Appendix E, **Geotechnical Reports**

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL
CONSULTANTS

LIMITED GEOTECHNICAL OBSERVATION

PROPOSED OFF-SITE SEWER, WATER, AND RECYCLED WATER IMPROVEMENTS ASSOSCIATED WITH BUTTERFIELD PROPERTY
HIGHLAND SPRINGS AVENUE AND BROOKSIDE AVENUE
BANNING, CALIFORNIA

PREPARED FOR

PARDEE HOMES
C/O HUGH HEWITT
IRVINE, CALIFORNIA

DECEMBER 11, 2007
PROJECT NO. T2305-22-02

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS

Project No. T2305-22-02
December 11, 2007

Pardee Homes
c/o Hewitt & O'Neil
19900 MacArthur Boulevard, #1050
Irvine, California 92612
Attn: Mr. Hugh Hewitt

SUBJECT: PROPOSED OFF-SITE SEWER, WATER, AND RECYCLED WATER IMPROVEMENTS ASSOCIATED WITH BUTTERFIELD PROPERTY
HIGHLAND SPRINGS AVENUE AND BROOKSIDE AVENUE
BANNING, CALIFORNIA
LIMITED GEOTECHNICAL OBSERVATION

Dear Mr. Hewitt:

In accordance with the request of Pardee Homes, and our work order dated November 13, 2007 (W.O. No. 426002A000), we have performed a limited geotechnical observation of the proposed sewer, water, and recycled water improvement routes for the subject project. The accompanying report presents the findings of our study and our recommendations relative to the geotechnical aspects of developing the off-site improvements as presently proposed.

It is our opinion that from a geotechnical standpoint, the proposed sewer, water, and recycled water alignments can be developed as planned in any of the presently proposed alignments. Neither existing topography, soil, nor geotechnical conditions were observed during this investigation that would preclude the construction of the proposed alignments. All proposed alignments are expected to be in alluvial soil comprised mostly of sand, gravel, and cobbles. No bedrock materials should be encountered in any of the proposed alignments.

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Jelisa Thomas

Jelisa Thomas
Staff Engineer

Scott Pearson

Scott Pearson
PG 6931

REGISTERED GEOLOGIST
SCOTT N. PEARSON
No. 6931
5/31/08
STATE OF CALIFORNIA

(6) Addressee
CC: Thuc Miyashiro – Pardee Homes
Michael Heishman – Pardee Homes

TABLE OF CONTENTS

LIMITED GEOTECHNICAL OBSERVATION

1. PURPOSE AND SCOPE

This report presents the findings of a limited geotechnical observation for proposed sewer, water, and recycled water improvements and facilities associated with the Butterfield property, located east of Highland Springs Avenue and north of Wilson Street Banning, Riverside County, California (see *Vicinity Map*, Figure 1). The purpose of the observation was to obtain reconnaissance-level geotechnical information to be used as a tool in the selection of the off-site sewer, water, and recycled water alignments, and based on that information, provide recommendations pertaining to the geotechnical aspects of developing the alignments as presently proposed. Based on our findings, no geotechnical constrains were found that would prevent the development of any of the proposed sewer, water, or recycled water alignment routes.

The scope of the observation included a review of recent and historic aerial photographs, a review of pertinent geologic maps and literature, a site reconnaissance of the potential wet utility alignments, and preparation of this report.

2. SITE AND PROJECT DESCRIPTION

The Butterfield property, associated with the proposed improvements and facilities, is located at the east corner of Highland Springs Avenue and north of Wilson Street in Banning, Riverside County, California. The proposed improvements include a sewer alignment, three alternatives for a water alignment, and a recycled water alignment. Topographically, these areas are generally flat with a few small hills, and slopes gently to the south and southeast.

Any changes in the design, location, or elevation of the proposed alignments as outlined in this report should be reviewed by this office. Geocon Inland Empire, Inc. should be contacted to determine the necessity for review and possible revision of this report.

3. AERIAL PHOTO REVIEW

3.1 General

Aerial photographs for the general site vicinity of the alignments were obtained from the City of Riverside Flood Control and Water Conservation District, and reviewed to observe the site history, and identify geotechnical issues which may impact development. All photos available were from relatively high altitude, so some fine details may have been indiscernible. Table 3.1 provides a comprehensive list of the photographs reviewed.

TABLE 3.1
AERIAL PHOTOS REVIEWED

Photo Dates	Photo Numbers
1962	226-228 272-273 258-259 300-301
1974	105-111 180-183
1980	105-110 182-186
1984	1458-1462 1546-1548 1653-1659
1990	3-36 - 3-42 4-36 - 4-42 5-43 - 5-50
1995	3-36 - 3-40 4-38 - 4-42 5-41 - 5-47
2000	3-38 - 3-41 4-40 - 4-45 5-41 - 5-47
2005	3-37 - 3-41 4-39 - 4-47 5-37 - 5-46

Nobel Street

1962 and 1974: Well established street surrounded by some developed and mostly undeveloped land. No topographic highs or lows were observed.

1980, 1984, and 1990: Well established street surrounded by a mixture of developed land and undeveloped land. No topographic highs or lows observed.

1995: Well established street surrounded by increasing ratio of developed land to undeveloped land. No topographic highs or lows observed.

2000 and 2005: Well established street surrounded by residential development with some vacant land. No topographic highs or lows observed.

Cherry Avenue

1962 and 1974: Well established street surrounded by some developed and mostly undeveloped land. Observed a small hill in Cherry Avenue near the intersection of High Street. Change in topographic relief in this area of Cherry Avenue is approximately 15 feet, and may need to be addressed for a pipeline alignment.

1980, 1984, and 1990: Well established street surrounded by a mixture of developed land and undeveloped land. No topographic changes observed.

1995: Well established street surrounded by increasing ratio of developed land to undeveloped land. No topographic changes observed.

2000 and 2005: Well established street surrounded by residential development with some vacant land. No topographic changes observed.

Dutton Street

1962 and 1974: Well established street surrounded by some developed and mostly undeveloped land. No topographic highs or lows were observed.

1980, 1984, and 1990: Well established street surrounded by a mixture of developed land and undeveloped land. No topographic highs or lows observed.

1995: Well established street surrounded by increasing ratio of developed land to undeveloped land. No topographic highs or lows observed.

2000 and 2005: Well established street surrounded by residential development with some vacant land. No topographic highs or lows observed.

Brookside Avenue

1962: West of Highland Springs Road, well established street surrounded by some developed and mostly undeveloped land. East of Highland Springs Road undeveloped roadway extends approximately 2500 feet to the east. Area east of Highland Springs Road is generally vacant with several stream channels and small topographic changes observed in the vicinity.

1974: West of Highland Springs Avenue, well established street surrounded by increased development to the north, mixture of developed and undeveloped land to the south. East of Highland Springs Road no significant change to roadway, surrounding land, or topography observed.

1980: West of Highland Springs Avenue, well established street surrounded by mostly developed land to the north, mixture of developed and undeveloped land to the south. East of Highland Springs Road no significant change to established roadway, surrounding land, or topography observed

1984: West of Highland Springs Avenue no significant change to established street, surrounding land, or topography observed. East of Highland Springs Road, an undeveloped roadway contours the southern edge of a golf course and meets back with the straight projection of the western portion of Brookside Avenue. A stream channel just north of the roadway east of the golf course was observed running parallel to Brookside Avenue. Area east of Highland Springs Road remains generally vacant. Several stream channels and gentle topographic changes observed in the vicinity.

1990, 1995, 2000, and 2005: West of Highland Springs Avenue, well established street surrounded by residential development to the north, increased ratio of developed to undeveloped land to the south. East of Highland Springs Road, no significant change to roadway, surrounding land, or topography observed.

Bellflower Avenue

1962 and 1974: Well established street surrounded by some developed and mostly undeveloped land. No topographic highs or lows were observed.

1980, 1984, and 1990: Well established street surrounded by a mixture of developed land and undeveloped land. No topographic highs or lows observed.

1995: Well established street surrounded by increasing ratio of developed land to undeveloped land. No topographic highs or lows observed.

2000 and 2005: Well established street surrounded by residential development with some vacant land. No topographic highs or lows observed.

Highland Springs Road

1962: Well established street surrounded by relatively flat, vacant land.

1974, 1980, 1984, 1990, 1995, and 2000: No significant changes to roadway observed. Stream channels running generally north south observed in surrounding area. Irrigation channels running generally south east observed in the surrounding western area. No topographic highs or lows observed.

2005: No significant change to established street observed. To the west, a residential development occupies some of the previously vacant land. Land to the east remains vacant. No topographic highs or lows observed.

Highland Home Road

1962: No established street, surrounding land is relatively flat and vacant with several small streams to the west.

1974, 1980, and 1984: Established roadway from Wilson Avenue to approximately 1/3 mile north. No established road observed north of this point. Northern area consists of vacant land with several small streams and gentle topographic highs and lows observed.

1990, 1995, 2000, and 2005: Established roadway from Wilson Avenue to approximately 1/3 mile north. Even less established non-straight roadway observed as access to northern vacant, undeveloped land. No significant change to surrounding land or topography observed.

Wilson Street

1962, 1974, and 1980: Well established street bordered by a mixture of developed and undeveloped land to the south, and mostly undeveloped land to the north. Smith Creek stream channel observed crossing underneath the street between Highland Springs Avenue and Highland Home Road. No major topographic highs or lows observed.

1984, 1990, and 1995: Well established street surrounded by an increased ratio of developed land to undeveloped land. No significant change to established roadway, surrounding land, or topography observed.

2000 and 2005: Well established street surrounded by an increasing ratio of developed to undeveloped land. No significant change to established roadway, surrounding land, or topography observed.

Sunset Avenue

1962, 1974, 1980, and 1984: North of Interstate 10, well established street surrounded by a mixture of relatively flat, developed and undeveloped land. South of Interstate 10 less established roadway surrounded by undeveloped land. South of Lincoln Street, small hills observed.

1990: No significant change to established roadway, surrounding land, or topography observed north of Interstate 10. South of Interstate 10, established roadway surrounded by vacant land to the west and under-development land to the east of Lincoln Avenue with no significant change to established roadway or topography.

1995, 2000, and 2005: No significant change to established roadway or topography observed. South of Westward Street, stream channel running southeast observed crossing undeveloped portion of Sunset Ave.

Omar Street

1962, 1974, 1980, 1984, and 1990: Street observed with surrounding land containing several stream channels running southeast. Area appears to slope to the south.

1995, 2000, and 2005: Well established streets surrounded by residential development. No change in topography observed.

Ramsey Avenue

1962, 1974, 1980, and 1984: Well established road surrounded by a mixture of developed and undeveloped land. No major topographic highs or lows observed.

1990, 1995, 2000, and 2005: Surrounding area is mostly developed. No significant changes in established roadway or topography.

Lincoln Street

1962, 1974, 1980, 1984, 1990, 1995, 2000, and 2005: Well established road surrounded by a mixture of developed and undeveloped land. Stream channel running south southeast observed crossing Lincoln Street near Roberge Avenue. No major topographic highs or lows observed.

San Gorgonio Avenue

1962, 1974, 1980, 1984, 1990, 1995, 2000, and 2005: Well established street surrounded by a mixture of developed and undeveloped land. North of Charles Street, no topographic highs or lows observed. South of Charles Street several stream channels crossing the area running towards the southeast as well as small topographic changes.

Hathaway Street

1962, 1974, 1980, 1984, 1990, 1995, 2000, and 2005: Well established roads surrounded by a mixture of developed and undeveloped land. No major topographic highs or lows observed.

Charles Street

1962, 1974, 1980, 1984, 1990, 1995, 2000, and 2005: Well established roads surrounded by a mixture of developed and undeveloped land. No major topographic highs or lows observed.

4. GEOLOGIC MAPS AND LITERATURE

4.1 Soil and Geologic Conditions

Based on a review of geotechnical maps and literature, the area is underlain by Pleistocene Age alluvial fan deposits. The majority of the area is underlain by alluvial fan deposits of the San Gorgonio Pass which consist of sand and gravel of plutonic and gneissic detritus derived from the San Bernardino Mountains to the north. The northern portions of Noble Street, Cherry Avenue and Dutton Street are underlain by dissected sand and gravel alluvial fan deposits. The northerly most portion of Noble (where the three proposed routes meet to go to the point of connection) is underlain by alluvial gravel and sand stream channel deposits. No bedrock materials are anticipated to be encountered in any of the proposed alignments.

4.2 Geologic Hazards

The site is located within a seismically active region near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas and San Jacinto fault zones.

By definition of the California Geologic Survey, an active fault has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). A potentially active fault is one, which has been active during the Quaternary Period (last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazards Zones Act of 1972 and as revised in 1994, 1997 and 2003, as the Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain habitable structures across the trace of known active faults. The principal seismic considerations for most structures in Southern California are surface rupturing of fault traces and damage caused by ground shaking or seismically induced ground settlement.

Based on our review of the referenced literature, the proposed sewer, water, and recycled water alignments do not lie within an Alquist-Priolo earthquake fault zone. No active or potentially active faults with the potential for surface fault rupture are known to pass beneath the proposed alignments. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

5. SITE RECONNAISSANCE

A site reconnaissance was performed on December 5, 2007 and consisted of observing existing street conditions, utility alignments, topographic conditions, and the area surrounding the proposed alignments alternatives.

5.1 Proposed Sewer Alignment

The proposed sewer alignment would join existing trunk sewer lines at the Wilson Street and Highland Home Road intersection, continue eastward on Wilson Street, south on Omar Street, and eastward on Ramsey Street to south on Sunset Avenue, continue eastward on Lincoln Street, and south on San Gorgonio Avenue to connect with the existing sewer trunk line at the San Gorgonio and Westward Avenue intersection (See Figure 2). An alternative would include the construction of a sewer lift station at the corner of Ramsey Street and Omar Street, as well as new off-site force main sewers within Omar Street and Wilson Street, or within Ramsey Street and Highland Home Road.

On Highland Home Road existing water, storm drain improvements were observed. Electric lines were observed to be above ground. An existing drainage ditch was observed running along the west side of Highland Home Road. The drainage crosses Wilson Street and continues in a southward direction. Highland Home road was observed to be in good condition, relatively straight, and sloping gently to the south.

On Wilson Street, existing underground sewer, water, electric, and storm drain improvements were observed. Wilson Street was observed to be in good condition, relatively straight, and gently sloping to the east.

On Omar Street, existing underground water and storm drain improvements were observed. Electric lines were observed above ground. Omar Street was observed to be in good condition, relatively straight, and gently sloping to the south.

On Ramsey Street existing underground sewer, water, electric, and storm drain improvements were observed. Ramsey Street was observed to be in good condition, with a non-linear alignment, contains gently rolling hills, and slopes to the south.

On Sunset Avenue existing underground sewer and water improvements were observed. Electric lines were observed to be above ground. South of Interstate 10, existing underground cable/telephone improvements was observed, as well as a drainage ditch on the west side of the street. Sunset Street was observed to be relatively straight, in poor to fair condition with recent trenching activities evident, and sloping to the south.

On Lincoln Street existing underground sewer, water, and gas improvements were observed. Electric lines were observed to be above ground. Drainage improvements for the Montgomery Creek stream channel were observed crossing Lincoln Street, near Adams Street. In this vicinity, the street was observed to be in fair to good condition, relatively straight, with gentle rolling topography. Beyond 16th Street, Lincoln street was observed to be relatively flat and gently sloping to the south.

On San Gorgonio Avenue, existing underground water and storm drain improvements were observed. Electric lines were observed to be above ground in this section of the street. San Gorgonio Avenue was observed to be in fair to good condition with some cracking of the existing asphalt concrete, relatively straight, and gently sloping to the south.

5.2 Proposed Water Alignment

The proposed water alignment alternatives are referred to as Alternative A, Alternative B, and Alternative C and include a pump station at the point of connection at the intersection of Orchard Street and Nobel Street (See Figure 3). Alternative A would travel south on Noble Street and east on Brookside Avenue to the project site; Alternative B would travel south on Noble Street, east on Dutton Street, south on Cherry Avenue and east on Brookside Avenue to the project site; Alternative C would travel south on Noble Street, east on Dutton Street, south on Bellflower Avenue and east on Brookside Avenue to the project site.

From the proposed point of connection to the intersection of Nobel Street and Dutton Street, Nobel Street was observed to have gently rolling topography and has a nonlinear roadway alignment. On the eastern connection of the proposed line, no established roadway was observed east of Highland Springs Road. Part of a golf course is in the proposed projection of the water alignment. The vacant land surrounding the golf course was inaccessible at the time of our observations.

5.2.1 Alternative A

On Nobel Street existing underground water, electric, and storm drain improvements were observed. Electric lines were also observed above the ground. Nobel Street was observed to be in good condition, relatively straight, and gently sloping south.

On Brookside Avenue existing underground sewer, water, and storm drain improvements were observed. Electric lines were observed to be above ground. Open water drainage pipes (up to approximately 18 inches in diameter) were observed crossing Brookside Avenue near the intersections with Nobel Street, Cherry Street, and Bellflower Avenue. Brookside Avenue was observed to be in poor to fair condition with cracking of the existing asphalt concrete, relatively straight, and gently sloping east with a small downgrade towards the east at the Cherry Avenue Intersection.

5.2.2 Alternative B

On Dutton Street, existing underground water was observed. Electrical lines were observed to be above ground. Dutton Street was observed to be in fair condition, relatively straight, and sloped up to meet Cherry Avenue.

On Cherry Avenue existing underground water was observed. Electrical lines were observed to be above ground. Cherry Avenue was observed to be in good condition, relatively straight, will gently rolling topography sloping to the south. At the intersection of Cherry Avenue and Brookside Avenue, open water drainage pipes (up to approximately 18 inches in diameter) were observed to cross Brookside Avenue underground.

On Brookside Avenue existing underground sewer, water, and storm drain improvements were observed. Electric lines were observed to be above ground. Brookside Avenue was observed to be in poor to fair condition with cracking of the existing asphalt concrete, relatively straight, and gently sloping east with a small downgrade towards the east at the Cherry Avenue Intersection.

5.2.3 Alternative C

On Dutton Street, existing underground water was observed. Electrical lines were observed to be above ground. Dutton Street was observed to be in fair condition, relatively straight, gently rolling topography.

On Bellflower Street, existing underground water and storm drain improvements were observed. Bellflower Street was observed to be in fair to good condition, relatively straight, and gently sloping south.

5.3 Proposed Recycled Water Alignment

The proposed off-site recycled water alignment would extend from the Butterfield property to Highland Home Road, traveling east along Wilson Street, south on Sunset Avenue, east on Lincoln Street, south on Hathaway Street, and east on Charles Street to the City's main wastewater treatment plant (See Figure 4).

On Wilson Street existing underground sewer, water, electric, and storm drain improvements were observed. Wilson Street was observed to be in good condition, relatively straight, and gently sloping to the east. From McGovern Avenue to Sunset Avenue, Wilson Street was closed for construction. One of the construction crew reported that a new water line was being installed.

On Sunset Avenue, from Wilson Street to Lincoln Street, existing underground sewer and water improvements were observed. Electric lines were observed to be above ground. South of Interstate 10, existing underground cable/telephone improvements was observed, as well as a drainage ditch on the west side of the street. Sunset Street was observed to be in poor to fair condition with recent trenching activities evident, relatively straight, and sloping to the south.

On Lincoln Street, from Sunset Avenue to San Gorgonio Avenue, existing underground sewer, water, and gas improvements were observed. Electric lines were observed to be above ground. Drainage improvements for the Montgomery Creek stream channel were observed crossing Lincoln Street, near Adams Street. In this vicinity, the street was observed to be in fair to good condition, relatively straight, with gentle rolling topography. Beyond 16th Street, Lincoln street was observed to be relatively flat and gently sloping to the south. Near the intersection of Hathaway Street, Lincoln Street was observed to change alignment and have an S shaped curve.

On Hathaway Street existing underground sewer, water, and gas improvements were observed. Electric lines were observed above ground. Hathaway Street was observed to be in fair to good condition with some cracking of the existing asphalt concrete, relatively straight, and gently sloping towards the south.

On Charles Street existing underground sewer, water, and gas improvements were observed. Electric lines were observed above the ground. Charles Street was observed to be in fair to good condition with some cracking of the existing asphalt concrete, relatively straight, and gently sloping towards the east.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 It is our opinion that from a geotechnical standpoint, the proposed sewer, water, and recycled water alignments can be developed as presently proposed. Neither existing topography, soil nor geotechnical conditions were observed during the investigation that would preclude the construction of the proposed alignments.

6.1.2 We recommend that existing underground utilities and physical roadway alignments be researched prior to making the final alignment decisions for the proposed off site improvements.

6.1.3 All proposed alignments are expected to be in alluvial material comprised mostly of sand, gravel, and cobbles. No bedrock materials should be encountered in any of the proposed alignments. Excavation activities may encounter occasional large cobbles or boulders which may require occasional rock breaking. However, it is anticipated that the alignment excavations may be completed with conventional excavation equipment.

6.2 Proposed Sewer Alignment

6.2.1 The topography of the proposed sewer alignment presents possible constructability issues. Both portions Ramsey Street and Lincoln Street proposed to contain the sewer alignment have gentle rolling hills. The grade difference on Ramsey Street is approximately 10 feet and on Lincoln Street approximately 5 feet. Additionally, crossing Lincoln Street is the drainage improvements for the Montgomery Creek steam channel. Depth to sewer line in some areas may need to be increased due to topography.

6.2.2 The proposal to construct a lift station at the intersection of Omar Street and Ramsey Street could reduce the topographic constrains in this vicinity of the proposed alignment.

6.2.3 Throughout the proposed alignment route, there are various existing underground utilities. These utilities run both parallel to and perpendicular to the proposed alignment. Further research is recommended to determine the depths and exact alignments of these utilities.

6.3 Proposed Water Alignment

6.3.1 Neither existing topography, soil, nor geotechnical conditions were encountered during the investigation that would prohibit the proposed water alignment from being constructed along any of the proposed alternate routes.

6.3.2 Part of alignment Alternatives A and B, Brookside Avenue, contains the most existing underground utilities that could present potential constructability conflicts. Without further research into the depths and exact alignments of these utilities, alignment Alternative C contains a smaller portion of Brookside Avenue that is east of the various drainage crossings described in Section 5.2, and may be more favorable to develop from an existing utility standpoint.

6.4 Proposed Recycled Water Alignment

6.4.1 Neither existing topography, soil, nor geotechnical conditions were encountered during the investigation that would prohibit the proposed water alignment from being constructed along the proposed alignment route.

6.4.2 Throughout the proposed alignment route, there are various existing underground utilities. These utilities run both parallel to and perpendicular to the proposed alignment. Further research is recommended to determine the depths and exact alignments of these utilities.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the alignments investigated and are based upon the assumption that the geotechnical conditions observed do not deviate from those disclosed in the investigation. Once plans have been finalized, Geocon should provide more site-specific data based on additional field work. The evaluation of subsurface soil or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

2. The findings of this report are valid as of the present date. However, changes in the conditions can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

REFERENCES

California Division of Mines and Geology, Alquist-Priolo Special Studies Zones, Cabazon Quadrangle, Revised Official Map, 1995.

California Division of Mines and Geology, Alquist-Priolo Special Studies Zones, Beaumont Quadrangle, Revised Official Map, 1995.

California Department of Conservation, California Geological Survey, (formally the California Division of Mines and Geology), *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

California Department of Conservation, California Geological Survey, (formally the California Division of Mines and Geology), *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, formally the California Division of Mines and Geology Special Publication 117, adopted March 13, 1997.

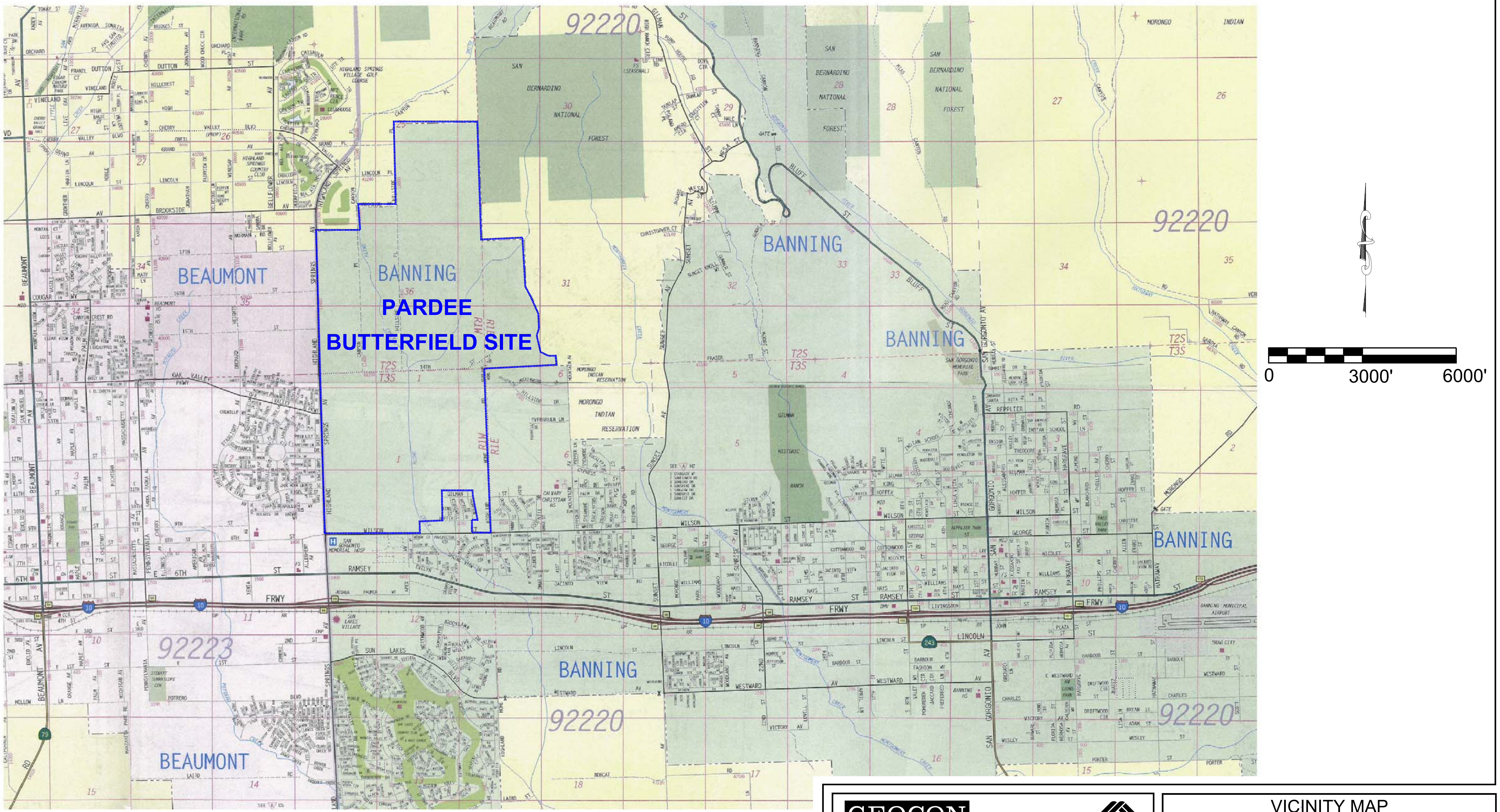
California Division of Mines and Geology, *Fault Evaluation Report FER-235, The San Gorgonio Pass, Banning and Related Faults, Riverside County California,* by Jerome A Teirman, Dated September 27, 1994.

California Division of Mines and Geology, *Fault Evaluation Report FER-235,***Supplement No. 1*** The San Gorgonio Pass, Banning and Related Faults, Riverside County California,* by Jerome A Teirman, Dated May 15, 1995.

Dibblee, Thomas W., *Geologic Map of the Cabazon Quadrangle, Riverside County, California*, Map #DF-114, Santa Barbara Museum of Natural History, 2003.

Dibblee, Thomas W., *Geologic Map of the Cabazon Quadrangle, Riverside County, California*, Map #DF-119, Santa Barbara Museum of Natural History, 2004.

Jennings, C. W., *Fault Activity Map of California and Adjacent Areas*, <u>California Geological Survey</u>, formally California Division of Mines and Geology, 1994.



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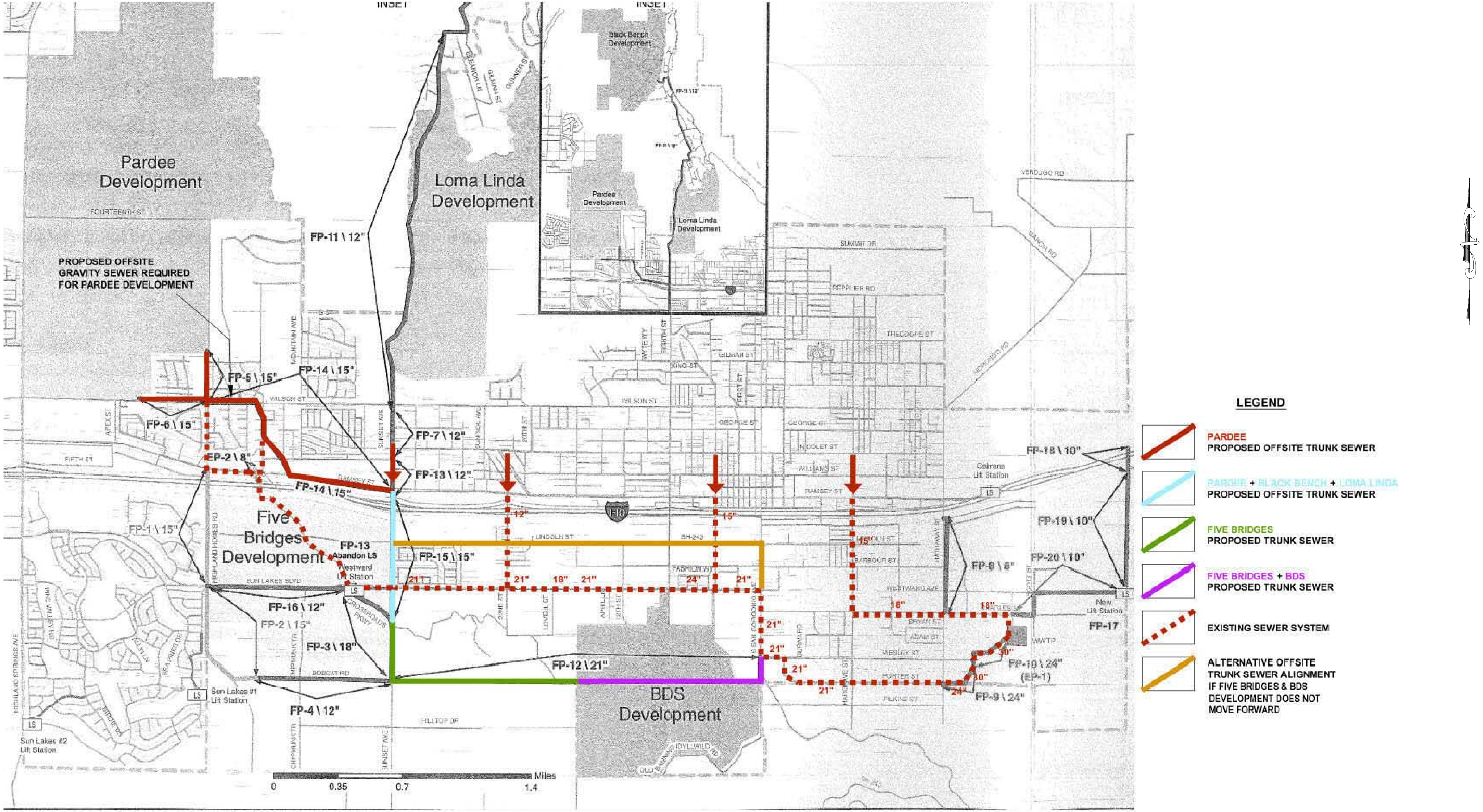
JT

VICINITY MAP

PROPOSED OFF-SITE IMPROVEMENTS
PARDEE - BUTTERFIELD SPECIFIC PLAN
BEAUMONT, CALIFORNIA

12 - 11 - 2007	PROJECT NO. T2305 - 22 - 02	FIG. 1



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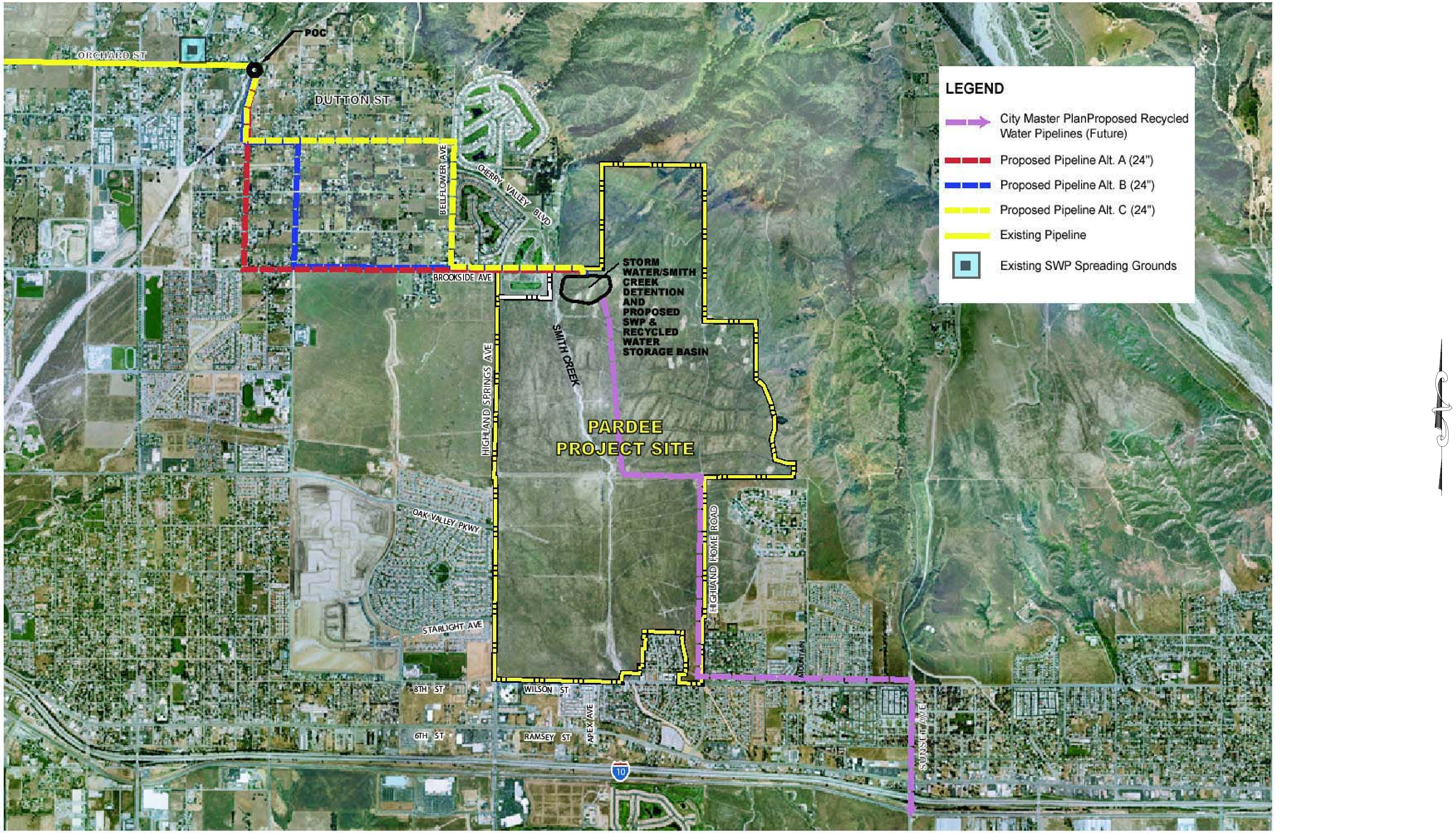
PROPOSED SEWER ALIGNMENT

PROPOSED OFF-SITE IMPROVEMENTS
PARDEE - BUTTERFIELD SPECIFIC PLAN
BEAUMONT, CALIFORNIA

12 - 11 - 2007	PROJECT NO. T2305 - 22 - 02	FIG. 2



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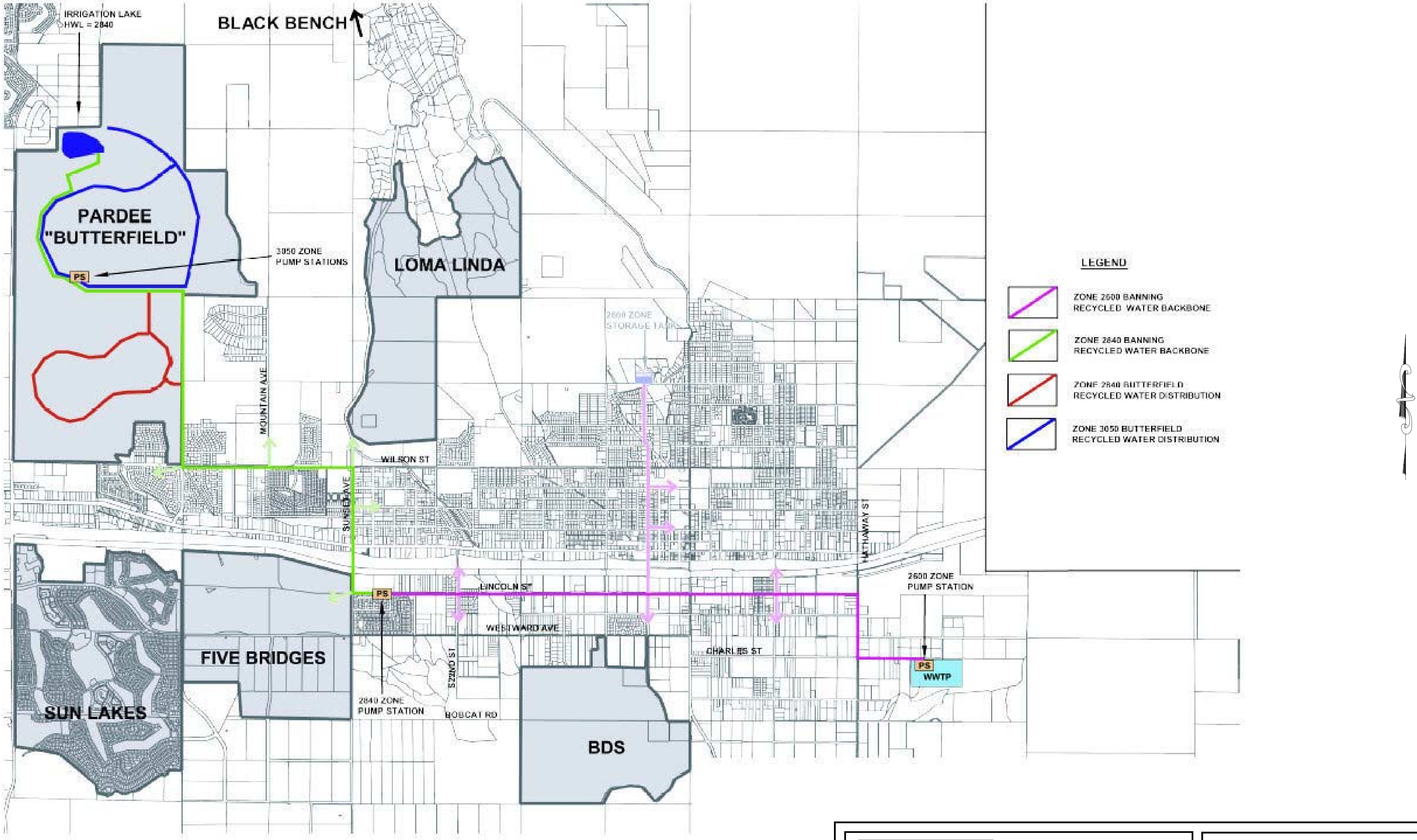
PROPOSED WATER ALIGNMENT

PROPOSED OFF-SITE IMPROVEMENTS
PARDEE - BUTTERFIELD SPECIFIC PLAN
BEAUMONT, CALIFORNIA

12 - 11 - 2007
PROJECT NO. T2305 - 22 - 02
FIG. 3



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PROPOSED RECYCLED WATER ALIGNMENT

PROPOSED OFF-SITE IMPROVEMENTS
PARDEE - BUTTERFIELD SPECIFIC PLAN
BEAUMONT, CALIFORNIA

12 - 11 - 2007	PROJECT NO. T2305 - 22 - 02	FIG. 4

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL CONSULTANTS

Project No. T2305-12-04
May 5, 2006

Pardee Homes
1385 Old Temescal Road
Corona, California 92881

Attention: Mr. Gregory Hohman

Subject: DEUTSCH BANNING PROPERTY
BANNING, CALIFORNIA
SCOPING STUDY

Reference:
1. *Geotechnical Investigation Deutsch Property, Highland Springs Avenue and Wilson Street, Banning, California*, prepared by Geocon Inland Empire, Inc., dated June 29, 2005, Project No. T2305-12-01.
2. *Fault Rupture Hazard Investigation, Deutsch Property, Highland Springs Avenue and Wilson Street, Banning California*, prepared by Geocon Inland Empire, Inc., dated November 9, 2005, Project No. T2305-12-03.
3. *City of Banning Mass Grading Plans for Phase 1 Deutsch Property Specific Plan*, prepared by RBF Consulting, dated April 7, 2006.

Dear Mr. Hohman:

Geocon has prepared this Scoping Study in accordance with your authorization dated March 8, 2005 and subsequent verbal authorizations. The scoping study was performed to provide geotechnical information throughout Phase 1 of the Deutsch Property Specific Plan with emphasis on the golf course/residential boundary. The initial proposal for the scoping study considered that the entire study would be performed with a single phase of field work. However, subsequent discussions regarding the scope of the project resulted in a two phased field study wherein the field work on the southern (south of the Edison easement) and northern (north of the Edison easement) areas was performed separately due to design issues. This Scoping Study includes the exploratory data obtained during the Geotechnical Investigation (Reference 1) and the both phases of the Scoping Study.

Previous Work

A geotechnical investigation, consisting of the excavation of 60 trenches and 14 small diameter borings, was performed in April and May of 2005. The excavation locations, with estimated remedial removal depths, are plotted on the *Mass Grading Plans*, Figures 4 through 30. The excavation logs are included in Appendix A.

A Fault Rupture Hazard Investigation was performed in April, May, and September of 2005. The approximate locations of the fault trenches are plotted on the *Mass Grading Plans*, Figures 4 through 30. The reader is referred to the fault investigation (Reference 2) for illustrations of the excavations and a discussion of the geologic units. Geocon performed in-situ moisture and density testing within the fault trenches with a nuclear gage (in accordance with ASTM Test Method D2922-96). Those results are provided in Table A1, attached. The approximate location of the building setback zone is plotted on the *Mass Grading Plans*. The reader is referred to Reference 2 for a more precise location.

Scoping Study

The field portion of the Scoping Study was performed in December, 2005 and February, 2006. The study entailed the excavation of an additional 12 small-diameter borings and 25 geotechnical trenches around the proposed perimeter of the golf course. The locations of the excavations with the estimated remedial removal depths are plotted on the *Mass Grading Plans*, Figures 4 through 30. The logs of the excavations are provided in Appendix A.

Geotechnical cross sections have been drawn across the golf course/residential boundary to illustrate the anticipated remedial grading measures, see Figures 2 and 3. Standard details are also provided to illustrate geotechnical recommendations with respect to anticipated conditions during grading, see Figure 2.

Recommendations

Removals within residential areas should extended into the golf course from the back of the residential pad at a 1:1 (horizontal:vertical) projection. Fill slopes ascending to residential lots should be keyed at least 2 feet into competent alluvium. In order to facilitate golf course boundary removals, the contractor may want to perform the remedial removals 20 feet into the golf course. This generalized recommendation is intended to reduce the amount of survey information, which would be required with variable removals.

Remedial removals are not necessary within the golf course green & fairway areas. Removals in accordance with those made for the residential areas should be performed within the proposed club house and cart barn locations. Other proposed structures such as the golf course restroom facilities should be constructed on a 3 foot mat of compacted fill. The upper 1 foot of soil within cart path areas should be compacted to 90 percent relative compaction.

Subdrains are not anticipated within Phase 1 of the Deutsch Property due to the lack of canyon-like topography and the percolation rate of the alluvium at the estimated depths of remedial removals.

The reader is referred to the Geotechnical Notes on the Scoping Plans, Figure 2, and Reference 1 for additional geotechnical recommendations.

Should you have any questions after reviewing this letter, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Robert R. Russell
GE 2042

REGISTERED PROFESSIONAL ENGINEER
ROBERT R. RUSSELL
No. 2042
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Lisa A. Battiato
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Enclosures: Figure 1, Mass Grading Plan Index Map
Figures 2 and 3, Geologic Cross Sections and Standard Details
Figures 4 through 30, Geologic Information Illustrated on Mass Grading Plans
Appendix A, Moisture/Density Data and Excavation Logs

(12) Addressee

TABLE A-1

Test No.	Location Trench # and Station	Depth Below Natural Ground feet	In-situ Dry Density	In-situ Moisture Content
1	FT-1 @ 430	-15	108.6	11.7
2	FT-1 @ 670	-5	108.7	10.8
3	FT-1 @ 670	-10	108.5	12.9
4	FT-1 @ 670	-15	114.4	13.5
5	FT-1@ 945	-15	108.9	11.4
6	FT-1 @ 1360	-15	105.1	11.1
7	FT-2 @ 70	-5	102.5	13.9
8	FT-2 @ 70	-10	103.1	14.2
9	FT-2 @ 70	-15	114.5	10.3
10	FT-3 @ 150	-10	114.9	9.7
11	FT-3 @ 205	-10	112.6	14.3
12	FT-3 @ 310	-10	120.4	9.2
13	FT-4 @ 200	-5	116.1	12.1
14	FT-4 @ 200	-10	111.8	13.4
15	FT-7 @ 80	-20	123.4	5.1
16	FT-7 @ 80	-15	111.2	10.7
17	FT-7 @ 80	-10	123.6	9.5
18	FT-6 @ 70	-5	114.6	11.5
19	FT-6 @ 70	-10	109.6	9.5
20	FT-6 @ 70	-15	113.1	10.0
21	FT-6 @ 210	-5	96.5	13.4
22	FT-6 @ 210	-10	108.2	10.6
23	FT-6 @ 210	-15	115.9	10.4
24	FT-9 @ 120	-5	105.5	9.9
25	FT-9 @ 120	-10	114.7	10.3
26	FT-9 @ 120	-15	113.8	11.0
27	FT-5 @ 170	-10	108.5	9.8
28	FT-5 @ 170	-15	102.9	12.4
29	FT-5 @ 60	-15	98.3	16.2
30	FT-8 @ 150	-10	114.5	14.8
31	FT-8 @ 150	-15	118.6	12.6
32	FT-8 @ 150	-20	114.8	10.0
33	FT-8 @ 80	-15	116.8	127.6
34	FT-10 @ 200	-10	105.7	9.1
35	FT-10 @ 200	-15	110.4	8.7
36	FT-10 @ 200	-20	107.0	10.4
37	FT-10 @ 70	-20	121.3	8.9

GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL
CONSULTANTS

FAULT RUPTURE HAZARD INVESTIGATION

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND WILSON STREET
BANNING, CALIFORNIA

PREPARED FOR

PARDEE HOMES
CORONA, CALIFORNIA

NOVEMBER 9, 2005
PROJECT NO. T2305-12-03

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS

Project No. T2305-12-03
November 9, 2005

Pardee Homes
1385 Old Temescal Road
Corona, California 92881

Attention: Mr. Gregory Hohman

Subject: DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND WILSON STREET
BANNING, CALIFORNIA
FAULT RUPTURE HAZARD INVESTIGATION

Dear Mr. Hohman:

In accordance with your authorization, we have performed a fault rupture hazard investigation for the subject property located northeast of the intersection of Highland Springs Avenue and Wilson Street in the city of Banning, Riverside County, California. The accompanying report presents the results of our investigation and our conclusions and recommendations pertaining to the geologic aspects of developing the property as presently proposed. It is our opinion that the site is suitable for development, provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Lisa A. Battiato
CEG 2316

PROFESSIONAL GEOLOGIST
LISA A.
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(4) Addressee
(2) RBF Consulting, Inc.
Attention: Mr. Don Dirian

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TABLE OF CONTENTS

FAULT RUPTURE HAZARD INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the findings of a fault rupture hazard investigation for the approximately 2000-acre proposed residential development. The location of the site is indicated on the enclosed Vicinity Map, Figure 1. The purpose of the investigation was to determine if previous mapped strands of the Banning Fault are located beneath the site, and if they represent a potential surface fault rupture hazard to future development.

The scope of the investigation included a site reconnaissance; and review of aerial photographs, previous fault studies in the vicinity of the property, and pertinent geologic literature (see *References*). Additionally, excavation of the necessary fault trenches, soil age dating by a Certified Professional Soil Scientist, and loose backfill of the trench excavations were accomplished. The surveyed locations of the exploratory excavations are depicted on the *Geologic Map,* Figure 3.

2. SITE AND PROJECT DESCRIPTION

The subject site is an irregular-shaped parcel of land consisting of approximately 2,000 acres, located in the city of Banning, Riverside County. The site is bounded on the west by Highland Springs Avenue; on the south by Wilson Street and a residential housing tract; on the northeast and north by mountainous terrain of the San Bernardino National Forest; and on the east by Highland Home Road and existing and proposed residential housing. Site drainage is to the south.

At the time of the field exploration, the property was occupied by a herd of long-horn cattle. Grasses and weeds were present throughout the site with occasional trees observed within the drainages.

Underground utilities known to exist within the site consist of two water wells and a gas transmission line in the southern portion of the property. Water lines are located along 14th Street. Overhead electrical transmission lines are located along 14th Street and within the northern portion of the property.

A preliminary site plan was superimposed on a topographic map for use during this investigation. Both 300-scale maps were prepared by RBF Consulting and were collectively utilized as the base for our *Geologic Map,* Figure 3. The initial investigation was based on Conceptual Plan D dated June 2, 2004 and discussions with Pardee Homes; where approximately 5,000 to 5,500 single family residences, two schools, a commercial site, a drainage basin, a fire station, and several parks are planned for the property. A preliminary site plan produced in September, 2005 generally coincides with the Concept D plan with exceptions in the northern and north-central portions of the property where development has been designed around preliminary building setback zones, which were provided to the Client in a draft form. A golf course is proposed along Smith Creek. Based on site topography and existing road elevations, cuts and fills on the order of 10 feet or less, exclusive of remedial grading, are anticipated in the southern portion of the property. Cuts and fills of several tens of feet are expected for the northern area. Additionally, it is assumed that slopes will have a maximum inclination of 2:1 (horizontal: vertical) with a maximum height of 30 feet. Geotechnical recommendations during grading were provided in Geocon's report entitled *Geotechnical Investigation, Deutsch Property, Highland Springs Avenue and Wilson Street, Banning, California,* Project No. T2305-12-01, dated June 29, 2005.

The site description and proposed development are based on a site reconnaissance, observations during the field investigation, and a review of the referenced geologic publications. If project details differ significantly from those described, Geocon should be contacted for review and possible revision to this report.

3. LITERATURE REVIEW

Geocon performed a literature review as part of our investigation. Studies produced by the United States Geologic Survey (USGS), the California Division of Mines and Geology, and Fault Evaluation Reports were reviewed. These reports are also discussed in the Regional Geology section.

A Fault Evaluation Report (FER-235) was prepared by California Division of Mines and Geology in 1994 for the Beaumont Quadrangle. The FER discussed the pertinent geologic literature with respect to the area and included an aerial photo review and site reconnaissance. The FER discussed work by several consultants, however, it relied primarily on work by Matti and others of the USGS and work on adjacent properties by other consultants. In an aerial photograph and field observation summary for FER-235, the Highland Springs scarp is described as being concealed by Holocene fan deposits. The two scarps south of Highland Springs are noted as expressions on remnants of an older mid-Pleistocene fan deposit and are buried by late-Pleistocene fans. The short north-south fault along Smith Creek mapped previously by Matti and Morton in 1992 was not noted in FER-235 and is believed to be an erosional channel margin. The north-south tear fault along the eastern property boundary was inferred by Matti & Morton but is concealed and has no youthful expression. The FER-235 concludes that the San Gorgonio Pass fault zone (SGPFZ) has evidence of Holocene displacement from the Banning Bench extending eastward. Rupture along these faults is accommodated by bending of poorly consolidated alluvial strata where rupture extended to the surface in only some of the events and only along part of the fault trace. The SGPFZ shows no evidence of Holocene activity west of the Banning Bench. However, future ground ruptures throughout the entire extent of the zone are possible.

4. REGIONAL GEOLOGIC SETTING

The site is located in the city of Banning just southeast of Highland Springs in an area known as the San Gorgonio Pass fault zone. The SGPFZ is an area of compression resulting from a left step in the San Andreas fault zone from the Coachella Valley segment (southeast) to the San Bernardino strand (northwest). Others have suggested the San Andreas is actually through going at depth and is overlain by a south verging thrust. The SGPFZ is believed to have accommodated 3km of right lateral displacement since its inception during the Quaternary. A Quaternary slip rate of 0.9 to 1.6 mm/yr has been calculated for the SGPFZ in Banning (CDMG, 1994). Several previously active faults which accommodated strike slip motion during the Miocene have been reactivated as thrust faults within the SGPFZ. ✓

The Banning fault is the dominant fault in the area extending from the Indio Hills approximately 100 km to the San Andreas fault. The Banning fault zone consists of western, central, and eastern segments. The central segment is present within the subject site and extends from Calimesa to Whitewater Canyon. It is obscured by Quaternary sediments in the vicinity of the property. The central Banning fault zone is comprised of two, parallel fault segments (A and B, located on-site) and the Wildwood Canyon fault (located northwest of the property). Strand A reveals compressional movement with a few segments of strike slip motion. Strand A passes beneath the Banning Bench and does not displace the Heights Fanglomerate and is, therefore, not considered active. The more northerly trace (Strand B) is believed to be an early trace of the San Gorgonio Pass fault zone. Strand B has a prominent scarp in the late-Pleistocene surface of the Banning Bench. Highland Springs scarp is thought to be a composite scarp resulting from activity on Strand B and on the Wildwood Canyon branch. CDMG concluded that the Wildwood Canyon branch shows no evidence of Holocene displacement and likely died out as Strand B became active (CDMG, 1994). ✓

The subject site appears to be an area of transition between the more active zone to the east and the inactive zone to the west. Fault trenching at Highland Springs (immediately northwest of the property) by Rassmussen encountered a north dipping (26°) thrust fault which was overlain by late-Pleistocene Age soils (Personal Communication, 2005, and CDMG, 1994). West of the property, it appears that faulting occurred within Pleistocene deposits and is no longer active. Activity increases eastward where faulting was observed within Holocene sediments along the Banning Bench (Matti, 1992.) ✓

The SGPFZ, within the property, includes the Banning fault (Strands A & B) within the northern area of the property; two small fault scarps approximately 3000 feet south of the Banning fault (referred to herein as the Central fault zone and the Southeastern fault); a north-south tear fault along the eastern property boundary Lineament L4; and a fault mapped near the central area of the site (L5). Other ✓

faults are postulated to extend from the northwestern property corner to the eastern site boundary near 14th Street (Lineaments L1, L2, and L3).

5. FIELD INVESTIGATION

5.1 Field Investigation

The Geocon fault investigation was performed in April, May, and September, 2005 and consisted of a site reconnaissance, pedochronological analyses, seismic traverses, and excavation of thirty fault trenches totaling 9,250 linear feet. Trenches were excavated across known mapped faults within the AP zone, across lineaments and other postulated faults within the property. Test trenches were excavated south of T-14 and T-25 to explore the depth of younger alluvium and determine if fault trenches in those areas would provide additional information. These test trenches exposed young sediments and were not geologically logged. Seismic refraction was also utilized to locate known faults across the site and to obtain deeper subsurface information where younger alluvium extended beyond the reach of the excavator. The results of seismic refraction surveys are presented in Appendix D. Trench 14 was actually a dozer cut along the side of a narrow ridge which could not be traversed by the excavator. The trenches were 8 to 25 feet deep and were benched at an effective slope ratio of 1:1 (horizontal:vertical) to provide safe working conditions. Soil conditions encountered in the trench excavations were visually observed, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). The fault trenches were geologically logged at a scale of 1 inch equals 5 feet by a Certified Engineering Geologist from our firm. The soil color was classified in accordance with the 2000 Munsel Soil Color Chart. Logs of the trenches are presented on Figures 4 through 43. Locations of the trenches are shown on the Geologic Map, Figure 3. Near vertical and inclined features which cross the trenches at angles other than 90 degrees do not align vertically on the trench logs. They appear to be offset across the benches, however, this is a bench effect and the features are not offset. The trench locations and faults were surveyed with survey points coinciding with zero stations and/or marked faults. Trenches were loosely backfilled with little compactive effort and should be re-excavated during grading and replaced with compacted fill.

5.2 Lineament Analysis

In order to identify possible unmapped faults and to evaluate topographic expressions of published fault traces, Geocon performed a lineament analysis of the site. Aerial photographs obtained from Riverside County Flood Control and Water Conservation District and Continental Aerial Photo were reviewed. The photographs covered the years 1948 through 2000 and were at scales ranging from 1 inch equals 1,600 feet to 1 inch equals 4,500 feet.

Lineaments were classified according to their development as strong, moderate or weak. A strong lineament is a well-defined feature, which can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well defined, somewhat discontinuous and can be traced for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet or less. Several lineaments were observed and are noted on the accompanying *Geologic Map*, Figure 3.

Lineaments L1 through L5 were noted on Matti's map (1992) and were observed during Geocon's aerial photo review.

L1-L4 - L1 through L4 were mapped based on tonal contrasts. Lineament L1 was evaluated in this investigation by trenches T-17 and T-22; L2 was evaluated by T-1; L3 was evaluated by T-2; and L4 was evaluated by T-10.

L5 - Lineament L5 was included based on mapping by previous consultants and a weak topographic contrast. L5 was evaluated by T-12.

Lineaments L6 through L14 were lineaments observed during Geocon's aerial photo review.

L6 – L6 is a moderate to strong lineament observed primarily east of the site in the form of aligned canyons and right laterally deflected drainages. L6 was evaluated by trenches T-1, T1B, and T-3.

L7 – L7 was noted as a moderate to strong tonal contrast and offset drainages east of the property. L7 was evaluated by trench T-4.

L8 – L8 was noted as a weak tonal contrast and was evaluated by T-2.

L9 – L9 is a weak tonal lineament with a slight topographic expression. L9 was evaluated by T-1.

L10 – L10 is a weak tonal contrast evaluated by T-4.

L11 – L11 is evidenced to the east in the form of aligned drainages, right laterally offset ridgelines and valleys. There is no evidence of this lineament west of L4. L11 is evaluated by T-8.

L12 – L12 is a weak to moderate tonal contrast and slight topographic expression generally north of Matti's mapped central fault. L12 is evaluated by trenches T-6, 7, 16, 18, and 21; and seismic traverses S-1, -2, and -5.

L13 – L13 is a weak tonal lineament evaluated by trench T-6 and seismic traverse S-1.

L14 – L14 is a weak tonal lineament evaluated by trench T-11 and seismic line S-3.

5.3 Age Dating

A Certified Professional Soil Scientists, Dr. Glenn Borchardt, was retained to assess the age of the soils within the site. Dr. Borchardt performed five soil profiles. Soil profile 1 was performed within T8; Soil Profile 2 was determined within a road cut along the nose of a ridge in the northern portion of the site; Soil Profiles 3 through 5 were performed within T6 on the hanging and footwalls of the thrust fault. Dr. Borchardt used the amount of clay within the soils to determine their age. He determined that the paleosol developed during the Wisconsin glaciation which occurred about 80 ka. Other paleosols within T6 generally having a color profile in the 7.5YR range were developed prior to the Holocene. The modern soil with a color profile in the 10YR range was determined to be about 10ka.

Based on the soil profiles within T6, Dr. Borchardt determined that four thrust fault events had occurred along that fault. The events were dated at 27, 57, 69, and <80ka resulting in a reoccurrence interval of 11 to 30ky with the quiescence becoming longer with time. The offsets ranged from 2.8 to 4.6 feet, with an average vertical offset of 3.8 feet. Although the last ground rupturing event occurred prior to the Holocene, given the long reoccurrence interval this fault is considered capable of movement and is therefore considered active.

6. SOIL AND GEOLOGIC CONDITIONS

The materials encountered during this investigation include surficial units of undocumented fill, modern soil, slopewash, colluvium, recent and older alluvium, and Pliestocene conglomerate. Landslide deposits and relatively shallow debris flow deposits were observed along the noses of several ridges in the northern area of the property. A paleosol (buried soil) was observed above the weathered and unweathered Pleistocene conglomerate (likely the Heights Fanglomerate). The Pleistocene conglomerate was the oldest unit encountered during the fault investigation and formed the hills in the northern portion of the property.

Undocumented Fill (Qudf) – Undocumented fill formed generally east-west trending drainage berms throughout the property. The fill appeared to be locally derived from the modern soil. It consisted of dry, loose, silty coarse sands which occasionally contained rural debris (metal, bones, fencing material).

Modern Soil (Qm) – The modern soil is present within the upper 6 to 24 inches of most of the trenches. The soil is loose, dry, olive brown (2.5Y4/4), silty coarse sand, with horizontal parting surfaces. The modern soil is thought to be a few hundred to 1000± years old.

Slope Wash (Qsw) – Slope wash was observed within the dozer cut (T14). The slope wash is loose to medium dense, damp, dark yellow brown (10YR ¾) silty sand, with trace gravel. It was observed to be porous, and generally massive.

Colluvium (Qcol) – Colluvium was observed along hillsides and slopes in several of the trenches. The colluvium consists of loose, dry, clast-supported conglomerate with 3- to 6-inch diameter semi-rounded clasts. The clasts are believed to be remnants of weathered core stones from the Pleistocene conglomerate due to their common composition, rounded shape, and only slightly weathered character (Borchart, personal communication, 2005). Abundant roots and porosity were observed throughout the colluvium.

Recent Alluvium (Qal_1 through Qal_5) – Several layers of recent (Holocene) alluvium were observed within the trenches and were labeled Qal_1 through Qal_5 on the trench logs. These units are discussed together here for simplification. The units generally increase in age and depositional sequence as the numbers increase (i.e. Qal_1 is the youngest and over lies the other alluvial units; Qal_5 is the oldest and is found at the bottom of the sequence). All of the units are not present in all of the trenches. The recent alluvial units were generally yellow brown to dark yellow brown (10YR ¾, 4/4, 5/4, 3/6, 4/6) coarse sands with some to trace silt. Gravel and coarse sand channels were common in the northern area of the property, near the hills. The units become more massive to the south. One detrital charcoal sample was observed in the alluvial sediment. This sample, extracted from a silt channel in Trench T-5, was submitted to a certified laboratory for C_{14} radiocarbon age dating. The date testing yielded a calibrated age of 1,420± 40 radio carbon years before present (rcybp). The silt channel containing the charcoal sample was incised into Qal_2 and was overlain by Qal_1. Therefore, it can be reasonably determined that Qal_2 is older than 1,420±40 rcybp and Qal_1 is younger than 1,420±40 rcybp. All of the recent alluvial units appear to be Holocene. The results of the radiocarbon dating are presented in Appendix C.

Debris Flow/Landslide Deposits (Qdf/Qls) – The debris flow and landslide deposits are quite similar in their content. However, the landslide deposits are differentiated from the debris flow deposits in that the landslide deposits are thicker than debris flows and a clay-lined basal rupture surface is present at the base of the landslide deposits. Both units consist of a medium dense, moist, matrix supported generally massive conglomerate with 3- to 6-inch angular cobbles. Matrix resembles that of the Pliestocene conglomerate in color and grain size. The debris flow deposits were observed within T-10 and along the noses of the ridges within the site. The landslide deposits were observed at the southern end of dozer cut Trench 14 and likely exist elsewhere within the hillsides north of the property. The debris flow deposits are considered to span time and have occurred within the site from the time of uplift of the Highland Springs scarp to the present (Matti, 1992).

Older Alluvium (Qoal$_1$ through Qoal$_8$) – Older alluvial units were observed within a majority of the trenches excavated between the Central fault zone and the hills in the northern portion of the property. The older alluvium was brown to strong brown (7.5 YR 4/3, ¾, 4/4, and 4/6), medium dense to dense, moist fine to coarse sands with variable amounts of silt. The soils exhibited an angular blocky structure with clay films on grains, clasts and lining pores. Eight older alluvial units were noted during our investigation. The units are numbered by their stratigraphic position, with Qoal$_1$ being the youngest and Qoal$_8$ being the oldest. The Pedochronologic Report, presented in Appendix B, dated three of the older alluvial units: Qoal$_3$ is referred to as Paleosol b1 which has an estimated age date of 55.6k ybp; Qoal$_4$ is referred to as Paleosol b2 which has an estimated age date of 69.3k ybp; and Qoal$_5$ is referred to as Paleosol b3 which has an estimated age date of <80k ybp. Furthermore, Qoal$_5$ overlies Qp which in turn overlies Qoal$_6$. Therefore, Qoal$_1$ and Qoal$_2$ are younger than 55.6k ybp and are likely Pliestocene. Qoal$_5$ is somewhat younger than Qp at approximately 80ka and Qoal$_6$ was deposited more than approximately 80ka. Qoal$_7$ and Qoal$_8$ are older than 80ka.

Undeveloped Soil - This unit refers to an undeveloped soil in depositional contact between two older alluvial units. It is generally loose, moist, dark yellow brown (10YR 4/6), and channelized. This Pliestocene soil was likely buried soon after deposition and did not develop to the extent of the older alluvial units located above and below it (Borchardt, 2005, personal communication.)

Paleosol (Qp) – A paleosol is a soil that formed on a landscape of the past, which had a different environment, and has since been buried, eroded, and otherwise affected by geomorphological factors. The paleosol was observed between Qoal$_5$ and Qoal$_6$ or directly overlying the conglomerate (Qps). The paleosol is dense, dry to damp, red brown (5YR 4/4 to 4/6) clayey silty sand with trace gravel, generally massive, cemented with an angular blocky structure. Medium to thick clay films were observed on the clasts, and ped faces. The Pedochronological Report assigns an age date of 80 ka to this soil.

Pliestocene Conglomerate (Qps) – The Pliestocene conglomerate was the oldest unit encountered within the site. It comprises the hills in the northern portion of the property and is encountered at depth within the central portion of the site. The conglomerate is a dense, moist, matrix to clast supported conglomerate. The matrix is generally a silty fine to coarse sand which is light olive brown (2.5Y 5/6). Clasts are composed of granite, gneiss, and gabbro which are up to 4 feet in diameter. The clasts are angular to semi-rounded, most of which are completely weathered (sapprolitic). A weathered zone is often present in areas with little to no slope. The weathered zone exhibits a yellow red (5YR 5/8 to 4/6) matrix which appears to have been discolored by the propagation of clays from the overlying paleosol (Qp). This unit is likely the Heights Fanglomerate (CDMG, 1994) which is believed to have been deposited in the late Pleistocene.

7. REGIONAL FAULTING

Southern California is a seismically active region near the active boundary between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. Total movement between the plates is estimated at 55 millimeters of slip per year.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Special Studies Zones Act of 1972 and as revised in 1994 and 1997 to the Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Hazard Zones (AP Zone). The intent of the act is to require fault investigations on sites located within Earthquake Fault Hazard Zones to preclude new construction of certain habitable structures across the traces of active faults. An AP zone established along a portion of the Banning fault (Strand A) is present within the property. Additionally, Banning Strand B, two thrust faults (the Central and Southeastern Fault Zones), a north-south tear fault (Lineament L4), and a localized fault near 14th Street (Lineament L5) have been geologically mapped through the property. Several postulated faults (Lineaments L1, L2, L3) cut northwesterly through the site to join the Banning fault extending from the Banning Bench (northwestern area of the property) to the Wildwood Canyon Branch (northwest of the property). Several lineaments were observed during our photo lineament review. The mapped and postulated faults as well as the lineaments are noted on the *Geologic Map*, Figure 3.

