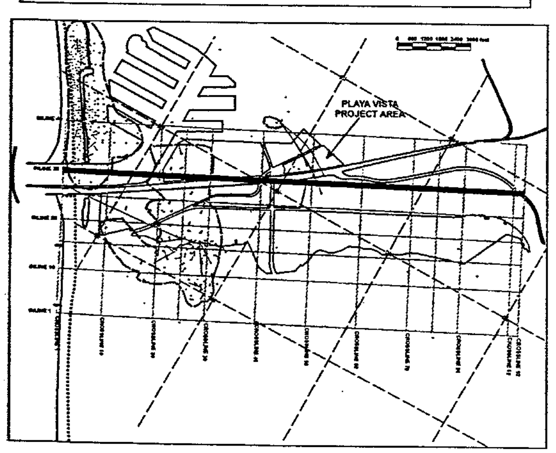
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

PLAYA VISTA 3D SEISMIC SURVEY
LINE 30

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X v.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH
TIME SCALE	10 INCHES/1.6 SECONDS
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	124
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	[illegible]
SEISMIC FILE:	[illegible]
FILE DESCRIPTION:	[illegible]
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIIID: Playa Vista 3D Seismic Survey Interpreted Inline 30

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA. 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/06/2000	Plate XXIIID~.cdr

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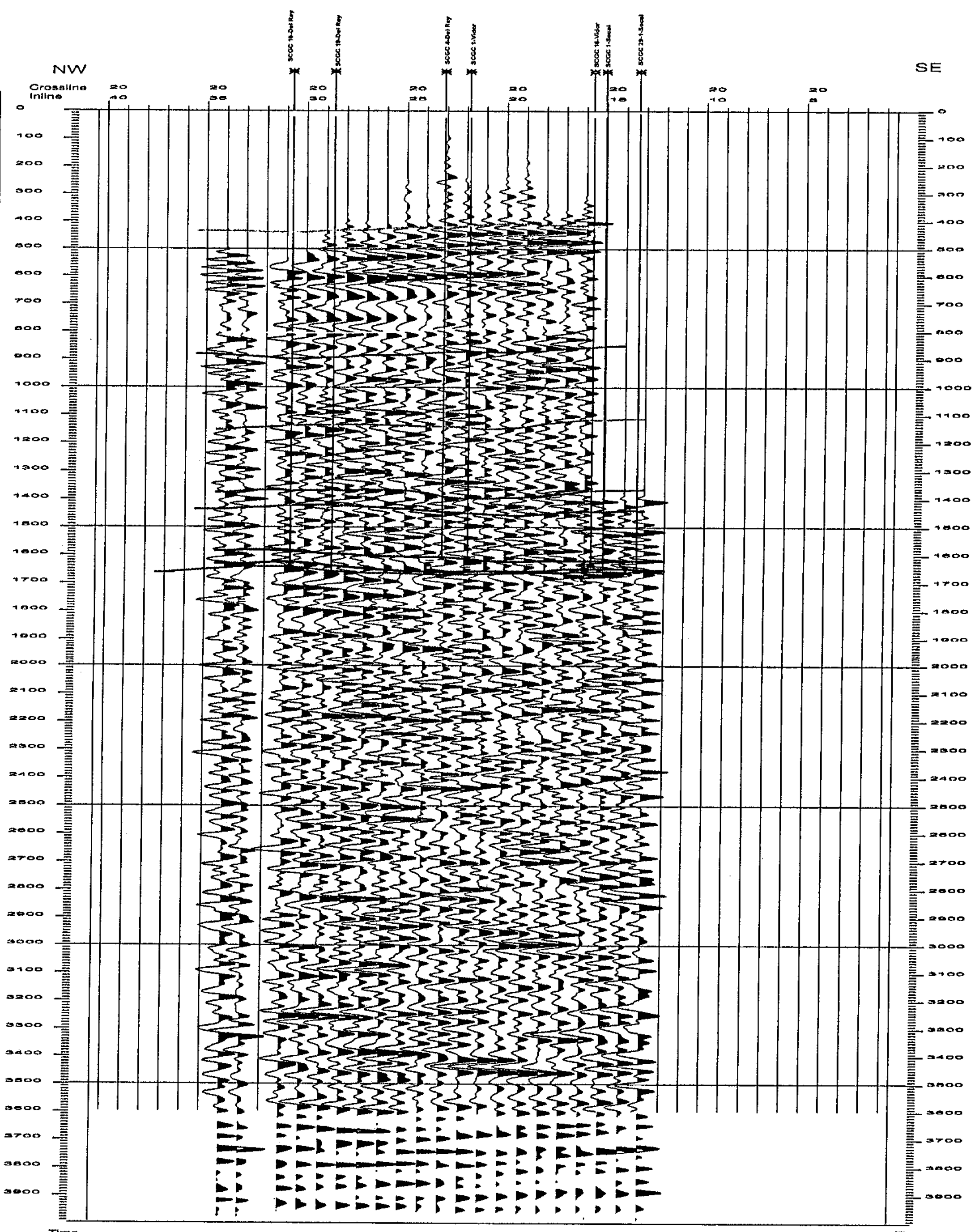
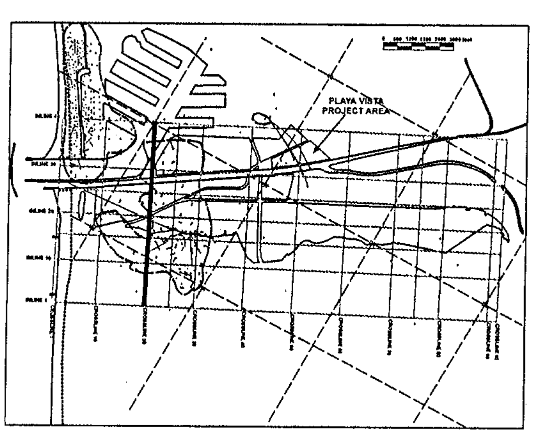
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista
pv3dfmig_98.MIG8.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY CROSSLINE 20