Based on our investigation and review of geologic literature the Banning fault exists within the site; the San Bernardino strand of the San Andreas fault located 4 miles to the north; the Mission Creek fault located 7.2 miles to the northeast; the Mill Creek fault located 8 miles to the north; the San Jacinto fault located 10 miles to the southwest; the Coachella Valley segment of the Banning fault located 12 miles to the east; and the Coachella Valley segment of the San Andreas fault located approximately 20 miles northeast of the property. The most significant fault with respect to location is the Banning fault which was the epicenter for the M5.6, 1986 North Palm Springs earthquake and which may have been associated with the June 16, 2005 M4.9 Yucaipa earthquake. The most significant fault with respect to possible ground motion is the San Bernardino segment of the San Andreas fault which is capable of producing an M8.0 earthquake.

The earthquake history within a 100 mile radius of the site has been generated by the program *EQSEARCH* (Blake, 2000) and is presented in Appendix A.

8. DATA INTERPRETATION

Each trench is discussed in detail below. Recommended building setbacks are from the northern most and southern most faulting observed if the faults are considered active. Recommended building setbacks are discussed and the end of each trench discussion and are delineated on the Geologic Map, Figure 3.

Trench 1 (T-1) – Trench 1 was excavated in the northwestern portion of the property across the AP Zone for the Banning (Highland Springs) fault and across Lineaments L1, L2, L6 and L9. The trench was 1,398 feet long, and generally 8 feet deep on the hillside extending to a depth of 19 feet within the relatively flat-lying area. Along the hillside, the excavation exposed Pliestocene conglomerate (Qps) overlaid by colluvium (Qcol). Materials within the flat-lying portion of the trench (south of Station 520) consisted of weathered conglomerate overlain by generally 10 feet of older alluvium which, in turn, was overlain by generally 5 feet of younger alluvium and capped with one to two feet of modern soil (Qm). Evidence of activity within the trench occurred at:

Station 386 – 450 where a soil wedge was observed and may be a graben or the infilling of sympathetic ground fractures which occurred on the hanging wall, north of the fault. Colluvium overlaid this feature, therefore, the date of its occurrence could not be determined.

A poorly defined thrust fault was observed at Station 520-540 where $Qoal_3$ was thrust beneath Qps. The thrust faulting was overlaid by $Qoal_2$. Channel deposits within a depression above the fault within $Qoal_2$ indicate that $Qoal_2$ was deposited shortly after the event. Because $Qoal_3$ is affected and $Qoal_2$ is not this event may be related to event W (27ka) documented on the Central fault zone (CFZ). Although the faulting appears to be older than 27ka, the height of the Highland Springs scarp is obviously the result of several events which are known to occur as much as 30ka apart.

A fissure within $Qoal_3$ was observed at Station 840. The infilled fissure was overlaid by undisturbed $Qoal_2$. This feature is likely due to sympathetic movement from the event at Station 520-540. Offset trenches east (T-24) and west (T-1A) of this feature did not encounter evidence of faulting. Due to the lack of evidence east and west of this feature, the fissure is likely a localized sympathetic fracture resulting from local faulting.

A subtle thrust fault was noted at Station 940-955 where $Qoal_2$ was thrust beneath $Qoal_3$. The date of this event proceeded the deposition of $Qoal_2$ and therefore, must be younger that that unit. Offset trenches on either side of this feature (T-1A and T-24) did not encounter evidence of faulting.

Although the faulting did affect $Qoal_2$ and is younger than 27ka, the fault was not observed in offset trenches located east and west of Trench 1.

A building setback extending 50 feet north of Station 386 and 50 feet south of Station 540 is recommended along Trench T-1.

Trench 1A (T-1A) – Trench 1A was excavated 150 feet northwest of T-1 to intercept the features noted at T-1 Stations 840 and 940-955. Trench 1A was generally 18 feet deep and 350 feet long. The excavation exposed weathered conglomerate (Qps) overlain by older alluvium ($Qoal_2$), and younger alluvium (Qal_1). The weathered conglomerate was not observed in the southern portion of the trench. However, the overlying older alluvium ($Qoal_2$) was continuous and unbroken throughout the trench exposure. There are no building setback zones recommended with respect to T-1A.

Trench T1B (T-1B) – Trench 1B was excavated 300 feet west of T-1 in order to intercept the wedge/graben feature at T-1 Station 386-450 and the thrust fault at T-1 Station 520-540. T-1B was generally 8 feet deep on the hillside and generally 17 feet deep within the relatively flat-lying area (south of Station 110). The hillside portion of the trench exposed the wedge/graben from Station 22-100. The conglomerate overlaid by colluvium was observed on either side of the wedge/graben. A subtle thrust fault was noted at Station 92-120. The fault was expressed as aligned cobbles parallel to the main thrust. Due to the subtlety and the lack of notable offset of this feature, it is likely the result of sympathetic movement. The main thrust fault was observed at Stations 193 through 215 where older alluvium ($Qoal_3$) is thrust beneath the conglomerate (Qps). An undisturbed older alluvial soil ($Qoal_2$) overlies the fault. These features are a continuation of the older thrust features exposed in T1 (Stations 520-540). Building setback zones extending 100 feet north of the northern end of the trench and 50 feet south of Station 215 are recommended.

Trench 1C (T-1C) – Trench T-1C was excavated approximately 100 feet west of T-1B in an effort to excavate below the wedge/graben material. However, the wedge was not observed within the T-1C trench exposure. The wedge/graben is likely north of T-1C where it was too steep for equipment access. T-1C exposed weathered and unweathered conglomerate overlain by colluvium. The thrust fault was observed from Station 57-83 (projected to ground surface) where older alluvium ($Qoal_3$) was thrust beneath the conglomerate. The trust fault is located at the base of the hill where an older alluvial unit ($Qoal_2$) begins at an erosional contact above the fault. This thrust is interpreted as a continuation of the thrust observed within T-1 (Station 520-540) and T-1B (Station 193-215). The fault (and in turn the slope face) curves to the northwest just east of T-1C. T-1C is located within the recommended setback zone as established at Trench T-1B.

Trench 2 (T-2) – Trench 2 was excavated in order to intercept Lineaments L3 and L8 in the northwestern portion of the property. The trench was generally 19 feet deep and was 450 feet long. The trench excavation exposed an older alluvial unit ($Qoal_5$) within the lower three feet, overlain by two younger alluvial units (Qal_1 and Qal_2) and the modern soil (Qm). The units were continuous and no features indicative of faulting were observed. There are no building setback zones recommended with respect to Trench 2.

Trench 3 (T-3) – Trench 3 was excavated within the AP Zone and across the postulated Banning Strands A and B and Lineament L6. Trench 3 was 450 feet long and extended to a depth of 10 feet along the hillside and 12 to 18 feet within the relatively flat-lying area (south of Station 390). The excavation exposed the conglomerate unit overlain by colluvium (Qcol) to Station 180. Beyond Station 180, the conglomerate was overlain by the paleosol (Qp) and colluvium (Qcol). In the southern end of the trench, the conglomerate was overlain by older ($Qoal_6$) and younger (Qal_4) alluvium.

Southerly dipping, arcuate, silica lined zones were observed from Station 7 to 25. It appears these features are due to slope failures within the conglomerate (Qps) and may have been the result of sympathetic movement during local faulting.

Fractures within the conglomerate were observed from Station 45-70. These fractures were lined with what appeared to be carbonate but was later identified as silica by Glenn Borchardt (personal communication, 2005). A majority of the fractures trended northwest. Vertical movements of 12 and 24 inches were measured resulting in a total measured offset of three feet down to the south. Although these fractures generally line up with the postulated trace of the Banning-Strand B fault, their northwest orientation is 90 degrees from the trend of the fault. The fractures have been attributed to slope movement which was either the result of sympathetic normal faulting or ridgeline shattering.

Southward dipping, silica lined fractures were observed within the Qps at Stations 83-95. These fractures also appear to be related to slope failure within the Qps which may have been induced by earthquake activity.

Relatively small, discontinuous, silica lined fractures were observed from Station 150-166 and 226-228. Some of these fractures could be traced across the trench and some could not. These fractures are interpreted as intra-conglomerate sympathetic fracturing during earthquake activity.

A wedge/graben infilling was observed from Station 180 to 220. This wedge/graben was similar in geometry to those observed in T-1, T-1B, and T-1C, however, the infilled material consisted of a red brown (5Y4/4) clayey silty sand which resembled the paleosol (Qp) and was likely eroded and re-deposited from the slope above.

The only evidence of faulting at the break in slope within T-3 was the presence of warped channels at Station 384.The warped channels generally aligned with a fault observed in Trench T-24. Trench T-24, located approximately 150 west of T-3, over lapped T-3 by approximately 50 and was continued southward 410 feet.

A northerly building setback extending 100 feet north of Station 7 is recommended; and based on our observations in T-3 and T-24 (see T-24 discussion), a 50 foot building setback zone is recommended south of T-3 Station 384.

Trench 4 (T-4) – Trench 4 was excavated along a low ridgeline in the southeastern portion of the AP Zone and was placed in order to intercept lineaments L7 and L10 observed during our aerial photograph review. T-4 was 410 feet long, and 9 to 12 feet deep. The excavation exposed the conglomerate and an older alluvial unit ($Qoal_6$) overlain by the paleosol (Qp). The northern portion of the trench extended into an active drainage in which older alluvium ($Qoal_6$) is overlain by younger alluvium (Qal_4).

Fracturing at Station 170 revealed apparent movement of 4 inches down to the south. The fractures continued into but did not go through the overlying paleosol (Qp). The contact between Qps and the overlying Qp was not offset. Therefore, the break above the fracture within the paleosol is believed to be due to shrink/swell within the paleosol above the fractures. This feature does project toward the southern feature in T-1 (Station 938 through 951). An offset trench T-26 was excavated approximately 350 feet west of T-4 to further investigate the feature (see discussion of T-26).

A fissure within Qps was observed at station 208. The soil filled zone is overlain by undisturbed $Qoal_6$ and is therefore considered to be older than 80ka. An offset trench was excavated along the trend of the fissure (T-25). T-25 exposed younger alluvial soils and did not provide additional information regarding the fissure. Based on the exposure within T-4 the feature is likely due to sympathetic ground cracking which occurred more than 80ka.

A fracture observed at Station 239 within the alluvium is localized and does not extend to the bottom of the trench and is therefore, interpreted as a non-tectonic ground crack.

Fractures within the older alluvium ($Qoal_6$) at Station 300-315 appear to offset a portion of $Qoal_6$ but do not propogate through the unit and do not offset the $Qoal_6$/Qp contact or break the overlying paleosol (Qp). There were no other features within T-4 which would indicate faulting.

There are no building setbacks recommended with respect to Trench T-4 due the apparent older activity of the faulting observed within the trench.

Trench 5 (T-5) – Trench 5 was excavated to intercept the mapped Southeastern fault (SF). T-5 was 20 feet deep and 220 feet long. The excavation exposed the conglomerate unit within the northern portion of the trench. The conglomerate ended at an erosional contact at Station 110. Younger alluvial units (Qal_1 and Qal_2) were exposed for the remainder of the trench. There were no fault features observed within this trench. However, a silt filled channel was observed above the erosional contact at Station 110. Radiocarbon age dating (C14 dating) from a charcoal sample from the channel yielded an age date of 1420 ± 40 rcybp. An offset trench (T-9) was excavated approximately 400 feet east of T-5 across the mapped fault and exposed unbroken younger alluvium. T-23 was excavated approximately 300 feet west of T-5 along the projected alignment of the silt channel (see T-23 discussion). Due to the depth of younger alluvium at this location, a seismic traverse (S-4) was performed to provide deeper subsurface information. The seismic traverse did not indicate any structural anomalies at depth similar to those encountered along the CFZ (see S-1, -2, and -5). No structural setback zones are recommended with respect to T-5.

Trench 6 (T-6) – Trench 6 was excavated to intercept Lineaments L12 and L13 and the mapped CFZ in the eastern area of the property. T-6 was 18 feet deep, 410 feet long, and exposed the conglomerate (Qps) overlain by the paleosol (Qp) and colluvium (Qcol) north of Station 190 and older alluvium ($Qoal_3$ through $Qoal_5$) south of Station 190.

A subtle, north dipping fault was observed at Stations 20-40 where aligned cobbles appear to be the result of fault movement and are likely the northern portion of an imbricated fault array. The paleosol (Qp) above this feature is irregular and eroded, therefore, the age of the faulting cannot be determined at this location. Exposures from Station 108-133 reveal imbricated clasts within the Qps beneath an irregularly cut alluvial channel. Qp does not align or maintain thickness across the channel. These features are also likely part of an imbricated fault array.

A thrust fault was noted at Station 165-195 where older alluvium ($Qoal_{4-6}$) was thrust beneath the conglomerate (Qps). The fault propagated into the overlying, modern soil where a small fault scarp was observed at the surface. The Pedochronologic Report provides a detailed description of four fault events and estimated timeline. Four events dated at 27ka, 57ka, 69ka, and >80ka where 2.8 to 4.6 feet of offset occurred during each event are evidenced in the older alluvial units. Reoccurrence intervals of 11ka (oldest), 12ka, and 30ka (most recent) were documented. Due to the affected younger alluvium, faulting has occurred within the last 27ka.

A disturbed zone was observed at Stations 220-255 where soil surrounded boulders were observed. The overlying older alluvium appeared to be unaffected.

A 100 foot building setback zone extending north from Station 40 is recommended. The southern limit of the building setback zone is should be extended 50 feet south of Station 255.

Trench 7 (T-7) – Trench 7 was excavated in the western portion of the property along Lineament L12 and the mapped CFZ. T-7 was 415 feet long, 15 to 22 feet deep, and exposed the conglomerate unit (Qps) overlain by the paleosol (Qp), older alluvium ($Qoal_{4-7}$), and colluvium (Qcol).

A soil-filled fracture was observed at Stations 57-75. The zone was approximately 12 inches wide and paralleled the main fault trace. Colluvium (Qcol) overlaid the affected Qps so an age could not be determined for this feature. A nine-foot wide fault zone of imbricated clasts and juxtaposed units was observed from Station 320-365. Qps and $Qoal_{5-7}$ were affected. $Qoal_4$ overlies the faulting but the basal contact is offset. Qp is missing from the sequence. This displacement could be the result of displacement from events X (57ka) or W (27ka).

The soil fill fracture at Stations 57-75 is included within a recommended structural setback zone which extends north of T-7 (see discussions on Trenches T-18 and T-27). A building setback zone of 50 feet is recommended extending south from Station 365.

Trench 8 (T-8) – Trench 8 was excavated in order to intercept a Lineament L11 observed at the nose of a ridge in the eastern portion of the property. T8 was 187 feet long and ranged in depth from 9 to 17 feet. The excavation exposed conglomerate overlain by the paleosol and older alluvium.

A fault observed at Stations 106 through 137 juxtaposes subunits within Qps. A younger alluvial channel incised the conglomerate above the fault on the east wall. The top of the conglomerate unit does not appear to be offset and is at the same elevation on either side of the channel scour. The fault could not be traced through the conglomerate on the west wall where the conglomerate was overlain by Qp. The fault was traced to the bottom of the paleosol on the west wall but it could not be traced through Qp. Due to the presence of the paleosol above the fault in the west trench wall this fault is likely older than 80ka and no longer active. Trench T-19 was excavated Approximately 100 feet southwest of theT-8. No evidence of faulting was observed within T-19 (see T-19 discussion).

Silica lined fractures were observed from Station 150-160 within $Qoal_7$ and $Qoal_8$ where Qps ends at what appears to be an erosional contact. The fractures do not offset horizontal gravel beds within $Qoal_7$. An undisturbed, intact $Qoal_6$ overlies the fractured units. Therefore, the fracturing is older than $Qoal_6$ at > 80ka.

Silica lined fractures were observed within $Qoal_8$ at Station 163-167. The fractures were not observed on the opposite trench wall and did not propagate into the overlying $Qoal_7$. These fractures are likely localized features due to seismic shaking at the site.

There are no structural setback zones are recommended with respect to Trench 8 due to the age of the features observed within the excavation..

Trench 9 (T-9) – T-9 was excavated along the mapped Southeastern fault, see also T-5, T-23, and S-4. The trench was 160 feet long and 18 feet deep. The excavation exposed three younger alluvial units (Qal_{2-4}) overlain by modern soil. There was no evidence of faulting observed within T-9. No structural setback zones are recommended with respect to T-9.

Trench 10 (T-10) – Trench 10 was excavated on the nose of a ridge in the eastern area of the property to intercept a Lineament L4. T-10 was 260 feet long and 12 to 21 feet deep. The northern portion of the trench, along the hillside, exposed the conglomerate unit overlain by a debris flow. The southern portion of the excavation (south of Station 85), in the relatively flat-lying area, exposed generally massive, younger alluvial sediments.

A steep, south-dipping planar feature was observed at Station 52-60 where debris flow deposits are displaced 6 feet or more down to the south. This feature is aligned with the mapped location of Lineament L4. However, it appears to be a landslide/debris flow slide plane within the trench exposure. There are no older units which overlie this feature which would enable a date assignment. Trench T-20 was excavated northerly of T-10 to intercept this feature. However, T-20 exposed continuous, young sediments which did not provide additional information regarding the age or activity of the feature. This feature is interpreted as a slide plane.

Structural setback zones are not recommended with respect to T-10.

Trench 11 (T-11) – Trench 11 was excavated to intercept a Lineament L14 in the eastern portion of the property. The trench was 240 feet long and extended to a depth of 25 feet. The excavation exposed continuous, younger alluvial units. There was no evidence of faulting observed within T-11. Due to the age of the material exposed in T-11, a seismic traverse (S-3) was performed. There were no anomalies indicative of faulting along S-3. There are no structural setback zones recommended with respect to T-11.

Trench 12 (T-12) – Trench 12 was excavated to intercept a mapped Lineament L5 in the central portion of the property near 14th Street. Trench 12 was 210 feet long, 18 feet deep and exposed conglomerate overlain by older and younger alluvium. There were no features within T-12 which indicated faulting was present. There are no structural setback zones recommended with respect to T-12.

Trench 13 (T-13) – Trench 13 was excavated to intercept the mapped trace of the CFZ and Lineament L13. The trench was 180 feet long, and 11 feet deep. The excavation exposed the conglomerate (Qps) overlain by the paleosol (Qp).

An intra-conglomerate fault was observed at Station 118 to 135. The fault did not propagate into the overlying paleosol and the contact of the Qp/Qps was not offset. Therefore, the faulting occurred before the deposition of Qp at 80ka.

The trench exposure revealed an intra-conglomerate fault between Stations 135-150. Again, the overlying Qp and the Qp/Qps contact were not offset. Therefore, an age of >80ka can be assigned to this feature.

There are no building setback zones recommended with respect to Trench 13.

Trench 14 (T-14) – Trench 14 was actually a dozer cut along an inaccessible ridgeline approximately 300 feet east of T-3. The cut was 420 feet long and 21 feet high. T-14 was cut within the AP Zone to intercept Banning Strands A and B and Lineament L6. The dozer cut was excavated with a bench at mid-height which resulted in windows of younger alluvium within the bottom of the profile. This alluvium is not actually below the conglomerate as it appears in the profile but it is a near surface wedge that was not removed along the side of the hill. The dozer cut revealed conglomerate overlain by slope wash and landslide deposits.

Intra-conglomerate fractures which appear to offset beds within the conglomerate were observed at Station 180.

A soil wedge was observed from Station 187-210. This wedge is aligned with the soil wedges observed within the trenches to the west (T-1, -3, and -1B). These features appear to grabens which, due to their relative lack of surficial expression, likely occurred as a result of older faulting.

Intra-conglomerate fractures were observed from Station 222-238, these fractures struck east-west to northwest and dipped steeply to the south. These fractures could be near surface branching of faults which joint the main branch at depth.

A fracture zone was observed from Station 275-370 the fractures trend northwest and are vertical at the bottom of the exposure and branch out as they near the surface. These fractures are also likely near surface branching of faults which joint the main branch at depth.

A soil filled fracture was observed at Station 360 at the northern (head) of a landslide deposit. The fracture is likely the upper portion of a head scarp generated by faulting. The landslide deposits are 10 or more feet deep and encompass the southern portion of the hill.

A test pit was excavated south of T-14 in an effort to extend the subsurface exposure of the bedrock to identify the fault location. The test pit was extended to a depth of 27 feet through young alluvium. Due to the lack of older sediments it was decided that trenching south of T-14 would not provide the necessary information.

The northern recommended building setback zone extends 100 feet north of Station 180. The southern limit of the building setback zone was extended 50 feet south of T-14 and was based on the alignment of exposures in T-3 and a break in a ridgeline east of the site.

Trench 15 (T-15) – Trench T-15 was excavated along the CFZ in the eastern portion of the property in order to intercept the CFZ and Lineament L13. The trench was 340 feet long and up to 27 feet deep. The soils exposed within T-15 consist of younger alluvial sediments in the northern 117 feet of the trench exposure and older alluvium ($Qoal_5$) within the lower 5 to 10 feet of the trench from Station 117-340. There was no evidence of faulting observed within T-15. Based on observations made within T-22, there is no recommended building setback associated with T-15.

Trench 16 (T-16) – Trench T-16 was excavated along the CFZ within the western portion of the property to intercept the CFZ and Lineament L12. The trench was 420 feet long, 23 feet deep and exposed the conglomerate unit overlain by colluvium (Qcol), younger alluvium ($Qal_{1, 2, \& 4}$), and older alluvium ($Qoal_{5\text{-}6}$). Older alluvium ($Qoal_{1\text{-}2}$) were overlain by younger alluvium (Qal $_{1, 4, \& 5}$) south of Station 250.

A fracture zone was observed from Station 12-104. The fractures were observed as imbricated cobbles within the conglomerate and were expressed as subtle discoloration with the younger alluvial deposits ((Qal_2). The fractures paralleled the thrust faulting and are likely near surface fault branches which join the main rupture at depth. A northwest trending imbricated fault branch was observed at Station 135-160. The fault can be traced through the conglomerate and Qal_4. It is overlaid byQal_2.

A fault zone consisting of three parallel faults was observed from Station 170-260. Younger alluvium ($Qal_{2\text{ and }4}$), older alluvium ($Qoal_{5\text{ and }6}$) and the conglomerate are juxtaposed and offset within this zone. South of this zone, faulting within the weathered conglomerate and older alluvium was not observed.

The recommended building setback zone north of T-16 extends approximately 200 feet north of T-16 and is based on exposures within T-27 and T-18. The southern building setback limit extends 50 feet south of Station 260.

Trench 17 (T-17) – Trench 17 was excavated in the east central portion of the property at a break in topography across Lineament L1. The trench was 110 feet long, 21 feet deep, and exposed young alluvium above older alluvium ($Qoal_6$). Gleying (zones of grey soil where iron and other minerals have been reduced due to poor drainage) was observed at stations 37 and 91 where they were followed in a north-northwest direction across the trench. The feature at station 91 aligns with L1. The gleyed zones were observed within $Qoal_6$ but did not project to the top of the unit. These features are likely due to sympathetic ground fracturing resulting from local faulting. No structural setbacks are recommended in association with T-17 due to the lack of movement observed on the gleyed features and the fact that the feature at Station 37 does not propagate through $Qoal_6$ and the feature at Station 91 is overlain by unaffected $Qoal_3$ (55.6ka).

Trench 18 (T-18) – Trench 18 was excavated in the central portion of the CFZ. T-18 was 335 feet long, 19 feet deep, and exposed the conglomerate overlain by colluvium in the northern portion of the trench, older alluvium above the conglomerate in the central portion of the trench, and younger alluvial deposits in the southern portion of the trench.

Soil-filled fissures were observed from Stations 55-75 and 110-120. These features appear to be similar to those exposed north of the fault in the northern portion of the property (see T-1, T-1B, T-3, and T-14) and are likely due to fault induced fracturing on the headwall.

A thrust fault with an 80 foot-wide soil and boulder zone immediately south of the fault was observed from Stations 112-147. The fault could not be traced into the overlying colluvium.

Several fractures parallel to the fault were observed between Stations 135-163. The fractures affected the conglomerate but could not be traced into the overlying alluvium.

A second thrust fault was observed from Station 157-187. Offset of the conglomerate, the colluvium, and younger alluvium (Qal_1) were observed. An alluvial filled channel was also observed immediately above the fault. A soil-filled fracture was observed from Station 225-255 where conglomerate, older alluvium ($Qoal_3$) and younger alluvium ($Qal_{1\ \&\ 2}$) are affected. The overlying modern soil does not appear to be faulted. These features are very young features by virtue of having affected the Qal_1 (younger than 1420ybp).

A group of three fractures affecting the conglomerate and older alluvium ($Qoal_3$) were observed from Station 242-270. These fractures were observed within the conglomerate and appear to affect the upper and lower contacts of the older alluvium ($Qoal_3$), however, they cannot be traced into the overlying younger alluvial units.

The northern recommended building setback zone is 50 feet north of Station 55. Due to the presence of continuous, undisturbed younger alluvial units south of Station 270, a recommended building setback of 100 feet extending southward from Station 270 is recommended.

Trench 19 (T-19) – Trench T-19 was excavated in the eastern portion of the property to intercept faulting observed within T-8 (Station 106-137). The trench was 100 feet long, 24 feet deep and exposed weathered conglomerate overlain by the paleosol (Qp) and younger alluvial units. A channel was encountered between Stations 50-65, along the projection of the fault in T-8. This area was deepened and three feet of unbroken conglomerate was observed below the channel. The channel may be the result of intra-conglomerate faulting which is likely older than the deposition of the paleosol at 80ka (see also discussion of T-8). Therefore, no building setback zones are recommended in association with T-19.

Trench 20 (T-20) – Trench T-20 was excavated along a projected feature observed within T-10 (Station 52-60). T-20 was 65 feet long, 24 feet deep, and exposed continuous, horizontal younger alluvium. Due to the youth of the materials exposed within T-20, the exposure did not provide additional information regarding the feature observed with T-10. Due to the horizontal, continuous bedding it can be concluded that faulting has not affected the soils within T-20 in the last 1500 years. There are no building setbacks recommended in association with T-20.

Trench 21 (T-21) – Trench 21 was excavated in the central portion of the CFZ. T-21 was 275 feet long, 19 feet deep, and exposed conglomerate (Qps) overlain by older ($Qoal_4$) and younger alluvium ($Qal_{2\ \&\ 4}$).

A deformation feature was observed from Station 65-80 where $Qoal_4$ appeared to be channelized into Qps. This feature could have occurred during the deposition of $Qoal_4$ at 69.3ka, however, Qal_2 (at approximately 1.5ka) is the only overlying, unaffected unit. Therefore, a more specific age determination was not possible. An intra-conglomerate thrust fault was observed from Station 132-182. Although this feature could not be traced into the overlying $Qoal_4$, warping and thickening of the older alluvium south of this feature indicates that it likely affected $Qoal_4$.

A group of parallel thrust faults were observed from Station 155-248 where they were observed within the conglomerate but were not observed within the overlying $Qoal_4$.

A subtle feature within the conglomerate was observed from Station 245-285(projected).

The northern limit of the recommended building setback zone is located 50 feet north of Station 65. The southern limit of the recommended building setback zone is 50 feet south of projected Station 285.

Trench 22 (T-22) – Trench 22 was excavated along the eastern portion of the CFZ. T-22 was 245 feet long, 25 feet deep, and exposed conglomerate overlain by the paleosol (Qp), older ($Qoal_5$) alluvium, and younger ($Qal_{1\&4}$) alluvium. The southern end of the trench was terminated at Station 245 because the conglomerate and older alluvium were no longer exposed. Please also note that the western trench wall was logged as the trench was being excavated resulting in a log which is stationed from right to left.

Silica lined fractures were observed from Stations 40-130. Fractures within the northern portion of this zone struck nearly north-south and became northwest trending from Station 110 south. Sand beds within the conglomerate were warped and offset. The fractures propagated through the conglomerate but could not be traced within the paleosol (Qp). The contact between the conglomerate and the paleosol was no offset by the fractures.

A graben zone was noted from Station 140-210. Within this zone red clayey sand with cobles and boulders exhibits extensive mottling and gleyed zones. The paleosol thickens in this area and the contact between the conglomerate and paleosol is irregular. A continuous, undeformed older alluvium ($Qoal_5$) was observed above the graben zone indicating the graben was formed approximately 80ka.

A thrust fault zone was observed between Stations 125-154 where the conglomerate and paleosol were offset. The offset could not be measured within the trench but exceeds the 8 foot where unweathered conglomerate is offset against the weathered conglomerate.

Fracturing continues within the conglomerate through the southern portion of the trench (Stations 195-238) where the conglomerate and overlying older soils are cut off abruptly at Station 248. The eastern portion of the CFZ has been observed to be 150 feet wide. Additionally, faulting was not observed within T-15 in which older sediments were observed south of Station 110.

The northern boundary of the recommended structural setback zone extends 100 feet north of Station 40 (offsite). The fault zone is extended south from Station 120 a length of 150 feet and the southern limit of the building setback zone is 100 feet south of the projected fault zone at projected Station 370.

Trench 23 (T-23) – Trench 23 was excavated along the SF in an effort to intercept a silt filled channel observed in Trench T-5. The trench was 190 feet long, 18 feet deep, and exposed young alluvial sediments. The bottom of the trench was pot-holed to a depth of 30 feet where young sediments were present the entire depth. The young alluvium exposed within trench T-23 was continuous and faulting or warping were not observed. A liquefaction feature (sand boil) was observed within $Qal_{1\ \&\ 2}$ at Station 106. The underlying Qal_3 was unbroken. No structural setback zones are recommended with respect to Trench T-23.

Trench 24 (T-24) – Trench 24 was excavated east of T-1 to investigate the eastern projection of fractures observed at Stations 840 and 940 within T-1. The excavation crossed Lineament L1. T-24 was 460 feet long, 18 feet deep and exposed conglomerate overlain by older alluvial soils in the northern portion of the trench and older alluvial soils south of Station 40. A thrust fault was observed from Station 2-30 where imbricated cobbles and boulders were noted. Faulting, gleyed zones and juxtaposed units (Qps, $Qoal_5$ and $Qoal_3$) were observed from Station 9-38. The overlying older alluvial unit ($Qoal_3$) was 8 feet thick above the fault zone and thinned to 2 feet south of the fault zone. Younger alluvial units ($Qal_{1\ \&\ 3}$) overlaid the fault south of the zone. The older alluvial units ($Qoal_{3\ \&\ 5}$) were continuous and unbroken south of the fault zone (Station 52). A building setback zone extending 100 feet northward from Station 2 and southward from 50 from Station 38 is recommended with respect to Trench 24.

Trench 25 (T-25) – Trench 25 was excavated south of T-14 across Lineament L1 in order to intercept a fault encountered within T-4 at Station 208. T-25 was 100 feet long and 20 feet deep. The trench exposed younger alluvial sediments ($Qal_{1\ \&\ 4}$) which were continuous and unfaulted. There are no building setback zones recommended with respect to T-25.

Trench 26 (T-26) – Trench 26 was excavated approximately 250 feet west of T-4 to intercept the fault encountered at Station 170 within T-4. T-26 was 45 feet long, 21 feet deep and exposed conglomerate overlain by older alluvium ($Qoal_2$) and younger (Qal_1) alluvium. No faulting was encountered within T-26. Therefore, no building setback zones are recommended with respect to T-26.

Trench 27 (T-27) – Trench 27 was excavated along the western portion of the CFZ between and extending north of Trenches T-7 and T-16. Trench 27 was 450 feet long, 17 feet deep, and exposed conglomerate overlain by older alluvium and colluvium in the northern portion of the trench (north of Station 90) and conglomerate overlain by colluvium south of Station 90.

A channel was observed within the Qps from Stations 40-90. The $Qoal_3$ filled channel extended to a depth of 12 feet. There was no deformation observed within the underlying conglomerate.

Conglomerate with a soil matrix was observed between Stations 75-99. The conglomerate within this zone had the same clast composition, distribution, and volume as the conglomerate on either side. However, the matrix was more soil-like than the surrounding conglomerate. This soil matrix was not observed within the conglomerate on the opposite trench wall.

A subtle, intra-conglomerate fracture was observed from Station 225-235. The fracture did not offset a gravel channel within the conglomerate. It appears that this feature was likely due to sympathetic movement.

An abrupt facies change occurred within the conglomerate at Station 295. Although a fault plane was not observed, it appears that the change is due to thrust faulting do to the apparent offset position of a 3" cobble zone and the shape of the contact.

A building setback zone extending 50 feet north of Station 225 is recommended. The southern building setback zone limit is dictated by T-7 and T-16 in this area and extends south of T-27.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 Geologic conditions that would preclude the proposed residential development of the property were not encountered during our investigation. Therefore, development of the property is considered feasible provided that the recommendations of this report are followed.

9.1.2 Exploratory trenches were backfilled will little compactive effort. The trench bottoms were surveyed by RBF Consulting, Inc. These surveyed trench locations should be plotted on the rough grading plans by RBF so that they may be accurately located, re-excavated, and backfilled with engineered fill during grading.

9.2 Fault Evaluation

There were several faulting issues within the property which were addressed in this investigation. Setback zones were determined based on fault activity and character of faulting observed within the trenches. The strength of lineaments and evidence in the literature were also considered. Building setback zones are discussed in Section 8.0 with respect to each trench. The recommended setback zones are depicted on the *Geologic Map*, Figure 3.

Faults located within the AP zone in the northern portion of the property no longer appear to be active. However, due to continued activity on the Banning Strand A southeast of the site and the lack of age dating on the $Qoal_2$, which overlies the faults in this area, building setback zones are recommended for the Banning Strands A, B, and the Highland Springs Scarp.

Faulting within the Central Fault Zone consists of a zone of imbricated faults, approximately 150 feet wide, which are believed to join the main rupture plane at depth. The zone widens to 600 feet on the western portion of the property. Based on faulting observed within the trenches, it appears that the CFZ is active. Therefore, recommended building setbacks have been established along the CFZ as is indicated on the *Geologic Map*, Figure 3.

Although a fault scarp was mapped along the Southeastern fault, no evidence of faulting was observed within the seismic data or trenches excavated along the SF. Therefore, no building setback zones are recommended for the SF.

Lineaments L1, L2, and L3 appear to be sympathetic ground cracking associated with local faulting. These features appear to have preceded the deposition of Qoal$_3$ (55.6ka). Due to the age and lack of evidence of movement, there are no recommended building setbacks associated with L1, L2 or L3.

Lineament L4 was observed in T-10 where it appeared to be due to land sliding rather than faulting. Additionally, the lineament is mapped based on inferred evidence and local fault geometry rather than the visual evidence which would indicate active faulting. Therefore, there are no building setback zones recommended in association with L4.

The east-west trending lineaments which enter the site from the east (L7, L11, L13) appear to be the result of older faulting affecting the hills east of the property and dying out at the eastern margin of the site. These faults are considered potentially active. Although no building setbacks are recommended for residential structures, in the event school, hospital, or public facilities are planned in these areas, building setbacks may be required.

There was no evidence of faulting observed in seismic data or within the fault trench across Lineament L14. Therefore, no building setback zones are recommended along L14.

There was no evidence of fault rupture observed within T-12 along L5. Therefore, no building setback zones are recommended along L5.

There was no evidence of faulting observed within the trenches across Lineaments L9, L8, or L10. Therefore, no building setback zones are recommended along these lineaments.

9.3 Slope Stability Issues

Debris flows and landslides were observed along the south-facing slopes. The client should be aware of these slope hazards and understand that once 40-scale rough grading plans are developed, additional work including a field investigation and slope stability analyses should be performed.

9.4 Plan Review

The soil engineer and engineering geologist should review the grading plans prior to finalization to verify their compliance with the recommendations of this report and the geotechnical report (Geocon, 2005) and determine the necessity for additional analyses and/or recommendations. The soils engineer should also be provided the opportunity to review the structural foundation plans prior to finalizing to verify substantial conformance with the recommendations of this report.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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Continental Aerial Photo
Aerial Photographs

Date	Photograph Numbers	Scale
6/1/49	12F-52-53, 12F-148-149	1"=1666'
5/9/67	1HH-217/284	1"=1666'
2/15/77	RIV 22-16-17, RIV 3-18-19	1"=4500'
1/15/76	PC11-1-2	1"=4000'
6/12/90	C83-12-5-6	1"=2800'
5/19/93	C92-17-176-177	1"=2000'
7/11/95	C114-31-126-127	1"=2000'
10/16/97	C119-31-123-124	1"=2000'
2/23/99	C133-31-101-102	1"=2000'

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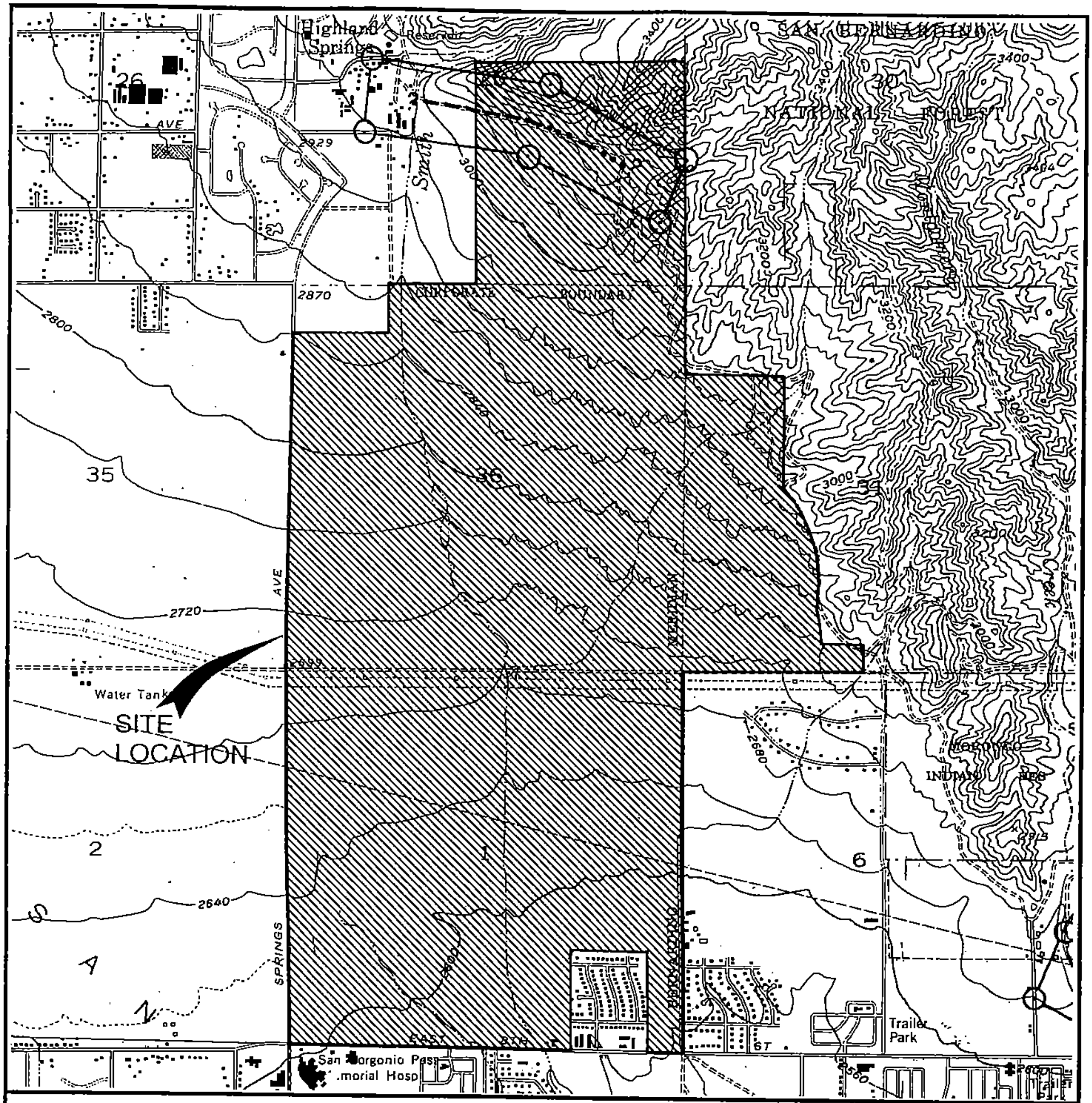
Riverside County Flood Control and Water Conservation District Aerial Photographs

DATE	PHOTO NUMBER	SCALE
5/5/48	149-152, 161-164	1"= APROX 1000'
1/29/62	2-226/227, 2-259/260	1"=2000'
5/24/74	105, 106, 180, 181	1"=2000'
1/23/80	106, 108, 109, 182, 183	1"=2000'
2/7/84	1542-1544, 1652-1654	1"=1600'
2-22-90	4-40/43, 3-42/44	1"=1600'
1/28/95	3-38/40, 4-40/43	1"=1600'
3/2/00	3-40/42, 4-42/44	1"=1600'



SOURCE: USGS Earthquake Fault Zones map,
7.5 minutes series, Beaumont
Quadrangle, dated 6/1/95.

N

SCALE

0 2,000 Feet

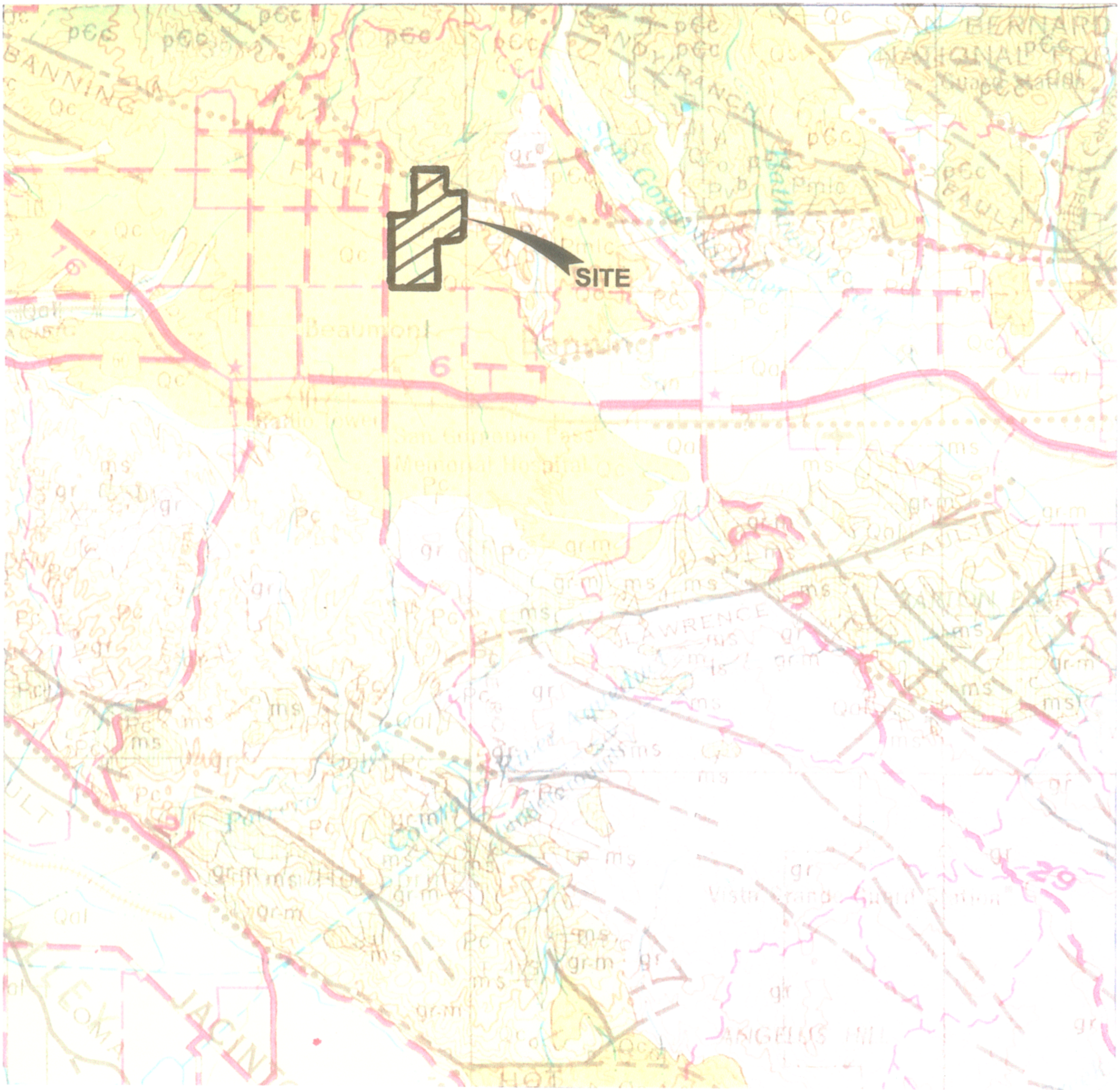
GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE, SUITE 101 - MURRIETA, CA. 92562-7065
PHONE 951 304-2300 - FAX 951 304-2392

SITE VICINITY MAP

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVE. AT WILSON ST.
BANNING, CALIFORNIA

DATE: **11-9-2005**	PROJECT NO.: T2305-12-03	FIG. 1



GEOCON LEGEND

Qc........PLIESTOCENE NONMARINE

SOURCE: DIVIDION OF MIRES AND GEOLOGY
GEOLOGIC MAP OF CALIFORNIA
SANTA ANA SHEET - 1966
SCALE 1:125,000 (ENLARGED)

GEOCON
INLAND EMPIRE
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LB / MM		DSK/GTYPD

REGIONAL GEOLOGIC MAP

DEUTSCH - BANNING
HIGHLAND SPRINGS AVENUE AND WILSON STREET
BANNING, CALIFORNIA

DATE 11 - 09 - 2005	PROJECT NO. T2305 - 12 - 03	FIG. 2

T2305-12-03_MM_LB_REGIONAL GEOLOGIC

APPENDIX A

APPENDIX A

HISTORICAL EARTHQUAKE DATA

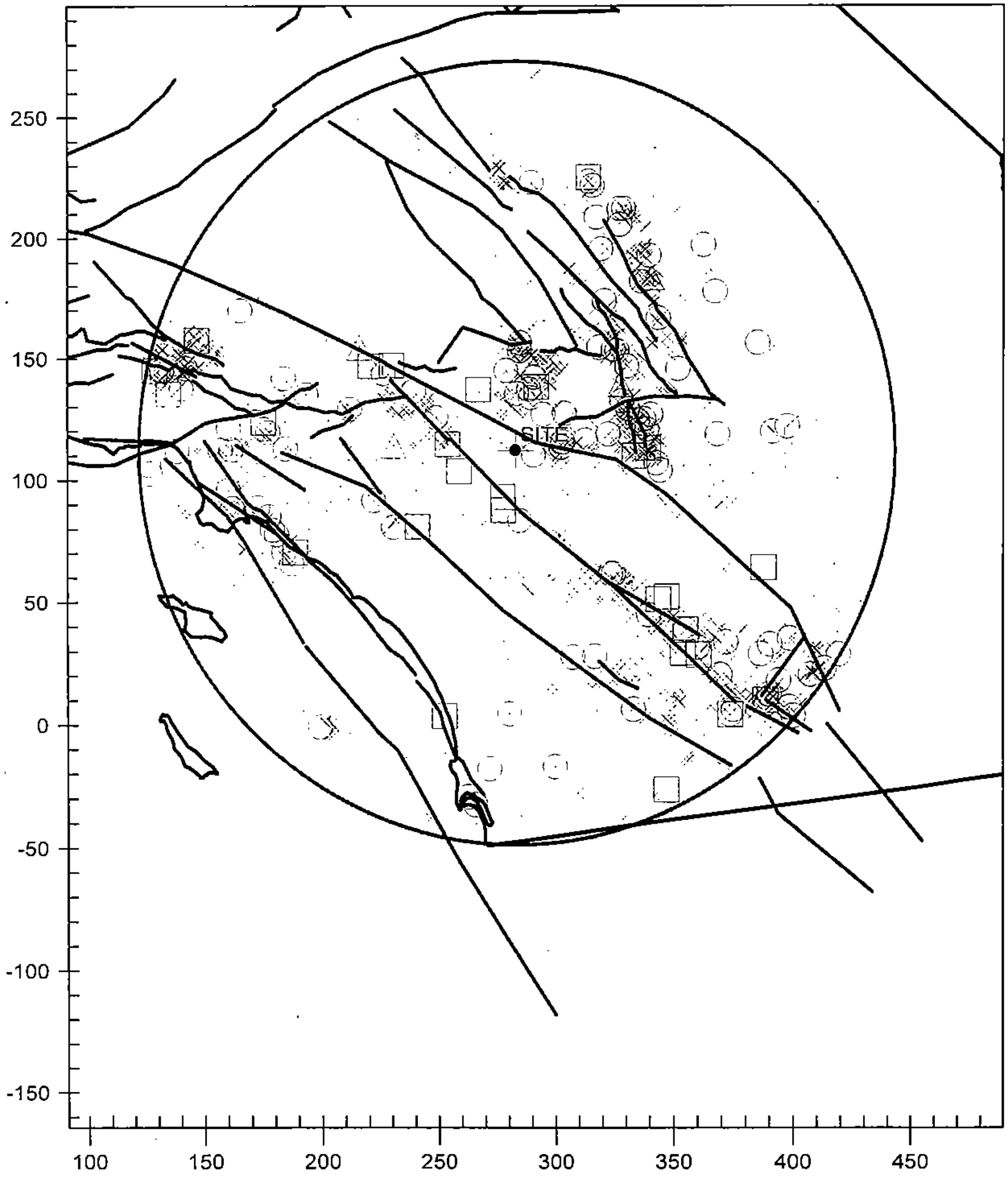
FOR

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND
WILSON STREET
BANNING, CALIFORNIA

PROJECT NO. T2305-12-03

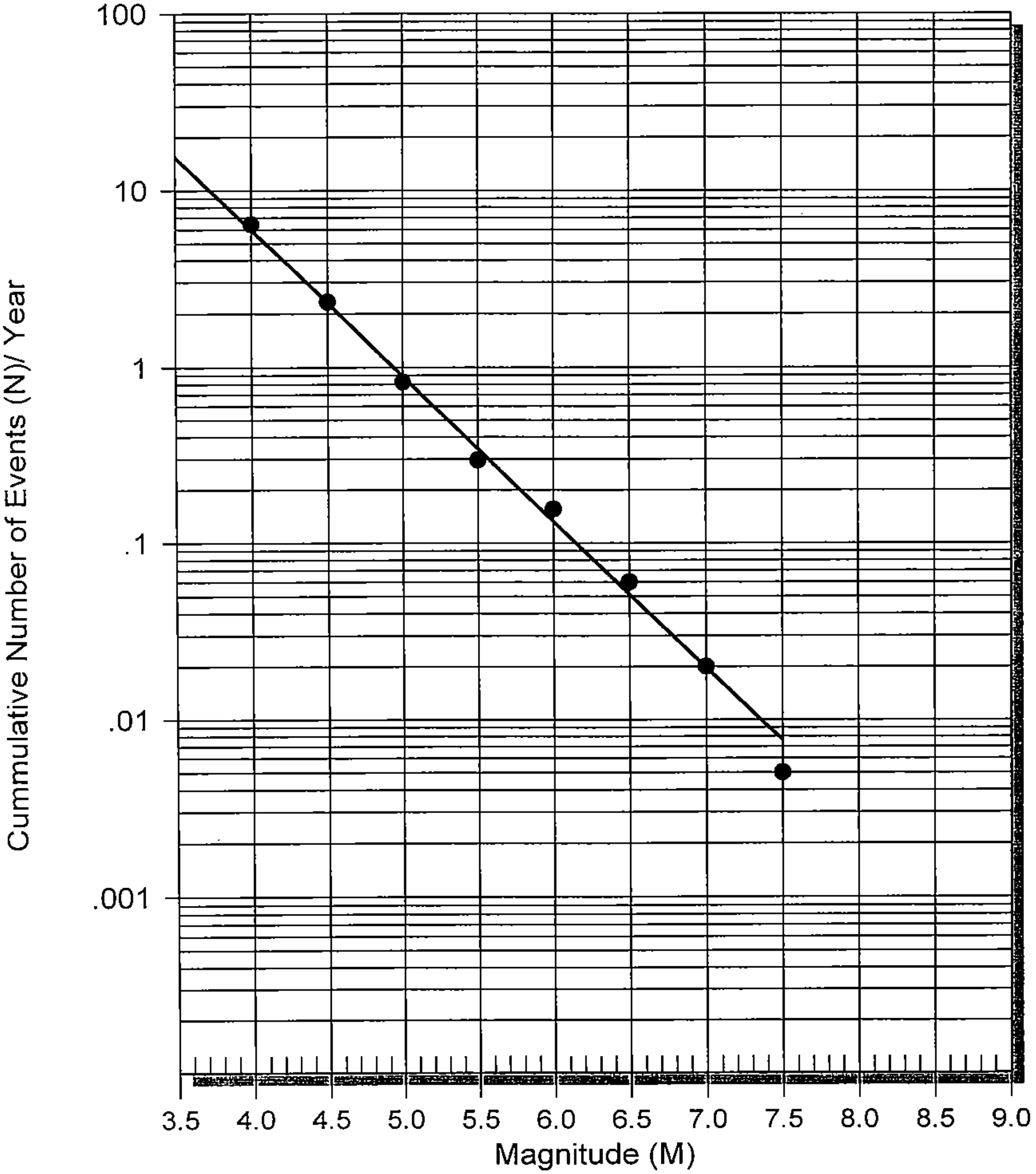
EARTHQUAKE EPICENTER MAP

Pardee - Banning



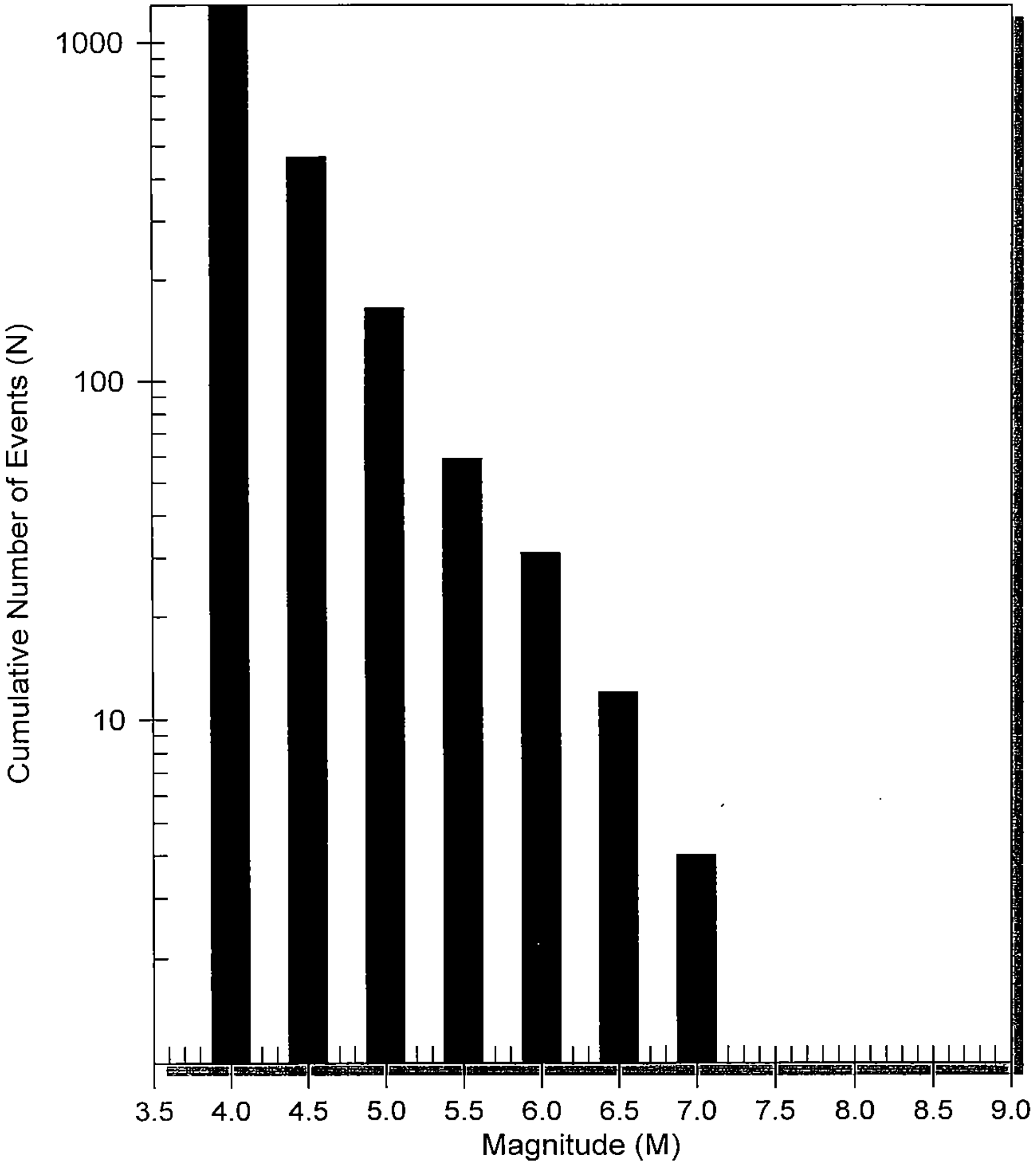
EARTHQUAKE RECURRENCE CURVE

Pardee - Banning



Number of Earthquakes (N) Above Magnitude (M)

Pardee - Banning



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                         *************************
                         *                       *
                         *     E Q S E A R C H   *
                         *                       *
                         *      Version 3.00     *
                         *                       *
                         *************************

                              ESTIMATION OF
                          PEAK ACCELERATION FROM
                       CALIFORNIA EARTHQUAKE CATALOGS


JOB NUMBER: T2305-12-03
                                                  DATE: 07-29-2005

JOB NAME:  Pardee - Banning

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE:  4.00
   MAXIMUM MAGNITUDE:  9.00

SITE COORDINATES:
   SITE LATITUDE:  33.9688
   SITE LONGITUDE:  116.9346

SEARCH DATES:
           START DATE:   1800
           END DATE:   2000

SEARCH RADIUS:
           100.0 mi
           160.9 km

ATTENUATION RELATION:  20) Sadigh et al. (1997) Horiz. - Soil
   UNCERTAINTY (M=Median, S=Sigma): M       Number of Sigmas:  0.0
   ASSUMED SOURCE TYPE:  DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND:   0  Depth Source:  A
   Basement Depth:  5.00 km     Campbell SSR:         Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km):  0.0
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                    -------------------------
                    EARTHQUAKE SEARCH RESULTS
                    -------------------------

Page  1
------------------------------------------------------------------------------------
    |       |        |          |  TIME   |     |     |       | SITE  |SITE|   APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC)  |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec | (km)| MAG.|   g   |INT.|  mi   [km]
----+-------+--------+----------+---------+-----+-----+-------+----+-----------
DMG |33.9680|116.8820|06/27/1959|162211.1| 13.8| 4.00| 0.106 | VII|  3.0(  4.8)
DMG |34.0000|117.0000|06/30/1923| 022 0.0|  0.0| 4.50| 0.116 | VII|  4.3(  6.9)
DMG |33.9500|116.8500|09/28/1946| 719 9.0|  0.0| 5.00| 0.147 |VIII|  5.0(  8.1)
DMG |34.0170|117.0500|02/19/1940|12 655.7|  0.0| 4.60| 0.080 | VII|  7.4( 11.9)
DMG |33.9670|116.8000|09/07/1945|153424.0|  0.0| 4.30| 0.061 | VI |  7.7( 12.4)
GSP |34.0850|116.9890|06/30/1992|214900.3|  3.0| 4.40| 0.059 | VI |  8.6( 13.8)
DMG |33.9760|116.7750|10/17/1965| 94519.0| 17.0| 4.90| 0.082 | VII|  9.1( 14.7)
DMG |34.0290|116.7870|04/30/1954| 03623.9| 11.1| 4.20| 0.046 | VI |  9.4( 15.1)
DMG |33.9730|116.7690|06/10/1944|111531.9| 10.0| 4.00| 0.038 |  V |  9.5( 15.3)
GSP |34.0970|116.9960|12/05/1997|170438.9|  4.0| 4.10| 0.041 |  V |  9.5( 15.3)
DMG |34.1000|116.8830|10/24/1935|1527 0.0|  0.0| 4.00| 0.038 |  V |  9.5( 15.3)
DMG |34.1000|116.8830|10/24/1935|1452 0.0|  0.0| 4.50| 0.057 | VI |  9.5( 15.3)
DMG |34.1000|116.8830|10/24/1935|1451 0.0|  0.0| 4.50| 0.057 | VI |  9.5( 15.3)
DMG |34.0140|116.7710|06/10/1944|111150.5| 10.0| 4.50| 0.055 | VI |  9.9( 15.9)
GSP |34.1120|116.9200|10/01/1998|181816.0|  4.0| 4.70| 0.064 | VI |  9.9( 16.0)
GSP |34.1210|116.9280|08/16/1998|133440.2|  6.0| 4.70| 0.060 | VI | 10.5( 16.9)
DMG |33.9330|116.7500|08/06/1938| 228 0.0|  0.0| 4.00| 0.033 |  V | 10.9( 17.5)
DMG |33.9330|116.7500|10/28/1944|183016.0|  0.0| 4.40| 0.046 | VI | 10.9( 17.5)
GSP |34.1200|116.9980|06/29/1992|144126.0|  4.0| 4.40| 0.045 | VI | 11.0( 17.8)
DMG |33.9170|116.7500|01/25/1933|1444 0.0|  0.0| 4.00| 0.032 |  V | 11.2( 18.0)
DMG |34.1330|116.9500|06/10/1938|1440 0.0|  0.0| 4.00| 0.031 |  V | 11.4( 18.3)
DMG |33.9500|116.7330|04/26/1942|151023.0|  0.0| 4.00| 0.030 |  V | 11.6( 18.7)
MGI |33.8000|116.9000|12/18/1920|1726 0.0|  0.0| 4.00| 0.030 |  V | 11.8( 19.0)
MGI |33.8000|116.9000|04/29/1918| 2 0 0.0|  0.0| 4.00| 0.030 |  V | 11.8( 19.0)
MGI |33.8000|116.9000|04/23/1918|1415 0.0|  0.0| 4.00| 0.030 |  V | 11.8( 19.0)
MGI |33.8000|116.9000|06/14/1918|1024 0.0|  0.0| 4.00| 0.030 |  V | 11.8( 19.0)
DMG |34.1000|116.8000|10/24/1935|1448 7.6|  0.0| 5.10| 0.073 | VII| 11.9( 19.1)
DMG |33.9760|116.7210|06/12/1944|104534.7| 10.0| 5.10| 0.071 | VI | 12.2( 19.7)
DMG |33.8000|117.0000|12/25/1899|1225 0.0|  0.0| 6.40| 0.194 |VIII| 12.2( 19.7)
GSP |34.1410|116.8570|09/19/1997|223714.5| 10.0| 4.10| 0.030 |  V | 12.7( 20.4)
PAS |33.9760|116.7130|08/06/1984| 81436.6| 14.2| 4.30| 0.035 |  V | 12.7( 20.4)
PAS |34.1510|116.9720|11/20/1978| 655 9.5|  6.1| 4.30| 0.035 |  V | 12.8( 20.5)
DMG |33.9940|116.7120|06/12/1944|111636.0| 10.0| 5.30| 0.079 | VII| 12.9( 20.7)
DMG |33.9810|116.7020|06/12/1944|222119.5| 10.0| 4.20| 0.030 |  V | 13.3( 21.5)
DMG |34.0000|116.7000|08/25/1944| 73025.0|  0.0| 4.20| 0.030 |  V | 13.6( 21.9)
DMG |33.9170|116.7000|11/17/1943|112841.0|  0.0| 4.50| 0.037 |  V | 13.9( 22.4)
DMG |34.1670|116.9830|10/16/1951|1241 5.0|  0.0| 4.00| 0.024 |  V | 14.0( 22.5)
GSP |34.1630|116.8550|06/28/1992|144321.0|  6.0| 5.30| 0.071 | VI | 14.2( 22.8)
GSP |34.1780|116.9220|06/28/1992|170131.9| 13.0| 4.70| 0.042 | VI | 14.5( 23.3)
PAS |33.9790|116.6810|12/16/1988| 553 5.0|  8.1| 4.80| 0.045 | VI | 14.5( 23.4)
DMG |34.1800|116.9200|01/16/1930| 02433.9|  0.0| 5.20| 0.063 | VI | 14.6( 23.5)
DMG |34.1800|116.9200|01/16/1930| 034 3.6|  0.0| 5.10| 0.058 | VI | 14.6( 23.5)
DMG |34.1170|116.7500|08/22/1942|125913.0|  0.0| 4.00| 0.023 | IV | 14.7( 23.7)
GSP |34.1630|116.8270|06/28/1992|150451.5| 12.0| 4.40| 0.032 |  V | 14.7( 23.7)
GSP |34.1800|117.0200|12/04/1991|081703.5| 11.0| 4.00| 0.021 | IV | 15.4( 24.7)
DMG |33.7500|117.0000|06/06/1918|2232 0.0|  0.0| 5.00| 0.049 | VI | 15.6( 25.0)
DMG |33.7500|117.0000|04/21/1918|223225.0|  0.0| 6.80| 0.197 |VIII| 15.6( 25.0)
PAS |34.1980|116.9590|04/01/1978|105227.4|  8.0| 4.00| 0.021 | IV | 15.9( 25.6)
DMG |33.9000|117.2000|12/19/1880| 0 0 0.0|  0.0| 6.00| 0.109 | VII| 15.9( 25.6)
GSP |34.1300|116.7340|06/30/1992|212254.4| 12.0| 4.80| 0.041 |  V | 16.0( 25.7)
MGI |34.2000|116.9000|10/10/1915| 5 6 0.0|  0.0| 4.00| 0.020 | IV | 16.1( 25.9)
GSP |34.1950|116.8620|08/17/1992|204152.1| 11.0| 5.30| 0.061 | VI | 16.2( 26.0)
DMG |34.1000|116.7000|02/07/1889| 520 0.0|  0.0| 5.30| 0.061 | VI | 16.2( 26.1
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EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.9590	116.6510	09/23/1949	214440.1	12.2	4.00	0.020	IV	16.2(26.2)
GSP	34.1980	116.8620	08/18/1992	094640.7	12.0	4.20	0.024	IV	16.4(26.3)
PAS	33.9890	116.6490	07/17/1986	203515.0	6.2	4.00	0.020	IV	16.4(26.4)
PAS	33.9910	116.6490	07/17/1986	215445.2	7.4	4.40	0.028	V	16.4(26.4)
PAS	34.0310	116.6570	07/08/1986	92412.8	6.0	4.40	0.028	V	16.5(26.5)
GSP	34.1830	116.8020	06/28/1992	192637.6	1.0	4.00	0.019	IV	16.6(26.7)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.168	VIII	17.3(27.8)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.028	V	17.3(27.9)
DMG	34.0430	117.2280	04/03/1939	25044.7	10.0	4.00	0.018	IV	17.6(28.2)
MGI	34.1000	117.2000	04/23/1923	2113 0.0	0.0	4.00	0.018	IV	17.7(28.4)
DMG	33.8000	116.7000	08/11/1911	1820 0.0	0.0	4.00	0.018	IV	17.8(28.6)
DMG	33.8000	116.7000	08/11/1911	2340 0.0	0.0	4.50	0.027	V	17.8(28.6)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.042	VI	17.9(28.8)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.035	V	17.9(28.9)
PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.035	V	18.2(29.2)
DMG	34.0000	117.2500	11/01/1932	445 0.0	0.0	4.00	0.017	IV	18.2(29.3)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.116	VII	18.2(29.3)
PAS	33.9670	116.6170	07/08/1986	155526.2	6.0	4.00	0.017	IV	18.2(29.3)
PAS	33.9670	116.6170	07/08/1986	102240.6	6.0	4.40	0.024	V	18.2(29.3)
GSP	34.2250	116.8440	07/09/1992	023435.0	0.0	4.10	0.018	IV	18.4(29.7)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.092	VII	18.6(29.9)
GSP	34.2320	116.8460	07/10/1992	012940.0	0.0	4.20	0.020	IV	18.9(30.4)
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.60	0.065	VI	18.9(30.4)
PAS	34.2430	116.8960	06/30/1979	03411.6	5.8	4.90	0.035	V	19.1(30.7)
GDP	34.0470	117.2550	02/21/2000	134943.1	15.0	4.50	0.025	V	19.1(30.8)
GSP	34.1110	116.6460	06/28/1992	140928.8	7.0	4.10	0.017	IV	19.2(30.9)
PAS	34.2460	116.9010	06/29/1979	55320.5	5.7	4.60	0.027	V	19.2(30.9)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.025	V	19.3(31.0)
PAS	33.7010	116.8370	08/22/1979	2 136.3	5.0	4.10	0.017	IV	19.3(31.1)
GSP	34.2070	116.7570	06/28/1992	161719.2	3.0	4.20	0.019	IV	19.3(31.1)
PAS	34.2490	116.9000	06/30/1979	7 353.0	5.6	4.50	0.024	V	19.4(31.3)
GSP	34.2390	116.8370	07/09/1992	014357.6	0.0	5.30	0.049	VI	19.5(31.3)
GSP	34.2110	116.7600	06/28/1992	152429.3	6.0	4.50	0.024	V	19.5(31.3)
T-A	34.0800	117.2500	10/07/1869	0 0 0.0	0.0	4.30	0.020	IV	19.6(31.6)
GSP	34.2190	116.7710	07/21/1992	211029.0	1.0	4.10	0.017	IV	19.6(31.6)
DMG	34.2290	116.7950	05/11/1956	163050.5	13.3	4.70	0.029	V	19.7(31.6)
GSP	34.2370	116.8110	06/28/1992	125730.8	10.0	4.00	0.015	IV	19.8(31.9)
GSP	34.2560	116.9120	06/28/1992	170557.5	8.0	4.60	0.026	V	19.9(32.0)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.028	V	20.1(32.3)
DMG	34.2670	116.9670	08/29/1943	35754.0	0.0	4.00	0.014	IV	20.7(33.3)
DMG	34.2670	116.9670	08/29/1943	51630.0	0.0	4.00	0.014	IV	20.7(33.3)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.054	VI	20.7(33.3)
PAS	33.9530	116.5720	10/15/1986	22847.8	8.7	4.70	0.027	V	20.8(33.5)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.022	IV	20.8(33.5)
PAS	33.9870	116.5690	07/09/1986	01232.1	6.0	4.40	0.020	IV	21.0(33.7)
DMG	33.8980	116.5690	11/17/1964	145228.2	10.3	4.00	0.014	III	21.5(34.6)
DMG	33.7380	117.1870	04/27/1962	91232.1	5.7	4.10	0.015	IV	21.5(34.6)
DMG	34.2500	116.7700	03/16/1956	203344.3	0.8	4.00	0.014	III	21.6(34.7)
DMG	34.0650	116.5740	08/26/1959	53250.2	16.7	4.30	0.018	IV	21.7(34.9)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.020	IV	22.3(35.9)
DMG	33.8000	116.6000	09/10/1931	436 0.0	0.0	4.00	0.013	III	22.4(36.1)
GSP	34.2670	116.7750	12/02/2000	082807.4	3.0	4.10	0.014	IV	22.5(36.2)
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.022	IV	22.8(36.7

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.040	V	22.8(36.7)
DMG	34.1000	117.3000	02/16/1931	1327 0.0	0.0	4.00	0.013	III	22.8(36.7)
MGI	34.1000	117.3000	11/22/1911	257 0.0	0.0	4.00	0.013	III	22.8(36.7)
DMG	34.2640	116.7550	03/16/1956	203613.6	3.3	4.00	0.013	III	22.8(36.7)
GSP	34.2730	116.7740	08/24/1992	135146.0	1.0	4.30	0.016	IV	22.9(36.9)
MGI	34.3000	116.9000	12/01/1915	14 5 0.0	0.0	4.00	0.012	III	22.9(36.9)
GSP	34.2500	116.7190	06/29/1992	164141.9	1.0	4.90	0.028	V	23.0(37.0)
DMG	34.3120	116.8790	01/31/1972	155 4.2	8.0	4.00	0.012	III	23.9(38.5)
GSP	34.2980	116.8040	07/05/1992	200303.1	3.0	4.00	0.012	III	23.9(38.5)
DMG	34.3070	116.8350	08/28/1950	194526.4	11.7	4.20	0.014	IV	24.0(38.7)
GSP	34.2750	116.7300	07/01/1992	204617.8	1.0	4.20	0.014	IV	24.2(38.9)
DMG	34.0330	117.3500	04/18/1940	184343.9	0.0	4.40	0.017	IV	24.2(38.9)
DMG	34.3200	116.9250	04/18/1968	174213.4	4.7	4.00	0.012	III	24.3(39.0)
DMG	34.2990	116.7840	03/18/1956	24217.3	6.3	4.40	0.016	IV	24.4(39.2)
DMG	33.6500	116.7500	09/05/1950	191956.0	0.0	4.80	0.023	IV	24.4(39.3)
GSP	34.2810	116.7310	07/01/1992	205356.8	1.0	4.00	0.011	III	24.5(39.4)
GSP	33.6500	116.7400	12/02/1989	231647.8	14.0	4.20	0.014	III	24.7(39.7)
DMG	34.3240	116.8850	12/01/1962	03548.8	9.6	4.30	0.015	IV	24.7(39.7)
GSP	34.3200	116.8500	10/27/1998	154017.1	4.0	4.10	0.012	III	24.7(39.8)
DMG	34.3250	116.8750	12/02/1962	04138.4	6.7	4.40	0.016	IV	24.8(39.9)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.011	III	24.9(40.0)
GSP	34.3220	116.8460	09/20/1999	070249.2	2.0	4.20	0.013	III	24.9(40.1)
DMG	34.3250	116.8650	10/29/1962	24253.9	8.6	4.80	0.023	IV	24.9(40.1)
GSP	34.3230	116.8440	10/27/1998	010840.7	5.0	4.90	0.025	V	25.0(40.2)
DMG	34.0170	116.5000	07/25/1947	161453.0	0.0	4.50	0.017	IV	25.1(40.4)
DMG	34.0170	116.5000	07/26/1947	231351.0	0.0	4.10	0.012	III	25.1(40.4)
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.030	V	25.1(40.4)
DMG	34.0170	116.5000	07/29/1947	163615.0	0.0	4.20	0.013	III	25.1(40.4)
DMG	34.0170	116.5000	07/24/1947	225426.0	0.0	4.90	0.025	V	25.1(40.4)
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.042	VI	25.1(40.4)
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.032	V	25.1(40.4)
DMG	34.0170	116.5000	07/25/1947	75730.0	0.0	4.20	0.013	III	25.1(40.4)
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.027	V	25.1(40.4)
DMG	34.0170	116.5000	07/26/1947	23 425.0	0.0	4.50	0.017	IV	25.1(40.4)
DMG	34.0170	116.5000	07/25/1947	51752.0	0.0	4.30	0.014	IV	25.1(40.4)
DMG	34.0170	116.5000	08/01/1947	17 137.0	0.0	4.10	0.012	III	25.1(40.4)
DMG	34.0170	116.5000	08/08/1947	64745.0	0.0	4.00	0.011	III	25.1(40.4)
DMG	34.0170	116.5000	07/26/1947	12415.0	0.0	4.20	0.013	III	25.1(40.4)
DMG	34.0170	116.5000	07/24/1947	225341.0	0.0	4.30	0.014	IV	25.1(40.4)
DMG	34.0170	116.5000	07/25/1947	15647.0	0.0	4.60	0.019	IV	25.1(40.4)
DMG	34.0170	116.5000	07/30/1947	52217.0	0.0	4.20	0.013	III	25.1(40.4)
GSP	34.2740	116.6920	07/01/1992	170715.1	4.0	4.20	0.013	III	25.2(40.6)
DMG	34.3170	116.8000	08/12/1950	21717.0	0.0	4.30	0.014	IV	25.2(40.6)
DMG	34.3330	116.8830	10/14/1943	142844.0	0.0	4.50	0.017	IV	25.3(40.7)
PAS	34.3220	116.8150	08/29/1985	759 8.7	6.1	4.10	0.012	III	25.3(40.7)
DMG	34.3060	116.7590	03/16/1956	202933.6	1.3	4.80	0.022	IV	25.3(40.8)
DMG	34.3330	117.0000	02/27/1942	1 853.0	0.0	4.00	0.011	III	25.4(40.9)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.014	IV	25.4(40.9)
DMG	34.3370	116.9090	11/30/1962	2351 5.5	7.0	4.30	0.014	IV	25.5(41.0)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.017	IV	25.5(41.1)
GSP	34.3400	116.9000	11/27/1992	160057.5	1.0	5.30	0.034	V	25.7(41.4)
DMG	34.1400	117.3390	02/26/1936	93327.6	10.0	4.00	0.010	III	26.0(41.8)
T-A	34.1700	117.3200	12/02/1859	2210 0.0	0.0	4.30	0.014	III	26.1(41.9)

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                         EARTHQUAKE SEARCH RESULTS
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Page  4
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    |       |         |          |  TIME   |     |      |  SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG.  |   DATE   |  (UTC)  |DEPTH|QUAKE |  ACC.  | MM |  DISTANCE
CODE| NORTH |  WEST   |          | H M Sec | (km)| MAG. |   g    |INT.|  mi   [km]
----+-------+---------+----------+---------+-----+------+--------+----+-----------
MGI |34.2000|117.3000|04/13/1913|1045 0.0|  0.0| 4.00|  0.010 | III| 26.3( 42.3)
GSP |33.6320|116.7190|07/19/1999|220927.5| 14.0| 4.20|  0.012 | III| 26.3( 42.4)
DMG |34.3500|116.8670|10/15/1943|1650 1.0|  0.0| 4.50|  0.016 | IV | 26.6( 42.8)
MGI |34.0000|117.4000|05/22/1907| 652 0.0|  0.0| 4.60|  0.017 | IV | 26.7( 43.0)
GSP |34.1680|117.3370|06/28/1997|214525.1|  9.0| 4.20|  0.012 | III| 26.8( 43.1)
DMG |34.0000|116.4670|12/05/1948| 05057.0|  0.0| 4.40|  0.014 | IV | 26.9( 43.2)
DMG |34.0000|116.4670|12/06/1948| 246 8.0|  0.0| 4.30|  0.013 | III| 26.9( 43.2)
GSP |34.3610|116.9130|12/04/1992|125942.1|  0.0| 4.20|  0.012 | III| 27.1( 43.6)
GSP |34.3620|116.9230|12/07/1992|033331.5|  1.0| 4.00|  0.010 | III| 27.2( 43.7)
GSP |34.3640|116.9040|11/27/1992|183225.0|  1.0| 4.10|  0.011 | III| 27.3( 44.0)
DMG |34.3360|116.7420|03/16/1956|233456.4|  1.7| 4.40|  0.014 | IV | 27.6( 44.5)
GSP |34.3690|116.8970|12/04/1992|020857.5|  3.0| 5.30|  0.031 |  V | 27.7( 44.6)
DMG |33.9670|116.4500|12/11/1948|161220.0|  0.0| 4.50|  0.015 | IV | 27.7( 44.6)
T-A |34.0000|117.4200|09/10/1920|1415 0.0|  0.0| 4.30|  0.012 | III| 27.9( 44.8)
T-A |34.0000|117.4200|04/12/1888|1315 0.0|  0.0| 4.30|  0.012 | III| 27.9( 44.8)
GSP |34.3700|116.8800|11/29/1992|142120.5|  3.0| 4.00|  0.009 | III| 27.9( 44.9)
DMG |34.0830|116.4670|03/01/1942|104631.0|  0.0| 4.00|  0.009 | III| 27.9( 44.9)
DMG |34.0830|116.4670|01/26/1934|1844 0.0|  0.0| 4.00|  0.009 | III| 27.9( 44.9)
GSP |34.3770|116.9180|12/04/1992|052511.2|  2.0| 4.80|  0.019 | IV | 28.2( 45.4)
DMG |33.8330|117.4000|06/05/1940| 82727.0|  0.0| 4.00|  0.009 | III| 28.3( 45.5)
USG |34.1390|117.3860|02/21/1987|231530.1|  2.6| 4.07|  0.010 | III| 28.4( 45.6)
DMG |33.9670|116.4330|12/05/1948| 04235.0|  0.0| 4.60|  0.016 | IV | 28.7( 46.2)
DMG |33.8800|116.4370|04/17/1959|1619 0.2| 22.2| 4.20|  0.011 | III| 29.2( 46.9)
DMG |33.9630|116.4250|01/13/1950| 5 719.4|  5.9| 4.10|  0.010 | III| 29.2( 47.0)
DMG |34.0500|116.4330|02/08/1938| 739 0.0|  0.0| 4.00|  0.009 | III| 29.2( 47.1)
PAS |34.0220|116.4260|08/14/1975| 8 849.8| 10.9| 4.00|  0.009 | III| 29.3( 47.2)
GSP |34.1520|116.4680|06/28/1992|224822.9| 11.0| 4.10|  0.010 | III| 29.5( 47.5)
DMG |34.0670|116.4320|12/04/1957| 25144.0|  3.7| 4.30|  0.011 | III| 29.5( 47.5)
DMG |34.4000|116.9170|02/01/1942|151828.0|  0.0| 4.50|  0.014 | III| 29.8( 47.9)
DMG |34.4000|116.9170|02/01/1942|16 334.0|  0.0| 4.50|  0.014 | III| 29.8( 47.9)
DMG |34.4000|116.9170|01/25/1942|215133.0|  0.0| 4.00|  0.009 | III| 29.8( 47.9)
DMG |34.4000|116.9170|02/01/1942|151555.0|  0.0| 4.00|  0.009 | III| 29.8( 47.9)
DMG |34.1120|117.4260|03/19/1937| 12338.4| 10.0| 4.00|  0.009 | III| 29.8( 48.0)
GSP |34.1900|117.3900|12/28/1989|094108.1| 15.0| 4.50|  0.013 | III| 30.2( 48.6)
GSP |34.0890|116.4260|06/28/1992|143906.9|  0.0| 4.30|  0.011 | III| 30.3( 48.7)
DMG |34.1320|117.4260|04/15/1965|20 833.3|  5.5| 4.50|  0.013 | III| 30.3( 48.7)
GSP |34.0950|116.4270|06/28/1992|211316.5|  3.0| 4.60|  0.015 | IV | 30.3( 48.8)
PAS |33.9850|116.4020|02/15/1985|232626.6|  2.3| 4.00|  0.008 | III| 30.5( 49.1)
GSP |33.9450|116.3990|07/05/1992|054938.2|  3.0| 4.00|  0.008 | III| 30.7( 49.4)
DMG |33.9330|116.4000|12/10/1948|204257.0|  0.0| 4.40|  0.012 | III| 30.7( 49.4)
GSP |34.0960|116.4170|07/18/1992|000611.2|  2.0| 4.00|  0.008 | III| 30.9( 49.7)
GSP |34.0920|116.4140|12/21/1992|114402.9|  3.0| 4.00|  0.008 | III| 31.0( 49.8)
DMG |34.2000|117.4000|07/22/1899| 046 0.0|  0.0| 5.50|  0.032 |  V | 31.0( 49.9)
GSP |34.1390|116.4310|06/28/1992|123640.6| 10.0| 5.10|  0.022 | IV | 31.1( 50.1)
DMG |34.4170|116.8500|02/11/1932|231120.0|  0.0| 4.00|  0.008 | III| 31.3( 50.4)
GSP |34.1120|116.4150|07/28/1992|182703.9|  0.0| 4.60|  0.014 | IV | 31.3( 50.4)
PAS |34.1350|117.4480|01/08/1983| 71930.4|  4.6| 4.10|  0.009 | III| 31.5( 50.7)
GSP |34.0880|116.4020|08/15/1992|082414.7|  0.0| 4.80|  0.016 | IV | 31.6( 50.8)
GSP |34.1110|116.4100|06/28/1992|135045.7|  0.0| 4.90|  0.018 | IV | 31.6( 50.8)
DMG |34.0000|116.3830|05/05/1944|134715.0|  0.0| 4.00|  0.008 | II | 31.6( 50.9)
DMG |33.9330|116.3830|12/04/1948|234317.0|  0.0| 6.50|  0.074 | VII| 31.7( 51.0)
GSP |34.1080|116.4040|06/29/1992|141338.8|  9.0| 5.40|  0.028 |  V | 31.8( 51.2)
GSP |33.9460|116.3790|04/24/1992|123605.7| 10.0| 4.10|  0.009 | III| 31.9( 51.3
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                         EARTHQUAKE SEARCH RESULTS
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Page  5
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    |       |       |          |  TIME  |     |     |       SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG.|   DATE   |  (UTC) |DEPTH|QUAKE|       ACC.  | MM |  DISTANCE
CODE| NORTH |  WEST |          | H M Sec| (km)| MAG.|        g    |INT.|  mi  [km]
----+-------+-------+----------+--------+-----+-----+-------+----+-------------
GSP |34.1060|116.4020|06/29/1992|140837.7| 11.0| 4.90| 0.018 | IV | 31.9( 51.3)
GSP |34.0300|116.3790|06/28/1992|160115.2|  1.0| 4.10| 0.008 | III| 32.1( 51.6)
DMG |34.4330|116.9830|04/18/1945| 458 2.0|  0.0| 4.30| 0.010 | III| 32.2( 51.8)
PAS |33.5580|116.6670|06/15/1982|234921.3| 12.2| 4.80| 0.016 | IV | 32.3( 51.9)
GSP |34.0690|116.3820|07/07/1992|082103.1|  3.0| 4.00| 0.008 | II | 32.4( 52.1)
DMG |33.5000|116.9170|11/04/1935| 355 0.0|  0.0| 4.50| 0.012 | III| 32.4( 52.1)
DMG |34.0000|117.5000|07/03/1908|1255 0.0|  0.0| 4.00| 0.008 | II | 32.4( 52.2)
MGI |34.0000|117.5000|12/16/1858|10 0 0.0|  0.0| 7.00| 0.103 | VII| 32.4( 52.2)
GSP |34.1990|116.4390|09/05/1995|202718.4|  0.0| 4.40| 0.011 | III| 32.5( 52.3)
DMG |33.7000|117.4000|05/15/1910|1547 0.0|  0.0| 6.00| 0.046 | VI | 32.5( 52.3)
DMG |33.7000|117.4000|04/11/1910| 757 0.0|  0.0| 5.00| 0.019 | IV | 32.5( 52.3)
DMG |33.7000|117.4000|05/13/1910| 620 0.0|  0.0| 5.00| 0.019 | IV | 32.5( 52.3)
DMG |34.1160|117.4750|06/28/1960|20 048.0| 12.0| 4.10| 0.008 | III| 32.5( 52.4)
DMG |33.5000|117.0000|08/08/1925|1013 0.0|  0.0| 4.50| 0.012 | III| 32.6( 52.4)
DMG |33.9330|116.3670|12/05/1948| 0 721.0|  0.0| 4.90| 0.017 | IV | 32.6( 52.5)
GSP |34.1270|116.3970|06/30/1992|000608.5|  2.0| 4.30| 0.010 | III| 32.6( 52.5)
DMG |34.0170|116.3670|06/06/1940|235637.2|  0.0| 4.40| 0.011 | III| 32.7( 52.6)
GSP |34.0610|116.3740|08/11/1992|061117.3|  0.0| 4.30| 0.010 | III| 32.7( 52.6)
GSN |34.2010|116.4360|06/28/1992|115734.1|  1.0| 7.60| 0.151 |VIII| 32.7( 52.6)
DMG |34.4360|116.8340|07/14/1973| 8 020.1|  8.0| 4.80| 0.016 | IV | 32.8( 52.7)
GSP |34.0820|116.3780|07/06/1992|194137.9|  3.0| 4.40| 0.011 | III| 32.8( 52.8)
GSP |34.1980|116.4320|07/20/1992|040822.6|  0.0| 4.10| 0.008 | III| 32.8( 52.8)
GSP |34.0570|116.3710|06/28/1992|160953.9|  3.0| 4.10| 0.008 | III| 32.8( 52.8)
GSP |34.0970|116.3820|07/01/1992|070149.2|  0.0| 4.30| 0.010 | III| 32.8( 52.8)
GSP |34.1020|116.3830|08/04/1992|190612.3|  0.0| 4.00| 0.007 | II | 32.9( 52.9)
GSP |34.0040|116.3610|06/30/1992|143811.6|  0.0| 4.80| 0.015 | IV | 32.9( 53.0)
DMG |34.1240|117.4800|05/15/1955|17 326.0|  7.6| 4.00| 0.007 | II | 33.0( 53.1)
GSP |34.1620|116.4050|06/28/1992|132605.1|  6.0| 4.90| 0.017 | IV | 33.1( 53.3)
GSP |34.1710|116.4090|06/30/1992|151905.0|  0.0| 4.00| 0.007 | II | 33.1( 53.3)
GSP |34.0620|116.3660|05/14/1999|075403.2|  1.0| 4.90| 0.017 | IV | 33.2( 53.4)
GSP |34.0340|116.3600|05/14/1999|105235.2|  1.0| 4.20| 0.009 | III| 33.2( 53.4)
MGI |33.5000|116.8000|03/30/1918|16 5 0.0|  0.0| 4.60| 0.013 | III| 33.3( 53.5)
MGI |33.5000|116.8000|11/26/1916|17 5 0.0|  0.0| 4.00| 0.007 | II | 33.3( 53.5)
MGI |33.5000|116.8000|06/02/1917| 435 0.0|  0.0| 4.00| 0.007 | II | 33.3( 53.5)
MGI |33.5000|116.8000|05/31/1917| 435 0.0|  0.0| 4.00| 0.007 | II | 33.3( 53.5)
T-A |33.5000|117.0700|12/29/1880| 7 0 0.0|  0.0| 4.30| 0.010 | III| 33.3( 53.6)
GSP |34.0920|116.3690|07/06/1992|120059.2|  1.0| 4.50| 0.012 | III| 33.5( 53.8)
GSP |34.0640|116.3610|09/15/1992|084711.3|  9.0| 5.20| 0.022 | IV | 33.5( 53.9)
DMG |33.9330|116.3500|12/05/1948| 04032.0|  0.0| 4.40| 0.010 | III| 33.6( 54.0)
DMG |33.9580|116.3460|01/08/1952| 63427.4| 11.4| 4.40| 0.010 | III| 33.7( 54.2)
GSP |34.2390|116.4430|06/29/1992|030156.4|  7.0| 4.40| 0.010 | III| 33.7( 54.3)
GSP |34.0580|116.3550|06/28/1992|221312.0|  7.0| 4.00| 0.007 | II | 33.7( 54.3)
DMG |34.4050|116.6670|07/02/1955|162938.5| 10.0| 4.20| 0.009 | III| 33.8( 54.3)
PAS |34.3020|116.4990|03/31/1979| 016 8.6|  0.1| 4.20| 0.009 | III| 33.9( 54.5)
PAS |34.3820|116.6130|06/11/1984|222110.4|  1.8| 4.00| 0.007 | II | 33.9( 54.6)
GSP |33.9400|116.3410|05/04/1992|011602.6|  6.0| 4.00| 0.007 | II | 34.1( 54.8)
DMG |33.9850|116.3400|02/01/1957| 75215.4| 11.0| 4.60| 0.012 | III| 34.1( 54.8)
GSP |33.9510|116.3380|05/18/1992|154418.0|  7.0| 4.90| 0.016 | IV | 34.2( 55.0)
PAS |34.4010|116.6410|02/10/1975|125117.6|  8.0| 4.40| 0.010 | III| 34.2( 55.1)
DMG |34.4500|116.7830|05/22/1942|151829.0|  0.0| 4.00| 0.007 | II | 34.3( 55.2)
DMG |33.4880|116.7770|06/12/1959|11 313.0|  5.7| 4.00| 0.007 | II | 34.4( 55.4)
DMG |33.7330|117.4670|10/26/1954|162226.0|  0.0| 4.10| 0.008 | II | 34.6( 55.7)
GSP |34.3410|116.5290|06/28/1992|124053.5|  6.0| 5.20| 0.021 | IV | 34.6( 55.7
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EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.2450	116.4290	07/08/1993	225744.9	2.0	4.00	0.007	II	34.6(55.7)
GSG	34.1570	116.3730	06/29/1992	103657.8	5.0	4.00	0.007	II	34.6(55.8)
GSP	33.9470	116.3300	09/09/1992	125045.1	5.0	4.30	0.009	III	34.7(55.8)
DMG	33.5330	116.6330	09/21/1942	7 754.0	0.0	4.00	0.007	II	34.7(55.9)
DMG	33.7480	117.4790	06/22/1971	104119.0	8.0	4.20	0.008	III	34.7(55.9)
GSP	34.0500	116.3350	04/26/1992	172138.0	0.0	4.30	0.009	III	34.8(56.0)
PAS	34.2570	116.4350	07/13/1979	226 3.5	5.0	4.00	0.007	II	34.8(56.0)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.007	II	34.9(56.2)
GSG	33.9430	116.3250	04/23/1992	052316.2	5.0	4.00	0.007	II	35.0(56.2)
GSG	34.0120	116.3250	04/23/1992	051009.4	3.0	4.60	0.012	III	35.0(56.4)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.020	IV	35.1(56.5)
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.017	IV	35.1(56.5)
DMG	34.1400	117.5150	01/01/1965	8 418.0	5.9	4.40	0.010	III	35.2(56.7)
DMG	34.1270	117.5210	12/27/1938	10 928.6	10.0	4.00	0.007	II	35.3(56.8)
GSP	33.9610	116.3180	04/23/1992	045023.0	12.0	6.10	0.045	VI	35.3(56.8)
DMG	34.0830	116.3330	06/02/1940	61310.2	0.0	4.50	0.011	III	35.3(56.8)
DMG	34.0830	116.3330	06/01/1940	527 1.2	0.0	4.70	0.013	III	35.3(56.8)
GSP	34.0120	116.3190	11/20/1994	043143.5	6.0	4.20	0.008	III	35.4(56.9)
GSP	34.0290	116.3210	08/21/1993	014638.4	9.0	5.00	0.017	IV	35.4(56.9)
GSP	33.9570	116.3170	04/23/1992	022529.9	11.0	4.60	0.012	III	35.4(56.9)
DMG	34.0000	116.3170	06/06/1940	222115.1	0.0	4.30	0.009	III	35.4(57.0)
DMG	33.4560	116.8960	06/16/1938	55916.9	10.0	4.00	0.007	II	35.5(57.1)
GSP	34.2940	116.4530	06/28/1992	173121.5	6.0	4.10	0.007	II	35.5(57.2)
GSP	33.9430	116.3150	05/06/1992	023843.3	7.0	4.50	0.011	III	35.5(57.2)
GSP	33.9530	116.3140	11/27/1996	014243.8	6.0	4.10	0.007	II	35.6(57.2)
DMG	34.1000	116.3330	06/01/1940	65428.0	0.0	4.30	0.009	III	35.6(57.3)
DMG	33.4540	116.8980	07/29/1936	142252.8	10.0	4.00	0.007	II	35.6(57.3)
DMG	34.0330	116.3170	06/11/1940	195118.1	0.0	4.40	0.010	III	35.6(57.3)
GSP	33.9510	116.3110	04/26/1992	062608.0	0.0	4.20	0.008	II	35.7(57.5)
GSP	34.3010	116.4520	09/28/1997	155723.0	7.0	4.40	0.009	III	35.9(57.7)
DMG	34.0670	116.3170	05/18/1940	6 430.6	0.0	4.60	0.011	III	36.0(57.9)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.015	IV	36.1(58.0)
PDP	33.9370	116.3060	07/25/1992	043160.0	5.0	4.90	0.015	IV	36.1(58.0)
DMG	33.4830	116.7000	12/28/1948	125341.0	0.0	4.00	0.006	II	36.1(58.2)
GSP	33.9420	116.3040	05/04/1992	161949.7	12.0	4.80	0.014	III	36.2(58.2)
DMG	33.5080	116.6310	08/11/1967	05711.4	10.7	4.10	0.007	II	36.3(58.4)
GSP	33.9330	116.3020	04/27/1992	031119.3	0.0	4.20	0.008	II	36.3(58.4)
GSP	34.1750	116.3500	06/11/1992	002419.2	0.0	4.30	0.008	III	36.3(58.5)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.012	III	36.4(58.6)
PAS	34.3090	116.4400	03/15/1979	201749.9	2.0	4.90	0.015	IV	36.7(59.1)
GSP	34.3130	116.4440	07/02/1992	001622.4	6.0	4.00	0.006	II	36.7(59.1)
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.016	IV	36.8(59.2)
GSP	34.3320	116.4620	07/01/1992	074029.9	9.0	5.40	0.023	IV	36.8(59.3)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.012	III	36.9(59.3)
DMG	33.5340	116.5610	09/23/1956	112441.9	12.2	4.30	0.008	III	36.9(59.4)
GSP	34.2720	116.4030	12/11/1992	013834.2	2.0	4.10	0.007	II	36.9(59.4)
GSP	33.9900	116.2870	05/02/1992	124641.4	4.0	4.10	0.007	II	37.1(59.7)
GSP	34.3420	116.4670	07/07/1992	220928.3	2.0	4.40	0.009	III	37.1(59.7)
DMG	33.7170	117.5070	08/06/1938	22 056.0	10.0	4.00	0.006	II	37.1(59.8)
DMG	33.9500	117.5830	04/11/1941	12024.0	0.0	4.00	0.006	II	37.2(59.8)
DMG	34.0830	116.3000	05/18/1940	5 358.5	0.0	5.40	0.023	IV	37.2(59.8)
GSP	33.9910	116.2840	04/23/1992	185603.0	3.0	4.40	0.009	III	37.3(60.0)
GSP	33.9050	116.2880	05/07/1995	110333.0	10.0	4.80	0.013	III	37.3(60.0)

EARTHQUAKE SEARCH RESULTS

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    |      |       |          |  TIME   |     |      | SITE |SITE|  APPROX.
FILE| LAT. | LONG. |   DATE   |  (UTC)  |DEPTH|QUAKE | ACC. | MM |  DISTANCE
CODE| NORTH| WEST  |          | H M Sec | (km)| MAG. |  g   |INT.|  mi   [km]
----+------+-------+----------+---------+-----+------+------+----+-----------
PAS |34.2300|116.3630|03/18/1979|2253 2.7|  3.4| 4.20| 0.007 | II | 37.3( 60.1)
PAS |34.3270|116.4450|03/15/1979|21 716.5|  2.5| 5.20| 0.019 | IV | 37.3( 60.1)
DMG |34.3000|116.4170|08/07/1942| 11533.0|  0.0| 4.50| 0.010 | III| 37.4( 60.2)
DMG |34.3000|116.4170|08/07/1942| 12358.0|  0.0| 4.00| 0.006 | II | 37.4( 60.2)
DMG |34.3000|116.4170|08/07/1942| 15314.0|  0.0| 4.00| 0.006 | II | 37.4( 60.2)
GSP |33.9020|116.2840|07/24/1992|181436.2|  9.0| 5.00| 0.015 | IV | 37.5( 60.4)
PAS |34.3300|116.4430|03/15/1979|23 758.2|  2.8| 4.80| 0.013 | III| 37.6( 60.4)
DMG |33.7170|117.5170|06/19/1935|1117 0.0|  0.0| 4.00| 0.006 | II | 37.6( 60.6)
DMG |34.0500|116.2830|06/08/1940|171032.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/18/1940|134719.0|  0.0| 4.50| 0.010 | III| 37.7( 60.7)
DMG |34.0500|116.2830|08/01/1940|193140.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/22/1940|1410 5.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/19/1940|193941.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|08/04/1940|181520.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|06/01/1940| 55646.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/22/1940| 63137.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/19/1940| 22730.0|  0.0| 4.50| 0.010 | III| 37.7( 60.7)
DMG |34.0500|116.2830|06/24/1940|163936.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/19/1940| 226 2.0|  0.0| 4.50| 0.010 | III| 37.7( 60.7)
DMG |34.0500|116.2830|06/14/1940|215850.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/19/1940| 35145.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|05/27/1940| 32727.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |34.0500|116.2830|06/06/1940|234849.0|  0.0| 4.00| 0.006 | II | 37.7( 60.7)
DMG |33.5060|116.5850|05/21/1967|144234.4| 19.4| 4.70| 0.012 | III| 37.7( 60.7)
PAS |33.5200|116.5580|08/02/1975| 014 7.7| 13.4| 4.70| 0.012 | III| 37.8( 60.8)
GSP |33.9920|116.2740|08/07/1994|151026.0|  7.0| 4.00| 0.006 | II | 37.9( 60.9)
PAS |34.2110|117.5300|10/19/1979|122237.8|  4.9| 4.10| 0.007 | II | 37.9( 61.0)
DMG |34.2110|117.5300|09/01/1937|1348 8.2| 10.0| 4.50| 0.010 | III| 37.9( 61.0)
DMG |33.6990|117.5110|05/31/1938| 83455.4| 10.0| 5.50| 0.024 |  V | 37.9( 61.1)
PAS |34.3480|116.4530|03/15/1979|213425.6|  1.5| 4.50| 0.010 | III| 38.0( 61.1)
DMG |34.1830|117.5480|09/01/1937|163533.5| 10.0| 4.50| 0.010 | III| 38.1( 61.3)
PAS |34.4220|116.5420|07/18/1985|14 525.8|  6.0| 4.20| 0.007 | II | 38.5( 61.9)
DMG |33.4500|116.6830|04/25/1955| 25515.0|  0.0| 4.00| 0.006 | II | 38.6( 62.2)
GSG |33.9820|116.2600|05/12/1992|023111.0|  6.0| 4.00| 0.006 | II | 38.6( 62.2)
DMG |33.4670|116.6330|02/20/1934|1035 0.0|  0.0| 4.00| 0.006 | II | 38.7( 62.3)
DMG |34.3810|116.4740|01/06/1964|234712.8| 12.3| 4.50| 0.009 | III| 38.8( 62.4)
GSP |33.8760|116.2670|06/29/1992|160142.8|  1.0| 5.20| 0.018 | IV | 38.8( 62.4)
DMG |34.2330|116.3330|05/11/1947| 5 620.0|  0.0| 4.90| 0.013 | III| 38.9( 62.6)
GSP |34.3770|116.4580|08/08/1992|153743.3|  2.0| 4.40| 0.008 | III| 39.2( 63.1)
DMG |34.2670|117.5180|09/12/1970|141011.2|  8.0| 4.10| 0.006 | II | 39.2( 63.1)
DMG |33.9170|116.2500|08/15/1946|19 1 8.0|  0.0| 4.00| 0.006 | II | 39.4( 63.4)
PAS |34.3290|116.3980|03/16/1979|173659.1|  5.0| 4.00| 0.006 | II | 39.5( 63.5)
DMG |33.7830|116.2830|03/04/1937|16 4 0.0|  0.0| 4.00| 0.006 | II | 39.5( 63.5)
DMG |34.3000|117.5000|07/22/1899|2032 0.0|  0.0| 6.50| 0.055 | VI | 39.6( 63.7)
GSP |34.3830|116.4520|07/02/1992|051632.2|  0.0| 4.00| 0.006 | II | 39.7( 63.9)
MGI |33.8000|117.6000|04/22/1918|2115 0.0|  0.0| 5.00| 0.014 | IV | 39.9( 64.2)
DMG |33.8000|117.6000|09/16/1903|1210 0.0|  0.0| 4.00| 0.006 | II | 39.9( 64.2)
DMG |34.1830|117.5830|10/03/1948| 24628.0|  0.0| 4.00| 0.006 | II | 39.9( 64.2)
DMG |33.4670|116.5830|03/27/1937| 742 0.0|  0.0| 4.50| 0.009 | III| 40.1( 64.5)
DMG |33.4670|116.5830|03/27/1937| 528 0.0|  0.0| 4.00| 0.006 | II | 40.1( 64.5)
DMG |33.4670|116.5830|01/04/1938| 029 0.0|  0.0| 4.50| 0.009 | III| 40.1( 64.5)
DMG |33.4670|116.5830|03/26/1937|2124 0.0|  0.0| 4.00| 0.006 | II | 40.1( 64.5)
PAS |33.4200|116.6980|06/05/1978|16 3 3.9| 11.9| 4.40| 0.008 | III| 40.3( 64.8)
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                     EARTHQUAKE SEARCH RESULTS
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Page  8
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    |       |        |          |  TIME    |     |     | SITE |SITE| APPROX.
FILE| LAT.  | LONG.  |   DATE   |  (UTC)   |DEPTH|QUAKE| ACC. | MM | DISTANCE
CODE| NORTH | WEST   |          | H M Sec  | (km)| MAG.|  g   |INT.|  mi  [km]
----+-------+--------+----------+--------+-----+-----+-------+----+-----------
PAS |33.5010|116.5130|02/25/1980|104738.5| 13.6| 5.50| 0.022 | IV | 40.4( 64.9)
GSP |34.4050|116.4640|02/15/1993|075933.2|  5.0| 4.20| 0.007 | II | 40.4( 65.0)
DMG |34.2700|117.5400|09/12/1970|143053.0|  8.0| 5.40| 0.020 | IV | 40.4( 65.0)
DMG |33.6820|117.5530|07/05/1938|18 655.7| 10.0| 4.50| 0.009 | III| 40.6( 65.4)
DMG |33.5000|116.5000|09/30/1916| 211 0.0|  0.0| 5.00| 0.014 | III| 40.9( 65.8)
GSP |34.4140|116.4610|06/28/1992|131050.5| 10.0| 4.80| 0.011 | III| 40.9( 65.9)
PAS |34.3040|116.3410|11/15/1975| 61327.6|  5.8| 4.60| 0.009 | III| 41.1( 66.1)
DMG |34.1740|116.2570|02/15/1938| 74539.8| 10.0| 4.50| 0.008 | III| 41.3( 66.4)
PAS |33.4840|116.5130|08/11/1976|152455.5| 15.4| 4.30| 0.007 | II | 41.3( 66.5)
DMG |34.2810|117.5520|09/13/1970| 44748.6|  8.0| 4.40| 0.008 | II | 41.3( 66.5)
PAS |34.2900|116.3220|12/14/1975|181620.1|  1.8| 4.70| 0.010 | III| 41.4( 66.7)
DMG |33.5000|116.4830|02/23/1941|183614.0|  0.0| 4.50| 0.008 | III| 41.5( 66.7)
DMG |33.4830|116.5000|02/15/1951|104759.0|  0.0| 4.80| 0.011 | III| 41.8( 67.3)
DMG |33.4830|116.5000|02/15/1951|104957.0|  0.0| 4.80| 0.011 | III| 41.8( 67.3)
DMG |34.4000|116.4170|11/10/1947| 22255.0|  0.0| 4.50| 0.008 | III| 42.0( 67.5)
MGI |33.7500|116.2500|11/19/1917|1730 0.0|  0.0| 4.00| 0.005 | II | 42.1( 67.7)
GSP |33.5100|116.4500|02/18/1990|155259.9|  9.0| 4.10| 0.006 | II | 42.2( 67.8)
GSG |34.4880|116.5400|06/29/1992|015808.8|  5.0| 4.10| 0.006 | II | 42.3( 68.1)
GSP |34.4570|116.4760|07/06/1992|180636.3|  0.0| 4.30| 0.007 | II | 42.7( 68.7)
GSP |34.4560|116.4690|08/31/1992|092540.6| 11.0| 4.30| 0.007 | II | 42.9( 69.0)
DMG |34.3040|117.5700|05/05/1969|16 2 9.6|  8.8| 4.40| 0.007 | II | 43.1( 69.3)
DMG |34.1540|116.2100|07/30/1963| 63457.3| 12.9| 4.70| 0.009 | III| 43.4( 69.8)
DMG |33.5010|116.4290|02/23/1971| 0 739.2|  8.0| 4.20| 0.006 | II | 43.4( 69.9)
DMG |33.4170|116.5670|12/22/1950| 2 536.0|  0.0| 4.00| 0.005 | II | 43.6( 70.1)
DMG |34.1000|117.6830|01/18/1934| 214 0.0|  0.0| 4.00| 0.005 | II | 43.8( 70.4)
DMG |34.1000|117.6830|01/09/1934|1410 0.0|  0.0| 4.50| 0.008 | II | 43.8( 70.4)
MGI |34.0000|117.7000|12/03/1929| 9 5 0.0|  0.0| 4.00| 0.005 | II | 43.9( 70.6)
GSP |34.6000|116.8400|06/04/1989|213358.1|  2.0| 4.50| 0.008 | II | 43.9( 70.7)
DMG |33.7830|116.2000|10/31/1943|131210.0|  0.0| 4.50| 0.008 | II | 44.0( 70.8)
PAS |33.4830|116.4380|07/02/1988| 02658.2| 12.6| 4.00| 0.005 | II | 44.0( 70.8)
GSP |34.4890|116.4830|07/24/1992|072356.1|  9.0| 4.00| 0.005 | II | 44.2( 71.1)
DMG |34.1570|116.1940|08/22/1963| 43355.9|  5.8| 4.40| 0.007 | II | 44.3( 71.3)
GSP |33.9510|117.7090|01/05/1998|181406.5| 11.0| 4.30| 0.006 | II | 44.4( 71.4)
DMG |34.3000|117.6000|07/30/1894| 512 0.0|  0.0| 6.00| 0.030 |  V | 44.4( 71.4)
DMG |33.4000|116.5670|02/04/1953| 43616.0|  0.0| 4.30| 0.006 | II | 44.6( 71.8)
GSP |33.8900|116.1600|10/12/1991|143932.0|  3.0| 4.00| 0.005 | II | 44.7( 71.9)
GSP |34.1400|117.6900|03/02/1990|172625.4|  6.0| 4.60| 0.008 | III| 44.8( 72.1)
DMG |34.1800|116.1910|12/12/1957| 8 0 7.2| 16.0| 4.40| 0.007 | II | 45.0( 72.3)
DMG |33.4670|116.4330|05/12/1939|1925 2.2|  0.0| 4.50| 0.007 | II | 45.1( 72.5)
GSP |34.1300|117.7000|03/01/1990|003457.1|  4.0| 4.00| 0.005 | II | 45.2( 72.7)
GSP |34.1400|117.7000|02/28/1990|234336.6|  5.0| 5.20| 0.014 | IV | 45.3( 73.0)
PAS |34.5160|116.4950|06/01/1975| 13849.2|  4.5| 5.20| 0.014 | IV | 45.3( 73.0)
PAS |33.4580|116.4340|02/12/1979| 44842.3|  3.9| 4.20| 0.005 | II | 45.5( 73.2)
DMG |34.3500|116.2830|09/20/1942|161414.0|  0.0| 4.00| 0.005 |  I | 45.6( 73.4)
DMG |33.4200|116.4900|03/29/1937|17 316.8| 10.0| 4.00| 0.005 |  I | 45.7( 73.5)
DMG |34.3500|116.2800|04/27/1931|23 758.6|  0.0| 4.00| 0.005 |  I | 45.7( 73.6)
PAS |34.1360|117.7090|06/26/1988|15 458.5|  7.9| 4.60| 0.008 | III| 45.8( 73.7)
GSP |34.1100|117.7200|04/17/1990|223227.2|  4.0| 4.60| 0.008 | II | 46.0( 74.0)
MGI |33.7000|116.2000|08/12/1917|11 0 0.0|  0.0| 4.00| 0.004 |  I | 46.0( 74.1)
GDP |33.8060|117.7150|03/07/2000|002028.2| 11.0| 4.00| 0.004 |  I | 46.1( 74.2)
DMG |34.5780|116.6030|06/01/1937|154144.3| 10.0| 4.00| 0.004 |  I | 46.1( 74.2)
PAS |34.0060|117.7390|02/18/1989| 717 4.8|  3.3| 4.30| 0.006 | II | 46.1( 74.2)
DMG |33.4000|116.5000|10/11/1918| 4 0 0.0|  0.0| 4.00| 0.004 |  I | 46.5( 74.9)
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                         EARTHQUAKE SEARCH RESULTS
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Page   9
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    |       |        |          | TIME   |     |     | SITE |SITE|  APPROX.
FILE| LAT.  | LONG.  |   DATE   | (UTC)  |DEPTH|QUAKE| ACC. | MM |  DISTANCE
CODE| NORTH | WEST   |          | H M Sec| (km)| MAG.|   g  |INT.|  mi  [km]
----+-------+--------+----------+--------+-----+-----+------+----+-----------
GSP |34.1500|117.7200|03/01/1990|032303.0| 11.0| 4.70| 0.008| III| 46.6( 75.0)
GSP |34.5950|116.6220|06/28/1992|163210.2|  0.0| 4.40| 0.006| II | 46.8( 75.3)
DMG |34.5160|116.4510|04/05/1974|104250.7|  4.8| 4.10| 0.005| II | 46.8( 75.3)
DMG |34.0520|116.1210|03/28/1968|212133.4| 10.2| 4.00| 0.004|  I | 46.9( 75.5)
GSP |34.6020|116.6350|10/02/1992|071957.4|  3.0| 4.30| 0.006| II | 46.9( 75.5)
DMG |33.8540|117.7520|10/04/1961| 22131.6|  4.3| 4.10| 0.005| II | 47.5( 76.4)
DMG |33.4260|116.4210|03/25/1937|20 4 8.3| 10.0| 4.00| 0.004|  I | 47.7( 76.8)
PAS |33.4600|116.3700|09/07/1984|175730.3| 15.2| 4.10| 0.005| II | 47.8( 76.9)
DMG |34.2500|116.1670|03/20/1945|2155 7.0|  0.0| 5.00| 0.011| III| 48.0( 77.2)
DMG |34.2830|116.1830|03/29/1945| 4 417.0|  0.0| 4.20| 0.005| II | 48.1( 77.4)
DMG |33.4170|116.4170|01/02/1943|141118.0|  0.0| 4.50| 0.007| II | 48.3( 77.8)
GSP |34.3300|116.2100|10/22/1999|124052.0|  7.0| 4.30| 0.006| II | 48.3( 77.8)
DMG |33.2670|117.0170|06/07/1935|1633 0.0|  0.0| 4.00| 0.004|  I | 48.7( 78.3)
GSP |34.6430|116.6530|06/30/1992|200025.4|  0.0| 4.30| 0.005| II | 49.2( 79.2)
GSP |34.6440|116.6560|06/30/1992|172629.7|  0.0| 4.30| 0.005| II | 49.2( 79.3)
DMG |34.3700|117.6500|12/08/1812|15 0 0.0|  0.0| 7.00| 0.061| VI | 49.4( 79.4)
GSP |34.3740|117.6490|08/20/1998|234958.4|  9.0| 4.40| 0.006| II | 49.5( 79.6)
GSP |34.3700|116.2100|10/16/1999|110433.0|  6.0| 4.00| 0.004|  I | 49.8( 80.1)
DMG |33.3680|116.4440|03/25/1937|232026.7| 10.0| 4.00| 0.004|  I | 50.2( 80.7)
GSP |34.4390|116.2620|10/16/1999|095148.3|  0.0| 4.90| 0.009| III| 50.3( 80.9)
DMG |34.1000|117.8000|03/31/1931|2033 0.0|  0.0| 4.00| 0.004|  I | 50.3( 81.0)
GSP |34.4300|116.2510|10/16/1999|173848.6|  0.0| 4.90| 0.009| III| 50.4( 81.1)
DMG |34.7000|117.0000|07/16/1916|1230 0.0|  0.0| 4.00| 0.004|  I | 50.6( 81.5)
DMG |34.7000|117.0000|07/16/1916|1150 0.0|  0.0| 4.50| 0.006| II | 50.6( 81.5)
DMG |34.0000|116.0500|12/27/1948|1119 4.0|  0.0| 4.00| 0.004|  I | 50.7( 81.6)
MGI |33.8000|117.8000|11/04/1926|2238 0.0|  0.0| 4.60| 0.007| II | 51.0( 82.0)
MGI |33.8000|117.8000|05/20/1917| 945 0.0|  0.0| 4.00| 0.004|  I | 51.0( 82.0)
MGI |33.8000|117.8000|05/19/1917| 719 0.0|  0.0| 4.00| 0.004|  I | 51.0( 82.0)
MGI |33.8000|117.8000|11/09/1926|1535 0.0|  0.0| 4.60| 0.007| II | 51.0( 82.0)
MGI |33.8000|117.8000|11/10/1926|1723 0.0|  0.0| 4.60| 0.007| II | 51.0( 82.0)
MGI |33.8000|117.8000|05/19/1917| 635 0.0|  0.0| 4.00| 0.004|  I | 51.0( 82.0)
MGI |33.8000|117.8000|11/07/1926|1948 0.0|  0.0| 4.60| 0.007| II | 51.0( 82.0)
GSP |34.4420|116.2480|10/16/1999|125721.0|  1.0| 5.70| 0.019| IV | 51.0( 82.1)
DMG |33.8870|116.0400|01/23/1969|23 1 1.0| 17.7| 4.80| 0.008| III| 51.6( 83.0)
GSP |33.3990|116.3540|07/26/1997|031456.0| 11.0| 4.80| 0.008| III| 51.6( 83.0)
GSP |34.3500|116.1500|10/18/1999|063547.0|  1.0| 4.60| 0.007| II | 52.0( 83.6)
GSP |34.6400|116.5170|08/01/1994|213431.1|  9.0| 4.90| 0.009| III| 52.1( 83.8)
GSP |34.4510|116.2300|10/16/1999|135117.6|  0.0| 4.30| 0.005| II | 52.2( 84.0)
DMG |33.7670|117.8170|08/22/1936| 521 0.0|  0.0| 4.00| 0.004|  I | 52.5( 84.4)
GSP |34.3500|116.1400|10/17/1999|162248.0|  0.0| 4.30| 0.005| II | 52.5( 84.4)
GSP |34.3630|116.1490|10/16/1999|102052.7|  0.0| 4.80| 0.008| II | 52.5( 84.5)
DMG |33.3330|116.4330|02/12/1954| 94428.0|  0.0| 4.50| 0.006| II | 52.5( 84.5)
DMG |33.7710|116.0500|09/02/1956| 24637.0| 14.1| 4.20| 0.004|  I | 52.5( 84.5)
PAS |34.1160|116.0300|02/17/1986| 21233.5| 11.3| 4.00| 0.004|  I | 52.7( 84.9)
GSP |34.5000|116.2700|10/22/1999|034933.0|  0.0| 4.00| 0.004|  I | 52.8( 84.9)
GSP |34.3620|116.1380|10/17/1999|163253.3|  0.0| 4.20| 0.004|  I | 53.0( 85.3)
DMG |33.8140|116.0280|05/28/1961|125946.7| 18.5| 4.40| 0.005| II | 53.0( 85.4)
MGI |33.2000|117.0000|07/20/1923| 7 0 0.0|  0.0| 4.00| 0.004|  I | 53.2( 85.6)
GSP |34.5070|116.2630|10/16/1999|125509.6|  0.0| 4.50| 0.006| II | 53.4( 85.9)
DMG |34.0000|116.0000|04/03/1926|20 8 0.0|  0.0| 5.50| 0.015| IV | 53.5( 86.2)
DMG |34.0000|116.0000|09/05/1928|1442 0.0|  0.0| 5.00| 0.009| III| 53.5( 86.2)
DMG |33.4000|116.3000|02/09/1890|12 6 0.0|  0.0| 6.30| 0.030|  V | 53.6( 86.2)
GSP |34.5200|116.2700|10/29/1999|123637.0|  0.0| 4.50| 0.006| II | 53.7( 86.5)
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EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.5760	116.3360	07/08/1992	022311.3	6.0	4.90	0.008	III	54.1(87.0)
PAS	33.9650	117.8860	01/01/1976	172012.9	6.2	4.20	0.004	I	54.5(87.7)
DMG	33.2000	116.7200	05/12/1930	172548.5	0.0	4.20	0.004	I	54.5(87.7)
DMG	33.4080	116.2610	03/25/1937	1649 1.8	10.0	6.00	0.022	IV	54.7(88.1)
DMG	33.2000	116.7000	01/01/1920	235 0.0	0.0	5.00	0.009	III	54.8(88.1)
DMG	33.3430	116.3460	04/28/1969	232042.9	20.0	5.80	0.019	IV	54.9(88.3)
GSP	33.7300	116.0200	12/18/1989	062704.5	10.0	4.20	0.004	I	55.0(88.5)
GSP	34.5830	116.3190	07/05/1992	211827.1	0.0	5.40	0.013	III	55.1(88.6)
GSP	34.6050	116.3510	07/08/1992	080538.7	10.0	4.40	0.005	II	55.1(88.7)
DMG	33.8260	115.9850	01/25/1969	3 0 4.0	13.6	4.10	0.004	I	55.3(89.0)
GSP	34.5830	116.3040	07/05/1992	223345.5	0.0	4.40	0.005	II	55.6(89.5)
DMG	33.7450	115.9970	09/01/1956	55752.8	15.1	4.00	0.003	I	55.9(90.0)
GSP	34.5600	116.2600	10/22/1999	015843.0	0.0	4.00	0.003	I	56.1(90.3)
GSP	34.5830	116.2830	10/16/1999	110638.4	0.0	4.20	0.004	I	56.4(90.7)
DMG	34.6260	116.3470	07/30/1974	739 7.1	8.0	4.40	0.005	II	56.4(90.8)
MGI	33.2000	116.6000	10/12/1920	1748 0.0	0.0	5.30	0.011	III	56.5(90.9)
MGI	33.8000	117.9000	05/22/1902	740 0.0	0.0	4.30	0.004	I	56.5(91.0)
DMG	34.7120	116.5030	09/25/1965	174344.1	10.6	5.20	0.010	III	56.9(91.6)
DMG	34.6340	116.3410	07/30/1974	83653.6	12.7	4.30	0.004	I	57.1(91.8)
DMG	33.3330	116.3000	08/06/1933	332 0.0	0.0	4.70	0.006	II	57.1(91.8)
DMG	33.3330	116.3000	08/05/1933	2331 0.0	0.0	4.40	0.005	II	57.1(91.8)
GSP	34.5990	116.2800	08/14/1996	030527.5	6.0	4.30	0.004	I	57.3(92.3)
DMG	33.2670	116.4000	06/06/1940	2321 4.0	0.0	4.00	0.003	I	57.4(92.3)
GSG	34.5940	116.2710	10/16/1999	094644.1	0.0	7.10	0.054	VI	57.4(92.4)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.013	III	57.5(92.5)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.006	II	57.5(92.5)
DMG	34.7110	116.4760	09/25/1965	1748 2.4	4.8	4.90	0.007	II	57.5(92.6)
GSP	34.5920	116.2650	12/23/1999	143054.4	7.0	4.10	0.003	I	57.5(92.6)
GSP	34.5900	116.2600	10/16/1999	100239.0	0.0	4.50	0.005	II	57.6(92.7)
GSP	34.6040	116.2780	10/20/1996	001733.4	6.0	4.10	0.003	I	57.7(92.8)
DMG	34.4000	117.8000	02/24/1946	6 752.0	0.0	4.10	0.003	I	57.7(92.9)
DMG	33.3150	116.3050	04/09/1968	1831 3.8	12.6	4.70	0.006	II	57.9(93.1)
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.005	II	58.0(93.3)
DMG	33.2830	116.3500	04/13/1949	75336.0	0.0	4.10	0.003	I	58.1(93.4)
MGI	33.7000	117.9000	07/08/1902	945 0.0	0.0	4.00	0.003	I	58.4(94.0)
DMG	33.7450	115.9480	04/02/1957	42247.4	4.5	4.10	0.003	I	58.6(94.4)
DMG	33.2910	116.3170	03/19/1966	142156.0	10.9	4.00	0.003	I	58.7(94.5)
DMG	33.3000	116.3000	01/04/1940	8 711.0	0.0	4.00	0.003	I	58.8(94.7)
GSP	34.6290	116.2770	10/16/1999	101048.9	0.0	4.30	0.004	I	59.0(95.0)
GSP	34.6800	116.3600	10/20/1999	164057.0	7.0	4.20	0.004	I	59.0(95.0)
GSP	34.6700	116.3400	10/16/1999	211050.0	6.0	4.10	0.003	I	59.1(95.1)
GSG	34.5230	116.1430	10/16/1999	102938.2	5.0	4.30	0.004	I	59.2(95.3)
GDP	34.6820	116.3570	06/12/2000	031502.7	7.0	4.00	0.003	I	59.2(95.3)
DMG	33.3330	116.2360	10/05/1962	1529 2.6	13.9	4.10	0.003	I	59.5(95.7)
DMG	33.9960	117.9750	06/15/1967	458 5.5	10.0	4.10	0.003	I	59.6(95.9)
DMG	33.3330	116.2330	06/09/1942	5 633.0	0.0	4.00	0.003	I	59.6(95.9)
GSP	34.6160	116.2420	10/25/1999	182600.6	0.0	4.60	0.005	II	59.6(96.0)
DMG	33.1500	116.5830	12/02/1935	319 0.0	0.0	4.00	0.003	I	60.0(96.6)
DMG	34.7500	116.4670	03/31/1938	17 3 0.0	0.0	4.00	0.003	I	60.2(96.8)
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.005	II	60.4(97.2)
MGI	33.1000	116.8000	06/22/1918	557 0.0	0.0	4.00	0.003	I	60.5(97.3)
DMG	33.3490	116.1880	05/19/1969	144033.0	8.6	4.50	0.005	II	60.6(97.5)
GSP	34.6800	116.3080	10/16/1999	160824.6	0.0	4.10	0.003	I	60.7(97.7)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.1670	116.5000	06/23/1932	23037.1	0.0	4.00	0.003	I	60.7(97.7)
DMG	33.1670	116.5000	06/23/1932	22552.7	0.0	4.00	0.003	I	60.7(97.7)
GSP	34.7100	116.3600	10/16/1999	225341.0	6.0	4.60	0.005	II	60.8(97.8)
GSP	34.6710	116.2920	10/16/1999	100954.6	1.0	4.00	0.003	I	60.8(97.8)
MGI	34.0000	118.0000	05/05/1929	735 0.0	0.0	4.00	0.003	I	61.0(98.2)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.007	II	61.0(98.2)
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.005	II	61.0(98.2)
DMG	33.3100	116.2240	05/22/1968	132655.4	7.5	4.40	0.004	I	61.1(98.4)
GSP	34.7100	116.3400	10/19/1999	122044.0	5.0	4.60	0.005	II	61.4(98.8)
DMG	33.1670	116.4670	08/01/1960	193930.0	0.0	4.20	0.003	I	61.5(99.0)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.005	II	61.6(99.2)
GSP	34.6800	116.2800	10/16/1999	095935.0	8.0	5.80	0.016	IV	61.7(99.3)
DMG	33.2790	116.2490	01/07/1966	191023.0	-1.7	4.00	0.003	I	61.8(99.5)
GSP	34.7000	116.3000	10/30/1999	111857.0	6.0	4.00	0.003	I	62.1(99.9)
DMG	33.8000	118.0000	10/21/1913	938 0.0	0.0	4.00	0.003	I	62.2(100.0)
GSP	34.6900	116.2800	10/16/1999	201337.0	6.0	4.70	0.005	II	62.2(100.1)
GSP	34.7040	116.2970	10/16/1999	180157.5	2.0	4.30	0.004	I	62.4(100.5)
DMG	33.1000	116.6330	02/08/1952	174028.0	0.0	4.00	0.003	I	62.4(100.5)
GSP	33.0700	116.8000	12/04/1991	071057.5	15.0	4.20	0.003	I	62.5(100.6)
PAS	33.1380	116.5010	10/10/1984	212258.9	11.6	4.50	0.004	I	62.5(100.7)
GSP	34.7110	116.3030	10/16/1999	114958.6	1.0	4.10	0.003	I	62.6(100.8)
MGI	33.5000	116.0000	09/30/1916	425 0.0	0.0	4.00	0.003	I	62.7(100.8)
DMG	33.8500	115.8500	10/13/1949	42040.0	0.0	4.00	0.003	I	62.7(100.9)
DMG	33.1830	116.3830	10/14/1949	02925.0	0.0	4.10	0.003	I	62.8(101.1)
DMG	33.1670	116.4170	12/05/1939	173352.0	0.0	4.00	0.003	I	62.9(101.2)
DMG	33.1670	116.4170	10/14/1935	1550 0.0	0.0	4.00	0.003	I	62.9(101.2)
DMG	33.1670	116.4170	07/10/1938	18 6 0.0	0.0	4.00	0.003	I	62.9(101.2)
DMG	33.7500	118.0000	11/16/1934	2126 0.0	0.0	4.00	0.003	I	62.9(101.3)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.005	II	63.0(101.3)
MGI	33.1000	116.6000	08/19/1917	710 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	02/16/1915	1330 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	03/04/1915	1250 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	02/05/1922	1915 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	08/10/1921	2151 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	05/28/1917	1017 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	02/09/1920	220 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	08/10/1921	19 6 0.0	0.0	4.00	0.003	I	63.0(101.4)
MGI	33.1000	116.6000	05/11/1915	1145 0.0	0.0	4.00	0.003	I	63.0(101.4)
GSP	34.7190	116.2980	10/16/1999	120318.4	0.0	4.30	0.004	I	63.2(101.8)
GSP	34.2500	117.9900	06/28/1991	170055.5	9.0	4.30	0.004	I	63.4(102.0)
DMG	33.6650	117.9790	10/20/1961	214240.7	7.2	4.00	0.003	I	63.5(102.1)
DMG	33.2350	116.2660	04/09/1968	93833.0	5.2	4.00	0.003	I	63.6(102.3)
DMG	33.6590	117.9810	10/20/1961	20 714.5	6.1	4.00	0.003	I	63.7(102.5)
DMG	33.1100	116.5230	01/24/1957	205449.9	3.9	4.60	0.005	II	63.8(102.7)
DMG	33.9670	118.0500	01/30/1941	13446.9	0.0	4.10	0.003	I	63.9(102.8)
DMG	33.6800	117.9930	11/20/1961	85334.7	4.4	4.00	0.003	I	63.9(102.8)
DMG	34.8300	116.5200	09/26/1929	20 022.7	0.0	5.10	0.008	II	64.0(103.0)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.023	IV	64.0(103.0)
DMG	34.8500	116.5830	07/30/1932	71359.7	0.0	4.50	0.004	I	64.1(103.1)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.005	II	64.1(103.1)
DMG	33.2830	116.1830	03/19/1954	101957.0	0.0	4.50	0.004	I	64.1(103.2)
DMG	33.2830	116.1830	10/26/1944	225410.0	0.0	4.20	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	957 7.0	0.0	4.60	0.005	II	64.1(103.2)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.2830	116.1830	03/19/1954	143750.0	0.0	4.00	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	102117.0	0.0	5.50	0.011	III	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	102610.0	0.0	4.00	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/20/1954	6 353.0	0.0	4.30	0.004	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	95748.0	0.0	4.00	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	13 8 4.0	0.0	4.30	0.004	I	64.1(103.2)
DMG	33.2830	116.1830	04/04/1954	42920.0	0.0	4.10	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	95556.0	0.0	5.00	0.007	II	64.1(103.2)
DMG	33.2830	116.1830	03/20/1954	41919.0	0.0	4.90	0.006	II	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	101522.0	0.0	4.50	0.004	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	95429.0	0.0	6.20	0.021	IV	64.1(103.2)
DMG	33.2830	116.1830	03/23/1954	41450.0	0.0	5.10	0.008	II	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	14 057.0	0.0	4.10	0.003	I	64.1(103.2)
DMG	33.2830	116.1830	03/19/1954	10 139.0	0.0	4.20	0.003	I	64.1(103.2)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.010	III	64.3(103.4)
DMG	33.2000	116.3000	05/12/1930	414 0.0	0.0	4.00	0.003	I	64.4(103.7)
DMG	33.6540	117.9940	10/20/1961	194950.5	4.6	4.30	0.004	I	64.5(103.9)
GSP	34.8000	116.4100	10/21/1999	015435.0	1.0	5.00	0.007	II	64.7(104.1)
DMG	34.8830	116.6670	09/20/1949	41411.0	0.0	4.10	0.003	I	64.9(104.5)
DMG	33.3330	116.1000	06/12/1943	192141.0	0.0	4.00	0.003	-	65.0(104.6)
DMG	33.6710	118.0120	10/20/1961	223534.2	5.6	4.10	0.003	I	65.1(104.8)
GSP	34.7400	116.2700	10/19/1999	103939.0	14.0	4.10	0.003	I	65.3(105.2)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.016	IV	65.8(105.9)
GSP	34.8030	116.3720	02/14/2000	095742.0	2.0	4.40	0.004	I	65.9(106.1)
DMG	33.1170	116.4170	10/21/1940	64933.0	0.0	4.50	0.004	I	65.9(106.1)
DMG	33.1170	116.4170	06/04/1940	103656.0	0.0	4.00	0.003	-	65.9(106.1)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.008	III	66.0(106.3)
DMG	33.1000	116.4500	11/23/1953	1339 7.0	0.0	4.30	0.003	I	66.1(106.5)
PAS	34.0500	118.0870	10/01/1987	155953.5	10.4	4.00	0.003	-	66.2(106.5)
DMG	33.6000	118.0000	03/11/1933	231 0.0	0.0	4.40	0.004	I	66.2(106.6)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.004	I	66.2(106.6)
DMG	33.2370	116.1900	04/14/1968	125558.7	10.8	4.30	0.003	I	66.2(106.6)
DMG	33.5670	117.9830	07/07/1937	1112 0.0	0.0	4.00	0.003	-	66.3(106.6)
DMG	33.5670	117.9830	04/17/1934	1833 0.0	0.0	4.00	0.003	-	66.3(106.6)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.005	II	66.4(106.8)
GSP	34.8200	116.3900	10/22/1999	164823.0	6.0	4.20	0.003	I	66.5(106.9)
DMG	33.0970	116.4440	08/18/1959	215221.3	17.3	4.30	0.003	I	66.5(107.0)
PAS	34.0760	118.0900	10/01/1987	1448 3.1	11.7	4.10	0.003	I	66.5(107.1)
DMG	34.9330	116.8830	04/27/1932	233518.3	0.0	4.00	0.003	-	66.6(107.2)
DMG	33.2000	116.2330	04/05/1942	92039.0	0.0	4.00	0.003	-	66.7(107.3)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.006	II	66.7(107.3)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.007	II	66.7(107.3)
DMG	33.6170	118.0170	10/02/1933	1326 1.0	0.0	4.00	0.003	-	66.7(107.3)
GSP	33.1100	116.4000	04/01/1984	071702.3	11.0	4.00	0.002	-	66.8(107.5)
DMG	34.5330	115.9830	07/18/1946	142758.0	0.0	5.60	0.011	III	66.8(107.5)
DMG	34.0170	115.7670	05/02/1949	112458.0	0.0	4.60	0.004	I	66.9(107.7)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.005	II	66.9(107.7)
DMG	33.6830	118.0500	03/11/1933	1250 0.0	0.0	4.40	0.004	I	66.9(107.7)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.010	III	66.9(107.7)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.009	III	67.0(107.8)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.005	II	67.0(107.8)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.005	II	67.0(107.8)
DMG	33.0000	117.0000	03/03/1906	2025 0.0	0.0	4.50	0.004	I	67.0(107.8)