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC
PROCESSED BY:	TRICON GEOPHYSICAL INC
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X v.3.0 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.6 LINES / INCH
TIME SCALE	10 INCHES/1.0 SECONDS
EXCURSION	1.000000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	Crossline_20_wt.hal
SEISMIC FILE:	pv3dfmig_98.MIG8.sgy
FILE DESCRIPTION:	Crossline20_wt.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVA: Playa Vista 3D Seismic Survey Interpreted Crossline 20

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By	Date	File Name
T. Davis & G. Gallant	11/07/2000	Plate XXIVA-.cdr

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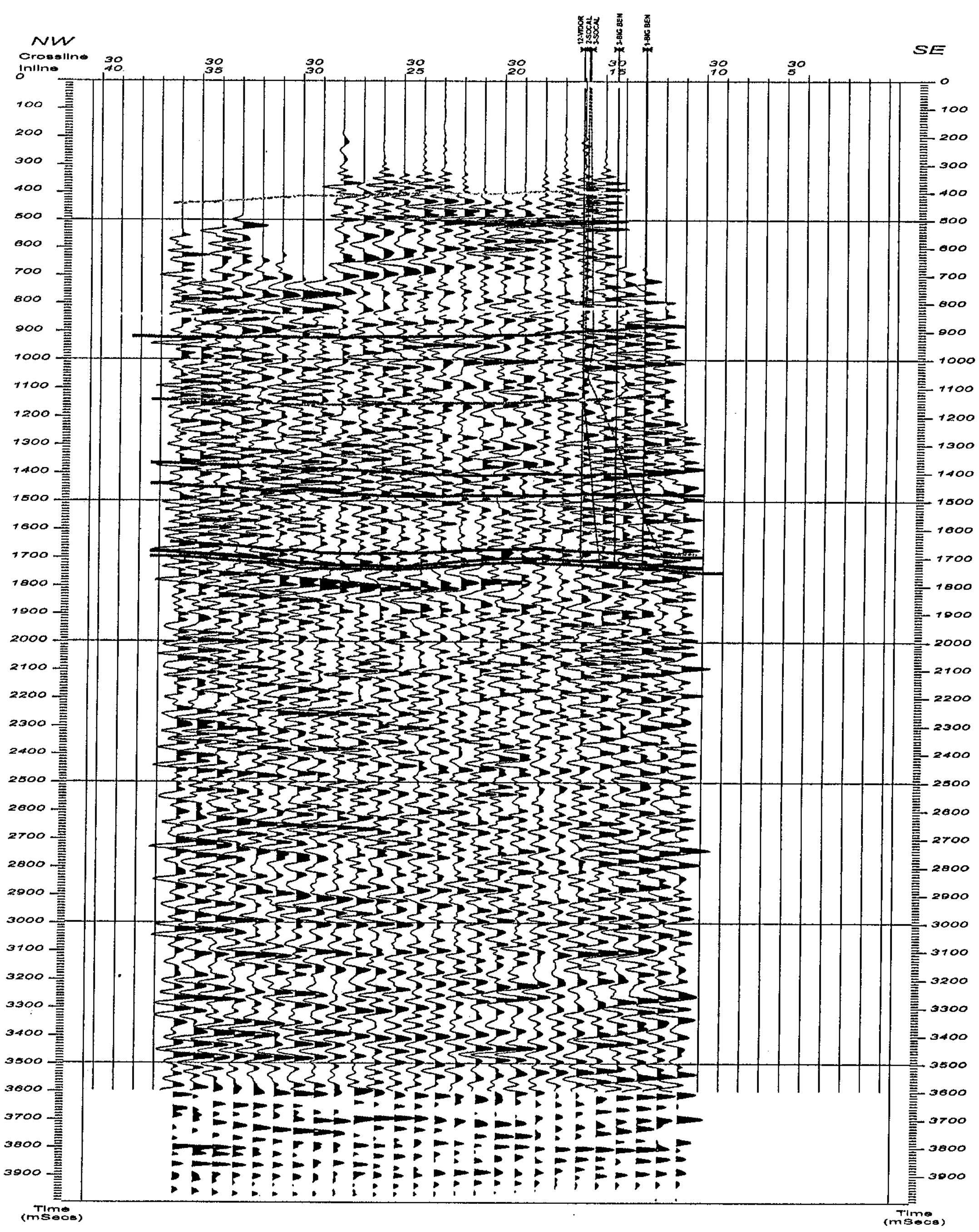
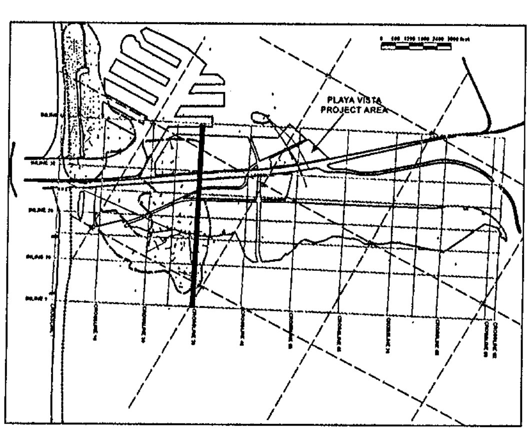
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista

pv3dfmig_30.MIG.8.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY CROSSLINE 30

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SECO, INC.
PROCESSED BY:	TRIGON GEOPHYSICAL INC
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X v3.6 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.6 LINES / INCH (1"=666')
TIME SCALE	10 INCHES/1.5 SECONDS (1"=-600')
EXCURSION	1.000000 TRACES
CLIPPING	1.000000 TRACES
VO_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	Crossline_30_wt.hgl
SEISMIC FILE:	pv3dfmig_30.MIG.8.sgy
FILE DESCRIPTION:	Crossline30_wt.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVB: Playa Vista 3D Seismic Survey Interpreted Crossline 30

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1826 FAX 818-838-0366 EMAIL davnamthom@aol.com