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                    EARTHQUAKE SEARCH RESULTS
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Page  13
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    |      |       |         |  TIME  |    |      | SITE |SITE|  APPROX.
FILE|  LAT. | LONG.  |  DATE   |  (UTC) |DEPTH|QUAKE| ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |         | H M Sec| (km)| MAG. |  g   |INT.|  mi  [km]
----+------+-------+---------+-------+----+----+------+---+-----------
MGI |33.0000|117.0000|09/21/1856| 730 0.0|  0.0| 5.00| 0.006 | II | 67.0(107.8)
MGI |33.0000|117.0000|12/29/1914|10 0 0.0|  0.0| 4.00| 0.002 |  - | 67.0(107.8)
GDP |34.7830|116.2940|06/26/2000|154307.5|  4.0| 4.60| 0.004 |  I | 67.0(107.9)
GSP |34.8360|116.4050|11/14/1999|142009.4|  6.0| 4.50| 0.004 |  I | 67.0(107.9)
DMG |33.6000|118.0170|12/25/1935|1715 0.0|  0.0| 4.50| 0.004 |  I | 67.1(108.0)
DMG |33.3170|116.0670|09/04/1944|125528.0|  0.0| 4.10| 0.003 |  I | 67.2(108.1)
MGI |34.1000|118.1000|07/11/1855| 415 0.0|  0.0| 6.30| 0.022 | IV | 67.3(108.3)
GSP |34.8130|116.3410|10/16/1999|112604.8|  0.0| 4.70| 0.005 | II | 67.4(108.4)
GSP |34.7900|116.2920|11/07/1999|064749.7|  5.0| 4.00| 0.002 |  - | 67.5(108.6)
DMG |33.1210|116.3490|05/25/1971|10 252.9|  8.0| 4.10| 0.003 |  I | 67.5(108.7)
DMG |33.6170|118.0330|05/21/1938| 944 0.0|  0.0| 4.00| 0.002 |  - | 67.5(108.7)
DMG |33.7000|118.0670|03/11/1933| 51022.0|  0.0| 5.10| 0.007 | II | 67.5(108.7)
DMG |33.7000|118.0670|02/08/1940|165617.0|  0.0| 4.00| 0.002 |  - | 67.5(108.7)
DMG |33.7000|118.0670|03/11/1933| 85457.0|  0.0| 5.10| 0.007 | II | 67.5(108.7)
DMG |33.7000|118.0670|07/20/1940| 4 113.0|  0.0| 4.00| 0.002 |  - | 67.5(108.7)
DMG |33.7500|118.0830|03/19/1933|2123 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 339 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1956 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/16/1933|1456 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 832 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933|1651 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|04/02/1933|1536 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 2 5 0.0|  0.0| 4.30| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 347 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 2 4 0.0|  0.0| 4.90| 0.006 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 216 0.0|  0.0| 4.80| 0.005 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933|1738 0.0|  0.0| 4.50| 0.004 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1025 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 611 0.0|  0.0| 4.40| 0.004 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/16/1933|1529 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/13/1933|1532 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933| 448 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 257 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933| 6 1 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 926 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 222 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933| 835 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|11 0 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 8 8 0.0|  0.0| 4.50| 0.004 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1129 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 2 9 0.0|  0.0| 5.00| 0.006 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1141 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|2232 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1944 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 513 0.0|  0.0| 4.70| 0.005 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/13/1933| 432 0.0|  0.0| 4.70| 0.005 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 751 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 230 0.0|  0.0| 5.10| 0.007 | II | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 524 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 252 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/14/1933| 036 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|04/02/1933| 8 0 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/25/1933|1346 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
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EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/12/1933	546 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/21/1933	326 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/23/1933	840 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.006	II	67.6(108.7)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.008	III	67.6(108.7)
DMG	33.7500	118.0830	03/30/1933	1225 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/13/1933	1929 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	1825 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	210 0.0	0.0	4.60	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	521 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	911 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/20/1933	1358 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	515 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	1045 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	15 2 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	2240 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	553 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	027 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	1138 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	759 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	3 5 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/15/1933	2 8 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/15/1933	540 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	336 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/13/1933	343 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/31/1933	1049 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	837 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	2128 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	211 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	1147 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	3 9 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	2231 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/13/1933	617 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.007	II	67.6(108.7)
DMG	33.7500	118.0830	03/14/1933	2242 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	23 5 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	555 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	034 0.0	0.0	4.00	0.002	-	67.6(108.7)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/15/1933	432 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	635 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	440 0.0	0.0	4.70	0.005	II	67.6(108.7)
DMG	33.7500	118.0830	03/23/1933	1831 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	439 0.0	0.0	4.90	0.006	II	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	436 0.0	0.0	4.60	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	22 0 0.0	0.0	4.40	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	1653 0.0	0.0	4.80	0.005	II	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/14/1933	1219 0.0	0.0	4.50	0.004	I	67.6(108.7)
DMG	33.7500	118.0830	03/18/1933	2052 0.0	0.0	4.20	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/16/1933	1530 0.0	0.0	4.10	0.003	I	67.6(108.7)
DMG	33.7500	118.0830	03/11/1933	311 0.0	0.0	4.20	0.003	I	67.6(108.7)

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                         EARTHQUAKE SEARCH RESULTS
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Page  15
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    |       |        |          |   TIME   |     |     |  SITE |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC)   |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec  | (km)| MAG.|   g   |INT.|  mi  [km]
----+-------+--------+----------+----------+-----+-----+-------+----+-----------
DMG |33.7500|118.0830|03/11/1933| 618 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/17/1933|1651 0.0|  0.0| 4.10| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|04/01/1933| 642 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933| 740 0.0|  0.0| 4.20| 0.003 |  I | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1357 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933|1547 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/11/1933| 258 0.0|  0.0| 4.00| 0.002 |  - | 67.6(108.7)
DMG |33.7500|118.0830|03/12/1933| 616 0.0|  0.0| 4.60| 0.004 |  I | 67.6(108.7)
GSP |34.8300|116.3700|10/17/1999|042248.0|  6.0| 4.20| 0.003 |  I | 67.6(108.8)
DMG |34.9500|116.9500|12/18/1948|234517.0|  0.0| 4.40| 0.004 |  I | 67.7(109.0)
GSP |34.9440|116.7980|10/11/1992|123812.5|  2.0| 4.50| 0.004 |  I | 67.8(109.1)
DMG |33.2000|116.2000|05/28/1892|1115 0.0|  0.0| 6.30| 0.022 | IV | 67.8(109.2)
DMG |34.0000|115.7500|03/03/1942| 1 324.0|  0.0| 5.00| 0.006 | II | 67.9(109.2)
DMG |34.0000|115.7500|03/04/1942|11 212.0|  0.0| 4.00| 0.002 |  - | 67.9(109.2)
DMG |34.9540|116.9610|10/01/1953|193516.2|  6.0| 4.10| 0.003 |  I | 68.0(109.5)
GSP |34.9100|116.5800|06/29/1991|175352.0|  6.0| 4.00| 0.002 |  - | 68.0(109.5)
DMG |33.2670|116.1000|01/04/1954|233152.0|  0.0| 4.20| 0.003 |  I | 68.2(109.7)
GSP |34.8290|116.3450|10/16/1999|135917.0|  0.0| 4.40| 0.004 |  I | 68.2(109.8)
DMG |33.2780|116.0850|08/26/1965|125351.0|  1.0| 4.20| 0.003 |  I | 68.3(109.9)
GSP |34.8600|116.4100|10/22/1999|160848.0|  1.0| 5.00| 0.006 | II | 68.4(110.1)
DMG |33.9500|118.1330|10/25/1933| 7 046.0|  0.0| 4.30| 0.003 |  I | 68.6(110.5)
GSP |34.8600|116.4000|10/21/1999|012542.0|  3.0| 4.30| 0.003 |  I | 68.7(110.5)
DMG |33.7330|118.1000|03/11/1933|1350 0.0|  0.0| 4.40| 0.004 |  I | 68.8(110.7)
DMG |33.7330|118.1000|03/11/1933|1447 0.0|  0.0| 4.40| 0.004 |  I | 68.8(110.7)
DMG |33.7330|118.1000|03/11/1933|15 9 0.0|  0.0| 4.40| 0.004 |  I | 68.8(110.7)
GSP |34.8440|116.3570|11/03/1999|032757.0|  7.0| 4.10| 0.003 |  I | 68.8(110.7)
GSP |34.8600|116.3900|10/21/1999|015738.0|  4.0| 5.00| 0.006 | II | 68.9(110.9)
GSP |34.8600|116.3900|10/22/1999|201730.0|  2.0| 4.30| 0.003 |  I | 68.9(110.9)
GSP |34.8600|116.3900|10/22/1999|201601.0|  3.0| 4.20| 0.003 |  I | 68.9(110.9)
DMG |34.9670|116.9330|12/30/1947|191914.0|  0.0| 4.00| 0.002 |  - | 68.9(110.9)
GSP |34.8500|116.3600|10/30/1999|033259.0|  6.0| 4.20| 0.003 |  I | 69.1(111.2)
GSP |34.9710|116.9370|07/01/1992|102947.7|  0.0| 4.30| 0.003 |  I | 69.2(111.4)
GSP |34.9710|116.9390|07/20/1992|044801.5|  4.0| 4.60| 0.004 |  I | 69.2(111.4)
DMG |33.7670|118.1170|11/04/1939|2141 0.0|  0.0| 4.00| 0.002 |  - | 69.2(111.4)
DMG |34.9670|116.8170|08/30/1950|1659 4.0|  0.0| 4.20| 0.003 |  I | 69.2(111.4)
GSP |34.8700|116.4000|10/21/1999|015406.0|  4.0| 4.50| 0.004 |  I | 69.3(111.5)
GSP |34.9730|116.9360|07/01/1992|103252.3|  0.0| 4.10| 0.003 |  - | 69.3(111.6)
GSP |34.8500|116.3500|10/18/1999|110220.0|  6.0| 4.40| 0.003 |  I | 69.4(111.6)
DMG |33.2170|116.1330|08/15/1945|175624.0|  0.0| 5.70| 0.012 | III| 69.4(111.7)
GSP |34.9470|116.6520|10/26/1993|092407.4|  6.0| 4.00| 0.002 |  - | 69.4(111.7)
GSP |34.9700|116.8190|03/18/1997|152447.7|  1.0| 5.10| 0.007 | II | 69.4(111.7)
DMG |34.3330|115.8000|12/22/1943|155028.0|  0.0| 5.50| 0.010 | III| 69.5(111.9)
DMG |34.6170|116.0000|11/09/1942|203425.0|  0.0| 4.50| 0.004 |  I | 69.6(112.0)
MGI |33.0000|116.6000|06/11/1917| 354 0.0|  0.0| 4.00| 0.002 |  - | 69.6(112.0)
DMG |34.9760|116.9960|11/07/1958|1738 3.7| 12.2| 4.10| 0.003 |  - | 69.6(112.0)
GSP |34.9790|116.9510|11/26/1992|214117.2|  0.0| 4.00| 0.002 |  - | 69.8(112.2)
GSP |34.9790|116.9520|08/05/1992|222240.8|  0.0| 4.80| 0.005 | II | 69.8(112.3)
PAS |34.1490|118.1350|12/03/1988|113826.4| 13.3| 4.90| 0.006 | II | 69.8(112.3)
DMG |33.7830|118.1330|11/20/1933|1032 0.0|  0.0| 4.00| 0.002 |  - | 69.9(112.5)
DMG |33.7830|118.1330|10/02/1933| 91017.6|  0.0| 5.40| 0.009 | III| 69.9(112.5)
DMG |33.7830|118.1330|01/13/1940| 749 7.0|  0.0| 4.00| 0.002 |  - | 69.9(112.5)
DMG |34.9330|116.5500|05/04/1947| 25039.0|  0.0| 4.00| 0.002 |  - | 70.1(112.8)
DMG |33.0000|117.3000|11/22/1800|2130 0.0|  0.0| 6.50| 0.025 |  V | 70.1(112.8)
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                 EARTHQUAKE SEARCH RESULTS
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Page  16
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    |       |        |          |  TIME   |     |     |      | SITE  |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC)  |DEPTH|QUAKE| ACC. | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec | (km)| MAG.|   g  |INT.|  mi  [km]
----+-------+--------+----------+---------+-----+-----+------+----+-----------
DMG |33.2830|116.0330|03/29/1951|233929.0|  0.0| 4.40| 0.003 |  I  | 70.2(113.0)
DMG |33.2830|116.0330|03/16/1949|18 027.0|  0.0| 4.00| 0.002 |  -  | 70.2(113.0)
DMG |33.7500|118.1330|03/11/1933|11 4 0.0|  0.0| 4.60| 0.004 |  I  | 70.3(113.2)
DMG |33.5610|118.0580|01/15/1937|183547.0| 10.0| 4.00| 0.002 |  -  | 70.4(113.2)
DMG |33.2330|116.0860|08/26/1965|133814.0| -2.0| 4.50| 0.004 |  I  | 70.4(113.4)
DMG |33.2880|116.0180|07/27/1965|14 441.4|  0.6| 4.30| 0.003 |  I  | 70.6(113.6)
GSP |34.9920|116.9480|07/20/1992|131319.4|  0.0| 4.60| 0.004 |  I  | 70.6(113.7)
DMG |34.9330|116.5170|04/11/1947|184340.0|  0.0| 4.10| 0.003 |  -  | 70.7(113.8)
DMG |34.9330|116.5170|04/21/1947|191529.0|  0.0| 4.40| 0.003 |  I  | 70.7(113.8)
DMG |34.9330|116.5170|04/12/1947|18 434.0|  0.0| 4.00| 0.002 |  -  | 70.7(113.8)
DMG |34.9330|116.5170|04/10/1947|222723.0|  0.0| 4.20| 0.003 |  I  | 70.7(113.8)
DMG |34.9330|116.5170|04/10/1947|171218.0|  0.0| 4.40| 0.003 |  I  | 70.7(113.8)
DMG |34.9330|116.5170|05/22/1947| 439 0.0|  0.0| 4.00| 0.002 |  -  | 70.7(113.8)
DMG |34.9330|116.5170|04/11/1947| 33210.0|  0.0| 4.30| 0.003 |  I  | 70.7(113.8)
DMG |34.9330|116.5170|04/12/1947|234852.0|  0.0| 4.20| 0.003 |  I  | 70.7(113.8)
DMG |33.9170|115.7000|06/04/1946|12 524.0|  0.0| 4.80| 0.005 | II  | 70.8(113.9)
DMG |33.1670|116.1670|11/16/1937|1057 0.0|  0.0| 4.00| 0.002 |  -  | 70.8(114.0)
GSP |33.2240|116.0880|07/10/1998|212913.8| 12.0| 4.10| 0.003 |  -  | 70.8(114.0)
DMG |33.2000|116.1170|12/28/1950| 52211.0|  0.0| 4.20| 0.003 |  I  | 70.9(114.1)
DMG |33.1900|116.1290|04/09/1968| 22859.1| 11.1| 6.40| 0.022 | IV  | 71.0(114.2)
GSP |33.2500|116.0500|08/31/1990|033800.0|  8.0| 4.20| 0.003 |  I  | 71.1(114.4)
DMG |33.8670|115.7000|04/28/1946|173123.0|  0.0| 4.40| 0.003 |  I  | 71.1(114.4)
DMG |35.0000|117.0000|08/01/1947|154230.0|  0.0| 4.00| 0.002 |  -  | 71.3(114.7)
GSP |34.0200|118.1800|06/12/1989|172225.5| 16.0| 4.10| 0.002 |  -  | 71.4(114.9)
GSP |34.0300|118.1800|06/12/1989|165718.4| 16.0| 4.40| 0.003 |  I  | 71.4(114.9)
DMG |34.9500|116.5330|04/11/1947| 2 711.0|  0.0| 4.10| 0.002 |  -  | 71.5(115.1)
DMG |34.9500|116.5330|04/10/1947|171822.0|  0.0| 5.00| 0.006 | II  | 71.5(115.1)
T-A |33.5000|115.8200|05/00/1868| 0 0 0.0|  0.0| 6.30| 0.020 | IV  | 71.7(115.4)
DMG |34.0170|115.6830|05/02/1949|112547.0|  0.0| 5.90| 0.014 | III | 71.7(115.4)
DMG |34.0170|115.6830|05/22/1949|232127.0|  0.0| 4.00| 0.002 |  -  | 71.7(115.4)
DMG |34.0170|115.6830|05/10/1949| 4 633.0|  0.0| 4.70| 0.004 |  I  | 71.7(115.4)
DMG |34.0170|115.6830|05/02/1949|143521.0|  0.0| 4.20| 0.003 |  I  | 71.7(115.4)
DMG |34.0170|115.6830|05/25/1949|173146.0|  0.0| 4.50| 0.004 |  I  | 71.7(115.4)
DMG |34.0170|115.6830|05/02/1949|1841 3.0|  0.0| 4.20| 0.003 |  I  | 71.7(115.4)
DMG |34.0170|115.6830|05/06/1949| 326 6.0|  0.0| 4.10| 0.002 |  -  | 71.7(115.4)
T-A |34.1700|118.1700|03/07/1888|1554 0.0|  0.0| 4.30| 0.003 |  I  | 72.0(115.9)
DMG |33.6170|118.1170|01/20/1934|2117 0.0|  0.0| 4.50| 0.004 |  I  | 72.1(116.0)
DMG |33.2400|116.0360|04/28/1961| 63021.2| -1.2| 4.20| 0.003 |  I  | 72.1(116.1)
DMG |33.0380|116.3610|02/26/1957|211652.2|  0.0| 4.10| 0.002 |  -  | 72.3(116.3)
DMG |33.7500|118.1670|05/16/1933|205855.0|  0.0| 4.00| 0.002 |  -  | 72.3(116.3)
DMG |34.9670|116.5500|04/10/1947|182759.0|  0.0| 4.30| 0.003 |  I  | 72.3(116.4)
DMG |34.9670|116.5500|04/11/1947| 747 0.0|  0.0| 5.00| 0.006 | II  | 72.3(116.4)
DMG |34.9670|116.5500|01/03/1949|134340.0|  0.0| 4.80| 0.005 | II  | 72.3(116.4)
DMG |34.9670|116.5500|04/10/1947|1713 0.0|  0.0| 4.30| 0.003 |  I  | 72.3(116.4)
DMG |34.9670|116.5500|04/19/1947| 229 9.0|  0.0| 4.70| 0.004 |  I  | 72.3(116.4)
DMG |34.9670|116.5500|04/10/1947|16 3 0.0|  0.0| 5.10| 0.006 | II  | 72.3(116.4)
MGI |34.0000|118.2000|06/26/1917| 424 0.0|  0.0| 4.00| 0.002 |  -  | 72.5(116.6)
MGI |34.0000|118.2000|06/26/1917|2130 0.0|  0.0| 4.60| 0.004 |  I  | 72.5(116.6)
MGI |34.0000|118.2000|06/26/1917|2120 0.0|  0.0| 4.60| 0.004 |  I  | 72.5(116.6)
MGI |34.0000|118.2000|02/13/1917|13 5 0.0|  0.0| 4.60| 0.004 |  I  | 72.5(116.6)
MGI |34.0000|118.2000|06/26/1917|2115 0.0|  0.0| 4.60| 0.004 |  I  | 72.5(116.6)
PAS |33.5080|118.0710|11/20/1988| 53928.7|  6.0| 4.50| 0.004 |  I  | 72.6(116.8)
DMG |33.9500|115.6670|08/04/1959|182522.0|  0.0| 4.10| 0.002 |  -  | 72.6(116.8)
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    |      |       |          |  TIME   |     |     | SITE  |SITE|   APPROX.
FILE| LAT. | LONG. |   DATE   |  (UTC)  |DEPTH|QUAKE|  ACC. | MM |  DISTANCE
CODE| NORTH|  WEST |          | H M Sec | (km)| MAG.|   g   |INT.|  mi   [km]
----+------+-------+----------+---------+-----+-----+-------+----+-----------
MGI |33.9000|118.2000|10/08/1927|1914 0.0|  0.0| 4.60| 0.004 |  I |  72.6(116.9)
DMG |33.1670|116.1170|04/09/1968| 233 9.0|  0.0| 4.30| 0.003 |  I |  72.6(116.9)
DMG |33.1670|116.1170|04/09/1968| 23930.0|  0.0| 4.40| 0.003 |  I |  72.6(116.9)
DMG |33.0020|116.4360|07/02/1957| 65638.5| 12.8| 4.10| 0.002 |  - |  72.7(116.9)
DMG |33.9390|118.2050|01/11/1950|214135.0|  0.4| 4.10| 0.002 |  - |  72.8(117.1)
DMG |34.7110|116.0270|09/26/1965| 7 0 1.7|  8.3| 5.00| 0.006 | II |  72.8(117.2)
DMG |33.8670|118.2000|11/13/1933|2128 0.0|  0.0| 4.00| 0.002 |  - |  72.8(117.2)
DMG |33.0530|116.3060|04/02/1967|201538.6|  1.0| 4.30| 0.003 |  I |  72.9(117.2)
DMG |33.0000|116.4330|06/04/1940|1035 8.3|  0.0| 5.10| 0.006 | II |  72.9(117.2)
DMG |34.3160|115.7290|12/14/1970|191419.4|  8.0| 4.00| 0.002 |  - |  72.9(117.4)
MGI |34.1000|118.2000|01/27/1860| 830 0.0|  0.0| 4.30| 0.003 |  I |  73.0(117.4)
MGI |34.1000|118.2000|04/21/1921|1538 0.0|  0.0| 4.00| 0.002 |  - |  73.0(117.4)
MGI |34.1000|118.2000|05/02/1916|1432 0.0|  0.0| 4.00| 0.002 |  - |  73.0(117.4)
GSP |35.0260|116.9680|08/06/1992|165060.0|  4.0| 4.00| 0.002 |  - |  73.0(117.5)
GSP |35.0260|116.9720|02/11/1993|123937.0|  3.0| 4.50| 0.004 |  I |  73.0(117.5)
DMG |33.7500|118.1830|08/04/1933| 41748.0|  0.0| 4.00| 0.002 |  - |  73.2(117.7)
PAS |33.4710|118.0610|02/27/1984|101815.0|  6.0| 4.00| 0.002 |  - |  73.2(117.9)
GSP |35.0300|116.9680|07/05/1992|105543.3|  0.0| 4.70| 0.004 |  I |  73.3(117.9)
DMG |34.9830|116.5500|04/10/1947|1558 6.0|  0.0| 6.20| 0.017 | IV |  73.4(118.1)
DMG |34.9830|116.5500|11/17/1947|14 710.0|  0.0| 4.30| 0.003 |  I |  73.4(118.1)
GSP |35.0330|116.9900|08/23/1992|064044.5|  4.0| 4.00| 0.002 |  - |  73.5(118.3)
DMG |35.0330|116.8670|11/10/1948|235613.0|  0.0| 4.10| 0.002 |  - |  73.6(118.4)
DMG |33.7830|118.2000|12/27/1939|192849.0|  0.0| 4.70| 0.004 |  I |  73.7(118.5)
DMG |35.0370|116.9400|08/13/1947|20 9 0.1| 15.6| 4.30| 0.003 |  I |  73.8(118.7)
DMG |33.8670|118.2170|06/19/1944| 3 6 7.0|  0.0| 4.40| 0.003 |  I |  73.8(118.8)
DMG |33.8670|118.2170|06/19/1944| 0 333.0|  0.0| 4.50| 0.003 |  I |  73.8(118.8)
DMG |33.5170|118.1000|03/22/1941| 82240.0|  0.0| 4.00| 0.002 |  - |  73.8(118.8)
DMG |33.2310|116.0040|05/26/1957|155933.6| 15.1| 5.00| 0.006 | II |  73.9(118.9)
GSP |35.0170|117.2030|06/29/1992|041642.6|  3.0| 4.00| 0.002 |  - |  74.0(119.0)
DMG |33.8170|118.2170|10/22/1941| 65718.5|  0.0| 4.90| 0.005 | II |  74.2(119.5)
GSP |35.0450|116.9760|11/25/1992|024024.9|  3.0| 4.10| 0.002 |  - |  74.3(119.6)
DMG |34.0500|115.6330|09/11/1953|205046.0|  0.0| 4.20| 0.003 |  - |  74.7(120.2)
DMG |33.0430|116.2600|08/22/1961|231933.6| 12.1| 4.40| 0.003 |  I |  74.8(120.4)
DMG |33.0500|116.2380|08/23/1961| 1 047.8| 11.9| 4.70| 0.004 |  I |  75.0(120.8)
GSP |34.9000|116.2500|10/16/1999|100728.0|  6.0| 4.70| 0.004 |  I |  75.2(121.0)
DMG |33.2670|115.9330|12/30/1960|214025.0|  0.0| 4.00| 0.002 |  - |  75.3(121.1)
DMG |33.2830|115.9170|03/28/1952| 11622.0|  0.0| 4.20| 0.003 |  - |  75.3(121.1)
DMG |33.1170|116.1170|06/18/1943|161546.0|  0.0| 4.50| 0.003 |  I |  75.3(121.2)
T-A |34.0000|118.2500|05/04/1857| 6 0 0.0|  0.0| 4.30| 0.003 |  I |  75.3(121.2)
T-A |34.0000|118.2500|09/23/1827| 0 0 0.0|  0.0| 5.00| 0.005 | II |  75.3(121.2)
T-A |34.0000|118.2500|01/17/1857| 1 0 0.0|  0.0| 4.30| 0.003 |  I |  75.3(121.2)
T-A |34.0000|118.2500|03/26/1860| 0 0 0.0|  0.0| 5.00| 0.005 | II |  75.3(121.2)
T-A |34.0000|118.2500|03/21/1880|1425 0.0|  0.0| 4.30| 0.003 |  I |  75.3(121.2)
T-A |34.0000|118.2500|01/10/1856| 0 0 0.0|  0.0| 5.00| 0.005 | II |  75.3(121.2)
T-A |34.0000|118.2500|05/02/1856| 810 0.0|  0.0| 4.30| 0.003 |  I |  75.3(121.2)
PAS |33.0580|116.2110|03/22/1982| 85328.6|  4.6| 4.50| 0.003 |  I |  75.4(121.4)
DMG |34.8460|116.1430|08/18/1938| 73945.4| 10.0| 4.50| 0.003 |  I |  75.5(121.5)
DMG |33.2000|116.0000|08/15/1951|1227 9.0|  0.0| 4.00| 0.002 |  - |  75.5(121.6)
DMG |33.1330|116.0830|10/06/1940|181953.0|  0.0| 4.00| 0.002 |  - |  75.7(121.8)
DMG |33.1330|116.0830|10/16/1940|175213.0|  0.0| 4.00| 0.002 |  - |  75.7(121.8)
DMG |33.1330|116.0830|02/28/1940|1728 7.0|  0.0| 4.50| 0.003 |  I |  75.7(121.8)
DMG |33.1330|116.0830|05/07/1936|1147 0.0|  0.0| 4.50| 0.003 |  I |  75.7(121.8)
PAS |33.1360|116.0710|02/29/1984| 2 731.7|  6.6| 4.30| 0.003 |  I |  76.0(122.3)
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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.9670	116.3830	10/31/1942	15 758.0	0.0	4.00	0.002	-	76.1(122.5)
DMG	33.0330	116.2330	09/20/1961	5 410.0	0.0	4.00	0.002	-	76.2(122.6)
DMG	33.6330	118.2000	11/01/1940	20 046.0	0.0	4.00	0.002	-	76.2(122.6)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.005	II	76.2(122.7)
DMG	33.6300	118.2000	09/13/1929	132338.2	0.0	4.00	0.002	-	76.3(122.7)
GSP	33.2100	115.9700	07/19/1991	024136.8	3.0	4.00	0.002	-	76.3(122.8)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.008	II	76.5(123.1)
GSP	35.0770	116.9960	09/09/1992	114455.0	0.0	4.20	0.002	-	76.6(123.3)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.005	II	76.8(123.6)
DMG	33.8500	118.2670	03/11/1933	629 0.0	0.0	4.40	0.003	I	76.8(123.6)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.003	I	77.0(123.8)
DMG	33.0210	116.2230	01/13/1963	23938.9	13.0	4.20	0.002	-	77.2(124.2)
DMG	33.0190	116.2250	08/20/1969	152957.2	0.6	4.00	0.002	-	77.3(124.3)
DMG	32.9900	116.2680	11/08/1958	132044.1	2.4	4.10	0.002	-	77.7(125.1)
DMG	33.1670	115.9830	07/21/1940	836 3.0	0.0	4.40	0.003	I	77.9(125.3)
DMG	33.1030	116.0610	04/09/1968	111754.5	4.8	4.00	0.002	-	78.1(125.7)
DMG	33.9830	118.3000	02/11/1940	192410.0	0.0	4.00	0.002	-	78.2(125.8)
MGI	34.0000	118.3000	06/22/1920	2035 0.0	0.0	4.00	0.002	-	78.2(125.8)
MGI	34.0000	118.3000	06/30/1920	350 0.0	0.0	4.00	0.002	-	78.2(125.8)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.007	II	78.2(125.8)
DMG	33.1130	116.0370	04/09/1968	3 353.5	5.0	5.20	0.006	II	78.5(126.3)
MGI	34.1000	118.3000	07/26/1920	1215 0.0	0.0	4.00	0.002	-	78.6(126.6)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.003	I	78.6(126.6)
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.003	I	78.6(126.6)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.003	I	78.6(126.6)
DMG	34.5650	118.1130	02/28/1969	45612.4	5.3	4.30	0.003	-	78.8(126.9)
PAS	33.5380	118.2070	05/25/1982	134430.3	13.7	4.10	0.002	-	78.9(126.9)
DMG	32.9610	116.2900	08/25/1971	23 033.0	8.0	4.00	0.002	-	78.9(126.9)
DMG	33.1040	116.0360	04/09/1968	34810.3	4.8	4.70	0.004	I	79.0(127.1)
MGI	33.8000	118.3000	12/31/1928	1045 0.0	0.0	4.00	0.002	-	79.1(127.3)
DMG	33.8000	118.3000	11/03/1931	16 5 0.0	0.0	4.00	0.002	-	79.1(127.3)
DMG	34.0330	115.5500	10/30/1954	2 243.0	0.0	4.60	0.003	I	79.4(127.7)
DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.005	I	79.4(127.8)
DMG	32.9520	116.2790	09/13/1973	173039.8	8.0	4.80	0.004	I	79.7(128.3)
DMG	33.1070	116.0070	04/09/1968	8 038.5	4.0	4.00	0.002	-	79.9(128.6)
GSP	35.1150	116.7230	09/22/1992	185233.3	7.0	4.10	0.002	-	80.0(128.8)
DMG	32.9500	116.2500	11/14/1951	2355 3.0	0.0	4.10	0.002	-	80.6(129.8)
MGI	32.8000	116.8000	08/14/1927	1448 0.0	0.0	4.60	0.003	I	81.1(130.5)
DMG	32.8000	116.8000	10/23/1894	23 3 0.0	0.0	5.70	0.009	III	81.1(130.5)
DMG	33.2330	115.8330	06/24/1942	235240.0	0.0	4.00	0.002	-	81.2(130.7)
DMG	33.2330	115.8330	06/14/1942	213623.0	0.0	4.00	0.002	-	81.2(130.7)
DMG	33.2330	115.8330	06/14/1942	222549.0	0.0	4.00	0.002	-	81.2(130.7)
MGI	32.8000	117.1000	05/25/1803	0 0 0.0	0.0	5.00	0.005	II	81.3(130.8)
DMG	33.3670	118.1500	04/16/1942	72833.0	0.0	4.00	0.002	-	81.3(130.8)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.005	II	81.5(131.2)
DMG	32.9230	116.2720	10/14/1969	131842.7	10.0	4.50	0.003	I	81.7(131.4)
DMG	35.1060	117.3460	10/11/1966	165912.9	6.5	4.40	0.003	I	81.9(131.8)
DMG	35.1560	117.0040	03/20/1949	193449.7	12.8	4.40	0.003	I	82.1(132.1)
DMG	33.0830	115.9830	03/02/1934	2130 0.0	0.0	4.50	0.003	I	82.1(132.1)
DMG	33.0830	115.9830	07/13/1940	163923.0	0.0	4.00	0.002	-	82.1(132.1)
DMG	33.0830	115.9830	12/10/1938	312 0.0	0.0	4.00	0.002	-	82.1(132.1)
DMG	33.0830	115.9830	12/15/1937	958 0.0	0.0	4.00	0.002	-	82.1(132.1)
DMG	33.0830	115.9830	07/14/1940	0 144.0	0.0	4.00	0.002	-	82.1(132.1)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	35.1470	117.1310	07/01/1960	221344.6	7.7	4.50	0.003	I	82.1(132.1)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.003	I	82.2(132.2)
DMG	33.0500	116.0170	08/26/1955	52322.0	0.0	4.30	0.002	-	82.5(132.8)
DMG	33.1830	115.8500	04/25/1957	222412.0	0.0	5.10	0.005	II	82.7(133.1)
DMG	33.1830	115.8500	04/25/1957	222148.0	0.0	4.20	0.002	-	82.7(133.1)
DMG	33.0020	116.0850	11/21/1964	172559.7	4.1	4.20	0.002	-	82.8(133.2)
DMG	34.3700	118.3020	02/10/1971	31212.0	0.8	4.00	0.002	-	82.9(133.4)
DMG	34.3610	118.3060	02/09/1971	141021.5	5.0	4.70	0.003	I	82.9(133.4)
DMG	33.2160	115.8080	04/25/1957	215738.7	-0.3	5.20	0.006	II	83.1(133.7)
USG	33.0170	117.8170	07/16/1986	1247 3.7	10.0	4.11	0.002	-	83.1(133.7)
USG	33.0170	117.8170	07/14/1986	11112.6	10.0	4.12	0.002	-	83.1(133.7)
PAS	32.9050	116.2610	12/25/1975	71852.3	3.6	4.00	0.002	-	83.1(133.7)
DMG	33.0560	115.9930	04/09/1968	35836.0	7.9	4.30	0.002	-	83.1(133.8)
DMG	32.8500	117.4830	02/23/1943	92112.0	0.0	4.00	0.002	-	83.5(134.3)
DMG	34.3680	118.3140	04/25/1971	1448 6.5	-2.0	4.00	0.002	-	83.5(134.3)
DMG	33.0400	116.0050	05/11/1968	810 4.0	8.8	4.20	0.002	-	83.5(134.4)
DMG	32.9500	116.1500	10/25/1942	185939.0	0.0	4.00	0.002	-	83.6(134.5)
DMG	33.2840	115.7350	10/27/1963	145023.4	-2.0	4.00	0.002	-	83.6(134.6)
DMG	34.3350	118.3310	02/09/1971	155820.7	14.2	4.80	0.004	I	83.7(134.7)
DMG	33.0480	115.9860	04/16/1968	33029.9	8.3	4.80	0.004	I	83.8(134.9)
DMG	34.3390	118.3320	02/09/1971	141612.9	11.1	4.10	0.002	-	83.8(134.9)
MGI	34.0000	118.4000	01/29/1927	2324 0.0	0.0	4.00	0.002	-	83.9(135.0)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.003	I	83.9(135.0)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.003	I	83.9(135.0)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.003	I	83.9(135.0)
PAS	33.1330	115.8730	11/24/1987	133355.8	0.0	4.00	0.002	-	84.0(135.2)
PAS	32.9470	117.7360	01/15/1989	153955.2	6.0	4.20	0.002	-	84.3(135.7)
DMG	33.1000	115.9000	04/25/1957	22 5 0.0	0.0	4.20	0.002	-	84.5(136.0)
DMG	33.1000	115.9000	04/25/1957	2248 0.0	0.0	4.10	0.002	-	84.5(136.0)
DMG	33.1000	115.9000	04/25/1957	2249 0.0	0.0	4.20	0.002	-	84.5(136.0)
DMG	33.8170	115.4670	01/28/1955	121020.0	0.0	4.30	0.002	-	84.8(136.4)
GSP	32.9850	117.8180	06/21/1995	211736.2	6.0	4.30	0.002	-	84.9(136.6)
DMG	34.0000	118.4170	12/07/1938	338 0.0	0.0	4.00	0.002	-	84.9(136.6)
PAS	32.9700	117.8030	07/14/1986	03246.2	10.0	4.00	0.002	-	85.2(137.1)
DMG	34.4110	118.3290	02/10/1971	5 636.0	4.7	4.30	0.002	-	85.3(137.2)
GSP	32.9700	117.8100	04/04/1990	085439.3	6.0	4.00	0.002	-	85.4(137.5)
GSP	35.1610	117.3500	06/29/1992	012615.6	6.0	4.10	0.002	-	85.6(137.8)
PAS	32.9900	117.8490	07/13/1986	14 133.0	12.0	4.60	0.003	I	85.7(137.9)
DMG	33.0390	115.9490	05/06/1968	173147.6	6.7	4.00	0.002	-	85.7(137.9)
PAS	32.9860	117.8440	10/01/1986	201218.6	6.0	4.00	0.002	-	85.7(137.9)
GSP	35.1600	117.3620	06/29/1992	011813.4	4.0	4.70	0.003	I	85.8(138.0)
DMG	33.9030	118.4310	11/29/1938	192115.8	10.0	4.00	0.002	-	85.8(138.1)
DMG	33.0000	116.0000	05/18/1920	625 0.0	0.0	4.50	0.003	I	85.9(138.2)
DMG	33.5430	118.3400	09/14/1963	35116.2	2.2	4.20	0.002	-	85.9(138.2)
DMG	33.7830	118.4170	11/02/1940	25826.0	0.0	4.00	0.002	-	85.9(138.3)
DMG	33.7830	118.4170	11/01/1940	725 3.0	0.0	4.00	0.002	-	85.9(138.3)
DMG	33.7830	118.4170	10/12/1940	024 0.0	0.0	4.00	0.002	-	85.9(138.3)
DMG	33.7830	118.4170	10/14/1940	205111.0	0.0	4.00	0.002	-	85.9(138.3)
GSP	34.2930	118.3890	12/06/1994	034834.5	9.0	4.50	0.003	I	86.1(138.5)
DMG	33.2330	115.7170	10/26/1942	615 4.0	0.0	4.50	0.003	I	86.5(139.2)
DMG	33.2330	115.7170	10/22/1942	15038.0	0.0	5.50	0.007	II	86.5(139.2)
DMG	33.2330	115.7170	10/26/1942	3 215.0	0.0	4.50	0.003	I	86.5(139.2)
DMG	33.2330	115.7170	10/26/1942	34316.0	0.0	4.00	0.002	-	86.5(139.2)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.3870	118.3640	02/09/1971	143917.8	-1.6	4.00	0.002	-	86.6(139.4)
GSP	34.3120	118.3930	05/25/1994	125657.1	7.0	4.40	0.002	-	86.6(139.4)
DMG	35.0830	116.2330	04/13/1934	1055 0.0	0.0	4.00	0.002	-	86.7(139.5)
DMG	33.3830	115.6000	06/29/1938	1040 0.0	0.0	4.00	0.002	-	86.7(139.5)
DMG	33.3830	115.6000	12/31/1939	151243.0	0.0	4.00	0.002	-	86.7(139.5)
PAS	32.9450	117.8060	09/07/1984	11 313.4	6.0	4.30	0.002	-	86.7(139.5)
DMG	33.1750	115.7640	10/28/1963	81417.1	0.9	4.00	0.002	-	86.8(139.7)
GSP	34.3110	118.3980	06/15/1994	055948.6	7.0	4.20	0.002	-	86.9(139.8)
PAS	33.0330	117.9440	02/22/1983	21830.4	10.0	4.30	0.002	-	86.9(139.8)
DMG	34.3960	118.3660	02/10/1971	173855.1	6.2	4.20	0.002	-	86.9(139.9)
DMG	33.1670	115.7670	05/10/1955	43840.0	0.0	4.30	0.002	-	87.0(140.1)
DMG	33.6330	118.4000	10/17/1934	938 0.0	0.0	4.00	0.002	-	87.2(140.3)
DMG	33.2330	115.7000	08/30/1946	111645.0	0.0	4.60	0.003	I	87.3(140.5)
DMG	32.9830	115.9830	05/23/1942	154729.0	0.0	5.00	0.004	I	87.4(140.6)
DMG	33.6630	118.4130	01/08/1967	738 5.3	17.7	4.00	0.002	-	87.4(140.6)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.006	II	87.5(140.7)
DMG	33.2670	115.6670	08/10/1951	1130 8.0	0.0	4.40	0.002	-	87.5(140.8)
PAS	32.9450	117.8310	07/29/1986	81741.8	10.0	4.10	0.002	-	87.5(140.9)
DMG	33.0360	115.9030	10/05/1964	121 9.5	-2.0	4.10	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	01/08/1943	024 3.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	162213.0	0.0	6.50	0.018	IV	87.6(141.0)
DMG	32.9670	116.0000	10/22/1942	125553.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/02/1943	175041.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	08/17/1943	155058.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/30/1942	53545.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	11/02/1943	165716.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/22/1942	181326.0	0.0	5.00	0.004	I	87.6(141.0)
DMG	32.9670	116.0000	11/02/1943	1753 5.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	04/30/1943	155256.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	1638 6.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	10/26/1942	434 4.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	162519.0	0.0	5.00	0.004	I	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	162654.0	0.0	5.00	0.004	I	87.6(141.0)
DMG	32.9670	116.0000	10/29/1942	162157.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	10/22/1942	113951.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	191028.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	04/07/1943	34614.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/02/1942	125942.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	11/02/1943	18 134.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	08/20/1944	113310.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	03/26/1943	62957.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	214928.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	225031.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	10/21/1942	163439.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	10/29/1942	173552.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/07/1942	439 6.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	02/24/1943	15831.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/12/1942	0 737.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	04/27/1943	32833.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/03/1942	101834.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	11/02/1943	164759.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	11/03/1942	5 629.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	11/22/1942	63951.0	0.0	4.00	0.002	-	87.6(141.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	32.9670	116.0000	10/29/1942	1556 0.0	0.0	4.50	0.003	I	87.6(141.0)
DMG	32.9670	116.0000	11/16/1943	18 9 9.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.9670	116.0000	03/07/1943	205631.0	0.0	4.00	0.002	-	87.6(141.0)
DMG	32.8940	116.1190	09/16/1961	194939.4	18.5	4.40	0.002	-	87.8(141.3)
DMG	34.4310	118.3690	08/14/1974	144555.2	8.2	4.20	0.002	-	87.9(141.5)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.003	I	88.0(141.6)
DMG	34.3570	118.4060	02/09/1971	141950.2	11.8	4.00	0.002	-	88.2(142.0)
GSB	34.2990	118.4280	01/23/1994	085508.7	6.0	4.20	0.002	-	88.3(142.2)
DMG	33.5000	115.5000	05/19/1933	162638.0	0.0	4.30	0.002	-	88.5(142.4)
DMG	33.0330	115.8830	08/27/1945	112520.0	0.0	4.00	0.002	-	88.5(142.5)
PAS	32.9330	117.8410	07/29/1986	81741.6	10.0	4.30	0.002	-	88.5(142.5)
PAS	33.0290	115.8880	11/26/1987	1739 2.0	1.8	4.30	0.002	-	88.5(142.5)
MGI	32.7000	116.7000	03/21/1918	2325 0.0	0.0	4.00	0.002	-	88.6(142.6)
DMG	33.0530	115.8550	10/05/1964	12455.5	0.0	4.40	0.002	-	88.7(142.7)
DMG	33.0450	115.8630	12/17/1968	225351.2	8.0	4.70	0.003	I	88.7(142.8)
DMG	34.2680	118.4450	08/30/1964	225737.1	15.4	4.00	0.002	-	88.8(142.9)
MGI	32.7000	117.2000	09/08/1915	742 0.0	0.0	4.00	0.002	-	88.9(143.1)
MGI	32.7000	117.2000	04/19/1906	028 0.0	0.0	4.30	0.002	-	88.9(143.1)
DMG	32.7000	117.2000	05/27/1862	20 0 0.0	0.0	5.90	0.010	III	88.9(143.1)
MGI	32.7000	117.2000	05/20/1920	1330 0.0	0.0	4.00	0.002	-	88.9(143.1)
GSP	34.2990	118.4390	02/03/1994	162335.4	8.0	4.20	0.002	-	88.9(143.1)
DMG	34.4110	118.4010	02/09/1971	14 325.0	8.0	4.40	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.009	III	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.016	IV	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 710.0	8.0	4.00	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 730.0	8.0	4.00	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 346.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.009	III	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 159.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 133.0	8.0	4.20	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 230.0	8.0	4.30	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 550.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 439.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 853.0	8.0	4.60	0.003	I	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 745.0	8.0	4.50	0.003	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 140.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 150.0	8.0	4.50	0.003	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 154.0	8.0	4.20	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 444.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 2 3.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.006	II	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 231.0	8.0	4.70	0.003	I	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 838.0	8.0	4.50	0.003	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 4 7.0	8.0	4.10	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 446.0	8.0	4.20	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 434.0	8.0	4.20	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 8 7.0	8.0	4.20	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 8 4.0	8.0	4.00	0.002	-	89.1(143.4)
DMG	34.4110	118.4010	02/09/1971	14 541.0	8.0	4.10	0.002	-	89.1(143.4)
PAS	33.0170	115.8810	11/24/1987	185040.3	0.0	4.30	0.002	-	89.4(143.9)
DMG	34.4330	118.3980	02/09/1971	144017.4	-2.0	4.10	0.002	-	89.5(144.0)
MGI	34.0000	118.5000	03/08/1918	1230 0.0	0.0	4.00	0.002	-	89.6(144.3)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.004	I	89.6(144.3)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.0000	118.5000	03/06/1918	1820 0.0	0.0	4.00	0.002	-	89.6(144.3)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.004	I	89.6(144.3)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.004	I	89.6(144.3)
MGI	34.0000	118.5000	06/23/1920	1220 0.0	0.0	4.00	0.002	-	89.6(144.3)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.003	-	89.6(144.3)
DMG	33.7700	118.4800	04/24/1931	182754.8	0.0	4.40	0.002	-	89.6(144.3)
GSP	34.3310	118.4420	01/17/1994	141430.3	1.0	4.50	0.003	-	89.7(144.3)
GSP	34.3010	118.4520	01/21/1994	185244.2	7.0	4.30	0.002	-	89.7(144.3)
DMG	34.3990	118.4190	02/10/1971	134953.7	9.7	4.30	0.002	-	89.8(144.6)
GSP	34.2450	118.4710	01/18/1994	155144.9	12.0	4.00	0.002	-	89.9(144.6)
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.005	II	89.9(144.7)
PAS	32.6790	117.1510	06/18/1985	32228.7	5.7	4.00	0.002	-	89.9(144.7)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.005	II	89.9(144.7)
GSP	34.2970	118.4580	01/21/1994	185344.6	7.0	4.30	0.002	-	90.0(144.8)
GSP	34.3110	118.4560	01/17/1994	193534.3	2.0	4.00	0.002	-	90.1(145.0)
DMG	32.8170	116.2000	11/22/1953	81138.0	0.0	4.10	0.002	-	90.1(145.0)
DMG	34.3920	118.4270	02/21/1971	71511.7	7.2	4.50	0.003	-	90.1(145.0)
GSP	34.3170	118.4550	01/17/1994	132644.7	2.0	4.70	0.003	I	90.1(145.1)
DMG	34.4280	118.4130	04/01/1971	15 3 3.6	8.0	4.10	0.002	-	90.2(145.1)
DMG	34.4260	118.4140	02/10/1971	518 7.2	5.8	4.50	0.003	-	90.2(145.1)
GSP	34.2870	118.4660	01/19/1994	071406.2	11.0	4.00	0.002	-	90.2(145.2)
DMG	34.2960	118.4640	03/30/1971	85443.3	2.6	4.10	0.002	-	90.3(145.3)
GSP	34.2920	118.4660	01/19/1994	144635.2	6.0	4.00	0.002	-	90.3(145.3)
GSB	34.3000	118.4660	01/21/1994	183915.3	10.0	4.70	0.003	I	90.5(145.6)
MGI	33.8000	118.5000	06/18/1915	15 5 0.0	0.0	4.00	0.002	-	90.5(145.6)
GSP	32.8220	116.1750	05/24/1992	122225.8	12.0	4.10	0.002	-	90.5(145.6)
PAS	33.0820	115.7750	11/24/1987	15414.5	4.9	5.80	0.009	III	90.6(145.8)
T-A	32.6700	117.1700	01/25/1863	1020 0.0	0.0	4.30	0.002	-	90.7(146.0)
T-A	32.6700	117.1700	05/24/1865	0 0 0.0	0.0	5.00	0.004	I	90.7(146.0)
T-A	32.6700	117.1700	04/15/1865	840 0.0	0.0	4.30	0.002	-	90.7(146.0)
T-A	32.6700	117.1700	10/21/1862	0 0 0.0	0.0	5.00	0.004	I	90.7(146.0)
T-A	32.6700	117.1700	12/00/1856	0 0 0.0	0.0	5.00	0.004	I	90.7(146.0)
PAS	33.0720	115.7820	11/24/1987	153 3.2	4.2	4.00	0.002	-	90.7(146.0)
PAS	34.4630	118.4090	09/24/1977	212824.3	5.0	4.20	0.002	-	90.8(146.2)
GSP	34.2910	118.4760	02/06/1994	131926.9	11.0	4.10	0.002	-	90.9(146.2)
PAS	33.0470	115.8080	11/24/1987	143629.9	0.0	4.00	0.002	-	90.9(146.2)
DMG	34.3970	118.4390	02/21/1971	55052.6	6.9	4.70	0.003	I	90.9(146.2)
DMG	34.3530	118.4560	03/07/1971	13340.5	3.3	4.50	0.002	-	90.9(146.2)
GSP	34.3040	118.4730	01/17/1994	150703.2	2.0	4.20	0.002	-	90.9(146.3)
PAS	33.0360	115.8200	11/24/1987	21435.5	4.7	4.50	0.002	-	90.9(146.3)
DMG	33.6320	118.4670	01/08/1967	73730.4	11.4	4.00	0.002	-	90.9(146.3)
PAS	32.9930	115.8720	11/24/1987	133259.9	0.0	4.20	0.002	-	91.0(146.5)
DMG	33.0330	115.8210	09/30/1971	224611.3	8.0	5.10	0.004	I	91.0(146.5)
PAS	33.0670	115.7810	11/24/1987	13248.1	4.0	4.20	0.002	-	91.0(146.5)
PAS	33.0400	115.8120	11/24/1987	253 0.7	3.5	4.70	0.003	I	91.0(146.5)
PAS	33.0500	115.8000	11/24/1987	21647.2	6.0	4.00	0.002	-	91.1(146.5)
GSB	34.3100	118.4740	01/21/1994	184228.8	7.0	4.20	0.002	-	91.1(146.6)
MGI	32.8000	116.2000	07/23/1929	1155 0.0	0.0	4.30	0.002	-	91.1(146.7)
PAS	33.0480	115.7980	11/24/1987	21523.2	5.0	4.80	0.003	I	91.2(146.8)
PAS	33.0130	115.8390	11/24/1987	131556.5	2.4	6.00	0.010	III	91.3(146.9)
PAS	33.0330	115.8140	11/24/1987	22159.6	4.5	4.00	0.002	-	91.3(146.9)
DMG	34.3840	118.4550	02/10/1971	113134.6	6.0	4.20	0.002	-	91.5(147.2)
DMG	32.9550	115.9110	04/10/1967	04717.3	4.4	4.00	0.002	-	91.5(147.3)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	34.3800	118.4590	08/12/1977	21926.1	9.5	4.50	0.002	-	91.6(147.4)
DMG	34.4570	118.4270	02/09/1971	161926.5	-1.0	4.20	0.002	-	91.6(147.5)
GSP	34.2150	118.5100	01/19/1994	140914.8	17.0	4.50	0.002	-	91.7(147.5)
DMG	33.2000	115.6330	10/27/1963	145245.2	-2.0	4.10	0.002	-	91.8(147.7)
DMG	34.4460	118.4360	02/10/1971	185441.7	8.1	4.20	0.002	-	91.8(147.8)
DMG	34.3560	118.4740	03/25/1971	2254 9.9	4.6	4.20	0.002	-	91.9(147.9)
GSG	34.3340	118.4840	01/17/1994	223152.1	10.0	4.20	0.002	-	92.0(148.1)
PAS	33.0220	115.8080	11/24/1987	62323.1	3.4	4.00	0.001	-	92.1(148.2)
DMG	33.0000	115.8330	01/08/1946	185418.0	0.0	5.40	0.006	II	92.2(148.3)
PAS	33.0140	115.8150	11/24/1987	131848.9	6.0	4.10	0.002	-	92.2(148.4)
GSP	34.3570	118.4800	02/25/1994	125912.6	1.0	4.10	0.002	-	92.3(148.5)
DMG	34.3610	118.4870	02/10/1971	143526.7	4.4	4.20	0.002	-	92.7(149.2)
DMG	34.3990	118.4730	03/09/1974	05431.9	24.4	4.70	0.003	I	92.7(149.3)
DMG	34.2860	118.5150	03/31/1971	145222.5	2.1	4.60	0.003	I	92.9(149.6)
PAS	32.9960	115.8160	11/27/1987	11010.5	6.0	4.70	0.003	I	93.1(149.8)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.019	IV	93.2(149.9)
PAS	32.9950	115.8130	12/02/1987	4 3 6.2	1.7	4.00	0.001	-	93.2(150.0)
GSP	33.1920	115.6080	12/31/1997	122245.1	10.0	4.10	0.002	-	93.3(150.1)
DMG	33.2000	115.6000	11/12/1942	175612.0	0.0	4.00	0.001	-	93.3(150.2)
DMG	33.3330	115.5000	01/02/1936	354 0.0	0.0	4.00	0.001	-	93.4(150.3)
GSP	34.3740	118.4950	01/28/1994	200953.4	0.0	4.20	0.002	-	93.4(150.3)
PAS	33.1810	115.6110	03/07/1989	02458.2	2.8	4.10	0.002	-	93.6(150.6)
GSP	34.2610	118.5340	01/17/1994	123939.8	14.0	4.50	0.002	-	93.6(150.7)
DMG	34.2840	118.5280	04/02/1971	54025.0	3.0	4.00	0.001	-	93.6(150.7)
PAS	33.0080	115.7860	11/24/1987	1321 0.2	6.0	4.10	0.002	-	93.7(150.7)
DMG	34.2730	118.5320	06/21/1971	16 1 8.5	4.1	4.00	0.001	-	93.7(150.8)
PAS	32.9790	115.8160	11/25/1987	135410.0	0.6	4.20	0.002	-	93.9(151.1)
PAS	33.1820	115.5990	03/06/1989	221647.6	1.0	4.30	0.002	-	94.1(151.4)
GSP	34.2540	118.5450	01/17/1994	130627.9	0.0	4.60	0.003	-	94.1(151.5)
PAS	32.9800	115.8090	11/28/1987	03910.9	0.8	4.20	0.002	-	94.1(151.5)
PAS	32.6150	117.1520	10/29/1986	23815.3	14.6	4.10	0.002	-	94.3(151.8)
PAS	33.1820	115.5940	03/07/1989	74344.1	0.5	4.20	0.002	-	94.3(151.8)
PAS	33.0790	115.6800	04/26/1981	124043.4	6.0	4.20	0.002	-	94.8(152.6)
DMG	32.7000	116.3000	02/24/1892	720 0.0	0.0	6.70	0.019	IV	94.9(152.8)
DMG	32.6800	116.3540	01/21/1970	1124 0.4	8.0	4.10	0.002	-	95.1(153.0)
PAS	32.9320	115.8470	09/05/1982	52126.6	4.2	4.40	0.002	-	95.1(153.1)
PAS	33.0940	115.6550	06/13/1979	194645.9	6.0	4.10	0.002	-	95.2(153.3)
PAS	35.2250	117.6290	05/02/1975	18 323.1	10.0	4.20	0.002	-	95.3(153.3)
GSP	34.2280	118.5730	01/17/1994	175608.2	19.0	4.60	0.003	-	95.4(153.5)
GSP	34.2740	118.5630	01/27/1994	171958.8	14.0	4.60	0.003	-	95.4(153.6)
DMG	32.7960	116.0550	11/30/1965	84325.1	16.4	4.00	0.001	-	95.5(153.8)
DMG	33.1310	115.6110	10/27/1963	181250.7	7.8	4.20	0.002	-	95.6(153.9)
PAS	33.1100	115.6270	04/25/1981	21155.3	4.8	4.10	0.002	-	95.8(154.2)
GSB	34.3190	118.5580	01/18/1994	132444.1	1.0	4.50	0.002	-	95.9(154.3)
DMG	32.8000	117.8330	01/24/1942	214148.0	0.0	4.00	0.001	-	95.9(154.3)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.004	I	96.0(154.4)
GSB	34.3450	118.5520	01/24/1994	041518.8	6.0	4.80	0.003	I	96.0(154.5)
PAS	33.1170	115.6150	04/26/1976	64637.5	14.8	4.00	0.001	-	96.0(154.6)
DMG	34.2650	118.5770	04/15/1971	111432.0	4.2	4.20	0.002	-	96.1(154.6)
GSP	34.2690	118.5760	01/17/1994	125546.8	16.0	4.10	0.002	-	96.1(154.6)
PAS	32.6270	117.3770	06/29/1983	8 836.4	5.0	4.60	0.002	-	96.1(154.6)
PAS	33.0980	115.6320	04/26/1981	12 928.4	3.8	5.70	0.007	II	96.1(154.6)
DMG	32.7860	116.0550	07/04/1938	215945.3	10.0	4.00	0.001	-	96.1(154.7)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	33.0990	115.6300	04/26/1981	12 557.4	4.2	4.00	0.001	-	96.1(154.7)
PAS	33.1090	115.6190	11/04/1976	114940.4	2.2	4.10	0.002	-	96.2(154.8)
MGI	33.2500	115.5000	12/27/1910	1715 0.0	0.0	4.60	0.002	-	96.3(154.9)
PAS	33.1030	115.6220	11/04/1976	133127.7	3.7	4.20	0.002	-	96.3(155.0)
PAS	33.1030	115.6210	11/04/1976	1139 8.4	0.9	4.10	0.002	-	96.4(155.1)
GSP	35.3620	116.8000	06/29/1992	033626.8	10.0	4.00	0.001	-	96.5(155.3)
PAS	33.1980	115.5350	07/13/1983	211648.3	1.1	4.00	0.001	-	96.5(155.3)
PAS	33.1230	115.5960	11/04/1976	54820.9	5.0	4.20	0.002	-	96.7(155.6)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.004	I	96.8(155.8)
PAS	33.1180	115.5950	11/04/1976	62110.7	5.0	4.10	0.002	-	96.9(156.0)
DMG	32.8850	115.8650	10/27/1963	145822.4	-2.0	4.40	0.002	-	96.9(156.0)
PAS	33.1170	115.5950	11/04/1976	141250.2	5.0	4.40	0.002	-	97.0(156.0)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.004	I	97.0(156.1)
DMG	32.9830	115.7330	01/24/1951	717 2.6	0.0	5.60	0.006	II	97.1(156.2)
DMG	32.9830	115.7330	01/24/1951	733 7.0	0.0	4.00	0.001	-	97.1(156.2)
DMG	32.9310	115.7980	01/12/1972	1231 9.6	0.0	4.00	0.001	-	97.1(156.2)
GSP	34.3790	118.5610	01/18/1994	152346.9	7.0	4.80	0.003	I	97.1(156.3)
PAS	33.1180	115.5900	11/04/1976	635 3.5	4.5	4.10	0.002	-	97.1(156.3)
DMG	33.0270	115.6810	05/23/1963	1553 1.8	0.4	4.80	0.003	I	97.1(156.3)
GSP	34.2180	118.6070	01/18/1994	113509.9	12.0	4.20	0.002	-	97.2(156.3)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.004	I	97.2(156.4)
GSP	34.3790	118.5630	01/18/1994	003935.0	7.0	4.40	0.002	-	97.2(156.5)
GSB	34.3600	118.5710	01/19/1994	044048.0	2.0	4.50	0.002	-	97.3(156.6)
DMG	34.4850	118.5210	07/16/1965	74622.4	15.1	4.00	0.001	-	97.3(156.6)
GSG	34.4080	118.5590	01/17/1994	200205.4	0.0	4.00	0.001	-	97.6(157.1)
MGI	32.6000	116.5000	05/03/1918	425 0.0	0.0	4.00	0.001	-	97.8(157.4)
PAS	32.9420	115.7630	11/24/1987	133439.9	14.0	4.80	0.003	I	97.9(157.5)
DMG	34.3000	118.6000	04/04/1893	1940 0.0	0.0	6.00	0.009	III	97.9(157.5)
GSP	34.2780	118.6110	01/29/1994	121656.4	2.0	4.30	0.002	-	98.2(158.0)
DMG	33.1170	115.5670	07/27/1950	112926.0	0.0	4.80	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1949 0.0	0.0	4.20	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/29/1950	1843 0.0	0.0	4.70	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	08/14/1950	1916 0.0	0.0	4.70	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	07/29/1950	143632.0	0.0	5.50	0.006	II	98.2(158.1)
DMG	33.1170	115.5670	07/27/1950	2251 0.0	0.0	4.50	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/27/1950	12 2 0.0	0.0	4.20	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1624 0.0	0.0	4.00	0.001	-	98.2(158.1)
DMG	33.1170	115.5670	07/29/1950	15 9 0.0	0.0	4.50	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/29/1950	1714 0.0	0.0	4.30	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	175048.0	0.0	5.40	0.005	II	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1840 0.0	0.0	4.00	0.001	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1817 0.0	0.0	4.20	0.002	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	2113 0.0	0.0	4.10	0.001	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1730 0.0	0.0	4.10	0.001	-	98.2(158.1)
DMG	33.1170	115.5670	07/27/1950	954 0.0	0.0	4.10	0.001	-	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	1727 0.0	0.0	4.70	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	08/01/1950	83720.0	0.0	4.70	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	325 0.0	0.0	4.70	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	07/28/1950	175812.0	0.0	4.80	0.003	I	98.2(158.1)
DMG	33.1170	115.5670	07/29/1950	017 0.0	0.0	4.50	0.002	-	98.2(158.1)
DMG	33.3560	115.3880	10/27/1963	145654.3	7.6	4.10	0.001	-	98.4(158.4)
DMG	33.0560	115.6200	06/16/1965	242 6.1	-0.5	4.40	0.002	-	98.5(158.5)
DMG	35.3880	116.7610	10/25/1963	15 523.0	2.8	4.00	0.001	-	98.5(158.5)

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-------------------------------------------------------------------------------
    |       |        |          |  TIME  |     |     |       |SITE|  APPROX.
FILE|  LAT. |  LONG. |   DATE   |  (UTC) |DEPTH|QUAKE|  SITE | MM |  DISTANCE
CODE| NORTH |  WEST  |          | H M Sec| (km)| MAG.|  ACC. |INT.| mi   [km]
    |       |        |          |        |     |     |   g   |    |
----+-------+--------+----------+--------+-----+-----+-------+----+----------
DMG |32.9900|115.6820|11/29/1964|142526.4| 13.8| 4.20| 0.002 | -  | 98.8(159.1)
DMG |33.0080|115.6600|06/17/1965| 74013.5|  8.8| 4.10| 0.001 | -  | 98.9(159.2)
GSB |34.2850|118.6240|01/17/1994|135602.4| 19.0| 4.70| 0.003 | I  | 99.0(159.3)
DMG |32.9500|115.7170|06/14/1953| 42958.0|  0.0| 4.80| 0.003 | I  | 99.3(159.8)
DMG |32.9500|115.7170|06/14/1953| 41729.9|  0.0| 5.50| 0.006 | II | 99.3(159.8)
PAS |33.9330|118.6690|10/17/1979|205237.3|  5.5| 4.20| 0.002 | -  | 99.4(159.9)
DMG |33.1670|115.5000|12/20/1935| 745 0.0|  0.0| 5.00| 0.003 | I  | 99.4(159.9)
GSB |34.3330|118.6230|01/18/1994|072356.0| 14.0| 4.30| 0.002 | -  | 99.7(160.4)
GSP |34.3620|118.6150|03/20/1996|073759.8| 13.0| 4.10| 0.001 | -  | 99.8(160.5)
GSP |34.5000|118.5600|07/05/1991|174157.1| 11.0| 4.10| 0.001 | -  | 99.8(160.5)
DMG |32.7500|116.0000|02/19/1919| 458 0.0|  0.0| 4.50| 0.002 | -  | 99.9(160.8)

*******************************************************************************
-END OF SEARCH-   1283 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH:   1800  TO  2000

LENGTH OF SEARCH TIME:   201  years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 3.0 MILES (4.8 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.197 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value=  4.075
  b-value=  0.826
  beta-value=  1.901


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TABLE OF MAGNITUDES AND EXCEEDANCES:
------------------------------------

  Earthquake | Number of Times | Cumulative
   Magnitude |    Exceeded     | No. / Year
  -----------+-----------------+-----------
     4.0     |      1283       |   6.38308
     4.5     |       463       |   2.30348
     5.0     |       164       |   0.81592
     5.5     |        59       |   0.29353
     6.0     |        31       |   0.15423
     6.5     |        12       |   0.05970
     7.0     |         4       |   0.01990
     7.5     |         1       |   0.00498
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APPENDIX B

APPENDIX B

PEDOCHRONOLOGICAL REPORT

FOR

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND
WILSON STREET
BANNING, CALIFORNIA

PROJECT NO. T2305-12-03

PEDOCHRONOLOGICAL REPORT FOR THE DUETSCH PROPERTY, HIGHLAND SPRINGS AVENUE AT WILSON STREET, BANNING, CALIFORNIA

June 8, 2005

GEOCON, Inc., Murrieta, CA Project No. T2305-12-03

Soil Tectonics
P.O. Box 5335
Berkeley, CA 94705

GBorchardt

Glenn Borchardt

Principal Soil Scientist
Certified Professional Soil Scientist No. 24836

PEDOCHRONOLOGICAL REPORT FOR THE DUETSCH PROPERTY, HIGHLAND SPRINGS AVENUE AT WILSON STREET, BANNING, CALIFORNIA

June 8, 2005

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Berkeley, CA 94705

Glenn Borchardt

INTRODUCTION

An assessment of seismic risk due to fault rupture can be aided greatly by the techniques of pedochronology (Borchardt, 1992, 1998), soil dating. This is because the youngest geological unit overlying fault traces is generally a soil horizon. The age and relative activity of faulting often can be estimated by evaluating the age and relative tectonic disturbance of overlying soil units.

Soil horizons exhibit a wide range of physical, chemical, and mineralogical properties that evolve at varying rates. Soil scientists use various terms to describe these properties. A black, highly organic "A" horizon, for example, may form within a few centuries, while a dark brown, clayey "Bt" horizon may take as much as 40,000 years to form. Certain soil properties are invariably absent in young soils. For instance, soils developed in granitic alluvium of the San Joaquin Valley do not have Munsell hues redder than 10YR until they are at least 100,000 years old (Birkeland, 1999; Harden, 1982). Still other properties, such as the movement and deposition of clay-size particles and the precipitation of calcium carbonate at extraordinary depths, indicate soil formation during a climate much wetter than at present. In the absence of a radiometric age date for the material from which a particular soil formed, an estimate of its age must take into account all the known properties of the soil and the landscape and climate in which it evolved.

METHOD

The first step in studying a soil is the compilation of the data necessary for describing it (Birkeland, 1999; Borchardt, 2004). At minimum, this requires a Munsell color chart, hand lens, acid bottle, meter for 1:1 soil:water pH and conductivity measurements. The second step may involve the collection of samples of each horizon for laboratory analysis of particle size. This is done to check the textural classifications made in the field and to evaluate the genetic relationships between horizons and between different soils in the landscape. When warranted, the clay mineralogy and chemistry of the soil is also analyzed in order to provide additional information on the changes undergone by the initial material from which the soil weathered. The last step is the comparison of this accumulated soil data with that for soils having developed under similar conditions. Such information is scattered in soil survey reports (e.g., Welch and others, 1966), soil science journals, and consulting reports. In a particular locality, there is seldom enough comparative data available for this purpose. That is why, at the very least, the study of one soil profile always makes the evaluation of the next that much easier.

RESULTS OF THIS EVALUATION

Five soil profiles representative of soil development within the landscape involving this project were measured, sampled, and described south of the main trace of the Banning fault (Tables 1 through 5). Particle size and bulk density analysis (Table 6), soil pH measurements (Fig. 1) and conductivity measurements (Fig. 2) support the discussion. Soil Profile No. 1, examined in a filled channel, represents the extremes in soil development within the present alluvial fan at the site (Photo 1). Soil Profile No. 2, developed in ancient gneissic and granitic debris, was examined in a road cut (Photo 2). It is a relict paleosol that survived as an erosional remnant that was on a spur ridge on the hillside south of the main trace of the fault. Soil Profile Nos. 3 through 5 represent cross sections taken at three places across a thrust fault south of the main trace of the Banning fault (Photo 3).

Soil Profile No. 1

This section contains late Holocene sandy alluvium overlying an early Wisconsin paleosol formed on sandy alluvium within a channel fill preserved beneath a thrust fault in Trench T-8 (Table 1, Photo 1). Except for the thin dark brown A horizon and the slightly oxidized Co horizon (Photo 1), the 252-cm Holocene section appears almost featureless. There is, however, a slightly darkened zone at the 113-cm depth, which was judged to be a buried Ajb1 horizon in the field. A drop in salt concentration due to leaching at that point seems to confirm this (Fig. 2).

The underlying ABtjb2 horizon appears to be an A horizon that was slightly eroded and mixed with material from the Btb2 horizon beneath it. The 7-mm thick clay band is a rearrangement of clay from that horizon as a result of percolation from the Holocene sand. The 45-cm thick Btb2 horizon is a red (2.5YR) heavy sandy loam with BCt and CBt horizons together being about 300 cm thick.

Age

This profile may be taken as the type section for this area. Parent materials in both the Holocene and Pleistocene portions of the channel fill consist of coarse to medium sand. The Holocene section in this channel fill depicts extensive, almost continuous aggradation. The current climate has led to extreme instability on the surrounding gneissic-granitic hillslopes. We may surmise that the similarly dry climate—during the last interglacial period between 130 ka and 80 ka—would have produced similar erosive results. Thus the red paleosol could have formed only during the intervening glacial period when effective precipitation was two or three times what it is at present (McFadden, 1982). The alluvial fan and adjacent hillslopes probably were populated by extensive woodland vegetation that intercepted heavy precipitation, preventing the kind of soil erosion that is currently prevalent. Thus, the weakly developed soil at the top of the channel fill has formed since 10 ka and the red paleosol has formed since the start of the early Wisconsin at 80 ka.

The nearest well-dated Holocene/Pleistocene type section developed in granitic and gneissic debris was studied in detail at Cajon pass (Tinsley and others, 1982; McFadden and Weldon, 1987). Unfortunately, these soils were under a good deal of eolian influence. McFadden and Weldon (1987) describe a relatively well-dated 55±12-ka soil at 34 15'42"N; 117 26'51"W as follows:

Horizon	cm	color	s	si	c	pH
BA	0-9	7.5YR3/4m; 5/4d	60.0	22.7	17.3	5.5
2Bt1	9-42	5YR4/4m; 4/6d	29.0	46.8	24.2	5.9
2Bt2	42-77	5YR4/4m; 5/6d	52.5	25.7	21.8	5.8
2Bt3	77-99	6.25YR4/4m; 5/4d	60.0	21.6	18.4	5.7
2BC	99-140	7.5YR4/6m; 6/6d	81.3	16.9	1.8	5.5
Cox1	140-190	8.75YR4/4m; 6/4d	88.0	12.0	0	5.3
Cox2	190+	10YR4/4m; 7/4d	93.5	6.4	0.1	5.3

Their Holocene soils have Bt horizons as well. The soils at our site, however, seem to have had very little eolian influence. Without the silt and clay contributions from wind-blown dust, Bt horizons may not form in sandy parent materials during the Holocene (Borchardt and others, 1968). This is because the very fine clay that characterizes Bt horizons must physically breakdown from coarse biotite crystals. In the similar climate and sandy soil of the San Joachin Valley, for instance, the resulting argillic B horizons take at least 30 ky to form (Marchand, 1977; Harden and Marchand, 1977). The upshot is that, because the parent materials at our site initially had no clay, the quantity of clay in the resulting soil could be used as a nearly direct measure of age.

Soil Profile No. 2

This soil contains a 70+-cm thick reddish brown (5YR) heavy sandy loam Bt horizon (Table 2, Photo 2) that exists as a relict paleosol that was formed directly on one of the cobbly pre-Wisconsin debris flows that underlie the entire site (see sample 05B124 in Table 3). This profile is a mere remnant of the soils that once existed on the hillside on either side of the Banning fault. Being on a lower portion of a spur ridge, it escaped the extensive Holocene erosion that characterizes the much-gullied hill front today.

Age

Although this Bt horizon is not quite as red as the paleosol in our type section, it has the same texture and a considerably greater thickness. The base of the soil could not be examined, so its total thickness could not be measured. Nevertheless, it is likely that this soil also began to form at 80 ka.

Transect Across a Thrust Fault Associated with the Banning Fault

This notable thrust fault south of the main trace of the Banning fault was studied in detail to assess its seismic threat to the site. Three soil profiles were examined, sampled, and analyzed as a transect across the fault (see log of Trench T-6 in main report). Soil Profile No. 3 was on the headwall about 200' north of the severely eroded leading edge of the thrust fault (Table 3). Soil Profile No. 4, on the footwall, consists of three paleosols overridden by the thrust in addition to a modern soil that formed after the most recent event (Table 4; Photo 3). Soil Profile No. 5 (Table 5), also on the footwall, but 165' further to the south, was used to help estimate when faulting began to be recorded in Soil Profile No. 4.

Soil Profile No. 3

This profile contains a 123-cm thick dark reddish brown (5YR) heavy sandy loam Bt horizon (Table 3) much like the one in Soil Profile No. 2, which also was formed in pre-Wisconsin gneissic-granitic debris (Table 2). Because of continuous uplift along the thrust fault, it appears to have escaped a portion of the Holocene degradation that lies all around it. The pH in this profile increases with depth, and then decreases with depth (Fig. 1).

Age

Like Soil Profile Nos. 1 and 2, this one likely began to form at the beginning of the early Wisconsin at about 80 ka.

Soil Profile No. 4

This profile contains a modern soil and three paleosols, each having been deposited as colluvial wedges after major events on the thrust fault immediately to the north (Photo 3). The pH in this profile increases steadily with depth (Fig. 1), presumably a manifestation of its cumulic character due to deposition after each event. The four sola are:

Modern Soil

The modern soil consists of a 132-cm thick dark brown (7.5YR) sandy loam colluvial wedge (Table 4) distinguished clearly by upward fining. Gravel contents decrease regularly from 28% at the bottom to 8% at the top (Table 6). Soil development is weak, with a 103-cm thick A horizon overlying a 29-cm thick Bw horizon with only moderate subangular blocky structure. Both the color and the texture in this wedge are the same as that found in the Ap/Bt horizon overlying the reddish brown sandy clay loam Bt of Soil Profile No. 3 (Table 3). Thus much of the color and texture may be inherited from the early Wisconsin soil that was eroded from the leading edge of the thrust (Photo 3).

Age

According to our calculations, this soil may have begun forming after 27 ka, during the late Wisconsin and Holocene (Table 4), oxygen isotope stages 2 and 1 (Shackleton and Opdyke, 1973).

Paleosol b1

This 140-cm thick paleosol contains a buried sandy loam 2Ab1 horizon overlying a 123-cm thick sandy loam 2Btjb1 horizon. Very fine clay from the A horizon was translocated to the Bt horizon, where it was found as "very few thin patchy clay films on clasts and coating pores" helping to form its moderate to strong subangular blocky structure.

Age

From calculations derived from the clay contents, this soil has a t_d of 28.7 ky and a t_o of 55.6 ka. Nevertheless, the development is relatively weak, with the relatively thin 18-cm A horizon indicating that it may have formed under the relatively dry climate extent during the mid-Wisconsin, oxygen isotope stage 3.

Paleosol b2

This 101-cm thick paleosol contains a 17-cm thick dark brown sandy loam 2Ab2 horizon overlying a brown sandy loam 3BCtjb2 horizon containing a "few thin patchy clay films on sand grains, clasts, and interstices" and fine weak subangular blocky structure.

Age

From calculations derived from the clay contents, this soil has a t_d of 13.7 ky and a t_o of 69.3 ka. The development is relatively weak, with the relatively thin 17-cm A horizon possibly indicative of its short development time during the early Wisconsin, oxygen isotope stage 4.

Paleosol b3

This 86-cm thick paleosol contains a dark brown loamy sand 4ABtjb3 horizon. It has a "few thin patchy clay films sand grains" helping to form its weak subangular blocky structure.

Age

From calculations derived from the clay contents, this soil has a t_d of 10.7 ky and a t_o of <80 ka. The development is especially weak because the parent material was derived from scarp materials that had little pedogenesis before being offset during the early Wisconsin.

Soil Profile No. 5

This profile contains what is essentially a 132-cm thick dark brown (10YR) sandy loam granular A horizon overlying a 151-cm thick dark brown (7.5YR) heavy sandy loam Bt horizon with medium moderate subangular blocky structure and "many thin to medium thick patchy clay films on sand grains and clasts and continuous medium thick clay films coating pores" (Table 5). Although there are no distinct paleosols within this profile, aggradation has had a continuing influence on soil development at this point 165' downslope from the thrust fault (Photo 3). The resulting "cumulic" soil has gradually increased in thickness as new material from upslope was mixed into the existing A horizon. The solum (A + B horizons) is nearly twice as thick (Table 5) as the one in Soil Profile No. 3 above the scarp (Table 3). The pH in this profile increases with depth, and then decreases with depth, similar to that of Soil Profile No. 3, but quite unlike that of Soil Profile No. 4 (Fig. 2).

Particle Size Distribution and Bulk Density Results

Samples from the transect were analyzed for particle size distribution and bulk density via standard methods (Table 6). Soil Profile Nos. 3, 4, and 5 were compared particularly with regard to clay contents. By determining the %clay, the bulk density, and thickness, the quantity of clay within each horizon could be calculated. For example, the 27-cm thick Ap horizon in Soil Profile No. 3, with 15.3% clay in the <2 mm fraction, 2.2% >2 mm gravel, and a bulk density of 1.76 g/cm^3, had 7.9 g of $clay/cm^2$. In other words, a channel sample 27-cm deep, 1 cm wide, and 1 cm long would have 7.9 g of clay. Calculations for each horizon and for each solum (A+B horizons) are at the end of Table 6.

Soil Profile No. 3, on the eroded headwall, had 37.4 g/cm^2, Soil Profile No. 4, immediately below the thrust, had 64.4 g/cm^2, and Soil Profile No. 5 had 61.8 g/cm^2. This demonstrates conclusively that degradation occurred on the headwall and that aggradation occurred on the footwall. Clay contents in Soil Profile No. 4 are nearly the same as those in Soil Profile No. 5, implying that both have had about the same t_d (development time): about 80,000 years.

Presumably, each of the sola in Soil Profile No. 4 formed from scarp-derived debris after ground-rupturing events occurred along the fault. A previously mentioned, pedogenesis in these coarse sandy materials is extremely slow—the soil development features are subtle. As time passes, clay contents within the paleosols tend to increase. Paleosol b3 has 10.7 g/cm2, b2 has 13.7 g/cm2, and b1 has 28.7 g/cm2. This is because, at t_o—80 ka, the material eroding from the scarp would be from an immature soil nearly devoid of clay. Later events, would deposit materials from a scarp that had undergone considerable pedogenesis.

Event W

Evidence for event W, the MRE (most recent event) is distinct, with gravel contents steadily increasing from the base of the solum at 132 cm (Table 6). The demarcation with the underlying horizon is especially clear, with the horizon above the 132 cm depth having 28% gravel and the horizon below it having 5% gravel (Table 6, Photo 4). Upward fining like that occurring in the modern soil is typical for deposition after surface rupture along faults with a vertical component of offset (Nelson, 1992; McCalpin, 1996). A significant offset, such as this one—132 cm—has enough potential energy to enable erosion to remove large clasts from the scarp—the debris facies. As the area beneath the scarp fills up, the distance from the top of the scarp to the bottom of the scarp decreases, decreasing the potential energy and causing mostly small particles to be deposited—the wash facies. As mentioned, the calculated date for this event was about 27 ka.

Event X

Paleosol b1, beneath the modern soil, is 141 cm thick (Photos 4 and 5). This paleosol has had slightly greater pedogenesis than the modern soil. A few thin patchy clay films coat clasts and pores in the 2Btjb1 horizon, but are absent in the 2Ab1 horizon (Table 6). A few cobbles were found above the b1/b2 boundary (Photo 5). As mentioned, the calculated date for this event was about 57 ka.

Event Y

Paleosol b2, beneath paleosol b1, is 101 cm thick (Photos 5 and 6). The 3BCtjb2 horizon has a "few thin patchy clay films on sand grains, clasts, and interstices," while these are absent in the overlying 2Ab2 horizon. Paleosol b2 is distinctly lighter in color than paleosol b3 beneath it (Photo 6). Paleosol b2 is brown (7.5YR5/4m), whereas paleosol b3 is dark brown (7.5YR4/4m) (Table 6). As mentioned, the calculated date for this event was about 69 ka.

Event Z

Paleosol b3, beneath paleosol b2, is 86 cm thick (Photo 6). The 4ABtjb3 horizon comprising this solum has a "few thin patchy clay films on sand grains". As mentioned, the clay content in this paleosol is extremely low, mostly because the scarp wash came from the early Wisconsin soil early in its development. As mentioned, the calculated date for this event was about 80 ka.

CONCLUSIONS

Soils at this site range in age from late Holocene to early Wisconsin. Most of the alluvial fan deposits and eroded hillslopes have sandy Holocene soils. The early Wisconsin soils, formed under a much wetter climate conducive to the stabilizing effects of forest vegetation. These now exist as a few relict paleosols that escaped the ravages of erosion during the relatively dry climate of the Holocene. In particular, they may be found associated with faults that shelter them from erosion by thrusting older material over them or by diverting drainages around them via uplift. These early Wisconsin soils are excellent for assessing seismic hazards. The Holocene soils, however, are virtually featureless as well as cumulic. Only in rare instances would they be suitable for assessing the hazard. The contact between the two should be considered 10 ka.

Soil Profile No. 4, described on the footwall beneath the thrust fault in Trench T-6, appears to have a modern soil and three paleosols providing evidence for its paleoseismicity. Measurements of these soils yield vertical offsets of: 132, 141, 101, and 86 cm, with ground-rupturing earthquakes occurring at: 27, 57, 69, and <80 ka. The average vertical offset for the 4 events was 115 cm (3.8') and the recurrence interval was between 14 and 29 ky. Although the last ground-rupturing event on the thrust fault seems to have occurred over 10,000 years ago, clay contents in the solum formed after the MRE are approaching those of the solum formed after the penultimate event (21.7 g/cm^2 vs. 23.1 g/cm^2, Table 6). Therefore, this fault appears capable of producing 3 to 5' of vertical offset at any time and should be considered a serious ground-rupture hazard.

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Table 1. Description of Soil Profile No. 1, representative of soil development within the present alluvial fan on the footwall of a thrust fault in Trench T-8 at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California. Abbreviations are given in USDA-Natural Resources Conservation Service publications (Soil Survey Staff, 1993, 1999; 2003).

Described by Glenn Borchardt on May 2, 2005 at station 160' in the east wall of Trench T-8 at about 2993'(GPS) elevation at 33° 57.399' latitude and 116° 55.552' longitude. Parent material is Quaternary channel fill. Mediterranean climate with MAP (mean annual precipitation) being 15.4" at Beaumont. Vegetation hay. Excessive drainage. The soil is slightly acid in the surface, becoming medium acid in the Holocene section and slightly acid in the Pleistocene section.

Horizon Depth, cm Description

Soil Profile No. 1

A 0-30 Dark brown (10YR3/3m, 4/3d) light loamy sand; single grain, noncoherent structure; nonsticky and nonplastic when wet, very friable when moist, and soft when dry; many fine roots; many fine irregular interstitial pores; diffuse smooth boundary; pH 6.4; conductivity 30 uS (Sample No. 05B091).

Co 30-113 Dark yellowish brown (10YR4/4m, 4/4d) sand; single grain, noncoherent structure; nonsticky and nonplastic when wet, very friable when moist, and soft when dry; many fine irregular interstitial pores; diffuse smooth boundary; benched at 35 cm; pH 6.0; conductivity 20 uS (Sample No. 05B092).

*ESTIMATED AGE: $t_o =$ 5 ka
$t_b =$ 0 ka
$t_d =$ 5 ky

Ajb1 113-136 Dark yellowish brown (10YR4/4m, 4/4d) light loamy sand; single grain, noncoherent structure; nonsticky and nonplastic when wet, very friable when moist, and soft when dry; many fine irregular interstitial pores; diffuse smooth boundary; pH 6.0; conductivity 10 uS (Sample No. 05B093).

Cob1 136-252 Dark yellowish brown (10YR4/4m, 4/4d) sand; single grain, noncoherent structure; nonsticky and nonplastic when wet, very friable when moist, and soft when dry; many fine irregular interstitial pores; clear smooth boundary; pH 6.2; conductivity 30 uS (Sample No. 05B094).

ESTIMATED AGE: $t_o =$ 10 ka
$t_b =$ 5 ka
$t_d =$ 5 ky

ABtjb2 252-292 Dark reddish brown (5YR3/4m, 4/4d) loamy sand; single grain, noncoherent structure; nonsticky and nonplastic when wet, very friable when moist, and soft when dry; many fine irregular interstitial pores; 7 mm thick clay band at 262 cm; clear smooth boundary; pH 6.6; conductivity 40 uS (Sample No. 05B095).

Bt1b2 292-311 Red (2.5YR4/6m, 6/6d) heavy sandy loam; moderate weak subangular blocky structure; sticky and plastic when wet, friable when moist, and very hard when dry; many fine irregular interstitial pores; many medium thick clay films on sand grains, clasts, and in pores; diffuse smooth boundary; benched at 305 cm; pH 6.3; conductivity 30 uS (Sample No. 05B096).

Bt2b2 311-337 Red (2.5YR4/6m, 6/6d) heavy sandy loam; moderate weak angular blocky structure; sticky and plastic when wet, friable when moist, and very hard when dry; common fine continuous random tubular and many fine irregular interstitial pores; many medium thick clay films on sand grains, clasts, peds, and in pores; diffuse smooth boundary; pH 6.4; conductivity 130 uS (Sample No. 05B097).

BCtb2 337-357 Red (2.5YR4/6m, 6/6d) sandy loam; moderate weak angular blocky structure; slightly sticky and slightly plastic when wet, friable when moist, and hard when dry; many fine irregular interstitial pores; common thin patchy clay films on sand grains, clasts, peds, and in pores; diffuse smooth boundary; pH 6.3; conductivity 80 uS (Sample No. 05B098).

CBt1b2 357-435 Yellowish red (5YR4/6m, 5/6d) sand; massive structure; nonsticky and nonplastic when wet, friable when moist, and hard when dry; many fine irregular interstitial pores; diffuse smooth boundary; benched at 420 cm; pH 6.4; conductivity 160 uS (Sample No. 05B099).

CBt2b2 435-520 Reddish brown (5YR5/4m, 5/6d) gravelly sand with common medium distinct red (2.5YR5/6m) 10-50 mm thick horizontal clay bands; massive structure; nonsticky and nonplastic when wet, friable when moist, and hard when dry; many fine irregular interstitial pores; diffuse smooth boundary; level line at 495 cm; pH 6.3; conductivity 90 uS (Sample No. 05B100).

CBqb2 520-600+ Reddish brown (5YR5/4m, 5/6d) gravelly sand with common coarse prominent yellow (10YR7/6m) to white silica(?) coatings; massive structure; nonsticky and nonplastic when wet, friable when moist, and hard when dry; many fine irregular interstitial pores; pH 6.4; conductivity 70 uS (Sample No. 05B101).

ESTIMATED AGE: t_o = 80 ka
t_b = 10 ka
t_d = 70 ky

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[*] Pedochronological estimates based on available information. All ages should be considered subject to ±50% variation unless otherwise indicated (Borchardt, 1992).
t_o = date when soil formation or aggradation began, ka
t_b = date when soil or strata was buried, ka
t_d = duration of soil development or aggradation, ky

Table 2. Description of Soil Profile No. 2 on a spur ridge on the hillside south of the Banning fault at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California.

Described by Glenn Borchardt on May 3, 2005 in a road cut immediately north of the water tanks at 3084' (GPS) elevation at 33° 57.741' latitude and 116° 55.776' longitude. Parent material is older alluvium consisting of granitic and gneissic debris. Mediterranean climate with MAP being 15.4" at Beaumont. Vegetation grass. Excessive drainage. The soil is slightly acid throughout.

Soil Profile No. 2

Horizon	Depth, cm	Description
A	0-30	Dark brown (7.5YR3/4m, 5/4d) coarse loamy sand with many fine to medium faint mottles due to remnants of the eroding light yellowish brown (5YR6/rd) 2Bt horizon; medium weak subangular blocky structure; slightly sticky and slightly plastic when wet, friable when moist, and hard when dry; few fine roots; many fine irregular interstitial pores; clear smooth boundary; pH 6.1; conductivity 30 uS (Sample No. 05B111).
2Bt	30-100+	Reddish brown (5YR4/4m, 6/4d) sandy loam; medium weak angular blocky structure; sticky and plastic when wet, friable when moist, and very hard when dry; few fine roots; many fine irregular interstitial pores; many thin patchy to medium thick clay films in pores and on sand grains, clasts, and peds; pH 6.2; conductivity 50 uS (Sample No. 05B112).

ESTIMATED AGE:

t_o = 80 ka
t_b = 0 ka
t_d = 80 ky

Table 3. Description of Soil Profile No. 3 on the headwall of a thrust fault on the alluvial fan south of the Banning fault at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California.

Described by Glenn Borchardt on May 4, 2005 at station 0 in the east wall of Trench T-6 across a north dipping thrust fault at 2960' (GPS) elevation at 33° 57.513' latitude and 116° 55.856' longitude. Parent material is older alluvium consisting of granitic and gneissic debris. Mediterranean climate with MAP being 15.4" at Beaumont. Vegetation hay. Excessive drainage. The soil is medium acid in the surface, becoming slightly acid in the subsoil and medium acid in the parent material.

Horizon Depth, cm Description

Soil Profile No. 3

Ap 0-27 Dark brown (7.5YR3/4m, 5/4d) sandy loam; medium to coarse strong subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; common fine roots; many fine to medium continuous random tubular pores; few thin patchy clay films on sand grains eroded from the underlying horizon; clear smooth boundary; pH 5.7; conductivity 60 uS (Sample No. 05B121).

Bt 27-150 Dark reddish brown (5YR3/4m, 7.5YR5/4d) sandy loam with a few fine prominent white mottles due to feldspar grains; medium strong subangular blocky structure; sticky and plastic when wet, friable when moist, and very hard when dry; very few fine roots; few fine continuous random tubular pores; common thin patchy clay films on sand grains and clasts; abrupt smooth boundary; level line at 135 cm; pH 6.1; conductivity 60 uS (Sample No. 05B122).

CBt1 150-185+ Dark reddish brown (5YR3/4m, 7.5YR5.5/4d) gravelly loamy sand cobble with very few fine prominent white mottles due to feldspar grains; loose structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; many interstitial pores; many thin to medium thick patchy clay films on sand grains and clasts; many medium thick to thick clay films in joints of saprolitic schistose clasts to 30 cm; pH 6.1; conductivity 10 uS (Sample No. 05B123).

From station 20':

CBt2 82-122+ Yellowish brown (10YR5/6m, 7/4d) cobble with gravelly loamy sand matrix with very few very fine prominent white mottles due to feldspar grains; loose structure; nonsticky and nonplastic when wet, loose when moist, and soft when dry; many interstitial pores; few medium thick to thick clay films in joints of saprolitic schistose clasts to 30 cm; pH 5.9; conductivity 20 uS (Sample No. 05B124).

ESTIMATED AGE: $t_o =$ 80 ka
$t_b =$ 0 ka
$t_d =$ 80 ky

Table 4. Description of Soil Profile No. 4 on the footwall of a thrust fault on the alluvial fan south of the Banning fault at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California.

Described by Glenn Borchardt on May 4, 2005 between stations 200' and 176' in the east wall of Trench T-6 across a north dipping thrust fault at 2944' (GPS) elevation at 33° 57.483' latitude and 116° 55.863' longitude. Parent materials are colluvial wedges reworked from an eroded scarp consisting of granitic and gneissic debris. Mediterranean climate with MAP being 15.4" at Beaumont. Vegetation hay. Excessive drainage. The soil is strongly acid in the surface, becoming medium acid at the base of the modern soil and paleosol b1, whereupon it becomes slightly acid in paleosols b2 and b3.

Horizon Depth, cm Description

Soil Profile No. 4

At station 200' with top of bench at 0 cm:

Ap 0-30 Dark brown (7.5YR4/2m, 10YR6/3d) sandy loam; fine to medium moderate granular structure; slightly sticky and slightly plastic when wet, very friable when moist, and hard when dry; common fine roots; common fine continuous random tubular pores; abrupt smooth boundary; pH 5.4; conductivity 40 uS (Sample No. 05B131).

A 30-103 Dark brown (7.5YR4/2m, 10YR5/4d) sandy loam; fine moderate granular structure; slightly sticky and slightly plastic when wet, very friable when moist, and slightly hard when dry; common fine roots; common fine continuous random tubular pores; diffuse smooth boundary; pH 5.5; conductivity 30 uS (Sample No. 05B132).

Bw 103-132 Dark brown (7.5YR4/3m, 10YR5/4d) gravelly sandy loam; fine to medium moderate subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; common fine roots; many fine continuous random tubular pores; few clay films on clasts reworked from an older soil; clear smooth boundary; pH 5.7; conductivity 30 uS (Sample No. 05B133).

ESTIMATED AGE*: t_o = 26.9 ka
t_b = **0** ka
t_d = 26.9 ky

2Ab1 132-150 Dark brown (7.5YR4/4m, 10YR5/4d) sandy loam; loose structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; many fine interstitial pores; few clay films on clasts reworked from an older soil; pH 6.0; conductivity 30 uS (Sample No. 05B134).

At station 188' with top of bench at 150 cm:

2Btj1b1 150-208 Dark brown (7.5YR3.5/4m, 10YR5/6d) sandy loam; medium moderate to strong subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; many fine continuous random tubular pores; very few thin patchy clay films on clasts and coating pores; clear smooth boundary; pH 6.1; conductivity 40 uS (Sample No. 05B135).

2Btj2b1 208-273 Dark brown (7.5YR4/4m, 6/4d) sandy loam; medium moderate to strong subangular blocky structure; sticky and slightly plastic when wet, friable when moist, and very hard when dry; many fine continuous random tubular pores; very few thin patchy clay films coating pores; clear wavy boundary; pH 6.4; conductivity 50 uS (Sample No. 05B136).

ESTIMATED AGE: t_o = 55.6 ka
t_b = 26.9 ka
t_d = 28.7 ky

At station 176' with top of bench at 290 cm and level line at 423 cm:
2Ab2 273-290 Dark brown (7.5YR4/4m, 5/4d) sandy loam; medium moderate to strong subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; few fine continuous random tubular pores; pH 6.4; conductivity 60 uS (Sample No. 05B137).

3BCtjb2 290-374 Brown (7.5YR5/4m, 7/4d) loamy sand; loose to fine weak subangular blocky structure; sticky and slightly plastic when wet, very friable when moist, and very hard when dry; many interstitial pores; few thin patchy clay films on sand grains, clasts, and interstices; pH 6.4; clear wavy boundary; conductivity 40 uS (Sample No. 05B138).

ESTIMATED AGE: t_o = 69.3 ka
t_b = 55.6 ka
t_d = 13.7 ky

4ABtjb3 374-460+ Dark brown (7.5YR4/4m, 7/4d) loamy sand; loose to medium weak subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and slightly hard when dry; many interstitial pores and few fine continuous random tubular pores; few thin patchy clay films on sand grains; pH 6.6; conductivity 60 uS (Sample No. 05B139).

ESTIMATED AGE: t_o = 80.0 ka
t_b = 69.3 ka
t_d = 10.7 ky

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*Estimated ages calculated from clay content data of Table 6. The precision implied is merely for ease of calculation. In addition, it was necessary to assume that event Z occurred exactly at 80 ka, when it had to have occurred at some unknown, slightly younger date. Vertical offsets associated with the four sola are: 132, 141, 102, and 86 cm, respectively.

Table 5. Description of Soil Profile No. 5 on the footwall of a thrust fault on the alluvial fan south of the Banning fault at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California.

Described by Glenn Borchardt on May 4, 2005 at station 385' in the east wall of Trench T-6 across a north dipping thrust fault at 2881' (GPS) elevation at 33° 57.452' latitude and 116° 55.874' longitude. Parent material is older alluvium consisting of granitic and gneissic debris. Mediterranean climate with MAP being 15.4" at Beaumont. Vegetation hay. Excessive drainage. The soil is strongly acid in the surface, becoming medium acid in the parent material.

Horizon	Depth, cm	Description

Soil Profile No. 5

Ap 0-20 Dark brown (10YR4/3m, 5.5/3d) sandy loam; fine moderate granular to medium moderate subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; many fine roots; few fine continuous random tubular pores; abrupt smooth boundary; pH 5.2; conductivity 10 uS (Sample No. 05B181)

A 20-88 Dark brown (10YR4/3m, 5/4d) sandy loam; fine moderate granular to medium moderate subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; few fine roots; many fine continuous random tubular pores; diffuse smooth boundary; pH 5.6; conductivity 30 uS (Sample No. 05B182).

Bw 88-132 Dark brown (10YR4/3m, 5/4d) sandy loam; fine moderate granular to medium moderate subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; few fine roots; many fine continuous random tubular pores; few thin patchy clay films on sand grains; diffuse smooth boundary; pH 6.4; conductivity 40 uS (Sample No. 05B183).

Bt 132-283 Dark brown (7.5YR3/4m, 5/4d) heavy sandy loam; medium moderate subangular blocky structure; sticky and plastic when wet, friable when moist, and very hard when dry; common fine continuous random tubular pores; many thin to medium thick patchy clay films on sand grains and clasts and continuous medium thick clay films coating pores; abrupt wavy boundary; pH 6.4; conductivity 60 uS (Sample No. 05B184).

CBt 82-122+ Yellowish brown (10YR5/6m, 7/4d) sandy cobble; loose structure; nonsticky and nonplastic when wet, loose when moist, and soft when dry; many interstitial pores; few medium thick to thick clay films in joints of saprolitic clasts to 30 cm; pH 5.9; conductivity 20 uS (Sample No. 05B124) (from station 20').

ESTIMATED AGE: t_o = 80 ka
t_b = 0 ka
t_d = 80 ky

Table 6. Particle size distribution across the thrust fault in Trench T-6.

No.	Horizon	Top	Bot	Sand	Silt	Clay	Gravel	Texture	c/s	si/s	BD	Thickness	Horizon	Solum	Profile
05B		cm		2-0.050	0.05-002	<0.002	>2 mm				g/cc	cm	---	g/cm^2**	---
Soil Profile No. 3															
121	Ap	0	27	61.1	23.5	15.3	2.2	sl	0.25	0.38	1.76	27	7.1		
122	Bt	27	150	61.5	24.3	14.2	1.4	sl	0.23	0.40	1.76	123	30.3	37.4	37.4
124	CBt2			79.4	13.7	6.9	37.2	gls	0.09	0.17					
Soil Profile No. 4															
Event W															
131	Ap	0	30	61.1	28.1	10.8	8.0	sl	0.18	0.46	1.51 *	30	4.5		
132	A	30	103	62.1	24.5	13.4	11.4	sl	0.22	0.39	1.51	73	13.2		
133	Bw	103	132	62.8	25.6	11.5	28.2	gsl	0.18	0.41	1.51 *	29	3.9	21.7	
Event X															
134	2Ab1	132	150	61.6	25.3	13.2	5.3	sl	0.21	0.41	1.43 *	18	3.2		
135	2Btj1b1	150	208	64.8	23.5	11.7	3.6	sl	0.18	0.36	1.43	58	9.4		
136	2Btj2b1	208	273	63.4	24.8	11.8	4.7	sl	0.19	0.39	1.43 *	65	10.5	23.1	
Event Y															
137	2Ab2	273	290	61.2	25.2	13.6	4.9	sl	0.22	0.41	1.43 *	17	3.2		
138	3BCtjb2	290	374	70.7	22.4	6.9	6.5	ls	0.10	0.32	1.43 *	84	7.8	11.0	
Event Z															
139	4ABtjb3	374	460	73.3	19.5	7.2	2.9	ls	0.10	0.27	1.43 *	86	8.6	8.6	64.4
Soil Profile No. 5															
182	A	20	88	61.7	26.8	11.6	5.0	sl	0.19	0.43	1.51 *	68	11.3		
183	Bw	88	132	56.9	30.6	12.5	3.8	sl	0.22	0.54	1.51 *	44	8.0		
184	Bt	132	283	56.7	26.6	16.7	4.3	sl	0.29	0.47	1.76 *	151	42.5	61.8	61.8

Analyses by Geocon Inc. Sand, silt, and clay contents calculated as percentages of the <2 mm fraction. C/s = clay/sand; si/s = silt/sand.

BD = bulk density. Gravel (>2 mm fraction) as a percentage of <2 mm weight.

*Assumed values derived from a similar horizon from which a measurement was taken.

**Clay contents, g/cm^2, derived from: horizon thickness*BD*%clay*(100/(100+%gravel)/100).

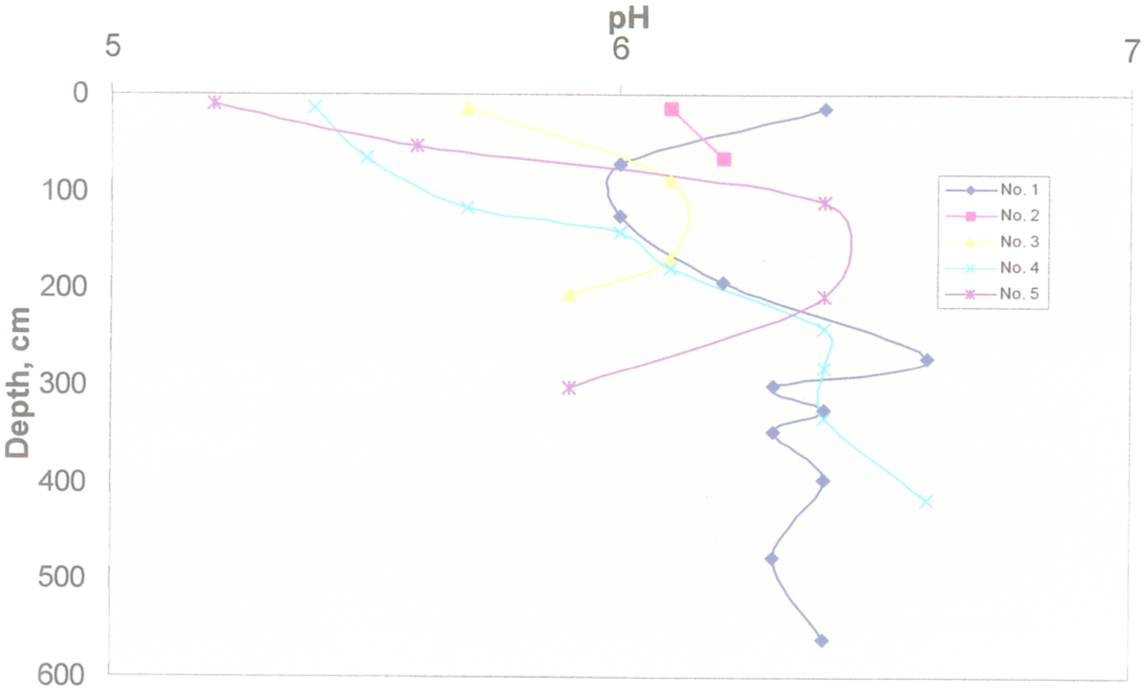

Figure 1. Depth functions for pH in Soil Profile Nos. 1 through 5 at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California.

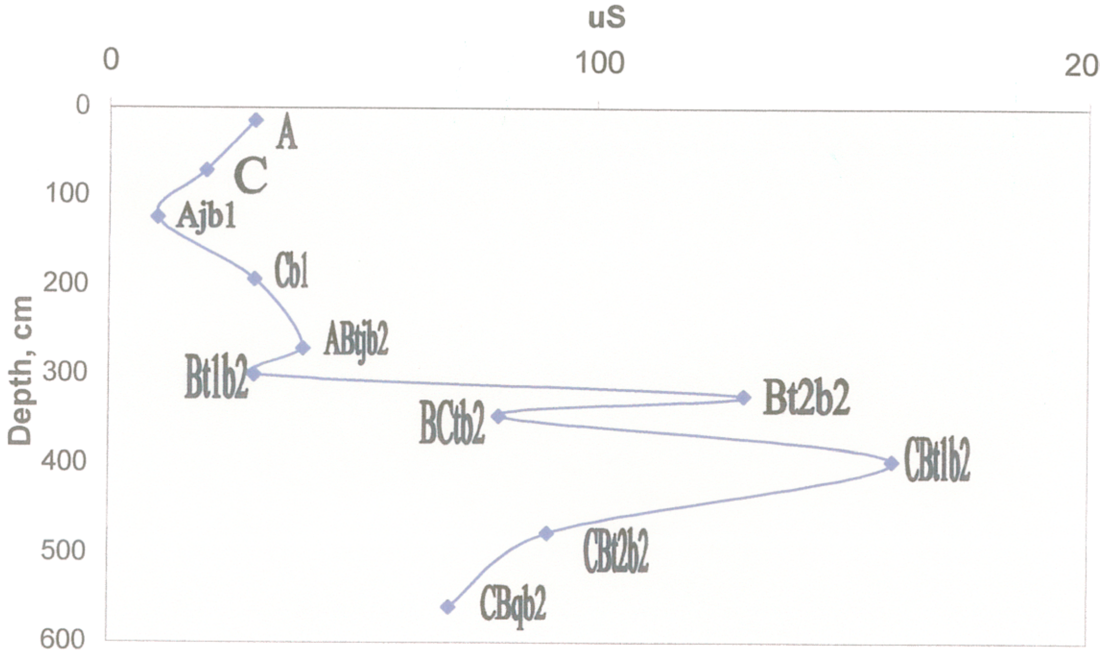

Figure 2. Depth function for conductivity in Soil Profile No. 1 at the Duetsch Property, Highland Springs Avenue at Wilson Street, Banning, California. The decreased conductivity within the youthful Ajb1 horizon supports its field designation as a former leached surface.

Photo 1. Trench T-8 showing a light gray 100-cm thick late Holocene channel fill (Cu horizon) cut through a mid Holocene channel fill (Co horizon), which in turn, overlies an early Wisconsin paleosol (Btb2 horizon). View north. Scale in cm.

Photo 2. A 1-m thick early Wisconsin relict paleosol in a road cut through a spur ridge. View northeast.

Photo 3. Soil Profile No. 4 developed on four colluvial wedges in the footwall of an eroded thrust fault in Trench T-6 at stations 176’, 188’, and 200’. Base of soil is at 460 cm. Soil Profile No. 3 was on the moderately eroded portion of the headwall at station 0’ to the north and Soil Profile No. 5 was at station 365’ to the south (not shown). View southeast.

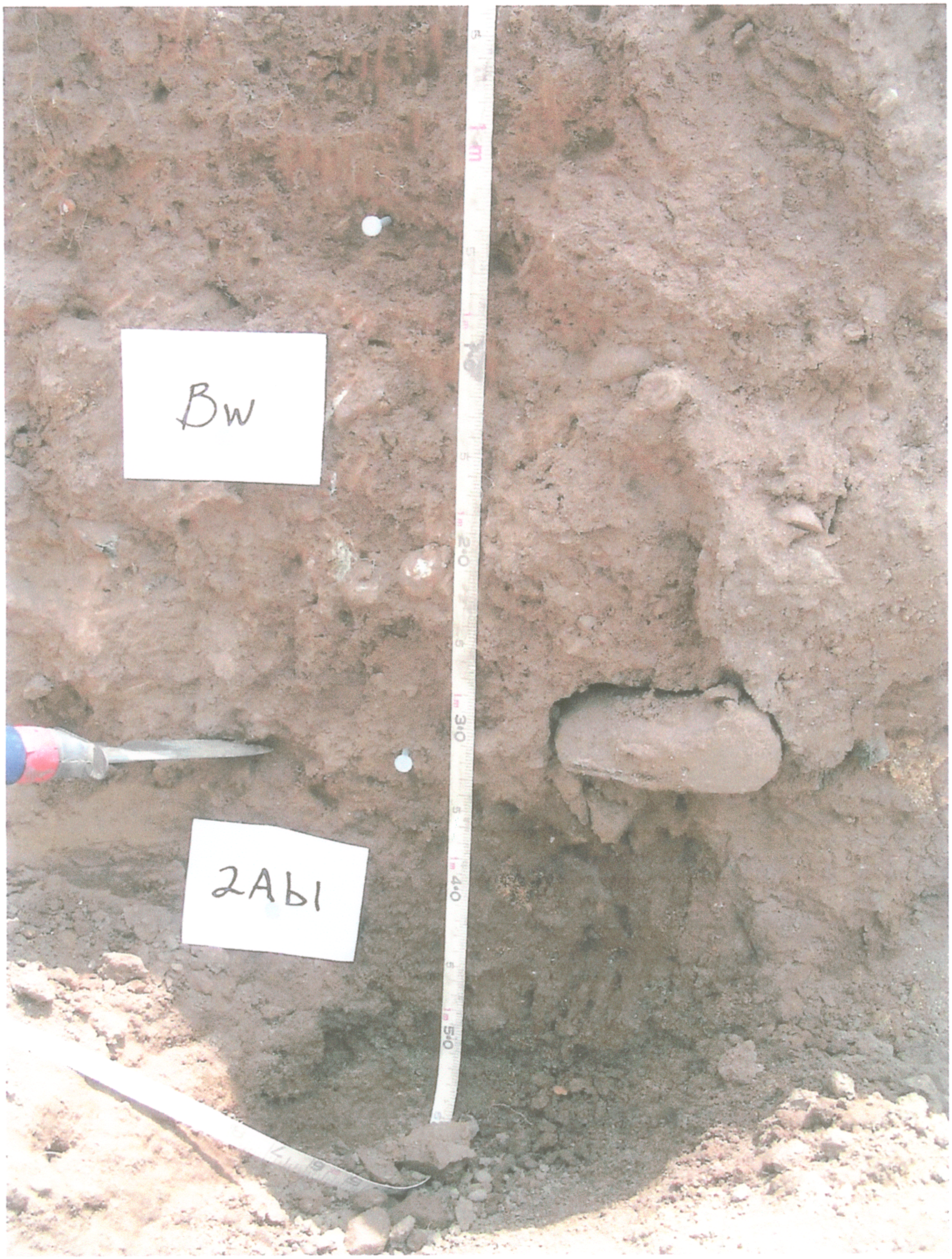

Photo 4. Relatively sharp contact between the modern soil and paleosol b1 in Soil Profile No. 4. Rocks above the contact at 132 cm appear to be part of the debris phase that followed the most recent earthquake (event W) when it produced a >132 cm vertical offset along the fault. Note flat-lying orientation of 10-cm long cobble to the right of the scale. View east. Scale in cm.

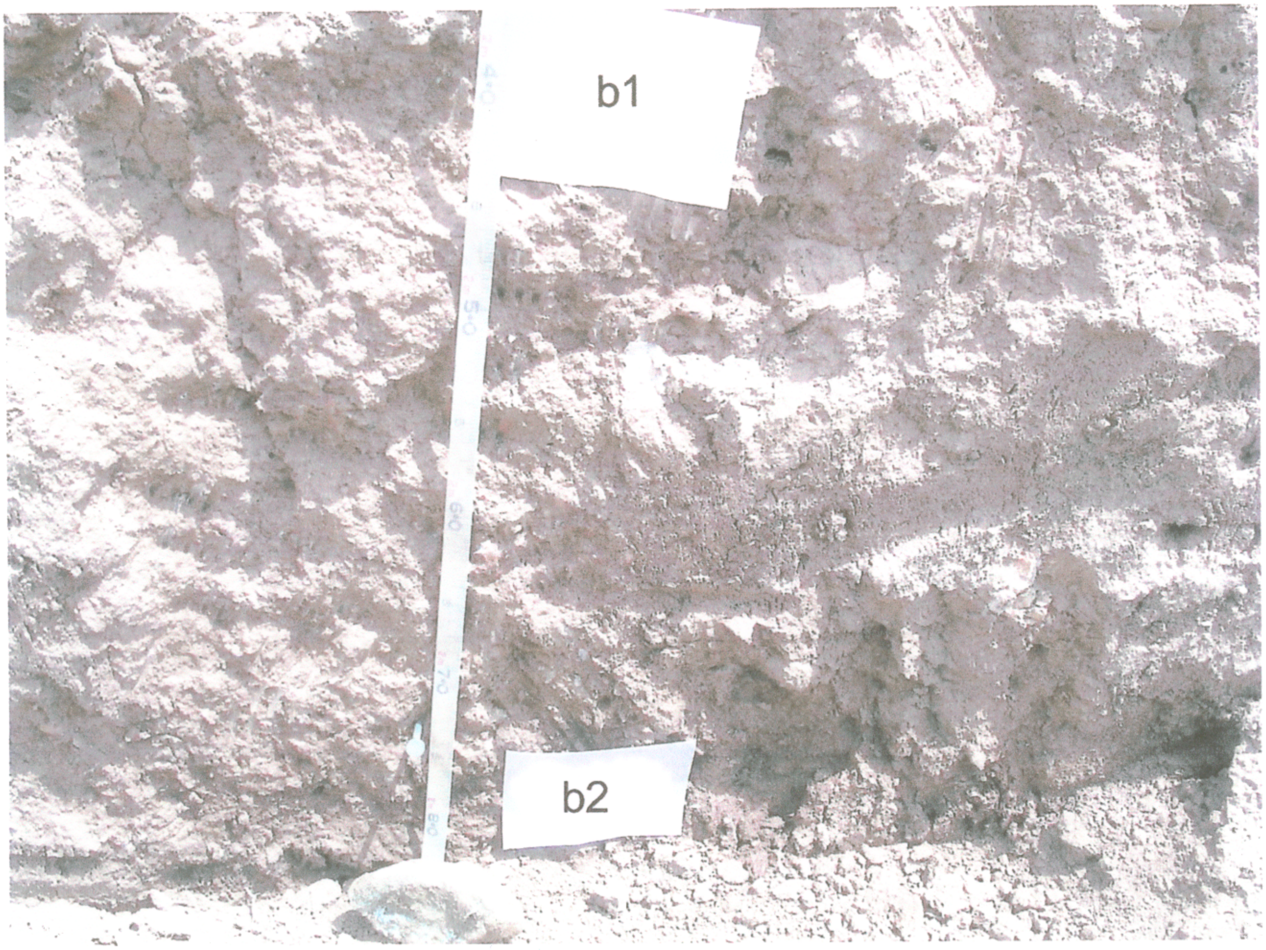

Photo 5. Contact between paleosol b1 and paleosol b2 in Soil Profile No. 4. Rocks above the b1/b2 contact at 273 cm appear to be part of the debris phase that followed event X, which produced a >141 cm vertical offset along the fault. View east. Scale in cm.

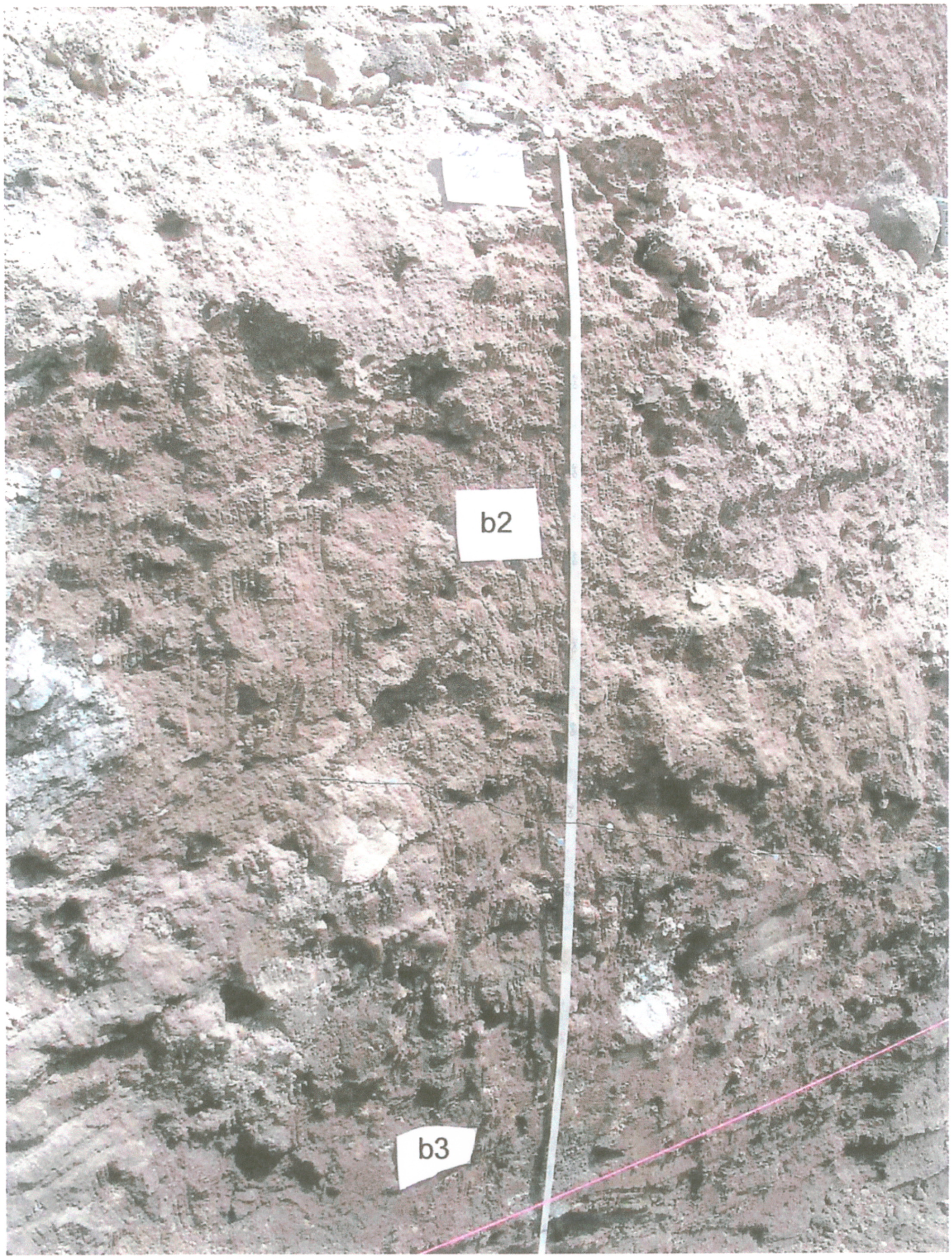

Photo 6. Contact between paleosol b2 and paleosol b3 in Soil Profile No. 4. Paleosol b2 developed after event Y, which produced >101 cm of offset. Rocks below the b2/b3 contact at 374 cm appear to be part of the debris phase that followed event Z when it produced a >86 cm vertical offset along the fault. Scale in cm. View east.

GLOSSARY

AGE. Elapsed time in calendar years. Because the cosmic production of C-14 has varied during the Quaternary, radiocarbon years (expressed as ky B.P.) must be corrected by using tree-ring and other data. Abbreviations used for corrected ages are: ka (kilo anno or years in thousands) or Ma (millions of years). Abbreviations used for intervals are: yr (years), ky (thousands of years). radiocarbon ages = yr B.P. Calibrated ages are calculated from process assumptions, relative ages fit in a sequence, and correlated ages refer to matching units. (See also yr B.P., HOLOCENE, PLEISTOCENE, QUATERNARY, PEDOCHRONOLOGY).

AGGRADATION. A modification of the earth's surface in the direction of uniformity of grade by deposition.

ALKALI (SODIC) SOIL. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 % or more of the total exchangeable bases), or both, that plant growth is restricted.

ALKALINE SOIL. Any soil that has a pH greater than 7.3. (See Reaction, Soil.)

ANGULAR ORPHANS. Angular fragments separated from weathered, well-rounded cobbles in colluvium derived from conglomerate.

ARGILLAN. (See Clay Film.)

ARGILLIC HORIZON. A horizon containing clay either translocated from above or formed in place through pedogenesis.

ALLUVIATION. The process of building up of sediments by a stream at places where stream velocity is decreased. The coarsest particles settle first and the finest particles settle last.

ANOXIC. (See also GLEYED SOIL). A soil having a low redox potential.

AQUICLUDE. A saturated body of sediment or rock that is incapable of transmitting significant quantities of water under ordinary hydraulic gradients.

AQUITARD. A body of rock or sediment that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs but may serve as a storage unit for groundwater.

ATTERBERG LIMITS. The moisture content at which a soil passes from a semi-solid to a plastic state (plastic limit, PL) and from a plastic to a liquid state (liquid limit, LL). The plasticity index (PI) is the numerical difference between the LL and the PL.

BEDROCK. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

BISEQUUM. Two soils in vertical sequence, each soil containing an eluvial horizon and its underlying B horizon.

BOUDIN, BOUDINAGE. From a French word for sausage, describes the way that layers of rock break up under extension. Imagine the hand, fingers together, flat on the table, encased in soft clay and being squeezed from above, as being like a layer of rock. As the spreading clay moves the fingers (sausages) apart, the most mobile rock fractions are drawn or squeezed into the developing gaps.

BURIED SOIL. A developed soil that was once exposed but is now overlain by a more recently formed soil.

CALCAREOUS SOIL. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

CATENA. A sequence of soils of about the same age, derived from similar parent material and occurring under similar climatic conditions, but having different characteristics due to variation in relief and drainage. (See also Toposequence.)

CEC. Cation exchange capacity. The amount of negative charge balanced by positively charged ions (cations) that are exchangeable by other cations in solution (meq/100 g soil = cmol(+)/kg soil).

CLAY. As a soil separate, the mineral soil particles are less than 0.002 mm in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

CLAY FILM. A coating of oriented clay on the surface of a sand grain, pebble, soil aggregate, or ped. Clay films also line pores or root channels and bridge sand grains. Frequency classification is based on the percent of the ped faces and/or pores that contain films: very few--<5%; few--5-25%; common--25-50%; many--50-90%; and continuous--90-100%. Thickness classification is based on visibility of sand grains: thin--very fine sand grains standout; moderately thick--very fine sand grains impart microrelief to film; thick--fine sand grains enveloped by clay and films visible without magnification. Synonyms: clay skin, clay coat, argillan, illuviation cutan.

COBBLE. Rounded or partially rounded fragments of rock ranging from 7.5 to 25 cm in diameter.

COLLUVIUM. Any loose mass of soil or rock fragments that moves downslope largely by the force of gravity. Usually it is thicker at the base of the slope.

COLLUVIUM-FILLED SWALE. The prefailure topography of the source area of a debris flow.

COMPARATIVE PEDOLOGY. The comparison of soils, particularly through examination of features known to evolve through time.

CONCRETIONS. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

CONDUCTIVITY. The ability of a soil solution to conduct electricity, generally expressed as the reciprocal of the electrical resistivity. Electrical conductance is the reciprocal of the resistance (1/R = 1/ohm = ohm^{-1} = mho [reverse of ohm] = siemens = S), while electrical conductivity is the reciprocal of the electrical resistivity (EC = 1/r = 1/ohm-cm = mho/cm = S/cm or mmho/cm = dS/m). EC, expressed as uS/cm, is equivalent to the ppm of salt in solution when multiplied by 0.640. Pure rain water has an EC of 0, standard 0.01 N KCl is 1411.8 uS at 25C, and the growth of salt-sensitive crops is restricted in soils having saturation extracts with an EC greater than 2,000 uS/cm. Measurements in soils are usually performed on 1:1 suspensions containing one part by weight of soil and one part by weight of distilled water.

CONSISTENCE, SOIL. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are --

Loose.--Noncoherent when dry or moist; does not hold together in a mass.

Friable.--When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.--When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.--When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.--When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.--When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.--When dry, breaks into powder or individual grains under very slight pressure.

Cemented.--Hard and brittle; little affected by moistening.

CTPOT. Easily remembered acronym for climate, topography, parent material, organisms, and time; the five factors of soil formation.

CUMULIC. A soil horizon that has undergone aggradation coincident with its active development.

CUTAN. (See Clay Film.)

DEBRIS FLOW. Incoherent or broken masses of rock, soil, and other debris that move downslope in a manner similar to a viscous fluid.

DEBRIS SLOPE. A constant slope with debris on it from the free face above.

DEGRADATION. A modification of the earth's surface by erosion.

DURIPAN. A subsurface soil horizon that is cemented by illuvial silica, generally deposited as opal or microcrystalline silica, to the degree that less than 50 percent of the volume of air-dry fragments will slake in water or HCl.

ELUVIATION. The removal of soluble material and solid particles, mostly clay and humus, from a soil horizon by percolating water.

EOLIAN. Deposits laid down by the wind, landforms eroded by the wind, or structures such as ripple marks made by the wind.

FAULT-LINE SCARP. A scarp that has been produced by differential erosion along an old fault line.

FIRST-ORDER DRAINAGE. The most upstream, field-discernible concavity that conducts water and sediments to lower parts of a watershed.

FLOOD PLAIN. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

FOSSIL FISSURE. A buried rectilinear chamber associated with extension due to ground movement. The chamber must be oriented along the strike of the shear and must have vertical and horizontal dimensions greater than its width. It must show no evidence of faunal activity and its walls may have silt or clay coatings indicative of frequent temporary saturation with ground water. May be mistaken for an animal burrow. Also known as a paleofissure.

FRIABILITY. Term for the ease with which soil crumbles. A friable soil is one that crumbles easily.

GENESIS, SOIL. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum (A and B horizons) from the unconsolidated parent material.

GEOMORPHIC. Pertaining to the form of the surface features of the earth. Specifically, geomorphology is the analysis of landforms and their mode of origin.

GLEYED SOIL. A soil having one or more neutral gray horizons as a result of water logging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent water logging.

GRAVEL. Rounded or angular fragments of rock 2 to 75 mm in diameter. Soil textures with >15% gravel have the prefix "gravelly" and those with >90% gravel have the suffix "gravel."

HIGHSTAND. The highest elevation reached by the ocean during an interglacial period.

HOLOCENE. The most recent epoch of geologic time, extending from 10 ka to the present.

HORIZON, SOIL. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major soil horizons:

O horizon.--The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.--The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

E horizon -- This eluvial horizon is light in color, lying beneath the A horizon and above the B horizon. It is made up mostly of sand and silt, having lost most of its clay and iron oxides through reduction, chelation, and translocation.

B horizon.--The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these.

C horizon.--The relatively unweathered material immediately beneath the solum. Included are sediment, saprolite, organic matter, and bedrock excavatable with a spade. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a number precedes the letter C.

R layer.--Consolidated rock not excavatable with a spade. It may contain a few cracks filled with roots or clay or oxides. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

These lower-case letters may be appended:

-a	Mostly decomposed organic matter; rubbed fiber content is than 17%.

-b	Buried soil horizon. If more than one buried soil exists, this letter is followed by an Arabic number indicating the sequence.
-c	Concretions or nodules cemented by iron, aluminum, manganese, or titanium.
-d	Dense horizon physically restricting root penetration.
-e	Intermediately decomposed organic matter; rubbed fiber content is between 17 and 40%.
-f	Frozen horizon cemented by permanent ice.
-g	Gleyed horizon in which iron has been removed during soil formation or saturation with stagnant water has preserved a reduced state. Strong gleying is indicated by chromas of one or less, and hues bluer than 10Y. Bg is used for a horizon with pedogenic features in addition to gleying, while Cg is not.
-h	Humus. Illuvial accumulation of amorphous organic matter-sesquioxide complexes that either coat grains, form pellets, or form sufficient coatings and pore fillings to cement the horizon.
-i	Least decomposed organic matter; rubbed fiber content is greater than 40%.
-j	Used in combination with another horizon designation (e.g., Btj, Ej) to denote incipient development of that feature.
-k	Carbonates. Illuvial accumulation of alkaline earth carbonates, mainly calcium carbonate; the properties do not meet those for the K horizon.
-l	Unused as of 1992.
-m	Cemented. Horizon that is more than 90% cemented. Denote cementing material (zm, soluble salts; ym, gypsum; km, carbonate; sm, iron; kqm, carbonate and silica)
-n	Sodium. Accumulation of exchangeable sodium.
-o	Oxides. Residual accumulation of sesquioxides.
-p	Plowed or otherwise disturbed by *Homo sapiens* or domesticated animals.
-q	Silica (secondary) accumulation.
-r	Rock weathered in place. Saprolite.
-s	Sesquioxides. Illuvial accumulation of sesquioxides with color value and chroma greater than three.
-ss	Slickensides
-t	Accumulation of silicate clay that has either formed in place or has been translocated from above. Only used with B horizons.
-u	Unweathered.
-v	Plinthite. Iron-rich, reddish material that hardens irreversibly when dried.
-w	Development of color (redder hue or higher chroma relative to C) or structure with little or no apparent illuvial accumulation of material.
-x	Fragipan. Subsurface horizon characterized by a bulk density greater than that of the overlying soil, hard to very hard consistence, brittleness, and seemingly cemented when dry.
-y	Gypsum. Accumulation of gypsum.
-z	Salts. Accumulation of salts more soluble than gypsum.

HUMUS. The well-decomposed, more or less stable part of the organic matter in mineral soils.

ILLUVIATION. The deposition by percolating water of solid particles, mostly clay or humus, within a soil horizon.

INTERFLUVE. The land lying between streams.

ISOCHRONOUS BOUNDARY. A gradational boundary between two sedimentary units indicating that they are approximately the same age. Opposed to a nonisochronous boundary, which by its abruptness indicates that it delineates units having significant age differences.

KROTOVINA. An animal burrow filled with soil.

LEACHING. The removal of soluble material from soil or other material by percolating water.

LOWSTAND. The lowest elevation reached by the ocean during a glacial period.

MANGAN. A thin coating of manganese oxide (cutan) on the surface of a sand grain, pebble, soil aggregate, or ped. Mangans also line pores or root channels and bridge sand grains.

MORPHOLOGY, SOIL. The physical make-up of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

MOTTLING, SOIL. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct and prominent. The size measurements are these: fine, less than 5 mm in diameter along the greatest dimension; medium, from 5 to 15 mm, and coarse, more than 15 mm.

MRT (MEAN RESIDENCE TIME.) The average age of the carbon atoms within a soil horizon. Under ideal reducing conditions, the humus in a soil will have a C-14 age that is half the true age of the soil. In oxic soils humus is typically destroyed as fast as it is produced, generally yielding MRT ages no older than 300-1000 years, regardless of the true age of the soil.

MUNSELL COLOR NOTATION. Scientific description of color determined by comparing soil to a Munsell Soil Color Chart (Available from Macbeth Division of Kollmorgen Corp., 2441 N. Calvert St., Baltimore, MD 21218). For example, dark yellowish brown is denoted as 10YR3/4m in which the 10YR refers to the hue or proportions of yellow and red, 3 refers to value or lightness (0 is black and 10 is white), 4 refers to chroma (0 is pure black and white and 20 is the pure color), and m refers to the moist condition rather than the dry (d) condition.

OVERBANK DEPOSIT. Fine-grained alluvial sediments deposited from floodwaters outside of the fluvial channel.

OXIC. A soil having a high redox potential. Such soils typically are well drained, seldom being waterlogged or lacking in oxygen. Rubification in such soils tends to increase with age.

PALEOSEISMOLOGY. The study of prehistoric earthquakes through the examination of soils, sediments, and rocks.

PALEOSOL. A soil that formed on a landscape in the past with distinctive morphological features resulting from a soil-forming environment that no longer exists at the site. The former pedogenic process was either altered because of external environmental change or interrupted by burial.

PALINSPASTIC RECONSTRUCTION. Diagrammatic reconstruction used to obtain a picture of what geologic and/or soil units looked like before their tectonic deformation.

PARENT MATERIAL. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

PED. An individual natural soil aggregate, such as a granule, a prism, or a block.

PEDOCHRONOLOGY. The study of pedogenesis with regard to the determination of when soil formation began, how long it occurred, and when it stopped. Also known as soil dating. Two ages and the calculated duration are important:

t_o = age when soil formation or aggradation began, ka
t_b = age when the soil or stratum was buried, ka
t_d = duration of soil development or aggradation, ky

Pedochronological estimates are based on available information. All ages should be considered subject to ±50% variation unless otherwise indicated.

PEDOCHRONOPALEOSEISMOLOGY. The study of prehistoric earthquakes by using pedochronology.

PEDOLOGY. The study of the process through which rocks, sediments, and their constituent minerals are transformed into soils and their constituent minerals at or near the surface of the earth.

PEDOGENESIS. The process through which rocks, sediments, and their constituent minerals are transformed into soils and their constituent minerals at or near the surface of the earth.

PERCOLATION. The downward movement of water through the soil.

pH VALUE. The negative log of the hydrogen ion concentration. Measurements in soils are usually performed on 1:1 suspensions containing one part by weight of soil and one part by weight of distilled water. A soil with a pH of 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid or "sour" soil is one that gives an acid reaction; an alkaline soil is one that gives an alkaline reaction. In words, the degrees of acidity or alkalinity are expressed as:

Extremely acid------- <4.5
Very strongly acid--- 4.5 to 5.0
Strongly acid-------- 5.1 to 5.5
Medium acid---------- 5.6 to 6.0
Slightly acid-------- 6.1 to 6.5
Neutral-------------- 6.6 to 7.3
Mildly alkaline------ 7.4 to 7.8
Moderately alkaline-- 7.9 to 8.4
Strongly alkaline---- 8.5 to 9.0
Very strongly alkaline >9.0

Used if significant:
Very slightly acid--- 6.6 to 6.9
Very mildly alkaline- 7.1 to 7.3

PHREATIC SURFACE. (See Water Table.)

PLANATION. The process of erosion whereby a portion of the surface of the Earth is reduced to a fundamentally even, flat, or level surface by a meandering stream, waves, currents, glaciers, or wind.

PLEISTOCENE. An epoch of geologic time extending from 10 ka to 1.8 Ma; it includes the last Ice Age.

PROFILE, SOIL. A vertical section of the soil through all its horizons and extending into the parent material.

QUATERNARY. A period of geologic time that includes the past 1.8 Ma. It consists of two epochs--the Pleistocene and Holocene.

PROGRADATION. The building outward toward the sea of a shoreline or coastline by nearshore deposition.

RELICT SOIL. A surface soil that was partly formed under climatic conditions significantly different from the present.

RUBIFICATION. The reddening of soils through the release and precipitation of iron as an oxide during weathering. Munsell hues and chromas of well-drained soils generally increase with soil age.

SALINE SOIL. A soil that contains soluble salts in amounts that impair the growth of crop plants but that does not contain excess exchangeable sodium.

SAND. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 mm. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

SECONDARY FAULT. A minor fault that bifurcates from or is associated with a primary fault. Movement on a secondary fault never occurs independently of movement on the primary, seismogenic fault.

SHORELINE ANGLE. The line formed by the intersection of the wave-cut platform and the sea cliff. It approximates the position of sea level at the time the platform was formed.

SILT. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 mm) to the lower limit of very find sand (0.05 mm.) Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

SLICKENSIDES. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may form along a fault plane; at the bases of slip surfaces on steep slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

SLIP RATE. The rate at which the geologic materials on the two sides of a fault move past each other over geologic time. The slip rate is expressed in mm/yr, and the applicable duration is stated. Faults having slip rates less than 0.01 mm/yr are generally considered inactive, while faults with Holocene slip rates greater than 0.1 mm/yr generally display tectonic geomorphology.