Drawn By	Date	File Name
T. Davis & G. Gallant	11/06/2000	Plate XXIVB - cdr

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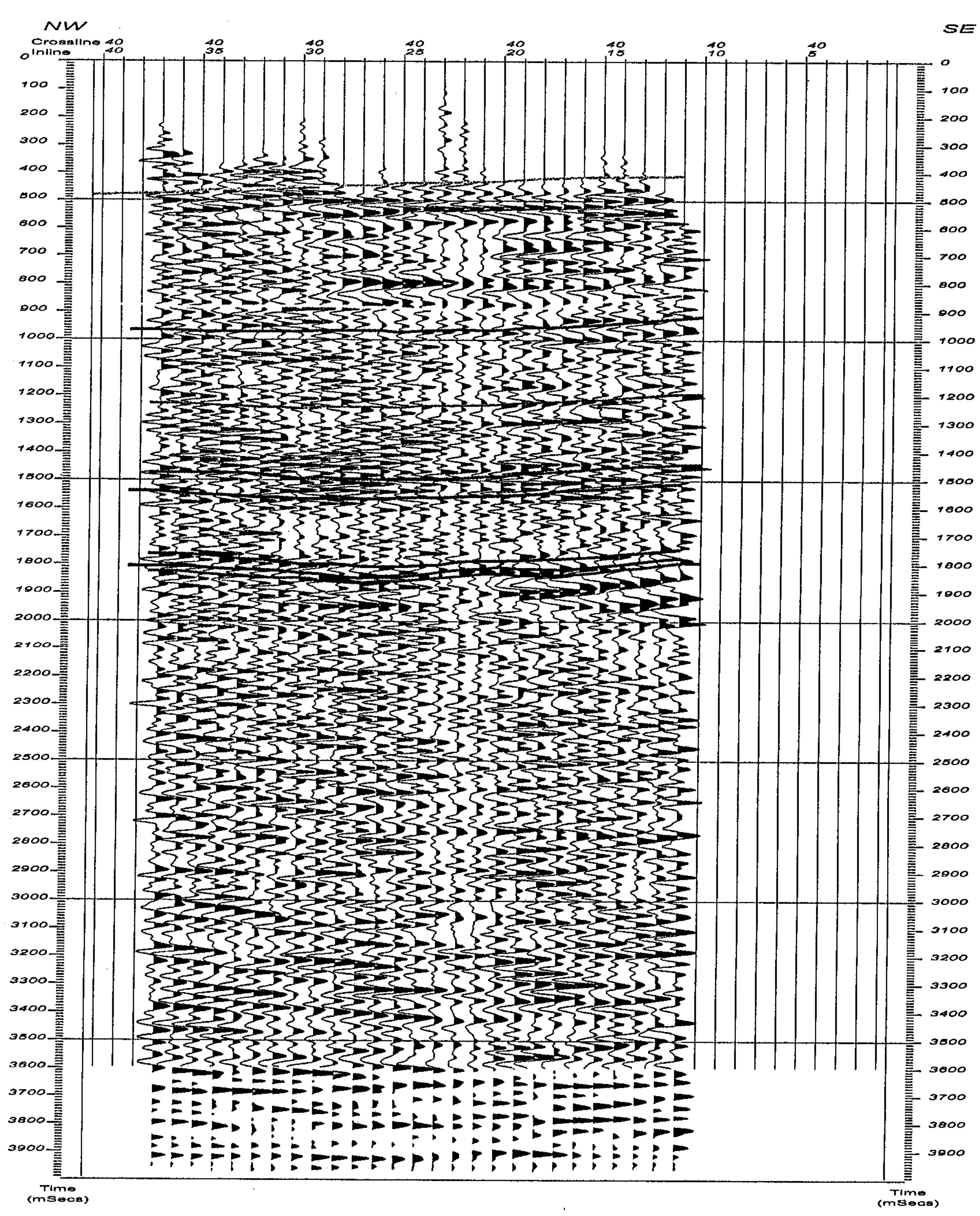
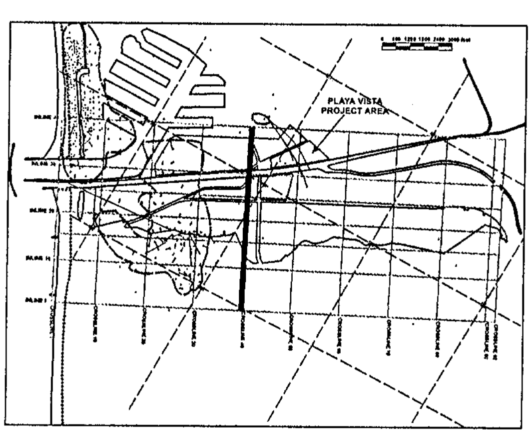
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

PLAYA VISTA 3D SEISMIC SURVEY CROSSLINE 40

SEISMIC PROCESSING AND ACQUISITION

DISPLAY PARAMETERS

PLOT SOURCE DATA

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVC:
Playa Vista 3D Seismic Survey
Interpreted Crossline 40

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By	Date	File Name
T. Davis & G. Gallant	11/06/2000	Plate XXIVC-.cdr

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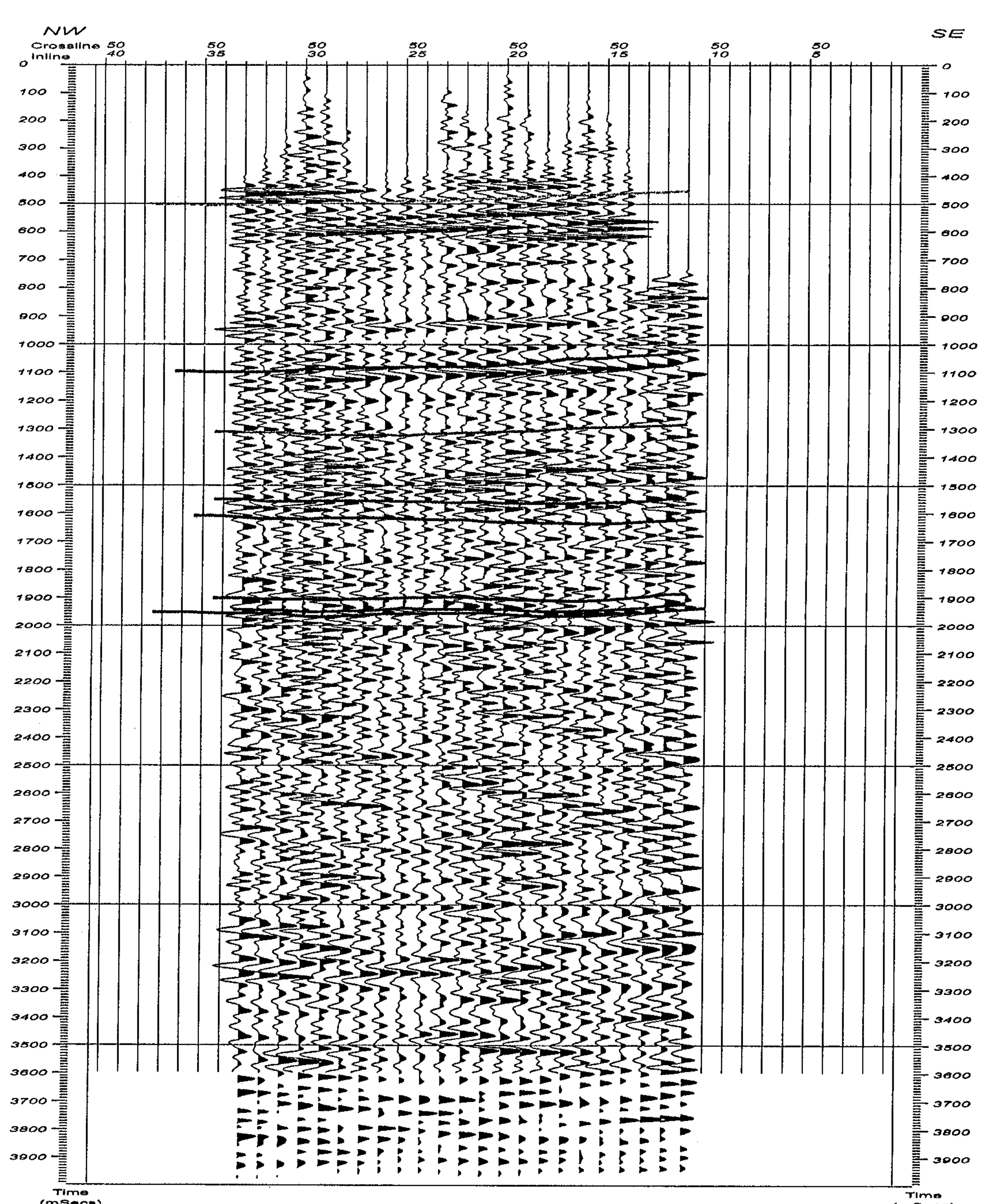
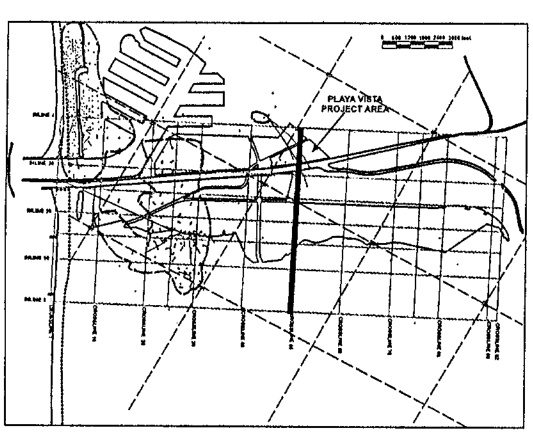
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