SMECTITE. A fine, platy, aluminosilicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when moist.

SOIL. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

SOIL SEISMOLOGIST. Soil scientist who studies the effects of earthquakes on soils.

SOIL TECTONICS. The study of the interactions between soil formation and tectonism.

SOIL TONGUE. That portion of a soil horizon extending into a lower horizon.

SOLUM. Combined A and B horizons. Also called the true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

STONE LINE. A thin, buried, planar layer of stones, cobbles, or bedrock fragments. Stone lines of geological origin may have been deposited upon a former land surface. The fragments are more often pebbles or cobbles than stones. A stone line generally overlies material that was subject to weathering, soil formation, and erosion before deposition of the overlying material.

Many stone lines seem to be buried erosion pavements, originally formed by running water on the land surface and concurrently covered by surficial sediment

STRATH TERRACE. A gently sloping terrace surface bearing little evidence of aggradation.

STRUCTURE, SOIL. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are--platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SUBSIDIARY FAULT. A branch fault that extends a substantial distance from the main fault zone.

TECTOTURBATION. Soil disturbance resulting from tectonic movement.

TEXTURE, SOIL. Particle size classification of a soil, generally given in terms of the USDA system which uses the term "loam" for a soil having equal properties of sand, silt, and clay. The basic textural classes, in order of their increasing proportions of fine particles are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sand clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

TOPOSEQUENCE. A sequence of kinds of soil in relation to position on a slope. (See also Catena.)

TRANSLOCATION. The physical movement of soil particles, particularly fine clay, from one soil horizon to another under the influence of gravity.

UNIFIED SOIL CLASSIFICATION SYSTEM. The particle size classification system used by the U.S. Army Corps of Engineers and the Bureau of Reclamation. Like the ASTM and AASHO systems, the sand/silt boundary is at 80 um instead of 50 um used by the USDA and FAA. Unlike all other systems the gravel/sand boundary is at 4 mm instead of 2 mm and the silt/clay boundary is determined by using Atterberg limits.

VERTISOL. A soil with at least 30% clay, usually smectite, that fosters pronounced changes in volume with change in moisture. Cracks greater than 1 cm wide appear at a depth of 50 cm during the dry season each year. One of the ten USDA soil orders.

WATER TABLE. The upper limit of the soil or underlying rock material that is wholly saturated with water. Also called the phreatic surface.

WAVE-CUT PLATFORM. The relatively smooth, slightly seaward-dipping surface formed along the coast by the action of waves generally accompanied by abrasive materials.

WEATHERING. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

yr B.P. Uncorrected radiocarbon age expressed in years before present, calculated from 1950. Calendar-corrected ages are expressed in ka, or, if warranted, as A.D. or B.C.

APPENDIX C

APPENDIX C

AGE DATE REPORT FROM BETA ANALYTICAL

FOR

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND
WILSON STREET
BANNING, CALIFORNIA

PROJECT NO. T2305-12-03

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Lisa A. Battiato

Report Date: 6/6/2005

Geocon Inland Empire, Inc.

Material Received: 5/6/2005

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 204693	1410 +/- 40 BP	-24.1 o/oo	1420 +/- 40 BP

SAMPLE : T23051203CT5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 570 to 670 (Cal BP 1380 to 1280)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: **Beta-204693**

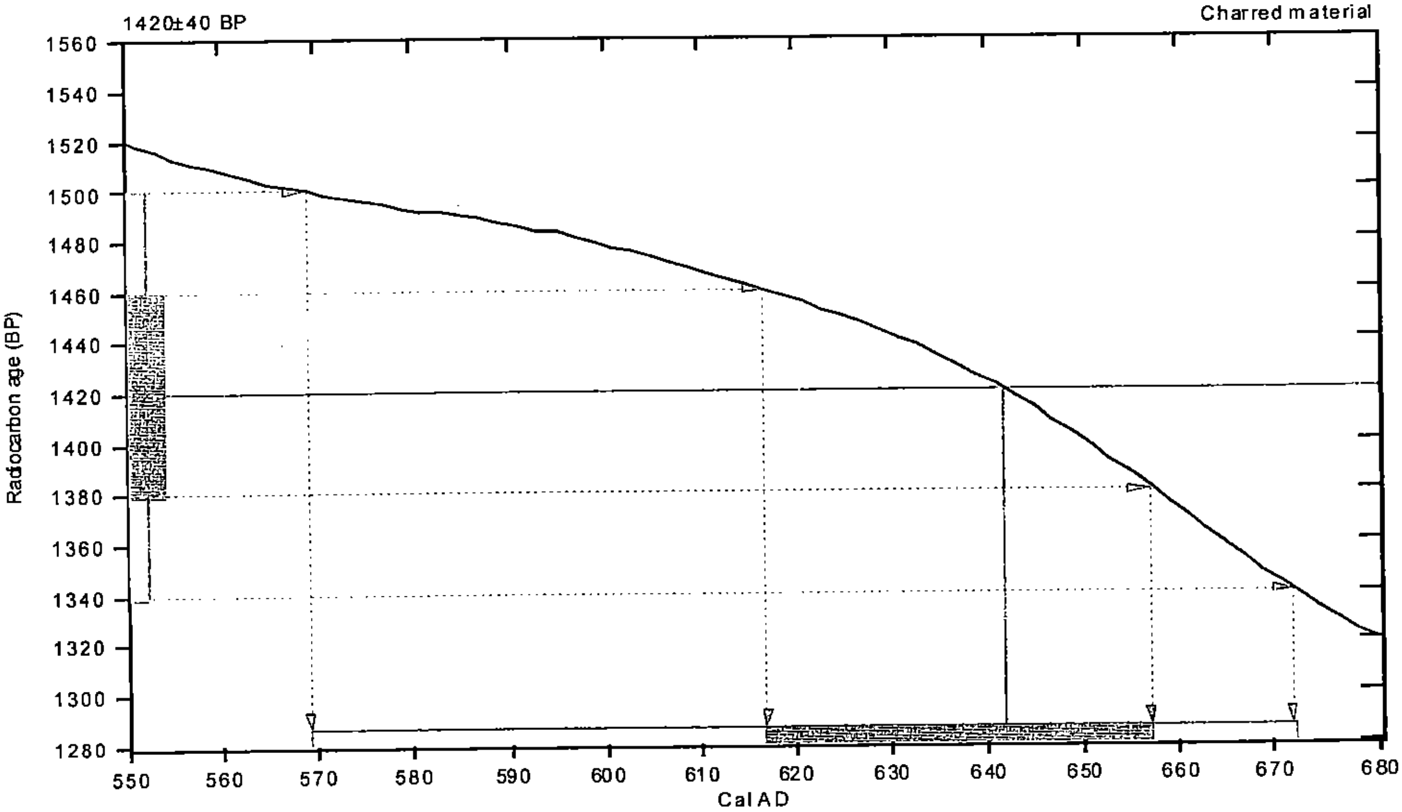
Conventional radiocarbon age: **1420±40 BP**

2 Sigma calibrated result: **Cal AD 570 to 670 (Cal BP 1380 to 1280)**
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 640 (Cal BP 1310)

1 Sigma calibrated result: Cal AD 620 to 660 (Cal BP 1330 to 1290)
(68% probability)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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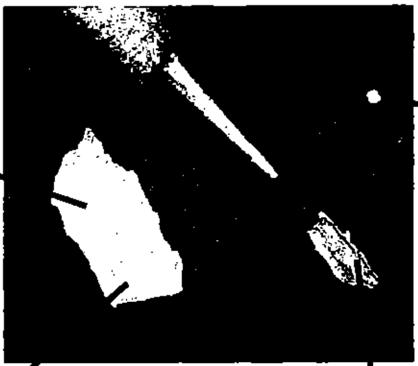
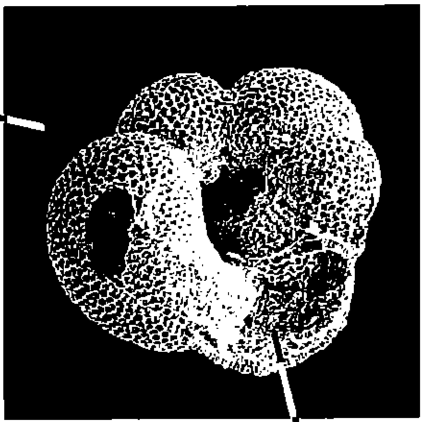
SCANNING ELECTRON MICROSCOPY (SEM) of materials submitted for radiocarbon dating

Scanning Electron Microscopy (SEM) can be used to magnify objects up to 50,000 times. SEM photographs showing microscopic details provide very useful information in the interpretation of radiocarbon dates. For instance, SEM can be used to distinguish primary vs. secondary shell structure and to identify very small wood, charcoal, and carbonate samples. SEM micrographs are also an excellent addition to reports and theses. We highly recommend this analysis through your own sources, or if not available, by our services.

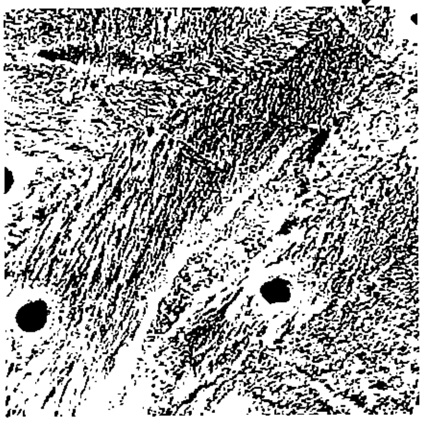
Primary $CaCO_3$, 690x, SEM



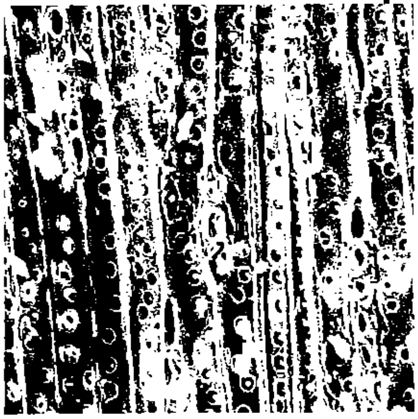
Samples and pencil point
6x, light photo



Planktonic foraminifera, 95x, SEM



Secondary $CaCO_3$, 690x, SEM



Cedar or cypress, 180x, SEM

$CaCO_3$ foram infilling, 1360x, SEM

<u>APPROPRIATE MATERIALS:</u> SEM is especially useful for AMS samples. It is recommended for: (1) very small carbonates which cannot be pretreated (forams, ostracods, coccoliths); (2) unidentified macrofossils concentrated from sediments; and (3) wood or charcoal for which some taxon identification is useful.

<u>THE SERVICE & COST:</u> Three (3) micrographs of various angles and/or magnifications are provided for each sample. Micrographs are obtained on a representative portion of the material submitted for radiocarbon dating, not on the dated material itself. The technician will usually be able to choose the angles and magnifications, which are most appropriate. The service does not include identification or characterization, but wherever possible, some will be provided.

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Final Report

The final report package includes the final date report, a statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, billing documents (containing balance/credit information and the number of samples submitted within the yearly discount period), and peripheral items to use with future submittals. The final report includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied. The final report has been sent by mail and e-mail (where available).

Pretreatment

Pretreatment methods are reported along with each result. All necessary chemical and mechanical pretreatments of the submitted material were applied at the laboratory to isolate the carbon which may best represent the time event of interest. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated, making their ^{14}C ages more subjective than samples which can be fully pretreated. Some materials receive no pretreatments. Please look at the pretreatment indicated for each sample and read the pretreatment glossary to understand the implications.

Analysis

Materials measured by the radiometric technique were analyzed by synthesizing sample carbon to benzene (92% C), measuring for ^{14}C content in one of 53 scintillation spectrometers, and then calculating for radiocarbon age. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time. AMS results were derived from reduction of sample carbon to graphite (100% C), along with standards and backgrounds. The graphite was then detected for ^{14}C content in one of 9 accelerator-mass-spectrometers (AMS) .

The Radiocarbon Age and Calendar Calibration

The "Conventional ^{14}C Age (*)" is the result after applying $^{13}C/^{12}C$ corrections to the measured age and is the most appropriate radiocarbon age. If an "*" is attached to this date, it means the $^{13}C/^{12}C$ was estimated rather than measured (The ratio is an option for radiometric analysis, but included on all AMS analyses.) Ages are reported with the units "BP" (Before Present). "Present" is defined as AD 1950 for the purposes of radiocarbon dating.

Results for samples containing more ^{14}C than the modern reference standard are reported as "percent modern carbon" (pMC). These results indicate the material was respiring carbon after the advent of thermo-nuclear weapons testing (and is less than ~ 50 years old).

Applicable calendar calibrations are included for materials between about 100 and 19,000 BP. If calibrations are not included with a report, those results were either too young, too old, or inappropriate for calibration. Please read the enclosed page discussing calibration.

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic

Unless otherwise requested by a submitter or discussed in a final date report, the following procedures apply to pretreatment of samples submitted for analysis. This glossary defines the pretreatment methods applied to each result listed on the date report form (e.g. you will see the designation "acid/alkali/acid" listed along with the result for a charcoal sample receiving such pretreatment).

Pretreatment of submitted materials is required to eliminate secondary carbon components. These components, if not eliminated, could result in a radiocarbon date, which is too young or too old. Pretreatment does not ensure that the radiocarbon date will represent the time event of interest. This is determined by the sample integrity. Effects such as the old wood effect, burned intrusive roots, bioturbation, secondary deposition, secondary biogenic activity incorporating recent carbon (bacteria) and the analysis of multiple components of differing age are just some examples of potential problems. The pretreatment philosophy is to reduce the sample to a single component, where possible, to minimize the added subjectivity associated with these types of problems. If you suspect your sample requires special pretreatment considerations be sure to tell the laboratory prior to analysis.

"acid/alkali/acid"

The sample was first gently crushed/dispersed in deionized water. It was then given hot HCI acid washes to eliminate carbonates and alkali washes (NaOH) to remove secondary organic acids. The alkali washes were followed by a final acid rinse to neutralize the solution prior to drying. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of the sample. Each chemical solution was neutralized prior to application of the next. During these serial rinses, mechanical contaminants such as associated sediments and rootlets were eliminated. This type of pretreatment is considered a "full pretreatment". On occasion the report will list the pretreatment as "acid/alkali/acid - insolubles" to specify which fraction of the sample was analyzed. This is done on occasion with sediments (See "acid/alkali/acid - solubles"

Typically applied to: charcoal, wood, some peats, some sediments, and textiles "acid/alkali/acid - solubles"

On occasion the alkali soluble fraction will be analyzed. This is a special case where soil conditions imply
That the soluble fraction will provide a more accurate date. It is also used on some occasions to verify the present/absence or degree of contamination present from secondary organic acids. The sample was first pretreated with acid to remove any carbonates and to weaken organic bonds. After the alkali washes (as discussed above) are used, the solution containing the alkali soluble fraction is isolated/filtered and combined with acid. The soluble fraction, which precipitates, is rinsed and dried prior to combustion.

"acid/alkali/acid/cellulose extraction"

Following full acid/alkali/acid pretreatments, the sample is bathed in (sodium chlorite) $NaClO_2$ under very controlled conditions (Ph = 3, temperature = 70 degrees C). This eliminates all components except wood cellulose. It is useful for woods that are either very old or highly contaminated.

Applied to: wood

"acid washes"

Surface area was increased as much a possible. Solid chunks were crushed, fibrous materials were shredded, and sediments were dispersed. Acid (HCl) was applied repeatedly to ensure the absence of carbonates. Chemical concentrations, temperatures, exposure times, and number of repetitions, were applied accordingly with the uniqueness of each sample. The sample was not be subjected to alkali washes to ensure the absence of secondary organic acids for intentional reasons. The most common reason is that the primary carbon is soluble in the alkali. Dating results reflect the total organic content of the analyzed material. Their accuracy depends on the researcher's ability to subjectively eliminate potential contaminants based on contextual facts.

Typically applied to: organic sediments, some peats, small wood or charcoal, special cases

PRETREATMENT GLOSSARY
Standard Pretreatment Protocols at Beta Analytic
(Continued)

"collagen extraction: with alkali or collagen extraction: without alkali

The material was first tested for friability ("softness"). Very soft bone material is an indication of the potential absence of the collagen fraction (basal bone protein acting as a "reinforcing agent" within the crystalline apatite structure). It was then washed in de-ionized water, the surface scraped free of the outer most layers and then gently crushed. Dilute, cold HCI acid was repeatedly applied and replenished until the mineral fraction (bone apatite) was eliminated. The collagen was then dissected and inspected for rootlets. Any rootlets present were also removed when replenishing the acid solutions. “With alkali” refers to additional pretreatment with sodium hydroxide (NaOH) to ensure the absence of secondary organic acids. “Without alkali” refers to the NaOH step being skipped due to poor preservation conditions, which could result in removal of all available organics if performed.

Typically applied to: bones

"acid etch"

The calcareous material was first washed in de-ionized water, removing associated organic sediments and debris (where present). The material was then crushed/dispersed and repeatedly subjected to HCI etches to eliminate secondary carbonate components. In the case of thick shells, the surfaces were physically abraded prior to etching down to a hard, primary core remained. In the case of porous carbonate nodules and caliches, very long exposure times were applied to allow infiltration of the acid. Acid exposure times, concentrations, and number of repetitions, were applied accordingly with the uniqueness of the sample.

Typically applied to: shells, caliches, and calcareous nodules

"neutralized"

Carbonates precipitated from ground water are usually submitted in an alkaline condition (ammonium Hydroxide or sodium hydroxide solution). Typically this solution is neutralized in the original sample container, using deionized water. If larger volume dilution was required, the precipitate and solution were transferred to a sealed separatory flask and rinsed to neutrality. Exposure to atmosphere was minimal.

Typically applied to: Strontium carbonate, Barium carbonate
(i.e. precipitated ground water samples)

"carbonate precipitation"

Dissolved carbon dioxide and carbonate species are precipitated from submitted water by complexing them as ammonium carbonate. Strontium chloride is added to the ammonium carbonate solution and strontium carbonate is precipitated for the analysis. The result is representative of the dissolved inorganic carbon within the water. Results are reported as "water DIC".

Applied to: water

"solvent extraction"

The sample was subjected to a series of solvent baths typically consisting of benzene, toluene, hexane, pentane, and/or acetone. This is usually performed prior to acid/alkali/acid pretreatments.

Applied to: textiles, prevalent or suspected cases of pitch/tar contamination, conserved materials.

"none"

No laboratory pretreatments were applied. Special requests and pre-laboratory pretreatment usually accounts for this.

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Calendar Calibration at Beta Analytic

Calibrations of radiocarbon age determinations are applied to convert BP results to calendar years. The short-term difference between the two is caused by fluctuations in the heliomagnetic modulation of the galactic cosmic radiation and, recently, large scale burning of fossil fuels and nuclear devices testing. Geomagnetic variations are the probable cause of longer-term differences.

The parameters used for the corrections have been obtained through precise analyses of hundreds of samples taken from known-age tree rings of oak, sequoia, and fir up to about 10,000 BP. Calibration using tree-rings to about 12,000 BP is still being researched and provides somewhat less precise correlation. Beyond that, up to about 20,000 BP, correlation using a modeled curve determined from U/Th measurements on corals is used. This data is still highly subjective. Calibrations are provided up to about 19,000 years BP using the most recent calibration data available.

The Pretoria Calibration Procedure (Radiocarbon, Vol 35, No.1, 1993, pg 317) program has been chosen for these calendar calibrations. It uses splines through the tree-ring data as calibration curves, which eliminates a large part of the statistical scatter of the actual data points. The spline calibration allows adjustment of the average curve by a quantified closeness-of-fit parameter to the measured data points. A single spline is used for the precise correlation data available back to 9900 BP for terrestrial samples and about 6900 BP for marine samples. Beyond that, splines are taken on the error limits of the correlation curve to account for the lack of precision in the data points.

In describing our calibration curves, the solid bars represent one sigma statistics (68% probability) and the hollow bars represent two sigma statistics (95% probability). Marine carbonate samples that have been corrected for $^{13}C/^{12}C$, have also been corrected for both global and local geographic reservoir effects (as published in Radiocarbon, Volume 35, Number 1, 1993) prior to the calibration. Marine carbonates that have not been corrected for $^{13}C/^{12}C$ are adjusted by an assumed value of 0 %0 in addition to the reservoir corrections. Reservoir corrections for fresh water carbonates are usually unknown and are generally not accounted for in those calibrations. In the absence of measured $^{13}C/^{12}C$ ratios, a typical value of -5 %0 is assumed for freshwater carbonates.

(Caveat: the correlation curve for organic materials assume that the material dated was living for exactly ten years (e.g. a collection of 10 individual tree rings taken from the outer portion of a tree that was cut down to produce the sample in the feature dated). For other materials, the maximum and minimum calibrated age ranges given by the computer program are uncertain. The possibility of an "old wood effect" must also be considered, as well as the potential inclusion of younger or older material in matrix samples. Since these factors are indeterminant error in most cases, these calendar calibration results should be used only for illustrative purposes. In the case of carbonates, reservoir correction is theoretical and the local variations are real, highly variable and dependent on provenience. Since imprecision in the correlation data beyond 10,000 years is high, calibrations in this range are likely to change in the future with refinement in the correlation curve. The age ranges and especially the intercept ages generated by the program must be considered as approximations.)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

Variables used in the calculation of age calibration → (Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-123456**

Conventional radiocarbon age[1]: **2400±60 BP** ← The uncalibrated Conventional Radiocarbon Age (± 1 sigma)

The calendar age range in both calendar years (AD or BC) and in Radiocarbon Years (BP) → **2 Sigma calibrated result: (95% probability)** **Cal BC 770 to 380 (Cal BP 2720 to 2330)**

Intercept data

The intercept between the average radiocarbon age and the calibrated curve time scale. This value is illustrative and should not be used by itself.

Intercept of radiocarbon age with calibration curve: Cal BC 410 (Cal BP 2360)

1 Sigma calibrated result: (68% probability) Cal BC 740 to 710 (Cal BP 2690 to 2660) and Cal BC 535 to 395 (Cal BP 2485 to 2345)

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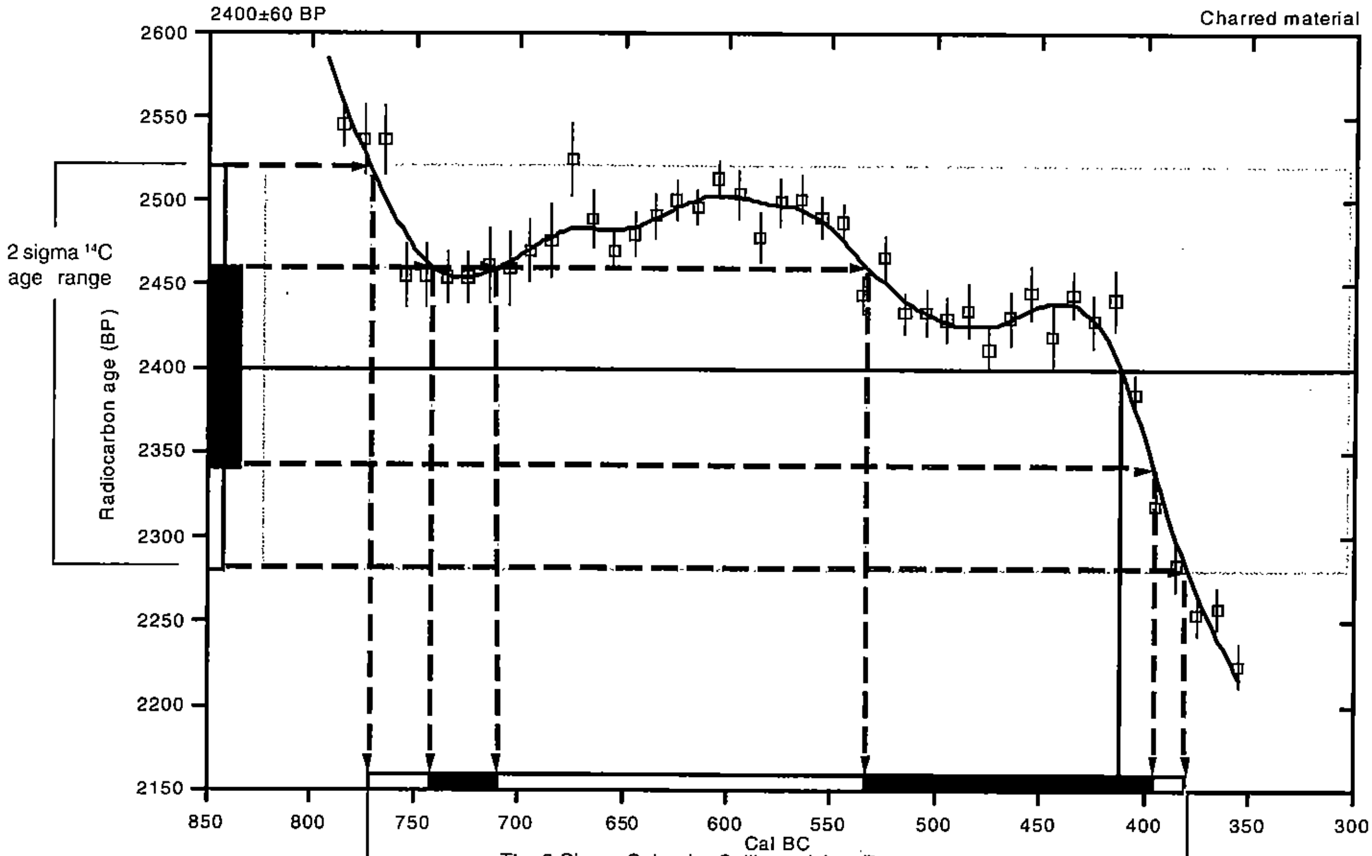
[1] C13/C12 ratio estimated



The 2 Sigma Calendar Calibrated Age Range

This range is determined by the portion of the curve that is in a "box" drawn from the 2 sigma limits on the radiocarbon age. If a section of the curve goes outside of the "box", multiple ranges will occur as shown by the two 1 sigma ranges which occur from sections going outside of a similar "box" which would be drawn at the 1 sigma limits.

References:

Database used
Intcal 98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

← References for the calibration data and the mathematics applied to the data. These references, as well as the Conventional Radiocarbon Age and the 13C/12C ratio used should be included in your papers.

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-mail: beta@radiocarbon.com

APPENDIX D

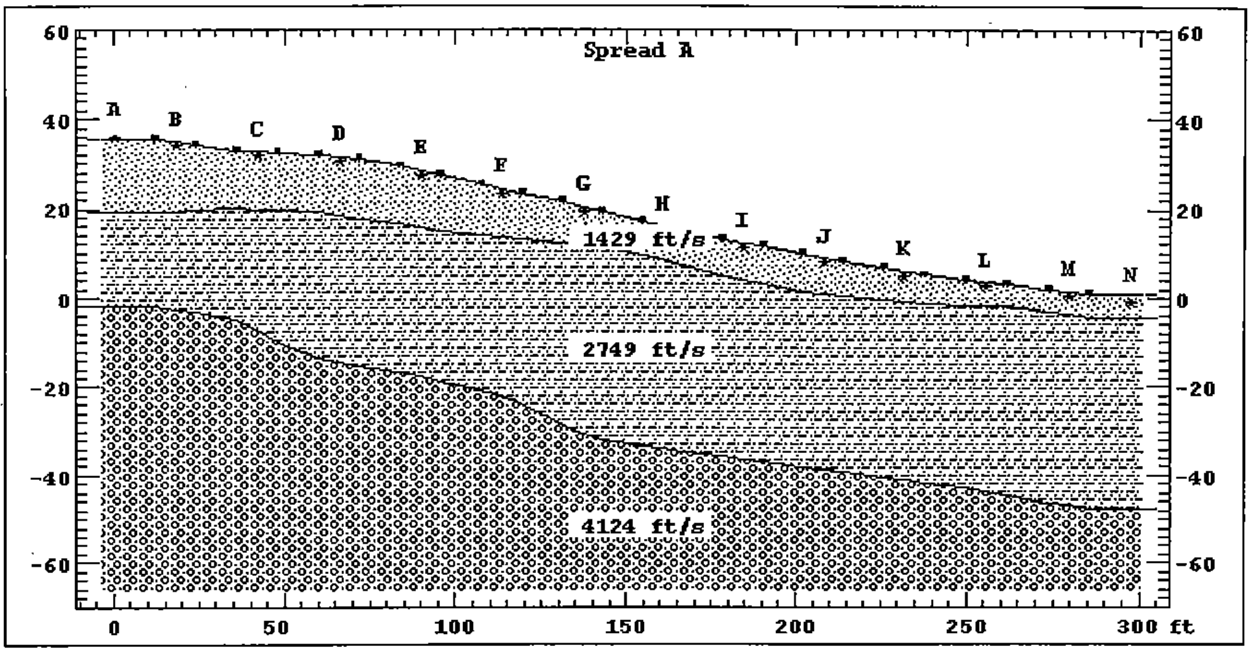
APPENDIX D

HIGH-RESOLUTION SEISMIC DATA

FOR

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND
WILSON STREET
BANNING, CALIFORNIA

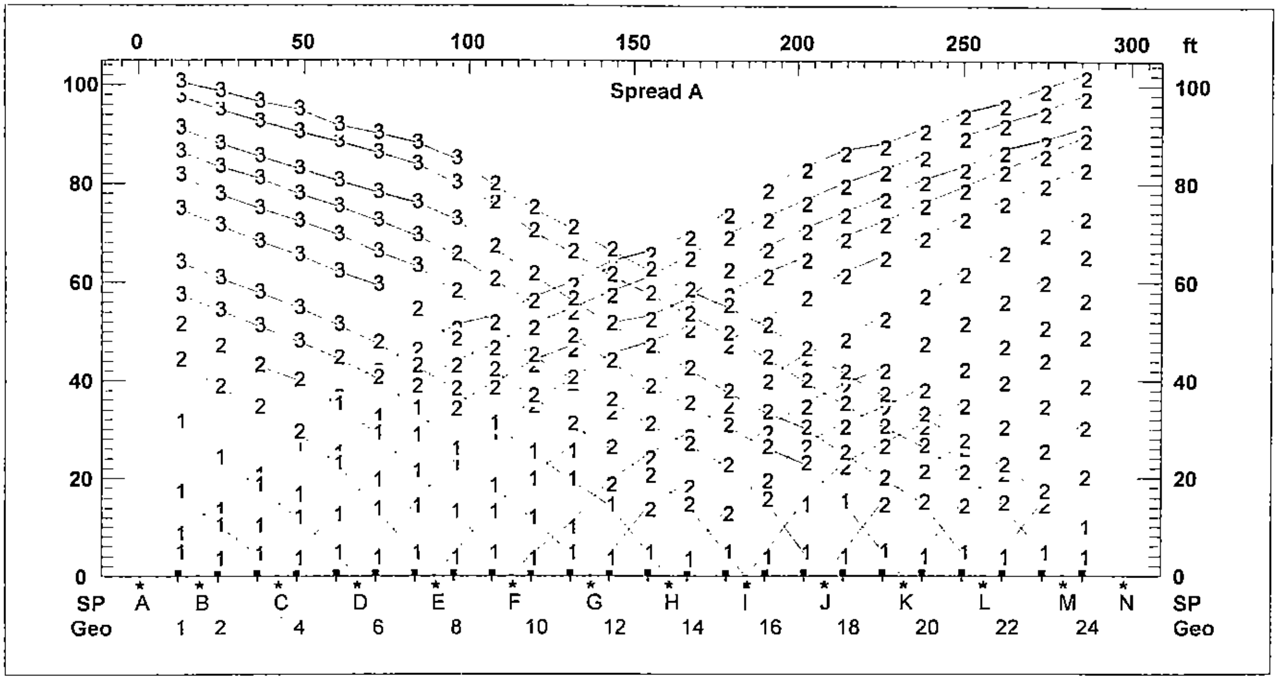
PROJECT NO. T2305-12-03



SEISMIC LINE S-1

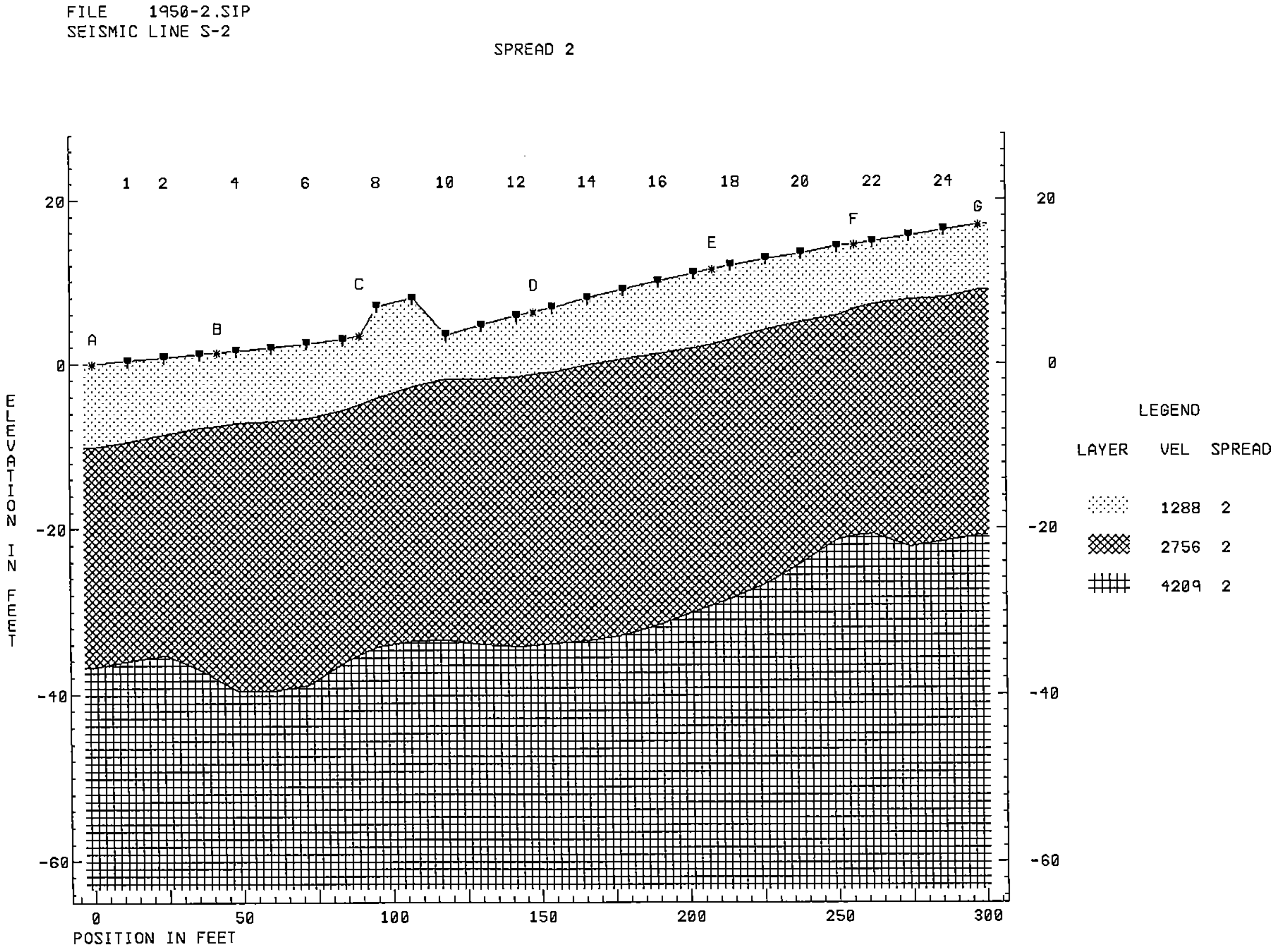
South 15° West →

Layer Assignments -- 1950-1.SIP -- Spread A (1 of 1) Raw observed arrivals

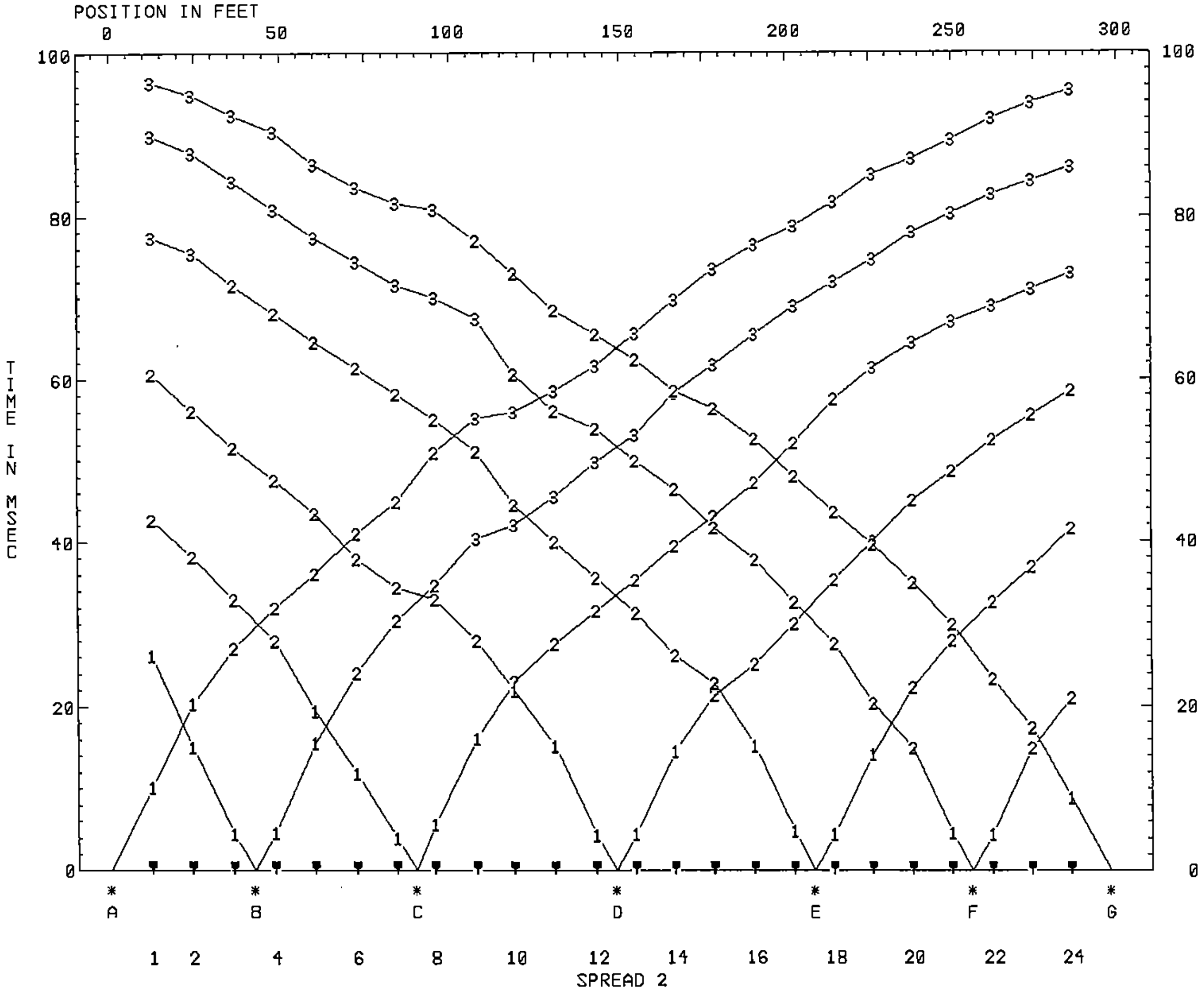


SEISMIC LINE S-2

North 15° East →

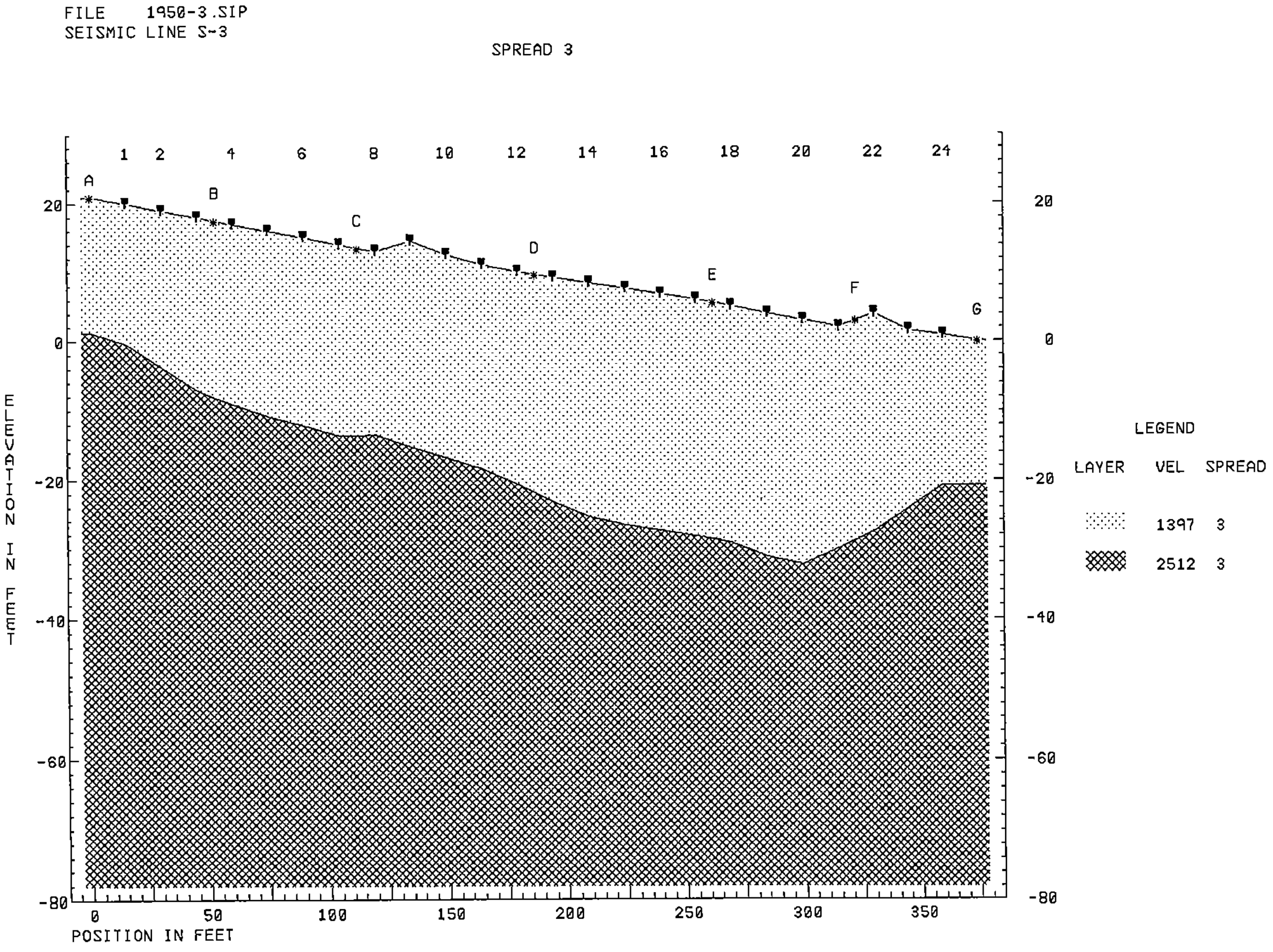


FILE 1950-2.SIP
SEISMIC LINE S-2 - RAW ARRIVAL TIMES

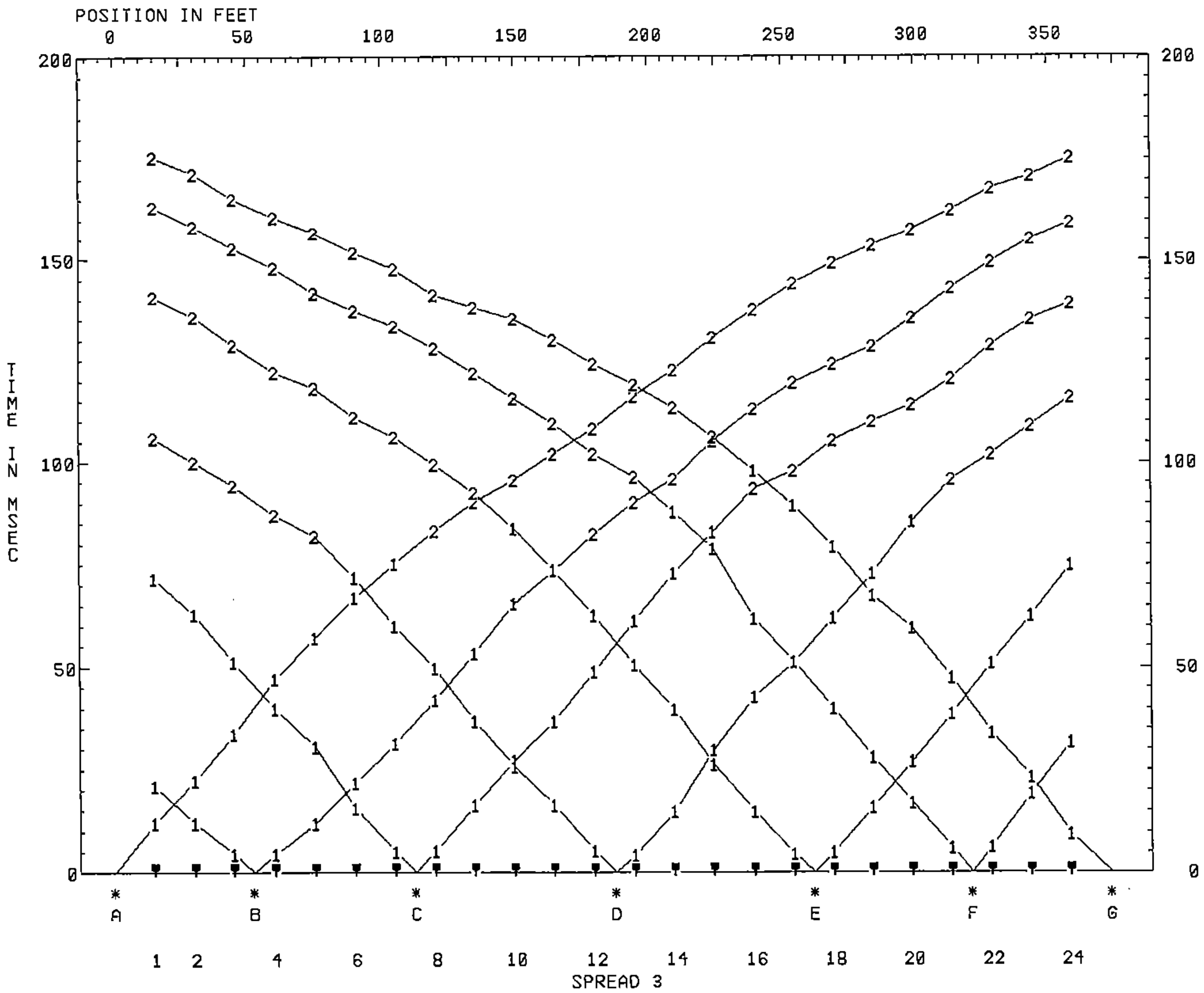


SEISMIC LINE S-3

South 30° West →



FILE 1950-3.SIP
SEISMIC LINE S-3 - RAW ARRIVAL TIMES

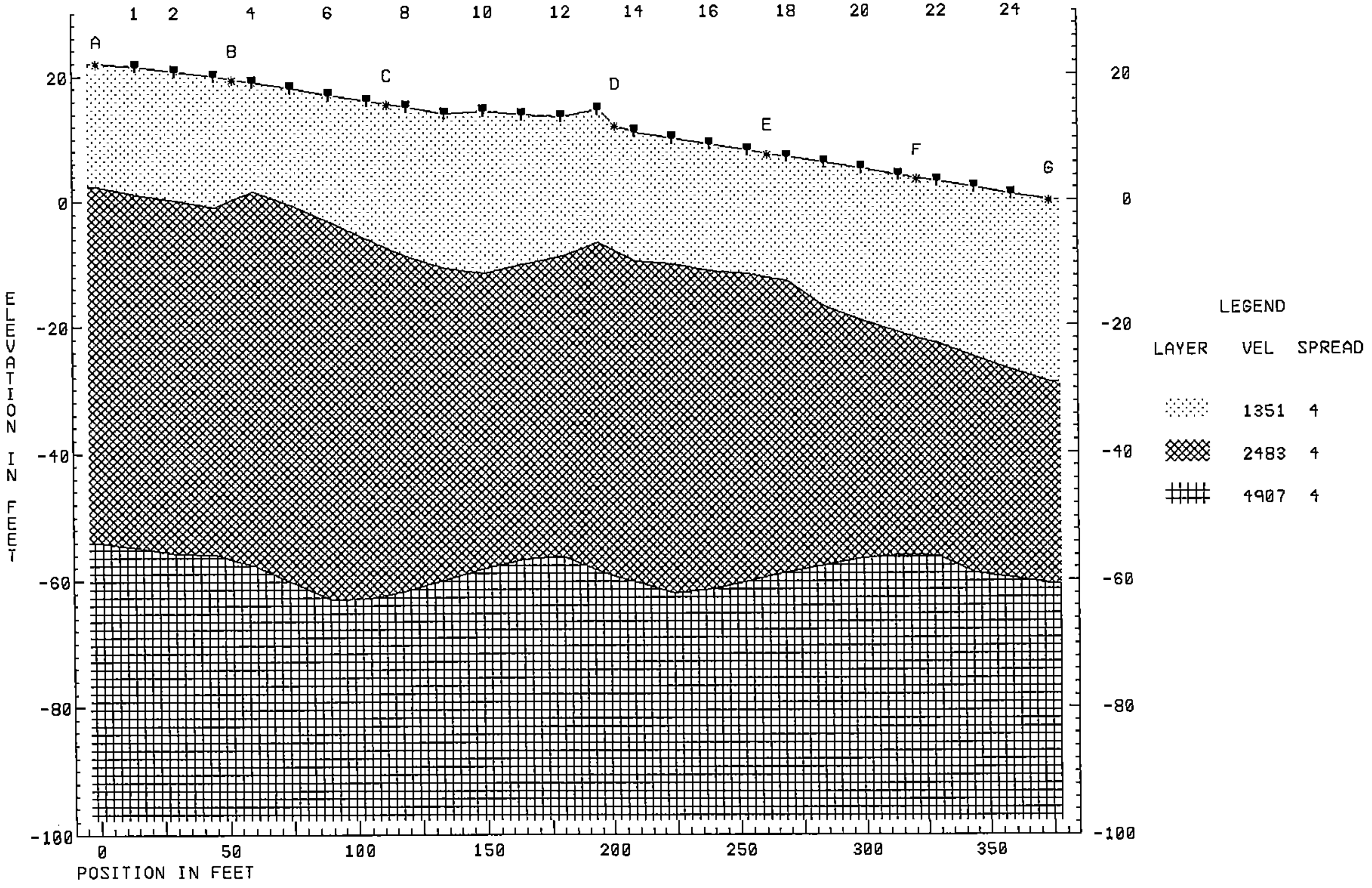


SEISMIC LINE S-4

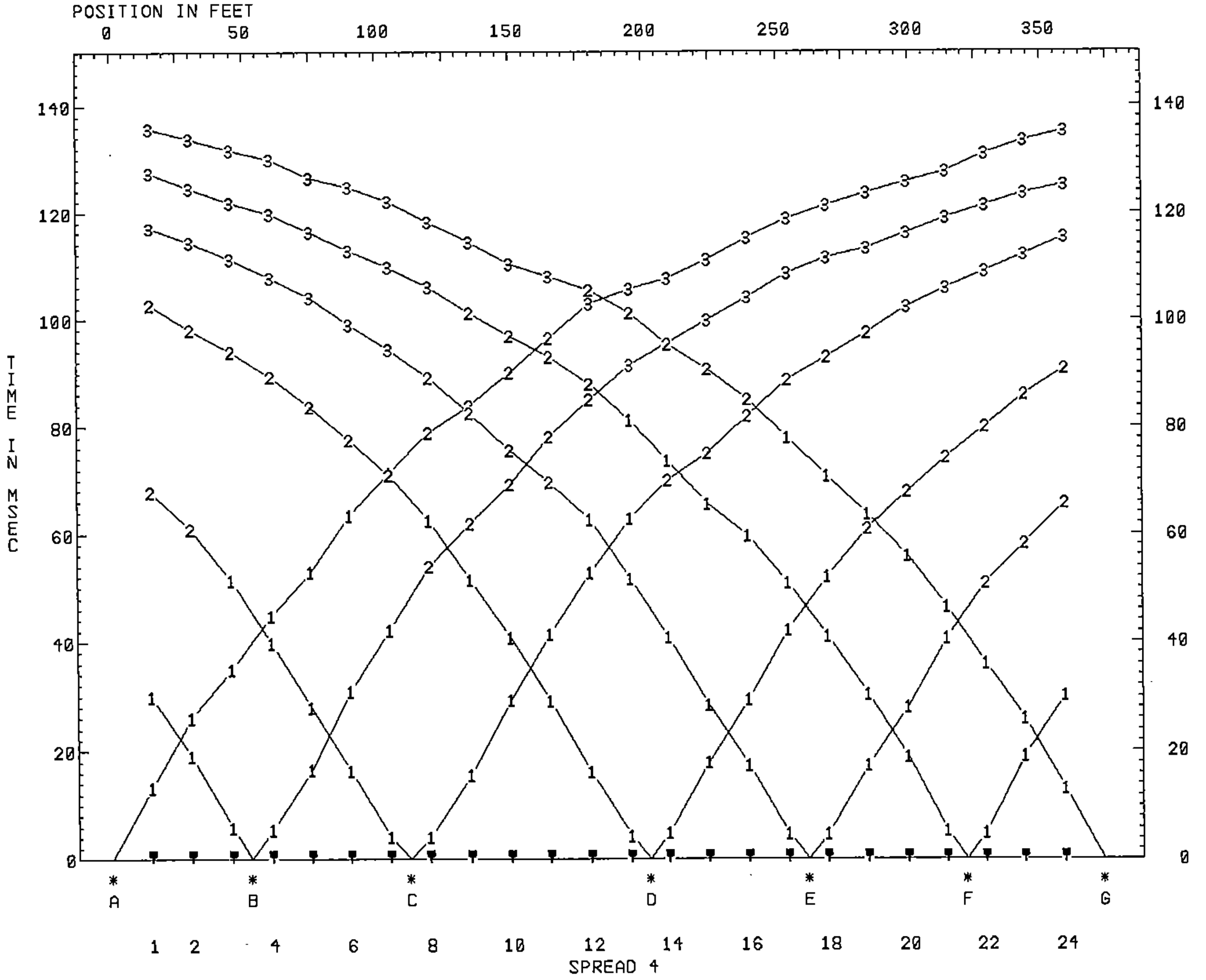
South 30° West →

FILE   1950-4.SIP
SEISMIC LINE S-4

SPREAD 4



FILE 1950-4.SIP
SEISMIC LINE S-4 ~ RAW ARRIVAL TIMES

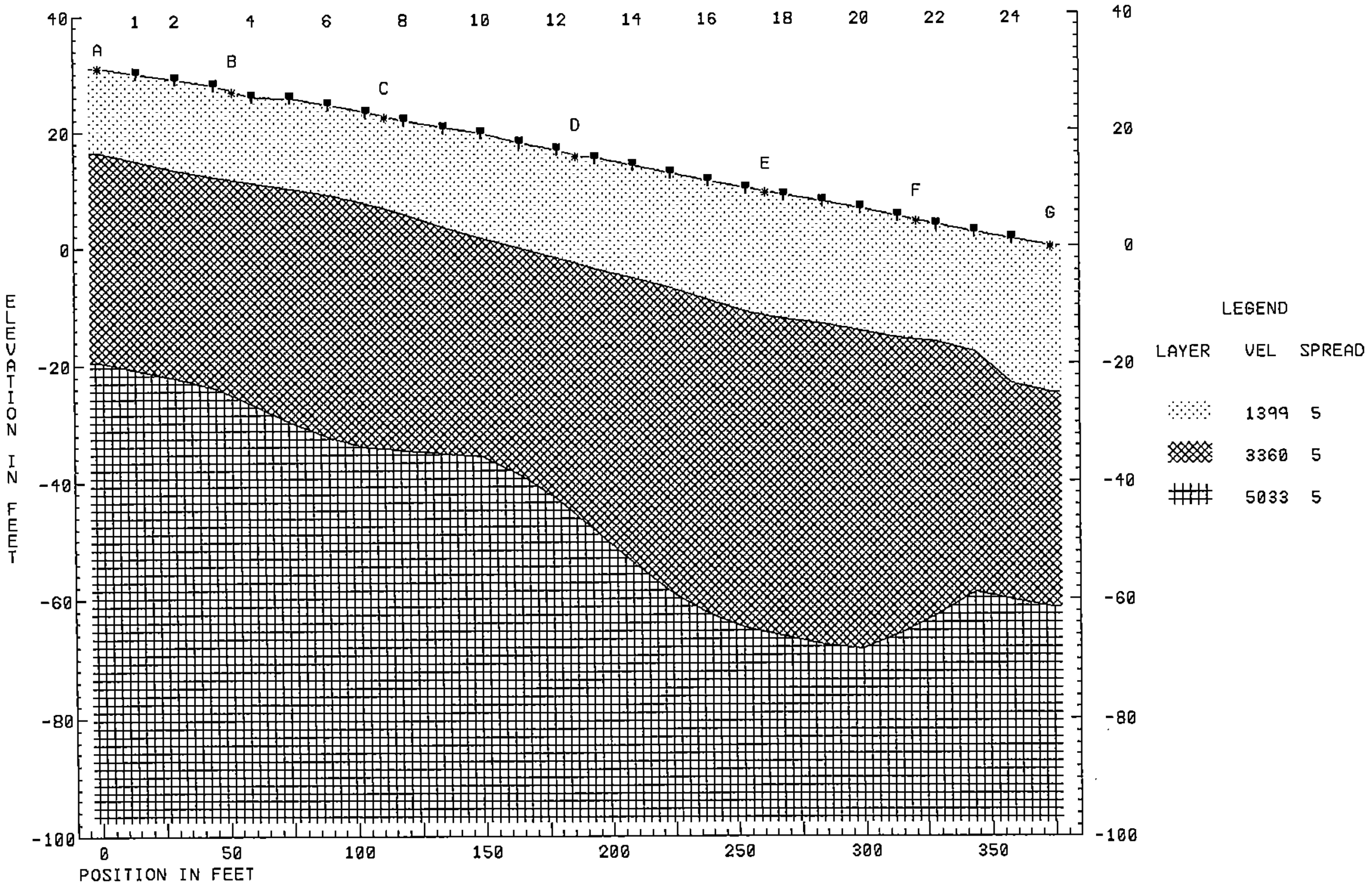


SEISMIC LINE S-5

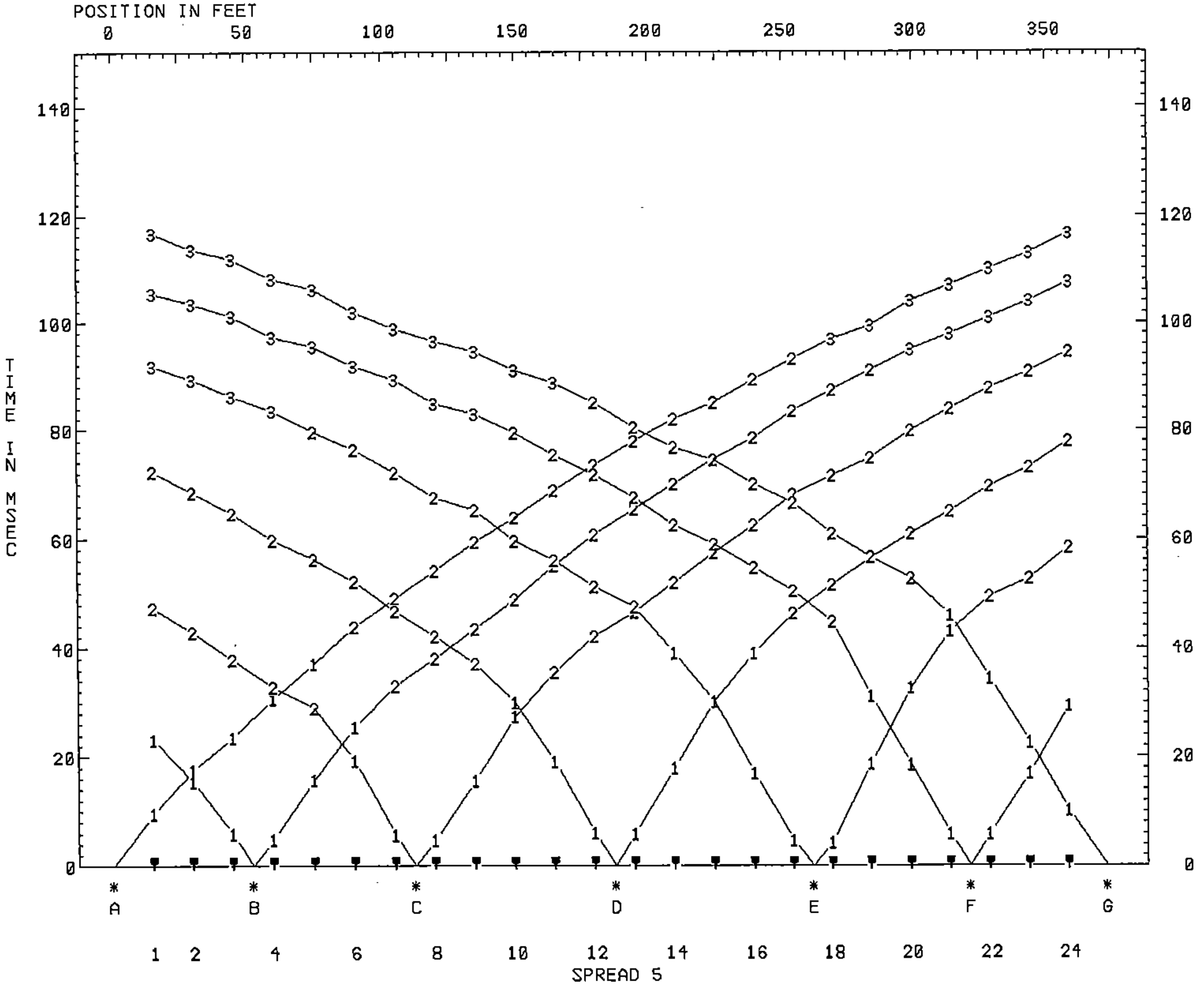
South 12° West →

FILE 1950-5.SIP
SEISMIC LINE S-5

SPREAD 5



FILE   1950-5.SIP
SEISMIC LINE S-5 - RAW ARRIVAL TIMES

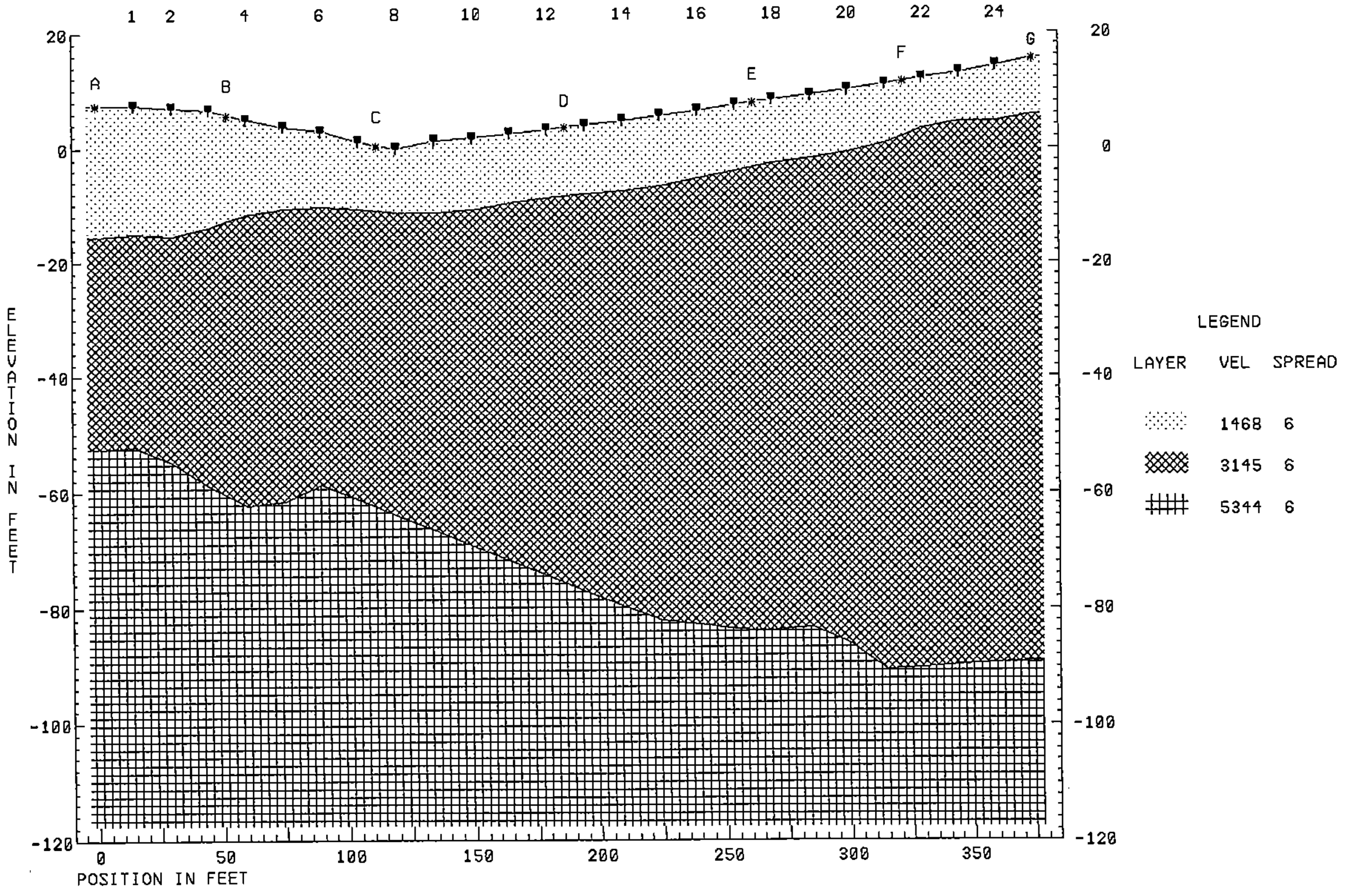


SEISMIC LINE S-6

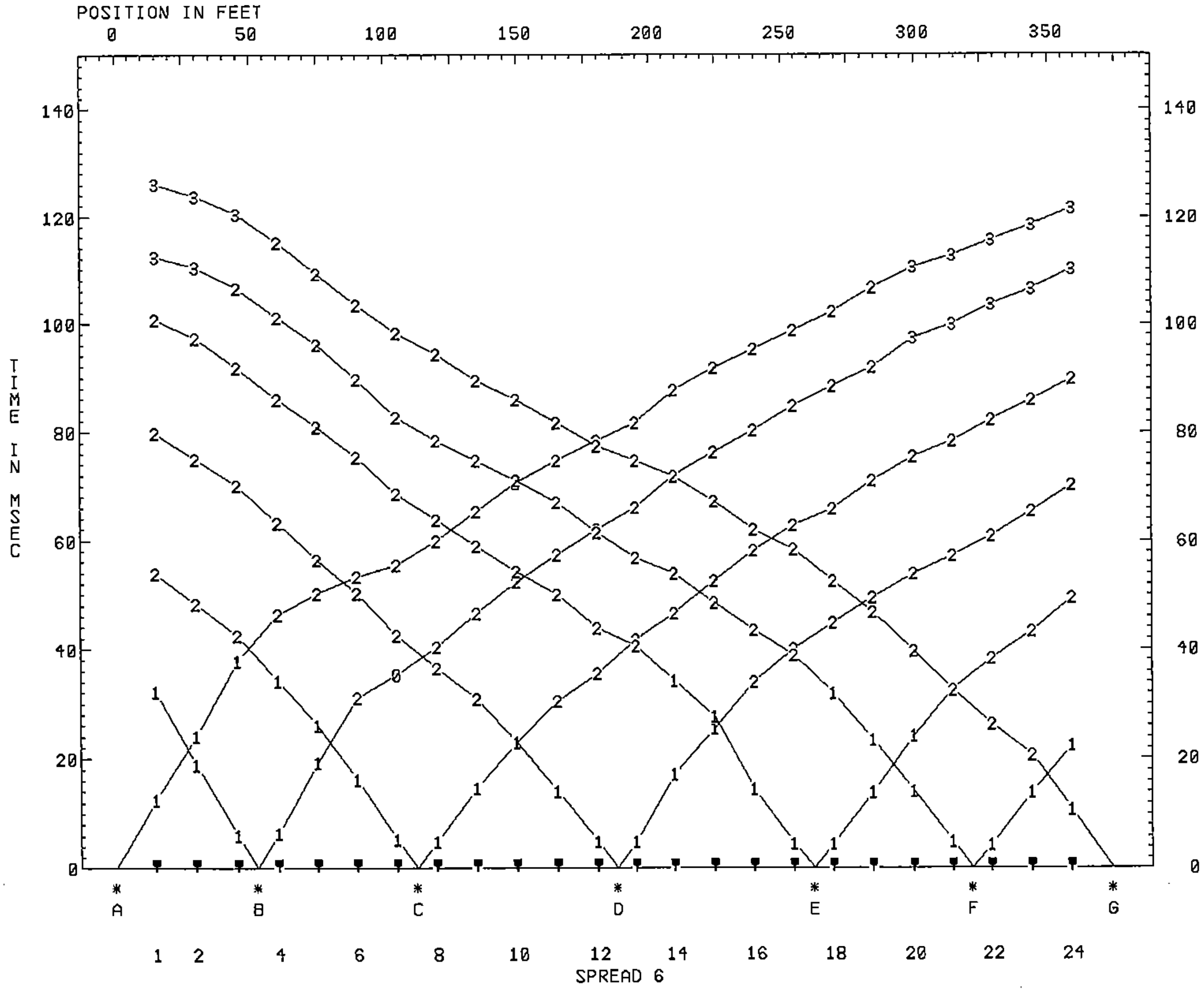
South 85° East →

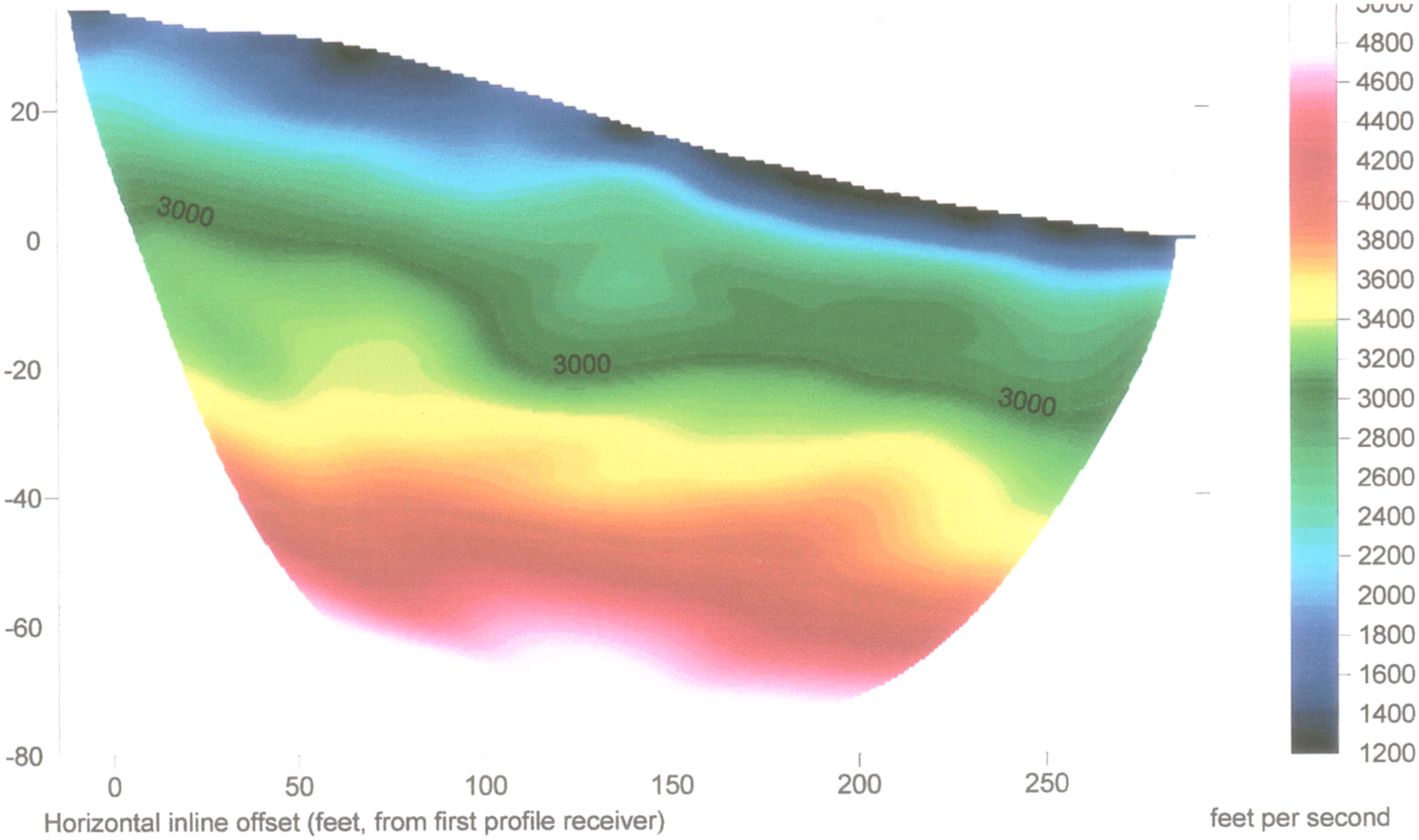
FILE 1950-6.SIP
SEISMIC LINE S-6

SPREAD 6

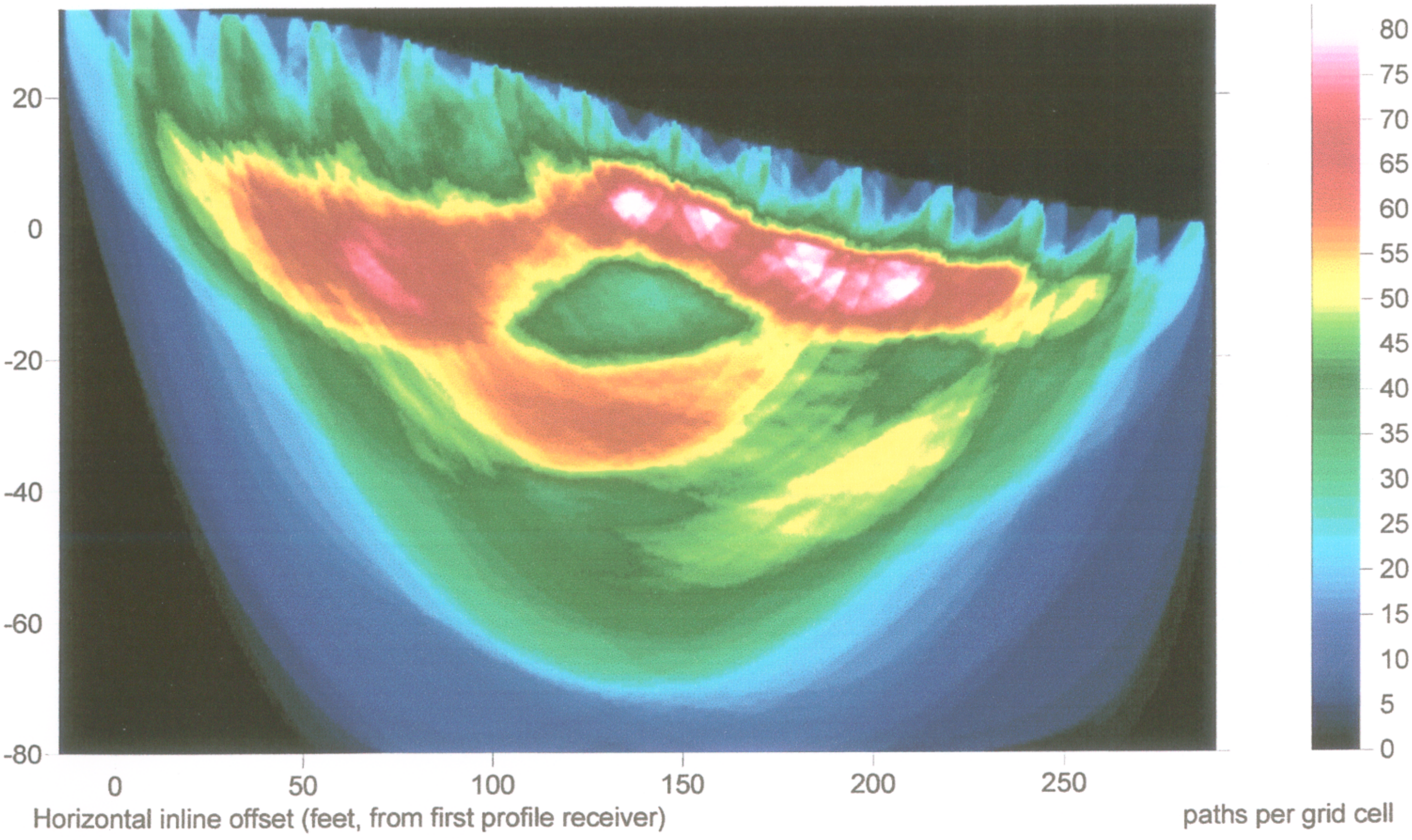


FILE 1950-6.SIP
SEISMIC LINE S-6 - RAW ARRIVAL TIMES

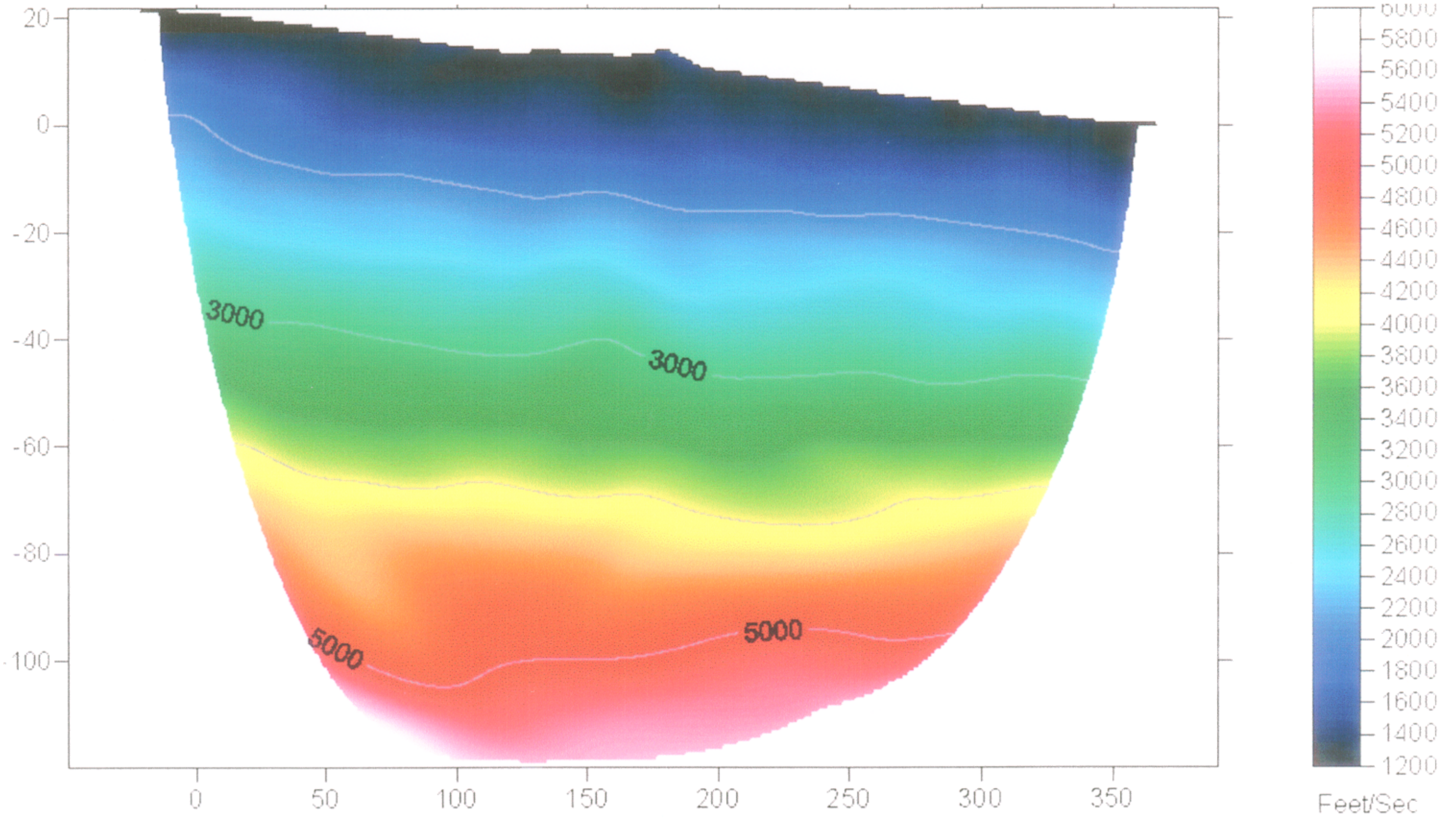




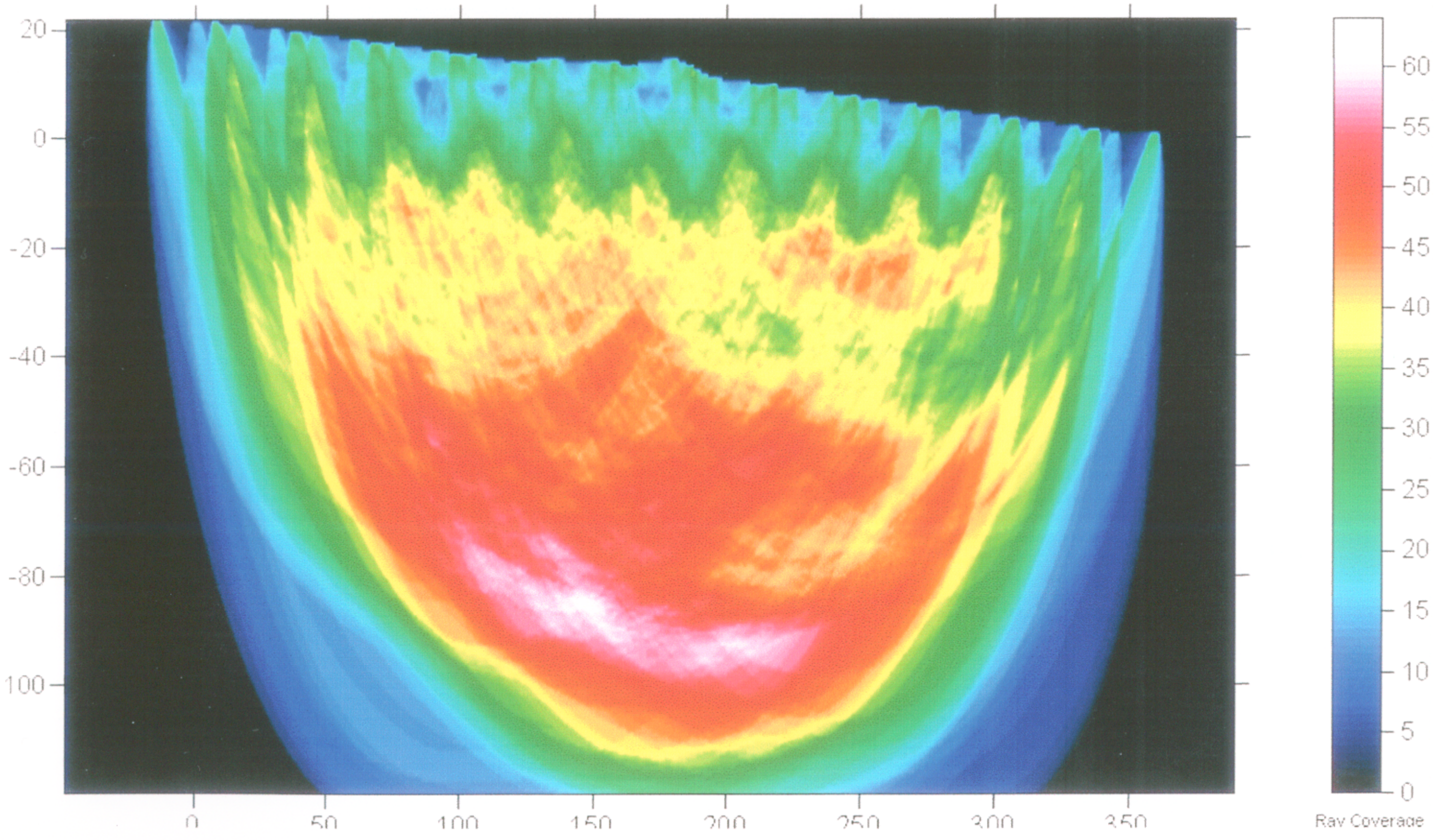
SEISMIC LINE S-1



Subsurface Ray Coverage



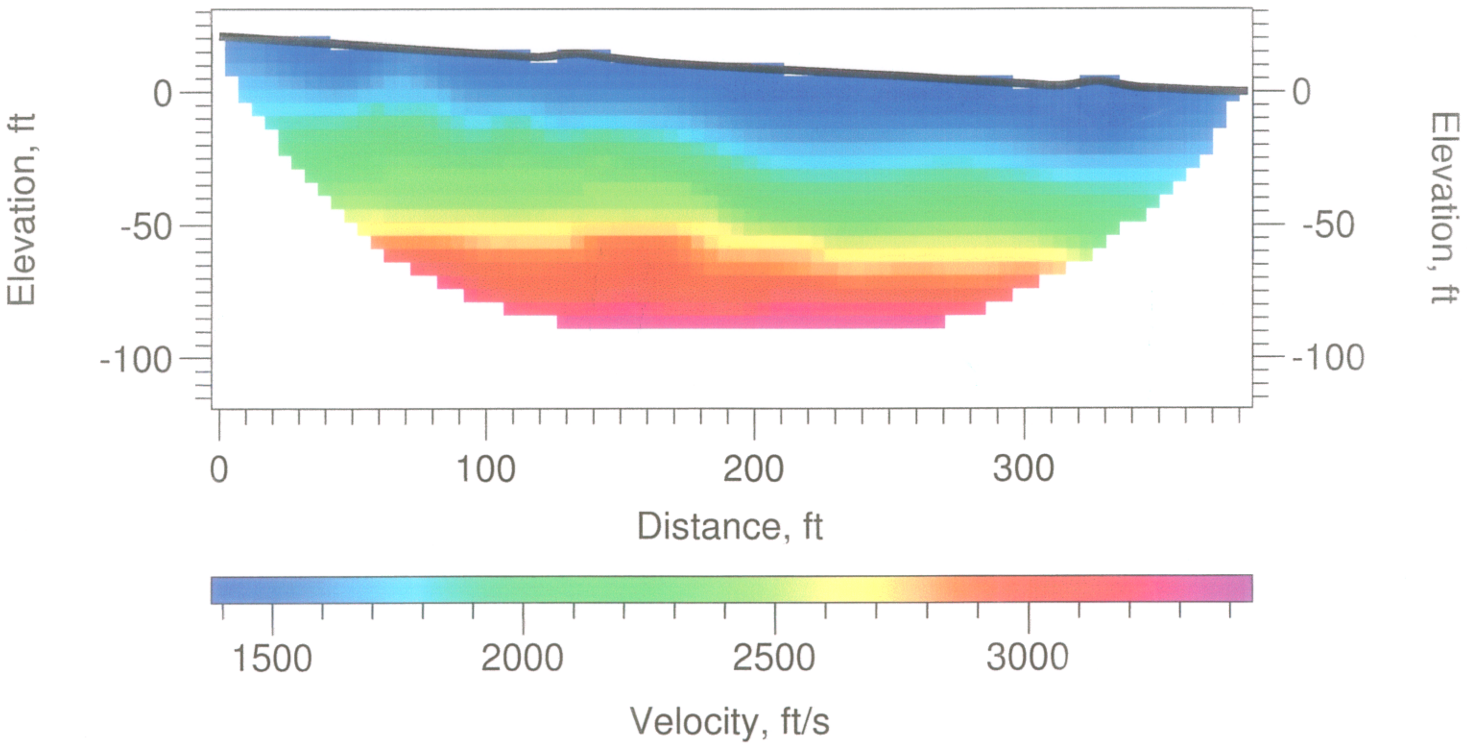
SEISMIC LINE S-4



Subsurface Raypath Coverage

SEISMIC LINE S-3

South 30° West →

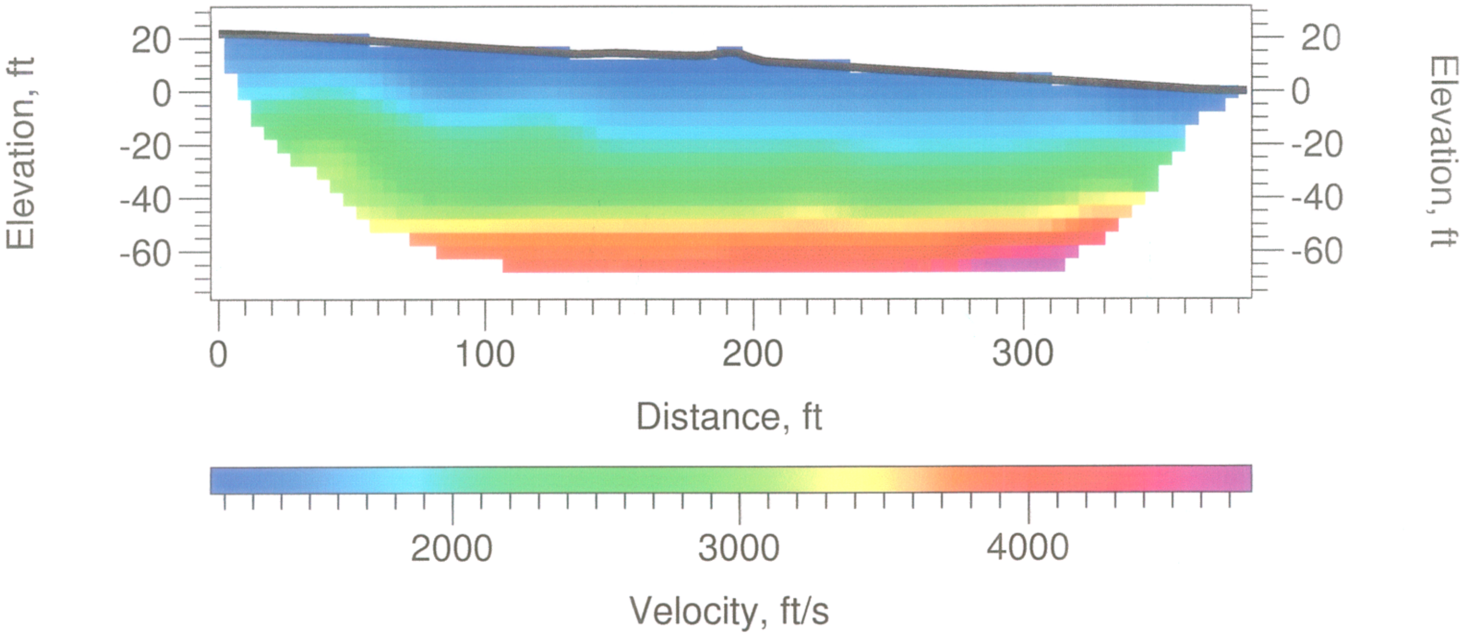


Velocity Gradient Model

SEISMIC LINE S-4

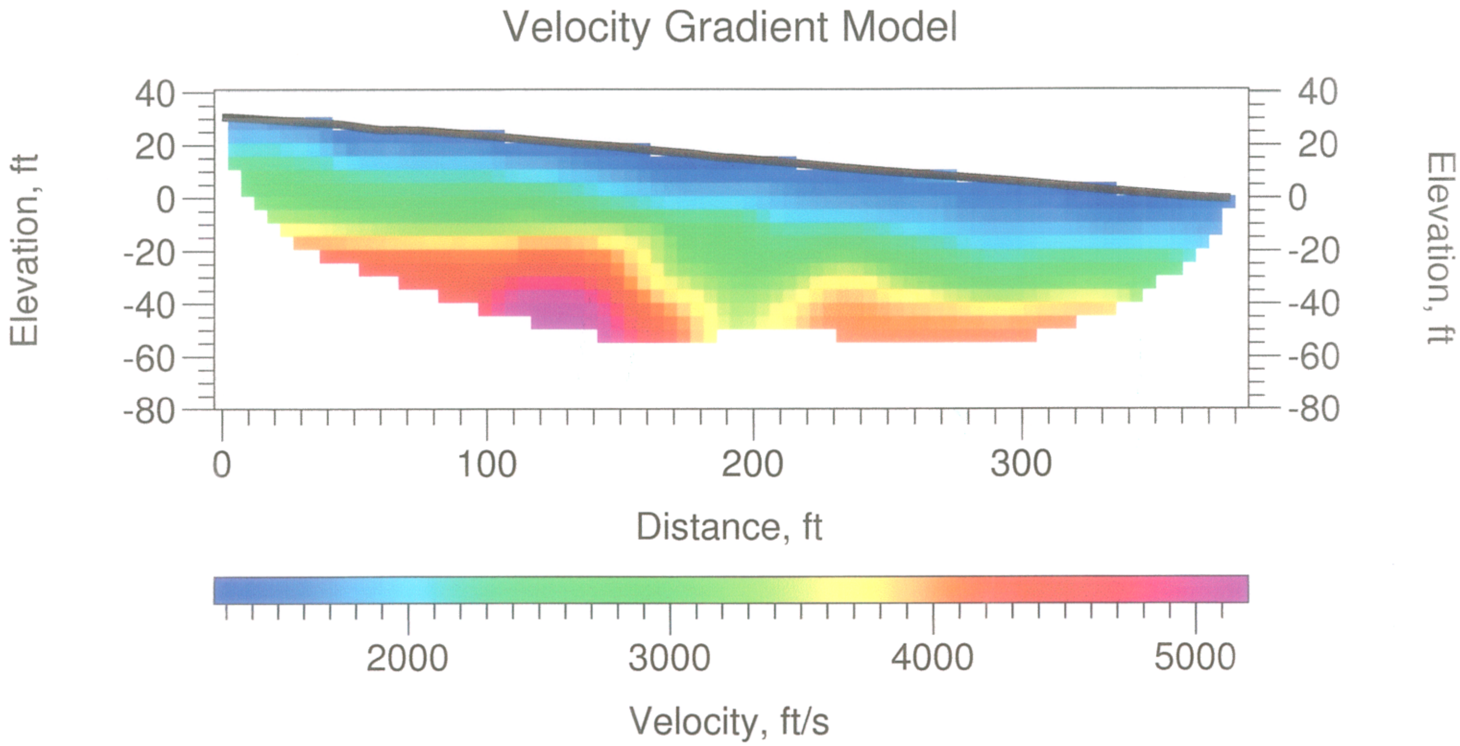
South 30° West →

Velocity Gradient Model



SEISMIC LINE S-5

South 12° West →



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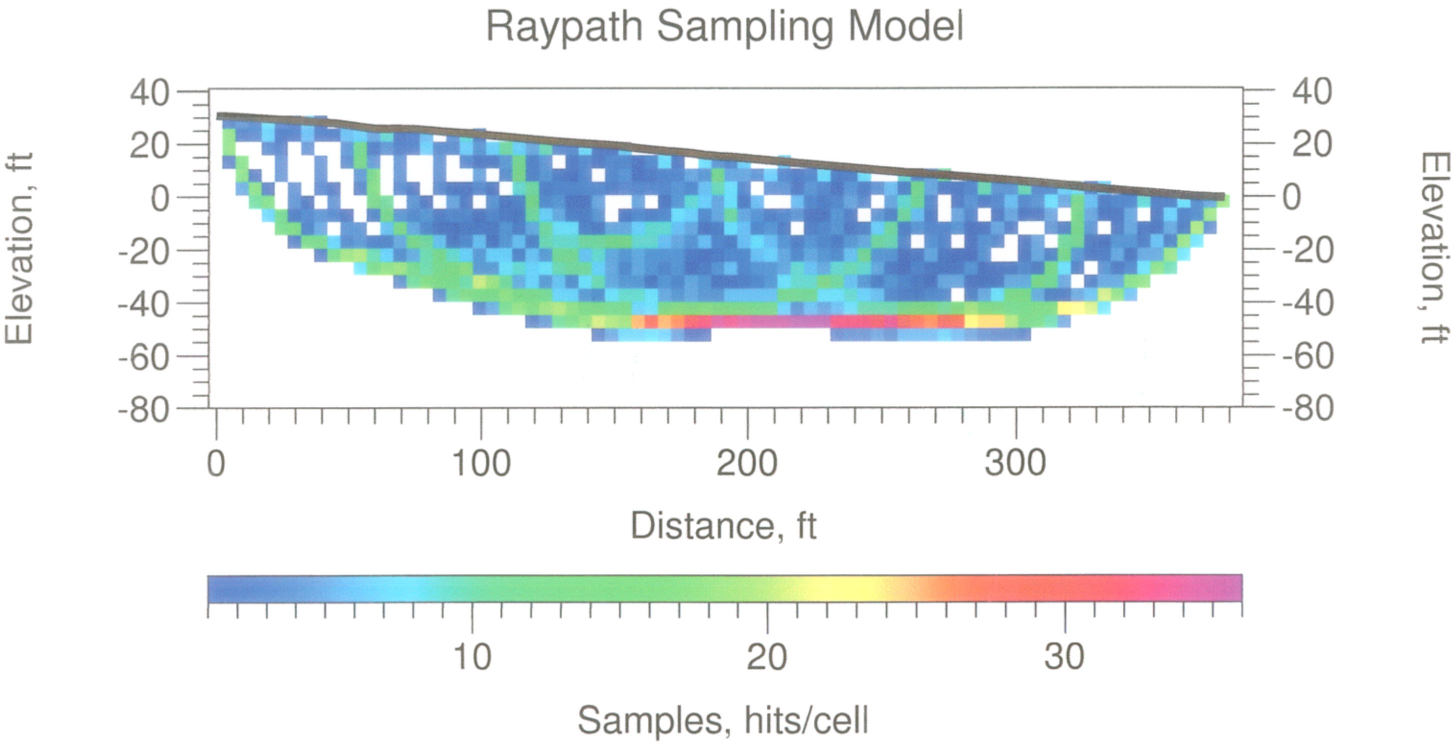
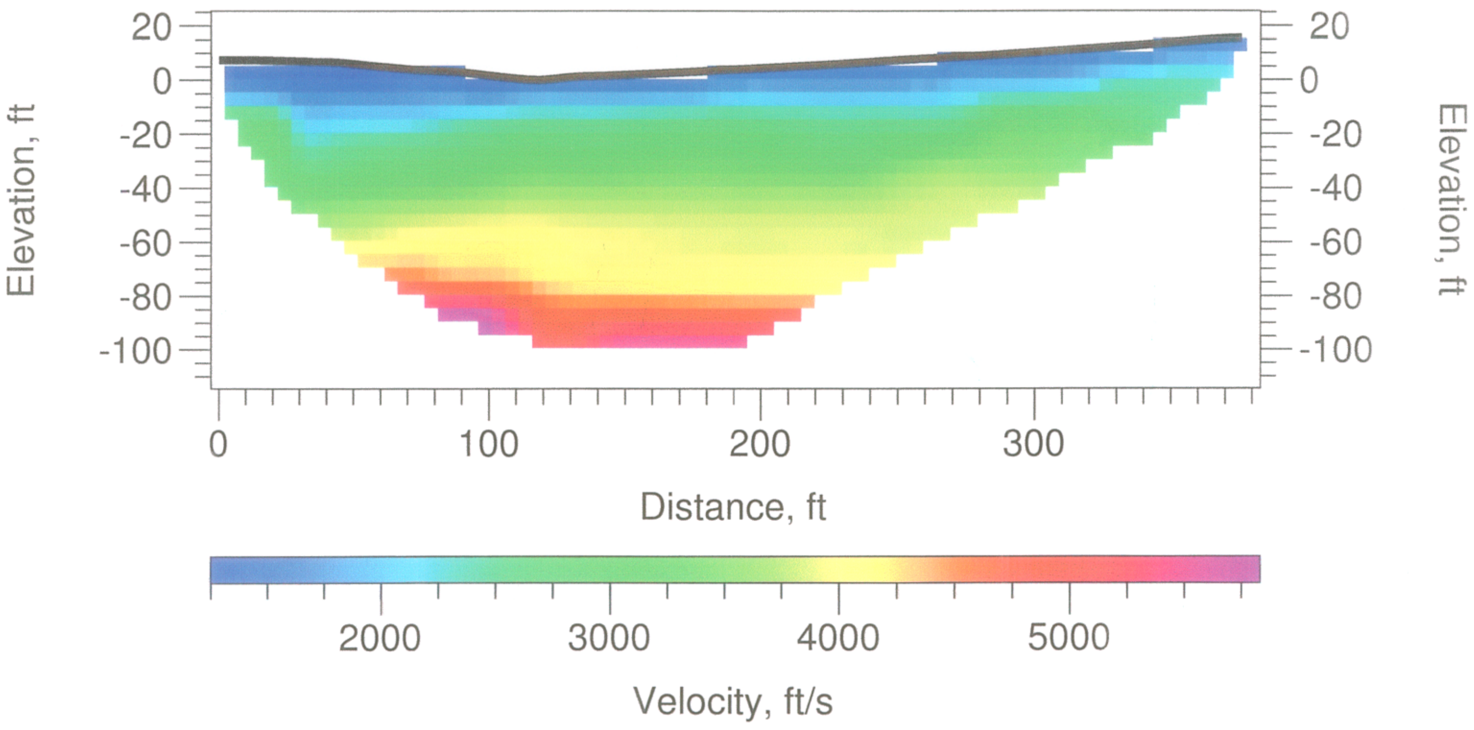


SEISMIC LINE S-6

South 85° East →

Velocity Gradient Model



GEOCON
INLAND EMPIRE, INC.
GEOTECHNICAL
CONSULTANTS

GEOTECHNICAL INVESTIGATION

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AND WILSON STREET
BANNING, CALIFORNIA

PREPARED FOR

PARDEE HOMES
CORONA, CALIFORNIA

JUNE 29, 2005

GEOCON
INLAND EMPIRE, INC.

GEOTECHNICAL CONSULTANTS

Project No. T2305-12-01
June 29, 2005

Pardee Homes
1385 Old Temescal Road
Corona, California 92881

Attention: Mr. Gregory Hohman

Subject: DEUTSCH PROPERTY
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA
GEOTECHNICAL INVESTIGATION

Dear Mr. Hohman:

In accordance with your authorization, we have performed a geotechnical investigation for the subject property located in the city of Banning, Riverside County, California. The accompanying report presents the results of our study and includes our conclusions and recommendations pertaining to the geologic and geotechnical aspects of developing the property as presently proposed. It is our opinion that the site is suitable for development, provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INLAND EMPIRE, INC.

Robert R. Russell
GE 2042

ROBERT R. RUSSELL
No. 2042
EXP. 12/31/06

Lisa A. Battiato
CEG 2316

LISA A. BATTIATO
No. 2316
CERTIFIED ENGINEERING GEOLOGIST

RRR:LAB:tg

(6) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the findings of a geotechnical investigation of the approximately 1,500+-acre property located immediately northeast of the intersection of Highland Springs Avenue and Wilson Street in the city of Banning, Riverside County, California. (see Vicinity Map, Figure 1). The purpose of the investigation was to identify the site geologic conditions sample and observe the prevailing soil conditions and, based on the conditions encountered, provide recommendations regarding the geotechnical aspects of developing the project as presently proposed.

The scope of the investigation included a site reconnaissance, review of aerial photographs and pertinent geologic literature (see *References*), the excavation of 14 small-diameter borings and 46 geotechnical trenches. Fault trenching was also performed in connection with the -03 phase of this project. The surveyed fault trench locations are noted on the *Geotechnical Map* as a reference for the nuclear gage test locations reported in Table A1. Details of the field investigation are presented in Appendix A. The approximate locations of the exploratory excavations are depicted on the *Geotechnical Map*, Figure 2.

Laboratory testing was performed on samples of materials obtained from the exploratory excavations to determine the in-situ density and moisture conditions, maximum dry density/optimum moisture content, expansion potential, shear strength properties, consolidation (collapse) characteristics, grain size distribution, soluble sulfate content, pH, and resistivity. Details of the laboratory testing are presented in Appendix B.

2. SITE AND PROJECT DESCRIPTION

The irregular-shaped property consists of approximately 1,500+ acres, located in Banning, California. The site is bounded on the west by Highland Springs Avenue, a golf course and the Highland Springs Conference Center; on the south by Wilson Street and a residential housing tract; on the east by Highland Home Road and existing and future residential housing; and on the northeast and north by mountainous terrain of the San Bernardino National Forest. The site is currently occupied by two overhead power easements and a herd of cattle. The property has been modified with the construction of a series of east-west trending earthen berms across the site in an effort to reduce erosion. Topographically, the site slopes steeply to gently to the south with elevations ranging from approximately 2,560 feet Mean Sea Level (MSL) to approximately 3,440 feet MSL.

Underground utilities are present within the property. A 30-inch-diameter gas transmission line trends in an east-southeast direction across the southern portion of the property; a water main extends westerly from Highland Home Road to the existing residential tract; a gas line extends northerly from Wilson Street to an existing water well along Marian Way. Two water wells were observed within the southern area of the property, near Marian Way. The watering troughs, along 14th Street, are fed by a metered water line which extends to the east along the alignment of 14th Street.

Grading plans were not available at the time of our investigation. Therefore, a 1-foot contour, 300-scale topographic map prepared by RBF Consulting was utilized as the base for our *Geotechnical Map*, Figure 2. Based on Conceptual Plan D dated June 2, 2004 and discussions with Pardee Homes; approximately 5,000 to 5,500 single family residences, two schools, a commercial site, a drainage basin, a fire station, and several parks are planned for the property. A golf course is proposed along Smith Creek. Based on site topography and existing road elevations, cuts and fills on the order of ten feet or less, exclusive of remedial grading, are anticipated in the southern portion of the property. Cuts and fills of several tens of feet are expected for the northern area. Additionally, it is assumed that slopes will have a maximum inclination of 2:1 (horizontal: vertical) with a maximum height of 30 feet. Slopes greater than 30 feet, if planned, should be addressed when grading plans become available.

The descriptions of the site and proposed development are based on a site reconnaissance, observations during the field investigation, and a review of the referenced geologic publications. If project details differ significantly from those described, Geocon should be contacted for review and possible revision to this report.

3. SOIL AND GEOLOGIC CONDITIONS

The materials encountered on the site consist of undocumented fill, younger alluvium, colluvium, older alluvium, debris flow deposits, and Pliestocene conglomerate deposits. The soils are discussed in detail below.

3.1 Undocumented Fill (Qudf)

Undocumented fill was observed as generally east-west trending berms within the property. The berms are approximately 3 to 5 feet high and were constructed in an effort to reduce erosion within the property. The undocumented fill soils were locally derived and consist of silty sands which are generally loose to medium dense and dry to moist. These materials are not suitable for support of engineered fill or structural loads however; they can be utilized as fill materials.

3.2 Alluvium (Qal)

Younger alluvial deposits are present to depths of approximately 5 to 19 feet with average depths of 10 feet within the southern area (south of 14th Street). The younger alluvium is generally 5 feet deep within the north-central area; 10 feet deep within the northwestern area and on the order of 15 feet within the east-central area of the property. The alluvium is comprised of brown to yellow brown silty coarse sands which were moist, loose and porous within the upper 5 to 9 feet. Density and moisture generally increased with depth. The upper 5 to 9 feet of the younger alluvium is not suitable to provide support for fill or structural loads and will require remedial grading prior to placing additional fill or settlement-sensitive structures. Younger alluvium may be utilized as fill material.

3.3 Colluvium (no map symbol)

Colluvium was observed along the hillsides to depths of 1 to 2 feet. The colluvium consists of semi-rounded cobbles that were generally 4 inches in diameter and moderately weathered. The unit is clast supported with an olive brown silty sand matrix. The colluvium is generally loose, dry and porous. This unit is not suitable to support structural loads or engineered fill and should be removed and moisture conditioned prior to its reuse as engineered fill.

3.4 Older Alluvium (no map symbol)

Older alluvial deposits are present beneath the younger alluvium within a majority of the property, south of the hills. The older alluvial deposits consisted of dark yellow brown silty coarse sands with variable amounts of silt and trace clay which have been estimated at about 40,000 years old. An older alluvial unit approximated at 100,000 years old was encountered along ridgelines and within the alluvial plain near fault zones. A detailed age discussion and pedochronological evaluation will be provided in the forthcoming *Fault Evaluation Report.* The 100,000 year old soil consisted of yellow red silty sand with trace clay which was very blocky and cemented. The older alluvium is suitable to support structural loads and engineered fill.

3.5 Debris Flow Deposits (Qdf)

Debris flow deposits were encountered within the upper portion of fault trenches T-3, T-9 and T-14 to depths in excess of 8 feet and were observed within isolated areas of the hillside during the field reconnaissance. Additional debris flow deposits may be encountered within the slopes consisting of Pliestocene conglomerate within the northern area of the property. The debris flow deposits consist of a yellow silty course sand matrix with saprolitic grantic and gneissic clasts. These deposits consist of interbedded boulder to cobble conglomerates and sand/gravel beds. The debris flow likely occurred shortly after deposition of the Pliestocene conglomerate and may be the result of regional earthquake loading. The primary evidence for the age correlation is the presence of intact saprolitic clasts within the debris flow. The weathered clasts would not have survived a debris flow unless the flow occurred prior to the extensive weathering of the clasts. The debris flow deposits are dense and moist, very similar to the Pliestocene fan deposits. The debris flow deposits should be removed and replaced as engineered fill to support structural loads and engineered fill prior to its reuse as engineered fill.

3.6 Pliestocene Conglomerate (Qps)

Pliestocene conglomerate was encountered within the hills in the northern portion of the property and is uplifted along the fault zone to the south. The Pliestocene conglomerate was initially deposited as an alluvial fan from a granitic and gneissic source area in the San Bernardino Mountains. The fan deposit has since been faulted, uplifted and eroded. The deposits consist of a matrix to clast-supported conglomerate. The matrix consists of a yellow, coarse silty sand. The granitic, gneissic and gabbroic clasts are generally 3 to 12 inches in diameter with occasional boulders to 4 feet in diameter. This unit is suitable to support structural and engineered fill loads.

4. GROUNDWATER

Groundwater was not encountered within any of the excavations for this investigation. Depth to water in an on-site well (Well #3S1W01N01S) read as high as 367 feet below ground surface (bgs) prior to 1998. After 1998, the well was dry to a depth of 550 feet bgs. For the purposes of this investigation high groundwater is considered to be in excess of 300 feet below natural grade within the property. Groundwater related problems are not expected to be encountered during grading operations.

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

The subject site, like the rest of southern California, is located within a seismically active region near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems are estimated to produce approximately 55 millimeters of slip per year between the plates.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo (AP) Special Studies Zones Act of 1972 and as revised in 1994 and 1997 to the Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain habitable structures across the trace of active faults.

Based on our review of available literature, the northern portion of the site is located within an Earthquake Fault Hazard Zone. Based on aerial photographs, several lineaments were observed south of the AP Zone. The AP Zone and the lineaments were trenched for the fault investigation and will be reported separately.

The site will likely be subjected to significant shaking in the event of a major earthquake on the San Andreas Fault or other nearby regional faults. Structures for the site should be constructed in accordance with current UBC seismic codes and local ordinances.

5.2 Seismic Design Criteria

The nearest known active faults with respect to the property are the on-site Banning fault branches A and B and the Highland Springs fault located within the northern area of the property. The San Andreas fault is located approximately 6 kilometers north of the property. The maximum credible earthquake on the San Andreas fault is estimated to have a moment magnitude (M_w) of 7.4. Due to the large possible magnitude, an earthquake on the San Andreas has been utilized as the design earthquake for the site.

The Uniform Building Code (UBC) established the Design Basis Ground Motion (often accepted as the minimum standard) as the maximum probable event to occur on a site along the closest active fault with a 10% probability of exceedance in 50 years (475 year return period). The maximum credible event for a site is one, which has a 10% probability of exceedance in 100 years (a return period of 949 years). Our analysis indicates a 10% probability that a horizontal peak ground acceleration of 0.74g (probabilistic mean) would be exceeded in 50 years and a peak ground acceleration of 0.85g would be exceeded in 100 years. The design basis earthquake is considered a magnitude 7.4 M_w event that would generate probabilistic peak ground acceleration (PHGA) of 0.74g (FRISKSP, Blake 2000). The effect of seismic shaking may be reduced by adhering to the 1997 UBC and seismic design parameters suggested by the Structural Engineers Association of California. The UBC seismic design parameters for this site are presented on Table 5.2:

TABLE 5.2
SITE DESIGN CRITERIA

Parameter	Value	UBC Reference
Seismic Zone Factor	0.40	Table 16-I
Soil Profile	S_D	Table 16-J
Seismic Coefficient, C_a	.53	Table 16-Q
Seismic Coefficient, C_v	1.2	Table 16-R
Near-Source Factor, Na	1.2	Table 16-S
Near-Source Factor, N_v	1.6	Table 16-T
Seismic Source	A	Table 16-U

The principal seismic considerations for most structures in southern California are surface rupturing of fault traces and damage caused by ground shaking or seismically induced ground settlement. A building setback zone will be recommended along fault traces and will be discussed in the forthcoming fault investigation report. The possibility of ground rupture outside the building setback zone is considered low within the low-lying area of the property. Ridgeline and slope factures were reported in the area in connection with the 1986 Palm Springs earthquake and cannot be ruled out for the hillside areas of this property. Lurching due to ground shaking from seismic events is considered to be a moderate hazard. Differential settlement of granular alluvium and fill soils due to high levels of ground shaking are anticipated to be within acceptable limits, provided the recommendations provided in this report are followed.

5.3 Liquefaction

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations. Due to the density of the soils at depth, and the depth of groundwater beneath the site, the potential for liquefaction at the site is considered to be very low.

5.4 Seismic Densification

Due to the presence of potentially strong ground shaking associated with nearby seismic activity, and the presence of medium dense alluvial deposits, this site is considered to be potentially susceptible to seismic densification. To estimate the magnitude of potential seismic-induced settlements, we utilized the methods outlined by Pradel (*Journal of Geotechnical and Geoenvironmental Engineering, 1998).*

Based on the results of this analysis, using the soil profile encountered within Boring B-12, we estimate a total seismic-induced settlement (dynamic densification) of less than ¾ inch for a ground acceleration of 0.74g. A differential settlement of 50 percent of the total estimated magnitude should be considered across any one building; thus, a maximum seismic induced differential settlement of less than ½ inch should be considered in design.

5.5 Landsliding and Debris Flows

Debris flow deposits have been observed within fault trenches and during the site reconnaissance of the property. These deposits appear to be relatively shallow. Additional debris flows deposits should be anticipated within the hillside areas of the property. Evidence of deep seated landslides were not observed on the property or during the aerial photograph review. Slope stability issues should be addressed in detail during a 40-scale grading plan review of the site.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 No soil or geologic conditions were encountered at the site that would preclude the development of the property as a residential development provided that the recommendations of this report are followed, including the recommended structural setback forthcoming in the *Fault Evaluation Report.*

6.1.2 Organic materials, undocumented fill, the upper portion of the younger alluvium, and debris flow deposits are considered unsuitable in their present condition for support of structural loads and will require removal. The organic materials and other deleterious materials should be removed from the site. The undocumented fill soils, unsuitable younger alluvium, and debris flow deposits may be utilized as fill materials after removal of any deleterious debris.

6.1.3 The geotechnical and fault trenches should be re-excavated and the loose soils should be replaced with engineered fill during grading.

6.1.4 Slope stability issues within the northern portion of the property should be evaluated in detail during the 40-scale grading plan review of the property.

6.1.5 Soils within the site do not possess a potential for liquefaction.

6.1.6 Groundwater was not encountered to a depth of 61 feet during this investigation. Furthermore, onsite well data indicates groundwater has historically been greater than 300 feet bgs. Therefore, groundwater related problems are not anticipated to be encountered during site development.

6.1.7 Active faulting does exist within the property. Accordingly, building setback zones have been recommended for the fault zones. Preliminary building setback zones are plotted on Figure 1. The surveyed building setback zones will be noted in the *Fault Evaluation Report.*

6.1.8 The majority of the on-site materials consist of silty sands, and sands and generally possess a *very low* expansion potential, as defined by the Uniform Building Code (UBC) Section 18-I-B, and exhibit moderate shear strength characteristics. *Very low* to *low* expansive on-site soils are considered suitable for use as fill, capping of lots and construction of fill slopes. Materials with an expansion potential greater than *low* (if encountered) should be kept at least three feet below proposed finish grade elevations, where possible.

6.2 Soil and Excavation Characteristics

6.2.1 In our opinion, the undocumented fill, alluvial and debris flow deposits can be excavated with conventional heavy-duty grading equipment. Any oversize rock, should be placed in accordance with the *Recommended Grading Specifications* presented in Appendix C.

6.2.2 Excavations should be performed in conformance with OSHA requirements. Excavations made adjacent to property lines or the existing improvements should not be left open during hours when construction is not being performed.

6.2.3 The results of our laboratory testing indicates that the sample tested yielded water-soluble sulfate content with a *negligible* sulfate rating as defined by the 1997 Uniform Building Code (UBC) Table 19-A-4. Chemical testing indicates the soils are *mildly corrosive*. This test is a general indication only and additional testing should be performed at finish grade (materials within three feet of rough pad grade elevations).

6.2.4 Geocon does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, it is recommended that further evaluation by a corrosion engineer be performed. It is also recommended that these results, and the recommendations from the corrosion engineer be forwarded to the appropriate design team members (i.e., project architect, engineer, etc.) for incorporation into the plans and implementation during construction.

6.3 Grading

6.3.1 Grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of this section conflict with those of Appendix C the recommendations of this section take precedence.

6.3.2 Prior to grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

6.3.3 Site preparation should begin with the removal of deleterious material, trash, and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.3.4 Removal bottoms should be liberally moisture conditioned and wheel rolled to achieve an relative compaction of at least 90 percent of the maximum density prior to the placement of engineered fill.

6.3.5 Water wells should be abandoned and sealed in accordance with California Well Standards Bulletin 74-81, amended by Bulletin 74-90.

6.3.6 Undocumented fill, loose alluvium, and debris flow deposits not removed by planned grading should be removed to a depth where suitable alluvium is encountered. For the purpose of this report, suitable alluvium is considered to be naturally occurring, which possess an in-situ density equal to or greater than 85 percent of the soils maximum dry density (per ASTM D1557-02) and does not posses a porous structure. Based on the findings of this study, we estimate that the depth of removal will be approximately 5 to 9 feet below existing, natural grade. Estimated removal depths are indicated next to each boring location on the *Geotechnical Map*, Figure 2. Actual removal depths should be determined by our personnel at the time of mass grading. The lateral extent of this remedial grading should include all areas to receive surface improvements or engineered fill.

6.3.7 Remedial grading is not considered necessary within the golf course except beneath surface improvements and adjacent to the structural fills. A detail illustrating removals along the margin of the golf course is presented on Figure 4.

6.3.8 During remedial grading, temporary slopes should be planned for an inclination no steeper than 1:1 (horizontal:vertical). Grading should be scheduled to backfill against these slopes as soon as practical. Removals along the edge of grading should include excavation of unsuitable soils that would adversely affect the performance of the planned fill, i.e., extend removals within a zone defined by a line projected down and out at an inclination of 1:1 from the limit of structural grading to intersect with approved left-in-place soils.

6.3.9 After removal of surficial soils, the exposed ground surface should be scarified, moisture conditioned to slightly above optimum moisture content, and compacted. Fill soils may then be placed and compacted in layers to the design finish grade elevations. Fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of the laboratory maximum dry density and near optimum moisture content, as determined by ASTM Test Procedure D1557-02.

6.3.10 Cut lots, street areas, and building pad areas where the recommended remedial removals are less than three feet below planned finish grade should be graded such that a three foot mat of compacted fill is constructed beneath the lot and/or street. This will result in cut lots being undercut three feet and shallow fills being deepened to three feet below finished grade.

6.3.11 Building pads graded that contain a cut/fill transition will require undercutting to reduce the potential for differential settlement. The cut portion of the cut/fill transition should be undercut at least 3 feet or H/4 whichever is greater (where H refers to the maximum depth of fill within a 1:1 projection from the lot) and replaced with properly compacted *very low* to *low* expansive fill. The bottom of the undercut portion should be sloped at a minimum of 1 percent towards the fill portion.

6.4 Bulking and Shrinkage Factors

Estimates of embankment bulking and shrinkage factors are based on comparing laboratory compaction tests with the density of the material in its natural state as encountered in the exploratory excavations. It should be emphasized that variations in natural soil density, as well as in compacted fill density, render shrinkage value estimates very approximate. As an example, the contractor can compact the fill soils to any relative compaction of 90 percent or higher of the maximum laboratory density. Thus, the contractor has approximately a 10 percent range of control over the fill volume. Based on the limited work performed to date, it is our opinion that the following shrinkage and bulking factors can be used as a basis for estimating how much the on-site soils may shrink or swell (bulk) when excavated from their natural state and placed as compacted fills.

TABLE 6.4
SHRINK/BULK FACTORS

Soil Unit	Shrink/Bulk Factor
Undocumented Fill	15 to 20 percent shrink
Younger Alluvium	12 to 17 percent shrink
Colluvium	10 to 15 percent shrink
Older Alluvium	5 to 10 percent shrink
Debris Flow Deposits	10 to 15 percent shrink
Pliestocene Conglomerate	5 to 10 percent shrink

We also suggest that a subsidence value of 0.2 to 0.3 foot be utilized across the site for estimating earthwork quantities.

6.5 Slopes

6.5.1 Fill slopes constructed with the on-site soils are estimated to be stable with respect to deep seated and surficial instability to the anticipated heights of 30 feet and at an inclination of 2:1 (horizontal:vertical). Fill slopes greater than 30 feet high, if planned, should be evaluated when grading plans become available. It is anticipated that cut slopes excavated within the Pleistocene conglomerate will require buttress stabilization. **A more detailed stability analysis should be performed once 40-scale grading plans are available.** A surficial stability analysis has been performed based on an assumed 4-foot zone of saturation. This analysis is provided on Figure 3.

6.5.2 Fill slopes should be overbuilt at least 3 feet horizontally and then cut to the design finish grade. As an alternative, fill slopes may be compacted by backrolling with a sheepsfoot compactor at vertical intervals not to exceed 4 feet and then track-walked with a D-8 bulldozer, or equivalent, such that the soils are uniformly compacted to at least 90 percent to the face of the finished slope.

6.5.3 In general, cohesionless soils should not be placed in the outer 15 feet of the face of fill slopes.

6.5.4 Slopes should be planted, drained and maintained to reduce erosion. Due to the very granular nature of the majority of the site soils, consideration should be given to landscaping the slopes relatively soon after completion to reduce the potential for surficial erosion.

6.6 Foundations

6.6.1 The following preliminary foundation recommendations are for one-and/or two-story residential structures. The recommendations are separated into categories dependent upon the expansive characteristics and the depth and geometry of fill underlying a particular building pad and/or lot. Final foundation design recommendations for each building will be presented in the final compaction report after the grading for the individual building pads has been completed. Foundation recommendations for the commercial structures and educational facilities will require additional subsurface exploration and analyses which should be performed when the building loads and locations are known.

6.6.2 Foundations for either Category I, II, or III, as described in Table 6.6.2, may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads such as wind or seismic forces.

TABLE 6.6.2
FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars One top and bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars Two top and bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars Two top and bottom	No. 3 bars at 18 inches on center, both directions

CATEGORY CRITERIA

Category I: Maximum fill thickness is less than 20 feet or Expansion Index is less than or equal to 50, or differential fill thickness is less than 10 feet.

Category II: Maximum fill thickness is less than 50 feet or Expansion Index is less than or equal to 90, or variation in fill thickness is between 10 feet and 20 feet across any one building.

Category III: Fill thickness exceeds 50 feet, or variation in fill thickness exceeds 20 feet, or Expansion Index exceeds 90, but is less than 130.

Notes:

1. Footings should have a minimum width of 12 inches.
2. Footing depth is measured from lowest adjacent subgrade (including topsoil, if planned). These depths apply to both exterior and interior footings.
3. Interior living area concrete slabs should be at least 4 inches thick for Categories I and II and 5 inches thick for Category III. This applies to both building and garage slabs-on-grade.
4. Interior concrete slabs should be underlain by at least 4 inches (3 inches for a 5-inch slab) of clean sand or crushed rock.
5. Slabs expected to receive moisture sensitive floor coverings or used to store moisture sensitive materials should be underlain by at least a 10-mil vapor barrier covered with at least 2 inches of the clean sand recommended in No. 4 above.

6.6.3 For Foundation Category III, the structural slab design should consider using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

6.6.4 No special subgrade preparation is deemed necessary prior to placing concrete, however, the exposed foundation and slab subgrade soils should be sprinkled, as necessary, to maintain a moist soil condition as would be expected in any such concrete placement. However, where drying of subgrade soils has occurred, reconditioning of surficial soils will be required. This recommendation applies to foundations as well as exterior concrete flatwork.

6.6.5 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building and wall footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- Where the height of the fill slope exceeds 20 feet for buildings and other improvements except walls, the minimum horizontal distance should be increased to H/3 (where H equals the vertical distance from the top of the slope to the toe) but need not exceed 40 feet. For composite (fill over cut) slopes, H equals the vertical distance from the top of the slope to the bottom of the fill portion of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- For fill slopes inclined at 3:1 (horizontal:vertical) or flatter, the bottom outside edge of building and wall footings should be at least 5 feet horizontally from the face of the slope, regardless of slope height.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, it is recommended that the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height.
- Although other improvements which are relatively rigid or brittle, such as concrete flatwork or masonry walls may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon should be consulted for specific recommendations

6.6.6 As an alternative to the foundation recommendations for each category, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (UBC Section 1816). Although this procedure was developed for expansive soils, it is understood that it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on the following table entitled *Post-Tensioned Foundation System Design Parameters* for the particular Foundation Category designated. It is recommended that post-tensioned slabs have a minimum thickness of 5 inches. Recommended allowable soil bearing pressures are presented in Section 6.6.2.

TABLE 6.6.6
PRELIMINARY POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Design Parameters	Foundation Category		
	I	II	III
1. Thornthwaite Index	-20	-20	-20
2. Clay Type – Montmorillonite	Yes	Yes	Yes
3. Clay Portion (Maximum)	30%	50%	70%
4. Depth to Constant Soil Suction	7.0 ft.	7.0 ft.	7.0 ft.
5. Soil Suction	3.6 ft.	3.6 ft.	3.6 ft.
6. Moisture Velocity	0.7 in./mo.	0.7 in./mo.	0.7 in./mo.
7. Edge Lift Moisture Variation Distance	2.6 ft.	2.6 ft.	2.6 ft.
8. Edge Lift	0.41 in.	0.78 in.	1.15 in.
9. Center Lift Moisture Variation Distance	5.3 ft.	5.3 ft.	5.3 ft.
10. Center Lift	2.12 in.	3.21 in.	4.74 in.

CATEGORY CRITERIA

Category I:	Maximum fill thickness is less than 20 feet or Expansion Index is less than or equal to 50, or differential fill thickness is less than 10 feet.
Category II:	Maximum fill thickness is less than 50 feet or Expansion Index is less than or equal to 90, or variation in fill thickness is between 10 feet and 20 feet across any one building.
Category III:	Fill thickness exceeds 50 feet, or variation in fill thickness exceeds 20 feet, or Expansion Index exceeds 90, but is less than 130.

Note:

Slabs to receive moisture sensitive floor coverings or used to store moisture sensitive materials should be underlain by a vapor barrier positioned at the midway point within a 4 inch clean sand bed.

6.6.7 Our experience indicates post-tensioned slabs are susceptible to edge lift, regardless of the underlying soil conditions, unless reinforcing steel is placed at the bottom of the perimeter footings and the interior stiffener beams. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The foundation system should be designed to reduce the potential of edge lift occurring for the proposed structures.

6.6.8 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soils and differential settlement of fills of varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entry slab corners occur.

6.7 Retaining Walls and Lateral Loads

6.7.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 30 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2.0 to 1.0, an active soil pressure of 40 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index of less than 50. For those lots with finish grade soils having an Expansion Index greater than 50 and/or where backfill materials do not conform to the above criteria, Geocon should be consulted for additional recommendations.

6.7.2 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining wall portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure.

6.7.3 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes, etc.) is not recommended where the seepage could be a nuisance or otherwise adversely impact the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (Expansion Index less than 50) backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are anticipated, or if specific drainage details are desired, Geocon should be contacted for additional recommendations.

6.7.4 In general, wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index of less than 50. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon should be consulted where such a condition is anticipated.

6.7.5 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed natural soils. The allowable passive pressure assumes a horizontal surface extending at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. An allowable friction coefficient of 0.4 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

6.7.6 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls are planned, such as crib-type walls, Geocon should be consulted for additional recommendations.

6.8 Flexible Pavement Design

6.8.1 The following pavement sections are preliminary. Final pavement design sections should be determined once subgrade elevations have been attained and R-Value testing on subgrade soils is performed. These preliminary pavement thicknesses were determined using procedures outlined in the *California Highway Design Manual* (Caltrans) and are based on an assumed R-Value of 30. The city of Banning was consulted with respect to pavement requirements. The City indicated that pavement recommendations should be determined by the project engineer. Summarized below are the recommended preliminary pavement section thicknesses.

TABLE 6.8.1
PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Base (inches)
Minor Streets	5.0	3.0	6.0
Collector Streets	6.0	3.0	9.0

Greater thicknesses may be required by the local governing agency.

6.8.2 Asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the *Standard Specifications of the State of California Department of Transportation* (Caltrans).

6.8.3 Prior to placing base material, the subgrade should be scarified to a depth of at least 12 inches, moisture conditioned and compacted to a minimum of 95 percent relative compaction per ASTM D1557-02. The base materials should also be compacted to at least 95 percent relative compaction. Asphalt concrete should be compacted to a minimum of 95 percent of the Hveem density.

6.8.4 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade and subsequent pavement distress.

6.9 Slope Maintenance

6.9.1 Slopes that are steeper than 3:1 (horizontal to vertical) may be, under conditions which are both difficult to prevent and predict, susceptible to near surface (surficial) slope instability. The instability is typically limited to the outer three feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

6.10 Drainage

6.10.1 Adequate drainage provisions are imperative. Under no circumstances should water be allowed to pond adjacent to footings. The building pads should be properly finish graded after the buildings and other improvements are in place so that drainage water is directed away from foundations, pavements, concrete slabs, and slope tops to controlled drainage devices.

6.11 Plan Review

6.11.1 The soil engineer and engineering geologist should review the grading plans prior to finalization to verify their compliance with the recommendations of this report and determine the necessity for additional analyses and/or recommendations. Should a post-tensioned foundation system be selected for the project, the soils engineer should be provided the opportunity to review the structural foundation plans prior to finalizing to verify substantial conformance with the recommendations of this report.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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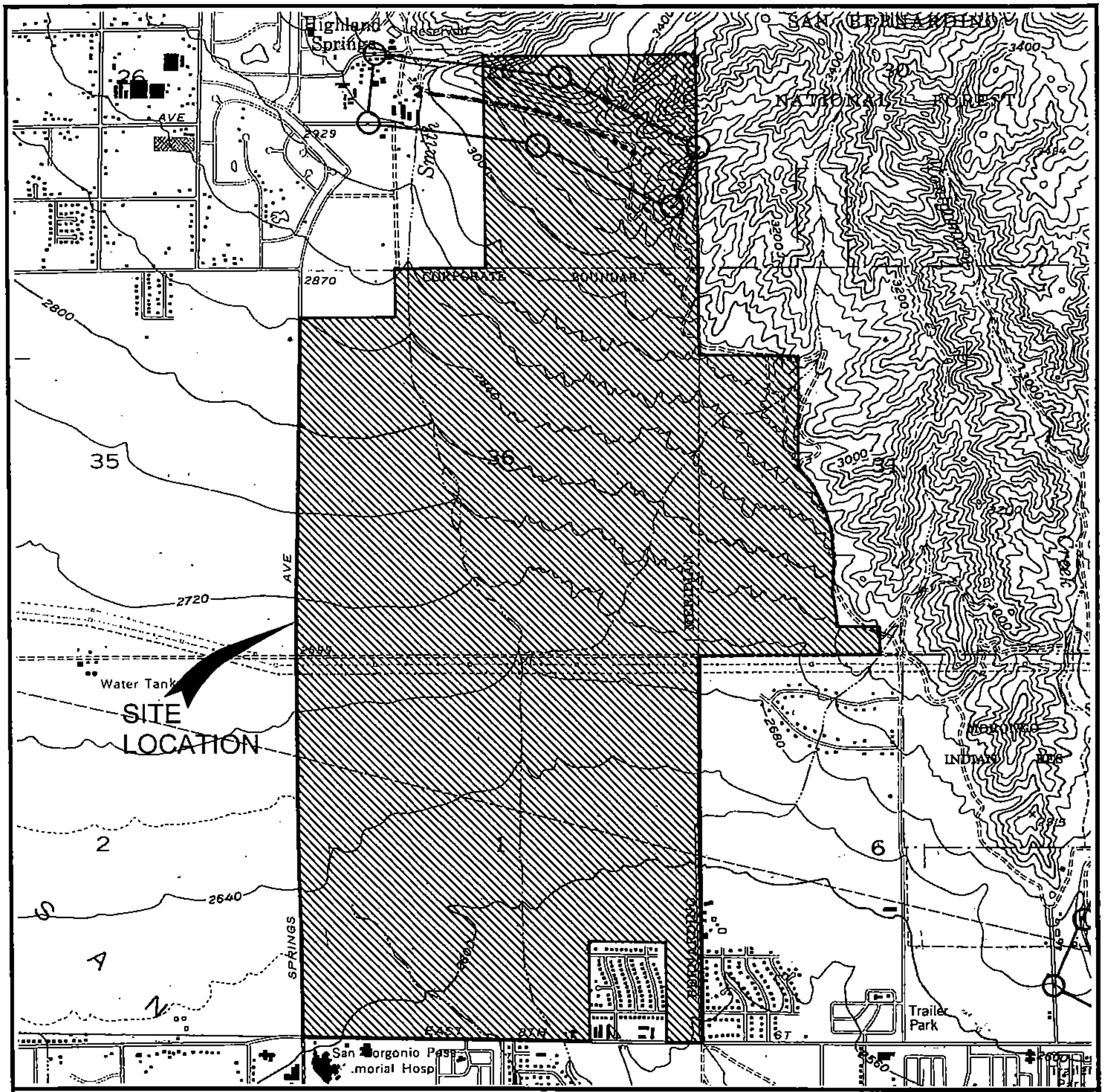
Continental Aerial Photo Inc.
Aerial Photographs

Date	Photograph Numbers	Scale
6-1-49	12F-148 & 149	1"=1666'
6-1-49	12F-52 & 53	1"=1666'
5-9-67	1HH-217 & 284	1"=1600'
1-15-76	PC11-1 & 2	1"=4000'
2-15-77	RIV2-16 & 17	1"=4500'
2-15-77	RIV3-18 & 19	1"=4500'
6-12-90	C83-12-5 & 6	1"=2800'
5-19-93	C98-17-176 & 177	1"=2000'
7-11-95	C114-31-126 & 127	1"=2000'
10-16-97	C119-31-123 & 124	1"=2000'
2-23-99	C133-31-101 & 102	1"=2000'

Riverside County Flood Control and Water Conservation District
Aerial Photographs

Date	Photograph Numbers	Scale
5-5-48	149-152 & 161-164	1 inch = 1000 feet
1-29-62	2-226, 227, 259, & 260	1 inch = 2000 feet
5-24-74	105, 106, 180, & 181	1 inch = 2000 feet
1-23-80	106, 108, 109, 182, & 183	1 inch = 2000 feet
2-7-84	1542, 1543, 1544, 1652, 1653, & 1654	1 inch = 1600 feet
2-22-90	4-40 & 43; 3-42 & 44	1 inch = 1600 feet
1-28-95	3-38 & 40; 4-40 & 43	1 inch = 1600 feet
3-2-00	3-40 & 42; 4-42 & 44	1 inch = 1600 feet



SOURCE: USGS Earthquake Fault Zones map,
7.5 minutes series, Beaumont
Quadrangle, dated 6/1/95.