PLAYA VISTA 3D SEISMIC SURVEY
CROSSLINE 50

SEISMIC PROCESSING AND ACQUISITION

DISPLAY PARAMETERS

PLOT SOURCE DATA

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVD: Playa Vista 3D Seismic Survey Interpreted Crossline 50

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Drafted By	Date	File Name
T. Davis & G. Gallant	11/06/2000	Plate XXIVD-.cdr

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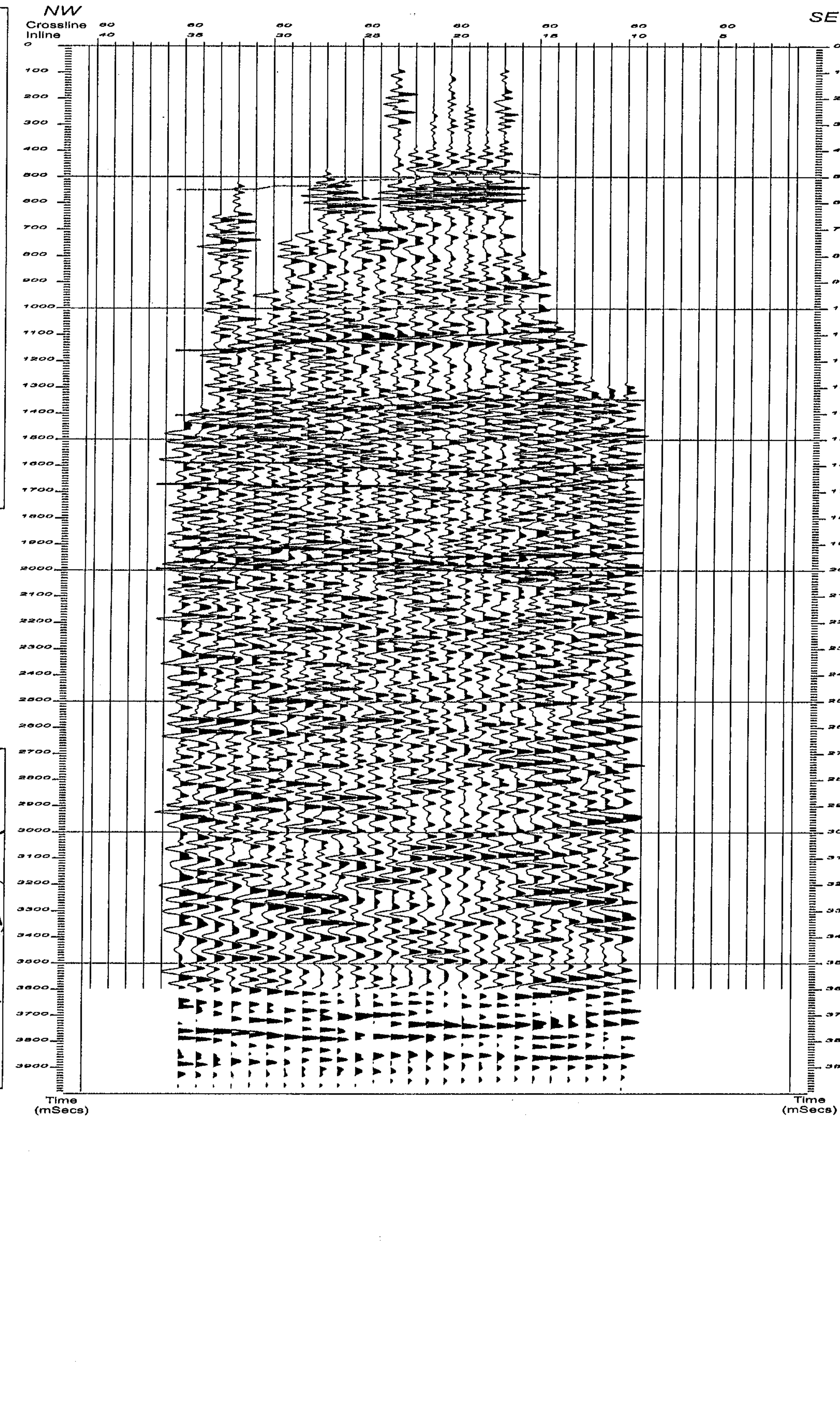
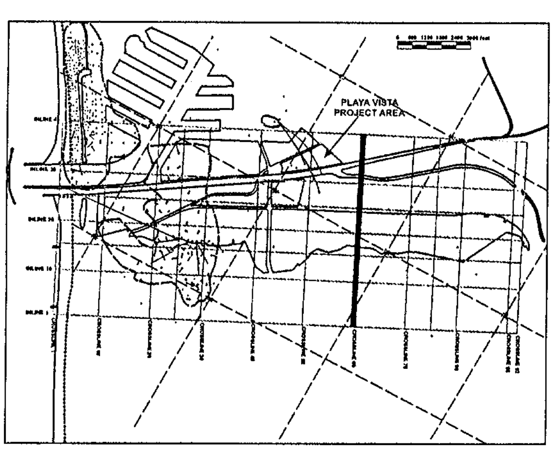
HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista
pv3dfmig_60.MIG.0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY
CROSSLINE 60

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	SEGO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X V.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.9

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=500')
TIME SCALE	15 INCHES/1.0 SECONDS (1"=-600')
EXCURSION	1.500000 TRACES
CLIPPING	1.000000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CDM FILENAME:	Crossline_60_wt.hgl
SEISMIC FILE:	pv3dfmig_60.MIG.0.sgy
FILE DESCRIPTION:	Crossline60_wt.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVE:
Playa Vista 3D Seismic Survey
Interpreted Crossline 60

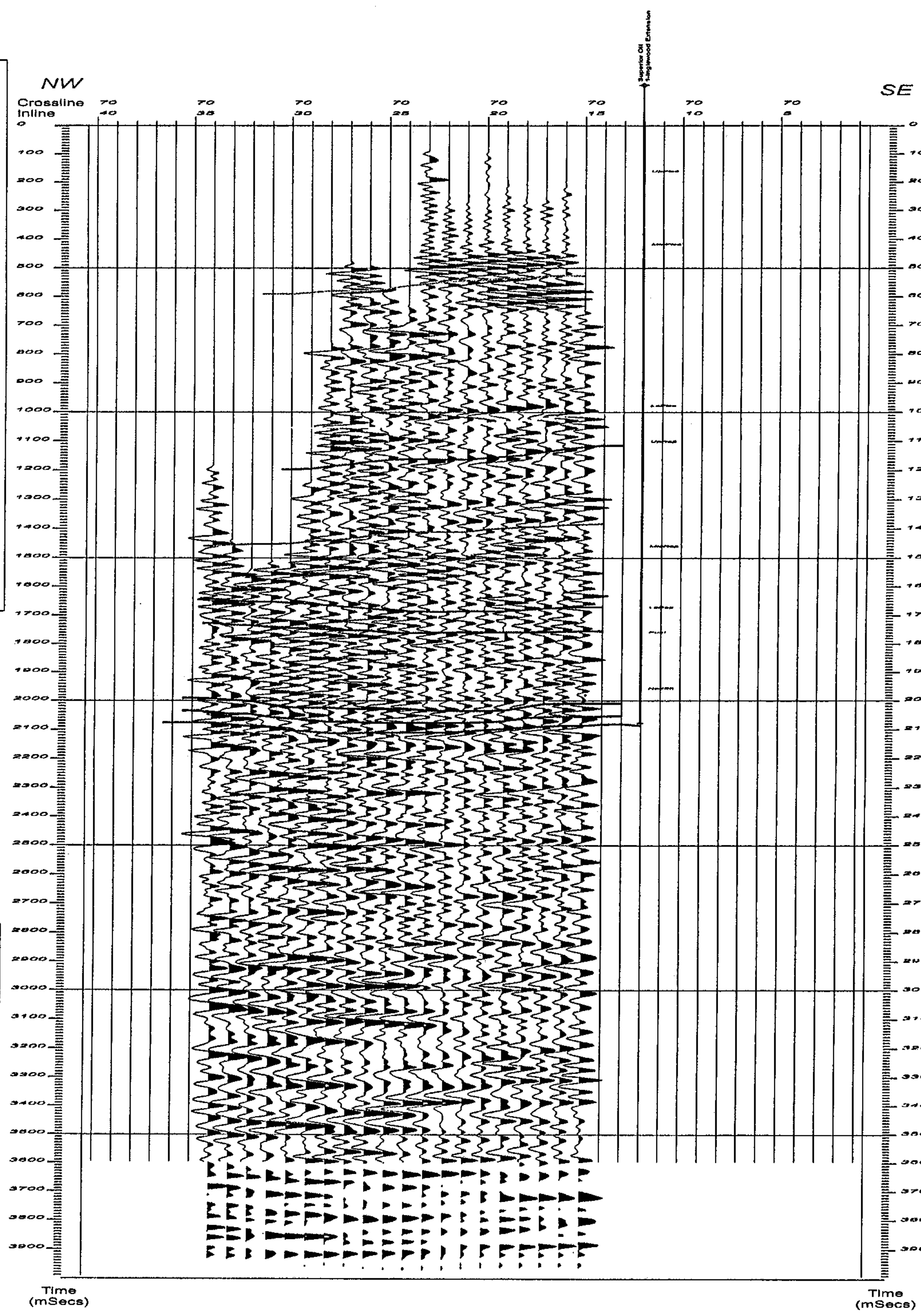
DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