N

SCALE

0 2,000 Feet

GEOCON
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SITE VICINITY MAP

DEUTSCH PROPERTY
HIGHLAND SPRINGS AVE. AT WILSON ST.
BANNING, CALIFORNIA

DATE: **6/29/2005** PROJECT NO.: T2305-12-01 FIG. 1

ASSUMED CONDITIONS:

Slope Height	H	=	Infinite	
Depth of Saturation	Z	=	4 feet	
Slope Inclination	2:1	(Horizontal:Vertical)		
Slope Angle	i	=	26.6	degrees
Unit Weight of Water	γ_w	=	62.4	pounds per cubic foot
Total Unit Weight of Soil	γ_t	=	130	pounds per cubic foot
Angle of Internal Friction	ϕ	=	32	degrees
Apparent Cohesion	C	=	260	pounds per square foot

Slope saturated to vertical depth Z below slope face.
Seepage forces parallel to slope face

ANALYSIS:

$$FS = \frac{C + (\gamma_t - \gamma_w) Z \cos^2 i \tan \phi}{\gamma_t Z \sin i \cos i} = 1.9$$

REFERENCES:

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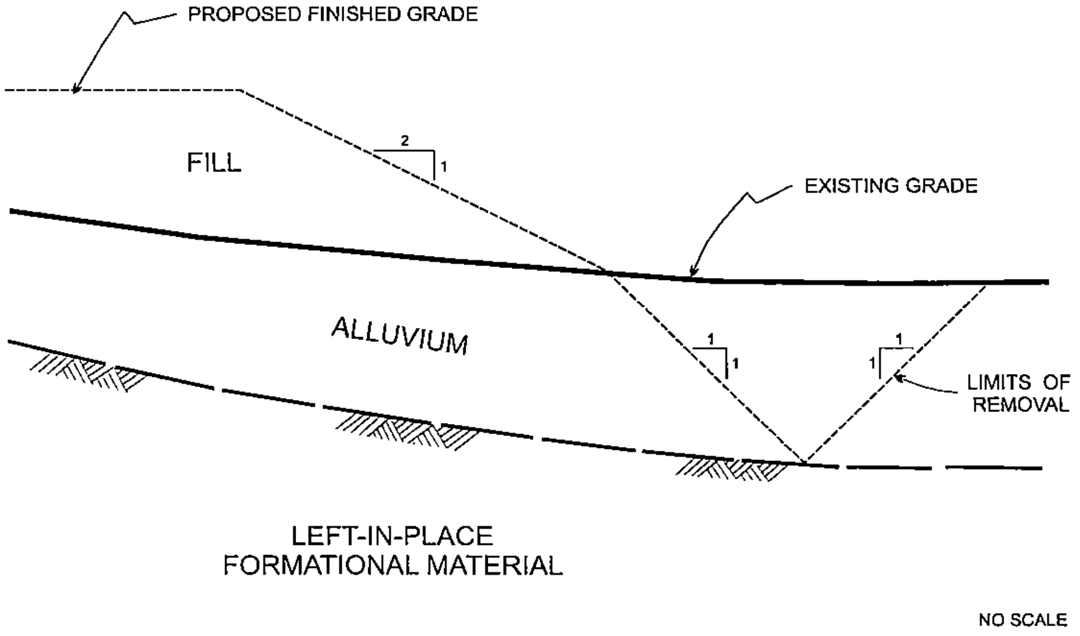
SURFICIAL SLOPE STABILITY ANALYSIS

DEUTSCH PROPERTY,
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

FIGURE 3



NOTE:

SLOPE OF BACKCUT MAY BE STEEPENED WITH THE APPROVAL OF THE
SOILS ENGINEER WHERE BOUNDARY CONSTRAINTS LIMIT EXTENT OF REMOVALS.

CONSTRUCTION DETAIL FOR LATERAL EXTENT OF REMOVAL

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DEUTSCH PROPERTY
HIGHLAND SPRINGS AVE. AT WILSON ST.
BANNING, CALIFORNIA

LB / RSS		DSK / E000D	DATE 6/29/2005	PROJECT NO. T2305 - 12 - 01	FIG. 4

T2305LB_COFLER / RSS

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on April 4 through 7, 14, 15, and 18 and May 12, 2005, and consisted of a site reconnaissance and the excavation of 14 small-diameter borings and 46 geotechnical trenches. The borings were advanced using a CME 75 and a Mobil B-61 truck-mounted drill rigs to a maximum depth of 61 feet below existing grade. During drilling, relatively undisturbed soil samples were obtained by driving a 3-inch O.D., split-tube sampler 12 inches into the undisturbed soil mass with blows from a 140-pound hammer falling a distance of 30 inches. The sampler was equipped with 1-inch by 2 3/8-inch diameter brass rings to facilitate laboratory testing. Bulk and Standard Penetrometer (SPT) samples were also collected.

The soil conditions encountered in the excavations were visually examined, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). Logs of the borings and geotechnical trenches are presented on Figures A-1 through A-60. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The approximate locations of the exploratory excavations are shown on the *Geotechnical Map*, Figure 2.

In-situ density and moisture testing was performed within the fault trenches with a nuclear gage. The following Table A1 provides the dry density and moisture information for each test.

Table A1

Test No.	Location Trench # and Station	Depth Below Natural Ground feet	In-situ Dry Density	In-situ Moisture Content
1	T-1 @ 430	-15	108.6	11.7
2	T-1 @ 670	-5	108.7	10.8
3	T-1 @ 670	-10	108.5	12.9
4	T-1 @ 670	-15	114.4	13.5
5	T-1@ 945	-15	108.9	11.4
6	T-1 @ 1360	-15	105.1	11.1
7	T-2 @ 70	-5	102.5	13.9
8	T-2 @ 70	-10	103.1	14.2
9	T-2 @ 70	-15	114.5	10.3
10	T-3 @ 150	-10	114.9	9.7
11	T-3 @ 205	-10	112.6	14.3
12	T-3 @ 310	-10	120.4	9.2
13	T-4 @ 200	-5	116.1	12.1
14	T-4 @ 200	-10	111.8	13.4
15	T-7 @ 80	-20	123.4	5.1
16	T-7 @ 80	-15	111.2	10.7
17	T-7 @ 80	-10	123.6	9.5
18	T-6 @ 70	-5	114.6	11.5
19	T-6 @ 70	-10	109.6	9.5
20	T-6 @ 70	-15	113.1	10.0
21	T-6 @ 210	-5	96.5	13.4
22	T-6 @ 210	-10	108.2	10.6
23	T-6 @ 210	-15	115.9	10.4
24	T-9 @ 120	-5	105.5	9.9
25	T-9 @ 120	-10	114.7	10.3
26	T-9 @ 120	-15	113.8	11.0
27	T-5 @ 170	-10	108.5	9.8
28	T-5 @ 170	-15	102.9	12.4
29	T-5 @ 60	-15	98.3	16.2
30	T-8 @ 150	-10	114.5	14.8
31	T-8 @ 150	-15	118.6	12.6
32	T-8 @ 150	-20	114.8	10.0
33	T-8 @ 80	-15	116.8	127.6
34	T-10 @ 200	-10	105.7	9.1
35	T-10 @ 200	-15	110.4	8.7
36	T-10 @ 200	-20	107.0	10.4
37	T-10 @ 70	-20	121.3	8.9

PROJECT NO. T2305-12-01

BORING B 1

ELEV. (MSL.) 2797'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty, fine to coarse SAND			
2								
	B1-1				-Loose at 3 feet	8	107.5	4.9
4								
6	B1-2			SM	-Very loose, moist, trace gravel at 6 feet	6	108.5	12.0
8								
	B1-3				-Loose, moist, rootlets at 9 feet	7	115.5	9.5
10								
12	B1-4				**PLEISTOCENE CONGLOMERATE (Qps)** Loose, moist, yellow brown, Silty, fine to coarse SAND with gravel and cobbles	11	106.6	7.2
14								
	B1-5					14		
16				SM				
18								
20	B1-6				-Loose, moist, red brown, silty to clayey, fine to coarse sand with gravel	9		
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled			

Figure A-1,
Log of Boring B 1, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS
◫ ... SHELBY TUBE
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 2

ELEV. (MSL.) 3070'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty, fine to coarse SAND with gravel			
2								
	B2-1					5	111.1	7.8
4								
6	B2-2			SM	-Loose, yellowish brown, increase gravel at 6 feet	11	120.3	9.6
8								
	B2-3					9	113.6	9.6
10								
12	B2-4				**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellowish brown, Silty, fine to coarse SAND with gravel, porous	16		
14								
	B2-5				-Trace clay at 15 feet	16		
16				SM				
18								
20	B2-6				-Increase coarse sand at 20 feet	28		
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled			

Figure A-2,
Log of Boring B 2, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 3

ELEV. (MSL.) 2945'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty, fine to coarse SAND with gravel			
2								
	B3-1				-Loose, yellow brown at 3 feet	8	113.1	11.5
4								
6	B3-2				-Medium dense, trace clay at 6 feet	16		5.2
8				SM				
	B3-3				-Loose, moist at 9 feet	14	118.5	14.0
10								
12	B3-4					14	115.3	14.7
14								
	B3-5				**PLEISTOCENE CONGLOMERATE** Medium dense, damp, light yellow brown, Silty, fine to coarse SAND with gravel	38		
16								
18				SM				
20	B3-6				-Very dense, some weathered cobbles at 20 feet	50/6"		

BORING TERMINATED AT 21 FEET
No groundwater encountered
Backfilled

Figure A-3,
Log of Boring B 3, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 4

ELEV. (MSL.) 2905'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty, fine to coarse SAND with gravel			
2								
	B4-1			SM		6	113.6	8.2
4								
6								
	B4-2				Loose, moist, yellow brown, SILT and fine to coarse SAND with gravel	12	119.6	10.7
8								
	B4-3			ML/SP		10	117.5	11.9
10								
12								
	B4-4				**PLEISTOCENE CONGLOMERATE** Medium dense, damp to moist, yellow brown, Silty, fine to coarse SAND with gravel	16		
14								
	B4-5					21		
16				SM				
18								
20								
	B4-6					28		
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled			

Figure A-4,
Log of Boring B 4, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 5

ELEV. (MSL.) **2800'±** DATE COMPLETED **04-14-2005**

EQUIPMENT **CME 75**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, yellow brown, Silty, fine to coarse SAND with gravel			
2								
	B5-1				-Loose at 3 feet	7	116.3	7.9
4								
				SM				
6	B5-2				-Very loose, moist, red brown, trace clay at 6 feet	4	95.9	10.6
8								
	B5-3				Very loose, moist, red brown, fine to coarse Sandy SILT with trace clay	5	122.3	14.0
10								
12	B5-4					8	120.5	12.0
					-Loose at 12 feet			
14				ML				
	B5-5				-Medium dense at 15 feet	21		
16								
18								
20	B5-6				**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine to coarse SAND with gravel and cobbles	22		
22								
				SM				
24								
	B5-7					23		
26								
28								

Figure A-5,
Log of Boring B 5, Page 1 of 2

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◣ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 5

ELEV. (MSL.) **2800'±** DATE COMPLETED **04-14-2005**

EQUIPMENT **CME 75**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B5-8			SM	-Medium dense, damp, yellow brown, Silty, fine to coarse SAND with gravel and cobbles (severely weathered)	23		
32								
34								
	B5-9				-Very dense, damp, light yellow brown, excavates as Silty, fine SAND with gravel and cobble size rock chunks	50/6"		
36								
38								
40	B5-10					64		

BORING TERMINATED AT 41.5 FEET (Refusal)
No groundwater encountered
Backfilled

Figure A-5,
Log of Boring B 5, Page 2 of 2

T2305-12-01.GPJ

SAMPLE SYMBOLS	▯ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 6

ELEV. (MSL.) 2735'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM** Very loose, damp, light brown, Silty, fine to coarse SAND with gravel, rootlets			
2								
4	B6-1				-Loose, increased silt content at 3 feet	7	115.8	9.3
6	B6-2			ML	Soft, damp, yellow brown, fine Sandy SILT with trace coarse sand	6	121.9	12.2
8								
10	B6-3				-Medium stiff, moist at 9 feet	7	118.3	13.8
12	B6-4			SM	Loose, moist, yellow brown, Silty, fine SAND with trace coarse sand	7	111.3	15.3
14								
16	B6-5			SM	**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine SAND with trace coarse sand, porous	16		
18								
20	B6-6				-Orange brown, some gravel at 20 feet	19		
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled			

Figure A-6,
Log of Boring B 6, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 7

ELEV. (MSL.) 2775'± DATE COMPLETED 04-14-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty, fine to coarse SAND with gravel			
2								
	B7-1					5		
4								
6	B7-2					5	112.7	8.0
8				SM				
	B7-3				-Moist, trace rootlets	5	106.9	9.5
10								
12	B7-4				-Yellow brown at 12 feet	5	120.3	9.2
14								
	B7-5				**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine to coarse SAND	17		
16								
18				SM	-No recovery at 15 feet			
20	B7-6					26		
					BORING TERMINATED AT 21 FEET (Refusal) No groundwater encountered Backfilled			

Figure A-7,
Log of Boring B 7, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 8

ELEV. (MSL.) 2657'± DATE COMPLETED 04-15-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, brown, Silty, fine SAND with gravel and trace coarse sand and rootlets			
2								
	B8-1					9	113.9	6.8
4								
6	B8-2				-Moist, red brown, porous at 6 feet	4	107.0	13.4
8				SM				
	B8-3				-Increased gravel at 9 feet	6	120.1	12.9
10								
12	B8-4				-Medium dense, some clay at 12 feet	13	118.7	14.8
14								
	B8-5				**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine SAND with trace clay, gravel, and coarse sand	33		
16								
18				SM				
20	B8-6				-Increase clay at 20 feet	34		
					BORING TERMINATED AT 21 FEET No groundwater encountered Backfilled			

Figure A-8,
Log of Boring B 8, Page 1 of 1

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 9

ELEV. (MSL.) 2610'± DATE COMPLETED 04-15-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, brown, Silty, fine SAND with trace coarse sand and gravel			
2								
	B9-1				-Medium dense, red brown at 3 feet	19		
4								
6	B9-2			SM	-Trace clay, moist at 6 feet	19	117.1	14.3
8								
	B9-3				-Orange brown at 9 feet	20	119.1	14.0
10								
					OLDER ALLUVIUM Medium dense, damp, orange brown, Silty, fine to coarse SAND with gravel (severely-weathered granitics)			
12	B9-4					40	118.8	12.0
14								
	B9-5			SM	-Very dense, gravel-sized severely-weathered rock pieces	78		
16								
18					**PLEISTOCENE CONGLOMERATE** Very dense, damp to dry, light yellow brown, excavates as Silty, fine to coarse SAND with angular gravel			
20	B9-6					49		
					BORING TERMINATED AT 21.5 FEET No groundwater encountered Backfilled			

Figure A-9,
Log of Boring B 9, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 10

ELEV. (MSL.) **2605'±** DATE COMPLETED **04-15-2005**

EQUIPMENT **CME 75**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B10-1	▨		SM	**ALLUVIUM** Very loose, damp, brown, Silty, fine SAND with trace gravel and coarse sand			8.8
2								
	B10-2	■		ML	Loose, damp, brown, fine Sandy SILT	10	125.4	11.5
4								
6	B10-3	■		SM	**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine to coarse SAND with gravel and trace clay	28	121.8	13.9
8								
	B10-4	■				21		
10								
12	B10-5	■				16		
14								
	B10-6	■			-Increased gravel and cobbles (severely weathered granitics)	40		
16								
18								
20	B10-7	■				33		

BORING TERMINATED AT 21 FEET
No groundwater encountered
Backfilled

Figure A-10,
Log of Boring B 10, Page 1 of 1

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 11

ELEV. (MSL.) 2640'± DATE COMPLETED 04-15-2005

EQUIPMENT CME 75

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B11-1				**ALLUVIUM** Very loose, damp, brown, Silty, fine SAND with gravel			
2				SM				
	B11-2				-Loose at 3 feet	9	120.1	12.5
4								
					Loose, damp, red brown, fine Sandy SILT			
6	B11-3					14	119.3	13.3
				ML				
8								
	B11-4				**OLDER ALLUVIUM** Medium dense, damp, red brown, fine Sandy SILT with trace clay, porous	22	118.0	15.5
10								
12	B11-5				-Trace medium to coarse sand and gravel at 12 feet	27		
14				ML				
	B11-6				-Increased gravel and cobbles (severely-weathered granitics)	35		
16								
18								
20	B11-7				-Mostly coarse sand at 20 feet	32		

BORING TERMINATED AT 21 FEET
No groundwater encountered
Backfilled

Figure A-11,
Log of Boring B 11, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 12

ELEV. (MSL.) 2575'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, light brown, Silty, fine to coarse SAND with gravel			
2								
4								
6	B12-1				-Moist, red brown, trace coarse sand at 5 feet	2		
8				SM				
10	B12-2					3		
12								
14								
16	B12-3				**OLDER ALLUVIUM** Medium dense, moist, orange brown, Silty, fine to coarse SAND with trace clay	11		
18								
20	B12-4			SM	-Dense, damp, light brown, with some dark gray at 20 feet	37		
22								
24								
26	B12-5				Medium dense, moist, yellow brown, Silty, fine SAND with trace medium to coarse sand and some gravel	14		
28								

Figure A-12,
Log of Boring B 12, Page 1 of 3

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◩ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 12

ELEV. (MSL.) 2575'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B12-6			SM		17		
32								
34								
36	B12-7				-Trace gravel at 35 feet	18		
38								
40	B12-8			SP/SM	Dense, damp, light brown, fine to medium SAND with trace coarse sand and silt	38		
42								
44								
46	B12-9			SM	Medium dense, moist, light brown, Silty, fine SAND with trace medium to coarse sand	20		
48								
50	B12-10				Medium dense, damp to moist, very light brown, interbedded layers of fine SAND and SILT	24		
52								
54								
56	B12-11			SM	-Dense layers at 55 feet	31		
58								

Figure A-12,
Log of Boring B 12, Page 2 of 3

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 12

ELEV. (MSL.) 2575'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B12-12 ■				-Trace gravel at 60 feet	35		
					BORING TERMINATED AT 61.5 FEET No groundwater encountered Backfilled			

Figure A-12,
Log of Boring B 12, Page 3 of 3

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 13

ELEV. (MSL.) **2587'±** DATE COMPLETED **04-18-2005**

EQUIPMENT **MOBILE B-53 4X4**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, light brown, Silty, fine to coarse SAND with gravel			
2								
4								
	B13-1					16		
6								
				SM				
8								
10	B13-2					7		
12								
14					Loose, moist, dark brown, Silty, fine SAND with trace medium to coarse sand			
	B13-3					7		
16								
				SM				
18								
					OLDER ALLUVIUM Medium dense, moist, brown gray, Silty, fine to coarse SAND with gravel			
20	B13-4					29		
22				SM				
24								
				SP/SM	**PLEISTOCENE CONGLOMERATE** Medium dense, moist, yellow brown, Silty, fine SAND with trace medium to coarse sand and gravel			
	B13-5					27		
26								
28								

Figure A-13,
Log of Boring B 13, Page 1 of 3

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 13

ELEV. (MSL.) 2587'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B13-6			SP/SM		29		
32								
34								
	B13-7				-Cobble at 35 feet	53		
36								
38								
					Medium dense, damp, yellow brown, Silty, very fine to fine SAND, moderately well cemented			
40	B13-8					28		
42								
44				SM				
	B13-9					31		
46								
48								
				SP/SM	Dense, damp, yellow brown, fine SAND with some medium to coarse cobble and gravel			
50	B13-10					41		
52								
54				SP/SM				
	B13-11				-Medium dense at 55 feet	38		
56								
58								

Figure A-13,
Log of Boring B 13, Page 2 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 13

ELEV. (MSL.) **2587'±** DATE COMPLETED **04-18-2005**

EQUIPMENT **MOBILE B-53 4X4**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B13-12 ■	⁘				30		
					BORING TERMINATED AT 61.5 FEET No groundwater encountered Backfilled			

Figure A-13,
Log of Boring B 13, Page 3 of 3

T2305-12-01 GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 14

ELEV. (MSL.) 2590'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, brown, Silty, fine to coarse SAND with gravel			
2								
4				SM				
	B14-1				-Medium dense at 5 feet	17		
6								
8								
					Loose, moist, yellow brown, Silty, fine to medium SAND with trace coarse sand			
10	B14-2					15		
12				SM				
14					**PLEISTOCENE CONGLOMERATE** Medium dense, damp, yellow brown, Silty, fine to coarse SAND with gravel			
	B14-3					33		
16								
18								
				SM				
20	B14-4				-Mostly fine sand, trace medium to coarse sand at 20 feet	24		
22								
24								
	B14-5					19		
26								
28				SM				

Figure A-14,
Log of Boring B 14, Page 1 of 3

SAMPLE SYMBOLS			
	▯ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 14

ELEV. (MSL.) 2590'± DATE COMPLETED 04-18-2005

EQUIPMENT MOBILE B-53 4X4

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B14-6				-Light yellow brown, fine to coarse sand with gravel at 30 feet	30		
32								
					Medium dense, moist, yellow brown, Silty fine SAND			
34								
	B14-7					22		
36								
38								
40	B14-8					30		
				SM				
42								
44								
	B14-9					27		
46								
48								
50	B14-10					35		
				SM				
52								
					Medium dense, moist, yellow brown, very fine to fine SAND			
54								
	B14-11					38		
56								
				SP				
58								

Figure A-14,
Log of Boring B 14, Page 2 of 3

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

BORING B 14

ELEV. (MSL.) **2590'±** DATE COMPLETED **04-18-2005**

EQUIPMENT **MOBILE B-53 4X4**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B14-12 ■					40		
					BORING TERMINATED AT 61.5 FEET No groundwater encountered Backfilled			

Figure A-14,
Log of Boring B 14, Page 3 of 3

T2305-12-01.GPJ

SAMPLE SYMBOLS			
SAMPLE SYMBOLS	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 1

ELEV. (MSL.) 2707'± DATE COMPLETED 04-04-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, moist, medium brown, Silty, fine SAND		93.8	8.0
4								
							94.1	7.7
6					-Loose to medium dense, red brown, trace clay at 6 feet			
8				SM				
10								
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-15,
Log of Trench T 1, Page 1 of 1

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 2

ELEV. (MSL.) **3122'±** DATE COMPLETED **04-04-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel		103.4	7.9
4							110.1	8.9
6								
8				SM				
10								
12								
14					-Medium dense at 13 feet			
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-16,
Log of Trench T 2, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 3

ELEV. (MSL.) **3075'±** DATE COMPLETED **04-04-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine SAND			
2				SM	**ALLUVIUM** Loose, moist, red brown, Silty, fine SAND		87.1	11.9
4					**OLDER ALLUVIUM** Dense, damp to moist, red, Silty, fine to coarse SAND with gravel and cobble			
6	T3-1 ▨							
8								
10				SM	-Medium dense at 9 feet			
12								
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered Backfilled			

Figure A-17,
Log of Trench T 3, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 4

ELEV. (MSL.) 2981'± DATE COMPLETED 04-04-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL**			
				SM	Loose, moist, red brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, moist, red brown, Silty, fine SAND, trace cobbles		96.0	12.9
4							93.5	15.3
6								
8	T4-1 ◩			SM			110.8	13.2
10								
12					-Gravel from 12 to 15 feet			
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered Backfilled			

Figure A-18,
Log of Trench T 4, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

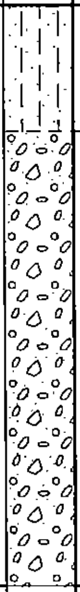
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 5

ELEV. (MSL.) 2986'± DATE COMPLETED 04-04-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
				SM	Loose, damp to moist, red brown, Silty, fine SAND with trace coarse sand			
2							115.9	16.6
					Gravelly SAND at 3 feet			
4								
					-Some boulders from 5 to 14 feet			
6								
8				GP/SM				
10								
12								
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered Backfilled			

Figure A-19,
Log of Trench T 5, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 6

ELEV. (MSL.) 2960'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T6-1 ▨				**ALLUVIUM** Loose, damp, red brown, Silty, fine SAND, some gravel and cobbles			
2								
					-Increased gravel and cobbles, medium dense at 3 feet			
4								
				SM				
6								
8								
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-20,
Log of Trench T 6, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 7

ELEV. (MSL.) **3005'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL**			
				SM	Loose, damp, red brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, moist, red brown, Silty, fine SAND			
							97.0	13.1
4								
				SM			92.1	13.2
					-Fine to coarse sand at 5 feet			
6								
8								
10					**OLDER ALLUVIUM** Loose to medium dense, moist, red, Silty, fine SAND			
12				SM				
					-Some clay from 13 to 16 feet			
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-21,
Log of Trench T 7, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 8

ELEV. (MSL.) 3045'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T8-1			SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, damp, red brown, Silty, fine SAND, trace gravel		105.5	6.7
4				SM			103.8	11.9
6								
8					**OLDER ALLUVIUM** Loose to medium dense, damp, red, Silty, fine SAND, trace gravel			
10				SM				
12								

TRENCH TERMINATED AT 13 FEET
No groundwater encountered
Backfilled

Figure A-22,
Log of Trench T 8, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 9

ELEV. (MSL.) **3200'±** DATE COMPLETED **04-04-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T9-1	▨		SM	**TOPSOIL** Loose, damp, red brown, Silty, fine to coarse SAND			
2 4 6 8 10 12				SM	**PLEISTOCENE CONGLOMERATE** Dense, damp, light brown, Silty, fine to coarse SAND with gravel and cobbles (rounded and angular) -Very dense, very light brown, highly fractured			
					TRENCH TERMINATED AT 13 FEET No groundwater encountered Backfilled			

Figure A-23,
Log of Trench T 9, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 10

ELEV. (MSL.) **3045'±** DATE COMPLETED **04-04-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL**			
				SM	Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, medium brown, Silty, fine to coarse SAND with some gravel, some caving in top 8 feet		103.7	10.7
4							103.7	12.2
6								
8				SM				
					-Moist at 8 feet			
10								
12								
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered Backfilled			

Figure A-24,
Log of Trench T 10, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 12

ELEV. (MSL.) 2950'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, red brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, moist, red brown, Silty, fine to coarse SAND, trace gravel		99.0	15.0
4							95.0	18.1
6				SM				
8								
10					-Trace clay at 10 feet			
12				SM/SC	**OLDER ALLUVIUM** Medium dense, moist, red brown, Silty to Clayey SAND, trace gravel and cobbles			
14								
					TRENCH TERMINATED AT 14.5 FEET No groundwater encountered Backfilled			

Figure A-26,
Log of Trench T 12, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 11

ELEV. (MSL.) **3030'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T11-1			SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND, trace gravel			
							103.9	7.2
4					-Red brown at 4 feet		103.3	11.5
					-Moist at 5 feet			
6								
8								
10	T11-2				-Some clay at 10 feet			
							119.4	13.4
12	T11-3							
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered Backfilled			

Figure A-25,
Log of Trench T 11, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 13

ELEV. (MSL.) **2890'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T13-1			SM	**TOPSOIL** Loose, damp, red brown, Silty, fine to coarse SAND			
2 4 6 8 10 12 14				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel, cobbles and boulders -Moist at 5 feet -Medium dense, yellow brown at 10 feet -Dense at 14 feet			
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled No density tests due to abundant rock			

Figure A-27,
Log of Trench T 13, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 14

ELEV. (MSL.) 2865'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**WEATHERED PLEISTOCENE CONGLOMERATE** Loose to medium dense, damp, red brown, Silty, fine to coarse SAND with gravel, cobbles and boulders (18 inch)		115.9	12.2
							102.6	11.8
4								
6								
8				SM				
10					-Becomes dense and red			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-28,
Log of Trench T 14, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 15

ELEV. (MSL.) **2910'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel		109.2	10.9
4							106.8	12.6
6				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine to coarse SAND with gravel			
8					-Dense at 8 feet			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-29,
Log of Trench T 15, Page 1 of 1

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 16

ELEV. (MSL.) 2915'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel and cobbles		102.6	17.4
4							103.0	18.5
6				SM	**OLDER ALLUVIUM** Medium dense, damp to moist, red, Silty, fine to coarse SAND with gravel and cobbles			
8								
10					-Dense at 10 feet			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-30,
Log of Trench T 16, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 17

ELEV. (MSL.) **2850'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T17-1	▨		SM	**TOPSOIL** Loose, damp, medium brown, Silty, fine to coarse SAND			
2		▨		SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel and trace cobbles		100.0	13.1
4		▨					105.7	11.4
6					**OLDER ALLUVIUM** Loose to medium dense, moist, red, fine to coarse SAND with gravel and trace cobbles			
8				SM	-Moist, trace clay at 8 feet			
10					-Dense at 10 feet			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-31,
Log of Trench T 17, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 18** ELEV. (MSL.) **2835'±** DATE COMPLETED **04-05-2005** EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Loose, moist, red brown, Silty, fine to coarse SAND with gravel and cobbles			
2				SM			100.4	11.7
4							104.0	14.3
6					**OLDER ALLUVIUM** Medium dense, very moist, red, Silty, fine to coarse SAND with gravel and cobbles			
8				SM				
					-Some clay, moist to wet at 9 feet			
10								
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-32,
Log of Trench T 18, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 19

ELEV. (MSL.) 2820'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, moist, dark yellow brown, Silty, fine to coarse SAND with gravel and trace cobbles		104.4	7.3
4								
6					-Medium dense, very moist at 5 feet		105.8	9.7
8				SM				
10								
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-33,
Log of Trench T 19, Page 1 of 1

SAMPLE SYMBOLS			
SAMPLE SYMBOLS	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 20

ELEV. (MSL.) **2855'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, moist, yellow brown, Silty, fine to coarse SAND with gravel		100.2	10.0
4				SM	-Very moist at 4 feet		97.7	15.6
6								
8					**OLDER ALLUVIUM** Loose to medium dense, moist, red, Silty, fine to coarse SAND			
10				SM	-Trace clay at 10 feet			
12								
					TRENCH TERMINATED AT 13 FEET No groundwater encountered Backfilled			

Figure A-34,
Log of Trench T 20, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

▩ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 21

ELEV. (MSL.) 2895'± DATE COMPLETED 04-05-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T21-1			SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel			
							99.5	10.3
4								
					-Moist at 5 feet		105.0	10.1
6								
8				SM				
10								
12								
14								

TRENCH TERMINATED AT 15 FEET
No groundwater encountered
Backfilled

Figure A-35,
Log of Trench T 21, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

▯ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 22

ELEV. (MSL.) **2825'±** DATE COMPLETED **04-05-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel			
2					-Prone to caving from 2 to 11 feet		106.5	5.3
4							102.6	8.2
6								
8				SM				
10								
					-Medium dense at 11 feet			
12								
14								
					TRENCH TERMINATED AT 15 FEET No groundwater encountered Backfilled			

Figure A-36,
Log of Trench T 22, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 23

ELEV. (MSL.) 2850'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, light brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, brown gray, Silty, fine to coarse SAND with gravel and cobbles (6 inch)		96.7	9.2
4				SM				
					-Medium dense at 5 feet		109.7	9.7
6								
8					**OLDER ALLUVIUM** Medium dense, damp, red, Silty, fine to coarse SAND with gravel and cobbles			
10								
12				SM				
					Medium dense, moist, red, Clayey, fine to coarse SAND with gravel			
14				SM				
16								

TRENCH TERMINATED AT 17 FEET
No groundwater encountered
Backfilled

Figure A-37,
Log of Trench T 23, Page 1 of 1

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. T2305-12-01

TRENCH T 24

ELEV. (MSL.) **2787'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel and trace cobbles		97.2	9.4
4				SM			93.6	10.0
6								
8					**OLDER ALLUVIUM** Loose to medium dense, damp, red, Silty, fine to coarse SAND with gravel and trace cobbles			
10								
12				SM	-Moist at 12 feet			
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-38,
Log of Trench T 24, Page 1 of 1

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 25

ELEV. (MSL.) 2770'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T25-1 ▨			SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel and trace cobbles		91.0	13.4
4					-Moist at 5 feet		85.5	17.0
8				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine to coarse SAND with gravel, trace cobbles			
10								
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-39,
Log of Trench T 25, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 26** ELEV. (MSL.) **2740'±** DATE COMPLETED **04-06-2005** EQUIPMENT **NEW HOLLAND LB 75B BACKHOE** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, moist, yellow brown, Silty, fine to coarse SAND with gravel			
							96.9	14.0
4								
							93.2	14.8
6				SM				
8								
10								
12								
14				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine to coarse SAND with gravel			

TRENCH TERMINATED AT 15 FEET
No groundwater encountered
Backfilled

Figure A-40,
Log of Trench T 26, Page 1 of 1

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 28

ELEV. (MSL.) 2715'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, very moist, yellow brown, Silty, fine to coarse SAND with gravel		87.8	14.7
4							90.1	13.9
6								
8								
10					-Medium dense at 9 feet			
12				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine to coarse SAND with gravel			
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-42,
Log of Trench T 28, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 27

ELEV. (MSL.) 2775'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T27-1	▨		SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2 4		▨		SM	**ALLUVIUM** Loose, damp, yellow brown, Silty, fine to coarse SAND with gravel and trace cobbles			
6 8 10 12 14				SM	**OLDER ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel and trace cobbles -Medium dense at 12 feet			

TRENCH TERMINATED AT 15 FEET
No groundwater encountered
Backfilled

Figure A-41,
Log of Trench T 27, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 29

ELEV. (MSL.) **2740'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2 4				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel and trace cobbles		86.5 99.4	14.8 16.6
6 8 10				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine to coarse SAND with gravel and trace cobbles -Slightly denser at 8 feet -Dense, trace clay at 10 feet -Orange brown at 11 feet			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-43,
Log of Trench T 29, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 30

ELEV. (MSL.) 2690'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2 4 6				SM	**ALLUVIUM** Loose, very moist, red brown, Silty, fine to coarse SAND with some gravel		92.5	13.2
8				SM/SC	**OLDER ALLUVIUM** Dense, damp, orange brown, Silty to Clayey, fine to coarse SAND with gravel, cobbles and boulders			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

T2305-12-01.GPJ

Figure A-44,
Log of Trench T 30, Page 1 of 1

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 31

ELEV. (MSL.) **2765'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2 4 6 8 10				SM	**ALLUVIUM** Loose, moist, red brown, Silty, fine to coarse SAND with gravel		96.5	11.8
12 14				SM/SC	**OLDER ALLUVIUM** Medium dense, moist, red, Silty to Clayey, fine to coarse SAND with gravel, cobbles and boulders			
					TRENCH TERMINATED AT 18 FEET No groundwater encountered Backfilled			

Figure A-45,
Log of Trench T 31, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 32

ELEV. (MSL.) **2825'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2 4 6 8 10				SM	**ALLUVIUM** Loose, moist, yellow brown, Silty, fine to coarse SAND with gravel and trace cobbles, prone to caving		92.8 104.9	7.2 6.9
12					TRENCH TERMINATED AT 12 FEET DUE TO CAVING No groundwater encountered Backfilled			

Figure A-46,
Log of Trench T 32, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 33

ELEV. (MSL.) 2837'± DATE COMPLETED 04-06-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T33-1 ▨			SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, brown, Silty, fine to coarse SAND with gravel		106.8	10.1
4								
6								
8				SM				
10					-Red brown at 10 feet			
12								
14								
					-Medium dense, moist, some cobbles at 15 feet			
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-47,
Log of Trench T 33, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 34

ELEV. (MSL.) **2793'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, brown, Silty, fine to coarse SAND with gravel		108.4	13.9
4							108.3	13.5
6								
8				SM				
10					-Red brown at 10 feet			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-48,
Log of Trench T 34, Page 1 of 1

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 35

ELEV. (MSL.) **2745'±** DATE COMPLETED **04-06-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T35-1 ▨			SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, very moist, red brown, Silty, fine to coarse SAND with gravel			
							86.7	12.1
4								
							107.0	11.9
6								
8								
10								
12				SM	**OLDER ALLUVIUM** Loose to medium dense, moist, red, Silty, fine to coarse SAND with gravel			
14								
	T35-2 ◩							
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-49,
Log of Trench T 35, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 36

ELEV. (MSL.) **2670'±** DATE COMPLETED **04-07-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T36-1 ▨			SM	**TOPSOIL** Loose, damp, brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, moist, brown, Silty, fine SAND			
							91.6	8.0
4							99.2	8.0
				SM				
6								
8								
10					**OLDER ALLUVIUM** Medium dense to dense, damp, red brown, Silty, fine to coarse SAND with gravel and cobbles			
12								
				SM				
14								
16								
					TRENCH TERMINATED AT 16.5 FEET No groundwater encountered Backfilled			

Figure A-50,
Log of Trench T 36, Page 1 of 1

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 37

ELEV. (MSL.) **2647'±** DATE COMPLETED **04-07-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine to coarse SAND			
2				SM	**ALLUVIUM** Loose, very moist, brown, Silty, fine to coarse SAND with trace gravel and cobbles		95.3	13.3
4								
					-Some cobbles at 5 feet		94.4	14.3
6					**OLDER ALLUVIUM** Loose to medium dense, very moist, red, Silty, fine to coarse SAND with trace gravel			
8								
10				SM	-Medium dense, trace clay at 10 feet			
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-51,
Log of Trench T 37, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

- ◫ ... SHELBY TUBE
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 38

ELEV. (MSL.) 2635'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine SAND			
2				SM	**ALLUVIUM** Loose, moist, brown, Silty, fine SAND		94.0	15.2
4								
6					-Red brown at 6 feet			
8								
10				SM	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine SAND with gravel and cobbles			
12								
					TRENCH TERMINATED AT 13 FEET No groundwater encountered Backfilled			

Figure A-52,
Log of Trench T 38, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 39

ELEV. (MSL.) 2615'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine SAND			
2				SM	**ALLUVIUM** Loose, moist, red brown, Silty, fine SAND with gravel		92.3	15.1
4							104.8	19.3
6								
8				SM/SC	**OLDER ALLUVIUM** Medium dense, moist, red, Silty, fine SAND with gravel			
10								
12								
					TRENCH TERMINATED AT 12.5 FEET No groundwater encountered Backfilled			

Figure A-53,
Log of Trench T 39, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 40

ELEV. (MSL.) 2595'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, red brown, Silty, fine SAND			
2 4 6				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine SAND with trace gravel		92.5	11.0
8 10 12 14				SM/SC	**OLDER ALLUVIUM** Medium dense, moist, red, Silty to Clayey, fine to coarse SAND with gravel and trace cobbles			
					TRENCH TERMINATED AT 14.5 FEET No groundwater encountered Backfilled			

Figure A-54,
Log of Trench T 40, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 41

ELEV. (MSL.) 2605'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T41-1 ▩			SM	**TOPSOIL** Loose, damp, red brown, Silty, fine to coarse SAND			
2					**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND with gravel			
4							104.6	15.3
				SM	-Increased gravel at 5 feet		101.6	13.7
6								
8					-Medium dense, moist at 8 feet			
10					**OLDER ALLUVIUM** Medium dense to dense, wet, orange brown, Silty, fine to coarse SAND with trace clay, gravel			
12				SM				
14	T41-2 ◣							
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-55,
Log of Trench T 41, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 42

ELEV. (MSL.) **2600'±** DATE COMPLETED **04-07-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, damp, brown to red brown, Silty, fine SAND with trace coarse sand and gravel		101.8	21.7
4				SM			106.7	20.0
6								
8					**OLDER ALLUVIUM** Medium dense, moist, red, Silty to Clayey, fine to coarse SAND with some gravel			
10								
12				SM/SC				
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-56,
Log of Trench T 42, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 43

ELEV. (MSL.) 2587'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp, red brown, Silty, fine to coarse SAND			
2							104.9	19.0
4				SM			106.8	18.1
6								
8					**OLDER ALLUVIUM** Medium dense, damp to moist, red, Silty, fine to coarse SAND with trace clay, some gravel			
10								
12				SM				
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-57,
Log of Trench T 43, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◨ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 44

ELEV. (MSL.) 2567'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T44-1			SM	**TOPSOIL** Loose, damp, yellow brown, Silty, fine to coarse SAND			
2	T44-2				**ALLUVIUM** Loose, very moist, red brown, Silty, fine to coarse SAND with gravel			
4	T44-3			SM			107.3	15.8
6	T44-4				-Medium dense at 6 feet			
8	T44-5				**OLDER ALLUVIUM** Dense, damp to dry, light yellow brown, Silty, fine SAND with trace coarse sand			
10				SM				
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-58,
Log of Trench T 44, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS

◫ ... SHELBY TUBE

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 45

ELEV. (MSL.) 2630'± DATE COMPLETED 04-07-2005

EQUIPMENT NEW HOLLAND LB 75B BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, dark brown, Silty, fine SAND			
2					**ALLUVIUM** Loose, very moist, dark red brown, Silty, fine to coarse SAND with gravel		110.8	8.9
4							113.5	9.3
6								
8				SM	-Moist, some clay at 8 feet			
10								
12								
14								
16					TRENCH TERMINATED AT 16 FEET No groundwater encountered Backfilled			

Figure A-59,
Log of Trench T 45, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	▯ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. T2305-12-01

TRENCH T 46

ELEV. (MSL.) **2655'±** DATE COMPLETED **04-07-2005**

EQUIPMENT **NEW HOLLAND LB 75B BACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty, fine SAND			
2				SM	**ALLUVIUM** Loose, damp, red brown, Silty, fine SAND with trace gravel		96.3	10.6
4								
6								
8					-Moist at 8 feet			
10								
12				SM/SC	**OLDER ALLUVIUM** Medium dense, moist, red brown, Silty to Clayey, fine to coarse SAND, trace gravel			
14				SM	Dense, damp, orange brown, Silty, fine to coarse SAND with trace gravel			

TRENCH TERMINATED AT 14 FEET
No groundwater encountered
Backfilled

Figure A-60,
Log of Trench T 46, Page 1 of 1

T2305-12-01.GPJ

SAMPLE SYMBOLS			
	◫ ... SHELBY TUBE	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected undisturbed samples were tested for their in-place dry density and moisture content and consolidation characteristics. Selected bulk samples were tested for maximum density, optimum moisture, water soluable sulfate, Chloride content, pH and resistivity, expansion index, grain size distribution, and direct shear properties. Results of the laboratory tests are presented in tabular and graphical form herewith. The results of the in-place dry density and moisture content tests have been plotted on the exploratory logs, see Appendix A. Grain size distribution graphs are presented on Figures B-1 through B-4.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D1557-02

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B10-1	Brown, Silty fine to course SAND with trace clay and gravel	132.1	9.6
T6-1	Light brown, Silty fine to course SAND with little gravel	132.3	9.7
T36-1	Dark brown, Clayey fine to course SAND with trace gravel	129.8	9.2

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D4829-95

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
B10-1	8.8	17.2	112.3	1
T6-1	8.3	21.1	119.9	0

TABLE B-III
SUMMARY OF DIRECT SHEAR TEST RESULTS*
ASTM D3080-98

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
*B10-1	118.0	10.4	275	32
*T6-1	115.9	12.6	260	41

*Samples remolded to 90 percent relative compaction at near or slightly above optimum moisture content.

TABLE B-IV
SUMMARY OF CHEMICAL TEST RESULTS

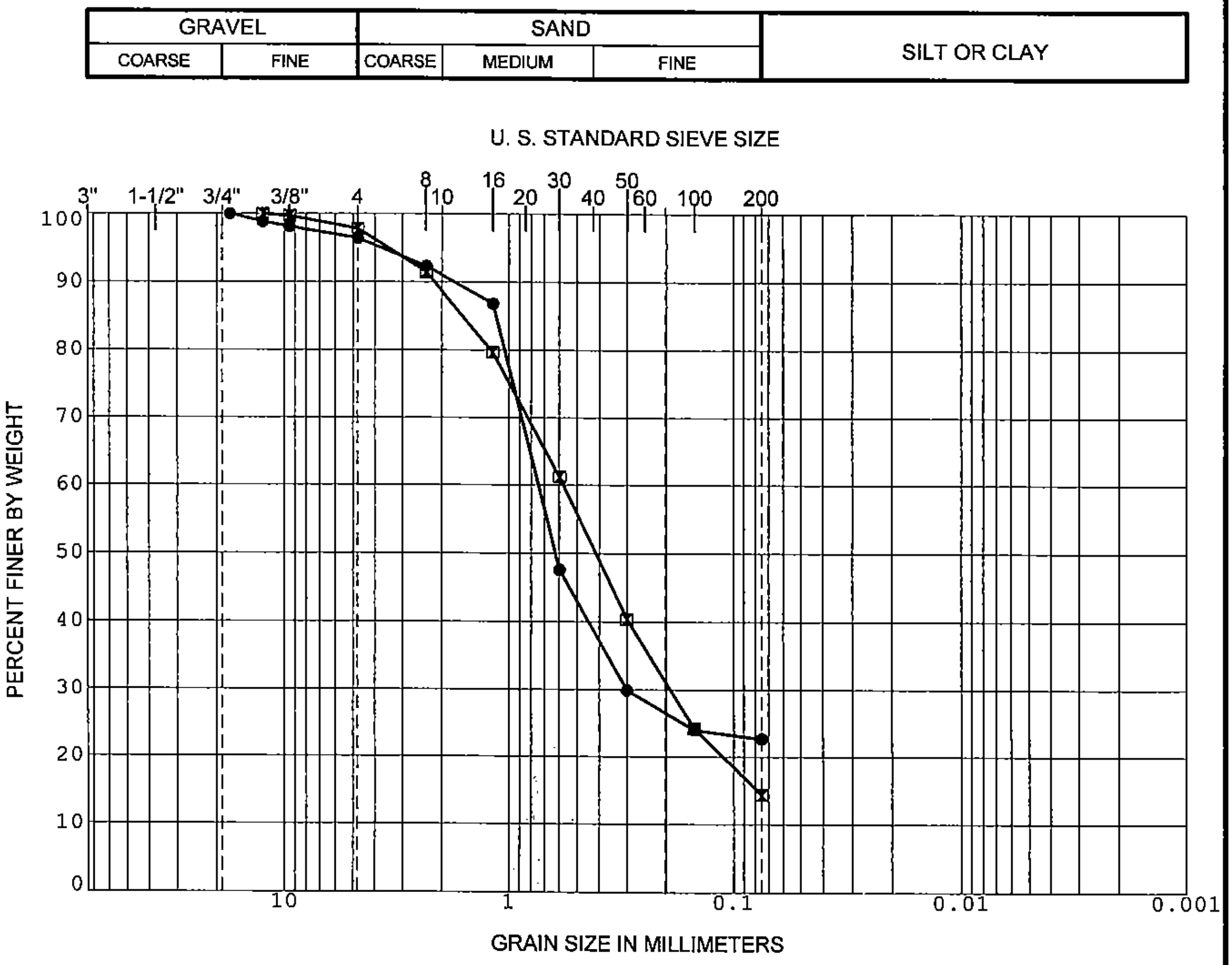
Sample No.	Chloride Content (%)	Sulfate Content (%)	pH	Resisitivity (ohm centimeters)
B10-1	0.001	0.047	7.0	7435
T6-1	Not Tested	0.010	Not Tested	Not Tested
T36-1	Not Tested	0.021	Not Tested	Not Tested

Resistivity and pH determined by Cal Trans Test 532.
Chloride content determined by California Test 422.
Water-soluable sulfate determined by California Test 417.

TABLE B-V
SUMMARY OF SINGLE-POINT CONSOLIDATION (COLLAPSE) TESTS
ASTM D2435-96

Sample No.	In-Situ Dry Density (pcf)	Moisture Content Before Test	Axial Load with Water Added (psf)	Consolidation Before Water Added (%)	Percent Collapse (After Water Added)
B1-1	112.1	6.7	2,000	2.1	0.7
B1-2	108.5	12.0	2,000	1.9	0.5
B1-3	115.5	9.5	2,000	2.3	0.8
B1-4	106.6	7.2	2,000	1.8	2.5
B2-4	116.2	10.5	2,000	1.2	0.4
B3-3	118.5	14.0	2,000	2.3	0.2
B3-4	115.3	14.7	2,000	2.3	0.1
B4-2	119.6	10.7	2,000	1.0	0.1
B5-3	122.3	14.0	2,000	3.5	0.1
B6-2	121.9	12.2	2,000	1.6	0.2
B6-3	118.3	13.8	2,000	2.3	0
B6-4	111.3	15.3	2,000	2.0	0.6
B7-2	112.7	8.0	2,000	1.5	0.8
B7-4	120.3	9.2	2,000	1.3	0.6
B9-2	117.1	14.3	2,000	1.5	0
T4-1	110.8	13.2	2,000	2.1	0.6
T11-2	119.4	13.4	2,000	1.9	0.2
T44-3	107.3	15.8	2,000	2.3	0.6

PROJECT NO. T2305-12-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B12-2	10.0	(SM) Brown, Silty, fine to coarse SAND				
⊠	B12-4	20.0	(SM) Brown, Silty, fine to coarse SAND				

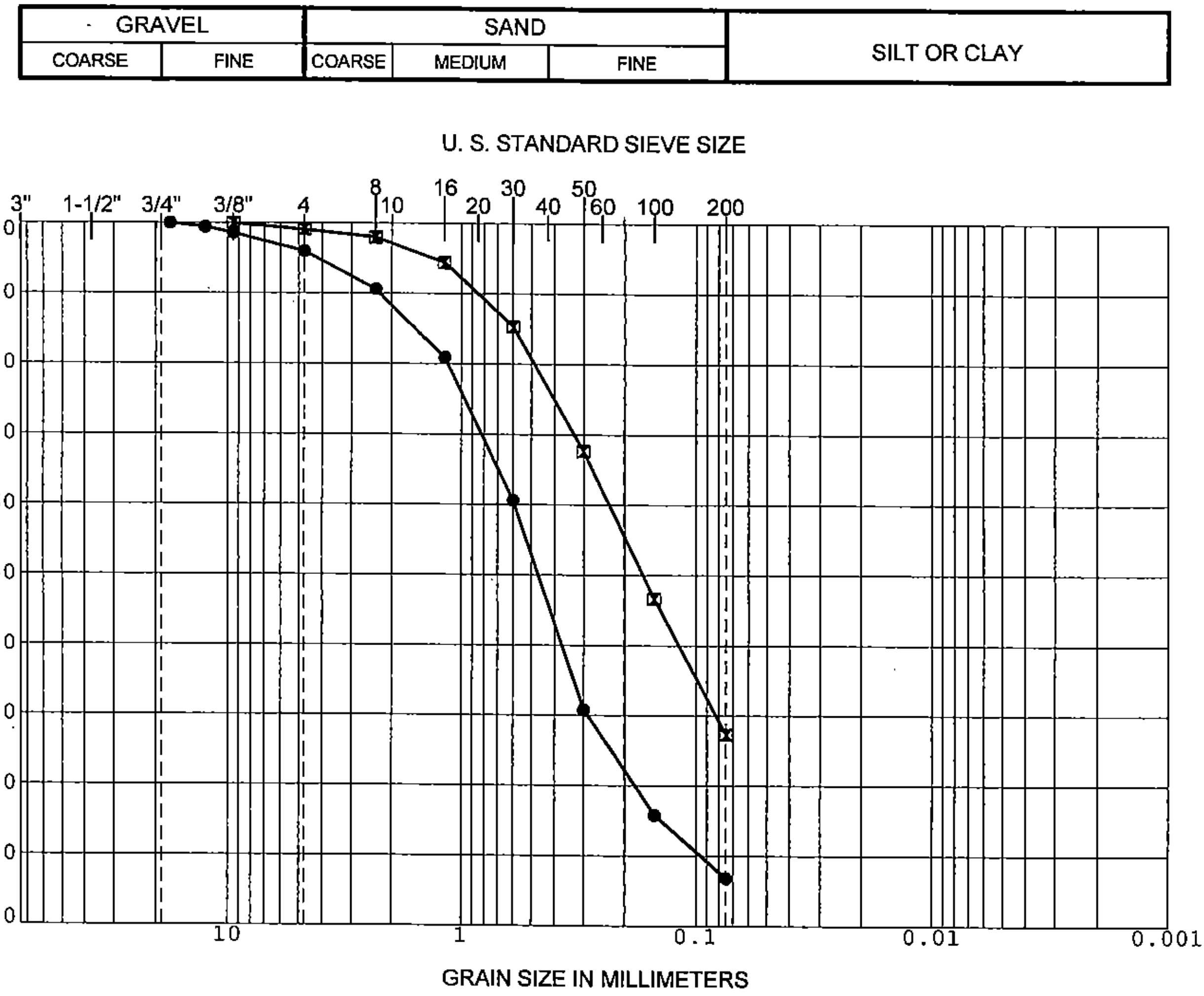
GRADATION CURVE

DUETSCH PROPERTY
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

T2305-12-01.GPJ

Figure B-1

PROJECT NO. T2305-12-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B12-8	40.0	(SP/SM) Light brown, Silty SAND				
⊠	B12-10	50.0	(SM) Dark yellowish brown, Silty SAND				

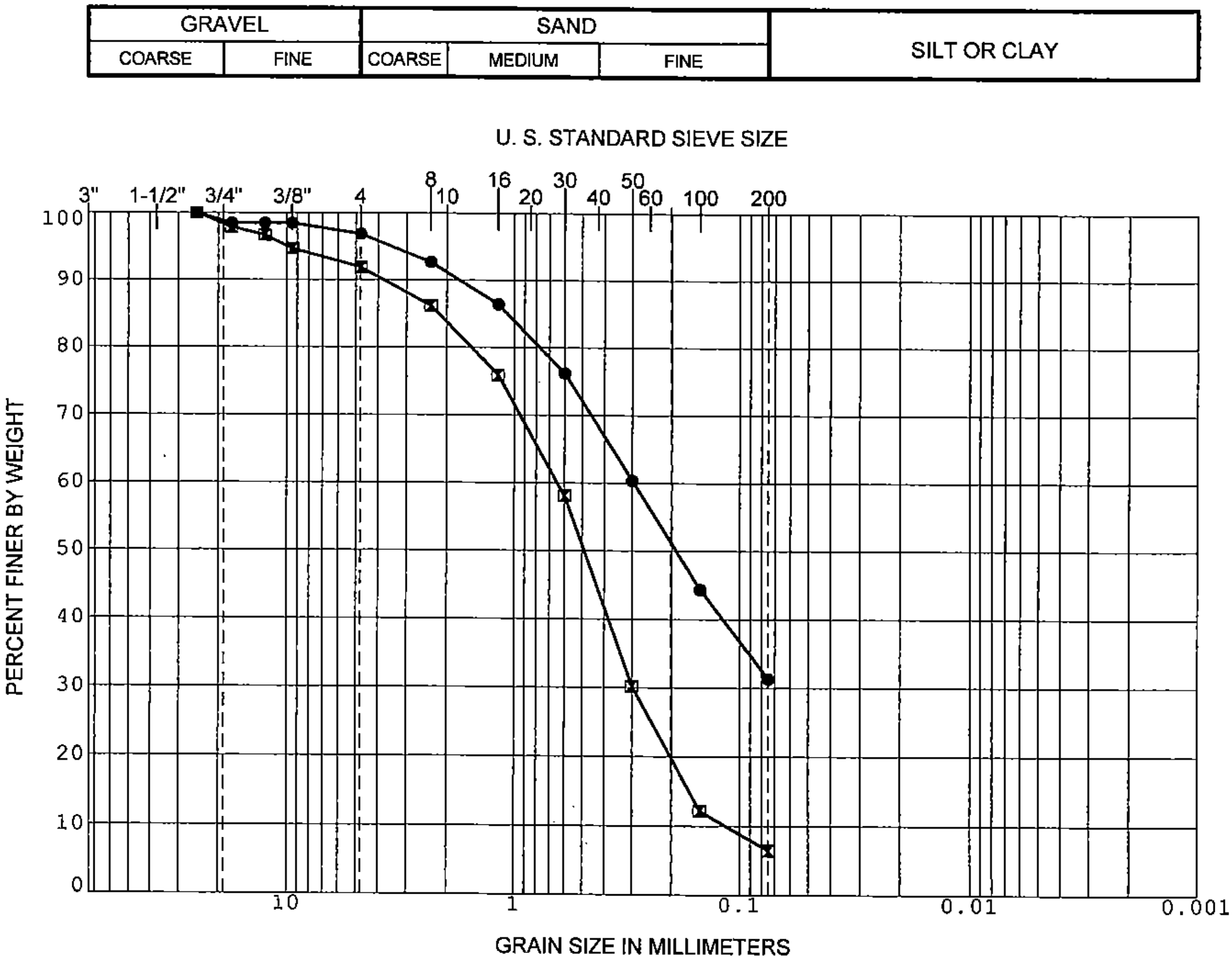
GRADATION CURVE

DUETSCH PROPERTY
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

T2305-12-01.GPJ

Figure B-2

PROJECT NO. T2305-12-01



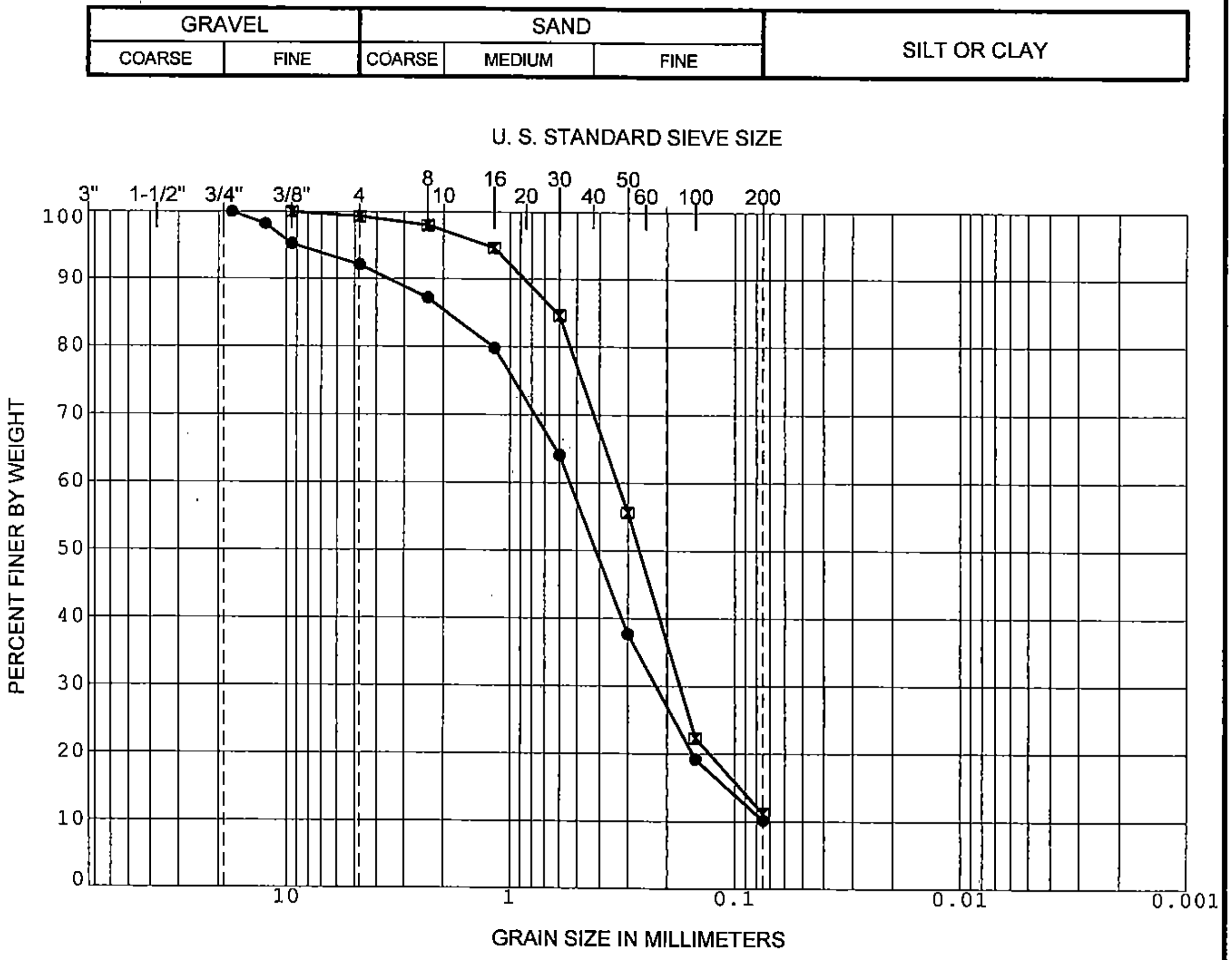
	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B13-2	10.0	(SM) Brown, Silty, fine to coarse SAND				
⊠	B13-5	25.0	(SP/SM) Brown, Silty, fine to coarse SAND				

GRADATION CURVE

DUETSCH PROPERTY
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

T2305-12-01.GPJ

PROJECT NO. T2305-12-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B13-7	35.0	(SP/SM) Brown, Silty, fine to coarse SAND				
⊠	B13-11	55.0	(SP/SM) Light brown, Silty SAND				

GRADATION CURVE

DUETSCH PROPERTY
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

DEUTSCH PROPERTY,
HIGHLAND SPRINGS AVENUE AT WILSON STREET
BANNING, CALIFORNIA

PROJECT NO. T 2305-12-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1. These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Inland Empire, Inc. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2. Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. It will be necessary that the Consultant provide adequate testing and observation services so that he may determine that, in his opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep him apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3. It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, and so forth, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that construction be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1. **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2. **Contractor** shall refer to the Contractor performing the site grading work.

2.3. **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4. **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5. **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6. **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7. **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1. Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1. **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than 3/4 inch in size.

3.1.2. **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3. **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than 3/4 inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2. Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3. Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4. The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized, provided it is acceptable to the governing agency, Owner and Consultant.

3.5. Representative samples of soil materials to be used for fill shall be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6. During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

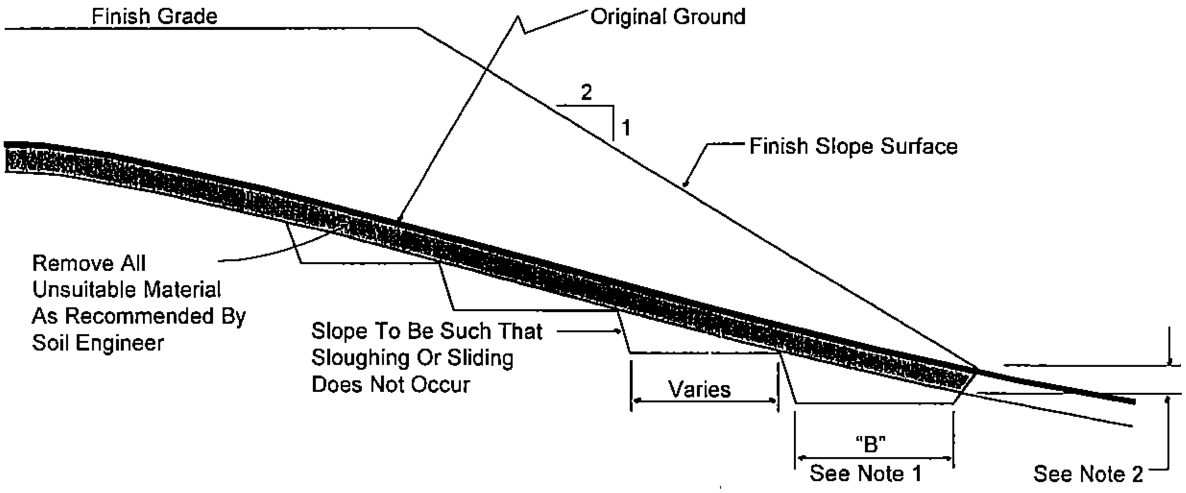
4.1. Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2. Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments which are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3. After clearing and grubbing of organic matter or other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction shall be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4. Where the slope ratio of the original ground is steeper than 6:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES:

(1) Key width "B" should be a minimum of 10 feet wide, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the bottom key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5. After areas to receive fill have been cleared, plowed or scarified, the surface should be disced or bladed by the Contractor until it is uniform and free from large clods. The area should then be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6.0 of these specifications.

5. COMPACTION EQUIPMENT

5.1. Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2. Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1. *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1. *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2. In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D1557-02.

6.1.3. When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4. When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5. After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D1557-02. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6. Soils having an Expansion Index of greater than 50 may be used in fills if placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7. Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8. As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2. *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1. Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2. Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3. For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4. For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5. Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6. All rock placement, fill placement and flooding of approved granular soil in the windrows must be continuously observed by the Consultant or his representative.

6.3. *Rock* fills, as defined in Section 3.1.3., shall be placed by the Contractor in accordance with the following recommendations:

6.3.1. The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent, maximum slope of 5 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2. *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made will be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3. Plate bearing tests, in accordance with ASTM D1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the number of passes of the compaction equipment to be performed. If performed, a minimum of three plate bearing tests shall be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4. A representative of the Consultant shall be present during *rock* fill operations to verify that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading. In general, at least one test should be performed for each approximately 5,000 to 10,000 cubic yards of *rock* fill placed.

6.3.5. Test pits shall be excavated by the Contractor so that the Consultant can state that, in his opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6. To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7. All *rock* fill placement shall be continuously observed during placement by representatives of the Consultant.

7. OBSERVATION AND TESTING

7.1. The Consultant shall be the Owners representative to observe and perform tests during clearing, grubbing, filling and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill shall be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test shall be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2. The Consultant shall perform random field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion as to whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3. During placement of *rock* fill, the Consultant shall verify that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant shall request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. If performed, plate bearing tests will be performed randomly on the surface of the most-recently placed lift. Plate bearing tests will be performed to provide a basis for expressing an opinion as to whether the *rock* fill is adequately seated. The maximum deflection in the *rock* fill determined in Section 6.3.3 shall be less than the maximum deflection of the properly compacted *soil* fill. When any of the above criteria indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4. A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5. The Consultant shall observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6. Testing procedures shall conform to the following Standards as appropriate:

7.6.1. Soil and Soil-Rock Fills:

7.6.1.1. Field Density Test, ASTM D1556-00, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2. Field Density Test, Nuclear Method, ASTM D2922-96, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3. Laboratory Compaction Test, ASTM D1557-02, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

7.6.1.4. Expansion Index Test, ASTM D4829-95, *Expansion Index Test.*

7.6.2. Rock Fills

7.6.2.1. Field Plate Bearing Test, ASTM D1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1. During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2. After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1. Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2. The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.