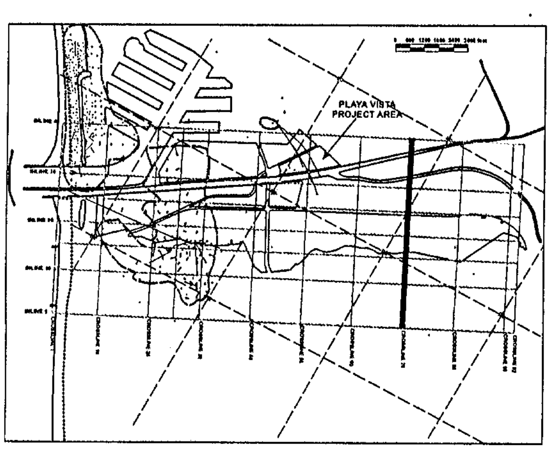
Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/07/2000	Plate XXIVE-.cdr

This Graphic Was Originally In Color And Been Converted To Black And White For Reproduction Purposes. Color Originals Are Available For Review At The Los Angeles City Planning Department - 221 N. Figueroa St., #900 (Until 7/20/01); and 200 N. Spring St., #720 (After 7/20/01); Los Angeles, CA 90012

HORIZON LEGEND

- Middle Pico
- Lower Pico
- Upper Repetto
- Middle Repetto
- Lower Repetto
- Puente
- Nodular Shale
- Schist Conglomerate
- Basement





PROJECT INFORMATION

Playa Vista
pv3dfmig_80.MIG.0.sgy

DATE: Mon Oct 23 2000

PLAYA VISTA 3D SEISMIC SURVEY CROSSLINE 70

SEISMIC PROCESSING AND ACQUISITION

ACQUISITION BY:	3ECO, INC.
PROCESSED BY:	TRICON GEOPHYSICAL INC.
INTERPRETATION BY:	DAVIS & NAMSON CONSULTING GEOLOGISTS
INTERPRETATION SOFTWARE:	SEIS-X V.3.5 (PARADIGM GEOPHYSICAL)
OUTPUT SOFTWARE:	CORELDRAW V.8

DISPLAY PARAMETERS

LINE SCALE	3.0 LINES / INCH (1"=400')
TIME SCALE	10 INCHES/1.0 SECONDS (1"=~400')
EXCURSION	1.500000 TRACES
CLIPPING	1.500000 TRACES
VD_CLIP_INDEX	128
MIN SCALE VALUE	AUTO
MAX SCALE VALUE	AUTO
SCALE TYPE	PEAK
SCALE MODE	TRACE MODE
PLOT DIRECTION	LTOR
POLARITY	NORMAL
DISPLAY MODE	VA WIGGLE
BIAS	0 TRACE SPACINGS

PLOT SOURCE DATA

CGM FILENAME:	Crossline_70_wt.hgl
SEISMIC FILE:	pv3dfmig_80.MIG.0.sgy
FILE DESCRIPTION:	Crossline70_wt.cdr
SYSTEM NAME:	bigdell
USER ID:	Administrator

PLAYA VISTA

12555 W. JEFFERSON BOULEVARD, SUITE 280, LOS ANGELES, CA 90066
TEL 310-822-0074 FAX 310-822-5336

Plate XXIVF: Playa Vista 3D Seismic Survey Interpreted Crossline 70

DAVIS & NAMSON - CONSULTING GEOLOGISTS
301 S. Maclay St., Suite 201, San Fernando, CA, 91340
TEL 818-838-1828 FAX 818-838-0366 EMAIL davnamthom@aol.com

Geology By:	Date:	File Name:
T. Davis & G. Gallant	11/07/2000	Plate XXIVF-.cdr